MOLDINO
The Edge To Innovation

CUTTING TOOLS PRODUCTS CATALOGUE

NORTH AMERICA 2023-2024 DM001A

MITSUBISHI MATERIALS U.S.A.

MOLDINO
The Edge To Innovation

Technology thoroughly applies in the service of
people and goods
Technology that values the accumulation of results
Technology that brings marvels and smiles

MOLDINO Tool Engineering, innovative product
development
Our principles are to…
be embodied in our technology

Stand together with our customers
Respond to each and every challenge for as long as necessary
Use great ideas to the creation of unique, world-beating products
Be a step ahead in fulfilling customers' dreams and visions
Take a holistic view toward manufacturing innovation

As earnest in our approach as our technology itself
Committed to doing all we can do for
our customers here and now

At MOLDINO Tool Engineering…
We grow with our customers and share in their pride
Taking on the challenge of exploring
The Edge To Innovation

Guide for Products Catalogue 2
MOLDINO's Recommended Tools 8
Carbide End Mills A
Threading Tools B
Indexable Tools Milling Inserts C
Shanks for Modular Mills, Parts D
Special shape tool E
Boring Tools F
Technical Data G
Item Code Index H

How to use this catalogue

Catalog structure

①Select the type of tool from the main index on page 1.

The major product classifications are listed on the preceding page.
You can open the catalog to the first page (intermediate index) of the section for the tool type you are looking for.

②Select the type of tool from the MOLDINO's Recommended Tools

The major product classifications are listed on the preceding page.
You can open the catalog to the first page (intermediate index) of the section for the tool type you are looking for.

③Select the tool from the intermediate index of product classifications.

The page number for each tool are listed in the intermediate index. Open the page for the tool you are looking for.
(For end mills, the tool shape classification page is listed.)

④Select the tool from the table of contents for each tool.

For indexable insert tools, end mills, and drills, immediately after the intermediate index, a summary of the details for each tool is provided for your reference.

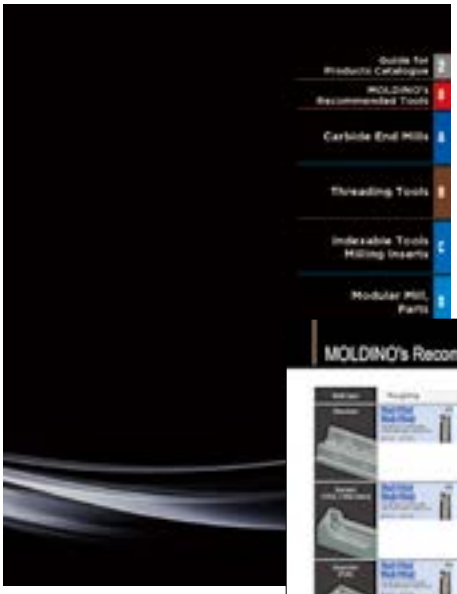
⑤Select the tool from the product code index starting on page H1.

The product codes for each tool are listed in alphabetical order.
If you know the product code, you can quickly open the page for the tool.

⑥Select the tool from the quick dimension lookup table by tool diameter (End mills & Carbide drills).

For end mills & carbide drills, a quick dimension lookup table by tool diameter is provided for your reference starting on page A10(Carbide end mills), F6(Boring tools).

① Select the type of tool from the main index.



③ Select the tool from the intermediate index of product classifications.

② Select the tool from the MOLDINO's Recommended Tools

④ Select the tool from the table of contents.

Item page structure

Product Name

Features and Applications

Product variations

If there are variations available for the product, such as regular type, short type, etc., the variations available will be listed.

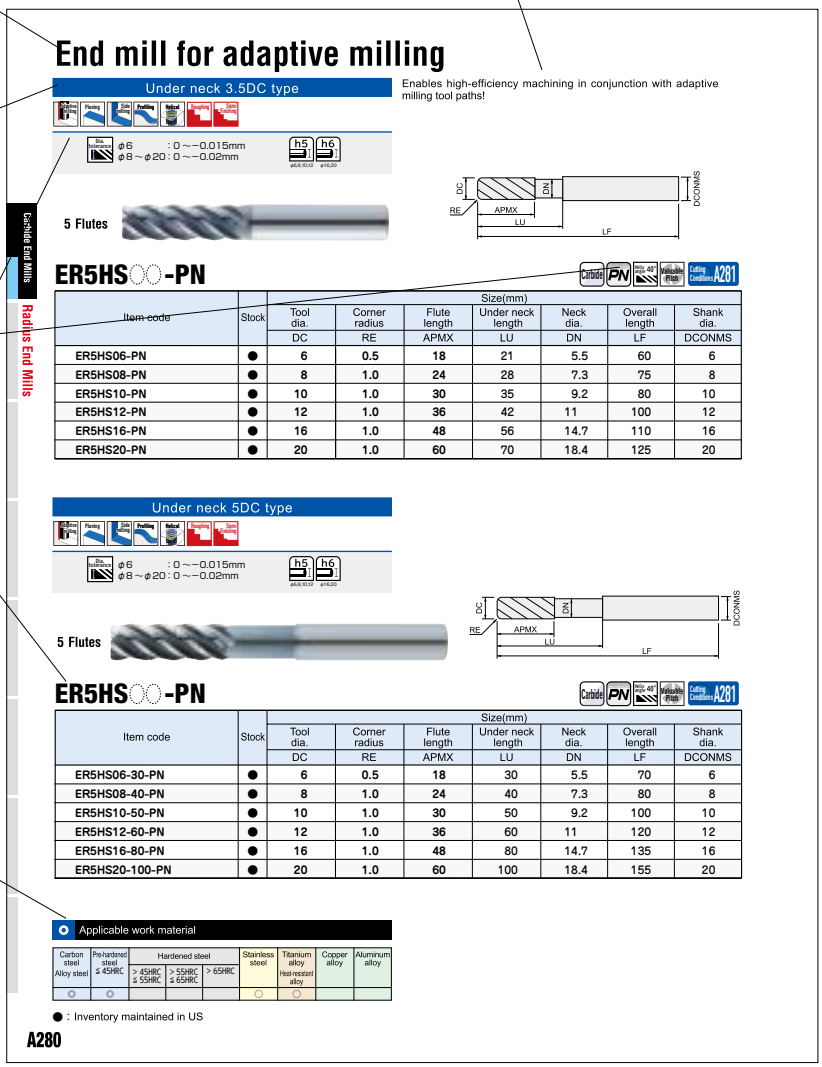
Icons

Show product statistics, applications, etc. For details of the icon meanings, refer to "Meaning of icons".

Item Code

Numeric figure in a circle ◌ and Alphabetical character comes in a square ⬚.

Applicable work material



Carbide End Mills

Radius End Mills

End mill for adaptive milling

Under neck 3.5DC type

Enables high-efficiency machining in conjunction with adaptive milling tool paths!

Slot Accuracy φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm

h5 (φ6,φ8,φ10) h6 (φ12,φ20)

5 Flutes

ER5HS○○-PN

Carbide PN Steel Alloy Stainless Alloy Cutting Conditions A281

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS
ER5HS06-PN	●	6	0.5	18	21	5.5	60	6
ER5HS08-PN	●	8	1.0	24	28	7.3	75	8
ER5HS10-PN	●	10	1.0	30	35	9.2	80	10
ER5HS12-PN	●	12	1.0	36	42	11	100	12
ER5HS16-PN	●	16	1.0	48	56	14.7	110	16
ER5HS20-PN	●	20	1.0	60	70	18.4	125	20

Under neck 5DC type

Slot Accuracy φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm

h5 (φ6,φ8,φ10) h6 (φ12,φ20)

5 Flutes

ER5HS○○-PN

Carbide PN Steel Alloy Stainless Alloy Cutting Conditions A281

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS
ER5HS06-30-PN	●	6	0.5	18	30	5.5	70	6
ER5HS08-40-PN	●	8	1.0	24	40	7.3	80	8
ER5HS10-50-PN	●	10	1.0	30	50	9.2	100	10
ER5HS12-60-PN	●	12	1.0	36	60	11	120	12
ER5HS16-80-PN	●	16	1.0	48	80	14.7	135	16
ER5HS20-100-PN	●	20	1.0	60	100	18.4	155	20

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≤ 45HRC	Hardened steel > 45HRC ≤ 55HRC	Hardened steel > 55HRC ≤ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	○				○	○		

● : Inventory maintained in US

A280

About stock table

● : Inventory maintained in US
★ : Inventory maintained in Japan
△ : Discontinued after stock run out
No Mark : Manufactured upon request only.
– : No manufactured

Specifications for the products listed in this catalog are subject to change without notice due to replacement or modification.

How to use this catalogue

Meaning of icons

Applications

High efficient side milling
Compatible with high-efficiency side cutting using load control tool paths

Profiling
Can be used for profiling.

Radius Taper
Can be used for radius taper cutting.

Planing
Can be used for planing.

Radius
Can be used for radius cutting.

Rest Material Machining
Can be used for side-open cavity cutting.

Side Cutting
Can be used for side cutting.

Helical
Can be used for helical cutting.

Corner Recessing
Can be used for corner recessing.

Slotting
Can be used for slotting.

Spot facing
Can be used for spot facing.

Miniature
Can be used for miniature cutting.

Die-sinking
Can be used for die-sinking.

Vertical
Can be used for vertical cutting.

Boring
Can be used for boring.

Types of finishing

Roughing
Can be used for roughing.

Finishing
Can be used for finishing.

Semi-Finishing
Can be used for semi-finishing.

Rib, Miniature
Can be used for rib cutting and miniature cutting.

Coating

Micro-THCoating
Super smooth THCoating has been applied.

HDCoating
New Diamond Coating has been applied.

TH3Coating
TH3Coating has been applied.

PNCoating
PNCoating has been applied.

ATCoating
ATCoating has been applied.

ATHCoating
ATHCoating has been applied.

CSCoating
Nano-composite CSCoating has been applied.

CCoating
C (century) Coating has been applied.

THCoating
Nano-composite THCoating has been applied.

SDCoating
S-DLC Coating has been applied.

GCoating
GCoating has been applied.

Tool Materials

Carbide
Carbide is used in the tool material.

CBN
CBN is used in the tool material.

Ceramic
Ceramic is used in the tool material.

Shank Specification

Straight Shank
Follows straight shank specifications.

End Mill Shank
Follows end mill shank specifications.

Integral No. Shank
Follows integral number shank specifications.

Statistics for indexable tools

Tolerance on dia.
Shows the mill diameter tolerance for the body unit.

Maximum Notch
Shows maximum notch amount.

Tolerance class
Shows tolerance class of insert

Notch angle
Shows notch angle.

Statistics for End Mills

Helix Angle
Shows the helix angle of the flute section.

Tolerance on RE
Shows RE tolerance of flute tip.

Tolerance on shank
Shows shank diameter tolerance.

Tolerance on dia.
Shows mill diameter tolerance.

Tolerance on RE
Shows corner radius tolerance of flute tip.

Unequal pitch geometry
Adopt Unequal pitch geometry.

Statistics for Drill, Non Step Borer

Helix angle
Shows the helix angle of the flute.

Tip angle
Shows the drill tip angle.

Tolerance on dia.
Shows the drill diameter tolerance.

Tolerance on shank
Shows shank diameter tolerance.

Drilling depth
Shows the maximum machining depth for the drill.

Others

Cutting condition table
Shows the corresponding page of the cutting condition tables.

Cutting movie
Our YouTube channel shows cutting movies.

Tolerance for shafts

(mm)

Standard dia. Over	Standard dia. Up to	h4	h5	h6	h7	h7	h8	h8
–	3	0 / −0.003	0 / −0.004	0 / −0.006	0 / −0.010		0 / −0.014	
3	6	0 / −0.004	0 / −0.005	0 / −0.008	0 / −0.012		0 / −0.018	
6	10	0 / −0.004	0 / −0.006	0 / −0.009	0 / −0.015		0 / −0.022	
10	18	0 / −0.005	0 / −0.008	0 / −0.011	0 / −0.018		0 / −0.027	
18	30	0 / −0.006	0 / −0.009	0 / −0.013	0 / −0.021		0 / −0.033	

WEB service for Products

Websight top page

1 CUTTING TOOLS PRODUCT CATALOGUE PDF

You can browse the digital catalog and download the PDF version.

2 MOLDINO Mobile Application

You can download an application that allows you to search for product information and calculate cutting power.

3 Database for selection MOLDINO Tool Products TOOL SEARCH®

You can search for tools suitable for the desired machining and download DXF/STP data.

4 CAD/CAM Support Data Pack

This search database specialized for carbide end mills enables calculation of interference angles.

5 NC Program Creation Software

Tool of creating NC programs for non step drilling, threading and SR machining.

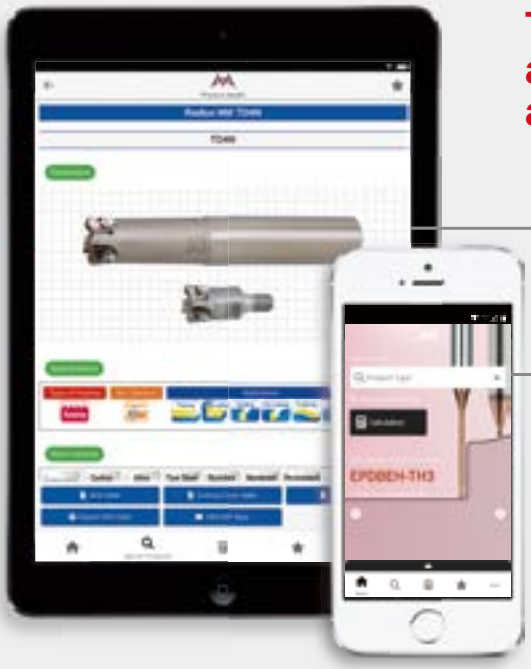
Tool shape DXF data can be downloaded.

*DXF data is not available for all tools. Tool data not yet available will be created and made available in succession.

MOLDINO

Mobile Application

for iOS and Android



Tools can be searched for by machining application, cutting material, etc. as well as product name or type!

Special display screen matched to the screens of smartphones or tablets

Rich tool search menu. Search method can be selected according to the application.

You can install this app for free.
Please search "MOLDINO" on
App Store or Google Play

Download on the App Store

GET IT ON Google Play

*Internet connection environment is necessary for use.

iOS

Android

MOLDINO
OFFICIAL YOUTUBE CHANNEL

www.youtube.com/c/MOLDINOToolEngineering

Movies of machining using the latest cutting tools are available for viewing any time. QR code links to movies are provided on some pages of this catalog for your convenience.

YouTube

Database for selection MOLDINO Tool Products

TOOL SEARCH®

From tool dimensions | From work material | From machining shape

You can narrow down the search to find the tools that suit your purpose. New products are being updated at any time! You can also download DXF data and STP data.

To access the "TOOL SEARCH" click below.

TOOLSEARCH

https://data.moldino.com/toolsearch/?lang=en

CAD/CAM Support Data Pack

It can be used offline after downloading. No installation required. In addition to searching for carbide end mills, you can search for tools with a length under the neck that matches the draft angle of the workpiece, which strongly supports especially minute and deep milling.

System requirements: Japanese, English, or Chinese version of Windows 7, 8, or Windows 10.

NC programs support software for Carbide NSB, Carbide Thread Mill and Carbide drill for SR machining

Service that can create NC programs for Carbide NSB non step drilling, Carbide Thread Mill and Carbide Drill for SR Machining

MOLDINO's Recommended Tools by tool shape (Solid end mill)

for Hardened steels / General steels

Tool shape		Hardened steels			
		Regular	Deep	Pencil neck	
Ball	2 flutes	EPBTS A85 Super hard milling	CBN-EHB A145 cBN end mill	EPDBPE-ATH A72 Deep milling	
		EPBT A88 Hard milling	EPDBEH-TH3 A30 Ultra hard milling	—	
		—	EPDBE-ATH A54 Hard milling	—	
	3 flutes	EMBE A105 Hard milling	—	EMBPE A106 Deep milling	
	4,6 flutes	EHHBE A119 Hard milling	—	—	
Radius	2 flutes	—	CBN-EPSR A298 cBN end mill	—	
		—	EPDREH2-TH3 A154 Ultra hard milling	—	
	4 flutes	EPP-TH A264 High stability	EPDREH4-TH3 A156 Ultra hard milling	—	
		ETM-TH A233 High efficiency milling	ETR-TH A227 High efficiency milling	ETRP-TH A228 High efficiency deep milling	
	6, 8 flutes	ER8WB A275 Vertical Wall/Bottom Face Finishing	—	—	—

		General steels			
	Rib	Regular	Deep	Pencil neck	Rib
	—	**HGOB-PN** A91 High strength	**EPDBE-PN** A57 Good surface	**EPDBPE-ATH** A72 Deep milling	—
	—	—	—	—	—
	—	—	—	—	—
	—	**EMBE** A105 Hard milling	—	**EMBPE** A106 Deep milling	—
	EB4HR/ECRB Rib slotting EB4HR A124 ECRB A130	—	—	—	**EB4HR/ECRB** Rib slotting EB4HR A124 ECRB A130
	—	—	—	—	—
	—	—	—	—	—
	—	**EPSM-PN** A249 High efficiency stable milling	**EPDRF-TH** A218 High accuracy milling	—	—
	—	**ETM-TH** A233 High efficiency milling	**ETR-TH** A227 High efficiency milling	**ETRP-TH** A228 High efficiency deep milling	—
	—	**ER8WB** A275 Vertical Wall/Bottom Face Finishing	—	—	—

MOLDINO's Recommended Tools by tool shape (Solid end mill)

for Hardened steels / General steels

Tool shape		Hardened steels			
		Regular	Deep	Pencil neck	
Square	2 flutes	—	EPDSE-ATH A301 Hard milling	—	
	4 flutes	EPP-TH A355 High stability	—	—	
	6, 8 flutes	ES8WB A383 Vertical Wall/Bottom Face Finishing CEPR-TH A397 High efficiency	—	—	
High feed	4,6 flutes	EHHRE A290 High feed	—	—	

Non ferrous (Copper, Graphite)

Tool shape		Non ferrous (Copper, Graphite)		
		Regular	Deep	
Ball	2 flutes	EPAB-SD A137 High accuracy finishing for copper	EPDB-SD A134 High accuracy finishing for copper	
Radius	2 flutes	EGR-HD A296 for Graphite	EGDR-HD A294 for Graphite	
Square	2 flutes	EPAS-SD A429 High accuracy finishing for copper	EPDS-SD A426 High accuracy finishing for copper	

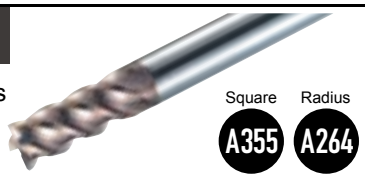
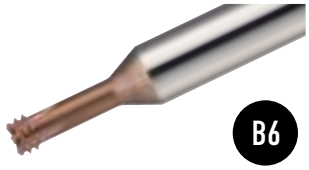
		General steels			
	Rib	Regular	Deep	Pencil neck	Rib
	—	**HGOS-PN** A319 General purpose 	**EPDSE-PN** A304 Good surface 	—	—
	—	**EPSM-PN** A332 High efficiency stable milling 	**EPPLS** A370 Long shank 	—	—
	—	**ES8WB** A383 Vertical Wall/Bottom Face Finishing **CEPR** A402 High speed, high fficiency 	—	—	—
	—	**EHHRE** A290 High feed 	—	—	—

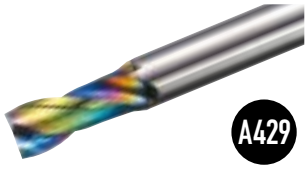
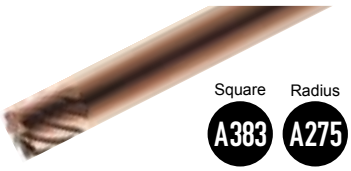
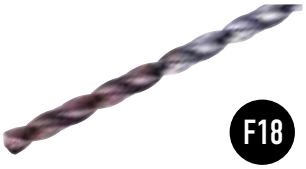
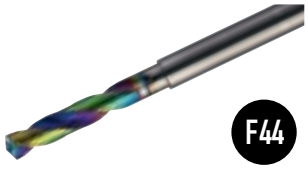
MOLDINO's Recommended Tools by tool shape (Indexable tool)

Tool shape		Roughing		
High feed radius	6 corners	—	—	
	4 corners	**TR4F/ITR4F TR4D/ITR4D** Maximum efficiency C8	**TD4N/ITD4N** Reduces remaining stock C34	
	4 corners	**ASRT/IASRT** 3 corners C48	—	
	2 corners	**ASR/IASR** High feed pioneer C40	**ASR/IASR Multi** Multi flutes C72	
Shoulder	4 corners	—	—	
	2 corners	**AHU/IAHU** Shoulder cutting C174	—	
Ball	4 flutes	—	—	
	2 flutes	—	—	
Radius	2 flutes	—	—	

	Roughing		Finishing	
	—	—	—	—
	ASRF/IASRF mini Mini series C64	—	—	—
	—	—	—	—
	ASM/IASM Mini series C162	**RH2P/IRH2P** for Hardened steel C86	—	—
	—	—	—	—
	ASM/IASM Mini series C162	—	**ASPV/IASPV** Bottom Face/Vertical Wall C204	**ASPVmini** Mini series C190
	—	—	**ABP4F/IABP4F** High efficiency C156	—
	—	—	**ABPF/IABPF** High accuracy C132	—
	—	—	**ARPF/IARPF** High accuracy C118	—

MOLDINO's Recommended Tools by machining shape

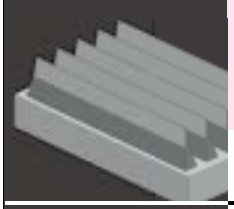
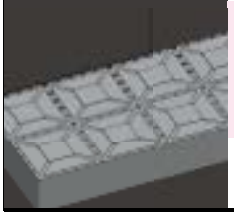
Machining method	Tool type	Hardened steels
Contouring		Refer to list of tool shape
Scan line milling		
Slotting, Side milling, Helical	Solid	**EPP-TH** Flute shape: Square / Radius Features: High stability  Square A355 / Radius A264
		—
	Indexable type	**ASPVmini** Flute shape: Radius Features: Low cutting force C190
Side milling	Solid	**CEPR-TH** Flute shape: Square / Radius Features: High efficiency A397
Adaptive milling (Trochoid)	Solid	**EHHBE/EMBE** Flute shape: Ball Features: High efficiency EHHBE A119 / EMBE A105
Vertical	Indexable type	**ASPV/IASPV** Flute shape: Radius Features: Reciprocating cutting C204
Drilling	Solid	**NSBH** Flute shape: Drill Features: Non step drilling F48
Threading	Solid	**EDT** Flute shape: Thread mill Features: Threading without pilot hole  B6

	General steels	Non ferrous (Copper, Graphite)
	Refer to list of tool shape	
	EPSM Flute shape: Square / Radius Features: High efficiency stable milling Square A332 / Radius A249	**EPAS-SD** Flute shape: Square (Copper) Features: High quality finishing for copper  A429
	—	**EGR-HD** Flute shape: Radius (Graphite) Features: High strength, long life A296
	ASM/IASM Flute shape: Radius Features: High efficiency stable milling C162	—
	ES(R)8WB Flute shape: Square / Radius Features: High accuracy  Square A383 / Radius A275	—
	ER5HS Flute shape: Radius Features: High efficiency A280	—
	ASPV/IASPV Flute shape: Radius Features: Reciprocating cutting C204	—
	WHNSB Flute shape: Drill Features: Non step drilling  F18	**WHNSB-SD** Flute shape: Drill Features: Non step drilling  F44
	ET Flute shape: Thread mill Features: High quality threading B2	—

MOLDINO's Recommended Tools (for Plastic molds)

Mold type	Roughing → Finishing			
Structure	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) Ultra high feed radius tool ϕ63mm~ϕ50mm	**AHU/IAHU** C174 Roughing ~ Semi finishing 90° type ϕ63mm~ϕ20mm	**ASPV mini** C190 Mini series ϕ32~ϕ10	**ER8WB ES8WB** A275 A383 Wall finishing ϕ12mm~ϕ10mm
			ARPF/IARPF C118 Semi finishing ~ Finishing High accuracy cutting ϕ30~ϕ10	
Bumper (1050, CrMo Steel)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) Ultra high feed radius tool ϕ80mm~ϕ50mm	**TD4N/ITD4N** C34 Roughing (Contouring) Design to reduce remaining stock ϕ32mm~ϕ16mm		**ABPF/IABPF SC** C132 Semi finishing ~ Finishing High accuracy cutting ϕ30mm~ϕ20mm
		ETM A233 Semi finishing (Corner recessing) Oval shape suppresses vibration ϕ16mm~ϕ6mm	**EPDBE-PN** A57 Semi finishing ~ Finishing (Corner recessing) ϕ10mm~ϕ1mm	
Door trim (P20)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) Ultra high feed radius tool ϕ63mm~ϕ50mm	**TD4N/ITD4N** C34 Roughing (Contouring) Design to reduce remaining stock ϕ32mm~ϕ16mm	**ABPF/IABPF SC** C132 Semi finishing ~ Finishing High accuracy cutting ϕ30mm~ϕ20mm	**EPDBE-PN** A57 Semi finishing ~ Finishing (Corner recessing) ϕ10~ϕ1mm
		ETM A233 Semi finishing (Corner recessing) Oval shape suppresses vibration ϕ16mm~ϕ6mm		**ECRB** A130 Stiffening rib Replaces EDM to milling ϕ1~ϕ0.8mm
Lamp Lens (P20) Extension (P21) Reflector (STAVAX, AISI420) Housing (Carbon Steel, CrMo Steel, P20)	**TD4N/ITD4N** C34 Roughing (Contouring) Design to reduce remaining stock ϕ32mm~ϕ16mm	**ABPF/IABPF SC** C132 Semi finishing ~ Finishing High accuracy cutting ϕ20mm~ϕ16mm		
	ETM A233 Semi finishing (Corner recessing) Oval shape suppresses vibration ϕ10mm~ϕ6mm	**EMBPE** A106 Semi finishing ~ Finishing ϕ10mm~ϕ1mm	**EPDBEH-TH3** A30 Semi finishing ~ Finishing ϕ2mm~ϕ0.6mm	
Connector (D2)	**EHHBE-TH3** A119 Roughing (Contouring) 4 flutes hard milling R1mm~R0.5mm	**EPDREH-TH3** A154 Roughing ~ Semi finishing (Contouring) Hard milling ϕ1mm~ϕ0.4mm	**EPDBEH-TH3** A30 Semi finishing ~ Finishing (Contouring) Hard milling R1mm~R0.05mm	**EPDREH-TH3** A154 Semi finishing ~ Finishing (Contouring) Hard milling ϕ0.6mm~ϕ0.2mm
Lens holder (STAVAX)	**EHHRE-TH3** A290 Roghing (Contouring) Hard milling ϕ3mm~ϕ1mm	**EPDBEH-TH3** A30 Semi finishing ~ Finishing (Contouring) Hard milling R0.5mm~R0.1mm		**EPDREH-TH3** A154 Semi finishing ~ Finishing (Contouring) Hard milling ϕ1mm~ϕ0.2mm
Cooling hole related (H13)	**WHNSB** F36 Cooling hole (Drilling) Deep hole drilling 40D~50D	**NSBH** F48 Cooling hole (Drilling) for hardness ϕ12mm~ϕ3mm		**EDT-PT** B12 For PT threads - threading hardened steels (high quality surface) PT1~PT1/16

MOLDINO's Recommended Tools (for Stamping dies)

Die type	Roughing → Finishing			
Structure (Cast Iron)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) Ultra high feed radius tool ϕ63mm~ϕ50mm	**AHU/IAHU** C174 Roughing ~ Semi finishing 90° type ϕ63mm~ϕ20mm	**ASPV/IASPV** C204 Semi finishing ~ Finishing High efficiency cutting with multi-flute ϕ63mm~ϕ25mm	**ARPF/IARPF** C118 Semi finishing ~ Finishing High accuracy cutting ϕ30mm~ϕ25mm
Outer panel (Cast Iron)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) Ultra high feed radius tool ϕ63mm~ϕ50mm	**ABPF/IABPF ST** C132 Semi finishing ~ Finishing High accuracy cutting ϕ30mm~ϕ10mm **ABP4F/IABP4F** C156 Semi finishing to finishing Efficiency pursuit type ϕ30mm~ϕ20mm	**HGOB** A91 Corner recessing 2 flutes tough cutting edge ϕ12mm~ϕ4mm **EMBE-ATH** A105 Corner recessing Improves efficiency with 3 flutes ϕ12mm~ϕ4mm
Center pillar (D2)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) Ultra high feed radius tool ϕ63mm~ϕ50mm	**ASRF/IASRF mini** C64 Roughing (Contouring) Low cutting force, usable for hard milling ϕ32mm~ϕ20mm **ABPF/IABPF SH** C132 Semi finishing ~ Finishing High accuracy cutting ϕ30mm~ϕ10mm	**EPBTS** A85 Corner recessing 2 flutes tough cutting edge ϕ12mm~ϕ4mm **EMBE-ATH** A105 Corner recessing Improves efficiency with 3 flutes ϕ12mm~ϕ4mm
Die cut roll (High Speed Steel) 	**EHHRE-TH3** A290 Roghing (Contouring) Hard milling ϕ4mm~ϕ2mm	**EHHBE-TH3** A119 Roghing (Contouring) Hard milling ϕ4mm~ϕ2mm	**EPDBEH-TH3** A30 Semi finishing ~ Finishing (Contouring) Hard milling R0.5mm~R0.1mm	**EPDREH-TH3** A154 Semi finishing ~ Finishing (Contouring) Hard milling ϕ1mm~ϕ0.2mm
Lead frame (High Speed Steel) 	**EHHRE-TH3** A290 Roghing (Contouring) Hard milling ϕ3mm~ϕ1mm		**EPDBEH-TH3** A30 Semi finishing ~ Finishing (Contouring) Hard milling R0.5mm~R0.1mm	**EPDREH-TH3** A154 Semi finishing ~ Finishing (Contouring) Hard milling ϕ1mm~ϕ0.2mm

MOLDINO's Recommended Tools (for Forging dies)

Die type	Roughing → Finishing					
Crankshaft (H13)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) High efficiency high feed ϕ63mm~ϕ32mm	**RH2P/IRH2P** C86 Medium roughing (Contouring) Hard milling ϕ32mm~ϕ12mm	**ABPF/IABPF SH** C132 Semi finishing ~ Finishing High accuracy cutting ϕ20mm~ϕ16mm	**EMBE-ATH** A105 Finishing (Contouring) Improves efficiency with 3 flutes R6mm~R2mm		
	ASR/IASR Multi C72 Roughing (Contouring) Design to reduce remaining stock ϕ32mm~ϕ16mm	**EHHRE-TH3** A290 Medium roghing (Contouring) Hard milling ϕ12mm~ϕ8mm	**EHHBE-TH3** A119 Semi finishing (Contouring) Hard milling with 4 flutes R6mm~R4mm			
Connecting rod (H13)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) High efficiency high feed ϕ63mm~ϕ32mm	**ETM** A233 Miedium roughing (Contouring) Hard milling ϕ12mm~ϕ8mm	**EMBE-ATH** A105 Semi finishing ~ Finishing (Contouring) Improves efficiency with 3 flutes ϕ10mm~ϕ6mm	**EPDBEH-TH3** A30 Finishing (Contouring) Hard milling R3mm~R0.5mm		
	TD4N/ITD4N C34 Roughing (Contouring) High efficiency high feed ϕ32mm~ϕ20mm	**ABPF/IABPF SH** C132 Semi finishing ~ Finishing High accuracy cutting ϕ20mm~ϕ16mm	**EPP-TH** A355 Bottom face finishing (Contouring) Hard milling ϕ12mm~ϕ6mm			
Bevel gear (High Speed Steel)	**TD4N/ITD4N** C34 Roughing (Contouring) High efficiency, reduces remaining stock ϕ32mm~ϕ16mm	**EHHRE-TH3** A290 Medium roghing (Contouring) Hard milling ϕ12mm~ϕ8mm	**EHHBE-TH3** A119 Semi finishing (Contouring) Hard milling with 4 flutes R6mm~R0.5mm	**EPDBEH-TH3** A30 Finishing (Contouring) Hard milling R5mm~R0.5mm		

MOLDINO's Recommended Tools (for Die-casting molds)

Mold type	Roughing → Finishing
Water jacket (H13)	**TD4N/ITD4N** C34 Roughing (Contouring) High efficiency, reduces remaining stock ϕ32mm~ϕ20mm **ASR/IASR Multi** C72 Roughing (Contouring) Design to reduce cutting remain ϕ32mm~ϕ16mm **ASPV mini** C190 Semi finishing ~ Finishing High efficiency finishing ϕ20mm~ϕ16mm **GF2T** E8 emi finishing ~ Finishing High efficiency with special shape tools ϕ35mm~ϕ2mm0
Cylinder head (H13)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) High efficiency, high feed ϕ63mm~ϕ32mm **ASRF/IASRF mini** C64 Roughing (Contouring) High efficiency high feed ϕ32mm~ϕ20mm **EPDBPE-ATH** A72 Semi finishing ~ Finishing (Contouring) High accuracy hard milling R3mm~R0.5mm **ASR/IASR Multi** C72 Roughing (Contouring) Design to reduce remaining stock ϕ32mm~ϕ16mm **EPSM-PN** A332 Roughing (Adaptive milling) Prevents warping due to cutting heat ϕ12mm~ϕ10mm **ETM(P)** A233 Middle roughing (Contouring) High efficiency hard milling with 4 flutes ϕ10mm~ϕ4mm
Valve body (H13)	**TR4F/ITR4F TR4D/ITR4D** C8 Roughing (Contouring) High efficiency high feed ϕ63mm~ϕ32mm **TD4N/ITD4N** C34 Roughing (Contouring) High efficiency, reduces remaining stock ϕ32mm~ϕ16mm **ABPF/IABPF** C132 Semi finishing ~ Finishing High accuracy cutting ϕ20mm~ϕ16mm **EMBPE-ATH** A106 Semi finishing (Contouring) High efficiency with 3 flutes R1.5mm~R0.75mm **ETM** A233 Roghing (Contouring) High efficiency milling ϕ10mm~ϕ4mm **ETRP** A228 Middle roughing (Contouring) High efficiency milling ϕ4mm~ϕ1.5mm **EPDRF-TH** A218 For bottom face, corner (Contouring) High efficiency with 4 flutes ϕ3mm~ϕ1.5mm
Inverter case (H13)	**TD4N/ITD4N** C34 Roughing (Contouring) High efficiency high feed ϕ32mm~ϕ20mm **ARPF/IARPF** C118 Finishing (Contouring) High accuracy cutting ϕ32mm~ϕ12mm **ASR/IASR Multi** C72 Roughing (Contouring) Design to reduce remaining stock ϕ32mm~ϕ20mm **ETM** A233 Roghing (Contouring) High efficiency milling ϕ10mm~ϕ4mm
Heat sink (H13)	**ETRP** A228 Medium roughing (Contouring) High efficiency milling ϕ4mm~ϕ1.5mm **EMBPE-ATH** A106 Semi finishing (Contouring) High efficiency with 3 flutes R1.5mm~R0.75mm **EB4HR** A124 Finishing (Contouring) High quality finishing surface (less steps) R0.6mm~R0.3mm
Cooling hole related (H13)	**WHNSB** F18 Cooling hole (Drilling) Deep hole drilling 40D~50D **NSBH** F48 Cooling hole drilling Hardened steels drilling ϕ12mm~ϕ3mm **EDT-PT** B12 For PT threads - threading hardened steels (high quality surface) PT1~PT1/16 **WHSR** F55 Cooling SR hole (Drilling) SR machining to suppress cracking ϕ12mm~ϕ3mm

Carbide End Mills

Selection criteria table according to carbide end mill shape ····· A2

Coating materials for solid end mills ····· A432

Quick dimension reference table by mill diameter

Ball ····· A10

Radius ····· A17

Square ····· A25

By type (catalog listing order)

Ball End Mills

EPDBEH-F-TH3 ····· A30
EPDBEH-TH3 ····· A32
EPDBE(-□□□) ····· A54
EPDBPE-ATH ····· A72
EPBTS-TH ····· A85
EPBT ····· A88
HGOB-PN ····· A91
HGOB-TH ····· A92
HGFB-TH ····· A99
ESHB2-H/N-TH ····· A102
EMB(P)E-ATH ····· A105
EHHBE-TH3 ····· A119
EB4HR-ATH ····· A124
ECRB-PN ····· A130
EPDB-SD ····· A134
EPAB-SD ····· A137
EGDB-HD ····· A140
EGB-HD ····· A143
CBN-EHB ····· A145
CBN-EPSB ····· A151

Radius End Mills

EPDREH2-TH3 ····· A154
EPDREH4-TH3 ····· A156
EPDRE-ATH ····· A191
EPDRF-TH ····· A218
ETR(P)-TH ····· A227
ETM(□□)-TH ····· A233
HGOF-TH ····· A243
HGOR-TH ····· A247
EPSM-R-PN ····· A249
EPP4-CR-TH ····· A264
EPP(□□)-CR ····· A267
ER8WB-ATH ····· A275
ER5HS-PN ····· A280
EMX□-TH ····· A283
EHHRE-TH3 ····· A290
EGDR-HD ····· A294
EGR-HD ····· A296
SCE ····· A297
CBN-EPSR ····· A298

Square End Mills

EPDSE(-□□□) ····· A301
HGOS-PN ····· A319
HGOSH-TH ····· A325
EPP3-CS ····· A328
EPSF(□)-PN ····· A331
EPSM(□□)-PN ····· A332
EPP(□)-TH ····· A355
EPP(□)4(-P)-CS ····· A362
EPP(□□) ····· A369
ES8WB-ATH ····· A383
IEMXR-TH ····· A386
EMX□-(SR)-TH ····· A386
CEP□-TH ····· A397
CEP□□ ····· A402
EPSW(□)-PN ····· A412
EPDS-SD ····· A426
EPAS-SD ····· A429

By item code (alphabetical order)

CBN-EHB ····· A145
CBN-EPSB ····· A151
CBN-EPSR ····· A298
CEP□-TH ····· A397
CEP□□ ····· A402
EB4HR-ATH ····· A124
ECRB-PN ····· A130
EGB-HD ····· A143
EGDB-HD ····· A140
EGDR-HD ····· A294
EGR-HD ····· A296
EHHBE-TH3 ····· A119
EHHRE-TH3 ····· A290
EMB(P)E-ATH ····· A105
EMX□-(SR)-TH ····· A386
EMX□-TH ····· A283
EPAB-SD ····· A137
EPAS-SD ····· A429
EPBT ····· A88
EPBTS-TH ····· A85
EPDB-SD ····· A134
EPDBE(-□□□) ····· A54
EPDBEH-F-TH3 ····· A30
EPDBEH-TH3 ····· A32
EPDBPE-ATH ····· A72
EPDRE-ATH ····· A191
EPDREH2-TH3 ····· A154
EPDREH4-TH3 ····· A156
EPDRF-TH ····· A218
EPDS-SD ····· A426
EPDSE(-□□□) ····· A301
EPP(□)-TH ····· A355
EPP(□)4(-P)-CS ····· A362
EPP(□□) ····· A369
EPP(□□)-CR ····· A267
EPP3-CS ····· A328
EPP4-CR-TH ····· A264
EPSF(□)-PN ····· A331
EPSM-R-PN ····· A249
EPSM(□□)-PN ····· A332
EPSW(□)-PN ····· A412
ER5HS-PN ····· A280
ER8WB-ATH ····· A275
ES8WB-ATH ····· A383
ESHB2-H/N-TH ····· A102
ETM(□□)-TH ····· A233
ETR(P)-TH ····· A227
HGFB-TH ····· A99
HGOB-PN ····· A91
HGOB-TH ····· A92
HGOF-TH ····· A243
HGOR-TH ····· A247
HGOS-PN ····· A319
HGOSH-TH ····· A325
IEMXR-TH ····· A386
SCE ····· A297

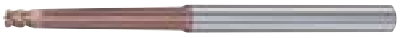
Selection criteria table according to carbide end mill shape

Type	Item Code	Product	Coating	Specification	No. of flutes	Tool Dia. (mm)
Carbide ball end mills	EPDBEH-F-TH3	Epoch Deep Ball Evolution Hard-TH3 Short shank type	TH3	Long neck	2	0.1~2.5
	EPDBEH-TH3	Epoch Deep Ball Evolution Hard-TH3 Regular shank type	TH3	Long neck	2	0.1~12
	EPDBEH-TH3	Epoch Deep Ball Evolution Hard-TH3 Strong neck type	TH3	Strong neck	2	0.1~ 1
	EPDBE-ATH	Epoch Deep Ball Evolution (ATH Coating)	ATH	Long neck	2	0.1~ 6
	EPDBE-PN	Epoch Deep Ball Evolution (PN Coating)	PN	Long neck	2	0.1~ 6
	EPDBPE-ATH	Epoch Pencil Deep Ball Evolution	ATH	Pencil neck	2	0.2~12
	EPBTS-TH	Epoch TH Hard Ball Strong	ATH	Regular	2	3 ~12
	EPBT	Epoch TH Hard Ball	TH	Regular	2	1 ~20
	HGOB-PN	Epoch Global Series Ball -Panacea	PN	Regular	2	0.3~20
	HGOB-TH	Epoch Global Series Ball	TH	Regular	2	0.5~20
	HGFB-TH	Global Forging Ball	TH	Regular	2	2 ~12
	ESHB-H-TH	Epoch Shrink Master Ball High accuracy rating products	TH	Regular	2	1 ~12
	ESHB-N-TH	Epoch Shrink Master Ball Standard rating products	TH	Regular	2	1 ~12
	EMBE-ATH	Epoch Mega Feed Ball Evolution Straight type	ATH	Regular	3	1 ~20
	EMBPE-ATH	Epoch Mega Feed Ball Evolution Pencil Neck	ATH	Pencil neck	3	1 ~12
	EHHBE-TH3	Epoch High Hard Ball-TH3	TH3	Regular	4	1 ~12
	EB4HR-ATH	Taper Ball End Mill for High Accuracy Rib Slotting	ATH	Regular	4	0.6~1.2
	ECRB-PN	Epoch Combination Rib Ball	PN	Regular	4	0.8・1
	EPDB-SD	Epoch SD(S-DLC) Deep Ball	SD	Long neck	2	0.2~ 5
	EPAB-SD	Epoch SD(S-DLC) Ball	SD	Regular	2	6 ~12
	EGDB-HD	Epoch HD Coating Deep Ball End Mill	HD	Long neck	2	0.4~ 3
	EGB-HD	Epoch HD Coating Ball End Mill	HD	Regular	2	4 ~10
	CBN-EHB	Epoch CBN High Precision Ball End Mill		Long neck	2	0.2~ 2
	CBN-EPSB	Epoch CBN Super Ball End Mill		Long neck	2	0.2~ 2

Shape	Applicable work material									Applications	Page	
	P		H			M	S	N			Size list	Cutting conditions
	Carbon steel, Alloy steel	Pre-harden Steel under 45 HRC	High-hardened over 45HRC to under 55HRC	High-hardened over 55HRC to under 65HRC	High-hardened over 65HRC	Stainless steel	Titanium alloy, Heat-resistant alloy	Copper alloy	Aluminum alloy			
	○	○	◎	◎	◎	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature	A30	A38
	○	○	◎	◎	◎	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature	A32	A38
	○	○	◎	◎	◎	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature	A37	A38
	○	◎	◎	◎	○	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature	A54	A60
	◎	◎	◎	○		◎	◎	◎	◎	Slotting, Die-sinking, Profiling, Radius, Miniature	A57	A60
	○	◎	◎	◎	○	○	◎	○	○	Die-sinking, Profiling, Radius, Rest material machining, Corner recessing, Miniature	A72	A77
	○	◎	◎	◎	◎	○	◎	○	○	Die-sinking, Profiling, Radius, Helical	A85	A86
	○	◎	◎	◎	○	○	◎	○	○	Die-sinking, Profiling, Radius, Helical	A88	A89
	◎	◎	◎	○		○		◎	◎	Planing, Profiling, Radius, Rest material machining	A91	A93
										Planing, Profiling, Radius, Rest material machining	A92	A95
										Planing, Profiling, Radius, Rest material machining	A99	A100
	◎	◎	◎	◎	○	○	◎	○	○	Die-sinking, Profiling, Radius, Helical	A102	A103
	◎	◎	◎	◎	○	○	◎	○	○	Die-sinking, Profiling, Radius, Helical	A102	A103
	◎	◎	◎	◎	○	○	◎	○	○	Half Negative Drilling, Die-sinking, Profiling, Radius	A105	A108
	◎	◎	◎	◎	○	○	◎	○	○	Die-sinking, Profiling, Radius, Rest material machining, Corner recessing, Miniature	A106	A111
	○	◎	◎	◎	◎					Half Negative Drilling, Side milling, Die-sinking, Profiling, Radius	A119	A120
	◎	◎	◎							Taper ball	A124	A126
	◎	◎	○							Taper ball, Miniature	A130	A131
								◎	◎	Slotting, Die-sinking, Profiling, Radius, Miniature	A134	A135
								◎	◎	Die-sinking, Profiling, Radius, Helical	A137	A138
	for Graphite, FRP, High Si aluminum alloy, etc									Slotting, Die-sinking, Profiling, Radius, Miniature	A140	A141
										Die-sinking, Profiling, Radius, Helical	A143	A144
			○	◎	◎					Planing, Die-sinking, Profiling, Radius, Rest material machining, Miniature	A145	A146
			○	◎	◎					Planing, Die-sinking, Profiling, Radius, Rest material machining, Miniature	A151	A152

Selection criteria table according to carbide end mill shape

Type	Item Code	Product	Coating	Specification	No. of flutes	Tool Dia. (mm)
Carbide radius end mills	EPDREH2-TH3	Epoch Deep Radius Evolution Hard-TH3 2 Flutes	TH3	Long neck	2	0.2~ 1
	EPDREH4-TH3	Epoch Deep Radius Evolution Hard-TH3 4 Flutes	TH3	Long neck	4	1 ~ 6
	EPDRE-ATH	Epoch Deep Radius Evolution	ATH	Long neck	2	0.2~ 6
	EPDRF-TH	Epoch Deep Radius F	TH	Long neck	4	1 ~ 6
	ETR-TH	Epoch Turbo Rib Straight Neck	TH	Long neck	4	1 ~ 3
	ETRP-TH	Epoch Turbo Rib Pencil Neck	TH	Pencil neck	4	1 ~ 3
	ETM-TH	Epoch Turbo Mill Straigh Neck, Corner Radius	TH	Regular	4	2 ~20
	ETMLN-TH	Epoch Turbo Mill Long Neck, Corner Radius	TH	Long Neck	4	4 ~16
	ETMP-TH	Epoch Turbo Mill Pencil Neck, Corner Radius	TH	Pencil Neck	4	2 ~16
	HGOF2-TH	Epoch G Turbo 2 flutes	ATH	Regular	2	2 ~12
	HGOF4-TH	Epoch G Turbo 4 flutes	ATH	Regular	4	2 ~12
	HGOR4-TH	Epoch G Radius 4 flutes	TH	Regular	4	6 ~20
	EPSM-CR-PN	Epoch SUS Multi Regular, Corner Radius	PN	Regular	4	1 ~20
	EPSM-5DC-CR-PN	Epoch SUS Multi Under neck 5DC, Corner Radius	PN	Long Neck	4	1 ~20
	EPP-CR-TH	Epoch TH Power Mill Corner Radius	TH	Regular	4	3 ~20
	EPP-CR	Epoch Power Mill Regular, Corner Radius	C	Regular	4	3 ~25
	EPPL-CR	Epoch Power Mill Long, Corner Radius	C	Long	4	6 ~25
	EPPLS-CR	Epoch Power Mill Long Shank, Corner Radius	C	Long Shank	4	3 ~17
	ER8WB-ATH	8-flutes End Mill for Vertical Wall/Bottom Face Finishing Radius	ATH		8	6 ~12
	ER5HS-3.5DC-PN	End mill for adaptive milling Under neck 3.5DC	PN		5	6 ~20
	ER5HS-5DC-PN	End mill for adaptive milling Under neck 5DC	PN		5	6 ~20
	EMXR-3DC-TH	Epoch Mirus Type R 4flutes, Radius, Straight, 3DC	ATH	Long Neck	4	6 ~12
	EMXR-5DC-TH	Epoch Mirus Type R 4flutes, Radius, Straight, 5DC	ATH	Long Neck	4	6 ~12
	EMXN-3DC-TH	Epoch Mirus Type N 4flutes, Radius, Straight, 3DC	ATH	Long Neck	4	6 ~12
	EMXN-5DC-TH	Epoch Mirus Type N 4flutes, Radius, Straight, 5DC	ATH	Long Neck	4	6 ~12
	EHHRE-TH3	Epoch High Hard Radius	TH3	Regular	4,6	1 ~12

Shape	Applicable work material									Applications	Page	
	P		H			M	S	N				
	Carbon steel, Alloy steel	Pre-harden Steel under 45 HRC	High-hardened over 45HRC to under 55HRC	High-hardened over 55HRC to under 65HRC	High-hardened over 65HRC	Stainless steel	Titanium alloy, Heat-resistant alloy	Copper alloy	Aluminum alloy		Size list	Cutting conditions
	○	○	◎	◎	◎	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature, Rest material machining	A154	A163
	○	○	◎	◎	◎	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature, Rest material machining	A156	A167
	○	◎	◎	◎	○	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature, Rest material machining	A191	A198
	◎	◎	◎	◎	○	○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature, Rest material machining	A218	A221
	◎	◎	◎	○		○	◎	○	○	Slotting, Die-sinking, Profiling, Radius, Miniature, Rest material machining	A227	A229
	◎	◎	◎	○		○	◎	○	○	Die-sinking, Profiling, Radius, Miniature, Rest material machining	A228	A230
	◎	◎	◎	○		○	◎	○	○	Die-sinking, Profiling, Radius	A233	A235
	◎	◎	◎	○		○	◎	○	○	Die-sinking, Profiling, Radius	A233	A235
	◎	◎	◎	○		○	◎	○	○	Die-sinking, Profiling, Radius	A234	A235
	◎	◎	◎	◎		○	◎	○	○	Planing, Side milling, Slotting, Die-sinking, Helical	A243	A244
	◎	◎	◎	◎	○	○	◎	○	○	Planing, Slotting, Die-sinking, Helical	A243	A245
										Planing, Side milling, Slotting, Die-sinking, Helical	A247	A248
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical	A249	A252
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical	A250	A255
	◎	◎	◎	◎	○	○	◎	○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical	A264	A265
	◎	◎	○	○		○	○			Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical	A267	A269
	◎	◎	○	○		○	○			Side milling, Profiling, Radius	A267	A271
	◎	◎	○	○		○	○			Side milling, Profiling, Radius	A268	A271
	○	◎	◎							Planing, Side milling, Slotting, Die-sinking, Profiling	A275	A276
	◎	◎				○	○			Auxiliary Positive milling, Planing, Side milling, Profiling, Helical	A280	A281
	◎	◎				○	○			Auxiliary Positive milling, Planing, Side milling, Profiling, Helical	A280	A281
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A283	A285
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A283	A286
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A284	A285
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A284	A286
			○	◎	◎					Die-sinking, Profiling, Radius	A290	A291

Selection criteria table according to carbide end mill shape

Type	Item Code	Product	Coating	Specification	No. of flutes	Tool Dia. (mm)
Carbide radius end mills	EGDR-HD	Epoch HD Coating Deep Radius End Mill	HD	Long neck	2	0.5~ 3
	EGR-HD	Epoch HD Coating Radius End Mill	HD	Regular	2	4 ~10
	SCE	Ceramic End Mill Corner Radius Type		Regular	6	6 ~12
	CBN-EPSR	Epoch CBN Super Radius End Mill		Long neck	2	0.2~ 3
Carbide square end mills	EPDSE-ATH	Epoch Deep Square Evolution (ATH Coating)	ATH	Long neck	2	0.1~ 6
	EPDSE-PN	Epoch Deep Square Evolution (PN Coating)	PN	Long neck	2	0.1~ 6
	HGOS2-PN	Epoch Panacea Square -2 flutes	PN	Regular	2	0.2~20
	HGOS4-PN	Epoch Panacea Square -4 flutes	PN	Regular	4	1 ~20
	HGOSH-TH	Epoch G Square	TH	Regular	4	1 ~12
	EPP3-CS	Epoch CS Power Mill -3Flutes	CS	Regular	3	2 ~25
	EPSF-PN	Epoch SUS Finish -Regular	PN	Regular	4	3 ~12
	EPSFM-PN	Epoch SUS Finish -Medium	PN	Medium	4	3 ~12
	EPSFL-PN	Epoch SUS Finish -Long	PN	Long	4	3 ~12
	EPSM-PN	Epoch SUS Multi -Regular	PN	Regular	4	1 ~20
	EPSMM-PN	Epoch SUS Multi -Medium	PN	Long	4	3 ~20
	EPSML-PN	Epoch SUS Multi -Long	PN	Long	4	6 ~20
	EPSMLS-PN	Epoch SUS Multi -Long shank	PN	Long shank	4	3 ~17
	EPSM-3DC-PN	Epoch SUS Multi -Under neck 3DC	PN	Long Neck	4	1 ~20
	EPSM-5DC-PN	Epoch SUS Multi -Under neck 5DC	PN	Long Neck	4	1 ~20
	EPPS-TH	Epoch TH Power Mill -Short	TH	Short	4	3 ~20
	EPP-TH	Epoch TH Power Mill -Regular	TH	Regular	4	3 ~20
	EPPM-TH	Epoch TH Power Mill -Medium	TH	Medium	4	3 ~20
	EPPL-TH	Epoch TH Power Mill -Long	TH	Long	4	6 ~20
	EPP4-CS	Epoch CS Power Mill -Regular	CS	Regular	4	3 ~20
	EPPS-P-CS	Epoch CS Power Mill "PINKADO" Short	CS	Short	4	1 ~12
	EPP-P-CS	Epoch CS Power Mill "PINKADO" Regular	CS	Regular	4	1 ~20

Shape	Applicable work material									Applications	Page	
	P		H			M	S	N				
	Carbon steel, Alloy steel	Pre-harden Steel under 45 HRC	High-hardened over 45HRC to under 55HRC	High-hardened over 55HRC to under 65HRC	High-hardened over 65HRC	Stainless steel	Titanium alloy, Heat-resistant alloy	Copper alloy	Aluminum alloy		Size list	Cutting conditions
	for Graphite, FRP, High Si aluminium alloy, etc									Slotting, Die-sinking, Profiling, Radius, Miniature, Rest material machining	A294	A295
										Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical	A296	A296
							◎			Planing, Side milling	A297	A297
			○	◎	◎					Planing, Die-sinking, Radius, Rest material machining, Miniature	A298	A299
	○	◎	◎	◎	○	○	◎	○	○	Side milling, Slotting, Miniature	A301	A307
	◎	◎	◎	○		◎	◎	◎	◎	Side milling, Slotting, Miniature	A304	A307
	◎	◎	○			◎	○	◎	◎	Planing, Side milling, Slotting, Die-sinking, Helical, Spot facing	A319	A321
	◎	◎	○			◎	○	◎	◎	Planing, Side milling, Die-sinking, Helical, Spot facing	A320	A321
										Planing, Side milling, Die-sinking, Helical, Spot facing	A325	A326
	◎	◎	◎	○		◎	◎	◎	◎	Planing, Side milling, Slotting, Die-sinking, Helical, Spot facing	A328	A329
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Helical, Spot facing	A331	A343
	◎	◎				◎	◎	◎	◎	Side milling	A331	A345
	◎	◎				◎	◎	◎	◎	Side milling	A331	A345
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Helical, Spot facing	A332	A337
	◎	◎				◎	◎	◎	◎	Side milling	A333	A342
	◎	◎				◎	◎	◎	◎	Side milling	A333	A342
	◎	◎				◎	◎	◎	◎	Side milling	A334	A340
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Helical, Spot facing	A335	A337
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Helical, Spot facing	A336	A340
	◎	◎	◎	◎	○	○	◎	○	○	Planing, Side milling, Slotting	A355	A356
	◎	◎	◎	◎	○	○	◎	○	○	Planing, Side milling, Slotting	A355	A357
	◎	◎	◎	◎	○	○	◎	○	○	Side milling	A355	A358
	◎	◎	◎	◎	○	○	◎	○	○	Side milling	A355	A358
	◎	◎	◎	○		◎	◎	◎	◎	Planing, Side milling, Slotting	A362	A363
	◎	◎	◎	○		◎	◎	◎	◎	Planing, Side milling, Slotting	A362	A365
	◎	◎	◎	○		◎	◎	◎	◎	Planing, Side milling, Slotting	A362	A365

Selection criteria table according to carbide end mill shape

Type	Item Code	Product	Coating	Specification	No. of flutes	Tool Dia. (mm)
Carbide square end mills	EPPS	Epoch Power Mill Short	C	Short	4	2 ~25
	EPP	Epoch Power Mill Regular	C	Regular	4	2 ~25
	EPPM	Epoch Power Mill Meduim	C	Medium	4	3 ~20
	EPPL	Epoch Power Mill Long	C	Long	4	3 ~20
	EPPLS	Epoch Power Mill Long Shank	C	Long Shank	4	3 ~20
	ES8WB-ATH	8-flutes End Mill for Vertical Wall/Bottom Face Finishing Square	ATH		8	6 ~12
	IEMXR-TH	Epoch Mirus Type R (Inch) 4flutes, Square, Straight	ATH	Regular	4	1/4″~1/2″
	EMXR-TH	Epoch Mirus Type R (Metric) 4flutes, Square, Straight	ATH	Regular	4	6 ~20
	EMXR-SR-TH	Epoch Mirus Type R 4flutes, Square, Semi long shank	ATH	Semi Long Shank	4	7 ~13
	EMXN-TH	Epoch Mirus Type N 4flutes, Square, Straight	ATH	Regular	4	6 ~20
	EMXN-SR-TH	Epoch Mirus Type N 4flutes, Square, Semi long shank	ATH	Semi Long Shank	4	7 ~13
	CEPS-TH	Epoch TH Hard Short	TH	Short	4,6	1 ~ 6
	CEPR-TH	Epoch TH Hard Regular	TH	Regular	4,6,8	1 ~32
	CEPL-TH	Epoch TH Hard Long	TH	Long	4,6,8	3 ~25
	CEPR	Epoch21 Regular	C	Regular	4,6,8	1 ~32
	CEPL	Epoch21 Long	C	Long	4,6,8	3 ~32
	CEPLS	Epoch21 Long Shank	C	Long Shank	6,8	6 ~32
	CEPH	Epoch Hard	C	Regular	4,6	3 ~20
	CEPU	Epoch Universal	C	Regular	4	4 ~20
	EPSW-PN	Epoch SUS Wave Regular	PN	Regular	3,4	4 ~20
	EPSWL-PN	Epoch SUS Wave Long	PN	Long	4	6 ~20
	EPSW-3DC-PN	Epoch SUS Wave Under neck 3DC	PN	Long Neck	3,4	4 ~20
	EPSW-5DC-PN	Epoch SUS Wave Under neck 5DC	PN	Long Neck	3,4	4 ~20
	EPDS-SD	Epoch SD(S-DLC) Deep Square	SD	Long neck	2	0.5~ 4
	EPAS-SD	Epoch SD(S-DLC) Square	SD	Regular	2	3 ~12

Shape	Applicable work material									Applications	Page	
	P		H			M	S	N				
	Carbon steel, Alloy steel	Pre-harden Steel under 45 HRC	High-hardened over 45HRC to under 55HRC	High-hardened over 55HRC to under 65HRC	High-hardened over 65HRC	Stainless steel	Titanium alloy, Heat-resistant alloy	Copper alloy	Aluminum alloy		Size list	Cutting conditions
	◎	◎	○	○		○	○	○	○	Planing, Side milling, Slotting	A369	A371
	◎	◎	○	○		○	○	○	○	Planing, Side milling, Slotting	A369	A373
	◎	◎	○	○		○	○	○	○	Side milling	A370	A375
	◎	◎	○	○		○	○	○	○	Side milling	A370	A375
	◎	◎	○	○		○	○	○	○	Side milling	A370	A376
	○	◎	◎							Planing, Side milling, Slotting, Die-sinking, Profiling	A383	A384
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A386	A388
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A386	A389
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A386	A390
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A387	A389
	◎	◎	○					○	○	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing, Rest material machining	A387	A390
	◎	◎	◎	◎	○	○	◎			Not recommended for Adaptive milling, Side milling	A397	A398
	◎	◎	◎	◎	○	○	◎			Not recommended for Adaptive milling, Side milling	A397	A398
	◎	◎	◎	◎	○	○	◎			Side milling	A397	A399
	◎	◎	○	○		○	○			Not recommended for Adaptive milling, Side milling	A402	A404
	◎	◎	○	○		○	○			Side milling	A402	A405
	◎	◎	○	○		○	○			Side milling	A403	A405
	◎	◎	○	○		○	○			Side milling	A403	A406
	◎	◎	○	○		○	○	○	○	Side milling, Slotting	A403	A407
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing	A412	A416
	◎	◎				◎	◎	◎	◎	Side milling	A413	A420
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing	A414	A416
	◎	◎				◎	◎	◎	◎	Planing, Side milling, Slotting, Die-sinking, Profiling, Radius, Helical, Spot facing	A415	A418
								◎	◎	Side milling, Slotting, Miniature	A426	A427
								◎	◎	Side milling, Slotting, Miniature	A429	A430

Quick dimension reference table by mill diameter

Carbide End Mill -Ball RE0.05 ~ RE0.3

Table for Carbide Endmill - Radius from A17
Square from A25

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBEH2001F-0.08-TH3	★	0.05	0.08	0.08	35	4	A30
EPDBEH2001-0.08-TH3	●	0.05	0.08	0.08	45	4	A32
EPDBEH2001F-0.2-TH3	★	0.05	0.2	0.08	35	4	A30
EPDBE2001-0.2-PN	●	0.05	0.2	0.08	45	4	A57
EPDBE2001-0.2-ATH	●	0.05	0.2	0.08	45	4	A54
EPDBEH2001-0.2-TH3	●	0.05	0.2	0.08	45	4	A32
EPDBEH2001F-0.3-TH3	★	0.05	0.3	0.08	35	4	A30
EPDBE2001-0.3-PN	●	0.05	0.3	0.08	45	4	A57
EPDBE2001-0.3-ATH	●	0.05	0.3	0.08	45	4	A54
EPDBEH2001-0.3-TH3	●	0.05	0.3	0.08	45	4	A32
EPDBEH2001F-0.5-TH3	★	0.05	0.5	0.08	35	4	A30
EPDBE2001-0.5-PN	★	0.05	0.5	0.08	45	4	A57
EPDBE2001-0.5-ATH	●	0.05	0.5	0.08	45	4	A54
EPDBEH2001-0.5-TH3	●	0.05	0.5	0.08	45	4	A32
EPDBEH20015F-0.12-TH3	★	0.075	0.12	0.12	35	4	A30
EPDBEH20015-0.12-TH3	●	0.075	0.12	0.12	45	4	A32
EPDBEH20015F-0.3-TH3	★	0.075	0.3	0.12	35	4	A30
EPDBEH20015-0.3-TH3	●	0.075	0.3	0.12	45	4	A32
EPDBEH20015F-0.5-TH3	★	0.075	0.5	0.12	35	4	A30
EPDBEH20015-0.5-TH3	●	0.075	0.5	0.12	45	4	A32
EPDBEH20015F-0.75-TH3	★	0.075	0.75	0.12	35	4	A30
EPDBEH20015-0.75-TH3	●	0.075	0.75	0.12	45	4	A32
EPDBEH20015-1-TH3	●	0.075	1	0.12	45	4	A32
EPDBEH2002F-0.15-TH3	★	0.1	0.15	0.15	35	4	A30
EPDBEH2002-0.15-TH3	●	0.1	0.15	0.15	50	4	A32
EPDBEH2002F-0.3-TH3	★	0.1	0.3	0.15	35	4	A30
EPDBEH2002-0.3-TH3	●	0.1	0.3	0.15	50	4	A32
EPDB2002-0.4-SD	★	0.1	0.4	0.15	50	4	A134
CBN-EPSB2002-0.5-F	●	0.1	0.5	0.12	50	4	A151
CBN-EPSB2002-0.5-S	★	0.1	0.5	0.12	50	4	A151
CBN-EHB2002-0.5	●	0.1	0.5	0.12	50	4	A145
EPDBEH2002F-0.5-TH3	★	0.1	0.5	0.15	35	4	A30
EPDBE2002-0.5-PN	●	0.1	0.5	0.15	50	4	A57
EPDBE2002-0.5-ATH	●	0.1	0.5	0.15	50	4	A54
EPDBEH2002-0.5-TH3	●	0.1	0.5	0.15	50	4	A32
EPDB2002-0.6-SD	★	0.1	0.6	0.15	50	4	A134
CBN-EHB2002-0.75	●	0.1	0.75	0.12	50	4	A145
EPDBEH2002F-0.75-TH3	★	0.1	0.75	0.15	35	4	A30
EPDBE2002-0.75-PN	●	0.1	0.75	0.15	50	4	A57
EPDBE2002-0.75-ATH	●	0.1	0.75	0.15	50	4	A54
EPDBEH2002-0.75-TH3	●	0.1	0.75	0.15	50	4	A32
CBN-EPSB2002-1-F	●	0.1	1	0.12	50	4	A151
CBN-EPSB2002-1-S	★	0.1	1	0.12	50	4	A151
CBN-EHB2002-1	●	0.1	1	0.12	50	4	A145
EPDBEH2002F-1-TH3	★	0.1	1	0.15	38	4	A30
EPDB2002-1-SD	★	0.1	1	0.15	50	4	A134
EPDBE2002-1-PN	●	0.1	1	0.15	50	4	A57
EPDBE2002-1-ATH	●	0.1	1	0.15	50	4	A54
EPDBEH2002-1-TH3	●	0.1	1	0.15	50	4	A32
EPDBPE2002-1-04-ATH	●	0.1	1	0.15	50	4	A72
EPDBPE2002-1-14-ATH	★	0.1	1	0.15	50	4	A72
EPDBPE2002-1-29-ATH	★	0.1	1	0.15	50	4	A72
EPDBE2002-1.25-PN	★	0.1	1.25	0.15	50	4	A57
EPDBE2002-1.25-ATH	●	0.1	1.25	0.15	50	4	A54
EPDBEH2002-1.25-TH3	●	0.1	1.25	0.15	50	4	A32
CBN-EHB2002-1.5	●	0.1	1.5	0.12	50	4	A145
EPDBE2002-1.5-PN	★	0.1	1.5	0.15	50	4	A57
EPDBE2002-1.5-ATH	●	0.1	1.5	0.15	50	4	A54
EPDBEH2002-1.5-TH3	●	0.1	1.5	0.15	50	4	A32
EPDBPE2002-1.5-04-ATH	★	0.1	1.5	0.15	50	4	A72
CBN-EHB2002-2	●	0.1	2	0.12	50	4	A145
EPDBE2002-2-PN	★	0.1	2	0.15	50	4	A57

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2002-2-ATH	●	0.1	2	0.15	50	4	A54
EPDBEH2002-2-TH3	●	0.1	2	0.15	50	4	A32
EPDBPE2002-2-04-ATH	★	0.1	2	0.15	50	4	A72
EPDBPE2002-2-09-ATH	●	0.1	2	0.15	50	4	A72
EPDBPE2002-2-14-ATH	★	0.1	2	0.15	50	4	A72
EPDBPE2002-2-29-ATH	★	0.1	2	0.15	50	4	A72
EPDBE2002-2.5-PN	★	0.1	2.5	0.15	50	4	A57
EPDBE2002-2.5-ATH	★	0.1	2.5	0.15	50	4	A54
EPDBEH2002-2.5-TH3	●	0.1	2.5	0.15	50	4	A32
EPDBPE2002-2.5-09-ATH	●	0.1	2.5	0.15	50	4	A72
EPDBE2002-3-PN	★	0.1	3	0.15	50	4	A57
EPDBE2002-3-ATH	★	0.1	3	0.15	50	4	A54
EPDBEH2002-3-TH3	●	0.1	3	0.15	50	4	A32
EPDBPE2002-3-04-ATH	★	0.1	3	0.15	50	4	A72
EPDBPE2002-3-09-ATH	★	0.1	3	0.15	50	4	A72
EPDBPE2002-3-14-ATH	★	0.1	3	0.15	50	4	A72
EPDBPE2002-3-29-ATH	★	0.1	3	0.15	50	4	A72
EPDBEH2003F-0.25-TH3	★	0.15	0.25	0.25	35	4	A30
EPDBEH2003-0.25-TH3	●	0.15	0.25	0.25	50	4	A32
CBN-EHB2003-0.5	●	0.15	0.5	0.18	50	4	A145
EPDBEH2003F-0.5-TH3	★	0.15	0.5	0.25	35	4	A30
EPDB2003-0.5-SD	★	0.15	0.5	0.25	50	4	A134
EPDBE2003-0.5-PN	●	0.15	0.5	0.25	50	4	A57
EPDBE2003-0.5-ATH	●	0.15	0.5	0.25	50	4	A54
EPDBEH2003-0.5-TH3	●	0.15	0.5	0.25	50	4	A32
CBN-EPSB2003-0.75-F	●	0.15	0.75	0.18	50	4	A151
CBN-EPSB2003-0.75-S	★	0.15	0.75	0.18	50	4	A151
CBN-EHB2003-0.75	●	0.15	0.75	0.18	50	4	A145
EPDBEH2003F-0.75-TH3	★	0.15	0.75	0.25	35	4	A30
EPDBE2003-0.75-PN	●	0.15	0.75	0.25	50	4	A57
EPDBE2003-0.75-ATH	●	0.15	0.75	0.25	50	4	A54
EPDBEH2003-0.75-TH3	●	0.15	0.75	0.25	50	4	A32
CBN-EHB2003-1	●	0.15	1	0.18	50	4	A145
EPDBEH2003F-1-TH3	★	0.15	1	0.25	35	4	A30
EPDB2003-1-SD	★	0.15	1	0.25	50	4	A134
EPDBE2003-1-PN	●	0.15	1	0.25	50	4	A57
EPDBE2003-1-ATH	●	0.15	1	0.25	50	4	A54
EPDBEH2003-1-TH3	●	0.15	1	0.25	50	4	A32
EPDBE2003-1.25-PN	●	0.15	1.25	0.25	50	4	A57
EPDBE2003-1.25-ATH	●	0.15	1.25	0.25	50	4	A54
EPDBEH2003-1.25-TH3	●	0.15	1.25	0.25	50	4	A32
CBN-EPSB2003-1.5-F	●	0.15	1.5	0.18	50	4	A151
CBN-EPSB2003-1.5-S	★	0.15	1.5	0.18	50	4	A151
CBN-EHB2003-1.5	●	0.15	1.5	0.18	50	4	A145
EPDBEH2003F-1.5-TH3	★	0.15	1.5	0.25	38	4	A30
EPDB2003-1.5-SD	★	0.15	1.5	0.25	50	4	A134
EPDBE2003-1.5-PN	★	0.15	1.5	0.25	50	4	A57
EPDBE2003-1.5-ATH	●	0.15	1.5	0.25	50	4	A54
EPDBEH2003-1.5-TH3	●	0.15	1.5	0.25	50	4	A32
CBN-EHB2003-2	●	0.15	2	0.18	50	4	A145
EPDBE2003-2-PN	★	0.15	2	0.25	50	4	A57
EPDBE2003-2-ATH	●	0.15	2	0.25	50	4	A54
EPDBEH2003-2-TH3	●	0.15	2	0.25	50	4	A32
EPDBPE2003-2-04-ATH	●	0.15	2	0.25	50	4	A72
EPDBE2003-2.5-PN	★	0.15	2.5	0.25	50	4	A57
EPDBE2003-2.5-ATH	★	0.15	2.5	0.25	50	4	A54
EPDBEH2003-2.5-TH3	●	0.15	2.5	0.25	50	4	A32
CBN-EHB2003-3	●	0.15	3	0.18	50	4	A145
EPDBE2003-3-PN	★	0.15	3	0.25	50	4	A57
EPDBE2003-3-ATH	★	0.15	3	0.25	50	4	A54
EPDBEH2003-3-TH3	●	0.15	3	0.25	50	4	A32
EPDBPE2003-3-04-ATH	★	0.15	3	0.25	50	4	A72

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBPE2003-3-09-ATH	●	0.15	3	0.25	50	4	A72
EPDBEH2003-3.5-TH3	●	0.15	3.5	0.25	50	4	A32
EPDBEH2003-4-TH3	●	0.15	4	0.25	50	4	A32
EPDBPE2003-4-09-ATH	★	0.15	4	0.25	50	4	A72
HGOB2003-PN	●	0.15	-	0.6	50	4	A91
EPDBEH2004F-0.3-TH3	★	0.2	0.3	0.3	35	4	A30
EPDBEH2004-0.3-TH3	●	0.2	0.3	0.3	50	4	A32
EPDBEH2004F-0.5-TH3	★	0.2	0.5	0.3	35	4	A30
EPDBEH2004-0.5-TH3	●	0.2	0.5	0.3	50	4	A32
EPDBEH2004F-0.75-TH3	★	0.2	0.75	0.3	35	4	A30
EPDBE2004-0.75-PN	●	0.2	0.75	0.3	50	4	A57
EPDBE2004-0.75-ATH	●	0.2	0.75	0.3	50	4	A54
EPDBEH2004-0.75-TH3	●	0.2	0.75	0.3	50	4	A32
CBN-EHB2004-0.75	●	0.2	0.75	0.4	50	4	A145
CBN-EPSB2004-1-F	●	0.2	1	0.24	50	4	A151
CBN-EPSB2004-1-S	★	0.2	1	0.24	50	4	A151
EPDBEH2004F-1-TH3	★	0.2	1	0.3	35	4	A30
EPDB2004-1-SD	★	0.2	1	0.3	50	4	A134
EPDBE2004-1-PN	●	0.2	1	0.3	50	4	A57
EPDBE2004-1-ATH	●	0.2	1	0.3	50	4	A54
EPDBEH2004-1-TH3	●	0.2	1	0.3	50	4	A32
CBN-EHB2004-1	●	0.2	1	0.4	50	4	A145
EPDBEH2004F-1.5-TH3	★	0.2	1.5	0.3	38	4	A30
EPDB2004-1.5-SD	★	0.2	1.5	0.3	50	4	A134
EPDBE2004-1.5-PN	●	0.2	1.5	0.3	50	4	A57
EPDBE2004-1.5-ATH	●	0.2	1.5	0.3	50	4	A54
EPDBEH2004-1.5-TH3	●	0.2	1.5	0.3	50	4	A32
CBN-EHB2004-1.5	●	0.2	1.5	0.4	50	4	A145
CBN-EPSB2004-2-F	●	0.2	2	0.24	50	4	A151
CBN-EPSB2004-2-S	★	0.2	2	0.24	50	4	A151
EPDBEH2004F-2-TH3	★	0.2	2	0.3	38	4	A30
EPDB2004-2-SD	★	0.2	2	0.3	50	4	A134
EPDBE2004-2-PN	●	0.2	2	0.3	50	4	A57
EPDBE2004-2-ATH	●	0.2	2	0.3	50	4	A54
EPDBEH2004-2-TH3	●	0.2	2	0.3	50	4	A32
EPDBPE2004-2-04-ATH	●	0.2	2	0.3	50	4	A72
EPDBPE2004-2-09-ATH	●	0.2	2	0.3	50	4	A72
EPDBPE2004-2-14-ATH	★	0.2	2	0.3	50	4	A72
EPDBPE2004-2-29-ATH	★	0.2	2	0.3	50	4	A72
CBN-EHB2004-2	●	0.2	2	0.4	50	4	A145
EPDBEH2004F-2.5-TH3	★	0.2	2.5	0.3	38	4	A30
EPDBE2004-2.5-PN	★	0.2	2.5	0.3	50	4	A57
EPDBE2004-2.5-ATH	●	0.2	2.5	0.3	50	4	A54
EPDBEH2004-2.5-TH3	●	0.2	2.5	0.3	50	4	A32
EPDBEH2004F-3-TH3	★	0.2	3	0.3	38	4	A30
EPDBE2004-3-PN	★	0.2	3	0.3	50	4	A57
EPDBE2004-3-ATH	●	0.2	3	0.3	50	4	A54
EPDBEH2004-3-TH3	●	0.2	3	0.3	50	4	A32
EPDBPE2004-3-04-ATH	●	0.2	3	0.3	50	4	A72
CBN-EHB2004-3	●	0.2	3	0.4	50	4	A145
EPDBE2004-3.5-PN	★	0.2	3.5	0.3	50	4	A57
EPDBE2004-3.5-ATH	★	0.2	3.5	0.3	50	4	A54
EPDBEH2004-3.5-TH3	●	0.2	3.5	0.3	50	4	A32
EPDBEH2004F-4-TH3	★	0.2	4	0.3	38	4	A30
EPDBE2004-4-PN	★	0.2	4	0.3	50	4	A57
EPDBE2004-4-ATH	●	0.2	4	0.3	50	4	A54
EPDBEH2004-4-TH3	●	0.2	4	0.3	50	4	A32
EPDBPE2004-4-04-ATH	★	0.2	4	0.3	50	4	A72
EPDBPE2004-4-09-ATH	●	0.2	4	0.3	50	4	A72
EPDBPE2004-4-14-ATH	★	0.2	4	0.3	50	4	A72
EPDBPE2004-4-29-ATH	★	0.2	4	0.3	50	4	A72
EGDB2004-4-HD	★	0.2	4	0.6	60	4	A140

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2004-4.5-PN	★	0.2	4.5	0.3	50	4	A57
EPDBE2004-4.5-ATH	★	0.2	4.5	0.3	50	4	A54
EPDBEH2004-4.5-TH3	●	0.2	4.5	0.3	50	4	A32
EPDBEH2004-5-TH3	●	0.2	5	0.3	50	4	A32
EPDBPE2004-5-04-ATH	★	0.2	5	0.3	50	4	A72
EPDBPE2004-5-09-ATH	●	0.2	5	0.3	50	4	A72
EPDBPE2004-6-04-ATH	★	0.2	6	0.3	50	4	A72
EPDBPE2004-6-09-ATH	★	0.2	6	0.3	50	4	A72
EPDBPE2004-6-14-ATH	★	0.2	6	0.3	50	4	A72
EPDBPE2004-6-29-ATH	★	0.2	6	0.3	50	4	A72
EPDBPE2004-8-04-ATH	★	0.2	8	0.3	50	4	A72
EGDB2004-8-HD	★	0.2	8	0.6	60	4	A140
EGDB2004-12-HD	★	0.2	12	0.6	60	4	A140
HGOB2004-PN	●	0.2	-	0.8	50	4	A91
EPDBEH2005F-0.35-TH3	★	0.25	0.35	0.35	35	4	A30
EPDBEH2005-0.35-TH3	●	0.25	0.35	0.35	50	4	A32
EPDBEH2005F-0.75-TH3	★	0.25	0.75	0.35	35	4	A30
EPDBEH2005-0.75-TH3	●	0.25	0.75	0.35	50	4	A32
EPDBEH2005F-1-TH3	★	0.25	1	0.35	35	4	A30
EPDBE2005-1-PN	●	0.25	1	0.35	50	4	A57
EPDBE2005-1-ATH	●	0.25	1	0.35	50	4	A54
EPDBEH2005-1-TH3	●	0.25	1	0.35	50	4	A33
CBN-EHB2005-1	●	0.25	1	0.5	50	4	A145
CBN-EPSB2005-1.5-F	●	0.25	1.5	0.3	50	4	A151
CBN-EPSB2005-1.5-S	★	0.25	1.5	0.3	50	4	A151
EPDBEH2005F-1.5-TH3	★	0.25	1.5	0.35	38	4	A30
EPDBE2005-1.5-PN	●	0.25	1.5	0.35	50	4	A57
EPDBE2005-1.5-ATH	●	0.25	1.5	0.35	50	4	A54
EPDBEH2005-1.5-TH3	●	0.25	1.5	0.35	50	4	A33
CBN-EHB2005-1.5	●	0.25	1.5	0.5	50	4	A145
EPDBEH2005F-2-TH3	★	0.25	2	0.35	38	4	A30
EPDB2005-2-SD	★	0.25	2	0.35	50	4	A134
EPDBE2005-2-PN	●	0.25	2	0.35	50	4	A57
EPDBE2005-2-ATH	●	0.25	2	0.35	50	4	A54
EPDBEH2005-2-TH3	●	0.25	2	0.35	50	4	A33
EPDBEH2005F-2.5-TH3	★	0.25	2.5	0.35	38	4	A30
EPDBE2005-2.5-PN	●	0.25	2.5	0.35	50	4	A57
EPDBE2005-2.5-ATH	●	0.25	2.5	0.35	50	4	A54
EPDBEH2005-2.5-TH3	●	0.25	2.5	0.35	50	4	A33
CBN-EHB2005-2.5	●	0.25	2.5	0.5	50	4	A145
CBN-EPSB2005-3-F	●	0.25	3	0.3	50	4	A151
CBN-EPSB2005-3-S	★	0.25	3	0.3	50	4	A151
EPDBEH2005F-3-TH3	★	0.25	3	0.35	38	4	A30
EPDBE2005-3-PN	●	0.25	3	0.35	50	4	A57
EPDBE2005-3-ATH	●	0.25	3	0.35	50	4	A54
EPDBEH2005-3-TH3	●	0.25	3	0.35	50	4	A33
CBN-EHB2005-3	●	0.25	3	0.5	50	4	A145
EPDBEH2005F-4-TH3	★	0.25	4	0.35	38	4	A30
EPDB2005-4-SD	★	0.25	4	0.35	50	4	A134
EPDBE2005-4-PN	●	0.25	4	0.35	50	4	A57
EPDBE2005-4-ATH	●	0.25	4	0.35	50	4	A54
EPDBEH2005-4-TH3	●	0.25	4	0.35	50	4	A33
EPDBPE2005-4-04-ATH	●	0.25	4	0.35	50	4	A72
EPDBEH2005F-5-TH3	★	0.25	5	0.35	42	4	A30
EPDBE2005-5-PN	★	0.25	5	0.35	50	4	A57
EPDBE2005-5-ATH	●	0.25	5	0.35	50	4	A54
EPDBEH2005-5-TH3	●	0.25	5	0.35	50	4	A33
EPDBE2005-5.5-PN	★	0.25	5.5	0.35	50	4	A57
EPDBE2005-5.5-ATH	★	0.25	5.5	0.35	50	4	A54
EPDBEH2005-5.5-TH3	●	0.25	5.5	0.35	50	4	A33
EPDB2005-6-SD	★	0.25	6	0.35	50	4	A134
EPDBE2005-6-PN	★	0.25	6	0.35	50	4	A57

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2005-6-ATH	●	0.25	6	0.35	50	4	A54
EPDBEH2005-6-TH3	●	0.25	6	0.35	50	4	A33
EPDBPE2005-6-04-ATH	●	0.25	6	0.35	50	4	A72
EPDBPE2005-6-09-ATH	●	0.25	6	0.35	50	4	A72
EPDBEH2005-7-TH3	●	0.25	7	0.35	50	4	A33
EPDBE2005-8-PN	★	0.25	8	0.35	50	4	A57
EPDBE2005-8-ATH	●	0.25	8	0.35	50	4	A54
EPDBEH2005-8-TH3	●	0.25	8	0.35	50	4	A33
EPDBPE2005-8-09-ATH	●	0.25	8	0.35	50	4	A72
EPDBPE2005-12-09-ATH	●	0.25	12	0.35	50	4	A72
HGOB2005-PN	●	0.25	-	1	50	4	A91
EPDBPE20054-2-04-ATH	★	0.27	2	0.37	50	4	A72
EPDBPE20054-4-04-ATH	★	0.27	4	0.37	50	4	A72
EPDBPE20054-5-04-ATH	★	0.27	5	0.37	50	4	A72
EPDBPE20054-6-04-ATH	★	0.27	6	0.37	50	4	A72
EPDBPE20054-6.5-04-ATH	★	0.27	6.5	0.37	50	4	A72
EPDBPE20054-7-04-ATH	★	0.27	7	0.37	50	4	A72
EPDBEH2006F-0.4-TH3	★	0.3	0.4	0.4	35	4	A30
EPDBEH2006-0.4-TH3	●	0.3	0.4	0.4	50	4	A33
EPDBEH2006F-0.75-TH3	★	0.3	0.75	0.4	35	4	A30
EPDBEH2006-0.75-TH3	●	0.3	0.75	0.4	50	4	A33
EPDBEH2006F-1-TH3	★	0.3	1	0.4	35	4	A30
EPDBE2006-1-PN	●	0.3	1	0.4	50	4	A57
EPDBE2006-1-ATH	●	0.3	1	0.4	50	4	A54
EPDBEH2006-1-TH3	●	0.3	1	0.4	50	4	A33
CBN-EHB2006-1	●	0.3	1	0.55	50	4	A145
CBN-EPSB2006-1.5-F	●	0.3	1.5	0.36	50	4	A151
CBN-EPSB2006-1.5-S	★	0.3	1.5	0.36	50	4	A151
EPDBEH2006F-1.5-TH3	★	0.3	1.5	0.4	35	4	A30
EPDBEH2006-1.5-TH3	●	0.3	1.5	0.4	50	4	A33
CBN-EHB2006-1.5	●	0.3	1.5	0.55	50	4	A145
EPDBEH2006F-2-TH3	★	0.3	2	0.4	38	4	A30
EPDB2006-2-SD	★	0.3	2	0.4	50	4	A134
EPDBE2006-2-PN	●	0.3	2	0.4	50	4	A57
EPDBE2006-2-ATH	●	0.3	2	0.4	50	4	A54
EPDBEH2006-2-TH3	●	0.3	2	0.4	50	4	A33
EPDBPE2006-2-04-ATH	●	0.3	2	0.4	50	4	A72
EPDBEH2006F-2.5-TH3	★	0.3	2.5	0.4	38	4	A30
EPDBE2006-2.5-PN	●	0.3	2.5	0.4	50	4	A57
EPDBE2006-2.5-ATH	●	0.3	2.5	0.4	50	4	A54
EPDBEH2006-2.5-TH3	●	0.3	2.5	0.4	50	4	A33
CBN-EPSB2006-3-F	●	0.3	3	0.36	50	4	A151
CBN-EPSB2006-3-S	★	0.3	3	0.36	50	4	A151
EPDBEH2006F-3-TH3	★	0.3	3	0.4	38	4	A30
EPDBE2006-3-PN	●	0.3	3	0.4	50	4	A57
EPDBE2006-3-ATH	●	0.3	3	0.4	50	4	A54
EPDBEH2006-3-TH3	●	0.3	3	0.4	50	4	A33
CBN-EHB2006-3	●	0.3	3	0.55	50	4	A145
EPDBEH2006F-3.5-TH3	★	0.3	3.5	0.4	38	4	A30
EPDBE2006-3.5-PN	★	0.3	3.5	0.4	50	4	A57
EPDBE2006-3.5-ATH	●	0.3	3.5	0.4	50	4	A54
EPDBEH2006-3.5-TH3	●	0.3	3.5	0.4	50	4	A33
EPDBEH2006F-4-TH3	★	0.3	4	0.4	38	4	A30
EPDB2006-4-SD	★	0.3	4	0.4	50	4	A134
EPDBE2006-4-PN	★	0.3	4	0.4	50	4	A57
EPDBE2006-4-ATH	●	0.3	4	0.4	50	4	A54
EPDBEH2006-4-TH3	●	0.3	4	0.4	50	4	A33
EPDBPE2006-4-04-ATH	●	0.3	4	0.4	50	4	A72
EPDBPE2006-4-09-ATH	●	0.3	4	0.4	50	4	A73
EPDBPE2006-4-14-ATH	●	0.3	4	0.4	50	4	A73
EB4HR0060TN-4-05-ATH	★	0.3	4	3.2	50	4	A124
EB4HR0060TN-4-10-ATH	★	0.3	4	3.2	50	4	A124

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2006-4.5-PN	★	0.3	4.5	0.4	50	4	A57
EPDBE2006-4.5-ATH	★	0.3	4.5	0.4	50	4	A54
EPDBEH2006-4.5-TH3	●	0.3	4.5	0.4	50	4	A33
EPDBEH2006F-5-TH3	★	0.3	5	0.4	42	4	A30
EPDBE2006-5-PN	★	0.3	5	0.4	50	4	A57
EPDBE2006-5-ATH	●	0.3	5	0.4	50	4	A54
EPDBEH2006-5-TH3	●	0.3	5	0.4	50	4	A33
EPDBPE2006-5-14-ATH	●	0.3	5	0.4	50	4	A73
EGDB2006-5-HD	★	0.3	5	0.9	60	4	A140
EB4HR0060TN-5-05-ATH	★	0.3	5	3.2	50	4	A124
EB4HR0060TN-5-10-ATH	★	0.3	5	3.2	50	4	A124
EPDBE2006-5.5-PN	★	0.3	5.5	0.4	50	4	A57
EPDBE2006-5.5-ATH	★	0.3	5.5	0.4	50	4	A54
EPDBEH2006-5.5-TH3	●	0.3	5.5	0.4	50	4	A33
EPDBEH2006F-6-TH3	★	0.3	6	0.4	42	4	A30
EPDB2006-6-SD	★	0.3	6	0.4	50	4	A134
EPDBE2006-6-PN	★	0.3	6	0.4	50	4	A57
EPDBE2006-6-ATH	●	0.3	6	0.4	50	4	A54
EPDBEH2006-6-TH3	●	0.3	6	0.4	50	4	A33
EPDBPE2006-6-04-ATH	●	0.3	6	0.4	50	4	A72
EPDBPE2006-6-09-ATH	●	0.3	6	0.4	50	4	A73
EPDBPE2006-6-14-ATH	●	0.3	6	0.4	50	4	A73
EPDBPE2006-6-29-ATH	★	0.3	6	0.4	50	4	A73
EB4HR0060TN-6-05-ATH	★	0.3	6	3.2	50	4	A124
EB4HR0060TN-6-10-ATH	★	0.3	6	3.2	50	4	A124
EPDBE2006-7-PN	★	0.3	7	0.4	50	4	A57
EPDBE2006-7-ATH	★	0.3	7	0.4	50	4	A54
EPDBEH2006-7-TH3	●	0.3	7	0.4	50	4	A33
EB4HR0060TN-7-05-ATH	★	0.3	7	3.2	50	4	A124
EB4HR0060TN-7-10-ATH	★	0.3	7	3.2	50	4	A124
EPDBE2006-8-PN	★	0.3	8	0.4	50	4	A57
EPDBE2006-8-ATH	●	0.3	8	0.4	50	4	A54
EPDBEH2006-8-TH3	●	0.3	8	0.4	50	4	A33
EPDBPE2006-8-04-ATH	●	0.3	8	0.4	50	4	A72
EPDBPE2006-8-09-ATH	●	0.3	8	0.4	50	4	A73
EPDBPE2006-8-14-ATH	●	0.3	8	0.4	50	4	A73
EPDBPE2006-8-29-ATH	★	0.3	8	0.4	50	4	A73
EB4HR0060TN-8-05-ATH	★	0.3	8	3.2	50	4	A124
EB4HR0060TN-8-10-ATH	★	0.3	8	3.2	50	4	A124
EPDBE2006-9-PN	★	0.3	9	0.4	50	4	A57
EPDBE2006-9-ATH	★	0.3	9	0.4	50	4	A54
EPDBEH2006-9-TH3	●	0.3	9	0.4	50	4	A33
EB4HR0060TN-9-05-ATH	★	0.3	9	3.2	50	4	A124
EB4HR0060TN-9-10-ATH	★	0.3	9	3.2	50	4	A124
EPDBE2006-10-PN	★	0.3	10	0.4	50	4	A57
EPDBE2006-10-ATH	●	0.3	10	0.4	50	4	A54
EPDBEH2006-10-TH3	●	0.3	10	0.4	50	4	A33
EPDBPE2006-10-04-ATH	●	0.3	10	0.4	50	4	A72
EPDBPE2006-10-09-ATH	●	0.3	10	0.4	50	4	A73
EPDBPE2006-10-14-ATH	●	0.3	10	0.4	50	4	A73
EGDB2006-10-HD	★	0.3	10	0.9	60	4	A140
EB4HR0060TN-10-05-ATH	★	0.3	10	3.2	50	4	A124
EB4HR0060TN-10-10-ATH	★	0.3	10	3.2	50	4	A124
EPDBE2006-12-PN	★	0.3	12	0.4	50	4	A57
EPDBE2006-12-ATH	★	0.3	12	0.4	50	4	A54
EPDBEH2006-12-TH3	●	0.3	12	0.4	50	4	A33
EPDBPE2006-12-04-ATH	★	0.3	12	0.4	55	4	A72
EPDBPE2006-12-09-ATH	●	0.3	12	0.4	55	4	A73
EPDBPE2006-12-29-ATH	★	0.3	12	0.4	55	4	A73
EPDBPE2006-15-04-ATH	★	0.3	15	0.4	55	4	A72
EPDBPE2006-15-09-ATH	●	0.3	15	0.4	55	4	A73
EGDB2006-15-HD	★	0.3	15	0.9	60	4	A140

Quick dimension reference table by mill diameter

Carbide End Mill -Ball

RE0.3 ~ RE0.6

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBPE2006-20-14-ATH	★	0.3	20	0.4	60	4	A73
EPDBPE2006-20-29-ATH	★	0.3	20	0.4	60	4	A73
EGDB2006-20-HD	★	0.3	20	0.9	60	4	A140
HGOB2006-PN	●	0.3	-	1.2	50	4	A91
EPDBEH2007F-0.45-TH3	★	0.35	0.45	0.45	35	4	A31
EPDBEH2007-0.45-TH3	●	0.35	0.45	0.45	50	4	A33
EPDBEH2007F-2-TH3	★	0.35	2	0.45	38	4	A31
EPDBE2007-2-PN	★	0.35	2	0.45	50	4	A58
EPDBE2007-2-ATH	★	0.35	2	0.45	50	4	A55
EPDBEH2007-2-TH3	●	0.35	2	0.45	50	4	A33
EPDBEH2007F-4-TH3	★	0.35	4	0.45	38	4	A31
EPDBE2007-4-PN	★	0.35	4	0.45	50	4	A58
EPDBE2007-4-ATH	★	0.35	4	0.45	50	4	A55
EPDBEH2007-4-TH3	●	0.35	4	0.45	50	4	A33
EB4HR0070TN-4-05-ATH	★	0.35	4	3.2	50	4	A124
EB4HR0070TN-4-10-ATH	★	0.35	4	3.2	50	4	A124
EB4HR0070TN-5-05-ATH	★	0.35	5	3.2	50	4	A124
EB4HR0070TN-5-10-ATH	★	0.35	5	3.2	50	4	A124
EPDBE2007-6-PN	★	0.35	6	0.45	50	4	A58
EPDBE2007-6-ATH	★	0.35	6	0.45	50	4	A55
EPDBEH2007-6-TH3	●	0.35	6	0.45	50	4	A33
EB4HR0070TN-6-05-ATH	★	0.35	6	3.2	50	4	A124
EB4HR0070TN-6-10-ATH	★	0.35	6	3.2	50	4	A124
EB4HR0070TN-7-05-ATH	★	0.35	7	3.2	50	4	A124
EB4HR0070TN-7-10-ATH	★	0.35	7	3.2	50	4	A124
EPDBE2007-8-PN	★	0.35	8	0.45	50	4	A58
EPDBE2007-8-ATH	★	0.35	8	0.45	50	4	A55
EPDBEH2007-8-TH3	●	0.35	8	0.45	50	4	A33
EB4HR0070TN-8-05-ATH	★	0.35	8	3.2	50	4	A124
EB4HR0070TN-8-10-ATH	★	0.35	8	3.2	50	4	A124
EB4HR0070TN-9-05-ATH	★	0.35	9	3.2	50	4	A124
EB4HR0070TN-9-10-ATH	★	0.35	9	3.2	50	4	A124
EB4HR0070TN-10-05-ATH	★	0.35	10	3.2	50	4	A124
EB4HR0070TN-10-10-ATH	★	0.35	10	3.2	50	4	A124
EPDBEH2008F-0.5-TH3	★	0.4	0.5	0.5	35	4	A31
EPDBEH2008-0.5-TH3	●	0.4	0.5	0.5	50	4	A33
EPDBEH2008F-1-TH3	★	0.4	1	0.5	35	4	A31
EPDBEH2008-1-TH3	●	0.4	1	0.5	50	4	A33
EPDBEH2008F-1.5-TH3	★	0.4	1.5	0.5	35	4	A31
EPDBEH2008-1.5-TH3	●	0.4	1.5	0.5	50	4	A33
CBN-EHB2008-1.5	●	0.4	1.5	0.7	50	4	A145
EPDBEH2008F-2-TH3	★	0.4	2	0.5	38	4	A31
EPDBE2008-2-PN	●	0.4	2	0.5	50	4	A58
EPDBE2008-2-ATH	●	0.4	2	0.5	50	4	A55
EPDBEH2008-2-TH3	●	0.4	2	0.5	50	4	A33
CBN-EPSB2008-2.5-F	●	0.4	2.5	0.48	50	4	A151
CBN-EPSB2008-2.5-S	★	0.4	2.5	0.48	50	4	A151
EPDBEH2008F-2.5-TH3	★	0.4	2.5	0.5	38	4	A31
EPDBEH2008-2.5-TH3	●	0.4	2.5	0.5	50	4	A33
CBN-EHB2008-2.5	●	0.4	2.5	0.7	50	4	A145
EPDBEH2008F-3-TH3	★	0.4	3	0.5	38	4	A31
EPDBEH2008-3-TH3	●	0.4	3	0.5	50	4	A33
EPDBEH2008F-4-TH3	★	0.4	4	0.5	38	4	A31
EPDB2008-4-SD	★	0.4	4	0.5	50	4	A134
EPDBE2008-4-PN	●	0.4	4	0.5	50	4	A58
EPDBE2008-4-ATH	●	0.4	4	0.5	50	4	A55
EPDBEH2008-4-TH3	●	0.4	4	0.5	50	4	A33
EPDBPE2008-4-04-ATH	●	0.4	4	0.5	50	4	A73
CBN-EHB2008-4	●	0.4	4	0.7	50	4	A145
EB4HR0080TN-4-05-ATH	★	0.4	4	3.2	50	4	A124
EB4HR0080TN-4-10-ATH	★	0.4	4	3.2	50	4	A124
CBN-EPSB2008-5-F	●	0.4	5	0.48	50	4	A151

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
CBN-EPSB2008-5-S	★	0.4	5	0.48	50	4	A151
EPDBEH2008F-5-TH3	★	0.4	5	0.5	42	4	A31
EPDBE2008-5-PN	●	0.4	5	0.5	50	4	A58
EPDBE2008-5-ATH	●	0.4	5	0.5	50	4	A55
EPDBEH2008-5-TH3	●	0.4	5	0.5	50	4	A33
EPDBEH2008F-6-TH3	★	0.4	6	0.5	42	4	A31
EPDB2008-6-SD	★	0.4	6	0.5	50	4	A134
EPDBE2008-6-PN	●	0.4	6	0.5	50	4	A58
EPDBE2008-6-ATH	●	0.4	6	0.5	50	4	A55
EPDBEH2008-6-TH3	●	0.4	6	0.5	50	4	A33
EPDBPE2008-6-04-ATH	●	0.4	6	0.5	50	4	A73
EB4HR0080TN-6-05-ATH	★	0.4	6	3.2	50	4	A124
EB4HR0080TN-6-10-ATH	★	0.4	6	3.2	50	4	A124
EPDBEH2008F-8-TH3	★	0.4	8	0.5	42	4	A31
EPDB2008-8-SD	★	0.4	8	0.5	50	4	A134
EPDBE2008-8-PN	★	0.4	8	0.5	50	4	A58
EPDBE2008-8-ATH	●	0.4	8	0.5	50	4	A55
EPDBEH2008-8-TH3	●	0.4	8	0.5	50	4	A33
EPDBPE2008-8-04-ATH	●	0.4	8	0.5	50	4	A73
EPDBPE2008-8-09-ATH	●	0.4	8	0.5	50	4	A73
EB4HR0080TN-8-05-ATH	★	0.4	8	3.2	50	4	A124
EB4HR0080TN-8-10-ATH	★	0.4	8	3.2	50	4	A124
EPDBE2008-10-PN	★	0.4	10	0.5	50	4	A58
EPDBE2008-10-ATH	●	0.4	10	0.5	50	4	A55
EPDBEH2008-10-TH3	●	0.4	10	0.5	50	4	A33
EB4HR0080TN-10-05-ATH	★	0.4	10	3.2	50	4	A124
EB4HR0080TN-10-10-ATH	★	0.4	10	3.2	50	4	A124
EPDBEH2008-12-TH3	●	0.4	12	0.5	50	4	A33
EPDBPE2008-12-04-ATH	★	0.4	12	0.5	55	4	A73
EPDBPE2008-12-09-ATH	●	0.4	12	0.5	55	4	A73
EB4HR0080TN-12-05-ATH	★	0.4	12	3.2	55	4	A124
EB4HR0080TN-12-10-ATH	★	0.4	12	3.2	55	4	A124
EB4HR0080TN-14-05-ATH	★	0.4	14	3.2	55	4	A124
EB4HR0080TN-14-10-ATH	★	0.4	14	3.2	55	4	A124
EPDBPE2008-16-09-ATH	●	0.4	16	0.5	55	4	A73
EPDBPE2008-16-29-ATH	★	0.4	16	0.5	55	4	A73
EPDBPE2008-20-29-ATH	★	0.4	20	0.5	60	4	A73
HGOB2008-PN	●	0.4	-	1.6	50	4	A91
ECRB0809-6-PN	★	0.4	-	6	60	4	A130
ECRB0810-6-PN	★	0.4	-	6	60	4	A130
ECRB0809-8-PN	★	0.4	-	8	60	4	A130
ECRB0810-8-PN	★	0.4	-	8	60	4	A130
ECRB0809-10-PN	★	0.4	-	10	60	4	A130
ECRB0810-10-PN	★	0.4	-	10	60	4	A130
ECRB0809-12-PN	★	0.4	-	12	60	4	A130
ECRB0810-12-PN	★	0.4	-	12	60	4	A130
EPDBEH2009F-0.6-TH3	★	0.45	0.6	0.6	35	4	A31
EPDBEH2009-0.6-TH3	●	0.45	0.6	0.6	50	4	A33
EPDBEH2009F-2-TH3	★	0.45	2	0.6	35	4	A31
EPDBE2009-2-PN	★	0.45	2	0.6	50	4	A58
EPDBE2009-2-ATH	★	0.45	2	0.6	50	4	A55
EPDBEH2009-2-TH3	●	0.45	2	0.6	50	4	A33
EPDBEH2009F-4-TH3	★	0.45	4	0.6	38	4	A31
EPDBE2009-4-PN	★	0.45	4	0.6	50	4	A58
EPDBE2009-4-ATH	★	0.45	4	0.6	50	4	A55
EPDBEH2009-4-TH3	●	0.45	4	0.6	50	4	A33
EPDBPE2009-4-04-ATH	★	0.45	4	0.6	50	4	A73
EB4HR0090TN-4-05-ATH	★	0.45	4	3.2	50	4	A124
EB4HR0090TN-4-10-ATH	★	0.45	4	3.2	50	4	A124
EPDBEH2009F-6-TH3	★	0.45	6	0.6	42	4	A31
EPDBE2009-6-PN	★	0.45	6	0.6	50	4	A58
EPDBE2009-6-ATH	★	0.45	6	0.6	50	4	A55

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBEH2009-6-TH3	●	0.45	6	0.6	50	4	A33
EB4HR0090TN-6-05-ATH	★	0.45	6	3.2	50	4	A124
EB4HR0090TN-6-10-ATH	★	0.45	6	3.2	50	4	A124
EPDBE2009-8-PN	★	0.45	8	0.6	50	4	A58
EPDBE2009-8-ATH	★	0.45	8	0.6	50	4	A55
EPDBEH2009-8-TH3	●	0.45	8	0.6	50	4	A33
EPDBPE2009-8-04-ATH	★	0.45	8	0.6	55	4	A73
EB4HR0090TN-8-05-ATH	★	0.45	8	3.2	50	4	A124
EB4HR0090TN-8-10-ATH	★	0.45	8	3.2	50	4	A124
EB4HR0090TN-10-05-ATH	★	0.45	10	3.2	50	4	A124
EB4HR0090TN-10-10-ATH	★	0.45	10	3.2	50	4	A124
EPDBPE2009-12-04-ATH	★	0.45	12	0.6	55	4	A73
EB4HR0090TN-12-05-ATH	★	0.45	12	3.2	55	4	A124
EB4HR0090TN-12-10-ATH	★	0.45	12	3.2	55	4	A124
EB4HR0090TN-14-05-ATH	★	0.45	14	3.2	55	4	A124
EB4HR0090TN-14-10-ATH	★	0.45	14	3.2	55	4	A124
EPDBPE2009-16-04-ATH	★	0.45	16	0.6	60	4	A73
EPDBPE2009-18-04-ATH	★	0.45	18	0.6	65	4	A73
EPDBPE2009-20-04-ATH	★	0.45	20	0.6	65	4	A73
EPDBPE2009-22-04-ATH	★	0.45	22	0.6	65	4	A73
EPDBPE2009-24-04-ATH	★	0.45	24	0.6	70	4	A73
EPDBEH2010F-0.8-TH3	★	0.5	0.8	0.8	35	4	A31
EPDBEH2010-0.8-TH3	●	0.5	0.8	0.8	50	4	A34
EPDBEH2010F-1.5-TH3	★	0.5	1.5	0.8	35	4	A31
EPDBEH2010-1.5-TH3	●	0.5	1.5	0.8	50	4	A34
CBN-EHB2010-1.5	●	0.5	1.5	1	50	4	A145
EPDBEH2010F-2-TH3	★	0.5	2	0.8	35	4	A31
EPDBE2010-2-PN	●	0.5	2	0.8	50	4	A58
EPDBE2010-2-ATH	●	0.5	2	0.8	50	4	A55
EPDBEH2010-2-TH3	●	0.5	2	0.8	50	4	A34
EPDBEH2010-2-S6-TH3	●	0.5	2	0.8	50	6	A34
CBN-EPSB2010-2.5-F	●	0.5	2.5	0.6	50	4	A151
CBN-EPSB2010-2.5-S	★	0.5	2.5	0.6	50	4	A151
EPDBEH2010F-2.5-TH3	★	0.5	2.5	0.8	38	4	A31
EPDBEH2010-2.5-TH3	●	0.5	2.5	0.8	50	4	A34
ESHB2010-H-TH	★	0.5	2.5	1	40	4	A102
ESHB2010-N-TH	★	0.5	2.5	1	40	4	A102
CBN-EHB2010-2.5	●	0.5	2.5	1	50	4	A145
EPBT2010	●	0.5	2.5	1.5	50	4	A88
EPDBEH2010F-3-TH3	★	0.5	3	0.8	38	4	A31
EPDBE2010-3-PN	●	0.5	3	0.8	50	4	A58
EPDBE2010-3-ATH	●	0.5	3	0.8	50	4	A55
EPDBEH2010-3-TH3	●	0.5	3	0.8	50	4	A34
EPDBEH2010-3-S6-TH3	●	0.5	3	0.8	50	6	A34
EHHBE4010-S4-TH3	●	0.5	3	1.5	50	4	A119
EMBE3010-S4-ATH	●	0.5	3	1.5	50	4	A105
EHHBE4010-S6-TH3	●	0.5	3	1.5	50	6	A119
EMBE3010-S6-ATH	●	0.5	3	1.5	50	6	A105
EPDBEH2010F-4-TH3	★	0.5	4	0.8	38	4	A31
EPDB2010-4-SD	★	0.5	4	0.8	50	4	A134
EPDBE2010-4-PN	●	0.5	4	0.8	50	4	A58
EPDBE2010-4-ATH	●	0.5	4	0.8	50	4	A55
EPDBEH2010-4-TH3	●	0.5	4	0.8	50	4	A34
CBN-EHB2010-4	●	0.5	4	1	50	4	A145
EB4HR0100TN-4-05-ATH	★	0.5	4	4	50	4	A125
EB4HR0100TN-4-10-ATH	★	0.5	4	4	50	4	A125
CBN-EPSB2010-5-F	●	0.5	5	0.6	50	4	A151
CBN-EPSB2010-5-S	★	0.5	5	0.6	50	4	A151
EPDBEH2010F-5-TH3	★	0.5	5	0.8	38	4	A31
EPDBE2010-5-PN	●	0.5	5	0.8	50	4	A58
EPDBE2010-5-ATH	●	0.5	5	0.8	50	4	A55
EPDBEH2010-5-TH3	●	0.5	5	0.8	50	4	A34

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
CBN-EHB2010-5	●	0.5	5	1	50	4	A145
EPDBEH2010F-6-TH3	★	0.5	6	0.8	42	4	A31
EPDBE2010-6-PN	●	0.5	6	0.8	50	4	A58
EPDBE2010-6-ATH	●	0.5	6	0.8	50	4	A55
EPDBEH2010-6-TH3	●	0.5	6	0.8	50	4	A34
EMBPE3010-6-09-ATH	●	0.5	6	0.8	50	6	A106
EPDBEH2010-6-S6-TH3	●	0.5	6	0.8	50	6	A34
EPDBPE2010-6-04-ATH	●	0.5	6	0.8	50	6	A73
EPDBPE2010-6-09-ATH	●	0.5	6	0.8	50	6	A73
EPDBPE2010-6-14-ATH	●	0.5	6	0.8	50	6	A74
EB4HR0100TN-6-05-ATH	★	0.5	6	4	50	4	A125
EB4HR0100TN-6-10-ATH	★	0.5	6	4	50	4	A125
EPDBEH2010F-7-TH3	★	0.5	7	0.8	42	4	A31
EPDBE2010-7-PN	★	0.5	7	0.8	50	4	A58
EPDBE2010-7-ATH	●	0.5	7	0.8	50	4	A55
EPDBEH2010-7-TH3	●	0.5	7	0.8	50	4	A34
EPDBEH2010F-8-TH3	★	0.5	8	0.8	42	4	A31
EPDB2010-8-SD	★	0.5	8	0.8	50	4	A134
EPDBE2010-8-PN	●	0.5	8	0.8	50	4	A58
EPDBE2010-8-ATH	●	0.5	8	0.8	50	4	A55
EPDBEH2010-8-TH3	●	0.5	8	0.8	50	4	A34
EPDBEH2010-8-S6-TH3	●	0.5	8	0.8	50	6	A34
EMBPE3010-8-09-ATH	●	0.5	8	0.8	55	6	A106
EPDBPE2010-8-04-ATH	●	0.5	8	0.8	55	6	A73
EB4HR0100TN-8-05-ATH	★	0.5	8	4	50	4	A125
EB4HR0100TN-8-10-ATH	★	0.5	8	4	50	4	A125
EPDBE2010-9-PN	★	0.5	9	0.8	50	4	A58
EPDBE2010-9-ATH	●	0.5	9	0.8	50	4	A55
EPDBEH2010-9-TH3	●	0.5	9	0.8	50	4	A34
CBN-EPSB2010-10-F	●	0.5	10	0.6	50	4	A151
CBN-EPSB2010-10-S	★	0.5	10	0.6	50	4	A151
EPDBEH2010F-10-TH3	★	0.5	10	0.8	45	4	A31
EPDBE2010-10-PN	●	0.5	10	0.8	50	4	A58
EPDBE2010-10-ATH	●	0.5	10	0.8	50	4	A55
EPDBEH2010-10-TH3	●	0.5	10	0.8	50	4	A34
EPDBEH2010-10-S6-TH3	●	0.5	10	0.8	50	6	A34
EMBPE3010-10-09-ATH	●	0.5	10	0.8	55	6	A106
EPDBPE2010-10-04-ATH	●	0.5	10	0.8	55	6	A73
EPDBPE2010-10-09-ATH	●	0.5	10	0.8	55	6	A73
EPDBPE2010-10-29-ATH	●	0.5	10	0.8	55	6	A74
EGDB2010-10-HD	★	0.5	10	1.5	60	4	A140
EB4HR0100TN-10-05-ATH	★	0.5	10	4	50	4	A125
EB4HR0100TN-10-10-ATH	★	0.5	10	4	50	4	A125
EPDBEH2010F-12-TH3	★	0.5	12	0.8	45	4	A31
EPDB2010-12-SD	★	0.5	12	0.8	55	4	A134
EPDBE2010-12-PN	★	0.5	12	0.8	55	4	A58
EPDBE2010-12-ATH	●	0.5	12	0.8	55	4	A55
EPDBEH2010-12-TH3	●	0.5	12	0.8	55	4	A34
EMBPE3010-12-09-ATH	●	0.5	12	0.8	60	6	A106
EPDBPE2010-12-14-ATH	●	0.5	12	0.8	60	6	A74
EB4HR0100TN-12-05-ATH	★	0.5	12	4	55	4	A125
EB4HR0100TN-12-10-ATH	★	0.5	12	4	55	4	A125
EPDBE2010-13-PN	★	0.5	13	0.8	55	4	A58
EPDBE2010-13-ATH	●	0.5	13	0.8	55	4	A55
EPDBEH2010-13-TH3	●	0.5	13	0.8	55	4	A34
EPDBE2010-14-PN	★	0.5	14	0.8	55	4	A58
EPDBE2010-14-ATH	●	0.5	14	0.8	55	4	A55
EPDBEH2010-14-TH3	●	0.5	14	0.8	55	4	A34
EMBPE3010-14-09-ATH	●	0.5	14	0.8	60	6	A106
EB4HR0100TN-14-05-ATH	★	0.5	14	4	55	4	A125
EB4HR0100TN-14-10-ATH	★	0.5	14	4	55	4	A125
EPDBPE2010-15-04-ATH	●	0.5	15	0.8	60	6	A73

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBPE2010-15-09-ATH	●	0.5	15	0.8	60	6	A73
EPDBPE2010-15-29-ATH	●	0.5	15	0.8	60	6	A74
EPDBE2010-16-PN	★	0.5	16	0.8	55	4	A58
EPDBE2010-16-ATH	●	0.5	16	0.8	55	4	A55
EPDBEH2010-16-TH3	●	0.5	16	0.8	55	4	A34
EMBPE3010-16-09-ATH	●	0.5	16	0.8	60	6	A106
EPDBPE2010-16-09-ATH	●	0.5	16	0.8	60	6	A73
EPDBPE2010-16-14-ATH	●	0.5	16	0.8	60	6	A74
EB4HR0100TN-16-05-ATH	★	0.5	16	4	55	4	A125
EB4HR0100TN-16-10-ATH	★	0.5	16	4	55	4	A125
EPDBE2010-18-PN	★	0.5	18	0.8	60	4	A58
EPDBE2010-18-ATH	★	0.5	18	0.8	60	4	A55
EPDBEH2010-18-TH3	●	0.5	18	0.8	60	4	A34
EMBPE3010-18-09-ATH	●	0.5	18	0.8	65	6	A106
EB4HR0100TN-18-05-ATH	★	0.5	18	4	60	4	A125
EB4HR0100TN-18-10-ATH	★	0.5	18	4	60	4	A125
EPDBE2010-20-PN	★	0.5	20	0.8	60	4	A58
EPDBE2010-20-ATH	●	0.5	20	0.8	60	4	A55
EPDBEH2010-20-TH3	●	0.5	20	0.8	60	4	A34
EMBPE3010-20-09-ATH	★	0.5	20	0.8	65	6	A106
EPDBPE2010-20-04-ATH	●	0.5	20	0.8	65	6	A73
EPDBPE2010-20-09-ATH	●	0.5	20	0.8	65	6	A73
EPDBPE2010-20-14-ATH	●	0.5	20	0.8	65	6	A74
EPDBPE2010-20-29-ATH	●	0.5	20	0.8	65	6	A74
EPDBPE2010-20-49-ATH	★	0.5	20	0.8	65	6	A74
EGDB2010-20-HD	★	0.5	20	1.5	60	4	A140
EB4HR0100TN-20-05-ATH	★	0.5	20	4	60	4	A125
EB4HR0100TN-20-10-ATH	★	0.5	20	4	60	4	A125
EMBPE3010-22-09-ATH	★	0.5	22	0.8	70	6	A106
EPDBPE2010-22-14-ATH	★	0.5	22	0.8	70	6	A74
EMBPE3010-24-09-ATH	★	0.5	24	0.8	70	6	A106
EPDBPE2010-25-04-ATH	★	0.5	25	0.8	70	6	A73
EPDBPE2010-25-09-ATH	●	0.5	25	0.8	70	6	A73
EPDBPE2010-25-14-ATH	★	0.5	25	0.8	70	6	A74
EMBPE3010-26-09-ATH	●	0.5	26	0.8	70	6	A106
EMBPE3010-28-09-ATH	★	0.5	28	0.8	75	6	A106
EMBPE3010-30-09-ATH	★	0.5	30	0.8	75	6	A106
EPDBPE2010-30-04-ATH	★	0.5	30	0.8	75	6	A73
EPDBPE2010-30-09-ATH	●	0.5	30	0.8	75	6	A73
EPDBPE2010-30-29-ATH	●	0.5	30	0.8	75	6	A74
EGDB2010-30-HD	★	0.5	30	1.5	80	4	A140
EMBPE3010-32-09-ATH	★	0.5	32	0.8	80	6	A106
EMBPE3010-34-09-ATH	★	0.5	34	0.8	80	6	A106
EPDBPE2010-35-09-ATH	●	0.5	35	0.8	80	6	A73
EMBPE3010-36-09-ATH	●	0.5	36	0.8	80	6	A106
EPDBPE2010-40-09-ATH	●	0.5	40	0.8	85	6	A73
EPDBPE2010-40-29-ATH	●	0.5	40	0.8	85	6	A74
EGDB2010-40-HD	★	0.5	40	1.5	80	4	A140
EPDBPE2010-50-04-ATH	★	0.5	50	0.8	95	6	A73
EPDBPE2010-50-09-ATH	●	0.5	50	0.8	95	6	A73
EPDBPE2010-50-14-ATH	★	0.5	50	0.8	95	6	A74
EPDBPE2010-50-29-ATH	★	0.5	50	0.8	130	6	A74
EPDBPE2010-60-09-ATH	★	0.5	60	0.8	105	6	A73
EPDBPE2010-70-04-ATH	★	0.5	70	0.8	115	6	A73
EPDBPE2010-70-09-ATH	★	0.5	70	0.8	115	6	A73
EPDBPE2010-90-14-ATH	★	0.5	90	0.8	135	6	A74
HGOB2010-PN	●	0.5	-	2.5	50	4	A91
ECRB1012-6-PN	★	0.5	-	6	60	4	A130
ECRB1012-8-PN	★	0.5	-	8	60	4	A130
ECRB1012-10-PN	★	0.5	-	10	60	4	A130
ECRB1012-12-PN	★	0.5	-	12	60	4	A130
ECRB1012-14-PN	★	0.5	-	14	60	4	A130

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
ECRB1012-16-PN	★	0.5	-	16	60	4	A130
EPDBE2011-2-PN	★	0.55	2	1	50	4	A58
EPDBE2011-2-ATH	★	0.55	2	1	50	4	A55
EPDBEH2011-2-TH3	●	0.55	2	1	50	4	A34
EPDBE2011-4-PN	★	0.55	4	1	50	4	A58
EPDBE2011-4-ATH	★	0.55	4	1	50	4	A55
EPDBEH2011-4-TH3	●	0.55	4	1	50	4	A34
EB4HR0110TN-4-05-ATH	★	0.55	4	4	50	4	A125
EB4HR0110TN-4-10-ATH	★	0.55	4	4	50	4	A125
EPDBE2011-6-PN	★	0.55	6	1	50	4	A58
EPDBE2011-6-ATH	★	0.55	6	1	50	4	A55
EPDBEH2011-6-TH3	●	0.55	6	1	50	4	A34
EB4HR0110TN-6-05-ATH	★	0.55	6	4	50	4	A125
EB4HR0110TN-6-10-ATH	★	0.55	6	4	50	4	A125
EPDBE2011-8-PN	★	0.55	8	1	50	4	A58
EPDBE2011-8-ATH	★	0.55	8	1	50	4	A55
EPDBEH2011-8-TH3	●	0.55	8	1	50	4	A34
EB4HR0110TN-8-05-ATH	★	0.55	8	4	50	4	A125
EB4HR0110TN-8-10-ATH	★	0.55	8	4	50	4	A125
EPDBE2011-10-PN	★	0.55	10	1	50	4	A58
EPDBE2011-10-ATH	★	0.55	10	1	50	4	A55
EPDBEH2011-10-TH3	●	0.55	10	1	50	4	A34
EB4HR0110TN-10-05-ATH	★	0.55	10	4	50	4	A125
EB4HR0110TN-10-10-ATH	★	0.55	10	4	50	4	A125
EB4HR0110TN-12-05-ATH	★	0.55	12	4	55	4	A125
EB4HR0110TN-12-10-ATH	★	0.55	12	4	55	4	A125
EB4HR0110TN-14-05-ATH	★	0.55	14	4	55	4	A125
EB4HR0110TN-14-10-ATH	★	0.55	14	4	55	4	A125
EB4HR0110TN-16-05-ATH	★	0.55	16	4	55	4	A125
EB4HR0110TN-16-10-ATH	★	0.55	16	4	55	4	A125
EB4HR0110TN-18-05-ATH	★	0.55	18	4	60	4	A125
EB4HR0110TN-18-10-ATH	★	0.55	18	4	60	4	A125
EB4HR0110TN-20-05-ATH	★	0.55	20	4	60	4	A125
EB4HR0110TN-20-10-ATH	★	0.55	20	4	60	4	A125
EPDBEH2012-2-TH3	●	0.6	2	1.1	50	4	A34
EPDBEH2012-2-S6-TH3	●	0.6	2	1.1	50	6	A34
EPDBEH2012-3-TH3	●	0.6	3	1.1	50	4	A34
EPDBE2012-4-PN	★	0.6	4	1.1	50	4	A58
EPDBE2012-4-ATH	●	0.6	4	1.1	50	4	A55
EPDBEH2012-4-TH3	●	0.6	4	1.1	50	4	A34
EPDBEH2012-4-S6-TH3	●	0.6	4	1.1	50	6	A34
EPDBE2012-6-PN	★	0.6	6	1.1	50	4	A58
EPDBE2012-6-ATH	★	0.6	6	1.1	50	4	A55
EPDBEH2012-6-TH3	●	0.6	6	1.1	50	4	A34
EB4HR0120TN-6-05-ATH	★	0.6	6	4.8	50	4	A125
EB4HR0120TN-6-10-ATH	★	0.6	6	4.8	50	4	A125
EPDBE2012-8-PN	★	0.6	8	1.1	50	4	A58
EPDBE2012-8-ATH	●	0.6	8	1.1	50	4	A55
EPDBEH2012-8-TH3	●	0.6	8	1.1	50	4	A34
EB4HR0120TN-8-05-ATH	★	0.6	8	4.8	50	4	A125
EB4HR0120TN-8-10-ATH	★	0.6	8	4.8	50	4	A125
EPDBE2012-10-PN	★	0.6	10	1.1	50	4	A58
EPDBE2012-10-ATH	★	0.6	10	1.1	50	4	A55
EPDBEH2012-10-TH3	●	0.6	10	1.1	50	4	A34
EB4HR0120TN-10-05-ATH	★	0.6	10	4.8	50	4	A125
EB4HR0120TN-10-10-ATH	★	0.6	10	4.8	50	4	A125
EPDBE2012-12-PN	★	0.6	12	1.1	55	4	A58
EPDBE2012-12-ATH	★	0.6	12	1.1	55	4	A55
EPDBEH2012-12-TH3	●	0.6	12	1.1	55	4	A34
EB4HR0120TN-12-05-ATH	★	0.6	12	4.8	55	4	A125
EB4HR0120TN-12-10-ATH	★	0.6	12	4.8	55	4	A125
EB4HR0120TN-14-05-ATH	★	0.6	14	4.8	55	4	A125

Quick dimension reference table by mill diameter

Carbide End Mill -Ball

RE0.6 ～ RE1.5

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EB4HR0120TN-14-10-ATH	★	0.6	14	4.8	55	4	A125
EB4HR0120TN-16-05-ATH	★	0.6	16	4.8	55	4	A125
EB4HR0120TN-16-10-ATH	★	0.6	16	4.8	55	4	A125
EB4HR0120TN-18-05-ATH	★	0.6	18	4.8	60	4	A125
EB4HR0120TN-18-10-ATH	★	0.6	18	4.8	60	4	A125
EPDBPE2012-20-29-ATH	★	0.6	20	1.1	65	6	A74
EB4HR0120TN-20-05-ATH	★	0.6	20	4.8	60	4	A125
EB4HR0120TN-20-10-ATH	★	0.6	20	4.8	60	4	A125
EB4HR0120TN-22-05-ATH	★	0.6	22	4.8	60	4	A125
EB4HR0120TN-22-10-ATH	★	0.6	22	4.8	60	4	A125
EB4HR0120TN-24-05-ATH	★	0.6	24	4.8	60	4	A125
EB4HR0120TN-24-10-ATH	★	0.6	24	4.8	60	4	A125
EPDBPE2012-35-29-ATH	★	0.6	35	1.1	80	6	A74
EPDBEH2014-3-TH3	●	0.7	3	1.3	50	4	A34
EPDBE2014-8-PN	★	0.7	8	1.3	50	4	A58
EPDBE2014-8-ATH	●	0.7	8	1.3	50	4	A55
EPDBEH2014-8-TH3	●	0.7	8	1.3	50	4	A34
EPDBE2014-12-PN	★	0.7	12	1.3	55	4	A58
EPDBE2014-12-ATH	●	0.7	12	1.3	55	4	A55
EPDBEH2014-12-TH3	●	0.7	12	1.3	55	4	A34
EPDBE2014-16-PN	★	0.7	16	1.3	55	4	A58
EPDBE2014-16-ATH	★	0.7	16	1.3	55	4	A55
EPDBEH2014-16-TH3	●	0.7	16	1.3	55	4	A34
EPDBEH2015F-2-TH3	★	0.75	2	1.35	35	4	A31
EPDBEH2015-2-TH3	●	0.75	2	1.35	50	4	A34
EPDBEH2015F-2.5-TH3	★	0.75	2.5	1.35	35	4	A31
EPDBEH2015-2.5-TH3	●	0.75	2.5	1.35	50	4	A34
CBN-EHB2015-2.5	●	0.75	2.5	1.35	50	4	A145
EPDBEH2015F-3-TH3	★	0.75	3	1.35	35	4	A31
EPDBEH2015-3-TH3	●	0.75	3	1.35	50	4	A34
EPDBEH2015-3-S6-TH3	●	0.75	3	1.35	50	6	A35
EPBT2015	●	0.75	3.5	2.5	50	4	A88
ESHB2015-H-TH	★	0.75	3.75	1.5	40	4	A102
ESHB2015-N-TH	★	0.75	3.75	1.5	40	4	A102
EPDBEH2015F-4-TH3	★	0.75	4	1.35	38	4	A31
EPDBE2015-4-PN	●	0.75	4	1.35	50	4	A58
EPDBE2015-4-ATH	●	0.75	4	1.35	50	4	A55
EPDBEH2015-4-TH3	●	0.75	4	1.35	50	4	A34
EHHBE4015-S4-TH3	●	0.75	4.5	2.5	50	4	A119
EMBE3015-S4-ATH	●	0.75	4.5	2.5	50	4	A105
EHHBE4015-S6-TH3	●	0.75	4.5	2.5	50	6	A119
EMBE3015-S6-ATH	●	0.75	4.5	2.5	50	6	A105
CBN-EPSB2015-5-F	●	0.75	5	0.9	50	4	A151
CBN-EPSB2015-5-S	★	0.75	5	0.9	50	4	A151
EPDBEH2015F-5-TH3	★	0.75	5	1.35	38	4	A31
EPDBEH2015-5-TH3	●	0.75	5	1.35	50	4	A34
CBN-EHB2015-5	●	0.75	5	1.35	50	4	A145
EPDBEH2015-5-S6-TH3	●	0.75	5	1.35	50	6	A35
EPDBEH2015F-6-TH3	★	0.75	6	1.35	38	4	A31
EPDB2015-6-SD	★	0.75	6	1.35	50	4	A134
EPDBE2015-6-PN	●	0.75	6	1.35	50	4	A58
EPDBE2015-6-ATH	●	0.75	6	1.35	50	4	A55
EPDBEH2015-6-TH3	●	0.75	6	1.35	50	4	A35
CBN-EHB2015-7.5	●	0.75	7.5	1.35	50	4	A145
EPDBEH2015F-8-TH3	★	0.75	8	1.35	42	4	A31
EPDBE2015-8-PN	●	0.75	8	1.35	50	4	A58
EPDBE2015-8-ATH	●	0.75	8	1.35	50	4	A55
EPDBEH2015-8-TH3	●	0.75	8	1.35	50	4	A35
EPDBEH2015-8-S6-TH3	●	0.75	8	1.35	50	6	A35
EMBPE3015-8-09-ATH	★	0.75	8	1.35	55	6	A106
EPDBPE2015-8-04-ATH	●	0.75	8	1.35	55	6	A74
CBN-EPSB2015-10-F	●	0.75	10	0.9	50	4	A151

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
CBN-EPSB2015-10-S	★	0.75	10	0.9	50	4	A151
EPDBEH2015F-10-TH3	★	0.75	10	1.35	42	4	A31
EPDBE2015-10-PN	●	0.75	10	1.35	50	4	A58
EPDBE2015-10-ATH	●	0.75	10	1.35	50	4	A55
EPDBEH2015-10-TH3	●	0.75	10	1.35	50	4	A35
EMBPE3015-10-09-ATH	★	0.75	10	1.35	55	6	A106
EPDBPE2015-10-04-ATH	●	0.75	10	1.35	55	6	A74
EPDBPE2015-10-09-ATH	●	0.75	10	1.35	55	6	A74
EPDBPE2015-10-14-ATH	★	0.75	10	1.35	55	6	A74
EPDBEH2015F-12-TH3	★	0.75	12	1.35	45	4	A31
EPDBEH2015-12-S6-TH3	●	0.75	12	1.35	50	6	A35
EPDB2015-12-SD	★	0.75	12	1.35	55	4	A134
EPDBE2015-12-PN	●	0.75	12	1.35	55	4	A58
EPDBE2015-12-ATH	●	0.75	12	1.35	55	4	A55
EPDBEH2015-12-TH3	●	0.75	12	1.35	55	4	A35
EPDBPE2015-12-04-ATH	●	0.75	12	1.35	55	6	A74
EPDBE2015-14-PN	★	0.75	14	1.35	55	4	A58
EPDBE2015-14-ATH	★	0.75	14	1.35	55	4	A55
EPDBEH2015-14-TH3	●	0.75	14	1.35	55	4	A35
EMBPE3015-14-09-ATH	★	0.75	14	1.35	60	6	A106
EPDBPE2015-15-09-ATH	●	0.75	15	1.35	60	6	A74
EPDBE2015-16-PN	●	0.75	16	1.35	55	4	A58
EPDBE2015-16-ATH	●	0.75	16	1.35	55	4	A55
EPDBEH2015-16-TH3	●	0.75	16	1.35	55	4	A35
EMBPE3015-16-09-ATH	★	0.75	16	1.35	60	6	A106
EPDB2015-18-SD	★	0.75	18	1.35	60	4	A134
EPDBE2015-18-PN	★	0.75	18	1.35	60	4	A58
EPDBE2015-18-ATH	●	0.75	18	1.35	60	4	A55
EPDBEH2015-18-TH3	●	0.75	18	1.35	60	4	A35
EMBPE3015-18-09-ATH	★	0.75	18	1.35	65	6	A106
EPDBE2015-20-PN	●	0.75	20	1.35	60	4	A58
EPDBE2015-20-ATH	●	0.75	20	1.35	60	4	A55
EPDBEH2015-20-TH3	●	0.75	20	1.35	60	4	A35
EMBPE3015-20-09-ATH	★	0.75	20	1.35	65	6	A106
EPDBPE2015-20-09-ATH	●	0.75	20	1.35	65	6	A74
EPDBPE2015-20-14-ATH	★	0.75	20	1.35	65	6	A74
EPDBPE2015-20-29-ATH	★	0.75	20	1.35	65	6	A74
EGDB2015-20-HD	★	0.75	20	2.25	60	4	A140
EMBPE3015-22-09-ATH	★	0.75	22	1.35	70	6	A106
EMBPE3015-24-09-ATH	★	0.75	24	1.35	70	6	A106
EMBPE3015-26-09-ATH	★	0.75	26	1.35	70	6	A106
EMBPE3015-28-09-ATH	★	0.75	28	1.35	75	6	A106
EMBPE3015-30-09-ATH	★	0.75	30	1.35	75	6	A106
EPDBPE2015-30-04-ATH	★	0.75	30	1.35	75	6	A74
EPDBPE2015-30-09-ATH	●	0.75	30	1.35	75	6	A74
EPDBPE2015-30-14-ATH	★	0.75	30	1.35	75	6	A74
EMBPE3015-32-09-ATH	★	0.75	32	1.35	80	6	A106
EMBPE3015-34-09-ATH	★	0.75	34	1.35	80	6	A106
EMBPE3015-36-09-ATH	★	0.75	36	1.35	80	6	A106
EMBPE3015-38-09-ATH	★	0.75	38	1.35	85	6	A106
EMBPE3015-40-09-ATH	★	0.75	40	1.35	85	6	A106
EPDBPE2015-40-14-ATH	★	0.75	40	1.35	85	6	A74
EGDB2015-40-HD	★	0.75	40	2.25	80	4	A140
EPDBPE2015-46-29-ATH	★	0.75	46	1.35	95	6	A74
EPDBPE2015-50-14-ATH	★	0.75	50	1.35	95	6	A74
HGOB2015-PN	●	0.75	-	4	50	4	A91
EPDBEH2016-4-TH3	●	0.8	4	1.4	50	4	A35
EPDBE2016-8-PN	★	0.8	8	1.4	50	4	A58
EPDBE2016-8-ATH	●	0.8	8	1.4	50	4	A55
EPDBEH2016-8-TH3	●	0.8	8	1.4	50	4	A35
EPDBE2016-12-PN	★	0.8	12	1.4	55	4	A58
EPDBE2016-12-ATH	●	0.8	12	1.4	55	4	A55

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBEH2016-12-TH3	●	0.8	12	1.4	55	4	A35
EPDBE2016-16-PN	★	0.8	16	1.4	55	4	A58
EPDBE2016-16-ATH	●	0.8	16	1.4	55	4	A55
EPDBEH2016-16-TH3	●	0.8	16	1.4	55	4	A35
EPDBE2016-20-PN	★	0.8	20	1.4	60	4	A58
EPDBE2016-20-ATH	●	0.8	20	1.4	60	4	A55
EPDBEH2016-20-TH3	●	0.8	20	1.4	60	4	A35
EPDBEH2018-4-TH3	●	0.9	4	1.6	50	4	A35
EPDBPE2018-4-04-ATH	★	0.9	4	1.6	50	6	A74
EPDBE2018-8-PN	★	0.9	8	1.6	50	4	A59
EPDBE2018-8-ATH	★	0.9	8	1.6	50	4	A56
EPDBEH2018-8-TH3	●	0.9	8	1.6	50	4	A35
EPDBPE2018-8-04-ATH	★	0.9	8	1.6	50	6	A74
EPDBE2018-12-PN	★	0.9	12	1.6	55	4	A59
EPDBE2018-12-ATH	★	0.9	12	1.6	55	4	A56
EPDBEH2018-12-TH3	●	0.9	12	1.6	55	4	A35
EPDBPE2018-12-04-ATH	★	0.9	12	1.6	55	6	A74
EPDBE2018-16-PN	★	0.9	16	1.6	55	4	A59
EPDBE2018-16-ATH	★	0.9	16	1.6	55	4	A56
EPDBEH2018-16-TH3	●	0.9	16	1.6	55	4	A35
EPDBPE2018-16-04-ATH	★	0.9	16	1.6	60	6	A74
EPDBE2018-20-PN	★	0.9	20	1.6	60	4	A59
EPDBE2018-20-ATH	★	0.9	20	1.6	60	4	A56
EPDBEH2018-20-TH3	●	0.9	20	1.6	60	4	A35
EPDBPE2018-20-04-ATH	★	0.9	20	1.6	65	6	A74
EPDBPE2018-24-04-ATH	★	0.9	24	1.6	65	6	A74
EPDBPE2018-28-04-ATH	★	0.9	28	1.6	70	6	A74
EPDBPE2018-32-04-ATH	★	0.9	32	1.6	70	6	A74
EPDBPE2018-36-04-ATH	★	0.9	36	1.6	75	6	A74
EPDBPE2018-38-04-ATH	★	0.9	38	1.6	80	6	A74
EPDBPE2018-40-04-ATH	★	0.9	40	1.6	80	6	A74
CBN-EHB2020-2.5	●	1	2.5	1.65	50	4	A145
EPDBEH2020F-2.5-TH3	★	1	2.5	1.7	35	4	A31
EPDBEH2020-2.5-TH3	●	1	2.5	1.7	50	4	A35
EPDBEH2020F-3-TH3	★	1	3	1.7	35	4	A31
EPDBE2020-3-PN	●	1	3	1.7	50	4	A59
EPDBE2020-3-ATH	●	1	3	1.7	50	4	A56
EPDBEH2020-3-TH3	●	1	3	1.7	50	4	A35
EPDBEH2020-3-S6-TH3	●	1	3	1.7	50	6	A35
EPDBEH2020F-4-TH3	★	1	4	1.7	35	4	A31
EPDBE2020-4-PN	●	1	4	1.7	50	4	A59
EPDBE2020-4-ATH	●	1	4	1.7	50	4	A56
EPDBEH2020-4-TH3	●	1	4	1.7	50	4	A35
EPBT2020	●	1	4	3	50	6	A88
CBN-EPSB2020-5-F	●	1	5	1.2	50	4	A151
CBN-EPSB2020-5-S	★	1	5	1.2	50	4	A151
CBN-EHB2020-5	●	1	5	1.65	50	4	A145
EPDBEH2020F-5-TH3	★	1	5	1.7	38	4	A31
EPDBEH2020-5-TH3	●	1	5	1.7	50	4	A35
ESHB2020-H-TH	★	1	5	2	45	6	A102
ESHB2020-N-TH	★	1	5	2	45	6	A102
EPDBEH2020F-6-TH3	★	1	6	1.7	38	4	A31
EPDBE2020-6-PN	●	1	6	1.7	50	4	A59
EPDBE2020-6-ATH	●	1	6	1.7	50	4	A56
EPDBEH2020-6-TH3	●	1	6	1.7	50	4	A35
EPDBEH2020-6-S6-TH3	●	1	6	1.7	50	6	A35
EHHBE4020-S4-TH3	●	1	6	3	50	4	A119
EMBE3020-S4-ATH	●	1	6	3	50	4	A105
EHHBE4020-S6-TH3	●	1	6	3	50	6	A119
EMBE3020-S6-ATH	●	1	6	3	50	6	A105
CBN-EHB2020-7.5	●	1	7.5	1.65	50	4	A145
EPDBEH2020F-8-TH3	★	1	8	1.7	42	4	A31

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDB2020-8-SD	★	1	8	1.7	50	4	A134
EPDBE2020-8-PN	●	1	8	1.7	50	4	A59
EPDBE2020-8-ATH	●	1	8	1.7	50	4	A56
EPDBEH2020-8-TH3	●	1	8	1.7	50	4	A35
EPDBEH2020-8-S6-TH3	●	1	8	1.7	50	6	A35
EPDBPE2020-8-04-ATH	●	1	8	1.7	50	6	A74
CBN-EPSB2020-10-F	●	1	10	1.2	50	4	A151
CBN-EPSB2020-10-S	★	1	10	1.2	50	4	A151
CBN-EHB2020-10	●	1	10	1.65	50	4	A145
EPDBEH2020F-10-TH3	★	1	10	1.7	42	4	A31
EPDBE2020-10-PN	●	1	10	1.7	50	4	A59
EPDBE2020-10-ATH	●	1	10	1.7	50	4	A56
EPDBEH2020-10-TH3	●	1	10	1.7	50	4	A35
EMBPE3020-10-09-ATH	●	1	10	1.7	55	6	A106
EPDBPE2020-10-14-ATH	●	1	10	1.7	55	6	A75
EPDBEH2020F-12-TH3	★	1	12	1.7	45	4	A31
EPDBEH2020-12-S6-TH3	●	1	12	1.7	50	6	A35
EPDBE2020-12-PN	●	1	12	1.7	55	4	A59
EPDBE2020-12-ATH	●	1	12	1.7	55	4	A56
EPDBEH2020-12-TH3	●	1	12	1.7	55	4	A35
EPDBPE2020-12-04-ATH	●	1	12	1.7	55	6	A74
EPDBPE2020-12-09-ATH	●	1	12	1.7	55	6	A74
EPDBPE2020-12-29-ATH	●	1	12	1.7	55	6	A75
EPDBEH2020F-13-TH3	★	1	13	1.7	45	4	A31
EPDBE2020-13-PN	★	1	13	1.7	55	4	A59
EPDBE2020-13-ATH	●	1	13	1.7	55	4	A56
EPDBEH2020-13-TH3	●	1	13	1.7	55	4	A35
EPDBEH2020F-14-TH3	★	1	14	1.7	45	4	A31
EPDBE2020-14-PN	★	1	14	1.7	55	4	A59
EPDBE2020-14-ATH	●	1	14	1.7	55	4	A56
EPDBEH2020-14-TH3	●	1	14	1.7	55	4	A35
EPDBPE2020-15-29-ATH	●	1	15	1.7	60	6	A75
EPDBEH2020F-16-TH3	★	1	16	1.7	50	4	A31
EPDBEH2020-16-S6-TH3	●	1	16	1.7	50	6	A35
EPDB2020-16-SD	★	1	16	1.7	55	4	A134
EPDBE2020-16-PN	●	1	16	1.7	55	4	A59
EPDBE2020-16-ATH	●	1	16	1.7	55	4	A56
EPDBEH2020-16-TH3	●	1	16	1.7	55	4	A35
EMBPE3020-16-09-ATH	●	1	16	1.7	60	6	A106
EPDBPE2020-16-04-ATH	●	1	16	1.7	60	6	A74
EPDBPE2020-16-09-ATH	●	1	16	1.7	60	6	A74
EPDBPE2020-16-14-ATH	●	1	16	1.7	60	6	A75
EPDBE2020-18-PN	★	1	18	1.7	60	4	A59
EPDBE2020-18-ATH	●	1	18	1.7	60	4	A56
EPDBEH2020-18-TH3	●	1	18	1.7	60	4	A35
CBN-EPSB2020-20-F	●	1	20	1.2	55	4	A151
CBN-EPSB2020-20-S	★	1	20	1.2	55	4	A151
EPDBEH2020F-20-TH3	★	1	20	1.7	55	4	A31
EPDBE2020-20-PN	●	1	20	1.7	60	4	A59
EPDBE2020-20-ATH	●	1	20	1.7	60	4	A56
EPDBEH2020-20-TH3	●	1	20	1.7	60	4	A35
EPDBEH2020-20-S6-TH3	●	1	20	1.7	60	6	A35
EMBPE3020-20-09-ATH	●	1	20	1.7	65	6	A106
EPDBPE2020-20-04-ATH	●	1	20	1.7	65	6	A74
EPDBPE2020-20-09-ATH	●	1	20	1.7	65	6	A74
EPDBPE2020-20-14-ATH	●	1	20	1.7	65	6	A75
EPDBPE2020-20-29-ATH	●	1	20	1.7	65	6	A75
EPDBPE2020-20-49-ATH	●	1	20	1.7	65	6	A75
EGDB2020-20-HD	★	1	20	3	60	4	A140
EPDBE2020-22-PN	★	1	22	1.7	60	4	A59
EPDBE2020-22-ATH	●	1	22	1.7	60	4	A56
EPDBEH2020-22-TH3	●	1	22	1.7	60	4	A35

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBPE2020-22-14-ATH	★	1	22	1.7	65	6	A75
EPDB2020-24-SD	★	1	24	1.7	60	4	A134
EMBPE3020-24-09-ATH	●	1	24	1.7	65	6	A106
EPDBE2020-25-PN	●	1	25	1.7	65	4	A59
EPDBE2020-25-ATH	●	1	25	1.7	65	4	A56
EPDBEH2020-25-TH3	●	1	25	1.7	65	4	A35
EPDBPE2020-25-04-ATH	●	1	25	1.7	65	6	A74
EPDBPE2020-25-09-ATH	●	1	25	1.7	65	6	A74
EPDBPE2020-25-14-ATH	★	1	25	1.7	65	6	A75
EPDBE2020-30-PN	●	1	30	1.7	70	4	A59
EPDBE2020-30-ATH	●	1	30	1.7	70	4	A56
EPDBEH2020-30-TH3	●	1	30	1.7	70	4	A35
EMBPE3020-30-09-ATH	●	1	30	1.7	70	6	A106
EPDBPE2020-30-04-ATH	●	1	30	1.7	70	6	A74
EPDBPE2020-30-09-ATH	●	1	30	1.7	70	6	A74
EPDBPE2020-30-14-ATH	★	1	30	1.7	70	6	A75
EPDBE2020-35-PN	★	1	35	1.7	75	4	A59
EPDBE2020-35-ATH	★	1	35	1.7	75	4	A56
EPDBEH2020-35-TH3	●	1	35	1.7	75	4	A35
EPDBPE2020-35-09-ATH	●	1	35	1.7	75	6	A74
EMBPE3020-36-09-ATH	●	1	36	1.7	80	6	A106
EPDBE2020-40-PN	★	1	40	1.7	80	4	A59
EPDBE2020-40-ATH	★	1	40	1.7	80	4	A56
EPDBEH2020-40-TH3	●	1	40	1.7	80	4	A35
EMBPE3020-40-09-ATH	●	1	40	1.7	80	6	A106
EPDBPE2020-40-04-ATH	●	1	40	1.7	80	6	A74
EPDBPE2020-40-09-ATH	●	1	40	1.7	80	6	A74
EPDBPE2020-40-14-ATH	★	1	40	1.7	80	6	A75
EGDB2020-40-HD	★	1	40	3	80	4	A140
EPDBPE2020-41-29-ATH	★	1	41	1.7	130	6	A75
EMBPE3020-46-09-ATH	★	1	46	1.7	90	6	A106
EPDBPE2020-50-09-ATH	●	1	50	1.7	90	6	A74
EPDBPE2020-50-14-ATH	★	1	50	1.7	90	6	A75
EMBPE3020-60-09-ATH	★	1	60	1.7	100	6	A106
EPDBPE2020-60-09-ATH	●	1	60	1.7	100	6	A74
EGDB2020-60-HD	★	1	60	3	100	4	A140
EPDBPE2020-70-09-ATH	●	1	70	1.7	110	6	A74
EPDBPE2020-75-09-ATH	★	1	75	1.7	115	6	A74
EPDBPE2020-75-14-ATH	★	1	75	1.7	115	6	A75
EPDBPE2020-80-04-ATH	★	1	80	1.7	120	6	A74
HGFB2020-TH	●	1	-	3	50	6	A99
HGOB2020-PN	●	1	-	5	50	6	A91
EPBT2025	★	1.25	5	4	50	6	A88
EPDBEH2025F-6-TH3	★	1.25	6	2	38	4	A31
EPDBE2025-6-PN	★	1.25	6	2	50	4	A59
EPDBE2025-6-ATH	★	1.25	6	2	50	4	A56
EPDBEH2025-6-TH3	●	1.25	6	2	50	4	A36
ESHB2025-H-TH	★	1.25	6.25	2.5	45	6	A102
ESHB2025-N-TH	★	1.25	6.25	2.5	45	6	A102
EHHBE4025-S4-TH3	●	1.25	7.5	4	50	4	A119
EMBE3025-S4-ATH	●	1.25	7.5	4	50	4	A105
EHHBE4025-S6-TH3	●	1.25	7.5	4	50	6	A119
EMBE3025-S6-ATH	●	1.25	7.5	4	50	6	A105
EPDBEH2025F-10-TH3	★	1.25	10	2	42	4	A31
EPDBE2025-10-PN	★	1.25	10	2	50	4	A59
EPDBE2025-10-ATH	★	1.25	10	2	50	4	A56
EPDBEH2025-10-TH3	●	1.25	10	2	50	4	A36
EPDBEH2025F-15-TH3	★	1.25	15	2	45	4	A31
EPDBE2025-15-PN	★	1.25	15	2	55	4	A59
EPDBE2025-15-ATH	★	1.25	15	2	55	4	A56
EPDBEH2025-15-TH3	●	1.25	15	2	55	4	A36
EMBPE3025-16-09-ATH	●	1.25	16	2	60	6	A106

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2025-20-PN	★	1.25	20	2	60	4	A59
EPDBE2025-20-ATH	★	1.25	20	2	60	4	A56
EPDBEH2025-20-TH3	●	1.25	20	2	60	4	A36
EMBPE3025-24-09-ATH	●	1.25	24	2	65	6	A106
EPDBE2025-25-PN	★	1.25	25	2	65	4	A59
EPDBE2025-25-ATH	★	1.25	25	2	65	4	A56
EPDBEH2025-25-TH3	●	1.25	25	2	65	4	A36
EPDBE2025-30-PN	★	1.25	30	2	70	4	A59
EPDBE2025-30-ATH	★	1.25	30	2	70	4	A56
EPDBEH2025-30-TH3	●	1.25	30	2	70	4	A36
EMBPE3025-30-09-ATH	●	1.25	30	2	70	6	A106
EMBPE3025-40-09-ATH	●	1.25	40	2	80	6	A106
EMBPE3025-50-09-ATH	★	1.25	50	2	90	6	A106
HGOB2025-PN	●	1.25	-	7	50	6	A91
EPBT2030	●	1.5	5.5	4.5	70	6	A88
EPBTS2030-TH	●	1.5	5.5	4.5	70	6	A85
EPDBEH2030-6-TH3	●	1.5	6	2.5	50	6	A36
ESHB2030-H-TH	★	1.5	7.5	3	45	6	A102
ESHB2030-N-TH	★	1.5	7.5	3	45	6	A102
EPDBPE2030-8-04-ATH	●	1.5	8	2.5	50	6	A75
EPDBE2030-8-PN	●	1.5	8	2.5	55	6	A59
EPDBE2030-8-ATH	●	1.5	8	2.5	55	6	A56
EPDBEH2030-8-TH3	●	1.5	8	2.5	55	6	A36
EHHBE4030-S4-TH3	●	1.5	9	4.5	70	4	A119
EMBE3030-S4-ATH	●	1.5	9	4.5	70	4	A105
EHHBE4030-S6-TH3	●	1.5	9	4.5	70	6	A119
EMBE3030-S6-ATH	●	1.5	9	4.5	70	6	A105
EPDBE2030-10-PN	●	1.5	10	2.5	55	6	A59
EPDBE2030-10-ATH	●	1.5	10	2.5	55	6	A56
EPDBEH2030-10-TH3	●	1.5	10	2.5	55	6	A36
EPDB2030-12-SD	★	1.5	12	2.5	55	6	A134
EPDBE2030-13-PN	●	1.5	13	2.5	60	6	A59
EPDBE2030-13-ATH	●	1.5	13	2.5	60	6	A56
EPDBEH2030-13-TH3	●	1.5	13	2.5	60	6	A36
EPDBPE2030-15-09-ATH	●	1.5	15	2.5	55	6	A75
EMBPE3030-16-09-ATH	●	1.5	16	2.5	55	6	A106
EPDBPE2030-16-04-ATH	●	1.5	16	2.5	55	6	A75
EPDBE2030-16-PN	●	1.5	16	2.5	60	6	A59
EPDBE2030-16-ATH	●	1.5	16	2.5	60	6	A56
EPDBEH2030-16-TH3	●	1.5	16	2.5	60	6	A36
EMBPE3030-20-09-ATH	●	1.5	20	2.5	60	6	A106
EPDBPE2030-20-04-ATH	●	1.5	20	2.5	60	6	A75
EPDBPE2030-20-09-ATH	●	1.5	20	2.5	60	6	A75
EPDBE2030-20-PN	●	1.5	20	2.5	65	6	A59
EPDBE2030-20-ATH	●	1.5	20	2.5	65	6	A56
EPDBEH2030-20-TH3	●	1.5	20	2.5	65	6	A36
EGDB2030-20-HD	★	1.5	20	4.5	60	4	A140
EMBPE3030-24-09-ATH	★	1.5	24	2.5	65	6	A106
EPDB2030-24-SD	★	1.5	24	2.5	65	6	A134
EPDBE2030-25-PN	●	1.5	25	2.5	70	6	A59
EPDBE2030-25-ATH	●	1.5	25	2.5	70	6	A56
EPDBEH2030-25-TH3	●	1.5	25	2.5	70	6	A36
EMBPE3030-30-09-ATH	★	1.5	30	2.5	70	6	A106
EPDBPE2030-30-04-ATH	●	1.5	30	2.5	70	6	A75
EPDBPE2030-30-09-ATH	●	1.5	30	2.5	70	6	A75
EPDBPE2030-30-14-ATH	●	1.5	30	2.5	70	6	A75
EPDBPE2030-30-29-ATH	★	1.5	30	2.5	70	6	A75
EPDBE2030-30-PN	●	1.5	30	2.5	75	6	A59
EPDBE2030-30-ATH	●	1.5	30	2.5	75	6	A56
EPDBEH2030-30-TH3	●	1.5	30	2.5	75	6	A36
EPDBPE2030-35-09-ATH	●	1.5	35	2.5	75	6	A75
EPDBE2030-35-PN	●	1.5	35	2.5	80	6	A59

Quick dimension reference table by mill diameter

Carbide End Mill -Ball RE1.5 ~ RE10

unit : mm

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2030-35-ATH	●	1.5	35	2.5	80	6	A56
EPDBEH2030-35-TH3	●	1.5	35	2.5	80	6	A36
EPDB2030-36-SD	★	1.5	36	2.5	80	6	A134
EMBPE3030-40-09-ATH	★	1.5	40	2.5	80	6	A106
EPDBPE2030-40-04-ATH	★	1.5	40	2.5	80	6	A75
EPDBPE2030-40-09-ATH	●	1.5	40	2.5	80	6	A75
EPDBPE2030-40-14-ATH	●	1.5	40	2.5	80	6	A75
EGDB2030-40-HD	★	1.5	40	4.5	80	4	A140
EMBPE3030-50-09-ATH	★	1.5	50	2.5	90	6	A106
EPDBPE2030-50-04-ATH	★	1.5	50	2.5	90	6	A75
EPDBPE2030-50-09-ATH	●	1.5	50	2.5	90	6	A75
EPDBPE2030-50-14-ATH	★	1.5	50	2.5	90	6	A75
EMBPE3030-60-09-ATH	★	1.5	60	2.5	100	6	A106
EPDBPE2030-60-09-ATH	●	1.5	60	2.5	100	6	A75
EGDB2030-60-HD	★	1.5	60	4.5	100	4	A140
EPDBPE2030-66-14-ATH	★	1.5	66	2.5	140	6	A75
EPDBPE2030-70-09-ATH	●	1.5	70	2.5	110	6	A75
EPDBPE2030-80-04-ATH	★	1.5	80	2.5	120	6	A75
EPDBPE2030-90-09-ATH	★	1.5	90	2.5	130	6	A75
HGFB2030-TH	●	1.5	-	4.5	70	6	A99
HGOB2030-PN	●	1.5	-	8	70	6	A91
ESHB2035-H-TH	★	1.75	8.75	3.5	45	6	A102
ESHB2035-N-TH	★	1.75	8.75	3.5	45	6	A102
EPDBEH2035-10-TH3	●	1.75	10	2.75	55	6	A36
EMBE3035-S4-ATH	★	1.75	10.5	5.5	70	4	A105
EMBE3035-S6-ATH	★	1.75	10.5	5.5	70	6	A105
EPDBE2035-15-PN	★	1.75	15	2.75	60	6	A59
EPDBE2035-15-ATH	★	1.75	15	2.75	60	6	A56
EPDBEH2035-15-TH3	●	1.75	15	2.75	60	6	A36
EMBPE3035-20-09-ATH	★	1.75	20	2.75	60	6	A107
EPDBE2035-25-PN	★	1.75	25	2.75	70	6	A59
EPDBE2035-25-ATH	★	1.75	25	2.75	70	6	A56
EPDBEH2035-25-TH3	●	1.75	25	2.75	70	6	A36
EMBPE3035-30-09-ATH	★	1.75	30	2.75	70	6	A107
EPDBE2035-35-PN	★	1.75	35	2.75	80	6	A59
EPDBE2035-35-ATH	★	1.75	35	2.75	80	6	A56
EPDBEH2035-35-TH3	●	1.75	35	2.75	80	6	A36
EMBPE3035-40-09-ATH	★	1.75	40	2.75	80	6	A107
EPDBE2035-45-PN	★	1.75	45	2.75	90	6	A59
EPDBE2035-45-ATH	★	1.75	45	2.75	90	6	A56
EPDBEH2035-45-TH3	●	1.75	45	2.75	90	6	A36
EMBPE3035-50-09-ATH	★	1.75	50	2.75	90	6	A107
EMBPE3035-60-09-ATH	★	1.75	60	2.75	100	6	A107
EPBT2040	●	2	7	6	70	6	A88
EPBTS2040-TH	●	2	7	6	70	6	A85
EPDBEH2040-8-TH3	●	2	8	3	55	6	A36
EPDBE2040-10-PN	●	2	10	3	55	6	A59
EPDBE2040-10-ATH	●	2	10	3	55	6	A56
EPDBEH2040-10-TH3	●	2	10	3	55	6	A36
ESHB2040-H-TH	★	2	10	4	45	6	A102
ESHB2040-N-TH	★	2	10	4	45	6	A102
EPDBEH2040-12-TH3	●	2	12	3	60	6	A36
EHHBE4040-S4-TH3	●	2	12	6	70	4	A119
EMBE3040-S4-ATH	●	2	12	6	70	4	A105
EHHBE4040-S6-TH3	●	2	12	6	70	6	A119
EMBE3040-S6-ATH	●	2	12	6	70	6	A105
EPDBE2040-13-PN	●	2	13	3	60	6	A59
EPDBE2040-13-ATH	●	2	13	3	60	6	A56
EPDBEH2040-13-TH3	●	2	13	3	60	6	A36
EPDB2040-16-SD	★	2	16	3	60	6	A134
EPDBE2040-16-PN	●	2	16	3	60	6	A59
EPDBE2040-16-ATH	●	2	16	3	60	6	A56

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBEH2040-16-TH3	●	2	16	3		6	A36
EPDBE2040-20-PN	●	2	20	3	65	6	A59
EPDBE2040-20-ATH	●	2	20	3	65	6	A56
EPDBEH2040-20-TH3	●	2	20	3	65	6	A36
EMBPE3040-20-09-ATH	●	2	20	6	70	6	A107
EPDBPE2040-20-09-ATH	●	2	20	8	70	8	A75
EPDBE2040-25-PN	●	2	25	3	70	6	A59
EPDBE2040-25-ATH	●	2	25	3	70	6	A56
EPDBEH2040-25-TH3	●	2	25	3	70	6	A36
EPDBPE2040-25-29-ATH	●	2	25	8	75	8	A75
EPDBE2040-30-PN	●	2	30	3	75	6	A59
EPDBE2040-30-ATH	●	2	30	3	75	6	A56
EPDBEH2040-30-TH3	●	2	30	3	75	6	A36
EMBPE3040-30-09-ATH	●	2	30	6	80	6	A107
EPDBPE2040-30-09-ATH	●	2	30	8	80	8	A75
EPDB2040-32-SD	★	2	32	3	75	6	A134
EPDBE2040-35-PN	●	2	35	3	80	6	A59
EPDBE2040-35-ATH	●	2	35	3	80	6	A56
EPDBEH2040-35-TH3	●	2	35	3	80	6	A36
EPDBPE2040-35-09-ATH	●	2	35	8	85	8	A75
EPDBE2040-40-PN	●	2	40	3	80	6	A59
EPDBE2040-40-ATH	●	2	40	3	80	6	A56
EPDBEH2040-40-TH3	●	2	40	3		6	A36
EMBPE3040-40-09-ATH	●	2	40	6	90	6	A107
EPDBPE2040-40-09-ATH	●	2	40	8	90	8	A75
EGB2040-HD	★	2	40	8	100	4	A143
EPDBE2040-45-PN	●	2	45	3	90	6	A59
EPDBE2040-45-ATH	●	2	45	3	90	6	A56
EPDBEH2040-45-TH3	●	2	45	3	90	6	A36
EPDBPE2040-45-14-ATH	●	2	45	8	95	8	A75
EPDB2040-48-SD	★	2	48	3	90	6	A134
EPDBE2040-50-PN	●	2	50	3	100	6	A59
EPDBE2040-50-ATH	●	2	50	3	100	6	A56
EPDBEH2040-50-TH3	●	2	50	3	100	6	A36
EMBPE3040-50-09-ATH	●	2	50	6	100	6	A107
EPDBPE2040-50-09-ATH	●	2	50	8	100	8	A75
EMBPE3040-60-09-ATH	●	2	60	6	110	6	A107
EPDBPE2040-60-04-ATH	★	2	60	8	110	8	A75
EPDBPE2040-60-09-ATH	●	2	60	8	110	8	A75
EMBPE3040-70-09-ATH	★	2	70	6	120	8	A107
EMBPE3040-80-09-ATH	★	2	80	6	130	8	A107
EPDBPE2040-80-14-ATH	★	2	80	8	130	8	A75
EPDBPE2040-100-04-ATH	★	2	100	8	150	8	A75
EPDBPE2040-120-09-ATH	★	2	120	8	170	8	A75
EPBT2040-4	★	2	-	6	70	4	A88
HGFB2040-TH	●	2	-	6	70	6	A99
HGOB2040-4-PN	●	2	-	8	70	4	A91
HGOB2040-PN	●	2	-	8	70	6	A91
EPBT2050	★	2.5	8.5	7.5	80	6	A88
EPBTS2050-TH	★	2.5	8.5	7.5	80	6	A85
EPDBEH2050-10-TH3	●	2.5	10	3.5	55	6	A36
ESHB2050-H-TH	★	2.5	12.5	5	50	6	A102
ESHB2050-N-TH	★	2.5	12.5	5	50	6	A102
EHHBE4050-TH3	●	2.5	15	7.5	80	6	A119
EMBE3050-ATH	●	2.5	15	7.5	80	6	A105
EPDB2050-20-SD	★	2.5	20	3.5	65	6	A134
EPDBE2050-20-PN	●	2.5	20	3.5	65	6	A59
EPDBE2050-20-ATH	●	2.5	20	3.5	65	6	A56
EPDBEH2050-20-TH3	●	2.5	20	3.5	65	6	A36
EPDBE2050-25-PN	●	2.5	25	3.5	70	6	A59
EPDBE2050-25-ATH	●	2.5	25	3.5	70	6	A56
EPDBEH2050-25-TH3	●	2.5	25	3.5	70	6	A36

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDBE2050-30-PN	●	2.5	30	3.5	75	6	A59
EPDBE2050-30-ATH	●	2.5	30	3.5	75	6	A56
EPDBEH2050-30-TH3	●	2.5	30	3.5	75	6	A36
EMBPE3050-30-09-ATH	●	2.5	30	7.5	80	8	A107
EPDBPE2050-30-09-ATH	★	2.5	30	10	80	8	A75
EPDB2050-40-SD	★	2.5	40	3.5	80	6	A134
EPDBE2050-40-PN	●	2.5	40	3.5	80	6	A59
EPDBE2050-40-ATH	●	2.5	40	3.5	80	6	A56
EPDBEH2050-40-TH3	●	2.5	40	3.5	80	6	A36
EMBPE3050-40-09-ATH	●	2.5	40	7.5	90	8	A107
EPDBPE2050-40-09-ATH	★	2.5	40	10	90	8	A75
EPDBPE2050-40-29-ATH	★	2.5	40	10	90	8	A75
EMBPE3050-50-09-ATH	●	2.5	50	7.5	100	8	A107
EMBPE3050-60-09-ATH	●	2.5	60	7.5	110	8	A107
EPDBPE2050-60-09-ATH	★	2.5	60	10	110	8	A75
EPDBPE2050-60-14-ATH	★	2.5	60	10	110	8	A75
EMBPE3050-70-09-ATH	●	2.5	70	7.5	120	8	A107
EPDBPE2050-74-14-ATH	★	2.5	74	10	150	8	A75
EMBPE3050-80-09-ATH	★	2.5	80	7.5	130	8	A107
EPDBPE2050-90-09-ATH	★	2.5	90	10	140	8	A75
EPDBPE2050-100-04-ATH	★	2.5	100	10	150	8	A75
HGOB2050-PN	●	2.5	-	10	80	6	A91
EPDBE2060-12-PN	●	3	12	6	60	6	A59
EPDBE2060-12-ATH	●	3	12	6	60	6	A56
EPDBEH2060-12-TH3	●	3	12	6	60	6	A36
ESHB2060-H-TH	★	3	15	6	50	6	A102
ESHB2060-N-TH	★	3	15	6	50	6	A102
EPAB2060-SD	★	3	15	6	90	6	A137
EHHBE4060-TH3	●	3	18	9	90	6	A119
EMBE3060-ATH	●	3	18	9	90	6	A105
EPDBE2060-20-PN	●	3	20	6	65	6	A59
EPDBE2060-20-ATH	●	3	20	6	65	6	A56
EPDBEH2060-20-TH3	●	3	20	6	65	6	A36
EPDBE2060-30-PN	●	3	30	6	75	6	A59
EPDBE2060-30-ATH	●	3	30	6	75	6	A56
EPDBEH2060-30-TH3	●	3	30	6	75	6	A36
EMBPE3060-30-09-ATH	●	3	30	9	80	8	A107
EPDBPE2060-30-09-ATH	●	3	30	12	80	8	A75
EPDBPE2060-30-29-ATH	★	3	30	12	80	10	A76
EMBPE3060-40-09-ATH	●	3	40	9	90	8	A107
EPDBPE2060-40-09-ATH	●	3	40	12	90	8	A75
EPDBPE2060-45-09-ATH	●	3	45	12	95	8	A75
EPDBE2060-50-PN	●	3	50	6	100	6	A59
EPDBE2060-50-ATH	●	3	50	6	100	6	A56
EPDBEH2060-50-TH3	●	3	50	6	100	6	A36
EMBPE3060-50-09-ATH	●	3	50	9	100	8	A107
EPDBPE2060-50-09-ATH	●	3	50	12	100	8	A75
EPDBPE2060-50-14-ATH	●	3	50	12	100	10	A76
EMBPE3060-60-09-ATH	●	3	60	9	110	8	A107
EPDBPE2060-60-09-ATH	●	3	60	12	110	10	A75
EGB2060-HD	★	3	60	12	120	6	A143
EMBPE3060-70-09-ATH	●	3	70	9	120	10	A107
EPDBPE2060-70-09-ATH	★	3	70	12	120	10	A75
EMBPE3060-80-09-ATH	●	3	80	9	130	10	A107
EPDBPE2060-80-09-ATH	★	3	80	12	130	10	A76
EPDBPE2060-96-14-ATH	★	3	96	12	200	10	A76
EMBPE3060-100-09-ATH	●	3	100	9	150	10	A107
EMBPE3060-120-09-ATH	★	3	120	9	200	10	A107
EPDBPE2060-120-04-ATH	★	3	120	12	200	8	A75
EPDBPE2060-120-09-ATH	★	3	120	12	200	10	A76
EPBT2060	●	3	-	9	90	6	A88
EPBTS2060-TH	●	3	-	9	90	6	A85

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
HGFB2060-TH	●	3	-	9	90	6	A99
HGOB2060-PN	●	3	-	12	90	6	A91
EPDBPE2070-40-29-ATH	★	3.5	40	14	90	10	A76
EPDBPE2070-45-09-ATH	★	3.5	45	14	95	10	A76
EPDBPE2070-60-14-ATH	★	3.5	60	14	110	10	A76
ESHB2080-H-TH	★	4	20	8	60	8	A102
ESHB2080-N-TH	★	4	20	8	60	8	A102
EPAB2080-SD	★	4	20	8	100	8	A137
EHHBE4080-TH3	●	4	24	12	100	8	A119
EMBE3080-ATH	●	4	24	12	100	8	A105
EPDBEH2080-24-TH3	●	4	24	12	100	8	A36
EPDBPE2080-35-29-ATH	●	4	35	14	95	10	A76
EMBPE3080-40-09-ATH	●	4	40	12	100	10	A107
EMBPE3080-50-09-ATH	●	4	50	12	110	10	A107
EPDBPE2080-50-09-ATH	●	4	50	14	110	10	A76
EPDBPE2080-50-14-ATH	●	4	50	14	110	10	A76
EPDBPE2080-55-09-ATH	●	4	55	14	115	10	A76
EMBPE3080-60-09-ATH	●	4	60	12	120	10	A107
EPDBPE2080-60-09-ATH	★	4	60	14	120	10	A76
EMBPE3080-70-09-ATH	●	4	70	12	130	10	A107
EPDBPE2080-70-09-ATH	★	4	70	14	130	10	A76
EMBPE3080-80-09-ATH	●	4	80	12	140	12	A107
EPDBPE2080-80-09-ATH	★	4	80	14	140	12	A76
EGB2080-HD	★	4	80	16	140	8	A143
EPDBPE2080-98-14-ATH	★	4	98	14	200	12	A76
EMBPE3080-100-09-ATH	●	4	100	12	160	12	A107
EMBPE3080-120-09-ATH	★	4	120	12	200	12	A107
EPDBPE2080-120-04-ATH	★	4	120	14	200	10	A76
EPDBPE2080-120-09-ATH	★	4	120	14	200	12	A76
EPBT2080	●	4	-	12	100	8	A88
EPBTS2080-TH	●	4	-	12	100	8	A85
HGFB2080-TH	●	4	-	12	100	8	A99
HGOB2080-PN	●	4	-	14	100	8	A91
ESHB2100-H-TH	★	5	25	10	70	10	A102
ESHB2100-N-TH	★	5	25	10	70	10	A102
EPAB2100-SD	★	5	25	10	100	10	A137
EHHBE4100-TH3	●	5	30	15	100	10	A119
EMBE3100-ATH	●	5	30	15	100	10	A105
EPDBEH2100-30-TH3	●	5	30	15	100	10	A36
EPDBPE2100-35-29-ATH	★	5	35	18	105	12	A76
EMBPE3100-50-09-ATH	●	5	50	15	120	12	A107
EPDBPE2100-55-14-ATH	★	5	55	18	125	12	A76
EMBPE3100-60-09-ATH	●	5	60	15	130	12	A107
EPDBPE2100-60-09-ATH	●	5	60	18	130	12	A76
EPDBPE2100-65-09-ATH	●	5	65	18	135	12	A76
EMBPE3100-75-09-ATH	●	5	75	15	140	12	A107
EPDBPE2100-75-09-ATH	●	5	75	18	140	12	A76
EMBPE3100-81-09-ATH	●	5	81	15	150	12	A107
EPDBPE2100-86-09-ATH	●	5	86	18	200	12	A76
EMBPE3100-100-09-ATH	●	5	100	15	170	16	A107
EGB2100-HD	★	5	100	20	150	10	A143
EMBPE3100-120-09-ATH	●	5	120	15	200	16	A107
EPDBPE2100-120-04-ATH	★	5	120	18	200	12	A76
EPDBPE2100-120-14-ATH	★	5	120	18	200	16	A76
EPBT2100	●	5	-	15	100	10	A88
EPBTS2100-TH	●	5	-	15	100	10	A85
HGFB2100-TH	●	5	-	15	100	10	A99
HGOB2100-PN	●	5	-	18	100	10	A91
ESHB2120-H-TH	★	6	30	12	75	12	A102
ESHB2120-N-TH	★	6	30	12	75	12	A102
EPAB2120-SD	★	6	30	12	110	12	A137
EHHBE4120-TH3	●	6	36	18	110	12	A119

Item Code	Stock	RE	Under neck length	Flute length	Overall length	Shank dia.	Page
EMBE3120-ATH	●	6	36	18	110	12	A105
EPDBEH2120-36-TH3	●	6	36	18	110	12	A36
EMBPE3120-60-09-ATH	●	6	60	18	140	16	A107
EPDBPE2120-60-29-ATH	★	6	60	22	140	16	A76
EPDBPE2120-75-09-ATH	●	6	75	22	150	14	A76
EMBPE3120-80-09-ATH	●	6	80	18	160	16	A107
EPDBPE2120-80-14-ATH	●	6	80	22	160	16	A76
EMBPE3120-100-09-ATH	●	6	100	18	180	16	A107
EPDBPE2120-106-14-ATH	★	6	106	22	200	16	A76
EMBPE3120-120-09-ATH	●	6	120	18	200	16	A107
EPDBPE2120-120-04-ATH	★	6	120	22	200	14	A76
EPDBPE2120-120-09-ATH	★	6	120	22	200	16	A76
EPBT2120	●	6	-	18	110	12	A88
EPBTS2120-TH	●	6	-	18	110	12	A85
HGFB2120-TH	●	6	-	18	110	12	A99
HGOB2120-PN	●	6	-	22	110	12	A91
EMBE3160-ATH	★	8	48	24	140	16	A105
EPBT2160	★	8	-	24	140	16	A88
HGOB2160-PN	●	8	-	30	140	16	A91
EMBE3200-ATH	★	10	60	30	160	20	A105
EPBT2200	★	10	-	30	160	20	A88
HGOB2200-PN	●	10	-	38	160	20	A91

Carbide End Mill -Radius

ϕ0.2 ~ ϕ0.5

unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDREH2002-0.5-002-TH3	●	0.02	0.2	0.5	0.15	50	4	A154
EPDRE2002-0.5-002-ATH	★	0.02	0.2	0.5	0.15	50	4	A191
EPDREH2002-1-002-TH3	●	0.02	0.2	1	0.15	50	4	A154
EPDRE2002-1-002-ATH	★	0.02	0.2	1	0.15	50	4	A191
EPDRE2002-2-002-ATH	★	0.02	0.2	2	0.15	50	4	A191
CBN-EPSR2002-0.5-005	●	0.05	0.2	0.5	0.07	50	4	A298
EPDREH2002-0.5-005-TH3	●	0.05	0.2	0.5	0.15	50	4	A154
EPDRE2002-0.5-005-ATH	●	0.05	0.2	0.5	0.15	50	4	A191
CBN-EPSR2002-1-005	●	0.05	0.2	1	0.07	50	4	A298
EPDREH2002-1-005-TH3	●	0.05	0.2	1	0.15	50	4	A154
EPDRE2002-1-005-ATH	●	0.05	0.2	1	0.15	50	4	A191
EPDRE2002-1.5-005-ATH	★	0.05	0.2	1.5	0.15	50	4	A191
EPDRE2002-2-005-ATH	●	0.05	0.2	2	0.15	50	4	A191
EPDREH2003-1-002-TH3	●	0.02	0.3	1	0.25	50	4	A154
EPDRE2003-1-002-ATH	★	0.02	0.3	1	0.25	50	4	A191
EPDREH2003-2-002-TH3	●	0.02	0.3	2	0.25	50	4	A154
EPDRE2003-2-002-ATH	★	0.02	0.3	2	0.25	50	4	A191
EPDRE2003-3-002-ATH	★	0.02	0.3	3	0.25	50	4	A191
CBN-EPSR2003-0.5-005	●	0.05	0.3	0.5	0.11	50	4	A298
CBN-EPSR2003-0.75-005	●	0.05	0.3	0.75	0.11	50	4	A298
EPDREH2003-1-005-TH3	●	0.05	0.3	1	0.25	50	4	A154
EPDRE2003-1-005-ATH	●	0.05	0.3	1	0.25	50	4	A191
CBN-EPSR2003-1.5-005	●	0.05	0.3	1.5	0.11	50	4	A298
EPDRE2003-1.5-005-ATH	★	0.05	0.3	1.5	0.25	50	4	A191
CBN-EPSR2003-2-005	●	0.05	0.3	2	0.11	50	4	A298
EPDREH2003-2-005-TH3	●	0.05	0.3	2	0.25	50	4	A154
EPDRE2003-2-005-ATH	●	0.05	0.3	2	0.25	50	4	A191
EPDRE2003-2.5-005-ATH	★	0.05	0.3	2.5	0.25	50	4	A191
EPDRE2003-3-005-ATH	●	0.05	0.3	3	0.25	50	4	A191
EPDREH2004-1-002-TH3	●	0.02	0.4	1	0.3	50	4	A154
EPDRE2004-1-002-ATH	★	0.02	0.4	1	0.3	50	4	A191
EPDREH2004-2-002-TH3	●	0.02	0.4	2	0.3	50	4	A154
EPDRE2004-2-002-ATH	★	0.02	0.4	2	0.3	50	4	A191
EPDRE2004-3-002-ATH	★	0.02	0.4	3	0.3	50	4	A191
EPDRE2004-4-002-ATH	★	0.02	0.4	4	0.3	50	4	A191
CBN-EPSR2004-0.5-005	●	0.05	0.4	0.5	0.14	50	4	A298
CBN-EPSR2004-1-005	●	0.05	0.4	1	0.14	50	4	A298
EPDREH2004-1-005-TH3	●	0.05	0.4	1	0.3	50	4	A154
EPDRE2004-1-005-ATH	●	0.05	0.4	1	0.3	50	4	A191
EPDRE2004-1.5-005-ATH	★	0.05	0.4	1.5	0.3	50	4	A191
CBN-EPSR2004-2-005	●	0.05	0.4	2	0.14	50	4	A298
EPDREH2004-2-005-TH3	●	0.05	0.4	2	0.3	50	4	A154
EPDRE2004-2-005-ATH	●	0.05	0.4	2	0.3	50	4	A191
EPDRE2004-2.5-005-ATH	★	0.05	0.4	2.5	0.3	50	4	A191
EPDRE2004-3-005-ATH	●	0.05	0.4	3	0.3	50	4	A191
EPDRE2004-3.5-005-ATH	★	0.05	0.4	3.5	0.3	50	4	A191
EPDRE2004-4-005-ATH	●	0.05	0.4	4	0.3	50	4	A191
EPDREH2004-1-01-TH3	●	0.1	0.4	1	0.3	50	4	A154
EPDRE2004-1-01-ATH	★	0.1	0.4	1	0.3	50	4	A191
EPDREH2004-2-01-TH3	●	0.1	0.4	2	0.3	50	4	A154
EPDRE2004-2-01-ATH	●	0.1	0.4	2	0.3	50	4	A191
EPDRE2004-3-01-ATH	●	0.1	0.4	3	0.3	50	4	A191
EPDRE2004-4-01-ATH	●	0.1	0.4	4	0.3	50	4	A191
EPDREH2005-1-002-TH3	●	0.02	0.5	1	0.35	50	4	A154
EPDRE2005-1-002-ATH	★	0.02	0.5	1	0.35	50	4	A191
EPDREH2005-2-002-TH3	●	0.02	0.5	2	0.35	50	4	A154
EPDRE2005-2-002-ATH	★	0.02	0.5	2	0.35	50	4	A191
EPDREH2005-3-002-TH3	●	0.02	0.5	3	0.35	50	4	A154
EPDRE2005-3-002-ATH	★	0.02	0.5	3	0.35	50	4	A191
EPDRE2005-4-002-ATH	★	0.02	0.5	4	0.35	50	4	A191
EPDRE2005-6-002-ATH	★	0.02	0.5	6	0.35	50	4	A191
CBN-EPSR2005-0.5-005	●	0.05	0.5	0.5	0.18	50	4	A298

Quick dimension reference table by mill diameter

Carbide End Mill -Radius

φ0.5～φ1.75

unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDREH2005-1-005-TH3	●	0.05	0.5	1	0.35	50	4	A154
EPDRE2005-1-005-ATH	●	0.05	0.5	1	0.35	50	4	A191
CBN-EPSR2005-1.5-005	●	0.05	0.5	1.5	0.18	50	4	A298
EPDREH2005-2-005-TH3	●	0.05	0.5	2	0.35	50	4	A154
EPDRE2005-2-005-ATH	●	0.05	0.5	2	0.35	50	4	A191
CBN-EPSR2005-3-005	●	0.05	0.5	3	0.18	50	4	A298
EPDREH2005-3-005-TH3	●	0.05	0.5	3	0.35	50	4	A154
EPDRE2005-3-005-ATH	●	0.05	0.5	3	0.35	50	4	A191
EPDRE2005-4-005-ATH	●	0.05	0.5	4	0.35	50	4	A191
EPDRE2005-5-005-ATH	●	0.05	0.5	5	0.35	50	4	A191
EPDRE2005-6-005-ATH	●	0.05	0.5	6	0.35	50	4	A191
CBN-EPSR2005-0.5-01	●	0.1	0.5	0.5	0.18	50	4	A298
EPDREH2005-1-01-TH3	●	0.1	0.5	1	0.35	50	4	A154
EPDRE2005-1-01-ATH	●	0.1	0.5	1	0.35	50	4	A191
CBN-EPSR2005-1.5-01	●	0.1	0.5	1.5	0.18	50	4	A298
EPDREH2005-2-01-TH3	●	0.1	0.5	2	0.35	50	4	A154
EPDRE2005-2-01-ATH	●	0.1	0.5	2	0.35	50	4	A191
CBN-EPSR2005-3-01	●	0.1	0.5	3	0.18	50	4	A298
EPDREH2005-3-01-TH3	●	0.1	0.5	3	0.35	50	4	A154
EPDRE2005-3-01-ATH	●	0.1	0.5	3	0.35	50	4	A191
EPDRE2005-4-01-ATH	●	0.1	0.5	4	0.35	50	4	A191
EPDRE2005-5-01-ATH	●	0.1	0.5	5	0.35	50	4	A191
EGDR2005-5-01-HD	★	0.1	0.5	5	0.75	60	4	A294
EPDRE2005-6-01-ATH	●	0.1	0.5	6	0.35	50	4	A191
EGDR2005-10-01-HD	★	0.1	0.5	10	0.75	60	4	A294
EGDR2005-15-01-HD	★	0.1	0.5	15	0.75	60	4	A294
EGDR2005-20-01-HD	★	0.1	0.5	20	0.75	60	4	A294
EPDREH2006-2-002-TH3	●	0.02	0.6	2	0.4	50	4	A154
EPDRE2006-2-002-ATH	★	0.02	0.6	2	0.4	50	4	A192
EPDREH2006-4-002-TH3	●	0.02	0.6	4	0.4	50	4	A154
EPDRE2006-4-002-ATH	★	0.02	0.6	4	0.4	50	4	A192
EPDRE2006-6-002-ATH	★	0.02	0.6	6	0.4	50	4	A192
EPDREH2006-2-005-TH3	●	0.05	0.6	2	0.4	50	4	A154
EPDRE2006-2-005-ATH	●	0.05	0.6	2	0.4	50	4	A192
EPDREH2006-4-005-TH3	●	0.05	0.6	4	0.4	50	4	A154
EPDRE2006-4-005-ATH	●	0.05	0.6	4	0.4	50	4	A192
EPDRE2006-6-005-ATH	★	0.05	0.6	6	0.4	50	4	A192
EPDRE2006-8-005-ATH	★	0.05	0.6	8	0.4	50	4	A192
EPDRE2006-10-005-ATH	★	0.05	0.6	10	0.4	50	4	A192
CBN-EPSR2006-1.5-01	●	0.1	0.6	1.5	0.21	50	4	A298
EPDREH2006-2-01-TH3	●	0.1	0.6	2	0.4	50	4	A154
EPDRE2006-2-01-ATH	●	0.1	0.6	2	0.4	50	4	A192
CBN-EPSR2006-3-01	●	0.1	0.6	3	0.21	50	4	A298
EPDREH2006-4-01-TH3	●	0.1	0.6	4	0.4	50	4	A154
EPDRE2006-4-01-ATH	●	0.1	0.6	4	0.4	50	4	A192
EPDRE2006-6-01-ATH	●	0.1	0.6	6	0.4	50	4	A192
EPDRE2006-8-01-ATH	●	0.1	0.6	8	0.4	50	4	A192
EPDRE2006-10-01-ATH	★	0.1	0.6	10	0.4	50	4	A192
EPDRE2007-2-005-ATH	★	0.05	0.7	2	0.45	50	4	A192
EPDRE2007-4-005-ATH	★	0.05	0.7	4	0.45	50	4	A192
EPDRE2007-6-005-ATH	★	0.05	0.7	6	0.45	50	4	A192
EPDRE2007-2-01-ATH	★	0.1	0.7	2	0.45	50	4	A192
EPDRE2007-4-01-ATH	★	0.1	0.7	4	0.45	50	4	A192
EPDRE2007-6-01-ATH	★	0.1	0.7	6	0.45	50	4	A192
EPDREH2008-2-002-TH3	●	0.02	0.8	2	0.5	50	4	A154
EPDRE2008-2-002-ATH	★	0.02	0.8	2	0.5	50	4	A192
EPDREH2008-4-002-TH3	●	0.02	0.8	4	0.5	50	4	A154
EPDRE2008-4-002-ATH	★	0.02	0.8	4	0.5	50	4	A192
EPDRE2008-6-002-ATH	★	0.02	0.8	6	0.5	50	4	A192
EPDREH2008-2-005-TH3	●	0.05	0.8	2	0.5	50	4	A154
EPDRE2008-2-005-ATH	★	0.05	0.8	2	0.5	50	4	A192
EPDREH2008-4-005-TH3	●	0.05	0.8	4	0.5	50	4	A154

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE2008-4-005-ATH	●	0.05	0.8	4	0.5	50	4	A192
EPDRE2008-6-005-ATH	●	0.05	0.8	6	0.5	50	4	A192
EPDRE2008-8-005-ATH	★	0.05	0.8	8	0.5	50	4	A192
EPDRE2008-12-005-ATH	★	0.05	0.8	12	0.5	55	4	A192
EPDREH2008-2-01-TH3	●	0.1	0.8	2	0.5	50	4	A154
EPDRE2008-2-01-ATH	★	0.1	0.8	2	0.5	50	4	A192
CBN-EPSR2008-2.5-01	●	0.1	0.8	2.5	0.28	50	4	A298
EPDREH2008-4-01-TH3	●	0.1	0.8	4	0.5	50	4	A154
EPDRE2008-4-01-ATH	●	0.1	0.8	4	0.5	50	4	A192
CBN-EPSR2008-5-01	●	0.1	0.8	5	0.28	50	4	A298
EPDRE2008-6-01-ATH	●	0.1	0.8	6	0.5	50	4	A192
EPDRE2008-8-01-ATH	●	0.1	0.8	8	0.5	50	4	A192
EPDRE2008-12-01-ATH	★	0.1	0.8	12	0.5	55	4	A192
EPDREH2008-2-02-TH3	●	0.2	0.8	2	0.5	50	4	A154
EPDRE2008-2-02-ATH	★	0.2	0.8	2	0.5	50	4	A192
EPDREH2008-4-02-TH3	●	0.2	0.8	4	0.5	50	4	A154
EPDRE2008-4-02-ATH	●	0.2	0.8	4	0.5	50	4	A192
EPDRE2008-6-02-ATH	●	0.2	0.8	6	0.5	50	4	A192
EPDRE2008-8-02-ATH	★	0.2	0.8	8	0.5	50	4	A192
EPDRE2008-12-02-ATH	★	0.2	0.8	12	0.5	55	4	A192
EPDREH4010-1.5-002-TH3	●	0.02	1	1.5	0.6	50	4	A156
EPDREH4010-2-002-TH3	●	0.02	1	2	0.6	50	4	A156
EPDREH2010-2-002-TH3	●	0.02	1	2	0.8	50	4	A155
EPDRE2010-2-002-ATH	★	0.02	1	2	0.8	50	4	A192
EPDREH4010-2.5-002-TH3	●	0.02	1	2.5	0.6	50	4	A156
EPDREH4010-3-002-TH3	●	0.02	1	3	0.6	50	4	A156
EPDREH4010-4-002-TH3	●	0.02	1	4	0.6	50	4	A156
EPDREH2010-4-002-TH3	●	0.02	1	4	0.8	50	4	A155
EPDRE2010-4-002-ATH	★	0.02	1	4	0.8	50	4	A192
EPDREH4010-5-002-TH3	●	0.02	1	5	0.6	50	4	A156
EPDREH4010-6-002-TH3	●	0.02	1	6	0.6	50	4	A156
EPDREH2010-6-002-TH3	●	0.02	1	6	0.8	50	4	A155
EPDRE2010-6-002-ATH	★	0.02	1	6	0.8	50	4	A192
EPDREH4010-8-002-TH3	●	0.02	1	8	0.6	50	4	A156
EPDREH2010-8-002-TH3	●	0.02	1	8	0.8	50	4	A155
EPDRE2010-8-002-ATH	★	0.02	1	8	0.8	50	4	A192
EPDRE2010-10-002-ATH	★	0.02	1	10	0.8	50	4	A192
EPDRE2010-12-002-ATH	★	0.02	1	12	0.8	55	4	A192
CBN-EPSR2010-1-005	●	0.05	1	1	0.35	50	4	A298
EPDREH4010-1.5-005-TH3	●	0.05	1	1.5	0.6	50	4	A156
EPDREH4010-2-005-TH3	●	0.05	1	2	0.6	50	4	A156
EPDREH2010-2-005-TH3	●	0.05	1	2	0.8	50	4	A155
EPDRE2010-2-005-ATH	●	0.05	1	2	0.8	50	4	A192
CBN-EPSR2010-2.5-005	●	0.05	1	2.5	0.35	50	4	A298
EPDREH4010-2.5-005-TH3	●	0.05	1	2.5	0.6	50	4	A156
EPDREH4010-3-005-TH3	●	0.05	1	3	0.6	50	4	A156
EPDRE2010-3-005-ATH	★	0.05	1	3	0.8	50	4	A192
EPDREH4010-4-005-TH3	●	0.05	1	4	0.6	50	4	A156
EPDREH2010-4-005-TH3	●	0.05	1	4	0.8	50	4	A155
EPDRE2010-4-005-ATH	●	0.05	1	4	0.8	50	4	A192
EPDRF4010-4-005-TH	●	0.05	1	4	0.8	50	4	A218
CBN-EPSR2010-5-005	●	0.05	1	5	0.35	50	4	A298
EPDREH4010-5-005-TH3	●	0.05	1	5	0.6	50	4	A156
EPDRE2010-5-005-ATH	★	0.05	1	5	0.8	50	4	A192
EPDREH4010-6-005-TH3	●	0.05	1	6	0.6	50	4	A156
EPDREH2010-6-005-TH3	●	0.05	1	6	0.8	50	4	A155
EPDRE2010-6-005-ATH	●	0.05	1	6	0.8	50	4	A192
EPDRF4010-6-005-TH	●	0.05	1	6	0.8	50	4	A218
EPDREH4010-8-005-TH3	●	0.05	1	8	0.6	50	4	A156
EPDREH2010-8-005-TH3	●	0.05	1	8	0.8	50	4	A155
EPDRE2010-8-005-ATH	●	0.05	1	8	0.8	50	4	A192
EPDRF4010-8-005-TH	★	0.05	1	8	0.8	50	4	A218

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE2010-10-005-ATH	★	0.05	1	10	0.8	50	4	A192
EPDRF4010-10-005-TH	★	0.05	1	10	0.8	50	4	A218
EPDRE2010-12-005-ATH	★	0.05	1	12	0.8	55	4	A192
EPDRF4010-12-005-TH	★	0.05	1	12	0.8	60	4	A218
EPDRE2010-16-005-ATH	★	0.05	1	16	0.8	60	4	A192
EPDRF4010-16-005-TH	★	0.05	1	16	0.8	60	4	A218
EPDRE2010-20-005-ATH	★	0.05	1	20	0.8	60	4	A192
EPDRF4010-20-005-TH	★	0.05	1	20	0.8	60	4	A218
CBN-EPSR2010-1-01	●	0.1	1	1	0.35	50	4	A298
EPDREH4010-1.5-01-TH3	●	0.1	1	1.5	0.6	50	4	A156
EPDREH4010-2-01-TH3	●	0.1	1	2	0.6	50	4	A156
EPDREH2010-2-01-TH3	●	0.1	1	2	0.8	50	4	A155
EPDRE2010-2-01-ATH	★	0.1	1	2	0.8	50	4	A193
CBN-EPSR2010-2.5-01	●	0.1	1	2.5	0.35	50	4	A298
EPDREH4010-2.5-01-TH3	●	0.1	1	2.5	0.6	50	4	A156
EPDREH4010-3-01-TH3	●	0.1	1	3	0.6	50	4	A156
EPDRE2010-3-01-ATH	★	0.1	1	3	0.8	50	4	A193
EHHRE4010-S4-TH3	●	0.1	1	3	1	50	4	A290
EHHRE4010-S6-TH3	●	0.1	1	3	1	50	6	A290
EPDREH4010-4-01-TH3	●	0.1	1	4	0.6	50	4	A156
EPDREH2010-4-01-TH3	●	0.1	1	4	0.8	50	4	A155
EPDRE2010-4-01-ATH	●	0.1	1	4	0.8	50	4	A193
EPDRF4010-4-01-TH	●	0.1	1	4	0.8	50	4	A218
CBN-EPSR2010-5-01	●	0.1	1	5	0.35	50	4	A298
EPDREH4010-5-01-TH3	●	0.1	1	5	0.6	50	4	A156
EPDRE2010-5-01-ATH	★	0.1	1	5	0.8	50	4	A193
EHHRE4010-5-S4-TH3	★	0.1	1	5	1	50	4	A290
EHHRE4010-5-S6-TH3	★	0.1	1	5	1	55	6	A290
EPSM4010-5-R0.1-PN	●	0.1	1	5	1.5	68	6	A250
EPDREH4010-6-01-TH3	●	0.1	1	6	0.6	50	4	A156
EPDREH2010-6-01-TH3	●	0.1	1	6	0.8	50	4	A155
EPDRE2010-6-01-ATH	●	0.1	1	6	0.8	50	4	A193
EPDRF4010-6-01-TH	●	0.1	1	6	0.8	50	4	A218
EPDREH4010-8-01-TH3	●	0.1	1	8	0.6	50	4	A156
EPDREH2010-8-01-TH3	●	0.1	1	8	0.8	50	4	A155
EPDRE2010-8-01-ATH	●	0.1	1	8	0.8	50	4	A193
EPDRF4010-8-01-TH	★	0.1	1	8	0.8	50	4	A218
EPDRE2010-10-01-ATH	●	0.1	1	10	0.8	50	4	A193
EPDRF4010-10-01-TH	★	0.1	1	10	0.8	50	4	A218
EPDRE2010-12-01-ATH	●	0.1	1	12	0.8	55	4	A193
EPDRF4010-12-01-TH	★	0.1	1	12	0.8	60	4	A218
EPDRE2010-16-01-ATH	★	0.1	1	16	0.8	60	4	A193
EPDRF4010-16-01-TH	★	0.1	1	16	0.8	60	4	A218
EPDRE2010-20-01-ATH	★	0.1	1	20	0.8	60	4	A193
EPDRF4010-20-01-TH	★	0.1	1	20	0.8	60	4	A218
EPSM4010-R0.1-PN	●	0.1	1	-	2.5	56	6	A249
EPDREH4010-1.5-02-TH3	●	0.2	1	1.5	0.6	50	4	A156
EPDREH4010-2-02-TH3	●	0.2	1	2	0.6	50	4	A156
EPDREH2010-2-02-TH3	●	0.2	1	2	0.8	50	4	A155
EPDRE2010-2-02-ATH	★	0.2	1	2	0.8	50	4	A193
CBN-EPSR2010-2.5-02	●	0.2	1	2.5	0.35	50	4	A298
EPDREH4010-2.5-02-TH3	●	0.2	1	2.5	0.6	50	4	A156
EPDREH4010-3-02-TH3	●	0.2	1	3	0.6	50	4	A156
EPDRE2010-3-02-ATH	★	0.2	1	3	0.8	50	4	A193
EPDREH4010-4-02-TH3	●	0.2	1	4	0.6	50	4	A156
EPDREH2010-4-02-TH3	●	0.2	1	4	0.8	50	4	A155
EPDRE2010-4-02-ATH	●	0.2	1	4	0.8	50	4	A193
CBN-EPSR2010-5-02	●	0.2	1	5	0.35	50	4	A298
EPDREH4010-5-02-TH3	●	0.2	1	5	0.6	50	4	A156
EPDRE2010-5-02-ATH	★	0.2	1	5	0.8	50	4	A193
ETR4010-5-02-TH	●	0.2	1	5	1	50	6	A227
ETRP4010-5-0902-TH	●	0.2	1	5	1	60	6	A228

unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDREH4010-6-02-TH3	●	0.2	1	6	0.6	50	4	A156
EPDREH2010-6-02-TH3	●	0.2	1	6	0.8	50	4	A155
EPDRE2010-6-02-ATH	●	0.2	1	6	0.8	50	4	A193
ETR4010-7.5-02-TH	●	0.2	1	7.5	1	50	6	A227
ETRP4010-7.5-0902-TH	●	0.2	1	7.5	1	60	6	A228
EPDREH4010-8-02-TH3	●	0.2	1	8	0.6	50	4	A156
EPDREH2010-8-02-TH3	●	0.2	1	8	0.8	50	4	A155
EPDRE2010-8-02-ATH	●	0.2	1	8	0.8	50	4	A193
CBN-EPSR2010-10-02	●	0.2	1	10	0.35	50	4	A298
EPDRE2010-10-02-ATH	●	0.2	1	10	0.8	50	4	A193
ETR4010-10-02-TH	●	0.2	1	10	1	50	6	A227
ETRP4010-10-0902-TH	●	0.2	1	10	1	60	6	A228
EGDR2010-10-02-HD	★	0.2	1	10	1.5	60	4	A294
EPDRE2010-12-02-ATH	●	0.2	1	12	0.8	55	4	A193
ETR4010-12.5-02-TH	●	0.2	1	12.5	1	60	6	A227
ETR4010-15-02-TH	●	0.2	1	15	1	60	6	A227
ETRP4010-15-0902-TH	●	0.2	1	15	1	60	6	A228
EPDRE2010-16-02-ATH	★	0.2	1	16	0.8	60	4	A193
ETR4010-17.5-02-TH	●	0.2	1	17.5	1	60	6	A227
EPDRE2010-20-02-ATH	★	0.2	1	20	0.8	60	4	A193
ETR4010-20-02-TH	●	0.2	1	20	1	60	6	A227
ETRP4010-20-0902-TH	●	0.2	1	20	1	70	6	A228
EGDR2010-20-02-HD	★	0.2	1	20	1.5	60	4	A294
ETR4010-22.5-02-TH	●	0.2	1	22.5	1	70	6	A227
ETR4010-25-02-TH	●	0.2	1	25	1	70	6	A227
ETRP4010-25-0902-TH	●	0.2	1	25	1	70	6	A228
ETR4010-27.5-02-TH	●	0.2	1	27.5	1	70	6	A227
ETR4010-30-02-TH	●	0.2	1	30	1	70	6	A227
ETRP4010-30-0902-TH	●	0.2	1	30	1	80	6	A228
EGDR2010-30-02-HD	★	0.2	1	30	1.5	80	4	A294
ETRP4010-35-0902-TH	●	0.2	1	35	1	80	6	A228
ETRP4010-40-0902-TH	●	0.2	1	40	1	90	6	A228
EGDR2010-40-02-HD	★	0.2	1	40	1.5	80	4	A294
ETRP4010-45-0902-TH	●	0.2	1	45	1	90	6	A228
ETRP4010-50-0902-TH	●	0.2	1	50	1	100	6	A228
EPDREH4010-1.5-03-TH3	●	0.3	1	1.5	0.6	50	4	A156
EPDREH4010-2-03-TH3	●	0.3	1	2	0.6	50	4	A156
EPDRE2010-2-03-ATH	★	0.3	1	2	0.8	50	4	A193
EPDREH4010-2.5-03-TH3	●	0.3	1	2.5	0.6	50	4	A156
EPDREH4010-3-03-TH3	●	0.3	1	3	0.6	50	4	A156
EPDRE2010-3-03-ATH	★	0.3	1	3	0.8	50	4	A193
EPDREH4010-4-03-TH3	●	0.3	1	4	0.6	50	4	A156
EPDRE2010-4-03-ATH	★	0.3	1	4	0.8	50	4	A193
EPDREH4010-5-03-TH3	●	0.3	1	5	0.6	50	4	A156
EPDRE2010-5-03-ATH	★	0.3	1	5	0.8	50	4	A193
EPDREH4010-6-03-TH3	●	0.3	1	6	0.6	50	4	A156
EPDRE2010-6-03-ATH	●	0.3	1	6	0.8	50	4	A193
EPDREH4010-8-03-TH3	●	0.3	1	8	0.6	50	4	A156
EPDRE2010-8-03-ATH	★	0.3	1	8	0.8	50	4	A193
EPDRE2010-10-03-ATH	●	0.3	1	10	0.8	50	4	A193
EPDRE2010-12-03-ATH	★	0.3	1	12	0.8	55	4	A193
EPDRE2010-16-03-ATH	★	0.3	1	16	0.8	60	4	A193
EPDRE2010-20-03-ATH	★	0.3	1	20	0.8	60	4	A193
EPDRE20125-5-01-ATH	★	0.1	1.25	5	1.15	50	4	A193
EPDRE20125-10-01-ATH	★	0.1	1.25	10	1.15	50	4	A193
EPDRE20125-15-01-ATH	★	0.1	1.25	15	1.15	55	4	A193
EPDRE20125-20-01-ATH	★	0.1	1.25	20	1.15	60	4	A193
EPDRE20125-5-02-ATH	★	0.2	1.25	5	1.15	50	4	A193
ETR40125-5-02-TH	●	0.2	1.25	5	1.25	50	6	A227
EPDRE20125-10-02-ATH	★	0.2	1.25	10	1.15	50	4	A193
ETR40125-10-02-TH	●	0.2	1.25	10	1.25	50	6	A227
ETRP40125-10-0902-TH	●	0.2	1.25	10	1.25	60	6	A228

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE20125-15-02-ATH	★	0.2	1.25	15	1.15	55	4	A193
ETRP40125-15-0902-TH	●	0.2	1.25	15	1.25	60	6	A228
ETR40125-15-02-TH	●	0.2	1.25	15	1.25	60	6	A227
EPDRE20125-20-02-ATH	★	0.2	1.25	20	1.15	60	4	A193
ETR40125-20-02-TH	●	0.2	1.25	20	1.25	60	6	A227
ETRP40125-20-0902-TH	●	0.2	1.25	20	1.25	70	6	A228
ETR40125-25-02-TH	●	0.2	1.25	25	1.25	70	6	A227
ETR40125-30-02-TH	●	0.2	1.25	30	1.25	70	6	A227
ETRP40125-30-0902-TH	●	0.2	1.25	30	1.25	80	6	A228
ETRP40125-40-0902-TH	●	0.2	1.25	40	1.25	90	6	A228
ETRP40125-50-0902-TH	●	0.2	1.25	50	1.25	100	6	A228
EPDRE20125-5-03-ATH	★	0.3	1.25	5	1.15	50	4	A193
EPDRE20125-10-03-ATH	★	0.3	1.25	10	1.15	50	4	A193
EPDRE20125-15-03-ATH	★	0.3	1.25	15	1.15	55	4	A193
EPDRE20125-20-03-ATH	★	0.3	1.25	20	1.15	60	4	A193
EPDREH4015-2-002-TH3	●	0.02	1.5	2	0.9	50	4	A157
EPDREH4015-3-002-TH3	●	0.02	1.5	3	0.9	50	4	A157
EPDREH4015-4-002-TH3	●	0.02	1.5	4	0.9	50	4	A157
EPDREH4015-5-002-TH3	●	0.02	1.5	5	0.9	50	4	A157
EPDREH4015-6-002-TH3	●	0.02	1.5	6	0.9	50	4	A157
EPDREH4015-8-002-TH3	●	0.02	1.5	8	0.9	50	4	A157
EPDREH4015-10-002-TH3	●	0.02	1.5	10	0.9	50	4	A157
EPDREH4015-12-002-TH3	●	0.02	1.5	12	0.9	50	4	A157
CBN-EPSR2015-2-005	●	0.05	1.5	2	0.53	50	4	A298
EPDREH4015-2-005-TH3	●	0.05	1.5	2	0.9	50	4	A157
EPDREH4015-3-005-TH3	●	0.05	1.5	3	0.9	50	4	A157
EPDREH4015-4-005-TH3	●	0.05	1.5	4	0.9	50	4	A157
EPDRF4015-4-005-TH	●	0.05	1.5	4	1.35	50	4	A218
CBN-EPSR2015-5-005	●	0.05	1.5	5	0.53	50	4	A298
EPDREH4015-5-005-TH3	●	0.05	1.5	5	0.9	50	4	A157
EPDREH4015-6-005-TH3	●	0.05	1.5	6	0.9	50	4	A157
EPDREH4015-8-005-TH3	●	0.05	1.5	8	0.9	50	4	A157
EPDRF4015-8-005-TH	●	0.05	1.5	8	1.35	50	4	A218
EPDREH4015-10-005-TH3	●	0.05	1.5	10	0.9	50	4	A157
EPDREH4015-12-005-TH3	●	0.05	1.5	12	0.9	50	4	A157
EPDRF4015-12-005-TH	★	0.05	1.5	12	1.35	60	4	A218
EPDRF4015-15-005-TH	★	0.05	1.5	15	1.35	60	4	A218
EPDRF4015-20-005-TH	★	0.05	1.5	20	1.35	60	4	A218
CBN-EPSR2015-2-01	●	0.1	1.5	2	0.53	50	4	A298
EPDREH4015-2-01-TH3	●	0.1	1.5	2	0.9	50	4	A157
EPDREH4015-3-01-TH3	●	0.1	1.5	3	0.9	50	4	A157
EPDREH4015-4-01-TH3	●	0.1	1.5	4	0.9	50	4	A157
EPDRE2015-4-01-ATH	●	0.1	1.5	4	1.35	50	4	A193
EPDRF4015-4-01-TH	●	0.1	1.5	4	1.35	50	4	A218
CBN-EPSR2015-5-01	●	0.1	1.5	5	0.53	50	4	A298
EPDREH4015-5-01-TH3	●	0.1	1.5	5	0.9	50	4	A157
EPDREH4015-6-01-TH3	●	0.1	1.5	6	0.9	50	4	A157
EPDRE2015-6-01-ATH	★	0.1	1.5	6	1.35	50	4	A193
EPDREH4015-8-01-TH3	●	0.1	1.5	8	0.9	50	4	A157
EPDRE2015-8-01-ATH	●	0.1	1.5	8	1.35	50	4	A193
EPDRF4015-8-01-TH	●	0.1	1.5	8	1.35	50	4	A218
EPDREH4015-10-01-TH3	●	0.1	1.5	10	0.9	50	4	A157
EPDREH4015-12-01-TH3	●	0.1	1.5	12	0.9	50	4	A157
EPDRE2015-12-01-ATH	●	0.1	1.5	12	1.35	55	4	A193
EPDRF4015-12-01-TH	★	0.1	1.5	12	1.35	60	4	A218
EPDRE2015-15-01-ATH	●	0.1	1.5	15	1.35	55	4	A193
EPDRF4015-15-01-TH	★	0.1	1.5	15	1.35	60	4	A218
EPDRE2015-20-01-ATH	●	0.1	1.5	20	1.35	60	4	A193
EPDRF4015-20-01-TH	★	0.1	1.5	20	1.35	60	4	A218
EPDREH4015-2-02-TH3	●	0.2	1.5	2	0.9	50	4	A157
EPDREH4015-3-02-TH3	●	0.2	1.5	3	0.9	50	4	A157
EPDREH4015-4-02-TH3	●	0.2	1.5	4	0.9	50	4	A157

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE2015-4-02-ATH	●	0.2	1.5	4	1.35	50	4	A194
CBN-EPSR2015-5-02	●	0.2	1.5	5	0.53	50	4	A298
EPDREH4015-5-02-TH3	●	0.2	1.5	5	0.9	50	4	A157
EPDREH4015-6-02-TH3	●	0.2	1.5	6	0.9	50	4	A157
EPDRE2015-6-02-ATH	★	0.2	1.5	6	1.35	50	4	A194
EPDREH4015-8-02-TH3	●	0.2	1.5	8	0.9	50	4	A157
EPDRE2015-8-02-ATH	●	0.2	1.5	8	1.35	50	4	A194
CBN-EPSR2015-10-02	●	0.2	1.5	10	0.53	50	4	A298
EPDREH4015-10-02-TH3	●	0.2	1.5	10	0.9	50	4	A157
EPDREH4015-12-02-TH3	●	0.2	1.5	12	0.9	50	4	A157
EPDRE2015-12-02-ATH	●	0.2	1.5	12	1.35	55	4	A194
EPDRE2015-15-02-ATH	●	0.2	1.5	15	1.35	55	4	A194
EPDRE2015-20-02-ATH	●	0.2	1.5	20	1.35	60	4	A194
EGDR2015-20-02-HD	★	0.2	1.5	20	2.25	60	4	A294
EGDR2015-40-02-HD	★	0.2	1.5	40	2.25	80	4	A294
EPDREH4015-2-03-TH3	●	0.3	1.5	2	0.9	50	4	A157
EPDREH4015-3-03-TH3	●	0.3	1.5	3	0.9	50	4	A157
EPDREH4015-4-03-TH3	●	0.3	1.5	4	0.9	50	4	A157
EPDRE2015-4-03-ATH	★	0.3	1.5	4	1.35	50	4	A194
EPDREH4015-5-03-TH3	●	0.3	1.5	5	0.9	50	4	A157
ETR4015-5-03-TH	●	0.3	1.5	5	1.5	50	6	A227
EPDREH4015-6-03-TH3	●	0.3	1.5	6	0.9	50	4	A157
EPDRE2015-6-03-ATH	★	0.3	1.5	6	1.35	50	4	A194
EPDREH4015-8-03-TH3	●	0.3	1.5	8	0.9	50	4	A157
EPDRE2015-8-03-ATH	●	0.3	1.5	8	1.35	50	4	A194
EPDREH4015-10-03-TH3	●	0.3	1.5	10	0.9	50	4	A157
ETR4015-10-03-TH	●	0.3	1.5	10	1.5	50	6	A227
ETRP4015-10-0903-TH	●	0.3	1.5	10	1.5	60	6	A228
EPDREH4015-12-03-TH3	●	0.3	1.5	12	0.9	50	4	A157
EPDRE2015-12-03-ATH	★	0.3	1.5	12	1.35	55	4	A194
EPDRE2015-15-03-ATH	●	0.3	1.5	15	1.35	55	4	A194
ETRP4015-15-0903-TH	●	0.3	1.5	15	1.5	60	6	A228
ETR4015-15-03-TH	●	0.3	1.5	15	1.5	60	6	A227
EPDRE2015-20-03-ATH	●	0.3	1.5	20	1.35	60	4	A194
ETR4015-20-03-TH	●	0.3	1.5	20	1.5	60	6	A227
ETRP4015-20-0903-TH	●	0.3	1.5	20	1.5	70	6	A228
ETR4015-25-03-TH	●	0.3	1.5	25	1.5	70	6	A227
ETR4015-30-03-TH	●	0.3	1.5	30	1.5	70	6	A227
ETRP4015-30-0903-TH	●	0.3	1.5	30	1.5	80	6	A228
ETRP4015-40-0903-TH	●	0.3	1.5	40	1.5	90	6	A228
ETRP4015-50-0903-TH	●	0.3	1.5	50	1.5	100	6	A228
EPDREH4015-2-05-TH3	●	0.5	1.5	2	0.9	50	4	A158
EPDREH4015-3-05-TH3	●	0.5	1.5	3	0.9	50	4	A158
EPDREH4015-4-05-TH3	●	0.5	1.5	4	0.9	50	4	A158
EPDRE2015-4-05-ATH	★	0.5	1.5	4	1.35	50	4	A194
EPDREH4015-5-05-TH3	●	0.5	1.5	5	0.9	50	4	A158
EPDREH4015-6-05-TH3	●	0.5	1.5	6	0.9	50	4	A158
EPDRE2015-6-05-ATH	★	0.5	1.5	6	1.35	50	4	A194
EPDREH4015-8-05-TH3	●	0.5	1.5	8	0.9	50	4	A158
EPDRE2015-8-05-ATH	★	0.5	1.5	8	1.35	50	4	A194
EPDREH4015-10-05-TH3	●	0.5	1.5	10	0.9	50	4	A158
EPDREH4015-12-05-TH3	●	0.5	1.5	12	0.9	50	4	A158
EPDRE2015-12-05-ATH	★	0.5	1.5	12	1.35	55	4	A194
EPDRE2015-15-05-ATH	★	0.5	1.5	15	1.35	55	4	A194
EPDRE2015-20-05-ATH	★	0.5	1.5	20	1.35	60	4	A194
EPDRE20175-5-01-ATH	★	0.1	1.75	5	1.55	50	4	A194
EPDRE20175-10-01-ATH	★	0.1	1.75	10	1.55	50	4	A194
EPDRE20175-15-01-ATH	★	0.1	1.75	15	1.55	55	4	A194
EPDRE20175-20-01-ATH	★	0.1	1.75	20	1.55	60	4	A194
EPDRE20175-5-02-ATH	★	0.2	1.75	5	1.55	50	4	A194
EPDRE20175-10-02-ATH	★	0.2	1.75	10	1.55	50	4	A194
EPDRE20175-15-02-ATH	★	0.2	1.75	15	1.55	55	4	A194

Quick dimension reference table by mill diameter

Carbide End Mill -Radius

φ1.75～φ4

unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE20175-20-02-ATH	★	0.2	1.75	20	1.55	60	4	A194
EPDRE20175-5-03-ATH	★	0.3	1.75	5	1.55	50	4	A194
EPDRE20175-10-03-ATH	★	0.3	1.75	10	1.55	50	4	A194
ETR40175-10-03-TH	●	0.3	1.75	10	1.75	50	6	A227
ETRP40175-10-0903-TH	●	0.3	1.75	10	1.75	60	6	A228
EPDRE20175-15-03-ATH	★	0.3	1.75	15	1.55	55	4	A194
ETRP40175-15-0903-TH	●	0.3	1.75	15	1.75	60	6	A228
EPDRE20175-20-03-ATH	★	0.3	1.75	20	1.55	60	4	A194
ETR40175-20-03-TH	●	0.3	1.75	20	1.75	60	6	A227
ETRP40175-20-0903-TH	●	0.3	1.75	20	1.75	70	6	A228
ETR40175-30-03-TH	●	0.3	1.75	30	1.75	70	6	A227
ETRP40175-30-0903-TH	●	0.3	1.75	30	1.75	80	6	A228
ETR40175-40-03-TH	●	0.3	1.75	40	1.75	80	6	A227
ETRP40175-40-0903-TH	●	0.3	1.75	40	1.75	90	6	A228
ETRP40175-50-0903-TH	●	0.3	1.75	50	1.75	100	6	A228
EPDREH4020-2.5-002-TH3	●	0.02	2	2.5	1.2	50	4	A158
EPDREH4020-3-002-TH3	●	0.02	2	3	1.2	50	4	A158
EPDREH4020-4-002-TH3	●	0.02	2	4	1.2	50	4	A158
EPDREH4020-5-002-TH3	●	0.02	2	5	1.2	50	4	A158
EPDREH4020-6-002-TH3	●	0.02	2	6	1.2	50	4	A158
EPDREH4020-8-002-TH3	●	0.02	2	8	1.2	50	4	A158
EPDREH4020-10-002-TH3	●	0.02	2	10	1.2	50	4	A158
EPDREH4020-12-002-TH3	●	0.02	2	12	1.2	50	4	A158
EPDREH4020-2.5-005-TH3	●	0.05	2	2.5	1.2	50	4	A158
CBN-EPSR2020-3-005	●	0.05	2	3	0.7	50	4	A298
EPDREH4020-3-005-TH3	●	0.05	2	3	1.2	50	4	A158
EPDREH4020-4-005-TH3	●	0.05	2	4	1.2	50	4	A158
EPDRF4020-4-005-TH	●	0.05	2	4	1.7	50	4	A218
CBN-EPSR2020-5-005	●	0.05	2	5	0.7	50	4	A298
EPDREH4020-5-005-TH3	●	0.05	2	5	1.2	50	4	A158
EPDREH4020-6-005-TH3	●	0.05	2	6	1.2	50	4	A158
EPDRF4020-6-005-TH	●	0.05	2	6	1.7	50	4	A218
EPDREH4020-8-005-TH3	●	0.05	2	8	1.2	50	4	A158
EPDRF4020-8-005-TH	●	0.05	2	8	1.7	50	4	A218
CBN-EPSR2020-10-005	●	0.05	2	10	0.7	50	4	A298
EPDREH4020-10-005-TH3	●	0.05	2	10	1.2	50	4	A158
EPDREH4020-12-005-TH3	●	0.05	2	12	1.2	50	4	A158
EPDRF4020-12-005-TH	●	0.05	2	12	1.7	60	4	A218
EPDRF4020-16-005-TH	●	0.05	2	16	1.7	60	4	A218
EPDRF4020-20-005-TH	★	0.05	2	20	1.7	60	4	A218
EPDREH4020-2.5-01-TH3	●	0.1	2	2.5	1.2	50	4	A158
CBN-EPSR2020-3-01	●	0.1	2	3	0.7	50	4	A298
EPDREH4020-3-01-TH3	●	0.1	2	3	1.2	50	4	A158
EPDREH4020-4-01-TH3	●	0.1	2	4	1.2	50	4	A158
EPDRE2020-4-01-ATH	★	0.1	2	4	1.7	50	4	A194
EPDRF4020-4-01-TH	●	0.1	2	4	1.7	50	4	A218
CBN-EPSR2020-5-01	●	0.1	2	5	0.7	50	4	A298
EPDREH4020-5-01-TH3	●	0.1	2	5	1.2	50	4	A158
EPDREH4020-6-01-TH3	●	0.1	2	6	1.2	50	4	A158
EPDRE2020-6-01-ATH	★	0.1	2	6	1.7	50	4	A194
EPDRF4020-6-01-TH	●	0.1	2	6	1.7	50	4	A218
EHHRE4020-S4-TH3	●	0.1	2	6	2	50	4	A290
EHHRE4020-S6-TH3	●	0.1	2	6	2	50	6	A290
EPDREH4020-8-01-TH3	●	0.1	2	8	1.2	50	4	A158
EPDRE2020-8-01-ATH	★	0.1	2	8	1.7	50	4	A194
EPDRF4020-8-01-TH	●	0.1	2	8	1.7	50	4	A218
CBN-EPSR2020-10-01	●	0.1	2	10	0.7	50	4	A298
EPDREH4020-10-01-TH3	●	0.1	2	10	1.2	50	4	A158
EHHRE4020-10-S4-TH3	★	0.1	2	10	2	50	4	A290
EHHRE4020-10-S6-TH3	★	0.1	2	10	2	55	6	A290
EPSM4020-10-R0.1-PN	●	0.1	2	10	3	68	6	A250
EPDREH4020-12-01-TH3	●	0.1	2	12	1.2	50	4	A158

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE2020-12-01-ATH	★	0.1	2	12	1.7	55	4	A194
EPDRF4020-12-01-TH	●	0.1	2	12	1.7	60	4	A218
EPDRE2020-16-01-ATH	★	0.1	2	16	1.7	55	4	A194
EPDRF4020-16-01-TH	●	0.1	2	16	1.7	60	4	A218
EPDRE2020-20-01-ATH	★	0.1	2	20	1.7	60	4	A194
EPDRF4020-20-01-TH	★	0.1	2	20	1.7	60	4	A218
EPDRE2020-25-01-ATH	★	0.1	2	25	1.7	65	4	A194
EPDRE2020-30-01-ATH	★	0.1	2	30	1.7	70	4	A194
EPSM4020-R0.1-PN	●	0.1	2	-	5	56	6	A249
EPDREH4020-2.5-02-TH3	●	0.2	2	2.5	1.2	50	4	A158
EPDREH4020-3-02-TH3	●	0.2	2	3	1.2	50	4	A158
EPDREH4020-4-02-TH3	●	0.2	2	4	1.2	50	4	A158
EPDRE2020-4-02-ATH	★	0.2	2	4	1.7	50	4	A194
EPDRF4020-4-02-TH	●	0.2	2	4	1.7	50	4	A218
CBN-EPSR2020-5-02	●	0.2	2	5	0.7	50	4	A298
EPDREH4020-5-02-TH3	●	0.2	2	5	1.2	50	4	A158
EPDREH4020-6-02-TH3	●	0.2	2	6	1.2	50	4	A158
EPDRE2020-6-02-ATH	●	0.2	2	6	1.7	50	4	A194
EPDRF4020-6-02-TH	●	0.2	2	6	1.7	50	4	A218
EPDREH4020-8-02-TH3	●	0.2	2	8	1.2	50	4	A158
EPDRE2020-8-02-ATH	●	0.2	2	8	1.7	50	4	A194
EPDRF4020-8-02-TH	●	0.2	2	8	1.7	50	4	A218
CBN-EPSR2020-10-02	●	0.2	2	10	0.7	50	4	A298
EPDREH4020-10-02-TH3	●	0.2	2	10	1.2	50	4	A158
EPSM4020-10-R0.2-PN	●	0.2	2	10	3	68	6	A250
EPDREH4020-12-02-TH3	●	0.2	2	12	1.2	50	4	A158
EPDRE2020-12-02-ATH	●	0.2	2	12	1.7	55	4	A194
EPDRF4020-12-02-TH	●	0.2	2	12	1.7	60	4	A218
EPDRE2020-16-02-ATH	●	0.2	2	16	1.7	55	4	A194
EPDRF4020-16-02-TH	●	0.2	2	16	1.7	60	4	A218
CBN-EPSR2020-20-02	●	0.2	2	20	0.7	55	4	A298
EPDRE2020-20-02-ATH	●	0.2	2	20	1.7	60	4	A194
EPDRF4020-20-02-TH	★	0.2	2	20	1.7	60	4	A218
EGDR2020-20-02-HD	★	0.2	2	20	3	60	4	A294
EPDRE2020-25-02-ATH	●	0.2	2	25	1.7	65	4	A194
EPDRF4020-25-02-TH	●	0.2	2	25	1.7	70	4	A218
EPDRE2020-30-02-ATH	★	0.2	2	30	1.7	70	4	A194
EPDRF4020-30-02-TH	★	0.2	2	30	1.7	70	4	A218
EGDR2020-40-02-HD	★	0.2	2	40	3	80	4	A294
EGDR2020-60-02-HD	★	0.2	2	60	3	100	4	A294
EPSM4020-R0.2-PN	●	0.2	2	-	5	56	6	A249
EPDREH4020-2.5-03-TH3	●	0.3	2	2.5	1.2	50	4	A159
EPDREH4020-3-03-TH3	●	0.3	2	3	1.2	50	4	A159
EPDREH4020-4-03-TH3	●	0.3	2	4	1.2	50	4	A159
EPDRE2020-4-03-ATH	★	0.3	2	4	1.7	50	4	A195
EPDRF4020-4-03-TH	★	0.3	2	4	1.7	50	4	A219
EPDREH4020-5-03-TH3	●	0.3	2	5	1.2	50	4	A159
EPDREH4020-6-03-TH3	●	0.3	2	6	1.2	50	4	A159
EPDRE2020-6-03-ATH	★	0.3	2	6	1.7	50	4	A195
EPDREH4020-8-03-TH3	●	0.3	2	8	1.2	50	4	A159
EPDRE2020-8-03-ATH	●	0.3	2	8	1.7	50	4	A195
EPDRF4020-8-03-TH	★	0.3	2	8	1.7	50	4	A219
EPDREH4020-10-03-TH3	●	0.3	2	10	1.2	50	4	A159
EPDREH4020-12-03-TH3	●	0.3	2	12	1.2	50	4	A159
EPDRE2020-12-03-ATH	★	0.3	2	12	1.7	55	4	A195
EPDRF4020-12-03-TH	★	0.3	2	12	1.7	60	4	A219
EPDRE2020-16-03-ATH	●	0.3	2	16	1.7	55	4	A195
EPDRF4020-16-03-TH	★	0.3	2	16	1.7	60	4	A219
EPDRE2020-20-03-ATH	●	0.3	2	20	1.7	60	4	A195
EPDRF4020-20-03-TH	★	0.3	2	20	1.7	60	4	A219
EPDRE2020-25-03-ATH	★	0.3	2	25	1.7	65	4	A195
EPDRE2020-30-03-ATH	★	0.3	2	30	1.7	70	4	A195

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDREH4020-2.5-05-TH3	●	0.5	2	2.5	1.2	50	4	A159
EPDREH4020-3-05-TH3	●	0.5	2	3	1.2	50	4	A159
EPDREH4020-4-05-TH3	●	0.5	2	4	1.2	50	4	A159
EPDRF4020-4-05-TH	★	0.5	2	4	1.7	50	4	A219
EPDREH4020-5-05-TH3	●	0.5	2	5	1.2	50	4	A159
HGOF4020-05-TH	●	0.5	2	6	1	60	6	A243
EPDREH4020-6-05-TH3	●	0.5	2	6	1.2	50	4	A159
EPDRE2020-6-05-ATH	●	0.5	2	6	1.7	50	4	A195
EPDRF4020-6-05-TH	★	0.5	2	6	1.7	50	4	A219
HGOF2020-05-TH	★	0.5	2	6	3	60	6	A243
ETM4020-05-TH	●	0.5	2	6	4	70	6	A229
EPDREH4020-8-05-TH3	●	0.5	2	8	1.2	50	4	A159
EPDRE2020-8-05-ATH	●	0.5	2	8	1.7	50	4	A195
EPDRF4020-8-05-TH	●	0.5	2	8	1.7	50	4	A219
EPDREH4020-10-05-TH3	●	0.5	2	10	1.2	50	4	A159
ETR4020-10-05-TH	●	0.5	2	10	2	50	6	A227
EPDREH4020-12-05-TH3	●	0.5	2	12	1.2	50	4	A159
EPDRE2020-12-05-ATH	●	0.5	2	12	1.7	55	4	A195
EPDRF4020-12-05-TH	★	0.5	2	12	1.7	60	4	A219
ETMP4020-12-05-TH	★	0.5	2	12	3	70	6	A230
ETR4020-15-05-TH	●	0.5	2	15	2	60	6	A227
ETRP4020-15-0905-TH	●	0.5	2	15	2	60	6	A228
EPDRE2020-16-05-ATH	●	0.5	2	16	1.7	55	4	A195
EPDRF4020-16-05-TH	●	0.5	2	16	1.7	60	4	A219
ETMP4020-16-05-TH	★	0.5	2	16	3	70	6	A230
EPDRE2020-20-05-ATH	●	0.5	2	20	1.7	60	4	A195
EPDRF4020-20-05-TH	●	0.5	2	20	1.7	60	4	A219
ETR4020-20-05-TH	●	0.5	2	20	2	60	6	A227
ETRP4020-20-0905-TH	●	0.5	2	20	2	70	6	A228
ETMP4020-20-05-TH	★	0.5	2	20	3	70	6	A230
EPDRE2020-25-05-ATH	●	0.5	2	25	1.7	65	4	A195
EPDRF4020-25-05-TH	●	0.5	2	25	1.7	70	4	A219
ETR4020-25-05-TH	●	0.5	2	25	2	70	6	A227
ETRP4020-25-0905-TH	●	0.5	2	25	2	70	6	A228
EPDRE2020-30-05-ATH	★	0.5	2	30	1.7	70	4	A195
EPDRF4020-30-05-TH	●	0.5	2	30	1.7	70	4	A219
ETR4020-30-05-TH	●	0.5	2	30	2	70	6	A227
ETRP4020-30-0905-TH	●	0.5	2	30	2	80	6	A228
ETR4020-35-05-TH	●	0.5	2	35	2	80	6	A227
ETRP4020-35-0905-TH	●	0.5	2	35	2	80	6	A228
ETR4020-40-05-TH	●	0.5	2	40	2	80	6	A227
ETRP4020-40-0905-TH	●	0.5	2	40	2	90	6	A228
ETRP4020-45-0905-TH	●	0.5	2	45	2	90	6	A228
ETRP4020-50-0905-TH	●	0.5	2	50	2	100	6	A228
ETRP4020-55-0905-TH	●	0.5	2	55	2	100	6	A228
ETRP4020-60-0905-TH	●	0.5	2	60	2	110	6	A228
EPDRE2020-6-08-ATH	★	0.8	2	6	1.7	50	4	A195
EPDRE2020-8-08-ATH	●	0.8	2	8	1.7	50	4	A195
EPDRE2020-12-08-ATH	★	0.8	2	12	1.7	55	4	A195
EPDRE2020-16-08-ATH	●	0.8	2	16	1.7	55	4	A195
EPDRE2020-20-08-ATH	●	0.8	2	20	1.7	60	4	A195
EPDRE2020-25-08-ATH	★	0.8	2	25	1.7	65	4	A195
EPDRE2020-30-08-ATH	★	0.8	2	30	1.7	70	4	A195
EPDRF4025-8-01-TH	●	0.1	2.5	8	2	50	4	A219
EPDRE2025-10-01-ATH	★	0.1	2.5	10	2	50	4	A195
EPDRF4025-16-01-TH	●	0.1	2.5	16	2	60	4	A219
EPDRE2025-20-01-ATH	★	0.1	2.5	20	2	60	4	A195
EPDRF4025-20-01-TH	●	0.1	2.5	20	2	60	4	A219
EPDRE2025-30-01-ATH	★	0.1	2.5	30	2	70	4	A195
EPDRF4025-8-02-TH	●	0.2	2.5	8	2	50	4	A219
EPDRE2025-10-02-ATH	★	0.2	2.5	10	2	50	4	A195
EPDRF4025-16-02-TH	●	0.2	2.5	16	2	60	4	A219

unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE2025-20-02-ATH	★	0.2	2.5	20	2	60	4	A195
EPDRF4025-20-02-TH	●	0.2	2.5	20	2	60	4	A219
EPDRE2025-30-02-ATH	★	0.2	2.5	30	2	70	4	A195
EPDRE2025-10-03-ATH	★	0.3	2.5	10	2	50	4	A195
EPDRF4025-12-03-TH	★	0.3	2.5	12	2	60	4	A219
EPDRE2025-20-03-ATH	★	0.3	2.5	20	2	60	4	A195
EPDRF4025-20-03-TH	★	0.3	2.5	20	2	60	4	A219
EPDRE2025-30-03-ATH	★	0.3	2.5	30	2	70	4	A195
EPDRE2025-10-05-ATH	★	0.5	2.5	10	2	50	4	A195
ETR4025-10-05-TH	●	0.5	2.5	10	2.5	50	6	A227
EPDRF4025-12-05-TH	★	0.5	2.5	12	2	60	4	A219
EPDRE2025-20-05-ATH	★	0.5	2.5	20	2	60	4	A195
EPDRF4025-20-05-TH	★	0.5	2.5	20	2	60	4	A219
ETR4025-20-05-TH	●	0.5	2.5	20	2.5	60	6	A227
ETRP4025-20-0905-TH	●	0.5	2.5	20	2.5	70	6	A228
EPDRE2025-30-05-ATH	★	0.5	2.5	30	2	70	4	A195
ETR4025-30-05-TH	●	0.5	2.5	30	2.5	70	6	A227
ETRP4025-30-0905-TH	●	0.5	2.5	30	2.5	80	6	A228
ETR4025-40-05-TH	●	0.5	2.5	40	2.5	80	6	A227
ETRP4025-40-0905-TH	●	0.5	2.5	40	2.5	90	6	A228
ETR4025-50-05-TH	●	0.5	2.5	50	2.5	90	6	A227
ETRP4025-50-0905-TH	●	0.5	2.5	50	2.5	100	6	A228
ETRP4025-60-0905-TH	●	0.5	2.5	60	2.5	110	6	A228
EPDREH4030-4-005-TH3	●	0.05	3	4	1.8	50	6	A159
CBN-EPSR2030-6-005	●	0.05	3	6	1.05	50	4	A298
EPDREH4030-6-005-TH3	●	0.05	3	6	1.8	50	6	A159
EPDREH4030-8-005-TH3	●	0.05	3	8	1.8	55	6	A159
EPDREH4030-10-005-TH3	●	0.05	3	10	1.8	55	6	A159
EPDREH4030-12-005-TH3	●	0.05	3	12	1.8	60	6	A159
EPDREH4030-14-005-TH3	●	0.05	3	14	1.8	60	6	A159
EPDREH4030-16-005-TH3	●	0.05	3	16	1.8	60	6	A159
EPDREH4030-18-005-TH3	●	0.05	3	18	1.8	65	6	A159
EPDREH4030-20-005-TH3	●	0.05	3	20	1.8	65	6	A159
EPDREH4030-4-01-TH3	●	0.1	3	4	1.8	50	6	A159
CBN-EPSR2030-6-01	●	0.1	3	6	1.05	50	4	A298
EPDREH4030-6-01-TH3	●	0.1	3	6	1.8	50	6	A159
EPDRE2030-6-01-ATH	★	0.1	3	6	2.5	50	6	A195
EPDREH4030-8-01-TH3	●	0.1	3	8	1.8	55	6	A159
EPDRE2030-8-01-ATH	★	0.1	3	8	2.5	55	6	A195
EPDRF4030-8-01-TH	●	0.1	3	8	2.5	60	6	A219
EPDREH4030-10-01-TH3	●	0.1	3	10	1.8	55	6	A159
EPDREH4030-12-01-TH3	●	0.1	3	12	1.8	60	6	A159
EPDRE2030-12-01-ATH	★	0.1	3	12	2.5	60	6	A195
EPDREH4030-14-01-TH3	●	0.1	3	14	1.8	60	6	A159
EPDREH4030-16-01-TH3	●	0.1	3	16	1.8	60	6	A159
EPDRE2030-16-01-ATH	★	0.1	3	16	2.5	60	6	A195
EPDRF4030-16-01-TH	●	0.1	3	16	2.5	60	6	A219
EPDREH4030-18-01-TH3	●	0.1	3	18	1.8	65	6	A159
EPDRE2030-18-01-ATH	★	0.1	3	18	2.5	65	6	A195
EPDREH4030-20-01-TH3	●	0.1	3	20	1.8	65	6	A159
EPDRE2030-20-01-ATH	★	0.1	3	20	2.5	65	6	A195
EPDRF4030-25-01-TH	★	0.1	3	25	2.5	70	6	A219
EPDRE2030-30-01-ATH	★	0.1	3	30	2.5	75	6	A195
EPDRF4030-30-01-TH	★	0.1	3	30	2.5	80	6	A219
EPDRE2030-35-01-ATH	★	0.1	3	35	2.5	80	6	A195
EPDREH4030-4-02-TH3	●	0.2	3	4	1.8	50	6	A159
EPDREH4030-6-02-TH3	●	0.2	3	6	1.8	50	6	A159
EPDRE2030-6-02-ATH	★	0.2	3	6	2.5	50	6	A195
EPDREH4030-8-02-TH3	●	0.2	3	8	1.8	55	6	A159
EPDRE2030-8-02-ATH	●	0.2	3	8	2.5	55	6	A195
EPDRF4030-8-02-TH	●	0.2	3	8	2.5	60	6	A219
EHHRE4030-S4-TH3	●	0.2	3	9	3	60	4	A290

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EHHRE4030-S6-TH3	●	0.2	3	9	3	60	6	A290
EPDREH4030-10-02-TH3	●	0.2	3	10	1.8	55	6	A159
EPPLS4030-02	★	0.2	3	10.5	4.5	80	6	A269
EPDREH4030-12-02-TH3	●	0.2	3	12	1.8	60	6	A159
EPDRE2030-12-02-ATH	●	0.2	3	12	2.5	60	6	A195
EPDRF4030-12-02-TH	●	0.2	3	12	2.5	60	6	A219
EPDREH4030-14-02-TH3	●	0.2	3	14	1.8	60	6	A159
EHHRE4030-15-S4-TH3	★	0.2	3	15	3	60	4	A290
EHHRE4030-15-S6-TH3	★	0.2	3	15	3	60	6	A290
EPSM4030-15-R0.2-PN	●	0.2	3	15	4.5	68	6	A250
EPDREH4030-16-02-TH3	●	0.2	3	16	1.8	60	6	A160
EPDRE2030-16-02-ATH	●	0.2	3	16	2.5	60	6	A195
EPDRF4030-16-02-TH	●	0.2	3	16	2.5	60	6	A219
EPDREH4030-18-02-TH3	●	0.2	3	18	1.8	65	6	A160
EPDRE2030-18-02-ATH	★	0.2	3	18	2.5	65	6	A195
EPDREH4030-20-02-TH3	●	0.2	3	20	1.8	65	6	A160
EPDRE2030-20-02-ATH	●	0.2	3	20	2.5	65	6	A195
EPDRF4030-20-02-TH	●	0.2	3	20	2.5	70	6	A219
EGDR2030-20-02-HD	★	0.2	3	20	4.5	60	4	A294
EPDRF4030-25-02-TH	★	0.2	3	25	2.5	70	6	A219
EPDRE2030-30-02-ATH	●	0.2	3	30	2.5	75	6	A195
EPDRF4030-30-02-TH	★	0.2	3	30	2.5	80	6	A219
EPDRE2030-35-02-ATH	●	0.2	3	35	2.5	80	6	A195
EGDR2030-40-02-HD	★	0.2	3	40	4.5	80	4	A294
EGDR2030-60-02-HD	★	0.2	3	60	4.5	100	4	A294
EPSM4030-R0.2-PN	●	0.2	3	-	7.5	56	6	A249
EPP4030-02	★	0.2	3	-	8	60	6	A267
EPP4030-02-TH	●	0.2	3	-	8	60	6	A264
EPDREH4030-4-03-TH3	●	0.3	3	4	1.8	50	6	A160
EPDREH4030-6-03-TH3	●	0.3	3	6	1.8	50	6	A160
EPDRE2030-6-03-ATH	★	0.3	3	6	2.5	50	6	A196
EPDREH4030-8-03-TH3	●	0.3	3	8	1.8	55	6	A160
EPDRE2030-8-03-ATH	●	0.3	3	8	2.5	55	6	A196
EPDRF4030-8-03-TH	●	0.3	3	8	2.5	60	6	A219
EPDREH4030-10-03-TH3	●	0.3	3	10	1.8	55	6	A160
EPDREH4030-12-03-TH3	●	0.3	3	12	1.8	60	6	A160
EPDRE2030-12-03-ATH	★	0.3	3	12	2.5	60	6	A196
EPDREH4030-14-03-TH3	●	0.3	3	14	1.8	60	6	A160
EPDREH4030-16-03-TH3	●	0.3	3	16	1.8	60	6	A160
EPDRE2030-16-03-ATH	●	0.3	3	16	2.5	60	6	A196
EPDRF4030-16-03-TH	●	0.3	3	16	2.5	60	6	A219
EPDREH4030-18-03-TH3	●	0.3	3	18	1.8	65	6	A160
EPDRE2030-18-03-ATH	★	0.3	3	18	2.5	65	6	A196
EPDREH4030-20-03-TH3	●	0.3	3	20	1.8	65	6	A160
EPDRE2030-20-03-ATH	●	0.3	3	20	2.5	65	6	A196
EPDRF4030-20-03-TH	●	0.3	3	20	2.5	70	6	A219
EPDRF4030-25-03-TH	★	0.3	3	25	2.5	70	6	A219
EPDRE2030-30-03-ATH	●	0.3	3	30	2.5	75	6	A196
EPDRF4030-30-03-TH	★	0.3	3	30	2.5	80	6	A219
EPDRE2030-35-03-ATH	★	0.3	3	35	2.5	80	6	A196
EPDREH4030-4-05-TH3	●	0.5	3	4	1.8	50	6	A160
CBN-EPSR2030-6-05	●	0.5	3	6	1.05	50	4	A298
EPDREH4030-6-05-TH3	●	0.5	3	6	1.8	50	6	A160
EPDREH4030-8-05-TH3	●	0.5	3	8	1.8	55	6	A160
EPDRE2030-8-05-ATH	●	0.5	3	8	2.5	55	6	A196
EPDRF4030-8-05-TH	●	0.5	3	8	2.5	60	6	A219
EPDREH4030-10-05-TH3	●	0.5	3	10	1.8	55	6	A160
EPPLS4030-05	★	0.5	3	10.5	4.5	80	6	A269
EPDREH4030-12-05-TH3	●	0.5	3	12	1.8	60	6	A160
EPDRE2030-12-05-ATH	●	0.5	3	12	2.5	60	6	A196
EPDRF4030-12-05-TH	●	0.5	3	12	2.5	60	6	A219
EPDREH4030-14-05-TH3	●	0.5	3	14	1.8	60	6	A160

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPSM4030-15-R0.5-PN	●	0.5	3	15	4.5	68	6	A250
EPDREH4030-16-05-TH3	●	0.5	3	16	1.8	60	6	A160
EPDRE2030-16-05-ATH	●	0.5	3	16	2.5	60	6	A196
EPDRF4030-16-05-TH	●	0.5	3	16	2.5	60	6	A219
EPDREH4030-18-05-TH3	●	0.5	3	18	1.8	65	6	A160
EPDRE2030-18-05-ATH	★	0.5	3	18	2.5	65	6	A196
EPDREH4030-20-05-TH3	●	0.5	3	20	1.8	65	6	A160
EPDRE2030-20-05-ATH	●	0.5	3	20	2.5	65	6	A196
EPDRF4030-20-05-TH	●	0.5	3	20	2.5	70	6	A219
EPDRF4030-25-05-TH	●	0.5	3	25	2.5	70	6	A219
EPDRE2030-30-05-ATH	●	0.5	3	30	2.5	75	6	A196
EPDRF4030-30-05-TH	●	0.5	3	30	2.5	80	6	A219
EPDRE2030-35-05-ATH	●	0.5	3	35	2.5	80	6	A196
EPDRF4030-35-05-TH	★	0.5	3	35	2.5	80	6	A219
EPSM4030-R0.5-PN	●	0.5	3	-	7.5	56	6	A249
EPP4030-05	★	0.5	3	-	8	60	6	A267
EPP4030-05-TH	●	0.5	3	-	8	60	6	A264
HGOF4030-08-TH	●	0.8	3	9	1.5	60	6	A243
HGOF2030-08-TH	★	0.8	3	9	4.5	60	6	A243
ETM4030-08-TH	●	0.8	3	9	6	70	6	A229
ETR4030-10-08-TH	●	0.8	3	10	3	50	6	A227
ETMP4030-18-08-TH	★	0.8	3	18	4.5	80	6	A230
ETR4030-20-08-TH	●	0.8	3	20	3	60	6	A227
ETRP4030-20-0908-TH	●	0.8	3	20	3	70	6	A228
ETMP4030-24-08-TH	★	0.8	3	24	4.5	80	6	A230
ETMP4030-30-08-TH	★	0.8	3	30	1.5	80	6	A230
ETR4030-30-08-TH	●	0.8	3	30	3	70	6	A227
ETRP4030-30-0908-TH	●	0.8	3	30	3	80	6	A228
ETR4030-40-08-TH	●	0.8	3	40	3	80	6	A227
ETRP4030-40-0908-TH	●	0.8	3	40	3	90	6	A228
ETR4030-50-08-TH	●	0.8	3	50	3	90	6	A227
ETRP4030-50-0908-TH	●	0.8	3	50	3	100	6	A228
ETRP4030-60-0908-TH	●	0.8	3	60	3	110	6	A228
EPDRE2030-8-1-ATH	★	1	3	8	2.5	55	6	A196
EPDRE2030-12-1-ATH	★	1	3	12	2.5	60	6	A196
EPDRE2030-16-1-ATH	★	1	3	16	2.5	60	6	A196
EPDRE2030-18-1-ATH	★	1	3	18	2.5	65	6	A196
EPDRE2030-20-1-ATH	★	1	3	20	2.5	65	6	A196
EPDRE2030-30-1-ATH	★	1	3	30	2.5	75	6	A196
EPDRE2030-35-1-ATH	★	1	3	35	2.5	80	6	A196
EPDREH4040-8-01-TH3	●	0.1	4	8	3.5	55	6	A160
EPDRE2040-8-01-ATH	★	0.1	4	8	3.5	55	6	A196
EPDREH4040-10-01-TH3	●	0.1	4	10	3.5	60	6	A160
EPDREH4040-12-01-TH3	●	0.1	4	12	3.5	60	6	A160
EPDRE2040-12-01-ATH	★	0.1	4	12	3.5	60	6	A196
EPDRF4040-12-01-TH	★	0.1	4	12	4	60	6	A220
EPDREH4040-14-01-TH3	●	0.1	4	14	3.5	60	6	A160
EPDREH4040-16-01-TH3	●	0.1	4	16	3.5	60	6	A160
EPDRE2040-16-01-ATH	★	0.1	4	16	3.5	60	6	A196
EPDREH4040-18-01-TH3	●	0.1	4	18	3.5	60	6	A160
EPDREH4040-20-01-TH3	●	0.1	4	20	3.5	65	6	A160
EPDRE2040-20-01-ATH	★	0.1	4	20	3.5	65	6	A196
EPDRF4040-20-01-TH	●	0.1	4	20	4	60	6	A220
EPDREH4040-22-01-TH3	●	0.1	4	22	3.5	65	6	A160
EPDREH4040-24-01-TH3	●	0.1	4	24	3.5	70	6	A160
EPDRE2040-30-01-ATH	★	0.1	4	30	3.5	75	6	A196
EPDRF4040-30-01-TH	★	0.1	4	30	4	80	6	A220
EPDRE2040-35-01-ATH	★	0.1	4	35	3.5	80	6	A196
EPDRF4040-40-01-TH	★	0.1	4	40	4	80	6	A220
EPDRE2040-45-01-ATH	★	0.1	4	45	3.5	90	6	A196
EPDREH4040-8-02-TH3	●	0.2	4	8	3.5	55	6	A160
EPDRE2040-8-02-ATH	★	0.2	4	8	3.5	55	6	A196

Quick dimension reference table by mill diameter

Carbide End Mill -Radius

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unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDREH4040-10-02-TH3	●	0.2	4	10	3.5	60	6	A160
EPDREH4040-12-02-TH3	●	0.2	4	12	3.5	60	6	A160
EPDRE2040-12-02-ATH	★	0.2	4	12	3.5	60	6	A196
EHHRE6040-S4-TH3	●	0.2	4	12	4	60	4	A290
EHHRE6040-S6-TH3	●	0.2	4	12	4	60	6	A290
EPDRF4040-12-02-TH	●	0.2	4	12	4	60	6	A220
EPDREH4040-14-02-TH3	●	0.2	4	14	3.5	60	6	A160
EPPLS4040-02	★	0.2	4	14	6	80	6	A269
EPDREH4040-16-02-TH3	●	0.2	4	16	3.5	60	6	A160
EPDRE2040-16-02-ATH	★	0.2	4	16	3.5	60	6	A196
EPDREH4040-18-02-TH3	●	0.2	4	18	3.5	60	6	A160
EPDREH4040-20-02-TH3	●	0.2	4	20	3.5	65	6	A160
EPDRE2040-20-02-ATH	★	0.2	4	20	3.5	65	6	A196
EHHRE6040-20-S4-TH3	★	0.2	4	20	4	60	4	A290
EHHRE6040-20-S6-TH3	★	0.2	4	20	4	60	6	A290
EPDRF4040-20-02-TH	●	0.2	4	20	4	60	6	A220
EPSM4040-20-R0.2-PN	●	0.2	4	20	6	68	6	A250
EPDREH4040-22-02-TH3	●	0.2	4	22	3.5	65	6	A160
EPDREH4040-24-02-TH3	●	0.2	4	24	3.5	70	6	A160
EPDRE2040-30-02-ATH	★	0.2	4	30	3.5	75	6	A196
EPDRF4040-30-02-TH	●	0.2	4	30	4	80	6	A220
EPDRE2040-35-02-ATH	★	0.2	4	35	3.5	80	6	A196
EPDRF4040-40-02-TH	★	0.2	4	40	4	80	6	A220
EPDRE2040-45-02-ATH	★	0.2	4	45	3.5	90	6	A196
EPSM4040-R0.2-PN	●	0.2	4	-	10	56	6	A249
EPP4040-02	★	0.2	4	-	11	60	6	A267
EPP4040-02-TH	●	0.2	4	-	11	60	6	A264
EPDREH4040-8-03-TH3	●	0.3	4	8	3.5	55	6	A161
EPDRE2040-8-03-ATH	★	0.3	4	8	3.5	55	6	A196
EPDREH4040-10-03-TH3	●	0.3	4	10	3.5	60	6	A161
EPDREH4040-12-03-TH3	●	0.3	4	12	3.5	60	6	A161
EPDRE2040-12-03-ATH	★	0.3	4	12	3.5	60	6	A196
EPDRF4040-12-03-TH	●	0.3	4	12	4	60	6	A220
EPDREH4040-14-03-TH3	●	0.3	4	14	3.5	60	6	A161
EPDREH4040-16-03-TH3	●	0.3	4	16	3.5	60	6	A161
EPDRE2040-16-03-ATH	★	0.3	4	16	3.5	60	6	A196
EPDREH4040-18-03-TH3	●	0.3	4	18	3.5	60	6	A161
EPDREH4040-20-03-TH3	●	0.3	4	20	3.5	65	6	A161
EPDRE2040-20-03-ATH	★	0.3	4	20	3.5	65	6	A196
EPDRF4040-20-03-TH	●	0.3	4	20	4	60	6	A220
EPDREH4040-22-03-TH3	●	0.3	4	22	3.5	65	6	A161
EPDREH4040-24-03-TH3	●	0.3	4	24	3.5	70	6	A161
EPDRE2040-30-03-ATH	★	0.3	4	30	3.5	75	6	A196
EPDRF4040-30-03-TH	★	0.3	4	30	4	80	6	A220
EPDRE2040-35-03-ATH	★	0.3	4	35	3.5	80	6	A196
EPDRF4040-40-03-TH	★	0.3	4	40	4	80	6	A220
EPDRE2040-45-03-ATH	★	0.3	4	45	3.5	90	6	A196
EPDREH4040-8-05-TH3	●	0.5	4	8	3.5	55	6	A161
EPDREH4040-10-05-TH3	●	0.5	4	10	3.5	60	6	A161
EPDREH4040-12-05-TH3	●	0.5	4	12	3.5	60	6	A161
EPDRE2040-12-05-ATH	★	0.5	4	12	3.5	60	6	A196
EPDRF4040-12-05-TH	●	0.5	4	12	4	60	6	A220
EPDREH4040-14-05-TH3	●	0.5	4	14	3.5	60	6	A161
EPPLS4040-05	★	0.5	4	14	6	80	6	A269
EPDREH4040-16-05-TH3	●	0.5	4	16	3.5	60	6	A161
EPDRE2040-16-05-ATH	★	0.5	4	16	3.5	60	6	A196
EPDREH4040-18-05-TH3	●	0.5	4	18	3.5	60	6	A161
EPDREH4040-20-05-TH3	●	0.5	4	20	3.5	65	6	A161
EPDRE2040-20-05-ATH	★	0.5	4	20	3.5	65	6	A196
EPDRF4040-20-05-TH	●	0.5	4	20	4	60	6	A220
EPSM4040-20-R0.5-PN	●	0.5	4	20	6	68	6	A250
EPDREH4040-22-05-TH3	●	0.5	4	22	3.5	65	6	A161

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDREH4040-24-05-TH3	●	0.5	4	24	3.5	70	6	A161
EPDRE2040-30-05-ATH	★	0.5	4	30	3.5	75	6	A196
EPDRF4040-30-05-TH	●	0.5	4	30	4	80	6	A220
EPDRE2040-35-05-ATH	★	0.5	4	35	3.5	80	6	A196
EPDRF4040-40-05-TH	●	0.5	4	40	4	80	6	A220
EGR2040-05-HD	★	0.5	4	40	8	100	4	A296
EPDRE2040-45-05-ATH	★	0.5	4	45	3.5	90	6	A196
EPSM4040-R0.5-PN	●	0.5	4	-	10	56	6	A249
EPP4040-05	★	0.5	4	-	11	60	6	A267
EPP4040-05-TH	●	0.5	4	-	11	60	6	A264
EPDREH4040-8-10-TH3	●	1	4	8	3.5	55	6	A161
EPDREH4040-10-10-TH3	●	1	4	10	3.5	60	6	A161
HGOF4040-10-TH	●	1	4	12	2	60	6	A243
EPDREH4040-12-10-TH3	●	1	4	12	3.5	60	6	A161
EPDRE2040-12-1-ATH	★	1	4	12	3.5	60	6	A197
HGOF2040-10-TH	★	1	4	12	6	60	6	A243
ETM4040-10-TH	●	1	4	12	8	70	6	A229
EPDREH4040-14-10-TH3	●	1	4	14	3.5	60	6	A161
EPDREH4040-16-10-TH3	●	1	4	16	3.5	60	6	A161
EPDRE2040-16-1-ATH	★	1	4	16	3.5	60	6	A197
EPDREH4040-18-10-TH3	●	1	4	18	3.5	60	6	A161
EPDREH4040-20-10-TH3	●	1	4	20	3.5	65	6	A161
EPDRE2040-20-1-ATH	★	1	4	20	3.5	65	6	A197
EPSM4040-20-R1.0-PN	●	1	4	20	6	68	6	A250
ETMLN4040-20-10-TH	★	1	4	20	6	70	4	A229
EPDREH4040-22-10-TH3	●	1	4	22	3.5	65	6	A161
EPDREH4040-24-10-TH3	●	1	4	24	3.5	70	6	A161
ETMP4040-24-10-TH	★	1	4	24	6	90	6	A230
ETMLN4040-28-10-TH	★	1	4	28	6	70	4	A229
EPDRE2040-30-1-ATH	★	1	4	30	3.5	75	6	A197
ETMP4040-32-10-TH	★	1	4	32	6	90	6	A230
EPDRE2040-35-1-ATH	★	1	4	35	3.5	80	6	A197
ETMP4040-40-10-TH	★	1	4	40	6	90	6	A230
EPDRE2040-45-1-ATH	★	1	4	45	3.5	90	6	A197
EPSM4040-R1.0-PN	●	1	4	-	10	56	6	A249
EPP4040-10	★	1	4	-	11	60	6	A267
EPP4040-10-TH	●	1	4	-	11	60	6	A264
EPDREH4050-10-01-TH3	●	0.1	5	10	4	60	6	A161
EPDREH4050-15-01-TH3	●	0.1	5	15	4	60	6	A161
EPDREH4050-20-01-TH3	●	0.1	5	20	4	65	6	A161
EPDRE2050-20-01-ATH	★	0.1	5	20	4	65	6	A197
EPDRF4050-20-01-TH	●	0.1	5	20	5	70	6	A220
EPDREH4050-25-01-TH3	●	0.1	5	25	4	70	6	A161
EPDRE2050-40-01-ATH	★	0.1	5	40	4	85	6	A197
EPDRF4050-40-01-TH	★	0.1	5	40	5	90	6	A220
EPDREH4050-10-02-TH3	●	0.2	5	10	4	60	6	A161
EPDREH4050-15-02-TH3	●	0.2	5	15	4	60	6	A161
EPPLS4050-02	★	0.2	5	17.5	7.5	100	6	A269
EPDREH4050-20-02-TH3	●	0.2	5	20	4	65	6	A161
EPDRE2050-20-02-ATH	★	0.2	5	20	4	65	6	A197
EPDRF4050-20-02-TH	●	0.2	5	20	5	70	6	A220
EPDREH4050-25-02-TH3	●	0.2	5	25	4	70	6	A161
EPSM4050-25-R0.2-PN	●	0.2	5	25	7.5	68	6	A250
EPDRE2050-40-02-ATH	★	0.2	5	40	4	85	6	A197
EPDRF4050-40-02-TH	●	0.2	5	40	5	90	6	A220
EPSM4050-R0.2-PN	●	0.2	5	-	12.5	56	6	A249
EPP4050-02	★	0.2	5	-	13	60	6	A267
EPP4050-02-TH	★	0.2	5	-	13	60	6	A264
EPDREH4050-10-03-TH3	●	0.3	5	10	4	60	6	A161
EPDREH4050-15-03-TH3	●	0.3	5	15	4	60	6	A161
EHHRE6050-TH3	●	0.3	5	15	5	60	6	A290
EPDREH4050-20-03-TH3	●	0.3	5	20	4	65	6	A161

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDRE2050-20-03-ATH	★	0.3	5	20	4	65	6	A197
EPDRF4050-20-03-TH	★	0.3	5	20	5	70	6	A220
EPDREH4050-25-03-TH3	●	0.3	5	25	4	70	6	A161
EHHRE6050-25-TH3	★	0.3	5	25	5	60	6	A290
EPDRE2050-40-03-ATH	★	0.3	5	40	4	85	6	A197
EPDRF4050-40-03-TH	★	0.3	5	40	5	90	6	A220
EPDREH4050-10-05-TH3	●	0.5	5	10	4	60	6	A162
EPDREH4050-15-05-TH3	●	0.5	5	15	4	60	6	A162
EPPLS4050-05	★	0.5	5	17.5	7.5	100	6	A269
EPDREH4050-20-05-TH3	●	0.5	5	20	4	65	6	A162
EPDRE2050-20-05-ATH	★	0.5	5	20	4	65	6	A197
EPDRF4050-20-05-TH	●	0.5	5	20	5	70	6	A220
EPDREH4050-25-05-TH3	●	0.5	5	25	4	70	6	A162
EPSM4050-25-R0.5-PN	●	0.5	5	25	7.5	68	6	A250
EPDRE2050-40-05-ATH	★	0.5	5	40	4	85	6	A197
EPDRF4050-40-05-TH	★	0.5	5	40	5	90	6	A220
EPSM4050-R0.5-PN	●	0.5	5	-	12.5	56	6	A249
EPP4050-05	★	0.5	5	-	13	60	6	A267
EPP4050-05-TH	●	0.5	5	-	13	60	6	A264
EPDREH4050-10-10-TH3	●	1	5	10	4	60	6	A162
EPDREH4050-15-10-TH3	●	1	5	15	4	60	6	A162
EPDREH4050-20-10-TH3	●	1	5	20	4	65	6	A162
EPDRE2050-20-1-ATH	★	1	5	20	4	65	6	A197
EPDRF4050-20-10-TH	★	1	5	20	5	70	6	A220
EPDREH4050-25-10-TH3	●	1	5	25	4	70	6	A162
EPSM4050-25-R1.0-PN	●	1	5	25	7.5	68	6	A250
EPDRE2050-40-1-ATH	★	1	5	40	4	85	6	A197
EPDRF4050-40-10-TH	★	1	5	40	5	90	6	A220
EPSM4050-R1.0-PN	●	1	5	-	12.5	56	6	A249
EPP4050-10	★	1	5	-	13	60	6	A267
EPP4050-10-TH	★	1	5	-	13	60	6	A264
HGOF4050-12-TH	●	1.2	5	15	2.5	60	6	A243
HGOF2050-12-TH	★	1.2	5	15	7.5	60	6	A243
ETM4050-12-TH	●	1.2	5	15	10	70	6	A229
ETMP4050-30-12-TH	★	1.2	5	30	7.5	90	6	A230
ETMP4050-40-12-TH	★	1.2	5	40	7.5	100	8	A230
ETMP4050-50-12-TH	★	1.2	5	50	7.5	110	8	A230
EPDRE2060-12-01-ATH	★	0.1	6	12	5	50	6	A197
EPDREH4060-12-01-TH3	●	0.1	6	12	5	60	6	A162
EPDREH4060-18-01-TH3	●	0.1	6	18	5	60	6	A162
EPDRE2060-18-01-ATH	★	0.1	6	18	5	60	6	A197
EPDREH4060-24-01-TH3	●	0.1	6	24	5	70	6	A162
EPDRE2060-24-01-ATH	★	0.1	6	24	5	70	6	A197
EPDREH4060-30-01-TH3	●	0.1	6	30	5	80	6	A162
EPDRE2060-35-01-ATH	★	0.1	6	35	5	80	6	A197
EPDRE2060-55-01-ATH	★	0.1	6	55	5	100	6	A197
EPDRE2060-12-02-ATH	★	0.2	6	12	5	50	6	A197
EPDREH4060-12-02-TH3	●	0.2	6	12	5	60	6	A162
EPDREH4060-18-02-TH3	●	0.2	6	18	5	60	6	A162
EPDRE2060-18-02-ATH	★	0.2	6	18	5	60	6	A197
EPDREH4060-24-02-TH3	●	0.2	6	24	5	70	6	A162
EPDRE2060-24-02-ATH	★	0.2	6	24	5	70	6	A197
EPDREH4060-30-02-TH3	●	0.2	6	30	5	80	6	A162
EPDRF4060-30-02-TH	●	0.2	6	30	6	80	6	A220
EPDRE2060-35-02-ATH	★	0.2	6	35	5	80	6	A197
EPDRF4060-54-02-TH	★	0.2	6	54	6	100	6	A220
EPDRE2060-55-02-ATH	★	0.2	6	55	5	100	6	A197
EPDRF4060-72-02-TH	★	0.2	6	72	6	120	6	A220
EPDRE2060-12-03-ATH	★	0.3	6	12	5	50	6	A197
EPDREH4060-12-03-TH3	●	0.3	6	12	5	60	6	A162
EPDREH4060-18-03-TH3	●	0.3	6	18	5	60	6	A162
EPDRE2060-18-03-ATH	★	0.3	6	18	5	60	6	A197

unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EHHRE6060-TH3	●	0.3	6	18	6	60	6	A290
HGOR4060-03-TH	●	0.3	6	18	9	50	6	A247
EPDREH4060-24-03-TH3	●	0.3	6	24	5	70	6	A162
EPDRE2060-24-03-ATH	★	0.3	6	24	5	70	6	A197
EPDREH4060-30-03-TH3	●	0.3	6	30	5	80	6	A162
EHHRE6060-30-TH3	★	0.3	6	30	6	70	6	A290
EPDRF4060-30-03-TH	●	0.3	6	30	6	80	6	A220
EPSM4060-30-R0.3-PN	●	0.3	6	30	9	68	6	A250
EPDRE2060-35-03-ATH	★	0.3	6	35	5	80	6	A197
EPDRF4060-54-03-TH	★	0.3	6	54	6	100	6	A220
EPDRE2060-55-03-ATH	★	0.3	6	55	5	100	6	A197
EPDRF4060-72-03-TH	★	0.3	6	72	6	120	6	A220
EPPLS4060-03	★	0.3	6	-	9	120	5	A269
EPP4060-03	★	0.3	6	-	13	60	6	A267
EPP4060-03-TH	★	0.3	6	-	13	60	6	A264
EPSM4060-R0.3-PN	●	0.3	6	-	15	56	6	A249
EPDREH4060-12-05-TH3	●	0.5	6	12	5	60	6	A162
EPDREH4060-18-05-TH3	●	0.5	6	18	5	60	6	A162
EPDRE2060-18-05-ATH	★	0.5	6	18	5	60	6	A197
HGOR4060-05-TH	●	0.5	6	18	9	50	6	A247
EMXN4060-18-05-TH	★	0.5	6	18	9	60	6	A284
ER5HS06-PN	●	0.5	6	21	18	60	6	A280
EPDREH4060-24-05-TH3	●	0.5	6	24	5	70	6	A162
EPDRE2060-24-05-ATH	★	0.5	6	24	5	70	6	A197
EPDREH4060-30-05-TH3	●	0.5	6	30	5	80	6	A162
EPDRF4060-30-05-TH	●	0.5	6	30	6	80	6	A220
EPSM4060-30-R0.5-PN	●	0.5	6	30	9	68	6	A250
ER5HS06-30-PN	●	0.5	6	30	18	70	6	A280
EPDRE2060-35-05-ATH	★	0.5	6	35	5	80	6	A197
EPDRF4060-54-05-TH	★	0.5	6	54	6	100	6	A220
EPDRE2060-55-05-ATH	★	0.5	6	55	5	100	6	A197
EGR2060-05-HD	★	0.5	6	60	12	120	6	A296
EPDRF4060-72-05-TH	★	0.5	6	72	6	120	6	A220
EPPLS4060-05	★	0.5	6	-	9	120	5	A269
EPP4060-05	★	0.5	6	-	13	60	6	A267
EPP4060-05-TH	●	0.5	6	-	13	60	6	A264
EPSM4060-R0.5-PN	●	0.5	6	-	15	56	6	A249
EPPL4060-05	★	0.5	6	-	25	70	6	A267
SCE6060-R0.75	★	0.75	6	-	6	60	6	A297
EPDREH4060-12-10-TH3	●	1	6	12	5	60	6	A162
EPDREH4060-18-10-TH3	●	1	6	18	5	60	6	A162
EPDRE2060-18-1-ATH	★	1	6	18	5	60	6	A197
HGOR4060-10-TH	●	1	6	18	9	50	6	A247
ER8WB0600LN-20-R1.0-ATH	●	1	6	20	7	70	6	A275
EPDREH4060-24-10-TH3	●	1	6	24	5	70	6	A162
EPDRE2060-24-1-ATH	★	1	6	24	5	70	6	A197
EPDREH4060-30-10-TH3	●	1	6	30	5	80	6	A162
EPDRF4060-30-10-TH	●	1	6	30	6	80	6	A220
ER8WB0600LN-30-R1.0-ATH	●	1	6	30	7	80	6	A275
EPSM4060-30-R1.0-PN	●	1	6	30	9	68	6	A250
EPDRE2060-35-1-ATH	★	1	6	35	5	80	6	A197
ER8WB0600LN-40-R1.0-ATH	●	1	6	40	7	90	6	A275
ER8WB0600LN-50-R1.0-ATH	●	1	6	50	7	100	6	A275
EPDRF4060-54-10-TH	★	1	6	54	6	100	6	A220
EPDRE2060-55-1-ATH	★	1	6	55	5	100	6	A197
EPDRF4060-72-10-TH	★	1	6	72	6	120	6	A220
EPPLS4060-10	★	1	6	-	9	120	5	A269
EPP4060-10	★	1	6	-	13	60	6	A267
EPP4060-10-TH	●	1	6	-	13	60	6	A264
EPSM4060-R1.0-PN	●	1	6	-	15	56	6	A249
EPPL4060-10	★	1	6	-	25	70	6	A267
HGOF4060-15-TH	●	1.5	6	18	3	60	6	A243

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
HGOF2060-15-TH	★	1.5	6	18	9	60	6	A243
EMXN4060-18-15-TH	★	1.5	6	18	9	60	6	A284
EMXR4060-18-15-TH	★	1.5	6	18	9	60	6	A283
EPSM4060-30-R1.5-PN	●	1.5	6	30	9	68	6	A250
ETMLN4060-30-15-TH	★	1.5	6	30	9	75	6	A229
EMXN4060-30-15-TH	★	1.5	6	30	9	75	6	A284
EMXR4060-30-15-TH	★	1.5	6	30	9	75	6	A283
ETMP4060-40-15-TH	★	1.5	6	40	9	100	8	A230
ETMLN4060-42-15-TH	★	1.5	6	42	9	90	6	A229
ETMLN4060-54-15-TH	★	1.5	6	54	9	100	6	A229
ETMP4060-55-15-TH	★	1.5	6	55	9	110	8	A230
ETMP4060-67-15-TH	★	1.5	6	67	9	125	8	A230
ETM4060-15-TH	●	1.5	6	-	12	90	6	A229
EPP4060-15	★	1.5	6	-	13	60	6	A267
EPP4060-15-TH	●	1.5	6	-	13	60	6	A264
EPSM4060-R1.5-PN	●	1.5	6	-	15	56	6	A249
EPSM4070-35-R0.3-PN	●	0.3	7	35	10.5	80	8	A250
EPPLS4070-03	★	0.3	7	-	9	120	6	A269
EPSM4070-R0.3-PN	●	0.3	7	-	17.5	63	8	A249
EPSM4070-35-R0.5-PN	●	0.5	7	35	10.5	80	8	A250
EPPLS4070-05	★	0.5	7	-	9	120	6	A269
EPSM4070-R0.5-PN	●	0.5	7	-	17.5	63	8	A249
EPSM4070-35-R1.0-PN	●	1	7	35	10.5	80	8	A250
ER8WB0700LS-R1.0-ATH	●	1	7	-	8	90	6	A275
EPPLS4070-10	★	1	7	-	9	120	6	A269
EPSM4070-R1.0-PN	●	1	7	-	17.5	63	8	A249
HGOR4080-03-TH	●	0.3	8	24	12	55	8	A247
EPSM4080-40-R0.3-PN	●	0.3	8	40	12	80	8	A250
EPP4080-03	★	0.3	8	-	19	75	8	A267
EPP4080-03-TH	★	0.3	8	-	19	75	8	A264
EPSM4080-R0.3-PN	●	0.3	8	-	20	63	8	A249
EHHRE6080-TH3	●	0.5	8	24	8	75	8	A290
HGOR4080-05-TH	●	0.5	8	24	12	55	8	A247
EMXN4080-24-05-TH	★	0.5	8	24	12	75	8	A284
EHHRE6080-40-TH3	★	0.5	8	40	8	80	8	A290
EPSM4080-40-R0.5-PN	●	0.5	8	40	12	80	8	A250
EGR2080-05-HD	★	0.5	8	80	16	140	8	A296
EPPLS4080-05	★	0.5	8	-	12	135	7	A269
EPP4080-05	★	0.5	8	-	19	75	8	A267
EPP4080-05-TH	★	0.5	8	-	19	75	8	A264
EPSM4080-R0.5-PN	●	0.5	8	-	20	63	8	A249
EPPL4080-05	★	0.5	8	-	35	90	8	A267
HGOR4080-10-TH	●	1	8	24	12	55	8	A247
ER5HS08-PN	●	1	8	28	24	75	8	A280
ER8WB0800LN-30-R1.0-ATH	●	1	8	30	9	75	8	A275
ER8WB0800LN-40-R1.0-ATH	●	1	8	40	9	90	8	A275
EPSM4080-40-R1.0-PN	●	1	8	40	12	80	8	A250
ER5HS08-40-PN	●	1	8	40	24	80	8	A280
ER8WB0800LN-50-R1.0-ATH	●	1	8	50	9	100	8	A275
ER8WB0800LN-60-R1.0-ATH	●	1	8	60	9	110	8	A275
SCE6080-R1.00	★	1	8	-	8	70	8	A297
EPPLS4080-10	★	1	8	-	12	135	7	A269
EPP4080-10	★	1	8	-	19	75	8	A267
EPP4080-10-TH	●	1	8	-	19	75	8	A264
EPSM4080-R1.0-PN	●	1	8	-	20	63	8	A249
EPPL4080-10	★	1	8	-	35	90	8	A267
EPSM4080-40-R1.5-PN	●	1.5	8	40	12	80	8	A250
EPPLS4080-15	★	1.5	8	-	12	135	7	A269
EPP4080-15	★	1.5	8	-	19	75	8	A267
EPP4080-15-TH	●	1.5	8	-	19	75	8	A264
EPSM4080-R1.5-PN	●	1.5	8	-	20	63	8	A249
EPPL4080-15	★	1.5	8	-	35	90	8	A267

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
HGOF4080-20-TH	●	2	8	24	4	75	8	A243
HGOF2080-20-TH	★	2	8	24	12	75	8	A243
EMXN4080-24-20-TH	★	2	8	24	12	75	8	A284
EMXR4080-24-20-TH	★	2	8	24	12	75	8	A283
EPSM4080-40-R2.0-PN	●	2	8	40	12	80	8	A250
ETMLN4080-40-20-TH	★	2	8	40	12	85	8	A229
EMXN4080-40-20-TH	★	2	8	40	12	85	8	A284
EMXR4080-40-20-TH	★	2	8	40	12	85	8	A283
ETMP4080-55-20-TH	★	2	8	55	12	110	10	A230
ETMLN4080-56-20-TH	★	2	8	56	12	100	8	A229
ETMP4080-70-20-TH	★	2	8	70	12	130	10	A230
ETMLN4080-72-20-TH	★	2	8	72	12	120	8	A229
ETMP4080-90-20-TH	★	2	8	90	12	145	12	A230
ETM4080-20-TH	●	2	8	-	16	100	8	A229
EPP4080-20	★	2	8	-	19	75	8	A267
EPP4080-20-TH	★	2	8	-	19	75	8	A264
EPSM4080-R2.0-PN	●	2	8	-	20	63	8	A249
EPPL4080-20	★	2	8	-	35	90	8	A267
EPSM4090-45-R0.3-PN	●	0.3	9	45	13.5	94	10	A250
EPSM4090-R0.3-PN	●	0.3	9	-	22.5	74	10	A249
EPSM4090-45-R0.5-PN	●	0.5	9	45	13.5	94	10	A250
EPPLS4090-05	★	0.5	9	-	12	135	8	A269
EPSM4090-R0.5-PN	●	0.5	9	-	22.5	74	10	A249
EPSM4090-45-R1.0-PN	●	1	9	45	13.5	94	10	A250
ER8WB0900LS-R1.0-ATH	●	1	9	-	10	100	8	A275
EPPLS4090-10	★	1	9	-	12	135	8	A269
EPSM4090-R1.0-PN	●	1	9	-	22.5	74	10	A249
EPPLS4090-15	★	1.5	9	-	12	135	8	A269
HGOR4100-03-TH	●	0.3	10	30	15	70	10	A247
EPSM4100-50-R0.3-PN	●	0.3	10	50	15	94	10	A250
EPP4100-03	★	0.3	10	-	22	80	10	A267
EPP4100-03-TH	★	0.3	10	-	22	80	10	A264
EPSM4100-R0.3-PN	●	0.3	10	-	25	74	10	A249
EHHRE6100-TH3	●	0.5	10	30	10	80	10	A290
HGOR4100-05-TH	●	0.5	10	30	15	70	10	A247
EMXN4100-30-05-TH	★	0.5	10	30	15	80	10	A284
EHHRE6100-50-TH3	★	0.5	10	50	10	90	10	A290
EPSM4100-50-R0.5-PN	●	0.5	10	50	15	94	10	A250
EGR2100-05-HD	★	0.5	10	100	20	150	10	A296
EPPLS4100-05	★	0.5	10	-	15	150	9	A269
EPP4100-05	★	0.5	10	-	22	80	10	A267
EPP4100-05-TH	★	0.5	10	-	22	80	10	A264
EPSM4100-R0.5-PN	●	0.5	10	-	25	74	10	A249
EPPL4100-05	★	0.5	10	-	45	100	10	A267
HGOR4100-10-TH	●	1	10	30	15	70	10	A247
ER8WB1000LN-35-R1.0-ATH	●	1	10	35	11	80	10	A275
ER5HS10-PN	●	1	10	35	30	80	10	A280
ER8WB1000LN-50-R1.0-ATH	●	1	10	50	11	100	10	A275
EPSM4100-50-R1.0-PN	●	1	10	50	15	94	10	A250
ER5HS10-50-PN	●	1	10	50	30	100	10	A280
ER8WB1000LN-60-R1.0-ATH	●	1	10	60	11	110	10	A275
ER8WB1000LN-80-R1.0-ATH	●	1	10	80	11	130	10	A275
EPPLS4100-10	★	1	10	-	15	150	9	A269
EPP4100-10	★	1	10	-	22	80	10	A267
EPP4100-10-TH	●	1	10	-	22	80	10	A264
EPSM4100-R1.0-PN	●	1	10	-	25	74	10	A249
EPPL4100-10	★	1	10	-	45	100	10	A267
SCE6100-R1.25	★	1.25	10	-	10	80	10	A297
EPSM4100-50-R1.5-PN	●	1.5	10	50	15	94	10	A250
EPPLS4100-15	★	1.5	10	-	15	150	9	A269
EPP4100-15	★	1.5	10	-	22	80	10	A267
EPP4100-15-TH	●	1.5	10	-	22	80	10	A264

Quick dimension reference table by mill diameter

Carbide End Mill -Radius

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unit : mm

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPSM4100-R1.5-PN	●	1.5	10	-	25	74	10	A249
EPPL4100-15	★	1.5	10	-	45	100	10	A267
HGOF4100-20-TH	●	2	10	30	5	80	10	A243
HGOF2100-20-TH	★	2	10	30	15	80	10	A243
EMXN4100-30-20-TH	★	2	10	30	15	80	10	A284
EMXR4100-30-20-TH	★	2	10	30	15	80	10	A283
EPSM4100-50-R2.0-PN	●	2	10	50	15	94	10	A250
EMXN4100-50-20-TH	★	2	10	50	15	100	10	A284
ETMLN4100-50-20-TH	★	2	10	50	15	100	10	A229
EMXR4100-50-20-TH	★	2	10	50	15	100	10	A283
ETMLN4100-70-20-TH	★	2	10	70	15	120	10	A229
ETMP4100-73-20-TH	★	2	10	73	15	135	12	A230
ETMLN4100-90-20-TH	★	2	10	90	15	140	10	A229
ETMP4100-95-20-TH	★	2	10	95	15	150	16	A230
ETMP4100-115-20-TH	★	2	10	115	15	170	16	A230
ETM4100-20-TH	●	2	10	-	20	110	10	A229
EPP4100-20	★	2	10	-	22	80	10	A267
EPP4100-20-TH	●	2	10	-	22	80	10	A264
EPSM4100-R2.0-PN	●	2	10	-	25	74	10	A249
EPPL4100-20	★	2	10	-	45	100	10	A267
EPSM4110-55-R0.3-PN	●	0.3	11	55	16.5	110	12	A250
EPSM4110-R0.3-PN	●	0.3	11	-	27.5	86	12	A249
EPSM4110-55-R0.5-PN	●	0.5	11	55	16.5	110	12	A250
EPPLS4110-05	★	0.5	11	-	15	150	10	A269
EPSM4110-R0.5-PN	●	0.5	11	-	27.5	86	12	A249
EPSM4110-55-R1.0-PN	●	1	11	55	16.5	110	12	A250
ER8WB1100LS-R1.0-ATH	●	1	11	-	12	110	10	A275
EPPLS4110-10	★	1	11	-	15	150	10	A269
EPSM4110-R1.0-PN	●	1	11	-	27.5	86	12	A249
EPPLS4110-15	★	1.5	11	-	15	150	10	A269
HGOR4120-03-TH	●	0.3	12	36	18	75	12	A247
EPSM4120-60-R0.3-PN	●	0.3	12	60	18	110	12	A250
EPSM4120-R0.3-PN	●	0.3	12	-	30	86	12	A249
EHHRE6120-TH3	●	0.5	12	36	12	100	12	A290
EMXN4120-36-05-TH	★	0.5	12	36	18	100	12	A284
EHHRE6120-60-TH3	★	0.5	12	60	12	110	12	A290
EPSM4120-60-R0.5-PN	●	0.5	12	60	18	110	12	A250
EPPLS4120-05	★	0.5	12	-	18	160	11	A269
EPP4120-05	★	0.5	12	-	26	100	12	A267
EPP4120-05-TH	★	0.5	12	-	26	100	12	A264
EPSM4120-R0.5-PN	●	0.5	12	-	30	86	12	A249
EPPL4120-05	★	0.5	12	-	55	120	12	A267
HGOR4120-10-TH	●	1	12	36	18	75	12	A247
ER8WB1200LN-40-R1.0-ATH	●	1	12	40	13	90	12	A275
ER5HS12-PN	●	1	12	42	36	100	12	A280
ER8WB1200LN-60-R1.0-ATH	●	1	12	60	13	110	12	A275
EPSM4120-60-R1.0-PN	●	1	12	60	18	110	12	A250
ER5HS12-60-PN	●	1	12	60	36	120	12	A280
ER8WB1200LN-80-R1.0-ATH	●	1	12	80	13	130	12	A275
ER8WB1200LN-100-R1.0-ATH	●	1	12	100	13	150	12	A275
EPPLS4120-10	★	1	12	-	18	160	11	A269
EPP4120-10	★	1	12	-	26	100	12	A267
EPP4120-10-TH	★	1	12	-	26	100	12	A264
EPSM4120-R1.0-PN	●	1	12	-	30	86	12	A249
EPPL4120-10	★	1	12	-	55	120	12	A267
EPSM4120-60-R1.5-PN	●	1.5	12	60	18	110	12	A250
SCE6120-R1.50	★	1.5	12	-	12	80	12	A297
EPPLS4120-15	★	1.5	12	-	18	160	11	A269
EPP4120-15	★	1.5	12	-	26	100	12	A267
EPP4120-15-TH	★	1.5	12	-	26	100	12	A264
EPSM4120-R1.5-PN	●	1.5	12	-	30	86	12	A249
EPPL4120-15	★	1.5	12	-	55	120	12	A267

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
HGOF4120-20-TH	●	2	12	36	6	100	12	A243
HGOF2120-20-TH	★	2	12	36	18	100	12	A243
EMXN4120-36-20-TH	★	2	12	36	18	100	12	A284
EMXR4120-36-20-TH	★	2	12	36	18	100	12	A283
EMXN4120-60-20-TH	★	2	12	60	18	110	12	A284
EPSM4120-60-R2.0-PN	●	2	12	60	18	110	12	A250
ETMLN4120-60-20-TH	★	2	12	60	18	110	12	A229
EMXR4120-60-20-TH	★	2	12	60	18	110	12	A283
ETMP4120-80-20-TH	★	2	12	80	18	135	16	A230
ETMLN4120-84-20-TH	★	2	12	84	18	135	12	A229
ETMP4120-105-20-TH	★	2	12	105	18	160	16	A230
ETMLN4120-108-20-TH	★	2	12	108	18	160	12	A229
EPPLS4120-20	★	2	12	-	18	160	11	A269
ETM4120-20-TH	●	2	12	-	24	120	12	A229
EPP4120-20	★	2	12	-	26	100	12	A267
EPP4120-20-TH	★	2	12	-	26	100	12	A264
EPSM4120-R2.0-PN	●	2	12	-	30	86	12	A249
EPPL4120-20	★	2	12	-	55	120	12	A267
EPSM4120-60-R2.5-PN	●	2.5	12	60	18	110	12	A250
EPSM4120-R2.5-PN	●	2.5	12	-	30	86	12	A249
EPSM4120-60-R3.0-PN	●	3	12	60	18	110	12	A250
EPP4120-30	★	3	12	-	26	100	12	A267
EPP4120-30-TH	★	3	12	-	26	100	12	A264
EPSM4120-R3.0-PN	●	3	12	-	30	86	12	A249
EPPL4120-30	★	3	12	-	55	120	12	A267
EPPLS4130-05	★	0.5	13	-	18	160	12	A269
EPPLS4130-10	★	1	13	-	18	160	12	A269
EPPLS4130-15	★	1.5	13	-	18	160	12	A269
EPPLS4130-20	★	2	13	-	18	160	12	A269
HGOR4160-05-TH	●	0.5	16	48	24	90	16	A247
EPSM4160-80-R0.5-PN	●	0.5	16	80	24	135	16	A251
EPSM4160-R0.5-PN	●	0.5	16	-	40	110	16	A249
ER5HS16-PN	●	1	16	56	48	110	16	A280
EPSM4160-80-R1.0-PN	●	1	16	80	24	135	16	A251
ER5HS16-80-PN	●	1	16	80	48	135	16	A280
EPPLS4160-10	★	1	16	-	24	180	15	A269
EPP4160-10	★	1	16	-	32	110	16	A267
EPP4160-10-TH	★	1	16	-	32	110	16	A264
EPSM4160-R1.0-PN	●	1	16	-	40	110	16	A249
EPPL4160-10	★	1	16	-	65	135	16	A267
EPSM4160-80-R1.5-PN	●	1.5	16	80	24	135	16	A251
EPPLS4160-15	★	1.5	16	-	24	180	15	A269
EPP4160-15	★	1.5	16	-	32	110	16	A267
EPP4160-15-TH	★	1.5	16	-	32	110	16	A264
EPSM4160-R1.5-PN	●	1.5	16	-	40	110	16	A249
EPPL4160-15	★	1.5	16	-	65	135	16	A267
HGOR4160-20-TH	●	2	16	48	24	90	16	A247
EPSM4160-80-R2.0-PN	●	2	16	80	24	135	16	A251
EPPLS4160-20	★	2	16	-	24	180	15	A269
EPP4160-20	★	2	16	-	32	110	16	A267
EPP4160-20-TH	★	2	16	-	32	110	16	A264
EPSM4160-R2.0-PN	●	2	16	-	40	110	16	A249
EPPL4160-20	★	2	16	-	65	135	16	A267
EPSM4160-80-R3.0-PN	●	3	16	80	24	135	16	A251
ETMLN4160-80-30-TH	★	3	16	80	24	140	16	A229
ETMP4160-105-30-TH	★	3	16	105	24	160	20	A230
ETMLN4160-120-30-TH	★	3	16	120	24	175	16	A229
ETMP4160-140-30-TH	★	3	16	140	24	200	20	A230
EPP4160-30	★	3	16	-	32	110	16	A267
EPP4160-30-TH	★	3	16	-	32	110	16	A264
ETM4160-30-TH	★	3	16	-	32	140	16	A229
EPSM4160-R3.0-PN	●	3	16	-	40	110	16	A249

Item Code	Stock	Corner radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPPL4160-30	★	3	16	-	65	135	16	A267
EPPLS4170-10	★	1	17	-	24	180	16	A269
EPPLS4170-15	★	1.5	17	-	24	180	16	A269
EPPLS4170-20	★	2	17	-	24	180	16	A269
HGOR4200-05-TH	●	0.5	20	60	30	100	20	A247
EPSM4200-100-R0.5-PN	●	0.5	20	100	30	155	20	A251
EPSM4200-R0.5-PN	●	0.5	20	-	50	125	20	A249
ER5HS20-PN	●	1	20	70	60	125	20	A280
EPSM4200-100-R1.0-PN	●	1	20	100	30	155	20	A251
ER5HS20-100-PN	●	1	20	100	60	155	20	A280
EPP4200-10	★	1	20	-	38	125	20	A267
EPP4200-10-TH	★	1	20	-	38	125	20	A264
EPSM4200-R1.0-PN	●	1	20	-	50	125	20	A249
EPPL4200-10	★	1	20	-	75	155	20	A267
EPSM4200-100-R1.5-PN	●	1.5	20	100	30	155	20	A251
EPP4200-15	★	1.5	20	-	38	125	20	A267
EPP4200-15-TH	★	1.5	20	-	38	125	20	A264
EPSM4200-R1.5-PN	●	1.5	20	-	50	125	20	A249
EPPL4200-15	★	1.5	20	-	75	155	20	A267
HGOR4200-20-TH	●	2	20	60	30	100	20	A247
EPSM4200-100-R2.0-PN	●	2	20	100	30	155	20	A251
EPP4200-20	★	2	20	-	38	125	20	A267
EPP4200-20-TH	★	2	20	-	38	125	20	A264
EPSM4200-R2.0-PN	●	2	20	-	50	125	20	A249
EPPL4200-20	★	2	20	-	75	155	20	A267
EPSM4200-100-R3.0-PN	●	3	20	100	30	155	20	A251
EPP4200-30	★	3	20	-	38	125	20	A267
EPP4200-30-TH	★	3	20	-	38	125	20	A264
ETM4200-30-TH	★	3	20	-	40	150	20	A229
EPSM4200-R3.0-PN	●	3	20	-	50	125	20	A249
EPPL4200-30	★	3	20	-	75	155	20	A267
EPSM4200-100-R5.0-PN	●	5	20	100	30	155	20	A251
EPSM4200-R5.0-PN	●	5	20	-	50	125	20	A249

Carbide End Mill -Square

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unit : mm

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2001-0.3-ATH	●	0.1	0.3	0.15	45	4	A301
EPDSE2001-0.3-PN	★	0.1	0.3	0.15	45	4	A304
EPDSE2001-0.5-ATH	●	0.1	0.5	0.15	45	4	A301
EPDSE2001-0.5-PN	★	0.1	0.5	0.15	45	4	A304
EPDSE2001-1-ATH	★	0.1	1	0.15	45	4	A301
EPDSE2001-1-PN	★	0.1	1	0.15	45	4	A304
EPDSE2002-0.5-ATH	●	0.2	0.5	0.3	50	4	A301
EPDSE2002-0.5-PN	★	0.2	0.5	0.3	50	4	A304
EPDSE2002-1-ATH	●	0.2	1	0.3	50	4	A301
EPDSE2002-1-PN	★	0.2	1	0.3	50	4	A304
EPDSE2002-1.5-ATH	★	0.2	1.5	0.3	50	4	A301
EPDSE2002-1.5-PN	★	0.2	1.5	0.3	50	4	A304
EPDSE2002-2-ATH	★	0.2	2	0.3	50	4	A301
EPDSE2002-2-PN	★	0.2	2	0.3	50	4	A304
EPDSE2002-3-ATH	★	0.2	3	0.3	50	4	A301
EPDSE2002-3-PN	★	0.2	3	0.3	50	4	A304
HGOS2002-PN	★	0.2	-	0.4	40	4	A319
EPDSE2003-1-ATH	●	0.3	1	0.45	50	4	A301
EPDSE2003-1-PN	★	0.3	1	0.45	50	4	A304
EPDSE2003-1.5-ATH	●	0.3	1.5	0.45	50	4	A301
EPDSE2003-1.5-PN	★	0.3	1.5	0.45	50	4	A304
EPDSE2003-2-ATH	★	0.3	2	0.45	50	4	A301
EPDSE2003-2-PN	★	0.3	2	0.45	50	4	A304
EPDSE2003-2.5-ATH	★	0.3	2.5	0.45	50	4	A301
EPDSE2003-2.5-PN	★	0.3	2.5	0.45	50	4	A304
EPDSE2003-3-ATH	★	0.3	3	0.45	50	4	A301
EPDSE2003-3-PN	★	0.3	3	0.45	50	4	A304
HGOS2003-PN	★	0.3	-	0.6	40	4	A319
EPDSE2004-1-ATH	●	0.4	1	0.6	50	4	A301
EPDSE2004-1-PN	★	0.4	1	0.6	50	4	A304
EPDSE2004-1.5-ATH	●	0.4	1.5	0.6	50	4	A301
EPDSE2004-1.5-PN	★	0.4	1.5	0.6	50	4	A304
EPDSE2004-2-ATH	●	0.4	2	0.6	50	4	A301
EPDSE2004-2-PN	★	0.4	2	0.6	50	4	A304
EPDSE2004-2.5-ATH	★	0.4	2.5	0.6	50	4	A301
EPDSE2004-2.5-PN	★	0.4	2.5	0.6	50	4	A304
EPDSE2004-3-ATH	●	0.4	3	0.6	50	4	A301
EPDSE2004-3-PN	★	0.4	3	0.6	50	4	A304
EPDSE2004-3.5-ATH	★	0.4	3.5	0.6	50	4	A301
EPDSE2004-3.5-PN	★	0.4	3.5	0.6	50	4	A304
EPDSE2004-4-ATH	●	0.4	4	0.6	50	4	A301
EPDSE2004-4-PN	★	0.4	4	0.6	50	4	A304
EPDSE2004-5-ATH	★	0.4	5	0.6	50	4	A301
EPDSE2004-5-PN	★	0.4	5	0.6	50	4	A304
EPDSE2004-6-ATH	★	0.4	6	0.6	50	4	A301
EPDSE2004-6-PN	★	0.4	6	0.6	50	4	A304
EPDSE2004-8-ATH	★	0.4	8	0.6	50	4	A301
EPDSE2004-8-PN	★	0.4	8	0.6	50	4	A304
EPDSE2004-10-ATH	★	0.4	10	0.6	50	4	A301
EPDSE2004-10-PN	★	0.4	10	0.6	50	4	A304
HGOS2004-PN	★	0.4	-	0.8	40	4	A319
EPDSE2005-1-ATH	●	0.5	1	0.75	50	4	A301
EPDSE2005-1-PN	★	0.5	1	0.75	50	4	A304
EPDSE2005-1.5-ATH	●	0.5	1.5	0.75	50	4	A301
EPDSE2005-1.5-PN	★	0.5	1.5	0.75	50	4	A304
EPDSE2005-2-ATH	●	0.5	2	0.75	50	4	A301
EPDSE2005-2-PN	★	0.5	2	0.75	50	4	A304
EPDS2005-2-SD	★	0.5	2	0.75	50	4	A426
EPDSE2005-2.5-ATH	●	0.5	2.5	0.75	50	4	A301
EPDSE2005-2.5-PN	★	0.5	2.5	0.75	50	4	A304
EPDSE2005-3-ATH	●	0.5	3	0.75	50	4	A301
EPDSE2005-3-PN	★	0.5	3	0.75	50	4	A304

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2005-4-ATH	●	0.5	4	0.75	50	4	A301
EPDSE2005-4-PN	★	0.5	4	0.75	50	4	A304
EPDS2005-4-SD	★	0.5	4	0.75	50	4	A426
EPDSE2005-5-ATH	★	0.5	5	0.75	50	4	A301
EPDSE2005-5-PN	★	0.5	5	0.75	50	4	A304
EPDSE2005-6-ATH	★	0.5	6	0.75	50	4	A301
EPDSE2005-6-PN	★	0.5	6	0.75	50	4	A304
EPDS2005-6-SD	★	0.5	6	0.75	50	4	A426
EPDSE2005-8-ATH	★	0.5	8	0.75	50	4	A301
EPDSE2005-8-PN	★	0.5	8	0.75	50	4	A304
EPDSE2005-10-ATH	★	0.5	10	0.75	50	4	A301
EPDSE2005-10-PN	★	0.5	10	0.75	50	4	A304
HGOS2005-PN	★	0.5	-	1	40	4	A319
EPDSE2006-2-ATH	●	0.6	2	0.9	50	4	A301
EPDSE2006-2-PN	★	0.6	2	0.9	50	4	A304
EPDS2006-2-SD	★	0.6	2	0.9	50	4	A426
EPDSE2006-3-ATH	●	0.6	3	0.9	50	4	A301
EPDSE2006-3-PN	★	0.6	3	0.9	50	4	A304
EPDSE2006-4-ATH	●	0.6	4	0.9	50	4	A301
EPDSE2006-4-PN	★	0.6	4	0.9	50	4	A304
EPDS2006-4-SD	★	0.6	4	0.9	50	4	A426
EPDSE2006-5-ATH	★	0.6	5	0.9	50	4	A301
EPDSE2006-5-PN	★	0.6	5	0.9	50	4	A304
EPDSE2006-6-ATH	★	0.6	6	0.9	50	4	A301
EPDSE2006-6-PN	★	0.6	6	0.9	50	4	A304
EPDS2006-6-SD	★	0.6	6	0.9	50	4	A426
EPDSE2006-7-ATH	★	0.6	7	0.9	50	4	A301
EPDSE2006-7-PN	★	0.6	7	0.9	50	4	A304
EPDSE2006-8-ATH	★	0.6	8	0.9	50	4	A301
EPDSE2006-8-PN	★	0.6	8	0.9	50	4	A304
EPDSE2006-9-ATH	★	0.6	9	0.9	50	4	A301
EPDSE2006-9-PN	★	0.6	9	0.9	50	4	A304
EPDSE2006-10-ATH	★	0.6	10	0.9	50	4	A301
EPDSE2006-10-PN	★	0.6	10	0.9	50	4	A304
HGOS2006-PN	★	0.6	-	1.2	40	4	A319
EPDSE2007-2-ATH	★	0.7	2	1.05	50	4	A301
EPDSE2007-2-PN	★	0.7	2	1.05	50	4	A304
EPDSE2007-4-ATH	★	0.7	4	1.05	50	4	A301
EPDSE2007-4-PN	★	0.7	4	1.05	50	4	A304
EPDSE2007-6-ATH	★	0.7	6	1.05	50	4	A301
EPDSE2007-6-PN	★	0.7	6	1.05	50	4	A304
EPDSE2007-8-ATH	★	0.7	8	1.05	50	4	A301
EPDSE2007-8-PN	★	0.7	8	1.05	50	4	A304
EPDSE2007-10-ATH	★	0.7	10	1.05	50	4	A301
EPDSE2007-10-PN	★	0.7	10	1.05	50	4	A304
HGOS2007-PN	★	0.7	-	1.4	40	4	A319
EPDSE2008-2-ATH	★	0.8	2	1.2	50	4	A302
EPDSE2008-2-PN	★	0.8	2	1.2	50	4	A305
EPDSE2008-4-ATH	●	0.8	4	1.2	50	4	A302
EPDSE2008-4-PN	★	0.8	4	1.2	50	4	A305
EPDS2008-4-SD	★	0.8	4	1.2	50	4	A426
EPDSE2008-6-ATH	●	0.8	6	1.2	50	4	A302
EPDSE2008-6-PN	★	0.8	6	1.2	50	4	A305
EPDS2008-6-SD	★	0.8	6	1.2	50	4	A426
EPDSE2008-8-ATH	★	0.8	8	1.2	50	4	A302
EPDSE2008-8-PN	★	0.8	8	1.2	50	4	A305
EPDS2008-8-SD	★	0.8	8	1.2	50	4	A426
EPDSE2008-10-ATH	★	0.8	10	1.2	50	4	A302
EPDSE2008-10-PN	★	0.8	10	1.2	50	4	A305
EPDSE2008-12-ATH	★	0.8	12	1.2	55	4	A302
EPDSE2008-12-PN	★	0.8	12	1.2	55	4	A305
HGOS2008-PN	★	0.8	-	1.6	40	4	A319

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2009-2-ATH	★	0.9	2	1.35	50	4	A302
EPDSE2009-2-PN	★	0.9	2	1.35	50	4	A305
EPDSE2009-4-ATH	★	0.9	4	1.35	50	4	A302
EPDSE2009-4-PN	★	0.9	4	1.35	50	4	A305
EPDSE2009-6-ATH	★	0.9	6	1.35	50	4	A302
EPDSE2009-6-PN	★	0.9	6	1.35	50	4	A305
EPDSE2009-8-ATH	★	0.9	8	1.35	50	4	A302
EPDSE2009-8-PN	★	0.9	8	1.35	50	4	A305
EPDSE2009-10-ATH	★	0.9	10	1.35	50	4	A302
EPDSE2009-10-PN	★	0.9	10	1.35	50	4	A305
EPDSE2009-12-ATH	★	0.9	12	1.35	55	4	A302
EPDSE2009-12-PN	★	0.9	12	1.35	55	4	A305
HGOS2009-PN	★	0.9	-	1.8	40	4	A319
EPDSE2010-2-ATH	●	1	2	1.5	50	4	A302
EPDSE2010-2-PN	★	1	2	1.5	50	4	A305
EPDSE2010-3-ATH	●	1	3	1.5	50	4	A302
EPDSE2010-3-PN	★	1	3	1.5	50	4	A305
EPSM4010-3-PN	●	1	3	1.5	56	6	A335
HGOSH4010-TH	●	1	3	2	50	6	A325
EPDSE2010-4-ATH	●	1	4	1.5	50	4	A302
EPDSE2010-4-PN	★	1	4	1.5	50	4	A305
EPDS2010-4-SD	★	1	4	1.5	50	4	A426
EPDSE2010-5-ATH	●	1	5	1.5	50	4	A302
EPDSE2010-5-PN	★	1	5	1.5	50	4	A305
EPSM4010-5-PN	●	1	5	1.5	68	6	A336
EPDSE2010-6-ATH	●	1	6	1.5	50	4	A302
EPDSE2010-6-PN	★	1	6	1.5	50	4	A305
EPDSE2010-7-ATH	●	1	7	1.5	50	4	A302
EPDSE2010-7-PN	★	1	7	1.5	50	4	A305
EPDSE2010-8-ATH	●	1	8	1.5	50	4	A302
EPDSE2010-8-PN	★	1	8	1.5	50	4	A305
EPDS2010-8-SD	★	1	8	1.5	50	4	A426
EPDSE2010-9-ATH	●	1	9	1.5	50	4	A302
EPDSE2010-9-PN	★	1	9	1.5	50	4	A305
EPDSE2010-10-ATH	●	1	10	1.5	50	4	A302
EPDSE2010-10-PN	★	1	10	1.5	50	4	A305
EPDSE2010-12-ATH	★	1	12	1.5	55	4	A302
EPDSE2010-12-PN	★	1	12	1.5	55	4	A305
EPDS2010-12-SD	★	1	12	1.5	55	4	A426
EPDSE2010-14-ATH	★	1	14	1.5	55	4	A302
EPDSE2010-14-PN	★	1	14	1.5	55	4	A305
EPDSE2010-16-ATH	★	1	16	1.5	55	4	A302
EPDSE2010-16-PN	★	1	16	1.5	55	4	A305
EPDSE2010-20-ATH	★	1	20	1.5	60	4	A302
EPDSE2010-20-PN	★	1	20	1.5	60	4	A305
EPDSE2010-25-ATH	★	1	25	1.5	65	4	A302
EPDSE2010-25-PN	★	1	25	1.5	65	4	A305
EPPS4010-P-CS	★	1	-	1.5	50	6	A362
HGOS2010-PN	★	1	-	2	40	4	A319
CEPS4010-TH	★	1	-	2	60	6	A397
HGOS4010-PN	★	1	-	2.5	40	4	A320
EPSM4010-PN	●	1	-	2.5	56	6	A332
EPP4010-P-CS	★	1	-	2.5	60	6	A362
CEPR4010-TH	●	1	-	3.5	60	6	A397
CEPR4010	★	1	-	3.5	60	6	A402
EPDSE2012-4-ATH	★	1.2	4	1.8	50	4	A302
EPDSE2012-4-PN	★	1.2	4	1.8	50	4	A305
EPDSE2012-6-ATH	★	1.2	6	1.8	50	4	A302
EPDSE2012-6-PN	★	1.2	6	1.8	50	4	A305
EPDSE2012-8-ATH	★	1.2	8	1.8	50	4	A302
EPDSE2012-8-PN	★	1.2	8	1.8	50	4	A305
EPDSE2012-10-ATH	★	1.2	10	1.8	50	4	A302

Quick dimension reference table by mill diameter

Carbide End Mill -Square

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unit : mm

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2012-10-PN	★	1.2	10	1.8	50	4	A305
EPDSE2012-12-ATH	★	1.2	12	1.8	55	4	A302
EPDSE2012-12-PN	★	1.2	12	1.8	55	4	A305
EPDSE2012-16-ATH	★	1.2	16	1.8	55	4	A302
EPDSE2012-16-PN	★	1.2	16	1.8	55	4	A305
EPDSE2014-6-ATH	★	1.4	6	2.1	50	4	A302
EPDSE2014-6-PN	★	1.4	6	2.1	50	4	A305
EPDSE2014-12-ATH	★	1.4	12	2.1	55	4	A302
EPDSE2014-12-PN	★	1.4	12	2.1	55	4	A305
EPDSE2015-4-ATH	●	1.5	4	2.25	50	4	A302
EPDSE2015-4-PN	★	1.5	4	2.25	50	4	A305
HGOSH4015-TH	●	1.5	4.5	3	50	6	A325
EPDSE2015-6-ATH	●	1.5	6	2.25	50	4	A302
EPDSE2015-6-PN	★	1.5	6	2.25	50	4	A305
EPDS2015-6-SD	★	1.5	6	2.25	50	4	A426
EPDSE2015-8-ATH	●	1.5	8	2.25	50	4	A302
EPDSE2015-8-PN	★	1.5	8	2.25	50	4	A305
EPDSE2015-10-ATH	●	1.5	10	2.25	50	4	A302
EPDSE2015-10-PN	★	1.5	10	2.25	50	4	A305
EPDSE2015-12-ATH	★	1.5	12	2.25	55	4	A302
EPDSE2015-12-PN	★	1.5	12	2.25	55	4	A305
EPDS2015-12-SD	★	1.5	12	2.25	55	4	A426
EPDSE2015-14-ATH	★	1.5	14	2.25	55	4	A302
EPDSE2015-14-PN	★	1.5	14	2.25	55	4	A305
EPDSE2015-16-ATH	★	1.5	16	2.25	55	4	A302
EPDSE2015-16-PN	★	1.5	16	2.25	55	4	A305
EPDSE2015-18-ATH	★	1.5	18	2.25	60	4	A302
EPDSE2015-18-PN	★	1.5	18	2.25	60	4	A305
EPDS2015-18-SD	★	1.5	18	2.25	60	4	A426
EPDSE2015-20-ATH	★	1.5	20	2.25	60	4	A302
EPDSE2015-20-PN	★	1.5	20	2.25	60	4	A305
EPDSE2015-25-ATH	★	1.5	25	2.25	65	4	A302
EPDSE2015-25-PN	★	1.5	25	2.25	65	4	A305
EPDSE2015-30-ATH	★	1.5	30	2.25	70	4	A302
EPDSE2015-30-PN	★	1.5	30	2.25	70	4	A305
EPDSE2015-35-ATH	★	1.5	35	2.25	75	4	A302
EPDSE2015-35-PN	★	1.5	35	2.25	75	4	A305
EPDSE2015-40-ATH	★	1.5	40	2.25	80	4	A302
EPDSE2015-40-PN	★	1.5	40	2.25	80	4	A305
EPPS4015-P-CS	★	1.5	-	2.3	50	6	A362
HGOS2015-PN	★	1.5	-	3	40	4	A319
CEPS4015-TH	★	1.5	-	3	60	6	A397
HGOS4015-PN	★	1.5	-	4	40	4	A320
EPP4015-P-CS	★	1.5	-	4	60	6	A362
CEPR4015-TH	★	1.5	-	5	60	6	A397
CEPR4015	★	1.5	-	5	60	6	A402
EPDSE2016-6-ATH	★	1.6	6	2.4	50	4	A302
EPDSE2016-6-PN	★	1.6	6	2.4	50	4	A305
EPDSE2016-8-ATH	★	1.6	8	2.4	50	4	A302
EPDSE2016-8-PN	★	1.6	8	2.4	50	4	A305
EPDSE2018-6-ATH	★	1.8	6	2.7	50	4	A302
EPDSE2018-6-PN	★	1.8	6	2.7	50	4	A305
EPDSE2018-8-ATH	★	1.8	8	2.7	50	4	A302
EPDSE2018-8-PN	★	1.8	8	2.7	50	4	A305
EPDSE2020-4-ATH	●	2	4	3	50	4	A303
EPDSE2020-4-PN	★	2	4	3	50	4	A306
EPDSE2020-6-ATH	●	2	6	3	50	4	A303
EPDSE2020-6-PN	★	2	6	3	50	4	A306
EPSM4020-6-PN	●	2	6	3	56	6	A335
HGOSH4020-TH	●	2	6	4	50	6	A325
EPDSE2020-8-ATH	●	2	8	3	50	4	A303
EPDSE2020-8-PN	★	2	8	3	50	4	A306

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDS2020-8-SD	★	2	8	3	50	4	A426
EPDSE2020-10-ATH	●	2	10	3	50	4	A303
EPDSE2020-10-PN	★	2	10	3	50	4	A306
EPSM4020-10-PN	●	2	10	3	68	6	A336
EPDSE2020-12-ATH	●	2	12	3	55	4	A303
EPDSE2020-12-PN	★	2	12	3	55	4	A306
EPDSE2020-14-ATH	●	2	14	3	55	4	A303
EPDSE2020-14-PN	★	2	14	3	55	4	A306
EPDSE2020-16-ATH	★	2	16	3	55	4	A303
EPDSE2020-16-PN	★	2	16	3	55	4	A306
EPDS2020-16-SD	★	2	16	3	55	4	A426
EPDSE2020-18-ATH	★	2	18	3	60	4	A303
EPDSE2020-18-PN	★	2	18	3	60	4	A306
EPDSE2020-20-ATH	★	2	20	3	60	4	A303
EPDSE2020-20-PN	★	2	20	3	60	4	A306
EPDS2020-24-SD	★	2	24	3	60	4	A426
EPDSE2020-25-ATH	★	2	25	3	65	4	A303
EPDSE2020-25-PN	★	2	25	3	65	4	A306
EPDSE2020-30-ATH	★	2	30	3	70	4	A303
EPDSE2020-30-PN	★	2	30	3	70	4	A306
EPDSE2020-35-ATH	★	2	35	3	75	4	A303
EPDSE2020-35-PN	★	2	35	3	75	4	A306
EPDSE2020-40-ATH	★	2	40	3	80	4	A303
EPDSE2020-40-PN	★	2	40	3	80	4	A306
EPDSE2020-50-ATH	★	2	50	3	90	4	A303
EPDSE2020-50-PN	★	2	50	3	90	4	A306
EPPS4020-P-CS	★	2	-	3	50	6	A362
CEPS4020-TH	★	2	-	4	60	6	A397
EPSM4020-PN	●	2	-	5	56	6	A332
HGOS4020-PN	★	2	-	6	40	4	A320
HGOS2020-PN	★	2	-	6	40	4	A319
EPP4020-P-CS	★	2	-	6	60	6	A362
CEPR4020-TH	●	2	-	7	60	6	A397
CEPR4020	★	2	-	7	60	6	A402
EPDSE2025-8-ATH	★	2.5	8	3.75	50	4	A303
EPDSE2025-8-PN	★	2.5	8	3.75	50	4	A306
EPDSE2025-12-ATH	★	2.5	12	3.75	55	4	A303
EPDSE2025-12-PN	★	2.5	12	3.75	55	4	A306
EPDSE2025-16-ATH	★	2.5	16	3.75	55	4	A303
EPDSE2025-16-PN	★	2.5	16	3.75	55	4	A306
EPDSE2025-20-ATH	★	2.5	20	3.75	60	4	A303
EPDSE2025-20-PN	★	2.5	20	3.75	60	4	A306
EPDSE2025-30-ATH	★	2.5	30	3.75	70	4	A303
EPDSE2025-30-PN	★	2.5	30	3.75	70	4	A306
EPDSE2025-40-ATH	★	2.5	40	3.75	80	4	A303
EPDSE2025-40-PN	★	2.5	40	3.75	80	4	A306
EPDSE2025-50-ATH	★	2.5	50	3.75	90	4	A303
EPDSE2025-50-PN	★	2.5	50	3.75	90	4	A306
EPPS4025-P-CS	★	2.5	-	3.8	50	6	A362
CEPS4025-TH	★	2.5	-	5	60	6	A397
HGOS4025-PN	★	2.5	-	8	40	4	A320
HGOS2025-PN	★	2.5	-	8	40	4	A319
CEPR4025-TH	★	2.5	-	8	60	6	A397
CEPR4025	★	2.5	-	8	60	6	A402
EPP4025-P-CS	★	2.5	-	8	60	6	A362
EPSMLS4030-PN	●	3	2.88	4.5	80	6	A334
EPDSE2030-8-ATH	●	3	8	4.5	55	6	A303
EPDSE2030-8-PN	★	3	8	4.5	55	6	A306
EPSM4030-9-PN	●	3	9	4.5	56	6	A335
HGOSH4030-TH	●	3	9	6	60	6	A325
EPPLS4030	★	3	10.5	4.5	80	6	A370
EPDSE2030-12-ATH	●	3	12	4.5	60	6	A303

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2030-12-PN	★	3	12	4.5	60	6	A306
EPDS2030-12-SD	★	3	12	4.5	60	6	A426
EPSM4030-15-PN	●	3	15	4.5	68	6	A336
EPDSE2030-16-ATH	●	3	16	4.5	60	6	A303
EPDSE2030-16-PN	★	3	16	4.5	60	6	A306
EPDSE2030-20-ATH	★	3	20	4.5	65	6	A303
EPDSE2030-20-PN	★	3	20	4.5	65	6	A306
EPDS2030-24-SD	★	3	24	4.5	65	6	A426
EPDSE2030-25-ATH	★	3	25	4.5	70	6	A303
EPDSE2030-25-PN	★	3	25	4.5	70	6	A306
EPDSE2030-30-ATH	★	3	30	4.5	75	6	A303
EPDSE2030-30-PN	★	3	30	4.5	75	6	A306
EPDS2030-36-SD	★	3	36	4.5	80	6	A426
EPDSE2030-40-ATH	★	3	40	4.5	90	6	A303
EPDSE2030-40-PN	★	3	40	4.5	90	6	A306
EPDSE2030-50-ATH	★	3	50	4.5	100	6	A303
EPDSE2030-50-PN	★	3	50	4.5	100	6	A306
EPPS4030-P-CS	★	3	-	4.5	50	6	A362
EPPS4030-TH	★	3	-	4.5	60	6	A355
EPPS4030	★	3	-	4.5	60	6	A369
CEPH4030	★	3	-	6	60	6	A403
CEPS4030-TH	★	3	-	6	60	6	A397
EPSF4030-PN	★	3	-	7.5	56	6	A331
EPSM4030-PN	●	3	-	7.5	56	6	A332
HGOS2030-PN	★	3	-	8	45	6	A319
EPP4030	★	3	-	8	60	6	A369
EPP4030-TH	●	3	-	8	60	6	A355
EPP3030-CS	★	3	-	8	60	6	A328
EPAS2030-SD	★	3	-	8	60	6	A429
EPP4030-CS	★	3	-	8	60	6	A362
EPP4030-P-CS	★	3	-	8	60	6	A362
HGOS4030-PN	★	3	-	10	45	6	A320
CEPR4030-TH	●	3	-	10	60	6	A397
CEPR4030	★	3	-	10	60	6	A402
EPSFM4030-PN	★	3	-	12	56	6	A331
EPSMM4030-PN	●	3	-	12	56	6	A333
EPSFL4030-PN	★	3	-	15	56	6	A331
EPPM4030-TH	★	3	-	15	60	6	A355
CEPL4030-TH	★	3	-	15	60	6	A397
CEPL4030	★	3	-	15	60	6	A402
EPPM4030	★	3	-	15	60	6	A370
EPPS4035-P-CS	★	3.5	-	5.3	50	6	A362
EPPS4035-TH	★	3.5	-	5.3	60	6	A355
EPPS4035	★	3.5	-	5.3	60	6	A369
EPSF4035-PN	★	3.5	-	8.8	56	6	A331
HGOS2035-PN	★	3.5	-	10	45	6	A319
CEPR4035-TH	★	3.5	-	12	60	6	A397
CEPR4035	★	3.5	-	12	60	6	A402
EPSFM4035-PN	★	3.5	-	14	56	6	A331
EPSMLS4040-PN	●	4	3.7	6	80	6	A334
EPSW3040-12-PN	★	4	12	6	56	6	A414
EPSM4040-12-PN	●	4	12	6	56	6	A335
EPDSE2040-12-ATH	●	4	12	6	60	6	A303
EPDSE2040-12-PN	★	4	12	6	60	6	A306
HGOSH4040-TH	●	4	12	8	60	6	A325
EPPLS4040	★	4	14	6	80	6	A370
EPDSE2040-16-ATH	●	4	16	6	60	6	A303
EPDSE2040-16-PN	★	4	16	6	60	6	A306
EPDS2040-16-SD	★	4	16	6	60	6	A426
EPSW3040-20-PN	★	4	20	6	68	6	A415
EPSM4040-20-PN	●	4	20	6	68	6	A336
EPDSE2040-20-ATH	●	4	20	6	70	6	A303

unit : mm

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2040-20-PN	★	4	20	6	70	6	A306
EPDSE2040-25-ATH	★	4	25	6	70	6	A303
EPDSE2040-25-PN	★	4	25	6	70	6	A306
EPDSE2040-30-ATH	★	4	30	6	80	6	A303
EPDSE2040-30-PN	★	4	30	6	80	6	A306
EPDS2040-32-SD	★	4	32	6	80	6	A426
EPDSE2040-35-ATH	★	4	35	6	80	6	A303
EPDSE2040-35-PN	★	4	35	6	80	6	A306
EPDSE2040-40-ATH	★	4	40	6	90	6	A303
EPDSE2040-40-PN	★	4	40	6	90	6	A306
EPDS2040-48-SD	★	4	48	6	90	6	A426
EPDSE2040-50-ATH	★	4	50	6	100	6	A303
EPDSE2040-50-PN	★	4	50	6	100	6	A306
EPPS4040-P-CS	★	4	-	6	50	6	A362
EPPS4040-TH	★	4	-	6	60	6	A355
EPPS4040	★	4	-	6	60	6	A369
CEPH4040	★	4	-	8	60	6	A403
CEPS4040-TH	★	4	-	8	60	6	A397
EPSF4040-PN	★	4	-	10	56	6	A331
EPSW3040-PN	●	4	-	10	56	6	A412
EPSM4040-PN	●	4	-	10	56	6	A332
HGOS2040-PN	★	4	-	11	45	6	A319
EPP4040	★	4	-	11	60	6	A369
EPP4040-CS	★	4	-	11	60	6	A362
EPP4040-TH	●	4	-	11	60	6	A355
EPP3040-CS	★	4	-	11	60	6	A328
EPAS2040-SD	★	4	-	11	60	6	A429
EPP4040-P-CS	★	4	-	11	60	6	A362
HGOS4040-PN	★	4	-	12	45	6	A320
CEPR4040-TH	●	4	-	12	60	6	A397
CEPR4040	★	4	-	12	60	6	A402
CEPU4040	★	4	-	12	60	6	A403
EPSFM4040-PN	★	4	-	16	56	6	A331
EPSMM4040-PN	●	4	-	16	56	6	A333
EPPM4040-TH	★	4	-	17	60	6	A355
EPPM4040	★	4	-	17	60	6	A370
CEPL4040-TH	★	4	-	20	65	6	A397
CEPL4040	★	4	-	20	65	6	A402
EPSFL4040-PN	★	4	-	20	70	6	A331
EPPS4045-P-CS	★	4.5	-	6.8	50	6	A362
EPPS4045-TH	★	4.5	-	6.8	60	6	A355
EPPS4045	★	4.5	-	6.8	60	6	A369
HGOS2045-PN	★	4.5	-	11	45	6	A319
EPSF4045-PN	★	4.5	-	11.3	56	6	A331
CEPR4045-TH	★	4.5	-	15	60	6	A397
CEPR4045	★	4.5	-	15	60	6	A402
EPSFM4045-PN	★	4.5	-	18	70	6	A331
EPSMLS4050-PN	●	5	4.6	7.5	100	6	A334
EPSW3050-15-PN	★	5	15	7.5	56	6	A414
EPSM4050-15-PN	●	5	15	7.5	56	6	A335
EPPLS4050	★	5	17.5	7.5	100	6	A370
EPDSE2050-20-ATH	●	5	20	7.5	70	6	A303
EPDSE2050-20-PN	★	5	20	7.5	70	6	A306
EPSW3050-25-PN	★	5	25	7.5	68	6	A415
EPSM4050-25-PN	●	5	25	7.5	68	6	A336
EPDSE2050-25-ATH	●	5	25	7.5	70	6	A303
EPDSE2050-25-PN	★	5	25	7.5	70	6	A306
EPDSE2050-30-ATH	★	5	30	7.5	80	6	A303
EPDSE2050-30-PN	★	5	30	7.5	80	6	A306
EPDSE2050-40-ATH	★	5	40	7.5	90	6	A303
EPDSE2050-40-PN	★	5	40	7.5	90	6	A306
EPDSE2050-50-ATH	★	5	50	7.5	100	6	A303

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPDSE2050-50-PN	★	5	50	7.5	100	6	A306
EPPS4050-P-CS	★	5	-	7.5	50	6	A362
EPPS4050-TH	★	5	-	7.5	60	6	A355
EPPS4050	★	5	-	7.5	60	6	A369
CEPH4050	★	5	-	10	60	6	A403
CEPS4050-TH	★	5	-	10	60	6	A397
EPSF4050-PN	★	5	-	12.5	56	6	A331
EPSW3050-PN	★	5	-	12.5	56	6	A412
EPSM4050-PN	●	5	-	12.5	56	6	A332
EPP4050	★	5	-	13	60	6	A369
EPP4050-CS	★	5	-	13	60	6	A362
HGOS2050-PN	★	5	-	13	60	6	A319
EPP4050-TH	★	5	-	13	60	6	A355
EPP3050-CS	★	5	-	13	60	6	A328
EPAS2050-SD	★	5	-	13	60	6	A429
EPP4050-P-CS	★	5	-	13	60	6	A362
HGOS4050-PN	★	5	-	15	60	6	A320
CEPR4050-TH	●	5	-	15	60	6	A397
CEPR4050	★	5	-	15	60	6	A402
EPPM4050	★	5	-	20	60	6	A370
EPPM4050-TH	★	5	-	20	60	6	A355
EPSFM4050-PN	★	5	-	20	70	6	A331
EPSMM4050-PN	●	5	-	20	70	6	A333
EPSFL4050-PN	★	5	-	25	70	6	A331
CEPL4050-TH	★	5	-	25	70	6	A397
CEPL4050	★	5	-	25	70	6	A402
EPPS4055-TH	★	5.5	-	8.3	60	6	A355
EPPS4055	★	5.5	-	8.3	60	6	A369
HGOS2055-PN	★	5.5	-	13	60	6	A319
EPSF4055-PN	★	5.5	-	13.8	56	6	A331
CEPR4055-TH	★	5.5	-	15	60	6	A397
CEPR4055	★	5.5	-	15	60	6	A402
EPSFM4055-PN	★	5.5	-	22	70	6	A331
EPSW4060-18-PN	★	6	18	9	56	6	A414
EPSM4060-18-PN	●	6	18	9	56	6	A335
HGOSH4060-TH	●	6	18	12	60	6	A325
ES8WB0600LN-20-ATH	●	6	20	6	70	6	A383
EPDSE2060-20-ATH	●	6	20	9	70	6	A303
EPDSE2060-20-PN	★	6	20	9	70	6	A306
ES8WB0600LN-30-ATH	●	6	30	6	80	6	A383
EPSW4060-30-PN	★	6	30	9	68	6	A415
EPSM4060-30-PN	●	6	30	9	68	6	A336
EPDSE2060-30-ATH	●	6	30	9	80	6	A303
EPDSE2060-30-PN	★	6	30	9	80	6	A306
ES8WB0600LN-40-ATH	●	6	40	6	90	6	A383
EPDSE2060-40-ATH	★	6	40	9	90	6	A303
EPDSE2060-40-PN	★	6	40	9	90	6	A306
ES8WB0600LN-50-ATH	●	6	50	6	100	6	A383
EPDSE2060-50-ATH	★	6	50	9	100	6	A303
EPDSE2060-50-PN	★	6	50	9	100	6	A306
EPPS4060-P-CS	★	6	-	9	50	6	A362
EPPS4060-TH	★	6	-	9	60	6	A355
EMXR4060-TH	●	6	-	9	60	6	A386
EMXN4060-TH	●	6	-	9	60	6	A387
EPPS4060	★	6	-	9	60	6	A369
EPPLS4060	★	6	-	9	120	5	A370
EPSMLS4060-PN	●	6	-	9	120	5	A334
CEPH6060	★	6	-	12	60	6	A403
CEPS6060-TH	★	6	-	12	60	6	A397
CEPLS6060	★	6	-	12	70	6	A403
EPP4060	★	6	-	13	60	6	A369
EPP4060-CS	★	6	-	13	60	6	A362

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPP4060-P-CS	★	6	-	13	60	6	A362
HGOS2060-PN	★	6	-	13	60	6	A319
EPP4060-TH	●	6	-	13	60	6	A355
EPP3060-CS	★	6	-	13	60	6	A328
EPAS2060-SD	★	6	-	13	70	6	A429
EPSF4060-PN	★	6	-	15	56	6	A331
EPSW4060-PN	●	6	-	15	56	6	A412
EPSM4060-PN	●	6	-	15	56	6	A332
HGOS4060-PN	★	6	-	15	60	6	A320
CEPR6060-TH	●	6	-	15	60	6	A397
CEPR6060	★	6	-	15	60	6	A402
CEPU4060	★	6	-	15	60	6	A403
EPPM4060	★	6	-	20	60	6	A370
EPPM4060-TH	★	6	-	20	60	6	A355
EPSFM4060-PN	★	6	-	24	70	6	A331
EPSMM4060-PN	●	6	-	24	70	6	A333
EPPL4060-TH	★	6	-	25	70	6	A355
EPPL4060	★	6	-	25	70	6	A370
CEPL6060-TH	★	6	-	25	70	6	A397
CEPL6060	★	6	-	25	70	6	A402
EPSFL4060-PN	★	6	-	30	70	6	A331
EPSML4060-PN	●	6	-	30	70	6	A333
EPSWL4060-PN	★	6	-	30	70	6	A413
EPPS4065-TH	★	6.5	-	9.8	70	8	A355
EPPS4065	★	6.5	-	9.8	70	8	A369
CEPR6065-TH	★	6.5	-	20	75	8	A397
CEPR6065	★	6.5	-	20	75	8	A402
EPSW4070-21-PN	★	7	21	10.5	63	8	A414
EPSM4070-21-PN	●	7	21	10.5	63	8	A335
EPSW4070-35-PN	★	7	35	10.5	80	8	A415
EPSM4070-35-PN	●	7	35	10.5	80	8	A336
ES8WB0700LS-ATH	●	7	-	7	90	6	A383
EMXR4070-SR-TH	★	7	-	9	90	6	A386
EMXN4070-SR-TH	★	7	-	9	90	6	A387
EPPLS4070	★	7	-	9	120	6	A370
EPSMLS4070-PN	●	7	-	9	120	6	A334
EPPS4070-P-CS	★	7	-	10.5	60	8	A362
EPPS4070-TH	★	7	-	10.5	70	8	A355
EPPS4070	★	7	-	10.5	70	8	A369
EPP4070	★	7	-	16	70	8	A369
HGOS2070-PN	★	7	-	16	70	8	A319
EPP4070-TH	★	7	-	16	70	8	A355
EPSF4070-PN	★	7	-	17.5	63	8	A331
EPSW4070-PN	★	7	-	17.5	63	8	A412
EPSM4070-PN	●	7	-	17.5	63	8	A332
EPAS2070-SD	★	7	-	20	70	8	A429
CEPR6070-TH	★	7	-	20	75	8	A397
CEPR6070	★	7	-	20	75	8	A402
EPSFM4070-PN	★	7	-	28	75	8	A331
EPSMM4070-PN	●	7	-	28	75	8	A333
EPSFL4070-PN	★	7	-	35	80	8	A331
CEPL6070	★	7	-	35	90	8	A402
CEPL6070-TH	★	7	-	35	90	8	A397
EPPS4075	★	7.5	-	11.3	75	8	A369
EPPS4075-TH	★	7.5	-	11.3	75	8	A355
CEPR6075-TH	★	7.5	-	20	75	8	A397
CEPR6075	★	7.5	-	20	75	8	A402
EPSW4080-24-PN	★	8	24	12	63	8	A414
EPSM4080-24-PN	●	8	24	12	63	8	A335
HGOSH4080-TH	●	8	24	16	75	8	A325
ES8WB0800LN-30-ATH	●	8	30	8	75	8	A383
ES8WB0800LN-40-ATH	●	8	40	8	90	8	A383

Quick dimension reference table by mill diameter

Carbide End Mill -Square

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unit : mm

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPSW4080-40-PN	★	8	40	12	80	8	A415
EPSM4080-40-PN	●	8	40	12	80	8	A336
ES8WB0800LN-50-ATH	●	8	50	8	100	8	A383
ES8WB0800LN-60-ATH	●	8	60	8	110	8	A383
EPPS4080-P-CS	★	8	-	12	60	8	A362
EPPS4080	★	8	-	12	75	8	A369
EPPS4080-TH	★	8	-	12	75	8	A355
EMXR4080-TH	●	8	-	12	75	8	A386
EMXN4080-TH	●	8	-	12	75	8	A387
EPPLS4080	★	8	-	12	135	7	A370
EPSMLS4080-PN	●	8	-	12	135	7	A334
CEPH6080	★	8	-	16	75	8	A403
CEPLS6080	★	8	-	16	90	8	A403
EPP4080	★	8	-	19	75	8	A369
EPP4080-CS	★	8	-	19	75	8	A362
EPP4080-P-CS	★	8	-	19	75	8	A362
HGOS2080-PN	★	8	-	19	75	8	A319
EPP4080-TH	●	8	-	19	75	8	A355
EPP3080-CS	★	8	-	19	75	8	A328
EPSF4080-PN	★	8	-	20	63	8	A331
EPSW4080-PN	●	8	-	20	63	8	A412
EPSM4080-PN	●	8	-	20	63	8	A332
HGOS4080-PN	★	8	-	20	75	8	A320
EPAS2080-SD	★	8	-	20	75	8	A429
CEPR6080-TH	●	8	-	20	75	8	A397
CEPR6080	★	8	-	20	75	8	A402
CEPU4080	★	8	-	20	75	8	A403
EPPM4080	★	8	-	25	75	8	A370
EPPM4080-TH	★	8	-	25	75	8	A355
EPSFM4080-PN	★	8	-	32	80	8	A331
EPSMM4080-PN	●	8	-	32	80	8	A333
CEPL6080	★	8	-	35	90	8	A402
EPPL4080-TH	★	8	-	35	90	8	A355
EPPL4080	★	8	-	35	90	8	A370
CEPL6080-TH	★	8	-	35	90	8	A397
EPSFL4080-PN	★	8	-	40	80	8	A331
EPSML4080-PN	●	8	-	40	80	8	A333
EPSWL4080-PN	★	8	-	40	80	8	A413
EPPS4085	★	8.5	-	12.8	80	10	A369
EPPS4085-TH	★	8.5	-	12.8	80	10	A355
CEPR6085-TH	★	8.5	-	25	80	10	A397
CEPR6085	★	8.5	-	25	80	10	A402
EPSW4090-27-PN	★	9	27	13.5	74	10	A414
EPSM4090-27-PN	●	9	27	13.5	74	10	A335
EPSW4090-45-PN	★	9	45	13.5	94	10	A415
EPSM4090-45-PN	●	9	45	13.5	94	10	A336
ES8WB0900LS-ATH	●	9	-	9	100	8	A383
EMXR4090-SR-TH	★	9	-	12	100	8	A386
EMXN4090-SR-TH	★	9	-	12	100	8	A387
EPPLS4090	★	9	-	12	135	8	A370
EPSMLS4090-PN	●	9	-	12	135	8	A334
EPPS4090-P-CS	★	9	-	13.5	65	10	A362
EPPS4090	★	9	-	13.5	80	10	A369
EPPS4090-TH	★	9	-	13.5	80	10	A355
EPP4090	★	9	-	19	80	10	A369
HGOS2090-PN	★	9	-	19	80	10	A319
EPP4090-TH	★	9	-	19	80	10	A355
EPAS2090-SD	★	9	-	20	80	10	A429
EPSW4090-PN	★	9	-	22.5	74	10	A412
EPSF4090-PN	★	9	-	22.5	74	10	A331
EPSM4090-PN	●	9	-	22.5	74	10	A332
CEPR6090-TH	★	9	-	25	80	10	A397

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
CEPR6090	★	9	-	25	80	10	A402
EPSFM4090-PN	★	9	-	36	100	10	A331
EPSMM4090-PN	●	9	-	36	100	10	A333
CEPL6090	★	9	-	45	100	10	A402
EPSFL4090-PN	★	9	-	45	100	10	A331
CEPL6090-TH	★	9	-	45	100	10	A397
EPPS4095	★	9.5	-	14.3	80	10	A369
EPPS4095-TH	★	9.5	-	14.3	80	10	A355
CEPR6095-TH	★	9.5	-	25	80	10	A397
CEPR6095	★	9.5	-	25	80	10	A402
EPSW4100-30-PN	★	10	30	15	74	10	A414
EPSM4100-30-PN	●	10	30	15	74	10	A335
HGOSH4100-TH	●	10	30	20	80	10	A325
ES8WB1000LN-35-ATH	●	10	35	10	80	10	A383
ES8WB1000LN-50-ATH	●	10	50	10	100	10	A383
EPSW4100-50-PN	★	10	50	15	94	10	A415
EPSM4100-50-PN	●	10	50	15	94	10	A336
ES8WB1000LN-60-ATH	●	10	60	10	110	10	A383
ES8WB1000LN-80-ATH	●	10	80	10	130	10	A383
EPPS4100-P-CS	★	10	-	15	70	10	A362
EPPS4100	★	10	-	15	80	10	A369
EPPS4100-TH	★	10	-	15	80	10	A355
EMXR4100-TH	●	10	-	15	80	10	A386
EMXN4100-TH	●	10	-	15	80	10	A387
EPPLS4100	★	10	-	15	150	9	A370
EPSMLS4100-PN	●	10	-	15	150	9	A334
CEPH6100	★	10	-	20	80	10	A403
CEPLS6100	★	10	-	20	100	10	A403
EPP4100	★	10	-	22	80	10	A369
EPP4100-CS	★	10	-	22	80	10	A362
EPP4100-P-CS	★	10	-	22	80	10	A362
HGOS2100-PN	★	10	-	22	80	10	A319
EPP4100-TH	●	10	-	22	80	10	A355
EPP3100-CS	★	10	-	22	80	10	A328
EPSW4100-PN	●	10	-	25	74	10	A412
EPSF4100-PN	★	10	-	25	74	10	A331
EPSM4100-PN	●	10	-	25	74	10	A332
HGOS4100-PN	★	10	-	25	80	10	A320
EPAS2100-SD	★	10	-	25	80	10	A429
CEPR6100-TH	●	10	-	25	80	10	A397
CEPR6100	★	10	-	25	80	10	A402
CEPU4100	★	10	-	25	80	10	A403
EPPM4100	★	10	-	33	80	10	A370
EPPM4100-TH	★	10	-	33	80	10	A355
EPSFM4100-PN	★	10	-	40	100	10	A331
EPSMM4100-PN	●	10	-	40	100	10	A333
CEPL6100	★	10	-	45	100	10	A402
EPPL4100-TH	★	10	-	45	100	10	A355
EPPL4100	★	10	-	45	100	10	A370
CEPL6100-TH	★	10	-	45	100	10	A397
EPSFL4100-PN	★	10	-	50	100	10	A331
EPSML4100-PN	●	10	-	50	100	10	A333
EPSWL4100-PN	★	10	-	50	100	10	A413
CEPR6105-TH	★	10.5	-	30	100	12	A397
CEPR6105	★	10.5	-	30	100	12	A402
EPSW4110-33-PN	★	11	33	16.5	86	12	A414
EPSM4110-33-PN	●	11	33	16.5	86	12	A335
EPSW4110-55-PN	★	11	55	16.5	110	12	A415
EPSM4110-55-PN	●	11	55	16.5	110	12	A336
ES8WB1100LS-ATH	●	11	-	11	110	10	A383
EMXR4110-SR-TH	★	11	-	15	110	10	A386
EMXN4110-SR-TH	★	11	-	15	110	10	A387

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EPSMLS4110-PN	●	11	-	15	150	10	A334
EPPLS4110	★	11	-	15	150	10	A370
EPPS4110-P-CS	★	11	-	16.5	75	12	A362
EPP4110	★	11	-	22	100	12	A369
EPP4110-TH	★	11	-	22	100	12	A355
EPAS2110-SD	★	11	-	25	100	12	A429
EPSW4110-PN	★	11	-	27.5	86	12	A412
EPSM4110-PN	●	11	-	27.5	86	12	A332
EPSF4110-PN	★	11	-	27.5	86	12	A331
CEPR6110-TH	★	11	-	30	100	12	A397
CEPR6110	★	11	-	30	100	12	A402
EPSFM4110-PN	★	11	-	44	120	12	A331
EPSMM4110-PN	●	11	-	44	120	12	A333
CEPL6110	★	11	-	55	120	12	A402
EPSFL4110-PN	★	11	-	55	120	12	A331
CEPL6110-TH	★	11	-	55	120	12	A397
CEPR6115-TH	★	11.5	-	30	100	12	A397
CEPR6115	★	11.5	-	30	100	12	A402
EPSM4120-36-PN	●	12	36	18	86	12	A335
EPSW4120-36-PN	★	12	36	18	86	12	A414
HGOSH4120-TH	●	12	36	24	100	12	A325
ES8WB1200LN-40-ATH	●	12	40	12	90	12	A383
ES8WB1200LN-60-ATH	●	12	60	12	110	12	A383
EPSM4120-60-PN	●	12	60	18	110	12	A336
EPSW4120-60-PN	★	12	60	18	110	12	A415
ES8WB1200LN-80-ATH	●	12	80	12	130	12	A383
ES8WB1200LN-100-ATH	●	12	100	12	150	12	A383
EPPS4120-P-CS	★	12	-	18	75	12	A362
EPPS4120	★	12	-	18	100	12	A369
EPPS4120-TH	★	12	-	18	100	12	A355
EMXR4120-TH	●	12	-	18	100	12	A386
EMXN4120-TH	●	12	-	18	100	12	A387
EPSMLS4120-PN	●	12	-	18	160	11	A334
EPPLS4120	★	12	-	18	160	11	A370
CEPH6120	★	12	-	24	100	12	A403
CEPLS6120-10	★	12	-	24	120	10	A403
CEPLS6120	★	12	-	24	120	12	A403
EPAS2120-SD	★	12	-	25	100	12	A429
EPP4120	★	12	-	26	100	12	A369
EPP4120-CS	★	12	-	26	100	12	A362
EPP4120-P-CS	★	12	-	26	100	12	A362
HGOS2120-PN	★	12	-	26	100	12	A319
EPP4120-TH	●	12	-	26	100	12	A355
EPP3120-CS	★	12	-	26	100	12	A328
EPSM4120-PN	●	12	-	30	86	12	A332
EPSW4120-PN	●	12	-	30	86	12	A412
EPSF4120-PN	★	12	-	30	86	12	A331
HGOS4120-PN	★	12	-	30	100	12	A320
CEPR6120-TH	●	12	-	30	100	12	A397
CEPR6120	★	12	-	30	100	12	A402
CEPU4120	★	12	-	30	100	12	A403
EPPM4120	★	12	-	37	100	12	A370
EPPM4120-TH	★	12	-	37	100	12	A355
EPSMM4120-PN	●	12	-	48	120	12	A333
EPSFM4120-PN	★	12	-	48	120	12	A331
CEPL6120	★	12	-	55	120	12	A402
EPPL4120-TH	★	12	-	55	120	12	A355
EPPL4120	★	12	-	55	120	12	A370
CEPL6120-TH	★	12	-	55	120	12	A397
EPSML4120-PN	●	12	-	60	120	12	A333
EPSFL4120-PN	★	12	-	60	120	12	A331
EPSWL4120-PN	★	12	-	60	120	12	A413

unit : mm

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
EMXR4130-SR-TH	★	13	-	18	120	12	A386
EMXN4130-SR-TH	★	13	-	18	120	12	A387
EPSMLS4130-PN	●	13	-	18	160	12	A334
EPPLS4130	★	13	-	18	160	12	A370
EPP4130	★	13	-	26	100	12	A369
EPP4130-TH	★	13	-	26	100	12	A355
CEPR6130-TH	★	13	-	35	105	16	A397
CEPR6130	★	13	-	35	105	16	A402
EPP4140	★	14	-	26	110	16	A369
EPP4140-TH	★	14	-	26	110	16	A355
CEPR6140-TH	★	14	-	35	105	16	A397
CEPR6140	★	14	-	35	105	16	A402
CEPL6140	★	14	-	55	125	16	A402
CEPL6140-TH	★	14	-	55	125	16	A397
EPP4150	★	15	-	26	110	16	A369
EPP4150-TH	★	15	-	26	110	16	A355
CEPR6150-TH	★	15	-	40	110	16	A397
CEPR6150	★	15	-	40	110	16	A402
CEPL6150	★	15	-	65	135	16	A402
EPSM4160-48-PN	●	16	48	24	110	16	A335
EPSW4160-48-PN	★	16	48	24	110	16	A414
EPSM4160-80-PN	●	16	80	24	135	16	A336
EPSW4160-80-PN	★	16	80	24	135	16	A415
EPPS4160	★	16	-	24	110	16	A369
EPPS4160-TH	★	16	-	24	110	16	A355
EMXR4160-TH	★	16	-	24	110	16	A386
EMXN4160-TH	★	16	-	24	110	16	A387
EPSMLS4160-PN	●	16	-	24	180	15	A334
EPPLS4160	★	16	-	24	180	15	A370
EPP4160	★	16	-	32	110	16	A369
EPP4160-CS	★	16	-	32	110	16	A362
CEPH6160	★	16	-	32	110	16	A403
EPP4160-P-CS	★	16	-	32	110	16	A362
EPP4160-TH	★	16	-	32	110	16	A355
EPP3160-CS	★	16	-	32	110	16	A328
CEPLS6160-12	★	16	-	32	135	12	A403
CEPLS6160	★	16	-	32	135	16	A403
HGOS4160-PN	★	16	-	35	110	16	A320
HGOS2160-PN	★	16	-	35	110	16	A319
EPSM4160-PN	●	16	-	40	110	16	A332
EPSW4160-PN	●	16	-	40	110	16	A412
CEPR6160-TH	★	16	-	40	110	16	A397
CEPR6160	★	16	-	40	110	16	A402
CEPU4160	★	16	-	40	110	16	A403
EPPM4160	★	16	-	47	110	16	A370
EPPM4160-TH	★	16	-	47	110	16	A355
EPSMM4160-PN	●	16	-	64	135	16	A333
CEPL6160	★	16	-	65	135	16	A402
EPPL4160-TH	★	16	-	65	135	16	A355
EPPL4160	★	16	-	65	135	16	A370
CEPL6160-TH	★	16	-	65	135	16	A397
EPSML4160-PN	●	16	-	80	135	16	A333
EPSWL4160-PN	★	16	-	80	135	16	A413
EPSMLS4170-PN	●	17	-	24	180	16	A334
EPPLS4170	★	17	-	24	180	16	A370
EPP4170	★	17	-	32	110	16	A369
EPP4170-TH	★	17	-	32	110	16	A355
CEPR6170-TH	★	17	-	40	120	20	A397
CEPR6170	★	17	-	40	120	20	A402
EPP4180	★	18	-	32	125	20	A369
EPP4180-TH	★	18	-	32	125	20	A355
CEPLS6180	★	18	-	36	145	16	A403

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
CEPR6180-TH	★	18	-	40	120	20	A397
CEPR6180	★	18	-	40	120	20	A402
CEPL6180	★	18	-	65	145	20	A402
CEPL6180-TH	★	18	-	65	145	20	A397
EPP4190	★	19	-	32	125	20	A369
EPP4190-TH	★	19	-	32	125	20	A355
CEPR6190-TH	★	19	-	45	125	20	A397
CEPR6190	★	19	-	45	125	20	A402
EPSM4200-60-PN	●	20	60	30	125	20	A335
EPSW4200-60-PN	★	20	60	30	125	20	A414
EPSM4200-100-PN	●	20	100	30	155	20	A336
EPSW4200-100-PN	★	20	100	30	155	20	A415
EPPS4200	★	20	-	30	125	20	A369
EPPS4200-TH	★	20	-	30	125	20	A355
EMXR4200-TH	★	20	-	30	125	20	A386
EMXN4200-TH	★	20	-	30	125	20	A387
EPP4200	★	20	-	38	125	20	A369
EPP4200-CS	★	20	-	38	125	20	A362
EPP4200-P-CS	★	20	-	38	125	20	A362
EPP4200-TH	★	20	-	38	125	20	A355
EPP3200-CS	★	20	-	38	125	20	A328
CEPH6200	★	20	-	40	125	20	A403
HGOS4200-PN	★	20	-	40	125	20	A320
HGOS2200-PN	★	20	-	40	125	20	A319
CEPLS6200-16	★	20	-	40	155	16	A403
CEPLS6200	★	20	-	40	155	20	A403
CEPU4200	★	20	-	45	125	20	A403
CEPR6200-TH	★	20	-	45	125	20	A397
CEPR6200	★	20	-	45	125	20	A402
EPSM4200-PN	●	20	-	50	125	20	A332
EPSW4200-PN	★	20	-	50	125	20	A412
EPPM4200	★	20	-	55	125	20	A370
EPPM4200-TH	★	20	-	55	125	20	A355
CEPL6200	★	20	-	75	155	20	A402
EPPL4200-TH	★	20	-	75	155	20	A355
EPPL4200	★	20	-	75	155	20	A370
CEPL6200-TH	★	20	-	75	155	20	A397
EPSMM4200-PN	●	20	-	80	155	20	A333
EPSML4200-PN	●	20	-	100	155	20	A333
EPSWL4200-PN	★	20	-	100	155	20	A413
CEPR6220-TH	★	22	-	45	135	20	A397
CEPR6220	★	22	-	45	135	20	A402
CEPLS6220	★	22	-	45	165	20	A403
CEPL6220	★	22	-	75	165	20	A402
CEPL6220-TH	★	22	-	75	165	20	A397
CEPR6240-TH	★	24	-	50	140	25	A397
CEPR6240	★	24	-	50	140	25	A402
CEPLS8250-20	★	25	-	45	180	20	A403
CEPLS8250	★	25	-	45	180	25	A403
CEPR8250-TH	★	25	-	50	140	25	A397
CEPR8250	★	25	-	50	140	25	A402
CEPL8250	★	25	-	90	180	25	A402
CEPL8250-TH	★	25	-	90	180	25	A397
CEPR8260-TH	★	26	-	50	140	25	A397
CEPR8260	★	26	-	50	140	25	A402
CEPR8280-TH	★	28	-	55	145	25	A397
CEPR8280	★	28	-	55	145	25	A402
CEPL8280	★	28	-	90	180	25	A402
CEPR8300-TH	★	30	-	60	165	32	A397
CEPR8300	★	30	-	60	165	32	A402
CEPL8300	★	30	-	90	195	32	A402
CEPR8320-TH	★	32	-	70	175	32	A397

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
CEPR8320	★	32	-	70	175	32	A402

1/4″～ 1/2″

unit : inch

Item Code	Stock	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Page
IEMXR4080-TH	●	1/4	-	0.375	2.953	0.25	A386
IEMXR4120-TH	●	3/8	-	0.562	3.15	0.375	A386
IEMXR4160-TH	●	1/2	-	0.75	3.937	0.5	A386

Epoch Deep Ball Evolution Hard-TH3

YouTube

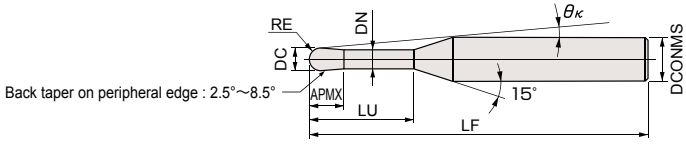
Short shank type

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h4

Applies newly developed next-generation hard coating "TH3".
Excellent wear resistance when machining hardened steel.



A type

2 Flutes

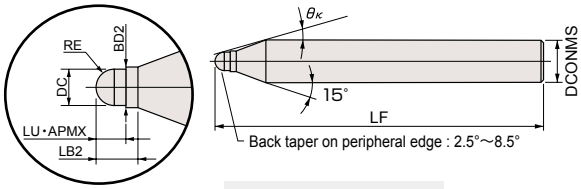
【Note】RE 2mm or larger does not have backdraft shape.

EPDBEH2○○○F-○○.○○-TH3

Carbide | TH3 | Helix angle 30° | Cutting Conditions A38

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θκ	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2001F-0.08-TH3	★	0.05	0.1	0.08	0.08	–	35	4	B	20.93	–	–	–	–	–
EPDBEH2001F-0.2-TH3	★			0.2	0.08	0.08	35	4	A	14.64	0.24	0.25	0.25	0.26	0.28
EPDBEH2001F-0.3-TH3	★			0.3	0.08	0.08	35	4	A	14.46	0.34	0.35	0.36	0.38	0.40
EPDBEH2001F-0.5-TH3	★			0.5	0.08	0.08	35	4	A	14.10	0.55	0.57	0.59	0.61	0.65
EPDBEH20015F-0.12-TH3	★	0.075	0.15	0.12	0.12	–	35	4	B	15.25	–	–	–	–	–
EPDBEH20015F-0.3-TH3	★			0.3	0.12	0.13	35	4	A	14.50	0.34	0.35	0.36	0.37	0.40
EPDBEH20015F-0.5-TH3	★			0.5	0.12	0.13	35	4	A	14.14	0.55	0.56	0.58	0.60	0.65
EPDBEH20015F-0.75-TH3	★			0.75	0.12	0.13	35	4	A	13.71	0.81	0.83	0.86	0.89	0.96
EPDBEH2002F-0.15-TH3	★	0.1	0.2	0.15	0.15	–	35	4	B	20.23	–	–	–	–	–
EPDBEH2002F-0.3-TH3	★			0.3	0.15	0.18	35	4	A	14.54	0.34	0.35	0.36	0.37	0.39
EPDBEH2002F-0.5-TH3	★			0.5	0.15	0.18	35	4	A	14.17	0.55	0.56	0.58	0.60	0.64
EPDBEH2002F-0.75-TH3	★			0.75	0.15	0.18	35	4	A	13.73	0.81	0.83	0.86	0.89	0.95
EPDBEH2002F-1-TH3	★			1	0.15	0.18	38	4	A	13.32	1.06	1.10	1.13	1.17	1.26
EPDBEH2003F-0.25-TH3	★	0.15	0.3	0.25	0.25	–	35	4	B	14.45	–	–	–	–	–
EPDBEH2003F-0.5-TH3	★			0.5	0.25	0.27	35	4	A	14.21	0.56	0.58	0.60	0.61	0.65
EPDBEH2003F-0.75-TH3	★			0.75	0.25	0.27	35	4	A	13.76	0.82	0.85	0.87	0.90	0.96
EPDBEH2003F-1-TH3	★			1	0.25	0.27	35	4	A	13.33	1.08	1.11	1.15	1.19	1.27
EPDBEH2003F-1.5-TH3	★			1.5	0.25	0.27	38	4	A	12.56	1.60	1.65	1.70	1.76	1.89
EPDBEH2004F-0.3-TH3	★	0.2	0.4	0.3	0.3	–	35	4	B	14.53	–	–	–	–	–
EPDBEH2004F-0.5-TH3	★			0.5	0.3	0.37	35	4	A	14.28	0.56	0.58	0.59	0.60	0.64
EPDBEH2004F-0.75-TH3	★			0.75	0.3	0.37	35	4	A	13.81	0.82	0.84	0.87	0.89	0.95
EPDBEH2004F-1-TH3	★			1	0.3	0.37	35	4	A	13.37	1.08	1.11	1.14	1.18	1.26
EPDBEH2004F-1.5-TH3	★			1.5	0.3	0.37	38	4	A	12.57	1.60	1.65	1.70	1.75	1.88
EPDBEH2004F-2-TH3	★			2	0.3	0.37	38	4	A	11.86	2.11	2.18	2.25	2.33	2.50
EPDBEH2004F-2.5-TH3	★			2.5	0.3	0.37	38	4	A	11.23	2.63	2.72	2.81	2.90	3.13
EPDBEH2004F-3-TH3	★			3	0.3	0.37	38	4	A	10.65	3.15	3.25	3.36	3.48	3.75
EPDBEH2004F-4-TH3	★			4	0.3	0.37	38	4	A	9.67	4.18	4.32	4.47	4.63	4.99
EPDBEH2005F-0.35-TH3	★	0.25	0.5	0.35	0.35	–	35	4	B	14.10	–	–	–	–	–
EPDBEH2005F-0.75-TH3	★			0.75	0.35	0.47	35	4	A	13.88	0.82	0.84	0.86	0.88	0.94
EPDBEH2005F-1-TH3	★			1	0.35	0.47	35	4	A	13.42	1.08	1.11	1.14	1.17	1.25
EPDBEH2005F-1.5-TH3	★			1.5	0.35	0.47	38	4	A	12.59	1.59	1.64	1.69	1.75	1.87
EPDBEH2005F-2-TH3	★			2	0.35	0.47	38	4	A	11.86	2.11	2.18	2.25	2.32	2.49
EPDBEH2005F-2.5-TH3	★			2.5	0.35	0.47	38	4	A	11.21	2.63	2.71	2.80	2.90	3.11
EPDBEH2005F-3-TH3	★			3	0.35	0.47	38	4	A	10.62	3.15	3.25	3.36	3.47	3.73
EPDBEH2005F-4-TH3	★			4	0.35	0.47	38	4	A	9.61	4.18	4.32	4.46	4.62	4.98
EPDBEH2005F-5-TH3	★			5	0.35	0.47	42	4	A	8.78	5.21	5.39	5.57	5.77	6.22
EPDBEH2006F-0.4-TH3	★	0.3	0.6	0.4	0.4	–	35	4	B	14.16	–	–	–	–	–
EPDBEH2006F-0.75-TH3	★			0.75	0.4	0.57	35	4	A	13.94	0.82	0.84	0.86	0.88	0.93
EPDBEH2006F-1-TH3	★			1	0.4	0.57	35	4	A	13.47	1.08	1.10	1.13	1.17	1.24
EPDBEH2006F-1.5-TH3	★			1.5	0.4	0.57	35	4	A	12.61	1.59	1.64	1.69	1.74	1.86
EPDBEH2006F-2-TH3	★			2	0.4	0.57	38	4	A	11.86	2.11	2.17	2.24	2.31	2.48
EPDBEH2006F-2.5-TH3	★			2.5	0.4	0.57	38	4	A	11.19	2.63	2.71	2.80	2.89	3.10
EPDBEH2006F-3-TH3	★			3	0.4	0.57	38	4	A	10.59	3.14	3.24	3.35	3.46	3.72
EPDBEH2006F-3.5-TH3	★			3.5	0.4	0.57	38	4	A	10.05	3.66	3.78	3.90	4.04	4.34
EPDBEH2006F-4-TH3	★			4	0.4	0.57	38	4	A	9.56	4.18	4.31	4.46	4.61	4.97
EPDBEH2006F-5-TH3	★			5	0.4	0.57	42	4	A	8.71	5.21	5.38	5.57	5.76	6.21
EPDBEH2006F-6-TH3	★			6	0.4	0.57	42	4	A	8.00	6.24	6.45	6.67	6.91	7.45

★ : Inventory maintained in Japan



B type

For details of B type, refer to page A37.

EPDBEH2○○○F-○○.○○-TH3

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θκ	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2007F-0.45-TH3	★	0.35	0.7	0.45	0.45	–	35	4	B	14.13	–	–	–	–	–
EPDBEH2007F-2-TH3	★			2	0.45	0.67	38	4	A	11.85	2.11	2.17	2.24	2.31	2.47
EPDBEH2007F-4-TH3	★			4	0.45	0.67	38	4	A	9.50	4.18	4.31	4.45	4.61	4.95
EPDBEH2008F-0.5-TH3	★	0.4	0.8	0.5	0.5	–	35	4	B	14.20	–	–	–	–	–
EPDBEH2008F-1-TH3	★			1	0.5	0.77	35	4	A	13.58	1.07	1.10	1.12	1.15	1.21
EPDBEH2008F-1.5-TH3	★			1.5	0.5	0.77	35	4	A	12.66	1.59	1.63	1.68	1.73	1.83
EPDBEH2008F-2-TH3	★			2	0.5	0.77	38	4	A	11.85	2.11	2.17	2.23	2.30	2.46
EPDBEH2008F-2.5-TH3	★			2.5	0.5	0.77	38	4	A	11.14	2.62	2.70	2.79	2.88	3.08
EPDBEH2008F-3-TH3	★			3	0.5	0.77	38	4	A	10.51	3.14	3.24	3.34	3.45	3.70
EPDBEH2008F-4-TH3	★			4	0.5	0.77	38	4	A	9.44	4.17	4.31	4.45	4.60	4.94
EPDBEH2008F-5-TH3	★			5	0.5	0.77	42	4	A	8.57	5.21	5.38	5.56	5.75	6.19
EPDBEH2008F-6-TH3	★			6	0.5	0.77	42	4	A	7.84	6.24	6.45	6.66	6.90	7.43
EPDBEH2008F-8-TH3	★			8	0.5	0.77	42	4	A	6.70	8.31	8.58	8.88	9.20	9.92
EPDBEH2009F-0.6-TH3	★	0.45	0.9	0.6	0.6	–	35	4	B	13.84	–	–	–	–	–
EPDBEH2009F-2-TH3	★			2	0.6	0.87	35	4	A	11.85	2.11	2.16	2.23	2.29	2.44
EPDBEH2009F-4-TH3	★			4	0.6	0.87	38	4	A	9.38	4.17	4.30	4.44	4.59	4.93
EPDBEH2009F-6-TH3	★			6	0.6	0.87	42	4	A	7.75	6.24	6.44	6.66	6.89	7.42
EPDBEH2010F-0.8-TH3	★	0.5	1	0.8	0.8	–	35	4	B	13.47	–	–	–	–	–
EPDBEH2010F-1.5-TH3	★			1.5	0.8	0.96	35	4	A	12.67	1.61	1.64	1.69	1.73	1.83
EPDBEH2010F-2-TH3	★			2	0.8	0.96	35	4	A	11.82	2.12	2.18	2.24	2.31	2.46
EPDBEH2010F-2.5-TH3	★			2.5	0.8	0.96	38	4	A	11.07	2.64	2.71	2.80	2.88	3.08
EPDBEH2010F-3-TH3	★			3	0.8	0.96	38	4	A	10.41	3.16	3.25	3.35	3.46	3.70
EPDBEH2010F-4-TH3	★			4	0.8	0.96	38	4	A	9.29	4.19	4.32	4.46	4.61	4.94
EPDBEH2010F-5-TH3	★			5	0.8	0.96	38	4	A	8.39	5.22	5.39	5.57	5.76	6.19
EPDBEH2010F-6-TH3	★			6	0.8	0.96	42	4	A	7.65	6.26	6.46	6.67	6.91	7.43
EPDBEH2010F-7-TH3	★			7	0.8	0.96	42	4	A	7.03	7.29	7.53	7.78	8.06	8.67
EPDBEH2010F-8-TH3	★			8	0.8	0.96	42	4	A	6.50	8.32	8.60	8.89	9.21	9.91
EPDBEH2010F-10-TH3	★			10	0.8	0.96	45	4	A	5.65	10.39	10.74	11.11	11.51	12.40
EPDBEH2010F-12-TH3	★			12	0.8	0.96	45	4	A	5.00	12.46	12.88	13.32	13.81	14.89
EPDBEH2015F-2-TH3	★	0.75	1.5	2	1.35	1.45	35	4	A	11.76	2.13	2.18	2.23	2.29	2.42
EPDBEH2015F-2.5-TH3	★			2.5	1.35	1.45	35	4	A	10.88	2.65	2.72	2.79	2.87	3.04
EPDBEH2015F-3-TH3	★			3	1.35	1.45	35	4	A	10.12	3.17	3.25	3.34	3.44	3.66
EPDBEH2015F-4-TH3	★			4	1.35	1.45	38	4	A	8.88	4.20	4.32	4.45	4.59	4.91
EPDBEH2015F-5-TH3	★			5	1.35	1.45	38	4	A	7.90	5.23	5.39	5.56	5.74	6.15
EPDBEH2015F-6-TH3	★			6	1.35	1.45	38	4	A	7.12	6.27	6.46	6.67	6.89	7.39
EPDBEH2015F-8-TH3	★			8	1.35	1.45	42	4	A	5.95	8.34	8.60	8.88	9.19	9.88
EPDBEH2015F-10-TH3	★			10	1.35	1.45	42	4	A	5.10	10.40	10.74	11.10	11.49	12.36
EPDBEH2015F-12-TH3	★			12	1.35	1.45	45	4	A	4.47	12.47	12.88	13.32	13.79	14.85
EPDBEH2020F-2.5-TH3	★	1	2	2.5	1.7	1.94	35	4	A	10.60	2.66	2.72	2.78	2.85	3.01
EPDBEH2020F-3-TH3	★			3	1.7	1.94	35	4	A	9.72	3.18	3.25	3.34	3.43	3.63
EPDBEH2020F-4-TH3	★			4	1.7	1.94	35	4	A	8.32	4.21	4.32	4.45	4.58	4.87
EPDBEH2020F-5-TH3	★			5	1.7	1.94	38	4	A	7.27	5.25	5.39	5.55	5.73	6.11
EPDBEH2020F-6-TH3	★			6	1.7	1.94	38	4	A	6.46	6.28	6.46	6.66	6.88	7.36
EPDBEH2020F-8-TH3	★			8	1.7	1.94	42	4	A	5.27	8.35	8.60	8.88	9.18	9.84
EPDBEH2020F-10-TH3	★			10	1.7	1.94	42	4	A	4.46	10.41	10.74	11.10	11.48	12.33
EPDBEH2020F-12-TH3	★			12	1.7	1.94	45	4	A	3.86	12.48	12.88	13.31	13.77	14.82
EPDBEH2020F-13-TH3	★			13	1.7	1.94	45	4	A	3.62	13.51	13.95	14.42	14.92	16.06
EPDBEH2020F-14-TH3	★			14	1.7	1.94	45	4	A	3.40	14.55	15.02	15.53	16.07	17.30
EPDBEH2020F-16-TH3	★			16	1.7	1.94	50	4	A	3.04	16.62	17.16	17.75	18.37	19.79
EPDBEH2020F-20-TH3	★			20	1.7	1.94	55	4	A	2.51	20.75	21.44	22.18	22.97	No interference
EPDBEH2025F-6-TH3	★	1.25	2.5	6	2	2.4	38	4	A	5.54	6.35	6.53	6.72	6.92	7.39
EPDBEH2025F-10-TH3	★			10	2	2.4	42	4	A	3.66	10.48	10.81	11.15	11.52	12.36
EPDBEH2025F-15-TH3	★			15	2	2.4	45	4	A	2.57	15.65	16.15	16.69	17.27	No interference

Epoch Deep Ball Evolution Hard-TH3

YouTube

Regular shank type

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

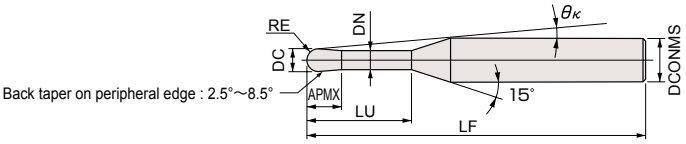
RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h4 (φ4) | h5 (φ6~12)

Applies newly developed next-generation hard coating "TH3".
Excellent wear resistance when machining hardened steel.

2 Flutes

[Note] RE 2mm or larger does not have backdraft shape.



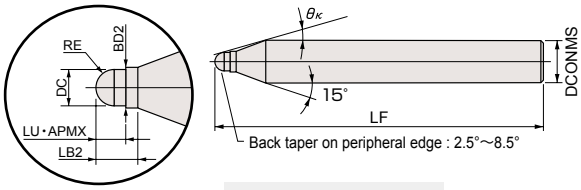
A type

EPDBEH2○○○-○○.○○-(S6)-TH3

Carbide | TH3 | Helix angle 30° | Cutting Conditions A38

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θκ	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2001-0.08-TH3	●	0.05	0.1	0.08	0.08	–	45	4	B	20.93	–	–	–	–	–
EPDBEH2001-0.2-TH3	●			0.2	0.08	0.08	45	4	A	14.64	0.24	0.25	0.25	0.26	0.28
EPDBEH2001-0.3-TH3	●			0.3	0.08	0.08	45	4	A	14.46	0.34	0.35	0.36	0.38	0.40
EPDBEH2001-0.5-TH3	●			0.5	0.08	0.08	45	4	A	14.10	0.55	0.57	0.59	0.61	0.65
EPDBEH20015-0.12-TH3	●	0.075	0.15	0.12	0.12	–	45	4	B	15.25	–	–	–	–	–
EPDBEH20015-0.3-TH3	●			0.3	0.12	0.13	45	4	A	14.50	0.34	0.35	0.36	0.37	0.40
EPDBEH20015-0.5-TH3	●			0.5	0.12	0.13	45	4	A	14.14	0.55	0.56	0.58	0.60	0.65
EPDBEH20015-0.75-TH3	●			0.75	0.12	0.13	45	4	A	13.71	0.81	0.83	0.86	0.89	0.96
EPDBEH20015-1-TH3	●			1	0.12	0.13	45	4	A	13.30	1.06	1.10	1.14	1.18	1.27
EPDBEH2002-0.15-TH3	●	0.1	0.2	0.15	0.15	–	50	4	B	20.23	–	–	–	–	–
EPDBEH2002-0.3-TH3	●			0.3	0.15	0.18	50	4	A	14.54	0.34	0.35	0.36	0.37	0.39
EPDBEH2002-0.5-TH3	●			0.5	0.15	0.18	50	4	A	14.17	0.55	0.56	0.58	0.60	0.64
EPDBEH2002-0.75-TH3	●			0.75	0.15	0.18	50	4	A	13.73	0.81	0.83	0.86	0.89	0.95
EPDBEH2002-1-TH3	●			1	0.15	0.18	50	4	A	13.32	1.06	1.10	1.13	1.17	1.26
EPDBEH2002-1.25-TH3	●			1.25	0.15	0.18	50	4	A	12.93	1.32	1.37	1.41	1.46	1.57
EPDBEH2002-1.5-TH3	●			1.5	0.15	0.18	50	4	A	12.56	1.58	1.63	1.69	1.75	1.88
EPDBEH2002-2-TH3	●			2	0.15	0.18	50	4	A	11.89	2.10	2.17	2.24	2.32	2.50
EPDBEH2002-2.5-TH3	●			2.5	0.15	0.18	50	4	A	11.28	2.61	2.70	2.80	2.90	3.13
EPDBEH2002-3-TH3	●			3	0.15	0.18	50	4	A	10.73	3.13	3.24	3.35	3.47	3.75
EPDBEH2003-0.25-TH3	●	0.15	0.3	0.25	0.25	–	50	4	B	14.45	–	–	–	–	–
EPDBEH2003-0.5-TH3	●			0.5	0.25	0.27	50	4	A	14.21	0.56	0.58	0.60	0.61	0.65
EPDBEH2003-0.75-TH3	●			0.75	0.25	0.27	50	4	A	13.76	0.82	0.85	0.87	0.90	0.96
EPDBEH2003-1-TH3	●			1	0.25	0.27	50	4	A	13.33	1.08	1.11	1.15	1.19	1.27
EPDBEH2003-1.25-TH3	●			1.25	0.25	0.27	50	4	A	12.93	1.34	1.38	1.43	1.47	1.58
EPDBEH2003-1.5-TH3	●			1.5	0.25	0.27	50	4	A	12.56	1.60	1.65	1.70	1.76	1.89
EPDBEH2003-2-TH3	●			2	0.25	0.27	50	4	A	11.86	2.12	2.18	2.26	2.34	2.52
EPDBEH2003-2.5-TH3	●			2.5	0.25	0.27	50	4	A	11.24	2.63	2.72	2.81	2.91	3.14
EPDBEH2003-3-TH3	●			3	0.25	0.27	50	4	A	10.68	3.15	3.25	3.37	3.49	3.76
EPDBEH2003-3.5-TH3	●			3.5	0.25	0.27	50	4	A	10.18	3.67	3.79	3.92	4.06	4.38
EPDBEH2003-4-TH3	●			4	0.25	0.27	50	4	A	9.72	4.18	4.32	4.47	4.64	5.00
EPDBEH2004-0.3-TH3	●	0.2	0.4	0.3	0.3	–	50	4	B	14.53	–	–	–	–	–
EPDBEH2004-0.5-TH3	●			0.5	0.3	0.37	50	4	A	14.28	0.56	0.58	0.59	0.60	0.64
EPDBEH2004-0.75-TH3	●			0.75	0.3	0.37	50	4	A	13.81	0.82	0.84	0.87	0.89	0.95
EPDBEH2004-1-TH3	●			1	0.3	0.37	50	4	A	13.37	1.08	1.11	1.14	1.18	1.26
EPDBEH2004-1.5-TH3	●			1.5	0.3	0.37	50	4	A	12.57	1.60	1.65	1.70	1.75	1.88
EPDBEH2004-2-TH3	●			2	0.3	0.37	50	4	A	11.86	2.11	2.18	2.25	2.33	2.50
EPDBEH2004-2.5-TH3	●			2.5	0.3	0.37	50	4	A	11.23	2.63	2.72	2.81	2.90	3.13
EPDBEH2004-3-TH3	●			3	0.3	0.37	50	4	A	10.65	3.15	3.25	3.36	3.48	3.75
EPDBEH2004-3.5-TH3	●			3.5	0.3	0.37	50	4	A	10.14	3.66	3.78	3.91	4.05	4.37
EPDBEH2004-4-TH3	●			4	0.3	0.37	50	4	A	9.67	4.18	4.32	4.47	4.63	4.99
EPDBEH2004-4.5-TH3	●			4.5	0.3	0.37	50	4	A	9.24	4.70	4.85	5.02	5.20	5.61
EPDBEH2004-5-TH3	●			5	0.3	0.37	50	4	A	8.85	5.21	5.39	5.58	5.78	6.23
EPDBEH2005-0.35-TH3	●	0.25	0.5	0.35	0.35	–	50	4	B	14.10	–	–	–	–	–
EPDBEH2005-0.75-TH3	●			0.75	0.35	0.47	50	4	A	13.88	0.82	0.84	0.86	0.88	0.94

● : Inventory maintained in US



B type

For details of B type, refer to page A37.

EPDBEH2○○○-○○.○○-(S6)-TH3

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2005-1-TH3	●	0.25	0.5	1	0.35	0.47	50	4	A	13.42	1.08	1.11	1.14	1.17	1.25
EPDBEH2005-1.5-TH3	●			1.5	0.35	0.47	50	4	A	12.59	1.59	1.64	1.69	1.75	1.87
EPDBEH2005-2-TH3	●			2	0.35	0.47	50	4	A	11.86	2.11	2.18	2.25	2.32	2.49
EPDBEH2005-2.5-TH3	●			2.5	0.35	0.47	50	4	A	11.21	2.63	2.71	2.80	2.90	3.11
EPDBEH2005-3-TH3	●			3	0.35	0.47	50	4	A	10.62	3.15	3.25	3.36	3.47	3.73
EPDBEH2005-4-TH3	●			4	0.35	0.47	50	4	A	9.61	4.18	4.32	4.46	4.62	4.98
EPDBEH2005-5-TH3	●			5	0.35	0.47	50	4	A	8.78	5.21	5.39	5.57	5.77	6.22
EPDBEH2005-5.5-TH3	●			5.5	0.35	0.47	50	4	A	8.41	5.73	5.92	6.13	6.35	6.84
EPDBEH2005-6-TH3	●			6	0.35	0.47	50	4	A	8.08	6.25	6.46	6.68	6.92	7.46
EPDBEH2005-7-TH3	●			7	0.35	0.47	50	4	A	7.48	7.28	7.53	7.79	8.07	8.71
EPDBEH2005-8-TH3	●			8	0.35	0.47	50	4	A	6.96	8.31	8.60	8.90	9.22	9.95
EPDBEH2006-0.4-TH3	●	0.3	0.6	0.4	0.4	–	50	4	B	14.16	–	–	–	–	–
EPDBEH2006-0.75-TH3	●			0.75	0.4	0.57	50	4	A	13.94	0.82	0.84	0.86	0.88	0.93
EPDBEH2006-1-TH3	●			1	0.4	0.57	50	4	A	13.47	1.08	1.10	1.13	1.17	1.24
EPDBEH2006-1.5-TH3	●			1.5	0.4	0.57	50	4	A	12.61	1.59	1.64	1.69	1.74	1.86
EPDBEH2006-2-TH3	●			2	0.4	0.57	50	4	A	11.86	2.11	2.17	2.24	2.31	2.48
EPDBEH2006-2.5-TH3	●			2.5	0.4	0.57	50	4	A	11.19	2.63	2.71	2.80	2.89	3.10
EPDBEH2006-3-TH3	●			3	0.4	0.57	50	4	A	10.59	3.14	3.24	3.35	3.46	3.72
EPDBEH2006-3.5-TH3	●			3.5	0.4	0.57	50	4	A	10.05	3.66	3.78	3.90	4.04	4.34
EPDBEH2006-4-TH3	●			4	0.4	0.57	50	4	A	9.56	4.18	4.31	4.46	4.61	4.97
EPDBEH2006-4.5-TH3	●			4.5	0.4	0.57	50	4	A	9.12	4.69	4.85	5.01	5.19	5.59
EPDBEH2006-5-TH3	●			5	0.4	0.57	50	4	A	8.71	5.21	5.38	5.57	5.76	6.21
EPDBEH2006-5.5-TH3	●			5.5	0.4	0.57	50	4	A	8.34	5.73	5.92	6.12	6.34	6.83
EPDBEH2006-6-TH3	●			6	0.4	0.57	50	4	A	8.00	6.24	6.45	6.67	6.91	7.45
EPDBEH2006-7-TH3	●			7	0.4	0.57	50	4	A	7.40	7.28	7.52	7.78	8.06	8.70
EPDBEH2006-8-TH3	●			8	0.4	0.57	50	4	A	6.88	8.31	8.59	8.89	9.21	9.94
EPDBEH2006-9-TH3	●			9	0.4	0.57	50	4	A	6.43	9.35	9.66	10.00	10.36	11.18
EPDBEH2006-10-TH3	●			10	0.4	0.57	50	4	A	6.03	10.38	10.73	11.11	11.51	12.43
EPDBEH2006-12-TH3	●			12	0.4	0.57	50	4	A	5.37	12.45	12.87	13.32	13.81	14.91
EPDBEH2007-0.45-TH3	●	0.35	0.7	0.45	0.45	–	50	4	B	14.13	–	–	–	–	–
EPDBEH2007-2-TH3	●			2	0.45	0.67	50	4	A	11.85	2.11	2.17	2.24	2.31	2.47
EPDBEH2007-4-TH3	●			4	0.45	0.67	50	4	A	9.50	4.18	4.31	4.45	4.61	4.95
EPDBEH2007-6-TH3	●			6	0.45	0.67	50	4	A	7.92	6.24	6.45	6.67	6.91	7.44
EPDBEH2007-8-TH3	●			8	0.45	0.67	50	4	A	6.79	8.31	8.59	8.89	9.21	9.93
EPDBEH2008-0.5-TH3	●	0.4	0.8	0.5	0.5	–	50	4	B	14.20	–	–	–	–	–
EPDBEH2008-1-TH3	●			1	0.5	0.77	50	4	A	13.58	1.07	1.10	1.12	1.15	1.21
EPDBEH2008-1.5-TH3	●			1.5	0.5	0.77	50	4	A	12.66	1.59	1.63	1.68	1.73	1.83
EPDBEH2008-2-TH3	●			2	0.5	0.77	50	4	A	11.85	2.11	2.17	2.23	2.30	2.46
EPDBEH2008-2.5-TH3	●			2.5	0.5	0.77	50	4	A	11.14	2.62	2.70	2.79	2.88	3.08
EPDBEH2008-3-TH3	●			3	0.5	0.77	50	4	A	10.51	3.14	3.24	3.34	3.45	3.70
EPDBEH2008-4-TH3	●			4	0.5	0.77	50	4	A	9.44	4.17	4.31	4.45	4.60	4.94
EPDBEH2008-5-TH3	●			5	0.5	0.77	50	4	A	8.57	5.21	5.38	5.56	5.75	6.19
EPDBEH2008-6-TH3	●			6	0.5	0.77	50	4	A	7.84	6.24	6.45	6.66	6.90	7.43
EPDBEH2008-8-TH3	●			8	0.5	0.77	50	4	A	6.70	8.31	8.58	8.88	9.20	9.92
EPDBEH2008-10-TH3	●			10	0.5	0.77	50	4	A	5.85	10.38	10.72	11.10	11.50	12.40
EPDBEH2008-12-TH3	●			12	0.5	0.77	50	4	A	5.19	12.44	12.86	13.31	13.80	14.89
EPDBEH2009-0.6-TH3	●	0.45	0.9	0.6	0.6	–	50	4	B	13.84	–	–	–	–	–
EPDBEH2009-2-TH3	●			2	0.6	0.87	50	4	A	11.85	2.11	2.16	2.23	2.29	2.44
EPDBEH2009-4-TH3	●			4	0.6	0.87	50	4	A	9.38	4.17	4.30	4.44	4.59	4.93
EPDBEH2009-6-TH3	●			6	0.6	0.87	50	4	A	7.75	6.24	6.44	6.66	6.89	7.42
EPDBEH2009-8-TH3	●			8	0.6	0.87	50	4	A	6.61	8.31	8.58	8.88	9.19	9.90

Epoch Deep Ball Evolution Hard-TH3

EPDBEH2○○○-○○.○○-(S6)-TH3

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2010-0.8-TH3	●			0.8	0.8	–	50	4	B	13.47	–	–	–	–	–
EPDBEH2010-1.5-TH3	●			1.5	0.8	0.96	50	4	A	12.67	1.61	1.64	1.69	1.73	1.83
EPDBEH2010-2-TH3	●			2	0.8	0.96	50	4	A	11.82	2.12	2.18	2.24	2.31	2.46
EPDBEH2010-2.5-TH3	●			2.5	0.8	0.96	50	4	A	11.07	2.64	2.71	2.80	2.88	3.08
EPDBEH2010-3-TH3	●			3	0.8	0.96	50	4	A	10.41	3.16	3.25	3.35	3.46	3.70
EPDBEH2010-4-TH3	●			4	0.8	0.96	50	4	A	9.29	4.19	4.32	4.46	4.61	4.94
EPDBEH2010-5-TH3	●			5	0.8	0.96	50	4	A	8.39	5.22	5.39	5.57	5.76	6.19
EPDBEH2010-6-TH3	●			6	0.8	0.96	50	4	A	7.65	6.26	6.46	6.67	6.91	7.43
EPDBEH2010-7-TH3	●			7	0.8	0.96	50	4	A	7.03	7.29	7.53	7.78	8.06	8.67
EPDBEH2010-8-TH3	●			8	0.8	0.96	50	4	A	6.50	8.32	8.60	8.89	9.21	9.91
EPDBEH2010-9-TH3	●			9	0.8	0.96	50	4	A	6.05	9.36	9.67	10.00	10.36	11.16
EPDBEH2010-10-TH3	●	0.5	1	10	0.8	0.96	50	4	A	5.65	10.39	10.74	11.11	11.51	12.40
EPDBEH2010-12-TH3	●			12	0.8	0.96	55	4	A	5.00	12.46	12.88	13.32	13.81	14.89
EPDBEH2010-13-TH3	●			13	0.8	0.96	55	4	A	4.72	13.49	13.95	14.43	14.96	16.13
EPDBEH2010-14-TH3	●			14	0.8	0.96	55	4	A	4.48	14.53	15.02	15.54	16.11	17.37
EPDBEH2010-16-TH3	●			16	0.8	0.96	55	4	A	4.06	16.59	17.16	17.76	18.40	19.86
EPDBEH2010-18-TH3	●			18	0.8	0.96	60	4	A	3.71	18.66	19.29	19.97	20.70	22.35
EPDBEH2010-20-TH3	●			20	0.8	0.96	60	4	A	3.42	20.73	21.43	22.19	23.00	24.83
EPDBEH2010-2-S6-TH3	●			2	0.8	0.96	50	6	A	12.92	2.12	2.18	2.24	2.31	2.46
EPDBEH2010-3-S6-TH3	●			3	0.8	0.96	50	6	A	11.86	3.16	3.25	3.35	3.46	3.70
EPDBEH2010-6-S6-TH3	●			6	0.8	0.96	50	6	A	9.53	6.26	6.46	6.67	6.91	7.43
EPDBEH2010-8-S6-TH3	●			8	0.8	0.96	50	6	A	8.42	8.32	8.60	8.89	9.21	9.91
EPDBEH2010-10-S6-TH3	●			10	0.8	0.96	50	6	A	7.54	10.39	10.74	11.11	11.51	12.40
EPDBEH2011-2-TH3	●			2	1	1.05	50	4	A	11.78	2.14	2.20	2.26	2.32	2.47
EPDBEH2011-4-TH3	●			4	1	1.05	50	4	A	9.20	4.21	4.34	4.47	4.62	4.95
EPDBEH2011-6-TH3	●	0.55	1.1	6	1	1.05	50	4	A	7.54	6.28	6.47	6.69	6.92	7.44
EPDBEH2011-8-TH3	●			8	1	1.05	50	4	A	6.39	8.34	8.61	8.91	9.22	9.93
EPDBEH2011-10-TH3	●			10	1	1.05	50	4	A	5.54	10.41	10.75	11.12	11.52	12.41
EPDBEH2012-2-TH3	●			2	1.1	1.15	50	4	A	11.78	2.14	2.19	2.25	2.31	2.46
EPDBEH2012-3-TH3	●			3	1.1	1.15	50	4	A	10.29	3.17	3.26	3.36	3.46	3.70
EPDBEH2012-4-TH3	●			4	1.1	1.15	50	4	A	9.13	4.21	4.33	4.47	4.61	4.94
EPDBEH2012-6-TH3	●			6	1.1	1.15	50	4	A	7.45	6.27	6.47	6.68	6.91	7.43
EPDBEH2012-8-TH3	●	0.6	1.2	8	1.1	1.15	50	4	A	6.29	8.34	8.61	8.90	9.21	9.91
EPDBEH2012-10-TH3	●			10	1.1	1.15	50	4	A	5.44	10.41	10.75	11.12	11.51	12.40
EPDBEH2012-12-TH3	●			12	1.1	1.15	55	4	A	4.79	12.48	12.89	13.33	13.81	14.89
EPDBEH2012-2-S6-TH3	●			2	1.1	1.15	50	6	A	12.94	2.14	2.19	2.25	2.31	2.46
EPDBEH2012-4-S6-TH3	●			4	1.1	1.15	50	6	A	10.92	4.21	4.33	4.47	4.61	4.94
EPDBEH2014-3-TH3	●			3	1.3	1.34	50	4	A	10.15	3.19	3.28	3.37	3.47	3.70
EPDBEH2014-8-TH3	●	0.7	1.4	8	1.3	1.34	50	4	A	6.06	8.36	8.62	8.91	9.22	9.91
EPDBEH2014-12-TH3	●			12	1.3	1.34	55	4	A	4.58	12.49	12.90	13.34	13.82	14.89
EPDBEH2014-16-TH3	●			16	1.3	1.34	55	4	A	3.68	16.63	17.18	17.78	18.42	19.86
EPDBEH2015-2-TH3	●			2	1.35	1.45	50	4	A	11.76	2.13	2.18	2.23	2.29	2.42
EPDBEH2015-2.5-TH3	●			2.5	1.35	1.45	50	4	A	10.88	2.65	2.72	2.79	2.87	3.04
EPDBEH2015-3-TH3	●	0.75	1.5	3	1.35	1.45	50	4	A	10.12	3.17	3.25	3.34	3.44	3.66
EPDBEH2015-4-TH3	●			4	1.35	1.45	50	4	A	8.88	4.20	4.32	4.45	4.59	4.91
EPDBEH2015-5-TH3	●			5	1.35	1.45	50	4	A	7.90	5.23	5.39	5.56	5.74	6.15

● : Inventory maintained in US

EPDBEH2○○○-○○.○○-(S6)-TH3

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2015-6-TH3	●	0.75	1.5	6	1.35	1.45	50	4	A	7.12	6.27	6.46	6.67	6.89	7.39
EPDBEH2015-8-TH3	●			8	1.35	1.45	50	4	A	5.95	8.34	8.60	8.88	9.19	9.88
EPDBEH2015-10-TH3	●			10	1.35	1.45	50	4	A	5.10	10.40	10.74	11.10	11.49	12.36
EPDBEH2015-12-TH3	●			12	1.35	1.45	55	4	A	4.47	12.47	12.88	13.32	13.79	14.85
EPDBEH2015-14-TH3	●			14	1.35	1.45	55	4	A	3.98	14.54	15.02	15.53	16.09	17.34
EPDBEH2015-16-TH3	●			16	1.35	1.45	55	4	A	3.58	16.60	17.16	17.75	18.39	19.82
EPDBEH2015-18-TH3	●			18	1.35	1.45	60	4	A	3.26	18.67	19.30	19.97	20.69	22.31
EPDBEH2015-20-TH3	●			20	1.35	1.45	60	4	A	2.99	20.74	21.44	22.18	22.99	No interference
EPDBEH2015-3-S6-TH3	●			3	1.35	1.45	50	6	A	11.84	3.17	3.25	3.34	3.44	3.66
EPDBEH2015-5-S6-TH3	●			5	1.35	1.45	50	6	A	10.02	5.23	5.39	5.56	5.74	6.15
EPDBEH2015-8-S6-TH3	●			8	1.35	1.45	50	6	A	8.14	8.34	8.60	8.88	9.19	9.88
EPDBEH2015-12-S6-TH3	●			12	1.35	1.45	50	6	A	6.51	12.47	12.88	13.32	13.79	14.85
EPDBEH2016-4-TH3	●	0.8	1.6	4	1.4	1.54	50	4	A	8.76	4.22	4.34	4.47	4.61	4.92
EPDBEH2016-8-TH3	●			8	1.4	1.54	50	4	A	5.82	8.35	8.62	8.90	9.20	9.89
EPDBEH2016-12-TH3	●			12	1.4	1.54	55	4	A	4.35	12.49	12.90	13.33	13.80	14.86
EPDBEH2016-16-TH3	●			16	1.4	1.54	55	4	A	3.47	16.62	17.17	17.77	18.40	19.84
EPDBEH2016-20-TH3	●			20	1.4	1.54	60	4	A	2.89	20.76	21.45	22.20	23.00	No interference
EPDBEH2018-4-TH3	●	0.9	1.8	4	1.6	1.73	50	4	A	8.53	4.23	4.35	4.48	4.61	4.92
EPDBEH2018-8-TH3	●			8	1.6	1.73	50	4	A	5.55	8.37	8.63	8.91	9.21	9.89
EPDBEH2018-12-TH3	●			12	1.6	1.73	55	4	A	4.11	12.50	12.91	13.34	13.81	14.86
EPDBEH2018-16-TH3	●			16	1.6	1.73	55	4	A	3.26	16.64	17.19	17.78	18.41	19.83
EPDBEH2018-20-TH3	●			20	1.6	1.73	60	4	A	2.70	20.77	21.47	22.21	23.01	No interference
EPDBEH2020-2.5-TH3	●	1	2	2.5	1.7	1.94	50	4	A	10.60	2.66	2.72	2.78	2.85	3.01
EPDBEH2020-3-TH3	●			3	1.7	1.94	50	4	A	9.72	3.18	3.25	3.34	3.43	3.63
EPDBEH2020-4-TH3	●			4	1.7	1.94	50	4	A	8.32	4.21	4.32	4.45	4.58	4.87
EPDBEH2020-5-TH3	●			5	1.7	1.94	50	4	A	7.27	5.25	5.39	5.55	5.73	6.11
EPDBEH2020-6-TH3	●			6	1.7	1.94	50	4	A	6.46	6.28	6.46	6.66	6.88	7.36
EPDBEH2020-8-TH3	●			8	1.7	1.94	50	4	A	5.27	8.35	8.60	8.88	9.18	9.84
EPDBEH2020-10-TH3	●			10	1.7	1.94	50	4	A	4.46	10.41	10.74	11.10	11.48	12.33
EPDBEH2020-12-TH3	●			12	1.7	1.94	55	4	A	3.86	12.48	12.88	13.31	13.77	14.82
EPDBEH2020-13-TH3	●			13	1.7	1.94	55	4	A	3.62	13.51	13.95	14.42	14.92	16.06
EPDBEH2020-14-TH3	●			14	1.7	1.94	55	4	A	3.40	14.55	15.02	15.53	16.07	17.30
EPDBEH2020-16-TH3	●			16	1.7	1.94	55	4	A	3.04	16.62	17.16	17.75	18.37	19.79
EPDBEH2020-18-TH3	●			18	1.7	1.94	60	4	A	2.75	18.68	19.30	19.96	20.67	No interference
EPDBEH2020-20-TH3	●			20	1.7	1.94	60	4	A	2.51	20.75	21.44	22.18	22.97	No interference
EPDBEH2020-22-TH3	●			22	1.7	1.94	60	4	A	2.31	22.82	23.58	24.40	25.27	No interference
EPDBEH2020-25-TH3	●			25	1.7	1.94	65	4	A	2.06	25.92	26.79	27.72	28.72	No interference
EPDBEH2020-30-TH3	●			30	1.7	1.94	70	4	A	1.75	31.09	32.14	33.26	No interference	No interference
EPDBEH2020-35-TH3	●			35	1.7	1.94	75	4	A	1.52	36.26	37.48	38.80	No interference	No interference
EPDBEH2020-40-TH3	●			40	1.7	1.94	80	4	A	1.34	41.42	42.83	No interference	No interference	No interference
EPDBEH2020-3-S6-TH3	●			3	1.7	1.94	50	6	A	11.80	3.18	3.25	3.34	3.43	3.63
EPDBEH2020-6-S6-TH3	●			6	1.7	1.94	50	6	A	9.04	6.28	6.46	6.66	6.88	7.36
EPDBEH2020-8-S6-TH3	●			8	1.7	1.94	50	6	A	7.82	8.35	8.60	8.88	9.18	9.84
EPDBEH2020-12-S6-TH3	●			12	1.7	1.94	50	6	A	6.15	12.48	12.88	13.31	13.77	14.82
EPDBEH2020-16-S6-TH3	●			16	1.7	1.94	50	6	A	5.07	16.62	17.16	17.75	18.37	19.79
EPDBEH2020-20-S6-TH3	●			20	1.7	1.94	60	6	A	4.31	20.75	21.44	22.18	22.97	24.76

Epoch Deep Ball Evolution Hard-TH3

EPDBEH2○○○-○○.○○-(S6)-TH3

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBEH2025-6-TH3	●	1.25	2.5	6	2	2.4	50	4	A	5.54	6.35	6.53	6.72	6.92	7.39
EPDBEH2025-10-TH3	●			10	2	2.4	50	4	A	3.66	10.48	10.81	11.15	11.52	12.36
EPDBEH2025-15-TH3	●			15	2	2.4	55	4	A	2.57	15.65	16.15	16.69	17.27	No interference
EPDBEH2025-20-TH3	●			20	2	2.4	60	4	A	1.98	20.82	21.50	22.23	No interference	No interference
EPDBEH2025-25-TH3	●			25	2	2.4	65	4	A	1.61	25.99	26.85	27.78	No interference	No interference
EPDBEH2025-30-TH3	●			30	2	2.4	70	4	A	1.36	31.16	32.20	No interference	No interference	No interference
EPDBEH2030-6-TH3	●	1.5	3	6	2.5	2.88	50	6	A	8.27	6.38	6.55	6.73	6.93	7.38
EPDBEH2030-8-TH3	●			8	2.5	2.88	55	6	A	6.95	8.45	8.69	8.95	9.23	9.86
EPDBEH2030-10-TH3	●			10	2.5	2.88	55	6	A	5.98	10.51	10.83	11.17	11.53	12.35
EPDBEH2030-13-TH3	●			13	2.5	2.88	60	6	A	4.95	13.61	14.04	14.49	14.98	16.08
EPDBEH2030-16-TH3	●			16	2.5	2.88	60	6	A	4.23	16.71	17.25	17.82	18.43	19.81
EPDBEH2030-20-TH3	●			20	2.5	2.88	65	6	A	3.53	20.85	21.52	22.25	23.03	24.78
EPDBEH2030-25-TH3	●			25	2.5	2.88	70	6	A	2.93	26.02	26.87	27.79	28.78	No interference
EPDBEH2030-30-TH3	●			30	2.5	2.88	75	6	A	2.51	31.19	32.22	33.33	34.53	No interference
EPDBEH2030-35-TH3	●			35	2.5	2.88	80	6	A	2.19	36.35	37.57	38.87	40.28	No interference
EPDBEH2035-10-TH3	●	1.75	3.5	10	2.75	3.35	55	6	A	5.42	10.56	10.87	11.20	11.56	12.36
EPDBEH2035-15-TH3	●			15	2.75	3.35	60	6	A	3.94	15.73	16.22	16.74	17.31	18.58
EPDBEH2035-25-TH3	●			25	2.75	3.35	70	6	A	2.54	26.07	26.92	27.83	28.81	No interference
EPDBEH2035-35-TH3	●			35	2.75	3.35	80	6	A	1.88	36.40	37.61	38.91	No interference	No interference
EPDBEH2035-45-TH3	●			45	2.75	3.35	90	6	A	1.49	46.74	48.31	No interference	No interference	No interference
EPDBEH2040-8-TH3	●	2	4	8	3	3.85	55	6	A	5.71	8.49	8.71	8.96	9.22	9.81
EPDBEH2040-10-TH3	●			10	3	3.85	55	6	A	4.76	10.55	10.85	11.17	11.52	12.30
EPDBEH2040-12-TH3	●			12	3	3.85	60	6	A	4.09	12.62	12.99	13.39	13.82	14.79
EPDBEH2040-13-TH3	●			13	3	3.85	60	6	A	3.82	13.65	14.06	14.50	14.97	16.03
EPDBEH2040-16-TH3	●			16	3	3.85	60	6	A	3.18	16.76	17.27	17.82	18.42	19.76
EPDBEH2040-20-TH3	●			20	3	3.85	65	6	A	2.61	20.89	21.55	22.26	23.02	No interference
EPDBEH2040-25-TH3	●			25	3	3.85	70	6	A	2.13	26.06	26.90	27.80	28.77	No interference
EPDBEH2040-30-TH3	●			30	3	3.85	75	6	A	1.79	31.23	32.25	33.34	No interference	No interference
EPDBEH2040-35-TH3	●			35	3	3.85	80	6	A	1.55	36.40	37.60	38.88	No interference	No interference
EPDBEH2040-40-TH3	●			40	3	3.85	80	6	A	1.37	41.56	42.94	No interference	No interference	No interference
EPDBEH2040-45-TH3	●			45	3	3.85	90	6	A	1.22	46.73	48.29	No interference	No interference	No interference
EPDBEH2040-50-TH3	●			50	3	3.85	100	6	A	1.11	51.90	53.64	No interference	No interference	No interference
EPDBEH2050-10-TH3	●	2.5	5	10	3.5	4.85	55	6	A	2.97	10.54	10.82	11.12	11.45	No interference
EPDBEH2050-20-TH3	●			20	3.5	4.85	65	6	A	1.46	20.87	21.52	No interference	No interference	No interference
EPDBEH2050-25-TH3	●			25	3.5	4.85	70	6	A	1.17	26.04	26.86	No interference	No interference	No interference
EPDBEH2050-30-TH3	●			30	3.5	4.85	75	6	A	0.97	31.21	No interference	No interference	No interference	No interference
EPDBEH2050-40-TH3	●			40	3.5	4.85	80	6	A	0.73	41.55	No interference	No interference	No interference	No interference
EPDBEH2060-12-TH3	●	3	6	12	6	5.85	60	6	A	0	No interference	No interference	No interference	No interference	No interference
EPDBEH2060-20-TH3	●			20	6	5.85	65	6	A	0	No interference	No interference	No interference	No interference	No interference
EPDBEH2060-30-TH3	●			30	6	5.85	75	6	A	0	No interference	No interference	No interference	No interference	No interference
EPDBEH2060-50-TH3	●			50	6	5.85	100	6	A	0	No interference	No interference	No interference	No interference	No interference
EPDBEH2080-24-TH3	●	4	8	24	12	7.6	100	8	A	0	No interference	No interference	No interference	No interference	No interference
EPDBEH2100-30-TH3	●	5	10	30	15	9.5	100	10	A	0	No interference	No interference	No interference	No interference	No interference
EPDBEH2120-36-TH3	●	6	12	36	18	11.5	110	12	A	0	No interference	No interference	No interference	No interference	No interference

●：Inventory maintained in US ★：Inventory maintained in Japan

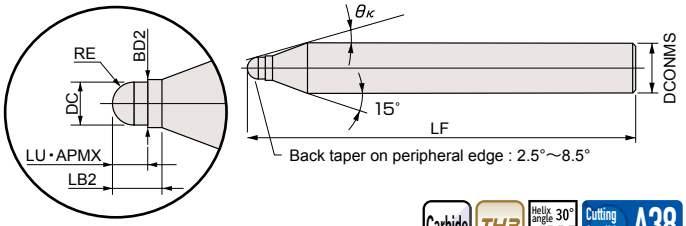
Strong neck type × Short shank type

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h4

2 Flutes



EPDBEH2○○○F-○○.○○-TH3

Carbide | TH3 | Helix angle 30° | Cutting Conditions A38

Item code	Stock	Size(mm)								Interference angle (°)
		Ball radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Neck size		
		RE	DC	LU	APMX	LF	DCONMS	LB2	BD2	θκ
EPDBEH2001F-0.08-TH3	★	0.05	0.1	0.08	0.08	35	4	0.2	0.13	20.93
EPDBEH20015F-0.12-TH3	★	0.075	0.15	0.12	0.12	35	4	0.3	0.18	15.25
EPDBEH2002F-0.15-TH3	★	0.1	0.2	0.15	0.15	35	4	0.3	0.25	20.23
EPDBEH2003F-0.25-TH3	★	0.15	0.3	0.25	0.25	35	4	0.5	0.35	14.45
EPDBEH2004F-0.3-TH3	★	0.2	0.4	0.3	0.3	35	4	0.5	0.45	14.53
EPDBEH2005F-0.35-TH3	★	0.25	0.5	0.35	0.35	35	4	0.75	0.55	14.10
EPDBEH2006F-0.4-TH3	★	0.3	0.6	0.4	0.4	35	4	0.75	0.65	14.16
EPDBEH2007F-0.45-TH3	★	0.35	0.7	0.45	0.45	35	4	0.8	0.75	14.13
EPDBEH2008F-0.5-TH3	★	0.4	0.8	0.5	0.5	35	4	0.8	0.85	14.20
EPDBEH2009F-0.6-TH3	★	0.45	0.9	0.6	0.6	35	4	1	0.95	13.84
EPDBEH2010F-0.8-TH3	★	0.5	1	0.8	0.8	35	4	1.2	1.05	13.47

Strong neck type

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h4

2 Flutes

EPDBEH2○○○-○○.○○-TH3

Carbide | TH3 | Helix angle 30° | Cutting Conditions A38

Item code	Stock	Size(mm)								Interference angle (°)
		Ball radius	Tool dia.	Under neck length	Flute length	Overall length	Shank dia.	Neck size		
		RE	DC	LU	APMX	LF	DCONMS	LB2	BD2	θκ
EPDBEH2001-0.08-TH3	●	0.05	0.1	0.08	0.08	45	4	0.2	0.13	20.93
EPDBEH20015-0.12-TH3	●	0.075	0.15	0.12	0.12	45	4	0.3	0.18	15.25
EPDBEH2002-0.15-TH3	●	0.1	0.2	0.15	0.15	50	4	0.3	0.25	20.23
EPDBEH2003-0.25-TH3	●	0.15	0.3	0.25	0.25	50	4	0.5	0.35	14.45
EPDBEH2004-0.3-TH3	●	0.2	0.4	0.3	0.3	50	4	0.5	0.45	14.53
EPDBEH2005-0.35-TH3	●	0.25	0.5	0.35	0.35	50	4	0.75	0.55	14.10
EPDBEH2006-0.4-TH3	●	0.3	0.6	0.4	0.4	50	4	0.75	0.65	14.16
EPDBEH2007-0.45-TH3	●	0.35	0.7	0.45	0.45	50	4	0.8	0.75	14.13
EPDBEH2008-0.5-TH3	●	0.4	0.8	0.5	0.5	50	4	0.8	0.85	14.20
EPDBEH2009-0.6-TH3	●	0.45	0.9	0.6	0.6	50	4	1	0.95	13.84
EPDBEH2010-0.8-TH3	●	0.5	1	0.8	0.8	50	4	1.2	1.05	13.47

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
○	○	◎	◎	◎	○	◎	○	○

Epoch Deep Ball Evolution Hard-TH3

Recommended cutting conditions EPDBEH-TH3

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A42 about high accuracy cutting conditions

Inch

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.05	0.1	0.08	.0002	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
		0.2	.0002	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
		0.3	.0002	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
		0.5	.0001	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
0.075	0.15	0.12	.0004	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		0.3	.0004	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		0.5	.0003	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		0.75	.0003	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		1	.0002	46,000	9.1	41,400	7.5	37,800	5.9	33,750	5.1	31,950	3.9
0.1	0.2	0.15	.0006	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		0.3	.0006	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		0.5	.0006	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		0.75	.0006	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		1	.0004	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		1.25	.0004	45,900	10.6	40,500	8.7	37,800	6.7	34,020	5.9	32,130	4.7
		1.5	.0002	45,900	10.6	40,500	8.7	37,800	6.7	34,020	5.9	32,130	4.7
		2	.0002	45,900	10.6	40,500	8.7	37,800	6.7	34,020	5.9	32,130	4.7
		2.5	.0002	40,800	8.3	36,000	6.7	33,600	5.1	30,240	4.7	28,560	3.5
		3	.0001	40,800	8.3	36,000	6.7	33,600	5.1	30,240	4.7	28,560	3.5
0.15	0.3	0.25	.0009	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		0.5	.0009	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		0.75	.0007	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		1	.0007	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		1.25	.0006	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		1.5	.0005	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		2	.0004	45,900	14.6	40,500	12.2	37,800	10.6	34,020	9.8	32,130	7.5
		2.5	.0003	45,900	14.6	40,500	12.2	37,800	10.6	34,020	9.8	32,130	7.5
		3	.0002	45,900	14.6	40,500	12.2	37,800	10.6	34,020	9.8	32,130	7.5
		3.5	.0002	36,720	10.2	29,400	8.3	26,400	7.1	23,760	6.3	22,440	5.1
		4	.0001	36,720	10.2	29,400	8.3	26,400	7.1	23,760	6.3	22,440	5.1
0.2	0.4	0.3	.0013	50,000	30.3	46,800	26.0	43,680	24.0	39,310	21.7	37,130	16.9
		0.5	.0013	50,000	30.3	46,800	26.0	43,680	24.0	39,310	21.7	37,130	16.9
		0.75	.0013	50,000	30.3	46,800	26.0	43,680	24.0	39,310	21.7	37,130	16.9
		1	.0013	50,000	30.3	46,800	26.0	43,680	24.0	39,310	21.7	37,130	16.9
		1.5	.0011	50,000	26.0	46,800	18.5	43,680	17.3	39,310	15.4	37,130	12.2
		2	.0009	50,000	21.7	46,800	18.5	43,680	17.3	39,310	15.4	37,130	12.2
		2.5	.0007	36,720	14.2	32,400	11.4	36,290	10.6	32,660	9.8	30,850	7.5
		3	.0005	36,720	14.2	32,400	11.4	36,290	10.6	32,660	9.8	30,850	7.5
		3.5	.0004	36,720	14.2	32,400	11.4	36,290	10.6	32,660	9.8	30,850	7.5
		4	.0003	36,720	14.2	32,400	11.4	36,290	10.6	32,660	9.8	30,850	7.5
		4.5	.0002	32,640	12.2	28,800	9.8	26,880	9.1	24,190	8.3	22,850	6.3
		5	.0002	32,640	12.2	28,800	9.8	26,880	9.1	24,190	8.3	22,850	6.3
0.25	0.5	0.35	.0014	50,000	46.9	47,130	41.3	43,930	29.1	39,820	26.4	37,560	20.5
		0.75	.0014	50,000	46.9	47,130	41.3	43,930	29.1	39,820	26.4	37,560	20.5
		1	.0014	50,000	46.9	47,130	41.3	43,930	29.1	39,820	26.4	37,560	20.5
		1.5	.0013	50,000	46.9	47,130	41.3	43,930	26.8	39,820	24.0	37,560	18.9
		2	.0011	50,000	37.8	47,130	33.1	43,930	26.8	39,820	24.0	37,560	18.9
		2.5	.0010	45,450	25.6	42,840	22.4	39,940	19.7	36,220	17.7	34,180	13.8
		3	.0009	45,450	25.6	42,840	22.4	39,940	15.4	36,220	13.8	34,180	10.6
		4	.0006	34,970	19.7	32,950	20.5	30,730	15.4	28,540	13.8	26,290	10.6
		5	.0006	34,970	19.7	32,950	20.5	30,730	15.4	28,540	13.8	26,290	10.6
		5.5	.0005	31,080	16.5	29,300	14.6	27,310	12.6	24,770	11.4	23,370	9.1
		6	.0004	31,080	16.5	29,300	14.6	27,310	12.6	24,770	11.4	23,370	9.1
		7	.0003	31,080	16.5	29,300	14.6	27,310	12.6	24,770	11.4	23,370	9.1
		8	.0002	31,080	16.5	29,300	14.6	27,310	12.6	24,770	11.4	23,370	9.1
0.3	0.6	0.4	.0024	50,000	76.8	48,000	68.1	44,800	52.8	40,320	47.6	38,080	37.0
		0.75	.0024	50,000	76.8	48,000	68.1	44,800	52.8	40,320	47.6	38,080	37.0

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
0.3	0.6	1	.0024	50,000	76.8	48,000	68.1	44,800	52.8	40,320	47.6	38,080	37.0
		1.5	.0022	50,000	76.8	48,000	68.1	44,800	52.8	40,320	47.6	38,080	37.0
		2	.0020	50,000	76.8	48,000	68.1	44,800	52.8	40,320	47.6	38,080	37.0
		2.5	.0014	50,000	61.4	48,000	54.3	44,800	39.0	40,320	35.0	38,080	27.2
		3	.0013	50,000	61.4	48,000	54.3	44,800	39.0	40,320	35.0	38,080	27.2
		3.5	.0011	48,960	57.1	43,200	46.5	40,320	33.1	36,290	29.9	34,270	23.2
		4	.0008	48,960	57.1	43,200	46.5	40,320	30.3	36,290	27.2	34,270	21.3
		4.5	.0007	45,900	42.1	40,500	34.6	37,800	26.8	34,020	24.0	32,130	18.9
		5	.0006	39,780	36.6	35,100	29.9	32,760	23.2	29,480	20.9	27,850	16.1
		5.5	.0006	39,780	36.6	35,100	29.9	32,760	23.2	29,480	20.9	27,850	16.1
		6	.0005	39,780	36.6	35,100	29.9	32,760	23.2	29,480	20.9	27,850	16.1
		7	.0005	27,200	23.6	24,000	19.3	22,400	16.5	20,160	14.6	19,040	11.4
		8	.0005	27,200	23.6	24,000	19.3	22,400	15.0	20,160	13.4	19,040	10.6
		9	.0004	27,200	23.6	24,000	19.3	22,400	15.0	20,160	13.4	19,040	10.6
		10	.0003	23,800	20.9	21,000	16.9	19,600	13.0	17,640	11.8	16,660	9.1
		12	.0002	20,400	16.5	18,000	13.8	16,800	10.6	15,120	9.4	14,280	7.5
0.35	0.7	0.45	.0029	50,000	85.0	48,000	76.0	44,800	46.9	40,320	42.1	38,080	32.7
		2	.0029	50,000	85.0	48,000	76.0	44,800	46.9	40,320	42.1	38,080	32.7
		4	.0013	48,960	63.0	43,200	52.0	43,870	33.5	39,480	29.9	37,370	23.2
		6	.0009	39,780	40.6	35,100	33.5	35,650	25.2	32,080	22.8	30,370	17.7
		8	.0006	27,200	24.8	24,000	20.5	24,370	16.5	21,940	15.0	20,760	11.8
0.4	0.8	0.5	.0047	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		1	.0047	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		1.5	.0047	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		2	.0038	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		2.5	.0035	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		3	.0031	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		4	.0025	50,000	94.5	48,000	102.0	44,800	74.0	40,320	66.5	38,080	52.0
		5	.0019	48,960	83.1	43,200	83.5	40,320	59.8	36,290	53.9	34,270	42.1
		6	.0013	42,840	68.1	37,800	56.3	35,280	49.2	31,750	44.1	29,990	34.3
		8	.0006	35,360	40.2	31,200	33.1	29,120	28.7	26,210	26.0	24,750	20.1
		10	.0006	27,200	29.1	24,000	24.0	22,400	20.9	20,160	18.9	19,040	14.6
		12	.0004	27,200	29.1	24,000	24.0	22,400	20.9	20,160	18.9	19,040	14.6
0.45	0.9	0.6	.0043	50,000	111.0	45,600	94.9	42,560	84.3	38,300	76.0	36,180	59.1
		2	.0043	50,000	111.0	45,600	94.9	42,560	84.3	38,300	76.0	36,180	59.1
		4	.0026	48,450	93.3	42,750	77.2	39,900	68.5	35,910	61.4	33,920	48.0
		6	.0017	40,700	59.8	35,910	49.2	33,520	43.7	30,160	39.4	28,490	30.7
		8	.0011	31,010	41.3	27,360	34.3	25,540	30.3	22,980	27.2	21,710	21.3
0.5	1	0.8	.0071	45,900	122.0	43,200	107.1	37,800	89.4	34,020	80.3	32,130	62.6
		1.5	.0071	45,900	122.0	43,200	107.1	37,800	89.4	34,020	80.3	32,130	62.6
		2	.0063	45,900	122.0	43,200	107.1	37,800	89.4	34,020	80.3	32,130	62.6
		2.5	.0063	45,900	122.0	43,200	107.1	37,800	89.4	34,020	80.3	32,130	62.6
		3	.0063	45,900	122.0	43,200	107.1	37,800	89.4	34,020	80.3	32,130	62.6
		4	.0044	45,900	122.0	43,200	107.1	37,800	89.4	34,020	80.3	32,130	62.6
		5	.0028	39,780	102.4	43,200	100.0	32,760	72.4	29,480	65.0	27,850	50.4
		6	.0019	38,560	91.3	38,880	92.5	29,480	54.3	26,540	48.8	25,060	38.2
		7	.0019	33,050	52.8	31,590	52.0	27,220	41.7	24,490	37.8	23,130	29.1
		8	.0019	33,050	52.8	31,590	52.0	27,220	38.6	24,490	34.6	23,130	27.2
		9	.0014	33,050	52.8	31,590	52.0	27,220	38.6	24,490	34.6	23,130	27.2
		10	.0012	33,050	52.8	31,590	52.0	27,220	38.6	24,490	34.6	23,130	27.2
		12	.0008	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		13	.0007	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		14	.0006	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		16	.0005	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		18	.0004	21,420	30.3	18,900	25.2	17,640	22.0	15,880	20.1	14,990	15.7
		20	.0003	18,360	26.0	16,200	21.3	15,120	18.9	13,610	17.3	12,850	13.4

【Note】 Upon usage, please refer to comments and notes below table on page A41.

Epoch Deep Ball Evolution Hard-TH3

EPDBEH-TH3

High efficiency cuttiing conditions

High accuracy cuttiing conditions

Please refer to P.A42 about high accuracy cutting conditions

Inch

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
0.55	1.1	2	.0063	42,840	115.4	37,800	96.5	35,280	85.8	31,750	77.2	29,990	59.8
		4	.0044	42,840	115.4	37,800	96.5	35,280	85.8	31,750	77.2	29,990	59.8
		6	.0019	33,810	67.3	29,840	56.3	27,850	50.0	25,060	44.9	23,670	35.0
		8	.0019	31,210	51.6	27,540	43.3	25,700	38.6	23,130	34.6	21,850	26.8
		10	.0012	31,210	51.6	27,540	43.3	25,700	38.6	23,130	34.6	21,850	26.8
0.6	1.2	2	.0061	39,230	107.1	36,920	100.8	32,310	73.2	29,080	65.7	27,460	51.2
		3	.0061	39,230	107.1	36,920	100.8	32,310	73.2	29,080	65.7	27,460	51.2
		4	.0050	39,230	107.1	36,920	100.8	32,310	73.2	29,080	65.7	27,460	51.2
		6	.0035	39,230	107.1	36,920	100.8	32,310	73.2	29,080	65.7	27,460	51.2
		8	.0019	31,820	81.5	30,240	81.1	26,210	41.3	23,590	37.0	22,280	28.7
		10	.0017	29,380	52.0	27,000	42.1	24,190	34.3	21,770	30.7	20,560	24.0
		12	.0014	29,380	52.0	25,920	40.6	24,190	34.3	21,770	30.7	20,560	24.0
0.7	1.4	3	.0062	33,420	92.5	29,480	78.3	27,520	70.5	24,770	63.4	23,390	49.2
		8	.0035	27,850	71.3	24,570	60.2	22,930	54.3	20,640	48.8	19,490	37.8
		12	.0017	25,700	49.2	22,680	41.7	21,170	37.4	19,050	33.9	17,990	26.4
		16	.0011	19,040	34.3	16,800	29.1	15,680	26.4	14,110	23.6	13,330	18.5
0.75	1.5	2	.0076	35,700	126.4	31,500	100.4	29,400	87.0	26,460	78.3	24,990	60.6
		2.5	.0076	35,700	126.4	31,500	100.4	29,400	87.0	26,460	78.3	24,990	60.6
		3	.0076	35,700	126.4	31,500	100.4	29,400	87.0	26,460	78.3	24,990	60.6
		4	.0063	35,700	126.4	31,500	100.4	29,400	87.0	26,460	78.3	24,990	60.6
		5	.0063	35,700	126.4	31,500	100.4	29,400	87.0	26,460	78.3	24,990	60.6
		6	.0063	35,700	126.4	31,500	100.4	29,400	87.0	26,460	78.3	24,990	60.6
		8	.0028	27,850	71.3	24,570	56.3	22,930	48.8	20,640	44.1	19,490	34.3
		10	.0028	25,700	65.7	22,680	52.0	21,170	44.9	19,050	40.6	17,990	31.5
		12	.0028	25,700	54.7	22,680	43.3	21,170	37.4	19,050	33.9	17,990	26.4
		14	.0024	22,850	46.1	20,160	36.6	18,820	31.5	16,930	28.3	15,990	22.0
		16	.0012	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
		18	.0012	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
		20	.0012	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
0.8	1.6	4	.0091	33,110	131.5	29,210	112.2	25,320	83.9	22,780	75.6	21,520	58.7
		8	.0069	30,940	98.0	27,300	83.9	23,660	62.6	21,290	56.3	20,110	43.7
		12	.0031	27,850	85.8	24,570	73.2	21,290	50.8	19,170	45.7	18,100	35.4
		16	.0019	23,870	52.4	21,060	44.9	19,660	39.0	17,690	35.0	16,710	27.2
		20	.0013	17,680	36.6	15,600	31.5	14,560	27.2	13,100	24.4	12,380	19.3
0.9	1.8	4	.0114	28,730	94.9	25,350	79.1	23,660	66.9	21,290	60.2	20,110	46.9
		8	.0082	28,730	94.9	25,350	79.1	23,660	66.9	21,290	60.2	20,110	46.9
		12	.0033	23,870	59.1	21,060	49.2	19,660	41.7	17,690	37.8	16,710	29.1
		16	.0021	23,870	59.1	21,060	49.2	19,660	41.7	17,690	37.8	16,710	29.1
		20	.0014	17,680	41.3	15,600	34.6	14,560	29.1	13,100	26.4	12,380	20.5
1	2	2.5	.0126	26,780	142.5	23,630	120.1	22,050	104.3	19,850	93.7	18,740	72.8
		3	.0126	26,780	142.5	23,630	120.1	22,050	104.3	19,850	93.7	18,740	72.8
		4	.0126	26,780	142.5	23,630	120.1	22,050	104.3	19,850	93.7	18,740	72.8
		5	.0126	26,780	142.5	23,630	120.1	22,050	104.3	19,850	93.7	18,740	72.8
		6	.0126	26,780	126.4	23,630	105.9	22,050	93.7	19,850	84.3	18,740	65.7
		8	.0088	26,780	126.4	23,630	105.9	22,050	93.7	19,850	84.3	18,740	65.7
		10	.0066	24,990	106.3	22,050	88.6	19,110	57.9	17,200	52.0	16,240	40.6
		12	.0038	22,490	95.7	19,850	80.7	17,200	52.0	15,480	46.9	14,620	36.6
		13	.0038	22,490	95.7	19,850	79.5	15,880	40.2	14,290	36.2	13,500	28.0
		14	.0038	22,490	83.1	18,430	64.2	15,880	40.2	14,290	36.2	13,500	28.0
		16	.0038	20,890	53.1	18,430	57.9	15,880	35.8	14,290	32.3	13,500	25.2
		18	.0028	19,280	49.2	18,430	53.1	15,880	35.8	14,290	32.3	13,500	25.2
		20	.0024	19,280	49.2	18,430	44.5	15,880	35.8	14,290	32.3	13,500	25.2
		22	.0016	15,170	36.6	13,390	30.3	14,990	32.3	13,500	28.7	12,750	22.4
		25	.0016	14,280	34.3	12,600	28.7	14,110	30.3	12,700	27.2	12,000	21.3
		30	.0009	14,280	34.3	12,600	28.7	14,110	30.3	12,700	27.2	12,000	21.3
		35	.0008	12,500	28.3	11,030	23.6	10,290	20.9	9,260	18.5	8,750	14.6
		40	.0007	10,710	24.4	9,450	20.1	8,820	17.7	7,940	16.1	7,500	12.6

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
1.25	2.5	6	.0157	23,590	149.6	20,810	121.7	19,430	99.6	17,480	89.8	16,610	71.7
		10	.0107	23,590	149.6	20,810	121.7	19,430	99.6	17,480	89.8	16,610	71.7
		15	.0047	18,400	83.9	16,230	79.5	15,150	55.9	13,640	50.4	12,950	40.2
		20	.0038	16,980	64.6	16,230	57.1	13,990	42.9	12,590	38.6	11,960	31.1
		25	.0031	16,980	58.3	14,990	47.2	13,990	38.6	12,590	34.6	11,960	28.0
		30	.0017	12,580	45.3	11,100	36.6	10,360	30.3	9,320	27.2	8,860	21.7
1.5	3	6	.0189	20,400	161.4	18,000	133.9	16,800	118.9	15,120	107.1	14,360	85.8
		8	.0189	20,400	161.4	18,000	133.9	16,800	118.9	15,120	107.1	14,360	85.8
		10	.0132	20,400	161.4	18,000	133.9	16,800	118.9	15,120	107.1	14,360	85.8
		13	.0099	19,040	120.5	16,800	100.0	15,680	89.0	14,110	79.9	13,410	64.2
		16	.0099	19,040	108.7	16,800	90.2	14,560	74.4	13,100	66.9	12,450	53.5
		20	.0057	15,910	75.6	14,040	62.6	12,100	51.6	10,890	46.5	10,340	37.0
		25	.0038	15,910	75.6	14,040	62.6	12,100	51.6	10,890	46.5	10,340	37.0
		30	.0038	14,690	69.7	12,960	57.9	12,100	51.6	10,890	46.5	10,340	37.0
		35	.0025	10,880	48.8	9,600	40.6	10,750	43.3	9,680	39.0	9,190	31.1
1.75	3.5	10	.0129	15,190	108.3	13,410	88.2	12,510	72.0	11,260	65.0	10,700	52.0
		15	.0113	15,190	108.3	13,410	88.2	12,510	72.0	11,260	65.0	10,700	52.0
		25	.0066	12,620	67.3	11,140	54.7	10,400	44.9	9,360	40.6	8,890	32.3
		35	.0028	12,620	67.3	11,140	54.7	10,400	44.9	9,360	40.6	8,890	32.3
		45	.0028	9,350	47.2	8,250	38.6	7,700	31.5	6,930	28.3	6,580	22.8
2	4	8	.0189	14,660	155.9	12,940	129.9	12,080	114.2	10,870	102.8	10,320	82.3
		10	.0189	14,660	155.9	12,940	129.9	12,080	114.2	10,870	102.8	10,320	82.3
		12	.0151	14,660	155.9	12,940	129.9	12,080	114.2	10,870	102.8	10,320	82.3
		13	.0151	14,660	155.9	12,940	129.9	12,080	114.2	10,870	102.8	10,320	82.3
		16	.0132	14,660	155.9	12,940	129.9	12,080	114.2	10,870	102.8	10,320	82.3
		20	.0132	12,710	108.3	11,210	90.2	10,470	79.1	9,420	71.3	8,950	57.1
		25	.0076	11,440	87.4	10,090	85.0	9,420	64.2	8,480	57.5	8,050	46.1
		30	.0050	10,560	67.3	9,320	56.3	8,690	49.2	7,820	44.5	7,430	35.4
		35	.0031	10,560	67.3	9,320	56.3	8,690	49.2	7,820	44.5	7,430	35.4
		40	.0031	10,560	67.3	9,320	56.3	8,690	49.2	7,820	44.5	7,430	35.4
		45	.0031	7,820	47.2	6,900	39.4	6,440	34.6	5,800	31.1	5,510	24.8
		50	.0031	7,820	47.2	6,900	39.4	6,440	34.6	5,800	31.1	5,510	24.8
2.5	5	10	.0230	10,710	126.4	9,450	111.8	8,820	93.7	7,940	84.3	7,540	67.3
		20	.0165	10,710	126.4	9,450	111.8	8,820	93.7	7,940	84.3	7,540	67.3
		25	.0165	9,950	117.3	8,780	103.5	8,190	87.0	7,370	78.3	7,000	62.6
		30	.0094	8,950	105.9	7,900	93.3	7,370	78.3	6,630	70.5	6,300	56.3
		40	.0063	8,260	58.7	7,290	51.6	6,800	43.3	6,120	39.0	5,820	31.1
3	6	12	.0189	11,480	167.3	10,130	136.2	9,450	111.8	8,510	100.4	8,080	80.3
		20	.0157	10,840	146.9	9,560	119.3	8,930	98.0	8,030	88.2	7,630	70.5
		30	.0132	8,840	83.5	7,800	79.9	7,280	61.8	6,550	55.5	6,220	44.5
		50	.0047	7,340	62.6	6,480	55.1	6,050	46.5	5,440	41.7	5,170	33.5
4	8	24	.0197	8,750	134.6	7,550	102.4	7,100	96.5	6,390	72.8	5,750	50.0
5	10	30	.0236	7,000	118.1	6,050	88.6	5,680	83.9	5,110	63.4	4,600	40.6
6	12	36	.0315	5,850	102.4	5,050	78.0	4,720	72.4	4,250	56.7	3,820	34.6

※(1) a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBEH2020-10-TH3 tool:
Cutting depth = .0066 (a_p) × .85 (cutting depth factor for Group 2 hardened steel) × .8 (for closed-area cutting) = .0045 inch

【Note】

① Although basically dry (air blow) cutting is recommended, please use appropriate coolant according to the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Ball Evolution Hard-TH3

Recommended cutting conditions EPDBEH-TH3

High efficiency cutting conditions | High accuracy cutting conditions

Please refer to P.A38 about high efficiency cutting conditions

Inch

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.05	0.1	0.08	.0001	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
		0.2	.0001	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
		0.3	.0001	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
		0.5	.0001	50,000	9.1	50,000	7.9	50,000	7.5	45,000	6.7	42,500	5.1
0.075	0.15	0.12	.0003	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		0.3	.0003	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		0.5	.0002	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		0.75	.0002	50,000	11.0	46,000	9.1	42,000	7.1	37,500	6.3	35,500	4.7
		1	.0001	46,000	9.1	41,400	7.5	37,800	5.9	33,750	5.1	31,950	3.9
0.1	0.2	0.15	.0005	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		0.3	.0005	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		0.5	.0005	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		0.75	.0004	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		1	.0004	50,000	13.0	45,500	10.6	42,000	8.3	37,800	7.5	35,700	5.9
		1.25	.0002	45,900	10.6	40,500	8.7	37,800	6.7	34,020	5.9	32,130	4.7
		1.5	.0002	45,900	10.6	40,500	8.7	37,800	6.7	34,020	5.9	32,130	4.7
		2	.0002	45,900	10.6	40,500	8.7	37,800	6.7	34,020	5.9	32,130	4.7
		2.5	.0002	40,800	8.3	36,000	6.7	33,600	5.1	30,240	4.7	28,560	3.5
		3	.0001	40,800	8.3	36,000	6.7	33,600	5.1	30,240	4.7	28,560	3.5
0.15	0.3	0.25	.0006	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		0.5	.0006	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		0.75	.0006	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		1	.0005	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		1.25	.0004	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		1.5	.0004	50,000	17.7	45,000	15.0	42,000	13.4	37,800	11.8	35,700	9.4
		2	.0003	45,900	14.6	40,500	12.2	37,800	10.6	34,020	9.8	32,130	7.5
		2.5	.0002	45,900	14.6	40,500	12.2	37,800	10.6	34,020	9.8	32,130	7.5
		3	.0002	45,900	14.6	40,500	12.2	37,800	10.6	34,020	9.8	32,130	7.5
		3.5	.0001	36,720	10.2	29,400	8.3	26,400	7.1	23,760	6.3	22,440	5.1
		4	.0001	36,720	10.2	29,400	8.3	26,400	7.1	23,760	6.3	22,440	5.1
0.2	0.4	0.3	.0013	40,800	17.7	36,000	14.2	33,600	13.4	30,240	11.8	28,560	9.4
		0.5	.0013	40,800	17.7	36,000	14.2	33,600	13.4	30,240	11.8	28,560	9.4
		0.75	.0013	40,800	17.7	36,000	14.2	33,600	13.4	30,240	11.8	28,560	9.4
		1	.0013	40,800	17.7	36,000	14.2	33,600	13.4	30,240	11.8	28,560	9.4
		1.5	.0011	40,800	17.7	36,000	14.2	33,600	13.4	30,240	11.8	28,560	9.4
		2	.0009	40,800	17.7	36,000	14.2	33,600	13.4	30,240	11.8	28,560	9.4
		2.5	.0005	36,720	14.2	32,400	11.4	30,240	10.6	27,220	9.8	25,700	7.5
		3	.0004	36,720	14.2	32,400	11.4	30,240	10.6	27,220	9.8	25,700	7.5
		3.5	.0002	36,720	14.2	32,400	11.4	30,240	10.6	27,220	9.8	25,700	7.5
		4	.0002	36,720	14.2	32,400	11.4	30,240	10.6	27,220	9.8	25,700	7.5
		4.5	.0001	32,640	12.2	28,800	9.8	26,880	9.1	24,190	8.3	22,850	6.3
		5	.0001	32,640	12.2	28,800	9.8	26,880	9.1	24,190	8.3	22,850	6.3
0.25	0.5	0.35	.0014	34,000	24.0	30,000	21.3	28,000	18.9	25,200	16.9	23,800	13.0
		0.75	.0014	34,000	24.0	30,000	21.3	28,000	18.9	25,200	16.9	23,800	13.0
		1	.0014	34,000	24.0	30,000	21.3	28,000	18.9	25,200	16.9	23,800	13.0
		1.5	.0013	34,000	24.0	30,000	21.3	28,000	18.9	25,200	16.9	23,800	13.0
		2	.0011	34,000	24.0	30,000	21.3	28,000	18.9	25,200	16.9	23,800	13.0
		2.5	.0010	30,600	19.7	27,000	17.3	25,200	15.4	22,680	13.8	21,420	10.6
		3	.0009	30,600	19.7	27,000	17.3	25,200	15.4	22,680	13.8	21,420	10.6
		4	.0006	30,600	19.7	27,000	17.3	25,200	15.4	22,680	13.8	21,420	10.6
		5	.0006	30,600	19.7	27,000	17.3	25,200	15.4	22,680	13.8	21,420	10.6
		5.5	.0002	27,200	16.5	24,000	14.6	22,400	12.6	20,160	11.4	19,040	9.1
		6	.0002	27,200	16.5	24,000	14.6	22,400	12.6	20,160	11.4	19,040	9.1
		7	.0002	27,200	16.5	24,000	14.6	22,400	12.6	20,160	11.4	19,040	9.1
		8	.0001	27,200	16.5	24,000	14.6	22,400	12.6	20,160	11.4	19,040	9.1
0.3	0.6	0.4	.0016	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4
		0.75	.0016	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM
0.3	0.6	1	.0016	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4
		1.5	.0015	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4
		2	.0013	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4
		2.5	.0012	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4
		3	.0011	34,000	34.6	30,000	28.3	28,000	22.0	25,200	19.7	23,800	15.4
		3.5	.0009	30,600	29.9	27,000	24.4	25,200	18.9	22,680	16.9	21,420	13.4
		4	.0007	30,600	29.9	27,000	24.4	25,200	18.9	22,680	16.9	21,420	13.4
		4.5	.0007	30,600	28.3	27,000	22.8	25,200	17.7	22,680	16.1	21,420	12.6
		5	.0006	30,600	28.3	27,000	22.8	25,200	17.7	22,680	16.1	21,420	12.6
		5.5	.0006	30,600	28.3	27,000	22.8	25,200	17.7	22,680	16.1	21,420	12.6
		6	.0005	30,600	28.3	27,000	22.8	25,200	17.7	22,680	16.1	21,420	12.6
		7	.0002	27,200	23.6	24,000	19.3	22,400	15.0	20,160	13.4	19,040	10.6
		8	.0002	27,200	23.6	24,000	19.3	22,400	15.0	20,160	13.4	19,040	10.6
		9	.0002	27,200	23.6	24,000	19.3	22,400	15.0	20,160	13.4	19,040	10.6
		10	.0002	23,800	20.9	21,000	16.9	19,600	13.0	17,640	11.8	16,660	9.1
		12	.0001	20,400	16.5	18,000	13.8	16,800	10.6	15,120	9.4	14,280	7.5
0.35	0.7	0.45	.0019	34,000	38.6	30,000	31.9	28,000	26.0	25,200	23.2	23,800	18.1
		2	.0019	34,000	38.6	30,000	31.9	28,000	26.0	25,200	23.2	23,800	18.1
		4	.0011	30,600	33.1	27,000	27.2	25,200	22.0	22,680	20.1	21,420	15.7
		6	.0009	30,600	31.1	27,000	25.6	25,200	21.3	22,680	18.9	21,420	14.6
		8	.0003	27,200	24.8	24,000	20.5	22,400	16.5	20,160	15.0	19,040	11.8
0.4	0.8	0.5	.0031	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		1	.0031	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		1.5	.0031	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		2	.0025	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		2.5	.0024	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		3	.0022	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		4	.0018	34,000	42.9	30,000	35.4	28,000	30.7	25,200	28.0	23,800	21.7
		5	.0014	30,600	34.6	27,000	28.7	25,200	25.2	22,680	22.4	21,420	17.7
		6	.0010	30,600	34.6	27,000	28.7	25,200	25.2	22,680	22.4	21,420	17.7
		8	.0006	27,200	30.7	24,000	25.6	22,400	22.0	20,160	20.1	19,040	15.7
		10	.0003	27,200	29.1	24,000	24.0	22,400	20.9	20,160	18.9	19,040	14.6
		12	.0002	27,200	29.1	24,000	24.0	22,400	20.9	20,160	18.9	19,040	14.6
0.45	0.9	0.6	.0028	32,300	48.0	28,500	39.4	26,600	35.0	23,940	31.5	22,610	24.4
		2	.0028	32,300	48.0	28,500	39.4	26,600	35.0	23,940	31.5	22,610	24.4
		4	.0018	32,300	48.0	28,500	39.4	26,600	35.0	23,940	31.5	22,610	24.4
		6	.0013	29,070	38.6	25,650	31.9	23,940	28.3	21,550	25.6	20,350	20.1
		8	.0009	25,840	34.6	22,800	28.3	21,280	25.2	19,150	22.8	18,090	17.7
0.5	1	0.8	.0035	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		1.5	.0035	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		2	.0031	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		2.5	.0031	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		3	.0031	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		4	.0022	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		5	.0019	30,600	54.3	27,000	44.5	25,200	39.8	22,680	35.8	21,420	28.0
		6	.0013	27,540	44.1	24,300	36.2	22,680	32.3	20,410	28.7	19,280	22.4
		7	.0013	27,540	44.1	24,300	36.2	22,680	32.3	20,410	28.7	19,280	22.4
		8	.0013	27,540	44.1	24,300	36.2	22,680	32.3	20,410	28.7	19,280	22.4
		9	.0009	27,540	44.1	24,300	36.2	22,680	32.3	20,410	28.7	19,280	22.4
		10	.0008	27,540	44.1	24,300	36.2	22,680	32.3	20,410	28.7	19,280	22.4
		12	.0004	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		13	.0004	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		14	.0003	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		16	.0002	24,480	37.0	21,600	30.3	20,160	27.2	18,140	24.4	17,140	18.9
		18	.0002	21,420	30.3	18,900	25.2	17,640	22.0	15,880	20.1	14,990	15.7
		20	.0002	18,360	26.0	16,200	21.3	15,120	18.9	13,610	17.3	12,850	13.4

【Note】 Upon usage, please refer to comments and notes below table on page A45.

Epoch Deep Ball Evolution Hard-TH3

EPDBEH-TH3

High efficiency cuttiing conditions | **High accuracy cuttiing conditions**

Please refer to P.A38 about high efficiency cutting conditions

Inch

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.55	1.1	2	.0031	28,560	51.2	25,200	42.9	23,520	38.2	21,170	34.3	19,990	26.8
		4	.0022	28,560	51.2	25,200	42.9	23,520	38.2	21,170	34.3	19,990	26.8
		6	.0013	26,010	42.9	22,950	36.2	21,420	31.9	19,280	28.7	18,210	22.4
		8	.0013	26,010	42.9	22,950	36.2	21,420	31.9	19,280	28.7	18,210	22.4
		10	.0008	26,010	42.9	22,950	36.2	21,420	31.9	19,280	28.7	18,210	22.4
0.6	1.2	2	.0030	26,150	47.6	23,080	39.4	21,540	35.0	19,380	31.5	18,310	24.4
		3	.0030	26,150	47.6	23,080	39.4	21,540	35.0	19,380	31.5	18,310	24.4
		4	.0025	26,150	47.6	23,080	39.4	21,540	35.0	19,380	31.5	18,310	24.4
		6	.0019	26,150	47.6	23,080	39.4	21,540	35.0	19,380	31.5	18,310	24.4
		8	.0013	24,480	44.7	21,600	37.4	20,160	31.9	18,140	28.7	17,140	22.0
		10	.0011	24,480	43.3	21,600	33.9	20,160	28.7	18,140	25.6	17,140	20.1
		12	.0009	24,480	43.3	21,600	33.9	20,160	28.7	18,140	25.6	17,140	20.1
0.7	1.4	3	.0035	21,420	45.7	18,900	38.6	17,640	34.6	15,880	31.1	14,990	24.4
		8	.0017	21,420	45.7	18,900	38.6	17,640	34.6	15,880	31.1	14,990	24.4
		12	.0011	21,420	40.9	18,900	35.0	17,640	31.1	15,880	28.3	14,990	22.0
		16	.0006	19,040	34.3	16,800	29.1	15,680	26.4	14,110	23.6	13,330	18.5
0.75	1.5	2	.0038	23,800	56.3	21,000	44.5	19,600	38.6	17,640	34.6	16,660	27.2
		2.5	.0038	23,800	56.3	21,000	44.5	19,600	38.6	17,640	34.6	16,660	27.2
		3	.0038	23,800	56.3	21,000	44.5	19,600	38.6	17,640	34.6	16,660	27.2
		4	.0031	23,800	56.3	21,000	44.5	19,600	38.6	17,640	34.6	16,660	27.2
		5	.0031	23,800	56.3	21,000	44.5	19,600	38.6	17,640	34.6	16,660	27.2
		6	.0031	23,800	56.3	21,000	44.5	19,600	38.6	17,640	34.6	16,660	27.2
		8	.0019	21,420	45.7	18,900	36.2	17,640	31.1	15,880	28.3	14,990	22.0
		10	.0019	21,420	45.7	18,900	36.2	17,640	31.1	15,880	28.3	14,990	22.0
		12	.0019	21,420	45.7	18,900	36.2	17,640	31.1	15,880	28.3	14,990	22.0
		14	.0016	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
		16	.0006	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
		18	.0006	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
		20	.0006	19,040	38.2	16,800	30.3	15,680	26.4	14,110	23.6	13,330	18.5
0.8	1.6	4	.0043	22,100	53.9	19,500	46.1	18,200	40.2	16,380	36.2	15,470	28.0
		8	.0035	22,100	53.9	19,500	46.1	18,200	40.2	16,380	36.2	15,470	28.0
		12	.0020	19,890	43.7	17,550	37.4	16,380	32.7	14,740	29.1	13,920	22.8
		16	.0013	19,890	43.7	17,550	37.4	16,380	32.7	14,740	29.1	13,920	22.8
		20	.0006	17,680	36.6	15,600	31.5	14,560	27.2	13,100	24.4	12,380	19.3
0.9	1.8	4	.0058	22,100	61.0	19,500	50.8	18,200	42.9	16,380	38.6	15,470	29.9
		8	.0041	22,100	61.0	19,500	50.8	18,200	42.9	16,380	38.6	15,470	29.9
		12	.0022	19,890	49.2	17,550	40.9	16,380	35.0	14,740	31.5	13,920	24.4
		16	.0014	19,890	49.2	17,550	40.9	16,380	35.0	14,740	31.5	13,920	24.4
		20	.0007	17,680	41.3	15,600	34.6	14,560	29.1	13,100	26.4	12,380	20.5
1	2	2.5	.0063	17,850	63.4	15,750	53.5	14,700	46.5	13,230	41.7	12,500	32.3
		3	.0063	17,850	63.4	15,750	53.5	14,700	46.5	13,230	41.7	12,500	32.3
		4	.0063	17,850	63.4	15,750	53.5	14,700	46.5	13,230	41.7	12,500	32.3
		5	.0063	17,850	63.4	15,750	53.5	14,700	46.5	13,230	41.7	12,500	32.3
		6	.0063	17,850	56.3	15,750	47.2	14,700	41.7	13,230	37.4	12,500	29.1
		8	.0044	17,850	56.3	15,750	47.2	14,700	41.7	13,230	37.4	12,500	29.1
		10	.0044	17,850	50.8	15,750	42.1	14,700	37.0	13,230	33.5	12,500	26.0
		12	.0025	16,070	45.7	14,180	37.8	13,230	33.5	11,910	29.9	11,250	23.2
		13	.0025	16,070	45.7	14,180	37.8	13,230	33.5	11,910	29.9	11,250	23.2
		14	.0025	16,070	45.7	14,180	37.8	13,230	33.5	11,910	29.9	11,250	23.2
		16	.0025	16,070	40.9	14,180	34.3	13,230	29.9	11,910	27.2	11,250	20.9
		18	.0019	16,070	40.9	14,180	34.3	13,230	29.9	11,910	27.2	11,250	20.9
		20	.0016	16,070	40.9	14,180	34.3	13,230	29.9	11,910	27.2	11,250	20.9
		22	.0013	15,170	36.6	13,390	30.3	12,500	26.8	11,250	24.0	10,620	18.9
		25	.0011	14,280	34.3	12,600	28.7	11,760	25.2	10,580	22.8	10,000	17.7
		30	.0005	14,280	34.3	12,600	28.7	11,760	25.2	10,580	22.8	10,000	17.7
		35	.0004	12,500	28.3	11,030	23.6	10,290	20.9	9,260	18.5	8,750	14.6
		40	.0003	10,710	24.4	9,450	20.1	8,820	17.7	7,940	16.1	7,500	12.6

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
1.25	2.5	6	.0079	15,730	66.5	13,880	53.9	12,950	44.5	11,660	39.8	11,070	31.9
		10	.0054	15,730	66.5	13,880	53.9	12,950	44.5	11,660	39.8	11,070	31.9
		15	.0031	14,150	53.9	12,490	43.7	11,660	35.8	10,490	32.3	9,970	26.0
		20	.0025	14,150	53.9	12,490	43.7	11,660	35.8	10,490	32.3	9,970	26.0
		25	.0020	14,150	48.4	12,490	39.4	11,660	32.3	10,490	29.1	9,970	23.2
		30	.0014	12,580	45.3	11,100	36.6	10,360	30.3	9,320	27.2	8,860	21.7
1.5	3	6	.0094	13,600	71.7	12,000	59.4	11,200	52.8	10,080	47.6	9,580	38.2
		8	.0094	13,600	71.7	12,000	59.4	11,200	52.8	10,080	47.6	9,580	38.2
		10	.0066	13,600	71.7	12,000	59.4	11,200	52.8	10,080	47.6	9,580	38.2
		13	.0066	13,600	71.7	12,000	59.4	11,200	52.8	10,080	47.6	9,580	38.2
		16	.0066	13,600	64.6	12,000	53.5	11,200	47.6	10,080	42.9	9,580	34.3
		20	.0038	12,240	58.3	10,800	48.4	10,080	42.9	9,070	38.6	8,620	30.7
		25	.0025	12,240	58.3	10,800	48.4	10,080	42.9	9,070	38.6	8,620	30.7
		30	.0025	12,240	58.3	10,800	48.4	10,080	42.9	9,070	38.6	8,620	30.7
		35	.0020	10,880	48.8	9,600	40.6	8,960	35.8	8,060	32.3	7,660	26.0
1.75	3.5	10	.0085	11,690	69.3	10,310	56.3	9,630	46.5	8,660	41.7	8,230	33.5
		15	.0076	11,690	69.3	10,310	56.3	9,630	46.5	8,660	41.7	8,230	33.5
		25	.0044	10,520	56.3	9,280	45.7	8,660	37.4	7,800	33.9	7,410	26.8
		35	.0028	10,520	56.3	9,280	45.7	8,660	37.4	7,800	33.9	7,410	26.8
		45	.0023	9,350	47.2	8,250	38.6	7,700	31.5	6,930	28.3	6,580	22.8
2	4	8	.0126	9,780	69.3	8,630	57.9	8,050	50.8	7,250	45.7	6,880	36.6
		10	.0126	9,780	69.3	8,630	57.9	8,050	50.8	7,250	45.7	6,880	36.6
		12	.0101	9,780	69.3	8,630	57.9	8,050	50.8	7,250	45.7	6,880	36.6
		13	.0101	9,780	69.3	8,630	57.9	8,050	50.8	7,250	45.7	6,880	36.6
		16	.0088	9,780	69.3	8,630	57.9	8,050	50.8	7,250	45.7	6,880	36.6
		20	.0088	9,780	69.3	8,630	57.9	8,050	50.8	7,250	45.7	6,880	36.6
		25	.0050	8,800	56.3	7,760	46.9	7,250	40.9	6,520	37.0	6,190	29.5
		30	.0050	8,800	56.3	7,760	46.9	7,250	40.9	6,520	37.0	6,190	29.5
		35	.0031	8,800	56.3	7,760	46.9	7,250	40.9	6,520	37.0	6,190	29.5
		40	.0031	8,800	56.3	7,760	46.9	7,250	40.9	6,520	37.0	6,190	29.5
		45	.0025	7,820	47.2	6,900	39.4	6,440	34.6	5,800	31.1	5,510	24.8
		50	.0022	7,820	47.2	6,900	39.4	6,440	34.6	5,800	31.1	5,510	24.8
2.5	5	10	.0154	7,650	60.2	6,750	53.1	6,300	44.5	5,670	40.2	5,390	32.3
		20	.0110	7,650	60.2	6,750	53.1	6,300	44.5	5,670	40.2	5,390	32.3
		25	.0110	7,650	60.2	6,750	53.1	6,300	44.5	5,670	40.2	5,390	32.3
		30	.0063	6,890	54.3	6,080	48.0	5,670	40.2	5,100	36.2	4,850	29.1
		40	.0063	6,890	48.8	6,080	42.9	5,670	36.2	5,100	32.7	4,850	26.0
3	6	12	.0189	7,650	74.4	6,750	60.6	6,300	49.6	5,670	44.5	5,390	35.8
		20	.0157	7,230	65.4	6,380	53.1	5,950	43.7	5,360	39.0	5,090	31.5
		30	.0132	6,800	53.5	6,000	47.2	5,600	39.8	5,040	35.8	4,790	28.7
		50	.0047	6,120	43.3	5,400	38.2	5,040	32.3	4,540	28.7	4,310	23.2
4	8	24	.0197	6,400	66.5	5,720	52.0	4,180	46.1	3,960	34.3	3,760	27.6
5	10	30	.0236	5,100	57.5	4,510	44.5	3,520	39.4	3,190	30.3	3,030	24.4
6	12	36	.0315	4,200	48.8	3,850	39.4	2,640	34.6	2,640	26.0	2,510	20.9

※(1) a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBEH2020-10-TH3 tool:
Cutting depth = .0044 (a_p) × .85 (cutting depth factor for Group 2 hardened steel) × .8 (for closed-area cutting) = .003 inch

【Note】

① Although basically dry (air blow) cutting is recommended, please use appropriate coolant according to the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Ball Evolution Hard-TH3

Recommended cutting conditions EPDBEH-TH3

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A50 about high accuracy cutting conditions

Metric

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.05	0.1	0.08	0.006	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
		0.2	0.006	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
		0.3	0.005	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
		0.5	0.003	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
0.075	0.15	0.12	0.009	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		0.3	0.009	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		0.5	0.008	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		0.75	0.007	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		1	0.005	46,000	230	41,400	190	37,800	150	33,750	130	31,950	100
0.1	0.2	0.15	0.016	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		0.3	0.016	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		0.5	0.016	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		0.75	0.014	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		1	0.011	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		1.25	0.009	45,900	270	40,500	220	37,800	170	34,020	150	32,130	120
		1.5	0.006	45,900	270	40,500	220	37,800	170	34,020	150	32,130	120
		2	0.006	45,900	270	40,500	220	37,800	170	34,020	150	32,130	120
		2.5	0.005	40,800	210	36,000	170	33,600	130	30,240	120	28,560	90
		3	0.003	40,800	210	36,000	170	33,600	130	30,240	120	28,560	90
0.15	0.3	0.25	0.022	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		0.5	0.022	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		0.75	0.019	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		1	0.017	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		1.25	0.015	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		1.5	0.013	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		2	0.01	45,900	370	40,500	310	37,800	270	34,020	250	32,130	190
		2.5	0.008	45,900	370	40,500	310	37,800	270	34,020	250	32,130	190
		3	0.006	45,900	370	40,500	310	37,800	270	34,020	250	32,130	190
		3.5	0.004	36,720	260	29,400	210	26,400	180	23,760	160	22,440	130
		4	0.003	36,720	260	29,400	210	26,400	180	23,760	160	22,440	130
0.2	0.4	0.3	0.034	50,000	770	46,800	660	43,680	610	39,310	550	37,130	430
		0.5	0.034	50,000	770	46,800	660	43,680	610	39,310	550	37,130	430
		0.75	0.034	50,000	770	46,800	660	43,680	610	39,310	550	37,130	430
		1	0.032	50,000	770	46,800	660	43,680	610	39,310	550	37,130	430
		1.5	0.027	50,000	660	46,800	470	43,680	440	39,310	390	37,130	310
		2	0.022	50,000	550	46,800	470	43,680	440	39,310	390	37,130	310
		2.5	0.018	36,720	360	32,400	290	36,290	270	32,660	250	30,850	190
		3	0.013	36,720	360	32,400	290	36,290	270	32,660	250	30,850	190
		3.5	0.01	36,720	360	32,400	290	36,290	270	32,660	250	30,850	190
		4	0.008	36,720	360	32,400	290	36,290	270	32,660	250	30,850	190
		4.5	0.006	32,640	310	28,800	250	26,880	230	24,190	210	22,850	160
		5	0.004	32,640	310	28,800	250	26,880	230	24,190	210	22,850	160
0.25	0.5	0.35	0.036	50,000	1,190	47,130	1,050	43,930	740	39,820	670	37,560	520
		0.75	0.036	50,000	1,190	47,130	1,050	43,930	740	39,820	670	37,560	520
		1	0.036	50,000	1,190	47,130	1,050	43,930	740	39,820	670	37,560	520
		1.5	0.032	50,000	1,190	47,130	1,050	43,930	680	39,820	610	37,560	480
		2	0.028	50,000	960	47,130	840	43,930	680	39,820	610	37,560	480
		2.5	0.026	45,450	650	42,840	570	39,940	500	36,220	450	34,180	350
		3	0.024	45,450	650	42,840	570	39,940	390	36,220	350	34,180	270
		4	0.016	34,970	500	32,950	520	30,730	390	28,540	350	26,290	270
		5	0.014	34,970	500	32,950	520	30,730	390	28,540	350	26,290	270
		5.5	0.012	31,080	420	29,300	370	27,310	320	24,770	290	23,370	230
		6	0.01	31,080	420	29,300	370	27,310	320	24,770	290	23,370	230
		7	0.008	31,080	420	29,300	370	27,310	320	24,770	290	23,370	230
		8	0.006	31,080	420	29,300	370	27,310	320	24,770	290	23,370	230
0.3	0.6	0.4	0.06	50,000	1,950	48,000	1,730	44,800	1,340	40,320	1,210	38,080	940
		0.75	0.06	50,000	1,950	48,000	1,730	44,800	1,340	40,320	1,210	38,080	940

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
0.3	0.6	1	0.06	50,000	1,950	48,000	1,730	44,800	1,340	40,320	1,210	38,080	940
		1.5	0.055	50,000	1,950	48,000	1,730	44,800	1,340	40,320	1,210	38,080	940
		2	0.05	50,000	1,950	48,000	1,730	44,800	1,340	40,320	1,210	38,080	940
		2.5	0.036	50,000	1,560	48,000	1,380	44,800	990	40,320	890	38,080	690
		3	0.033	50,000	1,560	48,000	1,380	44,800	990	40,320	890	38,080	690
		3.5	0.028	48,960	1,450	43,200	1,180	40,320	840	36,290	760	34,270	590
		4	0.021	48,960	1,450	43,200	1,180	40,320	770	36,290	690	34,270	540
		4.5	0.018	45,900	1,070	40,500	880	37,800	680	34,020	610	32,130	480
		5	0.016	39,780	930	35,100	760	32,760	590	29,480	530	27,850	410
		5.5	0.014	39,780	930	35,100	760	32,760	590	29,480	530	27,850	410
		6	0.012	39,780	930	35,100	760	32,760	590	29,480	530	27,850	410
		7	0.012	27,200	600	24,000	490	22,400	420	20,160	370	19,040	290
		8	0.012	27,200	600	24,000	490	22,400	380	20,160	340	19,040	270
		9	0.01	27,200	600	24,000	490	22,400	380	20,160	340	19,040	270
		10	0.007	23,800	530	21,000	430	19,600	330	17,640	300	16,660	230
		12	0.006	20,400	420	18,000	350	16,800	270	15,120	240	14,280	190
0.35	0.7	0.45	0.073	50,000	2,160	48,000	1,930	44,800	1,190	40,320	1,070	38,080	830
		2	0.073	50,000	2,160	48,000	1,930	44,800	1,190	40,320	1,070	38,080	830
		4	0.033	48,960	1,600	43,200	1,320	43,870	850	39,480	760	37,370	590
		6	0.022	39,780	1,030	35,100	850	35,650	640	32,080	580	30,370	450
		8	0.016	27,200	630	24,000	520	24,370	420	21,940	380	20,760	300
0.4	0.8	0.5	0.12	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		1	0.12	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		1.5	0.12	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		2	0.096	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		2.5	0.088	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		3	0.08	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		4	0.063	50,000	2,400	48,000	2,590	44,800	1,880	40,320	1,690	38,080	1,320
		5	0.047	48,960	2,110	43,200	2,120	40,320	1,520	36,290	1,370	34,270	1,070
		6	0.033	42,840	1,730	37,800	1,430	35,280	1,250	31,750	1,120	29,990	870
		8	0.016	35,360	1,020	31,200	840	29,120	730	26,210	660	24,750	510
		10	0.016	27,200	740	24,000	610	22,400	530	20,160	480	19,040	370
		12	0.01	27,200	740	24,000	610	22,400	530	20,160	480	19,040	370
0.45	0.9	0.6	0.108	50,000	2,820	45,600	2,410	42,560	2,140	38,300	1,930	36,180	1,500
		2	0.108	50,000	2,820	45,600	2,410	42,560	2,140	38,300	1,930	36,180	1,500
		4	0.065	48,450	2,370	42,750	1,960	39,900	1,740	35,910	1,560	33,920	1,220
		6	0.044	40,700	1,520	35,910	1,250	33,520	1,110	30,160	1,000	28,490	780
		8	0.029	31,010	1,050	27,360	870	25,540	770	22,980	690	21,710	540
0.5	1	0.8	0.18	45,900	3,100	43,200	2,720	37,800	2,270	34,020	2,040	32,130	1,590
		1.5	0.18	45,900	3,100	43,200	2,720	37,800	2,270	34,020	2,040	32,130	1,590
		2	0.16	45,900	3,100	43,200	2,720	37,800	2,270	34,020	2,040	32,130	1,590
		2.5	0.16	45,900	3,100	43,200	2,720	37,800	2,270	34,020	2,040	32,130	1,590
		3	0.16	45,900	3,100	43,200	2,720	37,800	2,270	34,020	2,040	32,130	1,590
		4	0.112	45,900	3,100	43,200	2,720	37,800	2,270	34,020	2,040	32,130	1,590
		5	0.072	39,780	2,600	43,200	2,540	32,760	1,840	29,480	1,650	27,850	1,280
		6	0.048	38,560	2,320	38,880	2,350	29,480	1,380	26,540	1,240	25,060	970
		7	0.048	33,050	1,340	31,590	1,320	27,220	1,060	24,490	960	23,130	740
		8	0.048	33,050	1,340	31,590	1,320	27,220	980	24,490	880	23,130	690
		9	0.036	33,050	1,340	31,590	1,320	27,220	980	24,490	880	23,130	690
		10	0.03	33,050	1,340	31,590	1,320	27,220	980	24,490	880	23,130	690
		12	0.02	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		13	0.018	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		14	0.016	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		16	0.012	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		18	0.01	21,420	770	18,900	640	17,640	560	15,880	510	14,990	400
		20	0.008	18,360	660	16,200	540	15,120	480	13,610	440	12,850	340

【Note】 Upon usage, please refer to comments and notes below table on page A49.

Epoch Deep Ball Evolution Hard-TH3

EPDBEH-TH3

High efficiency cuttiing conditions

High accuracy cuttiing conditions

Please refer to P.A50 about high accuracy cutting conditions

Metric

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.55	1.1	2	0.16	42,840	2,930	37,800	2,450	35,280	2,180	31,750	1,960	29,990	1,520
		4	0.112	42,840	2,930	37,800	2,450	35,280	2,180	31,750	1,960	29,990	1,520
		6	0.048	33,810	1,710	29,840	1,430	27,850	1,270	25,060	1,140	23,670	890
		8	0.048	31,210	1,310	27,540	1,100	25,700	980	23,130	880	21,850	680
		10	0.03	31,210	1,310	27,540	1,100	25,700	980	23,130	880	21,850	680
0.6	1.2	2	0.154	39,230	2,720	36,920	2,560	32,310	1,860	29,080	1,670	27,460	1,300
		3	0.154	39,230	2,720	36,920	2,560	32,310	1,860	29,080	1,670	27,460	1,300
		4	0.128	39,230	2,720	36,920	2,560	32,310	1,860	29,080	1,670	27,460	1,300
		6	0.088	39,230	2,720	36,920	2,560	32,310	1,860	29,080	1,670	27,460	1,300
		8	0.048	31,820	2,070	30,240	2,060	26,210	1,050	23,590	940	22,280	730
		10	0.042	29,380	1,320	27,000	1,070	24,190	870	21,770	780	20,560	610
		12	0.036	29,380	1,320	25,920	1,030	24,190	870	21,770	780	20,560	610
0.7	1.4	3	0.158	33,420	2,350	29,480	1,990	27,520	1,790	24,770	1,610	23,390	1,250
		8	0.088	27,850	1,810	24,570	1,530	22,930	1,380	20,640	1,240	19,490	960
		12	0.042	25,700	1,250	22,680	1,060	21,170	950	19,050	860	17,990	670
		16	0.028	19,040	870	16,800	740	15,680	670	14,110	600	13,330	470
0.75	1.5	2	0.192	35,700	3,210	31,500	2,550	29,400	2,210	26,460	1,990	24,990	1,540
		2.5	0.192	35,700	3,210	31,500	2,550	29,400	2,210	26,460	1,990	24,990	1,540
		3	0.192	35,700	3,210	31,500	2,550	29,400	2,210	26,460	1,990	24,990	1,540
		4	0.16	35,700	3,210	31,500	2,550	29,400	2,210	26,460	1,990	24,990	1,540
		5	0.16	35,700	3,210	31,500	2,550	29,400	2,210	26,460	1,990	24,990	1,540
		6	0.16	35,700	3,210	31,500	2,550	29,400	2,210	26,460	1,990	24,990	1,540
		8	0.072	27,850	1,810	24,570	1,430	22,930	1,240	20,640	1,120	19,490	870
		10	0.072	25,700	1,670	22,680	1,320	21,170	1,140	19,050	1,030	17,990	800
		12	0.072	25,700	1,390	22,680	1,100	21,170	950	19,050	860	17,990	670
		14	0.06	22,850	1,170	20,160	930	18,820	800	16,930	720	15,990	560
		16	0.03	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
		18	0.03	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
		20	0.03	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
0.8	1.6	4	0.23	33,110	3,340	29,210	2,850	25,320	2,130	22,780	1,920	21,520	1,490
		8	0.176	30,940	2,490	27,300	2,130	23,660	1,590	21,290	1,430	20,110	1,110
		12	0.078	27,850	2,180	24,570	1,860	21,290	1,290	19,170	1,160	18,100	900
		16	0.048	23,870	1,330	21,060	1,140	19,660	990	17,690	890	16,710	690
		20	0.032	17,680	930	15,600	800	14,560	690	13,100	620	12,380	490
0.9	1.8	4	0.29	28,730	2,410	25,350	2,010	23,660	1,700	21,290	1,530	20,110	1,190
		8	0.208	28,730	2,410	25,350	2,010	23,660	1,700	21,290	1,530	20,110	1,190
		12	0.084	23,870	1,500	21,060	1,250	19,660	1,060	17,690	960	16,710	740
		16	0.054	23,870	1,500	21,060	1,250	19,660	1,060	17,690	960	16,710	740
		20	0.036	17,680	1,050	15,600	880	14,560	740	13,100	670	12,380	520
1	2	2.5	0.32	26,780	3,620	23,630	3,050	22,050	2,650	19,850	2,380	18,740	1,850
		3	0.32	26,780	3,620	23,630	3,050	22,050	2,650	19,850	2,380	18,740	1,850
		4	0.32	26,780	3,620	23,630	3,050	22,050	2,650	19,850	2,380	18,740	1,850
		5	0.32	26,780	3,620	23,630	3,050	22,050	2,650	19,850	2,380	18,740	1,850
		6	0.32	26,780	3,210	23,630	2,690	22,050	2,380	19,850	2,140	18,740	1,670
		8	0.224	26,780	3,210	23,630	2,690	22,050	2,380	19,850	2,140	18,740	1,670
		10	0.168	24,990	2,700	22,050	2,250	19,110	1,470	17,200	1,320	16,240	1,030
		12	0.096	22,490	2,430	19,850	2,050	17,200	1,320	15,480	1,190	14,620	930
		13	0.096	22,490	2,430	19,850	2,020	15,880	1,020	14,290	920	13,500	710
		14	0.096	22,490	2,110	18,430	1,630	15,880	1,020	14,290	920	13,500	710
		16	0.096	20,890	1,350	18,430	1,470	15,880	910	14,290	820	13,500	640
		18	0.072	19,280	1,250	18,430	1,350	15,880	910	14,290	820	13,500	640
		20	0.06	19,280	1,250	18,430	1,130	15,880	910	14,290	820	13,500	640
		22	0.04	15,170	930	13,390	770	14,990	820	13,500	730	12,750	570
		25	0.04	14,280	870	12,600	730	14,110	770	12,700	690	12,000	540
		30	0.024	14,280	870	12,600	730	14,110	770	12,700	690	12,000	540
		35	0.02	12,500	720	11,030	600	10,290	530	9,260	470	8,750	370
		40	0.018	10,710	620	9,450	510	8,820	450	7,940	410	7,500	320

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
1.25	2.5	6	0.4	23,590	3,800	20,810	3,090	19,430	2,530	17,480	2,280	16,610	1,820
		10	0.272	23,590	3,800	20,810	3,090	19,430	2,530	17,480	2,280	16,610	1,820
		15	0.12	18,400	2,130	16,230	2,020	15,150	1,420	13,640	1,280	12,950	1,020
		20	0.096	16,980	1,640	16,230	1,450	13,990	1,090	12,590	980	11,960	790
		25	0.078	16,980	1,480	14,990	1,200	13,990	980	12,590	880	11,960	710
		30	0.044	12,580	1,150	11,100	930	10,360	770	9,320	690	8,860	550
1.5	3	6	0.48	20,400	4,100	18,000	3,400	16,800	3,020	15,120	2,720	14,360	2,180
		8	0.48	20,400	4,100	18,000	3,400	16,800	3,020	15,120	2,720	14,360	2,180
		10	0.336	20,400	4,100	18,000	3,400	16,800	3,020	15,120	2,720	14,360	2,180
		13	0.252	19,040	3,060	16,800	2,540	15,680	2,260	14,110	2,030	13,410	1,630
		16	0.252	19,040	2,760	16,800	2,290	14,560	1,890	13,100	1,700	12,450	1,360
		20	0.144	15,910	1,920	14,040	1,590	12,100	1,310	10,890	1,180	10,340	940
		25	0.096	15,910	1,920	14,040	1,590	12,100	1,310	10,890	1,180	10,340	940
		30	0.096	14,690	1,770	12,960	1,470	12,100	1,310	10,890	1,180	10,340	940
		35	0.064	10,880	1,240	9,600	1,030	10,750	1,100	9,680	990	9,190	790
1.75	3.5	10	0.328	15,190	2,750	13,410	2,240	12,510	1,830	11,260	1,650	10,700	1,320
		15	0.288	15,190	2,750	13,410	2,240	12,510	1,830	11,260	1,650	10,700	1,320
		25	0.168	12,620	1,710	11,140	1,390	10,400	1,140	9,360	1,030	8,890	820
		35	0.072	12,620	1,710	11,140	1,390	10,400	1,140	9,360	1,030	8,890	820
		45	0.072	9,350	1,200	8,250	980	7,700	800	6,930	720	6,580	580
2	4	8	0.48	14,660	3,960	12,940	3,300	12,080	2,900	10,870	2,610	10,320	2,090
		10	0.48	14,660	3,960	12,940	3,300	12,080	2,900	10,870	2,610	10,320	2,090
		12	0.384	14,660	3,960	12,940	3,300	12,080	2,900	10,870	2,610	10,320	2,090
		13	0.384	14,660	3,960	12,940	3,300	12,080	2,900	10,870	2,610	10,320	2,090
		16	0.336	14,660	3,960	12,940	3,300	12,080	2,900	10,870	2,610	10,320	2,090
		20	0.336	12,710	2,750	11,210	2,290	10,470	2,010	9,420	1,810	8,950	1,450
		25	0.192	11,440	2,220	10,090	2,160	9,420	1,630	8,480	1,460	8,050	1,170
		30	0.128	10,560	1,710	9,320	1,430	8,690	1,250	7,820	1,130	7,430	900
		35	0.08	10,560	1,710	9,320	1,430	8,690	1,250	7,820	1,130	7,430	900
		40	0.08	10,560	1,710	9,320	1,430	8,690	1,250	7,820	1,130	7,430	900
		45	0.08	7,820	1,200	6,900	1,000	6,440	880	5,800	790	5,510	630
		50	0.08	7,820	1,200	6,900	1,000	6,440	880	5,800	790	5,510	630
2.5	5	10	0.584	10,710	3,210	9,450	2,840	8,820	2,380	7,940	2,140	7,540	1,710
		20	0.42	10,710	3,210	9,450	2,840	8,820	2,380	7,940	2,140	7,540	1,710
		25	0.42	9,950	2,980	8,780	2,630	8,190	2,210	7,370	1,990	7,000	1,590
		30	0.24	8,950	2,690	7,900	2,370	7,370	1,990	6,630	1,790	6,300	1,430
		40	0.16	8,260	1,490	7,290	1,310	6,800	1,100	6,120	990	5,820	790
3	6	12	0.48	11,480	4,250	10,130	3,460	9,450	2,840	8,510	2,550	8,080	2,040
		20	0.4	10,840	3,730	9,560	3,030	8,930	2,490	8,030	2,240	7,630	1,790
		30	0.336	8,840	2,120	7,800	2,030	7,280	1,570	6,550	1,410	6,220	1,130
		50	0.12	7,340	1,590	6,480	1,400	6,050	1,180	5,440	1,060	5,170	850
4	8	24	0.5	8,750	3,420	7,550	2,600	7,100	2,450	6,390	1,850	5,750	1,270
5	10	30	0.6	7,000	3,000	6,050	2,250	5,680	2,130	5,110	1,610	4,600	1,030
6	12	36	0.8	5,850	2,600	5,050	1,980	4,720	1,840	4,250	1,440	3,820	880

※(1) a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBEH2020-10-TH3 tool:
Cutting depth = 0.168 (a_p) × 0.85 (cutting depth factor for Group 2 hardened steel) × 0.8 (for closed-area cutting) = 0.11mm

【Note】

① Although basically dry (air blow) cutting is recommended, please use appropriate coolant according to the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Ball Evolution Hard-TH3

Recommended cutting conditions EPDBEH-TH3

High efficiency cutting conditions | High accuracy cutting conditions

Please refer to P.A46 about high efficiency cutting conditions

Metric

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.05	0.1	0.08	0.003	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
		0.2	0.003	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
		0.3	0.002	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
		0.5	0.002	50,000	230	50,000	200	50,000	190	45,000	170	42,500	130
0.075	0.15	0.12	0.007	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		0.3	0.007	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		0.5	0.006	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		0.75	0.005	50,000	280	46,000	230	42,000	180	37,500	160	35,500	120
		1	0.003	46,000	230	41,400	190	37,800	150	33,750	130	31,950	100
0.1	0.2	0.15	0.012	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		0.3	0.012	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		0.5	0.012	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		0.75	0.01	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		1	0.009	50,000	330	45,500	270	42,000	210	37,800	190	35,700	150
		1.25	0.006	45,900	270	40,500	220	37,800	170	34,020	150	32,130	120
		1.5	0.006	45,900	270	40,500	220	37,800	170	34,020	150	32,130	120
		2	0.005	45,900	270	40,500	220	37,800	170	34,020	150	32,130	120
		2.5	0.004	40,800	210	36,000	170	33,600	130	30,240	120	28,560	90
		3	0.002	40,800	210	36,000	170	33,600	130	30,240	120	28,560	90
0.15	0.3	0.25	0.016	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		0.5	0.016	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		0.75	0.014	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		1	0.013	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		1.25	0.011	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		1.5	0.01	50,000	450	45,000	380	42,000	340	37,800	300	35,700	240
		2	0.007	45,900	370	40,500	310	37,800	270	34,020	250	32,130	190
		2.5	0.006	45,900	370	40,500	310	37,800	270	34,020	250	32,130	190
		3	0.005	45,900	370	40,500	310	37,800	270	34,020	250	32,130	190
		3.5	0.003	36,720	260	29,400	210	26,400	180	23,760	160	22,440	130
		4	0.002	36,720	260	29,400	210	26,400	180	23,760	160	22,440	130
0.2	0.4	0.3	0.034	40,800	450	36,000	360	33,600	340	30,240	300	28,560	240
		0.5	0.034	40,800	450	36,000	360	33,600	340	30,240	300	28,560	240
		0.75	0.034	40,800	450	36,000	360	33,600	340	30,240	300	28,560	240
		1	0.032	40,800	450	36,000	360	33,600	340	30,240	300	28,560	240
		1.5	0.027	40,800	450	36,000	360	33,600	340	30,240	300	28,560	240
		2	0.022	40,800	450	36,000	360	33,600	340	30,240	300	28,560	240
		2.5	0.013	36,720	360	32,400	290	30,240	270	27,220	250	25,700	190
		3	0.009	36,720	360	32,400	290	30,240	270	27,220	250	25,700	190
		3.5	0.006	36,720	360	32,400	290	30,240	270	27,220	250	25,700	190
		4	0.004	36,720	360	32,400	290	30,240	270	27,220	250	25,700	190
		4.5	0.003	32,640	310	28,800	250	26,880	230	24,190	210	22,850	160
		5	0.002	32,640	310	28,800	250	26,880	230	24,190	210	22,850	160
0.25	0.5	0.35	0.036	34,000	610	30,000	540	28,000	480	25,200	430	23,800	330
		0.75	0.036	34,000	610	30,000	540	28,000	480	25,200	430	23,800	330
		1	0.036	34,000	610	30,000	540	28,000	480	25,200	430	23,800	330
		1.5	0.032	34,000	610	30,000	540	28,000	480	25,200	430	23,800	330
		2	0.028	34,000	610	30,000	540	28,000	480	25,200	430	23,800	330
		2.5	0.026	30,600	500	27,000	440	25,200	390	22,680	350	21,420	270
		3	0.024	30,600	500	27,000	440	25,200	390	22,680	350	21,420	270
		4	0.016	30,600	500	27,000	440	25,200	390	22,680	350	21,420	270
		5	0.014	30,600	500	27,000	440	25,200	390	22,680	350	21,420	270
		5.5	0.006	27,200	420	24,000	370	22,400	320	20,160	290	19,040	230
		6	0.005	27,200	420	24,000	370	22,400	320	20,160	290	19,040	230
		7	0.004	27,200	420	24,000	370	22,400	320	20,160	290	19,040	230
		8	0.003	27,200	420	24,000	370	22,400	320	20,160	290	19,040	230
0.3	0.6	0.4	0.04	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390
		0.75	0.04	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
0.3	0.6	**1**	0.04	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390
		1.5	0.038	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390
		2	0.034	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390
		2.5	0.03	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390
		3	0.027	34,000	880	30,000	720	28,000	560	25,200	500	23,800	390
		3.5	0.023	30,600	760	27,000	620	25,200	480	22,680	430	21,420	340
		4	0.019	30,600	760	27,000	620	25,200	480	22,680	430	21,420	340
		4.5	0.018	30,600	720	27,000	580	25,200	450	22,680	410	21,420	320
		5	0.016	30,600	720	27,000	580	25,200	450	22,680	410	21,420	320
		5.5	0.014	30,600	720	27,000	580	25,200	450	22,680	410	21,420	320
		6	0.012	30,600	720	27,000	580	25,200	450	22,680	410	21,420	320
		7	0.006	27,200	600	24,000	490	22,400	380	20,160	340	19,040	270
		8	0.006	27,200	600	24,000	490	22,400	380	20,160	340	19,040	270
		9	0.005	27,200	600	24,000	490	22,400	380	20,160	340	19,040	270
		10	0.004	23,800	530	21,000	430	19,600	330	17,640	300	16,660	230
		12	0.003	20,400	420	18,000	350	16,800	270	15,120	240	14,280	190
0.35	0.7	**0.45**	0.049	34,000	980	30,000	810	28,000	660	25,200	590	23,800	460
		2	0.049	34,000	980	30,000	810	28,000	660	25,200	590	23,800	460
		4	0.027	30,600	840	27,000	690	25,200	560	22,680	510	21,420	400
		6	0.022	30,600	790	27,000	650	25,200	540	22,680	480	21,420	370
		8	0.008	27,200	630	24,000	520	22,400	420	20,160	380	19,040	300
0.4	0.8	**0.5**	0.08	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		1	0.08	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		1.5	0.08	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		2	0.064	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		2.5	0.06	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		3	0.055	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		4	0.045	34,000	1,090	30,000	900	28,000	780	25,200	710	23,800	550
		5	0.036	30,600	880	27,000	730	25,200	640	22,680	570	21,420	450
		6	0.026	30,600	880	27,000	730	25,200	640	22,680	570	21,420	450
		8	0.016	27,200	780	24,000	650	22,400	560	20,160	510	19,040	400
		10	0.008	27,200	740	24,000	610	22,400	530	20,160	480	19,040	370
		12	0.006	27,200	740	24,000	610	22,400	530	20,160	480	19,040	370
0.45	0.9	**0.6**	0.072	32,300	1,220	28,500	1,000	26,600	890	23,940	800	22,610	620
		2	0.072	32,300	1,220	28,500	1,000	26,600	890	23,940	800	22,610	620
		4	0.046	32,300	1,220	28,500	1,000	26,600	890	23,940	800	22,610	620
		6	0.034	29,070	980	25,650	810	23,940	720	21,550	650	20,350	510
		8	0.024	25,840	880	22,800	720	21,280	640	19,150	580	18,090	450
0.5	1	**0.8**	0.09	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		1.5	0.09	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		2	0.08	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		2.5	0.08	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		3	0.08	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		4	0.056	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		5	0.048	30,600	1,380	27,000	1,130	25,200	1,010	22,680	910	21,420	710
		6	0.032	27,540	1,120	24,300	920	22,680	820	20,410	730	19,280	570
		7	0.032	27,540	1,120	24,300	920	22,680	820	20,410	730	19,280	570
		8	0.032	27,540	1,120	24,300	920	22,680	820	20,410	730	19,280	570
		9	0.024	27,540	1,120	24,300	920	22,680	820	20,410	730	19,280	570
		10	0.02	27,540	1,120	24,300	920	22,680	820	20,410	730	19,280	570
		12	0.01	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		13	0.009	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		14	0.008	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		16	0.006	24,480	940	21,600	770	20,160	690	18,140	620	17,140	480
		18	0.005	21,420	770	18,900	640	17,640	560	15,880	510	14,990	400
		20	0.004	18,360	660	16,200	540	15,120	480	13,610	440	12,850	340

【Note】 Upon usage, please refer to comments and notes below table on page A53.

Epoch Deep Ball Evolution Hard-TH3

EPDBEH-TH3

High efficiency cuttiing conditions | **High accuracy cuttiing conditions**

Please refer to P.A46 about high efficiency cutting conditions

Metric

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
0.55	1.1	2	0.08	28,560	1,300	25,200	1,090	23,520	970	21,170	870	19,990	680
		4	0.056	28,560	1,300	25,200	1,090	23,520	970	21,170	870	19,990	680
		6	0.032	26,010	1,090	22,950	920	21,420	810	19,280	730	18,210	570
		8	0.032	26,010	1,090	22,950	920	21,420	810	19,280	730	18,210	570
		10	0.02	26,010	1,090	22,950	920	21,420	810	19,280	730	18,210	570
0.6	1.2	2	0.077	26,150	1,210	23,080	1,000	21,540	890	19,380	800	18,310	620
		3	0.077	26,150	1,210	23,080	1,000	21,540	890	19,380	800	18,310	620
		4	0.064	26,150	1,210	23,080	1,000	21,540	890	19,380	800	18,310	620
		6	0.048	26,150	1,210	23,080	1,000	21,540	890	19,380	800	18,310	620
		8	0.032	24,480	1,135	21,600	950	20,160	810	18,140	730	17,140	560
		10	0.028	24,480	1,100	21,600	860	20,160	730	18,140	650	17,140	510
		12	0.024	24,480	1,100	21,600	860	20,160	730	18,140	650	17,140	510
0.7	1.4	3	0.088	21,420	1,160	18,900	980	17,640	880	15,880	790	14,990	620
		8	0.044	21,420	1,160	18,900	980	17,640	880	15,880	790	14,990	620
		12	0.028	21,420	1,040	18,900	890	17,640	790	15,880	720	14,990	560
		16	0.014	19,040	870	16,800	740	15,680	670	14,110	600	13,330	470
0.75	1.5	2	0.096	23,800	1,430	21,000	1,130	19,600	980	17,640	880	16,660	690
		2.5	0.096	23,800	1,430	21,000	1,130	19,600	980	17,640	880	16,660	690
		3	0.096	23,800	1,430	21,000	1,130	19,600	980	17,640	880	16,660	690
		4	0.08	23,800	1,430	21,000	1,130	19,600	980	17,640	880	16,660	690
		5	0.08	23,800	1,430	21,000	1,130	19,600	980	17,640	880	16,660	690
		6	0.08	23,800	1,430	21,000	1,130	19,600	980	17,640	880	16,660	690
		8	0.048	21,420	1,160	18,900	920	17,640	790	15,880	720	14,990	560
		10	0.048	21,420	1,160	18,900	920	17,640	790	15,880	720	14,990	560
		12	0.048	21,420	1,160	18,900	920	17,640	790	15,880	720	14,990	560
		14	0.04	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
		16	0.015	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
		18	0.015	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
		20	0.015	19,040	970	16,800	770	15,680	670	14,110	600	13,330	470
0.8	1.6	4	0.11	22,100	1,370	19,500	1,170	18,200	1,020	16,380	920	15,470	710
		8	0.088	22,100	1,370	19,500	1,170	18,200	1,020	16,380	920	15,470	710
		12	0.052	19,890	1,110	17,550	950	16,380	830	14,740	740	13,920	580
		16	0.032	19,890	1,110	17,550	950	16,380	830	14,740	740	13,920	580
		20	0.016	17,680	930	15,600	800	14,560	690	13,100	620	12,380	490
0.9	1.8	4	0.147	22,100	1,550	19,500	1,290	18,200	1,090	16,380	980	15,470	760
		8	0.104	22,100	1,550	19,500	1,290	18,200	1,090	16,380	980	15,470	760
		12	0.056	19,890	1,250	17,550	1,040	16,380	890	14,740	800	13,920	620
		16	0.036	19,890	1,250	17,550	1,040	16,380	890	14,740	800	13,920	620
		20	0.018	17,680	1,050	15,600	880	14,560	740	13,100	670	12,380	520
1	2	2.5	0.16	17,850	1,610	15,750	1,360	14,700	1,180	13,230	1,060	12,500	820
		3	0.16	17,850	1,610	15,750	1,360	14,700	1,180	13,230	1,060	12,500	820
		4	0.16	17,850	1,610	15,750	1,360	14,700	1,180	13,230	1,060	12,500	820
		5	0.16	17,850	1,610	15,750	1,360	14,700	1,180	13,230	1,060	12,500	820
		6	0.16	17,850	1,430	15,750	1,200	14,700	1,060	13,230	950	12,500	740
		8	0.112	17,850	1,430	15,750	1,200	14,700	1,060	13,230	950	12,500	740
		10	0.112	17,850	1,290	15,750	1,070	14,700	940	13,230	850	12,500	660
		12	0.064	16,070	1,160	14,180	960	13,230	850	11,910	760	11,250	590
		13	0.064	16,070	1,160	14,180	960	13,230	850	11,910	760	11,250	590
		14	0.064	16,070	1,160	14,180	960	13,230	850	11,910	760	11,250	590
		16	0.064	16,070	1,040	14,180	870	13,230	760	11,910	690	11,250	530
		18	0.048	16,070	1,040	14,180	870	13,230	760	11,910	690	11,250	530
		20	0.04	16,070	1,040	14,180	870	13,230	760	11,910	690	11,250	530
		22	0.034	15,170	930	13,390	770	12,500	680	11,250	610	10,620	480
		25	0.028	14,280	870	12,600	730	11,760	640	10,580	580	10,000	450
		30	0.012	14,280	870	12,600	730	11,760	640	10,580	580	10,000	450
		35	0.01	12,500	720	11,030	600	10,290	530	9,260	470	8,750	370
		40	0.008	10,710	620	9,450	510	8,820	450	7,940	410	7,500	320

Work material				1		2		3		4		5	
				Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)		Hardened steel (65～68HRC)		Hardened steel (68～72HRC)	
Ratio to standard depth of cut				100%		85%		80%		65%		55%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
1.25	2.5	6	0.2	15,730	1,690	13,880	1,370	12,950	1,130	11,660	1,010	11,070	810
		10	0.136	15,730	1,690	13,880	1,370	12,950	1,130	11,660	1,010	11,070	810
		15	0.08	14,150	1,370	12,490	1,110	11,660	910	10,490	820	9,970	660
		20	0.064	14,150	1,370	12,490	1,110	11,660	910	10,490	820	9,970	660
		25	0.052	14,150	1,230	12,490	1,000	11,660	820	10,490	740	9,970	590
		30	0.035	12,580	1,150	11,100	930	10,360	770	9,320	690	8,860	550
1.5	3	6	0.24	13,600	1,820	12,000	1,510	11,200	1,340	10,080	1,210	9,580	970
		8	0.24	13,600	1,820	12,000	1,510	11,200	1,340	10,080	1,210	9,580	970
		10	0.168	13,600	1,820	12,000	1,510	11,200	1,340	10,080	1,210	9,580	970
		13	0.168	13,600	1,820	12,000	1,510	11,200	1,340	10,080	1,210	9,580	970
		16	0.168	13,600	1,640	12,000	1,360	11,200	1,210	10,080	1,090	9,580	870
		20	0.096	12,240	1,480	10,800	1,230	10,080	1,090	9,070	980	8,620	780
		25	0.064	12,240	1,480	10,800	1,230	10,080	1,090	9,070	980	8,620	780
		30	0.064	12,240	1,480	10,800	1,230	10,080	1,090	9,070	980	8,620	780
		35	0.051	10,880	1,240	9,600	1,030	8,960	910	8,060	820	7,660	660
1.75	3.5	10	0.216	11,690	1,760	10,310	1,430	9,630	1,180	8,660	1,060	8,230	850
		15	0.192	11,690	1,760	10,310	1,430	9,630	1,180	8,660	1,060	8,230	850
		25	0.112	10,520	1,430	9,280	1,160	8,660	950	7,800	860	7,410	680
		35	0.072	10,520	1,430	9,280	1,160	8,660	950	7,800	860	7,410	680
		45	0.058	9,350	1,200	8,250	980	7,700	800	6,930	720	6,580	580
2	4	8	0.32	9,780	1,760	8,630	1,470	8,050	1,290	7,250	1,160	6,880	930
		10	0.32	9,780	1,760	8,630	1,470	8,050	1,290	7,250	1,160	6,880	930
		12	0.256	9,780	1,760	8,630	1,470	8,050	1,290	7,250	1,160	6,880	930
		13	0.256	9,780	1,760	8,630	1,470	8,050	1,290	7,250	1,160	6,880	930
		16	0.224	9,780	1,760	8,630	1,470	8,050	1,290	7,250	1,160	6,880	930
		20	0.224	9,780	1,760	8,630	1,470	8,050	1,290	7,250	1,160	6,880	930
		25	0.128	8,800	1,430	7,760	1,190	7,250	1,040	6,520	940	6,190	750
		30	0.128	8,800	1,430	7,760	1,190	7,250	1,040	6,520	940	6,190	750
		35	0.08	8,800	1,430	7,760	1,190	7,250	1,040	6,520	940	6,190	750
		40	0.08	8,800	1,430	7,760	1,190	7,250	1,040	6,520	940	6,190	750
		45	0.064	7,820	1,200	6,900	1,000	6,440	880	5,800	790	5,510	630
		50	0.056	7,820	1,200	6,900	1,000	6,440	880	5,800	790	5,510	630
2.5	5	10	0.392	7,650	1,530	6,750	1,350	6,300	1,130	5,670	1,020	5,390	820
		20	0.28	7,650	1,530	6,750	1,350	6,300	1,130	5,670	1,020	5,390	820
		25	0.28	7,650	1,530	6,750	1,350	6,300	1,130	5,670	1,020	5,390	820
		30	0.16	6,890	1,380	6,080	1,220	5,670	1,020	5,100	920	4,850	740
		40	0.16	6,890	1,240	6,080	1,090	5,670	920	5,100	830	4,850	660
3	6	12	0.48	7,650	1,890	6,750	1,540	6,300	1,260	5,670	1,130	5,390	910
		20	0.4	7,230	1,660	6,380	1,350	5,950	1,110	5,360	990	5,090	800
		30	0.336	6,800	1,360	6,000	1,200	5,600	1,010	5,040	910	4,790	730
		50	0.12	6,120	1,100	5,400	970	5,040	820	4,540	730	4,310	590
4	8	24	0.5	6,400	1,690	5,720	1,320	4,180	1,170	3,960	870	3,760	700
5	10	30	0.6	5,100	1,460	4,510	1,130	3,520	1,000	3,190	770	3,030	620
6	12	36	0.8	4,200	1,240	3,850	1,000	2,640	880	2,640	660	2,510	530

※(1) a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBEH2020-10-TH3 tool:
Cutting depth = 0.112 (a_p) × 0.85 (cutting depth factor for Group 2 hardened steel) × 0.8 (for closed-area cutting) = 0.076mm

【Note】

① Although basically dry (air blow) cutting is recommended, please use appropriate coolant according to the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Ball Evolution ATH Coating

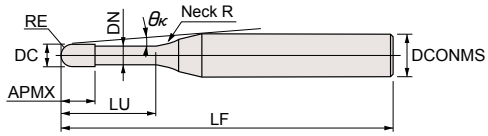
Straight neck

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h5

Improved flute tip shape and neck shape suppresses warping to enable high-accuracy cutting.
Use of ATH and PN coatings further extends tool life.



2 Flutes

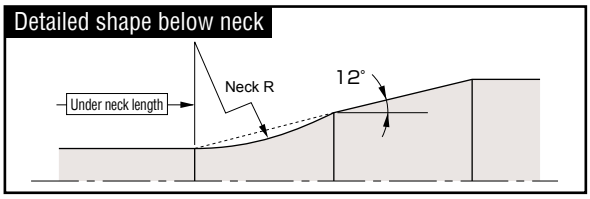
EPDBE2○○○-○○.○○-ATH

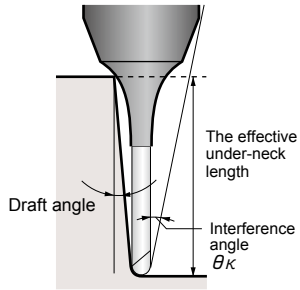
Carbide | ATH | Helix angle 30° | Cutting Conditions A60

Item code	Stock ATH	Size (mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θκ	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDBE2001-0.2-ATH	●	0.05	0.1	0.2	0.08	0.08	45	4	1	11.76	0.35	0.37	0.39	0.41	0.44
EPDBE2001-0.3-ATH	●			0.3	0.08	0.08	45	4	1	11.64	0.46	0.48	0.50	0.52	0.57
EPDBE2001-0.5-ATH	●			0.5	0.08	0.08	45	4	1	11.40	0.67	0.70	0.73	0.76	0.81
EPDBE2002-0.5-ATH	●	0.1	0.2	0.5	0.15	0.17	50	4	1	11.42	0.70	0.72	0.75	0.77	0.82
EPDBE2002-0.75-ATH	●			0.75	0.15	0.17	50	4	1	11.13	0.96	0.99	1.02	1.05	1.11
EPDBE2002-1-ATH	●			1	0.15	0.17	50	4	1	10.86	1.22	1.26	1.30	1.33	1.39
EPDBE2002-1.25-ATH	●			1.25	0.15	0.17	50	4	1	10.60	1.48	1.52	1.57	1.61	1.72
EPDBE2002-1.5-ATH	●			1.5	0.15	0.17	50	4	1	10.35	1.74	1.79	1.84	1.88	2.05
EPDBE2002-2-ATH	●			2	0.15	0.17	50	4	1	9.88	2.25	2.32	2.37	2.45	2.71
EPDBE2002-2.5-ATH	★			2.5	0.15	0.17	50	4	1	9.46	2.77	2.84	2.91	3.05	3.37
EPDBE2002-3-ATH	★			3	0.15	0.17	50	4	1	9.07	3.28	3.37	3.48	3.65	4.04
EPDBE2003-0.5-ATH	●	0.15	0.3	0.5	0.25	0.27	50	4	2	11.47	0.78	0.82	0.86	0.90	0.98
EPDBE2003-0.75-ATH	●			0.75	0.25	0.27	50	4	2	11.17	1.05	1.10	1.15	1.20	1.29
EPDBE2003-1-ATH	●			1	0.25	0.27	50	4	2	10.89	1.31	1.38	1.43	1.49	1.59
EPDBE2003-1.25-ATH	●			1.25	0.25	0.27	50	4	2	10.62	1.58	1.65	1.72	1.78	1.89
EPDBE2003-1.5-ATH	●			1.5	0.25	0.27	50	4	2	10.36	1.84	1.92	1.99	2.06	2.18
EPDBE2003-2-ATH	●			2	0.25	0.27	50	4	2	9.88	2.36	2.46	2.55	2.62	2.76
EPDBE2003-2.5-ATH	★			2.5	0.25	0.27	50	4	2	9.45	2.89	3.00	3.10	3.18	3.36
EPDBE2003-3-ATH	★			3	0.25	0.27	50	4	2	9.05	3.41	3.53	3.64	3.73	4.02
EPDBE2004-0.75-ATH	●	0.2	0.4	0.75	0.3	0.37	50	4	2	11.21	1.04	1.09	1.14	1.19	1.28
EPDBE2004-1-ATH	●			1	0.3	0.37	50	4	2	10.91	1.31	1.37	1.43	1.48	1.58
EPDBE2004-1.5-ATH	●			1.5	0.3	0.37	50	4	2	10.37	1.84	1.92	1.99	2.06	2.17
EPDBE2004-2-ATH	●			2	0.3	0.37	50	4	2	9.88	2.36	2.46	2.54	2.62	2.75
EPDBE2004-2.5-ATH	●			2.5	0.3	0.37	50	4	2	9.43	2.89	3.00	3.09	3.18	3.34
EPDBE2004-3-ATH	●			3	0.3	0.37	50	4	2	9.03	3.41	3.53	3.63	3.73	4.01
EPDBE2004-3.5-ATH	★			3.5	0.3	0.37	50	4	2	8.65	3.93	4.06	4.18	4.27	4.67
EPDBE2004-4-ATH	●			4	0.3	0.37	50	4	2	8.30	4.45	4.59	4.71	4.83	5.33
EPDBE2004-4.5-ATH	★			4.5	0.3	0.37	50	4	2	7.99	4.97	5.12	5.25	5.43	6.00
EPDBE2005-1-ATH	●	0.25	0.5	1	0.35	0.47	50	4	2	10.94	1.31	1.37	1.42	1.47	1.57
EPDBE2005-1.5-ATH	●			1.5	0.35	0.47	50	4	2	10.39	1.83	1.91	1.98	2.05	2.17
EPDBE2005-2-ATH	●			2	0.35	0.47	50	4	2	9.88	2.36	2.45	2.54	2.61	2.75
EPDBE2005-2.5-ATH	●			2.5	0.35	0.47	50	4	2	9.42	2.88	2.99	3.09	3.17	3.33
EPDBE2005-3-ATH	●			3	0.35	0.47	50	4	2	9.00	3.41	3.53	3.63	3.72	3.99
EPDBE2005-4-ATH	●			4	0.35	0.47	50	4	2	8.27	4.45	4.59	4.71	4.82	5.32
EPDBE2005-5-ATH	●			5	0.35	0.47	50	4	2	7.64	5.48	5.65	5.78	6.01	6.65
EPDBE2005-5.5-ATH	★			5.5	0.35	0.47	50	4	2	7.36	6.00	6.17	6.31	6.61	7.31
EPDBE2005-6-ATH	●			6	0.35	0.47	50	4	2	7.10	6.52	6.70	6.88	7.21	7.97
EPDBE2005-8-ATH	●			8	0.35	0.47	50	4	2	6.23	8.58	8.79	9.16	9.60	10.63
EPDBE2006-1-ATH	●	0.3	0.6	1	0.4	0.57	50	4	4	10.98	1.44	1.54	1.63	1.71	1.88
EPDBE2006-2-ATH	●			2	0.4	0.57	50	4	4	9.88	2.52	2.66	2.79	2.91	3.13
EPDBE2006-2.5-ATH	●			2.5	0.4	0.57	50	4	4	9.41	3.05	3.22	3.36	3.49	3.73
EPDBE2006-3-ATH	●			3	0.4	0.57	50	4	4	8.98	3.58	3.77	3.93	4.07	4.32
EPDBE2006-3.5-ATH	●			3.5	0.4	0.57	50	4	4	8.58	4.12	4.32	4.49	4.64	4.91
EPDBE2006-4-ATH	●			4	0.4	0.57	50	4	4	8.22	4.64	4.86	5.04	5.20	5.48
EPDBE2006-4.5-ATH	★			4.5	0.4	0.57	50	4	4	7.89	5.17	5.40	5.59	5.76	6.06
EPDBE2006-5-ATH	●			5	0.4	0.57	50	4	4	7.59	5.70	5.94	6.14	6.32	6.63
EPDBE2006-5.5-ATH	★			5.5	0.4	0.57	50	4	4	7.31	6.22	6.48	6.69	6.87	7.29
EPDBE2006-6-ATH	●			6	0.4	0.57	50	4	4	7.04	6.75	7.02	7.23	7.42	7.96
EPDBE2006-7-ATH	★			7	0.4	0.57	50	4	4	6.57	7.79	8.08	8.32	8.52	9.28
EPDBE2006-8-ATH	●			8	0.4	0.57	50	4	4	6.16	8.84	9.15	9.40	9.61	10.61
EPDBE2006-9-ATH	★			9	0.4	0.57	50	4	4	5.79	9.88	10.21	10.47	10.79	11.94
EPDBE2006-10-ATH	●			10	0.4	0.57	50	4	4	5.47	10.92	11.26	11.54	11.99	13.27
EPDBE2006-12-ATH	★			12	0.4	0.57	50	4	4	4.92	12.99	13.37	13.72	14.38	15.92

● : Inventory maintained in US ★ : Inventory maintained in Japan

Detailed shape below neck





【Note】
The effective under-neck length is different from Epoch Deep Ball EPDB. Please recheck the interference region.

EPDBE2○○○-○○.○○-ATH

Item code	Stock ATH	Size (mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDBE2007-2-ATH	★	0.35	0.7	2	0.45	0.67	50	4	4	9.88	2.52	2.66	2.79	2.90	3.12
EPDBE2007-4-ATH	★			4	0.45	0.67	50	4	4	8.18	4.64	4.86	5.04	5.20	5.48
EPDBE2007-6-ATH	★			6	0.45	0.67	50	4	4	6.98	6.74	7.01	7.23	7.42	7.94
EPDBE2007-8-ATH	★			8	0.45	0.67	50	4	4	6.09	8.83	9.14	9.39	9.61	10.60
EPDBE2008-2-ATH	●	0.4	0.8	2	0.5	0.77	50	4	4	9.87	2.51	2.65	2.78	2.89	3.11
EPDBE2008-4-ATH	●			4	0.5	0.77	50	4	4	8.14	4.64	4.85	5.03	5.19	5.47
EPDBE2008-5-ATH	●			5	0.5	0.77	50	4	4	7.48	5.69	5.93	6.13	6.31	6.61
EPDBE2008-6-ATH	●			6	0.5	0.77	50	4	4	6.92	6.74	7.01	7.23	7.41	7.92
EPDBE2008-8-ATH	●			8	0.5	0.77	50	4	4	6.01	8.83	9.14	9.39	9.60	10.58
EPDBE2008-10-ATH	●			10	0.5	0.77	50	4	4	5.32	10.91	11.26	11.53	11.97	13.23
EPDBE2009-2-ATH	★	0.45	0.9	2	0.6	0.87	50	4	4	9.87	2.51	2.65	2.77	2.89	3.10
EPDBE2009-4-ATH	★			4	0.6	0.87	50	4	4	8.09	4.64	4.85	5.03	5.18	5.46
EPDBE2009-6-ATH	★			6	0.6	0.87	50	4	4	6.85	6.74	7.00	7.22	7.41	7.91
EPDBE2009-8-ATH	★			8	0.6	0.87	50	4	4	5.94	8.83	9.14	9.38	9.60	10.56
EPDBE2010-2-ATH	●	0.5	1	2	0.8	0.96	50	4	4	9.84	2.54	2.67	2.79	2.90	3.11
EPDBE2010-3-ATH	●			3	0.8	0.96	50	4	4	8.84	3.61	3.78	3.93	4.06	4.30
EPDBE2010-4-ATH	●			4	0.8	0.96	50	4	4	8.02	4.66	4.87	5.04	5.20	5.47
EPDBE2010-5-ATH	●			5	0.8	0.96	50	4	4	7.34	5.72	5.95	6.14	6.31	6.61
EPDBE2010-6-ATH	●			6	0.8	0.96	50	4	4	6.77	6.76	7.02	7.23	7.42	7.92
EPDBE2010-7-ATH	●			7	0.8	0.96	50	4	4	6.28	7.81	8.09	8.32	8.52	9.25
EPDBE2010-8-ATH	●			8	0.8	0.96	50	4	4	5.85	8.85	9.15	9.40	9.61	10.58
EPDBE2010-9-ATH	●			9	0.8	0.96	50	4	4	5.48	9.89	10.21	10.47	10.78	11.91
EPDBE2010-10-ATH	●			10	0.8	0.96	50	4	4	5.15	10.93	11.27	11.54	11.98	13.23
EPDBE2010-12-ATH	●			12	0.8	0.96	55	4	4	4.60	13.00	13.37	13.72	14.37	15.89
EPDBE2010-13-ATH	●			13	0.8	0.96	55	4	4	4.37	14.04	14.42	14.86	15.57	17.21
EPDBE2010-14-ATH	●			14	0.8	0.96	55	4	4	4.16	15.07	15.47	16.00	16.76	18.54
EPDBE2010-16-ATH	●			16	0.8	0.96	55	4	4	3.79	17.13	17.56	18.28	19.16	21.20
EPDBE2010-18-ATH	★			18	0.8	0.96	60	4	4	3.49	19.19	19.66	20.56	21.55	23.85
EPDBE2010-20-ATH	●			20	0.8	0.96	60	4	4	3.23	21.25	21.84	22.84	23.94	26.51
EPDBE2011-2-ATH	★	0.55	1.1	2	1	1.05	50	4	4	9.81	2.58	2.70	2.81	2.92	3.12
EPDBE2011-4-ATH	★			4	1	1.05	50	4	4	7.95	4.69	4.89	5.06	5.21	5.48
EPDBE2011-6-ATH	★			6	1	1.05	50	4	4	6.68	6.79	7.04	7.25	7.43	7.94
EPDBE2011-8-ATH	★			8	1	1.05	50	4	4	5.76	8.87	9.17	9.41	9.61	10.59
EPDBE2011-10-ATH	★			10	1	1.05	50	4	4	5.06	10.95	11.28	11.55	12.00	13.25
EPDBE2012-4-ATH	●	0.6	1.2	4	1.1	1.15	50	4	4	7.89	4.69	4.88	5.05	5.20	5.47
EPDBE2012-6-ATH	★			6	1.1	1.15	50	4	4	6.60	6.79	7.03	7.24	7.42	7.92
EPDBE2012-8-ATH	●			8	1.1	1.15	50	4	4	5.67	8.87	9.16	9.40	9.61	10.58
EPDBE2012-10-ATH	★			10	1.1	1.15	50	4	4	4.97	10.95	11.28	11.54	11.99	13.23
EPDBE2012-12-ATH	★			12	1.1	1.15	55	4	4	4.43	13.02	13.38	13.73	14.38	15.89
EPDBE2014-8-ATH	●	0.7	1.4	8	1.3	1.34	50	4	4	5.48	8.89	9.18	9.41	9.61	10.58
EPDBE2014-12-ATH	●			12	1.3	1.34	55	4	4	4.24	13.04	13.39	13.74	14.39	15.89
EPDBE2014-16-ATH	★			16	1.3	1.34	55	4	4	3.46	17.16	17.57	18.31	19.17	21.20
EPDBE2015-4-ATH	●	0.75	1.5	4	1.35	1.44	50	4	4	7.68	4.71	4.89	5.06	5.20	5.46
EPDBE2015-6-ATH	●			6	1.35	1.44	50	4	4	6.33	6.81	7.04	7.25	7.42	7.91
EPDBE2015-8-ATH	●			8	1.35	1.44	50	4	4	5.39	8.89	9.17	9.41	9.61	10.56
EPDBE2015-10-ATH	●			10	1.35	1.44	50	4	4	4.68	10.96	11.29	11.55	11.98	13.22
EPDBE2015-12-ATH	●			12	1.35	1.44	55	4	4	4.14	13.03	13.39	13.74	14.38	15.87
EPDBE2015-14-ATH	★			14	1.35	1.44	55	4	4	3.72	15.10	15.48	16.02	16.77	18.52
EPDBE2015-16-ATH	●			16	1.35	1.44	55	4	4	3.77	17.16	17.57	18.30	19.16	21.18
EPDBE2015-18-ATH	●			18	1.35	1.44	60	4	4	3.08	19.22	19.69	20.58	21.56	23.83
EPDBE2015-20-ATH	●			20	1.35	1.44	60	4	4	2.84	21.27	21.87	22.86	23.95	No interference
EPDBE2016-8-ATH	●	0.8	1.6	8	1.4	1.54	50	4	4	5.28	8.89	9.17	9.40	9.60	10.55
EPDBE2016-12-ATH	●			12	1.4	1.54	55	4	4	4.05	13.03	13.39	13.73	14.37	15.85
EPDBE2016-16-ATH	●			16	1.4	1.54	55	4	4	3.28	17.16	17.57	18.29	19.15	21.16
EPDBE2016-20-ATH	●			20	1.4	1.54	60	4	4	2.75	21.27	21.87	22.86	23.94	No interference

Epoch Deep Ball Evolution ATHCoating

EPDBE2○○○-○○.○○-ATH

Item code	Stock	Size (mm)								Interference angle (°)	The effective under-neck length for the various draft angles				
	ATH	Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	θκ	0.5°	1°	1.5°	2°	3°
EPDBE2018-8-ATH	★	0.9	1.8	8	1.6	1.73	50	4	4	5.06	8.91	9.18	9.41	9.61	10.54
EPDBE2018-12-ATH	★			12	1.6	1.73	55	4	4	3.83	13.05	13.40	13.74	14.38	15.85
EPDBE2018-16-ATH	★			16	1.6	1.73	55	4	4	3.09	17.17	17.58	18.31	19.16	21.16
EPDBE2018-20-ATH	★			20	1.6	1.73	60	4	4	2.58	21.28	21.88	22.87	23.95	No interference
EPDBE2020-3-ATH	●	1	2	3	1.7	1.92	50	4	4	8.26	3.71	3.84	3.96	4.07	4.29
EPDBE2020-4-ATH	●			4	1.7	1.92	50	4	4	7.23	4.75	4.92	5.07	5.21	5.45
EPDBE2020-6-ATH	●			6	1.7	1.92	50	4	4	5.78	6.84	7.07	7.26	7.43	7.89
EPDBE2020-8-ATH	●			8	1.7	1.92	50	4	4	4.81	8.92	9.19	9.42	9.61	10.54
EPDBE2020-10-ATH	●			10	1.7	1.92	50	4	4	4.12	11.00	11.30	11.56	11.99	13.20
EPDBE2020-12-ATH	●			12	1.7	1.92	55	4	4	3.61	13.06	13.41	13.76	14.39	15.85
EPDBE2020-13-ATH	●			13	1.7	1.92	55	4	4	3.39	14.10	14.45	14.90	15.58	17.18
EPDBE2020-14-ATH	●			14	1.7	1.92	55	4	4	3.20	15.13	15.50	16.04	16.78	18.51
EPDBE2020-16-ATH	●			16	1.7	1.92	55	4	4	2.88	17.19	17.59	18.32	19.17	No interference
EPDBE2020-18-ATH	●			18	1.7	1.92	60	4	4	2.62	19.24	19.72	20.60	21.57	No interference
EPDBE2020-20-ATH	●			20	1.7	1.92	60	4	4	2.40	21.30	21.90	22.88	23.96	No interference
EPDBE2020-22-ATH	●			22	1.7	1.92	60	4	4	2.22	23.35	24.08	25.16	26.35	No interference
EPDBE2020-25-ATH	●			25	1.7	1.92	65	4	4	1.99	26.42	27.35	28.58	No interference	No interference
EPDBE2020-30-ATH	●			30	1.7	1.92	70	4	4	1.70	31.53	32.80	34.29	No interference	No interference
EPDBE2020-35-ATH	★			35	1.7	1.92	75	4	4	1.48	36.65	38.24	No interference	No interference	No interference
EPDBE2020-40-ATH	★			40	1.7	1.92	80	4	4	1.31	41.86	43.69	No interference	No interference	No interference
EPDBE2025-6-ATH	★	1.25	2.5	6	2	2.4	50	4	4	5.04	6.88	7.09	7.27	7.43	7.87
EPDBE2025-10-ATH	★			10	2	2.4	50	4	4	3.43	11.03	11.32	11.56	12.00	13.18
EPDBE2025-15-ATH	★			15	2	2.4	55	4	4	2.46	16.18	16.56	17.20	17.98	No interference
EPDBE2025-20-ATH	★			20	2	2.4	60	4	4	1.91	21.32	21.93	22.90	No interference	No interference
EPDBE2025-25-ATH	★			25	2	2.4	65	4	4	1.57	26.44	27.38	28.60	No interference	No interference
EPDBE2025-30-ATH	★			30	2	2.4	70	4	4	1.33	31.55	32.82	No interference	No interference	No interference
EPDBE2030-8-ATH	●	1.5	3	8	2.5	2.88	55	6	4	6.19	8.99	9.23	9.44	9.62	10.51
EPDBE2030-10-ATH	●			10	2.5	2.88	55	6	4	5.41	11.06	11.34	11.57	12.01	13.16
EPDBE2030-13-ATH	●			13	2.5	2.88	60	6	4	4.56	14.15	14.48	14.94	15.60	17.15
EPDBE2030-16-ATH	●			16	2.5	2.88	60	6	4	3.93	17.24	17.61	18.36	19.19	21.13
EPDBE2030-20-ATH	●			20	2.5	2.88	65	6	4	3.33	21.34	21.96	22.92	23.97	26.44
EPDBE2030-25-ATH	●			25	2.5	2.88	70	6	4	2.79	26.46	27.41	28.62	29.96	No interference
EPDBE2030-30-ATH	●			30	2.5	2.88	75	6	4	2.40	31.57	32.85	34.32	35.94	No interference
EPDBE2030-35-ATH	●			35	2.5	2.88	80	6	4	2.11	36.72	38.30	40.03	41.92	No interference
EPDBE2035-15-ATH	★	1.75	3.5	15	2.75	3.35	60	6	4	3.68	16.25	16.60	17.26	18.03	19.81
EPDBE2035-25-ATH	★			25	2.75	3.35	70	6	4	2.43	26.49	27.46	28.67	29.99	No interference
EPDBE2035-35-ATH	★			35	2.75	3.35	80	6	4	1.82	36.79	38.36	40.07	No interference	No interference
EPDBE2035-45-ATH	★			45	2.75	3.35	90	6	4	1.45	47.22	49.25	No interference	No interference	No interference
EPDBE2040-10-ATH	●	2	4	10	3	3.85	55	6	4	4.38	11.10	11.36	11.58	12.00	13.10
EPDBE2040-13-ATH	●			13	3	3.85	60	6	4	3.57	14.19	14.50	14.95	15.59	17.08
EPDBE2040-16-ATH	●			16	3	3.85	60	6	4	3.01	17.27	17.63	18.37	19.18	No interference
EPDBE2040-20-ATH	●			20	3	3.85	65	6	4	2.49	21.37	21.99	22.93	23.96	No interference
EPDBE2040-25-ATH	●			25	3	3.85	70	6	4	2.05	26.49	27.44	28.63	29.95	No interference
EPDBE2040-30-ATH	●			30	3	3.85	75	6	4	1.74	31.59	32.89	34.34	No interference	No interference
EPDBE2040-35-ATH	●			35	3	3.85	80	6	4	1.51	36.78	38.33	40.04	No interference	No interference
EPDBE2040-40-ATH	●			40	3	3.85	80	6	4	1.34	41.99	43.78	No interference	No interference	No interference
EPDBE2040-45-ATH	●			45	3	3.85	90	6	4	1.20	47.20	49.23	No interference	No interference	No interference
EPDBE2040-50-ATH	●			50	3	3.85	100	6	4	1.08	52.42	54.68	No interference	No interference	No interference
EPDBE2050-20-ATH	●	2.5	5	20	3.5	4.85	65	6	4	1.42	21.36	21.95	No interference	No interference	No interference
EPDBE2050-25-ATH	●			25	3.5	4.85	70	6	4	1.14	26.48	27.39	No interference	No interference	No interference
EPDBE2050-30-ATH	●			30	3.5	4.85	75	6	4	0.95	31.58	No interference	No interference	No interference	No interference
EPDBE2050-40-ATH	●			40	3.5	4.85	80	6	4	0.72	41.97	No interference	No interference	No interference	No interference
EPDBE2060-12-ATH	●	3	6	12	6	5.85	60	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDBE2060-20-ATH	●			20	6	5.85	65	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDBE2060-30-ATH	●			30	6	5.85	75	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDBE2060-50-ATH	●			50	6	5.85	100	6	-	0	No interference	No interference	No interference	No interference	No interference

●：Inventory maintained in US ★：Inventory maintained in Japan

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	○	○	◎	○	○

Epoch Deep Ball Evolution PN Coating

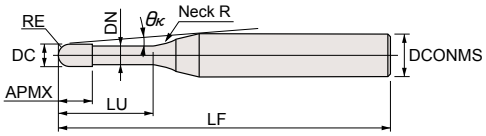
Straight neck

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h5

Improved flute tip shape and neck shape suppresses warping to enable high-accuracy cutting.
Use of ATH and PN coatings further extends tool life.



2 Flutes

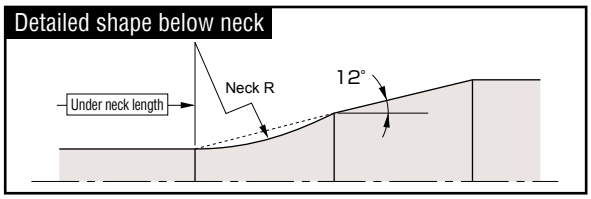
EPDBE2○○○-○○.○○-PN

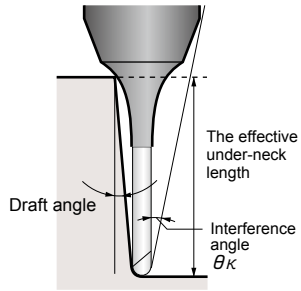
Carbide | PN | Helix angle 30° | Cutting Conditions A60

Item code	Stock PN	Size (mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDBE2001-0.2-PN	●	0.05	0.1	0.2	0.08	0.08	45	4	1	11.76	0.35	0.37	0.39	0.41	0.44
EPDBE2001-0.3-PN	●			0.3	0.08	0.08	45	4	1	11.64	0.46	0.48	0.50	0.52	0.57
EPDBE2001-0.5-PN	★			0.5	0.08	0.08	45	4	1	11.40	0.67	0.70	0.73	0.76	0.81
EPDBE2002-0.5-PN	●	0.1	0.2	0.5	0.15	0.17	50	4	1	11.42	0.70	0.72	0.75	0.77	0.82
EPDBE2002-0.75-PN	●			0.75	0.15	0.17	50	4	1	11.13	0.96	0.99	1.02	1.05	1.11
EPDBE2002-1-PN	●			1	0.15	0.17	50	4	1	10.86	1.22	1.26	1.30	1.33	1.39
EPDBE2002-1.25-PN	★			1.25	0.15	0.17	50	4	1	10.60	1.48	1.52	1.57	1.61	1.72
EPDBE2002-1.5-PN	★			1.5	0.15	0.17	50	4	1	10.35	1.74	1.79	1.84	1.88	2.05
EPDBE2002-2-PN	★			2	0.15	0.17	50	4	1	9.88	2.25	2.32	2.37	2.45	2.71
EPDBE2002-2.5-PN	★			2.5	0.15	0.17	50	4	1	9.46	2.77	2.84	2.91	3.05	3.37
EPDBE2002-3-PN	★			3	0.15	0.17	50	4	1	9.07	3.28	3.37	3.48	3.65	4.04
EPDBE2003-0.5-PN	●	0.15	0.3	0.5	0.25	0.27	50	4	2	11.47	0.78	0.82	0.86	0.90	0.98
EPDBE2003-0.75-PN	●			0.75	0.25	0.27	50	4	2	11.17	1.05	1.10	1.15	1.20	1.29
EPDBE2003-1-PN	●			1	0.25	0.27	50	4	2	10.89	1.31	1.38	1.43	1.49	1.59
EPDBE2003-1.25-PN	●			1.25	0.25	0.27	50	4	2	10.62	1.58	1.65	1.72	1.78	1.89
EPDBE2003-1.5-PN	★			1.5	0.25	0.27	50	4	2	10.36	1.84	1.92	1.99	2.06	2.18
EPDBE2003-2-PN	★			2	0.25	0.27	50	4	2	9.88	2.36	2.46	2.55	2.62	2.76
EPDBE2003-2.5-PN	★			2.5	0.25	0.27	50	4	2	9.45	2.89	3.00	3.10	3.18	3.36
EPDBE2003-3-PN	★			3	0.25	0.27	50	4	2	9.05	3.41	3.53	3.64	3.73	4.02
EPDBE2004-0.75-PN	●	0.2	0.4	0.75	0.3	0.37	50	4	2	11.21	1.04	1.09	1.14	1.19	1.28
EPDBE2004-1-PN	●			1	0.3	0.37	50	4	2	10.91	1.31	1.37	1.43	1.48	1.58
EPDBE2004-1.5-PN	●			1.5	0.3	0.37	50	4	2	10.37	1.84	1.92	1.99	2.06	2.17
EPDBE2004-2-PN	●			2	0.3	0.37	50	4	2	9.88	2.36	2.46	2.54	2.62	2.75
EPDBE2004-2.5-PN	★			2.5	0.3	0.37	50	4	2	9.43	2.89	3.00	3.09	3.18	3.34
EPDBE2004-3-PN	★			3	0.3	0.37	50	4	2	9.03	3.41	3.53	3.63	3.73	4.01
EPDBE2004-3.5-PN	★			3.5	0.3	0.37	50	4	2	8.65	3.93	4.06	4.18	4.27	4.67
EPDBE2004-4-PN	★			4	0.3	0.37	50	4	2	8.30	4.45	4.59	4.71	4.83	5.33
EPDBE2004-4.5-PN	★			4.5	0.3	0.37	50	4	2	7.99	4.97	5.12	5.25	5.43	6.00
EPDBE2005-1-PN	●	0.25	0.5	1	0.35	0.47	50	4	2	10.94	1.31	1.37	1.42	1.47	1.57
EPDBE2005-1.5-PN	●			1.5	0.35	0.47	50	4	2	10.39	1.83	1.91	1.98	2.05	2.17
EPDBE2005-2-PN	●			2	0.35	0.47	50	4	2	9.88	2.36	2.45	2.54	2.61	2.75
EPDBE2005-2.5-PN	●			2.5	0.35	0.47	50	4	2	9.42	2.88	2.99	3.09	3.17	3.33
EPDBE2005-3-PN	●			3	0.35	0.47	50	4	2	9.00	3.41	3.53	3.63	3.72	3.99
EPDBE2005-4-PN	●			4	0.35	0.47	50	4	2	8.27	4.45	4.59	4.71	4.82	5.32
EPDBE2005-5-PN	★			5	0.35	0.47	50	4	2	7.64	5.48	5.65	5.78	6.01	6.65
EPDBE2005-5.5-PN	★			5.5	0.35	0.47	50	4	2	7.36	6.00	6.17	6.31	6.61	7.31
EPDBE2005-6-PN	★			6	0.35	0.47	50	4	2	7.10	6.52	6.70	6.88	7.21	7.97
EPDBE2005-8-PN	★			8	0.35	0.47	50	4	2	6.23	8.58	8.79	9.16	9.60	10.63
EPDBE2006-1-PN	●	0.3	0.6	1	0.4	0.57	50	4	4	10.98	1.44	1.54	1.63	1.71	1.88
EPDBE2006-2-PN	●			2	0.4	0.57	50	4	4	9.88	2.52	2.66	2.79	2.91	3.13
EPDBE2006-2.5-PN	●			2.5	0.4	0.57	50	4	4	9.41	3.05	3.22	3.36	3.49	3.73
EPDBE2006-3-PN	●			3	0.4	0.57	50	4	4	8.98	3.58	3.77	3.93	4.07	4.32
EPDBE2006-3.5-PN	★			3.5	0.4	0.57	50	4	4	8.58	4.12	4.32	4.49	4.64	4.91
EPDBE2006-4-PN	★			4	0.4	0.57	50	4	4	8.22	4.64	4.86	5.04	5.20	5.48
EPDBE2006-4.5-PN	★			4.5	0.4	0.57	50	4	4	7.89	5.17	5.40	5.59	5.76	6.06
EPDBE2006-5-PN	★			5	0.4	0.57	50	4	4	7.59	5.70	5.94	6.14	6.32	6.63
EPDBE2006-5.5-PN	★			5.5	0.4	0.57	50	4	4	7.31	6.22	6.48	6.69	6.87	7.29
EPDBE2006-6-PN	★			6	0.4	0.57	50	4	4	7.04	6.75	7.02	7.23	7.42	7.96
EPDBE2006-7-PN	★			7	0.4	0.57	50	4	4	6.57	7.79	8.08	8.32	8.52	9.28
EPDBE2006-8-PN	★			8	0.4	0.57	50	4	4	6.16	8.84	9.15	9.40	9.61	10.61
EPDBE2006-9-PN	★			9	0.4	0.57	50	4	4	5.79	9.88	10.21	10.47	10.79	11.94
EPDBE2006-10-PN	★			10	0.4	0.57	50	4	4	5.47	10.92	11.26	11.54	11.99	13.27
EPDBE2006-12-PN	★			12	0.4	0.57	50	4	4	4.92	12.99	13.37	13.72	14.38	15.92

Epoch Deep Ball Evolution PN Coating

Detailed shape below neck





【Note】
The effective under-neck length is different from Epoch Deep Ball EPDB. Please recheck the interference region.

EPDBE2○○○-○○.○○-PN

Item code	Stock PN	Size (mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDBE2007-2-PN	★	0.35	0.7	2	0.45	0.67	50	4	4	9.88	2.52	2.66	2.79	2.90	3.12
EPDBE2007-4-PN	★			4	0.45	0.67	50	4	4	8.18	4.64	4.86	5.04	5.20	5.48
EPDBE2007-6-PN	★			6	0.45	0.67	50	4	4	6.98	6.74	7.01	7.23	7.42	7.94
EPDBE2007-8-PN	★			8	0.45	0.67	50	4	4	6.09	8.83	9.14	9.39	9.61	10.60
EPDBE2008-2-PN	●	0.4	0.8	2	0.5	0.77	50	4	4	9.87	2.51	2.65	2.78	2.89	3.11
EPDBE2008-4-PN	●			4	0.5	0.77	50	4	4	8.14	4.64	4.85	5.03	5.19	5.47
EPDBE2008-5-PN	●			5	0.5	0.77	50	4	4	7.48	5.69	5.93	6.13	6.31	6.61
EPDBE2008-6-PN	●			6	0.5	0.77	50	4	4	6.92	6.74	7.01	7.23	7.41	7.92
EPDBE2008-8-PN	★			8	0.5	0.77	50	4	4	6.01	8.83	9.14	9.39	9.60	10.58
EPDBE2008-10-PN	★			10	0.5	0.77	50	4	4	5.32	10.91	11.26	11.53	11.97	13.23
EPDBE2009-2-PN	★	0.45	0.9	2	0.6	0.87	50	4	4	9.87	2.51	2.65	2.77	2.89	3.10
EPDBE2009-4-PN	★			4	0.6	0.87	50	4	4	8.09	4.64	4.85	5.03	5.18	5.46
EPDBE2009-6-PN	★			6	0.6	0.87	50	4	4	6.85	6.74	7.00	7.22	7.41	7.91
EPDBE2009-8-PN	★			8	0.6	0.87	50	4	4	5.94	8.83	9.14	9.38	9.60	10.56
EPDBE2010-2-PN	●	0.5	1	2	0.8	0.96	50	4	4	9.84	2.54	2.67	2.79	2.90	3.11
EPDBE2010-3-PN	●			3	0.8	0.96	50	4	4	8.84	3.61	3.78	3.93	4.06	4.30
EPDBE2010-4-PN	●			4	0.8	0.96	50	4	4	8.02	4.66	4.87	5.04	5.20	5.47
EPDBE2010-5-PN	●			5	0.8	0.96	50	4	4	7.34	5.72	5.95	6.14	6.31	6.61
EPDBE2010-6-PN	●			6	0.8	0.96	50	4	4	6.77	6.76	7.02	7.23	7.42	7.92
EPDBE2010-7-PN	★			7	0.8	0.96	50	4	4	6.28	7.81	8.09	8.32	8.52	9.25
EPDBE2010-8-PN	●			8	0.8	0.96	50	4	4	5.85	8.85	9.15	9.40	9.61	10.58
EPDBE2010-9-PN	★			9	0.8	0.96	50	4	4	5.48	9.89	10.21	10.47	10.78	11.91
EPDBE2010-10-PN	●			10	0.8	0.96	50	4	4	5.15	10.93	11.27	11.54	11.98	13.23
EPDBE2010-12-PN	★			12	0.8	0.96	55	4	4	4.60	13.00	13.37	13.72	14.37	15.89
EPDBE2010-13-PN	★			13	0.8	0.96	55	4	4	4.37	14.04	14.42	14.86	15.57	17.21
EPDBE2010-14-PN	★			14	0.8	0.96	55	4	4	4.16	15.07	15.47	16.00	16.76	18.54
EPDBE2010-16-PN	★			16	0.8	0.96	55	4	4	3.79	17.13	17.56	18.28	19.16	21.20
EPDBE2010-18-PN	★			18	0.8	0.96	60	4	4	3.49	19.19	19.66	20.56	21.55	23.85
EPDBE2010-20-PN	★			20	0.8	0.96	60	4	4	3.23	21.25	21.84	22.84	23.94	26.51
EPDBE2011-2-PN	★	0.55	1.1	2	1	1.05	50	4	4	9.81	2.58	2.70	2.81	2.92	3.12
EPDBE2011-4-PN	★			4	1	1.05	50	4	4	7.95	4.69	4.89	5.06	5.21	5.48
EPDBE2011-6-PN	★			6	1	1.05	50	4	4	6.68	6.79	7.04	7.25	7.43	7.94
EPDBE2011-8-PN	★			8	1	1.05	50	4	4	5.76	8.87	9.17	9.41	9.61	10.59
EPDBE2011-10-PN	★			10	1	1.05	50	4	4	5.06	10.95	11.28	11.55	12.00	13.25
EPDBE2012-4-PN	★	0.6	1.2	4	1.1	1.15	50	4	4	7.89	4.69	4.88	5.05	5.20	5.47
EPDBE2012-6-PN	★			6	1.1	1.15	50	4	4	6.60	6.79	7.03	7.24	7.42	7.92
EPDBE2012-8-PN	★			8	1.1	1.15	50	4	4	5.67	8.87	9.16	9.40	9.61	10.58
EPDBE2012-10-PN	★			10	1.1	1.15	50	4	4	4.97	10.95	11.28	11.54	11.99	13.23
EPDBE2012-12-PN	★			12	1.1	1.15	55	4	4	4.43	13.02	13.38	13.73	14.38	15.89
EPDBE2014-8-PN	★	0.7	1.4	8	1.3	1.34	50	4	4	5.48	8.89	9.18	9.41	9.61	10.58
EPDBE2014-12-PN	★			12	1.3	1.34	55	4	4	4.24	13.04	13.39	13.74	14.39	15.89
EPDBE2014-16-PN	★			16	1.3	1.34	55	4	4	3.46	17.16	17.57	18.31	19.17	21.20
EPDBE2015-4-PN	●	0.75	1.5	4	1.35	1.44	50	4	4	7.68	4.71	4.89	5.06	5.20	5.46
EPDBE2015-6-PN	●			6	1.35	1.44	50	4	4	6.33	6.81	7.04	7.25	7.42	7.91
EPDBE2015-8-PN	●			8	1.35	1.44	50	4	4	5.39	8.89	9.17	9.41	9.61	10.56
EPDBE2015-10-PN	●			10	1.35	1.44	50	4	4	4.68	10.96	11.29	11.55	11.98	13.22
EPDBE2015-12-PN	●			12	1.35	1.44	55	4	4	4.14	13.03	13.39	13.74	14.38	15.87
EPDBE2015-14-PN	★			14	1.35	1.44	55	4	4	3.72	15.10	15.48	16.02	16.77	18.52
EPDBE2015-16-PN	●			16	1.35	1.44	55	4	4	3.77	17.16	17.57	18.30	19.16	21.18
EPDBE2015-18-PN	★			18	1.35	1.44	60	4	4	3.08	19.22	19.69	20.58	21.56	23.83
EPDBE2015-20-PN	●			20	1.35	1.44	60	4	4	2.84	21.27	21.87	22.86	23.95	No interference
EPDBE2016-8-PN	★	0.8	1.6	8	1.4	1.54	50	4	4	5.28	8.89	9.17	9.40	9.60	10.55
EPDBE2016-12-PN	★			12	1.4	1.54	55	4	4	4.05	13.03	13.39	13.73	14.37	15.85
EPDBE2016-16-PN	★			16	1.4	1.54	55	4	4	3.28	17.16	17.57	18.29	19.15	21.16
EPDBE2016-20-PN	★			20	1.4	1.54	60	4	4	2.75	21.27	21.87	22.86	23.94	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan

EPDBE2○○○-○○.○○-PN

Item code	Stock	Size (mm)								Interference angle (°)	The effective under-neck length for the various draft angles				
		Ball radius	Tool dia.	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.	Neck R						
	PN	RE	DC	LU	APMX	DN	LF	DCONMS		θK	0.5°	1°	1.5°	2°	3°
EPDBE2018-8-PN	★	0.9	1.8	8	1.6	1.73	50	4	4	5.06	8.91	9.18	9.41	9.61	10.54
EPDBE2018-12-PN	★			12	1.6	1.73	55	4	4	3.83	13.05	13.40	13.74	14.38	15.85
EPDBE2018-16-PN	★			16	1.6	1.73	55	4	4	3.09	17.17	17.58	18.31	19.16	21.16
EPDBE2018-20-PN	★			20	1.6	1.73	60	4	4	2.58	21.28	21.88	22.87	23.95	No interference
EPDBE2020-3-PN	●	1	2	3	1.7	1.92	50	4	4	8.26	3.71	3.84	3.96	4.07	4.29
EPDBE2020-4-PN	●			4	1.7	1.92	50	4	4	7.23	4.75	4.92	5.07	5.21	5.45
EPDBE2020-6-PN	●			6	1.7	1.92	50	4	4	5.78	6.84	7.07	7.26	7.43	7.89
EPDBE2020-8-PN	●			8	1.7	1.92	50	4	4	4.81	8.92	9.19	9.42	9.61	10.54
EPDBE2020-10-PN	●			10	1.7	1.92	50	4	4	4.12	11.00	11.30	11.56	11.99	13.20
EPDBE2020-12-PN	●			12	1.7	1.92	55	4	4	3.61	13.06	13.41	13.76	14.39	15.85
EPDBE2020-13-PN	★			13	1.7	1.92	55	4	4	3.39	14.10	14.45	14.90	15.58	17.18
EPDBE2020-14-PN	★			14	1.7	1.92	55	4	4	3.20	15.13	15.50	16.04	16.78	18.51
EPDBE2020-16-PN	●			16	1.7	1.92	55	4	4	2.88	17.19	17.59	18.32	19.17	No interference
EPDBE2020-18-PN	★			18	1.7	1.92	60	4	4	2.62	19.24	19.72	20.60	21.57	No interference
EPDBE2020-20-PN	●			20	1.7	1.92	60	4	4	2.40	21.30	21.90	22.88	23.96	No interference
EPDBE2020-22-PN	★			22	1.7	1.92	60	4	4	2.22	23.35	24.08	25.16	26.35	No interference
EPDBE2020-25-PN	●			25	1.7	1.92	65	4	4	1.99	26.42	27.35	28.58	No interference	No interference
EPDBE2020-30-PN	●			30	1.7	1.92	70	4	4	1.70	31.53	32.80	34.29	No interference	No interference
EPDBE2020-35-PN	★			35	1.7	1.92	75	4	4	1.48	36.65	38.24	No interference	No interference	No interference
EPDBE2020-40-PN	★			40	1.7	1.92	80	4	4	1.31	41.86	43.69	No interference	No interference	No interference
EPDBE2025-6-PN	★	1.25	2.5	6	2	2.4	50	4	4	5.04	6.88	7.09	7.27	7.43	7.87
EPDBE2025-10-PN	★			10	2	2.4	50	4	4	3.43	11.03	11.32	11.56	12.00	13.18
EPDBE2025-15-PN	★			15	2	2.4	55	4	4	2.46	16.18	16.56	17.20	17.98	No interference
EPDBE2025-20-PN	★			20	2	2.4	60	4	4	1.91	21.32	21.93	22.90	No interference	No interference
EPDBE2025-25-PN	★			25	2	2.4	65	4	4	1.57	26.44	27.38	28.60	No interference	No interference
EPDBE2025-30-PN	★			30	2	2.4	70	4	4	1.33	31.55	32.82	No interference	No interference	No interference
EPDBE2030-8-PN	●	1.5	3	8	2.5	2.88	55	6	4	6.19	8.99	9.23	9.44	9.62	10.51
EPDBE2030-10-PN	●			10	2.5	2.88	55	6	4	5.41	11.06	11.34	11.57	12.01	13.16
EPDBE2030-13-PN	●			13	2.5	2.88	60	6	4	4.56	14.15	14.48	14.94	15.60	17.15
EPDBE2030-16-PN	●			16	2.5	2.88	60	6	4	3.93	17.24	17.61	18.36	19.19	21.13
EPDBE2030-20-PN	●			20	2.5	2.88	65	6	4	3.33	21.34	21.96	22.92	23.97	26.44
EPDBE2030-25-PN	●			25	2.5	2.88	70	6	4	2.79	26.46	27.41	28.62	29.96	No interference
EPDBE2030-30-PN	●			30	2.5	2.88	75	6	4	2.40	31.57	32.85	34.32	35.94	No interference
EPDBE2030-35-PN	●			35	2.5	2.88	80	6	4	2.11	36.72	38.30	40.03	41.92	No interference
EPDBE2035-15-PN	★	1.75	3.5	15	2.75	3.35	60	6	4	3.68	16.25	16.60	17.26	18.03	19.81
EPDBE2035-25-PN	★			25	2.75	3.35	70	6	4	2.43	26.49	27.46	28.67	29.99	No interference
EPDBE2035-35-PN	★			35	2.75	3.35	80	6	4	1.82	36.79	38.36	40.07	No interference	No interference
EPDBE2035-45-PN	★			45	2.75	3.35	90	6	4	1.45	47.22	49.25	No interference	No interference	No interference
EPDBE2040-10-PN	●	2	4	10	3	3.85	55	6	4	4.38	11.10	11.36	11.58	12.00	13.10
EPDBE2040-13-PN	●			13	3	3.85	60	6	4	3.57	14.19	14.50	14.95	15.59	17.08
EPDBE2040-16-PN	●			16	3	3.85	60	6	4	3.01	17.27	17.63	18.37	19.18	No interference
EPDBE2040-20-PN	●			20	3	3.85	65	6	4	2.49	21.37	21.99	22.93	23.96	No interference
EPDBE2040-25-PN	●			25	3	3.85	70	6	4	2.05	26.49	27.44	28.63	29.95	No interference
EPDBE2040-30-PN	●			30	3	3.85	75	6	4	1.74	31.59	32.89	34.34	No interference	No interference
EPDBE2040-35-PN	●			35	3	3.85	80	6	4	1.51	36.78	38.33	40.04	No interference	No interference
EPDBE2040-40-PN	●			40	3	3.85	80	6	4	1.34	41.99	43.78	No interference	No interference	No interference
EPDBE2040-45-PN	●			45	3	3.85	90	6	4	1.20	47.20	49.23	No interference	No interference	No interference
EPDBE2040-50-PN	●			50	3	3.85	100	6	4	1.08	52.42	54.68	No interference	No interference	No interference
EPDBE2050-20-PN	●	2.5	5	20	3.5	4.85	65	6	4	1.42	21.36	21.95	No interference	No interference	No interference
EPDBE2050-25-PN	●			25	3.5	4.85	70	6	4	1.14	26.48	27.39	No interference	No interference	No interference
EPDBE2050-30-PN	●			30	3.5	4.85	75	6	4	0.95	31.58	No interference	No interference	No interference	No interference
EPDBE2050-40-PN	●			40	3.5	4.85	80	6	4	0.72	41.97	No interference	No interference	No interference	No interference
EPDBE2060-12-PN	●	3	6	12	6	5.85	60	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDBE2060-20-PN	●			20	6	5.85	65	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDBE2060-30-PN	●			30	6	5.85	75	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDBE2060-50-PN	●			50	6	5.85	100	6	-	0	No interference	No interference	No interference	No interference	No interference

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	○		◎	◎	◎	◎

Epoch Deep Ball Evolution

Recommended cutting conditions EPDBE-ATH EPDBE-PN

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A63 about high accuracy cutting conditions

Inch

Recommended range				PN series								ATH series					
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.05	0.1	0.2	.0003	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		0.3	.0002	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		0.5	.0002	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
0.1	0.2	0.5	.0008	50,000	20	50,000	20	50,000	20	50,000	10	45,500	9	42,000	8
		0.75	.0007	50,000	20	50,000	20	50,000	20	50,000	10	45,500	9	42,000	8
		1	.0006	50,000	20	50,000	20	50,000	20	50,000	10	45,500	9	42,000	8
		1.25	.0004	50,000	20	50,000	10	48,600	10	45,900	9	40,500	8	37,800	8
		1.5	.0003	50,000	20	50,000	10	48,600	10	45,900	9	40,500	8	37,800	8
		2	.0003	50,000	20	50,000	10	48,600	10	45,900	9	40,500	8	37,800	8
		2.5	.0002	48,000	10	48,000	10	43,200	9	40,800	8	36,000	7	33,600	7
		3	.0002	48,000	10	48,000	10	43,200	9	40,800	8	36,000	7	33,600	7
0.15	0.3	0.5	.0011	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		0.75	.0009	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		1	.0008	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		1.25	.0007	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		1.5	.0006	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		2	.0005	50,000	20	50,000	20	48,600	19	45,900	18	40,500	16	37,800	15
		2.5	.0004	50,000	20	50,000	20	48,600	19	45,900	18	40,500	16	37,800	15
		3	.0003	50,000	20	50,000	20	48,600	19	45,900	18	40,500	16	37,800	15
0.2	0.4	0.75	.0017	50,000	40	50,000	30	50,000	30	50,000	30	46,800	28	43,680	26
		1	.0016	50,000	40	50,000	30	50,000	30	50,000	30	46,800	28	43,680	26
		1.5	.0013	50,000	30	50,000	30	50,000	30	50,000	30	46,800	19	43,680	17
		2	.0011	50,000	30	50,000	20	50,000	20	50,000	20	46,800	19	43,680	17
		2.5	.0009	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	36,288	15
		3	.0006	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	36,288	15
		3.5	.0005	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	36,288	15
		4	.0004	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	36,288	15
		4.5	.0003	46,080	18	38,400	15	34,560	14	32,640	13	28,800	12	26,880	11
0.25	0.5	1	.0018	50,000	60	50,000	60	46,800	56	44,200	44	39,000	47	36,400	29
		1.5	.0016	50,000	60	50,000	60	46,800	56	44,200	44	39,000	47	36,400	29
		2	.0014	50,000	50	50,000	50	46,800	47	44,200	35	39,000	31	36,400	29
		2.5	.0013	50,000	40	50,000	40	42,120	34	39,780	24	35,100	21	32,760	20
		3	.0012	50,000	40	46,800	37	42,120	34	39,780	24	35,100	21	25,200	15
		4	.0008	43,200	35	36,000	29	32,400	26	30,600	18	32,400	19	25,200	15
		5	.0007	43,200	35	36,000	29	32,400	26	30,600	18	32,400	19	25,200	15
		5.5	.0006	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	13
		6	.0005	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	13
		8	.0003	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	13
0.3	0.6	1	.003	50,000	90	50,000	90	50,000	90	50,000	80	48,000	67	44,800	54
		2	.0025	50,000	90	50,000	90	50,000	90	50,000	80	48,000	67	44,800	54
		2.5	.0018	50,000	70	50,000	70	50,000	70	50,000	60	48,000	58	44,800	36
		3	.0016	50,000	70	50,000	70	50,000	70	50,000	60	48,000	58	44,800	36
		3.5	.0014	50,000	70	50,000	70	50,000	70	48,960	59	43,200	52	40,320	32
		4	.001	50,000	70	50,000	70	50,000	70	48,960	59	43,200	52	40,320	32
		4.5	.0009	50,000	60	50,000	60	48,600	58	45,900	46	40,500	32	37,800	30
		5	.0008	50,000	60	46,800	56	42,120	51	39,780	40	35,100	28	32,760	26
		5.5	.0007	50,000	60	46,800	56	42,120	51	39,780	40	35,100	28	32,760	26
		6	.0006	50,000	60	46,800	56	42,120	51	39,780	40	35,100	28	32,760	26
		7	.0006	38,400	38	32,000	32	28,800	35	27,200	22	24,000	19	22,400	18
		8	.0006	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18
		9	.0005	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18
		10	.0004	33,600	34	28,000	28	25,200	25	23,800	19	21,000	17	19,600	12
		12	.0003	28,800	29	24,000	24	21,600	22	20,400	16	18,000	14	16,800	10
0.35	0.7	2	.0036	50,000	100	50,000	100	50,000	100	50,000	90	48,000	77	42,000	50
		4	.0016	50,000	70	50,000	70	50,000	70	48,960	59	43,200	52	37,800	30
		6	.0011	50,000	60	46,800	56	42,120	51	39,780	40	35,100	35	30,240	24
		8	.0008	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.4	0.8	2	.0047	50,000	110	50,000	110	50,000	110	50,000	90	48,000	106	44,800	72
		4	.0031	50,000	110	50,000	110	50,000	110	50,000	90	48,000	106	44,800	72
		5	.0023	50,000	90	50,000	90	50,000	90	48,960	88	43,200	86	40,320	56
		6	.0017	50,000	90	50,000	90	45,360	82	42,840	69	37,800	53	35,280	49
		8	.0008	49,920	60	41,600	50	37,440	45	35,360	42	31,200	31	29,120	29
		10	.0008	38,400	46	32,000	38	28,800	35	27,200	33	24,000	24	22,400	22
0.45	0.9	2	.0053	50,000	130	50,000	130	50,000	130	50,000	110	45,600	91	42,560	85
		4	.0032	50,000	110	50,000	110	50,000	110	48,450	87	42,750	77	39,900	72
		6	.002	50,000	90	47,880	77	43,092	69	40,698	57	35,910	50	33,516	47
		8	.0014	43,776	61	36,480	51	32,832	46	31,008	43	27,360	33	25,536	31
0.5	1	2	.0079	50,000	150	50,000	150	48,600	146	45,900	119	43,200	112	37,800	91
		3	.0079	50,000	150	50,000	150	48,600	146	45,900	119	43,200	112	37,800	91
		4	.0055	50,000	150	50,000	150	48,600	146	45,900	119	43,200	112	37,800	91
		5	.0035	50,000	140	46,800	131	42,120	118	39,780	103	43,200	95	32,760	72
		6	.0024	50,000	130	42,120	110	40,824	98	38,556	93	38,880	93	29,484	53
		7	.0024	46,656	84	38,880	70	34,992	63	33,048	53	31,590	51	27,216	38
		8	.0024	46,656	84	38,880	70	34,992	63	33,048	53	31,590	51	27,216	38
		9	.0018	46,656	84	38,880	70	34,992	63	33,048	53	31,590	51	27,216	38
		10	.0015	46,656	84	38,880	70	34,992	63	33,048	53	31,590	51	27,216	38
		12	.001	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		13	.0009	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		14	.0008	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		16	.0006	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		18	.0005	30,240	48	25,200	40	22,680	36	21,420	30	18,900	26	17,640	21
		20	.0004	25,920	41	21,600	35	19,440	31	18,360	26	16,200	23	15,120	18
0.55	1.1	2	.0079	50,000	150	50,000	150	45,360	136	42,840	111	37,800	98	35,280	85
		4	.0055	50,000	150	50,000	150	45,360	136	42,840	111	37,800	98	35,280	85
		6	.0024	47,736	105	39,780	88	35,802	79	33,813	68	29,835	54	27,846	50
		8	.0024	47,736	86	39,780	88	35,802	64	31,212	50	27,540	44	25,704	36
		10	.0015	47,736	86	39,780	72	35,802	64	31,212	50	27,540	44	25,704	36
0.6	1.2	4	.0063	50,000	150	46,154	148	41,538	125	39,230	110	36,923	103	32,307	71
		6	.0043	44,928	99	37,440	82	33,696	81	31,824	83	30,240	79	26,208	42
		8	.0024	44,928	99	37,440	82	33,696	81	31,824	83	30,240	79	26,208	42
		10	.0021	41,472	75	34,560	69	31,104	56	29,376	53	27,000	43	24,192	34
		12	.0018	41,472	75	34,560	62	31,104	56	29,376	53	25,920	41	24,192	34
0.7	1.4	8	.0043	39,312	110	32,760	92	29,484	83	27,846	72	24,570	59	22,932	55
		12	.0021	36,288	80	30,240	67	27,216	60	25,704	46	22,680	41	21,168	38
		16	.0014	26,880	54	22,400	45	20,160	40	19,040	34	16,800	30	15,680	25
0.75	1.5	4	.0079	50,000	200	42,000	168	37,800	144	35,700	129	31,500	101	29,400	88
		6	.0079	50,000	200	42,000	168	37,800	144	35,700	129	31,500	101	29,400	88
		8	.0035	39,312	110	32,760	105	29,484	83	27,846	72	24,570	54	22,932	50
		10	.0035	36,288	102	30,240	85	27,216	76	25,704	67	22,680	50	21,168	47
		12	.0035	36,288	87	30,240	73	27,216	65	25,704	57	22,680	41	21,168	38
		14	.003	32,256	71	30,240	73	24,192	53	22,848	46	20,160	36	18,816	30
		16	.0015	26,880	59	22,400	49	20,160	44	19,040	38	16,800	30	15,680	25
		18	.0015	26,880	59	22,400	49	20,160	44	19,040	38	16,800	30	15,680	25
		20	.0015	26,880	59	22,400	49	20,160	44	19,040	38	16,800	30	15,680	25
0.8	1.6	8	.0087	43,680	149	36,400	124	32,760	111	30,940	99	27,300	82	23,660	62
		12	.0039	39,312	134	32,760	111	29,484	100	27,846	84	24,570	74	21,294	51
		16	.0024	33,696	88	28,080	67	25,272	61	23,868	53	21,060	46	19,656	39
		20	.0016	24,960	60	20,800	50	18,720	45	17,680	35	15,600	31	14,560	26
0.9	1.8	8	.0102	40,560	154	33,800	128	30,420	116	28,730	98	25,350	81	23,660	66
		12	.0041	33,696	94	28,080	79	25,272	71	23,868	62	21,060	51	19,656	43
		16	.0027	33,696	94	28,080	79	25,272	71	23,868	62	21,060	51	19,656	43
		20	.0018	24,960	65	20,800	54	18,720	49	17,680	42	15,600	34	14,560	29
1	2	3	.0157	37,800	227	31,500	189	28,350	170	26,775	145	23,625	123	22,050	106
		4	.0157	37,800	227	31,500	189	28,350	170	26,775	145	23,625	123	22,050	106
		6	.0157	37,800	204	31,500	170	28,350	147	26,775	129	23,625	104	22,050	93
		8	.011	37,800	204	31,500	170	28,350	147	26,775	129	23,625	104	22,050	93
		10	.0083	35,280	169	29,400	141	26,460	127	24,990	105	22,050	88	19,110	57

【Note】 Upon usage, please refer to comments and notes below table on page A62.

Epoch Deep Ball Evolution

EPDBE-ATH **EPDBE-PN** High efficiency cutting conditions High accuracy cutting conditions

Please refer to P.A63 about high accuracy cutting conditions

Inch

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
1	2	12	.0047	31,752	152	26,460	127	23,814	114	22,491	94	19,845	79	17,199	52
		13	.0047	31,752	152	26,460	127	23,814	114	22,491	94	19,845	79	15,876	41
		14	.0047	31,752	127	26,460	106	23,814	95	22,491	85	18,428	63	15,876	41
		16	.0047	29,484	83	24,570	69	22,113	62	20,885	54	18,428	59	15,876	35
		18	.0035	27,216	76	22,680	64	20,412	57	19,278	50	18,428	55	15,876	35
		20	.003	27,216	76	22,680	64	20,412	57	19,278	50	18,428	44	15,876	35
		22	.002	21,420	56	17,850	46	16,065	42	15,173	36	13,388	29	14,994	33
		25	.002	20,160	52	16,800	44	15,120	39	14,280	34	12,600	28	14,112	31
		30	.0012	20,160	52	16,800	44	15,120	39	14,280	34	12,600	28	14,112	31
		35	.001	17,640	46	14,700	38	13,230	34	12,495	27	11,025	24	10,290	21
		40	.0009	15,120	39	12,600	33	11,340	29	10,710	24	9,450	21	8,820	18
1.25	2.5	6	.0197	33,300	240	27,750	200	24,975	180	23,588	146	20,813	121	19,425	101
		10	.0134	33,300	240	27,750	200	24,975	180	23,588	146	20,813	121	19,425	101
		15	.0059	25,974	135	21,645	113	19,481	101	18,398	85	16,234	78	15,152	58
		20	.0047	23,976	105	19,980	88	17,982	79	16,983	65	16,234	58	13,986	42
		25	.0039	23,976	91	19,980	76	17,982	68	16,983	58	14,985	48	13,986	39
		30	.0022	17,760	71	14,800	59	13,320	53	12,580	45	11,100	38	10,360	31
1.5	3	8	.0236	28,800	253	24,000	211	21,600	190	20,400	159	18,000	133	16,800	118
		10	.0165	28,800	253	24,000	211	21,600	190	20,400	159	18,000	133	16,800	118
		13	.0124	26,880	188	22,400	157	20,160	141	19,040	118	16,800	101	15,680	88
		16	.0124	26,880	172	22,400	143	20,160	129	19,040	107	16,800	91	14,560	76
		20	.0071	22,464	121	18,720	97	16,848	91	15,912	76	14,040	62	12,096	51
		25	.0047	22,464	121	18,720	97	16,848	91	15,912	76	14,040	62	12,096	51
		30	.0047	20,736	112	17,280	93	15,552	84	14,688	71	12,960	57	12,096	51
		35	.0031	15,360	77	12,800	64	11,520	58	10,880	48	9,600	40	10,752	43
1.75	3.5	15	.0142	21,450	176	17,875	147	16,088	132	15,194	106	13,406	88	12,513	73
		25	.0083	17,820	107	14,850	89	13,365	80	12,623	68	11,138	53	10,395	46
		35	.0035	17,820	107	14,850	89	13,365	80	12,623	68	11,138	53	10,395	46
		45	.0035	13,200	77	11,000	64	9,900	57	9,350	47	8,250	38	7,700	31
2	4	10	.0236	20,700	244	17,250	204	15,525	183	14,663	155	12,938	129	12,075	114
		13	.0189	20,700	244	17,250	204	15,525	183	14,663	155	12,938	129	12,075	114
		16	.0165	20,700	244	17,250	204	15,525	183	14,663	155	12,938	129	12,075	114
		20	.0165	17,940	169	14,950	141	13,455	126	12,708	109	11,213	90	10,465	80
		25	.0094	16,146	139	13,455	116	12,110	104	11,437	87	10,092	85	9,419	64
		30	.0063	14,904	104	12,420	87	11,178	78	10,558	68	9,316	56	8,694	49
		35	.0039	14,904	104	12,420	87	11,178	78	10,558	68	9,316	56	8,694	49
		40	.0039	14,904	104	12,420	87	11,178	78	10,558	68	9,316	56	8,694	49
		45	.0039	11,040	73	9,200	61	8,280	55	7,820	47	6,900	39	6,440	35
		50	.0039	11,040	73	9,200	61	8,280	55	7,820	47	6,900	39	6,440	35
2.5	5	20	.0207	15,120	215	12,600	179	11,340	161	10,710	126	9,450	112	8,820	93
		25	.0207	14,040	199	11,700	143	10,530	150	9,945	117	8,775	104	8,190	87
		30	.0118	12,636	179	10,530	110	9,477	135	8,951	106	7,898	93	7,371	78
		40	.0079	11,664	100	9,720	84	8,748	75	8,262	58	7,290	51	6,804	44
3	6	12	.0236	16,200	269	13,500	224	12,150	202	11,475	168	10,125	136	9,450	112
		20	.0197	15,300	236	12,750	196	11,475	177	10,838	147	9,563	120	8,925	98
		30	.0165	12,480	142	10,400	119	9,360	107	8,840	83	7,800	80	7,280	63
		50	.0059	10,368	106	8,640	88	7,776	79	7,344	63	6,480	56	6,048	46

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib processing, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBE2020-10-ATH tool:
Cutting depth = 0.21 (a_p) × 0.65 (cutting depth factor for Group 5 hardened steel) × 0.8 (for closed-area cutting) = 0.11mm

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended cutting conditions EPDBE-ATH EPDBE-PN

High efficiency cutting conditions | High accuracy cuttiing conditions

Please refer to P.A60 about high efficiency cutting conditions

Inch

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.05	0.1	0.2	.0002	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		0.3	.0001	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		0.5	.0001	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
0.1	0.2	0.5	.0006	50,000	20	50,000	20	50,000	20	50,000	10	45,500	9	42,000	8
		0.75	.0005	50,000	20	50,000	20	50,000	20	50,000	10	45,500	9	42,000	8
		1	.0004	50,000	20	50,000	20	50,000	20	50,000	10	45,500	9	42,000	8
		1.25	.0003	50,000	20	50,000	10	48,600	10	45,900	9	40,500	8	37,800	8
		1.5	.0003	50,000	20	50,000	10	48,600	10	45,900	9	40,500	8	37,800	8
		2	.0002	50,000	20	50,000	10	48,600	10	45,900	9	40,500	8	37,800	8
		2.5	.0002	48,000	10	48,000	10	43,200	9	40,800	8	36,000	7	33,600	7
		3	.0001	48,000	10	48,000	10	43,200	9	40,800	8	36,000	7	33,600	7
0.15	0.3	0.5	.0008	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		0.75	.0007	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		1	.0006	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		1.25	.0006	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		1.5	.0005	50,000	20	50,000	20	50,000	20	50,000	20	45,000	18	42,000	17
		2	.0004	50,000	20	50,000	20	48,600	19	45,900	18	40,500	16	37,800	15
		2.5	.0003	50,000	20	50,000	20	48,600	19	45,900	18	40,500	16	37,800	15
		3	.0002	50,000	20	50,000	20	48,600	19	45,900	18	40,500	16	37,800	15
0.2	0.4	0.75	.0017	50,000	30	48,000	19	43,200	17	40,800	16	36,000	14	33,600	13
		1	.0016	50,000	30	48,000	19	43,200	17	40,800	16	36,000	14	33,600	13
		1.5	.0013	50,000	30	48,000	19	43,200	17	40,800	16	36,000	14	33,600	13
		2	.0011	50,000	30	48,000	19	43,200	17	40,800	16	36,000	14	33,600	13
		2.5	.0006	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	30,240	12
		3	.0004	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	30,240	12
		3.5	.0003	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	30,240	12
		4	.0002	50,000	20	43,200	17	38,880	16	36,720	15	32,400	13	30,240	12
		4.5	.0002	46,080	18	38,400	15	34,560	14	32,640	13	28,800	12	26,880	11
0.25	0.5	1	.0018	48,000	38	40,000	32	36,000	29	34,000	27	30,000	24	28,000	22
		1.5	.0016	48,000	38	40,000	32	36,000	29	34,000	27	30,000	24	28,000	22
		2	.0014	48,000	38	40,000	32	36,000	29	34,000	27	30,000	24	28,000	22
		2.5	.0013	43,200	35	40,000	32	32,400	26	30,600	18	27,000	16	25,200	15
		3	.0012	43,200	35	36,000	29	32,400	26	30,600	18	27,000	16	25,200	15
		4	.0008	43,200	35	36,000	29	32,400	26	30,600	18	27,000	16	25,200	15
		5	.0007	43,200	35	36,000	29	32,400	26	30,600	18	27,000	16	25,200	15
		5.5	.0003	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	13
		6	.0003	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	13
		8	.0002	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	13
0.3	0.6	1	.002	48,000	58	40,000	48	36,000	43	34,000	34	30,000	30	28,000	22
		2	.0017	48,000	58	40,000	48	36,000	43	34,000	34	30,000	30	28,000	22
		2.5	.0015	48,000	58	40,000	48	36,000	43	34,000	34	30,000	30	28,000	22
		3	.0013	48,000	58	40,000	48	36,000	43	34,000	34	30,000	30	28,000	22
		3.5	.0011	43,200	52	36,000	43	32,400	39	30,600	31	27,000	22	25,200	20
		4	.0009	43,200	52	36,000	43	32,400	39	30,600	31	27,000	22	25,200	20
		4.5	.0009	43,200	43	36,000	43	32,400	39	30,600	31	27,000	22	25,200	20
		5	.0008	43,200	43	36,000	43	32,400	39	30,600	31	27,000	22	25,200	20
		5.5	.0007	43,200	43	36,000	43	32,400	39	30,600	31	27,000	22	25,200	20
		6	.0006	43,200	43	36,000	43	32,400	39	30,600	31	27,000	22	25,200	20
		7	.0003	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18
		8	.0003	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18
		9	.0002	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18
		10	.0002	33,600	34	28,000	28	25,200	25	23,800	19	21,000	17	19,600	12
		12	.0002	28,800	29	24,000	24	21,600	22	20,400	16	18,000	14	16,800	10
0.35	0.7	2	.0024	48,000	67	40,000	56	36,000	50	34,000	41	30,000	30	28,000	28
		4	.0013	43,200	52	36,000	43	32,400	39	30,600	37	27,000	27	25,200	20
		6	.0011	43,200	52	36,000	43	32,400	39	30,600	31	27,000	27	25,200	20
		8	.0004	38,400	38	32,000	32	28,800	29	27,200	22	24,000	19	22,400	18

【Note】 Upon usage, please refer to comments and notes below table on page A65.

Epoch Deep Ball Evolution

EPDBE-ATH **EPDBE-PN** High efficiency cuttiing conditions **High accuracy cuttiing conditions** Please refer to P.A60 about high efficiency cutting conditions **Inch**

Recommended range				PN series								ATH series			
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
0.4	0.8	2	.0031	48,000	67	40,000	56	36,000	50	34,000	41	30,000	36	28,000	34
		4	.0022	48,000	67	40,000	56	36,000	50	34,000	41	30,000	36	28,000	34
		5	.0018	43,200	52	36,000	43	32,400	39	30,600	37	27,000	32	25,200	25
		6	.0013	43,200	52	36,000	43	32,400	39	30,600	37	27,000	32	25,200	25
		8	.0008	38,400	46	32,000	38	28,800	35	27,200	33	24,000	29	22,400	22
		10	.0004	38,400	46	32,000	38	28,800	35	27,200	33	24,000	24	22,400	22
0.45	0.9	2	.0035	45,600	73	38,000	61	34,200	55	32,300	45	28,500	40	26,600	37
		4	.0023	45,600	73	38,000	61	34,200	55	32,300	45	28,500	40	26,600	37
		6	.0017	41,040	57	34,200	48	30,780	43	29,070	41	25,650	31	23,940	29
		8	.0012	36,480	51	30,400	43	27,360	38	25,840	36	22,800	27	21,280	26
0.5	1	2	.0039	43,200	86	36,000	72	32,400	65	30,600	55	27,000	43	25,200	40
		3	.0039	43,200	86	36,000	72	32,400	65	30,600	55	27,000	43	25,200	40
		4	.0028	43,200	86	36,000	72	32,400	65	30,600	55	27,000	43	25,200	40
		5	.0024	43,200	86	36,000	72	32,400	65	30,600	55	27,000	43	25,200	40
		6	.0016	38,880	70	32,400	58	29,160	52	27,540	44	24,300	34	22,680	32
		7	.0016	38,880	70	32,400	58	29,160	52	27,540	44	24,300	34	22,680	32
		8	.0016	38,880	70	32,400	58	29,160	52	27,540	44	24,300	34	22,680	32
		9	.0012	38,880	70	32,400	58	29,160	52	27,540	44	24,300	34	22,680	32
		10	.001	38,880	70	32,400	58	29,160	52	27,540	44	24,300	34	22,680	32
		12	.0005	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		13	.0004	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		14	.0004	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		16	.0003	34,560	55	28,800	46	25,920	41	24,480	34	21,600	30	20,160	28
		18	.0002	30,240	48	25,200	40	22,680	36	21,420	30	18,900	26	17,640	21
		20	.0002	25,920	41	21,600	35	19,440	31	18,360	26	16,200	23	15,120	18
0.55	1.1	2	.0039	40,320	81	33,600	67	30,240	60	28,560	51	25,200	45	23,520	38
		4	.0028	40,320	81	33,600	67	30,240	60	28,560	51	25,200	45	23,520	38
		6	.0016	36,720	66	30,600	55	27,540	50	26,010	42	22,950	37	21,420	30
		8	.0016	36,720	66	30,600	55	27,540	50	26,010	42	22,950	37	21,420	30
		10	.001	36,720	66	30,600	55	27,540	50	26,010	42	22,950	37	21,420	30
0.6	1.2	4	.0031	36,923	74	30,769	62	27,692	55	26,154	47	23,077	42	21,538	34
		6	.0024	34,560	69	28,800	58	25,920	52	24,480	44	21,600	39	20,160	32
		8	.0016	34,560	69	28,800	58	25,920	52	24,480	44	21,600	39	20,160	32
		10	.0014	34,560	62	28,800	58	25,920	47	24,480	44	21,600	35	20,160	28
		12	.0012	34,560	62	28,800	52	25,920	47	24,480	44	21,600	35	20,160	28
0.7	1.4	8	.0022	30,240	73	25,200	60	22,680	54	21,420	47	18,900	38	17,640	35
		12	.0014	30,240	67	25,200	55	22,680	50	21,420	39	18,900	34	17,640	32
		16	.0007	26,880	54	22,400	45	20,160	40	19,040	34	16,800	30	15,680	25
0.75	1.5	4	.0039	33,600	87	28,000	73	25,200	66	23,800	57	21,000	46	19,600	39
		6	.0039	33,600	87	28,000	73	25,200	66	23,800	57	21,000	46	19,600	39
		8	.0024	30,240	73	25,200	60	22,680	54	21,420	47	18,900	34	17,640	32
		10	.0024	30,240	73	25,200	60	22,680	54	21,420	47	18,900	34	17,640	32
		12	.0024	30,240	73	25,200	60	22,680	54	21,420	47	18,900	34	17,640	32
		14	.002	26,880	59	25,200	60	20,160	44	19,040	38	16,800	30	15,680	25
		16	.0007	26,880	59	22,400	49	20,160	44	19,040	38	16,800	30	15,680	25
		18	.0007	26,880	59	22,400	49	20,160	44	19,040	38	16,800	30	15,680	25
		20	.0007	26,880	59	22,400	49	20,160	44	19,040	38	16,800	30	15,680	25
0.8	1.6	8	.0043	31,200	87	26,000	73	23,400	66	22,100	53	19,500	47	18,200	40
		12	.0026	28,080	67	23,400	56	21,060	55	19,890	44	17,550	39	16,380	33
		16	.0016	28,080	67	23,400	56	21,060	55	19,890	44	17,550	39	16,380	33
		20	.0008	24,960	60	20,800	50	18,720	45	17,680	35	15,600	31	14,560	26
0.9	1.8	8	.0051	31,200	100	26,000	83	23,400	75	22,100	62	19,500	51	18,200	44
		12	.0028	28,080	79	23,400	66	21,060	59	19,890	48	17,550	42	16,380	36
		16	.0018	28,080	79	23,400	66	21,060	59	19,890	48	17,550	42	16,380	36
		20	.0009	24,960	65	20,800	54	18,720	49	17,680	42	15,600	34	14,560	29
1	2	3	.0079	25,200	101	21,000	84	18,900	76	17,850	64	15,750	54	14,700	47
		4	.0079	25,200	101	21,000	84	18,900	76	17,850	64	15,750	54	14,700	47
		6	.0079	25,200	91	21,000	76	18,900	68	17,850	57	15,750	47	14,700	41
		8	.0055	25,200	91	21,000	76	18,900	68	17,850	57	15,750	47	14,700	41
		10	.0055	25,200	81	21,000	67	18,900	60	17,850	50	15,750	41	14,700	38

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM	Revolution n min-1	Feed rate v_f IPM
1	2	12	.0031	22,680	73	18,900	60	17,010	54	16,065	45	14,175	37	13,230	34
		13	.0031	22,680	73	18,900	60	17,010	54	16,065	45	14,175	37	13,230	34
		14	.0031	22,680	73	18,900	60	17,010	54	16,065	45	14,175	37	13,230	34
		16	.0031	22,680	64	18,900	53	17,010	48	16,065	42	14,175	34	13,230	29
		18	.0024	22,680	64	18,900	53	17,010	48	16,065	42	14,175	34	13,230	29
		20	.002	22,680	64	18,900	53	17,010	48	16,065	42	14,175	34	13,230	29
		22	.0017	21,420	56	17,850	46	16,065	42	15,173	36	13,388	29	12,495	27
		25	.0014	20,160	52	16,800	44	15,120	39	14,280	34	12,600	28	11,760	26
		30	.0006	20,160	52	16,800	44	15,120	39	14,280	34	12,600	28	11,760	26
		35	.0005	17,640	46	14,700	38	13,230	34	12,495	27	11,025	24	10,290	21
		40	.0004	15,120	39	12,600	33	11,340	29	10,710	24	9,450	21	8,820	18
1.25	2.5	6	.0098	22,200	107	18,500	89	16,650	80	15,725	66	13,875	53	12,950	44
		10	.0067	22,200	107	18,500	89	16,650	80	15,725	66	13,875	53	12,950	44
		15	.0039	19,980	88	16,650	73	14,985	66	14,153	54	12,488	42	11,655	35
		20	.0031	19,980	88	16,650	73	14,985	66	14,153	54	12,488	42	11,655	35
		25	.0026	19,980	76	16,650	63	14,985	57	14,153	48	12,488	40	11,655	33
		30	.0017	17,760	71	14,800	59	13,320	53	12,580	45	11,100	38	10,360	31
1.5	3	8	.0118	19,200	115	16,000	96	14,400	86	13,600	71	12,000	60	11,200	54
		10	.0083	19,200	115	16,000	96	14,400	86	13,600	71	12,000	60	11,200	54
		13	.0083	19,200	115	16,000	96	14,400	86	13,600	71	12,000	60	11,200	54
		16	.0083	19,200	104	16,000	86	14,400	78	13,600	65	12,000	53	11,200	47
		20	.0047	17,280	93	14,400	78	12,960	70	12,240	59	10,800	48	10,080	42
		25	.0031	17,280	93	14,400	78	12,960	70	12,240	59	10,800	48	10,080	42
		30	.0031	17,280	93	14,400	78	12,960	70	12,240	59	10,800	48	10,080	42
		35	.0025	15,360	77	12,800	64	11,520	58	10,880	48	9,600	40	8,960	36
1.75	3.5	15	.0094	16,500	109	13,750	91	12,375	82	11,688	70	10,313	58	9,625	46
		25	.0055	14,850	89	12,375	74	11,138	67	10,519	57	9,281	45	8,663	38
		35	.0035	14,850	89	12,375	74	11,138	67	10,519	57	9,281	45	8,663	38
		45	.0028	13,200	77	11,000	64	9,900	57	9,350	47	8,250	38	7,700	31
2	4	10	.0157	13,800	108	11,500	90	10,350	81	9,775	68	8,625	57	8,050	50
		13	.0126	13,800	108	11,500	90	10,350	81	9,775	68	8,625	57	8,050	50
		16	.011	13,800	108	11,500	90	10,350	81	9,775	68	8,625	57	8,050	50
		20	.011	13,800	108	11,500	90	10,350	81	9,775	68	8,625	57	8,050	50
		25	.0063	12,420	87	10,350	72	9,315	65	8,798	56	7,763	47	7,245	41
		30	.0063	12,420	87	10,350	72	9,315	65	8,798	56	7,763	47	7,245	41
		35	.0039	12,420	87	10,350	72	9,315	65	8,798	56	7,763	47	7,245	41
		40	.0039	12,420	87	10,350	72	9,315	65	8,798	56	7,763	47	7,245	41
		45	.0031	11,040	73	9,200	61	8,280	55	7,820	47	6,900	39	6,440	35
		50	.0028	11,040	73	9,200	61	8,280	55	7,820	47	6,900	39	6,440	35
2.5	5	20	.0138	10,800	102	9,000	85	8,100	76	7,650	60	6,750	53	6,300	44
		25	.0138	10,800	102	9,000	85	8,100	76	7,650	60	6,750	53	6,300	44
		30	.0079	9,720	91	8,100	76	7,290	69	6,885	54	6,075	47	5,670	40
		40	.0079	9,720	84	8,100	70	7,290	63	6,885	48	6,075	43	5,670	36
3	6	12	.0236	10,800	119	9,000	99	8,100	89	7,650	75	6,750	61	6,300	49
		20	.0197	10,200	104	8,500	87	7,650	78	7,225	65	6,375	54	5,950	44
		30	.0165	9,600	90	8,000	75	7,200	68	6,800	53	6,000	47	5,600	39
		50	.0059	8,640	74	7,200	62	6,480	56	6,120	43	5,400	38	5,040	32

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib processing, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBE2020-10-ATH tool:
Cutting depth = 0.14 (a_p) × 0.65 (cutting depth factor for Group 5 hardened steel) × 0.8 (for closed-area cutting) = 0.073mm

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Ball Evolution

Recommended cutting conditions EPDBE-ATH EPDBE-PN

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A69 about high accuracy cutting conditions

Metric

Recommended range				PN series											
										ATH series					
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.05	0.1	0.2	0.008	50,000	300	50,000	250	50,000	250	50,000	225	50,000	200	50,000	188
		0.3	0.006	50,000	300	50,000	250	50,000	250	50,000	225	50,000	200	50,000	188
		0.5	0.004	50,000	300	50,000	250	50,000	250	50,000	225	50,000	200	50,000	188
0.1	0.2	0.5	0.02	50,000	420	50,000	350	50,000	350	50,000	325	45,500	273	42,000	210
		0.75	0.017	50,000	420	50,000	350	50,000	350	50,000	325	45,500	273	42,000	210
		1	0.014	50,000	420	50,000	350	50,000	350	50,000	325	45,500	273	42,000	210
		1.25	0.011	50,000	378	50,000	315	48,600	306	45,900	269	40,500	219	37,800	170
		1.5	0.008	50,000	378	50,000	315	48,600	306	45,900	269	40,500	219	37,800	170
		2	0.008	50,000	378	50,000	315	48,600	306	45,900	269	40,500	219	37,800	170
		2.5	0.006	48,000	323	48,000	269	43,200	242	40,800	212	36,000	173	33,600	134
		3	0.004	48,000	323	48,000	269	43,200	242	40,800	212	36,000	173	33,600	134
0.15	0.3	0.5	0.027	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		0.75	0.024	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		1	0.021	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		1.25	0.019	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		1.5	0.016	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		2	0.012	50,000	540	50,000	450	48,600	437	45,900	372	40,500	310	37,800	272
		2.5	0.01	50,000	540	50,000	450	48,600	437	45,900	372	40,500	310	37,800	272
		3	0.008	50,000	540	50,000	450	48,600	437	45,900	372	40,500	310	37,800	272
0.2	0.4	0.75	0.043	50,000	967	50,000	840	50,000	839	50,000	770	46,800	655	43,680	612
		1	0.04	50,000	967	50,000	840	50,000	839	50,000	770	46,800	655	43,680	612
		1.5	0.034	50,000	829	50,000	720	50,000	719	50,000	660	46,800	468	43,680	437
		2	0.028	50,000	691	50,000	600	50,000	600	50,000	550	46,800	468	43,680	437
		2.5	0.022	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	36,288	272
		3	0.016	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	36,288	272
		3.5	0.012	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	36,288	272
		4	0.01	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	36,288	272
		4.5	0.008	46,080	470	38,400	392	34,560	353	32,640	305	28,800	245	26,880	228
0.25	0.5	1	0.045	50,000	1,500	50,000	1,500	46,800	1,404	44,200	1,193	39,000	1,053	36,400	743
		1.5	0.04	50,000	1,500	50,000	1,500	46,800	1,404	44,200	1,193	39,000	1,053	36,400	681
		2	0.035	50,000	1,200	50,000	1,200	46,800	1,123	44,200	955	39,000	842	36,400	681
		2.5	0.033	50,000	1,081	50,000	1,000	42,120	758	39,780	645	35,100	568	32,760	502
		3	0.03	50,000	900	46,800	842	42,120	758	39,780	645	35,100	568	25,200	386
		4	0.02	43,200	778	36,000	648	32,400	583	30,600	496	32,400	524	25,200	386
		5	0.018	43,200	778	36,000	648	32,400	583	30,600	496	32,400	524	25,200	386
		5.5	0.015	38,400	653	32,000	544	28,800	490	27,200	416	24,000	367	22,400	324
		6	0.013	38,400	653	32,000	544	28,800	490	27,200	416	24,000	367	22,400	324
		8	0.008	38,400	653	32,000	544	28,800	490	27,200	416	24,000	367	22,400	324
0.3	0.6	1	0.075	50,000	2,250	50,000	2,250	50,000	2,250	50,000	1,950	48,000	1,728	44,800	1,344
		2	0.063	50,000	2,250	50,000	2,250	50,000	2,250	50,000	1,950	48,000	1,728	44,800	1,344
		2.5	0.046	50,000	1,800	50,000	1,800	50,000	1,800	50,000	1,560	48,000	1,382	44,800	986
		3	0.041	50,000	1,800	50,000	1,800	50,000	1,800	50,000	1,560	48,000	1,382	44,800	986
		3.5	0.035	50,000	1,710	50,000	1,710	50,000	1,709	48,960	1,452	43,200	1,183	40,320	843
		4	0.026	50,000	1,710	50,000	1,710	50,000	1,709	48,960	1,452	43,200	1,183	40,320	766
		4.5	0.022	50,000	1,350	50,000	1,350	48,600	1,313	45,900	1,074	40,500	875	37,800	681
		5	0.02	50,000	1,350	46,800	1,264	42,120	1,138	39,780	931	35,100	758	32,760	590
		5.5	0.017	50,000	1,350	46,800	1,264	42,120	1,138	39,780	931	35,100	758	32,760	590
		6	0.015	50,000	1,350	46,800	1,264	42,120	1,138	39,780	931	35,100	758	32,760	590
		7	0.015	38,400	979	32,000	816	28,800	881	27,200	601	24,000	490	22,400	495
		8	0.015	38,400	979	32,000	816	28,800	734	27,200	601	24,000	490	22,400	381
		9	0.012	38,400	979	32,000	816	28,800	734	27,200	601	24,000	490	22,400	381
		10	0.009	33,600	857	28,000	714	25,200	643	23,800	526	21,000	428	19,600	333
		12	0.007	28,800	691	24,000	576	21,600	518	20,400	424	18,000	346	16,800	269
0.35	0.7	2	0.092	50,000	2,475	50,000	2,475	50,000	2,475	50,000	2,155	48,000	1,932	42,000	1,188
		4	0.041	50,000	1,880	50,000	1,880	50,000	1,880	48,960	1,603	43,200	1,321	37,800	846
		6	0.027	50,000	1,485	46,800	1,390	42,120	1,251	39,780	1,028	35,100	848	30,240	641
		8	0.02	38,400	1,013	32,000	844	28,800	760	27,200	625	24,000	515	22,400	422

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.4	0.8	2	0.12	50,000	2,700	50,000	2,700	50,000	2,700	50,000	2,400	48,000	2,592	44,800	1,882
		4	0.078	50,000	2,700	50,000	2,700	50,000	2,700	50,000	2,400	48,000	2,592	44,800	1,882
		5	0.059	50,000	2,431	50,000	2,429	50,000	2,431	48,960	2,114	43,200	2,123	40,320	1,524
		6	0.042	50,000	2,269	50,000	2,267	45,360	2,058	42,840	1,727	37,800	1,429	35,280	1,245
		8	0.02	49,920	1,617	41,600	1,348	37,440	1,213	35,360	1,018	31,200	842	29,120	733
		10	0.02	38,400	1,175	32,000	979	28,800	881	27,200	740	24,000	612	22,400	533
0.45	0.9	2	0.135	50,000	3,197	50,000	3,197	50,000	3,197	50,000	2,821	45,600	2,411	42,560	2,138
		4	0.081	50,000	2,771	50,000	2,771	50,000	2,771	48,450	2,369	42,750	1,959	39,900	1,737
		6	0.05	50,000	2,302	47,880	2,020	43,092	1,818	40,698	1,515	35,910	1,253	33,516	1,111
		8	0.036	43,776	1,679	36,480	1,399	32,832	1,259	31,008	1,049	27,360	868	25,536	770
0.5	1	2	0.2	50,000	3,750	50,000	3,750	48,600	3,645	45,900	3,098	43,200	2,722	37,800	2,268
		3	0.2	50,000	3,750	50,000	3,750	48,600	3,645	45,900	3,098	43,200	2,722	37,800	2,268
		4	0.14	50,000	3,750	50,000	3,750	48,600	3,645	45,900	3,098	43,200	2,722	37,800	2,268
		5	0.09	50,000	3,500	46,800	3,276	42,120	2,948	39,780	2,596	43,200	2,540	32,760	1,835
		6	0.06	50,000	3,151	42,120	2,654	40,824	2,558	38,556	2,319	38,880	2,353	29,484	1,379
		7	0.06	46,656	2,100	38,880	1,750	34,992	1,574	33,048	1,338	31,590	1,323	27,216	1,061
		8	0.06	46,656	2,100	38,880	1,750	34,992	1,574	33,048	1,338	31,590	1,323	27,216	979
		9	0.045	46,656	2,100	38,880	1,750	34,992	1,574	33,048	1,338	31,590	1,323	27,216	979
		10	0.038	46,656	2,100	38,880	1,750	34,992	1,574	33,048	1,338	31,590	1,323	27,216	979
		12	0.025	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		13	0.023	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		14	0.02	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		16	0.015	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		18	0.012	30,240	1,210	25,200	1,008	22,680	907	21,420	771	18,900	635	17,640	564
		20	0.01	25,920	1,037	21,600	864	19,440	778	18,360	661	16,200	544	15,120	484
0.55	1.1	2	0.2	50,000	3,924	50,000	3,924	45,360	3,560	42,840	2,927	37,800	2,452	35,280	2,176
		4	0.14	50,000	3,924	50,000	3,924	45,360	3,560	42,840	2,927	37,800	2,452	35,280	2,176
		6	0.06	47,736	2,767	39,780	2,306	35,802	2,075	33,813	1,706	29,835	1,430	27,846	1,268
		8	0.06	47,736	2,306	39,780	2,306	35,802	1,729	31,212	1,312	27,540	1,100	25,704	975
		10	0.038	47,736	2,306	39,780	1,774	35,802	1,729	31,212	1,312	27,540	1,100	25,704	975
0.6	1.2	4	0.16	50,000	3,924	46,154	3,743	41,538	3,260	39,230	2,717	36,923	2,555	32,307	1,860
		6	0.11	44,928	2,570	37,440	2,142	33,696	2,103	31,824	2,069	30,240	2,062	26,208	1,048
		8	0.06	44,928	2,570	37,440	2,142	33,696	2,103	31,824	2,069	30,240	2,062	26,208	1,048
		10	0.053	41,472	1,940	34,560	1,708	31,104	1,456	29,376	1,322	27,000	1,069	24,192	871
		12	0.045	41,472	1,940	34,560	1,618	31,104	1,456	29,376	1,322	25,920	1,026	24,192	871
0.7	1.4	8	0.11	39,312	2,830	32,760	2,359	29,484	2,123	27,846	1,805	24,570	1,533	22,932	1,376
		12	0.053	36,288	1,960	30,240	1,633	27,216	1,470	25,704	1,249	22,680	1,062	21,168	953
		16	0.035	26,880	1,371	22,400	1,142	20,160	1,028	19,040	874	16,800	743	15,680	666
0.75	1.5	4	0.2	50,000	4,951	42,000	4,158	37,800	3,742	35,700	3,213	31,500	2,552	29,400	2,205
		6	0.2	50,000	4,951	42,000	4,158	37,800	3,742	35,700	3,213	31,500	2,552	29,400	2,205
		8	0.09	39,312	2,802	32,760	2,627	29,484	2,101	27,846	1,805	24,570	1,434	22,932	1,239
		10	0.09	36,288	2,586	30,240	2,156	27,216	1,940	25,704	1,666	22,680	1,323	21,168	1,143
		12	0.09	36,288	2,155	30,240	1,796	27,216	1,616	25,704	1,388	22,680	1,103	21,168	953
		14	0.075	32,256	1,810	30,240	1,796	24,192	1,357	22,848	1,165	20,160	925	18,816	799
		16	0.038	26,880	1,508	22,400	1,257	20,160	1,131	19,040	971	16,800	771	15,680	666
		18	0.038	26,880	1,508	22,400	1,257	20,160	1,131	19,040	971	16,800	771	15,680	666
		20	0.038	26,880	1,508	22,400	1,257	20,160	1,131	19,040	971	16,800	771	15,680	666
0.8	1.6	8	0.22	43,680	3,669	36,400	3,058	32,760	2,752	30,940	2,493	27,300	2,129	23,660	1,590
		12	0.098	39,312	3,467	32,760	2,889	29,484	2,601	27,846	2,176	24,570	1,858	21,294	1,289
		16	0.06	33,696	2,123	28,080	1,769	25,272	1,592	23,868	1,332	21,060	1,138	19,656	991
		20	0.04	24,960	1,485	20,800	1,238	18,720	1,114	17,680	932	15,600	796	14,560	693
0.9	1.8	8	0.26	40,560	3,894	33,800	3,245	30,420	2,920	28,730	2,413	25,350	2,008	23,660	1,704
		12	0.105	33,696	2,426	28,080	2,022	25,272	1,819	23,868	1,504	21,060	1,250	19,656	1,062
		16	0.068	33,696	2,426	28,080	2,022	25,272	1,819	23,868	1,504	21,060	1,250	19,656	1,062
		20	0.045	24,960	1,697	20,800	1,414	18,720	1,273	17,680	1,052	15,600	875	14,560	743
1	2	3	0.4	37,800	5,670	31,500	4,725	28,350	4,253	26,775	3,616	23,625	3,049	22,050	2,646
		4	0.4	37,800	5,670	31,500	4,725	28,350	4,253	26,775	3,616	23,625	3,049	22,050	2,646
		6	0.4	37,800	5,103	31,500	4,253	28,350	3,827	26,775	3,213	23,625	2,693	22,050	2,381
		8	0.28	37,800	5,103	31,500	4,253	28,350	3,827	26,775	3,213	23,625	2,693	22,050	2,381
		10	0.21	35,280	4,234	29,400	3,528	26,460	3,175	24,990	2,699	22,050	2,249	19,110	1,468

【Note】 Upon usage, please refer to comments and notes below table on page A68.

Epoch Deep Ball Evolution

EPDBE-ATH **EPDBE-PN** High efficiency cutting conditions High accuracy cutting conditions

Please refer to P.A69 about high accuracy cutting conditions

Metric

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
1	2	12	0.12	31,752	3,809	26,460	3,175	23,814	2,858	22,491	2,430	19,845	2,051	17,199	1,321
		13	0.12	31,752	3,809	26,460	3,175	23,814	2,858	22,491	2,430	19,845	2,024	15,876	1,016
		14	0.12	31,752	3,301	26,460	2,752	23,814	2,477	22,491	2,106	18,428	1,629	15,876	1,016
		16	0.12	29,484	2,123	24,570	1,769	22,113	1,593	20,885	1,353	18,428	1,467	15,876	914
		18	0.09	27,216	1,960	22,680	1,633	20,412	1,470	19,278	1,249	18,428	1,354	15,876	914
		20	0.075	27,216	1,960	22,680	1,633	20,412	1,470	19,278	1,249	18,428	1,128	15,876	914
		22	0.05	21,420	1,457	17,850	1,214	16,065	1,092	15,173	929	13,388	774	14,994	816
		25	0.05	20,160	1,371	16,800	1,142	15,120	1,028	14,280	874	12,600	728	14,112	768
		30	0.03	20,160	1,371	16,800	1,142	15,120	1,028	14,280	874	12,600	728	14,112	768
		35	0.025	17,640	1,129	14,700	941	13,230	847	12,495	720	11,025	600	10,290	527
		40	0.022	15,120	968	12,600	806	11,340	726	10,710	617	9,450	514	8,820	452
1.25	2.5	6	0.5	33,300	6,075	27,750	5,063	24,975	4,556	23,588	3,797	20,813	3,088	19,425	2,531
		10	0.34	33,300	6,075	27,750	5,063	24,975	4,556	23,588	3,797	20,813	3,088	19,425	2,531
		15	0.15	25,974	3,411	21,645	2,842	19,481	2,558	18,398	2,132	16,234	2,023	15,152	1,421
		20	0.12	23,976	2,624	19,980	2,186	17,982	1,968	16,983	1,640	16,234	1,445	13,986	1,093
		25	0.098	23,976	2,360	19,980	1,967	17,982	1,770	16,983	1,475	14,985	1,200	13,986	983
		30	0.055	17,760	1,836	14,800	1,530	13,320	1,377	12,580	1,148	11,100	933	10,360	765
1.5	3	8	0.6	28,800	6,480	24,000	5,400	21,600	4,860	20,400	4,100	18,000	3,402	16,800	3,024
		10	0.42	28,800	6,480	24,000	5,400	21,600	4,860	20,400	4,100	18,000	3,402	16,800	3,024
		13	0.315	26,880	4,838	22,400	4,032	20,160	3,629	19,040	3,061	16,800	2,540	15,680	2,258
		16	0.315	26,880	4,355	22,400	3,629	20,160	3,266	19,040	2,755	16,800	2,286	14,560	1,888
		20	0.18	22,464	3,033	18,720	2,527	16,848	2,275	15,912	1,919	14,040	1,593	12,096	1,307
		25	0.12	22,464	3,033	18,720	2,527	16,848	2,275	15,912	1,919	14,040	1,593	12,096	1,307
		30	0.12	20,736	2,800	17,280	2,333	15,552	2,100	14,688	1,771	12,960	1,470	12,096	1,307
		35	0.08	15,360	1,958	12,800	1,632	11,520	1,469	10,880	1,239	9,600	1,028	10,752	1,097
1.75	3.5	15	0.36	21,450	4,399	17,875	3,666	16,088	3,299	15,194	2,750	13,406	2,236	12,513	1,833
		25	0.21	17,820	2,736	14,850	2,280	13,365	2,052	12,623	1,710	11,138	1,391	10,395	1,140
		35	0.09	17,820	2,736	14,850	2,280	13,365	2,052	12,623	1,710	11,138	1,391	10,395	1,140
		45	0.09	13,200	1,918	11,000	1,598	9,900	1,438	9,350	1,199	8,250	975	7,700	799
2	4	10	0.6	20,700	6,210	17,250	5,175	15,525	4,658	14,663	3,960	12,938	3,299	12,075	2,898
		13	0.48	20,700	6,210	17,250	5,175	15,525	4,658	14,663	3,960	12,938	3,299	12,075	2,898
		16	0.42	20,700	6,210	17,250	5,175	15,525	4,658	14,663	3,960	12,938	3,299	12,075	2,898
		20	0.42	17,940	4,306	14,950	3,588	13,455	3,229	12,708	2,746	11,213	2,287	10,465	2,009
		25	0.24	16,146	3,488	13,455	2,906	12,110	2,616	11,437	2,223	10,092	2,162	9,419	1,627
		30	0.16	14,904	2,683	12,420	2,236	11,178	2,012	10,558	1,710	9,316	1,426	8,694	1,252
		35	0.1	14,904	2,683	12,420	2,236	11,178	2,012	10,558	1,710	9,316	1,426	8,694	1,252
		40	0.1	14,904	2,683	12,420	2,236	11,178	2,012	10,558	1,710	9,316	1,426	8,694	1,252
		45	0.1	11,040	1,877	9,200	1,564	8,280	1,408	7,820	1,196	6,900	997	6,440	876
		50	0.1	11,040	1,877	9,200	1,564	8,280	1,408	7,820	1,196	6,900	997	6,440	876
2.5	5	20	0.525	15,120	5,443	12,600	4,536	11,340	4,082	10,710	3,213	9,450	2,835	8,820	2,381
		25	0.525	14,040	5,054	11,700	3,650	10,530	3,791	9,945	2,984	8,775	2,633	8,190	2,211
		30	0.3	12,636	4,549	10,530	2,780	9,477	3,413	8,951	2,685	7,898	2,369	7,371	1,991
		40	0.2	11,664	2,520	9,720	2,100	8,748	1,890	8,262	1,487	7,290	1,313	6,804	1,103
3	6	12	0.6	16,200	6,804	13,500	5,670	12,150	5,103	11,475	4,253	10,125	3,459	9,450	2,835
		20	0.5	15,300	5,967	12,750	4,973	11,475	4,475	10,838	3,729	9,563	3,033	8,925	2,486
		30	0.42	12,480	3,594	10,400	2,995	9,360	2,696	8,840	2,122	7,800	2,028	7,280	1,572
		50	0.15	10,368	2,687	8,640	2,239	7,776	2,016	7,344	1,587	6,480	1,400	6,048	1,175

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib processing, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBE2020-10-ATH tool:
Cutting depth = 0.21 (a_p) × 0.65 (cutting depth factor for Group 5 hardened steel) × 0.8 (for closed-area cutting) = 0.11mm

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended cutting conditions EPDBE-ATH EPDBE-PN

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A66 about high efficiency cutting conditions

Metric

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.05	0.1	0.2	0.004	50,000	300	50,000	250	50,000	250	50,000	225	50,000	200	50,000	188
		0.3	0.003	50,000	300	50,000	250	50,000	250	50,000	225	50,000	200	50,000	188
		0.5	0.002	50,000	300	50,000	250	50,000	250	50,000	225	50,000	200	50,000	188
0.1	0.2	0.5	0.015	50,000	420	50,000	350	50,000	350	50,000	325	45,500	273	42,000	210
		0.75	0.013	50,000	420	50,000	350	50,000	350	50,000	325	45,500	273	42,000	210
		1	0.011	50,000	420	50,000	350	50,000	350	50,000	325	45,500	273	42,000	210
		1.25	0.008	50,000	378	50,000	315	48,600	306	45,900	269	40,500	219	37,800	170
		1.5	0.007	50,000	378	50,000	315	48,600	306	45,900	269	40,500	219	37,800	170
		2	0.006	50,000	378	50,000	315	48,600	306	45,900	269	40,500	219	37,800	170
		2.5	0.005	48,000	323	48,000	269	43,200	242	40,800	212	36,000	173	33,600	134
		3	0.003	48,000	323	48,000	269	43,200	242	40,800	212	36,000	173	33,600	134
0.15	0.3	0.5	0.02	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		0.75	0.018	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		1	0.016	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		1.25	0.014	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		1.5	0.012	50,000	600	50,000	500	50,000	500	50,000	450	45,000	383	42,000	336
		2	0.009	50,000	540	50,000	450	48,600	437	45,900	372	40,500	310	37,800	272
		2.5	0.008	50,000	540	50,000	450	48,600	437	45,900	372	40,500	310	37,800	272
		3	0.006	50,000	540	50,000	450	48,600	437	45,900	372	40,500	310	37,800	272
0.2	0.4	0.75	0.043	50,000	691	48,000	576	43,200	518	40,800	449	36,000	360	33,600	336
		1	0.04	50,000	691	48,000	576	43,200	518	40,800	449	36,000	360	33,600	336
		1.5	0.034	50,000	691	48,000	576	43,200	518	40,800	449	36,000	360	33,600	336
		2	0.028	50,000	691	48,000	576	43,200	518	40,800	449	36,000	360	33,600	336
		2.5	0.016	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	30,240	272
		3	0.011	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	30,240	272
		3.5	0.008	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	30,240	272
		4	0.005	50,000	560	43,200	467	38,880	420	36,720	364	32,400	292	30,240	272
		4.5	0.004	46,080	470	38,400	392	34,560	353	32,640	305	28,800	245	26,880	228
0.25	0.5	1	0.045	48,000	960	40,000	800	36,000	720	34,000	612	30,000	540	28,000	476
		1.5	0.04	48,000	960	40,000	800	36,000	720	34,000	612	30,000	540	28,000	476
		2	0.035	48,000	960	40,000	800	36,000	720	34,000	612	30,000	540	28,000	476
		2.5	0.033	43,200	778	40,000	800	32,400	583	30,600	496	27,000	437	25,200	386
		3	0.03	43,200	778	36,000	648	32,400	583	30,600	496	27,000	437	25,200	386
		4	0.02	43,200	778	36,000	648	32,400	583	30,600	496	27,000	437	25,200	386
		5	0.018	43,200	778	36,000	648	32,400	583	30,600	496	27,000	437	25,200	386
		5.5	0.008	38,400	653	32,000	544	28,800	490	27,200	416	24,000	367	22,400	324
		6	0.007	38,400	653	32,000	544	28,800	490	27,200	416	24,000	367	22,400	324
		8	0.004	38,400	653	32,000	544	28,800	490	27,200	416	24,000	367	22,400	324
0.3	0.6	1	0.05	48,000	1,440	40,000	1,200	36,000	1,080	34,000	884	30,000	720	28,000	560
		2	0.042	48,000	1,440	40,000	1,200	36,000	1,080	34,000	884	30,000	720	28,000	560
		2.5	0.038	48,000	1,440	40,000	1,200	36,000	1,080	34,000	884	30,000	720	28,000	560
		3	0.034	48,000	1,440	40,000	1,200	36,000	1,080	34,000	884	30,000	720	28,000	560
		3.5	0.029	43,200	1,231	36,000	1,026	32,400	923	30,600	756	27,000	616	25,200	479
		4	0.024	43,200	1,231	36,000	1,026	32,400	923	30,600	756	27,000	616	25,200	479
		4.5	0.022	43,200	1,166	36,000	972	32,400	875	30,600	716	27,000	583	25,200	454
		5	0.02	43,200	1,166	36,000	972	32,400	875	30,600	716	27,000	583	25,200	454
		5.5	0.017	43,200	1,166	36,000	972	32,400	875	30,600	716	27,000	583	25,200	454
		6	0.015	43,200	1,166	36,000	972	32,400	875	30,600	716	27,000	583	25,200	454
		7	0.008	38,400	979	32,000	816	28,800	734	27,200	601	24,000	490	22,400	381
		8	0.008	38,400	979	32,000	816	28,800	734	27,200	601	24,000	490	22,400	381
		9	0.006	38,400	979	32,000	816	28,800	734	27,200	601	24,000	490	22,400	381
		10	0.005	33,600	857	28,000	714	25,200	643	23,800	526	21,000	428	19,600	333
		12	0.004	28,800	691	24,000	576	21,600	518	20,400	424	18,000	346	16,800	269
0.35	0.7	2	0.061	48,000	1,584	40,000	1,320	36,000	1,188	34,000	977	30,000	805	28,000	660
		4	0.034	43,200	1,354	36,000	1,128	32,400	1,015	30,600	835	27,000	688	25,200	564
		6	0.027	43,200	1,283	36,000	1,069	32,400	962	30,600	791	27,000	652	25,200	535
		8	0.01	38,400	1,013	32,000	844	28,800	760	27,200	625	24,000	515	22,400	422

【Note】 Upon usage, please refer to comments and notes below table on page A71.

Epoch Deep Ball Evolution

EPDBE-ATH **EPDBE-PN** High efficiency cuttiing conditions **High accuracy cuttiing conditions**

Please refer to P.A66 about high efficiency cutting conditions

Metric

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel		Stainless steel, Tool steel		Pre-hardened steel		Hardened steel		Hardened steel	
						(180～250HB)		(25～35HRC)		(35～45HRC)		(45～55HRC)		(55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.4	0.8	2	0.08	48,000	1,728	40,000	1,440	36,000	1,296	34,000	1,088	30,000	900	28,000	784
		4	0.056	48,000	1,728	40,000	1,440	36,000	1,296	34,000	1,088	30,000	900	28,000	784
		5	0.045	43,200	1,400	36,000	1,166	32,400	1,050	30,600	881	27,000	729	25,200	635
		6	0.032	43,200	1,400	36,000	1,166	32,400	1,050	30,600	881	27,000	729	25,200	635
		8	0.02	38,400	1,244	32,000	1,037	28,800	933	27,200	783	24,000	648	22,400	564
		10	0.01	38,400	1,175	32,000	979	28,800	881	27,200	740	24,000	612	22,400	533
0.45	0.9	2	0.09	45,600	1,944	38,000	1,620	34,200	1,458	32,300	1,215	28,500	1,004	26,600	891
		4	0.058	45,600	1,944	38,000	1,620	34,200	1,458	32,300	1,215	28,500	1,004	26,600	891
		6	0.042	41,040	1,574	34,200	1,312	30,780	1,181	29,070	984	25,650	813	23,940	722
		8	0.03	36,480	1,399	30,400	1,166	27,360	1,049	25,840	875	22,800	723	21,280	641
0.5	1	2	0.1	43,200	2,160	36,000	1,800	32,400	1,620	30,600	1,377	27,000	1,134	25,200	1,008
		3	0.1	43,200	2,160	36,000	1,800	32,400	1,620	30,600	1,377	27,000	1,134	25,200	1,008
		4	0.07	43,200	2,160	36,000	1,800	32,400	1,620	30,600	1,377	27,000	1,134	25,200	1,008
		5	0.06	43,200	2,160	36,000	1,800	32,400	1,620	30,600	1,377	27,000	1,134	25,200	1,008
		6	0.04	38,880	1,750	32,400	1,458	29,160	1,312	27,540	1,115	24,300	919	22,680	816
		7	0.04	38,880	1,750	32,400	1,458	29,160	1,312	27,540	1,115	24,300	919	22,680	816
		8	0.04	38,880	1,750	32,400	1,458	29,160	1,312	27,540	1,115	24,300	919	22,680	816
		9	0.03	38,880	1,750	32,400	1,458	29,160	1,312	27,540	1,115	24,300	919	22,680	816
		10	0.025	38,880	1,750	32,400	1,458	29,160	1,312	27,540	1,115	24,300	919	22,680	816
		12	0.013	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		13	0.011	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		14	0.01	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		16	0.008	34,560	1,469	28,800	1,224	25,920	1,102	24,480	936	21,600	771	20,160	685
		18	0.006	30,240	1,210	25,200	1,008	22,680	907	21,420	771	18,900	635	17,640	564
		20	0.005	25,920	1,037	21,600	864	19,440	778	18,360	661	16,200	544	15,120	484
0.55	1.1	2	0.1	40,320	2,110	33,600	1,758	30,240	1,582	28,560	1,301	25,200	1,090	23,520	967
		4	0.07	40,320	2,110	33,600	1,758	30,240	1,582	28,560	1,301	25,200	1,090	23,520	967
		6	0.04	36,720	1,774	30,600	1,478	27,540	1,330	26,010	1,094	22,950	916	21,420	813
		8	0.04	36,720	1,774	30,600	1,478	27,540	1,330	26,010	1,094	22,950	916	21,420	813
		10	0.025	36,720	1,774	30,600	1,478	27,540	1,330	26,010	1,094	22,950	916	21,420	813
0.6	1.2	4	0.08	36,923	1,932	30,769	1,610	27,692	1,449	26,154	1,208	23,077	998	21,538	886
		6	0.06	34,560	1,797	28,800	1,498	25,920	1,348	24,480	1,102	21,600	950	20,160	806
		8	0.04	34,560	1,797	28,800	1,498	25,920	1,348	24,480	1,102	21,600	950	20,160	806
		10	0.035	34,560	1,617	28,800	1,423	25,920	1,213	24,480	1,102	21,600	855	20,160	726
		12	0.03	34,560	1,617	28,800	1,348	25,920	1,213	24,480	1,102	21,600	855	20,160	726
0.7	1.4	8	0.055	30,240	1,814	25,200	1,512	22,680	1,361	21,420	1,157	18,900	983	17,640	882
		12	0.035	30,240	1,633	25,200	1,361	22,680	1,225	21,420	1,041	18,900	885	17,640	794
		16	0.017	26,880	1,371	22,400	1,142	20,160	1,028	19,040	874	16,800	743	15,680	666
0.75	1.5	4	0.1	33,600	2,218	28,000	1,848	25,200	1,663	23,800	1,428	21,000	1,134	19,600	980
		6	0.1	33,600	2,218	28,000	1,848	25,200	1,663	23,800	1,428	21,000	1,134	19,600	980
		8	0.06	30,240	1,796	25,200	1,497	22,680	1,347	21,420	1,157	18,900	919	17,640	794
		10	0.06	30,240	1,796	25,200	1,497	22,680	1,347	21,420	1,157	18,900	919	17,640	794
		12	0.06	30,240	1,796	25,200	1,497	22,680	1,347	21,420	1,157	18,900	919	17,640	794
		14	0.05	26,880	1,508	25,200	1,497	20,160	1,131	19,040	971	16,800	771	15,680	666
		16	0.019	26,880	1,508	22,400	1,257	20,160	1,131	19,040	971	16,800	771	15,680	666
		18	0.019	26,880	1,508	22,400	1,257	20,160	1,131	19,040	971	16,800	771	15,680	666
		20	0.019	26,880	1,508	22,400	1,257	20,160	1,131	19,040	971	16,800	771	15,680	666
0.8	1.6	8	0.11	31,200	2,184	26,000	1,820	23,400	1,638	22,100	1,370	19,500	1,170	18,200	1,019
		12	0.065	28,080	1,769	23,400	1,474	21,060	1,327	19,890	1,110	17,550	948	16,380	826
		16	0.04	28,080	1,769	23,400	1,474	21,060	1,327	19,890	1,110	17,550	948	16,380	826
		20	0.02	24,960	1,485	20,800	1,238	18,720	1,114	17,680	932	15,600	796	14,560	693
0.9	1.8	8	0.13	31,200	2,496	26,000	2,080	23,400	1,872	22,100	1,547	19,500	1,287	18,200	1,092
		12	0.07	28,080	2,022	23,400	1,685	21,060	1,516	19,890	1,253	17,550	1,042	16,380	885
		16	0.045	28,080	2,022	23,400	1,685	21,060	1,516	19,890	1,253	17,550	1,042	16,380	885
		20	0.022	24,960	1,697	20,800	1,414	18,720	1,273	17,680	1,052	15,600	875	14,560	743
1	2	3	0.2	25,200	2,520	21,000	2,100	18,900	1,890	17,850	1,607	15,750	1,355	14,700	1,176
		4	0.2	25,200	2,520	21,000	2,100	18,900	1,890	17,850	1,607	15,750	1,355	14,700	1,176
		6	0.2	25,200	2,268	21,000	1,890	18,900	1,701	17,850	1,428	15,750	1,197	14,700	1,058
		8	0.14	25,200	2,268	21,000	1,890	18,900	1,701	17,850	1,428	15,750	1,197	14,700	1,058
		10	0.14	25,200	2,016	21,000	1,680	18,900	1,512	17,850	1,285	15,750	1,071	14,700	941

Recommended range				PN series / ATH series											
Work material				1		2		3		4		5		6	
				Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n min-1	Feed rate v_f mm/min	Revolution n min-1	Feed rate v_f mm/min	Revolution n min-1	Feed rate v_f mm/min	Revolution n min-1	Feed rate v_f mm/min	Revolution n min-1	Feed rate v_f mm/min	Revolution n min-1	Feed rate v_f mm/min
1	2	12	0.08	22,680	1,814	18,900	1,512	17,010	1,361	16,065	1,157	14,175	964	13,230	847
		13	0.08	22,680	1,814	18,900	1,512	17,010	1,361	16,065	1,157	14,175	964	13,230	847
		14	0.08	22,680	1,814	18,900	1,512	17,010	1,361	16,065	1,157	14,175	964	13,230	847
		16	0.08	22,680	1,633	18,900	1,361	17,010	1,225	16,065	1,041	14,175	868	13,230	762
		18	0.06	22,680	1,633	18,900	1,361	17,010	1,225	16,065	1,041	14,175	868	13,230	762
		20	0.05	22,680	1,633	18,900	1,361	17,010	1,225	16,065	1,041	14,175	868	13,230	762
		22	0.042	21,420	1,457	17,850	1,214	16,065	1,092	15,173	929	13,388	774	12,495	680
		25	0.035	20,160	1,371	16,800	1,142	15,120	1,028	14,280	874	12,600	728	11,760	640
		30	0.015	20,160	1,371	16,800	1,142	15,120	1,028	14,280	874	12,600	728	11,760	640
		35	0.012	17,640	1,129	14,700	941	13,230	847	12,495	720	11,025	600	10,290	527
		40	0.01	15,120	968	12,600	806	11,340	726	10,710	617	9,450	514	8,820	452
1.25	2.5	6	0.25	22,200	2,700	18,500	2,250	16,650	2,025	15,725	1,688	13,875	1,373	12,950	1,125
		10	0.17	22,200	2,700	18,500	2,250	16,650	2,025	15,725	1,688	13,875	1,373	12,950	1,125
		15	0.1	19,980	2,186	16,650	1,822	14,985	1,640	14,153	1,367	12,488	1,111	11,655	911
		20	0.08	19,980	2,186	16,650	1,822	14,985	1,640	14,153	1,367	12,488	1,111	11,655	911
		25	0.065	19,980	1,967	16,650	1,639	14,985	1,475	14,153	1,229	12,488	1,000	11,655	820
		30	0.044	17,760	1,836	14,800	1,530	13,320	1,377	12,580	1,148	11,100	933	10,360	765
1.5	3	8	0.3	19,200	2,880	16,000	2,400	14,400	2,160	13,600	1,822	12,000	1,512	11,200	1,344
		10	0.21	19,200	2,880	16,000	2,400	14,400	2,160	13,600	1,822	12,000	1,512	11,200	1,344
		13	0.21	19,200	2,880	16,000	2,400	14,400	2,160	13,600	1,822	12,000	1,512	11,200	1,344
		16	0.21	19,200	2,592	16,000	2,160	14,400	1,944	13,600	1,640	12,000	1,361	11,200	1,210
		20	0.12	17,280	2,333	14,400	1,944	12,960	1,750	12,240	1,476	10,800	1,225	10,080	1,089
		25	0.08	17,280	2,333	14,400	1,944	12,960	1,750	12,240	1,476	10,800	1,225	10,080	1,089
		30	0.08	17,280	2,333	14,400	1,944	12,960	1,750	12,240	1,476	10,800	1,225	10,080	1,089
		35	0.064	15,360	1,958	12,800	1,632	11,520	1,469	10,880	1,239	9,600	1,028	8,960	914
1.75	3.5	15	0.24	16,500	2,820	13,750	2,350	12,375	2,115	11,688	1,763	10,313	1,434	9,625	1,175
		25	0.14	14,850	2,280	12,375	1,900	11,138	1,710	10,519	1,425	9,281	1,159	8,663	950
		35	0.09	14,850	2,280	12,375	1,900	11,138	1,710	10,519	1,425	9,281	1,159	8,663	950
		45	0.072	13,200	1,918	11,000	1,598	9,900	1,438	9,350	1,199	8,250	975	7,700	799
2	4	10	0.4	13,800	2,760	11,500	2,300	10,350	2,070	9,775	1,760	8,625	1,466	8,050	1,288
		13	0.32	13,800	2,760	11,500	2,300	10,350	2,070	9,775	1,760	8,625	1,466	8,050	1,288
		16	0.28	13,800	2,760	11,500	2,300	10,350	2,070	9,775	1,760	8,625	1,466	8,050	1,288
		20	0.28	13,800	2,760	11,500	2,300	10,350	2,070	9,775	1,760	8,625	1,466	8,050	1,288
		25	0.16	12,420	2,236	10,350	1,863	9,315	1,677	8,798	1,425	7,763	1,188	7,245	1,043
		30	0.16	12,420	2,236	10,350	1,863	9,315	1,677	8,798	1,425	7,763	1,188	7,245	1,043
		35	0.1	12,420	2,236	10,350	1,863	9,315	1,677	8,798	1,425	7,763	1,188	7,245	1,043
		40	0.1	12,420	2,236	10,350	1,863	9,315	1,677	8,798	1,425	7,763	1,188	7,245	1,043
		45	0.08	11,040	1,877	9,200	1,564	8,280	1,408	7,820	1,196	6,900	997	6,440	876
		50	0.07	11,040	1,877	9,200	1,564	8,280	1,408	7,820	1,196	6,900	997	6,440	876
2.5	5	20	0.35	10,800	2,592	9,000	2,160	8,100	1,944	7,650	1,530	6,750	1,350	6,300	1,134
		25	0.35	10,800	2,592	9,000	2,160	8,100	1,944	7,650	1,530	6,750	1,350	6,300	1,134
		30	0.2	9,720	2,333	8,100	1,944	7,290	1,750	6,885	1,377	6,075	1,215	5,670	1,021
		40	0.2	9,720	2,100	8,100	1,750	7,290	1,575	6,885	1,239	6,075	1,094	5,670	919
3	6	12	0.6	10,800	3,024	9,000	2,520	8,100	2,268	7,650	1,890	6,750	1,537	6,300	1,260
		20	0.5	10,200	2,652	8,500	2,210	7,650	1,989	7,225	1,658	6,375	1,348	5,950	1,105
		30	0.42	9,600	2,304	8,000	1,920	7,200	1,728	6,800	1,360	6,000	1,200	5,600	1,008
		50	0.15	8,640	1,866	7,200	1,555	6,480	1,400	6,120	1,102	5,400	972	5,040	816

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib processing, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDBE2020-10-ATH tool:
Cutting depth = 0.14 (a_p) × 0.65 (cutting depth factor for Group 5 hardened steel) × 0.8 (for closed-area cutting) = 0.073mm

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Pencil Deep Ball Evolution

Pencil neck

Die-sinking | Profiling | Radius | Rest material machining | Corner recessing | Miniature | Semi Finishing | Finishing | Miniature Rib

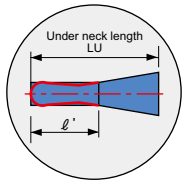
RE tolerance

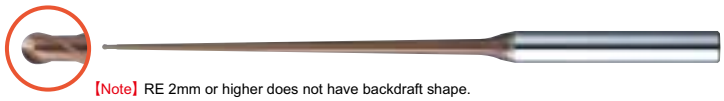
RE≦0.25 : ±0.003mm
0.25<RE≦3 : ±0.005mm
3<RE : ±0.01mm※1

h5 ※2

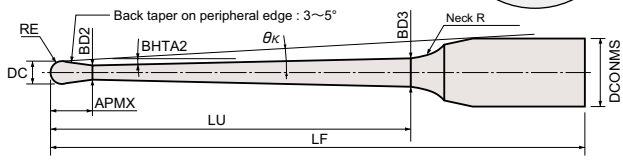
※1 ±0.015 for RE4 to RE5 types or types with under neck lengths of more than 80. ±0.015 for all RE6 types.
※2 The shank tolerance is h6 when the overall length is 140 mm or more.

Wider range of neck angle and under-neck length variations to handle all kinds of deep rib cutting.





【Note】RE 2mm or higher does not have backdraft shape.

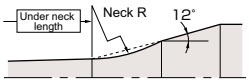
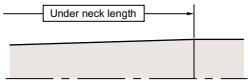
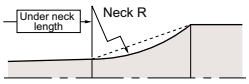
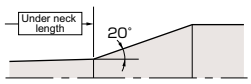


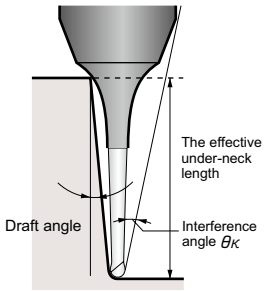
EPDBPE2○○○○-○○○.○-○○-ATH

Carbide | RTH | Helix angle 30° | Cutting Conditions A77

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Neck R	Neck shape	Approx neck length ℓ'	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBPE2002-1-04-ATH	●	0.1	0.2	0.4	1	0.15	0.17	0.182	50	4	7	A	1.35	10.89	1.55	1.72	1.88	2.03	2.31
EPDBPE2002-1.5-04-ATH	★				1.5	0.15	0.17	0.189	50	4	7	A	1.77	10.39	2.06	2.28	2.47	2.64	2.97
EPDBPE2002-2-04-ATH	★				2	0.15	0.17	0.196	50	4	10	A	2.20	9.94	2.70	3.03	3.30	3.56	4.02
EPDBPE2002-3-04-ATH	★				3	0.15	0.17	0.210	50	4	10	A	2.29	9.14	3.73	4.14	4.47	4.77	5.29
EPDBPE2002-2-09-ATH	●			0.9	2	0.15	0.17	0.228	50	4	10	A	1.10	10.01	2.32	2.81	3.14	3.42	3.92
EPDBPE2002-2.5-09-ATH	●				2.5	0.15	0.17	0.244	50	4	10	A	1.10	9.60	2.36	3.32	3.70	4.01	4.54
EPDBPE2002-3-09-ATH	★				3	0.15	0.17	0.260	50	4	10	A	1.10	9.23	2.36	3.84	4.25	4.58	5.15
EPDBPE2002-1-14-ATH	★			1.4	1	0.15	0.17	0.212	50	4	7	A	0.76	10.96	1.24	1.51	1.71	1.88	2.20
EPDBPE2002-2-14-ATH	★				2	0.15	0.17	0.260	50	4	10	A	0.76	10.08	1.13	2.47	2.93	3.26	3.80
EPDBPE2002-3-14-ATH	★				3	0.15	0.17	0.309	50	4	10	A	0.76	9.32	1.13	2.42	3.96	4.37	5.00
EPDBPE2002-1-29-ATH	★			2.9	1	0.15	0.17	0.256	50	4	7	A	0.44	11.08	0.51	0.62	0.81	1.57	1.99
EPDBPE2002-2-29-ATH	★				2	0.15	0.17	0.357	50	4	10	A	0.44	10.29	0.51	0.62	0.81	1.21	3.35
EPDBPE2002-3-29-ATH	★				3	0.15	0.17	0.459	50	4	10	A	0.44	9.61	0.51	0.62	0.81	1.21	4.37
EPDBPE2003-2-04-ATH	●	0.15	0.3	0.4	2	0.25	0.27	0.294	50	4	7	A	2.19	9.94	2.57	2.83	3.04	3.24	3.59
EPDBPE2003-3-04-ATH	★				3	0.25	0.27	0.308	50	4	10	A	2.39	9.12	3.73	4.14	4.47	4.76	5.28
EPDBPE2003-3-09-ATH	●			0.9	3	0.25	0.27	0.356	50	4	10	A	1.20	9.21	2.52	3.85	4.25	4.58	5.15
EPDBPE2003-4-09-ATH	★				4	0.25	0.27	0.388	50	4	10	A	1.20	8.53	2.52	4.87	5.35	5.73	6.35
EPDBPE2004-2-04-ATH	●	0.2	0.4	0.4	2	0.3	0.37	0.394	50	4	7	A	2.20	9.93	2.57	2.82	3.03	3.23	3.57
EPDBPE2004-3-04-ATH	●				3	0.3	0.37	0.408	50	4	7	A	2.44	9.10	3.60	3.92	4.18	4.40	4.80
EPDBPE2004-4-04-ATH	★				4	0.3	0.37	0.422	50	4	10	A	2.44	8.39	4.76	5.23	5.61	5.93	6.51
EPDBPE2004-5-04-ATH	★				5	0.3	0.37	0.436	50	4	10	A	2.44	7.78	5.78	6.33	6.74	7.10	7.71
EPDBPE2004-6-04-ATH	★				6	0.3	0.37	0.450	50	4	10	A	2.44	7.25	6.81	7.41	7.86	8.25	8.90
EPDBPE2004-8-04-ATH	★				8	0.3	0.37	0.478	50	4	10	A	2.44	6.39	8.85	9.57	10.08	10.51	11.24
EPDBPE2004-2-09-ATH	●			0.9	2	0.3	0.37	0.423	50	4	7	A	1.25	10.00	2.30	2.66	2.90	3.12	3.49
EPDBPE2004-4-09-ATH	●				4	0.3	0.37	0.486	50	4	10	A	1.25	8.49	2.57	4.87	5.35	5.72	6.34
EPDBPE2004-5-09-ATH	●				5	0.3	0.37	0.518	50	4	10	A	1.25	7.89	2.57	5.90	6.44	6.85	7.53
EPDBPE2004-6-09-ATH	★				6	0.3	0.37	0.549	50	4	10	A	1.25	7.37	2.57	6.92	7.52	7.97	8.69
EPDBPE2004-2-14-ATH	★			1.4	2	0.3	0.37	0.453	50	4	7	A	0.91	10.07	1.31	2.41	2.75	2.99	3.40
EPDBPE2004-4-14-ATH	★				4	0.3	0.37	0.551	50	4	10	A	0.91	8.60	1.31	2.70	5.00	5.47	6.16
EPDBPE2004-6-14-ATH	★				6	0.3	0.37	0.649	50	4	10	A	0.91	7.50	1.31	2.70	7.04	7.64	8.46
EPDBPE2004-2-29-ATH	★			2.9	2	0.3	0.37	0.542	50	4	7	A	0.59	10.28	0.67	0.80	1.02	1.48	3.04
EPDBPE2004-4-29-ATH	★				4	0.3	0.37	0.745	50	4	10	A	0.59	8.93	0.67	0.80	1.02	1.48	5.42
EPDBPE2004-6-29-ATH	★				6	0.3	0.37	0.947	50	4	10	A	0.59	7.90	0.67	0.80	1.02	1.48	7.45
EPDBPE2005-4-04-ATH	●	0.25	0.5	0.4	4	0.35	0.47	0.521	50	4	7	A	2.49	8.35	4.62	5.00	5.30	5.55	5.99
EPDBPE2005-6-04-ATH	●				6	0.35	0.47	0.549	50	4	10	A	2.49	7.20	6.80	7.41	7.86	8.24	8.89
EPDBPE2005-6-09-ATH	●			0.9	6	0.35	0.47	0.648	50	4	10	A	1.30	7.32	2.62	6.92	7.52	7.97	8.69
EPDBPE2005-8-09-ATH	●				8	0.35	0.47	0.710	50	4	10	A	1.30	6.45	2.62	8.96	9.67	10.18	10.99
EPDBPE2005-12-09-ATH	●				12	0.35	0.47	0.836	50	4	10	A	1.30	5.21	2.62	13.05	13.94	14.55	15.49
EPDBPE20054-2-04-ATH	★	0.27	0.54	0.4	2	0.37	0.52	0.543	50	4	4	A	1.80	9.95	2.36	2.55	2.70	2.83	3.06
EPDBPE20054-4-04-ATH	★				4	0.37	0.52	0.571	50	4	7	A	1.80	8.35	4.55	4.96	5.26	5.52	5.97
EPDBPE20054-5-04-ATH	★				5	0.37	0.52	0.585	50	4	7	A	1.80	7.72	5.57	6.04	6.38	6.66	7.15
EPDBPE20054-6-04-ATH	★				6	0.37	0.52	0.599	50	4	10	A	1.80	7.19	6.73	7.37	7.82	8.21	8.87
EPDBPE20054-6.5-04-ATH	★				6.5	0.37	0.52	0.606	50	4	10	A	1.80	6.94	7.24	7.91	8.38	8.78	9.46
EPDBPE20054-7-04-ATH	★				7	0.37	0.52	0.613	50	4	10	A	1.80	6.72	7.76	8.45	8.94	9.35	10.05
EPDBPE2006-2-04-ATH	●	0.3	0.6	0.4	2	0.4	0.57	0.592	50	4	4	A	2.17	9.93	2.42	2.59	2.73	2.85	3.08
EPDBPE2006-4-04-ATH	●				4	0.4	0.57	0.620	50	4	7	A	2.54	8.31	4.62	5.00	5.29	5.54	5.98
EPDBPE2006-6-04-ATH	●				6	0.4	0.57	0.648	50	4	10	A	2.54	7.14	6.80	7.41	7.85	8.23	8.88
EPDBPE2006-8-04-ATH	●				8	0.4	0.57	0.676	50	4	10	A	2.54	6.26	8.85	9.56	10.07	10.50	11.22
EPDBPE2006-10-04-ATH	●				10	0.4	0.57	0.704	50	4	10	A	2.54	5.57	10.89	11.70	12.27	12.73	13.52
EPDBPE2006-12-04-ATH	★				12	0.4	0.57	0.732	55	4	10	A	2.54	5.02	12.94	13.83	14.44	14.95	15.79
EPDBPE2006-15-04-ATH	★				15	0.4	0.57	0.774	55	4	10	A	2.54	4.37	15.99	17.01	17.68	18.24	19.27

■ Details of neck shape

Neck shape A Compound neck shape		**Neck shape C**	
Neck shape B Without taper		**Neck shape D** Taper 20°	



EPDBPE2○○○○-○○○.○-○○-ATH

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Neck R	Neck shape	Approx neck length ℓ'	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBPE2006-4-09-ATH	●				4	0.4	0.57	0.683	50	4	7	A	1.35	8.41	2.67	4.70	5.07	5.37	5.85
EPDBPE2006-6-09-ATH	●				6	0.4	0.57	0.746	50	4	10	A	1.35	7.26	2.67	6.92	7.51	7.96	8.68
EPDBPE2006-8-09-ATH	●			0.9	8	0.4	0.57	0.809	50	4	10	A	1.35	6.38	2.67	8.96	9.67	10.18	10.98
EPDBPE2006-10-09-ATH	●				10	0.4	0.57	0.872	50	4	10	A	1.35	5.70	2.67	11.01	11.81	12.37	13.25
EPDBPE2006-12-09-ATH	●				12	0.4	0.57	0.934	55	4	10	A	1.35	5.14	2.67	13.05	13.94	14.54	15.49
EPDBPE2006-15-09-ATH	●				15	0.4	0.57	1.029	55	4	10	A	1.35	4.49	2.67	16.10	17.11	17.78	18.81
EPDBPE2006-4-14-ATH	●				4	0.4	0.57	0.746	50	4	7	A	1.01	8.52	1.41	2.80	4.78	5.16	5.70
EPDBPE2006-5-14-ATH	●				5	0.4	0.57	0.795	50	4	7	A	1.01	7.91	1.41	2.80	5.80	6.23	6.83
EPDBPE2006-6-14-ATH	●	0.3	0.6	1.4	6	0.4	0.57	0.844	50	4	10	A	1.01	7.39	1.41	2.80	7.04	7.63	8.45
EPDBPE2006-8-14-ATH	●				8	0.4	0.57	0.941	50	4	10	A	1.01	6.52	1.41	2.80	9.08	9.78	10.71
EPDBPE2006-10-14-ATH	●				10	0.4	0.57	1.039	50	4	10	A	1.01	5.83	1.41	2.80	11.13	11.92	12.94
EPDBPE2006-20-14-ATH	★				20	0.4	0.57	1.528	60	4	10	A	1.01	3.82	1.41	2.80	21.31	22.47	23.84
EPDBPE2006-6-29-ATH	★				6	0.4	0.57	1.137	50	4	10	A	0.69	7.79	0.77	0.90	1.12	1.58	7.45
EPDBPE2006-8-29-ATH	★			2.9	8	0.4	0.57	1.340	50	4	10	A	0.69	6.95	0.77	0.90	1.12	1.58	9.49
EPDBPE2006-12-29-ATH	★				12	0.4	0.57	1.745	55	4	10	A	0.69	5.71	0.77	0.90	1.12	1.58	13.56
EPDBPE2006-20-29-ATH	★				20	0.4	0.57	2.556	60	4	10	B	0.69	4.15	0.77	0.90	1.12	1.58	21.68
EPDBPE2008-4-04-ATH	●				4	0.5	0.77	0.819	50	4	7	A	2.64	8.22	4.61	4.99	5.28	5.53	5.97
EPDBPE2008-6-04-ATH	●			0.4	6	0.5	0.77	0.847	50	4	7	A	2.64	7.01	6.66	7.14	7.50	7.79	8.30
EPDBPE2008-8-04-ATH	●				8	0.5	0.77	0.875	50	4	10	A	2.64	6.11	8.85	9.56	10.06	10.49	11.21
EPDBPE2008-12-04-ATH	★				12	0.5	0.77	0.931	55	4	10	A	2.64	4.86	12.93	13.83	14.44	14.94	15.77
EPDBPE2008-8-09-ATH	●	0.4	0.8		8	0.5	0.77	1.006	50	4	10	A	1.45	6.24	2.77	8.96	9.66	10.17	10.97
EPDBPE2008-12-09-ATH	●			0.9	12	0.5	0.77	1.131	55	4	10	A	1.45	4.99	2.77	13.04	13.93	14.54	15.48
EPDBPE2008-16-09-ATH	●				16	0.5	0.77	1.257	55	4	10	A	1.45	4.15	2.77	17.12	18.16	18.85	19.90
EPDBPE2008-16-29-ATH	★			2.9	16	0.5	0.77	2.340	55	4	10	B	0.79	4.67	0.87	1.00	1.22	1.69	17.62
EPDBPE2008-20-29-ATH	★				20	0.5	0.77	2.746	60	4	10	B	0.79	3.97	0.87	1.00	1.22	1.69	21.68
EPDBPE2009-4-04-ATH	★				4	0.6	0.86	0.907	50	4	4	A	3.46	8.15	4.50	4.75	4.94	5.11	5.41
EPDBPE2009-8-04-ATH	★				8	0.6	0.86	0.963	55	4	7	A	3.46	6.03	8.75	9.30	9.70	10.03	10.60
EPDBPE2009-12-04-ATH	★				12	0.6	0.86	1.019	55	4	10	A	3.46	4.78	12.99	13.86	14.46	14.95	15.78
EPDBPE2009-16-04-ATH	★	0.45	0.9	0.4	16	0.6	0.86	1.075	60	4	10	A	3.46	3.96	17.07	18.08	18.77	19.33	20.54
EPDBPE2009-18-04-ATH	★				18	0.6	0.86	1.103	65	4	10	A	3.46	3.65	19.10	20.19	20.91	21.50	23.11
EPDBPE2009-20-04-ATH	★				20	0.6	0.86	1.131	65	4	10	A	3.46	3.38	21.13	22.29	23.05	23.66	25.68
EPDBPE2009-22-04-ATH	★				22	0.6	0.86	1.159	65	4	10	A	3.46	3.15	23.17	24.38	25.17	25.81	28.24
EPDBPE2009-24-04-ATH	★				24	0.6	0.86	1.187	70	4	10	A	3.46	2.95	25.20	26.47	27.29	27.96	No interference
EPDBPE2010-6-04-ATH	●				6	0.8	0.94	1.013	50	6	7	A	5.09	8.26	6.82	7.24	7.57	7.85	8.34
EPDBPE2010-8-04-ATH	●				8	0.8	0.94	1.041	55	6	7	A	5.09	7.44	8.85	9.36	9.74	10.07	10.62
EPDBPE2010-10-04-ATH	●				10	0.8	0.94	1.068	55	6	10	A	5.09	6.76	11.07	11.79	12.33	12.78	13.54
EPDBPE2010-15-04-ATH	●				15	0.8	0.94	1.138	60	6	10	A	5.09	5.51	16.16	17.08	17.73	18.27	19.31
EPDBPE2010-20-04-ATH	●			0.4	20	0.8	0.94	1.208	65	6	10	A	5.09	4.65	21.23	22.33	23.08	23.69	25.73
EPDBPE2010-25-04-ATH	★				25	0.8	0.94	1.278	70	6	10	A	5.09	4.02	26.31	27.56	28.38	29.05	32.15
EPDBPE2010-30-04-ATH	★				30	0.8	0.94	1.348	75	6	10	A	5.09	3.54	31.37	32.76	33.66	34.82	38.57
EPDBPE2010-50-04-ATH	★				50	0.8	0.94	1.627	95	6	10	A	5.09	2.40	51.62	53.44	55.27	57.96	No interference
EPDBPE2010-70-04-ATH	★				70	0.8	0.94	1.906	115	6	10	A	5.09	1.81	71.83	73.98	77.33	No interference	No interference
EPDBPE2010-6-09-ATH	●				6	0.8	0.94	1.103	50	6	7	A	2.70	8.36	5.47	6.91	7.32	7.65	8.19
EPDBPE2010-10-09-ATH	●	0.5	1		10	0.8	0.94	1.229	55	6	10	A	2.70	6.88	5.47	11.20	11.91	12.44	13.28
EPDBPE2010-15-09-ATH	●				15	0.8	0.94	1.386	60	6	10	A	2.70	5.64	5.47	16.28	17.19	17.84	18.84
EPDBPE2010-16-09-ATH	●				16	0.8	0.94	1.418	60	6	10	A	2.70	5.44	5.47	17.29	18.24	18.91	19.94
EPDBPE2010-20-09-ATH	●				20	0.8	0.94	1.543	65	6	10	A	2.70	4.77	5.47	21.35	22.44	23.18	24.68
EPDBPE2010-25-09-ATH	●				25	0.8	0.94	1.700	70	6	10	A	2.70	4.14	5.47	26.42	27.66	28.48	30.83
EPDBPE2010-30-09-ATH	●			0.9	30	0.8	0.94	1.857	75	6	10	A	2.70	3.65	5.47	31.49	32.86	33.75	36.98
EPDBPE2010-35-09-ATH	●				35	0.8	0.94	2.015	80	6	10	A	2.70	3.27	5.47	36.55	38.04	39.00	43.12
EPDBPE2010-40-09-ATH	●				40	0.8	0.94	2.172	85	6	10	A	2.70	2.96	5.47	41.61	43.22	44.46	No interference
EPDBPE2010-50-09-ATH	●				50	0.8	0.94	2.486	95	6	10	A	2.70	2.48	5.47	51.73	53.53	55.55	No interference
EPDBPE2010-60-09-ATH	★				60	0.8	0.94	2.800	105	6	10	A	2.70	2.14	5.47	61.84	63.81	66.63	No interference
EPDBPE2010-70-09-ATH	★				70	0.8	0.94	3.114	115	6	10	A	2.70	1.88	5.47	71.94	74.09	No interference	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch Pencil Deep Ball Evolution

EPDBPE2○○○○-○○○.○-○○-ATH

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Neck R	Neck shape	Approx neck length ℓ'	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBPE2010-6-14-ATH	●	0.5	1	1.4	6	0.8	0.94	1.194	50	6	7	A	2.02	8.47	2.87	5.85	7.01	7.41	8.01
EPDBPE2010-12-14-ATH	●				12	0.8	0.94	1.487	60	6	10	A	2.02	6.45	2.87	5.85	13.36	14.14	15.20
EPDBPE2010-16-14-ATH	●				16	0.8	0.94	1.683	60	6	10	A	2.02	5.57	2.87	5.85	17.42	18.36	19.56
EPDBPE2010-20-14-ATH	●				20	0.8	0.94	1.878	65	6	10	A	2.02	4.90	2.87	5.85	21.48	22.55	23.88
EPDBPE2010-22-14-ATH	★				22	0.8	0.94	1.976	70	6	10	A	2.02	4.62	2.87	5.85	23.50	24.64	26.03
EPDBPE2010-25-14-ATH	★				25	0.8	0.94	2.123	70	6	10	A	2.02	4.26	2.87	5.85	26.55	27.76	29.51
EPDBPE2010-50-14-ATH	★				50	0.8	0.94	3.345	95	6	10	A	2.02	2.57	2.87	5.85	51.84	53.63	No interference
EPDBPE2010-90-14-ATH	★				90	0.8	0.94	5.300	135	6	10	B	2.02	1.56	2.87	5.85	92.23	No interference	No interference
EPDBPE2010-10-29-ATH	●			2.9	10	0.8	0.94	1.872	55	6	10	A	1.39	7.42	1.57	1.86	2.35	3.39	11.74
EPDBPE2010-15-29-ATH	●				15	0.8	0.94	2.379	60	6	10	A	1.39	6.20	1.57	1.86	2.35	3.39	16.81
EPDBPE2010-20-29-ATH	●				20	0.8	0.94	2.885	65	6	10	A	1.39	5.33	1.57	1.86	2.35	3.39	21.88
EPDBPE2010-30-29-ATH	●				30	0.8	0.94	3.898	75	6	10	A	1.39	4.16	1.57	1.86	2.35	3.39	32.00
EPDBPE2010-40-29-ATH	●				40	0.8	0.94	4.912	85	6	10	B	1.39	3.35	1.57	1.86	2.35	3.39	42.11
EPDBPE2010-50-29-ATH	★				50	0.8	0.94	6.000	130	6	-	C	1.39	2.89	1.57	1.86	2.35	3.39	No interference
EPDBPE2010-20-49-ATH	★			4.9	20	0.8	0.94	4.232	65	6	10	B	1.14	6.04	1.22	1.31	1.43	1.60	2.19
EPDBPE2012-20-29-ATH	★	0.6	1.2	2.9	20	1.1	1.13	3.045	65	6	10	A	1.79	5.21	2.03	2.41	3.07	4.45	21.98
EPDBPE2012-35-29-ATH	★				35	1.1	1.13	4.565	80	6	10	B	1.79	3.61	2.03	2.41	3.07	4.45	37.15
EPDBPE2015-8-04-ATH	●	0.75	1.5	0.4	8	1.35	1.42	1.513	55	6	7	A	7.07	7.21	8.95	9.41	9.78	10.09	10.62
EPDBPE2015-10-04-ATH	●				10	1.35	1.42	1.541	55	6	7	A	7.07	6.51	10.97	11.52	11.93	12.28	12.90
EPDBPE2015-12-04-ATH	●				12	1.35	1.42	1.569	55	6	7	A	7.07	5.93	13.00	13.62	14.07	14.45	15.47
EPDBPE2015-30-04-ATH	★				30	1.35	1.42	1.820	75	6	10	A	7.07	3.30	31.46	32.79	33.68	34.85	38.57
EPDBPE2015-10-09-ATH	●			0.9	10	1.35	1.42	1.692	55	6	7	A	3.89	6.63	7.83	11.08	11.61	12.02	12.67
EPDBPE2015-15-09-ATH	●				15	1.35	1.42	1.849	60	6	10	A	3.89	5.36	7.83	16.40	17.25	17.88	18.86
EPDBPE2015-20-09-ATH	●				20	1.35	1.42	2.006	65	6	10	A	3.89	4.50	7.83	21.47	22.49	23.21	24.72
EPDBPE2015-30-09-ATH	●				30	1.35	1.42	2.320	75	6	10	A	3.89	3.40	7.83	31.59	32.90	33.78	37.01
EPDBPE2015-10-14-ATH	★			1.4	10	1.35	1.42	1.843	55	6	7	A	2.98	6.75	4.23	8.59	11.19	11.70	12.45
EPDBPE2015-20-14-ATH	★				20	1.35	1.42	2.332	65	6	10	A	2.98	4.62	4.23	8.59	21.61	22.61	23.91
EPDBPE2015-30-14-ATH	★				30	1.35	1.42	2.820	75	6	10	A	2.98	3.51	4.23	8.59	31.73	33.02	35.45
EPDBPE2015-40-14-ATH	★				40	1.35	1.42	3.309	85	6	10	A	2.98	2.83	4.23	8.59	41.84	43.36	No interference
EPDBPE2015-50-14-ATH	★				50	1.35	1.42	3.798	95	6	10	A	2.98	2.37	4.23	8.59	51.95	53.67	No interference
EPDBPE2015-20-29-ATH	★			2.9	20	1.35	1.42	3.310	65	6	10	A	2.13	5.03	2.42	2.87	3.63	5.25	22.05
EPDBPE2015-46-29-ATH	★				46	1.35	1.42	6.000	95	6	-	C	2.13	2.84	2.42	2.87	3.63	5.25	No interference
EPDBPE2018-4-04-ATH	★	0.9	1.8	0.4	4	1.6	1.73	1.764	50	6	4	A	4.38	9.14	4.63	4.82	4.99	5.14	5.40
EPDBPE2018-8-04-ATH	★				8	1.6	1.73	1.819	50	6	4	A	6.61	7.07	8.68	9.01	9.27	9.49	10.27
EPDBPE2018-12-04-ATH	★				12	1.6	1.73	1.875	55	6	7	A	6.61	5.77	12.97	13.59	14.05	14.43	15.40
EPDBPE2018-16-04-ATH	★				16	1.6	1.73	1.931	60	6	7	A	6.61	4.87	17.02	17.77	18.30	18.73	20.53
EPDBPE2018-20-04-ATH	★				20	1.6	1.73	1.987	65	6	10	A	6.61	4.21	21.29	22.35	23.08	23.68	25.67
EPDBPE2018-24-04-ATH	★				24	1.6	1.73	2.043	65	6	10	A	6.61	3.71	25.35	26.53	27.33	27.97	30.80
EPDBPE2018-28-04-ATH	★				28	1.6	1.73	2.099	70	6	10	A	6.61	3.32	29.40	30.69	31.55	32.49	35.94
EPDBPE2018-32-04-ATH	★				32	1.6	1.73	2.154	70	6	10	A	6.61	3.00	33.45	34.85	35.76	37.11	No interference
EPDBPE2018-36-04-ATH	★				36	1.6	1.73	2.210	75	6	10	A	6.61	2.74	37.50	38.99	39.96	41.74	No interference
EPDBPE2018-38-04-ATH	★				38	1.6	1.73	2.238	80	6	10	A	6.61	2.62	39.53	41.06	42.05	44.06	No interference
EPDBPE2018-40-04-ATH	★				40	1.6	1.73	2.266	80	6	10	A	6.61	2.52	41.55	43.13	44.24	46.37	No interference
EPDBPE2020-8-04-ATH	●	1	2	0.4	8	1.7	1.92	2.008	50	6	4	A	7.42	6.96	8.70	9.03	9.28	9.50	10.27
EPDBPE2020-12-04-ATH	●				12	1.7	1.92	2.064	55	6	7	A	7.42	5.64	13.00	13.61	14.06	14.43	15.40
EPDBPE2020-16-04-ATH	●				16	1.7	1.92	2.120	60	6	7	A	7.42	4.74	17.05	17.79	18.31	18.74	20.54
EPDBPE2020-20-04-ATH	●				20	1.7	1.92	2.176	65	6	10	A	7.42	4.09	21.33	22.37	23.09	23.68	25.67
EPDBPE2020-25-04-ATH	●				25	1.7	1.92	2.245	65	6	10	A	7.42	3.49	26.40	27.59	28.39	29.05	32.09
EPDBPE2020-30-04-ATH	●				30	1.7	1.92	2.315	70	6	10	A	7.42	3.04	31.46	32.79	33.67	34.81	38.51
EPDBPE2020-40-04-ATH	●				40	1.7	1.92	2.455	80	6	10	A	7.42	2.42	41.58	43.14	44.26	46.39	No interference
EPDBPE2020-80-04-ATH	★				80	1.7	1.92	3.013	120	6	10	A	7.42	1.34	81.99	84.47	No interference	No interference	No interference
EPDBPE2020-12-09-ATH	●			0.9	12	1.7	1.92	2.244	55	6	7	A	4.24	5.76	8.30	13.11	13.70	14.14	14.84
EPDBPE2020-16-09-ATH	●				16	1.7	1.92	2.369	60	6	7	A	4.24	4.86	8.30	17.16	17.88	18.39	19.76
EPDBPE2020-20-09-ATH	●				20	1.7	1.92	2.495	65	6	10	A	4.24	4.20	8.30	21.48	22.49	23.20	24.68
EPDBPE2020-25-09-ATH	●				25	1.7	1.92	2.652	65	6	10	A	4.24	3.60	8.30	26.54	27.70	28.50	30.82
EPDBPE2020-30-09-ATH	●				30	1.7	1.92	2.809	70	6	10	A	4.24	3.14	8.30	31.60	32.90	33.77	36.97
EPDBPE2020-35-09-ATH	●				35	1.7	1.92	2.966	75	6	10	A	4.24	2.79	8.30	36.66	38.08	39.02	No interference
EPDBPE2020-40-09-ATH	●				40	1.7	1.92	3.123	80	6	10	A	4.24	2.51	8.30	41.72	43.25	44.50	No interference
EPDBPE2020-50-09-ATH	●				50	1.7	1.92	3.438	90	6	10	A	4.24	2.09	8.30	51.82	53.56	55.58	No interference
EPDBPE2020-60-09-ATH	●				60	1.7	1.92	3.752	100	6	10	A	4.24	1.79	8.30	61.92	63.84	No interference	No interference
EPDBPE2020-70-09-ATH	●				70	1.7	1.92	4.066	110	6	10	A	4.24	1.56	8.30	72.02	74.15	No interference	No interference
EPDBPE2020-75-09-ATH	★				75	1.7	1.92	4.223	115	6	10	B	4.24	1.47	8.30	77.06	No interference	No interference	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan

EPDBPE2○○○○-○○○.○-○○-ATH

Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Neck R	Neck shape	Approx neck length ℓ'	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBPE2020-10-14-ATH	●	1	2	1.4	10	1.7	1.92	2.326	55	6	7	A	3.33	6.47	4.63	9.19	11.20	11.70	12.43
EPDBPE2020-16-14-ATH	●				16	1.7	1.92	2.619	60	6	7	A	3.33	4.98	4.63	9.19	17.27	17.97	18.98
EPDBPE2020-20-14-ATH	●				20	1.7	1.92	2.814	65	6	10	A	3.33	4.32	4.63	9.19	21.62	22.61	23.90
EPDBPE2020-22-14-ATH	★				22	1.7	1.92	2.912	65	6	10	A	3.33	4.05	4.63	9.19	23.65	24.70	26.05
EPDBPE2020-25-14-ATH	★				25	1.7	1.92	3.059	65	6	10	A	3.33	3.71	4.63	9.19	26.68	27.82	29.55
EPDBPE2020-30-14-ATH	★				30	1.7	1.92	3.303	70	6	10	A	3.33	3.24	4.63	9.19	31.74	33.02	35.42
EPDBPE2020-40-14-ATH	★				40	1.7	1.92	3.792	80	6	10	A	3.33	2.60	4.63	9.19	41.85	43.36	No interference
EPDBPE2020-50-14-ATH	★				50	1.7	1.92	4.281	90	6	10	B	3.33	2.16	4.63	9.19	51.96	53.67	No interference
EPDBPE2020-75-14-ATH	★				75	1.7	1.92	5.503	115	6	10	B	3.33	1.51	4.63	9.19	77.19	No interference	No interference
EPDBPE2020-12-29-ATH	●			2.9	12	1.7	1.92	2.964	55	6	7	A	2.48	6.30	2.80	3.27	4.09	5.83	13.57
EPDBPE2020-15-29-ATH	●				15	1.7	1.92	3.267	60	6	7	A	2.48	5.60	2.80	3.27	4.09	5.83	16.59
EPDBPE2020-20-29-ATH	●				20	1.7	1.92	3.774	65	6	10	A	2.48	4.72	2.80	3.27	4.09	5.83	22.08
EPDBPE2020-41-29-ATH	★				41	1.7	1.92	6.000	130	6	-	C	2.48	2.85	2.8	3.27	4.09	5.83	No interference
EPDBPE2020-20-49-ATH	●			4.9	20	1.7	1.92	5.058	65	6	10	B	2.16	5.19	2.29	2.46	2.68	2.98	4.04
EPDBPE2030-8-04-ATH	●	1.5	3	0.4	8	2.5	2.86	2.937	50	6	4	A	8.50	6.25	8.87	9.13	9.35	9.55	10.33
EPDBPE2030-16-04-ATH	●				16	2.5	2.86	3.048	55	6	7	A	12.52	4.01	17.25	17.89	18.38	18.79	20.60
EPDBPE2030-20-04-ATH	●				20	2.5	2.86	3.104	60	6	7	A	12.52	3.40	21.29	22.04	22.60	23.34	25.74
EPDBPE2030-30-04-ATH	●				30	2.5	2.86	3.244	70	6	10	A	12.52	2.46	31.67	32.88	33.73	34.92	No interference
EPDBPE2030-40-04-ATH	★				40	2.5	2.86	3.384	80	6	10	A	12.52	1.93	41.78	43.23	44.38	No interference	No interference
EPDBPE2030-50-04-ATH	★				50	2.5	2.86	3.523	90	6	10	A	12.52	1.59	51.87	53.53	55.41	No interference	No interference
EPDBPE2030-80-04-ATH	★				80	2.5	2.86	3.942	120	6	10	A	12.52	1.04	82.14	84.60	No interference	No interference	No interference
EPDBPE2030-15-09-ATH	●			0.9	15	2.5	2.86	3.253	55	6	7	A	6.95	4.30	13.78	16.35	16.95	17.41	18.64
EPDBPE2030-20-09-ATH	●				20	2.5	2.86	3.410	60	6	7	A	6.95	3.50	13.78	21.40	22.14	22.68	24.78
EPDBPE2030-30-09-ATH	●				30	2.5	2.86	3.724	70	6	10	A	6.95	2.54	13.78	31.82	33.00	33.84	No interference
EPDBPE2030-35-09-ATH	●				35	2.5	2.86	3.881	75	6	10	A	6.95	2.24	13.78	36.87	38.18	39.11	No interference
EPDBPE2030-40-09-ATH	●				40	2.5	2.86	4.038	80	6	10	A	6.95	2.00	13.78	41.92	43.34	No interference	No interference
EPDBPE2030-50-09-ATH	●				50	2.5	2.86	4.352	90	6	10	B	6.95	1.64	13.78	52.01	53.64	No interference	No interference
EPDBPE2030-60-09-ATH	●				60	2.5	2.86	4.667	100	6	10	B	6.95	1.39	13.78	62.10	No interference	No interference	No interference
EPDBPE2030-70-09-ATH	●				70	2.5	2.86	4.981	110	6	10	B	6.95	1.20	13.78	72.19	No interference	No interference	No interference
EPDBPE2030-90-09-ATH	★				90	2.5	2.86	5.609	130	6	10	B	6.95	0.95	13.78	No interference	No interference	No interference	No interference
EPDBPE2030-30-14-ATH	●			1.4	30	2.5	2.86	4.204	70	6	10	B	5.36	2.63	7.51	15.05	31.97	33.13	No interference
EPDBPE2030-40-14-ATH	●				40	2.5	2.86	4.693	80	6	10	B	5.36	2.05	7.51	15.05	42.06	43.46	No interference
EPDBPE2030-50-14-ATH	★				50	2.5	2.86	5.182	90	6	10	B	5.36	1.68	7.51	15.05	52.16	No interference	No interference
EPDBPE2030-66-14-ATH	★				66	2.5	2.86	6.000	140	6	-	C	5.36	1.34	7.51	15.05	No interference	No interference	No interference
EPDBPE2030-30-29-ATH	★			2.9	30	2.5	2.86	5.646	70	6	10	B	3.88	2.83	4.37	5.14	6.45	9.22	No interference
EPDBPE2040-60-04-ATH	★	2	4	0.4	60	8	3.86	4.586	110	8	10	A	18.02	1.74	62.14	63.88	66.58	No interference	No interference
EPDBPE2040-100-04-ATH	★				100	8	3.86	5.145	150	8	10	B	18.02	1.10	102.44	105.83	No interference	No interference	No interference
EPDBPE2040-20-09-ATH	●			0.9	20	8	3.86	4.237	70	8	7	A	12.45	4.26	20.79	21.76	22.37	22.87	25.16
EPDBPE2040-30-09-ATH	●				30	8	3.86	4.551	80	8	7	A	12.45	3.17	25.53	31.83	32.66	33.95	37.45
EPDBPE2040-35-09-ATH	●				35	8	3.86	4.708	85	8	7	A	12.45	2.82	25.53	36.87	37.79	39.50	No interference
EPDBPE2040-40-09-ATH	●				40	8	3.86	4.865	90	8	10	B	12.45	2.53	25.53	42.31	43.56	45.04	No interference
EPDBPE2040-50-09-ATH	●				50	8	3.86	5.180	100	8	10	B	12.45	2.10	25.53	52.39	53.84	56.12	No interference
EPDBPE2040-60-09-ATH	●				60	8	3.86	5.494	110	8	10	B	12.45	1.80	25.53	62.46	64.14	No interference	No interference
EPDBPE2040-120-09-ATH	★				120	8	3.86	7.379	170	8	-	D	12.45	0.97	25.53	No interference	No interference	No interference	No interference
EPDBPE2040-45-14-ATH	●			1.4	45	8	3.86	5.669	95	8	10	B	10.86	2.37	15.79	33.06	47.66	48.93	No interference
EPDBPE2040-80-14-ATH	★				80	8	3.86	7.379	130	8	10	B	10.86	1.43	15.79	33.06	No interference	No interference	No interference
EPDBPE2040-25-29-ATH	●			2.9	25	8	3.86	5.582	75	8	7	B	9.38	3.99	10.91	13.27	17.30	25.73	27.74
EPDBPE2050-100-04-ATH	★	2.5	5	0.4	100	10	4.86	6.117	150	8	10	B	20.02	0.85	102.48	No interference	No interference	No interference	No interference
EPDBPE2050-30-09-ATH	★			0.9	30	10	4.86	5.488	80	8	7	B	14.45	2.58	29.41	31.92	32.71	34.04	No interference
EPDBPE2050-40-09-ATH	★				40	10	4.86	5.803	90	8	7	B	14.45	2.02	29.41	41.98	43.12	45.12	No interference
EPDBPE2050-60-09-ATH	★				60	10	4.86	6.431	110	8	10	B	14.45	1.40	29.41	62.56	No interference	No interference	No interference
EPDBPE2050-90-09-ATH	★				90	10	4.86	7.373	140	8	10	B	14.45	0.96	29.41	No interference	No interference	No interference	No interference
EPDBPE2050-60-14-ATH	★			1.4	60	10	4.86	7.304	110	8	10	B	12.86	1.43	18.62	38.82	No interference	No interference	No interference
EPDBPE2050-74-14-ATH	★				74	10	4.86	8.000	150	8	-	C	12.86	1.21	18.62	38.82	No interference	No interference	No interference
EPDBPE2050-40-29-ATH	★			2.9	40	10	4.86	8.000	90	8	-	C	11.38	2.28	13.23	16.06	20.92	31.18	No interference
EPDBPE2060-120-04-ATH	★	3	6	0.4	120	12	5.86	7.368	200	8	-	D	22.02	0.49	No interference	No interference	No interference	No interference	No interference
EPDBPE2060-30-09-ATH	●			0.9	30	12	5.86	6.426	80	8	7	B	16.45	1.87	30.63	32.00	32.76	No interference	No interference
EPDBPE2060-40-09-ATH	●				40	12	5.86	6.740	90	8	7	B	16.45	1.44	33.29	42.06	No interference	No interference	No interference
EPDBPE2060-45-09-ATH	●				45	12	5.86	6.897	95	8	7	B	16.45	1.29	33.29	47.09	No interference	No interference	No interference
EPDBPE2060-50-09-ATH	●				50	12	5.86	7.054	100	8	7	B	16.45	1.16	33.29	52.12	No interference	No interference	No interference
EPDBPE2060-60-09-ATH	●				60	12	5.86	7.368	110	10	10	B	16.45	1.82	33.29	62.65	64.34	No interference	No interference
EPDBPE2060-70-09-ATH	★				70	12	5.86	7.682	120	10	10	B	16.45	1.59	33.29	72.71	74.90	No interference	No interference

Epoch Pencil Deep Ball Evolution

EPDBPE2○○○○-○○○.○-○○-ATH

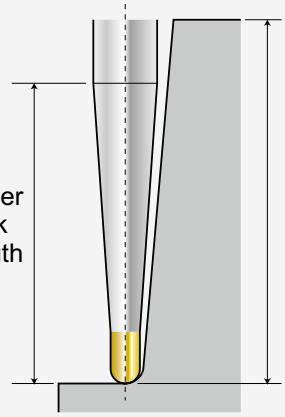
Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Neck R	Neck shape	Approx neck length ℓ'	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDBPE2060-80-09-ATH	★	3	6	0.9	80	12	5.86	7.996	130	10	10	B	16.45	1.41	33.29	82.78	No interference	No interference	No interference
EPDBPE2060-120-09-ATH	★				120	12	5.86	9.253	200	10	-	D	16.45	0.98	33.29	No interference	No interference	No interference	No interference
EPDBPE2060-50-14-ATH	●			1.4	50	12	5.86	7.717	100	10	7	B	14.86	2.19	21.46	44.58	52.43	54.41	No interference
EPDBPE2060-96-14-ATH	★				96	12	5.86	10.000	200	10	-	C	14.86	1.24	21.46	44.58	No interference	No interference	No interference
EPDBPE2060-30-29-ATH	★			2.9	30	12	5.86	7.684	80	10	7	B	13.38	3.53	15.54	18.85	24.53	31.45	33.60
EPDBPE2070-45-09-ATH	★	3.5	7	0.9	45	14	6.86	7.834	95	10	7	B	18.45	1.85	37.16	47.17	48.59	No interference	No interference
EPDBPE2070-60-14-ATH	★			1.4	60	14	6.86	9.108	110	10	7	B	16.86	1.46	24.29	50.33	No interference	No interference	No interference
EPDBPE2070-40-29-ATH	★			2.9	40	14	6.86	9.494	90	10	7	B	15.38	2.24	17.85	21.64	28.14	40.93	No interference
EPDBPE2080-120-04-ATH	★	4	8	0.4	120	14	7.86	9.340	200	10	-	D	24.02	0.50	No interference	No interference	No interference	No interference	No interference
EPDBPE2080-50-09-ATH	●			0.9	50	14	7.86	8.991	110	10	7	B	18.45	1.18	36.54	52.17	No interference	No interference	No interference
EPDBPE2080-55-09-ATH	●				55	14	7.86	9.148	115	10	7	B	18.45	1.08	36.54	57.20	No interference	No interference	No interference
EPDBPE2080-60-09-ATH	★				60	14	7.86	9.305	120	10	7	B	18.45	0.99	36.54	No interference	No interference	No interference	No interference
EPDBPE2080-70-09-ATH	★				70	14	7.86	9.619	130	10	7	B	18.45	0.85	36.54	No interference	No interference	No interference	No interference
EPDBPE2080-80-09-ATH	★				80	14	7.86	9.934	140	12	10	B	18.45	1.42	36.54	82.83	No interference	No interference	No interference
EPDBPE2080-120-09-ATH	★				120	14	7.86	11.190	200	12	-	D	18.45	0.98	36.54	No interference	No interference	No interference	No interference
EPDBPE2080-50-14-ATH	●			1.4	50	14	7.86	9.620	110	10	7	B	16.86	1.21	24.01	49.10	No interference	No interference	No interference
EPDBPE2080-98-14-ATH	★				98	14	7.86	12.000	200	12	-	C	16.86	1.22	24.01	49.10	No interference	No interference	No interference
EPDBPE2080-35-29-ATH	●			2.9	35	14	7.86	10.000	95	10	-	C	15.38	1.85	17.75	21.38	27.61	No interference	No interference
EPDBPE2100-120-04-ATH	★	5	10	0.4	120	18	9.86	11.284	200	12	-	D	28.02	0.50	No interference	No interference	No interference	No interference	No interference
EPDBPE2100-60-09-ATH	●			0.9	60	18	9.86	11.180	130	12	7	B	22.45	1.00	44.30	No interference	No interference	No interference	No interference
EPDBPE2100-65-09-ATH	●				65	18	9.86	11.337	135	12	7	B	22.45	0.93	44.30	No interference	No interference	No interference	No interference
EPDBPE2100-75-09-ATH	●				75	18	9.86	11.651	140	12	7	B	22.45	0.81	44.30	No interference	No interference	No interference	No interference
EPDBPE2100-86-09-ATH	●				86	18	9.86	12.000	200	12	-	C	22.45	0.71	44.30	No interference	No interference	No interference	No interference
EPDBPE2100-55-14-ATH	★			1.4	55	18	9.86	11.669	125	12	7	B	20.86	1.12	29.68	55.87	No interference	No interference	No interference
EPDBPE2100-120-14-ATH	★				120	18	9.86	14.846	200	16	-	D	20.86	1.48	29.68	60.62	No interference	No interference	No interference
EPDBPE2100-35-29-ATH	★			2.9	35	18	9.86	11.582	105	12	4	B	19.38	1.84	22.37	26.96	34.84	No interference	No interference
EPDBPE2120-120-04-ATH	★	6	12	0.4	120	22	11.86	13.228	200	14	-	D	32.02	0.50	No interference	No interference	No interference	No interference	No interference
EPDBPE2120-75-09-ATH	●			0.9	75	22	11.86	13.525	150	14	-	D	26.45	0.83	52.05	No interference	No interference	No interference	No interference
EPDBPE2120-120-09-ATH	★				120	22	11.86	14.939	200	16	-	D	26.45	1.00	52.05	No interference	No interference	No interference	No interference
EPDBPE2120-80-14-ATH	●			1.4	80	22	11.86	14.695	160	16	-	D	24.86	1.52	35.35	72.13	81.75	No interference	No interference
EPDBPE2120-106-14-ATH	★				106	22	11.86	16.000	200	16	-	C	24.86	1.15	35.35	72.13	No interference	No interference	No interference
EPDBPE2120-60-29-ATH	★			2.9	60	22	11.86	15.710	140	16	-	D	23.38	2.11	27.00	32.54	42.06	60.10	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan

Regarding over-hang length for products with neck shape C

Products with neck shape C have a neck taper section that runs directly into the shank, and can be used with over-hang lengths longer than the under-neck length.
Further, when using over-hang lengths longer than the under-neck length, the cutting conditions should be adjusted accordingly.

Item Code
EPDBPE2010-50-29-ATH
EPDBPE2015-46-29-ATH
EPDBPE2020-41-29-ATH
EPDBPE2030-66-14-ATH
EPDBPE2050-74-14-ATH
EPDBPE2050-40-29-ATH
EPDBPE2060-96-14-ATH
EPDBPE2080-98-14-ATH
EPDBPE2080-35-29-ATH
EPDBPE2100-86-09-ATH
EPDBPE2120-106-14-ATH



Cutting depth

Even if the processing depth is longer than the under-neck length, processing can be performed by adjusting the over-hang length.

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	○	○	◎	○	○

Recommended cutting conditions EPDBPE-ATH

High efficiency cuttiing conditions

High accuracy cuttiing conditions

Please refer to P.A81 about high accuracy cutting conditions

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM
0.1	0.2	0.4	1	0.017	.0007	40,000	800	31	34,000	680	27	28,000	504	20	26,000	416	16	26,000	364	14
			1.5	0.009	.0004	40,000	800	31	34,000	680	27	28,000	504	20	26,000	416	16	26,000	364	14
			2	0.006	.0002	32,000	461	18	27,200	392	15	22,400	323	13	20,800	266	10	20,800	233	9
			3	0.003	.0001	21,000	235	9	17,850	200	8	14,640	164	6	13,200	147	6	13,200	132	5
		0.9	2	0.007	.0003	32,000	461	18	27,200	392	15	22,400	323	13	20,800	266	10	20,800	233	9
			2.5	0.004	.0002	26,000	333	13	22,100	283	11	18,200	204	8	16,900	189	7	16,900	162	6
			3	0.004	.0002	21,000	235	9	17,850	200	8	14,640	164	6	13,200	147	6	13,200	132	5
		1.4	1	0.020	.0008	40,000	800	31	34,000	680	27	28,000	504	20	26,000	416	16	26,000	364	14
			2	0.008	.0003	32,000	461	18	27,200	392	15	22,400	323	13	20,800	266	10	20,800	233	9
			3	0.005	.0002	21,000	235	9	17,850	200	8	14,640	164	6	13,200	147	6	13,200	132	5
		2.9	1	0.022	.0009	40,000	800	31	34,000	680	27	28,000	504	20	26,000	416	16	26,000	364	14
			2	0.009	.0004	32,000	461	18	27,200	392	15	22,400	323	13	20,800	266	10	20,800	233	9
			3	0.006	.0002	21,000	235	9	17,850	200	8	14,640	164	6	13,200	147	6	13,200	132	5
0.15	0.3	0.4	2	0.025	.0010	40,000	1,200	47	34,000	1,020	40	28,000	756	30	26,000	624	25	26,000	546	21
			3	0.012	.0005	32,000	691	27	27,200	588	23	22,400	484	19	20,800	399	16	20,800	349	14
		0.9	3	0.013	.0005	32,000	691	27	27,200	588	23	22,400	484	19	20,800	399	16	20,800	349	14
			4	0.006	.0002	26,000	499	20	22,100	424	17	18,200	306	12	16,900	284	11	16,900	243	10
0.2	0.4	0.4	2	0.035	.0014	40,000	1,600	63	34,000	1,360	54	28,000	1,008	40	26,000	832	33	26,000	728	29
			3	0.020	.0008	40,000	1,600	63	34,000	1,360	54	28,000	1,008	40	26,000	832	33	26,000	728	29
			4	0.007	.0003	32,000	922	36	27,200	783	31	22,400	645	25	20,800	532	21	20,800	466	18
			5	0.006	.0002	26,000	666	26	22,100	566	22	18,200	408	16	16,900	379	15	16,900	324	13
			6	0.004	.0002	21,000	471	19	17,850	400	16	14,640	295	12	13,200	266	10	13,200	239	9
			8	0.002	.0001	17,000	272	11	14,450	231	9	11,850	189	7	10,700	153	6	10,700	137	5
		0.9	2	0.038	.0015	40,000	1,600	63	34,000	1,360	54	28,000	1,008	40	26,000	832	33	26,000	728	29
			4	0.009	.0004	32,000	922	36	27,200	783	31	22,400	645	25	20,800	532	21	20,800	466	18
			5	0.007	.0003	26,000	666	26	22,100	566	22	18,200	408	16	16,900	379	15	16,900	324	13
			6	0.005	.0002	21,000	471	19	17,850	400	16	14,640	328	13	13,200	266	10	13,200	239	9
		1.4	2	0.042	.0017	40,000	1,600	63	34,000	1,360	54	28,000	1,008	40	26,000	832	33	26,000	728	29
			4	0.010	.0004	32,000	922	36	27,200	783	31	22,400	645	25	20,800	532	21	20,800	466	18
			6	0.006	.0002	21,000	471	19	17,850	400	16	14,640	328	13	13,200	266	10	13,200	239	9
		2.9	2	0.045	.0018	40,000	1,600	63	34,000	1,360	54	28,000	1,008	40	26,000	832	33	26,000	728	29
			4	0.011	.0004	32,000	922	36	27,200	783	31	22,400	645	25	20,800	532	21	20,800	466	18
			6	0.007	.0003	21,000	471	19	17,850	400	16	14,640	328	13	13,200	266	10	13,200	239	9
0.25	0.5	0.4	4	0.026	.0010	40,000	2,000	79	34,000	1,700	67	28,000	1,260	50	26,000	1,040	41	26,000	910	36
			6	0.020	.0008	26,000	1,040	41	22,100	884	35	18,200	728	29	16,900	608	24	16,900	547	22
		0.9	6	0.022	.0009	26,000	1,040	41	22,100	884	35	18,200	728	29	16,900	608	24	16,900	547	22
			8	0.010	.0004	26,000	728	29	22,100	619	24	18,200	446	18	16,900	414	16	16,900	355	14
			12	0.005	.0002	22,400	627	25	19,040	533	21	15,680	384	15	14,560	357	14	14,560	306	12
0.27	0.54	0.4	2	0.050	.0020	40,000	2,160	85	34,000	1,836	72	28,000	1,361	54	26,000	1,123	44	26,000	983	39
			4	0.037	.0015	40,000	2,160	85	34,000	1,836	72	28,000	1,361	54	26,000	1,123	44	26,000	983	39
			5	0.031	.0012	40,000	1,512	60	34,000	1,428	56	28,000	1,176	46	26,000	1,040	41	26,000	832	33
			6	0.025	.0010	26,000	1,244	49	22,100	1,058	42	18,200	871	34	16,900	676	27	16,900	629	25
			6.5	0.020	.0008	26,000	1,011	40	22,100	859	34	18,200	619	24	16,900	575	23	16,900	493	19
			7	0.015	.0006	26,000	899	35	22,100	812	32	18,200	585	23	16,900	543	21	16,900	465	18
0.3	0.6	0.4	2	0.055	.0022	40,000	2,400	94	34,000	2,040	80	28,000	1,512	60	26,000	1,248	49	26,000	1,092	43
			4	0.035	.0014	40,000	2,400	94	34,000	2,040	80	28,000	1,512	60	26,000	1,248	49	26,000	1,092	43
			6	0.018	.0007	32,000	1,382	54	27,200	1,175	46	22,400	968	38	20,800	799	31	20,800	699	28
			8	0.015	.0006	26,000	998	39	22,100	848	33	18,200	698	27	16,900	583	23	16,900	524	21
			10	0.013	.0005	26,000	874	34	22,100	743	29	18,200	535	21	16,900	497	20	16,900	426	17
			12	0.008	.0003	26,000	874	34	22,100	743	29	18,200	535	21	16,900	497	20	16,900	426	17
			15	0.005	.0002	22,400	753	30	19,040	640	25	15,680	461	18	14,560	367	14	14,560	311	12
		0.9	4	0.038	.0015	40,000	2,400	94	34,000	2,040	80	28,000	1,512	60	26,000	1,248	49	26,000	1,092	43
			6	0.020	.0008	32,000	1,382	54	27,200	1,175	46	22,400	968	38	20,800	799	31	20,800	699	28
			8	0.018	.0007	26,000	998	39	22,100	849	33	18,200	612	24	16,900	568	22	16,900	487	19
			10	0.015	.0006	26,000	874	34	22,100	743	29	18,200	535	21	16,900	497	20	16,900	426	17
			12	0.010	.0004	26,000	874	34	22,100	743	29	18,200	535	21	16,900	497	20	16,900	426	17
			15	0.006	.0002	22,400	753	30	19,040	640	25	15,680	461	18	14,560	367	14	14,560	311	12
		1.4	4	0.042	.0017	40,000	2,400	94	34,000	2,040	80	28,000	1,512	60	26,000	1,248	49	26,000	1,092	43
			5	0.029	.0011	36,000	1,800	71	30,600	1,530	60	25,090	1,254	49	22,580	1,015	40	20,320	822	32
			6	0.022	.0009	32,000	1,382	54	27,200	1,175	46	22,400	968	38	20,800	799	31	20,800	699	28
			8	0.020	.0008	26,000	998	39	22,100	849	33	18,200	612	24	16,900	568	22	16,900	487	19
			10	0.016	.0006	26,000	874	34	22,100	743	29	18,200	535	21	16,900	497	20	16,900	426	17
			20	0.005	.0002	19,300	583	23	16,410	495	19	13,460	406	16	12,110	328	13	12,110	295	12
		2.9	6	0.023	.0009	32,000	1,382	54	27,200	1,175	46	22,400	968	38	20,800	799	31	20,800	699	28
			8	0.022	.0009	26,000	998	39	22,100	849	33	18,200	612	24	16,900	568	22	16,900	487	19
			12	0.011	.0004	26,000	874	34	22,100	743	29	18,200	535	21	16,900	497	20	16,900	426	17
			20	0.006	.0002	19,300	583	23	16,410	495	19	13,460	406	16	12,110	328	13	12,110	295	12
0.4	0.8	0.4	4	0.062	.0024	32,000	2,560	101	27,200	2,176	86	22,400	1,613	64	20,800	1,331	52	20,800	1,165	46
			6	0.045	.0018	32,000	2,560	101	27,200	2,176	86	22,400	1,613	64	20,800	1,331	52	20,800	1,165	46
			8	0.023	.0009	25,600	1,475	58	21,760	1,253	49	17,920	1,032	41	16,640	852	34	16,640	745	29
			12	0.018	.0007	20,800	1,065	42	17,680	905	36	14,560	699	28	13,520	606	24	13,520	519	20

【Note】 Upon usage, please refer to comments and notes below table on page A80.

Epoch Pencil Deep Ball Evolution

EPDBPE-ATH

High efficiency cuttiing conditions

High accuracy cuttiing conditions

Please refer to P.A81 about high accuracy cutting cuttiing conditions

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM
0.4	0.8	0.9	8	0.026	.0010	25,600	1,475	58	21,760	1,253	49	17,920	1,032	41	16,640	852	34	16,640	745	29
			12	0.020	.0008	20,800	1,065	42	17,680	905	36	14,560	699	28	13,520	606	24	13,520	519	20
			16	0.018	.0007	20,800	932	37	17,680	792	31	14,560	612	24	13,520	530	21	13,520	454	18
		2.9	16	0.020	.0008	20,800	932	37	17,680	792	31	14,560	612	24	13,520	530	21	13,520	454	18
			20	0.016	.0006	19,300	733	29	16,410	623	25	13,460	511	20	12,110	413	16	12,110	371	15
0.45	0.9	0.4	4	0.063	.0025	28,300	2,547	100	24,060	2,164	85	19,730	1,774	70	17,760	1,437	57	17,760	1,293	51
			8	0.050	.0020	28,300	2,547	100	24,060	2,164	85	19,730	1,774	70	17,760	1,437	57	17,760	1,293	51
			12	0.037	.0015	18,400	1,325	52	15,640	1,126	44	12,820	922	36	11,540	746	29	11,540	671	26
			16	0.024	.0009	18,400	1,325	52	15,640	1,126	44	12,820	922	36	11,540	746	29	11,540	671	26
			18	0.018	.0007	18,400	1,325	52	15,640	1,126	44	12,820	922	36	11,540	746	29	11,540	671	26
			20	0.015	.0006	15,850	1,141	45	13,470	969	38	11,050	794	31	9,950	643	25	9,950	578	23
			22	0.012	.0005	15,850	1,141	45	13,470	969	38	11,050	794	31	9,950	643	25	9,950	578	23
			24	0.009	.0004	14,150	1,009	40	12,030	856	34	9,860	699	28	8,870	564	22	8,870	479	19
0.5	1	0.4	6	0.055	.0022	25,600	2,560	101	21,760	2,176	86	17,920	1,613	64	16,640	1,331	52	16,640	1,165	46
			8	0.055	.0022	25,600	2,560	101	21,760	2,176	86	17,920	1,613	64	16,640	1,331	52	16,640	1,165	46
			10	0.032	.0013	20,800	1,872	74	17,680	1,591	63	14,560	1,310	52	13,520	1,082	43	13,520	946	37
			15	0.027	.0011	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			20	0.018	.0007	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			25	0.017	.0007	14,560	1,165	46	12,380	990	39	10,190	764	30	9,460	662	26	9,460	568	22
			30	0.015	.0006	12,480	874	34	10,610	743	29	8,740	568	22	8,110	487	19	8,110	406	16
			50	0.006	.0002	9,500	665	26	8,080	565	22	6,650	432	17	6,180	371	15	6,180	309	12
			70	0.002	.0001	8,500	595	23	7,230	505	20	5,950	387	15	5,530	332	13	5,530	276	11
		0.9	6	0.063	.0025	25,600	2,560	101	21,760	2,176	86	17,920	1,613	64	16,640	1,331	52	16,640	1,165	46
			10	0.035	.0014	20,800	1,872	74	17,680	1,591	63	14,560	1,310	52	13,520	1,082	43	13,520	946	37
			15	0.028	.0011	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			16	0.028	.0011	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			20	0.020	.0008	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			25	0.017	.0007	14,560	1,165	46	12,380	990	39	10,190	764	30	9,460	662	26	9,460	568	22
			30	0.017	.0007	12,480	874	34	10,610	743	29	8,740	568	22	8,110	487	19	8,110	406	16
			35	0.010	.0004	10,400	728	29	8,840	619	24	7,280	473	19	6,760	406	16	6,760	338	13
			40	0.009	.0004	10,000	700	28	8,500	595	23	7,000	455	18	6,500	390	15	6,500	325	13
			50	0.007	.0003	9,500	665	26	8,080	565	22	6,650	432	17	6,180	371	15	6,180	309	12
			60	0.005	.0002	9,000	630	25	7,650	536	21	6,300	410	16	5,850	351	14	5,850	293	12
			70	0.003	.0001	8,500	595	23	7,230	506	20	5,950	387	15	5,530	332	13	5,530	276	11
		1.4	6	0.068	.0027	25,600	2,560	101	21,760	2,176	86	17,920	1,613	64	16,640	1,331	52	16,640	1,165	46
			12	0.040	.0016	20,800	1,872	74	17,680	1,591	63	14,560	1,310	52	13,520	1,082	43	13,520	946	37
			16	0.033	.0013	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			20	0.022	.0009	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			22	0.022	.0009	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			25	0.021	.0008	14,560	1,165	46	12,380	990	39	10,190	764	30	9,460	662	26	9,460	568	22
			50	0.008	.0003	9,500	665	26	8,080	565	22	6,650	432	17	6,180	371	15	6,180	309	12
			90	0.002	.0001	8,500	595	23	7,230	506	20	5,950	387	15	5,530	332	13	5,530	276	11
		2.9	10	0.043	.0017	20,800	1,872	74	17,680	1,591	63	14,560	1,310	52	13,520	1,082	43	13,520	946	37
			15	0.036	.0014	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			20	0.024	.0009	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			30	0.020	.0008	12,480	874	34	10,610	743	29	8,740	568	22	8,110	487	19	8,110	406	16
			40	0.011	.0004	10,000	700	28	8,500	595	23	7,000	455	18	6,500	390	15	6,500	325	13
			50	0.009	.0004	9,500	665	26	8,080	565	22	6,650	432	17	6,180	371	15	6,180	309	12
		4.9	20	0.026	.0010	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
0.6	1.2	2.9	20	0.026	.0010	16,640	1,331	52	14,140	1,132	45	11,650	874	34	10,820	757	30	10,820	649	26
			35	0.014	.0006	10,000	700	28	8,500	595	23	7,000	455	18	6,500	390	15	6,500	325	13
0.75	1.5	0.4	8	0.070	.0028	16,960	2,544	100	14,420	2,162	85	11,870	1,603	63	11,020	1,323	52	11,020	1,158	46
			10	0.070	.0028	16,960	2,544	100	14,420	2,162	85	11,870	1,603	63	11,020	1,323	52	11,020	1,158	46
			12	0.070	.0028	16,960	2,544	100	14,420	2,162	85	11,870	1,603	63	11,020	1,323	52	11,020	1,158	46
			30	0.024	.0009	11,020	1,323	52	9,370	1,124	44	7,720	810	32	7,170	752	30	7,170	645	25
		0.9	10	0.080	.0031	16,960	2,544	100	14,420	2,162	85	11,870	1,603	63	11,020	1,323	52	11,020	1,158	46
			15	0.045	.0018	13,570	1,832	72	11,530	1,557	61	9,500	1,282	50	8,820	1,058	42	8,820	926	36
			20	0.040	.0016	11,020	1,323	52	9,370	1,124	44	7,720	810	32	7,170	752	30	7,170	645	25
			30	0.028	.0011	11,020	1,323	52	9,370	1,124	44	7,720	810	32	7,170	752	30	7,170	645	25
		1.4	10	0.090	.0035	16,960	2,544	100	14,420	2,162	85	11,870	1,603	63	11,020	1,323	52	11,020	1,158	46
			20	0.045	.0018	11,020	1,323	52	9,370	1,124	44	7,720	810	32	7,170	752	30	7,170	645	25
			30	0.030	.0012	11,020	1,323	52	9,370	1,124	44	7,720	810	32	7,170	752	30	7,170	645	25
			40	0.015	.0006	9,500	1,045	41	8,080	888	35	6,630	728	29	5,970	589	23	5,970	530	21
			50	0.011	.0004	9,500	950	37	8,080	807	32	6,630	662	26	5,970	536	21	5,970	482	19
		2.9	20	0.048	.0019	11,020	1,323	52	9,370	1,124	44	7,720	810	32	7,170	752	30	7,170	645	25
			46	0.013	.0005	9,500	950	37	8,080	807	32	6,630	662	26	5,970	536	21	5,970	482	19
0.9	1.8	0.4	4	0.120	.0047	14,200	2,556	101	12,070	2,173	86	9,940	1,610	63	9,230	1,329	52	9,230	1,163	46
			8	0.100	.0039	14,200	2,556	101	12,070	2,173	86	9,940	1,610	63	9,230	1,329	52	9,230	1,163	46
			12	0.080	.0031	14,200	2,556	101	12,070	2,173	86	9,940	1,610	63	9,230	1,329	52	9,230	1,163	46
			16	0.071	.0028	14,200	2,556	101	12,070	2,173	86	9,940	1,610	63	9,230	1,329	52	9,230	1,163	46
			20	0.062	.0024	9,230	1,329	52	7,850	1,130	44	6,460	814	32	6,000	756	30	6,000	648	26

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM
0.9	1.8	0.4	24	0.053	.0021	9,230	1,329	52	7,850	1,130	44	6,460	814	32	6,000	756	30	6,000	648	26
			28	0.044	.0017	9,230	1,329	52	7,850	1,130	44	6,460	814	32	6,000	756	30	6,000	648	26
			32	0.036	.0014	9,230	1,329	52	7,850	1,130	44	6,460	814	32	6,000	756	30	6,000	648	26
			36	0.028	.0011	9,230	1,329	52	7,850	1,130	44	6,460	814	32	6,000	756	30	6,000	648	26
			38	0.020	.0008	8,000	1,152	45	6,800	979	39	5,600	706	28	5,200	655	26	5,200	562	22
			40	0.015	.0006	8,000	1,152	45	6,800	979	39	5,600	706	28	5,200	655	26	5,200	562	22
1	2	0.4	8	0.150	.0059	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			12	0.090	.0035	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			16	0.090	.0035	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			20	0.060	.0024	12,160	2,189	86	10,340	1,860	73	8,510	1,532	60	7,900	1,265	50	7,900	1,107	44
			25	0.050	.0020	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			30	0.040	.0016	9,880	1,581	62	8,400	1,344	53	6,920	968	38	6,420	899	35	6,420	771	30
			40	0.030	.0012	9,880	1,581	62	8,400	1,344	53	6,920	968	38	6,420	899	35	6,420	771	30
			80	0.004	.0002	6,150	861	34	5,230	731	29	4,305	560	22	4,000	480	19	4,000	400	16
		0.9	12	0.100	.0039	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			16	0.100	.0039	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			20	0.070	.0028	12,160	2,189	86	10,340	1,860	73	8,512	1,532	60	7,900	1,265	50	7,900	1,107	44
			25	0.070	.0028	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			30	0.045	.0018	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			35	0.045	.0018	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			40	0.035	.0014	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			50	0.017	.0007	8,510	1,192	47	7,240	1,013	40	5,958	775	31	5,530	664	26	5,530	553	22
			60	0.009	.0004	7,240	1,013	40	6,150	861	34	5,065	658	26	4,700	564	22	4,700	470	19
			70	0.005	.0002	6,150	861	34	5,230	731	29	4,305	560	22	4,000	480	19	4,000	400	16
			75	0.005	.0002	6,150	861	34	5,230	731	29	4,305	560	22	4,000	480	19	4,000	400	16
		1.4	10	0.110	.0043	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			16	0.110	.0043	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			20	0.075	.0030	12,160	2,189	86	10,340	1,860	73	8,512	1,532	60	7,900	1,265	50	7,900	1,107	44
			22	0.075	.0030	12,160	2,189	86	10,340	1,860	73	8,512	1,532	60	7,900	1,265	50	7,900	1,107	44
			25	0.062	.0024	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			30	0.050	.0020	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			40	0.037	.0015	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
			50	0.019	.0007	8,510	1,192	47	7,240	1,013	40	5,958	775	31	5,530	664	26	5,530	553	22
			75	0.006	.0002	6,150	861	34	5,230	731	29	4,305	560	22	4,000	480	19	4,000	400	16
		2.9	12	0.120	.0047	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			15	0.120	.0047	15,200	3,040	120	12,920	2,584	102	10,640	1,915	75	9,880	1,581	62	9,880	1,383	54
			20	0.080	.0031	12,160	2,189	86	10,340	1,860	73	8,512	1,532	60	7,900	1,265	50	7,900	1,107	44
			41	0.040	.0016	9,880	1,581	62	8,400	1,344	53	6,916	968	38	6,420	899	35	6,420	771	30
		4.9	20	0.087	.0034	12,160	2,189	86	10,340	1,860	73	8,512	1,532	60	7,900	1,265	50	7,900	1,107	44
1.5	3	0.4	8	0.320	.0126	12,720	3,816	150	10,810	3,244	128	8,904	2,404	95	8,270	1,984	78	8,270	1,736	68
			16	0.220	.0087	12,720	3,816	150	10,810	3,244	128	8,904	2,404	95	8,270	1,984	78	8,270	1,736	68
			20	0.150	.0059	12,720	3,434	135	10,810	2,919	115	8,904	2,137	84	8,270	1,736	68	8,270	1,488	59
			30	0.080	.0031	10,176	2,748	108	8,650	2,335	92	7,123	1,496	59	6,610	1,389	55	6,610	1,191	47
			40	0.060	.0024	8,270	1,984	78	7,030	1,687	66	5,788	1,215	48	5,370	1,129	44	5,370	967	38
			50	0.043	.0017	8,270	1,984	78	7,030	1,687	66	5,788	1,215	48	5,370	1,129	44	5,370	967	38
			80	0.016	.0006	6,230	1,371	54	5,300	1,165	46	4,363	896	35	4,050	748	29	4,050	673	26
		0.9	15	0.250	.0098	12,720	3,816	150	10,810	3,244	128	8,904	2,404	95	8,270	1,984	78	8,270	1,736	68
			20	0.170	.0067	12,720	3,434	135	10,810	2,919	115	8,904	2,137	84	8,270	1,736	68	8,270	1,488	59
			30	0.090	.0035	10,180	2,748	108	8,650	2,335	92	7,123	1,496	59	6,610	1,389	55	6,610	1,191	47
			35	0.080	.0031	10,180	2,748	108	8,650	2,335	92	7,123	1,496	59	6,610	1,389	55	6,610	1,191	47
			40	0.070	.0028	8,270	1,984	78	7,030	1,687	66	5,788	1,215	48	5,370	1,129	44	5,370	967	38
			50	0.050	.0020	8,270	1,984	78	7,030	1,687	66	5,788	1,215	48	5,370	1,129	44	5,370	967	38
			60	0.030	.0012	7,120	1,710	67	6,060	1,453	57	4,986	1,047	41	4,630	972	38	4,630	833	33
			70	0.020	.0008	6,230	1,496	59	5,300	1,271	50	4,363	916	36	4,050	851	34	4,050	729	29
			90	0.013	.0005	6,230	1,371	54	5,300	1,165	46	4,363	896	35	4,050	748	29	4,050	673	26
		1.4	30	0.100	.0039	10,180	2,748	108	8,650	2,335	92	7,123	1,496	59	6,610	1,389	55	6,610	1,191	47
			40	0.075	.0030	8,270	1,984	78	7,030	1,687	66	5,788	1,215	48	5,370	1,129	44	5,370	967	38
			50	0.053	.0021	8,270	1,984	78	7,030	1,687	66	5,788	1,215	48	5,370	1,129	44	5,370	967	38
			66	0.022	.0009	6,230	1,496	59	5,300	1,165	46	4,363	916	36	4,050	748	29	4,050	673	26
		2.9	30	0.110	.0043	10,180	2,748	108	8,650	2,335	92	7,123	1,496	59	6,610	1,389	55	6,610	1,191	47
2	4	0.4	60	0.060	.0024	7,800	1,590	63	6,600	1,350	53	5,800	1,120	44	5,000	920	36	5,000	870	34
			100	0.030	.0012	6,230	1,246	49	5,300	1,059	42	4,350	869	34	3,920	704	28	3,920	633	25
		0.9	20	0.320	.0126	11,900	2,860	113	10,100	2,420	95	9,000	2,050	81	7,800	1,680	66	7,800	1,590	63
			30	0.230	.0091	11,900	2,570	101	10,100	2,180	86	9,000	1,850	73	7,800	1,520	60	7,800	1,430	56
			35	0.200	.0079	11,900	2,570	101	10,100	2,180	86	9,000	1,850	73	7,800	1,520	60	7,800	1,430	56
			40	0.140	.0055	9,500	1,940	76	8,100	1,650	65	7,200	1,400	55	6,200	1,140	45	6,200	1,080	43
			50	0.110	.0043	7,800	1,590	63	6,600	1,350	53	5,800	1,120	44	5,000	920	36	5,000	870	34
			60	0.070	.0028	7,800	1,590	63	6,600	1,350	53	5,800	1,120	44	5,000	920	36	5,000	870	34
			120	0.030	.0012	6,230	1,246	49	5,300	1,059	42	4,350	869	34	3,920	704	28	3,920	633	25

【Note】 Upon usage, please refer to comments and notes below table on page A80.

Epoch Pencil Deep Ball Evolution

EPDBPE-ATH

High efficiency cuttiing conditions

High accuracy cuttiing conditions

Please refer to P.A81 about high accuracy cutting conditions

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM
2	4	1.4	45	0.120	.0047	7,800	1,590	63	6,600	1,350	53	5,800	1,120	44	5,000	920	36	5,000	870	34
			80	0.060	.0024	6,230	1,246	49	5,300	1,059	42	4,350	869	34	3,920	704	28	3,920	633	25
		2.9	25	0.250	.0098	11,900	2,570	101	10,100	2,180	86	9,000	1,850	73	7,800	1,520	60	7,800	1,430	56
2.5	5	0.4	100	0.055	.0022	4,050	850	33	3,440	722	28	2,820	591	23	2,540	479	19	2,540	431	17
		0.9	30	0.340	.0134	9,500	2,140	84	8,100	1,820	72	7,200	1,540	61	6,200	1,260	50	6,200	1,190	47
			40	0.250	.0098	9,500	2,140	84	8,100	1,820	72	7,200	1,540	61	6,200	1,260	50	6,200	1,190	47
			60	0.150	.0059	6,200	1,320	52	5,300	1,130	44	4,700	950	37	4,000	770	30	4,000	720	28
			90	0.080	.0031	4,050	850	33	3,440	722	28	2,820	591	23	2,540	479	19	2,540	431	17
		1.4	60	0.165	.0065	6,200	1,320	52	5,300	1,130	44	4,700	950	37	4,000	770	30	4,000	720	28
			74	0.160	.0063	6,200	1,320	52	5,300	1,130	44	4,700	950	37	4,000	770	30	4,000	720	28
		2.9	40	0.300	.0118	9,500	2,140	84	8,100	1,820	72	7,200	1,540	61	6,200	1,260	50	6,200	1,190	47
3	6	0.4	120	0.060	.0024	4,200	840	33	3,570	714	28	2,930	586	23	2,900	522	21	2,900	469	18
		0.9	30	0.450	.0177	8,000	2,000	79	6,800	1,700	67	6,000	1,430	56	5,200	1,170	46	5,200	1,110	44
			40	0.400	.0157	8,000	1,800	71	6,800	1,530	60	6,000	1,280	50	5,200	1,050	41	5,200	990	39
			45	0.370	.0146	8,000	1,800	71	6,800	1,530	60	6,000	1,280	50	5,200	1,050	41	5,200	990	39
			50	0.320	.0126	8,000	1,800	71	6,800	1,530	60	6,000	1,280	50	5,200	1,050	41	5,200	990	39
			60	0.220	.0087	6,400	1,360	54	5,400	1,150	45	4,800	970	38	4,100	780	31	4,100	740	29
			70	0.180	.0071	5,200	1,110	44	4,400	940	37	3,900	790	31	3,400	650	26	3,400	610	24
			80	0.140	.0055	5,200	1,110	44	4,400	940	37	3,900	790	31	3,400	650	26	3,400	610	24
			120	0.072	.0028	4,200	840	33	3,570	714	28	2,930	586	23	2,640	475	19	2,640	427	17
		1.4	50	0.350	.0138	8,000	1,800	71	6,800	1,530	60	6,000	1,280	50	5,200	1,050	41	5,200	990	39
			96	0.170	.0067	4,620	925	36	3,930	786	31	3,220	644	25	2,900	522	21	2,900	469	18
		2.9	30	0.540	.0213	8,000	2,000	79	6,800	1,700	67	6,000	1,430	56	5,200	1,170	46	5,200	1,110	44
3.5	7	0.9	45	0.370	.0146	8,000	1,800	71	6,800	1,530	60	6,000	1,280	50	5,200	1,050	41	5,200	990	39
		1.4	60	0.350	.0138	6,400	1,360	54	5,400	1,150	45	4,800	970	38	4,100	780	31	4,100	740	29
		2.9	40	0.500	.0197	8,000	1,800	71	6,800	1,530	60	6,000	1,280	50	5,200	1,050	41	5,200	990	39
4	8	0.4	120	0.170	.0067	3,840	805	32	3,260	684	27	2,670	560	22	2,400	453	18	2,400	407	16
		0.9	50	0.500	.0197	6,000	1,460	57	5,100	1,240	49	4,500	1,040	41	3,900	850	33	3,900	810	32
			55	0.470	.0185	6,000	1,460	57	5,100	1,240	49	4,500	1,040	41	3,900	850	33	3,900	810	32
			60	0.430	.0169	6,000	1,460	57	5,100	1,240	49	4,500	1,040	41	3,900	850	33	3,900	810	32
			70	0.330	.0130	6,000	1,460	57	5,100	1,240	49	4,500	1,040	41	3,900	850	33	3,900	810	32
			80	0.250	.0098	4,800	1,100	43	4,080	935	37	3,350	767	30	3,020	622	24	3,020	559	22
			120	0.190	.0075	3,840	805	32	3,260	684	27	2,670	560	22	2,400	453	18	2,400	407	16
		1.4	50	0.550	.0217	6,000	1,460	57	5,100	1,240	49	4,500	1,040	41	3,900	850	33	3,900	810	32
			98	0.250	.0098	3,840	805	32	3,260	684	27	2,670	560	22	2,400	453	18	2,400	407	16
		2.9	35	0.700	.0276	6,000	1,460	57	5,100	1,240	49	4,500	1,040	41	3,900	850	33	3,900	810	32
5	10	0.4	120	0.250	.0098	3,120	780	31	2,650	663	26	2,170	542	21	1,950	438	17	1,950	394	16
		0.9	60	0.700	.0276	4,800	1,300	51	4,100	1,110	44	3,600	920	36	3,100	750	30	3,100	710	28
			65	0.600	.0236	4,800	1,300	51	4,100	1,110	44	3,600	920	36	3,100	750	30	3,100	710	28
			75	0.500	.0197	4,800	1,300	51	4,100	1,110	44	3,600	920	36	3,100	750	30	3,100	710	28
			86	0.400	.0157	3,840	1,000	39	3,260	850	33	2,670	696	27	2,400	563	22	2,400	506	20
		1.4	55	0.800	.0315	4,800	1,300	51	4,100	1,110	44	3,600	920	36	3,100	750	30	3,100	710	28
			120	0.270	.0106	3,120	780	31	2,650	663	26	2,170	542	21	1,950	438	17	1,950	394	16
		2.9	35	0.900	.0354	5,280	1,480	58	4,490	1,258	50	3,680	1,031	41	3,310	834	33	3,310	750	30
6	12	0.4	120	0.380	.0150	2,500	750	30	2,130	637	25	1,810	541	21	1,630	438	17	1,630	394	16
		0.9	75	0.720	.0283	3,840	1,250	49	3,260	1,062	42	2,770	902	36	2,490	729	29	2,490	656	26
			120	0.400	.0157	2,500	750	30	2,130	637	25	1,810	541	21	1,630	438	17	1,630	394	16
		1.4	80	0.790	.0311	3,840	1,250	49	3,260	1,062	42	2,770	902	36	2,490	729	29	2,490	656	26
			106	0.450	.0177	2,500	750	30	2,130	637	25	1,810	541	21	1,630	438	17	1,630	394	16
		2.9	60	0.900	.0354	3,840	1,250	49	3,260	1,062	42	2,770	902	36	2,490	729	29	2,490	656	26

※(1) Standard cutting depth is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.

※(2) When performing cutting where cutting chips may cause clogging, such as for rib processing, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.

【Cutting depth setting example】

When cutting rib groove contours in pre-harden steel (50HRC) using an EPDBPE2020-25-09-ATH tool:
Cutting depth = 0.07 (standard cutting depth) × 0.65 (cutting depth factor for Group 4 pre-harden steel) × 0.8 (for closed-area cutting) = 0.036mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended cutting conditions EPDBPE-ATH

High efficiency cutting conditions | **High accuracy cuttiing conditions**

Please refer to P.A77 about high efficiency cutting conditions

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM
0.1	0.2	0.4	1	0.012	.0005	40,000	560	22	34,000	476	19	28,000	353	14	26,000	291	11	26,000	255	10
			1.5	0.006	.0002	40,000	560	22	34,000	476	19	28,000	353	14	26,000	291	11	26,000	255	10
			2	0.004	.0002	32,000	323	13	27,200	274	11	22,400	226	9	20,800	186	7	20,800	163	6
			3	0.003	.0001	21,000	165	6	17,850	140	6	14,640	115	5	13,200	103	4	13,200	92	4
		0.9	2	0.005	.0002	32,000	323	13	27,200	274	11	22,400	226	9	20,800	186	7	20,800	163	6
			2.5	0.003	.0001	26,000	233	9	22,100	198	8	18,200	143	6	16,900	132	5	16,900	113	4
			3	0.003	.0001	21,000	165	6	17,850	140	6	14,640	115	5	13,200	103	4	13,200	92	4
		1.4	1	0.014	.0006	40,000	560	22	34,000	476	19	28,000	353	14	26,000	291	11	26,000	255	10
			2	0.006	.0002	32,000	323	13	27,200	274	11	22,400	226	9	20,800	186	7	20,800	163	6
			3	0.004	.0002	21,000	165	6	17,850	140	6	14,640	115	5	13,200	103	4	13,200	92	4
		2.9	1	0.015	.0006	40,000	560	22	34,000	476	19	28,000	353	14	26,000	291	11	26,000	255	10
			2	0.006	.0002	32,000	323	13	27,200	274	11	22,400	226	9	20,800	186	7	20,800	163	6
			3	0.005	.0002	21,000	165	6	17,850	140	6	14,640	115	5	13,200	103	4	13,200	92	4
0.15	0.3	0.4	2	0.018	.0007	40,000	840	33	34,000	714	28	28,000	529	21	26,000	437	17	26,000	382	15
			3	0.008	.0003	32,000	484	19	27,200	412	16	22,400	339	13	20,800	279	11	20,800	244	10
		0.9	3	0.009	.0004	32,000	484	19	27,200	412	16	22,400	339	13	20,800	279	11	20,800	244	10
			4	0.005	.0002	26,000	349	14	22,100	297	12	18,200	214	8	16,900	199	8	16,900	170	7
0.2	0.4	0.4	2	0.025	.0010	40,000	1,120	44	34,000	952	37	28,000	706	28	26,000	582	23	26,000	510	20
			3	0.014	.0006	40,000	1,120	44	34,000	952	37	28,000	706	28	26,000	582	23	26,000	510	20
			4	0.005	.0002	32,000	645	25	27,200	548	22	22,400	452	18	20,800	372	15	20,800	326	13
			5	0.004	.0002	26,000	466	18	22,100	396	16	18,200	286	11	16,900	265	10	16,900	227	9
			6	0.003	.0001	21,000	330	13	17,850	280	11	14,640	230	9	13,200	186	7	13,200	167	7
			8	0.002	.0001	17,000	190	7	14,450	162	6	11,850	132	5	10,700	107	4	10,700	96	4
		0.9	2	0.027	.0011	40,000	1,120	44	34,000	952	37	28,000	706	28	26,000	582	23	26,000	510	20
			4	0.006	.0002	32,000	645	25	27,200	548	22	22,400	452	18	20,800	372	15	20,800	326	13
			5	0.005	.0002	26,000	466	18	22,100	396	16	18,200	286	11	16,900	265	10	16,900	227	9
			6	0.004	.0002	21,000	330	13	17,850	280	11	14,640	230	9	13,200	186	7	13,200	167	7
		1.4	2	0.029	.0011	40,000	1,120	44	34,000	952	37	28,000	706	28	26,000	582	23	26,000	510	20
			4	0.007	.0003	32,000	645	25	27,200	548	22	22,400	452	18	20,800	372	15	20,800	326	13
			6	0.005	.0002	21,000	330	13	17,850	280	11	14,640	230	9	13,200	186	7	13,200	167	7
		2.9	2	0.032	.0013	40,000	1,120	44	34,000	952	37	28,000	706	28	26,000	582	23	26,000	510	20
			4	0.008	.0003	32,000	645	25	27,200	548	22	22,400	452	18	20,800	372	15	20,800	326	13
			6	0.006	.0002	21,000	330	13	17,850	280	11	14,640	230	9	13,200	186	7	13,200	167	7
0.25	0.5	0.4	4	0.018	.0007	40,000	1,400	55	34,000	1,190	47	28,000	882	35	26,000	728	29	26,000	637	25
			6	0.010	.0004	26,000	728	29	22,100	619	24	18,200	510	20	16,900	426	17	16,900	383	15
		0.9	6	0.012	.0005	26,000	728	29	22,100	619	24	18,200	510	20	16,900	426	17	16,900	383	15
			8	0.009	.0004	26,000	510	20	22,100	433	17	18,200	312	12	16,900	290	11	16,900	249	10
			12	0.004	.0002	22,400	502	20	19,040	426	17	15,680	307	12	14,560	286	11	14,560	245	10
0.27	0.54	0.4	2	0.034	.0013	40,000	1,512	60	34,000	1,285	51	28,000	953	38	26,000	786	31	26,000	688	27
			4	0.024	.0009	40,000	1,512	60	34,000	1,285	51	28,000	953	38	26,000	786	31	26,000	688	27
			5	0.018	.0007	40,000	1,058	42	34,000	1,000	39	28,000	823	32	26,000	728	29	26,000	582	23
			6	0.014	.0006	26,000	871	34	22,100	741	29	18,200	610	24	16,900	473	19	16,900	440	17
			6.5	0.013	.0005	26,000	708	28	22,100	601	24	18,200	433	17	16,900	403	16	16,900	345	14
			7	0.012	.0005	26,000	629	25	22,100	568	22	18,200	410	16	16,900	380	15	16,900	326	13
0.3	0.6	0.4	2	0.039	.0015	40,000	1,680	66	34,000	1,428	56	28,000	1,058	42	26,000	874	34	26,000	764	30
			4	0.025	.0010	40,000	1,680	66	34,000	1,428	56	28,000	1,058	42	26,000	874	34	26,000	764	30
			6	0.013	.0005	32,000	967	38	27,200	823	32	22,400	678	27	20,800	559	22	20,800	489	19
			8	0.012	.0005	26,000	699	28	22,100	594	23	18,200	489	19	16,900	408	16	16,900	367	14
			10	0.011	.0004	26,000	612	24	22,100	520	20	18,200	375	15	16,900	348	14	16,900	298	12
			12	0.007	.0003	26,000	612	24	22,100	520	20	18,200	375	15	16,900	348	14	16,900	298	12
			15	0.004	.0002	22,400	602	24	19,040	512	20	15,680	369	15	14,560	294	12	14,560	249	10
		0.9	4	0.027	.0011	40,000	1,680	66	34,000	1,428	56	28,000	1,058	42	26,000	874	34	26,000	764	30
			6	0.015	.0006	32,000	967	38	27,200	823	32	22,400	678	27	20,800	559	22	20,800	489	19
			8	0.014	.0006	26,000	699	28	22,100	594	23	18,200	428	17	16,900	398	16	16,900	341	13
			10	0.013	.0005	26,000	612	24	22,100	520	20	18,200	375	15	16,900	348	14	16,900	298	12
			12	0.009	.0004	26,000	612	24	22,100	520	20	18,200	375	15	16,900	348	14	16,900	298	12
			15	0.005	.0002	22,400	602	24	19,040	512	20	15,680	369	15	14,560	294	12	14,560	249	10
		1.4	4	0.029	.0011	40,000	1,680	66	34,000	1,428	56	28,000	1,058	42	26,000	874	34	26,000	764	30
			5	0.020	.0008	36,000	1,260	50	30,600	1,071	42	25,090	878	35	22,580	711	28	20,320	575	23
			6	0.017	.0007	32,000	967	38	27,200	823	32	22,400	678	27	20,800	559	22	20,800	489	19
			8	0.015	.0006	26,000	699	28	22,100	594	23	18,200	428	17	16,900	398	16	16,900	341	13
			10	0.014	.0006	26,000	612	24	22,100	520	20	18,200	375	15	16,900	348	14	16,900	298	12
			20	0.004	.0002	19,300	466	18	16,410	396	16	13,460	325	13	12,110	262	10	12,110	236	9
		2.9	6	0.016	.0006	32,000	967	38	27,200	823	32	22,400	678	27	20,800	559	22	20,800	489	19
			8	0.015	.0006	26,000	699	28	22,100	594	23	18,200	428	17	16,900	398	16	16,900	341	13
			12	0.009	.0004	26,000	612	24	22,100	520	20	18,200	375	15	16,900	348	14	16,900	298	12
			20	0.005	.0002	19,300	466	18	16,410	396	16	13,460	325	13	12,110	262	10	12,110	236	9
0.4	0.8	0.4	4	0.043	.0017	32,000	1,792	71	27,200	1,523	60	22,400	1,129	44	20,800	932	37	20,800	816	32
			6	0.032	.0013	32,000	1,792	71	27,200	1,523	60	22,400	1,129	44	20,800	932	37	20,800	816	32
			8	0.016	.0006	25,600	1,033	41	21,760	877	35	17,920	722	28	16,640	596	23	16,640	522	21
			12	0.015	.0006	20,800	746	29	17,680	634	25	14,560	489	19	13,520	424	17	13,520	363	14

【Note】 Upon usage, please refer to comments and notes below table on page A84.

Epoch Pencil Deep Ball Evolution

EPDBPE-ATH | High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A77 about high efficiency cutting conditions

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM
0.4	0.8	0.9	8	0.018	.0007	25,600	1,033	41	21,760	877	35	17,920	722	28	16,640	596	23	16,640	522	21
			12	0.017	.0007	20,800	746	29	17,680	634	25	14,560	489	19	13,520	424	17	13,520	363	14
			16	0.015	.0006	20,800	652	26	17,680	554	22	14,560	428	17	13,520	371	15	13,520	318	13
		2.9	16	0.017	.0007	20,800	652	26	17,680	554	22	14,560	428	17	13,520	371	15	13,520	318	13
			20	0.015	.0006	19,300	586	23	16,410	498	20	13,460	409	16	12,110	330	13	12,110	297	12
0.45	0.9	0.4	4	0.044	.0017	28,300	1,783	70	24,060	1,515	60	19,730	1,242	49	17,760	1,006	40	17,760	905	36
			8	0.035	.0014	28,300	1,783	70	24,060	1,515	60	19,730	1,242	49	17,760	1,006	40	17,760	905	36
			12	0.031	.0012	18,400	928	37	15,640	788	31	12,820	645	25	11,540	522	21	11,540	470	19
			16	0.020	.0008	18,400	928	37	15,640	788	31	12,820	645	25	11,540	522	21	11,540	470	19
			18	0.015	.0006	18,400	928	37	15,640	788	31	12,820	645	25	11,540	522	21	11,540	470	19
			20	0.015	.0006	15,850	913	36	13,470	775	31	11,050	635	25	9,950	514	20	9,950	462	18
			22	0.012	.0005	15,850	913	36	13,470	775	31	11,050	635	25	9,950	514	20	9,950	462	18
			24	0.009	.0004	14,150	807	32	12,030	685	27	9,860	559	22	8,870	451	18	8,870	383	15
0.5	1	0.4	6	0.039	.0015	25,600	1,792	71	21,760	1,523	60	17,920	1,129	44	16,640	932	37	16,640	816	32
			8	0.039	.0015	25,600	1,792	71	21,760	1,523	60	17,920	1,129	44	16,640	932	37	16,640	816	32
			10	0.023	.0009	20,800	1,310	52	17,680	1,114	44	14,560	917	36	13,520	757	30	13,520	662	26
			15	0.022	.0009	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			20	0.015	.0006	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			25	0.014	.0006	14,560	816	32	12,380	693	27	10,190	535	21	9,460	463	18	9,460	397	16
			30	0.013	.0005	12,480	699	28	10,610	594	23	8,740	454	18	8,110	390	15	8,110	325	13
			50	0.006	.0002	9,500	532	21	8,080	452	18	6,650	346	14	6,180	297	12	6,180	247	10
			70	0.002	.0001	8,500	476	19	7,230	404	16	5,950	310	12	5,530	266	10	5,530	221	9
		0.9	6	0.044	.0017	25,600	1,792	71	21,760	1,523	60	17,920	1,129	44	16,640	932	37	16,640	816	32
			10	0.025	.0010	20,800	1,310	52	17,680	1,114	44	14,560	917	36	13,520	757	30	13,520	662	26
			15	0.024	.0009	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			16	0.024	.0009	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			20	0.017	.0007	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			25	0.016	.0006	14,560	816	32	12,380	693	27	10,190	535	21	9,460	463	18	9,460	397	16
			30	0.015	.0006	12,480	699	28	10,610	594	23	8,740	454	18	8,110	390	15	8,110	325	13
			35	0.010	.0004	10,400	582	23	8,840	495	19	7,280	378	15	6,760	325	13	6,760	270	11
			40	0.009	.0004	10,000	560	22	8,500	476	19	7,000	364	14	6,500	312	12	6,500	260	10
			50	0.007	.0003	9,500	532	21	8,080	452	18	6,650	346	14	6,180	297	12	6,180	247	10
			60	0.005	.0002	9,000	504	20	7,650	429	17	6,300	328	13	5,850	281	11	5,850	234	9
			70	0.003	.0001	8,500	476	19	7,230	405	16	5,950	310	12	5,530	266	10	5,530	221	9
		1.4	6	0.048	.0019	25,600	1,792	71	21,760	1,523	60	17,920	1,129	44	16,640	932	37	16,640	816	32
			12	0.034	.0013	20,800	1,310	52	17,680	1,114	44	14,560	917	36	13,520	757	30	13,520	662	26
			16	0.028	.0011	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			20	0.020	.0008	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			22	0.018	.0007	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			25	0.017	.0007	14,560	816	32	12,380	693	27	10,190	535	21	9,460	463	18	9,460	397	16
			50	0.008	.0003	9,500	532	21	8,080	452	18	6,650	346	14	6,180	297	12	6,180	247	10
			90	0.002	.0001	8,500	476	19	7,230	405	16	5,950	310	12	5,530	266	10	5,530	221	9
		2.9	10	0.032	.0013	20,800	1,310	52	17,680	1,114	44	14,560	917	36	13,520	757	30	13,520	662	26
			15	0.030	.0012	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			20	0.020	.0008	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			30	0.018	.0007	12,480	699	28	10,610	594	23	8,740	454	18	8,110	390	15	8,110	325	13
			40	0.011	.0004	10,000	560	22	8,500	476	19	7,000	364	14	6,500	312	12	6,500	260	10
			50	0.009	.0004	9,500	532	21	8,080	452	18	6,650	346	14	6,180	297	12	6,180	247	10
		4.9	20	0.022	.0009	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
0.6	1.2	2.9	20	0.022	.0009	16,640	932	37	14,140	792	31	11,650	612	24	10,820	530	21	10,820	454	18
			35	0.013	.0005	10,000	560	22	8,500	476	19	7,000	364	14	6,500	312	12	6,500	260	10
0.75	1.5	0.4	8	0.049	.0019	16,960	1,781	70	14,420	1,513	60	11,870	1,122	44	11,020	926	36	11,020	811	32
			10	0.049	.0019	16,960	1,781	70	14,420	1,513	60	11,870	1,122	44	11,020	926	36	11,020	811	32
			12	0.049	.0019	16,960	1,781	70	14,420	1,513	60	11,870	1,122	44	11,020	926	36	11,020	811	32
			30	0.020	.0008	11,020	926	36	9,370	787	31	7,720	567	22	7,170	526	21	7,170	452	18
		0.9	10	0.056	.0022	16,960	1,781	70	14,420	1,513	60	11,870	1,122	44	11,020	926	36	11,020	811	32
			15	0.034	.0013	13,570	1,282	50	11,530	1,090	43	9,500	897	35	8,820	741	29	8,820	648	26
			20	0.032	.0013	11,020	926	36	9,370	787	31	7,720	567	22	7,170	526	21	7,170	452	18
			30	0.024	.0009	11,020	926	36	9,370	787	31	7,720	567	22	7,170	526	21	7,170	452	18
		1.4	10	0.063	.0025	16,960	1,781	70	14,420	1,513	60	11,870	1,122	44	11,020	926	36	11,020	811	32
			20	0.038	.0015	11,020	926	36	9,370	787	31	7,720	567	22	7,170	526	21	7,170	452	18
			30	0.026	.0010	11,020	926	36	9,370	787	31	7,720	567	22	7,170	526	21	7,170	452	18
			40	0.015	.0006	9,500	836	33	8,080	710	28	6,630	582	23	5,970	471	19	5,970	424	17
			50	0.011	.0004	9,500	760	30	8,080	646	25	6,630	530	21	5,970	429	17	5,970	386	15
		2.9	20	0.041	.0016	11,020	926	36	9,370	787	31	7,720	567	22	7,170	526	21	7,170	452	18
			46	0.013	.0005	9,500	760	30	8,080	646	25	6,630	530	21	5,970	429	17	5,970	386	15
0.9	1.8	0.4	4	0.084	.0033	14,200	1,789	70	12,070	1,521	60	9,940	1,127	44	9,230	930	37	9,230	814	32
			8	0.070	.0028	14,200	1,789	70	12,070	1,521	60	9,940	1,127	44	9,230	930	37	9,230	814	32
			12	0.056	.0022	14,200	1,789	70	12,070	1,521	60	9,940	1,127	44	9,230	930	37	9,230	814	32
			16	0.053	.0021	14,200	1,789	70	12,070	1,521	60	9,940	1,127	44	9,230	930	37	9,230	814	32
			20	0.050	.0020	9,230	930	37	7,850	791	31	6,460	570	22	6,000	529	21	6,000	454	18

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180～250HB)			Stainless Steel, Tool Steel (25～35HRC)			Pre-hardened Steel (35～45HRC)			Hardened Steel (45～55HRC)			Hardened Steel (55～65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (inch)	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM	Revolution n min-1	Feed rate vf mm/min	IPM
0.9	1.8	0.4	24	0.045	.0018	9,230	930	37	7,850	791	31	6,460	570	22	6,000	529	21	6,000	454	18
			28	0.037	.0015	9,230	930	37	7,850	791	31	6,460	570	22	6,000	529	21	6,000	454	18
			32	0.031	.0012	9,230	930	37	7,850	791	31	6,460	570	22	6,000	529	21	6,000	454	18
			36	0.024	.0009	9,230	930	37	7,850	791	31	6,460	570	22	6,000	529	21	6,000	454	18
			38	0.020	.0008	8,000	922	36	6,800	783	31	5,600	565	22	5,200	524	21	5,200	450	18
			40	0.015	.0006	8,000	922	36	6,800	783	31	5,600	565	22	5,200	524	21	5,200	450	18
1	2	0.4	8	0.105	.0041	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			12	0.063	.0025	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			16	0.063	.0025	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			20	0.043	.0017	12,160	1,532	60	10,340	1,302	51	8,510	1,072	42	7,900	886	35	7,900	775	31
			25	0.042	.0017	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			30	0.034	.0013	9,880	1,107	44	8,400	941	37	6,920	678	27	6,420	629	25	6,420	540	21
			40	0.026	.0010	9,880	1,107	44	8,400	941	37	6,920	678	27	6,420	629	25	6,420	540	21
			80	0.004	.0002	6,150	689	27	5,230	585	23	4,305	448	18	4,000	384	15	4,000	320	13
		0.9	12	0.070	.0028	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			16	0.070	.0028	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			20	0.049	.0019	12,160	1,532	60	10,340	1,302	51	8,512	1,072	42	7,900	886	35	7,900	775	31
			25	0.040	.0016	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			30	0.038	.0015	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			35	0.038	.0015	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			40	0.030	.0012	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			50	0.017	.0007	8,510	954	38	7,240	810	32	5,958	620	24	5,530	531	21	5,530	442	17
			60	0.009	.0004	7,240	810	32	6,150	689	27	5,065	526	21	4,700	451	18	4,700	376	15
			70	0.005	.0002	6,150	689	27	5,230	585	23	4,305	448	18	4,000	384	15	4,000	320	13
			75	0.005	.0002	6,150	689	27	5,230	585	23	4,305	448	18	4,000	384	15	4,000	320	13
		1.4	10	0.077	.0030	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			16	0.077	.0030	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			20	0.064	.0025	12,160	1,532	60	10,340	1,302	51	8,512	1,072	42	7,900	886	35	7,900	775	31
			22	0.064	.0025	12,160	1,532	60	10,340	1,302	51	8,512	1,072	42	7,900	886	35	7,900	775	31
			25	0.053	.0021	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			30	0.043	.0017	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			40	0.031	.0012	9,880	1,107	44	8,400	941	37	6,916	678	27	6,420	629	25	6,420	540	21
			50	0.019	.0007	8,510	954	38	7,240	810	32	5,958	620	24	5,530	531	21	5,530	442	17
			75	0.006	.0002	6,150	689	27	5,230	585	23	4,305	448	18	4,000	384	15	4,000	320	13
		2.9	12	0.084	.0033	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			15	0.084	.0033	15,200	2,128	84	12,920	1,809	71	10,640	1,341	53	9,880	1,107	44	9,880	968	38
			20	0.056	.0022	12,160	1,532	60	10,340	1,302	51	8,512	1,072	42	7,900	886	35	7,900	775	31
			41	0.040	.0016	9,880	1,265	50	8,400	1,075	42	6,916	774	30	6,420	719	28	6,420	617	24
		4.9	20	0.061	.0024	12,160	1,532	60	10,340	1,302	51	8,512	1,072	42	7,900	886	35	7,900	775	31
1.5	3	0.4	8	0.224	.0088	12,720	2,671	105	10,810	2,271	89	8,904	1,683	66	8,270	1,389	55	8,270	1,215	48
			16	0.154	.0061	12,720	2,671	105	10,810	2,271	89	8,904	1,683	66	8,270	1,389	55	8,270	1,215	48
			20	0.105	.0041	12,720	2,404	95	10,810	2,043	80	8,904	1,496	59	8,270	1,215	48	8,270	1,042	41
			30	0.056	.0022	10,176	1,924	76	8,650	1,635	64	7,123	1,047	41	6,610	972	38	6,610	834	33
			40	0.051	.0020	8,270	1,389	55	7,030	1,181	46	5,788	851	34	5,370	790	31	5,370	677	27
			50	0.037	.0015	8,270	1,389	55	7,030	1,181	46	5,788	851	34	5,370	790	31	5,370	677	27
			80	0.016	.0006	6,230	994	39	5,300	846	33	4,363	609	24	4,050	566	22	4,050	485	19
		0.9	15	0.175	.0069	12,720	2,671	105	10,810	2,271	89	8,904	1,683	66	8,270	1,389	55	8,270	1,215	48
			20	0.119	.0047	12,720	2,404	95	10,810	2,043	80	8,904	1,496	59	8,270	1,215	48	8,270	1,042	41
			30	0.063	.0025	10,180	1,924	76	8,650	1,635	64	7,123	1,047	41	6,610	972	38	6,610	834	33
			35	0.060	.0024	10,180	1,924	76	8,650	1,635	64	7,123	1,047	41	6,610	972	38	6,610	834	33
			40	0.060	.0024	8,270	1,389	55	7,030	1,181	46	5,788	851	34	5,370	790	31	5,370	677	27
			50	0.043	.0017	8,270	1,389	55	7,030	1,181	46	5,788	851	34	5,370	790	31	5,370	677	27
			60	0.026	.0010	7,120	1,197	47	6,060	1,017	40	4,986	733	29	4,630	680	27	4,630	583	23
			70	0.020	.0008	6,230	994	39	5,300	846	33	4,363	609	24	4,050	566	22	4,050	485	19
			90	0.013	.0005	6,230	994	39	5,300	846	33	4,363	609	24	4,050	566	22	4,050	485	19
		1.4	30	0.070	.0028	10,180	1,924	76	8,650	1,635	64	7,123	1,047	41	6,610	972	38	6,610	834	33
			40	0.064	.0025	8,270	1,389	55	7,030	1,181	46	5,788	851	34	5,370	790	31	5,370	677	27
			50	0.045	.0018	8,270	1,389	55	7,030	1,181	46	5,788	851	34	5,370	790	31	5,370	677	27
			66	0.022	.0009	6,230	994	39	5,300	846	33	4,363	609	24	4,050	566	22	4,050	485	19
		2.9	30	0.077	.0030	10,180	1,924	76	8,650	1,635	64	7,123	1,047	41	6,610	972	38	6,610	834	33
2	4	0.4	60	0.051	.0020	7,800	1,113	44	6,600	945	37	5,800	784	31	5,000	644	25	5,000	609	24
			100	0.030	.0012	6,230	997	39	5,300	847	33	4,350	695	27	3,920	563	22	3,920	506	20
		0.9	20	0.224	.0088	11,900	2,002	79	10,100	1,694	67	9,000	1,435	56	7,800	1,176	46	7,800	1,113	44
			30	0.161	.0063	11,900	1,799	71	10,100	1,526	60	9,000	1,295	51	7,800	1,064	42	7,800	1,001	39
			35	0.140	.0055	11,900	1,799	71	10,100	1,526	60	9,000	1,295	51	7,800	1,064	42	7,800	1,001	39
			40	0.098	.0039	9,500	1,358	53	8,100	1,155	45	7,200	980	39	6,200	798	31	6,200	756	30
			50	0.094	.0037	7,800	1,113	44	6,600	945	37	5,800	784	31	5,000	644	25	5,000	609	24
			60	0.060	.0024	7,800	1,113	44	6,600	945	37	5,800	784	31	5,000	644	25	5,000	609	24
			120	0.025	.0010	6,230	997	39	5,300	847	33	4,350	695	27	3,920	563	22	3,920	506	20

【Note】 Upon usage, please refer to comments and notes below table on page A84.

Epoch Pencil Deep Ball Evolution

EPDBPE-ATH | High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A77 about high efficiency cutting conditions

Work material						1			2			3			4			5		
						Carbon Steel, Alloy Steel (180~250HB)			Stainless Steel, Tool Steel (25~35HRC)			Pre-hardened Steel (35~45HRC)			Hardened Steel (45~55HRC)			Hardened Steel (55~65HRC)		
Ratio to standard depth of cut						100%			90%			80%			65%			60%		
Ball radius RE (mm)	Tool dia. DC (mm)	Neck angle	Under neck length (mm)	ap (mm)	ap (mm)	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM	Revolution n min⁻¹	Feed rate vf mm/min	IPM
2	4	1.4	45	0.102	.0040	7,800	1,113	44	6,600	945	37	5,800	784	31	5,000	644	25	5,000	609	24
			80	0.051	.0020	6,230	872	34	5,300	741	29	4,350	608	24	3,920	493	19	3,920	443	17
		2.9	25	0.175	.0069	11,900	1,799	71	10,100	1,526	60	9,000	1,295	51	7,800	1,064	42	7,800	1,001	39
2.5	5	0.4	100	0.047	.0019	4,050	595	23	3,440	505	20	2,820	414	16	2,540	335	13	2,540	302	12
		0.9	30	0.238	.0094	9,500	1,498	59	8,100	1,274	50	7,200	1,078	42	6,200	882	35	6,200	833	33
			40	0.175	.0069	9,500	1,498	59	8,100	1,274	50	7,200	1,078	42	6,200	882	35	6,200	833	33
			60	0.128	.0050	6,200	924	36	5,300	791	31	4,700	665	26	4,000	539	21	4,000	504	20
			90	0.068	.0027	4,050	595	23	3,440	505	20	2,820	414	16	2,540	335	13	2,540	302	12
		1.4	60	0.140	.0055	6,200	924	36	5,300	791	31	4,700	665	26	4,000	539	21	4,000	504	20
			74	0.136	.0054	6,200	924	36	5,300	791	31	4,700	665	26	4,000	539	21	4,000	504	20
		2.9	40	0.210	.0083	9,500	1,498	59	8,100	1,274	50	7,200	1,078	42	6,200	882	35	6,200	833	33
3	6	0.4	120	0.051	.0020	4,200	588	23	3,570	500	20	2,930	410	16	2,900	365	14	2,900	328	13
		0.9	30	0.315	.0124	8,000	1,400	55	6,800	1,190	47	6,000	1,001	39	5,200	819	32	5,200	777	31
			40	0.280	.0110	8,000	1,260	50	6,800	1,071	42	6,000	896	35	5,200	735	29	5,200	693	27
			45	0.259	.0102	8,000	1,260	50	6,800	1,071	42	6,000	896	35	5,200	735	29	5,200	693	27
			50	0.224	.0088	8,000	1,260	50	6,800	1,071	42	6,000	896	35	5,200	735	29	5,200	693	27
			60	0.154	.0061	6,400	952	37	5,400	805	32	4,800	679	27	4,100	546	21	4,100	518	20
			70	0.153	.0060	5,200	777	31	4,400	658	26	3,900	553	22	3,400	455	18	3,400	427	17
			80	0.119	.0047	5,200	777	31	4,400	658	26	3,900	553	22	3,400	455	18	3,400	427	17
			120	0.061	.0024	4,200	588	23	3,570	500	20	2,930	410	16	2,640	333	13	2,640	299	12
		1.4	50	0.245	.0096	8,000	1,260	50	6,800	1,071	42	6,000	896	35	5,200	735	29	5,200	693	27
			96	0.145	.0057	4,620	648	26	3,930	550	22	3,220	451	18	2,900	365	14	2,900	328	13
		2.9	30	0.378	.0149	8,000	1,400	55	6,800	1,190	47	6,000	1,001	39	5,200	819	32	5,200	777	31
3.5	7	0.9	45	0.259	.0102	8,000	1,260	50	6,800	1,071	42	6,000	896	35	5,200	735	29	5,200	693	27
		1.4	60	0.245	.0096	6,400	952	37	5,400	805	32	4,800	679	27	4,100	546	21	4,100	518	20
		2.9	40	0.350	.0138	8,000	1,260	50	6,800	1,071	42	6,000	896	35	5,200	735	29	5,200	693	27
4	8	0.4	120	0.145	.0057	3,840	564	22	3,260	479	19	2,670	392	15	2,400	317	12	2,400	285	11
		0.9	50	0.350	.0138	6,000	1,022	40	5,100	868	34	4,500	728	29	3,900	595	23	3,900	567	22
			55	0.329	.0130	6,000	1,022	40	5,100	868	34	4,500	728	29	3,900	595	23	3,900	567	22
			60	0.301	.0119	6,000	1,022	40	5,100	868	34	4,500	728	29	3,900	595	23	3,900	567	22
			70	0.231	.0091	6,000	1,022	40	5,100	868	34	4,500	728	29	3,900	595	23	3,900	567	22
			80	0.175	.0069	4,800	770	30	4,080	655	26	3,350	537	21	3,020	435	17	3,020	391	15
			120	0.162	.0064	3,840	564	22	3,260	479	19	2,670	392	15	2,400	317	12	2,400	285	11
		1.4	50	0.385	.0152	6,000	1,022	40	5,100	868	34	4,500	728	29	3,900	595	23	3,900	567	22
			98	0.213	.0084	3,840	564	22	3,260	479	19	2,670	392	15	2,400	317	12	2,400	285	11
		2.9	35	0.490	.0193	6,000	1,022	40	5,100	868	34	4,500	728	29	3,900	595	23	3,900	567	22
5	10	0.4	120	0.213	.0084	3,120	546	21	2,650	464	18	2,170	379	15	1,950	307	12	1,950	276	11
		0.9	60	0.490	.0193	4,800	910	36	4,100	777	31	3,600	644	25	3,100	525	21	3,100	497	20
			65	0.420	.0165	4,800	910	36	4,100	777	31	3,600	644	25	3,100	525	21	3,100	497	20
			75	0.350	.0138	4,800	910	36	4,100	777	31	3,600	644	25	3,100	525	21	3,100	497	20
			86	0.280	.0110	3,840	700	28	3,260	595	23	2,670	487	19	2,400	394	16	2,400	354	14
		1.4	55	0.560	.0220	4,800	910	36	4,100	777	31	3,600	644	25	3,100	525	21	3,100	497	20
			120	0.230	.0091	3,120	546	21	2,650	464	18	2,170	379	15	1,950	307	12	1,950	276	11
		2.9	35	0.630	.0248	5,280	1,036	41	4,490	881	35	3,680	722	28	3,310	584	23	3,310	525	21
6	12	0.4	120	0.266	.0105	2,500	525	21	2,130	446	18	1,810	379	15	1,630	307	12	1,630	276	11
		0.9	75	0.504	.0198	3,840	875	34	3,260	743	29	2,770	631	25	2,490	510	20	2,490	459	18
			120	0.280	.0110	2,500	525	21	2,130	446	18	1,810	379	15	1,630	307	12	1,630	276	11
		1.4	80	0.553	.0218	3,840	875	34	3,260	743	29	2,770	631	25	2,490	510	20	2,490	459	18
			106	0.315	.0124	2,500	525	21	2,130	446	18	1,810	379	15	1,630	307	12	1,630	276	11
		2.9	60	0.630	.0248	3,840	875	34	3,260	743	29	2,770	631	25	2,490	510	20	2,490	459	18

※(1) Standard cutting depth is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.

※(2) When performing cutting where cutting chips may cause clogging, such as for rib processing, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.

【Cutting depth setting example】

When cutting rib groove contours in pre-harden steel (50HRC) using an EPDBP2020-25-09-TH tool:
Cutting depth = 0.04 (standard cutting depth) × 0.65 (cutting depth factor for Group 4 pre-harden steel) × 0.8 (for closed-area cutting) = 0.020mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

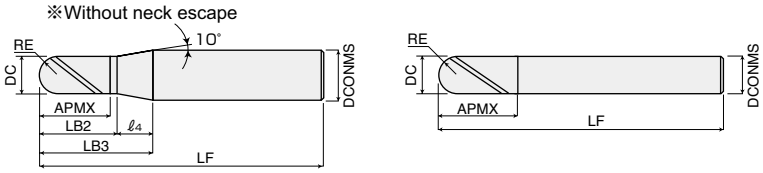
Epoch TH Hard Ball Strong

Die-sinking | Profiling | Radius | Helical | Semi Finishing | Finishing

RE tolerance ±0.005mm h5

For machining of high-hardness materials. Ideal for materials with hardnesses of 50HRC and higher.

2 Flutes



A type B type

EPBTS2○○○-TH

Carbide | ATH | Helix angle 30° | Cutting Conditions A86

Item code	Stock	Size (mm)								Shape
		Ball radius	Tool dia.	Flute length	Under neck length			Overall length	Shank dia.	
		RE	DC	APMX	LB2	LB3	ℓ4	LF	DCONMS	
EPBTS2030-TH	●	1.5	3	4.5	5.5	14.0	8.5	70	6	A
EPBTS2040-TH	●	2	4	6	7.0	12.7	5.7	70	6	A
EPBTS2050-TH	★	2.5	5	7.5	8.5	11.3	2.8	80	6	A
EPBTS2060-TH	●	3	6	9	–	–	–	90	6	B
EPBTS2080-TH	●	4	8	12	–	–	–	100	8	B
EPBTS2100-TH	●	5	10	15	–	–	–	100	10	B
EPBTS2120-TH	●	6	12	18	–	–	–	110	12	B

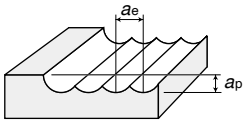
Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	◎	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch TH Hard Ball Strong

Recommended cutting conditions EPBTS-TH



Inch

<Roughing>

	Work material	Pre-hardened steels (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, M2		Hardened steel (65～72HRC) Powder steel	
High speed	Depth of cut (mm)	ap=0.12DC ae=0.36DC		ap=0.1DC ae=0.3DC		ap=0.06DC ae=0.18DC		ap=0.05DC ae=0.15DC	
	RE × DC Tool dia. (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	RE1.5×3	37,700	143	27,500	110	22,400	90	13,200	45
	RE2×4	28,300	142	20,600	111	16,800	91	9,900	44
	RE2.5×5	22,800	141	16,700	110	13,600	90	8,000	45
	RE3×6	19,200	146	14,000	112	11,400	91	6,800	45
	RE4×8	14,700	147	10,700	116	8,800	93	5,200	46
	RE5×10	11,800	149	8,600	115	7,000	94	4,100	45
	RE6×12	9,800	143	7,200	112	5,800	90	3,400	44
General	Depth of cut (mm)	ap=0.12DC ae=0.36DC		ap=0.1DC ae=0.3DC		ap=0.08DC ae=0.24DC		ap=0.07DC ae=0.21DC	
	RE × DC Tool dia. (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	RE1.5×3	17,300	62	14,300	40	12,200	29	7,100	13
	RE2×4	13,000	62	10,700	41	9,200	29	5,300	14
	RE2.5×5	10,500	63	8,600	41	7,400	30	4,300	14
	RE3×6	8,800	62	7,300	41	6,200	30	3,600	14
	RE4×8	6,800	64	5,600	43	4,800	31	2,800	14
	RE5×10	5,400	64	4,500	42	3,800	30	2,200	14
	RE6×12	4,500	62	3,700	41	3,200	29	1,900	14

Metric

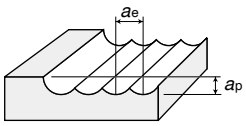
<Roughing>

	Work material	Pre-hardened steels (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, M2		Hardened steel (65～72HRC) Powder steel	
High speed	Depth of cut (mm)	ap=0.12DC ae=0.36DC		ap=0.1DC ae=0.3DC		ap=0.06DC ae=0.18DC		ap=0.05DC ae=0.15DC	
	RE × DC Tool dia. (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	RE1.5×3	37,700	3,620	27,500	2,810	22,400	2,280	13,200	1,110
	RE2×4	28,300	3,620	20,600	2,800	16,800	2,280	9,900	1,110
	RE2.5×5	22,800	3,650	16,700	2,840	13,600	2,310	8,000	1,120
	RE3×6	19,200	3,690	14,000	2,860	11,400	2,330	6,800	1,140
	RE4×8	14,700	3,760	10,700	2,910	8,800	2,390	5,200	1,160
	RE5×10	11,800	3,780	8,600	2,920	7,000	2,380	4,100	1,150
	RE6×12	9,800	3,650	7,200	2,850	5,800	2,300	3,400	1,110
General	Depth of cut (mm)	ap=0.12DC ae=0.36DC		ap=0.1DC ae=0.3DC		ap=0.08DC ae=0.24DC		ap=0.07DC ae=0.21DC	
	RE × DC Tool dia. (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	RE1.5×3	17,300	1,560	14,300	1,030	12,200	730	7,100	340
	RE2×4	13,000	1,560	10,700	1,030	9,200	740	5,300	340
	RE2.5×5	10,500	1,580	8,600	1,030	7,400	740	4,300	340
	RE3×6	8,800	1,580	7,300	1,050	6,200	740	3,600	350
	RE4×8	6,800	1,630	5,600	1,080	4,800	770	2,800	360
	RE5×10	5,400	1,620	4,500	1,080	3,800	760	2,200	350
	RE6×12	4,500	1,570	3,700	1,030	3,200	740	1,900	350

【Note】 ①Use the appropriate coolant for the work material and machining shape.
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.

<Finishing>

a_p: Finishing cut amount
a_e: Pick feed



Inch

	Work material	Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, M2		Hardened steel (65～72HRC) Powder steel	
High speed	Depth of cut (mm)	a_p=0.05DC a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC	
	RE × DC Tool dia. (mm)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
	RE1.5×3	27,500	154	26,400	127	23,100	111	17,600	84
	RE2×4	24,200	165	22,000	141	17,600	106	13,200	79
	RE2.5×5	20,900	159	18,150	131	14,850	101	11,000	75
	RE3×6	17,600	155	14,300	120	12,100	97	8,800	70
	RE4×8	13,200	127	11,000	101	8,800	67	6,600	58
	RE5×10	11,000	114	8,800	88	7,040	65	5,280	51
	RE6×12	8,800	95	7,260	76	5,830	58	4,400	44
General	Depth of cut (mm)	a_p=0.05~0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC	
	RE × DC Tool dia. (mm)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
	RE1.5×3	17,000	102	15,400	74	14,300	69	11,000	53
	RE2×4	13,000	96	11,000	68	10,560	61	7,920	48
	RE2.5×5	10,500	88	9,130	66	7,040	56	6,490	43
	RE3×6	8,500	82	7,590	62	5,280	56	5,280	42
	RE4×8	6,400	67	5,720	51	4,180	46	3,960	34
	RE5×10	5,100	57	4,510	44	3,520	39	3,190	31
	RE6×12	4,200	49	3,850	39	2,640	35	2,640	26

<Finishing>

Metric

	Work material	Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, M2		Hardened steel (65～72HRC) Powder steel	
High speed	Depth of cut (mm)	a_p=0.05DC a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC	
	RE × DC Tool dia. (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
	RE1.5×3	27,500	3,890	26,400	3,200	23,100	2,800	17,600	2,130
	RE2×4	24,200	4,150	22,000	3,550	17,600	2,660	13,200	2,000
	RE2.5×5	20,900	4,020	18,150	3,310	14,850	2,550	11,000	1,910
	RE3×6	17,600	3,910	14,300	3,030	12,100	2,440	8,800	1,780
	RE4×8	13,200	3,200	11,000	2,550	8,800	1,680	6,600	1,470
	RE5×10	11,000	2,890	8,800	2,220	7,040	1,640	5,280	1,280
	RE6×12	8,800	2,400	7,260	1,910	5,830	1,490	4,400	1,110
General	Depth of cut (mm)	a_p=0.05DC a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC		a_p=0.05~0.1 a_e=0.02DC	
	RE × DC Tool dia. (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
	RE1.5×3	17,000	2,620	15,400	1,850	14,300	1,720	11,000	1,320
	RE2×4	13,000	2,430	11,000	1,760	10,560	1,580	7,920	1,190
	RE2.5×5	10,500	2,260	9,130	1,670	7,040	1,440	6,490	1,100
	RE3×6	8,500	2,060	7,590	1,600	5,280	1,410	5,280	1,060
	RE4×8	6,400	1,690	5,720	1,320	4,180	1,170	3,960	870
	RE5×10	5,100	1,460	4,510	1,130	3,520	1,000	3,190	770
	RE6×12	4,200	1,240	3,850	1,000	2,640	880	2,640	660

【Note】 ①Use the appropriate coolant for the work material and machining shape.
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.

Epoch TH Hard Ball

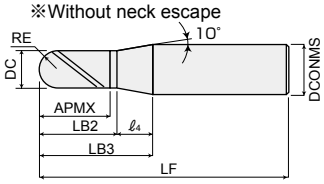
Die-sinking | Profiling | Radius | Helical | Semi Finishing | Finishing

For high-hardness materials (Ideal for materials with hardnesses of 40HRC or higher)

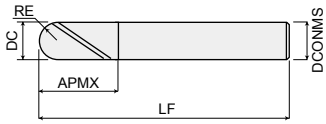
RE tolerance: RE0.5～RE6：±0.005mm
RE8～RE10：±0.01mm

h5

2 Flutes



A type



B type

EPBT2○○○(-○)

Carbide | TH | Helix angle 30° | Cutting Conditions A89

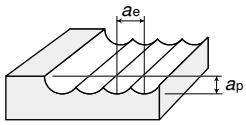
Item code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Flute length APMX	LB2	LB3	ℓ4	Overall length LF	Shank dia. DCONMS	Type
EPBT2010	●	0.5	1	1.5	2.5	11	8.5	50	4	A
EPBT2015	●	0.75	1.5	2.5	3.5	10.6	7.1	50	4	A
EPBT2020	●	1	2	3	4	15.3	11.3	50	6	A
EPBT2025	★	1.25	2.5	4	5	14.9	9.9	50	6	A
EPBT2030	●	1.5	3	4.5	5.5	14	8.5	70	6	A
EPBT2040-4	★	2	4	6	–	–	–	70	4	B
EPBT2040	●	2	4	6	7	12.7	5.7	70	6	A
EPBT2050	★	2.5	5	7.5	8.5	11.3	2.8	80	6	A
EPBT2060	●	3	6	9	–	–	–	90	6	B
EPBT2080	●	4	8	12	–	–	–	100	8	B
EPBT2100	●	5	10	15	–	–	–	100	10	B
EPBT2120	●	6	12	18	–	–	–	110	12	B
EPBT2160	★	8	16	24	–	–	–	140	16	B
EPBT2200	★	10	20	30	–	–	–	160	20	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Recommended cutting conditions EPBT



<Roughing> Inch

Work material	Tool steel (25～35HRC) P20				Pre-hardened Steel (35～45HRC) P21				Hardened Steel (45～55HRC) H13, L6				Hardened Steel (55～65HRC) D2, M2				Hardened Steel (65～70HRC) D2, M2			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.08DC a_e=0.24DC		a_p=0.1DC a_e=0.3DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC	
RE × DC Tool dia. (mm)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
RE0.5×1	50,000	70	20,000	28	50,000	60	20,000	24	50,000	60	20,000	20	50,000	50	20,000	20	38,000	38	16,000	16
RE1×2	48,000	125	20,000	52	48,000	106	20,000	44	38,000	76	16,000	29	29,000	52	13,000	21	19,000	34	8,000	14
RE1.5×3	32,000	128	16,000	64	32,000	115	16,000	58	25,000	85	11,000	33	19,000	57	8,500	22	13,000	39	5,300	14
RE2×4	24,000	134	12,000	67	24,000	115	12,000	58	19,000	84	8,000	32	14,000	59	6,400	23	10,000	40	4,000	14
RE3×6	16,000	131	8,000	66	16,000	115	8,000	58	13,000	88	5,300	32	9,600	60	4,200	24	6,400	40	2,700	15
RE4×8	12,000	142	6,000	71	12,000	120	6,000	60	10,000	92	4,000	33	7,200	59	3,200	24	4,800	39	2,000	15
RE5×10	10,000	142	4,800	68	10,000	122	4,800	60	7,600	85	3,200	32	5,700	58	2,500	23	3,800	39	1,600	15
RE6×12	8,000	122	4,000	61	8,000	106	4,000	53	6,400	78	2,700	30	4,800	53	2,100	21	3,200	35	1,300	13
RE8×16	6,000	102	3,000	51	6,000	88	3,000	44	4,800	64	2,000	24	3,600	44	1,600	17	2,400	29	1,000	11
RE10×20	4,800	81	2,400	40	4,800	70	2,400	35	3,800	51	1,600	19	2,900	35	1,300	14	1,900	23	800	9

<Roughing> Metric

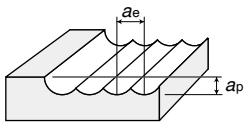
Work material	Tool steel (25～35HRC) P20				Pre-hardened Steel (35～45HRC) P21				Hardened Steel (45～55HRC) H13, L6				Hardened Steel (55～65HRC) D2, M2				Hardened Steel (65～70HRC) D2, M2			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.08DC a_e=0.24DC		a_p=0.1DC a_e=0.3DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC	
RE × DC Tool dia. (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
RE0.5×1	50,000	1,800	20,000	720	50,000	1,600	20,000	640	50,000	1,500	20,000	540	50,000	1,300	20,000	470	38,000	990	16,000	370
RE1×2	48,000	3,170	20,000	1,320	48,000	2,780	20,000	1,160	38,000	1,980	16,000	750	29,000	1,390	13,000	560	19,000	910	8,000	350
RE1.5×3	32,000	3,260	16,000	1,630	32,000	2,880	16,000	1,440	25,000	2,100	11,000	830	19,000	1,440	8,500	580	13,000	990	5,300	360
RE2×4	24,000	3,360	12,000	1,680	24,000	2,930	12,000	1,460	19,000	2,170	8,000	820	14,000	1,460	6,400	600	10,000	1,040	4,000	370
RE3×6	16,000	3,360	8,000	1,680	16,000	2,940	8,000	1,470	13,000	2,240	5,300	820	9,600	1,500	4,200	590	6,400	1,000	2,700	380
RE4×8	12,000	3,600	6,000	1,800	12,000	3,020	6,000	1,510	10,000	2,320	4,000	840	7,200	1,510	3,200	600	4,800	1,010	2,000	380
RE5×10	10,000	3,600	4,800	1,730	10,000	3,120	4,800	1,500	7,600	2,170	3,200	820	5,700	1,480	2,500	590	3,800	990	1,600	370
RE6×12	8,000	3,100	4,000	1,550	8,000	2,690	4,000	1,340	6,400	1,970	2,700	750	4,800	1,340	2,100	530	3,200	900	1,300	330
RE8×16	6,000	2,580	3,000	1,290	6,000	2,220	3,000	1,110	4,800	1,630	2,000	610	3,600	1,110	1,600	440	2,400	740	1,000	280
RE10×20	4,800	2,060	2,400	1,030	4,800	1,780	2,400	890	3,800	1,290	1,600	490	2,900	890	1,300	360	1,900	590	800	220

【Note】

① Use a highly rigid and accurate machine as possible.
② "a_e" (pick feed) figures in the above table are for general guidance. When making an actual selection, please refer to the cusp height table on A94 (inch) or A97 (metric).
③ Use the appropriate coolant for the work material and machining shape.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch TH Hard Ball

EPBT



Inch

<Finishing>

Work material	Tool steel (25～35HRC) P20				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6				Hardened steel (55～65HRC) D2, M2				Hardened steel (65～70HRC) D2, M2			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC	
RE × DC Tool dia. (mm)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
RE0.5×1	50,000	200	20,000	80	50,000	200	20,000	80	50,000	160	20,000	64	50,000	100	15,000	30	48,000	96	15,000	30
RE1×2	32,000	154	20,000	96	32,000	154	20,000	96	32,000	128	20,000	80	32,000	115	15,000	54	24,000	86	14,000	50
RE1.5×3	25,000	140	17,000	95	25,000	140	17,000	95	24,000	115	14,000	67	21,000	101	13,000	62	16,000	77	10,000	48
RE2×4	22,000	145	13,000	86	22,000	145	13,000	86	20,000	124	10,000	62	16,000	96	9,600	58	12,000	72	7,200	43
RE3×6	16,000	138	8,500	73	16,000	138	8,500	73	13,000	107	6,900	57	11,000	86	6,400	50	8,000	62	4,800	37
RE4×8	12,000	113	6,400	60	12,000	113	6,400	60	10,000	90	5,200	47	8,000	69	4,800	41	6,000	52	3,600	31
RE5×10	10,000	102	5,100	52	10,000	102	5,100	52	8,000	78	4,100	40	6,400	60	3,800	36	4,800	45	2,900	28
RE6×12	8,000	85	4,200	45	8,000	85	4,200	45	6,600	67	3,500	36	5,300	52	3,200	31	4,000	39	2,400	24
RE8×16	6,000	66	3,200	35	6,000	66	3,200	35	5,000	53	2,600	28	4,000	41	2,400	24	3,000	31	1,800	18
RE10×20	4,800	53	2,500	28	4,800	53	2,500	28	4,000	42	2,100	22	3,200	33	1,900	19	2,400	24	1,400	14

Metric

<Finishing>

Work material	Tool steel (25～35HRC) P20				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6				Hardened steel (55～65HRC) D2, M2				Hardened steel (65～70HRC) D2, M2			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC	
RE × DC Tool dia. (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
RE0.5×1	50,000	5,000	20,000	2,000	50,000	5,000	20,000	2,000	50,000	4,000	20,000	1,600	50,000	2,500	15,000	750	48,000	2,400	15,000	750
RE1×2	32,000	3,840	20,000	2,400	32,000	3,840	20,000	2,400	32,000	3,200	20,000	2,000	32,000	2,880	15,000	1350	24,000	2,160	14,000	1,260
RE1.5×3	25,000	3,500	17,000	2,380	25,000	3,500	17,000	2,380	24,000	2,880	14,000	1,680	21,000	2,520	13,000	1560	16,000	1,920	10,000	1,200
RE2×4	22,000	3,740	13,000	2,210	22,000	3,740	13,000	2,210	20,000	3,200	10,000	1,600	16,000	2,400	9,600	1440	12,000	1,800	7,200	1,080
RE3×6	16,000	3,520	8,500	1,870	16,000	3,520	8,500	1,870	13,000	2,730	6,900	1,450	11,000	2,200	6,400	1280	8,000	1,600	4,800	960
RE4×8	12,000	2,880	6,400	1,540	12,000	2,880	6,400	1,540	10,000	2,300	5,200	1,200	8,000	1,760	4,800	1060	6,000	1,320	3,600	790
RE5×10	10,000	2,600	5,100	1,330	10,000	2,600	5,100	1,330	8,000	2,000	4,100	1,030	6,400	1,540	3,800	910	4,800	1,150	2,900	700
RE6×12	8,000	2,160	4,200	1,130	8,000	2,160	4,200	1,130	6,600	1,720	3,500	910	5,300	1,330	3,200	800	4,000	1,000	2,400	600
RE8×16	6,000	1,680	3,200	900	6,000	1,680	3,200	900	5,000	1,350	2,600	700	4,000	1,040	2,400	620	3,000	780	1,800	470
RE10×20	4,800	1,340	2,500	700	4,800	1,340	2,500	700	4,000	1,080	2,100	570	3,200	830	1,900	490	2,400	620	1,400	360

【Note】

① Use a highly rigid and accurate machine as possible.
② "a_e" (pick feed) figures in the above table are for general guidance. When making an actual selection, please refer to the cusp height table on A94 (inch) or A97 (metric).
③ Use the appropriate coolant for the work material and machining shape.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Global Series Ball

HGOB-PN Panacea

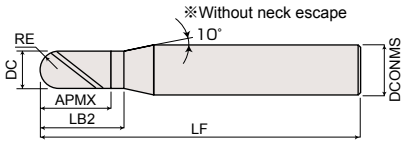
Planing | Profiling | Radius | Rest material machining | Roughing | Semi Finishing | Finishing

RE tolerance: RE0.15～RE6 : ±0.005mm
RE8～RE10 : ±0.01mm

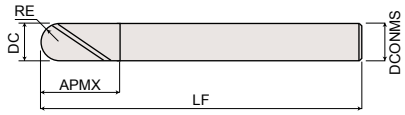
h5

Provides good machined surface finish for rough machining with high cutting depth. Enables machining of a wide variety of subject materials.

A type



B type



2 Flutes

HGOB2○○○(-○)-PN

Carbide | PN | Cutting Conditions A93

Item code	Stock	Size (mm)							No. of flutes	Type
		Ball radius	Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.		
		RE	DC	APMX	LU	DN	LF	DCONMS		
HGOB2003-PN	●	0.15	0.3	0.6	0.9	–	50	4	2	A
HGOB2004-PN	●	0.2	0.4	0.8	1.1	–	50	4	2	A
HGOB2005-PN	●	0.25	0.5	1	1.3	–	50	4	2	A
HGOB2006-PN	●	0.3	0.6	1.2	1.5	–	50	4	2	A
HGOB2008-PN	●	0.4	0.8	1.6	1.9	–	50	4	2	A
HGOB2010-PN	●	0.5	1	2.5	3.5	–	50	4	2	A
HGOB2015-PN	●	0.75	1.5	4	5	–	50	4	2	A
HGOB2020-PN	●	1	2	5	6	–	50	6	2	A
HGOB2025-PN	●	1.25	2.5	7	8	–	50	6	2	A
HGOB2030-PN	●	1.5	3	8	9	–	70	6	2	A
HGOB2040-4-PN	●	2	4	8	-	–	70	4	2	B
HGOB2040-PN	●	2	4	8	9	–	70	6	2	A
HGOB2050-PN	●	2.5	5	10	11	–	80	6	2	A
HGOB2060-PN	●	3	6	12	-	–	90	6	2	B
HGOB2080-PN	●	4	8	14	-	–	100	8	2	B
HGOB2100-PN	●	5	10	18	-	–	100	10	2	B
HGOB2120-PN	●	6	12	22	-	–	110	12	2	B
HGOB2160-PN	●	8	16	30	-	–	140	16	2	B
HGOB2200-PN	●	10	20	38	-	–	160	20	2	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	○		○		◎	◎

● : Inventory maintained in US

Epoch Global Series Ball

HGOB-TH

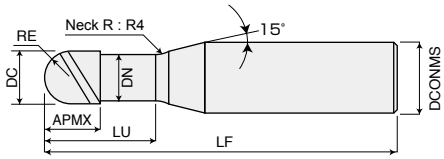
Planing | Profiling | Radius | Rest material machining | Roughing | Semi Finishing | Finishing

RE tolerance
RE0.15～RE6 : ±0.005mm
RE8～RE10 : ±0.01mm

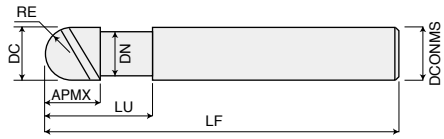
h5

2 Flutes

A type



B type



RE8 and RE10 don't have LU and DN

HGOB2○○○-TH

Carbide | TH | Cutting Conditions A95

Item code	Stock	Size (mm)							No. of flutes	Type	Coating
		Ball radius	Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.			
		RE	DC	APMX	LU	DN	LF	DCONMS			
HGOB2005-TH	●	0.25	0.5	0.5	1.25	0.47	40	4	2	A	TH
HGOB2010-TH	●	0.5	1	1	2.5	0.95	40	4	2	A	TH
HGOB2015-TH	●	0.75	1.5	1.5	3.75	1.45	40	4	2	A	TH
HGOB2020-TH	●	1	2	2	5	1.95	40	6	2	A	TH
HGOB2030-TH	●	1.5	3	3	7.5	2.9	45	6	2	A	TH
HGOB2040-TH	●	2	4	4	10	3.9	45	6	2	A	TH
HGOB2050-TH	●	2.5	5	5	12.5	4.9	50	6	2	A	TH
HGOB2060-TH	●	3	6	6	15	5.9	50	6	2	B	TH
HGOB2080-TH	●	4	8	8	20	7.9	60	8	2	B	TH
HGOB2100-TH	●	5	10	10	25	9.9	65	10	2	B	TH
HGOB2120-TH	●	6	12	12	30	11.9	75	12	2	B	TH
HGOB2160-TH	●	8	16	16	–	–	140	16	2	B	TH
HGOB2200-TH	●	10	20	20	–	–	160	20	2	B	TH

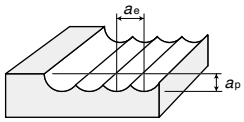
Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US

Recommended cutting conditions

HGOB-PN Panacea



Inch

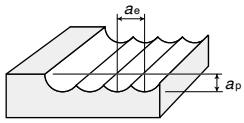
Types of finishing	Ball radius RE (mm)	Tool dia. DC (mm)	Flute length APMX (mm)	Copper alloy, Aluminium alloy				Cast iron, Carbon steel (150～200HB) No.35B, 1050, 1060				Stainless steel (25～35HRC) AISI 304, AISI 316			
				Revolution n min^{-1}	Feed rate vf IPM	a_p inch	a_e inch	Revolution n min^{-1}	Feed rate vf IPM	a_p inch	a_e inch	Revolution n min^{-1}	Feed rate vf IPM	a_p inch	a_e inch
Roughing	0.15	0.3	0.6	35,032	82.8	.002	.005	31,847	75.2	.002	.005	28,662	67.7	.001	.004
	0.2	0.4	0.8	35,032	82.8	.002	.006	31,847	75.2	.002	.006	28,662	67.7	.002	.006
	0.25	0.5	1	35,032	82.8	.003	.008	31,847	75.2	.003	.008	28,662	67.7	.002	.007
	0.3	0.6	1.2	29,193	91.9	.003	.009	26,539	83.6	.003	.009	23,885	75.2	.003	.009
	0.4	0.8	1.6	26,274	82.8	.004	.012	23,885	75.2	.004	.012	21,497	67.7	.004	.012
	0.5	1	2.5	28,025	110.4	.005	.015	25,478	100.3	.005	.015	22,930	90.3	.005	.015
	0.75	1.5	4	25,690	121.4	.008	.023	23,355	110.4	.008	.023	21,019	99.3	.007	.022
	1	2	5	24,522	135.2	.010	.031	22,293	122.9	.010	.031	20,064	110.6	.010	.030
	1.25	2.5	7	22,420	141.2	.013	.038	20,382	128.4	.013	.038	18,344	115.6	.012	.037
	1.5	3	8	21,019	148.9	.015	.046	19,108	135.4	.015	.046	17,197	121.9	.015	.044
	2	4	8	20,143	158.6	.020	.061	18,312	144.2	.020	.061	16,481	129.8	.020	.059
			8	20,143	190.3	.020	.061	18,312	173.0	.020	.061	16,481	155.7	.020	.059
	2.5	5	10	18,217	200.8	.026	.077	16,561	182.6	.026	.077	14,904	164.3	.025	.074
	3	6	12	15,764	198.6	.031	.092	14,331	180.6	.031	.092	12,898	162.5	.030	.089
	4	8	14	12,699	180.0	.041	.123	11,545	163.6	.041	.123	10,390	147.2	.039	.118
	5	10	18	10,860	171.0	.051	.154	9,873	155.5	.051	.154	8,885	139.9	.049	.148
	6	12	22	9,634	166.9	.061	.184	8,758	151.7	.061	.184	7,882	136.5	.059	.177
	8	16	30	7,444	140.7	.082	.246	6,768	127.9	.082	.246	6,091	115.1	.079	.236
	10	20	38	5,955	121.9	.102	.307	5,414	110.8	.102	.307	4,873	99.8	.098	.295
Finishing	0.15	0.3	0.6	44,586	70.2	.001	.001	37,155	58.5	.001	.001	33,439	47.4	.001	.001
	0.2	0.4	0.8	42,994	67.7	.001	.001	35,828	56.4	.001	.001	32,245	45.7	.001	.001
	0.25	0.5	1	42,038	66.2	.001	.001	35,032	55.2	.001	.001	31,529	44.7	.001	.001
	0.3	0.6	1.2	35,032	82.8	.001	.001	29,193	69.0	.001	.001	26,274	55.9	.001	.001
	0.4	0.8	1.6	31,051	73.3	.002	.002	25,876	61.1	.002	.002	23,288	49.5	.002	.002
	0.5	1	2.5	30,573	72.2	.002	.002	25,478	60.2	.002	.002	22,930	48.7	.002	.002
	0.75	1.5	4	29,299	69.2	.003	.003	24,416	57.7	.003	.003	21,975	46.7	.003	.003
	1	2	5	29,618	93.3	.004	.004	24,682	77.8	.004	.004	22,213	63.0	.004	.004
	1.25	2.5	7	28,280	89.1	.005	.005	23,567	74.2	.005	.005	21,210	60.1	.005	.005
	1.5	3	8	26,115	82.2	.006	.006	21,762	68.5	.006	.006	19,586	55.5	.006	.006
	2	4	8	24,363	76.7	.008	.008	20,303	63.9	.008	.008	18,272	51.8	.008	.008
			8	24,363	95.9	.008	.008	20,303	79.9	.008	.008	18,272	64.8	.008	.008
	2.5	5	10	22,548	88.8	.010	.010	18,790	74.0	.010	.010	16,911	59.9	.010	.010
	3	6	12	19,427	91.8	.012	.012	16,189	76.5	.012	.012	14,570	62.0	.012	.012
	4	8	14	16,003	75.6	.016	.016	13,336	63.0	.016	.016	12,002	51.0	.016	.016
	5	10	18	14,713	81.1	.020	.020	12,261	67.6	.020	.020	11,035	54.7	.020	.020
	6	12	22	13,535	95.9	.024	.024	11,279	79.9	.024	.024	10,151	64.8	.024	.024
	8	16	30	10,868	85.6	.031	.031	9,057	71.3	.031	.031	8,151	57.8	.031	.031
	10	20	38	7,739	60.9	.039	.039	6,449	50.8	.039	.039	5,804	41.1	.039	.039

【Note】

① PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ Use a highly rigid and accurate machine as possible.
④ The pick feed in the table is a general condition; please select the a_e according to the cusp height requested.
⑤ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑥ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Global Series Ball

HGOB-PN Panacea



Inch

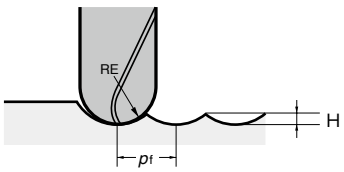
Types of finishing	Ball radius RE (mm)	Tool dia. DC (mm)	Flute length APMX (mm)	Alloy steel (25～35HRC) H13, L6				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～52HRC) H13			
				Revolution n min-1	Feed rate vf IPM	ap inch	ae inch	Revolution n min-1	Feed rate vf IPM	ap inch	ae inch	Revolution n min-1	Feed rate vf IPM	ap inch	ae inch
Roughing	0.15	0.3	0.6	28,662	64.3	.001	.004	25,796	54.8	.001	.004	22,930	46.3	.001	.004
	0.2	0.4	0.8	28,662	64.3	.002	.006	25,796	54.8	.002	.005	22,930	46.3	.002	.005
	0.25	0.5	1	28,662	64.3	.002	.007	25,796	54.8	.002	.007	22,930	46.3	.002	.006
	0.3	0.6	1.2	23,885	71.5	.003	.009	21,497	60.9	.003	.008	19,108	51.5	.003	.008
	0.4	0.8	1.6	21,497	64.3	.004	.011	19,347	54.8	.004	.011	17,197	46.3	.003	.010
	0.5	1	2.5	22,930	85.7	.005	.014	20,637	73.1	.005	.014	18,344	61.7	.004	.013
	0.75	1.5	4	21,019	94.3	.007	.021	18,917	80.4	.007	.020	16,815	67.9	.006	.019
	1	2	5	20,064	105.0	.009	.028	18,057	89.6	.009	.027	16,051	75.6	.009	.026
	1.25	2.5	7	18,344	109.8	.012	.035	16,510	93.6	.011	.034	14,675	79.1	.011	.032
	1.5	3	8	17,197	115.8	.014	.043	15,478	98.7	.014	.041	13,758	83.3	.013	.039
	2	4	8	16,481	123.3	.019	.057	14,833	105.1	.018	.054	13,185	88.8	.017	.052
			8	16,481	148.0	.019	.057	14,833	126.1	.018	.054	13,185	106.5	.017	.052
	2.5	5	10	14,904	156.1	.024	.071	13,414	133.1	.023	.068	11,924	112.4	.022	.065
	3	6	12	12,898	154.4	.028	.085	11,608	131.6	.027	.081	10,318	111.1	.026	.078
	4	8	14	10,390	139.9	.038	.113	9,351	119.3	.036	.109	8,312	100.7	.035	.104
	5	10	18	8,885	132.9	.047	.142	7,997	113.3	.045	.136	7,108	95.7	.043	.130
	6	12	22	7,882	129.7	.057	.170	7,094	110.6	.054	.163	6,306	93.4	.052	.156
	8	16	30	6,091	109.3	.076	.227	5,482	93.2	.072	.217	4,873	78.7	.069	.208
	10	20	38	4,873	94.8	.094	.283	4,385	80.8	.091	.272	3,898	68.2	.087	.260
Finishing	0.15	0.3	0.6	33,439	47.4	.0005	.0005	30,096	38.4	.0004	.0004	26,752	30.3	.0004	.0004
	0.2	0.4	0.8	32,245	45.7	.001	.001	29,021	37.0	.001	.001	25,796	29.3	.001	.001
	0.25	0.5	1	31,529	44.7	.001	.001	28,376	36.2	.001	.001	25,223	28.6	.001	.001
	0.3	0.6	1.2	26,274	55.9	.001	.001	23,646	45.2	.001	.001	21,019	35.7	.001	.001
	0.4	0.8	1.6	23,288	49.5	.001	.001	20,959	40.1	.001	.001	18,631	31.7	.001	.001
	0.5	1	2.5	22,930	48.7	.002	.002	20,637	39.5	.001	.001	18,344	31.2	.001	.001
	0.75	1.5	4	21,975	46.7	.002	.002	19,777	37.8	.002	.002	17,580	29.9	.002	.002
	1	2	5	22,213	63.0	.003	.003	19,992	51.0	.002	.002	17,771	40.3	.002	.002
	1.25	2.5	7	21,210	60.1	.004	.004	19,089	48.7	.003	.003	16,968	38.5	.003	.003
	1.5	3	8	19,586	55.5	.005	.005	17,627	45.0	.004	.004	15,669	35.6	.004	.004
	2	4	8	18,272	51.8	.006	.006	16,445	42.0	.005	.005	14,618	33.1	.005	.005
			8	18,272	64.8	.006	.006	16,445	52.4	.005	.005	14,618	41.4	.005	.005
	2.5	5	10	16,911	59.9	.008	.008	15,220	48.5	.006	.006	13,529	38.3	.006	.006
	3	6	12	14,570	62.0	.009	.009	13,113	50.2	.007	.007	11,656	39.6	.007	.007
	4	8	14	12,002	51.0	.013	.013	10,802	41.3	.009	.009	9,602	32.7	.009	.009
	5	10	18	11,035	54.7	.016	.016	9,932	44.3	.012	.012	8,828	35.0	.012	.012
	6	12	22	10,151	64.8	.019	.019	9,136	52.4	.014	.014	8,121	41.4	.014	.014
	8	16	30	8,151	57.8	.025	.025	7,336	46.8	.019	.019	6,521	37.0	.019	.019
	10	20	38	5,804	41.1	.031	.031	5,224	33.3	.024	.024	4,643	26.3	.024	.024

Ball end mill pick feed and theoretical cusp height table (μinch)

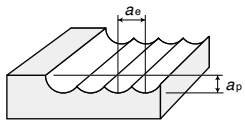
Ball Radius RE		Pick Feed : pf (inch)										
mm	inch	.0008	.0012	.0016	.0020	.0030	.0039	.0059	.0079	.0118	.0157	.0197
0.1	0.004	19.685	44.488	79.527	125.197	–	–	–	–	–	–	–
0.3	0.012	6.693	14.961	26.378	40.945	92.520	165.354	375.196	–	–	–	–
0.5	0.020	3.937	9.055	15.748	24.803	55.512	98.819	222.834	397.637	906.691	1643.304	2637.396
1	0.039	1.969	4.331	7.874	12.205	27.559	49.213	111.023	197.244	445.275	795.274	1249.998
1.5	0.059	1.181	3.150	5.118	8.268	18.504	32.677	74.016	131.496	296.062	527.164	825.983
2	0.079	1.181	2.362	3.937	6.299	13.780	24.803	55.512	98.425	221.653	394.881	617.715
2.5	0.098	.787	1.969	3.150	5.118	11.024	19.685	44.488	78.740	177.165	315.354	493.306
3	0.118	.669	1.575	2.756	3.937	9.055	16.535	37.008	65.748	147.638	262.598	410.629
4	0.157	.512	1.181	1.969	3.150	7.087	12.205	27.559	49.213	110.630	196.850	307.873
5	0.197	.394	.787	1.575	2.362	5.512	9.843	22.047	39.370	88.583	157.480	246.063
6	0.236	.315	.787	1.181	1.969	4.724	8.268	18.504	32.677	74.016	131.102	205.118

Pick feed and Cusp height

$$H = RE - \sqrt{RE^2 - pf^2/4} \fallingdotseq pf^2/8RE$$



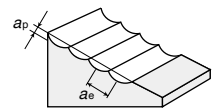
HGOB-TH



Inch

<Roughing>

Work material (Hardness)	Condition range	Depth of cut (mm)	Cutting condition	Ball radius RE × Tool dia. DC (mm)									
				RE0.5×1	RE1×2	RE1.5×3	RE2×4	RE3×6	RE4×8	RE5×10	RE6×12	RE8×16	RE10×20
Tool steel (25～35HRC) Alloy tool steels	High Speed	ap=0.1DC	Revolution n (min-1)	50,000	48,000	32,000	24,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.3DC	Feed rate vf (IPM)	70.9	124.8	128.3	132.3	132.3	141.7	141.7	122.0	101.6	81.1
	General	ap=0.1DC	Revolution n (min-1)	20,000	20,000	16,000	12,000	8,000	6,000	4,800	4,000	3,000	2,400
		ae=0.3DC	Feed rate vf (IPM)	28.3	52.0	64.2	66.1	66.1	70.9	68.1	61.0	50.8	40.6
Pre-hardened steel (35～45HRC) P21	High Speed	ap=0.1DC	Revolution n (min-1)	50,000	48,000	32,000	24,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.3DC	Feed rate vf (IPM)	63.0	109.4	113.4	115.4	115.7	118.9	122.8	105.9	87.4	70.1
	General	ap=0.1DC	Revolution n (min-1)	20,000	20,000	16,000	12,000	8,000	6,000	4,800	4,000	3,000	2,400
		ae=0.3DC	Feed rate vf (IPM)	25.2	45.7	56.7	57.5	57.9	59.4	59.1	52.8	43.7	35.0
Hardened steel (45～55HRC) H13, L6	High Speed	ap=0.08DC	Revolution n (min-1)	50,000	38,000	25,000	19,000	13,000	10,000	7,600	6,400	4,800	3,800
		ae=0.24DC	Feed rate vf (IPM)	59.1	78.0	82.7	85.4	88.2	91.3	85.4	77.6	64.2	50.8
	General	ap=0.1DC	Revolution n (min-1)	20,000	16,000	11,000	8,000	5,300	4,000	3,200	2,700	2,000	1,600
		ae=0.3DC	Feed rate vf (IPM)	21.3	29.5	32.7	32.3	32.3	33.1	32.3	29.5	24.0	19.3
Hardened steel (55～65HRC) D2, M2	High Speed	ap=0.05DC	Revolution n (min-1)	50,000	29,000	19,000	14,000	9,600	7,200	5,700	4,800	3,600	2,900
		ae=0.15DC	Feed rate vf (IPM)	51.2	54.7	56.7	57.5	59.1	59.4	58.3	52.8	43.7	35.0
	General	ap=0.07DC	Revolution n (min-1)	20,000	13,000	8,500	6,400	4,200	3,200	2,500	2,100	1,600	1,300
		ae=0.21DC	Feed rate vf (IPM)	18.5	22.0	22.8	23.6	23.2	23.6	23.2	20.9	17.3	14.2
Hardened steel (65～70HRC) High speed tool steel	High Speed	ap=0.05DC	Revolution n (min-1)	38,000	19,000	13,000	10,000	6,400	4,800	3,800	3,200	2,400	1,900
		ae=0.15DC	Feed rate vf (IPM)	39.0	35.8	39.0	40.9	39.4	39.8	39.0	35.4	29.1	23.2
	General	ap=0.07DC	Revolution n (min-1)	16,000	8,000	5,300	4,000	2,700	2,000	1,600	1,300	1,000	800
		ae=0.21DC	Feed rate vf (IPM)	14.6	13.8	14.2	14.6	15.0	15.0	14.6	13.0	11.0	8.7



Inch

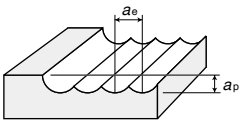
<Finishing>

Work material (Hardness)	Condition range	ap:Finishing cut amount ae：Pick feed (mm)	Cutting condition	Ball radius RE × Tool dia. DC (mm)									
				RE0.5×1	RE1×2	RE1.5×3	RE2×4	RE3×6	RE4×8	RE5×10	RE6×12	RE8×16	RE10×20
Tool steel (25～35HRC) Alloy tool steel	High Speed	ap=0.05～0.1	Revolution n (min-1)	50,000	32,000	25,000	22,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.02DC	Feed rate vf (IPM)	196.9	151.2	137.8	147.2	138.6	113.4	102.4	85.0	66.1	52.8
	General	ap=0.05～0.1	Revolution n (min-1)	20,000	20,000	17,000	13,000	8,500	6,400	5,100	4,200	3,200	2,500
		ae=0.02DC	Feed rate vf (IPM)	78.7	94.5	93.7	87.0	73.6	60.6	52.4	44.5	35.4	27.6
Pre-hardened steel (35～45HRC) P21	High Speed	ap=0.05～0.1	Revolution n (min-1)	50,000	32,000	25,000	22,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.02DC	Feed rate vf (IPM)	196.9	151.2	137.8	147.2	138.6	113.4	102.4	85.0	66.1	52.8
	General	ap=0.05～0.1	Revolution n (min-1)	20,000	20,000	17,000	13,000	8,500	6,400	5,100	4,200	3,200	2,500
		ae=0.02DC	Feed rate vf (IPM)	78.7	94.5	93.7	87.0	73.6	60.6	52.4	44.5	35.4	27.6
Hardened steel (45～55HRC) H13, L6	High Speed	ap=0.05～0.1	Revolution n (min-1)	50,000	32,000	24,000	20,000	13,000	10,000	8,000	6,600	5,000	4,000
		ae=0.02DC	Feed rate vf (IPM)	157.5	126.0	113.4	126.0	107.5	90.6	78.7	67.7	53.1	42.5
	General	ap=0.05～0.1	Revolution n (min-1)	20,000	20,000	14,000	10,000	6,900	5,200	4,100	3,500	2,600	2,100
		ae=0.02DC	Feed rate vf (IPM)	63.0	78.7	66.1	63.0	57.1	47.2	40.6	35.8	27.6	22.4
Hardened steel (55～65HRC) D2, M2	High Speed	ap=0.05～0.1	Revolution n (min-1)	50,000	32,000	21,000	16,000	11,000	8,000	6,400	5,300	4,000	3,200
		ae=0.02DC	Feed rate vf (IPM)	98.4	113.4	99.2	94.5	86.6	69.3	60.6	52.4	40.9	32.7
	General	ap=0.05～0.1	Revolution n (min-1)	15,000	15,000	13,000	9,600	6,400	4,800	3,800	3,200	2,400	1,900
		ae=0.02DC	Feed rate vf (IPM)	29.5	53.1	61.4	56.7	50.4	41.7	35.8	31.5	24.4	19.3
Hardened steel (65～70HRC) High speed tool steel	High Speed	ap=0.05～0.1	Revolution n (min-1)	48,000	24,000	16,000	12,000	8,000	6,000	4,800	4,000	3,000	2,400
		ae=0.02DC	Feed rate vf (IPM)	94.5	85.0	75.6	70.9	63.0	52.0	45.3	39.4	30.7	24.4
	General	ap=0.05～0.1	Revolution n (min-1)	15,000	14,000	10,000	7,200	4,800	3,600	2,900	2,400	1,800	1,400
		ae=0.02DC	Feed rate vf (IPM)	29.5	49.6	47.2	42.5	37.8	31.1	27.6	23.6	18.5	14.2

【Note】
① Use a highly rigid and accurate machine as possible.
② The pick feed in the table is a general condition; please select the *ae* according to the cusp height requested.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Global Series Ball

HGOB-PN Panacea



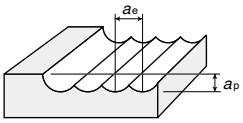
Metric

Types of finishing	Ball radius RE (mm)	Tool dia. DC (mm)	Flute length APMX (mm)	Copper alloy, Aluminium alloy				Cast iron, Carbon steel (150～200HB) No.35B, 1050, 1060				Stainless steel (25～35HRC) AISI 304, AISI 316			
				Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm
Roughing	0.15	0.3	0.6	35,032	2,102	0.039	0.117	31,847	1,911	0.039	0.117	28,662	1,720	0.038	0.112
	0.2	0.4	0.8	35,032	2,102	0.052	0.156	31,847	1,911	0.052	0.156	28,662	1,720	0.050	0.150
	0.25	0.5	1	35,032	2,102	0.065	0.195	31,847	1,911	0.065	0.195	28,662	1,720	0.063	0.187
	0.3	0.6	1.2	29,193	2,335	0.078	0.234	26,539	2,123	0.078	0.234	23,885	1,911	0.075	0.225
	0.4	0.8	1.6	26,274	2,102	0.104	0.312	23,885	1,911	0.104	0.312	21,497	1,720	0.100	0.300
	0.5	1	2.5	28,025	2,803	0.130	0.390	25,478	2,548	0.130	0.390	22,930	2,293	0.125	0.375
	0.75	1.5	4	25,690	3,083	0.195	0.585	23,355	2,803	0.195	0.585	21,019	2,522	0.188	0.562
	1	2	5	24,522	3,433	0.260	0.780	22,293	3,121	0.260	0.780	20,064	2,809	0.250	0.750
	1.25	2.5	7	22,420	3,587	0.325	0.975	20,382	3,261	0.325	0.975	18,344	2,935	0.313	0.937
	1.5	3	8	21,019	3,783	0.390	1.170	19,108	3,439	0.390	1.170	17,197	3,096	0.375	1.125
	2	4	8	20,143	4,029	0.520	1.560	18,312	3,662	0.520	1.560	16,481	3,296	0.500	1.500
			8	20,143	4,834	0.520	1.560	18,312	4,395	0.520	1.560	16,481	3,955	0.500	1.500
	2.5	5	10	18,217	5,101	0.650	1.950	16,561	4,637	0.650	1.950	14,904	4,173	0.625	1.875
	3	6	12	15,764	5,045	0.780	2.340	14,331	4,586	0.780	2.340	12,898	4,127	0.750	2.250
	4	8	14	12,699	4,572	1.040	3.120	11,545	4,156	1.040	3.120	10,390	3,740	1.000	3.000
	5	10	18	10,860	4,344	1.300	3.900	9,873	3,949	1.300	3.900	8,885	3,554	1.250	3.750
	6	12	22	9,634	4,239	1.560	4.680	8,758	3,854	1.560	4.680	7,882	3,468	1.500	4.500
	8	16	30	7,444	3,573	2.080	6.240	6,768	3,248	2.080	6.240	6,091	2,924	2.000	6.000
	10	20	38	5,955	3,097	2.600	7.800	5,414	2,815	2.600	7.800	4,873	2,534	2.500	7.500
Finishing	0.15	0.3	0.6	44,586	1,783	0.015	0.015	37,155	1,486	0.015	0.015	33,439	1,204	0.015	0.015
	0.2	0.4	0.8	42,994	1,720	0.020	0.020	35,828	1,433	0.020	0.020	32,245	1,161	0.020	0.020
	0.25	0.5	1	42,038	1,682	0.025	0.025	35,032	1,401	0.025	0.025	31,529	1,135	0.025	0.025
	0.3	0.6	1.2	35,032	2,102	0.030	0.030	29,193	1,752	0.030	0.030	26,274	1,419	0.030	0.030
	0.4	0.8	1.6	31,051	1,863	0.040	0.040	25,876	1,553	0.040	0.040	23,288	1,258	0.040	0.040
	0.5	1	2.5	30,573	1,834	0.050	0.050	25,478	1,529	0.050	0.050	22,930	1,238	0.050	0.050
	0.75	1.5	4	29,299	1,758	0.075	0.075	24,416	1,465	0.075	0.075	21,975	1,187	0.075	0.075
	1	2	5	29,618	2,369	0.100	0.100	24,682	1,975	0.100	0.100	22,213	1,599	0.100	0.100
	1.25	2.5	7	28,280	2,262	0.125	0.125	23,567	1,885	0.125	0.125	21,210	1,527	0.125	0.125
	1.5	3	8	26,115	2,089	0.150	0.150	21,762	1,741	0.150	0.150	19,586	1,410	0.150	0.150
	2	4	8	24,363	1,949	0.200	0.200	20,303	1,624	0.200	0.200	18,272	1,316	0.200	0.200
			8	24,363	2,436	0.200	0.200	20,303	2,030	0.200	0.200	18,272	1,645	0.200	0.200
	2.5	5	10	22,548	2,255	0.250	0.250	18,790	1,879	0.250	0.250	16,911	1,522	0.250	0.250
	3	6	12	19,427	2,331	0.300	0.300	16,189	1,943	0.300	0.300	14,570	1,574	0.300	0.300
	4	8	14	16,003	1,920	0.400	0.400	13,336	1,600	0.400	0.400	12,002	1,296	0.400	0.400
	5	10	18	14,713	2,060	0.500	0.500	12,261	1,717	0.500	0.500	11,035	1,390	0.500	0.500
	6	12	22	13,535	2,436	0.600	0.600	11,279	2,030	0.600	0.600	10,151	1,645	0.600	0.600
	8	16	30	10,868	2,174	0.800	0.800	9,057	1,811	0.800	0.800	8,151	1,467	0.800	0.800
	10	20	38	7,739	1,548	1.000	1.000	6,449	1,290	1.000	1.000	5,804	1,045	1.000	1.000

【Note】

① PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ Use a highly rigid and accurate machine as possible.
④ The pick feed in the table is a general condition; please select the a_e according to the cusp height requested.
⑤ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑥ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

HGOB-PN Panacea



Metric

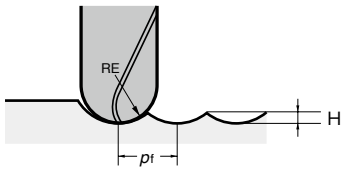
Types of finishing	Ball radius RE (mm)	Tool dia. DC (mm)	Flute length APMX (mm)	Alloy steel (25~35HRC) P20				Pre-hardened steel (35~45HRC) P21				Hardened steel (45~52HRC) H13			
				Revolution n min-1	Feed rate vf mm/min	ap mm	ae mm	Revolution n min-1	Feed rate vf mm/min	ap mm	ae mm	Revolution n min-1	Feed rate vf mm/min	ap mm	ae mm
Roughing	0.15	0.3	0.6	28,662	1,634	0.036	0.108	25,796	1,393	0.035	0.103	22,930	1,176	0.033	0.099
	0.2	0.4	0.8	28,662	1,634	0.048	0.144	25,796	1,393	0.046	0.138	22,930	1,176	0.044	0.132
	0.25	0.5	1	28,662	1,634	0.060	0.180	25,796	1,393	0.058	0.172	22,930	1,176	0.055	0.165
	0.3	0.6	1.2	23,885	1,815	0.072	0.216	21,497	1,548	0.069	0.207	19,108	1,307	0.066	0.198
	0.4	0.8	1.6	21,497	1,634	0.096	0.288	19,347	1,393	0.092	0.276	17,197	1,176	0.088	0.264
	0.5	1	2.5	22,930	2,178	0.120	0.360	20,637	1,857	0.115	0.345	18,344	1,568	0.110	0.330
	0.75	1.5	4	21,019	2,396	0.180	0.540	18,917	2,043	0.173	0.517	16,815	1,725	0.165	0.495
	1	2	5	20,064	2,668	0.240	0.720	18,057	2,275	0.230	0.690	16,051	1,921	0.220	0.660
	1.25	2.5	7	18,344	2,788	0.300	0.900	16,510	2,377	0.288	0.862	14,675	2,008	0.275	0.825
	1.5	3	8	17,197	2,941	0.360	1.080	15,478	2,507	0.345	1.035	13,758	2,117	0.330	0.990
	2	4	8	16,481	3,131	0.480	1.440	14,833	2,670	0.460	1.380	13,185	2,255	0.440	1.320
			8	16,481	3,758	0.480	1.440	14,833	3,204	0.460	1.380	13,185	2,706	0.440	1.320
	2.5	5	10	14,904	3,965	0.600	1.800	13,414	3,380	0.575	1.725	11,924	2,855	0.550	1.650
	3	6	12	12,898	3,921	0.720	2.160	11,608	3,343	0.690	2.070	10,318	2,823	0.660	1.980
	4	8	14	10,390	3,553	0.960	2.880	9,351	3,030	0.920	2.760	8,312	2,558	0.880	2.640
	5	10	18	8,885	3,376	1.200	3.600	7,997	2,879	1.150	3.450	7,108	2,431	1.100	3.300
	6	12	22	7,882	3,295	1.440	4.320	7,094	2,809	1.380	4.140	6,306	2,372	1.320	3.960
	8	16	30	6,091	2,777	1.920	5.760	5,482	2,368	1.840	5.520	4,873	2,000	1.760	5.280
	10	20	38	4,873	2,407	2.400	7.200	4,385	2,052	2.300	6.900	3,898	1,733	2.200	6.600
Finishing	0.15	0.3	0.6	33,439	1,204	0.012	0.012	30,096	975	0.009	0.009	26,752	770	0.009	0.009
	0.2	0.4	0.8	32,245	1,161	0.016	0.016	29,021	940	0.012	0.012	25,796	743	0.012	0.012
	0.25	0.5	1	31,529	1,135	0.020	0.020	28,376	919	0.015	0.015	25,223	726	0.015	0.015
	0.3	0.6	1.2	26,274	1,419	0.024	0.024	23,646	1,149	0.018	0.018	21,019	908	0.018	0.018
	0.4	0.8	1.6	23,288	1,258	0.032	0.032	20,959	1,019	0.024	0.024	18,631	805	0.024	0.024
	0.5	1	2.5	22,930	1,238	0.040	0.040	20,637	1,003	0.030	0.030	18,344	792	0.030	0.030
	0.75	1.5	4	21,975	1,187	0.060	0.060	19,777	961	0.045	0.045	17,580	759	0.045	0.045
	1	2	5	22,213	1,599	0.080	0.080	19,992	1,295	0.060	0.060	17,771	1,024	0.060	0.060
	1.25	2.5	7	21,210	1,527	0.100	0.100	19,089	1,237	0.075	0.075	16,968	977	0.075	0.075
	1.5	3	8	19,586	1,410	0.120	0.120	17,627	1,142	0.090	0.090	15,669	903	0.090	0.090
	2	4	8	18,272	1,316	0.160	0.160	16,445	1,066	0.120	0.120	14,618	842	0.120	0.120
			8	18,272	1,645	0.160	0.160	16,445	1,332	0.120	0.120	14,618	1,052	0.120	0.120
	2.5	5	10	16,911	1,522	0.200	0.200	15,220	1,233	0.150	0.150	13,529	974	0.150	0.150
	3	6	12	14,570	1,574	0.240	0.240	13,113	1,275	0.180	0.180	11,656	1,007	0.180	0.180
	4	8	14	12,002	1,296	0.320	0.320	10,802	1,050	0.240	0.240	9,602	830	0.240	0.240
	5	10	18	11,035	1,390	0.400	0.400	9,932	1,126	0.300	0.300	8,828	890	0.300	0.300
	6	12	22	10,151	1,645	0.480	0.480	9,136	1,332	0.360	0.360	8,121	1,052	0.360	0.360
	8	16	30	8,151	1,467	0.640	0.640	7,336	1,188	0.480	0.480	6,521	939	0.480	0.480
	10	20	38	5,804	1,045	0.800	0.800	5,224	846	0.600	0.600	4,643	669	0.600	0.600

Ball end mill pick feed and theoretical cusp height table (μm)

Ball Radius RE (mm)	Pick Feed : pf (mm) 0.02	0.03	0.04	0.05	0.075	0.1	0.15	0.2	0.3	0.4	0.5
0.1	0.50	1.13	2.02	3.18	–	–	–	–	–	–	–
0.3	0.17	0.38	0.67	1.04	2.35	4.20	9.53	–	–	–	–
0.5	0.10	0.23	0.40	0.63	1.41	2.51	5.66	10.10	23.03	41.74	66.99
1	0.05	0.11	0.20	0.31	0.70	1.25	2.82	5.01	11.31	20.20	31.75
1.5	0.03	0.08	0.13	0.21	0.47	0.83	1.88	3.34	7.52	13.39	20.98
2	0.03	0.06	0.10	0.16	0.35	0.63	1.41	2.50	5.63	10.03	15.69
2.5	0.02	0.05	0.08	0.13	0.28	0.50	1.13	2.00	4.50	8.01	12.53
3	0.017	0.04	0.07	0.10	0.23	0.42	0.94	1.67	3.75	6.67	10.43
4	0.013	0.03	0.05	0.08	0.18	0.31	0.70	1.25	2.81	5.00	7.82
5	0.010	0.02	0.04	0.06	0.14	0.25	0.56	1.00	2.25	4.00	6.25
6	0.008	0.02	0.03	0.05	0.12	0.21	0.47	0.83	1.88	3.33	5.21

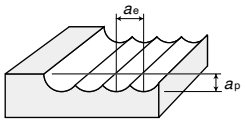
Pick feed and Cusp height

$H = RE - \sqrt{RE^2 - pf^2/4} \fallingdotseq pf^2/8RE$



Epoch Global Series Ball

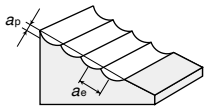
HGOB-TH



Metric

<Roughing>

Work material (Hardness)	Condition range	Depth of cut (mm)	Cutting condition	Ball radius RE × Tool dia. DC (mm)									
				RE0.5×1	RE1×2	RE1.5×3	RE2×4	RE3×6	RE4×8	RE5×10	RE6×12	RE8×16	RE10×20
Tool steel (25～35HRC) Alloy tool steel	High Speed	ap=0.1DC	Revolution n (min⁻¹)	50,000	48,000	32,000	24,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.3DC	Feed rate vf (mm/min)	1,800	3,170	3,260	3,360	3,360	3,600	3,600	3,100	2,580	2,060
	General	ap=0.1DC	Revolution n (min⁻¹)	20,000	20,000	16,000	12,000	8,000	6,000	4,800	4,000	3,000	2,400
		ae=0.3DC	Feed rate vf (mm/min)	720	1,320	1,630	1,680	1,680	1,800	1,730	1,550	1,290	1,030
Pre-hardened steel (35～45HRC) P21	High Speed	ap=0.1DC	Revolution n (min⁻¹)	50,000	48,000	32,000	24,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.3DC	Feed rate vf (mm/min)	1,600	2,780	2,880	2,930	2,940	3,020	3,120	2,690	2,220	1,780
	General	ap=0.1DC	Revolution n (min⁻¹)	20,000	20,000	16,000	12,000	8,000	6,000	4,800	4,000	3,000	2,400
		ae=0.3DC	Feed rate vf (mm/min)	640	1,160	1,440	1,460	1,470	1,510	1,500	1,340	1,110	890
Hardened steel (45～55HRC) H13, L6	High Speed	ap=0.08DC	Revolution n (min⁻¹)	50,000	38,000	25,000	19,000	13,000	10,000	7,600	6,400	4,800	3,800
		ae=0.24DC	Feed rate vf (mm/min)	1,500	1,980	2,100	2,170	2,240	2,320	2,170	1,970	1,630	1,290
	General	ap=0.1DC	Revolution n (min⁻¹)	20,000	16,000	11,000	8,000	5,300	4,000	3,200	2,700	2,000	1,600
		ae=0.3DC	Feed rate vf (mm/min)	540	750	830	820	820	840	820	750	610	490
Hardened steel (55～65HRC) D2, M2	High Speed	ap=0.05DC	Revolution n (min⁻¹)	50,000	29,000	19,000	14,000	9,600	7,200	5,700	4,800	3,600	2,900
		ae=0.15DC	Feed rate vf (mm/min)	1,300	1,390	1,440	1,460	1,500	1,510	1,480	1,340	1,110	890
	General	ap=0.07DC	Revolution n (min⁻¹)	20,000	13,000	8,500	6,400	4,200	3,200	2,500	2,100	1,600	1,300
		ae=0.21DC	Feed rate vf (mm/min)	470	560	580	600	590	600	590	530	440	360
Hardened steel (65～70HRC) High speed tool steel	High Speed	ap=0.05DC	Revolution n (min⁻¹)	38,000	19,000	13,000	10,000	6,400	4,800	3,800	3,200	2,400	1,900
		ae=0.15DC	Feed rate vf (mm/min)	990	910	990	1,040	1,000	1,010	990	900	740	590
	General	ap=0.07DC	Revolution n (min⁻¹)	16,000	8,000	5,300	4,000	2,700	2,000	1,600	1,300	1,000	800
		ae=0.21DC	Feed rate vf (mm/min)	370	350	360	370	380	380	370	330	280	220



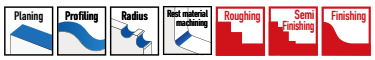
Metric

<Finishing>

Work material (Hardness)	Condition range	ap:Finishing cut amount ae : Pick feed (mm)	Cutting condition	Ball radius RE × Tool dia. DC (mm)									
				RE0.5×1	RE1×2	RE1.5×3	RE2×4	RE3×6	RE4×8	RE5×10	RE6×12	RE8×16	RE10×20
Tool steel (25～35HRC) Alloy tool steel	High Speed	ap=0.05～0.1	Revolution n (min⁻¹)	50,000	32,000	25,000	22,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.02DC	Feed rate vf (mm/min)	5,000	3,840	3,500	3,740	3,520	2,880	2,600	2,160	1,680	1,340
	General	ap=0.05～0.1	Revolution n (min⁻¹)	20,000	20,000	17,000	13,000	8,500	6,400	5,100	4,200	3,200	2,500
		ae=0.02DC	Feed rate vf (mm/min)	2,000	2,400	2,380	2,210	1,870	1,540	1,330	1,130	900	700
Pre-hardened steel (35～45HRC) P21	High Speed	ap=0.05～0.1	Revolution n (min⁻¹)	50,000	32,000	25,000	22,000	16,000	12,000	10,000	8,000	6,000	4,800
		ae=0.02DC	Feed rate vf (mm/min)	5,000	3,840	3,500	3,740	3,520	2,880	2,600	2,160	1,680	1,340
	General	ap=0.05～0.1	Revolution n (min⁻¹)	20,000	20,000	17,000	13,000	8,500	6,400	5,100	4,200	3,200	2,500
		ae=0.02DC	Feed rate vf (mm/min)	2,000	2,400	2,380	2,210	1,870	1,540	1,330	1,130	900	700
Hardened steel (45～55HRC) H13, L6	High Speed	ap=0.05～0.1	Revolution n (min⁻¹)	50,000	32,000	24,000	20,000	13,000	10,000	8,000	6,600	5,000	4,000
		ae=0.02DC	Feed rate vf (mm/min)	4,000	3,200	2,880	3,200	2,730	2,300	2,000	1,720	1,350	1,080
	General	ap=0.05～0.1	Revolution n (min⁻¹)	20,000	20,000	14,000	10,000	6,900	5,200	4,100	3,500	2,600	2,100
		ae=0.02DC	Feed rate vf (mm/min)	1,600	2,000	1,680	1,600	1,450	1,200	1,030	910	700	570
Hardened steel (55～65HRC) D2, M2	High Speed	ap=0.05～0.1	Revolution n (min⁻¹)	50,000	32,000	21,000	16,000	11,000	8,000	6,400	5,300	4,000	3,200
		ae=0.02DC	Feed rate vf (mm/min)	2,500	2,880	2,520	2,400	2,200	1,760	1,540	1,330	1,040	830
	General	ap=0.05～0.1	Revolution n (min⁻¹)	15,000	15,000	13,000	9,600	6,400	4,800	3,800	3,200	2,400	1,900
		ae=0.02DC	Feed rate vf (mm/min)	750	1,350	1,560	1,440	1,280	1,060	910	800	620	490
Hardened steel (65～70HRC) High speed tool steel	High Speed	ap=0.05～0.1	Revolution n (min⁻¹)	48,000	24,000	16,000	12,000	8,000	6,000	4,800	4,000	3,000	2,400
		ae=0.02DC	Feed rate vf (mm/min)	2,400	2,160	1,920	1,800	1,600	1,320	1,150	1,000	780	620
	General	ap=0.05～0.1	Revolution n (min⁻¹)	15,000	14,000	10,000	7,200	4,800	3,600	2,900	2,400	1,800	1,400
		ae=0.02DC	Feed rate vf (mm/min)	750	1,260	1,200	1,080	960	790	700	600	470	360

【Note】
① Use a highly rigid and accurate machine as possible.
② The pick feed in the table is a general condition; please select the *ae* according to the cusp height requested.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

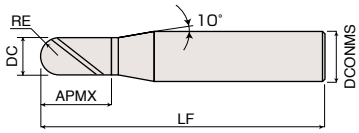
Global Forging Ball



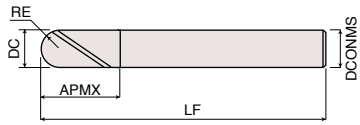
RE tolerance ±0.01mm

h5

A type



B type



2 Flutes

HGFB2○○○-TH

Carbide TH Helix angle 30° Cutting Conditions A100

Item Code	Stock	Size (mm) Ball radius RE	Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	No. of flutes	Type	Coating
HGFB2020-TH	●	1	2	3	50	6	2	A	TH
HGFB2030-TH	●	1.5	3	4.5	70	6	2	A	TH
HGFB2040-TH	●	2	4	6	70	6	2	A	TH
HGFB2060-TH	●	3	6	9	90	6	2	B	TH
HGFB2080-TH	●	4	8	12	100	8	2	B	TH
HGFB2100-TH	●	5	10	15	100	10	2	B	TH
HGFB2120-TH	●	6	12	18	110	12	2	B	TH

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	◎	○	○	○	○

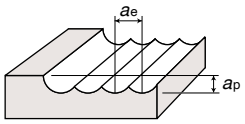
● : Inventory maintained in US

Global Forging Ball

Recommended cutting conditions

HGFB-TH

Applied for from heavy roughing to finishing of over 35HRC up to 70HRC. Recommended for Forging die and die casting die cutting.



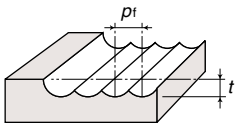
Inch

<Roughing>

Work material (Hardness)	Cutting range	Depth of cut (mm)	Cutting conditions	Ball radius RE × Tool dia. DC (mm)						
				RE1.5×3	RE2×4	RE2.5×5	RE3×6	RE4×8	RE5×10	RE6×12
Pre-hardened steel (35～45HRC) P21	High Speed	a_p=0.12DC a_e=0.36DC	Revolution n (min^{-1})	37,700	28,300	22,800	19,200	14,700	11,800	9,800
			Feed rate v_f (IPM)	142.5	142.5	143.7	145.3	148.0	148.8	143.7
	General	a_p=0.12DC a_e=0.36DC	Revolution n (min^{-1})	17,300	13,000	10,500	8,800	6,800	5,400	4,500
			Feed rate v_f (IPM)	61.4	61.4	62.2	62.2	64.2	63.8	61.8
Hardened steel (45～55HRC) H13, L6	High Speed	a_p=0.1DC a_e=0.3DC	Revolution n (min^{-1})	27,500	20,600	16,700	14,000	10,700	8,600	7,200
			Feed rate v_f (IPM)	110.6	110.2	111.8	112.6	114.6	115.0	112.2
	General	a_p=0.1DC a_e=0.3DC	Revolution n (min^{-1})	14,300	10,700	8,600	7,300	5,600	4,500	3,700
			Feed rate v_f (IPM)	40.6	40.6	40.6	41.3	42.5	42.5	40.6
Hardened steel (55～65HRC) D2, M2	High Speed	a_p=0.06DC a_e=0.18DC	Revolution n (min^{-1})	22,400	16,800	13,600	11,400	8,800	7,000	5,800
			Feed rate v_f (IPM)	89.8	89.8	90.9	91.7	94.1	93.7	90.6
	General	a_p=0.08DC a_e=0.24DC	Revolution n (min^{-1})	12,200	9,200	7,400	6,200	4,800	3,800	3,200
			Feed rate v_f (IPM)	28.7	29.1	29.1	29.1	30.3	29.9	29.1
Hardened steel (65～72HRC) High speed tool steel	High Speed	a_p=0.05DC a_e=0.15DC	Revolution n (min^{-1})	13,200	9,900	8,000	6,800	5,200	4,100	3,400
			Feed rate v_f (IPM)	43.7	43.7	44.1	44.9	45.7	45.3	43.7
	General	a_p=0.07DC a_e=0.21DC	Revolution n (min^{-1})	7,100	5,300	4,300	3,600	2,800	2,200	1,900
			Feed rate v_f (IPM)	13.4	13.4	13.4	13.8	14.2	13.8	13.8

<Finishing>

t: Finishing cut amount
p_f: Pick feed

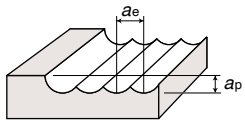


Inch

Work material (Hardness)	Cutting range	Depth of cut (mm)	Cutting conditions	Ball radius RE × Tool dia. DC (mm)						
				RE1.5×3	RE2×4	RE2.5×5	RE3×6	RE4×8	RE5×10	RE6×12
Pre-hardened steel (35～45HRC) P21	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	27,500	24,200	20,900	17,600	13,200	11,000	8,800
			Feed rate v_f (IPM)	153.1	163.4	158.3	153.9	126.0	113.8	94.5
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	17,000	13,000	10,500	8,500	6,400	5,100	4,200
			Feed rate v_f (IPM)	103.1	95.7	89.0	81.1	66.5	57.5	48.8
Hardened steel (45～55HRC) H13, L6	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	26,400	22,000	18,150	14,300	11,000	8,800	7,260
			Feed rate v_f (IPM)	126.0	139.8	130.3	119.3	100.4	87.4	75.2
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	15,400	11,000	9,130	7,590	5,720	4,510	3,850
			Feed rate v_f (IPM)	72.8	69.3	65.7	63.0	52.0	44.5	39.4
Hardened steel (55～65HRC) D2, M2	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	23,100	17,600	14,850	12,100	8,800	7,040	5,830
			Feed rate v_f (IPM)	110.2	104.7	100.4	96.1	66.1	64.6	58.7
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	14,300	10,560	7,040	5,280	4,180	3,520	2,640
			Feed rate v_f (IPM)	67.7	62.2	56.7	55.5	46.1	39.4	34.6
Hardened steel (65～72HRC) High speed tool steel	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	17,600	13,200	11,000	8,800	6,600	5,280	4,400
			Feed rate v_f (IPM)	83.9	78.7	75.2	70.1	57.9	50.4	43.7
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	11,000	7,920	6,490	5,280	3,960	3,190	2,640
			Feed rate v_f (IPM)	52.0	46.9	43.3	41.7	34.3	30.3	26.0

HGFB-TH

Applied for from heavy roughing to finishing of over 35HRC up to 70HRC. Recommended for Forging die and die casting die cutting.



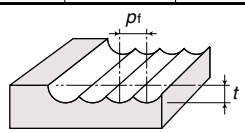
Metric

<Roughing>

Work material (Hardness)	Cutting range	Depth of cut (mm)	Cutting conditions	Ball radius RE × Tool dia. DC (mm)						
				RE1.5×3	RE2×4	RE2.5×5	RE3×6	RE4×8	RE5×10	RE6×12
Pre-hardened steel (35～45HRC) P21	High Speed	a_p=0.12DC a_e=0.36DC	Revolution n (min^{-1})	37,700	28,300	22,800	19,200	14,700	11,800	9,800
			Feed rate v_f (mm/min)	3,620	3,620	3,650	3,690	3,760	3,780	3,650
	General	a_p=0.12DC a_e=0.36DC	Revolution n (min^{-1})	17,300	13,000	10,500	8,800	6,800	5,400	4,500
			Feed rate v_f (mm/min)	1,560	1,560	1,580	1,580	1,630	1,620	1,570
Hardened steel (45～55HRC) H13, L6	High Speed	a_p=0.1DC a_e=0.3DC	Revolution n (min^{-1})	27,500	20,600	16,700	14,000	10,700	8,600	7,200
			Feed rate v_f (mm/min)	2,810	2,800	2,840	2,860	2,910	2,920	2,850
	General	a_p=0.1DC a_e=0.3DC	Revolution n (min^{-1})	14,300	10,700	8,600	7,300	5,600	4,500	3,700
			Feed rate v_f (mm/min)	1,030	1,030	1,030	1,050	1,080	1,080	1,030
Hardened steel (55～65HRC) D2, M2	High Speed	a_p=0.06DC a_e=0.18DC	Revolution n (min^{-1})	22,400	16,800	13,600	11,400	8,800	7,000	5,800
			Feed rate v_f (mm/min)	2,280	2,280	2,310	2,330	2,390	2,380	2,300
	General	a_p=0.08DC a_e=0.24DC	Revolution n (min^{-1})	12,200	9,200	7,400	6,200	4,800	3,800	3,200
			Feed rate v_f (mm/min)	730	740	740	740	770	760	740
Hardened steel (65～72HRC) High speed tool steel	High Speed	a_p=0.05DC a_e=0.15DC	Revolution n (min^{-1})	13,200	9,900	8,000	6,800	5,200	4,100	3,400
			Feed rate v_f (mm/min)	1,110	1,110	1,120	1,140	1,160	1,150	1,110
	General	a_p=0.07DC a_e=0.21DC	Revolution n (min^{-1})	7,100	5,300	4,300	3,600	2,800	2,200	1,900
			Feed rate v_f (mm/min)	340	340	340	350	360	350	350

<Finishing>

t: Finishing cut amount
p_f: Pick feed



Metric

Work material (Hardness)	Cutting range	Depth of cut (mm)	Cutting conditions	Ball radius RE × Tool dia. DC (mm)						
				RE1.5×3	RE2×4	RE2.5×5	RE3×6	RE4×8	R5E×10	RE6×12
Pre-hardened steel (35～45HRC) P21	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	27,500	24,200	20,900	17,600	13,200	11,000	8,800
			Feed rate v_f (mm/min)	3,890	4,150	4,020	3,910	3,200	2,890	2,400
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	17,000	13,000	10,500	8,500	6,400	5,100	4,200
			Feed rate v_f (mm/min)	2,620	2,430	2,260	2,060	1,690	1,460	1,240
Hardened steel (45～55HRC) H13, L6	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	26,400	22,000	18,150	14,300	11,000	8,800	7,260
			Feed rate v_f (mm/min)	3,200	3,550	3,310	3,030	2,550	2,220	1,910
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	15,400	11,000	9,130	7,590	5,720	4,510	3,850
			Feed rate v_f (mm/min)	1,850	1,760	1,670	1,600	1,320	1,130	1,000
Hardened steel (55～65HRC) D2, M2	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	23,100	17,600	14,850	12,100	8,800	7,040	5,830
			Feed rate v_f (mm/min)	2,800	2,660	2,550	2,440	1,680	1,640	1,490
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	14,300	10,560	7,040	5,280	4,180	3,520	2,640
			Feed rate v_f (mm/min)	1,720	1,580	1,440	1,410	1,170	1,000	880
Hardened steel (65～72HRC) High speed tool steel	High Speed	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	17,600	13,200	11,000	8,800	6,600	5,280	4,400
			Feed rate v_f (mm/min)	2,130	2,000	1,910	1,780	1,470	1,280	1,110
	General	t=0.05～0.1 p_f=0.02DC	Revolution n (min^{-1})	11,000	7,920	6,490	5,280	3,960	3,190	2,640
			Feed rate v_f (mm/min)	1,320	1,190	1,100	1,060	870	770	660

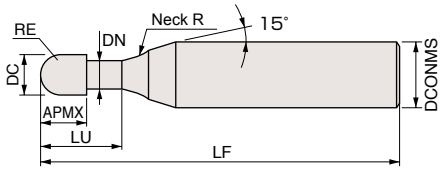
Epoch Shrink Master Ball

High accuracy rating product

Die-sinking | Profiling | Radius | Helical | Semi Finishing | Finishing

RE tolerance +0.001 ~−0.003mm h4

Ideal for press-fit holders. High-accuracy rating product.



2 Flutes

ESHB2○○○-H-TH

High-accuracy rating product | Inspection certificate included

Carbide | TH | Helix angle 30° | Cutting Conditions A103

Item code	Stock	Size (mm) Ball radius RE	Tool dia. DC	Flute length APMX	Neck dia. DN	Under neck length LU	Neck R	Overall length LF	Shank dia. DCONMS	Interference angle (°) θκ	Effective length (Effective length for work angle) 0°	0.5°	1°	1.5°	2°	3°
ESHB2010-H-TH	★	0.5	1	1	0.95	2.5	4	40	4	11.04	2.94	3.11	3.26	3.39	3.51	3.73
ESHB2015-H-TH	★	0.75	1.5	1.5	1.45	3.75	4	40	4	9.16	4.19	4.42	4.60	4.76	4.90	5.16
ESHB2020-H-TH	★	1	2	2	1.95	5	4	45	6	9.82	5.44	5.72	5.93	6.11	6.27	6.56
ESHB2025-H-TH	★	1.25	2.5	2.5	2.45	6.25	4	45	6	8.57	6.69	7.02	7.26	7.46	7.63	7.94
ESHB2030-H-TH	★	1.5	3	3	2.9	7.5	4	45	6	7.26	8.13	8.43	8.67	8.87	9.05	9.37
ESHB2035-H-TH	★	1.75	3.5	3.5	3.4	8.75	4	45	6	6.03	9.38	9.72	9.98	10.19	10.39	10.72
ESHB2040-H-TH	★	2	4	4	3.9	10	4	45	6	4.80	10.63	11.00	11.28	11.51	11.72	12.18
ESHB2050-H-TH	★	2.5	5	5	4.9	12.5	4	50	6	2.38	13.13	13.57	13.88	14.14	14.37	–
ESHB2060-H-TH	★	3	6	6	5.9	15	–	50	6	–	15.00	–	–	–	–	–
ESHB2080-H-TH	★	4	8	8	7.9	20	–	60	8	–	20.00	–	–	–	–	–
ESHB2100-H-TH	★	5	10	10	9.9	25	–	70	10	–	25.00	–	–	–	–	–
ESHB2120-H-TH	★	6	12	12	11.9	30	–	75	12	–	30.00	–	–	–	–	–

Standard rating product

RE tolerance ±0.005mm h4

Ideal for press-fit holders. Standard rating product

ESHB2○○○-N-TH

Standard rating product

Carbide | TH | Helix angle 30° | Cutting Conditions A103

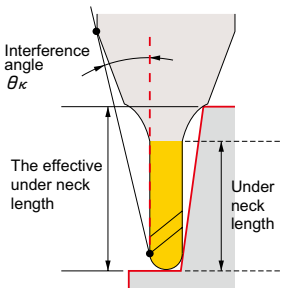
Item code	Stock	Size (mm) Ball radius RE	Tool dia. DC	Flute length APMX	Neck dia. DN	Under neck length LU	Neck R	Overall length LF	Shank dia. DCONMS	Interference angle (°) θκ	Effective length (Effective length for work angle) 0°	0.5°	1°	1.5°	2°	3°
ESHB2010-N-TH	★	0.5	1	1	0.95	2.5	4	40	4	11.04	2.94	3.11	3.26	3.39	3.51	3.73
ESHB2015-N-TH	★	0.75	1.5	1.5	1.45	3.75	4	40	4	9.16	4.19	4.42	4.60	4.76	4.90	5.16
ESHB2020-N-TH	★	1	2	2	1.95	5	4	45	6	9.82	5.44	5.72	5.93	6.11	6.27	6.56
ESHB2025-N-TH	★	1.25	2.5	2.5	2.45	6.25	4	45	6	8.57	6.69	7.02	7.26	7.46	7.63	7.94
ESHB2030-N-TH	★	1.5	3	3	2.9	7.5	4	45	6	7.26	8.13	8.43	8.67	8.87	9.05	9.37
ESHB2035-N-TH	★	1.75	3.5	3.5	3.4	8.75	4	45	6	6.03	9.38	9.72	9.98	10.19	10.39	10.72
ESHB2040-N-TH	★	2	4	4	3.9	10	4	45	6	4.80	10.63	11.00	11.28	11.51	11.72	12.18
ESHB2050-N-TH	★	2.5	5	5	4.9	12.5	4	50	6	2.38	13.13	13.57	13.88	14.14	14.37	–
ESHB2060-N-TH	★	3	6	6	5.9	15	–	50	6	–	15.00	–	–	–	–	–
ESHB2080-N-TH	★	4	8	8	7.9	20	–	60	8	–	20.00	–	–	–	–	–
ESHB2100-N-TH	★	5	10	10	9.9	25	–	70	10	–	25.00	–	–	–	–	–
ESHB2120-N-TH	★	6	12	12	11.9	30	–	75	12	–	30.00	–	–	–	–	–

Applicable work material of ESHB-H-TH, ESHB-N-TH

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

★ : Inventory maintained in Japan

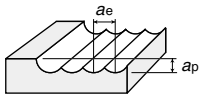
【Note】
If the workpiece has draft angle, the interference length will be longer than the under-neck length.
Please refer to the effective under-neck length for the variousdraft angles.
In addition, the angle at which the tool will interfere with the workpiece is shown as the "interference angle θκ", and should also be referred to.



Recommended cutting conditions

ESHB-H-TH High accuracy rating product

ESHB-N-TH Standard rating product



<Roughing> Inch

Work material	Tool steel (25～35HRC) P20				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6				Hardened steel (55～65HRC) D2, M2				Hardened steel (65～70HRC) Powder metal			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.08DC a_e=0.24DC		a_p=0.1DC a_e=0.3DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC	
RE Ball radius × DC Tool dia. (mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
RE0.5×1	50,000	70	20,000	28	50,000	60	20,000	24	50,000	60	20,000	20	50,000	50	20,000	20	38,000	38	16,000	16
RE1×2	48,000	125	20,000	52	48,000	106	20,000	44	38,000	76	16,000	29	29,000	52	13,000	21	19,000	34	8,000	14
RE1.5×3	32,000	128	16,000	64	32,000	115	16,000	58	25,000	85	11,000	33	19,000	57	8,500	22	13,000	39	5,300	14
RE2×4	24,000	134	12,000	67	24,000	115	12,000	58	19,000	84	8,000	32	14,000	59	6,400	23	10,000	40	4,000	14
RE3×6	16,000	131	8,000	66	16,000	115	8,000	58	13,000	88	5,300	32	9,600	60	4,200	24	6,400	40	2,700	15
RE4×8	12,000	142	6,000	71	12,000	120	6,000	60	10,000	92	4,000	33	7,200	59	3,200	24	4,800	39	2,000	15
RE5×10	10,000	142	4,800	68	10,000	122	4,800	60	7,600	85	3,200	32	5,700	58	2,500	23	3,800	39	1,600	15
RE6×12	8,000	122	4,000	61	8,000	106	4,000	53	6,400	78	2,700	30	4,800	53	2,100	21	3,200	35	1,300	13

<Roughing> Metric

Work material	Tool steel (25～35HRC) P20				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6				Hardened steel (55～65HRC) D2, M2				Hardened steel (65～70HRC) Powder metal			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.08DC a_e=0.24DC		a_p=0.1DC a_e=0.3DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC	
RE Ball radius × DC Tool dia. (mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
RE0.5×1	50,000	1,800	20,000	720	50,000	1,600	20,000	640	50,000	1,500	20,000	540	50,000	1,300	20,000	470	38,000	990	16,000	370
RE1×2	48,000	3,170	20,000	1,320	48,000	2,780	20,000	1,160	38,000	1,980	16,000	750	29,000	1,390	13,000	560	19,000	910	8,000	350
RE1.5×3	32,000	3,260	16,000	1,630	32,000	2,880	16,000	1,440	25,000	2,100	11,000	830	19,000	1,440	8,500	580	13,000	990	5,300	360
RE2×4	24,000	3,360	12,000	1,680	24,000	2,930	12,000	1,460	19,000	2,170	8,000	820	14,000	1,460	6,400	600	10,000	1,040	4,000	370
RE3×6	16,000	3,360	8,000	1,680	16,000	2,940	8,000	1,470	13,000	2,240	5,300	820	9,600	1,500	4,200	590	6,400	1,000	2,700	380
RE4×8	12,000	3,600	6,000	1,800	12,000	3,020	6,000	1,510	10,000	2,320	4,000	840	7,200	1,510	3,200	600	4,800	1,010	2,000	380
RE5×10	10,000	3,600	4,800	1,730	10,000	3,120	4,800	1,500	7,600	2,170	3,200	820	5,700	1,480	2,500	590	3,800	990	1,600	370
RE6×12	8,000	3,100	4,000	1,550	8,000	2,690	4,000	1,340	6,400	1,970	2,700	750	4,800	1,340	2,100	530	3,200	900	1,300	330

【Note】

① Use a highly rigid and accurate machine as possible.
② "a_e" (pick feed) figures in the above table are for general guidance. When making an actual selection, please refer to the cusp height table on A94 (inch) or A97 (metric).
③ Use the appropriate coolant for the work material and machining shape.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

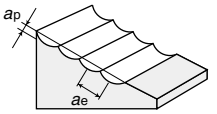
Epoch Shrink Master Ball

ESHB-H-TH High accuracy rating product

ESHB-N-TH Standard rating product

<Finishing>

a_p: Finishing cut amount
a_e: Pick feed



Inch

Work material	Tool steel (25～35HRC) P20				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6				Hardened steel (55～65HRC) D2, M2				Hardened steel (65～70HRC) Powder metal			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC	
RE Ball radius × DC Tool dia. (mm)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
RE0.5×1	50,000	200	20,000	80	50,000	200	20,000	80	50,000	160	20,000	64	50,000	100	15,000	30	48,000	96	15,000	30
RE1×2	32,000	154	20,000	96	32,000	154	20,000	96	32,000	128	20,000	80	32,000	115	15,000	54	24,000	86	14,000	50
RE1.5×3	25,000	140	17,000	95	25,000	140	17,000	95	24,000	115	14,000	67	21,000	101	13,000	62	16,000	77	10,000	48
RE2×4	22,000	145	13,000	86	22,000	145	13,000	86	20,000	124	10,000	62	16,000	96	9,600	58	12,000	72	7,200	43
RE3×6	16,000	138	8,500	73	16,000	138	8,500	73	13,000	107	6,900	57	11,000	86	6,400	50	8,000	62	4,800	37
RE4×8	12,000	113	6,400	60	12,000	113	6,400	60	10,000	90	5,200	47	8,000	69	4,800	41	6,000	52	3,600	31
RE5×10	10,000	102	5,100	52	10,000	102	5,100	52	8,000	78	4,100	40	6,400	60	3,800	36	4,800	45	2,900	28
RE6×12	8,000	85	4,200	45	8,000	85	4,200	45	6,600	67	3,500	36	5,300	52	3,200	31	4,000	39	2,400	24

<Finishing>

Metric

Work material	Tool steel (25～35HRC) P20				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6				Hardened steel (55～65HRC) D2, M2				Hardened steel (65～70HRC) Powder metal			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC		a_p=0.05～0.1 a_e=0.02DC	
RE Ball radius × DC Tool dia. (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
RE0.5×1	50,000	5,000	20,000	2,000	50,000	5,000	20,000	2,000	50,000	4,000	20,000	1,600	50,000	2,500	15,000	750	48,000	2,400	15,000	750
RE1×2	32,000	3,840	20,000	2,400	32,000	3,840	20,000	2,400	32,000	3,200	20,000	2,000	32,000	2,880	15,000	1,350	24,000	2,160	14,000	1,260
RE1.5×3	25,000	3,500	17,000	2,380	25,000	3,500	17,000	2,380	24,000	2,880	14,000	1,680	21,000	2,520	13,000	1,560	16,000	1,920	10,000	1,200
RE2×4	22,000	3,740	13,000	2,210	22,000	3,740	13,000	2,210	20,000	3,200	10,000	1,600	16,000	2,400	9,600	1,440	12,000	1,800	7,200	1,080
RE3×6	16,000	3,520	8,500	1,870	16,000	3,520	8,500	1,870	13,000	2,730	6,900	1,450	11,000	2,200	6,400	1,280	8,000	1,600	4,800	960
RE4×8	12,000	2,880	6,400	1,540	12,000	2,880	6,400	1,540	10,000	2,300	5,200	1,200	8,000	1,760	4,800	1,060	6,000	1,320	3,600	790
RE5×10	10,000	2,600	5,100	1,330	10,000	2,600	5,100	1,330	8,000	2,000	4,100	1,030	6,400	1,540	3,800	910	4,800	1,150	2,900	700
RE6×12	8,000	2,160	4,200	1,130	8,000	2,160	4,200	1,130	6,600	1,720	3,500	910	5,300	1,330	3,200	800	4,000	1,000	2,400	600

Epoch Mega Feed Ball Evolution

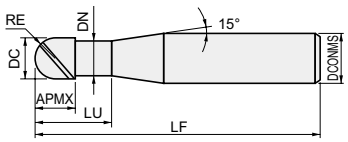
Straight Type

High helix ball flute shape that reduces cutting force and improves chip removal.

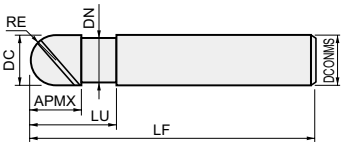
RE tolerance		Dia. tolerance	
RE0.5～RE1.75	: ±0.005mm	RE0.5～RE1.75	: 0～−0.010mm
RE2～RE3	: ±0.007mm	RE2～RE3	: 0～−0.014mm
RE4～RE6	: ±0.010mm	RE4～RE6	: 0～−0.020mm
RE8～RE10	: ±0.015mm	RE8～RE10	: 0～−0.030mm

h5

3 Flutes



A type



B type

EMBE3○○○ (-S○)-ATH

Carbide | ATH | Helix angle 40° | Valuable Pitch | Cutting Conditions A108

Item Code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Type
EMBE3010-S4-ATH	●	0.5	1	1.5	3	0.95	50	4	A
EMBE3010-S6-ATH	●			1.5	3	0.95	50	6	A
EMBE3015-S4-ATH	●	0.75	1.5	2.5	4.5	1.43	50	4	A
EMBE3015-S6-ATH	●			2.5	4.5	1.43	50	6	A
EMBE3020-S4-ATH	●	1	2	3	6	1.9	50	4	A
EMBE3020-S6-ATH	●			3	6	1.9	50	6	A
EMBE3025-S4-ATH	●	1.25	2.5	4	7.5	2.38	50	4	A
EMBE3025-S6-ATH	●			4	7.5	2.38	50	6	A
EMBE3030-S4-ATH	●	1.5	3	4.5	9	2.9	70	4	A
EMBE3030-S6-ATH	●			4.5	9	2.9	70	6	A
EMBE3035-S4-ATH	★	1.75	3.5	5.5	10.5	3.4	70	4	A
EMBE3035-S6-ATH	★			5.5	10.5	3.4	70	6	A
EMBE3040-S4-ATH	●	2	4	6	12	3.9	70	4	B
EMBE3040-S6-ATH	●			6	12	3.9	70	6	A
EMBE3050-ATH	●	2.5	5	7.5	15	4.7	80	6	A
EMBE3060-ATH	●	3	6	9	18	5.7	90	6	B
EMBE3080-ATH	●	4	8	12	24	7.6	100	8	B
EMBE3100-ATH	●	5	10	15	30	9.5	100	10	B
EMBE3120-ATH	●	6	12	18	36	11.5	110	12	B
EMBE3160-ATH	★	8	16	24	48	15	140	16	B
EMBE3200-ATH	★	10	20	30	60	19	160	20	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch Mega Feed Ball Evolution

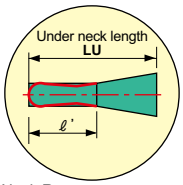
Pencil Neck

Die-sinking | Profiling | Radius | Rest material machining | Corner recessing | Miniature | Roughing | Semi Finishing | Finishing | Miniature Rib

RE tolerance
RE0.5～RE1.75 : ±0.005mm
RE2 ～ RE3 : ±0.007mm
RE4 ～ RE6 : ±0.010mm

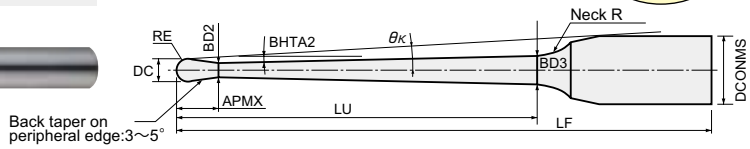
h5

High helix ball flute shape that reduces cutting force and improves chip removal.



3 Flutes

【Note】※:RE2mm or higher does not have backdraft shape.



EMBPE3○○○-○○○-○○-ATH

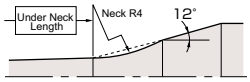
Carbide | ATH | Helix angle 40° | Valuable Pitch | Cutting Conditions A111

Item Code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Style	Approx neck length ℓ'	Interference angle θK	The effective under-neck length for the various draft angles. 0.75°	1°	1.5°	2°	3°
EMBPE3010-6-09-ATH	●	0.5	1	0.9	6	0.8	0.94	1.103	50	6	A	2.70	8.36	6.45	6.66	6.96	7.19	7.56
EMBPE3010-8-09-ATH	●			0.9	8	0.8	0.94	1.166	55	6	A	2.70	7.55	8.4	8.68	9.05	9.32	9.93
EMBPE3010-10-09-ATH	●			0.9	10	0.8	0.94	1.229	55	6	A	2.70	6.88	10.33	10.71	11.13	11.43	12.39
EMBPE3010-12-09-ATH	●			0.9	12	0.8	0.94	1.291	60	6	A	2.70	6.32	12.25	12.73	13.2	13.54	14.85
EMBPE3010-14-09-ATH	●			0.9	14	0.8	0.94	1.354	60	6	A	2.70	5.85	13.77	14.75	15.27	15.65	17.31
EMBPE3010-16-09-ATH	●			0.9	16	0.8	0.94	1.417	60	6	A	2.70	5.44	13.77	16.77	17.34	17.87	19.77
EMBPE3010-18-09-ATH	●			0.9	18	0.8	0.94	1.480	65	6	A	2.70	5.08	13.77	18.79	19.4	20.08	22.23
EMBPE3010-20-09-ATH	★			0.9	20	0.8	0.94	1.543	65	6	A	2.70	4.77	13.77	20.81	21.46	22.3	24.68
EMBPE3010-22-09-ATH	★			0.9	22	0.8	0.94	1.606	70	6	A	2.70	4.5	13.77	22.82	23.51	24.52	27.14
EMBPE3010-24-09-ATH	★			0.9	24	0.8	0.94	1.668	70	6	A	2.70	4.25	13.77	24.84	25.57	26.73	29.6
EMBPE3010-26-09-ATH	●			0.9	26	0.8	0.94	1.731	70	6	A	2.70	4.03	13.77	26.86	27.62	28.95	32.06
EMBPE3010-28-09-ATH	★			0.9	28	0.8	0.94	1.794	75	6	A	2.70	3.83	13.77	28.88	29.73	31.17	34.52
EMBPE3010-30-09-ATH	★			0.9	30	0.8	0.94	1.857	75	6	A	2.70	3.65	13.77	30.89	31.84	33.38	36.98
EMBPE3010-32-09-ATH	★			0.9	32	0.8	0.94	1.920	80	6	A	2.70	3.49	13.77	32.91	33.95	35.6	39.43
EMBPE3010-34-09-ATH	★			0.9	34	0.8	0.94	1.983	80	6	A	2.70	3.34	13.77	34.92	36.07	37.82	41.89
EMBPE3010-36-09-ATH	●			0.9	36	0.8	0.94	2.045	80	6	A	2.70	3.2	13.77	36.94	38.18	40.03	44.35
EMBPE3015-8-09-ATH	★	0.75	1.5	0.9	8	1.35	1.42	1.628	55	6	A	3.89	7.32	8.54	8.77	9.1	9.35	9.97
EMBPE3015-10-09-ATH	★			0.9	10	1.35	1.42	1.691	55	6	A	3.89	6.63	10.5	10.79	11.17	11.46	12.43
EMBPE3015-14-09-ATH	★			0.9	14	1.35	1.42	1.817	60	6	A	3.89	5.57	14.39	14.83	15.31	15.71	17.35
EMBPE3015-16-09-ATH	★			0.9	16	1.35	1.42	1.880	60	6	A	3.89	5.16	16.33	16.84	17.37	17.93	19.8
EMBPE3015-18-09-ATH	★			0.9	18	1.35	1.42	1.943	65	6	A	3.89	4.81	18.24	18.86	19.43	20.14	22.26
EMBPE3015-20-09-ATH	★			0.9	20	1.35	1.42	2.005	65	6	A	3.89	4.5	19.64	20.88	21.49	22.36	24.72
EMBPE3015-22-09-ATH	★			0.9	22	1.35	1.42	2.068	70	6	A	3.89	4.22	19.64	22.89	23.55	24.57	27.18
EMBPE3015-24-09-ATH	★			0.9	24	1.35	1.42	2.131	70	6	A	3.89	3.98	19.64	24.91	25.6	26.79	29.64
EMBPE3015-26-09-ATH	★			0.9	26	1.35	1.42	2.194	70	6	A	3.89	3.77	19.64	26.93	27.68	29.01	32.1
EMBPE3015-28-09-ATH	★			0.9	28	1.35	1.42	2.257	75	6	A	3.89	3.58	19.64	28.94	29.79	31.22	34.55
EMBPE3015-30-09-ATH	★			0.9	30	1.35	1.42	2.320	75	6	A	3.89	3.4	19.64	30.96	31.91	33.44	37.01
EMBPE3015-32-09-ATH	★			0.9	32	1.35	1.42	2.382	80	6	A	3.89	3.24	19.64	32.97	34.02	35.66	39.47
EMBPE3015-34-09-ATH	★			0.9	34	1.35	1.42	2.445	80	6	A	3.89	3.1	19.64	34.99	36.13	37.87	41.93
EMBPE3015-36-09-ATH	★			0.9	36	1.35	1.42	2.508	80	6	A	3.89	2.97	19.64	37	38.24	40.09	No interference
EMBPE3015-38-09-ATH	★			0.9	38	1.35	1.42	2.571	85	6	A	3.89	2.85	19.64	39.02	40.36	42.3	No interference
EMBPE3015-40-09-ATH	★			0.9	40	1.35	1.42	2.634	85	6	A	3.89	2.74	19.64	41.03	42.47	44.52	No interference
EMBPE3020-10-09-ATH	●	1	2	0.9	10	1.7	1.92	2.180	55	6	A	4.24	6.35	10.52	10.8	11.17	11.45	12.38
EMBPE3020-16-09-ATH	●			0.9	16	1.7	1.92	2.369	60	6	A	4.24	4.86	16.36	16.85	17.37	17.91	19.76
EMBPE3020-20-09-ATH	●			0.9	20	1.7	1.92	2.494	65	6	A	4.24	4.2	20.16	20.88	21.49	22.34	24.68
EMBPE3020-24-09-ATH	●			0.9	24	1.7	1.92	2.620	65	6	A	4.24	3.7	20.5	24.92	25.6	26.77	29.59
EMBPE3020-30-09-ATH	●			0.9	30	1.7	1.92	2.809	70	6	A	4.24	3.14	20.5	30.96	31.9	33.42	36.97
EMBPE3020-36-09-ATH	●			0.9	36	1.7	1.92	2.997	80	6	A	4.24	2.73	20.5	37.01	38.24	40.07	No interference
EMBPE3020-40-09-ATH	●			0.9	40	1.7	1.92	3.123	80	6	A	4.24	2.51	20.5	41.03	42.46	44.5	No interference
EMBPE3020-46-09-ATH	★			0.9	46	1.7	1.92	3.311	90	6	A	4.24	2.24	20.5	47.08	48.8	51.15	No interference
EMBPE3020-60-09-ATH	★			0.9	60	1.7	1.92	3.751	100	6	A	4.24	1.79	20.5	61.16	63.59	No interference	No interference
EMBPE3025-16-09-ATH	●	1.25	2.5	0.9	16	2	2.4	2.839	60	6	A	5.18	4.52	16.48	16.9	17.4	17.94	19.77
EMBPE3025-24-09-ATH	●			0.9	24	2	2.4	3.091	65	6	A	5.18	3.39	24.19	24.96	25.62	26.81	29.6
EMBPE3025-30-09-ATH	●			0.9	30	2	2.4	3.279	70	6	A	5.18	2.86	24.88	31.01	31.94	33.46	No interference
EMBPE3025-40-09-ATH	●			0.9	40	2	2.4	3.593	80	6	A	5.18	2.26	24.88	41.07	42.51	44.54	No interference
EMBPE3025-50-09-ATH	★			0.9	50	2	2.4	3.908	90	6	A	5.18	1.87	24.88	51.14	53.07	No interference	No interference
EMBPE3030-16-09-ATH	●	1.5	3	0.9	16	2.5	2.86	3.284	55	6	A	6.95	4.11	16.67	17	17.46	18.05	19.87
EMBPE3030-20-09-ATH	●			0.9	20	2.5	2.86	3.409	60	6	A	6.95	3.5	20.59	21.03	21.57	22.48	24.78
EMBPE3030-24-09-ATH	★			0.9	24	2.5	2.86	3.535	65	6	A	6.95	3.04	24.51	25.06	25.72	26.92	29.7
EMBPE3030-30-09-ATH	★			0.9	30	2.5	2.86	3.724	70	6	A	6.95	2.54	30.35	31.1	32.06	33.56	No interference
EMBPE3030-40-09-ATH	★			0.9	40	2.5	2.86	4.038	80	6	A	6.95	2	34.28	41.16	42.62	No interference	No interference
EMBPE3030-50-09-ATH	★			0.9	50	2.5	2.86	4.352	90	6	A	6.95	1.65	34.28	51.22	53.18	No interference	No interference
EMBPE3030-60-09-ATH	★			0.9	60	2.5	2.86	4.666	100	6	A	6.95	1.4	34.28	61.28	No interference	No interference	No interference

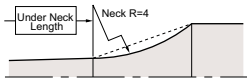
● : Inventory maintained in US ★ : Inventory maintained in Japan

■ Detail of neck shape

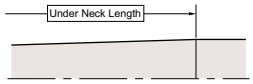
Neck shape A
Compound neck shape



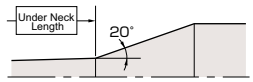
Neck shape B
Without taper

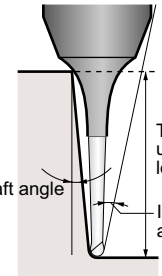


Neck shape C



Neck shape D
Taper 20°





EMBPE3○○○-○○○-○○-ATH

Item Code	Stock	Size(mm) Ball radius RE	Tool dia. DC	Neck angle BHTA2	Under neck length LU	Flute length APMX	Neck dia. BD2	Under neck dia. BD3	Overall length LF	Shank dia. DCONMS	Style	Approx neck length ℓ'	Interference angle θK	The effective under-neck length for the various draft angles. 0.75°	1°	1.5°	2°	3°
EMBPE3035-20-09-ATH	★	1.75	3.5	0.9	20	2.75	3.36	3.901	60	6	A	7.20	3.09	20.6	21.03	21.56	22.46	24.73
EMBPE3035-30-09-ATH	★			0.9	30	2.75	3.36	4.216	70	6	A	7.20	2.21	30.36	31.1	32.05	33.54	No interference
EMBPE3035-40-09-ATH	★			0.9	40	2.75	3.36	4.530	80	6	A	7.20	1.72	34.53	41.16	42.61	No interference	No interference
EMBPE3035-50-09-ATH	★			0.9	50	2.75	3.36	4.844	90	6	A	7.20	1.41	34.53	51.22	No interference	No interference	No interference
EMBPE3035-60-09-ATH	★			0.9	60	2.75	3.36	5.158	100	6	B	7.20	1.19	34.53	61.27	No interference	No interference	No interference
EMBPE3040-20-09-ATH	●	2	4	0.9	20	6	3.9	4.339	70	6	A	–	2.62	20.77	21.13	21.62	22.58	No interference
EMBPE3040-30-09-ATH	●			0.9	30	6	3.9	4.654	80	6	A	–	1.84	30.61	31.19	32.18	No interference	No interference
EMBPE3040-40-09-ATH	●			0.9	40	6	3.9	4.968	90	6	B	–	1.42	40.38	41.25	No interference	No interference	No interference
EMBPE3040-50-09-ATH	●			0.9	50	6	3.9	5.282	100	6	B	–	1.16	45.15	51.3	No interference	No interference	No interference
EMBPE3040-60-09-ATH	●			0.9	60	6	3.9	5.596	110	6	B	–	0.97	45.15	No interference	No interference	No interference	No interference
EMBPE3040-70-09-ATH	★			0.9	70	6	3.9	5.910	120	8	A	–	1.58	45.15	71.4	74.43	No interference	No interference
EMBPE3040-80-09-ATH	★			0.9	80	6	3.9	6.224	130	8	A	–	1.4	45.15	81.45	No interference	No interference	No interference
EMBPE3050-30-09-ATH	●	2.5	5	0.9	30	7.5	4.9	5.606	80	8	A	–	2.6	30.72	31.24	32.24	33.7	No interference
EMBPE3050-40-09-ATH	●			0.9	40	7.5	4.9	5.921	90	8	A	–	2.03	40.54	41.29	42.8	44.78	No interference
EMBPE3050-50-09-ATH	●			0.9	50	7.5	4.9	6.235	100	8	A	–	1.67	50.24	51.35	53.36	No interference	No interference
EMBPE3050-60-09-ATH	●			0.9	60	7.5	4.9	6.549	110	8	A	–	1.42	51.67	61.4	No interference	No interference	No interference
EMBPE3050-70-09-ATH	●			0.9	70	7.5	4.9	6.863	120	8	A	–	1.23	51.67	71.45	No interference	No interference	No interference
EMBPE3050-80-09-ATH	★			0.9	80	7.5	4.9	7.177	130	8	B	–	1.09	51.67	81.49	No interference	No interference	No interference
EMBPE3060-30-09-ATH	●	3	6	0.9	30	9	5.9	6.559	80	8	A	–	1.89	30.81	31.29	32.29	No interference	No interference
EMBPE3060-40-09-ATH	●			0.9	40	9	5.9	6.873	90	8	B	–	1.45	40.66	41.34	No interference	No interference	No interference
EMBPE3060-50-09-ATH	●			0.9	50	9	5.9	7.188	100	8	B	–	1.18	50.46	51.39	No interference	No interference	No interference
EMBPE3060-60-09-ATH	●			0.9	60	9	5.9	7.502	110	8	B	–	0.99	58.18	No interference	No interference	No interference	No interference
EMBPE3060-70-09-ATH	●			0.9	70	9	5.9	7.816	120	10	A	–	1.59	58.18	71.48	74.54	No interference	No interference
EMBPE3060-80-09-ATH	●			0.9	80	9	5.9	8.130	130	10	A	–	1.41	58.18	81.53	No interference	No interference	No interference
EMBPE3060-100-09-ATH	●			0.9	100	9	5.9	8.759	150	10	A	–	1.15	58.18	101.61	No interference	No interference	No interference
EMBPE3060-120-09-ATH	★			0.9	120	9	5.9	9.387	200	10	B	–	0.97	58.18	No interference	No interference	No interference	No interference
EMBPE3080-40-09-ATH	●	4	8	0.9	40	12	7.9	8.779	100	10	A	–	1.48	40.85	41.42	No interference	No interference	No interference
EMBPE3080-50-09-ATH	●			0.9	50	12	7.9	9.093	110	10	B	–	1.2	50.71	51.47	No interference	No interference	No interference
EMBPE3080-60-09-ATH	●			0.9	60	12	7.9	9.408	120	10	B	–	1	60.53	No interference	No interference	No interference	No interference
EMBPE3080-70-09-ATH	●			0.9	70	12	7.9	9.722	130	10	B	–	0.86	70.22	No interference	No interference	No interference	No interference
EMBPE3080-80-09-ATH	●			0.9	80	12	7.9	10.036	140	12	A	–	1.43	71.21	81.6	No interference	No interference	No interference
EMBPE3080-100-09-ATH	●			0.9	100	12	7.9	10.664	160	12	A	–	1.16	71.21	101.76	No interference	No interference	No interference
EMBPE3080-120-09-ATH	★			0.9	120	12	7.9	11.293	200	12	B	–	0.98	71.21	No interference	No interference	No interference	No interference
EMBPE3100-50-09-ATH	●	5	10	0.9	50	15	9.9	10.999	120	12	B	–	1.21	50.89	51.55	No interference	No interference	No interference
EMBPE3100-60-09-ATH	●			0.9	60	15	9.9	11.313	130	12	B	–	1.02	60.76	61.59	No interference	No interference	No interference
EMBPE3100-75-09-ATH	●			0.9	75	15	9.9	11.785	140	12	B	–	0.81	75.49	No interference	No interference	No interference	No interference
EMBPE3100-81-09-ATH	●			0.9	81	15	9.9	12.000	150	12	C	–	0.76	81.04	No interference	No interference	No interference	No interference
EMBPE3100-100-09-ATH	●			0.9	100	15	9.9	12.570	170	16	D	–	1.73	84.25	101.07	103.56	No interference	No interference
EMBPE3100-120-09-ATH	●			0.9	120	15	9.9	13.198	200	16	D	–	1.45	84.25	121.17	No interference	No interference	No interference
EMBPE3120-60-09-ATH	●	6	12	0.9	60	18	11.9	13.219	140	16	D	–	1.99	60.27	60.96	62.38	No interference	No interference
EMBPE3120-80-09-ATH	●			0.9	80	18	11.9	13.847	160	16	D	–	1.49	80.12	81.06	No interference	No interference	No interference
EMBPE3120-100-09-ATH	●			0.9	100	18	11.9	14.476	180	16	D	–	1.2	97.28	101.16	No interference	No interference	No interference
EMBPE3120-120-09-ATH	●			0.9	120	18	11.9	15.104	200	16	D	–	1	97.28	No interference	No interference	No interference	No interference

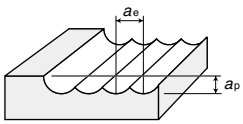
Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

Epoch Mega Feed Ball Evolution

Recommended cutting conditions

EMBE-ATH Straight type



<Roughing>

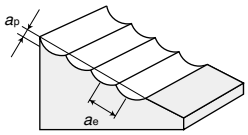
Work material		Carbon steel, Alloy steel (180～250HB)							Alloy steel, Tool steel (25～40HRC) P20 or equivalent							Pre-hardened steel, Hardened steel (40～50HRC) Tool steel Regular H13 or equivalent						
Ball radius RE (mm)	Tool dia. DC (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch
0.5	1	50,000	2,360	93	0.100	.004	0.300	.012	50,000	2,360	93	0.100	.004	0.300	.012	50,000	2,230	88	0.100	.004	0.300	.012
0.75	1.5	46,700	3,530	139	0.150	.006	0.450	.018	42,500	3,210	126	0.150	.006	0.450	.018	38,200	2,720	107	0.150	.006	0.450	.018
1	2	35,000	3,750	148	0.200	.008	0.600	.024	31,800	3,410	134	0.200	.008	0.600	.024	28,700	2,900	114	0.200	.008	0.600	.024
1.25	2.5	28,000	3,810	150	0.250	.010	0.750	.030	25,500	3,470	137	0.250	.010	0.750	.030	22,900	2,940	116	0.250	.010	0.750	.030
1.5	3	23,400	3,890	153	0.300	.012	0.900	.035	21,200	3,530	139	0.300	.012	0.900	.035	19,100	3,000	118	0.300	.012	0.900	.035
1.75	3.5	20,000	4,010	158	0.350	.014	1.050	.041	18,200	3,650	144	0.350	.014	1.050	.041	16,400	3,100	122	0.350	.014	1.050	.041
2	4	17,500	4,100	161	0.400	.016	1.200	.047	15,900	3,730	147	0.400	.016	1.200	.047	14,300	3,160	124	0.400	.016	1.200	.047
2.5	5	14,000	4,280	169	0.500	.020	1.500	.059	12,700	3,880	153	0.500	.020	1.500	.059	11,500	3,310	130	0.500	.020	1.500	.059
3	6	11,700	4,420	174	0.600	.024	1.800	.071	10,600	4,010	158	0.600	.024	1.800	.071	9,600	3,420	135	0.600	.024	1.800	.071
4	8	8,800	4,660	184	0.800	.032	2.400	.095	8,000	4,230	167	0.800	.032	2.400	.095	7,200	3,590	141	0.800	.032	2.400	.095
5	10	7,000	4,850	191	1.000	.039	3.000	.118	6,400	4,440	175	1.000	.039	3.000	.118	5,700	3,720	147	1.000	.039	3.000	.118
6	12	5,800	4,600	181	1.200	.047	3.600	.142	5,300	4,210	166	1.200	.047	3.600	.142	4,800	3,590	141	1.200	.047	3.600	.142
8	16	4,400	4,440	175	1.600	.063	4.800	.189	4,000	4,030	159	1.600	.063	4.800	.189	3,600	3,420	135	1.600	.063	4.800	.189
10	20	3,500	3,880	153	2.000	.079	6.000	.236	3,200	3,550	140	2.000	.079	6.000	.236	2,900	3,030	119	2.000	.079	6.000	.236

Work material		Pre-hardened steel, Hardened steel (40～50HRC) Premium Tool Steel Dievar, DH31 or equivalent							Hardened steel (50～55HRC)							Hardened steel (55～65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch
0.5	1	28,700	1,160	46	0.060	.002	0.180	.007	50,000	1,870	74	0.070	.003	0.210	.008	44,600	1,250	49	0.050	.002	0.150	.006
0.75	1.5	19,100	1,240	49	0.090	.004	0.270	.011	34,000	2,030	80	0.105	.004	0.315	.012	29,700	1,340	53	0.075	.003	0.225	.009
1	2	14,300	1,310	52	0.120	.005	0.360	.014	25,500	2,160	85	0.140	.006	0.420	.017	22,300	1,420	56	0.100	.004	0.300	.012
1.25	2.5	11,500	1,340	53	0.150	.006	0.450	.018	20,400	2,200	87	0.175	.007	0.525	.021	17,800	1,440	57	0.125	.005	0.375	.015
1.5	3	9,600	1,370	54	0.180	.007	0.540	.021	17,000	2,240	88	0.210	.008	0.630	.025	14,900	1,480	58	0.150	.006	0.450	.018
1.75	3.5	8,200	1,410	56	0.210	.008	0.630	.025	14,600	2,320	91	0.245	.010	0.735	.029	12,700	1,520	60	0.175	.007	0.525	.021
2	4	7,200	1,450	57	0.240	.009	0.720	.028	12,700	2,350	93	0.280	.011	0.840	.033	11,100	1,550	61	0.200	.008	0.600	.024
2.5	5	5,700	1,490	59	0.300	.012	0.900	.035	10,200	2,460	97	0.350	.014	1.050	.041	8,900	1,620	64	0.250	.010	0.750	.030
3	6	4,800	1,560	61	0.360	.014	1.080	.043	8,500	2,540	100	0.420	.017	1.260	.050	7,400	1,670	66	0.300	.012	0.900	.035
4	8	3,600	1,630	64	0.480	.019	1.440	.057	6,400	2,680	106	0.560	.022	1.680	.066	5,600	1,760	69	0.400	.016	1.200	.047
5	10	2,900	1,720	68	0.600	.024	1.800	.071	5,100	2,790	110	0.700	.028	2.100	.083	4,500	1,860	73	0.500	.020	1.500	.059
6	12	2,400	1,630	64	0.720	.028	2.160	.085	4,200	2,640	104	0.840	.033	2.520	.099	3,700	1,750	69	0.600	.024	1.800	.071
8	16	1,800	1,560	61	0.960	.038	2.880	.113	3,200	2,550	100	1.120	.044	3.360	.132	2,800	1,680	66	0.800	.032	2.400	.095
10	20	1,400	1,330	52	1.200	.047	3.600	.142	2,500	2,190	86	1.400	.055	4.200	.165	2,200	1,450	57	1.000	.039	3.000	.118

【Note】

① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

EMBE-ATH Straight type



<Finishing>

Work material		Carbon steel, Alloy steel (180 ～ 250HB)							Tool steel (25 ～ 40HRC) P20 or equivalent							Pre-hardened steel Hardened steel (40 ～ 50HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch
0.5	1	50,000	1,640	65	0.02~0.05	.001~.002	0.02	.001	50,000	1,640	65	0.02~0.05	.001~.002	0.02	.001	50,000	1,550	61	0.02~0.05	.001~.002	0.02	.001
0.75	1.5	50,000	2,630	104	0.02~0.07	.001~.003	0.03	.001	50,000	2,630	104	0.02~0.07	.001~.003	0.03	.001	50,000	2,480	98	0.02~0.07	.001~.003	0.03	.001
1	2	47,800	3,560	140	0.02~0.1	.001~.004	0.04	.002	44,600	3,320	131	0.02~0.1	.001~.004	0.04	.002	41,400	2,910	115	0.02~0.1	.001~.004	0.04	.002
1.25	2.5	38,200	3,680	145	0.05~0.12	.002~.005	0.05	.002	35,700	3,440	135	0.05~0.12	.002~.005	0.05	.002	33,100	3,010	119	0.05~0.12	.002~.005	0.05	.002
1.5	3	31,800	3,840	151	0.05~0.15	.002~.006	0.06	.002	29,700	3,590	141	0.05~0.15	.002~.006	0.06	.002	27,600	3,150	124	0.05~0.15	.002~.006	0.06	.002
1.75	3.5	27,300	3,890	153	0.05~0.15	.002~.006	0.07	.003	25,500	3,640	143	0.05~0.15	.002~.006	0.07	.003	23,700	3,190	126	0.05~0.15	.002~.006	0.07	.003
2	4	23,900	3,940	155	0.05~0.2	.002~.008	0.08	.003	22,300	3,670	145	0.05~0.2	.002~.008	0.08	.003	20,700	3,220	127	0.05~0.2	.002~.008	0.08	.003
2.5	5	19,100	4,060	160	0.05~0.25	.002~.01	0.10	.004	17,800	3,780	149	0.05~0.25	.002~.01	0.10	.004	16,600	3,330	131	0.05~0.25	.002~.01	0.10	.004
3	6	15,900	4,180	165	0.05~0.3	.002~.012	0.12	.005	14,900	3,920	154	0.05~0.3	.002~.012	0.12	.005	13,800	3,430	135	0.05~0.3	.002~.012	0.12	.005
4	8	11,900	4,380	172	0.05~0.4	.002~.016	0.16	.006	11,100	4,080	161	0.05~0.4	.002~.016	0.16	.006	10,400	3,620	143	0.05~0.4	.002~.016	0.16	.006
5	10	9,600	4,330	171	0.05~0.5	.002~.02	0.20	.008	8,900	4,020	158	0.05~0.5	.002~.02	0.20	.008	8,300	3,540	139	0.05~0.5	.002~.02	0.20	.008
6	12	8,000	4,290	169	0.05~0.6	.002~.024	0.24	.009	7,400	3,970	156	0.05~0.6	.002~.024	0.24	.009	6,900	3,500	138	0.05~0.6	.002~.024	0.24	.009
8	16	6,000	3,990	157	0.05~0.8	.002~.032	0.32	.013	5,600	3,730	147	0.05~0.8	.002~.032	0.32	.013	5,200	3,270	129	0.05~0.8	.002~.032	0.32	.013
10	20	4,800	3,700	146	0.05~1	.002~.039	0.40	.016	4,500	3,470	137	0.05~1	.002~.039	0.40	.016	4,100	2,990	118	0.05~1	.002~.039	0.40	.016

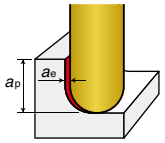
Work material		Hardened steel (50 ～ 55HRC)							Hardened steel (55 ～ 65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ap inch	ae mm	ae inch
0.5	1	50,000	1,320	52	0.02~0.05	.001~.002	0.02	.001	50,000	990	39	0.02~0.05	.001~.002	0.02	.001
0.75	1.5	44,600	1,880	74	0.02~0.07	.001~.003	0.03	.001	38,200	1,210	48	0.02~0.07	.001~.003	0.03	.001
1	2	33,400	1,990	78	0.02~0.1	.001~.004	0.04	.002	28,700	1,290	51	0.02~0.1	.001~.004	0.04	.002
1.25	2.5	26,800	2,070	82	0.05~0.12	.002~.005	0.05	.002	22,900	1,330	52	0.05~0.12	.002~.005	0.05	.002
1.5	3	22,300	2,160	85	0.05~0.15	.002~.006	0.06	.002	19,100	1,390	55	0.05~0.15	.002~.006	0.06	.002
1.75	3.5	19,100	2,180	86	0.05~0.15	.002~.006	0.07	.003	16,400	1,410	56	0.05~0.15	.002~.006	0.07	.003
2	4	16,700	2,200	87	0.05~0.2	.002~.008	0.08	.003	14,300	1,420	56	0.05~0.2	.002~.008	0.08	.003
2.5	5	13,400	2,280	90	0.05~0.25	.002~.01	0.10	.004	11,500	1,470	58	0.05~0.25	.002~.01	0.10	.004
3	6	11,100	2,340	92	0.05~0.3	.002~.012	0.12	.005	9,600	1,520	60	0.05~0.3	.002~.012	0.12	.005
4	8	8,400	2,480	98	0.05~0.4	.002~.016	0.16	.006	7,200	1,600	63	0.05~0.4	.002~.016	0.16	.006
5	10	6,700	2,420	95	0.05~0.5	.002~.02	0.20	.008	5,700	1,550	61	0.05~0.5	.002~.02	0.20	.008
6	12	5,600	2,410	95	0.05~0.6	.002~.024	0.24	.009	4,800	1,550	61	0.05~0.6	.002~.024	0.24	.009
8	16	4,200	2,240	88	0.05~0.8	.002~.032	0.32	.013	3,600	1,440	57	0.05~0.8	.002~.032	0.32	.013
10	20	3,300	2,040	80	0.05~1	.002~.039	0.40	.016	2,900	1,350	53	0.05~1	.002~.039	0.40	.016

【Note】

① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Mega Feed Ball Evolution

EMBE-ATH Straight type



<Side cutting>

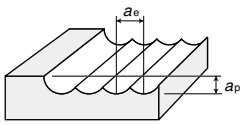
Work material		Carbon steel, Alloy steel (180～250HB)							Alloy steel, Tool steel (25～40HRC) P20 or equivalent							Pre-hardened steel, Hardened steel (40～50HRC) Tool steel Regular H13 or equivalent						
Ball radius RE (mm)	Tool dia. DC (mm)	Revolution n min^{-1}	Feed rate vf mm/min	IPM inch/min	a_p mm	a_p inch	a_e mm	a_e inch	Revolution n min^{-1}	Feed rate vf mm/min	IPM inch/min	a_p mm	a_p inch	a_e mm	a_e inch	Revolution n min^{-1}	Feed rate vf mm/min	IPM inch/min	a_p mm	a_p inch	a_e mm	a_e inch
0.5	**1**	50,000	2,700	106	1.0	.039	0.100	.004	50,000	2,480	98	1.0	.039	0.075	.003	50,000	2,230	88	1.0	.039	0.050	.002
0.75	**1.5**	38,200	3,300	130	1.5	.059	0.150	.006	38,200	3,030	119	1.5	.059	0.113	.004	38,200	2,720	107	1.5	.059	0.075	.003
1	**2**	28,700	3,510	138	2.0	.079	0.200	.008	28,700	3,220	127	2.0	.079	0.150	.006	28,700	2,900	114	2.0	.079	0.100	.004
1.25	**2.5**	22,900	3,570	141	2.5	.098	0.250	.010	22,900	3,270	129	2.5	.098	0.188	.007	22,900	2,940	116	2.5	.098	0.125	.005
1.5	**3**	19,100	3,630	143	3.0	.118	0.300	.012	19,100	3,330	131	3.0	.118	0.225	.009	19,100	3,000	118	3.0	.118	0.150	.006
1.75	**3.5**	16,400	3,760	148	3.5	.138	0.350	.014	16,400	3,450	136	3.5	.138	0.263	.010	16,400	3,100	122	3.5	.138	0.175	.007
2	**4**	14,300	3,830	151	4.0	.158	0.400	.016	14,300	3,510	138	4.0	.158	0.300	.012	14,300	3,160	124	4.0	.158	0.200	.008
2.5	**5**	11,500	4,020	158	5.0	.197	0.500	.020	11,500	3,680	145	5.0	.197	0.375	.015	11,500	3,310	130	5.0	.197	0.250	.010
3	**6**	9,600	4,150	163	6.0	.236	0.600	.024	9,600	3,800	150	6.0	.236	0.450	.018	9,600	3,420	135	6.0	.236	0.300	.012
4	**8**	7,200	4,350	171	8.0	.315	0.800	.032	7,200	3,990	157	8.0	.315	0.600	.024	7,200	3,590	141	8.0	.315	0.400	.016
5	**10**	5,700	4,510	178	10.0	.394	1.000	.039	5,700	4,140	163	10.0	.394	0.750	.030	5,700	3,720	147	10.0	.394	0.500	.020
6	**12**	4,800	4,350	171	12.0	.472	1.200	.047	4,800	3,990	157	12.0	.472	0.900	.035	4,800	3,590	141	12.0	.472	0.600	.024
8	**16**	3,600	4,150	163	16.0	.630	1.600	.063	3,600	3,800	150	16.0	.630	1.200	.047	3,600	3,420	135	16.0	.630	0.800	.032
10	**20**	2,900	3,670	145	20.0	.787	2.000	.079	2,900	3,370	133	20.0	.787	1.500	.059	2,900	3,030	119	20.0	.787	1.000	.039

Work material		Pre-hardened steel, Hardened steel (40～50HRC) Premium Tool Steel Dievar, DH31 or equivalent							Hardened steel (50～55HRC)							Hardened steel (55～65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Revolution n min^{-1}	Feed rate vf mm/min	IPM inch/min	a_p mm	a_p inch	a_e mm	a_e inch	Revolution n min^{-1}	Feed rate vf mm/min	IPM inch/min	a_p mm	a_p inch	a_e mm	a_e inch	Revolution n min^{-1}	Feed rate vf mm/min	IPM inch/min	a_p mm	a_p inch	a_e mm	a_e inch
0.5	**1**	28,700	1,160	46	1.0	.039	0.050	.002	50,000	1,870	74	1.0	.039	0.050	.002	44,600	1,210	48	1.0	.039	0.020	.001
0.75	**1.5**	19,100	1,240	49	1.5	.059	0.075	.003	34,000	2,030	80	1.5	.059	0.075	.003	29,700	1,290	51	1.5	.059	0.030	.001
1	**2**	14,300	1,310	52	2.0	.079	0.100	.004	25,500	2,160	85	2.0	.079	0.100	.004	22,300	1,380	54	2.0	.079	0.040	.002
1.25	**2.5**	11,500	1,340	53	2.5	.098	0.125	.005	20,400	2,200	87	2.5	.098	0.125	.005	17,800	1,400	55	2.5	.098	0.050	.002
1.5	**3**	9,600	1,370	54	3.0	.118	0.150	.006	17,000	2,240	88	3.0	.118	0.150	.006	14,900	1,430	56	3.0	.118	0.060	.002
1.75	**3.5**	8,200	1,410	56	3.5	.138	0.175	.007	14,600	2,320	91	3.5	.138	0.175	.007	12,700	1,470	58	3.5	.138	0.070	.003
2	**4**	7,200	1,450	57	4.0	.158	0.200	.008	12,700	2,350	93	4.0	.158	0.200	.008	11,100	1,500	59	4.0	.158	0.080	.003
2.5	**5**	5,700	1,490	59	5.0	.197	0.250	.010	10,200	2,460	97	5.0	.197	0.250	.010	8,900	1,570	62	5.0	.197	0.100	.004
3	**6**	4,800	1,560	61	6.0	.236	0.300	.012	8,500	2,540	100	6.0	.236	0.300	.012	7,400	1,610	63	6.0	.236	0.120	.005
4	**8**	3,600	1,630	64	8.0	.315	0.400	.016	6,400	2,680	106	8.0	.315	0.400	.016	5,600	1,710	67	8.0	.315	0.160	.006
5	**10**	2,900	1,720	68	10.0	.394	0.500	.020	5,100	2,790	110	10.0	.394	0.500	.020	4,500	1,800	71	10.0	.394	0.200	.008
6	**12**	2,400	1,630	64	12.0	.472	0.600	.024	4,200	2,640	104	12.0	.472	0.600	.024	3,700	1,690	67	12.0	.472	0.240	.009
8	**16**	1,800	1,560	61	16.0	.630	0.800	.032	3,200	2,550	100	16.0	.630	0.800	.032	2,800	1,630	64	16.0	.630	0.320	.013
10	**20**	1,400	1,330	52	20.0	.787	1.000	.039	2,500	2,190	86	20.0	.787	1.000	.039	2,200	1,410	56	20.0	.787	0.400	.016

	～62HRC	62～65HRC
Slant angle for helical boring	**1°**	**0.5°**
Feed rate for Helical interpolation	70% of side cutting conditions	

※Set the hole diameter for helical interpolation to between 1.6 and 2.0 times the tool diameter.
※Set the maximum depth for helical interpolation to the tool diameter or smaller (≤ 1DC).

EMBPE-ATH Pencil type

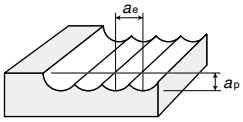


<Roughing>

Work material			Carbon steel Alloy steel (180～250HB)							Alloy steel Tool steel (25～40HRC) P20 or equivalent							Pre-hardened steel, Hardened steel (40～50HRC) Tool steel Regular H13 or equivalent						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch
0.5	1	6	50,000	2,160	85	0.090	.004	0.270	.011	50,000	2,160	85	0.090	.004	0.270	.011	48,000	1,940	76	0.090	.004	0.270	.011
		8	50,000	2,160	85	0.090	.004	0.270	.011	50,000	2,160	85	0.090	.004	0.270	.011	48,000	1,940	76	0.090	.004	0.270	.011
		10	50,000	2,160	85	0.080	.003	0.240	.009	48,700	2,100	83	0.080	.003	0.240	.009	43,900	1,780	70	0.080	.003	0.240	.009
		12	49,700	1,910	75	0.070	.003	0.210	.008	44,700	1,720	68	0.070	.003	0.210	.008	40,200	1,450	57	0.070	.003	0.210	.008
		14	44,600	1,710	67	0.060	.002	0.180	.007	40,100	1,540	61	0.060	.002	0.180	.007	36,100	1,300	51	0.060	.002	0.180	.007
		16	44,600	1,710	67	0.060	.002	0.180	.007	40,100	1,540	61	0.060	.002	0.180	.007	36,100	1,300	51	0.060	.002	0.180	.007
		18	40,100	1,540	61	0.050	.002	0.150	.006	36,100	1,390	55	0.050	.002	0.150	.006	32,500	1,170	46	0.050	.002	0.150	.006
		20	40,100	1,540	61	0.050	.002	0.150	.006	36,100	1,390	55	0.050	.002	0.150	.006	32,500	1,170	46	0.050	.002	0.150	.006
		22	35,000	1,340	53	0.040	.002	0.120	.005	31,500	1,210	48	0.040	.002	0.120	.005	28,400	1,020	40	0.040	.002	0.120	.005
		24	30,600	1,180	47	0.030	.001	0.090	.004	27,500	1,060	42	0.030	.001	0.090	.004	24,800	890	35	0.030	.001	0.090	.004
		26	30,600	1,180	47	0.030	.001	0.090	.004	27,500	1,060	42	0.030	.001	0.090	.004	24,800	890	35	0.030	.001	0.090	.004
		28	25,500	860	34	0.020	.001	0.060	.002	22,900	770	30	0.020	.001	0.060	.002	20,600	650	26	0.020	.001	0.060	.002
		30	25,500	860	34	0.020	.001	0.060	.002	22,900	770	30	0.020	.001	0.060	.002	20,600	650	26	0.020	.001	0.060	.002
		32	21,000	710	28	0.010	.000	0.030	.001	18,900	640	25	0.010	.000	0.030	.001	17,000	540	21	0.010	.000	0.030	.001
		34	15,900	530	20.9	0.005	.000	0.015	.001	14,300	480	18.9	0.005	.000	0.015	.001	12,900	410	16.1	0.005	.000	0.015	.001
		36	15,900	530	20.9	0.005	.000	0.015	.001	14,300	480	18.9	0.005	.000	0.015	.001	12,900	410	16.1	0.005	.000	0.015	.001
0.75	1.5	8	39,500	2,670	105	0.135	.005	0.405	.016	35,500	2,400	95	0.135	.005	0.405	.016	32,000	2,070	82	0.135	.005	0.405	.016
		10	39,500	2,670	105	0.135	.005	0.405	.016	35,500	2,400	95	0.135	.005	0.405	.016	32,000	2,070	82	0.135	.005	0.405	.016
		14	36,100	2,440	96	0.120	.005	0.360	.014	32,500	2,190	86	0.120	.005	0.360	.014	29,200	1,890	74	0.120	.005	0.360	.014
		16	33,100	1,990	78	0.105	.004	0.315	.012	29,800	1,790	71	0.105	.004	0.315	.012	26,800	1,540	61	0.105	.004	0.315	.012
		18	33,100	1,990	78	0.105	.004	0.315	.012	29,800	1,790	71	0.105	.004	0.315	.012	26,800	1,540	61	0.105	.004	0.315	.012
		20	29,700	1,780	70	0.090	.004	0.270	.011	26,800	1,610	63	0.090	.004	0.270	.011	24,100	1,390	55	0.090	.004	0.270	.011
		22	29,700	1,780	70	0.090	.004	0.270	.011	26,800	1,610	63	0.090	.004	0.270	.011	24,100	1,390	55	0.090	.004	0.270	.011
		24	29,700	1,780	70	0.090	.004	0.270	.011	26,800	1,610	63	0.090	.004	0.270	.011	24,100	1,390	55	0.090	.004	0.270	.011
		26	26,800	1,610	63	0.075	.003	0.225	.009	24,100	1,450	57	0.075	.003	0.225	.009	21,700	1,250	49	0.075	.003	0.225	.009
		28	26,800	1,610	63	0.075	.003	0.225	.009	24,100	1,450	57	0.075	.003	0.225	.009	21,700	1,250	49	0.075	.003	0.225	.009
		30	26,800	1,610	63	0.075	.003	0.225	.009	24,100	1,450	57	0.075	.003	0.225	.009	21,700	1,250	49	0.075	.003	0.225	.009
		32	23,400	1,400	55	0.060	.002	0.180	.007	21,000	1,260	50	0.060	.002	0.180	.007	18,900	1,090	43	0.060	.002	0.180	.007
		34	23,400	1,400	55	0.060	.002	0.180	.007	21,000	1,260	50	0.060	.002	0.180	.007	18,900	1,090	43	0.060	.002	0.180	.007
		36	20,400	1,220	48	0.045	.002	0.135	.005	18,300	1,100	43	0.045	.002	0.135	.005	16,500	950	37.4	0.045	.002	0.135	.005
		38	20,400	1,220	48	0.045	.002	0.135	.005	18,300	1,100	43	0.045	.002	0.135	.005	16,500	950	37.4	0.045	.002	0.135	.005
		40	17,000	890	35	0.030	.001	0.090	.004	15,300	800	31.5	0.030	.001	0.090	.004	13,800	700	27.6	0.030	.001	0.090	.004
1	2	10	31,800	3,430	135	0.200	.008	0.600	.024	28,700	3,100	122	0.200	.008	0.600	.024	25,800	2,630	104	0.200	.008	0.600	.024
		16	29,600	2,880	113	0.180	.007	0.540	.021	26,700	2,600	102	0.180	.007	0.540	.021	24,000	2,200	87	0.180	.007	0.540	.021
		20	27,100	2,630	104	0.120	.005	0.360	.014	24,400	2,370	93	0.120	.005	0.360	.014	21,900	2,010	79	0.120	.005	0.360	.014
		24	24,800	2,140	84	0.110	.004	0.330	.013	22,400	1,940	76	0.110	.004	0.330	.013	20,100	1,640	65	0.110	.004	0.330	.013
		30	22,300	1,930	76	0.100	.004	0.300	.012	20,100	1,740	69	0.100	.004	0.300	.012	18,100	1,480	58	0.100	.004	0.300	.012
		36	20,100	1,740	69	0.080	.003	0.240	.009	18,100	1,560	61	0.080	.003	0.240	.009	16,300	1,330	52	0.080	.003	0.240	.009
		40	20,100	1,740	69	0.080	.003	0.240	.009	18,100	1,560	61	0.080	.003	0.240	.009	16,300	1,330	52	0.080	.003	0.240	.009
		46	17,500	1,510	59	0.060	.002	0.180	.007	15,800	1,370	54	0.060	.002	0.180	.007	14,200	1,160	46	0.060	.002	0.180	.007
		60	12,700	960	37.8	0.044	.002	0.132	.005	11,500	870	34.3	0.044	.002	0.132	.005	10,300	740	29.1	0.044	.002	0.132	.005
1.25	2.5	16	23,700	2,880	113	0.225	.009	0.675	.027	21,300	2,590	102	0.225	.009	0.675	.027	19,200	2,230	88	0.225	.009	0.675	.027
		24	21,700	2,640	104	0.150	.006	0.450	.018	19,500	2,370	93	0.150	.006	0.450	.018	17,500	2,030	80	0.150	.006	0.450	.018
		30	19,900	2,150	85	0.138	.005	0.413	.016	17,900	1,930	76	0.138	.005	0.413	.016	16,100	1,660	65	0.138	.005	0.413	.016
		40	17,800	1,920	76	0.125	.005	0.375	.015	16,100	1,740	69	0.125	.005	0.375	.015	14,400	1,490	59	0.125	.005	0.375	.015
		50	16,100	1,740	69	0.100	.004	0.300	.012	14,400	1,560	61	0.100	.004	0.300	.012	13,000	1,340	53	0.100	.004	0.300	.012
1.5	3	16	19,700	2,930	115	0.270	.011	0.810	.032	17,800	2,640	104	0.270	.011	0.810	.032	16,000	2,250	89	0.270	.011	0.810	.032
		20	19,700	2,930	115	0.270	.011	0.810	.032	17,800	2,640	104	0.270	.011	0.810	.032	16,000	2,250	89	0.270	.011	0.810	.032
		24	19,700	2,930	115	0.270	.011	0.810	.032	17,800	2,640	104	0.270	.011	0.810	.032	16,000	2,250	89	0.270	.011	0.810	.032
		30	18,000	2,670	105	0.180	.007	0.540	.021	16,200	2,410	95	0.180	.007	0.540	.021	14,600	2,050	81	0.180	.007	0.540	.021
		40	14,900	1,970	78	0.150	.006	0.450	.018	13,400	1,770	70	0.150	.006	0.450	.018	12,000	1,500	59	0.150	.006	0.450	.018
		50	13,400	1,770	70	0.120	.005	0.360	.014	12,000	1,580	62	0.120	.005	0.360	.014	10,800	1,350	53	0.120	.005	0.360	.014
		60	13,400	1,770	70	0.120	.005	0.360	.014	12,000	1,580	62	0.120	.005	0.360	.014	10,800	1,350	53	0.120	.005	0.360	.014

Epoch Mega Feed Ball Evolution

EMBPE-ATH Pencil type

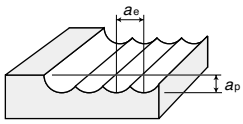


<Roughing>

Work material			Carbon steel Alloy steel (180～250HB)							Alloy steel Tool steel (25～40HRC) P20 or equivalent							Pre-hardened steel, Hardened steel (40～50HRC) Tool steel Regular H13 or equivalent						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch
1.75	3.5	20	16,900	3,060	121	0.315	.012	0.945	.037	15,200	2,750	108	0.315	.012	0.945	.037	13,700	2,330	92	0.315	.012	0.945	.037
		30	15,500	2,800	110	0.210	.008	0.630	.025	13,900	2,510	99	0.210	.008	0.630	.025	12,500	2,130	84	0.210	.008	0.630	.025
		40	14,200	2,280	90	0.193	.008	0.578	.023	12,800	2,060	81	0.193	.008	0.578	.023	11,500	1,740	69	0.193	.008	0.578	.023
		50	12,700	2,040	80	0.175	.007	0.525	.021	11,500	1,850	73	0.175	.007	0.525	.021	10,300	1,560	61	0.175	.007	0.525	.021
		60	11,500	1,850	73	0.140	.006	0.420	.017	10,300	1,660	65	0.140	.006	0.420	.017	9,300	1,410	56	0.140	.006	0.420	.017
2	4	20	15,900	3,720	147	0.400	.016	1.200	.047	14,300	3,350	132	0.400	.016	1.200	.047	12,900	2,860	113	0.400	.016	1.200	.047
		30	14,800	3,120	123	0.300	.012	0.900	.035	13,300	2,800	110	0.300	.012	0.900	.035	12,000	2,400	95	0.300	.012	0.900	.035
		40	13,500	2,840	112	0.260	.010	0.780	.031	12,200	2,570	101	0.260	.010	0.780	.031	11,000	2,200	87	0.260	.010	0.780	.031
		50	12,400	2,320	91	0.180	.007	0.540	.021	11,200	2,100	83	0.180	.007	0.540	.021	10,100	1,790	71	0.180	.007	0.540	.021
		60	11,100	2,080	82	0.120	.005	0.360	.014	10,000	1,870	74	0.120	.005	0.360	.014	9,000	1,600	63	0.120	.005	0.360	.014
		70	10,000	1,870	74	0.100	.004	0.300	.012	9,000	1,680	66	0.100	.004	0.300	.012	8,100	1,440	57	0.100	.004	0.300	.012
		80	10,000	1,870	74	0.100	.004	0.300	.012	9,000	1,680	66	0.100	.004	0.300	.012	8,100	1,440	57	0.100	.004	0.300	.012
2.5	5	30	11,800	3,250	128	0.375	.015	1.125	.044	10,700	2,950	116	0.375	.015	1.125	.044	9,600	2,490	98	0.375	.015	1.125	.044
		40	11,800	3,250	128	0.375	.015	1.125	.044	10,700	2,950	116	0.375	.015	1.125	.044	9,600	2,490	98	0.375	.015	1.125	.044
		50	10,800	2,970	117	0.325	.013	0.975	.038	9,700	2,670	105	0.325	.013	0.975	.038	8,800	2,280	90	0.325	.013	0.975	.038
		60	9,900	2,420	95	0.225	.009	0.675	.027	8,900	2,180	86	0.225	.009	0.675	.027	8,000	1,840	72	0.225	.009	0.675	.027
		70	8,900	2,180	86	0.150	.006	0.450	.018	8,000	1,960	77	0.150	.006	0.450	.018	7,200	1,660	65	0.150	.006	0.450	.018
		80	8,900	2,180	86	0.150	.006	0.450	.018	8,000	1,960	77	0.150	.006	0.450	.018	7,200	1,660	65	0.150	.006	0.450	.018
3	6	30	10,600	4,010	158	0.600	.024	1.800	.071	9,600	3,630	143	0.600	.024	1.800	.071	8,600	3,070	121	0.600	.024	1.800	.071
		40	9,900	3,370	133	0.420	.017	1.260	.050	8,900	3,030	119	0.420	.017	1.260	.050	8,000	2,570	101	0.420	.017	1.260	.050
		50	9,000	3,060	121	0.300	.012	0.900	.035	8,100	2,760	109	0.300	.012	0.900	.035	7,300	2,350	93	0.300	.012	0.900	.035
		60	9,000	3,060	121	0.300	.012	0.900	.035	8,100	2,760	109	0.300	.012	0.900	.035	7,300	2,350	93	0.300	.012	0.900	.035
		70	8,300	2,510	99	0.240	.009	0.720	.028	7,500	2,270	89	0.240	.009	0.720	.028	6,700	1,910	75	0.240	.009	0.720	.028
		80	7,400	2,240	88	0.180	.007	0.540	.021	6,700	2,030	80	0.180	.007	0.540	.021	6,000	1,710	67	0.180	.007	0.540	.021
		100	6,700	2,030	80	0.120	.005	0.360	.014	6,000	1,810	71	0.120	.005	0.360	.014	5,400	1,540	61	0.120	.005	0.360	.014
		120	6,700	2,030	80	0.120	.005	0.360	.014	6,000	1,810	71	0.120	.005	0.360	.014	5,400	1,540	61	0.120	.005	0.360	.014
4	8	40	8,000	4,220	166	0.800	.032	2.400	.095	7,200	3,800	150	0.800	.032	2.400	.095	6,400	3,190	126	0.800	.032	2.400	.095
		50	7,400	3,520	139	0.560	.022	1.680	.066	6,700	3,180	125	0.560	.022	1.680	.066	6,000	2,690	106	0.560	.022	1.680	.066
		60	7,400	3,520	139	0.560	.022	1.680	.066	6,700	3,180	125	0.560	.022	1.680	.066	6,000	2,690	106	0.560	.022	1.680	.066
		70	6,800	3,230	127	0.400	.016	1.200	.047	6,100	2,900	114	0.400	.016	1.200	.047	5,500	2,470	97	0.400	.016	1.200	.047
		80	6,800	3,230	127	0.400	.016	1.200	.047	6,100	2,900	114	0.400	.016	1.200	.047	5,500	2,470	97	0.400	.016	1.200	.047
		100	6,200	2,620	103	0.320	.013	0.960	.038	5,600	2,370	93	0.320	.013	0.960	.038	5,000	1,990	78	0.320	.013	0.960	.038
		120	5,600	2,370	93	0.240	.009	0.720	.028	5,000	2,110	83	0.240	.009	0.720	.028	4,500	1,790	71	0.240	.009	0.720	.028
5	10	50	6,400	4,440	175	1.000	.039	3.000	.118	5,700	3,950	156	1.000	.039	3.000	.118	5,200	3,400	134	1.000	.039	3.000	.118
		60	5,900	3,680	145	0.700	.028	2.100	.083	5,300	3,310	130	0.700	.028	2.100	.083	4,800	2,830	111	0.700	.028	2.100	.083
		75	5,900	3,680	145	0.700	.028	2.100	.083	5,300	3,310	130	0.700	.028	2.100	.083	4,800	2,830	111	0.700	.028	2.100	.083
		80	5,400	3,370	133	0.500	.020	1.500	.059	4,900	3,060	121	0.500	.020	1.500	.059	4,400	2,590	102	0.500	.020	1.500	.059
		100	5,400	3,370	133	0.500	.020	1.500	.059	4,900	3,060	121	0.500	.020	1.500	.059	4,400	2,590	102	0.500	.020	1.500	.059
		120	5,000	2,770	109	0.400	.016	1.200	.047	4,500	2,490	98	0.400	.016	1.200	.047	4,000	2,090	82	0.400	.016	1.200	.047
6	12	60	5,300	4,210	166	1.200	.047	3.600	.142	4,800	3,820	150	1.200	.047	3.600	.142	4,300	3,210	126	1.200	.047	3.600	.142
		80	4,900	3,510	138	0.840	.033	2.520	.099	4,400	3,150	124	0.840	.033	2.520	.099	4,000	2,690	106	0.840	.033	2.520	.099
		100	4,500	3,220	127	0.600	.024	1.800	.071	4,100	2,930	115	0.600	.024	1.800	.071	3,700	2,490	98	0.600	.024	1.800	.071
		120	4,500	3,220	127	0.600	.024	1.800	.071	4,100	2,930	115	0.600	.024	1.800	.071	3,700	2,490	98	0.600	.024	1.800	.071

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

EMBPE-ATH Pencil type

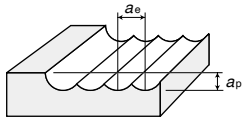


<Roughing>

Work material			Pre-hardened steel, Hardened steel (40～50HRC) Premium Tool Steel Dievar, DH31or equivalent							Hardened steel (50～55HRC)							Hardened steel (55～65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch
0.5	1	6	26,700	1,080	43	0.081	.003	0.243	.010	42,600	1,380	54	0.063	.003	0.189	.007	37,300	910	36	0.045	.002	0.135	.005
		8	26,700	1,080	43	0.081	.003	0.243	.010	42,600	1,380	54	0.063	.003	0.189	.007	37,300	910	36	0.045	.002	0.135	.005
		10	24,400	990	39	0.072	.003	0.216	.009	39,000	1,260	50	0.056	.002	0.168	.007	34,100	830	33	0.040	.002	0.120	.005
		12	22,400	810	32	0.063	.003	0.189	.007	35,800	1,030	41	0.049	.002	0.147	.006	31,300	680	27	0.035	.001	0.105	.004
		14	20,100	720	28	0.054	.002	0.162	.006	32,100	920	36	0.042	.002	0.126	.005	28,100	610	24	0.030	.001	0.090	.004
		16	20,100	720	28	0.054	.002	0.162	.006	32,100	920	36	0.042	.002	0.126	.005	28,100	610	24	0.030	.001	0.090	.004
		18	18,100	650	26	0.045	.002	0.135	.005	28,900	830	33	0.035	.001	0.105	.004	25,300	550	22	0.025	.001	0.075	.003
		20	18,100	650	26	0.045	.002	0.135	.005	28,900	830	33	0.035	.001	0.105	.004	25,300	550	22	0.025	.001	0.075	.003
		22	15,800	570	22	0.036	.001	0.108	.004	25,200	730	29	0.028	.001	0.084	.003	22,100	480	19	0.020	.001	0.060	.002
		24	13,800	500	20	0.027	.001	0.081	.003	22,000	630	25	0.021	.001	0.063	.003	19,300	420	17	0.015	.001	0.045	.002
		26	13,800	500	20	0.027	.001	0.081	.003	22,000	630	25	0.021	.001	0.063	.003	19,300	420	17	0.015	.001	0.045	.002
		28	11,500	360	14	0.018	.001	0.054	.002	18,300	460	18	0.014	.001	0.042	.002	16,100	300	12	0.010	.000	0.030	.001
		30	11,500	360	14	0.018	.001	0.054	.002	18,300	460	18	0.014	.001	0.042	.002	16,100	300	12	0.010	.000	0.030	.001
		32	9,500	300	12	0.009	.000	0.027	.001	15,100	380	15	0.007	.000	0.021	.001	13,200	250	10	0.005	.000	0.015	.001
		34	7,200	230	9.1	0.005	.000	0.014	.001	11,500	290	11.4	0.004	.000	0.011	.000	10,000	190	7.5	0.003	.000	0.008	.000
		36	7,200	230	9.1	0.005	.000	0.014	.001	11,500	290	11.4	0.004	.000	0.011	.000	10,000	190	7.5	0.003	.000	0.008	.000
0.75	1.5	8	17,800	1,150	45	0.122	.005	0.365	.014	28,400	1,530	60	0.095	.004	0.284	.011	24,900	1,010	40	0.068	.003	0.203	.008
		10	17,800	1,150	45	0.122	.005	0.365	.014	28,400	1,530	60	0.095	.004	0.284	.011	24,900	1,010	40	0.068	.003	0.203	.008
		14	16,200	1,050	41	0.108	.004	0.324	.013	26,000	1,400	55	0.084	.003	0.252	.010	22,700	920	36.2	0.060	.002	0.180	.007
		16	14,900	860	33.9	0.095	.004	0.284	.011	23,800	1,140	45	0.074	.003	0.221	.009	20,900	750	29.5	0.053	.002	0.158	.006
		18	14,900	860	33.9	0.095	.004	0.284	.011	23,800	1,140	45	0.074	.003	0.221	.009	20,900	750	29.5	0.053	.002	0.158	.006
		20	13,400	770	30.3	0.081	.003	0.243	.010	21,400	1,030	41	0.063	.003	0.189	.007	18,700	670	26.4	0.045	.002	0.135	.005
		22	13,400	770	30.3	0.081	.003	0.243	.010	21,400	1,030	41	0.063	.003	0.189	.007	18,700	670	26.4	0.045	.002	0.135	.005
		24	13,400	770	30.3	0.081	.003	0.243	.010	21,400	1,030	41	0.063	.003	0.189	.007	18,700	670	26.4	0.045	.002	0.135	.005
		26	12,000	690	27.2	0.068	.003	0.203	.008	19,300	930	36.6	0.053	.002	0.158	.006	16,900	610	24	0.038	.002	0.113	.004
		28	12,000	690	27.2	0.068	.003	0.203	.008	19,300	930	36.6	0.053	.002	0.158	.006	16,900	610	24	0.038	.002	0.113	.004
		30	12,000	690	27.2	0.068	.003	0.203	.008	19,300	930	36.6	0.053	.002	0.158	.006	16,900	610	24	0.038	.002	0.113	.004
		32	10,500	600	23.6	0.054	.002	0.162	.006	16,800	810	31.9	0.042	.002	0.126	.005	14,700	530	20.9	0.030	.001	0.090	.004
		34	10,500	600	23.6	0.054	.002	0.162	.006	16,800	810	31.9	0.042	.002	0.126	.005	14,700	530	20.9	0.030	.001	0.090	.004
		36	9,200	530	20.9	0.041	.002	0.122	.005	14,700	710	28	0.032	.001	0.095	.004	12,800	460	18.1	0.023	.001	0.068	.003
		38	9,200	530	20.9	0.041	.002	0.122	.005	14,700	710	28	0.032	.001	0.095	.004	12,800	460	18.1	0.023	.001	0.068	.003
		40	7,600	380	15	0.027	.001	0.081	.003	12,200	510	20.1	0.021	.001	0.063	.003	10,700	340	13.4	0.015	.001	0.045	.002
1	2	10	14,300	1,460	58	0.180	.007	0.540	.021	22,900	1,920	76	0.140	.006	0.420	.017	20,100	1,270	50	0.100	.004	0.300	.012
		16	13,300	1,220	48	0.162	.006	0.486	.019	21,300	1,610	63	0.126	.005	0.378	.015	18,700	1,060	42	0.090	.004	0.270	.011
		20	12,200	1,120	44	0.108	.004	0.324	.013	19,500	1,470	58	0.084	.003	0.252	.010	17,100	970	38.2	0.060	.002	0.180	.007
		24	11,200	910	35.8	0.099	.004	0.297	.012	17,900	1,200	47	0.077	.003	0.231	.009	15,600	790	31.1	0.055	.002	0.165	.007
		30	10,000	820	32.3	0.090	.004	0.270	.011	16,100	1,080	43	0.070	.003	0.210	.008	14,000	710	28	0.050	.002	0.150	.006
		36	9,000	730	28.7	0.072	.003	0.216	.009	14,400	970	38.2	0.056	.002	0.168	.007	12,600	640	25.2	0.040	.002	0.120	.005
		40	9,000	730	28.7	0.072	.003	0.216	.009	14,400	970	38.2	0.056	.002	0.168	.007	12,600	640	25.2	0.040	.002	0.120	.005
		46	7,900	640	25.2	0.054	.002	0.162	.006	12,600	850	33.5	0.042	.002	0.126	.005	11,000	550	21.7	0.030	.001	0.090	.004
		60	5,700	410	16.1	0.040	.002	0.119	.005	9,200	540	21.3	0.031	.001	0.092	.004	8,000	350	13.8	0.022	.001	0.066	.003
1.25	2.5	16	10,700	1,240	49	0.203	.008	0.608	.024	17,100	1,660	65	0.158	.006	0.473	.019	14,900	1,090	43	0.113	.004	0.338	.013
		24	9,700	1,130	45	0.135	.005	0.405	.016	15,600	1,520	60	0.105	.004	0.315	.012	13,600	990	39	0.075	.003	0.225	.009
		30	8,900	920	36.2	0.124	.005	0.371	.015	14,300	1,240	49	0.096	.004	0.289	.011	12,500	810	31.9	0.069	.003	0.206	.008
		40	8,000	830	32.7	0.113	.004	0.338	.013	12,800	1,110	44	0.088	.004	0.263	.010	11,200	730	28.7	0.063	.003	0.188	.007
		50	7,200	740	29.1	0.090	.004	0.270	.011	11,600	1,000	39	0.070	.003	0.210	.008	10,100	650	25.6	0.050	.002	0.150	.006
1.5	3	16	8,900	1,250	49	0.243	.010	0.729	.029	14,200	1,690	67	0.189	.007	0.567	.022	12,400	1,100	43	0.135	.005	0.405	.016
		20	8,900	1,250	49	0.243	.010	0.729	.029	14,200	1,690	67	0.189	.007	0.567	.022	12,400	1,100	43	0.135	.005	0.405	.016
		24	8,900	1,250	49	0.243	.010	0.729	.029	14,200	1,690	67	0.189	.007	0.567	.022	12,400	1,100	43	0.135	.005	0.405	.016
		30	8,100	1,140	45	0.162	.006	0.486	.019	13,000	1,540	61	0.126	.005	0.378	.015	11,400	1,020	40	0.090	.004	0.270	.011
		40	6,700	840	33.1	0.135	.005	0.405	.016	10,700	1,130	45	0.105	.004	0.315	.012	9,400	740	29.1	0.075	.003	0.225	.009
		50	6,000	750	29.5	0.108	.004	0.324	.013	9,600	1,010	40	0.084	.003	0.252	.010	8,400	670	26.4	0.060	.002	0.180	.007
		60	6,000	750	29.5	0.108	.004	0.324	.013	9,600	1,010	40	0.084	.003	0.252	.010	8,400	670	26.4	0.060	.002	0.180	.007

Epoch Mega Feed Ball Evolution

EMBPE-ATH Pencil type

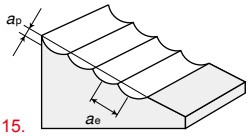


<Roughing>

Work material			Pre-hardened steel, Hardened steel (40～50HRC) Premium Tool Steel Dievar, DH31or equivalent							Hardened steel (50～55HRC)							Hardened steel (55～65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	IPM inch/min	a_p mm	a_e inch	a_e mm	a_e inch	Revolution n min^{-1}	Feed rate v_f mm/min	IPM inch/min	a_p mm	a_e inch	a_e mm	a_e inch	Revolution n min^{-1}	Feed rate v_f mm/min	IPM inch/min	a_p mm	a_e inch	a_e mm	a_e inch
1.75	3.5	20	7,600	1,290	51	0.284	.011	0.851	.034	12,200	1,750	69	0.221	.009	0.662	.026	10,700	1,160	46	0.158	.006	0.473	.019
		30	7,000	1,190	47	0.189	.007	0.567	.022	11,100	1,590	63	0.147	.006	0.441	.017	9,700	1,050	41	0.105	.004	0.315	.012
		40	6,400	970	38.2	0.173	.007	0.520	.021	10,200	1,300	51	0.135	.005	0.404	.016	8,900	850	33.5	0.096	.004	0.289	.011
		50	5,700	860	33.9	0.158	.006	0.473	.019	9,200	1,170	46	0.123	.005	0.368	.015	8,000	770	30.3	0.088	.004	0.263	.010
		60	5,200	790	31.1	0.126	.005	0.378	.015	8,300	1,060	42	0.098	.004	0.294	.012	7,200	690	27.2	0.070	.003	0.210	.008
2	4	20	7,200	1,600	63	0.360	.014	1.080	.043	11,500	2,140	84	0.280	.011	0.840	.033	10,000	1,410	56	0.200	.008	0.600	.024
		30	6,700	1,340	53	0.270	.011	0.810	.032	10,700	1,790	71	0.210	.008	0.630	.025	9,300	1,180	47	0.150	.006	0.450	.018
		40	6,100	1,220	48	0.234	.009	0.702	.028	9,700	1,620	64	0.182	.007	0.546	.022	8,500	1,080	43	0.130	.005	0.390	.015
		50	5,600	990	39	0.162	.006	0.486	.019	8,900	1,320	52	0.126	.005	0.378	.015	7,800	880	34.6	0.090	.004	0.270	.011
		60	5,000	890	35	0.108	.004	0.324	.013	8,000	1,190	47	0.084	.003	0.252	.010	7,000	790	31.1	0.060	.002	0.180	.007
		70	4,500	800	31.5	0.090	.004	0.270	.011	7,200	1,070	42	0.070	.003	0.210	.008	6,300	710	28	0.050	.002	0.150	.006
		80	4,500	800	31.5	0.090	.004	0.270	.011	7,200	1,070	42	0.070	.003	0.210	.008	6,300	710	28	0.050	.002	0.150	.006
2.5	5	30	5,300	1,370	54	0.338	.013	1.013	.040	8,500	1,860	73	0.263	.010	0.788	.031	7,500	1,240	49	0.188	.007	0.563	.022
		40	5,300	1,370	54	0.338	.013	1.013	.040	8,500	1,860	73	0.263	.010	0.788	.031	7,500	1,240	49	0.188	.007	0.563	.022
		50	4,900	1,270	50	0.293	.012	0.878	.035	7,800	1,710	67	0.228	.009	0.683	.027	6,800	1,120	44	0.163	.006	0.488	.019
		60	4,500	1,040	41	0.203	.008	0.608	.024	7,200	1,400	55	0.158	.006	0.473	.019	6,300	920	36.2	0.113	.004	0.338	.013
		70	4,000	920	36.2	0.135	.005	0.405	.016	6,400	1,240	49	0.105	.004	0.315	.012	5,600	820	32.3	0.075	.003	0.225	.009
		80	4,000	920	36.2	0.135	.005	0.405	.016	6,400	1,240	49	0.105	.004	0.315	.012	5,600	820	32.3	0.075	.003	0.225	.009
3	6	30	4,800	1,710	67	0.540	.021	1.620	.064	7,600	2,280	90	0.420	.017	1.260	.050	6,700	1,510	59	0.300	.012	0.900	.035
		40	4,400	1,410	56	0.378	.015	1.134	.045	7,100	1,920	76	0.294	.012	0.882	.035	6,200	1,260	50	0.210	.008	0.630	.025
		50	4,100	1,320	52	0.270	.011	0.810	.032	6,500	1,760	69	0.210	.008	0.630	.025	5,700	1,150	45	0.150	.006	0.450	.018
		60	4,100	1,320	52	0.270	.011	0.810	.032	6,500	1,760	69	0.210	.008	0.630	.025	5,700	1,150	45	0.150	.006	0.450	.018
		70	3,700	1,060	42	0.216	.009	0.648	.026	6,000	1,440	57	0.168	.007	0.504	.020	5,200	940	37	0.120	.005	0.360	.014
		80	3,300	940	37	0.162	.006	0.486	.019	5,400	1,300	51	0.126	.005	0.378	.015	4,700	850	33.5	0.090	.004	0.270	.011
		100	3,000	860	33.9	0.108	.004	0.324	.013	4,800	1,150	45	0.084	.003	0.252	.010	4,200	760	29.9	0.060	.002	0.180	.007
		120	3,000	860	33.9	0.108	.004	0.324	.013	4,800	1,150	45	0.084	.003	0.252	.010	4,200	760	29.9	0.060	.002	0.180	.007
4	8	40	3,600	1,790	71	0.720	.028	2.160	.085	5,700	2,380	94	0.560	.022	1.680	.066	5,000	1,580	62	0.400	.016	1.200	.047
		50	3,300	1,480	58	0.504	.020	1.512	.060	5,300	1,990	78	0.392	.015	1.176	.046	4,700	1,330	52	0.280	.011	0.840	.033
		60	3,300	1,480	58	0.504	.020	1.512	.060	5,300	1,990	78	0.392	.015	1.176	.046	4,700	1,330	52	0.280	.011	0.840	.033
		70	3,000	1,340	53	0.360	.014	1.080	.043	4,900	1,840	72	0.280	.011	0.840	.033	4,300	1,220	48	0.200	.008	0.600	.024
		80	3,000	1,340	53	0.360	.014	1.080	.043	4,900	1,840	72	0.280	.011	0.840	.033	4,300	1,220	48	0.200	.008	0.600	.024
		100	2,800	1,120	44	0.288	.011	0.864	.034	4,500	1,500	59	0.224	.009	0.672	.027	3,900	980	38.6	0.160	.006	0.480	.019
		120	2,500	1,000	39	0.216	.009	0.648	.026	4,000	1,330	52	0.168	.007	0.504	.020	3,500	880	34.6	0.120	.005	0.360	.014
5	10	50	3,200	2,090	82	0.900	.035	2.700	.106	4,600	2,530	100	0.700	.028	2.100	.083	4,000	1,660	65	0.500	.020	1.500	.059
		60	3,000	1,770	70	0.630	.025	1.890	.074	4,300	2,120	84	0.490	.019	1.470	.058	3,700	1,380	54	0.350	.014	1.050	.041
		75	3,000	1,770	70	0.630	.025	1.890	.074	4,300	2,120	84	0.490	.019	1.470	.058	3,700	1,380	54	0.350	.014	1.050	.041
		80	2,700	1,590	63	0.450	.018	1.350	.053	3,900	1,930	76	0.350	.014	1.050	.041	3,400	1,270	50	0.250	.010	0.750	.030
		100	2,700	1,590	63	0.450	.018	1.350	.053	3,900	1,930	76	0.350	.014	1.050	.041	3,400	1,270	50	0.250	.010	0.750	.030
		120	2,500	1,310	52	0.360	.014	1.080	.043	3,600	1,580	62	0.280	.011	0.840	.033	3,100	1,030	41	0.200	.008	0.600	.024
6	12	60	2,700	2,020	80	1.080	.043	3.240	.128	3,800	2,380	94	0.840	.033	2.520	.099	3,300	1,560	61	0.600	.024	1.800	.071
		80	2,500	1,680	66	0.756	.030	2.268	.089	3,600	2,030	80	0.588	.023	1.764	.069	3,100	1,320	52	0.420	.017	1.260	.050
		100	2,300	1,550	61	0.540	.021	1.620	.064	3,200	1,810	71	0.420	.017	1.260	.050	2,800	1,190	47	0.300	.012	0.900	.035
		120	2,300	1,550	61	0.540	.021	1.620	.064	3,200	1,810	71	0.420	.017	1.260	.050	2,800	1,190	47	0.300	.012	0.900	.035

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

EMBPE-ATH Pencil type



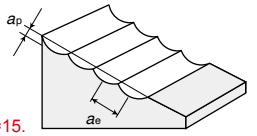
<Finishing>

※The condition of "*ap*" and "*ae*" assumes finishing process. In actual machining conditions please adjust "*ap*" and "*ae*" . Please set up the condition of "*ap*" and "*ae*" for roughing process, in case of processing over L/D=15.

Work material			Carbon steel Alloy steel (180～250HB)							Tool steel (25～40HRC) P20 or equivalent							Pre-hardened steels Hardened steels (40～50HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution *n* min-1	Feed rate *vf* mm/min	IPM inch/min	*ap* mm	*ae* inch	*ae* mm	*ae* inch	Revolution *n* min-1	Feed rate *vf* mm/min	IPM inch/min	*ap* mm	*ae* inch	*ae* mm	*ae* inch	Revolution *n* min-1	Feed rate *vf* mm/min	IPM inch/min	*ap* mm	*ae* inch	*ae* mm	*ae* inch
0.5	1	6	50,000	1,760	69	0.02~0.05	.001~.002	0.020	.001	50,000	1,760	69	0.02~0.05	.001~.002	0.020	.001	50,000	1,620	64	0.02~0.05	.001~.002	0.020	.001
		8	50,000	1,760	69	0.02~0.05	.001~.002	0.020	.001	50,000	1,760	69	0.02~0.05	.001~.002	0.020	.001	50,000	1,620	64	0.02~0.05	.001~.002	0.020	.001
		10	50,000	1,760	69	0.02~0.05	.001~.002	0.020	.001	50,000	1,760	69	0.02~0.05	.001~.002	0.020	.001	48,700	1,580	62	0.02~0.05	.001~.002	0.020	.001
		12	50,000	1,560	61	0.02~0.05	.001~.002	0.020	.001	49,700	1,550	61	0.02~0.05	.001~.002	0.020	.001	44,700	1,290	51	0.02~0.05	.001~.002	0.020	.001
		14	49,000	1,530	60	0.02~0.05	.001~.002	0.020	.001	44,600	1,390	55	0.02~0.05	.001~.002	0.020	.001	40,100	1,150	45	0.02~0.05	.001~.002	0.020	.001
		16	49,000	1,530	60	0.02~0.05	.001~.002	0.020	.001	44,600	1,390	55	0.02~0.05	.001~.002	0.020	.001	40,100	1,150	45	0.02~0.05	.001~.002	0.020	.001
		18	44,100	1,380	54	0.02~0.05	.001~.002	0.020	.001	40,100	1,250	49	0.02~0.05	.001~.002	0.020	.001	36,100	1,040	41	0.02~0.05	.001~.002	0.020	.001
		20	44,100	1,380	54	0.02~0.05	.001~.002	0.020	.001	40,100	1,250	49	0.02~0.05	.001~.002	0.020	.001	36,100	1,040	41	0.02~0.05	.001~.002	0.020	.001
		22	38,500	1,200	47	0.02~0.05	.001~.002	0.020	.001	35,000	1,090	43	0.02~0.05	.001~.002	0.020	.001	31,500	910	36	0.02~0.05	.001~.002	0.020	.001
		24	33,600	1,050	41	0.02~0.05	.001~.002	0.020	.001	30,600	950	37	0.02~0.05	.001~.002	0.020	.001	27,500	790	31	0.02~0.05	.001~.002	0.020	.001
		26	33,600	1,050	41	0.02~0.05	.001~.002	0.020	.001	30,600	950	37	0.02~0.05	.001~.002	0.020	.001	27,500	790	31	0.02~0.05	.001~.002	0.020	.001
		28	28,000	760	30	0.02~0.05	.001~.002	0.020	.001	25,500	700	28	0.02~0.05	.001~.002	0.020	.001	22,900	580	23	0.02~0.05	.001~.002	0.020	.001
		30	28,000	760	30	0.02~0.05	.001~.002	0.020	.001	25,500	700	28	0.02~0.05	.001~.002	0.020	.001	22,900	580	23	0.02~0.05	.001~.002	0.020	.001
		32	23,100	630	25	0.02~0.05	.001~.002	0.020	.001	21,000	570	22	0.02~0.05	.001~.002	0.020	.001	18,900	480	19	0.02~0.05	.001~.002	0.020	.001
		34	17,500	480	18.9	0.02~0.05	.001~.002	0.020	.001	15,900	430	16.9	0.02~0.05	.001~.002	0.020	.001	14,300	360	14.2	0.02~0.05	.001~.002	0.020	.001
		36	17,500	480	18.9	0.02~0.05	.001~.002	0.020	.001	15,900	430	16.9	0.02~0.05	.001~.002	0.020	.001	14,300	360	14.2	0.02~0.05	.001~.002	0.020	.001
0.75	1.5	8	43,400	2,340	92	0.02~0.07	.001~.003	0.030	.001	39,500	2,130	84	0.02~0.07	.001~.003	0.030	.001	35,500	1,820	72	0.02~0.07	.001~.003	0.030	.001
		10	43,400	2,340	92	0.02~0.07	.001~.003	0.030	.001	39,500	2,130	84	0.02~0.07	.001~.003	0.030	.001	35,500	1,820	72	0.02~0.07	.001~.003	0.030	.001
		14	39,700	2,140	84	0.02~0.07	.001~.003	0.030	.001	36,100	1,950	77	0.02~0.07	.001~.003	0.030	.001	32,500	1,670	66	0.02~0.07	.001~.003	0.030	.001
		16	36,400	1,750	69	0.02~0.07	.001~.003	0.030	.001	33,100	1,590	63	0.02~0.07	.001~.003	0.030	.001	29,800	1,360	54	0.02~0.07	.001~.003	0.030	.001
		18	36,400	1,750	69	0.02~0.07	.001~.003	0.030	.001	33,100	1,590	63	0.02~0.07	.001~.003	0.030	.001	29,800	1,360	54	0.02~0.07	.001~.003	0.030	.001
		20	32,700	1,570	62	0.02~0.07	.001~.003	0.030	.001	29,700	1,430	56	0.02~0.07	.001~.003	0.030	.001	26,800	1,220	48	0.02~0.07	.001~.003	0.030	.001
		22	32,700	1,570	62	0.02~0.07	.001~.003	0.030	.001	29,700	1,430	56	0.02~0.07	.001~.003	0.030	.001	26,800	1,220	48	0.02~0.07	.001~.003	0.030	.001
		24	32,700	1,570	62	0.02~0.07	.001~.003	0.030	.001	29,700	1,430	56	0.02~0.07	.001~.003	0.030	.001	26,800	1,220	48	0.02~0.07	.001~.003	0.030	.001
		26	29,400	1,410	56	0.02~0.07	.001~.003	0.030	.001	26,800	1,290	51	0.02~0.07	.001~.003	0.030	.001	24,100	1,100	43	0.02~0.07	.001~.003	0.030	.001
		28	29,400	1,410	56	0.02~0.07	.001~.003	0.030	.001	26,800	1,290	51	0.02~0.07	.001~.003	0.030	.001	24,100	1,100	43	0.02~0.07	.001~.003	0.030	.001
		30	29,400	1,410	56	0.02~0.07	.001~.003	0.030	.001	26,800	1,290	51	0.02~0.07	.001~.003	0.030	.001	24,100	1,100	43	0.02~0.07	.001~.003	0.030	.001
		32	25,700	1,230	48	0.02~0.07	.001~.003	0.030	.001	23,400	1,120	44	0.02~0.07	.001~.003	0.030	.001	21,000	960	38	0.02~0.07	.001~.003	0.030	.001
		34	25,700	1,230	48	0.02~0.07	.001~.003	0.030	.001	23,400	1,120	44	0.02~0.07	.001~.003	0.030	.001	21,000	960	38	0.02~0.07	.001~.003	0.030	.001
		36	22,400	1,080	43	0.02~0.07	.001~.003	0.030	.001	20,400	980	39	0.02~0.07	.001~.003	0.030	.001	18,300	830	32.7	0.02~0.07	.001~.003	0.030	.001
		38	22,400	1,080	43	0.02~0.07	.001~.003	0.030	.001	20,400	980	39	0.02~0.07	.001~.003	0.030	.001	18,300	830	32.7	0.02~0.07	.001~.003	0.030	.001
		40	18,700	790	31.1	0.02~0.07	.001~.003	0.030	.001	17,000	710	28	0.02~0.07	.001~.003	0.030	.001	15,300	610	24	0.02~0.07	.001~.003	0.030	.001
1	2	10	35,000	3,050	120	0.02~0.1	.001~.004	0.040	.002	31,800	2,770	109	0.02~0.1	.001~.004	0.040	.002	28,700	2,320	91	0.02~0.1	.001~.004	0.040	.002
		16	32,600	2,550	100	0.02~0.1	.001~.004	0.040	.002	29,600	2,320	91	0.02~0.1	.001~.004	0.040	.002	26,700	1,950	77	0.02~0.1	.001~.004	0.040	.002
		20	29,800	2,330	92	0.02~0.1	.001~.004	0.040	.002	27,100	2,120	84	0.02~0.1	.001~.004	0.040	.002	24,400	1,780	70	0.02~0.1	.001~.004	0.040	.002
		24	27,300	1,900	75	0.02~0.1	.001~.004	0.040	.002	24,800	1,730	68	0.02~0.1	.001~.004	0.040	.002	22,400	1,450	57	0.02~0.1	.001~.004	0.040	.002
		30	24,500	1,710	67	0.02~0.1	.001~.004	0.040	.002	22,300	1,550	61	0.02~0.1	.001~.004	0.040	.002	20,100	1,300	51	0.02~0.1	.001~.004	0.040	.002
		36	22,100	1,540	61	0.02~0.1	.001~.004	0.040	.002	20,100	1,400	55	0.02~0.1	.001~.004	0.040	.002	18,100	1,170	46	0.02~0.1	.001~.004	0.040	.002
		40	22,100	1,540	61	0.02~0.1	.001~.004	0.040	.002	20,100	1,400	55	0.02~0.1	.001~.004	0.040	.002	18,100	1,170	46	0.02~0.1	.001~.004	0.040	.002
		46	19,300	1,340	53	0.02~0.1	.001~.004	0.040	.002	17,500	1,220	48	0.02~0.1	.001~.004	0.040	.002	15,800	1,020	40	0.02~0.1	.001~.004	0.040	.002
		60	14,000	850	33.5	0.02~0.1	.001~.004	0.040	.002	12,700	770	30.3	0.02~0.1	.001~.004	0.040	.002	11,500	650	25.6	0.02~0.1	.001~.004	0.040	.002
1.25	2.5	16	26,100	2,540	100	0.05~0.12	.002~.005	0.050	.002	23,700	2,300	91	0.05~0.12	.002~.005	0.050	.002	21,300	1,960	77	0.05~0.12	.002~.005	0.050	.002
		24	23,800	2,310	91	0.05~0.12	.002~.005	0.050	.002	21,700	2,110	83	0.05~0.12	.002~.005	0.050	.002	19,500	1,790	71	0.05~0.12	.002~.005	0.050	.002
		30	21,900	1,890	74	0.05~0.12	.002~.005	0.050	.002	19,900	1,720	68	0.05~0.12	.002~.005	0.050	.002	17,900	1,460	58	0.05~0.12	.002~.005	0.050	.002
		40	19,600	1,690	67	0.05~0.12	.002~.005	0.050	.002	17,800	1,540	61	0.05~0.12	.002~.005	0.050	.002	16,100	1,310	52	0.05~0.12	.002~.005	0.050	.002
		50	17,700	1,530	60	0.05~0.12	.002~.005	0.050	.002	16,100	1,390	55	0.05~0.12	.002~.005	0.050	.002	14,400	1,180	47	0.05~0.12	.002~.005	0.050	.002
1.5	3	16	21,700	2,580	102	0.05~0.15	.002~.006	0.060	.002	19,700	2,340	92	0.05~0.15	.002~.006	0.060	.002	17,800	2,020	80	0.05~0.15	.002~.006	0.060	.002
		20	21,700	2,580	102	0.05~0.15	.002~.006	0.060	.002	19,700	2,340	92	0.05~0.15	.002~.006	0.060	.002	17,800	2,020	80	0.05~0.15	.002~.006	0.060	.002
		24	21,700	2,580	102	0.05~0.15	.002~.006	0.060	.002	19,700	2,340	92	0.05~0.15	.002~.006	0.060	.002	17,800	2,020	80	0.05~0.15	.002~.006	0.060	.002
		30	19,900	2,360	93	0.05~0.15	.002~.006	0.060	.002	18,000	2,140	84	0.05~0.15	.002~.006	0.060	.002	16,200	1,840	72	0.05~0.15	.002~.006	0.060	.002
		40	16,300	1,720	68	0.05~0.15	.002~.006	0.060	.002	14,900	1,570	62	0.05~0.15	.002~.006	0.060	.002	13,400	1,350	53	0.05~0.15	.002~.006	0.060	.002
		50	14,700	1,550	61	0.05~0.15	.002~.006	0.060	.002	13,400	1,420	56	0.05~0.15	.002~.006	0.060	.002	12,000	1,210	48	0.05~0.15	.002~.006	0.060	.002
		60	14,700	1,550	61	0.05~0.15	.002~.006	0.060	.002	13,400	1,420	56	0.05~0.15	.002~.006	0.060	.002	12,000	1,210	48	0.05~0.15	.002~.006	0.060	.002

Epoch Mega Feed Ball Evolution

EMBPE-ATH Pencil type



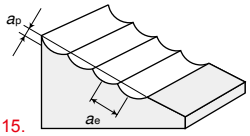
<Finishing>

※The condition of "ap" and "ae" assumes finishing process. In actual machining conditions please adjust "ap" and "ae" . Please set up the condition of "ap" and "ae" for roughing process, in case of processing over L/D=15.

Work material			Carbon steel Alloy steel (180～250HB)							Tool steel (25～40HRC) P20 or equivalent							Pre-hardened steels Hardened steels (40～50HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch
1.75	3.5	20	18,600	2,710	107	0.05~0.15	.002~.006	0.070	.003	16,900	2,460	97	0.05~0.15	.002~.006	0.070	.003	15,200	2,050	81	0.05~0.15	.002~.006	0.070	.003
		30	17,000	2,480	98	0.05~0.15	.002~.006	0.070	.003	15,500	2,260	89	0.05~0.15	.002~.006	0.070	.003	13,900	1,880	74	0.05~0.15	.002~.006	0.070	.003
		40	15,600	2,020	80	0.05~0.15	.002~.006	0.070	.003	14,200	1,840	72	0.05~0.15	.002~.006	0.070	.003	12,800	1,540	61	0.05~0.15	.002~.006	0.070	.003
		50	14,000	1,810	71	0.05~0.15	.002~.006	0.070	.003	12,700	1,650	65	0.05~0.15	.002~.006	0.070	.003	11,500	1,380	54	0.05~0.15	.002~.006	0.070	.003
		60	12,600	1,630	64	0.05~0.15	.002~.006	0.070	.003	11,500	1,490	59	0.05~0.15	.002~.006	0.070	.003	10,300	1,240	49	0.05~0.15	.002~.006	0.070	.003
2	4	20	17,500	3,260	128	0.05~0.2	.002~.008	0.080	.003	15,900	2,960	117	0.05~0.2	.002~.008	0.080	.003	14,300	2,530	100	0.05~0.2	.002~.008	0.080	.003
		30	16,300	2,730	108	0.05~0.2	.002~.008	0.080	.003	14,800	2,480	98	0.05~0.2	.002~.008	0.080	.003	13,300	2,120	84	0.05~0.2	.002~.008	0.080	.003
		40	14,900	2,490	98	0.05~0.2	.002~.008	0.080	.003	13,500	2,260	89	0.05~0.2	.002~.008	0.080	.003	12,200	1,940	76	0.05~0.2	.002~.008	0.080	.003
		50	13,700	2,040	80	0.05~0.2	.002~.008	0.080	.003	12,400	1,850	73	0.05~0.2	.002~.008	0.080	.003	11,200	1,590	63	0.05~0.2	.002~.008	0.080	.003
		60	12,300	1,830	72	0.05~0.2	.002~.008	0.080	.003	11,100	1,650	65	0.05~0.2	.002~.008	0.080	.003	10,000	1,420	56	0.05~0.2	.002~.008	0.080	.003
		70	11,000	1,640	65	0.05~0.2	.002~.008	0.080	.003	10,000	1,490	59	0.05~0.2	.002~.008	0.080	.003	9,000	1,270	50	0.05~0.2	.002~.008	0.080	.003
		80	11,000	1,640	65	0.05~0.2	.002~.008	0.080	.003	10,000	1,490	59	0.05~0.2	.002~.008	0.080	.003	9,000	1,270	50	0.05~0.2	.002~.008	0.080	.003
2.5	5	30	13,000	2,880	113	0.05~0.25	.002~.01	0.100	.004	11,800	2,610	103	0.05~0.25	.002~.01	0.100	.004	10,700	2,220	87	0.05~0.25	.002~.01	0.100	.004
		40	13,000	2,880	113	0.05~0.25	.002~.01	0.100	.004	11,800	2,610	103	0.05~0.25	.002~.01	0.100	.004	10,700	2,220	87	0.05~0.25	.002~.01	0.100	.004
		50	11,900	2,630	104	0.05~0.25	.002~.01	0.100	.004	10,800	2,390	94	0.05~0.25	.002~.01	0.100	.004	9,700	2,020	80	0.05~0.25	.002~.01	0.100	.004
		60	10,900	2,150	85	0.05~0.25	.002~.01	0.100	.004	9,900	1,950	77	0.05~0.25	.002~.01	0.100	.004	8,900	1,640	65	0.05~0.25	.002~.01	0.100	.004
		70	9,800	1,930	76	0.05~0.25	.002~.01	0.100	.004	8,900	1,750	69	0.05~0.25	.002~.01	0.100	.004	8,000	1,480	58	0.05~0.25	.002~.01	0.100	.004
		80	9,800	1,930	76	0.05~0.25	.002~.01	0.100	.004	8,900	1,750	69	0.05~0.25	.002~.01	0.100	.004	8,000	1,480	58	0.05~0.25	.002~.01	0.100	.004
3	6	30	11,700	3,550	140	0.05~0.3	.002~.012	0.120	.005	10,600	3,210	126	0.05~0.3	.002~.012	0.120	.005	9,600	2,740	108	0.05~0.3	.002~.012	0.120	.005
		40	10,900	2,970	117	0.05~0.3	.002~.012	0.120	.005	9,900	2,700	106	0.05~0.3	.002~.012	0.120	.005	8,900	2,280	90	0.05~0.3	.002~.012	0.120	.005
		50	9,900	2,700	106	0.05~0.3	.002~.012	0.120	.005	9,000	2,450	97	0.05~0.3	.002~.012	0.120	.005	8,100	2,080	82	0.05~0.3	.002~.012	0.120	.005
		60	9,900	2,700	106	0.05~0.3	.002~.012	0.120	.005	9,000	2,450	97	0.05~0.3	.002~.012	0.120	.005	8,100	2,080	82	0.05~0.3	.002~.012	0.120	.005
		70	9,100	2,210	87	0.05~0.3	.002~.012	0.120	.005	8,300	2,010	79	0.05~0.3	.002~.012	0.120	.005	7,500	1,710	67	0.05~0.3	.002~.012	0.120	.005
		80	8,200	1,990	78	0.05~0.3	.002~.012	0.120	.005	7,400	1,790	71	0.05~0.3	.002~.012	0.120	.005	6,700	1,530	60	0.05~0.3	.002~.012	0.120	.005
		100	7,400	1,790	71	0.05~0.3	.002~.012	0.120	.005	6,700	1,620	64	0.05~0.3	.002~.012	0.120	.005	6,000	1,370	54	0.05~0.3	.002~.012	0.120	.005
		120	7,400	1,790	71	0.05~0.3	.002~.012	0.120	.005	6,700	1,620	64	0.05~0.3	.002~.012	0.120	.005	6,000	1,370	54	0.05~0.3	.002~.012	0.120	.005
4	8	40	8,800	3,720	147	0.05~0.4	.002~.016	0.160	.006	8,000	3,380	133	0.05~0.4	.002~.016	0.160	.006	7,200	2,870	113	0.05~0.4	.002~.016	0.160	.006
		50	8,100	3,080	121	0.05~0.4	.002~.016	0.160	.006	7,400	2,820	111	0.05~0.4	.002~.016	0.160	.006	6,700	2,410	95	0.05~0.4	.002~.016	0.160	.006
		60	8,100	3,080	121	0.05~0.4	.002~.016	0.160	.006	7,400	2,820	111	0.05~0.4	.002~.016	0.160	.006	6,700	2,410	95	0.05~0.4	.002~.016	0.160	.006
		70	7,400	2,820	111	0.05~0.4	.002~.016	0.160	.006	6,800	2,590	102	0.05~0.4	.002~.016	0.160	.006	6,100	2,190	86	0.05~0.4	.002~.016	0.160	.006
		80	7,400	2,820	111	0.05~0.4	.002~.016	0.160	.006	6,800	2,590	102	0.05~0.4	.002~.016	0.160	.006	6,100	2,190	86	0.05~0.4	.002~.016	0.160	.006
		100	6,800	2,300	91	0.05~0.4	.002~.016	0.160	.006	6,200	2,100	83	0.05~0.4	.002~.016	0.160	.006	5,600	1,790	71	0.05~0.4	.002~.016	0.160	.006
		120	6,100	2,060	81	0.05~0.4	.002~.016	0.160	.006	5,600	1,900	75	0.05~0.4	.002~.016	0.160	.006	5,000	1,600	63	0.05~0.4	.002~.016	0.160	.006
5	10	50	7,000	3,890	153	0.05~0.5	.002~.02	0.200	.008	6,400	3,550	140	0.05~0.5	.002~.02	0.200	.008	5,700	2,980	117	0.05~0.5	.002~.02	0.200	.008
		60	6,500	3,250	128	0.05~0.5	.002~.02	0.200	.008	5,900	2,950	116	0.05~0.5	.002~.02	0.200	.008	5,300	2,490	98	0.05~0.5	.002~.02	0.200	.008
		75	6,500	3,250	128	0.05~0.5	.002~.02	0.200	.008	5,900	2,950	116	0.05~0.5	.002~.02	0.200	.008	5,300	2,490	98	0.05~0.5	.002~.02	0.200	.008
		80	6,000	3,000	118	0.05~0.5	.002~.02	0.200	.008	5,400	2,700	106	0.05~0.5	.002~.02	0.200	.008	4,900	2,300	91	0.05~0.5	.002~.02	0.200	.008
		100	6,000	3,000	118	0.05~0.5	.002~.02	0.200	.008	5,400	2,700	106	0.05~0.5	.002~.02	0.200	.008	4,900	2,300	91	0.05~0.5	.002~.02	0.200	.008
		120	5,500	2,440	96	0.05~0.5	.002~.02	0.200	.008	5,000	2,220	87	0.05~0.5	.002~.02	0.200	.008	4,500	1,880	74	0.05~0.5	.002~.02	0.200	.008
6	12	60	5,800	3,690	145	0.05~0.6	.002~.024	0.240	.009	5,300	3,370	133	0.05~0.6	.002~.024	0.240	.009	4,800	2,870	113	0.05~0.6	.002~.024	0.240	.009
		80	5,400	3,090	122	0.05~0.6	.002~.024	0.240	.009	4,900	2,800	110	0.05~0.6	.002~.024	0.240	.009	4,400	2,360	93	0.05~0.6	.002~.024	0.240	.009
		100	5,000	2,860	113	0.05~0.6	.002~.024	0.240	.009	4,500	2,580	102	0.05~0.6	.002~.024	0.240	.009	4,100	2,200	87	0.05~0.6	.002~.024	0.240	.009
		120	5,000	2,860	113	0.05~0.6	.002~.024	0.240	.009	4,500	2,580	102	0.05~0.6	.002~.024	0.240	.009	4,100	2,200	87	0.05~0.6	.002~.024	0.240	.009

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

EMBPE-ATH Pencil type



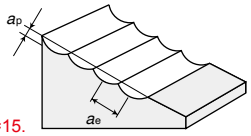
<Finishing>

※The condition of "ap" and "ae" assumes finishing process. In actual machining conditions please adjust "ap" and "ae" . Please set up the condition of "ap" and "ae" for roughing process, in case of processing over L/D=15.

Work material			Hardened steel (50～55HRC)							Hardened steel (55～65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min-1	Feed rate Vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate Vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch
0.5	1	6	47,400	1,280	50	0.02~0.05	.001~.002	0.020	.001	41,500	810	32	0.02~0.05	.001~.002	0.020	.001
		8	47,400	1,280	50	0.02~0.05	.001~.002	0.020	.001	41,500	810	32	0.02~0.05	.001~.002	0.020	.001
		10	43,300	1,170	46	0.02~0.05	.001~.002	0.020	.001	37,900	740	29	0.02~0.05	.001~.002	0.020	.001
		12	39,700	950	37	0.02~0.05	.001~.002	0.020	.001	34,800	600	24	0.02~0.05	.001~.002	0.020	.001
		14	35,700	860	34	0.02~0.05	.001~.002	0.020	.001	31,200	540	21	0.02~0.05	.001~.002	0.020	.001
		16	35,700	860	34	0.02~0.05	.001~.002	0.020	.001	31,200	540	21	0.02~0.05	.001~.002	0.020	.001
		18	32,100	770	30	0.02~0.05	.001~.002	0.020	.001	28,100	490	19	0.02~0.05	.001~.002	0.020	.001
		20	32,100	770	30	0.02~0.05	.001~.002	0.020	.001	28,100	490	19	0.02~0.05	.001~.002	0.020	.001
		22	28,000	670	26	0.02~0.05	.001~.002	0.020	.001	24,500	420	17	0.02~0.05	.001~.002	0.020	.001
		24	24,500	590	23	0.02~0.05	.001~.002	0.020	.001	21,400	370	15	0.02~0.05	.001~.002	0.020	.001
		26	24,500	590	23	0.02~0.05	.001~.002	0.020	.001	21,400	370	15	0.02~0.05	.001~.002	0.020	.001
		28	20,400	430	17	0.02~0.05	.001~.002	0.020	.001	17,800	270	11	0.02~0.05	.001~.002	0.020	.001
		30	20,400	430	17	0.02~0.05	.001~.002	0.020	.001	17,800	270	11	0.02~0.05	.001~.002	0.020	.001
		32	16,800	350	14	0.02~0.05	.001~.002	0.020	.001	14,700	220	9	0.02~0.05	.001~.002	0.020	.001
		34	12,700	270	10.6	0.02~0.05	.001~.002	0.020	.001	11,100	170	6.7	0.02~0.05	.001~.002	0.020	.001
		36	12,700	270	10.6	0.02~0.05	.001~.002	0.020	.001	11,100	170	6.7	0.02~0.05	.001~.002	0.020	.001
0.75	1.5	8	31,600	1,370	54	0.02~0.07	.001~.003	0.030	.001	27,600	890	35	0.02~0.07	.001~.003	0.030	.001
		10	31,600	1,370	54	0.02~0.07	.001~.003	0.030	.001	27,600	890	35	0.02~0.07	.001~.003	0.030	.001
		14	28,900	1,250	49	0.02~0.07	.001~.003	0.030	.001	25,300	820	32.3	0.02~0.07	.001~.003	0.030	.001
		16	26,500	1,020	40	0.02~0.07	.001~.003	0.030	.001	23,200	670	26.4	0.02~0.07	.001~.003	0.030	.001
		18	26,500	1,020	40	0.02~0.07	.001~.003	0.030	.001	23,200	670	26.4	0.02~0.07	.001~.003	0.030	.001
		20	23,800	910	36	0.02~0.07	.001~.003	0.030	.001	20,800	600	23.6	0.02~0.07	.001~.003	0.030	.001
		22	23,800	910	36	0.02~0.07	.001~.003	0.030	.001	20,800	600	23.6	0.02~0.07	.001~.003	0.030	.001
		24	23,800	910	36	0.02~0.07	.001~.003	0.030	.001	20,800	600	23.6	0.02~0.07	.001~.003	0.030	.001
		26	21,400	820	32.3	0.02~0.07	.001~.003	0.030	.001	18,700	540	21.3	0.02~0.07	.001~.003	0.030	.001
		28	21,400	820	32.3	0.02~0.07	.001~.003	0.030	.001	18,700	540	21.3	0.02~0.07	.001~.003	0.030	.001
		30	21,400	820	32.3	0.02~0.07	.001~.003	0.030	.001	18,700	540	21.3	0.02~0.07	.001~.003	0.030	.001
		32	18,700	720	28.3	0.02~0.07	.001~.003	0.030	.001	16,300	470	18.5	0.02~0.07	.001~.003	0.030	.001
		34	18,700	720	28.3	0.02~0.07	.001~.003	0.030	.001	16,300	470	18.5	0.02~0.07	.001~.003	0.030	.001
		36	16,300	630	24.8	0.02~0.07	.001~.003	0.030	.001	14,300	410	16.1	0.02~0.07	.001~.003	0.030	.001
		38	16,300	630	24.8	0.02~0.07	.001~.003	0.030	.001	14,300	410	16.1	0.02~0.07	.001~.003	0.030	.001
		40	13,600	460	18.1	0.02~0.07	.001~.003	0.030	.001	11,900	300	11.8	0.02~0.07	.001~.003	0.030	.001
1	2	10	25,500	1,680	66	0.02~0.1	.001~.004	0.040	.002	22,300	1,140	45	0.02~0.1	.001~.004	0.040	.002
		16	23,700	1,410	56	0.02~0.1	.001~.004	0.040	.002	20,700	950	37	0.02~0.1	.001~.004	0.040	.002
		20	21,700	1,290	51	0.02~0.1	.001~.004	0.040	.002	18,900	870	34.3	0.02~0.1	.001~.004	0.040	.002
		24	19,900	1,050	41	0.02~0.1	.001~.004	0.040	.002	17,400	710	28	0.02~0.1	.001~.004	0.040	.002
		30	17,800	940	37	0.02~0.1	.001~.004	0.040	.002	15,600	640	25.2	0.02~0.1	.001~.004	0.040	.002
		36	16,100	850	33.5	0.02~0.1	.001~.004	0.040	.002	14,000	570	22.4	0.02~0.1	.001~.004	0.040	.002
		40	16,100	850	33.5	0.02~0.1	.001~.004	0.040	.002	14,000	570	22.4	0.02~0.1	.001~.004	0.040	.002
		46	14,000	740	29.1	0.02~0.1	.001~.004	0.040	.002	12,300	500	19.7	0.02~0.1	.001~.004	0.040	.002
		60	10,200	470	18.5	0.02~0.1	.001~.004	0.040	.002	8,900	320	12.6	0.02~0.1	.001~.004	0.040	.002
1.25	2.5	16	19,000	1,490	59	0.05~0.12	.002~.005	0.050	.002	16,600	990	39	0.05~0.12	.002~.005	0.050	.002
		24	17,300	1,350	53	0.05~0.12	.002~.005	0.050	.002	15,200	900	35.4	0.05~0.12	.002~.005	0.050	.002
		30	15,900	1,110	44	0.05~0.12	.002~.005	0.050	.002	13,900	730	28.7	0.05~0.12	.002~.005	0.050	.002
		40	14,300	1,000	39	0.05~0.12	.002~.005	0.050	.002	12,500	660	26	0.05~0.12	.002~.005	0.050	.002
		50	12,800	890	35	0.05~0.12	.002~.005	0.050	.002	11,200	590	23.2	0.05~0.12	.002~.005	0.050	.002
1.5	3	16	15,800	1,490	59	0.05~0.15	.002~.006	0.060	.002	13,800	970	38	0.05~0.15	.002~.006	0.060	.002
		20	15,800	1,490	59	0.05~0.15	.002~.006	0.060	.002	13,800	970	38	0.05~0.15	.002~.006	0.060	.002
		24	15,800	1,490	59	0.05~0.15	.002~.006	0.060	.002	13,800	970	38	0.05~0.15	.002~.006	0.060	.002
		30	14,400	1,360	54	0.05~0.15	.002~.006	0.060	.002	12,600	880	35	0.05~0.15	.002~.006	0.060	.002
		40	11,900	1,000	39	0.05~0.15	.002~.006	0.060	.002	10,400	650	25.6	0.05~0.15	.002~.006	0.060	.002
		50	10,700	900	35	0.05~0.15	.002~.006	0.060	.002	9,400	590	23.2	0.05~0.15	.002~.006	0.060	.002
		60	10,700	900	35	0.05~0.15	.002~.006	0.060	.002	9,400	590	23.2	0.05~0.15	.002~.006	0.060	.002

Epoch Mega Feed Ball Evolution

EMBPE-ATH Pencil type



<Finishing>

※The condition of "ap" and "ae" assumes finishing process. In actual machining conditions please adjust "ap" and "ae" . Please set up the condition of "ap" and "ae" for roughing process, in case of processing over L/D=15.

Work material			Hardened steel (50～55HRC)							Hardened steel (55～65HRC)						
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck Length LU (mm)	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch	Revolution n min-1	Feed rate vf mm/min	IPM inch/min	ap mm	ae inch	ae mm	ae inch
1.75	3.5	20	13,500	1,530	60	0.05~0.15	.002~.006	0.070	.003	11,800	1,020	40	0.05~0.15	.002~.006	0.070	.003
		30	12,400	1,410	56	0.05~0.15	.002~.006	0.070	.003	10,800	930	37	0.05~0.15	.002~.006	0.070	.003
		40	11,400	1,150	45	0.05~0.15	.002~.006	0.070	.003	9,900	760	29.9	0.05~0.15	.002~.006	0.070	.003
		50	10,200	1,030	41	0.05~0.15	.002~.006	0.070	.003	8,900	680	26.8	0.05~0.15	.002~.006	0.070	.003
		60	9,200	930	37	0.05~0.15	.002~.006	0.070	.003	8,000	610	24	0.05~0.15	.002~.006	0.070	.003
2	4	20	12,700	1,910	75	0.05~0.2	.002~.008	0.080	.003	11,100	1,270	50	0.05~0.2	.002~.008	0.080	.003
		30	11,800	1,590	63	0.05~0.2	.002~.008	0.080	.003	10,400	1,070	42	0.05~0.2	.002~.008	0.080	.003
		40	10,800	1,460	58	0.05~0.2	.002~.008	0.080	.003	9,500	970	38	0.05~0.2	.002~.008	0.080	.003
		50	9,900	1,190	47	0.05~0.2	.002~.008	0.080	.003	8,700	790	31.1	0.05~0.2	.002~.008	0.080	.003
		60	8,900	1,070	42	0.05~0.2	.002~.008	0.080	.003	7,800	710	28	0.05~0.2	.002~.008	0.080	.003
		70	8,000	960	38	0.05~0.2	.002~.008	0.080	.003	7,000	640	25.2	0.05~0.2	.002~.008	0.080	.003
		80	8,000	960	38	0.05~0.2	.002~.008	0.080	.003	7,000	640	25.2	0.05~0.2	.002~.008	0.080	.003
2.5	5	30	9,500	1,670	66	0.05~0.25	.002~.01	0.100	.004	8,300	1,100	43	0.05~0.25	.002~.01	0.100	.004
		40	9,500	1,670	66	0.05~0.25	.002~.01	0.100	.004	8,300	1,100	43	0.05~0.25	.002~.01	0.100	.004
		50	8,700	1,530	60	0.05~0.25	.002~.01	0.100	.004	7,600	1,010	40	0.05~0.25	.002~.01	0.100	.004
		60	7,900	1,230	48	0.05~0.25	.002~.01	0.100	.004	7,000	820	32.3	0.05~0.25	.002~.01	0.100	.004
		70	7,100	1,110	44	0.05~0.25	.002~.01	0.100	.004	6,200	730	28.7	0.05~0.25	.002~.01	0.100	.004
		80	7,100	1,110	44	0.05~0.25	.002~.01	0.100	.004	6,200	730	28.7	0.05~0.25	.002~.01	0.100	.004
3	6	30	8,500	2,040	80	0.05~0.3	.002~.012	0.120	.005	7,400	1,330	52	0.05~0.3	.002~.012	0.120	.005
		40	7,900	1,710	67	0.05~0.3	.002~.012	0.120	.005	6,900	1,120	44	0.05~0.3	.002~.012	0.120	.005
		50	7,200	1,560	61	0.05~0.3	.002~.012	0.120	.005	6,300	1,020	40	0.05~0.3	.002~.012	0.120	.005
		60	7,200	1,560	61	0.05~0.3	.002~.012	0.120	.005	6,300	1,020	40	0.05~0.3	.002~.012	0.120	.005
		70	6,600	1,270	50	0.05~0.3	.002~.012	0.120	.005	5,800	840	33.1	0.05~0.3	.002~.012	0.120	.005
		80	5,900	1,130	45	0.05~0.3	.002~.012	0.120	.005	5,200	750	29.5	0.05~0.3	.002~.012	0.120	.005
		100	5,400	1,040	41	0.05~0.3	.002~.012	0.120	.005	4,700	680	26.8	0.05~0.3	.002~.012	0.120	.005
		120	5,400	1,040	41	0.05~0.3	.002~.012	0.120	.005	4,700	680	26.8	0.05~0.3	.002~.012	0.120	.005
4	8	40	6,400	2,130	84	0.05~0.4	.002~.016	0.160	.006	5,600	1,410	56	0.05~0.4	.002~.016	0.160	.006
		50	5,900	1,770	70	0.05~0.4	.002~.016	0.160	.006	5,200	1,180	47	0.05~0.4	.002~.016	0.160	.006
		60	5,900	1,770	70	0.05~0.4	.002~.016	0.160	.006	5,200	1,180	47	0.05~0.4	.002~.016	0.160	.006
		70	5,400	1,620	64	0.05~0.4	.002~.016	0.160	.006	4,700	1,070	42	0.05~0.4	.002~.016	0.160	.006
		80	5,400	1,620	64	0.05~0.4	.002~.016	0.160	.006	4,700	1,070	42	0.05~0.4	.002~.016	0.160	.006
		100	5,000	1,330	52	0.05~0.4	.002~.016	0.160	.006	4,300	870	34.3	0.05~0.4	.002~.016	0.160	.006
		120	4,500	1,200	47	0.05~0.4	.002~.016	0.160	.006	3,900	790	31.1	0.05~0.4	.002~.016	0.160	.006
5	10	50	5,100	2,230	88	0.05~0.5	.002~.02	0.200	.008	4,500	1,490	59	0.05~0.5	.002~.02	0.200	.008
		60	4,700	1,850	73	0.05~0.5	.002~.02	0.200	.008	4,100	1,220	48	0.05~0.5	.002~.02	0.200	.008
		75	4,700	1,850	73	0.05~0.5	.002~.02	0.200	.008	4,100	1,220	48	0.05~0.5	.002~.02	0.200	.008
		80	4,300	1,700	67	0.05~0.5	.002~.02	0.200	.008	3,800	1,130	45	0.05~0.5	.002~.02	0.200	.008
		100	4,300	1,700	67	0.05~0.5	.002~.02	0.200	.008	3,800	1,130	45	0.05~0.5	.002~.02	0.200	.008
		120	4,000	1,400	55	0.05~0.5	.002~.02	0.200	.008	3,500	920	36	0.05~0.5	.002~.02	0.200	.008
6	12	60	4,200	2,100	83	0.05~0.6	.002~.024	0.240	.009	3,700	1,400	55	0.05~0.6	.002~.024	0.240	.009
		80	3,900	1,760	69	0.05~0.6	.002~.024	0.240	.009	3,500	1,190	47	0.05~0.6	.002~.024	0.240	.009
		100	3,600	1,620	64	0.05~0.6	.002~.024	0.240	.009	3,200	1,090	43	0.05~0.6	.002~.024	0.240	.009
		120	3,600	1,620	64	0.05~0.6	.002~.024	0.240	.009	3,200	1,090	43	0.05~0.6	.002~.024	0.240	.009

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch High Hard Ball-TH3

Side milling | Die-sinking | Profiling | Radius | Roughing | Semi Finishing | Finishing

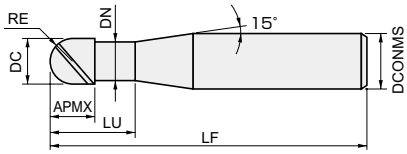
RE tolerance: RE0.5～RE1.5 : ±0.005mm
RE2 ～ RE3 : ±0.007mm
RE4 ～ RE6 : ±0.010mm

Dia. tolerance: RE0.5～RE1.5 : 0 ～−0.010mm
RE2～RE3 : 0 ～−0.014mm
RE4～RE6 : 0 ～−0.020mm

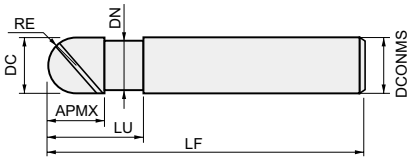
h5

Evolved by addopting a TH3 coating on 4-flute ball end mill for high hardened steel processing. On high-hardened steel processing, to achieve even longer tool life.

A type



B type



EHHBE4○○○(-S○)-TH3

Carbide | TH3 | Helix angle 40° | Valuable Pitch | Cutting Conditions A120

Item code	Stock	Size (mm) Ball radius RE	Tool dia. DC	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	No. of flutes	Type
EHHBE4010-S4-TH3	●	0.5	1	1.5	3	0.95	50	4	4	A
EHHBE4010-S6-TH3	●			1.5	3	0.95	50	6	4	A
EHHBE4015-S4-TH3	●	0.75	1.5	2.5	4.5	1.43	50	4	4	A
EHHBE4015-S6-TH3	●			2.5	4.5	1.43	50	6	4	A
EHHBE4020-S4-TH3	●	1	2	3	6	1.9	50	4	4	A
EHHBE4020-S6-TH3	●			3	6	1.9	50	6	4	A
EHHBE4025-S4-TH3	●	1.25	2.5	4	7.5	2.38	50	4	4	A
EHHBE4025-S6-TH3	●			4	7.5	2.38	50	6	4	A
EHHBE4030-S4-TH3	●	1.5	3	4.5	9	2.9	70	4	4	A
EHHBE4030-S6-TH3	●			4.5	9	2.9	70	6	4	A
EHHBE4040-S4-TH3	●	2	4	6	12	3.9	70	4	4	B
EHHBE4040-S6-TH3	●			6	12	3.9	70	6	4	A
EHHBE4050-TH3	●	2.5	5	7.5	15	4.7	80	6	4	A
EHHBE4060-TH3	●	3	6	9	18	5.7	90	6	4	B
EHHBE4080-TH3	●	4	8	12	24	7.6	100	8	4	B
EHHBE4100-TH3	●	5	10	15	30	9.5	100	10	4	B
EHHBE4120-TH3	●	6	12	18	36	11.5	110	12	4	B

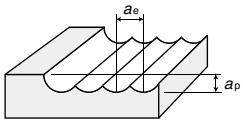
Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	◎				

● : Inventory maintained in US

Epoch High Hard Ball-TH3

Recommended cutting conditions EHHBE-TH3

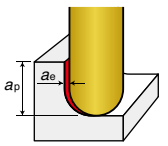


Inch

<Roughing>

For work materials with hardnesses up to 55HRC, we recommend our company's 2-flute or 3-flute tool series.

Work material		Hardened steel (55~62HRC) D2, Powder steel				Hardened steel (62~66HRC) Powder steel				Hardened steel (66~72HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=360 SFM				Cutting speed v_c=295 SFM				Cutting speed v_c=230 SFM			
		n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)
0.5	1	35,000	76	.0031	.0091	28,700	53	.0024	.0071	22,300	34	.0020	.0055
0.75	1.5	23,400	69	.0043	.0134	19,100	48	.0035	.0106	14,900	31	.0028	.0079
1	2	17,500	69	.0059	.0177	14,300	48	.0047	.0142	11,100	31	.0035	.0106
1.25	2.5	14,000	65	.0075	.0220	11,500	45	.0059	.0177	8,900	29	.0043	.0134
1.5	3	11,700	65	.0091	.0268	9,600	45	.0071	.0213	7,400	29	.0055	.0161
2	4	8,800	66	.0118	.0354	7,200	46	.0094	.0283	5,600	29	.0071	.0213
2.5	5	7,000	67	.0150	.0445	5,700	46	.0118	.0354	4,500	30	.0091	.0268
3	6	5,800	67	.0177	.0531	4,800	47	.0142	.0425	3,700	30	.0106	.0319
4	8	4,400	69	.0236	.0709	3,600	48	.0189	.0567	2,800	31	.0142	.0425
5	10	3,500	69	.0295	.0886	2,900	48	.0236	.0709	2,200	30	.0177	.0531
6	12	2,900	65	.0354	.1063	2,400	46	.0283	.0850	1,900	30	.0213	.0638



Inch

<Side Cutting>

For work materials with hardnesses up to 55HRC, we recommend our company's 2-flute or 3-flute tool series.

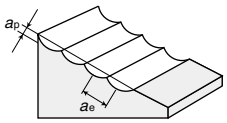
Work material		Hardened steel (55~62HRC) D2, Powder steel				Hardened steel (62~66HRC) Powder steel				Hardened steel (66~72HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=490 SFM				Cutting speed v_c=410 SFM				Cutting speed v_c=330 SFM			
		n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)
0.5	1	47,800	104	.0394	.0008	39,800	69	.0394	.0008	31,800	41	.0394	.0004
0.75	1.5	31,800	94	.0591	.0012	26,500	63	.0591	.0008	21,200	37	.0591	.0008
1	2	23,900	94	.0787	.0016	19,900	63	.0787	.0012	15,900	37	.0787	.0008
1.25	2.5	19,100	88	.0984	.0020	15,900	59	.0984	.0016	12,700	35	.0984	.0012
1.5	3	15,900	88	.1181	.0024	13,300	59	.1181	.0020	10,600	35	.1181	.0012
2	4	11,900	89	.1575	.0031	10,000	60	.1575	.0024	8,000	36	.1575	.0016
2.5	5	9,600	92	.1969	.0039	8,000	61	.1969	.0031	6,400	37	.1969	.0020
3	6	8,000	92	.2362	.0047	6,600	61	.2362	.0035	5,300	37	.2362	.0024
4	8	6,000	94	.3150	.0063	5,000	63	.3150	.0047	4,000	38	.3150	.0031
5	10	4,800	94	.3937	.0079	4,000	63	.3937	.0059	3,200	38	.3937	.0039
6	12	4,000	90	.4724	.0094	3,300	59	.4724	.0071	2,700	36	.4724	.0047

	55~62HRC	62~66HRC	66~72HRC
Slant angle for helical boring	1°	0.5°	0.2°
Feed rate for helical boring	70% of side cutting conditions		

※Set the hole diameter for helical boring to between 1.6 and 2.0 times the tool diameter.

※Set the maximum depth for helical boring to the tool diameter or smaller (≤ 1DC).

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.



Inch

<Finishing>

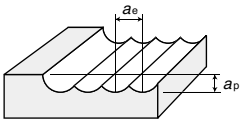
Work material		Tool steels (25 ～ 35HRC) P20				Pre-hardened steels (35 ～ 45HRC) P21				Hardened steels (45 ～ 55HRC) P21			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=900 SFM				Cutting speed v_c=820 SFM				Cutting speed v_c=690 SFM			
		n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)
0.5	**1**	**60,000**	128	.0008～.0020	.0008	**60,000**	117	.0008～.0020	.0008	**60,000**	106	.0008～.0020	.0008
0.75	**1.5**	**60,000**	191	.0008～.0028	.0012	**53,100**	155	.0008～.0028	.0012	**44,600**	119	.0008～.0028	.0012
1	**2**	**44,600**	190	.0008～.0039	.0016	**39,800**	155	.0008～.0039	.0016	**33,400**	119	.0008～.0039	.0016
1.25	**2.5**	**35,700**	198	.0020～.0047	.0020	**31,800**	162	.0020～.0047	.0020	**26,800**	124	.0020～.0047	.0020
1.5	**3**	**29,700**	198	.0020～.0059	.0024	**26,500**	162	.0020～.0059	.0024	**22,300**	124	.0020～.0059	.0024
2	**4**	**22,300**	200	.0020～.0079	.0031	**19,900**	164	.0020～.0079	.0031	**16,700**	125	.0020～.0079	.0031
2.5	**5**	**17,800**	204	.0020～.0098	.0039	**15,900**	167	.0020～.0098	.0039	**13,400**	128	.0020～.0098	.0039
3	**6**	**14,900**	205	.0020～.0118	.0047	**13,300**	168	.0020～.0118	.0047	**11,100**	127	.0020～.0118	.0047
4	**8**	**11,100**	210	.0020～.0157	.0063	**10,000**	173	.0020～.0157	.0063	**8,400**	132	.0020～.0157	.0063
5	**10**	**8,900**	210	.0020～.0197	.0079	**8,000**	173	.0020～.0197	.0079	**6,700**	132	.0020～.0197	.0079
6	**12**	**7,400**	199	.0020～.0236	.0094	**6,600**	163	.0020～.0236	.0094	**5,600**	126	.0020～.0236	.0094

Work material		Hardened steels (55 ～ 62HRC) D2, Powder steel				Hardened steels (62 ～ 66HRC) Powder steel				Hardened steels (66 ～ 72HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=525 SFM				Cutting speed v_c=460 SFM				Cutting speed v_c=395 SFM			
		n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)	n (min^{-1})	v_f (IPM)	a_p (inch)	a_e (inch)
0.5	**1**	**51,000**	72	.0008～.0020	.0008	**44,600**	51	.0008～.0020	.0008	**38,200**	37	.0008～.0020	.0008
0.75	**1.5**	**34,000**	72	.0008～.0028	.0012	**29,700**	51	.0008～.0028	.0012	**25,500**	37	.0008～.0028	.0012
1	**2**	**25,500**	72	.0008～.0039	.0016	**22,300**	51	.0008～.0039	.0016	**19,100**	37	.0008～.0039	.0016
1.25	**2.5**	**20,400**	76	.0020～.0047	.0020	**17,800**	54	.0020～.0047	.0020	**15,300**	39	.0020～.0047	.0020
1.5	**3**	**17,000**	76	.0020～.0059	.0024	**14,900**	54	.0020～.0059	.0024	**12,700**	39	.0020～.0059	.0024
2	**4**	**12,700**	76	.0020～.0079	.0031	**11,100**	54	.0020～.0079	.0031	**9,600**	39	.0020～.0079	.0031
2.5	**5**	**10,200**	78	.0020～.0098	.0039	**8,900**	55	.0020～.0098	.0039	**7,600**	40	.0020～.0098	.0039
3	**6**	**8,500**	78	.0020～.0118	.0047	**7,400**	55	.0020～.0118	.0047	**6,400**	40	.0020～.0118	.0047
4	**8**	**6,400**	81	.0020～.0157	.0063	**5,600**	57	.0020～.0157	.0063	**4,800**	42	.0020～.0157	.0063
5	**10**	**5,100**	80	.0020～.0197	.0079	**4,500**	57	.0020～.0197	.0079	**3,800**	41	.0020～.0197	.0079
6	**12**	**4,200**	76	.0020～.0236	.0094	**3,700**	54	.0020～.0236	.0094	**3,200**	39	.0020～.0236	.0094

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch High Hard Ball-TH3

EHHBE-TH3

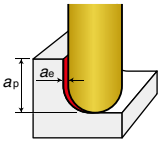


<Roughing>

For work materials with hardnesses up to 55HRC,
we recommend our company's 2-flute or 3-flute tool series.

Metric

Work material		Hardened steel (55~62HRC) D2, Powder steel				Hardened steel (62~66HRC) Powder steel				Hardened steel (66~72HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=110m/min				Cutting speed v_c=90m/min				Cutting speed v_c=70m/min			
		n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)
0.5	1	35,000	1,930	0.08	0.23	28,700	1,340	0.06	0.18	22,300	860	0.05	0.14
0.75	1.5	23,400	1,760	0.11	0.34	19,100	1,220	0.09	0.27	14,900	780	0.07	0.20
1	2	17,500	1,750	0.15	0.45	14,300	1,220	0.12	0.36	11,100	780	0.09	0.27
1.25	2.5	14,000	1,650	0.19	0.56	11,500	1,150	0.15	0.45	8,900	730	0.11	0.34
1.5	3	11,700	1,650	0.23	0.68	9,600	1,150	0.18	0.54	7,400	730	0.14	0.41
2	4	8,800	1,670	0.30	0.90	7,200	1,160	0.24	0.72	5,600	740	0.18	0.54
2.5	5	7,000	1,700	0.38	1.13	5,700	1,170	0.30	0.90	4,500	760	0.23	0.68
3	6	5,800	1,690	0.45	1.35	4,800	1,190	0.36	1.08	3,700	750	0.27	0.81
4	8	4,400	1,760	0.60	1.80	3,600	1,220	0.48	1.44	2,800	780	0.36	1.08
5	10	3,500	1,750	0.75	2.25	2,900	1,230	0.60	1.80	2,200	770	0.45	1.35
6	12	2,900	1,650	0.90	2.70	2,400	1,160	0.72	2.16	1,900	760	0.54	1.62



<Side Cutting>

For work materials with hardnesses up to 55HRC,
we recommend our company's 2-flute or 3-flute tool series.

Metric

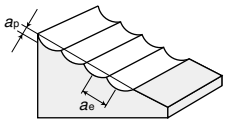
Work material		Hardened steel (55~62HRC) D2, Powder steel				Hardened steel (62~66HRC) Powder steel				Hardened steel (66~72HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=110m/min				Cutting speed v_c=90m/min				Cutting speed v_c=70m/min			
		n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)
0.5	1	47,800	2,630	1.00	0.02	39,800	1,750	1.00	0.02	31,800	1,050	1.00	0.01
0.75	1.5	31,800	2,390	1.50	0.03	26,500	1,590	1.50	0.02	21,200	950	1.50	0.02
1	2	23,900	2,390	2.00	0.04	19,900	1,590	2.00	0.03	15,900	950	2.00	0.02
1.25	2.5	19,100	2,240	2.50	0.05	15,900	1,490	2.50	0.04	12,700	900	2.50	0.03
1.5	3	15,900	2,240	3.00	0.06	13,300	1,500	3.00	0.05	10,600	900	3.00	0.03
2	4	11,900	2,260	4.00	0.08	10,000	1,520	4.00	0.06	8,000	910	4.00	0.04
2.5	5	9,600	2,330	5.00	0.10	8,000	1,550	5.00	0.08	6,400	930	5.00	0.05
3	6	8,000	2,330	6.00	0.12	6,600	1,540	6.00	0.09	5,300	930	6.00	0.06
4	8	6,000	2,400	8.00	0.16	5,000	1,600	8.00	0.12	4,000	960	8.00	0.08
5	10	4,800	2,400	10.00	0.20	4,000	1,600	10.00	0.15	3,200	960	10.00	0.10
6	12	4,000	2,280	12.00	0.24	3,300	1,500	12.00	0.18	2,700	920	12.00	0.12

	55~62HRC	62~66HRC	66~72HRC
Slant angle for helical boring	1°	0.5°	0.2°
Feed rate for helical boring	70% of side cutting conditions		

※Set the hole diameter for helical boring to between 1.6 and 2.0 times the tool diameter.
※Set the maximum depth for helical boring to the tool diameter or smaller (≤ 1DC).

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

<Finishing>



Metric

Work material		Tool steels (25 ~ 35HRC) P20				Pre-hardened steels (35 ~ 45HRC) P21				Hardened steels (45 ~ 55HRC) P21			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=280m/min				Cutting speed v_c=250m/min				Cutting speed v_c=210m/min			
		n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)
0.5	**1**	**60,000**	3,240	0.02~0.05	0.02	**60,000**	2,970	0.02~0.05	0.02	**60,000**	2,700	0.02~0.05	0.02
0.75	**1.5**	**60,000**	4,860	0.02~0.07	0.03	**53,100**	3,940	0.02~0.07	0.03	**44,600**	3,010	0.02~0.07	0.03
1	**2**	**44,600**	4,820	0.02~0.1	0.04	**39,800**	3,940	0.02~0.1	0.04	**33,400**	3,010	0.02~0.1	0.04
1.25	**2.5**	**35,700**	5,030	0.05~0.12	0.05	**31,800**	4,110	0.05~0.12	0.05	**26,800**	3,150	0.05~0.12	0.05
1.5	**3**	**29,700**	5,030	0.05~0.15	0.06	**26,500**	4,110	0.05~0.15	0.06	**22,300**	3,140	0.05~0.15	0.06
2	**4**	**22,300**	5,080	0.05~0.2	0.08	**19,900**	4,160	0.05~0.2	0.08	**16,700**	3,170	0.05~0.2	0.08
2.5	**5**	**17,800**	5,180	0.05~0.25	0.1	**15,900**	4,240	0.05~0.25	0.1	**13,400**	3,250	0.05~0.25	0.10
3	**6**	**14,900**	5,200	0.05~0.3	0.12	**13,300**	4,260	0.05~0.3	0.12	**11,100**	3,230	0.05~0.3	0.12
4	**8**	**11,100**	5,330	0.05~0.4	0.16	**10,000**	4,400	0.05~0.4	0.16	**8,400**	3,360	0.05~0.4	0.16
5	**10**	**8,900**	5,340	0.05~0.5	0.2	**8,000**	4,400	0.05~0.5	0.2	**6,700**	3,350	0.05~0.5	0.20
6	**12**	**7,400**	5,060	0.05~0.6	0.24	**6,600**	4,140	0.05~0.6	0.24	**5,600**	3,190	0.05~0.6	0.24

Work material		Hardened steels (55 ~ 62HRC) D2, Powder steel				Hardened steels (62 ~ 66HRC) Powder steel				Hardened steels (66 ~ 72HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Cutting speed v_c=160m/min				Cutting speed v_c=140m/min				Cutting speed v_c=120m/min			
		n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	v_f (mm/min)	a_p (mm)	a_e (mm)
0.5	**1**	**51,000**	1,840	0.02~0.05	0.02	**44,600**	1,300	0.02~0.05	0.02	**38,200**	950	0.02~0.05	0.02
0.75	**1.5**	**34,000**	1,840	0.02~0.07	0.03	**29,700**	1,300	0.02~0.07	0.03	**25,500**	950	0.02~0.07	0.03
1	**2**	**25,500**	1,840	0.02~0.1	0.04	**22,300**	1,300	0.02~0.1	0.04	**19,100**	950	0.02~0.1	0.04
1.25	**2.5**	**20,400**	1,920	0.05~0.12	0.05	**17,800**	1,360	0.05~0.12	0.05	**15,300**	990	0.05~0.12	0.05
1.5	**3**	**17,000**	1,920	0.05~0.15	0.06	**14,900**	1,370	0.05~0.15	0.06	**12,700**	980	0.05~0.15	0.06
2	**4**	**12,700**	1,930	0.05~0.2	0.08	**11,100**	1,370	0.05~0.2	0.08	**9,600**	1,000	0.05~0.2	0.08
2.5	**5**	**10,200**	1,980	0.05~0.25	0.10	**8,900**	1,400	0.05~0.25	0.10	**7,600**	1,010	0.05~0.25	0.10
3	**6**	**8,500**	1,980	0.05~0.3	0.12	**7,400**	1,400	0.05~0.3	0.12	**6,400**	1,020	0.05~0.3	0.12
4	**8**	**6,400**	2,050	0.05~0.4	0.16	**5,600**	1,460	0.05~0.4	0.16	**4,800**	1,060	0.05~0.4	0.16
5	**10**	**5,100**	2,040	0.05~0.5	0.20	**4,500**	1,460	0.05~0.5	0.20	**3,800**	1,050	0.05~0.5	0.20
6	**12**	**4,200**	1,920	0.05~0.6	0.24	**3,700**	1,370	0.05~0.6	0.24	**3,200**	1,000	0.05~0.6	0.24

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use as highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

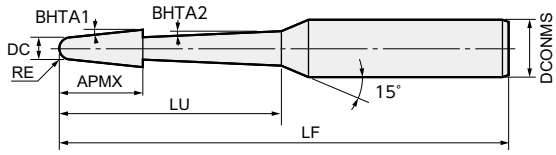
Taper Ball End Mill for High Accuracy Rib Slotting

YouTube

Taper ball | Finishing | Miniature Rib

RE tolerance ±0.02mm | h5

New proposal for machining rib groove. From electric discharge machining to direct milling.



Tip : 2 flutes
Periphery : 4 flutes

EB4HR○○○○TN-○○-○○-ATH

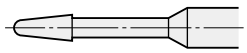
Carbide | ATH | Helix angle 40° | Cutting Conditions A126

Item code	Stock	Size (mm)							Neck shape	Neck angle θn (°)
		Ball radius	Tool dia.	Taper angle on side	Under neck length	Flute length	Overall length	Shank dia.		
		RE	DC	BHTA1	LU	APMX	LF	DCONMS		BHTA2
EB4HR0060TN-4-05-ATH	★	0.3	0.6	0.5	4	3.2	50	4	A	-
EB4HR0060TN-5-05-ATH	★	0.3	0.6	0.5	5	3.2	50	4	A	-
EB4HR0060TN-6-05-ATH	★	0.3	0.6	0.5	6	3.2	50	4	A	-
EB4HR0060TN-7-05-ATH	★	0.3	0.6	0.5	7	3.2	50	4	B	0.5
EB4HR0060TN-8-05-ATH	★	0.3	0.6	0.5	8	3.2	50	4	B	0.5
EB4HR0060TN-9-05-ATH	★	0.3	0.6	0.5	9	3.2	50	4	B	0.5
EB4HR0060TN-10-05-ATH	★	0.3	0.6	0.5	10	3.2	50	4	B	0.5
EB4HR0060TN-4-10-ATH	★	0.3	0.6	1	4	3.2	50	4	A	-
EB4HR0060TN-5-10-ATH	★	0.3	0.6	1	5	3.2	50	4	A	-
EB4HR0060TN-6-10-ATH	★	0.3	0.6	1	6	3.2	50	4	A	-
EB4HR0060TN-7-10-ATH	★	0.3	0.6	1	7	3.2	50	4	B	1
EB4HR0060TN-8-10-ATH	★	0.3	0.6	1	8	3.2	50	4	B	1
EB4HR0060TN-9-10-ATH	★	0.3	0.6	1	9	3.2	50	4	B	1
EB4HR0060TN-10-10-ATH	★	0.3	0.6	1	10	3.2	50	4	B	1
EB4HR0070TN-4-05-ATH	★	0.35	0.7	0.5	4	3.2	50	4	A	-
EB4HR0070TN-5-05-ATH	★	0.35	0.7	0.5	5	3.2	50	4	A	-
EB4HR0070TN-6-05-ATH	★	0.35	0.7	0.5	6	3.2	50	4	A	-
EB4HR0070TN-7-05-ATH	★	0.35	0.7	0.5	7	3.2	50	4	B	0.5
EB4HR0070TN-8-05-ATH	★	0.35	0.7	0.5	8	3.2	50	4	B	0.5
EB4HR0070TN-9-05-ATH	★	0.35	0.7	0.5	9	3.2	50	4	B	0.5
EB4HR0070TN-10-05-ATH	★	0.35	0.7	0.5	10	3.2	50	4	B	0.5
EB4HR0070TN-4-10-ATH	★	0.35	0.7	1	4	3.2	50	4	A	-
EB4HR0070TN-5-10-ATH	★	0.35	0.7	1	5	3.2	50	4	A	-
EB4HR0070TN-6-10-ATH	★	0.35	0.7	1	6	3.2	50	4	A	-
EB4HR0070TN-7-10-ATH	★	0.35	0.7	1	7	3.2	50	4	B	1
EB4HR0070TN-8-10-ATH	★	0.35	0.7	1	8	3.2	50	4	B	1
EB4HR0070TN-9-10-ATH	★	0.35	0.7	1	9	3.2	50	4	B	1
EB4HR0070TN-10-10-ATH	★	0.35	0.7	1	10	3.2	50	4	B	1
EB4HR0080TN-4-05-ATH	★	0.4	0.8	0.5	4	3.2	50	4	A	-
EB4HR0080TN-6-05-ATH	★	0.4	0.8	0.5	6	3.2	50	4	A	-
EB4HR0080TN-8-05-ATH	★	0.4	0.8	0.5	8	3.2	50	4	B	0.5
EB4HR0080TN-10-05-ATH	★	0.4	0.8	0.5	10	3.2	50	4	B	0.5
EB4HR0080TN-12-05-ATH	★	0.4	0.8	0.5	12	3.2	55	4	B	0.5
EB4HR0080TN-14-05-ATH	★	0.4	0.8	0.5	14	3.2	55	4	B	0.5
EB4HR0080TN-4-10-ATH	★	0.4	0.8	1	4	3.2	50	4	A	-
EB4HR0080TN-6-10-ATH	★	0.4	0.8	1	6	3.2	50	4	A	-
EB4HR0080TN-8-10-ATH	★	0.4	0.8	1	8	3.2	50	4	B	1
EB4HR0080TN-10-10-ATH	★	0.4	0.8	1	10	3.2	50	4	B	1
EB4HR0080TN-12-10-ATH	★	0.4	0.8	1	12	3.2	55	4	B	1
EB4HR0080TN-14-10-ATH	★	0.4	0.8	1	14	3.2	55	4	B	1
EB4HR0090TN-4-05-ATH	★	0.45	0.9	0.5	4	3.2	50	4	A	-
EB4HR0090TN-6-05-ATH	★	0.45	0.9	0.5	6	3.2	50	4	A	-
EB4HR0090TN-8-05-ATH	★	0.45	0.9	0.5	8	3.2	50	4	B	0.5
EB4HR0090TN-10-05-ATH	★	0.45	0.9	0.5	10	3.2	50	4	B	0.5
EB4HR0090TN-12-05-ATH	★	0.45	0.9	0.5	12	3.2	55	4	B	0.5
EB4HR0090TN-14-05-ATH	★	0.45	0.9	0.5	14	3.2	55	4	B	0.5
EB4HR0090TN-4-10-ATH	★	0.45	0.9	1	4	3.2	50	4	A	-
EB4HR0090TN-6-10-ATH	★	0.45	0.9	1	6	3.2	50	4	A	-
EB4HR0090TN-8-10-ATH	★	0.45	0.9	1	8	3.2	50	4	B	1
EB4HR0090TN-10-10-ATH	★	0.45	0.9	1	10	3.2	50	4	B	1
EB4HR0090TN-12-10-ATH	★	0.45	0.9	1	12	3.2	55	4	B	1
EB4HR0090TN-14-10-ATH	★	0.45	0.9	1	14	3.2	55	4	B	1

★ : Inventory maintained in Japan

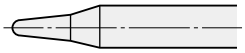
■ Detail of neck shape

Neck shape A
Straight neck



Neck shape B
Taper neck

Neck shape C
Without neck



EB4HR○○○○TN-○○-○○-ATH

Item code	Stock	Size (mm)							Neck shape	Neck angle θn (°)
		Ball radius	Tool dia.	Taper angle on side	Under neck length	Flute length	Overall length	Shank dia.		
		RE	DC	BHTA1	LU	APMX	LF	DCONMS		BHTA2
EB4HR0100TN-4-05-ATH	★	0.5	1	0.5	4	4	50	4	C	-
EB4HR0100TN-6-05-ATH	★	0.5	1	0.5	6	4	50	4	A	-
EB4HR0100TN-8-05-ATH	★	0.5	1	0.5	8	4	50	4	B	0.5
EB4HR0100TN-10-05-ATH	★	0.5	1	0.5	10	4	50	4	B	0.5
EB4HR0100TN-12-05-ATH	★	0.5	1	0.5	12	4	55	4	B	0.5
EB4HR0100TN-14-05-ATH	★	0.5	1	0.5	14	4	55	4	B	0.5
EB4HR0100TN-16-05-ATH	★	0.5	1	0.5	16	4	55	4	B	0.5
EB4HR0100TN-18-05-ATH	★	0.5	1	0.5	18	4	60	4	B	0.5
EB4HR0100TN-20-05-ATH	★	0.5	1	0.5	20	4	60	4	B	0.5
EB4HR0100TN-4-10-ATH	★	0.5	1	1	4	4	50	4	C	-
EB4HR0100TN-6-10-ATH	★	0.5	1	1	6	4	50	4	A	-
EB4HR0100TN-8-10-ATH	★	0.5	1	1	8	4	50	4	B	1
EB4HR0100TN-10-10-ATH	★	0.5	1	1	10	4	50	4	B	1
EB4HR0100TN-12-10-ATH	★	0.5	1	1	12	4	55	4	B	1
EB4HR0100TN-14-10-ATH	★	0.5	1	1	14	4	55	4	B	1
EB4HR0100TN-16-10-ATH	★	0.5	1	1	16	4	55	4	B	1
EB4HR0100TN-18-10-ATH	★	0.5	1	1	18	4	60	4	B	1
EB4HR0100TN-20-10-ATH	★	0.5	1	1	20	4	60	4	B	1
EB4HR0110TN-4-05-ATH	★	0.55	1.1	0.5	4	4	50	4	C	-
EB4HR0110TN-6-05-ATH	★	0.55	1.1	0.5	6	4	50	4	A	-
EB4HR0110TN-8-05-ATH	★	0.55	1.1	0.5	8	4	50	4	B	0.5
EB4HR0110TN-10-05-ATH	★	0.55	1.1	0.5	10	4	50	4	B	0.5
EB4HR0110TN-12-05-ATH	★	0.55	1.1	0.5	12	4	55	4	B	0.5
EB4HR0110TN-14-05-ATH	★	0.55	1.1	0.5	14	4	55	4	B	0.5
EB4HR0110TN-16-05-ATH	★	0.55	1.1	0.5	16	4	55	4	B	0.5
EB4HR0110TN-18-05-ATH	★	0.55	1.1	0.5	18	4	60	4	B	0.5
EB4HR0110TN-20-05-ATH	★	0.55	1.1	0.5	20	4	60	4	B	0.5
EB4HR0110TN-4-10-ATH	★	0.55	1.1	1	4	4	50	4	C	-
EB4HR0110TN-6-10-ATH	★	0.55	1.1	1	6	4	50	4	A	-
EB4HR0110TN-8-10-ATH	★	0.55	1.1	1	8	4	50	4	B	1
EB4HR0110TN-10-10-ATH	★	0.55	1.1	1	10	4	50	4	B	1
EB4HR0110TN-12-10-ATH	★	0.55	1.1	1	12	4	55	4	B	1
EB4HR0110TN-14-10-ATH	★	0.55	1.1	1	14	4	55	4	B	1
EB4HR0110TN-16-10-ATH	★	0.55	1.1	1	16	4	55	4	B	1
EB4HR0110TN-18-10-ATH	★	0.55	1.1	1	18	4	60	4	B	1
EB4HR0110TN-20-10-ATH	★	0.55	1.1	1	20	4	60	4	B	1
EB4HR0120TN-6-05-ATH	★	0.6	1.2	0.5	6	4.8	50	4	A	-
EB4HR0120TN-8-05-ATH	★	0.6	1.2	0.5	8	4.8	50	4	B	0.5
EB4HR0120TN-10-05-ATH	★	0.6	1.2	0.5	10	4.8	50	4	B	0.5
EB4HR0120TN-12-05-ATH	★	0.6	1.2	0.5	12	4.8	55	4	B	0.5
EB4HR0120TN-14-05-ATH	★	0.6	1.2	0.5	14	4.8	55	4	B	0.5
EB4HR0120TN-16-05-ATH	★	0.6	1.2	0.5	16	4.8	55	4	B	0.5
EB4HR0120TN-18-05-ATH	★	0.6	1.2	0.5	18	4.8	60	4	B	0.5
EB4HR0120TN-20-05-ATH	★	0.6	1.2	0.5	20	4.8	60	4	B	0.5
EB4HR0120TN-22-05-ATH	★	0.6	1.2	0.5	22	4.8	60	4	B	0.5
EB4HR0120TN-24-05-ATH	★	0.6	1.2	0.5	24	4.8	60	4	B	0.5
EB4HR0120TN-6-10-ATH	★	0.6	1.2	1	6	4.8	50	4	A	-
EB4HR0120TN-8-10-ATH	★	0.6	1.2	1	8	4.8	50	4	B	1
EB4HR0120TN-10-10-ATH	★	0.6	1.2	1	10	4.8	50	4	B	1
EB4HR0120TN-12-10-ATH	★	0.6	1.2	1	12	4.8	55	4	B	1
EB4HR0120TN-14-10-ATH	★	0.6	1.2	1	14	4.8	55	4	B	1
EB4HR0120TN-16-10-ATH	★	0.6	1.2	1	16	4.8	55	4	B	1
EB4HR0120TN-18-10-ATH	★	0.6	1.2	1	18	4.8	60	4	B	1
EB4HR0120TN-20-10-ATH	★	0.6	1.2	1	20	4.8	60	4	B	1
EB4HR0120TN-22-10-ATH	★	0.6	1.2	1	22	4.8	60	4	B	1
EB4HR0120TN-24-10-ATH	★	0.6	1.2	1	24	4.8	60	4	B	1

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎	◎						

Taper Ball End Mill for High Accuracy Rib Slotting

Recommended cutting conditions EB4HR-ATH

<Roughing> Inch

Work material				1		2		3		4	
				Carbon steel, Alloy steel (180~250HB)		Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened Steel (45~55HRC)	
Ratio to standard depth of cut				100%		90%		80%		65%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
0.3	0.6	4	.0009	36,000	41	32,400	36	30,600	30	27,000	24
	0.6	5	.0008	36,000	38	32,400	35	30,600	28	27,000	23
	0.6	6	.0006	36,000	38	32,400	35	30,600	28	27,000	23
	0.6	7	.0003	32,000	32	28,800	29	27,200	24	24,000	19
	0.6	8	.0003	32,000	32	28,800	29	27,200	24	24,000	19
	0.6	9	.0002	32,000	32	28,800	29	27,200	24	24,000	19
	0.6	10	.0002	28,000	28	25,200	25	23,800	21	21,000	17
0.35	0.7	4	.0013	36,000	44	32,400	40	30,600	33	27,000	27
	0.7	5	.0012	36,000	44	32,400	40	30,600	33	27,000	27
	0.7	6	.0011	36,000	42	32,400	38	30,600	31	27,000	26
	0.7	7	.0008	32,000	33	28,800	30	27,200	25	24,000	20
	0.7	8	.0004	32,000	33	28,800	30	27,200	25	24,000	20
	0.7	9	.0003	32,000	33	28,800	30	27,200	25	24,000	20
	0.7	10	.0002	28,000	29	25,200	26	23,800	22	21,000	18
0.4	0.8	4	.0014	40,000	57	36,000	51	34,000	43	30,000	35
	0.8	6	.0013	36,000	46	32,400	41	30,600	35	27,000	29
	0.8	8	.0008	32,000	41	28,800	37	27,200	31	24,000	26
	0.8	10	.0004	32,000	39	28,800	35	27,200	29	24,000	24
	0.8	12	.0003	32,000	39	28,800	35	27,200	29	24,000	24
	0.8	14	.0002	28,000	34	25,200	30	23,816	26	21,000	21
0.45	0.9	4	.0018	38,000	64	34,200	57	32,300	47	28,500	39
	0.9	6	.0017	34,200	52	30,800	46	29,100	39	25,700	32
	0.9	8	.0012	30,400	46	27,400	41	25,800	35	22,800	28
	0.9	10	.0008	30,400	46	27,400	41	25,800	35	22,800	28
	0.9	12	.0004	30,400	46	27,400	41	25,800	35	22,800	28
	0.9	14	.0003	26,000	39	23,500	35	22,100	30	19,500	24
0.5	1	4	.0016	32,400	57	29,200	52	27,500	44	24,300	36
	1	6	.0016	32,400	57	29,200	52	27,500	44	24,300	36
	1	8	.0016	32,400	57	29,200	52	27,500	44	24,300	36
	1	10	.0010	32,400	57	29,200	52	27,500	44	24,300	36
	1	12	.0005	28,800	48	25,900	43	24,500	37	21,600	30
	1	14	.0004	28,800	48	25,900	43	24,500	37	21,600	30
	1	16	.0003	28,800	48	25,900	43	24,500	37	21,600	30
	1	18	.0002	25,200	40	22,700	36	21,400	30	18,900	25
	1	20	.0002	21,600	34	19,400	31	18,400	26	16,200	21
0.55	1.1	4	.0016	30,600	58	27,500	52	26,000	43	23,000	36
	1.1	6	.0016	30,600	58	27,500	52	26,000	43	23,000	36
	1.1	8	.0016	30,600	58	27,500	52	26,000	43	23,000	36
	1.1	10	.0010	30,600	58	27,500	52	26,000	43	23,000	36
	1.1	12	.0008	27,200	49	24,500	44	23,100	36	20,400	30
	1.1	14	.0006	27,200	49	24,500	44	23,100	36	20,400	30
	1.1	16	.0004	27,200	49	24,500	44	23,100	36	20,400	30
	1.1	18	.0003	23,800	40	21,400	36	20,200	30	17,800	25
	1.1	20	.0002	20,400	34	18,300	31	17,300	25	15,200	21
0.6	1.2	6	.0024	28,800	59	25,900	53	24,500	43	21,600	37
	1.2	8	.0016	28,800	59	25,900	53	24,500	43	21,600	37
	1.2	10	.0014	28,800	56	25,900	48	24,500	43	21,600	34
	1.2	12	.0012	28,800	53	25,900	48	24,500	43	21,600	34
	1.2	14	.0010	24,600	45	22,200	41	21,000	37	18,500	29
	1.2	16	.0008	24,600	45	22,200	41	21,000	37	18,500	29
	1.2	18	.0006	24,600	45	22,200	41	21,000	37	18,500	29
	1.2	20	.0004	21,000	39	19,000	35	18,000	32	15,900	25
	1.2	22	.0004	21,000	39	19,000	35	18,000	32	15,900	25
	1.2	24	.0003	21,000	39	19,000	35	18,000	32	15,900	25

<Finishing> Inch

Work material				1		2		3		4	
				Carbon steel, Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened Steel (45～55HRC)	
Ratio to standard depth of cut				100%		90%		80%		65%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (inch)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
0.3	0.6	4	.001	18,000	41	16,200	36	15,300	30	13,500	24
	0.6	5	.001	18,000	38	16,200	35	15,300	28	13,500	23
	0.6	6	.001	18,000	38	16,200	35	15,300	28	13,500	23
	0.6	7	.001	16,000	32	14,400	29	13,600	24	12,000	19
	0.6	8	.001	16,000	32	14,400	29	13,600	24	12,000	19
	0.6	9	.001	16,000	32	14,400	29	13,600	24	12,000	19
	0.6	10	.001	14,000	28	12,600	25	11,900	21	10,500	17
0.35	0.7	4	.001	18,000	44	16,200	40	15,300	33	13,500	27
	0.7	5	.001	18,000	44	16,200	40	15,300	33	13,500	27
	0.7	6	.001	18,000	42	16,200	38	15,300	31	13,500	26
	0.7	7	.001	16,000	33	14,400	30	13,600	25	12,000	20
	0.7	8	.001	16,000	33	14,400	30	13,600	25	12,000	20
	0.7	9	.001	16,000	33	14,400	30	13,600	25	12,000	20
	0.7	10	.001	14,000	29	12,600	26	11,900	22	10,500	18
0.4	0.8	4	.001	20,000	57	18,000	51	17,000	43	15,000	35
	0.8	6	.001	18,000	46	16,200	41	15,300	35	13,500	29
	0.8	8	.001	16,000	41	14,400	37	13,600	31	12,000	26
	0.8	10	.001	16,000	39	14,400	35	13,600	29	12,000	24
	0.8	12	.001	16,000	39	14,400	35	13,600	29	12,000	24
	0.8	14	.001	14,000	34	12,600	30	11,900	26	10,500	21
0.45	0.9	4	.001	19,000	64	17,100	57	16,200	48	14,300	39
	0.9	6	.001	17,100	52	15,400	46	14,600	39	12,900	32
	0.9	8	.001	15,200	46	13,700	41	12,900	35	11,400	28
	0.9	10	.001	15,200	46	13,700	41	12,900	35	11,400	28
	0.9	12	.001	15,200	46	13,700	41	12,900	35	11,400	28
	0.9	14	.001	13,000	39	11,800	35	11,100	30	9,800	24
0.5	1	4	.001	16,200	57	14,600	52	13,800	44	12,200	36
	1	6	.001	16,200	57	14,600	52	13,800	44	12,200	36
	1	8	.001	16,200	57	14,600	52	13,800	44	12,200	36
	1	10	.001	16,200	57	14,600	52	13,800	44	12,200	36
	1	12	.001	14,400	48	13,000	43	12,300	37	10,800	30
	1	14	.001	14,400	48	13,000	43	12,300	37	10,800	30
	1	16	.001	14,400	48	13,000	43	12,300	37	10,800	30
	1	18	.001	12,600	40	11,400	35	10,700	30	9,500	25
	1	20	.001	10,800	34	9,700	31	9,200	26	8,100	21
0.55	1.1	4	.001	15,300	58	13,800	52	13,000	43	11,500	36
	1.1	6	.001	15,300	58	13,800	52	13,000	43	11,500	36
	1.1	8	.001	15,300	58	13,800	52	13,000	43	11,500	36
	1.1	10	.001	15,300	58	13,800	52	13,000	43	11,500	36
	1.1	12	.001	13,600	49	12,300	44	11,600	36	10,200	30
	1.1	14	.001	13,600	49	12,300	44	11,600	36	10,200	30
	1.1	16	.001	13,600	49	12,300	44	11,600	36	10,200	30
	1.1	18	.001	11,900	40	10,700	36	10,100	30	8,900	25
	1.1	20	.001	10,200	34	9,200	31	8,700	25	7,600	21
0.6	1.2	6	.002	14,400	59	13,000	53	12,300	43	10,800	37
	1.2	8	.002	14,400	59	13,000	53	12,300	43	10,800	37
	1.2	10	.002	14,400	55	13,000	48	12,300	43	10,800	34
	1.2	12	.002	14,400	53	13,000	48	12,300	43	10,800	34
	1.2	14	.002	12,300	45	11,100	41	10,500	37	9,300	29
	1.2	16	.002	12,300	45	11,100	41	10,500	37	9,300	29
	1.2	18	.002	12,300	45	11,100	41	10,500	37	9,300	29
	1.2	20	.002	10,500	39	9,500	35	9,000	32	8,000	25
	1.2	22	.002	10,500	39	9,500	35	9,000	32	8,000	25
	1.2	24	.002	10,500	39	9,500	35	9,000	32	8,000	25

【Note】 ①a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
②Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example : When finishing in pre-hardened steel with EB4HR0100TN-10-05-ATH.
Cutting depth = .032(a_p)×.8(Cutting depth factor for group 3 pre-hardened steel) = .0256mm

③Use the water or oil based coolant for the work material and machining shape.
④These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
⑤If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Taper Ball End Mill for High Accuracy Rib Slotting

EB4HR-ATH

<Roughing> Metric

Work material				1		2		3		4	
				Carbon steel, Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened Steel (45～55HRC)	
Ratio to standard depth of cut				100%		90%		80%		65%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
0.3	0.6	4	0.024	36,000	1,030	32,400	920	30,600	760	27,000	610
	0.6	5	0.020	36,000	970	32,400	880	30,600	720	27,000	580
	0.6	6	0.015	36,000	970	32,400	880	30,600	720	27,000	580
	0.6	7	0.008	32,000	820	28,800	730	27,200	600	24,000	490
	0.6	8	0.008	32,000	820	28,800	730	27,200	600	24,000	490
	0.6	9	0.006	32,000	820	28,800	730	27,200	600	24,000	490
	0.6	10	0.005	28,000	710	25,200	640	23,800	530	21,000	430
0.35	0.7	4	0.034	36,000	1,130	32,400	1,020	30,600	840	27,000	690
	0.7	5	0.030	36,000	1,130	32,400	1,020	30,600	840	27,000	690
	0.7	6	0.027	36,000	1,070	32,400	960	30,600	800	27,000	650
	0.7	7	0.020	32,000	840	28,800	760	27,200	630	24,000	520
	0.7	8	0.010	32,000	840	28,800	760	27,200	630	24,000	520
	0.7	9	0.008	32,000	840	28,800	760	27,200	630	24,000	520
	0.7	10	0.005	28,000	740	25,200	670	23,800	550	21,000	460
0.4	0.8	4	0.035	40,000	1,440	36,000	1,300	34,000	1,090	30,000	900
	0.8	6	0.032	36,000	1,170	32,400	1,050	30,600	880	27,000	730
	0.8	8	0.020	32,000	1,040	28,800	930	27,200	780	24,000	650
	0.8	10	0.010	32,000	980	28,800	880	27,200	740	24,000	610
	0.8	12	0.008	32,000	980	28,800	880	27,200	740	24,000	610
	0.8	14	0.005	28,000	860	25,200	770	23,816	650	21,000	530
0.45	0.9	4	0.045	38,000	1,620	34,200	1,460	32,300	1,200	28,500	1,000
	0.9	6	0.042	34,200	1,310	30,800	1,180	29,100	980	25,700	810
	0.9	8	0.030	30,400	1,170	27,400	1,050	25,800	880	22,800	720
	0.9	10	0.020	30,400	1,170	27,400	1,050	25,800	880	22,800	720
	0.9	12	0.010	30,400	1,170	27,400	1,050	25,800	880	22,800	720
	0.9	14	0.008	26,000	1,000	23,500	900	22,100	750	19,500	620
0.5	1	4	0.040	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	6	0.040	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	8	0.040	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	10	0.025	32,400	1,460	29,200	1,310	27,500	1,120	24,300	920
	1	12	0.013	28,800	1,220	25,900	1,100	24,500	940	21,600	770
	1	14	0.010	28,800	1,220	25,900	1,100	24,500	940	21,600	770
	1	16	0.008	28,800	1,220	25,900	1,100	24,500	940	21,600	770
	1	18	0.006	25,200	1,010	22,700	910	21,400	770	18,900	640
	1	20	0.005	21,600	860	19,400	780	18,400	660	16,200	540
0.55	1.1	4	0.040	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	6	0.040	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	8	0.040	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	10	0.025	30,600	1,480	27,500	1,330	26,000	1,090	23,000	920
	1.1	12	0.020	27,200	1,240	24,500	1,110	23,100	920	20,400	770
	1.1	14	0.015	27,200	1,240	24,500	1,110	23,100	920	20,400	770
	1.1	16	0.010	27,200	1,240	24,500	1,110	23,100	920	20,400	770
	1.1	18	0.008	23,800	1,020	21,400	910	20,200	750	17,800	630
	1.1	20	0.005	20,400	870	18,300	780	17,300	640	15,200	540
0.6	1.2	6	0.060	28,800	1,500	25,900	1,350	24,500	1,100	21,600	950
	1.2	8	0.040	28,800	1,500	25,900	1,350	24,500	1,100	21,600	950
	1.2	10	0.035	28,800	1,420	25,900	1,210	24,500	1,100	21,600	860
	1.2	12	0.030	28,800	1,350	25,900	1,210	24,500	1,100	21,600	860
	1.2	14	0.025	24,600	1,150	22,200	1,040	21,000	940	18,500	730
	1.2	16	0.020	24,600	1,150	22,200	1,040	21,000	940	18,500	730
	1.2	18	0.015	24,600	1,150	22,200	1,040	21,000	940	18,500	730
	1.2	20	0.010	21,000	990	19,000	890	18,000	810	15,900	630
	1.2	22	0.010	21,000	990	19,000	890	18,000	810	15,900	630
	1.2	24	0.008	21,000	990	19,000	890	18,000	810	15,900	630

<Finishing> Metric

Work material				1		2		3		4	
				Carbon steel, Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened Steel (45～55HRC)	
Ratio to standard depth of cut				100%		90%		80%		65%	
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
0.3	0.6	4	0.023	18,000	1,030	16,200	920	15,300	760	13,500	620
	0.6	5	0.023	18,000	970	16,200	880	15,300	720	13,500	580
	0.6	6	0.020	18,000	970	16,200	880	15,300	720	13,500	580
	0.6	7	0.020	16,000	820	14,400	730	13,600	600	12,000	490
	0.6	8	0.020	16,000	820	14,400	730	13,600	600	12,000	490
	0.6	9	0.020	16,000	820	14,400	730	13,600	600	12,000	490
	0.6	10	0.020	14,000	710	12,600	640	11,900	530	10,500	430
0.35	0.7	4	0.023	18,000	1,130	16,200	1,020	15,300	840	13,500	690
	0.7	5	0.023	18,000	1,130	16,200	1,020	15,300	840	13,500	690
	0.7	6	0.020	18,000	1,070	16,200	960	15,300	790	13,500	650
	0.7	7	0.020	16,000	840	14,400	760	13,600	630	12,000	520
	0.7	8	0.020	16,000	840	14,400	760	13,600	630	12,000	520
	0.7	9	0.020	16,000	840	14,400	760	13,600	630	12,000	520
	0.7	10	0.020	14,000	740	12,600	670	11,900	550	10,500	460
0.4	0.8	4	0.028	20,000	1,440	18,000	1,300	17,000	1,090	15,000	900
	0.8	6	0.028	18,000	1,170	16,200	1,050	15,300	880	13,500	730
	0.8	8	0.025	16,000	1,040	14,400	930	13,600	780	12,000	650
	0.8	10	0.025	16,000	980	14,400	880	13,600	740	12,000	610
	0.8	12	0.025	16,000	980	14,400	880	13,600	740	12,000	610
	0.8	14	0.025	14,000	860	12,600	770	11,900	650	10,500	530
0.45	0.9	4	0.028	19,000	1,620	17,100	1,460	16,200	1,220	14,300	1,000
	0.9	6	0.028	17,100	1,310	15,400	1,180	14,600	980	12,900	810
	0.9	8	0.025	15,200	1,170	13,700	1,050	12,900	880	11,400	720
	0.9	10	0.025	15,200	1,170	13,700	1,050	12,900	880	11,400	720
	0.9	12	0.025	15,200	1,170	13,700	1,050	12,900	880	11,400	720
	0.9	14	0.025	13,000	1,000	11,800	900	11,100	750	9,800	620
0.5	1	4	0.035	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	6	0.035	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	8	0.035	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	10	0.032	16,200	1,460	14,600	1,310	13,800	1,120	12,200	920
	1	12	0.032	14,400	1,220	13,000	1,100	12,300	940	10,800	770
	1	14	0.032	14,400	1,220	13,000	1,100	12,300	940	10,800	770
	1	16	0.032	14,400	1,220	13,000	1,100	12,300	940	10,800	770
	1	18	0.030	12,600	1,010	11,400	900	10,700	770	9,500	640
	1	20	0.030	10,800	860	9,700	780	9,200	660	8,100	540
0.55	1.1	4	0.035	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	6	0.035	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	8	0.035	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	10	0.032	15,300	1,480	13,800	1,330	13,000	1,090	11,500	920
	1.1	12	0.032	13,600	1,240	12,300	1,110	11,600	920	10,200	770
	1.1	14	0.032	13,600	1,240	12,300	1,110	11,600	920	10,200	770
	1.1	16	0.032	13,600	1,240	12,300	1,110	11,600	920	10,200	770
	1.1	18	0.030	11,900	1,020	10,700	910	10,100	750	8,900	630
	1.1	20	0.030	10,200	870	9,200	780	8,700	640	7,600	540
0.6	1.2	6	0.043	14,400	1,500	13,000	1,350	12,300	1,100	10,800	950
	1.2	8	0.043	14,400	1,500	13,000	1,350	12,300	1,100	10,800	950
	1.2	10	0.043	14,400	1,400	13,000	1,210	12,300	1,100	10,800	860
	1.2	12	0.040	14,400	1,350	13,000	1,210	12,300	1,100	10,800	860
	1.2	14	0.040	12,300	1,150	11,100	1,040	10,500	940	9,300	730
	1.2	16	0.040	12,300	1,150	11,100	1,040	10,500	940	9,300	730
	1.2	18	0.040	12,300	1,150	11,100	1,040	10,500	940	9,300	730
	1.2	20	0.037	10,500	990	9,500	890	9,000	810	8,000	630
	1.2	22	0.037	10,500	990	9,500	890	9,000	810	8,000	630
	1.2	24	0.037	10,500	990	9,500	890	9,000	810	8,000	630

【Note】 ①a_p is shown as the criteria for Group 1 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
②Adjust by setting a_e to (3 to 5)×(a_p)×(cutting depth ratio). When performing finishing processing, calculate the theoretical cusp height and set accordingly.

Cutting depth setting example : When finishing in pre-hardened steel with EB4HR0100TN-10-05-ATH.
Cutting depth = 0.032(a_p)×0.8(Cutting depth factor for group 3 pre-hardened steel) = 0.0256mm

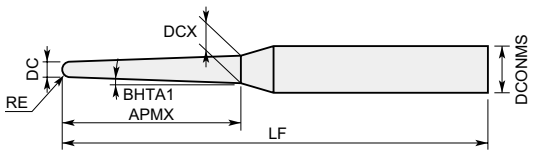
③Use the water or oil based coolant for the work material and machining shape.
④These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
⑤If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Combination Rib Ball

Taper ball | Miniature | Finishing | Miniature Rib

Dia. tolerance ±0.02mm | h5

Tip 2 futes
Periphery 4 flutes



ECRB○○○○-○○-PN

Carbide | PN | Helix angle 25° | Cutting Conditions A131

Item code	Stock	Size (mm)						Taper angle on side
		Ball radius	Tool dia.	Large edge dia.	Flute length	Shank dia.	Overall length	
		RE	DC	DCX	APMX	DCONMS	LF	BHTA1
ECRB0809-6-PN	★	0.4	**0.8**	**0.9**	6	4	60	(0.51)
ECRB0809-8-PN	★	0.4	**0.8**	**0.9**	8	4	60	(0.38)
ECRB0809-10-PN	★	0.4	**0.8**	**0.9**	10	4	60	(0.30)
ECRB0809-12-PN	★	0.4	**0.8**	**0.9**	12	4	60	(0.25)
ECRB0810-6-PN	★	0.4	**0.8**	**1.0**	6	4	60	(1.02)
ECRB0810-8-PN	★	0.4	**0.8**	**1.0**	8	4	60	(0.75)
ECRB0810-10-PN	★	0.4	**0.8**	**1.0**	10	4	60	(0.60)
ECRB0810-12-PN	★	0.4	**0.8**	**1.0**	12	4	60	(0.49)
ECRB1012-6-PN	★	0.5	**1**	**1.2**	6	4	60	(1.04)
ECRB1012-8-PN	★	0.5	**1**	**1.2**	8	4	60	(0.76)
ECRB1012-10-PN	★	0.5	**1**	**1.2**	10	4	60	(0.60)
ECRB1012-12-PN	★	0.5	**1**	**1.2**	12	4	60	(0.50)
ECRB1012-14-PN	★	0.5	**1**	**1.2**	14	4	60	(0.42)
ECRB1012-16-PN	★	0.5	**1**	**1.2**	16	4	60	(0.37)

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○	○		○	○	○	○

★ : Inventory maintained in Japan

Recommended cutting conditions

ECRB-PN

Inch

- When using a multi-speed spindle, etc. with fixed rotation speeds, select the condition which is closer to the rotation speeds listed below.
- When using a machining center, etc. where the rotation speed can be freely set, use 20,000 rpm as the standard condition.

Revolution (min^{-1})			Depth of cut ratio	Carbon Steel (180～250HB)	Alloy Steel (25～35HRC)	Pre-hardened Steel (35～45HRC)
				vf (IPM)	*vf* (IPM)	*vf* (IPM)
15,000			100%	48	39	30
Standard condition 20,000			100%	64	52	40
25,000			80%	80	65	50
30,000			60%	96	78	60
Ball radius RE (mm)	Tool dia. DC (mm)	Large edge dia. (mm)	Flute length (mm)	Depth of cut (inch)	Depth of cut (inch)	Depth of cut (inch)
0.4	**0.8**	**0.9**	6	.0009	.0008	.0006
0.4	**0.8**	**0.9**	8	.0007	.0006	.0005
0.4	**0.8**	**0.9**	10	.0006	.0005	.0004
0.4	**0.8**	**0.9**	12	.0005	.0004	.0003
0.4	**0.8**	**1**	6	.0009	.0008	.0006
0.4	**0.8**	**1**	8	.0007	.0006	.0005
0.4	**0.8**	**1**	10	.0006	.0005	.0004
0.4	**0.8**	**1**	12	.0005	.0004	.0003
0.5	**1**	**1.2**	6	.0012	.001	.0008
0.5	**1**	**1.2**	8	.0009	.0007	.0006
0.5	**1**	**1.2**	10	.0007	.0006	.0005
0.5	**1**	**1.2**	12	.0006	.0005	.0004
0.5	**1**	**1.2**	14	.0005	.0004	.0004
0.5	**1**	**1.2**	16	.0004	.0004	.0003

【Note】 ①Adjust the cutting depth referring to the depth of cut ratio.
②Use the appropriate coolant for the work material and machining shape.
③These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④If the rotation speed of the machine does not match the values in the table, adjust the rotation speed and feed rate using the same ratio.
⑤When machining a tapered surface of greater than 5°, make adjustments such as reducing the cutting depth, etc.

Epoch Combination Rib Ball

ECRB-PN

- When using a multi-speed spindle, etc. with fixed rotation speeds, select the condition which is closer to the rotation speeds listed below.
- When using a machining center, etc. where the rotation speed can be freely set, use 20,000 rpm as the standard condition.

Metric

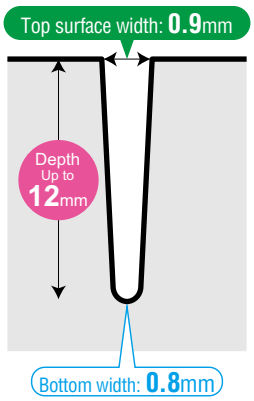
Revolution (min^{-1})	Depth of cut ratio	Carbon Steel (180～250HB)	Alloy Steel (25～35HRC)	Pre-hardened Steel (35～45HRC)
		*v*f (mm/min)	*v*f (mm/min)	*v*f (mm/min)
15,000	100%	1,200	960	770
Standard condition 20,000	100%	1,600	1,280	1,020
25,000	80%	2,000	1,600	1,280
30,000	60%	2,400	1,920	1,540

Ball radius RE (mm)	Tool dia. DC (mm)	Large edge dia. (mm)	Flute length (mm)	Depth of cut (mm)	Depth of cut (mm)	Depth of cut (mm)
0.4	**0.8**	**0.9**	6	0.024	0.02	0.016
0.4	**0.8**	**0.9**	8	0.018	0.015	0.012
0.4	**0.8**	**0.9**	10	0.014	0.012	0.01
0.4	**0.8**	**0.9**	12	0.012	0.01	0.008
0.4	**0.8**	**1**	6	0.024	0.02	0.016
0.4	**0.8**	**1**	8	0.018	0.015	0.012
0.4	**0.8**	**1**	10	0.014	0.012	0.01
0.4	**0.8**	**1**	12	0.012	0.01	0.008
0.5	**1**	**1.2**	6	0.03	0.025	0.02
0.5	**1**	**1.2**	8	0.023	0.019	0.015
0.5	**1**	**1.2**	10	0.018	0.015	0.012
0.5	**1**	**1.2**	12	0.015	0.013	0.01
0.5	**1**	**1.2**	14	0.013	0.011	0.009
0.5	**1**	**1.2**	16	0.011	0.009	0.007

【Note】 ①Adjust the cutting depth referring to the depth of cut ratio.
②Use the appropriate coolant for the work material and machining shape.
③These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④If the rotation speed of the machine does not match the values in the table, adjust the rotation speed and feed rate using the same ratio.
⑤When machining a tapered surface of greater than 5°, make adjustments such as reducing the cutting depth, etc.

Method of use

1



Use end mills having the same large edge diameter as the rib groove's top surface width and the same tool diameter as the rib groove's bottom in sequence starting with the shortest flute length.
For making the rib groove shown at right with a **top surface width of 0.9 mm and bottom width of 0.8 mm**, the following 4 items should be used.

Order of use

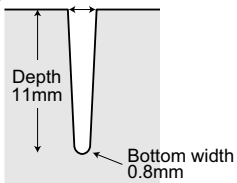
Item code	Stock	Size (mm)						Taper angle on side
		Ball radius	Tool dia.	Large edge dia.	Flute length	Shank dia.	Overall length	
		RE	DC	DCX	APMX	DCONMS	LF	BHTA1
ECRB0809-6-PN	★	0.4	**0.8**	**0.9**	6	4	60	(0.51)
ECRB0809-8-PN	★	0.4	**0.8**	**0.9**	8	4	60	(0.38)
ECRB0809-10-PN	★	0.4	**0.8**	**0.9**	10	4	60	(0.30)
ECRB0809-12-PN	★	0.4	**0.8**	**0.9**	12	4	60	(0.25)

★: Inventory maintained in Japan

Combination rib machining can combine the process for machining the top surface width and the process for machining the bottom width.

[Ex.] Shape to be machined

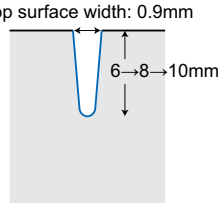
Top surface width: 0.9mm



For a rib groove with an top surface width of 0.9 mm, a bottom width of 0.8 mm, and a depth of 11 m

Process 1

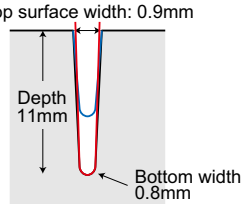
Top surface width: 0.9mm



Perform machining by reciprocating cutting using the above items in order starting with the shortest flute length: 6 mm => 8 mm => 10 mm. Set machining depth = Flute length. Since all of the items have a large edge diameter of 0.9 mm, the 0.9 mm width of the top surface of the rib groove can be machined.

Process 2

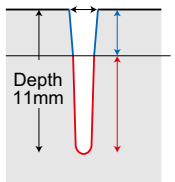
Top surface width: 0.9mm



Using the item above with a flute length of 12 mm, perform reciprocating cutting to the depth of 11 mm.
Since the ball radius is 0.4 mm, the bottom width of 0.8 mm can be machined.

Completed

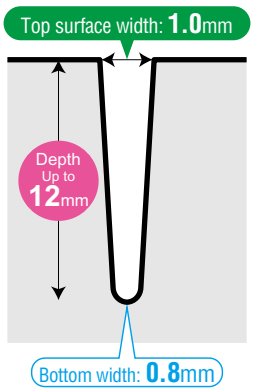
0.9mm



Since it is possible to machine the top surface width, bottom width, and depth with high accuracy, rib grooves with sinks or short shots are unlikely to occur can be completed. The taper in the release direction is also firmly maintained.

※Slight differences in the angle of the taper surface of completed rib grooves may occur. Whether or not they will be a problem should be checked beforehand.

2



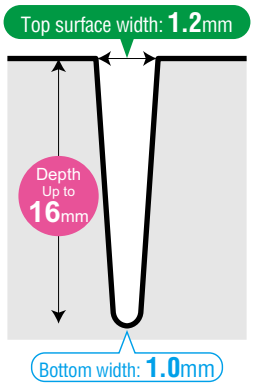
For making the rib groove shown at right with a **top surface width of 1.0 mm and bottom width of 0.8 mm**, the following 4 items should be used.

Order of use

Item code	Stock	Size (mm)						Taper angle on side
		Ball radius	Tool dia.	Large edge dia.	Flute length	Shank dia.	Overall length	
		RE	DC	DCX	APMX	DCONMS	LF	BHTA1
ECRB0810-6-PN	★	0.4	**0.8**	**1.0**	6	4	60	(1.02)
ECRB0810-8-PN	★	0.4	**0.8**	**1.0**	8	4	60	(0.75)
ECRB0810-10-PN	★	0.4	**0.8**	**1.0**	10	4	60	(0.60)
ECRB0810-12-PN	★	0.4	**0.8**	**1.0**	12	4	60	(0.49)

★: Inventory maintained in Japan

3



For making the rib groove shown at right with a **top surface width of 1.2 mm and bottom width of 1.0 mm**, the following 6 items should be used.

Order of use

Item code	Stock	Size (mm)						Taper angle on side
		Ball radius	Tool dia.	Large edge dia.	Flute length	Shank dia.	Overall length	
		RE	DC	DCX	APMX	DCONMS	LF	BHTA1
ECRB1012-6-PN	★	0.5	**1**	**1.2**	6	4	60	(1.04)
ECRB1012-8-PN	★	0.5	**1**	**1.2**	8	4	60	(0.76)
ECRB1012-10-PN	★	0.5	**1**	**1.2**	10	4	60	(0.60)
ECRB1012-12-PN	★	0.5	**1**	**1.2**	12	4	60	(0.50)
ECRB1012-14-PN	★	0.5	**1**	**1.2**	14	4	60	(0.42)
ECRB1012-16-PN	★	0.5	**1**	**1.2**	16	4	60	(0.37)

★: Inventory maintained in Japan

Epoch SD(S-DLC) Deep Ball

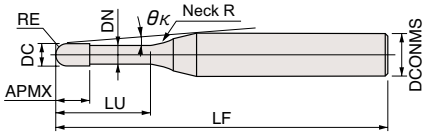
Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

High welding resistance makes it ideal for machining aluminum alloys and copper. DLC Coating.

RE tolerance: RE≦0.25 : ±0.003mm
0.25<RE : ±0.005mm

h5

2 Flutes

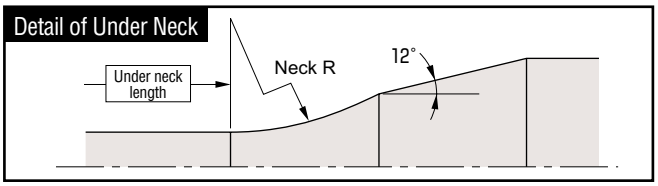


EPDB2○○○-○○-SD

Carbide | SD | Helix angle 30° | Cutting Conditions A135

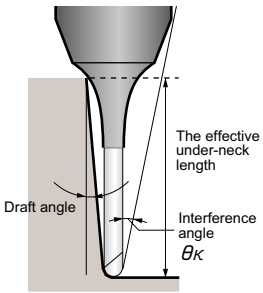
Item code	Stock	Size (mm) Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θκ	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDB2002-0.4-SD	★			0.4						11.54	0.59	0.61	0.63	0.66	0.7
EPDB2002-0.6-SD	★	0.1	0.2	0.6	0.15	0.17	50	4	1	11.3	0.8	0.83	0.86	0.88	0.93
EPDB2002-1-SD	★			1						10.86	1.22	1.26	1.3	1.33	1.39
EPDB2003-0.5-SD	★			0.5						11.47	0.78	0.82	0.86	0.9	0.98
EPDB2003-1-SD	★	0.15	0.3	1	0.25	0.27	50	4	2	10.89	1.31	1.38	1.43	1.49	1.59
EPDB2003-1.5-SD	★			1.5						10.36	1.84	1.92	1.99	2.06	2.18
EPDB2004-1-SD	★			1						10.91	1.31	1.37	1.43	1.48	1.58
EPDB2004-1.5-SD	★	0.2	0.4	1.5	0.3	0.37	50	4	2	10.37	1.84	1.92	1.99	2.06	2.17
EPDB2004-2-SD	★			2						9.88	2.36	2.46	2.54	2.62	2.75
EPDB2005-2-SD	★			2						9.88	2.86	3.14	3.39	3.62	4.06
EPDB2005-4-SD	★	0.25	0.5	4	0.35	0.47	50	4	10	8.27	5.06	5.45	5.78	6.08	6.61
EPDB2005-6-SD	★			6						7.1	7.23	7.69	8.08	8.43	9.05
EPDB2006-2-SD	★			2						9.88	2.86	3.13	3.38	3.61	4.04
EPDB2006-4-SD	★	0.3	0.6	4	0.4	0.57	50	4	10	8.22	5.06	5.44	5.77	6.07	6.6
EPDB2006-6-SD	★			6						7.04	7.22	7.69	8.08	8.42	9.04
EPDB2008-4-SD	★			4						8.14	5.05	5.43	5.75	6.05	6.58
EPDB2008-6-SD	★	0.4	0.8	6	0.5	0.77	50	4	10	6.92	7.21	7.68	8.06	8.41	9.02
EPDB2008-8-SD	★			8						6.01	9.36	9.89	10.33	10.71	11.38
EPDB2010-4-SD	★			4			50			8.02	5.09	5.45	5.77	6.06	6.58
EPDB2010-8-SD	★	0.5	1	8	0.8	0.96		4	10	5.85	9.39	9.91	10.34	10.72	11.38
EPDB2010-12-SD	★			12			55			4.6	13.63	14.26	14.78	15.22	15.99
EPDB2015-6-SD	★			6			50			6.33	7.31	7.73	8.09	8.42	9.01
EPDB2015-12-SD	★	0.75	1.5	12	1.35	1.44	55	4	10	4.14	13.68	14.29	14.79	15.23	15.98
EPDB2015-18-SD	★			18			60			3.08	19.97	20.72	21.32	21.84	23.83
EPDB2020-8-SD	★			8			50			4.81	9.5	9.97	10.37	10.73	11.37
EPDB2020-16-SD	★	1	2	16	1.7	1.92	55	4	10	2.88	17.92	18.61	19.17	19.65	No interference
EPDB2020-24-SD	★			24			60			2.06	26.26	27.11	27.77	28.75	No interference
EPDB2030-12-SD	★			12			55			4.81	13.82	14.36	14.83	15.24	15.96
EPDB2030-24-SD	★	1.5	3	24	2.5	2.88	65	6	10	2.88	26.33	27.14	27.79	28.76	No interference
EPDB2030-36-SD	★			36			80			2.06	38.74	39.74	41.17	43.12	No interference
EPDB2040-16-SD	★			16			60			3.03	17.93	18.58	19.11	19.58	20.91
EPDB2040-32-SD	★	2	4	32	3	3.9	75	6	10	1.64	34.56	35.5	36.48	No interference	No interference
EPDB2040-48-SD	★			48			90			1.13	51.05	52.37	No interference	No interference	No interference
EPDB2050-20-SD	★	2.5	5	20	3.5	4.9	65	6	10	1.38	22.09	22.81	No interference	No interference	No interference
EPDB2050-40-SD	★			40			80			0.71	42.8	No interference	No interference	No interference	No interference

Detail of Under Neck



【Note】

If the workpiece has draft angle, the interference length will be longer than the under-neck length. Please refer to the effective under-neck length for the various draft angles.
In addition, the angle at which the tool will interfere with the workpiece is shown as the "interference angle θκ", and should also be referred to.



Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
							◎	◎

★ : Inventory maintained in Japan

Recommended cutting conditions EPDB-SD

<Slotting>

Inch

Item code	Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	Work material: Axial direction cutting depth (inch)	1 Expanded aluminum alloy material 5052, 7075 etc. n (min-1)	1 vf (IPM)	2 Cast aluminum alloy material AC4A(JIS), 383.0 etc. n (min-1)	2 vf (IPM)	3 Pure copper C1100(JIS) etc. n (min-1)	3 vf (IPM)	4 Resin, Acrylic, etc. n (min-1)	4 vf (IPM)
EPDB2002-0.4-SD	0.1	0.2	0.4	.001	50,000	20	50,000	20	50,000	20	50,000	30
EPDB2002-0.6-SD	0.1	0.2	0.6	.001	50,000	20	50,000	20	50,000	20	50,000	30
EPDB2002-1-SD	0.1	0.2	1	.001	50,000	20	50,000	20	50,000	20	50,000	30
EPDB2003-0.5-SD	0.15	0.3	0.5	.001	50,000	30	50,000	30	50,000	30	50,000	50
EPDB2003-1-SD	0.15	0.3	1	.001	50,000	30	50,000	30	50,000	30	50,000	40
EPDB2003-1.5-SD	0.15	0.3	1.5	.001	50,000	20	50,000	20	50,000	20	50,000	40
EPDB2004-1-SD	0.2	0.4	1	.002	50,000	40	50,000	40	50,000	40	47,800	57
EPDB2004-1.5-SD	0.2	0.4	1.5	.002	50,000	30	50,000	30	50,000	30	43,000	52
EPDB2004-2-SD	0.2	0.4	2	.001	50,000	30	50,000	30	47,700	29	38,200	38
EPDB2005-2-SD	0.25	0.5	2	.004	50,000	40	50,000	40	48,000	38	38,400	54
EPDB2005-4-SD	0.25	0.5	4	.002	50,000	40	50,000	40	43,200	35	34,560	41
EPDB2005-6-SD	0.25	0.5	6	.001	50,000	30	50,000	30	38,400	23	30,720	31
EPDB2006-2-SD	0.3	0.6	2	.005	50,000	60	50,000	60	48,000	58	38,400	69
EPDB2006-4-SD	0.3	0.6	4	.003	50,000	60	50,000	60	43,200	52	34,560	62
EPDB2006-6-SD	0.3	0.6	6	.002	50,000	50	50,000	50	43,200	43	34,560	62
EPDB2008-4-SD	0.4	0.8	4	.006	50,000	70	50,000	70	48,000	67	38,400	69
EPDB2008-6-SD	0.4	0.8	6	.004	50,000	60	50,000	60	43,200	52	34,560	62
EPDB2008-8-SD	0.4	0.8	8	.002	50,000	60	50,000	60	38,400	46	34,560	62
EPDB2010-4-SD	0.5	1	4	.008	50,000	100	50,000	100	43,200	86	34,560	97
EPDB2010-8-SD	0.5	1	8	.005	50,000	90	50,000	90	38,880	70	31,100	81
EPDB2010-12-SD	0.5	1	12	.002	50,000	80	46,660	75	34,560	55	27,650	61
EPDB2015-6-SD	0.75	1.5	6	.012	50,000	130	45,360	118	33,600	87	26,880	75
EPDB2015-12-SD	0.75	1.5	12	.007	45,360	109	40,820	98	30,240	73	24,190	63
EPDB2015-18-SD	0.75	1.5	18	.004	40,320	89	36,290	80	26,880	59	21,500	47
EPDB2020-8-SD	1	2	8	.016	37,800	136	34,020	122	25,200	91	20,160	77
EPDB2020-16-SD	1	2	16	.009	34,020	95	30,620	86	22,680	64	18,100	62
EPDB2020-24-SD	1	2	24	.005	30,240	79	27,220	71	20,160	52	16,130	48
EPDB2030-12-SD	1.5	3	12	.024	28,800	173	25,920	156	19,200	115	15,360	71
EPDB2030-24-SD	1.5	3	24	.014	25,920	140	23,330	126	17,280	93	13,820	58
EPDB2030-36-SD	1.5	3	36	.007	23,040	115	20,740	104	15,360	77	12,300	52
EPDB2040-16-SD	2	4	16	.032	20,700	161	18,630	145	13,800	108	11,500	90
EPDB2040-32-SD	2	4	32	.019	18,630	134	16,770	117	12,420	89	10,350	72
EPDB2040-48-SD	2	4	48	.009	16,560	113	14,900	101	11,040	75	9,100	64
EPDB2050-20-SD	2.5	5	20	.039	16,200	152	14,580	137	10,800	102	8,640	62
EPDB2050-40-SD	2.5	5	40	.024	14,580	125	13,120	113	9,720	84	7,780	54

【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.

1. If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

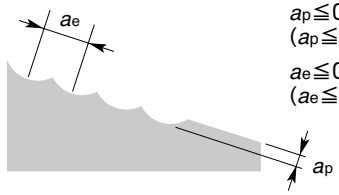
a_p : Axial direction cutting depth (mm)

<Finishing>

Inch

Work material	1 Expanded aluminum alloy material 5052, 7075 etc. n (min-1)	1 vf (IPM)	2 Resin, Acrylic, etc. n (min-1)	2 vf (IPM)
RE×DC (mm)				
RE0.1 x 0.2	50,000	40	50,000	40
RE0.15 x 0.3	50,000	50	50,000	50
RE0.2 x 0.4	50,000	60	50,000	60
RE0.25×0.5	50,000	80	50,000	80
RE0.3×0.6	48,000	77	48,000	77
RE0.4×0.8	44,000	88	44,000	88
RE0.5×1	40,000	96	40,000	96
RE0.75×1.5	34,000	95	34,000	95
RE1×2	30,000	96	30,000	96
RE1.5×3	26,000	83	26,000	83
RE2×4	24,000	77	24,000	77
RE2.5×5	22,000	70	22,000	70

Depth of cut (mm)



a_p≦0.02㎜~0.05㎜
(a_p≦.0007" ~ .0019")

a_e≦0.02㎜~0.05㎜
(a_e≦.0007" ~ .0019")

【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.

Epoch SD(S-DLC) Deep Ball

EPDB-SD

<Slotting>

Metric

Item code	Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	Axial direction cutting depth (mm)	1 Expanded aluminum alloy material 5052, 7075 etc. n (min-1)	1 vf (mm/min)	2 Cast aluminum alloy material AC4A(JIS), 383.0 etc. n (min-1)	2 vf (mm/min)	3 Pure copper C1100(JIS) etc. n (min-1)	3 vf (mm/min)	4 Resin, Acrylic, etc. n (min-1)	4 vf (mm/min)
EPDB2002-0.4-SD	0.1	0.2	0.4	0.03	50,000	500	50,000	500	50,000	500	50,000	750
EPDB2002-0.6-SD	0.1	0.2	0.6	0.025	50,000	450	50,000	450	50,000	450	50,000	680
EPDB2002-1-SD	0.1	0.2	1	0.017	50,000	450	50,000	450	50,000	450	50,000	680
EPDB2003-0.5-SD	0.15	0.3	0.5	0.033	50,000	800	50,000	800	50,000	800	50,000	1,200
EPDB2003-1-SD	0.15	0.3	1	0.026	50,000	700	50,000	700	50,000	700	50,000	1,050
EPDB2003-1.5-SD	0.15	0.3	1.5	0.02	50,000	600	50,000	600	50,000	600	50,000	900
EPDB2004-1-SD	0.2	0.4	1	0.05	50,000	980	50,000	980	50,000	980	47,800	1,470
EPDB2004-1.5-SD	0.2	0.4	1.5	0.04	50,000	840	50,000	840	50,000	840	43,000	1,260
EPDB2004-2-SD	0.2	0.4	2	0.034	50,000	700	50,000	700	47,700	700	38,200	1,050
EPDB2005-2-SD	0.25	0.5	2	0.1	50,000	1,000	50,000	1,000	48,000	960	38,400	1,280
EPDB2005-4-SD	0.25	0.5	4	0.06	50,000	900	50,000	900	43,200	780	34,560	1,050
EPDB2005-6-SD	0.25	0.5	6	0.03	50,000	850	50,000	850	38,400	650	30,720	810
EPDB2006-2-SD	0.3	0.6	2	0.12	50,000	1,500	50,000	1,500	48,000	1,440	38,400	1,820
EPDB2006-4-SD	0.3	0.6	4	0.07	50,000	1,420	50,000	1,420	43,200	1,230	34,560	1,490
EPDB2006-6-SD	0.3	0.6	6	0.04	50,000	1,350	50,000	1,350	43,200	1,170	34,560	1,490
EPDB2008-4-SD	0.4	0.8	4	0.16	50,000	1,800	50,000	1,800	48,000	1,730	38,400	1,820
EPDB2008-6-SD	0.4	0.8	6	0.1	50,000	1,620	50,000	1,620	43,200	1,400	34,560	1,490
EPDB2008-8-SD	0.4	0.8	8	0.05	50,000	1,610	50,000	1,610	38,400	1,240	34,560	1,490
EPDB2010-4-SD	0.5	1	4	0.2	50,000	2,500	50,000	2,500	43,200	2,160	34,560	2,440
EPDB2010-8-SD	0.5	1	8	0.12	50,000	2,250	50,000	2,250	38,880	1,750	31,100	2,010
EPDB2010-12-SD	0.5	1	12	0.06	50,000	2,130	46,660	1,980	34,560	1,470	27,650	1,570
EPDB2015-6-SD	0.75	1.5	6	0.3	50,000	3,300	45,360	3,000	33,600	2,220	26,880	1,910
EPDB2015-12-SD	0.75	1.5	12	0.18	45,360	2,700	40,820	2,430	30,240	1,800	24,190	1,570
EPDB2015-18-SD	0.75	1.5	18	0.09	40,320	2,270	36,290	2,040	26,880	1,510	21,500	1,220
EPDB2020-8-SD	1	2	8	0.4	37,800	3,410	34,020	3,060	25,200	2,270	20,160	1,910
EPDB2020-16-SD	1	2	16	0.24	34,020	2,450	30,620	2,200	22,680	1,630	18,100	1,570
EPDB2020-24-SD	1	2	24	0.12	30,240	2,060	27,220	1,850	20,160	1,370	16,130	1,220
EPDB2030-12-SD	1.5	3	12	0.6	28,800	4,320	25,920	3,890	19,200	2,880	15,360	1,820
EPDB2030-24-SD	1.5	3	24	0.36	25,920	3,500	23,330	3,150	17,280	2,330	13,820	1,490
EPDB2030-36-SD	1.5	3	36	0.18	23,040	2,940	20,740	2,650	15,360	1,960	12,300	1,320
EPDB2040-16-SD	2	4	16	0.8	20,700	4,140	18,630	3,730	13,800	2,760	11,500	2,300
EPDB2040-32-SD	2	4	32	0.48	18,630	3,360	16,770	3,020	12,420	2,240	10,350	1,860
EPDB2040-48-SD	2	4	48	0.24	16,560	2,820	14,900	2,540	11,040	1,880	9,100	1,640
EPDB2050-20-SD	2.5	5	20	1	16,200	3,890	14,580	3,500	10,800	2,590	8,640	1,560
EPDB2050-40-SD	2.5	5	40	0.6	14,580	3,150	13,120	2,840	9,720	2,100	7,780	1,400

【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.

1. If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

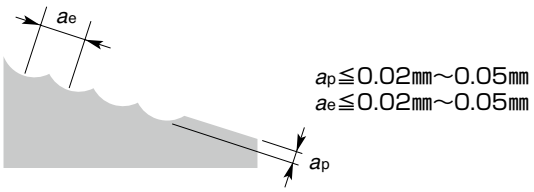
a_p : Axial direction cutting depth (mm)

<Finishing>

Metric

Work material	1 Expanded aluminum alloy material 5052, 7075 etc. n (min-1)	1 vf (mm/min)	2 Resin, Acrylic, etc. n (min-1)	2 vf (mm/min)
RE×DC (mm)				
RE0.1 x 0.2	50,000	1,000	50,000	1,000
RE0.15 x 0.3	50,000	1,200	50,000	1,200
RE0.2 x 0.4	50,000	1,500	50,000	1,500
RE0.25×0.5	50,000	2,000	50,000	2,000
RE0.3×0.6	48,000	1,920	48,000	1,920
RE0.4×0.8	44,000	2,200	44,000	2,200
RE0.5×1	40,000	2,400	40,000	2,400
RE0.75×1.5	34,000	2,400	34,000	2,400
RE1×2	30,000	2,400	30,000	2,400
RE1.5×3	26,000	2,080	26,000	2,080
RE2×4	24,000	1,920	24,000	1,920
RE2.5×5	22,000	1,760	22,000	1,760

Depth of cut (mm)



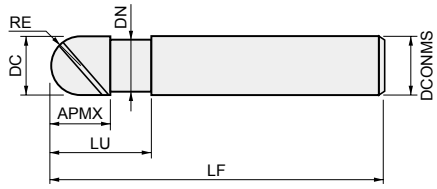
【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.

Epoch SD(S-DLC) Ball

Die-sinking | Profiling | Radius | Helical | Semi Finishing | Finishing

RE tolerance ±0.005mm h5

High welding resistance makes it ideal for machining aluminum alloys and copper. DLC Coating.



2 Flutes

EPAB2○○○-SD

Carbide | SD | Helix angle 30° | Cutting Conditions A138

Item code	Stock	Size (mm)						
		Ball radius	Tool dia.	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.
		RE	DC	LU	APMX	DN	LF	DCONMS
EPAB2060-SD	★	3	6	15	6	5.9	90	6
EPAB2080-SD	★	4	8	20	8	7.9	100	8
EPAB2100-SD	★	5	10	25	10	9.9	100	10
EPAB2120-SD	★	6	12	30	12	11.9	110	12

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
							◎	◎

★ : Inventory maintained in Japan

Epoch SD(S-DLC) Ball

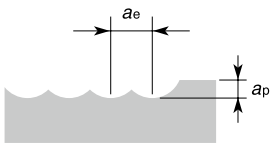
Recommended cutting conditions

EPAB-SD

Inch

Work material	1		2		3		4	
	Expanded aluminum alloy material 5052, 7075 etc.		Cast aluminum alloy material Die-casting, Si less than 10%		Pure copper C1100(JIS) etc.		Resin, Acrylic, etc.	
RE×DC (mm)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)
RE3×6	27,000	130	21,600	91	13,300	64	10,600	51
RE4×8	20,000	124	16,000	90	10,000	56	8,000	45
RE5×10	16,000	118	12,800	82	8,000	50	6,400	41
RE6×12	13,300	104	10,640	72	6,600	48	5,300	37

Depth of cut (mm)



$a_p \leqq 0.2DC$
$a_e \leqq 0.6DC$

【Note】
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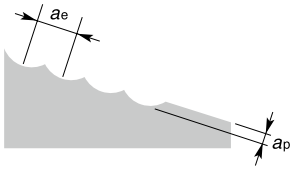
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
3. If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

<Finishing>

Inch

Work material	1		2	
	Expanded aluminum alloy material 5052, 7075 etc.		Resin, Acrylic, etc.	
RE×DC (mm)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)
RE3×6	20,000	64	20,000	64
RE4×8	15,000	48	15,000	48
RE5×10	12,000	48	12,000	48
RE6×12	10,000	40	10,000	40

Depth of cut (mm)



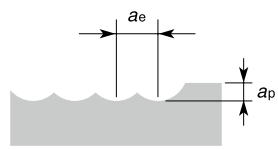
$a_p \leqq 0.02$mm~0.05mm
($a_p \leqq$ .0007" ~ .0019")
$a_e \leqq 0.02$mm~0.05mm
($a_e \leqq$ .0007" ~ .0019")

【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.

Metric

Work material	1		2		3		4	
	Expanded aluminum alloy material 5052, 7075 etc.		Cast aluminum alloy material Die-casting, Si less than 10%		Pure copper C1100(JIS) etc.		Resin, Acrylic, etc.	
RE×DC (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
RE3×6	27,000	3,300	21,600	2,310	13,300	1,600	10,600	1,280
RE4×8	20,000	3,200	16,000	2,240	10,000	1,400	8,000	1,120
RE5×10	16,000	3,000	12,800	2,100	8,000	1,280	6,400	1,030
RE6×12	13,300	2,660	10,640	1,860	6,600	1,190	5,300	950

Depth of cut (mm)



$a_p \leqq 0.2DC$
$a_e \leqq 0.6DC$

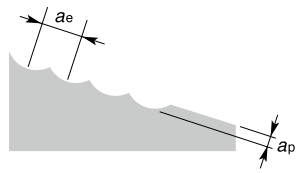
【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
3. If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

<Finishing>

Metric

Work material	1		2	
	Expanded aluminum alloy material 5052, 7075 etc.		Resin, Acrylic, etc.	
RE×DC (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
RE3×6	20,000	1,600	20,000	1,600
RE4×8	15,000	1,200	15,000	1,200
RE5×10	12,000	1,200	12,000	1,200
RE6×12	10,000	1,000	10,000	1,000

Depth of cut (mm)



$a_p \leqq 0.02$mm~ 0.05mm
$a_e \leqq 0.02$mm~ 0.05mm

【Note】
1. An air blower is recommended for some resin materials.
2. The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.

Epoch HD Coating Deep Ball End Mill

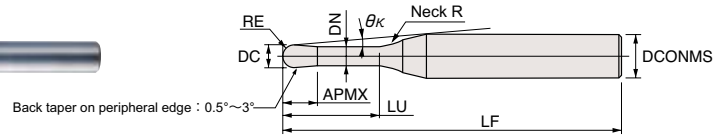
Diamond Coating

Slotting | Die-sinking | Profiling | Radius | Miniature | Semi Finishing | Finishing | Miniature Rib

h5

Ideal for machining of graphite, high-Si aluminum alloys, and FRP. Diamond Coating.

2 Flutes

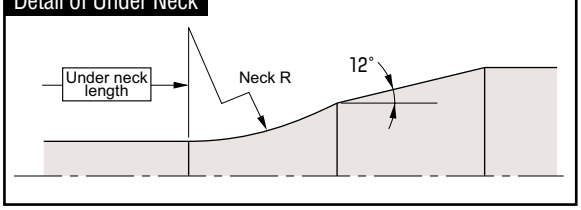


EGDB2○○○-○○-HD

Carbide | HD | Helix angle 30° | Cutting Conditions A141

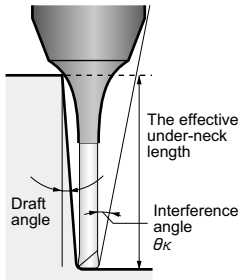
Item code	Stock	Size (mm) Ball radius RE	Tool dia. DC	Under neck length LU	Neck dia. DN	Flute length APMX	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θκ	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EGDB2004-4-HD	★	0.2	0.4	4	0.37	0.6	60	4	10	8.3	5.07	5.45	5.78	6.08	6.63
EGDB2004-8-HD	★			8	0.37	0.6	60	4	10	6.29	9.37	9.91	10.35	10.74	11.42
EGDB2004-12-HD	★			12	0.37	0.6	60	4	10	5.06	13.62	14.26	14.79	15.24	16.02
EGDB2006-5-HD	★	0.3	0.6	5	0.57	0.9	60	4	10	7.59	6.14	6.57	6.93	7.25	7.83
EGDB2006-10-HD	★			10	0.57	0.9	60	4	10	5.47	11.49	12.08	12.57	12.99	13.72
EGDB2006-15-HD	★			15	0.57	0.9	60	4	10	4.28	16.77	17.49	18.06	18.55	19.9
EGDB2006-20-HD	★			20	0.57	0.9	60	4	10	3.51	22.01	22.82	23.47	24.01	26.54
EGDB2010-10-HD	★	0.5	1	10	0.96	1.5	60	4	10	5.15	11.51	12.09	12.57	12.98	13.7
EGDB2010-20-HD	★			20	0.96	1.5	60	4	10	3.23	22.02	22.83	23.47	24.01	26.51
EGDB2010-30-HD	★			30	0.96	1.5	80	4	10	2.35	32.42	33.39	34.25	35.91	No interference
EGDB2010-40-HD	★			40	0.96	1.5	80	4	10	1.85	42.76	43.86	45.65	No interference	No interference
EGDB2015-20-HD	★	0.75	1.5	20	1.44	2.25	60	4	10	2.84	22.06	22.85	23.48	24.01	No interference
EGDB2015-40-HD	★			40	1.44	2.25	80	4	10	1.59	42.78	43.87	45.67	No interference	No interference
EGDB2020-20-HD	★	1	2	20	1.92	3	60	4	10	2.4	22.1	22.87	23.49	24.02	No interference
EGDB2020-40-HD	★			40	1.92	3	80	4	10	1.31	42.81	43.89	No interference	No interference	No interference
EGDB2020-60-HD	★			60	1.92	3	100	4	10	0.9	63.36	No interference	No interference	No interference	No interference
EGDB2030-20-HD	★	1.5	3	20	2.88	4.5	60	4	10	1.32	22.18	22.91	No interference	No interference	No interference
EGDB2030-40-HD	★			40	2.88	4.5	80	4	10	0.69	42.87	No interference	No interference	No interference	No interference
EGDB2030-60-HD	★			60	2.88	4.5	100	4	10	0.47	No interference	No interference	No interference	No interference	No interference

Detail of Under Neck



【Note】

If the workpiece has draft angle, the interference length will be longer than the under-neck length.
Please refer to the effective under-neck length for the various draft angles.
In addition, the angle at which the tool will interfere with the workpiece is
shown as the "interference angle θκ", and should also be referred to.



Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
For Graphite, FRP, High Si aluminum alloy etc.								

★：Inventory maintained in Japan

Recommended cutting conditions

EGDB-HD

Inch

					Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent) AC4A(JIS), 383.0	
Item code	Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	L/D	Depth of cut (inch) $a_p \times a_e$	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
EGDB2004-4-HD	0.2	0.4	4	10	.002×.006	18,000～21,000	14～21	13,000～18,000	13～18
EGDB2004-8-HD	0.2	0.4	8	20	.002×.005	17,000～20,000	14～20	12,000～17,000	12～17
EGDB2004-12-HD	0.2	0.4	12	30	.001×.004	15,000～18,000	12～14	11,000～16,000	9～13
EGDB2006-5-HD	0.3	0.6	5	8	.003×.008	15,000～18,000	15～18	13,000～18,000	13～18
EGDB2006-10-HD	0.3	0.6	10	17	.002×.007	15,000～18,000	12～18	13,000～18,000	10～14
EGDB2006-15-HD	0.3	0.6	15	25	.002×.005	13,000～16,000	10～13	11,000～16,000	9～13
EGDB2006-20-HD	0.3	0.6	20	33	.001×.004	12,000～14,000	10～11	9,000～14,000	7～11
EGDB2010-10-HD	0.5	1	10	10	.004×.012	15,000～18,000	15～18	10,000～15,000	12～15
EGDB2010-20-HD	0.5	1	20	20	.003×.009	13,000～16,000	13～16	8,000～13,000	11～16
EGDB2010-30-HD	0.5	1	30	30	.002×.007	12,000～14,000	10～14	6,000～11,000	10～13
EGDB2010-40-HD	0.5	1	40	40	.002×.005	10,000～12,000	10～12	5,000～10,000	10～14
EGDB2015-20-HD	0.75	1.5	20	13	.004×.012	15,000～18,000	18～18	10,000～15,000	14～18
EGDB2015-40-HD	0.75	1.5	40	27	.003×.009	12,000～15,000	12～15	7,000～12,000	11～17
EGDB2020-20-HD	1	2	20	10	.008×.024	15,000～18,000	18～22	10,000～15,000	14～18
EGDB2020-40-HD	1	2	40	20	.006×.019	13,000～16,000	13～19	7,000～12,000	11～17
EGDB2020-60-HD	1	2	60	30	.005×.014	12,000～14,000	10～14	5,000～10,000	10～16
EGDB2030-20-HD	1.5	3	20	7	.013×.039	15,000～18,000	33～40	10,000～15,000	14～18
EGDB2030-40-HD	1.5	3	40	13	.008×.024	15,000～18,000	21～29	7,000～12,000	11～17
EGDB2030-60-HD	1.5	3	60	20	.007×.021	13,000～15,000	13～21	5,000～10,000	10～16

Epoch HD Coating Deep Ball End Mill

EGDB-HD

Metric

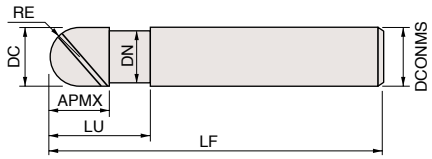
					Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent) AC4A(JIS), 383.0	
Item code	Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	L/D	Depth of cut (mm) $a_p \times a_e$	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
EGDB2004-4-HD	**0.2**	**0.4**	**4**	**10**	0.05×0.15	18,000～21,000	400～550	13,000～18,000	350～500
EGDB2004-8-HD	**0.2**	**0.4**	**8**	**20**	0.04×0.12	17,000～20,000	350～500	12,000～17,000	300～450
EGDB2004-12-HD	**0.2**	**0.4**	**12**	**30**	0.03×0.10	15,000～18,000	300～400	11,000～16,000	250～350
EGDB2006-5-HD	**0.3**	**0.6**	**5**	**8**	0.07×0.21	15,000～18,000	350～500	13,000～18,000	300～450
EGDB2006-10-HD	**0.3**	**0.6**	**10**	**17**	0.06×0.18	15,000～18,000	300～450	13,000～18,000	250～400
EGDB2006-15-HD	**0.3**	**0.6**	**15**	**25**	0.04×0.12	13,000～16,000	270～350	11,000～16,000	200～350
EGDB2006-20-HD	**0.3**	**0.6**	**20**	**33**	0.03×0.09	12,000～14,000	240～300	9,000～14,000	200～300
EGDB2010-10-HD	**0.5**	**1**	**10**	**10**	0.1×0.3	15,000～18,000	350～450	10,000～15,000	300～400
EGDB2010-20-HD	**0.5**	**1**	**20**	**20**	0.08×0.24	13,000～16,000	300～400	8,000～13,000	300～400
EGDB2010-30-HD	**0.5**	**1**	**30**	**30**	0.06×0.18	12,000～14,000	270～350	6,000～11,000	250～350
EGDB2010-40-HD	**0.5**	**1**	**40**	**40**	0.04×0.12	10,000～12,000	240～300	5,000～10,000	250～350
EGDB2015-20-HD	**0.75**	**1.5**	**20**	**13**	0.1×0.3	15,000～18,000	450～480	10,000～15,000	350～450
EGDB2015-40-HD	**0.75**	**1.5**	**40**	**27**	0.08×0.24	12,000～15,000	300～400	7,000～12,000	300～400
EGDB2020-20-HD	**1**	**2**	**20**	**10**	0.2×0.6	15,000～18,000	450～550	10,000～15,000	350～450
EGDB2020-40-HD	**1**	**2**	**40**	**20**	0.16×0.48	13,000～16,000	350～450	7,000～12,000	300～450
EGDB2020-60-HD	**1**	**2**	**60**	**30**	0.12×0.36	12,000～14,000	250～350	5,000～10,000	250～400
EGDB2030-20-HD	**1.5**	**3**	**20**	**7**	0.33×1.0	15,000～18,000	800～1,000	10,000～15,000	350～450
EGDB2030-40-HD	**1.5**	**3**	**40**	**13**	0.2×0.6	15,000～18,000	500～700	7,000～12,000	300～450
EGDB2030-60-HD	**1.5**	**3**	**60**	**20**	0.18×0.54	13,000～15,000	300～500	5,000～10,000	250～400

Epoch HD Coating Ball End Mill

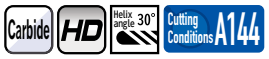
Diamond Coating

Ideal for machining of graphite, high-Si aluminum alloys, and FRP. Diamond Coating.

2 Flutes



EGB2○○○-HD



Item code	Stock	Size (mm)						
		Ball radius	Tool dia.	Under neck length	Neck dia.	Flute length	Overall length	Shank dia.
		RE	DC	LU	DN	APMX	LF	DCONMS
EGB2040-HD	★	2	4	40	3.9	8	100	4
EGB2060-HD	★	3	6	60	5.9	12	120	6
EGB2080-HD	★	4	8	80	7.9	16	140	8
EGB2100-HD	★	5	10	100	9.9	20	150	10

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
For Graphite, FRP, High Si aluminum alloy etc.								

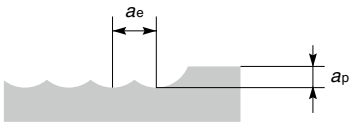
★ : Inventory maintained in Japan

Epoch HD Coating Ball End Mill

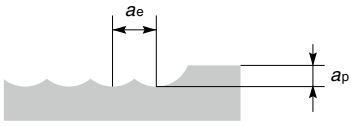
Recommended cutting conditions

EGB-HD

Inch

Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent) AC4A(JIS), 383.0	
Ball radius × Tool dia. RE × DC (mm)	*n* (min-1)	*vf* (IPM)	*n* (min-1)	*vf* (IPM)
RE2×4	8,000～10,000	47～59	6,000～9,000	31～47
RE3×6	7,000～9,000	39～51	5,000～8,000	28～43
RE4×8	6,000～8,000	35～43	4,000～7,000	24～39
RE5×10	5,000～7,000	31～39	3,000～6,000	20～35
Depth of cut (mm)	 $a_p \leqq 0.1DC$ $a_e \leqq 0.3DC$			

Metric

Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent) AC4A(JIS), 383.0	
Ball radius × Tool dia. RE × DC (mm)	*n* (min-1)	*vf* (mm/min)	*n* (min-1)	*vf* (mm/min)
RE2×4	8,000～10,000	1,200～1,500	6,000～9,000	800～1,200
RE3×6	7,000～9,000	1,000～1,300	5,000～8,000	700～1,100
RE4×8	6,000～8,000	900～1,100	4,000～7,000	600～1,000
RE5×10	5,000～7,000	800～1,000	3,000～6,000	500～900
Depth of cut (mm)	 $a_p \leqq 0.1DC$ $a_e \leqq 0.3DC$			

Epoch CBN High Precision Ball End Mill

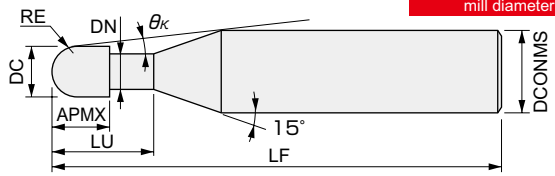
Planing | Die-sinking | Profiling | Radius | Rest material machining | Miniature | Finishing | Miniature Rib

RE tolerance: RE≦0.3mm : ±0.003mm : ±.0001inch
0.3mm<RE : ±0.005mm : ±.0002inch

h4

High-quality CBN ball end mill to provide high-accuracy cutting.

Includes actual measured mill diameter value.



CBN-EHB2○○○-○○.○○

Actual measured tool diameter value is shown on case.

Regrinding of tools with RE0.3 or larger is possible. (Necessary total length is at least 40mm.) Please contact us for details.

CBN | Helix angle 25° | Cutting Conditions A146

Item code	Stock	Size (mm) Display of actual measured Tool dia. for all tools: Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle (°) θK	Actual effective length in incline angles 0.5°	1°	1.5°	2°	3°
CBN-EHB2002-0.5	●	0.1	0.2	0.5	0.12	0.18	50	4	14.15	0.55	0.56	0.58	0.60	0.64
CBN-EHB2002-0.75	●			0.75	0.12	0.18	50	4	13.71	0.81	0.83	0.86	0.89	0.95
CBN-EHB2002-1	●			1	0.12	0.18	50	4	13.30	1.06	1.10	1.13	1.17	1.26
CBN-EHB2002-1.5	●			1.5	0.12	0.18	50	4	12.55	1.58	1.63	1.69	1.75	1.88
CBN-EHB2002-2	●			2	0.12	0.18	50	4	11.88	2.10	2.17	2.24	2.32	2.50
CBN-EHB2003-0.5	●	0.15	0.3	0.5	0.18	0.27	50	4	14.17	0.56	0.58	0.60	0.61	0.65
CBN-EHB2003-0.75	●			0.75	0.18	0.27	50	4	13.72	0.82	0.85	0.87	0.90	0.96
CBN-EHB2003-1	●			1	0.18	0.27	50	4	13.30	1.08	1.11	1.15	1.19	1.27
CBN-EHB2003-1.5	●			1.5	0.18	0.27	50	4	12.53	1.60	1.65	1.70	1.76	1.89
CBN-EHB2003-2	●			2	0.18	0.27	50	4	11.84	2.12	2.18	2.26	2.34	2.52
CBN-EHB2003-3	●			3	0.18	0.27	50	4	10.67	3.15	3.25	3.37	3.49	3.76
CBN-EHB2004-0.75	●	0.2	0.4	0.75	0.4	0.37	50	4	13.77	0.82	0.84	0.87	0.89	0.95
CBN-EHB2004-1	●			1	0.4	0.37	50	4	13.33	1.08	1.11	1.14	1.18	1.26
CBN-EHB2004-1.5	●			1.5	0.4	0.37	50	4	12.54	1.60	1.65	1.70	1.75	1.88
CBN-EHB2004-2	●			2	0.4	0.37	50	4	11.83	2.11	2.18	2.25	2.33	2.50
CBN-EHB2004-3	●			3	0.4	0.37	50	4	10.63	3.15	3.25	3.36	3.48	3.75
CBN-EHB2005-1	●	0.25	0.5	1	0.5	0.47	50	4	13.37	1.08	1.11	1.14	1.17	1.25
CBN-EHB2005-1.5	●			1.5	0.5	0.47	50	4	12.55	1.60	1.64	1.69	1.75	1.87
CBN-EHB2005-2.5	●			2.5	0.5	0.47	50	4	11.18	2.63	2.71	2.80	2.90	3.11
CBN-EHB2005-3	●			3	0.5	0.47	50	4	10.59	3.15	3.25	3.36	3.47	3.73
CBN-EHB2006-1	●	0.3	0.6	1	0.55	0.57	50	4	13.40	1.08	1.10	1.13	1.17	1.24
CBN-EHB2006-1.5	●			1.5	0.55	0.57	50	4	12.56	1.59	1.64	1.69	1.74	1.86
CBN-EHB2006-3	●			3	0.55	0.57	50	4	10.55	3.14	3.24	3.35	3.46	3.72
CBN-EHB2008-1.5	●	0.4	0.8	1.5	0.7	0.77	50	4	12.58	1.59	1.63	1.68	1.73	1.83
CBN-EHB2008-2.5	●			2.5	0.7	0.77	50	4	11.09	2.62	2.70	2.79	2.88	3.08
CBN-EHB2008-4	●			4	0.7	0.77	50	4	9.41	4.17	4.31	4.45	4.60	4.94
CBN-EHB2010-1.5	●	0.5	1	1.5	1	0.96	50	4	12.57	1.61	1.64	1.69	1.73	1.83
CBN-EHB2010-2.5	●			2.5	1	0.96	50	4	11.00	2.64	2.71	2.80	2.88	3.08
CBN-EHB2010-4	●			4	1	0.96	50	4	9.25	4.19	4.32	4.46	4.61	4.94
CBN-EHB2010-5	●			5	1	0.96	50	4	8.36	5.22	5.39	5.57	5.76	6.19
CBN-EHB2015-2.5	●	0.75	1.5	2.5	1.35	1.45	50	4	10.76	2.65	2.72	2.79	2.87	3.04
CBN-EHB2015-5	●			5	1.35	1.45	50	4	7.86	5.23	5.39	5.56	5.74	6.15
CBN-EHB2015-7.5	●			7.5	1.35	1.45	50	4	6.18	7.82	8.07	8.33	8.62	9.26
CBN-EHB2020-2.5	●	1	2	2.5	1.65	1.94	50	4	10.43	2.66	2.72	2.78	2.85	3.01
CBN-EHB2020-5	●			5	1.65	1.94	50	4	7.21	5.25	5.39	5.55	5.73	6.11
CBN-EHB2020-7.5	●			7.5	1.65	1.94	50	4	5.50	7.83	8.07	8.32	8.60	9.22
CBN-EHB2020-10	●			10	1.65	1.94	50	4	4.44	10.41	10.74	11.10	11.48	12.33

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		○	◎	◎				

● : Inventory maintained in US

Epoch CBN High Precision Ball End Mill

Recommended cutting conditions

<High efficiency condition>

Inch

Work material			Hardened steel (50～55HRC) AISI 420				Hardened steel (55～62HRC) D2, Matrix HSS				Hardened steel (62～64HRC) AISI M2, Powder steel				Hardened steel (64～70HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e
0.1	0.2	0.5	50,000	19	.0002	.0007	50,000	17	.0002	.0007	50,000	14	.0002	.0005	50,000	11	.0002	.0005
		0.75	50,000	19	.0002	.0005	50,000	17	.0002	.0005	50,000	14	.0001	.0004	50,000	11	.0001	.0004
		1	50,000	19	.0001	.0004	50,000	17	.0001	.0004	50,000	14	.0001	.0002	50,000	11	.0001	.0002
		1.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.15	0.3	0.5	50,000	28	.0004	.0011	50,000	24	.0004	.0011	50,000	21	.0003	.0008	50,000	17	.0002	.0007
		0.75	50,000	28	.0004	.0011	50,000	24	.0004	.0011	50,000	21	.0003	.0008	50,000	17	.0002	.0007
		1	50,000	28	.0003	.0009	50,000	24	.0003	.0009	50,000	21	.0002	.0007	50,000	17	.0002	.0006
		1.5	50,000	28	.0002	.0006	50,000	24	.0002	.0006	50,000	21	.0002	.0005	50,000	17	.0001	.0004
		2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.2	0.4	0.75	50,000	40	.0005	.0014	50,000	35	.0005	.0014	50,000	30	.0004	.0012	50,000	24	.0003	.0009
		1	50,000	40	.0005	.0014	50,000	35	.0005	.0014	50,000	30	.0004	.0012	50,000	24	.0003	.0009
		1.5	50,000	40	.0003	.0009	50,000	35	.0003	.0009	50,000	30	.0003	.0008	50,000	24	.0002	.0006
		2	50,000	40	.0002	.0007	50,000	35	.0002	.0007	50,000	30	.0002	.0006	50,000	24	.0002	.0005
		3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.25	0.5	1	50,000	50	.0006	.0018	50,000	44	.0006	.0018	50,000	37	.0005	.0014	50,000	30	.0004	.0012
		1.5	50,000	50	.0006	.0018	50,000	44	.0006	.0018	50,000	37	.0005	.0014	50,000	30	.0004	.0012
		2.5	50,000	50	.0003	.0009	50,000	44	.0003	.0009	50,000	37	.0002	.0007	50,000	30	.0002	.0006
		3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.3	0.6	1	50,000	64	.0007	.0021	50,000	55	.0007	.0021	50,000	47	.0006	.0018	50,000	38	.0005	.0014
		1.5	50,000	64	.0007	.0021	50,000	55	.0007	.0021	50,000	47	.0006	.0018	50,000	38	.0005	.0014
		3	50,000	64	.0004	.0011	50,000	55	.0004	.0011	50,000	47	.0003	.0008	50,000	38	.0002	.0007
0.4	0.8	1.5	50,000	85	.0009	.0028	50,000	74	.0009	.0028	50,000	62	.0008	.0024	50,000	51	.0006	.0019
		2.5	50,000	85	.0009	.0028	50,000	74	.0009	.0028	50,000	62	.0008	.0024	50,000	51	.0006	.0019
		4	40,000	68	.0005	.0014	40,000	59	.0005	.0014	40,000	50	.0004	.0012	40,000	41	.0003	.0009
0.5	1	1.5	40,000	94	.0012	.0035	40,000	82	.0012	.0035	40,000	69	.0009	.0028	40,000	57	.0008	.0024
		2.5	40,000	94	.0012	.0035	40,000	82	.0012	.0035	40,000	69	.0009	.0028	40,000	57	.0008	.0024
		4	36,000	85	.0008	.0024	36,000	74	.0008	.0024	36,000	62	.0006	.0019	36,000	51	.0005	.0015
		5	32,000	76	.0006	.0018	32,000	65	.0006	.0018	32,000	56	.0005	.0014	32,000	45	.0004	.0012
0.75	1.5	2.5	27,000	96	.0018	.0053	27,000	83	.0018	.0053	27,000	70	.0014	.0043	27,000	57	.0012	.0035
		5	27,000	96	.0018	.0053	27,000	83	.0018	.0053	27,000	70	.0014	.0043	27,000	57	.0012	.0035
		7.5	21,000	74	.0012	.0035	21,000	65	.0012	.0035	21,000	55	.0009	.0028	21,000	44	.0008	.0024
1	2	2.5	20,000	94	.0024	.0071	20,000	82	.0024	.0071	20,000	69	.0019	.0057	20,000	57	.0016	.0047
		5	20,000	94	.0024	.0071	20,000	82	.0024	.0071	20,000	69	.0019	.0057	20,000	57	.0016	.0047
		7.5	18,000	85	.0016	.0047	18,000	74	.0016	.0047	18,000	62	.0013	.0038	18,000	51	.0011	.0032
		10	16,000	76	.0012	.0035	16,000	65	.0012	.0035	16,000	56	.0009	.0028	16,000	45	.0008	.0024

【Note】

1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

＜Finishing condition＞

Inch

Work material			Hardened steel (50～55HRC) AISI 420				Hardened steel (55～62HRC) D2, Matrix HSS				Hardened steel (62～64HRC) AISI M2, Powder steel				Hardened steel (64～70HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e	Revolution n min^{-1}	Feed rate v_f IPM	Depth of cut (inch) a_p	Depth of cut (inch) a_e
0.1	0.2	0.5	50,000	17	.00016	.00016	50,000	14	.00016	.00016	50,000	11	.00016	.00016	50,000	9	.00016	.00016
		0.75	50,000	17	.00012	.00012	50,000	14	.00012	.00012	50,000	11	.00012	.00012	50,000	9	.00012	.00012
		1	50,000	17	.00008	.00008	50,000	14	.00008	.00008	50,000	11	.00008	.00008	50,000	9	.00008	.00008
		1.5	50,000	17	.00004	.00004	50,000	14	.00004	.00004	50,000	11	.00004	.00004	50,000	9	.00004	.00004
		2	50,000	17	.00004	.00004	50,000	14	.00004	.00004	50,000	11	.00004	.00004	50,000	9	.00004	.00004
0.15	0.3	0.5	50,000	24	.00024	.00024	50,000	21	.00024	.00024	50,000	17	.00024	.00024	50,000	13	.00024	.00024
		0.75	50,000	24	.00024	.00024	50,000	21	.00024	.00024	50,000	17	.00024	.00024	50,000	13	.00024	.00024
		1	50,000	24	.00020	.00020	50,000	21	.00020	.00020	50,000	17	.00020	.00020	50,000	13	.00020	.00020
		1.5	50,000	24	.00012	.00012	50,000	21	.00012	.00012	50,000	17	.00012	.00012	50,000	13	.00012	.00012
		2	50,000	24	.00012	.00012	50,000	21	.00012	.00012	50,000	17	.00012	.00012	50,000	13	.00012	.00012
		3	40,000	20	.00008	.00008	40,000	17	.00008	.00008	40,000	14	.00008	.00008	40,000	11	.00008	.00008
0.2	0.4	0.75	50,000	35	.00031	.00031	50,000	30	.00031	.00031	50,000	24	.00031	.00031	50,000	19	.00031	.00031
		1	50,000	35	.00031	.00031	50,000	30	.00031	.00031	50,000	24	.00031	.00031	50,000	19	.00031	.00031
		1.5	50,000	35	.00020	.00020	50,000	30	.00020	.00020	50,000	24	.00020	.00020	50,000	19	.00020	.00020
		2	50,000	35	.00016	.00016	50,000	30	.00016	.00016	50,000	24	.00016	.00016	50,000	19	.00016	.00016
		3	50,000	35	.00012	.00012	50,000	30	.00012	.00012	50,000	24	.00012	.00012	50,000	19	.00012	.00012
0.25	0.5	1	50,000	44	.00039	.00039	50,000	37	.00039	.00039	50,000	30	.00039	.00039	50,000	24	.00039	.00039
		1.5	50,000	44	.00039	.00039	50,000	37	.00039	.00039	50,000	30	.00039	.00039	50,000	24	.00039	.00039
		2.5	50,000	44	.00020	.00020	50,000	37	.00020	.00020	50,000	30	.00020	.00020	50,000	24	.00020	.00020
		3	48,000	42	.00020	.00020	48,000	35	.00020	.00020	48,000	29	.00020	.00020	48,000	22	.00020	.00020
0.3	0.6	1	50,000	55	.00047	.00047	50,000	47	.00047	.00047	50,000	38	.00047	.00047	50,000	30	.00047	.00047
		1.5	50,000	55	.00047	.00047	50,000	47	.00047	.00047	50,000	38	.00047	.00047	50,000	30	.00047	.00047
		3	50,000	55	.00024	.00024	50,000	47	.00024	.00024	50,000	38	.00024	.00024	50,000	30	.00024	.00024
0.4	0.8	1.5	50,000	74	.00063	.00063	50,000	62	.00063	.00063	50,000	51	.00063	.00063	50,000	40	.00063	.00063
		2.5	50,000	74	.00063	.00063	50,000	62	.00063	.00063	50,000	51	.00063	.00063	50,000	40	.00063	.00063
		4	40,000	59	.00031	.00031	40,000	50	.00031	.00031	40,000	41	.00031	.00031	40,000	32	.00031	.00031
0.5	1	1.5	40,000	82	.00079	.00079	40,000	69	.00079	.00079	40,000	57	.00079	.00079	40,000	44	.00079	.00079
		2.5	40,000	82	.00079	.00079	40,000	69	.00079	.00079	40,000	57	.00079	.00079	40,000	44	.00079	.00079
		4	36,000	74	.00051	.00051	36,000	62	.00051	.00051	36,000	51	.00051	.00051	36,000	40	.00051	.00051
		5	32,000	65	.00039	.00039	32,000	56	.00039	.00039	32,000	45	.00039	.00039	32,000	35	.00039	.00039
0.75	1.5	2.5	27,000	83	.00118	.00118	27,000	70	.00118	.00118	27,000	57	.00118	.00118	27,000	44	.00118	.00118
		5	27,000	83	.00118	.00118	27,000	70	.00118	.00118	27,000	57	.00118	.00118	27,000	44	.00118	.00118
		7.5	21,000	65	.00079	.00079	21,000	55	.00079	.00079	21,000	44	.00079	.00079	21,000	35	.00079	.00079
1	2	2.5	20,000	82	.00157	.00157	20,000	69	.00157	.00157	20,000	57	.00157	.00157	20,000	44	.00157	.00157
		5	20,000	82	.00157	.00157	20,000	69	.00157	.00157	20,000	57	.00157	.00157	20,000	44	.00157	.00157
		7.5	18,000	74	.00106	.00106	18,000	62	.00106	.00106	18,000	51	.00106	.00106	18,000	40	.00106	.00106
		10	16,000	65	.00079	.00079	16,000	56	.00079	.00079	16,000	45	.00079	.00079	16,000	35	.00079	.00079

【Note】

1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

Epoch CBN High Precision Ball End Mill

<High efficiency condition>

Metric

Work material			Hardened steel (50～55HRC) AISI 420				Hardened steel (55～62HRC) D2, Matrix HSS				Hardened steel (62～64HRC) AISI M2, Powder steel				Hardened steel (64～70HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e
0.1	0.2	0.5	50,000	480	0.006	0.018	50,000	420	0.006	0.018	50,000	350	0.004	0.012	50,000	290	0.004	0.012
		0.75	50,000	480	0.004	0.012	50,000	420	0.004	0.012	50,000	350	0.003	0.009	50,000	290	0.003	0.009
		1	50,000	480	0.003	0.009	50,000	420	0.003	0.009	50,000	350	0.002	0.006	50,000	290	0.002	0.006
		1.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.15	0.3	0.5	50,000	720	0.009	0.027	50,000	620	0.009	0.027	50,000	530	0.007	0.021	50,000	430	0.006	0.018
		0.75	50,000	720	0.009	0.027	50,000	620	0.009	0.027	50,000	530	0.007	0.021	50,000	430	0.006	0.018
		1	50,000	720	0.008	0.024	50,000	620	0.008	0.024	50,000	530	0.006	0.018	50,000	430	0.005	0.015
		1.5	50,000	720	0.005	0.015	50,000	620	0.005	0.015	50,000	530	0.004	0.012	50,000	430	0.003	0.009
		2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.2	0.4	0.75	50,000	1,020	0.012	0.036	50,000	880	0.012	0.036	50,000	750	0.01	0.03	50,000	610	0.008	0.024
		1	50,000	1,020	0.012	0.036	50,000	880	0.012	0.036	50,000	750	0.01	0.03	50,000	610	0.008	0.024
		1.5	50,000	1,020	0.008	0.024	50,000	880	0.008	0.024	50,000	750	0.007	0.021	50,000	610	0.005	0.015
		2	50,000	1,020	0.006	0.018	50,000	880	0.006	0.018	50,000	750	0.005	0.015	50,000	610	0.004	0.012
		3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.25	0.5	1	50,000	1,280	0.015	0.045	50,000	1,110	0.015	0.045	50,000	940	0.012	0.036	50,000	770	0.01	0.03
		1.5	50,000	1,280	0.015	0.045	50,000	1,110	0.015	0.045	50,000	940	0.012	0.036	50,000	770	0.01	0.03
		2.5	50,000	1,280	0.008	0.024	50,000	1,110	0.008	0.024	50,000	940	0.006	0.018	50,000	770	0.005	0.015
		3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.3	0.6	1	50,000	1,620	0.018	0.054	50,000	1,400	0.018	0.054	50,000	1,190	0.015	0.045	50,000	970	0.012	0.036
		1.5	50,000	1,620	0.018	0.054	50,000	1,400	0.018	0.054	50,000	1,190	0.015	0.045	50,000	970	0.012	0.036
		3	50,000	1,620	0.009	0.027	50,000	1,400	0.009	0.027	50,000	1,190	0.007	0.021	50,000	970	0.006	0.018
0.4	0.8	1.5	50,000	2,160	0.024	0.072	50,000	1,870	0.024	0.072	50,000	1,580	0.02	0.06	50,000	1,300	0.016	0.048
		2.5	50,000	2,160	0.024	0.072	50,000	1,870	0.024	0.072	50,000	1,580	0.02	0.06	50,000	1,300	0.016	0.048
		4	40,000	1,730	0.012	0.036	40,000	1,500	0.012	0.036	40,000	1,270	0.01	0.03	40,000	1,040	0.008	0.024
0.5	1	1.5	40,000	2,400	0.03	0.09	40,000	2,080	0.03	0.09	40,000	1,760	0.024	0.072	40,000	1,440	0.02	0.06
		2.5	40,000	2,400	0.03	0.09	40,000	2,080	0.03	0.09	40,000	1,760	0.024	0.072	40,000	1,440	0.02	0.06
		4	36,000	2,160	0.02	0.06	36,000	1,870	0.02	0.06	36,000	1,580	0.016	0.048	36,000	1,300	0.013	0.039
		5	32,000	1,920	0.015	0.045	32,000	1,660	0.015	0.045	32,000	1,410	0.012	0.036	32,000	1,150	0.01	0.03
0.75	1.5	2.5	27,000	2,430	0.045	0.135	27,000	2,110	0.045	0.135	27,000	1,780	0.036	0.108	27,000	1,460	0.03	0.09
		5	27,000	2,430	0.045	0.135	27,000	2,110	0.045	0.135	27,000	1,780	0.036	0.108	27,000	1,460	0.03	0.09
		7.5	21,000	1,890	0.03	0.09	21,000	1,640	0.03	0.09	21,000	1,390	0.024	0.072	21,000	1,130	0.02	0.06
1	2	2.5	20,000	2,400	0.06	0.18	20,000	2,080	0.06	0.18	20,000	1,760	0.048	0.144	20,000	1,440	0.04	0.12
		5	20,000	2,400	0.06	0.18	20,000	2,080	0.06	0.18	20,000	1,760	0.048	0.144	20,000	1,440	0.04	0.12
		7.5	18,000	2,160	0.04	0.12	18,000	1,870	0.04	0.12	18,000	1,580	0.032	0.096	18,000	1,300	0.027	0.081
		10	16,000	1,920	0.03	0.09	16,000	1,660	0.03	0.09	16,000	1,410	0.024	0.072	16,000	1,150	0.02	0.06

【Note】

1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

<Finishing condition>

Metric

Work material			Hardened steel (50～55HRC) AISI 420				Hardened steel (55～62HRC) D2, Matrix HSS				Hardened steel (62～64HRC) AISI M2, Powder steel				Hardened steel (64～70HRC) Powder steel			
Ball radius RE (mm)	Tool dia. DC (mm)	Under neck length LU (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n min^{-1}	Feed rate v_f mm/min	Depth of cut (mm) a_p	Depth of cut (mm) a_e
0.1	0.2	0.5	50,000	420	0.004	0.004	50,000	350	0.004	0.004	50,000	290	0.004	0.004	50,000	220	0.004	0.004
		0.75	50,000	420	0.003	0.003	50,000	350	0.003	0.003	50,000	290	0.003	0.003	50,000	220	0.003	0.003
		1	50,000	420	0.002	0.002	50,000	350	0.002	0.002	50,000	290	0.002	0.002	50,000	220	0.002	0.002
		1.5	50,000	420	0.001	0.001	50,000	350	0.001	0.001	50,000	290	0.001	0.001	50,000	220	0.001	0.001
		2	50,000	420	0.001	0.001	50,000	350	0.001	0.001	50,000	290	0.001	0.001	50,000	220	0.001	0.001
0.15	0.3	0.5	50,000	620	0.006	0.006	50,000	530	0.006	0.006	50,000	430	0.006	0.006	50,000	340	0.006	0.006
		0.75	50,000	620	0.006	0.006	50,000	530	0.006	0.006	50,000	430	0.006	0.006	50,000	340	0.006	0.006
		1	50,000	620	0.005	0.005	50,000	530	0.005	0.005	50,000	430	0.005	0.005	50,000	340	0.005	0.005
		1.5	50,000	620	0.003	0.003	50,000	530	0.003	0.003	50,000	430	0.003	0.003	50,000	340	0.003	0.003
		2	50,000	620	0.003	0.003	50,000	530	0.003	0.003	50,000	430	0.003	0.003	50,000	340	0.003	0.003
		3	40,000	500	0.002	0.002	40,000	420	0.002	0.002	40,000	350	0.002	0.002	40,000	270	0.002	0.002
0.2	0.4	0.75	50,000	880	0.008	0.008	50,000	750	0.008	0.008	50,000	610	0.008	0.008	50,000	480	0.008	0.008
		1	50,000	880	0.008	0.008	50,000	750	0.008	0.008	50,000	610	0.008	0.008	50,000	480	0.008	0.008
		1.5	50,000	880	0.005	0.005	50,000	750	0.005	0.005	50,000	610	0.005	0.005	50,000	480	0.005	0.005
		2	50,000	880	0.004	0.004	50,000	750	0.004	0.004	50,000	610	0.004	0.004	50,000	480	0.004	0.004
		3	50,000	880	0.003	0.003	50,000	750	0.003	0.003	50,000	610	0.003	0.003	50,000	480	0.003	0.003
0.25	0.5	1	50,000	1,110	0.01	0.01	50,000	940	0.01	0.01	50,000	770	0.01	0.01	50,000	600	0.01	0.01
		1.5	50,000	1,110	0.01	0.01	50,000	940	0.01	0.01	50,000	770	0.01	0.01	50,000	600	0.01	0.01
		2.5	50,000	1,110	0.005	0.005	50,000	940	0.005	0.005	50,000	770	0.005	0.005	50,000	600	0.005	0.005
		3	48,000	1,060	0.005	0.005	48,000	900	0.005	0.005	48,000	730	0.005	0.005	48,000	570	0.005	0.005
0.3	0.6	1	50,000	1,400	0.012	0.012	50,000	1,190	0.012	0.012	50,000	970	0.012	0.012	50,000	760	0.012	0.012
		1.5	50,000	1,400	0.012	0.012	50,000	1,190	0.012	0.012	50,000	970	0.012	0.012	50,000	760	0.012	0.012
		3	50,000	1,400	0.006	0.006	50,000	1,190	0.006	0.006	50,000	970	0.006	0.006	50,000	760	0.006	0.006
0.4	0.8	1.5	50,000	1,870	0.016	0.016	50,000	1,580	0.016	0.016	50,000	1,300	0.016	0.016	50,000	1,010	0.016	0.016
		2.5	50,000	1,870	0.016	0.016	50,000	1,580	0.016	0.016	50,000	1,300	0.016	0.016	50,000	1,010	0.016	0.016
		4	40,000	1,500	0.008	0.008	40,000	1,270	0.008	0.008	40,000	1,040	0.008	0.008	40,000	810	0.008	0.008
0.5	1	1.5	40,000	2,080	0.02	0.02	40,000	1,760	0.02	0.02	40,000	1,440	0.02	0.02	40,000	1,120	0.02	0.02
		2.5	40,000	2,080	0.02	0.02	40,000	1,760	0.02	0.02	40,000	1,440	0.02	0.02	40,000	1,120	0.02	0.02
		4	36,000	1,870	0.013	0.013	36,000	1,580	0.013	0.013	36,000	1,300	0.013	0.013	36,000	1,010	0.013	0.013
		5	32,000	1,660	0.01	0.01	32,000	1,410	0.01	0.01	32,000	1,150	0.01	0.01	32,000	900	0.01	0.01
0.75	1.5	2.5	27,000	2,110	0.03	0.03	27,000	1,780	0.03	0.03	27,000	1,460	0.03	0.03	27,000	1,130	0.03	0.03
		5	27,000	2,110	0.03	0.03	27,000	1,780	0.03	0.03	27,000	1,460	0.03	0.03	27,000	1,130	0.03	0.03
		7.5	21,000	1,640	0.02	0.02	21,000	1,390	0.02	0.02	21,000	1,130	0.02	0.02	21,000	880	0.02	0.02
1	2	2.5	20,000	2,080	0.04	0.04	20,000	1,760	0.04	0.04	20,000	1,440	0.04	0.04	20,000	1,120	0.04	0.04
		5	20,000	2,080	0.04	0.04	20,000	1,760	0.04	0.04	20,000	1,440	0.04	0.04	20,000	1,120	0.04	0.04
		7.5	18,000	1,870	0.027	0.027	18,000	1,580	0.027	0.027	18,000	1,300	0.027	0.027	18,000	1,010	0.027	0.027
		10	16,000	1,660	0.02	0.02	16,000	1,410	0.02	0.02	16,000	1,150	0.02	0.02	16,000	900	0.02	0.02

【Note】

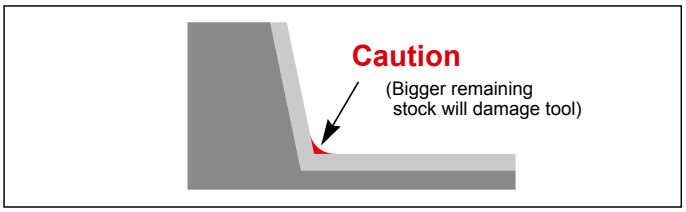
1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

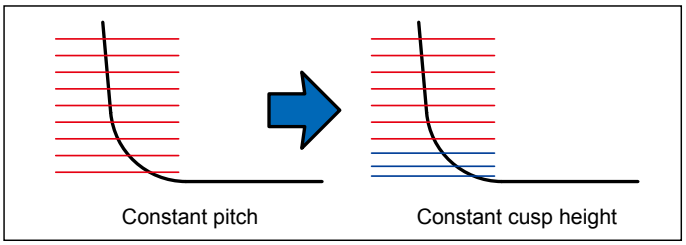
Epoch CBN High Precision Ball End Mill

Cautions

＜About semi-finishing＞

For stable machining, perform semi finishing to remove remaining stock in the corners. (This will make the machining amount for finishing uniform.)
At this time, it is recommended that the program should be set so that the cusp height will be a constant amount. In addition, it is recommended that semi finishing should be performed with CBN end mill.

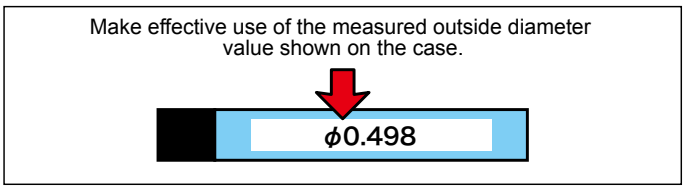


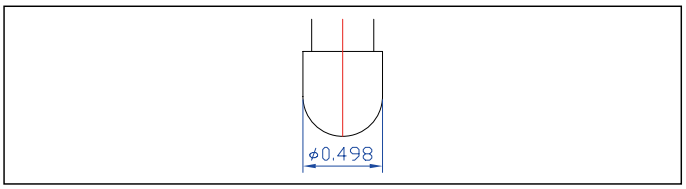


＜Input of diameter correction value＞

For Epoch CBN High Precision Ball End Mill, the measured outside diameter value is shown on the case.
Inputting the actual measured value for the tool diameter in CAM from roughing to finishing will enable improved final machining accuracy.

【Input example】
Ball end mill: Tool diameter Ø0.498 → RE0.249





＜Regarding feed rate＞

If the actual feed rate of the machine does not reach the set value (such as when workpiece is small and speed cannot be increased, etc.), sudden increases/decreases in feed rate may occur, which can cause chipping, etc.
In such cases, input the feed rate that the machine can support.

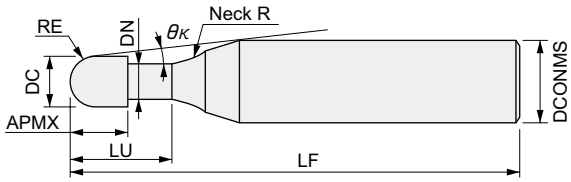
Epoch CBN Super Ball End Mill

Planing | Die-sinking | Profiling | Radius | Rest material machining | Miniature | Finishing | Miniature Rib

RE tolerance ±0.005mm h4

New-concept CBN end mill providing both good cutting performance and strong flute edges.

Includes actual measured tool diameter value.



CBN-EPSB2○○○-○○.○-○○○-S/F

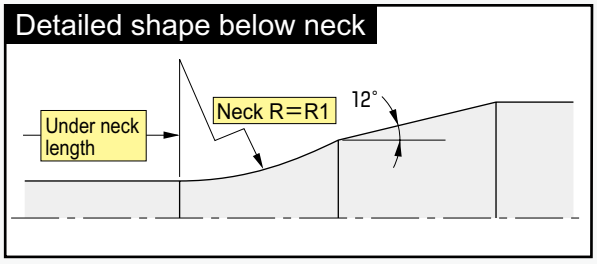
※Actual measured tool diameter value is shown on a case.

CBN Cutting Conditions A152

Strong (S) type		Fine (F) type		Size (mm) Display of actual measured mill dia. for all tools								Interference angle (°)	Actual effective length in Incline Angles				
Item code	Stock	Item code	Stock	Ball radius RE	Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	θK	0.5°	1°	1.5°	2°	3°
CBN-EPSB2002-0.5-S	★	CBN-EPSB2002-0.5-F	●	0.1	0.2	0.5	0.12	0.18	50	4	1	11.45	0.67	0.7	0.72	0.75	0.8
CBN-EPSB2002-1-S	★	CBN-EPSB2002-1-F	●			1	0.12	0.18	50	4	1	10.88	1.19	1.24	1.28	1.32	1.38
CBN-EPSB2003-0.75-S	★	CBN-EPSB2003-0.75-F	●	0.15	0.3	0.75	0.18	0.27	50	4	1	11.17	0.95	0.99	1.02	1.05	1.1
CBN-EPSB2003-1.5-S	★	CBN-EPSB2003-1.5-F	●			1.5	0.18	0.27	50	4	1	10.36	1.73	1.79	1.83	1.88	2.03
CBN-EPSB2004-1-S	★	CBN-EPSB2004-1-F	●	0.2	0.4	1	0.24	0.37	50	4	1	10.91	1.21	1.25	1.29	1.32	1.38
CBN-EPSB2004-2-S	★	CBN-EPSB2004-2-F	●			2	0.24	0.37	50	4	1	9.88	2.25	2.31	2.37	2.43	2.68
CBN-EPSB2005-1.5-S	★	CBN-EPSB2005-1.5-F	●	0.25	0.5	1.5	0.3	0.47	50	4	1	10.39	1.73	1.78	1.83	1.87	2
CBN-EPSB2005-3-S	★	CBN-EPSB2005-3-F	●			3	0.3	0.47	50	4	1	9	3.28	3.36	3.46	3.62	3.99
CBN-EPSB2006-1.5-S	★	CBN-EPSB2006-1.5-F	●	0.3	0.6	1.5	0.36	0.57	50	4	1	10.4	1.73	1.78	1.82	1.86	1.98
CBN-EPSB2006-3-S	★	CBN-EPSB2006-3-F	●			3	0.36	0.57	50	4	1	8.98	3.28	3.36	3.46	3.61	3.97
CBN-EPSB2008-2.5-S	★	CBN-EPSB2008-2.5-F	●	0.4	0.8	2.5	0.48	0.77	50	4	1	9.37	2.76	2.83	2.89	2.99	3.28
CBN-EPSB2008-5-S	★	CBN-EPSB2008-5-F	●			5	0.48	0.77	50	4	1	7.48	5.33	5.48	5.72	5.99	6.6
CBN-EPSB2010-2.5-S	★	CBN-EPSB2010-2.5-F	●	0.5	1	2.5	0.6	0.96	50	4	1	9.31	2.77	2.84	2.89	3	3.28
CBN-EPSB2010-5-S	★	CBN-EPSB2010-5-F	●			5	0.6	0.96	50	4	1	7.34	5.34	5.5	5.74	5.99	6.6
CBN-EPSB2010-10-S	★	CBN-EPSB2010-10-F	●			10	0.6	0.96	50	4	1	5.15	10.5	10.95	11.44	11.98	13.23
CBN-EPSB2015-5-S	★	CBN-EPSB2015-5-F	●	0.75	1.5	5	0.9	1.44	50	4	1	6.94	5.36	5.53	5.75	6	6.58
CBN-EPSB2015-10-S	★	CBN-EPSB2015-10-F	●			10	0.9	1.44	50	4	1	4.68	10.54	10.98	11.46	11.98	13.22
CBN-EPSB2020-5-S	★	CBN-EPSB2020-5-F	●	1	2	5	1.2	1.92	50	4	1	6.42	5.38	5.56	5.77	6.01	6.56
CBN-EPSB2020-10-S	★	CBN-EPSB2020-10-F	●			10	1.2	1.92	50	4	1	4.12	10.58	11.01	11.48	11.99	13.2
CBN-EPSB2020-20-S	★	CBN-EPSB2020-20-F	●			20	1.2	1.92	55	4	1	2.4	21	21.9	22.88	23.96	No interference

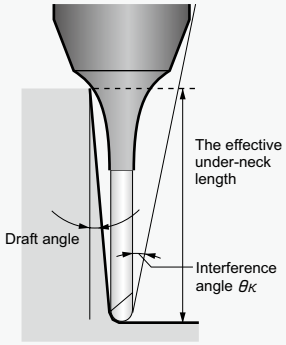
【Basic recommendation】F type : L/D(under neck length/tool dia)≦5, S type : L/D(under neck length/tool dia)>5

Detailed shape below neck



【Note】

If the workpiece has draft angle, the interference length will be longer than the under-neck length.Please refer to the effective under-neck length for the various draft angles.
In addition, the angle at which the tool will interfere with the workpiece is shown as the "interference angle θK", and should also be referred to.



Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
		○	◎	◎				

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch CBN Super Ball End Mill

Recommended cutting conditions CBN-EPSB-S CBN-EPSB-F

<Semi-finishing>

Inch

Work material					1		2		3		4	
					Hardened steel (~55HRC) P21,D2,L6		Hardened steel (55~65HRC) D2,D3		Hardened steel (65~68HRC) T1~T5,Melted HSS		Hardened steel (68~72HRC) Powder HSS	
Ratio to standard depth of cut					100%		90%		80%		70%	
RE (mm)	DC (mm)	LU (mm)	Depth of cut (inch) a_p	Depth of cut (inch) a_e	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
0.1	0.2	0.5	.0002	.0006	50,000	24	48,000	19	45,000	18	43,000	14
		1	.0002	.0006	46,000	18	44,000	14	42,000	13	39,000	9
0.15	0.3	0.75	.0002	.0007	50,000	35	47,000	30	45,000	25	42,000	20
		1.5	.0002	.0007	45,000	28	42,000	23	40,000	19	38,000	15
0.2	0.4	1	.0003	.0009	46,000	43	44,000	35	42,000	30	39,000	25
		2	.0003	.0009	41,000	32	39,000	28	37,000	23	35,000	17
0.25	0.5	1.5	.0005	.0015	46,000	54	44,000	45	41,000	36	39,000	28
		3	.0004	.0012	41,000	42	39,000	34	37,000	26	35,000	22
0.3	0.6	1.5	.0006	.0018	42,000	69	40,000	57	38,000	48	36,000	37
		3	.0005	.0014	38,000	54	36,000	45	34,000	37	32,000	28
0.4	0.8	2.5	.0008	.0024	42,000	93	40,000	79	38,000	63	36,000	51
		5	.0006	.0019	38,000	84	36,000	68	34,000	56	32,000	45
0.5	1	2.5	.0014	.0041	38,000	105	36,000	88	34,000	70	32,000	55
		5	.0008	.0024	34,000	94	33,000	81	31,000	63	29,000	50
		10	.0006	.0018	27,000	64	25,000	51	24,000	43	23,000	34
0.75	1.5	5	.0012	.0035	32,000	96	30,000	78	29,000	64	27,000	51
		10	.0008	.0024	22,000	52	21,000	43	20,000	36	19,000	28
1	2	5	.002	.0059	28,000	110	27,000	94	25,000	75	24,000	59
		10	.0012	.0035	25,000	98	24,000	83	23,000	69	21,000	51
		20	.0008	.0024	20,000	63	19,000	52	18,000	43	17,000	33

<Finishing>

Inch

Work material					1		2		3		4	
					Hardened steel (~55HRC) P21,D2,L6		Hardened steel (55~65HRC) D2,D3		Hardened steel (65~68HRC) T1~T5,Melted HSS		Hardened steel (68~72HRC) Powder HSS	
Ratio to standard depth of cut					100%		90%		80%		70%	
RE (mm)	DC (mm)	LU (mm)	Depth of cut (inch) a_p	Depth of cut (inch) a_e	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
0.1	0.2	0.5	.0002	.0006	50,000	20	48,000	15	45,000	14	43,000	10
		1	.0002	.0006	46,000	14	44,000	14	42,000	10	39,000	9
0.15	0.3	0.75	.0002	.0006	50,000	28	47,000	22	45,000	21	42,000	17
		1.5	.0002	.0006	45,000	21	42,000	17	40,000	16	38,000	12
0.2	0.4	1	.0002	.0007	46,000	36	44,000	31	42,000	26	39,000	21
		2	.0002	.0007	41,000	26	39,000	21	37,000	17	35,000	17
0.25	0.5	1.5	.0003	.0009	46,000	43	44,000	38	41,000	32	39,000	25
		3	.0003	.0009	41,000	32	39,000	28	37,000	23	35,000	19
0.3	0.6	1.5	.0004	.0012	42,000	56	40,000	47	38,000	39	36,000	34
		3	.0003	.0009	38,000	42	36,000	37	34,000	29	32,000	25
0.4	0.8	2.5	.0006	.0018	42,000	73	40,000	63	38,000	54	36,000	45
		5	.0005	.0014	38,000	66	36,000	57	34,000	48	32,000	40
0.5	1	2.5	.0008	.0024	38,000	84	36,000	71	34,000	59	32,000	50
		5	.0007	.0021	34,000	75	33,000	65	31,000	54	29,000	46
		10	.0004	.0012	27,000	51	25,000	43	24,000	36	23,000	31
0.75	1.5	5	.0009	.0027	32,000	76	30,000	64	29,000	55	27,000	45
		10	.0007	.0021	22,000	42	21,000	36	20,000	30	19,000	25
1	2	5	.001	.003	28,000	88	27,000	77	25,000	63	24,000	53
		10	.0008	.0024	25,000	79	24,000	68	23,000	58	21,000	46
		20	.0005	.0014	20,000	50	19,000	43	18,000	37	17,000	29

(※) The indicated standard cutting depth is a reference value for Group 1 work materials.
For materials in other groups, the cutting depth should be adjusted using the reference ratio shown in the above table.

【Note】
1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions.
The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

<Semi-finishing>

Metric

Work material					1		2		3		4	
					Hardened steel (~55HRC) P21,D2,L6		Hardened steel (55~65HRC) D2,D3		Hardened steel (65~68HRC) T1~T5,Melted HSS		Hardened steel (68~72HRC) Powder HSS	
Ratio to standard depth of cut					100%		90%		80%		70%	
RE (mm)	DC (mm)	LU (mm)	Depth of cut (mm) a_p	a_e	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
0.1	0.2	0.5	0.005	0.015	50,000	600	48,000	500	45,000	410	43,000	320
		1	0.005	0.015	46,000	460	44,000	390	42,000	320	39,000	240
0.15	0.3	0.75	0.006	0.018	50,000	900	47,000	740	45,000	610	42,000	470
		1.5	0.006	0.018	45,000	680	42,000	550	40,000	450	38,000	360
0.2	0.4	1	0.008	0.024	46,000	1,100	44,000	920	42,000	760	39,000	590
		2	0.008	0.024	41,000	820	39,000	680	37,000	560	35,000	440
0.25	0.5	1.5	0.013	0.039	46,000	1,380	44,000	1,160	41,000	920	39,000	730
		3	0.01	0.03	41,000	1,030	39,000	850	37,000	690	35,000	550
0.3	0.6	1.5	0.015	0.045	42,000	1,760	40,000	1,470	38,000	1,200	36,000	950
		3	0.012	0.036	38,000	1,370	36,000	1,130	34,000	920	32,000	720
0.4	0.8	2.5	0.02	0.06	42,000	2,350	40,000	1,960	38,000	1,600	36,000	1,260
		5	0.016	0.048	38,000	2,130	36,000	1,760	34,000	1,430	32,000	1,120
0.5	1	2.5	0.035	0.105	38,000	2,660	36,000	2,210	34,000	1,790	32,000	1,400
		5	0.02	0.06	34,000	2,380	33,000	2,020	31,000	1,630	29,000	1,270
		10	0.015	0.045	27,000	1,620	25,000	1,310	24,000	1,080	23,000	860
0.75	1.5	5	0.03	0.09	32,000	2,400	30,000	1,970	29,000	1,630	27,000	1,270
		10	0.02	0.06	22,000	1,320	21,000	1,100	20,000	900	19,000	710
1	2	5	0.05	0.15	28,000	2,800	27,000	2,360	25,000	1,880	24,000	1,500
		10	0.03	0.09	25,000	2,500	24,000	2,100	23,000	1,730	21,000	1,310
		20	0.02	0.06	20,000	1,600	19,000	1,330	18,000	1,080	17,000	850

<Finishing>

Metric

Work material					1		2		3		4	
					Hardened steel (~55HRC) P21,D2,L6		Hardened steel (55~65HRC) D2,D3		Hardened steel (65~68HRC) T1~T5,Melted HSS		Hardened steel (68~72HRC) Powder HSS	
Ratio to standard depth of cut					100%		90%		80%		70%	
RE (mm)	DC (mm)	LU (mm)	Depth of cut (mm) a_p	a_e	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
0.1	0.2	0.5	0.005	0.015	50,000	480	48,000	410	45,000	350	43,000	290
		1	0.005	0.015	46,000	370	44,000	320	42,000	270	39,000	220
0.15	0.3	0.75	0.005	0.015	50,000	720	47,000	610	45,000	520	42,000	420
		1.5	0.005	0.015	45,000	540	42,000	450	40,000	380	38,000	320
0.2	0.4	1	0.006	0.018	46,000	880	44,000	760	42,000	650	39,000	520
		2	0.006	0.018	41,000	660	39,000	560	37,000	470	35,000	390
0.25	0.5	1.5	0.008	0.024	46,000	1,100	44,000	950	41,000	790	39,000	660
		3	0.008	0.024	41,000	820	39,000	700	37,000	590	35,000	490
0.3	0.6	1.5	0.01	0.03	42,000	1,410	40,000	1,210	38,000	1,020	36,000	850
		3	0.008	0.024	38,000	1,090	36,000	930	34,000	780	32,000	650
0.4	0.8	2.5	0.015	0.045	42,000	1,880	40,000	1,610	38,000	1,360	36,000	1,130
		5	0.012	0.036	38,000	1,700	36,000	1,450	34,000	1,220	32,000	1,000
0.5	1	2.5	0.02	0.06	38,000	2,130	36,000	1,810	34,000	1,520	32,000	1,250
		5	0.018	0.054	34,000	1,900	33,000	1,660	31,000	1,390	29,000	1,140
		10	0.01	0.03	27,000	1,300	25,000	1,080	24,000	920	23,000	770
0.75	1.5	5	0.023	0.069	32,000	1,920	30,000	1,620	29,000	1,390	27,000	1,130
		10	0.018	0.054	22,000	1,060	21,000	910	20,000	770	19,000	640
1	2	5	0.025	0.075	28,000	2,240	27,000	1,940	25,000	1,600	24,000	1,340
		10	0.02	0.06	25,000	2,000	24,000	1,730	23,000	1,470	21,000	1,180
		20	0.012	0.036	20,000	1,280	19,000	1,090	18,000	920	17,000	760

(※) The indicated standard cutting depth is a reference value for Group 1 work materials.
For materials in other groups, the cutting depth should be adjusted using the reference ratio shown in the above table.

【Note】
1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions.
The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

Epoch Deep Radius Evolution Hard-TH3

2 Flutes

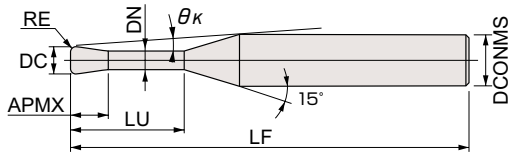
Slotting | Die-sinking | Profiling | Radius | Miniature | Rest material machining | Semi Finishing | Finishing | Miniature Rib

RE tolerance ±0.005mm (central axis) | h4

Performs excellent wear resistance when cutting hardened steel and contributes to high precision machining of molds & dies.

2 Flutes

Corner radius tolerance : ±0.005 (centerline datum)



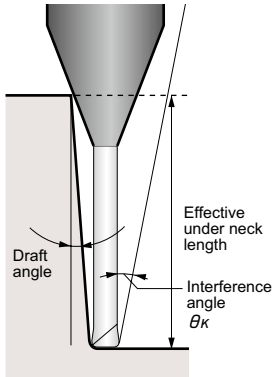
※The 2-flute tool uses a backdraft profile (with strong back taper).

EPDREH2○○○-○.○-○○○-TH3

Carbide | TH3 | Helix angle 30° | Cutting Conditions A163

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH2002-0.5-002-TH3	●	0.2 (.008inch)	0.02 (.001inch)	0.5 (.020inch)	0.15	0.17	50	4	13.99	0.57	0.59	0.61	0.63	0.68
EPDREH2002-1-002-TH3	●			1 (.039inch)					13.16	1.09	1.12	1.16	1.21	1.30
EPDREH2002-0.5-005-TH3	●		0.05 (.002inch)	0.5 (.020inch)					14.05	0.57	0.59	0.61	0.63	0.67
EPDREH2002-1-005-TH3	●			1 (.039inch)					13.21	1.08	1.12	1.16	1.20	1.30
EPDREH2003-1-002-TH3	●	0.3 (.012inch)	0.02 (.001inch)	1 (.039inch)	0.25	0.27	50	4	13.12	1.09	1.12	1.16	1.21	1.30
EPDREH2003-2-002-TH3	●			2 (.079inch)					11.70	2.12	2.19	2.27	2.36	2.55
EPDREH2003-1-005-TH3	●		0.05 (.002inch)	1 (.039inch)					13.17	1.08	1,12	1.16	1.20	1.30
EPDREH2003-2-005-TH3	●			2 (.079inch)					11.73	2.12	2.19	2.27	2.35	2.54
EPDREH2004-1-002-TH3	●	0.4 (.016inch)	0.02 (.001inch)	1 (.039inch)	0.3	0.37	50	4	13.07	1.09	1.12	1.16	1.21	1.30
EPDREH2004-2-002-TH3	●			2 (.079inch)					11.62	2.12	2.19	2.27	2.36	2.55
EPDREH2004-1-005-TH3	●		0.05 (.002inch)	1 (.039inch)					13.12	1.08	1.12	1.16	1.20	1.30
EPDREH2004-2-005-TH3	●			2 (.079inch)					11.66	2.12	2.19	2.27	2.35	2.54
EPDREH2004-1-01-TH3	●		0.1 (.004inch)	1 (.039inch)					13.21	1.08	1.12	1.15	1.19	1.28
EPDREH2004-2-01-TH3	●			2 (.079inch)					11.73	2.12	2.19	2.26	2.34	2.53
EPDREH2005-1-002-TH3	●	0.5 (.020inch)	0.02 (.001inch)	1 (.039inch)	0.35	0.47	50	4	13.03	1.09	1.12	1.16	1.21	1.30
EPDREH2005-2-002-TH3	●			2 (.079inch)					11.55	2.12	2.19	2.27	2.36	2.55
EPDREH2005-3-002-TH3	●			3 (.118inch)					10.37	3.15	3.26	3.38	3.51	3.79
EPDREH2005-1-005-TH3	●		0.05 (.002inch)	1 (.039inch)					13.08	1.08	1.12	1.16	1.20	1.30
EPDREH2005-2-005-TH3	●			2 (.079inch)					11.59	2.12	2.19	2.27	2.35	2.54
EPDREH2005-3-005-TH3	●			3 (.118inch)					10.40	3.15	3.26	3.38	3.50	3.78
EPDREH2005-1-01-TH3	●		0.1 (.004inch)	1 (.039inch)					13.16	1.08	1.12	1.15	1.19	1.28
EPDREH2005-2-01-TH3	●			2 (.079inch)					11.66	2.12	2.19	2.26	2.34	2.53
EPDREH2005-3-01-TH3	●			3 (.118inch)					10.46	3.15	3.26	3.37	3.49	3.77
EPDREH2006-2-002-TH3	●	0.6 (.024inch)	0.02 (.001inch)	2 (.079inch)	0.4	0.57	50	4	11.47	2.12	2.19	2.27	2.36	2.55
EPDREH2006-4-002-TH3	●			4 (.157inch)					9.31	4.19	4.33	4.49	4.66	5.03
EPDREH2006-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					11.51	2.12	2.19	2.27	2.35	2.54
EPDREH2006-4-005-TH3	●			4 (.157inch)					9.33	4.19	4.33	4.48	4.65	5.03
EPDREH2006-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					11.58	2.12	2.19	2.26	2.34	2.53
EPDREH2006-4-01-TH3	●			4 (.157inch)					9.38	4.18	4.33	4.48	4.64	5.01
EPDREH2008-2-002-TH3	●	0.8 (.031inch)	0.02 (.001inch)	2 (.079inch)	0.5	0.77	50	4	11.30	2.12	2.19	2.27	2.36	2.55
EPDREH2008-4-002-TH3	●			4 (.157inch)					9.09	4.19	4.33	4.49	4.66	5.03
EPDREH2008-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					11.35	2.12	2.19	2.27	2.35	2.54
EPDREH2008-4-005-TH3	●			4 (.157inch)					9.12	4.19	4.33	4.48	4.65	5.03
EPDREH2008-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					11.42	2.12	2.19	2.26	2.34	2.53
EPDREH2008-4-01-TH3	●			4 (.157inch)					9.16	4.18	4.33	4.48	4.64	5.01
EPDREH2008-2-02-TH3	●		0.2 (.008inch)	2 (.079inch)					11.56	2.11	2.18	2.25	2.33	2.50
EPDREH2008-4-02-TH3	●			4 (.157inch)					9.25	4.18	4.32	4.47	4.63	4.99

● : Inventory maintained in US



【Note】
The actual effective under neck length with respect to the draft angle differs from the Epoch Deep Radius Evolution EPDRE-ATH.
Please be sure to check this.

EPDREH2○○○-○.○-○○○-TH3

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH2010-2-002-TH3	●	1 (.039inch)		2 (.079inch)	0.8	0.94	50	4	11.04	2.18	2.25	2.33	2.42	2.62
EPDREH2010-4-002-TH3	●			4 (.157inch)					8.80	4.24	4.39	4.55	4.72	5.10
EPDREH2010-6-002-TH3	●			6 (.236inch)					7.32	6.31	6.53	6.77	7.02	7.59
EPDREH2010-8-002-TH3	●			8 (.315inch)					6.26	8.38	8.67	8.98	9.32	10.07
EPDREH2010-2-005-TH3	●			2 (.079inch)					11.08	2.18	2.25	2.33	2.42	2.61
EPDREH2010-4-005-TH3	●			4 (.157inch)					8.83	4.24	4.39	4.55	4.72	5.09
EPDREH2010-6-005-TH3	●			6 (.236inch)					7.34	6.31	6.53	6.76	7.02	7.58
EPDREH2010-8-005-TH3	●			8 (.315inch)					6.27	8.38	8.67	8.98	9.32	10.07
EPDREH2010-2-01-TH3	●			2 (.079inch)					11.16	2.17	2.25	2.33	2.41	2.60
EPDREH2010-4-01-TH3	●			4 (.157inch)					8.88	4.24	4.39	4.54	4.71	5.08
EPDREH2010-6-01-TH3	●			6 (.236inch)					7.37	6.31	6.53	6.76	7.01	7.57
EPDREH2010-8-01-TH3	●			8 (.315inch)					6.29	8.38	8.67	8.97	9.31	10.06
EPDREH2010-2-02-TH3	●			2 (.079inch)					11.30	2.17	2.24	2.31	2.39	2.57
EPDREH2010-4-02-TH3	●			4 (.157inch)					8.97	4.24	4.38	4.53	4.69	5.06
EPDREH2010-6-02-TH3	●			6 (.236inch)					7.43	6.31	6.52	6.75	6.99	7.55
EPDREH2010-8-02-TH3	●			8 (.315inch)					6.34	8.37	8.66	8.96	9.29	10.03

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	○	◎	◎	◎	○	◎	○	○

Epoch Deep Radius Evolution Hard-TH3

YouTube

4 Flutes

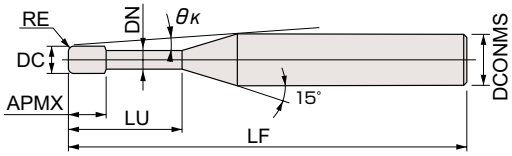
Slotting | Die-sinking | Profiling | Radius | Miniature | Rest material machining | Semi Finishing | Finishing | Miniature Rib

RE tolerance ±0.005mm (central axis)

h4 DCONMS=4 | h5 DCONMS=6

Performs excellent wear resistance when cutting hardened steel and contributes to high precision machining of molds & dies.

Corner radius tolerance : ±0.005 (centerline datum)



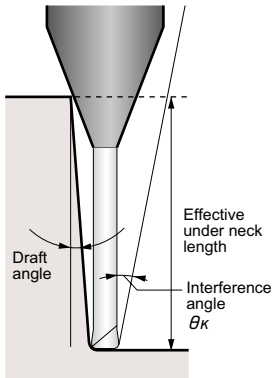
4 Flutes

EPDREH4○○○-○.○-○○○-TH3

Carbide | TH3 | Helix angle 30° | Cutting Conditions A167

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH4010-1.5-002-TH3	●	1 (.039inch)	0.02 (.001inch)	1.5 (.059inch)	0.6	0.96	50	4	11.85	1.62	1.68	1.74	1.80	1.95
EPDREH4010-2-002-TH3	●			2 (.079inch)					11.09	2.14	2.21	2.29	2.38	2.57
EPDREH4010-2.5-002-TH3	●			2.5 (.098inch)					10.43	2.66	2.75	2.85	2.95	3.19
EPDREH4010-3-002-TH3	●			3 (.118inch)					9.84	3.17	3.28	3.40	3.53	3.81
EPDREH4010-4-002-TH3	●			4 (.157inch)					8.84	4.21	4.35	4.51	4.68	5.06
EPDREH4010-5-002-TH3	●			5 (.197inch)					8.02	5.24	5.42	5.62	5.83	6.30
EPDREH4010-6-002-TH3	●			6 (.236inch)					7.34	6.27	6.49	6.73	6.98	7.54
EPDREH4010-8-002-TH3	●			8 (.315inch)					6.27	8.34	8.63	8.94	9.28	10.03
EPDREH4010-1.5-005-TH3	●		0.05 (.002inch)	1.5 (.059inch)					11.90	1.62	1.68	1.73	1.80	1.94
EPDREH4010-2-005-TH3	●			2 (.079inch)					11.14	2.14	2.21	2.29	2.37	2.56
EPDREH4010-2.5-005-TH3	●			2.5 (.098inch)					10.47	2.65	2.75	2.84	2.95	3.18
EPDREH4010-3-005-TH3	●			3 (.118inch)					9.87	3.17	3.28	3.40	3.52	3.81
EPDREH4010-4-005-TH3	●			4 (.157inch)					8.87	4.21	4.35	4.51	4.67	5.05
EPDREH4010-5-005-TH3	●			5 (.197inch)					8.04	5.24	5.42	5.61	5.82	6.29
EPDREH4010-6-005-TH3	●			6 (.236inch)					7.36	6.27	6.49	6.72	6.97	7.53
EPDREH4010-8-005-TH3	●			8 (.315inch)					6.29	8.34	8.63	8.94	9.27	10.02
EPDREH4010-1.5-01-TH3	●		0.1 (.004inch)	1.5 (.059inch)					11.98	1.62	1.67	1.73	1.79	1.93
EPDREH4010-2-01-TH3	●			2 (.079inch)					11.21	2.14	2.21	2.28	2.37	2.55
EPDREH4010-2.5-01-TH3	●			2.5 (.098inch)					10.53	2.65	2.74	2.84	2.94	3.17
EPDREH4010-3-01-TH3	●			3 (.118inch)					9.93	3.17	3.28	3.39	3.52	3.79
EPDREH4010-4-01-TH3	●			4 (.157inch)					8.91	4.20	4.35	4.50	4.67	5.04
EPDREH4010-5-01-TH3	●			5 (.197inch)					8.08	5.24	5.42	5.61	5.82	6.28
EPDREH4010-6-01-TH3	●			6 (.236inch)					7.39	6.27	6.49	6.72	6.97	7.52
EPDREH4010-8-01-TH3	●			8 (.315inch)					6.31	8.34	8.63	8.93	9.26	10.01
EPDREH4010-1.5-02-TH3	●		0.2 (.008inch)	1.5 (.059inch)					12.15	1.62	1.67	1.72	1.78	1.91
EPDREH4010-2-02-TH3	●			2 (.079inch)					11.36	2.13	2.20	2.27	2.35	2.53
EPDREH4010-2.5-02-TH3	●			2.5 (.098inch)					10.66	2.65	2.74	2.83	2.93	3.15
EPDREH4010-3-02-TH3	●			3 (.118inch)					10.04	3.17	3.27	3.38	3.50	3.77
EPDREH4010-4-02-TH3	●			4 (.157inch)					9.00	4.20	4.34	4.49	4.65	5.01
EPDREH4010-5-02-TH3	●			5 (.197inch)					8.16	5.23	5.41	5.60	5.80	6.26
EPDREH4010-6-02-TH3	●			6 (.236inch)					7.45	6.27	6.48	6.71	6.95	7.50
EPDREH4010-8-02-TH3	●			8 (.315inch)					6.36	8.33	8.62	8.92	9.25	9.99
EPDREH4010-1.5-03-TH3	●		0.3 (.012inch)	1.5 (.059inch)					12.32	1.61	1.66	1.71	1.76	1.88
EPDREH4010-2-03-TH3	●			2 (.079inch)					11.51	2.13	2.19	2.26	2.34	2.50
EPDREH4010-2.5-03-TH3	●			2.5 (.098inch)					10.79	2.65	2.73	2.82	2.91	3.12
EPDREH4010-3-03-TH3	●			3 (.118inch)					10.16	3.16	3.26	3.37	3.49	3.75
EPDREH4010-4-03-TH3	●			4 (.157inch)					9.10	4.20	4.33	4.48	4.64	4.99
EPDREH4010-5-03-TH3	●			5 (.197inch)					8.23	5.23	5.40	5.59	5.79	6.23
EPDREH4010-6-03-TH3	●			6 (.236inch)					7.52	6.26	6.47	6.70	6.94	7.48
EPDREH4010-8-03-TH3	●			8 (.315inch)					6.41	8.33	8.61	8.91	9.24	9.96

● : Inventory maintained in US



【Note】
The actual effective under neck length with respect to the draft angle differs from the Epoch Deep Radius Evolution EPDRE-ATH.
Please be sure to check this.

EPDREH4○○○-○.○-○○○-TH3

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH4015-2-002-TH3	●	1.5 (.059inch)	0.02 (.001inch)	2 (.079inch)	0.9	1.44	50	4	10.49	2.18	2.25	2.33	2.42	2.62
EPDREH4015-3-002-TH3	●			3 (.118inch)					9.16	3.21	3.32	3.44	3.57	3.86
EPDREH4015-4-002-TH3	●			4 (.157inch)					8.13	4.24	4.39	4.55	4.72	5.10
EPDREH4015-5-002-TH3	●			5 (.197inch)					7.31	5.28	5.46	5.66	5.87	6.35
EPDREH4015-6-002-TH3	●			6 (.236inch)					6.63	6.31	6.53	6.77	7.02	7.59
EPDREH4015-8-002-TH3	●			8 (.315inch)					5.60	8.38	8.67	8.98	9.32	10.07
EPDREH4015-10-002-TH3	●			10 (.394inch)					4.85	10.45	10.81	11.20	11.62	12.56
EPDREH4015-12-002-TH3	●			12 (.472inch)					4.27	12.51	12.95	13.42	13.92	15.05
EPDREH4015-2-005-TH3	●		0.05 (.002inch)	2 (.079inch)					10.53	2.18	2.25	2.33	2.42	2.61
EPDREH4015-3-005-TH3	●			3 (.118inch)					9.19	3.21	3.32	3.44	3.57	3.85
EPDREH4015-4-005-TH3	●			4 (.157inch)					8.16	4.24	4.39	4.55	4.72	5.09
EPDREH4015-5-005-TH3	●			5 (.197inch)					7.33	5.28	5.46	5.66	5.87	6.34
EPDREH4015-6-005-TH3	●			6 (.236inch)					6.65	6.31	6.53	6.76	7.02	7.58
EPDREH4015-8-005-TH3	●			8 (.315inch)					5.61	8.38	8.67	8.98	9.32	10.07
EPDREH4015-10-005-TH3	●			10 (.394inch)					4.86	10.45	10.81	11.20	11.61	12.55
EPDREH4015-12-005-TH3	●			12 (.472inch)					4.28	12.51	12.95	13.41	13.91	15.04
EPDREH4015-2-01-TH3	●		0.1 (.004inch)	2 (.079inch)					10.61	2.17	2.25	2.33	2.41	2.60
EPDREH4015-3-01-TH3	●			3 (.118inch)					9.25	3.21	3.32	3.43	3.56	3.84
EPDREH4015-4-01-TH3	●			4 (.157inch)					8.20	4.24	4.39	4.54	4.71	5.08
EPDREH4015-5-01-TH3	●			5 (.197inch)					7.37	5.28	5.46	5.65	5.86	6.33
EPDREH4015-6-01-TH3	●			6 (.236inch)					6.68	6.31	6.53	6.76	7.01	7.57
EPDREH4015-8-01-TH3	●			8 (.315inch)					5.64	8.38	8.67	8.97	9.31	10.06
EPDREH4015-10-01-TH3	●			10 (.394inch)					4.87	10.44	10.80	11.19	11.61	12.54
EPDREH4015-12-01-TH3	●			12 (.472inch)					4.29	12.51	12.94	13.41	13.91	15.03
EPDREH4015-2-02-TH3	●		0.2 (.008inch)	2 (.079inch)					10.77	2.17	2.24	2.31	2.39	2.57
EPDREH4015-3-02-TH3	●			3 (.118inch)					9.37	3.21	3.31	3.42	3.54	3.82
EPDREH4015-4-02-TH3	●			4 (.157inch)					8.30	4.24	4.38	4.53	4.69	5.06
EPDREH4015-5-02-TH3	●			5 (.197inch)					7.44	5.27	5.45	5.64	5.84	6.30
EPDREH4015-6-02-TH3	●			6 (.236inch)					6.74	6.31	6.52	6.75	6.99	7.55
EPDREH4015-8-02-TH3	●			8 (.315inch)					5.68	8.37	8.66	8.96	9.29	10.03
EPDREH4015-10-02-TH3	●			10 (.394inch)					4.91	10.44	10.80	11.18	11.59	12.52
EPDREH4015-12-02-TH3	●			12 (.472inch)					4.32	12.51	12.94	13.40	13.89	15.00
EPDREH4015-2-03-TH3	●		0.3 (.012inch)	2 (.079inch)					10.93	2.17	2.23	2.30	2.38	2.55
EPDREH4015-3-03-TH3	●			3 (.118inch)					9.50	3.20	3.30	3.41	3.53	3.79
EPDREH4015-4-03-TH3	●			4 (.157inch)					8.39	4.24	4.37	4.52	4.68	5.04
EPDREH4015-5-03-TH3	●			5 (.197inch)					7.52	5.27	5.44	5.63	5.83	6.28
EPDREH4015-6-03-TH3	●			6 (.236inch)					6.81	6.30	6.51	6.74	6.98	7.52
EPDREH4015-8-03-TH3	●			8 (.315inch)					5.73	8.37	8.65	8.95	9.28	10.01
EPDREH4015-10-03-TH3	●			10 (.394inch)					4.94	10.44	10.79	11.17	11.58	12.49
EPDREH4015-12-03-TH3	●			12 (.472inch)					4.34	12.50	12.93	13.39	13.88	14.98

Epoch Deep Radius Evolution Hard-TH3

EPDREH4○○○-○.○-○○○-TH3

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH4015-2-05-TH3	●	1.5 (.059inch)	0.5 (.020inch)	2 (.079inch)	0.9	1.44	50	4	11.27	2.16	2.22	2.28	2.35	2.50
EPDREH4015-3-05-TH3	●			3 (.118inch)					9.75	3.19	3.29	3.39	3.50	3.75
EPDREH4015-4-05-TH3	●			4 (.157inch)					8.59	4.23	4.36	4.50	4.65	4.99
EPDREH4015-5-05-TH3	●			5 (.197inch)					7.68	5.26	5.43	5.61	5.80	6.23
EPDREH4015-6-05-TH3	●			6 (.236inch)					6.94	6.30	6.50	6.72	6.95	7.47
EPDREH4015-8-05-TH3	●			8 (.315inch)					5.82	8.36	8.64	8.93	9.25	9.96
EPDREH4015-10-05-TH3	●			10 (.394inch)					5.01	10.43	10.78	11.15	11.55	12.45
EPDREH4015-12-05-TH3	●			12 (.472inch)					4.40	12.50	12.92	13.37	13.85	14.93
EPDREH4020-2.5-002-TH3	●	2 (.079inch)	0.02 (.001inch)	2.5 (.098inch)	1.2	1.92	50	4	8.94	2.73	2.83	2.93	3.04	3.28
EPDREH4020-3-002-TH3	●			3 (.118inch)					8.30	3.25	3.36	3.48	3.61	3.91
EPDREH4020-4-002-TH3	●			4 (.157inch)					7.25	4.28	4.43	4.59	4.76	5.15
EPDREH4020-5-002-TH3	●			5 (.197inch)					6.44	5.32	5.50	5.70	5.91	6.39
EPDREH4020-6-002-TH3	●			6 (.236inch)					5.80	6.35	6.57	6.81	7.06	7.63
EPDREH4020-8-002-TH3	●			8 (.315inch)					4.82	8.42	8.71	9.02	9.36	10.12
EPDREH4020-10-002-TH3	●			10 (.394inch)					4.13	10.49	10.85	11.24	11.66	12.61
EPDREH4020-12-002-TH3	●			12 (.472inch)					3.61	12.55	12.99	13.46	13.96	15.09
EPDREH4020-2.5-005-TH3	●		0.05 (.002inch)	2.5 (.098inch)					8.98	2.73	2.83	2.93	3.03	3.28
EPDREH4020-3-005-TH3	●			3 (.118inch)					8.33	3.25	3.36	3.48	3.61	3.90
EPDREH4020-4-005-TH3	●			4 (.157inch)					7.28	4.28	4.43	4.59	4.76	5.14
EPDREH4020-5-005-TH3	●			5 (.197inch)					6.47	5.32	5.50	5.70	5.91	6.38
EPDREH4020-6-005-TH3	●			6 (.236inch)					5.81	6.35	6.57	6.80	7.06	7.63
EPDREH4020-8-005-TH3	●			8 (.315inch)					4.84	8.42	8.71	9.02	9.36	10.11
EPDREH4020-10-005-TH3	●			10 (.394inch)					4.14	10.48	10.85	11.24	11.66	12.60
EPDREH4020-12-005-TH3	●			12 (.472inch)					3.62	12.55	12.99	13.45	13.96	15.09
EPDREH4020-2.5-01-TH3	●		0.1 (.004inch)	2.5 (.098inch)					9.05	2.73	2.82	2.92	3.03	3.26
EPDREH4020-3-01-TH3	●			3 (.118inch)					8.39	3.25	3.36	3.47	3.60	3.89
EPDREH4020-4-01-TH3	●			4 (.157inch)					7.33	4.28	4.43	4.58	4.75	5.13
EPDREH4020-5-01-TH3	●			5 (.197inch)					6.50	5.31	5.50	5.69	5.90	6.37
EPDREH4020-6-01-TH3	●			6 (.236inch)					5.84	6.35	6.57	6.80	7.05	7.62
EPDREH4020-8-01-TH3	●			8 (.315inch)					4.86	8.42	8.71	9.02	9.35	10.10
EPDREH4020-10-01-TH3	●			10 (.394inch)					4.16	10.48	10.84	11.23	11.65	12.59
EPDREH4020-12-01-TH3	●			12 (.472inch)					3.63	12.55	12.98	13.45	13.95	15.07
EPDREH4020-2.5-02-TH3	●		0.2 (.008inch)	2.5 (.098inch)					9.19	2.73	2.82	2.91	3.01	3.24
EPDREH4020-3-02-TH3	●			3 (.118inch)					8.52	3.24	3.35	3.46	3.59	3.86
EPDREH4020-4-02-TH3	●			4 (.157inch)					7.42	4.28	4.42	4.57	4.74	5.11
EPDREH4020-5-02-TH3	●			5 (.197inch)					6.58	5.31	5.49	5.68	5.89	6.35
EPDREH4020-6-02-TH3	●			6 (.236inch)					5.90	6.34	6.56	6.79	7.04	7.59
EPDREH4020-8-02-TH3	●			8 (.315inch)					4.90	8.41	8.70	9.01	9.34	10.08
EPDREH4020-10-02-TH3	●			10 (.394inch)					4.19	10.48	10.84	11.22	11.64	12.56
EPDREH4020-12-02-TH3	●			12 (.472inch)					3.65	12.55	12.98	13.44	13.94	15.05

● : Inventory maintained in US

EPDREH4○○○-○.○-○○○-TH3

Item code	Stock	Size(mm)							Interference angle θK (°)	Effective under neck length with respect to draft angle				
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.						
		DC	RE	LU	APMX	DN	LF	DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH4020-2.5-03-TH3	●	2 (.079inch)	0.3 (.012inch)	2.5 (.098inch)	1.2	1.92	50	4	9.34	2.72	2.81	2.90	3.00	3.22
EPDREH4020-3-03-TH3	●			3 (.118inch)					8.64	3.24	3.34	3.45	3.57	3.84
EPDREH4020-4-03-TH3	●			4 (.157inch)					7.52	4.27	4.41	4.56	4.72	5.08
EPDREH4020-5-03-TH3	●			5 (.197inch)					6.65	5.31	5.48	5.67	5.87	6.33
EPDREH4020-6-03-TH3	●			6 (.236inch)					5.96	6.34	6.55	6.78	7.02	7.57
EPDREH4020-8-03-TH3	●			8 (.315inch)					4.94	8.41	8.69	8.99	9.32	10.05
EPDREH4020-10-03-TH3	●			10 (.394inch)					4.22	10.48	10.83	11.21	11.62	12.54
EPDREH4020-12-03-TH3	●			12 (.472inch)					3.68	12.54	12.97	13.43	13.92	15.03
EPDREH4020-2.5-05-TH3	●		0.5 (.020inch)	2.5 (.098inch)					9.65	2.72	2.79	2.88	2.97	3.17
EPDREH4020-3-05-TH3	●			3 (.118inch)					8.91	3.23	3.33	3.43	3.54	3.79
EPDREH4020-4-05-TH3	●			4 (.157inch)					7.72	4.27	4.40	4.54	4.69	5.03
EPDREH4020-5-05-TH3	●			5 (.197inch)					6.81	5.30	5.47	5.65	5.84	6.28
EPDREH4020-6-05-TH3	●			6 (.236inch)					6.09	6.33	6.54	6.76	6.99	7.52
EPDREH4020-8-05-TH3	●			8 (.315inch)					5.03	8.40	8.68	8.97	9.29	10.01
EPDREH4020-10-05-TH3	●			10 (.394inch)					4.28	10.47	10.82	11.19	11.59	12.49
EPDREH4020-12-05-TH3	●			12 (.472inch)					3.72	12.54	12.96	13.41	13.89	14.98
EPDREH4030-4-005-TH3	●	3 (.118inch)	0.05 (.002inch)	4 (.157inch)	1.8	2.88	50	6	8.73	4.36	4.51	4.67	4.84	5.23
EPDREH4030-6-005-TH3	●			6 (.236inch)					7.27	6.43	6.65	6.89	7.14	7.72
EPDREH4030-8-005-TH3	●			8 (.315inch)			55		6.22	8.49	8.79	9.10	9.44	10.21
EPDREH4030-10-005-TH3	●			10 (.394inch)					5.44	10.56	10.93	11.32	11.74	12.69
EPDREH4030-12-005-TH3	●			12 (.472inch)			60		4.83	12.63	13.07	13.54	14.04	15.18
EPDREH4030-14-005-TH3	●			14 (.551inch)					4.34	14.70	15.21	15.75	16.34	17.67
EPDREH4030-16-005-TH3	●			16 (.630inch)					3.95	16.76	17.35	17.97	18.64	20.15
EPDREH4030-18-005-TH3	●			18 (.709inch)			65		3.62	18.83	19.49	20.19	20.94	22.64
EPDREH4030-20-005-TH3	●			20 (.787inch)					3.34	20.90	21.62	22.40	23.24	25.12
EPDREH4030-4-01-TH3	●		0.1 (.004inch)	4 (.157inch)			50		8.78	4.36	4.51	4.67	4.84	5.22
EPDREH4030-6-01-TH3	●			6 (.236inch)					7.30	6.43	6.65	6.88	7.14	7.71
EPDREH4030-8-01-TH3	●			8 (.315inch)			55		6.24	8.49	8.79	9.10	9.44	10.19
EPDREH4030-10-01-TH3	●			10 (.394inch)					5.45	10.56	10.92	11.32	11.74	12.68
EPDREH4030-12-01-TH3	●			12 (.472inch)			60		4.84	12.63	13.06	13.53	14.04	15.17
EPDREH4030-14-01-TH3	●			14 (.551inch)					4.35	14.69	15.20	15.75	16.34	17.65
EPDREH4030-16-01-TH3	●			16 (.630inch)					3.96	16.76	17.34	17.97	18.64	20.14
EPDREH4030-18-01-TH3	●			18 (.709inch)			65		3.62	18.83	19.48	20.18	20.94	22.63
EPDREH4030-20-01-TH3	●			20 (.787inch)					3.34	20.90	21.62	22.40	23.23	25.11
EPDREH4030-4-02-TH3	●		0.2 (.008inch)	4 (.157inch)			50		8.87	4.35	4.50	4.66	4.82	5.20
EPDREH4030-6-02-TH3	●			6 (.236inch)					7.36	6.42	6.64	6.87	7.12	7.68
EPDREH4030-8-02-TH3	●			8 (.315inch)			55		6.29	8.49	8.78	9.09	9.42	10.17
EPDREH4030-10-02-TH3	●			10 (.394inch)					5.49	10.56	10.92	11.30	11.72	12.66
EPDREH4030-12-02-TH3	●			12 (.472inch)			60		4.87	12.62	13.06	13.52	14.02	15.14
EPDREH4030-14-02-TH3	●			14 (.551inch)					4.38	14.69	15.20	15.74	16.32	17.63

Epoch Deep Radius Evolution Hard-TH3

EPDREH4○○○-○.○-○○○-TH3

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH4030-16-02-TH3	●	3 (.118inch)	0.2 (.008inch)	16 (.630inch)	1.8	2.88	60	6	3.97	16.76	17.34	17.95	18.62	20.12
EPDREH4030-18-02-TH3	●			18 (.709inch)			65		3.64	18.83	19.47	20.17	20.92	22.60
EPDREH4030-20-02-TH3	●			20 (.787inch)					3.36	20.89	21.61	22.39	23.22	25.09
EPDREH4030-4-03-TH3	●		0.3 (.012inch)	4 (.157inch)			50		8.96	4.35	4.49	4.64	4.81	5.17
EPDREH4030-6-03-TH3	●			6 (.236inch)					7.42	6.42	6.63	6.86	7.11	7.66
EPDREH4030-8-03-TH3	●			8 (.315inch)			55		6.33	8.49	8.77	9.08	9.41	10.15
EPDREH4030-10-03-TH3	●			10 (.394inch)					5.52	10.55	10.91	11.29	11.71	12.63
EPDREH4030-12-03-TH3	●			12 (.472inch)			60		4.90	12.62	13.05	13.51	14.01	15.12
EPDREH4030-14-03-TH3	●			14 (.551inch)					4.40	14.69	15.19	15.73	16.31	17.61
EPDREH4030-16-03-TH3	●			16 (.630inch)					3.99	16.76	17.33	17.94	18.61	20.09
EPDREH4030-18-03-TH3	●			18 (.709inch)			65		3.65	18.82	19.47	20.16	20.91	22.58
EPDREH4030-20-03-TH3	●			20 (.787inch)					3.37	20.89	21.61	22.38	23.21	25.07
EPDREH4030-4-05-TH3	●		0.5 (.020inch)	4 (.157inch)			50		9.15	4.34	4.48	4.62	4.78	5.13
EPDREH4030-6-05-TH3	●			6 (.236inch)					7.55	6.41	6.62	6.84	7.08	7.61
EPDREH4030-8-05-TH3	●			8 (.315inch)			55		6.43	8.48	8.76	9.06	9.38	10.10
EPDREH4030-10-05-TH3	●			10 (.394inch)					5.60	10.55	10.90	11.27	11.68	12.59
EPDREH4030-12-05-TH3	●			12 (.472inch)			60		4.95	12.61	13.04	13.49	13.98	15.07
EPDREH4030-14-05-TH3	●			14 (.551inch)					4.44	14.68	15.18	15.71	16.28	17.56
EPDREH4030-16-05-TH3	●			16 (.630inch)					4.03	16.75	17.31	17.92	18.58	20.05
EPDREH4030-18-05-TH3	●			18 (.709inch)			65		3.69	18.82	19.45	20.14	20.88	22.53
EPDREH4030-20-05-TH3	●			20 (.787inch)					3.40	20.88	21.59	22.36	23.18	25.02
EPDREH4040-8-01-TH3	●	4 (.157inch)	0.1 (.004inch)	8 (.315inch)	3.5	3.85	55	6	4.80	8.55	8.84	9.16	9.50	10.26
EPDREH4040-10-01-TH3	●			10 (.394inch)			60		4.12	10.62	10.98	11.38	11.80	12.75
EPDREH4040-12-01-TH3	●			12 (.472inch)					3.60	12.68	13.12	13.59	14.10	15.24
EPDREH4040-14-01-TH3	●			14 (.551inch)					3.20	14.75	15.26	15.81	16.40	17.72
EPDREH4040-16-01-TH3	●			16 (.630inch)					2.88	16.82	17.40	18.03	18.70	No interference
EPDREH4040-18-01-TH3	●			18 (.709inch)					2.62	18.89	19.54	20.24	21.00	No interference
EPDREH4040-20-01-TH3	●			20 (.787inch)			65		2.40	20.95	21.68	22.46	23.30	No interference
EPDREH4040-22-01-TH3	●			22 (.866inch)					2.22	23.02	23.82	24.68	25.60	No interference
EPDREH4040-24-01-TH3	●			24 (.945inch)			70		2.06	25.09	25.96	26.89	27.90	No interference
EPDREH4040-8-02-TH3	●		0.2 (.008inch)	8 (.315inch)			55		4.84	8.55	8.84	9.15	9.49	10.24
EPDREH4040-10-02-TH3	●			10 (.394inch)			60		4.15	10.61	10.98	11.37	11.79	12.73
EPDREH4040-12-02-TH3	●			12 (.472inch)					3.62	12.68	13.12	13.58	14.09	15.21
EPDREH4040-14-02-TH3	●			14 (.551inch)					3.22	14.75	15.26	15.80	16.39	17.70
EPDREH4040-16-02-TH3	●			16 (.630inch)					2.89	16.82	17.40	18.02	18.69	No interference
EPDREH4040-18-02-TH3	●			18 (.709inch)					2.63	18.88	19.53	20.23	20.98	No interference
EPDREH4040-20-02-TH3	●			20 (.787inch)			65		2.41	20.95	21.67	22.45	23.28	No interference
EPDREH4040-22-02-TH3	●			22 (.866inch)					2.22	23.02	23.81	24.67	25.58	No interference
EPDREH4040-24-02-TH3	●			24 (.945inch)			70		2.06	25.09	25.95	26.88	27.88	No interference

● : Inventory maintained in US

EPDREH4○○○-○.○-○○○-TH3

Item code	Stock	Size(mm)							Interference angle θK (°)	Effective under neck length with respect to draft angle				
		Tool dia.	Corner radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.						
		DC	RE	LU	APMX	DN	LF	DCONMS		0.5°	1°	1.5°	2°	3°
EPDREH4040-8-03-TH3	●	4 (.157inch)	0.3 (.012inch)	8 (.315inch)	3.5	3.85	55	6	4.89	8.54	8.83	9.14	9.47	10.22
EPDREH4040-10-03-TH3	●			10 (.394inch)			60		4.18	10.61	10.97	11.36	11.77	12.70
EPDREH4040-12-03-TH3	●			12 (.472inch)					3.65	12.68	13.11	13.57	14.07	15.19
EPDREH4040-14-03-TH3	●			14 (.551inch)					3.24	14.75	15.25	15.79	16.37	17.68
EPDREH4040-16-03-TH3	●			16 (.630inch)					2.91	16.81	17.39	18.01	18.67	No interference
EPDREH4040-18-03-TH3	●			18 (.709inch)					2.64	18.88	19.53	20.22	20.97	No interference
EPDREH4040-20-03-TH3	●			20 (.787inch)			65		2.42	20.95	21.67	22.44	23.27	No interference
EPDREH4040-22-03-TH3	●			22 (.866inch)					2.23	23.01	23.81	24.66	25.57	No interference
EPDREH4040-24-03-TH3	●			24 (.945inch)			70		2.07	25.08	25.95	26.87	27.87	No interference
EPDREH4040-8-05-TH3	●		0.5 (.020inch)	8 (.315inch)			55		4.97	8.54	8.82	9.12	9.44	10.17
EPDREH4040-10-05-TH3	●			10 (.394inch)			60		4.24	10.60	10.96	11.33	11.74	12.66
EPDREH4040-12-05-TH3	●			12 (.472inch)					3.69	12.67	13.10	13.55	14.04	15.14
EPDREH4040-14-05-TH3	●			14 (.551inch)					3.27	14.74	15.24	15.77	16.34	17.63
EPDREH4040-16-05-TH3	●			16 (.630inch)					2.94	16.81	17.37	17.98	18.64	No interference
EPDREH4040-18-05-TH3	●			18 (.709inch)					2.67	18.87	19.51	20.20	20.94	No interference
EPDREH4040-20-05-TH3	●			20 (.787inch)			65		2.44	20.94	21.65	22.42	23.24	No interference
EPDREH4040-22-05-TH3	●			22 (.866inch)					2.25	23.01	23.79	24.63	25.54	No interference
EPDREH4040-24-05-TH3	●			24 (.945inch)			70		2.09	25.08	25.93	26.85	27.84	No interference
EPDREH4040-8-10-TH3	●		1 (.039inch)	8 (.315inch)			55		5.19	8.52	8.78	9.06	9.37	10.05
EPDREH4040-10-10-TH3	●			10 (.394inch)			60		4.40	10.59	10.92	11.28	11.67	12.54
EPDREH4040-12-10-TH3	●			12 (.472inch)					3.82	12.65	13.06	13.50	13.97	15.02
EPDREH4040-14-10-TH3	●			14 (.551inch)					3.37	14.72	15.20	15.71	16.27	17.51
EPDREH4040-16-10-TH3	●			16 (.630inch)					3.02	16.79	17.34	17.93	18.57	20.00
EPDREH4040-18-10-TH3	●			18 (.709inch)					2.73	18.86	19.48	20.15	20.87	No interference
EPDREH4040-20-10-TH3	●			20 (.787inch)			65		2.49	20.92	21.62	22.36	23.17	No interference
EPDREH4040-22-10-TH3	●			22 (.866inch)					2.29	22.99	23.76	24.58	25.47	No interference
EPDREH4040-24-10-TH3	●			24 (.945inch)			70		2.13	25.06	25.90	26.80	27.77	No interference
EPDREH4050-10-01-TH3	●	5 (.197inch)	0.1 (.004inch)	10 (.394inch)	4	4.85	60	6	2.38	10.62	10.98	11.38	11.80	No interference
EPDREH4050-15-01-TH3	●			15 (.591inch)					1.69	15.79	16.33	16.92	No interference	No interference
EPDREH4050-20-01-TH3	●			20 (.787inch)			65		1.30	20.95	21.68	No interference	No interference	No interference
EPDREH4050-25-01-TH3	●			25 (.984inch)			70		1.06	26.12	27.03	No interference	No interference	No interference
EPDREH4050-10-02-TH3	●		0.2 (.008inch)	10 (.394inch)			60		2.40	10.61	10.98	11.37	11.79	No interference
EPDREH4050-15-02-TH3	●			15 (.591inch)					1.70	15.78	16.33	16.91	No interference	No interference
EPDREH4050-20-02-TH3	●			20 (.787inch)			65		1.31	20.95	21.67	No interference	No interference	No interference
EPDREH4050-25-02-TH3	●			25 (.984inch)			70		1.07	26.12	27.02	No interference	No interference	No interference
EPDREH4050-10-03-TH3	●		0.3 (.012inch)	10 (.394inch)			60		2.42	10.61	10.97	11.36	11.77	No interference
EPDREH4050-15-03-TH3	●			15 (.591inch)					1.71	15.78	16.32	16.90	No interference	No interference
EPDREH4050-20-03-TH3	●			20 (.787inch)			65		1.32	20.95	21.67	No interference	No interference	No interference
EPDREH4050-25-03-TH3	●			25 (.984inch)			70		1.07	26.12	27.02	No interference	No interference	No interference

Epoch Deep Radius Evolution Hard-TH3

EPDREH4○○○-○.○-○○○-TH3

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Interference angle θK (°)	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDREH4050-10-05-TH3	●	5 (.197inch)	0.5 (.020inch)	10 (.394inch)	4	4.85	60	6	2.46	10.60	10.96	11.33	11.74	No interference
EPDREH4050-15-05-TH3	●			15 (.591inch)					1.73	15.77	16.31	16.88	No interference	No interference
EPDREH4050-20-05-TH3	●			20 (.787inch)			65		1.33	20.94	21.65	No interference	No interference	No interference
EPDREH4050-25-05-TH3	●			25 (.984inch)			70		1.08	26.11	27.00	No interference	No interference	No interference
EPDREH4050-10-10-TH3	●		1 (.039inch)	10 (.394inch)			60		2.57	10.59	10.92	11.28	11.67	No interference
EPDREH4050-15-10-TH3	●			15 (.591inch)					1.78	15.76	16.27	16.82	No interference	No interference
EPDREH4050-20-10-TH3	●			20 (.787inch)			65		1.36	20.92	21.62	No interference	No interference	No interference
EPDREH4050-25-10-TH3	●			25 (.984inch)			70		1.10	26.09	26.97	No interference	No interference	No interference
EPDREH4060-12-01-TH3	●	6 (.236inch)	0.1 (.004inch)	12 (.472inch)	5	5.85	60	6	0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-01-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-01-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-01-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-02-TH3	●		0.2 (.008inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-02-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-02-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-02-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-03-TH3	●		0.3 (.012inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-03-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-03-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-03-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-05-TH3	●		0.5 (.020inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-05-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-05-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-05-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-12-10-TH3	●		1 (.039inch)	12 (.472inch)			60		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-18-10-TH3	●			18 (.709inch)					0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-24-10-TH3	●			24 (.945inch)			70		0.00	No interference	No interference	No interference	No interference	No interference
EPDREH4060-30-10-TH3	●			30 (1.181inch)			80		0.00	No interference	No interference	No interference	No interference	No interference

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
○	○	◎	◎	◎	○	◎	○	○

● : Inventory maintained in US

Recommended cutting conditions

EPDREH2-TH3 | 2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A165.

Inch

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)
.008	**.001**	**.02**	.0006	42,500	28.0	**37,500**	**21.7**	**35,000**	**17.7**	**31,500**	**16.1**	**31,880**	**12.6**
		.039	.0004	42,500	28.0	**37,500**	**21.7**	**35,000**	**17.7**	**31,500**	**16.1**	**31,880**	**12.6**
	.002	**.02**	.0008	42,500	28.0	**37,500**	**21.7**	**35,000**	**17.7**	**31,500**	**16.1**	**31,880**	**12.6**
		.039	.0006	42,500	28.0	**37,500**	**21.7**	**35,000**	**17.7**	**31,500**	**16.1**	**31,880**	**12.6**
.012	**.001**	**.039**	.0006	40,800	28.7	**36,000**	**21.7**	**33,600**	**17.3**	**30,240**	**15.7**	**30,600**	**12.2**
		.079	.0004	33,050	23.2	**29,160**	**17.3**	**27,220**	**14.2**	**24,490**	**12.6**	**24,790**	**9.8**
	.002	**.039**	.0008	40,800	28.7	**36,000**	**21.7**	**33,600**	**17.3**	**30,240**	**15.7**	**30,600**	**12.2**
		.079	.0005	33,050	23.2	**29,160**	**17.3**	**27,220**	**14.2**	**24,490**	**12.6**	**24,790**	**9.8**
.016	**.001**	**.039**	.0006	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.079	.0005	32,260	28.0	**28,800**	**22.0**	**26,730**	**18.1**	**24,050**	**16.1**	**24,480**	**12.6**
	.002	**.039**	.001	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.079	.0006	32,260	28.0	**28,800**	**22.0**	**26,730**	**18.1**	**24,050**	**16.1**	**24,480**	**12.6**
	.004	**.039**	.0013	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.079	.0011	32,260	28.0	**28,800**	**22.0**	**26,730**	**18.1**	**24,050**	**16.1**	**24,480**	**12.6**
.020	**.001**	**.039**	.0006	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.079	.0005	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.118	.0004	26,440	24.8	**23,330**	**18.5**	**21,770**	**15.0**	**19,600**	**13.4**	**19,830**	**10.6**
	.002	**.039**	.0012	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.079	.0009	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.118	.0007	26,440	24.8	**23,330**	**18.5**	**21,770**	**15.0**	**19,600**	**13.4**	**19,830**	**10.6**
	.004	**.039**	.0014	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.079	.0012	32,260	31.1	**28,800**	**24.4**	**26,730**	**20.1**	**24,050**	**18.1**	**24,480**	**14.2**
		.118	.0008	26,440	24.8	**23,330**	**18.5**	**21,770**	**15.0**	**19,600**	**13.4**	**19,830**	**10.6**
.024	**.001**	**.079**	.0006	32,260	39.0	**28,800**	**30.3**	**26,730**	**25.2**	**24,050**	**22.4**	**24,480**	**17.3**
		.157	.0005	26,440	31.1	**23,330**	**23.2**	**21,770**	**18.9**	**19,600**	**16.9**	**19,830**	**13.0**
	.002	**.079**	.0011	32,260	39.0	**28,800**	**30.3**	**26,730**	**25.2**	**24,050**	**22.4**	**24,480**	**17.3**
		.157	.0007	26,440	31.1	**23,330**	**23.2**	**21,770**	**18.9**	**19,600**	**16.9**	**19,830**	**13.0**
	.004	**.079**	.0014	32,260	39.0	**28,800**	**30.3**	**26,730**	**25.2**	**24,050**	**22.4**	**24,480**	**17.3**
		.157	.0009	26,440	31.1	**23,330**	**23.2**	**21,770**	**18.9**	**19,600**	**16.9**	**19,830**	**13.0**
.031	**.001**	**.079**	.0009	34,000	55.5	**30,000**	**43.7**	**28,000**	**35.4**	**25,200**	**31.9**	**25,500**	**24.8**
		.157	.0006	34,000	44.5	**30,000**	**35.0**	**28,000**	**28.3**	**25,200**	**25.6**	**25,500**	**20.1**
	.002	**.079**	.0015	34,000	55.5	**30,000**	**43.7**	**28,000**	**35.4**	**25,200**	**31.9**	**25,500**	**24.8**
		.157	.001	34,000	44.5	**30,000**	**35.0**	**28,000**	**28.3**	**25,200**	**25.6**	**25,500**	**20.1**
	.004	**.079**	.0019	34,000	55.5	**30,000**	**43.7**	**28,000**	**35.4**	**25,200**	**31.9**	**25,500**	**24.8**
		.157	.0013	34,000	44.5	**30,000**	**35.0**	**28,000**	**28.3**	**25,200**	**25.6**	**25,500**	**20.1**
	.008	**.079**	.0032	34,000	55.5	**30,000**	**43.7**	**28,000**	**35.4**	**25,200**	**31.9**	**25,500**	**24.8**
		.157	.0022	34,000	44.5	**30,000**	**35.0**	**28,000**	**28.3**	**25,200**	**25.6**	**25,500**	**20.1**

【Note】 Refer to the comments and notes below the table on page A164 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH2-TH3 | 2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition | Inch

For detailed information on high-accuracy cutting conditions, refer to page A165.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.039	.001	**.079**	.0006	33,440	71.3	**29,620**	**55.9**	**27,710**	**45.7**	**24,940**	**41.3**	**25,170**	**31.9**
		.157	.0005	30,600	65.0	**27,000**	**50.8**	**25,200**	**41.7**	**22,680**	**37.4**	**22,950**	**29.1**
		.236	.0004	24,790	52.8	**21,870**	**41.3**	**20,410**	**33.9**	**18,370**	**30.3**	**18,590**	**23.6**
		.315	.0003	22,030	46.9	**19,440**	**36.6**	**18,140**	**29.9**	**16,330**	**26.8**	**16,520**	**20.9**
	.002	**.079**	.0018	33,440	71.3	**29,620**	**55.9**	**27,710**	**45.7**	**24,940**	**41.3**	**25,170**	**31.9**
		.157	.0011	30,600	65.0	**27,000**	**50.8**	**25,200**	**41.7**	**22,680**	**37.4**	**22,950**	**29.1**
		.236	.0007	24,790	52.8	**21,870**	**41.3**	**20,410**	**33.9**	**18,370**	**30.3**	**18,590**	**23.6**
		.315	.0006	22,030	46.9	**19,440**	**36.6**	**18,140**	**29.9**	**16,330**	**26.8**	**16,520**	**20.9**
	.004	**.079**	.0026	33,440	71.3	**29,620**	**55.9**	**27,710**	**45.7**	**24,940**	**41.3**	**25,170**	**31.9**
		.157	.0015	30,600	65.0	**27,000**	**50.8**	**25,200**	**41.7**	**22,680**	**37.4**	**22,950**	**29.1**
		.236	.0009	24,790	52.8	**21,870**	**41.3**	**20,410**	**33.9**	**18,370**	**30.3**	**18,590**	**23.6**
		.315	.0009	22,030	46.9	**19,440**	**36.6**	**18,140**	**29.9**	**16,330**	**26.8**	**16,520**	**20.9**
	.008	**.079**	.0043	33,440	71.3	**29,620**	**55.9**	**27,710**	**45.7**	**24,940**	**41.3**	**25,170**	**31.9**
		.157	.0028	30,600	65.0	**27,000**	**50.8**	**25,200**	**41.7**	**22,680**	**37.4**	**22,950**	**29.1**
		.236	.0016	24,790	52.8	**21,870**	**41.3**	**20,410**	**33.9**	**18,370**	**30.3**	**18,590**	**23.6**
		.315	.0016	22,030	46.9	**19,440**	**36.6**	**18,140**	**29.9**	**16,330**	**26.8**	**16,520**	**20.9**

(1) a_p indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH2010-2-02-TH3 tool:
Cutting depth = .004 inch (0.11mm) (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .003 inch (0.075mm)

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDREH2-TH3 | 2 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition** | For detailed information on high-accuracy cutting conditions, refer to page A163. | **Inch**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
.008	.001	.02	.0006	50,000	8.3	**50,000**	**7.1**	**50,000**	**6.3**	**45,000**	**5.5**	**42,500**	**4.3**
		.039	.0004	50,000	8.3	**50,000**	**7.1**	**50,000**	**6.3**	**45,000**	**5.5**	**42,500**	**4.3**
	.002	.02	.0008	50,000	8.3	**50,000**	**7.1**	**50,000**	**6.3**	**45,000**	**5.5**	**42,500**	**4.3**
		.039	.0006	50,000	8.3	**50,000**	**7.1**	**50,000**	**6.3**	**45,000**	**5.5**	**42,500**	**4.3**
.012	.001	.039	.0006	50,000	18.1	**50,000**	**13.4**	**50,000**	**12.6**	**45,000**	**11.4**	**42,500**	**8.7**
		.079	.0004	45,000	16.5	**45,000**	**11.8**	**45,000**	**11.4**	**40,500**	**10.2**	**38,250**	**7.9**
	.002	.039	.0008	50,000	18.1	**50,000**	**13.4**	**50,000**	**12.6**	**45,000**	**11.4**	**42,500**	**8.7**
		.079	.0005	45,000	16.5	**45,000**	**11.8**	**45,000**	**11.4**	**40,500**	**10.2**	**38,250**	**7.9**
.016	.001	.039	.0006	50,000	18.1	**40,000**	**12.6**	**36,000**	**10.6**	**32,400**	**9.4**	**30,600**	**7.5**
		.079	.0005	45,000	16.1	**36,000**	**11.4**	**34,000**	**9.4**	**30,600**	**8.7**	**28,900**	**6.7**
	.002	.039	.001	50,000	18.1	**40,000**	**12.6**	**36,000**	**10.6**	**32,400**	**9.4**	**30,600**	**7.5**
		.079	.0006	45,000	16.1	**36,000**	**11.4**	**34,000**	**9.4**	**30,600**	**8.7**	**28,900**	**6.7**
	.004	.039	.0013	50,000	18.1	**40,000**	**12.6**	**36,000**	**10.6**	**32,400**	**9.4**	**30,600**	**7.5**
		.079	.0011	45,000	16.1	**36,000**	**11.4**	**34,000**	**9.4**	**30,600**	**8.7**	**28,900**	**6.7**
.020	.001	.039	.0006	40,000	18.1	**30,000**	**15.0**	**28,000**	**12.6**	**25,200**	**11.0**	**23,800**	**8.7**
		.079	.0005	40,000	18.1	**30,000**	**15.0**	**28,000**	**12.6**	**25,200**	**11.0**	**23,800**	**8.7**
		.118	.0004	36,000	16.1	**27,000**	**12.6**	**24,500**	**10.2**	**22,050**	**9.1**	**20,830**	**7.1**
	.002	.039	.0012	40,000	18.1	**30,000**	**15.0**	**28,000**	**12.6**	**25,200**	**11.0**	**23,800**	**8.7**
		.079	.0009	40,000	18.1	**30,000**	**15.0**	**28,000**	**12.6**	**25,200**	**11.0**	**23,800**	**8.7**
		.118	.0007	36,000	16.1	**27,000**	**12.6**	**24,500**	**10.2**	**22,050**	**9.1**	**20,830**	**7.1**
	.004	.039	.0014	40,000	18.1	**30,000**	**15.0**	**28,000**	**12.6**	**25,200**	**11.0**	**23,800**	**8.7**
		.079	.0012	40,000	18.1	**30,000**	**15.0**	**28,000**	**12.6**	**25,200**	**11.0**	**23,800**	**8.7**
		.118	.0008	36,000	16.1	**27,000**	**12.6**	**24,500**	**10.2**	**22,050**	**9.1**	**20,830**	**7.1**
.024	.001	.079	.0006	37,830	23.6	**28,200**	**15.4**	**23,000**	**12.6**	**20,700**	**11.4**	**19,550**	**8.7**
		.157	.0005	27,800	17.3	**23,600**	**11.0**	**21,000**	**9.1**	**18,900**	**8.3**	**17,850**	**6.3**
	.002	.079	.0011	37,830	23.6	**28,200**	**15.4**	**23,000**	**12.6**	**20,700**	**11.4**	**19,550**	**8.7**
		.157	.0007	27,800	17.3	**23,600**	**11.0**	**21,000**	**9.1**	**18,900**	**8.3**	**17,850**	**6.3**
	.004	.079	.0014	37,830	23.6	**28,200**	**15.4**	**23,000**	**12.6**	**20,700**	**11.4**	**19,550**	**8.7**
		.157	.0009	27,800	17.3	**23,600**	**11.0**	**21,000**	**9.1**	**18,900**	**8.3**	**17,850**	**6.3**
.031	.001	.079	.0009	28,000	25.6	**20,000**	**15.7**	**20,000**	**14.2**	**18,000**	**12.6**	**17,000**	**9.8**
		.157	.0006	28,000	20.5	**20,000**	**12.6**	**20,000**	**11.4**	**18,000**	**10.2**	**17,000**	**7.9**
	.002	.079	.0015	28,000	25.6	**20,000**	**15.7**	**20,000**	**14.2**	**18,000**	**12.6**	**17,000**	**9.8**
		.157	.001	28,000	20.5	**20,000**	**12.6**	**20,000**	**11.4**	**18,000**	**10.2**	**17,000**	**7.9**
	.004	.079	.0019	28,000	25.6	**20,000**	**15.7**	**20,000**	**14.2**	**18,000**	**12.6**	**17,000**	**9.8**
		.157	.0013	28,000	20.5	**20,000**	**12.6**	**20,000**	**11.4**	**18,000**	**10.2**	**17,000**	**7.9**
	.008	.079	.0032	28,000	25.6	**20,000**	**15.7**	**20,000**	**14.2**	**18,000**	**12.6**	**17,000**	**9.8**
		.157	.0022	28,000	20.5	**20,000**	**12.6**	**20,000**	**11.4**	**18,000**	**10.2**	**17,000**	**7.9**

【Note】 Refer to the comments and notes below the table on page A166 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH2-TH3 | 2 Flutes | High efficiency cutting condition | **High accuracy cuttiing condition** | For detailed information on high-accuracy cutting conditions, refer to page A163. | **Inch**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.039	.001	**.079**	.0006	30,290	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0005	27,540	40.9	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0004	22,310	33.1	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0003	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**
	.002	**.079**	.0018	30,250	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0011	28,920	44.5	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0007	24,540	36.6	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0006	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**
	.004	**.079**	.0026	30,290	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0015	27,540	40.9	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0009	22,310	33.1	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0009	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**
	.008	**.079**	.0043	30,290	47.6	**26,730**	**37.8**	**24,950**	**31.5**	**22,450**	**28.3**	**21,210**	**22.0**
		.157	.0028	27,540	40.9	**24,300**	**32.3**	**22,680**	**26.4**	**20,410**	**23.6**	**19,280**	**18.5**
		.236	.0016	22,310	33.1	**19,680**	**26.0**	**18,370**	**21.3**	**16,530**	**19.3**	**15,620**	**15.0**
		.315	.0016	19,830	29.5	**17,500**	**23.2**	**16,330**	**18.9**	**14,700**	**16.9**	**13,880**	**13.4**

(1) a_p indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH2010-2-02-TH3 tool:
Cutting depth = .004 inch (0.11mm) (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .003 inch (0.075mm)

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDREH4-TH3 | 4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition | For detailed information on high-accuracy cutting conditions, refer to page A172. | **Inch**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
.039	.001	.059	.0007	38,900	134.6	**38,900**	**122.0**	**28,300**	**80.3**	**23,000**	**72.4**	**21,200**	**56.7**
		.079	.0006	35,000	121.3	**35,000**	**110.2**	**25,500**	**72.4**	**20,700**	**65.4**	**19,100**	**51.2**
		.098	.0006	31,800	110.2	**31,800**	**100.0**	**23,100**	**65.4**	**18,800**	**59.1**	**17,400**	**46.5**
		.118	.0006	29,200	101.2	**29,200**	**92.1**	**21,200**	**60.2**	**17,200**	**54.3**	**15,900**	**42.5**
		.157	.0005	25,000	86.6	**25,000**	**78.7**	**18,200**	**51.6**	**14,800**	**46.5**	**13,600**	**36.2**
		.197	.0005	21,900	76.0	**21,900**	**68.9**	**15,900**	**44.9**	**12,900**	**40.6**	**11,900**	**31.9**
		.236	.0003	19,500	67.7	**19,500**	**61.4**	**14,100**	**40.2**	**11,500**	**36.2**	**10,600**	**28.3**
		.315	.0002	15,900	55.1	**15,900**	**50.0**	**11,600**	**33.1**	**9,400**	**29.5**	**8,700**	**23.2**
	.002	.059	.0018	38,900	134.6	**38,900**	**122.4**	**28,300**	**80.3**	**23,000**	**72.4**	**21,200**	**56.7**
		.079	.0013	35,000	121.3	**35,000**	**110.2**	**25,500**	**72.4**	**20,700**	**65.4**	**19,100**	**51.2**
		.098	.0013	31,800	110.2	**31,800**	**100.0**	**23,100**	**65.4**	**18,800**	**59.1**	**17,400**	**46.5**
		.118	.0012	29,200	101.2	**29,200**	**92.1**	**21,200**	**60.2**	**17,200**	**54.3**	**15,900**	**42.5**
		.157	.0011	25,000	86.6	**25,000**	**78.7**	**18,200**	**51.6**	**14,800**	**46.5**	**13,600**	**36.2**
		.197	.0011	21,900	76.0	**21,900**	**68.9**	**15,900**	**44.9**	**12,900**	**40.6**	**11,900**	**31.9**
		.236	.0006	19,500	67.7	**19,500**	**61.4**	**14,100**	**40.2**	**11,500**	**36.2**	**10,600**	**28.3**
		.315	.0004	15,900	55.1	**15,900**	**50.0**	**11,600**	**33.1**	**9,400**	**29.5**	**8,700**	**23.2**
	.004	.059	.0022	38,900	134.6	**38,900**	**122.4**	**28,300**	**80.3**	**23,000**	**72.4**	**21,200**	**56.7**
		.079	.0017	35,000	121.3	**35,000**	**110.2**	**25,500**	**72.4**	**20,700**	**65.4**	**19,100**	**51.2**
		.098	.0016	31,800	110.2	**31,800**	**100.0**	**23,100**	**65.4**	**18,800**	**59.1**	**17,400**	**46.5**
		.118	.0015	29,200	101.2	**29,200**	**92.1**	**21,200**	**60.2**	**17,200**	**54.3**	**15,900**	**42.5**
		.157	.0014	25,000	86.6	**25,000**	**78.7**	**18,200**	**51.6**	**14,800**	**46.5**	**13,600**	**36.2**
		.197	.0013	21,900	76.0	**21,900**	**68.9**	**15,900**	**44.9**	**12,900**	**40.6**	**11,900**	**31.9**
		.236	.0007	19,500	67.7	**19,500**	**61.4**	**14,100**	**40.2**	**11,500**	**36.2**	**10,600**	**28.3**
		.315	.0004	15,900	55.1	**15,900**	**50.0**	**11,600**	**33.1**	**9,400**	**29.5**	**8,700**	**23.2**
	.008	.059	.0025	38,900	134.6	**38,900**	**122.4**	**28,300**	**80.3**	**23,000**	**72.4**	**21,200**	**56.7**
		.079	.0019	35,000	121.3	**35,000**	**110.2**	**25,500**	**72.4**	**20,700**	**65.4**	**19,100**	**51.2**
		.098	.0018	31,800	110.2	**31,800**	**100.0**	**23,100**	**65.4**	**18,800**	**59.1**	**17,400**	**46.5**
		.118	.0017	29,200	101.2	**29,200**	**92.1**	**21,200**	**60.2**	**17,200**	**54.3**	**15,900**	**42.5**
		.157	.0015	25,000	86.6	**25,000**	**78.7**	**18,200**	**51.6**	**14,800**	**46.5**	**13,600**	**36.2**
		.197	.0015	21,900	76.0	**21,900**	**68.9**	**15,900**	**44.9**	**12,900**	**40.6**	**11,900**	**31.9**
		.236	.0008	19,500	67.7	**19,500**	**61.4**	**14,100**	**40.2**	**11,500**	**36.2**	**10,600**	**28.3**
		.315	.0005	15,900	55.1	**15,900**	**50.0**	**11,600**	**33.1**	**9,400**	**29.5**	**8,700**	**23.2**
	.012	.059	.0028	38,900	134.6	**38,900**	**122.4**	**28,300**	**80.3**	**23,000**	**72.4**	**21,200**	**56.7**
		.079	.0021	35,000	121.3	**35,000**	**110.2**	**25,500**	**72.4**	**20,700**	**65.4**	**19,100**	**51.2**
		.098	.0020	31,800	110.2	**31,800**	**100.0**	**23,100**	**65.4**	**18,800**	**59.1**	**17,400**	**46.5**
		.118	.0019	29,200	101.2	**29,200**	**92.1**	**21,200**	**60.2**	**17,200**	**54.3**	**15,900**	**42.5**
		.157	.0017	25,000	86.6	**25,000**	**78.7**	**18,200**	**51.6**	**14,800**	**46.5**	**13,600**	**36.2**
		.197	.0017	21,900	76.0	**21,900**	**68.9**	**15,900**	**44.9**	**12,900**	**40.6**	**11,900**	**31.9**
		.236	.0009	19,500	67.7	**19,500**	**61.4**	**14,100**	**40.2**	**11,500**	**36.2**	**10,600**	**28.3**
		.315	.0005	15,900	55.1	**15,900**	**50.0**	**11,600**	**33.1**	**9,400**	**29.5**	**8,700**	**23.2**
.059	.001	.079	.0007	26,900	130.3	**26,900**	**118.5**	**19,600**	**78.0**	**15,900**	**70.1**	**14,700**	**55.1**
		.118	.0006	23,300	113.0	**23,300**	**102.8**	**17,000**	**67.3**	**13,800**	**61.0**	**12,700**	**47.6**
		.157	.0006	20,600	100.0	**20,600**	**90.9**	**15,000**	**59.4**	**12,200**	**53.9**	**11,200**	**42.1**
		.197	.0005	18,400	89.4	**18,400**	**81.1**	**13,400**	**53.1**	**10,900**	**48.0**	**10,100**	**37.8**
		.236	.0005	16,700	81.1	**16,700**	**73.6**	**12,100**	**48.0**	**9,900**	**43.7**	**9,100**	**34.3**
		.315	.0004	15,200	73.6	**15,200**	**66.9**	**11,100**	**44.1**	**9,000**	**39.8**	**8,300**	**31.1**
		.394	.0004	14,000	67.7	**14,000**	**61.8**	**10,200**	**40.6**	**8,300**	**36.6**	**7,600**	**28.3**
		.472	.0003	12,100	58.7	**12,100**	**53.5**	**8,800**	**35.0**	**7,100**	**31.5**	**6,600**	**24.8**
	.002	.079	.0019	26,900	130.3	**26,900**	**118.5**	**19,600**	**78.0**	**15,900**	**70.1**	**14,700**	**55.1**
		.118	.0017	23,300	113.0	**23,300**	**102.8**	**17,000**	**67.3**	**13,800**	**61.0**	**12,700**	**47.6**
		.157	.0015	20,600	100.0	**20,600**	**90.9**	**15,000**	**59.4**	**12,200**	**53.9**	**11,200**	**42.1**
		.197	.0014	18,400	89.4	**18,400**	**81.1**	**13,400**	**53.1**	**10,900**	**48.0**	**10,100**	**37.8**
		.236	.0013	16,700	81.1	**16,700**	**73.6**	**12,100**	**48.0**	**9,900**	**43.7**	**9,100**	**34.3**
		.315	.0012	15,200	73.6	**15,200**	**66.9**	**11,100**	**44.1**	**9,000**	**39.8**	**8,300**	**31.1**
		.394	.0011	14,000	67.7	**14,000**	**61.8**	**10,200**	**40.6**	**8,300**	**36.6**	**7,600**	**28.3**
		.472	.0009	12,100	58.7	**12,100**	**53.5**	**8,800**	**35.0**	**7,100**	**31.5**	**6,600**	**24.8**
	.004	.079	.0031	26,900	130.3	**26,900**	**118.5**	**19,600**	**78.0**	**15,900**	**70.1**	**14,700**	**55.1**
		.118	.0028	23,300	113.0	**23,300**	**102.8**	**17,000**	**67.3**	**13,800**	**61.0**	**12,700**	**47.6**
		.157	.0025	20,600	100.0	**20,600**	**90.9**	**15,000**	**59.4**	**12,200**	**53.9**	**11,200**	**42.1**
		.197	.0022	18,400	89.4	**18,400**	**81.1**	**13,400**	**53.1**	**10,900**	**48.0**	**10,100**	**37.8**

【Note】 Refer to the comments and notes below the table on page A171 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition | For detailed information on high-accuracy cutting conditions, refer to page A172. | Inch

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		Hardened Steel (45~55HRC)		Hardened Steel (55~60HRC)		Hardened Steel (60~65HRC)		Hardened Steel (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
.059	.004	.236	.0020	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0019	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0017	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0014	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.008	.079	.0032	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0030	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0026	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0024	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0022	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0020	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0019	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0015	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.012	.079	.0033	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0030	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0027	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0024	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0022	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0021	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0019	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0015	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
	.020	.079	.0034	26,900	130.3	26,900	118.5	19,600	78.0	15,900	70.1	14,700	55.1
		.118	.0031	23,300	113.0	23,300	102.8	17,000	67.3	13,800	61.0	12,700	47.6
		.157	.0028	20,600	100.0	20,600	90.9	15,000	59.4	12,200	53.9	11,200	42.1
		.197	.0025	18,400	89.4	18,400	81.1	13,400	53.1	10,900	48.0	10,100	37.8
		.236	.0023	16,700	81.1	16,700	73.6	12,100	48.0	9,900	43.7	9,100	34.3
		.315	.0021	15,200	73.6	15,200	66.9	11,100	44.1	9,000	39.8	8,300	31.1
		.394	.0019	14,000	67.7	14,000	61.8	10,200	40.6	8,300	36.6	7,600	28.3
		.472	.0015	12,100	58.7	12,100	53.5	8,800	35.0	7,100	31.5	6,600	24.8
.079	.001	.098	.0007	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0006	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0006	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0006	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0005	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0005	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0005	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0004	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.002	.098	.0019	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0017	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0015	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0014	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0014	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0013	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0013	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0009	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.004	.098	.0032	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0029	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0025	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0024	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0023	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0023	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0021	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0016	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3
	.008	.098	.0036	20,600	142.9	20,600	129.9	15,000	85.0	12,200	76.8	11,200	59.8
		.118	.0032	19,500	135.0	19,500	122.8	14,100	79.9	11,500	72.4	10,600	56.7
		.157	.0028	17,500	121.3	17,500	110.2	12,700	72.0	10,300	65.0	9,500	50.8
		.197	.0027	15,900	110.2	15,900	100.0	11,600	65.7	9,400	59.1	8,700	46.5
		.236	.0026	14,600	101.2	14,600	92.1	10,600	60.2	8,600	54.3	8,000	42.9
		.315	.0026	12,500	86.6	12,500	78.7	9,100	51.6	7,400	46.5	6,800	36.2
		.394	.0024	10,900	75.6	10,900	68.5	8,000	45.3	6,500	40.9	6,000	32.3
		.472	.0018	9,700	67.3	9,700	61.0	7,100	40.2	5,700	35.8	5,300	28.3

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
.079	.012	**.098**	.0038	20,600	142.9	**20,600**	**129.9**	**15,000**	**85.0**	**12,200**	**76.8**	**11,200**	**59.8**
		.118	.0034	19,500	135.0	**19,500**	**122.8**	**14,100**	**79.9**	**11,500**	**72.4**	**10,600**	**56.7**
		.157	.0029	17,500	121.3	**17,500**	**110.2**	**12,700**	**72.0**	**10,300**	**65.0**	**9,500**	**50.8**
		.197	.0029	15,900	110.2	**15,900**	**100.0**	**11,600**	**65.7**	**9,400**	**59.1**	**8,700**	**46.5**
		.236	.0028	14,600	101.2	**14,600**	**92.1**	**10,600**	**60.2**	**8,600**	**54.3**	**8,000**	**42.9**
		.315	.0027	12,500	86.6	**12,500**	**78.7**	**9,100**	**51.6**	**7,400**	**46.5**	**6,800**	**36.2**
		.394	.0025	10,900	75.6	**10,900**	**68.5**	**8,000**	**45.3**	**6,500**	**40.9**	**6,000**	**32.3**
		.472	.0019	9,700	67.3	**9,700**	**61.0**	**7,100**	**40.2**	**5,700**	**35.8**	**5,300**	**28.3**
	.020	**.098**	.0040	20,600	142.9	**20,600**	**129.9**	**15,000**	**85.0**	**12,200**	**76.8**	**11,200**	**59.8**
		.118	.0036	19,500	135.0	**19,500**	**122.8**	**14,100**	**79.9**	**11,500**	**72.4**	**10,600**	**56.7**
		.157	.0031	17,500	121.3	**17,500**	**110.2**	**12,700**	**72.0**	**10,300**	**65.0**	**9,500**	**50.8**
		.197	.0030	15,900	110.2	**15,900**	**100.0**	**11,600**	**65.7**	**9,400**	**59.1**	**8,700**	**46.5**
		.236	.0029	14,600	101.2	**14,600**	**92.1**	**10,600**	**60.2**	**8,600**	**54.3**	**8,000**	**42.9**
		.315	.0029	12,500	86.6	**12,500**	**78.7**	**9,100**	**51.6**	**7,400**	**46.5**	**6,800**	**36.2**
		.394	.0027	10,900	75.6	**10,900**	**68.5**	**8,000**	**45.3**	**6,500**	**40.9**	**6,000**	**32.3**
		.472	.0020	9,700	67.3	**9,700**	**61.0**	**7,100**	**40.2**	**5,700**	**35.8**	**5,300**	**28.3**
.118	.002	**.157**	.0018	18,600	116.1	**18,600**	**105.5**	**13,500**	**68.9**	**11,000**	**62.2**	**10,200**	**49.2**
		.236	.0017	15,400	96.1	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,400**	**40.6**
		.315	.0017	13,100	81.9	**13,100**	**74.4**	**9,500**	**48.4**	**7,700**	**43.7**	**7,100**	**34.3**
		.394	.0016	11,400	71.3	**11,400**	**64.6**	**8,300**	**42.5**	**6,700**	**37.8**	**6,200**	**29.9**
		.472	.0015	10,100	63.0	**10,100**	**57.1**	**7,300**	**37.4**	**5,900**	**33.5**	**5,500**	**26.4**
		.551	.0014	9,000	56.3	**9,000**	**51.2**	**6,600**	**33.9**	**5,300**	**29.9**	**4,900**	**23.6**
		.630	.0013	8,200	51.2	**8,200**	**46.5**	**5,900**	**29.9**	**4,800**	**27.2**	**4,500**	**21.7**
		.709	.0012	7,500	46.9	**7,500**	**42.5**	**5,400**	**27.6**	**4,400**	**24.8**	**4,100**	**19.7**
		.787	.0009	6,900	42.9	**6,900**	**39.0**	**5,000**	**25.6**	**4,100**	**23.2**	**3,800**	**18.5**
	.004	**.157**	.0035	18,600	116.1	**18,600**	**105.5**	**13,500**	**68.9**	**11,000**	**62.2**	**10,200**	**49.2**
		.236	.0034	15,400	96.1	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,400**	**40.6**
		.315	.0033	13,100	81.9	**13,100**	**74.4**	**9,500**	**48.4**	**7,700**	**43.7**	**7,100**	**34.3**
		.394	.0032	11,400	71.3	**11,400**	**64.6**	**8,300**	**42.5**	**6,700**	**37.8**	**6,200**	**29.9**
		.472	.0030	10,100	63.0	**10,100**	**57.1**	**7,300**	**37.4**	**5,900**	**33.5**	**5,500**	**26.4**
		.551	.0027	9,000	56.3	**9,000**	**51.2**	**6,600**	**33.9**	**5,300**	**29.9**	**4,900**	**23.6**
		.630	.0026	8,200	51.2	**8,200**	**46.5**	**5,900**	**29.9**	**4,800**	**27.2**	**4,500**	**21.7**
		.709	.0024	7,500	46.9	**7,500**	**42.5**	**5,400**	**27.6**	**4,400**	**24.8**	**4,100**	**19.7**
		.787	.0017	6,900	42.9	**6,900**	**39.0**	**5,000**	**25.6**	**4,100**	**23.2**	**3,800**	**18.5**
	.008	**.157**	.0040	18,600	116.1	**18,600**	**105.5**	**13,500**	**68.9**	**11,000**	**62.2**	**10,200**	**49.2**
		.236	.0039	15,400	96.1	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,400**	**40.6**
		.315	.0037	13,100	81.9	**13,100**	**74.4**	**9,500**	**48.4**	**7,700**	**43.7**	**7,100**	**34.3**
		.394	.0036	11,400	71.3	**11,400**	**64.6**	**8,300**	**42.5**	**6,700**	**37.8**	**6,200**	**29.9**
		.472	.0033	10,100	63.0	**10,100**	**57.1**	**7,300**	**37.4**	**5,900**	**33.5**	**5,500**	**26.4**
		.551	.0031	9,000	56.3	**9,000**	**51.2**	**6,600**	**33.9**	**5,300**	**29.9**	**4,900**	**23.6**
		.630	.0030	8,200	51.2	**8,200**	**46.5**	**5,900**	**29.9**	**4,800**	**27.2**	**4,500**	**21.7**
		.709	.0027	7,500	46.9	**7,500**	**42.5**	**5,400**	**27.6**	**4,400**	**24.8**	**4,100**	**19.7**
		.787	.0020	6,900	42.9	**6,900**	**39.0**	**5,000**	**25.6**	**4,100**	**23.2**	**3,800**	**18.5**
	.012	**.157**	.0042	18,600	116.1	**18,600**	**105.5**	**13,500**	**68.9**	**11,000**	**62.2**	**10,200**	**49.2**
		.236	.0041	15,400	96.1	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,400**	**40.6**
		.315	.0040	13,100	81.9	**13,100**	**74.4**	**9,500**	**48.4**	**7,700**	**43.7**	**7,100**	**34.3**
		.394	.0038	11,400	71.3	**11,400**	**64.6**	**8,300**	**42.5**	**6,700**	**37.8**	**6,200**	**29.9**
		.472	.0035	10,100	63.0	**10,100**	**57.1**	**7,300**	**37.4**	**5,900**	**33.5**	**5,500**	**26.4**
		.551	.0032	9,000	56.3	**9,000**	**51.2**	**6,600**	**33.9**	**5,300**	**29.9**	**4,900**	**23.6**
		.630	.0031	8,200	51.2	**8,200**	**46.5**	**5,900**	**29.9**	**4,800**	**27.2**	**4,500**	**21.7**
		.709	.0028	7,500	46.9	**7,500**	**42.5**	**5,400**	**27.6**	**4,400**	**24.8**	**4,100**	**19.7**
		.787	.0021	6,900	42.9	**6,900**	**39.0**	**5,000**	**25.6**	**4,100**	**23.2**	**3,800**	**18.5**
	.020	**.157**	.0044	18,600	116.1	**18,600**	**105.5**	**13,500**	**68.9**	**11,000**	**62.2**	**10,200**	**49.2**
		.236	.0043	15,400	96.1	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,400**	**40.6**
		.315	.0042	13,100	81.9	**13,100**	**74.4**	**9,500**	**48.4**	**7,700**	**43.7**	**7,100**	**34.3**
		.394	.0040	11,400	71.3	**11,400**	**64.6**	**8,300**	**42.5**	**6,700**	**37.8**	**6,200**	**29.9**
		.472	.0037	10,100	63.0	**10,100**	**57.1**	**7,300**	**37.4**	**5,900**	**33.5**	**5,500**	**26.4**
		.551	.0034	9,000	56.3	**9,000**	**51.2**	**6,600**	**33.9**	**5,300**	**29.9**	**4,900**	**23.6**
		.630	.0033	8,200	51.2	**8,200**	**46.5**	**5,900**	**29.9**	**4,800**	**27.2**	**4,500**	**21.7**
		.709	.0030	7,500	46.9	**7,500**	**42.5**	**5,400**	**27.6**	**4,400**	**24.8**	**4,100**	**19.7**
		.787	.0022	6,900	42.9	**6,900**	**39.0**	**5,000**	**25.6**	**4,100**	**23.2**	**3,800**	**18.5**

【Note】 Refer to the comments and notes below the table on page A171 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition | For detailed information on high-accuracy cutting conditions, refer to page A172. | **Inch**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
.157	.004	.315	.0036	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0035	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0033	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0031	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0030	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0029	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0028	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0023	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0022	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.008	.315	.0050	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0048	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0046	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0043	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0041	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0040	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0038	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0032	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0030	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.012	.315	.0052	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0051	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0048	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0045	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0044	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0043	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0040	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0034	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0032	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.020	.315	.0054	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0052	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0050	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0046	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0045	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0044	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0042	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0035	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0033	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
	.039	.315	.0055	10,400	108.3	10,400	98.4	7,600	64.6	6,200	58.7	5,700	45.7
		.394	.0054	9,300	96.9	9,300	87.8	6,800	57.9	5,500	52.0	5,100	40.9
		.472	.0051	8,400	87.4	8,400	79.5	6,100	52.0	5,000	47.2	4,600	37.0
		.551	.0048	7,700	79.9	7,700	72.8	5,600	47.6	4,500	42.5	4,200	33.9
		.630	.0046	7,100	73.6	7,100	66.9	5,100	43.3	4,200	39.8	3,900	31.5
		.709	.0045	6,500	67.7	6,500	61.4	4,800	40.9	3,900	37.0	3,600	28.7
		.787	.0043	6,100	63.4	6,100	57.5	4,400	37.4	3,600	33.9	3,300	26.4
		.866	.0035	5,700	59.1	5,700	53.9	4,100	35.0	3,400	32.3	3,100	24.8
		.945	.0033	5,300	55.1	5,300	50.0	3,900	33.1	3,200	30.3	2,900	23.2
.197	.004	.394	.0038	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0032	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0030	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0030	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
	.008	.394	.0048	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0041	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0039	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0037	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
	.012	.394	.0065	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0055	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0052	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0051	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9
	.020	.394	.0068	9,300	128.7	9,300	117.3	6,800	77.2	5,500	69.3	5,100	54.7
		.591	.0057	7,400	102.4	7,400	93.3	5,400	61.4	4,400	55.5	4,000	42.9
		.787	.0054	6,100	84.6	6,100	76.8	4,400	50.0	3,600	45.3	3,300	35.4
		.984	.0052	5,200	72.0	5,200	65.4	3,800	42.9	3,100	39.0	2,800	29.9

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.197	**.039**	**.394**	.0069	9,300	366.1	**9,300**	**117.3**	**6,800**	**77.2**	**5,500**	**69.3**	**5,100**	**54.7**
		.591	.0058	7,400	291.3	**7,400**	**93.3**	**5,400**	**61.4**	**4,400**	**55.5**	**4,000**	**42.9**
		.787	.0055	6,100	240.2	**6,100**	**76.8**	**4,400**	**50.0**	**3,600**	**45.3**	**3,300**	**35.4**
		.984	.0053	5,200	204.7	**5,200**	**65.4**	**3,800**	**42.9**	**3,100**	**39.0**	**2,800**	**29.9**
.236	**.004**	**.472**	.0039	8,300	326.8	**8,300**	**117.7**	**6,100**	**78.0**	**4,900**	**69.3**	**4,500**	**54.3**
		.709	.0035	6,500	255.9	**6,500**	**92.1**	**4,700**	**59.8**	**3,800**	**53.9**	**3,500**	**42.1**
		.945	.0032	5,300	208.7	**5,300**	**75.2**	**3,900**	**49.6**	**3,100**	**44.1**	**2,900**	**35.0**
		1.181	.0031	4,500	177.2	**4,500**	**63.8**	**3,300**	**42.1**	**2,700**	**38.2**	**2,400**	**28.7**
	.008	**.472**	.0070	8,300	326.8	**8,300**	**117.7**	**6,100**	**78.0**	**4,900**	**69.3**	**4,500**	**54.3**
		.709	.0062	6,500	255.9	**6,500**	**92.1**	**4,700**	**59.8**	**3,800**	**53.9**	**3,500**	**42.1**
		.945	.0058	5,300	208.7	**5,300**	**75.2**	**3,900**	**49.6**	**3,100**	**44.1**	**2,900**	**35.0**
		1.181	.0056	4,500	177.2	**4,500**	**63.8**	**3,300**	**42.1**	**2,700**	**38.2**	**2,400**	**28.7**
	.012	**.472**	.0074	8,300	326.8	**8,300**	**117.7**	**6,100**	**78.0**	**4,900**	**69.3**	**4,500**	**54.3**
		.709	.0065	6,500	255.9	**6,500**	**92.1**	**4,700**	**59.8**	**3,800**	**53.9**	**3,500**	**42.1**
		.945	.0061	5,300	208.7	**5,300**	**75.2**	**3,900**	**49.6**	**3,100**	**44.1**	**2,900**	**35.0**
		1.181	.0059	4,500	177.2	**4,500**	**63.8**	**3,300**	**42.1**	**2,700**	**38.2**	**2,400**	**28.7**
	.020	**.472**	.0076	8,300	326.8	**8,300**	**117.7**	**6,100**	**78.0**	**4,900**	**69.3**	**4,500**	**54.3**
		.709	.0068	6,500	255.9	**6,500**	**92.1**	**4,700**	**59.8**	**3,800**	**53.9**	**3,500**	**42.1**
		.945	.0063	5,300	208.7	**5,300**	**75.2**	**3,900**	**49.6**	**3,100**	**44.1**	**2,900**	**35.0**
		1.181	.0061	4,500	177.2	**4,500**	**63.8**	**3,300**	**42.1**	**2,700**	**38.2**	**2,400**	**28.7**
	.039	**.472**	.0078	8,300	326.8	**8,300**	**117.7**	**6,100**	**78.0**	**4,900**	**69.3**	**4,500**	**54.3**
		.709	.0069	6,500	255.9	**6,500**	**92.1**	**4,700**	**59.8**	**3,800**	**53.9**	**3,500**	**42.1**
		.945	.0065	5,300	208.7	**5,300**	**75.2**	**3,900**	**49.6**	**3,100**	**44.1**	**2,900**	**35.0**
		1.181	.0062	4,500	177.2	**4,500**	**63.8**	**3,300**	**42.1**	**2,700**	**38.2**	**2,400**	**28.7**

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH4010-2-02-TH3 tool:
Cutting depth = .0019 inch (0.047mm) (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .0015 inch (0.0376mm)

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition** | For detailed information on high-accuracy cutting conditions, refer to page A167. | Inch

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		**Hardened Steel (45~55HRC)**		**Hardened Steel (55~60HRC)**		**Hardened Steel (60~65HRC)**		**Hardened Steel (65~72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)
.039	.001	.059	.0006	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0005	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0005	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0005	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0004	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0004	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0002	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0001	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.002	.059	.0015	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0011	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0011	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0010	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0009	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0009	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0005	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0003	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.004	.059	.0018	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0014	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0013	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0012	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0011	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0011	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0006	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0004	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.008	.059	.0020	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0015	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0015	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0014	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0013	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0012	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0007	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0004	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
	.012	.059	.0023	32,300	111.8	32,300	101.6	23,500	66.5	19,100	60.2	17,600	47.2
		.079	.0017	29,100	100.8	29,100	91.3	21,200	60.2	17,200	54.3	15,900	42.5
		.098	.0017	26,400	91.3	26,400	83.1	19,200	54.3	15,600	49.2	14,400	38.6
		.118	.0015	24,200	83.9	24,200	76.4	17,600	50.0	14,300	45.3	13,200	35.4
		.157	.0014	20,800	72.0	20,800	65.4	15,100	42.9	12,300	38.6	11,300	29.9
		.197	.0014	18,200	63.0	18,200	57.1	13,200	37.4	10,700	33.5	9,900	26.4
		.236	.0007	16,200	56.3	16,200	50.8	11,700	33.5	9,500	29.9	8,800	23.6
		.315	.0004	13,200	45.7	13,200	41.7	9,600	27.6	7,800	24.4	7,200	19.3
.059	.001	.079	.0006	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0005	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0005	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0004	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0004	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0003	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0003	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0002	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.002	.079	.0016	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0014	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0013	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0011	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0010	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0009	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0007	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0005	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.004	.079	.0026	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0023	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0021	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0019	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	a_p (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
.059	.004	.236	.0017	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0015	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0011	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0008	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.008	.079	.0027	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0024	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0022	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0020	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0018	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0015	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0012	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0008	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.012	.079	.0028	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0025	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0023	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0020	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0019	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0016	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0013	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0008	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
	.020	.079	.0028	22,300	108.3	22,300	98.4	16,300	64.6	13,200	58.3	12,200	45.7
		.118	.0026	19,300	93.7	19,300	85.4	14,100	55.9	11,500	50.8	10,500	39.4
		.157	.0023	17,100	83.1	17,100	75.6	12,500	49.2	10,100	44.9	9,300	35.0
		.197	.0020	15,300	74.0	15,300	67.3	11,100	44.1	9,000	39.8	8,400	31.5
		.236	.0019	13,900	67.3	13,900	61.0	10,000	39.8	8,200	36.2	7,600	28.3
		.315	.0016	12,600	61.0	12,600	55.5	9,200	36.6	7,500	33.1	6,900	26.0
		.394	.0013	11,600	56.3	11,600	51.2	8,500	33.5	6,900	30.3	6,300	23.6
		.472	.0009	10,000	48.8	10,000	44.5	7,300	29.1	5,900	26.0	5,500	20.5
.079	.001	.098	.0006	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0006	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0005	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0004	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0004	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0004	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0004	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0003	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.002	.098	.0016	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0014	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0012	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0012	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0011	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0011	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0010	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0008	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.004	.098	.0027	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0024	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0020	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0020	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0019	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0019	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0018	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0013	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6
	.008	.098	.0030	17,100	118.5	17,100	107.9	12,500	70.5	10,100	63.8	9,300	49.6
		.118	.0027	16,200	112.2	16,200	102.0	11,700	66.1	9,500	60.2	8,800	47.2
		.157	.0023	14,500	100.8	14,500	91.3	10,500	59.8	8,500	53.9	7,900	42.1
		.197	.0022	13,200	91.3	13,200	83.1	9,600	54.7	7,800	49.2	7,200	38.6
		.236	.0022	12,100	83.9	12,100	76.4	8,800	50.0	7,100	45.3	6,600	35.4
		.315	.0021	10,400	72.0	10,400	65.4	7,600	42.9	6,100	38.6	5,600	29.9
		.394	.0020	9,000	62.6	9,000	56.7	6,600	37.4	5,400	33.9	5,000	26.8
		.472	.0015	8,100	55.9	8,100	50.8	5,900	33.5	4,700	29.9	4,400	23.6

【Note】 Refer to the comments and notes below the table on page A176 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | High efficiency cutting condition | **High accuracy cutting condition** | For detailed information on high-accuracy cutting conditions, refer to page A167. | Inch

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)	Revolution n (min⁻¹)	Feed rate vf (IPM)
.079	.012	.098	.0032	17,100	118.5	**17,100**	**107.9**	**12,500**	**70.5**	**10,100**	**63.8**	**9,300**	**49.6**
		.118	.0028	16,200	112.2	**16,200**	**102.0**	**11,700**	**66.1**	**9,500**	**60.2**	**8,800**	**47.2**
		.157	.0024	14,500	100.8	**14,500**	**91.3**	**10,500**	**59.8**	**8,500**	**53.9**	**7,900**	**42.1**
		.197	.0024	13,200	91.3	**13,200**	**83.1**	**9,600**	**54.7**	**7,800**	**49.2**	**7,200**	**38.6**
		.236	.0023	12,100	83.9	**12,100**	**76.4**	**8,800**	**50.0**	**7,100**	**45.3**	**6,600**	**35.4**
		.315	.0022	10,400	72.0	**10,400**	**65.4**	**7,600**	**42.9**	**6,100**	**38.6**	**5,600**	**29.9**
		.394	.0021	9,000	62.6	**9,000**	**56.7**	**6,600**	**37.4**	**5,400**	**33.9**	**5,000**	**26.8**
		.472	.0016	8,100	55.9	**8,100**	**50.8**	**5,900**	**33.5**	**4,700**	**29.9**	**4,400**	**23.6**
	.020	.098	.0033	17,100	118.5	**17,100**	**107.9**	**12,500**	**70.5**	**10,100**	**63.8**	**9,300**	**49.6**
		.118	.0030	16,200	112.2	**16,200**	**102.0**	**11,700**	**66.1**	**9,500**	**60.2**	**8,800**	**47.2**
		.157	.0026	14,500	100.8	**14,500**	**91.3**	**10,500**	**59.8**	**8,500**	**53.9**	**7,900**	**42.1**
		.197	.0025	13,200	91.3	**13,200**	**83.1**	**9,600**	**54.7**	**7,800**	**49.2**	**7,200**	**38.6**
		.236	.0024	12,100	83.9	**12,100**	**76.4**	**8,800**	**50.0**	**7,100**	**45.3**	**6,600**	**35.4**
		.315	.0024	10,400	72.0	**10,400**	**65.4**	**7,600**	**42.9**	**6,100**	**38.6**	**5,600**	**29.9**
		.394	.0022	9,000	62.6	**9,000**	**56.7**	**6,600**	**37.4**	**5,400**	**33.9**	**5,000**	**26.8**
		.472	.0017	8,100	55.9	**8,100**	**50.8**	**5,900**	**33.5**	**4,700**	**29.9**	**4,400**	**23.6**
.118	.002	.157	.0015	15,400	96.5	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,500**	**40.9**
		.236	.0014	12,800	79.9	**12,800**	**72.4**	**9,300**	**47.2**	**7,600**	**42.9**	**7,000**	**33.5**
		.315	.0014	10,900	68.1	**10,900**	**61.8**	**7,900**	**40.2**	**6,400**	**36.2**	**5,900**	**28.3**
		.394	.0013	9,500	59.1	**9,500**	**53.5**	**6,900**	**35.4**	**5,600**	**31.5**	**5,100**	**24.8**
		.472	.0012	8,400	52.4	**8,400**	**47.2**	**6,100**	**31.1**	**4,900**	**28.0**	**4,600**	**22.0**
		.551	.0011	7,500	46.9	**7,500**	**42.5**	**5,500**	**28.0**	**4,400**	**24.8**	**4,100**	**19.7**
		.630	.0011	6,800	42.5	**6,800**	**38.6**	**4,900**	**24.8**	**4,000**	**22.4**	**3,700**	**18.1**
		.709	.0010	6,200	39.0	**6,200**	**35.4**	**4,500**	**22.8**	**3,700**	**20.5**	**3,400**	**16.5**
		.787	.0007	5,700	35.4	**5,700**	**32.3**	**4,200**	**21.3**	**3,400**	**19.3**	**3,200**	**15.4**
	.004	.157	.0030	15,400	96.5	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,500**	**40.9**
		.236	.0028	12,800	79.9	**12,800**	**72.4**	**9,300**	**47.2**	**7,600**	**42.9**	**7,000**	**33.5**
		.315	.0028	10,900	68.1	**10,900**	**61.8**	**7,900**	**40.2**	**6,400**	**36.2**	**5,900**	**28.3**
		.394	.0027	9,500	59.1	**9,500**	**53.5**	**6,900**	**35.4**	**5,600**	**31.5**	**5,100**	**24.8**
		.472	.0025	8,400	52.4	**8,400**	**47.2**	**6,100**	**31.1**	**4,900**	**28.0**	**4,600**	**22.0**
		.551	.0023	7,500	46.9	**7,500**	**42.5**	**5,500**	**28.0**	**4,400**	**24.8**	**4,100**	**19.7**
		.630	.0022	6,800	42.5	**6,800**	**38.6**	**4,900**	**24.8**	**4,000**	**22.4**	**3,700**	**18.1**
		.709	.0020	6,200	39.0	**6,200**	**35.4**	**4,500**	**22.8**	**3,700**	**20.5**	**3,400**	**16.5**
		.787	.0015	5,700	35.4	**5,700**	**32.3**	**4,200**	**21.3**	**3,400**	**19.3**	**3,200**	**15.4**
	.008	.157	.0033	15,400	96.5	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,500**	**40.9**
		.236	.0032	12,800	79.9	**12,800**	**72.4**	**9,300**	**47.2**	**7,600**	**42.9**	**7,000**	**33.5**
		.315	.0031	10,900	68.1	**10,900**	**61.8**	**7,900**	**40.2**	**6,400**	**36.2**	**5,900**	**28.3**
		.394	.0030	9,500	59.1	**9,500**	**53.5**	**6,900**	**35.4**	**5,600**	**31.5**	**5,100**	**24.8**
		.472	.0028	8,400	52.4	**8,400**	**47.2**	**6,100**	**31.1**	**4,900**	**28.0**	**4,600**	**22.0**
		.551	.0026	7,500	46.9	**7,500**	**42.5**	**5,500**	**28.0**	**4,400**	**24.8**	**4,100**	**19.7**
		.630	.0025	6,800	42.5	**6,800**	**38.6**	**4,900**	**24.8**	**4,000**	**22.4**	**3,700**	**18.1**
		.709	.0022	6,200	39.0	**6,200**	**35.4**	**4,500**	**22.8**	**3,700**	**20.5**	**3,400**	**16.5**
		.787	.0016	5,700	35.4	**5,700**	**32.3**	**4,200**	**21.3**	**3,400**	**19.3**	**3,200**	**15.4**
	.012	.157	.0035	15,400	96.5	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,500**	**40.9**
		.236	.0034	12,800	79.9	**12,800**	**72.4**	**9,300**	**47.2**	**7,600**	**42.9**	**7,000**	**33.5**
		.315	.0033	10,900	68.1	**10,900**	**61.8**	**7,900**	**40.2**	**6,400**	**36.2**	**5,900**	**28.3**
		.394	.0031	9,500	59.1	**9,500**	**53.5**	**6,900**	**35.4**	**5,600**	**31.5**	**5,100**	**24.8**
		.472	.0029	8,400	52.4	**8,400**	**47.2**	**6,100**	**31.1**	**4,900**	**28.0**	**4,600**	**22.0**
		.551	.0027	7,500	46.9	**7,500**	**42.5**	**5,500**	**28.0**	**4,400**	**24.8**	**4,100**	**19.7**
		.630	.0026	6,800	42.5	**6,800**	**38.6**	**4,900**	**24.8**	**4,000**	**22.4**	**3,700**	**18.1**
		.709	.0024	6,200	39.0	**6,200**	**35.4**	**4,500**	**22.8**	**3,700**	**20.5**	**3,400**	**16.5**
		.787	.0017	5,700	35.4	**5,700**	**32.3**	**4,200**	**21.3**	**3,400**	**19.3**	**3,200**	**15.4**
	.020	.157	.0037	15,400	96.5	**15,400**	**87.4**	**11,200**	**57.1**	**9,100**	**51.6**	**8,500**	**40.9**
		.236	.0035	12,800	79.9	**12,800**	**72.4**	**9,300**	**47.2**	**7,600**	**42.9**	**7,000**	**33.5**
		.315	.0035	10,900	68.1	**10,900**	**61.8**	**7,900**	**40.2**	**6,400**	**36.2**	**5,900**	**28.3**
		.394	.0033	9,500	59.1	**9,500**	**53.5**	**6,900**	**35.4**	**5,600**	**31.5**	**5,100**	**24.8**
		.472	.0031	8,400	52.4	**8,400**	**47.2**	**6,100**	**31.1**	**4,900**	**28.0**	**4,600**	**22.0**
		.551	.0028	7,500	46.9	**7,500**	**42.5**	**5,500**	**28.0**	**4,400**	**24.8**	**4,100**	**19.7**
		.630	.0028	6,800	42.5	**6,800**	**38.6**	**4,900**	**24.8**	**4,000**	**22.4**	**3,700**	**18.1**
		.709	.0025	6,200	39.0	**6,200**	**35.4**	**4,500**	**22.8**	**3,700**	**20.5**	**3,400**	**16.5**
		.787	.0018	5,700	35.4	**5,700**	**32.3**	**4,200**	**21.3**	**3,400**	**19.3**	**3,200**	**15.4**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
.157	.004	**.315**	.0030	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0029	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0028	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0026	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0025	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0024	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0023	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0019	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0018	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.008	**.315**	.0041	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0040	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0038	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0035	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0034	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0033	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0031	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0026	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0025	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.012	**.315**	.0043	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0042	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0040	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0037	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0036	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0035	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0033	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0028	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0026	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.020	**.315**	.0045	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0044	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0041	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0039	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0037	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0036	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0035	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0029	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0027	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
	.039	**.315**	.0046	8,600	89.8	**8,600**	**338.6**	**6,300**	**53.5**	**5,100**	**48.8**	**4,700**	**37.8**
		.394	.0044	7,700	80.3	**7,700**	**303.1**	**5,600**	**48.0**	**4,600**	**43.3**	**4,200**	**33.9**
		.472	.0043	7,000	72.4	**7,000**	**275.6**	**5,100**	**43.3**	**4,200**	**39.4**	**3,800**	**30.7**
		.551	.0039	6,400	66.1	**6,400**	**252.0**	**4,600**	**39.4**	**3,700**	**35.4**	**3,500**	**28.0**
		.630	.0038	5,900	61.0	**5,900**	**232.3**	**4,200**	**35.8**	**3,500**	**33.1**	**3,200**	**26.0**
		.709	.0037	5,400	56.3	**5,400**	**212.6**	**4,000**	**33.9**	**3,200**	**30.7**	**3,000**	**24.0**
		.787	.0035	5,100	52.8	**5,100**	**200.8**	**3,700**	**31.1**	**3,000**	**28.0**	**2,700**	**22.0**
		.866	.0030	4,700	49.2	**4,700**	**185.0**	**3,400**	**29.1**	**2,800**	**26.8**	**2,600**	**20.5**
		.945	.0028	4,400	45.7	**4,400**	**173.2**	**3,200**	**27.6**	**2,700**	**25.2**	**2,400**	**19.3**
.197	.004	**.394**	.0031	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0026	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0025	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0024	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
	.008	**.394**	.0040	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0034	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0032	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0031	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
	.012	**.394**	.0054	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0046	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0043	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0042	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
	.020	**.394**	.0056	7,700	106.7	**7,700**	**303.1**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0047	6,100	85.0	**6,100**	**240.2**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0045	5,100	70.1	**5,100**	**200.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0043	4,300	59.8	**4,300**	**169.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**

【Note】 Refer to the comments and notes below the table on page A176 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition** | Inch

For detailed information on high-accuracy cutting conditions, refer to page A167.

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (inch)	Corner radius RE (inch)	Under neck length (inch)	*a*p (inch)	Revolution *n* (min-1)	Feed rate *v*f (IPM)	Revolution *n* (min-1)	Feed rate *v*f (IPM)	Revolution *n* (min-1)	Feed rate *v*f (IPM)	Revolution *n* (min-1)	Feed rate *v*f (IPM)	Revolution *n* (min-1)	Feed rate *v*f (IPM)
.197	**.039**	**.394**	.0057	7,700	106.7	**7,700**	**97.2**	**5,600**	**64.2**	**4,600**	**57.5**	**4,200**	**45.3**
		.591	.0048	6,100	85.0	**6,100**	**77.6**	**4,500**	**50.8**	**3,700**	**46.1**	**3,300**	**35.4**
		.787	.0046	5,100	70.1	**5,100**	**63.8**	**3,700**	**41.3**	**3,000**	**37.4**	**2,700**	**29.5**
		.984	.0044	4,300	59.8	**4,300**	**54.3**	**3,200**	**35.4**	**2,600**	**32.3**	**2,300**	**24.8**
.236	**.004**	**.472**	.0032	6,900	107.5	**6,900**	**97.6**	**5,100**	**64.6**	**4,100**	**57.5**	**3,700**	**45.3**
		.709	.0029	5,400	83.9	**5,400**	**76.4**	**3,900**	**49.6**	**3,200**	**44.9**	**2,900**	**35.0**
		.945	.0027	4,400	68.5	**4,400**	**62.6**	**3,200**	**41.3**	**2,600**	**36.6**	**2,400**	**29.1**
		1.181	.0026	3,700	58.3	**3,700**	**52.8**	**2,700**	**35.0**	**2,200**	**31.9**	**2,000**	**24.0**
	.008	**.472**	.0058	6,900	107.5	**6,900**	**97.6**	**5,100**	**64.6**	**4,100**	**57.5**	**3,700**	**45.3**
		.709	.0052	5,400	83.9	**5,400**	**76.4**	**3,900**	**49.6**	**3,200**	**44.9**	**2,900**	**35.0**
		.945	.0048	4,400	68.5	**4,400**	**62.6**	**3,200**	**41.3**	**2,600**	**36.6**	**2,400**	**29.1**
		1.181	.0046	3,700	58.3	**3,700**	**52.8**	**2,700**	**35.0**	**2,200**	**31.9**	**2,000**	**24.0**
	.012	**.472**	.0061	6,900	107.5	**6,900**	**97.6**	**5,100**	**64.6**	**4,100**	**57.5**	**3,700**	**45.3**
		.709	.0054	5,400	83.9	**5,400**	**76.4**	**3,900**	**49.6**	**3,200**	**44.9**	**2,900**	**35.0**
		.945	.0051	4,400	68.5	**4,400**	**62.6**	**3,200**	**41.3**	**2,600**	**36.6**	**2,400**	**29.1**
		1.181	.0049	3,700	58.3	**3,700**	**52.8**	**2,700**	**35.0**	**2,200**	**31.9**	**2,000**	**24.0**
	.020	**.472**	.0063	6,900	107.5	**6,900**	**97.6**	**5,100**	**64.6**	**4,100**	**57.5**	**3,700**	**45.3**
		.709	.0056	5,400	83.9	**5,400**	**76.4**	**3,900**	**49.6**	**3,200**	**44.9**	**2,900**	**35.0**
		.945	.0052	4,400	68.5	**4,400**	**62.6**	**3,200**	**41.3**	**2,600**	**36.6**	**2,400**	**29.1**
		1.181	.0050	3,700	58.3	**3,700**	**52.8**	**2,700**	**35.0**	**2,200**	**31.9**	**2,000**	**24.0**
	.039	**.472**	.0064	6,900	107.5	**6,900**	**97.6**	**5,100**	**64.6**	**4,100**	**57.5**	**3,700**	**45.3**
		.709	.0057	5,400	83.9	**5,400**	**76.4**	**3,900**	**49.6**	**3,200**	**44.9**	**2,900**	**35.0**
		.945	.0054	4,400	68.5	**4,400**	**62.6**	**3,200**	**41.3**	**2,600**	**36.6**	**2,400**	**29.1**
		1.181	.0052	3,700	58.3	**3,700**	**52.8**	**2,700**	**35.0**	**2,200**	**31.9**	**2,000**	**24.0**

(1) *a*p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting *a*e to (5 or less) × (*a*p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and *a*p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH4010-2-02-TH3 tool:
Cutting depth = .0015 inch (0.039mm) (*a*p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = .0012 inch (0.0312mm)

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDREH2-TH3 | 2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition | For detailed information on high-accuracy cutting conditions, refer to page A179. | Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		**Hardened Steel (45~55HRC)**		**Hardened Steel (55~65HRC)**		**Hardened Steel (65~68HRC)**		**Hardened Steel (68~72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
0.2	0.02	0.5	0.016	42,500	710	**37,500**	**550**	**35,000**	**450**	**31,500**	**410**	**31,880**	**320**
		1	0.011	42,500	710	**37,500**	**550**	**35,000**	**450**	**31,500**	**410**	**31,880**	**320**
	0.05	0.5	0.020	42,500	710	**37,500**	**550**	**35,000**	**450**	**31,500**	**410**	**31,880**	**320**
		1	0.014	42,500	710	**37,500**	**550**	**35,000**	**450**	**31,500**	**410**	**31,880**	**320**
0.3	0.02	1	0.016	40,800	730	**36,000**	**550**	**33,600**	**440**	**30,240**	**400**	**30,600**	**310**
		2	0.011	33,050	590	**29,160**	**440**	**27,220**	**360**	**24,490**	**320**	**24,790**	**250**
	0.05	1	0.021	40,800	730	**36,000**	**550**	**33,600**	**440**	**30,240**	**400**	**30,600**	**310**
		2	0.012	33,050	590	**29,160**	**440**	**27,220**	**360**	**24,490**	**320**	**24,790**	**250**
0.4	0.02	1	0.016	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		2	0.013	32,260	710	**28,800**	**560**	**26,730**	**460**	**24,050**	**410**	**24,480**	**320**
	0.05	1	0.025	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		2	0.016	32,260	710	**28,800**	**560**	**26,730**	**460**	**24,050**	**410**	**24,480**	**320**
	0.1	1	0.033	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		2	0.028	32,260	710	**28,800**	**560**	**26,730**	**460**	**24,050**	**410**	**24,480**	**320**
0.5	0.02	1	0.016	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		2	0.013	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		3	0.010	26,440	630	**23,330**	**470**	**21,770**	**380**	**19,600**	**340**	**19,830**	**270**
	0.05	1	0.030	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		2	0.023	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		3	0.017	26,440	630	**23,330**	**470**	**21,770**	**380**	**19,600**	**340**	**19,830**	**270**
	0.1	1	0.035	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		2	0.030	32,260	790	**28,800**	**620**	**26,730**	**510**	**24,050**	**460**	**24,480**	**360**
		3	0.020	26,440	630	**23,330**	**470**	**21,770**	**380**	**19,600**	**340**	**19,830**	**270**
0.6	0.02	2	0.016	32,260	990	**28,800**	**770**	**26,730**	**640**	**24,050**	**570**	**24,480**	**440**
		4	0.013	26,440	790	**23,330**	**590**	**21,770**	**480**	**19,600**	**430**	**19,830**	**330**
	0.05	2	0.028	32,260	990	**28,800**	**770**	**26,730**	**640**	**24,050**	**570**	**24,480**	**440**
		4	0.019	26,440	790	**23,330**	**590**	**21,770**	**480**	**19,600**	**430**	**19,830**	**330**
	0.1	2	0.035	32,260	990	**28,800**	**770**	**26,730**	**640**	**24,050**	**570**	**24,480**	**440**
		4	0.024	26,440	790	**23,330**	**590**	**21,770**	**480**	**19,600**	**430**	**19,830**	**330**
0.8	0.02	2	0.023	34,000	1,410	**30,000**	**1,110**	**28,000**	**900**	**25,200**	**810**	**25,500**	**630**
		4	0.016	34,000	1,130	**30,000**	**890**	**28,000**	**720**	**25,200**	**650**	**25,500**	**510**
	0.05	2	0.038	34,000	1,410	**30,000**	**1,110**	**28,000**	**900**	**25,200**	**810**	**25,500**	**630**
		4	0.026	34,000	1,130	**30,000**	**890**	**28,000**	**720**	**25,200**	**650**	**25,500**	**510**
	0.1	2	0.047	34,000	1,410	**30,000**	**1,110**	**28,000**	**900**	**25,200**	**810**	**25,500**	**630**
		4	0.032	34,000	1,130	**30,000**	**890**	**28,000**	**720**	**25,200**	**650**	**25,500**	**510**
	0.2	2	0.081	34,000	1,410	**30,000**	**1,110**	**28,000**	**900**	**25,200**	**810**	**25,500**	**630**
		4	0.056	34,000	1,130	**30,000**	**890**	**28,000**	**720**	**25,200**	**650**	**25,500**	**510**

【Note】 Refer to the comments and notes below the table on page A178 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH2-TH3 | 2 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition | For detailed information on high-accuracy cutting conditions, refer to page A179. | Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
1	0.02	2	0.016	33,440	1,810	**29,620**	**1,420**	**27,710**	**1,160**	**24,940**	**1,050**	**25,170**	**810**
		4	0.013	30,600	1,650	**27,000**	**1,290**	**25,200**	**1,060**	**22,680**	**950**	**22,950**	**740**
		6	0.010	24,790	1,340	**21,870**	**1,050**	**20,410**	**860**	**18,370**	**770**	**18,590**	**600**
		8	0.008	22,030	1,190	**19,440**	**930**	**18,140**	**760**	**16,330**	**680**	**16,520**	**530**
	0.05	2	0.046	33,440	1,810	**29,620**	**1,420**	**27,710**	**1,160**	**24,940**	**1,050**	**25,170**	**810**
		4	0.027	30,600	1,650	**27,000**	**1,290**	**25,200**	**1,060**	**22,680**	**950**	**22,950**	**740**
		6	0.017	24,790	1,340	**21,870**	**1,050**	**20,410**	**860**	**18,370**	**770**	**18,590**	**600**
		8	0.016	22,030	1,190	**19,440**	**930**	**18,140**	**760**	**16,330**	**680**	**16,520**	**530**
	0.1	2	0.065	33,440	1,810	**29,620**	**1,420**	**27,710**	**1,160**	**24,940**	**1,050**	**25,170**	**810**
		4	0.038	30,600	1,650	**27,000**	**1,290**	**25,200**	**1,060**	**22,680**	**950**	**22,950**	**740**
		6	0.024	24,790	1,340	**21,870**	**1,050**	**20,410**	**860**	**18,370**	**770**	**18,590**	**600**
		8	0.024	22,030	1,190	**19,440**	**930**	**18,140**	**760**	**16,330**	**680**	**16,520**	**530**
	0.2	2	0.110	33,440	1,810	**29,620**	**1,420**	**27,710**	**1,160**	**24,940**	**1,050**	**25,170**	**810**
		4	0.070	30,600	1,650	**27,000**	**1,290**	**25,200**	**1,060**	**22,680**	**950**	**22,950**	**740**
		6	0.040	24,790	1,340	**21,870**	**1,050**	**20,410**	**860**	**18,370**	**770**	**18,590**	**600**
		8	0.040	22,030	1,190	**19,440**	**930**	**18,140**	**760**	**16,330**	**680**	**16,520**	**530**

(1) a_p indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH2010-2-02-TH3 tool:
Cutting depth = 0.11 (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.075 mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDREH2-TH3 | 2 Flutes | High efficiency cutting condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A177.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
0.2	0.02	0.5	0.016	50,000	210	**50,000**	**180**	**50,000**	**160**	**45,000**	**140**	**42,500**	**110**
		1	0.011	50,000	210	**50,000**	**180**	**50,000**	**160**	**45,000**	**140**	**42,500**	**110**
	0.05	0.5	0.020	50,000	210	**50,000**	**180**	**50,000**	**160**	**45,000**	**140**	**42,500**	**110**
		1	0.014	50,000	210	**50,000**	**180**	**50,000**	**160**	**45,000**	**140**	**42,500**	**110**
0.3	0.02	1	0.016	50,000	460	**50,000**	**340**	**50,000**	**320**	**45,000**	**290**	**42,500**	**220**
		2	0.011	45,000	420	**45,000**	**300**	**45,000**	**290**	**40,500**	**260**	**38,250**	**200**
	0.05	1	0.021	50,000	460	**50,000**	**340**	**50,000**	**320**	**45,000**	**290**	**42,500**	**220**
		2	0.012	45,000	420	**45,000**	**300**	**45,000**	**290**	**40,500**	**260**	**38,250**	**200**
0.4	0.02	1	0.016	50,000	460	**40,000**	**320**	**36,000**	**270**	**32,400**	**240**	**30,600**	**190**
		2	0.013	45,000	410	**36,000**	**290**	**34,000**	**240**	**30,600**	**220**	**28,900**	**170**
	0.05	1	0.025	50,000	460	**40,000**	**320**	**36,000**	**270**	**32,400**	**240**	**30,600**	**190**
		2	0.016	45,000	410	**36,000**	**290**	**34,000**	**240**	**30,600**	**220**	**28,900**	**170**
	0.1	1	0.033	50,000	460	**40,000**	**320**	**36,000**	**270**	**32,400**	**240**	**30,600**	**190**
		2	0.028	45,000	410	**36,000**	**290**	**34,000**	**240**	**30,600**	**220**	**28,900**	**170**
0.5	0.02	1	0.016	40,000	460	**30,000**	**380**	**28,000**	**320**	**25,200**	**280**	**23,800**	**220**
		2	0.013	40,000	460	**30,000**	**380**	**28,000**	**320**	**25,200**	**280**	**23,800**	**220**
		3	0.010	36,000	410	**27,000**	**320**	**24,500**	**260**	**22,050**	**230**	**20,830**	**180**
	0.05	1	0.030	40,000	460	**30,000**	**380**	**28,000**	**320**	**25,200**	**280**	**23,800**	**220**
		2	0.023	40,000	460	**30,000**	**380**	**28,000**	**320**	**25,200**	**280**	**23,800**	**220**
		3	0.017	36,000	410	**27,000**	**320**	**24,500**	**260**	**22,050**	**230**	**20,830**	**180**
	0.1	1	0.035	40,000	460	**30,000**	**380**	**28,000**	**320**	**25,200**	**280**	**23,800**	**220**
		2	0.030	40,000	460	**30,000**	**380**	**28,000**	**320**	**25,200**	**280**	**23,800**	**220**
		3	0.020	36,000	410	**27,000**	**320**	**24,500**	**260**	**22,050**	**230**	**20,830**	**180**
0.6	0.02	2	0.016	37,830	600	**28,200**	**390**	**23,000**	**320**	**20,700**	**290**	**19,550**	**220**
		4	0.013	27,800	440	**23,600**	**280**	**21,000**	**230**	**18,900**	**210**	**17,850**	**160**
	0.05	2	0.028	37,830	600	**28,200**	**390**	**23,000**	**320**	**20,700**	**290**	**19,550**	**220**
		4	0.019	27,800	440	**23,600**	**280**	**21,000**	**230**	**18,900**	**210**	**17,850**	**160**
	0.1	2	0.035	37,830	600	**28,200**	**390**	**23,000**	**320**	**20,700**	**290**	**19,550**	**220**
		4	0.024	27,800	440	**23,600**	**280**	**21,000**	**230**	**18,900**	**210**	**17,850**	**160**
0.8	0.02	2	0.023	28,000	650	**20,000**	**400**	**20,000**	**360**	**18,000**	**320**	**17,000**	**250**
		4	0.016	28,000	520	**20,000**	**320**	**20,000**	**290**	**18,000**	**260**	**17,000**	**200**
	0.05	2	0.038	28,000	650	**20,000**	**400**	**20,000**	**360**	**18,000**	**320**	**17,000**	**250**
		4	0.026	28,000	520	**20,000**	**320**	**20,000**	**290**	**18,000**	**260**	**17,000**	**200**
	0.1	2	0.047	28,000	650	**20,000**	**400**	**20,000**	**360**	**18,000**	**320**	**17,000**	**250**
		4	0.032	28,000	520	**20,000**	**320**	**20,000**	**290**	**18,000**	**260**	**17,000**	**200**
	0.2	2	0.081	28,000	650	**20,000**	**400**	**20,000**	**360**	**18,000**	**320**	**17,000**	**250**
		4	0.056	28,000	520	**20,000**	**320**	**20,000**	**290**	**18,000**	**260**	**17,000**	**200**

【Note】 Refer to the comments and notes below the table on page A180 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH2-TH3 | 2 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition** | For detailed information on high-accuracy cutting conditions, refer to page A177. | Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～65HRC)**		**Hardened Steel (65～68HRC)**		**Hardened Steel (68～72HRC)**	
Cutting depth ratio				100%		85%		80%		65%		55%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
1	0.02	2	0.016	30,290	1,210	**26,730**	**960**	**24,950**	**800**	**22,450**	**720**	**21,210**	**560**
		4	0.013	27,540	1,040	**24,300**	**820**	**22,680**	**670**	**20,410**	**600**	**19,280**	**470**
		6	0.010	22,310	840	**19,680**	**660**	**18,370**	**540**	**16,530**	**490**	**15,620**	**380**
		8	0.008	19,830	750	**17,500**	**590**	**16,330**	**480**	**14,700**	**430**	**13,880**	**340**
	0.05	2	0.046	30,250	1,210	**26,730**	**960**	**24,950**	**800**	**22,450**	**720**	**21,210**	**560**
		4	0.027	28,920	1,130	**24,300**	**820**	**22,680**	**670**	**20,410**	**600**	**19,280**	**470**
		6	0.017	24,540	930	**19,680**	**660**	**18,370**	**540**	**16,530**	**490**	**15,620**	**380**
		8	0.016	19,830	750	**17,500**	**590**	**16,330**	**480**	**14,700**	**430**	**13,880**	**340**
	0.1	2	0.065	30,290	1,210	**26,730**	**960**	**24,950**	**800**	**22,450**	**720**	**21,210**	**560**
		4	0.038	27,540	1,040	**24,300**	**820**	**22,680**	**670**	**20,410**	**600**	**19,280**	**470**
		6	0.024	22,310	840	**19,680**	**660**	**18,370**	**540**	**16,530**	**490**	**15,620**	**380**
		8	0.024	19,830	750	**17,500**	**590**	**16,330**	**480**	**14,700**	**430**	**13,880**	**340**
	0.2	2	0.110	30,290	1,210	**26,730**	**960**	**24,950**	**800**	**22,450**	**720**	**21,210**	**560**
		4	0.070	27,540	1,040	**24,300**	**820**	**22,680**	**670**	**20,410**	**600**	**19,280**	**470**
		6	0.040	22,310	840	**19,680**	**660**	**18,370**	**540**	**16,530**	**490**	**15,620**	**380**
		8	0.040	19,830	750	**17,500**	**590**	**16,330**	**480**	**14,700**	**430**	**13,880**	**340**

(1) a_p indicates guidelines for Group 1 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH2010-2-02-TH3 tool:
Cutting depth = 0.11 (a_p) × 0.85 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.075 mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDREH4-TH3 | 4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A186.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
1	0.02	**1.5**	0.019	38,900	3,420	**38,900**	**3,110**	**28,300**	**2,040**	**23,000**	**1,840**	**21,200**	**1,440**
		2	0.016	35,000	3,080	**35,000**	**2,800**	**25,500**	**1,840**	**20,700**	**1,660**	**19,100**	**1,300**
		2.5	0.015	31,800	2,800	**31,800**	**2,540**	**23,100**	**1,660**	**18,800**	**1,500**	**17,400**	**1,180**
		3	0.014	29,200	2,570	**29,200**	**2,340**	**21,200**	**1,530**	**17,200**	**1,380**	**15,900**	**1,080**
		4	0.013	25,000	2,200	**25,000**	**2,000**	**18,200**	**1,310**	**14,800**	**1,180**	**13,600**	**920**
		5	0.013	21,900	1,930	**21,900**	**1,750**	**15,900**	**1,140**	**12,900**	**1,030**	**11,900**	**810**
		6	0.007	19,500	1,720	**19,500**	**1,560**	**14,100**	**1,020**	**11,500**	**920**	**10,600**	**720**
		8	0.004	15,900	1,400	**15,900**	**1,270**	**11,600**	**840**	**9,400**	**750**	**8,700**	**590**
	0.05	**1.5**	0.046	38,900	3,420	**38,900**	**3,110**	**28,300**	**2,040**	**23,000**	**1,840**	**21,200**	**1,440**
		2	0.034	35,000	3,080	**35,000**	**2,800**	**25,500**	**1,840**	**20,700**	**1,660**	**19,100**	**1,300**
		2.5	0.033	31,800	2,800	**31,800**	**2,540**	**23,100**	**1,660**	**18,800**	**1,500**	**17,400**	**1,180**
		3	0.030	29,200	2,570	**29,200**	**2,340**	**21,200**	**1,530**	**17,200**	**1,380**	**15,900**	**1,080**
		4	0.028	25,000	2,200	**25,000**	**2,000**	**18,200**	**1,310**	**14,800**	**1,180**	**13,600**	**920**
		5	0.027	21,900	1,930	**21,900**	**1,750**	**15,900**	**1,140**	**12,900**	**1,030**	**11,900**	**810**
		6	0.015	19,500	1,720	**19,500**	**1,560**	**14,100**	**1,020**	**11,500**	**920**	**10,600**	**720**
		8	0.009	15,900	1,400	**15,900**	**1,270**	**11,600**	**840**	**9,400**	**750**	**8,700**	**590**
	0.1	**1.5**	0.056	38,900	3,420	**38,900**	**3,110**	**28,300**	**2,040**	**23,000**	**1,840**	**21,200**	**1,440**
		2	0.042	35,000	3,080	**35,000**	**2,800**	**25,500**	**1,840**	**20,700**	**1,660**	**19,100**	**1,300**
		2.5	0.040	31,800	2,800	**31,800**	**2,540**	**23,100**	**1,660**	**18,800**	**1,500**	**17,400**	**1,180**
		3	0.037	29,200	2,570	**29,200**	**2,340**	**21,200**	**1,530**	**17,200**	**1,380**	**15,900**	**1,080**
		4	0.035	25,000	2,200	**25,000**	**2,000**	**18,200**	**1,310**	**14,800**	**1,180**	**13,600**	**920**
		5	0.034	21,900	1,930	**21,900**	**1,750**	**15,900**	**1,140**	**12,900**	**1,030**	**11,900**	**810**
		6	0.019	19,500	1,720	**19,500**	**1,560**	**14,100**	**1,020**	**11,500**	**920**	**10,600**	**720**
		8	0.011	15,900	1,400	**15,900**	**1,270**	**11,600**	**840**	**9,400**	**750**	**8,700**	**590**
	0.2	**1.5**	0.063	38,900	3,420	**38,900**	**3,110**	**28,300**	**2,040**	**23,000**	**1,840**	**21,200**	**1,440**
		2	0.047	35,000	3,080	**35,000**	**2,800**	**25,500**	**1,840**	**20,700**	**1,660**	**19,100**	**1,300**
		2.5	0.045	31,800	2,800	**31,800**	**2,540**	**23,100**	**1,660**	**18,800**	**1,500**	**17,400**	**1,180**
		3	0.042	29,200	2,570	**29,200**	**2,340**	**21,200**	**1,530**	**17,200**	**1,380**	**15,900**	**1,080**
		4	0.039	25,000	2,200	**25,000**	**2,000**	**18,200**	**1,310**	**14,800**	**1,180**	**13,600**	**920**
		5	0.038	21,900	1,930	**21,900**	**1,750**	**15,900**	**1,140**	**12,900**	**1,030**	**11,900**	**810**
		6	0.021	19,500	1,720	**19,500**	**1,560**	**14,100**	**1,020**	**11,500**	**920**	**10,600**	**720**
		8	0.012	15,900	1,400	**15,900**	**1,270**	**11,600**	**840**	**9,400**	**750**	**8,700**	**590**
	0.3	**1.5**	0.070	38,900	3,420	**38,900**	**3,110**	**28,300**	**2,040**	**23,000**	**1,840**	**21,200**	**1,440**
		2	0.053	35,000	3,080	**35,000**	**2,800**	**25,500**	**1,840**	**20,700**	**1,660**	**19,100**	**1,300**
		2.5	0.050	31,800	2,800	**31,800**	**2,540**	**23,100**	**1,660**	**18,800**	**1,500**	**17,400**	**1,180**
		3	0.047	29,200	2,570	**29,200**	**2,340**	**21,200**	**1,530**	**17,200**	**1,380**	**15,900**	**1,080**
		4	0.044	25,000	2,200	**25,000**	**2,000**	**18,200**	**1,310**	**14,800**	**1,180**	**13,600**	**920**
		5	0.042	21,900	1,930	**21,900**	**1,750**	**15,900**	**1,140**	**12,900**	**1,030**	**11,900**	**810**
		6	0.023	19,500	1,720	**19,500**	**1,560**	**14,100**	**1,020**	**11,500**	**920**	**10,600**	**720**
		8	0.013	15,900	1,400	**15,900**	**1,270**	**11,600**	**840**	**9,400**	**750**	**8,700**	**590**
1.5	0.02	**2**	0.017	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.016	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.014	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.013	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**
		6	0.012	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.011	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.010	14,000	1,720	**14,000**	**1,570**	**10,200**	**1,030**	**8,300**	**930**	**7,600**	**720**
		12	0.008	12,100	1,490	**12,100**	**1,360**	**8,800**	**890**	**7,100**	**800**	**6,600**	**630**
	0.05	**2**	0.048	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.043	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.039	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.035	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**
		6	0.032	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.030	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.027	14,000	1,720	**14,000**	**1,570**	**10,200**	**1,030**	**8,300**	**930**	**7,600**	**720**
		12	0.022	12,100	1,490	**12,100**	**1,360**	**8,800**	**890**	**7,100**	**800**	**6,600**	**630**
	0.1	**2**	0.078	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.071	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.064	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.057	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**

【Note】 Refer to the comments and notes below the table on page A185 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A186.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		**Hardened Steel (45~55HRC)**		**Hardened Steel (55~60HRC)**		**Hardened Steel (60~65HRC)**		**Hardened Steel (65~72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
1.5	0.1	6	0.052	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.049	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.044	14,000	1,720	**14,000**	**1,570**	**10,200**	**1,030**	**8,300**	**930**	**7,600**	**720**
		12	0.035	12,100	1,490	**12,100**	**1,360**	**8,800**	**890**	**7,100**	**800**	**6,600**	**630**
	0.2	2	0.082	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.075	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.067	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.060	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**
		6	0.055	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.051	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.047	14,000	1,720	**14,000**	**1,570**	**10,200**	**1,030**	**8,300**	**930**	**7,600**	**720**
		12	0.037	12,100	1,490	**12,100**	**1,360**	**8,800**	**890**	**7,100**	**800**	**6,600**	**630**
	0.3	2	0.085	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.077	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.069	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.062	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**
		6	0.057	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.053	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.048	14,000	1,720	**14,000**	**1,570**	**10,200**	**1,030**	**8,300**	**930**	**7,600**	**720**
		12	0.039	12,100	1,490	**12,100**	**1,360**	**8,800**	**890**	**7,100**	**800**	**6,600**	**630**
	0.5	2	0.087	26,900	3,310	**26,900**	**3,010**	**19,600**	**1,980**	**15,900**	**1,780**	**14,700**	**1,400**
		3	0.079	23,300	2,870	**23,300**	**2,610**	**17,000**	**1,710**	**13,800**	**1,550**	**12,700**	**1,210**
		4	0.071	20,600	2,540	**20,600**	**2,310**	**15,000**	**1,510**	**12,200**	**1,370**	**11,200**	**1,070**
		5	0.063	18,400	2,270	**18,400**	**2,060**	**13,400**	**1,350**	**10,900**	**1,220**	**10,100**	**960**
		6	0.058	16,700	2,060	**16,700**	**1,870**	**12,100**	**1,220**	**9,900**	**1,110**	**9,100**	**870**
		8	0.054	15,200	1,870	**15,200**	**1,700**	**11,100**	**1,120**	**9,000**	**1,010**	**8,300**	**790**
		10	0.049	14,000	1,720	**14,000**	**1,570**	**10,200**	**1,030**	**8,300**	**930**	**7,600**	**720**
		12	0.039	12,100	1,490	**12,100**	**1,360**	**8,800**	**890**	**7,100**	**800**	**6,600**	**630**
2	0.02	2.5	0.018	20,600	3,630	**20,600**	**3,300**	**15,000**	**2,160**	**12,200**	**1,950**	**11,200**	**1,520**
		3	0.016	19,500	3,430	**19,500**	**3,120**	**14,100**	**2,030**	**11,500**	**1,840**	**10,600**	**1,440**
		4	0.014	17,500	3,080	**17,500**	**2,800**	**12,700**	**1,830**	**10,300**	**1,650**	**9,500**	**1,290**
		5	0.014	15,900	2,800	**15,900**	**2,540**	**11,600**	**1,670**	**9,400**	**1,500**	**8,700**	**1,180**
		6	0.013	14,600	2,570	**14,600**	**2,340**	**10,600**	**1,530**	**8,600**	**1,380**	**8,000**	**1,090**
		8	0.013	12,500	2,200	**12,500**	**2,000**	**9,100**	**1,310**	**7,400**	**1,180**	**6,800**	**920**
		10	0.012	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.009	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**
	0.05	2.5	0.048	20,600	3,630	**20,600**	**3,300**	**15,000**	**2,160**	**12,200**	**1,950**	**11,200**	**1,520**
		3	0.043	19,500	3,430	**19,500**	**3,120**	**14,100**	**2,030**	**11,500**	**1,840**	**10,600**	**1,440**
		4	0.037	17,500	3,080	**17,500**	**2,800**	**12,700**	**1,830**	**10,300**	**1,650**	**9,500**	**1,290**
		5	0.036	15,900	2,800	**15,900**	**2,540**	**11,600**	**1,670**	**9,400**	**1,500**	**8,700**	**1,180**
		6	0.035	14,600	2,570	**14,600**	**2,340**	**10,600**	**1,530**	**8,600**	**1,380**	**8,000**	**1,090**
		8	0.034	12,500	2,200	**12,500**	**2,000**	**9,100**	**1,310**	**7,400**	**1,180**	**6,800**	**920**
		10	0.032	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.024	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**
	0.1	2.5	0.082	20,600	3,630	**20,600**	**3,300**	**15,000**	**2,160**	**12,200**	**1,950**	**11,200**	**1,520**
		3	0.073	19,500	3,430	**19,500**	**3,120**	**14,100**	**2,030**	**11,500**	**1,840**	**10,600**	**1,440**
		4	0.063	17,500	3,080	**17,500**	**2,800**	**12,700**	**1,830**	**10,300**	**1,650**	**9,500**	**1,290**
		5	0.061	15,900	2,800	**15,900**	**2,540**	**11,600**	**1,670**	**9,400**	**1,500**	**8,700**	**1,180**
		6	0.059	14,600	2,570	**14,600**	**2,340**	**10,600**	**1,530**	**8,600**	**1,380**	**8,000**	**1,090**
		8	0.058	12,500	2,200	**12,500**	**2,000**	**9,100**	**1,310**	**7,400**	**1,180**	**6,800**	**920**
		10	0.054	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.041	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**
	0.2	2.5	0.092	20,600	3,630	**20,600**	**3,300**	**15,000**	**2,160**	**12,200**	**1,950**	**11,200**	**1,520**
		3	0.082	19,500	3,430	**19,500**	**3,120**	**14,100**	**2,030**	**11,500**	**1,840**	**10,600**	**1,440**
		4	0.071	17,500	3,080	**17,500**	**2,800**	**12,700**	**1,830**	**10,300**	**1,650**	**9,500**	**1,290**
		5	0.069	15,900	2,800	**15,900**	**2,540**	**11,600**	**1,670**	**9,400**	**1,500**	**8,700**	**1,180**
		6	0.066	14,600	2,570	**14,600**	**2,340**	**10,600**	**1,530**	**8,600**	**1,380**	**8,000**	**1,090**
		8	0.066	12,500	2,200	**12,500**	**2,000**	**9,100**	**1,310**	**7,400**	**1,180**	**6,800**	**920**
		10	0.061	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.046	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
2	0.3	2.5	0.097	20,600	3,630	**20,600**	**3,300**	**15,000**	**2,160**	**12,200**	**1,950**	**11,200**	**1,520**
		3	0.087	19,500	3,430	**19,500**	**3,120**	**14,100**	**2,030**	**11,500**	**1,840**	**10,600**	**1,440**
		4	0.074	17,500	3,080	**17,500**	**2,800**	**12,700**	**1,830**	**10,300**	**1,650**	**9,500**	**1,290**
		5	0.073	15,900	2,800	**15,900**	**2,540**	**11,600**	**1,670**	**9,400**	**1,500**	**8,700**	**1,180**
		6	0.070	14,600	2,570	**14,600**	**2,340**	**10,600**	**1,530**	**8,600**	**1,380**	**8,000**	**1,090**
		8	0.069	12,500	2,200	**12,500**	**2,000**	**9,100**	**1,310**	**7,400**	**1,180**	**6,800**	**920**
		10	0.064	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.049	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**
	0.5	2.5	0.102	20,600	3,630	**20,600**	**3,300**	**15,000**	**2,160**	**12,200**	**1,950**	**11,200**	**1,520**
		3	0.091	19,500	3,430	**19,500**	**3,120**	**14,100**	**2,030**	**11,500**	**1,840**	**10,600**	**1,440**
		4	0.078	17,500	3,080	**17,500**	**2,800**	**12,700**	**1,830**	**10,300**	**1,650**	**9,500**	**1,290**
		5	0.076	15,900	2,800	**15,900**	**2,540**	**11,600**	**1,670**	**9,400**	**1,500**	**8,700**	**1,180**
		6	0.074	14,600	2,570	**14,600**	**2,340**	**10,600**	**1,530**	**8,600**	**1,380**	**8,000**	**1,090**
		8	0.073	12,500	2,200	**12,500**	**2,000**	**9,100**	**1,310**	**7,400**	**1,180**	**6,800**	**920**
		10	0.068	10,900	1,920	**10,900**	**1,740**	**8,000**	**1,150**	**6,500**	**1,040**	**6,000**	**820**
		12	0.051	9,700	1,710	**9,700**	**1,550**	**7,100**	**1,020**	**5,700**	**910**	**5,300**	**720**
3	0.05	4	0.045	18,600	2,950	**18,600**	**2,680**	**13,500**	**1,750**	**11,000**	**1,580**	**10,200**	**1,250**
		6	0.043	15,400	2,440	**15,400**	**2,220**	**11,200**	**1,450**	**9,100**	**1,310**	**8,400**	**1,030**
		8	0.042	13,100	2,080	**13,100**	**1,890**	**9,500**	**1,230**	**7,700**	**1,110**	**7,100**	**870**
		10	0.041	11,400	1,810	**11,400**	**1,640**	**8,300**	**1,080**	**6,700**	**960**	**6,200**	**760**
		12	0.038	10,100	1,600	**10,100**	**1,450**	**7,300**	**950**	**5,900**	**850**	**5,500**	**670**
		14	0.035	9,000	1,430	**9,000**	**1,300**	**6,600**	**860**	**5,300**	**760**	**4,900**	**600**
		16	0.034	8,200	1,300	**8,200**	**1,180**	**5,900**	**760**	**4,800**	**690**	**4,500**	**550**
		18	0.030	7,500	1,190	**7,500**	**1,080**	**5,400**	**700**	**4,400**	**630**	**4,100**	**500**
		20	0.022	6,900	1,090	**6,900**	**990**	**5,000**	**650**	**4,100**	**590**	**3,800**	**470**
	0.1	4	0.090	18,600	2,950	**18,600**	**2,680**	**13,500**	**1,750**	**11,000**	**1,580**	**10,200**	**1,250**
		6	0.087	15,400	2,440	**15,400**	**2,220**	**11,200**	**1,450**	**9,100**	**1,310**	**8,400**	**1,030**
		8	0.085	13,100	2,080	**13,100**	**1,890**	**9,500**	**1,230**	**7,700**	**1,110**	**7,100**	**870**
		10	0.081	11,400	1,810	**11,400**	**1,640**	**8,300**	**1,080**	**6,700**	**960**	**6,200**	**760**
		12	0.075	10,100	1,600	**10,100**	**1,450**	**7,300**	**950**	**5,900**	**850**	**5,500**	**670**
		14	0.069	9,000	1,430	**9,000**	**1,300**	**6,600**	**860**	**5,300**	**760**	**4,900**	**600**
		16	0.067	8,200	1,300	**8,200**	**1,180**	**5,900**	**760**	**4,800**	**690**	**4,500**	**550**
		18	0.061	7,500	1,190	**7,500**	**1,080**	**5,400**	**700**	**4,400**	**630**	**4,100**	**500**
		20	0.044	6,900	1,090	**6,900**	**990**	**5,000**	**650**	**4,100**	**590**	**3,800**	**470**
	0.2	4	0.102	18,600	2,950	**18,600**	**2,680**	**13,500**	**1,750**	**11,000**	**1,580**	**10,200**	**1,250**
		6	0.098	15,400	2,440	**15,400**	**2,220**	**11,200**	**1,450**	**9,100**	**1,310**	**8,400**	**1,030**
		8	0.095	13,100	2,080	**13,100**	**1,890**	**9,500**	**1,230**	**7,700**	**1,110**	**7,100**	**870**
		10	0.092	11,400	1,810	**11,400**	**1,640**	**8,300**	**1,080**	**6,700**	**960**	**6,200**	**760**
		12	0.085	10,100	1,600	**10,100**	**1,450**	**7,300**	**950**	**5,900**	**850**	**5,500**	**670**
		14	0.078	9,000	1,430	**9,000**	**1,300**	**6,600**	**860**	**5,300**	**760**	**4,900**	**600**
		16	0.076	8,200	1,300	**8,200**	**1,180**	**5,900**	**760**	**4,800**	**690**	**4,500**	**550**
		18	0.068	7,500	1,190	**7,500**	**1,080**	**5,400**	**700**	**4,400**	**630**	**4,100**	**500**
		20	0.050	6,900	1,090	**6,900**	**990**	**5,000**	**650**	**4,100**	**590**	**3,800**	**470**
	0.3	4	0.107	18,600	2,950	**18,600**	**2,680**	**13,500**	**1,750**	**11,000**	**1,580**	**10,200**	**1,250**
		6	0.103	15,400	2,440	**15,400**	**2,220**	**11,200**	**1,450**	**9,100**	**1,310**	**8,400**	**1,030**
		8	0.101	13,100	2,080	**13,100**	**1,890**	**9,500**	**1,230**	**7,700**	**1,110**	**7,100**	**870**
		10	0.097	11,400	1,810	**11,400**	**1,640**	**8,300**	**1,080**	**6,700**	**960**	**6,200**	**760**
		12	0.090	10,100	1,600	**10,100**	**1,450**	**7,300**	**950**	**5,900**	**850**	**5,500**	**670**
		14	0.082	9,000	1,430	**9,000**	**1,300**	**6,600**	**860**	**5,300**	**760**	**4,900**	**600**
		16	0.080	8,200	1,300	**8,200**	**1,180**	**5,900**	**760**	**4,800**	**690**	**4,500**	**550**
		18	0.072	7,500	1,190	**7,500**	**1,080**	**5,400**	**700**	**4,400**	**630**	**4,100**	**500**
		20	0.053	6,900	1,090	**6,900**	**990**	**5,000**	**650**	**4,100**	**590**	**3,800**	**470**
	0.5	4	0.113	18,600	2,950	**18,600**	**2,680**	**13,500**	**1,750**	**11,000**	**1,580**	**10,200**	**1,250**
		6	0.109	15,400	2,440	**15,400**	**2,220**	**11,200**	**1,450**	**9,100**	**1,310**	**8,400**	**1,030**
		8	0.106	13,100	2,080	**13,100**	**1,890**	**9,500**	**1,230**	**7,700**	**1,110**	**7,100**	**870**
		10	0.102	11,400	1,810	**11,400**	**1,640**	**8,300**	**1,080**	**6,700**	**960**	**6,200**	**760**
		12	0.094	10,100	1,600	**10,100**	**1,450**	**7,300**	**950**	**5,900**	**850**	**5,500**	**670**
		14	0.087	9,000	1,430	**9,000**	**1,300**	**6,600**	**860**	**5,300**	**760**	**4,900**	**600**
		16	0.084	8,200	1,300	**8,200**	**1,180**	**5,900**	**760**	**4,800**	**690**	**4,500**	**550**
		18	0.076	7,500	1,190	**7,500**	**1,080**	**5,400**	**700**	**4,400**	**630**	**4,100**	**500**
		20	0.056	6,900	1,090	**6,900**	**990**	**5,000**	**650**	**4,100**	**590**	**3,800**	**470**

【Note】 Refer to the comments and notes below the table on page A185 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A186.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		**Hardened Steel (45~55HRC)**		**Hardened Steel (55~60HRC)**		**Hardened Steel (60~65HRC)**		**Hardened Steel (65~72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
4	0.1	8	0.091	10,400	2,750	**10,400**	**2,500**	**7,600**	**1,640**	**6,200**	**1,490**	**5,700**	**1,160**
		10	0.089	9,300	2,460	**9,300**	**2,230**	**6,800**	**1,470**	**5,500**	**1,320**	**5,100**	**1,040**
		12	0.084	8,400	2,220	**8,400**	**2,020**	**6,100**	**1,320**	**5,000**	**1,200**	**4,600**	**940**
		14	0.079	7,700	2,030	**7,700**	**1,850**	**5,600**	**1,210**	**4,500**	**1,080**	**4,200**	**860**
		16	0.076	7,100	1,870	**7,100**	**1,700**	**5,100**	**1,100**	**4,200**	**1,010**	**3,900**	**800**
		18	0.074	6,500	1,720	**6,500**	**1,560**	**4,800**	**1,040**	**3,900**	**940**	**3,600**	**730**
		20	0.070	6,100	1,610	**6,100**	**1,460**	**4,400**	**950**	**3,600**	**860**	**3,300**	**670**
		22	0.059	5,700	1,500	**5,700**	**1,370**	**4,100**	**890**	**3,400**	**820**	**3,100**	**630**
		24	0.055	5,300	1,400	**5,300**	**1,270**	**3,900**	**840**	**3,200**	**770**	**2,900**	**590**
	0.2	8	0.126	10,400	2,750	**10,400**	**2,500**	**7,600**	**1,640**	**6,200**	**1,490**	**5,700**	**1,160**
		10	0.123	9,300	2,460	**9,300**	**2,230**	**6,800**	**1,470**	**5,500**	**1,320**	**5,100**	**1,040**
		12	0.117	8,400	2,220	**8,400**	**2,020**	**6,100**	**1,320**	**5,000**	**1,200**	**4,600**	**940**
		14	0.109	7,700	2,030	**7,700**	**1,850**	**5,600**	**1,210**	**4,500**	**1,080**	**4,200**	**860**
		16	0.105	7,100	1,870	**7,100**	**1,700**	**5,100**	**1,100**	**4,200**	**1,010**	**3,900**	**800**
		18	0.102	6,500	1,720	**6,500**	**1,560**	**4,800**	**1,040**	**3,900**	**940**	**3,600**	**730**
		20	0.097	6,100	1,610	**6,100**	**1,460**	**4,400**	**950**	**3,600**	**860**	**3,300**	**670**
		22	0.081	5,700	1,500	**5,700**	**1,370**	**4,100**	**890**	**3,400**	**820**	**3,100**	**630**
		24	0.077	5,300	1,400	**5,300**	**1,270**	**3,900**	**840**	**3,200**	**770**	**2,900**	**590**
	0.3	8	0.133	10,400	2,750	**10,400**	**2,500**	**7,600**	**1,640**	**6,200**	**1,490**	**5,700**	**1,160**
		10	0.129	9,300	2,460	**9,300**	**2,230**	**6,800**	**1,470**	**5,500**	**1,320**	**5,100**	**1,040**
		12	0.123	8,400	2,220	**8,400**	**2,020**	**6,100**	**1,320**	**5,000**	**1,200**	**4,600**	**940**
		14	0.115	7,700	2,030	**7,700**	**1,850**	**5,600**	**1,210**	**4,500**	**1,080**	**4,200**	**860**
		16	0.111	7,100	1,870	**7,100**	**1,700**	**5,100**	**1,100**	**4,200**	**1,010**	**3,900**	**800**
		18	0.108	6,500	1,720	**6,500**	**1,560**	**4,800**	**1,040**	**3,900**	**940**	**3,600**	**730**
		20	0.102	6,100	1,610	**6,100**	**1,460**	**4,400**	**950**	**3,600**	**860**	**3,300**	**670**
		22	0.086	5,700	1,500	**5,700**	**1,370**	**4,100**	**890**	**3,400**	**820**	**3,100**	**630**
		24	0.081	5,300	1,400	**5,300**	**1,270**	**3,900**	**840**	**3,200**	**770**	**2,900**	**590**
	0.5	8	0.137	10,400	2,750	**10,400**	**2,500**	**7,600**	**1,640**	**6,200**	**1,490**	**5,700**	**1,160**
		10	0.133	9,300	2,460	**9,300**	**2,230**	**6,800**	**1,470**	**5,500**	**1,320**	**5,100**	**1,040**
		12	0.127	8,400	2,220	**8,400**	**2,020**	**6,100**	**1,320**	**5,000**	**1,200**	**4,600**	**940**
		14	0.118	7,700	2,030	**7,700**	**1,850**	**5,600**	**1,210**	**4,500**	**1,080**	**4,200**	**860**
		16	0.114	7,100	1,870	**7,100**	**1,700**	**5,100**	**1,100**	**4,200**	**1,010**	**3,900**	**800**
		18	0.111	6,500	1,720	**6,500**	**1,560**	**4,800**	**1,040**	**3,900**	**940**	**3,600**	**730**
		20	0.106	6,100	1,610	**6,100**	**1,460**	**4,400**	**950**	**3,600**	**860**	**3,300**	**670**
		22	0.088	5,700	1,500	**5,700**	**1,370**	**4,100**	**890**	**3,400**	**820**	**3,100**	**630**
		24	0.084	5,300	1,400	**5,300**	**1,270**	**3,900**	**840**	**3,200**	**770**	**2,900**	**590**
	1	8	0.140	10,400	2,750	**10,400**	**2,500**	**7,600**	**1,640**	**6,200**	**1,490**	**5,700**	**1,160**
		10	0.136	9,300	2,460	**9,300**	**2,230**	**6,800**	**1,470**	**5,500**	**1,320**	**5,100**	**1,040**
		12	0.130	8,400	2,220	**8,400**	**2,020**	**6,100**	**1,320**	**5,000**	**1,200**	**4,600**	**940**
		14	0.121	7,700	2,030	**7,700**	**1,850**	**5,600**	**1,210**	**4,500**	**1,080**	**4,200**	**860**
		16	0.117	7,100	1,870	**7,100**	**1,700**	**5,100**	**1,100**	**4,200**	**1,010**	**3,900**	**800**
		18	0.114	6,500	1,720	**6,500**	**1,560**	**4,800**	**1,040**	**3,900**	**940**	**3,600**	**730**
		20	0.108	6,100	1,610	**6,100**	**1,460**	**4,400**	**950**	**3,600**	**860**	**3,300**	**670**
		22	0.090	5,700	1,500	**5,700**	**1,370**	**4,100**	**890**	**3,400**	**820**	**3,100**	**630**
		24	0.085	5,300	1,400	**5,300**	**1,270**	**3,900**	**840**	**3,200**	**770**	**2,900**	**590**
5	0.1	10	0.096	9,300	3,270	**9,300**	**2,980**	**6,800**	**1,960**	**5,500**	**1,760**	**5,100**	**1,390**
		15	0.081	7,400	2,600	**7,400**	**2,370**	**5,400**	**1,560**	**4,400**	**1,410**	**4,000**	**1,090**
		20	0.077	6,100	2,150	**6,100**	**1,950**	**4,400**	**1,270**	**3,600**	**1,150**	**3,300**	**900**
		25	0.075	5,200	1,830	**5,200**	**1,660**	**3,800**	**1,090**	**3,100**	**990**	**2,800**	**760**
	0.2	10	0.123	9,300	3,270	**9,300**	**2,980**	**6,800**	**1,960**	**5,500**	**1,760**	**5,100**	**1,390**
		15	0.103	7,400	2,600	**7,400**	**2,370**	**5,400**	**1,560**	**4,400**	**1,410**	**4,000**	**1,090**
		20	0.098	6,100	2,150	**6,100**	**1,950**	**4,400**	**1,270**	**3,600**	**1,150**	**3,300**	**900**
		25	0.095	5,200	1,830	**5,200**	**1,660**	**3,800**	**1,090**	**3,100**	**990**	**2,800**	**760**
	0.3	10	0.166	9,300	3,270	**9,300**	**2,980**	**6,800**	**1,960**	**5,500**	**1,760**	**5,100**	**1,390**
		15	0.140	7,400	2,600	**7,400**	**2,370**	**5,400**	**1,560**	**4,400**	**1,410**	**4,000**	**1,090**
		20	0.133	6,100	2,150	**6,100**	**1,950**	**4,400**	**1,270**	**3,600**	**1,150**	**3,300**	**900**
		25	0.129	5,200	1,830	**5,200**	**1,660**	**3,800**	**1,090**	**3,100**	**990**	**2,800**	**760**
	0.5	10	0.172	9,300	3,270	**9,300**	**2,980**	**6,800**	**1,960**	**5,500**	**1,760**	**5,100**	**1,390**
		15	0.144	7,400	2,600	**7,400**	**2,370**	**5,400**	**1,560**	**4,400**	**1,410**	**4,000**	**1,090**
		20	0.137	6,100	2,150	**6,100**	**1,950**	**4,400**	**1,270**	**3,600**	**1,150**	**3,300**	**900**
		25	0.133	5,200	1,830	**5,200**	**1,660**	**3,800**	**1,090**	**3,100**	**990**	**2,800**	**760**

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
5	1	**10**	0.175	9,300	3,270	**9,300**	**2,980**	**6,800**	**1,960**	**5,500**	**1,760**	**5,100**	**1,390**
		15	0.147	7,400	2,600	**7,400**	**2,370**	**5,400**	**1,560**	**4,400**	**1,410**	**4,000**	**1,090**
		20	0.140	6,100	2,150	**6,100**	**1,950**	**4,400**	**1,270**	**3,600**	**1,150**	**3,300**	**900**
		25	0.135	5,200	1,830	**5,200**	**1,660**	**3,800**	**1,090**	**3,100**	**990**	**2,800**	**760**
6	0.1	**12**	0.098	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		18	0.088	6,500	2,570	**6,500**	**2,340**	**4,700**	**1,520**	**3,800**	**1,370**	**3,500**	**1,070**
		24	0.082	5,300	2,100	**5,300**	**1,910**	**3,900**	**1,260**	**3,100**	**1,120**	**2,900**	**890**
		30	0.079	4,500	1,780	**4,500**	**1,620**	**3,300**	**1,070**	**2,700**	**970**	**2,400**	**730**
	0.2	**12**	0.177	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		18	0.158	6,500	2,570	**6,500**	**2,340**	**4,700**	**1,520**	**3,800**	**1,370**	**3,500**	**1,070**
		24	0.148	5,300	2,100	**5,300**	**1,910**	**3,900**	**1,260**	**3,100**	**1,120**	**2,900**	**890**
		30	0.142	4,500	1,780	**4,500**	**1,620**	**3,300**	**1,070**	**2,700**	**970**	**2,400**	**730**
	0.3	**12**	0.187	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		18	0.166	6,500	2,570	**6,500**	**2,340**	**4,700**	**1,520**	**3,800**	**1,370**	**3,500**	**1,070**
		24	0.156	5,300	2,100	**5,300**	**1,910**	**3,900**	**1,260**	**3,100**	**1,120**	**2,900**	**890**
		30	0.150	4,500	1,780	**4,500**	**1,620**	**3,300**	**1,070**	**2,700**	**970**	**2,400**	**730**
	0.5	**12**	0.193	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		18	0.172	6,500	2,570	**6,500**	**2,340**	**4,700**	**1,520**	**3,800**	**1,370**	**3,500**	**1,070**
		24	0.161	5,300	2,100	**5,300**	**1,910**	**3,900**	**1,260**	**3,100**	**1,120**	**2,900**	**890**
		30	0.154	4,500	1,780	**4,500**	**1,620**	**3,300**	**1,070**	**2,700**	**970**	**2,400**	**730**
	1	**12**	0.197	8,300	3,290	**8,300**	**2,990**	**6,100**	**1,980**	**4,900**	**1,760**	**4,500**	**1,380**
		18	0.175	6,500	2,570	**6,500**	**2,340**	**4,700**	**1,520**	**3,800**	**1,370**	**3,500**	**1,070**
		24	0.164	5,300	2,100	**5,300**	**1,910**	**3,900**	**1,260**	**3,100**	**1,120**	**2,900**	**890**
		30	0.158	4,500	1,780	**4,500**	**1,620**	**3,300**	**1,070**	**2,700**	**970**	**2,400**	**730**

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH4010-2-02-TH3 tool:
Cutting depth = 0.047 (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.0376 mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | High efficiency cutting condition | **High accuracy cutting condition**

For detailed information on high-accuracy cutting conditions, refer to page A181.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		Hardened Steel (45~55HRC)		Hardened Steel (55~60HRC)		Hardened Steel (60~65HRC)		Hardened Steel (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
1	0.02	1.5	0.016	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200
		2	0.013	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080
		2.5	0.013	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980
		3	0.012	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900
		4	0.011	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760
		5	0.010	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670
		6	0.006	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600
		8	0.003	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490
	0.05	1.5	0.038	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200
		2	0.028	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080
		2.5	0.027	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980
		3	0.025	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900
		4	0.024	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760
		5	0.023	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670
		6	0.013	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600
		8	0.007	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490
	0.1	1.5	0.046	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200
		2	0.035	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080
		2.5	0.033	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980
		3	0.031	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900
		4	0.029	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760
		5	0.028	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670
		6	0.015	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600
		8	0.009	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490
	0.2	1.5	0.052	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200
		2	0.039	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080
		2.5	0.038	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980
		3	0.035	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900
		4	0.033	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760
		5	0.031	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670
		6	0.017	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600
		8	0.010	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490
	0.3	1.5	0.058	32,300	2,840	32,300	2,580	23,500	1,690	19,100	1,530	17,600	1,200
		2	0.044	29,100	2,560	29,100	2,320	21,200	1,530	17,200	1,380	15,900	1,080
		2.5	0.042	26,400	2,320	26,400	2,110	19,200	1,380	15,600	1,250	14,400	980
		3	0.039	24,200	2,130	24,200	1,940	17,600	1,270	14,300	1,150	13,200	900
		4	0.036	20,800	1,830	20,800	1,660	15,100	1,090	12,300	980	11,300	760
		5	0.035	18,200	1,600	18,200	1,450	13,200	950	10,700	850	9,900	670
		6	0.019	16,200	1,430	16,200	1,290	11,700	850	9,500	760	8,800	600
		8	0.011	13,200	1,160	13,200	1,060	9,600	700	7,800	620	7,200	490
1.5	0.02	2	0.014	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
		3	0.013	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
		4	0.012	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
		5	0.010	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800
		6	0.010	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720
		8	0.008	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660
		10	0.007	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600
		12	0.004	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520
	0.05	2	0.040	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
		3	0.036	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
		4	0.032	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
		5	0.029	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800
		6	0.026	13,900	1,710	13,900	1,550	10,000	1,010	8,200	920	7,600	720
		8	0.022	12,600	1,550	12,600	1,410	9,200	930	7,500	840	6,900	660
		10	0.018	11,600	1,430	11,600	1,300	8,500	850	6,900	770	6,300	600
		12	0.012	10,000	1,240	10,000	1,130	7,300	740	5,900	660	5,500	520
	0.1	2	0.065	22,300	2,750	22,300	2,500	16,300	1,640	13,200	1,480	12,200	1,160
		3	0.059	19,300	2,380	19,300	2,170	14,100	1,420	11,500	1,290	10,500	1,000
		4	0.053	17,100	2,110	17,100	1,920	12,500	1,250	10,100	1,140	9,300	890
		5	0.047	15,300	1,880	15,300	1,710	11,100	1,120	9,000	1,010	8,400	800

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
1.5	0.1	6	0.043	13,900	1,710	**13,900**	**1,550**	**10,000**	**1,010**	**8,200**	**920**	**7,600**	**720**
		8	0.037	12,600	1,550	**12,600**	**1,410**	**9,200**	**930**	**7,500**	**840**	**6,900**	**660**
		10	0.029	11,600	1,430	**11,600**	**1,300**	**8,500**	**850**	**6,900**	**770**	**6,300**	**600**
		12	0.020	10,000	1,240	**10,000**	**1,130**	**7,300**	**740**	**5,900**	**660**	**5,500**	**520**
	0.2	2	0.068	22,300	2,750	**22,300**	**2,500**	**16,300**	**1,640**	**13,200**	**1,480**	**12,200**	**1,160**
		3	0.062	19,300	2,380	**19,300**	**2,170**	**14,100**	**1,420**	**11,500**	**1,290**	**10,500**	**1,000**
		4	0.056	17,100	2,110	**17,100**	**1,920**	**12,500**	**1,250**	**10,100**	**1,140**	**9,300**	**890**
		5	0.050	15,300	1,880	**15,300**	**1,710**	**11,100**	**1,120**	**9,000**	**1,010**	**8,400**	**800**
		6	0.046	13,900	1,710	**13,900**	**1,550**	**10,000**	**1,010**	**8,200**	**920**	**7,600**	**720**
		8	0.039	12,600	1,550	**12,600**	**1,410**	**9,200**	**930**	**7,500**	**840**	**6,900**	**660**
		10	0.031	11,600	1,430	**11,600**	**1,300**	**8,500**	**850**	**6,900**	**770**	**6,300**	**600**
		12	0.021	10,000	1,240	**10,000**	**1,130**	**7,300**	**740**	**5,900**	**660**	**5,500**	**520**
	0.3	2	0.070	22,300	2,750	**22,300**	**2,500**	**16,300**	**1,640**	**13,200**	**1,480**	**12,200**	**1,160**
		3	0.064	19,300	2,380	**19,300**	**2,170**	**14,100**	**1,420**	**11,500**	**1,290**	**10,500**	**1,000**
		4	0.058	17,100	2,110	**17,100**	**1,920**	**12,500**	**1,250**	**10,100**	**1,140**	**9,300**	**890**
		5	0.051	15,300	1,880	**15,300**	**1,710**	**11,100**	**1,120**	**9,000**	**1,010**	**8,400**	**800**
		6	0.047	13,900	1,710	**13,900**	**1,550**	**10,000**	**1,010**	**8,200**	**920**	**7,600**	**720**
		8	0.040	12,600	1,550	**12,600**	**1,410**	**9,200**	**930**	**7,500**	**840**	**6,900**	**660**
		10	0.032	11,600	1,430	**11,600**	**1,300**	**8,500**	**850**	**6,900**	**770**	**6,300**	**600**
		12	0.021	10,000	1,240	**10,000**	**1,130**	**7,300**	**740**	**5,900**	**660**	**5,500**	**520**
	0.5	2	0.072	22,300	2,750	**22,300**	**2,500**	**16,300**	**1,640**	**13,200**	**1,480**	**12,200**	**1,160**
		3	0.065	19,300	2,380	**19,300**	**2,170**	**14,100**	**1,420**	**11,500**	**1,290**	**10,500**	**1,000**
		4	0.059	17,100	2,110	**17,100**	**1,920**	**12,500**	**1,250**	**10,100**	**1,140**	**9,300**	**890**
		5	0.052	15,300	1,880	**15,300**	**1,710**	**11,100**	**1,120**	**9,000**	**1,010**	**8,400**	**800**
		6	0.048	13,900	1,710	**13,900**	**1,550**	**10,000**	**1,010**	**8,200**	**920**	**7,600**	**720**
		8	0.041	12,600	1,550	**12,600**	**1,410**	**9,200**	**930**	**7,500**	**840**	**6,900**	**660**
		10	0.033	11,600	1,430	**11,600**	**1,300**	**8,500**	**850**	**6,900**	**770**	**6,300**	**600**
		12	0.022	10,000	1,240	**10,000**	**1,130**	**7,300**	**740**	**5,900**	**660**	**5,500**	**520**
2	0.02	2.5	0.015	17,100	3,010	**17,100**	**2,740**	**12,500**	**1,790**	**10,100**	**1,620**	**9,300**	**1,260**
		3	0.014	16,200	2,850	**16,200**	**2,590**	**11,700**	**1,680**	**9,500**	**1,530**	**8,800**	**1,200**
		4	0.012	14,500	2,560	**14,500**	**2,320**	**10,500**	**1,520**	**8,500**	**1,370**	**7,900**	**1,070**
		5	0.011	13,200	2,320	**13,200**	**2,110**	**9,600**	**1,390**	**7,800**	**1,250**	**7,200**	**980**
		6	0.011	12,100	2,130	**12,100**	**1,940**	**8,800**	**1,270**	**7,100**	**1,150**	**6,600**	**900**
		8	0.011	10,400	1,830	**10,400**	**1,660**	**7,600**	**1,090**	**6,100**	**980**	**5,600**	**760**
		10	0.010	9,000	1,590	**9,000**	**1,440**	**6,600**	**950**	**5,400**	**860**	**5,000**	**680**
		12	0.008	8,100	1,420	**8,100**	**1,290**	**5,900**	**850**	**4,700**	**760**	**4,400**	**600**
	0.05	2.5	0.040	17,100	3,010	**17,100**	**2,740**	**12,500**	**1,790**	**10,100**	**1,620**	**9,300**	**1,260**
		3	0.036	16,200	2,850	**16,200**	**2,590**	**11,700**	**1,680**	**9,500**	**1,530**	**8,800**	**1,200**
		4	0.031	14,500	2,560	**14,500**	**2,320**	**10,500**	**1,520**	**8,500**	**1,370**	**7,900**	**1,070**
		5	0.030	13,200	2,320	**13,200**	**2,110**	**9,600**	**1,390**	**7,800**	**1,250**	**7,200**	**980**
		6	0.029	12,100	2,130	**12,100**	**1,940**	**8,800**	**1,270**	**7,100**	**1,150**	**6,600**	**900**
		8	0.028	10,400	1,830	**10,400**	**1,660**	**7,600**	**1,090**	**6,100**	**980**	**5,600**	**760**
		10	0.026	9,000	1,590	**9,000**	**1,440**	**6,600**	**950**	**5,400**	**860**	**5,000**	**680**
		12	0.020	8,100	1,420	**8,100**	**1,290**	**5,900**	**850**	**4,700**	**760**	**4,400**	**600**
	0.1	2.5	0.068	17,100	3,010	**17,100**	**2,740**	**12,500**	**1,790**	**10,100**	**1,620**	**9,300**	**1,260**
		3	0.061	16,200	2,850	**16,200**	**2,590**	**11,700**	**1,680**	**9,500**	**1,530**	**8,800**	**1,200**
		4	0.052	14,500	2,560	**14,500**	**2,320**	**10,500**	**1,520**	**8,500**	**1,370**	**7,900**	**1,070**
		5	0.051	13,200	2,320	**13,200**	**2,110**	**9,600**	**1,390**	**7,800**	**1,250**	**7,200**	**980**
		6	0.049	12,100	2,130	**12,100**	**1,940**	**8,800**	**1,270**	**7,100**	**1,150**	**6,600**	**900**
		8	0.048	10,400	1,830	**10,400**	**1,660**	**7,600**	**1,090**	**6,100**	**980**	**5,600**	**760**
		10	0.045	9,000	1,590	**9,000**	**1,440**	**6,600**	**950**	**5,400**	**860**	**5,000**	**680**
		12	0.034	8,100	1,420	**8,100**	**1,290**	**5,900**	**850**	**4,700**	**760**	**4,400**	**600**
	0.2	2.5	0.077	17,100	3,010	**17,100**	**2,740**	**12,500**	**1,790**	**10,100**	**1,620**	**9,300**	**1,260**
		3	0.068	16,200	2,850	**16,200**	**2,590**	**11,700**	**1,680**	**9,500**	**1,530**	**8,800**	**1,200**
		4	0.059	14,500	2,560	**14,500**	**2,320**	**10,500**	**1,520**	**8,500**	**1,370**	**7,900**	**1,070**
		5	0.057	13,200	2,320	**13,200**	**2,110**	**9,600**	**1,390**	**7,800**	**1,250**	**7,200**	**980**
		6	0.055	12,100	2,130	**12,100**	**1,940**	**8,800**	**1,270**	**7,100**	**1,150**	**6,600**	**900**
		8	0.054	10,400	1,830	**10,400**	**1,660**	**7,600**	**1,090**	**6,100**	**980**	**5,600**	**760**
		10	0.050	9,000	1,590	**9,000**	**1,440**	**6,600**	**950**	**5,400**	**860**	**5,000**	**680**
		12	0.038	8,100	1,420	**8,100**	**1,290**	**5,900**	**850**	**4,700**	**760**	**4,400**	**600**

【Note】 Refer to the comments and notes below the table on page A190 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | High efficiency cutting condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A181.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35~45HRC)		Hardened Steel (45~55HRC)		Hardened Steel (55~60HRC)		Hardened Steel (60~65HRC)		Hardened Steel (65~72HRC)	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
2	0.3	2.5	0.081	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260
		3	0.072	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200
		4	0.062	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070
		5	0.060	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980
		6	0.058	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900
		8	0.057	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760
		10	0.053	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680
		12	0.041	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600
	0.5	2.5	0.085	17,100	3,010	17,100	2,740	12,500	1,790	10,100	1,620	9,300	1,260
		3	0.076	16,200	2,850	16,200	2,590	11,700	1,680	9,500	1,530	8,800	1,200
		4	0.065	14,500	2,560	14,500	2,320	10,500	1,520	8,500	1,370	7,900	1,070
		5	0.063	13,200	2,320	13,200	2,110	9,600	1,390	7,800	1,250	7,200	980
		6	0.061	12,100	2,130	12,100	1,940	8,800	1,270	7,100	1,150	6,600	900
		8	0.061	10,400	1,830	10,400	1,660	7,600	1,090	6,100	980	5,600	760
		10	0.056	9,000	1,590	9,000	1,440	6,600	950	5,400	860	5,000	680
		12	0.043	8,100	1,420	8,100	1,290	5,900	850	4,700	760	4,400	600
3	0.05	4	0.037	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040
		6	0.036	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850
		8	0.035	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720
		10	0.034	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630
		12	0.031	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560
		14	0.029	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500
		16	0.028	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460
		18	0.025	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420
		20	0.018	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390
	0.1	4	0.075	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040
		6	0.072	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850
		8	0.070	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720
		10	0.068	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630
		12	0.063	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560
		14	0.058	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500
		16	0.056	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460
		18	0.051	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420
		20	0.037	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390
	0.2	4	0.084	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040
		6	0.081	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850
		8	0.079	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720
		10	0.076	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630
		12	0.070	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560
		14	0.065	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500
		16	0.063	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460
		18	0.057	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420
		20	0.041	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390
	0.3	4	0.089	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040
		6	0.086	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850
		8	0.084	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720
		10	0.080	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630
		12	0.074	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560
		14	0.068	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500
		16	0.066	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460
		18	0.060	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420
		20	0.044	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390
	0.5	4	0.094	15,400	2,450	15,400	2,220	11,200	1,450	9,100	1,310	8,500	1,040
		6	0.090	12,800	2,030	12,800	1,840	9,300	1,200	7,600	1,090	7,000	850
		8	0.088	10,900	1,730	10,900	1,570	7,900	1,020	6,400	920	5,900	720
		10	0.084	9,500	1,500	9,500	1,360	6,900	900	5,600	800	5,100	630
		12	0.078	8,400	1,330	8,400	1,200	6,100	790	4,900	710	4,600	560
		14	0.072	7,500	1,190	7,500	1,080	5,500	710	4,400	630	4,100	500
		16	0.070	6,800	1,080	6,800	980	4,900	630	4,000	570	3,700	460
		18	0.063	6,200	990	6,200	900	4,500	580	3,700	520	3,400	420
		20	0.046	5,700	900	5,700	820	4,200	540	3,400	490	3,200	390

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
4	0.1	8	0.076	8,600	2,280	**8,600**	**2,080**	**6,300**	**1,360**	**5,100**	**1,240**	**4,700**	**960**
		10	0.073	7,700	2,040	**7,700**	**1,850**	**5,600**	**1,220**	**4,600**	**1,100**	**4,200**	**860**
		12	0.070	7,000	1,840	**7,000**	**1,680**	**5,100**	**1,100**	**4,200**	**1,000**	**3,800**	**780**
		14	0.065	6,400	1,680	**6,400**	**1,540**	**4,600**	**1,000**	**3,700**	**900**	**3,500**	**710**
		16	0.063	5,900	1,550	**5,900**	**1,410**	**4,200**	**910**	**3,500**	**840**	**3,200**	**660**
		18	0.061	5,400	1,430	**5,400**	**1,290**	**4,000**	**860**	**3,200**	**780**	**3,000**	**610**
		20	0.058	5,100	1,340	**5,100**	**1,210**	**3,700**	**790**	**3,000**	**710**	**2,700**	**560**
		22	0.049	4,700	1,250	**4,700**	**1,140**	**3,400**	**740**	**2,800**	**680**	**2,600**	**520**
		24	0.046	4,400	1,160	**4,400**	**1,050**	**3,200**	**700**	**2,700**	**640**	**2,400**	**490**
	0.2	8	0.105	8,600	2,280	**8,600**	**2,080**	**6,300**	**1,360**	**5,100**	**1,240**	**4,700**	**960**
		10	0.102	7,700	2,040	**7,700**	**1,850**	**5,600**	**1,220**	**4,600**	**1,100**	**4,200**	**860**
		12	0.097	7,000	1,840	**7,000**	**1,680**	**5,100**	**1,100**	**4,200**	**1,000**	**3,800**	**780**
		14	0.090	6,400	1,680	**6,400**	**1,540**	**4,600**	**1,000**	**3,700**	**900**	**3,500**	**710**
		16	0.087	5,900	1,550	**5,900**	**1,410**	**4,200**	**910**	**3,500**	**840**	**3,200**	**660**
		18	0.085	5,400	1,430	**5,400**	**1,290**	**4,000**	**860**	**3,200**	**780**	**3,000**	**610**
		20	0.080	5,100	1,340	**5,100**	**1,210**	**3,700**	**790**	**3,000**	**710**	**2,700**	**560**
		22	0.067	4,700	1,250	**4,700**	**1,140**	**3,400**	**740**	**2,800**	**680**	**2,600**	**520**
		24	0.064	4,400	1,160	**4,400**	**1,050**	**3,200**	**700**	**2,700**	**640**	**2,400**	**490**
	0.3	8	0.110	8,600	2,280	**8,600**	**2,080**	**6,300**	**1,360**	**5,100**	**1,240**	**4,700**	**960**
		10	0.107	7,700	2,040	**7,700**	**1,850**	**5,600**	**1,220**	**4,600**	**1,100**	**4,200**	**860**
		12	0.102	7,000	1,840	**7,000**	**1,680**	**5,100**	**1,100**	**4,200**	**1,000**	**3,800**	**780**
		14	0.095	6,400	1,680	**6,400**	**1,540**	**4,600**	**1,000**	**3,700**	**900**	**3,500**	**710**
		16	0.092	5,900	1,550	**5,900**	**1,410**	**4,200**	**910**	**3,500**	**840**	**3,200**	**660**
		18	0.090	5,400	1,430	**5,400**	**1,290**	**4,000**	**860**	**3,200**	**780**	**3,000**	**610**
		20	0.085	5,100	1,340	**5,100**	**1,210**	**3,700**	**790**	**3,000**	**710**	**2,700**	**560**
		22	0.071	4,700	1,250	**4,700**	**1,140**	**3,400**	**740**	**2,800**	**680**	**2,600**	**520**
		24	0.067	4,400	1,160	**4,400**	**1,050**	**3,200**	**700**	**2,700**	**640**	**2,400**	**490**
	0.5	8	0.114	8,600	2,280	**8,600**	**2,080**	**6,300**	**1,360**	**5,100**	**1,240**	**4,700**	**960**
		10	0.111	7,700	2,040	**7,700**	**1,850**	**5,600**	**1,220**	**4,600**	**1,100**	**4,200**	**860**
		12	0.105	7,000	1,840	**7,000**	**1,680**	**5,100**	**1,100**	**4,200**	**1,000**	**3,800**	**780**
		14	0.098	6,400	1,680	**6,400**	**1,540**	**4,600**	**1,000**	**3,700**	**900**	**3,500**	**710**
		16	0.095	5,900	1,550	**5,900**	**1,410**	**4,200**	**910**	**3,500**	**840**	**3,200**	**660**
		18	0.092	5,400	1,430	**5,400**	**1,290**	**4,000**	**860**	**3,200**	**780**	**3,000**	**610**
		20	0.088	5,100	1,340	**5,100**	**1,210**	**3,700**	**790**	**3,000**	**710**	**2,700**	**560**
		22	0.073	4,700	1,250	**4,700**	**1,140**	**3,400**	**740**	**2,800**	**680**	**2,600**	**520**
		24	0.069	4,400	1,160	**4,400**	**1,050**	**3,200**	**700**	**2,700**	**640**	**2,400**	**490**
	1	8	0.116	8,600	2,280	**8,600**	**2,080**	**6,300**	**1,360**	**5,100**	**1,240**	**4,700**	**960**
		10	0.113	7,700	2,040	**7,700**	**1,850**	**5,600**	**1,220**	**4,600**	**1,100**	**4,200**	**860**
		12	0.108	7,000	1,840	**7,000**	**1,680**	**5,100**	**1,100**	**4,200**	**1,000**	**3,800**	**780**
		14	0.100	6,400	1,680	**6,400**	**1,540**	**4,600**	**1,000**	**3,700**	**900**	**3,500**	**710**
		16	0.097	5,900	1,550	**5,900**	**1,410**	**4,200**	**910**	**3,500**	**840**	**3,200**	**660**
		18	0.094	5,400	1,430	**5,400**	**1,290**	**4,000**	**860**	**3,200**	**780**	**3,000**	**610**
		20	0.089	5,100	1,340	**5,100**	**1,210**	**3,700**	**790**	**3,000**	**710**	**2,700**	**560**
		22	0.075	4,700	1,250	**4,700**	**1,140**	**3,400**	**740**	**2,800**	**680**	**2,600**	**520**
		24	0.071	4,400	1,160	**4,400**	**1,050**	**3,200**	**700**	**2,700**	**640**	**2,400**	**490**
5	0.1	10	0.080	7,700	2,710	**7,700**	**2,470**	**5,600**	**1,630**	**4,600**	**1,460**	**4,200**	**1,150**
		15	0.067	6,100	2,160	**6,100**	**1,970**	**4,500**	**1,290**	**3,700**	**1,170**	**3,300**	**900**
		20	0.064	5,100	1,780	**5,100**	**1,620**	**3,700**	**1,050**	**3,000**	**950**	**2,700**	**750**
		25	0.062	4,300	1,520	**4,300**	**1,380**	**3,200**	**900**	**2,600**	**820**	**2,300**	**630**
	0.2	10	0.102	7,700	2,710	**7,700**	**2,470**	**5,600**	**1,630**	**4,600**	**1,460**	**4,200**	**1,150**
		15	0.086	6,100	2,160	**6,100**	**1,970**	**4,500**	**1,290**	**3,700**	**1,170**	**3,300**	**900**
		20	0.081	5,100	1,780	**5,100**	**1,620**	**3,700**	**1,050**	**3,000**	**950**	**2,700**	**750**
		25	0.079	4,300	1,520	**4,300**	**1,380**	**3,200**	**900**	**2,600**	**820**	**2,300**	**630**
	0.3	10	0.138	7,700	2,710	**7,700**	**2,470**	**5,600**	**1,630**	**4,600**	**1,460**	**4,200**	**1,150**
		15	0.116	6,100	2,160	**6,100**	**1,970**	**4,500**	**1,290**	**3,700**	**1,170**	**3,300**	**900**
		20	0.110	5,100	1,780	**5,100**	**1,620**	**3,700**	**1,050**	**3,000**	**950**	**2,700**	**750**
		25	0.107	4,300	1,520	**4,300**	**1,380**	**3,200**	**900**	**2,600**	**820**	**2,300**	**630**
	0.5	10	0.142	7,700	2,710	**7,700**	**2,470**	**5,600**	**1,630**	**4,600**	**1,460**	**4,200**	**1,150**
		15	0.120	6,100	2,160	**6,100**	**1,970**	**4,500**	**1,290**	**3,700**	**1,170**	**3,300**	**900**
		20	0.114	5,100	1,780	**5,100**	**1,620**	**3,700**	**1,050**	**3,000**	**950**	**2,700**	**750**
		25	0.110	4,300	1,520	**4,300**	**1,380**	**3,200**	**900**	**2,600**	**820**	**2,300**	**630**

【Note】 Refer to the comments and notes below the table on page A190 regarding usage.

Epoch Deep Radius Evolution Hard-TH3

EPDREH4-TH3 | 4 Flutes | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A181.

Metric

Work material				1		2		3		4		5	
				Pre-hardened Steel (35～45HRC)		**Hardened Steel (45～55HRC)**		**Hardened Steel (55～60HRC)**		**Hardened Steel (60～65HRC)**		**Hardened Steel (65～72HRC)**	
Cutting depth ratio				120%		100%		70%		50%		25%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
5	1	10	0.145	7,700	2,710	7,700	2,470	5,600	1,630	4,600	1,460	4,200	1,150
		15	0.122	6,100	2,160	6,100	1,970	4,500	1,290	3,700	1,170	3,300	900
		20	0.116	5,100	1,780	5,100	1,620	3,700	1,050	3,000	950	2,700	750
		25	0.112	4,300	1,520	4,300	1,380	3,200	900	2,600	820	2,300	630
6	0.1	12	0.082	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.073	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.068	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.065	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	0.2	12	0.147	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.131	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.123	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.118	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	0.3	12	0.155	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.138	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.129	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.124	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	0.5	12	0.160	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.142	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.133	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.128	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610
	1	12	0.163	6,900	2,730	6,900	2,480	5,100	1,640	4,100	1,460	3,700	1,150
		18	0.145	5,400	2,130	5,400	1,940	3,900	1,260	3,200	1,140	2,900	890
		24	0.136	4,400	1,740	4,400	1,590	3,200	1,050	2,600	930	2,400	740
		30	0.131	3,700	1,480	3,700	1,340	2,700	890	2,200	810	2,000	610

(1) a_p indicates guidelines for Group 2 workpieces. For other groups, adjust cutting depth based on the cutting depth factors in the above table.
(2) In cases in which cutting chips may cause clogging--for example, for rib cutting and blind grooves--set the cutting depth using a cutting depth factor to calculate the cutting depth amount. This amount should then be reduced to 80% of the calculated value.
(3) Adjust by setting a_e to (5 or less) × (a_p) × (cutting depth ratio). For finishing cutting, calculate the theoretical cusp height and set accordingly.
(4) The recommended slope entrance angle when engraving is 1° or less. Adjust the feed rate to 70% or less of values presented in the cutting condition table.
(5) When slotting such engraving letters, adjust the feed rate to 50% or less and a_p to 30% or less of the values shown. We recommend reciprocal cutting.

Cutting depth setting example: When cutting rib groove contours in hardened steel (50HRC) using an EPDREH4010-2-02-TH3 tool:
Cutting depth = 0.039 (a_p) × 1 (cutting depth factor for Group 2 Hardened steels) × 0.8 (for closed-area cutting) = 0.0312mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Radius Evolution

Straight Neck

Slotting | Die-sinking | Profiling | Radius | Miniature | Rest material machining | Semi Finishing | Finishing | Miniature Rib

RE tolerance ±0.005mm (central axis)

h5

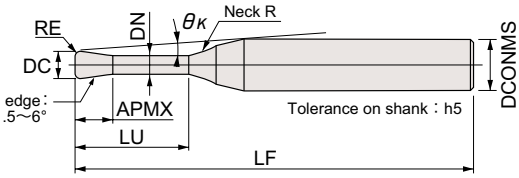
Improved flute tip shape and neck shape suppresses warping to enable high-accuracy cutting.
Use of ATH coating further extends tool life.

2 Flutes

φ 4 or higher does not have backdraft shape.

Helix angle：30°

Back taper on peripheral edge：1.5～6°



Tolerance on shank：h5

EPDRE2○○○○-○○.○-○○○-ATH

Carbide | ATH | Helix angle 30° | Cutting Conditions A198

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2002-0.5-002-ATH	★	0.2	0.02	0.5	0.15	0.17	50	4	1	11.33	0.70	0.73	0.75	0.78	0.83
EPDRE2002-1-002-ATH	★			1						10.77	1.22	1.26	1.30	1.34	1.41
EPDRE2002-2-002-ATH	★			2						9.81	2.26	2.32	2.38	2.47	2.74
EPDRE2002-0.5-005-ATH	●		0.05	0.5						11.36	0.70	0.73	0.75	0.78	0.82
EPDRE2002-1-005-ATH	●			1						10.81	1.22	1.26	1.30	1.34	1.40
EPDRE2002-1.5-005-ATH	★			1.5						10.30	1.74	1.79	1.84	1.89	2.06
EPDRE2002-2-005-ATH	●			2						9.84	2.25	2.32	2.38	2.46	2.73
EPDRE2003-1-002-ATH	★	0.3	0.02	1	0.25	0.27	50	4	2	10.74	1.32	1.39	1.45	1.51	1.62
EPDRE2003-2-002-ATH	★			2						9.77	2.37	2.47	2.56	2.64	2.78
EPDRE2003-3-002-ATH	★			3						8.95	3.42	3.54	3.65	3.74	4.06
EPDRE2003-1-005-ATH	●		0.05	1						10.78	1.32	1.39	1.45	1.50	1.61
EPDRE2003-1.5-005-ATH	★			1.5						10.26	1.84	1.93	2.01	2.07	2.20
EPDRE2003-2-005-ATH	●			2						9.79	2.37	2.47	2.56	2.64	2.77
EPDRE2003-2.5-005-ATH	★			2.5						9.36	2.89	3.01	3.10	3.19	3.39
EPDRE2003-3-005-ATH	●			3						8.97	3.41	3.54	3.65	3.74	4.05
EPDRE2004-1-002-ATH	★	0.4	0.02	1	0.3	0.37	50	4	2	10.71	1.32	1.39	1.45	1.51	1.62
EPDRE2004-2-002-ATH	★			2						9.72	2.37	2.47	2.56	2.64	2.78
EPDRE2004-3-002-ATH	★			3						8.89	3.42	3.54	3.65	3.74	4.06
EPDRE2004-4-002-ATH	★			4						8.19	4.46	4.60	4.73	4.86	5.39
EPDRE2004-1-005-ATH	●		0.05	1						10.75	1.32	1.39	1.45	1.50	1.61
EPDRE2004-1.5-005-ATH	★			1.5						10.22	1.84	1.93	2.01	2.07	2.20
EPDRE2004-2-005-ATH	●			2						9.74	2.37	2.47	2.56	2.64	2.77
EPDRE2004-2.5-005-ATH	★			2.5						9.31	2.89	3.01	3.10	3.19	3.39
EPDRE2004-3-005-ATH	●			3						8.91	3.41	3.54	3.65	3.74	4.05
EPDRE2004-3.5-005-ATH	★			3.5						8.54	3.93	4.07	4.19	4.29	4.72
EPDRE2004-4-005-ATH	●			4						8.21	4.45	4.60	4.72	4.86	5.38
EPDRE2004-1-01-ATH	★		0.1	1						10.80	1.31	1.38	1.44	1.50	1.60
EPDRE2004-2-01-ATH	●			2						9.79	2.37	2.47	2.55	2.63	2.77
EPDRE2004-3-01-ATH	●			3						8.95	3.41	3.54	3.64	3.74	4.04
EPDRE2004-4-01-ATH	●			4						8.24	4.45	4.60	4.72	4.85	5.37
EPDRE2005-1-002-ATH	★	0.5	0.02	1	0.35	0.47	50	4	2	10.68	1.32	1.39	1.45	1.51	1.62
EPDRE2005-2-002-ATH	★			2						9.66	2.37	2.47	2.56	2.64	2.78
EPDRE2005-3-002-ATH	★			3						8.82	3.42	3.54	3.65	3.74	4.06
EPDRE2005-4-002-ATH	★			4						8.11	4.46	4.60	4.73	4.86	5.39
EPDRE2005-6-002-ATH	★			6						6.99	6.53	6.71	6.92	7.26	8.05
EPDRE2005-1-005-ATH	●		0.05	1						10.71	1.32	1.39	1.45	1.50	1.61
EPDRE2005-2-005-ATH	●			2						9.69	2.37	2.47	2.56	2.64	2.77
EPDRE2005-3-005-ATH	●			3						8.84	3.41	3.54	3.65	3.74	4.05
EPDRE2005-4-005-ATH	●			4						8.13	4.45	4.60	4.72	4.86	5.38
EPDRE2005-5-005-ATH	●			5						7.53	5.49	5.66	5.79	6.05	6.71
EPDRE2005-6-005-ATH	●			6						7.00	6.53	6.71	6.91	7.25	8.04
EPDRE2005-1-01-ATH	●		0.1	1						10.77	1.31	1.38	1.44	1.50	1.60
EPDRE2005-2-01-ATH	●			2						9.74	2.37	2.47	2.55	2.63	2.77
EPDRE2005-3-01-ATH	●			3						8.88	3.41	3.54	3.64	3.74	4.04
EPDRE2005-4-01-ATH	●			4						8.17	4.45	4.60	4.72	4.85	5.37
EPDRE2005-5-01-ATH	●			5						7.55	5.49	5.66	5.79	6.04	6.69
EPDRE2005-6-01-ATH	●			6						7.03	6.52	6.71	6.90	7.24	8.02

● : Inventory maintained in US ★ : Inventory maintained in Japan

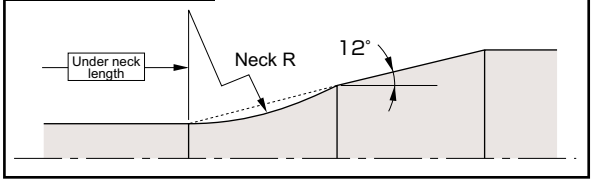
Epoch Deep Radius Evolution

EPDRE2○○○○-○○.○-○○○-ATH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θκ	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2006-2-002-ATH	★	0.6	0.02	2	0.4	0.57	50	4	4	9.61	2.54	2.70	2.83	2.96	3.19
EPDRE2006-4-002-ATH	★			4						8.04	4.66	4.88	5.07	5.24	5.52
EPDRE2006-6-002-ATH	★			6						6.90	6.76	7.03	7.26	7.45	8.05
EPDRE2006-2-005-ATH	●		0.05	2						9.64	2.54	2.69	2.83	2.95	3.18
EPDRE2006-4-005-ATH	●			4						8.06	4.66	4.88	5.07	5.23	5.52
EPDRE2006-6-005-ATH	★			6						6.92	6.76	7.03	7.26	7.45	8.04
EPDRE2006-8-005-ATH	★			8						6.06	8.85	9.16	9.41	9.64	10.69
EPDRE2006-10-005-ATH	★			10						5.39	10.93	11.28	11.55	12.04	13.35
EPDRE2006-2-01-ATH	●		0.1	2						9.68	2.53	2.69	2.82	2.95	3.17
EPDRE2006-4-01-ATH	●			4						8.09	4.65	4.88	5.06	5.23	5.51
EPDRE2006-6-01-ATH	●			6						6.94	6.76	7.03	7.25	7.44	8.02
EPDRE2006-8-01-ATH	●			8						6.08	8.85	9.16	9.41	9.63	10.67
EPDRE2006-10-01-ATH	★			10						5.41	10.92	11.27	11.55	12.03	13.33
EPDRE2007-2-005-ATH	★	0.7	0.05	2	0.45	0.67	50	4	4	9.58	2.54	2.69	2.83	2.95	3.18
EPDRE2007-4-005-ATH	★			4						7.98	4.66	4.88	5.07	5.23	5.52
EPDRE2007-6-005-ATH	★			6						6.83	6.76	7.03	7.26	7.45	8.04
EPDRE2007-2-01-ATH	★		0.1	2						9.63	2.53	2.69	2.82	2.95	3.17
EPDRE2007-4-01-ATH	★			4						8.01	4.65	4.88	5.06	5.23	5.51
EPDRE2007-6-01-ATH	★			6						6.86	6.76	7.03	7.25	7.44	8.02
EPDRE2008-2-002-ATH	★	0.8	0.02	2	0.5	0.77	50	4	4	9.49	2.54	2.70	2.83	2.96	3.19
EPDRE2008-4-002-ATH	★			4						7.87	4.66	4.88	5.07	5.24	5.52
EPDRE2008-6-002-ATH	★			6						6.73	6.76	7.03	7.26	7.45	8.05
EPDRE2008-2-005-ATH	★		0.05	2						9.52	2.54	2.69	2.83	2.95	3.18
EPDRE2008-4-005-ATH	●			4						7.89	4.66	4.88	5.07	5.23	5.52
EPDRE2008-6-005-ATH	●			6						6.74	6.76	7.03	7.26	7.45	8.04
EPDRE2008-8-005-ATH	★			8						5.88	8.85	9.16	9.41	9.64	10.69
EPDRE2008-12-005-ATH	★			12			55			4.68	13.00	13.38	13.75	14.43	16.00
EPDRE2008-2-01-ATH	★		0.1	2			50			9.57	2.53	2.69	2.82	2.95	3.17
EPDRE2008-4-01-ATH	●			4						7.93	4.65	4.88	5.06	5.23	5.51
EPDRE2008-6-01-ATH	●			6						6.77	6.76	7.03	7.25	7.44	8.02
EPDRE2008-8-01-ATH	●			8						5.90	8.85	9.16	9.41	9.63	10.67
EPDRE2008-12-01-ATH	★			12			55			4.70	13.00	13.38	13.75	14.42	15.98
EPDRE2008-2-02-ATH	★		0.2	2			50			9.67	2.53	2.68	2.81	2.93	3.15
EPDRE2008-4-02-ATH	●			4						8.00	4.65	4.87	5.05	5.21	5.50
EPDRE2008-6-02-ATH	●			6						6.82	6.75	7.02	7.24	7.43	7.99
EPDRE2008-8-02-ATH	★			8						5.94	8.84	9.15	9.40	9.62	10.64
EPDRE2008-12-02-ATH	★			12			55			4.72	12.99	13.37	13.73	14.40	15.95
EPDRE2010-2-002-ATH	★	1	0.02	2	0.8	0.94	50	4	4	9.29	2.64	2.78	2.91	3.03	3.24
EPDRE2010-4-002-ATH	★			4						7.65	4.75	4.95	5.13	5.29	5.56
EPDRE2010-6-002-ATH	★			6						6.50	6.84	7.09	7.31	7.49	8.14
EPDRE2010-8-002-ATH	★			8						5.65	8.92	9.21	9.46	9.73	10.79
EPDRE2010-10-002-ATH	★			10						5.00	10.99	11.32	11.59	12.13	13.45
EPDRE2010-12-002-ATH	★			12			55			4.48	13.06	13.42	13.84	14.52	16.10
EPDRE2010-2-005-ATH	●		0.05	2			50			9.32	2.64	2.78	2.91	3.02	3.24
EPDRE2010-3-005-ATH	★			3						8.41	3.70	3.87	4.02	4.16	4.41
EPDRE2010-4-005-ATH	●			4						7.67	4.75	4.95	5.13	5.28	5.56
EPDRE2010-5-005-ATH	★			5						7.04	5.79	6.02	6.22	6.39	6.80
EPDRE2010-6-005-ATH	●			6						6.51	6.84	7.09	7.30	7.49	8.13
EPDRE2010-8-005-ATH	●			8						5.66	8.92	9.21	9.46	9.73	10.78
EPDRE2010-10-005-ATH	★			10						5.00	10.99	11.32	11.59	12.12	13.44
EPDRE2010-12-005-ATH	★			12			55			4.48	13.06	13.42	13.84	14.51	16.09
EPDRE2010-16-005-ATH	★			16			60			3.71	17.18	17.60	18.40	19.30	21.40
EPDRE2010-20-005-ATH	★			20						3.17	21.29	21.93	22.96	24.09	26.71

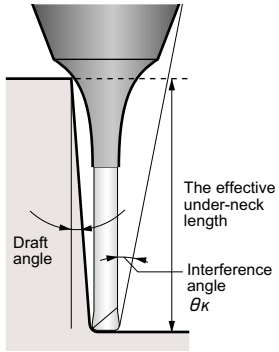
● : Inventory maintained in US ★ : Inventory maintained in Japan

Detail of neck shape



【Note】

The effective under-neck length is different from Epoch Deep Radius EPDR. Please recheck the interference region.



EPDRE2○○○○-○○.○-○○○-ATH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2010-2-01-ATH	★	1	0.1	2	0.8	0.94	50	4	4	9.37	2.64	2.78	2.90	3.01	3.23
EPDRE2010-3-01-ATH	★			3						8.45	3.69	3.87	4.02	4.15	4.40
EPDRE2010-4-01-ATH	●			4						7.70	4.74	4.95	5.12	5.28	5.55
EPDRE2010-5-01-ATH	★			5						7.07	5.79	6.02	6.21	6.39	6.79
EPDRE2010-6-01-ATH	●			6						6.54	6.83	7.09	7.30	7.49	8.11
EPDRE2010-8-01-ATH	●			8						5.68	8.91	9.21	9.45	9.72	10.77
EPDRE2010-10-01-ATH	●			10						5.02	10.99	11.32	11.59	12.11	13.42
EPDRE2010-12-01-ATH	●			12			55			4.50	13.06	13.42	13.83	14.50	16.08
EPDRE2010-16-01-ATH	★			16			60			3.72	17.18	17.60	18.39	19.29	21.39
EPDRE2010-20-01-ATH	★			20						3.17	21.29	21.93	22.95	24.08	26.70
EPDRE2010-2-02-ATH	★		0.2	2			50			9.47	2.63	2.77	2.89	3.00	3.21
EPDRE2010-3-02-ATH	★			3						8.54	3.69	3.86	4.01	4.14	4.39
EPDRE2010-4-02-ATH	●			4						7.77	4.74	4.94	5.11	5.27	5.54
EPDRE2010-5-02-ATH	★			5						7.13	5.79	6.01	6.21	6.38	6.75
EPDRE2010-6-02-ATH	●			6						6.59	6.83	7.08	7.29	7.48	8.08
EPDRE2010-8-02-ATH	●			8						5.72	8.91	9.20	9.45	9.70	10.74
EPDRE2010-10-02-ATH	●			10						5.05	10.98	11.32	11.58	12.09	13.39
EPDRE2010-12-02-ATH	●			12			55			4.52	13.05	13.42	13.81	14.48	16.05
EPDRE2010-16-02-ATH	★			16			60			3.74	17.18	17.59	18.38	19.27	21.35
EPDRE2010-20-02-ATH	★			20						3.19	21.29	21.92	22.94	24.06	26.66
EPDRE2010-2-03-ATH	★		0.3	2			50			9.57	2.63	2.76	2.87	2.98	3.19
EPDRE2010-3-03-ATH	★			3						8.62	3.68	3.85	3.99	4.13	4.37
EPDRE2010-4-03-ATH	★			4						7.84	4.73	4.93	5.10	5.25	5.53
EPDRE2010-5-03-ATH	★			5						7.19	5.78	6.01	6.20	6.37	6.72
EPDRE2010-6-03-ATH	●			6						6.64	6.82	7.07	7.28	7.47	8.05
EPDRE2010-8-03-ATH	★			8						5.75	8.91	9.20	9.44	9.68	10.70
EPDRE2010-10-03-ATH	●			10						5.08	10.98	11.31	11.58	12.07	13.36
EPDRE2010-12-03-ATH	★			12			55			4.54	13.05	13.41	13.80	14.46	16.01
EPDRE2010-16-03-ATH	★			16			60			3.75	17.17	17.59	18.36	19.25	21.32
EPDRE2010-20-03-ATH	★			20						3.20	21.28	21.91	22.92	24.04	26.63
EPDRE20125-5-01-ATH	★	1.25	0.1	5	1.15	1.18	50	4	4	6.80	5.81	6.04	6.23	6.40	6.82
EPDRE20125-10-01-ATH	★			10						4.76	11.01	11.34	11.60	12.14	13.45
EPDRE20125-15-01-ATH	★			15			55			3.66	16.17	16.57	17.28	18.12	20.09
EPDRE20125-20-01-ATH	★			20			60			2.97	21.30	21.95	22.98	24.10	No interference
EPDRE20125-5-02-ATH	★		0.2	5			50			6.86	5.81	6.03	6.22	6.39	6.79
EPDRE20125-10-02-ATH	★			10						4.79	11.00	11.33	11.59	12.12	13.42
EPDRE20125-15-02-ATH	★			15			55			3.68	16.16	16.56	17.26	18.10	20.06
EPDRE20125-20-02-ATH	★			20			60			2.98	21.30	21.95	22.97	24.09	No interference
EPDRE20125-5-03-ATH	★		0.3	5			50			6.92	5.81	6.03	6.21	6.38	6.75
EPDRE20125-10-03-ATH	★			10						4.82	11.00	11.32	11.59	12.10	13.39
EPDRE20125-15-03-ATH	★			15			55			3.69	16.16	16.56	17.25	18.08	20.03
EPDRE20125-20-03-ATH	★			20			60			2.99	21.30	21.94	22.95	24.07	No interference
EPDRE2015-4-01-ATH	●	1.5	0.1	4	1.35	1.42	50	4	4	7.15	4.80	4.99	5.16	5.31	5.58
EPDRE2015-6-01-ATH	★			6						5.97	6.88	7.12	7.33	7.51	8.18
EPDRE2015-8-01-ATH	●			8						5.12	8.96	9.24	9.48	9.77	10.83
EPDRE2015-12-01-ATH	●			12			55			3.98	13.09	13.45	13.88	14.56	16.14
EPDRE2015-15-01-ATH	●			15						3.42	16.18	16.58	17.30	18.15	20.12
EPDRE2015-20-01-ATH	●			20			60			2.76	21.32	21.98	23.01	24.13	No interference

Epoch Deep Radius Evolution

EPDRE2○○○○-○○.○-○○○-ATH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2015-4-02-ATH	●	1.5	0.2	4	1.35	1.42	50	4	4	7.22	4.79	4.98	5.15	5.30	5.57
EPDRE2015-6-02-ATH	★			6						6.02	6.88	7.12	7.32	7.50	8.14
EPDRE2015-8-02-ATH	●			8						5.16	8.95	9.24	9.47	9.75	10.80
EPDRE2015-12-02-ATH	●			12			55			4.01	13.09	13.44	13.87	14.54	16.11
EPDRE2015-15-02-ATH	●			15						3.43	16.18	16.58	17.29	18.13	20.09
EPDRE2015-20-02-ATH	●			20			60			2.77	21.32	21.97	22.99	24.11	No interference
EPDRE2015-4-03-ATH	★		0.3	4			50			7.30	4.79	4.97	5.14	5.29	5.55
EPDRE2015-6-03-ATH	★			6						6.07	6.87	7.11	7.31	7.49	8.11
EPDRE2015-8-03-ATH	●			8						5.19	8.95	9.23	9.47	9.73	10.77
EPDRE2015-12-03-ATH	★			12			55			4.03	13.09	13.44	13.85	14.52	16.08
EPDRE2015-15-03-ATH	●			15						3.45	16.18	16.57	17.28	18.11	20.06
EPDRE2015-20-03-ATH	●			20			60			2.78	21.31	21.96	22.98	24.09	No interference
EPDRE2015-4-05-ATH	★		0.5	4			50			7.45	4.78	4.96	5.12	5.26	5.53
EPDRE2015-6-05-ATH	★			6						6.17	6.86	7.10	7.30	7.48	8.05
EPDRE2015-8-05-ATH	★			8						5.27	8.94	9.22	9.45	9.70	10.70
EPDRE2015-12-05-ATH	★			12			55			4.07	13.08	13.43	13.83	14.48	16.01
EPDRE2015-15-05-ATH	★			15						3.48	16.17	16.56	17.25	18.07	19.99
EPDRE2015-20-05-ATH	★			20			60			2.80	21.31	21.95	22.95	24.06	No interference
EPDRE20175-5-01-ATH	★	1.75	0.1	5	1.55	1.67	50	4	4	6.19	5.84	6.06	6.25	6.42	6.85
EPDRE20175-10-01-ATH	★			10						4.19	11.03	11.35	11.61	12.17	13.49
EPDRE20175-15-01-ATH	★			15			55			3.16	16.18	16.58	17.30	18.15	20.12
EPDRE20175-20-01-ATH	★			20			60			2.54	21.32	21.98	23.01	24.13	No interference
EPDRE20175-5-02-ATH	★		0.2	5			50			6.25	5.84	6.05	6.24	6.41	6.82
EPDRE20175-10-02-ATH	★			10						4.22	11.02	11.34	11.61	12.15	13.45
EPDRE20175-15-02-ATH	★			15			55			3.18	16.18	16.58	17.29	18.13	20.09
EPDRE20175-20-02-ATH	★			20			60			2.55	21.32	21.97	22.99	24.11	No interference
EPDRE20175-5-03-ATH	★		0.3	5			50			6.31	5.83	6.05	6.23	6.40	6.79
EPDRE20175-10-03-ATH	★			10						4.24	11.02	11.34	11.60	12.13	13.42
EPDRE20175-15-03-ATH	★			15			55			3.20	16.18	16.57	17.28	18.11	20.06
EPDRE20175-20-03-ATH	★			20			60			2.56	21.31	21.96	22.98	24.09	No interference
EPDRE2020-4-01-ATH	★	2	0.1	4	1.7	1.92	50	4	4	6.49	4.80	4.99	5.16	5.31	5.58
EPDRE2020-6-01-ATH	★			6						5.30	6.88	7.12	7.33	7.51	8.18
EPDRE2020-8-01-ATH	★			8						4.47	8.96	9.24	9.48	9.77	10.83
EPDRE2020-12-01-ATH	★			12			55			3.41	13.09	13.45	13.88	14.56	16.14
EPDRE2020-16-01-ATH	★			16						2.76	17.21	17.62	18.44	19.35	No interference
EPDRE2020-20-01-ATH	★			20			60			2.31	21.32	21.98	23.01	24.13	No interference
EPDRE2020-25-01-ATH	★			25			65			1.93	26.44	27.43	28.71	No interference	No interference
EPDRE2020-30-01-ATH	★			30			70			1.65	31.55	32.88	34.41	No interference	No interference
EPDRE2020-4-02-ATH	★		0.2	4			50			6.57	4.79	4.98	5.15	5.30	5.57
EPDRE2020-6-02-ATH	●			6						5.35	6.88	7.12	7.32	7.50	8.14
EPDRE2020-8-02-ATH	●			8						4.51	8.95	9.24	9.47	9.75	10.80
EPDRE2020-12-02-ATH	●			12			55			3.43	13.09	13.44	13.87	14.54	16.11
EPDRE2020-16-02-ATH	●			16						2.77	17.21	17.62	18.43	19.33	No interference
EPDRE2020-20-02-ATH	●			20			60			2.32	21.32	21.97	22.99	24.11	No interference
EPDRE2020-25-02-ATH	●			25			65			1.93	26.44	27.42	28.69	No interference	No interference
EPDRE2020-30-02-ATH	★			30			70			1.66	31.55	32.87	34.40	No interference	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan

EPDRE2○○○○-○○.○-○○○-ATH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2020-4-03-ATH	★	2	0.3	4		0.94	50	4	4	6.64	4.79	4.97	5.14	5.29	5.55
EPDRE2020-6-03-ATH	★			6						5.40	6.87	7.11	7.31	7.49	8.11
EPDRE2020-8-03-ATH	●			8						4.55	8.95	9.23	9.47	9.73	10.77
EPDRE2020-12-03-ATH	★			12			55			3.45	13.09	13.44	13.85	14.52	16.08
EPDRE2020-16-03-ATH	●			16						2.79	17.21	17.61	18.42	19.31	No interference
EPDRE2020-20-03-ATH	●			20			60			2.33	21.31	21.96	22.98	24.09	No interference
EPDRE2020-25-03-ATH	★			25			65			1.94	26.43	27.41	28.68	No interference	No interference
EPDRE2020-30-03-ATH	★			30			70			1.66	31.55	32.86	34.38	No interference	No interference
EPDRE2020-6-05-ATH	●		0.5	6			50			5.50	6.86	7.10	7.30	7.48	8.05
EPDRE2020-8-05-ATH	●			8						4.62	8.94	9.22	9.45	9.70	10.70
EPDRE2020-12-05-ATH	●			12			55			3.50	13.08	13.43	13.83	14.48	16.01
EPDRE2020-16-05-ATH	●			16						2.81	17.20	17.61	18.39	19.27	No interference
EPDRE2020-20-05-ATH	●			20			60			2.35	21.31	21.95	22.95	24.06	No interference
EPDRE2020-25-05-ATH	●			25			65			1.95	26.43	27.39	28.65	No interference	No interference
EPDRE2020-30-05-ATH	★			30			70			1.67	31.54	32.84	34.36	No interference	No interference
EPDRE2020-6-08-ATH	★		0.8	6			50			5.66	6.85	7.08	7.27	7.45	7.95
EPDRE2020-8-08-ATH	●			8						4.73	8.93	9.20	9.43	9.64	10.61
EPDRE2020-12-08-ATH	★			12			55			3.56	13.07	13.41	13.78	14.42	15.92
EPDRE2020-16-08-ATH	●			16						2.85	17.19	17.59	18.35	19.21	No interference
EPDRE2020-20-08-ATH	●			20			60			2.38	21.30	21.92	22.91	24.00	No interference
EPDRE2020-25-08-ATH	★			25			65			1.97	26.42	27.37	28.61	No interference	No interference
EPDRE2020-30-08-ATH	★			30			70			1.69	31.53	32.81	34.31	No interference	No interference
EPDRE2025-10-01-ATH	★	2.5	0.1	10			50			3.14	11.08	11.39	11.68	12.25	13.58
EPDRE2025-20-01-ATH	★			20			60			1.82	21.36	22.06	23.09	No interference	No interference
EPDRE2025-30-01-ATH	★			30			70			1.28	31.59	32.95	No interference	No interference	No interference
EPDRE2025-10-02-ATH	★		0.2	10			50			3.16	11.08	11.39	11.67	12.23	13.55
EPDRE2025-20-02-ATH	★			20			60			1.83	21.36	22.05	23.07	No interference	No interference
EPDRE2025-30-02-ATH	★			30			70			1.28	31.58	32.94	No interference	No interference	No interference
EPDRE2025-10-03-ATH	★		0.3	10			50			3.19	11.08	11.38	11.65	12.21	13.52
EPDRE2025-20-03-ATH	★			20			60			1.83	21.36	22.04	23.06	No interference	No interference
EPDRE2025-30-03-ATH	★			30			70			1.29	31.58	32.93	No interference	No interference	No interference
EPDRE2025-10-05-ATH	★		0.5	10			50			3.24	11.07	11.37	11.63	12.17	13.45
EPDRE2025-20-05-ATH	★			20			60			1.85	21.35	22.02	23.03	No interference	No interference
EPDRE2025-30-05-ATH	★			30			70			1.30	31.58	32.92	No interference	No interference	No interference
EPDRE2030-6-01-ATH	★	3	0.1	6		1.18	50	4	4	6.45	7.01	7.23	7.42	7.59	8.36
EPDRE2030-8-01-ATH	★			8			55			5.61	9.07	9.34	9.56	9.94	11.02
EPDRE2030-12-01-ATH	★			12			60			4.45	13.20	13.53	14.04	14.73	16.33
EPDRE2030-16-01-ATH	★			16						3.69	17.30	17.78	18.60	19.52	21.64
EPDRE2030-18-01-ATH	★			18			65			3.40	19.35	19.96	20.89	21.91	24.29
EPDRE2030-20-01-ATH	★			20						3.15	21.40	22.13	23.17	24.30	26.95
EPDRE2030-30-01-ATH	★			30			75			2.31	31.62	33.03	34.57	36.27	No interference
EPDRE2030-35-01-ATH	★			35			80			2.04	36.83	38.48	40.27	42.25	No interference
EPDRE2030-6-02-ATH	★		0.2	6		1.42	50	4	4	6.49	7.00	7.22	7.41	7.58	8.33
EPDRE2030-8-02-ATH	●			8			55			5.65	9.07	9.33	9.55	9.92	10.99
EPDRE2030-12-02-ATH	●			12			60			4.48	13.19	13.52	14.03	14.71	16.30
EPDRE2030-16-02-ATH	●			16						3.71	17.30	17.77	18.59	19.50	21.60
EPDRE2030-18-02-ATH	★			18			65			3.41	19.35	19.95	20.87	21.89	24.26
EPDRE2030-20-02-ATH	●			20						3.16	21.40	22.13	23.15	24.28	26.91
EPDRE2030-30-02-ATH	●			30			75			2.31	31.62	33.02	34.56	36.25	No interference
EPDRE2030-35-02-ATH	●			35			80			2.04	36.83	38.47	40.26	42.23	No interference

Epoch Deep Radius Evolution

EPDRE2○○○○-○○.○-○○○-ATH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2030-6-03-ATH	★	3	0.3	6	2.5	2.86	50	6	4	6.54	7.00	7.22	7.40	7.57	8.30
EPDRE2030-8-03-ATH	●			8			55			5.68	9.07	9.33	9.54	9.90	10.95
EPDRE2030-12-03-ATH	★			12			60			4.50	13.19	13.52	14.02	14.69	16.26
EPDRE2030-16-03-ATH	●			16						3.72	17.30	17.76	18.58	19.48	21.57
EPDRE2030-18-03-ATH	★			18			65			3.43	19.35	19.94	20.86	21.87	24.23
EPDRE2030-20-03-ATH	●			20						3.17	21.40	22.12	23.14	24.26	26.88
EPDRE2030-30-03-ATH	●			30			75			2.32	31.62	33.01	34.54	36.23	No interference
EPDRE2030-35-03-ATH	★			35			80			2.05	36.82	38.46	40.25	42.21	No interference
EPDRE2030-8-05-ATH	●		0.5	8			55			5.76	9.06	9.31	9.53	9.87	10.89
EPDRE2030-12-05-ATH	●			12			60			4.55	13.18	13.51	13.99	14.65	16.20
EPDRE2030-16-05-ATH	●			16						3.75	17.29	17.74	18.55	19.44	21.51
EPDRE2030-18-05-ATH	★			18			65			3.45	19.34	19.92	20.83	21.83	24.16
EPDRE2030-20-05-ATH	●			20						3.20	21.39	22.10	23.11	24.22	26.82
EPDRE2030-30-05-ATH	●			30			75			2.33	31.61	32.99	34.52	36.19	No interference
EPDRE2030-35-05-ATH	●			35			80			2.06	36.82	38.44	40.22	42.17	No interference
EPDRE2030-8-1-ATH	★		1	8			55			5.96	9.05	9.29	9.50	9.77	10.73
EPDRE2030-12-1-ATH	★			12			60			4.67	13.17	13.49	13.92	14.55	16.04
EPDRE2030-16-1-ATH	★			16						3.84	17.28	17.70	18.48	19.34	21.35
EPDRE2030-18-1-ATH	★			18			65			3.52	19.33	19.88	20.76	21.73	24.00
EPDRE2030-20-1-ATH	★			20						3.26	21.38	22.05	23.04	24.13	26.66
EPDRE2030-30-1-ATH	★			30			75			2.37	31.60	32.95	34.45	36.09	No interference
EPDRE2030-35-1-ATH	★			35			80			2.08	36.79	38.40	40.15	42.08	No interference
EPDRE2040-8-01-ATH	★	4	0.1	8	3.5	3.8	55	6	4	4.38	9.18	9.42	9.64	10.11	11.21
EPDRE2040-12-01-ATH	★			12			60			3.36	13.29	13.60	14.20	14.90	16.51
EPDRE2040-16-01-ATH	★			16						2.72	17.39	17.93	18.77	19.68	No interference
EPDRE2040-20-01-ATH	★			20			65			2.29	21.48	22.29	23.33	24.47	No interference
EPDRE2040-30-01-ATH	★			30			75			1.64	31.77	33.18	34.73	No interference	No interference
EPDRE2040-35-01-ATH	★			35			80			1.43	36.98	38.63	No interference	No interference	No interference
EPDRE2040-45-01-ATH	★			45			90			1.15	47.41	49.52	No interference	No interference	No interference
EPDRE2040-8-02-ATH	★		0.2	8			55			4.41	9.18	9.42	9.63	10.09	11.17
EPDRE2040-12-02-ATH	★			12			60			3.38	13.29	13.59	14.19	14.88	16.48
EPDRE2040-16-02-ATH	★			16						2.73	17.39	17.92	18.75	19.66	No interference
EPDRE2040-20-02-ATH	★			20			65			2.30	21.48	22.28	23.31	24.45	No interference
EPDRE2040-30-02-ATH	★			30			75			1.64	31.76	33.17	34.72	No interference	No interference
EPDRE2040-35-02-ATH	★			35			80			1.44	36.98	38.62	No interference	No interference	No interference
EPDRE2040-45-02-ATH	★			45			90			1.15	47.40	49.52	No interference	No interference	No interference
EPDRE2040-8-03-ATH	★		0.3	8			55			4.45	9.17	9.41	9.62	10.07	11.14
EPDRE2040-12-03-ATH	★			12			60			3.40	13.28	13.59	14.18	14.86	16.45
EPDRE2040-16-03-ATH	★			16						2.75	17.38	17.91	18.74	19.65	No interference
EPDRE2040-20-03-ATH	★			20			65			2.31	21.48	22.27	23.30	24.43	No interference
EPDRE2040-30-03-ATH	★			30			75			1.65	31.76	33.16	34.71	No interference	No interference
EPDRE2040-35-03-ATH	★			35			80			1.44	36.97	38.61	No interference	No interference	No interference
EPDRE2040-45-03-ATH	★			45			90			1.15	47.40	49.51	No interference	No interference	No interference
EPDRE2040-12-05-ATH	★		0.5	12			60			3.44	13.28	13.58	14.15	14.82	16.39
EPDRE2040-16-05-ATH	★			16						2.77	17.38	17.89	18.71	19.61	No interference
EPDRE2040-20-05-ATH	★			20			65			2.33	21.47	22.25	23.27	24.39	No interference
EPDRE2040-30-05-ATH	★			30			75			1.66	31.75	33.15	34.68	No interference	No interference
EPDRE2040-35-05-ATH	★			35			80			1.45	36.96	38.59	No interference	No interference	No interference
EPDRE2040-45-05-ATH	★			45			90			1.16	47.39	49.49	No interference	No interference	No interference

● : Inventory maintained in US ★ : Inventory maintained in Japan

EPDRE2○○○○-○○.○-○○○-ATH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRE2040-12-1-ATH	★	4	1	12	3.5	3.8	60	6	4	3.54	13.27	13.56	14.08	14.72	16.23
EPDRE2040-16-1-ATH	★			16						2.84	17.37	17.85	18.64	19.51	No interference
EPDRE2040-20-1-ATH	★			20			65			2.37	21.46	22.21	23.20	24.30	No interference
EPDRE2040-30-1-ATH	★			30			75			1.68	31.73	33.10	34.61	No interference	No interference
EPDRE2040-35-1-ATH	★			35			80			1.47	36.94	38.55	No interference	No interference	No interference
EPDRE2040-45-1-ATH	★			45			90			1.17	47.37	49.44	No interference	No interference	No interference
EPDRE2050-20-01-ATH	★	5	0.1	20	4	4.75	65	6	4	1.26	21.54	22.42	No interference	No interference	No interference
EPDRE2050-40-01-ATH	★			40			85			0.67	42.32	No interference	No interference	No interference	No interference
EPDRE2050-20-02-ATH	★		0.2	20			65			1.26	21.54	22.41	No interference	No interference	No interference
EPDRE2050-40-02-ATH	★			40			85			0.68	42.31	No interference	No interference	No interference	No interference
EPDRE2050-20-03-ATH	★		0.3	20			65			1.27	21.54	22.40	No interference	No interference	No interference
EPDRE2050-40-03-ATH	★			40			85			0.68	42.31	No interference	No interference	No interference	No interference
EPDRE2050-20-05-ATH	★		0.5	20			65			1.28	21.54	22.38	No interference	No interference	No interference
EPDRE2050-40-05-ATH	★			40			85			0.68	42.30	No interference	No interference	No interference	No interference
EPDRE2050-20-1-ATH	★		1	20			65			1.31	21.53	22.34	No interference	No interference	No interference
EPDRE2050-40-1-ATH	★			40			85			0.69	42.28	No interference	No interference	No interference	No interference
EPDRE2060-12-01-ATH	★	6	0.1	12	5	5.7	50	6	–	0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-18-01-ATH	★			18			60			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-24-01-ATH	★			24			70			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-35-01-ATH	★			35			80			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-55-01-ATH	★			55			100			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-12-02-ATH	★		0.2	12			50			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-18-02-ATH	★			18			60			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-24-02-ATH	★			24			70			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-35-02-ATH	★			35			80			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-55-02-ATH	★			55			100			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-12-03-ATH	★		0.3	12			50			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-18-03-ATH	★			18			60			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-24-03-ATH	★			24			70			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-35-03-ATH	★			35			80			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-55-03-ATH	★			55			100			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-18-05-ATH	★		0.5	18			60			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-24-05-ATH	★			24			70			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-35-05-ATH	★			35			80			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-55-05-ATH	★			55			100			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-18-1-ATH	★		1	18			60			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-24-1-ATH	★			24			70			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-35-1-ATH	★			35			80			0.01	No interference	No interference	No interference	No interference	No interference
EPDRE2060-55-1-ATH	★			55			100			0.01	No interference	No interference	No interference	No interference	No interference

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	○	○	◎	○	○

Epoch Deep Radius Evolution

Recommended cutting conditions

EPDRE-ATH

High efficiency cuttiing condition | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A203.

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steel, Alloy steel (180~250HB)		Stainless steel, Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (Inch)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
0.2	0.02	0.5	.0006	50,000	40	50,000	40	45,000	36	42,500	26	37,500	23	35,000	21
		1	.0004	50,000	40	50,000	40	45,000	36	42,500	26	37,500	23	35,000	21
		2	.0003	50,000	30	42,000	34	40,500	32	38,250	23	33,750	20	31,500	19
	0.05	0.5	.0008	50,000	40	50,000	40	45,000	36	42,500	26	37,500	23	35,000	21
		1	.0006	50,000	40	50,000	40	45,000	36	42,500	26	37,500	23	35,000	21
		1.5	.0003	50,000	30	47,000	38	42,750	34	40,375	24	35,625	21	33,250	20
		2	.0003	50,000	30	42,000	34	40,500	32	38,250	23	33,750	20	31,500	19
0.3	0.02	1	.0006	50,000	50	48,000	48	43,200	43	40,800	33	36,000	22	33,600	20
		2	.0004	45,000	36	38,880	31	34,992	28	33,048	26	29,160	17	27,216	16
		3	.0003	42,750	34	36,936	30	33,242	27	31,396	19	27,702	17	25,855	10
	0.05	1	.0008	50,000	50	48,000	48	43,200	43	40,800	33	36,000	22	33,600	20
		1.5	.0006	47,500	48	45,600	46	41,040	41	38,760	31	34,200	21	31,920	19
		2	.0005	45,000	36	38,880	31	34,992	28	33,048	26	29,160	17	27,216	16
		2.5	.0004	45,000	36	38,880	31	34,992	28	33,048	26	29,160	17	27,216	16
		3	.0003	42,750	34	36,936	30	33,242	27	31,396	19	27,702	17	25,855	10
0.4	0.02	1	.0006	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		2	.0005	46,080	46	38,300	38	34,560	35	32,256	26	28,800	23	26,726	16
		3	.0004	35,250	28	29,325	23	26,437	21	24,675	20	22,031	18	20,445	12
		4	.0003	29,029	23	24,150	19	21,772	17	20,320	16	18,143	11	16,837	10
	0.05	1	.0010	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		1.5	.0008	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		2	.0006	46,080	46	38,300	38	34,560	35	32,256	26	28,800	23	26,726	16
		2.5	.0006	43,200	43	36,000	36	32,400	32	30,600	24	27,000	22	25,200	15
		3	.0006	35,250	28	29,325	23	26,437	21	24,675	20	22,031	18	20,445	12
		3.5	.0005	33,048	26	27,540	22	24,786	20	23,409	19	20,655	12	19,278	12
		4	.0003	29,029	23	24,150	19	21,772	17	20,320	16	18,143	11	16,837	10
	0.1	1	.0013	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		2	.0011	46,080	46	38,300	38	34,560	35	32,256	26	28,800	23	26,726	16
		3	.0006	35,250	28	29,325	23	26,437	21	24,675	20	22,031	18	20,445	12
		4	.0004	29,029	23	24,150	19	21,772	17	20,320	16	18,143	11	16,837	10
0.5	0.02	1	.0006	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		2	.0005	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		3	.0004	37,325	37	31,104	31	27,994	28	26,438	26	23,328	19	21,773	13
		4	.0003	33,178	33	27,648	28	24,883	25	23,501	24	20,736	17	19,354	12
		6	.0002	25,805	26	21,504	22	19,354	19	18,278	11	16,128	10	15,053	9
	0.05	1	.0012	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		2	.0009	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		3	.0007	37,325	37	31,104	31	27,994	28	26,438	26	23,328	19	21,773	13
		4	.0007	33,178	33	27,648	28	24,883	25	23,501	24	20,736	17	19,354	12
		5	.0004	29,030	29	24,192	24	21,773	22	20,563	21	18,144	15	16,934	10
		6	.0003	25,805	26	21,504	22	19,354	19	18,278	11	16,128	10	15,053	9
	0.1	1	.0014	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		2	.0012	46,080	46	38,300	38	34,560	35	32,256	32	28,800	23	26,726	21
		3	.0008	37,325	37	31,104	31	27,994	28	26,438	26	23,328	19	21,773	13
		4	.0008	33,178	33	27,648	28	24,883	25	23,501	24	20,736	17	19,354	12
		5	.0005	29,030	29	24,192	24	21,773	22	20,563	21	18,144	15	16,934	10
		6	.0005	25,805	26	21,504	22	19,354	19	18,278	11	16,128	10	15,053	9
0.6	0.02	2	.0006	46,080	65	38,300	54	34,560	48	32,256	39	28,800	29	26,726	27
		4	.0005	37,325	52	31,104	44	27,994	39	26,438	32	23,328	23	21,773	17
		6	.0004	29,030	41	24,192	34	21,773	30	20,563	25	18,144	18	16,934	14
	0.05	2	.0011	46,080	65	38,300	54	34,560	48	32,256	39	28,800	29	26,726	27
		4	.0007	37,325	52	31,104	44	27,994	39	26,438	32	23,328	23	21,773	17
		6	.0005	29,030	41	24,192	34	21,773	30	20,563	25	18,144	18	16,934	14
		8	.0004	27,579	39	22,982	32	20,684	29	19,535	23	17,237	17	16,088	13
		10	.0003	24,676	30	20,563	25	18,507	22	17,479	21	15,422	15	14,394	12
	0.1	2	.0014	46,080	65	38,300	54	34,560	48	32,256	39	28,800	29	26,726	27
		4	.0009	37,325	52	31,104	44	27,994	39	26,438	32	23,328	23	21,773	17
		6	.0006	29,030	41	24,192	34	21,773	30	20,563	25	18,144	18	16,934	14
		8	.0005	27,579	39	22,982	32	20,684	29	19,535	23	17,237	17	16,088	13
		10	.0004	24,676	30	20,563	25	18,507	22	17,479	21	15,422	15	14,394	12
0.7	0.05	2	.0014	45,960	64	38,300	54	34,470	48	32,555	39	28,725	29	26,810	27
		4	.0009	37,325	52	31,104	44	27,994	39	26,438	32	23,328	23	21,773	17
		6	.0006	29,030	41	24,192	34	21,773	30	20,563	25	18,144	18	16,934	14
	0.1	2	.0017	45,960	64	38,300	54	34,470	48	32,555	39	28,725	29	26,810	27
		4	.0011	37,325	52	31,104	44	27,994	39	26,438	32	23,328	23	21,773	17
		6	.0007	29,030	41	24,192	34	21,773	30	20,563	25	18,144	18	16,934	14
0.8	0.02	2	.0009	48,000	86	40,000	72	36,000	65	34,000	54	30,000	42	28,000	34
		4	.0006	48,000	67	40,000	56	36,000	50	34,000	48	30,000	36	28,000	28
		6	.0005	36,720	51	30,600	43	27,540	39	26,010	36	22,950	28	21,420	21
	0.05	2	.0015	48,000	86	40,000	72	36,000	65	34,000	54	30,000	42	28,000	34
		4	.0010	48,000	67	40,000	56	36,000	50	34,000	48	30,000	36	28,000	28
		6	.0006	36,720	51	30,600	43	27,540	39	26,010	36	22,950	28	21,420	21
		8	.0005	29,376	35	24,480	29	22,032	26	20,808	25	18,360	18	17,136	17
		12	.0004	26,438	32	22,032	26	19,829	24	18,727	22	16,524	17	15,422	12

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
0.8	0.1	2	.0019	48,000	86	40,000	72	36,000	65	34,000	54	30,000	42	28,000	34
		4	.0013	48,000	67	40,000	56	36,000	50	34,000	48	30,000	36	28,000	28
		6	.0007	36,720	51	30,600	43	27,540	39	26,010	36	22,950	28	21,420	21
		8	.0006	29,376	35	24,480	29	22,032	26	20,808	25	18,360	18	17,136	17
		12	.0005	26,438	32	22,032	26	19,829	24	18,727	22	16,524	17	15,422	12
	0.2	2	.0032	48,000	86	40,000	72	36,000	65	34,000	54	30,000	42	28,000	34
		4	.0022	48,000	67	40,000	56	36,000	50	34,000	48	30,000	36	28,000	28
		6	.0013	36,720	51	30,600	43	27,540	39	26,010	36	22,950	28	21,420	21
		8	.0007	29,376	35	24,480	29	22,032	26	20,808	25	18,360	18	17,136	17
		12	.0006	26,438	32	22,032	26	19,829	24	18,727	22	16,524	17	15,422	12
1	0.02	2	.0006	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		4	.0005	43,200	104	36,000	86	32,400	78	30,600	67	27,000	49	25,200	40
		6	.0004	34,992	77	29,160	64	29,299	70	24,786	55	21,870	39	20,412	33
		8	.0003	31,104	68	25,920	57	26,244	58	22,032	48	19,440	35	18,144	29
		10	.0002	27,216	60	22,680	50	23,328	51	19,278	42	17,010	31	15,876	25
		12	.0002	24,192	44	20,160	36	20,412	45	17,136	27	15,120	24	14,112	20
	0.05	2	.0018	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		3	.0014	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		4	.0011	43,200	104	36,000	86	32,400	78	30,600	67	27,000	49	25,200	40
		5	.0008	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		6	.0007	34,992	77	29,160	64	26,244	58	24,786	55	21,870	39	20,412	33
		8	.0006	31,104	68	25,920	57	23,328	51	22,032	48	19,440	35	18,144	29
		10	.0004	27,216	60	22,680	50	20,412	45	19,278	42	17,010	31	15,876	25
		12	.0004	24,192	44	20,160	36	18,144	33	17,136	27	15,120	24	14,112	20
		16	.0002	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0002	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
	0.1	2	.0026	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		3	.0020	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		4	.0015	43,200	104	36,000	86	32,400	78	30,600	67	27,000	49	25,200	40
		5	.0012	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		6	.0009	34,992	77	29,160	64	26,244	58	24,786	55	21,870	39	20,412	33
		8	.0009	31,104	68	25,920	57	23,328	51	22,032	48	19,440	35	18,144	29
		10	.0006	27,216	60	22,680	50	20,412	45	19,278	42	17,010	31	15,876	25
		12	.0006	24,192	44	20,160	36	18,144	33	17,136	27	15,120	24	14,112	20
		16	.0004	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0002	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
	0.2	2	.0043	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		3	.0035	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		4	.0028	43,200	104	36,000	86	32,400	78	30,600	67	27,000	49	25,200	40
		5	.0020	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		6	.0016	34,992	77	29,160	64	26,244	58	24,786	55	21,870	39	20,412	33
		8	.0016	31,104	68	25,920	57	23,328	51	22,032	48	19,440	35	18,144	29
		10	.0010	27,216	60	22,680	50	20,412	45	19,278	42	17,010	31	15,876	25
		12	.0010	24,192	44	20,160	36	18,144	33	17,136	27	15,120	24	14,112	20
		16	.0006	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0004	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
	0.3	2	.0043	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		3	.0035	47,770	115	39,490	95	35,668	86	33,439	74	29,617	53	27,707	44
		4	.0028	43,200	104	36,000	86	32,400	78	30,600	67	27,000	49	25,200	40
		5	.0020	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		6	.0016	34,992	77	29,160	64	26,244	58	24,786	55	21,870	39	20,412	33
		8	.0016	31,104	68	25,920	57	23,328	51	22,032	48	19,440	35	18,144	29
		10	.0010	27,216	60	22,680	50	20,412	45	19,278	42	17,010	31	15,876	25
		12	.0010	24,192	44	20,160	36	18,144	33	17,136	27	15,120	24	14,112	20
		16	.0006	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0004	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
1.25	0.1	5	.0012	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		10	.0006	27,216	60	25,920	57	20,412	45	19,278	42	17,010	31	15,876	25
		15	.0004	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0002	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
	0.2	5	.0020	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		10	.0010	27,216	60	25,920	57	20,412	45	19,278	42	17,010	31	15,876	25
		15	.0006	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0004	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
	0.3	5	.0020	39,808	96	31,847	76	29,299	70	27,707	61	24,522	44	22,929	37
		10	.0010	27,216	60	25,920	57	20,412	45	19,278	42	17,010	31	15,876	25
		15	.0006	24,192	39	20,160	32	18,144	29	17,136	27	15,120	21	14,112	17
		20	.0004	18,144	29	15,120	24	13,608	22	12,852	21	11,340	16	10,584	13
1.5	0.1	4	.0017	33,264	86	27,700	72	24,948	65	23,285	56	20,790	42	19,293	35
		6	.0016	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		8	.0014	30,240	79	25,200	66	22,680	59	21,420	51	18,900	38	17,640	32
		12	.0014	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0009	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0007	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18

【Note】 Upon usage, please refer to comments and notes below table on page A202.

Epoch Deep Radius Evolution

EPDRE-ATH | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A203.

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
1.5	0.2	4	.0028	33,264	86	27,700	72	24,948	65	23,285	56	20,790	42	19,293	35
		6	.0026	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		8	.0024	30,240	79	25,200	66	22,680	59	21,420	51	18,900	38	17,640	32
		12	.0024	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0015	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0012	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18
	0.3	4	.0028	33,264	86	27,700	72	24,948	65	23,285	56	20,790	42	19,293	35
		6	.0026	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		8	.0024	30,240	79	25,200	66	22,680	59	21,420	51	18,900	38	17,640	32
		12	.0024	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0015	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0012	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18
	0.5	4	.0033	33,264	86	27,700	72	24,948	65	23,285	56	20,790	42	19,293	35
		6	.0031	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		8	.0028	30,240	79	25,200	66	22,680	59	21,420	51	18,900	38	17,640	32
		12	.0026	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0018	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0014	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18
1.75	0.1	5	.0016	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		10	.0014	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0009	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0007	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18
	0.2	5	.0026	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		10	.0024	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0015	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0012	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18
	0.3	5	.0026	31,847	83	26,539	69	23,779	62	22,505	54	19,957	40	18,471	33
		10	.0024	24,192	63	20,160	52	18,144	47	17,136	41	15,120	30	14,112	25
		15	.0015	18,816	41	15,680	34	14,112	31	13,328	27	11,760	24	10,976	18
		20	.0012	18,816	38	15,680	31	14,112	28	13,328	24	11,760	21	10,976	18
2	0.1	4	.0031	28,662	126	24,203	106	21,815	96	20,541	90	18,152	65	17,038	51
		6	.0028	27,720	122	23,100	102	20,790	91	19,635	86	17,325	62	16,170	49
		8	.0022	25,200	111	21,000	92	18,900	83	17,850	79	15,750	57	14,700	44
		12	.0012	20,412	82	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		16	.0012	18,144	73	15,120	60	13,608	54	12,852	51	11,340	41	10,584	32
		20	.0010	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		25	.0006	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0004	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.2	4	.0039	28,662	126	24,203	106	21,815	96	20,541	90	18,152	65	17,038	51
		6	.0031	27,720	122	23,100	102	20,790	91	19,635	86	17,325	62	16,170	49
		8	.0028	25,200	111	21,000	92	18,900	83	17,850	79	15,750	57	14,700	44
		12	.0016	20,412	82	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		16	.0016	18,144	73	15,120	60	13,608	54	12,852	51	11,340	41	10,584	32
		20	.0014	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		25	.0010	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0007	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.3	4	.0051	28,662	126	24,203	106	21,815	96	20,541	90	18,152	65	17,038	51
		6	.0043	27,720	122	23,100	102	20,790	91	19,635	86	17,325	62	16,170	49
		8	.0035	25,200	111	21,000	92	18,900	83	17,850	79	15,750	57	14,700	44
		12	.0024	20,412	82	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		16	.0024	18,144	73	15,120	60	13,608	54	12,852	51	11,340	41	10,584	32
		20	.0015	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		25	.0012	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0008	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.5	6	.0067	27,720	122	23,100	102	20,790	91	19,635	86	17,325	62	16,170	49
		8	.0055	25,200	111	21,000	92	18,900	83	17,850	79	15,750	57	14,700	44
		12	.0031	20,412	82	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		16	.0031	18,144	73	15,120	60	13,608	54	12,852	51	11,340	41	10,584	32
		20	.0020	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		25	.0020	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0012	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.8	6	.0087	27,720	122	23,100	102	20,790	91	19,635	86	17,325	62	16,170	49
		8	.0079	25,200	111	21,000	92	18,900	83	17,850	79	15,750	57	14,700	44
		12	.0051	20,412	82	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		16	.0039	18,144	73	15,120	60	13,608	54	12,852	51	11,340	41	10,584	32
		20	.0024	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		25	.0022	15,876	64	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0018	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
2.5	0.1	10	.0020	20,412	90	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		20	.0012	15,876	70	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0006	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.2	10	.0028	20,412	90	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		20	.0016	15,876	70	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0010	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.3	10	.0035	20,412	90	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		20	.0024	15,876	70	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0012	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
	0.5	10	.0047	20,412	90	17,010	68	15,309	61	14,459	58	12,758	46	11,907	36
		20	.0031	15,876	70	13,230	53	11,907	48	11,246	45	9,923	32	9,261	26
		30	.0020	15,082	60	12,569	50	11,312	45	10,683	43	9,426	30	8,798	25
3	0.1	6	.0031	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		8	.0028	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		12	.0020	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		16	.0014	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		18	.0014	16,985	95	14,331	80	12,738	71	12,208	68	10,615	47	10,084	38
		20	.0014	15,552	87	12,960	73	11,664	65	11,016	62	9,720	43	9,072	34
		30	.0011	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
		35	.0008	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
	0.2	6	.0039	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		8	.0035	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		12	.0028	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		16	.0020	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		18	.0020	16,985	95	14,331	80	12,738	71	12,208	68	10,615	47	10,084	38
		20	.0020	15,552	87	12,960	73	11,664	65	11,016	62	9,720	43	9,072	34
		30	.0016	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
		35	.0014	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
	0.3	6	.0057	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		8	.0051	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		12	.0039	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		16	.0030	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		18	.0030	16,985	95	14,331	80	12,738	71	12,208	68	10,615	47	10,084	38
		20	.0030	15,552	87	12,960	73	11,664	65	11,016	62	9,720	43	9,072	34
		30	.0024	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
		35	.0020	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
	0.5	8	.0071	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		12	.0051	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		16	.0039	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		18	.0039	16,985	95	14,331	80	12,738	71	13,600	76	10,615	47	10,084	38
		20	.0039	15,552	87	12,960	73	11,664	65	11,016	62	9,720	43	9,072	34
		30	.0031	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
		35	.0026	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
	1	8	.0079	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		12	.0059	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		16	.0047	19,200	108	16,000	90	14,400	81	13,600	76	12,000	53	11,200	43
		18	.0043	16,985	95	14,331	80	12,738	71	13,600	76	10,615	47	10,084	38
		20	.0043	15,552	87	12,960	73	11,664	65	11,016	62	9,720	43	9,072	34
		30	.0035	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
		35	.0030	12,096	60	10,080	50	9,072	45	8,568	43	7,560	30	7,056	24
4	0.1	8	.0031	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		12	.0026	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		16	.0024	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		20	.0022	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		30	.0018	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		35	.0016	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		45	.0012	8,789	44	7,324	37	6,592	33	6,226	31	5,494	22	5,127	17
	0.2	8	.0063	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		12	.0055	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		16	.0051	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		20	.0043	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		30	.0039	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		35	.0031	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		45	.0024	8,789	44	7,324	37	6,592	33	6,226	31	5,494	22	5,127	17
	0.3	8	.0094	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		12	.0087	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		16	.0079	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		20	.0071	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		30	.0063	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		35	.0055	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		45	.0047	8,789	44	7,324	37	6,592	33	6,226	31	5,494	22	5,127	17

【Note】 Upon usage, please refer to comments and notes below table on page A202.

Epoch Deep Radius Evolution

EPDRE-ATH | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A203.

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (inch)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)
4	0.5	12	.0138	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		16	.0098	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		20	.0079	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		30	.0059	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		35	.0039	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		45	.0020	8,789	44	7,324	37	6,592	33	6,226	31	5,494	22	5,127	17
	1	12	.0157	16,560	113	13,800	94	12,420	84	11,730	80	10,350	56	9,660	46
		16	.0114	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		20	.0091	13,733	93	11,445	78	10,071	68	9,613	65	8,240	44	7,782	37
		30	.0067	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		35	.0047	10,985	68	9,154	57	8,239	51	7,781	48	6,866	34	6,408	28
		45	.0024	8,789	44	7,324	37	6,592	33	6,226	31	5,494	22	5,127	17
5	0.1	20	.0031	13,179	113	10,983	94	9,884	85	9,336	80	8,237	56	7,688	46
		40	.0024	11,868	90	9,890	75	8,901	68	8,407	64	7,418	46	6,923	37
	0.2	20	.0063	13,179	113	10,983	94	9,884	85	9,336	80	8,237	56	7,688	46
		40	.0051	11,868	90	9,890	75	8,901	68	8,407	64	7,418	46	6,923	37
	0.3	20	.0094	13,179	113	10,983	94	9,884	85	9,336	80	8,237	56	7,688	46
		40	.0079	11,868	90	9,890	75	8,901	68	8,407	64	7,418	46	6,923	37
	0.5	20	.0138	13,179	113	10,983	94	9,884	85	9,336	80	8,237	56	7,688	46
		40	.0053	11,868	90	9,890	75	8,901	68	8,407	64	7,418	46	6,923	37
	1	20	.0157	13,179	113	10,983	94	9,884	85	9,336	80	8,237	56	7,688	46
		40	.0059	11,868	90	9,890	75	8,901	68	8,407	64	7,418	46	6,923	37
6	0.1	12	.0031	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		18	.0026	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		24	.0024	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		35	.0020	9,881	91	8,234	76	7,411	68	6,999	64	6,176	46	5,764	37
		55	.0016	7,687	71	6,406	59	5,765	53	5,445	50	4,805	36	4,484	29
	0.2	12	.0063	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		18	.0055	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		24	.0051	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		35	.0043	9,881	91	8,234	76	7,411	68	6,999	64	6,176	46	5,764	37
		55	.0031	7,687	71	6,406	59	5,765	53	5,445	50	4,805	36	4,484	29
	0.3	12	.0094	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		18	.0087	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		24	.0079	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		35	.0071	9,881	91	8,234	76	7,411	68	6,999	64	6,176	46	5,764	37
		55	.0055	7,687	71	6,406	59	5,765	53	5,445	50	4,805	36	4,484	29
	0.5	18	.0138	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		24	.0114	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		35	.0094	9,881	91	8,234	76	7,411	68	6,999	64	6,176	46	5,764	37
		55	.0065	7,687	71	6,406	59	5,765	53	5,445	50	4,805	36	4,484	29
	1	18	.0157	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		24	.0138	10,985	112	9,154	93	8,239	84	7,781	79	6,866	56	6,408	46
		35	.0110	9,881	91	8,234	76	7,411	68	6,999	64	6,176	46	5,764	37
		55	.0079	7,687	71	6,406	59	5,765	53	5,445	50	4,805	36	4,484	29

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (5 or less)×(a_p)×(cutting depth ratio). When performing finishing cutting, calculate the theoretical cusp height and set accordingly.
※(4) Helical or sloped cutting is recommended for the approach method when engraving.
※(5) When L/D is 5 or greater:
①The recommended slope entrance angle when engraving is 1° or less. In addition, feed rate should be adjusted to 70% or less of the values in the cutting condition table.
②When slotting such engraving letters, adjust feed rate to 50% or less and ap to 30% or less of the values shown. In addition, cutting by reciprocal cutting is recommended.

【Cutting depth setting example】

When cutting rib groove contours in pre-hardened steel (40HRC) using an EPDRE2030-6-02-ATH tool:
Cutting depth = 0.1 (a_p) × 0.8 (cutting depth factor for Group 4 pre-hardened steel) × 0.8 (for closed-area cutting) = 0.064mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDRE-ATH

High efficiency cutting condition

High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A198.

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steel, Alloy steel (180~250HB)		Stainless steel, Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
0.2	0.02	0.5	.0006	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		1	.0004	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		2	.0003	50,000	10	42,000	8	37,800	8	36,700	7	36,700	7	36,700	7
	0.05	0.5	.0008	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		1	.0006	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10	50,000	10
		1.5	.0003	50,000	10	50,000	10	48,600	10	45,900	9	45,900	9	45,900	9
		2	.0003	50,000	10	42,000	8	37,800	8	36,700	7	36,700	7	36,700	7
0.3	0.02	1	.0006	50,000	30	50,000	20	50,000	20	50,000	20	50,000	10	50,000	10
		2	.0004	45,000	27	45,000	18	45,000	18	45,000	18	45,000	9	45,000	9
		3	.0003	40,000	16	35,000	14	35,000	14	35,000	14	30,000	6	30,000	6
	0.05	1	.0008	50,000	30	50,000	20	50,000	20	50,000	20	50,000	10	50,000	10
		1.5	.0006	50,000	30	50,000	20	45,000	18	45,000	18	45,000	9	45,000	9
		2	.0005	45,000	27	45,000	18	45,000	18	45,000	18	45,000	9	45,000	9
		2.5	.0004	40,000	24	40,000	16	40,000	16	40,000	16	40,000	8	40,000	8
		3	.0003	40,000	16	35,000	14	35,000	14	35,000	14	30,000	6	30,000	6
0.4	0.02	1	.0006	50,000	30	50,000	20	50,000	20	50,000	20	40,000	16	36,000	7
		2	.0005	45,000	27	45,000	18	45,000	18	45,000	18	36,000	14	34,000	7
		3	.0004	40,000	16	40,000	16	40,000	16	40,000	16	32,800	7	25,600	10
		4	.0003	30,000	12	30,000	12	30,000	12	30,000	12	21,600	4	19,200	8
	0.05	1	.0010	50,000	30	50,000	20	50,000	20	50,000	20	40,000	16	36,000	7
		1.5	.0008	50,000	30	50,000	20	50,000	20	50,000	20	40,000	16	36,000	7
		2	.0006	45,000	27	45,000	18	45,000	18	45,000	18	36,000	14	34,000	7
		2.5	.0006	40,500	24	40,500	16	40,500	16	40,500	16	33,400	13	30,600	6
		3	.0006	40,000	16	40,000	16	40,000	16	40,000	16	32,800	7	25,600	10
		3.5	.0005	36,000	14	36,000	14	36,000	14	36,000	14	29,400	6	22,920	9
		4	.0003	30,000	12	30,000	12	30,000	12	30,000	12	21,600	4	19,200	8
	0.1	1	.0013	50,000	30	50,000	20	50,000	20	50,000	20	40,000	16	36,000	7
		2	.0011	45,000	27	45,000	18	45,000	18	45,000	18	36,000	14	34,000	7
		3	.0006	40,000	16	40,000	16	40,000	16	40,000	16	32,800	7	25,600	10
		4	.0004	30,000	12	30,000	12	30,000	12	30,000	12	21,600	4	19,200	8
0.5	0.02	1	.0006	50,000	40	50,000	40	50,000	30	40,000	16	30,000	12	28,000	11
		2	.0005	50,000	40	50,000	40	50,000	30	40,000	16	30,000	12	28,000	11
		3	.0004	45,000	36	45,000	36	45,000	27	36,000	14	27,000	11	24,500	10
		4	.0003	40,000	32	40,000	32	40,000	24	32,000	13	24,000	10	20,000	8
		6	.0002	30,000	24	28,800	17	24,000	14	19,400	12	18,000	11	15,000	9
	0.05	1	.0012	50,000	40	50,000	40	50,000	30	40,000	16	30,000	12	28,000	11
		2	.0009	50,000	40	50,000	40	50,000	30	40,000	16	30,000	12	28,000	11
		3	.0007	45,000	36	45,000	36	45,000	27	36,000	14	27,000	11	24,500	10
		4	.0007	40,000	32	40,000	32	40,000	24	32,000	13	24,000	10	20,000	8
		5	.0004	30,000	24	28,800	23	24,000	14	19,400	12	18,000	11	15,000	9
		6	.0003	30,000	24	28,800	17	24,000	14	19,400	12	18,000	11	15,000	9
	0.1	1	.0014	50,000	40	50,000	40	50,000	30	40,000	16	30,000	12	28,000	11
		2	.0012	50,000	40	50,000	40	50,000	30	40,000	16	30,000	12	28,000	11
		3	.0008	45,000	36	45,000	36	45,000	27	36,000	14	27,000	11	24,500	10
		4	.0008	40,000	32	40,000	32	40,000	24	32,000	13	24,000	10	20,000	8
		5	.0005	30,000	24	28,800	23	24,000	14	19,400	12	18,000	11	15,000	9
		6	.0005	30,000	24	28,800	17	24,000	14	19,400	12	18,000	11	15,000	9
0.6	0.02	2	.0006	50,000	50	50,000	50	46,800	37	37,830	23	28,200	17	23,000	14
		4	.0005	40,000	40	40,000	32	34,500	28	27,800	17	23,600	9	21,000	8
		6	.0004	30,000	24	24,000	19	20,000	16	18,000	11	17,800	11	15,000	9
	0.05	2	.0011	50,000	50	50,000	50	46,800	37	37,830	23	28,200	17	23,000	14
		4	.0007	40,000	40	40,000	32	34,500	28	27,800	17	23,600	9	21,000	8
		6	.0005	30,000	24	24,000	19	20,000	16	18,000	11	17,800	11	15,000	9
		8	.0004	30,000	24	24,000	19	20,000	12	18,000	11	17,800	11	15,000	9
		10	.0003	30,000	24	24,000	19	20,000	12	18,000	11	17,800	7	15,000	9
	0.1	2	.0014	50,000	50	50,000	50	46,800	37	37,830	23	28,200	17	23,000	14
		4	.0009	40,000	40	40,000	32	34,500	28	27,800	17	23,600	9	21,000	8
		6	.0006	30,000	24	24,000	19	20,000	16	18,000	11	17,800	11	15,000	9
		8	.0005	30,000	24	24,000	19	20,000	12	18,000	11	17,800	11	15,000	9
		10	.0004	30,000	24	24,000	19	20,000	12	18,000	11	17,800	7	15,000	9
0.7	0.05	2	.0014	49,200	49	49,200	39	42,430	34	34,190	21	29,030	12	25,830	10
		4	.0009	40,000	40	40,000	32	34,500	28	27,800	17	23,600	9	21,000	8
		6	.0006	30,000	24	24,000	19	20,000	16	18,000	11	17,800	11	15,000	9
	0.1	2	.0017	49,200	49	49,200	39	42,430	34	34,190	21	29,030	12	25,830	10
		4	.0011	40,000	40	40,000	32	34,500	28	27,800	17	23,600	9	21,000	8
		6	.0007	30,000	24	24,000	19	20,000	16	18,000	11	17,800	11	15,000	9
0.8	0.02	2	.0009	50,000	60	48,000	58	36,000	36	28,000	28	20,000	16	20,000	16
		4	.0006	50,000	50	48,000	48	36,000	29	28,000	22	20,000	12	20,000	12
		6	.0005	40,000	40	38,700	31	26,000	21	25,000	20	18,000	11	18,000	11
	0.05	2	.0015	50,000	60	48,000	58	36,000	36	28,000	28	20,000	16	20,000	16
		4	.0010	50,000	50	48,000	48	36,000	29	28,000	22	20,000	12	20,000	12
		6	.0006	40,000	40	38,700	31	26,000	21	25,000	20	18,000	11	18,000	11
		8	.0005	30,000	30	29,025	23	20,800	17	20,000	16	16,200	10	16,200	10
		12	.0004	30,000	24	29,025	23	20,800	17	20,000	12	16,200	10	16,200	10

【Note】 Upon usage, please refer to comments and notes below table on page A207.

Epoch Deep Radius Evolution

EPDRE-ATH | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A198.

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
0.8	0.1	2	.0019	50,000	60	48,000	58	36,000	36	28,000	28	20,000	16	20,000	16
		4	.0013	50,000	50	48,000	48	36,000	29	28,000	22	20,000	12	20,000	12
		6	.0007	40,000	40	38,700	31	26,000	21	25,000	20	18,000	11	18,000	11
		8	.0006	30,000	30	29,025	23	20,800	17	20,000	16	16,200	10	16,200	10
		12	.0005	30,000	24	29,025	23	20,800	17	20,000	12	16,200	10	16,200	10
	0.2	2	.0032	50,000	60	48,000	58	36,000	36	28,000	28	20,000	16	20,000	16
		4	.0022	50,000	50	48,000	48	36,000	29	28,000	22	20,000	12	20,000	12
		6	.0013	40,000	40	38,700	31	26,000	21	25,000	20	18,000	11	18,000	11
		8	.0007	30,000	30	29,025	23	20,800	17	20,000	16	16,200	10	16,200	10
		12	.0006	30,000	24	29,025	23	20,800	17	20,000	12	16,200	10	16,200	10
1	0.02	2	.0006	42,675	77	35,668	64	32,076	58	30,294	48	26,730	37	24,948	30
		4	.0005	38,880	62	32,400	52	29,160	47	27,540	39	24,300	34	22,680	27
		6	.0004	31,493	44	26,244	37	23,620	33	22,307	31	19,683	28	18,371	22
		8	.0003	27,994	39	23,328	33	20,995	29	19,829	28	17,496	24	16,330	20
		10	.0002	21,773	35	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		12	.0002	21,773	30	18,144	25	16,330	23	15,422	19	13,608	16	12,701	13
	0.05	2	.0018	42,675	77	35,668	64	32,076	58	30,254	48	26,730	37	24,948	30
		3	.0014	40,796	65	34,020	54	30,618	49	30,294	48	25,515	36	23,814	29
		4	.0011	38,880	62	32,400	52	29,160	47	28,917	46	24,300	34	22,680	27
		5	.0008	34,713	56	28,868	46	25,982	42	27,540	39	21,651	30	20,208	24
		6	.0007	31,493	44	26,244	37	23,620	33	24,538	34	19,683	28	18,371	22
		8	.0006	27,994	39	23,328	33	20,995	29	19,829	28	17,496	24	16,330	20
		10	.0004	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		12	.0004	21,773	30	18,144	25	16,330	23	15,422	19	13,608	16	12,701	13
		16	.0002	21,773	26	18,144	22	16,330	20	15,422	15	13,608	14	12,701	10
		20	.0002	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
	0.1	2	.0026	42,675	77	35,668	64	32,076	58	30,294	48	26,730	37	24,948	30
		3	.0020	40,796	65	34,020	54	30,618	49	28,917	46	25,515	36	23,814	29
		4	.0015	38,880	62	32,400	52	29,160	47	27,540	39	24,300	34	22,680	27
		5	.0012	34,713	56	28,868	46	25,982	42	24,538	34	21,651	30	20,208	24
		6	.0009	31,493	44	26,244	37	23,620	33	22,307	31	19,683	28	18,371	22
		8	.0009	27,994	39	23,328	33	20,995	29	19,829	28	17,496	24	16,330	20
		10	.0006	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		12	.0006	21,773	30	18,144	25	16,330	23	15,422	19	13,608	16	12,701	13
		16	.0004	21,773	26	18,144	22	16,330	20	15,422	15	13,608	14	12,701	10
		20	.0002	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
	0.2	2	.0043	42,675	77	35,668	64	32,076	58	30,294	48	26,730	37	24,948	30
		3	.0035	40,796	65	34,020	54	30,618	49	28,917	46	25,515	36	23,814	29
		4	.0028	38,880	62	32,400	52	29,160	47	27,540	39	24,300	34	22,680	27
		5	.0020	34,713	56	28,868	46	25,982	42	24,538	34	21,651	30	20,208	24
		6	.0016	31,493	44	26,244	37	23,620	33	22,307	31	19,683	28	18,371	22
		8	.0016	27,994	39	23,328	33	20,995	29	19,829	28	17,496	24	16,330	20
		10	.0010	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		12	.0010	21,773	30	18,144	25	16,330	23	15,422	19	13,608	16	12,701	13
		16	.0006	21,773	26	18,144	22	16,330	20	15,422	15	13,608	14	12,701	10
		20	.0004	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
	0.3	2	.0043	42,675	77	35,668	64	32,076	58	30,294	48	26,730	37	24,948	30
		3	.0035	40,796	65	34,020	54	30,618	49	28,917	46	25,515	36	23,814	29
		4	.0028	38,880	62	32,400	52	29,160	47	27,540	39	24,300	34	22,680	27
		5	.0020	34,713	56	28,868	46	25,982	42	24,538	34	21,651	30	20,208	24
		6	.0016	31,493	44	26,244	37	23,620	33	22,307	31	19,683	28	18,371	22
		8	.0016	27,994	39	23,328	33	20,995	29	19,829	28	17,496	24	16,330	20
		10	.0010	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		12	.0010	21,773	30	18,144	25	16,330	23	15,422	19	13,608	16	12,701	13
		16	.0006	21,773	26	18,144	22	16,330	20	15,422	15	13,608	14	12,701	10
		20	.0004	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
1.25	0.1	5	.0012	34,713	56	28,868	46	25,982	42	24,538	34	21,651	30	20,208	24
		10	.0006	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		15	.0004	21,773	26	18,144	22	16,330	23	15,422	19	13,608	14	12,701	10
		20	.0002	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
	0.2	5	.0020	34,713	56	28,868	46	25,982	42	24,538	34	21,651	30	20,208	24
		10	.0010	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		15	.0006	21,773	26	18,144	22	16,330	23	15,422	19	13,608	14	12,701	10
		20	.0004	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
	0.3	5	.0020	34,713	56	28,868	46	25,982	42	24,538	34	21,651	30	20,208	24
		10	.0010	24,494	34	20,412	29	18,371	26	17,350	24	15,309	21	14,288	17
		15	.0006	21,773	26	18,144	22	16,330	23	15,422	19	13,608	14	12,701	10
		20	.0004	16,330	20	13,608	16	12,247	15	11,567	12	10,206	10	9,526	8
1.5	0.1	4	.0017	29,938	54	24,930	45	22,453	40	20,956	38	18,711	30	17,364	24
		6	.0016	28,450	51	23,779	43	21,443	39	20,382	37	17,834	29	16,560	23
		8	.0014	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		12	.0014	21,773	39	18,144	33	16,330	29	15,422	28	13,608	22	12,701	18
		15	.0009	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0007	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
1.5	0.2	4	.0028	29,938	54	24,930	45	22,453	40	20,956	34	18,711	26	17,364	21
		6	.0026	28,450	51	23,779	43	21,443	39	20,382	37	17,834	29	16,560	23
		8	.0024	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		12	.0024	21,773	39	18,144	33	16,330	29	15,422	28	13,608	22	12,701	18
		15	.0015	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0012	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
	0.3	4	.0028	29,938	54	24,930	45	22,453	40	20,956	34	18,711	26	17,364	21
		6	.0026	28,450	51	23,779	43	21,443	39	20,382	37	17,834	29	16,560	23
		8	.0024	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		12	.0024	21,773	39	18,144	33	16,330	29	15,422	28	13,608	22	12,701	18
		15	.0015	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0012	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
	0.5	4	.0033	29,938	54	24,930	45	22,453	40	20,956	34	18,711	26	17,364	21
		6	.0031	28,450	51	23,779	43	21,443	39	20,382	37	17,834	29	16,560	23
		8	.0028	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		12	.0026	21,773	39	18,144	33	16,330	29	15,422	28	13,608	22	12,701	18
		15	.0018	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0014	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
1.75	0.1	5	.0016	29,938	54	24,930	45	22,453	40	20,956	34	18,711	26	17,364	21
		10	.0014	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		15	.0009	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0007	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
	0.2	5	.0026	29,938	54	24,930	45	22,453	40	20,956	34	18,711	26	17,364	21
		10	.0024	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		15	.0015	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0012	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
	0.3	5	.0026	29,938	54	24,930	45	22,453	40	20,956	34	18,711	26	17,364	21
		10	.0024	27,216	49	22,680	41	20,412	37	19,278	35	17,010	27	15,876	22
		15	.0015	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
		20	.0012	16,934	27	14,112	23	12,701	20	11,995	17	10,584	15	9,878	12
2	0.1	4	.0031	26,114	78	21,974	66	19,745	59	18,471	55	16,401	39	15,286	34
		6	.0028	24,948	75	20,790	62	18,711	56	17,672	53	15,593	37	14,553	32
		8	.0022	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		12	.0012	18,371	51	15,309	43	13,778	39	13,013	36	11,482	28	10,716	24
		16	.0012	16,330	46	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		20	.0010	14,288	40	11,907	33	10,716	30	10,121	28	8,930	21	8,335	18
		25	.0006	14,288	37	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
		30	.0004	13,574	35	11,312	29	10,180	26	9,615	25	8,484	19	7,918	16
	0.2	4	.0039	26,114	78	21,974	66	19,745	59	18,471	55	16,401	39	15,286	34
		6	.0031	24,948	75	20,790	62	18,711	56	17,672	53	15,593	37	14,553	32
		8	.0028	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		12	.0016	18,371	51	15,309	43	13,778	39	13,013	36	11,482	28	10,716	24
		16	.0016	16,330	46	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		20	.0014	14,288	40	11,907	33	10,716	30	10,121	28	8,930	21	8,335	18
		25	.0010	14,288	37	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
		30	.0007	13,574	35	11,312	29	10,180	26	9,615	25	8,484	19	7,918	16
	0.3	4	.0051	26,114	78	21,974	66	19,745	59	18,471	55	16,401	39	15,286	34
		6	.0043	24,948	75	20,790	62	18,711	56	17,672	53	15,593	37	14,553	32
		8	.0035	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		12	.0024	18,371	55	15,309	43	13,778	39	13,013	36	11,482	28	10,716	24
		16	.0024	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		20	.0015	14,288	43	11,907	33	10,716	30	10,121	28	8,930	21	8,335	18
		25	.0012	14,288	37	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
		30	.0008	13,574	35	11,312	29	10,180	26	9,615	25	8,484	19	7,918	16
	0.5	6	.0067	24,948	75	20,790	62	18,711	56	17,672	53	15,593	37	14,553	32
		8	.0055	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		12	.0031	18,371	55	15,309	43	13,778	39	13,013	39	11,482	28	10,716	24
		16	.0031	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		20	.0020	14,288	43	11,907	33	10,716	30	10,121	28	8,930	21	8,335	18
		25	.0020	14,288	37	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
		30	.0012	13,574	35	11,312	29	10,180	26	9,615	25	8,484	19	7,918	16
	0.8	6	.0087	24,948	75	20,790	62	18,711	56	17,672	53	15,593	37	14,553	32
		8	.0079	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		12	.0051	18,371	55	15,309	43	13,778	39	13,013	36	11,482	28	10,716	24
		16	.0039	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		20	.0024	14,288	43	11,907	33	10,716	30	10,121	28	8,930	21	8,335	18
		25	.0022	14,288	37	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
		30	.0018	13,574	35	11,312	29	10,180	26	9,615	25	8,484	19	7,918	16

【Note】 Upon usage, please refer to comments and notes below table on page A207.

Epoch Deep Radius Evolution

EPDRE-ATH | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A198.

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (inch)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
2.5	0.1	10	.0022	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		20	.0012	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		30	.0006	14,288	40	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
	0.2	10	.0028	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		20	.0016	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		30	.0010	14,288	40	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
	0.3	10	.0035	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		20	.0024	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		30	.0012	14,288	40	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
	0.5	10	.0055	22,680	68	18,900	57	17,010	51	16,065	48	14,175	34	13,230	29
		20	.0031	16,330	49	13,608	38	12,247	34	11,567	32	10,206	24	9,526	21
		30	.0020	14,288	40	11,907	31	10,716	28	10,121	26	8,930	20	8,335	17
3	0.1	6	.0031	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		8	.0028	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		12	.0020	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		16	.0014	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		18	.0014	15,498	59	12,951	49	11,677	44	10,934	42	9,766	29	9,023	25
		20	.0014	13,997	53	11,664	44	10,498	40	9,914	38	8,748	26	8,165	23
		30	.0011	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
		35	.0008	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
	0.2	6	.0039	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		8	.0035	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		12	.0028	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		16	.0020	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		18	.0020	15,498	59	12,951	49	11,677	44	10,934	42	9,766	29	9,023	25
		20	.0020	13,997	53	11,664	44	10,498	40	9,914	38	8,748	26	8,165	23
		30	.0016	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
		35	.0014	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
	0.3	6	.0057	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		8	.0051	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		12	.0039	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		16	.0030	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		18	.0030	15,498	59	12,951	49	11,677	44	10,934	42	9,766	29	9,023	25
		20	.0030	13,997	53	11,664	44	10,498	40	9,914	38	8,748	26	8,165	23
		30	.0024	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
		35	.0020	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
	0.5	8	.0071	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		12	.0051	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		16	.0039	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		18	.0039	15,498	59	12,951	49	11,677	44	10,934	42	9,766	29	9,023	25
		20	.0039	13,997	53	11,664	44	10,498	40	9,914	38	8,748	26	8,165	23
		30	.0031	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
		35	.0026	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
	1	8	.0079	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		12	.0059	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		16	.0047	17,280	66	14,400	55	12,960	49	12,240	47	10,800	32	10,080	28
		18	.0043	15,498	59	12,951	49	11,677	44	10,934	42	9,766	29	9,023	25
		20	.0043	13,997	53	11,664	44	10,498	40	9,914	38	8,748	26	8,165	23
		30	.0035	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
		35	.0030	10,886	37	9,072	31	8,165	28	7,711	26	6,804	19	6,350	15
4	0.1	8	.0031	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		12	.0026	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		16	.0024	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		20	.0022	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		30	.0018	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		35	.0016	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		45	.0012	9,888	51	8,240	43	7,324	38	5,584	29	4,944	21	4,119	14
	0.2	8	.0063	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		12	.0055	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		16	.0051	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		20	.0043	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		30	.0039	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		35	.0031	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		45	.0024	9,888	51	8,240	43	7,324	38	5,584	29	4,944	21	4,119	14
	0.3	8	.0094	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		12	.0087	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		16	.0079	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		20	.0071	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		30	.0063	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		35	.0055	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		45	.0047	9,888	51	8,240	43	7,324	38	5,584	29	4,944	21	4,119	14

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (inch)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)	n (min⁻¹)	v_f (IPM)
4	0.5	12	.0138	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		16	.0098	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		20	.0079	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		30	.0059	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		35	.0039	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		45	.0020	9,888	51	8,240	43	7,324	38	5,584	29	4,944	21	4,119	14
	1	12	.0157	13,455	91	11,213	76	10,091	69	9,531	65	8,410	45	7,849	38
		16	.0114	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		20	.0091	12,360	84	10,255	70	9,155	62	8,697	59	7,599	41	6,684	32
		30	.0067	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		35	.0047	12,360	84	10,255	70	9,155	62	6,867	43	5,491	27	5,124	23
		45	.0024	9,888	51	8,240	43	7,324	38	5,584	29	4,944	21	4,119	14
5	0.1	20	.0031	10,985	94	9,154	79	8,239	71	7,781	67	6,866	47	6,408	38
		40	.0024	7,907	60	6,590	50	5,931	45	5,602	43	4,943	31	4,613	25
	0.2	20	.0063	10,985	94	9,154	79	8,239	71	7,781	67	6,866	47	6,408	38
		40	.0051	7,907	60	6,590	50	5,931	45	5,602	43	4,943	31	4,613	25
	0.3	20	.0094	10,985	94	9,154	79	8,239	71	7,781	67	6,866	47	6,408	38
		40	.0079	7,907	60	6,590	50	5,931	45	5,602	43	4,943	31	4,613	25
	0.5	20	.0138	10,985	94	9,154	79	8,239	71	7,781	67	6,866	47	6,408	38
		40	.0053	7,907	60	6,590	50	5,931	45	5,602	43	4,943	31	4,613	25
	1	20	.0157	10,985	94	9,154	79	8,239	71	7,781	67	6,866	47	6,408	38
		40	.0059	7,907	60	6,590	50	5,931	45	5,602	43	4,943	31	4,613	25
6	0.1	12	.0031	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		18	.0026	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		24	.0024	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		35	.0020	7,783	72	6,486	60	5,837	54	5,513	51	4,865	36	4,540	29
		55	.0016	6,590	50	5,491	42	4,943	38	4,668	35	4,118	25	3,844	20
	0.2	12	.0063	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		18	.0055	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		24	.0051	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		35	.0043	7,783	72	6,486	60	5,837	54	5,513	51	4,865	36	4,540	29
		55	.0031	6,590	50	5,491	42	4,943	38	4,668	35	4,118	25	3,844	20
	0.3	12	.0094	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		18	.0087	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		24	.0079	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		35	.0071	7,783	72	6,486	60	5,837	54	5,513	51	4,865	36	4,540	29
		55	.0055	6,590	50	5,491	42	4,943	38	4,668	35	4,118	25	3,844	20
	0.5	18	.0138	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		24	.0114	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		35	.0094	7,783	72	6,486	60	5,837	54	5,513	51	4,865	36	4,540	29
		55	.0065	6,590	50	5,491	42	4,943	38	4,668	35	4,118	25	3,844	20
	1	18	.0157	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		24	.0138	9,156	93	7,630	78	6,868	70	6,486	66	5,722	47	5,342	38
		35	.0110	7,783	72	6,486	60	5,837	54	5,513	51	4,865	36	4,540	29
		55	.0079	6,590	50	5,491	42	4,943	38	4,668	35	4,118	25	3,844	20

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (5 or less)×(a_p)×(cutting depth ratio). When performing finishing cutting, calculate the theoretical cusp height and set accordingly.
※(4) Helical or sloped cutting is recommended for the approach method when engraving.
※(5) When L/D is 5 or greater:
①The recommended slope entrance angle when engraving is 1° or less. In addition, feed rate should be adjusted to 70% or less of the values in the cutting condition table.
②When slotting such engraving letters, adjust feed rate to 50% or less and ap to 30% or less of the values shown. In addition, cutting by reciprocal cutting is recommended.

【Cutting depth setting example】

When cutting rib groove contours in pre-hardened steel (40HRC) using an EPDRE2030-6-02-ATH tool:
Cutting depth = 0.1 (a_p) × 0.8 (cutting depth factor for Group 4 pre-hardened steel) × 0.8 (for closed-area cutting) = 0.064mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Radius Evolution

Recommended cutting conditions

EPDRE-ATH

High efficiency cuttiing condition | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A213.

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steel, Alloy steel (180~250HB)		Stainless steel, Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
0.2	0.02	0.5	0.016	50,000	922	50,000	922	45,000	829	42,500	705	37,500	553	35,000	452
		1	0.011	50,000	922	50,000	922	45,000	829	42,500	705	37,500	553	35,000	452
		2	0.007	50,000	809	42,000	774	40,500	746	38,250	635	33,750	498	31,500	406
	0.05	0.5	0.02	50,000	922	50,000	922	45,000	829	42,500	705	37,500	553	35,000	452
		1	0.014	50,000	922	50,000	922	45,000	829	42,500	705	37,500	553	35,000	452
		1.5	0.008	50,000	809	47,000	866	42,750	788	40,375	670	35,625	525	33,250	429
		2	0.008	50,000	809	42,000	774	40,500	746	38,250	635	33,750	498	31,500	406
0.3	0.02	1	0.016	50,000	1,208	48,000	1,161	43,200	1,045	40,800	733	36,000	547	33,600	441
		2	0.011	45,000	998	38,880	860	34,992	774	33,048	594	29,160	443	27,216	357
		3	0.007	42,750	881	36,936	760	33,242	684	31,396	525	27,702	392	25,855	316
	0.05	1	0.021	50,000	1,208	48,000	1,161	43,200	1,045	40,800	733	36,000	547	33,600	441
		1.5	0.016	47,500	1,147	45,600	1,103	41,040	993	38,760	697	34,200	520	31,920	419
		2	0.012	45,000	998	38,880	860	34,992	774	33,048	594	29,160	443	27,216	357
		2.5	0.01	45,000	998	38,880	860	34,992	774	33,048	594	29,160	443	27,216	357
		3	0.008	42,750	881	36,936	760	33,242	684	31,396	525	27,702	392	25,855	316
0.4	0.02	1	0.016	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		2	0.013	46,080	1,115	38,300	929	34,560	836	32,256	714	28,800	557	26,726	457
		3	0.01	35,250	780	29,325	649	26,437	585	24,675	499	22,031	390	20,445	320
		4	0.007	29,029	642	24,150	535	21,772	481	20,320	411	18,143	321	16,837	263
	0.05	1	0.025	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		1.5	0.02	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		2	0.016	46,080	1,115	38,300	929	34,560	836	32,256	714	28,800	557	26,726	457
		2.5	0.015	43,200	1,062	36,000	885	32,400	796	30,600	677	27,000	531	25,200	434
		3	0.014	35,250	780	29,325	649	26,437	585	24,675	499	22,031	390	20,445	320
		3.5	0.012	33,048	731	27,540	609	24,786	548	23,409	467	20,655	365	19,278	299
		4	0.008	29,029	642	24,150	535	21,772	481	20,320	411	18,143	321	16,837	263
	0.1	1	0.033	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		2	0.028	46,080	1,115	38,300	929	34,560	836	32,256	714	28,800	557	26,726	457
		3	0.016	35,250	780	29,325	649	26,437	585	24,675	499	22,031	390	20,445	320
		4	0.01	29,029	642	24,150	535	21,772	481	20,320	411	18,143	321	16,837	263
0.5	0.02	1	0.016	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		2	0.013	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		3	0.01	37,325	1,000	31,104	839	27,994	750	26,438	634	23,328	473	21,773	381
		4	0.008	33,178	889	27,648	746	24,883	666	23,501	563	20,736	420	19,354	339
		6	0.006	25,805	666	21,504	555	19,354	499	18,278	320	16,128	282	15,053	222
	0.05	1	0.03	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		2	0.023	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		3	0.017	37,325	1,000	31,104	839	27,994	750	26,438	634	23,328	473	21,773	381
		4	0.017	33,178	889	27,648	746	24,883	666	23,501	563	20,736	420	19,354	339
		5	0.011	29,030	778	24,192	653	21,773	583	20,563	493	18,144	368	16,934	297
		6	0.008	25,805	666	21,504	555	19,354	499	18,278	320	16,128	282	15,053	222
	0.1	1	0.035	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		2	0.03	46,080	1,239	38,300	1,032	34,560	929	32,256	793	28,800	620	26,726	508
		3	0.02	37,325	1,000	31,104	839	27,994	750	26,438	634	23,328	473	21,773	381
		4	0.02	33,178	889	27,648	746	24,883	666	23,501	563	20,736	420	19,354	339
		5	0.013	29,030	778	24,192	653	21,773	583	20,563	493	18,144	368	16,934	297
		6	0.013	25,805	666	21,504	555	19,354	499	18,278	320	16,128	282	15,053	222
0.6	0.02	2	0.016	46,080	1,751	38,300	1,455	34,560	1,313	32,256	991	28,800	774	26,726	635
		4	0.013	37,325	1,376	31,104	1,147	27,994	1,032	26,438	792	23,328	591	21,773	477
		6	0.01	29,030	1,070	24,192	892	21,773	803	20,563	616	18,144	460	16,934	371
	0.05	2	0.028	46,080	1,751	38,300	1,455	34,560	1,313	32,256	991	28,800	774	26,726	635
		4	0.019	37,325	1,376	31,104	1,147	27,994	1,032	26,438	792	23,328	591	21,773	477
		6	0.012	29,030	1,070	24,192	892	21,773	803	20,563	616	18,144	460	16,934	371
		8	0.01	27,579	1,017	22,982	847	20,684	763	19,535	585	17,237	437	16,088	352
		10	0.007	24,676	814	20,563	678	18,507	610	17,479	489	15,422	355	14,394	287
	0.1	2	0.035	46,080	1,751	38,300	1,455	34,560	1,313	32,256	991	28,800	774	26,726	635
		4	0.024	37,325	1,376	31,104	1,147	27,994	1,032	26,438	792	23,328	591	21,773	477
		6	0.015	29,030	1,070	24,192	892	21,773	803	20,563	616	18,144	460	16,934	371
		8	0.013	27,579	1,017	22,982	847	20,684	763	19,535	585	17,237	437	16,088	352
		10	0.009	24,676	814	20,563	678	18,507	610	17,479	489	15,422	355	14,394	287
0.7	0.05	2	0.035	45,960	1,751	38,300	1,455	34,470	1,313	32,555	991	28,725	774	26,810	635
		4	0.024	37,325	1,376	31,104	1,147	27,994	1,032	26,438	792	23,328	591	21,773	477
		6	0.015	29,030	1,070	24,192	892	21,773	803	20,563	616	18,144	460	16,934	371
	0.1	2	0.042	45,960	1,751	38,300	1,455	34,470	1,313	32,555	991	28,725	774	26,810	635
		4	0.029	37,325	1,376	31,104	1,147	27,994	1,032	26,438	792	23,328	591	21,773	477
		6	0.018	29,030	1,070	24,192	892	21,773	803	20,563	616	18,144	460	16,934	371
0.8	0.02	2	0.016	48,000	2,211	40,000	1,843	36,000	1,658	34,000	1,410	30,000	1,106	28,000	903
		4	0.016	48,000	1,769	40,000	1,475	36,000	1,327	34,000	1,128	30,000	885	28,000	723
		6	0.013	36,720	1,218	30,600	1,015	27,540	914	26,010	863	22,950	677	21,420	553
	0.05	2	0.038	48,000	2,211	40,000	1,843	36,000	1,658	34,000	1,410	30,000	1,106	28,000	903
		4	0.026	48,000	1,769	40,000	1,475	36,000	1,327	34,000	1,128	30,000	885	28,000	723
		6	0.015	36,720	1,218	30,600	1,015	27,540	914	26,010	863	22,950	677	21,420	553
		8	0.012	29,376	906	24,480	755	22,032	680	20,808	642	18,360	504	17,136	411
		12	0.01	26,438	759	22,032	632	19,829	569	18,727	537	16,524	421	15,422	344

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
0.8	0.1	2	0.047	48,000	2,211	40,000	1,843	36,000	1,658	34,000	1,410	30,000	1,106	28,000	903
		4	0.032	48,000	1,769	40,000	1,475	36,000	1,327	34,000	1,128	30,000	885	28,000	723
		6	0.019	36,720	1,218	30,600	1,015	27,540	914	26,010	863	22,950	677	21,420	553
		8	0.015	29,376	906	24,480	755	22,032	680	20,808	642	18,360	504	17,136	411
		12	0.012	26,438	759	22,032	632	19,829	569	18,727	537	16,524	421	15,422	344
	0.2	2	0.081	48,000	2,211	40,000	1,843	36,000	1,658	34,000	1,410	30,000	1,106	28,000	903
		4	0.056	48,000	1,769	40,000	1,475	36,000	1,327	34,000	1,128	30,000	885	28,000	723
		6	0.032	36,720	1,218	30,600	1,015	27,540	914	26,010	863	22,950	677	21,420	553
		8	0.018	29,376	906	24,480	755	22,032	680	20,808	642	18,360	504	17,136	411
		12	0.015	26,438	759	22,032	632	19,829	569	18,727	537	16,524	421	15,422	344
1	0.02	2	0.016	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		4	0.013	43,200	2,588	36,000	2,157	32,400	1,941	30,600	1,650	27,000	1,294	25,200	1,057
		6	0.01	34,992	1,887	29,160	1,572	29,299	1,757	24,786	1,336	21,870	1,048	20,412	856
		8	0.008	31,104	1,677	25,920	1,397	26,244	1,415	22,032	1,188	19,440	932	18,144	761
		10	0.006	27,216	1,467	22,680	1,223	23,328	1,258	19,278	1,039	17,010	815	15,876	666
		12	0.005	24,192	1,159	20,160	966	20,412	1,100	17,136	719	15,120	634	14,112	507
	0.05	2	0.046	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		3	0.035	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		4	0.027	43,200	2,588	36,000	2,157	32,400	1,941	30,600	1,650	27,000	1,294	25,200	1,057
		5	0.021	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		6	0.017	34,992	1,887	29,160	1,572	26,244	1,415	24,786	1,336	21,870	1,048	20,412	856
		8	0.016	31,104	1,677	25,920	1,397	23,328	1,258	22,032	1,188	19,440	932	18,144	761
		10	0.011	27,216	1,467	22,680	1,223	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		12	0.01	24,192	1,159	20,160	966	18,144	870	17,136	719	15,120	634	14,112	507
		16	0.006	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.004	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
	0.1	2	0.065	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		3	0.05	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		4	0.038	43,200	2,588	36,000	2,157	32,400	1,941	30,600	1,650	27,000	1,294	25,200	1,057
		5	0.03	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		6	0.024	34,992	1,887	29,160	1,572	26,244	1,415	24,786	1,336	21,870	1,048	20,412	856
		8	0.024	31,104	1,677	25,920	1,397	23,328	1,258	22,032	1,188	19,440	932	18,144	761
		10	0.015	27,216	1,467	22,680	1,223	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		12	0.015	24,192	1,159	20,160	966	18,144	870	17,136	719	15,120	634	14,112	507
		16	0.009	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.006	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
	0.2	2	0.11	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		3	0.09	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		4	0.07	43,200	2,588	36,000	2,157	32,400	1,941	30,600	1,650	27,000	1,294	25,200	1,057
		5	0.05	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		6	0.04	34,992	1,887	29,160	1,572	26,244	1,415	24,786	1,336	21,870	1,048	20,412	856
		8	0.04	31,104	1,677	25,920	1,397	23,328	1,258	22,032	1,188	19,440	932	18,144	761
		10	0.025	27,216	1,467	22,680	1,223	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		12	0.025	24,192	1,159	20,160	966	18,144	870	17,136	719	15,120	634	14,112	507
		16	0.015	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.01	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
	0.3	2	0.11	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		3	0.09	47,770	2,866	39,490	2,369	35,668	2,140	33,439	1,805	29,617	1,421	27,707	1,163
		4	0.07	43,200	2,588	36,000	2,157	32,400	1,941	30,600	1,650	27,000	1,294	25,200	1,057
		5	0.05	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		6	0.04	34,992	1,887	29,160	1,572	26,244	1,415	24,786	1,336	21,870	1,048	20,412	856
		8	0.04	31,104	1,677	25,920	1,397	23,328	1,258	22,032	1,188	19,440	932	18,144	761
		10	0.025	27,216	1,467	22,680	1,223	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		12	0.025	24,192	1,159	20,160	966	18,144	870	17,136	719	15,120	634	14,112	507
		16	0.015	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.01	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
1.25	0.1	5	0.03	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		10	0.015	27,216	1,467	25,920	1,397	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		15	0.01	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.006	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
	0.2	5	0.05	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		10	0.025	27,216	1,467	25,920	1,397	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		15	0.016	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.01	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
	0.3	5	0.05	39,808	2,388	31,847	1,910	29,299	1,757	27,707	1,496	24,522	1,177	22,929	963
		10	0.025	27,216	1,467	25,920	1,397	20,412	1,100	19,278	1,039	17,010	815	15,876	666
		15	0.016	24,192	1,014	20,160	845	18,144	761	17,136	667	15,120	543	14,112	423
		20	0.01	18,144	761	15,120	634	13,608	571	12,852	500	11,340	408	10,584	317
1.5	0.1	4	0.042	33,264	2,153	27,700	1,793	24,948	1,614	23,285	1,378	20,790	1,076	19,293	883
		6	0.04	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		8	0.036	30,240	1,956	25,200	1,630	22,680	1,467	21,420	1,268	18,900	979	17,640	807
		12	0.036	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.023	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.018	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428

【Note】 Upon usage, please refer to comments and notes below table on page A212.

Epoch Deep Radius Evolution

EPDRE-ATH | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A213.

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
1.5	0.2	4	0.07	33,264	2,153	27,700	1,793	24,948	1,614	23,285	1,378	20,790	1,076	19,293	883
		6	0.065	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		8	0.06	30,240	1,956	25,200	1,630	22,680	1,467	21,420	1,268	18,900	979	17,640	807
		12	0.06	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.038	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.03	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428
	0.3	4	0.07	33,264	2,153	27,700	1,793	24,948	1,614	23,285	1,378	20,790	1,076	19,293	883
		6	0.065	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		8	0.06	30,240	1,956	25,200	1,630	22,680	1,467	21,420	1,268	18,900	979	17,640	807
		12	0.06	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.038	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.03	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428
	0.5	4	0.085	33,264	2,153	27,700	1,793	24,948	1,614	23,285	1,378	20,790	1,076	19,293	883
		6	0.08	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		8	0.07	30,240	1,956	25,200	1,630	22,680	1,467	21,420	1,268	18,900	979	17,640	807
		12	0.065	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.045	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.035	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428
1.75	0.1	5	0.04	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		10	0.036	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.023	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.018	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428
	0.2	5	0.065	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		10	0.06	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.038	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.03	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428
	0.3	5	0.065	31,847	2,057	26,539	1,714	23,779	1,536	22,505	1,332	19,957	1,033	18,471	845
		10	0.06	24,192	1,565	20,160	1,304	18,144	1,174	17,136	1,014	15,120	783	14,112	646
		15	0.038	18,816	1,082	15,680	902	14,112	812	13,328	671	11,760	592	10,976	473
		20	0.03	18,816	978	15,680	815	14,112	733	13,328	613	11,760	540	10,976	428
2	0.1	4	0.08	28,662	3,221	24,203	2,720	21,815	2,452	20,541	2,308	18,152	1,630	17,038	1,339
		6	0.07	27,720	3,114	23,100	2,595	20,790	2,335	19,635	2,205	17,325	1,557	16,170	1,271
		8	0.055	25,200	2,830	21,000	2,359	18,900	2,123	17,850	2,005	15,750	1,415	14,700	1,156
		12	0.03	20,412	2,063	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		16	0.03	18,144	1,834	15,120	1,528	13,608	1,376	12,852	1,299	11,340	1,019	10,584	832
		20	0.025	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		25	0.015	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.01	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.2	4	0.1	28,662	3,221	24,203	2,720	21,815	2,452	20,541	2,308	18,152	1,630	17,038	1,339
		6	0.08	27,720	3,114	23,100	2,595	20,790	2,335	19,635	2,205	17,325	1,557	16,170	1,271
		8	0.07	25,200	2,830	21,000	2,359	18,900	2,123	17,850	2,005	15,750	1,415	14,700	1,156
		12	0.04	20,412	2,063	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		16	0.04	18,144	1,834	15,120	1,528	13,608	1,376	12,852	1,299	11,340	1,019	10,584	832
		20	0.035	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		25	0.025	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.017	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.3	4	0.13	28,662	3,221	24,203	2,720	21,815	2,452	20,541	2,308	18,152	1,630	17,038	1,339
		6	0.11	27,720	3,114	23,100	2,595	20,790	2,335	19,635	2,205	17,325	1,557	16,170	1,271
		8	0.09	25,200	2,830	21,000	2,359	18,900	2,123	17,850	2,005	15,750	1,415	14,700	1,156
		12	0.06	20,412	2,063	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		16	0.06	18,144	1,834	15,120	1,528	13,608	1,376	12,852	1,299	11,340	1,019	10,584	832
		20	0.037	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		25	0.03	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.021	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.5	6	0.17	27,720	3,114	23,100	2,595	20,790	2,335	19,635	2,205	17,325	1,557	16,170	1,271
		8	0.14	25,200	2,830	21,000	2,359	18,900	2,123	17,850	2,005	15,750	1,415	14,700	1,156
		12	0.08	20,412	2,063	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		16	0.08	18,144	1,834	15,120	1,528	13,608	1,376	12,852	1,299	11,340	1,019	10,584	832
		20	0.05	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		25	0.05	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.03	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.8	6	0.22	27,720	3,114	23,100	2,595	20,790	2,335	19,635	2,205	17,325	1,557	16,170	1,271
		8	0.2	25,200	2,830	21,000	2,359	18,900	2,123	17,850	2,005	15,750	1,415	14,700	1,156
		12	0.13	20,412	2,063	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		16	0.1	18,144	1,834	15,120	1,528	13,608	1,376	12,852	1,299	11,340	1,019	10,584	832
		20	0.06	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		25	0.057	15,876	1,605	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.045	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
2.5	0.1	10	0.05	20,412	2,293	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		20	0.03	15,876	1,783	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.015	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.2	10	0.07	20,412	2,293	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		20	0.04	15,876	1,783	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.025	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.3	10	0.09	20,412	2,293	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		20	0.06	15,876	1,783	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.03	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
	0.5	10	0.12	20,412	2,293	17,010	1,720	15,309	1,548	14,459	1,462	12,758	1,146	11,907	936
		20	0.08	15,876	1,783	13,230	1,337	11,907	1,204	11,246	1,137	9,923	801	9,261	653
		30	0.05	15,082	1,525	12,569	1,271	11,312	1,143	10,683	1,080	9,426	761	8,798	621
3	0.1	6	0.08	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		8	0.07	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		12	0.05	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		16	0.035	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		18	0.035	16,985	2,384	14,331	2,012	12,738	1,788	12,208	1,714	10,615	1,193	10,084	992
		20	0.035	15,552	2,184	12,960	1,820	11,664	1,638	11,016	1,547	9,720	1,092	9,072	892
		30	0.027	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
		35	0.02	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
	0.2	6	0.1	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		8	0.09	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		12	0.07	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		16	0.05	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		18	0.05	16,985	2,384	14,331	2,012	12,738	1,788	12,208	1,714	10,615	1,193	10,084	992
		20	0.05	15,552	2,184	12,960	1,820	11,664	1,638	11,016	1,547	9,720	1,092	9,072	892
		30	0.04	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
		35	0.035	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
	0.3	6	0.145	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		8	0.13	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		12	0.1	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		16	0.075	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		18	0.075	16,985	2,384	14,331	2,012	12,738	1,788	12,208	1,714	10,615	1,193	10,084	992
		20	0.075	15,552	2,184	12,960	1,820	11,664	1,638	11,016	1,547	9,720	1,092	9,072	892
		30	0.06	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
		35	0.05	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
	0.5	8	0.18	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		12	0.13	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		16	0.1	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		18	0.1	16,985	2,384	14,331	2,012	12,738	1,788	13,600	1,909	10,615	1,193	10,084	992
		20	0.1	15,552	2,184	12,960	1,820	11,664	1,638	11,016	1,547	9,720	1,092	9,072	892
		30	0.08	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
		35	0.065	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
	1	8	0.2	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		12	0.15	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		16	0.12	19,200	2,696	16,000	2,246	14,400	2,022	13,600	1,909	12,000	1,348	11,200	1,101
		18	0.11	16,985	2,384	14,331	2,012	12,738	1,788	13,600	1,909	10,615	1,193	10,084	992
		20	0.11	15,552	2,184	12,960	1,820	11,664	1,638	11,016	1,547	9,720	1,092	9,072	892
		30	0.09	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
		35	0.075	12,096	1,524	10,080	1,270	9,072	1,143	8,568	1,079	7,560	771	7,056	621
4	0.1	8	0.08	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		12	0.065	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		16	0.06	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		20	0.055	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		30	0.045	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		35	0.04	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		45	0.03	8,789	1,100	7,324	917	6,592	825	6,226	780	5,494	554	5,127	446
	0.2	8	0.16	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		12	0.14	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		16	0.13	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		20	0.11	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		30	0.1	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		35	0.08	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		45	0.06	8,789	1,100	7,324	917	6,592	825	6,226	780	5,494	554	5,127	446
	0.3	8	0.24	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		12	0.22	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		16	0.2	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		20	0.18	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		30	0.16	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		35	0.14	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		45	0.12	8,789	1,100	7,324	917	6,592	825	6,226	780	5,494	554	5,127	446

【Note】 Upon usage, please refer to comments and notes below table on page A212.

Epoch Deep Radius Evolution

EPDRE-ATH | **High efficiency cuttiing condition** | High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A213.

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)
4	0.5	12	0.35	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		16	0.25	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		20	0.2	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		30	0.15	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		35	0.1	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		45	0.05	8,789	1,100	7,324	917	6,592	825	6,226	780	5,494	554	5,127	446
	1	12	0.4	16,560	2,880	13,800	2,400	12,420	2,160	11,730	2,040	10,350	1,440	9,660	1,176
		16	0.29	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		20	0.23	13,733	2,388	11,445	1,990	10,071	1,751	9,613	1,671	8,240	1,146	7,782	947
		30	0.17	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		35	0.12	10,985	1,719	9,154	1,433	8,239	1,290	7,781	1,218	6,866	860	6,408	702
		45	0.06	8,789	1,100	7,324	917	6,592	825	6,226	780	5,494	554	5,127	446
5	0.1	20	0.08	13,179	2,865	10,983	2,388	9,884	2,149	9,336	2,029	8,237	1,433	7,688	1,170
		40	0.06	11,868	2,312	9,890	1,926	8,901	1,734	8,407	1,637	7,418	1,156	6,923	944
	0.2	20	0.16	13,179	2,865	10,983	2,388	9,884	2,149	9,336	2,029	8,237	1,433	7,688	1,170
		40	0.13	11,868	2,312	9,890	1,926	8,901	1,734	8,407	1,637	7,418	1,156	6,923	944
	0.3	20	0.24	13,179	2,865	10,983	2,388	9,884	2,149	9,336	2,029	8,237	1,433	7,688	1,170
		40	0.2	11,868	2,312	9,890	1,926	8,901	1,734	8,407	1,637	7,418	1,156	6,923	944
	0.5	20	0.35	13,179	2,865	10,983	2,388	9,884	2,149	9,336	2,029	8,237	1,433	7,688	1,170
		40	0.135	11,868	2,312	9,890	1,926	8,901	1,734	8,407	1,637	7,418	1,156	6,923	944
	1	20	0.4	13,179	2,865	10,983	2,388	9,884	2,149	9,336	2,029	8,237	1,433	7,688	1,170
		40	0.15	11,868	2,312	9,890	1,926	8,901	1,734	8,407	1,637	7,418	1,156	6,923	944
6	0.1	12	0.08	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		18	0.065	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		24	0.06	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		35	0.05	9,881	2,320	8,234	1,933	7,411	1,740	6,999	1,643	6,176	1,160	5,764	947
		55	0.04	7,687	1,805	6,406	1,504	5,765	1,354	5,445	1,278	4,805	902	4,484	737
	0.2	12	0.16	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		18	0.14	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		24	0.13	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		35	0.11	9,881	2,320	8,234	1,933	7,411	1,740	6,999	1,643	6,176	1,160	5,764	947
		55	0.08	7,687	1,805	6,406	1,504	5,765	1,354	5,445	1,278	4,805	902	4,484	737
	0.3	12	0.24	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		18	0.22	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		24	0.2	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		35	0.18	9,881	2,320	8,234	1,933	7,411	1,740	6,999	1,643	6,176	1,160	5,764	947
		55	0.14	7,687	1,805	6,406	1,504	5,765	1,354	5,445	1,278	4,805	902	4,484	737
	0.5	18	0.35	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		24	0.29	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		35	0.24	9,881	2,320	8,234	1,933	7,411	1,740	6,999	1,643	6,176	1,160	5,764	947
		55	0.165	7,687	1,805	6,406	1,504	5,765	1,354	5,445	1,278	4,805	902	4,484	737
	1	18	0.4	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		24	0.35	10,985	2,866	9,154	2,388	8,239	2,149	7,781	2,030	6,866	1,433	6,408	1,170
		35	0.28	9,881	2,320	8,234	1,933	7,411	1,740	6,999	1,643	6,176	1,160	5,764	947
		55	0.2	7,687	1,805	6,406	1,504	5,765	1,354	5,445	1,278	4,805	902	4,484	737

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (5 or less)×(a_p)×(cutting depth ratio). When performing finishing cutting, calculate the theoretical cusp height and set accordingly.
※(4) Helical or sloped cutting is recommended for the approach method when engraving.
※(5) When L/D is 5 or greater:
①The recommended slope entrance angle when engraving is 1° or less. In addition, feed rate should be adjusted to 70% or less of the values in the cutting condition table.
②When slotting such engraving letters, adjust feed rate to 50% or less and ap to 30% or less of the values shown. In addition, cutting by reciprocal cutting is recommended.

【Cutting depth setting example】

When cutting rib groove contours in pre-hardened steel (40HRC) using an EPDRE2030-6-02-ATH tool:
Cutting depth = 0.1 (a_p) × 0.8 (cutting depth factor for Group 4 pre-hardened steel) × 0.8 (for closed-area cutting) = 0.064mm

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

EPDRE-ATH

High efficiency cuttiing condition

High accuracy cuttiing condition

For detailed information on high-accuracy cutting conditions, refer to page A208.

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steel, Alloy steel (180~250HB)		Stainless steel, Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
0.2	0.02	0.5	0.016	50,000	307	50,000	258	50,000	230	50,000	205	50,000	180	50,000	160
		1	0.011	50,000	307	50,000	258	50,000	230	50,000	205	50,000	180	50,000	160
		2	0.007	50,000	246	42,000	202	37,800	181	36,700	176	36,700	162	36,700	147
	0.05	0.5	0.02	50,000	307	50,000	258	50,000	230	50,000	205	50,000	180	50,000	160
		1	0.014	50,000	307	50,000	258	50,000	230	50,000	205	50,000	180	50,000	160
		1.5	0.008	50,000	276	50,000	240	48,600	223	45,900	202	45,900	170	45,900	153
		2	0.008	50,000	246	42,000	202	37,800	181	36,700	176	36,700	162	36,700	147
0.3	0.02	1	0.016	50,000	696	50,000	585	50,000	516	50,000	456	50,000	336	50,000	320
		2	0.011	45,000	620	45,000	530	45,000	460	45,000	420	45,000	300	45,000	290
		3	0.007	40,000	504	35,000	412	35,000	358	35,000	326	30,000	200	30,000	194
	0.05	1	0.021	50,000	696	50,000	585	50,000	516	50,000	456	50,000	336	50,000	320
		1.5	0.016	50,000	696	50,000	585	45,000	516	45,000	456	45,000	336	45,000	320
		2	0.012	45,000	620	45,000	530	45,000	460	45,000	420	45,000	300	45,000	290
		2.5	0.01	40,000	551	40,000	471	40,000	409	40,000	373	40,000	267	40,000	258
		3	0.008	40,000	504	35,000	412	35,000	358	35,000	326	30,000	200	30,000	194
0.4	0.02	1	0.016	50,000	691	50,000	580	50,000	518	50,000	461	40,000	320	36,000	270
		2	0.013	45,000	620	45,000	520	45,000	470	45,000	410	36,000	290	34,000	240
		3	0.01	40,000	480	40,000	410	40,000	370	40,000	330	32,800	240	25,600	200
		4	0.007	30,000	370	30,000	320	30,000	280	30,000	250	21,600	160	19,200	150
	0.05	1	0.025	50,000	691	50,000	580	50,000	518	50,000	461	40,000	320	36,000	270
		1.5	0.02	50,000	691	50,000	580	50,000	518	50,000	461	40,000	320	36,000	270
		2	0.016	45,000	620	45,000	520	45,000	470	45,000	410	36,000	290	34,000	240
		2.5	0.015	40,500	560	40,500	480	40,500	400	40,500	370	33,400	270	30,600	220
		3	0.014	40,000	480	40,000	410	40,000	370	40,000	330	32,800	240	25,600	200
		3.5	0.012	36,000	420	36,000	380	36,000	320	36,000	300	29,400	200	22,920	180
		4	0.008	30,000	370	30,000	320	30,000	280	30,000	250	21,600	160	19,200	150
	0.1	1	0.033	50,000	691	50,000	580	50,000	518	50,000	461	40,000	320	36,000	270
		2	0.028	45,000	620	45,000	520	45,000	470	45,000	410	36,000	290	34,000	240
		3	0.016	40,000	480	40,000	410	40,000	370	40,000	330	32,800	240	25,600	200
		4	0.01	30,000	370	30,000	320	30,000	280	30,000	250	21,600	160	19,200	150
0.5	0.02	1	0.016	50,000	1,070	50,000	898	50,000	756	40,000	464	30,000	378	28,000	315
		2	0.013	50,000	1,070	50,000	898	50,000	756	40,000	464	30,000	378	28,000	315
		3	0.01	45,000	960	45,000	810	45,000	684	36,000	414	27,000	315	24,500	261
		4	0.008	40,000	850	40,000	720	40,000	603	32,000	378	24,000	279	20,000	234
		6	0.006	30,000	570	28,800	480	24,000	380	19,400	260	18,000	250	15,000	200
	0.05	1	0.03	50,000	1,070	50,000	898	50,000	756	40,000	464	30,000	378	28,000	315
		2	0.023	50,000	1,070	50,000	898	50,000	756	40,000	464	30,000	378	28,000	315
		3	0.017	45,000	960	45,000	810	45,000	684	36,000	414	27,000	315	24,500	261
		4	0.017	40,000	850	40,000	720	40,000	603	32,000	378	24,000	279	20,000	234
		5	0.011	30,000	640	28,800	540	24,000	380	19,400	280	18,000	250	15,000	200
		6	0.008	30,000	570	28,800	480	24,000	380	19,400	260	18,000	250	15,000	200
	0.1	1	0.035	50,000	1,070	50,000	898	50,000	756	40,000	464	30,000	378	28,000	315
		2	0.03	50,000	1,070	50,000	898	50,000	756	40,000	464	30,000	378	28,000	315
		3	0.02	45,000	960	45,000	810	45,000	684	36,000	414	27,000	315	24,500	261
		4	0.02	40,000	850	40,000	720	40,000	603	32,000	378	24,000	279	20,000	234
		5	0.013	30,000	640	28,800	540	24,000	380	19,400	280	18,000	250	15,000	200
		6	0.013	30,000	570	28,800	480	24,000	380	19,400	260	18,000	250	15,000	200
0.6	0.02	2	0.016	50,000	1,380	50,000	1,159	46,800	920	37,830	600	28,200	390	23,000	320
		4	0.013	40,000	980	40,000	830	34,500	620	27,800	440	23,600	280	21,000	230
		6	0.01	30,000	580	24,000	490	20,000	360	18,000	300	17,800	240	15,000	210
	0.05	2	0.028	50,000	1,380	50,000	1,159	46,800	920	37,830	600	28,200	390	23,000	320
		4	0.019	40,000	980	40,000	830	34,500	620	27,800	440	23,600	280	21,000	230
		6	0.012	30,000	580	24,000	490	20,000	360	18,000	300	17,800	240	15,000	210
		8	0.01	30,000	551	24,000	466	20,000	342	18,000	285	17,800	228	15,000	200
		10	0.007	30,000	534	24,000	451	20,000	331	18,000	276	17,800	221	15,000	193
	0.1	2	0.035	50,000	1,380	50,000	1,159	46,800	920	37,830	600	28,200	390	23,000	320
		4	0.024	40,000	980	40,000	830	34,500	620	27,800	440	23,600	280	21,000	230
		6	0.015	30,000	580	24,000	490	20,000	360	18,000	300	17,800	240	15,000	210
		8	0.013	30,000	551	24,000	466	20,000	342	18,000	285	17,800	228	15,000	200
		10	0.009	30,000	534	24,000	451	20,000	331	18,000	276	17,800	221	15,000	193
0.7	0.05	2	0.035	49,200	1,244	49,200	1,054	42,430	787	34,190	558	29,030	355	25,830	292
		4	0.024	40,000	980	40,000	830	34,500	620	27,800	440	23,600	280	21,000	230
		6	0.015	30,000	580	24,000	490	20,000	360	18,000	300	17,800	240	15,000	210
	0.1	2	0.042	49,200	1,244	49,200	1,054	42,430	787	34,190	558	29,030	355	25,830	292
		4	0.029	40,000	980	40,000	830	34,500	620	27,800	440	23,600	280	21,000	230
		6	0.018	30,000	580	24,000	490	20,000	360	18,000	300	17,800	240	15,000	210
0.8	0.02	2	0.023	50,000	1,640	48,000	1,378	36,000	937	28,000	647	20,000	400	20,000	360
		4	0.016	50,000	1,312	48,000	1,102	36,000	750	28,000	518	20,000	320	20,000	288
		6	0.013	40,000	950	38,700	800	26,000	530	25,000	461	18,000	288	18,000	256
	0.05	2	0.038	50,000	1,640	48,000	1,378	36,000	937	28,000	647	20,000	400	20,000	360
		4	0.026	50,000	1,312	48,000	1,102	36,000	750	28,000	518	20,000	320	20,000	288
		6	0.015	40,000	950	38,700	800	26,000	530	25,000	461	18,000	288	18,000	256
		8	0.012	30,000	713	29,025	600	20,800	424	20,000	369	16,200	259	16,200	230
		12	0.01	30,000	677	29,025	570	20,800	403	20,000	350	16,200	246	16,200	219

【Note】 Upon usage, please refer to comments and notes below table on page A217.

Epoch Deep Radius Evolution

EPDRE-ATH | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A208.

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)
0.8	0.1	2	0.047	50,000	1,640	48,000	1,378	36,000	937	28,000	647	20,000	400	20,000	360
		4	0.032	50,000	1,312	48,000	1,102	36,000	750	28,000	518	20,000	320	20,000	288
		6	0.019	40,000	950	38,700	800	26,000	530	25,000	461	18,000	288	18,000	256
		8	0.015	30,000	713	29,025	600	20,800	424	20,000	369	16,200	259	16,200	230
		12	0.012	30,000	677	29,025	570	20,800	403	20,000	350	16,200	246	16,200	219
	0.2	2	0.081	50,000	1,640	48,000	1,378	36,000	937	28,000	647	20,000	400	20,000	360
		4	0.056	50,000	1,312	48,000	1,102	36,000	750	28,000	518	20,000	320	20,000	288
		6	0.032	40,000	950	38,700	800	26,000	530	25,000	461	18,000	288	18,000	256
		8	0.018	30,000	713	29,025	600	20,800	424	20,000	369	16,200	259	16,200	230
		12	0.015	30,000	677	29,025	570	20,800	403	20,000	350	16,200	246	16,200	219
1	0.02	2	0.016	42,675	1,877	35,668	1,569	32,076	1,411	30,294	1,212	26,730	962	24,948	798
		4	0.013	38,880	1,630	32,400	1,359	29,160	1,223	27,540	1,039	24,300	815	22,680	666
		6	0.01	31,493	1,189	26,244	990	23,620	891	22,307	842	19,683	660	18,371	539
		8	0.008	27,994	1,056	23,328	880	20,995	792	19,829	748	17,496	587	16,330	479
		10	0.006	21,773	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		12	0.005	21,773	730	18,144	609	16,330	548	15,422	453	13,608	399	12,701	320
	0.05	2	0.046	42,675	1,877	35,668	1,569	32,076	1,411	30,254	1,210	26,730	962	24,948	798
		3	0.035	40,796	1,754	34,020	1,462	30,618	1,317	30,294	1,212	25,515	867	23,814	714
		4	0.027	38,880	1,630	32,400	1,359	29,160	1,223	28,917	1,128	24,300	815	22,680	666
		5	0.021	34,713	1,388	28,868	1,154	25,982	1,039	27,540	1,039	21,651	727	20,208	594
		6	0.017	31,493	1,189	26,244	990	23,620	891	24,538	928	19,683	660	18,371	539
		8	0.016	27,994	1,056	23,328	880	20,995	792	19,829	748	17,496	587	16,330	479
		10	0.011	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		12	0.01	21,773	730	18,144	609	16,330	548	15,422	453	13,608	399	12,701	320
		16	0.006	21,773	639	18,144	533	16,330	479	15,422	420	13,608	342	12,701	266
		20	0.004	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
	0.1	2	0.065	42,675	1,877	35,668	1,569	32,076	1,411	30,294	1,212	26,730	962	24,948	798
		3	0.05	40,796	1,754	34,020	1,462	30,618	1,317	28,917	1,128	25,515	867	23,814	714
		4	0.038	38,880	1,630	32,400	1,359	29,160	1,223	27,540	1,039	24,300	815	22,680	666
		5	0.03	34,713	1,388	28,868	1,154	25,982	1,039	24,538	928	21,651	727	20,208	594
		6	0.024	31,493	1,189	26,244	990	23,620	891	22,307	842	19,683	660	18,371	539
		8	0.024	27,994	1,056	23,328	880	20,995	792	19,829	748	17,496	587	16,330	479
		10	0.015	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		12	0.015	21,773	730	18,144	609	16,330	548	15,422	453	13,608	399	12,701	320
		16	0.009	21,773	639	18,144	533	16,330	479	15,422	420	13,608	342	12,701	266
		20	0.006	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
	0.2	2	0.11	42,675	1,877	35,668	1,569	32,076	1,411	30,294	1,212	26,730	962	24,948	798
		3	0.09	40,796	1,754	34,020	1,462	30,618	1,317	28,917	1,128	25,515	867	23,814	714
		4	0.07	38,880	1,630	32,400	1,359	29,160	1,223	27,540	1,039	24,300	815	22,680	666
		5	0.05	34,713	1,388	28,868	1,154	25,982	1,039	24,538	928	21,651	727	20,208	594
		6	0.04	31,493	1,189	26,244	990	23,620	891	22,307	842	19,683	660	18,371	539
		8	0.04	27,994	1,056	23,328	880	20,995	792	19,829	748	17,496	587	16,330	479
		10	0.025	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		12	0.025	21,773	730	18,144	609	16,330	548	15,422	453	13,608	399	12,701	320
		16	0.015	21,773	639	18,144	533	16,330	479	15,422	420	13,608	342	12,701	266
		20	0.01	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
	0.3	2	0.11	42,675	1,877	35,668	1,569	32,076	1,411	30,294	1,212	26,730	962	24,948	798
		3	0.09	40,796	1,754	34,020	1,462	30,618	1,317	28,917	1,128	25,515	867	23,814	714
		4	0.07	38,880	1,630	32,400	1,359	29,160	1,223	27,540	1,039	24,300	815	22,680	666
		5	0.05	34,713	1,388	28,868	1,154	25,982	1,039	24,538	928	21,651	727	20,208	594
		6	0.04	31,493	1,189	26,244	990	23,620	891	22,307	842	19,683	660	18,371	539
		8	0.04	27,994	1,056	23,328	880	20,995	792	19,829	748	17,496	587	16,330	479
		10	0.025	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		12	0.025	21,773	730	18,144	609	16,330	548	15,422	453	13,608	399	12,701	320
		16	0.015	21,773	639	18,144	533	16,330	479	15,422	420	13,608	342	12,701	266
		20	0.01	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
1.25	0.1	5	0.03	34,713	1,388	28,868	1,154	25,982	1,039	24,538	928	21,651	727	20,208	594
		10	0.015	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		15	0.01	21,773	639	18,144	533	16,330	548	15,422	453	13,608	342	12,701	266
		20	0.006	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
	0.2	5	0.05	34,713	1,388	28,868	1,154	25,982	1,039	24,538	928	21,651	727	20,208	594
		10	0.025	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		15	0.016	21,773	639	18,144	533	16,330	548	15,422	453	13,608	342	12,701	266
		20	0.01	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
	0.3	5	0.05	34,713	1,388	28,868	1,154	25,982	1,039	24,538	928	21,651	727	20,208	594
		10	0.025	24,494	924	20,412	770	18,371	693	17,350	655	15,309	514	14,288	419
		15	0.016	21,773	639	18,144	533	16,330	548	15,422	453	13,608	342	12,701	266
		20	0.01	16,330	479	13,608	399	12,247	359	11,567	315	10,206	257	9,526	200
1.5	0.1	4	0.042	29,938	1,356	24,930	1,130	22,453	1,017	20,956	947	18,711	752	17,364	611
		6	0.04	28,450	1,285	23,779	1,074	21,443	969	20,382	921	17,834	716	16,560	582
		8	0.036	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		12	0.036	21,773	986	18,144	822	16,330	740	15,422	698	13,608	548	12,701	447
		15	0.023	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.018	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	ap (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
1.5	0.2	4	0.07	29,938	1,356	24,930	1,130	22,453	1,017	20,956	868	18,711	678	17,364	556
		6	0.065	28,450	1,285	23,779	1,074	21,443	969	20,382	921	17,834	716	16,560	582
		8	0.06	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		12	0.06	21,773	986	18,144	822	16,330	740	15,422	698	13,608	548	12,701	447
		15	0.038	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.03	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
	0.3	4	0.07	29,938	1,356	24,930	1,130	22,453	1,017	20,956	868	18,711	678	17,364	556
		6	0.065	28,450	1,285	23,779	1,074	21,443	969	20,382	921	17,834	716	16,560	582
		8	0.06	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		12	0.06	21,773	986	18,144	822	16,330	740	15,422	698	13,608	548	12,701	447
		15	0.038	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.03	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
	0.5	4	0.085	29,938	1,356	24,930	1,130	22,453	1,017	20,956	868	18,711	678	17,364	556
		6	0.08	28,450	1,285	23,779	1,074	21,443	969	20,382	921	17,834	716	16,560	582
		8	0.07	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		12	0.065	21,773	986	18,144	822	16,330	740	15,422	698	13,608	548	12,701	447
		15	0.045	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.035	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
1.75	0.1	5	0.04	29,938	1,356	24,930	1,130	22,453	1,017	20,956	868	18,711	678	17,364	556
		10	0.036	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		15	0.023	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.018	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
	0.2	5	0.065	29,938	1,356	24,930	1,130	22,453	1,017	20,956	868	18,711	678	17,364	556
		10	0.06	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		15	0.038	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.03	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
	0.3	5	0.065	29,938	1,356	24,930	1,130	22,453	1,017	20,956	868	18,711	678	17,364	556
		10	0.06	27,216	1,233	22,680	1,027	20,412	924	19,278	873	17,010	685	15,876	559
		15	0.038	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
		20	0.03	16,934	682	14,112	568	12,701	511	11,995	423	10,584	373	9,878	298
2	0.1	4	0.08	26,114	2,052	21,974	1,727	19,745	1,551	18,471	1,451	16,401	1,033	15,286	840
		6	0.07	24,948	1,962	20,790	1,635	18,711	1,471	17,672	1,389	15,593	981	14,553	801
		8	0.055	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		12	0.03	18,371	1,300	15,309	1,083	13,778	975	13,013	921	11,482	722	10,716	590
		16	0.03	16,330	1,156	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		20	0.025	14,288	1,011	11,907	843	10,716	758	10,121	716	8,930	562	8,335	459
		25	0.015	14,288	908	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
		30	0.01	13,574	863	11,312	719	10,180	647	9,615	611	8,484	480	7,918	391
	0.2	4	0.1	26,114	2,052	21,974	1,727	19,745	1,551	18,471	1,451	16,401	1,033	15,286	840
		6	0.08	24,948	1,962	20,790	1,635	18,711	1,471	17,672	1,389	15,593	981	14,553	801
		8	0.07	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		12	0.04	18,371	1,300	15,309	1,083	13,778	975	13,013	921	11,482	722	10,716	590
		16	0.04	16,330	1,156	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		20	0.035	14,288	1,011	11,907	843	10,716	758	10,121	716	8,930	562	8,335	459
		25	0.025	14,288	908	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
		30	0.017	13,574	863	11,312	719	10,180	647	9,615	611	8,484	480	7,918	391
	0.3	4	0.13	26,114	2,052	21,974	1,727	19,745	1,551	18,471	1,451	16,401	1,033	15,286	840
		6	0.11	24,948	1,962	20,790	1,635	18,711	1,471	17,672	1,389	15,593	981	14,553	801
		8	0.09	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		12	0.06	18,371	1,444	15,309	1,083	13,778	975	13,013	921	11,482	722	10,716	590
		16	0.06	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		20	0.037	14,288	1,123	11,907	843	10,716	758	10,121	716	8,930	562	8,335	459
		25	0.03	14,288	908	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
		30	0.021	13,574	863	11,312	719	10,180	647	9,615	611	8,484	480	7,918	391
	0.5	6	0.17	24,948	1,962	20,790	1,635	18,711	1,471	17,672	1,389	15,593	981	14,553	801
		8	0.14	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		12	0.08	18,371	1,444	15,309	1,083	13,778	975	13,013	1,023	11,482	722	10,716	590
		16	0.08	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		20	0.05	14,288	1,123	11,907	843	10,716	758	10,121	716	8,930	562	8,335	459
		25	0.05	14,288	908	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
		30	0.03	13,574	863	11,312	719	10,180	647	9,615	611	8,484	480	7,918	391
	0.8	6	0.22	24,948	1,962	20,790	1,635	18,711	1,471	17,672	1,389	15,593	981	14,553	801
		8	0.2	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		12	0.13	18,371	1,444	15,309	1,083	13,778	975	13,013	921	11,482	722	10,716	590
		16	0.1	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		20	0.06	14,288	1,123	11,907	843	10,716	758	10,121	716	8,930	562	8,335	459
		25	0.057	14,288	908	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
		30	0.045	13,574	863	11,312	719	10,180	647	9,615	611	8,484	480	7,918	391

【Note】 Upon usage, please refer to comments and notes below table on page A217.

Epoch Deep Radius Evolution

EPDRE-ATH | High efficiency cuttiing condition | **High accuracy cuttiing condition**

For detailed information on high-accuracy cutting conditions, refer to page A208.

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)
2.5	0.1	10	0.055	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		20	0.03	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		30	0.015	14,288	1,008	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
	0.2	10	0.07	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		20	0.04	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		30	0.025	14,288	1,008	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
	0.3	10	0.09	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		20	0.06	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		30	0.03	14,288	1,008	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
	0.5	10	0.14	22,680	1,783	18,900	1,486	17,010	1,337	16,065	1,263	14,175	892	13,230	728
		20	0.08	16,330	1,284	13,608	963	12,247	867	11,567	818	10,206	642	9,526	524
		30	0.05	14,288	1,008	11,907	757	10,716	681	10,121	643	8,930	505	8,335	411
3	0.1	6	0.08	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		8	0.07	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		12	0.05	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		16	0.035	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		18	0.035	15,498	1,521	12,951	1,271	11,677	1,149	10,934	1,073	9,766	767	9,023	620
		20	0.035	13,997	1,376	11,664	1,146	10,498	1,032	9,914	974	8,748	687	8,165	561
		30	0.027	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
		35	0.02	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
	0.2	6	0.1	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		8	0.09	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		12	0.07	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		16	0.05	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		18	0.05	15,498	1,521	12,951	1,271	11,677	1,149	10,934	1,073	9,766	767	9,023	620
		20	0.05	13,997	1,376	11,664	1,146	10,498	1,032	9,914	974	8,748	687	8,165	561
		30	0.04	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
		35	0.035	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
	0.3	6	0.145	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		8	0.13	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		12	0.1	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		16	0.075	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		18	0.075	15,498	1,521	12,951	1,271	11,677	1,149	10,934	1,073	9,766	767	9,023	620
		20	0.075	13,997	1,376	11,664	1,146	10,498	1,032	9,914	974	8,748	687	8,165	561
		30	0.06	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
		35	0.05	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
	0.5	8	0.18	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		12	0.13	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		16	0.1	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		18	0.1	15,498	1,521	12,951	1,271	11,677	1,149	10,934	1,073	9,766	767	9,023	620
		20	0.1	13,997	1,376	11,664	1,146	10,498	1,032	9,914	974	8,748	687	8,165	561
		30	0.08	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
		35	0.065	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
	1	8	0.2	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		12	0.15	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		16	0.12	17,280	1,698	14,400	1,415	12,960	1,274	12,240	1,203	10,800	849	10,080	693
		18	0.11	15,498	1,521	12,951	1,271	11,677	1,149	10,934	1,073	9,766	767	9,023	620
		20	0.11	13,997	1,376	11,664	1,146	10,498	1,032	9,914	974	8,748	687	8,165	561
		30	0.09	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
		35	0.075	10,886	962	9,072	801	8,165	721	7,711	681	6,804	480	6,350	393
4	0.1	8	0.08	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		12	0.065	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		16	0.06	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		20	0.055	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		30	0.045	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		35	0.04	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		45	0.03	9,888	1,289	8,240	1075	7,324	955	5,584	728	4,944	516	4,119	358
	0.2	8	0.16	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		12	0.14	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		16	0.13	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		20	0.11	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		30	0.1	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		35	0.08	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		45	0.06	9,888	1,289	8,240	1075	7,324	955	5,584	728	4,944	516	4,119	358
	0.3	8	0.24	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		12	0.22	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		16	0.2	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		20	0.18	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		30	0.16	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		35	0.14	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		45	0.12	9,888	1,289	8,240	1075	7,324	955	5,584	728	4,944	516	4,119	358

Work material				1		2		3		4		5		6	
				Copper		Carbon steels, Alloy steels (180~250HB)		Stainless steels, Tool steels (25~35HRC)		Pre-hardened steels (35~45HRC)		Hardened steels (45~55HRC)		Hardened steels (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length (mm)	a_p (mm)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)	n (min⁻¹)	v_f (mm/min)
4	0.5	12	0.35	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		16	0.25	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		20	0.2	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		30	0.15	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		35	0.1	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		45	0.05	9,888	1,289	8,240	1075	7,324	955	5,584	728	4,944	516	4,119	358
	1	12	0.4	13,455	2,340	11,213	1,950	10,091	1,755	9,531	1,658	8,410	1,170	7,849	956
		16	0.29	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		20	0.23	12,360	2,149	10,255	1,783	9,155	1,592	8,697	1,512	7,599	1,057	6,684	814
		30	0.17	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		35	0.12	12,360	2,149	10,255	1,783	9,155	1,592	6,867	1,075	5,491	688	5,124	561
		45	0.06	9,888	1,289	8,240	1075	7,324	955	5,584	728	4,944	516	4,119	358
5	0.1	20	0.08	10,985	2,388	9,154	1,990	8,239	1,791	7,781	1,692	6,866	1,194	6,408	975
		40	0.06	7,907	1,540	6,590	1,284	5,931	1,155	5,602	1,091	4,943	770	4,613	629
	0.2	20	0.16	10,985	2,388	9,154	1,990	8,239	1,791	7,781	1,692	6,866	1,194	6,408	975
		40	0.13	7,907	1,540	6,590	1,284	5,931	1,155	5,602	1,091	4,943	770	4,613	629
	0.3	20	0.24	10,985	2,388	9,154	1,990	8,239	1,791	7,781	1,692	6,866	1,194	6,408	975
		40	0.2	7,907	1,540	6,590	1,284	5,931	1,155	5,602	1,091	4,943	770	4,613	629
	0.5	20	0.35	10,985	2,388	9,154	1,990	8,239	1,791	7,781	1,692	6,866	1,194	6,408	975
		40	0.135	7,907	1,540	6,590	1,284	5,931	1,155	5,602	1,091	4,943	770	4,613	629
	1	20	0.4	10,985	2,388	9,154	1,990	8,239	1,791	7,781	1,692	6,866	1,194	6,408	975
		40	0.15	7,907	1,540	6,590	1,284	5,931	1,155	5,602	1,091	4,943	770	4,613	629
6	0.1	12	0.08	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		18	0.065	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		24	0.06	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		35	0.05	7,783	1,827	6,486	1,523	5,837	1,371	5,513	1,294	4,865	914	4,540	746
		55	0.04	6,590	1,260	5,491	1,050	4,943	945	4,668	892	4,118	623	3,844	508
	0.2	12	0.16	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		18	0.14	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		24	0.13	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		35	0.11	7,783	1,827	6,486	1,523	5,837	1,371	5,513	1,294	4,865	914	4,540	746
		55	0.08	6,590	1,260	5,491	1,050	4,943	945	4,668	892	4,118	623	3,844	508
	0.3	12	0.24	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		18	0.22	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		24	0.2	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		35	0.18	7,783	1,827	6,486	1,523	5,837	1,371	5,513	1,294	4,865	914	4,540	746
		55	0.14	6,590	1,260	5,491	1,050	4,943	945	4,668	892	4,118	623	3,844	508
	0.5	18	0.35	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		24	0.29	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		35	0.24	7,783	1,827	6,486	1,523	5,837	1,371	5,513	1,294	4,865	914	4,540	746
		55	0.165	6,590	1,260	5,491	1,050	4,943	945	4,668	892	4,118	623	3,844	508
	1	18	0.4	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		24	0.35	9,156	2,389	7,630	1,991	6,868	1,791	6,486	1,692	5,722	1,194	5,342	975
		35	0.28	7,783	1,827	6,486	1,523	5,837	1,371	5,513	1,294	4,865	914	4,540	746
		55	0.2	6,590	1,260	5,491	1,050	4,943	945	4,668	892	4,118	623	3,844	508

※(1) a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.
※(2) When performing cutting where cutting chips may cause clogging, such as for rib cutting, blind grooves, etc., cutting depth setting should be set by multiplying a cutting depth factor to calculate the cutting depth amount, and this amount should then be reduced to 80% of the calculated value.
※(3) Adjust by setting a_e to (5 or less)×(a_p)×(cutting depth ratio). When performing finishing cutting, calculate the theoretical cusp height and set accordingly.
※(4) Helical or sloped cutting is recommended for the approach method when engraving.
※(5) When L/D is 5 or greater:
①The recommended slope entrance angle when engraving is 1° or less. In addition, feed rate should be adjusted to 70% or less of the values in the cutting condition table.
②When slotting such engraving letters, adjust feed rate to 50% or less and ap to 30% or less of the values shown. In addition, cutting by reciprocal cutting is recommended.

【Cutting depth setting example】

When cutting rib groove contours in pre-hardened steel (40HRC) using an EPDRE2030-6-02-ATH tool:
Cutting depth = 0.1 (a_p) × 0.8 (cutting depth factor for Group 4 pre-hardened steel) × 0.8 (for closed-area cutting) = 0.064mm

【Note】

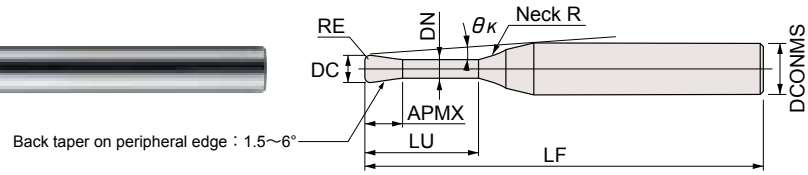
① Use the appropriate coolant for the work material and machining shape.
② These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Radius F

High-accuracy deep radius mill

±0.005mm (central axis)

4 Flutes



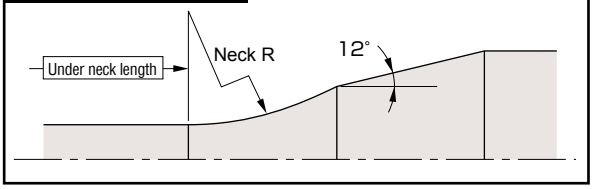
EPDRF4○○○-○○-○○○-TH

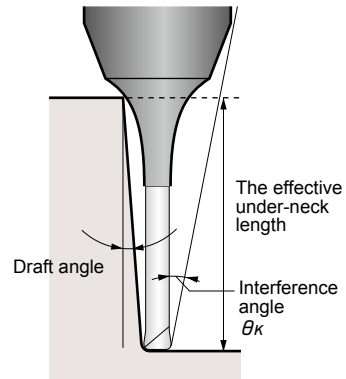
φ4 or larger does not have backdraft shape.

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRF4010-4-005-TH	●	1	0.05	4	0.8	0.94	50	4	4	7.67	4.75	4.95	5.13	5.28	5.56
EPDRF4010-6-005-TH	●			6						6.51	6.84	7.09	7.3	7.49	8.13
EPDRF4010-8-005-TH	★			8						5.66	8.92	9.21	9.46	9.73	10.78
EPDRF4010-10-005-TH	★			10						5	10.99	11.32	11.59	12.12	13.44
EPDRF4010-12-005-TH	★			12			60			4.48	13.06	13.42	13.84	14.51	16.09
EPDRF4010-16-005-TH	★			16						3.71	17.18	17.6	18.4	19.3	21.4
EPDRF4010-20-005-TH	★			20						3.17	21.29	21.93	22.96	24.09	26.71
EPDRF4010-4-01-TH	●		0.1	4			50			7.7	4.74	4.95	5.12	5.28	5.55
EPDRF4010-6-01-TH	●			6						6.54	6.83	7.09	7.3	7.49	8.11
EPDRF4010-8-01-TH	★			8						5.68	8.91	9.21	9.45	9.72	10.77
EPDRF4010-10-01-TH	★			10						5.02	10.99	11.32	11.59	12.11	13.42
EPDRF4010-12-01-TH	★			12			60			4.5	13.06	13.42	13.83	14.5	16.08
EPDRF4010-16-01-TH	★			16						3.72	17.18	17.6	18.39	19.29	21.39
EPDRF4010-20-01-TH	★			20						3.17	21.29	21.93	22.95	24.08	26.7
EPDRF4015-4-005-TH	●	1.5	0.05	4	1.35	1.42	50	4	4	7.12	4.8	4.99	5.16	5.31	5.59
EPDRF4015-8-005-TH	●			8						5.1	8.96	9.25	9.48	9.78	10.85
EPDRF4015-12-005-TH	★			12			60			3.97	13.09	13.45	13.89	14.57	16.16
EPDRF4015-15-005-TH	★			15						3.41	16.18	16.58	17.31	18.16	20.14
EPDRF4015-20-005-TH	★			20						2.76	21.32	21.98	23.01	24.14	–
EPDRF4015-4-01-TH	●		0.1	4			50			7.15	4.8	4.99	5.16	5.31	5.58
EPDRF4015-8-01-TH	●			8						5.12	8.96	9.24	9.48	9.77	10.83
EPDRF4015-12-01-TH	★			12			60			3.98	13.09	13.45	13.88	14.56	16.14
EPDRF4015-15-01-TH	★			15						3.42	16.18	16.58	17.3	18.15	20.12
EPDRF4015-20-01-TH	★			20						2.76	21.32	21.98	23.01	24.13	–
EPDRF4020-4-005-TH	●	2	0.05	4	1.7	1.92	50	4	4	6.46	4.8	4.99	5.16	5.31	5.59
EPDRF4020-6-005-TH	●			6						5.27	6.88	7.13	7.33	7.52	8.19
EPDRF4020-8-005-TH	●			8						4.46	8.96	9.25	9.48	9.78	10.85
EPDRF4020-12-005-TH	●			12			60			3.4	13.09	13.45	13.89	14.57	16.16
EPDRF4020-16-005-TH	●			16						2.75	17.21	17.63	18.45	19.36	–
EPDRF4020-20-005-TH	★			20						2.31	21.32	21.98	23.01	24.14	–
EPDRF4020-4-01-TH	●		0.1	4			50			6.49	4.8	4.99	5.16	5.31	5.58
EPDRF4020-6-01-TH	●			6						5.3	6.88	7.12	7.33	7.51	8.18
EPDRF4020-8-01-TH	●			8						4.47	8.96	9.24	9.48	9.77	10.83
EPDRF4020-12-01-TH	●			12			60			3.41	13.09	13.45	13.88	14.56	16.14
EPDRF4020-16-01-TH	●			16						2.76	17.21	17.62	18.44	19.35	–
EPDRF4020-20-01-TH	★			20						2.31	21.32	21.98	23.01	24.13	–
EPDRF4020-4-02-TH	●		0.2	4			50			6.57	4.79	4.98	5.15	5.3	5.57
EPDRF4020-6-02-TH	●			6						5.35	6.88	7.12	7.32	7.5	8.14
EPDRF4020-8-02-TH	●			8						4.51	8.95	9.24	9.47	9.75	10.8
EPDRF4020-12-02-TH	●			12			60			3.43	13.09	13.44	13.87	14.54	16.11
EPDRF4020-16-02-TH	●			16						2.77	17.21	17.62	18.43	19.33	–
EPDRF4020-20-02-TH	★			20						2.32	21.32	21.97	22.99	24.11	–
EPDRF4020-25-02-TH	●			25			70			1.93	26.44	27.42	28.69	–	–
EPDRF4020-30-02-TH	★			30						1.66	31.55	32.87	34.4	–	–

● : Inventory maintained in US ★ : Inventory maintained in Japan

Detailed shape below neck





EPDRF4○○○-○○-○○○-TH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRF4020-4-03-TH	★	2	0.3	4	1.7	1.92	50	4	4	6.64	4.79	4.97	5.14	5.29	5.55
EPDRF4020-8-03-TH	★			8						4.55	8.95	9.23	9.47	9.73	10.77
EPDRF4020-12-03-TH	★			12			60			3.45	13.09	13.44	13.85	14.52	16.08
EPDRF4020-16-03-TH	★			16						2.79	17.21	17.61	18.42	19.31	–
EPDRF4020-20-03-TH	★			20						2.33	21.31	21.96	22.98	24.09	–
EPDRF4020-4-05-TH	★		0.5	4			50			6.8	4.78	4.96	5.12	5.26	5.53
EPDRF4020-6-05-TH	★			6						5.5	6.86	7.1	7.3	7.48	8.05
EPDRF4020-8-05-TH	●			8						4.62	8.94	9.22	9.45	9.7	10.7
EPDRF4020-12-05-TH	★			12			60			3.5	13.08	13.43	13.83	14.48	16.01
EPDRF4020-16-05-TH	●			16						2.81	17.2	17.61	18.39	19.27	–
EPDRF4020-20-05-TH	●			20						2.35	21.31	21.95	22.95	24.06	–
EPDRF4020-25-05-TH	●			25			70			1.95	26.43	27.39	28.65	–	–
EPDRF4020-30-05-TH	●			30						1.67	31.54	32.84	34.36	–	–
EPDRF4025-8-01-TH	●	2.5	0.1	8	2	2.4	50	4	4	3.68	9	9.27	9.51	9.83	10.89
EPDRF4025-16-01-TH	●			16			60			2.19	17.24	17.67	18.5	19.4	–
EPDRF4025-20-01-TH	●			20						1.82	21.35	22.03	23.06	–	–
EPDRF4025-8-02-TH	●		0.2	8			50			3.72	8.99	9.27	9.5	9.81	10.86
EPDRF4025-16-02-TH	●			16			60			2.2	17.24	17.67	18.48	19.38	–
EPDRF4025-20-02-TH	●			20						1.83	21.34	22.02	23.05	–	–
EPDRF4025-12-03-TH	★		0.3	12						2.78	13.12	13.47	13.91	14.58	–
EPDRF4025-20-03-TH	★			20						1.84	21.34	22.01	23.03	–	–
EPDRF4025-12-05-TH	★		0.5	12						2.82	13.12	13.46	13.88	14.54	–
EPDRF4025-20-05-TH	★			20						1.85	21.34	22	23	–	–
EPDRF4030-8-01-TH	●	3	0.1	8	2.5	2.86	60	6	4	5.61	9.07	9.34	9.56	9.94	11.02
EPDRF4030-16-01-TH	●			16						3.69	17.3	17.78	18.6	19.52	21.64
EPDRF4030-25-01-TH	★			25			70			2.67	26.52	27.58	28.87	30.28	–
EPDRF4030-30-01-TH	★			30			80			2.31	31.62	33.03	34.57	36.27	–
EPDRF4030-8-02-TH	●		0.2	8			60			5.65	9.07	9.33	9.55	9.92	10.99
EPDRF4030-12-02-TH	●			12						4.48	13.19	13.52	14.03	14.71	16.3
EPDRF4030-16-02-TH	●			16						3.71	17.3	17.77	18.59	19.5	21.6
EPDRF4030-20-02-TH	●			20			70			3.16	21.4	22.13	23.15	24.28	26.91
EPDRF4030-25-02-TH	★			25						2.67	26.51	27.57	28.86	30.27	–
EPDRF4030-30-02-TH	★			30			80			2.31	31.62	33.02	34.56	36.25	–
EPDRF4030-8-03-TH	●		0.3	8			60			5.68	9.07	9.33	9.54	9.9	10.95
EPDRF4030-16-03-TH	●			16						3.72	17.3	17.76	18.58	19.48	21.57
EPDRF4030-20-03-TH	●			20			70			3.17	21.4	22.12	23.14	24.26	26.88
EPDRF4030-25-03-TH	★			25						2.68	26.51	27.56	28.84	30.25	–
EPDRF4030-30-03-TH	★			30			80			2.32	31.62	33.01	34.54	36.23	–
EPDRF4030-8-05-TH	●		0.5	8			60			5.76	9.06	9.31	9.53	9.87	10.89
EPDRF4030-12-05-TH	●			12						4.55	13.18	13.51	13.99	14.65	16.2
EPDRF4030-16-05-TH	●			16						3.75	17.29	17.74	18.55	19.44	21.51
EPDRF4030-20-05-TH	●			20			70			3.2	21.39	22.1	23.11	24.22	26.82
EPDRF4030-25-05-TH	●			25						2.7	26.51	27.55	28.81	30.21	–
EPDRF4030-30-05-TH	●			30			80			2.33	31.61	32.99	34.52	36.19	–
EPDRF4030-35-05-TH	★			35						2.06	36.82	38.44	40.22	42.17	–

Epoch Deep Radius F

EPDRF4○○○-○○-○○○-TH

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θκ	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDRF4040-12-01-TH	★	4	0.1	12	4	3.9	60	6	4	3.4	13.13	13.47	13.94	14.62	16.2
EPDRF4040-20-01-TH	●			20						2.31	21.35	22.03	23.06	24.19	–
EPDRF4040-30-01-TH	★			30			80			1.65	31.57	32.93	34.46	–	–
EPDRF4040-40-01-TH	★			40						1.28	41.95	43.82	–	–	–
EPDRF4040-12-02-TH	●		0.2	12			60			3.42	13.12	13.47	13.92	14.6	16.17
EPDRF4040-20-02-TH	●			20						2.32	21.34	22.02	23.05	24.17	–
EPDRF4040-30-02-TH	●			30			80			1.65	31.57	32.92	34.45	–	–
EPDRF4040-40-02-TH	★			40						1.29	41.94	43.81	–	–	–
EPDRF4040-12-03-TH	●		0.3	12			60			3.44	13.12	13.47	13.91	14.58	16.14
EPDRF4040-20-03-TH	●			20						2.33	21.34	22.01	23.03	24.15	–
EPDRF4040-30-03-TH	★			30			80			1.66	31.57	32.91	34.44	–	–
EPDRF4040-40-03-TH	★			40						1.29	41.94	43.8	–	–	–
EPDRF4040-12-05-TH	●		0.5	12			60			3.49	13.12	13.46	13.88	14.54	16.07
EPDRF4040-20-05-TH	●			20						2.35	21.34	22	23	24.11	–
EPDRF4040-30-05-TH	●			30			80			1.67	31.57	32.89	34.41	–	–
EPDRF4040-40-05-TH	●			40						1.29	41.93	43.79	–	–	–
EPDRF4050-20-01-TH	●	5	0.1	20	5	4.9	70	6	4	1.28	21.35	22.03	–	–	–
EPDRF4050-40-01-TH	★			40			90			0.68	41.95	–	–	–	–
EPDRF4050-20-02-TH	●		0.2	20			70			1.28	21.34	22.02	–	–	–
EPDRF4050-40-02-TH	●			40			90			0.68	41.94	–	–	–	–
EPDRF4050-20-03-TH	★		0.3	20			70			1.29	21.34	22.01	–	–	–
EPDRF4050-40-03-TH	★			40			90			0.68	41.94	–	–	–	–
EPDRF4050-20-05-TH	●		0.5	20			70			1.3	21.34	22	–	–	–
EPDRF4050-40-05-TH	★			40			90			0.69	41.93	–	–	–	–
EPDRF4050-20-10-TH	★		1	20			70			1.33	21.32	21.95	–	–	–
EPDRF4050-40-10-TH	★			40			90			0.69	41.91	–	–	–	–
EPDRF4060-30-02-TH	●	6	0.2	30	6	5.9	80	6	4	0	–	–	–	–	–
EPDRF4060-54-02-TH	★			54			100				–	–	–	–	–
EPDRF4060-72-02-TH	★			72			120				–	–	–	–	–
EPDRF4060-30-03-TH	●		0.3	30			80				–	–	–	–	–
EPDRF4060-54-03-TH	★			54			100				–	–	–	–	–
EPDRF4060-72-03-TH	★			72			120				–	–	–	–	–
EPDRF4060-30-05-TH	●		0.5	30			80				–	–	–	–	–
EPDRF4060-54-05-TH	★			54			100				–	–	–	–	–
EPDRF4060-72-05-TH	★			72			120				–	–	–	–	–
EPDRF4060-30-10-TH	●		1	30			80				–	–	–	–	–
EPDRF4060-54-10-TH	★			54			100				–	–	–	–	–
EPDRF4060-72-10-TH	★			72			120				–	–	–	–	–

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Recommended cutting conditions EPDRF-TH

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steel Alloy steel (180~250HB)		Stainless steel Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	a_p (inch)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
1	0.05	4	.0005	38,900	93	31,120	75	28,008	67	26,608	64	23,947	48	22,749	36
		6	.0004	31,500	76	25,200	60	22,680	54	21,546	52	19,391	39	18,422	29
		8	.0003	28,000	67	22,400	54	20,160	48	19,152	46	17,237	34	16,375	26
		10	.0002	24,500	59	19,600	47	17,640	42	16,758	40	15,082	30	14,328	23
		12	.0002	21,800	44	17,440	35	15,696	31	14,911	30	13,420	21	12,749	20
		16	.0001	21,800	35	17,440	28	15,696	25	14,911	24	13,420	21	12,749	15
		20	.0001	16,300	26	13,040	21	11,736	19	11,149	18	10,034	16	9,533	11
	0.1	4	.0008	38,900	93	31,120	75	28,008	67	26,608	64	23,947	48	22,749	36
		6	.0007	31,500	76	25,200	60	22,680	54	21,546	52	19,391	39	18,422	29
		8	.0006	28,000	67	22,400	54	20,160	48	19,152	46	17,237	34	16,375	26
		10	.0004	24,500	59	19,600	47	17,640	42	16,758	40	15,082	30	14,328	23
		12	.0003	21,800	44	17,440	35	15,696	31	14,911	30	13,420	21	12,749	20
		16	.0002	21,800	35	17,440	28	15,696	25	14,911	24	13,420	21	12,749	15
		20	.0002	16,300	26	13,040	21	11,736	19	11,149	18	10,034	16	9,533	11
1.5	0.05	4	.0008	29,900	84	23,920	67	21,528	60	20,452	57	18,406	37	17,486	35
		8	.0006	27,200	76	21,760	61	19,584	55	18,605	52	16,744	40	15,907	32
		12	.0003	21,800	61	17,440	49	15,696	44	14,911	42	13,420	32	12,749	25
		15	.0002	16,900	41	13,520	32	12,168	29	11,560	28	10,404	21	9,883	16
		20	.0002	16,900	41	13,520	32	12,168	29	11,560	28	10,404	21	9,883	16
	0.1	4	.0011	29,900	84	23,920	67	21,528	60	20,452	57	18,406	37	17,486	35
		8	.0008	27,200	76	21,760	61	19,584	55	18,605	52	16,744	40	15,907	32
		12	.0007	21,800	61	17,440	49	15,696	44	14,911	42	13,420	32	12,749	25
		15	.0006	16,900	41	13,520	32	12,168	29	11,560	28	10,404	21	9,883	16
		20	.0004	16,900	41	13,520	32	12,168	29	11,560	28	10,404	21	9,883	16
2	0.05	4	.0014	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		6	.0012	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		8	.0010	22,700	109	18,900	91	17,000	82	16,100	77	14,200	51	13,200	42
		12	.0008	18,400	74	15,300	61	13,800	55	13,000	52	11,500	41	10,700	34
		16	.0006	16,300	65	13,600	54	12,200	49	11,600	46	10,200	37	9,500	30
		20	.0004	14,300	57	11,900	48	10,700	43	10,100	40	8,900	32	8,300	27
	0.1	4	.0017	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		6	.0017	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		8	.0014	22,700	109	18,900	91	17,000	82	16,100	77	14,200	51	13,200	42
		12	.0014	18,400	74	15,300	61	13,800	55	13,000	52	11,500	41	10,700	34
		16	.0009	16,300	65	13,600	54	12,200	49	11,600	46	10,200	37	9,500	30
		20	.0007	14,300	57	11,900	48	10,700	43	10,100	40	8,900	32	8,300	27
	0.2	4	.0031	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		6	.0031	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		8	.0028	22,700	109	18,900	91	17,000	82	16,100	77	14,200	51	13,200	42
		12	.0016	18,400	74	15,300	61	13,800	55	13,000	52	11,500	41	10,700	34
		16	.0016	16,300	65	13,600	54	12,200	49	11,600	46	10,200	37	9,500	30
		20	.0014	14,300	57	11,900	48	10,700	43	10,100	40	8,900	32	8,300	27
		25	.0010	14,300	57	11,900	48	10,700	43	10,100	40	8,900	32	8,300	27
		30	.0007	13,600	54	11,300	45	10,200	41	9,600	38	8,500	31	7,900	25
	0.3	4	.0043	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		8	.0035	22,700	109	18,900	91	17,000	82	16,100	77	14,200	57	13,200	48
		12	.0024	18,400	88	15,300	73	13,800	66	13,000	62	11,500	46	10,700	39
		16	.0024	16,300	78	13,600	65	12,200	59	11,600	56	10,200	41	9,500	34
		20	.0015	14,300	69	11,900	57	10,700	51	10,100	48	8,900	36	8,300	30

【Note】Please refer to P.A223

Epoch Deep Radius F

EPDRF-TH

Inch

Work material				1		2		3		4		5		6	
				Copper		Carbon steel Alloy steel (180～250HB)		Stainless steel Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	a_p (inch)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
2	0.5	4	.0067	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		6	.0067	24,900	120	20,800	100	18,700	90	17,700	85	15,600	56	14,600	47
		8	.0055	22,700	109	18,900	91	17,000	82	16,100	77	14,200	57	13,200	48
		12	.0031	18,400	88	15,300	73	13,800	66	13,000	62	11,500	46	10,700	39
		16	.0031	16,300	78	13,600	65	12,200	59	11,600	56	10,200	41	9,500	34
		20	.0020	14,300	69	11,900	57	10,700	51	10,100	48	8,900	36	8,300	30
		25	.0020	14,300	69	11,900	57	10,700	51	10,100	48	8,900	36	8,300	30
		30	.0012	13,600	65	11,300	54	10,200	49	9,600	46	8,500	34	7,900	28
2.5	0.1	8	.0019	22,700	118	18,900	98	17,000	88	16,100	84	14,200	57	13,200	48
		16	.0015	16,300	78	13,600	65	12,200	59	11,600	56	10,200	41	9,500	34
		20	.0010	14,300	69	11,900	57	10,700	51	10,100	48	8,900	36	8,300	30
	0.2	8	.0031	19,400	101	16,200	84	14,600	76	13,800	72	12,200	49	11,300	45
		16	.0018	16,900	81	14,100	68	12,700	61	12,000	58	10,600	42	9,900	40
		20	.0017	14,100	68	11,800	57	10,600	51	10,000	48	8,800	35	8,200	30
	0.3	12	.0035	17,700	92	14,800	77	13,300	69	12,500	65	11,100	49	10,300	41
		20	.0020	14,100	73	11,800	61	10,600	55	10,000	52	8,800	42	8,200	33
	0.5	12	.0039	17,700	92	14,800	77	13,300	69	12,500	65	11,100	49	10,300	41
		20	.0028	14,100	73	11,800	61	10,600	55	10,000	52	8,800	42	8,200	33
3	0.1	8	.0022	17,300	97	14,400	81	13,000	73	12,200	73	10,800	52	10,100	40
		16	.0014	17,300	97	14,400	81	13,000	73	12,200	73	10,800	52	10,100	40
		25	.0009	14,000	78	11,700	66	10,500	63	9,900	59	8,700	45	8,200	36
		30	.0006	10,900	83	9,100	69	8,200	62	7,700	59	6,800	46	6,400	36
	0.2	8	.0035	17,300	97	14,400	81	13,000	73	12,200	73	10,800	52	10,100	40
		12	.0028	17,300	97	14,400	81	13,000	73	12,200	73	10,800	52	10,100	40
		16	.0020	17,300	97	14,400	81	13,000	73	12,200	73	10,800	52	10,100	40
		20	.0020	14,000	78	11,700	66	10,500	63	9,900	59	8,700	45	8,200	36
		25	.0018	14,000	78	11,700	66	10,500	63	9,900	59	8,700	45	8,200	36
		30	.0016	10,900	83	9,100	69	8,200	62	7,700	59	6,800	46	6,400	36
	0.3	8	.0051	17,300	111	14,400	92	13,000	83	12,200	78	10,800	56	10,100	44
		16	.0030	17,300	111	14,400	92	13,000	83	12,200	78	10,800	56	10,100	44
		20	.0030	14,000	90	11,700	75	10,500	67	9,900	63	8,700	49	8,200	39
		25	.0026	14,000	90	11,700	75	10,500	67	9,900	63	8,700	49	8,200	39
		30	.0024	10,900	92	9,100	76	8,200	69	7,700	65	6,800	49	6,400	41
	0.5	8	.0071	17,300	111	14,400	92	13,000	83	12,200	78	10,800	56	10,100	44
		12	.0051	17,300	111	14,400	92	13,000	83	12,200	78	10,800	56	10,100	44
		16	.0039	17,300	111	14,400	92	13,000	83	12,200	78	10,800	56	10,100	44
		20	.0039	14,000	90	11,700	75	10,500	67	9,900	63	8,700	49	8,200	39
		25	.0035	14,000	90	11,700	75	10,500	67	9,900	63	8,700	49	8,200	39
		30	.0031	10,900	92	9,100	76	8,200	69	7,700	65	6,800	49	6,400	41
		35	.0026	10,900	92	9,100	76	8,200	69	7,700	65	6,800	49	6,400	41
4	0.1	12	.0026	12,400	134	10,400	108	9,300	100	8,800	88	7,800	69	7,200	52
		20	.0022	12,400	134	10,400	108	9,300	100	8,800	88	7,800	69	7,200	52
		30	.0018	11,200	121	9,300	100	8,400	81	7,900	73	7,000	59	6,500	47
		40	.0012	11,200	121	9,300	100	8,400	81	7,900	73	7,000	59	6,500	47
	0.2	12	.0051	12,400	134	10,400	108	9,300	100	8,800	88	7,800	69	7,200	52
		20	.0039	12,400	134	10,400	108	9,300	100	8,800	88	7,800	69	7,200	52
		30	.0031	11,200	121	9,300	100	8,400	81	7,900	73	7,000	59	6,500	47
		40	.0024	11,200	121	9,300	100	8,400	81	7,900	73	7,000	59	6,500	47

Work material				1		2		3		4		5		6	
				Copper		Carbon steel Alloy steel (180～250HB)		Stainless steel Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	a_p (inch)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)	n (min^{-1})	v_f (IPM)
4	0.3	12	.0067	12,400	134	10,400	108	9,300	100	8,800	95	7,800	72	7,200	55
		20	.0051	12,400	134	10,400	108	9,300	100	8,800	95	7,800	72	7,200	55
		30	.0039	11,200	121	9,300	100	8,400	87	7,900	76	7,000	62	6,500	47
		40	.0031	11,200	121	9,300	100	8,400	87	7,900	76	7,000	62	6,500	47
	0.5	12	.0094	12,400	134	10,400	108	9,300	100	8,800	95	7,800	72	7,200	55
		20	.0079	12,400	134	10,400	108	9,300	100	8,800	95	7,800	72	7,200	55
		30	.0067	11,200	121	9,300	100	8,400	87	7,900	76	7,000	62	6,500	47
		40	.0039	11,200	121	9,300	100	8,400	87	7,900	76	7,000	62	6,500	47
5	0.1	20	.0028	9,700	105	8,100	87	7,300	79	6,900	69	6,100	54	5,700	41
		40	.0014	8,700	94	7,300	79	6,600	61	6,200	57	5,500	46	5,100	37
	0.2	20	.0059	9,700	105	8,100	87	7,300	79	6,900	69	6,100	54	5,700	41
		40	.0031	8,700	94	7,300	79	6,600	61	6,200	57	5,500	46	5,100	37
	0.3	20	.0083	9,700	105	8,100	87	7,300	79	6,900	75	6,100	59	5,700	43
		40	.0039	8,700	94	7,300	79	6,600	69	6,200	60	5,500	48	5,100	37
	0.5	20	.0110	9,700	105	8,100	87	7,300	79	6,900	75	6,100	59	5,700	43
		40	.0055	8,700	94	7,300	79	6,600	69	6,200	60	5,500	48	5,100	37
	1	20	.0138	9,700	105	8,100	87	7,300	79	6,900	75	6,100	59	5,700	43
		40	.0071	8,700	94	7,300	79	6,600	69	6,200	60	5,500	48	5,100	37
6	0.2	30	.0059	8,600	93	7,200	78	6,500	68	6,100	61	5,400	48	5,000	36
		54	.0039	7,800	81	6,500	68	5,800	56	5,500	51	4,900	39	4,500	32
		72	.0028	7,800	81	6,500	68	5,800	56	5,500	51	4,900	39	4,500	32
	0.3	30	.0098	8,600	93	7,200	78	6,500	68	6,100	61	5,400	52	5,000	38
		54	.0071	7,800	81	6,500	68	5,800	63	5,500	51	4,900	43	4,500	32
		72	.0039	7,800	81	6,500	68	5,800	63	5,500	51	4,900	43	4,500	32
	0.5	30	.0138	8,600	93	7,200	78	6,500	68	6,100	66	5,400	52	5,000	38
		54	.0098	7,800	81	6,500	68	5,800	63	5,500	53	4,900	43	4,500	32
		72	.0059	7,800	81	6,500	68	5,800	63	5,500	53	4,900	43	4,500	32
	1	30	.0217	8,600	93	7,200	78	6,500	68	6,100	66	5,400	52	5,000	38
		54	.0157	7,800	81	6,500	68	5,800	63	5,500	53	4,900	43	4,500	32
		72	.0087	7,800	81	6,500	68	5,800	63	5,500	53	4,900	43	4,500	32

【Note】

The indicated standard cutting depth is a reference value for Group 2 work materials. For materials in other groups, the cutting depth should be adjusted using the reference ratio shown in the above table.
The above conditions are reference conditions for finish machining. For rough machining, it is possible to increase the feed rate by around 30%.
To set a_e, calculate the theoretical cusp height and adjust it with (5 or less) x (a_p) x (cutting depth ratio) accordingly.

①Use the appropriate coolant for the work material and machining shape.
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions.
In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

Epoch Deep Radius F

EPDRF-TH

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steel Alloy steel (180～250HB)		Stainless steel Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	Standard depth of Cut (mm)	n min^{-1}	v_f (mm/min)	n min^{-1}	v_f (mm/min)	n min^{-1}	v_f (mm/min)	n min^{-1}	v_f (mm/min)	n min^{-1}	v_f (mm/min)	n min^{-1}	v_f (mm/min)
1	0.05	4	0.012	38,900	2,440	31,120	1,952	28,008	1,757	26,608	1,669	23,947	1,230	22,749	1,000
		6	0.01	31,500	1,780	25,200	1,424	22,680	1,282	21,546	1,218	19,391	990	18,422	810
		8	0.008	28,000	1,580	22,400	1,264	20,160	1,138	19,152	1,081	17,237	880	16,375	720
		10	0.005	24,500	1,390	19,600	1,112	17,640	1,001	16,758	951	15,082	770	14,328	630
		12	0.004	21,800	1,100	17,440	880	15,696	792	14,911	752	13,420	600	12,749	480
		16	0.003	21,800	960	17,440	768	15,696	691	14,911	657	13,420	510	12,749	400
		20	0.002	16,300	720	13,040	576	11,736	518	11,149	492	10,034	385	9,533	300
	0.1	4	0.02	38,900	2,440	31,120	1,952	28,008	1,757	26,608	1,669	23,947	1,230	22,749	1,000
		6	0.018	31,500	1,780	25,200	1,424	22,680	1,282	21,546	1,218	19,391	990	18,422	810
		8	0.014	28,000	1,580	22,400	1,264	20,160	1,138	19,152	1,081	17,237	880	16,375	720
		10	0.01	24,500	1,390	19,600	1,112	17,640	1,001	16,758	951	15,082	770	14,328	630
		12	0.008	21,800	1,100	17,440	880	15,696	792	14,911	752	13,420	600	12,749	480
		16	0.006	21,800	960	17,440	768	15,696	691	14,911	657	13,420	510	12,749	400
		20	0.004	16,300	720	13,040	576	11,736	518	11,149	492	10,034	385	9,533	300
1.5	0.05	4	0.02	29,900	2,030	23,920	1,624	21,528	1,462	20,452	1,389	18,406	1,020	17,486	830
		8	0.014	27,200	1,850	21,760	1,480	19,584	1,332	18,605	1,265	16,744	1,030	15,907	840
		12	0.007	21,800	1,480	17,440	1,184	15,696	1,066	14,911	1,012	13,420	820	12,749	670
		15	0.006	16,900	1,020	13,520	816	12,168	734	11,560	698	10,404	560	9,883	450
		20	0.004	16,900	1,020	13,520	816	12,168	734	11,560	698	10,404	560	9,883	450
	0.1	4	0.027	29,900	2,030	23,920	1,624	21,528	1,462	20,452	1,389	18,406	1,020	17,486	830
		8	0.02	27,200	1,850	21,760	1,480	19,584	1,332	18,605	1,265	16,744	1,030	15,907	840
		12	0.017	21,800	1,480	17,440	1,184	15,696	1,066	14,911	1,012	13,420	820	12,749	670
		15	0.014	16,900	1,020	13,520	816	12,168	734	11,560	698	10,404	560	9,883	450
		20	0.01	16,900	1,020	13,520	816	12,168	734	11,560	698	10,404	560	9,883	450
2	0.05	4	0.035	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		6	0.03	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		8	0.025	22,700	2,670	18,900	2,230	17,000	2,010	16,100	1,890	14,200	1,340	13,200	1,090
		12	0.02	18,400	1,950	15,300	1,620	13,800	1,460	13,000	1,380	11,500	1,080	10,700	890
		16	0.015	16,300	1,730	13,600	1,440	12,200	1,300	11,600	1,230	10,200	960	9,500	790
		20	0.01	14,300	1,520	11,900	1,260	10,700	1,140	10,100	1,070	8,900	840	8,300	690
	0.1	4	0.042	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		6	0.042	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		8	0.036	22,700	2,670	18,900	2,230	17,000	2,010	16,100	1,890	14,200	1,340	13,200	1,090
		12	0.036	18,400	1,950	15,300	1,620	13,800	1,460	13,000	1,380	11,500	1,080	10,700	890
		16	0.023	16,300	1,730	13,600	1,440	12,200	1,300	11,600	1,230	10,200	960	9,500	790
		20	0.018	14,300	1,520	11,900	1,260	10,700	1,140	10,100	1,070	8,900	840	8,300	690
	0.2	4	0.08	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		6	0.08	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		8	0.07	22,700	2,670	18,900	2,230	17,000	2,010	16,100	1,890	14,200	1,340	13,200	1,090
		12	0.04	18,400	1,950	15,300	1,620	13,800	1,460	13,000	1,380	11,500	1,080	10,700	890
		16	0.04	16,300	1,730	13,600	1,440	12,200	1,300	11,600	1,230	10,200	960	9,500	790
		20	0.035	14,300	1,520	11,900	1,260	10,700	1,140	10,100	1,070	8,900	840	8,300	690
		25	0.025	14,300	1,520	11,900	1,260	10,700	1,140	10,100	1,070	8,900	840	8,300	690
		30	0.017	13,600	1,440	11,300	1,200	10,200	1,080	9,600	1,020	8,500	800	7,900	650
	0.3	4	0.11	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		8	0.09	22,700	2,850	18,900	2,350	17,000	2,100	16,100	1,950	14,200	1,490	13,200	1,210
		12	0.06	18,400	2,170	15,300	1,810	13,800	1,620	13,000	1,530	11,500	1,200	10,700	980
		16	0.06	16,300	1,930	13,600	1,610	12,200	1,440	11,600	1,360	10,200	1,070	9,500	870
		20	0.037	14,300	1,680	11,900	1,400	10,700	1,260	10,100	1,190	8,900	940	8,300	770

Work material				1		2		3		4		5		6	
				Copper		Carbon steel Alloy steel (180～250HB)		Stainless steel Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	Standard depth of Cut (mm)	n min-1	vf (mm/min)	n min-1	vf (mm/min)	n min-1	vf (mm/min)	n min-1	vf (mm/min)	n min-1	vf (mm/min)	n min-1	vf (mm/min)
2	0.5	4	0.17	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		6	0.17	24,900	2,940	20,800	2,450	18,700	2,210	17,700	2,080	15,600	1,470	14,600	1,200
		8	0.14	22,700	2,850	18,900	2,350	17,000	2,100	16,100	1,950	14,200	1,490	13,200	1,210
		12	0.08	18,400	2,170	15,300	1,810	13,800	1,620	13,000	1,530	11,500	1,200	10,700	980
		16	0.08	16,300	1,930	13,600	1,610	12,200	1,440	11,600	1,360	10,200	1,070	9,500	870
		20	0.05	14,300	1,680	11,900	1,400	10,700	1,260	10,100	1,190	8,900	940	8,300	770
		25	0.05	14,300	1,680	11,900	1,400	10,700	1,260	10,100	1,190	8,900	940	8,300	770
		30	0.03	13,600	1,600	11,300	1,330	10,200	1,200	9,600	1,130	8,500	850	7,900	730
2.5	0.1	8	0.047	22,700	2,970	18,900	2,480	17,000	2,230	16,100	2,100	14,200	1,490	13,200	1,210
		16	0.037	16,300	1,930	13,600	1,610	12,200	1,440	11,600	1,360	10,200	1,070	9,500	870
		20	0.025	14,300	1,680	11,900	1,400	10,700	1,260	10,100	1,190	8,900	940	8,300	770
	0.2	8	0.08	19,400	2,570	16,200	2,140	14,600	1,920	13,800	1,820	12,200	1,280	11,300	1,100
		16	0.045	16,900	2,130	14,100	1,770	12,700	1,600	12,000	1,510	10,600	1,110	9,900	960
		20	0.042	14,100	1,750	11,800	1,410	10,600	1,270	10,000	1,200	8,800	930	8,200	790
	0.3	12	0.09	17,700	2,350	14,800	1,960	13,300	1,760	12,500	1,660	11,100	1,230	10,300	1,010
		20	0.052	14,100	1,870	11,800	1,560	10,600	1,400	10,000	1,330	8,800	1,040	8,200	850
	0.5	12	0.1	17,700	2,350	14,800	1,960	13,300	1,760	12,500	1,660	11,100	1,230	10,300	1,010
		20	0.07	14,100	1,870	11,800	1,560	10,600	1,400	10,000	1,330	8,800	1,040	8,200	850
3	0.1	8	0.055	17,300	2,550	14,400	2,120	13,000	1,910	12,200	1,800	10,800	1,270	10,100	1,040
		16	0.035	17,300	2,550	14,400	2,120	13,000	1,910	12,200	1,800	10,800	1,270	10,100	1,040
		25	0.022	14,000	2,060	11,700	1,720	10,500	1,550	9,900	1,460	8,700	1,150	8,200	940
		30	0.014	10,900	2,060	9,100	1,720	8,200	1,550	7,700	1,460	6,800	1,150	6,400	940
	0.2	8	0.09	17,300	2,550	14,400	2,120	13,000	1,910	12,200	1,800	10,800	1,270	10,100	1,040
		12	0.07	17,300	2,550	14,400	2,120	13,000	1,910	12,200	1,800	10,800	1,270	10,100	1,040
		16	0.05	17,300	2,550	14,400	2,120	13,000	1,910	12,200	1,800	10,800	1,270	10,100	1,040
		20	0.05	14,000	2,060	11,700	1,720	10,500	1,550	9,900	1,460	8,700	1,150	8,200	940
		25	0.045	14,000	2,060	11,700	1,720	10,500	1,550	9,900	1,460	8,700	1,150	8,200	940
		30	0.04	10,900	2,060	9,100	1,720	8,200	1,550	7,700	1,460	6,800	1,150	6,400	940
	0.3	8	0.13	17,300	2,830	14,400	2,360	13,000	2,120	12,200	2,010	10,800	1,410	10,100	1,160
		16	0.075	17,300	2,830	14,400	2,360	13,000	2,120	12,200	2,010	10,800	1,410	10,100	1,160
		20	0.075	14,000	2,290	11,700	1,910	10,500	1,720	9,900	1,620	8,700	1,270	8,200	1,040
		25	0.067	14,000	2,290	11,700	1,910	10,500	1,720	9,900	1,620	8,700	1,270	8,200	1,040
		30	0.06	10,900	2,290	9,100	1,910	8,200	1,720	7,700	1,620	6,800	1,270	6,400	1,040
	0.5	8	0.18	17,300	2,830	14,400	2,360	13,000	2,120	12,200	2,010	10,800	1,410	10,100	1,160
		12	0.13	17,300	2,830	14,400	2,360	13,000	2,120	12,200	2,010	10,800	1,410	10,100	1,160
		16	0.1	17,300	2,830	14,400	2,360	13,000	2,120	12,200	2,010	10,800	1,410	10,100	1,160
		20	0.1	14,000	2,290	11,700	1,910	10,500	1,720	9,900	1,620	8,700	1,270	8,200	1,040
		25	0.09	14,000	2,290	11,700	1,910	10,500	1,720	9,900	1,620	8,700	1,270	8,200	1,040
		30	0.08	10,900	2,290	9,100	1,910	8,200	1,720	7,700	1,620	6,800	1,270	6,400	1,040
		35	0.065	10,900	2,290	9,100	1,910	8,200	1,720	7,700	1,620	6,800	1,270	6,400	1,040
4	0.1	12	0.065	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,240	7,800	1,750	7,200	1,300
		20	0.055	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,240	7,800	1,750	7,200	1,300
		30	0.045	11,200	3,020	9,300	2,520	8,400	2,010	7,900	1,830	7,000	1,470	6,500	1,170
		40	0.03	11,200	3,020	9,300	2,520	8,400	2,010	7,900	1,830	7,000	1,470	6,500	1,170
	0.2	12	0.13	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,240	7,800	1,750	7,200	1,300
		20	0.1	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,240	7,800	1,750	7,200	1,300
		30	0.08	11,200	3,020	9,300	2,520	8,400	2,010	7,900	1,830	7,000	1,470	6,500	1,170
		40	0.06	11,200	3,020	9,300	2,520	8,400	2,010	7,900	1,830	7,000	1,470	6,500	1,170

【Note】 Please refer to P.A226

Epoch Deep Radius F

EPDRF-TH

Metric

Work material				1		2		3		4		5		6	
				Copper		Carbon steel Alloy steel (180～250HB)		Stainless steel Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut				120%		100%		90%		80%		65%		60%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	Standard depth of Cut (mm)	*n* min⁻¹	*vf* (mm/min)	*n* min⁻¹	*vf* (mm/min)	*n* min⁻¹	*vf* (mm/min)	*n* min⁻¹	*vf* (mm/min)	*n* min⁻¹	*vf* (mm/min)	*n* min⁻¹	*vf* (mm/min)
4	0.3	12	0.17	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,380	7,800	1,860	7,200	1,410
		20	0.13	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,380	7,800	1,860	7,200	1,410
		30	0.1	11,200	3,020	9,300	2,520	8,400	2,260	7,900	1,900	7,000	1,570	6,500	1,170
		40	0.08	11,200	3,020	9,300	2,520	8,400	2,260	7,900	1,900	7,000	1,570	6,500	1,170
	0.5	12	0.24	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,380	7,800	1,860	7,200	1,410
		20	0.2	12,400	3,350	10,400	2,790	9,300	2,520	8,800	2,380	7,800	1,860	7,200	1,410
		30	0.17	11,200	3,020	9,300	2,520	8,400	2,260	7,900	1,900	7,000	1,570	6,500	1,170
		40	0.1	11,200	3,020	9,300	2,520	8,400	2,260	7,900	1,900	7,000	1,570	6,500	1,170
5	0.1	20	0.07	9,700	2,620	8,100	2,190	7,300	1,970	6,900	1,760	6,100	1,370	5,700	1,020
		40	0.035	8,700	2,360	7,300	1,970	6,600	1,570	6,200	1,430	5,500	1,150	5,100	920
	0.2	20	0.15	9,700	2,620	8,100	2,190	7,300	1,970	6,900	1,760	6,100	1,370	5,700	1,020
		40	0.08	8,700	2,360	7,300	1,970	6,600	1,570	6,200	1,430	5,500	1,150	5,100	920
	0.3	20	0.21	9,700	2,620	8,100	2,190	7,300	1,970	6,900	1,860	6,100	1,460	5,700	1,110
		40	0.1	8,700	2,360	7,300	1,970	6,600	1,770	6,200	1,490	5,500	1,230	5,100	920
	0.5	20	0.28	9,700	2,620	8,100	2,190	7,300	1,970	6,900	1,860	6,100	1,460	5,700	1,110
		40	0.14	8,700	2,360	7,300	1,970	6,600	1,770	6,200	1,490	5,500	1,230	5,100	920
	1	20	0.35	9,700	2,620	8,100	2,190	7,300	1,970	6,900	1,860	6,100	1,460	5,700	1,110
		40	0.18	8,700	2,360	7,300	1,970	6,600	1,770	6,200	1,490	5,500	1,230	5,100	920
6	0.2	30	0.15	8,600	2,330	7,200	1,940	6,500	1,750	6,100	1,560	5,400	1,220	5,000	910
		54	0.1	7,800	2,100	6,500	1,750	5,800	1,400	5,500	1,270	4,900	1,020	4,500	820
		72	0.07	7,800	2,100	6,500	1,750	5,800	1,400	5,500	1,270	4,900	1,020	4,500	820
	0.3	30	0.25	8,600	2,330	7,200	1,940	6,500	1,750	6,100	1,560	5,400	1,300	5,000	980
		54	0.18	7,800	2,100	6,500	1,750	5,800	1,570	5,500	1,270	4,900	1,090	4,500	820
		72	0.1	7,800	2,100	6,500	1,750	5,800	1,570	5,500	1,270	4,900	1,090	4,500	820
	0.5	30	0.35	8,600	2,330	7,200	1,940	6,500	1,750	6,100	1,650	5,400	1,300	5,000	980
		54	0.25	7,800	2,100	6,500	1,750	5,800	1,570	5,500	1,320	4,900	1,090	4,500	820
		72	0.15	7,800	2,100	6,500	1,750	5,800	1,570	5,500	1,320	4,900	1,090	4,500	820
	1	30	0.55	8,600	2,330	7,200	1,940	6,500	1,750	6,100	1,650	5,400	1,300	5,000	980
		54	0.4	7,800	2,100	6,500	1,750	5,800	1,570	5,500	1,320	4,900	1,090	4,500	820
		72	0.22	7,800	2,100	6,500	1,750	5,800	1,570	5,500	1,320	4,900	1,090	4,500	820

【Note】

The indicated standard cutting depth is a reference value for Group 2 work materials. For materials in other groups, the cutting depth should be adjusted using the reference ratio shown in the above table.
The above conditions are reference conditions for finish machining. For rough machining, it is possible to increase the feed rate by around 30%.
To set *ae*, calculate the theoretical cusp height and adjust it with (5 or less) x (*ap*) x (cutting depth ratio) accordingly.

①Use the appropriate coolant for the work material and machining shape.
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions.
In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

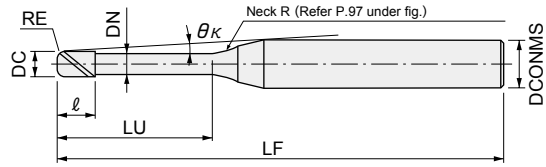
Epoch Turbo Rib

Straight Neck

Slotting | Die-sinking | Profiling | Radius | Miniature | Rest material machining | Roughing | Semi Finishing | Finishing | Miniature Rib

RE tolerance ±0.01mm h5

Suppresses chattering to enable deeper, faster machining.



4 Flutes

ETR4○○○○-○○-○○-TH

Carbide | TH | Helix angle 45° | Cutting Conditions A229

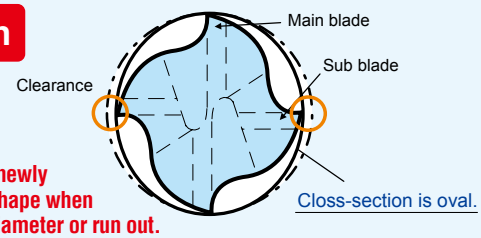
Item code	Stock	Size (mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length ℓ	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
ETR4010-5-02-TH	●	1 (.039inch)	0.2 (.008inch)	5 (.197inch)	1	0.94	50	6	4	8.52	5.79	6.01	6.21	6.38	6.75
ETR4010-7.5-02-TH	●			7.5 (.295inch)	1	0.94	50	6	4	7.42	8.39	8.68	8.91	9.11	10.07
ETR4010-10-02-TH	●			10 (.394inch)	1	0.94	50	6	4	6.58	10.98	11.32	11.58	12.09	13.39
ETR4010-12.5-02-TH	●			12.5 (.492inch)	1	0.94	60	6	4	5.90	13.57	13.94	14.38	15.08	16.71
ETR4010-15-02-TH	●			15 (.591inch)	1	0.94	60	6	4	5.35	16.15	16.55	17.24	18.07	20.03
ETR4010-17.5-02-TH	●			17.5 (.689inch)	1	0.94	60	6	4	4.90	18.72	19.20	20.09	21.07	23.35
ETR4010-20-02-TH	●			20 (.787inch)	1	0.94	60	6	4	4.51	21.29	21.92	22.94	24.06	26.66
ETR4010-22.5-02-TH	●			22.5 (.886inch)	1	0.94	70	6	4	4.19	23.85	24.64	25.79	27.05	29.98
ETR4010-25-02-TH	●			25 (.984inch)	1	0.94	70	6	4	3.90	26.41	27.37	28.64	30.04	33.30
ETR4010-27.5-02-TH	●			27.5 (1.083inch)	1	0.94	70	6	4	3.65	28.97	30.09	31.49	33.03	36.62
ETR4010-30-02-TH	●			30 (1.181inch)	1	0.94	70	6	4	3.44	31.52	32.82	34.34	36.02	39.94
ETR40125-5-02-TH	●	1.25 (.049inch)	0.2 (.008inch)	5 (.197inch)	1.25	1.18	50	6	4	8.38	5.81	6.03	6.22	6.39	6.79
ETR40125-10-02-TH	●			10 (.394inch)	1.25	1.18	50	6	4	6.42	11.00	11.33	11.59	12.12	13.42
ETR40125-15-02-TH	●			15 (.591inch)	1.25	1.18	60	6	4	5.20	16.16	16.56	17.26	18.10	20.06
ETR40125-20-02-TH	●			20 (.787inch)	1.25	1.18	60	6	4	4.37	21.30	21.95	22.97	24.09	26.69
ETR40125-25-02-TH	●			25 (.984inch)	1.25	1.18	70	6	4	3.77	26.42	27.39	28.67	30.07	33.33
ETR40125-30-02-TH	●			30 (1.181inch)	1.25	1.18	70	6	4	3.31	31.54	32.84	34.37	36.05	39.97
ETR4015-5-03-TH	●	1.5 (.059inch)	0.3 (.012inch)	5 (.197inch)	1.5	1.42	50	6	4	8.28	5.83	6.05	6.23	6.40	6.79
ETR4015-10-03-TH	●			10 (.394inch)	1.5	1.42	50	6	4	6.28	11.02	11.34	11.60	12.13	13.42
ETR4015-15-03-TH	●			15 (.591inch)	1.5	1.42	60	6	4	5.05	16.18	16.57	17.28	18.11	20.06
ETR4015-20-03-TH	●			20 (.787inch)	1.5	1.42	60	6	4	4.23	21.31	21.96	22.98	24.09	26.69
ETR4015-25-03-TH	●			25 (.984inch)	1.5	1.42	70	6	4	3.63	26.43	27.41	28.68	30.08	33.33
ETR4015-30-03-TH	●			30 (1.181inch)	1.5	1.42	70	6	4	3.19	31.55	32.86	34.38	36.06	39.97
ETR40175-10-03-TH	●	1.75 (.069inch)	0.3 (.012inch)	10 (.394inch)	1.75	1.65	50	6	4	6.09	11.06	11.37	11.63	12.18	13.48
ETR40175-20-03-TH	●			20 (.787inch)	1.75	1.65	60	6	4	4.07	21.34	22.01	23.03	24.15	26.76
ETR40175-30-03-TH	●			30 (1.181inch)	1.75	1.65	70	6	4	3.05	31.57	32.91	34.44	36.12	40.03
ETR40175-40-03-TH	●			40 (1.575inch)	1.75	1.65	80	6	4	2.44	41.94	43.80	45.84	48.08	No interference
ETR4020-10-05-TH	●	2 (.079inch)	0.5 (.020inch)	10 (.394inch)	2	1.92	50	6	4	5.98	11.01	11.33	11.59	12.09	13.36
ETR4020-15-05-TH	●			15 (.591inch)	2	1.92	60	6	4	4.75	16.17	16.56	17.25	18.07	19.99
ETR4020-20-05-TH	●			20 (.787inch)	2	1.92	60	6	4	3.94	21.31	21.95	22.95	24.06	26.63
ETR4020-25-05-TH	●			25 (.984inch)	2	1.92	70	6	4	3.36	26.43	27.39	28.65	30.04	33.27
ETR4020-30-05-TH	●			30 (1.181inch)	2	1.92	70	6	4	2.93	31.54	32.84	34.36	36.02	No interference
ETR4020-35-05-TH	●			35 (1.378inch)	2	1.92	80	6	4	2.60	36.67	38.29	40.06	42.00	No interference
ETR4020-40-05-TH	●			40 (1.575inch)	2	1.92	80	6	4	2.34	41.88	43.73	45.76	47.99	No interference
ETR4025-10-05-TH	●	2.5 (.098inch)	0.5 (.020inch)	10 (.394inch)	2.5	2.4	50	6	4	5.57	11.05	11.36	11.61	12.15	13.42
ETR4025-20-05-TH	●			20 (.787inch)	2.5	2.4	60	6	4	3.59	21.34	22.00	23.00	24.11	26.69
ETR4025-30-05-TH	●			30 (1.181inch)	2.5	2.4	70	6	4	2.64	31.57	32.89	34.41	36.08	No interference
ETR4025-40-05-TH	●			40 (1.575inch)	2.5	2.4	80	6	4	2.09	41.93	43.79	45.81	48.04	No interference
ETR4025-50-05-TH	●			50 (1.969inch)	2.5	2.4	90	6	4	1.73	52.36	54.68	57.22	No interference	No interference
ETR4030-10-08-TH	●	3 (.118inch)	0.8 (.031inch)	10 (.394inch)	3	2.86	50	6	4	5.17	11.12	11.40	11.66	12.20	13.45
ETR4030-20-08-TH	●			20 (.787inch)	3	2.86	60	6	4	3.23	21.39	22.07	23.07	24.17	26.72
ETR4030-30-08-TH	●			30 (1.181inch)	3	2.86	70	6	4	2.35	31.61	32.97	34.47	36.13	No interference
ETR4030-40-08-TH	●			40 (1.575inch)	3	2.86	80	6	4	1.85	42.02	43.86	45.88	No interference	No interference
ETR4030-50-08-TH	●			50 (1.969inch)	3	2.86	90	6	4	1.52	52.45	54.76	57.28	No interference	No interference

Applicable work material of ETR-TH, ETRP-TH

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	○		○	◎	○	○

● : Inventory maintained in US

Attention



Be careful of the newly developed flute shape when measuring tool diameter or run out.

The tool is designed with a smaller outer diameter connected to end sub blades. When measuring tool diameter or run out, measure the main blades.

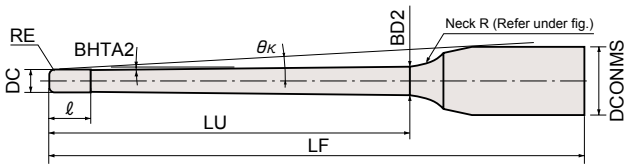
Epoch Turbo Rib

Pencil Neck

Die-sinking | Profiling | Radius | Miniature | Rest material machining | Roughing | Semi Finishing | Finishing | Miniature Rib

RE tolerance ±0.01mm h5

Suppresses chattering to enable deeper, faster machining.



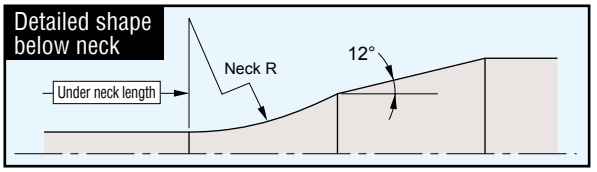
4 Flutes

ETRP4○○○○-○○-○○○○-TH

Carbide | TH | Helix angle 45° | Cutting Conditions A230

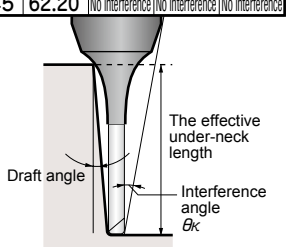
Item code	Stock	Size (mm) Tool dia. DC	Corner radius RE	Under neck length LU	Neck angle BHTA2	Flute length ℓ	Under neck dia. BD2	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θK	The effective under-neck length for the various draft angles 0°	1°	1.5°	2°	3°
ETRP4010-5-0902-TH	●	1 (.039inch)	0.2 (.008inch)	5 (.197inch)	0.9	1	1.066	60	6	4	8.67	2.91	5.70	5.96	6.17	6.51
ETRP4010-7.5-0902-TH	●			7.5 (.295inch)	0.9	1	1.144	60	6	7	7.61	2.91	8.50	8.97	9.34	9.93
ETRP4010-10-0902-TH	●			10 (.394inch)	0.9	1	1.223	60	6	7	6.78	2.91	11.04	11.60	12.03	12.70
ETRP4010-15-0902-TH	●			15 (.591inch)	0.9	1	1.380	60	6	10	5.57	2.91	16.35	17.25	17.89	18.89
ETRP4010-20-0902-TH	●			20 (.787inch)	0.9	1	1.537	70	6	10	4.72	2.91	21.42	22.49	23.22	24.80
ETRP4010-25-0902-TH	●			25 (.984inch)	0.9	1	1.694	70	6	10	4.10	2.91	26.49	27.70	28.52	30.95
ETRP4010-30-0902-TH	●			30 (1.181inch)	0.9	1	1.851	80	6	10	3.62	2.91	31.55	32.90	33.79	37.09
ETRP4010-35-0902-TH	●			35 (1.378inch)	0.9	1	2.008	80	6	10	3.24	2.91	36.61	38.08	39.03	43.24
ETRP4010-40-0902-TH	●			40 (1.575inch)	0.9	1	2.165	90	6	10	2.94	2.91	41.67	43.25	44.54	No interference
ETRP4010-45-0902-TH	●			45 (1.772inch)	0.9	1	2.322	90	6	10	2.68	2.91	46.73	48.41	50.08	No interference
ETRP4010-50-0902-TH	●			50 (1.969inch)	0.9	1	2.480	100	6	10	2.47	2.91	51.78	53.56	55.62	No interference
ETRP40125-10-0902-TH	●	1.25 (.049inch)	0.2 (.008inch)	10 (.394inch)	0.9	1.25	1.455	60	6	7	6.62	3.47	11.10	11.65	12.06	12.73
ETRP40125-15-0902-TH	●			15 (.591inch)	0.9	1.25	1.612	60	6	10	5.41	3.47	16.42	17.29	17.92	18.91
ETRP40125-20-0902-TH	●			20 (.787inch)	0.9	1.25	1.769	70	6	10	4.57	3.47	21.49	22.52	23.25	24.86
ETRP40125-30-0902-TH	●			30 (1.181inch)	0.9	1.25	2.083	80	6	10	3.49	3.47	31.61	32.93	33.81	37.15
ETRP40125-40-0902-TH	●			40 (1.575inch)	0.9	1.25	2.397	90	6	10	2.82	3.47	41.73	43.28	44.59	No interference
ETRP40125-50-0902-TH	●			50 (1.969inch)	0.9	1.25	2.712	100	6	10	2.37	3.47	51.83	53.59	55.67	No interference
ETRP4015-10-0903-TH	●	1.5 (.059inch)	0.3 (.012inch)	10 (.394inch)	0.9	1.5	1.687	60	6	7	6.47	4.04	11.15	11.67	12.08	12.74
ETRP4015-15-0903-TH	●			15 (.591inch)	0.9	1.5	1.844	60	6	7	5.26	4.04	16.21	16.89	17.40	18.73
ETRP4015-20-0903-TH	●			20 (.787inch)	0.9	1.5	2.001	70	6	10	4.43	4.04	21.54	22.55	23.27	24.88
ETRP4015-30-0903-TH	●			30 (1.181inch)	0.9	1.5	2.315	80	6	10	3.36	4.04	31.66	32.95	33.83	37.17
ETRP4015-40-0903-TH	●			40 (1.575inch)	0.9	1.5	2.630	90	6	10	2.71	4.04	41.77	43.30	44.62	No interference
ETRP4015-50-0903-TH	●			50 (1.969inch)	0.9	1.5	2.944	100	6	10	2.27	4.04	51.88	53.60	55.70	No interference
ETRP40175-10-0903-TH	●	1.75 (.069inch)	0.3 (.012inch)	10 (.394inch)	0.9	1.75	1.909	60	6	7	6.28	4.93	11.24	11.74	12.13	12.77
ETRP40175-15-0903-TH	●			15 (.591inch)	0.9	1.75	2.066	60	6	7	5.07	4.93	16.29	16.95	17.44	18.82
ETRP40175-20-0903-TH	●			20 (.787inch)	0.9	1.75	2.223	70	6	10	4.26	4.93	21.64	22.61	23.32	24.97
ETRP40175-30-0903-TH	●			30 (1.181inch)	0.9	1.75	2.538	80	6	10	3.22	4.93	31.75	33.00	33.86	37.26
ETRP40175-40-0903-TH	●			40 (1.575inch)	0.9	1.75	2.852	90	6	10	2.59	4.93	41.86	43.34	44.70	No interference
ETRP40175-50-0903-TH	●			50 (1.969inch)	0.9	1.75	3.166	100	6	10	2.16	4.93	51.95	53.64	55.78	No interference
ETRP4020-15-0905-TH	●	2 (.079inch)	0.5 (.020inch)	15 (.591inch)	0.9	2	2.328	60	6	7	4.95	4.54	16.23	16.91	17.40	18.72
ETRP4020-20-0905-TH	●			20 (.787inch)	0.9	2	2.486	70	6	7	4.12	4.54	21.29	22.10	22.67	24.86
ETRP4020-25-0905-TH	●			25 (.984inch)	0.9	2	2.643	70	6	10	3.54	4.54	26.63	27.77	28.57	31.01
ETRP4020-30-0905-TH	●			30 (1.181inch)	0.9	2	2.800	80	6	10	3.1	4.54	31.69	32.96	33.83	37.16
ETRP4020-35-0905-TH	●			35 (1.378inch)	0.9	2	2.957	80	6	10	2.75	4.54	36.75	38.14	39.09	No interference
ETRP4020-40-0905-TH	●			40 (1.575inch)	0.9	2	3.114	90	6	10	2.48	4.54	41.80	43.31	44.63	No interference
ETRP4020-45-0905-TH	●			45 (1.772inch)	0.9	2	3.271	90	6	10	2.25	4.54	46.85	48.46	50.17	No interference
ETRP4020-50-0905-TH	●			50 (1.969inch)	0.9	2	3.428	100	6	10	2.07	4.54	51.90	53.61	55.71	No interference
ETRP4020-55-0905-TH	●			55 (2.165inch)	0.9	2	3.585	100	6	10	1.91	4.54	56.95	58.75	No interference	No interference
ETRP4020-60-0905-TH	●			60 (2.362inch)	0.9	2	3.742	110	6	10	1.77	4.54	62.00	63.89	No interference	No interference
ETRP4025-20-0905-TH	●	2.5 (.098inch)	0.5 (.020inch)	20 (.787inch)	0.9	2.5	2.950	70	6	7	3.76	5.68	21.39	22.16	22.72	24.98
ETRP4025-30-0905-TH	●			30 (1.181inch)	0.9	2.5	3.264	80	6	10	2.79	5.68	31.80	33.02	33.88	No interference
ETRP4025-40-0905-TH	●			40 (1.575inch)	0.9	2.5	3.578	90	6	10	2.22	5.68	41.90	43.36	44.73	No interference
ETRP4025-50-0905-TH	●			50 (1.969inch)	0.9	2.5	3.892	100	6	10	1.85	5.68	52.00	53.66	No interference	No interference
ETRP4025-60-0905-TH	●			60 (2.362inch)	0.9	2.5	4.207	110	6	10	1.58	5.68	62.09	63.93	No interference	No interference
ETRP4030-20-0908-TH	●	3 (.118inch)	0.8 (.031inch)	20 (.787inch)	0.9	3	3.394	70	6	7	3.39	7.45	21.50	22.22	22.76	25.05
ETRP4030-30-0908-TH	●			30 (1.181inch)	0.9	3	3.708	80	6	7	2.49	7.45	31.59	32.54	33.74	No interference
ETRP4030-40-0908-TH	●			40 (1.575inch)	0.9	3	4.022	90	6	10	1.96	7.45	42.03	43.42	No interference	No interference
ETRP4030-50-0908-TH	●			50 (1.969inch)	0.9	3	4.337	100	6	10	1.62	7.45	52.12	53.72	No interference	No interference
ETRP4030-60-0908-TH	●			60 (2.362inch)	0.9	3	4.651	110	6	10	1.37	7.45	62.20	No interference	No interference	No interference

Detailed shape below neck



【Note】

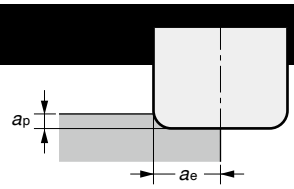
If the workpiece has draft angle, the interference length will be longer than the under-neck length.Please refer to the effective under-neck length for the various draft angles.
In addition, the angle at which the tool will interfere with the workpiece is shown as the "interference angle θK", and should also be referred to.



● : Inventory maintained in US

Recommended cutting conditions

ETR-TH Straight Neck



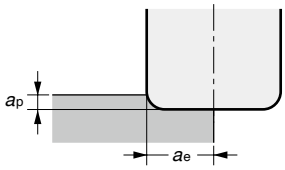
Inch

Work material		Cast Iron, Carbon Steel, Alloy Steel (150～250HB)				Tool Steel, (25～35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～60HRC)			
DC (inch)	LU (inch)	RPM (min^{-1})	Feed rate (IPM)	a_p (inch)	a_e (inch)	RPM (min^{-1})	Feed rate (IPM)	a_p (inch)	a_e (inch)	RPM (min^{-1})	Feed rate (IPM)	a_p (inch)	a_e (inch)	RPM (min^{-1})	Feed rate (IPM)	a_p (inch)	a_e (inch)	RPM (min^{-1})	Feed rate (IPM)	a_p (inch)	a_e (inch)
.039	.197	32,000	229.1	.0016	.0197	27,100	177.6	.0016	.0197	22,300	114.2	.0013	.0197	19,100	97.6	.0008	.0197	15,900	33.0	.0005	.0197
	.295	32,000	229.1	.0011	.0197	27,100	177.6	.0011	.0197	22,300	114.2	.0008	.0197	19,100	97.6	.0005	.0197	15,900	33.0	.0003	.0197
	.394	32,000	229.1	.0008	.0197	27,100	177.6	.0008	.0197	22,300	114.2	.0006	.0197	19,100	97.6	.0004	.0197	15,900	33.0	.0002	.0197
	.492	28,800	206.3	.0006	.0197	24,400	159.8	.0006	.0197	20,100	102.8	.0005	.0197	17,200	87.8	.0003	.0197	14,300	30.0	.0002	.0197
	.591	28,800	206.3	.0005	.0197	24,400	159.8	.0005	.0197	20,100	102.8	.0004	.0197	17,200	87.8	.0003	.0197	14,300	30.0	.0002	.0197
	.689	25,600	183.5	.0004	.0197	21,700	142.1	.0004	.0197	17,800	91.3	.0004	.0197	15,300	78.0	.0002	.0197	12,700	26.0	.0001	.0197
	.787	25,600	183.5	.0004	.0197	21,700	142.1	.0004	.0197	17,800	91.3	.0003	.0197	15,300	78.0	.0002	.0197	12,700	26.0	.0001	.0197
	.886	22,400	160.2	.0004	.0197	19,000	124.4	.0004	.0197	15,600	79.9	.0003	.0197	13,400	68.5	.0002	.0197	11,100	23.0	.0001	.0197
	.984	22,400	160.2	.0003	.0197	19,000	124.4	.0003	.0197	15,600	79.9	.0002	.0197	13,400	68.5	.0002	.0197	11,100	23.0	.0001	.0197
	1.083	19,200	137.4	.0003	.0197	16,300	106.7	.0003	.0197	13,400	68.5	.0002	.0197	11,500	58.7	.0002	.0197	9,500	20.0	.0001	.0197
	1.181	19,200	137.4	.0003	.0197	16,300	106.7	.0003	.0197	13,400	68.5	.0002	.0197	11,500	58.7	.0001	.0197	9,500	20.0	.0001	.0197
.049	.197	25,000	241.3	.0025	.0244	21,600	190.6	.0025	.0244	17,800	122.8	.0020	.0244	15,300	105.5	.0012	.0244	12,700	35.0	.0007	.0244
	.394	25,000	241.3	.0012	.0244	21,600	190.6	.0012	.0244	17,800	122.8	.0010	.0244	15,300	105.5	.0006	.0244	12,700	35.0	.0004	.0244
	.591	22,500	217.3	.0008	.0244	19,400	171.7	.0008	.0244	16,000	110.6	.0007	.0244	13,800	94.9	.0004	.0244	11,400	31.5	.0002	.0244
	.787	20,000	192.9	.0006	.0244	17,300	152.4	.0006	.0244	14,200	98.4	.0005	.0244	12,200	84.3	.0003	.0244	10,200	28.0	.0002	.0244
	.984	20,000	192.9	.0005	.0244	17,300	152.4	.0005	.0244	14,200	98.4	.0004	.0244	12,200	84.3	.0002	.0244	10,200	28.0	.0002	.0244
	1.181	17,500	168.9	.0004	.0244	15,100	133.5	.0004	.0244	12,500	85.8	.0003	.0244	10,700	74.0	.0002	.0244	8,900	24.4	.0001	.0244
.059	.197	21,000	260.6	.0035	.0295	18,000	203.9	.0035	.0295	14,900	131.9	.0028	.0295	12,700	112.6	.0018	.0295	10,600	37.4	.0011	.0295
	.394	21,000	260.6	.0018	.0295	18,000	203.9	.0018	.0295	14,900	131.9	.0014	.0295	12,700	112.6	.0009	.0295	10,600	37.4	.0006	.0295
	.591	21,000	260.6	.0012	.0295	18,000	203.9	.0012	.0295	14,900	131.9	.0009	.0295	12,700	112.6	.0006	.0295	10,600	37.4	.0004	.0295
	.787	18,900	234.6	.0009	.0295	16,200	183.5	.0009	.0295	13,400	118.9	.0007	.0295	11,400	101.2	.0004	.0295	9,500	33.9	.0003	.0295
	.984	16,800	208.7	.0007	.0295	14,400	163.0	.0007	.0295	11,900	105.5	.0006	.0295	10,200	90.2	.0004	.0295	8,500	29.9	.0002	.0295
	1.181	16,800	208.7	.0006	.0295	14,400	163.0	.0006	.0295	11,900	105.5	.0005	.0295	10,200	90.2	.0003	.0295	8,500	29.9	.0002	.0295
.069	.394	18,000	278.0	.0024	.0343	15,500	218.9	.0024	.0343	12,700	140.2	.0019	.0343	10,900	120.1	.0012	.0343	9,100	40.2	.0007	.0343
	.787	16,200	250.0	.0012	.0343	14,000	196.9	.0012	.0343	11,400	126.0	.0010	.0343	9,800	108.3	.0006	.0343	8,200	36.2	.0004	.0343
	1.181	14,400	222.4	.0008	.0343	12,400	175.2	.0008	.0343	10,200	112.2	.0006	.0343	8,700	96.1	.0004	.0343	7,300	32.3	.0002	.0343
	1.575	12,600	194.5	.0006	.0343	10,900	153.2	.0006	.0343	8,900	98.0	.0005	.0343	7,600	84.3	.0003	.0343	6,400	28.0	.0002	.0343
.079	.394	16,000	300.0	.0031	.0394	13,500	231.5	.0031	.0394	11,100	148.4	.0025	.0394	9,500	127.2	.0016	.0394	8,000	42.9	.0009	.0394
	.591	16,000	300.0	.0021	.0394	13,500	231.5	.0021	.0394	11,100	148.4	.0017	.0394	9,500	127.2	.0011	.0394	8,000	42.9	.0006	.0394
	.787	16,000	300.0	.0016	.0394	13,500	231.5	.0016	.0394	11,100	148.4	.0013	.0394	9,500	127.2	.0008	.0394	8,000	42.9	.0005	.0394
	.984	14,400	270.1	.0013	.0394	12,200	208.3	.0013	.0394	10,000	133.5	.0010	.0394	8,600	114.6	.0006	.0394	7,200	38.6	.0004	.0394
	1.181	14,400	270.1	.0011	.0394	12,200	208.3	.0011	.0394	10,000	133.5	.0008	.0394	8,600	114.6	.0005	.0394	7,200	38.6	.0003	.0394
	1.378	12,800	240.2	.0009	.0394	10,800	185.0	.0009	.0394	8,900	118.9	.0007	.0394	7,600	101.6	.0004	.0394	6,400	34.3	.0003	.0394
	1.575	12,800	240.2	.0008	.0394	10,800	185.0	.0008	.0394	8,900	118.9	.0006	.0394	7,600	101.6	.0004	.0394	6,400	34.3	.0002	.0394
.098	.394	13,000	322.4	.0049	.0492	10,800	244.9	.0049	.0492	8,900	157.9	.0039	.0492	7,600	134.6	.0025	.0492	6,400	45.3	.0015	.0492
	.787	13,000	322.4	.0025	.0492	10,800	244.9	.0025	.0492	8,900	157.9	.0020	.0492	7,600	134.6	.0012	.0492	6,400	45.3	.0007	.0492
	1.181	11,700	290.2	.0017	.0492	9,700	220.5	.0017	.0492	8,000	142.1	.0013	.0492	6,800	121.3	.0008	.0492	5,800	40.9	.0005	.0492
	1.575	10,400	257.9	.0012	.0492	8,600	196.1	.0012	.0492	7,100	126.4	.0010	.0492	6,100	107.9	.0006	.0492	5,100	36.2	.0004	.0492
	1.969	10,400	257.9	.0010	.0492	8,600	196.1	.0010	.0492	7,100	126.4	.0008	.0492	6,100	107.9	.0005	.0492	5,100	36.2	.0003	.0492
.118	.394	10,600	333.1	.0071	.0551	9,000	258.7	.0071	.0551	7,400	166.1	.0057	.0551	6,400	143.7	.0035	.0551	5,300	47.6	.0021	.0551
	.787	10,600	333.1	.0035	.0551	9,000	258.7	.0035	.0551	7,400	166.1	.0028	.0551	6,400	143.7	.0018	.0551	5,300	47.6	.0011	.0551
	1.181	10,600	333.1	.0024	.0551	9,000	258.7	.0024	.0551	7,400	166.1	.0019	.0551	6,400	143.7	.0012	.0551	5,300	47.6	.0007	.0551
	1.575	9,540	299.6	.0018	.0551	8,100	232.7	.0018	.0551	6,700	149.6	.0014	.0551	5,800	129.5	.0009	.0551	4,800	42.9	.0006	.0551
	1.969	8,480	266.5	.0014	.0551	7,200	207.1	.0014	.0551	5,900	133.1	.0011	.0551	5,100	115.0	.0007	.0551	4,200	38.2	.0004	.0551

【Note】
① Use a machine having as high rigidity and high accuracy as possible.
② Use the appropriate coolant for the work material and machining shape.
③ The cutting conditions shown in this table are intended as general criteria and should be adjusted according to the cutting shape, purpose, machine used, etc.
④ If the rotation speed of the machine is insufficient, reduce the rotation speed and feed rate by the same ratios.
⑤ For cutting in, set the ramp introduction angle to 1° and set the feed rate to 60 to 70% of the above values.
⑥ In the case of using tools with L/D = 15 or more length from the first process, in order to suppress the chattering vibration of the tools and stabilize the cutting, it is recommended to make suitable guides by using short neck type or ball end mills.

Epoch Turbo Rib

ETRP-TH Pencil Neck

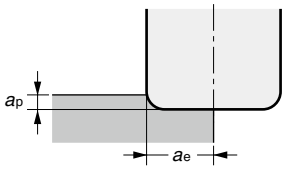


Inch

Work material		Cast Iron, Carbon Steel, Alloy Steel (150～250HB)				Tool Steel, (25～35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～60HRC)			
DC (inch)	LU (inch)	RPM (min-1)	Feed rate (IPM)	ap (inch)	ae (inch)	RPM (min-1)	Feed rate (IPM)	ap (inch)	ae (inch)	RPM (min-1)	Feed rate (IPM)	ap (inch)	ae (inch)	RPM (min-1)	Feed rate (IPM)	ap (inch)	ae (inch)	RPM (min-1)	Feed rate (IPM)	ap (inch)	ae (inch)
.039	.197	32,000	229.1	.0024	.0197	27,100	177.6	.0024	.0197	22,300	114.2	.0019	.0197	19,100	97.6	.0012	.0197	15,900	32.7	.0007	.0197
	.295	32,000	229.1	.0018	.0197	27,100	177.6	.0018	.0197	22,300	114.2	.0014	.0197	19,100	97.6	.0009	.0197	15,900	32.7	.0005	.0197
	.394	32,000	229.1	.0012	.0197	27,100	177.6	.0012	.0197	22,300	114.2	.0009	.0197	19,100	97.6	.0006	.0197	15,900	32.7	.0004	.0197
	.591	28,800	206.3	.0008	.0197	24,400	159.8	.0008	.0197	20,100	102.8	.0006	.0197	17,200	87.8	.0004	.0197	14,300	29.5	.0002	.0197
	.787	28,800	206.3	.0006	.0197	24,400	159.8	.0006	.0197	20,100	102.8	.0005	.0197	17,200	87.8	.0003	.0197	14,300	29.5	.0002	.0197
	.984	25,600	183.5	.0005	.0197	21,700	142.1	.0005	.0197	17,800	91.3	.0004	.0197	15,300	78.0	.0002	.0197	12,700	26.0	.0002	.0197
	1.181	24,000	172.0	.0004	.0197	20,300	133.1	.0004	.0197	16,700	85.8	.0003	.0197	14,300	73.2	.0002	.0197	11,900	24.4	.0001	.0197
	1.378	22,400	160.2	.0004	.0197	19,000	124.4	.0004	.0197	15,600	79.9	.0003	.0197	13,400	68.5	.0002	.0197	11,100	22.8	.0001	.0197
	1.575	20,800	148.8	.0003	.0197	17,600	115.4	.0003	.0197	14,500	74.4	.0002	.0197	12,400	63.4	.0002	.0197	10,300	21.3	.0001	.0197
	1.772	19,200	137.4	.0003	.0197	16,300	106.7	.0003	.0197	13,400	68.5	.0002	.0197	11,500	58.7	.0001	.0197	9,500	19.7	.0001	.0197
	1.969	16,000	114.6	.0002	.0197	13,600	89.0	.0002	.0197	11,200	57.1	.0002	.0197	9,600	48.8	.0001	.0197	8,000	16.5	.0001	.0197
.049	.394	25,000	241.3	.0019	.0244	21,600	190.6	.0019	.0244	17,800	122.8	.0015	.0244	15,300	105.5	.0009	.0244	12,700	35.0	.0006	.0244
	.591	23,800	229.5	.0014	.0244	20,500	181.1	.0014	.0244	16,900	116.7	.0011	.0244	14,550	100.2	.0007	.0244	12,050	33.3	.0004	.0244
	.787	22,500	217.3	.0009	.0244	19,400	171.7	.0009	.0244	16,000	110.6	.0007	.0244	13,800	94.9	.0005	.0244	11,400	31.5	.0003	.0244
	1.181	20,000	192.9	.0006	.0244	17,300	152.4	.0006	.0244	14,200	98.4	.0005	.0244	12,200	84.3	.0003	.0244	10,200	28.0	.0002	.0244
	1.575	17,500	168.9	.0005	.0244	15,100	133.5	.0005	.0244	12,500	85.8	.0004	.0244	10,700	74.0	.0002	.0244	8,900	24.4	.0002	.0244
	1.969	16,300	156.7	.0004	.0244	14,000	124.0	.0004	.0244	11,600	79.9	.0003	.0244	9,900	68.5	.0002	.0244	8,300	22.8	.0001	.0244
.059	.394	21,000	260.6	.0027	.0295	18,000	203.9	.0027	.0295	14,900	131.9	.0021	.0295	12,700	112.6	.0013	.0295	10,600	37.4	.0008	.0295
	.591	21,000	260.6	.0020	.0295	18,000	203.9	.0020	.0295	14,900	131.9	.0016	.0295	12,700	112.6	.0010	.0295	10,600	37.4	.0006	.0295
	.787	18,900	234.6	.0013	.0295	16,200	183.5	.0013	.0295	13,400	118.9	.0011	.0295	11,400	101.2	.0007	.0295	9,500	33.9	.0004	.0295
	1.181	18,900	234.6	.0009	.0295	16,200	183.5	.0009	.0295	13,400	118.9	.0007	.0295	11,400	101.2	.0004	.0295	9,500	33.9	.0003	.0295
	1.575	15,800	195.7	.0007	.0295	13,500	153.1	.0007	.0295	11,200	98.8	.0006	.0295	9,500	84.6	.0003	.0295	8,000	28.0	.0002	.0295
	1.969	14,700	182.3	.0006	.0295	12,600	142.9	.0006	.0295	10,400	92.5	.0004	.0295	8,900	78.7	.0003	.0295	7,400	26.4	.0002	.0295
.069	.394	18,000	278.0	.0036	.0343	15,500	218.9	.0036	.0343	12,700	140.2	.0029	.0343	10,900	120.1	.0018	.0343	9,100	40.2	.0011	.0343
	.591	18,000	278.0	.0027	.0343	15,500	218.9	.0027	.0343	12,700	140.2	.0022	.0343	10,900	120.1	.0014	.0343	9,100	40.2	.0008	.0343
	.787	16,200	250.0	.0018	.0343	14,000	196.9	.0018	.0343	11,400	126.0	.0015	.0343	9,800	108.3	.0009	.0343	8,200	36.2	.0006	.0343
	1.181	16,200	250.0	.0012	.0343	14,000	196.9	.0012	.0343	11,400	126.0	.0010	.0343	9,800	108.3	.0006	.0343	8,200	36.2	.0004	.0343
	1.575	14,400	222.4	.0009	.0343	12,400	175.2	.0009	.0343	10,200	112.2	.0007	.0343	8,700	96.1	.0004	.0343	7,300	32.3	.0003	.0343
	1.969	13,500	208.7	.0007	.0343	11,600	164.2	.0007	.0343	9,500	105.1	.0006	.0343	8,200	90.2	.0004	.0343	6,800	30.3	.0002	.0343
.079	.591	16,000	300.0	.0031	.0394	13,500	231.5	.0031	.0394	11,100	148.4	.0025	.0394	9,500	127.2	.0016	.0394	8,000	42.9	.0009	.0394
	.787	16,000	300.0	.0024	.0394	13,500	231.5	.0024	.0394	11,100	148.4	.0019	.0394	9,500	127.2	.0012	.0394	8,000	42.9	.0007	.0394
	.984	14,400	270.1	.0019	.0394	12,200	208.3	.0019	.0394	10,000	133.5	.0015	.0394	8,600	114.6	.0009	.0394	7,200	38.6	.0006	.0394
	1.181	14,400	270.1	.0016	.0394	12,200	208.3	.0016	.0394	10,000	133.5	.0013	.0394	8,600	114.6	.0008	.0394	7,200	38.6	.0005	.0394
	1.378	14,400	270.1	.0013	.0394	12,200	208.3	.0013	.0394	10,000	133.5	.0011	.0394	8,600	114.6	.0007	.0394	7,200	38.6	.0004	.0394
	1.575	14,400	270.1	.0012	.0394	12,200	208.3	.0012	.0394	10,000	133.5	.0009	.0394	8,600	114.6	.0006	.0394	7,200	38.6	.0004	.0394
	1.772	12,800	240.2	.0011	.0394	10,800	185.0	.0011	.0394	8,900	118.9	.0008	.0394	7,600	101.6	.0005	.0394	6,400	34.3	.0003	.0394
	1.969	12,800	240.2	.0009	.0394	10,800	185.0	.0009	.0394	8,900	118.9	.0007	.0394	7,600	101.6	.0005	.0394	6,400	34.3	.0003	.0394
	2.165	12,000	225.2	.0009	.0394	10,100	173.6	.0009	.0394	8,300	111.4	.0007	.0394	7,100	95.3	.0004	.0394	6,000	32.3	.0003	.0394
	2.362	12,000	225.2	.0008	.0394	10,100	173.6	.0008	.0394	8,300	111.4	.0006	.0394	7,100	95.3	.0004	.0394	6,000	32.3	.0002	.0394
.098	.787	13,000	322.4	.0037	.0492	10,800	244.9	.0037	.0492	8,900	157.9	.0030	.0492	7,600	134.6	.0019	.0492	6,400	45.3	.0011	.0492
	1.181	11,700	290.2	.0025	.0492	9,700	220.5	.0025	.0492	8,000	142.1	.0020	.0492	6,800	121.3	.0012	.0492	5,800	40.9	.0007	.0492
	1.575	11,700	290.2	.0019	.0492	9,700	220.5	.0019	.0492	8,000	142.1	.0015	.0492	6,800	121.3	.0009	.0492	5,800	40.9	.0006	.0492
	1.969	11,700	290.2	.0015	.0492	9,700	220.5	.0015	.0492	8,000	142.1	.0012	.0492	6,800	121.3	.0007	.0492	5,800	40.9	.0004	.0492
	2.362	10,400	257.9	.0012	.0492	8,600	196.1	.0012	.0492	7,100	126.4	.0010	.0492	6,100	107.9	.0006	.0492	5,100	36.2	.0004	.0492
.118	.787	10,600	333.1	.0053	.0551	9,000	258.7	.0053	.0551	7,400	166.1	.0043	.0551	6,400	143.7	.0027	.0551	5,300	47.6	.0016	.0551
	1.181	10,600	333.1	.0035	.0551	9,000	258.7	.0035	.0551	7,400	166.1	.0028	.0551	6,400	143.7	.0018	.0551	5,300	47.6	.0011	.0551
	1.575	9,500	299.6	.0027	.0551	8,100	232.7	.0027	.0551	6,700	149.6	.0021	.0551	5,800	129.5	.0013	.0551	4,800	42.9	.0008	.0551
	1.969	9,500	299.6	.0021	.0551	8,100	232.7	.0021	.0551	6,700	149.6	.0017	.0551	5,800	129.5	.0011	.0551	4,800	42.9	.0006	.0551
	2.362	9,500	299.6	.0018	.0551	8,100	232.7	.0018	.0551	6,700	149.6	.0014	.0551	5,800	129.5	.0009	.0551	4,800	42.9	.0006	.0551

【Note】 Please refer to P.A229

ETR-TH Straight Neck



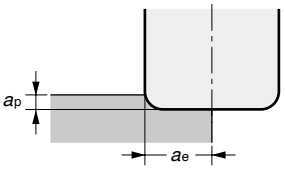
Metric

Work material		Cast Iron, Carbon Steel, Alloy Steel (150～250HB)				Tool Steel, (25～35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～60HRC)			
DC (mm)	LU (mm)	RPM (min⁻¹)	Feed rate (mm/min)	ap (mm)	ae (mm)	RPM (min⁻¹)	Feed rate (mm/min)	ap (mm)	ae (mm)	RPM (min⁻¹)	Feed rate (mm/min)	ap (mm)	ae (mm)	RPM (min⁻¹)	Feed rate (mm/min)	ap (mm)	ae (mm)	RPM (min⁻¹)	Feed rate (mm/min)	ap (mm)	ae (mm)
1	5	32,000	5,820	0.040	0.50	27,100	4,510	0.040	0.50	22,300	2,900	0.032	0.50	19,100	2,480	0.020	0.50	15,900	830	0.012	0.50
	7.5	32,000	5,820	0.027	0.50	27,100	4,510	0.027	0.50	22,300	2,900	0.021	0.50	19,100	2,480	0.013	0.50	15,900	830	0.008	0.50
	10	32,000	5,820	0.020	0.50	27,100	4,510	0.020	0.50	22,300	2,900	0.016	0.50	19,100	2,480	0.010	0.50	15,900	830	0.006	0.50
	12.5	28,800	5,240	0.016	0.50	24,400	4,060	0.016	0.50	20,100	2,610	0.013	0.50	17,200	2,230	0.008	0.50	14,300	750	0.005	0.50
	15	28,800	5,240	0.013	0.50	24,400	4,060	0.013	0.50	20,100	2,610	0.011	0.50	17,200	2,230	0.007	0.50	14,300	750	0.004	0.50
	17.5	25,600	4,660	0.011	0.50	21,700	3,610	0.011	0.50	17,800	2,320	0.009	0.50	15,300	1,980	0.006	0.50	12,700	660	0.003	0.50
	20	25,600	4,660	0.010	0.50	21,700	3,610	0.010	0.50	17,800	2,320	0.008	0.50	15,300	1,980	0.005	0.50	12,700	660	0.003	0.50
	22.5	22,400	4,070	0.009	0.50	19,000	3,160	0.009	0.50	15,600	2,030	0.007	0.50	13,400	1,740	0.004	0.50	11,100	580	0.003	0.50
	25	22,400	4,070	0.008	0.50	19,000	3,160	0.008	0.50	15,600	2,030	0.006	0.50	13,400	1,740	0.004	0.50	11,100	580	0.002	0.50
	27.5	19,200	3,490	0.007	0.50	16,300	2,710	0.007	0.50	13,400	1,740	0.006	0.50	11,500	1,490	0.004	0.50	9,500	500	0.002	0.50
	30	19,200	3,490	0.007	0.50	16,300	2,710	0.007	0.50	13,400	1,740	0.005	0.50	11,500	1,490	0.003	0.50	9,500	500	0.002	0.50
1.25	5	25,000	6,130	0.063	0.62	21,600	4,840	0.063	0.62	17,800	3,120	0.050	0.62	15,300	2,680	0.031	0.62	12,700	890	0.019	0.62
	10	25,000	6,130	0.031	0.62	21,600	4,840	0.031	0.62	17,800	3,120	0.025	0.62	15,300	2,680	0.016	0.62	12,700	890	0.009	0.62
	15	22,500	5,520	0.021	0.62	19,400	4,360	0.021	0.62	16,000	2,810	0.017	0.62	13,800	2,410	0.010	0.62	11,400	800	0.006	0.62
	20	20,000	4,900	0.016	0.62	17,300	3,870	0.016	0.62	14,200	2,500	0.013	0.62	12,200	2,140	0.008	0.62	10,200	710	0.005	0.62
	25	20,000	4,900	0.013	0.62	17,300	3,870	0.013	0.62	14,200	2,500	0.010	0.62	12,200	2,140	0.006	0.62	10,200	710	0.004	0.62
	30	17,500	4,290	0.010	0.62	15,100	3,390	0.010	0.62	12,500	2,180	0.008	0.62	10,700	1,880	0.005	0.62	8,900	620	0.003	0.62
1.5	5	21,000	6,620	0.090	0.75	18,000	5,180	0.090	0.75	14,900	3,350	0.072	0.75	12,700	2,860	0.045	0.75	10,600	950	0.027	0.75
	10	21,000	6,620	0.045	0.75	18,000	5,180	0.045	0.75	14,900	3,350	0.036	0.75	12,700	2,860	0.023	0.75	10,600	950	0.014	0.75
	15	21,000	6,620	0.030	0.75	18,000	5,180	0.030	0.75	14,900	3,350	0.024	0.75	12,700	2,860	0.015	0.75	10,600	950	0.009	0.75
	20	18,900	5,960	0.023	0.75	16,200	4,660	0.023	0.75	13,400	3,020	0.018	0.75	11,400	2,570	0.011	0.75	9,500	860	0.007	0.75
	25	16,800	5,300	0.018	0.75	14,400	4,140	0.018	0.75	11,900	2,680	0.014	0.75	10,200	2,290	0.009	0.75	8,500	760	0.005	0.75
	30	16,800	5,300	0.015	0.75	14,400	4,140	0.015	0.75	11,900	2,680	0.012	0.75	10,200	2,290	0.008	0.75	8,500	760	0.005	0.75
1.75	10	18,000	7,060	0.061	0.87	15,500	5,560	0.061	0.87	12,700	3,560	0.049	0.87	10,900	3,050	0.031	0.87	9,100	1,020	0.018	0.87
	20	16,200	6,350	0.031	0.87	14,000	5,000	0.031	0.87	11,400	3,200	0.025	0.87	9,800	2,750	0.015	0.87	8,200	920	0.009	0.87
	30	14,400	5,650	0.020	0.87	12,400	4,450	0.020	0.87	10,200	2,850	0.016	0.87	8,700	2,440	0.010	0.87	7,300	820	0.006	0.87
	40	12,600	4,940	0.015	0.87	10,900	3,890	0.015	0.87	8,900	2,490	0.012	0.87	7,600	2,140	0.008	0.87	6,400	710	0.005	0.87
2	10	16,000	7,620	0.080	1.00	13,500	5,880	0.080	1.00	11,100	3,770	0.064	1.00	9,500	3,230	0.040	1.00	8,000	1,090	0.024	1.00
	15	16,000	7,620	0.053	1.00	13,500	5,880	0.053	1.00	11,100	3,770	0.043	1.00	9,500	3,230	0.027	1.00	8,000	1,090	0.016	1.00
	20	16,000	7,620	0.040	1.00	13,500	5,880	0.040	1.00	11,100	3,770	0.032	1.00	9,500	3,230	0.020	1.00	8,000	1,090	0.012	1.00
	25	14,400	6,860	0.032	1.00	12,200	5,290	0.032	1.00	10,000	3,390	0.026	1.00	8,600	2,910	0.016	1.00	7,200	980	0.010	1.00
	30	14,400	6,860	0.027	1.00	12,200	5,290	0.027	1.00	10,000	3,390	0.021	1.00	8,600	2,910	0.013	1.00	7,200	980	0.008	1.00
	35	12,800	6,100	0.023	1.00	10,800	4,700	0.023	1.00	8,900	3,020	0.018	1.00	7,600	2,580	0.011	1.00	6,400	870	0.007	1.00
	40	12,800	6,100	0.020	1.00	10,800	4,700	0.020	1.00	8,900	3,020	0.016	1.00	7,600	2,580	0.010	1.00	6,400	870	0.006	1.00
2.5	10	13,000	8,190	0.125	1.25	10,800	6,220	0.125	1.25	8,900	4,010	0.100	1.25	7,600	3,420	0.063	1.25	6,400	1,150	0.038	1.25
	20	13,000	8,190	0.063	1.25	10,800	6,220	0.063	1.25	8,900	4,010	0.050	1.25	7,600	3,420	0.031	1.25	6,400	1,150	0.019	1.25
	30	11,700	7,370	0.042	1.25	9,700	5,600	0.042	1.25	8,000	3,610	0.033	1.25	6,800	3,080	0.021	1.25	5,800	1,040	0.013	1.25
	40	10,400	6,550	0.031	1.25	8,600	4,980	0.031	1.25	7,100	3,210	0.025	1.25	6,100	2,740	0.016	1.25	5,100	920	0.009	1.25
	50	10,400	6,550	0.025	1.25	8,600	4,980	0.025	1.25	7,100	3,210	0.020	1.25	6,100	2,740	0.013	1.25	5,100	920	0.008	1.25
3	10	10,600	8,460	0.180	1.40	9,000	6,570	0.180	1.40	7,400	4,220	0.144	1.40	6,400	3,650	0.090	1.40	5,300	1,210	0.054	1.40
	20	10,600	8,460	0.090	1.40	9,000	6,570	0.090	1.40	7,400	4,220	0.072	1.40	6,400	3,650	0.045	1.40	5,300	1,210	0.027	1.40
	30	10,600	8,460	0.060	1.40	9,000	6,570	0.060	1.40	7,400	4,220	0.048	1.40	6,400	3,650	0.030	1.40	5,300	1,210	0.018	1.40
	40	9,540	7,610	0.045	1.40	8,100	5,910	0.045	1.40	6,700	3,800	0.036	1.40	5,800	3,290	0.023	1.40	4,800	1,090	0.014	1.40
	50	8,480	6,770	0.036	1.40	7,200	5,260	0.036	1.40	5,900	3,380	0.029	1.40	5,100	2,920	0.018	1.40	4,200	970	0.011	1.40

【Note】
① Use a machine having as high rigidity and high accuracy as possible.
② Use the appropriate coolant for the work material and machining shape.
③ The cutting conditions shown in this table are intended as general criteria and should be adjusted according to the cutting shape, purpose, machine used, etc.
④ If the rotation speed of the machine is insufficient, reduce the rotation speed and feed rate by the same ratios.
⑤ For cutting in, set the ramp introduction angle to 1° and set the feed rate to 60 to 70% of the above values.
⑥ In the case of using tools with L/D = 15 or more length from the first process, in order to suppress the chattering vibration of the tools and stabilize the cutting, it is recommended to make suitable guides by using short neck type or ball end mills.

Epoch Turbo Rib

ETRP-TH Pencil Neck



Metric

Work material		Cast Iron, Carbon Steel, Alloy Steel (150～250HB)				Tool Steel, (25～35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～60HRC)			
DC (mm)	LU (mm)	RPM (min^{-1})	Feed rate (mm/min)	a_p (mm)	a_e (mm)	RPM (min^{-1})	Feed rate (mm/min)	a_p (mm)	a_e (mm)	RPM (min^{-1})	Feed rate (mm/min)	a_p (mm)	a_e (mm)	RPM (min^{-1})	Feed rate (mm/min)	a_p (mm)	a_e (mm)	RPM (min^{-1})	Feed rate (mm/min)	a_p (mm)	a_e (mm)
1	5	32,000	5,820	0.060	0.50	27,100	4,510	0.060	0.50	22,300	2,900	0.048	0.50	19,100	2,480	0.030	0.50	15,900	830	0.018	0.50
	7.5	32,000	5,820	0.045	0.50	27,100	4,510	0.045	0.50	22,300	2,900	0.036	0.50	19,100	2,480	0.023	0.50	15,900	830	0.013	0.50
	10	32,000	5,820	0.030	0.50	27,100	4,510	0.030	0.50	22,300	2,900	0.024	0.50	19,100	2,480	0.015	0.50	15,900	830	0.009	0.50
	15	28,800	5,240	0.020	0.50	24,400	4,060	0.020	0.50	20,100	2,610	0.016	0.50	17,200	2,230	0.010	0.50	14,300	750	0.006	0.50
	20	28,800	5,240	0.015	0.50	24,400	4,060	0.015	0.50	20,100	2,610	0.012	0.50	17,200	2,230	0.008	0.50	14,300	750	0.005	0.50
	25	25,600	4,660	0.012	0.50	21,700	3,610	0.012	0.50	17,800	2,320	0.010	0.50	15,300	1,980	0.006	0.50	12,700	660	0.004	0.50
	30	24,000	4,370	0.010	0.50	20,300	3,380	0.010	0.50	16,700	2,180	0.008	0.50	14,300	1,860	0.005	0.50	11,900	620	0.003	0.50
	35	22,400	4,070	0.009	0.50	19,000	3,160	0.009	0.50	15,600	2,030	0.007	0.50	13,400	1,740	0.004	0.50	11,100	580	0.003	0.50
	40	20,800	3,780	0.008	0.50	17,600	2,930	0.008	0.50	14,500	1,890	0.006	0.50	12,400	1,610	0.004	0.50	10,300	540	0.002	0.50
	45	19,200	3,490	0.007	0.50	16,300	2,710	0.007	0.50	13,400	1,740	0.005	0.50	11,500	1,490	0.003	0.50	9,500	500	0.002	0.50
	50	16,000	2,910	0.006	0.50	13,600	2,260	0.006	0.50	11,200	1,450	0.005	0.50	9,600	1,240	0.003	0.50	8,000	420	0.002	0.50
1.25	10	25,000	6,130	0.047	0.62	21,600	4,840	0.047	0.62	17,800	3,120	0.038	0.62	15,300	2,680	0.023	0.62	12,700	890	0.014	0.62
	15	23,800	5,830	0.035	0.62	20,500	4,600	0.035	0.62	16,900	2,965	0.029	0.62	14,550	2,545	0.018	0.62	12,050	845	0.011	0.62
	20	22,500	5,520	0.023	0.62	19,400	4,360	0.023	0.62	16,000	2,810	0.019	0.62	13,800	2,410	0.012	0.62	11,400	800	0.007	0.62
	30	20,000	4,900	0.016	0.62	17,300	3,870	0.016	0.62	14,200	2,500	0.013	0.62	12,200	2,140	0.008	0.62	10,200	710	0.005	0.62
	40	17,500	4,290	0.012	0.62	15,100	3,390	0.012	0.62	12,500	2,180	0.009	0.62	10,700	1,880	0.006	0.62	8,900	620	0.004	0.62
	50	16,300	3,980	0.009	0.62	14,000	3,150	0.009	0.62	11,600	2,030	0.008	0.62	9,900	1,740	0.005	0.62	8,300	580	0.003	0.62
1.5	10	21,000	6,620	0.068	0.75	18,000	5,180	0.068	0.75	14,900	3,350	0.054	0.75	12,700	2,860	0.034	0.75	10,600	950	0.020	0.75
	15	21,000	6,620	0.051	0.75	18,000	5,180	0.051	0.75	14,900	3,350	0.041	0.75	12,700	2,860	0.026	0.75	10,600	950	0.015	0.75
	20	18,900	5,960	0.034	0.75	16,200	4,660	0.034	0.75	13,400	3,020	0.027	0.75	11,400	2,570	0.017	0.75	9,500	860	0.010	0.75
	30	18,900	5,960	0.023	0.75	16,200	4,660	0.023	0.75	13,400	3,020	0.018	0.75	11,400	2,570	0.011	0.75	9,500	860	0.007	0.75
	40	15,800	4,970	0.017	0.75	13,500	3,890	0.017	0.75	11,200	2,510	0.014	0.75	9,500	2,150	0.008	0.75	8,000	710	0.005	0.75
	50	14,700	4,630	0.014	0.75	12,600	3,630	0.014	0.75	10,400	2,350	0.011	0.75	8,900	2,000	0.007	0.75	7,400	670	0.004	0.75
1.75	10	18,000	7,060	0.092	0.87	15,500	5,560	0.092	0.87	12,700	3,560	0.074	0.87	10,900	3,050	0.046	0.87	9,100	1,020	0.028	0.87
	15	18,000	7,060	0.069	0.87	15,500	5,560	0.069	0.87	12,700	3,560	0.056	0.87	10,900	3,050	0.035	0.87	9,100	1,020	0.021	0.87
	20	16,200	6,350	0.046	0.87	14,000	5,000	0.046	0.87	11,400	3,200	0.037	0.87	9,800	2,750	0.023	0.87	8,200	920	0.014	0.87
	30	16,200	6,350	0.031	0.87	14,000	5,000	0.031	0.87	11,400	3,200	0.025	0.87	9,800	2,750	0.015	0.87	8,200	920	0.009	0.87
	40	14,400	5,650	0.023	0.87	12,400	4,450	0.023	0.87	10,200	2,850	0.018	0.87	8,700	2,440	0.011	0.87	7,300	820	0.007	0.87
	50	13,500	5,300	0.018	0.87	11,600	4,170	0.018	0.87	9,500	2,670	0.015	0.87	8,200	2,290	0.009	0.87	6,800	770	0.006	0.87
2	15	16,000	7,620	0.080	1.00	13,500	5,880	0.080	1.00	11,100	3,770	0.064	1.00	9,500	3,230	0.040	1.00	8,000	1,090	0.024	1.00
	20	16,000	7,620	0.060	1.00	13,500	5,880	0.060	1.00	11,100	3,770	0.048	1.00	9,500	3,230	0.030	1.00	8,000	1,090	0.018	1.00
	25	14,400	6,860	0.048	1.00	12,200	5,290	0.048	1.00	10,000	3,390	0.038	1.00	8,600	2,910	0.024	1.00	7,200	980	0.014	1.00
	30	14,400	6,860	0.040	1.00	12,200	5,290	0.040	1.00	10,000	3,390	0.032	1.00	8,600	2,910	0.020	1.00	7,200	980	0.012	1.00
	35	14,400	6,860	0.034	1.00	12,200	5,290	0.034	1.00	10,000	3,390	0.027	1.00	8,600	2,910	0.017	1.00	7,200	980	0.010	1.00
	40	14,400	6,860	0.030	1.00	12,200	5,290	0.030	1.00	10,000	3,390	0.024	1.00	8,600	2,910	0.015	1.00	7,200	980	0.009	1.00
	45	12,800	6,100	0.027	1.00	10,800	4,700	0.027	1.00	8,900	3,020	0.021	1.00	7,600	2,580	0.013	1.00	6,400	870	0.008	1.00
	50	12,800	6,100	0.024	1.00	10,800	4,700	0.024	1.00	8,900	3,020	0.019	1.00	7,600	2,580	0.012	1.00	6,400	870	0.007	1.00
	55	12,000	5,720	0.022	1.00	10,100	4,410	0.022	1.00	8,300	2,830	0.017	1.00	7,100	2,420	0.011	1.00	6,000	820	0.007	1.00
	60	12,000	5,720	0.020	1.00	10,100	4,410	0.020	1.00	8,300	2,830	0.016	1.00	7,100	2,420	0.010	1.00	6,000	820	0.006	1.00
2.5	20	13,000	8,190	0.094	1.25	10,800	6,220	0.094	1.25	8,900	4,010	0.075	1.25	7,600	3,420	0.047	1.25	6,400	1,150	0.028	1.25
	30	11,700	7,370	0.063	1.25	9,700	5,600	0.063	1.25	8,000	3,610	0.050	1.25	6,800	3,080	0.031	1.25	5,800	1,040	0.019	1.25
	40	11,700	7,370	0.047	1.25	9,700	5,600	0.047	1.25	8,000	3,610	0.038	1.25	6,800	3,080	0.023	1.25	5,800	1,040	0.014	1.25
	50	11,700	7,370	0.038	1.25	9,700	5,600	0.038	1.25	8,000	3,610	0.030	1.25	6,800	3,080	0.019	1.25	5,800	1,040	0.011	1.25
	60	10,400	6,550	0.031	1.25	8,600	4,980	0.031	1.25	7,100	3,210	0.025	1.25	6,100	2,740	0.016	1.25	5,100	920	0.009	1.25
3	20	10,600	8,460	0.135	1.40	9,000	6,570	0.135	1.40	7,400	4,220	0.108	1.40	6,400	3,650	0.068	1.40	5,300	1,210	0.041	1.40
	30	10,600	8,460	0.090	1.40	9,000	6,570	0.090	1.40	7,400	4,220	0.072	1.40	6,400	3,650	0.045	1.40	5,300	1,210	0.027	1.40
	40	9,500	7,610	0.068	1.40	8,100	5,910	0.068	1.40	6,700	3,800	0.054	1.40	5,800	3,290	0.034	1.40	4,800	1,090	0.020	1.40
	50	9,500	7,610	0.054	1.40	8,100	5,910	0.054	1.40	6,700	3,800	0.043	1.40	5,800	3,290	0.027	1.40	4,800	1,090	0.016	1.40
	60	9,500	7,610	0.045	1.40	8,100	5,910	0.045	1.40	6,700	3,800	0.036	1.40	5,800	3,290	0.023	1.40	4,800	1,090	0.014	1.40

【Note】Please refer to P.A231

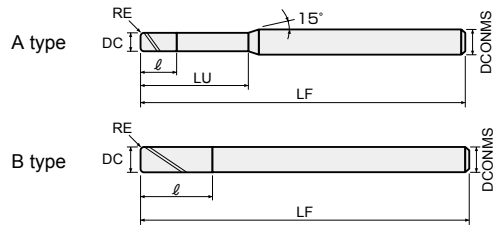
Epoch Turbo Mill

Straight Neck

Suppresses chattering. Corner R end mill for high-efficiency machining.

Die-sinking | Profiling | Radius | Roughing | Semi Finishing

RE tolerance ±0.015mm h5



ETM4○○○-○○-TH

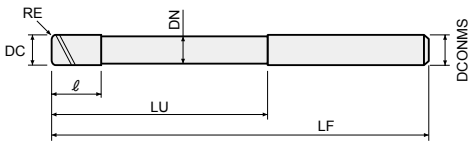
Carbide | TH | Helix angle 45° | Cutting Conditions A235

Item code	Stock	Size (mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length ℓ	Overall length LF	Shank dia. DCONMS	Shape
ETM4020-05-TH	●	2 (.079inch)	0.5	6	4	70	6	A
ETM4030-08-TH	●	3 (.118inch)	0.8	9	6	70	6	
ETM4040-10-TH	●	4 (.157inch)	1.0	12	8	70	6	
ETM4050-12-TH	●	5 (.197inch)	1.2	15	10	70	6	
ETM4060-15-TH	●	6 (.236inch)	1.5	–	12	90	6	B
ETM4080-20-TH	●	8 (.315inch)	2.0	–	16	100	8	
ETM4100-20-TH	●	10 (.394inch)	2.0	–	20	110	10	
ETM4120-20-TH	●	12 (.472inch)	2.0	–	24	120	12	
ETM4160-30-TH	★	16 (.630inch)	3.0	–	32	140	16	
ETM4200-30-TH	★	20 (.787inch)	3.0	–	40	150	20	

Long Neck

Die-sinking | Profiling | Radius | Roughing | Semi Finishing

RE tolerance ±0.015mm h5



ETMLN4○○○-○○○-○○-TH

Carbide | TH | Helix angle 45° | Cutting Conditions A235

Item code	Stock	Size (mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length ℓ	Neck dia. DN	Overall length LF	Shank dia. DCONMS
ETMLN4040-20-10-TH	★	4 (.157inch)	1.0	20	6	3.8	70	4
ETMLN4040-28-10-TH	★			28	6	3.8	70	4
ETMLN4060-30-15-TH	★	6 (.236inch)	1.5	30	9	5.7	75	6
ETMLN4060-42-15-TH	★			42	9	5.7	90	6
ETMLN4060-54-15-TH	★			54	9	5.7	100	6
ETMLN4080-40-20-TH	★	8 (.315inch)	2.0	40	12	7.6	85	8
ETMLN4080-56-20-TH	★			56	12	7.6	100	8
ETMLN4080-72-20-TH	★			72	12	7.6	120	8
ETMLN4100-50-20-TH	★	10 (.394inch)	2.0	50	15	9.5	100	10
ETMLN4100-70-20-TH	★			70	15	9.5	120	10
ETMLN4100-90-20-TH	★			90	15	9.5	140	10
ETMLN4120-60-20-TH	★	12 (.472inch)	2.0	60	18	11.5	110	12
ETMLN4120-84-20-TH	★			84	18	11.5	135	12
ETMLN4120-108-20-TH	★			108	18	11.5	160	12
ETMLN4160-80-30-TH	★	16 (.630inch)	3.0	80	24	15.5	140	16
ETMLN4160-120-30-TH	★			120	24	15.5	175	16

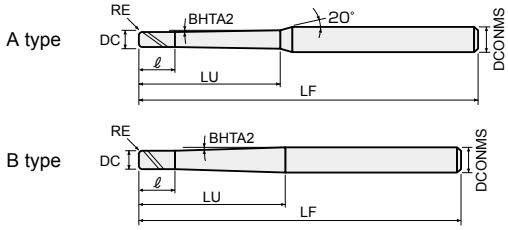
● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch Turbo Mill

Pencil Neck

Die-sinking | Profiling | Radius | Roughing | Semi Finishing

RE tolerance ±0.015mm | h5



ETMP4○○○-○○○-○○-TH

Carbide | TH | Helix angle 45° | Cutting Conditions A235

Item code	Stock	Size (mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length ℓ	Neck angle BHTA2	Overall length LF	Shank dia. DCONMS	Shape
ETMP4020-12-05-TH	★	2 (.079inch)	0.5	12	3	1°	70	6	A
ETMP4020-16-05-TH	★			16	3	1°	70	6	A
ETMP4020-20-05-TH	★			20	3	1°	70	6	A
ETMP4030-18-08-TH	★	3 (.118inch)	0.8	18	4.5	1°	80	6	A
ETMP4030-24-08-TH	★			24	4.5	1°	80	6	A
ETMP4030-30-08-TH	★			30	4.5	1°	80	6	A
ETMP4040-24-10-TH	★	4 (.157inch)	1.0	24	6	1°	90	6	A
ETMP4040-32-10-TH	★			32	6	1°	90	6	A
ETMP4040-40-10-TH	★			40	6	1°	90	6	A
ETMP4050-30-12-TH	★	5 (.197inch)	1.2	30	7.5	1°	90	6	A
ETMP4050-40-12-TH	★			40	7.5	1°	100	8	A
ETMP4050-50-12-TH	★			50	7.5	1°	110	8	A
ETMP4060-40-15-TH	★	6 (.236inch)	1.5	40	9	1°	100	8	A
ETMP4060-55-15-TH	★			55	9	1°	110	8	A
ETMP4060-67-15-TH	★			67	9	1°	125	8	B
ETMP4080-55-20-TH	★	8 (.315inch)	2.0	55	12	1°	110	10	A
ETMP4080-70-20-TH	★			70	12	1°	130	10	B
ETMP4080-90-20-TH	★			90	12	1°	145	12	A
ETMP4100-73-20-TH	★	10 (.394inch)	2.0	73	15	1°	135	12	B
ETMP4100-95-20-TH	★			95	15	1°	150	16	A
ETMP4100-115-20-TH	★			115	15	1°	170	16	A
ETMP4120-80-20-TH	★	12 (.472inch)	2.0	80	18	1°	135	16	A
ETMP4120-105-20-TH	★			105	18	1°	160	16	A
ETMP4160-105-30-TH	★	16 (.630inch)	3.0	105	24	1°	160	20	A
ETMP4160-140-30-TH	★			140	24	1°	200	20	B

Applicable work material of ETM-TH, ETMLN-TH, ETMP-TH

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	○		○	◎	○	○

★ : Inventory maintained in Japan

Recommended cutting conditions

ETM-TH Straight Neck | **ETMLN-TH** Long Neck | **ETMP-TH** Pencil Neck

Select the conditions for use from the five types of cutting conditions below based on the equipment and application. It is recommended that the standard condition be used first.

		Features
Roughing condition	Standard condition	General-purpose condition for low-speed use. Provides stable high-efficiency cutting with the longest tool life.
	High speed condition	Condition for use with high-performance high-speed machines capable of high feed rates. Enables ultra-high-efficiency cutting by enabling higher feed rates due to higher rotation speeds.
	High depth of cut condition	Condition for machines which are not capable of the feed rates of the standard condition, but which have sufficient rigidity. The reduced feed rate is compensated for by setting a large cutting depth, minimizing reductions in work efficiency.
	Low load condition	Condition which reduces cutting load by reducing the per-flute feed rate. Since cutting resistance can be reduced, it enables use even on machines with low rigidity.
Finish condition		Condition for finish cutting. High-accuracy finishing is possible. (Tolerance on RE is ±0.015mm.)

Standard conditions (Low revolution, High feed)

Inch

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	100%			100%			100%			70%			50%		
Tool dia. DC (mm)	n (min^{-1})	f_z (IPT)	v_f (IPM)	n (min^{-1})	f_z (IPT)	v_f (IPM)	n (min^{-1})	f_z (IPT)	v_f (IPM)	n (min^{-1})	f_z (IPT)	v_f (IPM)	n (min^{-1})	f_z (IPT)	v_f (IPM)
ϕ2	12,000	.004	206	11,000	.004	172	10,000	.003	124	8,000	.003	99	8,000	.001	38
ϕ3	8,000	.008	240	7,400	.007	198	6,900	.006	152	5,300	.006	117	5,300	.002	42
ϕ4	6,000	.011	254	5,600	.009	211	5,200	.008	156	4,000	.008	120	4,000	.003	50
ϕ5	4,800	.013	250	4,500	.012	212	4,100	.009	154	3,200	.009	120	3,200	.004	50
ϕ6	4,000	.017	264	3,700	.015	222	3,400	.012	160	2,700	.012	127	2,700	.005	51
ϕ8	3,000	.022	264	2,800	.020	225	2,600	.016	163	2,000	.016	126	2,000	.006	50
ϕ10	2,400	.028	265	2,200	.025	222	2,100	.020	165	1,600	.020	126	1,600	.008	51
ϕ12	2,000	.032	252	1,900	.029	218	1,700	.022	152	1,300	.022	116	1,300	.009	47
ϕ16	1,500	.035	212	1,400	.032	181	1,300	.025	131	1,000	.025	101	1,000	.010	41
ϕ20	1,200	.036	172	1,100	.033	144	1,000	.026	102	800	.026	82	800	.010	33

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Turbo Mill

High speed conditions (High revolution, High feed)

Inch

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	80%			80%			70%			60%			40%		
Tool dia. DC (mm)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)
ϕ2	20,000	.004	344	18,000	.004	281	16,000	.003	198	12,700	.003	157	11,100	.001	53
ϕ3	13,300	.008	399	11,700	.007	314	10,600	.006	233	8,500	.006	187	7,400	.002	59
ϕ4	9,900	.011	420	8,800	.009	331	8,000	.008	240	6,400	.008	192	5,600	.003	69
ϕ5	8,000	.013	416	7,000	.012	330	6,400	.009	241	5,100	.009	192	4,500	.004	70
ϕ6	6,600	.017	436	5,800	.015	348	5,300	.012	250	4,200	.012	198	3,700	.005	70
ϕ8	5,000	.022	440	4,400	.020	354	4,000	.016	251	3,200	.016	201	2,800	.006	71
ϕ10	4,000	.028	442	3,500	.025	353	3,200	.020	252	2,500	.020	197	2,200	.008	70
ϕ12	3,300	.032	416	2,900	.029	333	2,700	.022	242	2,100	.022	188	1,900	.009	69
ϕ16	2,500	.035	354	2,200	.032	284	2,000	.025	202	1,600	.025	161	1,400	.010	57
ϕ20	2,000	.036	286	1,800	.033	235	1,600	.026	164	1,300	.026	133	1,100	.010	45

High depth of cut conditions (Low revolution, High depth of cut)

Inch

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	200%			180%			160%			120%			70%		
Tool dia. DC (mm)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)	n (min⁻¹)	f_z (IPT)	v_f (IPM)
ϕ2	12,000	.002	96	11,000	.002	88	10,000	.002	64	8,000	.002	51	8,000	.001	26
ϕ3	8,000	.004	112	7,400	.003	92	6,900	.003	77	5,300	.003	59	5,300	.001	25
ϕ4	6,000	.005	113	5,600	.004	96	5,200	.004	81	4,000	.004	62	4,000	.002	32
ϕ5	4,800	.006	113	4,500	.006	99	4,100	.005	77	3,200	.005	60	3,200	.002	31
ϕ6	4,000	.008	120	3,700	.007	105	3,400	.006	80	2,700	.006	64	2,700	.003	30
ϕ8	3,000	.010	122	2,800	.009	105	2,600	.008	82	2,000	.008	63	2,000	.004	31
ϕ10	2,400	.013	121	2,200	.012	104	2,100	.010	82	1,600	.010	63	1,600	.005	30
ϕ12	2,000	.014	114	1,900	.013	102	1,700	.011	78	1,300	.011	59	1,300	.006	29
ϕ16	1,500	.016	97	1,400	.015	84	1,300	.013	66	1,000	.013	50	1,000	.006	24
ϕ20	1,200	.017	79	1,100	.015	68	1,000	.013	52	800	.013	40	800	.006	20

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

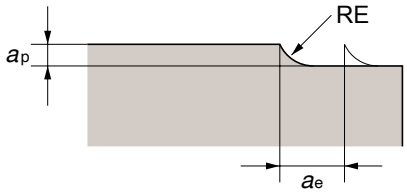
Low load conditions (Medium revolution, high feed)

Inch

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	100%			100%			100%			70%			50%		
Tool dia. DC (mm)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)
ϕ2	15,000	.004	210	14,000	.003	174	14,000	.002	134	10,300	.002	99	9,500	.001	30
ϕ3	10,100	.006	238	9,500	.005	194	9,000	.004	140	6,900	.004	97	6,400	.002	41
ϕ4	7,600	.008	252	7,200	.007	204	6,800	.006	150	5,200	.005	106	4,800	.002	46
ϕ5	6,000	.010	245	5,700	.009	207	5,400	.007	153	4,100	.007	110	3,800	.003	43
ϕ6	5,000	.013	252	4,800	.011	219	4,500	.009	164	3,400	.008	113	3,200	.004	45
ϕ8	3,800	.017	257	3,600	.015	216	3,400	.012	160	2,600	.011	114	2,400	.005	45
ϕ10	3,000	.021	256	2,900	.019	219	2,700	.015	162	2,100	.014	116	1,900	.006	45
ϕ12	2,500	.024	244	2,400	.022	208	2,300	.017	155	1,700	.016	107	1,600	.007	43
ϕ16	1,900	.027	207	1,800	.024	173	1,700	.019	131	1,300	.018	92	1,200	.008	36
ϕ20	1,500	.028	166	1,400	.024	137	1,400	.019	108	1,000	.018	72	1,000	.008	32

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Relation between the depth of cut and overhang.



*a*e : Half of flat length on bottom edge=(Tool dia.DC/2)−Corner radius
*a*p : Below table

Overhang	*a*p : Z pick (inch)	Overhang	*a*p : Z pick (inch)
5DC or less	0.3×RE×Cutting depth ratio	**8DC**	0.23×RE×Cutting depth ratio
6DC	0.27×RE×Cutting depth ratio	**9DC**	0.19×RE×Cutting depth ratio
7DC	0.25×RE×Cutting depth ratio	**10DC**	0.15×RE×Cutting depth ratio

① Feed rates for pencil-neck types are shown for 6DC and higher in the above table. For straight type and long-neck type of 6DC or higher, cutting depth in the Z direction should be set about 10% lower than the above values.
② Use for cutting contour lines or down cutting. In Z direction, cut at an incline (incline angle: 1°) and reduce feed rate to between 60% and 70%.
③ It is recommended that speed reduction for corners be set. The speed reduction distance should be approximately 1/2 the diameter of the tool being used, and the feed rate should be reduced to between 50% and 60%.

Epoch Turbo Mill

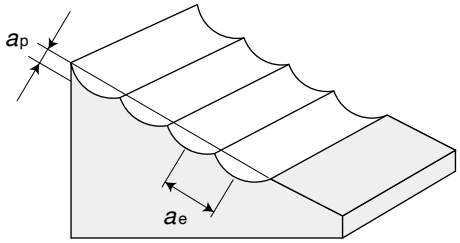
Finish condition

Inch

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Tool dia. DC (mm)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)	*n* (min⁻¹)	*fz* (IPT)	*vf* (IPM)
ϕ2	29,000	.0008	92	24,000	.0004	37	19,000	.0004	30	14,300	.0004	22	11,100	.0004	17
ϕ3	19,100	.0012	90	15,900	.0008	50	12,700	.0008	40	9,500	.0004	15	7,400	.0004	12
ϕ4	14,300	.0016	90	11,900	.0012	56	9,500	.0008	30	7,200	.0008	23	5,600	.0008	18
ϕ5	11,500	.0020	91	9,500	.0016	60	7,600	.0012	36	5,700	.0008	18	4,500	.0008	14
ϕ6	9,500	.0024	90	8,000	.0020	63	6,400	.0016	40	4,800	.0012	23	3,700	.0008	12
ϕ8	7,200	.0032	91	6,000	.0024	57	4,800	.0020	38	3,600	.0016	23	2,800	.0012	13
ϕ10	5,700	.0039	90	4,800	.0032	60	3,800	.0024	36	2,900	.0020	23	2,200	.0016	14
ϕ12	4,800	.0043	83	4,000	.0035	57	3,200	.0028	35	2,400	.0024	23	1,900	.0020	15
ϕ16	3,600	.0051	74	3,000	.0039	47	2,400	.0032	30	1,800	.0024	17	1,400	.0020	11
ϕ20	2,900	.0051	59	2,400	.0039	38	1,900	.0032	24	1,400	.0028	15	1,100	.0020	9

【Note】
① Use a highly rigid and accurate machine as possible.
② The below cutting depths are general criteria. In actual use, the cutting depth should be selected by referring to the cusp height.
③ Use the appropriate coolant for the work material and machining shape.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Depth of cut



a_p : Finishing cut amount
a_p=0.05㎜～0.1㎜ (.0019"～.0039")

a_e : Pick feed
a_e=0.1RE

Standard conditions (Low revolution, High feed)

Metric

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	100%			100%			100%			70%			50%		
Tool dia. DC (mm)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)
ϕ2	12,000	0.11	5,380	11,000	0.1	4,510	10,000	0.08	3,200	8,000	0.08	2,560	8,000	0.03	1,020
ϕ3	8,000	0.19	6,050	7,400	0.17	5,110	6,900	0.14	3,730	5,300	0.14	2,860	5,300	0.05	1,140
ϕ4	6,000	0.27	6,380	5,600	0.24	5,450	5,200	0.19	3,950	4,000	0.19	3,040	4,000	0.08	1,220
ϕ5	4,800	0.33	6,380	4,500	0.3	5,470	4,100	0.24	3,900	3,200	0.24	3,040	3,200	0.1	1,220
ϕ6	4,000	0.42	6,720	3,700	0.38	5,680	3,400	0.3	4,080	2,700	0.3	3,240	2,700	0.12	1,300
ϕ8	3,000	0.56	6,720	2,800	0.51	5,730	2,600	0.4	4,160	2,000	0.4	3,200	2,000	0.16	1,280
ϕ10	2,400	0.7	6,720	2,200	0.64	5,630	2,100	0.5	4,200	1,600	0.5	3,200	1,600	0.2	1,280
ϕ12	2,000	0.8	6,380	1,900	0.73	5,540	1,700	0.57	3,880	1,300	0.57	2,960	1,300	0.23	1,190
ϕ16	1,500	0.9	5,380	1,400	0.82	4,590	1,300	0.64	3,330	1,000	0.64	2,560	1,000	0.26	1,020
ϕ20	1,200	0.91	4,370	1,100	0.83	3,660	1,000	0.65	2,600	800	0.65	2,080	800	0.26	830

High speed conditions (High revolution, High feed)

Metric

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	80%			80%			70%			60%			40%		
Tool dia. DC (mm)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)
ϕ2	20,000	0.11	8,960	18,000	0.1	7,370	16,000	0.08	5,120	12,700	0.08	4,060	11,100	0.03	1,420
ϕ3	13,300	0.19	10,050	11,700	0.17	8,090	10,600	0.14	5,720	8,500	0.14	4,590	7,400	0.05	1,600
ϕ4	9,900	0.27	10,530	8,800	0.24	8,560	8,000	0.19	6,080	6,400	0.19	4,860	5,600	0.08	1,700
ϕ5	8,000	0.33	10,640	7,000	0.3	8,510	6,400	0.24	6,080	5,100	0.24	4,850	4,500	0.1	1,710
ϕ6	6,600	0.42	11,090	5,800	0.38	8,910	5,300	0.3	6,360	4,200	0.3	5,040	3,700	0.12	1,780
ϕ8	5,000	0.56	11,200	4,400	0.51	9,010	4,000	0.4	6,400	3,200	0.4	5,120	2,800	0.16	1,790
ϕ10	4,000	0.7	11,200	3,500	0.64	8,960	3,200	0.5	6,400	2,500	0.5	5,000	2,200	0.2	1,760
ϕ12	3,300	0.8	10,530	2,900	0.73	8,460	2,700	0.57	6,160	2,100	0.57	4,790	1,900	0.23	1,730
ϕ16	2,500	0.9	8,960	2,200	0.82	7,210	2,000	0.64	5,120	1,600	0.64	4,100	1,400	0.26	1,430
ϕ20	2,000	0.91	7,280	1,800	0.83	5,990	1,600	0.65	4,160	1,300	0.65	3,380	1,100	0.26	1,140

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Turbo Mill

High depth of cut conditions (Low revolution, High depth of cut)

Metric

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	200%			180%			160%			120%			70%		
Tool dia. DC (mm)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)
ϕ2	12,000	0.05	2,460	11,000	0.05	2,110	10,000	0.04	1,600	8,000	0.04	1,280	8,000	0.02	610
ϕ3	8,000	0.09	2,760	7,400	0.08	2,400	6,900	0.07	1,860	5,300	0.07	1,430	5,300	0.03	690
ϕ4	6,000	0.12	2,920	5,600	0.11	2,550	5,200	0.1	1,980	4,000	0.1	1,520	4,000	0.05	730
ϕ5	4,800	0.15	2,920	4,500	0.14	2,570	4,100	0.12	1,950	3,200	0.12	1,520	3,200	0.06	730
ϕ6	4,000	0.19	3,070	3,700	0.18	2,660	3,400	0.15	2,040	2,700	0.15	1,620	2,700	0.07	780
ϕ8	3,000	0.26	3,070	2,800	0.24	2,690	2,600	0.2	2,080	2,000	0.2	1,600	2,000	0.1	770
ϕ10	2,400	0.32	3,070	2,200	0.3	2,640	2,100	0.25	2,100	1,600	0.25	1,600	1,600	0.12	770
ϕ12	2,000	0.36	2,920	1,900	0.34	2,600	1,700	0.29	1,940	1,300	0.29	1,480	1,300	0.14	710
ϕ16	1,500	0.41	2,460	1,400	0.38	2,150	1,300	0.32	1,660	1,000	0.32	1,280	1,000	0.15	610
ϕ20	1,200	0.42	2,000	1,100	0.39	1,720	1,000	0.33	1,300	800	0.33	1,040	800	0.16	500

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

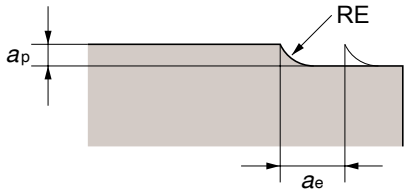
Low load conditions (Medium revolution, high feed)

Metric

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Ratio to standard depth of cut	100%			100%			100%			70%			50%		
Tool dia. DC (mm)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)	n (min^{-1})	f_z (mm/t)	v_f (mm/min)
ϕ2	15,000	0.09	5,180	14,000	0.08	4,300	14,000	0.06	3,400	10,300	0.06	2,310	9,500	0.02	910
ϕ3	10,100	0.15	5,890	9,500	0.13	4,920	9,000	0.1	3,690	6,900	0.09	2,610	6,400	0.04	1,040
ϕ4	7,600	0.21	6,240	7,200	0.18	5,250	6,800	0.14	3,930	5,200	0.13	2,770	4,800	0.06	1,090
ϕ5	6,000	0.26	6,160	5,700	0.23	5,200	5,400	0.18	3,900	4,100	0.17	2,730	3,800	0.07	1,080
ϕ6	5,000	0.32	6,480	4,800	0.29	5,530	4,500	0.23	4,100	3,400	0.21	2,860	3,200	0.09	1,150
ϕ8	3,800	0.43	6,570	3,600	0.38	5,530	3,400	0.3	4,130	2,600	0.28	2,910	2,400	0.12	1,150
ϕ10	3,000	0.54	6,480	2,900	0.48	5,570	2,700	0.38	4,100	2,100	0.35	2,940	1,900	0.15	1,140
ϕ12	2,500	0.62	6,160	2,400	0.55	5,250	2,300	0.43	3,990	1,700	0.4	2,710	1,600	0.17	1,090
ϕ16	1,900	0.69	5,250	1,800	0.61	4,420	1,700	0.49	3,310	1,300	0.45	2,330	1,200	0.19	920
ϕ20	1,500	0.7	4,210	1,400	0.62	3,490	1,400	0.49	2,770	1,000	0.46	1,820	1,000	0.2	780

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Relation between the depth of cut and overhang.



a_e : Half of flat length on bottom edge=(Tool dia.DC/2)−Corner radius
a_p : Below table

Overhang	a_p : Z pick (mm)	Overhang	a_p : Z pick (mm)
5DC or less	0.3×RE×Cutting depth ratio	**8DC**	0.23×RE×Cutting depth ratio
6DC	0.27×RE×Cutting depth ratio	**9DC**	0.19×RE×Cutting depth ratio
7DC	0.25×RE×Cutting depth ratio	**10DC**	0.15×RE×Cutting depth ratio

① Feed rates for pencil-neck types are shown for 6DC and higher in the above table. For straight type and long-neck type of 6DC or higher, cutting depth in the Z direction should be set about 10% lower than the above values.
② Use for cutting contour lines or down cutting. In Z direction, cut at an incline (incline angle: 1°) and reduce feed rate to between 60% and 70%.
③ It is recommended that speed reduction for corners be set. The speed reduction distance should be approximately 1/2 the diameter of the tool being used, and the feed rate should be reduced to between 50% and 60%.

Epoch Turbo Mill

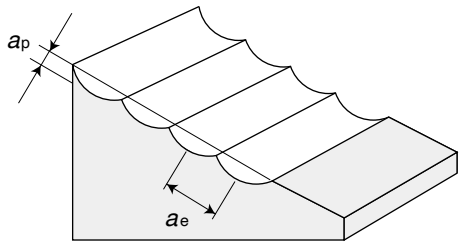
Finish condition

Metric

Work material	Cast iron Carbon steel, Alloy steel (150～250HB) 1050, 4140			Tool steel (25～35HRC) 304, P20			Pre-hardened steel (35～45HRC) P21			Hardened steel (45～55HRC) D2, L6			Hardened steel (55～60HRC) D2, M2		
Tool dia. DC (mm)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)	*n* (min⁻¹)	*fz* (mm/t)	*vf* (mm/min)
ϕ2	29,000	0.02	1,860	24,000	0.01	1,230	19,000	0.01	730	14,300	0.01	460	11,100	0.01	280
ϕ3	19,100	0.03	2,060	15,900	0.02	1,370	12,700	0.02	820	9,500	0.01	510	7,400	0.01	320
ϕ4	14,300	0.04	2,170	11,900	0.03	1,450	9,500	0.02	870	7,200	0.02	550	5,600	0.02	340
ϕ5	11,500	0.05	2,190	9,500	0.04	1,440	7,600	0.03	870	5,700	0.02	540	4,500	0.02	340
ϕ6	9,500	0.06	2,280	8,000	0.05	1,540	6,400	0.04	920	4,800	0.03	580	3,700	0.02	360
ϕ8	7,200	0.08	2,300	6,000	0.06	1,540	4,800	0.05	920	3,600	0.04	580	2,800	0.03	360
ϕ10	5,700	0.1	2,280	4,800	0.08	1,540	3,800	0.06	910	2,900	0.05	580	2,200	0.04	350
ϕ12	4,800	0.11	2,190	4,000	0.09	1,460	3,200	0.07	880	2,400	0.06	550	1,900	0.05	350
ϕ16	3,600	0.13	1,840	3,000	0.1	1,230	2,400	0.08	740	1,800	0.06	460	1,400	0.05	290
ϕ20	2,900	0.13	1,510	2,400	0.1	1,000	1,900	0.08	590	1,400	0.07	360	1,100	0.05	230

【Note】
① Use a highly rigid and accurate machine as possible.
② The below cutting depths are general criteria. In actual use, the cutting depth should be selected by referring to the cusp height.
③ Use the appropriate coolant for the work material and machining shape.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Depth of cut



a_p : Finishing cut amount
a_p=0.05㎜～0.1㎜

a_e : Pick feed
a_e=0.1RE

Epoch G Turbo

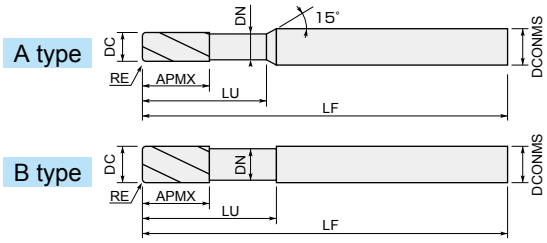
2 Flutes

Planing | Side milling | Slotting | Die-sinking | Helical | Roughing | Semi Finishing

Dia. tolerance 0～−0.03mm | RE tolerance ±0.01mm | h5

Employs low-resistance flute shape to enable high-efficiency machining of high-hardness materials. Focus on general-purpose characteristics.

2 Flutes



HGOF2○○○-○○-TH

Carbide | RTH | Cutting Conditions A244

Item code	Stock	Size (mm)							No. of flutes	Type
		Tool dia. DC	Corner radius RE	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS		
HGOF2020-05-TH	★	2	0.5	3	6	1.9	60	6	2	A
HGOF2030-08-TH	★	3	0.8	4.5	9	2.9	60	6	2	A
HGOF2040-10-TH	★	4	1	6	12	3.8	60	6	2	A
HGOF2050-12-TH	★	5	1.2	7.5	15	4.7	60	6	2	A
HGOF2060-15-TH	★	6	1.5	9	18	5.7	60	6	2	B
HGOF2080-20-TH	★	8	2	12	24	7.6	75	8	2	B
HGOF2100-20-TH	★	10	2	15	30	9.5	80	10	2	B
HGOF2120-20-TH	★	12	2	18	36	11.5	100	12	2	B

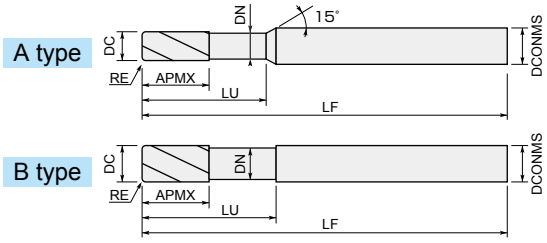
4 Flutes

Planing | Slotting | Die-sinking | Helical | Roughing | Semi Finishing

Dia. tolerance 0～−0.03mm | RE tolerance ±0.01mm | h5

Employs low-resistance flute shape to enable high-efficiency machining of high-hardness materials. Focus on general-purpose characteristics.

4 Flutes



HGOF4○○○-○○-TH

Carbide | RTH | Cutting Conditions A245

Item code	Stock	Size (mm)							No. of flutes	Type
		Tool dia. DC	Corner radius RE	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS		
HGOF4020-05-TH	●	2	0.5	1	6	1.9	60	6	4	A
HGOF4030-08-TH	●	3	0.8	1.5	9	2.9	60	6	4	A
HGOF4040-10-TH	●	4	1	2	12	3.8	60	6	4	A
HGOF4050-12-TH	●	5	1.2	2.5	15	4.7	60	6	4	A
HGOF4060-15-TH	●	6	1.5	3	18	5.7	60	6	4	B
HGOF4080-20-TH	●	8	2	4	24	7.6	75	8	4	B
HGOF4100-20-TH	●	10	2	5	30	9.5	80	10	4	B
HGOF4120-20-TH	●	12	2	6	36	11.5	100	12	4	B

Applicable work material

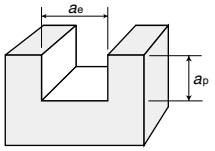
No. of flutes	Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
2	◎	◎	◎	◎		○	◎	○	○
4	◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch G Turbo

Recommended cutting conditions

HGOF2-TH



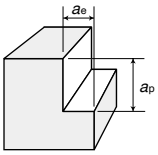
Inch

<Slotting>

Work material (Hardness)	Depth of cut DC:Tool dia. (mm)	Cutting condition	Tool dia. DC (mm)							
			φ2	φ3	φ4	φ5	φ6	φ8	φ10	φ12
Cast iron, Carbon steel, Alloy steel (200～250HB) Cast Iron, 1050	a_p≦1DC	Revolution n (min^{-1})	9,550	6,400	4,800	3,800	3,200	2,400	1,900	1,600
	a_e=1DC	Feed rate v_f (IPM)	6.6	7.7	8.7	9.1	9.6	10.2	9.1	8.5
Alloy steel (25～35HRC)	a_p≦0.5DC	Revolution n (min^{-1})	9,550	6,400	4,800	3,800	3,200	2,400	1,900	1,600
	a_e=1DC	Feed rate v_f (IPM)	5.4	6.9	7.9	8.3	8.7	9.3	8.2	7.6
Stainless steel (25～35HRC) 304	a_p≦0.5DC	Revolution n (min^{-1})	6,685	4,480	3,360	2,660	2,240	1,680	1,330	1,120
	a_e=1DC	Feed rate v_f (IPM)	3.5	4.5	5.1	5.4	5.7	6.1	5.3	4.9
Pre-hardened steel (35～45HRC) P21	a_p≦0.5DC	Revolution n (min^{-1})	8,750	5,800	4,400	3,500	2,900	2,200	1,800	1,500
	a_e=1DC	Feed rate v_f (IPM)	4.4	5.7	6.5	6.8	7.1	7.6	6.9	6.3
Hardened steel (45～55HRC) H13, L6	a_p≦0.2DC	Revolution n (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600	1,300
	a_e=1DC	Feed rate v_f (IPM)	3.0	3.8	4.4	4.6	4.9	5.2	4.6	4.1

【Note】
① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ To increase efficiency even further, increase the rotation speed and the feed rate by the same ratio.

HGOF2-TH



Inch

<Side cutting>

Work material (Hardness)	Depth of cut DC:Tool dia. (mm)	Cutting condition	Tool dia. DC (mm)							
			φ2	φ3	φ4	φ5	φ6	φ8	φ10	φ12
Cast iron, Carbon steel, Alloy steel (200～250HB) Cast Iron, 1050	a_p≦1.5DC	Revolution n (min^{-1})	14,300	9,600	7,200	5,700	4,800	3,600	2,900	2,400
	a_e=0.15DC	Feed rate v_f (IPM)	15.2	16.9	18.1	19.7	21.3	22.6	21.1	19.7
Alloy steel (25～35HRC)	a_p≦1.5DC	Revolution n (min^{-1})	14,300	9,600	7,200	5,700	4,800	3,600	2,900	2,400
	a_e=0.1DC	Feed rate v_f (IPM)	13.6	15.2	16.3	17.7	19.1	20.5	18.9	17.7
Stainless steel (25～35HRC) 304	a_p≦1.5DC	Revolution n (min^{-1})	10,000	6,720	5,040	4,000	3,360	2,520	2,030	1,680
	a_e=0.1DC	Feed rate v_f (IPM)	8.9	9.8	10.6	11.6	12.4	13.4	12.4	11.6
Pre-hardened steel (35～45HRC) P21	a_p≦1.5DC	Revolution n (min^{-1})	12,700	8,500	6,400	5,100	4,200	3,200	2,500	2,100
	a_e=0.07DC	Feed rate v_f (IPM)	11.0	12.0	13.0	14.2	14.8	16.1	14.6	13.8
Hardened steel (45～55HRC) H13, L6	a_p≦1.5DC	Revolution n (min^{-1})	11,100	7,400	5,600	4,500	3,700	2,800	2,200	1,900
	a_e=0.05DC	Feed rate v_f (IPM)	7.9	9.1	9.8	10.8	11.4	12.4	11.2	10.8

【Note】
① Use a highly rigid and accurate machine as possible.
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③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ To increase efficiency even further, increase the rotation speed and the feed rate by the same ratio.

HGOF2-TH HGOF4-TH

When using the 2-flute model, set feed rate only to 50% of the value below as a general criteria. Further, it is not recommended to use the 2-flute model for cutting materials with hardness of 55HRC.

<Contouring>

Inch

Work material (Hardness)	Cutting condition	Tool dia. DC x Corner radius RE (mm)							
		ϕ2×RE0.5	ϕ3×RE0.8	ϕ4×RE1	ϕ5×RE1.2	ϕ6×RE1.5	ϕ8×RE2	ϕ10×RE2	ϕ12×RE2
Cast Iron, Carbon steel, Alloy steel (150~250HB) Cast Iron, 1050	Revolution *n* (min^{-1})	12,000	8,000	6,000	4,800	4,000	3,000	2,400	2,000
	Feed rate *vf* (IPM)	211.8	238.2	251.2	251.2	264.6	264.6	264.6	251.2
	*a*p (inch)	.005	.007	.009	.011	.014	.019	.019	.019
	*a*e (inch)	.020	.028	.039	.051	.059	.079	.118	.157
Tool steel (25~35HRC) 304	Revolution *n* (min^{-1})	11,000	7,400	5,600	4,500	3,700	2,800	2,200	1,900
	Feed rate *vf* (IPM)	177.6	201.2	214.6	215.4	223.6	225.6	221.7	218.1
	*a*p (inch)	.005	.007	.009	.011	.014	.019	.019	.019
	*a*e (inch)	.020	.028	.039	.051	.059	.079	.118	.157
Pre-hardened steel (35~45HRC) P21	Revolution *n* (min^{-1})	10,000	6,900	5,200	4,100	3,400	2,600	2,100	1,700
	Feed rate *vf* (IPM)	126.0	146.9	155.5	153.5	160.6	163.8	165.4	152.8
	*a*p (inch)	.005	.007	.009	.011	.014	.019	.019	.019
	*a*e (inch)	.020	.028	.039	.051	.059	.079	.118	.157
Hardened steel (45~55HRC) H13, L6	Revolution *n* (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600	1,300
	Feed rate *vf* (IPM)	100.8	112.6	119.7	119.7	127.6	126.0	126.0	116.5
	*a*p (inch)	.003	.005	.007	.008	.010	.013	.013	.013
	*a*e (inch)	.020	.028	.039	.051	.059	.079	.118	.157
Hardened steel (55~60HRC) D2, M2	Revolution *n* (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600	1,300
	Feed rate *vf* (IPM)	50.2	56.1	60.0	60.0	64.0	63.0	63.0	58.6
	*a*p (inch)	.002	.004	.005	.006	.007	.009	.009	.009
	*a*e (inch)	.020	.028	.039	.051	.059	.079	.118	.157

【Note】
① Use a highly rigid and accurate machine as possible.
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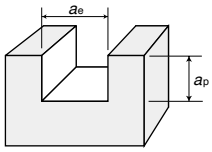
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

HGOF2-TH



<Slotting>

Metric

Work material (Hardness)	Depth of cut DC:Tool dia. (mm)	Cutting condition	Tool dia. (mm)							
			ϕ2	ϕ3	ϕ4	ϕ5	ϕ6	ϕ8	ϕ10	ϕ12
Cast iron, Carbon steel, Alloy steel (200~250HB) Cast Iron, 1050	*a*p≦1DC	Revolution *n* (min^{-1})	9,550	6,400	4,800	3,800	3,200	2,400	1,900	1,600
	*a*e=1DC	Feed rate *vf* (mm/min)	168	196	220	232	244	260	232	216
Alloy steel (25~35HRC)	*a*p≦0.5DC	Revolution *n* (min^{-1})	9,550	6,400	4,800	3,800	3,200	2,400	1,900	1,600
	*a*e=1DC	Feed rate *vf* (mm/min)	136	176	200	212	220	236	208	192
Stainless steel (25~35HRC) 304	*a*p≦0.5DC	Revolution *n* (min^{-1})	6,685	4,480	3,360	2,660	2,240	1,680	1,330	1,120
	*a*e=1DC	Feed rate *vf* (mm/min)	90	115	130	138	145	155	135	125
Pre-hardened steel (35~45HRC) P21	*a*p≦0.5DC	Revolution *n* (min^{-1})	8,750	5,800	4,400	3,500	2,900	2,200	1,800	1,500
	*a*e=1DC	Feed rate *vf* (mm/min)	112	144	164	172	180	192	176	160
Hardened steel (45~55HRC) H13, L6	*a*p≦0.2DC	Revolution *n* (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600	1,300
	*a*e=1DC	Feed rate *vf* (mm/min)	76	96	112	116	124	132	116	104

【Note】
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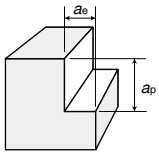
Epoch G Turbo

HGOF2-TH



Metric

<Side cutting>

Work material (Hardness)	Depth of cut DC:Tool dia. (mm)	Cutting condition	Tool dia. (mm)							
			φ2	φ3	φ4	φ5	φ6	φ8	φ10	φ12
Cast iron, Carbon steel, Alloy steel (200～250HB) Cast Iron, 1050	a_p≦1.5DC	Revolution n (min^{-1})	14,300	9,600	7,200	5,700	4,800	3,600	2,900	2,400
	a_e=0.15DC	Feed rate v_f (mm/min)	385	430	460	500	540	575	535	500
Alloy steel (25～35HRC)	a_p≦1.5DC	Revolution n (min^{-1})	14,300	9,600	7,200	5,700	4,800	3,600	2,900	2,400
	a_e=0.1DC	Feed rate v_f (mm/min)	345	385	415	450	485	520	480	450
Stainless steel (25～35HRC) 304	a_p≦1.5DC	Revolution n (min^{-1})	10,000	6,720	5,040	4,000	3,360	2,520	2,030	1,680
	a_e=0.1DC	Feed rate v_f (mm/min)	225	250	270	295	315	340	315	295
Pre-hardened steel (35～45HRC) P21	a_p≦1.5DC	Revolution n (min^{-1})	12,700	8,500	6,400	5,100	4,200	3,200	2,500	2,100
	a_e=0.07DC	Feed rate v_f (mm/min)	280	305	330	360	375	410	370	350
Hardened steel (45～55HRC) H13, L6	a_p≦1.5DC	Revolution n (min^{-1})	11,100	7,400	5,600	4,500	3,700	2,800	2,200	1,900
	a_e=0.05DC	Feed rate v_f (mm/min)	200	230	250	275	290	315	285	275

【Note】
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② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ To increase efficiency even further, increase the rotation speed and the feed rate by the same ratio.

HGOF2-TH HGOF4-TH

When using the 2-flute model, set feed rate only to 50% of the value below as a general criteria. Further, it is not recommended to use the 2-flute model for cutting materials with hardness of 55HRC.

Metric

<Contouring>

Work material (Hardness)	Cutting condition	Tool dia DC× Corner radius RE (mm)							
		φ2×RE0.5	φ3×RE0.8	φ4×RE1	φ5×RE1.2	φ6×RE1.5	φ8×RE2	φ10×RE2	φ12×RE2
Cast Iron, Carbon steel, Alloy steel (150～250HB) Cast Iron, 1050	Revolution n (min^{-1})	12,000	8,000	6,000	4,800	4,000	3,000	2,400	2,000
	Feed rate v_f (mm/min)	5,380	6,050	6,380	6,380	6,720	6,720	6,720	6,380
	a_p (mm)	0.12	0.19	0.24	0.29	0.36	0.48	0.48	0.48
	a_e (mm)	0.5	0.7	1	1.3	1.5	2	3	4
Tool steel (25～35HRC) 304	Revolution n (min^{-1})	11,000	7,400	5,600	4,500	3,700	2,800	2,200	1,900
	Feed rate v_f (mm/min)	4,510	5,110	5,450	5,470	5,680	5,730	5,630	5,540
	a_p (mm)	0.12	0.19	0.24	0.29	0.36	0.48	0.48	0.48
	a_e (mm)	0.5	0.7	1	1.3	1.5	2	3	4
Pre-hardened steel (35～45HRC) P21	Revolution n (min^{-1})	10,000	6,900	5,200	4,100	3,400	2,600	2,100	1,700
	Feed rate v_f (mm/min)	3,200	3,730	3,950	3,900	4,080	4,160	4,200	3,880
	a_p (mm)	0.12	0.19	0.24	0.29	0.36	0.48	0.48	0.48
	a_e (mm)	0.5	0.7	1	1.3	1.5	2	3	4
Hardened steel (45～55HRC) H13, L6	Revolution n (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600	1,300
	Feed rate v_f (mm/min)	2,560	2,860	3,040	3,040	3,240	3,200	3,200	2,960
	a_p (mm)	0.08	0.13	0.17	0.20	0.25	0.34	0.34	0.34
	a_e (mm)	0.5	0.7	1	1.3	1.5	2	3	4
Hardened steel (55～60HRC) D2, M2	Revolution n (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600	1,300
	Feed rate v_f (mm/min)	1,275	1,425	1,525	1,525	1,625	1,600	1,600	1,488
	a_p (mm)	0.06	0.10	0.12	0.14	0.18	0.24	0.24	0.24
	a_e (mm)	0.5	0.7	1	1.3	1.5	2	3	4

【Note】
① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch G Radius

Planing | Side milling | Slotting | Die-sinking | Helical | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.03mm h5

4 Flutes

HGOR4○○○-○○-TH

Carbide TH Cutting Conditions A248

Item code	Stock	Size (mm)							No. of flutes
		Tool dia.	Corner radius	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.	
HGOR4060-03-TH	●	6	0.3	9	18	5.7	50	6	4
HGOR4060-05-TH	●	6	0.5	9	18	5.7	50	6	4
HGOR4060-10-TH	●	6	1	9	18	5.7	50	6	4
HGOR4080-03-TH	●	8	0.3	12	24	7.6	55	8	4
HGOR4080-05-TH	●	8	0.5	12	24	7.6	55	8	4
HGOR4080-10-TH	●	8	1	12	24	7.6	55	8	4
HGOR4100-03-TH	●	10	0.3	15	30	9.5	70	10	4
HGOR4100-05-TH	●	10	0.5	15	30	9.5	70	10	4
HGOR4100-10-TH	●	10	1	15	30	9.5	70	10	4
HGOR4120-03-TH	●	12	0.3	18	36	11.5	75	12	4
HGOR4120-10-TH	●	12	1	18	36	11.5	75	12	4
HGOR4160-05-TH	●	16	0.5	24	48	15	90	16	4
HGOR4160-20-TH	●	16	2	24	48	15	90	16	4
HGOR4200-05-TH	●	20	0.5	30	60	19	100	20	4
HGOR4200-20-TH	●	20	2	30	60	19	100	20	4

Applicable work material

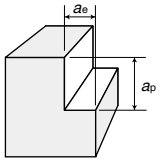
Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US

Epoch G Radius

Recommended cutting conditions

HGOR-TH



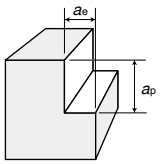
Inch

<Side cutting>

Work material (Hardness)	Depth of cut DC:Tool dia. (mm)	Cutting condition	Tool dia. DC (mm)					
			φ6	φ8	φ10	φ12	φ16	φ20
Cast Iron, Carbon steel, Alloy steel (200～250HB) Cast Iron, 1050	a_p≦1.5DC	Revolution n (min^{-1})	5,836	4,377	3,501	2,918	2,188	1,751
	a_e=0.1DC	Feed rate v_f (IPM)	36.8	34.4	33.1	32.2	31	30.3
Alloy steel (25～35HRC)	a_p≦1.5DC	Revolution n (min^{-1})	4,775	3,581	2,865	2,387	1,790	1,432
	a_e=0.1DC	Feed rate v_f (IPM)	26.3	25.4	24.8	24.4	24	22.6
Pre-hardened steel (35～45HRC) P21	a_p≦1DC	Revolution n (min^{-1})	4,244	3,183	2,546	2,122	1,592	1,273
	a_e=0.07DC	Feed rate v_f (IPM)	20	20	20	20	20	18
Hardened steel (45～55HRC) H13, L6	a_p≦1DC	Revolution n (min^{-1})	3,714	2,785	2,228	1,857	1,393	1,114
	a_e=0.05DC	Feed rate v_f (IPM)	8.8	8.8	8.8	8.8	8.8	7.9

【Note】
① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ To increase efficiency even further, increase the rotation speed and the feed rate by the same ratio.

HGOR-TH



Metric

<Side cutting>

Work material (Hardness)	Depth of cut DC:Tool dia. (mm)	Cutting condition	Tool dia. DC (mm)					
			φ6	φ8	φ10	φ12	φ16	φ20
Cast Iron, Carbon steel, Alloy steel (200～250HB) Cast Iron, 1050	a_p≦1.5DC	Revolution n (min^{-1})	5,836	4,377	3,501	2,918	2,188	1,751
	a_e=0.1DC	Feed rate v_f (mm/min)	934	875	840	817	788	770
Alloy steel (25～35HRC)	a_p≦1.5DC	Revolution n (min^{-1})	4,775	3,581	2,865	2,387	1,790	1,432
	a_e=0.1DC	Feed rate v_f (mm/min)	668	645	630	621	609	573
Pre-hardened steel (35～45HRC) P21	a_p≦1DC	Revolution n (min^{-1})	4,244	3,183	2,546	2,122	1,592	1,273
	a_e=0.07DC	Feed rate v_f (mm/min)	509	509	509	509	509	458
Hardened steel (45～55HRC) H13, L6	a_p≦1DC	Revolution n (min^{-1})	3,714	2,785	2,228	1,857	1,393	1,114
	a_e=0.05DC	Feed rate v_f (mm/min)	223	223	223	223	223	201

【Note】
① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ To increase efficiency even further, increase the rotation speed and the feed rate by the same ratio.

Epoch SUS Multi

YouTube

Regular, Radius type

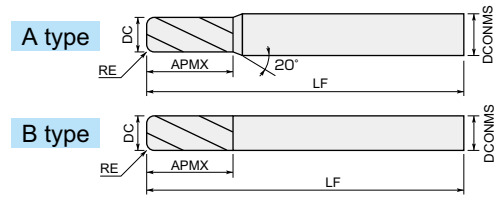
Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ7～φ20 : 0～−0.02mm

h5 (φ6～12) | h6 (φ16, φ20)

Multi-purpose for roughing to finishing of stainless steel, carbon steel, alloy steel, etc.

Please refer to page A332 for Square



4 Flutes

EPSM4○○○-R○.○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A252

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSM4010-R0.1-PN	●	1	0.1	2.5	56	6	A
EPSM4020-R0.1-PN	●	2	0.1	5	56	6	A
EPSM4020-R0.2-PN	●		0.2	5	56	6	A
EPSM4030-R0.2-PN	●	3	0.2	7.5	56	6	A
EPSM4030-R0.5-PN	●		0.5	7.5	56	6	A
EPSM4040-R0.2-PN	●	4	0.2	10	56	6	A
EPSM4040-R0.5-PN	●		0.5	10	56	6	A
EPSM4040-R1.0-PN	●		1	10	56	6	A
EPSM4050-R0.2-PN	●	5	0.2	12.5	56	6	A
EPSM4050-R0.5-PN	●		0.5	12.5	56	6	A
EPSM4050-R1.0-PN	●		1	12.5	56	6	A
EPSM4060-R0.3-PN	●	6	0.3	15	56	6	B
EPSM4060-R0.5-PN	●		0.5	15	56	6	B
EPSM4060-R1.0-PN	●		1	15	56	6	B
EPSM4060-R1.5-PN	●		1.5	15	56	6	B
EPSM4070-R0.3-PN	●	7	0.3	17.5	63	8	A
EPSM4070-R0.5-PN	●		0.5	17.5	63	8	A
EPSM4070-R1.0-PN	●		1	17.5	63	8	A
EPSM4080-R0.3-PN	●	8	0.3	20	63	8	B
EPSM4080-R0.5-PN	●		0.5	20	63	8	B
EPSM4080-R1.0-PN	●		1	20	63	8	B
EPSM4080-R1.5-PN	●		1.5	20	63	8	B
EPSM4080-R2.0-PN	●		2	20	63	8	B
EPSM4090-R0.3-PN	●	9	0.3	22.5	74	10	A
EPSM4090-R0.5-PN	●		0.5	22.5	74	10	A
EPSM4090-R1.0-PN	●		1	22.5	74	10	A
EPSM4100-R0.3-PN	●	10	0.3	25	74	10	B
EPSM4100-R0.5-PN	●		0.5	25	74	10	B
EPSM4100-R1.0-PN	●		1	25	74	10	B
EPSM4100-R1.5-PN	●		1.5	25	74	10	B
EPSM4100-R2.0-PN	●		2	25	74	10	B
EPSM4110-R0.3-PN	●	11	0.3	27.5	86	12	A
EPSM4110-R0.5-PN	●		0.5	27.5	86	12	A
EPSM4110-R1.0-PN	●		1	27.5	86	12	A

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSM4120-R0.3-PN	●	12	0.3	30	86	12	B
EPSM4120-R0.5-PN	●		0.5	30	86	12	B
EPSM4120-R1.0-PN	●		1	30	86	12	B
EPSM4120-R1.5-PN	●		1.5	30	86	12	B
EPSM4120-R2.0-PN	●		2	30	86	12	B
EPSM4120-R2.5-PN	●		2.5	30	86	12	B
EPSM4120-R3.0-PN	●		3	30	86	12	B
EPSM4160-R0.5-PN	●	16	0.5	40	110	16	B
EPSM4160-R1.0-PN	●		1	40	110	16	B
EPSM4160-R1.5-PN	●		1.5	40	110	16	B
EPSM4160-R2.0-PN	●		2	40	110	16	B
EPSM4160-R3.0-PN	●		3	40	110	16	B
EPSM4200-R0.5-PN	●	20	0.5	50	125	20	B
EPSM4200-R1.0-PN	●		1	50	125	20	B
EPSM4200-R1.5-PN	●		1.5	50	125	20	B
EPSM4200-R2.0-PN	●		2	50	125	20	B
EPSM4200-R3.0-PN	●		3	50	125	20	B
EPSM4200-R5.0-PN	●		5	50	125	20	B

Applicable work material of EPSM-CR, EPSML-CR

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

● : Inventory maintained in US

Epoch SUS Multi

YouTube

Under neck 5DC, Radius type

Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Roughing | Semi Finishing | Finishing

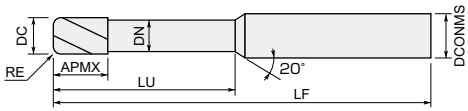
Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ7～φ20 : 0～−0.02mm

h5 (φ6～12) | h6 (φ16, φ20)

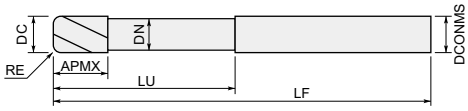
Multi-purpose for roughing to finishing of stainless steel, carbon steel, alloy steel, etc.

Please refer to page A332 for Square

A type



B type



4 Flutes

EPSM4○○○-○○○-R○.○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A255

Item code	Stock	Size (mm) Tool dia. DC	Coner radius RE	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	No. of flutes	Shape
EPSM4010-5-R0.1-PN	●	1	0.1	1.5	5	0.96	68	6	4	A
EPSM4020-10-R0.1-PN	●	2	0.1	3	10	1.92	68	6	4	A
EPSM4020-10-R0.2-PN	●		0.2	3	10	1.92	68	6	4	A
EPSM4030-15-R0.2-PN	●	3	0.2	4.5	15	2.88	68	6	4	A
EPSM4030-15-R0.5-PN	●		0.5	4.5	15	2.88	68	6	4	A
EPSM4040-20-R0.2-PN	●	4	0.2	6	20	3.7	68	6	4	A
EPSM4040-20-R0.5-PN	●		0.5	6	20	3.7	68	6	4	A
EPSM4040-20-R1.0-PN	●		1	6	20	3.7	68	6	4	A
EPSM4050-25-R0.2-PN	●	5	0.2	7.5	25	4.6	68	6	4	A
EPSM4050-25-R0.5-PN	●		0.5	7.5	25	4.6	68	6	4	A
EPSM4050-25-R1.0-PN	●		1	7.5	25	4.6	68	6	4	A
EPSM4060-30-R0.3-PN	●	6	0.3	9	30	5.5	68	6	4	B
EPSM4060-30-R0.5-PN	●		0.5	9	30	5.5	68	6	4	B
EPSM4060-30-R1.0-PN	●		1	9	30	5.5	68	6	4	B
EPSM4060-30-R1.5-PN	●		1.5	9	30	5.5	68	6	4	B
EPSM4070-35-R0.3-PN	●	7	0.3	10.5	35	6.4	80	8	4	A
EPSM4070-35-R0.5-PN	●		0.5	10.5	35	6.4	80	8	4	A
EPSM4070-35-R1.0-PN	●		1	10.5	35	6.4	80	8	4	A
EPSM4080-40-R0.3-PN	●	8	0.3	12	40	7.3	80	8	4	B
EPSM4080-40-R0.5-PN	●		0.5	12	40	7.3	80	8	4	B
EPSM4080-40-R1.0-PN	●		1	12	40	7.3	80	8	4	B
EPSM4080-40-R1.5-PN	●		1.5	12	40	7.3	80	8	4	B
EPSM4080-40-R2.0-PN	●		2	12	40	7.3	80	8	4	B
EPSM4090-45-R0.3-PN	●	9	0.3	13.5	45	8.3	94	10	4	A
EPSM4090-45-R0.5-PN	●		0.5	13.5	45	8.3	94	10	4	A
EPSM4090-45-R1.0-PN	●		1	13.5	45	8.3	94	10	4	A
EPSM4100-50-R0.3-PN	●	10	0.3	15	50	9.1	94	10	4	B
EPSM4100-50-R0.5-PN	●		0.5	15	50	9.1	94	10	4	B
EPSM4100-50-R1.0-PN	●		1	15	50	9.1	94	10	4	B
EPSM4100-50-R1.5-PN	●		1.5	15	50	9.1	94	10	4	B
EPSM4100-50-R2.0-PN	●		2	15	50	9.1	94	10	4	B
EPSM4110-55-R0.3-PN	●	11	0.3	16.5	55	10.2	110	12	4	A
EPSM4110-55-R0.5-PN	●		0.5	16.5	55	10.2	110	12	4	A
EPSM4110-55-R1.0-PN	●		1	16.5	55	10.2	110	12	4	A
EPSM4120-60-R0.3-PN	●	12	0.3	18	60	11	110	12	4	B
EPSM4120-60-R0.5-PN	●		0.5	18	60	11	110	12	4	B
EPSM4120-60-R1.0-PN	●		1	18	60	11	110	12	4	B
EPSM4120-60-R1.5-PN	●		1.5	18	60	11	110	12	4	B
EPSM4120-60-R2.0-PN	●		2	18	60	11	110	12	4	B
EPSM4120-60-R2.5-PN	●		2.5	18	60	11	110	12	4	B
EPSM4120-60-R3.0-PN	●		3	18	60	11	110	12	4	B

● : Inventory maintained in US No Mark : Manufactured upon request only

EPSM4○○○-○○○-R○.○-PN

Item code	Stock	Size (mm)							No. of flutes	Shape
		Tool dia.	Coner radius	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.		
		DC	RE	APMX	LU	DN	LF	DCONMS		
EPSM4160-80-R0.5-PN	●	16	0.5	24	80	14.5	135	16	4	B
EPSM4160-80-R1.0-PN	●		1	24	80	14.5	135	16	4	B
EPSM4160-80-R1.5-PN	●		1.5	24	80	14.5	135	16	4	B
EPSM4160-80-R2.0-PN	●		2	24	80	14.5	135	16	4	B
EPSM4160-80-R3.0-PN	●		3	24	80	14.5	135	16	4	B
EPSM4200-100-R0.5-PN	●	20	0.5	30	100	18.2	155	20	4	B
EPSM4200-100-R1.0-PN	●		1	30	100	18.2	155	20	4	B
EPSM4200-100-R1.5-PN	●		1.5	30	100	18.2	155	20	4	B
EPSM4200-100-R2.0-PN	●		2	30	100	18.2	155	20	4	B
EPSM4200-100-R3.0-PN	●		3	30	100	18.2	155	20	4	B
EPSM4200-100-R5.0-PN	●		5	30	100	18.2	155	20	4	B

Applicable work material

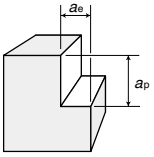
Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎				◎	◎	◎	◎

Epoch SUS Multi

Recommended cutting conditions

General Side milling conditions

EPSM-CR
Regular, Corner radius



Inch

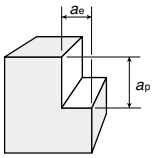
Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	31,800	25	22,300	18	19,100	15	12,700	6	9,500	3
2	15,900	32	11,100	13	9,500	11	6,400	8	4,800	3
3	10,600	34	7,400	15	6,400	13	4,200	9	3,200	3
4	8,000	35	5,600	18	4,800	13	3,200	9	2,400	4
5	6,400	38	4,500	18	3,800	15	2,500	10	1,900	4
6	5,300	38	3,700	18	3,200	15	2,100	10	1,600	4
7	4,500	38	3,200	18	2,700	15	1,800	10	1,400	4
8	4,000	38	2,800	18	2,400	15	1,600	10	1,200	4
9	3,500	36	2,500	18	2,100	15	1,400	10	1,100	4
10	3,200	38	2,200	18	1,900	15	1,300	10	1,000	4
11	2,900	36	2,000	17	1,700	14	1,200	10	900	4
12	2,700	35	1,900	16	1,600	14	1,100	9	800	3
16	2,000	32	1,400	15	1,200	13	800	9	600	3
20	1,600	30	1,100	14	1,000	12	600	8	500	3

【Note】
PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity and high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

High speed Side milling conditions

EPSM-CR

Regular, Corner radius



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	41,400	33	31,800	25	28,600	23	19,100	8	15,900	6
2	20,700	41	15,900	19	14,300	17	9,500	8	8,000	6
3	13,800	44	10,600	21	9,500	19	6,400	10	5,300	6
4	10,300	45	8,000	26	7,200	23	4,800	12	4,000	6
5	8,300	50	6,400	26	5,700	23	3,800	11	3,200	6
6	6,900	50	5,300	25	4,800	23	3,200	12	2,700	6
7	5,900	50	4,500	25	4,100	23	2,700	11	2,300	6
8	5,200	50	4,000	26	3,600	23	2,400	12	2,000	6
9	4,600	50	3,500	25	3,200	23	2,100	11	1,800	6
10	4,100	49	3,200	26	2,900	23	1,900	11	1,600	6
11	3,800	47	2,900	24	2,600	21	1,700	11	1,400	6
12	3,400	44	2,700	23	2,400	20	1,600	10	1,300	6
16	2,600	42	2,000	22	1,800	19	1,200	10	1,000	5
20	2,100	39	1,600	20	1,400	18	1,000	10	800	5

【Note】

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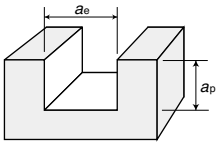
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Multi

General Slotting conditions

EPSM-CR

Regular, Corner radius



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=1DC		ap=1DC		ap=1DC		ap=0.5DC		ap=0.5DC	
	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
1	28,600	11	19,100	8	17,500	7	11,100	4	6,400	3
2	14,300	17	9,500	8	8,800	7	5,600	2	3,200	1
3	9,500	19	6,400	10	5,800	7	3,700	3	2,100	1
4	7,200	23	4,800	12	4,400	9	2,800	3	1,600	1
5	5,700	25	3,800	14	3,500	10	2,200	4	1,300	2
6	4,800	29	3,200	15	2,900	10	1,900	5	1,100	2
7	4,100	28	2,700	15	2,500	10	1,600	4	900	1
8	3,600	29	2,400	15	2,200	11	1,400	4	800	2
9	3,200	28	2,100	15	1,900	10	1,200	4	700	1
10	2,900	29	1,900	15	1,800	11	1,100	4	600	1
11	2,600	27	1,700	14	1,600	10	1,000	4	600	1
12	2,400	26	1,600	14	1,500	10	900	4	500	1
16	1,800	24	1,200	13	1,100	9	700	4	400	1
20	1,400	22	1,000	12	900	9	600	4	300	1

【Note】

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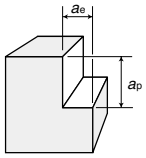
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Side finishing conditions

EPSM-CR
Regular, Corner radius

EPSM-5DC-CR※
Under neck 5DC, Corner radius



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC	
	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
1	45,500	36	35,000	14	31,500	13	21,000	8	17,500	7
2	22,800	46	17,500	21	15,800	19	10,500	8	8,800	4
3	15,200	43	11,700	23	10,500	21	7,000	11	5,800	5
4	11,400	46	8,800	25	7,900	22	5,300	11	4,400	5
5	9,100	47	7,000	25	6,300	23	4,200	12	3,500	6
6	7,600	49	5,800	26	5,300	23	3,500	11	2,900	6
7	6,500	49	5,000	24	4,500	22	3,000	11	2,500	6
8	5,700	48	4,400	25	3,900	22	2,600	11	2,200	6
9	5,100	49	3,900	25	3,500	22	2,300	11	1,900	6
10	4,600	50	3,500	25	3,200	23	2,100	11	1,800	6
11	4,100	46	3,200	23	2,900	22	1,900	11	1,600	6
12	3,800	44	2,900	22	2,600	20	1,800	10	1,500	6
16	2,800	40	2,200	21	2,000	19	1,300	9	1,100	5
20	2,300	39	1,800	20	1,600	18	1,100	9	900	5

※The table above indicates cutting parameter for regular type, please reduce both rotation and feed rate to 70% when using 5DC type

【Note】

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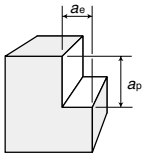
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Multi

General Side milling conditions

EPSM-5DC-CR※

Under neck 5DC, Corner radius



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.1DC		a_p=0.5DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	28,600	23	19,100	15	15,900	13	12,700	5	9,500	4
2	14,300	29	9,500	11	8,000	10	6,400	5	4,800	4
3	9,500	30	6,400	13	5,300	11	4,200	7	3,200	4
4	7,200	32	4,800	13	4,000	11	3,200	8	2,400	4
5	5,700	34	3,800	15	3,200	13	2,500	7	1,900	4
6	4,800	35	3,200	15	2,700	13	2,100	8	1,600	4
7	4,100	34	2,700	15	2,300	13	1,800	7	1,400	4
8	3,600	35	2,400	15	2,000	13	1,600	8	1,200	4
9	3,200	33	2,100	15	1,800	12	1,400	7	1,100	4
10	2,900	35	1,900	15	1,600	13	1,300	8	1,000	4
11	2,600	32	1,700	14	1,400	11	1,200	8	900	4
12	2,400	31	1,600	14	1,300	11	1,100	7	800	4
16	1,800	29	1,200	13	1,000	11	800	6	600	3
20	1,400	26	1,000	12	800	10	600	6	500	3

※ The above table shows cutting conditions for 5DC type tools with a 5DC overhang. Adjust conditions according to the tool overhang amount.

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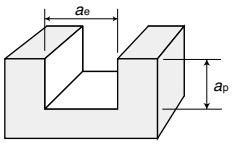
General Slotting conditions

EPSM-5DC-CR

Under neck 5DC, Corner radius



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast irons (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloys		Super heat-resistant alloys	
	a_p=0.5DC		a_p=0.5DC		a_p=0.5DC		a_p=0.25DC		a_p=0.25DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	25,500	10	15,900	6	14,300	6	9,500	4	4,800	2
2	12,700	15	8,000	6	7,200	6	4,800	2	2,400	1
3	8,500	17	5,300	8	4,800	6	3,200	3	1,600	1
4	6,400	20	4,000	10	3,600	7	2,400	3	1,200	1
5	5,100	22	3,200	12	2,900	8	1,900	4	1,000	1
6	4,200	25	2,700	13	2,400	9	1,600	4	800	1
7	3,600	24	2,300	13	2,000	8	1,400	4	700	1
8	3,200	26	2,000	13	1,800	9	1,200	4	600	1
9	2,800	25	1,800	12	1,600	9	1,100	4	500	1
10	2,500	25	1,600	13	1,400	8	1,000	4	500	1
11	2,300	24	1,400	11	1,300	8	900	4	400	1
12	2,100	23	1,300	11	1,200	8	800	4	400	1
16	1,600	21	1,000	11	900	7	600	3	300	1
20	1,300	20	800	10	700	7	500	3	200	1

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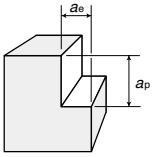
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Epoch SUS Multi

General Side milling conditions

EPSM-CR

Regular, Corner radius



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
1	31,800	760	22,300	360	19,100	310	12,700	150	9,500	76
2	15,900	810	11,100	380	9,500	320	6,400	160	4,800	82
3	10,600	860	7,400	400	6,400	350	4,200	170	3,200	86
4	8,000	910	5,600	430	4,800	360	3,200	180	2,400	91
5	6,400	960	4,500	450	3,800	380	2,500	190	1,900	95
6	5,300	950	3,700	440	3,200	380	2,100	190	1,600	96
7	4,500	940	3,200	450	2,700	380	1,800	190	1,400	98
8	4,000	960	2,800	450	2,400	380	1,600	190	1,200	96
9	3,500	940	2,500	450	2,100	380	1,400	190	1,100	99
10	3,200	960	2,200	440	1,900	380	1,300	200	1,000	100
11	2,900	910	2,000	420	1,700	360	1,200	190	900	94
12	2,700	870	1,900	410	1,600	350	1,100	180	800	86
16	2,000	820	1,400	380	1,200	330	800	160	600	82
20	1,600	770	1,100	350	1,000	320	600	140	500	80

【Note】

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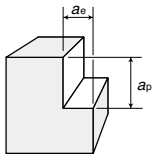
Please adjust machining conditions if chatter or vibration become excessive.

High speed Side milling conditions

EPSM-CR

Regular, Corner radius



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
1	41,400	990	31,800	510	28,600	460	19,100	230	15,900	127
2	20,700	1,060	15,900	540	14,300	490	9,500	240	8,000	136
3	13,800	1,120	10,600	570	9,500	510	6,400	260	5,300	143
4	10,300	1,170	8,000	610	7,200	550	4,800	270	4,000	152
5	8,300	1,250	6,400	640	5,700	570	3,800	280	3,200	160
6	6,900	1,240	5,300	640	4,800	580	3,200	290	2,700	162
7	5,900	1,240	4,500	630	4,100	570	2,700	280	2,300	161
8	5,200	1,250	4,000	640	3,600	580	2,400	290	2,000	160
9	4,600	1,240	3,500	630	3,200	580	2,100	280	1,800	162
10	4,100	1,230	3,200	640	2,900	580	1,900	290	1,600	160
11	3,800	1,190	2,900	610	2,600	540	1,700	270	1,400	146
12	3,400	1,100	2,700	580	2,400	520	1,600	260	1,300	140
16	2,600	1,060	2,000	540	1,800	490	1,200	240	1,000	136
20	2,100	1,010	1,600	510	1,400	450	1,000	240	800	128

【Note】

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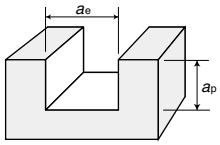
Epoch SUS Multi

General Slotting conditions

EPSM-CR

Regular, Corner radius



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=1DC		ap=1DC		ap=1DC		ap=0.5DC		ap=0.5DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
1	28,600	360	19,100	190	17,500	130	11,100	60	6,400	19
2	14,300	430	9,500	230	8,800	160	5,600	70	3,200	23
3	9,500	500	6,400	270	5,800	180	3,700	80	2,100	26
4	7,200	580	4,800	310	4,400	210	2,800	90	1,600	31
5	5,700	640	3,800	340	3,500	240	2,200	100	1,300	35
6	4,800	720	3,200	380	2,900	260	1,900	110	1,100	40
7	4,100	720	2,700	380	2,500	260	1,600	110	900	38
8	3,600	720	2,400	380	2,200	260	1,400	110	800	38
9	3,200	720	2,100	380	1,900	260	1,200	110	700	38
10	2,900	730	1,900	380	1,800	270	1,100	110	600	36
11	2,600	680	1,700	360	1,600	250	1,000	100	600	38
12	2,400	650	1,600	350	1,500	240	900	100	500	32
16	1,800	610	1,200	330	1,100	220	700	100	400	33
20	1,400	560	1,000	320	900	220	600	100	300	29

【Note】

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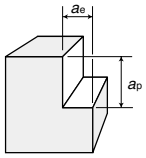
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Side finishing conditions

EPSM-CR
Regular, Corner radius

EPSM-5DC-CR※
Under neck 5DC, Corner radius



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC		a_p=1DC, a_e=0.001DC~0.02DC	
	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
1	45,500	980	35,000	500	31,500	450	21,000	230	17,500	130
2	22,800	1,050	17,500	540	15,800	480	10,500	240	8,800	130
3	15,200	1,110	11,700	570	10,500	510	7,000	260	5,800	140
4	11,400	1,170	8,800	600	7,900	540	5,300	270	4,400	150
5	9,100	1,230	7,000	630	6,300	570	4,200	280	3,500	160
6	7,600	1,230	5,800	630	5,300	570	3,500	280	2,900	160
7	6,500	1,230	5,000	630	4,500	570	3,000	280	2,500	160
8	5,700	1,230	4,400	630	3,900	560	2,600	280	2,200	160
9	5,100	1,240	3,900	630	3,500	570	2,300	280	1,900	150
10	4,600	1,240	3,500	630	3,200	580	2,100	280	1,800	160
11	4,100	1,160	3,200	600	2,900	550	1,900	270	1,600	150
12	3,800	1,110	2,900	560	2,600	510	1,800	260	1,500	150
16	2,800	1,030	2,200	540	2,000	490	1,300	240	1,100	130
20	2,300	990	1,800	520	1,600	460	1,100	240	900	130

※The table above indicates cutting parameter for regular type, please reduce both rotation and feed rate to 70% when using 5DC type

【Note】

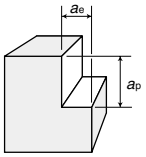
PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity and high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Multi

General Side milling conditions

EPSM-5DC-CR※

Under neck 5DC, Corner radius



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.1DC		a_p=0.5DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
1	28,600	690	19,100	310	15,900	250	12,700	150	9,500	76
2	14,300	730	9,500	320	8,000	270	6,400	160	4,800	82
3	9,500	770	6,400	350	5,300	290	4,200	170	3,200	86
4	7,200	820	4,800	360	4,000	300	3,200	180	2,400	91
5	5,700	860	3,800	380	3,200	320	2,500	190	1,900	95
6	4,800	860	3,200	380	2,700	320	2,100	190	1,600	96
7	4,100	860	2,700	380	2,300	320	1,800	190	1,400	98
8	3,600	860	2,400	380	2,000	320	1,600	190	1,200	96
9	3,200	860	2,100	380	1,800	320	1,400	190	1,100	99
10	2,900	870	1,900	380	1,600	320	1,300	200	1,000	100
11	2,600	820	1,700	360	1,400	290	1,200	190	900	94
12	2,400	780	1,600	350	1,300	280	1,100	180	800	86
16	1,800	730	1,200	330	1,000	270	800	160	600	82
20	1,400	670	1,000	320	800	260	600	140	500	80

※ The above table shows cutting conditions for 5DC type tools with a 5DC overhang. Adjust conditions according to the tool overhang amount.

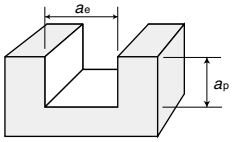
【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity and high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

General Slotting conditions

EPSM-5DC-CR

Under neck 5DC, Corner radius



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=0.5DC		ap=0.5DC		ap=0.5DC		ap=0.25DC		ap=0.25DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
1	25,500	320	15,900	160	14,300	110	9,500	50	4,800	14
2	12,700	380	8,000	190	7,200	130	4,800	60	2,400	17
3	8,500	450	5,300	220	4,800	150	3,200	70	1,600	20
4	6,400	510	4,000	260	3,600	170	2,400	80	1,200	23
5	5,100	570	3,200	290	2,900	200	1,900	90	1,000	27
6	4,200	630	2,700	320	2,400	220	1,600	100	800	29
7	3,600	630	2,300	320	2,000	210	1,400	100	700	29
8	3,200	640	2,000	320	1,800	220	1,200	100	600	29
9	2,800	630	1,800	320	1,600	220	1,100	100	500	27
10	2,500	630	1,600	320	1,400	210	1,000	100	500	30
11	2,300	600	1,400	290	1,300	200	900	90	400	25
12	2,100	570	1,300	280	1,200	190	800	90	400	26
16	1,600	540	1,000	270	900	180	600	80	300	24
20	1,300	520	800	260	700	170	500	80	200	19

【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Epoch TH Power Mill

Corner radius

Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm

h6

For machining of high-hardness materials. Excellent chip removal performance enables high efficiency.

Please refer to page A355 for Square

EPP4○○○-○○-TH

Carbide | TH | Helix angle 43° | Cutting Conditions A265

Item code	Stock	Size (mm)				
		Tool dia.	Corner radius	Flute length	Overall length	Shank dia.
EPP4030-02-TH	●	3	0.2	8	60	6
EPP4030-05-TH	●		0.5	8	60	6
EPP4040-02-TH	●	4	0.2	11	60	6
EPP4040-05-TH	●		0.5	11	60	6
EPP4040-10-TH	●		1.0	11	60	6
EPP4050-02-TH	★	5	0.2	13	60	6
EPP4050-05-TH	●		0.5	13	60	6
EPP4050-10-TH	★		1.0	13	60	6
EPP4060-03-TH	★	6	0.3	13	60	6
EPP4060-05-TH	●		0.5	13	60	6
EPP4060-10-TH	●		1.0	13	60	6
EPP4060-15-TH	●		1.5	13	60	6
EPP4080-03-TH	★	8	0.3	19	75	8
EPP4080-05-TH	★		0.5	19	75	8
EPP4080-10-TH	●		1.0	19	75	8
EPP4080-15-TH	●		1.5	19	75	8
EPP4080-20-TH	★		2.0	19	75	8
EPP4100-03-TH	★	10	0.3	22	80	10
EPP4100-05-TH	★		0.5	22	80	10
EPP4100-10-TH	●		1.0	22	80	10
EPP4100-15-TH	●		1.5	22	80	10
EPP4100-20-TH	●		2.0	22	80	10
EPP4120-05-TH	★	12	0.5	26	100	12
EPP4120-10-TH	★		1.0	26	100	12
EPP4120-15-TH	★		1.5	26	100	12
EPP4120-20-TH	★		2.0	26	100	12
EPP4120-30-TH	★		3.0	26	100	12
EPP4160-10-TH	★	16	1.0	32	110	16
EPP4160-15-TH	★		1.5	32	110	16
EPP4160-20-TH	★		2.0	32	110	16
EPP4160-30-TH	★		3.0	32	110	16
EPP4200-10-TH	★	20	1.0	38	125	20
EPP4200-15-TH	★		1.5	38	125	20
EPP4200-20-TH	★		2.0	38	125	20
EPP4200-30-TH	★		3.0	38	125	20

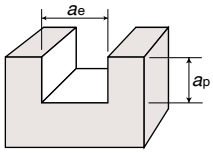
Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Recommended cutting conditions

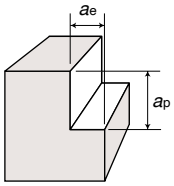
EPP4-CR-TH



Inch

<Slotting>

Work material	Alloy steel (200～250HB) H13, D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～55HRC) H13, L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)
ϕ3	8,500	31	6,400	20			6,400	18			5,800	14			5,300	8
ϕ4	6,400	36	4,800	21			4,800	19			4,400	16			4,000	11
ϕ5	5,100	39	3,800	23			3,800	21			3,500	17			3,200	12
ϕ6	4,200	40	3,200	24			3,200	22			2,900	17			2,700	12
ϕ8	3,200	44	2,400	26			2,400	23			2,200	18			2,000	13
ϕ10	2,500	37	1,900	23			1,900	21			1,800	17			1,600	12
ϕ12	2,100	34	1,600	21			1,600	19			1,500	16			1,300	10
ϕ16	1,600	30	1,200	18			1,200	16			1,100	13			1,000	9
ϕ20	1,300	30	1,000	18			1,000	16			900	13			800	8



Inch

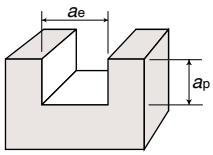
<Side milling>

Work material	Alloy steel (200~250HB) SKD61,SKD11				Alloy steel (25~35HRC) SCM440				Pre-hardened steel (35~45HRC) NAK80				Hardened steel (45~55HRC) SKD61,SKT4			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.15DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.07DC		a_p=1.5DC a_e=0.02DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)
ϕ3	16,000	70	9,600	35	14,000	56	9,600	31	12,000	43	8,500	24	11,000	35	7,400	18
ϕ4	12,000	77	7,200	37	10,000	56	7,200	32	8,800	42	6,400	26	8,000	35	5,600	20
ϕ5	9,600	84	5,700	39	8,300	63	5,700	36	7,000	48	5,100	29	6,400	38	4,500	22
ϕ6	8,000	86	4,800	42	6,900	66	4,800	38	5,800	51	4,200	30	5,300	40	3,700	22
ϕ8	6,000	94	3,600	45	5,200	75	3,600	40	4,400	55	3,200	32	4,000	45	2,800	25
ϕ10	4,800	86	2,900	42	4,100	67	2,900	38	3,500	52	2,500	29	3,200	41	2,200	23
ϕ12	4,000	83	2,400	39	3,500	63	2,400	36	2,900	48	2,100	28	2,700	39	1,900	22
ϕ16	3,000	67	1,800	32	2,600	51	1,800	29	2,200	40	1,600	22	2,000	30	1,400	17
ϕ20	2,400	55	1,400	26	2,100	44	1,400	24	1,800	34	1,300	20	1,590	26	1,110	15

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch TH Power Mill

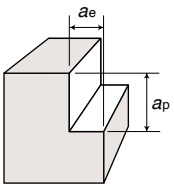
EPP4-CR-TH



Metric

<Slotting>

Work material	Alloy steel (200~250HB) SKD61,SKD11				Alloy steel (25~35HRC) SCM440				Pre-hardened steel (35~45HRC) NAK80				Hardened steel (45~55HRC) SKD61,SKT4			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
ϕ3	8,500	820	6,400	490			6,400	440			5,800	360			5,300	240
ϕ4	6,400	920	4,800	550			4,800	500			4,400	410			4,000	280
ϕ5	5,100	980	3,800	580			3,800	530			3,500	430			3,200	290
ϕ6	4,200	1,010	3,200	610			3,200	550			2,900	450			2,700	310
ϕ8	3,200	1,090	2,400	650			2,400	590			2,200	480			2,000	330
ϕ10	2,500	950	1,900	580			1,900	520			1,800	440			1,600	290
ϕ12	2,100	880	1,600	540			1,600	480			1,500	400			1,300	260
ϕ16	1,600	770	1,200	460			1,200	410			1,100	340			1,000	230
ϕ20	1,300	750	1,000	460			1,000	420			900	330			800	200



Metric

<Side milling>

Work material	Alloy steel (200~250HB) SKD61,SKD11				Alloy steel (25~35HRC) SCM440				Pre-hardened steel (35~45HRC) NAK80				Hardened steel (45~55HRC) SKD61,SKT4			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.15DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.07DC		a_p=1.5DC a_e=0.02DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
ϕ3	16,000	1,800	9,600	860	14,000	1,400	9,600	770	12,000	1,100	8,500	610	11,000	860	7,400	460
ϕ4	12,000	1,900	7,200	920	10,000	1,400	7,200	830	8,800	1,100	6,400	660	8,000	900	5,600	500
ϕ5	9,600	2,100	5,700	1,000	8,300	1,600	5,700	900	7,000	1,200	5,100	720	6,400	990	4,500	550
ϕ6	8,000	2,200	4,800	1,080	6,900	1,700	4,800	970	5,800	1,300	4,200	750	5,300	1,040	3,700	580
ϕ8	6,000	2,400	3,600	1,150	5,200	1,900	3,600	1,040	4,400	1,400	3,200	820	4,000	1,120	2,800	630
ϕ10	4,800	2,200	2,900	1,070	4,100	1,700	2,900	960	3,500	1,300	2,500	740	3,200	1,030	2,200	570
ϕ12	4,000	2,100	2,400	1,000	3,500	1,600	2,400	900	2,900	1,200	2,100	700	2,700	980	1,900	550
ϕ16	3,000	1,700	1,800	810	2,600	1,300	1,800	730	2,200	1,000	1,600	570	2,000	780	1,400	440
ϕ20	2,400	1,400	1,400	670	2,100	1,100	1,400	600	1,800	860	1,300	500	1,590	670	1,110	370

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Power Mill

Excellent chip removal enables high efficiency.

Please refer to page A369 for Square

Regular, Corner radius

Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ25 : 0～−0.02mm
h6

Long, Corner radius

Side milling | Profiling | Radius | Semi Finishing | Finishing

Dia. tolerance: φ6 : 0～−0.015mm
φ8～φ25 : 0～−0.02mm
h6

EPP4○○○-○○

Carbide | C | Helix angle 43° | Cutting Conditions A269

Item code	Stock	Size (mm) Tool dia.	Corner radius	Flute length	Overall length	Shank dia.
EPP4030-02	★	3	0.2	8	60	6
EPP4030-05	★		0.5	8	60	6
EPP4040-02	★	4	0.2	11	60	6
EPP4040-05	★		0.5	11	60	6
EPP4040-10	★		1	11	60	6
EPP4050-02	★	5	0.2	13	60	6
EPP4050-05	★		0.5	13	60	6
EPP4050-10	★		1	13	60	6
EPP4060-03	★	6	0.3	13	60	6
EPP4060-05	★		0.5	13	60	6
EPP4060-10	★		1	13	60	6
EPP4060-15	★		1.5	13	60	6
EPP4080-03	★	8	0.3	19	75	8
EPP4080-05	★		0.5	19	75	8
EPP4080-10	★		1	19	75	8
EPP4080-15	★		1.5	19	75	8
EPP4080-20	★		2	19	75	8
EPP4100-03	★	10	0.3	22	80	10
EPP4100-05	★		0.5	22	80	10
EPP4100-10	★		1	22	80	10
EPP4100-15	★		1.5	22	80	10
EPP4100-20	★		2	22	80	10
EPP4120-05	★	12	0.5	26	100	12
EPP4120-10	★		1	26	100	12
EPP4120-15	★		1.5	26	100	12
EPP4120-20	★		2	26	100	12
EPP4120-30	★		3	26	100	12
EPP4160-10	★	16	1	32	110	16
EPP4160-15	★		1.5	32	110	16
EPP4160-20	★		2	32	110	16
EPP4160-30	★		3	32	110	16
EPP4200-10	★	20	1	38	125	20
EPP4200-15	★		1.5	38	125	20
EPP4200-20	★		2	38	125	20
EPP4200-30	★		3	38	125	20

EPPL4○○○-○○

Carbide | C | Helix angle 43° | Cutting Conditions A271

Item code	Stock	Size (mm) Tool dia.	Corner radius	Flute length	Overall length	Shank dia.
EPPL4060-05	★	6	0.5	25	70	6
EPPL4060-10	★		1	25	70	6
EPPL4080-05	★	8	0.5	35	90	8
EPPL4080-10	★		1	35	90	8
EPPL4080-15	★		1.5	35	90	8
EPPL4080-20	★		2	35	90	8
EPPL4100-05	★	10	0.5	45	100	10
EPPL4100-10	★		1	45	100	10
EPPL4100-15	★		1.5	45	100	10
EPPL4100-20	★		2	45	100	10
EPPL4120-05	★	12	0.5	55	120	12
EPPL4120-10	★		1	55	120	12
EPPL4120-15	★		1.5	55	120	12
EPPL4120-20	★		2	55	120	12
EPPL4120-30	★		3	55	120	12
EPPL4160-10	★	16	1	65	135	16
EPPL4160-15	★		1.5	65	135	16
EPPL4160-20	★		2	65	135	16
EPPL4160-30	★		3	65	135	16
EPPL4200-10	★	20	1	75	155	20
EPPL4200-15	★		1.5	75	155	20
EPPL4200-20	★		2	75	155	20
EPPL4200-30	★		3	75	155	20

Applicable work material of EPP-CR, EPPL-CR, EPPLS-CR

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○	○		○	○		

★ : Inventory maintained in Japan

Epoch Power Mill

Long Shank, Corner radius

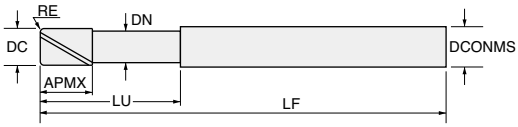
Side milling | Profiling | Radius | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ17 : 0～−0.02mm

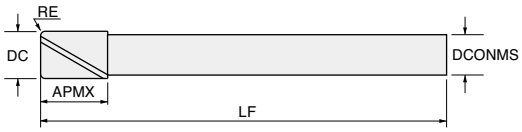
h6

Excellent chip removal enables high efficiency.

Please refer to page A369 for Square



A type



B type

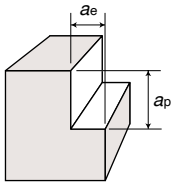
EPPLS4○○○-○○

Carbide | C | Helix angle 43° | Cutting Conditions A271

Item code	Stock	Size (mm)							Shape
		Tool dia.	Corner radius	Flute length	Neck dia.	Under neck length	Overall length	Shank dia.	
		DC	RE	APMX	DN	LU	LF	DCONMS	
EPPLS4030-02	★	3	0.2	4.5	2.9	10.5	80	6	A
EPPLS4030-05	★		0.5	4.5	2.9	10.5	80	6	A
EPPLS4040-02	★	4	0.2	6	3.8	14	80	6	A
EPPLS4040-05	★		0.5	6	3.8	14	80	6	A
EPPLS4050-02	★	5	0.2	7.5	4.8	17.5	100	6	A
EPPLS4050-05	★		0.5	7.5	4.8	17.5	100	6	A
EPPLS4060-03	★	6	0.3	9	–	–	120	5	B
EPPLS4060-05	★		0.5	9	–	–	120	5	B
EPPLS4060-10	★		1	9	–	–	120	5	B
EPPLS4070-03	★	7	0.3	9	–	–	120	6	B
EPPLS4070-05	★		0.5	9	–	–	120	6	B
EPPLS4070-10	★		1	9	–	–	120	6	B
EPPLS4080-05	★	8	0.5	12	–	–	135	7	B
EPPLS4080-10	★		1	12	–	–	135	7	B
EPPLS4080-15	★		1.5	12	–	–	135	7	B
EPPLS4090-05	★	9	0.5	12	–	–	135	8	B
EPPLS4090-10	★		1	12	–	–	135	8	B
EPPLS4090-15	★		1.5	12	–	–	135	8	B
EPPLS4100-05	★	10	0.5	15	–	–	150	9	B
EPPLS4100-10	★		1	15	–	–	150	9	B
EPPLS4100-15	★		1.5	15	–	–	150	9	B
EPPLS4110-05	★	11	0.5	15	–	–	150	10	B
EPPLS4110-10	★		1	15	–	–	150	10	B
EPPLS4110-15	★		1.5	15	–	–	150	10	B
EPPLS4120-05	★	12	0.5	18	–	–	160	11	B
EPPLS4120-10	★		1	18	–	–	160	11	B
EPPLS4120-15	★		1.5	18	–	–	160	11	B
EPPLS4120-20	★		2	18	–	–	160	11	B
EPPLS4130-05	★	13	0.5	18	–	–	160	12	B
EPPLS4130-10	★		1	18	–	–	160	12	B
EPPLS4130-15	★		1.5	18	–	–	160	12	B
EPPLS4130-20	★		2	18	–	–	160	12	B
EPPLS4160-10	★	16	1	24	–	–	180	15	B
EPPLS4160-15	★		1.5	24	–	–	180	15	B
EPPLS4160-20	★		2	24	–	–	180	15	B
EPPLS4170-10	★	17	1	24	–	–	180	16	B
EPPLS4170-15	★		1.5	24	–	–	180	16	B
EPPLS4170-20	★		2	24	–	–	180	16	B

Recommended cutting conditions

EPP-CR **Regular, Corner radius**



Inch

<Side milling>

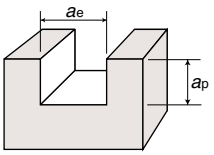
Work material		Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)		Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)
High speed	**ϕ3**	12,700	41	12,700	41	10,600	34	8,490	20	8,490	20	6,370	10	6,370	10	2,650	4
	ϕ4	9,550	46	9,550	46	7,960	38	6,370	25	6,370	25	4,770	15	4,770	15	1,990	6
	ϕ5	7,640	49	7,640	49	6,370	41	5,090	29	5,090	29	3,820	18	3,820	18	1,590	8
	ϕ6	6,370	51	6,370	51	5,310	42	4,240	27	4,240	27	3,180	18	3,180	18	1,330	7
	ϕ8	4,770	53	4,770	53	3,980	43	3,180	25	3,180	25	2,390	17	2,390	17	990	7
	ϕ10	3,820	47	3,820	47	3,180	41	2,550	24	2,550	24	1,910	17	1,910	17	800	7
	ϕ12	3,180	45	3,180	45	2,650	37	2,120	23	2,120	23	1,590	15	1,590	15	660	6
	ϕ16	2,390	38	2,390	38	1,990	32	1,590	21	1,590	21	1,190	13	1,190	13	500	6
	ϕ20	1,910	36	1,910	36	1,590	30	1,270	20	1,270	20	950	12	950	12	400	5
General	**ϕ3**	10,600	34	10,600	34	8,490	27	6,370	15	6,370	15	4,240	7	4,240	7	2,120	3
	ϕ4	7,960	38	7,960	38	6,370	31	4,770	19	4,770	19	3,180	10	3,180	10	1,590	5
	ϕ5	6,370	41	6,370	41	5,090	33	3,820	21	3,820	21	2,550	12	2,550	12	1,270	6
	ϕ6	5,310	42	5,310	42	4,240	34	3,180	20	3,180	20	2,120	12	2,120	12	1,060	6
	ϕ8	3,980	43	3,980	43	3,180	36	2,390	19	2,390	19	1,590	11	1,590	11	800	5
	ϕ10	3,180	41	3,180	41	2,550	33	1,910	18	1,910	18	1,270	11	1,270	11	640	6
	ϕ12	2,650	37	2,650	37	2,120	30	1,590	18	1,590	18	1,060	10	1,060	10	530	5
	ϕ16	1,990	32	1,990	32	1,590	25	1,190	16	1,190	16	800	9	800	9	400	4
	ϕ20	1,590	30	1,590	30	1,270	24	950	15	950	15	640	8	640	8	320	4

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch Power Mill

EPP-CR Regular, Corner radius



Inch

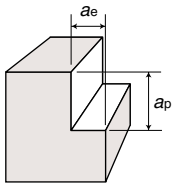
<Slotting>

	Work material	Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC							
	Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
	ϕ3	5,310	17	8,490	27	7,430	24	5,310	13	5,310	13						
	ϕ4	3,980	19	6,370	31	5,570	27	3,980	16	3,980	16						
	ϕ5	3,180	20	5,090	33	4,460	29	3,180	18	3,180	18						
	ϕ6	2,650	21	4,240	34	3,710	30	2,650	17	2,650	17						
	ϕ8	1,990	22	3,180	36	2,790	31	1,990	16	1,990	16						
	ϕ10	1,590	20	2,550	33	2,230	28	1,590	15	1,590	15						
	ϕ12	1,330	19	2,120	30	1,860	26	1,330	14	1,330	14						
	ϕ16	990	16	1,590	25	1,390	22	990	13	990	13						
	ϕ20	800	15	1,270	24	1,110	21	800	12	800	12						
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
	ϕ3	3,180	10	7,430	24	5,310	17	4,240	10	4,240	10	2,120	3	3,180	5	1,590	3
	ϕ4	2,390	11	5,570	27	3,980	19	3,180	13	3,180	13	1,590	5	2,390	8	1,190	4
	ϕ5	1,910	12	4,460	29	3,180	20	2,550	14	2,550	14	1,270	6	1,910	9	950	4
	ϕ6	1,590	13	3,710	30	2,650	21	2,120	14	2,120	14	1,060	6	1,590	9	800	4
	ϕ8	1,190	13	2,790	31	1,990	22	1,590	13	1,590	13	800	5	1,190	8	600	4
	ϕ10	950	12	2,230	28	1,590	20	1,270	12	1,270	12	640	6	950	8	480	4
	ϕ12	800	12	1,860	26	1,330	19	1,060	12	1,060	12	530	5	800	7	400	4
	ϕ16	600	9	1,390	22	990	16	800	11	800	11	400	4	600	7	300	3
	ϕ20	480	9	1,110	21	800	15	640	10	640	10	320	4	480	6	240	3

【Note】

① Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
② Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
③ Use a machine tool with rigidity and rigid set-up, to machine stably.
④ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑤ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

EPPL-CR Long, Corner radius

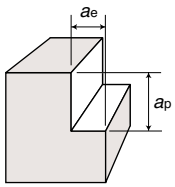


Inch

<Side milling>

Work material	Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
ϕ6	2,650	21	2,650	21	2,120	16	1,590	10	1,590	10	1,060	6	1,060	6	530	3
ϕ8	1,990	22	1,990	22	1,590	18	1,190	10	1,190	10	800	5	800	5	400	3
ϕ10	1,590	20	1,590	20	1,270	16	950	9	950	9	640	6	640	6	320	3
ϕ12	1,330	19	1,330	19	1,060	15	800	9	800	9	530	5	530	5	270	3
ϕ16	990	16	990	16	800	12	600	8	600	8	400	4	400	4	200	2
ϕ20	800	15	800	15	640	12	480	7	480	7	320	4	320	4	160	2

EPPLS-CR Long shank, Corner radius



Inch

<Side milling>

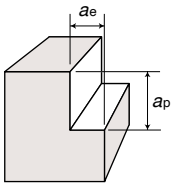
Work material	Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
ϕ3	5,310	34	5,310	34	4,240	27	3,180	15	3,180	15	2,120	7	2,120	7	1,060	3
ϕ4	3,980	38	3,980	38	3,180	31	2,390	19	2,390	19	1,590	10	1,590	10	800	5
ϕ5	3,180	41	3,180	41	2,550	33	1,910	21	1,910	21	1,270	12	1,270	12	640	6
ϕ6	2,650	41	2,650	41	2,120	33	1,590	20	1,590	20	1,060	12	1,060	12	530	6
ϕ8	1,990	44	1,990	44	1,590	36	1,190	19	1,190	19	800	11	800	11	400	5
ϕ10	1,590	40	1,590	40	1,270	33	950	18	950	18	640	11	640	11	320	6
ϕ12	1,330	38	1,330	38	1,060	30	800	17	800	17	530	10	530	10	270	5
ϕ16	990	32	990	32	800	25	600	16	600	16	400	9	400	9	200	4

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch Power Mill

EPP-CR Regular, Corner radius



Metric

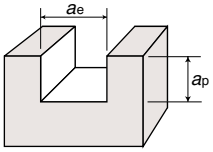
<Side milling>

Work material		Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)		Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)
High speed	ϕ3	12,700	1,020	12,700	1,020	10,600	850	8,490	510	8,490	510	6,370	250	6,370	250	2,650	110
	ϕ4	9,550	1,150	9,550	1,150	7,960	960	6,370	640	6,370	640	4,770	380	4,770	380	1,990	160
	ϕ5	7,640	1,220	7,640	1,220	6,370	1,020	5,090	710	5,090	710	3,820	460	3,820	460	1,590	190
	ϕ6	6,370	1,270	6,370	1,270	5,310	1,060	4,240	680	4,240	680	3,180	450	3,180	450	1,330	190
	ϕ8	4,770	1,340	4,770	1,340	3,980	1,110	3,180	640	3,180	640	2,390	430	2,390	430	990	180
	ϕ10	3,820	1,220	3,820	1,220	3,180	1,020	2,550	610	2,550	610	1,910	420	1,910	420	800	180
	ϕ12	3,180	1,140	3,180	1,140	2,650	950	2,120	590	2,120	590	1,590	380	1,590	380	660	160
	ϕ16	2,390	960	2,390	960	1,990	800	1,590	540	1,590	540	1,190	330	1,190	330	500	140
	ϕ20	1,910	920	1,910	920	1,590	760	1,270	510	1,270	510	950	300	950	300	400	130
General	ϕ3	10,600	850	10,600	850	8,490	680	6,370	380	6,370	380	4,240	170	4,240	170	2,120	85
	ϕ4	7,960	960	7,960	960	6,370	760	4,770	480	4,770	480	3,180	250	3,180	250	1,590	130
	ϕ5	6,370	1,020	6,370	1,020	5,090	810	3,820	530	3,820	530	2,550	310	2,550	310	1,270	150
	ϕ6	5,310	1,060	5,310	1,060	4,240	850	3,180	510	3,180	510	2,120	300	2,120	300	1,060	150
	ϕ8	3,980	1,110	3,980	1,110	3,180	890	2,390	480	2,390	480	1,590	290	1,590	290	800	140
	ϕ10	3,180	1,020	3,180	1,020	2,550	820	1,910	460	1,910	460	1,270	280	1,270	280	640	140
	ϕ12	2,650	950	2,650	950	2,120	760	1,590	450	1,590	450	1,060	250	1,060	250	530	130
	ϕ16	1,990	800	1,990	800	1,590	640	1,190	400	1,190	400	800	220	800	220	400	110
	ϕ20	1,590	760	1,590	760	1,270	610	950	380	950	380	640	200	640	200	320	100

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

EPP-CR Regular, Corner radius



Metric

<Slotting>

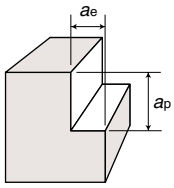
	Work material	Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC							
	Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
	ϕ3	5,310	420	8,490	680	7,430	590	5,310	320	5,310	320						
	ϕ4	3,980	480	6,370	760	5,570	670	3,980	400	3,980	400						
	ϕ5	3,180	510	5,090	810	4,460	710	3,180	450	3,180	450						
	ϕ6	2,650	530	4,240	850	3,710	740	2,650	420	2,650	420						
	ϕ8	1,990	560	3,180	890	2,790	780	1,990	400	1,990	400						
	ϕ10	1,590	510	2,550	820	2,230	710	1,590	380	1,590	380						
	ϕ12	1,330	480	2,120	760	1,860	670	1,330	370	1,330	370						
	ϕ16	990	400	1,590	640	1,390	560	990	340	990	340						
	ϕ20	800	380	1,270	610	1,110	530	800	320	800	320						
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
	ϕ3	3,180	250	7,430	590	5,310	420	4,240	250	4,240	250	2,120	85	3,180	130	1,590	65
	ϕ4	2,390	290	5,570	670	3,980	480	3,180	320	3,180	320	1,590	130	2,390	190	1,190	95
	ϕ5	1,910	310	4,460	710	3,180	510	2,550	360	2,550	360	1,270	150	1,910	230	950	110
	ϕ6	1,590	320	3,710	740	2,650	530	2,120	340	2,120	340	1,060	150	1,590	220	800	110
	ϕ8	1,190	330	2,790	780	1,990	560	1,590	320	1,590	320	800	140	1,190	210	600	110
	ϕ10	950	300	2,230	710	1,590	510	1,270	300	1,270	300	640	140	950	210	480	110
	ϕ12	800	290	1,860	670	1,330	480	1,060	300	1,060	300	530	130	800	190	400	95
	ϕ16	600	240	1,390	560	990	400	800	270	800	270	400	110	600	170	300	85
	ϕ20	480	230	1,110	530	800	380	640	260	640	260	320	100	480	150	240	75

【Note】

① Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
② Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
③ Use a machine tool with rigidity and rigid set-up, to machine stably.
④ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑤ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch Power Mill

EPPL-CR Long, Corner radius

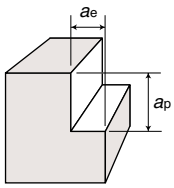


Metric

<Side milling>

Work material	Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
ϕ6	2,650	530	2,650	530	2,120	420	1,590	250	1,590	250	1,060	150	1,060	150	530	75
ϕ8	1,990	560	1,990	560	1,590	450	1,190	240	1,190	240	800	140	800	140	400	70
ϕ10	1,590	510	1,590	510	1,270	410	950	230	950	230	640	140	640	140	320	70
ϕ12	1,330	480	1,330	480	1,060	380	800	220	800	220	530	130	530	130	270	65
ϕ16	990	400	990	400	800	320	600	200	600	200	400	110	400	110	200	55
ϕ20	800	380	800	380	640	310	480	190	480	190	320	100	320	100	160	50

EPPLS-CR Long shank, Corner radius



Metric

<Side milling>

Work material	Cast irons (150～200HB) No. 35B		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) S304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
ϕ3	5,310	420	5,310	420	4,240	340	3,180	190	3,180	190	2,120	85	2,120	85	1,060	42
ϕ4	3,980	480	3,980	480	3,180	380	2,390	240	2,390	240	1,590	130	1,590	130	800	65
ϕ5	3,180	510	3,180	510	2,550	410	1,910	270	1,910	270	1,270	150	1,270	150	640	75
ϕ6	2,650	530	2,650	530	2,120	420	1,590	250	1,590	250	1,060	150	1,060	150	530	75
ϕ8	1,990	560	1,990	560	1,590	450	1,190	240	1,190	240	800	140	800	140	400	70
ϕ10	1,590	510	1,590	510	1,270	410	950	230	950	230	640	140	640	140	320	70
ϕ12	1,330	480	1,330	480	1,060	380	800	220	800	220	530	130	530	130	270	65
ϕ16	990	400	990	400	800	320	600	200	600	200	400	110	400	110	200	55

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

8-flutes End Mill for Vertical Wall/Bottom Face Finishing

YouTube

Planing | Side milling | Slotting | Die-sinking | Profiling | Semi Finishing | Finishing

Dia. tolerance: φ6 : 0～−0.015mm; φ7～φ12 : 0～−0.02mm

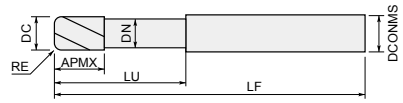
h5 (φ6,8,10,12) h6 (φ7,9,11)

The Zenith of Milling for Vertical Wall and Bottom Face Finishing
Vertical wall and bottom face finishing with a single tool!

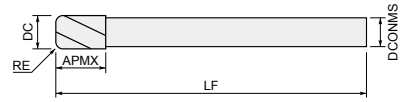
Please refer to page A383 for Square

8 Flutes

A type



B type



ER8WB○○○○LN(LS)-○○-R○○-ATH

Carbide | ATH | Helix angle 38° | Cutting Conditions A276

Item code	Stock	Size(mm) Tool dia. DC	Corner radius RE	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Shape
ER8WB0600LN-20-R1.0-ATH	●	6 (.236inch)	1	7 (.276inch)	20	5.88	70	6	A
ER8WB0600LN-30-R1.0-ATH	●		1		30	5.88	80	6	A
ER8WB0600LN-40-R1.0-ATH	●		1		40	5.88	90	6	A
ER8WB0600LN-50-R1.0-ATH	●		1		50	5.88	100	6	A
ER8WB0700LS-R1.0-ATH	●	7 (.276inch)	1	8 (.315inch)	—	—	90	6	B
ER8WB0800LN-30-R1.0-ATH	●	8 (.315inch)	1	9 (.354inch)	30	7.84	75	8	A
ER8WB0800LN-40-R1.0-ATH	●		1		40	7.84	90	8	A
ER8WB0800LN-50-R1.0-ATH	●		1		50	7.84	100	8	A
ER8WB0800LN-60-R1.0-ATH	●		1		60	7.84	110	8	A
ER8WB0900LS-R1.0-ATH	●	9 (.354inch)	1	10 (.394inch)	—	—	100	8	B
ER8WB1000LN-35-R1.0-ATH	●	10 (.394inch)	1	11 (.433inch)	35	9.8	80	10	A
ER8WB1000LN-50-R1.0-ATH	●		1		50	9.8	100	10	A
ER8WB1000LN-60-R1.0-ATH	●		1		60	9.8	110	10	A
ER8WB1000LN-80-R1.0-ATH	●		1		80	9.8	130	10	A
ER8WB1100LS-R1.0-ATH	●	11 (.433inch)	1	12 (.472inch)	—	—	110	10	B
ER8WB1200LN-40-R1.0-ATH	●	12 (.472inch)	1	13 (.512inch)	40	11.8	90	12	A
ER8WB1200LN-60-R1.0-ATH	●		1		60	11.8	110	12	A
ER8WB1200LN-80-R1.0-ATH	●		1		80	11.8	130	12	A
ER8WB1200LN-100-R1.0-ATH	●		1		100	11.8	150	12	A

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎						

● : Inventory maintained in US

8-flutes End Mill for Vertical Wall/Bottom Face Finishing

Recommended cutting conditions

ER8WB-ATH

Vertical wall finishing

Inch

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Item code	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
ER8WB0600LN-20-R1.0-ATH	.118	≦.004	7960	75.2	6370	60.2	4770	44.9	3180	29.9	2650	25.2
ER8WB0600LN-30-R1.0-ATH	.118	≦.004	6630	62.6	5310	50.0	3980	37.8	2650	25.2	2120	20.1
ER8WB0600LN-40-R1.0-ATH	.118	≦.004	4640	30.7	3710	24.4	2790	18.5	1860	12.2	1490	9.8
ER8WB0600LN-50-R1.0-ATH	.118	≦.004	3320	15.7	2650	12.6	1990	9.4	1330	6.3	1060	5.1
ER8WB0700LS-R1.0-ATH	.138	≦.004	5680	62.6	4550	50.0	3410	37.4	2270	25.2	1820	20.1
ER8WB0800LN-30-R1.0-ATH	.157	≦.004	5970	75.2	4770	60.2	3580	45.3	2390	29.9	1990	25.2
ER8WB0800LN-40-R1.0-ATH	.157	≦.004	4970	62.6	3980	50.0	2980	37.4	1990	25.2	1590	20.1
ER8WB0800LN-50-R1.0-ATH	.157	≦.004	3480	35.0	2790	24.4	2090	21.3	1390	14.2	1110	11.0
ER8WB0800LN-60-R1.0-ATH	.157	≦.004	2490	15.7	1990	12.6	1490	9.4	990	6.3	800	5.1
ER8WB0900LS-R1.0-ATH	.177	≦.004	4420	62.6	3540	50.0	2650	37.4	1770	25.2	1410	20.1
ER8WB1000LN-35-R1.0-ATH	.197	≦.004	4770	75.2	3820	60.2	2860	44.9	1910	29.9	1590	25.2
ER8WB1000LN-50-R1.0-ATH	.197	≦.004	3980	62.6	3180	50.0	2390	37.8	1590	25.2	1270	20.1
ER8WB1000LN-60-R1.0-ATH	.197	≦.004	2790	35.0	2230	24.4	1670	20.9	1110	14.2	890	11.0
ER8WB1000LN-80-R1.0-ATH	.197	≦.004	1990	15.7	1590	12.6	1190	9.4	800	6.3	640	5.1
ER8WB1100LS-R1.0-ATH	.217	≦.004	3620	59.4	2890	47.6	2170	35.8	1450	24.0	1160	18.9
ER8WB1200LN-40-R1.0-ATH	.236	≦.004	3980	67.7	3180	53.9	2390	40.6	1590	27.2	1330	22.4
ER8WB1200LN-60-R1.0-ATH	.236	≦.004	3320	56.3	2650	44.9	1990	33.9	1330	22.4	1060	18.1
ER8WB1200LN-80-R1.0-ATH	.236	≦.004	2320	27.6	1860	22.0	1390	16.5	930	11.0	740	8.7
ER8WB1200LN-100-R1.0-ATH	.236	≦.004	1660	14.2	1330	11.4	990	8.3	660	5.5	530	4.3

* Cutting conditions for the long-shank type (⌀7/9/11) are for a tool projection of 5DC (tool diameter × 5). Modify the conditions using the following correction factors if the projection amount changes:

Cutting condition correction factors for long-shank type (%)

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Projection	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
5DC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6DC	100%	100%	70%	60%	70%	60%	70%	60%	70%	60%	70%	60%
7DC	100%	100%	70%	50%	70%	50%	70%	50%	70%	50%	70%	50%

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

ER8WB-ATH

Bottom face finishing

Inch

※ A radius type (ER8WB-ATH) should be used for bottom face finishing.

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Item code	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
ER8WB0600LN-20-R1.0-ATH	.002～.004	.118～.236	9550	90.2	7960	75.2	6370	60.2	4770	44.9	3180	29.9
ER8WB0600LN-30-R1.0-ATH	.002～.004	.118～.236	7960	75.2	6630	62.6	5310	50.0	3980	37.8	2650	25.2
ER8WB0600LN-40-R1.0-ATH	.002～.004	.118～.236	5570	37.0	4640	30.7	3710	24.4	2790	18.5	1860	12.2
ER8WB0600LN-50-R1.0-ATH	.002～.004	.118～.236	3980	18.9	3320	15.7	2650	12.6	1990	9.4	1330	6.3
ER8WB0700LS-R1.0-ATH	.002～.004	.138～.276	6820	75.2	5680	62.6	4550	50.0	3410	37.4	2270	25.2
ER8WB0800LN-30-R1.0-ATH	.002～.004	.157～.315	7160	90.2	5970	75.2	4770	60.2	3580	45.3	2390	29.9
ER8WB0800LN-40-R1.0-ATH	.002～.004	.157～.315	5970	75.2	4970	62.6	3980	50.0	2980	37.4	1990	25.2
ER8WB0800LN-50-R1.0-ATH	.002～.004	.157～.315	4180	42.1	3480	35.0	2790	28.0	2090	21.3	1390	14.2
ER8WB0800LN-60-R1.0-ATH	.002～.004	.157～.315	2980	18.9	2490	15.7	1990	12.6	1490	9.4	990	6.3
ER8WB0900LS-R1.0-ATH	.002～.004	.177～.354	5310	75.2	4420	62.6	3540	50.0	2650	37.4	1770	25.2
ER8WB1000LN-35-R1.0-ATH	.002～.004	.197～.394	5730	90.2	4770	75.2	3820	60.2	2860	44.9	1910	29.9
ER8WB1000LN-50-R1.0-ATH	.002～.004	.197～.394	4770	75.2	3980	62.6	3180	50.0	2390	37.8	1590	25.2
ER8WB1000LN-60-R1.0-ATH	.002～.004	.197～.394	3340	42.1	2790	35.0	2230	28.0	1670	20.9	1110	14.2
ER8WB1000LN-80-R1.0-ATH	.002～.004	.197～.394	2390	18.9	1990	15.7	1590	12.6	1190	9.4	800	6.3
ER8WB1100LS-R1.0-ATH	.002～.004	.217～.433	4340	71.3	3620	59.4	2890	47.6	2170	35.8	1450	24.0
ER8WB1200LN-40-R1.0-ATH	.002～.004	.236～.472	4770	81.1	3980	67.7	3180	53.9	2390	40.6	1590	27.2
ER8WB1200LN-60-R1.0-ATH	.002～.004	.236～.472	3980	67.7	3320	56.3	2650	44.9	1990	33.9	1330	22.4
ER8WB1200LN-80-R1.0-ATH	.002～.004	.236～.472	2790	33.1	2320	27.6	1860	22.0	1390	16.5	930	11.0
ER8WB1200LN-100-R1.0-ATH	.002～.004	.236～.472	1990	16.9	1660	14.2	1330	11.4	990	8.3	660	5.5

* Cutting conditions for the long-shank type (⌀7/9/11) are for a tool projection of 5DC (tool diameter × 5). Modify the conditions using the following correction factors if the projection amount changes:

Cutting condition correction factors for long-shank type (%)

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Projection	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
5DC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6DC	100%	100%	70%	60%	70%	60%	70%	60%	70%	60%	70%	60%
7DC	100%	100%	70%	50%	70%	50%	70%	50%	70%	50%	70%	50%

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ For slotting, adjust the feed rate to 50% as general criteria.
⑥ For ramping, adjust the ramp angle to 0.5° or less and the feed rate to 50% as general criteria.

8-flutes End Mill for Vertical Wall/Bottom Face Finishing

ER8WB-ATH

Vertical wall finishing

Metric

Work material			Carbon steel Alloy steel (180~250HB)		Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~62HRC)	
Item code	a_p (mm)	a_e (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
ER8WB0600LN-20-R1.0-ATH	3	≦0.1	7960	1910	6370	1530	4770	1140	3180	760	2650	640
ER8WB0600LN-30-R1.0-ATH	3	≦0.1	6630	1590	5310	1270	3980	960	2650	640	2120	510
ER8WB0600LN-40-R1.0-ATH	3	≦0.1	4640	780	3710	620	2790	470	1860	310	1490	250
ER8WB0600LN-50-R1.0-ATH	3	≦0.1	3320	400	2650	320	1990	240	1330	160	1060	130
ER8WB0700LS-R1.0-ATH	3.5	≦0.1	5680	1590	4550	1270	3410	950	2270	640	1820	510
ER8WB0800LN-30-R1.0-ATH	4	≦0.1	5970	1910	4770	1530	3580	1150	2390	760	1990	640
ER8WB0800LN-40-R1.0-ATH	4	≦0.1	4970	1590	3980	1270	2980	950	1990	640	1590	510
ER8WB0800LN-50-R1.0-ATH	4	≦0.1	3480	890	2790	620	2090	540	1390	360	1110	280
ER8WB0800LN-60-R1.0-ATH	4	≦0.1	2490	400	1990	320	1490	240	990	160	800	130
ER8WB0900LS-R1.0-ATH	4.5	≦0.1	4420	1590	3540	1270	2650	950	1770	640	1410	510
ER8WB1000LN-35-R1.0-ATH	5	≦0.1	4770	1910	3820	1530	2860	1140	1910	760	1590	640
ER8WB1000LN-50-R1.0-ATH	5	≦0.1	3980	1590	3180	1270	2390	960	1590	640	1270	510
ER8WB1000LN-60-R1.0-ATH	5	≦0.1	2790	890	2230	620	1670	530	1110	360	890	280
ER8WB1000LN-80-R1.0-ATH	5	≦0.1	1990	400	1590	320	1190	240	800	160	640	130
ER8WB1100LS-R1.0-ATH	5.5	≦0.1	3620	1510	2890	1210	2170	910	1450	610	1160	480
ER8WB1200LN-40-R1.0-ATH	6	≦0.1	3980	1720	3180	1370	2390	1030	1590	690	1330	570
ER8WB1200LN-60-R1.0-ATH	6	≦0.1	3320	1430	2650	1140	1990	860	1330	570	1060	460
ER8WB1200LN-80-R1.0-ATH	6	≦0.1	2320	700	1860	560	1390	420	930	280	740	220
ER8WB1200LN-100-R1.0-ATH	6	≦0.1	1660	360	1330	290	990	210	660	140	530	110

* Cutting conditions for the long-shank type (⌀7/9/11) are for a tool projection of 5DC (tool diameter × 5). Modify the conditions using the following correction factors if the projection amount changes:

Cutting condition correction factors for long-shank type (%)

Work material			Carbon steel Alloy steel (180~250HB)		Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~62HRC)	
Projection	a_p (mm)	a_e (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
5DC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6DC	100%	100%	70%	60%	70%	60%	70%	60%	70%	60%	70%	60%
7DC	100%	100%	70%	50%	70%	50%	70%	50%	70%	50%	70%	50%

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

ER8WB-ATH

Bottom face finishing

Metric

※ A radius type (ER8WB-ATH) should be used for bottom face finishing.

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Item code	a_p (mm)	a_e (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
ER8WB0600LN-20-R1.0-ATH	0.05～0.1	3～6	9550	2290	7960	1910	6370	1530	4770	1140	3180	760
ER8WB0600LN-30-R1.0-ATH	0.05～0.1	3～6	7960	1910	6630	1590	5310	1270	3980	960	2650	640
ER8WB0600LN-40-R1.0-ATH	0.05～0.1	3～6	5570	940	4640	780	3710	620	2790	470	1860	310
ER8WB0600LN-50-R1.0-ATH	0.05～0.1	3～6	3980	480	3320	400	2650	320	1990	240	1330	160
ER8WB0700LS-R1.0-ATH	0.05～0.1	3.5～7	6820	1910	5680	1590	4550	1270	3410	950	2270	640
ER8WB0800LN-30-R1.0-ATH	0.05～0.1	4～8	7160	2290	5970	1910	4770	1530	3580	1150	2390	760
ER8WB0800LN-40-R1.0-ATH	0.05～0.1	4～8	5970	1910	4970	1590	3980	1270	2980	950	1990	640
ER8WB0800LN-50-R1.0-ATH	0.05～0.1	4～8	4180	1070	3480	890	2790	710	2090	540	1390	360
ER8WB0800LN-60-R1.0-ATH	0.05～0.1	4～8	2980	480	2490	400	1990	320	1490	240	990	160
ER8WB0900LS-R1.0-ATH	0.05～0.1	4.5～9	5310	1910	4420	1590	3540	1270	2650	950	1770	640
ER8WB1000LN-35-R1.0-ATH	0.05～0.1	5～10	5730	2290	4770	1910	3820	1530	2860	1140	1910	760
ER8WB1000LN-50-R1.0-ATH	0.05～0.1	5～10	4770	1910	3980	1590	3180	1270	2390	960	1590	640
ER8WB1000LN-60-R1.0-ATH	0.05～0.1	5～10	3340	1070	2790	890	2230	710	1670	530	1110	360
ER8WB1000LN-80-R1.0-ATH	0.05～0.1	5～10	2390	480	1990	400	1590	320	1190	240	800	160
ER8WB1100LS-R1.0-ATH	0.05～0.1	5.5～11	4340	1810	3620	1510	2890	1210	2170	910	1450	610
ER8WB1200LN-40-R1.0-ATH	0.05～0.1	6～12	4770	2060	3980	1720	3180	1370	2390	1030	1590	690
ER8WB1200LN-60-R1.0-ATH	0.05～0.1	6～12	3980	1720	3320	1430	2650	1140	1990	860	1330	570
ER8WB1200LN-80-R1.0-ATH	0.05～0.1	6～12	2790	840	2320	700	1860	560	1390	420	930	280
ER8WB1200LN-100-R1.0-ATH	0.05～0.1	6～12	1990	430	1660	360	1330	290	990	210	660	140

* Cutting conditions for the long-shank type (⌀7/9/11) are for a tool projection of 5DC (tool diameter × 5). Modify the conditions using the following correction factors if the projection amount changes:

Cutting condition correction factors for long-shank type (%)

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Projection	a_p (mm)	a_e (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
5DC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6DC	100%	100%	70%	60%	70%	60%	70%	60%	70%	60%	70%	60%
7DC	100%	100%	70%	50%	70%	50%	70%	50%	70%	50%	70%	50%

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ For slotting, adjust the feed rate to 50% as general criteria.
⑥ For ramping, adjust the ramp angle to 0.5° or less and the feed rate to 50% as general criteria.

End mill for adaptive milling

YouTube

Under neck 3.5DC type

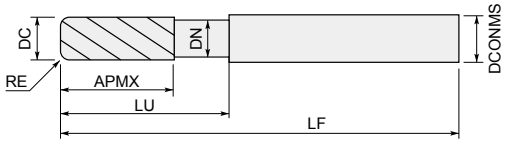
Adaptive milling | Planing | Side milling | Profiling | Helical | Roughing | Semi Finishing

Dia. tolerance: φ6 : 0 ~ −0.015mm; φ8 ~ φ20 : 0 ~ −0.02mm

h5 (φ6,8,10,12) | h6 (φ16,20)

Enables high-efficiency machining in conjunction with adaptive milling tool paths!

5 Flutes



ER5HS○○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A281

Item code	Stock	Size(mm)						
		Tool dia.	Corner radius	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.
		DC	RE	APMX	LU	DN	LF	DCONMS
ER5HS06-PN	●	6	0.5	18	21	5.5	60	6
ER5HS08-PN	●	8	1.0	24	28	7.3	75	8
ER5HS10-PN	●	10	1.0	30	35	9.2	80	10
ER5HS12-PN	●	12	1.0	36	42	11	100	12
ER5HS16-PN	●	16	1.0	48	56	14.7	110	16
ER5HS20-PN	●	20	1.0	60	70	18.4	125	20

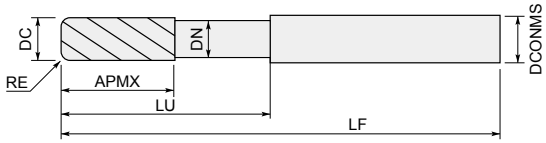
Under neck 5DC type

Adaptive milling | Planing | Side milling | Profiling | Helical | Roughing | Semi Finishing

Dia. tolerance: φ6 : 0 ~ −0.015mm; φ8 ~ φ20 : 0 ~ −0.02mm

h5 (φ6,8,10,12) | h6 (φ16,20)

5 Flutes



ER5HS○○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A281

Item code	Stock	Size(mm)						
		Tool dia.	Corner radius	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.
		DC	RE	APMX	LU	DN	LF	DCONMS
ER5HS06-30-PN	●	6	0.5	18	30	5.5	70	6
ER5HS08-40-PN	●	8	1.0	24	40	7.3	80	8
ER5HS10-50-PN	●	10	1.0	30	50	9.2	100	10
ER5HS12-60-PN	●	12	1.0	36	60	11	120	12
ER5HS16-80-PN	●	16	1.0	48	80	14.7	135	16
ER5HS20-100-PN	●	20	1.0	60	100	18.4	155	20

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				○	○		

● : Inventory maintained in US

End mill for adaptive milling

Recommended cutting conditions ER5HS-3.5DC-PN ER5HS-5DC-PN

Recommended cutting conditions

Inch

Work material	Carbon steel, Alloy steel (～30HRC)		Pre-hardened steel (30～40HRC)		Stainless steel	
Cutting speed	v_c=492 SFM		v_c=328 SFM		v_c=492 SFM	
Depth of cut (inch)	a_p=3DC- .0039", a_e=0.08DC		a_p=3DC- .0039", a_e=0.08DC		a_p=3DC- .0039", a_e=0.06DC	
Tool dia.DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
6	7,960	157	5,310	105	7,960	125
8	5,970	118	3,980	78	5,970	94
10	4,775	113	3,185	75	4,775	94
12	3,980	94	2,660	63	3,980	78
16	2,990	59	1,990	39	2,990	47
20	2,390	47	1,600	31	2,390	38

Under neck 5DC cutting conditions (as percentage of recommended cutting conditions)

Work material	Carbon steel, Alloy steel (～30HRC)			Pre-hardened steel (30～40HRC)			Stainless steel		
Percentage	Revolution n (min^{-1})	Feed rate v_f (IPM)	Radial depth of cut a_e (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Radial depth of cut a_e (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Radial depth of cut a_e (inch)
	100%	100%	60%	100%	50%	75%	100%	100%	50%

Example of carbon steel : ϕ10mm n=4,775min^{-1} v_f=113 IPM a_p= 1.1417" a_e= .0189" Adjust a_p by referring to the recommended cutting conditions.

High-speed cutting conditions (under neck 3.5DC only)

Work material	Carbon steel, Alloy steel (～30HRC)		Pre-hardened steel (30～40HRC)	
Cutting speed	v_c=656 SFM		v_c=492 SFM	
Depth of cut (inch)	a_p=3DC- .0039", a_e=0.08DC		a_p=3DC- .0039", a_e=0.08DC	
Tool dia.DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
6	10,610	209	7,960	157
8	7,960	157	5,970	118
10	6,370	150	4,775	113
12	5,310	126	3,980	94
16	3,980	79	2,990	59
20	3,185	63	2,390	47

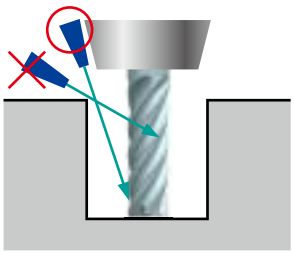
High-speed cutting is not recommended with stainless steel.

【Note】

① Use a highly rigid machine as possible.
※When using ϕ16 or larger tools, use a BT50-class or higher high-rigidity machine.
② Supply coolant from the holder end face (using a through-collet air supply, for example) when cutting work material with many enclosed areas.
③ Use the appropriate coolant for the work material and machining shape.
④ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑥ The recommended ramping angle for helical interpolation is 1°. Set the feed rate to between 50% and 60% of the values indicated above. Additionally, where this can be adjusted, set the rotation speed to around v_c = 100 m/min.

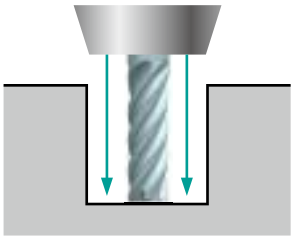
Coolant

Coolant nozzle



When using a coolant nozzle, arrange the coolant nozzle so that the coolant hits the end of the tool.
Adjust the coolant pressure required to discharge the chips. Insufficient pressure may result in edge damage or tool breakage due to chip clogging.

End feed using through-collet supply



Using a through-collet coolant feed improves chip discharge and reduces edge damage and tool breakage.

End mill for adaptive milling

Recommended cutting conditions

Metric

Work material	Carbon steel, Alloy steel (～30HRC)		Pre-hardened steel (30～40HRC)		Stainless steel	
Cutting speed	v_c=150m/min		v_c=100m/min		v_c=150m/min	
Depth of cut (mm)	a_p=3DC-1mm, a_e=0.08DC		a_p=3DC-1mm, a_e=0.08DC		a_p=3DC-1mm, a_e=0.06DC	
Tool dia.DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
6	7,960	3,980	5,310	2,655	7,960	3,180
8	5,970	2,985	3,980	1,990	5,970	2,390
10	4,775	2,865	3,185	1,910	4,775	2,390
12	3,980	2,390	2,660	1,600	3,980	1,990
16	2,990	1,500	1,990	1,000	2,990	1,200
20	2,390	1,200	1,600	800	2,390	960

Under neck 5DC cutting conditions (as percentage of recommended cutting conditions)

Work material	Carbon steel, Alloy steel (～30HRC)			Pre-hardened steel (30～40HRC)			Stainless steel		
Percentage	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Radial depth of cut a_e (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Radial depth of cut a_e (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Radial depth of cut a_e (mm)
	100%	100%	60%	100%	50%	75%	100%	100%	50%

Example of carbon steel : ϕ10 n=4,775min^{-1} v_f=2,865mm/min a_p=29mm a_e=0.48mm Adjust a_p by referring to the recommended cutting conditions.

High-speed cutting conditions (under neck 3.5DC only)

Work material	Carbon steel, Alloy steel (～30HRC)		Pre-hardened steel (30～40HRC)	
Cutting speed	v_c=200m/min		v_c=150m/min	
Depth of cut (mm)	a_p=3DC-1mm, a_e=0.08DC		a_p=3DC-1mm, a_e=0.08DC	
Tool dia.DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
6	10,610	5,300	7,960	3,980
8	7,960	4,000	5,970	2,985
10	6,370	3,820	4,775	2,865
12	5,310	3,190	3,980	2,390
16	3,980	2,000	2,990	1,500
20	3,185	1,600	2,390	1,200

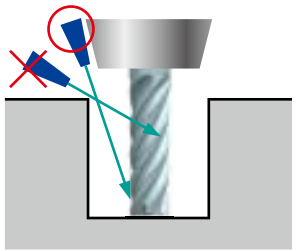
High-speed cutting is not recommended with stainless steel.

【Note】

① Use a highly rigid machine as possible.
※When using ϕ16 or larger tools, use a BT50-class or higher high-rigidity machine.
② Supply coolant from the holder end face (using a through-collet air supply, for example) when cutting work material with many enclosed areas.
③ Use the appropriate coolant for the work material and machining shape.
④ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑥ The recommended ramping angle for helical interpolation is 1°. Set the feed rate to between 50% and 60% of the values indicated above. Additionally, where this can be adjusted, set the rotation speed to around v_c = 100 m/min.

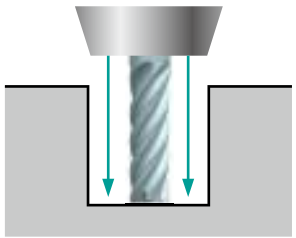
Coolant

Coolant nozzle



When using a coolant nozzle, arrange the coolant nozzle so that the coolant hits the end of the tool.
Adjust the coolant pressure required to discharge the chips. Insufficient pressure may result in edge damage or tool breakage due to chip clogging.

End feed using through-collet supply



Using a through-collet coolant feed improves chip discharge and reduces edge damage and tool breakage.

Epoch Mirus Type R

4 flutes, Radius, Straight, 3DC

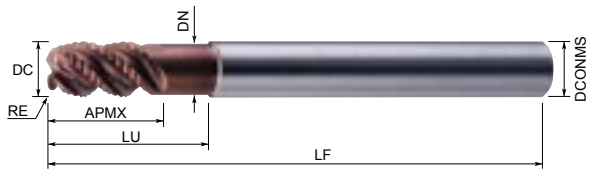
Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.05mm h5

Achieves amazing machining efficiency with high cutting depth and high feed rate.

Please refer to page A386 for Square

4 Flutes



EMXR4○○○-○○-○○-TH 3DC

Carbide | RTH | Helix angle 45° | Cutting Conditions A285

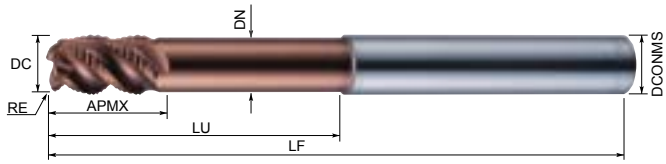
Item code	Stock	Size (mm)							No. of flutes
		Tool dia.	Flute length	Corner radius	Neck dia.	Under neck length	Overall length	Shank dia.	
		DC	APMX	RE	DN	LU	LF	DCONMS	
EMXR4060-18-15-TH	★	6	9	1.5	5.5	18	60	6	4
EMXR4080-24-20-TH	★	8	12	2	7.3	24	75	8	4
EMXR4100-30-20-TH	★	10	15	2	9.1	30	80	10	4
EMXR4120-36-20-TH	★	12	18	2	11	36	100	12	4

4 flutes, Radius, Straight, 5DC

Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.05mm h5

4 Flutes



EMXR4○○○-○○-○○-TH 5DC

Carbide | RTH | Helix angle 45° | Cutting Conditions A286

Item code	Stock	Size (mm)							No. of flutes
		Tool dia.	Flute length	Corner radius	Neck dia.	Under neck length	Overall length	Shank dia.	
		DC	APMX	RE	DN	LU	LF	DCONMS	
EMXR4060-30-15-TH	★	6	9	1.5	5.5	30	75	6	4
EMXR4080-40-20-TH	★	8	12	2	7.3	40	85	8	4
EMXR4100-50-20-TH	★	10	15	2	9.1	50	100	10	4
EMXR4120-60-20-TH	★	12	18	2	11	60	110	12	4

Applicable work material of EMXR-3DC-TH, EMXR-5DC-TH

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○					○	○

★ : Inventory maintained in Japan

Epoch Mirus Type N

4 flutes, Radius, Straight, 3DC

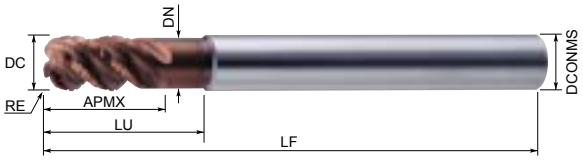
Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.03mm h5

Achieves amazing machining efficiency with high cutting depth and high feed rate.

Please refer to page A387 for Square

4 Flutes



EMXN4○○○-○○-○○-TH 3DC

Carbide | ATH | Helix angle 45° | Cutting Conditions A285

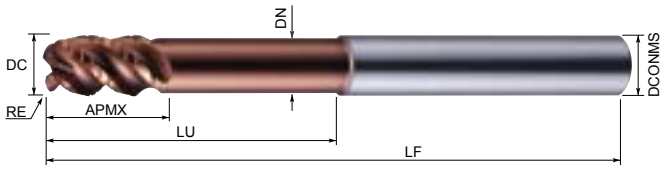
Item code	Stock	Size (mm)							No. of flutes
		Tool dia. DC	Flute length APMX	Corner radius RE	Neck dia. DN	Under neck length LU	Overall length LF	Shank dia. DCONMS	
EMXN4060-18-05-TH	★	6	9	0.5	5.5	18	60	6	4
EMXN4060-18-15-TH	★		9	1.5	5.5	18	60	6	4
EMXN4080-24-05-TH	★	8	12	0.5	7.3	24	75	8	4
EMXN4080-24-20-TH	★		12	2	7.3	24	75	8	4
EMXN4100-30-05-TH	★	10	15	0.5	9.1	30	80	10	4
EMXN4100-30-20-TH	★		15	2	9.1	30	80	10	4
EMXN4120-36-05-TH	★	12	18	0.5	11	36	100	12	4
EMXN4120-36-20-TH	★		18	2	11	36	100	12	4

4 flutes, Radius, Straight, 5DC

Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.03mm h5

4 Flutes



EMXN4○○○-○○-○○-TH 5DC

Carbide | ATH | Helix angle 45° | Cutting Conditions A286

Item code	Stock	Size (mm)							No. of flutes
		Tool dia. DC	Flute length APMX	Corner radius RE	Neck dia. DN	Under neck length LU	Overall length LF	Shank dia. DCONMS	
EMXN4060-30-15-TH	★	6	9	1.5	5.5	30	75	6	4
EMXN4080-40-20-TH	★	8	12	2	7.3	40	85	8	4
EMXN4100-50-20-TH	★	10	15	2	9.1	50	100	10	4
EMXN4120-60-20-TH	★	12	18	2	11	60	110	12	4

Applicable work material of EMXN-3DC-TH, EMXR-5DC-TH

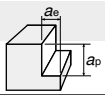
Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○					○	○

Epoch Mirus Type R/Type N

Recommended cutting conditions

EMXR-CR-TH **EMXN-CR-TH** **4 flutes, Radius, Straight** **3DC** **Inch**

Side milling



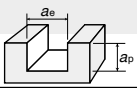
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	8,000	54	7,200	40	6,400	28	5,600	20
ϕ8	6,000	58	5,400	41	4,800	29	4,200	20
ϕ10	4,800	58	4,300	41	3,800	29	3,300	20
ϕ12	4,000	54	3,600	39	3,200	28	2,800	20

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	7,400	50	6,600	37	6,600	11	5,800	26	5,000	18
ϕ8	5,600	54	5,000	38	5,000	12	4,400	26	3,800	18
ϕ10	4,500	54	4,000	38	4,000	11	3,500	27	3,000	18
ϕ12	3,700	50	3,300	36	3,300	11	2,900	26	2,500	17

Slotting



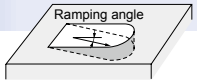
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,900	39	6,100	27	5,300	19	4,500	13
ϕ8	5,200	40	4,600	28	4,000	19	3,400	14
ϕ10	4,100	39	3,700	28	3,200	19	2,700	13
ϕ12	3,400	37	3,100	27	2,700	18	2,300	13

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,400	36	5,600	25	5,600	7	4,800	17	4,000	11
ϕ8	4,800	36	4,200	25	4,200	8	3,600	17	3,000	12
ϕ10	3,800	36	3,300	25	3,300	8	2,900	17	2,400	12
ϕ12	3,200	35	2,800	25	2,800	8	2,400	16	2,000	11

Ramping



Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,900	30	6,100	22	5,300	15	4,500	9
ϕ8	5,200	31	4,600	22	4,000	16	3,400	11
ϕ10	4,100	31	3,700	22	3,200	15	2,700	10
ϕ12	3,400	29	3,100	21	2,700	15	2,300	10

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	20° or less		10° or less		5° or less		10° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,400	28	5,600	18	5,600	4	4,800	13	4,000	8
ϕ8	4,800	29	4,200	20	4,200	7	3,600	14	3,000	10
ϕ10	3,800	29	3,300	20	3,300	5	2,900	14	2,400	9
ϕ12	3,200	27	2,800	19	2,800	6	2,400	13	2,000	9

Two-way profiling

Fig.1

Type R

	Cast irons, Carbon steels Alloy steels (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	8,000	67	7,200	49	6,400	36	5,600	25
ϕ8	6,000	72	5,400	52	4,800	36	4,200	25
ϕ10	4,800	71	4,300	52	3,800	36	3,300	25
ϕ12	4,000	69	3,600	49	3,200	35	2,800	25

Type N

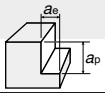
	Cast irons, Carbon steels Alloy steels (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	7,400	62	6,600	45	6,600	13	5,800	32	5,000	22
ϕ8	5,600	67	5,000	48	5,000	14	4,400	33	3,800	23
ϕ10	4,500	67	4,000	48	4,000	14	3,500	34	3,000	23
ϕ12	3,700	64	3,300	45	3,300	13	2,900	31	2,500	22

【Note】 Upon usage, please refer to comments and notes below table on page A289.

Epoch Mirus Type R/Type N

EMXR-CR-TH **EMXN-CR-TH** **4 flutes, Radius, Straight** **5DC** **Inch**

Side milling



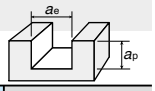
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC a_e=0.35DC		a_p=0.7DC a_e=0.26DC		a_p=0.7DC a_e=0.175DC		a_p=0.7DC a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	8,000	54	7,200	40	6,400	28	5,600	20
ϕ8	6,000	58	5,400	41	4,800	29	4,200	20
ϕ10	4,800	58	4,300	41	3,800	29	3,300	21
ϕ12	4,000	54	3,600	39	3,200	28	2,800	19

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC a_e=0.35DC		a_p=0.7DC a_e=0.26DC		a_p=0.7DC a_e=0.26DC		a_p=0.7DC a_e=0.175DC		a_p=0.7DC a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	7,400	50	6,600	37	6,600	11	5,800	26	5,000	18
ϕ8	5,600	54	5,000	38	5,000	12	4,400	26	3,800	18
ϕ10	4,500	54	4,000	38	4,000	11	3,500	27	3,000	18
ϕ12	3,700	50	3,300	36	3,300	11	2,900	26	2,500	18

Slotting



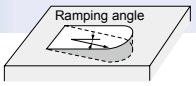
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC		a_p=0.56DC		a_p=0.35DC		a_p=0.14DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,900	39	6,100	27	5,300	19	4,500	13
ϕ8	5,200	40	4,600	28	4,000	19	3,400	14
ϕ10	4,100	39	3,700	28	3,200	19	2,700	14
ϕ12	3,400	37	3,100	27	2,700	18	2,300	13

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC		a_p=0.56DC		a_p=0.56DC		a_p=0.35DC		a_p=0.14DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,400	36	5,600	25	5,600	7	4,800	17	4,000	11
ϕ8	4,800	36	4,200	25	4,200	7	3,600	17	3,000	12
ϕ10	3,800	36	3,300	25	3,300	8	2,900	17	2,400	12
ϕ12	3,200	35	2,800	25	2,800	8	2,400	16	2,000	11

Ramping



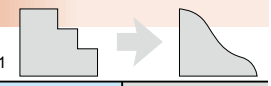
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,900	30	6,100	22	5,300	15	4,500	9
ϕ8	5,200	31	4,600	22	4,000	14	3,400	11
ϕ10	4,100	31	3,700	22	3,200	15	2,700	11
ϕ12	3,400	29	3,100	21	2,700	15	2,300	10

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	20° or less		10° or less		5° or less		10° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,400	28	5,600	20	5,600	7	4,800	13	4,000	10
ϕ8	4,800	29	4,200	20	4,200	7	3,600	13	3,000	8
ϕ10	3,800	29	3,300	20	3,300	5	2,900	14	2,400	10
ϕ12	3,200	27	2,800	19	2,800	6	2,400	13	2,000	9

Two-way profiling



Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	max. a_e=0.35DC		max. a_e=0.26DC		max. a_e=0.175DC		max. a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	8,000	67	7,200	49	6,400	36	5,600	25
ϕ8	6,000	72	5,400	52	4,800	36	4,200	25
ϕ10	4,800	71	4,300	52	3,800	36	3,300	25
ϕ12	4,000	69	3,600	49	3,200	35	2,800	25

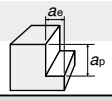
Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	max. a_e=0.35DC		max. a_e=0.26DC		max. a_e=0.26DC		max. a_e=0.175DC		max. a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	7,400	62	6,600	45	6,600	13	5,800	32	5,000	22
ϕ8	5,600	67	5,000	48	5,000	14	4,400	33	3,800	23
ϕ10	4,500	68	4,000	48	4,000	14	3,500	34	3,000	23
ϕ12	3,700	64	3,300	45	3,300	13	2,900	31	2,500	22

EMXR-CR-TH EMXN-CR-TH 4 flutes, Radius, Straight 3DC

Metric

Side milling



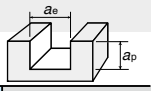
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	8,000	1,380	7,200	1,000	6,400	710	5,600	500
ϕ8	6,000	1,460	5,400	1,050	4,800	750	4,200	520
ϕ10	4,800	1,460	4,300	1,050	3,800	740	3,300	510
ϕ12	4,000	1,380	3,600	1,000	3,200	710	2,800	500

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	7,400	1,280	6,600	910	6,600	270	5,800	640	5,000	440
ϕ8	5,600	1,360	5,000	970	5,000	290	4,400	680	3,800	470
ϕ10	4,500	1,370	4,000	970	4,000	290	3,500	680	3,000	470
ϕ12	3,700	1,280	3,300	910	3,300	270	2,900	640	2,500	440

Slotting



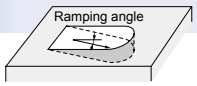
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,900	950	6,100	670	5,300	470	4,500	320
ϕ8	5,200	1,010	4,600	720	4,000	500	3,400	340
ϕ10	4,100	1,000	3,700	720	3,200	500	2,700	340
ϕ12	3,400	940	3,100	690	2,700	480	2,300	330

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,400	880	5,600	620	5,600	190	4,800	420	4,000	280
ϕ8	4,800	930	4,200	650	4,200	200	3,600	450	3,000	300
ϕ10	3,800	920	3,300	640	3,300	190	2,900	450	2,400	300
ϕ12	3,200	880	2,800	620	2,800	190	2,400	420	2,000	280

Ramping



Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,900	750	6,100	530	5,300	370	4,500	250
ϕ8	5,200	790	4,600	560	4,000	390	3,400	260
ϕ10	4,100	780	3,700	560	3,200	390	2,700	260
ϕ12	3,400	730	3,100	540	2,700	370	2,300	250

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	20° or less		10° or less		5° or less		10° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,400	690	5,600	480	5,600	140	4,800	330	4,000	220
ϕ8	4,800	730	4,200	510	4,200	150	3,600	350	3,000	230
ϕ10	3,800	720	3,300	500	3,300	150	2,900	350	2,400	230
ϕ12	3,200	690	2,800	480	2,800	140	2,400	330	2,000	220

Two-way profiling

Type R

	Cast irons, Carbon steels Alloy steels (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	8,000	1,730	7,200	1,240	6,400	880	5,600	620
ϕ8	6,000	1,820	5,400	1,310	4,800	930	4,200	650
ϕ10	4,800	1,820	4,300	1,310	3,800	920	3,300	640
ϕ12	4,000	1,730	3,600	1,240	3,200	880	2,800	620

Type N

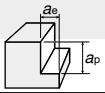
	Cast irons, Carbon steels Alloy steels (150~250HB) 1050, P20		Tool steels (25~35HRC) D3		Stainless steels SUS		Pre-hardened steels (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	7,400	1,600	6,600	1,140	6,600	340	5,800	800	5,000	550
ϕ8	5,600	1,700	5,000	1,220	5,000	370	4,400	860	3,800	590
ϕ10	4,500	1,710	4,000	1,220	4,000	370	3,500	850	3,000	580
ϕ12	3,700	1,600	3,300	1,140	3,300	340	2,900	800	2,500	550

【Note】 Upon usage, please refer to comments and notes below table on page A289.

Epoch Mirus Type R/Type N

EMXR-CR-TH **EMXN-CR-TH** **4 flutes, Radius, Straight** **5DC** Metric

Side milling



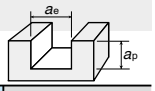
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC a_e=0.35DC		a_p=0.7DC a_e=0.26DC		a_p=0.7DC a_e=0.175DC		a_p=0.7DC a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	5,600	970	4,800	660	4,000	440	3,200	280
ϕ8	4,200	1,020	3,600	700	3,000	470	2,400	300
ϕ10	3,300	1,000	2,900	710	2,400	470	1,900	300
ϕ12	2,800	970	2,400	660	2,000	440	1,600	280

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC a_e=0.35DC		a_p=0.7DC a_e=0.26DC		a_p=0.7DC a_e=0.26DC		a_p=0.7DC a_e=0.175DC		a_p=0.7DC a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	5,300	920	4,500	620	4,500	190	3,700	410	2,900	260
ϕ8	4,000	970	3,400	660	3,400	200	2,800	440	2,200	270
ϕ10	3,200	970	2,700	660	2,700	200	2,200	430	1,800	280
ϕ12	2,700	930	2,300	640	2,300	190	1,900	420	1,500	270

Slotting



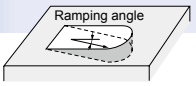
Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC		a_p=0.56DC		a_p=0.35DC		a_p=0.14DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	4,200	580	3,400	380	2,700	240	1,900	130
ϕ8	3,200	620	2,600	400	2,000	250	1,400	140
ϕ10	2,500	610	2,100	410	1,600	250	1,100	140
ϕ12	2,100	580	1,700	380	1,300	230	900	130

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	a_p=0.7DC		a_p=0.56DC		a_p=0.56DC		a_p=0.35DC		a_p=0.14DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	3,700	510	2,900	320	2,900	100	2,100	190	1,300	90
ϕ8	2,800	540	2,200	340	2,200	100	1,600	200	1,000	100
ϕ10	2,200	540	1,800	350	1,800	110	1,300	200	800	100
ϕ12	1,900	530	1,500	330	1,500	100	1,100	190	700	100

Ramping



Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	4,800	520	4,000	350	3,200	220	2,400	130
ϕ8	3,600	550	3,000	360	2,400	230	1,800	140
ϕ10	2,900	550	2,400	360	1,900	230	1,400	140
ϕ12	2,400	520	2,000	350	1,600	220	1,200	130

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Max. ramping angle	20° or less		10° or less		5° or less		10° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	4,500	490	3,700	320	3,700	100	2,900	200	2,100	120
ϕ8	3,400	520	2,800	340	2,800	100	2,200	210	1,600	120
ϕ10	2,700	510	2,200	330	2,200	100	1,800	220	1,300	130
ϕ12	2,300	500	1,900	330	1,900	100	1,500	210	1,100	120

Two-way profiling

Type R

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	max. a_e=0.35DC		max. a_e=0.26DC		max. a_e=0.175DC		max. a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	5,600	1,210	4,800	830	4,000	550	3,200	350
ϕ8	4,200	1,280	3,600	880	3,000	580	2,400	370
ϕ10	3,300	1,250	2,900	880	2,400	580	1,900	370
ϕ12	2,800	1,210	2,400	830	2,000	550	1,600	350

Type N

	Cast iron, Carbon steel Alloy steel (150~250HB) 1050, P20		Tool steel (25~35HRC) D3		Stainless steels SUS		Pre-hardened steel (35~45HRC) P21		Hardened steels (45~55HRC) H13	
Depth of cut (mm)	max. a_e=0.35DC		max. a_e=0.26DC		max. a_e=0.26DC		max. a_e=0.175DC		max. a_e=0.087DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	5,300	1,140	4,500	780	4,500	230	3,700	510	2,900	320
ϕ8	4,000	1,220	3,400	830	3,400	250	2,800	540	2,200	340
ϕ10	3,200	1,220	2,700	820	2,700	250	2,200	540	1,800	350
ϕ12	2,700	1,170	2,300	790	2,300	240	1,900	530	1,500	330

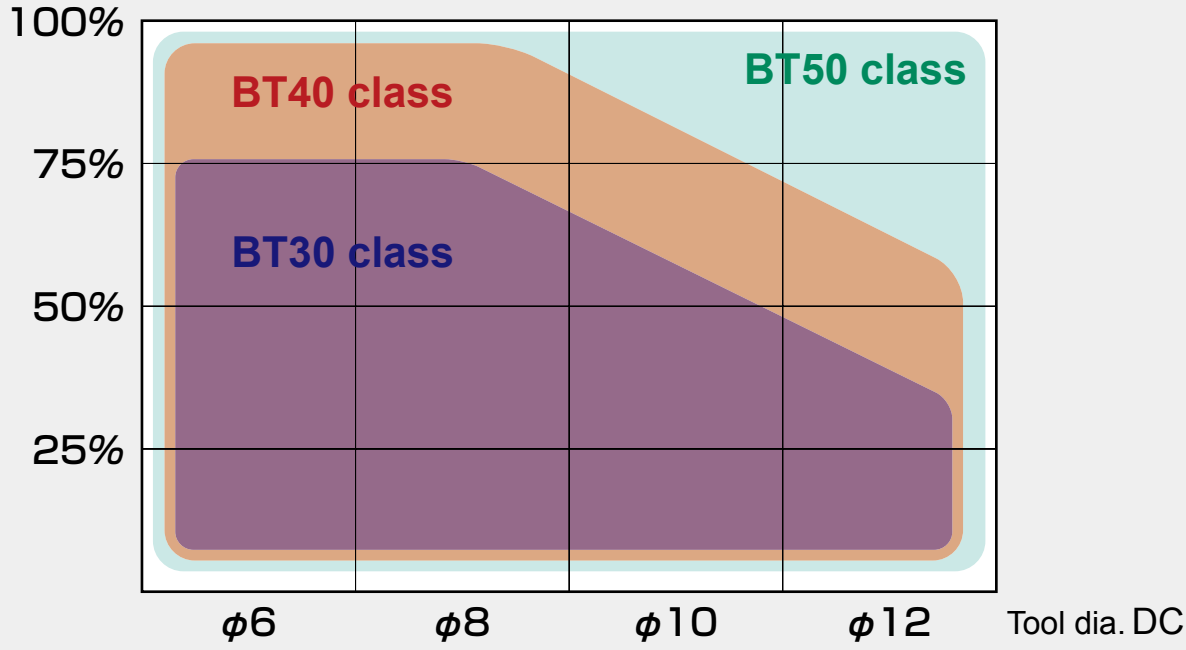
※Type R is not recommendable for milling stainless steel or Ti alloy.

【Note】

① Radius type is not recommendable for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥ In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.

Cutting condition adjustment based on spindle type

Ratio of depth of cut



Standard cutting condition is for BT50 class spindle situation. Please adjust the depth of cut according to above chart.

Epoch High Hard Radius

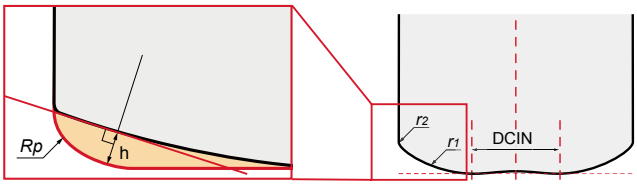
Die-sinking | Profiling | Radius | Roughing

Dia. tolerance 0～−0.02mm h5

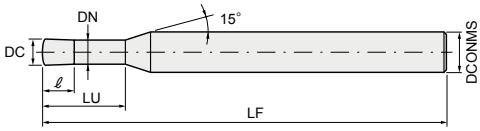
Adopt the design of indexable high-feed cutter to solid end mill.
High feed cutting for high hardness steel possible

Under neck length 3DC type

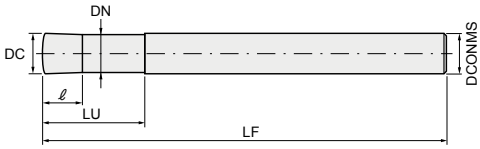
Under neck length 5DC type



Atype



Btype



EHHRE○○○○(-S○)-TH3

Carbide | TH3 | Helix angle 20° | Cutting Conditions A291

Item code	在庫 Stock	Size (mm) Tool dia. DC	Approx radius Rp	Lowest point diameter DCIN	End R r1	Corner radius r2	Under neck length LU	Flute length ℓ	Neck dia. DN	Overall length LF	Shank dia. DCONMS	No. of flutes	Type
EHHRE4010-S4-TH3	●	1	0.134	0.28	1.1	0.1	3	1	0.95	50	4	4	A
EHHRE4010-S6-TH3	●										6		
EHHRE4010-5-S4-TH3	★						5				4		
EHHRE4010-5-S6-TH3	★									55	6		
EHHRE4020-S4-TH3	●	2	0.194	0.56	2.2	0.1	6	2	1.9	50	4		
EHHRE4020-S6-TH3	●										6		
EHHRE4020-10-S4-TH3	★						10				4		
EHHRE4020-10-S6-TH3	★									55	6		
EHHRE4030-S4-TH3	●	3	0.328	0.84	3.3	0.2	9	3	2.9	60	4		
EHHRE4030-S6-TH3	●										6		
EHHRE4030-15-S4-TH3	★						15				4		
EHHRE4030-15-S6-TH3	★										6		
EHHRE6040-S4-TH3	●	4	0.387	1.12	4.4	0.2	12	4	3.9	60	4	6	B
EHHRE6040-S6-TH3	●										6		A
EHHRE6040-20-S4-TH3	★						20				4		B
EHHRE6040-20-S6-TH3	★										6		A
EHHRE6050-TH3	●	5	0.521	1.4	5.5	0.3	15	5	4.7	60	6		A
EHHRE6050-25-TH3	★						25						
EHHRE6060-TH3	●	6	0.581	1.68	6.6	0.3	18	6	5.7	60	6		B
EHHRE6060-30-TH3	★						30			70			
EHHRE6080-TH3	●	8	0.849	2.24	8.8	0.5	24	8	7.6	75	8		
EHHRE6080-40-TH3	★						40			80			
EHHRE6100-TH3	●	10	0.968	2.8	11	0.5	30	10	9.5	80	10		
EHHRE6100-50-TH3	★						50			90			
EHHRE6120-TH3	●	12	1.088	3.36	13.2	0.5	36	12	11.5	100	12		
EHHRE6120-60-TH3	★						60			110			

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		○	◎	◎				

● : Inventory maintained in US ★ : Inventory maintained in Japan

Recommended cutting conditions EHHRE-TH3

Cutting condition for under neck length 3DC type

Inch

General cutting conditions (Emphasis on tool life)

Work material		Hardened steel (50～55HRC) ※1				Hardened steel (55～62HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=260 SFM				Cutting speed vc=200 SFM			
		n (min-1)	Vf (IPM)	ap (inch)	ae (inch)	n (min-1)	Vf (IPM)	ap (inch)	ae (inch)
1	4	25,500	143	.002	.022	19,100	69	.001	.022
2		12,700	142	.003	.043	9,600	69	.002	.043
3		8,500	150	.005	.065	6,400	72	.003	.065
4	6	6,400	230	.006	.087	4,800	107	.004	.087
5		5,100	233	.008	.108	3,800	109	.005	.108
6		4,200	232	.009	.130	3,200	109	.005	.130
8		3,200	363	.013	.173	2,400	114	.007	.173
10		2,500	236	.016	.217	1,900	112	.009	.217
12		2,100	227	.019	.260	1,600	108	.011	.260

Work material		Hardened steel (62～66HRC)				Hardened steel (66～72HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=50m/min				Cutting speed vc=40m/min			
		n (min-1)	Vf (IPM)	ap (inch)	ae (inch)	n (min-1)	Vf (IPM)	ap (inch)	ae (inch)
1	4	15,900	45	.001	.022	12,700	20	.001	.020
2		8,000	42	.002	.043	6,400	23	.001	.039
3		5,300	45	.002	.065	4,200	24	.002	.059
4	6	4,000	67	.003	.087	3,200	36	.002	.079
5		3,200	69	.004	.108	2,500	36	.003	.098
6		2,700	70	.005	.130	2,100	37	.003	.118
8		2,000	71	.006	.173	1,600	37	.004	.158
10		1,600	71	.008	.217	1,300	38	.005	.197
12		1,300	66	.009	.260	1,100	37	.006	.236

Cutting conditions for high-efficiency cutting (Emphasis on efficiency)

Work material		Hardened steel (50～55HRC) ※1				Hardened steel (55～62HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=330 SFM				Cutting speed vc=70m/min			
		n (min-1)	Vf (IPM)	ap (inch)	ae (inch)	n (min-1)	Vf (IPM)	ap (inch)	ae (inch)
1	4	31,880	191	.002	.028	22,280	80	.001	.028
2		15,880	184	.003	.055	11,200	81	.002	.055
3		10,630	196	.005	.083	7,470	87	.003	.083
4	6	8,000	298	.006	.110	5,600	131	.003	.110
5		6,380	302	.008	.138	4,430	130	.004	.138
6		5,250	296	.009	.165	3,730	132	.005	.165
8		4,000	312	.012	.221	2,800	136	.007	.221
10		3,130	304	.015	.276	2,220	135	.009	.276
12		2,630	292	.018	.331	1,870	129	.010	.331

Work material		Hardened steel (62～66HRC)				Hardened steel (66～72HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=200 SFM				Cutting speed vc=160 SFM			
		n (min-1)	Vf (IPM)	ap (inch)	ae (inch)	n (min-1)	Vf (IPM)	ap (inch)	ae (inch)
1	4	19,080	53	.001	.028	15,880	32	.001	.024
2		9,600	54	.001	.055	8,000	29	.001	.047
3		6,360	53	.002	.083	5,250	29	.002	.071
4	6	4,800	84	.003	.110	4,000	46	.002	.095
5		3,840	85	.004	.138	3,130	47	.002	.118
6		3,240	86	.004	.165	2,630	46	.003	.142
8		2,400	88	.006	.221	2,000	49	.004	.189
10		1,920	88	.007	.276	1,630	50	.005	.236
12		1,560	81	.009	.331	1,380	48	.006	.284

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ **Please use for contouring process.**
⑥ **Setting pick feed (ae) larger than lowest point diameter will remain cusp.**

※1 Since EHHRE-TH3 adopts a cutting edge geometry for high hardness steel cutting, it is not suitable for sticky hard material such as hot forging material H13 (reformed). EMBE-ATH is recommended for cutting SKD61 (reformed).

Epoch High Hard Radius

Cutting condition for under neck length 3DC type

Metric

General cutting conditions (Emphasis on tool life)

Work material		Hardened steels (50～55HRC) ※1				Hardened steels (55～62HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=80m/min				Cutting speed vc=60m/min			
		n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)
1	4	25,500	3,670	0.040	0.55	19,100	1,720	0.023	0.55
2		12,700	3,660	0.080	1.1	9,600	1,730	0.046	1.1
3		8,500	3,840	0.120	1.65	6,400	1,800	0.069	1.65
4	6	6,400	5,840	0.160	2.2	4,800	2,740	0.092	2.2
5		5,100	5,940	0.200	2.75	3,800	2,760	0.115	2.75
6		4,200	5,870	0.240	3.3	3,200	2,790	0.138	3.3
8		3,200	6,140	0.320	4.4	2,400	2,880	0.184	4.4
10		2,500	6,000	0.400	5.5	1,900	2,850	0.230	5.5
12		2,100	5,750	0.480	6.6	1,600	2,740	0.276	6.6

Work material		Hardened steels (62～66HRC)				Hardened steels (66～72HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=50m/min				Cutting speed vc=40m/min			
		n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)
1	4	15,900	1,070	0.019	0.55	12,700	570	0.013	0.5
2		8,000	1,080	0.038	1.1	6,400	580	0.026	1
3		5,300	1,120	0.057	1.65	4,200	590	0.039	1.5
4	6	4,000	1,710	0.076	2.2	3,200	910	0.052	2
5		3,200	1,750	0.095	2.75	2,500	910	0.065	2.5
6		2,700	1,770	0.114	3.3	2,100	920	0.078	3
8		2,000	1,800	0.152	4.4	1,600	960	0.104	4
10		1,600	1,800	0.190	5.5	1,300	980	0.130	5
12		1,300	1,670	0.228	6.6	1,100	940	0.156	6

Cutting conditions for high-efficiency cutting (Emphasis on efficiency)

Work material		Hardened steels (50～55HRC) ※1				Hardened steels (55～62HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=100m/min				Cutting speed vc=70m/min			
		n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)
1	4	31,880	4,730	0.038	0.7	22,280	2,070	0.022	0.7
2		15,880	4,710	0.076	1.4	11,200	2,080	0.044	1.4
3		10,630	4,940	0.114	2.1	7,470	2,170	0.066	2.1
4	6	8,000	7,510	0.152	2.8	5,600	3,290	0.087	2.8
5		6,380	7,650	0.190	3.5	4,430	3,320	0.109	3.5
6		5,250	7,550	0.228	4.2	3,730	3,350	0.131	4.2
8		4,000	7,910	0.304	5.6	2,800	3,460	0.175	5.6
10		3,130	7,740	0.380	7	2,220	3,430	0.219	7
12		2,630	7,410	0.456	8.4	1,870	3,290	0.262	8.4

Work material		Hardened steels (62～66HRC)				Hardened steels (66～72HRC)			
Tool dia. DC (mm)	No. of flutes	Cutting speed vc=60m/min				Cutting speed vc=50m/min			
		n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)
1	4	19,080	1,330	0.018	0.7	15,880	740	0.012	0.6
2		9,600	1,330	0.036	1.4	8,000	740	0.025	1.2
3		6,360	1,390	0.054	2.1	5,250	760	0.037	1.8
4	6	4,800	2,110	0.072	2.8	4,000	1,170	0.049	2.4
5		3,840	2,160	0.090	3.5	3,130	1,170	0.062	3
6		3,240	2,190	0.108	4.2	2,630	1,180	0.074	3.6
8		2,400	2,220	0.144	5.6	2,000	1,240	0.099	4.8
10		1,920	2,220	0.181	7	1,630	1,260	0.124	6
12		1,560	2,060	0.217	8.4	1,380	1,220	0.148	7.2

【Note】
① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ **Please use for contouring process.**
⑥ **Setting pick feed (ae) larger than lowest point diameter will remain cusp.**

※1 Since EHHRE-TH3 adopts a cutting edge geometry for high hardness steel cutting, it is not suitable for sticky hard material such as hot forging material H13 (reformed). EMBE-ATH is recommended for cutting SKD61 (reformed).

General cutting condition for under neck length 5DC type

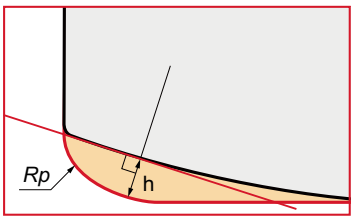
Calculate by multiplying the general cutting conditions for under neck length 3DC type by the correction value below.

n (min^{-1}) or (SFM)	v_f (mm/min) or (IPM)	a_p (mm) or (in)	a_e (mm) or (in)
75%	75%	70%	100%

【Example】 Work material: Hardened steel Tool: EHHRE6060-30-TH3
n=2,400min^{-1} v_f=2,090mm/min a_p=0.097mm a_e=3.3mm

※There are no high-efficiency cutting conditions for the neck length 5DC type.

Precaution for creating machining program



- When entering corner radius into CAM as radius end mill, Please use approximate R for your programing corner radius.
- For precise tool definition for the CAM system please download DXF data from "TOOL SEARCH" program on our website.

【Note】

- Since the shape of this tool is different from that of a conventional radius tool, adjustment may be required in case of using automatic tool measurement equipment. Depending on the model of the measuring equipment, it may not be possible to measure accurately, so please check the tool shape with DXF before use.

Tool dia. DC	Approx radius and maximum remains at CAM input		Ramping angle	Possible helical hole dia.
	Approx radius *Rp*	Max remains h	*θ*	D
Φ1	0.134	0.026	0.5° or less	1.3～1.9
Φ2	0.194	0.068		2.6～3.8
Φ3	0.328	0.094		3.9～5.7
Φ4	0.387	0.136		5.2～7.6
Φ5	0.521	0.162		6.4～9.5
Φ6	0.581	0.204		7.7～11.4
Φ8	0.849	0.255		10.3～15.2
Φ10	0.968	0.34		12.8～19.0
Φ12	1.088	0.424		15.4～22.8

※For helical machining, Please set feed rate to 70% of recommended cutting condition.

Epoch HD Coating Deep Radius End Mill

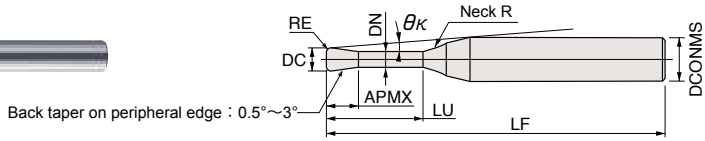
Diamond Coating

Slotting | Die-sinking | Profiling | Radius | Miniature | Rest material machining | Semi Finishing | Finishing | Miniature Rib

h5

Ideal for machining of graphite, high-Si aluminum alloys, and FRP. Diamond Coating.

2 Flutes

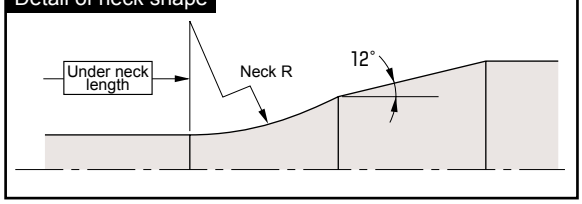


EGDR2○○○-○○-○○-HD

Carbide | HD | Helix angle 30° | Cutting Conditions A295

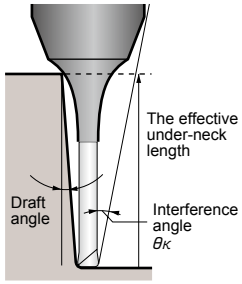
Item code	Stock	Size (mm)									The effective under-neck length for the various draft angles				
		Tool dia.	Corner radius	Under neck length	Neck dia.	Flute length	Overall length	Shank dia.	Neck R	Interference angle					
		DC	RE	LU	DN	APMX	LF	DCONMS		θκ	0.5°	1°	1.5°	2°	3°
EGDR2005-5-01-HD	★	0.5	0.1	5	0.47	0.75	60	4	10	7.55	6.16	6.59	6.96	7.29	7.87
EGDR2005-10-01-HD	★	0.5	0.1	10	0.47	0.75	60	4	10	5.5	11.5	12.1	12.59	13.01	13.75
EGDR2005-15-01-HD	★	0.5	0.1	15	0.47	0.75	60	4	10	4.32	16.78	17.5	18.07	18.57	19.97
EGDR2005-20-01-HD	★	0.5	0.1	20	0.47	0.75	60	4	10	3.56	22.02	22.84	23.48	24.03	26.6
EGDR2010-10-02-HD	★	1	0.2	10	0.96	1.5	60	4	10	5.06	11.53	12.12	12.6	13.02	13.75
EGDR2010-20-02-HD	★	1	0.2	20	0.96	1.5	60	4	10	3.19	22.04	22.85	23.49	24.04	26.6
EGDR2010-30-02-HD	★	1	0.2	30	0.96	1.5	80	4	10	2.33	32.43	33.41	34.29	35.97	No interference
EGDR2010-40-02-HD	★	1	0.2	40	0.96	1.5	80	4	10	1.83	42.77	43.87	45.69	No interference	No interference
EGDR2015-20-02-HD	★	1.5	0.2	20	1.44	2.25	60	4	10	2.78	22.09	22.88	23.52	24.06	No interference
EGDR2015-40-02-HD	★	1.5	0.2	40	1.44	2.25	80	4	10	1.57	42.8	43.9	45.75	No interference	No interference
EGDR2020-20-02-HD	★	2	0.2	20	1.92	3	60	4	10	2.32	22.13	22.92	23.55	24.11	No interference
EGDR2020-40-02-HD	★	2	0.2	40	1.92	3	80	4	10	1.29	42.84	43.92	No interference	No interference	No interference
EGDR2020-60-02-HD	★	2	0.2	60	1.92	3	100	4	10	0.89	63.38	No interference	No interference	No interference	No interference
EGDR2030-20-02-HD	★	3	0.2	20	2.88	4.5	60	4	10	1.25	22.23	22.99	No interference	No interference	No interference
EGDR2030-40-02-HD	★	3	0.2	40	2.88	4.5	80	4	10	0.67	42.9	No interference	No interference	No interference	No interference
EGDR2030-60-02-HD	★	3	0.2	60	2.88	4.5	100	4	10	0.46	No interference	No interference	No interference	No interference	No interference

Detail of neck shape



【Note】

If the workpiece has draft angle, the interference length will be longer than the under-neck length.
Please refer to the effective under-neck length for the various draft angles.
In addition, the angle at which the tool will interfere with the workpiece is
shown as the "interference angle θκ", and should also be referred to.



Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
For Graphite, FRP, High Si aluminum alloy etc.								

★：Inventory maintained in Japan

Recommended cutting conditions EGDR-HD

Inch

					Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent)	
Item code	Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	L/D	Depth of cut (inch) $a_p \times a_e$	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
EGDR2005-5-01-HD	0.5	0.1	5	10	.002×.016	15,000~18,000	27~36	13,000~18,000	16~25
EGDR2005-10-01-HD	0.5	0.1	10	20	.002×.016	14,000~16,000	25~32	13,000~18,000	13~25
EGDR2005-15-01-HD	0.5	0.1	15	30	.002×.016	12,000~15,000	26~30	11,000~16,000	9~19
EGDR2005-20-01-HD	0.5	0.1	20	40	.002×.016	10,000~13,000	24~29	9,000~14,000	7~17
EGDR2010-10-02-HD	1	0.2	10	10	.004×.032	13,000~16,000	26~32	10,000~15,000	12~24
EGDR2010-20-02-HD	1	0.2	20	20	.004×.032	12,000~14,000	24~28	8,000~13,000	11~23
EGDR2010-30-02-HD	1	0.2	30	30	.003×.032	10,000~12,000	22~26	6,000~11,000	10~20
EGDR2010-40-02-HD	1	0.2	40	40	.002×.032	9,000~11,000	20~24	5,000~10,000	10~20
EGDR2015-20-02-HD	1.5	0.2	20	13	.006×.039	12,000~15,000	26~33	10,000~15,000	14~24
EGDR2015-40-02-HD	1.5	0.2	40	27	.005×.039	10,000~12,000	26~29	7,000~12,000	11~19
EGDR2020-20-02-HD	2	0.2	20	10	.008×.055	12,000~15,000	26~33	10,000~15,000	14~27
EGDR2020-40-02-HD	2	0.2	40	20	.006×.055	10,000~13,000	20~29	7,000~12,000	11~22
EGDR2020-60-02-HD	2	0.2	60	30	.005×.055	8,000~10,000	22~28	5,000~10,000	10~20
EGDR2030-20-02-HD	3	0.2	20	7	.012×.083	10,000~13,000	30~34	10,000~15,000	14~27
EGDR2030-40-02-HD	3	0.2	40	13	.009×.083	8,000~10,000	26~30	7,000~12,000	11~26
EGDR2030-60-02-HD	3	0.2	60	20	.008×.083	7,000~ 9,000	24~27	5,000~10,000	10~24

Metric

					Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent)	
Item code	Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	L/D	Depth of cut (mm) $a_p \times a_e$	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
EGDR2005-5-01-HD	0.5	0.1	5	10	0.05×0.4	15,000~18,000	700~900	13,000~18,000	400~600
EGDR2005-10-01-HD	0.5	0.1	10	20	0.05×0.4	14,000~16,000	650~800	13,000~18,000	300~600
EGDR2005-15-01-HD	0.5	0.1	15	30	0.045×0.4	12,000~15,000	650~750	11,000~16,000	200~500
EGDR2005-20-01-HD	0.5	0.1	20	40	0.04×0.4	10,000~13,000	600~700	9,000~14,000	200~400
EGDR2010-10-02-HD	1	0.2	10	10	0.1×0.8	13,000~16,000	650~800	10,000~15,000	300~600
EGDR2010-20-02-HD	1	0.2	20	20	0.1×0.8	12,000~14,000	600~700	8,000~13,000	300~600
EGDR2010-30-02-HD	1	0.2	30	30	0.08×0.8	10,000~12,000	550~650	6,000~11,000	250~500
EGDR2010-40-02-HD	1	0.2	40	40	0.06×0.8	9,000~11,000	500~600	5,000~10,000	250~500
EGDR2015-20-02-HD	1.5	0.2	20	13	0.15×1.0	12,000~15,000	700~850	10,000~15,000	350~600
EGDR2015-40-02-HD	1.5	0.2	40	27	0.12×1.0	10,000~12,000	650~750	7,000~12,000	300~500
EGDR2020-20-02-HD	2	0.2	20	10	0.2×1.4	12,000~15,000	650~800	10,000~15,000	350~650
EGDR2020-40-02-HD	2	0.2	40	20	0.16×1.4	10,000~13,000	500~750	7,000~12,000	300~550
EGDR2020-60-02-HD	2	0.2	60	30	0.12×1.4	8,000~10,000	550~700	5,000~10,000	250~500
EGDR2030-20-02-HD	3	0.2	20	7	0.3×2.1	10,000~13,000	750~850	10,000~15,000	350~650
EGDR2030-40-02-HD	3	0.2	40	13	0.24×2.1	8,000~10,000	650~750	7,000~12,000	300~650
EGDR2030-60-02-HD	3	0.2	60	20	0.2×2.1	7,000~ 9,000	600~700	5,000~10,000	250~600

【Note】 ①Use the appropriate coolant for the work material and machining shape.
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.

Epoch HD Coating Radius End Mill

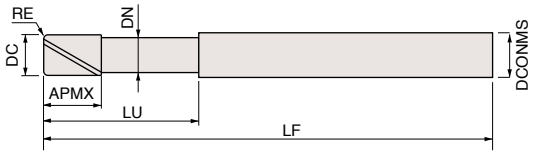
Diamond Coating

Planing | Side milling | Slotting | Die-sinking | Profiling | Radius | Helical | Roughing | Semi Finishing | Finishing

h5

Ideal for machining of graphite, high-Si aluminum alloys, and FRP.
Diamond Coating.

2 Flutes



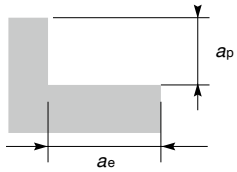
EGR2○○○-05-HD

Carbide | HD | Helix angle 30° | Cutting Conditions A296

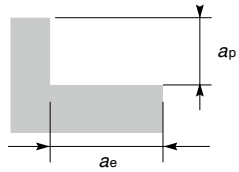
Item code	Stock	Size (mm)						
		Tool dia.	Corner radius	Under neck length	Neck dia.	Flute length	Overall length	Shank dia.
		DC	RE	LU	DN	APMX	LF	DCONMS
EGR2040-05-HD	★	4	0.5	40	3.9	8	100	4
EGR2060-05-HD	★	6	0.5	60	5.9	12	120	6
EGR2080-05-HD	★	8	0.5	80	7.9	16	140	8
EGR2100-05-HD	★	10	0.5	100	9.9	20	150	10

Recommended cutting conditions EDR-HD

Inch

Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent)	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
4	8,000~10000	51~62	6,000~9,000	36~50
6	7,000~9000	59~70	5,000~8,000	31~48
8	6,000~8000	67~78	4,000~7,000	27~43
10	6,000~8000	74~86	3,000~6,000	23~40
Depth of cut (mm)	 $a_p \leqq 0.1DC$ $a_e \leqq 0.8DC$			

Metric

Work material	Graphite		Cast aluminum alloy (Air-brow or wet:water-soluble agent)	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
4	8,000~10000	1,300~1,600	6,000~9,000	900~1,300
6	7,000~9000	1,500~1,800	5,000~8,000	800~1,200
8	6,000~8000	1,700~2,000	4,000~7,000	700~1,100
10	6,000~8000	1,900~2,200	3,000~6,000	600~1,000
Depth of cut (mm)	 $a_p \leqq 0.1DC$ $a_e \leqq 0.8DC$			

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
For Graphite, FRP, High Si aluminum alloy etc.								

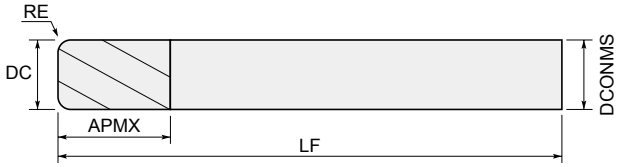
★ : Inventory maintained in Japan

Ceramic End Mill Corner Radius Type

Planing | Side milling | Roughing

Achieves next-generation high-performance machining!
Achieves cutting speed of *vc*=800m/min.!

Dia. tolerance −0.01 ～−0.04mm | RE tolerance ±0.02mm | h5



SCE6○○○-R○.○○

Ceramic | Cutting Conditions A297

Item code	Stock	Size (mm)					No. of flutes
		Tool dia. DC	Flute length APMX	Corner radius RE	Overall length LF	Shank dia. DCONMS	
SCE6060-R0.75	★	**6**	6	**0.75**	60	6	6
SCE6080-R1.00	★	**8**	8	**1**	70	8	6
SCE6100-R1.25	★	**10**	10	**1.25**	80	10	6
SCE6120-R1.50	★	**12**	12	**1.5**	80	12	6

Recommended cutting conditions SCE

Work material : Superalloy

Inch

Tool dia. DC (mm)	Cutting speed *Vc* (SFM)	Feed per tooth *fz* (IPT)	Planing		Side cutting	
			Depth of cut *ap* (inch)	Depth of cut *ae* (inch)	Depth of cut *ap* (inch)	Depth of cut *ae* (inch)
6	1,312 ～ 3,281	.0009	.012 or less	.118 or less	.118 or less	.024 or less
8		.0011	.016 or less	.158 or less	.158 or less	.032 or less
10		.0012	.02 or less	.197 or less	.197 or less	.039 or less
12		.0013	.024 or less	.236 or less	.236 or less	.047 or less

Metric

Tool dia. DC (mm)	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)	Planing		Side cutting	
			Depth of cut *ap* (mm)	Depth of cut *ae* (mm)	Depth of cut *ap* (mm)	Depth of cut *ae* (mm)
6	400～1,000	0.024	0.3 or less	3.0 or less	6.0 or less	0.6 or less
8		0.028	0.4 or less	4.0 or less	8.0 or less	0.8 or less
10		0.03	0.5 or less	5.0 or less	10.0 or less	1.0 or less
12		0.032	0.6 or less	6.0 or less	12.0 or less	1.2 or less

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
						◎		

★ : Inventory maintained in Japan

Epoch CBN Super Radius End Mill

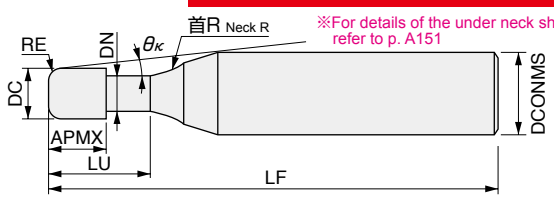
Planing | Die-sinking | Radius | Rest material machining | Miniature | Finishing | Miniature Rib

RE tolerance ±0.005mm (central axis) | h4

(mm)

New-concept CBN end mill providing both good cutting performance and strong flute edges.

Includes actual measured tool diameter value.



CBN-EPSR2○○○-○○.○-○○○

※Actual measured tool diameter value is shown on case.

CBN | Cutting Conditions A299

Item code	Stock	Size (mm) Tool dia. DC	Corner radius RE	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Actual effective length in incline angles 0.5°	1°	1.5°	2°	3°
					Display of actual measured mill dia. for all tools										
CBN-EPSR2002-0.5-005	●	0.2	0.05	0.5	0.07	0.18	50	4	1	11.39	0.67	0.7	0.73	0.76	0.81
CBN-EPSR2002-1-005	●			1	0.07	0.18	50	4	1	10.83	1.19	1.24	1.28	1.32	1.39
CBN-EPSR2003-0.5-005	●	0.3	0.05	0.5	0.11	0.27	50	4	1	11.35	0.7	0.73	0.75	0.78	0.82
CBN-EPSR2003-0.75-005	●			0.75	0.11	0.27	50	4	1	11.05	0.96	0.99	1.03	1.06	1.12
CBN-EPSR2003-1.5-005	●			1.5	0.11	0.27	50	4	1	10.26	1.74	1.79	1.84	1.89	2.06
CBN-EPSR2003-2-005	●			2	0.11	0.27	50	4	1	9.79	2.25	2.32	2.38	2.46	2.73
CBN-EPSR2004-0.5-005	●	0.4	0.05	0.5	0.14	0.37	50	4	1	11.33	0.7	0.73	0.75	0.78	0.82
CBN-EPSR2004-1-005	●			1	0.14	0.37	50	4	1	10.75	1.22	1.26	1.3	1.34	1.4
CBN-EPSR2004-2-005	●			2	0.14	0.37	50	4	1	9.74	2.25	2.32	2.38	2.46	2.73
CBN-EPSR2005-0.5-005	●	0.5	0.05	0.5	0.18	0.47	50	4	1	11.31	0.7	0.73	0.75	0.78	0.82
CBN-EPSR2005-1.5-005	●			1.5	0.18	0.47	50	4	1	10.18	1.74	1.79	1.84	1.89	2.06
CBN-EPSR2005-3-005	●			3	0.18	0.47	50	4	1	8.84	3.29	3.37	3.49	3.66	4.05
CBN-EPSR2005-0.5-01	●		0.1	0.5	0.18	0.47	50	4	1	11.37	0.7	0.72	0.75	0.77	0.82
CBN-EPSR2005-1.5-01	●			1.5	0.18	0.47	50	4	1	10.23	1.74	1.79	1.84	1.88	2.05
CBN-EPSR2005-3-01	●			3	0.18	0.47	50	4	1	8.88	3.28	3.37	3.48	3.65	4.04
CBN-EPSR2006-1.5-01	●	0.6	0.1	1.5	0.21	0.57	50	4	1	10.18	1.74	1.79	1.84	1.88	2.05
CBN-EPSR2006-3-01	●			3	0.21	0.57	50	4	1	8.82	3.28	3.37	3.48	3.65	4.04
CBN-EPSR2008-2.5-01	●	0.8	0.1	2.5	0.28	0.77	50	4	1	9.1	2.77	2.84	2.91	3.05	3.37
CBN-EPSR2008-5-01	●			5	0.28	0.77	50	4	1	7.3	5.34	5.51	5.76	6.04	6.69
CBN-EPSR2010-1-005	●	1	0.05	1	0.35	0.96	50	4	1	10.5	1.24	1.28	1.32	1.35	1.43
CBN-EPSR2010-2.5-005	●			2.5	0.35	0.96	50	4	1	8.88	2.79	2.86	2.95	3.09	3.42
CBN-EPSR2010-5-005	●			5	0.35	0.96	50	4	1	7.07	5.35	5.54	5.8	6.08	6.74
CBN-EPSR2010-1-01	●		0.1	1	0.35	0.96	50	4	1	10.56	1.24	1.28	1.31	1.35	1.42
CBN-EPSR2010-2.5-01	●			2.5	0.35	0.96	50	4	1	8.93	2.79	2.86	2.94	3.08	3.41
CBN-EPSR2010-5-01	●			5	0.35	0.96	50	4	1	7.1	5.35	5.54	5.79	6.07	6.72
CBN-EPSR2010-2.5-02	●		0.2	2.5	0.35	0.96	50	4	1	9.02	2.78	2.85	2.93	3.06	3.37
CBN-EPSR2010-5-02	●			5	0.35	0.96	50	4	1	7.16	5.35	5.53	5.78	6.05	6.69
CBN-EPSR2010-10-02	●			10	0.35	0.96	50	4	1	5.06	10.51	10.97	11.48	12.03	13.33
CBN-EPSR2015-2-005	●	1.5	0.05	2	0.53	1.44	50	4	1	8.92	2.31	2.36	2.43	2.55	2.82
CBN-EPSR2015-5-005	●			5	0.53	1.44	50	4	1	6.5	5.38	5.59	5.85	6.14	6.8
CBN-EPSR2015-2-01	●		0.1	2	0.53	1.44	50	4	1	8.97	2.31	2.36	2.42	2.54	2.8
CBN-EPSR2015-5-01	●			5	0.53	1.44	50	4	1	6.53	5.38	5.59	5.84	6.13	6.79
CBN-EPSR2015-5-02	●		0.2	5	0.53	1.44	50	4	1	6.59	5.38	5.58	5.83	6.11	6.75
CBN-EPSR2015-10-02	●			10	0.53	1.44	50	4	1	4.52	10.56	11.03	11.53	12.09	13.39
CBN-EPSR2020-3-005	●	2	0.05	3	0.7	1.92	50	4	1	7.27	3.36	3.46	3.62	3.8	4.21
CBN-EPSR2020-5-005	●			5	0.7	1.92	50	4	1	5.81	5.4	5.64	5.91	6.19	6.87
CBN-EPSR2020-10-005	●			10	0.7	1.92	50	4	1	3.86	10.62	11.09	11.61	12.18	13.5
CBN-EPSR2020-3-01	●		0.1	3	0.7	1.92	50	4	1	7.32	3.36	3.46	3.62	3.79	4.19
CBN-EPSR2020-5-01	●			5	0.7	1.92	50	4	1	5.84	5.4	5.64	5.9	6.18	6.85
CBN-EPSR2020-10-01	●			10	0.7	1.92	50	4	1	3.87	10.62	11.09	11.6	12.17	13.49
CBN-EPSR2020-5-02	●		0.2	5	0.7	1.92	50	4	1	5.9	5.4	5.63	5.88	6.16	6.82
CBN-EPSR2020-10-02	●			10	0.7	1.92	50	4	1	3.9	10.61	11.08	11.59	12.15	13.45
CBN-EPSR2020-20-02	●			20	0.7	1.92	55	4	1	2.32	21.04	21.97	22.99	24.11	No interference
CBN-EPSR2030-6-005	●	3	0.05	6	1.05	2.86	50	4	1	3.32	6.59	6.89	7.21	7.56	8.38
CBN-EPSR2030-6-01	●		0.1	6	1.05	2.86	50	4	1	3.34	6.59	6.88	7.2	7.55	8.36
CBN-EPSR2030-6-05	●		0.5	6	1.05	2.86	50	4	1	3.5	6.57	6.85	7.14	7.47	8.24

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		○	◎	◎				

● : Inventory maintained in US

Inch

<Finishing condition>

Work material					1		2		3		4	
					Hardened steel (~55HRC) P21,D2,L6		Hardened steel (55~65HRC) D2,D3		Hardened steel (65~68HRC) T1~T5,Melted HSS		Hardened steel (68~72HRC) Powder HSS	
Ratio to standard depth of cut					100%		90%		80%		70%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	Depth of cut (inch) a_p	a_e	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
0.2	0.05	0.5	.0002	.002	50,000	20	48,000	10	45,000	9	43,000	9
		1	.0001	.002	45,000	9	43,000	9	41,000	8	38,000	8
0.3	0.05	0.5	.0002	.004	50,000	20	48,000	19	45,000	18	43,000	17
		0.75	.0002	.004	50,000	20	48,000	19	45,000	18	43,000	17
		1.5	.0002	.004	45,000	18	43,000	17	41,000	16	38,000	15
		2	.0001	.004	40,000	16	38,000	15	36,000	14	34,000	7
0.4	0.05	0.5	.0003	.006	46,000	28	44,000	26	41,000	16	39,000	16
		1	.0003	.006	46,000	28	44,000	26	41,000	16	39,000	16
		2	.0002	.006	41,000	25	39,000	23	37,000	15	35,000	14
0.5	0.05	0.5	.0004	.008	46,000	37	44,000	35	41,000	25	39,000	23
		1.5	.0004	.008	46,000	37	44,000	35	41,000	25	39,000	23
		3	.0002	.008	37,000	30	35,000	21	33,000	20	31,000	12
	0.1	0.5	.0004	.006	46,000	37	44,000	35	41,000	25	39,000	23
		1.5	.0004	.006	46,000	37	44,000	35	41,000	25	39,000	23
		3	.0002	.006	37,000	30	35,000	21	33,000	20	31,000	12
0.6	0.1	1.5	.0005	.008	42,000	42	40,000	32	38,000	30	36,000	22
		3	.0004	.008	38,000	30	36,000	29	34,000	27	32,000	19
0.8	0.1	2.5	.0005	.012	42,000	50	40,000	40	38,000	38	36,000	29
		5	.0003	.012	38,000	46	36,000	36	34,000	34	32,000	26
1	0.05	1	.0008	.018	38,000	61	36,000	50	34,000	41	32,000	38
		2.5	.0008	.018	38,000	61	36,000	50	34,000	41	32,000	38
		5	.0006	.018	34,000	48	32,000	45	31,000	37	29,000	29
	0.1	1	.0008	.016	38,000	61	36,000	50	34,000	41	32,000	38
		2.5	.0008	.016	38,000	61	36,000	50	34,000	41	32,000	38
		5	.0006	.016	34,000	48	32,000	45	31,000	37	29,000	29
	0.2	2.5	.0008	.012	38,000	61	36,000	50	34,000	41	32,000	38
		5	.0006	.012	34,000	48	32,000	45	31,000	37	29,000	29
		10	.0002	.012	27,000	38	26,000	31	24,000	24	23,000	23
1.5	0.05	2	.0008	.028	32,000	77	30,000	66	29,000	52	27,000	43
		5	.0008	.028	29,000	64	28,000	56	26,000	47	25,000	40
	0.1	2	.0008	.026	32,000	77	30,000	66	29,000	52	27,000	43
		5	.0008	.026	29,000	64	28,000	56	26,000	47	25,000	40
	0.2	5	.0008	.022	29,000	64	28,000	56	26,000	47	25,000	40
		10	.0006	.022	26,000	57	25,000	50	23,000	37	22,000	31
2	0.05	3	.0008	.037	28,000	90	27,000	76	25,000	65	24,000	53
		5	.0008	.037	28,000	90	27,000	76	25,000	65	24,000	53
		10	.0008	.037	25,000	75	24,000	62	23,000	55	21,000	46
	0.1	3	.0008	.035	28,000	90	27,000	76	25,000	65	24,000	53
		5	.0008	.035	28,000	90	27,000	76	25,000	65	24,000	53
		10	.0008	.035	25,000	75	24,000	62	23,000	55	21,000	46
	0.2	5	.0008	.032	28,000	90	27,000	76	25,000	65	24,000	53
		10	.0008	.032	25,000	75	24,000	62	23,000	55	21,000	46
		20	.0004	.032	20,000	52	19,000	46	18,000	40	17,000	31
3	0.05	6	.0008	.057	24,000	96	23,000	83	22,000	70	20,000	56
	0.1	6	.0008	.055	24,000	96	23,000	83	22,000	70	20,000	56
	0.5	6	.0008	.039	24,000	96	23,000	83	22,000	70	20,000	56

(※) The indicated standard cutting depth is a reference value for Group 1 work materials. For materials in other groups, the cutting depth should be adjusted using the reference ratio shown in the above table.
The depth of cut stated in these cutting conditions are calculated assuming bottom surface machining.
For finishing machining such as slope machining, it should be set according to the theoretical surface roughness (cusp height).

【Note】
1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions.
The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

Epoch CBN Super Radius End Mill

Metric

<Finishing condition>

Work material					1		2		3		4	
					Hardened steel (~55HRC) P21,D2,L6		Hardened steel (55~65HRC) D2,D3		Hardened steel (65~68HRC) T1~T5,Melted HSS		Hardened steel (68~72HRC) Powder HSS	
Ratio to standard depth of cut					100%		90%		80%		70%	
Tool dia. DC (mm)	Corner radius RE (mm)	Under neck length LU (mm)	Depth of cut (mm) a_p	Depth of cut (mm) a_e	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
0.2	0.05	0.5	0.004	0.05	50,000	400	48,000	350	45,000	290	43,000	240
		1	0.003	0.05	45,000	340	43,000	290	41,000	250	38,000	200
0.3	0.05	0.5	0.006	0.1	50,000	600	48,000	520	45,000	430	43,000	360
		0.75	0.006	0.1	50,000	600	48,000	520	45,000	430	43,000	360
		1.5	0.005	0.1	45,000	510	43,000	440	41,000	370	38,000	300
		2	0.003	0.1	40,000	430	38,000	370	36,000	310	34,000	260
0.4	0.05	0.5	0.008	0.15	46,000	740	44,000	630	41,000	520	39,000	440
		1	0.008	0.15	46,000	740	44,000	630	41,000	520	39,000	440
		2	0.006	0.15	41,000	620	39,000	530	37,000	450	35,000	370
0.5	0.05	0.5	0.01	0.2	46,000	920	44,000	790	41,000	660	39,000	550
		1.5	0.01	0.2	46,000	920	44,000	790	41,000	660	39,000	550
		3	0.005	0.2	37,000	670	35,000	570	33,000	480	31,000	390
	0.1	0.5	0.01	0.15	46,000	920	44,000	790	41,000	660	39,000	550
		1.5	0.01	0.15	46,000	920	44,000	790	41,000	660	39,000	550
		3	0.005	0.15	37,000	670	35,000	570	33,000	480	31,000	390
0.6	0.1	1.5	0.012	0.2	42,000	1,010	40,000	860	38,000	730	36,000	600
		3	0.009	0.2	38,000	870	36,000	740	34,000	620	32,000	510
0.8	0.1	2.5	0.012	0.3	42,000	1,280	40,000	1,090	38,000	920	36,000	770
		5	0.008	0.3	38,000	1,090	36,000	930	34,000	780	32,000	650
1	0.05	1	0.02	0.45	38,000	1,520	36,000	1,300	34,000	1,090	32,000	900
		2.5	0.02	0.45	38,000	1,520	36,000	1,300	34,000	1,090	32,000	900
		5	0.015	0.45	34,000	1,290	32,000	1,090	31,000	940	29,000	770
	0.1	1	0.02	0.4	38,000	1,520	36,000	1,300	34,000	1,090	32,000	900
		2.5	0.02	0.4	38,000	1,520	36,000	1,300	34,000	1,090	32,000	900
		5	0.015	0.4	34,000	1,290	32,000	1,090	31,000	940	29,000	770
	0.2	2.5	0.02	0.3	38,000	1,520	36,000	1,300	34,000	1,090	32,000	900
		5	0.015	0.3	34,000	1,290	32,000	1,090	31,000	940	29,000	770
		10	0.005	0.3	27,000	920	26,000	800	24,000	650	23,000	550
1.5	0.05	2	0.02	0.7	32,000	1,920	30,000	1,620	29,000	1,390	27,000	1,130
		5	0.02	0.7	29,000	1,650	28,000	1,440	26,000	1,190	25,000	1,000
	0.1	2	0.02	0.65	32,000	1,920	30,000	1,620	29,000	1,390	27,000	1,130
		5	0.02	0.65	29,000	1,650	28,000	1,440	26,000	1,190	25,000	1,000
	0.2	5	0.02	0.55	29,000	1,650	28,000	1,440	26,000	1,190	25,000	1,000
		10	0.015	0.55	26,000	1,400	25,000	1,220	23,000	990	22,000	830
2	0.05	3	0.02	0.95	28,000	2,240	27,000	1,940	25,000	1,600	24,000	1,340
		5	0.02	0.95	28,000	2,240	27,000	1,940	25,000	1,600	24,000	1,340
		10	0.02	0.95	25,000	1,900	24,000	1,640	23,000	1,400	21,000	1,120
	0.1	3	0.02	0.9	28,000	2,240	27,000	1,940	25,000	1,600	24,000	1,340
		5	0.02	0.9	28,000	2,240	27,000	1,940	25,000	1,600	24,000	1,340
		10	0.02	0.9	25,000	1,900	24,000	1,640	23,000	1,400	21,000	1,120
	0.2	5	0.02	0.8	28,000	2,240	27,000	1,940	25,000	1,600	24,000	1,340
		10	0.02	0.8	25,000	1,900	24,000	1,640	23,000	1,400	21,000	1,120
		20	0.01	0.8	20,000	1,360	19,000	1,160	18,000	980	17,000	810
3	0.05	6	0.02	1.45	24,000	2,450	23,000	2,110	22,000	1,800	20,000	1,430
	0.1	6	0.02	1.4	24,000	2,450	23,000	2,110	22,000	1,800	20,000	1,430
	0.5	6	0.02	1	24,000	2,450	23,000	2,110	22,000	1,800	20,000	1,430

(※) The indicated standard cutting depth is a reference value for Group 1 work materials. For materials in other groups, the cutting depth should be adjusted using the reference ratio shown in the above table.
The depth of cut stated in these cutting conditions are calculated assuming bottom surface machining.
For finishing machining such as slope machining, it should be set according to the theoretical surface roughness (cusp height).

【Note】 1) Use the appropriate coolant for the work material and machining shape.
2) This standard cutting condition table is intended as reference cutting conditions.
The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
3) If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

Epoch Deep Square Evolution ATHCoating

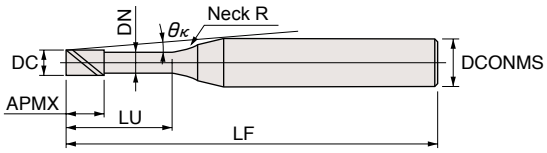
Side milling | Slotting | Miniature | Finishing | Miniature Rib

Dia. tolerance: φ0.1～φ0.5 : 0～−0.007mm
φ0.6～φ0.9 : 0～−0.01mm
φ1～φ6 : 0～−0.015mm

h5

Improved flute tip shape and neck shape suppresses warping to enable high-accuracy cutting. Use of ATH and PN coatings further extends tool life.

2 Flutes



EPDSE2○○○-○○.○-ATH

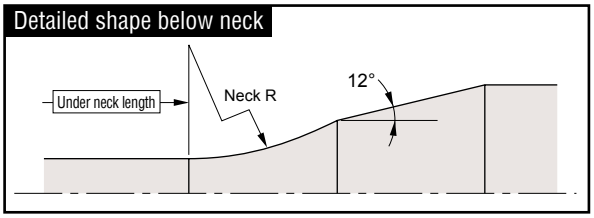
Carbide | ATH | Helix angle 30° | Cutting Conditions A307

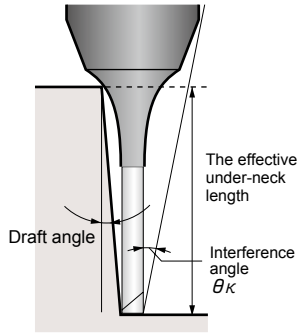
Item code	Stock ATH	Size(mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θκ	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDSE2001-0.3-ATH	●	0.1	0.3	0.15	0.08	45	4	1	11.58	0.46	0.49	0.51	0.53	0.58
EPDSE2001-0.5-ATH	●		0.5						11.35	0.67	0.71	0.74	0.76	0.82
EPDSE2001-1-ATH	★		1						10.81	1.20	1.25	1.29	1.33	1.39
EPDSE2002-0.5-ATH	●	0.2	0.5	0.3	0.17	50	4	1	11.30	0.70	0.73	0.76	0.78	0.83
EPDSE2002-1-ATH	●		1						10.75	1.22	1.27	1.31	1.34	1.42
EPDSE2002-1.5-ATH	★		1.5						10.25	1.74	1.80	1.85	1.89	2.08
EPDSE2002-2-ATH	★		2						9.80	2.26	2.32	2.38	2.47	2.74
EPDSE2002-3-ATH	★		3						9.00	3.29	3.37	3.50	3.67	4.07
EPDSE2003-1-ATH	●	0.3	1	0.45	0.27	50	4	2	10.72	1.32	1.39	1.45	1.51	1.62
EPDSE2003-1.5-ATH	●		1.5						10.21	1.85	1.93	2.01	2.08	2.21
EPDSE2003-2-ATH	★		2						9.75	2.37	2.47	2.56	2.64	2.78
EPDSE2003-2.5-ATH	★		2.5						9.32	2.89	3.01	3.11	3.20	3.41
EPDSE2003-3-ATH	★		3						8.93	3.42	3.54	3.65	3.75	4.07
EPDSE2004-1-ATH	●	0.4	1	0.6	0.37	50	4	2	10.69	1.32	1.39	1.45	1.51	1.62
EPDSE2004-1.5-ATH	●		1.5						10.17	1.85	1.93	2.01	2.08	2.21
EPDSE2004-2-ATH	●		2						9.70	2.37	2.47	2.56	2.64	2.78
EPDSE2004-2.5-ATH	★		2.5						9.27	2.89	3.01	3.11	3.20	3.41
EPDSE2004-3-ATH	●		3						8.87	3.42	3.54	3.65	3.75	4.07
EPDSE2004-3.5-ATH	★		3.5						8.51	3.94	4.08	4.19	4.29	4.73
EPDSE2004-4-ATH	●		4						8.17	4.46	4.61	4.73	4.87	5.40
EPDSE2004-5-ATH	★		5						7.58	5.49	5.66	5.79	6.06	6.72
EPDSE2004-6-ATH	★		6						7.06	6.53	6.71	6.92	7.26	8.05
EPDSE2004-8-ATH	★		8						6.22	8.59	8.80	9.20	9.65	10.71
EPDSE2004-10-ATH	★		10						5.55	10.64	10.97	11.48	12.05	13.36
EPDSE2005-1-ATH	●	0.5	1	0.75	0.47	50	4	2	10.66	1.32	1.39	1.45	1.51	1.62
EPDSE2005-1.5-ATH	●		1.5						10.13	1.85	1.93	2.01	2.08	2.21
EPDSE2005-2-ATH	●		2						9.64	2.37	2.47	2.56	2.64	2.78
EPDSE2005-2.5-ATH	●		2.5						9.21	2.89	3.01	3.11	3.20	3.41
EPDSE2005-3-ATH	●		3						8.81	3.42	3.54	3.65	3.75	4.07
EPDSE2005-4-ATH	●		4						8.10	4.46	4.61	4.73	4.87	5.40
EPDSE2005-5-ATH	★		5						7.50	5.49	5.66	5.79	6.06	6.72
EPDSE2005-6-ATH	★		6						6.98	6.53	6.71	6.92	7.26	8.05
EPDSE2005-8-ATH	★		8						6.13	8.59	8.80	9.20	9.65	10.71
EPDSE2005-10-ATH	★		10						5.47	10.64	10.97	11.48	12.05	13.36
EPDSE2006-2-ATH	●	0.6	2	0.9	0.57	50	4	4	9.59	2.54	2.70	2.84	2.96	3.19
EPDSE2006-3-ATH	●		3						8.74	3.60	3.80	3.96	4.11	4.37
EPDSE2006-4-ATH	●		4						8.02	4.66	4.89	5.07	5.24	5.53
EPDSE2006-5-ATH	★		5						7.42	5.71	5.96	6.17	6.35	6.72
EPDSE2006-6-ATH	★		6						6.90	6.76	7.04	7.26	7.45	8.05
EPDSE2006-7-ATH	★		7						6.44	7.81	8.10	8.34	8.55	9.38
EPDSE2006-8-ATH	★		8						6.04	8.85	9.17	9.42	9.65	10.71
EPDSE2006-9-ATH	★		9						5.69	9.89	10.22	10.49	10.85	12.03
EPDSE2006-10-ATH	★		10						5.38	10.93	11.28	11.56	12.05	13.36
EPDSE2007-2-ATH	★	0.7	2	1.05	0.67	50	4	4	9.53	2.54	2.70	2.84	2.96	3.19
EPDSE2007-4-ATH	★		4						7.94	4.66	4.89	5.07	5.24	5.53
EPDSE2007-6-ATH	★		6						6.81	6.76	7.04	7.26	7.45	8.05
EPDSE2007-8-ATH	★		8						5.95	8.85	9.17	9.42	9.65	10.71
EPDSE2007-10-ATH	★		10						5.29	10.93	11.28	11.56	12.05	13.36

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch Deep Square Evolution ATHCoating

Detailed shape below neck





【Note】
The effective under-neck length is different from Epoch Deep Square EPDS. Please recheck the interference region.

EPDSE2○○○-○○.○-ATH

Item code	Stock ATH	Size(mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDSE2008-2-ATH	★	0.8	2	1.2	0.77	50	4	4	9.47	2.54	2.70	2.84	2.96	3.19
EPDSE2008-4-ATH	●		4						7.86	4.66	4.89	5.07	5.24	5.53
EPDSE2008-6-ATH	●		6						6.72	6.76	7.04	7.26	7.45	8.05
EPDSE2008-8-ATH	★		8						5.86	8.85	9.17	9.42	9.65	10.71
EPDSE2008-10-ATH	★		10						5.20	10.93	11.28	11.56	12.05	13.36
EPDSE2008-12-ATH	★		12			55			4.67	13.00	13.38	13.76	14.44	16.02
EPDSE2009-2-ATH	★	0.9	2	1.35	0.86	50	4	4	9.38	2.58	2.73	2.86	2.98	3.21
EPDSE2009-4-ATH	★		4						7.76	4.69	4.91	5.09	5.26	5.54
EPDSE2009-6-ATH	★		6						6.61	6.79	7.06	7.28	7.47	8.08
EPDSE2009-8-ATH	★		8						5.76	8.87	9.18	9.43	9.68	10.74
EPDSE2009-10-ATH	★		10						5.10	10.95	11.30	11.57	12.07	13.39
EPDSE2009-12-ATH	★		12			55			4.58	13.02	13.40	13.79	14.47	16.05
EPDSE2010-2-ATH	●	1	2	1.5	0.96	50	4	4	9.31	2.58	2.73	2.86	2.98	3.21
EPDSE2010-3-ATH	●		3						8.41	3.64	3.82	3.99	4.13	4.39
EPDSE2010-4-ATH	●		4						7.67	4.69	4.91	5.09	5.26	5.54
EPDSE2010-5-ATH	●		5						7.04	5.74	5.99	6.19	6.37	6.76
EPDSE2010-6-ATH	●		6						6.51	6.79	7.06	7.28	7.47	8.08
EPDSE2010-7-ATH	●		7						6.06	7.83	8.12	8.36	8.56	9.41
EPDSE2010-8-ATH	●		8						5.66	8.87	9.18	9.43	9.68	10.74
EPDSE2010-9-ATH	●		9						5.31	9.91	10.24	10.50	10.88	12.07
EPDSE2010-10-ATH	●		10						5.00	10.95	11.30	11.57	12.07	13.39
EPDSE2010-12-ATH	★		12			55			4.48	13.02	13.40	13.79	14.47	16.05
EPDSE2010-14-ATH	★		14						4.06	15.09	15.49	16.07	16.86	18.70
EPDSE2010-16-ATH	★		16						3.71	17.15	17.58	18.35	19.25	21.36
EPDSE2010-20-ATH	★		20			60			3.17	21.26	21.89	22.91	24.04	26.66
EPDSE2010-25-ATH	★		25			65			2.68	26.39	27.33	28.61	30.02	No interference
EPDSE2012-4-ATH	★	1.2	4	1.8	1.15	50	4	4	7.46	4.72	4.93	5.11	5.27	5.55
EPDSE2012-6-ATH	★		6						6.29	6.81	7.08	7.29	7.48	8.11
EPDSE2012-8-ATH	★		8						5.44	8.90	9.20	9.45	9.71	10.77
EPDSE2012-10-ATH	★		10						4.80	10.97	11.31	11.58	12.10	13.42
EPDSE2012-12-ATH	★		12			55			4.29	13.04	13.41	13.82	14.49	16.08
EPDSE2012-16-ATH	★		16						3.53	17.16	17.59	18.38	19.28	21.39
EPDSE2014-6-ATH	★	1.4	6	2.1	1.34	50	4	4	6.06	6.84	7.09	7.31	7.50	8.15
EPDSE2014-12-ATH	★		12			55			4.08	13.06	13.43	13.84	14.52	16.11
EPDSE2015-4-ATH	●	1.5	4	2.25	1.44	50	4	4	7.11	4.75	4.95	5.13	5.29	5.57
EPDSE2015-6-ATH	●		6						5.94	6.84	7.09	7.31	7.50	8.15
EPDSE2015-8-ATH	●		8						5.10	8.92	9.22	9.46	9.74	10.80
EPDSE2015-10-ATH	●		10						4.47	10.99	11.33	11.59	12.13	13.45
EPDSE2015-12-ATH	★		12			55			3.97	13.06	13.43	13.84	14.52	16.11
EPDSE2015-14-ATH	★		14						3.58	15.12	15.52	16.12	16.92	18.76
EPDSE2015-16-ATH	★		16						3.25	17.18	17.60	18.40	19.31	21.42
EPDSE2015-18-ATH	★		18			60			2.98	19.24	19.76	20.69	21.70	No interference
EPDSE2015-20-ATH	★		20						2.76	21.29	21.94	22.97	24.10	No interference
EPDSE2015-25-ATH	★		25			65			2.31	26.42	27.39	28.67	30.08	No interference
EPDSE2015-30-ATH	★		30			70			1.99	31.53	32.83	34.37	No interference	No interference
EPDSE2015-35-ATH	★		35			75			1.75	36.64	38.28	40.07	No interference	No interference
EPDSE2015-40-ATH	★		40			80			1.56	41.85	43.73	45.78	No interference	No interference
EPDSE2016-6-ATH	★	1.6	6	2.4	1.54	50	4	4	5.82	6.84	7.09	7.31	7.50	8.15
EPDSE2016-8-ATH	★		8						4.98	8.92	9.22	9.46	9.74	10.80
EPDSE2018-6-ATH	★	1.8	6	2.7	1.73	50	4	4	5.55	6.86	7.11	7.32	7.51	8.18
EPDSE2018-8-ATH	★		8						4.72	8.94	9.23	9.47	9.76	10.83

EPDSE2○○○-○○.○-ATH

Item code	Stock ATH	Size(mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θκ	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDSE2020-4-ATH	●	2	4	3	1.92	50	4	4	6.42	4.80	5.00	5.17	5.32	5.59
EPDSE2020-6-ATH	●		6						5.25	6.88	7.13	7.34	7.52	8.21
EPDSE2020-8-ATH	●		8						4.44	8.96	9.25	9.49	9.79	10.86
EPDSE2020-10-ATH	●		10						3.85	11.03	11.35	11.62	12.19	13.52
EPDSE2020-12-ATH	●		12			55			3.39	13.10	13.45	13.90	14.58	16.17
EPDSE2020-14-ATH	●		14						3.03	15.16	15.54	16.18	16.97	18.83
EPDSE2020-16-ATH	★		16						2.75	17.21	17.63	18.46	19.37	No interference
EPDSE2020-18-ATH	★		18			60			2.51	19.27	19.81	20.74	21.76	No interference
EPDSE2020-20-ATH	★		20						2.31	21.32	21.99	23.02	24.15	No interference
EPDSE2020-25-ATH	★		25			65			1.92	26.44	27.44	28.72	No interference	No interference
EPDSE2020-30-ATH	★		30			70			1.65	31.55	32.88	34.42	No interference	No interference
EPDSE2020-35-ATH	★		35			75			1.44	36.69	38.33	No interference	No interference	No interference
EPDSE2020-40-ATH	★		40			80			1.28	41.90	43.78	No interference	No interference	No interference
EPDSE2020-50-ATH	★		50			90			1.05	52.33	54.67	No interference	No interference	No interference
EPDSE2025-8-ATH	★	2.5	8	3.75	2.4	50	4	4	3.65	9.00	9.28	9.51	9.85	10.93
EPDSE2025-12-ATH	★		12			55			2.73	13.13	13.48	13.95	14.64	No interference
EPDSE2025-16-ATH	★		16						2.18	17.25	17.68	18.51	19.42	No interference
EPDSE2025-20-ATH	★		20			60			1.81	21.35	22.04	23.07	No interference	No interference
EPDSE2025-30-ATH	★		30			70			1.28	31.58	32.94	No interference	No interference	No interference
EPDSE2025-40-ATH	★		40			80			0.99	41.95	No interference	No interference	No interference	No interference
EPDSE2025-50-ATH	★		50			90			0.80	52.38	No interference	No interference	No interference	No interference
EPDSE2030-8-ATH	●	3	8	4.5	2.88	55	6	4	5.59	9.04	9.31	9.54	9.91	10.99
EPDSE2030-12-ATH	●		12			60			4.44	13.16	13.50	14.00	14.69	16.30
EPDSE2030-16-ATH	●		16						3.68	17.28	17.73	18.57	19.48	21.61
EPDSE2030-20-ATH	★		20			65			3.15	21.38	22.09	23.13	24.26	26.91
EPDSE2030-25-ATH	★		25			70			2.66	26.49	27.54	28.83	30.25	No interference
EPDSE2030-30-ATH	★		30			75			2.31	31.60	32.99	34.53	36.23	No interference
EPDSE2030-40-ATH	★		40			90			1.82	42.00	43.88	45.94	No interference	No interference
EPDSE2030-50-ATH	★		50			100			1.50	52.43	54.78	No interference	No interference	No interference
EPDSE2040-12-ATH	●	4	12	6	3.85	60	6	4	3.36	13.21	13.54	14.08	14.78	16.39
EPDSE2040-16-ATH	●		16						2.72	17.32	17.81	18.65	19.56	No interference
EPDSE2040-20-ATH	●		20			70			2.29	21.42	22.17	23.21	24.35	No interference
EPDSE2040-25-ATH	★		25						1.91	26.53	27.62	28.91	No interference	No interference
EPDSE2040-30-ATH	★		30			80			1.64	31.65	33.06	34.61	No interference	No interference
EPDSE2040-35-ATH	★		35						1.44	36.86	38.51	No interference	No interference	No interference
EPDSE2040-40-ATH	★		40			90			1.28	42.08	43.96	No interference	No interference	No interference
EPDSE2040-50-ATH	★		50			100			1.05	52.50	54.85	No interference	No interference	No interference
EPDSE2050-20-ATH	●	5	20	7.5	4.85	70	6	4	1.27	21.42	22.17	No interference	No interference	No interference
EPDSE2050-25-ATH	●		25						1.04	26.53	27.62	No interference	No interference	No interference
EPDSE2050-30-ATH	★		30			80			0.88	31.65	No interference	No interference	No interference	No interference
EPDSE2050-40-ATH	★		40			90			0.68	42.08	No interference	No interference	No interference	No interference
EPDSE2050-50-ATH	★		50			100			0.55	52.50	No interference	No interference	No interference	No interference
EPDSE2060-20-ATH	●	6	20	9	5.85	70	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDSE2060-30-ATH	●		30			80			0	No interference	No interference	No interference	No interference	No interference
EPDSE2060-40-ATH	★		40			90			0	No interference	No interference	No interference	No interference	No interference
EPDSE2060-50-ATH	★		50			100			0	No interference	No interference	No interference	No interference	No interference

Applicable work material of EPDSE-ATH

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch Deep Square Evolution PN Coating

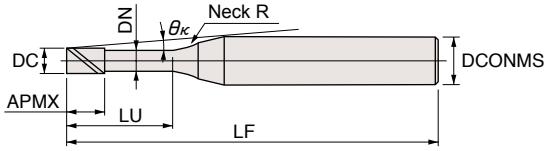
Side milling | Slotting | Miniature | Finishing | Miniature Rib

Dia. tolerance
φ0.1～φ0.5: 0～−0.007mm
φ0.6～φ0.9: 0～−0.01mm
φ1～φ6 : 0～−0.015mm

h5

Improved flute tip shape and neck shape suppresses warping to enable high-accuracy cutting. Use of ATH and PN coatings further extends tool life.

2 Flutes

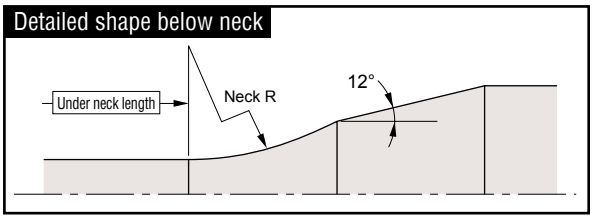


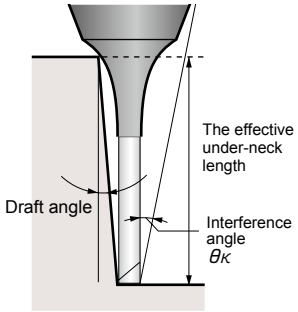
EPDSE2○○○-○○.○-PN

Carbide | PN | Helix angle 30° | Cutting Conditions A307

Item code	Stock PN	Size(mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θκ	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDSE2001-0.3-PN	★		0.3						11.58	0.46	0.49	0.51	0.53	0.58
EPDSE2001-0.5-PN	★	0.1	0.5	0.15	0.08	45	4	1	11.35	0.67	0.71	0.74	0.76	0.82
EPDSE2001-1-PN	★		1						10.81	1.20	1.25	1.29	1.33	1.39
EPDSE2002-0.5-PN	★		0.5						11.30	0.70	0.73	0.76	0.78	0.83
EPDSE2002-1-PN	★		1						10.75	1.22	1.27	1.31	1.34	1.42
EPDSE2002-1.5-PN	★	0.2	1.5	0.3	0.17	50	4	1	10.25	1.74	1.80	1.85	1.89	2.08
EPDSE2002-2-PN	★		2						9.80	2.26	2.32	2.38	2.47	2.74
EPDSE2002-3-PN	★		3						9.00	3.29	3.37	3.50	3.67	4.07
EPDSE2003-1-PN	★		1						10.72	1.32	1.39	1.45	1.51	1.62
EPDSE2003-1.5-PN	★		1.5						10.21	1.85	1.93	2.01	2.08	2.21
EPDSE2003-2-PN	★	0.3	2	0.45	0.27	50	4	2	9.75	2.37	2.47	2.56	2.64	2.78
EPDSE2003-2.5-PN	★		2.5						9.32	2.89	3.01	3.11	3.20	3.41
EPDSE2003-3-PN	★		3						8.93	3.42	3.54	3.65	3.75	4.07
EPDSE2004-1-PN	★		1						10.69	1.32	1.39	1.45	1.51	1.62
EPDSE2004-1.5-PN	★		1.5						10.17	1.85	1.93	2.01	2.08	2.21
EPDSE2004-2-PN	★		2						9.70	2.37	2.47	2.56	2.64	2.78
EPDSE2004-2.5-PN	★		2.5						9.27	2.89	3.01	3.11	3.20	3.41
EPDSE2004-3-PN	★		3						8.87	3.42	3.54	3.65	3.75	4.07
EPDSE2004-3.5-PN	★	0.4	3.5	0.6	0.37	50	4	2	8.51	3.94	4.08	4.19	4.29	4.73
EPDSE2004-4-PN	★		4						8.17	4.46	4.61	4.73	4.87	5.40
EPDSE2004-5-PN	★		5						7.58	5.49	5.66	5.79	6.06	6.72
EPDSE2004-6-PN	★		6						7.06	6.53	6.71	6.92	7.26	8.05
EPDSE2004-8-PN	★		8						6.22	8.59	8.80	9.20	9.65	10.71
EPDSE2004-10-PN	★		10						5.55	10.64	10.97	11.48	12.05	13.36
EPDSE2005-1-PN	★		1						10.66	1.32	1.39	1.45	1.51	1.62
EPDSE2005-1.5-PN	★		1.5						10.13	1.85	1.93	2.01	2.08	2.21
EPDSE2005-2-PN	★		2						9.64	2.37	2.47	2.56	2.64	2.78
EPDSE2005-2.5-PN	★		2.5						9.21	2.89	3.01	3.11	3.20	3.41
EPDSE2005-3-PN	★	0.5	3	0.75	0.47	50	4	2	8.81	3.42	3.54	3.65	3.75	4.07
EPDSE2005-4-PN	★		4						8.10	4.46	4.61	4.73	4.87	5.40
EPDSE2005-5-PN	★		5						7.50	5.49	5.66	5.79	6.06	6.72
EPDSE2005-6-PN	★		6						6.98	6.53	6.71	6.92	7.26	8.05
EPDSE2005-8-PN	★		8						6.13	8.59	8.80	9.20	9.65	10.71
EPDSE2005-10-PN	★		10						5.47	10.64	10.97	11.48	12.05	13.36
EPDSE2006-2-PN	★		2						9.59	2.54	2.70	2.84	2.96	3.19
EPDSE2006-3-PN	★		3						8.74	3.60	3.80	3.96	4.11	4.37
EPDSE2006-4-PN	★		4						8.02	4.66	4.89	5.07	5.24	5.53
EPDSE2006-5-PN	★		5						7.42	5.71	5.96	6.17	6.35	6.72
EPDSE2006-6-PN	★	0.6	6	0.9	0.57	50	4	4	6.90	6.76	7.04	7.26	7.45	8.05
EPDSE2006-7-PN	★		7						6.44	7.81	8.10	8.34	8.55	9.38
EPDSE2006-8-PN	★		8						6.04	8.85	9.17	9.42	9.65	10.71
EPDSE2006-9-PN	★		9						5.69	9.89	10.22	10.49	10.85	12.03
EPDSE2006-10-PN	★		10						5.38	10.93	11.28	11.56	12.05	13.36
EPDSE2007-2-PN	★		2						9.53	2.54	2.70	2.84	2.96	3.19
EPDSE2007-4-PN	★		4						7.94	4.66	4.89	5.07	5.24	5.53
EPDSE2007-6-PN	★	0.7	6	1.05	0.67	50	4	4	6.81	6.76	7.04	7.26	7.45	8.05
EPDSE2007-8-PN	★		8						5.95	8.85	9.17	9.42	9.65	10.71
EPDSE2007-10-PN	★		10						5.29	10.93	11.28	11.56	12.05	13.36

Detailed shape below neck





【Note】
The effective under-neck length is different from Epoch Deep Square EPDS. Please recheck the interference region.

EPDSE2○○○-○○.○-PN

Item code	Stock PN	Size(mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDSE2008-2-PN	★	0.8	2	1.2	0.77	50	4	4	9.47	2.54	2.70	2.84	2.96	3.19
EPDSE2008-4-PN	★		4						7.86	4.66	4.89	5.07	5.24	5.53
EPDSE2008-6-PN	★		6						6.72	6.76	7.04	7.26	7.45	8.05
EPDSE2008-8-PN	★		8						5.86	8.85	9.17	9.42	9.65	10.71
EPDSE2008-10-PN	★		10						5.20	10.93	11.28	11.56	12.05	13.36
EPDSE2008-12-PN	★		12			55			4.67	13.00	13.38	13.76	14.44	16.02
EPDSE2009-2-PN	★	0.9	2	1.35	0.86	50	4	4	9.38	2.58	2.73	2.86	2.98	3.21
EPDSE2009-4-PN	★		4						7.76	4.69	4.91	5.09	5.26	5.54
EPDSE2009-6-PN	★		6						6.61	6.79	7.06	7.28	7.47	8.08
EPDSE2009-8-PN	★		8						5.76	8.87	9.18	9.43	9.68	10.74
EPDSE2009-10-PN	★		10						5.10	10.95	11.30	11.57	12.07	13.39
EPDSE2009-12-PN	★		12			55			4.58	13.02	13.40	13.79	14.47	16.05
EPDSE2010-2-PN	★	1	2	1.5	0.96	50	4	4	9.31	2.58	2.73	2.86	2.98	3.21
EPDSE2010-3-PN	★		3						8.41	3.64	3.82	3.99	4.13	4.39
EPDSE2010-4-PN	★		4						7.67	4.69	4.91	5.09	5.26	5.54
EPDSE2010-5-PN	★		5						7.04	5.74	5.99	6.19	6.37	6.76
EPDSE2010-6-PN	★		6						6.51	6.79	7.06	7.28	7.47	8.08
EPDSE2010-7-PN	★		7						6.06	7.83	8.12	8.36	8.56	9.41
EPDSE2010-8-PN	★		8						5.66	8.87	9.18	9.43	9.68	10.74
EPDSE2010-9-PN	★		9						5.31	9.91	10.24	10.50	10.88	12.07
EPDSE2010-10-PN	★		10						5.00	10.95	11.30	11.57	12.07	13.39
EPDSE2010-12-PN	★		12			55			4.48	13.02	13.40	13.79	14.47	16.05
EPDSE2010-14-PN	★		14						4.06	15.09	15.49	16.07	16.86	18.70
EPDSE2010-16-PN	★		16						3.71	17.15	17.58	18.35	19.25	21.36
EPDSE2010-20-PN	★		20			60			3.17	21.26	21.89	22.91	24.04	26.66
EPDSE2010-25-PN	★		25			65			2.68	26.39	27.33	28.61	30.02	No interference
EPDSE2012-4-PN	★	1.2	4	1.8	1.15	50	4	4	7.46	4.72	4.93	5.11	5.27	5.55
EPDSE2012-6-PN	★		6						6.29	6.81	7.08	7.29	7.48	8.11
EPDSE2012-8-PN	★		8						5.44	8.90	9.20	9.45	9.71	10.77
EPDSE2012-10-PN	★		10						4.80	10.97	11.31	11.58	12.10	13.42
EPDSE2012-12-PN	★		12			55			4.29	13.04	13.41	13.82	14.49	16.08
EPDSE2012-16-PN	★		16						3.53	17.16	17.59	18.38	19.28	21.39
EPDSE2014-6-PN	★	1.4	6	2.1	1.34	50	4	4	6.06	6.84	7.09	7.31	7.50	8.15
EPDSE2014-12-PN	★		12			55			4.08	13.06	13.43	13.84	14.52	16.11
EPDSE2015-4-PN	★	1.5	4	2.25	1.44	50	4	4	7.11	4.75	4.95	5.13	5.29	5.57
EPDSE2015-6-PN	★		6						5.94	6.84	7.09	7.31	7.50	8.15
EPDSE2015-8-PN	★		8						5.10	8.92	9.22	9.46	9.74	10.80
EPDSE2015-10-PN	★		10						4.47	10.99	11.33	11.59	12.13	13.45
EPDSE2015-12-PN	★		12			55			3.97	13.06	13.43	13.84	14.52	16.11
EPDSE2015-14-PN	★		14						3.58	15.12	15.52	16.12	16.92	18.76
EPDSE2015-16-PN	★		16						3.25	17.18	17.60	18.40	19.31	21.42
EPDSE2015-18-PN	★		18			60			2.98	19.24	19.76	20.69	21.70	No interference
EPDSE2015-20-PN	★		20						2.76	21.29	21.94	22.97	24.10	No interference
EPDSE2015-25-PN	★		25			65			2.31	26.42	27.39	28.67	30.08	No interference
EPDSE2015-30-PN	★		30			70			1.99	31.53	32.83	34.37	No interference	No interference
EPDSE2015-35-PN	★		35			75			1.75	36.64	38.28	40.07	No interference	No interference
EPDSE2015-40-PN	★		40			80			1.56	41.85	43.73	45.78	No interference	No interference
EPDSE2016-6-PN	★	1.6	6	2.4	1.54	50	4	4	5.82	6.84	7.09	7.31	7.50	8.15
EPDSE2016-8-PN	★		8						4.98	8.92	9.22	9.46	9.74	10.80
EPDSE2018-6-PN	★	1.8	6	2.7	1.73	50	4	4	5.55	6.86	7.11	7.32	7.51	8.18
EPDSE2018-8-PN	★		8						4.72	8.94	9.23	9.47	9.76	10.83

Epoch Deep Square Evolution PN Coating

EPDSE2○○○-○○.○-PN

Item code	Stock PN	Size(mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle θK	The effective under-neck length for the various draft angles 0.5°	1°	1.5°	2°	3°
EPDSE2020-4-PN	★	2	4	3	1.92	50	4	4	6.42	4.80	5.00	5.17	5.32	5.59
EPDSE2020-6-PN	★		6						5.25	6.88	7.13	7.34	7.52	8.21
EPDSE2020-8-PN	★		8						4.44	8.96	9.25	9.49	9.79	10.86
EPDSE2020-10-PN	★		10						3.85	11.03	11.35	11.62	12.19	13.52
EPDSE2020-12-PN	★		12			55			3.39	13.10	13.45	13.90	14.58	16.17
EPDSE2020-14-PN	★		14						3.03	15.16	15.54	16.18	16.97	18.83
EPDSE2020-16-PN	★		16						2.75	17.21	17.63	18.46	19.37	No interference
EPDSE2020-18-PN	★		18			60			2.51	19.27	19.81	20.74	21.76	No interference
EPDSE2020-20-PN	★		20						2.31	21.32	21.99	23.02	24.15	No interference
EPDSE2020-25-PN	★		25			65			1.92	26.44	27.44	28.72	No interference	No interference
EPDSE2020-30-PN	★		30			70			1.65	31.55	32.88	34.42	No interference	No interference
EPDSE2020-35-PN	★		35			75			1.44	36.69	38.33	No interference	No interference	No interference
EPDSE2020-40-PN	★		40			80			1.28	41.90	43.78	No interference	No interference	No interference
EPDSE2020-50-PN	★		50			90			1.05	52.33	54.67	No interference	No interference	No interference
EPDSE2025-8-PN	★	2.5	8	3.75	2.4	50	4	4	3.65	9.00	9.28	9.51	9.85	10.93
EPDSE2025-12-PN	★		12			55			2.73	13.13	13.48	13.95	14.64	No interference
EPDSE2025-16-PN	★		16						2.18	17.25	17.68	18.51	19.42	No interference
EPDSE2025-20-PN	★		20			60			1.81	21.35	22.04	23.07	No interference	No interference
EPDSE2025-30-PN	★		30			70			1.28	31.58	32.94	No interference	No interference	No interference
EPDSE2025-40-PN	★		40			80			0.99	41.95	No interference	No interference	No interference	No interference
EPDSE2025-50-PN	★		50			90			0.80	52.38	No interference	No interference	No interference	No interference
EPDSE2030-8-PN	★	3	8	4.5	2.88	55	6	4	5.59	9.04	9.31	9.54	9.91	10.99
EPDSE2030-12-PN	★		12			60			4.44	13.16	13.50	14.00	14.69	16.30
EPDSE2030-16-PN	★		16						3.68	17.28	17.73	18.57	19.48	21.61
EPDSE2030-20-PN	★		20			65			3.15	21.38	22.09	23.13	24.26	26.91
EPDSE2030-25-PN	★		25			70			2.66	26.49	27.54	28.83	30.25	No interference
EPDSE2030-30-PN	★		30			75			2.31	31.60	32.99	34.53	36.23	No interference
EPDSE2030-40-PN	★		40			90			1.82	42.00	43.88	45.94	No interference	No interference
EPDSE2030-50-PN	★		50			100			1.50	52.43	54.78	No interference	No interference	No interference
EPDSE2040-12-PN	★	4	12	6	3.85	60	6	4	3.36	13.21	13.54	14.08	14.78	16.39
EPDSE2040-16-PN	★		16						2.72	17.32	17.81	18.65	19.56	No interference
EPDSE2040-20-PN	★		20			70			2.29	21.42	22.17	23.21	24.35	No interference
EPDSE2040-25-PN	★		25						1.91	26.53	27.62	28.91	No interference	No interference
EPDSE2040-30-PN	★		30			80			1.64	31.65	33.06	34.61	No interference	No interference
EPDSE2040-35-PN	★		35						1.44	36.86	38.51	No interference	No interference	No interference
EPDSE2040-40-PN	★		40			90			1.28	42.08	43.96	No interference	No interference	No interference
EPDSE2040-50-PN	★		50			100			1.05	52.50	54.85	No interference	No interference	No interference
EPDSE2050-20-PN	★	5	20	7.5	4.85	70	6	4	1.27	21.42	22.17	No interference	No interference	No interference
EPDSE2050-25-PN	★		25						1.04	26.53	27.62	No interference	No interference	No interference
EPDSE2050-30-PN	★		30			80			0.88	31.65	No interference	No interference	No interference	No interference
EPDSE2050-40-PN	★		40			90			0.68	42.08	No interference	No interference	No interference	No interference
EPDSE2050-50-PN	★		50			100			0.55	52.50	No interference	No interference	No interference	No interference
EPDSE2060-20-PN	★	6	20	9	5.85	70	6	-	0	No interference	No interference	No interference	No interference	No interference
EPDSE2060-30-PN	★		30			80			0	No interference	No interference	No interference	No interference	No interference
EPDSE2060-40-PN	★		40			90			0	No interference	No interference	No interference	No interference	No interference
EPDSE2060-50-PN	★		50			100			0	No interference	No interference	No interference	No interference	No interference

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	○		◎	◎	◎	◎

★ : Inventory maintained in Japan

Recommended cutting conditions EPDSE-ATH EPDSE-PN

High efficiency cutting conditions | High accuracy cutting conditions

Please refer to P.A310 about high accuracy cutting conditions

Inch

Recommended range			PN series / ATH series											
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
0.1	0.3	.0002	50,000	20	50,000	20	50,000	20	48,600	19	42,750	9	40,050	8
	0.5	.0002	50,000	20	50,000	20	50,000	20	48,600	19	42,750	9	40,050	8
	1	.0001	50,000	20	50,000	20	48,600	19	43,700	17	38,500	8	36,050	7
0.2	0.5	.0008	50,000	30	45,000	27	40,500	24	38,250	15	33,750	14	31,500	13
	1	.0006	50,000	30	45,000	27	40,500	24	38,250	15	33,750	14	31,500	13
	1.5	.0003	48,600	19	40,500	16	36,450	15	34,425	14	30,375	12	28,350	11
	2	.0002	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	5
	3	.0001	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	5
0.3	1	.0008	48,000	29	40,000	24	36,000	22	34,000	14	30,000	12	28,000	11
	1.5	.0008	48,000	29	40,000	24	36,000	22	34,000	14	30,000	12	28,000	11
	2	.0005	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	10
	2.5	.0004	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	10
	3	.0003	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	10
0.4	1	.0016	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	9
	1.5	.0011	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	9
	2	.0011	38,400	31	32,000	26	28,800	23	27,200	16	24,000	14	22,400	9
	2.5	.0009	34,560	28	28,800	23	25,920	21	24,480	15	21,600	13	20,160	8
	3	.0006	34,560	28	28,800	23	25,920	21	24,480	15	21,600	13	20,160	8
	3.5	.0005	34,560	28	28,800	23	25,920	21	24,480	15	21,600	13	20,160	8
	4	.0004	34,560	28	28,800	23	25,920	21	24,480	15	21,600	13	20,160	8
	5	.0004	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7
	6	.0002	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7
	8	.0001	26,880	16	22,400	13	20,160	12	19,040	8	16,800	7	15,680	6
	10	.0001	23,040	14	19,200	12	17,280	10	16,320	7	14,400	6	13,440	5
0.5	1	.002	38,400	31	32,000	26	28,800	23	27,200	22	24,000	14	22,400	9
	1.5	.002	38,400	31	32,000	26	28,800	23	27,200	22	24,000	14	22,400	9
	2	.0014	38,400	31	32,000	26	28,800	23	27,200	22	24,000	14	22,400	9
	2.5	.0012	34,560	28	28,800	23	25,920	21	24,480	20	21,600	13	20,160	8
	3	.0008	34,560	28	28,800	23	25,920	21	24,480	20	21,600	13	20,160	8
	4	.0008	34,560	28	28,800	23	25,920	21	24,480	15	21,600	13	20,160	8
	5	.0005	34,560	28	28,800	23	25,920	21	24,480	15	21,600	13	20,160	8
	6	.0005	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7
	8	.0003	30,720	18	25,600	15	23,040	14	21,760	9	19,200	8	17,920	7
	10	.0002	26,880	16	22,400	13	20,160	12	19,040	8	16,800	7	15,680	6
0.6	2	.0017	38,400	46	32,000	38	28,800	35	27,200	27	24,000	19	22,400	18
	3	.0014	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	4	.0009	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	5	.0008	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	6	.0006	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	7	.0006	30,720	37	25,600	31	23,040	28	21,760	17	19,200	15	17,920	11
	8	.0006	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
	9	.0005	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
	10	.0004	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
0.7	2	.0028	38,400	46	32,000	38	28,800	35	27,200	27	24,000	19	22,400	18
	4	.0019	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	6	.0007	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	8	.0007	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
	10	.0007	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11

【Note】 Please refer to P.A309

Epoch Deep Square Evolution

EPDSE-ATH **EPDSE-PN** High efficiency cuttiing conditions High accuracy cuttiing conditions

Please refer to P.A310 about high accuracy cutting conditions

Inch

Recommended range			PN series											
											ATH series			
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
0.8	2	.0031	38,400	46	32,000	38	28,800	35	27,200	33	24,000	29	22,400	18
	4	.0022	38,400	46	32,000	38	28,800	35	27,200	33	24,000	29	22,400	18
	6	.0013	34,560	41	28,800	35	25,920	31	24,480	29	24,000	29	20,160	16
	8	.0008	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	10	.0008	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
	12	.0005	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
0.9	2	.0035	38,400	54	32,000	45	28,800	40	27,200	33	24,000	29	22,400	18
	4	.0025	38,400	54	32,000	45	28,800	40	27,200	33	24,000	29	22,400	18
	6	.0014	34,560	41	28,800	40	25,920	36	24,480	29	21,600	22	20,160	16
	8	.0009	34,560	41	28,800	35	25,920	31	24,480	24	21,600	22	20,160	16
	10	.0009	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
	12	.0009	30,720	31	25,600	26	23,040	23	21,760	17	19,200	15	17,920	11
1	2	.0039	34,560	62	28,800	52	25,920	47	24,480	44	22,930	41	20,160	32
	3	.0033	34,560	62	28,800	52	25,920	47	24,480	44	22,930	41	20,160	32
	4	.0028	34,560	62	28,800	52	25,920	47	24,480	44	22,930	37	20,160	28
	5	.0022	34,560	62	28,800	52	25,920	47	24,480	39	22,930	32	20,160	28
	6	.0016	31,104	56	25,920	47	23,328	42	22,032	35	20,700	29	18,144	18
	7	.0016	31,104	56	25,920	47	23,328	42	22,032	31	20,700	29	18,144	18
	8	.0016	31,104	56	25,920	47	23,328	42	22,032	31	20,700	25	18,144	18
	9	.0013	31,104	56	25,920	47	23,328	42	22,032	31	19,440	23	18,144	18
	10	.001	31,104	56	25,920	47	23,328	42	22,032	31	19,440	23	18,144	18
	12	.001	27,648	39	23,040	32	20,736	29	19,584	20	17,280	17	16,128	13
	14	.001	27,648	39	23,040	32	20,736	29	19,584	20	17,280	17	16,128	13
	16	.0006	27,648	33	23,040	28	20,736	25	19,584	20	17,280	14	16,128	13
	20	.0004	24,828	30	20,690	25	22,345	22	17,587	14	15,518	12	14,483	9
	25	.0002	21,000	25	17,500	21	18,900	15	14,875	12	13,125	11	12,250	7
1.2	4	.0035	30,720	55	25,600	46	23,040	41	21,760	35	19,200	23	17,920	18
	6	.0033	30,720	55	25,600	46	23,040	41	21,760	35	19,200	23	17,920	18
	8	.0019	27,648	50	23,040	41	20,736	37	19,584	31	17,280	21	16,128	16
	10	.0012	27,648	50	23,040	41	20,736	37	19,584	27	17,280	21	16,128	16
	12	.0012	27,648	50	23,040	41	20,736	37	19,584	27	17,280	21	16,128	16
	16	.0008	24,576	44	20,480	37	18,432	33	17,408	24	15,360	18	14,336	14
1.4	6	.0039	26,880	48	22,400	40	20,160	36	19,040	27	16,800	20	15,680	16
	12	.0014	24,192	44	20,160	36	18,144	33	17,136	24	15,120	18	14,112	14
1.5	4	.0043	26,880	54	22,400	45	20,160	40	19,040	30	16,800	24	15,680	19
	6	.0043	26,880	54	22,400	45	20,160	40	19,040	30	16,800	24	15,680	19
	8	.0031	24,192	44	20,160	36	18,144	36	17,136	27	15,120	21	14,112	17
	10	.0024	24,192	44	20,160	36	18,144	33	17,136	27	15,120	21	14,112	17
	12	.0024	24,192	44	20,160	36	18,144	33	17,136	27	15,120	18	14,112	14
	14	.0015	24,192	44	20,160	36	18,144	33	17,136	27	15,120	18	14,112	14
	16	.0015	21,504	30	17,920	25	16,128	23	15,232	15	13,440	13	12,544	10
	18	.0015	21,504	30	17,920	25	16,128	23	15,232	15	13,440	13	12,544	10
	20	.0015	21,504	30	17,920	25	16,128	23	15,232	15	13,440	13	12,544	10
	25	.0009	16,128	19	13,440	16	12,096	15	11,424	11	10,080	8	9,408	8
	30	.0006	13,440	13	11,200	11	12,096	10	9,520	8	8,400	5	7,840	5
	35	.0004	13,440	13	11,200	11	12,096	10	9,520	8	8,400	5	7,840	5
	40	.0002	10,752	9	8,960	7	8,064	6	7,616	3	6,720	3	6,272	3
1.6	6	.0043	24,960	50	20,800	46	18,720	45	17,680	28	15,600	22	14,560	17
	8	.0043	24,960	50	20,800	46	18,720	37	17,680	28	15,600	22	14,560	17
1.8	6	.0051	24,960	50	20,800	46	18,720	45	17,680	28	15,600	25	14,560	20
	8	.0051	24,960	50	20,800	46	18,720	41	17,680	28	15,600	25	14,560	20

Recommended range			PN series						ATH series					
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
2	4	.0079	20,160	56	16,800	47	15,120	42	14,280	29	12,600	23	11,760	16
	6	.0079	20,160	56	16,800	47	15,120	42	14,280	29	12,600	23	11,760	16
	8	.0055	20,160	56	16,800	47	15,120	42	14,280	29	12,600	23	11,760	16
	10	.0055	20,160	56	16,800	47	15,120	42	14,280	29	12,600	23	11,760	16
	12	.0039	18,144	47	15,120	39	13,608	35	12,852	26	11,340	20	10,584	15
	14	.0031	18,144	47	15,120	39	13,608	35	12,852	26	11,340	20	10,584	15
	16	.0031	18,144	40	15,120	36	13,608	35	12,852	23	11,340	18	10,584	15
	18	.002	18,144	40	15,120	36	13,608	35	12,852	23	11,340	18	10,584	15
	20	.002	18,144	40	15,120	33	13,608	30	12,852	23	11,340	18	10,584	15
	25	.002	16,128	32	13,440	27	12,096	24	11,424	16	10,080	14	9,408	11
	30	.0012	16,128	32	13,440	27	12,096	24	11,424	16	10,080	14	9,408	11
	35	.0008	14,112	23	11,760	19	10,584	17	9,996	12	8,820	9	8,232	7
	40	.0004	14,112	23	11,760	19	10,584	17	9,996	12	8,820	9	8,232	7
	50	.0002	12,096	15	10,080	12	9,072	11	8,568	7	7,560	6	7,056	4
2.5	8	.0071	17,280	59	14,400	49	12,960	44	12,240	32	10,800	26	10,080	18
	12	.0071	17,280	48	14,400	49	12,960	44	12,240	27	10,800	24	10,080	16
	16	.0039	15,552	44	12,960	41	11,664	37	11,016	24	9,720	21	9,072	15
	20	.0039	15,552	44	12,960	36	11,664	33	11,016	24	9,720	21	9,072	15
	30	.0024	13,824	33	11,520	28	10,368	25	9,792	18	8,640	14	8,064	11
	40	.0012	12,096	24	10,080	20	9,072	18	8,568	12	7,560	9	7,056	8
	50	.0004	12,096	24	10,080	20	9,072	18	8,568	12	7,560	9	7,056	8
3	8	.0118	15,360	52	12,800	44	11,520	39	10,880	28	10,600	23	8,960	16
	12	.0083	15,360	52	12,800	44	11,520	39	10,880	28	10,600	23	8,960	16
	16	.0059	13,824	44	11,520	39	10,368	33	9,792	25	9,450	21	8,064	15
	20	.0047	13,824	39	11,520	37	10,368	33	9,792	25	9,450	21	8,064	15
	25	.0031	13,824	39	11,520	37	10,368	33	9,792	25	9,450	21	8,064	15
	30	.0031	13,824	39	11,520	32	10,368	29	9,792	25	9,450	21	8,064	15
	40	.002	12,288	34	10,240	29	9,216	26	8,704	19	7,680	15	7,168	11
	50	.0008	10,752	22	8,960	18	8,064	16	7,616	11	6,720	8	6,272	8
4	12	.0157	11,500	90	9,400	73	8,460	59	7,990	53	7,050	35	6,580	29
	16	.011	11,500	90	9,400	73	8,460	59	7,990	53	7,050	35	6,580	29
	20	.011	10,350	81	8,460	66	7,614	53	7,191	47	6,345	32	5,922	26
	25	.0063	10,350	72	8,460	59	7,614	49	7,191	43	6,345	32	5,922	26
	30	.0063	10,350	72	8,460	59	7,614	49	7,191	43	6,345	32	5,922	26
	35	.0039	9,137	64	7,614	53	6,853	44	6,472	39	5,711	29	5,330	23
	40	.0039	9,137	64	7,614	53	6,853	44	6,472	39	5,711	29	5,330	23
	50	.0024	7,896	44	6,580	37	5,922	33	5,593	26	4,935	18	4,606	14
5	20	.0118	9,014	70	7,512	65	6,761	58	6,385	41	5,634	28	5,258	22
	25	.0118	8,112	63	6,760	53	6,084	47	5,746	37	5,070	25	4,732	20
	30	.0079	8,112	57	6,760	47	6,084	43	5,746	33	5,070	22	4,732	18
	40	.0059	7,301	51	6,084	43	5,476	38	5,171	30	4,563	20	4,259	16
	50	.0039	7,301	51	6,084	43	5,476	38	5,171	30	4,563	20	4,259	16
6	20	.0197	7,418	64	6,182	58	5,564	52	5,255	41	4,637	31	4,327	23
	30	.0157	6,744	58	5,620	53	5,058	48	4,777	37	4,215	28	3,934	20
	40	.0118	6,744	53	5,620	44	5,058	39	4,777	33	4,215	24	3,934	18
	50	.0079	6,000	43	5,000	39	4,500	35	4,250	27	3,750	20	3,500	15

※a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Square Evolution

Recommended cutting conditions EPDSE-ATH EPDSE-PN

High efficiency cutting conditions | High accuracy cutting conditions

Please refer to P.A307 about high efficiency cutting conditions

Inch

Recommended range			PN series						ATH series					
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
	0.3	.0002	50,000	20	50,000	20	50,000	10	48,600	10	42,750	9	40,050	8
	0.5	.0002	50,000	20	50,000	20	50,000	10	48,600	10	42,750	9	40,050	8
	1	.0001	50,000	10	50,000	10	48,600	10	43,700	9	38,500	8	36,050	7
	0.5	.0006	50,000	20	45,000	18	40,500	16	38,250	15	33,750	7	31,500	6
	1	.0004	50,000	20	45,000	18	40,500	16	38,250	15	33,750	7	31,500	6
	1.5	.0002	48,600	19	40,500	16	36,450	15	34,425	14	30,375	6	28,350	6
	2	.0002	43,200	17	36,000	14	32,400	13	30,600	6	27,000	5	25,200	5
	3	.0001	43,200	17	36,000	14	32,400	13	30,600	6	27,000	5	25,200	5
	1	.0008	48,000	19	40,000	16	36,000	14	34,000	14	30,000	12	28,000	6
	1.5	.0008	48,000	19	40,000	16	36,000	14	34,000	14	30,000	12	28,000	6
	2	.0005	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	5
	2.5	.0004	43,200	17	36,000	14	32,400	13	30,600	12	27,000	11	25,200	5
	3	.0003	43,200	17	36,000	14	32,400	13	30,600	12	27,000	5	25,200	5
	1	.0016	38,400	31	32,000	26	28,800	23	27,200	16	24,000	10	22,400	9
	1.5	.0011	38,400	31	32,000	26	28,800	23	27,200	16	24,000	10	22,400	9
	2	.0011	38,400	31	32,000	26	28,800	23	27,200	16	24,000	10	22,400	9
	2.5	.0009	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	3	.0006	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	3.5	.0005	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	4	.0004	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	5	.0004	30,720	18	25,600	10	23,040	9	21,760	9	19,200	8	17,920	7
	6	.0002	30,720	18	25,600	10	23,040	9	21,760	9	19,200	8	17,920	7
	8	.0001	26,880	11	22,400	9	20,160	8	19,040	8	16,800	7	15,680	6
	10	.0001	23,040	9	19,200	8	17,280	7	16,320	7	14,400	6	13,440	3
	1	.002	38,400	31	32,000	26	28,800	23	27,200	16	24,000	10	22,400	9
	1.5	.002	38,400	31	32,000	26	28,800	23	27,200	16	24,000	10	22,400	9
	2	.0014	38,400	31	32,000	26	28,800	23	27,200	16	24,000	10	22,400	9
	2.5	.0012	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	3	.0008	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	4	.0008	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	5	.0005	34,560	21	28,800	17	25,920	16	24,480	15	21,600	9	20,160	8
	6	.0005	30,720	18	25,600	15	23,040	14	21,760	9	19,200	8	17,920	7
	8	.0003	30,720	12	25,600	10	23,040	9	21,760	9	19,200	8	17,920	4
	10	.0002	26,880	11	22,400	9	20,160	8	19,040	4	16,800	3	15,680	3
	2	.0017	38,400	46	32,000	38	28,800	35	27,200	22	24,000	19	22,400	13
	3	.0014	34,560	35	28,800	29	25,920	26	24,480	20	21,600	17	20,160	12
	4	.0009	34,560	35	28,800	29	25,920	26	24,480	20	21,600	17	20,160	12
	5	.0008	34,560	35	28,800	29	25,920	21	24,480	20	21,600	13	20,160	12
	6	.0006	34,560	35	28,800	29	25,920	21	24,480	20	21,600	13	20,160	12
	7	.0006	30,720	25	25,600	20	23,040	18	21,760	17	19,200	12	17,920	11
	8	.0006	30,720	25	25,600	20	23,040	18	21,760	13	19,200	12	17,920	7
	9	.0005	30,720	25	25,600	20	23,040	18	21,760	13	19,200	12	17,920	7
	10	.0004	30,720	25	25,600	20	23,040	18	21,760	13	19,200	12	17,920	7
	2	.0028	38,400	46	32,000	38	28,800	35	27,200	22	24,000	19	22,400	13
	4	.0019	34,560	35	28,800	29	25,920	21	24,480	20	21,600	13	20,160	12
	6	.0007	34,560	35	28,800	29	25,920	21	24,480	20	21,600	13	20,160	12
	8	.0007	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7
	10	.0007	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7

Recommended range			PN series						ATH series					
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
0.8	2	.0031	38,400	46	32,000	38	28,800	35	27,200	27	24,000	19	22,400	18
	4	.0022	38,400	46	32,000	38	28,800	35	27,200	27	24,000	19	22,400	18
	6	.0013	34,560	35	28,800	29	25,920	21	24,480	24	21,600	17	20,160	16
	8	.0008	34,560	35	28,800	29	25,920	21	24,480	20	21,600	13	20,160	12
	10	.0008	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7
	12	.0005	30,720	25	25,600	20	23,040	18	21,760	9	19,200	8	17,920	7
0.9	2	.0035	38,400	46	32,000	38	28,800	35	27,200	27	24,000	19	22,400	18
	4	.0025	38,400	46	32,000	38	28,800	35	27,200	27	24,000	19	22,400	18
	6	.0014	34,560	41	28,800	35	25,920	31	24,480	24	21,600	17	20,160	16
	8	.0009	34,560	41	28,800	29	25,920	31	24,480	24	21,600	17	20,160	16
	10	.0009	30,720	25	25,600	20	23,040	18	21,760	13	19,200	12	17,920	7
	12	.0009	30,720	25	25,600	20	23,040	18	21,760	13	19,200	12	17,920	7
1	2	.0035	34,560	55	28,800	46	25,920	41	24,480	34	21,600	26	20,160	24
	3	.0028	34,560	55	28,800	46	25,920	41	24,480	34	21,600	26	20,160	24
	4	.0026	34,560	55	28,800	46	25,920	41	24,480	34	21,600	26	20,160	24
	5	.002	34,560	55	28,800	46	25,920	41	24,480	34	21,600	26	20,160	24
	6	.0014	31,104	50	25,920	36	23,328	33	22,032	31	19,440	23	18,144	18
	7	.0014	31,104	50	25,920	36	23,328	33	22,032	31	19,440	23	18,144	18
	8	.0014	31,104	44	25,920	36	23,328	33	22,032	31	19,440	23	18,144	18
	9	.0012	31,104	44	25,920	36	23,328	33	22,032	26	19,440	19	18,144	15
	10	.0009	31,104	44	25,920	36	23,328	33	22,032	26	19,440	19	18,144	15
	12	.0009	27,648	33	23,040	28	20,736	25	19,584	16	17,280	14	16,128	13
	14	.0009	27,648	33	23,040	28	20,736	25	19,584	16	17,280	14	16,128	13
	16	.0005	27,648	28	23,040	23	20,736	21	19,584	16	17,280	14	16,128	10
	20	.0003	24,828	25	20,690	21	18,621	19	17,587	11	15,518	9	14,483	6
	25	.0002	21,000	17	17,500	14	15,750	13	14,875	9	13,125	5	12,250	5
1.2	4	.0035	30,720	49	25,600	41	23,040	37	21,760	30	19,200	19	17,920	18
	6	.0033	30,720	49	25,600	41	23,040	37	21,760	30	19,200	19	17,920	18
	8	.0019	27,648	39	23,040	32	20,736	29	19,584	27	17,280	17	16,128	16
	10	.0012	27,648	39	23,040	32	20,736	29	19,584	27	17,280	17	16,128	16
	12	.0012	27,648	39	23,040	28	20,736	25	19,584	24	17,280	17	16,128	13
	16	.0008	24,576	34	20,480	29	18,432	22	17,408	21	15,360	15	14,336	11
1.4	6	.0039	26,880	43	22,400	36	20,160	32	19,040	23	16,800	17	15,680	16
	12	.0014	24,192	34	20,160	28	18,144	25	17,136	21	15,120	15	14,112	14
1.5	4	.0043	26,880	48	22,400	40	20,160	36	19,040	27	16,800	20	15,680	16
	6	.0043	26,880	43	22,400	36	20,160	32	19,040	27	16,800	20	15,680	16
	8	.0024	24,192	44	20,160	36	18,144	33	17,136	24	15,120	18	14,112	14
	10	.0024	24,192	44	20,160	28	18,144	25	17,136	24	15,120	18	14,112	14
	12	.0024	24,192	34	20,160	28	18,144	25	17,136	24	15,120	15	14,112	14
	14	.0015	24,192	34	20,160	28	18,144	25	17,136	24	15,120	15	14,112	14
	16	.0015	21,504	30	17,920	25	16,128	23	15,232	15	13,440	13	12,544	10
	18	.0015	21,504	30	17,920	25	16,128	23	15,232	15	13,440	13	12,544	10
	20	.0015	21,504	30	17,920	25	16,128	19	15,232	12	13,440	11	12,544	10
	25	.0009	16,128	19	13,440	16	12,096	12	11,424	9	10,080	8	9,408	6
	30	.0006	13,440	13	11,200	11	12,096	10	9,520	6	8,400	5	7,840	3
	35	.0004	13,440	11	11,200	9	12,096	7	9,520	6	8,400	5	7,840	3
	40	.0002	10,752	6	8,960	5	8,064	5	7,616	3	6,720	3	6,272	3
1.6	6	.0043	24,960	45	20,800	37	18,720	34	17,680	28	15,600	22	14,560	17
	8	.0043	24,960	45	20,800	37	18,720	34	17,680	25	15,600	22	14,560	17
1.8	6	.0051	24,960	45	20,800	37	18,720	34	17,680	28	15,600	22	14,560	17
	8	.0051	24,960	45	20,800	37	18,720	34	17,680	25	15,600	22	14,560	17

【Note】 Please refer to P.A312

Epoch Deep Square Evolution

High efficiency cuttiing conditions | **High accuracy cuttiing conditions**

Please refer to P.A307 about high efficiency cutting conditions

Inch

Recommended range			PN series								ATH series			
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (inch)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
2	4	.0079	20,160	48	16,800	37	15,120	33	14,280	26	12,600	20	11,760	16
	6	.0079	20,160	48	16,800	37	15,120	33	14,280	26	12,600	20	11,760	16
	8	.0055	20,160	48	16,800	37	15,120	33	14,280	26	12,600	20	11,760	16
	10	.0055	20,160	48	16,800	37	15,120	33	14,280	26	12,600	20	11,760	16
	12	.0031	18,144	40	15,120	33	13,608	30	12,852	23	11,340	18	10,584	15
	14	.0031	18,144	40	15,120	33	13,608	30	12,852	23	11,340	18	10,584	13
	16	.0031	18,144	36	15,120	30	13,608	27	12,852	21	11,340	16	10,584	13
	18	.0020	18,144	36	15,120	30	13,608	27	12,852	21	11,340	16	10,584	13
	20	.0020	18,144	33	15,120	27	13,608	24	12,852	18	11,340	14	10,584	13
	25	.0020	16,128	29	13,440	24	12,096	22	11,424	14	10,080	12	9,408	9
	30	.0012	16,128	26	13,440	22	12,096	19	11,424	11	10,080	12	9,408	8
	35	.0008	14,112	20	11,760	14	10,584	13	9,996	8	8,820	7	8,232	7
	40	.0004	14,112	17	11,760	14	10,586	13	9,996	8	8,820	7	8,232	5
	50	.0002	12,096	12	10,080	10	9,072	7	8,568	5	7,560	3	7,056	3
2.5	8	.0071	17,280	52	14,400	43	12,960	39	12,240	27	10,800	22	10,080	16
	12	.0071	17,280	45	14,400	40	12,960	36	12,240	24	10,800	19	10,080	14
	16	.0039	15,552	40	12,960	34	11,664	30	11,016	22	9,720	17	9,072	13
	20	.0039	15,552	34	12,960	31	11,664	28	11,016	20	9,720	17	9,072	13
	30	.0024	13,824	28	11,520	23	10,368	19	9,792	14	8,640	10	8,064	10
	40	.0012	12,096	17	10,080	14	9,072	13	8,568	10	7,560	8	7,056	6
	50	.0004	12,096	15	10,080	14	9,072	13	8,568	9	7,560	6	7,056	6
3	8	.0118	15,360	46	12,800	38	11,520	35	10,880	24	9,600	19	8,960	14
	12	.0083	15,360	46	12,800	38	11,520	35	10,880	24	9,600	19	8,960	14
	16	.0047	13,824	39	11,520	32	10,368	29	9,792	22	8,640	17	8,064	13
	20	.0047	13,824	36	11,520	30	10,368	27	9,792	22	8,640	17	8,064	13
	25	.0031	13,824	36	11,520	30	10,368	27	9,792	22	8,640	17	8,064	13
	30	.0031	13,824	30	11,520	25	10,368	23	9,792	22	8,640	17	8,064	11
	40	.002	12,288	25	10,240	20	9,216	18	8,704	14	7,680	12	7,168	10
	50	.0008	10,752	15	8,960	13	8,064	11	7,616	8	6,720	5	6,272	5
4	12	.0157	11,500	81	9,400	66	8,460	54	7,990	48	7,050	32	6,580	26
	16	.011	11,500	81	9,400	66	8,460	54	7,990	48	7,050	32	6,580	26
	20	.011	10,350	72	8,460	59	7,614	49	7,191	43	6,345	29	5,922	24
	25	.0063	10,350	66	8,460	54	7,614	44	7,191	39	6,345	29	5,922	24
	30	.0063	10,350	66	8,460	54	7,614	44	7,191	35	6,345	25	5,922	24
	35	.0039	9,137	51	7,614	43	6,853	36	6,472	31	5,711	23	5,330	18
	40	.0039	9,137	46	7,614	38	6,853	30	6,472	27	5,711	21	5,330	16
	50	.0024	7,896	32	6,580	26	7,106	24	5,593	18	4,935	12	4,606	10
5	20	.0118	9,014	63	7,512	53	6,761	47	6,385	37	5,634	25	5,258	20
	25	.0118	8,112	57	6,760	47	6,084	43	5,746	33	5,070	22	4,732	18
	30	.0079	8,112	52	6,760	43	6,084	39	5,746	30	5,070	20	4,732	16
	40	.0059	7,301	41	6,084	34	5,476	31	5,171	24	4,563	16	4,259	13
	50	.0039	7,301	39	6,084	34	5,476	27	5,171	23	4,563	14	4,259	11
6	20	.0197	7,418	58	6,182	48	5,564	43	5,255	34	4,637	23	4,327	18
	30	.0157	6,744	53	5,620	44	5,058	39	4,777	31	4,215	21	3,934	17
	40	.0118	6,744	47	5,620	39	5,058	35	4,777	28	4,215	19	3,934	15
	50	.0079	6,000	38	5,000	32	4,500	29	4,250	26	3,750	17	3,500	13

※ap is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Recommended cutting conditions EPDSE-ATH EPDSE-PN

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A316 about high accuracy cutting conditions

Metric

Recommended range			PN series						ATH series					
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
0.1	0.3	0.006	50,000	500	50,000	500	50,000	475	48,600	348	42,750	255	40,050	208
	0.5	0.004	50,000	500	50,000	500	50,000	475	48,600	348	42,750	255	40,050	208
	1	0.003	50,000	455	50,000	455	48,600	430	43,700	315	38,500	232	36,050	187
0.2	0.5	0.02	50,000	708	45,000	638	40,500	574	38,250	403	33,750	301	31,500	242
	1	0.014	50,000	708	45,000	638	40,500	574	38,250	403	33,750	301	31,500	242
	1.5	0.008	48,600	630	40,500	525	36,450	472	34,425	362	30,375	271	28,350	218
	2	0.005	43,200	504	36,000	420	32,400	378	30,600	286	27,000	214	25,200	172
	3	0.003	43,200	454	36,000	378	32,400	340	30,600	257	27,000	193	25,200	155
0.3	1	0.021	48,000	680	40,000	567	36,000	510	34,000	358	30,000	267	28,000	216
	1.5	0.021	48,000	680	40,000	567	36,000	510	34,000	358	30,000	267	28,000	216
	2	0.012	43,200	560	36,000	467	32,400	420	30,600	322	27,000	241	25,200	194
	2.5	0.01	43,200	560	36,000	467	32,400	420	30,600	322	27,000	241	25,200	194
	3	0.008	43,200	560	36,000	467	32,400	420	30,600	322	27,000	241	25,200	194
0.4	1	0.04	38,400	847	32,000	706	28,800	635	27,200	446	24,000	333	22,400	268
	1.5	0.028	38,400	847	32,000	706	28,800	635	27,200	446	24,000	333	22,400	268
	2	0.028	38,400	847	32,000	706	28,800	635	27,200	446	24,000	333	22,400	268
	2.5	0.022	34,560	697	28,800	581	25,920	523	24,480	401	21,600	299	20,160	241
	3	0.016	34,560	697	28,800	581	25,920	523	24,480	401	21,600	299	20,160	241
	3.5	0.012	34,560	697	28,800	581	25,920	523	24,480	401	21,600	299	20,160	241
	4	0.01	34,560	697	28,800	581	25,920	523	24,480	401	21,600	299	20,160	241
	5	0.01	30,720	542	25,600	452	23,040	406	21,760	260	19,200	230	17,920	181
	6	0.006	30,720	542	25,600	452	23,040	406	21,760	260	19,200	230	17,920	181
	8	0.003	26,880	413	22,400	344	20,160	310	19,040	200	16,800	172	15,680	131
	10	0.002	23,040	304	19,200	253	17,280	228	16,320	147	14,400	127	13,440	96
0.5	1	0.05	38,400	847	32,000	706	28,800	635	27,200	535	24,000	333	22,400	268
	1.5	0.05	38,400	847	32,000	706	28,800	635	27,200	535	24,000	333	22,400	268
	2	0.035	38,400	847	32,000	706	28,800	635	27,200	535	24,000	333	22,400	268
	2.5	0.03	34,560	697	28,800	581	25,920	523	24,480	441	21,600	299	20,160	241
	3	0.02	34,560	697	28,800	581	25,920	523	24,480	441	21,600	299	20,160	241
	4	0.02	34,560	697	28,800	581	25,920	523	24,480	401	21,600	299	20,160	241
	5	0.013	34,560	697	28,800	581	25,920	523	24,480	401	21,600	299	20,160	241
	6	0.013	30,720	542	25,600	452	23,040	406	21,760	260	19,200	230	17,920	181
	8	0.008	30,720	464	25,600	387	23,040	348	21,760	247	19,200	194	17,920	147
	10	0.004	26,880	360	22,400	300	20,160	270	19,040	174	16,800	150	15,680	114
0.6	2	0.042	38,400	1,210	32,000	1,008	28,800	907	27,200	636	24,000	475	22,400	383
	3	0.035	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	4	0.024	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	5	0.02	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	6	0.015	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	7	0.015	30,720	859	25,600	716	23,040	644	21,760	494	19,200	369	17,920	298
	8	0.015	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
	9	0.012	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
	10	0.009	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
0.7	2	0.07	38,400	1,210	32,000	1,008	28,800	907	27,200	636	24,000	475	22,400	384
	4	0.049	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	6	0.018	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	8	0.018	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
	10	0.018	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258

【Note】 Please refer to P.A315

Epoch Deep Square Evolution

EPDSE-ATH **EPDSE-PN** High efficiency cuttiing conditions High accuracy cuttiing conditions

Please refer to P.A316 about high accuracy cutting conditions

Metric

Recommended range			PN series / ATH series											
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
0.8	2	0.08	38,400	1,210	32,000	1,008	28,800	907	27,200	780	24,000	688	22,400	422
	4	0.056	38,400	1,210	32,000	1,008	28,800	907	27,200	780	24,000	688	22,400	422
	6	0.032	34,560	995	28,800	829	25,920	746	24,480	678	24,000	665	20,160	379
	8	0.02	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	10	0.02	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
	12	0.012	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
0.9	2	0.09	38,400	1,326	32,000	1,205	28,800	1,085	27,200	833	24,000	674	22,400	502
	4	0.063	38,400	1,326	32,000	1,205	28,800	1,085	27,200	833	24,000	674	22,400	502
	6	0.036	34,560	1094	28,800	994	25,920	895	24,480	687	21,600	556	20,160	414
	8	0.023	34,560	1094	28,800	911	25,920	820	24,480	630	21,600	513	20,160	379
	10	0.023	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
	12	0.023	30,720	774	25,600	645	23,040	581	21,760	372	19,200	328	17,920	258
1	2	0.1	34,560	1,628	28,800	1,356	25,920	1,220	24,480	1,150	22,930	1,008	20,160	846
	3	0.085	34,560	1,628	28,800	1,356	25,920	1,220	24,480	1,150	22,930	1,008	20,160	846
	4	0.07	34,560	1,628	28,800	1,356	25,920	1,220	24,480	1,077	22,930	963	20,160	766
	5	0.055	34,560	1,628	28,800	1,356	25,920	1,220	24,480	1,028	22,930	871	20,160	685
	6	0.04	31,104	1,344	25,920	1,120	23,328	1,008	22,032	903	20,700	745	18,144	465
	7	0.04	31,104	1,344	25,920	1,120	23,328	1,008	22,032	837	20,700	703	18,144	465
	8	0.04	31,104	1,344	25,920	1,120	23,328	1,008	22,032	837	20,700	622	18,144	465
	9	0.033	31,104	1,344	25,920	1,120	23,328	1,008	22,032	773	19,440	577	18,144	465
	10	0.025	31,104	1,344	25,920	1,120	23,328	1,008	22,032	773	19,440	577	18,144	465
	12	0.025	27,648	1,045	23,040	871	20,736	784	19,584	502	17,280	443	16,128	348
	14	0.025	27,648	1,045	23,040	871	20,736	784	19,584	502	17,280	443	16,128	348
	16	0.015	27,648	896	23,040	746	20,736	672	19,584	476	17,280	373	16,128	283
	20	0.01	24,828	732	20,690	610	22,345	549	17,587	348	15,518	305	14,483	226
	25	0.005	21,000	569	17,500	474	18,900	427	14,875	270	13,125	237	12,250	175
1.2	4	0.09	30,720	1,452	25,600	1,210	23,040	1,089	21,760	870	19,200	570	17,920	460
	6	0.084	30,720	1,452	25,600	1,210	23,040	1,089	21,760	870	19,200	570	17,920	460
	8	0.048	27,648	1,194	23,040	995	20,736	896	19,584	783	17,280	513	16,128	414
	10	0.03	27,648	1,194	23,040	995	20,736	896	19,584	744	17,280	513	16,128	414
	12	0.03	27,648	1,194	23,040	995	20,736	896	19,584	687	17,280	513	16,128	414
	16	0.02	24,576	1,061	20,480	884	18,432	796	17,408	611	15,360	456	14,336	368
1.4	6	0.1	26,880	1,270	22,400	1,058	20,160	953	19,040	668	16,800	499	15,680	403
	12	0.035	24,192	1,045	20,160	871	18,144	784	17,136	601	15,120	449	14,112	362
1.5	4	0.11	26,880	1,397	22,400	1,163	20,160	1048	19,040	801	16,800	648	15,680	482
	6	0.11	26,880	1,397	22,400	1,163	20,160	1048	19,040	801	16,800	623	15,680	482
	8	0.08	24,192	1,149	20,160	958	18,144	940	17,136	721	15,120	538	14,112	416
	10	0.06	24,192	1,149	20,160	871	18,144	862	17,136	721	15,120	538	14,112	416
	12	0.06	24,192	1,045	20,160	871	18,144	784	17,136	721	15,120	449	14,112	362
	14	0.038	24,192	1,045	20,160	871	18,144	784	17,136	721	15,120	449	14,112	362
	16	0.038	21,504	813	17,920	677	16,128	610	15,232	391	13,440	345	12,544	271
	18	0.038	21,504	813	17,920	677	16,128	610	15,232	391	13,440	345	12,544	271
	20	0.038	21,504	813	17,920	677	16,128	610	15,232	391	13,440	345	12,544	271
	25	0.023	16,128	523	13,440	435	12,096	392	11,424	278	10,080	218	9,408	165
	30	0.015	13,440	355	11,200	296	12,096	266	9,520	178	8,400	139	7,840	112
	35	0.01	13,440	355	11,200	296	12,096	266	9,520	178	8,400	139	7,840	112
	40	0.005	10,752	190	8,960	158	8,064	142	7,616	95	6,720	74	6,272	60
1.6	6	0.11	24,960	1,310	20,800	1,201	18,720	1,130	17,680	759	15,600	566	14,560	456
	8	0.11	24,960	1,310	20,800	1,201	18,720	983	17,680	690	15,600	566	14,560	456
1.8	6	0.13	24,960	1,310	20,800	1,201	18,720	1,179	17,680	759	15,600	618	14,560	498
	8	0.13	24,960	1,310	20,800	1,201	18,720	1,081	17,680	690	15,600	618	14,560	498

Recommended range			PN series / ATH series											
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	a_p (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
2	4	0.2	20,160	1,397	16,800	1,174	15,120	1,048	14,280	734	12,600	548	11,760	443
	6	0.2	20,160	1,397	16,800	1,174	15,120	1,048	14,280	734	12,600	548	11,760	443
	8	0.14	20,160	1,397	16,800	1,174	15,120	1,048	14,280	734	12,600	548	11,760	443
	10	0.14	20,160	1,397	16,800	1,174	15,120	1,048	14,280	734	12,600	548	11,760	443
	12	0.1	18,144	1,149	15,120	958	13,608	862	12,852	661	11,340	493	10,584	398
	14	0.08	18,144	1,149	15,120	958	13,608	862	12,852	661	11,340	493	10,584	362
	16	0.08	18,144	1,045	15,120	914	13,608	862	12,852	601	11,340	449	10,584	362
	18	0.05	18,144	1,045	15,120	914	13,608	862	12,852	601	11,340	449	10,584	362
	20	0.05	18,144	1,045	15,120	871	13,608	784	12,852	601	11,340	449	10,584	362
	25	0.05	16,128	813	13,440	677	12,096	610	11,424	391	10,080	345	9,408	271
	30	0.03	16,128	813	13,440	677	12,096	610	11,424	391	10,080	345	9,408	271
	35	0.02	14,112	583	11,760	486	10,584	437	9,996	282	8,820	228	8,232	185
	40	0.01	14,112	583	11,760	486	10,584	437	9,996	282	8,820	228	8,232	185
	50	0.005	12,096	355	10,080	296	9,072	266	8,568	172	7,560	139	7,056	112
2.5	8	0.18	17,280	1,497	14,400	1,247	12,960	1,123	12,240	787	10,800	642	10,080	474
	12	0.18	17,280	1,260	14,400	1,247	12,960	1,123	12,240	716	10,800	588	10,080	431
	16	0.1	15,552	1,120	12,960	1,073	11,664	966	11,016	644	9,720	529	9,072	388
	20	0.1	15,552	1,120	12,960	933	11,664	840	11,016	644	9,720	529	9,072	388
	30	0.06	13,824	870	11,520	725	10,368	653	9,792	435	8,640	341	8,064	276
	40	0.03	12,096	625	10,080	521	9,072	469	8,568	313	7,560	245	7,056	198
	50	0.01	12,096	625	10,080	521	9,072	469	8,568	313	7,560	245	7,056	198
3	8	0.3	15,360	1,331	12,800	1,108	11,520	997	10,880	699	10,600	570	8,960	422
	12	0.21	15,360	1,331	12,800	1,108	11,520	997	10,880	699	10,600	570	8,960	422
	16	0.15	13,824	1,144	11,520	994	10,368	820	9,792	630	9,450	513	8,064	379
	20	0.12	13,824	995	11,520	911	10,368	820	9,792	630	9,450	513	8,064	379
	25	0.08	13,824	995	11,520	911	10,368	820	9,792	630	9,450	513	8,064	379
	30	0.08	13,824	995	11,520	829	10,368	746	9,792	630	9,450	513	8,064	347
	40	0.05	12,288	884	10,240	737	9,216	663	8,704	509	7,680	380	7,168	307
	50	0.02	10,752	556	8,960	463	8,064	417	7,616	278	6,720	218	6,272	176
4	12	0.4	11,500	2,300	9,400	1,880	8,460	1,524	7,990	1,358	7,050	902	6,580	728
	16	0.28	11,500	2,300	9,400	1,880	8,460	1,524	7,990	1,358	7,050	902	6,580	728
	20	0.28	10,350	2,070	8,460	1,692	7,614	1,371	7,191	1,222	6,345	812	5,922	655
	25	0.16	10,350	1,863	8,460	1,524	7,614	1,233	7,191	1,100	6,345	812	5,922	655
	30	0.16	10,350	1,863	8,460	1,524	7,614	1,233	7,191	1,100	6,345	812	5,922	655
	35	0.1	9,137	1,645	7,614	1,371	6,853	1,110	6,472	990	5,711	731	5,330	589
	40	0.1	9,137	1,645	7,614	1,371	6,853	1,110	6,472	990	5,711	731	5,330	589
	50	0.06	7,896	1,128	6,580	940	5,922	846	5,593	658	4,935	442	4,606	357
5	20	0.3	9,014	1,802	7,512	1,652	6,761	1,487	6,385	1,051	5,634	706	5,258	571
	25	0.3	8,112	1,621	6,760	1,351	6,084	1,216	5,746	946	5,070	635	4,732	513
	30	0.2	8,112	1,461	6,760	1,217	6,084	1,094	5,746	851	5,070	573	4,732	462
	40	0.15	7,301	1,315	6,084	1,096	5,476	986	5,171	767	4,563	515	4,259	416
	50	0.1	7,301	1,315	6,084	1,096	5,476	986	5,171	767	4,563	515	4,259	416
6	20	0.5	7,418	1,629	6,182	1,481	5,564	1,333	5,255	1,036	4,637	766	4,327	562
	30	0.4	6,744	1,480	5,620	1,346	5,058	1,212	4,777	942	4,215	696	3,934	511
	40	0.3	6,744	1,332	5,620	1,109	5,058	998	4,777	847	4,215	625	3,934	459
	50	0.2	6,000	1,090	5,000	986	4,500	887	4,250	690	3,750	515	3,500	379

※a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch Deep Square Evolution

Recommended cutting conditions EPDSE-ATH EPDSE-PN

High efficiency cuttiing conditions | High accuracy cuttiing conditions

Please refer to P.A313 about high efficiency cutting conditions

Metric

Recommended range			PN series						ATH series					
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
0.1	0.3	0.006	50,000	350	50,000	350	50,000	332	48,600	242	42,750	178	40,050	144
	0.5	0.004	50,000	350	50,000	350	50,000	332	48,600	242	42,750	178	40,050	144
	1	0.003	50,000	318	50,000	318	48,600	301	43,700	220	38,500	162	36,050	129
0.2	0.5	0.015	50,000	495	45,000	446	40,500	401	38,250	282	33,750	210	31,500	169
	1	0.011	50,000	495	45,000	446	40,500	401	38,250	282	33,750	210	31,500	169
	1.5	0.006	48,600	441	40,500	367	36,450	330	34,425	253	30,375	189	28,350	152
	2	0.004	43,200	352	36,000	294	32,400	264	30,600	200	27,000	165	25,200	147
	3	0.002	43,200	317	36,000	264	32,400	238	30,600	179	27,000	165	25,200	133
0.3	1	0.021	48,000	544	40,000	453	36,000	408	34,000	286	30,000	240	28,000	193
	1.5	0.021	48,000	544	40,000	453	36,000	408	34,000	286	30,000	240	28,000	193
	2	0.012	43,200	448	36,000	373	32,400	336	30,600	257	27,000	192	25,200	155
	2.5	0.01	43,200	448	36,000	373	32,400	336	30,600	257	27,000	192	25,200	155
	3	0.008	43,200	448	36,000	373	32,400	336	30,600	257	27,000	180	25,200	145
0.4	1	0.04	38,400	762	32,000	635	28,800	571	27,200	401	24,000	297	22,400	241
	1.5	0.028	38,400	762	32,000	635	28,800	571	27,200	401	24,000	297	22,400	241
	2	0.028	38,400	762	32,000	635	28,800	571	27,200	401	24,000	297	22,400	241
	2.5	0.022	34,560	557	28,800	464	25,920	418	24,480	320	21,600	239	20,160	192
	3	0.016	34,560	557	28,800	464	25,920	418	24,480	320	21,600	239	20,160	192
	3.5	0.012	34,560	557	28,800	464	25,920	418	24,480	320	21,600	239	20,160	192
	4	0.01	34,560	557	28,800	464	25,920	418	24,480	320	21,600	239	20,160	192
	5	0.01	30,720	406	25,600	316	23,040	284	21,760	208	19,200	184	17,920	144
	6	0.006	30,720	406	25,600	316	23,040	284	21,760	208	19,200	184	17,920	144
	8	0.003	26,880	289	22,400	240	20,160	217	19,040	160	16,800	141	15,680	128
	10	0.002	23,040	212	19,200	177	17,280	159	16,320	117	14,400	103	13,440	94
0.5	1	0.05	38,400	762	32,000	635	28,800	571	27,200	446	24,000	299	22,400	241
	1.5	0.05	38,400	762	32,000	635	28,800	571	27,200	446	24,000	299	22,400	241
	2	0.035	38,400	762	32,000	635	28,800	571	27,200	446	24,000	299	22,400	241
	2.5	0.03	34,560	557	28,800	464	25,920	418	24,480	354	21,600	239	20,160	192
	3	0.02	34,560	557	28,800	464	25,920	418	24,480	354	21,600	239	20,160	192
	4	0.02	34,560	557	28,800	464	25,920	418	24,480	320	21,600	239	20,160	192
	5	0.013	34,560	557	28,800	464	25,920	418	24,480	320	21,600	239	20,160	192
	6	0.013	30,720	433	25,600	361	23,040	324	21,760	208	19,200	184	17,920	144
	8	0.008	30,720	371	25,600	309	23,040	278	21,760	172	19,200	155	17,920	117
	10	0.004	26,880	288	22,400	240	20,160	216	19,040	121	16,800	105	15,680	79
0.6	2	0.042	38,400	1,089	32,000	907	28,800	816	27,200	572	24,000	427	22,400	344
	3	0.035	34,560	895	28,800	746	25,920	671	24,480	515	21,600	385	20,160	310
	4	0.024	34,560	895	28,800	746	25,920	671	24,480	515	21,600	385	20,160	310
	5	0.02	34,560	796	28,800	663	25,920	596	24,480	458	21,600	342	20,160	276
	6	0.015	34,560	796	28,800	663	25,920	596	24,480	458	21,600	342	20,160	276
	7	0.015	30,720	687	25,600	572	23,040	515	21,760	395	19,200	295	17,920	238
	8	0.015	30,720	595	25,600	516	23,040	464	21,760	297	19,200	262	17,920	206
	9	0.012	30,720	595	25,600	516	23,040	464	21,760	297	19,200	262	17,920	206
	10	0.009	30,720	595	25,600	516	23,040	464	21,760	297	19,200	262	17,920	206
0.7	2	0.07	38,400	1,089	32,000	907	28,800	816	27,200	572	24,000	427	22,400	344
	4	0.049	34,560	796	28,800	663	25,920	596	24,480	458	21,600	342	20,160	276
	6	0.018	34,560	796	28,800	663	25,920	596	24,480	458	21,600	342	20,160	276
	8	0.018	30,720	541	25,600	451	23,040	406	21,760	260	19,200	229	17,920	180
	10	0.018	30,720	541	25,600	451	23,040	406	21,760	260	19,200	229	17,920	180

Metric

Recommended range			PN series								ATH series			
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
0.8	2	0.08	38,400	1,089	32,000	907	28,800	816	27,200	636	24,000	475	22,400	383
	4	0.056	38,400	1,089	32,000	907	28,800	816	27,200	636	24,000	475	22,400	383
	6	0.032	34,560	796	28,800	663	25,920	596	24,480	573	21,600	428	20,160	345
	8	0.02	34,560	796	28,800	663	25,920	596	24,480	458	21,600	342	20,160	276
	10	0.02	30,720	541	25,600	451	23,040	406	21,760	260	19,200	229	17,920	180
	12	0.012	30,720	541	25,600	451	23,040	406	21,760	260	19,200	229	17,920	180
0.9	2	0.09	38,400	1,206	32,000	1,005	28,800	904	27,200	695	24,000	519	22,400	418
	4	0.063	38,400	1,206	32,000	1,005	28,800	904	27,200	695	24,000	519	22,400	418
	6	0.036	34,560	995	28,800	829	25,920	746	24,480	573	21,600	428	20,160	345
	8	0.023	34,560	995	28,800	746	25,920	746	24,480	573	21,600	428	20,160	345
	10	0.023	30,720	619	25,600	516	23,040	464	21,760	297	19,200	262	17,920	206
	12	0.023	30,720	541	25,600	451	23,040	414	21,760	297	19,200	262	17,920	206
1	2	0.09	34,560	1,465	28,800	1,220	25,920	1,098	24,480	936	21,600	699	20,160	563
	3	0.07	34,560	1,465	28,800	1,220	25,920	1,098	24,480	936	21,600	699	20,160	563
	4	0.065	34,560	1,465	28,800	1,220	25,920	1,098	24,480	936	21,600	699	20,160	563
	5	0.05	34,560	1,465	28,800	1,220	25,920	1,098	24,480	936	21,600	699	20,160	563
	6	0.035	31,104	1,276	25,920	1,008	23,328	907	22,032	773	19,440	577	18,144	418
	7	0.035	31,104	1,276	25,920	1,008	23,328	907	22,032	773	19,440	577	18,144	418
	8	0.035	31,104	1,209	25,920	1,008	23,328	907	22,032	773	19,440	577	18,144	418
	9	0.03	31,104	1,209	25,920	1,008	23,328	907	22,032	695	19,440	461	18,144	372
	10	0.022	31,104	1,209	25,920	896	23,328	816	22,032	695	19,440	461	18,144	372
	12	0.022	27,648	836	23,040	696	20,736	627	19,584	401	17,280	354	16,128	278
	14	0.022	27,648	836	23,040	696	20,736	627	19,584	401	17,280	354	16,128	278
	16	0.012	27,648	716	23,040	596	20,736	537	19,584	380	17,280	298	16,128	226
	20	0.008	24,828	586	20,690	488	18,621	439	17,587	278	15,518	213	14,483	158
	25	0.005	21,000	455	17,500	379	15,750	341	14,875	216	13,125	165	12,250	122
1.2	4	0.09	30,720	1,306	25,600	1,089	23,040	980	21,760	760	19,200	513	17,920	414
	6	0.084	30,720	1,306	25,600	1,089	23,040	980	21,760	760	19,200	513	17,920	414
	8	0.048	27,648	1,074	23,040	895	20,736	806	19,584	684	17,280	461	16,128	372
	10	0.03	27,648	1,074	23,040	895	20,736	806	19,584	684	17,280	461	16,128	372
	12	0.03	27,648	955	23,040	716	20,736	642	19,584	549	17,280	410	16,128	331
	16	0.02	24,576	848	20,480	707	18,432	557	17,408	488	15,360	364	14,336	294
1.4	6	0.1	26,880	1,143	22,400	952	20,160	857	19,040	601	16,800	449	15,680	361
	12	0.035	24,192	940	20,160	783	18,144	705	17,136	540	15,120	404	14,112	325
1.5	4	0.11	26,880	1,270	22,400	1,058	20,160	953	19,040	668	16,800	499	15,680	402
	6	0.11	26,880	1,143	22,400	952	20,160	866	19,040	668	16,800	499	15,680	402
	8	0.06	24,192	1,045	20,160	871	18,144	784	17,136	601	15,120	449	14,112	362
	10	0.06	24,192	1,045	20,160	783	18,144	705	17,136	601	15,120	449	14,112	362
	12	0.06	24,192	940	20,160	783	18,144	705	17,136	601	15,120	404	14,112	325
	14	0.038	24,192	940	20,160	783	18,144	705	17,136	601	15,120	404	14,112	325
	16	0.038	21,504	731	17,920	609	16,128	549	15,232	351	13,440	310	12,544	243
	18	0.038	21,504	731	17,920	609	16,128	549	15,232	351	13,440	310	12,544	243
	20	0.038	21,504	731	17,920	609	16,128	488	15,232	312	13,440	276	12,544	216
	25	0.023	16,128	470	13,440	391	12,096	313	11,424	222	10,080	174	9,408	132
	30	0.015	13,440	319	11,200	266	12,096	212	9,520	149	8,400	111	7,840	89
	35	0.01	13,440	284	11,200	236	12,096	186	9,520	149	8,400	111	7,840	89
	40	0.005	10,752	152	8,960	126	8,064	113	7,616	76	6,720	59	6,272	48
1.6	6	0.11	24,960	1,179	20,800	977	18,720	884	17,680	690	15,600	515	14,560	415
	8	0.11	24,960	1,179	20,800	977	18,720	884	17,680	621	15,600	515	14,560	415
1.8	6	0.13	24,960	1,179	20,800	997	18,720	884	17,680	690	15,600	515	14,560	415
	8	0.13	24,960	1,179	20,800	997	18,720	884	17,680	621	15,600	515	14,560	415

【Note】 Please refer to P.A318

Epoch Deep Square Evolution

High efficiency cuttiing conditions | **High accuracy cuttiing conditions**

Please refer to P.A313 about high efficiency cutting conditions

Metric

Recommended range			PN series								ATH series			
Work material			1		2		3		4		5		6	
			Copper (Cu)		Carbon steel, Alloy steel (180～250HB)		Stainless steel, Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～65HRC)	
Ratio to standard depth of cut			120%		100%		90%		70%		50%		45%	
Tool dia. DC (mm)	Under neck length LU (mm)	ap (mm)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
2	4	0.2	20,160	1,270	16,800	952	15,120	861	14,280	655	12,600	499	11,760	402
	6	0.2	20,160	1,270	16,800	952	15,120	861	14,280	655	12,600	499	11,760	402
	8	0.14	20,160	1,270	16,800	952	15,120	861	14,280	655	12,600	499	11,760	402
	10	0.14	20,160	1,270	16,800	952	15,120	861	14,280	655	12,600	499	11,760	402
	12	0.08	18,144	1,045	15,120	871	13,608	784	12,852	590	11,340	449	10,584	362
	14	0.08	18,144	1,045	15,120	871	13,608	784	12,852	590	11,340	449	10,584	325
	16	0.08	18,144	940	15,120	783	13,608	707	12,852	540	11,340	426	10,584	325
	18	0.05	18,144	940	15,120	783	13,608	707	12,852	540	11,340	404	10,584	289
	20	0.05	18,144	888	15,120	696	13,608	627	12,852	480	11,340	359	10,584	289
	25	0.05	16,128	731	13,440	609	12,096	549	11,424	312	10,080	310	9,408	232
	30	0.03	16,128	650	13,440	541	12,096	488	11,424	273	10,080	276	9,408	216
	35	0.02	14,112	466	11,760	388	10,584	349	9,996	225	8,820	182	8,232	148
	40	0.01	14,112	408	11,760	340	10,586	306	9,996	197	8,820	159	8,232	129
	50	0.005	12,096	284	10,080	236	9,072	186	8,568	120	7,560	97	7,056	78
2.5	8	0.18	17,280	1,361	14,400	1,134	12,960	1,021	12,240	716	10,800	535	10,080	431
	12	0.18	17,280	1,134	14,400	1,020	12,960	933	12,240	644	10,800	520	10,080	387
	16	0.1	15,552	1,008	12,960	839	11,664	758	11,016	579	9,720	450	9,072	349
	20	0.1	15,552	840	12,960	794	11,664	711	11,016	515	9,720	450	9,072	310
	30	0.06	13,824	696	11,520	580	10,368	457	9,792	348	8,640	272	8,064	220
	40	0.03	12,096	437	10,080	364	9,072	328	8,568	250	7,560	196	7,056	158
	50	0.01	12,096	375	10,080	338	9,072	304	8,568	203	7,560	171	7,056	138
3	8	0.3	15,360	1,210	12,800	1,008	11,520	907	10,880	636	9,600	475	8,960	383
	12	0.21	15,360	1,210	12,800	1,008	11,520	907	10,880	636	9,600	475	8,960	383
	16	0.12	13,824	995	11,520	829	10,368	746	9,792	573	8,640	428	8,064	344
	20	0.12	13,824	895	11,520	787	10,368	705	9,792	573	8,640	428	8,064	344
	25	0.08	13,824	895	11,520	787	10,368	705	9,792	573	8,640	428	8,064	344
	30	0.08	13,824	796	11,520	663	10,368	601	9,792	573	8,640	428	8,064	310
	40	0.05	12,288	618	10,240	515	9,216	464	8,704	356	7,680	304	7,168	245
	50	0.02	10,752	389	8,960	347	8,064	291	7,616	194	6,720	152	6,272	123
4	12	0.4	11,500	2,070	9,400	1,692	8,460	1,370	7,990	1,222	7,050	811	6,580	654
	16	0.28	11,500	2,070	9,400	1,692	8,460	1,370	7,990	1,222	7,050	811	6,580	654
	20	0.28	10,350	1,863	8,460	1,522	7,614	1,233	7,191	1,099	6,345	730	5,922	588
	25	0.16	10,350	1,676	8,460	1,370	7,614	1,109	7,191	990	6,345	730	5,922	588
	30	0.16	10,350	1,676	8,460	1,370	7,614	1,109	7,191	880	6,345	649	5,922	588
	35	0.1	9,137	1,316	7,614	1,096	6,853	888	6,472	792	5,711	584	5,330	471
	40	0.1	9,137	1,151	7,614	959	6,853	777	6,472	693	5,711	511	5,330	412
	50	0.06	7,896	789	6,580	658	7,106	592	5,593	460	4,935	309	4,606	249
5	20	0.3	9,014	1,621	7,512	1,351	6,761	1,216	6,385	945	5,634	635	5,258	513
	25	0.3	8,112	1,458	6,760	1,215	6,084	1,094	5,746	850	5,070	571	4,732	461
	30	0.2	8,112	1,313	6,760	1,094	6,084	984	5,746	765	5,070	514	4,732	415
	40	0.15	7,301	1,052	6,084	876	5,476	788	5,171	613	4,563	412	4,259	332
	50	0.1	7,301	986	6,084	876	5,476	690	5,171	575	4,563	360	4,259	291
6	20	0.5	7,418	1,481	6,182	1,234	5,564	1,111	5,255	864	4,637	580	4,327	469
	30	0.4	6,744	1,346	5,620	1,122	5,058	1,010	4,777	785	4,215	527	3,934	426
	40	0.3	6,744	1,211	5,620	1,009	5,058	908	4,777	706	4,215	474	3,934	383
	50	0.2	6,000	981	5,000	817	4,500	735	4,250	636	3,750	427	3,500	345

※a_p is shown as the criteria for Group 2 workpieces. For other groups, adjust the cutting depth according to the cutting depth factors in the above table.

【Note】
① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② Use the appropriate coolant for the work material and machining shape.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

Epoch G Square

2 Flutes Panacea

Planing | Side milling | Slotting | Die-sinking | Helical | Spot facing | Semi Finishing | Finishing

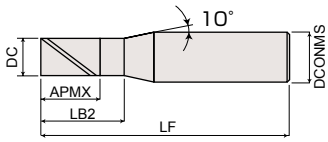
Dia. tolerance: φ0.2～φ0.9 : 0～−0.015mm
φ1.0～φ20 : 0～−0.02mm

h5

PN Coating for amazing seizure resistance and wear resistance. Enables machining of a wide variety of materials.

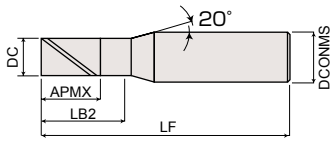
2 Flutes

A type



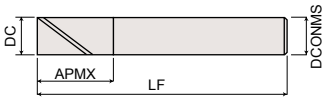
※Without neck escape

B type



※Without neck escape

C type



HGOS2○○○-PN

Carbide | PN | Helix angle 30° | Cutting Conditions A321

Item code	Stock	Size (mm) Tool dia. DC	Flute length APMX	Under neck length LB2	Overall length LF	Shank dia. DCONMS	No. of flutes	Type
HGOS2002-PN	★	0.2	0.4	0.6	40	4	2	A
HGOS2003-PN	★	0.3	0.6	0.9	40	4	2	A
HGOS2004-PN	★	0.4	0.8	1.1	40	4	2	A
HGOS2005-PN	★	0.5	1	1.3	40	4	2	A
HGOS2006-PN	★	0.6	1.2	1.5	40	4	2	A
HGOS2007-PN	★	0.7	1.4	1.7	40	4	2	A
HGOS2008-PN	★	0.8	1.6	1.9	40	4	2	A
HGOS2009-PN	★	0.9	1.8	2.1	40	4	2	A
HGOS2010-PN	★	1	2	2.5	40	4	2	A
HGOS2015-PN	★	1.5	3	3.5	40	4	2	A
HGOS2020-PN	★	2	6	7	40	4	2	A
HGOS2025-PN	★	2.5	8	9	40	4	2	A
HGOS2030-PN	★	3	8	9	45	6	2	A
HGOS2035-PN	★	3.5	10	11	45	6	2	A
HGOS2040-PN	★	4	11	12	45	6	2	B
HGOS2045-PN	★	4.5	11	12	45	6	2	B
HGOS2050-PN	★	5	13	14	60	6	2	B
HGOS2055-PN	★	5.5	13	14	60	6	2	B
HGOS2060-PN	★	6	13	–	60	6	2	C
HGOS2070-PN	★	7	16	17	70	8	2	B
HGOS2080-PN	★	8	19	–	75	8	2	C
HGOS2090-PN	★	9	19	20	80	10	2	B
HGOS2100-PN	★	10	22	–	80	10	2	C
HGOS2120-PN	★	12	26	–	100	12	2	C
HGOS2160-PN	★	16	35	–	110	16	2	C
HGOS2200-PN	★	20	40	–	125	20	2	C

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○			◎	○	◎	◎

★ : Inventory maintained in Japan

Epoch G Square

4 Flutes Panacea

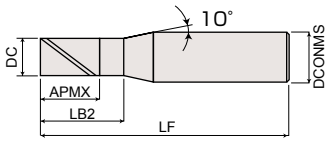
Planing | Side milling | Die-sinking | Helical | Spot facing | Semi Finishing | Finishing

Dia. tolerance 0～−0.02mm h5

PN Coating for amazing seizure resistance and wear resistance. Enables machining of a wide variety of materials.

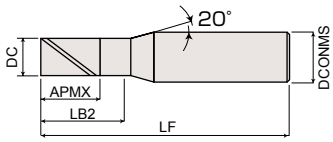
4 Flutes

A type



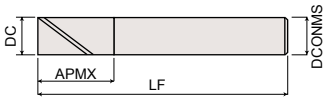
※Without neck escape

B type



※Without neck escape

C type



HGOS4○○○-PN

Carbide | PN | Helix angle 30° | Cutting Conditions A321

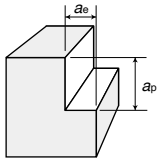
Item code	Stock	Size (mm) Tool dia. DC	Flute length APMX	Under neck length LB2	Overall length LF	Shank dia. DCONMS	No. of flutes	Type
HGOS4010-PN	★	1	2.5	3	40	4	4	A
HGOS4015-PN	★	1.5	4	4.5	40	4	4	A
HGOS4020-PN	★	2	6	7	40	4	4	A
HGOS4025-PN	★	2.5	8	9	40	4	4	A
HGOS4030-PN	★	3	10	11	45	6	4	A
HGOS4040-PN	★	4	12	13	45	6	4	B
HGOS4050-PN	★	5	15	16	60	6	4	B
HGOS4060-PN	★	6	15	–	60	6	4	C
HGOS4080-PN	★	8	20	–	75	8	4	C
HGOS4100-PN	★	10	25	–	80	10	4	C
HGOS4120-PN	★	12	30	–	100	12	4	C
HGOS4160-PN	★	16	35	–	110	16	4	C
HGOS4200-PN	★	20	40	–	125	20	4	C

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○			◎	○	◎	◎

Epoch G Square

Recommended cutting conditions HGOS2-PN HGOS4-PN



Inch

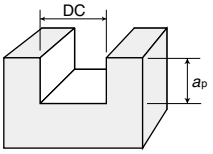
<Side cutting>

Tool dia. DC (mm)	Flute length APMX (mm)	Copper alloy, Aluminium alloy				Cast iron, Carbon steel (150~200HB) No.35 B, 1050, 1055				Stainless steel (25~35HRC) 304, 316			
		Revolution n (min^{-1})	Feed rate v_f (IPM)	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	a_p (inch)	a_e (inch)
0.2	0.4	66,879	26.3	.012	.0004	55,732	21.9	.012	.0004	33,439	11.9	.012	.0003
0.3	0.6	44,586	17.6	.018	.001	37,155	14.6	.018	.001	22,293	7.9	.018	.0005
0.4	0.8	38,217	15.0	.024	.001	27,866	11.0	.024	.001	16,720	5.9	.024	.001
0.5	1	38,217	15.0	.030	.001	25,478	10.0	.030	.001	15,287	5.4	.030	.001
0.6	1.2	41,401	26.1	.035	.001	26,539	16.7	.035	.001	15,924	9.0	.035	.001
0.7	1.4	35,487	22.4	.041	.001	29,572	18.6	.041	.001	17,743	10.1	.041	.001
0.8	1.6	33,439	21.1	.047	.002	25,876	16.3	.047	.002	15,525	8.8	.047	.001
0.9	1.8	33,970	21.4	.053	.002	24,770	15.6	.053	.002	14,862	8.4	.053	.001
1	2	38,217	30.1	.059	.002	25,478	20.1	.059	.002	15,287	10.8	.059	.002
1.5	3	28,025	22.1	.089	.006	21,231	16.7	.089	.006	12,739	9.0	.089	.005
2	6	21,019	24.8	.118	.008	19,108	22.6	.118	.008	11,465	12.2	.118	.007
2.5	8	16,815	19.8	.148	.010	17,834	21.1	.148	.010	10,701	11.4	.148	.009
3	8	15,287	24.1	.177	.012	15,924	25.1	.177	.012	9,554	13.5	.177	.011
3.5	10	13,103	20.6	.207	.014	14,559	22.9	.207	.014	8,735	12.4	.207	.012
4	11	11,465	22.6	.236	.016	13,535	26.7	.236	.016	8,121	14.4	.236	.014
4.5	11	10,191	20.1	.266	.018	12,739	25.1	.266	.018	7,643	13.5	.266	.016
5	13	9,172	21.7	.295	.020	12,102	28.6	.295	.020	7,261	15.4	.295	.018
5.5	13	8,338	19.7	.325	.022	11,581	27.4	.325	.022	6,948	14.8	.325	.019
6	13	7,643	18.1	.354	.024	10,616	25.1	.354	.024	6,369	13.5	.354	.021
7	16	6,551	18.1	.413	.028	9,099	25.1	.413	.028	5,460	13.5	.413	.025
8	19	5,732	15.8	.472	.031	7,962	21.9	.472	.031	4,777	11.9	.472	.028
9	19	5,096	16.1	.531	.035	7,077	22.3	.531	.035	4,246	12.0	.531	.032
10	22	4,586	18.1	.591	.039	6,369	25.1	.591	.039	3,822	13.5	.591	.035
12	26	3,822	18.1	.709	.047	5,308	25.1	.709	.047	3,185	13.5	.709	.043
16	35	2,866	15.8	.945	.063	3,981	21.9	.945	.063	2,389	11.9	.945	.057
20	40	2,293	14.4	1.181	.079	3,185	20.1	1.181	.079	1,911	10.8	1.181	.071

Tool dia. DC (mm)	Flute length APMX (mm)	Alloy steel (25~35HRC) P20, H13, L6				Pre-hardened steel (35~45HRC) P21				Hardened steel (45~52HRC) H13			
		Revolution n (min^{-1})	Feed rate v_f (IPM)	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	a_p (inch)	a_e (inch)
0.2	0.4	33,439	11.9	.012	.0003	26,752	8.5	.012	.0002	16,720	4.1	.012	.0002
0.3	0.6	22,293	7.9	.018	.0005	17,834	5.7	.018	.0004	11,146	2.8	.018	.0004
0.4	0.8	16,720	5.9	.024	.001	13,376	4.3	.024	.0005	8,360	2.1	.024	.0005
0.5	1	15,287	5.4	.030	.001	12,229	3.9	.030	.001	7,643	1.9	.030	.001
0.6	1.2	15,924	9.0	.035	.001	12,739	6.5	.035	.001	7,962	3.1	.035	.001
0.7	1.4	17,743	10.1	.041	.001	14,195	7.2	.041	.001	8,872	3.5	.041	.001
0.8	1.6	15,525	8.8	.047	.001	12,420	6.3	.047	.001	7,763	3.1	.047	.001
0.9	1.8	14,862	8.4	.053	.001	11,890	6.1	.053	.001	7,431	3.0	.053	.001
1	2	15,287	10.8	.059	.002	12,229	7.8	.059	.001	7,643	3.8	.059	.001
1.5	3	12,739	9.0	.089	.005	10,191	6.5	.089	.005	6,369	3.1	.089	.002
2	6	11,465	12.2	.118	.007	6,115	5.9	.118	.006	5,732	4.3	.118	.002
2.5	8	10,701	11.4	.148	.009	5,707	5.5	.148	.008	5,350	4.0	.148	.003
3	8	9,554	13.5	.177	.011	5,096	6.5	.177	.009	4,777	4.7	.177	.004
3.5	10	8,735	12.4	.207	.012	4,659	5.9	.207	.011	4,368	4.3	.207	.004
4	11	8,121	14.4	.236	.014	4,331	6.9	.236	.013	4,061	5.0	.236	.005
4.5	11	7,643	13.5	.266	.016	4,076	6.5	.266	.014	3,822	4.7	.266	.005
5	13	7,261	15.4	.295	.018	3,873	7.4	.295	.016	3,631	5.4	.295	.006
5.5	13	6,948	14.8	.325	.019	3,706	7.1	.325	.017	3,474	5.2	.325	.006
6	13	6,369	13.5	.354	.021	3,397	6.5	.354	.019	3,185	4.7	.354	.007
7	16	5,460	13.5	.413	.025	2,912	6.5	.413	.022	2,730	4.7	.413	.008
8	19	4,777	11.9	.472	.028	2,548	5.7	.472	.025	2,389	4.1	.472	.009
9	19	4,246	12.0	.531	.032	2,265	5.8	.531	.028	2,123	4.2	.531	.011
10	22	3,822	13.5	.591	.035	2,038	6.5	.591	.031	1,911	4.7	.591	.012
12	26	3,185	13.5	.709	.043	1,699	6.5	.709	.038	1,592	4.7	.709	.014
16	35	2,389	11.9	.945	.057	1,274	5.7	.945	.050	1,194	4.1	.945	.019
20	40	1,911	10.8	1.181	.071	1,019	5.2	1.181	.063	955	3.8	1.181	.024

【Note】
① PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② The cutting conditions given above is applied to 2 flutes type end mills. As for 4 flutes type, increase the feed rate by 1.5 times.
③ Use a highly rigid and accurate machine as possible.
④ Use the appropriate coolant for the work material and machining shape.
⑤ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑥ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

HGOS2-PN



Inch

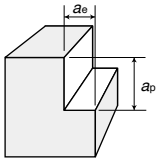
<Slotting>

Tool dia. DC (mm)	Flute length APMX (mm)	Copper alloy, Aluminium alloy			Cast iron, Carbon steel (150~200HB) No.35 B, 1050, 1055			Stainless steel (25~35HRC) 304, 316		
		Revolution *n* (min-1)	Feed rate *vf* (IPM)	*ap* (inch)	Revolution *n* (min-1)	Feed rate *vf* (IPM)	*ap* (inch)	Revolution *n* (min-1)	Feed rate *vf* (IPM)	*ap* (inch)
0.2	0.4	58,678	9.3	.0004	53,344	8.4	.0004	37,341	6.2	.0004
0.3	0.6	39,119	6.1	.001	35,563	5.6	.001	24,894	5.5	.001
0.4	0.8	35,032	5.5	.001	26,672	4.2	.001	22,293	6.1	.001
0.5	1	31,529	5.0	.001	25,478	4.0	.001	20,064	5.5	.001
0.6	1.2	32,113	10.1	.001	23,885	7.5	.001	20,435	5.6	.001
0.7	1.4	30,027	9.4	.002	25,023	7.9	.002	19,108	6.3	.002
0.8	1.6	28,463	9.0	.002	23,885	7.5	.002	18,113	6.0	.002
0.9	1.8	27,247	8.6	.002	23,001	7.2	.002	17,339	6.7	.002
1	2	28,025	11.0	.002	22,293	8.8	.002	17,834	6.9	.002
1.5	3	21,019	8.3	.003	16,985	6.7	.003	14,862	5.7	.003
2	6	15,764	7.4	.005	14,331	6.8	.005	11,146	6.1	.005
2.5	8	12,611	5.9	.007	11,465	5.4	.007	8,917	4.9	.007
3	8	11,677	6.4	.012	9,554	5.3	.012	7,431	4.1	.012
3.5	10	10,009	5.5	.014	9,099	5.0	.014	6,369	5.3	.014
4	11	8,758	5.5	.024	7,962	5.0	.024	5,573	4.6	.024
4.5	11	7,785	4.9	.035	7,077	4.4	.035	4,954	5.5	.035
5	13	7,006	5.5	.049	6,369	5.0	.049	4,459	4.9	.049
5.5	13	6,369	5.0	.054	5,790	4.6	.054	4,053	4.4	.054
6	13	5,839	9.2	.071	5,308	8.3	.071	3,715	6.1	.071
7	16	5,005	7.9	.096	4,550	7.2	.096	3,185	6.1	.096
8	19	4,379	6.9	.126	3,981	6.3	.126	1,672	3.7	.126
9	19	3,892	9.2	.159	3,539	8.3	.159	1,486	5.7	.159
10	22	3,503	8.3	.197	3,185	7.5	.197	1,338	5.9	.197
12	26	2,919	9.2	.236	2,654	8.3	.236	1,115	5.5	.236
16	35	2,189	8.6	.315	1,990	7.8	.315	975	5.4	.315
20	40	1,752	8.3	.394	1,592	7.5	.394	836	5.5	.394

Tool dia. DC (mm)	Flute length APMX (mm)	Alloy steel (25~35HRC) P20, H13, L6			Pre-hardened steel (35~45HRC) P21			Hardened steel (45~52HRC) H13		
		Revolution *n* (min-1)	Feed rate *vf* (IPM)	*ap* (inch)	Revolution *n* (min-1)	Feed rate *vf* (IPM)	*ap* (inch)	Revolution *n* (min-1)	Feed rate *vf* (IPM)	*ap* (inch)
0.2	0.4	24,005	4.8	.0004	14,936	2.2	.0004	8,402	1.3	.0004
0.3	0.6	16,003	4.3	.001	9,958	2.0	.0004	5,601	1.2	.0004
0.4	0.8	14,331	4.8	.001	8,917	2.2	.001	5,016	1.3	.001
0.5	1	12,898	4.3	.001	8,025	2.0	.001	4,514	1.2	.001
0.6	1.2	13,137	4.4	.001	8,174	2.0	.001	4,598	1.2	.001
0.7	1.4	12,284	4.9	.002	7,643	2.3	.001	4,299	1.4	.001
0.8	1.6	11,644	4.7	.002	7,245	2.2	.002	4,075	1.3	.001
0.9	1.8	11,146	5.2	.002	6,936	2.4	.002	3,901	1.5	.002
1	2	11,465	5.4	.002	7,134	2.5	.002	4,013	1.5	.002
1.5	3	9,554	4.5	.003	5,945	2.0	.003	3,344	1.3	.002
2	6	7,166	4.8	.005	4,459	2.2	.004	2,508	1.3	.004
2.5	8	5,732	3.8	.007	3,567	1.8	.006	2,006	1.1	.006
3	8	4,777	3.2	.012	2,972	1.5	.011	1,672	0.9	.009
3.5	10	4,095	4.1	.014	2,548	1.9	.013	1,433	1.1	.011
4	11	3,583	3.6	.024	2,229	1.7	.021	1,254	1.0	.019
4.5	11	3,185	4.3	.035	1,982	2.0	.032	1,115	1.2	.029
5	13	2,866	3.8	.049	1,783	1.8	.044	1,003	1.1	.040
5.5	13	2,606	3.5	.054	1,621	1.6	.049	912	1.0	.044
6	13	2,389	4.8	.071	1,486	2.2	.064	836	1.3	.057
7	16	2,047	4.8	.096	1,274	2.2	.087	717	1.3	.078
8	19	1,075	2.9	.126	669	1.3	.113	376	0.8	.102
9	19	955	4.5	.159	594	2.0	.144	334	1.3	.129
10	22	860	4.6	.197	535	2.1	.177	301	1.3	.159
12	26	717	4.3	.236	446	2.0	.213	251	1.2	.191
16	35	627	4.2	.315	390	1.9	.283	219	1.2	.255
20	40	537	4.3	.394	334	2.0	.354	188	1.2	.319

【Note】 The 4 flutes not suitable for slotting.

Epoch G Square



Metric

HGOS2-PN HGOS4-PN

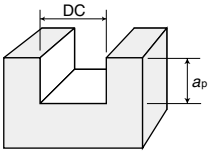
<Side cutting>

Tool dia. DC (mm)	Flute length APMX (mm)	Copper alloy, Aluminium alloy				Cast iron, Carbon steel (150～200HB) No.35 B, 1050, 1055				Stainless steel (25～35HRC) 304, 316			
		Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm
0.2	0.4	66,879	669	0.300	0.010	55,732	557	0.300	0.010	33,439	301	0.300	0.008
0.3	0.6	44,586	446	0.450	0.015	37,155	372	0.450	0.015	22,293	201	0.450	0.012
0.4	0.8	38,217	382	0.600	0.020	27,866	279	0.600	0.020	16,720	150	0.600	0.016
0.5	1	38,217	382	0.750	0.025	25,478	255	0.750	0.025	15,287	138	0.750	0.020
0.6	1.2	41,401	662	0.900	0.030	26,539	425	0.900	0.030	15,924	229	0.900	0.024
0.7	1.4	35,487	568	1.050	0.035	29,572	473	1.050	0.035	17,743	256	1.050	0.028
0.8	1.6	33,439	535	1.200	0.040	25,876	414	1.200	0.040	15,525	224	1.200	0.032
0.9	1.8	33,970	544	1.350	0.045	24,770	396	1.350	0.045	14,862	214	1.350	0.036
1	2	38,217	764	1.500	0.050	25,478	510	1.500	0.050	15,287	275	1.500	0.040
1.5	3	28,025	561	2.250	0.150	21,231	425	2.250	0.150	12,739	229	2.250	0.135
2	6	21,019	631	3.000	0.200	17,516	525	3.000	0.200	10,510	284	3.000	0.180
2.5	8	16,815	504	3.750	0.250	14,013	420	3.750	0.250	8,408	227	3.750	0.225
3	8	15,287	611	4.500	0.300	11,677	467	4.500	0.300	7,006	252	4.500	0.270
3.5	10	13,103	524	5.250	0.350	10,919	437	5.250	0.350	6,551	236	5.250	0.315
4	11	11,465	573	6.000	0.400	9,554	478	6.000	0.400	5,732	258	6.000	0.360
4.5	11	10,191	510	6.750	0.450	8,493	425	6.750	0.450	5,096	229	6.750	0.405
5	13	9,172	550	7.500	0.500	7,643	459	7.500	0.500	4,586	248	7.500	0.450
5.5	13	8,338	500	8.250	0.550	6,948	417	8.250	0.550	4,169	225	8.250	0.495
6	13	7,643	459	9.000	0.600	6,369	382	9.000	0.600	3,822	206	9.000	0.540
7	16	6,551	459	10.500	0.700	5,460	382	10.500	0.700	3,276	206	10.500	0.630
8	19	5,732	401	12.000	0.800	4,777	334	12.000	0.800	2,866	181	12.000	0.720
9	19	5,096	408	13.500	0.900	4,246	340	13.500	0.900	2,548	183	13.500	0.810
10	22	4,586	459	15.000	1.000	3,822	382	15.000	1.000	2,293	206	15.000	0.900
12	26	3,822	459	18.000	1.200	3,185	382	18.000	1.200	1,911	206	18.000	1.080
16	35	2,866	401	24.000	1.600	2,389	334	24.000	1.600	1,433	181	24.000	1.440
20	40	2,293	367	30.000	2.000	1,911	306	30.000	2.000	1,146	165	30.000	1.800

Tool dia. DC (mm)	Flute length APMX (mm)	Alloy steel (25～35HRC) P20, H13, L6				Pre-hardened steel (35～45HRC) P21				Hardened steel (45～52HRC) H13			
		Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate v_f mm/min	a_p mm	a_e mm
0.2	0.4	33,439	301	0.300	0.008	26,752	217	0.300	0.006	16,720	105	0.300	0.006
0.3	0.6	22,293	201	0.450	0.012	17,834	144	0.450	0.009	11,146	70	0.450	0.009
0.4	0.8	16,720	150	0.600	0.016	13,376	108	0.600	0.012	8,360	53	0.600	0.012
0.5	1	15,287	138	0.750	0.020	12,229	99	0.750	0.015	7,643	48	0.750	0.015
0.6	1.2	15,924	229	0.900	0.024	12,739	165	0.900	0.018	7,962	80	0.900	0.018
0.7	1.4	17,743	256	1.050	0.028	14,195	184	1.050	0.021	8,872	89	1.050	0.021
0.8	1.6	15,525	224	1.200	0.032	12,420	161	1.200	0.024	7,763	78	1.200	0.024
0.9	1.8	14,862	214	1.350	0.036	11,890	154	1.350	0.027	7,431	75	1.350	0.027
1	2	15,287	275	1.500	0.040	12,229	198	1.500	0.030	7,643	96	1.500	0.030
1.5	3	12,739	229	2.250	0.135	10,191	165	2.250	0.120	6,369	80	2.250	0.045
2	6	10,510	284	3.000	0.180	6,115	149	3.000	0.160	5,732	108	3.000	0.060
2.5	8	8,408	227	3.750	0.225	5,707	139	3.750	0.200	5,350	101	3.750	0.075
3	8	7,006	252	4.500	0.270	5,096	165	4.500	0.240	4,777	120	4.500	0.090
3.5	10	6,551	236	5.250	0.315	4,659	151	5.250	0.280	4,368	110	5.250	0.105
4	11	5,732	258	6.000	0.360	4,331	175	6.000	0.320	4,061	128	6.000	0.120
4.5	11	5,096	229	6.750	0.405	4,076	165	6.750	0.360	3,822	120	6.750	0.135
5	13	4,586	248	7.500	0.450	3,873	188	7.500	0.400	3,631	137	7.500	0.150
5.5	13	4,169	225	8.250	0.495	3,706	180	8.250	0.440	3,474	131	8.250	0.165
6	13	3,822	206	9.000	0.540	3,397	165	9.000	0.480	3,185	120	9.000	0.180
7	16	3,276	206	10.500	0.630	2,912	165	10.500	0.560	2,730	120	10.500	0.210
8	19	2,866	181	12.000	0.720	2,548	144	12.000	0.640	2,389	105	12.000	0.240
9	19	2,548	183	13.500	0.810	2,265	147	13.500	0.720	2,123	107	13.500	0.270
10	22	2,293	206	15.000	0.900	2,038	165	15.000	0.800	1,911	120	15.000	0.300
12	26	1,911	206	18.000	1.080	1,699	165	18.000	0.960	1,592	120	18.000	0.360
16	35	1,433	181	24.000	1.440	1,274	144	24.000	1.280	1,194	105	24.000	0.480
20	40	1,146	165	30.000	1.800	1,019	132	30.000	1.600	955	96	30.000	0.600

【Note】
① PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
② The cutting conditions given above is applied to 2 flutes type end mills. As for 4 flutes type, increase the feed rate by 1.5 times.
③ Use a highly rigid and accurate machine as possible.
④ Use the appropriate coolant for the work material and machining shape.
⑤ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑥ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

HGOS2-PN



Metric

<Slotting>

Tool dia. DC (mm)	Flute length APMX (mm)	Copper alloy, Aluminium alloy			Cast iron, Carbon steel (150~200HB) No.35 B, 1050, 1055			Stainless steel (25~35HRC) 304, 316		
		Revolution *n* min-1	Feed rate *vf* mm/min	*ap* mm	Revolution *n* min-1	Feed rate *vf* mm/min	*ap* mm	Revolution *n* min-1	Feed rate *vf* mm/min	*ap* mm
0.2	0.4	58,678	235	0.01	53,344	213	0.01	37,341	157	0.01
0.3	0.6	39,119	156	0.02	35,563	142	0.02	24,894	120	0.02
0.4	0.8	35,032	140	0.02	26,672	107	0.02	22,293	103	0.02
0.5	1	31,529	126	0.03	25,478	102	0.03	20,064	103	0.03
0.6	1.2	32,113	180	0.03	23,885	191	0.03	20,435	143	0.03
0.7	1.4	30,027	240	0.04	25,023	200	0.04	19,108	161	0.04
0.8	1.6	28,463	228	0.04	23,885	191	0.04	18,113	152	0.04
0.9	1.8	27,247	218	0.05	23,001	184	0.05	17,339	143	0.05
1	2	28,025	215	0.05	22,293	175	0.05	17,834	125	0.05
1.5	3	21,019	210	0.08	16,985	170	0.08	12,739	115	0.08
2	6	15,764	189	0.12	14,331	172	0.12	8,917	96	0.12
2.5	8	12,611	151	0.18	11,465	138	0.18	7,643	83	0.18
3	8	11,677	163	0.30	9,554	134	0.30	6,794	86	0.30
3.5	10	10,009	140	0.35	9,099	127	0.35	6,187	78	0.35
4	11	8,758	140	0.60	7,962	127	0.60	5,732	83	0.60
4.5	11	7,785	125	0.90	7,077	113	0.90	4,034	58	0.90
5	13	7,006	140	1.25	6,369	127	1.25	3,822	69	1.25
5.5	13	6,369	127	1.38	5,790	116	1.38	3,648	66	1.38
6	13	5,839	160	1.80	5,308	150	1.80	3,503	90	1.80
7	16	5,005	200	2.45	4,550	182	2.45	3,139	113	2.45
8	19	4,379	215	3.20	3,981	200	3.20	1,672	125	3.20
9	19	3,892	234	4.05	3,539	212	4.05	1,486	146	4.05
10	22	3,503	210	5.00	3,185	191	5.00	1,338	134	5.00
12	26	2,919	234	6.00	2,654	212	6.00	1,115	103	6.00
16	35	2,189	219	8.00	1,990	199	8.00	975	100	8.00
20	40	1,752	210	10.00	1,592	191	10.00	836	103	10.00

Tool dia. DC (mm)	Flute length APMX (mm)	Alloy steel (25~35HRC) P20, H13, L6			Pre-hardened steel (35~45HRC) P21			Hardened steel (45~52HRC) H13		
		Revolution *n* min-1	Feed rate *vf* mm/min	*ap* mm	Revolution *n* min-1	Feed rate *vf* mm/min	*ap* mm	Revolution *n* min-1	Feed rate *vf* mm/min	*ap* mm
0.2	0.4	24,005	122	0.01	14,936	56	0.01	8,402	34	0.01
0.3	0.6	16,003	109	0.02	9,958	50	0.01	5,601	30	0.01
0.4	0.8	14,331	103	0.02	8,917	56	0.02	5,016	34	0.02
0.5	1	12,898	93	0.03	8,025	51	0.02	4,514	31	0.02
0.6	1.2	13,137	112	0.03	8,174	51	0.03	4,598	31	0.02
0.7	1.4	12,284	125	0.04	7,643	58	0.03	4,299	35	0.03
0.8	1.6	11,644	119	0.04	7,245	55	0.04	4,075	33	0.03
0.9	1.8	11,146	133	0.05	6,936	61	0.04	3,901	37	0.04
1	2	11,465	125	0.05	7,134	58	0.05	4,013	35	0.04
1.5	3	9,554	114	0.08	5,945	52	0.07	3,344	32	0.06
2	6	7,166	122	0.12	4,459	56	0.11	2,508	34	0.10
2.5	8	5,732	97	0.18	3,567	45	0.16	2,006	27	0.14
3	8	4,777	81	0.30	2,972	37	0.27	1,672	23	0.24
3.5	10	4,095	104	0.35	2,548	48	0.32	1,433	29	0.28
4	11	3,583	91	0.60	2,229	42	0.54	1,254	26	0.49
4.5	11	3,185	92	0.90	1,982	50	0.81	1,115	30	0.73
5	13	2,866	103	1.25	1,783	45	1.13	1,003	27	1.01
5.5	13	2,606	89	1.38	1,621	41	1.24	912	25	1.11
6	13	2,389	105	1.80	1,486	48	1.62	836	30	1.46
7	16	2,047	122	2.45	1,274	56	2.21	717	34	1.98
8	19	1,075	120	3.20	669	54	2.88	376	33	2.59
9	19	955	114	4.05	594	52	3.65	334	32	3.28
10	22	860	117	5.00	535	54	4.50	301	33	4.05
12	26	717	110	6.00	446	51	5.40	251	31	4.86
16	35	627	107	8.00	390	49	7.20	219	30	6.48
20	40	537	100	10.00	334	51	9.00	188	31	8.10

【Note】 The 4 flutes not suitable for slotting.

Epoch G Square

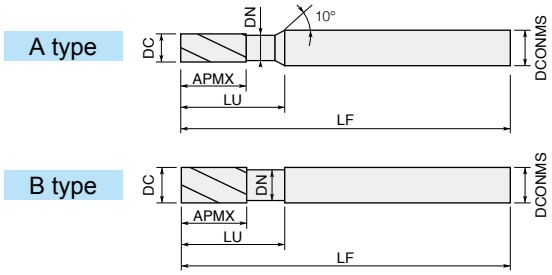
4 Flutes TH Coating

Planing | Side milling | Die-sinking | Helical | Spot facing | Semi Finishing | Finishing

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ8～φ12 : 0～−0.02mm

h5

4 Flutes



HGOSH4○○○-TH

Carbide | TH | Cutting Conditions A326

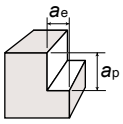
Item Code	Stock	Size (mm) Tool dia. DC	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	No. of flutes	Type
HGOSH4010-TH	●	1	2	3	0.96	50	6	4	A
HGOSH4015-TH	●	1.5	3	4.5	1.44	50	6	4	A
HGOSH4020-TH	●	2	4	6	1.92	50	6	4	A
HGOSH4030-TH	●	3	6	9	2.88	60	6	4	A
HGOSH4040-TH	●	4	8	12	3.85	60	6	4	A
HGOSH4060-TH	●	6	12	18	5.85	60	6	4	B
HGOSH4080-TH	●	8	16	24	7.8	75	8	4	B
HGOSH4100-TH	●	10	20	30	9.8	80	10	4	B
HGOSH4120-TH	●	12	24	36	11.8	100	12	4	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US

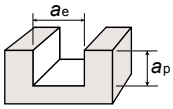
Recommended cutting conditions HGOSH4-TH



Inch

<Side milling>

Work Material (Hardness)	Cutting range	Depth of cut mm	Cutting conditions	Tool dia. DC (mm)								
				ϕ1	ϕ1.5	ϕ2	ϕ3	ϕ4	ϕ6	ϕ8	ϕ10	ϕ12
Carbon steel Alloy Steel (200～250HB) 1050	High speed	ap=1.5DC	Revolution n (min-1)	47,800	31,800	23,800	16,000	12,000	8,000	6,000	4,800	4,000
		ae=0.1DC	Feed rate vf (IPM)	59.1	63.0	66.9	70.9	74.8	86.6	94.5	86.6	82.7
	General	ap=1.5DC	Revolution n (min-1)	28,600	19,100	14,300	9,600	7,200	4,800	3,600	2,900	2,400
		ae=0.15DC	Feed rate vf (IPM)	27.2	29.9	32.7	33.9	36.2	42.5	45.3	42.1	39.4
Alloy steel P20	High speed	ap=1.5DC	Revolution n (min-1)	41,400	27,600	20,700	14,000	10,000	6,900	5,200	4,100	3,500
		ae=0.05DC	Feed rate vf (IPM)	45.7	52.4	52.4	55.1	55.1	66.9	74.8	66.9	63.0
	General	ap=1.5DC	Revolution n (min-1)	28,600	19,100	14,300	9,600	7,200	4,800	3,600	2,900	2,400
		ae=0.1DC	Feed rate vf (IPM)	22.8	27.2	29.1	30.3	32.7	38.2	40.9	37.8	35.4
Pre-hardened steel (35～45HRC) P21	High speed	ap=1.5DC	Revolution n (min-1)	35,000	23,300	17,500	12,000	8,800	5,800	4,400	3,500	2,900
		ae=0.05DC	Feed rate vf (IPM)	27.6	36.6	38.6	43.3	43.3	51.2	55.1	51.2	47.2
	General	ap=1.5DC	Revolution n (min-1)	25,500	17,000	12,700	8,500	6,400	4,200	3,200	2,500	2,100
		ae=0.07DC	Feed rate vf (IPM)	18.1	20.1	22.0	24.0	26.0	29.5	32.3	29.1	27.6
Hardened steel (45～55HRC) H13	High speed	ap=1.5DC	Revolution n (min-1)	31,800	21,200	15,900	11,000	8,000	5,300	4,000	3,200	2,700
		ae=0.02DC	Feed rate vf (IPM)	25.2	29.9	32.7	33.9	35.4	40.9	44.1	40.6	38.6
	General	ap=1.5DC	Revolution n (min-1)	22,300	14,800	11,100	7,400	5,600	3,700	2,800	2,200	1,900
		ae=0.05DC	Feed rate vf (IPM)	14.2	16.1	17.3	18.1	19.7	22.8	24.8	22.4	21.7



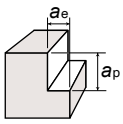
Inch

<Slotting>

Work Material (Hardness)	Cutting range	Depth of cut mm	Cutting conditions	Tool dia. DC (mm)								
				ϕ1	ϕ1.5	ϕ2	ϕ3	ϕ4	ϕ6	ϕ8	ϕ10	ϕ12
Carbon steel Alloy Steel (200～250HB) 1050	High speed	ap≦0.5DC	Revolution n (min-1)	25,500	17,000	12,700	8,500	6,400	4,200	3,200	2,500	2,100
		ae=1DC	Feed rate vf (IPM)	28.3	29.5	31.9	32.3	36.2	39.8	42.9	37.4	34.6
	General	ap≦1DC	Revolution n (min-1)	19,100	12,700	9,500	6,400	4,800	3,200	2,400	1,900	1,600
		ae=1DC	Feed rate vf (IPM)	15.0	16.9	17.7	19.3	21.7	24.0	25.6	22.8	21.3
Alloy steel P20	High speed		Revolution n (min-1)									
			Feed rate vf (IPM)									
	General	ap≦0.5DC	Revolution n (min-1)	19,100	12,700	9,500	6,400	4,800	3,200	2,400	1,900	1,600
		ae=0.1DC	Feed rate vf (IPM)	13.4	15.0	15.7	17.3	19.7	21.7	23.2	20.5	18.9
Pre-hardened steel (35～45HRC) P21	High speed		Revolution n (min-1)									
			Feed rate vf (IPM)									
	General	ap≦0.5DC	Revolution n (min-1)	17,500	11,700	8,800	5,800	4,400	2,900	2,200	1,800	1,500
		ae=1DC	Feed rate vf (IPM)	11.0	11.8	13.0	14.2	16.1	17.7	18.9	17.3	15.7
Hardened steel (45～55HRC) H13	High speed		Revolution n (min-1)									
			Feed rate vf (IPM)									
	General	ap≦0.2DC	Revolution n (min-1)	16,000	10,600	8,000	5,300	4,000	2,700	2,000	1,600	1,300
		ae=1DC	Feed rate vf (IPM)	7.5	8.3	9.4	9.4	11.0	12.2	13.0	11.4	10.2

【Note】
①Use the high-rigidity and high accuracy machine as possible
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

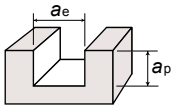
Epoch G Square



Metric

<Side milling>

Work Material (Hardness)	Cutting range	Depth of cut mm	Cutting conditions	Tool dia. DC (mm)								
				ϕ1	ϕ1.5	ϕ2	ϕ3	ϕ4	ϕ6	ϕ8	ϕ10	ϕ12
Carbon steel Alloy Steel (200～250HB) 1050	High speed	ap=1.5DC	Revolution n (min-1)	47,800	31,800	23,800	16,000	12,000	8,000	6,000	4,800	4,000
		ae=0.1DC	Feed rate vf (mm/min)	1,500	1,600	1,700	1,800	1,900	2,200	2,400	2,200	2,100
	General	ap=1.5DC	Revolution n (min-1)	28,600	19,100	14,300	9,600	7,200	4,800	3,600	2,900	2,400
		ae=0.15DC	Feed rate vf (mm/min)	690	760	830	860	920	1,080	1,150	1,070	1,000
Alloy steel P20	High speed	ap=1.5DC	Revolution n (min-1)	41,400	27,600	20,700	14,000	10,000	6,900	5,200	4,100	3,500
		ae=0.05DC	Feed rate vf (mm/min)	1,160	1,330	1,330	1,400	1,400	1,700	1,900	1,700	1,600
	General	ap=1.5DC	Revolution n (min-1)	28,600	19,100	14,300	9,600	7,200	4,800	3,600	2,900	2,400
		ae=0.1DC	Feed rate vf (mm/min)	580	690	740	770	830	970	1,040	960	900
Pre-hardened steel (35～45HRC) P21	High speed	ap=1.5DC	Revolution n (min-1)	35,000	23,300	17,500	12,000	8,800	5,800	4,400	3,500	2,900
		ae=0.05DC	Feed rate vf (mm/min)	700	930	980	1,100	1,100	1,300	1,400	1,300	1,200
	General	ap=1.5DC	Revolution n (min-1)	25,500	17,000	12,700	8,500	6,400	4,200	3,200	2,500	2,100
		ae=0.07DC	Feed rate vf (mm/min)	460	510	560	610	660	750	820	740	700
Hardened steel (45～55HRC) H13	High speed	ap=1.5DC	Revolution n (min-1)	31,800	21,200	15,900	11,000	8,000	5,300	4,000	3,200	2,700
		ae=0.02DC	Feed rate vf (mm/min)	640	760	830	860	900	1,040	1,120	1,030	980
	General	ap=1.5DC	Revolution n (min-1)	22,300	14,800	1,1100	7,400	5,600	3,700	2,800	2,200	1,900
		ae=0.05DC	Feed rate vf (mm/min)	360	410	440	460	500	580	630	570	550



Metric

<Slotting>

Work Material (Hardness)	Cutting range	Depth of cut mm	Cutting conditions	Tool dia. DC (mm)								
				ϕ1	ϕ1.5	ϕ2	ϕ3	ϕ4	ϕ6	ϕ8	ϕ10	ϕ12
Carbon steel Alloy Steel (200～250HB) 1050	High speed	ap≦0.5DC	Revolution n (min-1)	25,500	17,000	12,700	8,500	6,400	4,200	3,200	2,500	2,100
		ae=1DC	Feed rate vf (mm/min)	720	750	810	820	920	1,010	1,090	950	880
	General	ap≦1DC	Revolution n (min-1)	19,100	12,700	9,500	6,400	4,800	3,200	2,400	1,900	1,600
		ae=1DC	Feed rate vf (mm/min)	380	430	450	490	550	610	650	580	540
Alloy steel P20	High speed		Revolution n (min-1)									
			Feed rate vf (mm/min)									
	General	ap≦0.5DC	Revolution n (min-1)	19,100	12,700	9,500	6,400	4,800	3,200	2,400	1,900	1,600
		ae=0.1DC	Feed rate vf (mm/min)	340	380	400	440	500	550	590	520	480
Pre-hardened steel (35～45HRC) P21	High speed		Revolution n (min-1)									
			Feed rate vf (mm/min)									
	General	ap≦0.5DC	Revolution n (min-1)	17,500	11,700	8,800	5,800	4,400	2,900	2,200	1,800	1,500
		ae=1DC	Feed rate vf (mm/min)	280	300	330	360	410	450	480	440	400
Hardened steel (45～55HRC) H13	High speed		Revolution n (min-1)									
			Feed rate vf (mm/min)									
	General	ap≦0.2DC	Revolution n (min-1)	16,000	10,600	8,000	5,300	4,000	2,700	2,000	1,600	1,300
		ae=1DC	Feed rate vf (mm/min)	190	210	240	240	280	310	330	290	260

【Note】 ①Use the high-rigidity and high accuracy machine as possible
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch CS Power Mill 3flutes

Regular

3-flute multi-function end mill. Uses CS Coating for long life.

Planing | Side milling | Slotting | Die-sinking | Helical | Spot facing | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ2～φ6 : 0～−0.015mm
φ6.5～φ25 : 0～−0.0mm

h5

3 Flutes

EPP3○○○-CS

Carbide | CS | Helix angle 43° | Cutting Conditions A329

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPP3030-CS	★	3	8	60	6
EPP3040-CS	★	4	11	60	6
EPP3050-CS	★	5	13	60	6
EPP3060-CS	★	6	13	60	6
EPP3080-CS	★	8	19	75	8
EPP3100-CS	★	10	22	80	10
EPP3120-CS	★	12	26	100	12
EPP3160-CS	★	16	32	110	16
EPP3200-CS	★	20	38	125	20

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎	◎	○		◎	◎	◎	◎

★ : Inventory maintained in Japan

Epoch CS Power Mill 3flutes

Recommended cutting conditions EPP3-CS

Slotting | Side milling

Inch

	Work material	Aluminum alloy wrought A7075 A5052		Cast iron (150～200HB) No.35		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB)		Tool steel, Pre-hardened steel (25～40HRC) P20, P21		Stainless steel S30400 S17400		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Slotting Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC									
	Side milling Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC									
	Tool Dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ2	50,000	90	9,500	17	14,000	25	11,000	20								
	ϕ3	37,000	111	6,400	19	9,600	35	7,400	27								
	ϕ4	28,000	118	4,800	20	7,200	35	5,600	27								
	ϕ5	22,000	125	3,800	22	5,700	38	4,500	30								
	ϕ6	19,000	137	3,200	24	4,800	40	3,700	31								
	ϕ8	14,000	143	2,400	24	3,600	41	2,800	31								
	ϕ10	11,000	129	1,900	22	2,900	39	2,200	30								
	ϕ12	9,300	123	1,600	21	2,400	35	1,900	28								
	ϕ16	7,000	103	1,200	18	1,800	30	1,400	23								
	ϕ20	5,600	94	1,000	17	1,400	26	1,100	20								
	ϕ25	4,460	79	760	13	1,100	20	890	16								
General	Slotting Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Side milling Depth of cut (mm)	ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.15DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC	
	Tool Dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ2	31,800	57	6,400	15	11,000	26	8,000	14	8,000	14	7,950	12	7,950	14	3,180	3
	ϕ3	21,000	63	4,200	13	7,400	22	5,300	16	5,300	14	5,300	11	5,300	14	2,100	4
	ϕ4	16,000	67	3,200	13	5,600	24	4,000	17	4,000	14	4,000	12	4,000	14	1,600	4
	ϕ5	13,000	74	2,500	14	4,500	26	3,200	18	3,200	15	3,200	12	3,200	15	1,300	4
	ϕ6	11,000	79	2,100	15	3,700	27	2,700	19	2,700	17	2,700	14	2,700	17	1,100	5
	ϕ8	8,000	79	1,600	16	2,800	28	2,000	20	2,000	17	2,000	13	2,000	17	800	4
	ϕ10	6,400	75	1,300	15	2,200	26	1,600	19	1,600	16	1,600	13	1,600	16	640	4
	ϕ12	5,300	67	1,100	14	1,900	25	1,300	17	1,300	14	1,300	11	1,300	14	530	4
	ϕ16	4,000	59	800	12	1,400	21	1,000	15	1,000	13	1,000	10	1,000	13	400	3
	ϕ20	3,200	51	600	10	1,100	18	800	13	800	11	800	9	800	11	320	3
	ϕ25	2,550	44	510	9	890	17	640	9	640	9	630	8	630	10	250	2

※For slotting, please refer to above table with depth of cut for slotting.
※For side milling, please increase Revolution Speed to 1～1.3 times and Feed Rate to 1～1.5 times of above table.
When the rpm generally used for slotting is used for spot facing, just lower the feed rate by about 20%.

【Note】
① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ For the stainless steel and heat resistant alloys please use cutting fluid. (Please provide adequate fire prevention.)

Slotting | Side milling

Metric

	Work material	Aluminum alloy wrought A7075 A5052		Cast iron (150～200HB) No.35		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB)		Tool steel, Pre-hardened steel (25～40HRC) P20, P21		Stainless steel S30400 S17400		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Slotting Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦0.5DC a_e=1DC		a_p≦0.5DC a_e=1DC		a_p≦0.5DC a_e=1DC									
	Side milling Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC									
	Tool Dia. DC (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
	ϕ2	50,000	2,240	9,500	420	14,000	630	11,000	490								
	ϕ3	37,000	2,800	6,400	480	9,600	860	7,400	670								
	ϕ4	28,000	2,900	4,800	500	7,200	860	5,600	670								
	ϕ5	22,000	3,200	3,800	550	5,700	940	4,500	740								
	ϕ6	19,000	3,500	3,200	600	4,800	1,010	3,700	780								
	ϕ8	14,000	3,600	2,400	610	3,600	1,030	2,800	800								
	ϕ10	11,000	3,300	1,900	570	2,900	1,000	2,200	760								
	ϕ12	9,300	3,100	1,600	530	2,400	900	1,900	710								
	ϕ16	7,000	2,600	1,200	450	1,800	760	1,400	590								
	ϕ20	5,600	2,400	1,000	420	1,400	650	1,100	510								
	ϕ25	4,460	2,000	760	340	1,100	500	890	400								
General	Slotting Depth of cut (mm)	a_p≦1DC a_e=1DC		a_p≦1DC a_e=1DC		a_p≦1DC a_e=1DC		a_p≦1DC a_e=1DC		a_p≦0.5DC a_e=1DC		a_p≦0.5DC a_e=1DC		a_p≦0.2DC a_e=1DC		a_p≦0.2DC a_e=1DC	
	Side milling Depth of cut (mm)	a_p=1.5DC a_e=0.2DC		a_p=1.5DC a_e=0.2DC		a_p=1.5DC a_e=0.2DC		a_p=1.5DC a_e=0.15DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC	
	Tool Dia. DC (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
	ϕ2	31,800	1,400	6,400	380	11,000	660	8,000	360	8,000	360	7,950	280	7,950	360	3,180	80
	ϕ3	21,000	1,600	4,200	320	7,400	560	5,300	400	5,300	360	5,300	290	5,300	360	2,100	90
	ϕ4	16,000	1,700	3,200	340	5,600	590	4,000	420	4,000	360	4,000	290	4,000	360	1,600	100
	ϕ5	13,000	1,900	2,500	360	4,500	650	3,200	460	3,200	400	3,200	320	3,200	400	1,300	110
	ϕ6	11,000	2,000	2,100	390	3,700	690	2,700	500	2,700	430	2,700	340	2,700	430	1,100	120
	ϕ8	8,000	2,000	1,600	410	2,800	710	2,000	510	2,000	430	2,000	340	2,000	430	800	110
	ϕ10	6,400	1,900	1,300	390	2,200	660	1,600	480	1,600	410	1,600	330	1,600	410	640	110
	ϕ12	5,300	1,700	1,100	360	1,900	630	1,300	430	1,300	370	1,300	290	1,300	370	530	100
	ϕ16	4,000	1,500	800	300	1,400	530	1,000	380	1,000	320	1,000	250	1,000	320	400	80
	ϕ20	3,200	1,300	600	250	1,100	460	800	340	800	280	800	220	800	280	320	70
	ϕ25	2,550	1,100	510	240	890	430	640	230	640	230	630	190	630	250	250	60

※For slotting, please refer to above table with depth of cut for slotting.
※For side milling, please increase Revolution Speed to 1～1.3 times and Feed Rate to 1～1.5 times of above table.
When the rpm generally used for slotting is used for spot facing, just lower the feed rate by about 20%.

【Note】① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ For the stainless steel and heat resistant alloys please use cutting fluid. (Please provide adequate fire prevention.)

Epoch SUS Finish

Additional lineup of Epoch SUS Finish for finishing.

YouTube

Regular

Planing | Side milling | Slotting | Helical | Spot facing | Semi Finishing | Finishing

Dia. tolerance: $\phi3 \sim \phi6$: 0~−0.015mm
$\phi7 \sim \phi12$: 0~−0.02mm

h5

4 Flutes

EPSF4○○○-PN

Carbide | PN | Helix angle 43° | Valuable Pitch | Cutting Conditions A343

Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSF4030-PN	★	3	7.5	56	6	A
EPSF4035-PN	★	3.5	8.8	56	6	A
EPSF4040-PN	★	4	10	56	6	A
EPSF4045-PN	★	4.5	11.3	56	6	A
EPSF4050-PN	★	5	12.5	56	6	A
EPSF4055-PN	★	5.5	13.8	56	6	A
EPSF4060-PN	★	6	15	56	6	B
EPSF4070-PN	★	7	17.5	63	8	A
EPSF4080-PN	★	8	20	63	8	B
EPSF4090-PN	★	9	22.5	74	10	A
EPSF4100-PN	★	10	25	74	10	B
EPSF4110-PN	★	11	27.5	86	12	A
EPSF4120-PN	★	12	30	86	12	B

Medium

Side milling | Semi Finishing | Finishing

Dia. tolerance: $\phi3 \sim \phi6$: 0~−0.015mm
$\phi7 \sim \phi12$: 0~−0.02mm

h5

4 Flutes

EPSFM○○○-PN

Carbide | PN | Helix angle 43° | Valuable Pitch | Cutting Conditions A345

Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSFM4030-PN	★	3	12	56	6	A
EPSFM4035-PN	★	3.5	14	56	6	A
EPSFM4040-PN	★	4	16	56	6	A
EPSFM4045-PN	★	4.5	18	70	6	A
EPSFM4050-PN	★	5	20	70	6	A
EPSFM4055-PN	★	5.5	22	70	6	A
EPSFM4060-PN	★	6	24	70	6	B
EPSFM4070-PN	★	7	28	75	8	A
EPSFM4080-PN	★	8	32	80	8	B
EPSFM4090-PN	★	9	36	100	10	A
EPSFM4100-PN	★	10	40	100	10	B
EPSFM4110-PN	★	11	44	120	12	A
EPSFM4120-PN	★	12	48	120	12	B

Long

Side milling | Semi Finishing | Finishing

Dia. tolerance: $\phi3 \sim \phi6$: 0~−0.015mm
$\phi7 \sim \phi12$: 0~−0.02mm

h5

4 Flutes

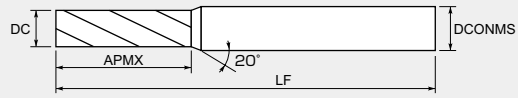
EPSFL4○○○-PN

Carbide | PN | Helix angle 43° | Valuable Pitch | Cutting Conditions A345

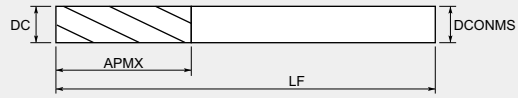
Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSFL4030-PN	★	3	15	56	6	A
EPSFL4040-PN	★	4	20	70	6	A
EPSFL4050-PN	★	5	25	70	6	A
EPSFL4060-PN	★	6	30	70	6	B
EPSFL4070-PN	★	7	35	80	8	A
EPSFL4080-PN	★	8	40	80	8	B
EPSFL4090-PN	★	9	45	100	10	A
EPSFL4100-PN	★	10	50	100	10	B
EPSFL4110-PN	★	11	55	120	12	A
EPSFL4120-PN	★	12	60	120	12	B

Tool shape of Epoch SUS Finish

A type



B type



Applicable work material of EPSF-PN, EPSFM-PN, EPSFL-PN

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

★ : Inventory maintained in Japan

Epoch SUS Multi

Multi-purpose for roughing to finishing of stainless steel, carbon steel, alloy steel, etc.

YouTube

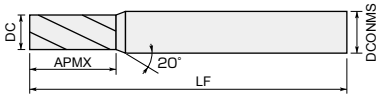
Regular

Please refer to page A249 for Radius

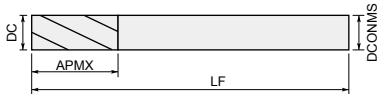
Planing | Side milling | Slotting | Helical | Spot facing | Roughing | Semi Finishing | Finishing

Dia. tolerance
φ1 ~ φ6 : 0~−0.015mm
φ6.05 ~ φ20 : 0~−0.02mm
h5 (φ6~12) h6 (φ16,φ20)

A type



B type



4 Flutes

EPSM4○○○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A337

Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	No. of flutes	Shape
EPSM4010-PN	●	1	2.5	56	6	4	A
EPSM4020-PN	●	2	5	56	6	4	A
EPSM4030-PN	●	3	7.5	56	6	4	A
EPSM4040-PN	●	4	10	56	6	4	A
EPSM4050-PN	●	5	12.5	56	6	4	A
EPSM4060-PN	●	6	15	56	6	4	B
EPSM4070-PN	●	7	17.5	63	8	4	A
EPSM4080-PN	●	8	20	63	8	4	B
EPSM4090-PN	●	9	22.5	74	10	4	A
EPSM4100-PN	●	10	25	74	10	4	B
EPSM4110-PN	●	11	27.5	86	12	4	A
EPSM4120-PN	●	12	30	86	12	4	B
EPSM4160-PN	●	16	40	110	16	4	B
EPSM4200-PN	●	20	50	125	20	4	B

Applicable work material of EPSM-PN, EPSMM-PN, EPSML-PN

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

● : Inventory maintained in US

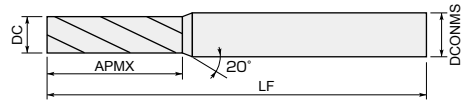
Medium

Side milling | Semi Finishing | Finishing

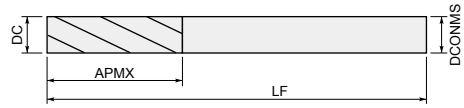
Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ20 : 0～−0.02mm

h5 (φ6～12) | h6 (φ16, φ20)

A type



B type



4 Flutes

EPSMM4○○○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A342

Item code	Stock	Size (mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSMM4030-PN	●	3	12	56	6	A
EPSMM4040-PN	●	4	16	56	6	A
EPSMM4050-PN	●	5	20	70	6	A
EPSMM4060-PN	●	6	24	70	6	B
EPSMM4070-PN	●	7	28	75	8	A
EPSMM4080-PN	●	8	32	80	8	B

Item code	Stock	Size (mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Shape
EPSMM4090-PN	●	9	36	100	10	A
EPSMM4100-PN	●	10	40	100	10	B
EPSMM4110-PN	●	11	44	120	12	A
EPSMM4120-PN	●	12	48	120	12	B
EPSMM4160-PN	●	16	64	135	16	B
EPSMM4200-PN	●	20	80	155	20	B

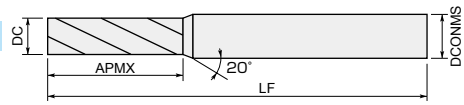
Long

Side milling | Semi Finishing | Finishing

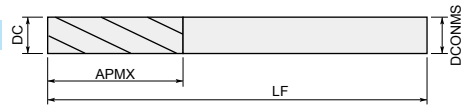
Dia. tolerance: φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm

h5 (φ6～12) | h6 (φ16, φ20)

A type



B type



4 Flutes

EPSML4○○○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A342

Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	No. of flutes	Shape
EPSML4060-PN	●	6	30	70	6	4	B
EPSML4080-PN	●	8	40	80	8	4	B
EPSML4100-PN	●	10	50	100	10	4	B
EPSML4120-PN	●	12	60	120	12	4	B
EPSML4160-PN	●	16	80	135	16	4	B
EPSML4200-PN	●	20	100	155	20	4	B

Epoch SUS Multi

Multi-purpose for roughing to finishing of stainless steel, carbon steel, alloy steel, etc.

YouTube

Long shank

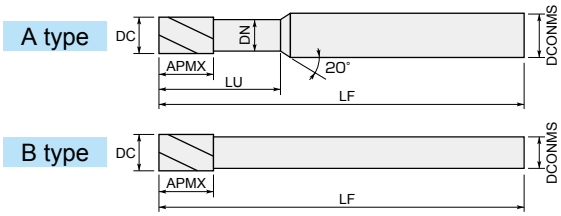
Please refer to page A249 for Radius

Side milling | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ17 : 0～−0.02mm

h5 (DC:3～5) | h6 (DC:6～17)

4 Flutes



EPSMLS4○○○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A340

Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	No. of flutes	Shape
EPSMLS4030-PN	●	3	4.5	10.5	2.88	80	6	4	A
EPSMLS4040-PN	●	4	6	14	3.7	80	6	4	A
EPSMLS4050-PN	●	5	7.5	17.5	4.6	100	6	4	A
EPSMLS4060-PN	●	6	9	–	–	120	5	4	B
EPSMLS4070-PN	●	7	9	–	–	120	6	4	B
EPSMLS4080-PN	●	8	12	–	–	135	7	4	B
EPSMLS4090-PN	●	9	12	–	–	135	8	4	B
EPSMLS4100-PN	●	10	15	–	–	150	9	4	B
EPSMLS4110-PN	●	11	15	–	–	150	10	4	B
EPSMLS4120-PN	●	12	18	–	–	160	11	4	B
EPSMLS4130-PN	●	13	18	–	–	160	12	4	B
EPSMLS4160-PN	●	16	24	–	–	180	15	4	B
EPSMLS4170-PN	●	17	24	–	–	180	16	4	B

Applicable work material of EPSMLS-PN, EPSM-3DC-PN

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

● : Inventory maintained in US

Under neck 3DC

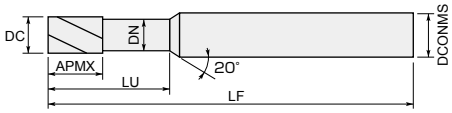
Planing | Side milling | Slotting | Helical | Spot facing | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ1 ~φ6 : 0~−0.015mm
φ6.5 ~φ20 : 0~−0.02mm

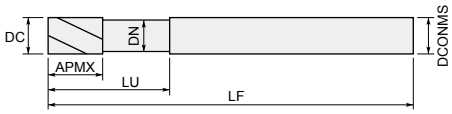
h5 (φ6~12) h6 (φ16,φ20)

4 Flutes

A type



B type



EPSM4○○○-○○.○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A337

Item code	Stock	Size (mm)						No. of flutes	Shape
		Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.		
		DC	APMX	LU	DN	LF	DCONMS		
EPSM4010-3-PN	●	**1**	**1.5**	3	0.96	56	6	4	A
EPSM4020-6-PN	●	**2**	**3**	6	1.92	56	6	4	A
EPSM4030-9-PN	●	**3**	**4.5**	9	2.88	56	6	4	A
EPSM4040-12-PN	●	**4**	**6**	12	3.7	56	6	4	A
EPSM4050-15-PN	●	**5**	**7.5**	15	4.6	56	6	4	A
EPSM4060-18-PN	●	**6**	**9**	18	5.5	56	6	4	B
EPSM4070-21-PN	●	**7**	**10.5**	21	6.4	63	8	4	A
EPSM4080-24-PN	●	**8**	**12**	24	7.3	63	8	4	B
EPSM4090-27-PN	●	**9**	**13.5**	27	8.3	74	10	4	A
EPSM4100-30-PN	●	**10**	**15**	30	9.1	74	10	4	B
EPSM4110-33-PN	●	**11**	**16.5**	33	10.2	86	12	4	A
EPSM4120-36-PN	●	**12**	**18**	36	11	86	12	4	B
EPSM4160-48-PN	●	**16**	**24**	48	14.5	110	16	4	B
EPSM4200-60-PN	●	**20**	**30**	60	18.2	125	20	4	B

Epoch SUS Multi

Multi-purpose for roughing to finishing of stainless steel, carbon steel, alloy steel, etc.

YouTube

Under neck 5DC

Please refer to page A249 for Radius

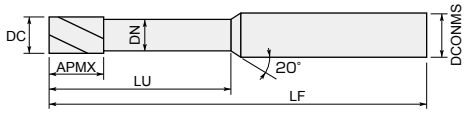
Planing | Side milling | Slotting | Helical | Spot facing | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ1 ~φ6 : 0~−0.015mm
φ6.5 ~φ20 : 0~−0.02mm

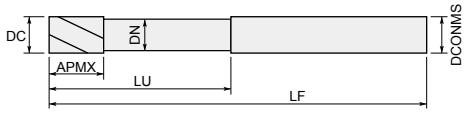
h5 (φ6~12) h6 (φ16,φ20)

4 Flutes

A type



B type



EPSM4○○○-○○○.○-PN

Carbide | PN | Helix angle 40° | Valuable Pitch | Cutting Conditions A340

Item code	Stock	Size (mm)						No. of flutes	Shape
		Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.		
		DC	APMX	LU	DN	LF	DCONMS		
EPSM4010-5-PN	●	**1**	**1.5**	5	0.96	68	6	4	A
EPSM4020-10-PN	●	**2**	**3**	10	1.92	68	6	4	A
EPSM4030-15-PN	●	**3**	**4.5**	15	2.88	68	6	4	A
EPSM4040-20-PN	●	**4**	**6**	20	3.7	68	6	4	A
EPSM4050-25-PN	●	**5**	**7.5**	25	4.6	68	6	4	A
EPSM4060-30-PN	●	**6**	**9**	30	5.5	68	6	4	B
EPSM4070-35-PN	●	**7**	**10.5**	35	6.4	80	8	4	A
EPSM4080-40-PN	●	**8**	**12**	40	7.3	80	8	4	B
EPSM4090-45-PN	●	**9**	**13.5**	45	8.3	94	10	4	A
EPSM4100-50-PN	●	**10**	**15**	50	9.1	94	10	4	B
EPSM4110-55-PN	●	**11**	**16.5**	55	10.2	110	12	4	A
EPSM4120-60-PN	●	**12**	**18**	60	11	110	12	4	B
EPSM4160-80-PN	●	**16**	**24**	80	14.5	135	16	4	B
EPSM4200-100-PN	●	**20**	**30**	100	18.2	155	20	4	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

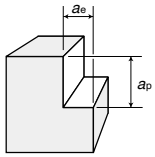
● : Inventory maintained in US

Recommended cutting conditions

General Side milling conditions

EPSM Regular

EPSM-3DC Under neck 3DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	31,800	25	22,300	18	19,100	15	12,700	6	9,500	3
2	15,900	32	11,100	13	9,500	11	6,400	8	4,800	3
3	10,600	34	7,400	15	6,400	13	4,200	9	3,200	3
4	8,000	35	5,600	18	4,800	13	3,200	9	2,400	4
5	6,400	38	4,500	18	3,800	15	2,500	10	1,900	4
6	5,300	38	3,700	18	3,200	15	2,100	10	1,600	4
7	4,500	38	3,200	18	2,700	15	1,800	10	1,400	4
8	4,000	38	2,800	18	2,400	15	1,600	10	1,200	4
9	3,500	36	2,500	18	2,100	15	1,400	10	1,100	4
10	3,200	38	2,200	18	1,900	15	1,300	10	1,000	4
11	2,900	36	2,000	17	1,700	14	1,200	10	900	4
12	2,700	35	1,900	16	1,600	14	1,100	9	800	3
16	2,000	32	1,400	15	1,200	13	800	9	600	3
20	1,600	30	1,100	14	1,000	12	600	8	500	3

【Note】

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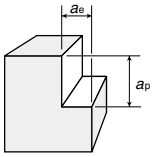
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Multi

High speed Side milling conditions

EPSM Regular

EPSM-3DC Under neck 3DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	41,400	33	31,800	25	28,600	23	19,100	8	15,900	6
2	20,700	41	15,900	19	14,300	17	9,500	8	8,000	6
3	13,800	44	10,600	21	9,500	19	6,400	10	5,300	6
4	10,300	45	8,000	26	7,200	23	4,800	12	4,000	6
5	8,300	50	6,400	26	5,700	23	3,800	11	3,200	6
6	6,900	50	5,300	25	4,800	23	3,200	12	2,700	6
7	5,900	50	4,500	25	4,100	23	2,700	11	2,300	6
8	5,200	50	4,000	26	3,600	23	2,400	12	2,000	6
9	4,600	50	3,500	25	3,200	23	2,100	11	1,800	6
10	4,100	49	3,200	26	2,900	23	1,900	11	1,600	6
11	3,800	47	2,900	24	2,600	21	1,700	11	1,400	6
12	3,400	44	2,700	23	2,400	20	1,600	10	1,300	6
16	2,600	42	2,000	22	1,800	19	1,200	10	1,000	5
20	2,100	39	1,600	20	1,400	18	1,000	10	800	5

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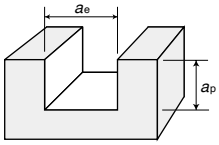
General Slotting conditions

EPSM Regular | **EPSM-3DC** Under neck 3DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC		a_p=1DC		a_p=1DC		a_p=0.5DC		a_p=0.5DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	28,600	11	19,100	8	17,500	7	11,100	4	6,400	3
2	14,300	17	9,500	8	8,800	7	5,600	2	3,200	1
3	9,500	19	6,400	10	5,800	7	3,700	3	2,100	1
4	7,200	23	4,800	12	4,400	9	2,800	3	1,600	1
5	5,700	25	3,800	14	3,500	10	2,200	4	1,300	2
6	4,800	29	3,200	15	2,900	10	1,900	5	1,100	2
7	4,100	28	2,700	15	2,500	10	1,600	4	900	1
8	3,600	29	2,400	15	2,200	11	1,400	4	800	2
9	3,200	28	2,100	15	1,900	10	1,200	4	700	1
10	2,900	29	1,900	15	1,800	11	1,100	4	600	1
11	2,600	27	1,700	14	1,600	10	1,000	4	600	1
12	2,400	26	1,600	14	1,500	10	900	4	500	1
16	1,800	24	1,200	13	1,100	9	700	4	400	1
20	1,400	22	1,000	12	900	9	600	4	300	1

【Note】

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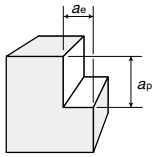
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Epoch SUS Multi

General Side milling conditions

EPSMLS※ Long shank

EPSM-5DC Under neck 5DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.1DC		a_p=0.5DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	28,600	23	19,100	15	15,900	13	12,700	5	9,500	4
2	14,300	29	9,500	11	8,000	10	6,400	5	4,800	4
3	9,500	30	6,400	13	5,300	11	4,200	7	3,200	4
4	7,200	32	4,800	13	4,000	11	3,200	8	2,400	4
5	5,700	34	3,800	15	3,200	13	2,500	7	1,900	4
6	4,800	35	3,200	15	2,700	13	2,100	8	1,600	4
7	4,100	34	2,700	15	2,300	13	1,800	7	1,400	4
8	3,600	35	2,400	15	2,000	13	1,600	8	1,200	4
9	3,200	33	2,100	15	1,800	12	1,400	7	1,100	4
10	2,900	35	1,900	15	1,600	13	1,300	8	1,000	4
11	2,600	32	1,700	14	1,400	11	1,200	8	900	4
12	2,400	31	1,600	14	1,300	11	1,100	7	800	4
13	2,200	30	1,500	14	1,200	11	1,000	7	700	3
16	1,800	29	1,200	13	1,000	11	800	6	600	3
17	1,700	29	1,100	12	900	10	700	6	600	3
20	1,400	26	1,000	12	800	10	600	6	500	3

※ The above table shows cutting conditions for 5DC type tools with a 5DC overhang. Adjust conditions according to the tool overhang amount.

【Note】

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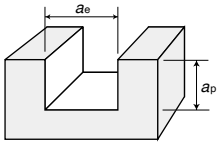
General Slotting conditions

EPSM-5DC

Under neck 5DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC		a_p=0.5DC		a_p=0.5DC		a_p=0.25DC		a_p=0.25DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
1	25,500	10	15,900	6	14,300	6	9,500	4	4,800	2
2	12,700	15	8,000	6	7,200	6	4,800	2	2,400	1
3	8,500	17	5,300	8	4,800	6	3,200	3	1,600	1
4	6,400	20	4,000	10	3,600	7	2,400	3	1,200	1
5	5,100	22	3,200	12	2,900	8	1,900	4	1,000	1
6	4,200	25	2,700	13	2,400	9	1,600	4	800	1
7	3,600	24	2,300	13	2,000	8	1,400	4	700	1
8	3,200	26	2,000	13	1,800	9	1,200	4	600	1
9	2,800	25	1,800	12	1,600	9	1,100	4	500	1
10	2,500	25	1,600	13	1,400	8	1,000	4	500	1
11	2,300	24	1,400	11	1,300	8	900	4	400	1
12	2,100	23	1,300	11	1,200	8	800	4	400	1
16	1,600	21	1,000	11	900	7	600	3	300	1
20	1,300	20	800	10	700	7	500	3	200	1

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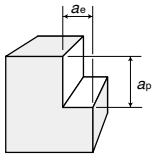
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Epoch SUS Multi

General Side milling conditions

EPSMM
Medium

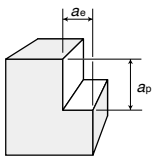


Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=2.5DC, a_e=0.05DC		a_p=2.5DC, a_e=0.05DC		a_p=2.5DC, a_e=0.05DC		a_p=2.5DC, a_e=0.03DC		a_p=2.5DC, a_e=0.02DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
3	7,400	24	5,300	11	4,500	9	3,000	5	2,100	3
4	5,600	25	4,000	11	3,400	11	2,200	4	1,600	3
5	4,500	27	3,200	13	2,700	11	1,800	5	1,300	3
6	3,700	27	2,600	12	2,300	11	1,500	5	1,100	3
7	3,200	27	2,200	12	2,000	11	1,300	5	900	3
8	2,800	27	2,000	13	1,700	11	1,100	5	800	3
9	2,500	26	1,700	12	1,500	11	1,000	5	700	3
10	2,200	26	1,600	13	1,400	11	900	5	600	2
11	2,000	25	1,400	11	1,200	10	800	5	600	2
12	1,800	23	1,300	11	1,100	9	750	5	500	2
16	1,400	22	1,000	11	850	9	550	4	400	2
20	1,100	21	800	10	650	8	450	4	300	2

General Side milling conditions

EPSML
Long



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.02DC		a_p=3DC, a_e=0.01DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
6	2,700	19	1,900	9	1,600	8	1,100	4	800	2
8	2,000	19	1,400	8	1,200	8	800	4	600	2
10	1,600	19	1,100	9	1,000	8	600	4	500	2
12	1,300	17	900	8	800	7	500	3	400	2
16	1,000	16	700	8	600	6	400	3	300	2
20	800	15	600	7	500	6	300	3	200	1

【Note】

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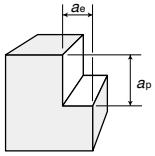
General Side milling conditions

EPSF
Regular



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1.0DC, a_e=0.2DC		a_p=1.0DC, a_e=0.1DC		a_p=1.0DC, a_e=0.1DC		a_p=1.0DC, a_e=0.05DC		a_p=1.0DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
3	9,000	32	6,900	19	6,400	18	5,300	6	4,200	3
3.5	7,700	34	5,900	19	5,500	18	4,500	5	3,600	3
4	6,800	35	5,200	19	4,800	17	4,000	6	3,200	4
4.5	6,000	36	4,600	18	4,200	18	3,500	6	2,800	3
5	5,400	37	4,100	20	3,800	18	3,200	6	2,500	4
5.5	4,900	37	3,800	20	3,500	20	2,900	6	2,300	4
6	4,500	38	3,400	20	3,200	19	2,700	6	2,100	3
7	3,900	37	3,000	20	2,700	18	2,300	6	1,800	4
8	3,400	38	2,600	21	2,400	19	2,000	6	1,600	4
9	3,000	37	2,300	20	2,100	18	1,800	6	1,400	4
10	2,700	38	2,100	21	1,900	19	1,600	6	1,300	4
11	2,500	36	1,900	20	1,700	17	1,400	6	1,200	4
12	2,300	34	1,700	18	1,600	17	1,300	6	1,100	4

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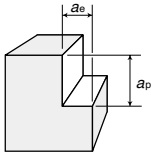
Epoch SUS Multi

Side finishing conditions

EPSF	EPSM	EPSM-3DC	EPSM-5DC※1
Regular	Regular	Under neck 3DC	Under neck 5DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=1DC, ae=0.001DC~0.02DC		ap=1DC, ae=0.001DC~0.02DC		ap=1DC, ae=0.001DC~0.02DC		ap=1DC, ae=0.001DC~0.02DC		ap=1DC, ae=0.001DC~0.02DC	
	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
1	45,500	36	35,000	14	31,500	13	21,000	8	17,500	7
2	22,800	46	17,500	21	15,800	19	10,500	8	8,800	4
3	15,200	43	11,700	23	10,500	21	7,000	11	5,800	5
3.5	13,000	47	10,000	24	9,000	22	6,000	10	5,000	6
4	11,400	23	8,800	11	7,900	9	5,300	4	4,400	2
4.5	10,100	24	7,800	12	7,000	8	4,700	4	3,900	2
5	9,100	25	7,000	14	6,300	10	4,200	3	3,500	1
5.5	8,300	27	6,400	15	5,700	9	3,800	5	3,200	1
6	7,600	49	5,800	26	5,300	23	3,500	11	2,900	6
7	6,500	49	5,000	24	4,500	22	3,000	11	2,500	6
8	5,700	48	4,400	25	3,900	22	2,600	11	2,200	6
9	5,100	49	3,900	25	3,500	22	2,300	11	1,900	6
10	4,600	50	3,500	25	3,200	23	2,100	11	1,800	6
11	4,100	46	3,200	23	2,900	22	1,900	11	1,600	6
12	3,800	44	2,900	22	2,600	20	1,800	10	1,500	6
16	2,800	40	2,200	21	2,000	19	1,300	9	1,100	5
20	2,300	39	1,800	20	1,600	18	1,100	9	900	5

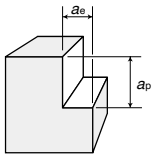
※1 The table above indicates cutting parameter for regular type and 3DC type, please reduce both rotation and feed rate to 70% when using 5DC type

【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

Side finishing conditions

EPSFM
Medium

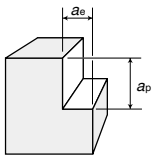


Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC	
	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
3	7,070	20	4,060	10	4,830	12	4,830	8	2,940	2
4	5,320	19	3,080	10	3,640	12	3,640	7	2,240	3
5	4,200	20	2,450	11	2,870	13	2,870	8	1,750	3
6	3,500	21	2,030	11	2,380	12	2,380	8	1,470	3
7	3,010	20	1,750	11	2,100	13	2,100	8	1,260	3
8	2,660	21	1,540	11	1,820	13	1,820	8	1,120	3
9	2,380	21	1,330	11	1,610	13	1,610	8	980	3
10	2,100	21	1,260	11	1,470	13	1,470	8	910	3
11	1,890	20	1,120	10	1,330	12	1,330	7	840	3
12	1,750	18	1,050	10	1,190	11	1,190	7	770	3

Side finishing conditions

EPSFL
Long



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC	
	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
3	5,050	14	2,900	7	3,450	8	3,450	6	2,100	2
4	3,800	14	2,200	8	2,600	8	2,600	5	1,600	2
5	3,000	14	1,750	8	2,050	9	2,050	6	1,250	2
6	2,500	15	1,450	8	1,700	9	1,700	5	1,050	2
7	2,150	15	1,250	8	1,500	10	1,500	5	900	2
8	1,900	15	1,100	8	1,300	9	1,300	6	800	2
9	1,700	15	950	8	1,150	9	1,150	6	700	2
10	1,500	15	900	8	1,050	9	1,050	5	650	2
11	1,350	14	800	7	950	9	950	5	600	2
12	1,250	14	750	7	850	8	850	5	550	2

【Note】

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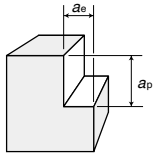
Use the appropriate coolant for the work material and machining shape.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.

Epoch SUS Multi

General Side milling conditions

EPSM Regular | **EPSM-3DC** Under neck 3DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
1	31,800	760	22,300	360	19,100	310	12,700	150	9,500	76
2	15,900	810	11,100	380	9,500	320	6,400	160	4,800	82
3	10,600	860	7,400	400	6,400	350	4,200	170	3,200	86
4	8,000	910	5,600	430	4,800	360	3,200	180	2,400	91
5	6,400	960	4,500	450	3,800	380	2,500	190	1,900	95
6	5,300	950	3,700	440	3,200	380	2,100	190	1,600	96
7	4,500	940	3,200	450	2,700	380	1,800	190	1,400	98
8	4,000	960	2,800	450	2,400	380	1,600	190	1,200	96
9	3,500	940	2,500	450	2,100	380	1,400	190	1,100	99
10	3,200	960	2,200	440	1,900	380	1,300	200	1,000	100
11	2,900	910	2,000	420	1,700	360	1,200	190	900	94
12	2,700	870	1,900	410	1,600	350	1,100	180	800	86
16	2,000	820	1,400	380	1,200	330	800	160	600	82
20	1,600	770	1,100	350	1,000	320	600	140	500	80

【Note】

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Insure high Machine rigidity an d high accuracy machine setting are utilized.
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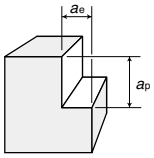
Please adjust machining conditions if chatter or vibration become excessive.

High speed Side milling conditions

EPSM Regular | **EPSM-3DC** Under neck 3DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=1DC, ae=0.5DC		ap=1DC, ae=0.5DC		ap=1DC, ae=0.5DC		ap=1DC, ae=0.1DC		ap=1DC, ae=0.05DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
1	41,400	990	31,800	510	28,600	460	19,100	230	15,900	127
2	20,700	1,060	15,900	540	14,300	490	9,500	240	8,000	136
3	13,800	1,120	10,600	570	9,500	510	6,400	260	5,300	143
4	10,300	1,170	8,000	610	7,200	550	4,800	270	4,000	152
5	8,300	1,250	6,400	640	5,700	570	3,800	280	3,200	160
6	6,900	1,240	5,300	640	4,800	580	3,200	290	2,700	162
7	5,900	1,240	4,500	630	4,100	570	2,700	280	2,300	161
8	5,200	1,250	4,000	640	3,600	580	2,400	290	2,000	160
9	4,600	1,240	3,500	630	3,200	580	2,100	280	1,800	162
10	4,100	1,230	3,200	640	2,900	580	1,900	290	1,600	160
11	3,800	1,190	2,900	610	2,600	540	1,700	270	1,400	146
12	3,400	1,100	2,700	580	2,400	520	1,600	260	1,300	140
16	2,600	1,060	2,000	540	1,800	490	1,200	240	1,000	136
20	2,100	1,010	1,600	510	1,400	450	1,000	240	800	128

【Note】

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Insure high Machine rigidity an d high accuracy machine setting are utilized.
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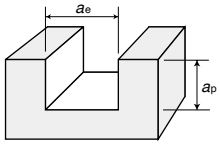
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Multi

General Slotting conditions

EPSM Regular | **EPSM-3DC** Under neck 3DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=1DC		ap=1DC		ap=1DC		ap=0.5DC		ap=0.5DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
1	28,600	360	19,100	190	17,500	130	11,100	60	6,400	19
2	14,300	430	9,500	230	8,800	160	5,600	70	3,200	23
3	9,500	500	6,400	270	5,800	180	3,700	80	2,100	26
4	7,200	580	4,800	310	4,400	210	2,800	90	1,600	31
5	5,700	640	3,800	340	3,500	240	2,200	100	1,300	35
6	4,800	720	3,200	380	2,900	260	1,900	110	1,100	40
7	4,100	720	2,700	380	2,500	260	1,600	110	900	38
8	3,600	720	2,400	380	2,200	260	1,400	110	800	38
9	3,200	720	2,100	380	1,900	260	1,200	110	700	38
10	2,900	730	1,900	380	1,800	270	1,100	110	600	36
11	2,600	680	1,700	360	1,600	250	1,000	100	600	38
12	2,400	650	1,600	350	1,500	240	900	100	500	32
16	1,800	610	1,200	330	1,100	220	700	100	400	33
20	1,400	560	1,000	320	900	220	600	100	300	29

【Note】

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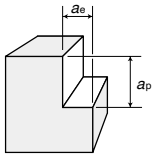
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

General Side milling conditions

EPSMLS※ Long shank

EPSM-5DC Under neck 5DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.1DC		a_p=0.5DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
1	28,600	690	19,100	310	15,900	250	12,700	150	9,500	76
2	14,300	730	9,500	320	8,000	270	6,400	160	4,800	82
3	9,500	770	6,400	350	5,300	290	4,200	170	3,200	86
4	7,200	820	4,800	360	4,000	300	3,200	180	2,400	91
5	5,700	860	3,800	380	3,200	320	2,500	190	1,900	95
6	4,800	860	3,200	380	2,700	320	2,100	190	1,600	96
7	4,100	860	2,700	380	2,300	320	1,800	190	1,400	98
8	3,600	860	2,400	380	2,000	320	1,600	190	1,200	96
9	3,200	860	2,100	380	1,800	320	1,400	190	1,100	99
10	2,900	870	1,900	380	1,600	320	1,300	200	1,000	100
11	2,600	820	1,700	360	1,400	290	1,200	190	900	94
12	2,400	780	1,600	350	1,300	280	1,100	180	800	86
13	2,200	760	1,500	350	1,200	280	1,000	170	700	81
16	1,800	730	1,200	330	1,000	270	800	160	600	82
17	1,700	730	1,100	310	900	260	700	150	600	86
20	1,400	670	1,000	320	800	260	600	140	500	80

※ The above table shows cutting conditions for 5DC type tools with a 5DC overhang. Adjust conditions according to the tool overhang amount.

【Note】

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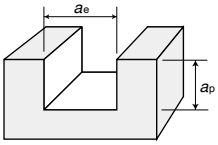
Epoch SUS Multi

General Slotting conditions

EPSM-5DC
Under neck 5DC



Metric

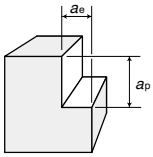
Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=0.5DC		ap=0.5DC		ap=0.5DC		ap=0.25DC		ap=0.25DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
1	25,500	320	15,900	160	14,300	110	9,500	50	4,800	14
2	12,700	380	8,000	190	7,200	130	4,800	60	2,400	17
3	8,500	450	5,300	220	4,800	150	3,200	70	1,600	20
4	6,400	510	4,000	260	3,600	170	2,400	80	1,200	23
5	5,100	570	3,200	290	2,900	200	1,900	90	1,000	27
6	4,200	630	2,700	320	2,400	220	1,600	100	800	29
7	3,600	630	2,300	320	2,000	210	1,400	100	700	29
8	3,200	640	2,000	320	1,800	220	1,200	100	600	29
9	2,800	630	1,800	320	1,600	220	1,100	100	500	27
10	2,500	630	1,600	320	1,400	210	1,000	100	500	30
11	2,300	600	1,400	290	1,300	200	900	90	400	25
12	2,100	570	1,300	280	1,200	190	800	90	400	26
16	1,600	540	1,000	270	900	180	600	80	300	24
20	1,300	520	800	260	700	170	500	80	200	19

【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

General Side milling conditions

EPSMM
Medium

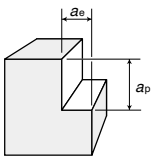


Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=2.5DC, ae=0.05DC		ap=2.5DC, ae=0.05DC		ap=2.5DC, ae=0.05DC		ap=2.5DC, ae=0.03DC		ap=2.5DC, ae=0.02DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
3	7,400	600	5,300	290	4,500	240	3,000	120	2,100	57
4	5,600	640	4,000	300	3,400	260	2,200	120	1,600	61
5	4,500	670	3,200	320	2,700	270	1,800	130	1,300	65
6	3,700	660	2,600	310	2,300	270	1,500	130	1,100	66
7	3,200	670	2,200	310	2,000	280	1,300	130	900	63
8	2,800	670	2,000	320	1,700	270	1,100	130	800	64
9	2,500	670	1,700	310	1,500	270	1,000	130	700	63
10	2,200	660	1,600	320	1,400	280	900	130	600	60
11	2,000	630	1,400	290	1,200	250	800	120	600	63
12	1,800	580	1,300	280	1,100	240	750	120	500	54
16	1,400	570	1,000	270	850	230	550	110	400	54
20	1,100	530	800	260	650	210	450	110	300	48

General Side milling conditions

EPSML
Long



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=3DC, ae=0.05DC		ap=3DC, ae=0.05DC		ap=3DC, ae=0.05DC		ap=3DC, ae=0.02DC		ap=3DC, ae=0.01DC	
	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)	Revolution n (min-1)	Feed rate vf (mm/min)
6	2,700	490	1,900	230	1,600	190	1,100	100	800	48
8	2,000	480	1,400	220	1,200	190	800	100	600	48
10	1,600	480	1,100	220	1,000	200	600	90	500	50
12	1,300	420	900	190	800	170	500	80	400	43
16	1,000	410	700	190	600	160	400	80	300	41
20	800	380	600	190	500	160	300	70	200	32

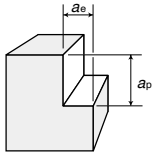
【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Multi

General Side milling conditions

EPSF
Regular



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1.0DC, a_e=0.2DC		a_p=1.0DC, a_e=0.1DC		a_p=1.0DC, a_e=0.1DC		a_p=1.0DC, a_e=0.05DC		a_p=1.0DC, a_e=0.05DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
3	9,000	850	6,900	470	6,400	430	5,300	140	4,200	85
3.5	7,700	850	5,900	460	5,500	430	4,500	140	3,600	85
4	6,800	900	5,200	490	4,800	460	4,000	150	3,200	91
4.5	6,000	900	4,600	490	4,200	450	3,500	150	2,800	90
5	5,400	950	4,100	510	3,800	480	3,200	160	2,500	94
5.5	4,900	940	3,800	520	3,500	480	2,900	160	2,300	95
6	4,500	950	3,400	510	3,200	480	2,700	160	2,100	95
7	3,900	960	3,000	530	2,700	470	2,300	160	1,800	95
8	3,400	950	2,600	520	2,400	480	2,000	160	1,600	96
9	3,000	950	2,300	520	2,100	470	1,800	160	1,400	95
10	2,700	950	2,100	530	1,900	480	1,600	160	1,300	98
11	2,500	910	1,900	500	1,700	440	1,400	150	1,200	94
12	2,300	870	1,700	460	1,600	430	1,300	140	1,100	89

【Note】

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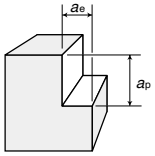
Use the appropriate coolant for the work material and machining shape.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.

Side finishing conditions

EPSF	EPSM	EPSM-3DC	EPSM-5DC※1
Regular	Regular	Under neck 3DC	Under neck 5DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.001DC～0.02DC		a_p=1DC, a_e=0.001DC～0.02DC		a_p=1DC, a_e=0.001DC～0.02DC		a_p=1DC, a_e=0.001DC～0.02DC		a_p=1DC, a_e=0.001DC～0.02DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
1	45,500	980	35,000	500	31,500	450	21,000	230	17,500	130
2	22,800	1,050	17,500	540	15,800	480	10,500	240	8,800	130
3	15,200	1,110	11,700	570	10,500	510	7,000	260	5,800	140
3.5	13,000	1,130	10,000	580	9,000	520	6,000	260	5,000	140
4	11,400	1,170	8,800	600	7,900	540	5,300	270	4,400	150
4.5	10,100	1,190	7,800	610	7,000	550	4,700	280	3,900	150
5	9,100	1,230	7,000	630	6,300	570	4,200	280	3,500	160
5.5	8,300	1,230	6,400	630	5,700	560	3,800	280	3,200	160
6	7,600	1,230	5,800	630	5,300	570	3,500	280	2,900	160
7	6,500	1,230	5,000	630	4,500	570	3,000	280	2500	160
8	5,700	1,230	4,400	630	3,900	560	2,600	280	2200	160
9	5,100	1,240	3,900	630	3,500	570	2,300	280	1900	150
10	4,600	1,240	3,500	630	3,200	580	2,100	280	1800	160
11	4,100	1,160	3,200	600	2,900	550	1,900	270	1600	150
12	3,800	1,110	2,900	560	2,600	510	1,800	260	1500	150
13	3,500	1,080	2,700	560	2,400	490	1,600	250	1300	130
16	2,800	1,030	2,200	540	2,000	490	1,300	240	1100	130
17	2,700	1,030	2,100	530	1,900	480	1,200	230	1000	130
20	2,300	990	1,800	520	1600	460	1,100	240	900	130

※1 The table above indicates cutting parameter for regular type and 3DC type, please reduce both rotation and feed rate to 70% when using 5DC type

【Note】

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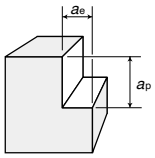
Epoch SUS Multi

Side finishing conditions

EPSFM
Medium

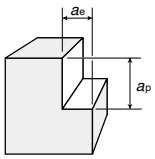


Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC		a_p=2.5DC, a_e=0.001DC~0.01DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
3	7,070	480	4,060	250	4,830	290	4,830	180	2,940	71
4	5,320	510	3,080	260	3,640	310	3,640	190	2,240	77
5	4,200	530	2,450	280	2,870	320	2,870	190	1,750	79
6	3,500	530	2,030	270	2,380	320	2,380	190	1,470	79
7	3,010	530	1,750	280	2,100	330	2,100	200	1,260	79
8	2,660	530	1,540	280	1,820	330	1,820	200	1,120	81
9	2,380	540	1,330	270	1,610	330	1,610	200	980	79
10	2,100	530	1,260	280	1,470	330	1,470	200	910	82
11	1,890	490	1,120	260	1,330	310	1,330	190	840	79
12	1,750	470	1,050	260	1,190	290	1,190	170	770	75

Side finishing conditions

EPSFL
Long



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC		a_p=3DC, a_e=0.001DC~0.01DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
3	5,050	340	2,900	180	3,450	210	3,450	130	2,100	51
4	3,800	360	2,200	190	2,600	220	2,600	130	1,600	55
5	3,000	380	1,750	200	2,050	230	2,050	140	1,250	56
6	2,500	380	1,450	200	1,700	230	1,700	140	1,050	57
7	2,150	380	1,250	200	1,500	240	1,500	140	900	57
8	1,900	380	1,100	200	1,300	230	1,300	140	800	58
9	1,700	380	950	190	1,150	230	1,150	140	700	57
10	1,500	380	900	200	1,050	240	1,050	140	650	59
11	1,350	350	800	190	950	220	950	130	600	56
12	1,250	340	750	180	850	210	850	120	550	53

【Note】

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Epoch TH Power Mill

For machining of high-hardness materials.
Excellent chip removal performance
enables high efficiency.

Please refer to page A264 for Radius

Short

Planing / Side milling / Slotting / Roughing / Semi Finishing / Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ6.5～φ20 : 0～−0.02mm
h6

EPPS4○○○-TH

Carbide TH Helix angle 43° Cutting Conditions A356

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPPS4030-TH	★	3	4.5	60	6
EPPS4035-TH	★	3.5	5.3	60	6
EPPS4040-TH	★	4	6	60	6
EPPS4045-TH	★	4.5	6.8	60	6
EPPS4050-TH	★	5	7.5	60	6
EPPS4055-TH	★	5.5	8.3	60	6
EPPS4060-TH	★	6	9	60	6
EPPS4065-TH	★	6.5	9.8	70	8
EPPS4070-TH	★	7	10.5	70	8
EPPS4075-TH	★	7.5	11.3	75	8
EPPS4080-TH	★	8	12	75	8
EPPS4085-TH	★	8.5	12.8	80	10
EPPS4090-TH	★	9	13.5	80	10
EPPS4095-TH	★	9.5	14.3	80	10
EPPS4100-TH	★	10	15	80	10
EPPS4120-TH	★	12	18	100	12
EPPS4160-TH	★	16	24	110	16
EPPS4200-TH	★	20	30	125	20

Regular

Planing / Side milling / Slotting / Roughing / Semi Finishing / Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ20 : 0～−0.02mm
h6

EPP4○○○-TH

Carbide TH Helix angle 43° Cutting Conditions A357

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPP4030-TH	●	3	8	60	6
EPP4040-TH	●	4	11	60	6
EPP4050-TH	★	5	13	60	6
EPP4060-TH	●	6	13	60	6
EPP4070-TH	★	7	16	70	8
EPP4080-TH	●	8	19	75	8
EPP4090-TH	★	9	19	80	10
EPP4100-TH	●	10	22	80	10
EPP4110-TH	★	11	22	100	12
EPP4120-TH	●	12	26	100	12
EPP4130-TH	★	13	26	100	12
EPP4140-TH	★	14	26	110	16
EPP4150-TH	★	15	26	110	16
EPP4160-TH	★	16	32	110	16
EPP4170-TH	★	17	32	110	16
EPP4180-TH	★	18	32	125	20
EPP4190-TH	★	19	32	125	20
EPP4200-TH	★	20	38	125	20

Medium

Side milling / Roughing / Semi Finishing / Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

EPPM4○○○-TH

Carbide TH Helix angle 43° Cutting Conditions A358

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPPM4030-TH	★	3	15	60	6
EPPM4040-TH	★	4	17	60	6
EPPM4050-TH	★	5	20	60	6
EPPM4060-TH	★	6	20	60	6
EPPM4080-TH	★	8	25	75	8
EPPM4100-TH	★	10	33	80	10
EPPM4120-TH	★	12	37	100	12
EPPM4160-TH	★	16	47	110	16
EPPM4200-TH	★	20	55	125	20

Long

Side milling / Semi Finishing / Finishing

Dia. tolerance: φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

EPPL4○○○-TH

Carbide TH Helix angle 43° Cutting Conditions A358

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPPL4060-TH	★	6	25	70	6
EPPL4080-TH	★	8	35	90	8
EPPL4100-TH	★	10	45	100	10
EPPL4120-TH	★	12	55	120	12
EPPL4160-TH	★	16	65	135	16
EPPL4200-TH	★	20	75	155	20

Applicable work material of EPPS-TH,EPP-TH,EPPM-TH,EPPL-TH

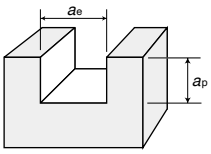
Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎	○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch TH Power Mill

Recommended cutting conditions

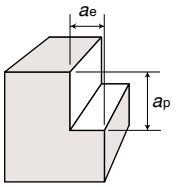
EPPS4-TH
Short



Inch

<Slotting>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC		a_p≦0.2DC a_e=1DC		a_p≦0.5DC a_e=1DC		a_p≦0.2DC a_e=1DC		a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)
ϕ3	15,900	51	11,100	36	9,600	23	7,950	19	9,280	22	7,690	18			3,990	8
ϕ4	11,940	57	8,250	40	7,200	29	6,000	24	6,960	28	5,800	23			3,000	10
ϕ5	9,540	61	6,840	41	5,700	32	4,800	27	5,510	31	4,640	26			2,430	12
ϕ6	7,980	64	5,760	44	4,800	29	3,900	25	4,640	28	3,770	24			1,950	13
ϕ8	5,940	64	4,320	47	3,600	29	3,000	24	3,480	28	2,900	23			1,500	12
ϕ10	4,800	60	3,420	41	2,850	27	2,400	22	2,760	26	2,320	21			1,200	11
ϕ12	3,750	56	2,850	39	2,400	26	1,950	21	2,320	25	1,890	20			1,020	9
ϕ16	3,000	47	2,100	33	1,800	24	1,500	20	1,740	23	1,450	19			750	8
ϕ20	2,340	45	1,650	31	1,500	22	1,200	19	1,450	21	1,160	18			600	7



Inch

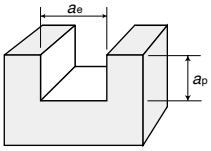
<Side milling>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)	Revolution n (min⁻¹)	Feed rate v_f (IPM)
ϕ3	19,100	61	15,900	51	17,400	35	12,500	30	15,900	38	10,400	25	12,700	25	9,560	19
ϕ4	14,300	69	11,900	57	13,000	47	9,600	38	12,000	43	7,920	29	9,560	31	7,160	23
ϕ5	11,500	74	9,600	61	10,400	54	7,500	42	9,560	50	6,300	30	7,640	37	5,730	28
ϕ6	9,560	76	7,970	64	8,700	49	6,600	40	7,970	48	5,220	31	6,360	36	4,770	27
ϕ8	7,160	80	5,970	64	6,480	47	4,950	38	5,970	45	3,960	35	4,770	34	3,590	26
ϕ10	5,730	71	4,770	61	5,220	44	3,900	36	4,770	42	3,240	31	3,830	34	2,870	25
ϕ12	4,770	67	3,750	57	4,320	43	3,300	34	3,750	41	2,700	28	3,180	31	2,390	22
ϕ16	3,590	56	2,930	49	3,240	40	2,550	32	2,930	36	1,980	25	2,390	27	1,790	20
ϕ20	2,870	54	2,400	45	2,520	37	1,950	30	2,400	35	1,620	23	1,910	24	1,500	19

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

EPP4-TH

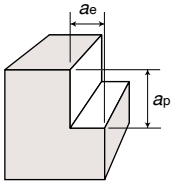
Regular



Inch

<Slotting>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
ϕ3	8,500	31	6,400	20			6,400	18			5,800	14			5,300	8
ϕ4	6,400	36	4,800	21			4,800	19			4,400	16			4,000	11
ϕ5	5,100	39	3,800	23			3,800	21			3,500	17			3,200	12
ϕ6	4,200	40	3,200	24			3,200	22			2,900	17			2,700	12
ϕ8	3,200	44	2,400	26			2,400	23			2,200	18			2,000	13
ϕ10	2,500	37	1,900	23			1,900	21			1,800	17			1,600	12
ϕ12	2,100	34	1,600	21			1,600	19			1,500	16			1,300	10
ϕ16	1,600	30	1,200	18			1,200	16			1,100	13			1,000	9
ϕ20	1,300	30	1,000	18			1,000	16			900	13			800	8



Inch

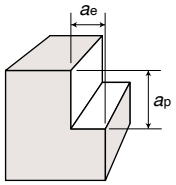
<Side milling>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.15DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.07DC		a_p=1.5DC a_e=0.02DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
ϕ3	16,000	70	9,600	35	14,000	56	9,600	31	12,000	43	8,500	24	11,000	35	7,400	18
ϕ4	12,000	77	7,200	37	10,000	56	7,200	32	8,800	42	6,400	26	8,000	35	5,600	20
ϕ5	9,600	84	5,700	39	8,300	63	5,700	36	7,000	48	5,100	29	6,400	38	4,500	22
ϕ6	8,000	86	4,800	42	6,900	66	4,800	38	5,800	51	4,200	30	5,300	40	3,700	22
ϕ8	6,000	94	3,600	45	5,200	75	3,600	40	4,400	55	3,200	32	4,000	45	2,800	25
ϕ10	4,800	86	2,900	42	4,100	67	2,900	38	3,500	52	2,500	29	3,200	41	2,200	23
ϕ12	4,000	83	2,400	39	3,500	63	2,400	36	2,900	48	2,100	28	2,700	39	1,900	22
ϕ16	3,000	67	1,800	32	2,600	51	1,800	29	2,200	40	1,600	22	2,000	30	1,400	17
ϕ20	2,400	55	1,400	26	2,100	44	1,400	24	1,800	34	1,300	20	1,590	26	1,110	15

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch TH Power Mill

EPPM4-TH
Medium

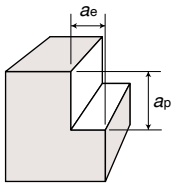


Inch

<Side milling>

Work material	Alloy steel (200～250HB) H13,D2		Alloy steel (25～35HRC) 4140		Pre-hardened steel (35～45HRC) P20		Hardened steel (45～55HRC) H13,L6	
Depth of cut (mm)	a_p=2.5DC a_e=0.02DC		a_p=2.5DC a_e=0.02DC		a_p=2.5DC a_e=0.02DC		a_p=2.5DC a_e=0.01DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
ϕ3	8,730	28	7,920	22	6,210	15	3,500	7
ϕ4	6,480	31	5,940	24	4,680	15	2,950	9
ϕ5	5,220	33	4,770	27	3,690	16	2,300	12
ϕ6	4,320	35	3,960	29	3,060	17	1,600	12
ϕ8	3,240	38	2,970	31	2,340	20	1,450	12
ϕ10	2,610	35	2,340	28	1,890	17	1,200	12
ϕ12	2,160	33	1,980	27	1,530	17	900	11
ϕ16	1,620	27	1,530	23	1,170	14	750	8
ϕ20	1,260	21	1,170	18	900	11	600	7

EPPL4-TH
Long



Inch

<Side milling>

Work material	Alloy steel (200～250HB) H13,D2		Alloy steel (25～35HRC) 4140		Pre-hardened steel (35～45HRC) P20		Hardened steel (45～55HRC) H13,L6	
Depth of cut (mm)	a_p=3DC a_e=0.02DC		a_p=3DC a_e=0.02DC		a_p=3DC a_e=0.02DC		a_p=3DC a_e=0.01DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
ϕ6	3,840	29	2,940	21	2,400	15	1,590	9
ϕ8	2,880	28	2,200	19	1,800	14	1,200	9
ϕ10	2,280	27	1,750	19	1,400	13	960	8
ϕ12	1,920	25	1,500	18	1,200	12	800	8
ϕ16	1,440	22	1,100	17	900	12	600	7
ϕ20	1,200	20	900	15	700	10	500	6

【Note】

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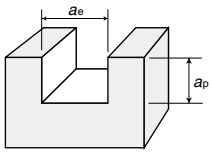
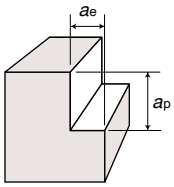
EPPS4-TH
Short



Metric

<Slotting>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC		a_p≦0.2DC a_e=1DC		a_p≦0.5DC a_e=1DC		a_p≦0.2DC a_e=1DC		a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)
ϕ3	15,900	1,260	11,100	900	9,600	570	7,950	480	9,280	550	7,690	460			3,990	200
ϕ4	11,940	1,440	8,250	1,005	7,200	720	6,000	600	6,960	700	5,800	580			3,000	240
ϕ5	9,540	1,530	6,840	1,050	5,700	810	4,800	690	5,510	780	4,640	670			2,430	300
ϕ6	7,980	1,590	5,760	1,110	4,800	750	3,900	630	4,640	730	3,770	610			1,950	330
ϕ8	5,940	1,650	4,320	1,170	3,600	720	3,000	600	3,480	700	2,900	580			1,500	300
ϕ10	4,800	1,530	3,420	1,050	2,850	690	2,400	570	2,760	670	2,320	550			1,200	270
ϕ12	3,750	1,410	2,850	990	2,400	660	1,950	540	2,320	640	1,890	520			1,020	240
ϕ16	3,000	1,200	2,100	840	1,800	600	1,500	510	1,740	580	1,450	490			750	210
ϕ20	2,340	1,140	1,650	780	1,500	570	1,200	480	1,450	550	1,160	460			600	180



Metric

<Side milling>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)
ϕ3	19,100	1,530	15,900	1,280	17,400	960	12,500	780	15,900	900	10,400	650	12,700	600	9,560	440
ϕ4	14,300	1,730	11,900	1,440	13,000	1,200	9,600	960	12,000	1,140	7,920	740	9,560	810	7,160	570
ϕ5	11,500	1,830	9,600	1,530	10,400	1,350	7,500	1,050	9,560	1,280	6,300	780	7,640	920	5,730	690
ϕ6	9,560	1,910	7,970	1,590	8,700	1,280	6,600	1,020	7,970	1,190	5,220	800	6,360	890	4,770	680
ϕ8	7,160	2,010	5,970	1,650	6,480	1,200	4,950	960	5,970	1,140	3,960	870	4,770	860	3,590	650
ϕ10	5,730	1,830	4,770	1,530	5,220	1,140	3,900	900	4,770	1,050	3,240	800	3,830	840	2,870	630
ϕ12	4,770	1,710	3,750	1,440	4,320	1,110	3,300	870	3,750	1,020	2,700	720	3,180	770	2,390	570
ϕ16	3,590	1,440	2,930	1,260	3,240	1,020	2,550	810	2,930	930	1,980	620	2,390	680	1,790	510
ϕ20	2,870	1,380	2,400	1,140	2,520	960	1,950	750	2,400	870	1,620	600	1,910	620	1,500	470

【Note】
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② Use the appropriate coolant for the work material and machining shape.
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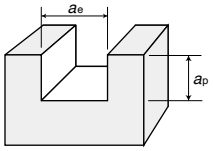
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch TH Power Mill

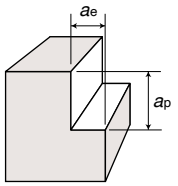
EPP4-TH
Regular



Metric

<Slotting>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)
ϕ3	8,500	820	6,400	490			6,400	440			5,800	360			5,300	240
ϕ4	6,400	920	4,800	550			4,800	500			4,400	410			4,000	280
ϕ5	5,100	980	3,800	580			3,800	530			3,500	430			3,200	290
ϕ6	4,200	1,010	3,200	610			3,200	550			2,900	450			2,700	310
ϕ8	3,200	1,090	2,400	650			2,400	590			2,200	480			2,000	330
ϕ10	2,500	950	1,900	580			1,900	520			1,800	440			1,600	290
ϕ12	2,100	880	1,600	540			1,600	480			1,500	400			1,300	260
ϕ16	1,600	770	1,200	460			1,200	410			1,100	340			1,000	230
ϕ20	1,300	750	1,000	460			1,000	420			900	330			800	200



Metric

<Side milling>

Work material	Alloy steel (200～250HB) H13,D2				Alloy steel (25～35HRC) 4140				Pre-hardened steel (35～45HRC) P20				Hardened steel (45～55HRC) H13,L6			
Cutting range	High speed		General		High speed		General		High speed		General		High speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.15DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.07DC		a_p=1.5DC a_e=0.02DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)
ϕ3	16,000	1,800	9,600	860	14,000	1,400	9,600	770	12,000	1,100	8,500	610	11,000	860	7,400	460
ϕ4	12,000	1,900	7,200	920	10,000	1,400	7,200	830	8,800	1,100	6,400	660	8,000	900	5,600	500
ϕ5	9,600	2,100	5,700	1,000	8,300	1,600	5,700	900	7,000	1,200	5,100	720	6,400	990	4,500	550
ϕ6	8,000	2,200	4,800	1,080	6,900	1,700	4,800	970	5,800	1,300	4,200	750	5,300	1,040	3,700	580
ϕ8	6,000	2,400	3,600	1,150	5,200	1,900	3,600	1,040	4,400	1,400	3,200	820	4,000	1,120	2,800	630
ϕ10	4,800	2,200	2,900	1,070	4,100	1,700	2,900	960	3,500	1,300	2,500	740	3,200	1,030	2,200	570
ϕ12	4,000	2,100	2,400	1,000	3,500	1,600	2,400	900	2,900	1,200	2,100	700	2,700	980	1,900	550
ϕ16	3,000	1,700	1,800	810	2,600	1,300	1,800	730	2,200	1,000	1,600	570	2,000	780	1,400	440
ϕ20	2,400	1,400	1,400	670	2,100	1,100	1,400	600	1,800	860	1,300	500	1,590	670	1,110	370

【Note】
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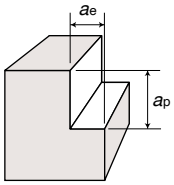
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

EPPM4-TH

Medium



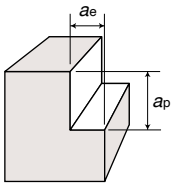
Metric

<Side milling>

Work material	Alloy steel (200～250HB) H13,D2		Alloy steel (25～35HRC) 4140		Pre-hardened steel (35～45HRC) P20		Hardened steel (45～55HRC) H13,L6	
Depth of cut (mm)	a_p=2.5DC a_e=0.02DC		a_p=2.5DC a_e=0.02DC		a_p=2.5DC a_e=0.02DC		a_p=2.5DC a_e=0.01DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
ϕ3	8,730	730	7,920	590	6,210	370	3,500	170
ϕ4	6,480	760	5,940	620	4,680	390	2,950	240
ϕ5	5,220	850	4,770	690	3,690	420	2,300	300
ϕ6	4,320	880	3,960	720	3,060	440	1,600	310
ϕ8	3,240	960	2,970	790	2,340	490	1,450	300
ϕ10	2,610	890	2,340	710	1,890	450	1,200	300
ϕ12	2,160	840	1,980	690	1,530	420	900	270
ϕ16	1,620	680	1,530	580	1,170	350	750	200
ϕ20	1,260	540	1,170	450	900	270	600	180

EPPL4-TH

Long



Metric

<Side milling>

Work material	Alloy steel (200～250HB) H13,D2		Alloy steel (25～35HRC) 4140		Pre-hardened steel (35～45HRC) P20		Hardened steel (45～55HRC) H13,L6	
Depth of cut (mm)	a_p=3DC a_e=0.02DC		a_p=3DC a_e=0.02DC		a_p=3DC a_e=0.02DC		a_p=3DC a_e=0.01DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
ϕ6	3,840	740	2,940	530	2,400	380	1,590	230
ϕ8	2,880	700	2,200	500	1,800	350	1,200	220
ϕ10	2,280	690	1,750	480	1,400	330	960	210
ϕ12	1,920	640	1,500	450	1,200	320	800	200
ϕ16	1,440	550	1,100	420	900	300	600	170
ϕ20	1,200	500	900	380	700	250	500	150

【Note】
① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch CS Power Mill

Power mill with excellent chip removal plus CS Coating for long life.

Regular

Planing | Side milling | Slotting | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

EPP4○○○-CS

Carbide | CS | Helix angle 43° | Cutting Conditions A363

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPP4030-CS	★	3	8	60	6
EPP4040-CS	★	4	11	60	6
EPP4050-CS	★	5	13	60	6
EPP4060-CS	★	6	13	60	6
EPP4080-CS	★	8	19	75	8

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPP4100-CS	★	10	22	80	10
EPP4120-CS	★	12	26	100	12
EPP4160-CS	★	16	32	110	16
EPP4200-CS	★	20	38	125	20

SHARP EDGE Short

Planing | Side milling | Slotting | Semi Finishing | Finishing

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ7～φ12 : 0～−0.02mm
h6

EPPS4○○○-P-CS

Carbide | CS | Helix angle 43° | Cutting Conditions A365

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPPS4010-P-CS	★	1	1.5	50	6
EPPS4015-P-CS	★	1.5	2.3	50	6
EPPS4020-P-CS	★	2	3	50	6
EPPS4025-P-CS	★	2.5	3.8	50	6
EPPS4030-P-CS	★	3	4.5	50	6
EPPS4035-P-CS	★	3.5	5.3	50	6
EPPS4040-P-CS	★	4	6	50	6
EPPS4045-P-CS	★	4.5	6.8	50	6
EPPS4050-P-CS	★	5	7.5	50	6
EPPS4060-P-CS	★	6	9	50	6
EPPS4070-P-CS	★	7	10.5	60	8
EPPS4080-P-CS	★	8	12	60	8
EPPS4090-P-CS	★	9	13.5	65	10
EPPS4100-P-CS	★	10	15	70	10
EPPS4110-P-CS	★	11	16.5	75	12
EPPS4120-P-CS	★	12	18	75	12

SHARP EDGE Regular

Planing | Side milling | Slotting | Semi Finishing | Finishing

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

EPP4○○○-P-CS

Carbide | CS | Helix angle 43° | Cutting Conditions A365

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPP4010-P-CS	★	1	2.5	60	6
EPP4015-P-CS	★	1.5	4	60	6
EPP4020-P-CS	★	2	6	60	6
EPP4025-P-CS	★	2.5	8	60	6
EPP4030-P-CS	★	3	8	60	6
EPP4040-P-CS	★	4	11	60	6
EPP4050-P-CS	★	5	13	60	6
EPP4060-P-CS	★	6	13	60	6
EPP4080-P-CS	★	8	19	75	8
EPP4100-P-CS	★	10	22	80	10
EPP4120-P-CS	★	12	26	100	12
EPP4160-P-CS	★	16	32	110	16
EPP4200-P-CS	★	20	38	125	20

Applicable work material of EPP4-CS, EPPS4-P-CS, EPP4-P-CS

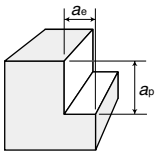
Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎	◎	○		◎	◎	◎	◎

★ : Inventory maintained in Japan

Recommended cutting conditions

EPP4-CS

Regular



Inch

<Side milling>

Work material		Cast iron (150～200HB)		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.02DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.02DC	
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	13,000	68	13,000	68	11,000	48	9,600	35	8,500	37	6,400	23	9,600	38	8,500	20
	ϕ4	9,600	69	9,600	69	8,000	48	7,200	37	6,400	38	4,800	23	7,200	40	6,400	23
	ϕ5	7,600	73	7,600	73	6,400	51	5,700	41	5,100	41	3,800	26	5,700	43	5,100	24
	ϕ6	6,400	74	6,400	74	5,300	53	4,800	42	4,200	40	3,200	26	4,800	44	4,200	24
	ϕ8	4,800	75	4,800	75	4,000	53	3,600	43	3,200	44	2,400	26	3,600	45	3,200	26
	ϕ10	3,800	71	3,800	71	3,200	51	2,900	41	2,500	40	1,900	25	2,900	44	2,500	24
	ϕ12	3,200	65	3,200	65	2,700	46	2,400	37	2,100	37	1,600	23	2,400	39	2,100	22
	ϕ16	2,400	55	2,400	55	2,000	39	1,800	31	1,600	31	1,200	19	1,800	33	1,600	18
	ϕ20	1,900	48	1,900	48	1,600	35	1,400	26	1,300	28	960	17	1,400	29	1,300	17
General	Depth of cut (mm)	ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.15DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.07DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC	
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	9,000	32	9,000	32	8,000	29	6,400	20	5,300	17	4,200	10	6,400	18	3,200	5
	ϕ4	6,800	33	6,800	33	6,000	31	4,800	21	4,000	18	3,200	12	4,800	19	2,400	6
	ϕ5	5,400	37	5,400	37	4,800	33	3,800	23	3,200	19	2,500	11	3,800	20	1,900	6
	ϕ6	4,500	36	4,500	36	4,000	34	3,200	23	2,700	19	2,100	12	3,200	20	1,600	6
	ϕ8	3,400	38	3,400	38	3,000	35	2,400	24	2,000	20	1,600	12	2,400	21	1,200	7
	ϕ10	2,700	36	2,700	36	2,400	33	1,900	23	1,600	19	1,300	12	1,900	20	960	6
	ϕ12	2,300	33	2,300	33	2,000	30	1,600	21	1,300	17	1,100	11	1,600	19	800	6
	ϕ16	1,700	27	1,700	27	1,500	25	1,200	17	1,000	14	800	9	1,200	15	600	5
	ϕ20	1,400	25	1,400	25	1,200	22	960	15	800	13	640	8	960	13	480	4

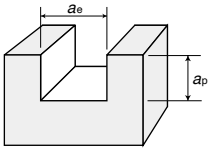
【Note】

① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ For stainless steel and heat resistant alloys please use cutting fluid. (Please provide adequate fire prevention.)

Epoch CS Power Mill

EPP4-CS

Regular



Inch

<Slotting>

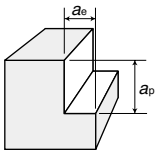
Work material		Cast iron (150～200HB)		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) P20		Pre-hardened steel (35～45HRC) P21		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC									
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	5,300	17	9,600	35	7,400	27								
	ϕ4	4,000	19	7,200	40	5,600	31								
	ϕ5	3,200	20	5,700	43	4,500	34								
	ϕ6	2,700	22	4,800	46	3,700	36								
	ϕ8	2,000	22	3,600	48	2,800	37								
	ϕ10	1,600	20	2,900	44	2,200	33								
	ϕ12	1,300	19	2,400	41	1,900	32								
	ϕ16	1,000	16	1,790	34	1,400	26								
	ϕ20	800	15	1,430	32	1,100	25								
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	3,200	9	7,400	24	5,300	17	5,300	15	5,300	15	4,200	12	1,600	3
	ϕ4	2,400	12	5,600	25	4,000	18	4,000	18	4,000	18	3,200	14	1,200	3
	ϕ5	1,900	12	4,500	27	3,200	19	3,200	18	3,200	18	2,500	14	1,000	4
	ϕ6	1,600	13	3,700	28	2,700	21	2,700	19	2,700	19	2,100	15	800	4
	ϕ8	1,200	13	2,800	29	2,000	22	2,000	20	2,000	20	1,600	16	600	4
	ϕ10	1,000	12	2,200	26	1,600	19	1,600	18	1,600	18	1,300	15	480	3
	ϕ12	800	12	1,900	26	1,300	18	1,300	17	1,300	17	1,100	14	400	4
	ϕ16	600	9	1,400	21	1,000	15	1,000	14	1,000	14	800	12	300	3
	ϕ20	480	9	1,100	20	800	15	800	14	800	14	640	11	240	3

【Note】

① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ For stainless steel and heat resistant alloys please use cutting fluid. (Please provide adequate fire prevention.)

EPPS-P-CS Short, Pinkado

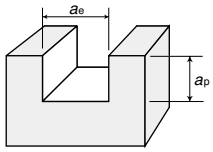
EPP-P-CS Regular, Pinkado



Inch

<Side milling>

Work material	Carbon steel, Cast iron (150～200HB) 1045, 1020, No 35 B		Alloy steel, Tool steel, Pre-hardened steel (25～35HRC) SCM, SKD, HPM		Stainless steel, Heat-resistant alloy steel SUS304, SUH61		Hardened steel (40～50HRC) SKD, SKT		Aluminum alloy wrought A7075, A5052 etc.		Aluminum alloy casting AC, ADC	
Depth of cut (mm)	ap≦1DC ae≦0.01DC		ap≦1DC ae≦0.01DC		ap≦1DC ae≦0.01DC		ap≦1DC ae≦0.01DC		ap=1DC ae≦0.1DC		ap=1DC ae≦0.1DC	
Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
ϕ1	27,000	22	17,500	14	16,000	13	11,000	9	50,000	80	50,000	60
ϕ2	13,500	27	8,800	14	8,000	10	5,500	9	50,000	120	43,000	103
ϕ3	9,000	29	5,800	16	5,300	13	3,700	12	42,000	202	29,000	139
ϕ4	6,500	29	4,400	16	4,000	11	2,800	12	32,000	205	21,000	134
ϕ6	4,800	35	2,900	17	2,650	13	2,000	12	21,000	193	14,000	129
ϕ8	3,600	32	2,200	18	2,000	14	1,500	11	16,000	198	11,000	136
ϕ10	2,800	28	1,750	17	1,600	13	1,200	10	13,000	203	8,600	134
ϕ12	2,400	29	1,460	16	1,300	12	1,000	10	10,000	172	7,200	127



Inch

<Slotting>

Work material	Carbon steel, Cast iron (150～200HB) 1045, 1020, No 35 B		Alloy steel, Tool steel, Pre-hardened steel (25～35HRC) SCM, SKD, HPM		Stainless steel, Heat-resistant alloy steel SUS304, SUH61		Hardened steel (40～50HRC) SKD, SKT		Aluminum alloy wrought A7075, A5052 etc.		Aluminum alloy casting AC, ADC	
Depth of cut (mm)	ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC	
Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
ϕ1	22,000	26	16,000	13	11,000	9	8,000	6	50,000	60	50,000	60
ϕ2	11,000	18	8,000	13	5,500	7	4,000	5	48,000	77	32,000	51
ϕ3	7,500	18	5,300	11	3,700	6	2,600	4	32,000	102	21,000	67
ϕ4	6,000	19	4,400	11	2,800	7	2,000	4	24,000	134	16,000	90
ϕ6	4,000	22	2,900	14	1,900	6	1,300	5	16,000	115	11,000	79
ϕ8	3,000	24	2,200	14	1,400	6	1,000	6	12,000	110	8,000	74
ϕ10	2,400	21	1,750	13	1,100	6	750	6	10,000	112	6,400	72
ϕ12	2,000	18	1,450	12	900	6	660	6	8,000	96	5,300	64

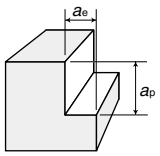
【Note】

① Use a highly rigid and accurate machine as possible.
② Be sure to use water-soluble cutting fluid.
③ The cutting conditions shown in the above table are only general recommendations. If chatter or abnormal vibration occurs, adjust the condition.
④ Please using helical ramping to enter the work-piece. (ramp angle of 1.)

Epoch CS Power Mill

EPP4-CS

Regular



Metric

<Side milling>

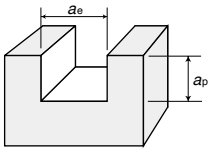
Work material		Cast iron (150～200HB)		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.02DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.02DC	
	Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	ϕ3	13,000	1,660	13,000	1,660	11,000	1,200	9,600	920	8,500	920	6,400	570	9,600	980	8,500	540
	ϕ4	9,600	1,730	9,600	1,730	8,000	1,220	7,200	970	6,400	980	4,800	600	7,200	1,040	6,400	580
	ϕ5	7,600	1,820	7,600	1,820	6,400	1,310	5,700	1,030	5,100	1,040	3,800	640	5,700	1,090	5,100	610
	ϕ6	6,400	1,870	6,400	1,870	5,300	1,320	4,800	1,050	4,200	1,040	3,200	650	4,800	1,120	4,200	610
	ϕ8	4,800	1,920	4,800	1,920	4,000	1,360	3,600	1,080	3,200	1,090	2,400	670	3,600	1,150	3,200	640
	ϕ10	3,800	1,820	3,800	1,820	3,200	1,310	2,900	1,040	2,500	1,020	1,900	640	2,900	1,110	2,500	600
	ϕ12	3,200	1,660	3,200	1,660	2,700	1,190	2,400	940	2,100	930	1,600	580	2,400	1,000	2,100	550
	ϕ16	2,400	1,390	2,400	1,390	2,000	990	1,800	780	1,600	790	1,200	490	1,800	840	1,600	460
	ϕ20	1,900	1,220	1,900	1,220	1,600	870	1,400	670	1,300	710	960	430	1,400	720	1,300	420
General	Depth of cut (mm)	ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.2DC		ap=1.5DC ae=0.15DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.07DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC	
	Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	ϕ3	9,000	810	9,000	810	8,000	740	6,400	520	5,300	430	4,200	260	6,400	460	3,200	140
	ϕ4	6,800	860	6,800	860	6,000	780	4,800	550	4,000	460	3,200	280	4,800	480	2,400	150
	ϕ5	5,400	910	5,400	910	4,800	830	3,800	580	3,200	490	2,500	290	3,800	510	1,900	160
	ϕ6	4,500	920	4,500	920	4,000	840	3,200	600	2,700	500	2,100	300	3,200	520	1,600	160
	ϕ8	3,400	950	3,400	950	3,000	870	2,400	610	2,000	510	1,600	310	2,400	540	1,200	170
	ϕ10	2,700	910	2,700	910	2,400	830	1,900	580	1,600	490	1,300	310	1,900	510	960	160
	ϕ12	2,300	840	2,300	840	2,000	750	1,600	530	1,300	430	1,100	280	1,600	470	800	150
	ϕ16	1,700	690	1,700	690	1,500	630	1,200	440	1,000	370	800	230	1,200	390	600	120
	ϕ20	1,400	630	1,400	630	1,200	550	960	390	800	330	640	200	960	340	480	110

【Note】

① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ For stainless steel and heat resistant alloys please use cutting fluid. (Please provide adequate fire prevention.)

EPP4-CS

Regular



Metric

<Slotting>

Work material		Cast iron (150～200HB)		Carbon steel (180～220HB) 1050		Alloy steel (200～250HB) 4140		Stainless steel, Tool steel (25～35HRC) P20		Pre-hardened steel (35～45HRC) P21		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC									
	Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	ϕ3	5,300	420	9,600	920	7,400	710								
	ϕ4	4,000	480	7,200	1,040	5,600	810								
	ϕ5	3,200	510	5,700	1,090	4,500	860								
	ϕ6	2,700	540	4,800	1,150	3,700	890								
	ϕ8	2,000	560	3,600	1,210	2,800	940								
	ϕ10	1,600	510	2,900	1,110	2,200	840								
	ϕ12	1,300	470	2,400	1,040	1,900	820								
	ϕ16	1,000	400	1,790	860	1,400	670								
	ϕ20	800	380	1,430	820	1,100	630								
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	ϕ3	3,200	230	7,400	570	5,300	410	5,300	380	5,300	380	4,200	300	1,600	80
	ϕ4	2,400	290	5,600	650	4,000	460	4,000	430	4,000	430	3,200	350	1,200	90
	ϕ5	1,900	300	4,500	690	3,200	490	3,200	460	3,200	460	2,500	360	1,000	100
	ϕ6	1,600	320	3,700	710	2,700	520	2,700	490	2,700	490	2,100	380	800	100
	ϕ8	1,200	340	2,800	750	2,000	540	2,000	500	2,000	500	1,600	400	600	100
	ϕ10	1,000	320	2,200	680	1,600	490	1,600	460	1,600	460	1,300	370	480	90
	ϕ12	800	290	1,900	660	1,300	450	1,300	420	1,300	420	1,100	360	400	90
	ϕ16	600	240	1,400	540	1,000	380	1,000	360	1,000	360	800	290	300	70
	ϕ20	480	230	1,100	510	800	370	800	350	800	350	640	280	240	70

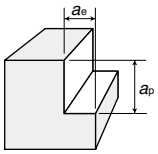
【Note】

① Use a highly rigid and accurate machine as possible.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
④ For stainless steel and heat resistant alloys please use cutting fluid. (Please provide adequate fire prevention.)

Epoch CS Power Mill

EPPS-P-CS Short, Pinkado

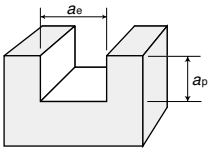
EPP-P-CS Regular, Pinkado



Metric

<Side milling>

Work material	Carbon steel, Cast iron (150～200HB) 1045, 1020, No 35 B		Alloy steel, Tool steel, Pre-hardened steel (25～35HRC) SCM, SKD, HPM		Stainless steel, Heat-resistant alloy steel SUS304, SUH61		Hardened steel (40～50HRC) SKD, SKT		Aluminum alloy wrought A7075, A5052 etc.		Aluminum alloy casting AC, ADC	
Depth of cut (mm)	ap≦1DC ae≦0.01DC		ap≦1DC ae≦0.01DC		ap≦1DC ae≦0.01DC		ap≦1DC ae≦0.01DC		ap=1DC ae≦0.1DC		ap=1DC ae≦0.1DC	
Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
ϕ1	27,000	540	17,500	270	16,000	250	11,000	220	50,000	2,000	50,000	1,650
ϕ2	13,500	650	8,800	320	8,000	260	5,500	240	50,000	3,000	43,000	2,600
ϕ3	9,000	720	5,800	400	5,300	300	3,700	300	42,000	5,000	29,000	3,400
ϕ4	6,500	710	4,400	400	4,000	300	2,800	300	32,000	5,100	21,000	3,400
ϕ6	4,800	900	2,900	450	2,650	320	2,000	300	21,000	5,000	14,000	3,300
ϕ8	3,600	800	2,200	480	2,000	360	1,500	270	16,000	5,100	11,000	3,500
ϕ10	2,800	720	1,750	420	1,600	320	1,200	240	13,000	5,200	8,600	3,450
ϕ12	2,400	720	1,460	410	1,300	310	1,000	240	10,000	4,400	7,200	3,200



Metric

<Slotting>

Work material	Carbon steel, Cast iron (150～200HB) 1045, 1020, No 35 B		Alloy steel, Tool steel, Pre-hardened steel (25～35HRC) SCM, SKD, HPM		Stainless steel, Heat-resistant alloy steel SUS304, SUH61		Hardened steel (40～50HRC) SKD, SKT		Aluminum alloy wrought A7075, A5052 etc.		Aluminum alloy casting AC, ADC	
Depth of cut (mm)	ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC	
Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
ϕ1	22,000	700	16,000	400	11,000	250	8,000	160	50,000	1,600	50,000	1,300
ϕ2	11,000	450	8,000	300	5,500	170	4,000	120	48,000	2,000	32,000	1,350
ϕ3	7,500	450	5,300	260	3,700	160	2,600	110	32,000	2,600	21,000	1,700
ϕ4	6,000	480	4,400	290	2,800	160	2,000	110	24,000	3,400	16,000	2,300
ϕ6	4,000	550	2,900	350	1,900	150	1,300	130	16,000	2,900	11,000	2,000
ϕ8	3,000	600	2,200	350	1,400	150	1,000	150	12,000	2,800	8,000	1,900
ϕ10	2,400	530	1,750	330	1,100	150	750	150	10,000	2,800	6,400	1,800
ϕ12	2,000	460	1,450	290	900	160	660	160	8,000	2,400	5,300	1,600

【Note】

① Use a highly rigid and accurate machine as possible.
② Be sure to use water-soluble cutting fluid.
③ The cutting conditions shown in the above table are only general recommendations. If chatter or abnormal vibration occurs, adjust the condition.
④ Please using helical ramping to enter the work-piece. (ramp angle of 1.)

Epoch Power Mill

Excellent chip removal enables high efficiency.

Please refer to page A267 for Radius

Short

Planing / Side milling / Slotting / Roughing / Semi Finishing / Finishing

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ6.5～φ25 : 0～−0.02mm

h6

Regular

Planing / Side milling / Slotting / Roughing / Semi Finishing / Finishing

Dia. tolerance: φ2～φ6 : 0～−0.015mm
φ7～φ25 : 0～−0.02mm

h6

EPPS4○○○

Carbide C | Helix angle 43° | Cutting Conditions A371

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPPS4030	★	3	4.5	60	6
EPPS4035	★	3.5	5.3	60	6
EPPS4040	★	4	6	60	6
EPPS4045	★	4.5	6.8	60	6
EPPS4050	★	5	7.5	60	6
EPPS4055	★	5.5	8.3	60	6
EPPS4060	★	6	9	60	6
EPPS4065	★	6.5	9.8	70	8
EPPS4070	★	7	10.5	70	8
EPPS4075	★	7.5	11.3	75	8
EPPS4080	★	8	12	75	8
EPPS4085	★	8.5	12.8	80	10
EPPS4090	★	9	13.5	80	10
EPPS4095	★	9.5	14.3	80	10
EPPS4100	★	10	15	80	10
EPPS4120	★	12	18	100	12
EPPS4160	★	16	24	110	16
EPPS4200	★	20	30	125	20

EPP4○○○

Carbide C | Helix angle 43° | Cutting Conditions A373

Item code	Stock	Size (mm)			
		Tool dia.	Flute length	Overall length	Shank dia.
EPP4030	★	3	8	60	6
EPP4040	★	4	11	60	6
EPP4050	★	5	13	60	6
EPP4060	★	6	13	60	6
EPP4070	★	7	16	70	8
EPP4080	★	8	19	75	8
EPP4090	★	9	19	80	10
EPP4100	★	10	22	80	10
EPP4110	★	11	22	100	12
EPP4120	★	12	26	100	12
EPP4130	★	13	26	100	12
EPP4140	★	14	26	110	16
EPP4150	★	15	26	110	16
EPP4160	★	16	32	110	16
EPP4170	★	17	32	110	16
EPP4180	★	18	32	125	20
EPP4190	★	19	32	125	20
EPP4200	★	20	38	125	20

Applicable work material of EPPS, EPP

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎	○	○		○	○	○	○

★ : Inventory maintained in Japan

Epoch Power Mill

Excellent chip removal enables high efficiency.

Please refer to page A267 for Radius

Medium

Side milling | Roughing | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

EPPM4○○○

Carbide | C | Helix angle 43° | Cutting Conditions A375

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPPM4030	★	3	15	60	6
EPPM4040	★	4	17	60	6
EPPM4050	★	5	20	60	6
EPPM4060	★	6	20	60	6
EPPM4080	★	8	25	75	8
EPPM4100	★	10	33	80	10
EPPM4120	★	12	37	100	12
EPPM4160	★	16	47	110	16
EPPM4200	★	20	55	125	20

Long

Side milling | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

EPPL4○○○

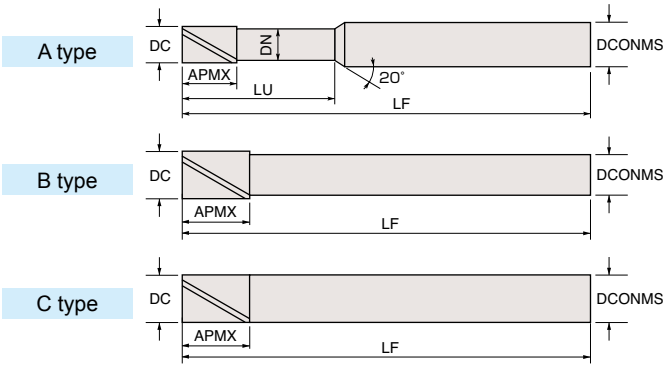
Carbide | C | Helix angle 43° | Cutting Conditions A375

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPPL4060	★	6	25	70	6
EPPL4080	★	8	35	90	8
EPPL4100	★	10	45	100	10
EPPL4120	★	12	55	120	12
EPPL4160	★	16	65	135	16
EPPL4200	★	20	75	155	20

Long shank

Side milling | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ20 : 0～−0.02mm
h6



EPPLS4○○○

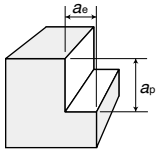
Carbide | C | Helix angle 43° | Cutting Conditions A376

Item code	Stock	Size (mm) Tool dia. DC	Flute length APMX	Neck dia. DN	Under neck length. LU	Overall length LF	Shank dia. DCONMS	Shape
EPPLS4030	★	3	4.5	2.9	10.5	80	6	A
EPPLS4040	★	4	6	3.8	14	80	6	A
EPPLS4050	★	5	7.5	4.8	17.5	100	6	A
EPPLS4060	★	6	9	–	–	120	5	B
EPPLS4070	★	7	9	–	–	120	6	B
EPPLS4080	★	8	12	–	–	135	7	B
EPPLS4090	★	9	12	–	–	135	8	B
EPPLS4100	★	10	15	–	–	150	9	B
EPPLS4110	★	11	15	–	–	150	10	B
EPPLS4120	★	12	18	–	–	160	11	B
EPPLS4130	★	13	18	–	–	160	12	B
EPPLS4160	★	16	24	–	–	180	15	B
EPPLS4170	★	17	24	–	–	180	16	B

★ : Inventory maintained in Japan

Recommended cutting conditions

EPPS
Short



Inch

<Side milling>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)		n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
High speed	ϕ3	15,900	51	15,900	51	12,700	41	10,600	25	10,600	25	8,490	14	8,490	14	3,180	5
	ϕ4	11,900	57	11,900	57	9,550	46	7,960	32	7,960	32	6,370	20	6,370	20	2,390	8
	ϕ5	9,550	61	9,550	61	7,640	49	6,370	36	6,370	36	5,090	24	5,090	24	1,910	9
	ϕ6	7,960	64	7,960	64	6,370	51	5,310	34	5,310	34	4,240	24	4,240	24	1,590	9
	ϕ8	5,970	67	5,970	67	4,770	53	3,980	32	3,980	32	3,180	23	3,180	23	1,190	8
	ϕ10	4,770	61	4,770	61	3,820	47	3,180	31	3,180	31	2,550	22	2,550	22	950	8
	ϕ12	3,980	56	3,980	56	3,180	45	2,650	29	2,650	29	2,120	20	2,120	20	800	7
	ϕ16	2,980	46	2,980	46	2,390	38	1,990	27	1,990	27	1,590	18	1,590	18	600	7
	ϕ20	2,390	45	2,390	45	1,910	36	1,590	25	1,590	25	1,270	16	1,270	16	480	6
General	ϕ3	12,700	41	12,700	41	10,600	34	8,490	20	8,490	20	6,370	10	6,370	10	2,650	4
	ϕ4	9,550	46	9,550	46	7,960	38	6,370	25	6,370	25	4,770	15	4,770	15	1,990	6
	ϕ5	7,640	49	7,640	49	6,370	41	5,090	29	5,090	29	3,820	18	3,820	18	1,590	8
	ϕ6	6,370	51	6,370	51	5,310	42	4,240	27	4,240	27	3,180	18	3,180	18	1,330	7
	ϕ8	4,770	53	4,770	53	3,980	43	3,180	25	3,180	25	2,390	17	2,390	17	990	7
	ϕ10	3,820	47	3,820	47	3,180	41	2,550	24	2,550	24	1,910	17	1,910	17	800	7
	ϕ12	3,180	45	3,180	45	2,650	37	2,120	23	2,120	23	1,590	15	1,590	15	660	6
	ϕ16	2,390	38	2,390	38	1,990	32	1,590	21	1,590	21	1,190	13	1,190	13	500	6
	ϕ20	1,910	36	1,910	36	1,590	30	1,270	20	1,270	20	950	12	950	12	400	5

【Note】

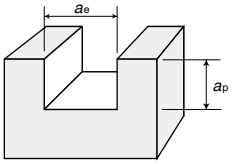
① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Applicable work material of EPPM, EPPL, EPPLS

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○	○		○	○	○	○

Epoch Power Mill

EPPS
Short



Inch

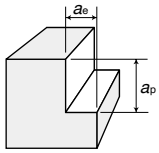
<Slotting>

Work material		Cast iron (150~200HB) No. 35 B		Carbon steel (180~220HB) 1020, 1050		Alloy steel (200~250HB) 4140, 8620		Stainless steel, Tool steel (25~35HRC) 304, D3		Pre-hardened steel (35~45HRC) P21		Hardened steel (45~55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC							
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	6,370	41	12,700	81	10,600	68	6,370	31	6,370	31						
	ϕ4	4,770	46	9,550	92	7,960	76	4,770	38	4,770	38						
	ϕ5	3,820	47	7,640	95	6,370	82	3,820	41	3,820	41						
	ϕ6	3,180	51	6,370	99	5,310	83	3,180	41	3,180	41						
	ϕ8	2,390	53	4,770	105	3,980	88	2,390	38	2,390	38						
	ϕ10	1,910	48	3,820	96	3,180	80	1,910	36	1,910	36						
	ϕ12	1,590	45	3,180	90	2,650	75	1,590	36	1,590	36						
	ϕ16	1,190	38	2,390	76	1,990	63	1,190	31	1,190	31						
	ϕ20	950	36	1,910	73	1,590	60	950	30	950	30						
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	5,310	34	8,490	54	7,430	48	5,310	25	5,310	25	2,650	8	4,240	14	2,120	7
	ϕ4	3,980	38	6,370	61	5,570	53	3,980	32	3,980	32	1,990	13	3,180	19	1,590	10
	ϕ5	3,180	41	5,090	63	4,460	55	3,180	36	3,180	36	1,590	15	2,550	24	1,270	12
	ϕ6	2,650	41	4,240	66	3,710	58	2,650	33	2,650	33	1,330	15	2,120	24	1,060	12
	ϕ8	1,990	44	3,180	70	2,790	61	1,990	32	1,990	32	990	14	1,590	23	800	11
	ϕ10	1,590	40	2,550	64	2,230	56	1,590	30	1,590	30	800	14	1,270	22	640	11
	ϕ12	1,330	38	2,120	60	1,860	53	1,330	29	1,330	29	660	13	1,060	20	530	10
	ϕ16	990	32	1,590	50	1,390	44	990	27	990	27	500	11	800	17	400	9
	ϕ20	800	30	1,270	48	1,110	42	800	25	800	25	400	10	640	16	320	8

【Note】

① Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
② Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
③ Use a machine tool with rigidity and rigid set-up, to machine stably.
④ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑤ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

EPP
Regular



Inch

<Side milling>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)		n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
High speed	ϕ3	12,700	41	12,700	41	10,600	34	8,490	20	8,490	20	6,370	10	6,370	10	2,650	4
	ϕ4	9,550	46	9,550	46	7,960	38	6,370	25	6,370	25	4,770	15	4,770	15	1,990	6
	ϕ5	7,640	49	7,640	49	6,370	41	5,090	29	5,090	29	3,820	18	3,820	18	1,590	8
	ϕ6	6,370	51	6,370	51	5,310	42	4,240	27	4,240	27	3,180	18	3,180	18	1,330	7
	ϕ8	4,770	53	4,770	53	3,980	43	3,180	25	3,180	25	2,390	17	2,390	17	990	7
	ϕ10	3,820	47	3,820	47	3,180	41	2,550	24	2,550	24	1,910	17	1,910	17	800	7
	ϕ12	3,180	45	3,180	45	2,650	37	2,120	23	2,120	23	1,590	15	1,590	15	660	6
	ϕ16	2,390	38	2,390	38	1,990	32	1,590	21	1,590	21	1,190	13	1,190	13	500	6
	ϕ20	1,910	36	1,910	36	1,590	30	1,270	20	1,270	20	950	12	950	12	400	5
General	ϕ3	10,600	34	10,600	34	8,490	27	6,370	15	6,370	15	4,240	7	4,240	7	2,120	3
	ϕ4	7,960	38	7,960	38	6,370	31	4,770	19	4,770	19	3,180	10	3,180	10	1,590	5
	ϕ5	6,370	41	6,370	41	5,090	33	3,820	21	3,820	21	2,550	12	2,550	12	1,270	6
	ϕ6	5,310	42	5,310	42	4,240	34	3,180	20	3,180	20	2,120	12	2,120	12	1,060	6
	ϕ8	3,980	43	3,980	43	3,180	36	2,390	19	2,390	19	1,590	11	1,590	11	800	5
	ϕ10	3,180	41	3,180	41	2,550	33	1,910	18	1,910	18	1,270	11	1,270	11	640	6
	ϕ12	2,650	37	2,650	37	2,120	30	1,590	18	1,590	18	1,060	10	1,060	10	530	5
	ϕ16	1,990	32	1,990	32	1,590	25	1,190	16	1,190	16	800	9	800	9	400	4
	ϕ20	1,590	30	1,590	30	1,270	24	950	15	950	15	640	8	640	8	320	4

【Note】

① Down-cutting is recommended.
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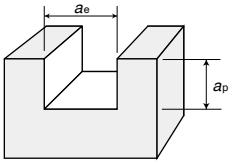
Epoch Power Mill

EPP

Regular



Inch

<Slotting>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC							
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	5,310	17	8,490	27	7,430	24	5,310	13	5,310	13						
	ϕ4	3,980	19	6,370	31	5,570	27	3,980	16	3,980	16						
	ϕ5	3,180	20	5,090	33	4,460	29	3,180	18	3,180	18						
	ϕ6	2,650	21	4,240	34	3,710	30	2,650	17	2,650	17						
	ϕ8	1,990	22	3,180	36	2,790	31	1,990	16	1,990	16						
	ϕ10	1,590	20	2,550	33	2,230	28	1,590	15	1,590	15						
	ϕ12	1,330	19	2,120	30	1,860	26	1,330	14	1,330	14						
	ϕ16	990	16	1,590	25	1,390	22	990	13	990	13						
	ϕ20	800	15	1,270	24	1,110	21	800	12	800	12						
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
	ϕ3	3,180	10	7,430	24	5,310	17	4,240	10	4,240	10	2,120	3	3,180	5	1,590	3
	ϕ4	2,390	11	5,570	27	3,980	19	3,180	13	3,180	13	1,590	5	2,390	8	1,190	4
	ϕ5	1,910	12	4,460	29	3,180	20	2,550	14	2,550	14	1,270	6	1,910	9	950	4
	ϕ6	1,590	13	3,710	30	2,650	21	2,120	14	2,120	14	1,060	6	1,590	9	800	4
	ϕ8	1,190	13	2,790	31	1,990	22	1,590	13	1,590	13	800	5	1,190	8	600	4
	ϕ10	950	12	2,230	28	1,590	20	1,270	12	1,270	12	640	6	950	8	480	4
	ϕ12	800	12	1,860	26	1,330	19	1,060	12	1,060	12	530	5	800	7	400	4
	ϕ16	600	9	1,390	22	990	16	800	11	800	11	400	4	600	7	300	3
	ϕ20	480	9	1,110	21	800	15	640	10	640	10	320	4	480	6	240	3

【Note】

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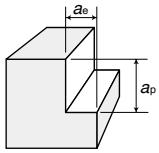
EPPM
Medium

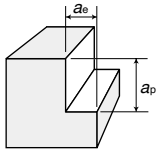


Inch

<Side milling>

Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.01DC		ap=2.5DC ae=0.01DC		ap=2.5DC ae=0.01DC	
Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
ϕ3	7,430	24	7,430	24	5,840	19	4,240	10	4,240	10	2,650	4	2,650	4	1,590	3
ϕ4	5,570	27	5,570	27	4,380	21	3,180	13	3,180	13	1,990	6	1,990	6	1,190	4
ϕ5	4,460	29	4,460	29	3,500	22	2,550	14	2,550	14	1,590	8	1,590	8	950	4
ϕ6	3,710	30	3,710	30	2,920	23	2,120	14	2,120	14	1,330	7	1,330	7	800	4
ϕ8	2,790	31	2,790	31	2,190	24	1,590	13	1,590	13	990	7	990	7	600	4
ϕ10	2,230	28	2,230	28	1,750	22	1,270	12	1,270	12	800	7	800	7	480	4
ϕ12	1,860	26	1,860	26	1,460	21	1,060	12	1,060	12	660	6	660	6	400	4
ϕ16	1,390	22	1,390	22	1,090	17	800	11	800	11	500	6	500	6	300	3
ϕ20	1,110	21	1,110	21	880	17	640	10	640	10	400	5	400	5	240	3

EPPL
Long



Inch

<Side milling>

Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
ϕ6	2,650	21	2,650	21	2,120	16	1,590	10	1,590	10	1,060	6	1,060	6	530	3
ϕ8	1,990	22	1,990	22	1,590	18	1,190	10	1,190	10	800	5	800	5	400	3
ϕ10	1,590	20	1,590	20	1,270	16	950	9	950	9	640	6	640	6	320	3
ϕ12	1,330	19	1,330	19	1,060	15	800	9	800	9	530	5	530	5	270	3
ϕ16	990	16	990	16	800	12	600	8	600	8	400	4	400	4	200	2
ϕ20	800	15	800	15	640	12	480	7	480	7	320	4	320	4	160	2

【Note】

① Down-cutting is recommended.
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④ Use a machine tool with rigidity and rigid set-up, to machine stably.
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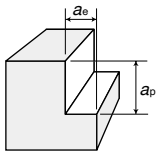
Epoch Power Mill

EPPLS

Long shank



Inch

<Side milling>

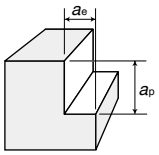
Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)	n (min-1)	vf (IPT)
ϕ3	5,310	17	5,310	17	4,240	14	3,180	8	3,180	8	2,120	3	2,120	3	1,060	2
ϕ4	3,980	19	3,980	19	3,180	15	2,390	10	2,390	10	1,590	5	1,590	5	800	3
ϕ5	3,180	20	3,180	20	2,550	16	1,910	11	1,910	11	1,270	6	1,270	6	640	3
ϕ6	2,650	21	2,650	21	2,120	16	1,590	10	1,590	10	1,060	6	1,060	6	530	3
ϕ8	1,990	22	1,990	22	1,590	18	1,190	10	1,190	10	800	5	800	5	400	3
ϕ10	1,590	20	1,590	20	1,270	16	950	9	950	9	640	6	640	6	320	3
ϕ12	1,330	19	1,330	19	1,060	15	800	9	800	9	530	5	530	5	270	3
ϕ16	990	16	990	16	800	12	600	8	600	8	400	4	400	4	200	2

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

EPPS

Short



Metric

<Side milling>

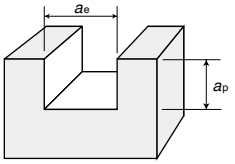
Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)		n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
High speed	ϕ3	15,900	1,270	15,900	1,270	12,700	1,020	10,600	640	10,600	640	8,490	340	8,490	340	3,180	130
	ϕ4	11,900	1,430	11,900	1,430	9,550	1,150	7,960	800	7,960	800	6,370	510	6,370	510	2,390	190
	ϕ5	9,550	1,530	9,550	1,530	7,640	1,220	6,370	890	6,370	890	5,090	610	5,090	610	1,910	230
	ϕ6	7,960	1,590	7,960	1,590	6,370	1,270	5,310	850	5,310	850	4,240	590	4,240	590	1,590	220
	ϕ8	5,970	1,670	5,970	1,670	4,770	1,340	3,980	800	3,980	800	3,180	570	3,180	570	1,190	210
	ϕ10	4,770	1,530	4,770	1,530	3,820	1,220	3,180	760	3,180	760	2,550	560	2,550	560	950	210
	ϕ12	3,980	1,430	3,980	1,430	3,180	1,140	2,650	740	2,650	740	2,120	510	2,120	510	800	190
	ϕ16	2,980	1,190	2,980	1,190	2,390	960	1,990	680	1,990	680	1,590	450	1,590	450	600	170
	ϕ20	2,390	1,150	2,390	1,150	1,910	920	1,590	640	1,590	640	1,270	410	1,270	410	480	150
General	ϕ3	12,700	1,020	12,700	1,020	10,600	850	8,490	510	8,490	510	6,370	250	6,370	250	2,650	110
	ϕ4	9,550	1,150	9,550	1,150	7,960	960	6,370	640	6,370	640	4,770	380	4,770	380	1,990	160
	ϕ5	7,640	1,220	7,640	1,220	6,370	1,020	5,090	710	5,090	710	3,820	460	3,820	460	1,590	190
	ϕ6	6,370	1,270	6,370	1,270	5,310	1,060	4,240	680	4,240	680	3,180	450	3,180	450	1,330	190
	ϕ8	4,770	1,340	4,770	1,340	3,980	1,110	3,180	640	3,180	640	2,390	430	2,390	430	990	180
	ϕ10	3,820	1,220	3,820	1,220	3,180	1,020	2,550	610	2,550	610	1,910	420	1,910	420	800	180
	ϕ12	3,180	1,140	3,180	1,140	2,650	950	2,120	590	2,120	590	1,590	380	1,590	380	660	160
	ϕ16	2,390	960	2,390	960	1,990	800	1,590	540	1,590	540	1,190	330	1,190	330	500	140
	ϕ20	1,910	920	1,910	920	1,590	760	1,270	510	1,270	510	950	300	950	300	400	130

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch Power Mill

EPPS
Short



Metric

<Slotting>

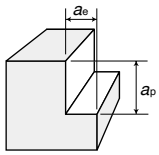
Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC							
	Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	ϕ3	6,370	510	12,700	1,020	10,600	850	6,370	380	6,370	380						
	ϕ4	4,770	570	9,550	1,150	7,960	960	4,770	480	4,770	480						
	ϕ5	3,820	610	7,640	1,220	6,370	1,020	3,820	530	3,820	530						
	ϕ6	3,180	640	6,370	1,270	5,310	1,060	3,180	510	3,180	510						
	ϕ8	2,390	670	4,770	1,340	3,980	1,110	2,390	480	2,390	480						
	ϕ10	1,910	610	3,820	1,220	3,180	1,020	1,910	460	1,910	460						
	ϕ12	1,590	570	3,180	1,140	2,650	950	1,590	450	1,590	450						
	ϕ16	1,190	480	2,390	960	1,990	800	1,190	400	1,190	400						
	ϕ20	950	460	1,910	920	1,590	760	950	380	950	380						
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
	ϕ3	5,310	420	8,490	680	7,430	590	5,310	320	5,310	320	2,650	110	4,240	170	2,120	85
	ϕ4	3,980	480	6,370	760	5,570	670	3,980	400	3,980	400	1,990	160	3,180	250	1,590	130
	ϕ5	3,180	510	5,090	810	4,460	710	3,180	450	3,180	450	1,590	190	2,550	310	1,270	150
	ϕ6	2,650	530	4,240	850	3,710	740	2,650	420	2,650	420	1,330	190	2,120	300	1,060	150
	ϕ8	1,990	560	3,180	890	2,790	780	1,990	400	1,990	400	990	180	1,590	290	800	140
	ϕ10	1,590	510	2,550	820	2,230	710	1,590	380	1,590	380	800	180	1,270	280	640	140
	ϕ12	1,330	480	2,120	760	1,860	670	1,330	370	1,330	370	660	160	1,060	250	530	130
	ϕ16	990	400	1,590	640	1,390	560	990	340	990	340	500	140	800	220	400	110
	ϕ20	800	380	1,270	610	1,110	530	800	320	800	320	400	130	640	200	320	100

【Note】

① Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
② Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
③ Use a machine tool with rigidity and rigid set-up, to machine stably.
④ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑤ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

EPP

Regular



Metric

<Side milling>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)		n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
High speed	ϕ3	12,700	1,020	12,700	1,020	10,600	850	8,490	510	8,490	510	6,370	250	6,370	250	2,650	110
	ϕ4	9,550	1,150	9,550	1,150	7,960	960	6,370	640	6,370	640	4,770	380	4,770	380	1,990	160
	ϕ5	7,640	1,220	7,640	1,220	6,370	1,020	5,090	710	5,090	710	3,820	460	3,820	460	1,590	190
	ϕ6	6,370	1,270	6,370	1,270	5,310	1,060	4,240	680	4,240	680	3,180	450	3,180	450	1,330	190
	ϕ8	4,770	1,340	4,770	1,340	3,980	1,110	3,180	640	3,180	640	2,390	430	2,390	430	990	180
	ϕ10	3,820	1,220	3,820	1,220	3,180	1,020	2,550	610	2,550	610	1,910	420	1,910	420	800	180
	ϕ12	3,180	1,140	3,180	1,140	2,650	950	2,120	590	2,120	590	1,590	380	1,590	380	660	160
	ϕ16	2,390	960	2,390	960	1,990	800	1,590	540	1,590	540	1,190	330	1,190	330	500	140
	ϕ20	1,910	920	1,910	920	1,590	760	1,270	510	1,270	510	950	300	950	300	400	130
General	ϕ3	10,600	850	10,600	850	8,490	680	6,370	380	6,370	380	4,240	170	4,240	170	2,120	85
	ϕ4	7,960	960	7,960	960	6,370	760	4,770	480	4,770	480	3,180	250	3,180	250	1,590	130
	ϕ5	6,370	1,020	6,370	1,020	5,090	810	3,820	530	3,820	530	2,550	310	2,550	310	1,270	150
	ϕ6	5,310	1,060	5,310	1,060	4,240	850	3,180	510	3,180	510	2,120	300	2,120	300	1,060	150
	ϕ8	3,980	1,110	3,980	1,110	3,180	890	2,390	480	2,390	480	1,590	290	1,590	290	800	140
	ϕ10	3,180	1,020	3,180	1,020	2,550	820	1,910	460	1,910	460	1,270	280	1,270	280	640	140
	ϕ12	2,650	950	2,650	950	2,120	760	1,590	450	1,590	450	1,060	250	1,060	250	530	130
	ϕ16	1,990	800	1,990	800	1,590	640	1,190	400	1,190	400	800	220	800	220	400	110
	ϕ20	1,590	760	1,590	760	1,270	610	950	380	950	380	640	200	640	200	320	100

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
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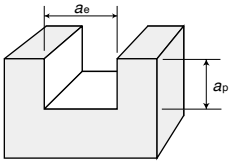
Epoch Power Mill

EPP
Regular



Metric

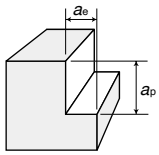
<Slotting>

	Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
High speed	Depth of cut (mm)	ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC							
	Tool dia. DC (mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
	ϕ3	5,310	420	8,490	680	7,430	590	5,310	320	5,310	320						
	ϕ4	3,980	480	6,370	760	5,570	670	3,980	400	3,980	400						
	ϕ5	3,180	510	5,090	810	4,460	710	3,180	450	3,180	450						
	ϕ6	2,650	530	4,240	850	3,710	740	2,650	420	2,650	420						
	ϕ8	1,990	560	3,180	890	2,790	780	1,990	400	1,990	400						
	ϕ10	1,590	510	2,550	820	2,230	710	1,590	380	1,590	380						
	ϕ12	1,330	480	2,120	760	1,860	670	1,330	370	1,330	370						
	ϕ16	990	400	1,590	640	1,390	560	990	340	990	340						
	ϕ20	800	380	1,270	610	1,110	530	800	320	800	320						
General	Depth of cut (mm)	ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦1DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.5DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC		ap≦0.2DC ae=1DC	
	Tool dia. DC (mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
	ϕ3	3,180	250	7,430	590	5,310	420	4,240	250	4,240	250	2,120	85	3,180	130	1,590	65
	ϕ4	2,390	290	5,570	670	3,980	480	3,180	320	3,180	320	1,590	130	2,390	190	1,190	95
	ϕ5	1,910	310	4,460	710	3,180	510	2,550	360	2,550	360	1,270	150	1,910	230	950	110
	ϕ6	1,590	320	3,710	740	2,650	530	2,120	340	2,120	340	1,060	150	1,590	220	800	110
	ϕ8	1,190	330	2,790	780	1,990	560	1,590	320	1,590	320	800	140	1,190	210	600	110
	ϕ10	950	300	2,230	710	1,590	510	1,270	300	1,270	300	640	140	950	210	480	110
	ϕ12	800	290	1,860	670	1,330	480	1,060	300	1,060	300	530	130	800	190	400	95
	ϕ16	600	240	1,390	560	990	400	800	270	800	270	400	110	600	170	300	85
	ϕ20	480	230	1,110	530	800	380	640	260	640	260	320	100	480	150	240	75

【Note】

① Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
② Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
③ Use a machine tool with rigidity and rigid set-up, to machine stably.
④ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑤ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

EPPM
Medium

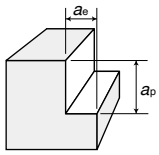


Metric

<Side milling>

Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.02DC		ap=2.5DC ae=0.01DC		ap=2.5DC ae=0.01DC		ap=2.5DC ae=0.01DC	
Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
ϕ3	7,430	590	7,430	590	5,840	470	4,240	250	4,240	250	2,650	110	2,650	110	1,590	65
ϕ4	5,570	670	5,570	670	4,380	530	3,180	320	3,180	320	1,990	160	1,990	160	1,190	95
ϕ5	4,460	710	4,460	710	3,500	560	2,550	360	2,550	360	1,590	190	1,590	190	950	110
ϕ6	3,710	740	3,710	740	2,920	580	2,120	340	2,120	340	1,330	190	1,330	190	800	110
ϕ8	2,790	780	2,790	780	2,190	610	1,590	320	1,590	320	990	180	990	180	600	110
ϕ10	2,230	710	2,230	710	1,750	560	1,270	300	1,270	300	800	180	800	180	480	110
ϕ12	1,860	670	1,860	670	1,460	530	1,060	300	1,060	300	660	160	660	160	400	95
ϕ16	1,390	560	1,390	560	1,090	440	800	270	800	270	500	140	500	140	300	85
ϕ20	1,110	530	1,110	530	880	420	640	260	640	260	400	130	400	130	240	75

EPPL
Long



Metric

<Side milling>

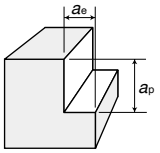
Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.02DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
ϕ6	2,650	530	2,650	530	2,120	420	1,590	250	1,590	250	1,060	150	1,060	150	530	75
ϕ8	1,990	560	1,990	560	1,590	450	1,190	240	1,190	240	800	140	800	140	400	70
ϕ10	1,590	510	1,590	510	1,270	410	950	230	950	230	640	140	640	140	320	70
ϕ12	1,330	480	1,330	480	1,060	380	800	220	800	220	530	130	530	130	270	65
ϕ16	990	400	990	400	800	320	600	200	600	200	400	110	400	110	200	55
ϕ20	800	380	800	380	640	310	480	190	480	190	320	100	320	100	160	50

【Note】
① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch Power Mill

EPPLS

Long shank



Metric

<Side milling>

Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Titanium alloy Ti-6Al-4V		Super heat-resistant alloy Inconel Hasteloy	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
ϕ3	5,310	420	5,310	420	4,240	340	3,180	190	3,180	190	2,120	85	2,120	85	1,060	42
ϕ4	3,980	480	3,980	480	3,180	380	2,390	240	2,390	240	1,590	130	1,590	130	800	65
ϕ5	3,180	510	3,180	510	2,550	410	1,910	270	1,910	270	1,270	150	1,270	150	640	75
ϕ6	2,650	530	2,650	530	2,120	420	1,590	250	1,590	250	1,060	150	1,060	150	530	75
ϕ8	1,990	560	1,990	560	1,590	450	1,190	240	1,190	240	800	140	800	140	400	70
ϕ10	1,590	510	1,590	510	1,270	410	950	230	950	230	640	140	640	140	320	70
ϕ12	1,330	480	1,330	480	1,060	380	800	220	800	220	530	130	530	130	270	65
ϕ16	990	400	990	400	800	320	600	200	600	200	400	110	400	110	200	55

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

8-flutes End Mill for Vertical Wall/Bottom Face Finishing

YouTube

Planing | Side milling | Slotting | Die-sinking | Profiling | Semi Finishing | Finishing

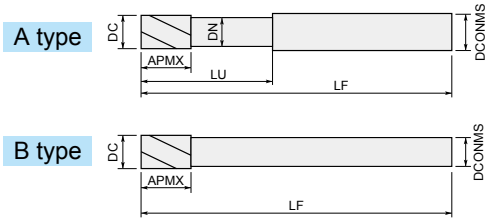
Dia. tolerance φ6 : 0～−0.015mm
φ7～φ12 : 0～−0.02mm

h5 (φ6,8,10,12) h6 (φ7,9,11)

The Zenith of Milling for Vertical Wall and Bottom Face Finishing
Vertical wall and bottom face finishing with a single tool!

Please refer to page A275 for Radius

8 Flutes



ES8WB○○○○LN(LS)-○○-ATH

Carbide | ATH | Helix angle 38° | Cutting Conditions A384

Item code	Stock	Size(mm) Tool dia. DC	Flute length APMX	Under neck length LU	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Shape
ES8WB0600LN-20-ATH	●	6 (.236inch)	6 (.236inch)	20	5.88	70	6	A
ES8WB0600LN-30-ATH	●			30	5.88	80	6	A
ES8WB0600LN-40-ATH	●			40	5.88	90	6	A
ES8WB0600LN-50-ATH	●			50	5.88	100	6	A
ES8WB0700LS-ATH	●	7 (.276inch)	7 (.276inch)	–	–	90	6	B
ES8WB0800LN-30-ATH	●	8 (.315inch)	8 (.315inch)	30	7.84	75	8	A
ES8WB0800LN-40-ATH	●			40	7.84	90	8	A
ES8WB0800LN-50-ATH	●			50	7.84	100	8	A
ES8WB0800LN-60-ATH	●			60	7.84	110	8	A
ES8WB0900LS-ATH	●	9 (.354inch)	9 (.354inch)	–	–	100	8	B
ES8WB1000LN-35-ATH	●	10 (.394inch)	10 (.394inch)	35	9.8	80	10	A
ES8WB1000LN-50-ATH	●			50	9.8	100	10	A
ES8WB1000LN-60-ATH	●			60	9.8	110	10	A
ES8WB1000LN-80-ATH	●			80	9.8	130	10	A
ES8WB1100LS-ATH	●	11 (.433inch)	11 (.433inch)	–	–	110	10	B
ES8WB1200LN-40-ATH	●	12 (.472inch)	12 (.472inch)	40	11.8	90	12	A
ES8WB1200LN-60-ATH	●			60	11.8	110	12	A
ES8WB1200LN-80-ATH	●			80	11.8	130	12	A
ES8WB1200LN-100-ATH	●			100	11.8	150	12	A

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
○	◎	◎						

● : Inventory maintained in US

8-flutes End Mill for Vertical Wall/Bottom Face Finishing

Recommended cutting conditions

ES8WB-ATH

Vertical wall finishing

Inch

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Item code	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
ES8WB0600LN-20-ATH	.118	≦.004	7960	75.2	6370	60.2	4770	44.9	3180	29.9	2650	25.2
ES8WB0600LN-30-ATH	.118	≦.004	6630	62.6	5310	50.0	3980	37.8	2650	25.2	2120	20.1
ES8WB0600LN-40-ATH	.118	≦.004	4640	30.7	3710	24.4	2790	18.5	1860	12.2	1490	9.8
ES8WB0600LN-50-ATH	.118	≦.004	3320	15.7	2650	12.6	1990	9.4	1330	6.3	1060	5.1
ES8WB0700LS-ATH	.138	≦.004	5680	62.6	4550	50.0	3410	37.4	2270	25.2	1820	20.1
ES8WB0800LN-30-ATH	.157	≦.004	5970	75.2	4770	60.2	3580	45.3	2390	29.9	1990	25.2
ES8WB0800LN-40-ATH	.157	≦.004	4970	62.6	3980	50.0	2980	37.4	1990	25.2	1590	20.1
ES8WB0800LN-50-ATH	.157	≦.004	3480	35.0	2790	24.4	2090	21.3	1390	14.2	1110	11.0
ES8WB0800LN-60-ATH	.157	≦.004	2490	15.7	1990	12.6	1490	9.4	990	6.3	800	5.1
ES8WB0900LS-ATH	.177	≦.004	4420	62.6	3540	50.0	2650	37.4	1770	25.2	1410	20.1
ES8WB1000LN-35-ATH	.197	≦.004	4770	75.2	3820	60.2	2860	44.9	1910	29.9	1590	25.2
ES8WB1000LN-50-ATH	.197	≦.004	3980	62.6	3180	50.0	2390	37.8	1590	25.2	1270	20.1
ES8WB1000LN-60-ATH	.197	≦.004	2790	35.0	2230	24.4	1670	20.9	1110	14.2	890	11.0
ES8WB1000LN-80-ATH	.197	≦.004	1990	15.7	1590	12.6	1190	9.4	800	6.3	640	5.1
ES8WB1100LS-ATH	.217	≦.004	3620	59.4	2890	47.6	2170	35.8	1450	24.0	1160	18.9
ES8WB1200LN-40-ATH	.236	≦.004	3980	67.7	3180	53.9	2390	40.6	1590	27.2	1330	22.4
ES8WB1200LN-60-ATH	.236	≦.004	3320	56.3	2650	44.9	1990	33.9	1330	22.4	1060	18.1
ES8WB1200LN-80-ATH	.236	≦.004	2320	27.6	1860	22.0	1390	16.5	930	11.0	740	8.7
ES8WB1200LN-100-ATH	.236	≦.004	1660	14.2	1330	11.4	990	8.3	660	5.5	530	4.3

* Cutting conditions for the long-shank type (⌀7/9/11) are for a tool projection of 5DC (tool diameter × 5). Modify the conditions using the following correction factors if the projection amount changes:

Cutting condition correction factors for long-shank type (%)

Work material			Carbon steel Alloy steel (180～250HB)		Tool steel (25～35HRC)		Pre-hardened steel (35～45HRC)		Hardened steel (45～55HRC)		Hardened steel (55～62HRC)	
Projection	a_p (inch)	a_e (inch)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)	Revolution n (min^{-1})	Feed rate vf (IPM)
5DC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6DC	100%	100%	70%	60%	70%	60%	70%	60%	70%	60%	70%	60%
7DC	100%	100%	70%	50%	70%	50%	70%	50%	70%	50%	70%	50%

【Note】

① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

ES8WB-ATH

Vertical wall finishing

Metric

Work material			Carbon steel Alloy steel (180~250HB)		Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~62HRC)	
Item code	a_p (mm)	a_e (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
ES8WB0600LN-20-ATH	3	≦0.1	7960	1910	6370	1530	4770	1140	3180	760	2650	640
ES8WB0600LN-30-ATH	3	≦0.1	6630	1590	5310	1270	3980	960	2650	640	2120	510
ES8WB0600LN-40-ATH	3	≦0.1	4640	780	3710	620	2790	470	1860	310	1490	250
ES8WB0600LN-50-ATH	3	≦0.1	3320	400	2650	320	1990	240	1330	160	1060	130
ES8WB0700LS-ATH	3.5	≦0.1	5680	1590	4550	1270	3410	950	2270	640	1820	510
ES8WB0800LN-30-ATH	4	≦0.1	5970	1910	4770	1530	3580	1150	2390	760	1990	640
ES8WB0800LN-40-ATH	4	≦0.1	4970	1590	3980	1270	2980	950	1990	640	1590	510
ES8WB0800LN-50-ATH	4	≦0.1	3480	890	2790	620	2090	540	1390	360	1110	280
ES8WB0800LN-60-ATH	4	≦0.1	2490	400	1990	320	1490	240	990	160	800	130
ES8WB0900LS-ATH	4.5	≦0.1	4420	1590	3540	1270	2650	950	1770	640	1410	510
ES8WB1000LN-35-ATH	5	≦0.1	4770	1910	3820	1530	2860	1140	1910	760	1590	640
ES8WB1000LN-50-ATH	5	≦0.1	3980	1590	3180	1270	2390	960	1590	640	1270	510
ES8WB1000LN-60-ATH	5	≦0.1	2790	890	2230	620	1670	530	1110	360	890	280
ES8WB1000LN-80-ATH	5	≦0.1	1990	400	1590	320	1190	240	800	160	640	130
ES8WB1100LS-ATH	5.5	≦0.1	3620	1510	2890	1210	2170	910	1450	610	1160	480
ES8WB1200LN-40-ATH	6	≦0.1	3980	1720	3180	1370	2390	1030	1590	690	1330	570
ES8WB1200LN-60-ATH	6	≦0.1	3320	1430	2650	1140	1990	860	1330	570	1060	460
ES8WB1200LN-80-ATH	6	≦0.1	2320	700	1860	560	1390	420	930	280	740	220
ES8WB1200LN-100-ATH	6	≦0.1	1660	360	1330	290	990	210	660	140	530	110

* Cutting conditions for the long-shank type (⌀7/9/11) are for a tool projection of 5DC (tool diameter × 5). Modify the conditions using the following correction factors if the projection amount changes:

Cutting condition correction factors for long-shank type (%)

Work material			Carbon steel Alloy steel (180~250HB)		Tool steel (25~35HRC)		Pre-hardened steel (35~45HRC)		Hardened steel (45~55HRC)		Hardened steel (55~62HRC)	
Projection	a_p (mm)	a_e (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
5DC	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
6DC	100%	100%	70%	60%	70%	60%	70%	60%	70%	60%	70%	60%
7DC	100%	100%	70%	50%	70%	50%	70%	50%	70%	50%	70%	50%

【Note】

① Use the appropriate coolant for the work material and machining shape.
② Use a highly rigid and accurate machine as possible.
③ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch Mirus Type R

Achieves amazing machining efficiency with high cutting depth and high feed rate.

Please refer to page A283 for Radius

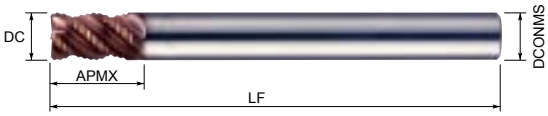
4 flutes, Square, Straight

Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance: 0 ~ −0.05mm

h5 (φ6~12) | h6 (φ16, φ20)

4 Flutes



IEMXR4○○○-TH Inch

Carbide | RTH | Helix angle 45° | Cutting Conditions A388

Item code	Stock	Size (inch)					No. of flutes
		Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Approx radius	
IEMXR4080-TH	●	1/4"	3/8"	2.953"	1/4"	.0157"	4
IEMXR4120-TH	●	3/8"	9/16"	3.150"	3/8"	.0196"	4
IEMXR4160-TH	●	1/2"	3/4"	3.937"	1/2"	.0275"	4

EMXR4○○○-TH Metric

Carbide | RTH | Helix angle 45° | Cutting Conditions A389

Item code	Stock	Size (mm)					No. of flutes
		Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Approx radius	
EMXR4060-TH	●	6	9	60	6	0.4	4
EMXR4080-TH	●	8	12	75	8	0.5	4
EMXR4100-TH	●	10	15	80	10	0.5	4
EMXR4120-TH	●	12	18	100	12	0.5	4
EMXR4160-TH	★	16	24	110	16	0.7	4
EMXR4200-TH	★	20	30	125	20	0.7	4

4 flutes, Square, Semi long shank

Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance: 0 ~ −0.05mm

h5 (φ6~12) | h6 (φ16, φ20)

4 Flutes

EMXR4○○○-SR-TH Metric

Carbide | RTH | Helix angle 45° | Cutting Conditions A390

Item code	Stock	Size (mm)					No. of flutes
		Tool dia. DC	Flute length APMX	Overall length LF	Shank dia. DCONMS	Approx radius	
EMXR4070-SR-TH	★	7	9	90	6	0.4	4
EMXR4090-SR-TH	★	9	12	100	8	0.5	4
EMXR4110-SR-TH	★	11	15	110	10	0.5	4
EMXR4130-SR-TH	★	13	18	120	12	0.7	4

※ Special geometry is adopted on tip of square type, for chipping resistance. please set up tool corner R with approx R for both type.

Applicable work material of EMXR-TH, EMXR-SR-TH

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○					○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Epoch Mirus Type N

Achieves amazing machining efficiency with high cutting depth and high feed rate.

Please refer to page A311 for Radius

4 flutes, Square, Straight

Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.03mm h5 (φ6~12) h6 (φ16, φ20)

4 Flutes

EMXN4○○○-TH Metric

Carbide | ATH | Helix angle 45° | Cutting Conditions A389

Item code	Stock	Size (mm)					No. of flutes
		Tool dia.	Flute length	Overall length	Shank dia.	Approx radius	
		DC	APMX	LF	DCONMS		
EMXN4060-TH	●	6	9	60	6	0.4	4
EMXN4080-TH	●	8	12	75	8	0.5	4
EMXN4100-TH	●	10	15	80	10	0.5	4
EMXN4120-TH	●	12	18	100	12	0.5	4
EMXN4160-TH	★	16	24	110	16	0.7	4
EMXN4200-TH	★	20	30	125	20	0.7	4

4 flutes, Square, Semi long shank

Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Rest material machining | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.03mm h5 (φ6~12) h6 (φ16, φ20)

4 Flutes

EMXN4○○○-SR-TH Metric

Carbide | ATH | Helix angle 45° | Cutting Conditions A390

Item code	Stock	Size (mm)					No. of flutes
		Tool dia.	Flute length	Overall length	Shank dia.	Approx radius	
		DC	APMX	LF	DCONMS		
EMXN4070-SR-TH	★	7	9	90	6	0.4	4
EMXN4090-SR-TH	★	9	12	100	8	0.5	4
EMXN4110-SR-TH	★	11	15	110	10	0.5	4
EMXN4130-SR-TH	★	13	18	120	12	0.5	4

※ Special geometry is adopted on tip of square type, for chipping resistance. please set up tool corner R with approx R for both type.

Applicable work material of EMXN-TH, EMXN-SR-TH

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○					○	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

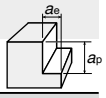
Epoch Mirus Type R/Type N

Recommended cutting conditions

IEMXR-TH **4 flutes, Square, Straight**

Inch

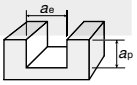
Side milling (Cat-40)



Type R

	Mild Steel Cast Iron				P20-PX5 (25-35HRC)				Pre-Hardened Steel (35-45HRC)				Hardened steel (45-52HRC)			
Tool dia. DC(inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)
1/4"	7500	50	.250"	.125"	6750	36	.250"	.094"	6000	25	.250"	.063"	5250	18	.250"	.031"
3/8"	5000	60	.281"	.188"	4500	43	.281"	.141"	4000	30	.281"	.094"	3500	22	.281"	.047"
1/2"	3750	50	.250"	.250"	3375	36	.250"	.188"	3000	25	.250"	.125"	2625	18	.250"	.063"

Slotting (Cat-40)



Type R

	Mild Steel Cast Iron				P20-PX5 (25-35HRC)				Pre-Hardened Steel (35-45HRC)				Hardened steel (45-52HRC)			
Tool dia. DC(inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)	*n* (min⁻¹)	*vf* (IPM)	Step Down (inch)	Step Over (inch)
1/4"	6500	35	.250"	.250"	5850	25	.200"	.250"	5200	18	.125"	.250"	4550	12	.050"	.250"
3/8"	4350	40	.281"	.375"	3915	29	.225"	.375"	3480	20	.141"	.375"	3045	13	.056"	.375"
1/2"	3250	35	.250"	.500"	2925	25	.200"	.500"	2600	18	.125"	.500"	2275	12	.050"	.500"

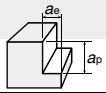
Max Ramp Angle

-20HRc = less 30deg
25-30HRc = less 15deg
35-45HRc = less 15deg
45-55HRc = less 5deg

EMXR-TH EMXN-TH 4 flutes, Square, Straight

Inch

Side milling



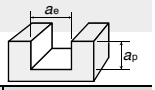
Type R

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	8,000	54	7,200	40	6,400	28	5,600	20
ϕ8	6,000	58	5,400	41	4,800	29	4,200	20
ϕ10	4,800	58	4,300	41	3,800	29	3,300	20
ϕ12	4,000	54	3,600	39	3,200	28	2,800	20
ϕ16	3,000	52	2,700	37	2,400	26	2,100	18
ϕ20	2,400	45	2,100	32	1,900	23	1,700	16

Type N

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	7,400	50	6,600	37	6,600	11	5,800	26	5,000	18
ϕ8	5,600	54	5,000	38	5,000	12	4,400	26	3,800	18
ϕ10	4,500	54	4,000	38	4,000	11	3,500	27	3,000	18
ϕ12	3,700	50	3,300	36	3,300	11	2,900	26	2,500	17
ϕ16	2,800	48	2,500	34	2,500	10	2,200	24	1,900	17
ϕ20	2,200	41	2,000	30	2,000	9	1,800	22	1,500	14

Slotting



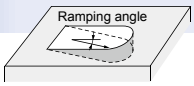
Type R

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,900	39	6,100	27	5,300	19	4,500	13
ϕ8	5,200	40	4,600	28	4,000	19	3,400	14
ϕ10	4,100	39	3,700	28	3,200	19	2,700	13
ϕ12	3,400	37	3,100	27	2,700	18	2,300	13
ϕ16	2,600	35	2,300	25	2,000	18	1,700	12
ϕ20	2,100	32	1,800	22	1,600	15	1,400	11

Type N

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,400	36	5,600	25	5,600	7	4,800	17	4,000	11
ϕ8	4,800	36	4,200	25	4,200	8	3,600	17	3,000	12
ϕ10	3,800	36	3,300	25	3,300	8	2,900	17	2,400	12
ϕ12	3,200	35	2,800	25	2,800	8	2,400	16	2,000	11
ϕ16	2,400	33	2,100	23	2,100	7	1,800	16	1,500	11
ϕ20	1,900	29	1,700	20	1,700	6	1,400	13	1,200	10

Ramping



Type R

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,900	30	6,100	22	5,300	15	4,500	9
ϕ8	5,200	31	4,600	22	4,000	16	3,400	11
ϕ10	4,100	31	3,700	22	3,200	15	2,700	10
ϕ12	3,400	29	3,100	21	2,700	15	2,300	10
ϕ16	2,600	28	2,300	19	2,000	14	1,700	10
ϕ20	2,100	25	1,800	17	1,600	12	1,400	8

Type N

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Max. ramping angle	20° or less		10° or less		5°or less		10° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	6,400	28	5,600	18	5,600	4	4,800	13	4,000	8
ϕ8	4,800	29	4,200	20	4,200	7	3,600	14	3,000	10
ϕ10	3,800	29	3,300	20	3,300	5	2,900	14	2,400	9
ϕ12	3,200	27	2,800	19	2,800	6	2,400	13	2,000	9
ϕ16	2,400	26	2,100	18	2,100	6	1,800	12	1,500	8
ϕ20	1,900	23	1,700	16	1,700	5	1,400	11	1,200	7

※Type R is not recommendable for milling stainless steel or Ti alloy.

Note
① Please use rpm and 1/3 those of slotting cutting conditions respectively for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥ In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.

Epoch Mirus Type R/Type N

EMXR-TH EMXN-TH 4 flutes, Square, Straight

Inch

Two-way profiling

Type R | Type N

Fig.1

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC		max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ6	8,000	67	7,200	49	6,400	36	5,600	25	7,400	62	6,600	45	6,600	13	5,800	32	5,000	22
ϕ8	6,000	72	5,400	52	4,800	36	4,200	25	5,600	67	5,000	48	5,000	14	4,400	33	3,800	23
ϕ10	4,800	71	4,300	52	3,800	36	3,300	25	4,500	67	4,000	48	4,000	14	3,500	34	3,000	23
ϕ12	4,000	69	3,600	49	3,200	35	2,800	25	3,700	64	3,300	45	3,300	13	2,900	31	2,500	22
ϕ16	3,000	64	2,700	46	2,400	33	2,100	23	2,800	59	2,500	43	2,500	13	2,200	30	1,900	21
ϕ20	2,400	57	2,100	39	1,900	29	1,700	20	2,200	52	2,000	38	2,000	11	1,800	27	1,500	18

※Type R is not recommendable for milling stainless steel or Ti alloy.

Features MIRUS has the capability of two-way profiling a work from geometry as figure 1 shown. Please refer to side milling cutting conditions for previous process.

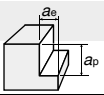
Note Please refer to the precautions in previous page.

EMXR-SR-TH EMXN-SR-TH 4 flutes, Square, Semi long shank

Inch

Side milling

Type R | Type N

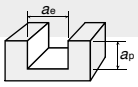


			Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)			a_p=1.0DC, a_e=0.5DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.375DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.25DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.125DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.5DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.375DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.375DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.25DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.125DC × Ratio to standard depth of cut	
Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
ϕ7	4	100%	6,800	54	6,100	39	5,500	29	4,800	19	6,400	51	5,700	36	5,700	11	5,000	26	4,300	17
	5	70%	4,800	38	4,300	28	3,900	20	3,400	14	4,500	36	4,000	26	4,000	8	3,500	18	3,000	12
	6	50%	3,400	27	3,100	20	2,800	15	2,400	10	3,200	26	2,900	19	2,900	6	2,500	13	2,200	9
ϕ9	4	100%	5,300	57	4,800	42	4,200	29	3,700	21	5,000	54	4,400	37	4,400	11	3,900	27	3,400	19
	5	70%	3,700	40	3,400	29	2,900	21	2,600	15	3,500	38	3,100	26	3,100	7	2,700	18	2,400	13
	6	50%	2,700	29	2,400	21	2,100	14	1,900	10	2,500	27	2,200	18	2,200	5	2,000	14	1,700	10
ϕ11	4	100%	4,300	57	3,900	41	3,500	29	3,000	20	4,100	54	3,600	37	3,600	12	3,200	27	2,700	18
	5	70%	3,000	40	2,700	29	2,500	21	2,100	14	2,900	38	2,500	26	2,500	8	2,200	18	1,900	13
	6	50%	2,200	28	2,000	21	1,800	15	1,500	10	2,100	27	1,800	19	1,800	6	1,600	13	1,400	9
ϕ13	4	100%	3,700	55	3,300	40	2,900	27	2,600	20	3,400	50	3,100	37	3,100	11	2,700	26	2,300	17
	5	70%	2,600	38	2,300	28	2,000	19	1,800	14	2,400	35	2,200	26	2,200	8	1,900	18	1,600	12
	6	50%	1,900	27	1,700	20	1,500	14	1,300	10	1,700	25	1,600	19	1,600	6	1,400	13	1,200	9

※Type R is not recommendable for milling stainless steel or Ti alloy.

Note
① Please use rpm and 1/3 those of slotting cutting conditions respectively for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥ In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.
⑦ Please change ratio to standard depth of cut in the appllication with more than 4DC tool overhang.

Slotting



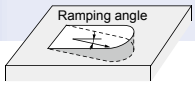
Type R

Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020 n (min⁻¹)	vf (IPM)	Tool steel (25～35HRC) D3 n (min⁻¹)	vf (IPM)	Pre-hardned steel (35～45HRC) P21 n (min⁻¹)	vf (IPM)	Hardened steel (45～55HRC) H13, L6 n (min⁻¹)	vf (IPM)
Depth of cut (mm)			ap=1.0DC × Ratio to standard depth of cut		ap=0.8DC × Ratio to standard depth of cut		ap=0.5DC × Ratio to standard depth of cut		ap=0.2DC × Ratio to standard depth of cut	
ϕ7	4	100%	5,900	38	5,200	27	4,500	18	3,900	12
	5	70%	3,500	22	3,100	16	2,700	11	2,300	7
	6	50%	1,800	12	1,600	8	1,400	6	1,200	4
ϕ9	4	100%	4,600	40	4,100	28	3,500	20	3,000	13
	5	70%	2,800	24	2,500	17	2,100	12	1,800	8
	6	50%	1,400	12	1,200	9	1,100	6	900	4
ϕ11	4	100%	3,800	40	3,300	28	2,900	20	2,500	13
	5	70%	2,300	24	2,000	17	1,700	12	1,500	8
	6	50%	1,100	12	1,000	8	900	6	800	4
ϕ13	4	100%	3,200	38	2,800	27	2,400	18	2,100	13
	5	70%	1,900	23	1,700	16	1,400	11	1,300	7
	6	50%	1,000	12	800	8	700	6	600	4

Type N

Tool dia. DC (mm)	L/D	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020 n (min⁻¹)	vf (IPM)	Tool steel (25～35HRC) D3 n (min⁻¹)	vf (IPM)	Stainless steel n (min⁻¹)	vf (IPM)	Pre-hardned steel (35～45HRC) P21 n (min⁻¹)	vf (IPM)	Hardened steel (45～55HRC) H13, L6 n (min⁻¹)	vf (IPM)
Depth of cut (mm)		ap=1.0DC × Ratio to standard depth of cut		ap=0.8DC × Ratio to standard depth of cut		ap=0.8DC × Ratio to standard depth of cut		ap=0.5DC × Ratio to standard depth of cut		ap=0.2DC × Ratio to standard depth of cut	
ϕ7	4	5,500	35	4,800	25	4,800	8	4,100	16	3,400	11
	5	3,300	21	2,900	15	2,900	5	2,500	10	2,000	6
	6	1,700	11	1,400	7	1,400	2	1,200	5	1,000	3
ϕ9	4	4,200	37	3,700	25	3,700	7	3,200	18	2,700	12
	5	2,500	22	2,200	15	2,200	4	1,900	11	1,600	7
	6	1,300	11	1,100	8	1,100	2	1,000	6	800	4
ϕ11	4	3,500	36	3,000	25	3,000	7	2,600	18	2,200	11
	5	2,100	22	1,800	15	1,800	4	1,600	11	1,300	7
	6	1,100	11	900	8	900	3	800	5	700	4
ϕ13	4	2,900	35	2,600	24	2,600	7	2,200	17	1,800	11
	5	1,700	20	1,600	15	1,600	4	1,300	10	1,100	7
	6	900	10	800	7	800	2	700	5	500	3

Ramping



Type R

Tool dia. DC (mm)	L/D	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020 n (min⁻¹)	vf (IPM)	Tool steel (25～35HRC) D3 n (min⁻¹)	vf (IPM)	Pre-hardned steel (35～45HRC) P21 n (min⁻¹)	vf (IPM)	Hardened steel (45～55HRC) H13, L6 n (min⁻¹)	vf (IPM)
Max. ramping angle		30° or less		15° or less		15° or less		5° or less	
ϕ7	4	5,900	28	5,200	21	4,500	14	3,900	9
	5	4,100	20	3,600	14	3,200	10	2,700	8
	6	3,000	14	2,600	10	2,300	7	2,000	5
ϕ9	4	4,600	31	4,100	21	3,500	15	3,000	11
	5	3,200	22	2,900	15	2,500	11	2,100	7
	6	2,300	16	2,100	11	1,800	7	1,500	5
ϕ11	4	3,800	30	3,300	21	2,900	15	2,500	11
	5	2,700	22	2,300	16	2,000	10	1,800	7
	6	1,900	16	1,700	11	1,500	8	1,300	6
ϕ13	4	3,200	29	2,800	20	2,400	14	2,100	10
	5	2,200	21	2,000	14	1,700	10	1,500	7
	6	1,600	15	1,400	10	1,200	7	1,100	5

Type N

Tool dia. DC (mm)	L/D	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020 n (min⁻¹)	vf (IPM)	Tool steel (25～35HRC) D3 n (min⁻¹)	vf (IPM)	Stainless steel n (min⁻¹)	vf (IPM)	Pre-hardned steel (35～45HRC) P21 n (min⁻¹)	vf (IPM)	Hardened steel (45～55HRC) H13, L6 n (min⁻¹)	vf (IPM)
Max. ramping angle		20° or less		10° or less		5° or less		10° or less		5° or less	
ϕ7	4	5,500	26	4,800	19	4,800	6	4,100	13	3,400	8
	5	3,900	19	3,400	14	3,400	4	2,900	9	2,400	6
	6	2,800	13	2,400	10	2,400	3	2,100	7	1,700	4
ϕ9	4	4,200	29	3,700	21	3,700	6	3,200	14	2,700	10
	5	2,900	20	2,600	15	2,600	4	2,200	10	1,900	7
	6	2,100	14	1,900	10	1,900	3	1,600	7	1,400	4
ϕ11	4	3,500	29	3,000	19	3,000	6	2,600	14	2,200	10
	5	2,500	20	2,100	13	2,100	4	1,800	10	1,500	7
	6	1,800	14	1,500	10	1,500	3	1,300	7	1,100	5
ϕ13	4	2,900	27	2,600	20	2,600	6	2,200	13	1,800	9
	5	2,000	19	1,800	14	1,800	4	1,500	9	1,300	6
	6	1,500	13	1,300	10	1,300	3	1,100	7	900	4

※Type R is not recommendable for milling stainless steel or Ti alloy.

Note
① Please use rpm and 1/3 those of slotting cutting conditions respectively for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥ In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.
⑦ Please change ratio to standard depth of cut in the appllication with more than 4DC tool overhang.

Epoch Mirus Type R/Type N

EMXR-SR-TH **EMXN-SR-TH** **4 flutes, Square, Semi long shank**

Inch

Two-way profiling

Type R

Type N

Fig.1

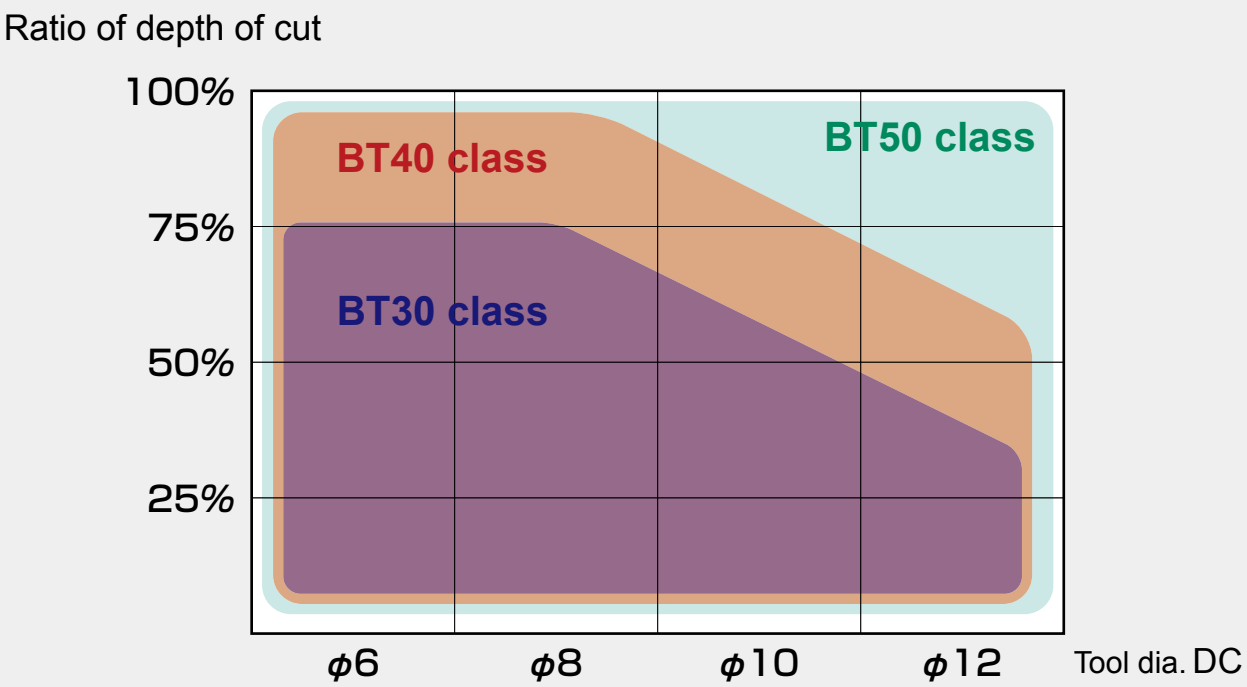
			Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)			max. *ae*=0.5DC × Ratio to standard depth of cut		max. *ae*=0.375DC × Ratio to standard depth of cut		max. *ae*=0.25DC × Ratio to standard depth of cut		max. *ae*=0.125DC × Ratio to standard depth of cut		max. *ae*=0.5DC × Ratio to standard depth of cut		max. *ae*=0.375DC × Ratio to standard depth of cut		max. *ae*=0.375DC × Ratio to standard depth of cut		max. *ae*=0.25DC × Ratio to standard depth of cut		max. *ae*=0.125DC × Ratio to standard depth of cut	
Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)	*n* (min⁻¹)	*vf* (IPM)
ϕ7	4	100%	6,800	68	6,100	49	5,500	35	4,800	25	6,400	64	5,700	46	5,700	14	5,000	32	4,300	22
	5	70%	4,800	48	4,300	34	3,900	25	3,400	16	4,500	45	4,000	32	4,000	10	3,500	22	3,000	16
	6	50%	3,400	34	3,100	25	2,800	18	2,400	12	3,200	32	2,900	23	2,900	7	2,500	16	2,200	11
ϕ9	4	100%	5,300	72	4,800	52	4,200	37	3,700	25	5,000	68	4,400	48	4,400	14	3,900	33	3,400	23
	5	70%	3,700	50	3,400	37	2,900	26	2,600	18	3,500	48	3,100	33	3,100	10	2,700	24	2,400	16
	6	50%	2,700	36	2,400	26	2,100	18	1,900	13	2,500	34	2,200	24	2,200	7	2,000	17	1,700	12
ϕ11	4	100%	4,300	71	3,900	51	3,500	36	3,000	25	4,100	67	3,600	48	3,600	14	3,200	33	2,700	23
	5	70%	3,000	49	2,700	36	2,500	26	2,100	18	2,900	48	2,500	33	2,500	10	2,200	24	1,900	16
	6	50%	2,200	35	2,000	26	1,800	19	1,500	13	2,100	34	1,800	24	1,800	7	1,600	17	1,400	11
ϕ13	4	100%	3,700	68	3,300	49	2,900	35	2,600	24	3,400	63	3,100	46	3,100	14	2,700	32	2,300	22
	5	70%	2,600	48	2,300	34	2,000	24	1,800	17	2,400	44	2,200	32	2,200	10	1,900	23	1,600	15
	6	50%	1,900	34	1,700	24	1,500	17	1,300	12	1,700	31	1,600	23	1,600	6	1,400	16	1,200	11

※Type R is not recommendable for milling stainless steel or Ti alloy.

Features MIRUS has the capability of two-way profiling a work from geometry as figure 1 shown. Please refer to side milling cutting conditions for previous process.

Note Please refer to the precautions in page A391.

Cutting condition adjustment based on spindle type



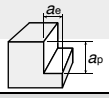
Standard cutting condition is for BT50 class spindle situation. Please adjust the depth of cut according to above chart.

Recommended cutting conditions

EMXR-TH EMXN-TH 4 flutes, Square, Straight

Metric

Side milling



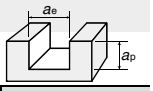
Type R

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	8,000	1,380	7,200	1,000	6,400	710	5,600	500
ϕ8	6,000	1,460	5,400	1,050	4,800	750	4,200	520
ϕ10	4,800	1,460	4,300	1,050	3,800	740	3,300	510
ϕ12	4,000	1,380	3,600	1,000	3,200	710	2,800	500
ϕ16	3,000	1,310	2,700	940	2,400	670	2,100	470
ϕ20	2,400	1,150	2,100	810	1,900	580	1,700	420

Type N

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC a_e=0.5DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.375DC		a_p=1.0DC a_e=0.25DC		a_p=1.0DC a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	7,400	1,280	6,600	910	6,600	270	5,800	640	5,000	440
ϕ8	5,600	1,360	5,000	970	5,000	290	4,400	680	3,800	470
ϕ10	4,500	1,370	4,000	970	4,000	290	3,500	680	3,000	470
ϕ12	3,700	1,280	3,300	910	3,300	270	2,900	640	2,500	440
ϕ16	2,800	1,220	2,500	870	2,500	260	2,200	610	1,900	420
ϕ20	2,200	1,060	2,000	770	2,000	230	1,800	550	1,500	370

Slotting



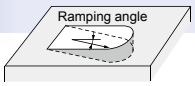
Type R

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,900	950	6,100	670	5,300	470	4,500	320
ϕ8	5,200	1,010	4,600	720	4,000	500	3,400	340
ϕ10	4,100	1,000	3,700	720	3,200	500	2,700	340
ϕ12	3,400	940	3,100	690	2,700	480	2,300	330
ϕ16	2,600	910	2,300	640	2,000	450	1,700	300
ϕ20	2,100	810	1,800	550	1,600	390	1,400	280

Type N

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	a_p=1.0DC		a_p=0.8DC		a_p=0.8DC		a_p=0.5DC		a_p=0.2DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,400	880	5,600	620	5,600	190	4,800	420	4,000	280
ϕ8	4,800	930	4,200	650	4,200	200	3,600	450	3,000	300
ϕ10	3,800	920	3,300	640	3,300	190	2,900	450	2,400	300
ϕ12	3,200	880	2,800	620	2,800	190	2,400	420	2,000	280
ϕ16	2,400	840	2,100	580	2,100	170	1,800	400	1,500	270
ϕ20	1,900	730	1,700	520	1,700	160	1,400	340	1,200	240

Ramping



Type R

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Max. ramping angle	30° or less		15° or less		15° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,900	750	6,100	530	5,300	370	4,500	250
ϕ8	5,200	790	4,600	560	4,000	390	3,400	260
ϕ10	4,100	780	3,700	560	3,200	390	2,700	260
ϕ12	3,400	730	3,100	540	2,700	370	2,300	250
ϕ16	2,600	710	2,300	500	2,000	350	1,700	240
ϕ20	2,100	630	1,800	430	1,600	310	1,400	220

Type N

	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Max. ramping angle	20° or less		10° or less		5°or less		10° or less		5° or less	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	6,400	690	5,600	480	5,600	140	4,800	330	4,000	220
ϕ8	4,800	730	4,200	510	4,200	150	3,600	350	3,000	230
ϕ10	3,800	720	3,300	500	3,300	150	2,900	350	2,400	230
ϕ12	3,200	690	2,800	480	2,800	140	2,400	330	2,000	220
ϕ16	2,400	650	2,100	460	2,100	140	1,800	310	1,500	210
ϕ20	1,900	570	1,700	410	1,700	120	1,400	270	1,200	180

※Type R is not recommendable for milling stainless steel or Ti alloy.

Note
① Please use rpm and 1/3 those of slotting cutting conditions respectively for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.

Epoch Mirus Type R/Type N

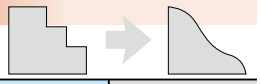
EMXR-TH EMXN-TH 4 flutes, Square, Straight

Metric

Two-way profiling

Type R / Type N

Fig.1



	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)	max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC		max. a_e=0.5DC		max. a_e=0.375DC		max. a_e=0.375DC		max. a_e=0.25DC		max. a_e=0.125DC	
Tool dia. DC(mm)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ6	8,000	1,730	7,200	1,240	6,400	880	5,600	620	7,400	1,600	6,600	1,140	6,600	340	5,800	800	5,000	550
ϕ8	6,000	1,820	5,400	1,310	4,800	930	4,200	650	5,600	1,700	5,000	1,220	5,000	370	4,400	860	3,800	590
ϕ10	4,800	1,820	4,300	1,310	3,800	920	3,300	640	4,500	1,710	4,000	1,220	4,000	370	3,500	850	3,000	580
ϕ12	4,000	1,730	3,600	1,240	3,200	880	2,800	620	3,700	1,600	3,300	1,140	3,300	340	2,900	800	2,500	550
ϕ16	3,000	1,630	2,700	1,180	2,400	840	2,100	580	2,800	1,520	2,500	1,090	2,500	330	2,200	770	1,900	530
ϕ20	2,400	1,440	2,100	1,010	1,900	730	1,700	520	2,200	1,320	2,000	960	2,000	290	1,800	690	1,500	460

※Type R is not recommendable for milling stainless steel or Ti alloy.

Features MIRUS has the capability of two-way profiling a work from geometry as figure 1 shown. Please refer to side milling cutting conditions for previous process.

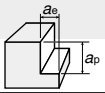
Note Please refer to the precautions in previous page.

EMXR-SR-TH EMXN-SR-TH 4 flutes, Square, Semi long shank

Metric

Side milling

Type R / Type N

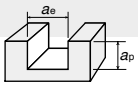


			Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)			a_p=1.0DC, a_e=0.5DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.375DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.25DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.125DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.5DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.375DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.375DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.25DC × Ratio to standard depth of cut		a_p=1.0DC, a_e=0.125DC × Ratio to standard depth of cut	
Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
ϕ7	4	100%	6,800	1,370	6,100	980	5,500	710	4,800	500	6,400	1,290	5,700	920	5,700	280	5,000	650	4,300	440
	5	70%	4,800	960	4,300	690	3,900	500	3,400	350	4,500	900	4,000	640	4,000	190	3,500	460	3,000	310
	6	50%	3,400	690	3,100	490	2,800	360	2,400	250	3,200	650	2,900	460	2,900	140	2,500	330	2,200	220
ϕ9	4	100%	5,300	1,450	4,800	1,050	4,200	740	3,700	520	5,000	1,370	4,400	960	4,400	290	3,900	680	3,400	480
	5	70%	3,700	1,020	3,400	740	2,900	520	2,600	360	3,500	960	3,100	670	3,100	200	2,700	480	2,400	340
	6	50%	2,700	730	2,400	530	2,100	370	1,900	260	2,500	690	2,200	480	2,200	140	2,000	340	1,700	240
ϕ11	4	100%	4,300	1,440	3,900	1,040	3,500	750	3,000	510	4,100	1,370	3,600	960	3,600	290	3,200	680	2,700	460
	5	70%	3,000	1,010	2,700	730	2,500	530	2,100	360	2,900	960	2,500	670	2,500	200	2,200	480	1,900	320
	6	50%	2,200	720	2,000	520	1,800	380	1,500	260	2,100	690	1,800	480	1,800	140	1,600	340	1,400	230
ϕ13	4	100%	3,700	1,390	3,300	990	2,900	690	2,600	500	3,400	1,270	3,100	930	3,100	280	2,700	650	2,300	440
	5	70%	2,600	970	2,300	690	2,000	480	1,800	350	2,400	890	2,200	650	2,200	200	1,900	460	1,600	310
	6	50%	1,900	700	1,700	500	1,500	350	1,300	250	1,700	640	1,600	470	1,600	140	1,400	330	1,200	220

※Type R is not recommendable for milling stainless steel or Ti alloy.

Note
① Please use rpm and 1/3 those of slotting cutting conditions respectively for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥ In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.
⑦ Please change ratio to standard depth of cut in the appllication with more than 4DC tool overhang.

Slotting



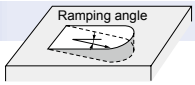
Type R

Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)			ap=1.0DC × Ratio to standard depth of cut		ap=0.8DC × Ratio to standard depth of cut		ap=0.5DC × Ratio to standard depth of cut		ap=0.2DC × Ratio to standard depth of cut	
			n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
φ7	4	100%	5,900	950	5,200	670	4,500	460	3,900	320
	5	70%	3,500	570	3,100	400	2,700	280	2,300	190
	6	50%	1,800	290	1,600	200	1,400	140	1,200	100
φ9	4	100%	4,600	1,010	4,100	720	3,500	490	3,000	340
	5	70%	2,800	610	2,500	430	2,100	290	1,800	200
	6	50%	1,400	300	1,200	220	1,100	150	900	100
φ11	4	100%	3,800	1,020	3,300	710	2,900	500	2,500	340
	5	70%	2,300	610	2,000	430	1,700	300	1,500	200
	6	50%	1,100	310	1,000	210	900	150	800	100
φ13	4	100%	3,200	960	2,800	670	2,400	460	2,100	320
	5	70%	1,900	580	1,700	400	1,400	280	1,300	190
	6	50%	1,000	290	800	200	700	140	600	100

Type N

Tool dia. DC (mm)	L/D	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)		ap=1.0DC × Ratio to standard depth of cut		ap=0.8DC × Ratio to standard depth of cut		ap=0.8DC × Ratio to standard depth of cut		ap=0.5DC × Ratio to standard depth of cut		ap=0.2DC × Ratio to standard depth of cut	
		n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
φ7	4	5,500	890	4,800	620	4,800	190	4,100	420	3,400	280
	5	3,300	530	2,900	370	2,900	110	2,500	250	2,000	170
	6	1,700	270	1,400	190	1,400	60	1,200	130	1,000	80
φ9	4	4,200	920	3,700	650	3,700	200	3,200	450	2,700	300
	5	2,500	550	2,200	390	2,200	120	1,900	270	1,600	180
	6	1,300	280	1,100	200	1,100	60	1,000	140	800	90
φ11	4	3,500	940	3,000	640	3,000	190	2,600	450	2,200	300
	5	2,100	560	1,800	380	1,800	110	1,600	270	1,300	180
	6	1,100	280	900	190	900	60	800	140	700	90
φ13	4	2,900	870	2,600	620	2,600	190	2,200	420	1,800	280
	5	1,700	520	1,600	370	1,600	110	1,300	250	1,100	170
	6	900	260	800	190	800	60	700	130	500	80

Ramping



Type R

Tool dia. DC (mm)	L/D	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Max. ramping angle		30° or less		15° or less		15° or less		5° or less	
		n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
φ7	4	5,900	740	5,200	520	4,500	360	3,900	250
	5	4,100	520	3,600	360	3,200	250	2,700	180
	6	3,000	370	2,600	260	2,300	180	2,000	130
φ9	4	4,600	790	4,100	560	3,500	380	3,000	260
	5	3,200	550	2,900	390	2,500	270	2,100	180
	6	2,300	400	2,100	280	1,800	190	1,500	130
φ11	4	3,800	790	3,300	550	2,900	390	2,500	270
	5	2,700	550	2,300	390	2,000	270	1,800	190
	6	1,900	400	1,700	280	1,500	200	1,300	140
φ13	4	3,200	750	2,800	520	2,400	360	2,100	250
	5	2,200	530	2,000	360	1,700	250	1,500	180
	6	1,600	380	1,400	260	1,200	180	1,100	130

Type N

Tool dia. DC (mm)	L/D	Cast iron, Carbon steel, Alloy steel (150～250HB) 1050, 1020		Tool steel (25～35HRC) D3		Stainless steel		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Max. ramping angle		20° or less		10° or less		5° or less		10° or less		5° or less	
		n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
φ7	4	5,500	690	4,800	480	4,800	140	4,100	330	3,400	220
	5	3,900	480	3,400	340	3,400	100	2,900	230	2,400	150
	6	2,800	350	2,400	240	2,400	70	2,100	170	1,700	110
φ9	4	4,200	720	3,700	510	3,700	150	3,200	350	2,700	240
	5	2,900	500	2,600	360	2,600	110	2,200	250	1,900	170
	6	2,100	360	1,900	260	1,900	80	1,600	180	1,400	120
φ11	4	3,500	730	3,000	500	3,000	150	2,600	350	2,200	240
	5	2,500	510	2,100	350	2,100	110	1,800	250	1,500	170
	6	1,800	370	1,500	250	1,500	80	1,300	180	1,100	120
φ13	4	2,900	680	2,600	490	2,600	150	2,200	330	1,800	220
	5	2,000	480	1,800	340	1,800	100	1,500	230	1,300	150
	6	1,500	340	1,300	250	1,300	80	1,100	170	900	110

※Type R is not recommendable for milling stainless steel or Ti alloy.

Note
① Please use rpm and 1/3 those of slotting cutting conditions respectively for Z plunging.
② Use a highly rigid and accurate machine as possible.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.
⑤ Please ensure that air blow or coolant is correctly positioned in order to remove the chip immediately.
⑥ In order to avoid clamping looseness, Please adjust cutting conditions according to type of machine center and holder.
⑦ Please change ratio to standard depth of cut in the appllication with more than 4DC tool overhang.

Epoch Mirus Type R/Type N

EMXR-SR-TH **EMXN-SR-TH** **4 flutes, Square, Semi long shank**

Metric

Two-way profiling

Fig.1

Type R

			Cast iron, Carbon steel, Alloy steel (150~250HB) 1050, 1020		Tool steel (25~35HRC) D3		Pre-hardned steel (35~45HRC) P21		Hardened steel (45~55HRC) H13, L6	
Depth of cut (mm)			max. *ae*=0.5DC × Ratio to standard depth of cut		max. *ae*=0.375DC × Ratio to standard depth of cut		max. *ae*=0.25DC × Ratio to standard depth of cut		max. *ae*=0.125DC × Ratio to standard depth of cut	
Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)
φ7	4	100%	6,800	1,710	6,100	1,230	5,500	890	4,800	620
	5	70%	4,800	1,200	4,300	860	3,900	620	3,400	430
	6	50%	3,400	860	3,100	620	2,800	450	2,400	310
φ9	4	100%	5,300	1,810	4,800	1,310	4,200	920	3,700	650
	5	70%	3,700	1,270	3,400	920	2,900	640	2,600	460
	6	50%	2,700	910	2,400	660	2,100	460	1,900	330
φ11	4	100%	4,300	1,800	3,900	1,300	3,500	940	3,000	640
	5	70%	3,000	1,260	2,700	910	2,500	660	2,100	450
	6	50%	2,200	900	2,000	650	1,800	470	1,500	320
φ13	4	100%	3,700	1,730	3,300	1,240	2,900	870	2,600	620
	5	70%	2,600	1,210	2,300	870	2,000	610	1,800	430
	6	50%	1,900	870	1,700	620	1,500	440	1,300	310

Type N

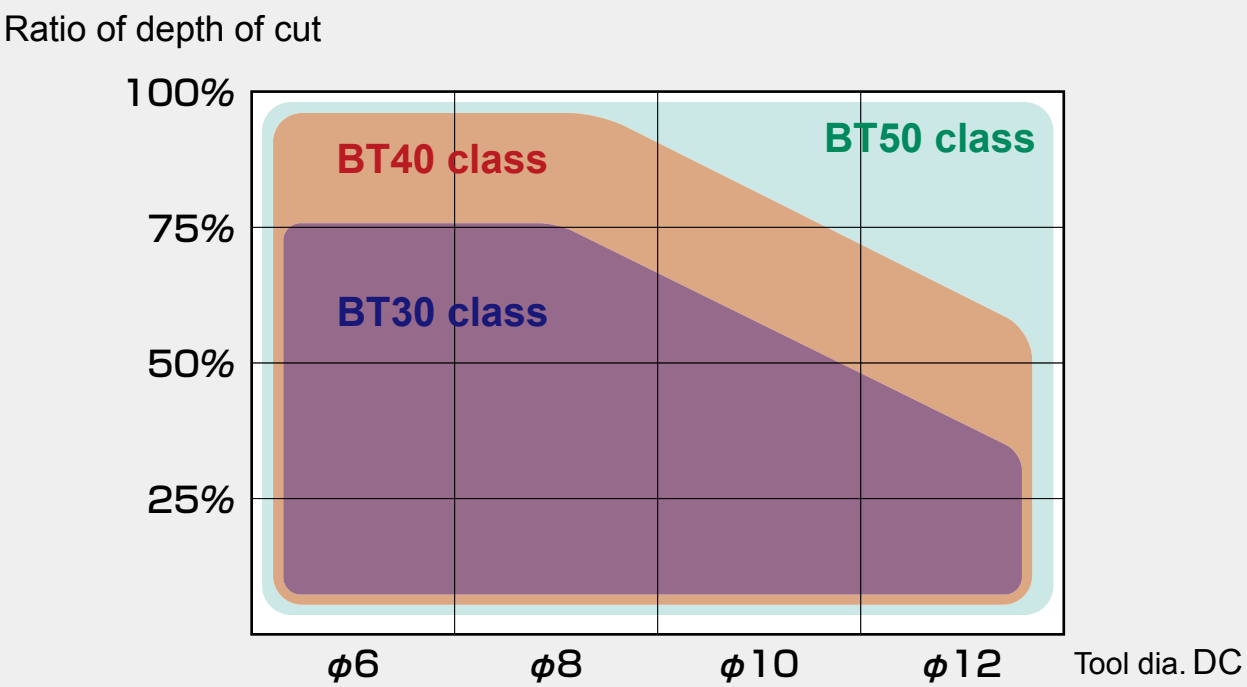
			Cast iron, Carbon steel, Alloy steel (150~250HB) 1050, 1020		Tool steel (25~35HRC) D3		Stainless steel		Pre-hardned steel (35~45HRC) P21		Hardened steel (45~55HRC) H13, L6	
Depth of cut (mm)			max. *ae*=0.5DC × Ratio to standard depth of cut		max. *ae*=0.375DC × Ratio to standard depth of cut		max. *ae*=0.375DC × Ratio to standard depth of cut		max. *ae*=0.25DC × Ratio to standard depth of cut		max. *ae*=0.125DC × Ratio to standard depth of cut	
Tool dia. DC (mm)	L/D	Ratio to standard depth of cut	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)
φ7	4	100%	6,400	1,610	5,700	1,150	5,700	350	5,000	810	4,300	550
	5	70%	4,500	1,130	4,000	810	4,000	240	3,500	570	3,000	390
	6	50%	3,200	810	2,900	580	2,900	170	2,500	410	2,200	280
φ9	4	100%	5,000	1,710	4,400	1,200	4,400	360	3,900	850	3,400	600
	5	70%	3,500	1,200	3,100	840	3,100	250	2,700	600	2,400	420
	6	50%	2,500	860	2,200	600	2,200	180	2,000	430	1,700	300
φ11	4	100%	4,100	1,710	3,600	1,200	3,600	360	3,200	860	2,700	580
	5	70%	2,900	1,200	2,500	840	2,500	250	2,200	600	1,900	410
	6	50%	2,100	860	1,800	600	1,800	180	1,600	430	1,400	290
φ13	4	100%	3,400	1,590	3,100	1,160	3,100	350	2,700	810	2,300	550
	5	70%	2,400	1,110	2,200	810	2,200	240	1,900	570	1,600	390
	6	50%	1,700	800	1,600	580	1,600	170	1,400	410	1,200	280

※Type R is not recommendable for milling stainless steel or Ti alloy.

Features MIRUS has the capability of two-way profiling a work from geometry as figure 1 shown. Please refer to side milling cutting conditions for previous process.

Note Please refer to the precautions in page A395.

Cutting condition adjustment based on spindle type



Standard cutting condition is for BT50 class spindle situation. Please adjust the depth of cut according to above chart.

Epoch TH Hard

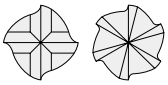
Square end mill for machining high-hardness materials.

Short

Side milling | Semi Finishing | Finishing

Dia. tolerance: 0～−0.015mm

h6



φ1～5 φ6

CEPS○○○○-TH

Carbide | TH | Helix angle 46° | Cutting Conditions A398

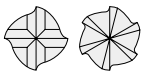
Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
CEPS4010-TH	★	1	2	60	6	4
CEPS4015-TH	★	1.5	3	60	6	4
CEPS4020-TH	★	2	4	60	6	4
CEPS4025-TH	★	2.5	5	60	6	4
CEPS4030-TH	★	3	6	60	6	4
CEPS4040-TH	★	4	8	60	6	4
CEPS4050-TH	★	5	10	60	6	4
CEPS6060-TH	★	6	12	60	6	6

Long

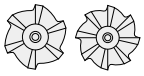
Side milling | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ25 : 0～−0.02mm

h6



φ3～5 φ6～12



φ14～22 φ25

CEPL○○○○-TH

Carbide | TH | Helix angle 46° | Cutting Conditions A399

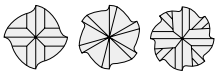
Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
CEPL4030-TH	★	3	15	60	6	4
CEPL4040-TH	★	4	20	65	6	4
CEPL4050-TH	★	5	25	70	6	4
CEPL6060-TH	★	6	25	70	6	6
CEPL6070-TH	★	7	35	90	8	6
CEPL6080-TH	★	8	35	90	8	6
CEPL6090-TH	★	9	45	100	10	6
CEPL6100-TH	★	10	45	100	10	6
CEPL6110-TH	★	11	55	120	12	6
CEPL6120-TH	★	12	55	120	12	6
＊ CEPL6140-TH	★	14	55	125	16	6
＊ CEPL6160-TH	★	16	65	135	16	6
＊ CEPL6180-TH	★	18	65	145	20	6
＊ CEPL6200-TH	★	20	75	155	20	6
＊ CEPL6220-TH	★	22	75	165	20	6
＊ CEPL8250-TH	★	25	90	180	25	8

Regular

Side milling | Semi Finishing | Finishing

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ6.5～φ32 : 0～−0.02mm

h6



φ1～5.5 φ6～24 φ25～32

CEPR○○○○-TH

Carbide | TH | Helix angle 46° | Cutting Conditions A398

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
CEPR4010-TH	●	1	3.5	60	6	4
CEPR4015-TH	★	1.5	5	60	6	4
CEPR4020-TH	●	2	7	60	6	4
CEPR4025-TH	★	2.5	8	60	6	4
CEPR4030-TH	●	3	10	60	6	4
CEPR4035-TH	★	3.5	12	60	6	4
CEPR4040-TH	●	4	12	60	6	4
CEPR4045-TH	★	4.5	15	60	6	4
CEPR4050-TH	●	5	15	60	6	4
CEPR4055-TH	★	5.5	15	60	6	4
CEPR6060-TH	●	6	15	60	6	6
CEPR6065-TH	★	6.5	20	75	8	6
CEPR6070-TH	★	7	20	75	8	6
CEPR6075-TH	★	7.5	20	75	8	6
CEPR6080-TH	●	8	20	75	8	6
CEPR6085-TH	★	8.5	25	80	10	6
CEPR6090-TH	★	9	25	80	10	6
CEPR6095-TH	★	9.5	25	80	10	6
CEPR6100-TH	●	10	25	80	10	6
CEPR6105-TH	★	10.5	30	100	12	6
CEPR6110-TH	★	11	30	100	12	6
CEPR6115-TH	★	11.5	30	100	12	6
CEPR6120-TH	●	12	30	100	12	6
CEPR6130-TH	★	13	35	105	16	6
CEPR6140-TH	★	14	35	105	16	6
CEPR6150-TH	★	15	40	110	16	6
CEPR6160-TH	★	16	40	110	16	6
CEPR6170-TH	★	17	40	120	20	6
CEPR6180-TH	★	18	40	120	20	6
CEPR6190-TH	★	19	45	125	20	6
CEPR6200-TH	★	20	45	125	20	6
CEPR6220-TH	★	22	45	135	20	6
CEPR6240-TH	★	24	50	140	25	6
CEPR8250-TH	★	25	50	140	25	8
CEPR8260-TH	★	26	50	140	25	8
CEPR8280-TH	★	28	55	145	25	8
CEPR8300-TH	★	30	60	165	32	8
CEPR8320-TH	★	32	70	175	32	8

Applicable work material of CEPS-TH, CEPR-TH, CEPL-TH

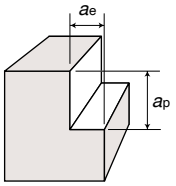
Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	◎	◎	○	○	◎		

● : Inventory maintained in US ★ : Inventory maintained in Japan ＊ : Center eyed

Epoch TH Hard

Recommended cutting conditions

CEPS-TH Short | **CEPR-TH** Regular



Inch

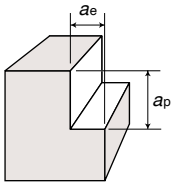
<Side milling>

Work material		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3		Hardened steel (65～70HRC) Powder steel	
High Speed	Depth of cut (mm)	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.05DC	ap=1.5DC	ae=0.03DC	ap=1.5DC	ae=0.02DC	ap=1.5DC	ae=0.02DC
	Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
	ϕ1	50,000	60	50,000	60	50,000	60	48,000	38	32,000	26
	ϕ2	40,000	112	40,000	96	32,000	77	24,000	48	16,000	32
	ϕ3	27,000	130	27,000	108	21,000	76	16,000	51	11,000	31
	ϕ4	20,000	136	20,000	120	16,000	83	12,000	58	8,000	35
	ϕ6	13,000	195	13,000	172	11,000	125	8,000	86	5,300	51
	ϕ8	10,000	198	10,000	180	8,000	125	6,000	86	4,000	50
	ϕ10	8,000	192	8,000	168	6,400	119	4,800	81	3,200	48
	ϕ12	6,600	174	6,600	154	5,300	111	4,000	74	2,700	45
	ϕ16	5,000	165	5,000	147	4,000	103	3,000	70	2,000	42
	ϕ20	4,000	158	4,000	142	3,200	100	2,400	68	1,600	41
	ϕ25	3,200	182	3,200	161	2,500	112	1,900	78	1,300	47
	ϕ30	2,700	162	2,700	145	2,100	99	1,600	69	1,100	42
General	Depth of cut (mm)	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.06DC	ap=1.5DC	ae=0.04DC	ap=1.5DC	ae=0.04DC
	Tool dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
	ϕ1	15,000	18	15,000	12	15,000	12	15,000	12	13,000	5
	ϕ2	15,000	42	15,000	24	13,000	21	9,600	15	6,400	8
	ϕ3	13,000	62	11,000	31	8,000	19	6,400	15	4,200	8
	ϕ4	10,000	68	8,000	32	6,000	22	4,800	15	3,200	9
	ϕ6	6,400	96	5,300	48	4,200	35	3,200	23	2,100	14
	ϕ8	4,800	95	4,000	50	3,200	35	2,400	23	1,600	14
	ϕ10	3,800	91	3,200	48	2,500	33	1,900	23	1,300	14
	ϕ12	3,200	84	2,700	44	2,100	30	1,600	21	1,100	13
	ϕ16	2,400	82	2,000	42	1,600	30	1,200	20	800	12
	ϕ20	1,900	75	1,600	39	1,300	28	1,000	20	600	11
	ϕ25	1,500	83	1,300	45	1,000	30	800	22	510	13
	ϕ30	1,300	79	1,100	41	800	26	600	18	420	11

【Note】

① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

CEPL-TH
Long



Inch

<Side milling (Finishing)>

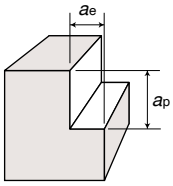
Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, CrNiMo		Stainless steel, Tool steel (25～35HRC) 304, P20		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)	ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool Dia. DC (mm)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)	Revolution n (min-1)	Feed rate vf (IPM)
3	7,960	38	7,960	38	6,370	31	6,370	31	5,310	17	5,310	13	4,240	10
4	5,970	48	5,970	48	4,770	38	4,770	38	3,980	16	3,980	13	3,180	10
5	4,700	49	4,700	49	3,820	40	3,820	40	3,180	15	3,180	13	2,550	10
6	3,980	74	3,980	74	3,180	61	3,180	61	2,650	25	2,650	19	2,120	15
8	2,980	73	2,980	73	2,390	59	2,390	59	1,990	24	1,990	19	1,590	15
10	2,390	67	2,390	67	1,910	54	1,910	54	1,590	23	1,590	19	1,270	15
12	1,990	61	1,990	61	1,590	49	1,590	49	1,320	21	1,320	19	1,060	15
16	1,490	51	1,490	51	1,190	41	1,190	41	990	19	990	17	800	13
20	1,190	45	1,190	45	950	36	950	36	800	17	800	15	640	12
25	950	47	950	47	760	38	760	38	640	18	640	16	510	13

【Note】

① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch TH Hard

CEPS-TH Short | **CEPR-TH** Regular



Metric

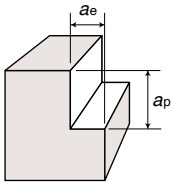
<Side milling>

Work material		Tool steel (25～35HRC) D3		Pre-hardned steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3		Hardened steel (65～70HRC) Powder steel	
High Speed	Depth of cut (mm)	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.05DC	ap=1.5DC	ae=0.03DC	ap=1.5DC	ae=0.02DC	ap=1.5DC	ae=0.02DC
	Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
	ϕ1	50,000	1,680	50,000	1,500	50,000	1,320	48,000	1,150	32,000	690
	ϕ2	40,000	2,910	40,000	2,600	32,000	1,830	24,000	1,250	16,000	750
	ϕ3	27,000	3,180	27,000	2,840	21,000	1,940	16,000	1,340	11,000	830
	ϕ4	20,000	3,360	20,000	3,000	16,000	2,110	12,000	1,440	8,000	860
	ϕ6	13,000	4,910	13,000	4,390	11,000	3,270	8,000	2,160	5,300	1,290
	ϕ8	10,000	5,040	10,000	4,500	8,000	3,170	6,000	2,160	4,000	1,300
	ϕ10	8,000	4,840	8,000	4,320	6,400	3,040	4,800	2,070	3,200	1,240
	ϕ12	6,600	4,440	6,600	3,960	5,300	2,800	4,000	1,920	2,700	1,170
	ϕ16	5,000	4,200	5,000	3,750	4,000	2,640	3,000	1,800	2,000	1,080
	ϕ20	4,000	4,030	4,000	3,600	3,200	2,530	2,400	1,730	1,600	1,040
	ϕ25	3,200	4,590	3,200	4,100	2,500	2,820	1,900	1,950	1,300	1,200
	ϕ30	2,700	4,110	2,700	3,670	2,100	2,510	1,600	1,740	1,100	1,080
General	Depth of cut (mm)	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.06DC	ap=1.5DC	ae=0.04DC	ap=1.5DC	ae=0.04DC
	Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
	ϕ1	15,000	500	15,000	320	15,000	280	15,000	250	13,000	200
	ϕ2	15,000	1,090	15,000	680	13,000	520	9,600	350	6,400	210
	ϕ3	13,000	1,530	11,000	810	8,000	520	6,400	380	4,200	220
	ϕ4	10,000	1,680	8,000	840	6,000	550	4,800	400	3,200	240
	ϕ6	6,400	2,420	5,300	1,250	4,200	870	3,200	600	2,100	360
	ϕ8	4,800	2,420	4,000	1,260	3,200	890	2,400	600	1,600	360
	ϕ10	3,800	2,300	3,200	1,210	2,500	830	1,900	570	1,300	350
	ϕ12	3,200	2,150	2,700	1,130	2,100	780	1,600	540	1,100	330
	ϕ16	2,400	2,070	2,000	1,080	1,600	760	1,200	520	800	310
	ϕ20	1,900	1,920	1,600	1,010	1,300	720	1,000	500	600	270
	ϕ25	1,500	2,110	1,300	1,140	1,000	770	800	560	510	320
	ϕ30	1,300	2,000	1,100	1,060	800	670	600	460	420	290

【Note】

① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

CEPL-TH
Long



Metric

<Side milling (Finishing)>

Work material	Cast iron		Carbon steel		Alloy steel		Stainless steel, Tool steel		Pre-hardened steel		Hardened steel		Hardened steel	
	(150～200HB) No. 35 B		(180～220HB) 1020, 1050		(200～250HB) 4140, CrNiMo		(25～35HRC) 304, P20		(35～45HRC) P21		(45～55HRC) H13, L6		(55～65HRC) D2, D3	
Depth of cut (mm)	a_p=3DC a_e=0.01DC		a_p=3DC a_e=0.01DC		a_p=3DC a_e=0.01DC		a_p=3DC a_e=0.01DC		a_p=3DC a_e=0.01DC		a_p=3DC a_e=0.01DC		a_p=3DC a_e=0.01DC	
Tool Dia. DC (mm)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)	Revolution n (min⁻¹)	Feed rate v_f (mm/min)
3	7,960	960	7,960	960	6,370	760	6,370	760	5,310	420	5,310	320	4,240	250
4	5,970	1,190	5,970	1,190	4,770	950	4,770	950	3,980	400	3,980	320	3,180	250
5	4,700	1,220	4,700	1,220	3,820	990	3,820	990	3,180	380	3,180	320	2,550	260
6	3,980	1,910	3,980	1,910	3,180	1,530	3,180	1,530	2,650	640	2,650	480	2,120	380
8	2,980	1,880	2,980	1,880	2,390	1,510	2,390	1,510	1,990	600	1,990	480	1,590	380
10	2,390	1,720	2,390	1,720	1,910	1,380	1,910	1,380	1,590	570	1,590	480	1,270	380
12	1,990	1,550	1,990	1,550	1,590	1,240	1,590	1,240	1,320	550	1,320	480	1,060	380
16	1,490	1,300	1,490	1,300	1,190	1,040	1,190	1,040	990	480	990	420	800	340
20	1,190	1,140	1,190	1,140	950	910	950	910	800	430	800	380	640	310
25	950	1,200	950	1,200	760	970	760	970	640	460	640	410	510	330

【Note】

① Use a highly rigid and accurate machine as possible.
② Use the appropriate coolant for the work material and machining shape.
③ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Epoch End Mill

Square end mill for machining high-hardness materials.

Epoch 21, Regular

Dia. tolerance: φ1～φ6 : 0～−0.015mm
φ6.5～φ32 : 0～−0.02mm
h6

φ1～5.5 φ6~24 φ25~32

CEPR

Carbide C Helix angle 46° Cutting Conditions A404

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
CEPR4010	★	1	3.5	60	6	4
CEPR4015	★	1.5	5	60	6	4
CEPR4020	★	2	7	60	6	4
CEPR4025	★	2.5	8	60	6	4
CEPR4030	★	3	10	60	6	4
CEPR4035	★	3.5	12	60	6	4
CEPR4040	★	4	12	60	6	4
CEPR4045	★	4.5	15	60	6	4
CEPR4050	★	5	15	60	6	4
CEPR4055	★	5.5	15	60	6	4
CEPR6060	★	6	15	60	6	6
CEPR6065	★	6.5	20	75	8	6
CEPR6070	★	7	20	75	8	6
CEPR6075	★	7.5	20	75	8	6
CEPR6080	★	8	20	75	8	6
CEPR6085	★	8.5	25	80	10	6
CEPR6090	★	9	25	80	10	6
CEPR6095	★	9.5	25	80	10	6
CEPR6100	★	10	25	80	10	6
CEPR6105	★	10.5	30	100	12	6
CEPR6110	★	11	30	100	12	6
CEPR6115	★	11.5	30	100	12	6
CEPR6120	★	12	30	100	12	6
CEPR6130	★	13	35	105	16	6
CEPR6140	★	14	35	105	16	6
CEPR6150	★	15	40	110	16	6
CEPR6160	★	16	40	110	16	6
CEPR6170	★	17	40	120	20	6
CEPR6180	★	18	40	120	20	6
CEPR6190	★	19	45	125	20	6
CEPR6200	★	20	45	125	20	6
CEPR6220	★	22	45	135	20	6
CEPR6240	★	24	50	140	25	6
CEPR8250	★	25	50	140	25	8
CEPR8260	★	26	50	140	25	8
CEPR8280	★	28	55	145	25	8
CEPR8300	★	30	60	165	32	8
CEPR8320	★	32	70	175	32	8

Epoch 21, Long

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ7～φ30 : 0～−0.02mm
h6

φ3~5 φ6~12
φ14~24 φ25~30

CEPL

Carbide C Helix angle 46° Cutting Conditions A405

	Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
	CEPL4030	★	3	15	60	6	4
	CEPL4040	★	4	20	65	6	4
	CEPL4050	★	5	25	70	6	4
	CEPL6060	★	6	25	70	6	6
	CEPL6070	★	7	35	90	8	6
	CEPL6080	★	8	35	90	8	6
	CEPL6090	★	9	45	100	10	6
	CEPL6100	★	10	45	100	10	6
	CEPL6110	★	11	55	120	12	6
	CEPL6120	★	12	55	120	12	6
*	CEPL6140	★	14	55	125	16	6
*	CEPL6150	★	15	65	135	16	6
*	CEPL6160	★	16	65	135	16	6
*	CEPL6180	★	18	65	145	20	6
*	CEPL6200	★	20	75	155	20	6
*	CEPL6220	★	22	75	165	20	6
*	CEPL8250	★	25	90	180	25	8
*	CEPL8280	★	28	90	180	25	8
*	CEPL8300	★	30	90	195	32	8

Applicable work material of CEPR, CEPL

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○	○		○	○		

★ : Inventory maintained in Japan ＊ : Center eyed

Epoch 21, Long Shank

Side milling | Finishing

Dia. tolerance: φ6 : 0～−0.015mm
φ8～φ32 : 0～−0.02mm
h6

φ6～12 φ16～22 φ25

CEPLS○○○○(-○○)

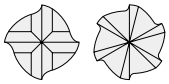
Carbide | C | Helix angle 46° | Cutting Conditions A405

	Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
	CEPLS6060	★	6	12	70	6	6
	CEPLS6080	★	8	16	90	8	6
	CEPLS6100	★	10	20	100	10	6
	CEPLS6120-10	★	12	24	120	10	6
	CEPLS6120	★	12	24	120	12	6
＊	CEPLS6160-12	★	16	32	135	12	6
＊	CEPLS6160	★	16	32	135	16	6
＊	CEPLS6180	★	18	36	145	16	6
＊	CEPLS6200-16	★	20	40	155	16	6
＊	CEPLS6200	★	20	40	155	20	6
＊	CEPLS6220	★	22	45	165	20	6
＊	CEPLS8250-20	★	25	45	180	20	8
＊	CEPLS8250	★	25	45	180	25	8

Epoch Hard

Side milling | Semi Finishing | Finishing

Dia. tolerance: φ3～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6


φ3～5 φ6～20

CEPH○○○○

Carbide | C | Helix angle 46° | Cutting Conditions A406

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.	No. of Flutes
CEPH4030	★	3	6	60	6	4
CEPH4040	★	4	8	60	6	4
CEPH4050	★	5	10	60	6	4
CEPH6060	★	6	12	60	6	6
CEPH6080	★	8	16	75	8	6
CEPH6100	★	10	20	80	10	6
CEPH6120	★	12	24	100	12	6
CEPH6160	★	16	32	110	16	6
CEPH6200	★	20	40	125	20	6

Epoch Universal

Side milling | Slotting | Semi Finishing | Finishing

Dia. tolerance: φ4～φ6 : 0～−0.015mm
φ8～φ20 : 0～−0.02mm
h6

2-step flute groove enables high-efficiency machining from grooving to side cutting. Focus on efficiency.

CEPU4○○○

Carbide | C | Helix angle 52° | Cutting Conditions A407

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
CEPU4040	★	4	12	60	6
CEPU4060	★	6	15	60	6
CEPU4080	★	8	20	75	8
CEPU4100	★	10	25	80	10
CEPU4120	★	12	30	100	12
CEPU4160	★	16	40	110	16
CEPU4200	★	20	45	125	20

Applicable work material of CEPLS, CEPH

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○	○		○	○		

Applicable work material of CEPU

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC	Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎	○	○		○	○	○	○

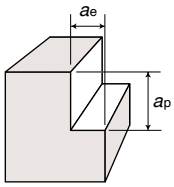
★ : Inventory maintained in Japan ＊ : Center eyed

Epoch End Mill

Recommended cutting conditions

CEPR

Epoch21, Regular



Inch

<Side milling>

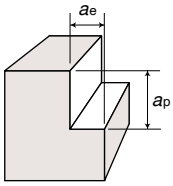
Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.02DC		ap=1.5DC ae≦0.01DC		ap=1.5DC ae≦0.01DC	
Tool dia. DC (mm)		n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
High Speed	ϕ3	33,300	186	32,000	128	30,000	120	27,600	88	26,500	85	12,700	41	10,600	34
	ϕ4	25,000	180	24,000	182	22,300	125	20,700	99	19,900	96	9,500	46	8,000	38
	ϕ5	20,000	208	19,000	182	17,800	171	16,600	133	16,000	128	7,600	61	6,400	51
	ϕ6	16,660	310	16,000	259	15,000	252	13,800	199	13,300	192	6,400	92	5,300	76
	ϕ8	12,500	308	12,000	281	11,100	266	10,300	173	9,950	167	4,800	78	4,000	67
	ϕ10	10,000	270	9,550	246	8,900	230	8,300	159	8,000	149	3,800	71	3,200	60
	ϕ12	8,330	245	8,000	226	7,400	209	6,900	161	6,600	154	3,200	75	2,650	62
	ϕ16	6,250	199	6,000	184	5,600	175	5,200	147	5,000	141	2,400	68	2,000	56
	ϕ20	5,000	165	4,770	146	4,460	136	4,140	119	4,000	113	1,900	55	1,600	45
	ϕ25	4,000	176	3,800	158	3,560	145	3,300	124	3,200	120	1,500	56	1,270	47
	ϕ30	3,330	147	3,200	131	3,000	122	2,760	104	2,650	100	1,300	49	1,060	39
General	ϕ3	16,700	94	16,700	67	12,700	51	11,700	37	9,500	30	4,200	13	2,700	9
	ϕ4	12,700	91	12,700	71	9,550	53	8,800	42	7,200	35	3,200	15	2,000	10
	ϕ5	10,200	102	10,200	98	7,600	70	7,000	56	5,700	46	2,550	20	1,600	13
	ϕ6	8,500	128	8,500	143	6,400	108	5,850	84	4,800	69	2,100	29	1,300	19
	ϕ8	6,400	157	6,400	150	4,770	112	4,400	74	3,600	58	1,600	26	1,000	17
	ϕ10	5,100	138	5,100	132	3,800	98	3,500	65	2,900	56	1,300	25	800	15
	ϕ12	4,200	123	4,200	118	3,200	90	2,920	68	2,400	56	1,060	25	660	16
	ϕ16	3,200	102	3,200	98	2,400	73	2,200	63	1,800	51	800	23	500	14
	ϕ20	2,550	70	2,550	78	1,900	59	1,750	49	1,450	41	640	18	400	12
	ϕ25	2,040	90	2,040	83	1,530	62	1,400	53	1,150	43	510	19	320	12
	ϕ30	1,700	75	1,700	69	1,270	52	1,170	44	950	36	420	16	265	10

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

CEPL

Epoch21, Long



Inch

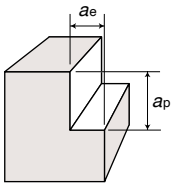
<Side finishing>

Work material	Cast iron		Carbon steel		Alloy steel		Stainless steel, Tool steel		Pre-hardened steel		Hardened steel		Hardened steel	
	(150～200HB) No. 35 B		(180～220HB) 1020, 1050		(200～250HB) 4140, 8620		(25～35HRC) 304, D3		(35～45HRC) P21		(45～55HRC) H13, L6		(55～65HRC) D2, D3	
Depth of cut (mm)	ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
ϕ3	7,960	38	7,960	38	6,370	31	6,370	31	5,310	17	5,310	13	4,240	10
ϕ4	5,970	48	5,970	48	4,770	38	4,770	38	3,980	16	3,980	13	3,180	10
ϕ5	4,700	49	4,700	49	3,820	40	3,820	40	3,180	15	3,180	13	2,550	10
ϕ6	3,980	74	3,980	74	3,180	61	3,180	61	2,650	25	2,650	19	2,120	15
ϕ8	2,980	73	2,980	73	2,390	59	2,390	59	1,990	24	1,990	19	1,590	15
ϕ10	2,390	67	2,390	67	1,910	54	1,910	54	1,590	23	1,590	19	1,270	15
ϕ12	1,990	61	1,990	61	1,590	49	1,590	49	1,320	21	1,320	19	1,060	15
ϕ16	1,490	51	1,490	51	1,190	41	1,190	41	990	19	990	17	800	13
ϕ20	1,190	45	1,190	45	950	36	950	36	800	17	800	15	640	12
ϕ25	950	47	950	47	760	38	760	38	640	18	640	16	510	13
ϕ30	800	40	800	40	640	32	640	32	530	15	530	14	420	11

【Note】
① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

CEPLS

Epoch21, Long shank



Inch

<Side milling>

Work material	Cast iron		Carbon steel		Alloy steel		Stainless steel, Tool steel		Pre-hardened steel		Hardened steel		Hardened steel	
	(150～200HB) No. 35 B		(180～220HB) 1020, 1050		(200～250HB) 4140, 8620		(25～35HRC) 304, D3		(35～45HRC) P21		(45～55HRC) H13, L6		(55～65HRC) D2, D3	
Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
ϕ6	3,980	74	3,980	74	3,180	61	3,180	61	2,650	25	2,650	19	2,120	15
ϕ8	2,980	73	2,980	73	2,390	59	2,390	59	1,990	24	1,990	19	1,590	15
ϕ10	2,390	67	2,390	67	1,910	54	1,910	54	1,590	23	1,590	19	1,270	15
ϕ12	1,990	61	1,990	61	1,590	49	1,590	49	1,320	21	1,320	19	1,060	15
ϕ16	1,490	51	1,490	51	1,190	41	1,190	41	990	19	990	17	800	13
ϕ20	1,190	45	1,190	45	950	36	950	36	800	17	800	15	640	12
ϕ25	950	48	950	48	760	38	760	38	640	18	640	16	510	13
ϕ30	800	40	800	40	640	32	640	32	530	15	530	14	420	11

【Note】
① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
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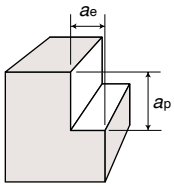
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch End Mill

CEPH
Hard



Inch

<Side milling>

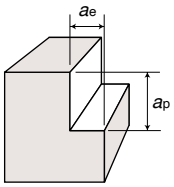
被削材 Work material		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened Steels (55～65HRC) D2, D3		Hardened steel (65～70HRC) Powder steel	
Depth of cut (mm)		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.02DC		ap=1.5DC ae≦0.01DC		ap=1.5DC ae≦0.01DC		ap=1.5DC ae≦0.01DC	
Tool dia. DC (mm)		n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)	n (min-1)	vf (IPM)
High speed	ϕ3	26,500	106	26,500	106	26,500	85	26,500	85	21,200	68	16,000	51	10,600	34
	ϕ4	19,900	111	19,900	111	19,900	96	19,900	96	15,900	76	12,000	58	8,000	38
	ϕ5	16,000	166	16,000	166	16,000	128	16,000	128	12,700	102	9,500	76	6,400	51
	ϕ6	13,300	255	13,300	255	13,300	192	13,300	192	10,600	153	8,000	115	5,300	76
	ϕ8	9,950	245	9,950	245	9,950	167	9,950	167	8,000	134	6,000	101	4,000	67
	ϕ10	8,000	216	8,000	216	8,000	149	8,000	149	6,400	119	4,800	89	3,200	61
	ϕ12	6,600	194	6,600	194	6,600	154	6,600	154	5,300	124	4,000	94	2,600	61
	ϕ16	5,000	156	5,000	156	5,000	141	5,000	141	4,000	113	3,000	85	2,000	56
	ϕ20	4,000	132	4,000	132	4,000	113	4,000	113	3,200	90	2,400	68	1,600	45
General	ϕ3	16,000	64	16,000	64	11,700	37	8,000	26	4,800	15	3,200	10	2,100	7
	ϕ4	11,200	63	11,200	63	8,800	42	6,000	29	3,600	17	2,400	12	1,600	8
	ϕ5	9,550	99	9,550	99	7,000	56	4,800	38	2,900	23	1,900	15	1,300	10
	ϕ6	8,000	149	8,000	149	5,850	84	3,000	43	2,400	35	1,600	23	1,060	15
	ϕ8	6,000	148	6,000	148	4,400	74	3,000	50	1,800	30	1,200	19	800	13
	ϕ10	4,800	127	4,800	127	3,500	65	2,400	45	1,430	27	950	9	640	12
	ϕ12	4,000	118	4,000	118	2,920	68	2,000	47	1,200	28	800	19	530	13
	ϕ16	3,000	94	3,000	94	2,200	62	1,500	42	900	25	600	17	400	12
	ϕ20	2,400	79	2,400	79	1,750	49	1,200	34	720	20	480	14	320	9

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch Universal

CEPU
Universal



Inch

<Side milling>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.02DC		ap=1.5DC ae≦0.01DC		ap=1.5DC ae≦0.01DC	
Tool dia.DC (mm)		n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
High Speed	ϕ4	25,000	180	23,900	134	22,300	125	20,700	91	19,900	96	9,500	46	8,000	38
	ϕ6	16,660	207	16,000	179	14,900	167	13,700	132	13,300	128	6,400	59	5,300	51
	ϕ8	12,500	205	12,000	187	11,100	173	10,350	116	9,950	111	4,800	54	4,000	45
	ϕ10	10,000	180	9,550	164	8,900	153	8,300	103	8,000	99	3,800	47	3,200	40
	ϕ12	8,330	163	8,000	150	7,400	139	6,900	108	6,600	103	3,200	50	2,650	41
	ϕ16	6,250	135	6,000	122	5,600	114	5,200	98	5,000	94	2,400	45	2,000	38
	ϕ20	5,000	110	4,770	99	4,450	91	4,100	77	4,000	75	1,900	36	1,600	30
General	ϕ4	12,700	91	12,700	71	9,500	53	8,800	42	7,200	35	3,200	15	2,700	10
	ϕ6	8,500	105	8,500	95	6,400	72	5,850	56	4,800	46	2,100	19	1,300	12
	ϕ8	6,400	108	6,400	102	4,800	75	4,400	49	3,600	39	1,600	18	1,000	11
	ϕ10	5,100	92	5,100	86	3,800	67	3,500	43	2,900	37	1,300	17	800	10
	ϕ12	4,200	82	4,200	79	3,200	59	2,920	46	2,400	37	1,060	17	660	10
	ϕ16	3,200	68	3,200	65	2,400	49	2,200	41	1,800	34	800	15	500	9
	ϕ20	2,550	55	2,500	51	1,900	40	1,750	33	1,400	26	640	12	400	8

【Note】
① Down-cutting is recommended.
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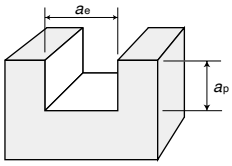


Inch

<Slotting>

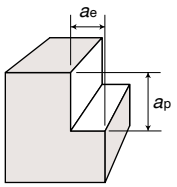
Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)				ap≦0.5DC, ae=1DC		ap≦0.5DC, ae=1DC		ap≦0.2DC, ae=1DC			
Tool dia. DC (mm)		n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
High Speed	ϕ4			9,550	61	7,960	38	3,980	16		
	ϕ6			6,370	61	5,310	42	2,650	17		
	ϕ8			4,770	61	3,980	40	1,990	16		
	ϕ10			3,820	60	3,180	41	1,590	15		
	ϕ12			3,180	55	2,650	37	1,330	14		
	ϕ16			2,390	45	1,990	32	990	13		
	ϕ20			1,910	36	1,590	25	800	10		
Depth of cut (mm)		ap≦1DC, ae=1DC		ap≦1DC, ae=1DC		ap≦1DC, ae=1DC		ap≦0.5DC, ae=1DC		ap≦0.2DC ,ae=1DC	
Tool dia. DC (mm)		n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)	n (min⁻¹)	vf (IPM)
General	ϕ4	2,390	15	6,370	41	5,570	27	3,180	13	1,590	5
	ϕ6	1,590	15	4,240	41	3,710	30	2,120	14	1,060	5
	ϕ8	1,190	15	3,180	41	2,790	29	1,590	13	800	5
	ϕ10	950	15	2,550	40	2,230	28	1,270	12	640	5
	ϕ12	800	14	2,120	36	1,860	26	1,060	11	530	5
	ϕ16	600	12	1,590	30	1,390	22	800	10	400	4
	ϕ20	480	9	1,270	24	1,110	17	640	8	320	3

【Note】
①Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
②Use a machine tool with rigidity and rigid set-up, to machine stably.
③When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
④Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch End Mill

CEPR

Epoch21, Regular



Metric

<Side milling>

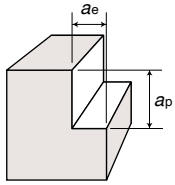
Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)		a_p=1.5DC a_e≦0.1DC		a_p=1.5DC a_e≦0.1DC		a_p=1.5DC a_e≦0.05DC		a_p=1.5DC a_e≦0.05DC		a_p=1.5DC a_e≦0.02DC		a_p=1.5DC a_e≦0.01DC		a_p=1.5DC a_e≦0.01DC	
Tool dia. DC (mm)		n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)	n (min^{-1})	v_f (mm/min)
High Speed	ϕ3	33,300	4,660	32,000	3,200	30,000	3,000	27,600	2,200	26,500	2,120	12,700	1,000	10,600	850
	ϕ4	25,000	4,500	24,000	4,700	22,300	3,100	20,700	2,500	19,900	2,400	9,500	1,140	8,000	960
	ϕ5	20,000	5,200	19,000	4,560	17,800	4,300	16,600	3,300	16,000	3,200	7,600	1,520	6,400	1,280
	ϕ6	16,660	7,980	16,000	6,700	15,000	6,300	13,800	5,000	13,300	4,800	6,400	2,300	5,300	1,900
	ϕ8	12,500	7,860	12,000	7,200	11,100	6,700	10,300	4,330	9,950	4,180	4,800	2,000	4,000	1,680
	ϕ10	10,000	6,900	9,550	6,300	8,900	5,800	8,300	4,000	8,000	3,840	3,800	1,800	3,200	1,500
	ϕ12	8,330	6,250	8,000	5,760	7,400	5,300	6,900	4,140	6,600	3,900	3,200	1,920	2,650	1,590
	ϕ16	6,250	5,060	6,000	4,680	5,600	4,400	5,200	3,750	5,000	3,600	2,400	1,730	2,000	1,440
	ϕ20	5,000	4,200	4,770	3,720	4,460	3,500	4,140	3,000	4,000	2,880	1,900	1,400	1,600	1,150
	ϕ25	4,000	4,480	3,800	4,000	3,560	3,700	3,300	3,170	3,200	3,070	1,500	1,440	1,270	1,200
	ϕ30	3,330	3,700	3,200	3,330	3,000	3,120	2,760	2,650	2,650	2,540	1,300	1,250	1,060	1,000
General	ϕ3	16,700	2,340	16,700	1,670	12,700	1,270	11,700	940	9,500	760	4,200	340	2,700	220
	ϕ4	12,700	2,300	12,700	1,800	9,550	1,340	8,800	1,060	7,200	865	3,200	380	2,000	240
	ϕ5	10,200	2,600	10,200	2,500	7,600	1,800	7,000	1,400	5,700	1,140	2,550	510	1,600	320
	ϕ6	8,500	3,250	8,500	3,570	6,400	2,700	5,850	2,100	4,800	1,730	2,100	750	1,300	470
	ϕ8	6,400	4,000	6,400	3,840	4,770	2,860	4,400	1,850	3,600	1,500	1,600	670	1,000	420
	ϕ10	5,100	3,500	5,100	3,350	3,800	2,500	3,500	1,680	2,900	1,400	1,300	625	800	380
	ϕ12	4,200	3,150	4,200	3,000	3,200	2,300	2,920	1,750	2,400	1,440	1,060	640	660	400
	ϕ16	3,200	2,600	3,200	2,500	2,400	1,870	2,200	1,600	1,800	1,300	800	580	500	360
	ϕ20	2,550	1,800	2,550	2,000	1,900	1,500	1,750	1,260	1,450	1,040	640	460	400	290
	ϕ25	2,040	2,300	2,040	2,120	1,530	1,600	1,400	1,340	1,150	1,100	510	490	320	300
	ϕ30	1,700	1,900	1,700	1,770	1,270	1,320	1,170	1,120	950	910	420	400	265	254

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

CEPL

Epoch21, Long



Metric

<Side finishing>

Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)	ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
ϕ3	7,960	960	7,960	960	6,370	760	6,370	760	5,310	420	5,310	320	4,240	250
ϕ4	5,970	1,190	5,970	1,190	4,770	950	4,770	950	3,980	400	3,980	320	3,180	250
ϕ5	4,700	1,220	4,700	1,220	3,820	990	3,820	990	3,180	380	3,180	320	2,550	260
ϕ6	3,980	1,910	3,980	1,910	3,180	1,530	3,180	1,530	2,650	640	2,650	480	2,120	380
ϕ8	2,980	1,880	2,980	1,880	2,390	1,510	2,390	1,510	1,990	600	1,990	480	1,590	380
ϕ10	2,390	1,720	2,390	1,720	1,910	1,380	1,910	1,380	1,590	570	1,590	480	1,270	380
ϕ12	1,990	1,550	1,990	1,550	1,590	1,240	1,590	1,240	1,320	550	1,320	480	1,060	380
ϕ16	1,490	1,300	1,490	1,300	1,190	1,040	1,190	1,040	990	480	990	420	800	340
ϕ20	1,190	1,140	1,190	1,140	950	910	950	910	800	430	800	380	640	310
ϕ25	950	1,200	950	1,200	760	970	760	970	640	460	640	410	510	330
ϕ30	800	1,020	800	1,020	640	820	640	820	530	380	530	340	420	270

【Note】
① Down-cutting is recommended.
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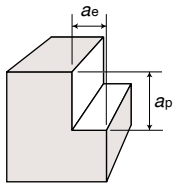
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

CEPLS

Epoch21, Long shank



Metric

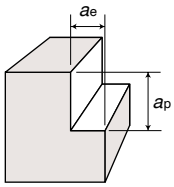
<Side milling>

Work material	Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)	ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.1DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC		ap=1.5DC ae=0.05DC	
Tool dia. DC (mm)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)	n (min-1)	vf (mm/min)
ϕ6	3,980	1,910	3,980	1,910	3,180	1,530	3,180	1,530	2,650	640	2,650	480	2,120	380
ϕ8	2,980	1,880	2,980	1,880	2,390	1,510	2,390	1,510	1,990	600	1,990	480	1,590	380
ϕ10	2,390	1,720	2,390	1,720	1,910	1,380	1,910	1,380	1,590	570	1,590	480	1,270	380
ϕ12	1,990	1,550	1,990	1,550	1,590	1,240	1,590	1,240	1,320	550	1,320	480	1,060	380
ϕ16	1,490	1,300	1,490	1,300	1,190	1,040	1,190	1,040	990	480	990	420	800	340
ϕ20	1,190	1,140	1,190	1,140	950	910	950	910	800	430	800	380	640	310
ϕ25	950	1,220	950	1,220	760	970	760	970	640	460	640	410	510	330
ϕ30	800	1,020	800	1,020	640	820	640	820	530	380	530	340	420	270

【Note】
① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch End Mill

CEPH
Hard



Metric

<Side milling>

Work material		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened Steels (55～65HRC) D2, D3		Hardened steel (65～70HRC) Powder steel	
Depth of cut (mm)		a_p=1.5DC a_e≦0.1DC		a_p=1.5DC a_e≦0.05DC		a_p=1.5DC a_e≦0.05DC		a_p=1.5DC a_e≦0.02DC		a_p=1.5DC a_e≦0.01DC		a_p=1.5DC a_e≦0.01DC		a_p=1.5DC a_e≦0.01DC	
Tool dia. DC (mm)		*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)	*n* (min⁻¹)	*vf* (mm/min)
High speed	**ϕ3**	26,500	2,650	26,500	2,650	26,500	2,120	26,500	2,120	21,200	1,700	16,000	1,280	10,600	850
	ϕ4	19,900	2,790	19,900	2,790	19,900	2,400	19,900	2,400	15,900	1,900	12,000	1,440	8,000	960
	ϕ5	16,000	4,160	16,000	4,160	16,000	3,200	16,000	3,200	12,700	2,540	9,500	1,900	6,400	1,280
	ϕ6	13,300	6,400	13,300	6,400	13,300	4,800	13,300	4,800	10,600	3,800	8,000	2,880	5,300	1,900
	ϕ8	9,950	6,270	9,950	6,270	9,950	4,200	9,950	4,200	8,000	3,360	6,000	2,520	4,000	1,680
	ϕ10	8,000	5,520	8,000	5,520	8,000	3,840	8,000	3,840	6,400	3,050	4,800	2,300	3,200	1,580
	ϕ12	6,600	4,950	6,600	4,950	6,600	3,960	6,600	3,960	5,300	3,180	4,000	2,400	2,600	1,560
	ϕ16	5,000	4,000	5,000	4,000	5,000	3,600	5,000	3,600	4,000	2,880	3,000	2,160	2,000	1,440
	ϕ20	4,000	3,360	4,000	3,360	4,000	2,880	4,000	2,880	3,200	2,300	2,400	1,730	1,600	1,150
General	**ϕ3**	16,000	1,600	16,000	1,600	11,700	940	8,000	640	4,800	385	3,200	256	2,100	170
	ϕ4	11,200	1,570	11,200	1,570	8,800	1,060	6,000	720	3,600	430	2,400	290	1,600	190
	ϕ5	9,550	2,500	9,550	2,500	7,000	1,400	4,800	960	2,900	580	1,900	380	1,300	260
	ϕ6	8,000	3,840	8,000	3,840	5,850	2,100	3,000	1,080	2,400	860	1,600	580	1,060	380
	ϕ8	6,000	3,780	6,000	3,780	4,400	1,850	3,000	1,260	1,800	760	1,200	500	800	330
	ϕ10	4,800	3,200	4,800	3,200	3,500	1,680	2,400	1,150	1,430	690	950	220	640	300
	ϕ12	4,000	3,000	4,000	3,000	2,920	1,750	2,000	1,200	1,200	720	800	480	530	320
	ϕ16	3,000	2,400	3,000	2,400	2,200	1,580	1,500	1,080	900	650	600	430	400	290
	ϕ20	2,400	2,000	2,400	2,000	1,750	1,260	1,200	860	720	520	480	350	320	230

【Note】

① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
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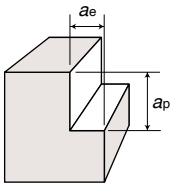
Epoch Universal

CEPU
Universal

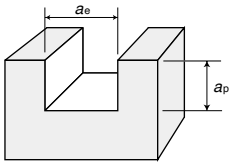


Metric

<Side milling>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Stainless steel, Tool steel (25～35HRC) 304, D3		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6		Hardened steel (55～65HRC) D2, D3	
Depth of cut (mm)		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.1DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.05DC		ap=1.5DC ae≦0.02DC		ap=1.5DC ae≦0.01DC		ap=1.5DC ae≦0.01DC	
Tool dia.DC (mm)		n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
High Speed	ϕ4	25,000	4,500	23,900	3,350	22,300	3,100	20,700	2,400	19,900	2,400	9,500	1,140	8,000	960
	ϕ6	16,660	5,300	16,000	4,500	14,900	4,200	13,700	3,300	13,300	3,200	6,400	1,500	5,300	1,300
	ϕ8	12,500	5,250	12,000	4,800	11,100	4,400	10,350	2,900	9,950	2,800	4,800	1,350	4,000	1,120
	ϕ10	10,000	4,600	9,550	4,200	8,900	3,900	8,300	2,650	8,000	2,560	3,800	1,200	3,200	1,000
	ϕ12	8,330	4,170	8,000	3,800	7,400	3,550	6,900	2,760	6,600	2,640	3,200	1,280	2,650	1,060
	ϕ16	6,250	3,400	6,000	3,100	5,600	2,900	5,200	2,500	5,000	2,400	2,400	1,150	2,000	960
	ϕ20	5,000	2,800	4,770	2,500	4,450	2,300	4,100	1,970	4,000	1,920	1,900	910	1,600	770
General	ϕ4	12,700	2,300	12,700	1,780	9,500	1,330	8,800	1,060	7,200	865	3,200	380	2,700	240
	ϕ6	8,500	2,720	8,500	2,400	6,400	1,800	5,850	1,400	4,800	1,150	2,100	500	1,300	310
	ϕ8	6,400	2,700	6,400	2,600	4,800	1,900	4,400	1,230	3,600	1,000	1,600	450	1,000	280
	ϕ10	5,100	2,350	5,100	2,200	3,800	1,680	3,500	1,120	2,900	930	1,300	420	800	260
	ϕ12	4,200	2,100	4,200	2,000	3,200	1,500	2,920	1,170	2,400	960	1,060	420	660	260
	ϕ16	3,200	1,720	3,200	1,660	2,400	1,250	2,200	1,060	1,800	860	800	380	500	240
	ϕ20	2,550	1,400	2,500	1,300	1,900	1,000	1,750	840	1,400	670	640	300	400	190

【Note】
① Down-cutting is recommended.
② Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
③ Oil base coolant is recommended for machining stainless steels and heat-resistant alloys.
④ Use a machine tool with rigidity and rigid set-up, to machine stably.
⑤ When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
⑥ Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.



Metric

<Slotting>

Work material		Cast iron (150～200HB) No. 35 B		Carbon steel (180～220HB) 1020, 1050		Alloy steel (200～250HB) 4140, 8620		Pre-hardened steel (35～45HRC) P21		Hardened steel (45～55HRC) H13, L6	
Depth of cut (mm)				ap≦0.5DC, ae=1DC		ap≦0.5DC, ae=1DC		ap≦0.2DC, ae=1DC			
Tool dia. DC (mm)		n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
High Speed	ϕ4			9,550	1,530	7,960	960	3,980	400		
	ϕ6			6,370	1,530	5,310	1,060	2,650	420		
	ϕ8			4,770	1,530	3,980	1,030	1,990	400		
	ϕ10			3,820	1,530	3,180	1,020	1,590	380		
	ϕ12			3,180	1,400	2,650	950	1,330	350		
	ϕ16			2,390	1,150	1,990	800	990	320		
	ϕ20			1,910	920	1,590	640	800	260		
Depth of cut (mm)		ap≦1DC, ae=1DC		ap≦1DC, ae=1DC		ap≦1DC, ae=1DC		ap≦0.5DC, ae=1DC		ap≦0.2DC ,ae=1DC	
Tool dia. DC (mm)		n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)	n (min⁻¹)	vf (mm/min)
General	ϕ4	2,390	380	6,370	1,020	5,570	670	3,180	320	1,590	130
	ϕ6	1,590	380	4,240	1,020	3,710	740	2,120	340	1,060	130
	ϕ8	1,190	380	3,180	1,020	2,790	730	1,590	320	800	130
	ϕ10	950	380	2,550	1,020	2,230	710	1,270	300	640	130
	ϕ12	800	350	2,120	930	1,860	670	1,060	280	530	120
	ϕ16	600	290	1,590	760	1,390	560	800	260	400	100
	ϕ20	480	230	1,270	610	1,110	440	640	200	320	80

【Note】
①Use generally dry (air-blow) or oil-mist coolant, especially at the high-speed machining.
②Use a machine tool with rigidity and rigid set-up, to machine stably.
③When the revolution speed is not enough, reduce the revolution speed and table speed at the same ratio.
④Adjust the revolution speed and table speed, according to cutting conditions such as machining shape, rigidity of machine tool, over-hang and so on.

Epoch SUS Wave

YouTube

Regular

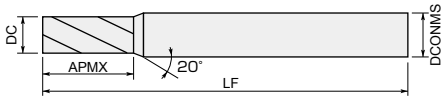
Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Roughing | Semi Finishing

Dia. tolerance 0～−0.05mm

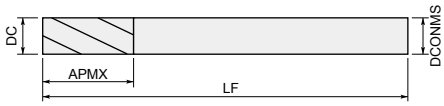
h5 (φ6～12) h6 (φ16, φ20)

For stable cutting of stainless steel in environments using low-rigidity machines and weak clamps.

A type



B type



EPSW○○○○-PN

Carbide | PN | Helix angle 30° | Valuable Pitch | Cutting Conditions A416

Item code	Stock	Size (mm)					No. of flutes	Shape
		Tool dia.	Flute length	Overall length	Shank dia.	Corner chamfering width		
		DC	APMX	LF	DCONMS			
EPSW3040-PN	●	**4**	**10**	56	6	0.3	3	A
EPSW3050-PN	★	**5**	**12.5**	56	6	0.3	3	A
EPSW4060-PN	●	**6**	**15**	56	6	0.4	4	B
EPSW4070-PN	★	**7**	**17.5**	63	8	0.4	4	A
EPSW4080-PN	●	**8**	**20**	63	8	0.5	4	B
EPSW4090-PN	★	**9**	**22.5**	74	10	0.5	4	A
EPSW4100-PN	●	**10**	**25**	74	10	0.5	4	B
EPSW4110-PN	★	**11**	**27.5**	86	12	0.5	4	A
EPSW4120-PN	●	**12**	**30**	86	12	0.5	4	B
EPSW4160-PN	●	**16**	**40**	110	16	0.7	4	B
EPSW4200-PN	★	**20**	**50**	125	20	0.7	4	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎				◎	◎	◎	◎

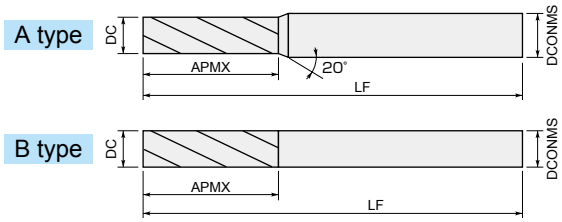
● : Inventory maintained in US ★ : Inventory maintained in Japan

Long

Side milling | Roughing

Dia. tolerance 0～−0.05mm h5 (φ6～12) h6 (φ16, φ20)

For stable cutting of stainless steel in environments using low-rigidity machines and weak clamps.



EPSWL4○○○-PN

Carbide | PN | Helix angle 30° | Valuable Pitch | Cutting Conditions A420

Item code	Stock	Size (mm)					No. of flutes	Shape
		Tool dia.	Flute length	Overall length	Shank dia.	Corner chamfering width		
		DC	APMX	LF	DCONMS			
EPSWL4060-PN	★	**6**	**30**	70	6	0.4	4	B
EPSWL4080-PN	★	**8**	**40**	80	8	0.5	4	B
EPSWL4100-PN	★	**10**	**50**	100	10	0.5	4	B
EPSWL4120-PN	★	**12**	**60**	120	12	0.5	4	B
EPSWL4160-PN	★	**16**	**80**	135	16	0.7	4	B
EPSWL4200-PN	★	**20**	**100**	155	20	0.7	4	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
◎	◎				◎	◎	◎	◎

Epoch SUS Wave

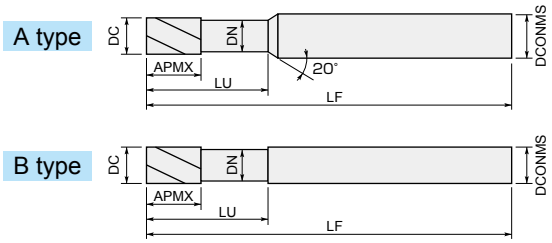
Under neck 3DC type

Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Roughing | Semi Finishing

Dia. tolerance 0～−0.05mm

h5 (φ6～12) h6 (φ16,φ20)

For stable cutting of stainless steel in environments using low-rigidity machines and weak clamps.



EPSW○○○○-○○-PN

Carbide | PN | Helix angle 30° | Valuable Pitch | Cutting Conditions A416

Item code	Stock	Size (mm)							No. of flutes	Shape
		Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.	Corner chamfering width		
		DC	APMX	LU	DN	LF	DCONMS			
EPSW3040-12-PN	★	**4**	**6**	12	3.7	56	6	0.3	3	A
EPSW3050-15-PN	★	**5**	**7.5**	15	4.6	56	6	0.3	3	A
EPSW4060-18-PN	★	**6**	**9**	18	5.5	56	6	0.4	4	B
EPSW4070-21-PN	★	**7**	**10.5**	21	6.4	63	8	0.4	4	A
EPSW4080-24-PN	★	**8**	**12**	24	7.3	63	8	0.5	4	B
EPSW4090-27-PN	★	**9**	**13.5**	27	8.3	74	10	0.5	4	A
EPSW4100-30-PN	★	**10**	**15**	30	9.1	74	10	0.5	4	B
EPSW4110-33-PN	★	**11**	**16.5**	33	10.2	86	12	0.5	4	A
EPSW4120-36-PN	★	**12**	**18**	36	11	86	12	0.5	4	B
EPSW4160-48-PN	★	**16**	**24**	48	14.5	110	16	0.7	4	B
EPSW4200-60-PN	★	**20**	**30**	60	18.2	125	20	0.7	4	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

★ : Inventory maintained in Japan

Under neck 5DC

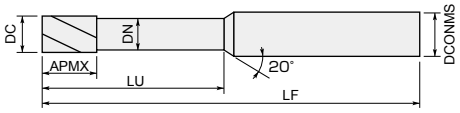
Planing | Side milling | Slotting | Die-sinking | Profiling | R | Helical | Spot facing | Roughing | Semi Finishing

Dia. tolerance 0 ~ −0.05mm

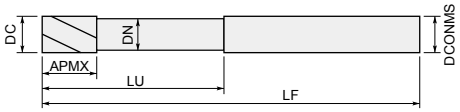
h5 (φ6~12) h6 (φ16, φ20)

For stable cutting of stainless steel in environments using low-rigidity machines and weak clamps.

A type



B type



EPSW○○○○-○○○-PN

Carbide | PN | Helix angle 30° | Valuable Pitch | Cutting Conditions A418

Item code	Stock	Size (mm)							No. of flutes	Shape
		Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.	Corner chamfering width		
		DC	APMX	LU	DN	LF	DCONMS			
EPSW3040-20-PN	★	**4**	**6**	20	3.7	68	6	0.3	3	A
EPSW3050-25-PN	★	**5**	**7.5**	25	4.6	68	6	0.3	3	A
EPSW4060-30-PN	★	**6**	**9**	30	5.5	68	6	0.4	4	B
EPSW4070-35-PN	★	**7**	**10.5**	35	6.4	80	8	0.4	4	A
EPSW4080-40-PN	★	**8**	**12**	40	7.3	80	8	0.5	4	B
EPSW4090-45-PN	★	**9**	**13.5**	45	8.3	94	10	0.5	4	A
EPSW4100-50-PN	★	**10**	**15**	50	9.1	94	10	0.5	4	B
EPSW4110-55-PN	★	**11**	**16.5**	55	10.2	110	12	0.5	4	A
EPSW4120-60-PN	★	**12**	**18**	60	11	110	12	0.5	4	B
EPSW4160-80-PN	★	**16**	**24**	80	14.5	135	16	0.7	4	B
EPSW4200-100-PN	★	**20**	**30**	100	18.2	155	20	0.7	4	B

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
◎	◎				◎	◎	◎	◎

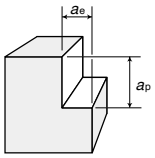
Epoch SUS Wave

Recommended cutting conditions

General Side milling conditions

EPSW Regular

EPSW-3DC Under neck 3DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
4	8,000	35※	5,600	18※	4,800	13※	3,200	9※	2,400	4※
5	6,400	38※	4,500	18※	3,800	15※	2,500	10※	1,900	4※
6	5,300	38	3,700	18	3,200	15	2,100	10	1,600	4
7	4,500	38	3,200	18	2,700	15	1,800	10	1,400	4
8	4,000	38	2,800	18	2,400	15	1,600	10	1,200	4
9	3,500	36	2,500	18	2,100	15	1,400	10	1,100	4
10	3,200	38	2,200	18	1,900	15	1,300	10	1,000	4
11	2,900	36	2,000	17	1,700	14	1,200	10	900	4
12	2,700	35	1,900	16	1,600	14	1,100	9	800	3
16	2,000	32	1,400	15	1,200	13	800	9	600	3
20	1,600	30	1,100	14	1,000	12	600	8	500	3

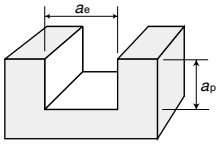
※ Please reduce feed rate to 75% because EPSW with dia. 4 and 5 are 3 flutes type.

【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

General Slotting conditions

EPSW Regular | **EPSW-3DC** Under neck 3DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC		a_p=1DC		a_p=1DC		a_p=0.5DC		a_p=0.5DC	
	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
4	7,200	23※	4,800	12※	4,400	9※	2,800	3※	1,600	1※
5	5,700	25※	3,800	14※	3,500	10※	2,200	4※	1,300	2※
6	4,800	29	3,200	15	2,900	10	1,900	5	1,100	2
7	4,100	28	2,700	15	2,500	10	1,600	4	900	1
8	3,600	29	2,400	15	2,200	11	1,400	4	800	2
9	3,200	28	2,100	15	1,900	10	1,200	4	700	1
10	2,900	29	1,900	15	1,800	11	1,100	4	600	1
11	2,600	27	1,700	14	1,600	10	1,000	4	600	1
12	2,400	26	1,600	14	1,500	10	900	4	500	1
16	1,800	24	1,200	13	1,100	9	700	4	400	1
20	1,400	22	1,000	12	900	9	600	4	300	1

※ Please reduce feed rate to 75% because EPSW with dia. 4 and 5 are 3 flutes type.

【Note】

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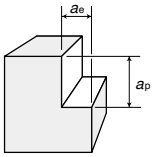
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Epoch SUS Wave

General Side milling conditions

EPSW-5DC

Under neck 5DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.1DC		a_p=0.5DC, a_e=0.05DC	
	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM	Revolution n min^{-1}	Feed rate v_f IPM
4	7,200	32※	4,800	13※	4,000	11※	3,200	8※	2,400	4※
5	5,700	34※	3,800	15※	3,200	13※	2,500	7※	1,900	4※
6	4,800	35	3,200	15	2,700	13	2,100	8	1,600	4
7	4,100	34	2,700	15	2,300	13	1,800	7	1,400	4
8	3,600	35	2,400	15	2,000	13	1,600	8	1,200	4
9	3,200	33	2,100	15	1,800	12	1,400	7	1,100	4
10	2,900	35	1,900	15	1,600	13	1,300	8	1,000	4
11	2,600	32	1,700	14	1,400	11	1,200	8	900	4
12	2,400	31	1,600	14	1,300	11	1,100	7	800	4
16	1,800	29	1,200	13	1,000	11	800	6	600	3
20	1,400	26	1,000	12	800	10	600	6	500	3

※ Please reduce feed rate to 75% because EPSW with dia. 4, and 5 are 3 flutes type.

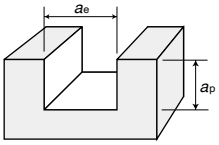
【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

General Slotting conditions

EPSW-5DC

Under neck 5DC



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=0.5DC		ap=0.5DC		ap=0.5DC		ap=0.25DC		ap=0.25DC	
	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM	Revolution n min-1	Feed rate vf IPM
4	6,400	20※	4,000	10※	3,600	7※	2,400	3※	1,200	1※
5	5,100	22※	3,200	12※	2,900	8※	1,900	4※	1,000	1※
6	4,200	25	2,700	13	2,400	9	1,600	4	800	1
7	3,600	24	2,300	13	2,000	8	1,400	4	700	1
8	3,200	26	2,000	13	1,800	9	1,200	4	600	1
9	2,800	25	1,800	12	1,600	9	1,100	4	500	1
10	2,500	25	1,600	13	1,400	8	1,000	4	500	1
11	2,300	24	1,400	11	1,300	8	900	4	400	1
12	2,100	23	1,300	11	1,200	8	800	4	400	1
16	1,600	21	1,000	11	900	7	600	3	300	1
20	1,300	20	800	10	700	7	500	3	200	1

※ Please reduce feed rate to 75% because EPSW with dia. 4, and 5 are 3 flutes type.

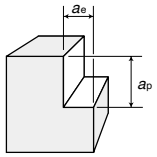
【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

Epoch SUS Wave

General Side milling conditions

EPSWL
Long



Inch

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.02DC		a_p=3DC, a_e=0.01DC	
	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
6	2,700	19	1,900	9	1,600	8	1,100	4	800	2
8	2,000	19	1,400	8	1,200	8	800	4	600	2
10	1,600	19	1,100	9	1,000	8	600	4	500	2
12	1,300	17	900	8	800	7	500	3	400	2
16	1,000	16	700	8	600	6	400	3	300	2
20	800	15	600	7	500	6	300	3	200	1

【Note】

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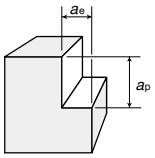
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

General Side milling conditions

EPSW Regular | **EPSW-3DC** Under neck 3DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.5DC		a_p=1DC, a_e=0.1DC		a_p=1DC, a_e=0.05DC	
	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
4	8,000	910※	5,600	430※	4,800	360※	3,200	180※	2,400	91※
5	6,400	960※	4,500	450※	3,800	380※	2,500	190※	1,900	95※
6	5,300	950	3,700	440	3,200	380	2,100	190	1,600	96
7	4,500	940	3,200	450	2,700	380	1,800	190	1,400	98
8	4,000	960	2,800	450	2,400	380	1,600	190	1,200	96
9	3,500	940	2,500	450	2,100	380	1,400	190	1,100	99
10	3,200	960	2,200	440	1,900	380	1,300	200	1,000	100
11	2,900	910	2,000	420	1,700	360	1,200	190	900	94
12	2,700	870	1,900	410	1,600	350	1,100	180	800	86
16	2,000	820	1,400	380	1,200	330	800	160	600	82
20	1,600	770	1,100	350	1,000	320	600	140	500	80

※ Please reduce feed rate to 75% because EPSW with dia. 4 and 5 are 3 flutes type.

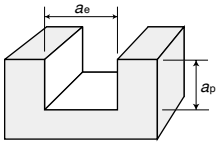
【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
Insure high Machine rigidity an d high accuracy machine setting are utilized.
These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Wave

General Slotting conditions

EPSW Regular | **EPSW-3DC** Under neck 3DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (~30HRC)		Tool steel, Pre-hardened steel (30~40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=1DC		ap=1DC		ap=1DC		ap=0.5DC		ap=0.5DC	
	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
4	7,200	580※	4,800	310※	4,400	210※	2,800	90※	1,600	31※
5	5,700	640※	3,800	340※	3,500	240※	2,200	100※	1,300	35※
6	4,800	720	3,200	380	2,900	260	1,900	110	1,100	40
7	4,100	720	2,700	380	2,500	260	1,600	110	900	38
8	3,600	720	2,400	380	2,200	260	1,400	110	800	38
9	3,200	720	2,100	380	1,900	260	1,200	110	700	38
10	2,900	730	1,900	380	1,800	270	1,100	110	600	36
11	2,600	680	1,700	360	1,600	250	1,000	100	600	38
12	2,400	650	1,600	350	1,500	240	900	100	500	32
16	1,800	610	1,200	330	1,100	220	700	100	400	33
20	1,400	560	1,000	320	900	220	600	100	300	29

※ Please reduce feed rate to 75% because EPSW with dia. 4 and 5 are 3 flutes type.

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Insure high Machine rigidity an d high accuracy machine setting are utilized.
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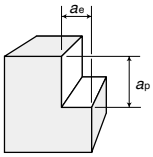
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

General Side milling conditions

EPSW-5DC

Under neck 5DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.25DC		a_p=0.5DC, a_e=0.1DC		a_p=0.5DC, a_e=0.05DC	
	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min	Revolution n min^{-1}	Feed rate v_f mm/min
4	7,200	820※	4,800	360※	4,000	300※	3,200	180※	2,400	91※
5	5,700	860※	3,800	380※	3,200	320※	2,500	190※	1,900	95※
6	4,800	860	3,200	380	2,700	320	2,100	190	1,600	96
7	4,100	860	2,700	380	2,300	320	1,800	190	1,400	98
8	3,600	860	2,400	380	2,000	320	1,600	190	1,200	96
9	3,200	860	2,100	380	1,800	320	1,400	190	1,100	99
10	2,900	870	1,900	380	1,600	320	1,300	200	1,000	100
11	2,600	820	1,700	360	1,400	290	1,200	190	900	94
12	2,400	780	1,600	350	1,300	280	1,100	180	800	86
16	1,800	730	1,200	330	1,000	270	800	160	600	82
20	1,400	670	1,000	320	800	260	600	140	500	80

※ Please reduce feed rate to 75% because EPSW with dia. 4, and 5 are 3 flutes type.

【Note】

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Insure high Machine rigidity an d high accuracy machine setting are utilized.
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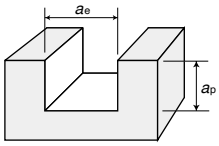
Please adjust machining conditions if chatter or vibration become excessive.

Epoch SUS Wave

General Slotting conditions

EPSW-5DC
Under neck 5DC



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	ap=0.5DC		ap=0.5DC		ap=0.5DC		ap=0.25DC		ap=0.25DC	
	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min	Revolution n min-1	Feed rate vf mm/min
4	6,400	510	4,000	260	3,600	170	2,400	80	1,200	23
5	5,100	570	3,200	290	2,900	200	1,900	90	1,000	27
6	4,200	630	2,700	320	2,400	220	1,600	100	800	29
7	3,600	630※	2,300	320※	2,000	210※	1,400	100※	700	29※
8	3,200	640※	2,000	320※	1,800	220※	1,200	100※	600	29※
9	2,800	630	1,800	320	1,600	220	1,100	100	500	27
10	2,500	630	1,600	320	1,400	210	1,000	100	500	30
11	2,300	600	1,400	290	1,300	200	900	90	400	25
12	2,100	570	1,300	280	1,200	190	800	90	400	26
16	1,600	540	1,000	270	900	180	600	80	300	24
20	1,300	520	800	260	700	170	500	80	200	19

※ Please reduce feed rate to 75% because EPSW with dia. 4, and 5 are 3 flutes type.

【Note】

PN Coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
Use the appropriate coolant for the work material and machining shape.
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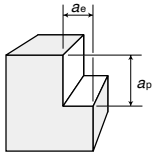
Please adjust machining conditions if chatter or vibration become excessive.
Please adjust feed 1/5 that of slotting parameter and step 0.01DC for drilling application.
Please adjust feed 70% of slotting parameter and ramping angle 3° for ramping application.

General Side milling conditions

EPSWL
Long



Metric

Tool dia. DC (mm)	Carbon steel, Alloy steel Cast iron (～30HRC)		Tool steel, Pre-hardened steel (30～40HRC)		Stainless steel		Titanium alloy		Super heat-resistant alloy	
	a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.05DC		a_p=3DC, a_e=0.02DC		a_p=3DC, a_e=0.01DC	
	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
6	2,700	490	1,900	230	1,600	190	1,100	100	800	48
8	2,000	480	1,400	220	1,200	190	800	100	600	48
10	1,600	480	1,100	220	1,000	200	600	90	500	50
12	1,300	420	900	190	800	170	500	80	400	43
16	1,000	410	700	190	600	160	400	80	300	41
20	800	380	600	190	500	160	300	70	200	32

【Note】

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Please adjust machining conditions if chatter or vibration become excessive.

Epoch SD(S-DLC) Deep Square

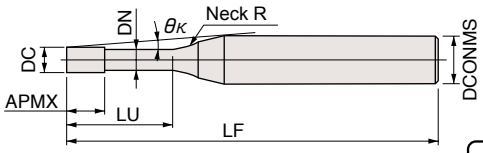
Side milling | Slotting | Miniature | Finishing | Miniature Rib

High welding resistance makes it ideal for machining aluminum alloys and copper. DLC Coating.

Dia. tolerance
DC≦0.5 : 0 ～−0.007mm
0.5<DC<1 : 0 ～−0.010mm
1≦DC : 0 ～−0.015mm

h5

2 Flutes

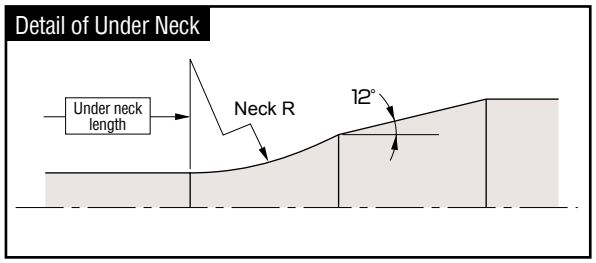


EPDS2○○○-○○-SD

Carbide | SD | Helix angle 30° | Cutting Conditions A427

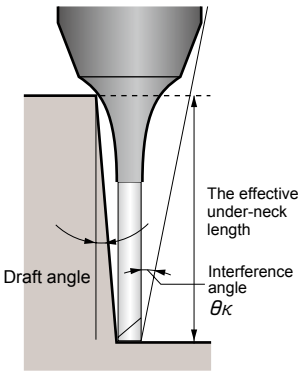
Item code	Stock	Size (mm) Tool dia. DC	Under neck length LU	Flute length APMX	Neck dia. DN	Overall length LF	Shank dia. DCONMS	Neck R	Interference angle (°) θK	Effective under neck length with respect to draft angle 0.5°	1°	1.5°	2°	3°
EPDS2005-2-SD	★	0.5	2	0.75	0.47	50	4	10	9.64	2.89	3.18	3.44	3.69	4.14
EPDS2005-4-SD	★		4						8.1	5.08	5.48	5.82	6.12	6.67
EPDS2005-6-SD	★		6						6.98	7.27	7.72	8.12	8.47	9.09
EPDS2006-2-SD	★	0.6	2	0.9	0.57	50	4	10	9.59	2.89	3.18	3.44	3.69	4.14
EPDS2006-4-SD	★		4						8.02	5.08	5.48	5.82	6.12	6.67
EPDS2006-6-SD	★		6						6.9	7.24	7.72	8.12	8.47	9.09
EPDS2008-4-SD	★	0.8	4	1.2	0.77	50	4	10	7.86	5.08	5.48	5.82	6.12	6.67
EPDS2008-6-SD	★		6						6.72	7.24	7.72	8.12	8.47	9.09
EPDS2008-8-SD	★		8						5.86	9.38	9.93	10.37	10.76	11.45
EPDS2010-4-SD	★	1	4	1.5	0.96	50	4	10	7.67	5.13	5.52	5.85	6.15	6.69
EPDS2010-8-SD	★		8						5.66	9.42	9.95	10.4	10.78	11.46
EPDS2010-12-SD	★		12			55			4.48	13.66	14.3	14.82	15.28	16.06
EPDS2015-6-SD	★	1.5	6	2.25	1.44	50	4	10	5.94	7.37	7.81	8.19	8.54	9.15
EPDS2015-12-SD	★		12			55			3.97	13.72	14.35	14.86	15.31	16.11
EPDS2015-18-SD	★		18			60			2.98	20.01	20.77	21.38	21.9	No interference
EPDS2020-8-SD	★	2	8	3	1.92	50	4	10	4.44	9.56	10.06	10.48	10.86	11.53
EPDS2020-16-SD	★		16			55			2.75	17.97	18.68	19.25	19.75	No interference
EPDS2020-24-SD	★		24			60			1.99	26.3	27.16	27.84	No interference	No interference
EPDS2030-12-SD	★	3	12	4.5	2.88	60	6	10	4.44	13.89	14.48	14.97	15.4	16.3
EPDS2030-24-SD	★		24			65			2.75	26.39	27.22	27.89	29.05	No interference
EPDS2030-36-SD	★		36			80			1.99	38.79	39.81	41.38	No interference	No interference
EPDS2040-16-SD	★	4	16	6	3.85	60	6	10	2.72	18.14	18.81	19.36	19.84	No interference
EPDS2040-32-SD	★		32			80			1.55	34.72	35.66	36.89	No interference	No interference
EPDS2040-48-SD	★		48			90			1.08	51.18	52.67	No interference	No interference	No interference

Detail of Under Neck



【Note】

If the workpiece has draft angle, the interference length will be longer than the under-neck length. Please refer to the effective under-neck length for the various draft angles.
In addition, the angle at which the tool will interfere with the workpiece is shown as the "interference angle θK", and should also be referred to.



Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
							◎	◎

★ : Inventory maintained in Japan

Recommended cutting conditions EPDS-SD

<Slotting>

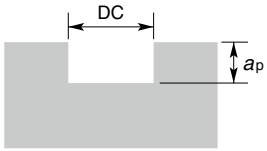
Inch

Item code	Tool dia. DC (mm)	Under neck length LU (mm)	Work material: Axial direction cutting depth (inch)	1 Expanded aluminum alloy materials: Revolution n (min^{-1})	1: Feed rate v_f (IPM)	2 Cast aluminum alloy materials Die-casting, Si less than 10%: Revolution n min^{-1}	2: Feed rate v_f (IPM)	3 Pure coppers: Revolution n min^{-1}	3: Feed rate v_f (IPM)	4 Resin, Acrylic, etc.: Revolution n min^{-1}	4: Feed rate v_f (IPM)
EPDS2005-2-SD	**0.5**	**2**	.006	50,000	50	50,000	50	38,400	31	38,400	54
EPDS2005-4-SD	**0.5**	**4**	.004	50,000	40	46,660	37	34,560	28	34,560	41
EPDS2005-6-SD	**0.5**	**6**	.002	46,080	37	41,470	33	30,720	18	30,720	31
EPDS2006-2-SD	**0.6**	**2**	.007	50,000	70	50,000	60	38,400	46	38,400	69
EPDS2006-4-SD	**0.6**	**4**	.004	50,000	60	46,660	56	34,560	41	34,560	62
EPDS2006-6-SD	**0.6**	**6**	.002	50,000	60	46,660	56	34,560	41	34,560	62
EPDS2008-4-SD	**0.8**	**4**	.009	50,000	70	50,000	60	38,400	46	38,400	69
EPDS2008-6-SD	**0.8**	**6**	.006	50,000	60	46,660	56	34,560	41	34,560	62
EPDS2008-8-SD	**0.8**	**8**	.004	50,000	60	46,660	56	34,560	41	34,560	62
EPDS2010-4-SD	**1**	**4**	.012	50,000	100	46,660	93	34,560	62	34,560	97
EPDS2010-8-SD	**1**	**8**	.007	46,650	84	41,990	76	31,100	50	31,100	81
EPDS2010-12-SD	**1**	**12**	.004	41,480	66	37,330	60	27,650	39	27,650	61
EPDS2015-6-SD	**1.5**	**6**	.018	40,320	81	36,290	73	26,880	48	26,880	75
EPDS2015-12-SD	**1.5**	**12**	.010	36,290	65	32,660	59	24,190	44	24,190	63
EPDS2015-18-SD	**1.5**	**18**	.006	32,250	52	29,030	46	21,500	30	21,500	47
EPDS2020-8-SD	**2**	**8**	.024	30,240	79	27,220	71	20,160	48	20,160	77
EPDS2020-16-SD	**2**	**16**	.014	27,150	65	24,440	59	18,100	40	18,100	62
EPDS2020-24-SD	**2**	**24**	.008	24,200	53	21,780	44	16,130	32	16,130	48
EPDS2030-12-SD	**3**	**12**	.035	23,040	78	20,740	66	15,360	49	15,360	71
EPDS2030-24-SD	**3**	**24**	.014	20,730	62	18,660	56	13,820	39	13,820	58
EPDS2030-36-SD	**3**	**36**	.010	18,450	55	16,610	50	12,300	34	12,300	52
EPDS2040-16-SD	**4**	**16**	.047	17,250	145	15,530	127	11,500	90	11,500	90
EPDS2040-32-SD	**4**	**32**	.025	15,530	118	13,970	103	10,350	72	10,350	72
EPDS2040-48-SD	**4**	**48**	.014	13,650	104	12,290	91	9,100	64	9,100	64

【Note】

① An air blower is recommended for some resin materials.
② The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③ If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

a_p : Axial direction cutting depth (mm)
DC : Outer diameter(mm)

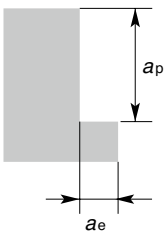


<Side Finishing>

Inch

Work material	1 Expanded aluminum alloy materials: Revolution n (min^{-1})	1: Feed rate v_f (IPM)	2 Resin, Acrylic, etc.: Revolution n (min^{-1})	2: Feed rate v_f (IPM)
Tool dia. DC (mm)				
0.5	50,000	80	50,000	80
0.6	48,000	77	48,000	77
0.8	44,000	88	44,000	88
1	40,000	96	40,000	96
1.5	34,000	95	34,000	95
2	30,000	96	30,000	96
3	26,000	83	26,000	83
4	24,000	77	24,000	77

Depth of cut (mm)



$a_p \leqq 1DC$
$a_e \leqq 0.02$mm～0.05mm
($a_e \leqq .0007$"～$.0019$")

Epoch SD(S-DLC) Deep Square

<Slotting>

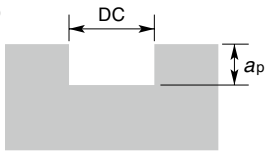
Metric

			Work material	1		2		3		4	
				Expanded aluminum alloy materials		Cast aluminum alloy materials Die-casting, Si less than 10%		Pure coppers		Resin, Acrylic, etc.	
Item code	Tool dia. DC (mm)	Under neck length LU (mm)	Axial direction cutting depth (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n min^{-1}	Feed rate v_f (mm/min)	Revolution n min^{-1}	Feed rate v_f (mm/min)	Revolution n min^{-1}	Feed rate v_f (mm/min)
EPDS2005-2-SD	0.5	2	0.15	50,000	1,180	50,000	1,150	38,400	850	38,400	1,280
EPDS2005-4-SD	0.5	4	0.09	50,000	1,080	46,660	980	34,560	700	34,560	1,050
EPDS2005-6-SD	0.5	6	0.06	46,080	860	41,470	760	30,720	540	30,720	810
EPDS2006-2-SD	0.6	2	0.18	50,000	1,680	50,000	1,535	38,400	1,210	38,400	1,820
EPDS2006-4-SD	0.6	4	0.11	50,000	1,535	46,660	1,390	34,560	995	34,560	1,490
EPDS2006-6-SD	0.6	6	0.06	50,000	1,535	46,660	1,390	34,560	995	34,560	1,490
EPDS2008-4-SD	0.8	4	0.24	50,000	1,680	50,000	1,535	38,400	1,210	38,400	1,820
EPDS2008-6-SD	0.8	6	0.14	50,000	1,535	46,660	1,390	34,560	995	34,560	1,490
EPDS2008-8-SD	0.8	8	0.09	50,000	1,535	46,660	1,390	34,560	995	34,560	1,490
EPDS2010-4-SD	1	4	0.3	50,000	2,500	46,660	2,280	34,560	1,628	34,560	2,440
EPDS2010-8-SD	1	8	0.17	46,650	2,140	41,990	1,880	31,100	1,340	31,100	2,010
EPDS2010-12-SD	1	12	0.11	41,480	1,670	37,330	1,460	27,650	1,045	27,650	1,570
EPDS2015-6-SD	1.5	6	0.45	40,320	2,030	36,290	1,780	26,880	1,270	26,880	1,910
EPDS2015-12-SD	1.5	12	0.25	36,290	1,670	32,660	1,460	24,190	1,045	24,190	1,570
EPDS2015-18-SD	1.5	18	0.16	32,250	1,300	29,030	1,130	21,500	810	21,500	1,220
EPDS2020-8-SD	2	8	0.6	30,240	2,030	27,220	1,780	20,160	1,270	20,160	1,910
EPDS2020-16-SD	2	16	0.35	27,150	1,670	24,440	1,460	18,100	1,045	18,100	1,570
EPDS2020-24-SD	2	24	0.21	24,200	1,300	21,780	1,130	16,130	810	16,130	1,220
EPDS2030-12-SD	3	12	0.9	23,040	1,940	20,740	1,690	15,360	1,210	15,360	1,820
EPDS2030-24-SD	3	24	0.36	20,730	1,600	18,660	1,390	13,820	995	13,820	1,490
EPDS2030-36-SD	3	36	0.26	18,450	1,400	16,610	1,230	12,300	880	12,300	1,320
EPDS2040-16-SD	4	16	1.2	17,250	3,680	15,530	3,220	11,500	2,300	11,500	2,300
EPDS2040-32-SD	4	32	0.64	15,530	2,980	13,970	2,600	10,350	1,860	10,350	1,860
EPDS2040-48-SD	4	48	0.35	13,650	2,640	12,290	2,300	9,100	1,640	9,100	1,640

【Note】

① An air blower is recommended for some resin materials.
② The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③ If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

a_p : Axial direction cutting depth (mm)
DC : Outer diameter(mm)

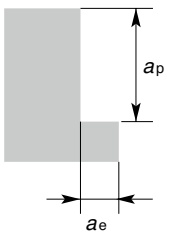


<Side Finishing>

Metric

Work material	1		2	
	Expanded aluminum alloy materials		Resin, Acrylic, etc.	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
0.5	50,000	2,000	50,000	2,000
0.6	48,000	1,920	48,000	1,920
0.8	44,000	2,200	44,000	2,200
1	40,000	2,400	40,000	2,400
1.5	34,000	2,400	34,000	2,400
2	30,000	2,400	30,000	2,400
3	26,000	2,080	26,000	2,080
4	24,000	1,920	24,000	1,920

Depth of cut (mm)



$a_p \leqq 1$DC
$a_e \leqq 0.02$mm~0.05mm

Epoch SD(S-DLC) Square

Side milling | Slotting | Spot facing | Semi Finishing | Finishing

High welding resistance makes it ideal for machining aluminum alloys and copper. DLC Coating.

Dia. tolerance: φ3～φ6 ：0～−0.015mm
φ7～φ12：0～−0.02mm

h5

2 Flutes

EPAS2○○○-SD

Carbide | SD | Helix angle 30° | Cutting Conditions A430

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPAS2030-SD	★	3	8	60	6
EPAS2040-SD	★	4	11	60	6
EPAS2050-SD	★	5	13	60	6
EPAS2060-SD	★	6	13	70	6
EPAS2070-SD	★	7	20	70	8

Item code	Stock	Size (mm) Tool dia.	Flute length	Overall length	Shank dia.
EPAS2080-SD	★	8	20	75	8
EPAS2090-SD	★	9	20	80	10
EPAS2100-SD	★	10	25	80	10
EPAS2110-SD	★	11	25	100	12
EPAS2120-SD	★	12	25	100	12

Applicable work material

Carbon steel / Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel > 45HRC ≦ 55HRC	Hardened steel > 55HRC ≦ 65HRC	Hardened steel > 65HRC	Stainless steel	Titanium alloy / Heat-resistant alloy	Copper alloy	Aluminum alloy
							◎	◎

★：Inventory maintained in Japan

Epoch SD(S-DLC) Square

Recommended cutting conditions

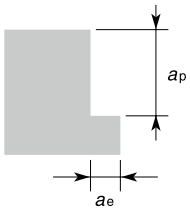
EPAS-SD

<Side milling>

Inch

Work material	1 Expanded aluminum alloy materials		2 Cast aluminum alloy materials		3 Pure coppers		4 Resin, Acrylic, etc.	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
4	24,000	72	19,000	49	12,000	36	12,000	41
6	16,000	80	13,000	55	8,000	40	8,000	45
8	12,000	79	9,500	59	6,000	40	6,000	44
10	9,500	78	7,600	59	4,700	39	4,700	44
12	8,000	78	6,400	59	4,000	39	4,000	44

Depth of cut (mm)



$a_p \leqq 1.5DC$
$a_e \leqq 0.2DC$

【Note】

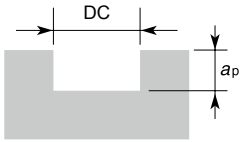
① An air blower is recommended for some resin materials.
② The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

<Slotting>

Inch

Work material	1 Expanded aluminum alloy materials		2 Cast aluminum alloy materials		3 Pure coppers		4 Resin, Acrylic, etc.	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Revolution n (min^{-1})	Feed rate v_f (IPM)
4	19,000	42	16,000	29	8,750	21	8,750	26
6	13,000	47	11,000	33	5,800	21	5,800	23
8	9,500	51	8,000	35	4,300	23	4,300	24
10	7,600	52	6,400	36	3,500	24	3,500	25
12	6,400	51	5,300	35	3,000	24	3,000	26

Depth of cut (mm)



Wet cutting : $a_p \leqq 1DC$
Dry cutting : $a_p \leqq 0.5DC$

【Note】

① An air blower is recommended for some resin materials.
② The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

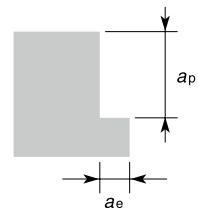
EPAS-SD

<Side milling>

Metric

Work material	1 Expanded aluminum alloy materials		2 Cast aluminum alloy materials		3 Pure coppers		4 Resin, Acrylic, etc.	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
4	24,000	1,800	19,000	1,300	12,000	900	12,000	1,020
6	16,000	2,000	13,000	1,400	8,000	1,000	8,000	1,120
8	12,000	2,000	9,500	1,500	6,000	1,000	6,000	1,120
10	9,500	2,000	7,600	1,500	4,700	1,000	4,700	1,120
12	8,000	2,000	6,400	1,500	4,000	1,000	4,000	1,120

Depth of cut (mm)



$a_p \leqq 1.5DC$
$a_e \leqq 0.2DC$

【Note】

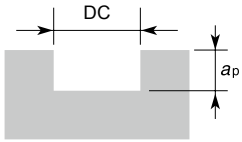
① An air blower is recommended for some resin materials.
② The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③ If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

<Slotting>

Metric

Work material	1 Expanded aluminum alloy materials		2 Cast aluminum alloy materials		3 Pure coppers		4 Resin, Acrylic, etc.	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
4	19,000	1,100	16,000	750	8,750	550	8,750	650
6	13,000	1,200	11,000	850	5,800	530	5,800	580
8	9,500	1,300	8,000	900	4,300	600	4,300	620
10	7,600	1,300	6,400	900	3,500	600	3,500	620
12	6,400	1,300	5,300	900	3,000	610	3,000	660

Depth of cut (mm)



Wet cutting : $a_p \leqq 1DC$
Dry cutting : $a_p \leqq 0.5DC$

【Note】

① An air blower is recommended for some resin materials.
② The cutting conditions shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③ If the machine rotation speed is insufficient, reduce the rotation speed and feed rate by the same ratio.

Coating materials for solid end mills

PVD Technology ATH Coating

Features and characteristics

- Hardness and oxidation resistance of TH coatings is further improved. Enables longer life and higher efficient when cutting high-hardness materials. (Si nano composite coating with finer crystal particles)
- Exhibits amazing performance when cutting high-hardness materials (55HRC or higher) Cold-worked die steel, HSS, tool steel.
- Long life for both dry cutting and wet cutting

PVD Technology TH3 Coating

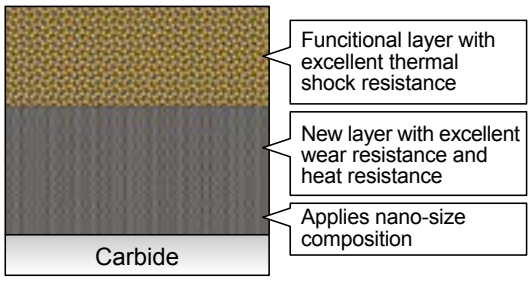
Features and characteristics

- High hardness coating with excellent wear resistance and heat resistance
- Has excellent thermal shock resistance enables to suppress sudden chipping
- Long tool life when cutting high-hardness materials (50HRC or higher) such as hardened steel

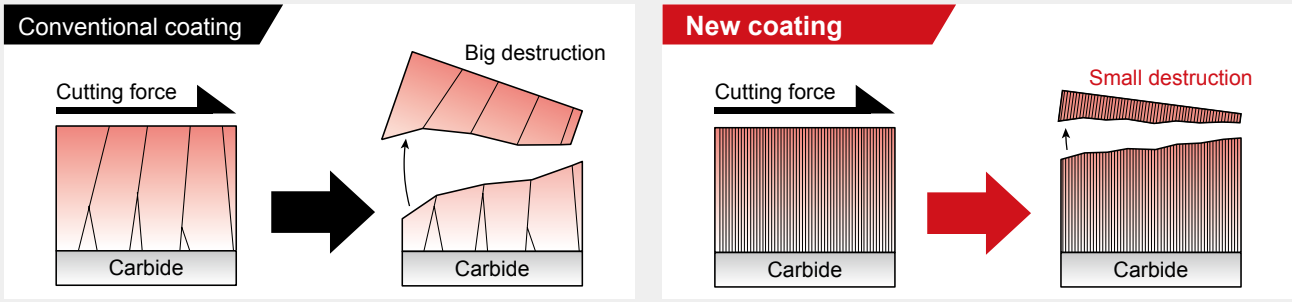
Target steel grade

- Hardened steel (especially 50HRC or higher), high-speed steel

Coating structure



- New coating achieves to reduce destruction unit of layer by applying "nano-size composition".



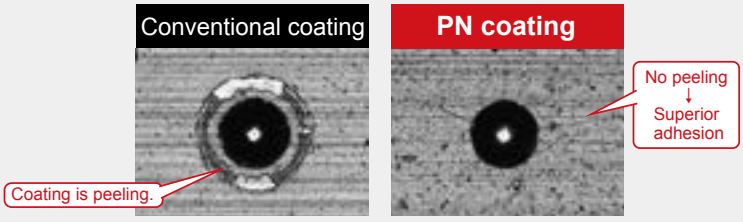
PVD Technology PN Coating

Features and characteristics

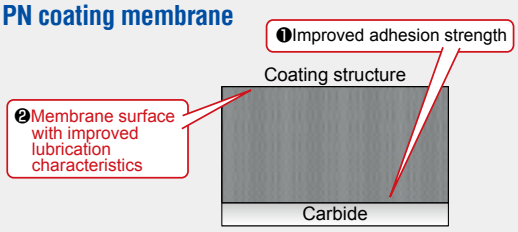
- A heat-resistant coating material with excellent adhesion to the tool substrate was achieved by optimizing the Al content.
- Exhibits excellent cutting life for cutting materials such as plastic molds, etc. where tool seizure often occurs. (2x the cutting life compared to conventional products.) Provides the long life in cutting processing of materials starting with HPM-MAGIC and including prehardened steel, carbon steel, alloy steel, stainless steel, D2, H13, etc.
- By improving heat resistance, long life are possible for both wet cutting and dry cutting.
  Note) This product obtains less electric conductivity. Therefore, Please caution of using electric transmitted measuring systems.

Adhesion of PN coating

Substrate: Carbide alloy



Cross-sectional structure and characteristics of PN coating membrane



PVD Technology

SD Coating

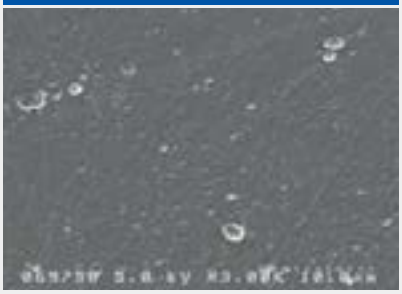
Features and characteristics

- **High hardness**
  The hydrogen-free DLC coating infinitely close to that of diamond.
- **High heat-resistance temperature**
  Impurities are low, providing high heat resistance and enabling high-efficiency machining.
- **High-efficiency cutting machining**
  Cutting machining of aluminum alloys or resins showcases the effects, with low heat generation making it ideal for dry cutting.

■ Comparison of abnormal surface particles on carbide insert tools

Ultra smooth (New filtering technology)

Conventinal DLC



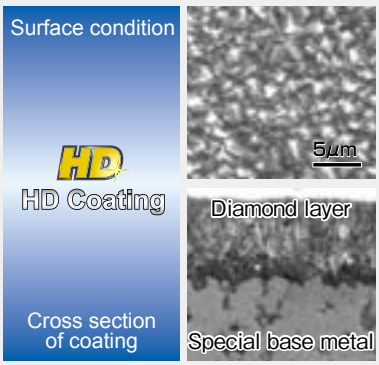
SD (S-DLC)

High adhesion
Diamond coating

Diamond Coating HD

Characteristics

- Uses diamond with good crystallization. Ideal for cutting of graphite, high-silicon aluminum alloys and fiber-reinforced plastics (FRP).
- Our exclusive pre-treatment technology is used to provide higher adhesion due to anchor effect.
- Special material for diamond coating is adopted for base metal.



A434

Threading Tools

Epoch Thread Mill ET-PN ····· B2

Epoch D Thread Mill

UN Screw Thread EDT-U-TH ····· B6

Metric Screw Thread type EDT-TH ····· B7

UNJ Screw Thread type EDT-UNJ-TH ····· B8

Epoch D Thread Mill for PT, NPT Threads EDT-(□)PT-ATH ··· B12

NC program support software for "Epoch Thread Mill" series
https://data.moldino.com/en-US/technical/nc-et/

Epoch Thread Mill

4 flutes

No incomplete thread

ET-(U)○○.○○-○○.○-PN

Unit

Unified Threads : inch, Metric Threads : mm

Carbide PN h5 Cutting Conditions B4

Order Number		Stock	Thread Dia. D_1		Thread Pitch TP	Cutting Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole
For Unified threads 2D type Under neck length: 2 × D_1	ET-U64-3.7-PN	★	No.1-64UNC	.073	64	.055	.146	1.969	.236	-
	ET-U56-4.4-PN	★	No.2-56UNC	.086	56	.065	.173	1.969	.236	-
	ET-U48-5-PN	★	No.3-48UNC	.099	48	.075	.197	1.969	.236	-
	ET-U40-5.7-PN	★	No.4-40UNC	.112	40	.083	.224	1.969	.236	-
	ET-U32-7-PN	★	No.6-32UNC	.138	32	.100	.276	1.969	.236	-
	ET-U36-8.3-PN	★	No.8-36UNF	.164	36	.130	.327	1.969	.236	-
	ET-U24-9.7-PN	★	No.10-24UNC	.190	24	.138	.382	2.756	.236	-
	ET-U20-12.7-PN	●	¼-20UNC	1/4	20	.187	.500	2.756	.236	-
	ET-U28-12.7-PN	●	¼-28UNF	1/4	28	.197	.500	2.756	.236	-
	ET-U18-15.9-PN	●	5/16-18UNC	5/16	18	.236	.626	3.150	.394	-
	ET-U16-19.1-PN	●	3/8-16UNC	3/8	16	.264	.752	3.150	.394	-
	ET-U14-22.2-PN	★	7/16-14UNC	7/16	14	.303	.874	3.150	.394	-
	ET-U13-25.4-PN	●	½-13UNC	1/2	13	.362	1.000	3.150	.394	-
	ET-U12-28.6-PN	★	9/16-12UNC	9/16	12	.413	1.126	3.937	.472	-
	ET-U11-31.8-PN	●	⅝-11UNC	5/8	11	.449	1.252	3.937	.472	-
For Unified threads 2.5D type Under neck length: 2.5 × D_1	ET-U64-4.6-PN	★	No.1-64UNC	.073	64	.055	.181	1.969	.236	-
	ET-U56-5.5-PN	★	No.2-56UNC	.086	56	.065	.217	1.969	.236	-
	ET-U48-6.3-PN	★	No.3-48UNC	.099	48	.075	.248	1.969	.236	-
	ET-U40-7.1-PN	★	No.4-40UNC	.112	40	.083	.280	1.969	.236	-
	ET-U32-8.8-PN	★	No.6-32UNC	.138	32	.100	.346	1.969	.236	-
	ET-U36-10.4-PN	★	No.8-36UNF	.164	36	.130	.409	1.969	.236	-
	ET-U24-12.1-PN	★	No.10-24UNC	.190	24	.138	.476	2.756	.236	-
	ET-U20-15.9-PN	●	¼-20UNC	1/4	20	.187	.626	2.756	.236	-
	ET-U28-15.9-PN	●	¼-28UNF	1/4	28	.197	.626	2.756	.236	-
	ET-U18-19.8-PN	●	5/16-18UNC	5/16	18	.236	.780	3.150	.394	-
	ET-U16-23.8-PN	●	3/8-16UNC	3/8	16	.264	.937	3.150	.394	-
	ET-U14-27.8-PN	★	7/16-14UNC	7/16	14	.303	1.094	3.150	.394	-
	ET-U13-31.8-PN	●	½-13UNC	1/2	13	.362	1.252	3.150	.394	-
	ET-U12-35.7-PN	★	9/16-12UNC	9/16	12	.413	1.406	3.937	.472	-
	ET-U11-39.7-PN	●	⅝-11UNC	5/8	11	.449	1.563	3.937	.472	-
For Metric threads 2D type Under neck length: 2 × D_1	ET-0.4-4-PN	★	M2		0.4	1.4	4	50	6	-
	ET-0.45-4.4-PN	★	M2.2		0.45	1.6	4.4	50	6	-
	ET-0.45-5-PN	★	M2.5		0.45	1.8	5	50	6	-
	ET-0.5-6-PN	●	M3		0.5	2.4	6	50	6	-
	ET-0.7-8-PN	●	M4		0.7	3.1	8	50	6	-
	ET-0.8-10-PN	●	M5		0.8	3.8	10	50	6	-
	ET-1.0-12-PN	●	M6		1	4.6	12	50	6	-
	ET-1.25-16-PN	●	M8		1.25	6.2	16	70	10	-
	ET-1.5-20-PN	●	M10		1.5	7.5	20	70	10	-
	ET-1.75-24-PN	●	M12		1.75	9	24	80	10	-
	ET-2-32-PN	★	M16		2	11.5	32	100	12	-
	ET-2.5-36-PN	★	M18		2.5	14	36	135	16	○
	ET-2.5-40-PN	★	M20		2.5	15	40	135	16	○
For Metric threads 2.5D type Under neck length: 2.5 × D_1	ET-0.4-5-PN	★	M2		0.4	1.4	5	50	6	-
	ET-0.45-5.5-PN	★	M2.2		0.45	1.6	5.5	50	6	-
	ET-0.45-6.25-PN	★	M2.5		0.45	1.8	6.25	50	6	-
	ET-0.5-7.5-PN	●	M3		0.5	2.4	7.5	50	6	-
	ET-0.7-10-PN	●	M4		0.7	3.1	10	50	6	-
	ET-0.8-12.5-PN	●	M5		0.8	3.8	12.5	50	6	-
	ET-1.0-15-PN	●	M6		1	4.6	15	50	6	-
	ET-1.25-20-PN	●	M8		1.25	6.2	20	70	10	-
	ET-1.5-25-PN	●	M10		1.5	7.5	25	70	10	-
	ET-1.75-30-PN	●	M12		1.75	9	30	80	10	-
	ET-2-40-PN	★	M16		2	11.5	40	100	12	-
	ET-2.5-45-PN	★	M18		2.5	14	45	135	16	○
	ET-2.5-50-PN	★	M20		2.5	15	50	135	16	○

● : Inventory maintained in US ★ : Inventory maintained in Japan

※For information about tool diameter correction, refer to the item in "Cautions on use" on p. B7, B16.

ET-○.○○-○○.○-PN

Unit Unified Threads : inch, Metric Threads : mm

Carbide PN h5 Cutting Conditions B5

Order Number		Stock	Thread Dia. D_1	Thread Pitch TP	Cutting Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole
For Metric threads 3D type Under neck length: 3 × D_1	ET-0.5-9-PN	●	M3	0.5	2.4	9	55	6	-
	ET-0.7-12-PN	●	M4	0.7	3.1	12	55	6	-
	ET-0.8-15-PN	●	M5	0.8	3.8	15	60	6	-
	ET-1.0-18-PN	●	M6	1	4.6	18	60	6	-
	ET-1.25-24-PN	●	M8	1.25	6.2	24	80	10	-
	ET-1.5-30-PN	●	M10	1.5	7.5	30	80	10	-
	ET-1.75-36-PN	●	M12	1.75	9	36	95	10	-
	ET-2-48-PN	●	M16	2	11.5	48	120	12	-
For Metric threads 3.5D type Under neck length: 3.5 × D_1	ET-0.5-10.5-PN	●	M3	0.5	2.4	10.5	55	6	-
	ET-0.7-14-PN	●	M4	0.7	3.1	14	55	6	-
	ET-0.8-17.5-PN	●	M5	0.8	3.8	17.5	60	6	-
	ET-1.0-21-PN	●	M6	1	4.6	21	60	6	-
	ET-1.25-28-PN	●	M8	1.25	6.2	28	80	10	-
	ET-1.5-35-PN	●	M10	1.5	7.5	35	80	10	-
	ET-1.75-42-PN	●	M12	1.75	9	42	95	10	-
	ET-2-56-PN	●	M16	2	11.5	56	120	12	-

※For information about tool diameter correction, refer to the item in "Cautions on use" on p. B7, B16.

Recommended pilot hole dia.

Metric threads

Thread size	Recommended pilot hole dia. (mm)
M2×0.4	1.6
M2.2×0.45	1.75
M2.5×0.45	2.05
M3×0.5	2.5
M4×0.7	3.3
M5×0.8	4.2
M6×1	5
M8×1.25	6.75
M10×1.5	8.5
M12×1.75	10.25
M16×2	14
M18×2.5	15.5
M20×2.5	17.5

※Recommended pilot hole diameters refer to former JIS Class 2 and JIS Class 2B.

Unified threads

Thread size	Recommended pilot hole dia.	
	(mm)	(inch)
No.1-64UNC	1.51	.0594
No.2-56UNC	1.79	.0705
No.3-48UNC	2.05	.0807
No.4-40UNC	2.27	.0894
No.6-32UNC	2.77	.1091
No.8-36UNF	3.51	.1382
No.10-24UNC	3.83	.1508
1/4-20UNC	5.12	.2016
1/4-28UNF	5.47	.2154
5/16-18UNC	6.57	.2587
3/8-16UNC	7.98	.3142
7/16-14UNC	9.35	.3681
1/2-13UNC	10.81	.4256
9/16-12UNC	12.2	.4803
5/8-11UNC	13.6	.5354

Epoch Thread Mill

Recommended cutting conditions ET-PN

UN Screw Thread

Work Material		Cast Iron, Carbon Steels 150～200HB / Stainless Steels 300 series		Tool Steels 25 ～ 35HRC		Pre-hardened Steels 35 ～ 45HRC	
vc (SFM)		262 ～ **279** ～ 295		230 ～ **246** ～ 262		197 ～ **213** ～ 230	
Thread Dia. *D1*	DC (inch)	RPM (min^{-1})	Feed Rate *vf* (IPM)	RPM (min^{-1})	Feed Rate *vf* (IPM)	RPM (min^{-1})	Feed Rate *vf* (IPM)
No.1-64UNC	.055	19,300	6.690	17,100	5.280	14,800	4.570
No.2-56UNC	.065	16,400	6.930	14,500	6.140	12,500	4.800
No.3-48UNC	.075	14,200	7.130	12,600	5.830	10,900	4.610
No.4-40UNC	.083	12,900	7.990	11,400	6.570	9,900	5.310
No.6-32UNC	.100	10,600	8.190	9,400	6.850	8,100	5.550
No.8-36UNF	.130	8,200	6.690	7,200	5.670	6,300	4.530
No.10-24UNC	.138	7,700	8.980	6,800	7.360	5,900	5.870
¼-20UNC	.187	5,700	8.580	5,000	7.130	4,400	5.750
¼-28UNF	.197	5,400	7.240	4,800	6.100	4,100	4.800
5/16-18UNC	.236	4,500	8.310	4,000	6.930	3,400	5.470
⅜-16UNC	.264	4,000	10.080	3,600	8.430	3,100	6.810
7/16-14UNC	.303	3,500	10.510	3,100	8.700	2,700	7.050
½-13UNC	.362	2,900	9.330	2,600	7.800	2,200	6.100
9/16-12UNC	.413	2,600	8.700	2,300	7.200	2,000	5.830
⅝-11UNC	.449	2,400	9.250	2,100	7.560	1,800	6.060

Work Material		Hardened Steels 45 ～ 55HRC		Hardened Steels 55 ～ 62HRC		Hardened Steels 62 ～ 66HRC	
vc (SFM)		164 ～ **180** ～ 197		131 ～ **148** ～ 164		98 ～ **115** ～ 131	
Thread Dia. *D1*	DC (inch)	RPM (min^{-1})	Feed Rate *vf* (IPM)	RPM (min^{-1})	Feed Rate *vf* (IPM)	RPM (min^{-1})	Feed Rate *vf* (IPM)
No.1-64UNC	.055	12,500	3.390	10,200	2.360	8,000	1.850
No.2-56UNC	.065	10,600	3.660	8,700	2.360	6,800	1.850
No.3-48UNC	.075	9,200	3.540	7,500	2.320	5,900	1.810
No.4-40UNC	.083	8,300	4.090	6,800	2.520	5,300	1.970
No.6-32UNC	.100	6,900	4.450	5,600	2.640	4,400	2.090
No.8-36UNF	.130	5,300	3.460	4,300	2.240	3,400	1.770
No.10-24UNC	.138	5,000	4.760	4,100	3.030	3,200	2.360
¼-20UNC	.187	3,700	4.570	3,000	2.870	2,300	2.200
¼-28UNF	.197	3,500	3.860	2,900	2.440	2,200	1.850
5/16-18UNC	.236	2,900	4.330	2,400	2.760	1,900	2.200
⅜-16UNC	.264	2,600	5.350	2,100	3.350	1,700	2.720
7/16-14UNC	.303	2,300	5.550	1,900	3.580	1,400	2.640
½-13UNC	.362	1,900	4.960	1,600	3.190	1,200	2.400
9/16-12UNC	.413	1,700	4.610	1,400	2.910	1,100	2.280
⅝-11UNC	.449	1,500	4.650	1,300	3.110	1,000	2.400

【Note】

①ET thread mills are only for threading the inside of holes.
②The above cutting conditions are for the thread diameters stated in the table. Cutting conditions for other thread diameters should be calculated taking into consideration the Cutting Considerations (page B16).
③The machinery should be a machining center equipped with NC (numerical control) equipment having a helical interpolation function.
④The feed rate stated in the above conditions table is the feed rate at the tool center during tapping. In addition, the per-tooth feed rate is the numerical value at the cutting point.
⑤Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to use the oil holes.
⑥Use the appropriate coolant for the work material and machining shape.
⑦These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine conditions.

Metric Screw

Work Material			Cast Iron, Carbon Steels 150～200HB / Stainless Steels 300 series			Tool Steels 25 ～ 35HRC			Pre-hardened Steels 35 ～ 45HRC		
v_c (SFM)			262 ～ **279** ～ 295			230 ～ **246** ～ 262			197 ～ **213** ～ 230		
Thread Dia. D_1	DC (inch)	DC (mm)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)
M2	.055	1.4	19,300	8.189	208	17,100	6.457	164	14,800	5.591	142
M2.2	.063	1.6	16,900	7.992	203	14,900	6.417	163	12,900	5.551	141
M2.5	.071	1.8	15,000	7.953	202	13,300	6.457	164	11,500	5.591	142
M3	.094	2.4	11,300	6.063	154	9,900	5.000	127	8,600	4.055	103
M4	.122	3.1	8,700	7.402	188	7,700	5.984	152	6,700	5.000	127
M5	.150	3.8	7,100	7.795	198	6,300	6.417	163	5,400	5.118	130
M6	.181	4.6	5,900	8.031	204	5,200	6.693	170	4,500	5.276	134
M8	.244	6.2	4,400	7.795	198	3,900	6.496	165	3,300	5.039	128
M10	.295	7.5	3,600	8.504	216	3,200	7.047	179	2,800	5.827	148
M12	.354	9	3,000	8.504	216	2,700	7.244	184	2,300	5.709	145
M16	.453	11.5	2,400	9.252	235	2,100	7.638	194	1,800	6.063	154
M18	.551	14	1,900	6.732	171	1,700	5.669	144	1,500	4.606	117
M20	.591	15	1,800	7.244	184	1,600	6.063	154	1,400	4.921	125

Work Material			Hardened Steels 45 ～ 55HRC			Hardened Steels 55 ～ 62HRC			Hardened Steels 62 ～ 66HRC		
v_c (m/min)			164 ～ **180** ～ 197			131 ～ **148** ～ 164			98 ～ **115** ～ 131		
Thread Dia. D_1	DC (inch)	DC (mm)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)
M2	.055	1.4	12,500	4.134	105	10,200	2.874	73	8,000	2.283	58
M2.2	.063	1.6	10,900	4.213	107	9,000	2.717	69	7,000	2.087	53
M2.5	.071	1.8	9,700	4.291	109	8,000	2.835	72	6,200	2.205	56
M3	.094	2.4	7,300	3.228	82	6,000	2.087	53	4,600	1.575	40
M4	.122	3.1	5,600	3.780	96	4,600	2.441	62	3,600	1.929	49
M5	.150	3.8	4,600	4.016	102	3,800	2.598	66	2,900	1.969	50
M6	.181	4.6	3,800	4.173	106	3,100	2.638	67	2,400	2.047	52
M8	.244	6.2	2,800	3.976	101	2,300	2.520	64	1,800	1.969	50
M10	.295	7.5	2,300	4.449	113	1,900	2.835	72	1,500	2.244	57
M12	.354	9	1,900	4.409	112	1,600	2.835	72	1,200	2.126	54
M16	.453	11.5	1,500	4.724	120	1,200	2.913	74	1,000	2.441	62
M18	.551	14	1,300	3.740	95	1,000	2.205	56	800	1.772	45
M20	.591	15	1,200	3.937	100	1,000	2.520	64	700	1.772	45

With cutting materials exceeding 55HRC, the maximum machining depth should not exceed 2.5D for under neck length 3D and 3.5D type tools.

【Note】

①ET thread mills are only for threading the inside of holes.
②The above cutting conditions are for the thread diameters stated in the table. Cutting conditions for other thread diameters should be calculated taking into consideration the Cutting Considerations (page B16).
③The machinery should be a machining center equipped with NC (numerical control) equipment having a helical interpolation function.
④The feed rate stated in the above conditions table is the feed rate at the tool center during tapping. In addition, the per-tooth feed rate is the numerical value at the cutting point.
⑤Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to use the oil holes.
⑥Use the appropriate coolant for the work material and machining shape.
⑦These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine conditions.

Epoch D Thread Mill

4 flutes

1 incomplete thread and
2 complete threads

EDT-U○○-○○.○-TH UN Screw Thread Type

Unit inch

Carbide RTH h5 Cutting Conditions B9

Threading Tools

Order Number		Stock	Thread Dia. D_1		Thread Pitch TP	Cutting Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole
For Unified threads 2D type Under neck length: 2 × D_1	EDT-U64-3.7-TH	●	No.1-64UNC	.073	64	.055	.146	1.969	.236	-
	EDT-U56-4.4-TH	●	No.2-56UNC	.086	56	.065	.173	1.969	.236	-
	EDT-U48-5-TH	●	No.3-48UNC	.099	48	.075	.197	1.969	.236	-
	EDT-U40-5.7-TH	●	No.4-40UNC	.112	40	.083	.224	1.969	.236	-
	EDT-U32-7-TH	●	No.6-32UNC	.138	32	.100	.276	1.969	.236	-
	EDT-U32-8.3-TH	●	No.8-32UNC	.164	32	.130	.327	2.362	.236	-
	EDT-U36-8.3-TH	●	No.8-36UNF	.164	36	.130	.327	1.969	.236	-
	EDT-U24-9.7-TH	●	No.10-24UNC	.190	24	.138	.382	2.362	.236	-
	EDT-U32-9.7-TH	●	NO.10-32UNF	.190	32	.138	.382	2.756	.236	-
	EDT-U20-12.7-TH	●	¼-20UNC	1/4	20	.187	.500	2.756	.236	-
	EDT-U28-12.7-TH	●	¼-28UNF	1/4	28	.197	.500	2.756	.236	-
	EDT-U18-15.9-TH	●	5/16-18UNC	5/16	18	.236	.626	3.150	.394	-
	EDT-U24-15.9-TH	●	5/16-24UNF	5/16	24	.236	.626	3.150	.394	-
	EDT-U16-19.1-TH	●	⅜-16UNC	3/8	16	.264	.752	3.150	.394	-
	EDT-U14-22.2-TH	●	7/16-14UNC	7/16	14	.303	.874	3.150	.394	○
	EDT-U13-25.4-TH	●	½-13UNC	1/2	13	.362	1.000	3.150	.394	○
	EDT-U20-25.4-TH	●	½-20UNF	1/2	20	.362	1.000	3.150	.394	○
	EDT-U12-28.6-TH	●	9/16-12UNC	9/16	12	.413	1.126	3.937	.472	○
	EDT-U11-31.8-TH	●	⅝-11UNC	5/8	11	.449	1.252	3.937	.472	○
	EDT-U18-31.8-TH	●	⅝-18UNF	5/8	18	.449	1.252	3.937	.472	○
	EDT-U10-3/4-38.1-TH	●	¾-10UNC	3/4	10	.571	1.500	5.315	.630	○
	EDT-U9-7/8-44.5-TH	●	⅞-9UNC	7/8	9	.591	1.752	5.315	.630	○
	EDT-U8-1-50.8-TH	●	1-8UNC	1	8	.622	2.000	5.315	.630	○
For Unified threads 2.5D type Under neck length: 2.5 × D_1	EDT-U64-4.6-TH	●	No.1-64UNC	.073	64	.055	.181	1.969	.236	-
	EDT-U56-5.5-TH	●	No.2-56UNC	.086	56	.065	.217	1.969	.236	-
	EDT-U48-6.3-TH	●	No.3-48UNC	.099	48	.075	.248	1.969	.236	-
	EDT-U40-7.1-TH	●	No.4-40UNC	.112	40	.083	.280	1.969	.236	-
	EDT-U32-8.8-TH	●	No.6-32UNC	.138	32	.100	.346	1.969	.236	-
	EDT-U32-10.4-TH	●	No.8-32UNC	.164	32	.130	.409	2.362	.236	-
	EDT-U36-10.4-TH	●	No.8-36UNF	.164	36	.130	.409	1.969	.236	-
	EDT-U24-12.1-TH	●	No.10-24UNC	.190	24	.138	.476	2.756	.236	-
	EDT-U32-12.1-TH	●	No.10-32UNF	.190	32	.138	.476	2.362	.236	-
	EDT-U20-15.9-TH	●	¼-20UNC	1/4	20	.187	.626	2.756	.236	-
	EDT-U28-15.9-TH	●	¼-28UNF	1/4	28	.197	.626	2.756	.236	-
	EDT-U18-19.8-TH	●	5/16-18UNC	5/16	18	.236	.780	3.150	.394	-
	EDT-U24-19.8-TH	●	5/16-24UNF	5/16	24	.236	.780	3.150	.394	-
	EDT-U16-23.8-TH	●	⅜-16UNC	3/8	16	.264	.937	3.150	.394	-
	EDT-U14-27.8-TH	●	7/16-14UNC	7/16	14	.303	1.094	3.150	.394	○
	EDT-U13-31.8-TH	●	½-13UNC	1/2	13	.362	1.252	3.150	.394	○
	EDT-U20-31.8-TH	●	½-20UNF	1/2	20	.362	1.252	3.150	.394	○
	EDT-U12-35.7-TH	●	9/16-12UNC	9/16	12	.413	1.406	3.937	.472	○
	EDT-U11-39.7-TH	●	⅝-11UNC	5/8	11	.449	1.563	3.937	.472	○
	EDT-U18-39.7-TH	●	⅝-18UNF	5/8	18	.449	1.563	3.937	.472	○
	EDT-U10-3/4-47.6-TH	●	¾-10UNC	3/4	10	.571	1.874	5.315	.630	○
	EDT-U9-7/8-55.6-TH	●	⅞-9UNC	7/8	9	.591	2.189	5.315	.630	○
	EDT-U8-1-63.5-TH	●	1-8UNC	1	8	.622	2.500	5.315	.630	○

※For information about tool diameter correction, refer to the item in "Cautions on use" on p. B7, B16.

● : Inventory maintained in US

EDT○.○○-○○.○-TH Metric Screw Thread Type

Unit mm

Carbide ATH h5 Cutting Conditions B11

Order Number		Stock	Thread Dia. D_1	Thread Pitch TP	Cutting Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole
For Metric threads 2D type Under neck length: 2 × D_1	EDT-0.4-4-TH	●	M2	0.4	1.4	4	50	6	-
	EDT-0.45-4.4-TH	●	M2.2	0.45	1.6	4.4	50	6	-
	EDT-0.45-5-TH	●	M2.5	0.45	1.8	5	50	6	-
	EDT-0.5-6-TH	●	M3	0.5	2.4	6	50	6	-
	EDT-0.7-8-TH	●	M4	0.7	3.1	8	50	6	-
	EDT-0.8-10-TH	●	M5	0.8	3.8	10	50	6	-
	EDT-1.0-12-TH	●	M6	1	4.6	12	50	6	-
	EDT-1.25-16-TH	●	M8	1.25	6.2	16	70	10	-
	EDT-1.5-20-TH	●	M10	1.5	7.5	20	70	10	○
	EDT-1.75-24-TH	●	M12	1.75	9	24	80	10	○
	EDT-2-32-TH	●	M16	2	11.5	32	100	12	○
	EDT-2.5-36-TH	●	M18	2.5	14	36	135	16	○
	EDT-2.5-40-TH	●	M20	2.5	15	40	135	16	○
For Metric threads 2.5D type Under neck length: 2.5 × D_1	EDT-0.4-5-TH	●	M2	0.4	1.4	5	50	6	-
	EDT-0.45-5.5-TH	●	M2.2	0.45	1.6	5.5	50	6	-
	EDT-0.45-6.25-TH	●	M2.5	0.45	1.8	6.25	50	6	-
	EDT-0.5-7.5-TH	●	M3	0.5	2.4	7.5	50	6	-
	EDT-0.7-10-TH	●	M4	0.7	3.1	10	50	6	-
	EDT-0.8-12.5-TH	●	M5	0.8	3.8	12.5	50	6	-
	EDT-1.0-15-TH	●	M6	1	4.6	15	50	6	-
	EDT-1.25-20-TH	●	M8	1.25	6.2	20	70	10	-
	EDT-1.5-25-TH	●	M10	1.5	7.5	25	70	10	○
	EDT-1.75-30-TH	●	M12	1.75	9	30	80	10	○
	EDT-2-40-TH	●	M16	2	11.5	40	100	12	○
	EDT-2.5-45-TH	●	M18	2.5	14	45	135	16	○
	EDT-2.5-50-TH	●	M20	2.5	15	50	135	16	○
	EDT-3.0-60-TH	●	M24	3	15	60	135	16	○
For Metric threads 3D type Under neck length: 3 × D_1	EDT-0.5-9-TH	●	M3	0.5	2.4	9	55	6	-
	EDT-0.7-12-TH	●	M4	0.7	3.1	12	55	6	-
	EDT-0.8-15-TH	●	M5	0.8	3.8	15	60	6	-
	EDT-1.0-18-TH	●	M6	1	4.6	18	60	6	-
	EDT-1.25-24-TH	●	M8	1.25	6.2	24	80	10	-
	EDT-1.5-30-TH	●	M10	1.5	7.5	30	80	10	○
	EDT-1.75-36-TH	●	M12	1.75	9	36	95	10	○
	EDT-2-48-TH	●	M16	2	11.5	48	120	12	○
For Metric threads 3.5D type Under neck length: 3.5 × D_1	EDT-0.5-10.5-TH	●	M3	0.5	2.4	10.5	55	6	-
	EDT-0.7-14-TH	●	M4	0.7	3.1	14	55	6	-
	EDT-0.8-17.5-TH	●	M5	0.8	3.8	17.5	60	6	-
	EDT-1.0-21-TH	●	M6	1	4.6	21	60	6	-
	EDT-1.25-28-TH	●	M8	1.25	6.2	28	80	10	-
	EDT-1.5-35-TH	●	M10	1.5	7.5	35	80	10	○
	EDT-1.75-42-TH	●	M12	1.75	9	42	95	10	○
	EDT-2-56-TH	●	M16	2	11.5	56	120	12	○

※For information about tool diameter correction, refer to the item in "Cautions on use" on p. B7, B16

About tool diameter correction

Corrections may be needed when threading with thread mill. The internal thread diameter is reduced due to the tool deflection induced by cutting resistance.
The figures in the following tables are provided for reference purposes. Use them as a guide when adjusting tool diameter correction values.

Metric threads

Thread size	Adjustment amounts (mm)	Thread size	Adjustment amounts (mm)
M2×0.4	0.026	M8×1.25	0.049
M2.2×0.45	0.036	M10×1.5	0.053
M2.5×0.45	0.036	M12×1.75	0.060
M3×0.5	0.038	M16×2	0.064
M4×0.7	0.044	M18×2.5	0.071
M5×0.8	0.047	M20×2.5	0.071
M6×1	0.045	M24×3.0	0.075

Unified threads

Thread size	Adjustment amounts (mm)	Adjustment amounts (inch)	Thread size	Adjustment amounts (mm)	Adjustment amounts (inch)
No.1-64UNC	0.024	.0009	1/4-28UNF	0.040	.0016
No.2-56UNC	0.026	.0010	5/16-18UNC	0.050	.0020
No.3-48UNC	0.028	.0011	3/8-16UNC	0.054	.0021
No.4-40UNC	0.031	.0012	7/16-14UNC	0.058	.0023
No.6-32UNC	0.035	.0014	1/2-13UNC	0.062	.0024
No.8-36UNF	0.034	.0013	9/16-12UNC	0.065	.0026
No.10-24UNC	0.041	.0016	5/8-11UNC	0.068	.0027
1/4-20UNC	0.046	.0018			

The adjustment amounts are set for an effective diameter tolerance of 75 % with former JIS Class 2 and JIS Class 2B internal threads.
Example：M3×0.5　former JIS Class 2 effective diameter tolerance 0 ～ +0.100
0.100×75%÷2（conversion to radius）≒0.038
Refer to P. B16 for the specific correction procedure.

Epoch D Thread Mill

4 flutes

1 incomplete thread and
2 complete threads

EDT-○○-○○UNJ○-○.○-TH UNJ-Standard Thread Type

Unit inch

Carbide RTH h5 Cutting Conditions B9

For UNJ-Standard Thread 3D type

Under neck length: 3 × D_1

Order Number	Stock	Thread Dia. D_1		Thread Pitch TP	Cutting Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole
EDT-NO.4-40UNJC-8.5-TH	●	No.4-40UNJC	.112	40	.083	.335	2.362	.236	-
EDT-NO.4-48UNJF-8.5-TH	●	No.4-48UNJF	.112	48	.083	.335	2.362	.236	-
EDT-NO.5-44UNJF-9.5-TH	●	No.5-44UNJF	.125	44	.091	.374	2.362	.236	-
EDT-NO.6-32UNJC-10.5-TH	●	No.6-32UNJC	.138	32	.100	.413	2.362	.236	-
EDT-NO.6-40UNJF-10.5-TH	●	No.6-40UNJF	.138	40	.100	.413	2.362	.236	-
EDT-NO.8-32UNJC-12.5-TH	●	No.8-32UNJC	.164	32	.130	.492	2.362	.236	-
EDT-NO.8-36UNJF-12.5-TH	●	No.8-36UNJF	.164	36	.130	.492	2.362	.236	-
EDT-NO.10-32UNJF-14.5-TH	●	No.10-32UNJF	.190	32	.138	.571	2.756	.236	-
EDT-NO.12-28UNJF-16.5-TH	●	No.12-28UNJF	.216	28	.157	.650	2.756	.236	-
EDT-1/4-20UNJC-19.1-TH	●	1/4-20UNJC	1/4	20	.187	.752	2.756	.236	-
EDT-1/4-28UNJF-19.1-TH	●	1/4-28UNJF	1/4	28	.187	.752	2.756	.236	-
EDT-5/16-18UNJC-23.8-TH	●	5/16-18UNJC	5/16	18	.236	.937	3.150	.394	-
EDT-5/16-24UNJF-23.8-TH	●	5/16-24UNJF	5/16	24	.236	.937	3.150	.394	-
EDT-3/8-16UNJC-28.6-TH	●	3/8-16UNJC	3/8	16	.264	1.126	3.150	.394	-
EDT-3/8-24UNJF-28.6-TH	●	3/8-24UNJF	3/8	24	.264	1.126	3.150	.394	-
EDT-7/16-14UNJC-33.3-TH	●	7/16-14UNJC	7/16	14	.303	1.311	3.543	.394	○
EDT-7/16-20UNJF-33.3-TH	●	7/16-20UNJF	7/16	20	.303	1.311	3.543	.394	○
EDT-1/2-13UNJC-38.1-TH	●	1/2-13UNJC	1/2	13	.362	1.500	3.543	.394	○
EDT-1/2-20UNJF-38.1-TH	●	1/2-20UNJF	1/2	20	.362	1.500	3.543	.394	○
EDT-9/16-18UNJF-42.9-TH	●	9/16-18UNJF	9/16	18	.413	1.689	3.937	.472	○
EDT-5/8-18UNJF-47.6-TH	●	5/8-18UNJF	5/8	18	.449	1.874	3.937	.472	○
EDT-3/4-16UNJF-57.2-TH	●	3/4-16UNJF	3/4	16	.567	2.252	5.315	.630	○
EDT-7/8-14UNJF-66.7-TH	●	7/8-14UNJF	7/8	14	.610	2.626	5.315	.630	○
EDT-1-12UNJF-76.2-TH	●	1 inch-12UNJF	1	12	.618	3.000	5.315	.630	○

● : Inventory maintained in US

Recommended cutting conditions EDT-TH

UN Screw Thread UNJ Screw Thread

Work Material		Cast Iron, Carbon Steels 150～200HB		Tool Steels 25 ～ 35HRC		Pre-hardened Steels 35 ～ 45HRC	
vc (SFM)		262 ～ **279** ～ 295		230 ～ **246** ～ 262		197 ～ **219** ～ 230	
Thread Dia. *D*1	DC (inch)	RPM (min^{-1})	Feed Rate *vf* (IPM)	RPM (min^{-1})	Feed Rate *vf* (IPM)	RPM (min^{-1})	Feed Rate *vf* (IPM)
No.1-64UNC	.055	19,300	4.450	17,100	3.940	14,800	3.430
No.2-56UNC	.065	16,400	4.410	14,500	3.900	12,500	3.390
No.3-48UNC	.075	14,200	4.370	12,600	3.900	10,900	3.350
No.4-40UN(J)C	.083	12,900	4.800	11,400	4.210	9,900	3.660
No.4-48UNJF	.083	12,900	4.800	11,400	4.210	9,900	3.660
No.5-44UNJF	.091	11,800	5.080	10,400	4.450	9,000	3.860
No.6-32UN(J)C	.100	10,600	5.000	9,400	4.450	8,100	3.820
No.6-40UNJF	.100	10,600	5.000	9,400	4.450	8,100	3.820
No.8-32UN(J)C	.130	8,200	4.290	7,200	3.780	6,300	3.310
No.8-36UN(J)F	.130	8,200	4.290	7,200	3.780	6,300	3.310
No.10-24UNC	.138	7,700	5.670	6,800	5.000	5,900	4.330
No.10-32UN(J)F	.138	7,700	5.670	6,800	5.000	5,900	4.330
No.12-28UNJF	.157	6,800	5.790	6,000	5.120	5,200	4.450
1/4-20UN(J)C	.187	5,700	5.430	5,000	4.760	4,400	4.170
1/4-28UNJF	.187	5,700	5.430	5,000	4.760	4,400	4.170
1/4-28UNF	.197	5,400	4.530	4,800	4.020	4,100	3.430
5/16-18UN(J)C	.236	4,500	5.200	4,000	4.610	3,400	3.940
5/16-24UN(J)F	.236	4,500	5.200	4,000	4.610	3,400	3.940
3/8-16UN(J)C	.264	4,000	6.340	3,600	5.710	3,100	4.920
3/8-24UNJF	.264	4,000	6.340	3,600	5.710	3,100	4.920
7/16-14UN(J)C	.303	3,500	6.610	3,100	5.830	2,700	5.080
7/16-20UNJF	.303	3,500	6.610	3,100	5.830	2,700	5.080
1/2-13UN(J)C	.362	2,900	5.790	2,600	5.200	2,200	4.410
1/2-20UN(J)F	.362	2,900	5.790	2,600	5.200	2,200	4.410
9/16-12UNC	.413	2,600	5.430	2,300	4.800	2,000	4.170
9/16-18UNJF	.413	2,600	5.430	2,300	4.800	2,000	4.170
5/8-11UNC	.449	2,400	5.750	2,100	5.040	1,800	4.330
5/8-18UN(J)F	.449	2,400	5.750	2,100	5.040	1,800	4.330
3/4-10UNC	.571	1,900	4.450	1,600	3.740	1,400	3.270
3/4-16UNJF	.567	1,900	4.530	1,700	4.060	1,400	3.350
7/8-9UNC	.591	1,800	5.910	1,600	5.240	1,400	4.610
7/8-14UNJF	.610	1,700	5.390	1,500	4.760	1,300	4.130
1 inch-8UNC	.622	1,700	6.770	1,500	5.980	1,300	5.200
1 inch-12UNJF	.618	1,700	6.890	1,500	6.100	1,300	5.280

With cutting materials exceeding 55HRC, the maximum machining depth should not exceed 2.5D for under neck length 3D and 3.5D type tools.

When cutting Inconel, pilot holes are required before threading.

【Note】

①EDT thread mills are capable of simultaneous boring and threading.
②The above cutting conditions are for the thread diameters stated in the table. Cutting conditions for other thread diameters should be calculated taking into consideration the Cutting Considerations (page B16).
③The machinery should be a machining center equipped with NC (numerical control) equipment having a helical interpolation function.
④The feed rate stated in the above conditions table is the feed rate at the tool center during tapping. In addition, the per-tooth feed rate is the numerical value at the cutting point.
⑤Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to use the oil holes.
⑥Use the appropriate coolant for the work material and machining shape.
⑦These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine conditions.

Epoch D Thread Mill

EDT-TH

UN Screw Thread | UNJ Screw Thread

Work Material		Hardened Steels 45 ~ 55HRC		Hardened Steels 55 ~ 62HRC		Hardened Steels 62~66HRC / Stainless Steels 300 series / Heat-resistant steels Titanium alloys	
v_c (SFM)		164 ~ **180** ~ 197		131 ~ **148** ~ 164		98 ~ **115** ~ 131	
Thread Dia. D_1	DC (inch)	RPM (min^{-1})	Feed Rate v_f (IPM)	RPM (min^{-1})	Feed Rate v_f (IPM)	RPM (min^{-1})	Feed Rate v_f (IPM)
No.1-64UNC	.055	12,500	2.870	10,200	2.360	8,000	1.850
No.2-56UNC	.065	10,600	2.870	8,700	2.360	6,800	1.850
No.3-48UNC	.075	9,200	2.830	7,500	2.320	5,900	1.810
No.4-40UN(J)C	.083	8,300	3.070	6,800	2.520	5,300	1.970
No.4-48UNJF	.083	8,300	3.070	6,800	2.520	5,300	1.970
No.5-44UNJF	.091	7,600	3.270	6,200	2.680	4,800	2.050
No.6-32UN(J)C	.100	6,900	3.270	5,600	2.640	4,400	2.090
No.6-40UNJF	.100	6,900	3.270	5,600	2.640	4,400	2.090
No.8-32UN(J)C	.130	5,300	2.800	4,300	2.240	3,400	1.770
No.8-36UN(J)F	.130	5,300	2.800	4,300	2.240	3,400	1.770
No.10-24UNC	.138	5,000	3.660	4,100	3.030	3,200	2.360
No.10-32UN(J)F	.138	5,000	3.660	4,100	3.030	3,200	2.360
No.12-28UNJF	.157	4,400	3.740	3,600	3.070	2,800	2.400
1/4-20UN(J)C	.187	3,700	3.500	3,000	2.870	2,300	2.200
1/4-28UNJF	.187	3,700	3.500	3,000	2.870	2,300	2.200
1/4-28UNF	.197	3,500	2.910	2,900	2.440	2,200	1.850
5/16-18UN(J)C	.236	2,900	3.350	2,400	2.760	1,900	2.200
5/16-24UN(J)F	.236	2,900	3.350	2,400	2.760	1,900	2.200
3/8-16UN(J)C	.264	2,600	4.130	2,100	3.350	1,700	2.720
3/8-24UNJF	.264	2,600	4.130	2,100	3.350	1,700	2.720
7/16-14UN(J)C	.303	2,300	4.330	1,900	3.580	1,400	2.640
7/16-20UNJF	.303	2,300	4.330	1,900	3.580	1,400	2.640
1/2-13UN(J)C	.362	1,900	3.780	1,600	3.190	1,200	2.400
1/2-20UN(J)F	.362	1,900	3.780	1,600	3.190	1,200	2.400
9/16-12UNC	.413	1,700	3.540	1,400	2.910	1,100	2.280
9/16-18UNJF	.413	1,700	3.540	1,400	2.910	1,100	2.280
5/8-11UNC	.449	1,500	3.580	1,300	3.110	1,000	2.400
5/8-18UN(J)F	.449	1,500	3.580	1,300	3.110	1,000	2.400
3/4-10UNC	.571	1,200	2.800	1,000	2.320	800	1.850
3/4-16UNJF	.567	1,200	2.870	1,000	2.360	800	1.890
7/8-9UNC	.591	1,200	3.940	1,000	3.270	700	2.280
7/8-14UNJF	.610	1,100	3.500	900	2.870	700	2.200
1 inch-8UNC	.622	1,100	4.370	900	3.580	700	2.800
1 inch-12UNJF	.618	1,100	4.450	900	3.660	700	2.830

With cutting materials exceeding 55HRC, the maximum machining depth should not exceed 2.5D for under neck length 3D and 3.5D type tools.

When cutting Inconel, pilot holes are required before threading.

【Note】

①EDT thread mills are capable of simultaneous boring and threading.
②The above cutting conditions are for the thread diameters stated in the table. Cutting conditions for other thread diameters should be calculated taking into consideration the Cutting Considerations (page B16).
③The machinery should be a machining center equipped with NC (numerical control) equipment having a helical interpolation function.
④The feed rate stated in the above conditions table is the feed rate at the tool center during tapping. In addition, the per-tooth feed rate is the numerical value at the cutting point.
⑤Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to use the oil holes.
⑥Use the appropriate coolant for the work material and machining shape.
⑦These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine conditions.

Metric Screw

Work Material			Cast Iron, Carbon Steels 150～200HB			Tool Steels 25 ～ 35HRC			Pre-hardened Steels 35 ～ 45HRC		
v_c (SFM)			262 ～ **279** ～ 295			230 ～ **246** ～ 262			197 ～ **213** ～ 230		
Thread Dia. D_1	DC (inch)	DC (mm)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)
M2	.055	1.4	19,300	5.472	139	17,100	4.843	123	14,800	4.213	107
M2.2	.063	1.6	16,900	5.079	129	14,900	4.488	114	12,900	3.898	99
M2.5	.071	1.8	15,000	5.276	134	13,300	4.685	119	11,500	4.055	103
M3	.094	2.4	11,300	3.898	99	9,900	3.425	87	8,600	2.992	76
M4	.122	3.1	8,700	4.606	117	7,700	4.094	104	6,700	3.543	90
M5	.150	3.8	7,100	4.843	123	6,300	4.291	109	5,400	3.661	93
M6	.181	4.6	5,900	5.000	127	5,200	4.409	112	4,500	3.819	97
M8	.244	6.2	4,400	4.843	123	3,900	4.291	109	3,300	3.622	92
M10	.295	7.5	3,600	5.394	137	3,200	4.803	122	2,800	4.173	106
M12	.354	9	3,000	5.315	135	2,700	4.803	122	2,300	4.094	104
M16	.453	11.5	2,400	5.866	149	2,100	5.118	130	1,800	4.370	111
M18	.551	14	1,900	4.173	106	1,700	3.740	95	1,500	3.307	84
M20	.591	15	1,800	4.528	115	1,600	4.016	102	1,400	3.543	90
M24	.591	15	1,800	4.528	115	1,600	4.016	102	1,400	3.543	90

Work Material			Hardened Steels 45 ～ 55HRC			Hardened Steels 55 ～ 62HRC			Hardened Steels 62 ～ 66HRC / Stainless Steels 300 series		
v_c (SFM)			164 ～ **180** ～ 197			131 ～ **148** ～ 164			98 ～ **115** ～ 131		
Thread Dia. D_1	DC (inch)	DC (mm)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)
M2	.055	1.4	12,500	3.543	90	10,200	2.874	73	8,000	2.283	58
M2.2	.063	1.6	10,900	3.268	83	9,000	2.717	69	7,000	2.087	53
M2.5	.071	1.8	9,700	3.425	87	8,000	2.835	72	6,200	2.205	56
M3	.094	2.4	7,300	2.520	64	6,000	2.087	53	4,600	1.575	40
M4	.122	3.1	5,600	2.992	76	4,600	2.441	62	3,600	1.929	49
M5	.150	3.8	4,600	3.110	79	3,800	2.598	66	2,900	1.969	50
M6	.181	4.6	3,800	3.228	82	3,100	2.638	67	2,400	2.047	52
M8	.244	6.2	2,800	3.071	78	2,300	2.520	64	1,800	1.969	50
M10	.295	7.5	2,300	3.425	87	1,900	2.835	72	1,500	2.244	57
M12	.354	9	1,900	3.386	86	1,600	2.835	72	1,200	2.126	54
M16	.453	11.5	1,500	3.661	93	1,200	2.913	74	1,000	2.441	62
M18	.551	14	1,300	2.874	73	1,000	2.205	56	800	1.772	45
M20	.591	15	1,200	3.031	77	1,000	2.520	64	700	1.772	45
M24	.591	15	1,200	3.031	77	1,000	2.520	64	700	1.772	45

With cutting materials exceeding 55HRC, the maximum machining depth should not exceed 2.5D for under neck length 3D and 3.5D type tools.

【Note】

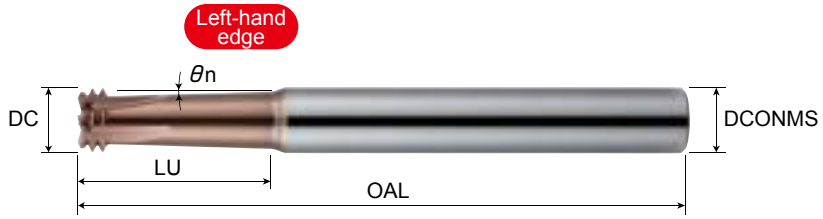
①EDT thread mills are capable of simultaneous boring and threading.
②The above cutting conditions are for the thread diameters stated in the table. Cutting conditions for other thread diameters should be calculated taking into consideration the Cutting Considerations (page B16).
③The machinery should be a machining center equipped with NC (numerical control) equipment having a helical interpolation function.
④The feed rate stated in the above conditions table is the feed rate at the tool center during tapping. In addition, the per-tooth feed rate is the numerical value at the cutting point.
⑤Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to use the oil holes.
⑥Use the appropriate coolant for the work material and machining shape.
⑦These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine conditions.

Epoch D Thread Mill for PT, NPT Threads

YouTube

4 flutes

1 incomplete thread and 2 complete threads



θn : 1.7°
※The neck angle (θn) of EDT-PT1(NPT1)-45-ATH is 0° (straight neck).

EDT-NPT○○-○○-ATH

Unit inch

Carbide ATH h5 Cutting Conditions B13

NPT Thread Order Number	Stock	Thread dia. Pilot hole not required D_1	Thread dia. Pilot hole required (pilot hole diameter) D_1	Thread Pitch TP	Reference Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole	Compensation Value D_2
EDT-NPT1/16-18-ATH	●	NPT1/16-27 .311	NPT1/8-27(φ.1578 or larger) .403	27	.189	.709	2.756	.236	–	.0012
EDT-NPT1/8-19-ATH	●	NPT1/8-27 .403	–	27	.224	.748	2.756	.236	–	.0012
EDT-NPT1/4-28-ATH	●	NPT1/4-18 .536	NPT3/8-18(φ.2362 or larger) .672	18	.311	1.102	3.150	.394	–	.0018
EDT-NPT3/8-28-ATH	●	NPT3/8-18 .672	–	18	.378	1.102	3.150	.394	–	.0018
EDT-NPT1/2-35-ATH	●	NPT1/2-14 .836	NPT3/4-14(φ.3150 or larger) 1.046	14	.453	1.378	4.331	.472	–	.0023
EDT-NPT1-45-ATH	●	–	NPT1-11.5(φ.3937 or larger) 1.308	11.5	.606	1.772	5.315	.630	–	.0028

EDT-PT○○-○○-ATH

Unit mm

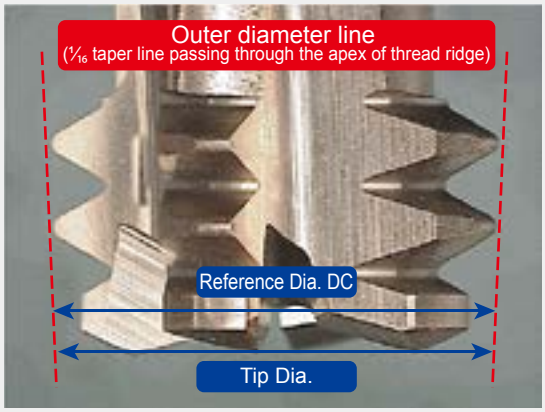
Carbide ATH h5 Cutting Conditions B13

PT (Rc) Thread Order Number	Stock	Thread dia. Pilot hole not required D_1	Thread dia. Pilot hole required (pilot hole diameter) D_1	Thread Pitch TP	Reference Dia. DC	Neck Length LU	Overall Length OAL	Connection Dia. DCONMS	Oil Hole	Compensation Value D_2
EDT-PT1/16-18-ATH	●	PT1/16-28 7.723	PT1/8-28(φ4 or large) 9.728	0.9071	4.8	18.0	70.0	6.0	–	0.029
EDT-PT1/8-19-ATH	●	PT1/8-28 9.728	–	0.9071	5.7	19.0	70.0	6.0	–	0.029
EDT-PT1/4-28-ATH	●	PT1/4-19 13.157	PT3/8-19(φ6 or large) 16.662	1.3368	7.9	28.0	80.0	10.0	–	0.043
EDT-PT3/8-28-ATH	●	PT3/8-19 16.662	–	1.3368	9.6	28.0	80.0	10.0	–	0.043
EDT-PT1/2-35-ATH	●	PT1/2-14 20.955	PT3/4-14(φ8 or large) 26.441	1.8143	11.5	35.0	110.0	12.0	–	0.058
EDT-PT1-45-ATH	●	–	PT1-11(φ10 or large) 33.249	2.3091	15.4	45.0	135.0	16.0	–	0.074

●: Inventory maintained in US

Thread diameter which requires pilot hole can not be used without larger pilot hole than the values shown in the table.

Cautions when using Epoch D Thread Mill for PT, NPT threads



Reference Dia. DC:
diameter at the virtual crest position of the first thread
Tip Dia. : diameter at the tool tip position

Since the reference diameter DC and the tool tip diameter are different, it is necessary to correct the thread diameter D_1 and program.
The thread diameter D_1 corresponds to the reference diameter of the groove of the internal thread (reference diameter of the tap).

Example

PT1/4 thread milling with EDT-PT1/4-28-ATH

Thread diameter D_1 + compensation value D_2
= setup thread diameter .5180 inch+ .0017 inch= .5197 inch

* The NC program provided by MOLDINO already incorporates the D_2 thread diameter compensation value.

Recommended cutting conditions EDT-PT-ATH EDT-NPT-ATH

NPT Thread

Work Material		Cast Iron, Carbon Steels 150～200HB		Tool Steels 25 ～ 35HRC		Pre-hardened Steels 35 ～ 45HRC	
v_c (SFM)		262 ～ **279** ～ 295		230 ～ **246** ～ 262		197 ～ **219** ～ 230	
Thread Dia. D_1	DC (inch)	RPM (min^{-1})	Feed Rate v_f (IPM)	RPM (min^{-1})	Feed Rate v_f (IPM)	RPM (min^{-1})	Feed Rate v_f (IPM)
NPT1/16-27	.189	5,600	6.140	5,000	5.510	4,300	4.720
NPT1/8-27	.224	4,700	7.950	4,200	7.090	3,600	6.100
NPT1/4-18	.311	3,400	7.170	3,000	6.300	2,600	5.470
NPT3/8-18	.378	2,800	7.870	2,500	7.050	2,200	6.180
NPT1/2-14	.453	2,400	8.230	2,100	7.200	1,800	6.180
NPT3/4-14	.453	2,400	10.980	2,100	9.610	1,800	8.230
NPT1-11.5	.606	1,800	9.090	1,600	8.070	1,300	6.570

Work Material		Hardened Steels 45 ～ 55HRC		Hardened Steels 55 ～ 62HRC		Hardened Steels 62 ～ 66HRC	Stainless Steels 300 series
v_c (SFM)		164 ～ **180** ～ 197		131 ～ **148** ～ 164		98 ～ **115** ～ 131	
Thread Dia. D_1	DC (inch)	RPM (min^{-1})	Feed Rate v_f (IPM)	RPM (min^{-1})	Feed Rate v_f (IPM)	RPM (min^{-1})	Feed Rate v_f (IPM)
NPT1/16-27	.189	3,600	3.980	3,000	3.310	2,300	2.520
NPT1/8-27	.224	3,100	5.240	2,500	4.210	2,000	3.390
NPT1/4-18	.311	2,200	4.650	1,800	3.780	1,400	2.950
NPT3/8-18	.378	1,800	5.080	1,500	4.210	1,200	3.390
NPT1/2-14	.453	1,500	5.160	1,200	4.130	1,000	3.430
NPT3/4-14	.453	1,500	6.850	1,200	5.470	1,000	4.570
NPT1-11.5	.606	1,100	5.550	900	4.570	700	3.540

PT (Rc) Thread

Work Material			Cast Iron, Carbon Steels 150～200HB			Tool Steels 25 ～ 35HRC			Pre-hardened Steels 35 ～ 45HRC		
v_c (SFM)			262 ～ **279** ～ 295			230 ～ **246** ～ 262			197 ～ **213** ～ 230		
Thread Dia. D_1	DC (inch)	DC (mm)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)
PT1/16-28	.189	4.8	5,600	5.748	146	5,000	5.157	131	4,300	4.409	112
PT1/8-28	.224	5.7	4,700	7.126	181	4,200	6.378	162	3,600	5.472	139
PT1/4-19	.311	7.9	3,400	6.575	167	3,000	5.827	148	2,600	5.039	128
PT3/8-19	.378	9.6	2,800	7.559	192	2,500	6.732	171	2,200	5.906	150
PT1/2-14	.453	11.5	2,400	8.031	204	2,100	7.047	179	1,800	6.024	153
PT3/4-14	.453	11.5	2,400	10.945	278	2,100	9.567	243	1,800	8.189	208
PT1-11	.606	15.4	1,800	9.094	231	1,600	8.110	206	1,300	6.575	167

Work Material			Hardened Steels 45 ～ 55HRC			Hardened Steels 55 ～ 62HRC			Hardened Steels 62 ～ 66HRC		Stainless Steels 300 series
v_c (SFM)			164 ～ **180** ～ 197			131 ～ **148** ～ 164			98 ～ **115** ～ 131		
Thread Dia. D_1	DC (inch)	DC (mm)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)	RPM (min^{-1})	Feed Rate v_f (IPM)	Feed Rate v_f (mm/min)
PT1/16-28	.189	4.8	3,600	3.701	94	3,000	3.071	78	2,300	2.362	60
PT1/8-28	.224	5.7	3,100	4.724	120	2,500	3.780	96	2,000	3.031	77
PT1/4-19	.311	7.9	2,200	4.252	108	1,800	3.504	89	1,400	2.717	69
PT3/8-19	.378	9.6	1,800	4.843	123	1,500	4.055	103	1,200	3.228	82
PT1/2-14	.453	11.5	1,500	5.039	128	1,200	4.016	102	1,000	3.346	85
PT3/4-14	.453	11.5	1,500	6.850	174	1,200	5.472	139	1,000	4.567	116
PT1-11	.606	15.4	1,100	5.551	141	900	4.567	116	700	3.543	90

【Note】
①Epoch D Thread Mill is capable of simultaneous boring and threading.
②The above cutting conditions are for the thread diameters stated in the table. Cutting conditions for other thread diameters should be calculated taking into consideration the cautions on use (p.B16).
③The machinery should be a machining center equipped with NC (numerical control) equipment having a helical interpolation function.
④The feed rate stated in the above conditions table is the feed rate at the tool center during tapping. In addition, the per-tooth feed rate is the numerical value at the cutting point.
⑤Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to perform processing using the oil holes.
⑥Use the appropriate coolant for the work material and machining shape.
⑦These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine conditions.

Epoch D Thread Mill for PT, NPT Threads

Reference diameter position adjustment procedure for PT, NPT threads

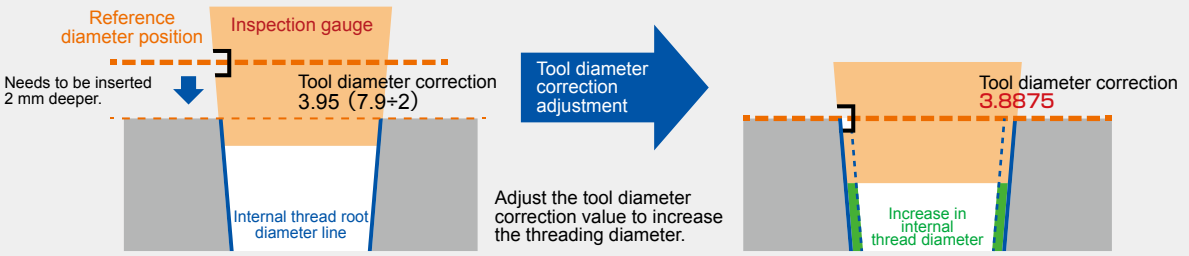
For the machining of tapered internal threads using a thread mill, in contrast to conventional taps, the reference diameter position is adjusted by adjusting the internal thread diameter with tool diameter correction. In the example shown in the following diagram, the tool diameter correction value is calculated as follows:

Example **PT1/4 thread milling with EDT-PT1/4-28-ATH**

(Reference Dia. DC ± reference diameter position adjustment amount × 1/16) ÷ 2 (conversion to radius)

(7.9 - 2 × 1/16) ÷ 2 =3.8875

A positive value indicates shallower cuts; a negative value indicates deeper cuts. In this case, the value will be 2 mm deeper.



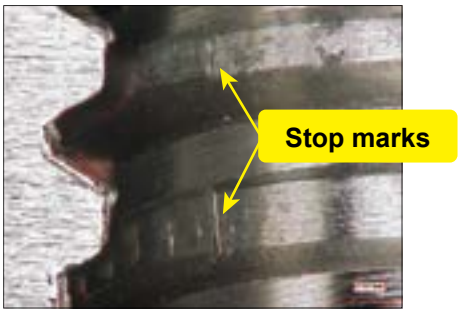
※The example above illustrates corrections made using an NC program with a tool center datum.

Advantages of using Epoch D Thread Mill in pipe threading

Epoch D Thread Mill

Good finished surface without tear

General tap



Tears easily and stop marks occurred

Effective for countermeasures against liquid leakage that is often caused by tapping.

Epoch D Thread Mill

Troubleshooting

Regarding thread diameter expansion/contraction

Suitable tool diameter correction should be performed according to the work material and tool wear condition. Also, please be careful not to forget to input the tool diameter correction value into the machine.

Dimensional accuracy worsens when moving toward the bottom of the hole (deflection)

A characteristic of the thread milling method is that tool deflection increases as the tool progresses toward the bottom of the hole.
It may be necessary to perform zero cutting in order to perform high-accuracy thread milling with low deflection.

Regarding tool breakage

As a countermeasure against tool breakage, performing processing with a reduced feed rate is effective. In addition, when processing with tool extended or when large rough cutting chips are produced, breakage due to chip clogging should be considered. In such cases, if processing is performed with a higher cutting speed, the cutting chips will be broken into smaller bits which may improve conditions.

Changes in cutting chip conditions due to different cutting speeds;
Simultaneous boring and thread milling (M8 × P 1.25) of carbon steel

The NC program created using MOLDINO's NC program creation software doesn't work properly.

There are differences in the programming code for the machine being used. Please contact the machine manufacturer for details.

Regarding upper limit on machinable thread diameters

Please note that since the Epoch D Thread Mill performs boring simultaneously, it cannot perform thread milling for diameters of more than 1.68 times the tool diameter DC.
There are no particular similar limitations on using the Epoch Thread Mill.
Also, please be aware that if screws of a size smaller than the thread diameter described in the line-up table are processed, there is a possibility of malfunctioning the screw shape.
Example) Threading M14×2 with ET-2-40-PN (designed for M16×2)

Epoch D Thread Mill

Cautions regarding use for Epoch Thread Mill/Epoch D Thread Mill

About tool feed rate

When performing thread milling by helical interpolation, the cutting point feed rate should be multiplied by a coefficient to determine the tool center feed rate.
The equation for calculating the tool center feed rate is shown at right.

The standard cutting conditions for PT and NPT threads are calculated based on the thread diameter D_1 at the machinable maximum depth (neck length).

Example) Thread milling PT⅛ with EDT-PT1/8-19-ATH
.383 inch (9.728mm) (D_1) - .748 inch (19mm) (under neck length)
x 1/16 (thread taper angle) = .336 inch (8.5405mm)

$$v_f = f_z \times z \times n \times \frac{D_1\text{-DC}}{D_1}$$

v_f	: Feed rate	(IPM) or (mm/min)
f_z	: Feed per tooth	(IPT) or (mm/t)
z	: No. of flutes	
n	: Rotation	(min^{-1})
D_1	: Thread Dia.	(inch) or (mm)
DC	: Tool Dia.	(inch) or (mm)

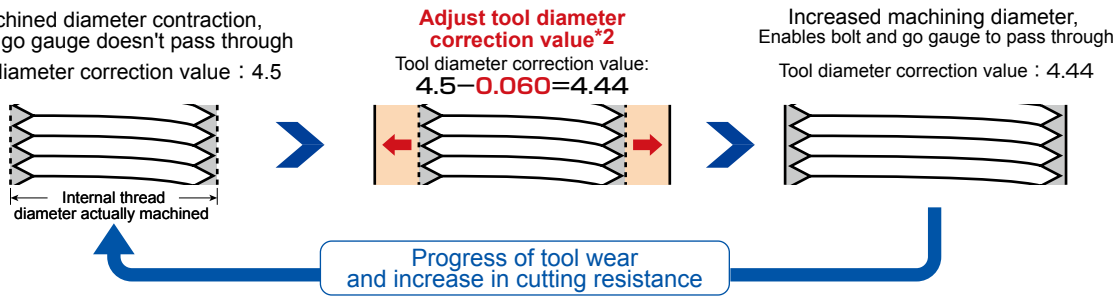
* Above formula applies to both inch and metric.

About tool diameter correction

The internal thread machining diameter with thread mill may need to be adjusted if reduced by wear and tool deflection. In such cases, the machining diameter can be adjusted by considering the adjustment amounts*1 described on Page B7 to the tool diameter correction value.

Example **Machining an M12 × 1.75 thread with EDT-1.75-30-TH when tool centerline datum NC program prompts a radius**

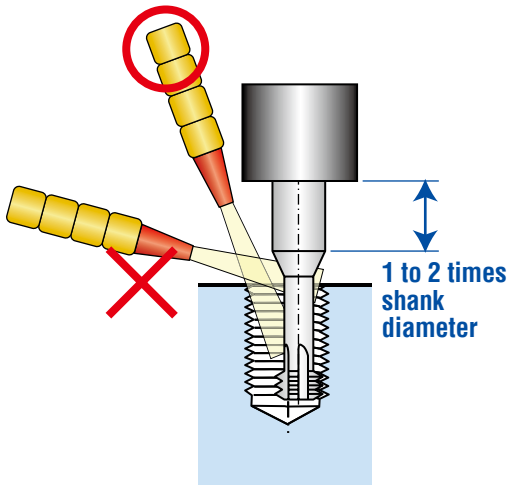
Tool Dia. : DC=9.0, Tool diameter correction value : 4.5, Adjustment amount of tool diameter correction value : 0.060



*1: Use these adjustment amounts only as guidelines. The adjustment amounts are set for an effective diameter tolerance of 75 % with former JIS Class 2 and JIS Class 2B internal threads.
*2: Make further adjustments if the bolt or go gauge still doesn't pass through after adjusting the tool diameter correction value.

About coolant

- The first recommended coolant shown in the table tends to have the superior tool life. When priority is given to finished surface quality, water-soluble cutting fluids are effective. Oil-based cutting fluids are not suitable because they degrade chip removal characteristics.
- The holder should grip the tool shank so that the holder does not block the hole and the shank projection amount is 1 to 2 times the shank diameter. The coolant nozzle should then be positioned so that the coolant will reach the bottom of the hole. In addition, coolant pressure should be adjusted so that it removes cutting chips. If the setting is bad, cutting chip clogging may lead to flute tip damage or tool breakage.
- Since there is a risk of cutting chips getting inside the machine, when using tools equipped with oil holes, be sure to perform processing using the oil holes.



Work material	ET		EDT	
	Air-blow	Water-base	Air-blow	Water-base
Hardened steel, Pre-hardened steel Tool steel, Cast iron, Carbon steel	◎	○	◎	△
Stainless steel	×	◎	×	◎
Super heat resistant alloy, Titanium alloy	×	◎	×	◎
Aluminium alloy, Copper alloy, Resin	○	◎	×	◎

◎: First recommended
○: Second recommended
△: Tendency to decrease tool life
×: Not recommended

Indexable Tools, Milling Inserts

Table of Indexable Tools ····· C2
Guide to grades for milling inserts ····· C5
Coating materials for milling inserts ····· C6
Milling Inserts ····· C242

Indexable tools, by type (catalog listing order)

High Feed Radius End Mills
TR4F ····· C8
TR4D ····· C28
TD4N ····· C34
ASR ····· C40
ASRT ····· C48
ASRF ····· C56
ASRF mini ····· C64
ASR Multi-flutes type ··· C72

Radius End Mills
RH2P ····· C86
AR ····· C90
RV ····· C110
ARPF ····· C118

Ball End Mills
ABPF ····· C132
ABPFN ····· C146
ABP4F ····· C156

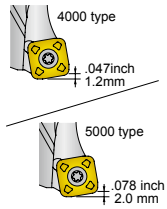
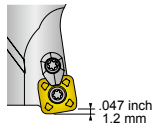
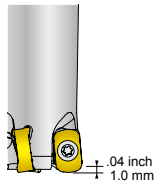
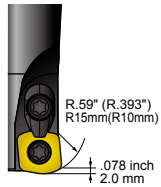
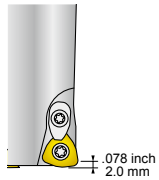
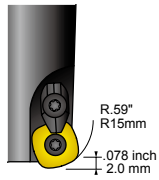
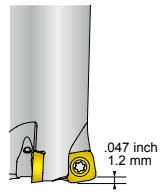
Square End Mills
ASM ····· C162
AHU ····· C174
ASPV mini ····· C190
ASPV ····· C204

Face Mills
ASDH ····· C232
ASF ····· C238

Indexable tools, by item code (alphabetical order)

ABP4F ····· C156
ABPF ····· C132
ABPFN ····· C146
AHU ····· C174
AR ····· C90
ARPF ····· C118
ASDH ····· C232
ASF ····· C238
ASM ····· C162
ASPV ····· C204
ASPV mini ····· C190
ASR ····· C40
ASR Multi-flutes type ··· C72
ASRF ····· C56
ASRF mini ····· C64
ASRT ····· C48
RH2P ····· C86
RV ····· C110
TD4N ····· C34
TR4D ····· C28
TR4F ····· C8

Table of Indexable Tools

Type	Name/Item code	Shape, Tool dia.	Cutting edge angle Max. depth of cut	Finishing group	Cutting applications	Page
High Feed Radius End Mills	**TR4F / ITR4F** **Radius Mill TR4F** Cutter body -.0039" -.0078" (4000 type); Cutter body -.0047" -.0094" (5000 type); Cutter body -0.1mm -0.2mm (4000 type); Cutter body -0.12mm -0.24mm (5000 type); Insert M/N	 ϕ1.25~6 inch ϕ32~125 mm		Roughing	Planing, Slotting, Vertical, Die-sinking, Profiling, Helical	C8
High Feed Radius End Mills	**TR4D / ITR4D** **Radius Mill TR4D** Cutter body -.0039" -.0078"; Cutter body -0.1mm -0.2mm; Insert M/N	 ϕ2~4 inch ϕ50~100 mm		Roughing	Planing, Slotting, Vertical, Die-sinking, Profiling, Helical	C28
High Feed Radius End Mills	**TD4N / ITD4N** **Radius Mill TD4N** Cutter body -.0023" -.0043"; Cutter body -0.06mm -0.11mm; Insert M	 ϕ.625~2.0 inch ϕ16~42 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C34
High Feed Radius End Mills	**ASR / IASR** **Radius Mill ASR** Cutter body 0 -.0078"; Cutter body 0 -0.2mm; Insert M/N; Insert E	 ϕ.75~4 inch ϕ20~100 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C40
High Feed Radius End Mills	**ASRT / IASRT** **Radius Mill 3 Corners ASRT** Cutter body 0 -.0078"; Cutter body 0 -0.2mm; Insert N	 ϕ2~5 inch ϕ25~100 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C48
High Feed Radius End Mills	**ASRF / IASRF** **Radius Mill 4 Corners ASRF** Cutter body 0 -.0078"; Cutter body 0 -0.2mm; Insert M/N	 ϕ1.25~4 inch ϕ32~100 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C56
High Feed Radius End Mills	**ASRF mini / IASRF mini** **Radius Mill 4 Corners ASRF mini** Cutter body -.0039" -.0078"; Cutter body -0.1mm -0.2mm; Insert M/N	 ϕ.75~2.5 inch ϕ20~63 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C64

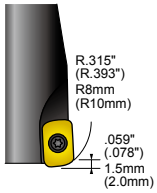
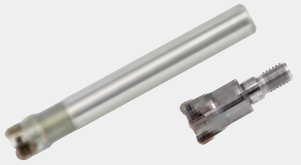
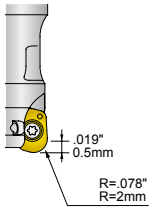
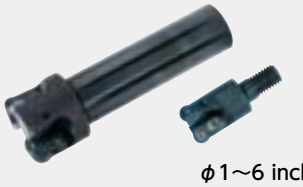
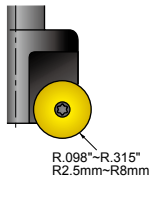
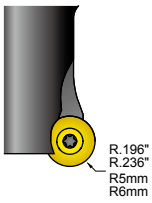
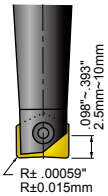
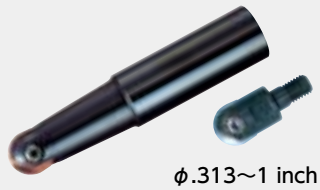
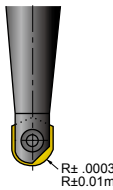
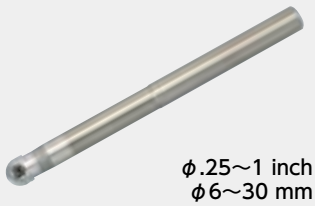
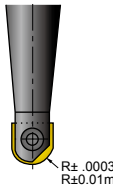
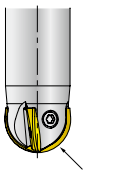
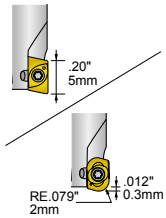
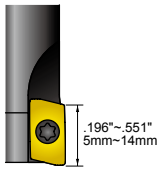
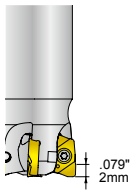
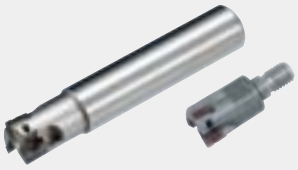
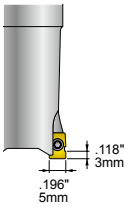
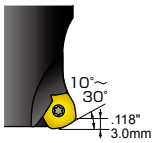
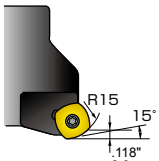
Type	Name/Item code	Shape, Tool dia.	Cutting edge angle Max. depth of cut	Finishing group	Cutting applications	Page
High Feed Radius End Mills	**ASR Multi-flutes type / IASR Multi-flutes type** **Radius Mill ASR Multi-flutes type** Cutter body 0 / -.0078" · Cutter body 0 / -0.2mm · Insert M/N	 ϕ.625~2.5 inch ϕ16~66 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C72
Radius End Mills	**RH2P / IRH2P** **High Hard Radius Mill RH2P** Cutter body -.0018" / -.0037" · Cutter body -0.046mm / -0.096mm · Insert H	 ϕ.375~1.25 inch ϕ8~32 mm		Roughing, Semi Finishing, Finishing	Planing, Side milling, Die-sinking, Helical	C86
	AR / IAR **Easy Cut Radius Mill AR** Cutter body 0 / -.0078" · Cutter body 0 / -0.2mm · Insert M · Insert H	 ϕ1~6 inch ϕ12~141 mm		Roughing	Planing, Slotting, Die-sinking, Profiling, Helical	C90
	RV / IRV **Radius Milll RV** Cutter body 0 / -.0078" · Cutter body 0 / -0.2mm · Insert M · Insert E · Insert H	 ϕ2~2.5 inch ϕ25~80 mm		Roughing, Semi Finishing	Planing, Slotting, Die-sinking, Profiling, Helical	C110
	ARPF / IARPF **Radius Precision ARPF** Cutter body 0 / -.0008" · Cutter body 0 / -0.02mm · Insert F	 ϕ.375~1 inch ϕ6~32 mm		Semi Finishing, Finishing	Planing, Side milling, Die-sinking, Profiling, Helical	C118
Ball End Mills	**ABPF / IABPF** **Ball Precision F ABPF** Cutter body ±.0004" · Cutter body ±0.01mm · Insert F	 ϕ.313~1 inch ϕ6~32 mm		Finishing	Planing, Side milling, Die-sinking, Profiling, Radius, Helical	C132
	ABPFN / IABPFN **Ball Precision F ABPFN** Cutter body ±.0004" · Cutter body ±0.01mm · Insert F	 ϕ.25~1 inch ϕ6~30 mm		Finishing	Planing, Side milling, Die-sinking, Profiling, Radius, Helical	C146

Table of Indexable Tools

Type	Name/Item code	Shape, Tool dia.	Cutting edge angle Max. depth of cut	Finishing group	Cutting applications	Page
Ball End Mills	**ABP4F / IABP4F** **Ball Precision Multi Flutes ABP4F** Cutter body ±.0004" / Cutter body ±0.01mm / Insert F	 ϕ1 inch ϕ20~30 mm		Semi Finishing Finishing	Planing, Side milling, Profiling, Radius	C156
Square End Mills	**ASM / IASM** **Super Excellent Mini ASM** Cutter body -.0039" -.0078" / Cutter body -0.1mm -0.2mm / Insert M	 ϕ.375~1.25 inch ϕ8~32 mm		Roughing Semi Finishing	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical	C162
	AHU / IAHU **High Feed End Mill AHU** Cutter body -.0039" -.0078" ϕ16~40 / Cutter body -.0078" -.0157" ϕ50~100 / Cutter body -0.1mm -0.2mm ϕ16~40 / Cutter body -0.2mm -0.4mm ϕ50~100 / Insert M / Insert E	 ϕ1~4 inch ϕ16~100 mm		Roughing Semi Finishing	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical	C174
	ASPV mini **Polish Mill V type ASPVmini** Cutter body -.0018" -.0037" / Cutter body -0.046mm -0.096mm / Insert H	 ϕ10~32 mm		Finishing	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical, Vertical	C190
	ASPV / IASPV **Polish Mill V type ASPV** Cutter body -.0011" -.0037" / Cutter body -0.03mm -0.1mm / Insert N / Insert H	 ϕ.625~2.5 inch ϕ16~63 mm		Roughing Semi Finishing Finishing	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical, Vertical	C204
Face Mills	**ASDF / IASDF** **Dual Face Mill ASDF** Cutter body -.0059" -.0098" / Cutter body -0.15mm -0.25mm / Insert M / Insert G	 ϕ2.5~6 inch ϕ42~139 mm		Roughing	Planing	C232
	ASF / IASF **Face Mill ASF** Cutter body ±.0078" / Cutter body ±0.2mm / Insert M/N / Insert E	 ϕ2.5~10 inch ϕ63~125 mm		Roughing Semi Finishing	Planing	C238

Guide to grades for milling inserts

JIS use classification (ISO)			Coating: Carbide alloy	Coating: Cermet	CBN	Cermet	Carbide
P Carbon steel, Alloyed steel (SS,SCM,SCr SC,SNCM...), Tool steel, HSS, Cast steel, Stainless steel	01	Finishing	TH303, ATH80D, TH308, ATH08M, PCA08M, PN08M, PTH08M, ACS05E, TH315, PN215, PN15M, PCA12M, JP4105, JP4115, JP4120, GX2120, CY9020, PTH30E, JS4045, CY250, CY25, CY250V, HC844, GX2140, GF30, JS4030, JS4060, JM4160, GX2160	MZ1000		CH550	
	10						
	20	General				CH7030	EX35
	30						
	40	Roughing					
M Steel, Cast steel, Stainless steel (SUS304), Mn steel, Cast iron, Alloyed cast iron	01	Finishing	TH308, ATH08M, PN215, JP4105, JP4120, PTH30E, JS4045, CY25, CY250, CY250V, GF30, HC844, PTH40H, AX2040, JS4060, GX2160, JM4160			CH550	
	10						
	20	General					EX35
	30						
	40	Roughing					
K Cast irons (FC250…), Ductile cast iron (FCD450…)	01	Finishing	TH303, ATH80D, ATH08M, TH308, PTH08M, PN08M, PCA08M, ACS05E, ATH10E, TH315, PN215, PN15M, PCA12M, JP4105, CY100H, JP4120, CY9020, PTH13S, GX2120, JS4045, CY250, JS4030, PTH30E, JS4060, GX2160, GX2140				
	10						WH10
	20	General					
	30	Roughing					
N Non ferrous metal, Aluminium, Aluminum alloy, Copper alloy		Finishing	PN08M, PN215, JP4120, PTH30E, SD5010, HD7010				WH10
		General					
S Super alloy, Titanium alloy		Finishing	ATH08M, JP4105, JP4120, JS1025, PTH30E, JM4160				
		General					
H Hardened material		Finishing	TH303, ATH80D, TH308, ATH08M, PTH08M, PN08M, PCA08M, ACS05E, PN215, PN15M, PCA12M, TH315, JP4105, JP4115, JP4120		BH200		
		General					

Coating materials for milling inserts

Grade name	Coating name Coating type	Base material hardness (HRA) Base material bending strength (GPa)	Application	Features
JP4105	AJ Coating PVD	93.3 4.0	For hardened steel 50HRC or more	Uses ultra micro grain substrate and AJ Coating. Suitable for 50HRC or more high hardness material cutting.
JP4115	AJ Coating PVD	92.4 4.2	General purpose for steel and hardened steel	Uses ultra micro grain substrate and AJ Coating. Suitable for cutting of common steels through hardened steels.
CY100H	C Coating PVD	92.0 2.6	For cast iron	Uses TiAlN coating; Excellent for cutting cast iron.
PTH13S	TH Coating PVD	91.3 2.8	For cast iron	Uses nanocomposite coating; Excellent for cast iron.
CY9020	C Coating PVD	91.5 4.1	General purpose for steel	Uses TiAlN coating; Suitable for semi-finishing
JP4120	AJ Coating PVD	91.0 4.0	For hardened steel and alloy steel (35-50HRC)	Uses micro grain substrate and AJ Coating. Suitable for cutting of common steels through hardened steels.
GX2120	GX Coating CVD	91.0 4.0	For high-speed cutting of cast iron	Uses micro grain substrate and GX Coating. Suitable for the continuous cutting of cast iron.
JS1025	JS Coating PVD	91.0 4.0	For titanium alloys	Uses micro grain substrate and JS Coating. Suitable for cutting of titanium alloy.
PTH30E	TH Coating PVD	90.5 3.8	For wet general purpose of steel	Uses micro grain substrate and nanocomposite coating. Suitable for wet cutting.
JS4045	JS Coating PVD	90.6 2.7	General purpose for steel	Uses coarse grain substrate and JS coating. Suitable for cutting of the common steels.
CY250	C Coating PVD	90.6 2.7	General purpose for steel	Uses coarse grain substrate and TiAlN coating. Suitable for general purpose cutting.
CY25	PC Coating PVD	90.6 2.7	General purpose for steel	Uses coarse grain substrate and TiCN coating. Suitable for general purpose cutting.
CY250V	PC Coating PVD	90.6 2.7	General purpose for steel	Uses coarse grain substrate and TiCN coating. Suitable for general purpose cutting.
HC844	G Coating PVD	90.6 2.7	General purpose for steel	Uses coarse grain substrate and TiN coating. Suitable for general purpose cutting.
GX2140	GX Coating CVD	89.0 3.0	Dry high speed cutting for Steel 35HRC or less	Uses coarse grain substrate and GX Coating. Suitable for dry high speed mild steel cutting.
AX2040	AX Coating CVD	89.0 3.0	For dry high speed stainless steel cutting	Uses coarse grain substrate and GX Coating. Suitable for dry high speed stainless steel cutting.
GX2160	GX Coating CVD	89.0 3.0	For dry high speed stainless steel cutting	Uses coarse grain substrate and GX Coating. Suitable for dry high speed stainless steel cutting.
GF30	GF Coating CVD	89.0 3.0	For wet general purpose of steel	Suitable for wet mild steel cutting.
JS4030	JS Coating PVD	90.5 2.7	General purpose for steel	Uses coarse grain substrate and JS coating. Suitable for cutting of the common steels.

Each characteristic value represents a typical value. Please refer to C5 for ISO classification of each grades.

Grade name	Coating name Coating type	Base material hardness (HRA) Base material bending strength (GPa)	Application	Features
JS4060	JS Coating PVD	89.0 3.0	For wet unstable cutting	Uses coarse grain substrate and JS Coating. Suitable for unstable mild steel cutting and wet cuttting
JM4160	AJ Coating PVD	89.0 3.8	General purpose for wet stainless steel cutting	Uses coarse grain substrate and AJ Coating. Suitable for univerasal stainless cutting.
PTH40H	TH Coating PVD	89.0 3.8	General purpose for wet stainless steel cutting	Uses coarse grain substrate and nanocomposite coating. Suitable for stainless cutting.
ATH80D	ATH Coating PVD	93.6 4.0	Finishing for hardened steels (45-65HRC)	Uses ultra micro grain substrate and ATH Coating. High wear resistance, Suitable for high hard material finishing.
TH303	TH3 Coating PVD	93.6 4.0	Finishing for hardened steels (45-65HRC)	Uses ultra micro grain substrate and TH3 Coating. High wear resistance, Suitable for high hard material finishing.
TH308	TH3 Coating PVD	93.3 4.0	Finishing for hardened steels	Uses ultra micro grain substrate and TH3 Coating. Suitable for hardened steel general finishing.
ATH08M	ATH Coating PVD	93.3 4.0	Finishing for hardened steels	Uses ultra micro grain substrate and ATH Coating. High wear resistance, Suitable for high hard material finishing.
PN08M	PN Coating PVD	93.3 4.0	Finishing for hardened steels	Uses ultra micro grain substrate and PN Coating. Suitable for high speed steel finishing.
PTH08M	TH Coating PVD	93.3 4.0	Finishing for hardened steels	Uses ultra micro grain substrate and nanocomposite coating. Suitable for high speed steel finishing.
PCA08M	C Coating PVD	93.3 4.0	Finishing for general steels	Uses ultra micro grain substrate and TiAlN coating. Suitable for general cutting.
ACS05E	ACS Coating PVD	93.1 3.6	Finishing for hardened steels	Uses ultra micro grain substrate and ACS Coating. Suitable for high speed steel finishing.
ATH10E	ATH Coating PVD	93.0 3.8	Finishing for cast iron	Uses micro grain substrate and ATH Coating. Suitable for cast iron finishing.
TH315	TH3 Coating PVD	92.4 4.2	Finishing for hardened steels	Uses ultra micro grain substrate and TH3 Coating. Excellent in finishing of high hardened materials up to 55HRC.
PN215	PN2 Coating PVD	92.4 4.2	Finishing for general steels	Uses ultra micro grain substrate and PN2 Coating. High adhesion resistance, Suitable for general steel finishing.
PN15M	PN Coating PVD	92.4 4.2	Finishing for general steels	Uses ultra micro grain substrate and PN Coating. Suitable for general steel finishing.
PCA12M	C Coating PVD	92.4 4.2	Finishing for general steels	Uses ultra micro grain substrate and TiAlN coating. Suitable for general cutting.
MZ1000	TH Coating PVD	92.0 2.0	For face milling of steel	Uses cermet substrate and TH Coating. Suitable for finished surface and high speed cutting.
SD5010	SD Coating PVD	92.0 2.6	For aluminum alloys and non ferrous metals	Uses high hardness DLC Coating. Suitable for aluminum alloys etc. and non ferrous metals.
HD7010	HD Coating CVD	91.3 2.8	For graphites and fiber-reinforced plastics (FRP)	Uses high hardness diamond coating. Suitable for wear resistance and graphite cutting etc.

Each characteristic value represents a typical value. Please refer to C5 for ISO classification of each grades.

Radius Mill TR4F

YouTube

・Exclusive high-efficiency cutting, resulting from unique insert and body shapes

Roughing | Planing | Slotting | Die-sinking | Profiling | Helical | Vertical | Cutting Conditions C14

Shank type

Fig.1（Standard type）

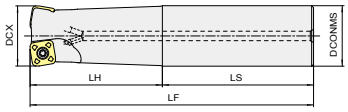
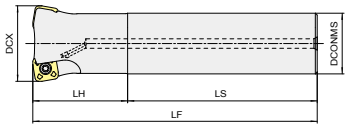


Fig.2（Undercut type）



With air hole

Inch ITR4F40○○□-○

Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

Type	Item code	Stock	No.of flutes	Size (inch)					Shape	Recommended insert
				DCX	LF	LH	LS	DCONMS		
Regular	ITR4F4020S-2	●	2	1.250	6.000	2.750	3.250	1.250	Fig.1	SDNW120520TR(-P) SDMT120520TR
	ITR4F4024S-3	●	3	1.500	6.000	2.000	4.000	1.500	Fig.1	
Long	ITR4F4020L-2	●	2	1.250	8.000	5.000	3.000	1.250	Fig.1	
	ITR4F4024L-3	●	3	1.500	10.000	2.000	8.000	1.500	Fig.1	

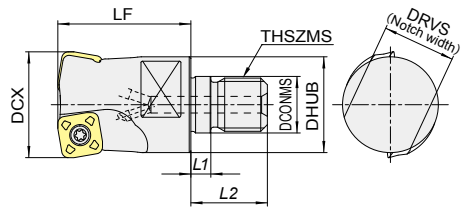
Metric TR4F40○○□32-○

Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

Type	Item code	Stock	No.of flutes	Size (mm)					Shape	Recommended insert
				DCX	LF	LH	LS	DCONMS		
Regular	TR4F4032S32-2	●	2	32	150	70	80	32	Fig.1	SDNW120520TR(-P) SDMT120520TR
	TR4F4040S32-3	●	3	40	150	50	100	32	Fig.2	
Long	TR4F4032L32-2	●	2	32	200	120	80	32	Fig.1	
	TR4F4040L32-3	●	3	40	250	50	200	32	Fig.2	

● : Inventory maintained in US

Modular type



With air hole

Inch ITR4F40○○M-○

Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (inch)								Recommended insert
			DCX	LF	*L1*	*L2*	DCONMS	DHUB	THSZMS	DRVS	
ITR4F4020M-2	●	2	1.250	1.575	.236	.906	.669	1.134	M16	.866	SDNW120520TR(-P) SDMT120520TR
ITR4F4024M-3	●	3	1.500	1.575	.236	.906	.669	1.134	M16	.866	

Metric TR4F40○○M-○

Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (mm)								Recommended insert
			DCX	LF	*L1*	*L2*	DCONMS	DHUB	THSZMS	DRVS	
TR4F4032M-2	●	2	32	40	6	23	17	28.8	M16	22	SDNW120520TR(-P) SDMT120520TR
TR4F4040M-3	●	3	40	40	6	23	17	28.8	M16	22	

【Note】

When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease,etc. to the "contact faces" and "modular screws" of the "modular mill","dedicated shanks" and "dedicated arbor".

Radius Mill TR4F

Bore type

Numeric figure comes in a circle ◌ and alphabetical character comes in a square ⬚.

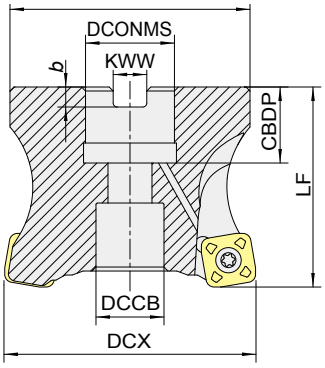


Fig.1（With air hole）

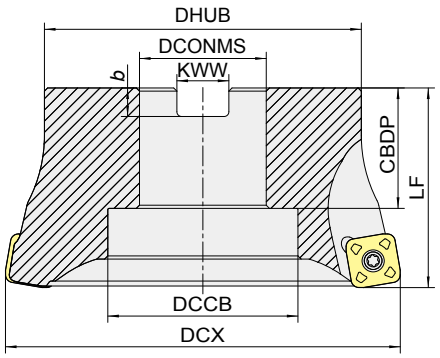


Fig.2（Without air hole）

Inch ITR4F◌◌◌◌B-◌◌(-1.25)

Numeric figure comes in a circle ◌.

Type	Item code	Stock	No.of flutes	Size (inch) DCX	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB	Shape	Recommended insert
Internal diameter inch size	ITR4F4032B-5	●	5	2.000	1.874	2.000	.748	.315	.197	1.874	.630	Fig.1	SDNW120520TR(-P) SDMT120520TR
	ITR4F4040B-6	●	6	2.500	2.374	2.000	.945	.374	.236	1.000	.787	Fig.1	
	ITR4F4048B-7	●	7	3.000	2.752	2.000	.945	.374	.236	1.000	.787	Fig.1	
	ITR4F4048B-7-1.25	●	7	3.000	2.874	2.500	1.260	.500	.315	1.250	1.024	Fig.1	
	ITR4F4064B-8	●	8	4.000	3.815	2.500	1.181	.626	.394	1.500	1.181	Fig.1	
	ITR4F4080B-9	●	9	5.000	3.815	2.500	1.654	.626	.394	1.500	2.205	Fig.2	
	ITR4F4096B-11	●	11	6.000	4.874	2.500	1.693	.752	.433	2.000	3.228	Fig.2	
	ITR4F5040B-4	●	4	2.500	2.374	2.000	.945	.374	.236	1.000	.787	Fig.1	SDNW150525ZTR SDMT150525ZTR
	ITR4F5048B-5	●	5	3.000	2.752	2.000	.945	.374	.236	1.000	.787	Fig.1	
	ITR4F5048B-5-1.25	●	5	3.000	2.874	2.500	1.260	.500	.315	1.250	1.024	Fig.1	
	ITR4F5064B-6	●	6	4.000	3.815	2.500	1.181	.626	.394	1.500	1.181	Fig.1	
	ITR4F5080B-7	●	7	5.000	3.815	2.500	1.654	.626	.394	1.500	2.205	Fig.2	
	ITR4F5096B-10	●	10	6.000	4.874	2.500	1.693	.752	.433	2.000	3.228	Fig.2	

【Note】Arbor screw is not included.

Parts

Parts / Shape / Cutter body	Clamp screw	Fastening torque N·m	Fastening torque lbf·in	Wrench	Screw anti-seizure agent
(I)TR4F4◌◌◌S/L/M/B(32)-◌	262-141	2.9	25.67	105-T15	P-37
(I)TR4F5◌◌◌B(M)-◌(-1.25)	555-141	4.9	43.37	105-T20	

【Note】The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage. Includes one spare clamp screw for shank type and modular, two spare clamp screws for bore type.

● : Inventory maintained in US

Metric TR4F○○○○B□-○

Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

Type	Item code	Stock	No.of flutes	Size (mm) DCX	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB	Shape	Recommended insert
Internal diameter inch size	TR4F4050B-3	●	3	50	47	50	19	8.4	5	22.225	17	Fig.1	SDNW120520TR(-P) SDMT120520TR
	TR4F4050B-4	●	4										
	TR4F4050B-5	●	5										
	TR4F4063B-4	●	4	63	60	50	19	8.4	5	22.225	17		
	TR4F4063B-5	●	5										
	TR4F4063B-6	●	6										
	TR4F4080B-5	●	5	80	76	70	32	12.7	8	31.75	26		
	TR4F4080B-7	●	7										
	TR4F4100B-6	●	6	100	96	70	32	12.7	8	31.75	26		
	TR4F4100B-8	●	8										
	TR4F5063B-4	●	4	63	60	50	19	8.4	5	22.225	17		SDNW150525ZTR SDMT150525ZTR
	TR4F5080B-5	●	5	80	76	70	32	12.7	8	31.75	26		
	TR4F5100B-6	●	6	100	96	70	32	12.7	8	31.75	26		
	TR4F5125B-6	●	6	125	100	63	38	15.9	10	38.1	60	Fig.2	
	TR4F5125B-7	●	7										
Internal diameter mm size	TR4F4050BM-3	●	3	50	47	50	20	10.4	6.3	22	17	Fig.1	SDNW120520TR(-P) SDMT120520TR
	TR4F4050BM-4	●	4										
	TR4F4050BM-5	●	5										
	TR4F4063BM-4	●	4	63	60	50	20	10.4	6.3	22	17		
	TR4F4063BM-5	●	5										
	TR4F4063BM-6	●	6										
	TR4F4080BM-5	●	5	80	76	70	22	12.4	7	27	20		
	TR4F4080BM-7	●	7										
	TR4F4100BM-6	●	6	100	96	70	25.5	14.4	8	32	26		
	TR4F4100BM-8	●	8										
	TR4F5063BM-4	●	4	63	60	50	20	10.4	6.3	22	17		SDNW150525ZTR SDMT150525ZTR
	TR4F5080BM-5	●	5	80	76	70	22	12.4	7	27	20		
	TR4F5100BM-6	●	6	100	96	70	25.5	14.4	8	32	26		
	TR4F5125BM-6	●	6	125	100	63	38	16.4	9	40	60	Fig.2	
	TR4F5125BM-7	●	7										

【Note】Arbor screw is not included.

Radius Mill TR4F

Insert

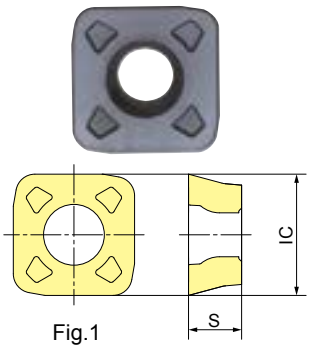


Fig.1

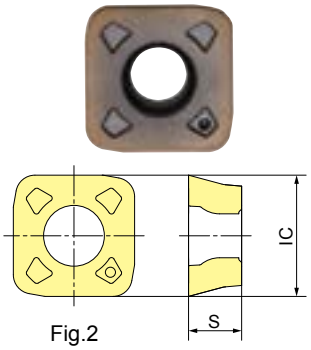


Fig.2

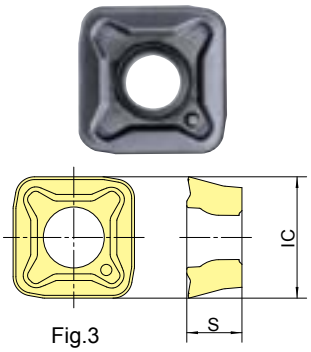


Fig.3

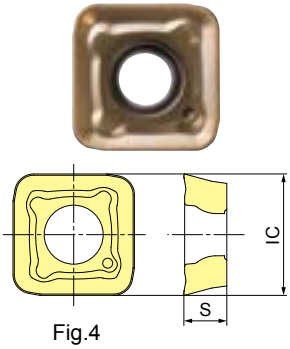


Fig.4

P	Carbon steel		■		□	■
M	Stainless steel, etc.			■		
K	Cast iron		■		□	□
H	Hardened steel	■	□			

■ : General cutting, First recommendation
□ : General cutting, Second recommendation

Item code	Tolerance class	AJ-Coating			JS-Coating	GX-Coating	Size (mm)		Shape
		JP4105	JP4120	JM4160	JS4060	GX2140	IC	S	
SDNW120520TR	N	●	●	●	●	●	12.7	5.56	Fig.1
SDNW120520TR-P			●※1	●					Fig.2
SDNW150525ZTR		●	●	●	●	●	15.875		Fig.1
SDMT120520TR	M		●	●	●	●	12.7	5.76	Fig.3
SDMT150525ZTR			●	●	●	●	15.875	5.61	Fig.4

※ 1 : Can be used to process the precipitation hardening stainless steel.
【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Proper use of inserts

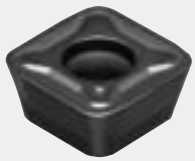
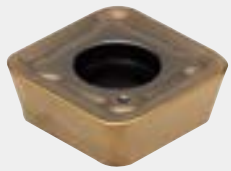
SDNW120520TR / SDNW150525ZTR

The recommended default insert offers superior cutting edge strength. Ideal for general high-feed cutting.

SDNW120520TR-P

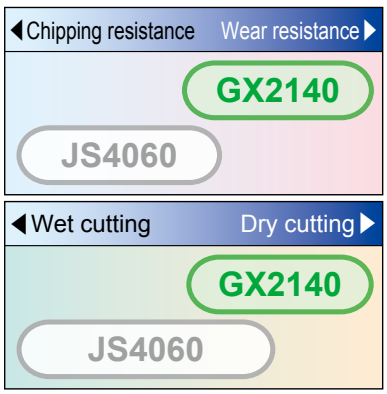
Recommended for relatively continuous (uninterrupted) cutting with short overhangs.
Ideal for pre-hardened steels (P20 and P21 materials).

SDMT120520TRSDMT150525ZTR

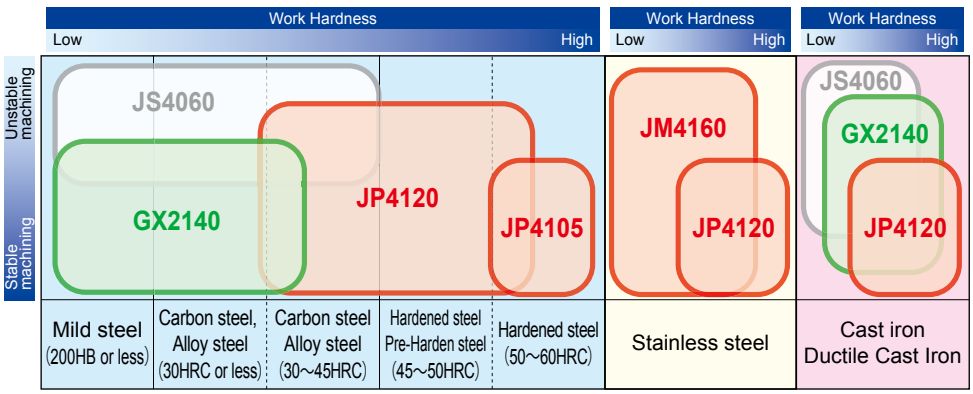



Breaker type insert.
Ideal for rough machining with low-rigidity work materials and low-horsepower M/C.

Grade map for less than 35HRC



Grade map for work materials

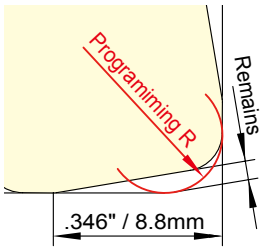


● : Inventory maintained in US No Mark : Manufactured upon request only

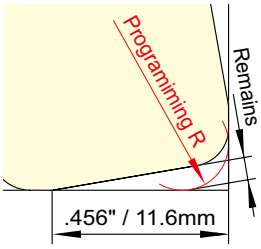
Programming R and maximum cutting depth

- Please define the tool shape in the CAM as indicated in the following table:

Insert	Programming R (inch/mm)	Remains (inch/mm)	Maximum cutting depth(inch/mm)
SDNW120520TR(-P) SDMT120520TR	.1181" 3.0mm	.0394" 1mm	.0472" 1.2mm
SDNW150525ZTR SDMT150525ZTR	.1181" 3.0mm	.0579" 1.47mm	.0787" 2.0mm
	.1575" 4.0mm	.0520" 1.32mm	



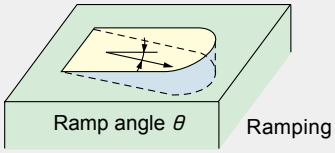
SDNW120520TR(-P)
SDMT120520TR



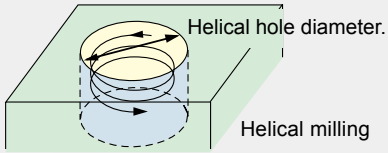
SDNW150525ZTR
SDMT150525ZTR

Maximum ramp angle and helical hole diameter

- Since the cutting flute do not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



Ramping



Helical milling

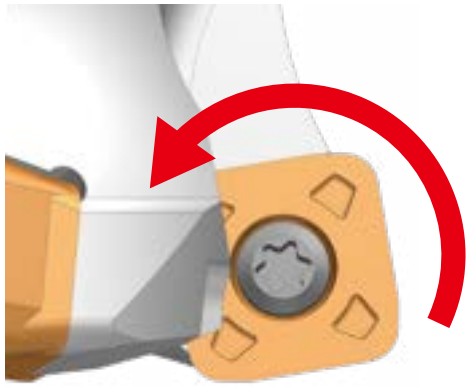
- **For ramping and helical cutting, please set the "*Vf*" to around 50% of recommended cutting condition.**

Cutter type		Modular/ Shank Type		Bore Type												
Inserts		SDNW120520TR(-P) SDMT120520TR									SDNW150525ZTR / SDMT150525ZTR					
Tool dia. DCX		1.25" φ32mm	1.5" φ40mm	2" φ50mm	2.5" φ63mm	3"	φ80mm	4" φ100mm	5"	6"	2.5" φ63mm	3"	φ80	4" φ100mm	5" φ125mm	6"
Ramping	Maximum ramp angle θ	1°	1.4°	2°	2°	1.5°	1.5°	1°	0.7°	0.5°	3°	2°	2°	1.5°	1°	0.7°
	Recommendation	1°							0.5°	0.5°	2°	1°			0.5°	
Helical milling	Hole Dia. (Inch)	1.79" ~2.34"	2.29" ~2.84"	3.29" ~3.84"	4.29" ~4.84"	5.29" ~5.84"	5.59" ~6.14"	7.29" ~7.84"	9.29" ~9.84"	11.29" ~11.84"	4.06" ~4.80"	5.06" ~5.80"	5.59" ~6.14"	7.06" ~7.80"	9.06" ~9.80"	11.06" ~11.80"
	Hole Dia. (mm)	46～60	62～76	82～96	108～122		142～156	182～196	226～245		102～121		142～156	182～196	226～245	

【Note】① The ramp angle θ should be set within the ranges listed above. Do not exceed the recommended value.
② For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.
③ It is recommended that the tool be used while performing sufficient chip removal and checking that there are no abnormal vibrations.

Attention for the corner change

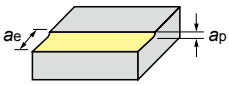
- Turn the insert counterclockwise upon corner change.



Radius Mill TR4F

①Shank type / Modular type

ITR4F4000type(ITR4F40○○S/M/L-○)
Numeric figure in a circle ○.



Standard cutting conditions for contour roughing

Inch

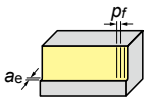
Type			Shank Type				Modular Type					
Work material	Recommended inserts grade	Tool dia. DCX	1.25"(2 Flutes)		1.5"(3 Flutes)		1.25"(2 Flutes)			1.5"(3 Flutes)		
		Overhang	<3DCX		<3DCX		<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High-speed Cutting	General purpose	High-speed Cutting	General purpose	High-speed Cutting		General purpose	High-speed Cutting	
Mild steel (200HB or less)	GX2140 JS4060	*n* (min-1)	1,500	2,010	1,250	1,670	1,500	2,010	1,500	1,250	1,670	1,250
		Vc(SFM)	492	656	492	656	492	656	492	492	656	492
		Vf(IPM)	210	320	270	400	210	320	210	270	400	270
		fz(IPT)	.071	.079	.071	.079	.071	.079	.071	.071	.079	.071
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(in3/min)	5	7	8	12	5	7	5	8	12	8
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	*n* (min-1)	1,500	2,010	1,250	1,670	1,500	2,010	1,500	1,250	1,670	1,250
		Vc(SFM)	492	656	492	656	492	656	492	492	656	492
		Vf(IPM)	210	320	270	400	210	320	210	270	400	270
		fz(IPT)	.071	.079	.071	.079	.071	.079	.071	.071	.079	.071
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(in3/min)	5	7	8	12	5	7	5	8	12	8
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	*n* (min-1)	1,300	1,500	1,090	1,250	1,300	1,500	1,300	1,090	1,250	1,090
		Vc(SFM)	427	492	427	492	427	492	427	427	492	427
		Vf(IPM)	180	240	230	300	180	240	180	230	300	230
		fz(IPT)	.071	.079	.071	.079	.071	.079	.071	.071	.079	.071
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(in3/min)	4	5	7	9	4	5	4	7	9	7
Stainless steel	JM4160	*n* (min-1)	1,000	2,010	840	1,670	1,000	2,010	1,000	840	1,670	840
		Vc(SFM)	328	656	328	656	328	656	328	328	656	328
		Vf(IPM)	80	160	100	200	80	160	80	100	200	100
		fz(IPT)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(in3/min)	2	3	3	6	2	3	2	3	6	3
Cast iron	JP4120 GX2140	*n* (min-1)	1,500	2,010	1,250	1,670	1,500	2,010	1,500	1,250	1,670	1,250
		Vc(SFM)	492	656	492	656	492	656	492	492	656	492
		Vf(IPM)	240	320	300	400	240	320	240	300	400	300
		fz(IPT)	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(in3/min)	5	7	9	12	5	7	5	9	12	9
Hardened steel (45～50HRC)	JP4120 JP4105	*n* (min-1)	800	900	670	750	800	900	800	670	750	670
		Vc(SFM)	262	295	262	295	262	295	262	262	295	262
		Vf(IPM)	30	60	40	70	30	60	30	40	70	40
		fz(IPT)	.02	.031	.02	.031	.02	.031	.02	.02	.031	.02
		ap(inch)	.031	.031	.031	.031	.031	.031	.031	.031	.031	.031
		ae(inch)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(in3/min)	1	1	1	2	1	1	1	1	2	1
Hardened steel (50～60HRC)	JP4105 JP4120	*n* (min-1)	800	900	670	750	800	900	800	670	750	670
		Vc(m/min)	262	295	262	295	262	295	262	262	295	262
		Vf(mm/min)	30	40	30	50	30	40	30	30	50	30
		fz(mm/t)	.016	.024	.016	.024	.016	.024	.016	.016	.024	.016
		ap(mm)	.031	.031	.031	.031	.031	.031	.031	.031	.031	.031
		ae(mm)	.551	.551	.748	.748	.551	.551	.551	.748	.748	.748
		Q(cm3/min)	1	1	1	1	1	1	1	1	1	1

Standard cutting conditions for vertical roughing

Inch

Work material	Recommended inserts grade	Tool dia. DCX	1.25"(2 Flutes)		1.5"(3 Flutes)	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	*n* (min-1)	2,010	2,010	1,670	1,670
		Vc(SFM)	656	656	656	656
		Vf(IPM)	24	24	30	30
		fz(IPT)	.006	.006	.006	.006
		pf(inch)	≦ 0.5DCX		≦ 0.5DCX	
		ae(inch)	≦ .354		≦ .354	

【Note】



① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
- Reduce rotation speed and table feed rate by 50 to 70%
- Reduce cutting depth *a*p by 50 to 70%
- Reduce cutting width *a*e by 50 to 70%

② Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.
④ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth *a*p to suit machining conditions.
⑤ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑥ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑦ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑧ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑨ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑩ The following equation can be used to determine the metal removal rate per unit time *Q*;

$$Q(cm^3/min)=a_p(mm)\times a_e(mm)\times V_f(mm/min) / 1000$$

Radius Mill TR4F

②Bore type ITR4F4000 type

Numeric figure in a circle ◌ and Alphabetical character comes in a square ⬚.

Standard cutting conditions for contour roughing

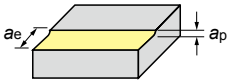
Work material	Recommended inserts grade	Tool dia. DCX	2"(5 Flutes)			2.5"(6 Flutes)			3"(7 Flutes)		
		Overhang	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High-speed Cutting		General purpose	High-speed Cutting		General purpose	High-speed Cutting	
Mild steel (200HB or less)	GX2140 JS4060	*n* (min-1)	940	1,250	940	750	1,000	750	630	840	630
		Vc(SFM)	492	656	492	492	656	492	492	656	492
		Vf(IPM)	330	490	330	320	470	320	310	460	310
		fz(IPT)	.071	.079	.071	.071	.079	.071	.071	.079	.071
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	15	23	15	22	32	22	27	40	27
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	*n* (min-1)	940	1,250	940	750	1,000	750	630	840	630
		Vc(SFM)	492	656	492	492	656	492	492	656	492
		Vf(IPM)	330	490	330	320	470	320	310	460	310
		fz(IPT)	.071	.079	.071	.071	.079	.071	.071	.079	.071
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	15	23	15	22	32	22	27	40	27
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	*n* (min-1)	810	940	810	650	750	650	540	630	540
		Vc(SFM)	427	492	427	427	492	427	427	492	427
		Vf(IPM)	290	370	290	280	360	280	270	350	270
		fz(IPT)	.071	.079	.071	.071	.079	.071	.071	.079	.071
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	13	17	13	19	24	19	24	31	24
Stainless steel	JM4160	*n* (min-1)	630	1,250	630	500	1,000	500	420	840	420
		Vc(SFM)	328	656	328	328	656	328	328	656	328
		Vf(IPM)	120	240	120	120	230	120	110	230	110
		fz(IPT)	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	6	11	6	8	16	8	10	20	10
Cast iron	JP4120 GX2140	*n* (min-1)	940	1,250	940	750	1,000	750	630	840	630
		Vc(SFM)	492	656	492	492	656	492	492	656	492
		Vf(IPM)	370	490	370	360	470	360	350	460	350
		fz(IPT)	.079	.079	.079	.079	.079	.079	.079	.079	.079
		ap(inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	17	23	17	24	32	24	31	40	31
Hardened steel (45～50HRC)	JP4120 JP4105	*n* (min-1)	500	560	500	400	450	400	330	380	330
		Vc(SFM)	262	295	262	262	295	262	262	295	262
		Vf(IPM)	50	90	50	50	80	50	50	80	50
		fz(IPT)	.02	.031	.02	.02	.031	.02	.02	.031	.02
		ap(inch)	.031	.031	.031	.031	.031	.031	.031	.031	.031
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	2	3	2	3	4	3	3	6	3
Hardened steel (50～60HRC)	JP4105 JP4120	*n* (min-1)	500	560	500	400	450	400	330	380	330
		Vc(SFM)	262	295	262	262	295	262	262	295	262
		Vf(IPM)	40	70	40	40	60	40	40	60	40
		fz(IPT)	.016	.024	.016	.016	.024	.016	.016	.024	.016
		ap(inch)	.031	.031	.031	.031	.031	.031	.031	.031	.031
		ae(inch)	1.181	1.181	1.181	1.732	1.732	1.732	2.244	2.244	2.244
		Q(in³/min)	1	3	1	2	3	2	3	4	3

Standard cutting conditions for vertical roughing

Work material	Recommended inserts grade	Tool dia. DCX	2"(5 Flutes)		2.5"(6 Flutes)		3"(7 Flutes)	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	*n* (min-1)	1,250	1,250	1,000	1,000	840	840
		Vc(SFM)	656	656	656	656	656	656
		Vf(IPM)	50	50	40	40	47	47
		fz(IPT)	.008	.008	.008	.008	.008	.008
		pf(inch)	≦ 0.5DCX		≦ 0.5DCX		≦ 0.5DCX	
		ae(inch)	≦ 0.354		≦ 0.354		≦ 0.354	

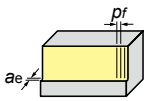
【Note】 ① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
- Reduce rotation speed and table feed rate by 50 to 70%
- Reduce cutting depth *ap* by 50 to 70%
- Reduce cutting width *ae* by 50 to 70%

② Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.



Inch

4"(8 Flutes)			5"(9 Flutes)			6"(11 Flutes)			Work material
<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	
General purpose	High-speed Cutting		General purpose	High-speed Cutting		General purpose	High-speed Cutting		
470	630	470	380	500	380	310	420	310	Mild steel (200HB or less)
492	656	492	492	656	492	492	656	492	
270	400	270	240	360	240	240	360	240	
.071	.079	.071	.071	.079	.071	.071	.079	.071	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
34	50	34	40	60	40	48	72	48	
470	630	470	380	500	380	310	420	310	Carbon steel Alloy steel (35HRC or less)
492	656	492	492	656	492	492	656	492	
270	400	270	240	360	240	240	360	240	
.071	.079	.071	.071	.079	.071	.071	.079	.071	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
34	50	34	40	60	40	48	72	48	
410	470	410	330	380	330	270	310	270	Carbon steel Alloy steel (35～45HRC)
427	492	427	427	492	427	427	492	427	
230	300	230	210	270	210	210	270	210	
.071	.079	.071	.071	.079	.071	.071	.079	.071	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
29	37	29	35	45	35	42	54	42	
310	630	310	250	500	250	210	420	210	Stainless steel
328	656	328	328	656	328	328	656	328	
100	200	100	90	180	90	90	180	90	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
12	25	12	15	30	15	18	36	18	
470	630	470	380	500	380	310	420	310	Cast iron
492	656	492	492	656	492	492	656	492	
300	400	300	270	360	270	270	360	270	
.079	.079	.079	.079	.079	.079	.079	.079	.079	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
37	50	37	45	60	45	54	72	54	
250	280	250	200	230	200	170	190	170	Hardened steel (45～50HRC)
262	295	262	262	295	262	262	295	262	
40	70	40	40	60	40	40	60	40	
.02	.031	.02	.02	.031	.02	.02	.031	.02	
.031	.031	.031	.031	.031	.031	.031	.031	.031	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
4	7	4	5	8	5	6	10	6	
250	280	250	200	230	200	170	190	170	Hardened steel (50～60HRC)
262	295	262	262	295	262	262	295	262	
30	50	30	30	50	30	30	50	30	
.016	.024	.016	.016	.024	.016	.016	.024	.016	
.031	.031	.031	.031	.031	.031	.031	.031	.031	
3.189	3.189	3.189	4.252	4.252	4.252	5.118	5.118	5.118	
3	5	3	4	7	4	5	8	5	



Inch

4"(8 Flutes)		5"(9 Flutes)		6"(11 Flutes)		Work material
<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	
630	630	500	500	420	420	Cast iron
656	656	656	656	656	656	
40	40	36	36	37	37	
.008	.008	.008	.008	.008	.008	
≦ 0.5DCX		≦ 0.5DCX		≦ 0.5DCX		
≦ 0.354		≦ 0.354		≦ 0.354		

④ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth ap to suit machining conditions.
⑤ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑥ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑦ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑧ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑨ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑩ The following equation can be used to determine the metal removal rate per unit time Q; $Q(cm^3/min)=a_p(mm)\times a_e(mm)\times V_f(mm/min) / 1000$

Radius Mill TR4F

②Bore type ITR4F5000 type

Numeric figure in a circle ◌ and Alphabetical character comes in a square ⬚

Standard cutting conditions for contour roughing

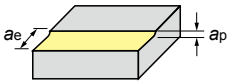
Work material	Recommended inserts grade	Tool dia. DCX	2.5"(4 Flutes)			3"(5 Flutes)		
		Overhang	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High efficiency		General purpose	High efficiency	
Mild steel (200HB or less)	GX2140 JS4060	*n* (min-1)	750	900	750	630	750	630
		Vc(SFM)	492	591	492	492	591	492
		Vf(IPM)	180	280	210	190	300	220
		fz(IPT)	.059	.079	.071	.059	.079	.071
		ap(inch)	.079	.079	.039	.079	.079	.039
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	21	33	12	30	47	17
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	*n* (min-1)	750	900	750	630	750	630
		Vc(SFM)	492	591	492	492	591	492
		Vf(IPM)	180	280	210	190	300	220
		fz(IPT)	.059	.079	.071	.059	.079	.071
		ap(inch)	.079	.079	.039	.079	.079	.039
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	21	33	12	30	47	17
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	*n* (min-1)	650	750	650	540	630	540
		Vc(SFM)	427	492	427	427	492	427
		Vf(IPM)	180	240	180	190	250	190
		fz(IPT)	.071	.079	.071	.071	.079	.071
		ap(inch)	.059	.059	.039	.059	.059	.039
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	16	21	11	22	29	15
Stainless steel	JM4160	*n* (min-1)	500	1,000	500	420	840	420
		Vc(SFM)	328	656	328	328	656	328
		Vf(IPM)	80	160	80	80	160	80
		fz(IPT)	.039	.039	.039	.039	.039	.039
		ap(inch)	.059	.059	.039	.059	.059	.039
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	7	14	5	9	19	6
Cast iron	JP4120 GX2140	*n* (min-1)	750	900	750	630	750	630
		Vc(SFM)	492	591	492	492	591	492
		Vf(IPM)	240	330	240	250	340	250
		fz(IPT)	.079	.091	.079	.079	.091	.079
		ap(inch)	.079	.079	.079	.079	.079	.079
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	28	39	28	39	53	39
Hardened steel (45～50HRC)	JP4120 JP4105	*n* (min-1)	400	450	400	330	380	330
		Vc(SFM)	262	295	262	262	295	262
		Vf(IPM)	30	60	30	30	60	30
		fz(IPT)	.02	.031	.02	.02	.031	.02
		ap(inch)	.039	.039	.039	.039	.039	.039
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	2	4	2	2	5	2
Hardened steel (50～60HRC)	JP4105 JP4120	*n* (min-1)	400	450	400	330	380	330
		Vc(SFM)	262	295	262	262	295	262
		Vf(IPM)	30	40	30	30	50	30
		fz(IPT)	.016	.024	.016	.016	.024	.016
		ap(inch)	.039	.039	.039	.039	.039	.039
		ae(inch)	1.496	1.496	1.496	1.969	1.969	1.969
		Q(in³/min)	2	2	2	2	4	2

Standard cutting conditions for vertical roughing

Work material	Recommended inserts grade	Tool dia. DCX	2.5"(4 Flutes)		3"(5 Flutes)	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	*n* (min-1)	1,000	1,000	840	840
		Vc(SFM)	656	656	656	656
		Vf(IPM)	32	32	34	34
		fz(IPT)	008	.008	.008	.008
		pf(inch)	≦ 0.5DCX		≦ 0.5DCX	
		ae(inch)	≦ 0.433		≦ 0.433	

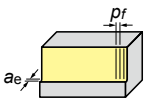
【Note】 ① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
・Reduce rotation speed and table feed rate by 50 to 70%
・Reduce cutting depth *ap* by 50 to 70%
・Reduce cutting width *ae* by 50 to 70%
② If the machine has insufficient power, first try reducing the cutting depth. Next, try reducing the rotation speed and table feed rate.
③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.

※ To ensure high-efficiency conditions, we recommend checking the machine's power/torque chart and using a rotation speed that can maintain the rated power of the spindle.



Inch

4"(6 Flutes)			5"(7 Flutes)			6"(10 Flutes)			Work material
<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	
General purpose	High efficiency		General purpose	High efficiency		General purpose	High efficiency		
470	560	470	380	450	380	310	380	310	Mild steel (200HB or less)
492	591	492	492	591	492	492	591	492	
170	270	200	160	250	190	180	300	220	
.059	.079	.071	.059	.079	.071	.059	.079	.071	
.079	.079	.039	.079	.079	.039	.079	.079	.039	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
40	64	23	51	79	30	68	114	41	
470	560	470	380	450	380	310	380	310	Carbon steel Alloy steel (35HRC or less)
492	591	492	492	591	492	492	591	492	
170	270	200	160	250	190	180	300	220	
.059	.079	.071	.059	.079	.071	.059	.079	.071	
.079	.079	.039	.079	.079	.039	.079	.079	.039	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
40	64	23	51	79	30	68	114	41	
410	470	410	330	380	330	270	310	270	Carbon steel Alloy steel (35～45HRC)
427	492	427	427	492	427	427	492	427	
170	220	170	160	210	160	190	240	190	
.071	.079	.071	.071	.079	.071	.071	.079	.071	
.059	.059	.039	.059	.059	.039	.059	.059	.039	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
30	39	20	38	50	25	54	68	36	
310	630	310	250	500	250	210	420	210	Stainless steel
328	656	328	328	656	328	328	656	328	
70	150	70	70	140	70	80	160	80	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
.059	.059	.039	.059	.059	.039	.059	.059	.039	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
12	26	8	17	33	11	23	45	15	
470	560	470	380	450	380	310	380	310	Cast iron
492	591	492	492	591	492	492	591	492	
220	310	220	210	290	210	240	350	240	
.079	.091	.079	.079	.091	.079	.079	.091	.079	
.079	.079	.079	.079	.079	.079	.079	.079	.079	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
52	73	52	67	92	67	91	133	91	
250	280	250	200	230	200	170	190	170	Hardened steel (45～50HRC)
262	295	262	262	295	262	262	295	262	
30	50	30	30	50	30	30	60	30	
.02	.031	.02	.02	.031	.02	.02	.031	.02	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
4	6	4	5	8	5	6	11	6	
250	280	250	200	230	200	170	190	170	Hardened steel (50～60HRC)
262	295	262	262	295	262	262	295	262	
20	40	20	20	40	20	30	50	30	
.016	.024	.016	.016	.024	.016	.016	.024	.016	
.039	.039	.039	.039	.039	.039	.039	.039	.039	
2.992	2.992	2.992	4.016	4.016	4.016	4.803	4.803	4.803	
2	5	2	3	6	3	6	9	6	



Inch

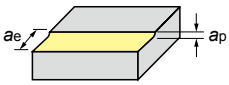
4"(6 Flutes)		5"(7 Flutes)		6"(10 Flutes)		Work material
<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	
630	630	500	500	420	420	Cast iron
656	656	656	656	656	656	
30	30	28	28	34	34	
.008	.008	.008	.008	.008	.008	
≦ 0.5DCX		≦ 0.5DCX		≦ 0.5DCX		
≦ 0.433		≦ 0.433		≦ 0.433		

⑤ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth *a*p to suit machining conditions.
⑥ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑦ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑧ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑨ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑩ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑪ The following equation can be used to determine the metal removal rate per unit time Q; $Q(cm^3/min) = a_p(mm) \times a_e(mm) \times V_f(mm/min) / 1000$

Radius Mill TR4F

①Shank type / Modular type

TR4F4000type(TR4F40◯◯S/M/L(32)-◯)
Numeric figure in a circle ◯.



Standard cutting conditions for contour roughing

Metric

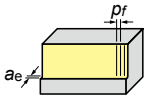
Type			Shank Type				Modular Type					
Work material	Recommended inserts grade	Tool dia. DCX	φ32(2 Flutes)		φ40(3 Flutes)		φ32(2 Flutes)			φ40(3 Flutes)		
		Overhang	<3DCX		<3DCX		<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High-speed Cutting	General purpose	High-speed Cutting	General purpose	High-speed Cutting		General purpose	High-speed Cutting	
Mild steel (200HB or less)	GX2140 JS4060	n (min-1)	1,490	1,990	1,190	1,590	1,490	1,990	1,490	1,190	1,590	1,190
		Vc(m/min)	150	200	150	200	150	200	150	150	200	150
		Vf(mm/min)	5,360	7,960	6,430	9,540	5,360	7,960	5,360	6,430	9,540	6,430
		fz(mm/t)	1.8	2.0	1.8	2.0	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	75	111	141	210	75	111	75	141	210	141
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	n (min-1)	1,490	1,990	1,190	1,590	1,490	1,990	1,490	1,190	1,590	1,190
		Vc(m/min)	150	200	150	200	150	200	150	150	200	150
		Vf(mm/min)	5,360	7,960	6,430	9,540	5,360	7,960	5,360	6,430	9,540	6,430
		fz(mm/t)	1.8	2.0	1.8	2.0	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	75	111	141	210	75	111	75	141	210	141
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	n (min-1)	1,290	1,490	1,030	1,190	1,290	1,490	1,290	1,030	1,190	1,030
		Vc(m/min)	130	150	130	150	130	150	130	130	150	130
		Vf(mm/min)	4,640	5,960	5,560	7,140	4,640	5,960	4,640	5,560	7,140	5,560
		fz(mm/t)	1.8	2.0	1.8	2.0	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	65	83	122	157	65	83	65	122	157	122
Stainless steel	JM4160	n (min-1)	990	1,990	800	1,590	990	1,990	990	800	1,590	800
		Vc(m/min)	100	200	100	200	100	200	100	100	200	100
		Vf(mm/min)	1,980	3,980	2,400	4,770	1,980	3,980	1,980	2,400	4,770	2,400
		fz(mm/t)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	28	56	53	105	28	56	28	53	105	53
Cast iron	JP4120 GX2140	n (min-1)	1,490	1,990	1,190	1,590	1,490	1,990	1,490	1,190	1,590	1,190
		Vc(m/min)	150	200	150	200	150	200	150	150	200	150
		Vf(mm/min)	5,960	7,960	7,140	9,540	5,960	7,960	5,960	7,140	9,540	7,140
		fz(mm/t)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	83	111	157	210	83	111	83	157	210	157
Hardened steel (45～50HRC)	JP4120 JP4105	n (min-1)	800	900	640	720	800	900	800	640	720	640
		Vc(m/min)	80	90	80	90	80	90	80	80	90	80
		Vf(mm/min)	800	1,440	960	1,730	800	1,440	800	960	1,730	960
		fz(mm/t)	0.5	0.8	0.5	0.8	0.5	0.8	0.5	0.5	0.8	0.5
		ap(mm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	9	16	17	30	9	16	9	17	30	17
Hardened steel (50～60HRC)	JP4105 JP4120	n (min-1)	800	900	640	720	800	900	800	640	720	640
		Vc(m/min)	80	90	80	90	80	90	80	80	90	80
		Vf(mm/min)	～640	～1,080	～770	～1,300	～640	～1,080	～640	～770	～1,300	～770
		fz(mm/t)	～0.4	～0.6	～0.4	～0.6	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4
		ap(mm)	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8
		ae(mm)	14	14	22	22	14	14	14	22	22	22
		Q(cm3/min)	～7	～12	～14	～23	～7	～12	～7	～14	～23	～14

Standard cutting conditions for vertical roughing

Metric

Work material	Recommended inserts grade	Tool dia. DCX	ϕ32（2 Flutes）		ϕ40（3 Flutes）	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	*n* (min-1)	1,990	1,990	1,590	1,590
		*V*c(m/min)	200	200	200	200
		*V*f(mm/min)	600	600	720	720
		*f*z(mm/t)	0.15	0.15	0.15	0.15
		*p*f(mm)	≦ 0.5DCX		≦ 0.5DCX	
		*a*e(mm)	≦ 9.0		≦ 9.0	

【Note】



① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
- Reduce rotation speed and table feed rate by 50 to 70%
- Reduce cutting depth *a*p by 50 to 70%
- Reduce cutting width *a*e by 50 to 70%

② Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.
④ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth *a*p to suit machining conditions.
⑤ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑥ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑦ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑧ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑨ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑩ The following equation can be used to determine the metal removal rate per unit time *Q*;

$$Q(cm^3/min)=a_p(mm)\times a_e(mm)\times V_f(mm/min) / 1000$$

Radius Mill TR4F

②Bore type TR4F4000 type(TR4F4050B□-○,TR4F4063B□-○)

Numeric figure in a circle ○ and Alphabetical character comes in a square □

Standard cutting conditions for contour roughing

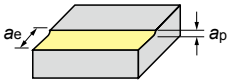
Work material	Recommended inserts grade	Tool dia. DCX	φ50(3 Flutes)			φ50(4 Flutes)			φ50(5 Flutes)		
		Overhang	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High-speed Cutting		General purpose	High-speed Cutting		General purpose	High-speed Cutting	
Mild steel (200HB or less)	GX2140 JS4060	n (min-1)	950	1,270	950	950	1,270	950	950	1,270	950
		Vc(m/min)	150	200	150	150	200	150	150	200	150
		Vf(mm/min)	5,130	7,620	5,130	6,840	10,160	6,840	8,550	12,700	8,550
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	154	229	154	205	305	205	257	381	257
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	n (min-1)	950	1,270	950	950	1,270	950	950	1,270	950
		Vc(m/min)	150	200	150	150	200	150	150	200	150
		Vf(mm/min)	5,130	7,620	5,130	6,840	10,160	6,840	8,550	12,700	8,550
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	154	229	154	205	305	205	257	381	257
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	n (min-1)	830	950	830	830	950	830	830	950	830
		Vc(m/min)	130	150	130	130	150	130	130	150	130
		Vf(mm/min)	4,480	5,700	4,480	5,980	7,600	5,980	7,470	9,500	7,470
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	134	171	134	179	228	179	224	285	224
Stainless steel	JM4160	n (min-1)	640	1,270	640	640	1,270	640	640	1,270	640
		Vc(m/min)	100	200	100	100	200	100	100	200	100
		Vf(mm/min)	1,920	3,810	1,920	2,560	5,080	2,560	3,200	6,350	3,200
		fz(mm/t)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	58	114	58	77	152	77	96	191	96
Cast iron	JP4120 GX2140	n (min-1)	950	1,270	950	950	1,270	950	950	1,270	950
		Vc(m/min)	150	200	150	150	200	150	150	200	150
		Vf(mm/min)	5,700	7,620	5,700	7,600	10,160	7,600	9,500	12,700	9,500
		fz(mm/t)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	171	229	171	228	305	228	285	381	285
Hardened steel (45～50HRC)	JP4120 JP4105	n (min-1)	510	570	510	510	570	510	510	570	510
		Vc(m/min)	80	90	80	80	90	80	80	90	80
		Vf(mm/min)	770	1,370	770	1,020	1,820	1,020	1,280	2,280	1,280
		fz(mm/t)	0.5	0.8	0.5	0.5	0.8	0.5	0.5	0.8	0.5
		ap(mm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	18	33	18	24	44	24	31	55	31
Hardened steel (50～60HRC)	JP4105 JP4120	n (min-1)	510	570	510	510	570	510	510	570	510
		Vc(m/min)	80	90	80	80	90	80	80	90	80
		Vf(mm/min)	～610	～1,030	～610	～820	～1,370	～820	～1,020	～1,710	～1,020
		fz(mm/t)	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4
		ap(mm)	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8
		ae(mm)	30	30	30	30	30	30	30	30	30
		Q(cm3/min)	～15	～25	～15	～20	～33	～20	～24	～41	～24

Standard cutting conditions for vertical roughing

Work material	Recommended inserts grade	Tool dia. DCX	φ50(3 Flutes)		φ50(4 Flutes)		φ50(5 Flutes)	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	n (min-1)	1,270	1,270	1,270	1,270	1,270	1,270
		Vc(m/min)	200	200	200	200	200	200
		Vf(mm/min)	760	760	1,020	1,020	1,270	1,270
		fz(mm/t)	0.2	0.2	0.2	0.2	0.2	0.2
		pf(mm)	≦0.5DCX		≦0.5DCX		≦0.5DCX	
		ae(mm)	≦9.0		≦9.0		≦9.0	

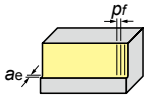
【Note】 ① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
- Reduce rotation speed and table feed rate by 50 to 70%
- Reduce cutting depth ap by 50 to 70%
- Reduce cutting width ae by 50 to 70%

② Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.



Metric

ϕ63(4 Flutes)			ϕ63(5 Flutes)			ϕ63(6 Flutes)			Work material
<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	
General purpose	High-speed Cutting		General purpose	High-speed Cutting		General purpose	High-speed Cutting		
760	1,010	760	760	1,010	760	760	1,010	760	Mild steel (200HB or less)
150	200	150	150	200	150	150	200	150	
5,470	8,080	5,470	6,840	10,100	6,840	8,210	12,120	8,210	
1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
44	44	44	44	44	44	44	44	44	
241	356	241	301	444	301	361	533	361	
760	1,010	760	760	1,010	760	760	1,010	760	Carbon steel Alloy steel (35HRC or less)
150	200	150	150	200	150	150	200	150	
5,470	8,080	5,470	6,840	10,100	6,840	8,210	12,120	8,210	
1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
44	44	44	44	44	44	44	44	44	
241	356	241	301	444	301	361	533	361	
660	760	660	660	760	660	660	760	660	Carbon steel Alloy steel (35～45HRC)
130	150	130	130	150	130	130	150	130	
4,750	6,080	4,750	5,940	7,600	5,940	7,130	9,120	7,130	
1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
44	44	44	44	44	44	44	44	44	
209	268	209	261	334	261	314	401	314	
510	1,010	510	510	1,010	510	510	1,010	510	Stainless steel
100	200	100	100	200	100	100	200	100	
2,040	4,040	2,040	2,550	5,050	2,550	3,060	6,060	3,060	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
44	44	44	44	44	44	44	44	44	
90	178	90	112	222	112	135	267	135	
760	1,010	760	760	1,010	760	760	1,010	760	Cast iron
150	200	150	150	200	150	150	200	150	
6,080	8,080	6,080	7,600	10,100	7,600	9,120	12,120	9,120	
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
44	44	44	44	44	44	44	44	44	
268	356	268	334	444	334	401	533	401	
400	450	400	400	450	400	400	450	400	Hardened steel (45～50HRC)
80	90	80	80	90	80	80	90	80	
800	1,440	800	1,000	1,800	1,000	1,200	2,160	1,200	
0.5	0.8	0.5	0.5	0.8	0.5	0.5	0.8	0.5	
0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
44	44	44	44	44	44	44	44	44	
28	51	28	35	63	35	42	76	42	
400	450	400	400	450	400	400	450	400	Hardened steel (50～60HRC)
80	90	80	80	90	80	80	90	80	
～640	～1,080	～640	～800	～1,350	～800	～960	～1,620	～960	
～0.4	～0.6	～0.4	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4	
～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	
44	44	44	44	44	44	44	44	44	
～23	～38	～23	～28	～48	～28	～34	～57	～34	



Metric

ϕ63(4 Flutes)		ϕ63(5 Flutes)		ϕ63(6 Flutes)		Work material
<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	
1,010	1,010	1,010	1,010	1,010	1,010	Cast iron
200	200	200	200	200	200	
810	810	1,010	1,010	1,210	1,210	
0.2	0.2	0.2	0.2	0.2	0.2	
≦0.5DCX		≦0.5DCX		≦0.5DCX		
≦9.0		≦9.0		≦9.0		

④ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth ap to suit machining conditions.
⑤ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑥ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑦ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑧ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑨ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑩ The following equation can be used to determine the metal removal rate per unit time Q; $Q(cm^3/min)=ap(mm)\times ae(mm)\times Vf(mm/min)\ /\ 1000$

Radius Mill TR4F

②Bore type TR4F4000 type(TR4F4080B□-○,TR4F4100B□-○)

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Standard cutting conditions for contour roughing

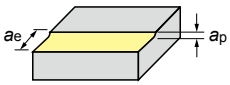
Work material	Recommended inserts grade	Tool dia. DCX	φ80(5 Flutes)			φ80(7 Flutes)		
		Overhang	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High-speed Cutting		General purpose	High-speed Cutting	
Mild steel (200HB or less)	GX2140 JS4060	n (min-1)	600	800	600	600	800	600
		Vc(m/min)	150	200	150	150	200	150
		Vf(mm/min)	5,400	8,000	5,400	7,560	11,200	7,560
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	324	480	324	454	672	454
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	n (min-1)	600	800	600	600	800	600
		Vc(m/min)	150	200	150	150	200	150
		Vf(mm/min)	5,400	8,000	5,400	7,560	11,200	7,560
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	324	480	324	454	672	454
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	n (min-1)	520	600	520	520	600	520
		Vc(m/min)	130	150	130	130	150	130
		Vf(mm/min)	4,680	6,000	4,680	6,550	8,400	6,550
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	281	360	281	393	504	393
Stainless steel	JM4160	n (min-1)	400	800	400	400	800	400
		Vc(m/min)	100	200	100	100	200	100
		Vf(mm/min)	2,000	4,000	2,000	2,800	5,600	2,800
		fz(mm/t)	1.0	1.0	1.0	1.0	1.0	1.0
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	120	240	120	168	336	168
Cast iron	JP4120 GX2140	n (min-1)	600	800	600	600	800	600
		Vc(m/min)	150	200	150	150	200	150
		Vf(mm/min)	6,000	8,000	6,000	8,400	11,200	8,400
		fz(mm/t)	2.0	2.0	2.0	2.0	2.0	2.0
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	360	480	360	504	672	504
Hardened steel (45～50HRC)	JP4120 JP4105	n (min-1)	320	360	320	320	360	320
		Vc(m/min)	80	90	80	80	90	80
		Vf(mm/min)	800	1,440	800	1,120	2,020	1,120
		fz(mm/t)	0.5	0.8	0.5	0.5	0.8	0.5
		ap(mm)	0.8	0.8	0.8	0.8	0.8	0.8
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	38	69	38	54	97	54
Hardened steel (50～60HRC)	JP4105 JP4120	n (min-1)	320	360	320	320	360	320
		Vc(m/min)	80	90	80	80	90	80
		Vf(mm/min)	～640	～1,080	～640	～900	～1,510	～900
		fz(mm/t)	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4
		ap(mm)	～0.8	～0.8	～0.8	～0.8	～0.8	～0.8
		ae(mm)	60	60	60	60	60	60
		Q(cm3/min)	～31	～52	～31	～43	～72	～43

Standard cutting conditions for vertical roughing

Work material	Recommended inserts grade	Tool dia. DCX	φ80(5 Flutes)		φ80(7 Flutes)	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	n (min-1)	800	800	800	800
		Vc(m/min)	200	200	200	200
		Vf(mm/min)	800	800	1,120	1,120
		fz(mm/t)	0.2	0.2	0.2	0.2
		pf(mm)	≦0.5DCX		≦0.5DCX	
		ae(mm)	≦9.0		≦9.0	

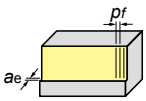
【Note】 ① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
- Reduce rotation speed and table feed rate by 50 to 70%
- Reduce cutting depth ap by 50 to 70%
- Reduce cutting width ae by 50 to 70%

② Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.



Metric

φ100(6 Flutes)			φ100(8 Flutes)			Work material
<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	
General purpose	High-speed Cutting		General purpose	High-speed Cutting		
480	640	480	480	640	480	Mild steel (200HB or less)
150	200	150	150	200	150	
5,180	7,680	5,180	6,910	10,240	6,910	
1.8	2.0	1.8	1.8	2.0	1.8	
1.0	1.0	1.0	1.0	1.0	1.0	
80	80	80	80	80	80	
414	614	414	553	819	553	
480	640	480	480	640	480	Carbon steel Alloy steel (35HRC or less)
150	200	150	150	200	150	
5,180	7,680	5,180	6,910	10,240	6,910	
1.8	2.0	1.8	1.8	2.0	1.8	
1.0	1.0	1.0	1.0	1.0	1.0	
80	80	80	80	80	80	
414	614	414	553	819	553	
410	480	410	410	480	410	Carbon steel Alloy steel (35～45HRC)
130	150	130	130	150	130	
4,430	5,760	4,430	5,900	7,680	5,900	
1.8	2.0	1.8	1.8	2.0	1.8	
1.0	1.0	1.0	1.0	1.0	1.0	
80	80	80	80	80	80	
354	461	354	472	614	472	
320	640	320	320	640	320	Stainless steel
100	200	100	100	200	100	
1,920	3,840	1,920	2,560	5,120	2,560	
1.0	1.0	1.0	1.0	1.0	1.0	
1.0	1.0	1.0	1.0	1.0	1.0	
80	80	80	80	80	80	
154	307	154	205	410	205	
480	640	480	480	640	480	Cast iron
150	200	150	150	200	150	
5,760	7,680	5,760	7,680	10,240	7,680	
2.0	2.0	2.0	2.0	2.0	2.0	
1.0	1.0	1.0	1.0	1.0	1.0	
80	80	80	80	80	80	
461	614	461	614	819	614	
250	290	250	250	290	250	Hardened steel (45～50HRC)
80	90	80	80	90	80	
750	1,390	750	1,000	1,860	1,000	
0.5	0.8	0.5	0.5	0.8	0.5	
0.8	0.8	0.8	0.8	0.8	0.8	
80	80	80	80	80	80	
48	89	48	64	119	64	
250	290	250	250	290	250	Hardened steel (50～60HRC)
80	90	80	80	90	80	
～600	～1,040	～600	～800	～1,390	～800	
～0.4	～0.6	～0.4	～0.4	～0.6	～0.4	
～0.8	～0.8	～0.8	～0.8	～0.8	～0.8	
80	80	80	80	80	80	
～38	～67	～38	～51	～89	～51	



Metric

φ100(6 Flutes)		φ100(8 Flutes)		Work material
<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	
640	640	640	640	Cast iron
200	200	200	200	
770	770	1,020	1,020	
0.2	0.2	0.2	0.2	
≦0.5DCX		≦0.5DCX		
≦9.0		≦9.0		

④ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth ap to suit machining conditions.
⑤ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑥ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑦ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑧ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑨ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑩ The following equation can be used to determine the metal removal rate per unit time Q; $Q(cm^3/min) = a_p(mm) \times a_e(mm) \times V_f(mm/min) / 1000$

Radius Mill TR4F

②Bore type TR4F5000 type(TR4F5○○○B□-○)

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Standard cutting conditions for contour roughing

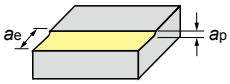
Work material	Recommended inserts grade	Tool dia. DCX	φ63(4 Flutes)			φ80(5 Flutes)		
		Overhang	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX
			General purpose	High efficiency		General purpose	High efficiency	
Mild steel (200HB or less)	GX2140 JS4060	n (min-1)	760	910	760	600	720	600
		Vc(m/min)	150	180	150	150	180	150
		Vf(mm/min)	4,560	7,280	5,470	4,500	7,200	5,400
		fz(mm/t)	1.5	2.0	1.8	1.5	2.0	1.8
		ap(mm)	2.0	2.0	1.0	2.0	2.0	1.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	347	553	208	504	806	302
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060	n (min-1)	760	910	760	600	720	600
		Vc(m/min)	150	180	150	150	180	150
		Vf(mm/min)	4,560	7,280	5,470	4,500	7,200	5,400
		fz(mm/t)	1.5	2.0	1.8	1.5	2.0	1.8
		ap(mm)	2.0	2.0	1.0	2.0	2.0	1.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	347	553	208	504	806	302
Carbon steel Alloy steel (35～45HRC)	JP4120 JS4060	n (min-1)	660	760	660	520	600	520
		Vc(m/min)	130	150	130	130	150	130
		Vf(mm/min)	4,750	6,080	4,750	4,680	6,000	4,680
		fz(mm/t)	1.8	2.0	1.8	1.8	2.0	1.8
		ap(mm)	1.5	1.5	1.0	1.5	1.5	1.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	271	347	181	393	504	262
Stainless steel	JM4160	n (min-1)	510	1,010	510	400	800	400
		Vc(m/min)	100	200	100	100	200	100
		Vf(mm/min)	2,040	4,040	2,040	2,000	4,000	2,000
		fz(mm/t)	1.0	1.0	1.0	1.0	1.0	1.0
		ap(mm)	1.5	1.5	1.0	1.5	1.5	1.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	116	230	78	168	336	112
Cast iron	JP4120 GX2140	n (min-1)	760	910	760	600	720	600
		Vc(m/min)	150	180	150	150	180	150
		Vf(mm/min)	6,080	8,370	6,080	6,000	8,280	6,000
		fz(mm/t)	2.0	2.3	2.0	2.0	2.3	2.0
		ap(mm)	2.0	2.0	2.0	2.0	2.0	2.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	462	636	462	672	927	672
Hardened steel (45～50HRC)	JP4120 JP4105	n (min-1)	400	450	400	320	360	320
		Vc(m/min)	80	90	80	80	90	80
		Vf(mm/min)	800	1,440	800	800	1,440	800
		fz(mm/t)	0.5	0.8	0.5	0.5	0.8	0.5
		ap(mm)	1.0	1.0	1.0	1.0	1.0	1.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	30	55	30	45	81	45
Hardened steel (50～60HRC)	JP4105 JP4120	n (min-1)	400	450	400	320	360	320
		Vc(m/min)	80	90	80	80	90	80
		Vf(mm/min)	～640	～1080	～640	～640	～1080	～640
		fz(mm/t)	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4
		ap(mm)	～1.0	～1.0	～1.0	～1.0	～1.0	～1.0
		ae(mm)	38	38	38	56	56	56
		Q(cm3/min)	～24	～41	～24	～36	～60	～36

Standard cutting conditions for vertical roughing

Work material	Recommended inserts grade	Tool dia. DCX	φ63(4 Flutes)		φ80(5 Flutes)	
		Overhang	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX
Cast iron	JP4120 GX2140	n (min-1)	1,010	1,010	800	800
		Vc(m/min)	200	200	200	200
		Vf(mm/min)	810	810	800	800
		fz(mm/t)	0.2	0.2	0.2	0.2
		pf(mm)	≦0.5DCX		≦0.5DCX	
		ae(mm)	≦11.0		≦11.0	

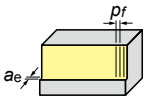
【Note】 ① This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
・Reduce rotation speed and table feed rate by 50 to 70%
・Reduce cutting depth ap by 50 to 70%
・Reduce cutting width ae by 50 to 70%
② If the machine has insufficient power, first try reducing the cutting depth. Next, try reducing the rotation speed and table feed rate.
③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.

※ To ensure high-efficiency conditions, we recommend checking the machine's power/torque chart and using a rotation speed that can maintain the rated power of the spindle.



Metric

ϕ100(6 Flutes)			ϕ125(6 Flutes)			ϕ125(7 Flutes)			Work material
<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	<3DCX		3DCX-5DCX	
General purpose	High efficiency		General purpose	High efficiency		General purpose	High efficiency		
480	570	480	380	460	380	380	460	380	Mild steel (200HB or less)
150	180	150	150	180	150	150	180	150	
4,320	6,840	5,180	3,420	5,520	4,100	3,990	6,440	4,790	
1.5	2.0	1.8	1.5	2.0	1.8	1.5	2.0	1.8	
2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	
75	75	75	100	100	100	100	100	100	
648	1026	389	684	1104	410	798	1288	479	
480	570	480	380	460	380	380	460	380	Carbon steel Alloy steel (35HRC or less)
150	180	150	150	180	150	150	180	150	
4,320	6,840	5,180	3,420	5,520	4,100	3,990	6,440	4,790	
1.5	2.0	1.8	1.5	2.0	1.8	1.5	2.0	1.8	
2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	
75	75	75	100	100	100	100	100	100	
648	1026	389	684	1104	410	798	1288	479	
410	480	410	330	380	330	330	380	330	Carbon steel Alloy steel (35～45HRC)
130	150	130	130	150	130	130	150	130	
4,430	5,760	4,430	3,560	4,560	3,560	4,160	5,320	4,160	
1.8	2.0	1.8	1.8	2.0	1.8	1.8	2.0	1.8	
1.5	1.5	1.0	1.5	1.5	1.0	1.5	1.5	1.0	
75	75	75	100	100	100	100	100	100	
498	648	332	534	684	356	624	798	416	
320	640	320	250	510	250	250	510	250	Stainless steel
100	200	100	100	200	100	100	200	100	
1,920	3,840	1,920	1,500	3,060	1,500	1,750	3,570	1,750	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
1.5	1.5	1.0	1.5	1.5	1.0	1.5	1.5	1.0	
75	75	75	100	100	100	100	100	100	
216	432	144	225	459	150	263	536	175	
480	570	480	380	460	380	380	460	380	Cast iron
150	180	150	150	180	150	150	180	150	
5,760	7,870	5,760	4,560	6,350	4,560	5,320	7,410	5,320	
2.0	2.3	2.0	2.0	2.3	2.0	2.0	2.3	2.0	
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
75	75	75	100	100	100	100	100	100	
864	1,181	864	912	1,270	912	1,064	1,482	1,064	
250	290	250	200	230	200	200	230	200	Hardened steel (45～50HRC)
80	90	80	80	90	80	80	90	80	
750	1,390	750	600	1,100	600	700	1,290	700	
0.5	0.8	0.5	0.5	0.8	0.5	0.5	0.8	0.5	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
75	75	75	100	100	100	100	100	100	
56	104	56	60	110	60	70	129	70	
250	290	250	200	230	200	200	230	200	Hardened steel (50～60HRC)
80	90	80	80	90	80	80	90	80	
～600	～1040	～600	～480	～830	～480	～560	～970	～560	
～0.4	～0.6	～0.4	～0.4	～0.6	～0.4	～0.4	～0.6	～0.4	
～1.0	～1.0	～1.0	～1.0	～1.0	～1.0	～1.0	～1.0	～1.0	
75	75	75	100	100	100	100	100	100	
～45	～78	～45	～48	～83	～48	～56	～97	～56	



Metric

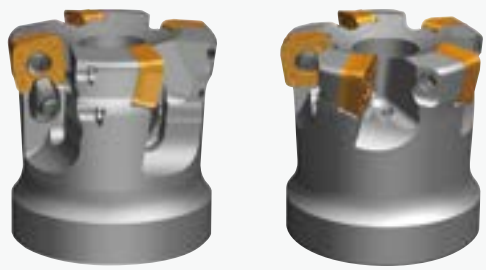
ϕ100(6 Flutes)		ϕ125(6 Flutes)		ϕ125(7 Flutes)		Work material
<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	<3DCX	3DCX-5DCX	
640	640	510	510	510	510	Cast iron
200	200	200	200	200	200	
770	770	610	610	710	710	
0.2	0.2	0.2	0.2	0.2	0.2	
≦0.5DCX		≦0.5DCX		≦0.5DCX		
≦11.0		≦11.0		≦11.0		

⑤ The machinability of hardened steels (50 - 60HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth ap to suit machining conditions.
⑥ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑦ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑧ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑨ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑩ Use of the MOLDINO anti-vibration arbor is recommended for overhang of 5DCX or more.
⑪ The following equation can be used to determine the metal removal rate per unit time Q; $Q(cm^3/min)=a_p(mm)\times a_e(mm)\times V_f(mm/min) / 1000$

Radius Mill TR4D

· Exclusive high-efficiency cutting, resulting from unique insert and body shapes

Bore type



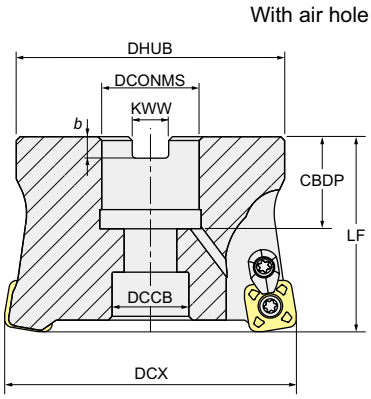


Fig.1 with clamp piece set

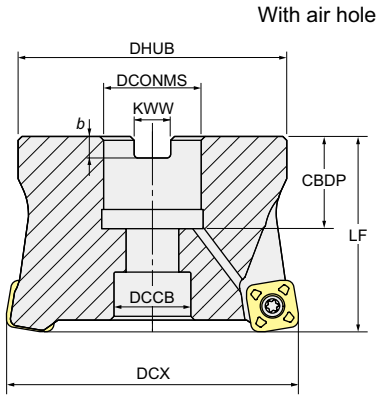


Fig.2 Multi-flutes (no clamp piece set)

Inch ITR4D40○○B-○ (-1.25)

Numeric figure comes in a circle ○.

Item code	Stock	No. of flutes	Dimensions (inch)								Insert	Fig.
			DCX	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB		
ITR4D4032B-4	●	4	2.000	1.875	2.000	.748	.313	.187	.750	.630	SDNW120520TR SDNW120520TR-P SDMT120520TR	Fig.1
ITR4D4032B-5	●	5	2.000	1.875	2.000	.748	.313	.187	.750	.630		Fig.2
ITR4D4040B-4	●	4	2.500	2.375	2.000	.945	.375	.219	1.000	.787		Fig.1
ITR4D4040B-6	●	6	2.500	2.375	2.000	.945	.375	.219	1.000	.787		Fig.2
ITR4D4048B-5	●	5	3.000	2.750	2.000	.945	.375	.219	1.000	.787		Fig.1
ITR4D4048B-7	●	7	3.000	2.750	2.000	.945	.375	.219	1.000	.787		Fig.2
ITR4D4048B-7-1.25	●	7	3.000	2.875	2.500	1.260	.500	.281	1.250	1.024		Fig.2
ITR4D4064B-6	●	6	4.000	3.813	2.500	1.181	.625	.375	1.500	1.181		Fig.1
ITR4D4064B-8	●	8	4.000	3.813	2.500	1.181	.625	.375	1.500	1.181		Fig.2

Metric TR4D4○○○BM-○

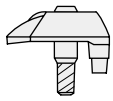
Numeric figure comes in a circle ○.

Item code	Stock	No. of flutes	Dimensions (mm)								Insert	Fig.
			DCX	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB		
TR4D4050BM-3	●	3	50	47	50	20	10.4	6.3	22	17	SDNW120520TR SDNW120520TR-P SDMT120520TR	Fig.1
TR4D4050BM-4	●	4	50	47	50	20	10.4	6.3	22	17		Fig.1
TR4D4063BM-4	●	4	63	60	50	20	10.4	6.3	22	17		Fig.1
TR4D4063BM-5	●	5	63	60	50	20	10.4	6.3	22	17		Fig.1
TR4D4080BM-5	●	5	80	76	70	22	12.4	7	27	20		Fig.1
TR4D4100BM-6	●	6	100	96	70	25.5	14.4	8	32	26		Fig.1

●: Inventory maintained in US No Mark: Manufactured upon request only

Parts

The clamp screw is a consumable part. Clamp screw replacement is dependent on use.
We recommend replacing screw at signs of wear on screw seat chamfer.

Parts	Insert Screw			Clamp Piece Set	Wrench	Screw Anti-Seizure Agent
Shape		Fastening torque N•m	Fastening torque lbf•in			
Item code	262-141	2.9	25.67	CM3.5-141	105-T15	P37

Insert

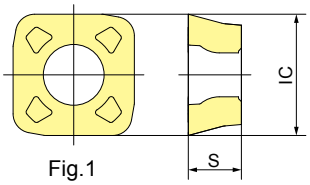


Fig.1

SDNW120520TR

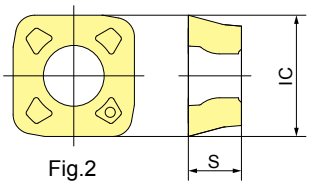


Fig.2

SDNW120520TR-P

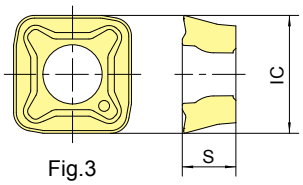


Fig.3

SDMT120520TR

P	Carbon steel		■		■	■
M	Stainless Steel			■		
K	Cast Iron/Ductile Cast Iron		■		■	■
H	Hardened steel	■	□			

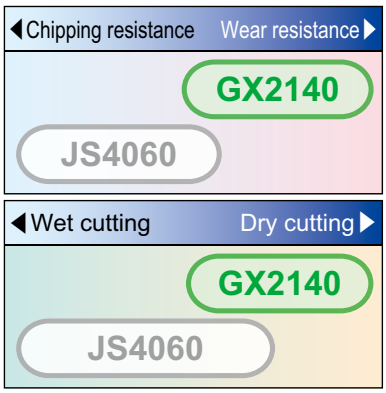
■ : General cutting, First recommendation
□ : General cutting, Second recommendation

Item Code	Tolerance Class	AJ-Coated			JS-Coated	GX-Coated	Dimensions (mm)		Dimensions (inch)		Shape
		JP4105	JP4120	JM4160	JS4060	GX2140	IC	T	IC	T	
SDNW120520TR	N	●	●	●	●	●	12.7	5.56	.500	.219	Fig.1
SDNW120520TR-P	N		●	●			12.7	5.56	.500	.219	Fig.2
SDMT120520TR	M		●※1	●※1	●	●	12.7	5.76	.500	.227	Fig.3

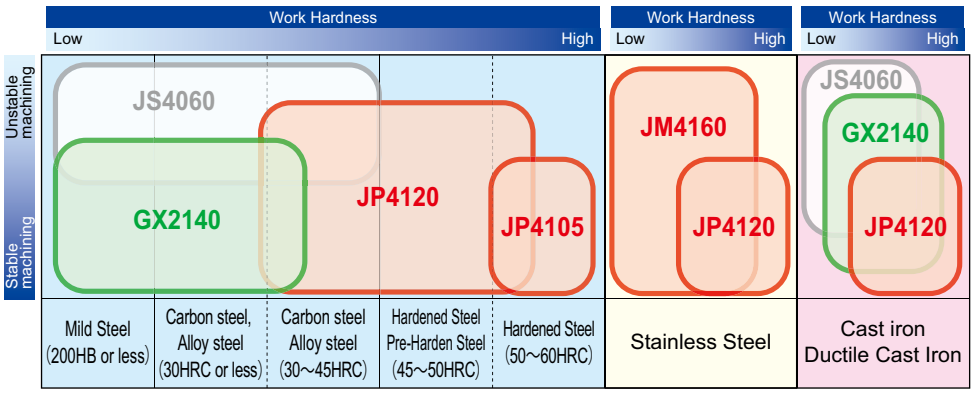
※ 1 : Can be used to process the precipitation hardend stainless steel.

【Note】 Please note that the GX coating and JS coating do not cause a reaction in conductive touch sensors.

Grade map for less than 35HRC



Grade map for work material



Radius Mill TR4D

Recommended cutting conditions

Face Milling, Side Milling

Inch

Red indicates primary recommended insert grade.

Work Material	Insert Grade	Cutter Dia.	ϕ2.000(4NT)					ϕ2.000(5NT)					ϕ2.500(4NT)					ϕ2.500(6NT)				
		Overhang Ratio	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC
			General	High Speed				General	High Speed				General	High Speed				General	High Speed			
General Structural Steel (200HB or less)	GX2140 JS4060	n (min⁻¹)	940	1,250	940	810	690	940	1,250	940	810	690	750	1,000	750	650	550	750	1,000	750	650	550
		Vc (SFM)	492	654	492	424	361	492	654	492	424	361	491	654	491	425	360	491	654	491	425	360
		Vf (IPM)	270	400	270	230	200	330	490	330	290	240	210	320	210	180	160	320	470	320	280	230
		fz (IPT)	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
		Q (inch³/min)	16.8	25.0	16.8	11.4	9.9	20.6	30.6	20.6	14.4	11.9	16.4	25.0	16.4	11.2	9.9	25.0	36.7	25.0	17.4	14.3
Carbon Steel Alloy Steel (<35HRC)	GX2140 JS4060	n (min⁻¹)	940	1,250	940	810	690	940	1,250	940	810	690	750	1,000	750	650	550	750	1,000	750	650	550
		Vc (SFM)	492	654	492	424	361	492	654	492	424	361	491	654	491	425	360	491	654	491	425	360
		Vf (IPM)	270	400	270	230	200	330	490	330	290	240	210	320	210	180	160	320	470	320	280	230
		fz (IPT)	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
		Q (inch³/min)	16.8	25.0	16.8	11.4	9.9	20.6	30.6	20.6	14.4	11.9	16.4	25.0	16.4	11.2	9.9	25.0	36.7	25.0	17.4	14.3
Carbon Steel Alloy Steel (35～45HRC)	JP4120 JS4060	n (min⁻¹)	810	940	810	690	560	810	940	810	690	560	650	750	650	550	450	650	750	650	550	450
		Vc (SFM)	424	492	424	361	293	424	492	424	361	293	425	491	425	360	295	425	491	425	360	295
		Vf (IPM)	230	300	230	170	140	290	370	290	220	180	180	240	180	140	110	280	360	280	210	170
		fz (IPT)	.071	.079	.071	.063	.063	.071	.079	.071	.063	.063	.071	.079	.071	.063	.063	.071	.079	.071	.063	.063
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
		Q (inch³/min)	14.4	18.7	14.4	8.4	6.9	18.1	23.1	18.1	10.9	8.9	14.0	18.7	14.0	8.7	6.8	21.8	28.1	21.8	13.0	10.5
300 series Stainless Steel (WET)	JM4160	n (min⁻¹)	630	-	630	530	440	630	-	630	530	440	500	-	500	430	350	500	-	500	430	350
		Vc (SFM)	330	-	330	278	230	330	-	330	278	230	327	-	327	281	229	327	-	327	281	229
		Vf (IPM)	100	-	100	80	70	120	-	120	100	90	80	-	80	70	50	120	-	120	100	80
		fz (IPT)	.039	-	.039	.039	.039	.039	-	.039	.039	.039	.039	-	.039	.039	.039	.039	-	.039	.039	.039
		ap (inch)	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031
		ae (inch)	1.600	-	1.600	1.600	1.600	1.600	-	1.600	1.600	1.600	2.000	-	2.000	2.000	2.000	2.000	-	2.000	2.000	2.000
		Q (inch³/min)	6.2	-	6.2	4.0	3.5	7.5	-	7.5	5.0	4.5	6.2	-	6.2	4.3	3.1	9.4	-	9.4	6.2	5.0
Precipitation Hardening Stainless Steel (WET)	JM4160 JP4120	n (min⁻¹)	560	-	560	500	440	560	-	560	500	440	450	-	450	400	350	450	-	450	400	350
		Vc (SFM)	293	-	293	262	230	293	-	293	262	230	295	-	295	262	229	295	-	295	262	229
		Vf (IPM)	70	-	70	60	50	90	-	90	80	70	60	-	60	50	40	80	-	80	70	70
		fz (IPT)	.031	-	.031	.031	.031	.031	-	.031	.031	.031	.031	-	.031	.031	.031	.031	-	.031	.031	.031
		ap (inch)	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031
		ae (inch)	1.600	-	1.600	1.600	1.600	1.600	-	1.600	1.600	1.600	2.000	-	2.000	2.000	2.000	2.000	-	2.000	2.000	2.000
		Q (inch³/min)	4.4	-	4.4	3.0	2.5	5.6	-	5.6	4.0	3.5	4.7	-	4.7	3.1	2.5	6.2	-	6.2	4.3	4.3
Cast Iron Ductile Cast Iron	GX2140 JS4060 JP4120	n (min⁻¹)	940	1,250	940	810	690	940	1,250	940	810	690	750	1,000	750	650	550	750	1,000	750	650	550
		Vc (SFM)	492	654	492	424	361	492	654	492	424	361	491	654	491	425	360	491	654	491	425	360
		Vf (IPM)	300	400	300	260	220	370	490	370	320	270	240	320	240	210	170	360	470	360	310	260
		fz (IPT)	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
		Q (inch³/min)	18.7	25.0	18.7	12.9	10.9	23.1	30.6	23.1	15.9	13.4	18.7	25.0	18.7	13.0	10.5	28.1	36.7	28.1	19.2	16.1
Hardened Steel (45～50HRC)	JP4120 JP4105	n (min⁻¹)	500	560	500	440	380	500	560	500	440	380	400	450	400	350	300	400	450	400	350	300
		Vc (SFM)	262	293	262	230	199	262	293	262	230	199	262	295	262	229	196	262	295	262	229	196
		Vf (IPM)	40	70	40	40	30	50	90	50	40	40	30	60	30	30	20	50	80	50	40	40
		fz (IPT)	.020	.031	.020	.020	.020	.020	.031	.020	.020	.020	.020	.031	.020	.020	.020	.020	.031	.020	.020	.020
		ap (inch)	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024
		ae (inch)	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
		Q (inch³/min)	2.0	3.5	2.0	1.5	1.2	2.5	4.5	2.5	1.5	1.5	1.9	3.7	1.9	1.4	1.0	3.1	5.0	3.1	1.9	1.9
Hardened Steel (50～60HRC)	JP4105 JP4120	n (min⁻¹)	500	560	500	440	380	500	560	500	440	380	400	450	400	350	300	400	450	400	350	300
		Vc (SFM)	262	293	262	230	199	262	293	262	230	199	262	295	262	229	196	262	295	262	229	196
		Vf (IPM)	30	50	30	30	20	40	70	40	40	30	30	40	30	20	20	40	60	40	30	30
		fz (IPT)	.016	.024	.016	.016	.016	.016	.024	.016	.016	.016	.016	.024	.016	.016	.016	.016	.024	.016	.016	.016
		ap (inch)	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024
		ae (inch)	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	1.600	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
		Q (inch³/min)	1.5	2.5	1.5	1.2	.8	2.0	3.5	2.0	1.5	1.2	1.9	2.5	1.9	1.0	1.0	2.5	3.7	2.5	1.4	1.4

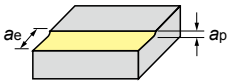
Standard Cutting Conditions for plunging

Inch

Red indicates primary recommended insert grade.

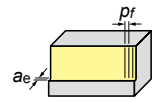
Work Material	Insert Grade	Cutter Dia.	ϕ2.000(4NT)				ϕ2.000(5NT)				ϕ2.500(4NT)				ϕ2.500(6NT)			
		Overhang Ratio	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC
Cast Iron Ductile Cast Iron	JP4120 GX2140 JS4060	n (min⁻¹)	1,250	1,250	1,070	940	1,250	1,250	1,070	940	1,000	1,000	850	750	1,000	1,000	850	750
		Vc (SFM)	654	654	560	492	654	654	560	492	654	654	556	491	654	654	556	491
		Vf (IPM)	40	40	30	20	50	50	30	30	30	30	20	20	50	50	30	30
		fz (IPT)	.008	.008	.006	.006	.008	.008	.006	.006	.008	.008	.006	.006	.008	.008	.006	.006
		pf (inch)	≦0.5DC				≦0.5DC				≦0.5DC				≦0.5DC			
		ae (inch)	≦.354				≦.354				≦.354				≦.354			

【Note】①This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble.
Therefore, please consider the following when adjusting the conditions;
・Reduce rotation speed and table feed rate by 50 to 70%
・Reduce cutting depth ap by 50 to 70%
・Reduce cutting width ae by 50 to 70%
②Please note that the GX coating and JS coating do not cause a reaction in conductive touch sensors.
③JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.



Inch

Work Material	Insert Grade	Cutter Dia.	φ3.000(5NT)					φ3.000(7NT)					φ4.000(6NT)					φ4.000(8NT)				
		Overhang Ratio	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC
			General	High Speed				General	High Speed				General	High Speed				General	High Speed			
General Structural Steel (200HB or less)	GX2140 JS4060	n (min-1)	630	840	630	540	460	630	840	630	540	460	470	630	470	410	340	470	630	470	410	340
		vc (SFM)	495	660	495	424	361	495	660	495	424	361	492	660	492	429	356	492	660	492	429	356
		vf (IPM)	220	330	220	190	160	310	460	310	270	230	200	300	200	170	140	270	400	270	230	190
		fz (IPT)	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
		Q (inch3/min)	20.6	30.9	20.6	14.1	11.9	29.0	43.1	29.0	20.1	17.1	25.0	37.4	25.0	16.9	13.9	33.7	49.9	33.7	22.8	18.8
Carbon Steel Alloy Steel (<35HRC)	GX2140 JS4060	n (min-1)	630	840	630	540	460	630	840	630	540	460	470	630	470	410	340	470	630	470	410	340
		vc (SFM)	495	660	495	424	361	495	660	495	424	361	492	660	492	429	356	492	660	492	429	356
		vf (IPM)	220	330	220	190	160	310	460	310	270	230	200	300	200	170	140	270	400	270	230	190
		fz (IPT)	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071	.071	.079	.071	.071	.071
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
		Q (inch3/min)	20.6	30.9	20.6	14.1	11.9	29.0	43.1	29.0	20.1	17.1	25.0	37.4	25.0	16.9	13.9	33.7	49.9	33.7	22.8	18.8
Carbon Steel Alloy Steel (35～45HRC)	JP4120 JS4060	n (min-1)	540	630	540	460	380	540	630	540	460	380	410	470	410	340	280	410	470	410	340	280
		vc (SFM)	424	495	424	361	298	424	495	424	361	298	429	492	429	356	293	429	492	429	356	293
		vf (IPM)	190	250	190	140	120	270	350	270	200	170	170	220	170	130	110	230	300	230	170	140
		fz (IPT)	.071	.079	.071	.063	.063	.071	.079	.071	.063	.063	.071	.079	.071	.063	.063	.071	.079	.071	.063	.063
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
		Q (inch3/min)	17.8	23.4	17.8	10.4	8.9	25.3	32.8	25.3	14.9	12.6	21.2	27.5	21.2	12.9	10.9	28.7	37.4	28.7	16.9	13.9
300 series Stainless Steel (WET)	JM4160	n (min-1)	420	-	420	360	290	420	-	420	360	290	310	-	310	270	220	310	-	310	270	220
		vc (SFM)	330	-	330	283	228	330	-	330	283	228	325	-	325	283	230	325	-	325	283	230
		vf (IPM)	80	-	80	70	60	110	-	110	100	80	70	-	70	60	50	100	-	100	80	70
		fz (IPT)	.039	-	.039	.039	.039	.039	-	.039	.039	.039	.039	-	.039	.039	.039	.039	-	.039	.039	.039
		ap (inch)	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031
		ae (inch)	2.400	-	2.400	2.400	2.400	2.400	-	2.400	2.400	2.400	3.200	-	3.200	3.200	3.200	3.200	-	3.200	3.200	3.200
		Q (inch3/min)	7.5	-	7.5	5.2	4.5	10.3	-	10.3	7.4	6.0	8.7	-	8.7	6.0	5.0	12.5	-	12.5	7.9	6.9
Precipitation Hardening Stainless Steel (WET)	JM4160 JP4120	n (min-1)	380	-	380	330	290	380	-	380	330	290	280	-	280	250	220	280	-	280	250	220
		vc (SFM)	298	-	298	259	228	298	-	298	259	228	293	-	293	262	230	293	-	293	262	230
		vf (IPM)	60	-	60	50	40	80	-	80	70	60	50	-	50	50	40	70	-	70	60	50
		fz (IPT)	.031	-	.031	.031	.031	.031	-	.031	.031	.031	.031	-	.031	.031	.031	.031	-	.031	.031	.031
		ap (inch)	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031	.039	-	.039	.031	.031
		ae (inch)	2.400	-	2.400	2.400	2.400	2.400	-	2.400	2.400	2.400	3.200	-	3.200	3.200	3.200	3.200	-	3.200	3.200	3.200
		Q (inch3/min)	5.6	-	5.6	3.7	3.0	7.5	-	7.5	5.2	4.5	6.2	-	6.2	5.0	4.0	8.7	-	8.7	6.0	5.0
Cast Iron Ductile Cast Iron	GX2140 JS4060 JP4120	n (min-1)	630	840	630	540	460	630	840	630	540	460	470	630	470	410	340	470	630	470	410	340
		vc (SFM)	495	660	495	424	361	495	660	495	424	361	492	660	492	429	356	492	660	492	429	356
		vf (IPM)	250	330	250	210	180	350	460	350	300	250	220	300	220	190	160	300	400	300	260	210
		fz (IPT)	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079
		ap (inch)	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031	.039	.039	.039	.031	.031
		ae (inch)	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
		Q (inch3/min)	23.4	30.9	23.4	15.6	13.4	32.8	43.1	32.8	22.3	18.6	27.5	37.4	27.5	18.8	15.9	37.4	49.9	37.4	25.8	20.8
Hardened Steel (45～50HRC)	JP4120 JP4105	n (min-1)	330	380	330	290	250	330	380	330	290	250	250	280	250	220	190	250	280	250	220	190
		vc (SFM)	259	298	259	228	196	259	298	259	228	196	262	293	262	230	199	262	293	262	230	199
		vf (IPM)	30	60	30	30	30	50	80	50	40	40	30	50	30	30	20	40	70	40	40	30
		fz (IPT)	.020	.031	.020	.020	.020	.020	.031	.020	.020	.020	.020	.031	.020	.020	.020	.020	.031	.020	.020	.020
		ap (inch)	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024
		ae (inch)	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
		Q (inch3/min)	2.2	4.5	2.2	1.7	1.7	3.7	6.0	3.7	2.3	2.3	3.0	5.0	3.0	2.3	1.5	4.0	6.9	4.0	3.1	2.3
Hardened Steel (50～60HRC)	JP4105 JP4120	n (min-1)	330	380	330	290	250	330	380	330	290	250	250	280	250	220	190	250	280	250	220	190
		vc (SFM)	259	298	259	228	196	259	298	259	228	196	262	293	262	230	199	262	293	262	230	199
		vf (IPM)	30	50	30	20	20	40	60	40	30	30	20	40	20	20	20	30	50	30	30	20
		fz (IPT)	.016	.024	.016	.016	.016	.016	.024	.016	.016	.016	.016	.024	.016	.016	.016	.016	.024	.016	.016	.016
		ap (inch)	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024	.031	.031	.031	.024	.024
		ae (inch)	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200	3.200
		Q (inch3/min)	2.2	3.7	2.2	1.2	1.2	3.0	4.5	3.0	1.7	1.7	2.0	4.0	2.0	1.5	1.5	3.0	5.0	3.0	2.3	1.5



Inch

Work Material	Insert Grade	Cutter Dia.	φ3.000(5NT)				φ3.000(7NT)				φ4.000(6NT)				φ4.000(8NT)			
		Overhang Ratio	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC
Cast Iron Ductile Cast Iron	JP4120 GX2140 JS4060	n (min-1)	840	840	710	630	840	840	710	630	630	630	530	470	630	630	530	470
		vc (SFM)	660	660	558	495	660	660	558	495	660	660	555	492	660	660	555	492
		vf (IPM)	30	30	20	20	50	50	30	30	30	30	20	20	40	40	30	20
		fz (IPT)	.008	.008	.006	.006	.008	.008	.006	.006	.008	.008	.006	.006	.008	.008	.006	.006
		pf (inch)	≦0.5DC				≦0.5DC				≦0.5DC				≦0.5DC			
		ae (inch)	≦.354				≦.354				≦.354				≦.354			

【Note】
④For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑤To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑥Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑦Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑧The following equation can be used to determine the metal removal rate per unit time Q;
$Q(\text{inch}^3/\text{min}) = a_p(\text{inch}) \times a_e(\text{inch}) \times v_f(\text{IPM})$

Radius Mill TR4D

Recommended cutting conditions

Face Milling, Side Milling

Metric

Red indicates primary recommended insert grade.

Work Material	Insert Grade	Cutter Dia.	ϕ1.969 inch (ϕ50mm) (3NT)					ϕ1.969 inch (ϕ50mm) (4NT)					ϕ2.480 inch (ϕ63mm) (4NT)				
		Overhang Ratio	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC
			General	High Speed				General	High Speed				General	High Speed			
General Structural Steel (200HB or less)	GX2140 JS4060	n (min-1)	950	1,270	950	830	700	950	1,270	950	830	700	760	1,010	760	660	560
		vc (m/min)	150	200	150	130	110	150	200	150	130	110	150	200	150	130	110
		vf (mm/min)	5,130	7,620	5,130	4,480	3,780	6,840	10,160	6,840	5,980	5,040	5,470	8,080	5,470	4,750	4,030
		fz (mm/t)	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50
		Q (cm3/min)	205	305	205	143	121	274	406	274	191	161	274	404	274	190	161
Carbon Steel Alloy Steel (<35HRC)	GX2140 JS4060	n (min-1)	950	1,270	950	830	700	950	1,270	950	830	700	760	1,010	760	660	560
		vc (m/min)	150	200	150	130	110	150	200	150	130	110	150	200	150	130	110
		vf (mm/min)	5,130	7,620	5,130	4,480	3,780	6,840	10,160	6,840	5,980	5,040	5,470	8,080	5,470	4,750	4,030
		fz (mm/t)	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50
		Q (cm3/min)	205	305	205	143	121	274	406	274	191	161	274	404	274	190	161
Carbon Steel Alloy Steel (35～45HRC)	JP4120 JS4060	n (min-1)	830	950	830	700	570	830	950	830	700	570	660	760	660	560	450
		vc (m/min)	130	150	130	110	90	130	150	130	110	90	130	150	130	110	90
		vf (mm/min)	4,480	5,700	4,480	3,360	2,740	5,980	7,600	5,980	4,480	3,650	4,750	6,080	4,750	3,580	2,880
		fz (mm/t)	1.8	2	1.8	1.6	1.6	1.8	2	1.8	1.6	1.6	1.8	2	1.8	1.6	1.6
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50
		Q (cm3/min)	179	228	179	108	88	239	304	239	143	117	238	304	238	143	115
300 series Stainless Steel (WET)	JM4160	n (min-1)	640	-	640	540	450	640	-	640	540	450	510	-	510	430	350
		vc (m/min)	100	-	100	85	70	100	-	100	85	70	100	-	100	85	70
		vf (mm/min)	1,920	-	1,920	1,620	1,350	2,560	-	2,560	2,160	1,800	2,040	-	2,040	1,720	1,400
		fz (mm/t)	1	-	1	1	1	1	-	1	1	1	1	-	1	1	1
		ap (mm)	1	-	1	0.8	0.8	1	-	1	0.8	0.8	1	-	1	0.8	0.8
		ae (mm)	40	-	40	40	40	40	-	40	40	40	50	-	50	50	50
		Q (cm3/min)	77	-	77	52	43	102	-	102	69	58	102	-	102	69	56
Precipitation Hardening Stainless Steel (WET)	JM4160 JP4120	n (min-1)	570	-	570	510	450	570	-	570	510	450	450	-	450	400	350
		vc (m/min)	90	-	90	80	70	90	-	90	80	70	90	-	90	80	70
		vf (mm/min)	1,370	-	1,370	1,220	1,080	1,820	-	1,820	1,630	1,440	1,440	-	1,440	1,280	1,120
		fz (mm/t)	0.8	-	0.8	0.8	0.8	0.8	-	0.8	0.8	0.8	0.8	-	0.8	0.8	0.8
		ap (mm)	1	-	1	0.8	0.8	1	-	1	0.8	0.8	1	-	1	0.8	0.8
		ae (mm)	40	-	40	40	40	40	-	40	40	40	50	-	50	50	50
		Q (cm3/min)	55	-	55	39	35	73	-	73	52	46	72	-	72	51	45
Cast Iron Ductile Cast Iron	GX2140 JS4060 JP4120	n (min-1)	950	1,270	950	830	700	950	1,270	950	830	700	760	1,010	760	660	560
		vc (m/min)	150	200	150	130	110	150	200	150	130	110	150	200	150	130	110
		vf (mm/min)	5,700	7,620	5,700	4,980	4,200	7,600	10,160	7,600	6,640	5,600	6,080	8,080	6,080	5,280	4,480
		fz (mm/t)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50
		Q (cm3/min)	228	305	228	159	134	304	406	304	212	179	304	404	304	211	179
Hardened Steel (45～50HRC)	JP4120 JP4105	n (min-1)	510	570	510	450	380	510	570	510	450	380	400	450	400	350	300
		vc (m/min)	80	90	80	70	60	80	90	80	70	60	80	90	80	70	60
		vf (mm/min)	770	1,370	770	680	570	1,020	1,820	1,020	900	760	800	1,440	800	700	600
		fz (mm/t)	0.5	0.8	0.5	0.5	0.5	0.5	0.8	0.5	0.5	0.5	0.5	0.8	0.5	0.5	0.5
		ap (mm)	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6
		ae (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50
		Q (cm3/min)	25	44	25	16	14	33	58	33	22	18	32	58	32	21	18
Hardened Steel (50～60HRC)	JP4105 JP4120	n (min-1)	510	570	510	450	380	510	570	510	450	380	400	450	400	350	300
		vc (m/min)	80	90	80	70	60	80	90	80	70	60	80	90	80	70	60
		vf (mm/min)	610	1,030	610	540	460	820	1,370	820	720	610	640	1,080	640	560	480
		fz (mm/t)	0.4	0.6	0.4	0.4	0.4	0.4	0.6	0.4	0.4	0.4	0.4	0.6	0.4	0.4	0.4
		ap (mm)	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6
		ae (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50
		Q (cm3/min)	20	33	20	13	11	26	44	26	17	15	26	43	26	17	14

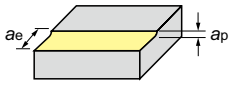
Standard Cutting Conditions for plunging

Metric

Red indicates primary recommended insert grade.

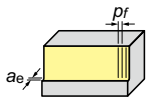
Work Material	Insert Grade	Cutter Dia.	ϕ1.969 inch (ϕ50mm) (3NT)				ϕ1.969 inch (ϕ50mm) (4NT)				ϕ2.480 inch (ϕ63mm) (4NT)			
		Overhang Ratio	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC
Cast Iron Ductile Cast Iron	JP4120 GX2140 JS4060	n (min-1)	1,270	1,270	1,080	950	1,270	1,270	1,080	950	1,010	1,010	860	760
		vc (m/min)	200	200	170	150	200	200	170	150	200	200	170	150
		vf (mm/min)	760	760	490	430	1,020	1,020	650	570	810	810	520	460
		fz (mm/t)	0.2	0.2	0.15	0.15	0.2	0.2	0.15	0.15	0.2	0.2	0.15	0.15
		pf (mm)	≦0.5DC				≦0.5DC				≦0.5DC			
		ae (mm)	≦9.0				≦9.0				≦9.0			

【Note】①This table provides general guidelines for cutting conditions; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble.
Therefore, please consider the following when adjusting the conditions;
・Reduce rotation speed and table feed rate by 50 to 70%
・Reduce cutting depth ap by 50 to 70%
・Reduce cutting width ae by 50 to 70%
②Please note that the GX coating and JS coating do not cause a reaction in conductive touch sensors.
③JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.



Metric

Work Material	Insert Grade	Cutter Dia.	ϕ2.480 inch (ϕ63mm) (5NT)					ϕ3.150 inch (ϕ80mm) (5NT)					ϕ3.937 inch (ϕ100mm) (6NT)				
		Overhang Ratio	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC	<3DC		3~5DC	5~7DC	>7DC
			General	High Speed				General	High Speed				General	High Speed			
General Structural Steel (200HB or less)	GX2140 JS4060	n (min-1)	760	1,010	760	660	560	600	800	600	520	440	480	640	480	410	350
		vc (m/min)	150	200	150	130	110	150	200	150	130	110	150	200	150	130	110
		vf (mm/min)	6,840	10,100	6,840	5,940	5,040	5,400	8,000	5,400	4,680	3,960	5,180	7,680	5,180	4,430	3,780
		fz (mm/t)	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm3/min)	342	505	342	238	202	346	512	346	240	203	414	614	414	284	242
Carbon Steel Alloy Steel (<35HRC)	GX2140 JS4060	n (min-1)	760	1,010	760	660	560	600	800	600	520	440	480	640	480	410	350
		vc (m/min)	150	200	150	130	110	150	200	150	130	110	150	200	150	130	110
		vf (mm/min)	6,840	10,100	6,840	5,940	5,040	5,400	8,000	5,400	4,680	3,960	5,180	7,680	5,180	4,430	3,780
		fz (mm/t)	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8	1.8	2	1.8	1.8	1.8
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm3/min)	342	505	342	238	202	346	512	346	240	203	414	614	414	284	242
Carbon Steel Alloy Steel (35～45HRC)	JP4120 JS4060	n (min-1)	660	760	660	560	450	520	600	520	440	360	410	480	410	350	290
		vc (m/min)	130	150	130	110	90	130	150	130	110	90	130	150	130	110	90
		vf (mm/min)	5,940	7,600	5,940	4,480	3,600	4,680	6,000	4,680	3,520	2,880	4,430	5,760	4,430	3,360	2,780
		fz (mm/t)	1.8	2	1.8	1.6	1.6	1.8	2	1.8	1.6	1.6	1.8	2	1.8	1.6	1.6
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm3/min)	297	380	297	179	144	300	384	300	180	147	354	461	354	215	178
300 series Stainless Steel (WET)	JM4160	n (min-1)	510	-	510	430	350	400	-	400	340	280	320	-	320	270	220
		vc (m/min)	100	-	100	85	70	100	-	100	85	70	100	-	100	85	70
		vf (mm/min)	2,550	-	2,550	2,150	1,750	2,000	-	2,000	1,700	1,400	1,920	-	1,920	1,620	1,320
		fz (mm/t)	1	-	1	1	1	1	-	1	1	1	1	-	1	1	1
		ap (mm)	1	-	1	0.8	0.8	1	-	1	0.8	0.8	1	-	1	0.8	0.8
		ae (mm)	50	-	50	50	50	64	-	64	64	64	80	-	80	80	80
		Q (cm3/min)	128	-	128	86	70	128	-	128	87	72	154	-	154	104	84
Precipitation Hardening Stainless Steel (WET)	JM4160 JP4120	n (min-1)	450	-	450	400	350	360	-	360	320	280	290	-	290	250	220
		vc (m/min)	90	-	90	80	70	90	-	90	80	70	90	-	90	80	70
		vf (mm/min)	1,800	-	1,800	1,600	1,400	1,440	-	1,440	1,280	1,120	1,390	-	1,390	1,200	1,060
		fz (mm/t)	0.8	-	0.8	0.8	0.8	0.8	-	0.8	0.8	0.8	0.8	-	0.8	0.8	0.8
		ap (mm)	1	-	1	0.8	0.8	1	-	1	0.8	0.8	1	-	1	0.8	0.8
		ae (mm)	50	-	50	50	50	64	-	64	64	64	80	-	80	80	80
		Q (cm3/min)	90	-	90	64	56	92	-	92	66	57	111	-	111	77	68
Cast Iron Ductile Cast Iron	GX2140 JS4060 JP4120	n (min-1)	760	1,010	760	660	560	600	800	600	520	440	480	640	480	410	350
		vc (m/min)	150	200	150	130	110	150	200	150	130	110	150	200	150	130	110
		vf (mm/min)	7,600	10,100	7,600	6,600	5,600	6,000	8,000	6,000	5,200	4,400	5,760	7,680	5,760	4,920	4,200
		fz (mm/t)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		ap (mm)	1	1	1	0.8	0.8	1	1	1	0.8	0.8	1	1	1	0.8	0.8
		ae (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm3/min)	380	505	380	264	224	384	512	384	266	225	461	614	461	315	269
Hardened Steel (45～50HRC)	JP4120 JP4105	n (min-1)	400	450	400	350	300	320	360	320	280	240	250	290	250	220	190
		vc (m/min)	80	90	80	70	60	80	90	80	70	60	80	90	80	70	60
		vf (mm/min)	1,000	1,800	1,000	880	750	800	1,440	800	700	600	750	1,390	750	660	570
		fz (mm/t)	0.5	0.8	0.5	0.5	0.5	0.5	0.8	0.5	0.5	0.5	0.5	0.8	0.5	0.5	0.5
		ap (mm)	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6
		ae (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm3/min)	40	72	40	26	23	41	74	41	27	23	48	89	48	32	27
Hardened Steel (50～60HRC)	JP4105 JP4120	n (min-1)	400	450	400	350	300	320	360	320	280	240	250	290	250	220	190
		vc (m/min)	80	90	80	70	60	80	90	80	70	60	80	90	80	70	60
		vf (mm/min)	800	1,350	800	700	600	640	1,080	640	560	480	600	1,040	600	530	460
		fz (mm/t)	0.4	0.6	0.4	0.4	0.4	0.4	0.6	0.4	0.4	0.4	0.4	0.6	0.4	0.4	0.4
		ap (mm)	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6	0.8	0.8	0.8	0.6	0.6
		ae (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm3/min)	32	54	32	21	18	33	55	33	22	18	38	67	38	25	22



Metric

Work Material	Insert Grade	Cutter Dia.	ϕ2.480 inch (ϕ63mm) (5NT)				ϕ3.150 inch (ϕ80mm) (5NT)				ϕ3.937 inch (ϕ100mm) (6NT)			
		Overhang Ratio	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC	<3DC	3~5DC	5~7DC	>7DC
Cast Iron Ductile Cast Iron	JP4120 GX2140 JS4060	n (min-1)	1,010	1,010	860	760	800	800	680	600	640	640	540	480
		vc (m/min)	200	200	170	150	200	200	170	150	200	200	170	150
		vf (mm/min)	1,010	1,010	650	570	800	800	510	450	770	770	490	430
		fz (mm/t)	0.2	0.2	0.15	0.15	0.2	0.2	0.15	0.15	0.2	0.2	0.15	0.15
		pf (mm)	≦0.5DC				≦0.5DC				≦0.5DC			
		ae (mm)	≦9.0				≦9.0				≦9.0			

【Note】 ④For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑤To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑥Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑦Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑧The following equation can be used to determine the metal removal rate per unit time Q;
$Q(cm^3/min) = a_p(mm) \times a_e(mm) \times v_f(mm/min) / 1000$

Radius Mill TD4N

YouTube

· High efficiency, low cutting force, and economical 4-corner specification leaves less of the uncut remnants. Reduces the load on the next process.

Roughing | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C37

Shank type

Fig.1
(Standard type)

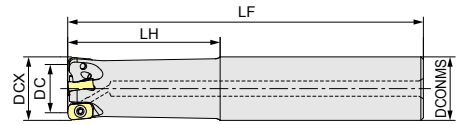
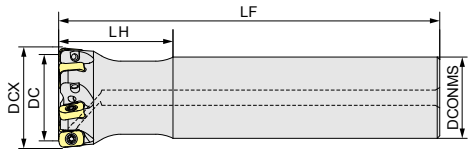


Fig.2
(Undercut type)



Inch ITD4N20○○□-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □ .

Style		Item code	Stock	No. of flutes	Dimensions (Inch) DCX	DC	LF	LH	DCONMS	Type	Insert
Shank Style	Regular	ITD4N2010S-2	●	2	.625	.389	4.000	1.250	.625	Fig.1	EN□U0603ER-□
		ITD4N2012S-3	●	3	.750	.514	5.000	2.000	.750		
		ITD4N2016S-4	●	4	1.000	.764	5.500	2.500	1.000		
		ITD4N2020S-5	●	5	1.250	1.014	6.000	2.750	1.250		
		ITD4N2024S-6	●	6	1.500	1.264	6.000	1.750	1.500		
	Long	ITD4N2010L-2	●	2	.625	.389	6.000	2.000	.625		
		ITD4N2012L-3	●	3	.750	.514	6.250	3.250	.750		
		ITD4N2016L-4	●	4	1.000	.764	7.000	4.000	1.000		
		ITD4N2020L-5	●	5	1.250	1.014	8.000	5.000	1.250		
		ITD4N2024L-6	●	6	1.500	1.264	9.000	1.750	1.500		

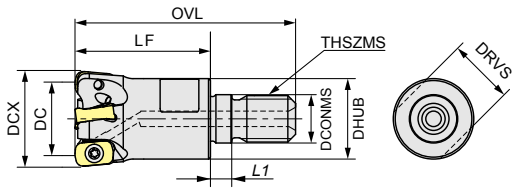
Metric TD4N20○○□(32)-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □ .

Style		Item code	Stock	No. of flutes	Dimensions (mm) DCX	DC	LF	LH	DCONMS	Type	Insert
Shank Style	Regular	TD4N2016S-2	●	2	16	10	100	30	16	Fig.1	EN□U0603ER-□
		TD4N2020S-3	●	3	20	14	130	50	20		
		TD4N2025S-4	●	4	25	19	140	60	25		
		TD4N2032S-5	●	5	32	26	150	70	32		
		TD4N2040S32-6	●	6	40	34	150	45	32	Fig.2	
	Long	TD4N2016L-2	●	2	16	10	150	50	16	Fig.1	
		TD4N2018L-2	●	2	18	12	150	25	16	Fig.2	
		TD4N2020L-3	●	3	20	14	160	80	20	Fig.1	
		TD4N2022L-3	●	3	22	16	160	30	20	Fig.2	
		TD4N2025L-4	●	4	25	19	180	100	25	Fig.1	
		TD4N2028L-4	●	4	28	22	180	35	25	Fig.2	
		TD4N2032L-5	●	5	32	26	200	120	32	Fig.1	
		TD4N2035L-5	●	5	35	29	200	40	32	Fig.2	
		TD4N2040L32-6	●	6	40	34	220	45	32	Fig.2	

● : Inventory maintained in US

Modular type



Inch ITD4N20○○M-○

Numeric figure in a circle ○ and
Alphabetical character comes in a square □ .

Item code	Stock	No. of flutes	Dimensions (Inch)									Insert
			DCX	DC	LF	OVL	L11	DCON	DCSFMS	CRKS	H	
ITD4N2010M-2	●	2	.625	.389	.984	1.653	.217	.335	.504	M8	.394	EN□U0603ER-□
ITD4N2012M-3	●	3	.750	.514	1.181	1.929	.217	.413	.701	M10	.591	
ITD4N2016M-4	●	4	1.000	.764	1.378	2.244	.217	.492	.819	M12	.669	
ITD4N2020M-5	●	5	1.250	1.014	1.575	2.481	.236	.669	1.134	M16	.866	
ITD4N2024M-6	●	6	1.500	1.264	1.575	2.481	.236	.669	1.134	M16	.866	

Metric TD4N20○○M-○

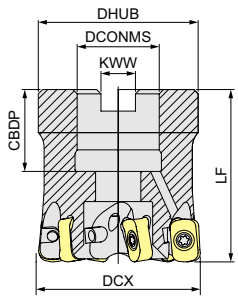
Numeric figure in a circle ○ and
Alphabetical character comes in a square □ .

Item code	Stock	No. of flutes	Dimensions (mm)									Insert
			DCX	DC	LF	OVL	L11	DCON	DCSFMS	CRKS	H	
TD4N2016M-2	●	2	16	10	25	42	5.5	8.5	12.8	M8	10	EN□U0603ER-□
TD4N2018M-2	●	2	18	12	25	42	5.5	8.5	12.8	M8	10	
TD4N2020M-3	●	3	20	14	30	49	5.5	10.5	17.8	M10	15	
TD4N2022M-3	●	3	22	16	30	49	5.5	10.5	17.8	M10	15	
TD4N2025M-4	●	4	25	19	35	57	5.5	12.5	20.8	M12	17	
TD4N2028M-4	●	4	28	22	35	57	5.5	12.5	20.8	M12	17	
TD4N2032M-5	●	5	32	26	40	63	6	17	28.8	M16	22	
TD4N2035M-5	●	5	35	29	40	63	6	17	28.8	M16	22	
TD4N2040M-6	●	6	40	34	40	63	6	17	28.8	M16	22	
TD4N2042M-6	●	6	42	36	40	63	6	17	28.8	M16	22	

【Note】 Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicatedarbor".

Bore type

Numeric figure in a circle ○ and
Alphabetical character comes in a square □ .



Inch ITD4N20○○B-6

Item code	Stock	No. of flutes	Dimensions (Inch)								Insert
			DCX	DHUB	LF	CBDP	KWW	b	DCONMS	DCCB	
ITD4N2024B-6	●	6	1.50	37.1mm	40mm	19mm	8mm	5mm	19.05mm	17mm	EN□U0603ER-□
ITD4N2032B-6	●	6	2.00	47.6mm	50.8mm	19mm	8mm	5mm	19.05mm	17mm	

Radius Mill TD4N

Insert

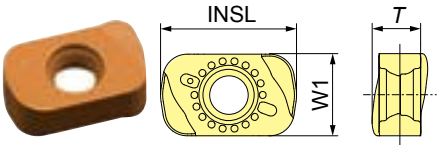


Fig.1 ENMU0603ER-B

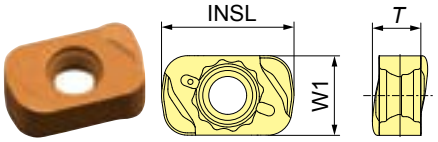


Fig.2 ENMU0603ER-C

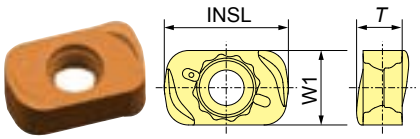


Fig.3 ENGU0603ER-C

P	Carbon steels		■		■	■
M	SUS, etc.			■		
K	FC・FCD Cast irons		■		□	□
H	Hardened steels	■	□			

■:General cutting, First recommendation
□:General cutting, Second recommendation

Item code	Tolerance class	AJ Coating			JS Coating	GX Coating	Size (mm)			Shape
		JP4105	JP4120	JM4160	JS4045	GX2140	INSL	W1	*T*	
ENMU0603ER-B	M		●	●	●	●	10	6	3.7	Fig.1
ENMU0603ER-C	M		●	●	●	●	10	6	3.7	Fig.2
ENGU0603ER-C	G	●					10	6	3.7	Fig.3

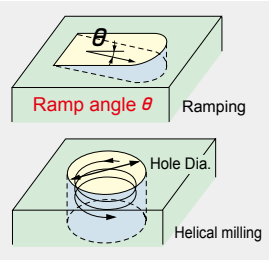
【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Parts

Parts	Clamp screw		Screw Driver	Screw anti-seizure agent
Shape		Fastening torque (N・m)		
Item Code	**250-141**	1.1	104-T8	P-37

【Note】
The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

Regarding ramping and helical milling diameter



RAMPING/HELICAL MILLING - METRIC DIAMETER

Tool dia. DCX (mm)	φ16	φ18	φ20	φ22	φ25	φ28	φ32	φ35	φ40	φ42
Maximum ramp angle θ	0.8°	0.8°	0.8°	0.8°	0.8°	0.6°	0.5°	0.5°	0.3°	0.3°
Hole Dia. (mm)	24～30	28～34	32～38	36～42	42～48	48～54	56～62	62～68	72～78	76～82

RAMPING/HELICAL MILLING - INCH DIAMETER

Tool dia. DCX (inch)	.625"	.750"	1.000"	1.250"	1.500"	2.000"
Maximum ramp angle θ	0.8°	0.8°	0.8°	0.5°	0.3°	0.2°
Hole Dia. (inch)	.940～1.176	1.191～1.427	1.693～1.929	2.195～2.431	2.697～2.933	3.701～3.937

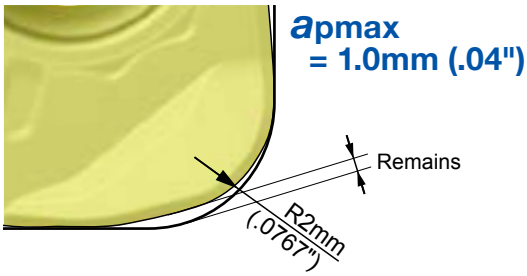
Cutting depth per rotation should be set to *a*p = 1 mm or less.

【Note】 ① It is recommended that the tool be used while performing sufficient chip removal and checking that there are no abnormal vibrations.
② The ramp angle *θ* should be set within the ranges listed above. Use at ramp angles of 0.5° or less is recommended.
③ For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Points requiring care when creating the machining program

- In CAM, define the tool shape as an R2.0mm (.0787") radius shape.
- Use with axial-direction cutting depths ap of 1.0mm (.04") or less.

	Corner R Definition in CAM	Remains (inch/mm)	Over Cut (inch/mm)
	.0591" / R1.5mm	.0118" / 0.3mm	0
Recommended	.0787" / R2.0mm	.0079" / 0.2mm	0
	.1181" / R3.0mm	0	0.0157" / 0.4mm



● : Inventory maintained in US No Mark : Manufactured upon request only

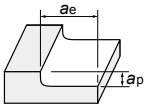
Recommended cutting conditions

Inch

※ Red indicates primary recommended insert grade.

Work material	Recommended inserts grade	Tool dia. DCX	φ 5/8"(2 flutes)		φ 3/4"(3 flutes)		φ 1"(4 flutes)		φ 1.25" (5 flutes)		φ 1.5"(6 flutes)		φ 2"(6 flutes)	
		Overhang	~3DCX	4DCX~7DCX	~3DCX	4DCX~7DCX	~3DCX	4DCX~7DCX	~3DCX	4DCX~7DCX	~3DCX	4DCX~7DCX	~3DCX	4DCX~7DCX
Carbon Steel Alloy Steel <30HRC	※ GX2140 JS4045	*n* (min-1)	3,380	2,990	2,710	2,390	2,170	1,910	1,690	1,490	1,350	1,190	1065	940
		Vc(SFM)	558	492	558	492	558	492	558	492	558	492	558	492
		Vf(IPM)	319	282	384	339	410	361	399	352	383	337	302	266
		fz(IPT)	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047
		*a*p(inch)	.031	.024	.031	.024	.031	.024	.031	.024	.031	.024	.031	.024
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.866	.866	1.102	1.102	1.5	1.5
		Q (in3/min)	3.9	2.7	6.6	4.5	9.5	6.5	1.7	7.3	13.1	8.9	14	9.6
Alloy Steel Tool Steel 30 ~ 40HRC	JP4120 JS4045	*n* (min-1)	2,990	2,590	2,390	2,070	1,910	1,660	1,490	1,290	1,190	1,040	940	815
		Vc(SFM)	492	426	492	426	492	426	492	426	492	426	492	427
		Vf(IPM)	235	204	282	244	301	261	293	254	281	246	222	192
		fz(IPT)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
		*a*p(inch)	.031	.024	.031	.024	.031	.024	.031	.024	.031	.024	.031	.024
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.866	.866	1.102	1.102	1.5	1.5
		Q (in3/min)	2.9	1.9	4.8	3.2	7	4.7	7.9	5.3	9.6	6.5	1.3	6.9
Pre-Hardened Steel Alloy Steel 40 ~ 50HRC	JP4120 JS4045	*n* (min-1)	1,990	1,790	1,590	1,430	1,270	1,150	1,000	900	800	720	627	564
		Vc(SFM)	328	295	328	295	328	295	328	295	328	295	328	295
		Vf(IPM)	157	113	188	135	200	145	197	142	189	136	148	107
		fz(IPT)	.039	.031	.039	.031	.039	.031	.039	.031	.039	.031	.039	.031
		*a*p(inch)	.024	.02	.024	.02	.024	.02	.024	.02	.024	.02	.024	.02
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.866	.866	1.102	1.102	1.5	1.5
		Q (in3/min)	1.5	.9	2.5	1.5	3.6	2.2	4.1	2.5	5	3	5.3	3.2
Stainless Steel	JM4160	*n* (min-1)	1,990	1,790	1,590	1,430	1,270	1,150	1,000	900	800	720	627	564
		Vc(SFM)	328	295	328	295	328	295	328	295	328	295	328	295
		Vf(IPM)	157	113	188	135	200	145	197	142	189	136	148	107
		fz(IPT)	.039	.031	.039	.031	.039	.031	.039	.031	.039	.031	.039	.031
		*a*p(inch)	.024	.02	.024	.02	.024	.02	.024	.02	.024	.02	.024	.02
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.866	.866	1.102	1.102	1.5	1.5
		Q (in3/min)	1.5	.9	2.5	1.5	3.6	2.2	4.1	2.5	5	3	5.3	3.2
Cast Iron	JP4120 GX2140	*n* (min-1)	3980	3580	3180	2870	2550	2290	1990	1790	1590	1430	1253	1128
		Vc(SFM)	656	590	656	590	656	590	656	590	656	590	656	591
		Vf(IPM)	470	338	563	407	602	433	587	423	563	405	444	320
		fz(IPT)	.059	.047	.059	.047	.059	.047	.059	.047	.059	.047	.059	.047
		*a*p(inch)	.031	.024	.031	.024	.031	.024	.031	.024	.031	.024	.031	.024
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.866	.866	1.102	1.102	1.5	1.5
		Q (in3/min)	5.7	3.2	9.6	5.4	14	7.8	15.8	8.8	19.2	1.7	2.6	11.5
High-hardened Steel 50 ~ 55HRC	JP4105 JP4120	*n* (min-1)	1,590	1,390	1,270	1,110	1,020	890	800	700	640	560	501	439
		Vc(SFM)	262	230	262	230	262	230	262	230	262	230	262	230
		Vf(IPM)	50	4	60	4	64	45	63	44	60	42	47	33
		fz(IPT)	.016	.013	.016	.013	.016	.013	.016	.013	.016	.013	.016	.013
		*a*p(inch)	.012	.008	.012	.008	.012	.008	.012	.008	.012	.008	.012	.008
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.945	.945	1.102	1.102	1.5	1.5
		Q (in3/min)	.244	.122	.366	.183	.549	.305	.671	.366	.784	.366	.8	.4
High-hardened Steel 55 ~ 62HRC	JP4105	*n* (min-1)	1,590	1,390	1,270	1,110	1,020	890	800	700	640	560	376	376
		Vc(SFM)	197	197	197	197	197	197	197	197	197	197	197	197
		Vf(IPM)	~ 28	~ 22	~ 34	~ 27	~ 36	~ 29	~ 35	~ 28	~ 34	~ 27	~ 27	~ 21
		fz(IPT)	~ .012	~ .009	~ .012	~ .009	~ .012	~ .009	~ .012	~ .009	~ .012	~ .009	~ .012	~ .009
		*a*p (inch) 55~57HRC	~ .012	~ .006	~ .012	~ .006	~ .012	~ .006	~ .012	~ .006	~ .012	~ .006	~ .012	~ .006
		*a*p (inch) 58~62HRC	~ .008	~ .004	~ .008	~ .004	~ .008	~ .004	~ .008	~ .004	~ .008	~ .004	~ .008	~ .004
		*a*e(inch)	.394	.394	.551	.551	.748	.748	.945	.945	1.102	1.102	1.5	1.5
		Q (in3/min)	~ .122	~ .061	~ .244	~ .122	~ .305	~ .183	~ .366	~ .244	~ .441	~ .236	~ .486	~ .252

【Note】 ① Use the appropriate coolant for the work material and machining shape.
② Conditions are for general guidance on shoulder face milling.In actual machining conditions please adjust the parameters according to your actual machine and work-piece conditions.Especially when the chip discharge or vibration is a problem in Slotting or near machining, please adjust the cutting conditions as follows.
· Reduce depth of cut(*a*p) to 50 to 70%.
· Reduce number of revolution(*n*) and feed rate(*V*f) to 50 to 70%.



③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.
⑤ The machinability of hardened steels (55 - 62HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth *a*p to suit machining conditions.
⑥ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑦ GX2140 should be used for dry cutting.
⑧ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑨ Ensure to exchange the insert at the correct time to ensure safety of the tool-body.
⑩ The following equation can be used to determine the metal removal rate per unit time *Q*:
Q(cm3/min)=*a*p(mm) × *a*e(mm) × *V*f(mm/min) ／1000

Radius Mill TD4N

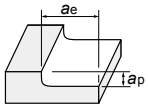
Recommended cutting conditions

Metric

※ Red indicates primary recommended insert grade.

Work material	Recommended inserts grade	Tool dia. DCX	φ16(2 flutes)		φ20(3 flutes)		φ25(4 flutes)		φ32(5 flutes)		φ40(6 flutes)	
		Overhang	～3DCX	4DCX～7DCX	～3DCX	4DCX～7DCX	～3DCX	4DCX～7DCX	～3DCX	4DCX～7DCX	～3DCX	4DCX～7DCX
Carbon Steel Alloy Steel <30HRC	※ GX2140 JS4045	*n* (min-1)	3,380	2,990	2,710	2,390	2,170	1,910	1,690	1,490	1,350	1,190
		Vc(m/min)	170	150	170	150	170	150	170	150	170	150
		Vf(mm/min)	6,760	4,780	8,130	5,730	10,410	9,160	10,140	8,940	9,720	8,560
		fz(mm/t)	1	0.8	1	0.8	1.2	1.2	1.2	1.2	1.2	1.2
		ap(mm)	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
		ae(mm)	10	10	14	14	19	19	22	22	28	28
		Q (cm3/min)	41	29	68	48	158	104	112	98	136	120
Alloy Steel Tool Steel 30 ~ 40HRC	JP4120 JS4045	*n* (min-1)	2,990	2,590	2,390	2,070	1,910	1,660	1,490	1,290	1,190	1,040
		Vc(m/min)	150	130	150	130	150	130	150	130	150	130
		Vf(mm/min)	5,980	4,140	7,170	4,960	7,640	6,640	7,450	6,450	7,140	6,240
		fz(mm/t)	1	0.8	1	0.8	1	1	1	1	1	1
		ap(mm)	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
		ae(mm)	10	10	14	14	19	19	22	22	28	28
		Q (cm3/min)	36	25	60	42	116	76	82	71	100	87
Pre-Hardened Steel Alloy Steel 40 ~ 50HRC	JP4120 JS4045	*n* (min-1)	1,990	1,790	1,590	1,430	1,270	1,150	1,000	900	800	720
		Vc(m/min)	100	90	100	90	100	90	100	90	100	90
		Vf(mm/min)	3,980	2,860	4,770	3,430	5,080	3,680	5,000	3,600	4,800	3,450
		fz(mm/t)	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8
		ap(mm)	0.6	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5
		ae(mm)	10	10	14	14	19	19	22	22	28	28
		Q (cm3/min)	24	14	40	24	58	35	55	40	67	48
Stainless Steel	JM4160	*n* (min-1)	1,990	1,790	1,590	1,430	1,270	1,150	1,000	900	800	720
		Vc(m/min)	100	90	100	90	100	90	100	90	100	90
		Vf(mm/min)	3,980	2,860	4,770	3,430	5,080	3,680	5,000	3,600	4,800	3,450
		fz(mm/t)	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8
		ap(mm)	0.6	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5
		ae(mm)	10	10	14	14	19	19	22	22	28	28
		Q (cm3/min)	24	14	40	24	58	35	55	40	67	48
Cast Iron	JP4120 GX2140	*n* (min-1)	3,980	3,580	3,180	2,870	2,550	2,290	1,990	1,790	1,590	1,430
		Vc(m/min)	200	180	200	180	200	180	200	180	200	180
		Vf(mm/min)	9,550	7,160	11,440	8,610	12,240	9,160	11,940	8,950	11,440	8,580
		fz(mm/t)	1.2	1	1.2	1	1.2	1	1.2	1	1.2	1
		ap(mm)	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.6
		ae(mm)	10	10	14	14	19	19	22	22	28	28
		Q (cm3/min)	76	43	128	72	186	104	210	118	256	144
High-hardened Steel 50 ~ 55HRC	JP4105 JP4120	*n* (min-1)	1,590	1,390	1,270	1,110	1,020	890	800	700	640	560
		Vc(m/min)	80	70	80	70	80	70	80	70	80	70
		Vf(mm/min)	1,270	890	1,530	1,070	1,630	1,140	1,590	1,110	1,530	1,070
		fz(mm/t)	0.4	0.32	0.4	0.32	0.4	0.32	0.4	0.32	0.4	0.32
		ap(mm)	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2
		ae(mm)	10	10	14	14	19	19	24	24	30	30
		Q (cm3/min)	4	2	6	3	9	5	11	6	14	7
High-hardened Steel 55 ~ 62HRC	JP4105	*n* (min-1)	1,190	1,190	950	950	760	760	600	600	480	480
		Vc(m/min)	60	60	60	60	60	60	60	60	60	60
		Vf(mm/min)	～720	～570	～860	～690	～920	～730	～900	～720	～860	～690
		fz(mm/t)	～0.3	～0.24	～0.3	～0.24	～0.3	～0.24	～0.3	～0.24	～0.3	～0.24
		ap(mm) 55~57HRC	～0.3	～0.15	～0.3	～0.15	～0.3	～0.15	～0.3	～0.15	～0.3	～0.15
		ap(mm) 58~62HRC	～0.2	～0.1	～0.2	～0.1	～0.2	～0.1	～0.2	～0.1	～0.2	～0.1
		ae(mm)	10	10	14	14	19	19	24	24	30	30
		Q (cm3/min)	～2	～1	～4	～2	～5	～3	～6	～4	～8	～4

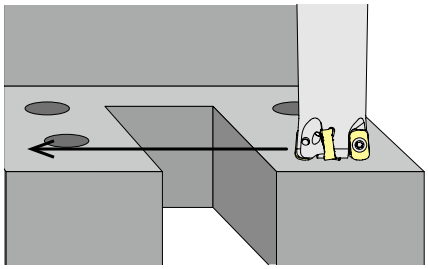
【Note】 ① Use the appropriate coolant for the work material and machining shape.
② Conditions are for general guidance on shoulder face milling.In actual machining conditions please adjust the parameters according to your actual machine and work-piece conditions.Especially when the chip discharge or vibration is a problem in Slotting or near machining, please adjust the cutting conditions as follows.
· Reduce depth of cut(*ap*) to 50 to 70%.
· Reduce number of revolution(*n*) and feed rate(*Vf*) to 50 to 70%.
③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.
⑤ The machinability of hardened steels (55 - 62HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth *ap* to suit machining conditions.
⑥ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑦ GX2140 should be used for dry cutting.
⑧ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑨ Ensure to exchange the insert at the correct time to ensure safety of the tool-body.
⑩ The following equation can be used to determine the metal removal rate per unit time *Q*:
Q(cm3/min)=*ap*(mm) × *ae*(mm) × *Vf*(mm/min) ／1000



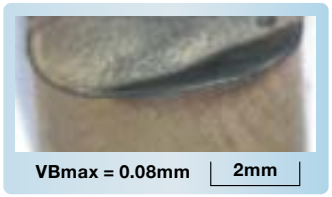
Field data

01 Shortened machining time

Interrupted machining



Cutting edge condition after 30 minutes of cutting



[Work material] Pre-hardened steel (40HRC)

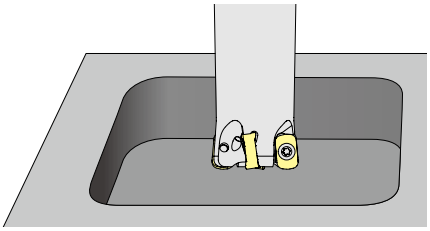
[Tool] TD4N2032S-5 (Ø1.5"-5 flutes)
ENMU0603EN-B (JP4120)

[Cutting conditions]
Vc = 100 m/min (328 sfm)
Vf = 9,000 mm/min (354 ipm)
fz = 1.8 mm/t (.071 in/tooth)
ap × ae = 0.6 × 20 mm (.024" x .79")
Air-blow

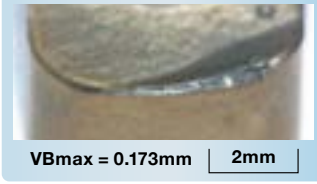
● 90-minute machining time shortened to approximately 30 minutes.

02 Improved tool life

Pocketing



Cutting edge condition after 100 minutes of cutting



[Work material] Carbon steel

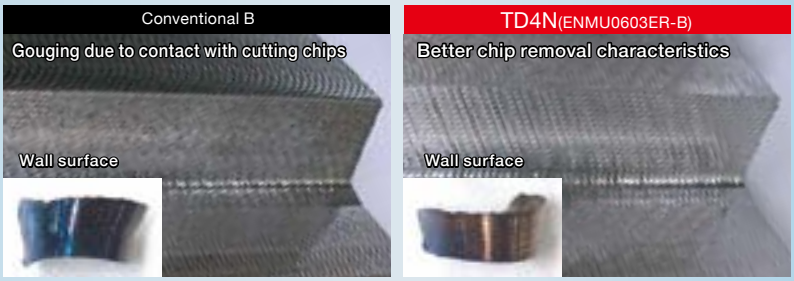
[Tool] TD4N2020S-3 (Ø 0.75"-3 flutes)
ENMU0603EN-B (JP4120)

[Cutting conditions]
Vc = 140 m/min (459 sfm)
Vf = 5,000 mm/min (197 ipm)
fz = 0.75 mm/t (.03 in/tooth)
ap × ae = 0.8 × 10 mm (.031" x .394")
Emulsion oil

● There is no major chipping and damage is reduced.

03 Machining condition comparison for walls

Condition of machined wall and cutting chips



[Work material] Carbon steel

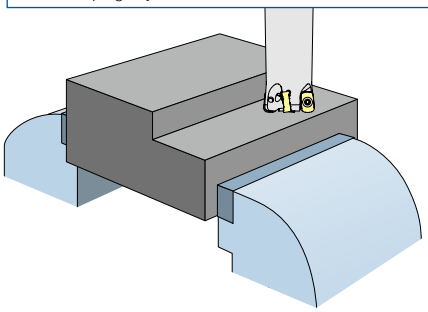
[Tool] TD4N2025S-4 (Ø 1"-4 flutes)
ENMU0603EN-B (JM4160)

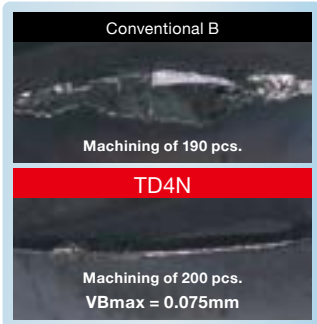
[Cutting conditions]
Vc = 180 m/min (590 sfm)
Vf = 7,300 mm/min (287 ipm)
fz = 0.8 mm/t (.031 in/tooth)
ap × ae = 0.5 × 18 mm (.02" x .71")
Air-blow

● New free cutting design curls chip up and into the pocket minimizing chip discharge contact with walls.

04 High-performance machining when clamp rigidity is weak

Low clamp rigidity





[Work material] Mild steel

[Tool] TD4N2032S-5 (Ø 1.5"-5 flutes)
ENMU0603EN-C (JS4045)

[Cutting conditions]
Vc = 200 m/min (656 sfm)
Vf = 8,000 mm/min (315 ipm)
fz = 0.8 mm/t (.031 in/tooth)
ap × ae = 0.5 × 20 mm (.02" x.79")
Emulsion oil

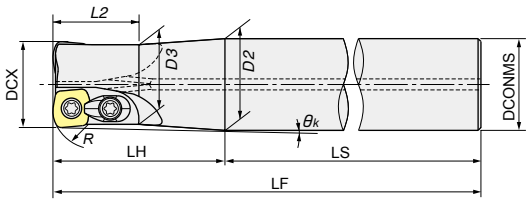
● Even after machining 200 pieces, wear is minimal.

Radius Mill ASR

- At higher-than-normal cutting feed rates, offers 3 to 5 times the deep-cutting of conventional products, reducing cutting time and processing costs.
- Insert has a unique R shape to enable maximum cutting depth of 2mm.

Roughing | Maximum Notch 2.0 | 13° | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C45

Shank type



With air hole

Inch IASR□○○○○R

Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

		Item code	Stock	No. of flutes	Size(inch) DCX	LF	DCONMS	R	LH	LS	L2	θk	D2	D3	Inserts
Shank type	Regular	IASRS0012R	●	2	.750	5.118	.750	10	1.969	3.150	.787	–	.750	.669	EPNW0803TN-10
		IASRS0016R	●	2	1.000	5.512	1.000		2.362	3.150	.984	–	1.000	.894	EDNW10T3TN-10
		IASRS4020R	●	2	1.250	5.906	1.250	10 (15)	2.756	3.000	1.181	–	.250	1.158	ED□□13T4TN-15(Z) ED□W13T4TN-10
		IASRS4024R	●	2	1.500	5.906	1.500		1.969	3.937	1.575	–	1.500	1.181	
	Long	IASRL0012R	●	2	.750	7.087	.750	10	3.937	3.150	.787	–	.750	.669	EPNW0803TN-10
		IASRL0016R	●	2	1.000	7.874	1.000		4.724	3.150	.984	–	1.000	.894	EDNW10T3TN-10
		IASRL4020R	●	2	1.250	7.874	1.250	10 (15)	4.724	3.150	1.181	–	1.250	1.158	ED□□13T4TN-15(Z) ED□W13T4TN-10
		IASRL4024R	●	2	1.500	9.843	1.500		1.969	7.874	1.575	–	1.500	1.181	
	Extra Long	IASRE0012R	●	2	.750	9.843	.750	10	5.118	4.724	.787	–	.750	.669	EPNW0803TN-10
		IASRE0016R	●	2	1.000	11.811	1.000		7.087	4.724	.984	–	1.000	.894	EDNW10T3TN-10
		IASRE4020R	●	2	1.250	11.811	1.250	10 (15)	7.087	4.724	1.181	–	1.250	1.158	ED□□13T4TN-15(Z) ED□W13T4TN-10
		IASRE4024R	●	2	1.500	11.811	1.500		1.969	9.843	1.575	–	1.500	1.181	

● : Inventory maintained in US ★ : Inventory maintained in Japan

Metric ASR□○○○○

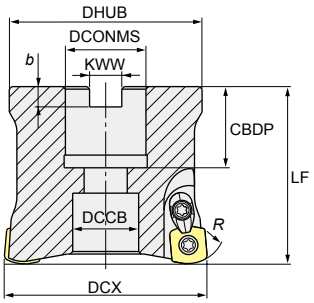
Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

Item code			Stock	No. of flutes	Size(mm)										Inserts
					DCX	LF	DCONMS	*R*	LH	LS	*L2*	*θk*	*D2*	*D3*	
Shank type	Regular	ASRS0020	●	2	20	130	20	10	50	80	20	–	20	18	EPNW0803TN-10
		ASRS0025	●	2	25	140	25		60	80	25	–	25	22.3	EDNW10T3TN-10
		ASRS4030	★	2	30	150	32	15 (10)	70	80	29	1.1°	32	27.8	ED□□13T4TN-15(Z) ED□W13T4TN-10
		ASRS4032	●	2	32	150	32		70	80	29	–	32	29.6	
		ASRS4040	●	3	40	150	42		50	100	40	1.5°	42	35	
		ASRS5050	★	3	50	110	25※		50	60	50	–	47	47	ED□□15T4TN-15(Z) ED□W15T4TN-10
		ASRS5063	★	4	63	120	32※		50	70	50	–	60	60	
	Long	ASRL0020	●	2	20	180	20	10	100	80	20	–	20	18	EPNW0803TN-10
		ASRL0025	●	2	25	200	25		120	80	25	–	25	22.3	EDNW10T3TN-10
		ASRL4030	★	2	30	200	32	15 (10)	120	80	30	0.7°	32	27.8	ED□□13T4TN-15(Z) ED□W13T4TN-10
		ASRL4032	●	2	32	200	32		120	80	30	–	32	29.6	
		ASRL4040	●	3	40	250	42		50	200	40	1.5°	42	35	
		ASRL5050	★	3	50	250	42		50	200	50	–	47	47	ED□□15T4TN-15(Z)
		ASRL5063	★	4	63	250	42		50	200	50	–	60	60	ED□W15T4TN-10
	Extra Long	ASRE0020	●	2	20	250	20	10	130	120	20	–	20	18	EPNW0803TN-10
		ASRE0025	●	2	25	300	25		180	120	25	–	25	22.3	EDNW10T3TN-10
		ASRE4030	★	2	30	300	32	15 (10)	180	120	30	0.5°	32	27.8	ED□□13T4TN-15(Z) ED□W13T4TN-10
		ASRE4032	●	2	32	300	32		180	120	30	–	32	29.6	
		ASRE4040	●	2	40	300	42		50	250	40	1.5°	42	35	

【Note】 ※Marked Shanks are available for both milling chucks of BT40 & BT50.

Radius Mill ASR

Bore type



Inch IASR○○○○-○

Numeric figure comes in a circle ○.

	Item code	Stock	No. of flutes	Size(inch) DCX	DHUB	LF	CBDP	R	KWW	b	DCONMS	DCCB	Inserts
Bore type	IASR4032-4	●	4	2.000	1.850	1.969	.748	.591	.320	.197	.750	.630	ED□□13T4TN-15(Z) ED□W13T4TN-10
	IASR5040-4	●	4	2.500	2.382	1.969	1.024		.320	.197	.750	.630	
	IASR5048-5	●	5	3.000	2.843	1.969	1.378		.380	.236	1.000	.827	ED□□15T4TN-15(Z) ED□W15T4TN-10
	IASR5064-6	●	6	4.000	3.843	1.969	1.378		.630	.394	1.500	1.969	

Metric ASR○○○○(M)-○

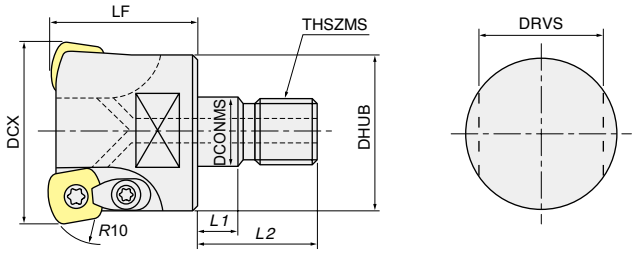
Numeric figure comes in a circle ○.

		Item code	Stock	No. of flutes	Size(mm) DCX	DHUB	LF	CBDP	R	KWW	b	DCONMS	DCCB	Inserts
Bore type	Internal diameter inch size	ASR4050-3	★	3	50	47	50	19	15 (10)	8.4	5	22.225	17	ED□□13T4TN-15(Z) ED□W13T4TN-10
		ASR4050-4	★	4	50	47	50	19		8.4	5	22.225	17	
		ASR5060-4	★	4	60	57	50	19		8.4	5	22.225	17	ED□□15T4TN-15(Z) ED□W15T4TN-10
		ASR5063-4	★	4	63	60	50	19		8.4	5	22.225	17	
		ASR5080-5	★	5	80	76	70	32		12.7	8	31.75	26	
		ASR5100-5	★	5	100	96	70	32		12.7	8	31.75	26	
		ASR5100-6	★	6	100	96	70	32		12.7	8	31.75	26	
	Internal diameter mm size	ASR4050M-4	★	4	50	47	50	20		10.4	6.3	22	17	ED□□13T4TN-15(Z) ED□W13T4TN-10
		ASR5060M-4	★	4	60	57	50	20		10.4	6.3	22	17	ED□□15T4TN-15(Z) ED□W15T4TN-10
		ASR5063M-4	●	4	63	60	50	20		10.4	6.3	22	17	
		ASR5080M-5	●	5	80	76	70	22		12.4	7	27	20	
		ASR5100M-6	●	6	100	96	70	25		14.4	8	32	26	

【Note】 Arbor screw is not included.

● : Inventory maintained in US ★ : Inventory maintained in Japan

Modular Type



With air hole

Metric ASRM00◯◯-◯

Numeric figure in a circle◯.

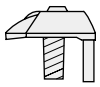
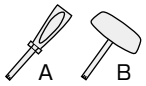
Item code	Stock	No. of flutes	Size(mm)								Inserts
			DCX	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
ASRM0020-2	●	2	20	30	10.5	M10	17.8	5.5	19	15	EPNW0803TN-10
ASRM0025-2	●	2	25	35	12.5	M12	20.8	5.5	22	17	EDNW10T3TN-10
ASRM0030-3	★	3	30	40	17	M16	28.8	6	23	22	
ASRM0032-3	●	3	32	40	17	M16	28.8	6	23	22	
※1 ASRM0035-3	★	3	35	40	17	M16	28.8	6	23	22	
※1 ASRM0040-4	●	4	40	40	17	M16	28.8	6	23	22	

【Note】

When ※1 and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

Parts

Numeric figure in a circle◯.

Parts	Clamp screw			Clamp piece set	Screw driver / Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N•m)	Fastening torque (lbf•in)		 A B	Shape	
IASRE0012R ASR S/L/E0020	242-141	2.9	25.67	—	104-T15	A	—
ASRM0020-2							P-37
IASRE0016R ASR S/L/E0025	412-141	2.9	25.67	CM3.5-141			—
ASRM ◯◯◯◯-◯							P-37
IASRE4020R IASR4024R ASR S/L/E4◯◯◯ ASR S/L5◯◯◯ ASR◯◯◯◯-◯ ASR◯◯◯◯M-◯	555-141	4.9	43.37	CM5-147	105-T20	B	—

Radius Mill ASR

Inserts

Numeric figure in a circle ◌.

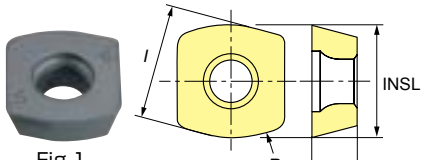


Fig-1
Standard shape

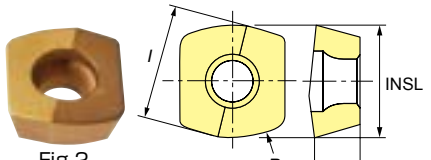


Fig-2
Convex shape type

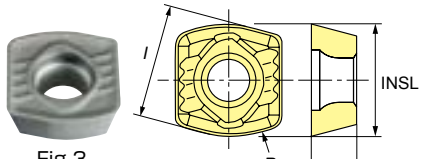


Fig-3
Breaker type

		JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	CY250	GF30
P	Carbon steel		■		■	■	□		
M	Stainless steel, etc.			■					
K	Cast iron		■		■	■			
H	Hardened steel	■	■						

■ : General cutting, First recommended

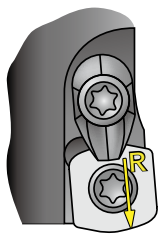
□ : General cutting, Second recommended

Item code	Tolerance class	JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	CY250	GF30	R	I	S	INSL	Shape	Cutter body
		AJ Coating			GX Coating	JS Coating		C Coating	G Coating	Size(mm)					
EPNW0803TN-10	N	★	★	★	★	●	★	●		10	8.1	3.18	7.94	Fig-1	ASR S/L/E 0020 ASRM0020-2 IASR S/L/E 0012R
EDNW10T3TN-10	N	★	★	★	★	●	★	●	★	10	10	3.97	10	Fig-1	ASR S/L/E 0025 ASRM◌◌◌◌-◌ IASR S/L/E/0016R
EDNW13T4TN-10	N	★	★		★	●	★	●		10	13.5	5.56	12.7	Fig-1	ASR S/L/E 4◌◌◌(-◌) ASR4050(◌)-◌ IASR S/L/E 4020R IASR S/L/E 4024R IASR4032-4, IASR5040-4
EDNW13T4TN-15	N	★	★	★	★	●	★	●	★	15	13.5	5.56	12.7	Fig-1	
EDNW15T4TN-10	N	★	★		★	●	★	●		10	15	5.56	14	Fig-1	ASR S/L 5◌◌◌(-◌) ASR5◌◌◌(◌)-◌ IASR5048-5 IASR5064-6
EDNW15T4TN-15	N	★	★	★	★	●	★	●	★	15	15	5.56	14	Fig-1	
EDEW13T4TN-10	E					★		★		10	13.5	5.56	12.7	Fig-1	ASR S/L/E 4◌◌◌(-◌) ASR4050(◌)-◌ IASR S/L/E 4020R IASR S/L/E 4024R IASR4032-4, IASR5040-4
EDEW13T4TN-15	E					★		★		15	13.5	5.56	12.7	Fig-1	
EDEW15T4TN-10	E					★		★		10	15	5.56	14	Fig-1	ASR S/L 5◌◌◌(-◌) ASR5◌◌◌(◌)-◌ IASR5048-5 IASR5064-6
EDEW15T4TN-15	E					★		★		15	15	5.56	14	Fig-1	
EDNW13T4TN-15Z	N		★	★		★	★			15	13.5	5.56	12.7	Fig-2	ASR S/L/E 4◌◌◌(-◌) ASR4050(◌)-◌ IASR S/L/E 402◌R IASR4032-4, IASR5040-4
EDNW15T4TN-15Z	N		★	★		★	★			15	15	5.56	14	Fig-2	ASR S/L 5◌◌◌(-◌) ASR5◌◌◌(◌)-◌ IASR5048-5, IASR5064-6
EDMT13T4TN-15	M			★	★	★	★	★		15	13.5	5.56	12.7	Fig-3	ASR S/L/E 4◌◌◌(-◌) ASR4050(◌)-◌ IASR S/L/E 402◌R IASR4032-4, IASR5040-4
EDMT15T4TN-15	M			★	★	★	★	★		15	15	5.56	14	Fig-3	ASR S/L 5◌◌◌(-◌) ASR5◌◌◌(◌)-◌ IASR5048-5, IASR5064-6

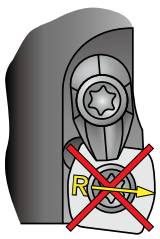
【Note】

We recommend, R15 for overhang 5DCX or less; R10 for overhang 4~5DCX or more.
Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
Mount the insert in the correct orientation as shown in the figure on the right.

Insert mounting



Correct mounting

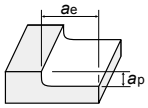


Incorrect mounting

● : Inventory maintained in US ★ : Inventory maintained in Japan
No Mark : Manufactured upon request only

Recommended cutting conditions

Inch



※Red indicates primary recommended grade.

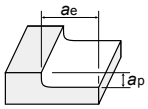
Work material	Recommended grade	Cutting speed Vc (SFM)	Feed rate fz(IPT)	φ20mm or .750" (2 Flutes)			φ25mm or 1.000" (2 flutes)			φ30mm or 1.25" (2 Flutes)			φ40mm or 1.575" (3 Flutes)		
				Revolution (min-1)	Feed speed (IPM)	Q (in3/min)	Revolution (min-1)	Feed speed (IPM)	Q (in3/min)	Revolution (min-1)	Feed speed (IPM)	Q (in3/min)	Revolution (min-1)	Feed speed (IPM)	Q (in3/min)
General structural steel (200HB or less)	※GX2140 JS4060 JS4045	561~656	.024~.059	2,860	137	4.0	2,290	110	4.3	1,900	224	10.9	1,430	253	6.3
				vc=591SFM fz=.024in/t ap=.039in ae=1.0DCX						vc=591SFM fz=.059in/t ap=.039in ae=1.0DCX					
		295~492	.024~.079	1,430	69	2.0	1,150	55	4.3	960	113	5.5	720	127	7.8
				vc=295SFM fz=.024in/t ap=.039in ae=1.0DCX						vc=295SFM fz=.059in/t ap=.039in ae=1.0DCX					
Carbon steel Alloy steels (30HRC or less)	GX2140 JS4045 JS4060	591~656	.024~.059	2,860	137	4.0	2,290	110	4.3	1,900	224	10.9	1,430	253	15.5
				vc=591SFM fz=.024in/t ap=.039in ae=1.0DCX						vc=591SFM fz=.059in/t ap=.039in ae=1.0DCX					
		295~492	.024~.079	1,430	69	2.0	1,150	55	2.2	960	113	5.5	720	127	7.8
				vc=295SFM fz=.024in/t ap=.039in ae=1.0DCX						vc=295SFM fz=.059in/t ap=.039in ae=1.0DCX					
Carbon steel Alloy steels (30~45HRC)	JP4120 JS4045 JS4060	262~394	.016~.032	1,430	57	3.0	1,150	46	1.8	960	61	3.0	720	69	4.2
				vc=295SFM fz=.020in/t ap=.039in ae=1.0DCX						vc=295SFM fz=.032in/t ap=.039in ae=1.0DCX					
Stainless steel	JM4160	262~427	.020~.039	1,592	76	4.0	1,274	61	2.4	1,061	51	2.5	796	57	3.5
				vc=328SFM fz=.024in/t ap=.039in ae=1.0DCX											
		492~656		3,183	153	3.7	2,547	122	3.9	2,122	102	4.1	1,592	115	5.8
				vc=656SFM fz=.024in/t ap=.032in/t ae=1.0DCX											
Cast iron	JP4120	295~492	.032~.079	2,860	183	9.5	2,290	147	5.7	1,900	300	19.9	1,430	339	31.5
				vc=591SFM fz=.032in/t ap=.039in/t ae=1.0DCX						vc=591SFM fz=.079in/t ap=.059in ae=1.0DCX					
	GX2140 JS4045	230~394		1,430	92	3.4	1,150	74	3.6	960	152	11.2	720	171	15.9
				vc=90SFM fz=.032in/t ap=.049in ae=1.0DCX						vc=295SFM fz=.079in/t ap=.059in ae=1.0DCX					
Hardened steel Pre-Hardened steel (45~50HRC)	JP4120 JS4045	230~394	.008~.024	1,600	38	2.0	1,270	30	1.2	1,060	25	1.2	790	28	2.6
				vc=328SFM fz=.012in/t ap=.039in ae=1.0DCX											
				1,110	18	.3	890	14	.6	740	12	.6	550	13	.8
				vc=230SFM fz=.008in/t ap=.039in ae=1.0DCX											
Hardened steel (50~55HRC)	JP4105	230~328	.002~.008	1,110	18	.3	890	14	.3	740	12	.3	550	13	.4
				vc=230SFM fz=.008in/t ap=.020in ae=1.0DCX											
Hardened steel (55~60HRC)	JP4105	164~328		790	3	.05	630	3	.1	530	2	.1	400	2	.1
				vc=164SFM fz=.002in/t ap=.020in ae=1.0DCX											

Work material	Recommended grade	Cutting speed Vc (SFM)	Feed rate fz(IPT)	φ50mm or 2.000" (4 Flutes)			φ 63mm or 2.500" (4 Flutes)			φ80mm or 3.150" (5 Flutes)			φ100mm or 4.000" (6 Flutes)		
				Revolution (min-1)	Feed speed (IPM)	Q (in3/min)	Revolution (min-1)	Feed speed (IPM)	Q (in3/min)	Revolution (min-1)	Feed speed (IPM)	Q (in3/min)	Revolution (min-1)	Feed speed (IPM)	Q (in3/min)
General structural steel (200HB or less)	※GX2140 JS4060 JS4045	561~656	.024~.059	1,150	271	32.0	910	215	31.7	720	212	39.5	570	202	47.6
				vc=591SFM fz=.059in/t ap=.059in ae=1.0DCX											
		295~492	.024~.079	570	135	15.9	455	107	15.8	360	106	19.7	290	103	24.2
				vc=295SFM fz=.059in/t ap=.059in ae=1.0DCX											
Carbon steel Alloy steels (30HRC or less)	GX2140 JS4045 JS4060	591~656	.024~.059	1,150	271	32.0	910	215	31.7	720	212	39.5	570	202	47.6
				vcc=591SFM fz=.059in/t ap=.059in ae=1.0DCX											
		295~492	.024~.079	570	135	15.9	455	107	15.8	360	106	19.7	290	103	24.2
				vc=295SFM fz=.059in/t ap=.059in ae=1.0DCX											
Carbon steel Alloy steels (30~45HRC)	JP4120 JS4045 JS4060	262~394	.016~.032	570	71	8.3	455	56	8.3	360	56	10.4	290	54	12.7
				vc=295SFM fz=.031in/t ap=.059in ae=1.0DCX											
Stainless steel	JM4160	262~427	.020~.039	637	61	4.8	505	48	4.7	398	48	5.9	319	46	7.2
				vc=328SFM fz=.024in/t ap=.039in ae=1.0DCX											
		492~656		1,274	122	7.6	1,011	97	7.5	796	96	9.3	637	92	11.4
				vc=656SFM fz=.024in/t ap=.031in ae 1.0DCX											
Cast iron	JP4120	295~492	.032~.079	1,150	363	57.4	910	288	56.8	720	284	70.8	570	270	85.4
				vc=591SFM fz=.079in/t ap=.079mm ae=1.0DCX											
	GX2140 JS4045	230~394		570	180	28.5	455	144	28.4	360	142	17.5	290	137	43.4
				vc=295SFM fz=.079inmm/t ap=.079in ae=1.0DCX											
Hardened steel Pre-Hardened steels (45~50HRC)	JP4120 JS4045	230~394	.008~.024	630	30	2.4	500	24	2.3	400	24	2.9	320	23	3.6
				vc=328SFM fz=.012in/t ap=.039in ae=1.0DCX											
				440	14	1.1	350	11	1.1	280	11	1.4	220	11	1.6
				vc=230SFM fz=.008in/t ap=.039in ae=1.0DCX											
Hardened steel (50~55HRC)	JP4105	230~328	.002~.008	440	14	.6	350	11	.6	270	11	.7	220	11	.8
				vc=230SFM fz=.008in/t ap=.020in ae=1.0DCX											
Hardened steel (55~60HRC)	JP4105	164~328		310	2	.2	250	2	.1	200	2	.1	160	2	.2
				vc=164SFM fz=.002in/t ap=.020in ae=1.0DCX											

Radius Mill ASR

Recommended cutting conditions

Metric



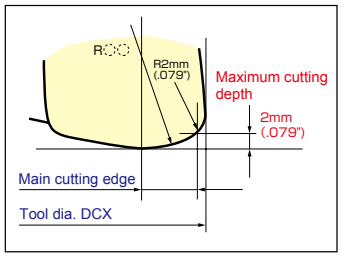
※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting speed Vc (m/min)	Feed rate fz(mm/t)	φ20(2 Flutes)			φ25(2 Flutes)			φ30(2 Flutes)			φ40(3 Flutes)		
				Revolution min-1	Feed speed mm/min	Q cm3/min	Revolution min-1	Feed speed mm/min	Q cm3/min	Revolution min-1	Feed speed mm/min	Q cm3/min	Revolution min-1	Feed speed mm/min	Q cm3/min
General structural steel (200HB or less)	※GX2140 JS4060 JS4045	180~200	0.6~1.5	2,860	3,430	69	2,290	2,750	69	1,900	5,700	171	1,430	6,400	256
				vc=180m/min fz=0.6mm/t ap=1.0mm ae=1.0DCX						vc=180m/min fz=1.5mm/t ap=1.0mm ae=1.0DCX					
		90~150	0.6~2.0	1,430	1,720	34	1,150	1,380	34	960	2,880	86	720	3,240	130
				vc=90m/min fz=0.6mm/t ap=1.0mm ae=1.0DCX						vc=90m/min fz=1.5mm/t ap=1.0mm ae=1.0DCX					
Carbon steel Alloy steel (30HRC or less)	GX2140 JS4045 JS4060	180~200	0.6~1.5	2,860	3,430	69	2,290	2,750	69	1,900	5,700	171	1,430	6,400	256
				vc=180m/min fz=0.6mm/t ap=1.0mm ae=1.0DCX						vc=180m/min fz=1.5mm/t ap=1.0mm ae=1.0DCX					
		90~150	0.6~2.0	1,430	1,720	34	1,150	1,380	34	960	2,880	86	720	3,240	130
				vc=90m/min fz=0.6mm/t ap=1.0mm ae=1.0DCX						vc=90m/min fz=1.5mm/t ap=1.0mm ae=1.0DCX					
Carbon steel Alloy steel (30~45HRC)	JP4120 JS4045 JS4060	80~120	0.4~0.8	1,430	1,430	29	1,150	1,150	29	960	1,500	45	720	1,730	69
				vc=90m/min fz=0.5mm/t ap=1.0mm ae=1.0DCX						vc=90m/min fz=0.8mm/t ap=1.0mm ae=1.0DCX					
Stainless steel	JM4160	80~130	0.5~1.0	1,592	1,910	38	1,274	1,528	38	1,061	1,273	38	796	1,433	57
				vc=100m/min fz=0.6mm/t ap=1.0mm ae=1.0DCX											
		150~200		3,183	3,820	61	2,547	3,056	61	2,122	2,547	61	1,592	2,865	92
				vc=200m/min fz=0.6mm/t ap=0.8mm ae=1.0DCX											
Cast iron	JP4120	180~200	0.8~2.0	2,860	4,580	92	2,290	3,670	92	1,900	7,600	342	1,430	8,580	515
				vc=180m/min fz=0.8mm/t ap=1.0mm ae=1.0DCX						vc=180m/min fz=2.0mm/t ap=1.5mm ae=1.0DCX					
	GX2140 JS4045	90~150		1,430	2,290	57	1,150	1,840	58	960	3,840	173	720	4,320	259
				vc=90m/min fz=0.8mm/t ap=1.25mm ae=1.0DCX						vc=90m/min fz=2.0mm/t ap=1.5mm ae=1.0DCX					
Hardened steel Pre-Hardened steel (45~50HRC)	JP4120 JS4045	70~120	0.2~0.6	1,600	950	19	1,270	760	19	1,060	640	19	790	710	28
				vc=100m/min fz=0.3mm/t ap=1.0mm ae=1.0DCX											
				1,110	440	9	890	350	9	740	300	9	550	330	13
				vc=70m/min fz=0.2mm/t ap=1.0mm ae=1.0DCX											
Hardened steel (50~55HRC)	JP4105	70~100	0.05~0.2	1,110	440	5	890	350	5	740	300	5	550	330	7
				vc=70m/min fz=0.2mm/t ap=0.5mm ae=1.0DCX											
Hardened steel (55~60HRC)	JP4105	50~100		790	80	1	630	60	1	530	53	0.8	400	60	1
				vc=50m/min fz=0.05mm/t ap=0.5mm ae=1.0DCX											

Work material	Recommended grade	Cutting speed Vc (m/min)	Feed rate fz(mm/t)	φ50(4 Flutes)			φ63(4 Flutes)			φ80(5 Flutes)			φ100(6 Flutes)		
				Revolution min-1	Feed speed mm/min	Q cm3/min	Revolution min-1	Feed speed mm/min	Q cm3/min	Revolution min-1	Feed speed mm/min	Q cm3/min	Revolution min-1	Feed speed mm/min	Q cm3/min
General structural steel (200HB or less)	※GX2140 JS4060 JS4045	180~200	0.6~1.5	1,150	6,900	510	910	5,500	520	720	5,400	650	570	5,130	770
				vc=180m/min fz=1.5mm/t ap=1.5mm ae=1.0DCX											
		90~150	0.6~2.0	570	3,420	257	455	2,730	258	360	2,700	325	290	2,610	390
				vc=90m/min fz=1.5mm/t ap=1.5mm ae=1.0DCX											
Carbon steel Alloy steel (30HRC or less)	GX2140 JS4045 JS4060	180~200	0.6~1.5	1,150	6,900	510	910	5,500	520	720	5,400	650	570	5,130	770
				vc=180m/min fz=1.5mm/t ap=1.5mm ae=1.0DCX											
		90~150	0.6~2.0	570	3,420	257	455	2,730	258	360	2,700	325	290	2,610	390
				vc=90m/min fz=1.5mm/t ap=1.5mm ae=1.0DCX											
Carbon steel Alloy steel (30~45HRC)	JP4120 JS4045 JS4060	80~120	0.4~0.8	570	1,820	130	455	1,450	140	360	1,440	170	290	1,400	210
				vc=90m/min fz=0.8mm/t ap=1.5mm ae=1.0DCX											
Stainless steel	JM4160	80~130	0.5~1.0	637	1,528	76	505	1,213	76	398	1,194	96	319	1,146	115
				vc=100m/min fz=0.6mm/t ap=1.0mm ae=1.0DCX											
		150~200		1,274	3,056	122	1,011	2,426	122	796	2,388	153	637	2,292	184
				vc=200m/min fz=0.6mm/t ap=0.8mm ae=1.0DCX											
Cast iron	JP4120	180~200	0.8~2.0	1,150	9,200	920	910	7,280	920	720	7,200	1,150	570	6,840	1,370
				vc=180m/min fz=2.0mm/t ap=2.0mm ae=1.0DCX											
	GX2140 JS4045	90~150		570	4,560	456	455	3,640	459	360	3,600	576	290	3,480	696
				vc=90m/min fz=2.0mm/t ap=2.0mm ae=1.0DCX											
Hardened steel Pre-Hardened steel (45~50HRC)	JP4120 JS4045	70~120	0.2~0.6	630	760	38	500	600	38	400	600	48	320	576	58
				vc=100m/min fz=0.3mm/t ap=1.0mm ae=1.0DCX											
				440	360	18	350	280	18	280	280	22	220	260	26
				vc=70m/min fz=0.2mm/t ap=1.0mm ae=1.0DCX											
Hardened steel (50~55HRC)	JP4105	70~100	0.05~0.2	440	350	9	350	280	9	270	270	11	220	260	13
				vc=70m/min fz=0.2mm/t ap=0.5mm ae=1.0DCX											
Hardened steel (55~60HRC)	JP4105	50~100		310	62	1.5	250	50	1.5	200	50	2.0	160	48	2.4
				vc=50m/min fz=0.05mm/t ap=0.5mm ae=1.0DCX											

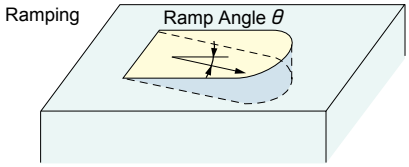
【Note】

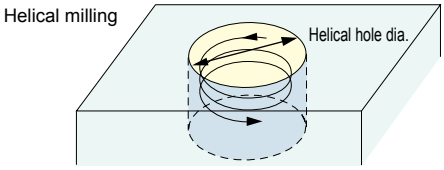
① When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (a_p) or 2.reducing per-flute feed rate (f_z).
② The cutting conditions in this catalog shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.
③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④ JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.
⑤ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑥ Please use an air-blast to remove the thick and heavy swarf created by this tool, through spindle air is recommended if available. Pay particular attention for vertical operations.
⑦ For man-less machining be sure to take care of swarf evacuation to create safe working conditions.
⑧ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑨ Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑩ Ensure that the depth of cut is no greater than 2mm (Right figure).
⑪ Due to fire risks do not use neat cutting oil as a coolant.



Processing by direct milling possible

・Although Ramp angle is limited due to cutting edge design, direct milling is possible without pre-cutting with Ramping and helical milling methods like next pictures.





RAMPING/HELICAL MILLING - METRIC DIAMETER

Tool dia. DCX (mm)	φ20	φ25	φ30	φ32	φ40	φ50	φ60	φ63	φ80	φ100
Maximum ramp angle θ	2°	2°	3°	2.5°	2°	1.5°	1°	1°	0.5°	0.5°
Helical hole dia. (mm)	27~38	37~48	38~58	42~62	58~78	78~98	98~118	101~124	136~158	176~198

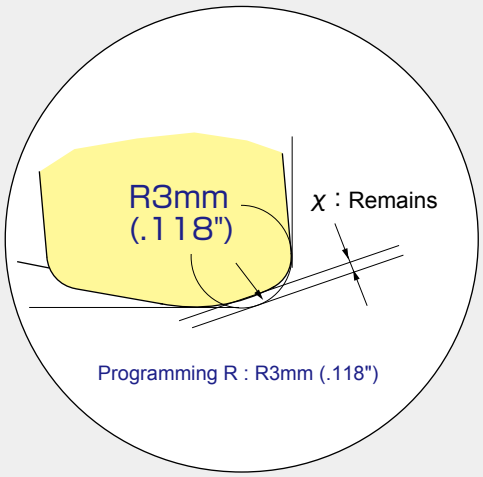
RAMPING/HELICAL MILLING - INCH DIAMETER

Tool dia. DCX (inch)	.750"	1.000"	1.250"	1.500"	2.000"	2.500"	3.000"	4.000"
Maximum ramp angle θ	2°	2°	2.5°	2°	1.5°	1°	0.5°	0.5°
Helical hole dia. (inch)	.988~1.421	1.488~1.921	1.988~2.421	2.488~2.921	3.488~3.921	4.488~4.921	5.488~5.921	7.488~7.921

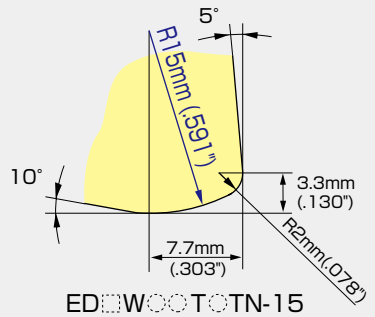
【Note】①The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 0.5° or less is recommended.
②For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

To define cutting edge shape for programming

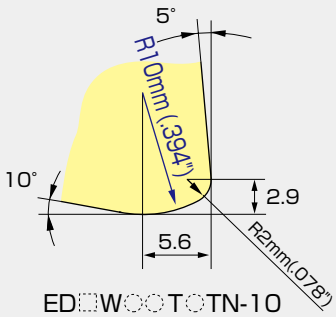
・By inputting Radius Mill programming R (R3mm or R.118"), insert R cutting remains cutting as shown below is possible for roughing procedures.



Insert shape rough sketch



ED□W○○T○TN-15
Remains χ = approx. 0.6mm(.024")
R15mm (.591") : Overhang 5DCX or less recommended



ED□W○○T○TN-10
Remains χ = approx. 0.5mm(.02")
R10mm (.394") : Overhang 4~5DCX or more recommended

Radius Mill 3 Corners ASRT

- Ultra-high efficiency! 3-corner specification added for high feed radius end mill.
- Introducing new material JP4120. Show it's potential for difficult to cut die and mold materials.
- B type breaker of low cutting force is added.

Roughing | Maximum Notch 2.0 | 13° | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C52

Shank type

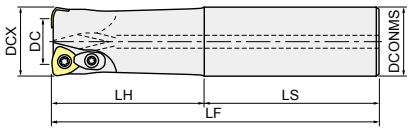


Fig.1 (Standard type)

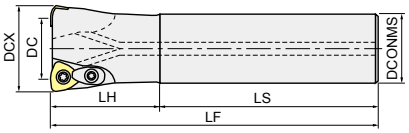


Fig.2 (Undercut type)

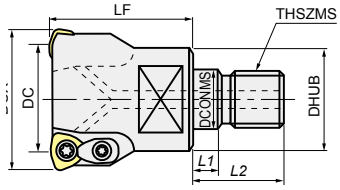
With air hole

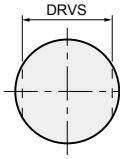
Metric ASRT□○○○○R-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Item code			Stock	No.of flutes	Size (mm) DCX	DC	LF	DCONMS	LH	LS	Shape	Inserts
Shank type	Regular	ASRTS3025R-2	★	2	25	14	140	25	60	80	Fig1	WDNW09T320 WDNT09T320 (-B/ZH)
		ASRTS3028R-2	★	2	28	17	140	25	40	100	Fig2	
		ASRTS4032R-2	★	2	32	20	150	32	70	80	Fig1	WDNW120420(Z) WDNT120420(-B/ZH)
		ASRTS4035R-2	★	2	35	23	150	32	50	100	Fig2	
		ASRTS4040R-3	★	3	40	28	150	32	50	100	Fig2	
	Long	ASRTL3025R-2	★	2	25	14	200	25	120	80	Fig1	WDNW09T320 WDNT09T320(-B/ZH)
		ASRTL3028R-2	★	2	28	17	200	25	40	160	Fig2	
		ASRTL4032R-2	★	2	32	20	200	32	120	80	Fig1	WDNW120420(Z) WDNT120420(-B/ZH)
		ASRTL4035R-2	★	2	35	23	200	32	50	150	Fig2	
		ASRTL4040R-3	★	3	40	28	250	32	50	200	Fig2	

Modular type





With air hole

Metric ASRTM30○○R-○

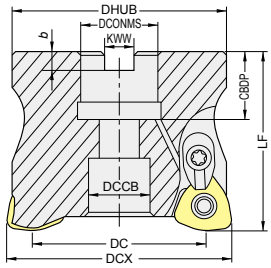
Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (mm) DCX	DC	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	Inserts
ASRTM3025R-2	★	2	25	14	35	12.5	M12	20.8	5.5	22	17	WDNW09T320 WDNT09T320 WDNT09T320-B WDNT09T320ZH
※1 ASRTM3028R-2	★	2	28	17	35	12.5	M12	23	5.5	22	17	
ASRTM3030R-3	★	3	30	19	40	17	M16	28.8	6	23	22	
ASRTM3032R-3	★	3	32	21	40	17	M16	28.8	6	23	22	
※1 ASRTM3035R-3	★	3	35	24	40	17	M16	28.8	6	23	22	
※1 ASRTM3040R-4	★	4	40	29	40	17	M16	28.8	6	23	22	

【Note】 When ※1 and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

● : Inventory maintained in US ★ : Inventory maintained in Japan

Bore type



With air hole

Inch IASRT○○○○R-○

Numeric figure comes in a circle ○.

	Item code	Stock	No.of flutes	Size (inch)									Inserts
				DCX	DC	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB	
Bore type	IASRT4032-4	●	4	2.000	1.539	1.850	1.969	.748	.315	.197	.750	.630	WDNW120420 WDNT120420
Bore type	IASRT5048-5	●	5	3.000	2.532	2.992	2.480	1.378	.374	.236	1.000	.827	WDNW140520 WDNT140520
Bore type	IASRT5064-6	●	6	4.000	3.532	3.780	2.756	1.378	.626	.394	1.500	1.260	
Bore type	IASRT6040R-4	●	4	2.500	1.935	2.362	1.969	1.024	.320	.197	.750	.630	WDNW150620
Bore type	IASRT6048R-5	●	5	3.000	2.435	2.756	2.480	1.378	.380	.236	1.000	.827	
Bore type	IASRT6064R-6	●	6	4.000	3.435	3.937	2.756	1.378	.630	.394	1.500	1.240	
Bore type	IASRT6080R-7	●	7	5.000	4.435	3.937	2.756	1.378	.630	.394	1.500	1.969	

Metric ASRT○○○○R(M)-○

Numeric figure comes in a circle ○.

		Item code	Stock	No.of flutes	Size (mm)									Inserts
					DCX	DC	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB	
Bore type	Internal diameter inch size	ASRT4050R-3	★	3	50	38	47	50	19	8.4	5	22.225	16.5	WDNW120420(Z) WDNT120420(-B/ZH)
Bore type	Internal diameter inch size	ASRT4050R-4	★	4	50	38	47	50	19	8.4	5	22.225	16.5	
Bore type	Internal diameter inch size	ASRT5063R-4	★	4	63	50	60	50	19	8.4	5	22.225	17	WDNW140520(Z) WDNT140520(-B/ZH)
Bore type	Internal diameter inch size	ASRT5080R-5	★	5	80	67	76	63	32	12.7	8	31.75	26	
Bore type	Internal diameter inch size	ASRT5100R-6	★	6	100	87	96	63	32	12.7	8	31.75	26	
Bore type	Internal diameter mm size	ASRT4050RM-3	★	3	50	38	47	50	20	10.4	6.3	22	16.5	WDNW120420(Z) WDNT120420(-B/ZH)
Bore type	Internal diameter mm size	ASRT4050RM-4	★	4	50	38	47	50	20	10.4	6.3	22	16.5	
Bore type	Internal diameter mm size	ASRT5063RM-4	★	4	63	50	60	50	20	10.4	6.3	22	17	WDNW140520(Z) WDNT140520(-B/ZH)
Bore type	Internal diameter mm size	ASRT5080RM-5	★	5	80	67	76	63	22	12.4	7	27	20	
Bore type	Internal diameter mm size	ASRT5100RM-6	★	6	100	87	96	63	25.5	14.4	8	32	26	

【Note】Arbor screw is not included.

Radius Mill 3 Corners ASRT

Inserts

Numeric figure in a circle ◌.

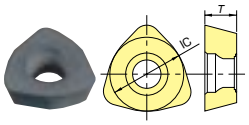


Fig.1 Standard shape

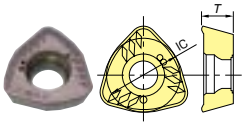


Fig.2 Standard breaker

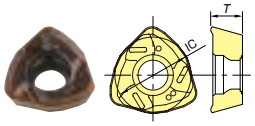


Fig.3 B breaker

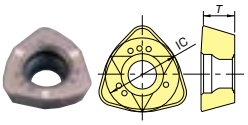


Fig.4 Z breaker

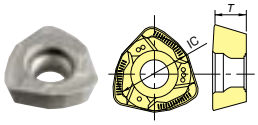


Fig.5 ZH breaker

P	Carbon steel		■		■	■	■
M	Stainless steel, etc.			■			
K	Cast iron		■		■	■	■
H	Hardened steel	■	⊔				

■ :General cutting, First recommended

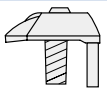
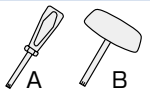
⊔ :General cutting, Second recommended

Item code	Tolerance class	AJ Coating			GX Coating	JS Coating		Size (mm)		Shape	Cutter body
		JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	IC	*T*		
WDNW09T320	N	★	★	★	★	★	★	9.525	3.97	Fig.1	ASRT M/S/L30◌◌R-◌
WDNW120420		●	●	●	★	●	★	12	4.76		ASRT S/L40◌◌R(M)-◌ IASRT4032-4
WDNW140520		★	●	●	★	●	★	14	5.56		ASRT 5◌◌◌R(M)-◌ IASRT50◌◌-◌
WDNT09T320					★	★	★	9.525	3.97	Fig.2	ASRT M/S/L30◌◌R-◌
WDNT120420					★	●	★	12	4.76		ASRT S/L40◌◌R(M)-◌ IASRT4032-4
WDNT140520					★	●	★	14	5.56		ASRT 5◌◌◌R(M)-◌ IASRT50◌◌-◌
WDNT09T320-B			★	★	★	★	★	9.525	3.97	Fig.3	ASRT M/S/L30◌◌R-◌
WDNT120420-B			★	★	★	★	★	12	4.76		ASRT S/L40◌◌R(M)-◌ IASRT4032-4
WDNT140520-B			★	★	★	★	★	14	5.56		ASRT 5◌◌◌R(M)-◌ IASRT50◌◌-◌
WDNW120420Z			★	★		★		12	4.76	Fig.4	ASRT S/L40◌◌R(M)-◌ IASRT4032-4
WDNW140520Z			★	★		★		14	5.56		ASRT 5◌◌◌R(M)-◌ IASRT50◌◌-◌
WDNT09T320ZH				★			★	9.525	3.97	Fig.5	ASRT M/S/L30◌◌R-◌
WDNT120420ZH				★			★	12	4.76		ASRT S/L40◌◌R(M)-◌ IASRT4032-4
WDNT140520ZH				★			★	14	5.56		ASRT 5◌◌◌R(M)-◌ IASRT50◌◌-◌
WDNW150620			●	★		●	●	14	5.56	Fig.1	IASRT60◌◌-◌

【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Parts

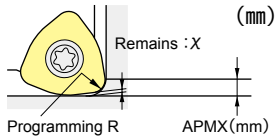
Numeric figure in a circle ◌.

Parts	Clamp screw			Clamp piece set	Screw driver / Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque N·m	Fastening torque lbp·in		 A B	Shape	
ASRT M/S/L30◌◌R-◌	242-141	2.9	25.67	CM3.5-141	104-T15	A	P-37
IASRT4032 ASRT S/L40◌◌R(M)-◌	262-142	2.9	25.67	CM4-141	105-T15	B	
IASRT50◌◌-◌ IASRT60◌◌-◌ ASRT5◌◌◌R(M)-◌	555-141	4.9	43.37	CM5-147	105-T20	B	

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Flute tip shape definition method in program

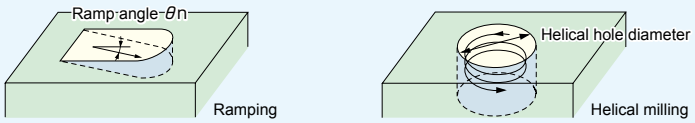
Item code	Programming R		Remains : X		Maximum cut depth	
	mm	inch	mm	inch	mm	inch
WDN W/T09T320	3	.118	0.47	.019	2	.079
WDN W/T120420(Z)	3	.118	0.63	.025	2	.079
WDN W/T140520(Z)	3	.118	0.64	.025	2	.079



When creating the CAM program, create the program as if a corner R3 radius cutter was being used.

Cutting by direct milling is also possible

Since the cutting flute do not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



RAMPING/HELICAL MILLING - METRIC DIAMETER

Inserts	Modular type/Shank type									Bore type			
	WDN W/T09T320						WDN W/T120420(Z)			WDN W/T140520(Z)			
Tool Diameter (mm)	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ35**	**ϕ40**	**ϕ32**	**ϕ35**	**ϕ40**	**ϕ50**	**ϕ63**	**ϕ80**	**ϕ100**
Max ramp angle θ	4°	3°	2.5°	2.5°	2°	1.5°	4°	3.5°	3°	2°	2.5°	1.5°	1°
Hole Dia. (mm)	33~46	39~52	43~56	47~60	53~66	63~76	41~60	47~66	57~76	77~96	98~122	132~156	172~196

RAMPING/HELICAL MILLING - INCH DIAMETER

Inserts	Bore Type IASRT40**/50**			Bore Type IASRT60**			
	WDN W/T120420(Z)	WDN W/T140520(Z)		WDNW150620			
Tool Diameter (inch)	**2.000"**	**3.000"**	**4.000"**	**2.500"**	**3.000"**	**4.000"**	**5.000"**
Max ramp angle θ	2.0°	1.5°	1.0°	2.0°	1.0° or less		
Hole Dia. (inch)	3.094~3.843	4.898~5.843	6.898~7.843	3.819~4.843	4.819~5.843	6.819~7.843	8.819~9.843

【Note】① The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 1。 or less is recommended.
② For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Field data

No	Work material	Tool dia. DCX	Grade	Cutting conditions					Result
				v_c [n]	f_z [v_f]	$a_p \times a_e$	Coolant	Overhang	
1	P21 (40HRC)	40mm	Equivalent to JP4120	75m/min (245SFM) [600min^{-1}]	1.1mm/t(.043"/t) [1,980mm/min(80IPM)]	a_p=0.5mm (.020") a_e=24mm (.945")	Air	50mm (2")	1.5× the tool life of conventional products
2	H13 (45HRC)	63mm	Equivalent to JP4120	70m/min (230SFM) [350min^{-1}]	0.6mm/t (.236"/t) [840mm/min (30IPM)]	a_p=0.5mm (.020") a_e=36mm (1.415")	Air	100mm (4")	Long tool life with less chipping than conventional products
3	H13 (43HRC)	40mm	Equivalent to JP4120	70m/min (230SFM) [560min^{-1}]	0.7mm/t (.276"/t) [1,180mm/min (45IPM)]	a_p=1.0mm (.039") a_e=24mm (.945")	Air	40mm (1.575")	1.5× the tool life of conventional products
4	1055 (220HB)	63mm	JS4060	130m/min (427SFM) [567min^{-1}]	1.5mm/t (.059"/t) [3,400mm/min (130IPM)]	a_p=1.0mm (.039") a_e=50mm (2")	Air	200mm (7.875")	2× the tool life of conventional products
5	D2 (≦255HB)	50mm	JS4060	188m/min (617SFM) [1,200min^{-1}]	1.0mm/t (.039"/t) [4,800mm/min (190IPM)]	a_p=1.5mm (.059") a_e=40mm (1.575")	Air	150mm (5.905")	2× the tool life of conventional products
6	P20	80mm	GX2140	180m/min (590SFM) [720min^{-1}]	1.1mm/t (.043"/t) [4,000mm/min (155IPM)]	a_p=0.8mm (.032") a_e=56mm (2.205")	Air	150mm (5.905")	2× the tool life of conventional products

Radius Mill 3 Corners ASRT

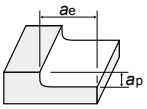
Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DCX	Straight shank type						Modular carbide shank Type								
			ϕ25mm (2NT)		ϕ32mm (2NT)		ϕ40mm (3NT)		ϕ25mm (2NT)			ϕ32mm (2NT)			ϕ40mm (3NT)		
		Overhang	<3DCX		<3DCX		<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX
			General purpose	High speed processing	General purpose	High speed processing	General purpose	High speed processing									
Mild steel (200HB or less)	※ GX2140 JS4060 JS4045	n (min-1)	1,910	2,550	1,500	1,990	1,200	1,600	1,910	1,660	1,150	1,500	1,300	900	1,200	1,040	720
		vc (SFM)	500	667	491	651	471	628	500	434	301	491	425	294	471	408	283
		vf (IPM)	151	241	236	470	142	284	180	131	72	212	154	85	227	164	91
		fz (IPT)	.040	.047	.039	.059	.039	.059	.047	.039	.031	.047	.039	.031	.047	.039	.032
		ap (inch)	.039	.032	.047	.039	.047	.039	.032	.020	.012	.032	.020	.012	.032	.020	.012
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	4.7	6.0	11.0	18.2	8.4	14.1	4.0	1.8	.6	6.6	3.0	1.0	9.0	4.1	1.4
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060 JS4045	n (min-1)	1,910	2,550	1,500	1,990	1,200	1,600	1,910	1,660	1,150	1,500	1,300	900	1,200	1,040	720
		vc (SFM)	500	667	491	651	471	628	500	434	301	491	425	294	471	408	283
		vf (IPM)	151	241	236	470	142	284	180	131	72	212	154	85	227	164	91
		fz (IPT)	.040	.047	.039	.059	.039	.059	.047	.039	.031	.047	.039	.031	.047	.039	.032
		ap (inch)	.039	.032	.047	.039	.047	.039	.032	.020	.012	.032	.020	.012	.032	.020	.012
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	4.7	6.0	11.0	18.2	8.4	14.1	4.0	1.8	.6	6.6	3.0	1.0	9.0	4.1	1.4
Carbon steel Alloy steel (35~45HRC)	JP4120 JS4045 JS4060	n (min-1)	1,280	1,910	1,000	1,500	800	1,200	1,280	1,150	1,150	1,000	900	900	800	720	720
		vc (SFM)	335	500	327	491	314	471	335	301	301	327	294	294	314	283	283
		vf (IPM)	81	120	126	189	76	113	81	54	45	95	64	53	101	68	57
		fz (IPT)	.032	.031	.032	.032	.032	.031	.032	.023	.020	.032	.024	.020	.032	.024	.020
		ap (inch)	.039	.032	.047	.039	.047	.039	.032	.020	.012	.032	.020	.012	.032	.020	.012
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	2.5	3.0	5.9	7.3	4.5	5.6	1.8	.8	.4	3.0	1.2	.6	4.0	1.7	.9
Stainless steel	JM4160	n (min-1)	1,280	2,550	1,000	1,990	800	1,600	1,280	1,280	1,150	1,000	1,000	900	800	800	720
		vc (SFM)	335	667	327	651	314	628	335	335	301	327	327	294	314	314	283
		vf (IPM)	81	161	126	251	76	151	81	81	54	95	95	64	101	101	68
		fz (IPT)	.032	.032	.032	.032	.032	.031	.032	.032	.023	.032	.032	.024	.032	.032	.024
		ap (inch)	.039	.032	.047	.039	.047	.039	.032	.020	.012	.032	.020	.012	.032	.020	.012
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	2.5	4.0	5.9	9.7	4.5	7.5	1.8	1.1	.5	3.0	1.8	.7	4.0	2.5	1.0
Cast iron	GX2140 JS4045 JP4120	n (min-1)	1,910	2,550	1,500	1,990	1,200	1,600	1,910	1,660	1,150	1,500	1,300	900	1,200	1,040	720
		vc (SFM)	500	667	491	651	471	628	500	434	301	491	425	294	471	408	283
		vf (IPM)	226	301	355	470	213	284	210	157	91	248	184	106	264	196	113
		fz (IPT)	.059	.059	.059	.059	.059	.059	.055	.047	.040	.055	.047	.039	.055	.047	.039
		ap (inch)	.039	.032	.047	.039	.047	.039	.039	.032	.024	.039	.032	.024	.039	.032	.024
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	7.0	7.5	16.5	18.2	12.7	14.1	5.9	3.5	1.5	9.6	5.7	2.5	13.1	7.8	3.4
Hardened steel Pre-Hardened steel (45~55HRC)	JP4120	n (min-1)	1,020	1,530	800	1,200	640	960	1,020	1,020	1,020	800	800	800	640	640	640
		vc (SFM)	267	400	262	393	251	377	267	267	267	262	262	262	251	251	251
		vf (IPM)	16	24	25	38	15	23	16	16	16	19	19	19	20	20	20
		fz (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ap (inch)	.039	.032	.047	.039	.047	.039	.032	.020	.012	.032	.020	.012	.032	.020	.012
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	.5	.6	1.2	1.5	.9	1.1	.4	.2	.1	.6	.4	.2	.8	.5	.3
Hardened steel (55~62HRC)	JP4105	n (min-1)	770	1,280	600	1,000	480	800	770	770	770	600	600	600	480	480	480
		vc (SFM)	201	335	196	327	188	314	201	201	201	196	196	196	188	188	188
		vf (IPM)	3	5	5	8	3	5	3	3	3	4	4	4	4	4	4
		fz (IPT)	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002
		ap (inch)	.020	.020	.020	.020	.020	.020	.020	.020	.012	.020	.020	.012	.020	.020	.012
		ae (inch)	.787	.787	.984	.984	1.260	1.260	.709	.709	.709	.984	.984	.984	1.260	1.260	1.260
		Q (in3/min)	.1	.1	.1	.2	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1

【Note】①This table shows the general conditions for shoulder milling. The conditions should be adjusted according to the machine rigidity, tooling, condition of object to be milled, etc. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions:
・Use inserts equipped with breakers. ・Reduce rotation speed and table feed rate by 50 to 70%. ・Reduce cutting depth ap by 50 to 70%.



②Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③JP4105 is a special high-hardness steel, and is not suitable for Non-heat-treated steel material.
④For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.

Bore type																					Work material
φ50mm or 2" (4NT)					φ63mm or 2.5" (4NT)					φ80mm or 3" (5NT)					φ100mm or 4" (6NT)					
<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	
General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing				
960	1,280	960	830	580	760	1,020	760	660	460	600	800	600	520	360	480	640	480	420	290	Mild steel (200HB or less)
502	670	502	434	304	497	667	497	432	301	471	628	471	408	283	502	670	502	440	304	
227	303	227	196	137	180	241	180	156	109	177	236	177	154	106	170	227	170	149	103	
.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	
.059	.049	.039	.028	.028	.059	.049	.039	.028	.028	.059	.049	.039	.028	.028	.059	.049	.039	.028	.028	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
21.1	23.5	14.1	8.5	6.0	20.9	23.3	14.0	8.5	5.9	26.8	29.7	17.9	10.9	7.5	31.6	35.2	21.1	13.0	9.0	
960	1,280	960	830	580	760	1,020	760	660	460	600	800	600	520	360	480	640	480	420	290	Carbon steel Alloy steel (35HRC or less)
502	670	502	434	304	497	667	497	432	301	471	628	471	408	283	502	670	502	440	304	
227	303	227	196	137	180	241	180	156	109	177	236	177	154	106	170	227	170	149	103	
.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	.059	
.059	.049	.039	.028	.028	.059	.049	.039	.028	.028	.059	.049	.039	.028	.028	.059	.049	.039	.028	.028	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
21.1	23.5	14.1	8.5	6.0	20.9	23.3	14.0	8.5	5.9	26.8	29.7	17.9	10.9	7.5	31.6	35.2	21.1	13.0	9.0	
640	960	640	580	580	510	760	510	460	460	400	600	400	360	360	320	480	320	290	290	Carbon steel Alloy steel (35~45HRC)
335	502	335	304	304	334	497	334	301	301	314	471	314	283	283	335	502	335	304	304	
81	121	81	73	73	64	96	64	58	58	63	95	63	57	57	60	91	60	55	55	
.032	.032	.032	.031	.031	.031	.032	.031	.032	.032	.032	.032	.032	.032	.032	.031	.032	.031	.032	.032	
.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
7.5	11.3	5.0	3.2	3.2	7.5	11.2	5.0	3.2	3.2	9.5	14.4	6.4	4.0	4.0	11.2	16.9	7.5	4.8	4.8	
640	1,280	640	640	580	510	1,020	510	510	460	400	800	400	400	360	320	640	320	320	290	Stainless steel
335	670	335	335	304	334	667	334	334	301	314	628	314	314	283	335	670	335	335	304	
81	161	81	81	73	64	129	64	64	58	63	126	63	63	57	60	121	60	60	55	
.032	.031	.032	.032	.031	.031	.032	.031	.031	.032	.032	.032	.032	.032	.032	.031	.032	.031	.031	.032	
.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
7.5	15.0	5.0	3.5	3.2	7.5	15.0	5.0	3.5	3.2	9.5	19.1	6.4	4.5	4.0	11.2	22.5	7.5	5.2	4.8	
960	1,280	960	830	580	760	1,020	760	660	460	600	800	600	520	360	480	640	480	420	290	Cast iron
502	670	502	434	304	497	667	497	432	301	471	628	471	408	283	502	670	502	440	304	
227	303	227	196	137	239	321	239	156	109	236	315	236	154	106	227	302	227	149	103	
.059	.059	.059	.059	.059	.079	.079	.079	.059	.059	.079	.079	.079	.059	.059	.079	.079	.079	.059	.059	
.059	.059	.059	.039	.028	.059	.059	.059	.039	.028	.059	.059	.059	.039	.028	.059	.059	.059	.039	.028	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
21.1	28.2	21.1	12.2	6.0	27.8	37.3	27.8	12.1	5.9	35.7	47.6	35.7	15.5	7.5	42.3	56.2	42.3	18.5	9.0	
510	770	510	510	510	410	610	410	410	410	320	480	320	320	320	260	390	260	260	260	Hardened steel Pre-Hardened steel (45~55HRC)
267	403	267	267	267	268	399	268	268	268	251	377	251	251	251	272	408	272	272	272	
16	24	16	16	16	13	19	13	13	13	13	19	13	13	13	12	18	12	12	12	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	.059	.059	.039	.028	.028	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
1.5	2.2	1.0	.7	.7	1.5	2.2	1.0	.7	.7	2.0	2.9	1.3	.9	.9	2.2	3.4	1.5	1.0	1.0	
390	640	390	390	390	310	510	310	310	310	240	400	240	240	240	200	320	200	200	200	Hardened steel (55~62HRC)
204	335	204	204	204	203	334	203	203	203	188	314	188	188	188	209	335	209	209	209	
3	5	3	3	3	2	4	2	2	2	2	4	2	2	2	2	4	2	2	2	
.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	
.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	
1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	2.559	2.559	2.559	2.559	2.559	3.150	3.150	3.150	3.150	3.150	
.1	.2	.1	.1	.1	.1	.2	.1	.1	.1	.1	.2	.1	.1	.1	.1	.3	.1	.1	.1	

④For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑤As a measure to prevent tool damage due to chip jamming, always use an air blower, etc. to remove chips.
⑥Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area
with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑦Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑧The following equation expresses the chip removal amount per unit time:
$Q(\text{inch}^3/\text{min.}) = a_p(\text{inch}) \times a_e(\text{inch}) \times v_f(\text{IPM})$

Radius Mill 3 Corners ASRT

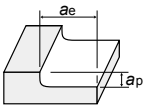
Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DCX	Straight shank type						Modular carbide shank Type								
			ϕ25 (2 flutes)		ϕ32 (2 flutes)		ϕ40 (3 flutes)		ϕ25 (2 flutes)			ϕ32 (3 flutes)			ϕ40 (4 flutes)		
		Overhang	<3DCX		<3DCX		<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX
			General purpose	High speed processing	General purpose	High speed processing	General purpose	High speed processing									
Mild steel (200HB or less)	※ GX2140 JS4060 JS4045	n (min-1)	1,910	2,550	1,500	1,990	1,200	1,600	1,910	1,660	1,150	1,500	1,300	900	1,200	1,040	720
		vc (m/min)	150	200	150	200	150	200	150	130	90	150	130	90	150	130	90
		vf (mm/min)	3,820	6,120	3,000	5,970	3,600	7,200	4,590	3,320	1,840	5,400	3,900	2,160	5,760	4,160	2,310
		fz (mm/t)	1.0	1.2	1.0	1.5	1.0	1.5	1.2	1.0	0.8	1.2	1.0	0.8	1.2	1.0	0.8
		ap (mm)	1.0	0.8	1.2	1.0	1.2	1.0	0.8	0.5	0.3	0.8	0.5	0.3	0.8	0.5	0.3
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	76	98	90	149	138	230	66	30	10	108	49	16	147	67	22
Carbon steel Alloy steel (35HRC or less)	GX2140 JS4060 JS4045	n (min-1)	1,910	2,550	1,500	1,990	1,200	1,600	1,910	1,660	1,150	1,500	1,300	900	1,200	1,040	720
		vc (m/min)	150	200	150	200	150	200	150	130	90	150	130	90	150	130	90
		vf (mm/min)	3,820	6,120	3,000	5,970	3,600	7,200	4,590	3,320	1,840	5,400	3,900	2,160	5,760	4,160	2,310
		fz (mm/t)	1.0	1.2	1.0	1.5	1.0	1.5	1.2	1.0	0.8	1.2	1.0	0.8	1.2	1.0	0.8
		ap (mm)	1.0	0.8	1.2	1.0	1.2	1.0	0.8	0.5	0.3	0.8	0.5	0.3	0.8	0.5	0.3
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	76	98	90	149	138	230	66	30	10	108	49	16	147	67	22
Carbon steel Alloy steel (35~45HRC)	JP4120 JS4045 JS4060	n (min-1)	1,280	1,910	1,000	1,500	800	1,200	1,280	1,150	1,150	1,000	900	900	800	720	720
		vc (m/min)	100	150	100	150	100	150	100	90	90	100	90	90	100	90	90
		vf (mm/min)	2,050	3,060	1,600	2,400	1,920	2,880	2,050	1,380	1,150	2,400	1,620	1,350	2,560	1,730	1,440
		fz (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.5	0.8	0.6	0.5	0.8	0.6	0.5
		ap (mm)	1.0	0.8	1.2	1.0	1.2	1.0	0.8	0.5	0.3	0.8	0.5	0.3	0.8	0.5	0.3
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	41	49	48	60	74	92	30	12	6	48	20	10	66	28	14
Stainless steel	JM4160	n (min-1)	1,280	2,550	1,000	1,990	800	1,600	1,280	1,280	1,150	1,000	1,000	900	800	800	720
		vc (m/min)	100	200	100	200	100	200	100	100	90	100	100	90	100	100	90
		vf (mm/min)	2,050	4,080	1,600	3,190	1,920	3,840	2,050	2,050	1,380	2,400	2,400	1,620	2,560	2,560	1,730
		fz (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.8	0.8	0.6	0.8	0.8	0.6
		ap (mm)	1.0	0.8	1.2	1.0	1.2	1.0	0.8	0.5	0.3	0.8	0.5	0.3	0.8	0.5	0.3
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	41	65	48	80	74	123	30	18	7	48	30	12	66	41	17
Cast iron	GX2140 JS4045 JP4120	n (min-1)	1,910	2,550	1,500	1,990	1,200	1,600	1,910	1,660	1,150	1,500	1,300	900	1,200	1,040	720
		vc (m/min)	150	200	150	200	150	200	150	130	90	150	130	90	150	130	90
		vf (mm/min)	5,730	7,650	4,500	5,970	5,400	7,200	5,350	3,990	2,300	6,300	4,680	2,700	6,720	5,000	2,880
		fz (mm/t)	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.2	1.0	1.4	1.2	1.0	1.4	1.2	1.0
		ap (mm)	1.0	0.8	1.2	1.0	1.2	1.0	1.0	0.8	0.6	1.0	0.8	0.6	1.0	0.8	0.6
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	115	122	135	149	207	230	96	57	25	158	94	41	215	128	55
Hardened steel Pre-Hardened steel (45~55HRC)	JP4120	n (min-1)	1,020	1,530	800	1,200	640	960	1,020	1,020	1,020	800	800	800	640	640	640
		vc (m/min)	80	120	80	120	80	120	80	80	80	80	80	80	80	80	80
		vf (mm/min)	410	620	320	480	390	580	410	410	410	480	480	480	520	520	520
		fz (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ap (mm)	1.0	0.8	1.2	1.0	1.2	1.0	0.8	0.5	0.3	0.8	0.5	0.3	0.8	0.5	0.3
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	8	10	10	12	15	19	6	4	2	10	6	4	13	8	5
Hardened steel (55~62HRC)	JP4105	n (min-1)	770	1,280	600	1,000	480	800	770	770	770	600	600	600	480	480	480
		vc (m/min)	60	100	60	100	60	100	60	60	60	60	60	60	60	60	60
		vf (mm/min)	80	130	60	100	80	120	80	80	80	90	90	90	100	100	100
		fz (mm/t)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		ap (mm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.5	0.3	0.5	0.5	0.3
		ae (mm)	20	20	25	25	32	32	18	18	18	25	25	25	32	32	32
		Q (cm3/min)	1	1	1	1	1	2	1	1	0	1	1	1	2	2	1

【Note】①This table shows the general conditions for shoulder milling. The conditions should be adjusted according to the machine rigidity, tooling, condition of object to be milled, etc. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions:
・Use inserts equipped with breakers. ・Reduce rotation speed and table feed rate by 50 to 70%. ・Reduce cutting depth ap by 50 to 70%.



②Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③JP4105 is a special high-hardness steel, and is not suitable for Non-heat-treated steel material.
④For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.

Bore type																					
φ50mm or 2" (4NT)					φ63mm or 2.5" (4NT)					φ80mm or 3" (5NT)					φ100mm or 4" (6NT)					Work material
<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	
General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing				
960	1,280	960	830	580	760	1,020	760	660	460	600	800	600	520	360	480	640	480	420	290	Mild steel (200HB or less)
150	200	150	130	90	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90	
5,760	7,680	5,760	4,980	3,480	4,560	6,120	4,560	3,960	2,760	4,500	6,000	4,500	3,900	2,700	4,320	5,760	4,320	3,780	2,610	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
1.5	1.25	1.0	0.7	0.7	1.5	1.25	1.0	0.7	0.7	1.5	1.25	1.0	0.7	0.7	1.5	1.25	1.0	0.7	0.7	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
346	384	230	139	97	342	383	228	139	97	439	488	293	177	123	518	576	346	212	146	
960	1,280	960	830	580	760	1,020	760	660	460	600	800	600	520	360	480	640	480	420	290	Carbon steel Alloy steel (35HRC or less)
150	200	150	130	90	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90	
5,760	7,680	5,760	4,980	3,480	4,560	6,120	4,560	3,960	2,760	4,500	6,000	4,500	3,900	2,700	4,320	5,760	4,320	3,780	2,610	
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
1.5	1.25	1.0	0.7	0.7	1.5	1.25	1.0	0.7	0.7	1.5	1.25	1.0	0.7	0.7	1.5	1.25	1.0	0.7	0.7	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
346	384	230	139	97	342	383	228	139	97	439	488	293	177	123	518	576	346	212	146	
640	960	640	580	580	510	760	510	460	460	400	600	400	360	360	320	480	320	290	290	Carbon steel Alloy steel (35~45HRC)
100	150	100	90	90	100	150	100	90	90	100	150	100	90	90	100	150	100	90	90	
2,050	3,080	2,050	1,860	1,860	1,640	2,440	1,640	1,480	1,480	1,600	2,400	1,600	1,440	1,440	1,540	2,310	1,540	1,400	1,400	
0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
123	185	82	52	52	123	183	82	52	52	156	234	104	66	66	185	277	123	78	78	
640	1,280	640	640	580	510	1,020	510	510	460	400	800	400	400	360	320	640	320	320	290	Stainless steel
100	200	100	100	90	100	200	100	100	90	100	200	100	100	90	100	200	100	100	90	
2,050	4,100	2,050	2,050	1,860	1,640	3,270	1,640	1,640	1,480	1,600	3,200	1,600	1,600	1,440	1,540	3,080	1,540	1,540	1,400	
0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
123	246	82	57	52	123	245	82	57	52	156	312	104	73	66	185	370	123	86	78	
960	1,280	960	830	580	760	1,020	760	660	460	600	800	600	520	360	480	640	480	420	290	Cast iron
150	200	150	130	90	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90	
5,760	7,680	5,760	4,980	3,480	6,080	8,160	6,080	3,960	2,760	6,000	8,000	6,000	3,900	2,700	5,760	7,680	5,760	3,780	2,610	
1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	1.5	1.5	2.0	2.0	2.0	1.5	1.5	2.0	2.0	2.0	1.5	1.5	
1.5	1.5	1.5	1.0	0.7	1.5	1.5	1.5	1.0	0.7	1.5	1.5	1.5	1.0	0.7	1.5	1.5	1.5	1.0	0.7	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
346	461	346	199	97	456	612	456	198	97	585	780	585	254	123	691	922	691	302	146	
510	770	510	510	510	410	610	410	410	410	320	480	320	320	320	260	390	260	260	260	Hardened steel Pre-Hardened steel (45~55HRC)
80	120	80	80	80	80	120	80	80	80	80	120	80	80	80	80	120	80	80	80	
410	620	410	410	410	330	490	330	330	330	320	480	320	320	320	320	470	320	320	320	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	1.5	1.5	1.0	0.7	0.7	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
25	37	16	11	11	25	37	17	12	12	31	47	21	15	15	38	56	26	18	18	
390	640	390	390	390	310	510	310	310	310	240	400	240	240	240	200	320	200	200	200	Hardened steel (55~62HRC)
60	100	60	60	60	60	100	60	60	60	60	100	60	60	60	60	100	60	60	60	
80	130	80	80	80	70	110	70	70	70	60	100	60	60	60	60	100	60	60	60	
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
40	40	40	40	40	50	50	50	50	50	65	65	65	65	65	80	80	80	80	80	
2	3	2	2	2	2	3	2	2	2	2	3	2	2	2	2	4	2	2	2	

④For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
⑤As a measure to prevent tool damage due to chip jamming, always use an air blower, etc. to remove chips.
⑥Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area
with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑦Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑧The following equation expresses the chip removal amount per unit time:
$Q(cm^3/min.) = ap(mm) \times ae(mm) \times vf(mm/min.)/1000$

Radius Mill 4 Corners ASRF

- Economical ASR 4-corner type.
- At higher-than-normal cutting feed rates, offers 3 to 5 times the deep-cutting of conventional products, reducing cutting time and processing costs.
- Insert has a unique R shape to enable maximum cutting depth of 2mm.

Shank type

Fig.1(Standard type)

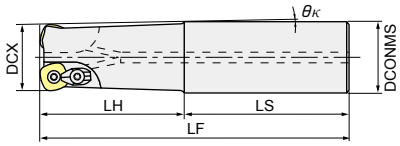
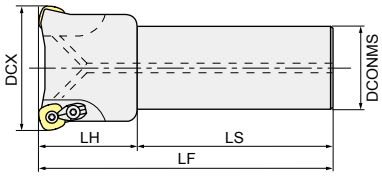


Fig.2(Undercut type)



With air hole

Inch IASRFS402◌R

Numeric figure in a circle ◌.

Item code		Stock	No. of flutes	Size(inch) DCX	LF	DCONMS	LH	LS	θκ	Shape	Inserts
Shank type	IASRFS4020R	●	2	1.250	6.000	1.250	2.750	3.250	–	Fig.1	SDNW1205ZDTN-R15 SDMT1205ZDTN-R15
	IASRFS4024R	●	3	1.500	6.000	1.500	1.750	4.250	–		

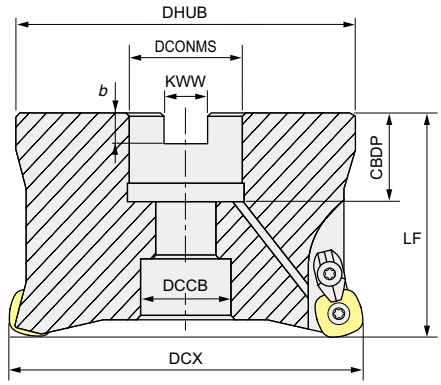
Metric ASRF□40◌◌R

Numeric figure in a circle ◌ and Alphabetical character comes in a square□.

Item code			Stock	No. of flutes	Size(mm) DCX	LF	DCONMS	LH	LS	θκ	Shape	Inserts
Shank type	Regular	ASRFS4032R	★	2	32	150	32	70	80	–	Fig.1	SDNW1205ZDTN-R15 SDMT1205ZDTN-R15
		ASRFS4040R	★	3	40	150	42	70	80	1.4°		
		ASRFS4050R	★	4	50	150	42	50	100	–	Fig.2	
		ASRFS4063R	★	4	63	150	42	50	100	–		
	Long	ASRFL4032R	★	2	32	200	32	120	80	–	Fig.1	
		ASRFL4040R	★	3	40	220	42	120	100	0.6°		
		ASRFL4050R	★	3	50	250	42	50	200	–	Fig.2	
		ASRFL4063R	★	4	63	250	42	50	200	–		
	Extra Long	ASRFE4032R	★	2	32	300	32	180	120	–	Fig.1	
		ASRFE4040R	★	2	40	300	42	180	120	0.4°		

● : Inventory maintained in US ★ : Inventory maintained in Japan

Bore type



With air hole

Inch IASRF40○○-○

Numeric figure in a circle ○.

Item code		Stock	No. of flutes	Size(inch) DCX	DHUB	LF	CBDP	KWW	b	DCONMS	DCCB	Inserts
Bore type	IASRF4032-4	●	4	2.000	1.850	1.969	.748	.315	.197	.750	.630	SDNW1205ZDTN-R15 SDMT1205ZDTN-R15
Bore type	IASRF4048-5	●	5	3.000	2.990	2.480	1.378	.374	.236	1.000	.827	
Bore type	IASRF4064-6	●	6	4.000	3.780	2.756	1.378	.626	.394	1.500	1.236	

Metric ASRF4○○○R(M)-○

Numeric figure in a circle ○.

Item code			Stock	No. of flutes	Size(mm) DCX	DHUB	LF	CBDP	KWW	b	DCONMS	DCCB	Inserts
Bore type	Internal diameter inch size	ASRF4050R-3	★	3	50	47	50	19	8.4	5	22.225	17	SDNW1205ZDTN-R15 SDMT1205ZDTN-R15
		ASRF4050R-4	★	4	50	47	50	19	8.4	5	22.225	17	
		ASRF4063R-3	★	3	63	60	50	19	8.4	5	22.225	17	
		ASRF4063R-4	★	4	63	60	50	19	8.4	5	22.225	17	
		ASRF4080R-4	★	4	80	76	70	32	12.7	8	31.75	26	
		ASRF4080R-5	★	5	80	76	70	32	12.7	8	31.75	26	
		ASRF4100R-5	★	5	100	96	70	32	12.7	8	31.75	26	
		ASRF4100R-6	★	6	100	96	70	32	12.7	8	31.75	26	
	Internal diameter mm size	ASRF4050RM-3	★	3	50	47	50	20	10.4	6.3	22	17	
		ASRF4050RM-4	★	4	50	47	50	20	10.4	6.3	22	17	
		ASRF4063RM-3	★	3	63	60	50	20	10.4	6.3	22	17	
		ASRF4063RM-4	★	4	63	60	50	20	10.4	6.3	22	17	
		ASRF4080RM-5	★	5	80	76	70	22	12.4	7	27	20	
		ASRF4100RM-6	★	6	100	96	70	25.5	14.4	8	32	26	

Radius Mill 4 Corners ASRF

Inserts

Fig.1
Standard shape

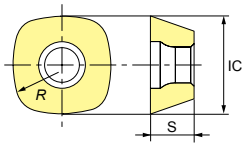
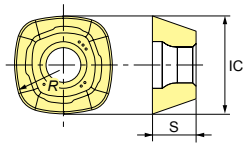


Fig.2
With breaker



P	Carbon steel		■		■	■	■	
M	Stainlesss steel, etc.			■				
K	Cast iron		■		■	■		
H	Hardened steel	■	□					

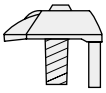
■ : General cutting, First recommended

□ : General cutting, Second recommended

Item code	Tolerance class	AJ Coating			GX Coating	JS Coating		C Coating	Size(mm)			Shape	Cutter body
		JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	CY250	*R*	S	IC		
SDNW1205ZDTN-R15	N	★	●	●	★	●	●	★	15	5.56	12.7	Fig.1	(I)ASRF S/L/E 4○○○R (I)ASRF 4○○○R-○ ASRF 4○○○RM-○
SDMT1205ZDTN-R15	M	★	●	●	★	●	●	●				Fig.2	

【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Parts

Parts	Clamp screw			Clamp piece set	Wrench	Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N・m)	Fastening torque (lbf・in)			
(I)ASRF S/L/E 4○○○R (I)ASRF 4○○○R-○ ASRF 4○○○RM-○	262-142	2.9	25.67	CM4-141	105-T15	P-37

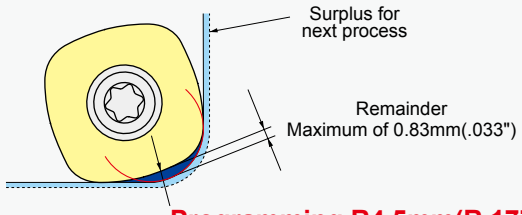
【Note】 The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.Includes two spare clamp screws.

● : Inventory maintained in US ★ : Inventory maintained in Japan

Method for defining conditions of insert tip programmatically

・For roughing, please create a program with corner R values close to those shown as references below.

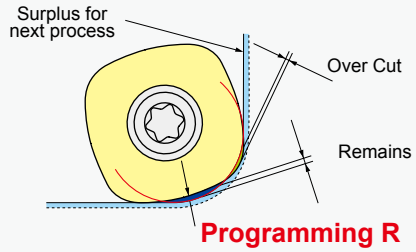
When corner R is set to 4.5mm (.177"):



Programming R4.5mm(R.177")

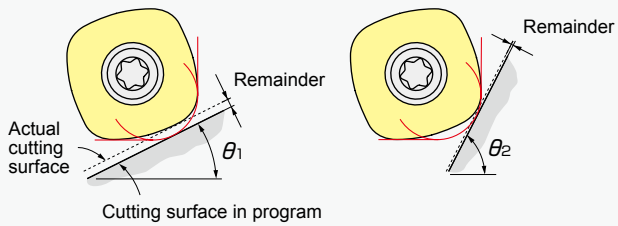
Normally, you should create a program with an input corner R of approximately 4.5mm (R.177"). At an approximate input corner R of 4.5mm (R.177"), there is no overcutting.

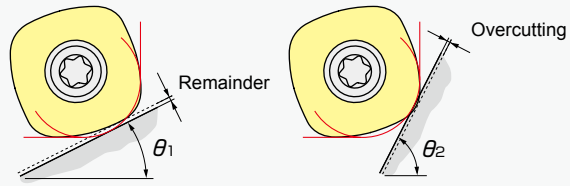
When corner R is set larger:



Programming R

Although overcutting occurs when the approximate R is set to higher values, if the overcutting is within the surplus for the next process, there is no problem with the cutting shape and the amount of remainder can be suppressed.





(mm)

Programming R	R4.5	R5	R5.5	R6	R6.5
Remainder	0.83 or less (θ1=22.1°)	0.69 or less (θ1=20.6°)	0.55 or less (θ1=19°)	0.42 or less (θ1=17.1°)	0.3 or less (θ1=14.9°)
Overcutting	No overcutting	0.07 or less (θ2=75.3°)	0.2 or less (θ2=67.7°)	0.37 or less (θ2=63.1°)	0.55 or less (θ2=60°)

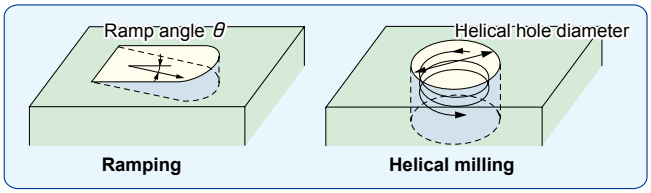
【Note】①Overcutting and remainder vary according to the processing shape. The values in the table above are maximum values.
②The values of θ shown are the slopes of the processing surfaces when overcutting and remainder are at their maximum respective values.

For example, when a program is created with an programming R of 5:

Remainder of around 0.69mm(.027") is left when the slope of the processing surface is approximately 20.6°, and when the slope of the cutting surface is approximately 75.3°, about 0.07mm(.003") of overcutting occurs. At areas with other slopes, the overcutting and remainder values are below these values.

Cutting by direct milling is also possible

・Since the cutting flute do not extend to the center, the ramp angle and hole diameter were limited, but as shown below, cutting by direct milling without a pilot hole is possible by ramping and helical milling.



RAMPING/HELICAL MILLING - METRIC DIAMETER

Tool dia. DCX (mm)	φ32	φ40	φ50	φ63	φ80	φ100
Maximum ramp angle θ	7°	4.5°	3°	1.7°	1°	1°
Hole Dia. (mm)	φ44～61	φ61～76	φ80～96	φ107～122	φ142～156	φ179～195

RAMPING/HELICAL MILLING - INCH DIAMETER

Tool dia. DCX (inch)	1.250"	1.500"	2.000"	3.000"	4.000"
Maximum ramp angle θ	7°	4.5°	3°	1°	1°
Hole Dia. (inch)	1.752～2.382	2.252～2.843	3.252～3.843	5.252～5.843	7.252～7.843

【Note】① The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 1° or less is recommended.
② In case of hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

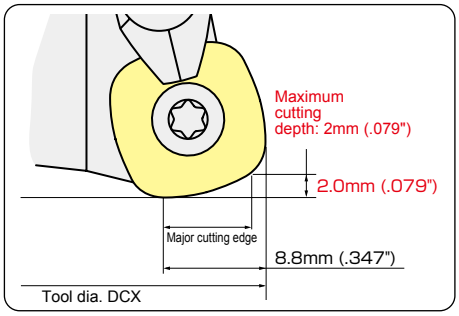
Radius Mill 4 Corners ASRF

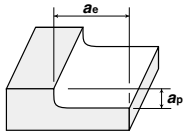
Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DCX	φ32mm or 1.25" / 2 flutes					φ40mm or 1.5" / 3 flutes					φ50mm or 2" / 4 flutes				
		Overhang	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX
			General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing			
Mild steel 200HB or less	※ GX2140 JS4060 JS4045	*n* (min^{-1})	1,490	1,990	1,490	1,290	900	1,190	1,590	1,190	1,030	720	950	1,270	950	830	570
		vc (SFM)	487	651	487	422	294	467	624	467	404	283	497	665	497	434	298
		vf (IPM)	176	282	176	152	106	211	338	211	183	128	225	360	225	196	135
		fz (IPT)	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059
		ap (inch)	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020	.059	.047	.043	.032	.032
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	7.1	9.1	5.0	3.1	2.1	10.5	13.4	7.3	4.5	3.2	20.9	26.8	15.3	9.7	6.7
Carbon steel Alloy steel 35HRC or less	GX2140 JS4060 JS4045	*n* (min^{-1})	1,490	1,990	1,490	1,290	900	1,190	1,590	1,190	1,030	720	950	1,270	950	830	570
		vc (SFM)	487	651	487	422	294	467	624	467	404	283	497	665	497	434	298
		vf (IPM)	117	188	117	102	71	141	225	141	122	85	225	360	225	196	135
		fz (IPT)	.039	.047	.039	.039	.039	.039	.047	.039	.039	.039	.059	.071	.059	.059	.059
		ap (inch)	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020	.059	.047	.043	.032	.032
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	4.7	6.1	3.3	2.0	1.4	7.0	8.9	4.9	3.0	2.1	20.9	26.8	15.3	9.7	6.7
Carbon steel Alloy steel 35~45HRC or less	JP4120 JS4045 JS4060	*n* (min^{-1})	900	1,190	900	780	540	720	950	720	620	430	570	760	570	500	340
		vc (SFM)	294	389	294	255	177	283	373	283	243	169	298	398	298	262	178
		vf (IPM)	57	94	57	49	34	68	112	68	59	41	72	120	72	63	43
		fz (IPT)	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032
		ap (inch)	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020	.059	.047	.043	.032	.032
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	2.3	3.0	1.6	1.0	.7	3.4	4.5	2.4	1.5	1.0	6.7	8.9	4.9	3.1	2.1
Stainless steel	JM4160	*n* (min^{-1})	990	1,320	990	870	600	800	1,060	800	690	480	640	850	640	550	380
		vc (SFM)	324	432	324	285	196	314	416	314	271	188	335	445	335	288	199
		vf (IPM)	62	104	62	55	38	76	125	76	65	45	81	134	81	69	48
		fz (IPT)	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032
		ap (inch)	.047	.039	.032	.024	.024	.047	.039	.032	.024	.024	.059	.047	.043	.032	.032
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	3.0	4.2	2.0	1.3	.9	4.5	6.2	3.0	1.9	1.3	7.5	10.0	5.5	3.4	2.4
Cast iron	GX2140 JS4045 JP4120	*n* (min^{-1})	1,490	1,990	1,490	1,290	900	1,190	1,590	1,190	1,030	720	950	1,270	950	830	570
		vc (SFM)	487	651	487	422	294	467	624	467	404	283	497	665	497	434	298
		vf (IPM)	176	282	176	152	106	281	451	281	243	170	299	480	299	261	179
		fz (IPT)	.059	.071	.059	.059	.059	.079	.095	.079	.079	.079	.079	.095	.079	.079	.079
		ap (inch)	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032	.079	.063	.055	.039	.039
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	10.7	13.6	7.8	4.9	3.4	20.9	26.8	15.3	9.7	6.7	37.1	47.6	25.9	16.2	11.1
Hardened steel 45~55HRC	JP4120	*n* (min^{-1})	900	1,190	900	780	540	720	950	720	620	430	570	760	570	500	340
		vc (SFM)	294	389	294	255	177	283	373	283	243	169	298	398	298	262	178
		vf (IPM)	14	19	14	12	9	17	23	17	15	10	18	24	18	16	11
		fz (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ap (inch)	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	.573	.606	.402	.249	.172	.847	.893	.593	.365	.253	1.118	1.191	.783	.490	.333
Hardened steel 55~60HRC	JP4105	*n* (min^{-1})	600	800	600	520	360	480	640	480	410	290	380	510	380	330	230
		vc (SFM)	196	262	196	170	118	188	251	188	161	114	199	267	199	173	120
		vf (IPM)	2	6	5	4	3	3	7	6	5	3	3	8	6	5	4
		fz (IPT)	.002	.004	.004	.004	.004	.002	.004	.004	.004	.004	.002	.004	.004	.004	.004
		ap (inch)	.020	.016	.016	.012	.012	.020	.016	.016	.012	.012	.020	.016	.016	.012	.012
		ae (inch)	1.024	1.024	1.024	1.024	1.024	1.260	1.260	1.260	1.260	1.260	1.575	1.575	1.575	1.575	1.575
		Q (in^3/min)	.048	.100	.075	.049	.034	.071	.148	.111	.071	.050	.094	.197	.147	.096	.067





Work material	Recommended grade	Tool dia. DCX	ϕ63mm or 2.5" / 4 flutes					ϕ80mm or 3" / 5 flutes					ϕ100mm or 4" / 6 flutes				
		Overhang	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX
			General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing			
Mild steel 200HB or less	※ GX2140 JS4060 JS4045	n (min^{-1})	760	1,010	760	660	450	600	800	600	520	360	480	640	480	410	290
		v_c (SFM)	497	661	497	432	294	471	628	471	408	283	502	670	502	429	304
		v_f (IPM)	180	286	180	156	106	177	284	177	154	106	170	272	170	145	103
		f_z (IPT)	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059
		a_p (inch)	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	20.9	26.6	15.3	9.7	6.6	26.4	33.7	19.3	12.2	8.4	31.7	40.5	23.2	14.4	10.2
Carbon steel Alloy steel 35HRC or less	GX2140 JS4060 JS4045	n (min^{-1})	760	1,010	760	660	450	600	800	600	520	360	480	640	480	410	290
		v_c (SFM)	497	661	497	432	294	471	628	471	408	283	502	670	502	429	304
		v_f (IPM)	180	286	180	156	106	177	284	177	154	106	170	272	170	145	103
		f_z (IPT)	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059
		a_p (inch)	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	20.9	26.6	15.3	9.7	6.6	26.4	33.7	19.3	12.2	8.4	31.7	40.5	23.2	14.4	10.2
Carbon steel Alloy steel 35~45HRC or less	JP4120 JS4045 JS4060	n (min^{-1})	450	610	450	390	270	360	480	360	310	210	290	380	290	220	170
		v_c (SFM)	294	399	294	255	177	283	377	283	243	165	304	398	304	230	178
		v_f (IPM)	57	96	57	49	34	57	95	57	49	33	55	90	55	42	32
		f_z (IPT)	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032
		a_p (inch)	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	6.6	8.9	4.8	3.0	2.1	8.4	11.2	6.2	3.9	2.6	10.2	13.4	7.5	4.1	3.2
Stainless steel	JM4160	n (min^{-1})	510	670	510	440	300	400	530	400	350	240	320	420	320	280	190
		v_c (SFM)	334	438	334	288	196	314	416	314	275	188	335	440	335	293	199
		v_f (IPM)	64	106	64	55	38	63	104	63	55	38	60	99	60	53	36
		f_z (IPT)	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032	.032	.039	.032	.032	.032
		a_p (inch)	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032	.059	.047	.043	.032	.032
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	7.5	9.8	5.5	3.4	2.3	9.4	12.4	6.9	4.4	3.0	11.3	14.8	8.2	5.3	3.6
Cast iron	GX2140 JS4045 JP4120	n (min^{-1})	760	1,010	760	660	450	600	800	600	520	360	480	640	480	410	290
		v_c (SFM)	497	661	497	432	294	471	628	471	408	283	502	670	502	429	304
		v_f (IPM)	239	382	239	208	142	236	378	236	205	142	227	363	227	194	137
		f_z (IPT)	.079	.095	.079	.079	.079	.079	.095	.079	.079	.079	.079	.095	.079	.079	.079
		a_p (inch)	.079	.063	.055	.039	.039	.079	.063	.055	.039	.039	.079	.063	.055	.039	.039
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	37.1	47.3	25.9	16.1	11.0	46.8	60.0	32.8	20.3	14.1	56.2	72.0	39.3	24.0	17.0
Hardened steel 45~55HRC	JP4120	n (min^{-1})	450	610	450	390	270	360	480	360	310	210	290	380	290	250	170
		v_c (SFM)	294	399	294	255	177	283	377	283	243	165	304	398	304	262	178
		v_f (IPM)	14	19	14	12	9	14	19	14	12	8	14	18	14	12	8
		f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		a_p (inch)	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020	.039	.032	.028	.020	.020
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	1.103	1.195	.773	.478	.331	1.412	1.505	.989	.608	.412	1.706	1.787	1.195	.735	.500
Hardened steel 55~60HRC	JP4105	n (min^{-1})	300	400	300	260	180	240	320	240	210	140	190	250	190	170	110
		v_c (SFM)	196	262	196	170	118	188	251	188	165	110	199	262	199	178	115
		v_f (IPM)	2	6	5	4	3	2	6	5	4	3	2	6	4	4	3
		f_z (IPT)	.002	.004	.004	.004	.004	.002	.004	.004	.004	.004	.002	.004	.004	.004	.004
		a_p (inch)	.020	.016	.016	.012	.012	.020	.016	.016	.012	.012	.020	.016	.016	.012	.012
		a_e (inch)	1.969	1.969	1.969	1.969	1.969	2.520	2.520	2.520	2.520	2.520	3.150	3.150	3.150	3.150	3.150
		Q (in^3/min)	.093	.193	.145	.094	.065	.119	.247	.185	.122	.081	.141	.289	.220	.148	.096

【Note】

1. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. (If the overhang is 3DCX or less, the recommended cutting speed is v_c=590~650 SF; 3DCX or more : v_c=295~425 SFM.)
2. Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
3. 「JP4105」insert's grade specialized in High hardened steel is not suitable for Non-heat-treated steel material.
4. The thick and heavy chips are generated by using this tool. Be sure to remove them with air blow in order to avoid any breakage by blocking with chips. The recommended method is "Spindle center through" when blowing air. (Pay attention when removing chips in cavity work with the machining center <vertical type>.)
5. Before carrying out the work without any workers, be sure to remove the chips and confirm the safe condition for cutting.
6. The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safety cover around the tool and wear the safety glasses when carrying out any works.
7. Replace the insert in good time to avoid any breakage of the tools because of wear and tear.
8. The following formula shows the metal removal rate (Q) per unit time.

$$Q(\text{in}^3/\text{min}) = a_p(\text{inch}) \times a_e(\text{inch}) \times v_f(\text{IPM})$$

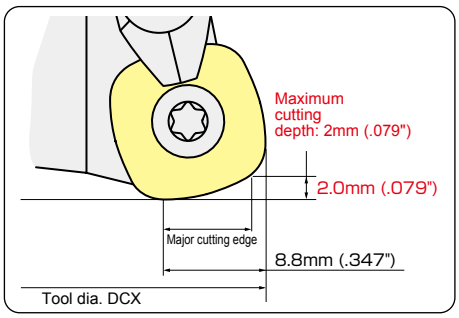
Radius Mill 4 Corners ASRF

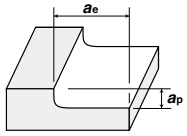
Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DCX	φ32 / 2 flutes					φ40 / 3 flutes					φ50 / 4 flutes				
		Overhang	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX
			General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing			
Mild steel 200HB or less	※ GX2140 JS4060 JS4045	n (min-1)	1,490	1,990	1,490	1,290	900	1,190	1,590	1,190	1,030	720	950	1,270	950	830	570
		vc (m/min)	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90
		vf (mm/min)	4,470	7,160	4,470	3,870	2,700	5,360	8,590	5,360	4,640	3,240	5,700	9,140	5,700	4,980	3,420
		fz (mm/t)	1.5	1.8	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5
		ap (mm)	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5	1.5	1.2	1.1	0.8	0.8
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	116	149	81	50	35	172	220	120	74	52	342	439	251	159	109
Carbon steel Alloy steel 35HRC or less	GX2140 JS4060 JS4045	n (min-1)	1,490	1,990	1,490	1,290	900	1,190	1,590	1,190	1,030	720	950	1,270	950	830	570
		vc (m/min)	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90
		vf (mm/min)	2,980	4,780	2,980	2,580	1,800	3,570	5,720	3,570	3,090	2,160	5,700	9,140	5,700	4,980	3,420
		fz (mm/t)	1.0	1.2	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.5	1.8	1.5	1.5	1.5
		ap (mm)	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5	1.5	1.2	1.1	0.8	0.8
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	77	99	54	34	23	114	146	80	49	35	342	439	251	159	109
Carbon steel Alloy steel 35~45HRC or less	JP4120 JS4045 JS4060	n (min-1)	900	1,190	900	780	540	720	950	720	620	430	570	760	570	500	340
		vc (m/min)	90	120	90	78	54	90	120	90	78	54	90	120	90	78	54
		vf (mm/min)	1,440	2,380	1,440	1,250	860	1,730	2,850	1,730	1,490	1,030	1,820	3,040	1,820	1,600	1,090
		fz (mm/t)	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8
		ap (mm)	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5	1.5	1.2	1.1	0.8	0.8
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	37	50	26	16	11	55	73	39	24	16	109	146	80	51	35
Stainless steel	JM4160	n (min-1)	990	1,320	990	870	600	800	1,060	800	690	480	640	850	640	550	380
		vc (m/min)	100	133	100	87	60	100	133	100	87	60	100	133	100	87	60
		vf (mm/min)	1,580	2,640	1,580	1,390	960	1,920	3,180	1,920	1,660	1,150	2,050	3,400	2,050	1,760	1,220
		fz (mm/t)	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8
		ap (mm)	1.2	1.0	0.8	0.6	0.6	1.2	1.0	0.8	0.6	0.6	1.5	1.2	1.1	0.8	0.8
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	49	69	33	22	15	74	102	49	32	22	123	163	90	56	39
Cast irons	GX2140 JS4045 JP4120	n (min-1)	1,490	1,990	1,490	1,290	900	1,190	1,590	1,190	1,030	720	950	1,270	950	830	570
		vc (m/min)	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90
		vf (mm/min)	4,470	7,160	4,470	3,870	2,700	7,140	11,450	7,140	6,180	4,320	7,600	12,190	7,600	6,640	4,560
		fz (mm/t)	1.5	1.8	1.5	1.5	1.5	2.0	2.4	2.0	2.0	2.0	2.0	2.4	2.0	2.0	2.0
		ap (mm)	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8	2.0	1.6	1.4	1.0	1.0
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	174	223	128	80	56	343	440	251	158	111	608	780	426	266	182
Hardened steel 45~55HRC	JP4120	n (min-1)	900	1,190	900	780	540	720	950	720	620	430	570	760	570	500	340
		vc (m/min)	90	120	90	78	54	90	120	90	78	54	90	120	90	78	54
		vf (mm/min)	360	480	360	310	220	430	570	430	370	260	460	610	460	400	270
		fz (mm/t)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		ap (mm)	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	9	10	7	4	3	14	15	10	6	4	18	20	13	8	5
Hardened steel 55~60HRC	JP4105	n (min-1)	600	800	600	520	360	480	640	480	410	290	380	510	380	330	230
		vc (m/min)	60	80	60	52	36	60	80	60	52	36	60	80	60	52	36
		vf (mm/min)	60	160	120	100	70	70	190	140	120	90	80	200	150	130	90
		fz (mm/t)	0.05	0.10	0.10	0.10	0.10	0.05	0.10	0.10	0.10	0.10	0.05	0.10	0.10	0.10	0.10
		ap (mm)	0.5	0.4	0.4	0.3	0.3	0.5	0.4	0.4	0.3	0.3	0.5	0.4	0.4	0.3	0.3
		ae (mm)	26	26	26	26	26	32	32	32	32	32	40	40	40	40	40
		Q (cm3/min)	1	2	1	1	1	1	2	2	1	1	2	3	2	2	1





Work material	Recommended grade	Tool dia. DCX	ϕ63 / 4 flutes					ϕ80 / 5 flutes					ϕ100 / 6 flutes				
		Overhang	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX	<3DCX		3DCX ~ 5DCX	5DCX ~ 7DCX	>7DCX
			General purpose	High speed processing				General purpose	High speed processing				General purpose	High speed processing			
Mild steel 200HB or less	※ GX2140 JS4060 JS4045	n (min^{-1})	760	1,010	760	660	450	600	800	600	520	360	480	640	480	410	290
		v_c (m/min)	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90
		v_f (mm/min)	4,560	7,270	4,560	3,960	2,700	4,500	7,200	4,500	3,900	2,700	4,320	6,910	4,320	3,690	2,610
		f_z (mm/t)	1.5	1.8	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5
		a_p (mm)	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	342	436	251	158	108	432	553	317	200	138	518	663	380	236	167
Carbon steel Alloy steel 35HRC or less	GX2140 JS4060 JS4045	n (min^{-1})	760	1,010	760	660	450	600	800	600	520	360	480	640	480	410	290
		v_c (m/min)	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90
		v_f (mm/min)	4,560	7,270	4,560	3,960	2,700	4,500	7,200	4,500	3,900	2,700	4,320	6,910	4,320	3,690	2,610
		f_z (mm/t)	1.5	1.8	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5	1.5	1.8	1.5	1.5	1.5
		a_p (mm)	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	342	436	251	158	108	432	553	317	200	138	518	663	380	236	167
Carbon steel Alloy steel 35~45HRC or less	JP4120 JS4045 JS4060	n (min^{-1})	450	610	450	390	270	360	480	360	310	210	290	380	290	220	170
		v_c (m/min)	90	120	90	78	54	90	120	90	78	54	90	120	90	68	54
		v_f (mm/min)	1,440	2,440	1,440	1,250	860	1,440	2,400	1,440	1,240	840	1,390	2,280	1,390	1,060	820
		f_z (mm/t)	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8
		a_p (mm)	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	108	146	79	50	34	138	184	101	63	43	167	219	122	68	52
Stainless steel	JM4160	n (min^{-1})	510	670	510	440	300	400	530	400	350	240	320	420	320	280	190
		v_c (m/min)	100	133	100	87	60	100	133	100	87	60	100	133	100	87	60
		v_f (mm/min)	1,630	2,680	1,630	1,410	960	1,600	2,650	1,600	1,400	960	1,540	2,520	1,540	1,340	910
		f_z (mm/t)	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.8
		a_p (mm)	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8	1.5	1.2	1.1	0.8	0.8
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	122	161	90	56	38	154	204	113	72	49	185	242	136	86	58
Cast irons	GX2140 JS4045 JP4120	n (min^{-1})	760	1,010	760	660	450	600	800	600	520	360	480	640	480	410	290
		v_c (m/min)	150	200	150	130	90	150	200	150	130	90	150	200	150	130	90
		v_f (mm/min)	6,080	9,700	6,080	5,280	3,600	6,000	9,600	6,000	5,200	3,600	5,760	9,220	5,760	4,920	3,480
		f_z (mm/t)	2.0	2.4	2.0	2.0	2.0	2.0	2.4	2.0	2.0	2.0	2.0	2.4	2.0	2.0	2.0
		a_p (mm)	2.0	1.6	1.4	1.0	1.0	2.0	1.6	1.4	1.0	1.0	2.0	1.6	1.4	1.0	1.0
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	608	776	426	264	180	768	983	538	333	230	922	1180	645	394	278
Hardened steel 45~55HRC	JP4120	n (min^{-1})	450	610	450	390	270	360	480	360	310	210	290	380	290	250	170
		v_c (m/min)	90	120	90	78	54	90	120	90	78	54	90	120	90	78	54
		v_f (mm/min)	360	490	360	310	220	360	480	360	310	210	350	460	350	300	200
		f_z (mm/t)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		a_p (mm)	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5	1.0	0.8	0.7	0.5	0.5
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	18	20	13	8	6	23	25	16	10	7	28	29	20	12	8
Hardened steel 55~60HRC	JP4105	n (min^{-1})	300	400	300	260	180	240	320	240	210	140	190	250	190	170	110
		v_c (m/min)	60	80	60	52	36	60	80	60	52	36	60	80	60	52	36
		v_f (mm/min)	60	160	120	100	70	60	160	120	110	70	60	150	110	100	70
		f_z (mm/t)	0.05	0.10	0.10	0.10	0.10	0.05	0.10	0.10	0.10	0.10	0.05	0.10	0.10	0.10	0.10
		a_p (mm)	0.5	0.4	0.4	0.3	0.3	0.5	0.4	0.4	0.3	0.3	0.5	0.4	0.4	0.3	0.3
		a_e (mm)	50	50	50	50	50	64	64	64	64	64	80	80	80	80	80
		Q (cm^3/min)	2	3	2	2	1	2	4	3	2	1	2	5	4	2	2

【Note】

1. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. (If the overhang is 3DCX or less, the recommended cutting speed is v_c=180~200m/min; 3DCX or more : v_c=90~130m/min.)
2. Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
3. 「JP4105」insert's grade specialized in High hardened steel is not suitable for Non-heat-treated steel material.
4. The thick and heavy chips are generated by using this tool. Be sure to remove them with air blow in order to avoid any breakage by blocking with chips. The recommended method is "Spindle center through" when blowing air. (Pay attention when removing chips in cavity work with the machining center <vertical type>.)
5. Before carrying out the work without any workers, be sure to remove the chips and confirm the safe condition for cutting.
6. The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safety cover around the tool and wear the safety glasses when carrying out any works.
7. Replace the insert in good time to avoid any breakage of the tools because of wear and tear.
8. The following formula shows the metal removal rate (Q) per unit time.

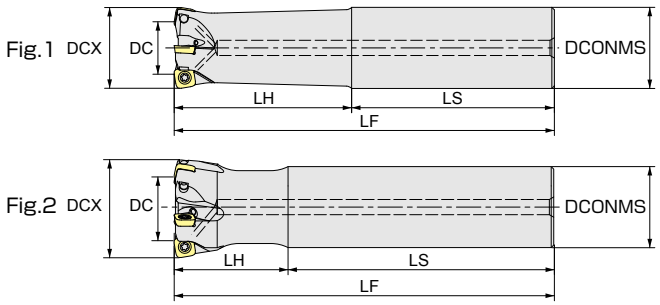
$$Q(\text{cm}^3/\text{min}) = a_p(\text{mm}) \times a_e(\text{mm}) \times v_f(\text{mm/min})/1000$$

Radius Mill 4 Corners ASRF mini

- New proposal to reduce cost and cutting force during high-feed-rate processing
- The economical four corner inserts.
  Three kinds of breaker can be selected according to applications.

Roughing | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C68

Shank type



With air hole

Inch IASRF□30○○R-○

Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

Item code		Stock	No.of flutes	Size (inch)						Shape
				DCX	DC	LF	LH	LS	DCONMS	
Regular Length	IASRFS3012R-2	●	2	.750	.280	5.000	2.000	3.000	.750	Fig.1
	IASRFS3016R-3	●	3	1.000	.530	5.500	2.500	3.000	1.000	Fig.1
	IASRFS3020R-4	●	4	1.250	.780	6.000	2.750	3.250	1.250	Fig.1
	IASRFS3024R-5	●	5	1.500	1.030	6.000	1.750	4.250	1.500	Fig.1
Long Length	IASRFL3012R-2	●	2	.750	.280	6.250	3.250	3.000	.750	Fig.1
	IASRFL3016R-3	●	3	1.000	.530	7.000	4.000	3.000	1.000	Fig.1
	IASRFL3020R-3	●	3	1.250	.780	8.000	5.000	3.000	1.250	Fig.1
	IASRFL3024R-3	●	3	1.500	1.030	9.000	1.750	7.250	1.500	Fig.1

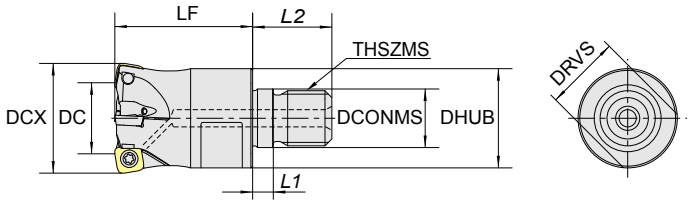
Metric ASRF□30○○R-○

Numeric figure comes in a circle ○ and alphabetical character comes in a square □.

Item code		Stock	No.of flutes	Size (mm)						Shape
				DCX	DC	LF	LH	LS	DCONMS	
Regular Length	ASRFS3020R-2	●	2	20	8	130	50	80	20	Fig.1
	ASRFS3025R-3	●	3	25	13	140	60	80	25	Fig.1
	ASRFS3032R-4	●	4	32	20	150	70	80	32	Fig.1
	ASRFS3040R-5	●	5	40	28	150	45	105	32	Fig.2
Long Length	ASRFL3020R-2	●	2	20	8	160	80	80	20	Fig.1
	ASRFL3022R-2	★	2	22	10	160	30	130	20	Fig.2
	ASRFL3025R-3	●	3	25	13	180	100	80	25	Fig.1
	ASRFL3028R-3	★	3	28	16	180	35	145	25	Fig.2
	ASRFL3032R-3	●	3	32	20	200	120	80	32	Fig.1
	ASRFL3035R-3	★	3	35	23	200	40	160	32	Fig.2
	ASRFL3040R-3	●	3	40	28	220	45	175	32	Fig.2

● : Inventory maintained in US ★ : Inventory maintained in Japan

Modular Type



With air hole

Inch IASRFM30○○R-○-M1○

Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (inch)								
			DCX	DC	LF	*L1*	*L2*	DCONMS	DHUB	THSZMS	DRVS
IASRFM3012R-2-M10	●	2	.750	.280	1.181	.217	.748	.413	.701	M10	.591
IASRFM3016R-3-M12	●	3	1.000	.530	1.378	.217	.866	.492	.819	M12	.669
IASRFM3020R-4-M16	●	4	1.250	.780	1.575	.236	.906	.669	.134	M16	.866
IASRFM3024R-5-M16	●	5	1.500	1.030	1.575	.236	.906	.669	.134	M16	.866

Metric ASRFM30○○R-○-M1○

Numeric figure comes in a circle ○.

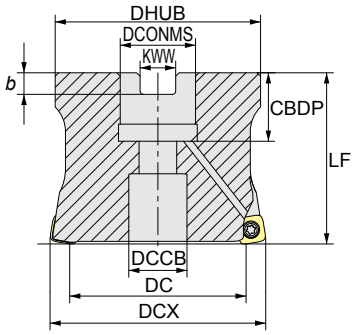
Item code	Stock	No.of flutes	Size (mm)								
			DCX	DC	LF	*L1*	*L2*	DCONMS	DHUB	THSZMS	DRVS
ASRFM3020R-2-M10	●	2	20	8	30	5.5	19	10.5	17.8	M10	15
※ ASRFM3022R-2-M10	★	2	22	10	30	5.5	19	10.5	17.8	M10	15
ASRFM3025R-3-M12	●	3	25	13	35	5.5	22	12.5	20.8	M12	17
※ ASRFM3028R-3-M12	★	3	28	16	35	5.5	22	12.5	20.8	M12	17
ASRFM3032R-4-M16	●	4	32	20	40	6	23	17	28.8	M16	22
※ ASRFM3035R-4-M16	★	4	35	23	40	6	23	17	28.8	M16	22
※ ASRFM3040R-5-M16	●	5	40	28	40	6	23	17	28.8	M16	22

【Note】

When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease, etc. to the “contact faces” and “modular screws” of the “modular mill”, “dedicated shanks” and “dedicated arbor”.

Radius Mill 4 Corners ASRF mini

Bore type



With air hole

Inch IASRFB30○○R-○

Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (inch)								
			DCX	DC	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB
IASRFB3032R-7	●	7	2.000	1.530	1.575	1.969	.750	.315	.197	.750	.669
IASRFB3040R-8	●	8	2.500	2.030	1.575	1.969	1.024	.374	.236	1.000	.669

Metric ASRFB30○○R(M)-○-○○

Numeric figure comes in a circle ○.

Item code		Stock	No.of flutes	Size (mm)								
				DCX	DC	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB
Internal diameter inch size	ASRFB3050R-7	★	7	50	38	47	50	19	8.4	5	22.225	17
	ASRFB3063R-8	●	8	63	51	60	50	19	8.4	5	22.225	20
Internal diameter mm size	ASRFB3040RM-5-16	●	5	40	28	35	40	19	8.4	5.6	16	13.5
	ASRFB3050RM-7-22	●	7	50	38	40	50	20	10.4	6.3	22	17
	ASRFB3063RM-8-22	★	8	63	51	60	50	20	10.4	6.3	22	17
	ASRFB3063RM-8-27	●	8	63	51	60	50	22	12.4	7	27	20

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Inserts

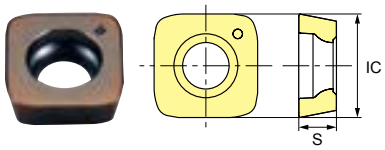


Fig.3 General edge type

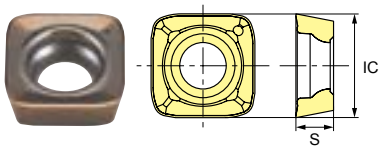


Fig.4 Sharp edge type

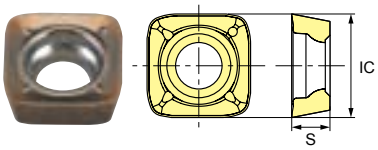


Fig.5 Ultra sharp edge type

P	Carbon steel		■		■	■
M	Stainless steel, etc.			■		
K	Cast iron		□		■	■
H	Hardened steel	■				

■ : General cutting, First recommended

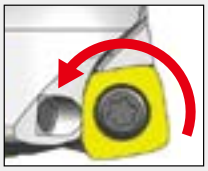
□ : General cutting, Second recommended

Item code	Tolerance class	AJ Coating			GX Coating	JS Coating	Size (mm)		Shape
		JP4105	JP4120	JM4160	GX2140	JS4045	IC	S	
SPNW07T2TR	N	●	●	●	●	●	**7.8**	**2.8**	**Fig.3**
SPMT07T2TR	M		●	●		●	**7.8**	**2.8**	**Fig.4**
SPMT07T2ER-LF			● ※1	●			**7.8**	**2.8**	**Fig.5**

【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
※1 Cutting of M (SUS, etc.) and S (titanium alloys, Ni-based alloys).

Attention for the corner change

・Please turn the insert counterclockwise upon corner change of insert.



Parts

Parts	Clamp screw			Screw driver	Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N・m)	Fastening torque (lbf・in)		
ASRF S/L/M/B30... IASRF S/L/M/B30...	**265-143**	2.0	17.7	104-T10	P-37

【Note】
The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.
One spare clamp screw is provided for cutter bodies with 3 or less flutes, and two for 4 or more flutes.

Radius Mill 4 Corners ASRF mini

Recommended cutting conditions

Inch

※ Red indicates primary recommended insert grade.

Work material	Recommended inserts grade	Tool dia. DCX	20mm or 3/4"		25mm or 1"		32mm or 1.25"		40mm or 1.5"		40mm or 1.5"	50mm or 2"	63mm or 2.5"
		Type	Regular	Long	Regular	Long	Regular	Long	Regular	Long	Bore	Bore	Bore
		flutes	2	2	3	3	4	3	5	3	5	7	8
Carbon steel Alloy steel <30HRC	※ GX2140 JS4045	*n* (min-1)	2,710	2,390	2,170	1,910	1,690	1,490	1,350	1,190	1,350	1,080	860
		Vc(SFM)	532	469	568	500	553	487	530	467	530	565	563
		Vf(IPM)	277	244	333	293	346	229	345	183	345	387	352
		fz(IPT)	.051	.051	.051	.051	.051	.051	.051	.051	.051	.051	.051
		ap(inch)	.031	.024	.031	.024	.031	.024	.031	.024	.031	.031	.031
		ae(inch)	.472	.472	.591	.591	.787	.787	.945	.945	.945	1.181	1.496
		Q (in3/min)	4.1	2.7	6.2	4.1	8.6	4.3	10.3	4.1	10.3	14.4	16.6
Alloy steel Tool steel 30 ～ 40HRC	JS4045 JP4120	*n* (min-1)	2,390	2,070	1,910	1,660	1,490	1,290	1,190	1,040	1,190	960	760
		Vc(SFM)	469	406	500	434	487	422	467	408	467	502	497
		Vf(IPM)	226	195	270	235	281	183	281	147	281	317	287
		fz(IPT)	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047
		ap(inch)	.031	.024	.031	.024	.031	.024	.031	.024	.031	.031	.031
		ae(inch)	.472	.472	.591	.591	.787	.787	.945	.945	.945	1.181	1.496
		Q (in3/min)	3.4	2.2	5.0	3.3	7.0	3.4	8.4	3.3	8.4	11.8	13.5
Pre-Hardened steel 40 ～ 50HRC	JP4120 JS4045	*n* (min-1)	1,590	1,430	1,270	1,150	1,000	900	800	720	800	640	510
		Vc(SFM)	312	281	332	301	327	294	314	283	314	335	334
		Vf(IPM)	150	113	180	136	189	106	189	85	189	211	193
		fz(IPT)	.047	.039	.047	.039	.047	.039	.047	.039	.047	.047	.047
		ap(inch)	.020	.016	.020	.016	.020	.016	.020	.016	.020	.020	.020
		ae(inch)	.472	.472	.591	.591	.787	.787	.945	.945	.945	1.181	1.496
		Q (in3/min)	1.4	.8	2.1	1.3	2.9	1.3	3.5	1.3	3.5	4.9	5.7
Stainless steel	JM4160	*n* (min-1)	1,590	1,430	1,270	1,150	1,000	900	800	720	800	640	510
		Vc(SFM)	312	281	332	301	327	294	314	283	314	335	334
		Vf(IPM)	125	90	150	109	157	85	157	68	157	176	161
		fz(IPT)	.039	.031	.039	.031	.039	.031	.039	.031	.039	.039	.039
		ap(inch)	.031	.020	.031	.020	.031	.020	.031	.020	.031	.031	.031
		ae(inch)	.472	.472	.591	.591	.787	.787	.945	.945	.945	1.181	1.496
		Q (in3/min)	1.9	.8	2.8	1.3	3.9	1.3	4.7	1.3	4.7	6.6	7.6
Cast iron	JP4120 GX2140	*n* (min-1)	3,180	2,870	2,550	2,290	1,990	1,790	1,590	1,430	1,590	1,270	1,010
		Vc(SFM)	624	563	667	599	651	585	624	561	624	665	661
		Vf(IPM)	376	271	452	324	470	254	469	202	469	525	477
		fz(IPT)	.059	.047	.059	.047	.059	.047	.059	.047	.059	.059	.059
		ap(inch)	.031	.024	.031	.024	.031	.024	.031	.024	.031	.031	.031
		ae(inch)	.472	.472	.591	.591	.787	.787	.945	.945	.945	1.181	1.496
		Q (in3/min)	5.6	3.0	8.4	4.5	11.7	4.7	14.0	4.5	14.0	19.5	22.5
High-Hardened steel 50 ～ 55HRC	JP4105 JP4120	*n* (min-1)	1,270	1,110	1,020	890	800	700	640	560	640	510	400
		Vc(SFM)	249	218	267	233	262	229	251	220	251	267	262
		Vf(IPM)	60	44	72	52	76	41	76	33	76	84	76
		fz(IPT)	.024	.020	.024	.020	.024	.020	.024	.020	.024	.024	.024
		ap(inch)	.020	.012	.020	.012	.020	.012	.020	.012	.020	.020	.020
		ae(inch)	.472	.472	.591	.591	.787	.787	.945	.945	.945	1.181	1.496
		Q (in3/min)	.6	.2	.8	.4	1.2	.4	1.4	.4	1.4	2.0	2.2
High-Hardened steel 55 ～ 62HRC	JP4105	*n* (min-1)	1,040	960	830	760	650	600	520	480	520	410	330
		Vc(SFM)	204	188	217	199	213	196	204	188	204	215	216
		Vf(IPM)	～33	～26	～39	～31	～41	～25	～41	～20	～41	～45	～41
		fz(IPT)	～.016	～.014	～.016	～.014	～.016	～.014	～.016	～.014	～.016	～.016	～.016
		ap(inch)	～.012	～.008	～.012	～.008	～.012	～.008	～.012	～.008	～.012	～.012	～.012
		ae(inch)	.394	.394	.472	.472	.630	.630	.787	.787	.787	.984	1.260
		Q (in3/min)	～.15	～.08	～.22	～.12	～.30	～.12	～.38	～.12	～.38	～.52	～.62

※ This cutting condition table shows general guidelines for cutting conditions when L/D < 3. When performing actual machining, adjust the cutting conditions according to the shape to be machined, purpose, machine being used, etc.

【Note】
1. Before carrying out the work without operator, be sure to remove the chips and confirm the safe condition for cutting.
2. The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safety cover around the tool and wear the safety glasses when carrying out any works.
3. JP4105 is for the high-hardness steels. It is not suitable for Non-heat-treated steel material.
4. The machinability of hardened steels (55 - 62HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth ap to suit machining conditions.
5. For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
6. Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
7. Replace the insert in good time to avoid any breakage of the tools because of wear and tear.

Metric

※ Red indicates primary recommended insert grade.

Work material	Recommended inserts grade	Tool dia. DCX	20mm or 3/4"		25mm or 1"		32mm or 1.25"		40mm or 1.5"		40mm or 1.5"	50mm or 2"	63mm or 2.5"
		Type	Regular	Long	Regular	Long	Regular	Long	Regular	Long	Bore	Bore	Bore
		flutes	2	2	3	3	4	3	5	3	5	7	8
Carbon steel Alloy steel <30HRC	※ GX2140 JS4045	*n* (min-1)	2,710	2,390	2,170	1,910	1,690	1,490	1,350	1,190	1,350	1,080	860
		Vc(m/min)	170	150	170	150	170	150	170	150	170	170	170
		Vf(mm/min)	7,040	6,210	8,460	7,440	8,780	5,810	8,770	4,640	8,770	9,820	8,940
		fz(mm/t)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
		*a*p(mm)	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.8	0.8
		*a*e(mm)	12	12	15	15	20	20	24	24	24	30	38
		Q (cm3/min)	68	45	102	67	140	70	168	67	168	236	272
Alloy steel Tool steel 30 ～ 40HRC	JS4045 JP4120	*n* (min-1)	2,390	2,070	1,910	1,660	1,490	1,290	1,190	1,040	1,190	960	760
		Vc(m/min)	150	130	150	130	150	130	150	130	150	150	150
		Vf(mm/min)	5,730	4,960	6,870	5,970	7,150	4,640	7,140	3,740	7,140	8,060	7,290
		fz(mm/t)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		*a*p(mm)	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.8	0.8
		*a*e(mm)	12	12	15	15	20	20	24	24	24	30	38
		Q (cm3/min)	55	36	82	54	114	56	137	54	137	193	222
Pre-Hardened steel 40 ～ 50HRC	JP4120 JS4045	*n* (min-1)	1,590	1,430	1,270	1,150	1,000	900	800	720	800	640	510
		Vc(m/min)	100	90	100	90	100	90	100	90	100	100	100
		Vf(mm/min)	3,810	2,860	4,570	3,450	4,800	2,700	4,800	2,160	4,800	5,370	4,890
		fz(mm/t)	1.2	1	1.2	1	1.2	1	1.2	1	1.2	1.2	1.2
		*a*p(mm)	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.5
		*a*e(mm)	12	12	15	15	20	20	24	24	24	30	38
		Q (cm3/min)	23	14	34	21	48	22	58	21	58	81	93
Stainless steel	JM4160	*n* (min-1)	1,590	1,430	1,270	1,150	1,000	900	800	720	800	640	510
		Vc(m/min)	100	90	100	90	100	90	100	90	100	100	100
		Vf(mm/min)	3,180	2,280	3,810	2,760	4,000	2,160	4,000	1,720	4,000	4,480	4,080
		fz(mm/t)	1	0.8	1	0.8	1	0.8	1	0.8	1	1	1
		*a*p(mm)	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.8	0.8
		*a*e(mm)	12	12	15	15	20	20	24	24	24	30	38
		Q (cm3/min)	31	14	46	21	64	22	77	21	77	108	124
Cast iron	JP4120 GX2140	*n* (min-1)	3,180	2,870	2,550	2,290	1,990	1,790	1,590	1,430	1,590	1,270	1,010
		Vc(m/min)	200	180	200	180	200	180	200	180	200	200	200
		Vf(mm/min)	9,540	6,880	11,470	8,240	11,940	6,440	11,920	5,140	11,920	13,330	12,120
		fz(mm/t)	1.5	1.2	1.5	1.2	1.5	1.2	1.5	1.2	1.5	1.5	1.5
		*a*p(mm)	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.6	0.8	0.8	0.8
		*a*e(mm)	12	12	15	15	20	20	24	24	24	30	38
		Q (cm3/min)	92	50	138	74	191	77	229	74	229	320	368
High-Hardened steel 50 ～ 55HRC	JP4105 JP4120	*n* (min-1)	1,270	1,110	1,020	890	800	700	640	560	640	510	400
		Vc(m/min)	80	70	80	70	80	70	80	70	80	80	80
		Vf(mm/min)	1,520	1,110	1,830	1,330	1,920	1,050	1,920	840	1,920	2,140	1,920
		fz(mm/t)	0.6	0.5	0.6	0.5	0.6	0.5	0.6	0.5	0.6	0.6	0.6
		*a*p(mm)	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.5	0.5
		*a*e(mm)	12	12	15	15	20	20	24	24	24	30	38
		Q (cm3/min)	9	4	14	6	19	6	23	6	23	32	36
High-Hardened steel 55 ～ 62HRC	JP4105	*n* (min-1)	1,040	960	830	760	650	600	520	480	520	410	330
		Vc(m/min)	65	60	65	60	65	60	65	60	65	65	65
		Vf(mm/min)	～ 830	～ 670	～ 990	～ 790	～ 1,040	～ 630	～ 1,040	～ 500	～ 1,040	～ 1,140	～ 1,050
		fz(mm/t)	～ 0.4	～ 0.35	～ 0.4	～ 0.35	～ 0.4	～ 0.35	～ 0.4	～ 0.35	～ 0.4	～ 0.4	～ 0.4
		*a*p(mm)	～ 0.3	～ 0.2	～ 0.3	～ 0.2	～ 0.3	～ 0.2	～ 0.3	～ 0.2	～ 0.3	～ 0.3	～ 0.3
		*a*e(mm)	10	10	12	12	16	16	20	20	20	25	32
		Q (cm3/min)	～ 2	～ 1	～ 4	～ 2	～ 5	～ 2	～ 6	～ 2	～ 6	～ 9	～ 10

※ This cutting condition table shows general guidelines for cutting conditions when L/D < 3. When performing actual machining, adjust the cutting conditions according to the shape to be machined, purpose, machine being used, etc.

【Note】
1. Before carrying out the work without operator, be sure to remove the chips and confirm the safe condition for cutting.
2. The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safety cover around the tool and wear the safety glasses when carrying out any works.
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4. The machinability of hardened steels (55 - 62HRC) can vary significantly depending on the particular steel type and tool overhang. Adjust the table feed rate and cutting depth ap to suit machining conditions.
5. For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
6. Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
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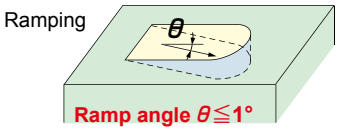
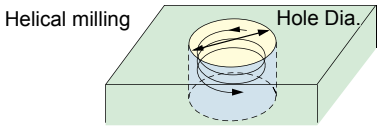
Radius Mill 4 Corners ASRF mini

Regarding ramping and helical milling diameter





RAMPING/HELICAL MILLING - METRIC DIAMETER

Tool dia. DCX (mm)	ϕ20	ϕ25	ϕ32	ϕ40	ϕ50	ϕ63
Ramp angle θ	1°or less					
Hole diameter (mm)	26～38	36～48	50～62	66～78	86～98	112～124

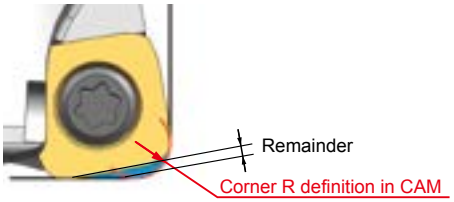
RAMPING/HELICAL MILLING - INCH DIAMETER

Tool dia. DCX (inch)	.750"	1.000"	1.250"	1.500"	2.000"	2.500"
Ramp angle θ	1°or less					
Hole diameter (inch)	.949～1.421	1.449～1.921	1.949～2.421	2.449～2.921	3.449～3.921	4.449～4.921

For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Points requiring care when creating the machining program

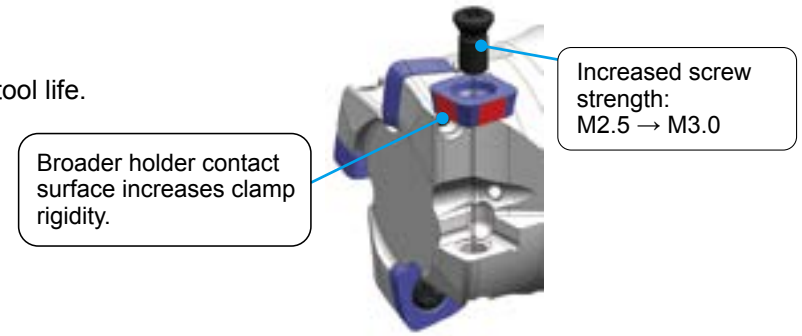
- Define the tool as the shape of the R2.0mm (R.079") radius.
- Use with axial-direction cutting depths ap of 1.2mm (.047") or less.



Technology

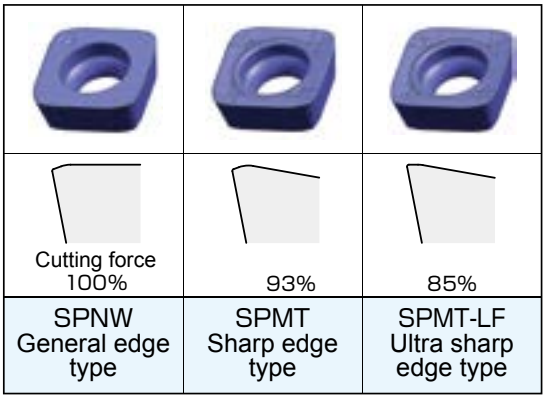
Improvements in clamp rigidity, which affects tool life.

- Size of insert holding screw was increased.
- Larger contact surface with holder



3 types of shapes to select from according to the use application.

- The economical four corner inserts.
- In addition to the conventional free-cutting breaker, an LF breaker with the emphasis on further cutting performance has been added. This expands the applicable range for high-feed-rate machining.



Field data

Product items	Work material	Tool dia. DCX	Item code	Cutting conditions	Result
Die-cast mold	Alloy tool steel (40HRC)	50mm (2.000")	ASRFB3050RM-7-22 SPMT07T2TR (JP4120)	v_c = 115m/min (377SFM) v_f = 6,150mm/min (242IPM) a_p = 0.5mm (.02")	Multi-flute effect realizes efficiency cutting and long tool life.
Mold parts	Structural steel	32mm (1.250")	ASRFM3032R-4-M16 SPNW07T2TR (JS4045)	v_c = 115m/min (377SFM) v_f = 9,850mm/min (388IPM) a_p = 0.8mm (.031")	By increases flute rigidity effect, high feed rate per flute realizes efficiency cutting.
Mold parts	Alloy tool steel (35HRC)	25mm (1.000")	ASRFM3025R-3-M12 SPMT07T2TR (JP4120)	v_c = 173m/min (568SFM) v_f = 9,000mm/min (351IPM) a_p = 0.8mm (.031")	The processing cost could be reduced 60% on the long overhang condition by the separated cutting process.
Parts	Stainless steel 316	50mm (2.000")	ASRFB3050RM-7-22 SPMT07T2ER-LF (JM4160)	v_c = 120m/min (394SFM) v_f = 3,000mm/min (116IPM) a_p = 0.5mm (.02")	Cutting force is reduced by LF breaker and the heat of cutting process which occurs is suppressed.

Radius Mill ASR Multi-flutes type

- ASR multi-flute type
- Despite the use of small inserts, it provides greatly improved chipping resistance and enables amazing feed rates.
- Maximum cutting depth is 1.5mm for R8 type and 2mm for R10 type.

Roughing | Maximum Notch 1.5 | Maximum Notch 2.0 | 13° | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C77

Straight Shank Type

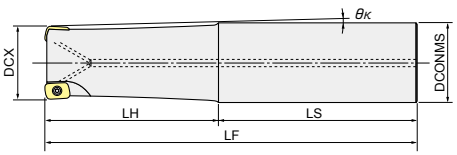


Fig.1 (Standard type)

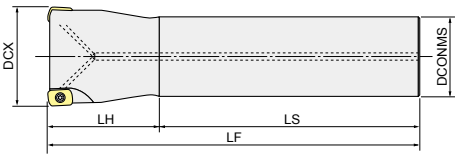


Fig.2 (Undercut type)

With air hole

Inch IASR□20○○R-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □

Shank type		Item code	Stock	No.of flutes	Size (inch) DCX	LF	DCONMS	LH	LS	θκ	Shape	Inserts
	Regular	IASRS2010R-2	●	2	.625	4.000	.625	1.250	2.750	–	Fig.1	EPNW0603TN-8 EPMT0603TN-8 EPMT0603EN-8LF
		IASRS2012R-3	●	3	.750	5.000	.750	2.000	3.000	–		
		IASRS2016R-4	●	4	1.000	5.500	1.000	2.500	3.000	–		
		IASRS2020R-5	●	5	1.250	6.000	1.250	2.750	3.250	–		
		IASRS2024R-6	●	6	1.500	6.000	1.500	1.750	4.250	–	Fig.2	
	Long	IASRL2010R-2	●	2	.625	6.000	.625	2.000	4.000	–	Fig.1	
		IASRL2012R-3	●	3	.750	6.250	.750	3.250	3.000	–		
		IASRL2016R-4	●	4	1.000	7.000	1.000	4.000	3.000	–		
		IASRL2020R-5	●	5	1.250	8.000	1.250	5.000	3.000	–		
		IASRL2024R-6	●	6	1.500	9.000	1.500	1.750	7.250	–		

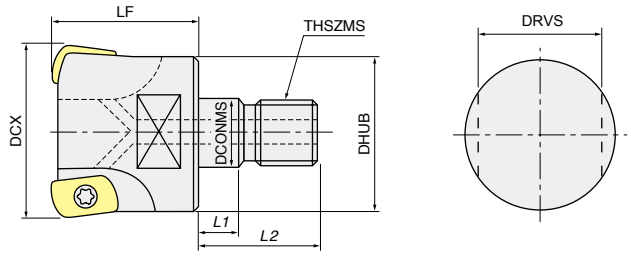
Metric ASR□20○○(S○○)R-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □

Shank type		Item code	Stock	No.of flutes	Size (mm) DCX	LF	DCONMS	LH	LS	θκ	Shape	Inserts
	Regular	ASRS2016R-2	●	2	16	100	16	30	70	—	Fig.1	EPNW0603TN-8 EPMT0603TN-8 EPMT0603EN-8LF
		ASRS2020R-3	●	3	20	130	20	50	80	—		
		ASRS2025R-4	●	4	25	140	25	60	80	—		
		ASRS2030R-4	●	4	30	150	32	70	80	0.9°		
		ASRS2032R-5	●	5	32	150	32	70	80	—		
		ASRS2040R-6	●	6	40	150	32	45	105	—	Fig.2	
	Long	ASRL2016R-2	●	2	16	150	16	50	100	—	Fig.1	
		ASRL2016S15R-2	★	2	16	150	15	25	125	—	Fig.2	
		ASRL2018R-2	★	2	18	150	16	25	125	—		
		ASRL2020R-3	●	3	20	160	20	80	80	—	Fig.1	
		ASRL2020S18R-3	★	3	20	160	18	30	130	—	Fig.2	
		ASRL2022R-3	★	3	22	160	20	30	130	—		
		ASRL2025R-4	●	4	25	180	25	100	80	—	Fig.1	
		ASRL2025S23R-4	★	4	25	180	23	35	145	—	Fig.2	
		ASRL2028R-4	★	4	28	180	25	35	145	—		
		ASRL2030R-4	●	4	30	200	32	120	80	0.6°	Fig.1	
		ASRL2030S28R-4	★	4	30	200	28	40	160	—	Fig.2	
		ASRL2032R-5	●	5	32	200	32	120	80	—	Fig.1	
		ASRL2032S30R-5	★	5	32	200	30	40	160	—	Fig.2	
		ASRL2040R-6	●	6	40	220	32	45	175	—		

● : Inventory maintained in US ★ : Inventory maintained in Japan

Modular Type



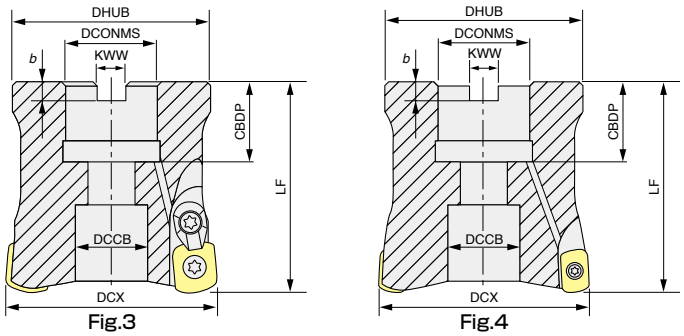
Metric ASRM20○○R-○

Numeric figure in a circle ○.

Item code	Stock	No.of flutes	Size (mm) DCX	LF	DCONMS	THSZMS	DHUB	L1	L2	DRVS	Inserts
ASRM2016R-2	●	2	16	25	8.5	M8	12.8	5.5	17	10	EPNW0603TN-8 EPMT0603TN-8 EPMT0603EN-8LF
※ ASRM2018R-2	★	2	18	25	8.5	M8	14.5	5.5	17	10	
ASRM2020R-3	●	3	20	30	10.5	M10	17.8	5.5	19	15	
※ ASRM2022R-3	★	3	22	30	10.5	M10	17.8	5.5	19	15	
ASRM2025R-4	●	4	25	35	12.5	M12	20.8	5.5	22	17	
※ ASRM2028R-4	★	4	28	35	12.5	M12	23	5.5	22	17	
ASRM2030R-4	●	4	30	40	17	M16	28.8	6	23	22	
ASRM2032R-5	●	5	32	40	17	M16	28.8	6	23	22	
※ ASRM2040R-6	●	6	40	40	17	M16	28.8	6	23	22	

【Note】 When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

Bore Type



With air hole

Inch IASR20○○R-○

Numeric figure in a circle ○.

	Item code	Stock	No.of flutes	Size (inch) DCX	DHUB	LF	CBDP	KWW	b	DCONMS	DCCB	Shape	Inserts
Bore type	IASR2032R-7	●	7	2.000	1.803	2.000	.750	.315	.197	.750	.669	Fig.4	EDNW12T3TN-10 EDMT12T3TN-10
	IASR2040R-8	●	8	2.500	2.264	2.000	.750	.315	.197	.750	.669		

Metric ASR○○○○R(M)-○

Numeric figure in a circle ○.

		Item code	Stock	No.of flutes	Size (mm) DCX	DHUB	LF	CBDP	KWW	b	DCONMS	DCCB	Shape	Inserts
Bore type	Internal diameter inch size	ASR3050R-5	★	5	50	47	50	19	8.4	5	22.225	17	Fig.3	EDNW12T3TN-10 EDMT12T3TN-10
		ASR3063R-6	★	6	63	60	50	19	8.4	5	22.225	17		
		ASR2052R-7	★	7	52	47	50	19	8.4	5	22.225	17	Fig.4	EPNW0603TN-8 EPMT0603TN-8 EPMT0603EN-8LF
		ASR2052RS-7	●	7	52	47	50	19	8.4	5	19.95	17		
		ASR2066R-8	★	8	66	60	50	19	8.4	5	22.225	17		
		ASR2066RS-8	●	8	66	60	50	19	8.4	5	19.95	17		
	Internal diameter mm size	ASR3050RM-5	★	5	50	47	50	20	10.4	6.3	22	17	Fig.3	EDNW12T3TN-10 EDMT12T3TN-10
		ASR3063RM-6	★	6	63	60	50	20	10.4	6.3	22	17		
		ASR2052RM-7	★	7	52	47	50	20	10.4	6.3	22	17	Fig.4	EPNW0603TN-8 EPMT0603TN-8 EPMT0603EN-8LF
		ASR2066RM-8	★	8	66	60	50	20	10.4	6.3	22	17		

【Note】 Arbor screw is not included.

Radius Mill ASR Multi-flutes type

Inserts

Standard shape

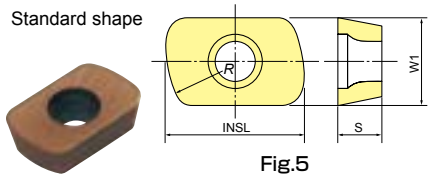


Fig.5

With breaker

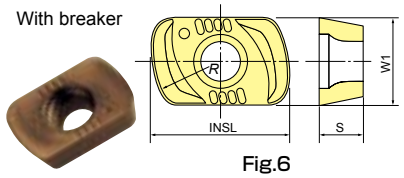


Fig.6

Spiral shape
(low cutting force)

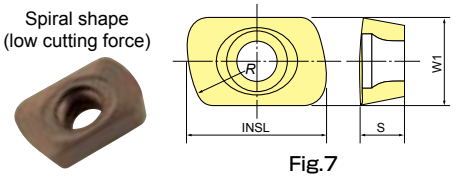


Fig.7

P	Carbon steel		■		■	■	■
M	Stainless steel, etc.			■			
K	Cast iron		⊔		⊔	■	
H	Hardened steel	■	■				

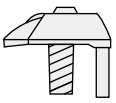
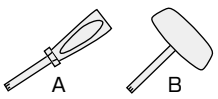
■ : General cutting, First recommended
⊔ : General cutting, Second recommended

Item code	Tolerance class	AJ Coating			GX Coating	JS Coating		Size(mm)				Shape
		JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	*R*	INSL	S	W1	
EPNW0603TN-8	N	★	●	●	★	●	●	8	10	3.18	6.35	Fig.5
EDNW12T3TN-10		★	★	★	★	★	★	10	12	3.97	10	
EPMT0603TN-8	M	★	●	●	★	●	●	8	10	3.18	6.35	Fig.6
EDMT12T3TN-10		★	★	★	★	★	★	10	12	3.97	10	
EPMT0603EN-8LF				●				8	10	3.18	6.35	Fig.7

【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Parts

Numeric figure in a circle ◌.

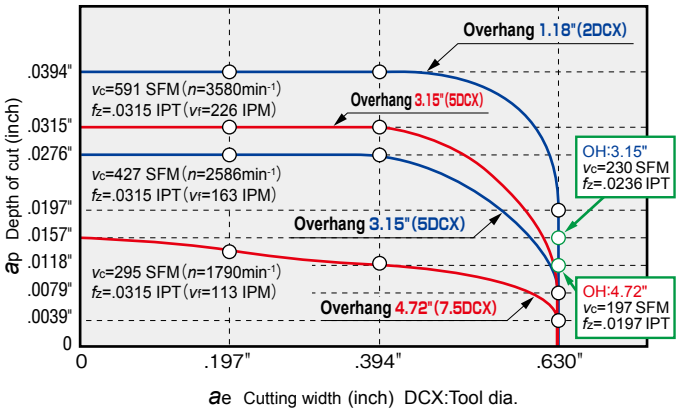
Parts	Clamp screw			Clamp piece set	Screw driver / Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N·m)	Fastening torque (lbf·in)		 A B	Shape	
IASR S/L◌◌(S◌◌)R-◌ IASR 20◌◌R(M)-◌ IASR S/L◌◌(S◌◌)R-◌ IASR 20◌◌R(M)-◌ ASR S/L/M20◌◌(S◌◌)R-◌ ASR 20◌◌R(M)-◌	250 - 141	1.1	9.74	—	104 - T8	A	P-37
ASR 30◌◌R(M)-◌	412 - 141	2.9	25.67	CM3.5 - 141	105 - T15	B	

【Note】 The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage. Includes two spare clamp screws.

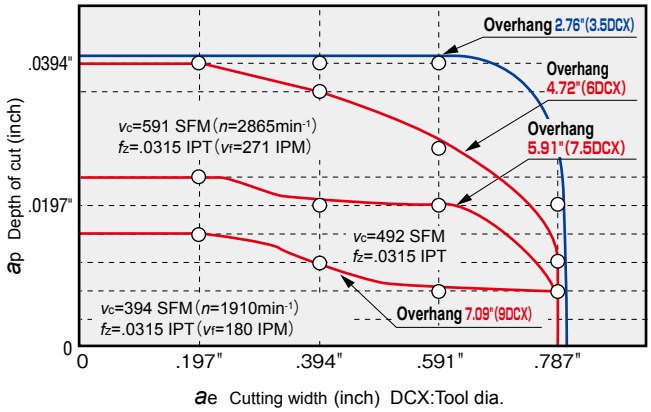
● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Overhang and Application Area 1（for BT40）

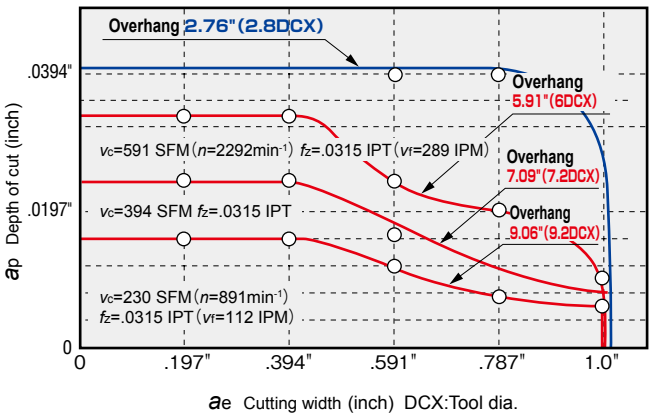
❶ φ16mm / φ5/8"（2 Flutes）



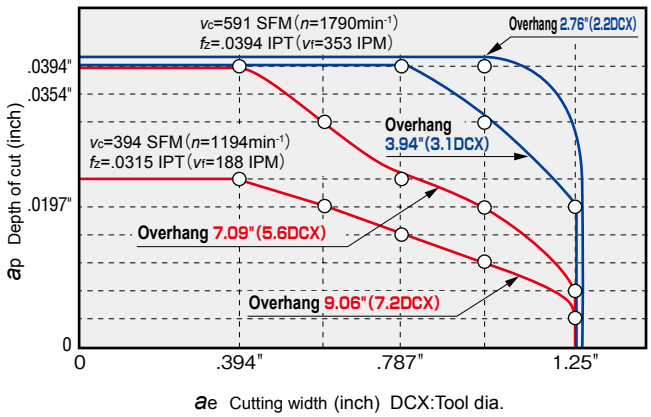
❷ φ20mm / φ4/3"（3 Flutes）



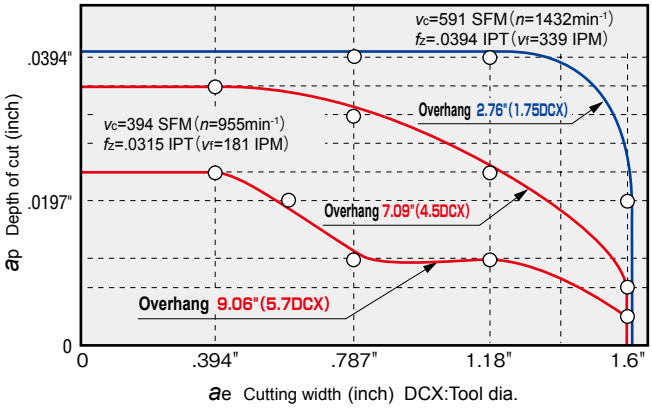
❸ φ25mm / φ1"（4 Flutes）



❹ φ32mm / φ1.25"（5 Flutes）



❺ φ40mm / φ1.575"（6 Flutes）



Machine: BT40 11/7.5kw
Work material: AISI1050(220HB)
1.1213(Cf35)

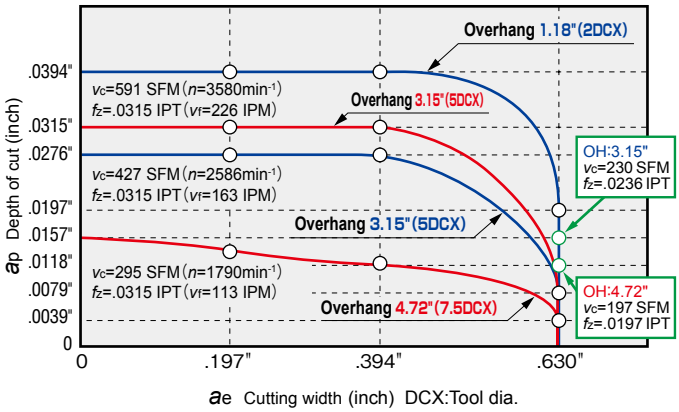
: Steel Shank

: Carbide Shank

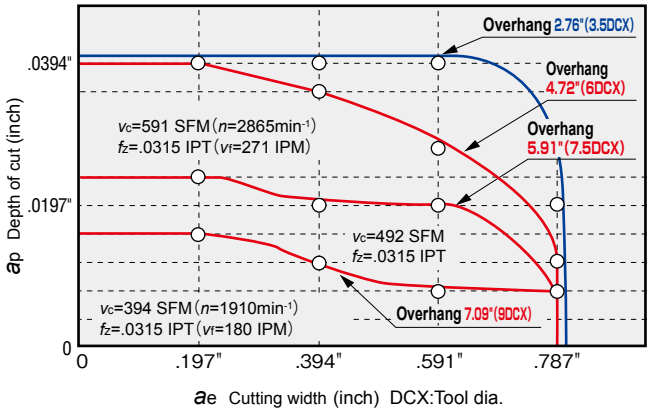
Radius Mill ASR Multi-flutes type

Overhang and Application Area 1 (for BT40)

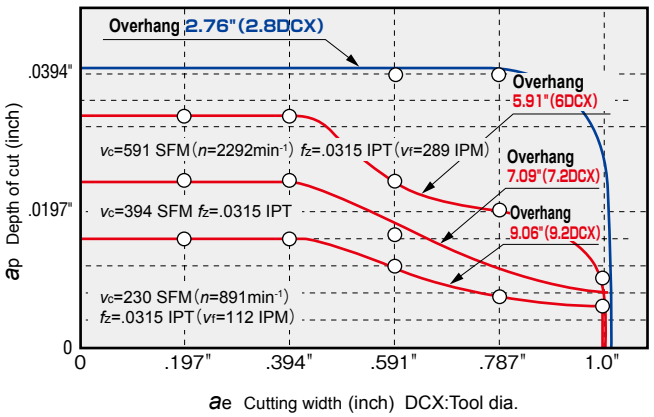
❶ φ16mm / φ5/8" (2 Flutes)



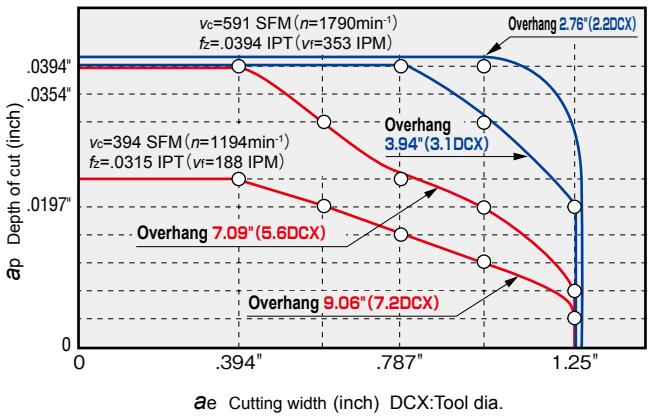
❷ φ20mm / φ4/3" (3 Flutes)



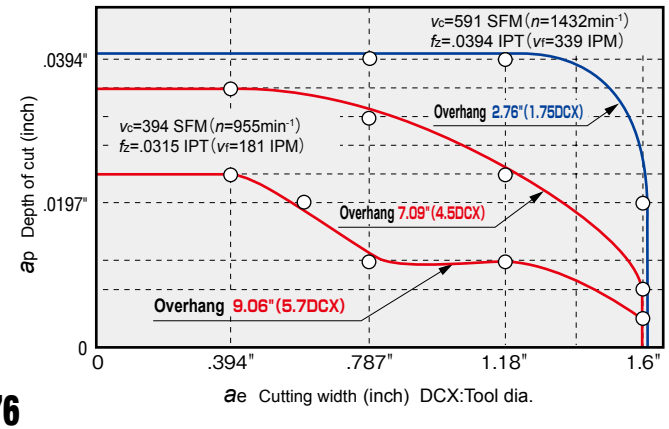
❸ φ25mm / φ1" (4 Flutes)



❹ φ32mm / φ1.25" (5 Flutes)



❺ φ40mm / φ1.575" (6 Flutes)



Machine: BT40 11/7.5kw
Work material: AISI1050(220HB)
1.1213(Cf35)

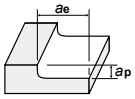
: Steel Shank

: Carbide Shank

Recommended cutting conditions

Inch ① For Straight Shank Type

※Red indicates primary recommended grade.



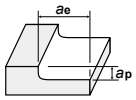
Note Next Page

Work material	Recommended grade	Tool dia. DCX	ϕ16mm or 5/8" 2 flutes		ϕ20mm or 3/4" 3 flutes		ϕ25mm or 1" 4 flutes		ϕ32mm or 1.25" 5 flutes		ϕ40mm or 1.5" 6 flutes	
		Overhang	<3DCX		<3DCX		<3DCX		<3DCX		<3DCX	
			General purpose	High-speed processing	General purpose	High-speed processing	General purpose	High-speed processing	General purpose	High-speed processing	General purpose	High-speed processing
Carbon steel Alloy steel <30HRC	※ GX2140 JS4060 JS4045	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (SFM)	294	587	283	563	301	602	294	589	283	565
		v_f (IPM)	113	396	136	475	181	580	177	567	170	544
		f_z (IPT)	.031	.055	.031	.055	.039	.063	.039	.063	.039	.063
		a_p (inch)	.031	.024	.039	.020	.039	.020	.039	.020	.039	.020
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	1.8	4.8	3.4	5.9	5.6	9.0	6.9	11.0	8.4	13.5
Pre-Hardened steel Alloy steel 30~40HRC	JP4120 JS4045 JS4060	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (SFM)	294	587	283	563	301	602	294	589	283	565
		v_f (IPM)	113	396	136	475	181	580	177	567	170	544
		f_z (IPT)	.031	.055	.031	.055	.039	.063	.039	.063	.039	.063
		a_p (inch)	.031	.024	.039	.020	.039	.020	.039	.020	.039	.020
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	1.8	4.8	3.4	5.9	5.6	9.0	6.9	11.0	8.4	13.5
Pre-hardened steel Alloy steel 40~50HRC	JP4120 JS4045	n (min^{-1})	1,800	2,590	1,440	2,080	1,150	1,660	900	1,300	720	1,040
		v_c (SFM)	294	424	283	408	301	434	294	425	283	408
		v_f (IPM)	85	245	102	295	109	314	106	307	102	295
		f_z (IPT)	.024	.047	.024	.047	.024	.047	.024	.047	.024	.047
		a_p (inch)	.020	.014	.024	.014	.024	.014	.024	.014	.024	.014
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	.9	1.7	1.5	2.6	2.0	3.4	2.5	4.2	3.0	5.1
Stainless steel	JM4160	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (SFM)	294	587	283	563	301	602	294	589	283	565
		v_f (IPM)	71	283	85	339	91	362	89	354	85	340
		f_z (IPT)	.020	.039	.020	.039	.020	.039	.020	.039	.020	.039
		a_p (inch)	.031	.024	.039	.020	.039	.020	.039	.020	.039	.020
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	1.1	3.4	2.1	4.2	2.8	5.6	3.4	6.9	4.2	8.4
Cast iron	JS4045 GX2140 JP4120	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (SFM)	294	587	283	563	301	602	294	589	283	565
		v_f (IPM)	170	452	238	610	254	652	248	638	238	612
		f_z (IPT)	.047	.063	.055	.071	.055	.071	.055	.071	.055	.071
		a_p (inch)	.039	.031	.049	.039	.049	.039	.049	.039	.049	.039
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	3.4	7.3	7.4	15.1	9.8	20.2	12.0	24.7	14.8	30.4
Hardened steel Pre-hardened steel 50-55HRC	JP4120 JP4105	n (min^{-1})	1,600	2,390	1,280	1,920	1,020	1,530	800	1,200	640	960
		v_c (SFM)	262	391	251	377	267	400	262	393	251	377
		v_f (IPM)	25	38	30	45	32	48	31	47	30	45
		f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		a_p (inch)	.016	.010	.016	.010	.016	.010	.016	.010	.016	.010
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	.20	.19	.30	.28	.40	.37	.49	.46	.60	.56
Hardened steel 55-62HRC	JP4105	n (min^{-1})	1,200	2,000	960	1,600	770	1,280	600	1,000	480	800
		v_c (SFM)	196	327	188	314	201	335	196	327	188	314
		v_f (IPM)	5	8	6	9	6	10	6	10	6	9
		f_z (IPT)	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002
		a_p (inch)	.020	.012	.020	.012	.020	.012	.020	.012	.020	.012
		a_e (inch)	.512	.512	.630	.630	.787	.787	.984	.984	1.260	1.260
		Q (in^3/min)	.05	.05	.07	.07	.09	.09	.11	.11	.14	.14
Maximum f_z (IPT)			< .071 (General use f_z:< .039)				< .071 (General use f_z:< .039)					
Maximum a_p (inch)			< .049 (General use a_p:< .039)				< .059 (General use a_p:< .039)					

Radius Mill ASR Multi-flutes type

Inch ② For Modular Carbide Shank Type

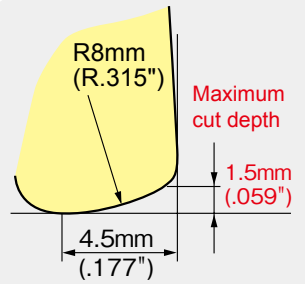
※Red indicates primary recommended grade.



Work material	Recommended grade	Tool dia. DCX	φ16mm or 5/8" 2 flutes			φ20mm or 3/4" 3 flutes			φ25mm or 1" 4 flutes			φ32mm or 1.25" 5 flutes			φ40mm or 1.5" 6 flutes		
		Overhang	Modular carbide shank			Modular carbide shank			Modular carbide shank			Modular carbide shank			Modular carbide shank		
			3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX
Carbon steel Alloy steel <30HRC	※ GX2140 JS4060 JS4045	n (min^{-1})	2,590	2,590	1,800	2,080	2,080	1,440	1,660	1,660	1,150	1,300	1,300	900	1,040	1,040	720
		v_c (SFM)	424	424	294	408	408	283	434	434	301	425	425	294	408	408	283
		v_f (IPM)	163	163	113	197	197	136	261	261	181	256	256	177	246	246	170
		f_z (IPT)	.031	.031	.031	.031	.031	.031	.039	.039	.039	.039	.039	.039	.039	.039	.039
		a_p (inch)	.024	.020	.016	.031	.020	.016	.031	.020	.016	.031	.020	.016	.031	.020	.016
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	2.0	1.6	.9	3.9	2.4	1.3	6.5	4.1	2.2	7.9	5.0	2.7	9.7	6.1	3.4
Pre-hardened steel Alloy steel 30~40HRC	JP4120 JS4045 JS4060	n (min^{-1})	2,590	2,590	1,800	2,080	2,080	1,440	1,660	1,660	1,150	1,300	1,300	900	1,040	1,040	720
		v_c (SFM)	424	424	294	408	408	283	434	434	301	425	425	294	408	408	283
		v_f (IPM)	163	163	113	197	197	136	261	261	181	256	256	177	246	246	170
		f_z (IPT)	.031	.031	.031	.031	.031	.031	.039	.039	.039	.039	.039	.039	.039	.039	.039
		a_p (inch)	.024	.020	.016	.031	.020	.016	.031	.020	.016	.031	.020	.016	.031	.020	.016
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	2.0	1.6	.9	3.9	2.4	1.3	6.5	4.1	2.2	7.9	5.0	2.7	9.7	6.1	3.4
Pre-hardened steel Alloy steel 40~50HRC	JP4120 JS4045	n (min^{-1})	1,800	1,800	1,800	1,440	1,440	1,440	1,150	1,150	1,150	900	900	900	720	720	720
		v_c (SFM)	294	294	294	283	283	283	301	301	301	294	294	294	283	283	283
		v_f (IPM)	85	85	85	102	102	102	109	109	109	106	106	106	102	102	102
		f_z (IPT)	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024
		a_p (inch)	.020	.016	.012	.020	.016	.012	.020	.016	.012	.020	.016	.012	.020	.016	.012
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	.9	.7	.5	1.3	1.0	.8	1.7	1.3	1.0	2.1	1.6	1.2	2.5	2.0	1.5
Stainless steel	JM4160	n (min^{-1})	2,990	1,800	1,800	2,390	1,440	1,440	1,920	1,150	1,150	1,500	900	900	1,200	720	720
		v_c (SFM)	489	294	294	469	283	283	502	301	301	491	294	294	471	283	283
		v_f (IPM)	118	71	71	141	85	85	151	91	91	148	89	89	142	85	85
		f_z (IPT)	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		a_p (inch)	.024	.020	.016	.031	.020	.016	.031	.020	.016	.031	.020	.016	.031	.020	.016
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	1.4	.7	.6	2.8	1.1	.8	3.7	1.4	1.1	4.6	1.7	1.4	5.6	2.1	1.7
Cast iron	JS4045 GX2140 JP4120	n (min^{-1})	2,590	2,590	1,800	2,080	2,080	1,440	1,660	1,660	1,150	1,300	1,300	900	1,040	1,040	720
		v_c (SFM)	424	424	294	408	408	283	434	434	301	425	425	294	408	408	283
		v_f (IPM)	245	245	170	344	344	238	366	366	254	358	358	248	344	344	238
		f_z (IPT)	.047	.047	.047	.055	.055	.055	.055	.055	.055	.055	.055	.055	.055	.055	.055
		a_p (inch)	.031	.024	.020	.031	.024	.016	.031	.024	.016	.031	.024	.016	.031	.024	.016
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	3.9	3.0	1.7	6.8	5.1	2.4	9.1	6.8	3.1	11.1	8.3	3.8	13.6	10.2	4.7
Hardened steel Pre-hardened steel 50-55HRC	JP4120 JP4105	n (min^{-1})	1,600	1,600	1,600	1,280	1,280	1,280	1,020	1,020	1,020	800	800	800	640	640	640
		v_c (SFM)	262	262	262	251	251	251	267	267	267	262	262	262	251	251	251
		v_f (IPM)	25	25	25	30	30	30	32	32	32	31	31	31	30	30	30
		f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		a_p (inch)	.014	.010	.006	.014	.010	.006	.014	.010	.006	.014	.010	.006	.014	.010	.006
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	.18	.13	.08	.26	.19	.11	.35	.25	.15	.43	.31	.18	.52	.37	.22
Hardened steel 55-62HRC	JP4105	n (min^{-1})	1,200	1,200	1,200	960	960	960	770	770	770	600	600	600	480	480	480
		v_c (SFM)	196	196	196	188	188	188	201	201	201	196	196	196	188	188	188
		v_f (IPM)	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6
		f_z (IPT)	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002
		a_p (inch)	.020	.012	.008	.020	.012	.008	.020	.012	.008	.020	.012	.008	.020	.012	.008
		a_e (inch)	.512	.512	.512	.630	.630	.630	.787	.787	.787	.984	.984	.984	1.260	1.260	1.260
		Q (in^3/min)	.05	.03	.02	.07	.04	.03	.09	.06	.04	.11	.07	.05	.14	.08	.06
Maximum f_z (IPT)			< .071 (General use f_z:< .039)						< .071 (General use f_z:< .039)								
Maximum a_p (inch)			< .049 (General use a_p:< .039)						< .059 (General use a_p:< .039)								

【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③This table shows the general conditions for shoulder milling. The conditions should be adjusted according to the machine rigidity, tooling, condition of object to be milled, etc. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions:
·When performing shoulder milling in combination with slotting,please refer to the cutting region on pp. C75 - C76.
·Use inserts equipped with breakers.
·Reduce rotation speed and table feed rate by 50 to 70%.
·Reduce cutting depth a_p by 50 to 70%.
④Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
⑤JP4105 and JP4005 are a hardened steel, and is not suitable for Non-heat-treated steel material.
⑥For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 and JM4060 are recommended.
⑦As a measure to prevent tool damage due to chip jamming, always use an air blower, etc. to remove chips.
⑧Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑨Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑩The following equation expresses the metal removal rate per unit time:
Q(in^3/min)=a_p(inch)×a_e(inch)×v_f(IPM)
⑪The maximum value of cut depth is shown in the table below. Be sure to use settings that do not exceed the maximum value.

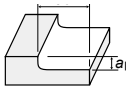


EPNW(MT)0603TN-8
(Programming R:R2.0)
EPMT0603EN-8LF

Applicable cutter
ASR S/L/M20◯◯(S◯◯)R-◯

Inch ③ For Bore Type

※Red indicates primary recommended grade.



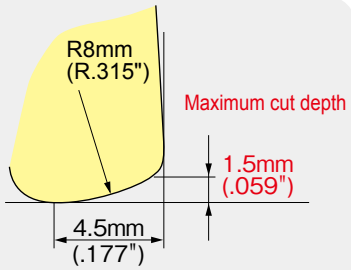
Note Previous Page

Work material	Recommended grade	Tool dia. DCX / Overhang	φ50mm or 2" 6 flutes <3DCX General purpose	φ50mm <3DCX High-speed processing	φ50mm 3DCX-5DCX	φ50mm 5DCX-7DCX	φ50mm >7DCX	φ52mm 7 flutes <3DCX General purpose	φ52mm <3DCX High-speed processing	φ52mm 3DCX-5DCX	φ52mm 5DCX-7DCX	φ52mm >7DCX	φ63mm or 2.5" 6 flutes <3DCX General purpose	φ63mm <3DCX High-speed processing	φ63mm 3DCX-5DCX	φ63mm 5DCX-7DCX	φ63mm >7DCX	φ66mm 8 flutes <3DCX General purpose	φ66mm <3DCX High-speed processing	φ66mm 3DCX-5DCX	φ66mm 5DCX-7DCX	φ66mm >7DCX
Carbon steels Alloy steels <30HRC	※ GX2140 JS4060 JS4045	n (min^{-1})	580	1,150	830	830	580	560	1,110	800	800	560	460	910	660	660	460	440	870	630	630	440
		v_c (SFM)	304	602	434	434	304	300	595	429	429	300	301	595	432	432	301	299	591	428	428	299
		v_f (IPM)	178	435	196	196	137	154	489	220	220	154	141	344	156	156	109	139	438	198	198	139
		f_z (IPT)	.051	.063	.039	.039	.039	.039	.063	.039	.039	.039	.051	.063	.039	.039	.039	.039	.063	.039	.039	.039
		a_p (inch)	.039	.031	.039	.028	.020	.039	.020	.031	.020	.016	.039	.031	.039	.028	.020	.039	.020	.031	.020	.016
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	11.0	21.6	12.2	8.5	4.2	9.6	15.2	10.9	6.8	3.8	10.9	21.3	12.1	8.5	4.2	10.7	17.0	12.3	7.7	4.3
Pre-hardened steels Alloy steels 30~40HRC	JP4120 JS4045 JS4060	n (min^{-1})	580	1,150	830	830	580	560	1,110	800	800	560	460	910	660	660	460	440	870	630	630	440
		v_c (SFM)	304	602	434	434	304	300	595	429	429	300	301	595	432	432	301	299	591	428	428	299
		v_f (IPM)	178	435	196	196	137	154	489	220	220	154	141	344	156	156	109	139	438	198	198	139
		f_z (IPT)	.051	.063	.039	.039	.039	.039	.063	.039	.039	.039	.051	.063	.039	.039	.039	.039	.063	.039	.039	.039
		a_p (inch)	.039	.031	.039	.028	.020	.039	.020	.031	.020	.016	.039	.031	.039	.028	.020	.039	.020	.031	.020	.016
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	11.0	21.6	12.2	8.5	4.2	9.6	15.2	10.9	6.8	3.8	10.9	21.3	12.1	8.5	4.2	10.7	17.0	12.3	7.7	4.3
Pre-hardened steels Alloy steels 40~50HRC	JP4120 JS4045	n (min^{-1})	580	830	580	580	580	560	800	560	560	560	460	660	460	460	460	440	630	440	440	440
		v_c (SFM)	304	434	304	304	304	300	429	300	300	300	301	432	301	301	301	299	428	299	299	299
		v_f (IPM)	110	157	110	110	110	93	265	93	93	93	87	125	87	87	87	83	238	83	83	83
		f_z (IPT)	.031	.031	.031	.031	.031	.024	.047	.024	.024	.024	.031	.031	.031	.031	.031	.024	.047	.024	.024	.024
		a_p (inch)	.039	.039	.039	.028	.020	.024	.014	.020	.016	.012	.039	.039	.039	.028	.020	.024	.014	.020	.016	.012
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	6.8	9.7	6.8	4.8	3.4	3.4	5.7	2.9	2.3	1.7	6.7	9.7	6.7	4.7	3.4	3.9	6.5	3.2	2.6	1.9
Stainless steels	JM4160	n (min^{-1})	580	1,150	960	580	580	560	1,110	920	560	560	460	910	760	460	460	440	870	730	440	440
		v_c (SFM)	304	602	502	304	304	300	595	493	300	300	301	595	497	301	301	299	591	496	299	299
		v_f (IPM)	69	272	113	69	69	77	306	127	77	77	54	215	90	54	54	69	274	115	69	69
		f_z (IPT)	.020	.039	.020	.020	.020	.020	.039	.020	.020	.020	.020	.039	.020	.020	.020	.020	.039	.020	.020	.020
		a_p (inch)	.039	.031	.039	.028	.020	.039	.020	.031	.020	.016	.039	.031	.039	.028	.020	.039	.020	.031	.020	.016
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	4.2	13.5	7.0	3.0	2.1	4.8	9.5	6.3	2.4	1.9	4.2	13.3	7.0	2.9	2.1	5.4	10.6	7.1	2.7	2.1
Cast iron	JS4045 GX2140 JP4120	n (min^{-1})	580	1,150	830	830	580	580	1,150	830	830	580	460	910	660	660	460	440	870	630	630	440
		v_c (SFM)	304	602	434	434	304	311	616	445	445	311	301	595	432	432	301	299	591	428	428	299
		v_f (IPM)	206	489	294	294	206	240	570	343	343	240	163	387	234	234	163	194	493	278	278	194
		f_z (IPT)	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059	.059	.071	.059	.059	.059	.055	.071	.055	.055	.055
		a_p (inch)	.059	.059	.059	.039	.028	.059	.059	.059	.039	.028	.059	.059	.059	.039	.028	.049	.039	.031	.024	.016
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	19.1	45.5	27.4	18.2	8.9	22.3	53.1	31.9	21.3	10.4	18.9	45.0	27.2	18.1	8.8	18.8	38.2	17.2	12.9	6.0
Hardened steels Pre-hardened steels 50-55HRC	JP4120 JP4105	n (min^{-1})	510	770	510	510	510	810	770	510	510	510	410	610	410	410	410	390	580	390	390	390
		v_c (SFM)	267	403	267	267	267	434	412	273	273	273	268	399	268	268	268	265	394	265	265	265
		v_f (IPM)	24	36	24	24	24	45	42	28	28	28	19	29	19	19	19	25	37	25	25	25
		f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		a_p (inch)	.039	.039	.039	.028	.020	.039	.039	.039	.028	.020	.039	.039	.039	.028	.020	.016	.010	.014	.010	.006
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	1.5	2.3	1.5	1.0	.75	2.8	2.6	1.7	1.2	.87	1.5	2.2	1.5	1.1	.75	.76	.71	.69	.48	.29
Hardened steels 55-62HRC	JP4105	n (min^{-1})	390	640	390	390	390	370	620	370	370	370	310	510	310	310	310	290	490	290	290	290
		v_c (SFM)	204	335	204	204	204	198	332	198	198	198	203	334	203	203	203	197	333	197	197	197
		v_f (IPM)	5	8	5	5	5	5	9	5	5	5	4	6	4	4	4	5	8	5	5	5
		f_z (IPT)	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002	.002
		a_p (inch)	.020	.020	.020	.020	.020	.020	.012	.020	.012	.008	.020	.020	.020	.020	.020	.020	.012	.020	.012	.008
		a_e (inch)	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.575	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969	1.969
		Q (in^3/min)	.14	.23	.14	.14	.14	.16	.16	.16	.09	.06	.14	.23	.14	.14	.14	.18	.18	.18	.11	.07
Maximum f_z (IPT)			< .071 (General use f_z< .039)										< .071 (General use f_z< .039)									
Maximum a_p (inch)			< .049 (General use a_p:< .039)										< .059 (General use a_p:< .039)									

Radius Mill ASR Multi-flutes type

Inch For LF type inserts（BT30 modular type）

Work material	Recommended grade	Coolant	Tool dia. DCX	φ16mm or 8/5" 2 flutes			φ20mm or 3/4" 3 flutes			φ25mm or 1" 4 flutes		
			Overhang (inch)	2	3	4	2	3	4	2	3	4
Carbon steel Alloy steel <30HRC Cast iron	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655
			v_c (SFM)	585	423	293	562	562	406	599	599	433
			v_f (IPM)	226	163	113	271	271	196	289	289	209
			f_z (IPT)	.031	.031	.031	.031	.031	.031	.031	.031	.031
			a_p (inch)	.020	.020	.016	.024	.020	.016	.024	.020	.020
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709
			Q (in^3/min)	1.9	1.4	.8	3.5	2.9	1.7	4.8	4.0	2.9
Stainless steel	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655
			v_c (SFM)	585	423	293	562	562	406	599	599	433
			v_f (IPM)	226	163	113	271	271	196	289	289	209
			f_z (IPT)	.031	.031	.031	.031	.031	.031	.031	.031	.031
			a_p (inch)	.020	.020	.016	.024	.020	.016	.024	.020	.020
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709
			Q (in^3/min)	1.9	1.4	.8	3.5	2.9	1.7	4.8	4.0	2.9
		Wet	n (min^{-1})	2,586	2,586	1,790	2,070	2,070	1,432	1,655	1,655	1,273
			v_c (SFM)	423	423	293	406	406	281	433	433	333
			v_f (IPM)	163	163	113	196	196	135	209	209	160
			f_z (IPT)	.031	.031	.031	.031	.031	.031	.031	.031	.031
			a_p (inch)	.024	.020	.016	.024	.020	.016	.024	.020	.020
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709
			Q (in^3/min)	1.7	1.4	.8	2.5	2.1	1.2	3.5	2.9	2.2
Titanium alloys	JM4160	Wet	n (min^{-1})	1,193	1,193	1,193	955	955	955	764	764	764
			v_c (SFM)	195	195	195	187	187	187	200	200	200
			v_f (IPM)	38	38	38	45	45	45	48	48	48
			f_z (IPT)	.016	.016	.016	.016	.016	.016	.016	.016	.016
			a_p (inch)	.024	.020	.016	.031	.024	.020	.039	.031	.024
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709
			Q (in^3/min)	.38	.32	.26	.78	.59	.49	1.3	1.1	.81



EPMT0603EN-8LF
(Programming R:R2.0)

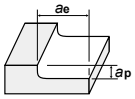
Applicable cutter
ASR S/L/M20◌◌ ~
ASR 20◌◌R(M)-◌

Inch For LF type inserts（BT40 modular type）

Work material	Recommended grade	Coolant	Tool dia. DCX	φ16mm or 8/5" 2 flutes			φ20mm or 3/4" 3 flutes			φ25mm or 1" 4 flutes			φ32mm or 1.25" 5 flutes			φ40mm or 1.5" 6 flutes		
			Overhang (mm)	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
Carbon steel Alloy steel <30HRC Cast iron	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655	1,790	1,790	1,790	1,432	1,432	1,432
			v_c (SFM)	585	423	293	562	562	406	599	599	433	585	585	585	562	562	562
			v_f (IPM)	282	204	141	338	338	244	361	361	261	352	352	352	338	338	338
			f_z (IPT)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
			a_p (inch)	.020	.020	.016	.024	.020	.020	.031	.024	.020	.039	.039	.031	.039	.039	.031
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709	.866	.866	.866	1.102	1.102	1.102
			Q (in^3/min)	2.4	1.7	1.0	4.4	3.7	2.7	8.1	6.0	3.6	12.0	12.0	9.6	14.7	14.7	11.7
Stainless steel	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655	1,790	1,790	1,790	1,432	1,432	1,432
			v_c (SFM)	585	423	293	562	562	406	599	599	433	585	585	585	562	562	562
			v_f (IPM)	282	204	141	338	338	244	361	361	261	352	352	352	338	338	338
			f_z (IPT)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
			a_p (inch)	.020	.020	.016	.024	.020	.020	.031	.024	.020	.039	.039	.031	.039	.039	.031
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709	.866	.866	.866	1.102	1.102	1.102
			Q (in^3/min)	2.4	1.7	1.0	4.4	3.7	2.7	8.1	6.0	3.6	12.0	12.0	9.6	14.7	14.7	11.7
		Wet	n (min^{-1})	2,586	2,586	1,790	2,070	2,070	1,432	1,655	1,655	1,273	1,193	1,193	1,193	955	955	955
			v_c (SFM)	423	423	293	406	406	281	433	433	333	390	390	390	375	375	375
			v_f (IPM)	204	204	141	244	244	169	261	261	200	235	235	235	226	226	226
			f_z (IPT)	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039	.039
			a_p (inch)	.024	.020	.016	.024	.020	.016	.031	.024	.020	.039	.039	.031	.039	.039	.031
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709	.866	.866	.866	1.102	1.102	1.102
			Q (in^3/min)	2.1	1.7	1.0	3.2	2.7	1.5	5.8	4.4	2.8	8.0	8.0	6.4	9.8	9.8	7.8
Titanium alloy	JM4160	Wet	n (min^{-1})	1,193	1,193	1,193	955	955	955	764	764	764	597	597	597	477	477	477
			v_c (SFM)	195	195	195	187	187	187	200	200	200	195	195	195	187	187	187
			v_f (IPM)	47	47	47	56	56	56	60	60	60	59	59	59	56	56	56
			f_z (IPT)	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
			a_p (inch)	.024	.020	.016	.031	.024	.020	.039	.031	.024	.039	.039	.031	.039	.039	.031
			a_e (inch)	.433	.433	.433	.551	.551	.551	.709	.709	.709	.866	.866	.866	1.102	1.102	1.102
			Q (in^3/min)	.48	.40	.32	1.0	.73	.61	1.7	1.3	1.0	2.0	2.0	1.6	2.4	2.4	2.0

Metric ① For Straight Shank Type

※Red indicates primary recommended grade.



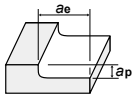
Note Next Page

Work material	Recommended grade	Tool dia. DCX	φ16mm or 5/8" 2 flutes		φ20mm or 3/4" 3 flutes		φ25mm or 1" 4 flutes		φ32mm or 1.25" 5 flutes		φ40mm or 1.5" 6 flutes	
		Overhang	<3DCX		<3DCX		<3DCX		<3DCX		<3DCX	
			General purpose	High-speed processing	General purpose	High-speed processing	General purpose	High-speed processing	General purpose	High-speed processing	General purpose	High-speed processing
Carbon steel Alloy steel <30HRC	※ GX2140 JS4060 JS4045	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (m/min)	90	180	90	180	90	180	90	180	90	180
		v_f (mm/min)	2,880	10,060	3,460	12,060	4,600	14,720	4,500	14,400	4,320	13,830
		f_z (mm/t)	0.8	1.4	0.8	1.4	1.0	1.6	1.0	1.6	1.0	1.6
		a_p (mm)	0.8	0.6	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	30	78	55	96	92	147	113	180	138	221
Pre-Hardened steel Alloy steel 30~40HRC	JP4120 JS4045 JS4060	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (m/min)	90	180	90	180	90	180	90	180	90	180
		v_f (mm/min)	2,880	10,060	3,460	12,060	4,600	14,720	4,500	14,400	4,320	13,830
		f_z (mm/t)	0.8	1.4	0.8	1.4	1.0	1.6	1.0	1.6	1.0	1.6
		a_p (mm)	0.8	0.6	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	30	78	55	96	92	147	113	180	138	221
Pre-hardened steel Alloy steel 40~50HRC	JP4120 JS4045	n (min^{-1})	1,800	2,590	1,440	2,080	1,150	1,660	900	1,300	720	1,040
		v_c (m/min)	90	130	90	130	90	130	90	130	90	130
		v_f (mm/min)	2,160	6,220	2,600	7,490	2,760	7,970	2,700	7,800	2,600	7,490
		f_z (mm/t)	0.6	1.2	0.6	1.2	0.6	1.2	0.6	1.2	0.6	1.2
		a_p (mm)	0.5	0.35	0.6	0.35	0.6	0.35	0.6	0.35	0.6	0.35
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	14	28	25	42	33	56	41	68	50	84
Stainless steel	JM4160	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (m/min)	90	180	90	180	90	180	90	180	90	180
		v_f (mm/min)	1,800	7,180	2,160	8,610	2,300	9,200	2,250	9,000	2,160	8,640
		f_z (mm/t)	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
		a_p (mm)	0.8	0.6	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	19	56	35	69	46	92	56	113	69	138
Cast iron	JS4045 GX2140 JP4120	n (min^{-1})	1,800	3,590	1,440	2,870	1,150	2,300	900	1,800	720	1,440
		v_c (m/min)	90	180	90	180	90	180	90	180	90	180
		v_f (mm/min)	4,320	11,490	6,050	15,500	6,440	16,560	6,300	16,200	6,050	15,560
		f_z (mm/t)	1.2	1.6	1.4	1.8	1.4	1.8	1.4	1.8	1.4	1.8
		a_p (mm)	1.0	0.8	1.25	1.0	1.25	1.0	1.25	1.0	1.25	1.0
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	56	119	121	248	161	331	197	405	242	498
Hardened steel Pre-hardened steel 50-55HRC	JP4120 JP4105	n (min^{-1})	1,600	2,390	1,280	1,920	1,020	1,530	800	1,200	640	960
		v_c (m/min)	80	120	80	120	80	120	80	120	80	120
		v_f (mm/min)	640	960	770	1,160	820	1,230	800	1,200	770	1,160
		f_z (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		a_p (mm)	0.4	0.25	0.4	0.25	0.4	0.25	0.4	0.25	0.4	0.25
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	3	3	5	5	7	6	8	8	10	9
Hardened steel 55-62HRC	JP4105	n (min^{-1})	1,200	2,000	960	1,600	770	1,280	600	1,000	480	800
		v_c (m/min)	60	100	60	100	60	100	60	100	60	100
		v_f (mm/min)	120	200	150	240	160	260	150	250	150	240
		f_z (mm/t)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		a_p (mm)	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3
		a_e (mm)	13	13	16	16	20	20	25	25	32	32
		Q (cm^3/min)	0.8	0.8	1.2	1.2	1.6	1.6	1.9	1.9	2.4	2.3
Maximum f_z (mm/t)			<1.8 (General purpose f_z:<1.0)				<1.8 (General purpose f_z:<1.0)					
Maximum a_p (mm)			<1.25 (General purpose a_p:<1.0)				<1.5 (General purpose a_p:<1.0)					

Radius Mill ASR Multi-flutes type

Metric ② For Modular Carbide Shank Type

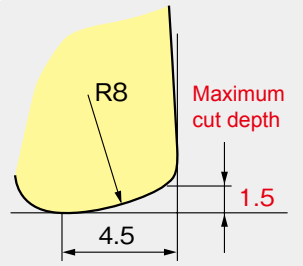
※Red indicates primary recommended grade.



Work material	Recommended grade	Tool dia. DCX	φ16mm or 5/8" 2 flutes			φ20mm or 3/4" 3 flutes			φ25mm or 1" 4 flutes			φ32mm or 1.25" 5 flutes			φ40mm or 1.5" 6 flutes		
		Overhang	Modular carbide shank			Modular carbide shank			Modular carbide shank			Modular carbide shank			Modular carbide shank		
			3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX	3DCX-5DCX	5DCX-7DCX	>7DCX
Carbon steel / Alloy steel <30HRC	※ GX2140 JS4060 JS4045	n (min^{-1})	2,590	2,590	1,800	2,080	2,080	1,440	1,660	1,660	1,150	1,300	1,300	900	1,040	1,040	720
		v_c (m/min)	130	130	90	130	130	90	130	130	90	130	130	90	130	130	90
		v_f (mm/min)	4,150	4,150	2,880	5,000	5,000	3,460	6,640	6,640	4,600	6,500	6,500	4,500	6,240	6,240	4,320
		f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		a_p (mm)	0.6	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	32	27	15	64	40	22	106	66	37	130	81	45	160	100	55
Pre-hardened steel / Alloy steel 30~40HRC	JP4120 JS4045 JS4060	n (min^{-1})	2,590	2,590	1,800	2,080	2,080	1,440	1,660	1,660	1,150	1,300	1,300	900	1,040	1,040	720
		v_c (m/min)	130	130	90	130	130	90	130	130	90	130	130	90	130	130	90
		v_f (mm/min)	4,150	4,150	2,880	5,000	5,000	3,460	6,640	6,640	4,600	6,500	6,500	4,500	6,240	6,240	4,320
		f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		a_p (mm)	0.6	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	32	27	15	64	40	22	106	66	37	130	81	45	160	100	55
Pre-hardened steel / Alloy steel 40~50HRC	JP4120 JS4045	n (min^{-1})	1,800	1,800	1,800	1,440	1,440	1,440	1,150	1,150	1,150	900	900	900	720	720	720
		v_c (m/min)	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
		v_f (mm/min)	2,160	2,160	2,160	2,600	2,600	2,600	2,760	2,760	2,760	2,700	2,700	2,700	2,600	2,600	2,600
		f_z (mm/t)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		a_p (mm)	0.5	0.4	0.3	0.5	0.4	0.3	0.5	0.4	0.3	0.5	0.4	0.3	0.5	0.4	0.3
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	14	11	8	21	17	12	28	22	17	34	27	20	42	33	25
Stainless steel	JM4160	n (min^{-1})	2,990	1,800	1,800	2,390	1,440	1,440	1,920	1,150	1,150	1,500	900	900	1,200	720	720
		v_c (m/min)	150	90	90	150	90	90	150	90	90	150	90	90	150	90	90
		v_f (mm/min)	2,990	1,800	1,800	3,590	2,160	2,160	3,840	2,300	2,300	3,750	2,250	2,250	3,600	2,160	2,160
		f_z (mm/t)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		a_p (mm)	0.6	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4	0.8	0.5	0.4
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	23	12	9	46	17	14	61	23	18	75	28	23	92	35	28
Cast iron	JS4045 GX2140 JP4120	n (min^{-1})	2,590	2,590	1,800	2,080	2,080	1,440	1,660	1,660	1,150	1,300	1,300	900	1,040	1,040	720
		v_c (m/min)	130	130	90	130	130	90	130	130	90	130	130	90	130	130	90
		v_f (mm/min)	6,220	6,220	4,320	8,740	8,740	6,050	9,300	9,300	6,440	9,100	9,100	6,300	8,740	8,740	6,050
		f_z (mm/t)	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
		a_p (mm)	0.8	0.6	0.5	0.8	0.6	0.4	0.8	0.6	0.4	0.8	0.6	0.4	0.8	0.6	0.4
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	65	49	28	112	84	39	149	112	52	182	137	63	224	168	77
Hardened steel / Pre-hardened steel 50-55HRC	JP4120 JP4105	n (min^{-1})	1,600	1,600	1,600	1,280	1,280	1,280	1,020	1,020	1,020	800	800	800	640	640	640
		v_c (m/min)	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		v_f (mm/min)	640	640	640	770	770	770	820	820	820	800	800	800	770	770	770
		f_z (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		a_p (mm)	0.35	0.25	0.15	0.35	0.25	0.15	0.35	0.25	0.15	0.35	0.25	0.15	0.35	0.25	0.15
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	3	2	1	4	3	2	6	4	2	7	5	3	9	6	4
Hardened steel 55-62HRC	JP4105	n (min^{-1})	1,200	1,200	1,200	960	960	960	770	770	770	600	600	600	480	480	480
		v_c (m/min)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
		v_f (mm/min)	120	120	120	150	150	150	160	160	160	150	150	150	150	150	150
		f_z (mm/t)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		a_p (mm)	0.5	0.3	0.2	0.5	0.3	0.2	0.5	0.3	0.2	0.5	0.3	0.2	0.5	0.3	0.2
		a_e (mm)	13	13	13	16	16	16	20	20	20	25	25	25	32	32	32
		Q (cm^3/min)	0.8	0.5	0.3	1.2	0.7	0.5	1.6	1.0	0.6	1.9	1.1	0.8	2.4	1.4	1.0
Maximum f_z (mm/t)			<1.8 (General purpose f_z:<1.0)						<1.8 (General purpose f_z:<1.0)								
Maximum a_p (mm)			<1.25 (General purpose a_p:<1.0)						<1.5 (General purpose a_p:<1.0)								

【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③This table shows the general conditions for shoulder milling. The conditions should be adjusted according to the machine rigidity, tooling, condition of object to be milled, etc. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions:
·When performing shoulder milling in combination with slotting,please refer to the cutting region on pp. C75 - C76.
·Use inserts equipped with breakers.
·Reduce rotation speed and table feed rate by 50 to 70%.
·Reduce cutting depth ap by 50 to 70%.
④Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
⑤JP4105 and JP4005 are a hardened steel, and is not suitable for Non-heat-treated steel material.
⑥For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 and JM4060 are recommended.
⑦As a measure to prevent tool damage due to chip jamming, always use an air blower, etc. to remove chips.
⑧Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑨Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑩The following equation expresses the metal removal rate per unit time:
$Q(cm^3/min)=a_p(mm)\times a_e(mm)\times v_f(mm/min)/1000$
⑪The maximum value of cut depth is shown in the table below. Be sure to use settings that do not exceed the maximum value.

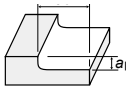


EPNW(MT)0603TN-8
(**Programming R:** R2.0)
EPMT0603EN-8LF

Applicable cutter
ASR S/L/M20◇◇(S◇◇)R-◇

Metric ③ For Bore Type

※Red indicates primary recommended grade.



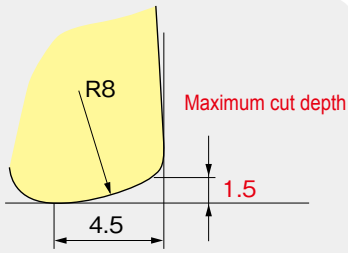
Note Previous Page

Work material	Recommended grade	Tool dia. DCX / Overhang	ϕ50mm or 2" 6 flutes <3DCX General purpose	ϕ50mm <3DCX High-speed processing	ϕ50mm 3DCX-5DCX	ϕ50mm 5DCX-7DCX	ϕ50mm >7DCX	ϕ52mm 7 flutes <3DCX General purpose	ϕ52mm <3DCX High-speed processing	ϕ52mm 3DCX-5DCX	ϕ52mm 5DCX-7DCX	ϕ52mm >7DCX	ϕ63mm or 2.5" 6 flutes <3DCX General purpose	ϕ63mm <3DCX High-speed processing	ϕ63mm 3DCX-5DCX	ϕ63mm 5DCX-7DCX	ϕ63mm >7DCX	ϕ66mm 8 flutes <3DCX General purpose	ϕ66mm <3DCX High-speed processing	ϕ66mm 3DCX-5DCX	ϕ66mm 5DCX-7DCX	ϕ66mm >7DCX
Carbon steel Alloy steel <30HRC	※ GX2140 JS4060 JS4045	n (min^{-1})	580	1,150	830	830	580	560	1,110	800	800	560	460	910	660	660	460	440	870	630	630	440
		v_c (m/min)	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90
		v_f (mm/min)	3,770	9,200	4,150	4,150	2,900	3,920	12,440	5,600	5,600	3,920	3,590	8,740	3,960	3,960	2,760	3,520	11,140	5,040	5,040	3,520
		f_z (mm/t)	1.3	1.6	1.0	1.0	1.0	1.0	1.6	1.0	1.0	1.0	1.3	1.6	1.0	1.0	1.0	1.0	1.6	1.0	1.0	1.0
		a_p (mm)	1.0	0.8	1.0	0.7	0.5	1.0	0.5	0.8	0.5	0.4	1.0	0.8	1.0	0.7	0.5	1.0	0.5	0.8	0.5	0.4
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	151	294	166	116	58	157	249	179	112	63	180	350	198	139	69	176	279	202	126	70
Pre-hardened steel Alloy steel 30~40HRC	JP4120 JS4045 JS4060	n (min^{-1})	580	1,150	830	830	580	560	1,110	800	800	560	460	910	660	660	460	440	870	630	630	440
		v_c (m/min)	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90
		v_f (mm/min)	3,770	9,200	4,150	4,150	2,900	3,920	12,440	5,600	5,600	3,920	3,590	8,740	3,960	3,960	2,760	3,520	11,140	5,040	5,040	3,520
		f_z (mm/t)	1.3	1.6	1.0	1.0	1.0	1.0	1.6	1.0	1.0	1.0	1.3	1.6	1.0	1.0	1.0	1.0	1.6	1.0	1.0	1.0
		a_p (mm)	1.0	0.8	1.0	0.7	0.5	1.0	0.5	0.8	0.5	0.4	1.0	0.8	1.0	0.7	0.5	1.0	0.5	0.8	0.5	0.4
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	151	294	166	116	58	157	249	179	112	63	180	350	198	139	69	176	279	202	126	70
Pre-hardened steel Alloy steel 40~50HRC	JP4120 JS4045	n (min^{-1})	580	830	580	580	580	560	800	560	560	560	460	660	460	460	460	440	630	440	440	440
		v_c (m/min)	90	130	90	90	90	90	130	90	90	90	90	130	90	90	90	90	130	90	90	90
		v_f (mm/min)	2,320	3,320	2,320	2,320	2,320	2,360	6,720	2,360	2,360	2,360	2,210	3,170	2,210	2,210	2,210	2,120	6,050	2,120	2,120	2,120
		f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.6	1.2	0.6	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.6	1.2	0.6	0.6	0.6
		a_p (mm)	1.0	1.0	1.0	0.7	0.5	0.6	0.35	0.5	0.4	0.3	1.0	1.0	1.0	0.7	0.5	0.6	0.35	0.5	0.4	0.3
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	93	133	93	65	46	57	94	47	38	28	111	159	111	77	55	64	106	53	42	32
Stainless steel	JM4160	n (min^{-1})	580	1,150	960	580	580	560	1,110	920	560	560	460	910	760	460	460	440	870	730	440	440
		v_c (m/min)	90	180	150	90	90	90	180	150	90	90	90	180	150	90	90	90	180	150	90	90
		v_f (mm/min)	1,450	5,750	2,400	1,450	1,450	1,960	7,770	3,220	1,960	1,960	1,380	5,460	2,280	1,380	1,380	1,760	6,960	2,920	1,760	1,760
		f_z (mm/t)	0.5	1.0	0.5	0.5	0.5	0.5	1.0	0.5	0.5	0.5	0.5	1.0	0.5	0.5	0.5	0.5	1.0	0.5	0.5	0.5
		a_p (mm)	1.0	0.8	1.0	0.7	0.5	1.0	0.5	0.8	0.5	0.4	1.0	0.8	1.0	0.7	0.5	1.0	0.5	0.8	0.5	0.4
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	58.0	184.0	96.0	40.6	29.0	78.4	155.4	103.0	39.2	31.4	69.0	218.4	114.0	48.3	34.5	88.0	174.0	116.8	44.0	35.2
Cast iron	JS4045 GX2140 JP4120	n (min^{-1})	580	1,150	830	830	580	560	1,110	800	800	560	460	910	660	660	460	440	870	630	630	440
		v_c (m/min)	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90
		v_f (mm/min)	4,350	10,350	6,230	6,230	4,350	5,490	13,990	7,840	7,840	5,490	4,140	9,830	5,940	5,940	4,140	4,930	12,530	7,060	7,060	4,930
		f_z (mm/t)	1.5	1.8	1.5	1.5	1.5	1.4	1.8	1.4	1.4	1.4	1.5	1.8	1.5	1.5	1.5	1.4	1.8	1.4	1.4	1.4
		a_p (mm)	1.5	1.5	1.5	1.0	0.7	1.25	1.0	0.8	0.6	0.4	1.5	1.5	1.5	1.0	0.7	1.25	1.0	0.8	0.6	0.4
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	261	621	374	249	122	275	560	251	188	88	311	737	446	297	145	308	627	282	212	99
Hardened steel Pre-hardened steel 50-55HRC	JP4120 JP4105	n (min^{-1})	510	770	510	510	510	490	740	490	490	490	410	610	410	410	410	390	580	390	390	390
		v_c (m/min)	80	120	80	80	80	80	120	80	80	80	80	120	80	80	80	80	120	80	80	80
		v_f (mm/min)	510	770	510	510	510	690	1,040	690	690	690	500	740	500	500	500	630	930	630	630	630
		f_z (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		a_p (mm)	1.0	1.0	1.0	0.7	0.5	0.4	0.25	0.35	0.25	0.15	1.0	1.0	1.0	0.7	0.5	0.4	0.25	0.35	0.25	0.15
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	20	31	20	14	10	11	10	10	7	4	25	37	25	18	13	13	12	11	8	5
Hardened steel 55-62HRC	JP4105	n (min^{-1})	390	640	390	390	390	370	620	370	370	370	310	510	310	310	310	290	490	290	290	290
		v_c (m/min)	60	100	60	60	60	60	100	60	60	60	60	100	60	60	60	60	100	60	60	60
		v_f (mm/min)	100	160	100	100	100	130	220	130	130	130	100	160	100	100	100	120	200	120	120	120
		f_z (mm/t)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		a_p (mm)	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.3	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.3	0.2
		a_e (mm)	40	40	40	40	40	40	40	40	40	40	50	50	50	50	50	50	50	50	50	50
		Q (cm^3/min)	2.0	3.2	2.0	2.0	2.0	2.6	2.6	2.6	1.6	1.0	2.5	4.0	2.5	2.5	2.5	3.0	3.0	3.0	1.8	1.2
Maximum f_z (mm/t)			<2.0 (General purpose f_z:<1.0)					<1.8 (General purpose f_z:<1.0)					<2.0 (General purpose f_z:<1.0)					<1.8 (General purpose f_z:<1.0)				
Maximum a_p (mm)			<2.0 (General purpose a_p:<1.5)					<1.5 (General purpose a_p:<1.0)					<2.0 (General purpose a_p:<1.5)					<1.5 (General purpose a_p:<1.0)				

Radius Mill ASR Multi-flutes type

Metric For LF type inserts（BT30 modular type）

Work material	Recommended grade	Coolant	Tool dia. DCX	φ16mm or 8/5" 2 flutes			φ20mm or 3/4" 3 flutes			φ25mm or 1" 4 flutes		
			Overhang (mm)	50	75	100	50	75	100	50	75	100
Carbon steels Alloy steels <30HRC Cast iron	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655
			v_c (m/min)	180	130	90	180	180	130	180	180	130
			v_f (mm/min)	5,728	4,138	2,864	6,876	6,876	4,970	7,331	7,331	5,296
			f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
			a_p (mm)	0.5	0.5	0.4	0.6	0.5	0.4	0.6	0.5	0.5
			a_e (mm)	11	11	11	14	14	14	18	18	18
			Q (cm^3/min)	32	23	13	58	48	28	79	66	48
Stainless steels	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655
			v_c (m/min)	180	130	90	180	180	130	180	180	130
			v_f (mm/min)	5,728	4,138	2,864	6,876	6,876	4,970	7,331	7,331	5,296
			f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
			a_p (mm)	0.5	0.5	0.4	0.6	0.5	0.4	0.6	0.5	0.5
			a_e (mm)	11	11	11	14	14	14	18	18	18
			Q (cm^3/min)	32	23	13	58	48	28	79	66	48
		Wet	n (min^{-1})	2,586	2,586	1,790	2,070	2,070	1,432	1,655	1,655	1,273
			v_c (m/min)	130	130	90	130	130	90	130	130	100
			v_f (mm/min)	4,136	4,136	2,864	4,970	4,970	3,437	5,296	5,296	3,055
			f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
			a_p (mm)	0.6	0.5	0.4	0.6	0.5	0.4	0.6	0.5	0.5
			a_e (mm)	11	11	11	14	14	14	18	18	18
			Q (cm^3/min)	27	23	13	42	35	19	57	48	27
Titanium alloys	JM4160	Wet	n (min^{-1})	1,193	1,193	1,193	955	955	955	764	764	764
			v_c (m/min)	60	60	60	60	60	60	60	60	60
			v_f (mm/min)	954	954	954	1,146	1,146	1,146	1,222	1,222	1,222
			f_z (mm/t)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
			a_p (mm)	0.6	0.5	0.4	0.8	0.6	0.5	1.0	0.8	0.6
			a_e (mm)	11	11	11	14	14	14	18	18	18
			Q (cm^3/min)	6	5	4	13	10	8	22	18	13



EPMT0603EN-8LF
(**Programming R:**R2.0)

Applicable cutter
ASR S/L/M20○○ ～
ASR 20○○R(M)-○

Metric For LF type inserts（BT40 modular type）

Work material	Recommended grade	Coolant	Tool dia. DCX	φ16mm or 8/5" 2 flutes			φ20mm or 3/4" 3 flutes			φ25mm or 1" 4 flutes			φ32mm or 1.25" 5 flutes			φ40mm or 1.5" 6 flutes		
			Overhang (mm)	50	75	100	50	75	100	50	75	100	50	75	100	50	75	100
Carbon steels Alloy steels <30HRC Cast iron	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655	1,790	1,790	1,790	1,432	1,432	1,432
			v_c (m/min)	180	130	90	180	180	130	180	180	130	180	180	180	180	180	180
			v_f (mm/min)	7,160	5,170	3,580	8,595	8,595	6,210	9,164	9,164	6,620	8,950	8,950	8,950	8,592	8,592	8,592
			f_z (mm/t)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			a_p (mm)	0.5	0.5	0.4	0.6	0.5	0.5	0.8	0.6	0.5	1.0	1.0	0.8	1.0	1.0	0.8
			a_e (mm)	11	11	11	14	14	14	18	18	18	22	22	22	28	28	28
			Q (cm^3/min)	39	28	16	72	60	43	132	99	60	197	197	158	241	241	192
Stainless steels	JM4160	Air	n (min^{-1})	3,580	2,586	1,790	2,865	2,865	2,070	2,291	2,291	1,655	1,790	1,790	1,790	1,432	1,432	1,432
			v_c (m/min)	180	130	90	180	180	130	180	180	130	180	180	180	180	180	180
			v_f (mm/min)	7,160	5,170	3,580	8,595	8,595	6,210	9,164	9,164	6,620	8,950	8,950	8,950	8,592	8,592	8,592
			f_z (mm/t)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			a_p (mm)	0.5	0.5	0.4	0.6	0.5	0.5	0.8	0.6	0.5	1.0	1.0	0.8	1.0	1.0	0.8
			a_e (mm)	11	11	11	14	14	14	18	18	18	22	22	22	28	28	28
			Q (cm^3/min)	39	28	16	72	60	43	132	99	60	197	197	158	241	241	192
		Wet	n (min^{-1})	2,586	2,586	1,790	2,070	2,070	1,432	1,655	1655	1,273	1,193	1,193	1,193	955	955	955
			v_c (m/min)	130	130	90	130	130	90	130	130	100	120	120	120	120	120	120
			v_f (mm/min)	5,172	5,172	3,580	6,210	6,210	4,296	6,620	6,620	5,092	5,965	5,965	4,772	5,730	5,730	4,584
			f_z (mm/t)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			a_p (mm)	0.6	0.5	0.4	0.6	0.5	0.4	0.8	0.6	0.5	1.0	1.0	0.8	1.0	1.0	0.8
			a_e (mm)	11	11	11	14	14	14	18	18	18	22	22	22	28	28	28
			Q (cm^3/min)	34	28	16	52	43	24	95	74	46	131	131	84	160	160	103
Titanium alloys	JM4160	Wet	n (min^{-1})	1,193	1,193	1,193	955	955	955	764	764	764	597	597	597	477	477	477
			v_c (m/min)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
			v_f (mm/min)	1,193	1,193	1,193	1,432	1,432	1,432	1,528	1,528	1,528	1,194	1,194	1,194	1,431	1,431	1,431
			f_z (mm/t)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
			a_p (mm)	0.6	0.5	0.4	0.8	0.6	0.5	1.0	0.8	0.6	1.0	1.0	0.8	1.0	1.0	0.8
			a_e (mm)	11	11	11	14	14	14	18	18	18	22	22	22	28	28	28
			Q (cm^3/min)	8	7	5	16	12	10	28	22	17	26	26	21	40	40	32

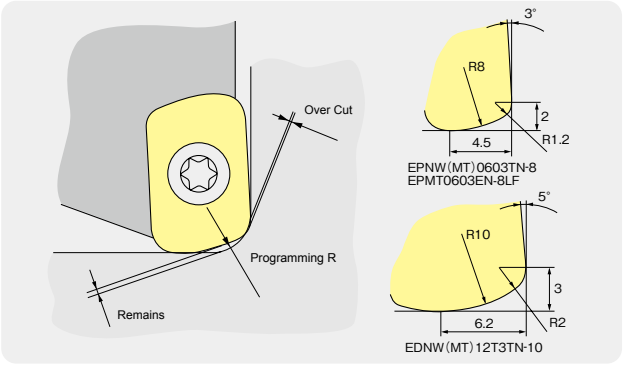
Standard cutting conditions for LF type inserts Shank type / Modular Carbide Shank / Bore Type

• Refer to the standard cutting conditions ①, ②, ③ for "Carbon steels/alloy steels <30HRC", "Cast irons", and "Stainless steels". The applicable insert material is JM4160.

【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③These tables show general conditions for shoulder cutting. Please make adjustments according to the machine rigidity and work material conditions. In particular, for inclined cutting such as pocket machining or groove cutting, reduce cutting depth a_p by 50 to 60%.
④LF type breakers are not suitable for strong interrupted cutting.
⑤Since there is a danger of discharged chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses to enable work to be performed in a safe environment.
⑥Perform insert replacement at an early stage to prevent chipping due to excessive use.

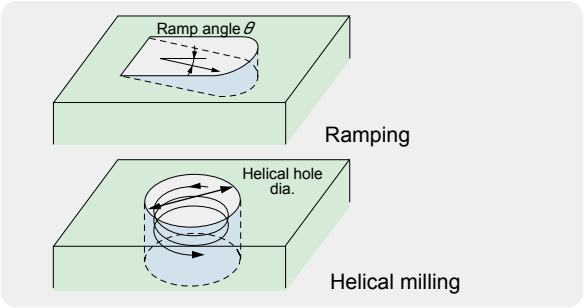
When setting the definition of insert shape for programming, please refer to the Programming R in the diagram below.

Item code	Programming R (mm)	Programming R (inch)	Over cut (mm)	Over cut (inch)	Remains (mm)	Remains (inch)
Insert : EPNW(MT)0603TN-8 EPMT0603EN-8LF Body : IASR S/L◌◌(S◌◌)R-◌ IASR 20◌◌R(M)-◌ ASRS/L/M20◌◌(S◌◌)R-◌ ASR20◌◌R(M)-◌	R2.0	R.079	0	0	0.497	.0196
	R2.5	R.098	0.076	.0030	0.349	.0137
	R3.0	R.118	0.218	.0086	0.236	.0093
	R3.5	R.138	0.419	.0165	0.108	.0043
	R4.0	R.157	0.612	.0241	0.03	.0012
Insert : EDNW(MT)12T3TN-10 Body : ASR30◌◌R(M)-◌	R3.0	R.079	0	0	0.700	.0276
	R3.5	R.098	0.03	.0012	0.542	.0213
	R4.0	R.118	0.155	.0061	0.394	.0155
	R4.5	R.138	0.319	.0126	0.259	.0102
	R5.0	R.157	0.5	.0197	0.144	.0057



Processing by direct milling is also possible.

Since the cutting flute do not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, processing by direct milling without a pilot hole is possible for ramping and helical milling.



RAMPING/HELICAL MILLING - METRIC DIAMETER

Inserts	EPNW(MT)0603TN-8,EPMT0603EN-8LF											EPNW(MT)12T3TN-10	
Tool dia. DCX (mm)	ϕ16	ϕ18	ϕ20	ϕ22	ϕ25	ϕ28	ϕ30	ϕ32	ϕ40	ϕ52	ϕ66	ϕ50	ϕ63
Maximum ramp angle θ	4°	3.5°	3°	2.5°	2°	2°	2°	2°	1.5°	1°	0.5°	1.5°	1°
Helical hole dia. (mm)	22~30	26~34	30~38	34~42	40~48	46~54	50~58	54~62	70~78	94~102	122~130	83~98	109~124

RAMPING/HELICAL MILLING - INCH DIAMETER

Inserts	EPNW(MT)0603TN-8,EPMT0603EN-8LF						
Tool dia. DCX (inch)	.625"	.750"	1.000"	1.250"	1.500"	2.000"	2.500"
Maximum ramp angle θ	4°	3°	2°	2°	1.5°	1°	0.5°
Helical hole dia. (inch)	.856~1.171	1.106~1.421	1.606~1.921	2.106~2.421	2.606~2.921	3.606~3.921	4.606~4.921

【Note】
①The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 0.5° or less is recommended.
②For helical hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

High Hard Radius Mill RH2P

- Combination of high-accuracy-ground inserts (H grade) and high-accuracy bodies improves edge runout accuracy and stable cutting performance.
- RH2P adopts cornerR 2mm in order to reduce the remains by programming R.
- By having negative setting of the rake angle against the axial direction, RH2P improves toughness of edges and reduces wear.

Roughing | Semi Finishing | Finishing | Maximum Notch 0.5 | Planing | Side milling | Die-sinking | Helical | Cutting Conditions C88

Shank type

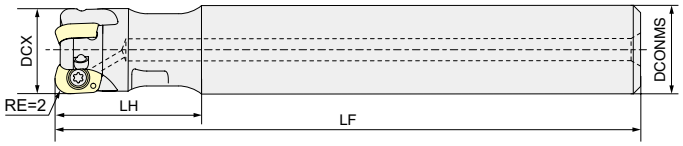


Fig-1 Regular type

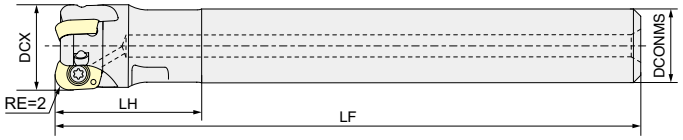


Fig-2 Undercut type

Recommended fastening torque
0.5N•m
4.43lbf•in

Inch IRH2P1○○○S-○

Numeric figure in a circle ○.

Item code	Stock	No. of flutes	Size (inch)				Shape
			DCX	LF	DCONMS	LH	
IRH2P1006S-2	●	2	.375	3.000	.375	.750	Fig-1
IRH2P1008S-3	●	3	.500	3.000	.500	.750	Fig-1
IRH2P1010S-4	●	4	.625	3.500	.625	1.000	Fig-2
IRH2P1012S-5	●	5	.750	4.000	.750	1.000	Fig-1
IRH2P1016S-6	●	6	1.000	5.500	1.000	2.500	Fig-2

Metric RH2P1○○○S(○○)-○

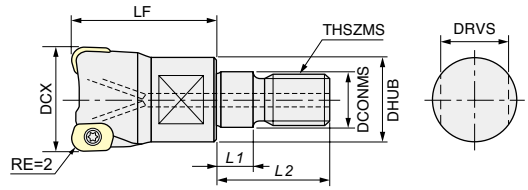
Numeric figure in a circle ○.

Item code	Stock	No. of flutes	Size (mm)				Shape
			DCX	LF	DCONMS	LH	
RH2P1008S-1	★	1	8	75	10	16	Fig-1
RH2P1010S-2	●	2	10	80	10	20	Fig-1
RH2P1010S08-2	★	2	10	80	8	20	Fig-2
RH2P1012S-3	●	3	12	80	12	20	Fig-1
RH2P1012S10-3	★	3	12	80	10	20	Fig-2
RH2P1016S-4	●	4	16	90	16	25	Fig-1
RH2P1020S-5	●	5	20	105	20	25	Fig-1

● : Inventory maintained in US ★ : Inventory maintained in Japan

Modular Type

Fig-3
Modular type



Recommended fastening torque
0.5N•m
4.43lbf•in

Inch IRH2P1○○○M-○

Numeric figure in a circle ○.

Item code	Stock	No. of flutes	Size (inch)							
			DCX	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS
IRH2P1006M-2	●	2	.375	.669	.256	M6	.370	.217	.571	.276
IRH2P1008M-3	●	3	.500	.669	.256	M6	.386	.217	.571	.276
IRH2P1010M-4	●	4	.625	.866	.335	M8	.504	.217	.669	.394
IRH2P1012M-5	●	5	.750	.984	.413	M10	.701	.217	.748	.591
IRH2P1016M-6	●	6	1.000	.984	.492	M12	.819	.217	.866	.669
IRH2P1020M-8	●	8	1.250	1.063	.669	M16	1.134	.236	.906	.866

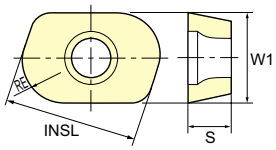
Metric RH2P1○○○M-○

Numeric figure in a circle ○.

Item code	Stock	No. of flutes	Size (mm)							
			DCX	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS
RH2P1008M-1	★	1	8	19	6.5	M6	9.4	5.5	14.5	7
RH2P1010M-2	★	2	10	17	6.5	M6	9.4	5.5	14.5	7
RH2P1012M-3	★	3	12	17	6.5	M6	9.8	5.5	14.5	7
RH2P1016M-4	★	4	16	22	8.5	M8	12.8	5.5	17	10
RH2P1020M-5	★	5	20	25	10.5	M10	17.8	5.5	19	15
RH2P1025M-6	★	6	25	25	12.5	M12	20.8	5.5	22	17
RH2P1032M-8	★	8	32	27	17	M16	28.8	6	23	22

【Note】 Do not apply lubricants such as grease, etc. to the “contact faces” and “modular screws” of the “modular mill”, “special shanks” and “special arbor”.

Inserts



P	Carbon steel		■	■ : General cutting, First recommended
H	Hardened steel	■	■	□ : General cutting, Second recommended

Item code	Tolerance class	AJ Coating		Size (mm)			
		JP4105	JP4115	RE	INSL	S	W1
EPHW0402TN-2	H	●	●	2	6.215	2	4.2

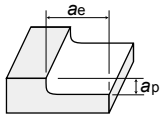
Parts

Parts / Shape / Cutter body	Clamp screw			Screw driver	Screw anti-seizure agent
		Fastening torque (N•m)	Fastening torque (lbf•in)		
RH2P10...	240-140	0.5	4.43	104-T6	P-37

High Hard Radius Mill RH2P

Recommended cutting conditions

Inch



※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting conditions	φ8mm 1 flute	φ10mm or .375" 2 flutes	φ12mm or .5" 3 flutes	φ16mm or .625" 4 flutes	φ20mm or .75" 5 flutes	φ25mm or 1" 6 flutes	φ32mm or 1.25" 8 flutes
Pre-hardened steel (40HRC or less)	※ JP4115	vc (SFM)	427	406	451	424	406	434	422
		n (min-1)	5,180	4,140	3,450	2,590	2,070	1,660	1,290
		fz (IPT)	.016	.020	.020	.020	.020	.020	.020
		vf (IPM)	81	163	204	204	204	196	203
		ap (inch)	.012	.014	.016	.016	.016	.016	.016
		ae (inch)	.177	.197	.276	.374	.472	.591	.748
		Q (in3/min)	.17	.44	.9	1.2	1.5	1.8	2.4
Pre-hardened steel (40～50HRC)	JP4115	vc (SFM)	328	312	347	325	312	332	327
		n (min-1)	3,980	3,180	2,650	1,990	1,590	1,270	1,000
		fz (IPT)	.016	.020	.020	.020	.020	.020	.020
		vf (IPM)	62	125	157	157	157	150	158
		ap (inch)	.012	.014	.016	.016	.016	.016	.016
		ae (inch)	.177	.197	.276	.374	.472	.591	.748
		Q (in3/min)	.13	.34	.68	.92	1.2	1.4	1.9
Hardened steel (50～55HRC)	JP4105 JP4115	vc (SFM)	295	282	313	293	281	301	294
		n (min-1)	3,580	2,870	2,390	1,790	1,430	1,150	900
		fz (IPT)	.016	.016	.016	.016	.016	.016	.016
		vf (IPM)	56	90	113	112	112	108	113
		ap (inch)	.008	.012	.012	.012	.012	.012	.012
		ae (inch)	.177	.197	.276	.374	.472	.591	.748
		Q (in3/min)	.08	.21	.37	.49	.62	.75	1.0
Hardened steel (55～60HRC)	JP4105	vc (SFM)	246	235	260	244	234	251	245
		n (min-1)	2,990	2,390	1,990	1,490	1,190	960	750
		fz (IPT)	.012	.016	.016	.016	.016	.016	.016
		vf (IPM)	35	75	94	94	93	90	94
		ap (inch)	.006	.008	.008	.008	.008	.008	.008
		ae (inch)	.118	.157	.197	.256	.315	.394	.512
		Q (in3/min)	.02	.09	.15	.19	.23	.28	.4
Hardened steel (60～62HRC)	JP4105	vc (SFM)	213	203	226	211	204	217	213
		n (min-1)	2,590	2,070	1,730	1,290	1,040	830	650
		fz (IPT)	.010	.012	.012	.012	.012	.012	.012
		vf (IPM)	25	49	61	61	61	59	61
		ap (inch)	.006	.006	.006	.006	.006	.006	.006
		ae (inch)	.118	.157	.197	.256	.315	.394	.512
		Q (in3/min)	.02	.05	.07	.09	.11	.14	.18

【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual cutting conditions adjust the parameters according to your actual machine and work-piece conditions.
③For slotting or ramping, feed rate should be set to 70% as recommended cutting conditions.
④When using an RH2P1010S08-2 or RH2P1012S10-3 undercut type shank, as a general rule the feed rate per flute (fz) should be reduced to 50~70% of the value listed in the recommended cutting conditions.
⑤Ensure to exchange the insert at the correct time to ensure safety of the tool-body.
⑥The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑦Due to fire risks do not use cutting oil as a coolant.

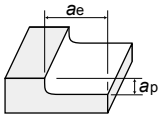
Ramping / Helical milling

Tool dia.	φ8mm	.375"	.5"	.625"	.75"	1"	1.25"
Max. ramp angle °	Less than 0.5 ° (max. 1.0 °)						
Helical milling / Hole dia.(inch)	.394～.591	.512～.748	.669～.906	1～1.22	1.3～1.5	1.7～1.9	2.2～2.4

For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Metric

※Red indicates primary recommended grade.



Work material	Recommended grade	Cutting conditions	ϕ8mm 1 flute	ϕ10mm or .375" 2 flutes	ϕ12mm or .5" 3 flutes	ϕ16mm or .625" 4 flutes	ϕ20mm or .75" 5 flutes	ϕ25mm or 1" 6 flutes	ϕ32mm or 1.25" 8 flutes
Pre-hardened steel (40HRC or less)	※ JP4115	vc (m/min)	130	130	130	130	130	130	130
		n (min-1)	5,180	4,140	3,450	2,590	2,070	1,660	1,290
		fz (mm/t)	0.4	0.5	0.5	0.5	0.5	0.5	0.5
		vf (mm/min)	2,070	4,140	5,170	5,180	5,170	4,980	5,160
		ap (mm)	0.3	0.35	0.4	0.4	0.4	0.4	0.4
		ae (mm)	4.5	5	7	9.5	12	15	19
		Q (cm3/min)	2.8	7.2	14.5	19.7	24.8	29.9	39.2
Pre-hardened steel (40～50HRC)	JP4115	vc (m/min)	100	100	100	100	100	100	100
		n (min-1)	3,980	3,180	2,650	1,990	1,590	1,270	1,000
		fz (mm/t)	0.4	0.5	0.5	0.5	0.5	0.5	0.5
		vf (mm/min)	1,590	3,180	3,970	3,980	3,970	3,810	4,000
		ap (mm)	0.3	0.35	0.4	0.4	0.4	0.4	0.4
		ae (mm)	4.5	5	7	9.5	12	15	19
		Q (cm3/min)	2.1	5.6	11.1	15.1	19.1	22.9	30.4
Hardened steel (50～55HRC)	JP4105 JP4115	vc (m/min)	90	90	90	90	90	90	90
		n (min-1)	3,580	2,870	2,390	1,790	1,430	1,150	900
		fz (mm/t)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		vf (mm/min)	1,430	2,290	2,860	2,860	2,860	2,760	2,880
		ap (mm)	0.2	0.3	0.3	0.3	0.3	0.3	0.3
		ae (mm)	4.5	5	7	9.5	12	15	19
		Q (cm3/min)	1.3	3.4	6.0	8.2	10.3	12.4	16.4
Hardened steel (55～60HRC)	JP4105	vc (m/min)	75	75	75	75	75	75	75
		n (min-1)	2,990	2,390	1,990	1,490	1,190	960	750
		fz (mm/t)	0.3	0.4	0.4	0.4	0.4	0.4	0.4
		vf (mm/min)	890	1,910	2,380	2,380	2,380	2,300	2,400
		ap (mm)	0.15	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	3	4	5	6.5	8	10	13
		Q (cm3/min)	0.4	1.5	2.4	3.1	3.8	4.6	6.2
Hardened steel (60～62HRC)	JP4105	vc (m/min)	65	65	65	65	65	65	65
		n (min-1)	2,590	2,070	1,730	1,290	1,040	830	650
		fz (mm/t)	0.25	0.3	0.3	0.3	0.3	0.3	0.3
		vf (mm/min)	640	1,240	1,550	1,540	1,560	1,490	1,560
		ap (mm)	0.15	0.15	0.15	0.15	0.15	0.15	0.15
		ae (mm)	3	4	5	6.5	8	10	13
		Q (cm3/min)	0.3	0.7	1.2	1.5	1.9	2.2	3.0

【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual cutting conditions adjust the parameters according to your actual machine and work-piece conditions.
③For slotting or ramping, feed rate should be set to 70% as recommended cutting conditions.
④When using an RH2P1010S08-2 or RH2P1012S10-3 undercut type shank, as a general rule the feed rate per flute (fz) should be reduced to 50~70% of the value listed in the recommended cutting conditions.
⑤Ensure to exchange the insert at the correct time to ensure safety of the tool-body.
⑥The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑦Due to fire risks do not use cutting oil as a coolant.

Ramping / Helical milling

Tool dia.(mm)	ϕ8	ϕ10	ϕ12	ϕ16	ϕ20	ϕ25	ϕ32
Max. ramp angle °	Less than 0.5 ° (max. 1.0 °)						
Helical milling / Hole dia.(mm)	10-15	13-19	17-23	25-31	33-39	43-49	57-63

For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Easy Cut Radius Mill AR

- Uses 15° positive round inserts.
- Can perform direct plunge cutting.
- Can perform Z-direction or slant milling.
- Also suitable for cutting high-hardness materials (50 to 55HRC) and difficult-to-cut materials.

Roughing | Maximum Notch 2.5~8 | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C96

Shank type

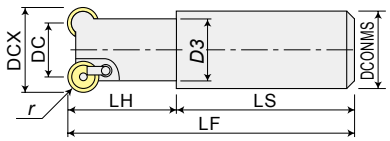


Fig.1

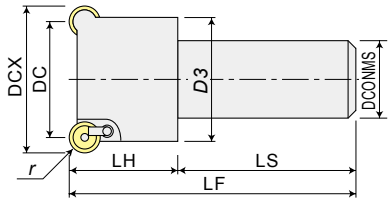


Fig.2

Inch IAR◻◯◯R

Numeric figure in a circle ◯ and alphabetical character comes in a square ◻.

Item code	Stock	No.of flutes	Size(inch) DCX	DC	LF	DCONMS	r	LH	LS	D3	Shape	Inserts
IARS16R	●	2	1.000	.528	5.512	1.000	6mm	2.362	3.150	.803	Fig-1	RDHW12/RDMT12
IARS20R	●	2	1.250	.778	5.906	1.250	6mm	2.756	3.150	1.102		
IARS24R	●	3	1.500	1.028	6.299	1.500	6mm	3.150	3.150	1.299		
IARL16R	●	2	1.000	.528	7.874	1.000	6mm	4.724	3.150	.803		
IARL20R	●	2	1.250	.778	8.268	1.250	6mm	5.118	3.150	1.102		
IARL24R	●	3	1.500	1.028	8.661	1.500	6mm	5.512	3.150	1.299		
IARE16R	●	2	1.000	.528	11.811	1.000	6mm	7.087	4.724	.803		
IARE20R	●	2	1.250	.778	12.205	1.250	6mm	7.480	4.724	1.102		
IARE24R	●	3	1.500	1.028	12.598	1.500	6mm	7.874	4.724	1.299		

Parts

Numeric figure in a circle ◯.

Parts / Shape / Cutter body	Clamp screw for Inserts	fastening torque N·m	fastening torque lbf·in	Clamp piece set	Clamp piece	Clamp screw for Clamp piece	Spring	Screw driver/ Wrench	Shape
ARS/L/E0020R	261-140	1.1	9.74	CM3.5-141	—	—	—	104-T8	A
ARS/L/E3025R~ARS/L/E3032R	501-161	2.9	25.67	CM3.5-141				104-T15	A
ARS/L/E4032R~ARS/L/E4050R(42)	262-142	2.9	25.67	CM4-141	—	—	—	104-T15	A
ARS/L5040R~ARS/L5063R(42)	223-141	4.9	43.37	—	215-192	200-150	715-201	105-T20	B
IAR S/L/E◯◯R	262-141			CM4-141	—	—	—	104-T15	A

● : Inventory maintained in US ★ : Inventory maintained in Japan

Metric AR□○○○○R(42)

Numeric figure in a circle ○ and alphabetical character comes in a square □.

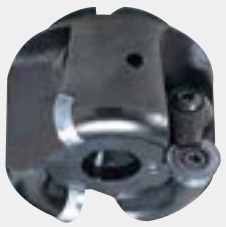
Item code			Stock	No.of flutes	Size (mm)								Shape	Inserts
					DCX	DC	LF	DCONMS	*r*	LH	LS	*D3*		
Straight shank type	Regular	※ ARS0020R	●	2	20	12	130	20	4	50	80	18	Fig.1	RDHW0802M0TN RDMT0802M0TN RDMT0802M0EN
		※ ARS3025R	●	2	25	15	140	25	5	60	80	21		RDHW10T3M0TN RDMT10T3M0TN RDMT10T3M0EN
		※ ARS3030R	★	3	30	20	150	32	5	70	80	26		
		※ ARS3032R	●	3	32	22	150	32	5	70	80	28		
		※ ARS4040R	●	3	40	28	150	32	6	50	100	35	Fig.2	RDHW1204M0TN RDMT1204M0TN RDMT1204M0EN
		※ ARS4050R	★	3	50	38	150	32	6	50	100	45		
		※ ARS4050R42	★	4	50	38	150	42	6	50	100	45		
		ARS5040R	★	2	40	24	150	32	8	50	100	35		RDHW1604M0TN RDMX1604M0TN RDMX1604M0EN RDMT1604M0TN RDMT1604M0EN
		ARS5050R	★	3	50	34	150	32	8	50	100	44		
		ARS5050R42	★	3	50	34	150	42	8	50	100	44		
		ARS5063R	★	3	63	47	150	32	8	50	100	58		
		ARS5063R42	★	3	63	47	150	42	8	50	100	58		
	Long	※ ARL0020R	★	2	20	12	180	20	4	100	80	18	Fig.1	RDHW0802M0TN RDMT0802M0TN RDMT0802M0EN
		※ ARL3025R	★	2	25	15	200	25	5	120	80	21		RDHW10T3M0TN RDMT10T3M0TN RDMT10T3M0EN
		※ ARL3030R	★	3	30	20	200	32	5	120	80	26		
		※ ARL3032R	★	3	32	22	200	32	5	120	80	28		
		※ ARL4032R	★	2	32	20	250	32	6	150	100	28		RDHW1204M0TN RDMT1204M0TN RDMT1204M0EN
		※ ARL4040R	★	3	40	28	250	32	6	50	200	35	Fig.2	
		※ ARL4050R42	★	4	50	38	250	42	6	50	200	45		
		ARL5040R	★	2	40	24	250	32	8	50	200	35		RDHW1604M0TN RDMX1604M0TN RDMX1604M0EN RDMT1604M0TN RDMT1604M0EN
		ARL5050R42	★	3	50	34	250	42	8	50	200	44		
		ARL5063R42	★	3	63	47	250	42	8	50	200	58		
	Extra Long	※ ARE0020R	★	2	20	12	250	20	4	130	120	18	Fig.1	RDHW0802M0TN RDMT0802M0TN RDMT0802M0EN
		※ ARE3025R	★	2	25	15	300	25	5	180	120	21		RDHW10T3M0TN RDMT10T3M0TN RDMT10T3M0EN
		※ ARE3030R	★	2	30	20	300	32	5	180	120	26		
		※ ARE3032R	★	3	32	22	300	32	5	180	120	28		
		※ ARE4032R	★	2	32	20	300	32	6	180	120	28		RDHW1204M0TN RDMT1204M0TN RDMT1204M0EN
		※ ARE4040R	★	2	40	28	300	32	6	50	250	35	Fig.2	
		※ ARE4050R42	★	2	50	38	300	42	6	50	250	45		

※:With air-hole.

Easy Cut Radius Mill AR

Bore type

Numeric figure in a circle◌



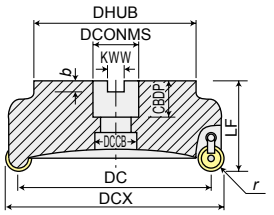


Fig.3

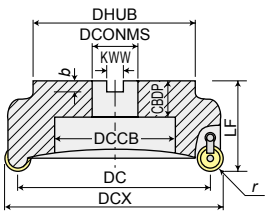


Fig.4

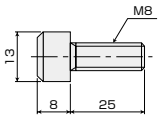


Fig.5

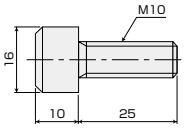


Fig.6

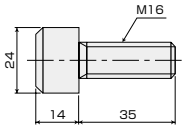


Fig.7

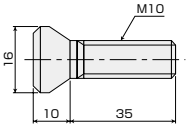


Fig.8 **100-211**

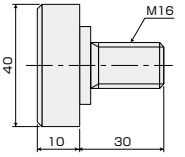


Fig.9

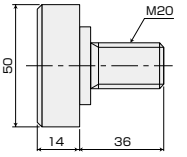


Fig.10 **600-211**

Inch IARB◌◌◌◌R

Numeric figure in a circle◌

Item code	Stock	No.of flutes	Size(inch) DCX	DC	DHUB	r (mm)	LF	DCONMS	DCCB	KWW	b	CBDP	Shape	Inserts
IARB4032R-4	●	4	2.000	1.370	1.921	6	1.969	.750	.630	.315	.197	.748	Fig-3	RDHW12/RDMT12
IARB5040R-3	●	3	2.500	1.870	2.421	8	1.969	1.024	.630	.315	.197	1.024	Fig-3	RDHW16 RDMT16
IARB5048R-4	●	4	3.000	2.370	2.843	8	2.480	1.378	.827	.374	.236	1.378	Fig-3	
IARB5064R-5	●	5	4.000	3.370	3.843	8	2.480	1.378	2.165	.626	.394	1.378	Fig-4	
IARB5080R-6	●	6	5.000	4.370	4.094	8	2.480	1.378	2.165	.626	.394	1.378	Fig-4	
IARB5096R-8	●	8	6.000	5.370	5.118	8	2.480	1.378	2.165	.626	.394	1.378	Fig-4	

【Note】 Arbor screws for cutter as lours are not equipped with cutter bodies. AR5047R exceptionally has arbor screws (100-211).

Parts

Numeric figure in a circle◌

Parts / Shape / Cutter body	Clamp screw for inserts	Fastening torque N·m	Fastening torque lbf·in	Clamp piece set	Clamp piece	Clamp screw for clamp piece	Spring	Wrench	Screw anti-seizure agent
IARB4◌◌◌R-◌ ARB4◌◌◌R-◌(M)	262-142	2.9	25.67	CM4-141	—	—	—	105-T15	P-37
IARB5◌◌◌R-◌ ARB5◌◌◌R-◌	263-141	4.9	43.37	CM5-147	—	—	—	105-T20	
AR5◌◌◌R	223-141	4.9	43.37	—	215-192	200-150	715-201	105-T20	

● : Inventory maintained in US ★ : Inventory maintained in Japan

Metric ARB○○○○R-○(M) AR5○○○R

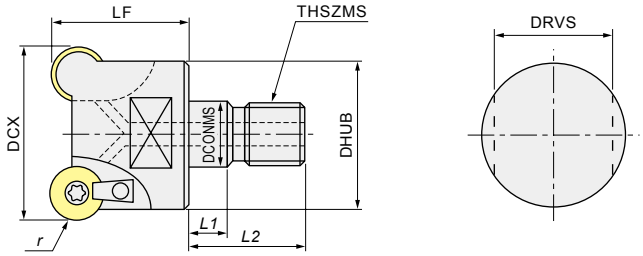
Numeric figure in a circle ○.

		Item code	Stock	No.of flutes	Size (mm) DCX	DC	DHUB	*r*	LF	DCONMS	DCCB	KWW	*b*	CBDP	Arbor screw	Shape	Inserts
Bore type	Outside diameter type	ARB4040R-3	★	3	40	28	32	6	50	16	13.5	8.4	5.6	19	M8×25 (Fig.5)	Fig.3	RDHW1204M0TN RDMT1204M0TN RDMT1204M0EN
		ARB4050R-3	★	3	50	38	48	6	50	22.225	17	8.4	5	19	M10×25 (Fig.6)		
		ARB4050R-5	★	5	50	38	48	6	50	22.225	17	8.4	5	19	M10×25 (Fig.6)		
		ARB4050R-3M	★	3	50	38	48	6	50	22	17	10.4	6.3	20	M10×25 (Fig.6)		
		ARB4050R-5M	●	5	50	38	48	6	50	22	17	10.4	6.3	20	M10×25 (Fig.6)		
		ARB4063R-4	★	4	63	51	61	6	50	22.225	17	8.4	5	19	M10×25 (Fig.6)		
		ARB4063R-6	★	6	63	51	61	6	50	22.225	17	8.4	5	19	M10×25 (Fig.6)		
		ARB4063R-4M	★	4	63	51	61	6	50	22	17	10.4	6.3	20	M10×25 (Fig.6)		
		ARB4063R-6M	●	6	63	51	61	6	50	22	17	10.4	6.3	20	M10×25 (Fig.6)		
		ARB4080R-4	★	4	80	68	76	6	70	31.75	26	12.7	8	32	M16×35 (Fig.7)		
		ARB4080R-6	●	6	80	68	76	6	70	31.75	26	12.7	8	32	M16×35 (Fig.7)		
		ARB4100R-5	●	5	100	88	96	6	70	31.75	26	12.7	8	32	M16×35 (Fig.7)		
		ARB4125R-6	★	6	125	113	102	6	70	38.1	55	15.9	10	38	M20 (Fig.10)	Fig.4	
		ARB5063R-3	●	3	63	47	61	8	50	22.225	17	8.4	5	19	M10×25 (Fig.6)	Fig.3	RDHW1605M0TN RDMT1605M0TN RDMT1605M0EN
		ARB5080R-4	●	4	80	64	76	8	70	31.75	26	12.7	8	32	M16×35 (Fig.7)		
		ARB5100R-5	●	5	100	84	96	8	70	31.75	26	12.7	8	32	M16×35 (Fig.7)		
		ARB5125R-6	★	6	125	109	102	8	70	38.1	55	15.9	10	38	M20 (Fig.10)	Fig.4	
	Tip end type	AR5047R	★	3	63	47	47	8	47	22.225	16.5	8.4	5	19	M10 (Fig.8)	Fig.3	RDHW1604M0TN RDMX1604M0TN RDMX1604M0EN RDMT1604M0TN RDMT1604M0EN
		AR5080R	★	4	96	80	65	8	63	31.75	43	12.7	8	32	M16 (Fig.9)		
		AR5100R	★	5	116	100	85	8	63	38.1	53	15.9	10	38	M20 (Fig.10)	Fig.4	
		AR5125R	★	6	141	125	85	8	63	38.1	60	15.9	10	38	M20 (Fig.10)		

【Note】 Arbor screws for cutter as lours are not equipped with cutter bodies. AR5047R exceptionally has arbor screws (100-211).

Easy Cut Radius Mill AR

Modular type ARM○○○○R-○



Metric ARM○○○○R-○

Numeric figure in a circle○.

Item code	Stock	No.of flutes	Size(mm) DCX	r	LF	DCONMS	THSZMS	DHUB	L1	L2	DRVS	Inserts
※1 ARM0512R-2	★	2	12	2.5	20	6.5	M6	9.8	5.5	14.5	7	RDMW0501M0EN
※1 ARM0512R-3	★	3	12	2.5	20	6.5	M6	9.8	5.5	14.5	7	
ARM0716R-2	★	2	16	3.5	25	8.5	M8	12.8	5.5	17	10	RDMW0702M0EN
ARM0020R-2	●	2	20	4	30	10.5	M10	17.8	5.5	19	15	RDHW0802M0TN RDMT0802M0TN RDMT0802M0EN
※ ARM0022R-2	★	2	22	4	30	10.5	M10	17.8	5.5	19	15	
ARM3025R-2	●	2	25	5	35	12.5	M12	20.8	5.5	22	17	RDHW10T3M0TN RDMT10T3M0TN RDMT10T3M0EN
※ ARM3028R-2	★	2	28	5	35	12.5	M12	23	5.5	22	17	
ARM3030R-3	★	3	30	5	40	17	M16	28.8	6	23	22	
ARM3032R-2	★	2	32	5	40	17	M16	28.8	6	23	22	
ARM3032R-3	●	3	32	5	40	17	M16	28.8	6	23	22	
※ ARM3040R-4	●	4	40	5	40	17	M16	28.8	6	23	22	

【Note】①When ※ and carbide shank are used together as a set, there is no interference. ②※1 with tool dia. (DCX) of ϕ12 do not have air holes. ③Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

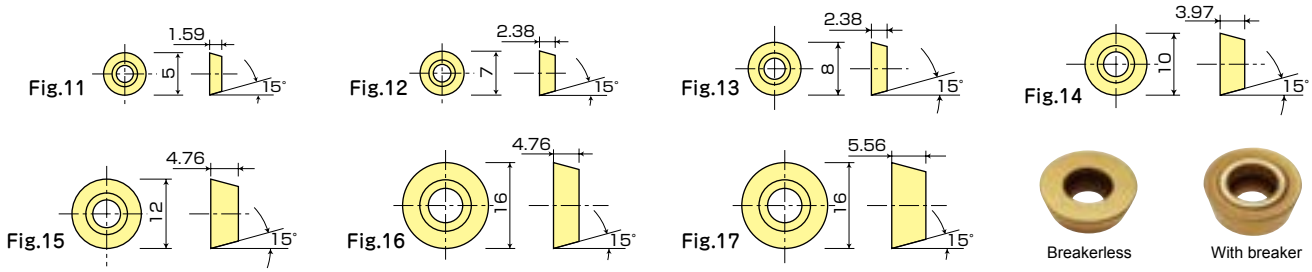
Parts

Parts / Shape / Cutter body	Clamp screw	fastening torque (N·m)	Clamp piece set	Screw Driver	Screw anti-seizure agent
ARM0512R-○	240-140	0.4	—	104-T6	P-37
ARM0716R-2	250-141	1.1	—	104-T8	
ARM0020R-2 ARM0022R-2	261-140	1.1	CM3.5-141	104-T8 104-T15	
ARM3025R-2 ARM3028R-2 ARM3030R-3 ARM3032R-○ ARM3040R-4	501-161	2.9	CM3.5-141	104-T15	

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark: Manufactured upon request only

Inserts

Numeric figure in a circle◌



P	Carbon steel		■		■	■						
M	Stainless steel, etc.			■								
K	Cast iron		■									
H	Hardened steel	■	■									

■:General cutting, First recommended

⊔:General cutting, Second recommended

Item code	Tolerance class	AJ Coating JP4105	AJ Coating JP4120	AJ Coating JM4160	JS Coating JS4045	JS Coating JS4060	TH Coating PTH08M	C Coating CY100H	C Coating CY25	C Coating CY250	G Coating GF30	K WH10	Shape	Cutter body (Metric)	Cutter body (Inch)
RDMW0501M0EN	M breakerless	★※		★			★			★			Fig.11	ARM0512R-2 ARM0512R-3	–
RDMW0702M0EN	M breakerless	★※		★			★			★			Fig.12	ARM0716R-2	–
RDHW0802M0TN	H breakerless			★	●					●			Fig.13	ARS0020R ARL0020R ARE0020R ARM0020R-2 ARM0022R-2	–
RDMT0802M0TN	M with breaker	★	★	★	●	★			★	●					
RDMT0802M0EN												★			
RDHW10T3M0TN	H breakerless				●					●			Fig.14	ARS30◌◌R ARL30◌◌R ARE30◌◌R ARM3025R-2 ~ ARM3040R-4	–
RDMT10T3M0TN	M with breaker	★	★	★	●	★			★	●	★				
RDMT10T3M0EN								★				★			
RDHW1204M0TN	H breakerless				●					●			Fig.15	ARS40◌◌R(42) ARL40◌◌R(42) ARE40◌◌R ARB4◌◌◌R-◌(M)	IAR□◌◌R IARB4032R-4
RDMT1204M0TN	M with breaker	★	★	★	●	★				●					
RDMT1204M0EN															
RDHW1604M0TN	H breakerless				●					●			Fig.16	ARS50◌◌R(42) ARL50◌◌R(42) ARE50◌◌R(42) AR5◌◌◌R	IARB50◌◌R-◌
RDMT1604M0TN	M with breaker	★	★	★	●	★				●					
RDMT1604M0EN								★				★			
RDHW1605M0TN	H breakerless				●					●			Fig.17	ARB5◌◌◌R-◌	IARB50◌◌R-◌
RDMT1605M0TN	M with breaker	★		★	●					●					
RDMT1605M0EN															

※Secondary recommended work material for RDMW0501M0EN: JP4105 and RDMW0702M0EN: JP4105 are P (steel) and K (FC, FCD).

【Note】 Please note that the JS Coating does not cause a reaction in conductive touch sensors.

Easy Cut Radius Mill AR

Recommended cutting conditions

ARS/IARS Regular | **ARL/IARL** Long | **ARE/IARE** Extra long

Inch ＜ Shoulder Milling ＞

※ Red indicates primary recommended grade.

Work mateiral	Insert grade	Cutting Speed (SFM)	Feed per tooth (IPT)	Spindle size	Diameter Metric / Inch	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ63mm or 2.5"
					Insert size	R4mm	R5mm	R5mm	R6mm	R6mm	R8mm	R8mm	R8mm
					Flute No.	2	2	3	3	4	2	3	3
Mild steel (<200HB)	※ JS4060 JS4045	492～820	.0118～.0315	BT40	n (min^{-1})	3,980	3,180	2,490	1,990	1,590	1,990	1,590	1,260
					v_c (SFM)	781	832	814	781	832	781	832	824
					v_f (IPM)	125	100	117	118	125	78	94	74
					f_z (IPT)	.016	.016	.016	.020	.020	.020	.020	.020
					a_p (inch)	.059	.059	.059	.079	.079	.079	.079	.079
					a_e (inch)	.236	.295	.378	.472	.591	.472	.591	.744
					Q (in^3/min)	1.7	1.7	2.6	4.4	5.8	2.9	4.4	4.4
				BT50	n (min^{-1})	3,980	3,180	2,490	1,990	1,590	1,990	1,590	1,260
					v_c (SFM)	781	832	814	781	832	781	832	824
					v_f (IPM)	125	100	118	188	200	125	150	119
					f_z (IPT)	.016	.016	.016	.031	.031	.031	.031	.031
					a_p (inch)	.059	.059	.059	.079	.079	.098	.098	.098
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	1.7	1.8	2.6	6.7	9.5	5.6	8.9	8.8
Carbon steel Alloy steel (<30HRC)	JS4060 JS4045	394～754	.0118～.0315	BT40	n (min^{-1})	3,180	2,550	1,990	1,590	1,270	1,590	1,270	1,010
					v_c (SFM)	624	667	651	624	665	624	665	661
					v_f (IPM)	100	80	94	75	80	50	60	48
					f_z (IPT)	.016	.016	.016	.016	.016	.016	.016	.016
					a_p (inch)	.059	.059	.059	.079	.079	.079	.079	.079
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	1.3	1.4	2.1	2.7	3.8	1.8	2.8	2.8
				BT50	n (min^{-1})	3,180	2,550	1,990	1,590	1,270	1,590	1,270	1,010
					v_c (SFM)	624	667	651	624	665	624	665	661
					v_f (IPM)	100	80	94	113	120	75	90	84
					f_z (IPT)	.016	.016	.016	.024	.024	.024	.024	.028
					a_p (inch)	.059	.059	.059	.079	.079	.098	.098	.098
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	1.3	1.4	2.1	4.0	5.7	3.3	5.3	6.2
Carbon steel Alloy steel (30～40HRC)	JS4060 JS4045	328～656	.0079～.0236	BT40	n (min^{-1})	2,390	1,910	1,490	1,190	960	1,190	960	760
					v_c (SFM)	469	500	487	467	502	467	502	497
					v_f (IPM)	38	30	35	28	30	19	23	18
					f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008
					a_p (inch)	.059	.059	.059	.079	.079	.079	.079	.079
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.5	.5	.8	1.0	1.4	.7	1.1	1.1
				BT50	n (min^{-1})	2,390	1,910	1,490	1,190	960	1,190	960	760
					v_c (SFM)	469	500	487	467	502	467	502	497
					v_f (IPM)	56	45	53	42	45	37	45	36
					f_z (IPT)	.012	.012	.012	.012	.012	.016	.016	.016
					a_p (inch)	.059	.059	.059	.079	.079	.098	.098	.098
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.8	.8	1.2	1.5	2.1	1.7	2.7	2.7
Carbon steel Alloy steel (40～45HRC)	JP4120 JS4045	197～492	.0059～.0118	BT40	n (min^{-1})	1,590	1,270	990	800	640	800	640	510
					v_c (SFM)	312	332	324	314	335	314	335	334
					v_f (IPM)	19	15	18	14	15	9	11	9
					f_z (IPT)	.006	.006	.006	.006	.006	.006	.006	.006
					a_p (inch)	.039	.039	.039	.059	.059	.059	.059	.059
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.2	.2	.3	.4	.5	.3	.4	.4
				BT50	n (min^{-1})	1,590	1,270	990	800	640	800	640	510
					v_c (SFM)	312	332	324	314	335	314	335	334
					v_f (IPM)	25	20	23	19	20	13	15	12
					f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008
					a_p (inch)	.039	.039	.039	.059	.059	.079	.079	.079
					a_e (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.2	.2	.3	.5	.7	.4	.7	.7

Work mateiral	Insert grade	Cutting Speed (SFM)	Feed per tooth (IPT)	Spindle size	Diameter Metric / Inch	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ63mm or 2.5"
					Insert size	R4mm	R5mm	R5mm	R6mm	R6mm	R8mm	R8mm	R8mm
					Flute No.	2	2	3	3	4	2	3	3
Stainless steel	JM4160	492～787	.0079～.0315	BT40	*n* (min^{-1})	3,180	2,550	1,990	1,590	1,270	1,590	1,270	1,010
					vc (SFM)	624	667	651	624	665	624	665	661
					vf (IPM)	63	50	59	56	60	38	45	36
					fz (IPT)	.010	.010	.010	.012	.012	.012	.012	.012
					ap (inch)	.059	.059	.059	.079	.079	.079	.079	.079
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.8	.9	1.3	2.0	2.8	1.3	2.1	2.1
				BT50	*n* (min^{-1})	2,860	2,290	1,790	1,430	1,150	1,430	1,150	910
					vc (SFM)	561	599	585	561	602	561	602	595
					vf (IPM)	68	54	63	84	91	68	81	64
					fz (IPT)	.012	.012	.012	.020	.020	.024	.024	.024
					ap (inch)	.059	.059	.059	.079	.079	.098	.098	.098
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.9	1.0	1.4	3.0	4.3	3.0	4.8	4.8
Cast iron	JS4060 JS4045 JP4120	328～722	.0118～.0394	BT40	*n* (min^{-1})	2,860	2,290	1,790	1,430	1,150	1,430	1,150	910
					vc (SFM)	561	599	585	561	602	561	602	595
					vf (IPM)	90	72	85	84	91	56	68	54
					fz (IPT)	.016	.016	.016	.020	.020	.020	.020	.020
					ap (inch)	.059	.059	.059	.079	.079	.079	.079	.079
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	1.2	1.3	1.9	3.0	4.3	2.0	3.2	3.2
				BT50	*n* (min^{-1})	2,860	2,290	1,790	1,430	1,150	1,430	1,150	910
					vc (SFM)	561	599	585	561	602	561	602	595
					vf (IPM)	113	90	106	135	145	90	109	86
					fz (IPT)	.020	.020	.020	.031	.031	.031	.031	.031
					ap (inch)	.059	.059	.059	.079	.079	.098	.098	.098
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	1.5	1.6	2.3	4.8	6.8	4.0	6.4	6.3
Hardened steel (45～50HRC)	JP4120 JP4105	197～328	.0059～.0018	BT40	*n* (min^{-1})	1,270	1,020	800	640	510	640	510	400
					vc (SFM)	249	267	262	251	267	251	267	262
					vf (IPM)	15	12	14	11	12	9	10	8
					fz (IPT)	.006	.006	.006	.006	.006	.007	.007	.007
					ap (inch)	.039	.039	.039	.039	.039	.059	.059	.059
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.13	.14	.21	.20	.28	.23	.36	.36
				BT50	*n* (min^{-1})	1,270	1,020	800	640	510	640	510	400
					vc (SFM)	249	267	262	251	267	251	267	262
					vf (IPM)	15	12	14	13	14	10	12	9
					fz (IPT)	0.006	0.006	0.006	0.007	0.007	0.008	0.008	0.008
					ap (inch)	0.039	0.039	0.039	0.039	0.039	0.059	0.059	0.059
					ae (inch)	0.225	0.300	0.375	0.450	0.600	0.450	0.600	0.750
					Q (in^3/min)	.13	.14	.21	.23	.32	.27	.43	.42
Hardened steel (50～60HRC)	JP4105 JP4120	164～328	.0020～.0079	BT40	*n* (min^{-1})	1,110	890	690	550	440	550	440	350
					vc (SFM)	218	233	226	216	230	216	230	229
					vf (IPM)	9	7	8	6	7	4	5	4
					fz (IPT)	.004	.004	.004	.004	.004	.004	.004	.004
					ap (inch)	.039	.039	.039	.039	.039	.039	.039	.039
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.1	.1	.1	.1	.2	.1	.1	.1
				BT50	*n* (min^{-1})	1,110	890	690	550	440	550	440	350
					vc (SFM)	218	233	226	216	230	216	230	229
					vf (IPM)	9	7	8	6	7	4	5	4
					fz (IPT)	.004	.004	.004	.004	.004	.004	.004	.004
					ap (inch)	.039	.039	.039	.039	.039	.039	.039	.039
					ae (inch)	.225	.300	.375	.450	.600	.450	.600	.750
					Q (in^3/min)	.08	.08	.12	.12	.16	.08	.12	.12

【Note】 Upon usage, please refer to comments and notes below table on page C109.

Easy Cut Radius Mill AR

ARB/IARB Bore type | **AR** Bore type

Inch

※ Red indicates primary recommended grade.

Work mateiral	Insert grade	Cutting Speed (SFM)	Feed per tooth (IPT)	Spindle size	Diameter Metric / Inch	ϕ40mm or ϕ1.5"	ϕ50mm or ϕ2.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ125mm or ϕ5.0"
					Insert size	R6mm	R6mm	R6mm	R6mm	R6mm	R8mm	R6mm	R6mm	R6mm
					Flute No.	3	5	6	6	5	3	4	5	5
Mild steel (<200HB)	(JS4060) JS4045 CY250	492 ~ 820	.0118 ~ .0315	BT40	n (min^{-1})	1,990	1,590	1,260	-	-	1,260	-	-	-
					v_c (SFM)	781	832	824	-	-	824	-	-	-
					v_f (IPM)	118	156	149	-	-	74	-	-	-
					f_z (IPT)	.020	.020	.020	-	-	.020	-	-	-
					a_p (inch)	.079	.079	.079	-	-	.079	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	4.2	7.4	8.8	-	-	4.4	-	-	-
				BT50	n (min^{-1})	1,990	1,590	1,260	1,000	800	1,260	1,000	800	640
					v_c (SFM)	781	832	824	785	837	824	785	837	837
					v_f (IPM)	188	250	238	189	126	119	126	126	121
					f_z (IPT)	.031	.031	.031	.031	.031	.031	.031	.031	.031
					a_p (inch)	.079	.079	.079	.079	.079	.098	.098	.098	.098
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	11.1	19.7	23.4	22.3	19.8	14.6	15.5	15.5	14.9
Carbon steel Alloy steel (<30HRC)	(JS4060) JS4045 CY250	394 ~ 754	.0118 ~ .0315	BT40	n (min^{-1})	1,590	1,270	1,010	-	-	1,010	-	-	-
					v_c (SFM)	624	665	661	-	-	661	-	-	-
					v_f (IPM)	75	100	95	-	-	48	-	-	-
					f_z (IPT)	.016	.016	.016	-	-	.016	-	-	-
					a_p (inch)	.079	.079	.079	-	-	.079	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	2.7	4.7	5.6	-	-	2.8	-	-	-
				BT50	n (min^{-1})	1,590	1,270	1,010	800	640	1,010	800	640	510
					v_c (SFM)	624	665	661	628	670	661	628	670	667
					v_f (IPM)	113	150	143	113	76	84	88	88	84
					f_z (IPT)	.024	.024	.024	.024	.024	.028	.028	.028	.028
					a_p (inch)	.079	.079	.079	.079	.079	.098	.098	.098	.098
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	6.7	11.8	14.1	13.4	11.9	10.3	10.9	10.9	10.4
Carbon steel Alloy steel (30~ 40HRC)	(JS4060) JS4045 CY250	328 ~ 656	.0079 ~ .0236	BT40	n (min^{-1})	1,190	960	760	-	-	760	-	-	-
					v_c (SFM)	467	502	497	-	-	497	-	-	-
					v_f (IPM)	28	38	36	-	-	18	-	-	-
					f_z (IPT)	.008	.008	.008	-	-	.008	-	-	-
					a_p (inch)	.079	.079	.079	-	-	.079	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	1.0	1.8	2.1	-	-	1.1	-	-	-
				BT50	n (min^{-1})	1,190	960	760	600	480	760	600	480	380
					v_c (SFM)	467	502	497	471	502	497	471	502	497
					v_f (IPM)	42	57	54	43	28	36	38	38	36
					f_z (IPT)	.012	.012	.012	.012	.012	.016	.016	.016	.016
					a_p (inch)	.079	.079	.079	.079	.079	.098	.098	.098	.098
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	2.5	4.5	5.3	5.0	4.5	4.4	4.7	4.7	4.4
Carbon steel Alloy steel (40~ 45HRC)	(JP4120) JS4045 CY250	197 ~ 492	.0059 ~ .0118	BT40	n (min^{-1})	800	640	510	-	-	510	-	-	-
					v_c (SFM)	314	335	334	-	-	334	-	-	-
					v_f (IPM)	19	25	24	-	-	9	-	-	-
					f_z (IPT)	.008	.008	.008	-	-	.006	-	-	-
					a_p (inch)	.059	.059	.059	-	-	.079	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	.50	.89	1.1	-	-	.53	-	-	-
				BT50	n (min^{-1})	800	640	510	400	320	510	400	320	250
					v_c (SFM)	314	335	334	314	335	334	314	335	327
					v_f (IPM)	19	25	24	19	13	12	13	13	12
					f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008
					a_p (inch)	.059	.059	.059	.059	.059	.079	.079	.079	.079
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	.84	1.5	1.8	1.7	1.5	1.2	1.2	1.2	1.2

Work mateiral	Insert grade	Cutting Speed (SFM)	Feed per tooth (IPT)	Spindle size	Diameter Metric / Inch	ϕ40mm or ϕ1.5"	ϕ50mm or ϕ2.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ125mm or ϕ5.0"
					Insert size	R6mm	R6mm	R6mm	R6mm	R6mm	R8mm	R6mm	R6mm	R6mm
					Flute No.	3	5	6	6	5	3	4	5	5
Stainless steel	(JM4160) JS4045 CY250	492 ～ 787	.0079 ～ .0315	BT40	n (min^{-1})	1,590	1,270	1,010	-	-	1,010	-	-	-
					v_c (SFM)	624	665	661	-	-	661	-	-	-
					v_f (IPM)	56	75	72	-	-	36	-	-	-
					f_z (IPT)	.012	.012	.012	-	-	.012	-	-	-
					a_p (inch)	.079	.079	.079	-	-	.079	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	2.0	3.5	4.2	-	-	2.1	-	-	-
				BT50	n (min^{-1})	1,430	1,150	910	720	570	910	720	570	460
					v_c (SFM)	561	602	595	565	597	595	565	597	602
					v_f (IPM)	84	113	107	85	56	64	68	67	65
					f_z (IPT)	.020	.020	.020	.020	.020	.024	.024	.024	.024
					a_p (inch)	.079	.079	.079	.079	.079	.098	.098	.098	.098
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	5.0	8.9	10.6	10.0	8.8	7.9	8.4	8.3	8.0
Cast iron	(JS4060) JS4045 CY250 (JP4120)	328 ～ 722	.0118 ～ .0394	BT40	n (min^{-1})	1,430	1,150	910	-	-	910	-	-	-
					v_c (SFM)	561	602	595	-	-	595	-	-	-
					v_f (IPM)	84	113	107	-	-	54	-	-	-
					f_z (IPT)	.020	.020	.020	-	-	.020	-	-	-
					a_p (inch)	.079	.079	.079	-	-	.079	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	3.0	5.3	6.3	-	-	3.2	-	-	-
				BT50	n (min^{-1})	1,430	1,150	910	720	570	910	720	570	460
					v_c (SFM)	561	602	595	565	597	595	565	597	602
					v_f (IPM)	135	181	172	136	90	86	91	90	87
					f_z (IPT)	.031	.031	.031	.031	.031	.031	.031	.031	.031
					a_p (inch)	.079	.079	.079	.079	.079	.098	.098	.098	.098
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	8.0	14.3	16.9	16.1	14.1	10.6	11.2	11.0	10.7
Hardened steel (45～ 50HRC)	(JP4120) (JP4105) JS4045 CY250	197 ～ 328	.0059 ～ .0018	BT40	n (min^{-1})	640	510	400	-	-	400	-	-	-
					v_c (SFM)	251	267	262	-	-	262	-	-	-
					v_f (IPM)	15	20	19	-	-	8	-	-	-
					f_z (IPT)	.008	.008	.008	-	-	.007	-	-	-
					a_p (inch)	.039	.039	.039	-	-	.059	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	.27	.47	.56	-	-	.36	-	-	-
				BT50	n (min^{-1})	640	510	400	320	250	400	320	250	200
					v_c (SFM)	251	267	262	251	262	262	251	262	262
					v_f (IPM)	15	20	19	15	10	9	10	10	9
					f_z (IPT)	.008	.008	.008	.008	.008	.008	.008	.008	.008
					a_p (inch)	.039	.039	.039	.039	.039	.059	.059	.059	.059
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	.45	.79	.93	.89	.78	.70	.74	.73	.70
Hardened steel (50～ 60HRC)	(JP4105) (JP4120) JS4045 CY250	164 ～ 328	.0020 ～ .0079	BT40	n (min^{-1})	550	440	350	270	220	350	-	-	-
					v_c (SFM)	216	230	229	-	-	229	-	-	-
					v_f (IPM)	6	9	8	-	-	4	-	-	-
					f_z (IPT)	.004	.004	.004	-	-	.004	-	-	-
					a_p (inch)	.039	.039	.039	-	-	.039	-	-	-
					a_e (inch)	.450	.600	.750	-	-	.750	-	-	-
					Q (in^3/min)	.12	.20	.24	-	-	.12	-	-	-
				BT50	n (min^{-1})	550	440	350	270	220	350	270	220	170
					v_c (SFM)	216	230	229	212	230	229	212	230	222
					v_f (IPM)	6	9	8	6	4	4	4	4	4
					f_z (IPT)	.004	.004	.004	.004	.004	.004	.004	.004	.004
					a_p (inch)	.039	.039	.039	.039	.039	.039	.039	.039	.039
					a_e (inch)	.750	1.000	1.250	1.500	2.000	1.250	1.250	1.250	1.250
					Q (in^3/min)	.19	.34	.41	.38	.34	.20	.21	.21	.20

【Note】 Upon usage, please refer to comments and notes below table on page C109.

Easy Cut Radius Mill AR

ARM
Modular

Inch

※ Red indicates primary recommended grade.

Work mateiral	Insert grade	Cutting Speed (SFM)	Feed per tooth (IPT)	Spindle size	Diameter Metric / Inch	ϕ12mm or 0.5"	ϕ16mm or 5/8"	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"
					Insert size	R2.5mm	R3.5mm	R4.0mm	R5.0mm	R5.0mm	R5.0mm
					Flute No.	3	2	2	2	3	4
Mild steel (<200HB)	(JS4060) JS4045 CY250	492 ~ 820	.0118 ~ .0315	BT40	n (min^{-1})	6,630	4,970	3,980	3,180	2,490	1,990
					v_c (SFM)	867	813	781	832	814	496
					v_f (IPM)	78	78	125	100	118	125
					f_z (IPT)	.004	.008	.016	.016	.016	.016
					a_p (inch)	.039	.039	.059	.059	.059	.059
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.77	.96	1.67	1.77	2.61	3.33
				BT50	n (min^{-1})	6,630	4,970	3,980	3,180	2,490	1,990
					v_c (SFM)	867	813	781	832	814	74
					v_f (IPM)	78	78	125	100	118	125
					f_z (IPT)	.004	.008	.016	.016	.016	.016
					a_p (inch)	.020	.039	.059	.059	.059	.059
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.39	.96	1.67	1.77	2.61	3.33
Carbon steel Alloy steel (<30HRC)	(JS4060) JS4045 CY250	394 ~ 754	.0118 ~ .0315	BT40	n (min^{-1})	5,310	3,980	3,180	2,550	1,990	1,590
					v_c (SFM)	695	651	624	667	651	67
					v_f (IPM)	63	63	100	80	94	100
					f_z (IPT)	.004	.008	.016	.016	.016	.016
					a_p (inch)	.020	.039	.059	.059	.059	.059
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.31	.77	1.33	1.42	2.08	2.66
				BT50	n (min^{-1})	5,310	3,980	3,180	2,550	1,990	1,590
					v_c (SFM)	695	651	624	667	651	89
					v_f (IPM)	63	63	100	80	94	100
					f_z (IPT)	.004	.008	.016	.016	.016	.016
					a_p (inch)	.020	.039	.059	.059	.059	.059
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.31	.77	1.33	1.42	2.08	2.66
Carbon steel Alloy steel (30～40HRC)	(JS4060) JS4045 CY250	328 ~ 656	.0079 ~ .0236	BT40	n (min^{-1})	3,980	2,980	2,390	1,910	1,490	1,190
					v_c (SFM)	521	487	469	500	487	247
					v_f (IPM)	38	35	75	60	70	75
					f_z (IPT)	.003	.006	.016	.016	.016	.016
					a_p (inch)	.020	.039	.059	.059	.059	.059
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.19	.43	1.00	1.07	1.56	1.99
				BT50	n (min^{-1})	3,980	2,980	2,390	1,910	1,490	1,190
					v_c (SFM)	521	487	469	500	487	267
					v_f (IPM)	38	35	56	45	53	56
					f_z (IPT)	.003	.006	.012	.012	.012	.012
					a_p (inch)	.020	.039	.012	.012	.012	.012
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.19	.43	.15	.16	.23	.30
Carbon steel Alloy steel (40～45HRC)	(JP4120) JS4045 CY250	197 ~ 492	.0059 ~ .0118	BT40	n (min^{-1})	2,650	1,990	1,590	1,270	990	800
					v_c (SFM)	347	325	312	332	324	0
					v_f (IPM)	25	24	19	15	18	19
					f_z (IPT)	.003	.006	.006	.006	.006	.006
					a_p (inch)	.020	.024	.039	.039	.039	.039
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.12	.17	.17	.18	.26	.33
				BT50	n (min^{-1})	2,650	1,990	1,590	1,270	990	800
					v_c (SFM)	347	325	312	332	324	299
					v_f (IPM)	25	24	25	20	23	25
					f_z (IPT)	.003	.006	.008	.008	.008	.008
					a_p (inch)	.020	.024	.039	.039	.039	.039
					a_e (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.12	.17	.22	.24	.35	.45

Work mateiral	Insert grade	Cutting Speed (SFM)	Feed per tooth (IPT)	Spindle size	Diameter Metric / Inch	ϕ12mm or 0.5"	ϕ16mm or 5/8"	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"
					Insert size	R2.5mm	R3.5mm	R4.0mm	R5.0mm	R5.0mm	R5.0mm
					Flute No.	3	2	2	2	3	4
Stainless steel	(JM4160) JS4045 CY250	492～787	.0079～.0315	BT40	*n* (min^{-1})	4,770	3,580	3,180	2,550	1,990	1,590
					vc (SFM)	624	585	624	667	651	53
					vf (IPM)	56	56	63	50	59	63
					fz (IPT)	.004	.008	.010	.010	.010	.010
					ap (inch)	.020	.039	.059	.059	.059	.059
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.28	.69	.83	.89	1.30	1.66
				BT50	*n* (min^{-1})	4,770	3,580	2,860	2,290	1,790	1,430
					vc (SFM)	624	585	561	599	585	48
					vf (IPM)	56	56	68	54	63	68
					fz (IPT)	.004	.008	.012	.012	.012	.012
					ap (inch)	.020	.039	.059	.059	.059	.059
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.28	.69	.90	.96	1.40	1.80
Cast iron	(JS4060) JS4045 CY250 (JP4120)	328～722	.0118～.0394	BT40	*n* (min^{-1})	4,770	3,580	2,860	2,290	1,790	1,430
					vc (SFM)	624	585	561	599	585	28
					vf (IPM)	56	56	90	0	0	0
					fz (IPT)	0.004	0.008	0.016	0.000	0.000	0.000
					ap (inch)	0.020	0.039	0.059	0.059	0.059	0.059
					ae (inch)	0.250	0.313	0.225	0.300	0.375	0.450
					Q (in^3/min)	.28	.69	1.20	.00	.00	.00
				BT50	*n* (min^{-1})	4,770	3,580	2,860	2,290	1,790	1,430
					vc (SFM)	624	585	561	599	585	28
					vf (IPM)	56	56	113	90	106	113
					fz (IPT)	.004	.008	.020	.020	.020	.020
					ap (inch)	.020	.039	.059	.059	.059	.059
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.28	.69	1.50	1.60	2.34	2.99
Hardened steel (45～50HRC)	(JP4120) (JP4105) JS4045 CY250	197～328	.0059～.0018	BT40	*n* (min^{-1})	2,120	1,590	1,270	1,020	800	640
					vc (SFM)	277	260	249	267	262	0
					vf (IPM)	20	13	15	12	14	15
					fz (IPT)	.003	.004	.006	.006	.006	.006
					ap (inch)	.012	.020	.039	.039	.039	.039
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.06	.08	.13	.14	.21	.27
				BT50	*n* (min^{-1})	2,120	1,590	1,270	1,020	800	640
					vc (SFM)	277	260	249	267	262	0
					vf (IPM)	20	13	15	12	14	15
					fz (IPT)	.003	.004	.006	.006	.006	.006
					ap (inch)	.012	.020	.039	.039	.039	.039
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.06	.08	.13	.14	.21	.27
Hardened steel (50～60HRC)	(JP4105) (JP4120) JS4045 CY250	164～328	.0020～.0079	BT40	*n* (min^{-1})	1,860	1,390	1,110	890	690	560
					vc (SFM)	243	227	218	233	226	0
					vf (IPM)	11	11	9	7	8	9
					fz (IPT)	.002	.004	.004	.004	.004	.004
					ap (inch)	.012	.012	.039	.039	.039	.039
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.03	.04	.08	.08	.12	.16
				BT50	*n* (min^{-1})	1,860	1,390	1,110	890	690	560
					vc (SFM)	243	227	218	233	226	0
					vf (IPM)	11	11	9	7	8	9
					fz (IPT)	.002	.004	.004	.004	.004	.004
					ap (inch)	.012	.012	.039	.039	.039	.039
					ae (inch)	.250	.313	.225	.300	.375	.450
					Q (in^3/min)	.03	.04	.08	.08	.12	.16

【Note】 Upon usage, please refer to comments and notes below table on page C109.

Easy Cut Radius Mill AR

ARS/IARS	ARL/IARL	ARE/IARE
Regular	Long	Extra long

Metric < Shoulder Milling >

※ Red indicates primary recommended grade.

Work mateiral	Insert grade	Cutting Speed (m/min)	Feed per tooth (mm/t)	Spindle size	Diameter Metric / Inch	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ63mm or 2.5"
					Insert size	R4mm	R5mm	R5mm	R6mm	R6mm	R8mm	R8mm	R8mm
					Flute No.	2	2	3	3	4	2	3	3
Mild steel (<200HB)	(JS4060) JS4045 CY250	150～250	0.3～0.8	BT40	n (min-1)	3,980	3,180	2,490	1,990	1,590	1,990	1,590	1,260
					vc (m/min)	250	250	250	250	250	250	250	250
					vf (mm/min)	3,180	2,540	2,990	2990	3180	1990	2390	1,890
					fz (mm/t)	0.4	0.4	0.4	0.5	0.5	0.5	0.5	1
					ap (mm)	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
					ae (mm)	6	8	10	12	15	12	15	19
					Q (cm3/min)	28.6	28.6	43.1	71.8	95.4	47.8	71.7	71.4
				BT50	n (min-1)	3,980	3,180	2,490	1,990	1,590	1,990	1,590	1,260
					vc (m/min)	250	250	250	250	250	250	250	250
					vf (mm/min)	3,180	2,540	2,990	4,780	5,090	3180	3820	3,020
					fz (mm/t)	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8
					ap (mm)	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5
					ae (mm)	10	13	16	20	25	20	25	32
					Q (cm3/min)	48	48	72	191	155	159	238.8	238
Carbon steel Alloy steel (<30HRC)	(JS4060) JS4045 CY250	120～230	0.3～0.8	BT40	n (min-1)	3,180	2,550	1,990	1,590	1,270	1,590	1,270	1,010
					vc (m/min)	200	200	200	200	200	200	200	200
					vf (mm/min)	2,540	2,040	2,390	1910	2030	1270	1520	1,210
					fz (mm/t)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0
					ap (mm)	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
					ae (mm)	6	8	10	12	15	12	15	19
					Q (cm3/min)	22.9	23.0	34.4	45.8	60.9	30.5	45.6	45.7
				BT50	n (min-1)	3,180	2,550	1,990	1,590	1,270	1,590	1,270	1,010
					vc (m/min)	200	200	200	200	200	200	200	200
					vf (mm/min)	22,540	2,040	2,390	2860	3050	1910	2290	2,120
					fz (mm/t)	0.4	0.4	0.4	0.6	0.6	0.6	0.6	0.7
					ap (mm)	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5
					ae (mm)	10	13	16	20	25	20	25	32
					Q (cm3/min)	38.1	38.3	57.4	114.4	152.5	95.5	143.1	167.0
Carbon steel Alloy steel (30～40HRC)	(JS4060) JS4045 CY250	100～200	0.2～0.6	BT40	n (min-1)	2,390	1,910	1,490	1,190	960	1,190	960	760
					vc (m/min)	150	150	150	150	150	150	150	150
					vf (mm/min)	960	760	890	710	770	480	580	460
					fz (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0
					ap (mm)	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
					ae (mm)	6	8	10	12	15	12	15	19
					Q (cm3/min)	8.6	8.6	12.8	17.0	23.1	11.5	17.4	17.4
				BT50	n (min-1)	2,390	1,910	1,490	1,190	960	1,190	960	760
					vc (m/min)	150	150	150	150	150	150	150	150
					vf (mm/min)	1,430	1,150	1,340	1070	1150	950	1150	910
					fz (mm/t)	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
					ap (mm)	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5
					ae (mm)	10	13	16	20	25	20	25	32
					Q (cm3/min)	22	22	32	42.8	57.5	47.5	71.9	72
Carbon steel Alloy steel (40～45HRC)	(JP4120) JS4045 CY250	60～150	0.15～0.3	BT40	n (min-1)	1,590	1,270	990	800	640	800	640	510
					vc (m/min)	100	100	100	100	100	100	100	100
					vf (mm/min)	480	380	450	360	380	240	290	230
					fz (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
					ap (mm)	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5
					ae (mm)	6	8	10	12	15	12	15	19
					Q (cm3/min)	2.9	2.9	4.3	6.5	8.6	4.3	6.5	6.5
				BT50	n (min-1)	1,590	1,270	990	800	640	800	640	510
					vc (m/min)	100	100	100	100	100	100	100	100
					vf (mm/min)	640	510	590	480	510	320	380	310
					fz (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
					ap (mm)	1.0	1.0	1.0	1.5	1.5	2.0	2.0	2.0
					ae (mm)	10	13	16	20	25	20	25	32
					Q (cm3/min)	6.4	6.4	9.4	14.4	19.1	12.8	19.0	19.5

Work mateiral	Insert grade	Cutting Speed (m/min)	Feed per tooth (mm/t)	Spindle size	Diameter Metric / Inch	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ40mm or 1.5"	ϕ50mm or 2.0"	ϕ63mm or 2.5"
					Insert size	R4mm	R5mm	R5mm	R6mm	R6mm	R8mm	R8mm	R8mm
					Flute No.	2	2	3	3	4	2	3	3
Stainless steel	(JM4160) JS4045 CY250	150～240	0.2～0.8	BT40	n (min^{-1})	3,180	2,550	1,990	1,590	1,270	1,590	1,270	1,010
					v_c (m/min)	200	200	200	200	200	200	200	200
					v_f (mm/min)	1,590	1,280	1,490	1430	1520	950	1140	910
					f_z (mm/t)	0.25	0.25	0.25	0.3	0.3	0.3	0.3	0.3
					a_p (mm)	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
					a_e (mm)	6	8	10	12	15	12	15	19
					Q (cm^3/min)	14.3	14.4	21.5	34.3	45.6	22.8	34.2	34.4
				BT50	n (min^{-1})	2,860	2,290	1,790	1,430	1,150	1,430	1,150	910
					v_c (m/min)	180	180	180	180	180	180	180	180
					v_f (mm/min)	1,716	1,370	1,610	2150	2300	1720	2070	1,640
					f_z (mm/t)	0.3	0.3	0.3	0.5	0.5	0.6	0.6	0.6
					a_p (mm)	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5
					a_e (mm)	10	13	16	20	25	20	25	32
					Q (cm^3/min)	25.7	25.7	38.6	86.0	115.0	86.0	129.4	129.2
Cast iron	(JS4060) JS4045 CY250 (JP4120)	100～220	0.3～1.0	BT40	n (min^{-1})	2,860	2,290	1,790	1,430	1,150	1,430	1,150	910
					v_c (m/min)	180	180	180	180	180	180	180	180
					v_f (mm/min)	2,290	1,830	2,150	2150	2300	1430	1730	1,370
					f_z (mm/t)	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5
					a_p (mm)	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0
					a_e (mm)	6	8	10	12	15	12	15	19
					Q (cm^3/min)	20.6	20.6	31.0	51.6	69.0	34.3	51.9	51.8
				BT50	n (min^{-1})	2,860	2,290	1,790	1,430	1,150	1,430	1,150	910
					v_c (m/min)	180	180	180	180	180	180	180	180
					v_f (mm/min)	2860	2290	2690	3430	3680	2290	2760	2,180
					f_z (mm/t)	0.5	0.5	0.5	0.8	0.8	0.8	0.8	0.8
					a_p (mm)	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5
					a_e (mm)	10	13	16	20	25	20	25	32
					Q (cm^3/min)	42.9	42.9	64.6	137.2	184.0	114.5	172.5	171.7
Hardened steel (45～50HRC)	(JP4120) (JP4105) JS4045 CY250	60～100	0.15～0.3	BT40	n (min^{-1})	1,270	1,020	800	640	510	640	510	400
					v_c (m/min)	80	80	80	80	80	80	80	80
					v_f (mm/min)	380	310	360	290	310	220	260	200
					f_z (mm/t)	0.15	0.15	0.15	0.15	0.15	0.17	0.17	0.17
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.50	1.50	1.50
					a_e (mm)	6	8	10	12	15	12	15	19
					Q (cm^3/min)	2.3	2.3	3.5	3.5	4.7	4.0	5.9	5.7
				BT50	n (min^{-1})	1,270	1,020	800	640	510	640	510	400
					v_c (m/min)	80	80	80	80	80	80	80	80
					v_f (mm/min)	380	310	360	330	350	260	310	240
					f_z (mm/t)	0.15	0.15	0.15	0.17	0.17	0.2	0.2	0.2
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.50	1.50	1.50
					a_e (mm)	10	13	16	20	25	20	25	32
					Q (cm^3/min)	3.8	3.9	5.8	6.6	8.8	7.8	11.6	11.3
Hardened steel (50～60HRC)	(JP4105) (JP4120) JS4045 CY250	50～100	0.05～0.2	BT40	n (min^{-1})	1,110	890	690	550	440	550	440	350
					v_c (m/min)	70	70	70	70	70	70	70	70
					v_f (mm/min)	220	170	200	160	170	110	130	100
					f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
					a_e (mm)	6	8	10	12	15	12	15	19
					Q (cm^3/min)	1.3	1.2	1.9	1.9	2.5	1.3	1.9	1.9
				BT50	n (min^{-1})	1,110	890	690	550	440	550	440	350
					v_c (m/min)	70	70	70	70	70	70	70	70
					v_f (mm/min)	220	170	200	160	440	110	130	100
					f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
					a_e (mm)	10	13	16	20	25	20	25	32
					Q (cm^3/min)	2.2	2.1	3.2	3.2	4.2	2.2	3.2	3.1

【Note】 Upon usage, please refer to comments and notes below table on page C109.

Easy Cut Radius Mill AR

ARB/IARB	AR
Bore type	Bore type

Metric

※ Red indicates primary recommended grade.

Work mateiral	Insert grade	Cutting Speed (m/min)	Feed per tooth (mm/t)	Spindle size	Diameter Metric / Inch	ϕ40mm or ϕ1.5"	ϕ50mm or ϕ2.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ125mm or ϕ5.0"
					Insert size	R6mm	R6mm	R6mm	R6mm	R6mm	R8mm	R6mm	R6mm	R6mm
					Flute No.	3	5	6	6	5	3	4	5	5
Mild steel (<200HB)	(JS4060) JS4045 CY250	150 ~ 250	0.3 ~ 0.8	BT40	n (min-1)	1,990	1,590	1,260	-	-	1,260	-	-	-
					vc (m/min)	250	250	250	-	-	250	-	-	-
					vf (mm/min)	2,990	3,975	3,780	-	-	1,890	-	-	-
					fz (mm/t)	0.5	0.5	0.5	-	-	0.5	-	-	-
					ap (mm)	2.0	2.0	2.0	-	-	2.0	-	-	-
					ae (mm)	12	15	19	-	-	12	-	-	-
					Q (cm3/min)	71.8	95.4	142.9	-	-	71.4	-	-	-
				BT50	n (min-1)	1,990	1,590	1,260	1,000	800	1,260	1,000	800	640
					vc (m/min)	250	250	250	250	250	250	250	250	250
					vf (mm/min)	4,780	6,360	6,050	4,800	3,200	3,020	3,200	3,200	3,070
					fz (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
					ap (mm)	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5
					ae (mm)	20	25	32	40	50	20	25	32	40
					Q (cm3/min)	191.2	254.5	381.2	384.0	320.0	238	320	400	480
Carbon steel Alloy steel (<30HRC)	(JS4060) JS4045 CY250	120 ~ 230	0.3 ~ 0.8	BT40	n (min-1)	1,590	1,270	1,010	-	-	1,010	-	-	-
					vc (m/min)	200	200	200	-	-	200	-	-	-
					vf (mm/min)	1,910	2,540	2,420	-	-	1,210	-	-	-
					fz (mm/t)	0.4	0.4	0.4	-	-	0.4	-	-	-
					ap (mm)	2.0	2.0	2.0	-	-	2.0	-	-	-
					ae (mm)	12	15	19	-	-	12	-	-	-
					Q (cm3/min)	45.8	60.9	91.5	-	-	45.7	-	-	-
				BT50	n (min-1)	1,590	1,270	1,010	800	640	1,010	800	640	510
					vc (m/min)	200	200	200	200	200	200	200	200	200
					vf (mm/min)	2,860	3,810	3,640	2,880	1,920	2,120	2,240	2,240	2,140
					fz (mm/t)	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7
					ap (mm)	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5
					ae (mm)	20	25	32	40	50	20	25	32	40
					Q (cm3/min)	42.8	57.5	86.3	86	72	167.0	224.0	280.0	334
Carbon steel Alloy steel (30~ 40HRC)	(JS4060) JS4045 CY250	100 ~ 200	0.2 ~ 0.6	BT40	n (min-1)	1,190	960	760	-	-	760	-	-	-
					vc (m/min)	150	150	150	-	-	150	-	-	-
					vf (mm/min)	710	960	910	-	-	460	-	-	-
					fz (mm/t)	0.2	0.2	0.2	-	-	0.2	-	-	-
					ap (mm)	2.0	2.0	2.0	-	-	2.0	-	-	-
					ae (mm)	12	15	19	-	-	12	-	-	-
					Q (cm3/min)	17.0	23.1	34.4	-	-	17.4	-	-	-
				BT50	n (min-1)	1,190	960	760	600	480	760	600	480	380
					vc (m/min)	150	150	150	150	150	150	150	150	150
					vf (mm/min)	1,070	1,440	1,370	1,080	720	910	960	960	910
					fz (mm/t)	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
					ap (mm)	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5
					ae (mm)	20	25	32	40	50	20	25	32	40
					Q (cm3/min)	42.8	57.5	86.3	86	72	71.7	96.0	120.0	142
Carbon steel Alloy steel (40~ 45HRC)	(JP4120) JS4045 CY250	60 ~ 150	0.15 ~ 0.3	BT40	n (min-1)	800	640	510	-	-	510	-	-	-
					vc (m/min)	100	100	100	-	-	100	-	-	-
					vf (mm/min)	360	480	460	-	-	230	-	-	-
					fz (mm/t)	0.2	0.2	0.2	-	-	0.2	-	-	-
					ap (mm)	1.5	1.5	1.5	-	-	2.0	-	-	-
					ae (mm)	12	15	19	-	-	12	-	-	-
					Q (cm3/min)	6.5	8.6	13.0	-	-	6.5	-	-	-
				BT50	n (min-1)	800	640	510	400	320	510	400	320	250
					vc (m/min)	100	100	100	100	100	100	100	100	100
					vf (mm/min)	480	640	610	480	320	310	320	320	300
					fz (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
					ap (mm)	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0
					ae (mm)	20	25	32	40	50	20	25	32	40
					Q (cm3/min)	14.4	19.1	28.8	29	24	19.5	25.6	32.0	38

Work mateiral	Insert grade	Cutting Speed (m/min)	Feed per tooth (mm/t)	Spindle size	Diameter Metric / Inch	ϕ40mm or ϕ1.5"	ϕ50mm or ϕ2.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ63mm or ϕ2.5"	ϕ80mm or ϕ3.0"	ϕ100mm or ϕ4.0"	ϕ125mm or ϕ5.0"
					Insert size	R6mm	R6mm	R6mm	R6mm	R6mm	R8mm	R6mm	R6mm	R6mm
					Flute No.	3	5	6	6	5	3	4	5	5
Stainless steel	(JM4160) JS4045 CY250	150 ~ 240	0.2 ~ 0.8	BT40	n (min^{-1})	1,590	1,270	1,010	-	-	1,010	-	-	-
					v_c (m/min)	200	200	200	-	-	200	-	-	-
					v_f (mm/min)	1,430	1,905	1,820	-	-	910	-	-	-
					f_z (mm/t)	0.3	0.3	0.3	-	-	0.3	-	-	-
					a_p (mm)	2.0	2.0	2.0	-	-	2.0	-	-	-
					a_e (mm)	12	15	19	-	-	12	-	-	-
					Q (cm^3/min)	34.3	45.6	68.8	-	-	34.4	-	-	-
				BT50	n (min^{-1})	1,430	1,150	910	720	570	910	720	570	460
					v_c (m/min)	180	180	180	180	180	180	180	180	180
					v_f (mm/min)	2,150	2,875	2,730	2,160	1,430	1,640	1,730	1,710	1,660
					f_z (mm/t)	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
					a_p (mm)	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5
					a_e (mm)	20	25	32	40	50	20	25	32	40
					Q (cm^3/min)	86.0	115.0	172.0	173	143	129.2	173.0	213.8	259
Cast iron	(JS4060) JS4045 CY250 (JP4120)	100 ~ 220	0.3 ~ 1.0	BT40	n (min^{-1})	1,430	1,150	910	-	-	910	-	-	-
					v_c (m/min)	180	180	180	-	-	180	-	-	-
					v_f (mm/min)	2,150	2,875	2,730	-	-	1,370	-	-	-
					f_z (mm/t)	0.5	0.5	0.5	-	-	0.5	-	-	-
					a_p (mm)	2.0	2.0	2.0	-	-	2.0	-	-	-
					a_e (mm)	12	15	19	-	-	12	-	-	-
					Q (cm^3/min)	51.6	69.0	103.2	-	-	51.8	-	-	-
				BT50	n (min^{-1})	1,430	1,150	910	720	570	910	720	570	460
					v_c (m/min)	180	180	180	180	180	180	180	180	180
					v_f (mm/min)	3,430	4,600	4,370	3,460	2,280	2,180	2,300	2,280	2,210
					f_z (mm/t)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
					a_p (mm)	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5
					a_e (mm)	20	25	32	40	50	20	25	32	40
					Q (cm^3/min)	137.2	184.0	275.3	276.8	228	171.7	230.0	285.0	345.3
Hardened steel (45～50HRC)	(JP4120) (JP4105) JS4045 CY250	60 ~ 100	0.15 ~ 0.3	BT40	n (min^{-1})	640	510	400	-	-	400	-	-	-
					v_c (m/min)	80	80	80	-	-	80	-	-	-
					v_f (mm/min)	290	383	360	-	-	200	-	-	-
					f_z (mm/t)	0.2	0.2	0.2	-	-	0.2	-	-	-
					a_p (mm)	1.0	1.0	1.0	-	-	1.5	-	-	-
					a_e (mm)	12	15	19	-	-	12	-	-	-
					Q (cm^3/min)	3.5	4.7	6.8	-	-	5.7	-	-	-
				BT50	n (min^{-1})	640	510	400	320	250	400	320	250	200
					v_c (m/min)	80	80	80	80	80	80	80	80	80
					v_f (mm/min)	330	434	410	330	210	240	260	250	240
					f_z (mm/t)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	20	25	32	40	50	20	25	32	40
					Q (cm^3/min)	6.6	8.8	12.9	13.2	10.5	11.3	15.6	18.8	22.5
Hardened steel (50～60HRC)	(JP4105) (JP4120) JS4045 CY250	50 ~ 100	0.05 ~ 0.2	BT40	n (min^{-1})	550	440	350	270	220	350	-	-	-
					v_c (m/min)	70	70	70	70	70	70	-	-	-
					v_f (mm/min)	160	220	210	160	110	100	-	-	-
					f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-
					a_e (mm)	12	15	19	24	30	12	-	-	-
					Q (cm^3/min)	1.9	2.5	3.9	3.8	3.3	1.9	-	-	-
				BT50	n (min^{-1})	550	440	350	270	220	350	270	220	170
					v_c (m/min)	70	70	70	70	70	70	70	70	70
					v_f (mm/min)	160	220	210	160	110	100	110	110	100
					f_z (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
					a_p (mm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
					a_e (mm)	20	25	32	40	50	20	25	32	40
					Q (cm^3/min)	3.2	4.2	6.6	6.4	5.5	3.1	4.4	5.5	6.2

【Note】 Upon usage, please refer to comments and notes below table on page C109.

Easy Cut Radius Mill AR

ARM
Modular

Metric

※ Red indicates primary recommended grade.

Work mateiral	Insert grade	Cutting Speed (m/min)	Feed per tooth (mm/t)	Spindle size	Diameter Metric / Inch	ϕ12mm or 0.5"	ϕ16mm or 5/8"	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"
					Insert size	R2.5mm	R3.5mm	R4.0mm	R5.0mm	R5.0mm	R5.0mm
					Flute No.	3	2	2	2	3	4
Mild steel (<200HB)	(JS4060) JS4045 CY250	150～250	0.1～0.8	BT40	n (min^{-1})	6,630	4,970	3,980	3,180	2,490	1,990
					v_c (m/min)	250	250	250	250	250	250
					v_f (mm/min)	1,990	1,990	3,180	2,540	2,990	3,180
					f_z (mm/t)	0.1	0.2	0.4	0.4	0.4	0.4
					a_p (mm)	1.0	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	6.0		28.6	28.6	43.1	57.2
				BT50	n (min^{-1})	6,630	4,970	3,980	3,180	2,490	1,990
					v_c (m/min)	250	250	250	250	250	250
					v_f (mm/min)	1,990	1,990	3,180	2,540	2,990	3,180
					f_z (mm/t)	0.1	0.2	0.4	0.4	0.4	0.4
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	6	16	48	48	72	95
Carbon steel Alloy steel (<30HRC)	(JS4060) JS4045 CY250	120～230	0.1～0.8	BT40	n (min^{-1})	5,310	3,980	3,180	2,550	1,990	1,590
					v_c (m/min)	200	200	200	200	200	200
					v_f (mm/min)	1,590	1,590	2,540	2,040	2,390	2,540
					f_z (mm/t)	0.1	0.2	0.4	0.4	0.4	0.4
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	4.8	12.7	22.9	23.0	34.4	45.7
				BT50	n (min^{-1})	5,310	3,980	3,180	2,550	1,990	1,590
					v_c (m/min)	200	200	200	200	200	200
					v_f (mm/min)	1,590	1,590	2,540	2,040	2,390	2,510
					f_z (mm/t)	0.1	0.2	0.4	0.4	0.4	0.4
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	4.8	12.7	38	3	57	76
Carbon steel Alloy steel (30～40HRC)	(JS4060) JS4045 CY250	100～200	0.08～0.6	BT40	n (min^{-1})	3,980	2,980	2,390	1,910	1,490	1,190
					v_c (m/min)	150	150	150	150	150	150
					v_f (mm/min)	960	890	960	760	890	950
					f_z (mm/t)	0.08	0.15	0.4	0.4	0.4	0.4
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	2.9	7.1	8.6	8.6	12.8	17.1
				BT50	n (min^{-1})	3,980	2,980	2,390	1,910	1,490	1,190
					v_c (m/min)	150	150	150	150	150	150
					v_f (mm/min)	960	890	1,430	1,150	1,340	1,430
					f_z (mm/t)	0.08	0.15	0.3	0.3	0.3	0.3
					a_p (mm)	0.5	1.0	0.3	0.3	0.3	0.3
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	2.9	7.1	21.5	21.6	32.2	42.9
Carbon steel Alloy steel (40～45HRC)	(JP4120) JS4045 CY250	60～150	0.08～0.3	BT40	n (min^{-1})	2,650	1,990	1,590	1,270	990	800
					v_c (m/min)	100	100	100	100	100	100
					v_f (mm/min)	640	600	480	380	450	480
					f_z (mm/t)	0.08	0.15	0.15	0.15	0.15	0.15
					a_p (mm)	0.5	0.6	1.0	1.0	1.0	1.0
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	1.9	2.9	2.9	2.9	4.3	5.8
				BT50	n (min^{-1})	2,650	1,990	1,590	1,270	990	800
					v_c (m/min)	100	100	100	100	100	100
					v_f (mm/min)	640	600	640	510	590	640
					f_z (mm/t)	0.08	0.15	0.2	0.2	0.2	0.2
					a_p (mm)	0.5	0.6	1.0	1.0	1.0	1.0
					a_e (mm)	6.0	8.0	10.0	12.5	16.0	20.0
					Q (cm^3/min)	1.9	2.9	6.4	6.4	9.4	12.8

Work mateiral	Insert grade	Cutting Speed (m/min)	Feed per tooth (mm/t)	Spindle size	Diameter Metric / Inch	ϕ12mm or 0.5"	ϕ16mm or 5/8"	ϕ20mm or 3/4"	ϕ25mm or 1"	ϕ32mm or 1.25"	ϕ40mm or 1.5"
					Insert size	R2.5mm	R3.5mm	R4.0mm	R5.0mm	R5.0mm	R5.0mm
					Flute No.	3	2	2	2	3	4
Stainless steel	(JM4160) JS4045 CY250	150～240	0.1～0.8	BT40	n (min^{-1})	4,770	3,580	3,180	2,550	1,990	1,590
					v_c (m/min)	180	180	200	200	200	200
					v_f (mm/min)	1,430	1,430	1,590	1,280	1,490	1,590
					f_z (mm/t)	0.1	0.2	0.25	0.25	0.25	0.25
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	4.3	11.4	14.3	14.4	21.5	28.6
				BT50	n (min^{-1})	4,770	3,580	2,860	2,290	1,790	1,430
					v_c (m/min)	180	180	180	180	180	180
					v_f (mm/min)	1,430	1,430	1,716	1,370	1,610	1,720
					f_z (mm/t)	0.1	0.2	0.3	0.3	0.3	0.3
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	4.3	11.4	25.7	25.7	38.6	51.6
Cast iron	(JS4060) JS4045 CY250 (JP4120)	100～220	0.1～1.0	BT40	n (min^{-1})	4,770	3,580	2,860	2,290	1,790	1,430
					v_c (m/min)	180	180	180	180	180	180
					v_f (mm/min)	1,430	1,430	2,290	1,830	2,150	2,290
					f_z (mm/t)	0.1	0.2	0.4			
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	4.3	11.4	20.6	20.6	31.0	41.2
				BT50	n (min^{-1})	4,770	3,580	2,860	2,290	1,790	1,430
					v_c (m/min)	180	180	180	180	180	180
					v_f (mm/min)	1,430	1,430	2,860	2,290	2,690	2,860
					f_z (mm/t)	0.1	0.2	0.5	0.5	0.5	0.5
					a_p (mm)	0.5	1.0	1.5	1.5	1.5	1.5
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	4.3	11.4	43	43	65	86
Hardened steel (45～50HRC)	(JP4120) (JP4105) JS4045 CY250	60～100	0.05～0.3	BT40	n (min^{-1})	2,120	1,590	1,270	1,020	800	640
					v_c (m/min)	80	80	80	80	80	80
					v_f (mm/min)	510	320	380	310	360	380
					f_z (mm/t)	0.08	0.1	0.15	0.15	0.15	0.15
					a_p (mm)	0.3	0.5	1.0	1.0	1.0	1.0
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	0.9	1.3	2.3	2.3	3.5	4.6
				BT50	n (min^{-1})	2,120	1,590	1,270	1,020	800	640
					v_c (m/min)	80	80	80	80	80	80
					v_f (mm/min)	510	320	380	310	360	380
					f_z (mm/t)	0.08	0.1	0.15	0.15	0.15	0.15
					a_p (mm)	0.3	0.5	1.0	1.0	1.0	1.0
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	0.9	1.3	4	4	6	8
Hardened steel (50～60HRC)	(JP4105) (JP4120) JS4045 CY250	50～100	0.05～0.2	BT40	n (min^{-1})	1,860	1,390	1,110	890	690	560
					v_c (m/min)	70	70	70	70	70	70
					v_f (mm/min)	280	280	220	170	200	230
					f_z (mm/t)	0.05	0.1	0.1	0.1	0.1	0.1
					a_p (mm)	0.3	0.3	1.0	1.0	1.0	1.0
					a_e (mm)	6	8	6	8	10	12
					Q (cm^3/min)	0.5	0.7	1.3	1.2	1.9	2.8
				BT50	n (min^{-1})	1,860	1,390	1,110	890	690	560
					v_c (m/min)	70	70	70	70	70	70
					v_f (mm/min)	280	280	220	170	200	230
					f_z (mm/t)	0.05	0.1	0.1	0.1	0.1	0.1
					a_p (mm)	0.3	0.3	1.0	1.0	1.0	1.0
					a_e (mm)	6	8	10	13	16	20
					Q (cm^3/min)	0.5	0.7	2.2	2.1	3.2	4.6

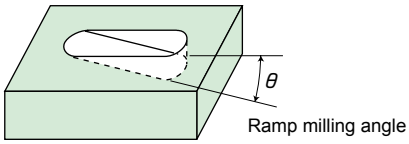
【Note】 Upon usage, please refer to comments and notes below table on page C109.

Easy Cut Radius Mill AR

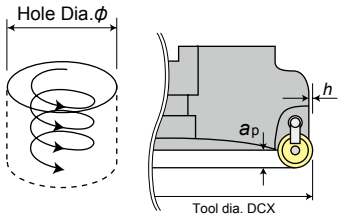
Ramping, Helical Milling, Feeding toward Z-AXIS

There are restrictions to ramp angle (θ) and cutting depth (a_p) toward Z-axis because of designs of cutting edge.

Ramping



Helical milling



ARM
Modular

Metric

DCX Tool dia.	(mm)	12(*r*2.5)	16(*r*3.5)	20(*r*4)	22(*r*4)	25(*r*5)	28(*r*5)	30(*r*5)	32(*r*5)	40(*r*5)
Maximum ramp angle	θ	Below 2 degrees		Below 3 degrees						
h	(mm)	0.8	1	1	2	2	2	0.5	1.5	2
*a*p	(mm)	0.8	1	2	3	3	3	3	3	3
Hole Dia.	(mm)	17 ~ 22	22 ~ 30	28 ~ 38	32 ~ 42	34 ~ 38	40 ~ 54	44 ~ 58	48 ~ 62	64 ~ 78

ARS / ARL / ARE
Regular / Long / Extra long

Metric

DCX Tool dia.	(mm)	20(*r*4)	25(*r*5)	32(*r*5)	40(*r*6)	50(*r*8)	63(*r*8)
Maximum ramp angle	θ	Below 3 degrees					
h	(mm)	1	2	2	2.5	2.5	2.5
*a*p	(mm)	2	3	3	3.7	4.5	5.5
Hole Dia.	(mm)	28 ~ 38	34 ~ 38	48 ~ 62	60 ~ 78	75 ~ 98	101 ~ 124

ARB / AR
Bore type / Bore type

Metric

DCX Tool dia.	(mm)	40(*r*6)	50(*r*6)	63(*r*8)	80(*r*8)	100(*r*8)	125(*r*8)
Maximum ramp angle	θ	Below 3 degrees					Below 2 degrees
h	(mm)	2.5	2.5	2.5	2.5	2.5	2.5
*a*p	(mm)	3.7	3.3	5.5	5.5	5.5	5.5
Hole Dia.	(mm)	60 ~ 78	77 ~ 100	101 ~ 124	135 ~ 158	175 ~ 198	248 ~ 255

IARS / IARL / IARE / IARB
Regular / Long / Extra long / Bore type

Inch

DCX Tool dia.	(inch)	1.000"	1.250"	1.500"	2.000"	2.500"	3.000"	4.000"	5.000"	6.000"
Maximum ramp angle	θ	Below 3 degrees							Below 2 degrees	Below 1 degrees
h	(inch)	.079	.071	.059	.098	.098	.098	.098	.098	.098
*a*p	(inch)	.165	.165	.154	.157	.197	.228	.228	.228	.228
Hole Dia.	(inch)	1.213~1.921	1.713~2.421	2.213~2.921	3.016~3.921	4.016~4.921	5.016~5.921	7.016~7.921	9.016~9.921	11.016~11.921

「JP4105」insert's grade specialized in High hardened steel is not suitable for Non-heat-treated steel material.
「JS4060」「JM4160」is recommended under heavy interrupt cutting.

【Note】

① Please note that the JS Coating does not cause a reaction in conductive touch sensors.
② Due to fire risks do not use neat cutting oil as a coolant.
③ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (a_p) or 2.reducing per-flute feed rate (f_z).
⑥ In the case of slotting, feed speed could be down to 70% of the whole.
⑦ In steel exceeding 60HRC, such as dice steel between the colds, please set the sending (f_z) value per one edge about to 1/2.

Field data

No.	Tool dia. DCX	User	Insert grade	Work material	Cutting conditions			Result
					V_c m/min n(min^{-1})	V_f mm/min f_z(mm/t)	$a_p \times a_e$:mm	
1	50	Company A	JS4060	SCM (35HRC)	188 (1,200)	2,500 (0.69)	a_p=1.0 a_e=1.0~2.0	Enabled stable semi-finishing processing approx. 10 hours.
2	32	Company B	Equivalent to JP4120	P21 (40HRC)	200 (2,000)	3,000 (0.5)	a_p=0.5 a_e=15	1.5× the tool life of conventional products.
3	80	Company C	JS4060	S50C (220HB)	120 (480)	1,150 (0.6)	a_p=1.2 a_e=50	2× the tool life of conventional products.

Features comparing with conventional product

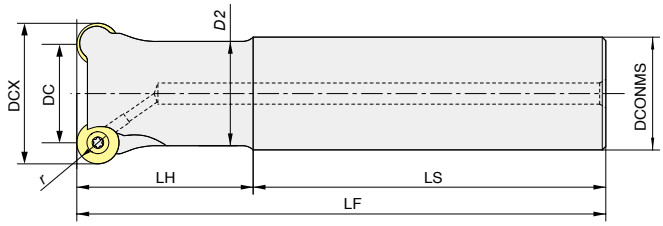
	AR type	Conventional A	Conventional B
Face milling	○	○	○
Side milling	○	○	○
Slotting	○	○	
Helical milling	○	△	
Scanning path	○	△	
Contouring path	○	○	○
Chip removal	○	△	
For difficult to cut material	○	△	△

Radius Milll RV

- Achieves secure insert indexing using our original rotation prevention mechanism.
- Suitable for difficult-to-cut materials such as stainless steel, titanium alloys, nickel-based alloys, etc.
- For cutting turbine blades

Roughing | Semi Finishing | Maximum Notch 5~6 | Planing | Slotting | Die-sinking | Profiling | Helical | Cutting Conditions C114

Straight shank type



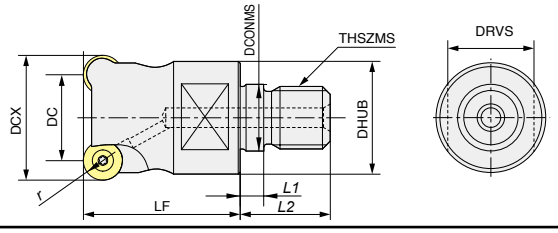
With coolant hole

Metric RV○S○○○R-○

Numeric figure in a circle ○.

	Item code	Stock	No.of flutes	Size(mm) r	DCX	DC	LF	DCONMS	LH	LS	D2	Inserts
Shank type	RV3S025R-3	★	3	5	25	15	140	25	60	80	21	RP□T10T3M0□N-□○
	RV3S032R-4	★	4	5	32	22	150	32	70	80	28	
	RV3S040R-5	★	5	5	40	30	150	32	70	80	30	
	RV4S032R-3	★	3	6	32	20	150	32	70	80	28	RP□T1204M0□N-□○
	RV4S040R-3	★	3	6	40	28	150	32	50	100	29.6	
	RV4S040R-4	★	4	6	40	28	150	32	50	100	29.6	

Modular Type



With coolant hole

Metric RV○M○○○R-○

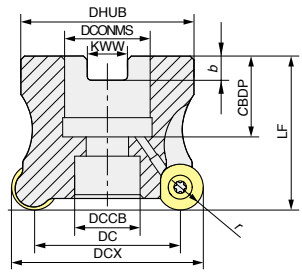
Numeric figure in a circle ○.

	Item code	Stock	No.of flutes	Size(mm) r	DCX	DC	LF	DCONMS	THSZMS	DHUB	L1	L2	DRVS	Inserts
Modular type	RV3M025R-3	★	3	5	25	15	35	12.5	M12	20.8	5.5	22	17	RP□T10T3M0□N-□○
	RV3M032R-4	★	4	5	32	22	40	17	M16	28.8	6	23	22	
	※RV3M040R-5	★	5	5	40	30	40	17	M16	28.8	6	23	22	
	RV4M032R-3	★	3	6	32	20	40	17	M16	28.8	6	23	22	RP□T1204M0□N-□○
	※RV4M040R-3	★	3	6	40	28	40	17	M16	28.8	6	23	22	
	※RV4M040R-4	★	4	6	40	28	40	17	M16	28.8	6	23	22	

【Note】 When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

● : Inventory maintained in US ★ : Inventory maintained in Japan

Bore type



With coolant hole

Inch IRV4B○○○R-○

Numeric figure in a circle ○.

Item code	Stock	No.of flutes	Size(inch)										Inserts
			r	DCX	DC	DHUB	LF	DCONMS	DCCB	KWW	*b*	CBDP	
IRV4B032R-5	●	5	6mm	2.000	1.606	.803	1.575	.750	.670	.315	.197	.748	RP□T1204M0□N-□○
IRV4B040R-6	●	6	6mm	2.500	2.106	2.303	1.575	.750	.670	.315	.197	.748	

Metric RV○B○○○R(M)-○

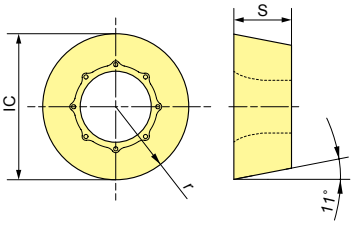
Numeric figure in a circle ○ and alphabetical character comes in a square□.

	Item code	Stock	No.of flutes	Size(mm)										Inserts
				r	DCX	DC	DHUB	LF	DCONMS	DCCB	KWW	*b*	CBDP	
Internal diameter inch size	RV4B050R-5	★	5	6	50	38	45	40	22.225	17	8.4	5	19	RP□T1204M0□N-□○
	RV4B063R-6	★	6	6	63	51	58	40	22.225	17	8.4	5	19	
	RV4B080R-7	★	7	6	80	68	76	63	31.75	26	12.7	8	32	
Internal diameter mm size	RV3B040RM-5	★	5	5	40	30	35	40	16	13.2	8.4	5.6	19	RP□T10T3M0□N-□○
	RV3B042RM-5	★	5	5	42	32	35	40	16	13.2	8.4	5.6	19	
	RV4B040RM-4	★	4	6	40	28	35	40	16	13.2	8.4	5.6	19	RP□T1204M0□N-□○
	RV4B042RM-4	★	4	6	42	30	35	40	16	13.2	8.4	5.6	19	
	RV4B050RM-5	★	5	6	50	38	45	40	22	17	10.4	6.3	20	
	RV4B063RM-6	★	6	6	63	51	58	40	22	17	10.4	6.3	20	
	RV4B080RM-7	★	7	6	80	68	76	50	27	20	12.4	7	22	

【Note】 Arbor screw is not included.

Radius Milll RV

Inserts



M	Stainless steel	■ (Dry)	■ (Wet)	■ (Dry)			■ General cutting
N	Aluminum alloy					■	
S	Titanium alloy				■		

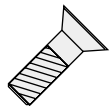
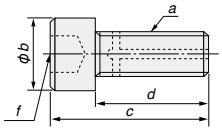
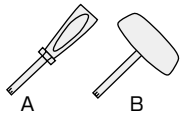
Item code	Tolerance class	AX Coating	AJ Coating	GX Coating	JS Coating	SD Coating	Size(mm)		
		AX2040	JM4160	GX2160	JS1025	SD5010	*r*	IC	S
RPET10T3M0FN-A8	E	–	–	–	★	★	5	10	3.97
RPMT10T3M0EN-B8	M	★	★	★	–	–			
RPMT10T3M0EN-C8		★	★	★	–	–			
RPHT10T3M0EN-B8	H	★	★	★	★	–			
RPHT10T3M0EN-C8		★	★	★	–	–			
RPET1204M0FN-A8	E	–	–	–	●	●	6	12	4.76
RPMT1204M0EN-B8	M	★	●	●	–	–			
RPMT1204M0EN-C8		★	●	●	–	–			
RPHT1204M0EN-B8	H	★	●	●	●	–			
RPHT1204M0EN-C8		★	●	●	–	–			

【Note】Please note that the AX Coating, GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only – : No manufactured

Parts

Numeric figure in a circle◯.

Parts		Clamp screw			Arbor screw※2						Screw driver / Wrench		Screw anti-seizure agent
Shape / Cutter body					 With air hole						 A B		
			Fastening torque (N·m)	Fastening torque (lbp·in)	Item code	a	φb	c	d	f		Shape	
Shank	RV3S0◯◯R-◯	265-141	2.0	17.7	–	–	–	–	–	–	104-T10	A	P-37
	RV4S0◯◯R-◯	262-142	2.9	25.67	–	–	–	–	–	–	104-T15	A	
Modular	RV3M0◯◯R-◯	265-141	2.0	17.7	–	–	–	–	–	–	104-T10	A	
	RV4M0◯◯R-◯	262-142	2.9	25.67	–	–	–	–	–	–	104-T15	A	
Bore inch size	IRV4B032R-5 IRV4B040R-6 RV4B050R-5 RV4B063R-6	262-142	2.9	25.67	100-178	M10×1.5	16	35	25	8	105-T15	B	
	RV4B080R-7	262-142	2.9	25.67	100-180※1	M16×2.0	24	51	35	14			
Bore mm size	RV3B0◯◯R-◯	265-141	2.0	17.7	100-183	M8×1.25	13	33	25	6	104-T10	A	
	RV4B040RM-4 RV4B042RM-4	262-142	2.9	25.67	100-183	M8×1.25	13	33	25	6	105-T15	B	
	RV4B050RM-5 RV4B063RM-6	262-142	2.9	25.67	100-178	M10×1.5	16	35	25	8			
	RV4B080RM-7	262-142	2.9	25.67	100-179※1	M12×1.75	18	42	30	10			

※1 Part size for arbor screw for Ø80 is different due to inlay size. ※2 When supplying air or cutting oil to each cutting flute, please use this arbor screw.

Field data

	User	Work material	Tools	Cutting conditions	Result
1	Company A	Stainless steel 304 Plate	Body : RV4S040R-3 Insert : RPMT1204M0EN-B8/JM4160	Wet cutting v_c = 200m/min, f_z = 0.15mm/t, $a_p \times a_e$ = 1.5×25mm v_c=656SFM, f_z= .006IPT, $a_p \times a_e$ = .059× .954in	50% higher efficiency than conventional tools. Tool life is also good.
2	Company B	Stainless steel 304 Machine parts	Body : RV4S040R-3 Insert : RPMT1204M0EN-B8/JM4160	Wet cutting v_c = 200m/min, f_z = 0.2mm/t, $a_p \times a_e$ = 1.5×20mm v_c=656SFM, f_z= .008IPT, $a_p \times a_e$ = .059× .787in	Good results with low wear amount.
3	Company C	Stainless steel 410 Impeller	Body : RV4B080R-7 Insert : RPMT1204M0EN-B8/GX2160	Dry cutting v_c = 200m/min, f_z = 0.5mm/t, $a_p \times a_e$ = 2×60mm v_c=656SFM, f_z= .02IPT, $a_p \times a_e$ = .079×2.362 in	Good; tool life is approximately 2 times that of conventional tools.
4	Company D	Blade Stainless steel	Body : RV4B050R-5 Insert : RPMT1204M0EN-C8/GX2160	Dry cutting v_c = 330m/min, f_z = 0.24mm/t, $a_p \times a_e$ = 5×12mm v_c=1083SFM, f_z= .009IPT, $a_p \times a_e$ = .197× .472in	Good; tool life is approximately 2 times that of conventional tools.
5	Company E	Blade Stainless steel	Body : RV4B050RM-5 Insert : RPMT1204M0EN-B8/JM4160	Wet cutting v_c = 200m/min, f_z = 0.5mm/t, $a_p \times a_e$ = 1×35mm v_c=656SFM, f_z= .02in/t, $a_p \times a_e$ = .039×1.378in	Good; tool life is approximately 1.5 to 2 times that of conventional tools.

Radius Milll RV

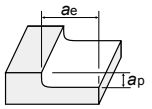
Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

Work material	Cutting method	Recommended grade	Breaker shape	Cutting speed Vc(SFM)	Depth of cut ap(inch)	Feed rate fz(IPT)	Shank type(r5) Modular type(r5)						Bore type(r5)			
							ϕ25mm or 1" 3 flutes		ϕ32mm or 1.25" 4 flutes		ϕ40mm or 1.5" 5 flutes		ϕ40mm or 1.5" 5 flutes		ϕ42mm or 1.5" 5 flutes	
							Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM
Austenite type Ferrite type Stainless steel 304 316 430 etc	Dry cutting	AX2040 GX2160	-C8	591～722	.079～	.004～.008	2,546	60	1,989	63	1,592	63	1,592	63	1,516	60
					.039～.079	.008～.012	vc=656SFM, fz=.008in/t						vc=656SFM, fz= .008in/t			
					～.039	.016～.02										
	Wet cutting	JM4160	-B8	295～361	.079～	.004～.008	1,273	30	995	31	796	31	796	31	758	30
					.039～.079	.008～.012	vc=328SFM, fz=.008in/t						vc=328SFM, fz=.008in/t			
					～.039	.016～.02										
Martensite type Stainless steel 410 420 etc	Dry cutting	AX2040 GX2160	-C8	656～787	.079～	.004～.008	2,801	67	2,188	69	1,751	69	1,751	69	1,667	66
					.039～.079	.008～.012	vc=720SFM, fz=.008in/t						vc=722SFM, ffz=.008in/t			
					～.039	.016～.02										
	Wet cutting	JM4160	-B8	394～656	.079～	.004～.008	2,037	48	1,592	50	1,273	50	1,273	50	1,213	49
					.039～.079	.008～.012	vc=525SFM, fz=.008in/t						vc=525SFM, fz=.008in/t			
					～.039	.016～.02										
Precipitation-hardened type Stainless steel S17400 S17700 etc	Dry cutting	AX2040 GX2160	-C8	525～656	.079～	.004～.008	2,292	54	1,790	56	1,432	56	1,432	56	1,364	54
					.039～.079	.008～.012	vc=590SFM, fz=.008in/t						vc=590SFM, fz=.008in/t			
					～.039	.016～.02										
	Wet cutting	JM4160	-B8	328～591	.079～	.004～.008	1,528	36	1,194	38	955	38	955	38	909	36
					.039～.079	.008～.012	vc=394SFM, fz=.008in/t						vc=394m/min, fz=.008in/t			
					～.039	.016～.02										
Aluminum alloy A5052 etc	Dry cutting Wet cutting	SD5010	-A8	984～1640	.079～	.004～.008	3,820	90	2,984	94	2,387	94	2,387	94	2,274	90
					.039～.079	.008～.012	vc=984SFM, fz=.008in/t						vc=984SFM, fz=.008in/t			
					～.039	.016～.02										
Titanium alloy Ti-6AL-4V etc	Wet cutting	JS1025	-B8 (Roughing) -A8 (Finishing)	98～164	～.079	.003～.005	509	6	398	6	318	6	318	6	303	6
							vc=131SFM, fz=.004in/t						vc=131SFM, fz=004in/t			
Ni based alloy	Wet cutting	JS1025	-B8	98～131	～.079	.002～.004	446	4	348	4	279	4	279	4	265	4
							vc=115SFM, fz=.003in/t						vc=115SFM, fz=.003in/t			

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②Please note that the AX Coating, GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③In order to avoid of insert breakage, please change insert earlier.
④Use the appropriate coolant for the work material and machining shape.



Adjustment of cutting conditions

- Feed rate and spindle revolution must be adjusted to correspond to tool overhang and machining conditions.
- Please consider the standard cutting conditions as 100% and adjust the machining conditions by referring to the right table.

		Overhang		
		＜3DCX	3DCX～5DCX	5DCX＜
Surfacing Shoulder cutting	Rotation speed	100%	70%	50%
	Feed rate	100%	70%	50%
Slotting	Rotation speed	100%	70%	50%
	Feed rate	70%	50%	35%
Ramping	Rotation speed	100%	70%	50%
	Feed rate	80%	55%	40%

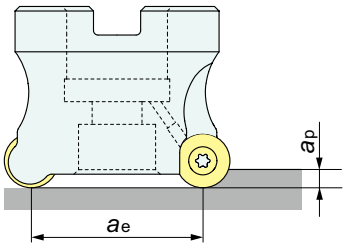
Work material	Cutting method	Shank type(r6)						Bore type(r6)									
		ϕ32mm or 1.25" 3 flutes		ϕ40mm or 1.5" 3 flutes		ϕ40mm or 1.5" 4 flutes		ϕ40mm or 1.5" 4 flutes		ϕ42mm or 1.5" 4 flutes		ϕ50mm or 2" 5 flutes		ϕ63mm or 2.5" 6 flutes		ϕ80mm or 3.15" 7 flutes	
		Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM	Revolution min^{-1}	Feed speed IPM
Austenite type Ferrite type Stainless steel 304 316 430 etc	Dry cutting	1,989	59	1,592	47	1,592	63	1,592	63	1,516	60	1,273	63	1,011	60	796	55
		v_c=656SFM, f_z=.01in/t						v_c=656SFM, f_z=.01in/t									
	Wet cutting	995	29	796	24	796	31	796	31	758	30	637	31	505	30	398	27
		v_c=328SFM, f_z=.01in/t						v_c=328SFM, f_z=.01in/t									
Martensite type Stainless steel 410 420 etc	Dry cutting	2,188	65	1,751	24	1,751	31	1,751	69	1,667	66	1,401	69	1,112	66	875	60
		v_c=722SFM, f_z=.01in/t						v_c=722SFM, f_z=.01in/t									
	Wet cutting	1,592	47	1,273	38	1,273	50	1,273	50	1,213	48	1,019	50	808	48	637	44
		v_c=525SFM, f_z=.01in/t						v_c=525SFM, f_z=.01in/t									
Precipitation-hardened type Stainless steel S17400 S17700 etc	Dry cutting	1,790	53	1,432	42	1,432	56	1,432	56	1,364	54	1,146	56	909	54	716	49
		v_c=590SFM, f_z=.01in/t						v_c=590SFM, f_z=.01in/t									
	Wet cutting	1,194	35	955	28	955	38	955	38	909	36	764	38	606	36	477	33
		v_c=394SFM, f_z=.01in/t						v_c=394SFM, f_z=.01in/t									
Aluminum alloy A5052 etc	Dry cutting Wet cutting	2,984	88	2,387	70	2,387	94	2,387	94	2,274	90	1,910	90	1,516	90	1,194	82
		v_c=984SFM, f_z=.01in/t						v_c=984SFM, f_z=.01in/t									
Titanium alloy Ti-6AL-4V etc	Wet cutting	398	5	318	4	318	5	318	5	303	5	255	5	202	5	159	4
		v_c=131SFM, f_z=.004in/t						v_c=131SFM, f_z=.004in/t									
Ni based alloy	Wet cutting	348	3	279	3	279	4	279	4	265	3	223	4	177	3	139	3
		v_c=89SFM, f_z=003in/t						v_c=115SFM, f_z=.003in/t									

⚠ Attentions on Safety

①The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safty cover around the tool and wear the safty glasses when carring out any works.
②Do not use non-water-soluble cutting oils.Such oils may result in fire.

Depth of cut

- a_p according to the size of the insert being used.
- It is recommended that a_e be set between 0.3DCX and 0.6DCX.



Inserts size	Recommended a_p	Maximum a_p	Recommended a_e
RP□T1204M0	.039～ .118 inch	.236 inch	0.3DCX～0.6DCX
RP□T10T3M0	.039～ .098 inch	.197 inch	

Radius Milll RV

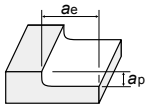
Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

Work material	Cutting method	Recommended grade	Breaker shape	Cutting speed Vc(m/min)	Depth of cut ap(mm)	Feed rate fz(mm/t)	Shank type(r5) Modular type(r5)						Bore type(r5)			
							ϕ25mm or 1" 3 flutes		ϕ32mm or 1.25" 4 flutes		ϕ40mm or 1.5" 5 flutes		ϕ40mm or 1.5" 5 flutes		ϕ42mm or 1.5" 5 flutes	
							Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min
Austenite type Ferrite type Stainless steel 304 316 430 etc	Dry cutting	AX2040 GX2160	-C8	180~220	2~	0.1~0.2	2,546	1,528	1,989	1,592	1,592	1,592	1,592	1,592	1,516	1,516
					1~2	0.2~0.3	Vc=200m/min、fz=0.2mm/t						Vc=200m/min、fz=0.2mm/t			
					~1	0.4~0.5										
	Wet cutting	JM4160	-B8	90~110	2~	0.1~0.2	1,273	764	995	796	796	796	796	796	758	758
					1~2	0.2~0.3	Vc=100m/min、fz=0.2mm/t						Vc=100m/min、fz=0.2mm/t			
					~1	0.4~0.5										
Martensite type Stainless steel 410 420 etc	Dry cutting	AX2040 GX2160	-C8	200~240	2~	0.1~0.2	2,801	1,681	2,188	1,751	1,751	1,751	1,751	1,751	1,667	1,667
					1~2	0.2~0.3	Vc=220m/min、fz=0.2mm/t						Vc=220m/min、fz=0.2mm/t			
					~1	0.4~0.5										
	Wet cutting	JM4160	-B8	120~200	2~	0.1~0.2	2,037	1,222	1,592	1,273	1,273	1,273	1,273	1,273	1,213	1,213
					1~2	0.2~0.3	Vc=160m/min、fz=0.2mm/t						Vc=160m/min、fz=0.2mm/t			
					~1	0.4~0.5										
Precipitation-hardened type Stainless steel S17400 S17700 etc	Dry cutting	AX2040 GX2160	-C8	160~200	2~	0.1~0.2	2,292	1,375	1,790	1,432	1,432	1,432	1,432	1,432	1,364	1,364
					1~2	0.2~0.3	Vc=180m/min、fz=0.2mm/t						Vc=180m/min、fz=0.2mm/t			
					~1	0.4~0.5										
	Wet cutting	JM4160	-B8	100~180	2~	0.1~0.2	1,528	917	1,194	955	955	955	955	955	909	909
					1~2	0.2~0.3	Vc=120m/min、fz=0.2mm/t						Vc=120m/min、fz=0.2mm/t			
					~1	0.4~0.5										
Aluminum alloy A5052 etc	Dry cutting Wet cutting	SD5010	-A8	300~500	2~	0.1~0.2	3,820	2,292	2,984	2,387	2,387	2,387	2,387	2,387	2,274	2,274
					1~2	0.2~0.3	Vc=300m/min、fz=0.2mm/t						Vc=300m/min、fz=0.2mm/t			
					~1	0.4~0.5										
Titanium alloy Ti-6AL-4V etc	Wet cutting	JS1025	-B8 (Roughing) -A8 (Finishing)	30~50	~2	0.07~0.13	509	153	398	159	318	159	318	159	303	152
							Vc=40m/min、fz=0.1mm/t						Vc=40m/min、fz=0.1mm/t			
Ni based alloy	Wet cutting	JS1025	-B8	30~40	~2	0.06~0.1	446	107	348	111	279	111	279	111	265	106
							Vc=35m/min、fz=0.08mm/t						Vc=35m/min、fz=0.08mm/t			

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②Please note that the AX Coating, GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
③In order to avoid of insert breakage, please change insert earlier.
④Use the appropriate coolant for the work material and machining shape.



Adjustment of cutting conditions

- Feed rate and spindle revolution must be adjusted to correspond to tool overhang and machining conditions.
- Please consider the standard cutting conditions as 100% and adjust the machining conditions by referring to the right table.

		Overhang		
		<3DCX	3DCX~5DCX	5DCX<
Surfacing Shoulder cutting	Rotation speed	100%	70%	50%
	Feed rate	100%	70%	50%
Slotting	Rotation speed	100%	70%	50%
	Feed rate	70%	50%	35%
Ramping	Rotation speed	100%	70%	50%
	Feed rate	80%	55%	40%

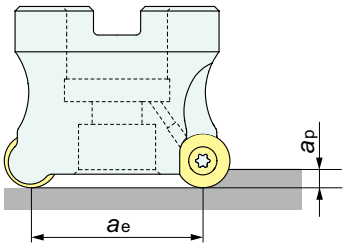
Work material	Cutting method	Shank type(r6)						Bore type(r6)									
		ϕ32mm or 1.25" 3 flutes		ϕ40mm or 1.5" 3 flutes		ϕ40mm or 1.5" 4 flutes		ϕ40mm or 1.5" 4 flutes		ϕ42mm or 1.5" 4 flutes		ϕ50mm or 2" 5 flutes		ϕ63mm or 2.5" 6 flutes		ϕ80mm or 3.15" 7 flutes	
		Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min	Revolution min^{-1}	Feed speed mm/min
Austenite type Ferrite type Stainless steel 304 316 430 etc	Dry cutting	1,989	1,492	1,592	1,194	1,592	1,592	1,592	1,592	1,516	1,516	1,273	1,592	1,011	1,516	796	1,393
		v_c=200m/min、f_z=0.25mm/t						v_c=200m/min、f_z=0.25mm/t									
	Wet cutting	995	746	796	597	796	796	796	796	758	758	637	796	505	758	398	696
		v_c=100m/min、f_z=0.25mm/t						v_c=100m/min、f_z=0.25mm/t									
Martensite type Stainless steel 410 420 etc	Dry cutting	2,188	1,641	1,751	1,313	1,751	1,751	1,751	1,751	1,667	1,667	1,401	1,751	1,112	1,667	875	1,532
		v_c=220m/min、f_z=0.25mm/t						v_c=220m/min、f_z=0.25mm/t									
	Wet cutting	1,592	1,194	1,273	955	1,273	1,273	1,273	1,273	1,213	1,213	1,019	1,273	808	1,213	637	1,114
		v_c=160m/min、f_z=0.25mm/t						v_c=160m/min、f_z=0.25mm/t									
Precipitation-hardened type Stainless steel S17400 S17700 etc	Dry cutting	1,790	1,343	1,432	1,074	1,432	1,432	1,432	1,432	1,364	1,364	1,146	1,432	909	1,364	716	1,253
		v_c=180m/min、f_z=0.25mm/t						v_c=180m/min、f_z=0.25mm/t									
	Wet cutting	1,194	895	955	716	955	955	955	955	909	909	764	955	606	909	477	835
		v_c=120m/min、f_z=0.25mm/t						v_c=120m/min、f_z=0.25mm/t									
Aluminum alloy A5052 etc	Dry cutting Wet cutting	2,984	2,238	2,387	1,790	2,387	2,387	2,387	2,387	2,274	2,274	1,910	2,387	1,516	2,274	1,194	2,089
		v_c=300m/min、f_z=0.25mm/t						v_c=300m/min、f_z=0.25mm/t									
Titanium alloy Ti-6AL-4V etc	Wet cutting	398	119	318	95	318	127	318	127	303	121	255	127	202	121	159	111
		v_c=40m/min、f_z=0.1mm/t						v_c=40m/min、f_z=0.1mm/t									
Ni based alloy	Wet cutting	348	84	279	67	279	89	279	89	265	85	223	89	177	85	139	78
		v_c=35m/min、f_z=0.08mm/t						v_c=35m/min、f_z=0.08mm/t									

⚠ Attentions on Safety

①The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safty cover around the tool and wear the safty glasses when carring out any works.
②Do not use non-water-soluble cutting oils.Such oils may result in fire.

Depth of cut

- a_p according to the size of the insert being used.
- It is recommended that a_e be set between 0.3DCX and 0.6DCX.



Inserts size	Recommended a_p	Maximum a_p	Recommended a_e
RP□T1204M0	1～3mm	6mm	0.3DCX～0.6DCX
RP□T10T3M0	1～2.5mm	5mm	

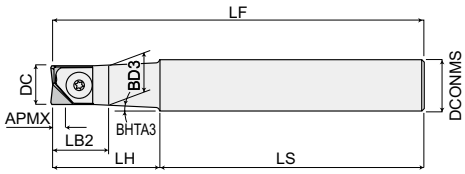
Radius Precision ARPF

YouTube

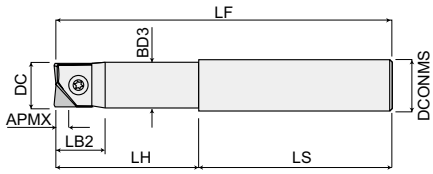
- Additional lineup of helical cutting edge inserts which offer both cutting edge strength and cutting performance.
- 2 flutes radius end Mill for high-precision finishing. (Mounting runout accuracy of 0.02mm or less)
- Unique clamp mechanism comprised of high-accuracy bodyand mounting screw enables inserts to be attached firmly with high accuracy.

Semi Finishing | Finishing | Maximum Notch 2.5~10 | 90° | Cutting Conditions C129
Planing | Side milling | Profiling | Die-sinking | Helical

Steel shank・Carbide shank



Type A (Taper Neck)



Type B (Straight Neck)

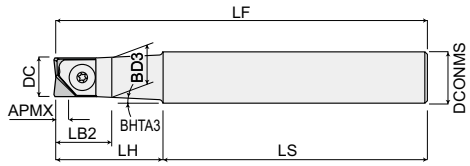
Inch IARPF○○S○○(□/□□)

Numeric figure in a circle ○ and alphabetical character comes in a square □.

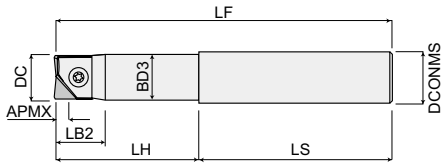
Type		Item Code	Stock	# of Inserts	Size (inch) DC	LF	DCONMS	APMX	LB2	LH	BHTA3	BD3	LS	Type	Inserts
Steel Shank	Regular	IARPF06S08	●	1	.375	3.937(3.955)	.5	.118	.512(.53)	.984 (1.002)	3°	.354	2.953	A	IZCFG060SG-R○.○ IZCFW060-R○.○
		IARPF08S08	●	1	.5	4.331(4.351)	.5	.157	.591(.611)	1.181(1.201)	–	.48	3.150	B	IZCFG080S□-R○.○ IZCFW080-R○.○
		IARPF12S12	●	1	.75	5.512(5.551)	.75	.236	.827(.866)	2.362(2.401)	–	.728	3.150	B	IZCFG120S□-R○.○ IZCFW120-R○.○
		IARPF16S16	●	1	1.0	5.906(5.978)	1.0	.315	.945(1.017)	2.756(2.828)	–	.98	3.150	B	IZCFG160SG-R○.○ IZCFW160-R○.○
	Long Length	IARPF06S08L	●	1	.375	5.906(5.924)	.5	.118	.512(.53)	1.969(1.987)	4.5°	.354	3.937	A	IZCFG060SG-R○.○ IZCFW060-R○.○
		IARPF08S10L	●	1	.5	6.299(6.319)	.625	.157	.591(.611)	2.362(2.382)	2°	.48	3.937	A	IZCFG080S□-R○.○ IZCFW080-R○.○
		IARPF12S16L	●	1	.75	7.087(7.126)	1.0	.236	.827(.866)	3.15(3.189)	–	.728	3.937	B	IZCFG120S□-R○.○ IZCFW120-R○.○
		IARPF16S20L	●	1	1.0	7.874(7.946)	1.25	.315	.945(1.017)	3.543(3.615)	–	.98	4.331	B	IZCFG160SG-R○.○ IZCFW160-R○.○
Carbide Shank	Regular	IARPF06S06W	●	1	.375	3.937(3.955)	.375	.118	.906(.924)	1.378(1.396)	–	.366	2.559	B	IZCFG060SG-R○.○ IZCFW060-R○.○
		IARPF08S08W	●	1	.5	4.331(4.351)	.5	.157	1.024(1.044)	1.772(1.792)	–	.492	2.559	B	IZCFG080S□-R○.○ IZCFW080-R○.○
		IARPF12S12W	●	1	.75	6.299(6.338)	.75	.236	.866(.905)	2.165(2.204)	–	.728	4.134	B	IZCFG120S□-R○.○ IZCFW120-R○.○
		IARPF16S16W	●	1	1.0	7.087(7.159)	1.0	.315	.984(1.056)	2.5(2.572)	–	.98	4.587	B	IZCFG160SG-R○.○ IZCFW160-R○.○
	Medium	IARPF06S06WR	●	1	.375	5.512(5.530)	.375	.118	.906(.924)	2.935(2.953)	–	.366	2.577	B	IZCFG060SG-R○.○ IZCFW060-R○.○
		IARPF08S08WR	●	1	.5	5.906(5.926)	.5	.157	1.024(1.044)	3.346(3.366)	–	.492	2.560	B	IZCFG080S□-R○.○ IZCFW080-R○.○
	Long Length	IARPF06S06WL	●	1	.375	7.087(7.105)	.375	.118	.512(.53)	1.378(1.396)	–	.366	5.709	B	IZCFG060SG-R○.○ IZCFW060-R○.○
		IARPF08S08WL	●	1	.5	7.087(7.107)	.5	.157	.591(.611)	1.772(1.792)	–	.492	5.315	B	IZCFG080S□-R○.○ IZCFW080-R○.○
		IARPF12S12WL	●	1	.75	9.843(9.522)	.75	.236	.827(.866)	3.15(3.189)	–	.728	6.693	B	IZCFG120S□-R○.○ IZCFW120-R○.○
		IARPF16S16WL	●	1	1.0	9.843(9.915)	1.0	.315	.945(1.017)	3.15(3.222)	–	.98	6.693	B	IZCFG160SG-R○.○ IZCFW160-R○.○
		IARPF16S20WL	●	1	1.0	11.811(11.883)	1.0	.315	.945(1.017)	7.48(7.552)	–	.98	4.331	B	

● : Inventory maintained in US ★ : Inventory maintained in Japan

Steel shank



Type A (Taper Neck)



Type B (Straight Neck)

Metric ARPF○○S○○(□○○○)

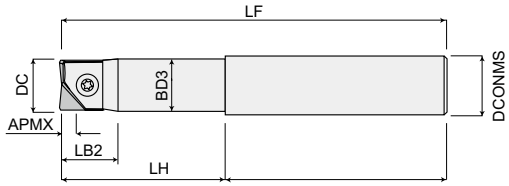
Numeric figure in a circle ◌ and alphabetical character comes in a square □.

Type	Item Code	Stock	# of Inserts	Size (mm) DC	LF	DCON	APMX	LB2	LH	BHTA3	BD3	LS	Type	Inserts
Regular	ARPF06S10	★	1	6	80	10	2	15	30	8.25°	5.4	50	A	ZCFG06NS□-R○.○ ZCFW060-R○.○
	ARPF08S12	●	1	8	100(100.2)	12	2.5	10(10.2)	22(22.2)	9.5°	7.5	78	A	ZCFG080S□-R○.○ ZCFW080-R○.○
	ARPF10S12	●	1	10	100(100.5)	12	3	13(13.5)	25(25.5)	3°	9.5	75	A	ZCFG100S□-R○.○ ZCFW100-R○.○
	ARPF12S12	●	1	12	110(110.5)	12	4	21(21.5)	30(30.5)	–	11.5	80	B	ZCFG120S□-R○.○ ZCFW120-R○.○ ZCFG130S□-R○.○
	ARPF16S16	●	1	16	130(130.6)	16	5	27(27.6)	50(50.6)	–	15.5	80	B	ZCFG160S□-R○.○ ZCFW160-R○.○ ZCFG170S□-R○.○
	ARPF20S20	●	1	20	140(141)	20	6	35(36)	60(61)	–	19.5	80	B	ZCFG200S□-R○.○ ZCFW200-R○.○ ZCFG210S□-R○.○
	ARPF25S25	●	1	25	150(151.8)	25	8	43(44.8)	70(71.8)	–	24.5	80	B	ZCFG250S□-R○.○ ZCFW250-R○.○ ZCFG260S□-R○.○
	ARPF30S32	★	1	30	160(162.2)	32	10	55(57.2)	80(82.2)	–	29.5	80	B	ZCFG300S□-R○.○ ZCFW300-R○.○
	ARPF32S32	★	1	32	160(162.2)	32	10	58(60.2)	80(82.2)	–	31.5	80	B	ZCFG320S□-R○.○ ZCFW320-R○.○
Long Length	ARPF08S12L	●	1	8	130(130.2)	12	2.5	10(10.2)	50(50.2)	3°	7.5	80	A	ZCFG080S□-R○.○ ZCFW080-R○.○
	ARPF10S16L	●	1	10	150(150.5)	16	3	13(13.5)	50(50.5)	4.5°	9.5	100	A	ZCFG100S□-R○.○ ZCFW100-R○.○
	ARPF12S16L	●	1	12	160(160.5)	16	4	21(21.5)	60(60.5)	2°	11.5	100	A	ZCFG120S□-R○.○ ZCFW120-R○.○ ZCFG130S□-R○.○
	ARPF16S16L	●	1	16	165(165.6)	16	5	27(27.6)	65(65.6)	–	15.5	100	B	ZCFG160S□-R○.○ ZCFW160-R○.○ ZCFG170S□-R○.○
	ARPF20S20L	●	1	20	180(181)	20	6	35(36)	80(81)	–	19.5	100	B	ZCFG200S□-R○.○ ZCFW200-R○.○
	ARPF20S20L120	★	1	20	220(221)	20	6	35(36)	120(121)	–	19.5	100	B	ZCFG210S□-R○.○
	ARPF20S20L150	★	1	20	250(251)	20	6	35(36)	150(151)	–	19.5	100	B	
	ARPF25S25L	●	1	25	200(201.8)	25	8	43(44.8)	90(91.8)	–	24.5	110	B	ZCFG250S□-R○.○ ZCFW250-R○.○
	ARPF25S32L150	★	1	25	250(251.8)	32	8	43(44.8)	150(151.8)	–	24.5	100	B	ZCFG260S□-R○.○
	ARPF30S32L	★	1	30	220(222.2)	32	10	55(57.2)	100(102.2)	–	29.5	120	B	
	ARPF30S32L150	★	1	30	250(252.2)	32	10	55(57.2)	150(152.2)	–	29.5	100	B	ZCFG300S□-R○.○ ZCFW300-R○.○
	ARPF30S32L200	★	1	30	300(302.2)	32	10	55(57.2)	200(202.2)	–	29.5	100	B	
	ARPF32S32L	★	1	32	220(222.2)	32	10	58(60.2)	100(102.2)	–	31.5	120	B	ZCFG320S□-R○.○ ZCFW320-R○.○
Long Shank	ARPF16S16E	★	1	16	200(200.6)	16	5	27(27.6)	65(65.6)	–	15.5	135	B	ZCFG160S□-R○.○ ZCFW160-R○.○ ZCFG170S□-R○.○
	ARPF20S20E	★	1	20	250(251)	20	6	35(36)	80(81)	–	19.5	170	B	ZCFG200S□-R○.○ ZCFW200-R○.○ ZCFG210S□-R○.○
	ARPF25S25E	★	1	25	300(301.8)	25	8	43(44.8)	90(91.8)	–	24.5	210	B	ZCFG250S□-R○.○ ZCFW250-R○.○
	ARPF25S32E	★	1	25	300(301.8)	32	8	43(44.8)	100(101.8)	3.5°	24.5	200	A	ZCFG260S□-R○.○
	ARPF30S32E	★	1	30	350(352.2)	32	10	55(57.2)	100(102.2)	–	29.5	250	B	ZCFG300S□-R○.○ ZCFW300-R○.○
	ARPF30S42E	★	1	30	350(352.2)	42	10	55(57.2)	120(122.2)	5.3°	29.5	230	A	
	ARPF32S32E	★	1	32	350(352.2)	32	10	58(60.2)	100(102.2)	–	31.5	250	B	ZCFG320S□-R○.○ ZCFW320-R○.○

【Note】( )dimension indicates when ZCFG type insert is installed.

Radius Precision ARPF

Carbide shank



Metric **ARPF○○S○○W(□○○)**

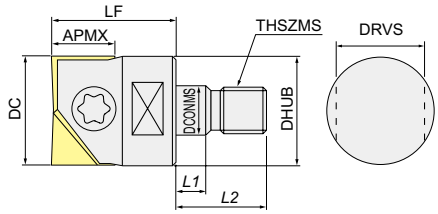
Numeric figure in a circle ○ and alphabetical character comes in a square □.

Type		Item Code	Stock	# of Inserts	Size (mm) DC	LF	DCONMS	APMX	LB2	LH	BD3	LS	Inserts
Carbide Shank	Regular	**ARPF06S06W**	★	1	6	90	6	2	10.3	25	5.8	65	ZCFG06NS□-R○.○ ZCFW060-R○.○
Carbide Shank	Long Length	**ARPF06S06WL65**	★	1	6	120	6	2	10.3	65	5.8	55	ZCFG06NS□-R○.○ ZCFW060-R○.○
Carbide Shank	Long Length	**ARPF08S08WL**	●	1	8	130(130.2)	8	2.5	65(65.2)	65(65.2)	7.8	65	ZCFG080S□-R○.○ ZCFW080-R○.○
Carbide Shank	Long Length	**ARPF10S10WL**	●	1	10	140(140.5)	10	3	18(18.5)	75(75.5)	9.8	65	ZCFG100S□-R○.○ ZCFW100-R○.○
Carbide Shank	Long Length	**ARPF12S12WL**	●	1	12	150(150.5)	12	4	21(21.5)	85(85.5)	11.8	65	ZCFG120S□-R○.○ ZCFW120-R○.○ ZCFG130S□-R○.○ ZCFW160-R○.○
Carbide Shank	Long Shank	**ARPF16S16WE**	●	1	16	200(200.6)	16	5	27(27.6)	120(120.6)	15.5	80	ZCFG160S□-R○.○ ZCFW200-R○.○ ZCFG170S□-R○.○ ZCFW250-R○.○
Carbide Shank	Long Shank	**ARPF20S20WE**	●	1	20	250(251)	20	6	35(36)	150(151)	19.5	100	ZCFG200S□-R○.○ ZCFW300-R○.○ ZCFG210S□-R○.○ ZCFW320-R○.○
Carbide Shank	Long Shank	**ARPF25S25WE**	●	1	25	300(301.8)	25	8	43(44.8)	190(191.8)	24.5	110	ZCFG250S□-R○.○ ZCFG260S□-R○.○
Carbide Shank	Long Shank	**ARPF30S32WE**	★	1	30	350(352.2)	32	10	55(57.2)	230(232.2)	29.5	120	ZCFG300S□-R○.○
Carbide Shank	Long Shank	**ARPF32S32WE**	★	1	32	350(352.2)	32	10	58(60.2)	230(232.2)	31.5	120	ZCFG320S□-R○.○

● : Inventory maintained in US ★ : Inventory maintained in Japan

Modular Mill Type

Numeric figure in a circle ◯ and alphabetical character comes in a square ☐.



Inch IARPFM◯◯

Numeric figure in a circle ◯.

Item Code	Stock	No. of Inserts	Size (inch)									Inserts
			DC	LF	APMX	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
IARPFM06	●	1	.375	1.024	.118	.256	M6	.365	.217	.571	.276	IZCFG060SG-R◯.◯ IZCFW060-R◯.◯
IARPFM08	●	1	.500	1.024	.158	.256	M6	.386	.217	.571	.276	IZCFG080SG-R◯.◯ IZCFG080SW-R◯.◯ IZCFW080-R◯.◯
IARPFM12	●	1	.750	1.496	.276	.413	M10	.701	.217	.748	.591	IZCFG120SG-R◯.◯ IZCFG120SW-R◯.◯ IZCFW120-R◯.◯
IARPFM16	●	1	1.000	1.496	.315	.492	M12	.819	.217	.866	.669	IZCFG160SG-R◯.◯ IZCFW160-R◯.◯

Metric ARPFM◯◯

Numeric figure in a circle ◯.

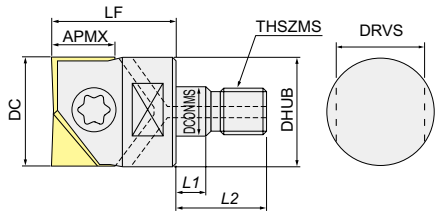
Item Code	Stock	No. of Inserts	Size (mm)									Inserts
			DC	LF	APMX	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
ARPFM10	★	1	10	26(26.4)	3	6.5	M6	9.8	5.5	14.5	7	ZCFG100S☐-R◯.◯ ZCFW100-R◯.◯
ARPFM12	★	1	12 13※	26(26.6)	4	6.5	M6	9.8	5.5	14.5	7	ZCFG120S☐-R◯.◯ ZCFW120-R◯.◯ ZCFG130S☐-R◯.◯※
ARPFM16	★	1	16 17※	32(32.6)	5	8.5	M8	12.8	5.5	17	10	ZCFG160S☐-R◯.◯ ZCFW160-R◯.◯ ZCFG170S☐-R◯.◯※
ARPFM20	●	1	20 21※	38(39)	6	10.5	M10	17.8	5.5	19	15	ZCFG200S☐-R◯.◯ ZCFW200-R◯.◯ ZCFG210S☐-R◯.◯※
ARPFM25	●	1	25 26※	38(39.8)	8	12.5	M12	20.8	5.5	22	17	ZCFG250S☐-R◯.◯ ZCFW250-R◯.◯ ZCFG260S☐-R◯.◯※
ARPFM30	★	1	30	43(45.2)	10	17	M16	28.8	6	23	22	ZCFG300S☐-R◯.◯ ZCFW300-R◯.◯
ARPFM32	★	1	32	43(45.2)	10	17	M16	28.8	6	23	22	ZCFG320S☐-R◯.◯ ZCFW320-R◯.◯

※ A ϕ13 mm insert can be mounted on a ϕ12 mm body, a ϕ17 mm insert can be mounted on a ϕ16 mm body, a ϕ21 mm insert can be mounted on a ϕ20 mm body, or a ϕ26 mm insert can be mounted on a ϕ25 mm body.

【Note】 Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

Radius Precision ARPF

Modular Mill Type



With air hole

Metric ARPFM○○-H

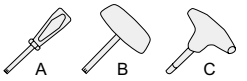
Numeric figure in a circle ○ and alphabetical character comes in a square □.

Item Code	Stock	No. of Inserts	Size (mm)									Inserts	
			DC	LF	APMX	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS		
ARPFM10-H	★	1	10	26(26.4)	3	6.5	M6	9.8	5.5	14.5	7	ZCFG100S□-R○.○	ZCFW100-R○.○
ARPFM12-H	★	1	12 13※	26(26.6)	4	6.5	M6	9.8	5.5	14.5	7	ZCFG120S□-R○.○ ZCFG130S□-R○.○※	ZCFW120-R○.○
ARPFM16-H	★	1	16 17※	32(32.6)	5	8.5	M8	12.8	5.5	17	10	ZCFG160S□-R○.○ ZCFG170S□-R○.○※	ZCFW160-R○.○
ARPFM20-H	★	1	20 21※	38(39)	6	10.5	M10	17.8	5.5	19	15	ZCFG200S□-R○.○ ZCFG210S□-R○.○※	ZCFW200-R○.○
ARPFM25-H	★	1	25 26※	38(39.8)	8	12.5	M12	20.8	5.5	22	17	ZCFG250S□-R○.○ ZCFG260S□-R○.○※	ZCFW250-R○.○
ARPFM30-H	★	1	30	43(45.2)	10	17	M16	28.8	6	23	22	ZCFG300S□-R○.○	ZCFW300-R○.○
ARPFM32-H	★	1	32	43(45.2)	10	17	M16	28.8	6	23	22	ZCFG320S□-R○.○	ZCFW320-R○.○

※ A ϕ13 mm insert can be mounted on a ϕ12 mm body, a ϕ17 mm insert can be mounted on a ϕ16 mm body, a ϕ21 mm insert can be mounted on a ϕ20 mm body, or a ϕ26 mm insert can be mounted on a ϕ25 mm body.

【Note】 Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

Parts

Parts	Clamp screw			Screw Driver / Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N·m)	Fastening torque (lbf·in)	 A B C	Type	
ARPF06S○○(W/WL○○)	581-140	0.5	4.43	104-T6	A	P-37
ARPF08S○○(L/WL)	581-141	1.1	9.74	104-T8	A	
ARPF10S○○(L/WL) ARPFM10 **IARPF06S○○(L/WL)**	581-142	2.2	19.47	104-T10	A	
ARPF12S○○(L/WL) ARPFM12 **IARPF08S○○(L/WL)**	581-143	4.9	43.37	105-T20	B	
ARPF16S○○(L/E/WE) ARPFM16	581-144	4.9	43.37			
ARPF20S○○(L○○○/E/WE) ARPFM20 **IARPF12S○○(L○○○/E/WE)**	581-145	6.9	61.07	101-T25S	B	
ARPF25S○○(L○○○/E/WE) ARPFM25 **IARPF16S○○(L○○○/E/WE)**	581-146	9.8	86.74	105-T30A	C	
ARPF30S○○(L○○○/E/WE) ARPFM30	581-147	9.8	86.74			
ARPF32S○○(L/E/WE) ARPFM32						

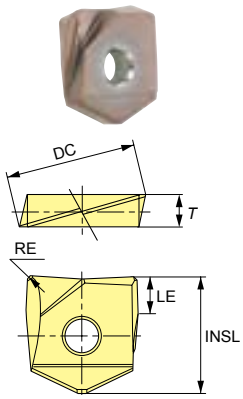
【Note】 ①One clamp screw is attached to the body. Spare screws are not included (sold separately).
②The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

● : Inventory maintained in US ★ : Inventory maintained in Japan

Inch SG・SW type (helical cutting edge inserts)

		TH3 Coated	PN2 Coated
P	Carbon steel	⊔	■
K	Cast Iron・Ductile Cast Iron	■	⊔
	Graphite	⊔	
N	Aluminum Alloy		⊔
H	Hardened steel	■	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

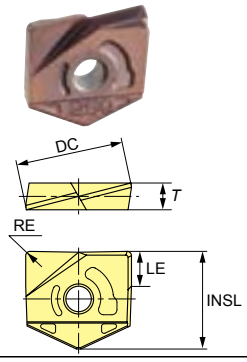


Shape		Item Code	Tolerance Class	TH3 Coated TH308	PN2 Coated PN215	Size (inch) DC	RE	LE	INSL	T
	SG type	IZCFG060SG-R0.8	F	●	●	.375	.031	.118	.492	.106
		IZCFG060SG-R1.6		●	●		.063			
		IZCFG060SG-R3.2		●	●		.126	.177		
		IZCFG080SG-R0.8		●	●	.5	.031	.157	.594	.126
		IZCFG080SG-R1.6		●	●		.063			
		IZCFG080SG-R3.2		●	●		.126	.177		
		IZCFG120SG-R0.8		●	●	.75	.031	.276	.823	.205
		IZCFG120SG-R1.6		●	●		.063			
		IZCFG120SG-R3.2		●	●		.126			
		IZCFG160SG-R0.8		●	●	1.0	.031	.315	.961	.244
		IZCFG160SG-R1.6		●	●		.063			
		IZCFG160SG-R3.2		●	●		.126			
	SW type	IZCFG080SW-R0.8	F	●	●	.5	.031	.157	.594	.126
		IZCFG120SW-R0.8		●	●	.75	.031	.276	.823	.205

Inch General cutting edge shape inserts

		C Coated	ATH Coated
P	Carbon steel	⊔	■
K	Cast Iron・Ductile Cast Iron	⊔	■
H	Hardened steel	⊔	■

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation



Shape	Item Code	Tolerance Class	C Coated PCA12M	ATH Coated ATH08M	Size (inch) DC	RE	LE	INSL	T
	IZCFW060-R0.8	F	●	●	.375	.031	.118	.474	.106
	IZCFW060-R1.6		●	●		.063			
	IZCFW060-R3.2		●	●		.126	.157		
	IZCFW080-R0.8		●	●	.5	.031	.157	.574	.126
	IZCFW080-R1.6		●	●		.063			
	IZCFW080-R3.2		●	●		.126			
	IZCFW120-R0.8		●	●	.75	.031	.236	.784	.205
	IZCFW120-R1.6		●	●		.063			
	IZCFW120-R3.2		●	●		.126			
	IZCFW160-R0.8		●	●	1.0	.031	.315	.889	.244
	IZCFW160-R1.6		●	●		.063			
	IZCFW160-R3.2		●	●		.126			

Radius Precision ARPF

Metric SG • SW type (helical cutting edge inserts)

		TH3 Coated	PN2 Coated
P	Carbon steel	⊔	■
K	Cast iron	■	⊔
	Graphite	⊔	
N	Aluminum Alloy		⊔
H	Hardened steel	■	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

Shape		Item Code	Tolerance Class	TH3 Coated TH308	PN2 Coated PN215	Size (mm) DC	RE	LE	INSL	T	Shape
	SG type	ZCFG06NSG-R0.3	F	★	★	6	0.3	2	5	2	Fig1
		ZCFG06NSG-R0.5		★	★		0.5				
		ZCFG06NSG-R1.0		★	★		1.0				
		ZCFG080SG-R0.3		●	●	8	0.3	2.5	9.9	2.1	Fig2
		ZCFG080SG-R0.5		●	●		0.5				
		ZCFG080SG-R1.0		●	●		1.0				
		ZCFG080SG-R1.5		●	●		1.5				
		ZCFG080SG-R2.0		●	●		2.0	3			
		ZCFG100SG-R0.3		●	●	10	0.3	3	12.5	2.7	
		ZCFG100SG-R0.5		●	●		0.5				
		ZCFG100SG-R1.0		●	●		1.0				
		ZCFG100SG-R1.5		●	●		1.5				
		ZCFG100SG-R2.0		●	●		2.0				
		ZCFG100SG-R3.0		●	●		3.0	4			
		ZCFG120SG-R0.3		●	●	12	0.3	4	15.1	3.2	
		ZCFG120SG-R0.5		●	●		0.5				
		ZCFG120SG-R1.0		●	●		1.0				
		ZCFG120SG-R1.5		●	●		1.5				
		ZCFG120SG-R2.0		●	●		2.0				
		ZCFG120SG-R3.0		●	●		3.0				
		ZCFG130SG-R0.3		★	★	13	0.3	4	15.1	3.2	
		ZCFG130SG-R0.5		★	★		0.5				
		ZCFG130SG-R1.0		★	★		1.0				
		ZCFG130SG-R1.5		★	★		1.5				
		ZCFG130SG-R2.0		★	★		2.0				
		ZCFG130SG-R3.0		★	★		3.0				
		ZCFG160SG-R0.3		●	●	16	0.3	5	17.2	4.2	
		ZCFG160SG-R0.5		●	●		0.5				
		ZCFG160SG-R1.0		●	●		1.0				
		ZCFG160SG-R1.5		●	●		1.5				
		ZCFG160SG-R2.0		●	●		2.0				
		ZCFG160SG-R3.0		●	●		3.0				
		ZCFG170SG-R0.3		★	★	17	0.3	5	17.2	4.2	
		ZCFG170SG-R0.5		★	★		0.5				
		ZCFG170SG-R1.0		★	★		1.0				
		ZCFG170SG-R1.5		★	★		1.5				
		ZCFG170SG-R2.0		★	★		2.0				
		ZCFG170SG-R3.0		★	★		3.0				
		ZCFG200SG-R0.3		●	●	20	0.3	7	20.9	5.2	
		ZCFG200SG-R0.5		●	●		0.5				
		ZCFG200SG-R1.0		●	●		1.0				
		ZCFG200SG-R1.5		●	●		1.5				
		ZCFG200SG-R2.0		●	●		2.0				
		ZCFG200SG-R3.0		●	●		3.0				
		ZCFG210SG-R0.3		★	★	21	0.3	7	20.9	5.2	
		ZCFG210SG-R0.5		★	★		0.5				
		ZCFG210SG-R1.0		★	★		1.0				
		ZCFG210SG-R1.5		★	★		1.5				
		ZCFG210SG-R2.0		★	★		2.0				
		ZCFG210SG-R3.0		★	★		3.0				
		ZCFG250SG-R0.3		●	●	25	0.3	8	24.4	6.2	
		ZCFG250SG-R0.5		●	●		0.5				
		ZCFG250SG-R1.0		●	●		1.0				
		ZCFG250SG-R1.5		●	●		1.5				
		ZCFG250SG-R2.0		●	●		2.0				
		ZCFG250SG-R3.0		●	●		3.0				

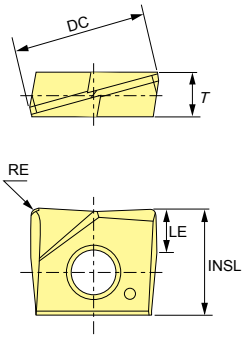


Fig.1

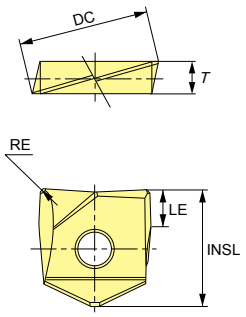


Fig.2

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark: Manufactured upon request only -: No manufactured

		TH3 Coated	PN2 Coated
P	Carbon steel	⊔	■
K	Cast iron	■	⊔
	Graphite	⊔	
N	Aluminum Alloy		⊔
H	Hardened steel	■	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

Shape		Item Code	Tolerance Class	TH3 Coated TH308	PN2 Coated PN215	Size (mm) DC	RE	LE	INSL	*T*	Shape
	SG type	ZCFG260SG-R0.3	F	★	★	26	0.3	8	24.4	6.2	Fig2
		ZCFG260SG-R0.5		★	★		0.5				
		ZCFG260SG-R1.0		★	★		1.0				
		ZCFG260SG-R1.5		★	★		1.5				
		ZCFG260SG-R2.0		★	★		2.0				
		ZCFG260SG-R3.0		★	★		3.0				
		ZCFG300SG-R0.3		★	★	30	0.3	10	29.4	7.2	
		ZCFG300SG-R0.5		★	★		0.5				
		ZCFG300SG-R1.0		★	★		1.0				
		ZCFG300SG-R1.5		★	★		1.5				
		ZCFG300SG-R2.0		★	★		2.0				
		ZCFG300SG-R3.0		★	★		3.0				
		ZCFG320SG-R0.3		★	★	32	0.3	10	30.4	7.2	
		ZCFG320SG-R0.5		★	★		0.5				
		ZCFG320SG-R1.0		★	★		1.0				
		ZCFG320SG-R1.5		★	★		1.5				
		ZCFG320SG-R2.0		★	★		2.0				
		ZCFG320SG-R3.0		★	★		3.0				
	SW type	ZCFG06NSW-R0.3	F	★	★	6	0.3	2	5	2	Fig1
		ZCFG06NSW-R0.5		★	★		0.5				
		ZCFG080SW-R0.3		★	★	8	0.3	2.5	9.9	2.1	Fig2
		ZCFG080SW-R0.5		★	★		0.5				
		ZCFG080SW-R1.0		★	★		1.0				
		ZCFG100SW-R0.3		★	★	10	0.3	3	12.5	2.7	
		ZCFG100SW-R0.5		★	★		0.5				
		ZCFG100SW-R1.0		★	★		1.0				
		ZCFG120SW-R0.3		★	★	12	0.3	4	15.1	3.2	
		ZCFG120SW-R0.5		●	●		0.5				
		ZCFG120SW-R1.0		●	●		1.0				
		ZCFG130SW-R0.3		★	★	13	0.3	4	15.1	3.2	
		ZCFG130SW-R0.5		★	★		0.5				
		ZCFG130SW-R1.0		★	★		1.0				
		ZCFG160SW-R0.3		★	★	16	0.3	5	17.2	4.2	
		ZCFG160SW-R0.5		●	●		0.5				
		ZCFG160SW-R1.0		●	●		1.0				
		ZCFG170SW-R0.3		★	★	17	0.3	5	17.2	4.2	
		ZCFG170SW-R0.5		★	★		0.5				
		ZCFG170SW-R1.0		★	★		1.0				
		ZCFG200SW-R0.3		★	★	20	0.3	7	20.9	5.2	
		ZCFG200SW-R0.5		●	●		0.5				
		ZCFG200SW-R1.0		●	●		1.0				
		ZCFG210SW-R0.3		★	★	21	0.3	7	20.9	5.2	
		ZCFG210SW-R0.5		★	★		0.5				
		ZCFG210SW-R1.0		★	★		1.0				
		ZCFG250SW-R0.3		★	★	25	0.3	8	24.4	6.2	
		ZCFG250SW-R0.5		●	●		0.5				
		ZCFG250SW-R1.0		●	●		1.0				
		ZCFG260SW-R0.3		★	★	26	0.3	8	24.4	6.2	
		ZCFG260SW-R0.5		★	★		0.5				
		ZCFG260SW-R1.0		★	★		1.0				
		ZCFG300SW-R0.3		★	★	30	0.3	10	29.4	7.2	
		ZCFG300SW-R0.5		★	★		0.5				
		ZCFG300SW-R1.0		★	★		1.0				
		ZCFG320SW-R0.3		★	★	32	0.3	10	30.4	7.2	
		ZCFG320SW-R0.5		★	★		0.5				
		ZCFG320SW-R1.0		★	★		1.0				

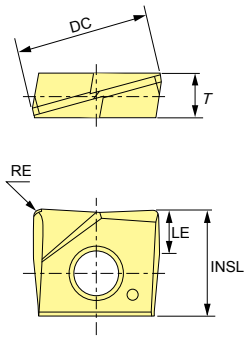


Fig.1

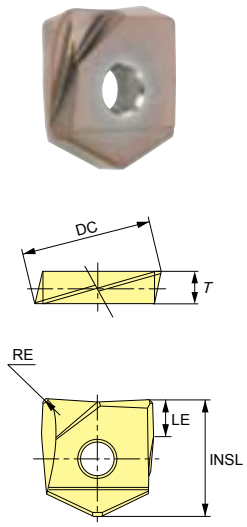


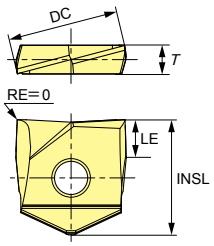
Fig.2

Radius Precision ARPF

Metric SQ type (helical cutting edge inserts)

P	Carbon steel	■
K	Cast iron	□
	Graphite	□
N	Aluminum Alloy	□
H	Hardened steel	□

■ : General cutting, First recommendation
□ : General cutting, Second recommendation

Shape		Item Code	Tolerance Class	PN2 Coated	Size (mm)				Shape
				PN215	DC	APMX	L	S	
 Fig.3	SQ type	ZCFG080SQ	F	★	8	2.5	9.9	2.1	Fig3
		ZCFG100SQ		★	10	3	12.5	2.7	
		ZCFG120SQ		★	12	4	15.1	3.2	
		ZCFG130SQ		★	13	4	15.1	3.2	
		ZCFG160SQ		★	16	5	17.2	4.2	
		ZCFG170SQ		★	17	5	17.2	4.2	
		ZCFG200SQ		★	20	7	20.9	5.2	
		ZCFG210SQ		★	21	7	20.9	5.2	
		ZCFG250SQ		★	25	8	24.4	6.2	
		ZCFG260SQ		★	26	8	24.4	6.2	

【Note】Inserts of SG, SW, SQ type can be installed on Ball Precision F "ABPF type" bodies.
Inserts(ϕ 8 ～ϕ 32) of SG, SW, SQ type have a design with a longer A dimension than conventional products. Be careful of the dimension when installed on body.

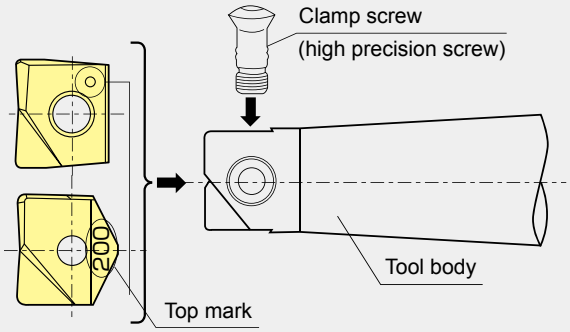
Set-up Procedures of Inserts

1 Clean the insert seat: Using air-blow or alike, clean the seat.

2 Put in the insert with its top positioned to the screw-tightening side of the tool body.

3 Tighten the clamp screw with the special wrench.
Please do not press down the insert during this tightening process.

4 This is the end of insert set-up.



In order to satisfy runout of 0.02mm (.0008") or less, follow the procedure at above.

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only — : No manufactured

Metric General cutting edge shape inserts

Fig.1

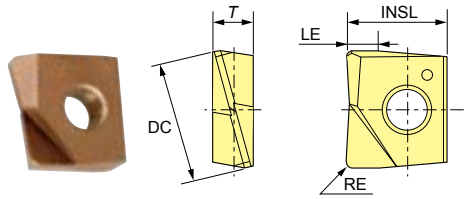
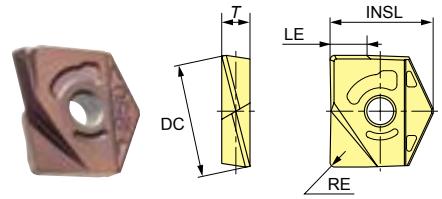


Fig.2



P	Carbon steel	⊔	■		
K	Cast iron	⊔	■		
	Graphite			■	
N	Aluminum Alloy			■	
H	Hardened steel	⊔	■		

■ : General cutting, First recommendation

⊔ : General cutting, Second recommendation

Item Code	Tolerance Class	C Coating	TH Coaing	HD Coating	CBN	Size (mm)					Shape
		PCA12M	PTH08M	HD7010	BH250	DC	RE	LE	INSL	T	
ZCFW060-R0.3	F		★	★	–	6	0.3	2	5.0	2.0	Fig.1
ZCFW060-R0.5			★		–		0.5				
ZCFW060-R1.0			★		–		1.0				
ZCFW080-R0.3		●	●	★	–	8	0.3	2.5	9.7	2.1	Fig.2
ZCFW080-R0.5		●	●		–		0.5				
ZCFW080-R1.0		●	●		–		1.0				
ZCFW100-R0.3		●	●	★	–	10	0.3	3	12.0	2.7	
ZCFW100-R0.5		●	●		–		0.5				
ZCFW100-R1.0		●	●		–		1.0				
ZCFW100-R1.5		●	●		–		1.5				
ZCFW100-R2.0		●	●		–		2.0				
ZCFW100-R3.0		●	●		–		3.0	4			
ZCFW120-R0.3		●	●	★	–	12	0.3	4	14.6	3.2	
ZCFW120-R0.5		●	●		–		0.5				
ZCFW120-R1.0		●	●		–		1.0				
ZCFW120-R1.5		●	●		–		1.5				
ZCFW120-R2.0		●	●		–		2.0				
ZCFW120-R3.0		●	●		–		3.0				
ZCFW160-R0.3		●	●	★		16	0.3	5	16.6	4.2	
ZCFW160-R0.5		●	●				0.5				
ZCFW160-R1.0		●	●		★		1.0				
ZCFW160-R1.5		●	●				1.5				
ZCFW160-R2.0		●	●		★		2.0				
ZCFW160-R3.0		●	●				3.0				
ZCFW200-R0.3		●	●	★		20	0.3	6	19.9	5.2	
ZCFW200-R0.5		●	●				0.5				
ZCFW200-R1.0		●	●		★		1.0				
ZCFW200-R1.5		●	●				1.5				
ZCFW200-R2.0		●	●		★		2.0				
ZCFW200-R3.0		●	●				3.0				
ZCFW250-R0.3		●	●			25	0.3	8	22.6	6.2	
ZCFW250-R0.5		●	●				0.5				
ZCFW250-R1.0		●	●		★		1.0				
ZCFW250-R2.0		●	●		★		2.0				
ZCFW250-R3.0		●	●				3.0				
ZCFW300-R0.3		★	★			30	0.3	10	27.2	7.2	
ZCFW300-R0.5		★	★				0.5				
ZCFW300-R1.0		★	★		★		1.0				
ZCFW300-R2.0		★	★		★		2.0				
ZCFW300-R3.0		★	★				3.0				
ZCFW320-R0.3		★	★			32	0.3	10	28.2	7.2	
ZCFW320-R0.5		★	★				0.5				
ZCFW320-R1.0		★	★				1.0				
ZCFW320-R2.0		★	★				2.0				
ZCFW320-R3.0		★	★				3.0				

Radius Precision ARPF

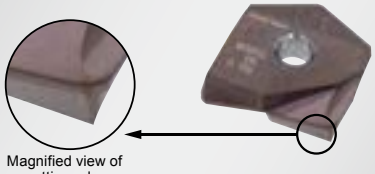
Proper use of helical cutting edge inserts

How to select helical cutting edge inserts

SG type

High-efficiency machining.

Application : semi-finishing to finishing



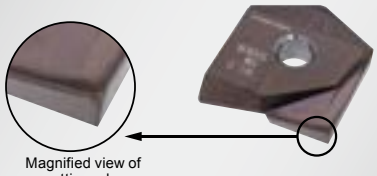
Magnified view of cutting edge

Suitable for machining of 3-dimensional shapes including flat surfaces and angled surfaces.

SW type

High-accuracy machining of vertical walls

Application : Finishing

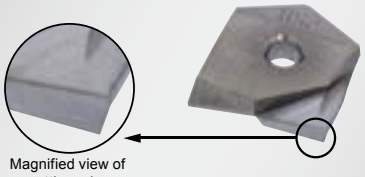


Magnified view of cutting edge

Suitable for high-accuracy finishing of vertical side surfaces (Vertical walls) which will be used as reference surfaces.

SQ type

Application : Corner R removal



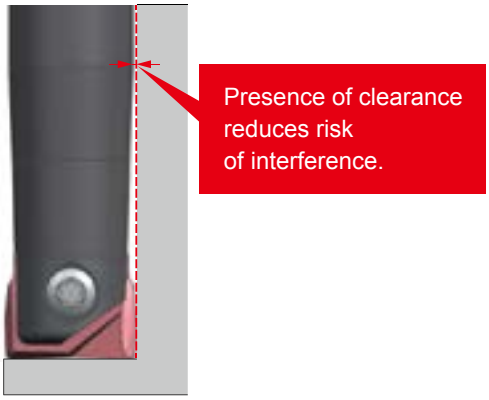
Magnified view of cutting edge

Suitable for removing remaining corner material after rough machining.

Mounting inserts with diameter of shank diameter +1mm

・A ϕ13 mm insert can be mounted on a ϕ12 mm body, a ϕ17 mm insert can be mounted on a ϕ16 mm body, a ϕ21 mm insert can be mounted on a ϕ20 mm body, or a ϕ26 mm insert can be mounted on a ϕ25 mm body.

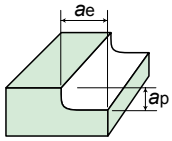
When insert with same diameter as shank is mounted



When insert with diameter +1mm larger than shank diameter is mounted.

Recommended cutting conditions

Inch



※Red indicates primary recommended insert grade.

Work material	Insert Grade: SG・SW (helical cutting edge inserts)	Insert Grade: General Edge Shape	Cutting Conditions	ϕ.375 Semi Finishing General purpose	ϕ.375 Semi Finishing High-speed	ϕ.375 Finishing	ϕ.5 Semi Finishing General purpose	ϕ.5 Semi Finishing High-speed	ϕ.5 Finishing	ϕ.75 Semi Finishing General purpose	ϕ.75 Semi Finishing High-speed	ϕ.75 Finishing	ϕ1 Semi Finishing General purpose	ϕ1 Semi Finishing High-speed	ϕ1 Finishing
Carbon steel Alloy steel (30HRC or less)	※ PN215 TH308	ATH08M (PCA12M)	n (min-1)	5,348	10,028	10,028	4,011	7,521	7,521	2,550	5,014	5,014	2,006	3,820	3,820
			SFM	525	984	984	525	984	984	525	984	984	525	984	984
			IPM	84.2	118.4	118.4	63.2	88.8	88.8	52.6	79.0	79.0	39.5	59.2	59.2
			IPT	.0079	.0059	.0059	.0079	.0059	.0059	.0098	.0079	.0079	.0098	.0079	.0079
			ap (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0079	.0492	.0492	.0079
			ae (inch)	.0394	.0197	.0079	.0472	.0236	.0079	.0787	.0787	.0079	.0984	.0492	.0079
Carbon steel Alloy steel (30～45HRC)	TH308 PN215	ATH08M (PCA12M)	n (min-1)	3,820	9,359	9,359	3,008	7,020	7,020	2,006	4,680	4,680	1,530	3,510	3,510
			SFM	397	918	918	397	918	918	397	918	918	397	918	918
			IPM	63.2	110.5	110.5	47.4	82.9	82.9	39.5	73.7	73.7	29.6	55.3	55.3
			IPT	.0079	.0059	.0059	.0079	.0059	.0059	.0098	.0079	.0079	.0098	.0079	.0079
			ap (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0079	.0492	.0492	.0079
			ae (inch)	.0394	.0197	.0079	.0472	.0236	.0079	.0787	.0787	.0079	.0984	.0492	.0079
Cast Iron	TH308 PN215	ATH08M (PCA12M)	n (min-1)	5,090	12,100	12,100	4,011	10,080	10,080	2,674	6,351	6,351	2,006	4,763	4,763
			SFM	525	1,246	1,246	525	1,246	1,246	525	1,246	1,246	525	1,246	1,246
			IPM	126.3	200.0	200.0	94.8	150.0	150.0	73.7	150.0	150.0	55.3	112.5	112.5
			IPT	.0118	.0079	.0079	.0118	.0079	.0079	.0138	.0118	.0118	.0138	.0118	.0118
			ap (inch)	.0098	.0079	.0039	.0098	.0079	.0039	.0394	.0394	.0079	.0492	.049	.0079
			ae (inch)	.0394	.0154	.0079	.0472	.0236	.0079	.0787	.787	.0079	.0984	.0984	.0079
Graphite	TH308		n (min-1)	10,028	13,371	13,371	7,521	10,028	10,028	5,014	6,685	6,685	3,760	5,012	5,012
			SFM	984	1,312	1,312	984	1,312	1,312	984	1,312	1,312	984	1,312	1,312
			IPM	157.9	315.8	210.6	118.4	236.9	157.9	98.7	157.9	131.6	73.7	118.3	98.2
			IPT	.0079	.0118	.0079	.0079	.0118	.0079	.0098	.0118	.0098	.0098	.0118	.0098
			ap (inch)	.0197	.0118	.0079	.0236	.0157	.0079	.0394	.0276	.0079	.0492	.0492	.0079
			ae (inch)	.0394	.0315	.0098	.0472	.0354	.0118	.0787	.0591	.0157	.0984	.0984	.0157
Cast aluminum alloy AC4A, ADC12 etc	PN215		n (min-1)	10,028	15,920	15,920	7,521	13,270	13,270	5,014	7,960	7,960	3,760	6,265	6,265
			SFM	984	1,640	1,640	984	1,640	1,640	984	1,640	1,640	984	1,640	1,640
			IPM	157.9	526.4	263.2	118.4	394.8	197.4	98.7	263.2	131.6	73.7	147.8	122.8
			IPT	.0079	.0157	.0079	.0079	.0157	.0079	.0098	.0157	.0098	.0098	.0157	.0098
			ap (inch)	.0197	.0118	.0079	.0236	.0157	.0079	.0394	.0276	.0079	.0492	.0492	.0079
			ae (inch)	.0394	.0315	.0098	.0472	.0354	.0118	.0787	.0591	.0157	.0984	.0984	.0157
Hardened Steel 45～55HRC	TH308 PN215	ATH08M (PCA12M)	n (min-1)	3,343	9,359	9,359	2,507	7,020	7,020	1,590	4,680	4,680	1,254	3,510	3,510
			SFM	328	918	918	328	918	918	328	918	918	328	918	918
			IPM	26.3	36.8	36.8	19.7	27.6	27.6	15.8	22.1	22.1	11.8	16.6	16.6
			IPT	.0039	.002	.002	.0039	.002	.002	.0047	.0024	.0024	.0047	.0024	.0024
			ap (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0787	.0492	.0492	.0079
			ae (inch)	.0394	.0098	.0078	.0472	.0118	.0078	.0787	.0394	.0079	.0984	.0492	.0079
Hardened Steel 55～62HRC	TH308	ATH08M	n (min-1)	2,674	7,354	7,354	2,006	5,515	5,515	1,337	3,677	3,677	1,003	2,758	2,758
			SFM	262	721	721	262	721	721	262	721	721	262	721	721
			IPM	21.1	29.0	29.0	15.8	21.7	21.7	12.6	17.4	17.4	9.5	13.0	13.0
			IPT	.0039	.002	.002	.0039	.002	.002	.0047	.0024	.0024	.0047	.0024	.0024
			ap (inch)	.0098	.0098	.0039	.0118	.0118	.0039	.0394	.0394	.0787	.0492	.0492	.0079
			ae (inch)	.0394	.0098	.0078	.0472	.0118	.0078	.0787	.0394	.0079	.0984	.0492	.0079
Maximum fz (inch/t)				<0.0197			<0.0197			<0.0236			<0.0236		
Maximum ap (inch)				<0.118			<0.1575			<0.236			<0.236		

【Note】

1. Use the appropriate coolant for the work material and machining shape.
2. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
3. Be sure to practice safety instructions and precautions such as wearing glasses and safety shoes, and placing safety covers when you use this tool. Because this tool can be broken during machining so failure to follow these instructions may cause personal injury.
4. Never attempt to modify the carbide shank holder. Use the value for the depth of cut (ap) when the carbide shank holder is used.
   Mill diameters DC≦.5" :ap≦.008". Mill diameters DC≧.75 ":ap≦0.012".

※with overhang of more than 3Dc, please modify parameter using the chart below

Overhang ratio	SFM	IPM
<3DC	100%	100%
3DC～5DC	70%	70%
5DC～8DC	60%	60%
8DC～10DC	50%	50%

Radius Precision ARPF

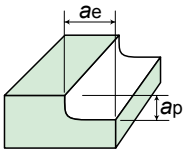
Recommended cutting conditions

Metric

※Red indicates primary recommended insert grade.

Work material	Insert Grade: SG・SW (helical cutting edge inserts)	Insert Grade: General edge shape	Cutting Conditions	ϕ6 Semi Finishing General purpose	ϕ6 Semi Finishing High-speed	ϕ6 Finishing	ϕ8 Semi Finishing General purpose	ϕ8 Semi Finishing High-speed	ϕ8 Finishing	ϕ10 Semi Finishing General purpose	ϕ10 Semi Finishing High-speed	ϕ10 Finishing	ϕ12 Semi Finishing General purpose	ϕ12 Semi Finishing High-speed	ϕ12 Finishing
Carbon steel Alloy steel (30HRC or less)	※ PN215 TH308	PTH08M (PCA12M)	n (min⁻¹)	8,490	16,450	16,450	6,370	11,940	11,940	5,090	9,550	9,550	4,240	7,960	7,960
			Vc (m/min)	160	310	310	160	300	300	160	300	300	160	300	300
			Vf (mm/min)	1,700	2,300	2,300	2,550	3,580	3,580	2,040	2,870	2,870	1,700	2,390	2,390
			fz (mm/t)	0.1	0.07	0.07	0.2	0.15	0.15	0.2	0.15	0.15	0.2	0.15	0.15
			ap (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			ae (mm)	0.6	0.3	0.2	0.8	0.4	0.2	1	0.5	0.2	1.2	0.6	0.2
Carbon steel Alloy steel (30～45HRC)	TH308 PN215	PTH08M (PCA12M)	n (min⁻¹)	6,370	14,850	14,850	4,770	11,150	11,150	3,820	8,920	8,920	3,180	7,430	7,430
			Vc (m/min)	120	280	280	120	280	280	120	280	280	120	280	280
			Vf (mm/min)	1,270	2,080	2,080	1,910	3,350	3,350	1,530	2,680	2,680	1,270	2,230	2,230
			fz (mm/t)	0.1	0.07	0.07	0.2	0.15	0.15	0.2	0.15	0.15	0.2	0.15	0.15
			ap (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			ae (mm)	0.6	0.3	0.2	0.8	0.4	0.2	1	0.5	0.2	1.2	0.6	0.2
Cast Iron	TH308 PN215	PTH08M (PCA12M)	n (min⁻¹)	8,490	20,160	20,160	6,370	15,120	15,120	5,090	12,100	12,100	4,240	10,080	10,080
			Vc (m/min)	160	380	380	160	380	380	160	380	380	160	380	380
			Vf (mm/min)	2,550	4,030	4,030	3,820	6,050	6,050	3,050	4,840	4,840	2,550	4,030	4,030
			fz (mm/t)	0.15	0.1	0.1	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2
			ap (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.2	0.1	0.3	0.3	0.1
			ae (mm)	0.6	0.3	0.2	0.8	0.4	0.2	1	0.4	0.2	1.2	0.6	0.2
Graphite	TH308	HD7010	n (min⁻¹)	15,920	21,220	21,220	11,940	15,920	15,920	9,550	12,740	12,740	7,960	10,620	10,620
			Vc (m/min)	300	400	400	300	400	400	300	400	400	300	400	400
			Vf (mm/min)	3,180	6,370	4,240	4,780	9,550	6,370	3,820	7,640	5,100	3,190	6,370	4,240
			fz (mm/t)	0.1	0.15	0.1	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2
			ap (mm)	0.3	0.15	0.15	0.4	0.2	0.2	0.5	0.3	0.2	0.6	0.4	0.2
			ae (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.25	1.2	0.9	0.3
Cast aluminum alloy AC4A, ADC12 etc	PN215	HD7010	n (min⁻¹)	15,920	26,530	26,530	11,940	19,900	19,900	9,550	15,920	15,920	7,960	13,270	13,270
			Vc (m/min)	300	500	500	300	500	500	300	500	500	300	500	500
			Vf (mm/min)	3,180	10,610	5,310	4,780	15,920	7,960	3,820	12,740	6,370	3,190	10,620	5,310
			fz (mm/t)	0.1	0.2	0.1	0.2	0.4	0.2	0.2	0.4	0.2	0.2	0.4	0.2
			ap (mm)	0.3	0.15	0.15	0.4	0.2	0.2	0.5	0.3	0.2	0.6	0.4	0.2
			ae (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.25	1.2	0.9	0.3
Hardened Steel 45～55HRC	TH308 PN215	PTH08M (PCA12M)	n (min⁻¹)	5,310	14,850	14,850	3,980	11,150	11,150	3,180	8,920	8,920	2,650	7,430	7,430
			Vc (m/min)	100	280	280	100	280	280	100	280	280	100	280	280
			Vf (mm/min)	850	1,190	1,190	800	1,120	1,120	640	890	890	530	740	740
			fz (mm/t)	0.08	0.04	0.04	0.1	0.05	0.05	0.1	0.05	0.05	0.1	0.05	0.05
			ap (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			ae (mm)	0.6	0.2	0.2	0.8	0.2	0.2	1	0.25	0.2	1.2	0.3	0.2
Hardened Steel 55～62HRC	TH308	PTH08M	n (min⁻¹)	4,240	11,670	11,670	3,180	8,760	8,760	2,550	7,000	7,000	2,120	5,840	5,840
			Vc (m/min)	80	220	220	80	220	220	80	220	220	80	220	220
			Vf (mm/min)	680	930	930	640	880	880	510	700	700	420	580	580
			fz (mm/t)	0.08	0.04	0.04	0.1	0.05	0.05	0.1	0.05	0.05	0.1	0.05	0.05
			ap (mm)	0.1	0.1	0.05	0.2	0.2	0.1	0.25	0.25	0.1	0.3	0.3	0.1
			ae (mm)	0.6	0.2	0.2	0.8	0.2	0.2	1	0.25	0.2	1.2	0.3	0.2
Maximum fz (mm/t)				<0.2			<0.5			<0.5			<0.5		
Maximum ap (mm)				<0.6			<2.5			<3.0			<4.0		

【Note】
1. Use the appropriate coolant for the work material and machining shape.
2. These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
3. Be sure to practice safety instructions and precautions such as wearing glasses and safety shoes, and placing safety covers when you use this tool. Because this tool can be broken during machining so failure to follow these instructions may cause personal injury.
4. Never attempt to modify the carbide shank holder. Use the value for the depth of cut (ap) when the carbide shank holder is used.
   Mill diameters DC≦12mm:ap≦0.2mm. Mill diameters DC≧16mm:ap≦0.3mm.



※Red indicates primary recommended insert grade.

Work material	Insert Grade: SG・SW (helical cutting edge inserts)	Insert Grade: General edge shape	Cutting Conditions	ϕ16 Semi Finishing General purpose	ϕ16 Semi Finishing High-speed	ϕ16 Finishing	ϕ20 Semi Finishing General purpose	ϕ20 Semi Finishing High-speed	ϕ20 Finishing	ϕ25 Semi Finishing General purpose	ϕ25 Semi Finishing High-speed	ϕ25 Finishing	ϕ30 Semi Finishing General purpose	ϕ30 Semi Finishing High-speed	ϕ30 Finishing	ϕ32 Semi Finishing General purpose	ϕ32 Semi Finishing High-speed	ϕ32 Finishing
Carbon steel Alloy steel (30HRC or less)	※ PN215 TH308	PTH08M (PCA12M)	n (min⁻¹)	3,190	5,970	5,970	2,550	4,780	4,780	2,040	3,820	3,820	1,700	3,180	3,180	1,590	2,990	2,990
			Vc (m/min)	160	300	300	160	300	300	160	300	300	160	300	300	160	300	300
			Vf (mm/min)	1,600	2,390	2,390	1,280	1,910	1,910	1,020	1,530	1,530	850	1,270	1,270	800	1,200	1,200
			fz (mm/t)	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.6	0.2	2	2	0.2	2.5	1.25	0.2	3.2	3.2	0.2	3.2	3.2	0.2
Carbon steel Alloy steel (30~45HRC)	TH308 PN215	PTH08M (PCA12M)	n (min⁻¹)	2,390	5,570	5,570	1,910	4,460	4,460	1,530	3,570	3,570	1,270	2,970	2,970	1,190	2,790	2,790
			Vc (m/min)	120	280	280	120	280	280	120	280	280	120	280	280	120	280	280
			Vf (mm/min)	1,200	2,230	2,230	960	1,780	1,780	760	1,430	1,430	640	1,190	1,190	600	1,120	1,120
			fz (mm/t)	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.6	0.2	2	2	0.2	2.5	2.5	0.2	3.2	3.2	0.2	3.2	3.2	0.2
Cast Iron	TH308 PN215	PTH08M (PCA12M)	n (min⁻¹)	3,190	7,560	7,560	2,550	6,050	6,050	2,040	4,840	4,840	1,700	4,030	4,030	1,590	3,780	3,780
			Vc (m/min)	160	380	380	160	380	380	160	380	380	160	380	380	160	380	380
			Vf (mm/min)	2,240	4,540	4,540	1,790	3,630	3,630	1,430	2,900	2,900	1,190	2,420	2,420	1,110	2,270	2,270
			fz (mm/t)	0.35	0.3	0.3	0.35	0.3	0.3	0.35	0.3	0.3	0.35	0.3	0.3	0.35	0.3	0.3
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.6	0.2	2	2	0.2	2.5	2.5	0.2	3.2	3.2	0.2	3.2	3.2	0.2
Graphite	TH308	HD7010	n (min⁻¹)	5,970	7,960	7,960	4,780	6,370	6,370	3,830	5,100	5,100	3,190	4,250	4,250	3,190	4,250	4,250
			Vc (m/min)	300	400	400	300	400	400	300	400	400	300	400	400	300	400	400
			Vf (mm/min)	2,990	4,780	3,980	2,390	3,820	3,190	1,920	3,060	2,550	1,600	2,550	2,130	1,600	2,550	2,130
			fz (mm/t)	0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.3	0.25
			ap (mm)	0.8	0.6	0.2	1	0.7	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.1	0.3	2	1.5	0.4	2.5	2.5	0.4	3.2	3.2	0.4	3.2	3.2	0.4
Cast aluminum alloy AC4A, ADC12 etc	PN215	HD7010	n (min⁻¹)	5,970	9,950	9,950	4,780	7,960	7,960	3,830	6,370	6,370	3,190	5,310	5,310	3,190	5,310	5,310
			Vc (m/min)	300	500	500	300	500	500	300	500	500	300	500	500	300	500	500
			Vf (mm/min)	2,990	7,960	4,980	2,390	6,370	3,980	1,920	5,100	3,190	1,600	4,250	2,660	1,600	4,250	2,660
			fz (mm/t)	0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.4	0.25
			ap (mm)	0.8	0.6	0.2	1	0.7	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	1.1	0.3	2	1.5	0.4	2.5	2.5	0.4	3.2	3.2	0.4	3.2	3.2	0.4
Hardened Steel 45~55HRC	TH308 PN215	PTH08M (PCA12M)	n (min⁻¹)	1,990	5,570	5,570	1,590	4,460	4,460	1,270	3,570	3,570	1,060	2,970	2,970	1,000	2,790	2,790
			Vc (m/min)	100	280	280	100	280	280	100	280	280	100	280	280	100	280	280
			Vf (mm/min)	480	670	670	380	530	530	310	430	430	250	360	360	240	330	330
			fz (mm/t)	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	0.8	0.2	2	1	0.2	2.5	1.25	0.2	3.2	1.6	0.2	3.2	1.6	0.2
Hardened Steel 55~62HRC	TH308	PTH08M	n (min⁻¹)	1,590	4,380	4,380	1,270	3,500	3,500	1,020	2,800	2,800	850	2,330	2,330	800	2,190	2,190
			Vc (m/min)	80	220	220	80	220	220	80	220	220	80	220	220	80	220	220
			Vf (mm/min)	380	530	530	300	420	420	240	340	340	200	280	280	190	260	260
			fz (mm/t)	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06	0.12	0.06	0.06
			ap (mm)	0.8	0.8	0.2	1	1	0.2	1.25	1.25	0.2	1.6	1.6	0.2	1.6	1.6	0.2
			ae (mm)	1.6	0.8	0.2	2	1	0.2	2.5	1.25	0.2	3.2	1.6	0.2	3.2	1.6	0.2
Maximum fz (mm/t)				<0.6			<0.6			<0.6			<0.6			<0.6		
Maximum ap (mm)				<5.0			<6.0			<8.0			<10.0			<10.0		

※with overhang of more than 3DC, please modify parameter using the chart below

Overhang ratio	Vc (m/min)	Vf (mm/min)
<3DC	100%	100%
3DC~5DC	70%	70%
5DC~8DC	60%	60%
8DC~10DC	50%	50%

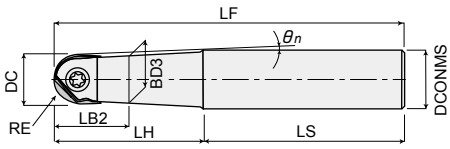
Ball Precision F ABPF

YouTube

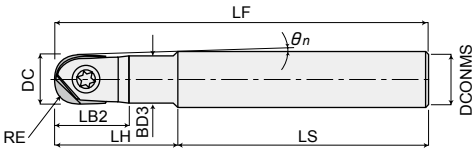
- Set up R accuracy : ±0.01mm
  High accuracy is exhibited from the ball tip to the outer circumference.
- Excellent cutting performance and beautiful finish
  Special shape of central cutting flute provides excellent finished surface roughness.
- Long life. High-performance coated inserts provide long life.

Finishing | Maximum Notch 3~16 | Planing | Side milling | Die-sinking | Profiling | Radius | Helical | Cutting Conditions C142

Steel Shank



Type A (Taper neck)



Type B (Straight neck)

Inch IABPF○○S○○(L)

Numeric figure in a circle ◯ and Alphabetical character comes in a square □.

	Item code	Stock	No.of inserts	Size (inch) DC	RE	LF	DCONMS	LB2	LH	BD3	LS	θn	Type	Inserts
Regular	IABPF05S08	●	1	.313	.156	3.937	.500	.394	.984	.291	2.953	6.5°	A	IZ□FG050
	IABPF06S08	●	1	.375	.188	3.937	.500	.512	.984	.335	2.953	4.5°	A	IZ□FG060
	IABPF08S08	●	1	.500	.250	4.331	.500	.591	1.181	.480	3.150	-	B	IZ□FG080
	IABPF10S10	●	1	.625	.313	5.118	.625	.748	1.969	.602	3.150	-	B	IZ□FG100
	IABPF12S12	●	1	.750	.375	5.512	.750	.866	2.362	.728	3.150	-	B	IZ□FG120
	IABPF16S16	●	1	1.000	.500	5.906	1.000	.984	2.756	.980	3.150	-	B	IZ□FG160
Long neck	IABPF05S08L	●	1	.313	.156	5.906	.500	.394	1.969	.291	3.937	-	A	IZ□FG050
	IABPF06S08L	●	1	.375	.188	5.906	.500	.512	1.969	.335	3.937	-	A	IZ□FG060
	IABPF08S10L	●	1	.500	.250	6.299	.625	.591	2.362	.480	3.937	-	A	IZ□FG080
	IABPF10S12L	●	1	.625	.313	6.496	.750	.748	2.559	.602	3.937	-	A	IZ□FG100
	IABPF12S16L	●	1	.750	.375	7.087	1.000	.866	3.150	.728	3.937	-	A	IZ□FG120
	IABPF16S20L	●	1	1.000	.500	7.874	1.250	.984	3.543	.980	4.331	-	A	IZ□FG160

● : Inventory maintained in US ★ : Inventory maintained in Japan

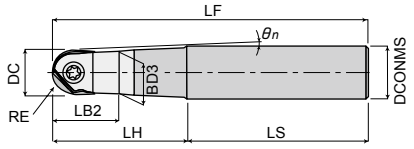
Metric ABPF○○S○○(L/L○○○)

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

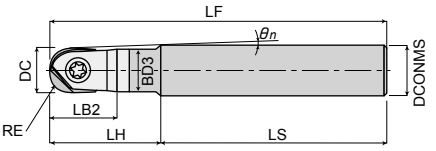
	Item code	Stock	No.of inserts	Size (mm)									Type	Inserts	
				DC	RE	LF	DCONMS	LB2	LH	BD3	LS	θn			
Regular	ABPF06S10	★	1	6	3	80	10	15	30	5.4	50	4.3°	A	ZPFG06N-SH	ZDFG06N-S□
	ABPF08S12	●	1	8	4	100	12	10	22	7.5	78	6.4°	A	ZPFG080-SH	ZDFG080-S□
	ABPF10S12	●	1	10	5	100	12	13	25	9.5	75	2.9°	A	ZPFG100-SH	ZDFG100-S□
	ABPF12S12	●	1	12	6	110	12	15	30	11.5	80	—	B	ZPFG120-SH	ZDFG120-S□
	ABPF16S20	●	1	16	8	130	20	27	50	15	80	2.8°	A	ZPFG160-SH	ZDFG160-S□
	ABPF20S25	●	1	20	10	140	25	35	60	19	80	2.9°	A	ZPFG200-SH	ZDFG200-S□
	ABPF25S32	●	1	25	12.5	150	32	43	70	24	80	3.5°	A	ZPFG250-SH	ZDFG250-S□
	ABPF30S32	★	1	30	15	160	32	55	80	29	80	1.2°	A	ZPFG300-SH	ZDFG300-S□
	ABPF32S32	★	1	32	16	160	32	58	80	31	80	—	B	ZPFG320(-G□)	ZDFG320-W□
Under neck long	ABPF08S12L	●	1	8	4	130	12	10	50	7.5	80	2.5°	A	ZPFG080-SH	ZDFG080-S□
	ABPF10S16L	●	1	10	5	150	16	13	50	9.5	100	3.9°	A	ZPFG100-SH	ZDFG100-S□
	ABPF12S16L	●	1	12	6	160	16	15	60	10.8	100	2.2°	A	ZPFG120-SH	ZDFG120-S□
	ABPF16S20L	●	1	16	8	160	20	27	65	15	95	2.1°	A	ZPFG160-SH	ZDFG160-S□
	ABPF20S25L	●	1	20	10	180	25	35	80	19	100	2.1°	A	ZPFG200-SH	ZDFG200-S□
	ABPF20S20L120	★	1	20	10	220	20	35	120	19	100	—	B		
	ABPF20S20L150	★	1	20	10	250	20	35	150	19	100	—	B		
	ABPF25S32L	●	1	25	12.5	200	32	43	90	24	110	2.6°	A	ZPFG250-SH	ZDFG250-S□
	ABPF25S32L150	●	1	25	12.5	250	32	43	150	24	100	1.5°	B		
	ABPF30S32L	★	1	30	15	220	32	55	100	29	120	0.7°	A	ZPFG300-SH	ZDFG300-S□
	ABPF30S32L150	★	1	30	15	250	32	55	150	29	100	0.5°	B		
	ABPF30S32L200	★	1	30	15	300	32	55	200	29	100	0.3°	B		
	ABPF32S32L	★	1	32	16	220	32	58	100	31	120	—	B	ZPFG320(-G□)	ZDFG320-W□

Ball Precision F ABPF

Carbide Shank



Type A (Taper neck)



Type B (Straight neck)

Inch IABPF○○S○○W(R/L)

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Item code	Stock	No.of inserts	Size (inch)									Type	Inserts
			DC	RE	LF	DCONMS	LB2	L/D*	LH	BD3	LS		
IABPF05S05W	●	1	.313	.156	3.937	.313	.709	3.773	1.181	.303	2.756	B	IZ□FG050
IABPF06S06W	●	1	.375	.188	3.937	.375	.906	3.675	1.378	.366	2.559	B	IZ□FG060
IABPF08S08W	●	1	.500	.250	4.331	.500	1.024	3.544	1.772	.472	2.559	B	IZ□FG080
IABPF10S10W	●	1	.625	.313	5.512	.625	.748	2.520	1.575	.602	3.937	B	IZ□FG100
IABPF12S12W	●	1	.750	.375	4.724	.750	.866	2.887	2.165	.728	2.559	B	IZ□FG120
IABPF16S16W	●	1	1.000	.500	5.315	1.000	.984	2.559	2.559	.980	2.756	B	IZ□FG160
IABPF05S05WR	●	1	.313	.156	5.118	.310	.394	8.176	2.559	.303	2.559	B	IZ□FG050
IABPF06S06WR	●	1	.375	.188	5.512	.375	.512	7.875	2.953	.366	2.559	B	IZ□FG060
IABPF08S08WR	●	1	.500	.250	5.906	.500	.591	6.692	3.346	.472	2.559	B	IZ□FG080
IABPF12S12WR	●	1	.750	.375	6.299	.750	.709	2.887	2.165	.728	4.134	B	IZ□FG120
IABPF16S16WR	●	1	1.000	.500	7.087	1.000	.709	1.651	1.651	.980	4.528	B	IZ□FG160
IABPF05S05WL	●	1	.313	.156	7.087	.303	.394	4.403	1.378	.303	5.709	B	IZ□FG050
IABPF06S06WL	●	1	.375	.188	7.087	.366	.512	3.675	1.378	.366	5.709	B	IZ□FG060
IABPF08S08WL	●	1	.500	.250	7.087	.472	.591	3.544	1.772	.472	5.315	B	IZ□FG080
IABPF10S10WL	●	1	.625	.313	7.874	.602	.787	4.094	2.559	.602	5.315	B	IZ□FG100
IABPF12S12WL	●	1	.750	.375	9.843	.728	.866	4.200	3.150	.728	6.693	B	IZ□FG120
IABPF16S16WL	●	1	1.000	.500	9.843	.980	.984	3.150	3.150	.980	6.693	B	IZ□FG160

*L/D is LH/DC

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark: Manufactured upon request only

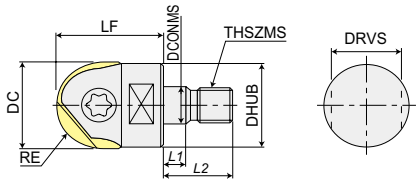
Metric ABPF○○S○○W(□/□○○○)

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Item code	Stock	No.of inserts	Size (mm)									Type	Inserts
			DC	RE	LF	DCONMS	LB2	LH	BD3	LS	θn		
ABPF06S06W	★	1	6	3	90	6	10.3	25	5.5	65	—	B	ZPFG06N-SH ZDFG06N-S□
ABPF06S06WL65	★	1	6	3	120	6	10.3	65	5.5	55	—	B	
ABPF08S08W-90-25	★	1	8	4	90	8	25	25	7.5	65	—	B	ZPFG080-SH ZDFG080-S□
ABPF08S08W	●	1	8	4	100	8	30	30	7.5	70	—	B	
ABPF08S08W-115-50	★	1	8	4	115	8	50	50	7.5	65	—	B	
ABPF08S08WL	●	1	8	4	130	8	65	65	7.5	65	—	B	
ABPF08S08W-140-75	●	1	8	4	140	8	75	75	7.5	65	—	B	
ABPF08S08WL95	★	1	8	4	160	8	95	95	7.5	65	—	B	
ABPF08S08W-175-110	★	1	8	4	175	8	110	110	7.5	65	—	B	
ABPF08S12WLT75		1	8	4	140	12	14	75	7.5	65	1.62°	A	
ABPF10S10W-90-25	★	1	10	5	90	10	18	25	9.5	65	—	B	ZPFG100-SH ZDFG100-S□
ABPF10S10W	●	1	10	5	100	10	18	35	9.5	65	—	B	
ABPF10S10W-115-50	★	1	10	5	115	10	18	50	9.5	65	—	B	
ABPF10S10WL	●	1	10	5	140	10	18	75	9.5	65	—	B	
ABPF10S10WL95	★	1	10	5	160	10	18	95	9.5	65	—	B	
ABPF10S10W-185-120	●	1	10	5	185	10	18	120	9.5	65	—	B	
ABPF10S10WL140	★	1	10	5	220	10	18	140	9.5	80	—	B	
ABPF10S12WLT75		1	10	5	140	12	18	75	9.5	65	0.82°	A	
ABPF12S12W-95-30	★	1	12	6	95	12	21	30	11.5	65	—	B	ZPFG120-SH ZDFG120-S□
ABPF12S12W	●	1	12	6	110	12	21	45	11.5	65	—	B	
ABPF12S12W-125-60	★	1	12	6	125	12	21	60	11.5	65	—	B	
ABPF12S12WL	●	1	12	6	150	12	21	85	11.5	65	—	B	
ABPF12S12WL100	★	1	12	6	200	12	21	100	11.5	100	—	B	
ABPF12S12WL120	★	1	12	6	200	12	21	120	11.5	80	—	B	
ABPF12S12WL150	★	1	12	6	220	12	21	150	11.5	70	—	B	
ABPF12S16WLT85		1	12	6	150	16	21	85	11.5	65	1.45°	A	
ABPF16S16W-105-35	★	1	16	8	105	16	27	35	15	70	—	B	ZPFG160-SH ZDFG160-S□
ABPF16S16W-120-50	★	1	16	8	120	16	27	50	15	70	—	B	
ABPF16S16W60	★	1	16	8	130	16	27	60	15	70	—	B	
ABPF16S16WL80	★	1	16	8	160	16	27	80	15	80	—	B	
ABPF16S16WL100	★	1	16	8	200	16	27	100	15	100	—	B	
ABPF16S16WE	●	1	16	8	200	16	27	120	15	80	—	B	
ABPF16S16WE150	★	1	16	8	220	16	27	150	15	70	—	B	
ABPF16S16W-250-180	★	1	16	8	250	16	27	180	15	70	—	B	
ABPF16S20WLT100		1	16	8	165	20	27	100	15	65	1.25°	A	
ABPF20S20W-120-40	★	1	20	10	120	20	35	40	19	80	—	B	ZPFG200-SH ZDFG200-S□
ABPF20S20W-140-60	★	1	20	10	140	20	35	60	19	80	—	B	
ABPF20S20W80	★	1	20	10	160	20	35	80	19	80	—	B	
ABPF20S20WL100	★	1	20	10	220	20	35	100	19	120	—	B	
ABPF20S20WL120	★	1	20	10	220	20	35	120	19	100	—	B	
ABPF20S20WE	●	1	20	10	250	20	35	150	19	100	—	B	
ABPF20S20W-270-190	●	1	20	10	270	20	35	190	19	80	—	B	
ABPF20S20WE220	★	1	20	10	300	20	35	220	19	80	—	B	
ABPF20S25WLT115		1	20	10	195	25	35	115	19	80	1.37°	A	
ABPF25S25W-130-50	★	1	25	12.5	130	25	43	50	24	80	—	B	ZPFG250-SH ZDFG250-S□
ABPF25S25W-160-80	★	1	25	12.5	160	25	43	80	24	80	—	B	
ABPF25S25W100	★	1	25	12.5	220	25	43	100	24	120	—	B	
ABPF25S25WL120	★	1	25	12.5	220	25	43	120	24	100	—	B	
ABPF25S25WL150	★	1	25	12.5	250	25	43	150	24	100	—	B	
ABPF25S25WE	●	1	25	12.5	300	25	43	190	24	110	—	B	
ABPF25S25W-300-220	●	1	25	12.5	300	25	43	220	24	80	—	B	
ABPF25S32WLT135		1	25	12.5	215	32	43	135	24	80	1.64°	A	
ABPF30S32W-160-80	●	1	30	15	160	32	55	80	29	80	—	B	ZPFG300-SH ZDFG300-S□
ABPF30S32W100	★	1	30	15	180	32	55	100	29	80	0.7°	B	
ABPF30S32W120	★	1	30	15	220	32	55	120	29	100	0.6°	B	
ABPF30S32WL150	★	1	30	15	250	32	55	150	29	100	0.4°	B	
ABPF30S32W-260-180	★	1	30	15	260	32	55	180	29	80	—	B	
ABPF30S32W-290-210	●	1	30	15	290	32	55	210	29	80	—	B	
ABPF30S32WE	★	1	30	15	350	32	55	230	29	120	0.3°	B	
ABPF30S32WLT160		1	30	15	240	32	55	160	29	80	0.4°	A	
ABPF32S32W120	★	1	32	16	200	32	58	120	31	80	—	B	ZPFG320(-G□) ZDFG320-W□
ABPF32S32WL150	★	1	32	16	250	32	58	150	31	100	—	B	
ABPF32S32WE220	●	1	32	16	300	32	58	220	31	80	—	B	

Ball Precision F ABPF

Modular Mill Type



Inch IABPFM○○

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Item code	Stock	No.of inserts	Size (inch)									Inserts
			DC	RE	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
IABPFM08	●	1	.500	.250	1.024	.256	M6	.386	.217	.571	.276	IZ□FG080
IABPFM12	●	1	.750	.375	1.496	.413	M10	.701	.217	.748	.591	IZ□FG120
IABPFM16	●	1	1.000	.500	1.496	.492	M12	.819	.217	.866	.669	IZ□FG160

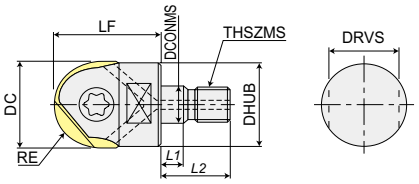
Metric ABPFM○○

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

Item code	Stock	No.of inserts	Size (mm)									Inserts	
			DC	RE	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS		
ABPFM10	★	1	10	5	26	6.5	M6	9.8	5.5	14.5	7	ZPFG100-SH	ZDFG100-S□
ABPFM12	★	1	12	6	26	6.5	M6	9.8	5.5	14.5	7	ZPFG120-SH	ZDFG120-S□
ABPFM16	★	1	16	8	32	8.5	M8	12.8	5.5	17	10	ZPFG160-SH	ZDFG160-S□
ABPFM20	●	1	20	10	38	10.5	M10	17.8	5.5	19	15	ZPFG200-SH	ZDFG200-S□
ABPFM25	●	1	25	12.5	38	12.5	M12	20.8	5.5	22	17	ZPFG250-SH	ZDFG250-S□
ABPFM30	★	1	30	15	43	17	M16	28.8	6	23	22	ZPFG300-SH	ZDFG300-S□
ABPFM32	★	1	32	16	43	17	M16	28.8	6	23	22	ZPFG320(-G□)	ZDFG320-W□

【Note】Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

Modular Mill Type With air hole



With air hole

Metric ABPFM○○-M○○H

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

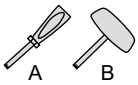
Item code	Stock	No.of inserts	Size (mm)									Inserts	
			DC	RE	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS		
ABPFM10-M6H	★	1	10	5	26	6.5	M6	9.8	5.5	14.5	7	ZPFG100-SH	ZDFG100-S□
ABPFM12-M6H	★	1	12	6	26	6.5	M6	9.8	5.5	14.5	7	ZPFG120-SH	ZDFG120-S□
ABPFM16-M8H	★	1	16	8	32	8.5	M8	12.8	5.5	17	10	ZPFG160-SH	ZDFG160-S□
ABPFM20-M10H	★	1	20	10	38	10.5	M10	17.8	5.5	19	15	ZPFG200-SH	ZDFG200-S□
ABPFM25-M12H	★	1	25	12.5	38	12.5	M12	20.8	5.5	22	17	ZPFG250-SH	ZDFG250-S□
ABPFM30-M16H	★	1	30	15	43	17	M16	28.8	6	23	22	ZPFG300-SH	ZDFG300-S□

【Note】Do not apply lubricants such as grease, etc. to the “contact faces” and “modular screws” of the “modular mill”, “dedicated shanks” and “dedicated arbor”.

● : Inventory maintained in US ★ : Inventory maintained in Japan

Parts

Numeric figure in a circle ◯.

Parts	Clamp screw			Screw driver / Wrench		Screw anti-seizure agent
Cutter Body \ Shape		Fastening torque (N•m)	Fastening torque (lbf•in)	 A B	Shape	
IABPF05S◯◯(L/W/WR/WL)	581-141	1.1	9.74	104-T8	A	P-37
IABPF06S◯◯(L/W/WR/WL)	581-142	2.2	19.47	104-T10	A	
IABPF08S◯◯(L/W/WR/WL), IABPFM08	581-143	4.9	43.37	105-T20	B	
IABPF10S◯◯(L/W/WR/WL)	581-144	4.9	43.37			
IABPF12S◯◯(L/W/WR/WL), IABPFM12	581-145	6.9	61.07	101-T25S	B	
IABPF16S◯◯(L/W/WR/WL), IABPFM16	581-146	9.8	86.73	105-T30A	B	
ABPF06S◯◯(W/WL◯◯)	581-140	0.5	4.43	104-T6	A	P-37
ABPF08S◯◯(L/W/WL/WL◯◯◯/WLT◯◯)	581-141	1.1	9.74	104-T8	A	
ABPF10S◯◯(L/W/WL/WL◯◯◯/WLT◯◯) ABPFM10(−M6H)	581-142	2.2	19.47	104-T10	A	
ABPF12S◯◯(L/W/WL/WL◯◯◯/WLT◯◯) ABPFM12(−M6H)	581-143	4.9	43.37	105-T20	B	
ABPF16S◯◯(L/W◯◯/WL◯◯◯/WE/WE◯◯◯/WLT◯◯◯)	581-144	4.9	43.37			
ABPFU16W220 ABPFM16(−M8H)						
ABPF20S◯◯(L/W◯◯/WL◯◯◯/WE/WE◯◯◯/WLT◯◯◯)	581-145	6.9	61.07	101-T25S	B	
ABPF20MT2 ABPFU20W270 ABPFM20(−M10H)						
ABPF25S◯◯(L/W◯◯/WL◯◯◯/WE/WE◯◯◯/WLT◯◯◯)	581-146	9.8	86.73	105-T30A	B	
ABPF25MT3 ABPFU25W300 ABPFM25(−M12H)						
ABPF30S◯◯(L/W◯◯/WL◯◯◯/WE/WE◯◯◯/WLT◯◯◯)	581-147	9.8	86.73			
ABPF30MT4 ABPFU30W300 ABPFM30(−M16H)						
ABPF32S◯◯(L/W◯◯◯/WL◯◯◯/WE◯◯◯)	581-147	9.8	86.73			
ABPF32MT4 ABPFM32						

Ball Precision F ABPF

Inserts

Inch High helix edge shape inserts

		TH3 Coating	PN Coating	
P	Carbon steel	⊔	■	⊔
K	Cast Iron, Ductile Cast Iron	⊔	⊔	⊔
H	Hardened steel	■	⊔	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

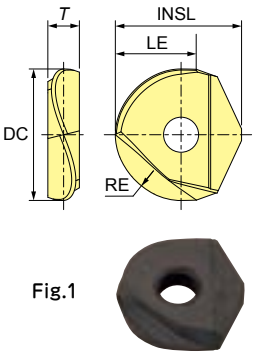


Fig.1

Shape	Item code	Tolerance class	TH303	PN08M	PN15M	RE	LE	INSL	DC	T	Shape
Type SH	IZPFG050-SH	F	●			.156	.217	.383	.312	.083	Fig.1
	IZPFG060-SH		●			.188	.256	.478	.375	.106	
	IZPFG080-SH		●			.250	.295	.574	.500	.126	
	IZPFG100-SH		●			.313	.315	.648	.625	.165	
	IZPFG120-SH		●			.375	.394	.795	.750	.205	
	IZPFG160-SH		●			.500	.492	.943	1.000	.244	
Type ST	IZDFG050-ST	F	●		●	.156	.217	.383	.312	.083	Fig.1
	IZDFG060-ST		●		●	.188	.256	.478	.375	.106	
	IZDFG080-ST		●		●	.250	.295	.574	.500	.126	
	IZDFG100-ST		●		●	.313	.315	.648	.625	.165	
	IZDFG120-ST		●		●	.375	.394	.795	.750	.205	
	IZDFG160-ST		●		●	.500	.492	.943	1.000	.244	
Type SC	IZDFG050-SC	F		●		.156	.217	.383	.312	.083	Fig.1
	IZDFG060-SC			●		.188	.256	.478	.375	.106	
	IZDFG080-SC			●		.250	.295	.574	.500	.126	
	IZDFG100-SC			●		.313	.315	.648	.625	.165	
	IZDFG120-SC			●		.375	.394	.795	.750	.205	
	IZDFG160-SC			●		.500	.492	.943	1.000	.244	

Inch Standard insert

		C Coating	TH Coating	ACS Coating
P	Carbon steel	⊔		■
K	Cast Iron, Ductile Cast Iron	⊔	⊔	■
H	Hardened steel	⊔	■	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

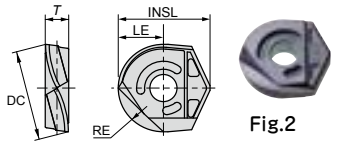


Fig.2

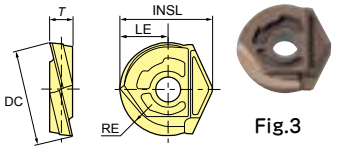


Fig.3

W type:WF/WH
For vertical wall machining;
Regrinding is not possible.

Shape	Item code	Tolerance class	PCA12M	ATH80D	ACS05E	RE	LE	INSL	DC	T	Shape
Fig.2	IZPFG050	F	△			.156	.217	.381	.312	.083	Fig.2
	IZPFG060		△			.188	.256	.478	.375	.106	
	IZPFG080		△			.250	.295	.574	.500	.126	
	IZPFG100		△			.313	.315	.654	.625	.165	
	IZPFG120		△			.375	.394	.800	.750	.205	
	IZPFG160		△			.500	.492	.948	1.000	.244	
Fig.3	IZDFG050-WF	F			△	.156	.217	.381	.312	.083	Fig.3
	IZDFG050-WH			△		.156	.217	.381	.312	.083	
	IZDFG060-WF				△	.188	.256	.478	.375	.106	
	IZDFG060-WH			△		.188	.256	.478	.375	.106	
	IZDFG080-WF				△	.250	.295	.574	.500	.126	
	IZDFG080-WH			△		.250	.295	.574	.500	.126	
	IZDFG100-WF				△	.313	.315	.654	.625	.165	
	IZDFG100-WH			△		.313	.315	.654	.625	.165	
	IZDFG120-WF				△	.375	.394	.800	.750	.205	
	IZDFG120-WH			△		.375	.394	.800	.750	.205	
	IZDFG160-WF				△	.500	.492	.948	1.000	.244	
	IZDFG160-WH			△		.500	.492	.948	1.000	.244	

●: Inventory maintained in US ★: Inventory maintained in Japan △:Discontined after stock run out No Mark: Manufactured upon request only

Metric High helix edge shape inserts

		TH303	ATH80D	ATH10E	PN08M	PN15M	HD7010
P	Carbon steel	☐	☐	☐	■	☐	
K	Cast Iron, Ductile Cast Iron	☐	☐	■	☐	☐	
	Graphite						■
N	Aluminum alloy						■
H	Hardened steel	■	■		☐	☐	

■ : General cutting, First recommendation

☐ : General cutting, Second recommendation

Shape	Item code	Tolerance class	TH Coating TH303	TH Coating ATH80D	TH Coating ATH10E	PN Coating PN08M	PN Coating PN15M	HD Coating HD7010	Size (mm) RE	LE	INSL	DC	T	Shape
Type SH	ZPFG06N-SH	F	★						3	3	5	6	2	Fig.1
	ZPFG080-SH		★						4	4.4	9.7	8	2.1	Fig.2
	ZPFG100-SH		★						5	5.6	12.1	10	2.7	
	ZPFG120-SH		★						6	6.6	14.6	12	3.2	
	ZPFG160-SH		★						8	9	16.6	16	4.2	
	ZPFG200-SH		★						10	11.5	20.3	20	5.2	
	ZPFG250-SH		★						12.5	14.5	24.1	25	6.2	
	ZPFG300-SH		★						15	18.5	29.2	30	7.2	
Type ST	ZDFG06N-ST	F		★			★		3	3	5	6	2	Fig.1
	ZDFG080-ST			●			●		4	4.4	9.7	8	2.1	Fig.2
	ZDFG100-ST			●			●		5	5.6	12.1	10	2.7	
	ZDFG120-ST			●			●		6	6.6	14.6	12	3.2	
	ZDFG160-ST			●			●		8	9	16.6	16	4.2	
	ZDFG200-ST			●			●		10	11.5	20.3	20	5.2	
	ZDFG250-ST			●			●		12.5	14.5	24.1	25	6.2	
	ZDFG300-ST			★			★		15	18.5	29.2	30	7.2	
Type SC	ZDFG06N-SC	F				★			3	3	5	6	2	Fig.1
	ZDFG080-SC					●			4	4.4	9.7	8	2.1	Fig.2
	ZDFG100-SC					●			5	5.6	12.1	10	2.7	
	ZDFG120-SC					●			6	6.6	14.6	12	3.2	
	ZDFG160-SC					●			8	9	16.6	16	4.2	
	ZDFG200-SC					●			10	11.5	20.3	20	5.2	
	ZDFG250-SC					●			12.5	14.5	24.1	25	6.2	
	ZDFG300-SC					★			15	18.5	29.2	30	7.2	
Type SF	ZDFG06N-SF	F						★	3	3	5	6	2	Fig.1
	ZDFG080-SF							★	4	4.4	9.7	8	2.1	Fig.2
	ZDFG100-SF							★	5	5.6	12.1	10	2.7	
	ZDFG120-SF							★	6	6.6	14.6	12	3.2	
	ZDFG160-SF				★			★	8	9	16.6	16	4.2	
	ZDFG200-SF				★			★	10	11.5	20.3	20	5.2	
	ZDFG250-SF				★				12.5	14.5	24.1	25	6.2	
	ZDFG300-SF				★				15	18.5	29.2	30	7.2	

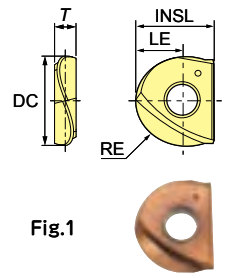


Fig.1

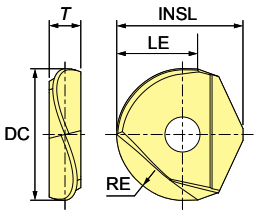


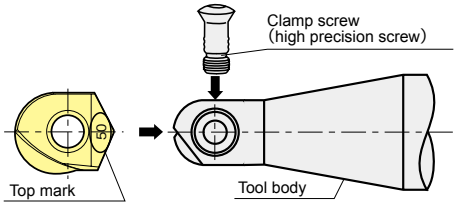
Fig.2

Set-up Procedures of Inserts

1. Clean the insert seat: Using air-blow or alike, clean the seat.
2. Put in the insert with its top positioned to the screw-tightening side of the tool body.
3. Tighten the clamp screw with the special wrench. Please do not press down the insert during this tightening process.
4. This is the end of insert set-up.

Attention Never tighten the clamp screw without assembling the insert into the tool.

Do not tighten the screw without putting insert



To meet the specification for precision of ±.0004 inch, please follow this procedure.

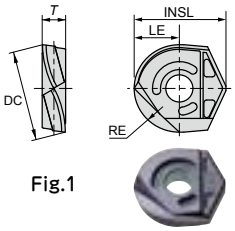
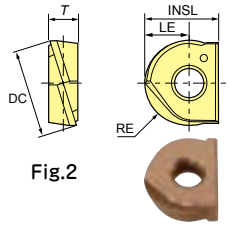
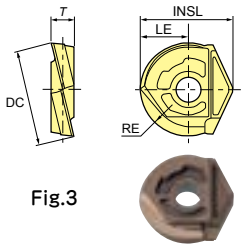
Ball Precision F ABPF

Inserts

		PCA12M	PCA08M	PTH08M	ATH80D	ACS05E	BH200
P	Carbon steel	⊔	⊔			■	
K	Cast Iron, Ductile Cast Iron	⊔	⊔	⊔	⊔	■	
	Graphite						
N	Aluminum alloy						
H	Hardened steel	⊔	⊔	⊔	■	⊔	

■ : General cutting, First recommendation

⊔ : General cutting, Second recommendation

Shape	Item code	Tolerance class	C Coating		TH Coating		ACS Coating	CBN	Size (mm)					
			PCA12M	PCA08M	PTH08M	ATH80D	ACS05E	BH200	RE	LE	INSL	DC	*T*	Shape
 Fig.1	ZPFG080	F				-	-	-	4	4.4	9.7	8	2.1	Fig.1
	ZPFG100					-	-	-	5	5.5	12.1	10	2.7	
	ZPFG120					-	-	-	6	6.6	14.6	12	3.2	
	ZPFG160					-	-	★	8	8.8	16.6	16	4.2	
	ZPFG200					-	-	★	10	11	20.3	20	5.2	
	ZPFG250					-	-	★	12.5	13.7	24.1	25	6.2	
	ZPFG300					-	-	★	15	16.5	29.2	30	7.2	
	ZPFG320		△	△	△	-	-	-	16	17.6	30.2	32	7.2	
 Fig.2	ZDFG060-WF	F	-	-	-	-		-	3	3	5	6	2	Fig.2
	ZDFG060-WH		-	-	-		-	-	3	3	5	6	2	
	ZDFG080-WF		-	-	-	-		-	4	4	9.7	8	2.1	Fig.3
	ZDFG080-WH		-	-	-		-	-	4	4	9.7	8	2.1	
	ZDFG100-WF		-	-	-	-		-	5	5	12.1	10	2.7	
	ZDFG100-WH		-	-	-		-	-	5	5	12.1	10	2.7	
	ZDFG120-WF		-	-	-	-		-	6	6	14.6	12	3.2	
	ZDFG120-WH		-	-	-		-	-	6	6	14.6	12	3.2	
 Fig.3	ZDFG160-WF		-	-	-	-		-	8	8	16.6	16	4.2	
	ZDFG160-WH		-	-	-		-	-	8	8	16.6	16	4.2	
	ZDFG200-WF		-	-	-	-		-	10	10	20.3	20	5.2	
	ZDFG200-WH		-	-	-		-	-	10	10	20.3	20	5.2	
	ZDFG250-WF		-	-	-	-		-	12.5	12.5	24.1	25	6.2	
	ZDFG250-WH		-	-	-		-	-	12.5	12.5	24.1	25	6.2	
	ZDFG300-WF		-	-	-	-		-	15	15	29.2	30	7.2	
	ZDFG300-WH		-	-	-		-	-	15	15	29.2	30	7.2	
	ZDFG320-WF		-	-	-	-	△	-	16	16	30.2	32	7.2	
	ZDFG320-WH		-	-	-	△	-	-	16	16	30.2	32	7.2	

W type:WF/WH
For vertical wall machining;
Regrinding is not possible.

Comparative table of the conventional and new items.

Numeric figure comes in a circle ◌.

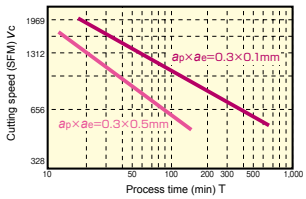
Conventional		Diameter		High helix edge shape inserts	
Item Code	Grade			Item Code	Grade
ZPFG◌◌◌	PTH08M	φ8 ~ 30 (mm)	➡	ZDFG◌◌◌-ST	ATH80D
	PCA08M		➡	ZDFG◌◌◌-SC	PN08M
	PCA12M		➡	ZDFG◌◌◌-ST	PN15M
IZPFG◌◌◌		.312 ~ 1.000 (inch)	➡	IZDFG◌◌◌-ST	
IZDFG◌◌◌-WH	ATH80D	.312 ~ 1.000 (inch)	➡	IZDFG◌◌◌-ST	TH303
ZDFG◌◌◌-WH	ATH80D	φ6 ~ 30 (mm)	➡	ZDFG◌◌◌-ST	ATH80D
(I)ZDFG◌◌◌-WF	ACS05E	φ6 ~ 12 (mm), .312 ~ 1.000 (inch)	➡	(I)ZDFG◌◌◌-SC	PN08M
		φ16 ~ 30 (mm)	➡	ZDFG◌◌◌-SF	ATH10E

★ : Inventory maintained in Japan △:Discontined after stock run out No Mark: Manufactured upon request only -: No manufactured

Field data

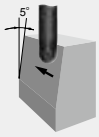
01	02	03	04
Vc-T chart for D2 (60HRC)	*Vc*-T chart for D2 (60HRC)	*Vc*-T chart for Pre-hardened steel (P21 40HRC)	*Vc*-T chart for Cast Iron

Type SH

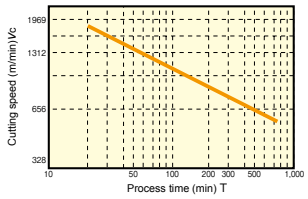


Cutting conditions

Work material：D2 (60HRC)
Tool：ABPF25S25W100
Insert：ZPFG250-SH(TH303)
Overhang：4.724 inch
Feed rate：f_z= .016 IPT
Radial depth of cut：a_p×a_e= .012 × .004 inch,
a_p×a_e= .012 × .020 inch
Machine：Vertical type(BT50)
Cutting shape：contouring cutting on the sloped face 5°
Air

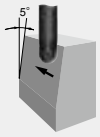


Type ST

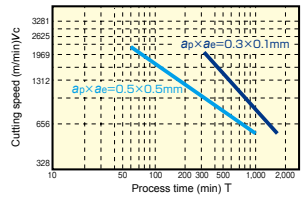


Cutting conditions

Work material：D2 (60HRC)
Tool：ABPF30S32WL150
Insert：ZDFG300-ST (ATH80D)
Overhang：5.906 inch
Feed rate：f_z= .012 IPT
Radial depth of cut：a_p×a_e= .012 × .004 inch
Machine：Vertical type(BT50)
Cutting shape：contouring cutting on the sloped face 5°
Air

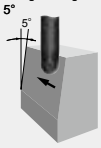


Type SC

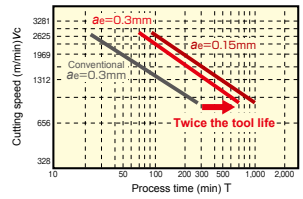


Cutting conditions

Work material：P21 (40HRC)
Tool：ABPFM20
Shank：ASC20-10.5-120-50Z
Insert：ZDFG200-SC (PN08M)
Overhang：3.937 inch
Feed rate：f_z= .012 IPT
Radial depth of cut：a_p×a_e= .012 × .004 inch,
a_p×a_e= .020 × .020 inch
Machine：Vertical type(BT50)
Cutting shape：contouring cutting on the sloped face 5°
Air

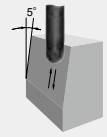


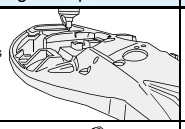
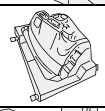
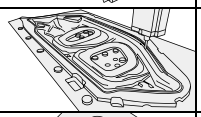
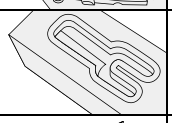
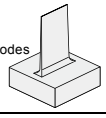
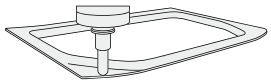
Type SF



Cutting conditions

Work material：Cast Iron
v_c=Variable
Feed rate：f_z= .019 IPT
Machine：Vertical type(BT50)
Tool：ABPFM30 Diameter φ30 (DC 1.181 inch)
Shank：ASC32-17-260-140 (Overhang：7.874 inch)
Insert：ZDFG300-SF (ATH10E)
Radial depth of cut (a_e)= .006, .012 inch
Pick feed (pf)= .020 inch
Cutting shape：5° sloped surface
Air



Cutting examples	Cutting Conditions	Result
Frame hard steels (surface 55～60HRC) 	Tool：ABPF25S25W100 Work material：Frame hard steels (surface 55～60HRC) Insert：ZDFG250-ST(ATH80D) Machine：Gate type M/C(BT50) Cutting speed：V_c = 1,289 SFM Revolution：n = 5,000min^{-1} Feed rate：V_f = 204.7 IPM Feed rate：f_z= .020 IPT Depth of cut：a_p = .004 inch Pick feed：a_e = .020 inch Coolant：Dry	Still nomal wear even after 11 hours process. Improves the surface roughness than conventional.
Plastic mold (S50C) 	Tool：ABPF20S20WL100 Work material：1050 Insert：ZDFG200-SC(PN08M) Machine：Horizontal type M/C(BT50) Cutting speed：V_c = 823 SFM Revolution：n = 4,000min^{-1} Feed rate：V_f = 78.7 IPM Feed rate：f_z= .010 IPT Depth of cut：a_p = .004 inch Pick feed：a_e = .016 inch Coolant：Dry	Still nomal wear even after 15 hours process. Improves the surface roughness than conventional.
Press die (as FCD700) 	Tool：ABPF30S32W120 Work material：Material equivalent to Cast Iron Insert：ZDFG300-SF(ATH10E) Machine：Gate type M/C(BT50) Cutting speed：V_c = 1,673 SFM Revolution：n = 5,400min^{-1} Feed rate：V_f = 177.2 IPM Feed rate：f_z= .017 IPT Depth of cut：a_p = .008 inch Pick feed：a_e = .020 inch Coolant：Dry	Finished surface is fine. Re-grinding is possible by nomal wear after process.
Forging die 	Tool：ABPF12S12W Work material：H13 (45HRC) Insert：ZDFG120-ST (PN15M) Machine：Vertical type M/C(BT50) Cutting speed：V_c = 308 SFM Revolution：n = 2,500min^{-1} Feed rate：V_f = 31.5 IPM Feed rate：f_z= .006 IPT Depth of cut：a_p = .012～ .020 inch Pick feed：a_e = .020 inch Coolant：Dry	Nomal wear after overhang cutting (2.362 inch L/D：5)
Machining of graphite electrodes 	Tool：ABPF10S10WL Work material：Graphite Insert：ZDFG100-SF(HD7010) Machine：Vertical type M/C(BT40) Cutting speed：V_c = 823 SFM Revolution：n = 8,000min^{-1} Feed rate：V_f = 23.6 IPM Feed rate：f_z= .001 IPT Depth of cut(Rough): a_p = .118 inch (Finishing): a_p = .012 inch Pick feed(Rough)：a_e = .157 inch (Finishing): a_e = .004 inch Coolant：Dry	Even for tool projection of 75mm (L/D：7.5), roughing was stable resulting in good finished surface accuracy.
Ductile cast iron and frame hard steels 	Tool：ABPF30S32WL150 Work material：Ductile cast iron and frame hard steels(55HRC) Insert：ZPFG300-SH (TH303) Machine：Gate type M/C(BT50) Cutting speed：V_c = 1,545 SFM Revolution：n = 5,000min^{-1} Feed rate：V_f = 196.9 IPM Feed rate：f_z= .020 IPT Depth of cut：a_p = .008 inch Pick feed：a_e = .079 inch Coolant：Air	SH (TH 303) performed well with steady wear even in semi-finishing which conventional tool life was unstable. Finishing accuracy of next process was also stabilized.
SKD11 (60HRC)	Tool：ABPF30S32W120 Work material：D2 (60HRC) Insert：ZPFG300-SH (TH303) Machine：Vertical type M/C(BT50) Cutting speed：V_c = 1,237 SFM Revolution：n = 4,000min^{-1} Feed rate：V_f = 118.1 IPM Feed rate：f_z= .015 IPT Depth of cut：a_p = .008 inch Pick feed：a_e = .024 inch Coolant：Dry	SH (TH303) stabilized tool life and could increase efficiency even in semi-finishing which conventional tool had to reduce cutting conditions. Finishing surface roughness is also good.

Ball Precision F ABPF

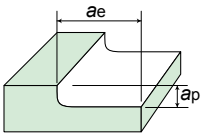
Recommended cutting conditions

Inch

※ Red indicates primary recommended insert grades.

Work material	Recommended inserts grade: High helix edge shape	Recommended inserts grade: Standard	Cutting conditions	φ6mm Semi Finishing: General purpose	φ6mm Semi Finishing: High-speed processing	φ6mm Finishing	5/16" (φ8mm) Semi Finishing: General purpose	5/16" (φ8mm) Semi Finishing: High-speed processing	5/16" (φ8mm) Finishing	3/8" (φ10mm) Semi Finishing: General purpose	3/8" (φ10mm) Semi Finishing: High-speed processing	3/8" (φ10mm) Finishing	1/2" (φ12mm) Semi Finishing: General purpose	1/2" (φ12mm) Semi Finishing: High-speed processing	1/2" (φ12mm) Finishing
Carbon Steel Alloy Steel (<30HRC)	※ PN08M PN15M TH303 ATH80D ATH10E	ACS05E (PCA12M PCA08M)	n (min^{-1})	8,490	16,450	16,450	6,370	12,340	12,340	5,100	9,240	11,150	4,250	7,170	10,080
			v_c (SFM)	525	1,017	1,017	525	1,018	1,018	526	952	1,149	526	887	1,247
			v_f (IPM)	68	197	132	102	395	197	82	296	178	68	229	161
			f_z (IPT)	.004	.006	.004	.008	.016	.008	.008	.016	.008	.008	.016	.008
			a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004	.012	.008	.004
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Carbon Steel Alloy Steel (30-45HRC)	PN08M PN15M TH303 ATH80D	ACS05E (PCA12M PCA08M)	n (min^{-1})	6,370	14,320	14,320	4,780	10,750	10,750	3,820	7,640	9,550	3,180	6,100	8,760
			v_c (SFM)	394	886	886	394	886	886	394	787	984	393	754	1,083
			v_f (IPM)	51	172	115	76	344	172	61	244	153	51	195	140
			f_z (IPT)	.004	.006	.004	.008	.016	.008	.008	.016	.008	.008	.016	.008
			a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004	.012	.008	.004
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Cast Iron	ATH10E TH303 ATH80D PN08M PN15M	(ACS05E ATH80D PTH08M PCA12M PCA08M)	n (min^{-1})	8,490	16,450	16,450	6,370	12,340	12,340	5,090	9,240	11,150	4,240	7,170	10,080
			v_c (SFM)	525	1,017	1,017	525	1,018	1,018	525	952	1,149	524	887	1,247
			v_f (IPM)	68	263	132	153	592	197	122	444	268	102	344	242
			f_z (IPT)	.004	.008	.004	.012	.024	.008	.012	.024	.012	.012	.024	.012
			a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004	.012	.008	.004
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Graphite	HD7010 ATH10E	HD7010	n (min^{-1})	15,920	21,220	21,220	11,940	15,920	15,920	9,550	12,740	12,740	7,960	10,620	10,620
			v_c (SFM)	985	1,312	1,312	985	1,313	1,313	984	1,313	1,313	985	1,314	1,314
			v_f (IPM)	127	255	170	191	382	255	153	306	204	127	255	170
			f_z (IPT)	.004	.006	.004	.008	.012	.008	.008	.012	.008	.008	.012	.008
			a_p (inch)	.012	.006	.006	.016	.008	.008	.020	.012	.008	.024	.016	.008
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Cast Aluminum alloy AC4A, ADC12, etc.	HD7010 PN08M	HD7010	n (min^{-1})	15,920	26,530	26,530	11,940	19,900	19,900	9,550	15,920	15,920	7,960	13,270	13,270
			v_c (SFM)	985	1,641	1,641	985	1,641	1,641	984	1,641	1,641	985	1,641	1,641
			v_f (IPM)	127	424	212	191	637	318	153	509	255	127	425	212
			f_z (IPT)	.004	.008	.004	.008	.016	.008	.008	.016	.008	.008	.016	.008
			a_p (inch)	.012	.006	.006	.016	.008	.008	.020	.012	.008	.024	.016	.008
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Hardened Steel 45-55HRC	TH303 ATH80D PN15M PN08M	ATH80D (PTH08M PCA12M PCA08M ACS05E)	n (min^{-1})	5,310	12,200	12,200	3,980	9,160	9,160	3,180	6,690	8,280	2,650	5,310	7,700
			v_c (SFM)	328	754	754	328	755	755	328	690	853	328	657	952
			v_f (IPM)	31.86	98	98	31.84	147	147	25.44	107	132	21.2	85	123
			f_z (IPT)	.003	.004	.004	.004	.008	.008	.004	.008	.008	.004	.008	.008
			a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004	.012	.008	.004
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Hardened Steel 55-62HRC	TH303 ATH80D	ATH80D (PTH08M)	n (min^{-1})	4,240	9,550	9,550	3,180	7,170	7,170	2,550	5,410	6,370	2,120	4,250	6,100
			v_c (SFM)	262	591	591	262	591	591	263	558	657	262	526	754
			v_f (IPM)	25.44	76	76	25.44	115	115	20.4	87	102	16.96	68	98
			f_z (IPT)	.003	.004	.004	.004	.008	.008	.004	.008	.008	.004	.008	.008
			a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004	.012	.008	.004
			a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010	.047	.035	.012
Maximum f_z (IPT)				< .008			< .031			< .031			< .031		
Maximum a_p (inch)				< .118			< .157			< .197			< .236		

【Note】 ①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③Be sure to practice safety instructions and precautions such as wearing glasses and safety shoes, and placing safety covers when you use this tool. Because this tool can be broken during machining so failure to follow these instructions may cause personal injury.
④Never attempt to modify the carbide shank holder. In case of finish cut with overhang=3DC or more, please set cutting depth a_p as below. When DC=12mm or less, a_p=0.2mm or less. When DC=16mm or more, a_p=0.3mm or less.



5/8" (φ16mm)			3/4" (φ20mm)			1" (φ25mm)			φ30mm			φ32mm			Work material
Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	
General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		
3,180	4,180	9,950	2,550	3,340	9,080	2,040	2,680	8,030	1,700	2,230	7,640	1,590	2,090	7,170	Carbon Steel Alloy Steel (<30HRC)
524	689	1,641	526	689	1,872	526	691	2,069	526	690	2,362	524	689	2,365	
64	167	239	51	134	291	41	107	321	34	89	367	31.8	84	344	
.010	.020	.012	.010	.020	.016	.010	.020	.020	.010	.020	.024	.010	.020	.024	
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004	.063	.043	.004	
.063	.043	.014	.079	.059	.016	.098	.071	.020	.126	.094	.020	.126	.094	.020	
2,390	2,990	7,560	1,910	2,550	6,690	1,530	2,040	5,990	1,270	1,700	5,730	1,190	1,590	5,370	Carbon Steel Alloy Steel (30-45HRC)
394	493	1,247	394	526	1,379	394	526	1,543	393	526	1,772	392	524	1,771	
48	120	181	38.2	102	214	30.6	82	240	25.4	68	275	23.8	64	258	
.010	.020	.012	.010	.020	.016	.010	.020	.020	.010	.020	.024	.010	.020	.024	
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004	.063	.043	.004	
.063	.043	.012	.079	.059	.016	.098	.071	.020	.126	.094	.024	.126	.094	.024	
3,180	4,180	9,950	2,550	3,340	9,080	2,040	2,680	8,030	1,700	2,230	7,640	1,590	2,090	7,170	Cast Iron
524	689	1,641	526	689	1,872	526	691	2,069	526	690	2,362	524	689	2,365	
89	234	239	71	187	291	57	150	321	48	125	367	45	117	344	
.014	.028	.012	.014	.028	.016	.014	.028	.020	.014	.028	.024	.014	.028	.024	
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004	.063	.043	.004	
.063	.043	.012	.079	.059	.016	.098	.071	.020	.126	.094	.024	.126	.094	.024	
5,970	7,960	7,960	4,780	6,370	6,370	3,820	5,090	5,090	3,180	4,240	4,240				Graphite
985	1,313	1,313	985	1,313	1,313	984	1,312	1,312	983	1,311	1,311				
119	191	159	96	153	127	76	204	204	64	170	204				
.010	.012	.010	.010	.012	.010	.010	.020	.020	.010	.020	.024				
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004				
.063	.043	.012	.079	.059	.016	.098	.071	.020	.126	.094	.024				
5,970	9,950	9,950	4,780	7,960	7,960	3,820	6,370	6,370	3,180	5,310	5,310				Cast Aluminum alloy AC4A, ADC12, etc.
985	1,641	1,641	985	1,641	1,641	984	1,641	1,641	983	1,642	1,642				
119	318	199	96	255	159	76	255	255	64	212	255				
.010	.016	.010	.010	.016	.010	.010	.020	.020	.010	.020	.024				
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004				
.063	.043	.012	.079	.059	.016	.098	.071	.020	.126	.094	.024				
1,990	2,990	6,970	1,590	2,390	6,370	1,270	1,910	5,730	1,060	1,590	5,310	1,000	1,490	4,980	Hardened Steel 45-55HRC
328	493	1,149	328	493	1,313	327	492	1,476	328	492	1,642	330	491	1,643	
19.9	54	167	15.9	43	204	12.7	34.38	229	10.6	28.62	255	10	26.82	239	
.005	.009	.012	.005	.009	.016	.005	.009	.020	.005	.009	.024	.005	.009	.024	
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004	.063	.043	.004	
.063	.043	.012	.079	.059	.016	.098	.071	.020	.126	.094	.024	.126	.094	.024	
1,590	2,390	5,570	1,270	1,910	5,100	1,020	1,530	4,590	850	1,270	4,240	800	1,190	3,980	Hardened Steel 55-62HRC
262	394	919	262	394	1,051	263	394	1,183	263	393	1,311	264	392	1,313	
15.9	43	134	12.7	34.38	163	10.2	27.54	184	8.5	22.86	204	8	21.42	191	
.005	.009	.012	.005	.009	.016	.005	.009	.020	.005	.009	.024	.005	.009	.024	
.031	.024	.004	.039	.028	.004	.049	.035	.004	.063	.043	.004	.063	.043	.004	
.063	.043	.012	.079	.059	.016	.098	.071	.020	.126	.094	.024	.126	.094	.024	
< .039			< .039			< .039			< .039			< .039			Maximum *fz* (IPT)
< .315			< .394			< .492			< .591			< .630			Maximum a_p (inch)

※If overhang length is 3DC or more, make adjustments to the table above according to the table at right.

Overhang	*Vc* (SFM)	*Vf* (IPM)
<3DC	100%	100%
3D～5DC	70%	70%
5D～8DC	60%	60%
8D～10DC	50%	50%

Ball Precision F ABPF

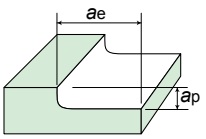
Recommended cutting conditions

Metric

※ Red indicates primary recommended insert grades.

Work material	Recommended inserts grade: High helix edge shape	Recommended inserts grade: Standard	Cutting conditions	φ6 Semi Finishing: General purpose	φ6 Semi Finishing: High-speed processing	φ6 Finishing	φ8 Semi Finishing: General purpose	φ8 Semi Finishing: High-speed processing	φ8 Finishing	φ10 Semi Finishing: General purpose	φ10 Semi Finishing: High-speed processing	φ10 Finishing	φ12 Semi Finishing: General purpose	φ12 Semi Finishing: High-speed processing	φ12 Finishing
Carbon Steel Alloy Steel (<30HRC)	※ PN08M PN15M TH303 ATH80D ATH10E	ACS05E PCA12M PCA08M	n (min^{-1})	8,490	16,450	16,450	6,370	12,340	12,340	5,100	9,240	11,150	4,250	7,170	10,080
			v_c (m/min)	160	310	310	160	310	310	160	290	350	160	270	380
			v_f (mm/min)	1,700	4,930	3,290	2,550	9,870	4,940	2,040	7,390	4,460	1,700	5,740	4,030
			f_z (mm/t)	0.1	0.15	0.1	0.2	0.4	0.2	0.2	0.4	0.2	0.2	0.4	0.2
			a_p (mm)	0.1	0.05	0.05	0.2	0.1	0.1	0.25	0.15	0.1	0.3	0.2	0.1
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1	0.8	0.25	1.2	0.9	0.3
Carbon Steel Alloy Steel (30-45HRC)	PN08M PN15M TH303 ATH80D	ACS05E PCA12M PCA08M	n (min^{-1})	6,370	14,320	14,320	4,780	10,750	10,750	3,820	7,640	9,550	3,180	6,100	8,760
			v_c (m/min)	120	270	270	120	270	270	120	240	300	120	230	330
			v_f (mm/min)	1,270	4,300	2,860	1,910	8,600	4,300	1,530	6,110	3,820	1,270	4,880	3,500
			f_z (mm/t)	0.1	0.15	0.1	0.2	0.4	0.2	0.2	0.4	0.2	0.2	0.4	0.2
			a_p (mm)	0.1	0.05	0.05	0.2	0.1	0.1	0.25	0.15	0.1	0.3	0.2	0.1
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1	0.8	0.25	1.2	0.9	0.3
Cast Iron	ATH10E TH303 ATH80D PN08M PN15M	ACS05E ATH80D PTH08M PCA12M PCA08M	n (min^{-1})	8,490	16,450	16,450	6,370	12,340	12,340	5,090	9,240	11,150	4,240	7,170	10,080
			v_c (m/min)	160	310	310	160	310	310	160	290	350	160	270	380
			v_f (mm/min)	1,700	6,580	3,290	3,820	14,810	4,940	3,050	11,090	6,690	2,550	8,600	6,050
			f_z (mm/t)	0.1	0.2	0.1	0.3	0.6	0.2	0.3	0.6	0.3	0.3	0.6	0.3
			a_p (mm)	0.1	0.05	0.05	0.2	0.1	0.1	0.25	0.15	0.1	0.3	0.2	0.1
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1	0.8	0.25	1.2	0.9	0.3
Graphite	HD7010 ATH10E	HD7010	n (min^{-1})	15,920	21,220	21,220	11,940	15,920	15,920	9,550	12,740	12,740	7,960	10,620	10,620
			v_c (m/min)	300	400	400	300	400	400	300	400	400	300	400	400
			v_f (mm/min)	3,180	6,370	4,240	4,780	9,550	6,370	3,820	7,640	5,100	3,190	6,370	4,240
			f_z (mm/t)	0.1	0.15	0.1	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.2
			a_p (mm)	0.3	0.15	0.15	0.4	0.2	0.2	0.5	0.3	0.2	0.6	0.4	0.2
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.25	1.2	0.9	0.3
Cast Aluminum alloy AC4A, ADC12, etc.	HD7010 PN08M	HD7010	n (min^{-1})	15,920	26,530	26,530	11,940	19,900	19,900	9,550	15,920	15,920	7,960	13,270	13,270
			v_c (m/min)	300	500	500	300	500	500	300	500	500	300	500	500
			v_f (mm/min)	3,180	10,610	5,310	4,780	15,920	7,960	3,820	12,740	6,370	3,190	10,620	5,310
			f_z (mm/t)	0.1	0.2	0.1	0.2	0.4	0.2	0.2	0.4	0.2	0.2	0.4	0.2
			a_p (mm)	0.3	0.15	0.15	0.4	0.2	0.2	0.5	0.3	0.2	0.6	0.4	0.2
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.25	1.2	0.9	0.3
Hardened Steel 45-55HRC	TH303 ATH80D PN15M PN08M	ATH80D PTH08M PCA12M PCA08M ACS05E	n (min^{-1})	5,310	12,200	12,200	3,980	9,160	9,160	3,180	6,690	8,280	2,650	5,310	7,700
			v_c (m/min)	100	230	230	100	230	230	100	210	260	100	200	290
			v_f (mm/min)	850	2,440	2,440	800	3,660	3,660	640	2,680	3,310	530	2,120	3,080
			f_z (mm/t)	0.08	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2
			a_p (mm)	0.1	0.05	0.05	0.2	0.1	0.1	0.25	0.15	0.1	0.3	0.2	0.1
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1	0.8	0.25	1.2	0.9	0.3
Hardened Steel 55-62HRC	TH303 ATH80D	ATH80D (PTH08M)	n (min^{-1})	4,240	9,550	9,550	3,180	7,170	7,170	2,550	5,410	6,370	2,120	4,250	6,100
			v_c (m/min)	80	180	180	80	180	180	80	170	200	80	160	230
			v_f (mm/min)	680	1,910	1,910	640	2,870	2,870	510	2,160	2,550	420	1,700	2,440
			f_z (mm/t)	0.08	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2
			a_p (mm)	0.1	0.05	0.05	0.2	0.1	0.1	0.25	0.15	0.1	0.3	0.2	0.1
			a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1	0.8	0.25	1.2	0.9	0.3
Maximum f_z (mm/t)				< 0.2			< 0.8			< 0.8			< 0.8		
Maximum a_p (mm)				< 3.0			< 4.0			< 5.0			< 6.0		

【Note】 ①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③Be sure to practice safety instructions and precautions such as wearing glasses and safety shoes, and placing safety covers when you use this tool. Because this tool can be broken during machining so failure to follow these instructions may cause personal injury.
④Never attempt to modify the carbide shank holder. In case of finish cut with overhang=3DC or more, please set cutting depth a_p as below. When DC=12mm or less, a_p=0.2mm or less. When DC=16mm or more, a_p=0.3mm or less.



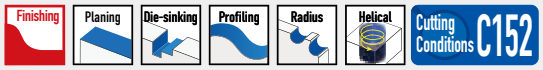
φ16			φ20			φ25			φ30			φ32			Work material
Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	
General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		
3,180	4,180	9,950	2,550	3,340	9,080	2,040	2,680	8,030	1,700	2,230	7,640	1,590	2,090	7,170	Carbon Steel Alloy Steel (<30HRC)
160	210	500	160	210	570	160	210	630	160	210	720	160	210	720	
1,590	4,180	5,970	1,280	3,340	7,260	1,020	2,680	8,030	850	2,230	9,170	800	2,090	8,600	
0.25	0.5	0.3	0.25	0.5	0.4	0.25	0.5	0.5	0.25	0.5	0.6	0.25	0.5	0.6	
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1	1.6	1.1	0.1	
1.6	1.1	0.35	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.5	3.2	2.4	0.5	
2,390	2,990	7,560	1,910	2,550	6,690	1,530	2,040	5,990	1,270	1,700	5,730	1,190	1,590	5,370	Carbon Steel Alloy Steel (30-45HRC)
120	150	380	120	160	420	120	160	470	120	160	540	120	160	540	
1,200	2,990	4,540	960	2,550	5,350	770	2,040	5,990	640	1,700	6,880	600	1,590	6,440	
0.25	0.5	0.3	0.25	0.5	0.4	0.25	0.5	0.5	0.25	0.5	0.6	0.25	0.5	0.6	
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1	1.6	1.1	0.1	
1.6	1.1	0.3	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.6	3.2	2.4	0.6	
3,180	4,180	9,950	2,550	3,340	9,080	2,040	2,680	8,030	1,700	2,230	7,640	1,590	2,090	7,170	Cast Iron
160	210	500	160	210	570	160	210	630	160	210	720	160	210	720	
2,230	5,850	5,970	1,790	4,680	7,260	1,430	3,750	8,030	1,190	3,120	9,170	1,110	2,930	8,600	
0.35	0.7	0.3	0.35	0.7	0.4	0.35	0.7	0.5	0.35	0.7	0.6	0.35	0.7	0.6	
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1	1.6	1.1	0.1	
1.6	1.1	0.3	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.6	3.2	2.4	0.6	
5,970	7,960	7,960	4,780	6,370	6,370	3,820	5,090	5,090	3,180	4,240	4,240				Graphite
300	400	400	300	400	400	300	400	400	300	400	400				
2,990	4,780	3,980	2,390	3,820	3,190	1,910	5,090	5,090	1,590	4,240	5,090				
0.25	0.3	0.25	0.25	0.3	0.25	0.25	0.5	0.5	0.25	0.5	0.6				
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1				
1.6	1.1	0.3	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.6				
5,970	9,950	9,950	4,780	7,960	7,960	3,820	6,370	6,370	3,180	5,310	5,310				Cast Aluminum alloy AC4A, ADC12, etc.
300	500	500	300	500	500	300	500	500	300	500	500				
2,990	7,960	4,980	2,390	6,370	3,980	1,910	6,370	6,370	1,590	5,310	6,370				
0.25	0.4	0.25	0.25	0.4	0.25	0.25	0.5	0.5	0.25	0.5	0.6				
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1				
1.6	1.1	0.3	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.6				
1,990	2,990	6,970	1,590	2,390	6,370	1,270	1,910	5,730	1,060	1,590	5,310	1,000	1,490	4,980	Hardened Steel 45-55HRC
100	150	350	100	150	400	100	150	450	100	150	500	100	150	500	
480	1,440	4,180	380	1,150	5,100	310	920	5,730	250	760	6,370	240	720	5,980	
0.12	0.24	0.3	0.12	0.24	0.4	0.12	0.24	0.5	0.12	0.24	0.6	0.12	0.24	0.6	
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1	1.6	1.1	0.1	
1.6	1.1	0.3	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.6	3.2	2.4	0.6	
1,590	2,390	5,570	1,270	1,910	5,100	1,020	1,530	4,590	850	1,270	4,240	800	1,190	3,980	Hardened Steel 55-62HRC
80	120	280	80	120	320	80	120	360	80	120	400	80	120	400	
380	1,150	3,340	300	920	4,080	240	730	4,590	200	610	5,090	190	570	4,780	
0.12	0.24	0.3	0.12	0.24	0.4	0.12	0.24	0.5	0.12	0.24	0.6	0.12	0.24	0.6	
0.8	0.6	0.1	1	0.7	0.1	1.25	0.9	0.1	1.6	1.1	0.1	1.6	1.1	0.1	
1.6	1.1	0.3	2	1.5	0.4	2.5	1.8	0.5	3.2	2.4	0.6	3.2	2.4	0.6	
< 1.0			< 1.0			< 1.0			< 1.0			< 1.0			Maximum f_z (mm/t)
< 8.0			< 10.0			< 12.5			< 15.0			< 16.0			Maximum a_p (mm)

※If overhang length is 3DC or more, make adjustments to the table above according to the table at right.

Overhang	v_c (m/min)	v_f (mm/min)
<3DC	100%	100%
3D～5DC	70%	70%
5D～8DC	60%	60%
8D～10DC	50%	50%

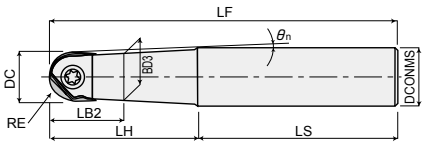
Ball Precision F ABPFN

- High accuracy is exhibited from the ball tip to the outer circumference.
- Excellent cutting performance and beautiful finish
  Special shape of central cutting flute provides excellent finished surface roughness.
- Long life. High-performance coated inserts provide long life.

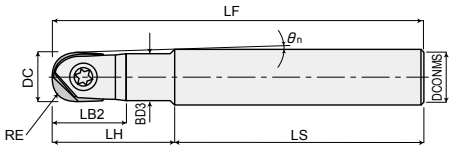


Shank type

Numeric figure comes in a circle ◌.



Type A (Tapered neck)



Type B (Straight Neck)

Inch IABPFN◌◌S◌◌(W)-◌.◌-◌.◌◌

	Item code	Stock	Size (inch)									Shape	Insert
			DC	RE	LF	DCONMS	LB2	LH	BD3	LS	θn		
Steel shank	IABPFN04S06-4-1.25	●	.250	.125	4.000	.375	.591	1.250	.213	2.750	3.180	A	IZDFG040N-ST
	IABPFN05S08-4-1.25	●	.313	.156	4.000	.500	.591	1.250	.295	2.750	4.870	A	IZDFG050N-ST
	IABPFN06S06-4-1.25	●	.375	.188	4.000	.375	.709	1.250	.354	2.750	–	B	IZDFG060N-ST
	IABPFN08S08-6-3	●	.500	.250	6.000	.500	.827	3.000	.453	3.000	–	B	IZDFG080N-ST
	IABPFN10S10-6-3	●	.625	.313	6.000	.625	1.063	3.000	.583	3.000	–	B	IZDFG100N-ST
	IABPFN12S12-6-3	●	.750	.375	6.000	.750	1.378	3.000	.709	3.000	–	B	IZDFG120N-ST
	IABPFN16S16-6-3	●	1.000	.500	6.000	1.000	1.693	3.000	.945	3.000	–	B	IZDFG160N-ST
Carbide shank	IABPFN04S04W-3.5-1	●	.250	.125	3.500	.250	-	1.000	.270	2.500	–	B	IZDFG040N-ST
	IABPFN04S06W-4-2	●	.250	.125	4.000	.375	.406	2.000	.217	2.000	–	B	IZDFG040N-ST
	IABPFN05S05W-4-1.5	●	.313	.156	4.000	.313	-	1.500	.295	2.500	–	B	IZDFG050N-ST
	IABPFN05S08W-4-2	●	.313	.156	4.000	.500	.591	2.000	.295	2.000	–	B	IZDFG050N-ST
	IABPFN06S06W-4-1.5	●	.375	.188	4.000	.375	-	1.500	.354	2.500	–	B	IZDFG060N-ST
	IABPFN06S08W-4-2	●	.375	.188	4.000	.500	.709	2.000	.354	2.000	–	B	IZDFG060N-ST
	IABPFN08S08W-5-2	●	.500	.250	5.000	.500	-	2.000	.453	3.000	–	B	IZDFG080N-ST
	IABPFN08S10W-6-3	●	.500	.250	6.000	.625	.827	3.000	.453	3.000	–	B	IZDFG080N-ST
	IABPFN10S10W-6-3	●	.625	.313	6.000	.625	1.063	3.000	.583	3.000	–	B	IZDFG100N-ST
	IABPFN12S12W-6-3	●	.750	.375	6.000	.750	1.378	3.000	.709	3.000	–	B	IZDFG120N-ST
	IABPFN12S12W-8-4	●	.750	.375	8.000	.750	1.378	4.000	.709	4.000	–	B	IZDFG120N-ST
	IABPFN16S16W-8-4	●	1.000	.500	8.000	1.000	1.693	4.000	.945	4.000	–	B	IZDFG160N-ST

●: Inventory maintained in US ★: Inventory maintained in Japan

Metric ABPFN○○S○○(W)-○○○-○○○

	Item code	Stock	Size (mm)									Shape	Insert
			DC	RE	LF	DCONMS	LB2	LH	BD3	LS	θn		
Steel shank	ABPFN06S08-90-30	●	6	3	90	8	15	30	5.4	60	2.12	A	ZDFG06N-ST
	ABPFN06S06-100-50	●	6	3	100	6	10.3	50	5.5	50	–	B	ZDFG06N-ST
	ABPFN08S10-100-30	●	8	4	100	10	15	30	7.5	70	2.2	A	ZDFG08N-ST
	ABPFN10S10-100-30	●	10	5	100	10	18	30	9	70	–	B	ZDFG10N-ST
	ABPFN12S12-110-40	●	12	6	110	12	21	40	11.5	70	–	B	ZDFG12N-ST
	ABPFN12S12-150-75	●	12	6	150	12	21	75	11.5	75	–	B	ZDFG12N-ST
	ABPFN16S16-130-50	●	16	8	130	16	27	50	14.8	80	–	B	ZDFG16N-ST
	ABPFN20S20-140-60	●	20	10	140	20	35	60	18	80	–	B	ZDFG20N-ST
	ABPFN25S25-150-75	●	25	12.5	150	25	43	75	24	75	–	B	ZDFG25N-ST
	ABPFN30S32-160-80	★	30	15	160	32	55	80	29	80	1.2	A	ZDFG30N-ST
Carbide shank	ABPFN06S06W-75-25	●	6	3	75	6	10.3	25	5.5	50	–	B	ZDFG06N-ST
	ABPFN06S06W-100-50	●	6	3	100	6	10.3	50	5.5	50	–	B	ZDFG06N-ST
	ABPFN08S08W-90-25	●	8	4	90	8	25	25	7.5	65	–	B	ZDFG08N-ST
	ABPFN08S08W-140-75	●	8	4	140	8	75	75	7.5	65	–	B	ZDFG08N-ST
	ABPFN10S10W-100-35	●	10	5	100	10	18	35	9	65	–	B	ZDFG10N-ST
	ABPFN10S10W-140-75	●	10	5	140	10	18	75	9	65	–	B	ZDFG10N-ST
	ABPFN12S12W-105-40	●	12	6	105	12	21	40	11.5	65	–	B	ZDFG12N-ST
	ABPFN12S12W-120-55	●	12	6	120	12	21	55	11.5	65	–	B	ZDFG12N-ST
	ABPFN12S12W-150-75	●	12	6	150	12	21	75	11.5	75	–	B	ZDFG12N-ST
	ABPFN16S16W-115-45	●	16	8	115	16	27	45	14.8	70	–	B	ZDFG16N-ST
	ABPFN16S16W-160-90	●	16	8	160	16	27	90	14.8	70	–	B	ZDFG16N-ST
	ABPFNU20S18W-200-51	●	20	10	200	18	35	51	18.3	149	–	C	ZDFG20N-ST
	ABPFN20S20W-180-100	★	20	10	180	20	35	100	18	80	–	B	ZDFG20N-ST
	ABPFN25S25W-140-65	●	25	12.5	140	25	43	65	24	75	–	B	ZDFG25N-ST
	ABPFN25S25W-165-90	●	25	12.5	165	25	43	90	24	75	–	B	ZDFG25N-ST
	ABPFN25S25W-200-100	●	25	12.5	200	25	43	100	24	100	–	B	ZDFG25N-ST
	ABPFN30S32W-250-150	★	30	15	250	32	55	150	29	100	0.4	B	ZDFG30N-ST

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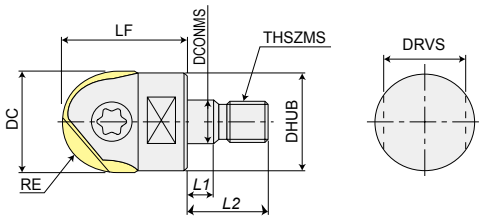
Modular Mill Type



Inch IABPFNM○○

Numeric figure in a circle ○.

Item code	Stock	Size (inch)									Inserts
		DC	RE	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
IABPFNM06	●	.375	**.188**	1.024	.256	M6	.386	.217	.571	.276	IZDFG060N-ST ZDFG06N-ST
IABPFNM08	●	.500	**.250**	1.024	.256	M6	.386	.217	.571	.276	IZDFG080N-ST ZDFG12N-ST
IABPFNM10	●	.625	**.312**	1.260	.335	M8	.504	.217	.669	.394	IZDFG100N-ST ZDFG16N-ST
IABPFNM12	●	.750	**.375**	1.496	.413	M10	.701	.217	.748	.591	IZDFG120N-ST ZDFG20N-ST
IABPFNM16	●	1.000	**.500**	1.496	.492	M12	.819	.217	.866	.669	IZDFG160N-ST ZDFG25N-ST

Metric ABPFNM10

Numeric figure in a circle ○.

Item code	Stock	Size (mm)									Inserts
		DC	RE	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
ABPFNM10	●	10	**5**	26	6.5	M6	9.8	5.5	14.5	7	IZDFG040N-ST ZDFG06N-ST

[Note] Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

● : Inventory maintained in US ★ : Inventory maintained in Japan

High helix edge shape inserts

Inch

P	Carbon stee	⊔	⊔
K	Cast iron	⊔	⊔
H	Hardened steel	■	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

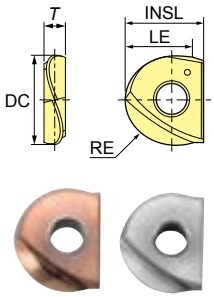


Figure · Size		Item code	Tolerance class	Stocked grade TH Coating ATH80D	Stocked grade PN Coating PN15M	Edge shape Inserts size (inch) RE	LE	INSL	DC	T
	Type ST	IZDFG040N-ST	F	●	●	.125	.137	.204	.250	.079
		IZDFG050N-ST		●	●	.156	.172	.274	.313	.094
		IZDFG060N-ST		●	●	.187	.211	.325	.375	.102
		IZDFG080N-ST		●	●	.250	.273	.407	.500	.118
		IZDFG100N-ST		●	●	.312	.352	.470	.625	.157
		IZDFG120N-ST		●	●	.375	.434	.572	.750	.197
		IZDFG160N-ST		●	●	.500	.579	.736	1.000	.236

Metric

P	Carbon steel	⊔	⊔
K	Cast iron	⊔	⊔
H	Hardened steel	■	⊔

■ : General cutting, First recommendation
⊔ : General cutting, Second recommendation

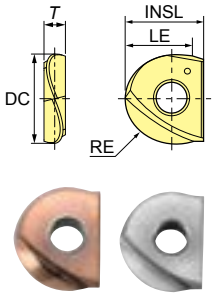


Figure · Size		Item code	Tolerance class	Stocked grade TH Coating ATH80D	Stocked grade PN Coating PN15M	Edge shape Inserts size (mm) RE	LE	INSL	DC	T
	Type ST	ZDFG06N-ST	F	●	●	3	3.3	5	6	2
		ZDFG08N-ST		●	●	4	4.4	7	8	2.4
		ZDFG10N-ST		●	●	5	5.6	8.5	10	2.6
		ZDFG12N-ST		●	●	6	6.6	10	12	3
		ZDFG16N-ST		●	●	8	9	12	16	4
		ZDFG20N-ST		●	●	10	11.5	15	20	5
		ZDFG25N-ST		●	●	12.5	14.5	18.5	25	6
		ZDFG30N-ST		★	★	15	18.5	22.5	30	7

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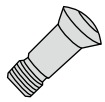
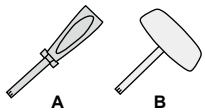
Parts

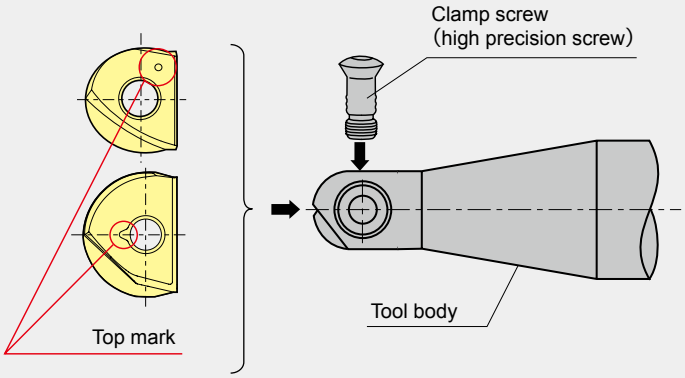
Numeric figure comes in a circle ◌.

Parts	Clamp screw			Screw Driver / Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N・m)	Fastening torque (lbf・in)	 A B	Shape	
ABPFN06S◌◌(W)-◌◌-◌◌ IABPFN04S◌◌(W)-◌◌-◌◌	581-140	0.5	4.43	104-T6	A	P-37
ABPFN08S◌◌(W)-◌◌◌-◌◌ IABPFN05S◌◌(W)-◌◌◌-◌◌	581-149	0.9	7.97	104-T7	A	
ABPFN10S◌◌(W)-◌◌◌-◌◌ ABPFNM10◌◌(W)-◌◌◌-◌◌ IABPFN06S◌◌(W)-◌◌◌-◌◌ IABPFNM06◌◌(W)-◌◌◌-◌◌	581-150	1.1	9.74	104-T8	A	
ABPFN12S◌◌(W)-◌◌◌-◌◌ IABPFN08S◌◌(W)-◌◌◌-◌◌ IABPFNM08◌◌(W)-◌◌◌-◌◌	581-151	2.2	19.47	104-T10	A	
ABPFN16S◌◌(W)-◌◌◌-◌◌ IABPFN10S◌◌(W)-◌◌◌-◌◌ IABPFNM10◌◌(W)-◌◌◌-◌◌	581-152	2.9	25.67	104-T15	A	
ABPFN20S◌◌(W)-◌◌◌-◌◌ IABPFN12S◌◌(W)-◌◌◌-◌◌ IABPFNM12◌◌(W)-◌◌◌-◌◌	581-144	4.9	43.37	105-T20	B	
ABPFN25S◌◌(W)-◌◌◌-◌◌ IABPFN16S◌◌(W)-◌◌◌-◌◌ IABPFNM16◌◌(W)-◌◌◌-◌◌	581-146	9.8	86.73	105-T30A	B	
ABPFN30S◌◌(W)-◌◌◌-◌◌	581-147	9.8	86.73			

【Note】The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

Set-up Procedures of Inserts

1. Clean the insert seat:
   Using air-blow or alike, clean the seat.
2. Put in the insert with its top positioned to the screw-tightening side of the tool body.
3. Tighten the clamp screw with the special wrench. Please do not press down the insert during this tightening process.
4. This is the end of insert set-up.



To meet the specification for precision of ±0.01mm, please follow this procedure.

Attention

Never tighten the clamp screw without putting the insert. The tool body may be deformed, resulting in improper insert mounting or deterioration of mounting accuracy.

Do not tighten the screw without putting insert

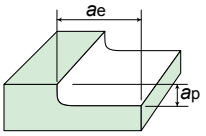
Ball Precision F ABPFN

Recommended cutting conditions

Inch

※ Red indicates primary recommended insert grades.

Work material	Insert grade	Cutting conditions	φ6mm or 1/4"(.250")			φ8mm or 5/16"(.3125")			φ10mm or 3/8"(.375")		
			Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing
			General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing	
Mild steel (<200HB)	※ PN15M ATH80D	n (min^{-1})	8,030	15,550	15,550	6,420	12,440	12,440	5,350	9,700	11,710
		v_c (SFM)	525	1,017	1,017	525	1,017	1,017	525	952	1,149
		v_f (IPM)	63	184	122	101	392	196	84	306	184
		f_z (IPT)	.004	.006	.004	.008	.016	.008	.008	.016	.008
		a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004
		a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010
Carbon steel Alloy steel (30~40HRC)	PN15M ATH80D	n (min^{-1})	6,020	13,550	13,550	4,820	10,840	10,840	4,020	8,030	10,040
		v_c (SFM)	394	886	886	394	886	886	394	788	985
		v_f (IPM)	47	160	107	76	341	171	63	253	158
		f_z (IPT)	.004	.006	.004	.008	.016	.008	.008	.016	.008
		a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004
		a_e (inch)	.024	.024	.079	.031	.031	.010	.039	.031	.010
Cast iron	ATH80D PN15M	n (min^{-1})	8,030	15,550	15,550	6,420	12,440	12,440	5,350	9,700	11,710
		v_c (SFM)	525	1,017	1,017	525	1,017	1,017	525	952	1,149
		v_f (IPM)	63	245	122	152	588	196	126	458	277
		f_z (IPT)	.004	.008	.004	.012	.024	.008	.012	.024	.012
		a_p (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010
		a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010
Hardened steel (45~50HRC)	ATH80D PN15M	n (min^{-1})	5,020	11,540	11,540	4,020	9,230	9,230	3,350	7,030	8,700
		v_c (SFM)	328	755	755	329	755	755	329	690	854
		v_f (IPM)	32	91	91	32	145	145	26	111	137
		f_z (IPT)	.003	.004	.004	.004	.008	.008	.004	.008	.008
		a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004
		a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010
Hardened steel (50~60HRC)	ATH80D	n (min^{-1})	4,020	9,030	9,030	3,210	7,230	7,230	2,680	5,690	6,690
		v_c (SFM)	263	591	591	262	591	591	263	558	656
		v_f (IPM)	25	71	71	25	114	114	21	90	105
		f_z (IPT)	.003	.004	.004	.004	.008	.008	.004	.008	.008
		a_p (inch)	.004	.002	.002	.008	.004	.004	.010	.006	.004
		a_e (inch)	.024	.024	.008	.031	.031	.010	.039	.031	.010
Maximum f_z (IPT)			< .008			< .031			< .031		
Maximum a_p (inch)			< .125			< .156			< .187		



ϕ 12mm or 1/2"(.5")			ϕ 16mm or 5/8"(.625")			ϕ 20mm or 3/4"(.75")			ϕ 25mm or 1.0"			Work material
Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	
General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		
4,020	6,780	9,530	3,210	4,220	10,040	2,680	3,520	9,530	2,010	2,640	7,900	Mild steel (<200HB)
526	887	1,247	525	690	1,642	526	691	1,870	526	691	2,067	
63	214	150	63	166	237	53	139	300	40	104	311	
.008	.016	.008	.010	.020	.012	.010	.020	.016	.010	.020	.020	
.008	.016	.008	.031	.024	.004	.039	.028	.004	.049	.035	.004	
.047	.035	.012	.063	.043	.014	.079	.059	.016	.098	.071	.020	
3,010	5,770	8,280	2,410	3,010	7,630	2,010	2,680	7,030	1,510	2,010	5,900	Carbon steel Alloy steel (30~40HRC)
394	755	1,083	394	492	1,248	394	526	1,380	395	526	1,544	
47	182	130	47	119	180	40	106	221	30	79	232	
.008	.016	.008	.010	.020	.012	.010	.020	.016	.010	.020	.020	
.012	.008	.004	.031	.024	.004	.039	.028	.004	.049	.035	.004	
.047	.035	.012	.063	.043	.012	.079	.059	.016	.098	.071	.020	
4,020	6,780	9,530	3,210	4,220	10,040	2,680	3,520	9,530	2,010	2,640	7,900	Cast iron
526	887	1,247	525	690	1,642	526	691	1,870	526	691	2,067	
95	320	225	88	233	237	74	194	300	55	146	311	
.012	.024	.012	.014	.028	.012	.014	.028	.016	.014	.028	.020	
.047	.035	.012	.031	.024	.004	.039	.028	.004	.049	.035	.004	
.047	.035	.012	.063	.043	.012	.079	.059	.016	.098	.071	.020	
2,510	5,020	7,280	2,010	3,010	7,030	1,680	2,510	6,690	1,260	1,890	5,650	Hardened steel (45~50HRC)
328	657	952	329	492	1,150	330	493	1,313	330	495	1,478	
20	79	115	19	57	166	16	47	211	12	36	222	
.004	.008	.008	.005	.009	.012	.005	.009	.016	.005	.009	.020	
.012	.008	.004	.031	.024	.004	.039	.028	.004	.049	.035	.004	
.047	.035	.012	.063	.043	.012	.079	.059	.016	.098	.071	.020	
2,010	4,020	5,770	1,610	2,410	5,620	1,340	2,010	5,350	1,010	1,510	4,520	Hardened steel (50~60HRC)
263	526	755	263	394	919	263	394	1,050	264	395	1,183	
16	63	91	15	46	133	13	38	169	10	29	178	
.004	.008	.008	.005	.009	.012	.005	.009	.016	.005	.009	.020	
.012	.008	.004	.031	.024	.004	.039	.028	.004	.049	.035	.004	
.047	.035	.012	.063	.043	.012	.079	.059	.016	.098	.071	.020	
< .031			< .039			< .039			< .039			Maximum *fz* (IPT)
< .25			< .312			< .375			< .5			Maximum a_p (inch)

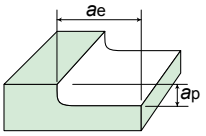
Ball Precision F ABPFN

Recommended cutting conditions

Metric

※ Red indicates primary recommended insert grades.

Work material	Insert grade	Cutting conditions	ϕ6mm or 1/4"(.250")			ϕ8mm or 5/16"(.3125")			ϕ10mm or 3/8"(.375")		
			Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing
			General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing	
Mild steel (<200HB)	※ PN15M ATH80D	n (min^{-1})	8,500	16,460	16,460	6,370	12,350	12,350	5,100	9,240	11,150
		v_c (m/min)	160	310	310	160	310	310	160	290	350
		v_f (mm/min)	1,700	4,940	3,300	2,550	9,880	4,940	2,040	7,400	4,460
		f_z (mm/t)	0.10	0.15	0.10	0.20	0.40	0.20	0.20	0.40	0.20
		a_p (mm)	0.10	0.05	0.05	0.20	0.10	0.10	0.25	0.15	0.10
		a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.25	1.0	0.8	0.3
Carbon steel Alloy steel (30~40HRC)	PN15M ATH80D	n (min^{-1})	6,370	14,340	14,340	4,780	10,750	10,750	3,830	7,650	9,560
		v_c (m/min)	120	270	270	120	270	270	120	240	300
		v_f (mm/min)	1,280	4,310	2,870	1,920	8,600	4,300	1,540	6,120	3,830
		f_z (mm/t)	0.10	0.15	0.10	0.20	0.40	0.20	0.20	0.40	0.20
		a_p (mm)	0.10	0.05	0.05	0.20	0.10	0.10	0.25	0.15	0.10
		a_e (mm)	0.6	0.6	2.0	0.8	0.8	0.3	1.0	0.8	0.3
Cast iron	ATH80D PN15M	n (min^{-1})	8,500	16,460	16,460	6,370	12,350	12,350	5,100	920	11,150
		v_c (m/min)	160	310	310	160	310	310	160	290	350
		v_f (mm/min)	1,700	6,590	3,300	3,830	14,820	4,940	3,060	11,090	6,690
		f_z (mm/t)	0.1	0.2	0.1	0.3	0.6	0.2	0.3	0.6	0.3
		a_p (mm)	0.6	0.6	0.2	0.8	0.8	0.3	1.0	0.8	0.3
		a_e (mm)	0.6	0.6	0.2	0.8	0.8	0.3	1.0	0.8	0.3
Hardened steel (45~50HRC)	ATH80D PN15M	n (min^{-1})	5,310	12,210	1,210	3,990	9,160	9,160	3,190	6,690	8,290
		v_c (m/min)	100	230	230	100	230	230	100	210	260
		v_f (mm/min)	850	2,450	2,450	800	3,670	3,670	640	2,680	3,320
		f_z (mm/t)	0.08	0.10	0.10	0.10	0.20	0.20	0.10	0.20	0.20
		a_p (mm)	0.1	0.1	0.1	0.2	0.1	0.1	0.3	0.2	0.1
		a_e (mm)	0.60	0.60	0.20	0.80	0.80	0.25	1.00	0.80	0.25
Hardened steel (50~60HRC)	ATH80D	n (min^{-1})	4,250	9,560	9,560	3,190	7,170	7,170	2,550	5,420	6,370
		v_c (m/min)	80	180	180	80	180	180	80	170	200
		v_f (mm/min)	680	1,920	1,920	640	2,870	2,870	510	2,170	2,550
		f_z (mm/t)	0.08	0.10	0.10	0.10	0.20	0.20	0.10	0.20	0.20
		a_p (mm)	0.10	0.05	0.05	0.20	0.10	0.10	0.25	0.15	0.10
		a_e (mm)	0.60	0.60	0.20	0.80	0.80	0.25	1.00	0.80	0.25
Maximum f_z (mm)			< 0.2			< 0.8			< 0.8		
Maximum a_p (mm)			< 3.0			< 4.0			< 5.0		



φ 12mm or 1/2"(.5")			φ 16mm or 5/8"(.625")			φ 20mm or 3/4"(.75")			φ 25mm or 1.0"			Work material
Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	Semi Finishing		Finishing	
General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		General purpose	High-speed processing		
4,250	7,170	10,090	3,190	4,180	9,960	2,550	3,350	9,080	2,040	2,680	8,030	Mild steel (<200HB)
160	270	380	160	210	500	160	210	570	160	210	630	
1,700	5,740	4,040	1,600	4,180	5,980	1,280	3,350	7,270	1,020	2,680	8,030	
0.20	0.40	0.20	0.25	0.5	0.3	0.25	0.5	0.4	0.25	0.5	0.5	
0.20	0.40	0.20	0.80	0.60	0.10	1.00	0.70	0.10	1.25	0.90	0.10	
1.2	0.9	0.3	1.6	1.1	0.4	2.0	1.5	0.4	2.5	1.8	0.5	
3,190	6,110	8,760	2,390	2,990	7,570	1,920	2,550	6,690	1,530	2,040	5,990	Carbon steel Alloy steel (30~40HRC)
120	230	330	120	150	380	120	160	420	120	160	470	
1,280	4,890	3,510	1,200	2,990	4,550	960	2,550	5,360	770	2,040	5,990	
0.20	0.40	0.20	0.25	0.50	0.30	0.25	0.50	0.40	0.25	0.50	0.50	
0.30	0.20	0.10	0.80	0.60	0.10	1.00	0.70	0.10	1.25	0.90	0.10	
1.2	0.9	0.3	1.6	1.1	0.3	2.0	1.5	0.4	2.5	1.8	0.5	
4,250	7,170	10,090	3,190	4,180	9,960	2,550	3,350	9,080	2,040	2,680	8,030	Cast iron
160	270	380	160	210	500	160	210	570	160	210	630	
2,550	8,610	6,060	220	5,860	5,980	1,790	4,690	7,270	1,430	3,760	8,030	
0.3	0.6	0.3	0.35	0.70	0.30	0.35	0.70	0.40	0.35	0.70	0.50	
1.2	0.9	0.3	0.80	0.60	0.10	1.00	0.70	0.10	1.25	0.90	0.10	
1.2	0.9	0.3	1.6	1.1	0.3	2.0	1.5	0.4	2.5	1.8	0.5	
2,660	5,310	7,700	2,000	2,990	6,970	1,600	2,390	6,370	1,280	1,920	5,740	Hardened steel (45~50HRC)
100	200	290	100	150	350	100	150	400	100	150	450	
540	2,130	3,080	480	1,440	4,190	390	1,150	5,100	310	930	5,740	
0.10	0.20	0.20	0.12	0.24	0.30	0.12	0.24	0.40	0.12	0.24	0.50	
0.3	0.2	0.1	0.8	0.6	0.1	1.00	0.70	0.10	1.25	0.90	0.10	
1.20	0.90	0.30	1.60	1.10	0.30	2.00	1.50	0.40	2.50	1.80	0.50	
2,130	4,250	6,110	1,600	2,390	5,580	1,280	1,920	5,100	1,020	1,530	4,590	Hardened steel (50~60HRC)
80	160	230	80	120	280	80	120	320	80	120	360	
430	1,700	2,450	390	1,150	3,350	310	930	4,080	250	740	4,590	
0.10	0.20	0.20	0.12	0.24	0.30	0.12	0.24	0.40	0.12	0.24	0.50	
0.30	0.20	0.10	0.80	0.60	0.10	1.00	0.70	0.10	1.25	0.90	0.10	
1.20	0.90	0.30	1.60	1.10	0.30	2.00	1.50	0.40	2.50	1.80	0.50	
< 0.8			< 1.0			< 1.0			< 1.0			Maximum *fz* (mm)
< 6.0			< 8.0			< 10.0			< 12.5			Maximum a_p (mm)

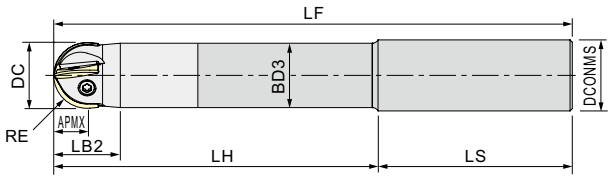
Ball Precision Multi Flutes ABP4F

YouTube

- We devised an original insert mounting method to achieve a four-insert indexable ball end mill with finishing insert tips.
- Compatible with the latest highest-speed machines.
- Compared with conventional products, it provides twice the processing performance and 3 times the tool life.

Semi Finishing | Finishing | Planing | Side milling | Profiling | Radius | Cutting Conditions C160

Carbide shank



Inch IABP4F16S16W-○-○

Numeric figure in a circle ○.

Item code	Stock	No.of inserts Main insert	No.of inserts Sub insert	DC	RE	LF	DCONMS	APMX	LB2	LH	BD3	LS	Inserts Main insert	Inserts Sub insert
				Size (inch)										
IABP4F16S16W-5-2	●	1	2	1.000	.500	5.000	1.000	.500	.830	2.000	.940	3.000	IZDFG160CT	IZDFG160SE
IABP4F16S16W-8-5	●					8.000				5.000				

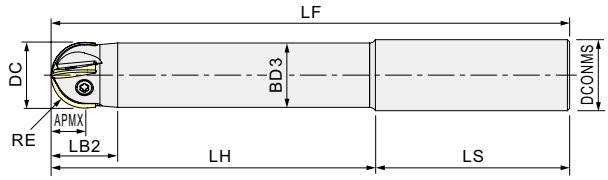
Metric ABP4F○○S○○WL○○○

Numeric figure in a circle ○.

Item code	Stock	No.of inserts Main insert	No.of inserts Sub insert	DC	RE	LF	DCONMS	APMX	LB2	LH	BD3	LS	Inserts Main insert	Inserts Sub insert
				Size (mm)										
ABP4F20S20WL80	●	1	2	20	10	160	20	10	17	80	19	80	ZDFG200CE ZDFG200CT	ZDFG200SE ZDFG200SK
ABP4F20S20WL100	●					180				100				
ABP4F20S20WL120	●					200				120				
ABP4F25S25WL100	●	1	2	25	12.5	180	25	12.5	23.5	100	24	80	ZDFG250CE ZDFG250CT	ZDFG250SE ZDFG250SK
ABP4F25S25WL120	●					200				120				
ABP4F25S25WL150	●					230				150				
ABP4F30S32WL100	●	1	2	30	15	180	32	15	30	100	28	80	ZDFG300CE ZDFG300CT	ZDFG300SE ZDFG300SK
ABP4F30S32WL120	●					200				120				
ABP4F30S32WL150	●					230				150				

●: Inventory maintained in US ★: Inventory maintained in Japan

Steel shank



Inch IABP4F16S16-○-○

Numeric figure in a circle ○.

Item code	Stock	No.of inserts		Size (inch)									Inserts	
		Main insert	Sub insert	DC	RE	LF	DCONMS	APMX	LB2	LH	BD3	LS	Main insert	Sub insert
IABP4F16S16-6-3	●	1	2	1.000	.500	6.000	1.000	.500	.830	3.000	.940	3.000	IZDFG160CT	IZDFG160SE
IABP4F16S16-7-4	●					7.000				4.000				

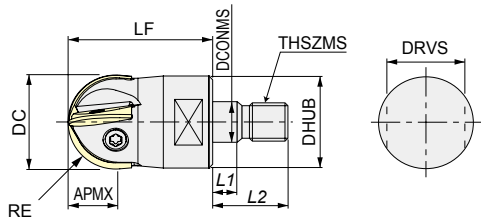
Metric ABP4F○○S○○L○○○

Numeric figure in a circle ○.

Item code	Stock	No.of inserts		Size (mm)									Inserts	
		Main insert	Sub insert	DC	RE	LF	DCONMS	APMX	LB2	LH	BD3	LS	Main insert	Sub insert
ABP4F20S20L60	●	1	2	20	10	140	20	10	17	60	19	80	ZDFG200CE ZDFG200CT	ZDFG200SE ZDFG200SK
ABP4F20S20L80	●					160				80				
ABP4F20S20L100	●					180				100				
ABP4F25S25L100	●	1	2	25	12.5	180	25	12.5	23.5	100	24	80	ZDFG250CE ZDFG250CT	ZDFG250SE ZDFG250SK
ABP4F25S25L120	●					200				120				
ABP4F25S25L150	●					230				150				
ABP4F30S32L100	●	1	2	30	15	180	32	15	30	100	28	80	ZDFG300CE ZDFG300CT	ZDFG300SE ZDFG300SK
ABP4F30S32L120	●					200				120				
ABP4F30S32L150	●					230				150				

Ball Precision Multi Flutes ABP4F

Modular Mill Type



Inch IABP4FM16

Item code	Stock	No. of inserts		Size (inch)										Inserts	
		Main insert	Sub insert	DC	RE	LF	DCONMS	APMX	THSZMS	DHUB	*L1*	*L2*	DRVS	Main insert	Sub insert
IABP4FM16	●	1	2	1.000	**.500**	1.496	.492	.500	M12	.819	.217	.866	.669	IZDFG160CT	IZDFG160SE

Metric ABP4FM○○

Numeric figure in a circle ○.

Item code	Stock	No. of inserts		Size (mm)										Inserts	
		Main insert	Sub insert	DC	RE	LF	DCONMS	APMX	THSZMS	DHUB	*L1*	*L2*	DRVS	Main insert	Sub insert
ABP4FM20	●	1	2	20	**10**	38	10.5	10	M10	17.8	5.5	19	15	ZDFG200CE ZDFG200CT	ZDFG200SE ZDFG200SK
ABP4FM25	●			25	**12.5**	38	12.5	12.5	M12	20.8	5.5	22	17	ZDFG250CE ZDFG250CT	ZDFG250SE ZDFG250SK
ABP4FM30	●			30	**15**	43	17	15	M16	28.8	6	23	22	ZDFG300CE ZDFG300CT	ZDFG300SE ZDFG300SK

【Note】Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

Set-up procedures of Inserts

To meet the specification for radius tolerance ±0.01mm, attach inserts according to the procedure below.

Inserts must be set up in the order of ① main insert then ② sub insert.
Clean the insert seat by air-blow etc.Apply the Screw anti-seizure agent to the whole clamp screw. Excessive tightening torque or the screw to which chip adhered cause screw damage or the problem from which a screw does not separate.Please tighten the screw NOT to exceed the torque of the following table.

Set-up procedures of main insert

1 Place a top mark on the insert as shown toward a screw tightening side.

2 Tighten the insert screw without pressing down the insert too much strongly.

Set-up procedures of sub inserts

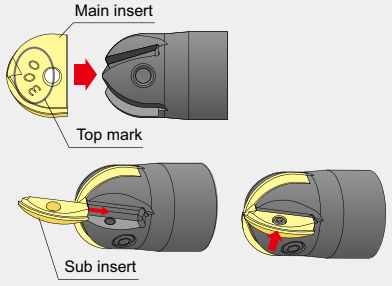
3 Install a sub insert along the restraining wall.

4 Pressing the insert firmly against the wall while tighten the insert screw.

Inserts must be removed in the order of ① sub insert then ② main insert.

Tightening torque

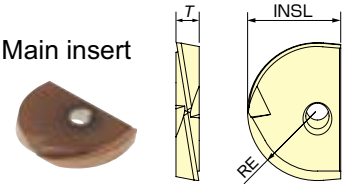
Tool dia. DC (mm)	Main insert		Sub insert	
	(N•m)	(lbf•in)	(N•m)	(lbf•in)
ϕ20	2.2	19.47	0.5	4.43
ϕ25mm/1"	2.9	25.67	1.1	9.74
ϕ30	4.9	43.37	2.0	17.7



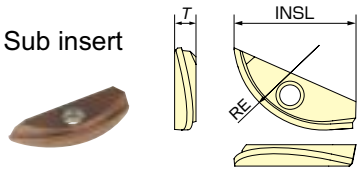
●: Inventory maintained in US ★: Inventory maintained in Japan No Mark : Manufactured upon request only

Inserts

Main insert



Sub insert



Inch

Set items : Main inserts are packaged 1 + Sub inserts are packaged 2

P	Carbon steel	⊔		⊔	■	■	■ : General cutting, First recommended	
K	Cast iron	■	■	■	⊔	⊔	⊔ : General cutting, Second recommended	
H	Hardened steel	■		■	⊔	⊔		

Shape	Item code	Tolerance class	TH303	ATH10E	ATH80D	PN215	PN15M	RE	INSL	*T*
Main insert + Sub insert + Sub insert	**IZDFG160SET**	F			●		●	.500	.750	.157 / .118

Metric

Set items : Main inserts are packaged 1 + Sub inserts are packaged 2

P	Carbon steel	⊔		⊔	■	■	■ : General cutting, First recommended	
K	Cast iron	■	■	■	⊔	⊔	⊔ : General cutting, Second recommended	
H	Hardened steel	■		■	⊔	⊔		

Shape	Item code	Tolerance class	TH303	ATH10E	ATH80D	PN215	PN15M	RE	INSL	*T*
Main insert + Sub insert + Sub insert	**ZDFG200SET**	F	★	●	●	★	●	10	13.8	3.2/2.4
	ZDFG250SET		★	●	●	★	●	12.5	16.8	4.0/4.3
	ZDFG300SET		★	●	●	★	●	15	20	5.0/3.6

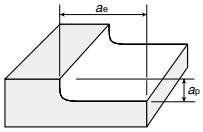
Parts

Parts	Clamp screw						Screw driver / Wrench				Screw anti-seizure agent
Shape / Cutter body							A		B		
	Main insert	Fastening torque (N•m)	Fastening torque (lbf•in)	Sub insert	Fastening torque (N•m)	Fastening torque (lbf•in)	Main insert	Shape	Sub insert	Shape	
ABP4F(M)20	**155-158**	2.2	19.47	**250-140**	0.5	4.43	**104-T15**	A	**104-T6**	A	**P-37**
ABP4F(M)25 IABP4F(M)16	**155-159**	2.9	25.67	**250-141**	1.1	9.74	**104-T15**	A	**104-T8**	A	
ABP4F(M)30	**155-160**	4.9	43.37	**265-141**	2	17.7	**105-T20**	B	**104-T10**	A	

Ball Precision Multi Flutes ABP4F

Recommended cutting conditions

Inch



※ Red indicates primary recommended insert grades.

Work materials	Insert grade: Semi finishing	Insert grade: Finishing	Cutting conditions	20mm or 3/4" Semi finishing	20mm or 3/4" Finishing: General	20mm or 3/4" Finishing: High-speed processing	25mm or 1" Semi finishing	25mm or 1" Finishing: General	25mm or 1" Finishing: High-speed processing	30mm or 1.1811" Semi finishing	30mm or 1.1811" Finishing: General	30mm or 1.1811" Finishing: High-speed processing
Carbon steel Alloy steel (<30HRC)	PN215 PN15M	PN215 PN15M	*n* (min-1)	4,780	9,240	10,350	4,460	8,790	10,190	3,820	7,640	10,080
			Vc(SFM)	938	1813	2031	1167	2300	2666	1249	2499	3297
			Vf(IPM)	135	262	359	141	277	353	120	241	349
			fz(IPT)	.007	.007	.009	.008	.008	.009	.008	.008	.009
			ap(inch)	.012	.004	.004	.016	.004	.004	.020	.004	.004
			ae(inch)	.047	.016	.016	.055	.018	.018	.059	.020	.020
Carbon steel Alloy steel (30~45HRC)	PN215 TH303 PN15M ATH80D	PN215 TH303 PN15M ATH80D	*n* (min-1)	3,670	6,850	7,960	3,060	6,880	8,280	2,650	6,050	8,490
			Vc(SFM)	720	1344	1562	801	1800	2167	867	1979	2777
			Vf(IPM)	104	194	251	96	217	261	83	191	267
			fz(IPT)	.007	.007	.008	.008	.008	.008	.008	.008	.008
			ap(inch)	.012	.004	.004	.016	.004	.004	.020	.004	.004
			ae(inch)	.039	.016	.016	.055	.018	.018	.059	.020	.020
Cast iron	TH303 PN215 ATH80D PN15M	ATH10E TH303 PN215 ATH80D	*n* (min-1)	6,690	10,190	11,150	5,930	10,570	11,460	5,940	9,550	11,670
			Vc(SFM)	1313	2000	2188	1552	2766	2999	1943	3124	3817
			Vf(IPM)	190	321	439	187	333	451	187	301	459
			fz(IPT)	.007	.008	.010	.008	.008	.010	.008	.008	.010
			ap(inch)	.012	.004	.004	.016	.004	.004	.020	.004	.004
			ae(inch)	.047	.016	.016	.055	.018	.018	.059	.020	.020
Hardened steel (45~55HRC)	TH303 PN215 ATH80D PN15M	TH303 PN215 ATH80D PN15M	*n* (min-1)	1,910	4,780	6,690	1,790	4,460	6,120	1,700	4,240	5,840
			Vc(SFM)	375	938	1313	468	1167	1601	556	1387	1910
			Vf(IPM)	54	135	211	51	141	193	48	134	184
			fz(IPT)	.007	.007	.008	.007	.008	.008	.007	.008	.008
			ap(inch)	.008	.004	.004	.012	.004	.004	.016	.004	.004
			ae(inch)	.031	.012	.012	.035	.016	.016	.039	.020	.020
Hardened steel (55~62HRC)	TH303 ATH80D	TH303 ATH80D	*n* (min-1)	1,600	3,190	5,420	1,410	3,570	5,230	1,270	3,820	5,200
			Vc(SFM)	314	626	1064	369	934	1369	415	1249	1701
			Vf(IPM)	45	91	170	40	113	165	36	120	164
			fz(IPT)	.007	.007	.008	.007	.008	.008	.007	.008	.008
			ap(inch)	.008	.004	.004	.012	.004	.004	.016	.004	.004
			ae(inch)	.020	.012	.012	.024	.016	.016	.031	.020	.020
Maximum *fz*(IPT)				< .020			< .024			< .028		
Maximum *ap*(inch)				< .394			< .492			< 0.591		

Overhang	*Vc* (SFM)	*Vf* (IPM)
4DC	100%	100%
4DC ～ 6DC	85%	85%

【Note】
① These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
② The above table is for an overhang of <4DC using a carbide shank as the standard. When using a steel shank, reduce the cutting conditions by approximately 20%.
③ When overhang is 4DC or more, values in the above table should be adjusted by referring to the table.

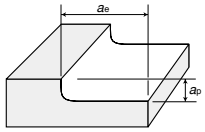
Attention

Never tighten the clamp screw without putting the insert. The tool body may be deformed, resulting in improper insert mounting or deterioration of mounting accuracy.

Do not tighten the screw without putting insert

Metric

※ Red indicates primary recommended insert grades.



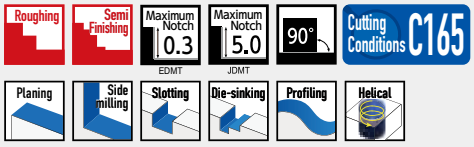
Work materials	Insert grade: Semi finishing	Insert grade: Finishing	Cutting conditions	20mm or 3/4" Semi finishing	20mm or 3/4" Finishing: General	20mm or 3/4" Finishing: High-speed processing	25mm or 1" Semi finishing	25mm or 1" Finishing: General	25mm or 1" Finishing: High-speed processing	30mm or 1.1811" Semi finishing	30mm or 1.1811" Finishing: General	30mm or 1.1811" Finishing: High-speed processing
Carbon steel Alloy steel (<30HRC)	PN215 PN15M	PN215 PN15M	*n* (min-1)	4,780	9,240	10,350	4,460	8,790	10,190	3,820	7,640	10,080
			Vc(m/min)	300	580	650	350	690	800	360	720	950
			Vf(mm/min)	3,440	6,650	9,110	3,570	7,030	8,970	3,060	6,110	8,870
			fz(mm/t)	0.18	0.18	0.22	0.2	0.2	0.22	0.2	0.2	0.22
			*a*p(mm)	0.3	0.1	0.1	0.4	0.1	0.1	0.5	0.1	0.1
			*a*e(mm)	1.2	0.4	0.4	1.4	0.45	0.45	1.5	0.5	0.5
Carbon steel Alloy steel (30~45HRC)	PN215 TH303 PN15M ATH80D	PN215 TH303 PN15M ATH80D	*n* (min-1)	3,670	6,850	7,960	3,060	6,880	8,280	2,650	6,050	8,490
			Vc(m/min)	230	430	500	240	540	650	250	570	800
			Vf(mm/min)	2,640	4,930	6,370	2,450	5,510	6,630	2,120	4,840	6,790
			fz(mm/t)	0.18	0.18	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			*a*p(mm)	0.3	0.1	0.1	0.4	0.1	0.1	0.5	0.1	0.1
			*a*e(mm)	1	0.4	0.4	1.4	0.45	0.45	1.5	0.5	0.5
Cast iron	TH303 PN215 ATH80D PN15M	ATH10E TH303 PN215 ATH80D	*n* (min-1)	6,690	10,190	11,150	5,930	10,570	11,460	5,940	9,550	11,670
			Vc(m/min)	420	640	700	465	830	900	560	900	1,100
			Vf(mm/min)	4,820	8,150	11,150	4,740	8,460	11,460	4,750	7,640	11,670
			fz(mm/t)	0.18	0.2	0.25	0.2	0.2	0.25	0.2	0.2	0.25
			*a*p(mm)	0.3	0.1	0.1	0.4	0.1	0.1	0.5	0.1	0.1
			*a*e(mm)	1.2	0.4	0.4	1.4	0.45	0.45	1.5	0.5	0.5
Hardened steel (45~55HRC)	TH303 PN215 ATH80D PN15M	TH303 PN215 ATH80D PN15M	*n* (min-1)	1,910	4,780	6,690	1,790	4,460	6,120	1,700	4,240	5,840
			Vc(m/min)	120	300	420	140	350	480	160	400	550
			Vf(mm/min)	1,380	3,440	5,350	1,290	3,570	4,890	1,220	3,400	4,670
			fz(mm/t)	0.18	0.18	0.2	0.18	0.2	0.2	0.18	0.2	0.2
			*a*p(mm)	0.2	0.1	0.1	0.3	0.1	0.1	0.4	0.1	0.1
			*a*e(mm)	0.8	0.3	0.3	0.9	0.4	0.4	1	0.5	0.5
Hardened steel (55~62HRC)	TH303 ATH80D	TH303 ATH80D	*n* (min-1)	1,600	3,190	5,420	1,410	3,570	5,230	1,270	3,820	5,200
			Vc(m/min)	100	200	340	110	280	410	120	360	490
			Vf(mm/min)	1,150	2,300	4,330	1,010	2,860	4,180	920	3,060	4,160
			fz(mm/t)	0.18	0.18	0.2	0.18	0.2	0.2	0.18	0.2	0.2
			*a*p(mm)	0.2	0.1	0.1	0.3	0.1	0.1	0.4	0.1	0.1
			*a*e(mm)	0.5	0.3	0.3	0.6	0.4	0.4	0.8	0.5	0.5
Maximum *fz*(mm/t)				< 0.5			< 0.6			< 0.7		
Maximum *a*p(mm)				< 10.0			< 12.5			< 15.0		

Overhang	*Vc* (m/min)	*Vf* (mm/min)
4DC	100%	100%
4DC ～ 6DC	85%	85%

【Note】
① These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
② The above table is for an overhang of <4DC using a carbide shank as the standard. When using a steel shank, reduce the cutting conditions by approximately 20%.
③ When overhang is 4DC or more, values in the above table should be adjusted by referring to the table.

Super Excellent Mini ASM

- Indexable end mill using advanced small inserts.
- Pocket design and 3D-shaped cutting edge enables high-efficient machining of even small diameter sizes.



Shank type

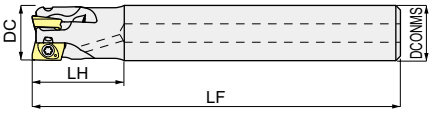


Fig-1 Standard type JDMT insert

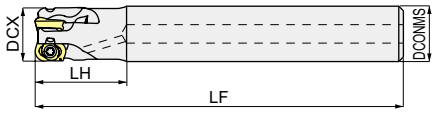


Fig-2 Standard type EDMT insert

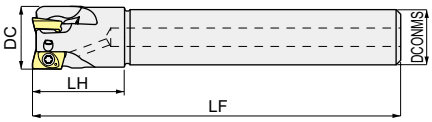


Fig-3 Undercut type JDMT insert

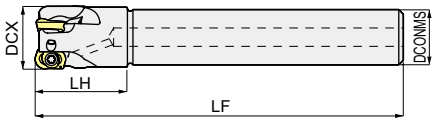


Fig-4 Undercut type EDMT insert

Maximum tightening torque **0.5Nm(4.43 lbf•in)** Spare screw included

Inch IASM(L)07◌◌S◌◌R-◌

Numeric figure in a circle◌.

Item code	Stock	No. of Flutes	Size (Inch) DC DCX	LF	LH	DCONMS	Fig	Insert
IASM0706S06R-2	●	2	.375	3.0	.75	.375	Standard type (Fig-1,2)	JDMT0702◌◌R EDMT070220R(-T)
IASM0708S08R-3	●	3	.5	3.0	.75	.5	Standard type (Fig-1,2)	
IASM0710S10R-4	●	4	.625	3.5	1.0	.625	Standard type (Fig-1,2)	
IASM0712S12R-5	●	5	.75	4.0	1.0	.75	Standard type (Fig-1,2)	
IASML0710S10R-4	●	4	.625	4.5	2.0	.625	Standard type (Fig-1,2)	
IASML0712S12R-5	●	5	.75	5.5	2.5	.750	Standard type (Fig-1,2)	

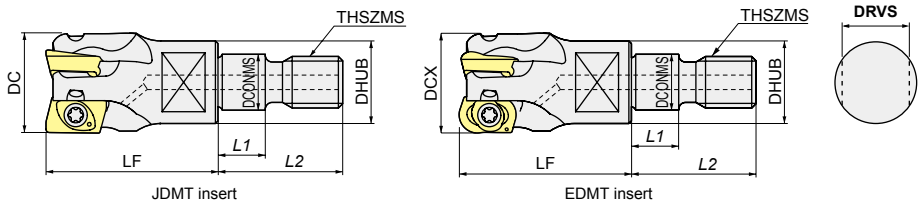
Metric ASM(L)07◌◌S◌◌R-◌

Numeric figure in a circle◌.

Item code	Stock	# of Flutes	Size (mm) DC DCX	LF	LH	DCONMS	Fig	Insert
ASM0708S10R-1	★	1	8	75	16	10	Standard type (Fig-1,2)	JDMT0702◌◌R EDMT070220R(-T)
ASM0710S10R-2	●	2	10	80	20	10	Standard type (Fig-1,2)	
ASM0710S08R-2	★	2	10	80	20	8	Undercut type (Fig-3,4)	
ASM0711S10R-2	★	2	11	80	20	10	Undercut type (Fig-3,4)	
ASM0712S12R-3	●	3	12	80	20	12	Standard type (Fig-1,2)	
ASM0712S10R-3	★	3	12	80	20	10	Undercut type (Fig-3,4)	
ASM0714S12R-3	★	3	14	80	20	12	Undercut type (Fig-3,4)	
ASM0716S16R-4	●	4	16	90	25	16	Standard type (Fig-1,2)	
ASML0716S16R-4	●	4	16	115	50	16	Standard type (Fig-1,2)	
ASM0717S16R-4	★	4	17	115	20	16	Undercut type (Fig-3,4)	
ASM0720S20R-5	●	5	20	105	25	20	Standard type (Fig-1,2)	
ASML0720S20R-5	●	5	20	140	60	20	Standard type (Fig-1,2)	
ASM0721S20R-5	★	5	21	140	20	20	Undercut type (Fig-3,4)	

●: Inventory maintained in US ★: Inventory maintained in Japan

Modular type



Maximum tightening torque
0.5Nm(4.43 lbf•in)
Spare screw included

Inch IASMM07○○R-○

Numeric figure in a circle ○.

Item code	Stock	# of Flutes	Size (Inch) DC DCX	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	Insert
IASMM0706R-2	●	2	.375	.787	.256	M6	.37	.217	.571	.276	JDMT0702○○R EDMT070220R-(T)
IASMM0708R-3	●	3	.5	.787	.256	M6	.386	.217	.571	.276	
IASMM0710R-4	●	4	.625	.984	.335	M8	.504	.217	.669	.394	
IASMM0712R-5	●	5	.75	1.181	.413	M10	.701	.217	.748	.591	
IASMM0716R-6	●	6	1.0	1.181	.492	M12	.819	.217	.866	.669	
IASMM0720R-8	●	8	1.25	1.181	.669	M16	1.134	.236	.906	.866	

Metric ASMM07○○R-○

Numeric figure in a circle ○.

Item code	Stock	# of Flutes	Size (mm) DC DCX	LF	DCONMS	THSZMS	DHUB	L1	L2	DRVS	Insert
ASMM0708R-1	★	1	8	20	6.5	M6	9.8	5.5	14.5	7	JDMT0702○○R EDMT070220R-(T)
ASMM0710R-2	●	2	10	20	6.5	M6	9.4	5.5	14.5	7	
ASMM0711R-2	★	2	11	20	6.5	M6	9.8	5.5	14.5	7	
ASMM0712R-3	●	3	12	20	6.5	M6	9.8	5.5	14.5	7	
ASMM0716R-4	●	4	16	25	8.5	M8	12.8	5.5	17	10	
ASMM0720R-5	●	5	20	30	10.5	M10	17.8	5.5	19	15	
ASMM0725R-6	★	6	25	30	12.5	M12	20.8	5.5	22	17	
ASMM0732R-8	★	8	32	30	17	M16	28.8	6	23	22	

【Note】
Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".

Super Excellent Mini ASM

Inserts

Fig-3 JDMT07020◌R
Insert with 5mm(.197") cutting edge for shoulder cutting
a_{pmax}=5.0mm(.197")

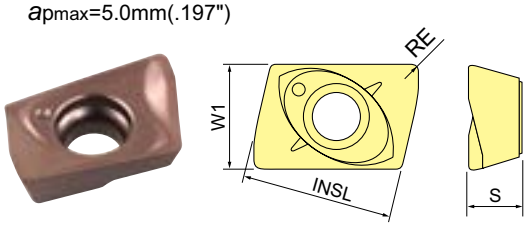
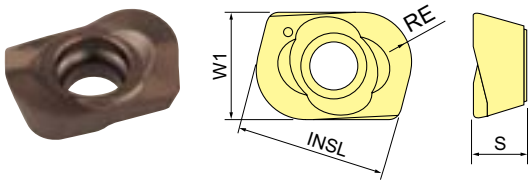


Fig-4 EDMT070220R(-T)
Insert with 2.0mm(.079") corner RE for small-depth, high-feed-rate cutting
a_{pmax}=0.3mm(.012")



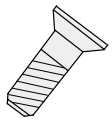
P	Carbon steel		■		□	
M	Stainless Steel		□	■	■	
K	Cast Iron・Ductile Cast Iron				□	
N	Aiuminum Alloy		□		□	■
H	Hardened steel	■	□			

■ : General cutting, First recommended

□ : General cutting, Second recommended

Item code	Tolerance Class	AJ Coated			TH Coated	DLC Coated	Size (mm)				Shape
		JP4105	JP4120	JM4160	PTH30E	SD5010	INSL	W1	RE	S	
JDMT070202R	M	●	●	●	●	●	6.4	4.3	0.2	2.45	Fig-3
JDMT070204R		●	●	●	●	●	6.4	4.3	0.4	2.45	
JDMT070208R		●	●	●	●	●	6.4	4.3	0.8	2.45	
EDMT070220R-T		●	●	●			6.4	4.3	2	2.5	Fig-4 Standard type
EDMT070220R		●	●	●			6.4	4.3	2	2.5	Fig-4 Low-resistance type

Parts

Parts	Clamp screw			Screw Driver	Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N・m)	Fastening torque (lbf・in)		
All ASM Cutter	240-140	0.5	4.43	104-T6	P-37

●: Inventory maintained in US No Mark : Manufactured upon request only

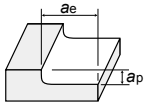
Side Milling standard cutting conditions for EDMT-type inserts：Low cutting depth, high feed rate

Inch

※Red indicates primary recommended grade.

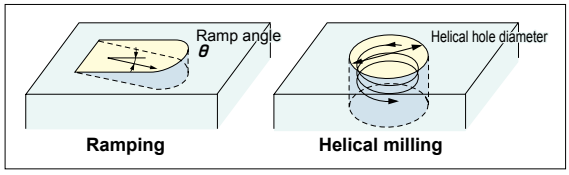
Work material	Recommended grade	Tool dia.	ϕ.375 / 2 Flutes	ϕ.5 / 3 Flutes	ϕ.625 / 4 Flutes	ϕ.75 / 5 Flutes	ϕ1 / 6 Flutes	ϕ1.25 / 8 Flutes
Carbon Steel Alloy Steel <30HRC	※ JP4120 (SFM=328～590)	n(min^{-1})	4,000	3,000	2,408	2,007	1,505	1,204
		SFM	394	394	394	394	394	394
		IPM	～189	～212	～303	～316	～284	～303
		IPT	～.024	～.024	～.032	～.032	～.032	～.032
		a_p(inch)	.012	.012	.012	.012	.012	.012
		a_e(inch)	～.1875	～.291	～.39	～.412	～.68	～.859
		Q(inch^3/min)	.427	.732	1.403	1.525	2.258	3.051
Carbon Steel Alloy Steel 30～40HRC	JP4120 (SFM=328～524)	n(min^{-1})	3,667	2,750	2,200	1,833	1,375	1,100
		SFM	360	360	360	360	360	360
		IPM	～173	～194.7	～277	～288.7	～260	～277.2
		IPT	～.024	～.024	～.032	～.032	～.032	～.032
		a_p(inch)	.012	.012	.012	.012	.012	.012
		a_e(inch)	～.1875	～.291	～.39	～.412	～.68	～.859
		Q(inch^3/min)	.366	.671	1.281	1.403	2.075	2.807
Hardened Steel 40～50HRC	JP4120 (SFM=262～393)	n(min^{-1})	3,005	2,254	1,803	1,502	1,127	900
		SFM	295	295	295	295	295	295
		IPM	～94.4	～106.2	～170.2	～177.2	～159.6	～170
		IPT	～.016	～.016	～.024	～.024	～.024	～.024
		a_p(inch)	.012	.012	.012	.012	.012	.012
		a_e(inch)	～.1875	～.291	～.39	～.412	～.68	～.859
		Q(inch^3/min)	.183	.366	.793	.854	1.281	1.709
Stainless Steel	JM4160 JP4120 (SFM=262～393)	n(min^{-1})	3,005	2,254	1,803	1,502	1,127	900
		SFM	295	295	295	295	295	295
		IPM	～94.4	～106.2	～170.2	～177.2	～159.6	～170
		IPT	～.016	～.016	～.024	～.024	～.024	～.024
		a_p(inch)	.012	.012	.012	.012	.012	.012
		a_e(inch)	～.1875	～.291	～.39	～.412	～.68	～.859
		Q(inch^3/min)	.183	.366	.793	.854	1.281	1.709
Cast Iron/ Ductile Cast Iron	JP4120 (SFM=363～720)	n(min^{-1})	5,011	3,759	3,007	2,506	1,879	1,503
		SFM	492	492	492	492	492	492
		IPM	～236.5	～266.1	～378.9	～394.7	～355.1	～378.8
		IPT	～.024	～.024	～.032	～.032	～.032	～.032
		a_p(inch)	.012	.012	.012	.012	.012	.012
		a_e(inch)	～.1875	～.291	～.39	～.412	～.68	～.859
		Q(inch^3/min)	.549	.915	1.77	1.953	2.868	3.845
Hardened Steel 50～60HRC	JP4105 JP4120 (SFM=197～328)	n(min^{-1})	2,007	1,505	1,204	1,003	752	600
		SFM	197	197	197	197	197	197
		IPM	～47.4	～53.3	～75.6	～78.7	～70.8	～75.3
		IPT	～.012	～.012	～.016	～.016	～.016	～.016
		a_p(inch)	.008	.008	.008	.008	.008	.008
		a_e(inch)	～.1875	～.291	～.39	～.412	～.68	～.859
		Q(inch^3/min)	.061	.122	.183	.183	.366	.488

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For slotting or ramping, feed rate should be set to 70% as general criteria.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑤The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥Due to fire risks do not use neat cutting oil as a coolant.



Ramping with EDMT-type inserts

Since the cutting flute does not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



Inserts	EDMT070220R(-T)					
Tool dia. (inch)	.375"	.500"	.625"	.750"	1.000"	1.250"
Recommended θ	Less than 0.5 °					
Hole Dia (inch)	.474～.711	.724～.961	.974～1.211	1.224～1.461	1.724～1.961	2.224～2.461

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

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Side Milling standard cutting conditions for JDMT-type inserts

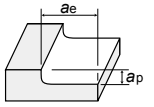
Inch

It is make standard that the depth cut *ap* and the cutting width *ae* be as shown in Tool Overhang (OH) and Cutting Region on the Page C167.
Work Hardness > Please use the conditions in the table as a guideline for the cut depth *ap* and width *ae* of 40HRC.

※Red indicates primary recommended grade.

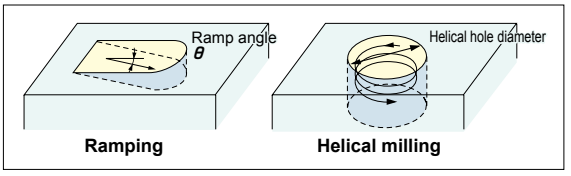
Work material	Recommended grade	Cutting speed (SFM) / Feed rate per tooth (IPT)	Tool dia.	ϕ.375 / 2 Flutes	ϕ.5 / 3 Flutes	ϕ.625 / 4 Flutes	ϕ.75 / 5 Flutes	ϕ1 / 6 Flutes	ϕ1.25 / 8 Flutes
Carbon Steel Alloy Steel <30HRC	※ JP4120 PTH30E	SFM=492～656	n(min^{-1})	5,730	4,780	3,580	2,870	2,290	1,790
			SFM	590	590	590	590	590	590
		IPT=.002～.004	IPM	31.5	39.4	39.4	39.4	37.8	39.4
			IPT	.00275	.00275	.00275	.00275	.00275	.00275
Die Tool Steel <30HRC	JP4120 PTH30E	SFM=426～590	n(min^{-1})	4,780	3,980	2,990	2,390	1,910	1,490
			SFM	492	492	492	492	492	492
		IPT=.002～.003	IPM	22.4	28.3	28.3	28.3	27.2	28.3
			IPT	.00236	.00236	.00236	.00236	.00236	.00236
Pre-Hardened Steel Alloy Steel Die Tool Steel 30～40HRC	JP4120 PTH30E	SFM=328～492	n(min^{-1})	3,820	3,180	2,390	1,910	1,530	1,190
			SFM	394	394	394	394	394	394
		IPT=.002～.003	IPM	18.1	22.4	22.4	22.4	21.7	22.4
			IPT	.00236	.00236	.00236	.00236	.00236	.00236
Pre-Hardened Steel Alloy Steel Die Tool Steel 40～50HRC	JP4120	SFM=262～394	n(min^{-1})	2,860	2,390	1,790	1,430	1,150	900
			SFM	295	295	295	295	295	295
		IPT=.002～.003	IPM	13.4	16.9	16.9	16.9	16.1	16.9
			IPT	.00236	.00236	.00236	.00236	.00236	.00236
			a_p(inch)	.079	.079	.079	.079	.079	.079
			a_e(inch)	.05DC	.05DC	.05DC	.05DC	.05DC	.05DC
Stainless Steel	JM4160 PTH30E JP4120	SFM=328～492	n(min^{-1})	3,820	3,180	2,390	1,910	1,530	1,190
			SFM	394	394	394	394	394	394
		IPT=.002～.004	IPM	18.1	22.4	22.4	22.4	21.7	22.4
			IPT	.00236	.00236	.00236	.00236	.00236	.00236
Cast Iron/ Ductile Cast Iron	JP4120 PTH30E	SFM=426～590	n(min^{-1})	4,780	3,980	2,990	2,390	1,910	1,490
			SFM	492	492	492	492	492	492
		IPT=.002～.004	IPM	26.4	33.1	33.1	33.1	31.5	33.1
			IPT	.00275	.00275	.00275	.00275	.00275	.00275
Alminum Alloy (Wet Condition)	SD5010 PTH30E JP4120	SFM=656～1,640	n(min^{-1})	9,550	7,960	5,970	4,780	3,820	2,990
			SFM	984	984	984	984	984	984
		IPT=.002～.005	IPM	60.2	75.2	75.2	75.2	72	75.2
			IPT	.00315	.00315	.00315	.00315	.00315	.00315
Hardened Steel 50～60HRC	JP4105 JP4120	SFM=197～328	n(min^{-1})	1,910	1,590	1,190	950	760	600
			SFM	197	197	197	197	197	197
		IPT=.002～.003	IPM	9.0	11.4	11.4	11.4	10.6	11.4
			IPT	.00236	.00236	.00236	.00236	.00236	.00236
			a_p(inch)	.079	.079	.079	.079	.079	.079
			a_e(inch)	.05DC	.05DC	.05DC	.05DC	.05DC	.05DC

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For slotting or ramping, feed rate should be set to 70% as general criteria.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑤The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥Due to fire risks do not use neat cutting oil as a coolant.



Ramping with JDMT-type inserts

Since the cutting flute does not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



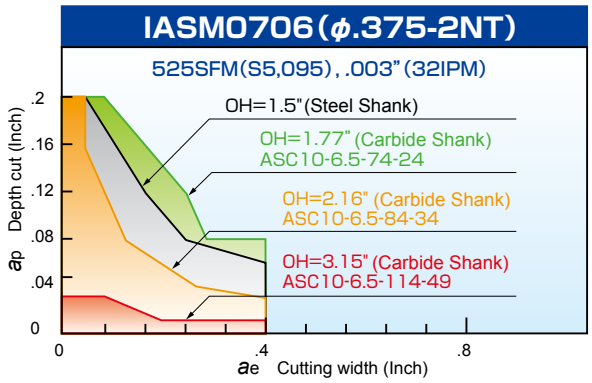
Inserts	JDMT0702○○R					
Tool dia. (inch)	.375"	.500"	.625"	.750"	1.000"	1.250"
Recommended θ	Less than 1 °					
Hole dia. (inch)	.474~.711	.724~.961	.974~1.211	1.224~1.461	1.724~1.961	2.224~2.461

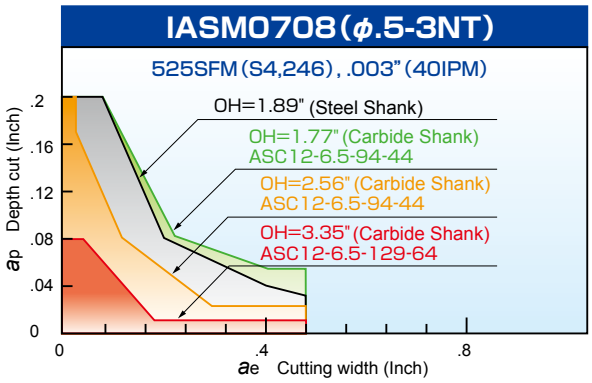
【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

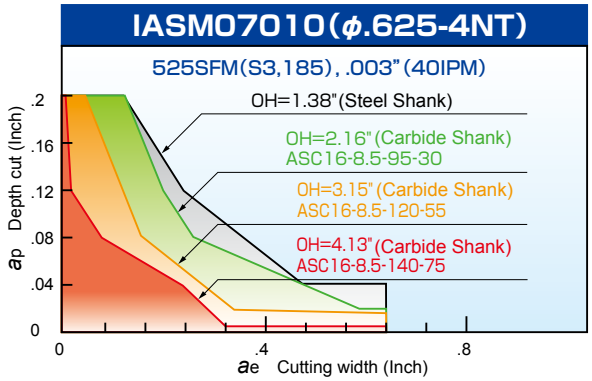
Relation between Tool Overhang（OH）and Limits of the cutting region

The cutting region curves shown below indicate criteria for selecting cutting conditions at each overhang (OH).
If chattering occurs near the limits of the cutting region, make adjustments by reducing the per-flute feed rate (*fz*).

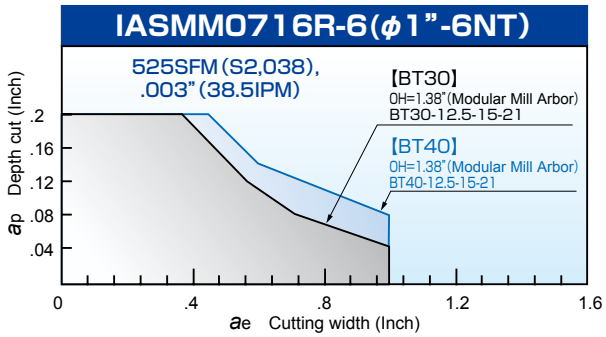
Milling Conditions	Machine：BT30 5.5/3.7kw Work material：Carbon Steel　Cutting Conditions：525SFM, .003”

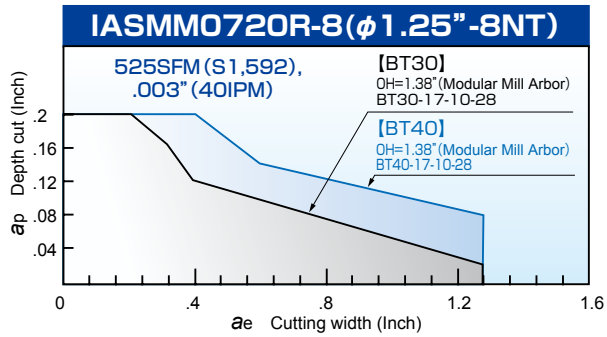






Milling Conditions	Machine：BT40 11kw Work material：Carbon Steel　Cutting Conditions：525SFM, .003”





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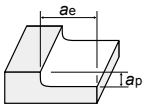
Cutting conditions for aluminum alloy and copper

<Shoulder cutting>：*a*e=0.5DC　<Recommended grade>：SD5010

Inch

Work material		ϕ.375	ϕ.5	ϕ.625	ϕ.75	ϕ1	ϕ1.25
Expanded aluminum alloy material 5052,7075, etc. (Wet：Water-soluble agent)	*n* (min^{-1})	12,700	10,600	9,900	9,500	7,600	6,000
	IPM	80.1	100.2	124.7	149.6	143.6	151.2
	IPT	.00315	.00315	.00315	.00315	.00315	.00315
	SFM	1,312	1,312	1,640	1,968	1,968	1,968
	*a*p (inch)	.079	.079	.079	.079	.079	.079
Cast aluminum alloy material 383.0, etc. (Wet：Water-soluble agent)	*n* (min^{-1})	11,100	9,300	8,000	8,000	6,400	5,000
	IPM	69.9	87.9	100.8	126.0	121.0	126.0
	IPT	.00315	.00315	.00315	.00315	.00315	.00315
	SFM	1,148	1,148	1,312	1,640	1,640	1,640
	*a*p (inch)	.079	.079	.079	.079	.079	.079
Pure copper C11000,C10200, etc. (Wet：Water-soluble agent)	*n* (min^{-1})	9,500	8,000	6,000	4,800	3,820	3,000
	IPM	59.9	75.6	75.6	75.6	72.2	75.6
	IPT	.00315	.00315	.00315	.00315	.00315	.00315
	SFM	984	984	984	984	984	984
	*a*p (inch)	.079	.079	.079	.079	.079	.079

【Note】



❶Use the appropriate coolant for the work material and machining shape.
❷The cutting conditions shown in the above table are for reference and should be adjusted according to the actual machining circumstances.
❸When cutting grooves, reduce the feed rate by 30% (set it to 0.7 times the value shown above).
❹When L/D=4 or higher, reduce rotation speed and feed rate by 50% (set to 0.5× stated values) as general criteria. In addition, when machining copper, set cutting depth in axial direction to 1mm or less.
❺Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
❻When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the *f*z value.
❼Be sure to use this tool at rotation speeds within the acceptable range for the milling chuck being used. If the acceptable rotation speed range is below the rotation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the *f*z value.

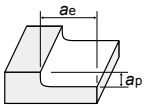
Side Milling standard cutting conditions for EDMT-type inserts：Low cutting depth, high feed rate

Metric

※Red indicates primary recommended grade.

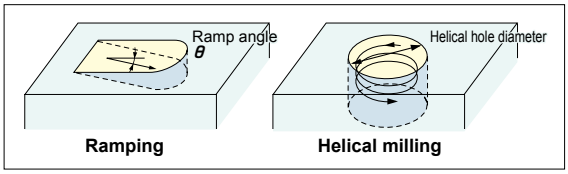
Work material	Recommended grade	Tool dia.	ϕ8 / 1 Flute	ϕ10 / 2 Flutes	ϕ12 / 3 Flutes	ϕ14 / 3 Flutes	ϕ16 / 4 Flutes	ϕ20 / 5 Flutes	ϕ25 / 6 Flutes	ϕ32 / 8 Flutes
Carbon Steel Alloy Steel <30HRC	※ JP4120 (vc=100～180)	n(min-1)	4,780	3,820	3,180	2,730	2,390	1,910	1,530	1,190
		vc(m/min)	120	120	120	120	120	120	120	120
		vf(mm/min)	～2,870	～4,590	～5,730	～6,550	～7,640	～7,640	～7,340	～7,640
		fz(mm/t)	～0.6	～0.6	～0.6	～0.8	～0.8	～0.8	～0.8	～0.8
		ap(mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		ae(mm)	～3	～5	～7	～8	～10	～11	～17	～22
		Q(cm3/min)	3	7	12	16	23	25	37	50
Carbon Steel Alloy Steel 30～40HRC	JP4120 (vc=100～160)	n(min-1)	4,380	3,500	2,920	2,500	2,190	1,750	1,400	1,090
		vc(m/min)	110	110	110	110	110	110	110	110
		vf(mm/min)	～2,630	～4,200	～5,260	～6,010	～7,010	～7,010	～6,730	～7,010
		fz(mm/t)	～0.6	～0.6	～0.6	～0.8	～0.8	～0.8	～0.8	～0.8
		ap(mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		ae(mm)	～3	～5	～7	～8	～10	～11	～17	～22
		Q(cm3/min)	2	6	11	14	21	23	34	46
Hardened Steel 40～50HRC	JP4120 (vc=80～120)	n(min-1)	3,580	2,870	2,390	2,050	1,790	1,430	1,150	900
		vc(m/min)	90	90	90	90	90	90	90	90
		vf(mm/min)	～1,430	～2,290	～2,870	～3,690	～4,300	～4,300	～4,130	～4,300
		fz(mm/t)	～0.4	～0.4	～0.4	～0.6	～0.6	～0.6	～0.6	～0.6
		ap(mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		ae(mm)	～3	～5	～7	～8	～10	～11	～17	～22
		Q(cm3/min)	1	3	6	9	13	14	21	28
Stainless Steel	JM4160 JP4120 (vc=80～120)	n(min-1)	3,580	2,870	2,390	2,050	1,790	1,430	1,150	900
		vc(m/min)	90	90	90	90	90	90	90	90
		vf(mm/min)	～1,430	～2,290	～2,870	～3,690	～4,300	～4,300	～4,130	～4,300
		fz(mm/t)	～0.4	～0.4	～0.4	～0.6	～0.6	～0.6	～0.6	～0.6
		ap(mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		ae(mm)	～3	～5	～7	～8	～10	～11	～17	～22
		Q(cm3/min)	1	3	6	9	13	14	21	28
Cast Iron/ Ductile Cast Iron	JP4120 (vc=120～220)	n(min-1)	5,970	4,780	3,980	3,410	2,990	2,390	1,910	1,490
		vc(m/min)	150	150	150	150	150	150	150	150
		vf(mm/min)	～3,580	～5,730	～7,170	～8,190	～9,550	～9,550	～9,170	～9,550
		fz(mm/t)	～0.6	～0.6	～0.6	～0.8	～0.8	～0.8	～0.8	～0.8
		ap(mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		ae(mm)	～3	～5	～7	～8	～10	～11	～17	～22
		Q(cm3/min)	3	9	15	20	29	32	47	63
Hardened Steel 50～60HRC	JP4105 JP4120 (vc=60～100)	n(min-1)	2,390	1,910	1,590	1,360	1,190	950	760	600
		vc(m/min)	60	60	60	60	60	60	60	60
		vf(mm/min)	～720	～1,150	～1,430	～1,630	～1,900	～1,900	～1,820	～1,900
		fz(mm/t)	～0.3	～0.3	～0.3	～0.4	～0.4	～0.4	～0.4	～0.4
		ap(mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae(mm)	～3	～5	～7	～8	～10	～11	～17	～22
		Q(cm3/min)	0.4	1	2	2	3	3	6	8

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For slotting or ramping, feed rate should be set to 70% as general criteria.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑤The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥Due to fire risks do not use neat cutting oil as a coolant.
⑦When using an ASM0710S08R-2 or ASM0712S10R-2 undercut type shank, as a general rule the feed rate per flute (f_z) should be reduced to 50~70% of the value listed in the standard cutting conditions.



Ramping with EDMT-type inserts

Since the cutting flute does not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



Inserts	EDMT070220R(-T)									
Tool dia. (mm)	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ17	ϕ20	ϕ21	ϕ25	ϕ32
Recommended θ	Less than 0.5 °									
Hole dia. (mm)	10～15	13～19	17～23	21～27	25～31	27～33	33～39	35～41	43～49	57～63

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

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Side Milling standard cutting conditions for JDMT-type inserts

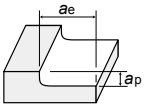
Metric

It is make standard that the depth cut *ap* and the cutting width *ae* be as shown in Tool Overhang (OH) and Cutting Region on the Page C171.
Work Hardness > Please use the conditions in the table as a guideline for the cut depth *ap* and width *ae* of 40HRC.

※Red indicates primary recommended grade.

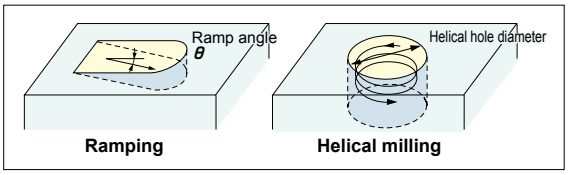
Work material	Recommended grade	Cutting speed v_c (m/min) / Feed rate per tooth f_z (mm/t)	Tool dia.	φ8 / 1 Flute	φ10 / 2 flutes	φ12 / 3 Flutes	φ14 / 3 Flutes	φ16 / 4 Flutes	φ20 / 5 Flutes	φ25 / 6 Flutes	φ32 / 8 Flutes
Carbon Steel Alloy Steel <30HRC	※ JP4120 PTH30E	v_c=150~200	n(min^{-1})	7,170	5,730	4,780	4,090	3,580	2,870	2,290	1,790
			v_c(m/min)	180	180	180	180	180	180	180	180
		f_z=0.04~0.09	v_f(mm/min)	500	800	1,000	860	1,000	1,000	960	1,000
			f_z(mm/t)	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Die Tool Steel <30HRC	JP4120 PTH30E	v_c=130~180	n(min^{-1})	5,970	4,780	3,980	3,410	2,990	2,390	1,910	1,490
			v_c(m/min)	150	150	150	150	150	150	150	150
		f_z=0.04~0.07	v_f(mm/min)	360	570	720	610	720	720	690	720
			f_z(mm/t)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Pre-Hardened Steel Alloy Steel Die Tool Steel 30~40HRC	JP4120 PTH30E	v_c=100~150	n(min^{-1})	4,780	3,820	3,180	2,730	2,390	1,910	1,530	1,190
			v_c(m/min)	120	120	120	120	120	120	120	120
		f_z=0.04~0.07	v_f(mm/min)	290	460	570	490	570	570	550	570
			f_z(mm/t)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Pre-Hardened Steel Alloy Steel Die Tool Steel 40~50HRC	JP4120	v_c=80~120	n(min^{-1})	3,580	2,860	2,390	2,050	1,790	1,430	1,150	900
			v_c(m/min)	90	90	90	90	90	90	90	90
		f_z=0.04~0.07	v_f(mm/min)	220	340	430	370	430	430	410	430
			f_z(mm/t)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
			a_p(mm)	2	2	2	2	2	2	2	2
			a_e(mm)	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC
Stainless Steel	JM4160 PTH30E JP4120	v_c=100~150	n(min^{-1})	4,780	3,820	3,180	2,730	2,390	1,910	1,530	1,190
			v_c(m/min)	120	120	120	120	120	120	120	120
		f_z=0.04~0.09	v_f(mm/min)	290	460	570	490	570	570	550	570
			f_z(mm/t)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Cast Iron/ Ductile Cast Iron	JP4120 PTH30E	v_c=130~180	n(min^{-1})	5,970	4,780	3,980	3,410	2,990	2,390	1,910	1,490
			v_c(m/min)	150	150	150	150	150	150	150	150
		f_z=0.04~0.10	v_f(mm/min)	420	670	840	720	840	840	800	840
			f_z(mm/t)	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Alminum Alloy (Wet Condition)	SD5010 PTH30E JP4120	v_c=200~500	n(min^{-1})	11,940	9,550	7,960	6,820	5,970	4,780	3,820	2,990
			v_c(m/min)	300	300	300	300	300	300	300	300
		f_z=0.04~0.12	v_f(mm/min)	960	1,530	1,910	1,640	1,910	1,910	1,830	1,910
			f_z(mm/t)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Hardened Steel 50~60HRC	JP4105 JP4120	v_c=60~100	n(min^{-1})	2,390	1,910	1,590	1,360	1,190	950	760	600
			v_c(m/min)	60	60	60	60	60	60	60	60
		f_z=0.04~0.07	v_f(mm/min)	140	230	290	240	290	290	270	290
			f_z(mm/t)	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
			a_p(mm)	2	2	2	2	2	2	2	2
			a_e(mm)	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC	0.05DC

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For slotting or ramping, feed rate should be set to 70% as general criteria.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑤The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥Due to fire risks do not use neat cutting oil as a coolant.



Ramping with JDMT-type inserts

Since the cutting flute does not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown below, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



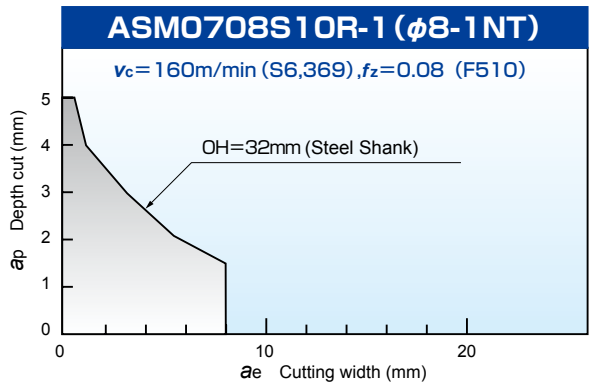
Inserts	JDMT0702○○									
Tool dia. (mm)	φ8	φ10	φ12	φ14	φ16	φ17	φ20	φ21	φ25	φ32
Recommended θ	Less than 1 °									
Hole dia. (mm)	10~15	13~19	17~23	21~27	25~31	27~33	33~39	35~41	43~49	57~63

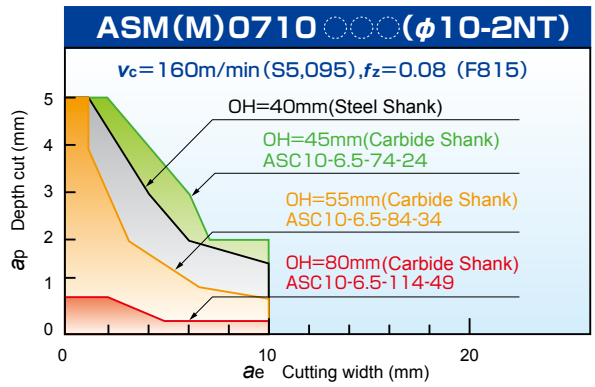
【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

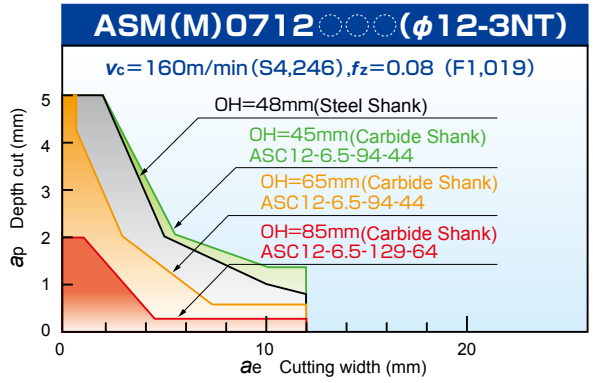
Relation between Tool Overhang（OH）and Limits of the cutting region

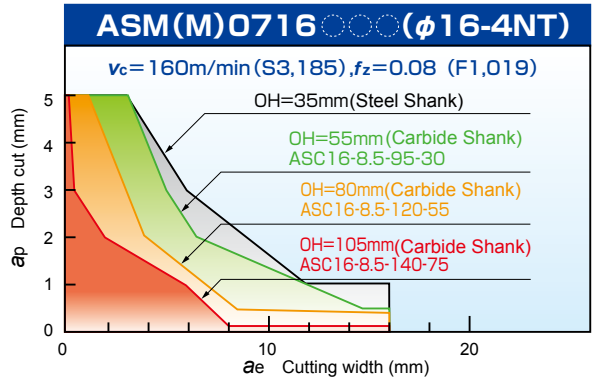
The cutting region curves shown below indicate criteria for selecting cutting conditions at each overhang (OH).
If chattering occurs near the limits of the cutting region, make adjustments by reducing the per-flute feed rate (*fz*).

Milling Conditions	Machine：BT30 5.5/3.7kw Work material：Carbon Steel　Cutting Conditions：v_c=160m/min,　f_z=0.08mm/t



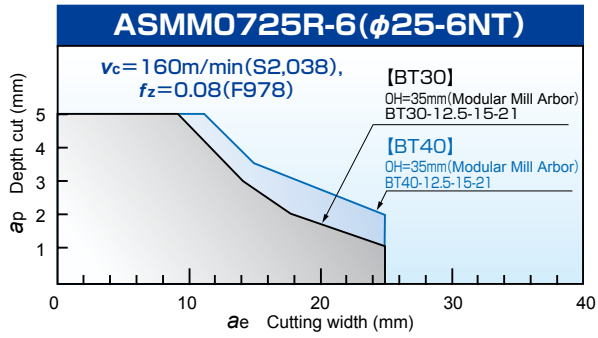


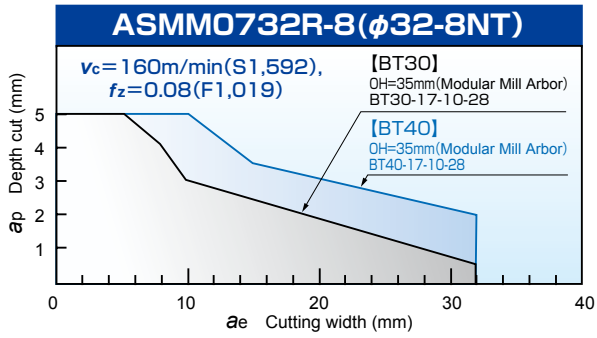




※As a general rule, the cutting amount for ASM0710S08R-2 undercut type shank should be set within 50% of the cutting region for ASM0710S10R-2, and the cutting amount for ASM0712S10R-2 should be set within the cutting region for ASM0710S10R-2.

Milling Conditions	Machine：BT40 11kw Work material：Carbon Steel　Cutting Conditions：v_c=160m/min,　f_z=0.08mm/t





Super Excellent Mini ASM

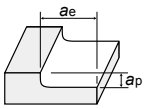
Cutting conditions for aluminum alloy and copper

<Shoulder cutting>：*a*e=0.5DC　<Recommended grade>：SD5010

Metric

Work material		φ8	φ10	φ12	φ14	φ16	φ17	φ20	φ21	φ25	φ32
Expanded aluminum alloy material 5052,7075, etc. (Wet：Water-soluble agent)	*n* (min⁻¹)	11,900	12,700	10,600	11,400	9,900	9,400	9,500	9,100	7,600	6,000
	*v*f (mm/min)	950	2,040	2,550	2,730	3,180	3,000	3,820	3,640	3,670	3,820
	*f*z (mm/t)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	*v*c (m/min)	300	400	400	500	500	500	600	600	600	600
	*a*p (mm)	2	2	2	2	2	2	2	2	2	2
Cast aluminum alloy material 383.0, etc. (Wet：Water-soluble agent)	*n* (min⁻¹)	9,900	11,100	9,300	9,100	8,000	7,500	8,000	7,600	6,400	5,000
	*v*f (mm/min)	800	1,780	2,230	2,180	2,550	2,400	3,180	3,030	3,060	3,180
	*f*z (mm/t)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	*v*c (m/min)	250	350	350	400	400	400	500	500	500	500
	*a*p (mm)	2	2	2	2	2	2	2	2	2	2
Pure copper C11000,C10200, etc. (Wet：Water-soluble agent)	*n* (min⁻¹)	9,900	9,500	8,000	6,800	6,000	5,600	4,800	4,500	3,820	3,000
	*v*f (mm/min)	800	1,530	1,910	1,640	1,910	1,800	1,910	1,820	1,830	1,910
	*f*z (mm/t)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	*v*c (m/min)	250	300	300	300	300	300	300	300	300	300
	*a*p (mm)	2	2	2	2	2	2	2	2	2	2

【Note】

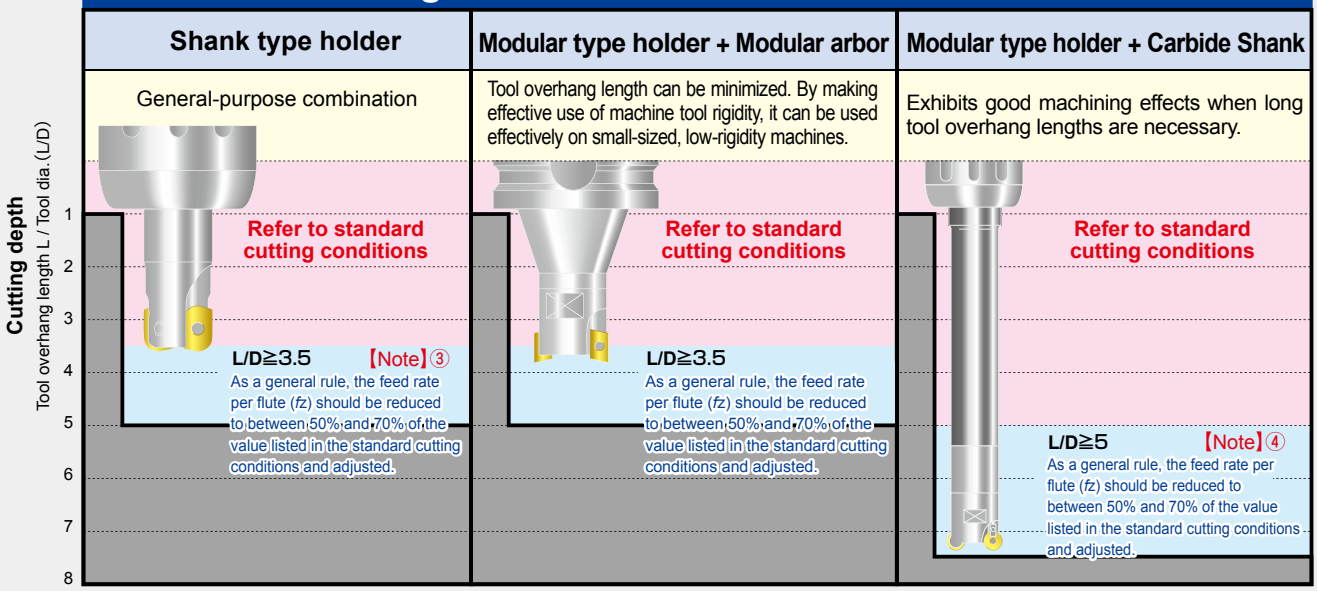


❶Use the appropriate coolant for the work material and machining shape.
❷The cutting conditions shown in the above table are for reference and should be adjusted according to the actual machining circumstances.
❸When cutting grooves, reduce the feed rate by 30% (set it to 0.7 times the value shown above).
❹When L/D=4 or higher, reduce rotation speed and feed rate by 50% (set to 0.5× stated values) as general criteria. In addition, when machining copper, set cutting depth in axial direction to 1mm or less.
❺Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
❻When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the *f*z value.

High-efficient tooling system and selecting a cutting conditions

・ASM enables high-efficient machining according to cutting shape by combined use with various tooling systems.

Features & Cutting Conditions



【Note】①This table shows general conditions for shoulder cutting. Adjustments should be made according to machine rigidity or tooling and the shape of the subject for cutting.
②When using ASM Ø20 to Ø32 inserts in a BT30 or BT40 arbor, the use of a combination of modular type holder and modular arbor is recommended.
③When using an ASM0710S08R-2 or ASM0712S10R-2 undercut type shank, as a general rule the feed rate per flute (*fz*) should be reduced to in addition, 50~70% of the value listed in the standard cutting conditions.
④Select the cutting condition of *fz*=0.3mm/t and less than *a*p=0.2mm when you use carbide shank ASC10-6.5-114-49/24 with L/D≧5.

2 kinds of insert geometry

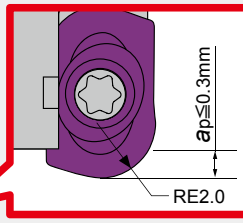
・2 kinds of inserts are available: Standard type inserts (T-type) and low-cutting force-type inserts.
・Low cutting force-type inserts reduce cutting force at the corners when pocketting by approximately 10%.

Standard type Insert
(EDMT070220R-T)

Low-force type Insert
(EDMT070220R)

Cutting programs

・Regular R shape is used for corner R. There is no need for an approximate R definition.

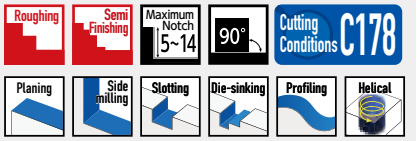


•Tool corner is R2.0mm (.079")
(Unique to high-feed-rate tools to leave no uncut areas.)
•Axial direction cutting depth *a*p should be set to 0.3mm (.012") or less. (*a*p ≦ 0.3mm (.012"))

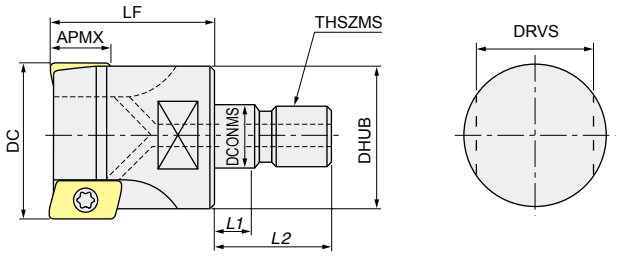
【Note】
①Cutting dia. =DCX - 4mm(.0157")
②When performing pocket cutting, be careful of the cutting width (*a*e) and generated variations due to remaining work to cut. (Recommended Cutting width *a*e=Cutting dia.×0.5~0.8mm (.02"~.031"))
③When cutting the corner area of a vertical wall, setting thetool path corner area to R will enable more stable cutting.

High Feed End Mill AHU

・Shoulder mill with good cutting performance and cutting edge strength.
・Multifunction tool which can perform inclined cutting is ideal for blade cutting.



Modular Type



Metric AHUM○○○○R-○ (-M○○)

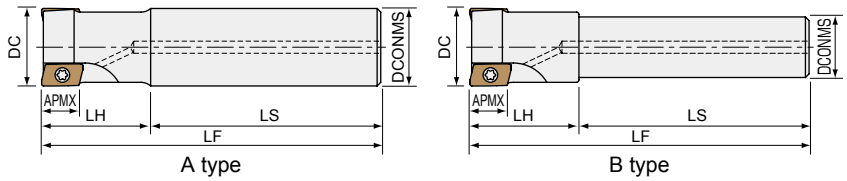
Numeric figure in a circle ○.

Item code	Stock	No.of flutes	Size(mm) DC	LF	APMX	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	Inserts
AHUM1016R-2	★	2	16	25	9 (5)※	8.5	M8	12.8	5.5	17	10	JDMT1003○○R JDMT1003○○R-FW JDMT1003○○R-B5/C5※ JDET1003○○R-FF JDET100304R-FA
※1 AHUM1018R-2	★	2	18	25		8.5	M8	14.5	5.5	17	10	
※1 AHUM1020R-2-M8	★	2	20	25		8.5	M8	14.5	5.5	17	10	
AHUM1020R-3	★	3	20	30		10.5	M10	17.8	5.5	19	15	
※1 AHUM1022R-3	★	3	22	30		10.5	M10	17.8	5.5	19	15	
※1 AHUM1025R-2-M10	★	2	25	30		10.5	M10	17.8	5.5	19	15	
AHUM1025R-4	★	4	25	35		12.5	M12	20.8	5.5	22	17	
※1 AHUM1028R-4	★	4	28	35		12.5	M12	23	5.5	22	17	
※1 AHUM1030R-2-M12	★	2	30	35		12.5	M12	23	5.5	22	17	
AHUM1030R-5	★	5	30	40		17	M16	28.8	6	23	22	
AHUM1032R-5	★	5	32	40		17	M16	28.8	6	23	22	
※1 AHUM1035R-2	★	2	35	40		17	M16	28.8	6	23	22	
※1 AHUM1035R-5	★	5	35	40		17	M16	28.8	6	23	22	
※1 AHUM1040R-6	★	6	40	40		17	M16	28.8	6	23	22	
AHUM1525R-2	●	2	25	35	14 (7)※	12.5	M12	20.8	5.5	22	17	JDMT1505○○R JDMT1505○○R-FW JDMT150508R-TFW JDMT1505○○R-B7/C7※ JDET1505○○R-FF JDET1505○○R-FA
※1 AHUM1528R-2	★	2	28	35		12.5	M12	23	5.5	22	17	
※1 AHUM1528R-3	★	3	28	35		12.5	M12	23	5.5	22	17	
※1 AHUM1530R-2-M12	★	2	30	35		12.5	M12	23	5.5	22	17	
AHUM1530R-3	★	3	30	40		17	M16	28.8	6	23	22	
AHUM1532R-3	●	3	32	40		17	M16	28.8	6	23	22	

【Note】
①※ The APMX in the case of using JDMT1003○○R-B5/C5, JDMT1505○○R-B7/C7 is a value shown in ( ).
②Slotting by AHUM○○○○R-○-M○○ has a possibility that a tool may be damaged. Please adjust a cutting condition with reference to the diagram of P15.
③Please refer to the D4 table for the combination of modular mill and carbide shank.
④Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".
⑤When※1 and carbide shank are used together as a set, there is no interference.

●: Inventory maintained in US ★: Inventory maintained in Japan

Shank type



A type
(Standard type)

B type
(Undercut type)

Inch IAHU1516R-2

Item code	Stock	No. of flutes	Size(inch) DC	LF	APMX	LH	LS	DCONMS	Shape	Inserts
IAHU1516R-2	●	2	1.000	4.000	.551	1.500	2.500	1.000	A	JDMT1505···

Metric AHU(L)○○○○R-○

Numeric figure in a circle○.

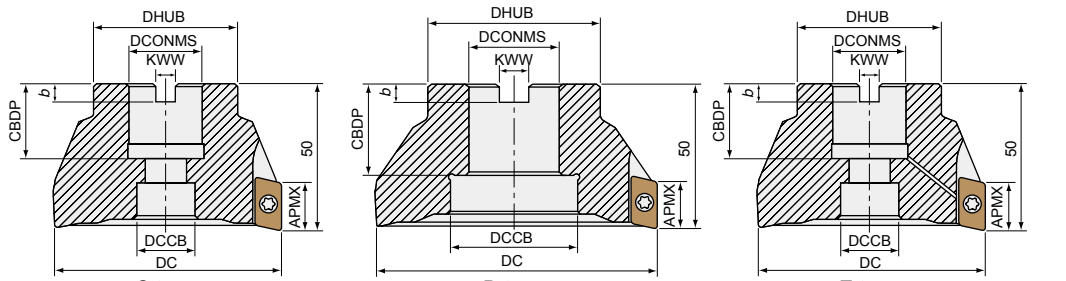
	Item code	Stock	No. of flutes	Size(mm) DC	LF	APMX	LH	LS	DCONMS	Shape	Inserts
Regular shank type	AHU1016R-2	★	2	16	100	9 (5)※	30	70	16	A	JDMT1003○○R
	AHU1020R-3	★	3	20	110		30	80	20	A	JDMT1003○○R-FW
	AHU1025R-4	★	4	25	120		35	85	25	A	JDMT1003○○R-B5/C5※
	AHU1030R-5	★	5	30	120		45	75	32	A	JDET1003○○R-FF
	AHU1032R-5	★	5	32	130		45	85	32	A	JDET100304R-FA
	AHU1525R-2	●	2	25	125	14 (7)※	40	85	25	A	JDMT1505○○R
	AHU1530R-2	★	2	30	130		45	85	25	B	
	AHU1532R-3	●	3	32	140		45	95	32	A	JDMT1505○○R-FW
	AHU1535R-3	★	3	35	140		45	95	32	B	JDMT150508R-TFW
	AHU1540R-2	●	2	40	140		45	95	32	B	JDMT1505○○R-B7/C7※
	AHU1540R-3	★	3	40	140		45	95	32	B	
	AHU1540R-4	★	4	40	140		45	95	32	B	JDET1505○○R-FF
	AHU1550R-3	★	3	50	140		45	95	32	B	JDET1505○○R-FA
	AHU1550R-5	★	5	50	140		45	95	32	B	
Long shank type	AHUL1016R-2	★	2	16	150	9 (5)※	50	100	16	A	JDMT1003○○R
	AHUL1020R-2	★	2	20	160		60	100	20	A	
	AHUL1020R-3	★	3	20	160		60	100	20	A	
	AHUL1021R-3	★	3	21	160		30	130	20	B	
	AHUL1025R-2	★	2	25	180		75	105	25	A	JDMT1003○○R-FW
	AHUL1025R-3	★	3	25	180		75	105	25	A	JDMT1003○○R-B5/C5※
	AHUL1026R-3	★	3	26	180		35	145	25	B	
	AHUL1030R-2	★	2	30	180		45	135	25	B	JDET1003○○R-FF
	AHUL1030R-3	★	3	30	180		45	135	25	B	
	AHUL1032R-4	★	4	32	200		90	110	32	A	JDET100304R-FA
	AHUL1035R-2	★	2	35	200		45	155	32	B	
	AHUL1035R-4	★	4	35	200		45	155	32	B	
	AHUL1525R-2	●	2	25	180	14 (7)※	75	105	25	A	JDMT1505○○R
	AHUL1530R-2	★	2	30	180		45	135	25	B	
	AHUL1532R-3	●	3	32	200		90	110	32	A	JDMT1505○○R-FW
	AHUL1535R-2	★	2	35	200		45	155	32	B	JDMT150508R-TFW
	AHUL1535R-3	★	3	35	200		45	155	32	B	
	AHUL1540R-2	★	2	40	220		45	175	32	B	JDMT1505○○R-B7/C7※
	AHUL1540R-3	★	3	40	220		45	175	32	B	
	AHUL1540R-4	★	4	40	220		45	175	32	B	JDET1505○○R-FF
	AHUL1540R-5	●	5	40	220		45	175	32	B	JDET1505○○R-FA
	AHUL1550R-4	★	4	50	220		45	175	42	B	

【Note】※ The APMX in the case of using JDMT1003○○R-B5/C5, JDMT1505○○R-B7/C7 is a value shown in ( ).

High Feed End Mill AHU

Bore type

Numeric figure in a circle◌.



Inch IAHUB15◌◌R-◌

Item code	Stock	No. of flutes	Size(inch) DC	APMX	DCONMS	DCCB	DHUB	CBDP	KWW	b	Shape	Inserts
IAHUB1532R-5	●	5	2.000	.551" (.276")※	.750	.650	1.850	.748	.315	.197	C	JDMT1505◌◌R JDMT1505◌◌R-FW JDMT150508R-TFW JDMT1505◌◌R-B7/C7※ JDET1505◌◌R-FF JDET1505◌◌R-FA
IAHUB1540R-6	●	6	2.500		.750	.650	2.362	.748	.315	.197	C	
IAHUB1548R-7	●	7	3.000		1.000	.830	2.756	1.378	.354	.236	C	
IAHUB1564R-8	●	8	4.000		1.500	1.260	3.543	1.378	.626	.394	C	

Metric AHUB◌◌◌◌◌R(M)-◌

Item code	Stock	No. of flutes	Size(mm) DC	APMX	DCONMS	DCCB	DHUB	CBDP	KWW	b	Shape	Inserts
AHUB1550R-3	★	3	50	14 (7)※	22.225	17	47	20	8.4	5	E	JDMT1505◌◌R JDMT1505◌◌R-FW JDMT150508R-TFW JDMT1505◌◌R-B7/C7※ JDET1505◌◌R-FF JDET1505◌◌R-FA
AHUB1550R-5	★	5	50		22.225	17	47	20	8.4	5	C	
AHUB1550RM-3	★	3	50		22	17	47	20	10.4	6.3	E	
AHUB1550RM-5	●	5	50		22	17	47	20	10.4	6.3	C	
AHUB1563R-3	★	3	63		22.225	17	45	20	8.4	5	E	
AHUB1563R-6	★	6	63		22.225	17	45	20	8.4	5	C	
AHUB1563RM-3	★	3	63		22	17	45	20	10.4	6.3	E	
AHUB1563RM-6	●	6	63		22	17	45	20	10.4	6.3	C	
AHUB1580R-4	★	4	80		25.4	20	50	26	9.5	6	E	
AHUB1580R-7	●	7	80		25.4	20	50	26	9.5	6	C	
AHUB15100R-8	●	8	100		31.75	45	60	32	12.7	8	D	

【Note】 The arbor screw for attaching the cutter is included with the cutter body of C type and E type.
A commercial face mill clamping bolt is required to mount a D type into our bore type arbor.
※ The APMX in the case of using JDMT1505◌◌R-B7/C7 is a value shown in ( ).

Parts

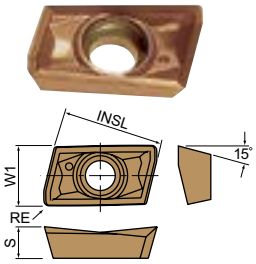
※ The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

Numeric figure in a circle◌.

Parts / Shape / Cutter body	Clamp screw	Fastening torque (N・m)	Fastening torque (lbp・in)	Driver	Wrench	Screw anti-seizure agent
AHU(L)1016R-2	250-141	1.1	9.7	104-T8	—	P-37
AHU(L)1020R-◌～1035R-◌	251-141	1.1	9.7			
AHU(L)15◌◌R-◌	412-141	2.9	25.7	104-T15	—	
AHUB1550R(M)-3～1563R(M)-3				—	105-T15	
AHUB1550R(M)-5～1563R(M)-6						
AHUB1580R-4						
AHUB1580R-7						
AHUB15100R-8						
AHUM10◌◌R-◌(-M◌◌)	250-141	1.1	9.7	104-T8	—	
AHUM15◌◌R-◌(-M◌◌), IAHU(B)15◌◌R-◌	412-141	2.9	25.7	104-T15	—	

●: Inventory maintained in US ★: Inventory maintained in Japan No Mark: Manufactured upon request only -: No manufactured

Inserts



	FW, FF, Conventional (M-class)(E-class)	TFW type (M-class)	FA type (E-class)	B5/B7 type (M-class)	C5/C7 type (M-class)
Insert cross-section shape	Fig.1	Fig.2	Sharp edge Fig.3	Positive land (Large rake) Fig.4	Positive land (Small rake) Fig.5
Application	General purpose	Forged surface cutting; Strong intermittent cutting	Aluminum use	Stainless steels (Wet cutting) Titanium, Nickel based alloy use	Stainless steels (Dry cutting) Nickel based alloy use

【Note】When using the insert with Radius bigger than R2.0, it is necessary to carry out additional cutting of cutter body corner part.

P	Carbon steel	■			■	■						
M	Stainless steel, etc.		Wet	Dry			□					
K	Cast iron	□							■			
	Graphite										■	
N	Aluminum alloy									■	■	■
S	Titanium alloy, Nickel-based alloy	■	□				■					

■ : General cutting, First recommended

□ : General cutting, Second recommended

Item code	Tolerance class	AJ Coating		GX Coating	JS Coating		TH Coating			DLC Coating	HD Coating	Carbide	Size(mm)				Insert cross-section shape
		JP4120	JM4160	GX2160	JS4045	JS4060	PTH30E	PTH40H	PTH13S	SD5010	HD7010	WH10	INSL	W1	S	RE	
JDMT100304R	M	★			★	★	★		★			–	11	6.1	3.5	0.4	Fig.1
JDMT100308R		★			★	★	★	★	★			–				0.8	
JDMT100320R		★			★	★	★					–				2.0	
JDMT100332R		★	★		★	★	★					–				3.2	
JDMT100304R-FW		★			★	★	★					–				0.4	
JDMT100308R-FW		★	★		★	★	★					–				0.8	
JDMT100308R-B5		★※1	★							–	–	–				0.8	Fig.4
JDMT100308R-C5		★※2		★						–	–	–				0.8	Fig.5
JDMT100320R-B5		★※1	★							–	–	–				2.0	Fig.4
JDMT100320R-C5		★※2		★						–	–	–				2.0	Fig.5
JDMT100330R-B5		★※1	★							–	–	–				3.0	Fig.4
JDMT100330R-C5		★※2		★						–	–	–				3.0	Fig.5
JDMT100332R-B5		★※1	★							–	–	–				3.2	Fig.4
JDMT100332R-C5		★※2		★						–	–	–				3.2	Fig.5
JDMT150504R		★				★	●		★			–	16	9.12	5	0.4	Fig.1
JDMT150508R		★			●	★	●	★	★			–				0.8	
JDMT150520R		★			★	★	★					–				2.0	
JDMT150530R		★			●	★	●	★				–				3.0	
JDMT150504R-FW		★			★	★	★					–				0.4	
JDMT150508R-FW		★	★		★	★	★					–				0.8	
JDMT150508R-TFW		★	★		★	★	★					–				0.8	Fig.2
JDMT150508R-B7		●※1	●							–	–	–				0.8	Fig.4
JDMT150508R-C7		●※2		●						–	–	–				0.8	Fig.5
JDMT150520R-B7		●※1	★							–	–	–				2.0	Fig.4
JDMT150520R-C7		●※2		★						–	–	–				2.0	Fig.5
JDMT150530R-B7		●※1	★							–	–	–				3.0	Fig.4
JDMT150530R-C7		●※2		★						–	–	–				3.0	Fig.5
JDET100304R-FF	E				★		★				★	–	11	6.1	3.5	0.4	Fig.1
JDET100308R-FF					★		★				★	–				0.8	
JDET150504R-FF					★		★				★	–	16	9.12	5	0.4	
JDET150508R-FF					★		★				★	–				0.8	
JDET100304R-FA		–	–	–	–		–		–	★		★	11	6.1	3.5	0.4	Fig.3
JDET150502R-FA		–	–	–	–		–		–	●		★	16	9.12	5	0.2	
JDET150504R-FA		–	–	–	–		–		–	●		★				0.4	
JDET150530R-FA		–	–	–	–		–		–	●		★				3.0	

※1 For JDMT○○○○○○R-B○: JP4120, the primary recommended work material is S (titanium alloys) and the secondary recommended work material M (stainless-steel; semi-finishing).
※2 For JMDT○○○○○○R-C○: JP4120, the primary recommended work material is S (Ni-based alloys) and the secondary recommended work material is P (carbon steel).
※3 The stated recommended work materials are general criteria. In actual use, suitable recommended materials may be different depending on the cutting situation.

【Note】Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

High Feed End Mill AHU

Recommended cutting conditions

Inch

Red indicates primary recommended grade.

Work material	Recommended grade	Cutting conditions	Tool dia. DC AHU/AHUM 10 type Φ16mm 2 flutes Revolution min-1	Φ16mm 2 flutes Feed speed (IPM)	Φ20mm 3 flutes Revolution min-1	Φ20mm 3 flutes Feed speed (IPM)	Φ25mm or 1" / 4 flutes Revolution min-1	Φ25mm or 1" / 4 flutes Feed speed (IPM)	Φ32mm or 1.25" / 5 flutes Revolution min-1	Φ32mm or 1.25" / 5 flutes Feed speed (IPM)
Mild steel	JS4060	Revolution *n* / Feed speed *Vf*	3,180	25	2,390	42	1,910	45	1,490	44
		Cutting Speed *Vc* (SFM)	394 ~ 656 (525)		394 ~ 591 (492)					
		Feed Rate *fz* (IPT)	.002 ~ .005 (.004)		.004 ~ .008 (.006)					
Carbon steel Alloy steel	JS4060 JS4045	Revolution *n* / Feed speed *Vf*	3,180	25	2,390	39	1,910	42	1,490	41
		Cutting Speed *Vc* (SFM)	394 ~ 656 (525)		394 ~ 591 (492)					
		Feed Rate *fz* (IPT)	.002 ~ .004 (.003)		.003 ~ .008 (.006)					
Die steel (<300HB)	JS4060 JS4045	Revolution *n* / Feed speed *Vf*	2,980	24	2,230	37	1,780	39	1,390	38
		Cutting Speed *Vc* (SFM)	394 ~ 591 (492)		394 ~ 525 (459)					
		Feed Rate *fz* (IPT)	.002 ~ .004 (.003)		.003 ~ .008 (.006)					
Pre-hardened steel (30~40HRC)	JP4120	Revolution *n* / Feed speed *Vf*	1,990	16	1,590	26	1,270	28	990	27
		Cutting Speed *Vc* (SFM)	262 ~ 394 (328)		262 ~ 394 (328)					
		Feed Rate *fz* (IPT)	.002 ~ .004 (.003)		.003 ~ .008 (.006)					
Stainless steel (Dry cutting)	GX2160 JM4160	Revolution *n* / Feed speed *Vf*	4,970	40	3,980	80	3,180	85	2,490	83
		Cutting Speed *Vc* (SFM)	656 ~ 984 (820)		656 ~ 984 (820)					
		Feed Rate *fz* (IPT)	.004 ~ .006 (.005)		.006 ~ .008 (.007)					
Stainless steel (Wet cutting)	JM4160 PTH30E	Revolution *n* / Feed speed *Vf*	1,990	16	1,590	32	1,270	34	990	33
		Cutting Speed *Vc* (SFM)	262 ~ 394 (328)		262 ~ 394 (328)					
		Feed Rate *fz* (IPT)	.004 ~ .006 (.005)		.006 ~ .008 (.007)					
Cast iron	PTH13S JP4120	Revolution *n* / Feed speed *Vf*	2,980	24	2,230	39	1,780	42	1,390	41
		Cutting Speed *Vc* (SFM)	394 ~ 591 (492)		394 ~ 525 (459)					
		Feed Rate *fz* (IPT)	.002 ~ .005 (.004)		.004 ~ .008 (.006)					
Aluminum alloy (wet condition)	WH10 SD5010	Revolution *n* / Feed speed *Vf*	6,960	56	6,370	113	5,090	120	3,980	117
		Cutting Speed *Vc* (SFM)	656 ~ 1640 (350)		656 ~ 600 (400)					
		Feed Rate *fz* (IPT)	.004 ~ .006 (.005)		.004 ~ .008 (.006)					
Titanium alloy (wet condition)	JP4120 PTH30E	Revolution *n* / Feed speed *Vf*	900	7	720	13	570	13	450	13
		Cutting Speed *Vc* (SFM)	98 ~ 197 (148)		98 ~ 197 (148)					
		Feed Rate *fz* (IPT)	.003 ~ .004 (.004)		.004 ~ .008 (.006)					
Ni based alloy (wet condition)	JP4120 JM4160	Revolution *n* / Feed speed *Vf*	800	6	640	7	510	8	400	8
		Cutting Speed *Vc* (SFM)	98 ~ 164 (131)		98 ~ 164 (131)					
		Feed Rate *fz* (IPT)	.003 ~ .005 (.004)		.003 ~ .005 (.004)					

【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Tool dia. DC															Work material
AHU/AHUM/AHUB 15 type															
Φ25mm or 1" / 2 flutes		Φ32mm or 1.25" / 3 flutes		Φ40mm or 1.5" / 4 flutes		Φ50mm or 2" / 5 flutes		Φ63mm or 2.5" / 6 flutes		Φ80mm or 3" / 7 flutes		Φ100mm or 4" / 8 flutes			
Revolution min^{-1}	Feed speed (IPM)	Revolution min^{-1}	Feed speed (IPM)	Revolution min^{-1}	Feed speed (IPM)	Revolution min^{-1}	Feed speed (IPM)	Revolution min^{-1}	Feed speed (IPM)	Revolution min^{-1}	Feed speed (IPM)	Revolution min^{-1}	Feed speed (IPM)		
1,910	30	1,490	35	1,190	38	950	38	760	36	600	33	480	30		Mild steel
394 ~ 591 (492)								394 ~ 591 (492)				394 ~ 591 (492)			
.006 ~ .010 (.008)															
1,910	30	1,490	35	1,190	38	950	38	760	36	600	33	480	30		Carbon steel Alloy steel
394 ~ 591 (492)								394 ~ 591 (492)				394 ~ 591 (492)			
.006 ~ .010 (.008)															
1,780	21	1,390	25	1,110	26	890	26	710	25	560	23	450	21		Die steel (<300HB)
394 ~ 525 (459)								394 ~ 525 (459)				394 ~ 525 (459)			
.004 ~ .008 (.006)															
1,270	15	990	18	800	19	640	19	510	18	400	17	320	15		Pre-hardened steel (30~40HRC)
262 ~ 394 (328)								262 ~ 394 (328)				262 ~ 394 (328)			
.004 ~ .008 (.006)															
3,180	38	2,490	44	1,990	47	1,590	47	1,260	45	990	41	760	36		Stainless steel (Dry cutting)
656 ~ 984 (820)								656 ~ 984 (820)				656 ~ 280 (240)			
.006 ~ .010 (.006)															
1,270	20	990	23	800	25	640	25	510	24	400	22	320	20		Stainless steel (Wet cutting)
262 ~ 394 (328)								262 ~ 394 (328)				262 ~ 394 (328)			
.006 ~ .010 (.008)															
1,780	28	1,390	33	1,110	35	890	35	710	34	560	31	450	28		Cast iron
394 ~ 525 (459)								394 ~ 525 (459)				394 ~ 525 (459)			
.006 ~ .010 (.008)															
5,090	68	3,980	80	3,180	85	2,550	85	2,530	102	1,990	93	1,590	85		Aluminum alloy (wet condition)
656 ~ 600 (400)								656 ~ 800 (1640)				656 ~ 800 (1640)			
.004 ~ .010 (.007)															
570	7	450	8	360	8	290	9	230	8	591	24	130	6		Titanium alloy (wet condition)
98 ~ 197 (148)								98 ~ 197 (148)				98 ~ 164 (131)			
.004 ~ .008 (.006)															
510	4	400	5	320	5	250	16	656	15	525	14	130	4		Ni based alloy (wet condition)
98 ~ 164 (131)								98 ~ 164 (131)				98 ~ 164 (131)			
.003 ~ .005 (.004)															

High Feed End Mill AHU

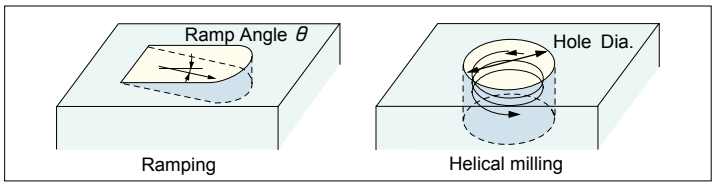
Adjustment of cutting conditions

・Feed rate and spindle revolution must be adjusted to correspond to tool overhang and machining conditions.
・Please consider the standard cutting conditions as 100% and adjust the machining conditions by referring to the table below.

		Overhang		
		<3DC	3DC~5DC	5DC<
Surfacing Shoulder milling	Rotation speed *n*	100%	70%	50%
	Feed rate *Vf*	100%	70%	50%
Slotting	Rotation speed *n*	100%	70%	50%
	Feed rate *Vf*	70%	50%	35%
Ramping	Rotation speed *n*	100%	70%	50%
	Feed rate *Vf*	80%	55%	40%

Ramping

Although ramp angle is limited due to cutting edge design, direct milling is possible without pre-drill-hole with ramping and helical milling methods like next pictures.



Attentions on Safety

①The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safty cover around the tool and wear the safty glasses when carring out any works.
②Do not use non-water-soluble cutting oils.Such oils may result in fire.

❶ AHU(L)/AHUM 15 type

(inch)

Tool dia. DC	1.000"		
Maximum ramp angle θ	5°		
Hole Dia.	1.370~1.882		

❷ AHUB15 type

(inch)

Tool dia. DC	2.000"	2.500"	3.000"	4.000"
Maximum ramp angle θ	2°	1.5°	1.0°	0.5°
Hole Dia.	3.331~3.843	3.976~4.843	5.016~5.843	6.740~7.843

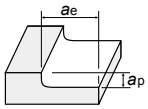
【Note】
①The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 1° or less is recommended.
②For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Cutting conditions for cutting aluminum alloy and copper using SD5010

Inch ＜Shoulder cutting＞：*a*e=0.5DC

Work material	Cutting conditions	AHU/AHUM 10 type					AHU/AHUB/AHUM 15 type							
		Φ16 or .63" 2 Flutes	Φ20 or .785" 3 Flutes	Φ25mm or 1" 4 Flutes	Φ32mm or 1.25" 5 Flutes	Φ35mm or 1.378" 5 Flutes	Φ25mm or 1" 2 Flutes	Φ32mm or 1.25" 3 Flutes	Φ35mm or 1.378" 3 Flutes	Φ40mm or 1.5" 4 Flutes	Φ50mm or 2" 5 Flutes	Φ63mm or 2.5" 6 Flutes	Φ80mm or 3" 7 Flutes	Φ100mm or 4" 8 Flutes
Expanded aluminum alloy material A5052 A7075 etc. Air-blow or wet: Water-soluble agent	Revolution *n* (min^{-1})	15,900	15,900	12,700	11,900	10,910	12,000	9,950	9,090	9,500	7,640	6,060	5,970	4,770
	Cutting speed *vc*(SFM)	2,621	3,274	3,323	3,892	3,934	3,140	3,254	3,278	3,729	3,998	3,964	4,686	4,993
	Feed speed *vf* (IPM)	188	281	300	351	322	190	236	215	300	302	287	330	301
	Feed rate *fz*(IPT)	.006	.006	.006	.006	.006	.008	.008	.008	.008	.008	.008	.008	.008
	Axial depth of cut *ap* (inch)	.118	.118	.118	.118	.118	.197	.197	.197	.197	.197	.197	.197	.197
Cast aluminum alloy material AC4A ADC12 etc Air-blow or wet: Water-soluble agent	Revolution *n* (min^{-1})	12,700	12,700	10,160	9,520	8,730	9,600	7,960	7,270	7,600	6,110	4,850	4,780	3,820
	Cutting speed *vc*(SFM)	2,094	2,615	2,659	3,114	3,148	2,512	2,604	2,621	2,983	3,198	3,173	3,752	3,998
	Feed speed *vf* (IPM)	150	225	240	281	258	152	189	172	240	241	230	264	241
	Feed rate *fz*(IPT)	.006	.006	.006	.006	.006	.008	.008	.008	.008	.008	.008	.008	.008
	Axial depth of cut *ap* (inch)	.118	.118	.118	.118	.118	.197	.197	.197	.197	.197	.197	.197	.197
Pure copper C1100 C1020 etc Wet: Water-soluble agent	Revolution *n* (min^{-1})	5,970	4,770	3,820	2,980	2,730	3,820	2,980	2,730	2,390	1,910	1,520	1,190	955
	Cutting speed *vc*(SFM)	984	982	1,000	975	984	1,000	975	984	938	1,000	994	934	1,000
	Feed speed *vf* (IPM)	70	84	90	88	81	60	71	65	76	75	72	66	60
	Feed rate *fz*(IPT)	.006	.006	.006	.006	.006	.008	.008	.008	.008	.008	.008	.008	.008
	Axial depth of cut *ap* (inch)	.118	.118	.118	.118	.118	.197	.197	.197	.197	.197	.197	.197	.197

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③When cutting grooves, reduce the feed rate by 30% (set it to 0.7 times the value shown above).
④When L/D = 4 or higher, reduce the rotation speed and feed rate by 60% (set them to 0.4 times the values shown above).
⑤Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
⑥When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the *fz* value.
⑦Be sure to use this tool at rotation speeds within the acceptable range for the milling chuck being used. If the acceptable rotation speed range is below the rotation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the *fz* value.



Cutting conditions for cutting graphite and cast aluminium alloy

Inch

Work material	Recommended grade	Cutting conditions	AHU/AHUM 10 type		AHU/AHUB/AHUM 15 type		
			φ16mm or .63"	φ20mm~35mm or .785"~13.78"	φ25mm~50mm or 1" ~ 2"	φ3mm~80mm or 2.5" ~ 3"	φ100mm or 4"
Graphite	HD7010	Cutting speed *Vc*(SFM)	492~984	492~984	492~984	492~984	492~984
		Feed rate *fz*(IPT)	.004~.008	.004~.008	.004~.010	.004~.010	.004~.010
Cast aluminum alloy AC4A、ADC12 etc. Air-blow or wet: water-soluble agent	HD7010	Cutting speed *Vc*(SFM)	656~1640	656~1640	656~1970	656~1970	656~1970
		Feed rate *fz*(IPT)	.004~.008	.10~.20	.004~.010	.004~.010	.004~.010

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③Since there is a danger of breakage when using this tool, be sure to use the cutting area cover, protective goggles, safety shoes, etc.

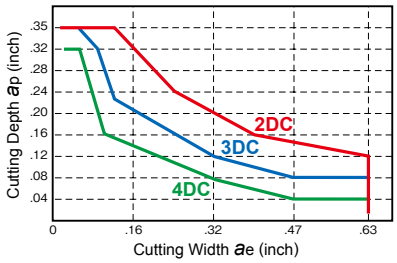
High Feed End Mill AHU

Overhang and Cutting Area

Inch ・Cutting Speed：*Vc*=394 SFM ・Work material：AISI1050 (220HB) ・Machine：BT50 M/C

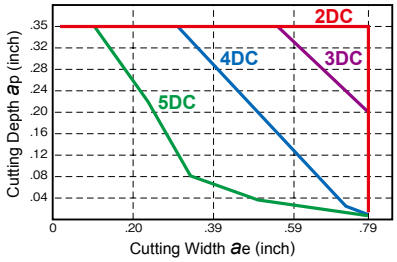
AHU（L）10 type

.63″ *fz*=.004 (IPT)



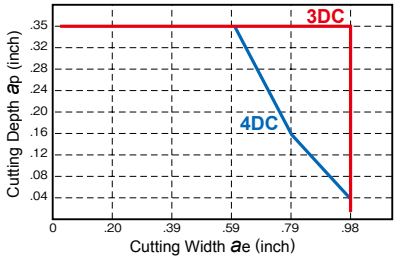
Overhang：**2DC**
AHU1016R-2
Overhang：**3DC**、**4DC**
AHUL1016R-2
DC:Tool Dia.

.79″ *fz*=.006 (IPT)



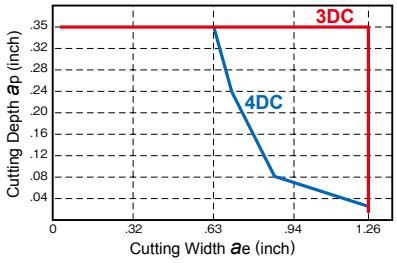
Overhang：**2DC**、**3DC**
AHU1020R-3
Overhang：**4DC**、**5DC**
AHUL1020R-3
DC:Tool Dia.

.98″ *fz*=.006 (IPT)



Overhang：**3DC**
AHU1025R-4
Overhang：**4DC**
AHUL1025R-3
DC:Tool Dia.

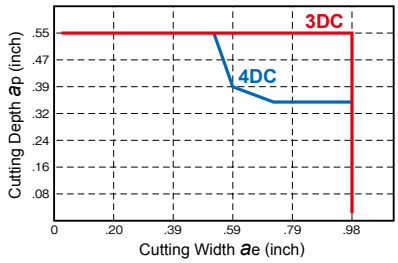
1.26″ *fz*=.006 (IPT)



Overhang：**3DC**
AHU1032R-5
Overhang：**4DC**
AHUL1032R-4
DC:Tool Dia.

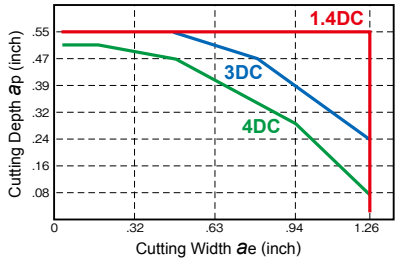
AHU（L）15 type

.98″ *fz*=.006 (IPT)



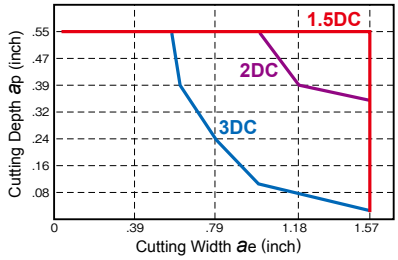
Overhang：**3DC**
AHU1525R-2
Overhang：**4DC**
AHUL1525R-2
DC:Tool Dia.

1.26″ *fz*=.006 (IPT)



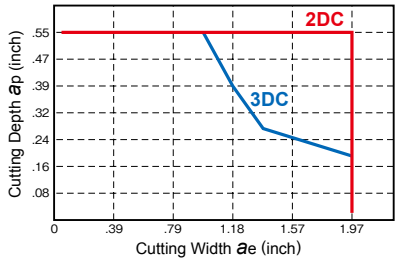
Overhang：**1.4DC**
AHU1532R-3
Overhang：**3DC**、**4DC**
AHUL1532R-3
DC:Tool Dia.

1.57″ *fz*=.006 (IPT)



Overhang：**1.5DC**、**2DC**
AHU1540R-4
Overhang：**3DC**
AHUL1540R-4
DC:Tool Dia.

1.97″ *fz*=.006 (IPT)



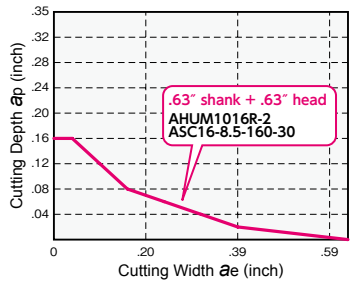
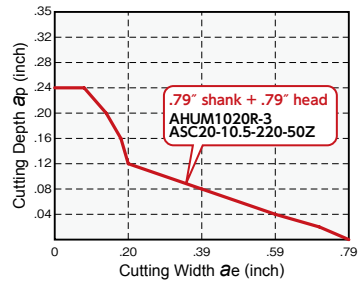
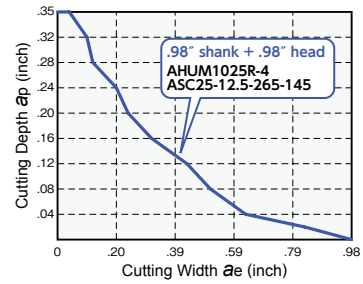
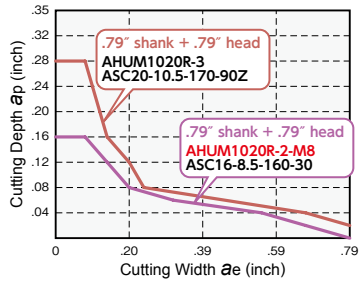
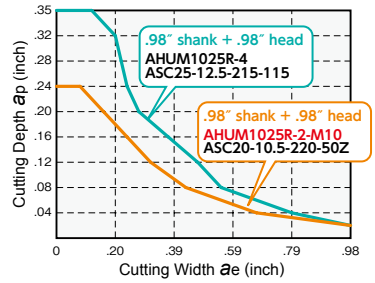
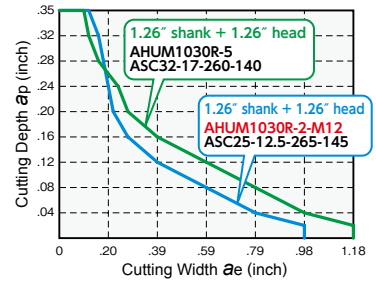
Overhang：**2DC**
AHU1550R-5
Overhang：**3DC**
AHUL1550R-4
DC:Tool Dia.

【Note】
Please adjust the cutting condition with reference to the above-stated graph depending on the stiffness of a work piece or a machine.

Cutting area of modular mill

Inch

・Work material：AISI1050 (220HB) ・Cutting Speed：*Vc*=328 SFM
・Feed rate：*fz*=.004 IPT ・Machine：BT50

Overhang **4.724 inch**		Overhang **5.906 inch**		Overhang **7.874 inch**	
.63″		.79″		.98″	
.79″		.98″		1.18″	

【Note】

Please adjust the cutting condition with reference to the above-stated graph depending on the stiffness of a work piece or a machine.

High Feed End Mill AHU

Recommended cutting conditions

Metric

Red indicates primary recommended grade.

Work material	Recommended grade	Cutting conditions	Tool dia. DC AHU/AHUM 10 type Φ16mm 2 flutes Revolution min-1	Φ16mm 2 flutes Feed speed (mm/min)	Φ20mm 3 flutes Revolution min-1	Φ20mm 3 flutes Feed speed (mm/min)	Φ25mm or 1" / 4 flutes Revolution min-1	Φ25mm or 1" / 4 flutes Feed speed (mm/min)	Φ32mm or 1.25" / 5 flutes Revolution min-1	Φ32mm or 1.25" / 5 flutes Feed speed (mm/min)
Mild steel	JS4060	Revolution *n* / Feed speed *Vf*	3,180	570	2,390	1,080	1,910	1,150	1,490	1,120
		Cutting Speed *Vc* (m/min)	120 ~ 200 (160)		120 ~ 180 (150)					
		Feed Rate *fz* (mm/t)	0.06 ~ 0.12 (0.09)		0.1 ~ 0.2 (0.15)					
Carbon steel Alloy steel	JS4060 JS4045	Revolution *n* / Feed speed *Vf*	3,180	450	2,390	1,000	1,910	1,070	1,490	1,040
		Cutting Speed *Vc* (m/min)	120 ~ 200 (160)		120 ~ 180 (150)					
		Feed Rate *fz* (mm/t)	0.05 ~ 0.1 (0.07)		0.08 ~ 0.2 (0.14)					
Die steel (<300HB)	JS4060 JS4045	Revolution *n* / Feed speed *Vf*	2,980	420	2,230	940	1,780	1,000	1,390	970
		Cutting Speed *Vc* (m/min)	120 ~ 180 (150)		120 ~ 160 (140)					
		Feed Rate *fz* (mm/t)	0.05 ~ 0.1 (0.07)		0.08 ~ 0.2 (0.14)					
Pre-hardened steel (30~40HRC)	JP4120	Revolution *n* / Feed speed *Vf*	1,990	280	1,590	670	1,270	710	990	700
		Cutting Speed *Vc* (m/min)	80 ~ 120 (100)		80 ~ 120 (100)					
		Feed Rate *fz* (mm/t)	0.05 ~ 0.1 (0.07)		0.08 ~ 0.2 (0.14)					
Stainless steel (Dry cutting)	GX2160 JM4160	Revolution *n* / Feed speed *Vf*	4,970	1,190	3,980	2,030	3,180	2,160	2,490	2,110
		Cutting Speed *Vc* (m/min)	200 ~ 300 (250)		200 ~ 300 (250)					
		Feed Rate *fz* (mm/t)	0.1 ~ 0.15 (0.12)		0.15 ~ 0.2 (0.17)					
Stainless steel (Wet cutting)	JM4160 PTH30E	Revolution *n* / Feed speed *Vf*	1,990	480	1,590	810	1,270	870	990	850
		Cutting Speed *Vc* (m/min)	80 ~ 120 (100)		80 ~ 120 (100)					
		Feed Rate *fz* (mm/t)	0.1 ~ 0.15 (0.12)		0.15 ~ 0.2 (0.17)					
Cast iron	PTH13S JP4120	Revolution *n* / Feed speed *Vf*	2,980	540	2,230	1,000	1,780	1,070	1,390	1,040
		Cutting Speed *Vc* (m/min)	120 ~ 180 (150)		120 ~ 160 (140)					
		Feed Rate *fz* (mm/t)	0.06 ~ 0.12 (0.09)		0.1 ~ 0.2 (0.15)					
Aluminum alloy (wet condition)	WH10 SD5010	Revolution *n* / Feed speed *Vf*	6,960	1,670	6,370	2,860	5,090	3,060	3,980	2,980
		Cutting Speed *Vc* (m/min)	200 ~ 500 (350)		200 ~ 600 (400)					
		Feed Rate *fz* (mm/t)	0.1 ~ 0.15 (0.12)		0.1 ~ 0.2 (0.15)					
Titanium alloy (wet condition)	JP4120 PTH30E	Revolution *n* / Feed speed *Vf*	900	160	720	320	570	340	450	340
		Cutting Speed *Vc* (m/min)	30 ~ 60 (45)		30 ~ 60 (45)					
		Feed Rate *fz* (mm/t)	0.08 ~ 0.1 (0.09)		0.1 ~ 0.2 (0.15)					
Ni based alloy (wet condition)	JP4120 JM4160	Revolution *n* / Feed speed *Vf*	800	160	640	190	510	200	400	200
		Cutting Speed *Vc* (m/min)	30 ~ 50 (40)		30 ~ 50 (40)					
		Feed Rate *fz* (mm/t)	0.07 ~ 0.13 (0.1)		0.07 ~ 0.13 (0.1)					

【Note】
Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Tool dia. DC															Work material
AHU/AHUM/AHUB 15 type															
Φ25mm or 1" / 2 flutes		Φ32mm or 1.25" / 3 flutes		Φ40mm or 1.5" / 4 flutes		Φ50mm or 2" / 5 flutes		Φ63mm or 2.5" / 6 flutes		Φ80mm or 3" / 7 flutes		Φ100mm or 4" / 8 flutes			
Revolution min^{-1}	Feed speed (mm/min)	Revolution min^{-1}	Feed speed (mm/min)	Revolution min^{-1}	Feed speed (mm/min)	Revolution min^{-1}	Feed speed (mm/min)	Revolution min^{-1}	Feed speed (mm/min)	Revolution min^{-1}	Feed speed (mm/min)	Revolution min^{-1}	Feed speed (mm/min)		
1,910	760	1,490	900	1,190	950	950	950	760	910	600	840	480	760		Mild steel
120 ~ 180 (150)								120 ~ 180 (150)				120 ~ 180 (150)			
0.15 ~ 0.25 (0.2)															
1,910	760	1,490	900	1,190	950	950	950	760	910	600	840	480	760		Carbon steel Alloy steel
120 ~ 180 (150)								120 ~ 180 (150)				120 ~ 180 (150)			
0.15 ~ 0.25 (0.2)															
1,780	530	1,390	630	1,110	670	890	670	710	640	560	580	450	530		Die steel (<300HB)
120 ~ 160 (140)								120 ~ 160 (140)				120 ~ 160 (140)			
0.1 ~ 0.2 (0.15)															
1,270	380	990	450	800	480	640	480	510	450	400	420	320	380		Pre-hardened steel (30~40HRC)
80 ~ 120 (100)								80 ~ 120 (100)				80 ~ 120 (100)			
0.1 ~ 0.2 (0.15)															
3,180	1,270	2,490	1,490	1,990	1,590	1,590	1,590	1,260	1,520	990	1,390	760	1,220		Stainless steel (Dry cutting)
200 ~ 300 (250)								200 ~ 300 (250)				200 ~ 280 (240)			
0.15 ~ 0.25 (0.2)															
1,270	510	990	600	800	640	640	640	510	610	400	560	320	510		Stainless steel (Wet cutting)
80 ~ 120 (100)								80 ~ 120 (100)				80 ~ 120 (100)			
0.15 ~ 0.25 (0.2)															
1,780	710	1,390	840	1,110	890	890	890	710	850	560	780	450	710		Cast iron
120 ~ 160 (140)								120 ~ 160 (140)				120 ~ 160 (140)			
0.15 ~ 0.25 (0.2)															
5,090	1,730	3,980	2,030	3,180	2,160	2,550	2,160	2,530	2,580	1,990	2,370	1,590	2,160		Aluminum alloy (wet condition)
200 ~ 600 (400)								200 ~ 800 (500)				200 ~ 800 (500)			
0.1 ~ 0.25 (0.17)															
570	170	450	200	360	210	290	210	230	200	180	190	130	150		Titanium alloy (wet condition)
30 ~ 60 (45)								30 ~ 60 (45)				30 ~ 50 (40)			
0.1 ~ 0.2 (0.15)															
510	100	400	120	320	130	250	130	200	120	160	110	130	100		Ni based alloy (wet condition)
30 ~ 50 (40)								30 ~ 50 (40)				30 ~ 50 (40)			
0.07 ~ 0.13 (0.1)															

High Feed End Mill AHU

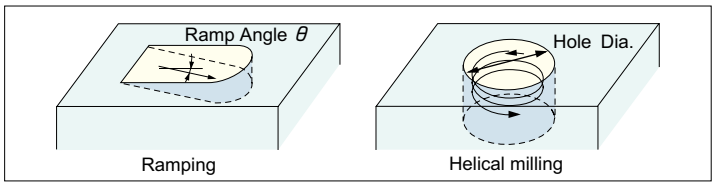
Adjustment of cutting conditions

・Feed rate and spindle revolution must be adjusted to correspond to tool overhang and machining conditions.
・Please consider the standard cutting conditions as 100% and adjust the machining conditions by referring to the table below.

		Overhang		
		<3DC	3DC~5DC	5DC<
Surfacing Shoulder milling	Rotation speed *n*	100%	70%	50%
	Feed rate *Vf*	100%	70%	50%
Slotting	Rotation speed *n*	100%	70%	50%
	Feed rate *Vf*	70%	50%	35%
Ramping	Rotation speed *n*	100%	70%	50%
	Feed rate *Vf*	80%	55%	40%

Ramping

Although ramp angle is limited due to cutting edge design, direct milling is possible without pre-drill-hole with ramping and helical milling methods like next pictures.



Attentions on Safety

①The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safty cover around the tool and wear the safty glasses when carring out any works.
②Do not use non-water-soluble cutting oils.Such oils may result in fire.

❶ AHU(L)/AHUM 10 type

(mm)

Tool dia. DC	φ16	φ20	φ21	φ25	φ26	φ30	φ32	φ35
Maximum ramp angle θ	4°	3°	3°	2.5°	2.5°	2°	2°	1.5°
Hole Dia.	21~29	29~37	31~39	39~47	41~49	49~56	53~61	59~66

❷ AHU(L)/AHUM 15 type

(mm)

Tool dia. DC	φ25	φ30	φ32	φ35	φ40	φ50
Maximum ramp angle θ	5°	4°	4°	3.5°	3°	2°
Hole Dia.	34~47	43~56	47~60	54~66	64~76	83~96

❸ AHUB15 type

(mm)

Tool dia. DC	φ50	φ63	φ80	φ100
Maximum ramp angle θ	2°	1.5°	1.0°	0.5°
Hole Dia.	83~96	100~116	135~152	168~192

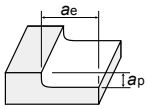
【Note】
①The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 1° or less is recommended.
②For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Cutting conditions for cutting aluminum alloy and copper using SD5010

Metric ＜Shoulder cutting＞：*a*e=0.5DC

Work material	Cutting conditions	AHU/AHUM 10 type					AHU/AHUB/AHUM 15 type							
		Φ16 2 Flutes	Φ20 3 Flutes	Φ25mm or 1" 4 Flutes	Φ32mm or 1.25" 5 Flutes	Φ35mm or 1.378" 5 Flutes	Φ25mm or 1" 2 Flutes	Φ32mm or 1.25" 3 Flutes	Φ35mm or 1.378" 3 Flutes	Φ40mm or 1.5" 4 Flutes	Φ50mm or 2" 5 Flutes	Φ63mm or 2.5" 6 Flutes	Φ80mm or 3" 7 Flutes	Φ100mm or 4" 8 Flutes
Expanded aluminum alloy material A5052 A7075 etc. Air-blow or wet: Water-soluble agent	Revolution *n* (min^{-1})	15,900	15,900	12,700	11,900	10,910	12,000	9,950	9,090	9,500	7,640	6,060	5,970	4,770
	Cutting speed *vc*(m/min)	800	1,000	1,000	1,200	1,200	950	1,000	1,000	1,200	1,200	1,200	1,500	1,500
	Feed speed *vf* (mm/min)	4,770	7,150	7,620	8,920	8,180	4,800	5,970	5,450	7,600	7,640	7,270	8,360	7,630
	Feed rate *fz*(mm/t)	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Axial depth of cut *ap* (mm)	3	3	3	3	3	5	5	5	5	5	5	5	5
Cast aluminum alloy material AC4A ADC12 etc Air-blow or wet: Water-soluble agent	Revolution *n* (min^{-1})	12,700	12,700	10,160	9,520	8,730	9,600	7,960	7,270	7,600	6,110	4,850	4,780	3,820
	Cutting speed *vc*(m/min)	640	800	800	960	960	760	800	800	960	960	960	1,200	1,200
	Feed speed *vf* (mm/min)	3,820	5,720	6,100	7,140	6,550	3,840	4,780	4,360	6,080	6,110	5,820	6,690	6,100
	Feed rate *fz*(mm/t)	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Axial depth of cut *ap* (mm)	3	3	3	3	3	5	5	5	5	5	5	5	5
Pure copper C1100 C1020 etc Wet: Water-soluble agent	Revolution *n* (min^{-1})	5,970	4,770	3,820	2,980	2,730	3,820	2,980	2,730	2,390	1,910	1,520	1,190	955
	Cutting speed *vc*(m/min)	300	300	300	300	300	300	300	300	300	300	300	300	300
	Feed speed *vf* (mm/min)	1,790	2,150	2,290	2,240	2,050	1,530	1,790	1,640	1,910	1,910	1,820	1,670	1,530
	Feed rate *fz*(mm/t)	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	Axial depth of cut *ap* (mm)	3	3	3	3	3	5	5	5	5	5	5	5	5

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③When cutting grooves, reduce the feed rate by 30% (set it to 0.7 times the value shown above).
④When L/D = 4 or higher, reduce the rotation speed and feed rate by 60% (set them to 0.4 times the values shown above).
⑤Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
⑥When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the *fz* value.
⑦Be sure to use this tool at rotation speeds within the acceptable range for the milling chuck being used. If the acceptable rotation speed range is below the rotation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the *fz* value.



Cutting conditions for cutting graphite and cast aluminium alloy

Metric

Work material	Recommended grade	Cutting conditions	AHU/AHUM 10 type		AHU/AHUB/AHUM 15 type		
			φ16mm or 0.63"	φ20mm~35mm or 0.785"~13.78"	φ25mm~50mm or 1"~2"	φ3mm~80mm or 2.5"~3"	φ100mm or 4"
Graphite	HD7010	Cutting speed *Vc*(m/min)	150~300	150~300	150~300	150~300	150~300
		Feed rate *fz*(mm/t)	0.10~0.20	0.10~0.20	0.1~0.25	0.1~0.25	0.1~0.25
Cast aluminum alloy AC4A、ADC12 etc. Air-blow or wet: water-soluble agent	HD7010	Cutting speed *Vc*(m/min)	200~500	200~500	200~600	200~600	200~600
		Feed rate *fz*(mm/t)	0.10~0.20	0.10~0.20	0.1~0.25	0.1~0.25	0.1~0.25

【Note】①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③Since there is a danger of breakage when using this tool, be sure to use the cutting area cover, protective goggles, safety shoes, etc.

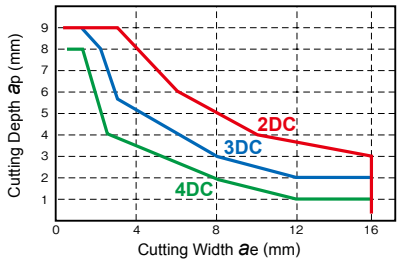
High Feed End Mill AHU

Overhang and Cutting Area

Metric ・Cutting Speed：*Vc*=120m/min ・Work material：AISI1050 (220HB) ・Machine：BT50 M/C

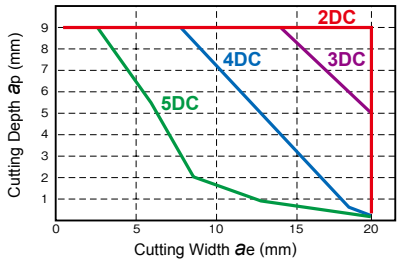
AHU（L）10 type

φ16
fz=0.1 (mm/t)



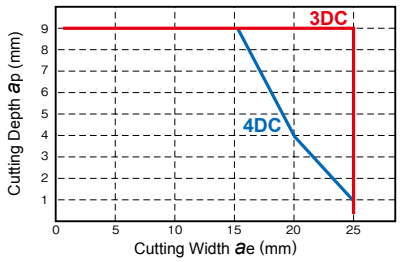
Overhang：2DC
AHU1016R-2
Overhang：3DC、4DC
AHUL1016R-2
DC:Tool Dia.

φ20
fz=0.15 (mm/t)



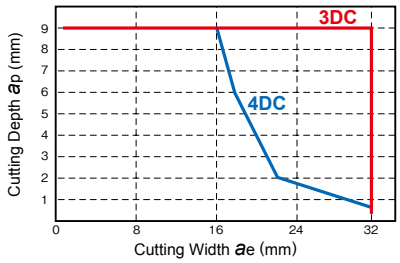
Overhang：2DC、3DC
AHU1020R-3
Overhang：4DC、5DC
AHUL1020R-3
DC:Tool Dia.

φ25
fz=0.15 (mm/t)



Overhang：3DC
AHU1025R-4
Overhang：4DC
AHUL1025R-3
DC:Tool Dia.

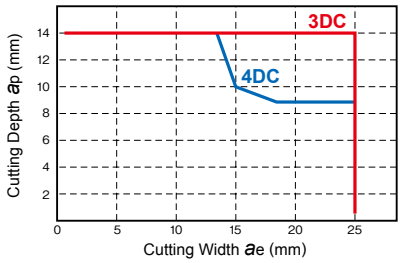
φ32
fz=0.15 (mm/t)



Overhang：3DC
AHU1032R-5
Overhang：4DC
AHUL1032R-4
DC:Tool Dia.

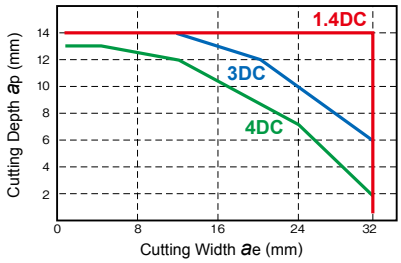
AHU（L）15 type

φ25
fz=0.15 (mm/t)



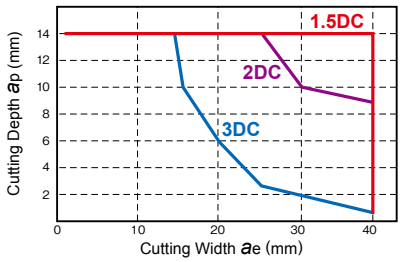
Overhang：3DC
AHU1525R-2
Overhang：4DC
AHUL1525R-2
DC:Tool Dia.

φ32
fz=0.15 (mm/t)



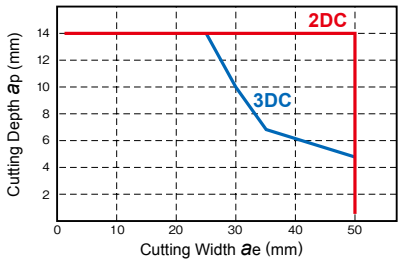
Overhang：1.4DC
AHU1532R-3
Overhang：3DC、4DC
AHUL1532R-3
DC:Tool Dia.

φ40
fz=0.15 (mm/t)



Overhang：1.5DC、2DC
AHU1540R-4
Overhang：3DC
AHUL1540R-4
DC:Tool Dia.

φ50
fz=0.15 (mm/t)



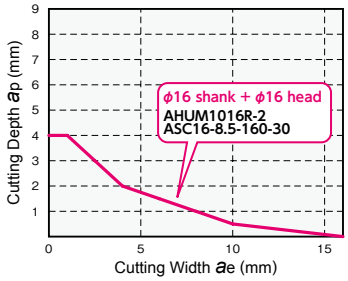
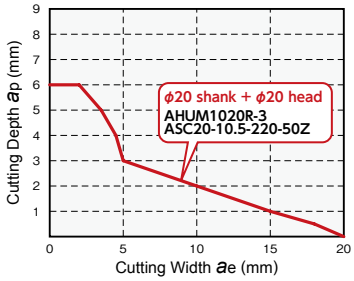
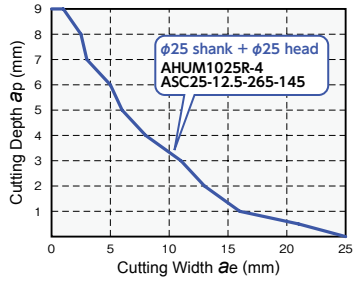
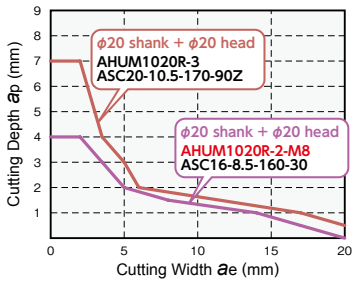
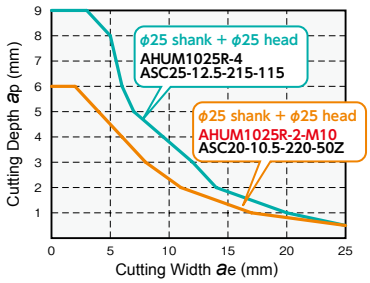
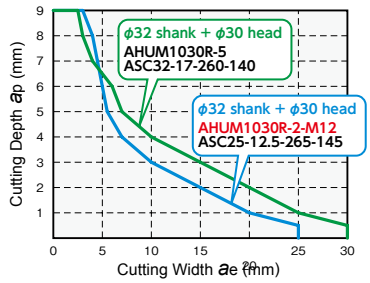
Overhang：2DC
AHU1550R-5
Overhang：3DC
AHUL1550R-4
DC:Tool Dia.

【Note】
Please adjust the cutting condition with reference to the above-stated graph depending on the stiffness of a work piece or a machine.

Cutting area of modular mill

Metric

・Work material：AISI1050C (220HB) ・Cutting Speed：*V*c=100m/min
・Feed rate：*f*z=0.1mm/t ・Machine：BT50

	Overhang **120mm**		Overhang **150mm**		Overhang **200mm**
ϕ16		ϕ20		ϕ25	
ϕ20		ϕ25		ϕ30	

【Note】

Please adjust the cutting condition with reference to the above-stated graph depending on the stiffness of a work piece or a machine.

Polish Mill V type ASPVmini

YouTube

・We've added high-precision finishing tools to our small-diameter multi-flute cutting tool series.
The free-cutting edge shape solves issues related to vertical wall cutting.

Roughing | Semi Finishing | Finishing | Cutting Conditions C192

Planing | Side milling | Slotting | Die-sinking | Profiling | Helical | Vertical

Steel shank Type

Metric **ASPV10○○R-○**

Numeric figure in a circle ○.

Fig.1
(Standard type)

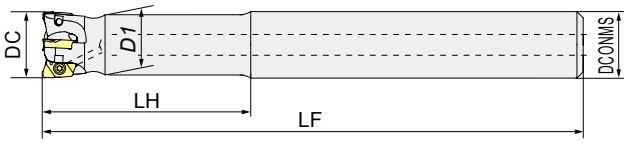
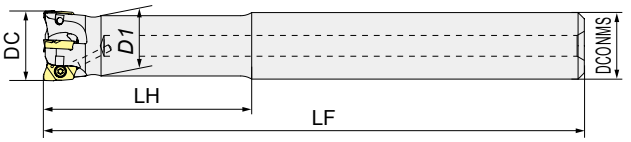


Fig.2
(Undercut type)

※DC > DCONMS

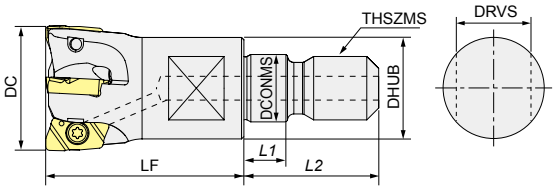


Item code	Stock	No.of flutes	Size (mm)					Shape	Recommended insert
			DC	LF	LH	*D1*	DCONMS		
ASPV1010R-2	●	2	10	100	30	9.4	10	Fig-1 Standard type	MPHT0402○○ ZEL(- ○○)
ASPV1011R-2	●	2	11	100	30	9.4	10	Fig.2 Undercut type	
ASPV1012R-3	●	3	12	100	40	11.2	12	Fig-1 Standard type	
ASPV1013R-3	●	3	13	100	40	11.2	12	Fig.2 Undercut type	
ASPV1016R-4	●	4	16	130	50	14.5	16	Fig-1 Standard type	
ASPV1017R-4	●	4	17	130	50	14.5	16	Fig.2 Undercut type	
ASPV1020R-5	●	5	20	160	60	18	20	Fig-1 Standard type	
ASPV1021R-5	●	5	21	160	60	18	20	Fig.2 Undercut type	
ASPV1025R-6	●	6	25	180	75	23	25	Fig-1 Standard type	
ASPV1026R-6	●	6	26	180	75	23	25	Fig.2 Undercut type	
ASPV1032R-8	●	8	32	200	100	30	32	Fig-1 Standard type	

Modular Type

Metric **ASPVM10○○R-○-M○○**

Numeric figure in a circle ○.



Item code	Stock	No.of flutes	Size (mm)								Recommended insert
			DC	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
ASPVM1010R-2-M6	●	2	10	20	6.5	M6	9.4	5.5	14.5	7	MPHT0402○○ ZEL(- ○○)
※ASPVM1011R-2-M6	●	2	11	20	6.5	M6	9.8	5.5	14.5	7	
ASPVM1012R-3-M6	●	3	12	20	6.5	M6	9.8	5.5	14.5	7	
※ASPVM1013R-3-M6	●	3	13	20	6.5	M6	9.8	5.5	14.5	7	
ASPVM1016R-4-M8	●	4	16	25	8.5	M8	12.8	5.5	17	10	
※ASPVM1017R-4-M8	●	4	17	25	8.5	M8	12.8	5.5	17	10	
ASPVM1020R-5-M10	●	5	20	30	10.5	M10	17.8	5.5	19	15	
※ASPVM1021R-5-M10	●	5	21	30	10.5	M10	17.8	5.5	19	15	
ASPVM1025R-6-M12	●	6	25	30	12.5	M12	20.8	5.5	22	17	
※ASPVM1026R-6-M12	●	6	26	30	12.5	M12	20.8	5.5	22	17	
ASPVM1032R-8-M16	●	8	32	30	17	M16	28.8	6	23	22	

【Note】 When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants to the threaded section or end surface sections in contact with the dedicated shank/arbor for modular mills.

● : Inventory maintained in US

Inserts

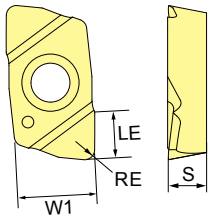


Fig.1

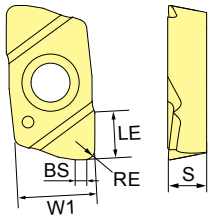


Fig.2

P	Carbon steel	■
M	SUS, etc.	■
K	Cast iron	■
H	Hardened steel	■

■ : General cutting, First recommendation

Item code	Tolerance class	TH308	Size (mm) W1	BS	S	LE	RE	Shape
MPHT040202ZEL	H	●	4.3	0	2	2.3	0.2	Fig. 1
MPHT040202ZEL-0.5		●		0.5				Fig. 2
MPHT040205ZEL		●		0			0.5	Fig. 1
MPHT040205ZEL-0.5		●		0.5				Fig. 2
MPHT040210ZEL		●		0			1	Fig. 1
MPHT040210ZEL-0.5		●		0.5				Fig. 2

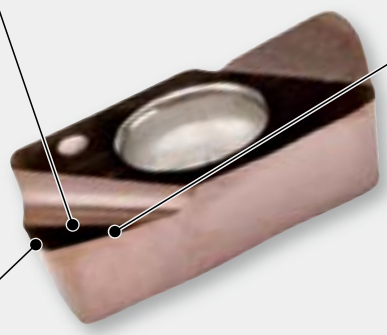
Features

Free-cutting chipbreaker

Achieves high-cutting surface grades, even for work materials whose cut surface tends to be cloudy, like carbon steel.
Maintains high dimensional accuracy when cutting, even for tools with long overhangs.

Front cutting edge

This edge is used for bottom surface finishing.
Various shapes with wiper edges are lined up for each R size.
Makes it possible to boost feed rates when finishing bottom surfaces.



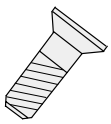
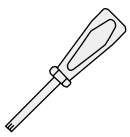
Peripheral cutting edge

Functions as peripheral cutting edge when side cutting.

● Without wiper edge

● With wiper edge

Parts

Parts	Clamp screw			Screw Driver	Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N·m)	Fastening torque (lbf·in)		
ASPV10◌◌R-◌ ASPVM10◌◌R-◌-M◌	240-140	0.5	4.43	104-T6	P-37

The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.
As spare parts for the tools, one clamp screw is attached when the tool diameter is 13 mm or smaller, while two clamp screws are attached when the tool diameter is 16 mm or larger.

Polish Mill V type ASPVmini

Recommended cutting conditions : Side finishing

Inch

Work material	Recommended grade	Tool dia.DC	ϕ10mm ϕ.394" (2 Flutes)					ϕ11mm ϕ.433" (2 Flutes)					ϕ12mm ϕ.500" (3 Flutes)					ϕ13mm ϕ.512" (3 Flutes)					ϕ16mm ϕ.630" (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC
Mild steel (200HB or less)	TH308	n (min-1)	12,732	19,099	15,915	12,732	12,732	11,575	17,362	14,469	11,575	11,575	10,610	18,568	15,915	10,610	10,610	9,794	19,588	14,691	9,794	9,794	7,958	15,915	11,937	7,958	7,958
		Vc(SFM)	1,313	1,969	1,641	1,313	1,313	1,311	1,967	1,639	1,311	1,311	1,388	2,429	2,082	1,388	1,388	1,312	2,624	1,968	1,312	1,312	1,312	2,624	1,968	1,312	1,312
		Vf(IPM)	99	225	188	120	99	90	205	171	109	90	124	329	282	150	124	115	347	260	138	115	124	376	282	150	124
		fz(IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Carbon steel Alloy steel (30HRC or less)	TH308	n (min-1)	9,549	19,099	12,732	12,732	9,549	8,681	17,362	11,575	11,575	8,681	7,958	15,915	10,610	10,610	7,958	7,346	14,691	9,794	9,794	7,346	5,968	11,937	7,958	7,958	5,968
		Vc(SFM)	984	1,969	1,313	1,313	984	984	1,967	1,311	1,311	984	1,041	2,082	1,388	1,388	1,041	984	1,968	1,312	1,312	984	984	1,968	1,312	1,312	984
		Vf(IPM)	74	225	150	120	74	68	205	137	109	68	93	282	188	150	93	86	260	173	138	86	93	282	188	150	93
		fz(IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Carbon steel Alloy steel (30～45HRC)	TH308	n (min-1)	6,366	15,915	11,141	9,549	9,549	5,787	14,469	10,128	8,681	8,681	5,305	13,263	9,284	7,958	7,958	4,897	12,243	8,570	7,346	7,346	3,979	9,947	6,963	5,968	5,968
		Vc(SFM)	656	1,641	1,149	984	984	656	1,639	1,148	984	984	694	1,735	1,215	1,041	1,041	656	1,640	1,148	984	984	656	1,640	1,148	984	984
		Vf(IPM)	50	150	105	74	59	45	136	95	68	54	62	187	131	93	74	57	173	121	86	68	62	187	131	93	74
		fz(IPT)	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Hardened steel (45～55HRC)	TH308	n (min-1)	4,775	7,958	5,730	4,775	4,775	4,341	7,234	5,209	4,341	4,341	3,979	6,631	4,775	3,979	3,979	3,673	6,121	4,407	3,673	3,673	2,984	4,974	3,581	2,984	2,984
		Vc(SFM)	492	820	591	492	492	492	820	590	492	492	521	868	625	521	521	492	820	590	492	492	492	820	590	492	492
		Vf(IPM)	37	62	45	30	30	34	56	41	27	27	47	78	56	37	37	43	72	52	34	34	47	78	56	37	37
		fz(IPT)	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Hardened steel (55～62HRC)	TH308	n (min-1)	4,138	6,366	5,093	4,138	4,138	3,762	5,787	4,630	3,762	3,762	3,448	5,305	4,244	3,448	3,448	3,183	4,897	3,918	3,183	3,183	2,586	3,979	3,183	2,586	2,586
		Vc(SFM)	427	656	525	427	427	426	656	525	426	426	451	694	555	451	451	426	656	525	426	426	426	656	525	426	426
		Vf(IPM)	32	50	40	26	17	29	45	36	23	15	40	62	50	32	21	37	57	46	30	19	40	62	50	32	21
		fz(IPT)	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Stainless steel	TH308	n (min-1)	9,549	19,099	12,732	12,732	9,549	8,681	17,362	11,575	11,575	8,681	7,958	15,915	10,610	10,610	7,958	7,346	14,691	9,794	9,794	7,346	5,968	11,937	7,958	7,958	5,968
		Vc(SFM)	984	1,969	1,313	1,313	984	984	1,967	1,311	1,311	984	1,041	2,082	1,388	1,388	1,041	984	1,968	1,312	1,312	984	984	1,968	1,312	1,312	984
		Vf(IPM)	74	225	150	120	74	68	205	137	109	68	93	282	188	150	93	86	260	173	138	86	93	282	188	150	93
		fz(IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Cast iron	TH308	n (min-1)	9,549	19,099	15,915	12,732	12,732	8,681	17,362	14,469	11,575	11,575	7,958	15,915	13,263	10,610	10,610	7,346	14,691	12,243	9,794	9,794	5,968	11,937	9,947	7,958	7,958
		Vc(SFM)	984	1,969	1,641	1,313	1,313	984	1,967	1,639	1,311	1,311	1,041	2,082	1,735	1,388	1,388	984	1,968	1,640	1,312	1,312	984	1,968	1,640	1,312	1,312
		Vf(IPM)	74	225	188	120	99	68	205	171	109	90	93	282	235	150	124	86	260	217	138	115	93	282	235	150	124
		fz(IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap(inch)	.059	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500
		ae(inch)	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01

【Note】
① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ For slotting or ramping, feed rate should be set to 70% as general criteria.
④ Ensure to index the insert at the correct time to ensure safety of the tool-body.

Finishing

ϕ17mm ϕ.670" (4 Flutes)					ϕ20mm ϕ.787" (5 Flutes)					ϕ21mm ϕ.827" (5 Flutes)					ϕ25mm ϕ1.000" (6 Flutes)					ϕ26mm ϕ1.024" (6 Flutes)					ϕ32mm ϕ1.260" (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			
General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	
7,490	14,979	11,234	7,490	7,490	6,366	12,732	9,549	6,366	6,366	6,063	12,126	9,095	6,063	6,063	5,093	10,186	7,639	5,093	5,093	4,897	9,794	7,346	4,897	4,897	4,897	9,794	7,346	4,897	4,897	Mild steel (200HB or less)
1,313	2,626	1,970	1,313	1,313	1,311	2,622	1,966	1,311	1,311	1,312	2,624	1,968	1,312	1,312	1,333	2,665	1,999	1,333	1,333	1,312	2,624	1,968	1,312	1,312	1,615	3,229	2,422	1,615	1,615	
117	354	265	141	117	124	376	282	150	124	118	358	268	142	118	119	361	270	144	119	115	347	260	138	115	153	462	347	184	153	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
5,617	11,234	7,490	7,490	5,617	4,775	9,549	6,366	6,366	4,775	4,547	9,095	6,063	6,063	4,547	3,820	7,639	5,093	5,093	3,820	3,673	7,346	4,897	4,897	3,673	2,984	5,968	3,979	3,979	2,984	Carbon steel Alloy steel (30HRC or less)
985	1,970	1,313	1,313	985	983	1,966	1,311	1,311	983	984	1,968	1,312	1,312	984	1,000	1,999	1,333	1,333	1,000	984	1,968	1,312	1,312	984	984	1,968	1,312	1,312	984	
88	265	177	141	88	93	282	188	150	93	89	268	179	142	89	89	270	180	144	89	86	260	173	138	86	93	282	188	150	93	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
3,745	9,362	6,553	5,617	5,617	3,183	7,958	5,570	4,775	4,775	3,032	7,579	5,305	4,547	4,547	2,546	6,366	4,456	3,820	3,820	2,449	6,121	4,285	3,673	3,673	1,989	4,974	3,482	2,984	2,984	Carbon steel Alloy steel (30～45HRC)
657	1,641	1,149	985	985	655	1,639	1,147	983	983	656	1,640	1,148	984	984	666	1,666	1,166	1,000	1,000	656	1,640	1,148	984	984	656	1,640	1,148	984	984	
58	176	123	88	70	62	187	131	93	74	59	178	125	89	70	60	180	126	89	71	57	173	121	86	68	62	187	131	93	74	
.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
2,809	4,681	3,370	2,809	2,809	2,387	3,979	2,865	2,387	2,387	2,274	3,789	2,728	2,274	2,274	1,910	3,183	2,292	1,910	1,910	1,836	3,061	2,204	1,836	1,836	1,492	2,487	1,790	1,492	1,492	Hardened steel (45～55HRC)
492	821	591	492	492	492	819	590	492	492	492	820	590	492	492	500	833	600	500	500	492	820	591	492	492	492	820	590	492	492	
44	73	53	35	35	47	78	56	37	37	44	74	53	35	35	45	74	54	36	36	43	72	52	34	34	47	78	56	37	37	
.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
2,434	3,745	2,996	2,434	2,434	2,069	3,183	2,546	2,069	2,069	1,970	3,032	2,425	1,970	1,970	1,655	2,546	2,037	1,655	1,655	1,592	2,449	1,959	1,592	1,592	1,293	1,989	1,592	1,293	1,293	Hardened steel (55～62HRC)
427	657	525	427	427	426	655	524	426	426	426	656	525	426	426	433	666	533	433	433	427	656	525	427	427	426	656	525	426	426	
38	58	47	30	19	40	62	50	32	21	38	59	47	31	20	39	60	48	31	20	37	57	46	30	19	40	62	50	32	21	
.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
5,617	11,234	7,490	7,490	5,617	4,775	9,549	6,366	6,366	4,775	4,547	9,095	6,063	6,063	4,547	3,820	7,639	5,093	5,093	3,820	3,673	7,346	4,897	4,897	3,673	2,984	5,968	3,979	3,979	2,984	Stainless steel
985	1,970	1,313	1,313	985	983	1,966	1,311	1,311	983	984	1,968	1,312	1,312	984	1,000	1,999	1,333	1,333	1,000	984	1,968	1,312	1,312	984	984	1,968	1,312	1,312	984	
88	265	177	141	88	93	282	188	150	93	89	268	179	142	89	89	270	180	144	89	86	260	173	138	86	93	282	188	150	93	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	
5,617	11,234	9,362	7,490	7,490	4,775	9,549	7,958	6,366	6,366	4,547	9,095	7,579	6,063	6,063	3,820	7,639	6,366	5,093	5,093	3,673	7,346	6,121	4,897	4,897	2,984	5,968	4,974	3,979	3,979	Cast iron
985	1,970	1,641	1,313	1,313	983	1,966	1,639	1,311	1,311	984	1,968	1,640	1,312	1,312	1,000	1,999	1,666	1,333	1,333	984	1,968	1,640	1,312	1,312	984	1,968	1,640	1,312	1,312	
88	265	221	141	117	93	282	235	150	124	89	268	224	142	118	89	270	225	144	119	86	260	217	138	115	93	282	235	150	124	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	1.500	1.500	1.000	.700	.500	
<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	<.01	

⑤ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥ Due to fire risks do not use neat cutting oil as a coolant.

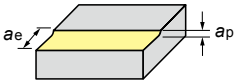
Polish Mill V type ASPVmini

Recommended cutting conditions : Bottom finishing

Inch

Work material	Recommended grade	Tool dia.DC	ϕ10mm ϕ.394" (2 Flutes)					ϕ11mm ϕ.433" (2 Flutes)					ϕ12mm ϕ.500" (3 Flutes)					ϕ13mm ϕ.512" (3 Flutes)					ϕ16mm ϕ.630" (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC
Mild steel (200HB or less)	TH308	n (min-1)	4,775	9,549	6,366	4,775	4,138	4,341	8,681	5,787	4,341	3,762	3,979	7,958	5,305	3,979	3,448	3,673	7,346	4,897	3,673	3,183	2,984	5,968	3,979	2,984	2,586
		Vc(SFM)	492	984	656	492	427	492	984	656	492	426	521	1,041	694	521	451	492	984	656	492	426	492	984	656	492	426
		Vf(IPM)	37	113	75	45	32	34	102	68	41	29	47	141	94	56	40	43	130	87	52	37	47	141	94	56	40
		fz(IPT)	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004
		ap(inch)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22-0.43	0.22-0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31..0.63
Carbon steel Alloy steel (30HRC or less)	TH308	n (min-1)	4,775	7,958	5,730	4,138	3,183	4,341	7,234	5,209	3,762	2,894	3,979	6,631	4,775	3,448	2,653	3,673	6,121	4,407	3,183	2,449	2,984	4,974	3,581	2,586	1,989
		Vc(SFM)	492	820	591	427	328	492	820	590	426	328	521	868	625	451	347	492	820	590	426	328	492	820	590	426	328
		Vf(IPM)	37	94	68	39	25	34	85	61	35	23	47	117	85	49	31	43	108	78	45	29	47	117	85	49	31
		fz(IPT)	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004
		ap(inch)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63
Carbon steel Alloy steel (30 ～ 45HRC)	TH308	n (min-1)	4,138	6,366	5,093	4,138	2,865	3,762	5,787	4,630	3,762	2,604	3,448	5,305	4,244	3,448	2,387	3,183	4,897	3,918	3,183	2,204	2,586	3,979	3,183	2,586	1,790
		Vc(SFM)	427	656	525	427	295	426	656	525	426	295	451	694	555	451	312	426	656	525	426	295	426	656	525	426	295
		Vf(IPM)	32	60	48	32	18	29	54	44	29	16	40	75	60	40	22	37	69	55	37	20	40	75	60	40	22
		fz(IPT)	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003
		ap(inch)	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63
Hardened steel (45～ 55HRC)	TH308	n (min-1)	2,546	3,820	3,183	2,546	2,546	2,315	3,472	2,894	2,315	2,315	2,122	3,183	2,653	2,122	2,122	1,959	2,938	2,449	1,959	1,959	1,592	2,387	1,989	1,592	1,592
		Vc(SFM)	262	394	328	262	262	262	393	328	262	262	278	416	347	278	278	262	394	328	262	262	262	393	328	262	262
		Vf(IPM)	20	30	25	16	16	18	27	23	14	14	25	37	31	20	20	23	34	29	18	18	25	37	31	20	20
		fz(IPT)	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003
		ap(inch)	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63
Hardened steel (55～ 62HRC)	TH308	n (min-1)	1,592	3,183	2,228	1,592	1,592	1,447	2,894	2,026	1,447	1,447	1,326	2,653	1,857	1,326	1,326	1,224	2,449	1,714	1,224	1,224	995	1,989	1,393	995	995
		Vc(SFM)	164	328	230	164	164	164	328	230	164	164	173	347	243	173	173	164	328	230	164	164	164	328	230	164	164
		Vf(IPM)	12	25	17	10	6	11	23	16	9	6	16	31	22	12	8	14	29	20	11	7	16	31	22	12	8
		fz(IPT)	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002
		ap(inch)	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63
Stainless steel	TH308	n (min-1)	4,775	7,958	5,730	4,138	3,183	4,341	7,234	5,209	3,762	2,894	3,979	6,631	4,775	3,448	2,653	3,673	6,121	4,407	3,183	2,449	2,984	4,974	3,581	2,586	1,989
		Vc(SFM)	492	820	591	427	328	492	820	590	426	328	521	868	625	451	347	492	820	590	426	328	492	820	590	426	328
		Vf(IPM)	37	94	68	39	25	34	85	61	35	23	47	117	85	49	31	43	108	78	45	29	47	117	85	49	31
		fz(IPT)	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004
		ap(inch)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63
Cast iron	TH308	n (min-1)	4,775	7,958	6,366	4,775	4,138	4,341	7,234	5,787	4,341	3,762	3,979	6,631	5,305	3,979	3,448	3,673	6,121	4,897	3,673	3,183	2,984	4,974	3,979	2,984	2,586
		Vc(SFM)	492	820	656	492	427	492	820	656	492	426	521	868	694	521	451	492	820	656	492	426	492	820	656	492	426
		Vf(IPM)	37	94	75	45	32	34	85	68	41	29	47	117	94	56	40	43	108	87	52	37	47	117	94	56	40
		fz(IPT)	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004
		ap(inch)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
		ae(inch)	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.2-0.39	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.22- 0.43	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.24-0.47	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.26-0.51	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63	0.31-0.63

【Note】
① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ For slotting or ramping, feed rate should be set to 70% as general criteria.
④ Ensure to index the insert at the correct time to ensure safety of the tool-body.



Finishing

ϕ17mm ϕ.670" (4 Flutes)					ϕ20mm ϕ.787" (5 Flutes)					ϕ21mm ϕ.827" (5 Flutes)					ϕ25mm ϕ1.000" (6 Flutes)					ϕ26mm ϕ1.024" (6 Flutes)					ϕ32mm ϕ1.260" (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			
General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	
2,809	5,617	3,745	2,809	2,434	2,387	4,775	3,183	2,387	2,069	2,274	4,547	3,032	2,274	1,970	1,910	3,820	2,546	1,910	1,655	1,836	3,673	2,449	1,836	1,592	1,836	3,673	2,449	1,836	1,592	Mild steel (200HB or less)
492	985	657	492	427	492	983	655	492	426	492	984	656	492	426	500	1,000	666	500	433	492	984	656	492	427	605	1,211	807	605	525	
44	133	88	53	38	47	141	94	56	40	44	134	89	53	38	45	135	90	54	39	43	130	87	52	37	57	173	116	69	50	
0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	
0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	
2,809	4,681	3,370	2,434	1,872	2,387	3,979	2,865	2,069	1,592	2,274	3,789	2,728	1,970	1,516	1,910	3,183	2,292	1,655	1,273	1,836	3,061	2,204	1,592	1,224	1,492	2,487	1,790	1,293	995	Carbon steel Alloy steel (30HRC or less)
492	821	591	427	328	492	819	590	426	328	492	820	590	426	328	500	833	600	433	333	492	820	591	427	328	492	820	590	426	328	
44	110	80	46	29	47	117	85	49	31	44	112	80	46	30	45	113	81	47	30	43	108	78	45	29	47	117	84	49	31	
0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	
0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	
2,434	3,745	2,996	2,434	1,685	2,069	3,183	2,546	2,069	1,432	1,970	3,032	2,425	1,970	1,364	1,655	2,546	2,037	1,655	1,146	1,592	2,449	1,959	1,592	1,102	1,293	1,989	1,592	1,293	895	Carbon steel Alloy steel (30～45HRC)
427	657	525	427	295	426	655	524	426	295	426	656	525	426	295	433	666	533	433	300	427	656	525	427	295	426	656	525	426	295	
38	70	56	38	21	40	75	60	40	22	38	71	57	38	21	39	72	57	39	21	37	69	55	37	20	40	75	60	40	22	
0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	0.004	0.005	0.005	0.004	0.003	
0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	
1,498	2,247	1,872	1,498	1,498	1,273	1,910	1,592	1,273	1,273	1,213	1,819	1,516	1,213	1,213	1,019	1,528	1,273	1,019	1,019	979	1,469	1,224	979	979	796	1,194	995	796	796	Hardened steel (45～55HRC)
263	394	328	263	263	262	393	328	262	262	262	394	328	262	262	267	400	333	267	267	262	394	328	262	262	262	394	328	262	262	
23	35	29	19	19	25	37	31	20	20	24	35	30	19	19	24	36	30	19	19	23	34	29	18	18	25	37	31	20	20	
0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.003	0.003	
0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	
936	1,872	1,311	936	936	796	1,592	1,114	796	796	758	1,516	1,061	758	758	637	1,273	891	637	637	612	1,224	857	612	612	497	995	696	497	497	Hardened steel (55～62HRC)
164	328	230	164	164	164	328	229	164	164	164	328	230	164	164	167	333	233	167	167	164	328	230	164	164	164	328	229	164	164	
15	29	20	12	7	16	31	22	12	8	15	30	21	12	8	15	30	21	12	8	14	29	20	11	7	16	31	22	12	8	
0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.004	0.003	0.002	
0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	
2,809	4,681	3,370	2,434	1,872	2,387	3,979	2,865	2,069	1,592	2,274	3,789	2,728	1,970	1,516	1,910	3,183	2,292	1,655	1,273	1,836	3,061	2,204	1,592	1,224	1,492	2,487	1,790	1,293	995	Stainless steel
492	821	591	427	328	492	819	590	426	328	492	820	590	426	328	500	833	600	433	333	492	820	591	427	328	492	820	590	426	328	
44	110	80	46	29	47	117	85	49	31	44	112	80	46	30	45	113	81	47	30	43	108	78	45	29	47	117	84	49	31	
0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	
0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	
2,809	4,681	3,745	2,809	2,434	2,387	3,979	3,183	2,387	2,069	2,274	3,789	3,032	2,274	1,970	1,910	3,183	2,546	1,910	1,655	1,836	3,061	2,449	1,836	1,592	1,492	2,487	1,989	1,492	1,293	Cast iron
492	821	657	492	427	492	819	655	492	426	492	820	656	492	426	500	833	666	500	433	492	820	656	492	427	492	820	656	492	426	
44	110	88	53	38	47	117	94	56	40	44	112	89	53	38	45	113	90	54	39	43	108	87	52	37	47	117	94	56	40	
0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	0.004	0.006	0.006	0.005	0.004	
0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.33-0.67	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.39-0.79	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.41-0.83	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.49-0.98	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.51-1.02	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	0.63-1.26	

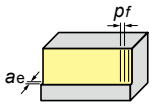
⑤ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥ Due to fire risks do not use neat cutting oil as a coolant.

Polish Mill V type ASPVmini

Recommended cutting conditions : Vertical cutting (※ Use only in pushing-down direction.) Inch

Work material	Recommended grade	Tool dia.DC	ϕ10mm ϕ.394" (2 Flutes)					ϕ11mm ϕ.433" (2 Flutes)					ϕ12mm ϕ.500" (3 Flutes)					ϕ13mm ϕ.512" (3 Flutes)					ϕ16mm ϕ.630" (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC
Mild steel (200HB or less)	TH308	n (min-1)	9,549	19,099	12,732	12,732	9,549	8,681	17,362	11,575	11,575	8,681	7,958	15,915	10,610	10,610	7,958	7,346	14,691	9,794	9,794	7,346	5,968	11,937	7,958	7,958	5,968
		Vc(SFM)	984	1,969	1,313	1,313	984	984	1,967	1,311	1,311	984	1,041	2,082	1,388	1,388	1,041	984	1,968	1,312	1,312	984	984	1,968	1,312	1,312	984
		Vf(IPM)	97	302	150	130	74	89	274	137	118	68	122	377	188	162	93	112	348	173	150	86	122	377	188	162	93
		fz(IPT)	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Carbon steel Alloy steel (30HRC or less)	TH308	n (min-1)	7,958	14,324	9,549	9,549	7,958	7,234	13,022	8,681	8,681	7,234	6,631	11,937	7,958	7,958	6,631	6,121	11,018	7,346	7,346	6,121	4,974	8,952	5,968	5,968	4,974
		Vc(SFM)	820	1,477	984	984	820	820	1,475	984	984	820	868	1,562	1,041	1,041	868	820	1,476	984	984	820	820	1,476	984	984	820
		Vf(IPM)	81	226	113	97	62	74	206	102	89	56	101	283	141	122	78	94	261	130	112	72	101	283	141	122	78
		fz(IPT)	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Carbon steel Alloy steel (30～45HRC)	TH308	n (min-1)	5,730	11,141	7,958	6,366	5,730	5,209	10,128	7,234	5,787	5,209	4,775	9,284	6,631	5,305	4,775	4,407	8,570	6,121	4,897	4,407	3,581	6,963	4,974	3,979	3,581
		Vc(SFM)	591	1,149	820	656	591	590	1,148	820	656	590	625	1,215	868	694	625	590	1,148	820	656	590	590	1,148	820	656	590
		Vf(IPM)	45	105	75	50	36	41	95	68	45	32	56	131	93	62	44	52	121	86	57	41	56	131	94	62	44
		fz(IPT)	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Hardened steel (45～55HRC)	TH308	n (min-1)	3,820	6,366	5,730	4,775	3,820	3,472	5,787	5,209	4,341	3,472	3,183	5,305	4,775	3,979	3,183	2,938	4,897	4,407	3,673	2,938	2,387	3,979	3,581	2,984	2,387
		Vc(SFM)	394	656	591	492	394	393	656	590	492	393	416	694	625	521	416	394	656	590	492	394	393	656	590	492	393
		Vf(IPM)	30	50	45	30	24	27	45	41	27	22	37	62	56	37	30	34	57	52	34	27	37	62	56	37	30
		fz(IPT)	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Hardened steel (55～62HRC)	TH308	n (min-1)	3,183	5,730	4,775	3,820	3,183	2,894	5,209	4,341	3,472	2,894	2,653	4,775	3,979	3,183	2,653	2,449	4,407	3,673	2,938	2,449	1,989	3,581	2,984	2,387	1,989
		Vc(SFM)	328	591	492	394	328	328	590	492	393	328	347	625	521	416	347	328	590	492	394	328	328	590	492	393	328
		Vf(IPM)	25	45	37	24	13	23	41	34	22	12	31	56	47	30	16	29	52	43	27	15	31	56	47	30	16
		fz(IPT)	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Stainless steel	TH308	n (min-1)	7,958	14,324	9,549	9,549	7,958	7,234	13,022	8,681	8,681	7,234	6,631	11,937	7,958	7,958	6,631	6,121	11,018	7,346	7,346	6,121	4,974	8,952	5,968	5,968	4,974
		Vc(SFM)	820	1,477	984	984	820	820	1,475	984	984	820	868	1,562	1,041	1,041	868	820	1,476	984	984	820	820	1,476	984	984	820
		Vf(IPM)	62	169	113	90	62	56	154	102	82	56	78	211	141	112	78	72	195	130	104	72	78	211	141	112	78
		fz(IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008
Cast iron	TH308	n (min-1)	7,958	14,324	12,732	11,141	9,549	7,234	13,022	11,575	10,128	8,681	6,631	11,937	10,610	9,284	7,958	6,121	11,018	9,794	8,570	7,346	4,974	8,952	7,958	6,963	5,968
		Vc(SFM)	820	1,477	1,313	1,149	984	820	1,475	1,311	1,148	984	868	1,562	1,388	1,215	1,041	820	1,476	1,312	1,148	984	820	1,476	1,312	1,148	984
		Vf(IPM)	62	169	150	105	74	56	154	137	95	68	78	211	188	131	93	72	195	173	121	86	78	211	188	131	93
		fz(IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		pf(inch)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ae(inch)	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008

【Note】 ① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ Ensure to index the insert at the correct time to ensure safety of the tool-body.



Finishing

ϕ17mm ϕ.670" (4 Flutes)					ϕ20mm ϕ.787" (5 Flutes)					ϕ21mm ϕ.827" (5 Flutes)					ϕ25mm ϕ1.000" (6 Flutes)					ϕ26mm ϕ1.024" (6 Flutes)					ϕ32mm ϕ1.260" (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			
General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	
5,617	11,234	7,490	7,490	5,617	4,775	9,549	6,366	6,366	4,775	4,547	9,095	6,063	6,063	4,547	3,820	7,639	5,093	5,093	3,820	3,673	7,346	4,897	4,897	3,673	3,673	7,346	4,897	4,897	3,673	Mild steel (200HB or less)
985	1,970	1,313	1,313	985	983	1,966	1,311	1,311	983	984	1,968	1,312	1,312	984	1,000	1,999	1,333	1,333	1,000	984	1,968	1,312	1,312	984	1,211	2,422	1,615	1,615	1,211	
115	355	177	153	88	122	377	188	162	93	116	359	179	155	89	117	362	180	156	89	112	348	173	150	86	150	464	231	200	115	
.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	
4,681	8,426	5,617	5,617	4,681	3,979	7,162	4,775	4,775	3,979	3,789	6,821	4,547	4,547	3,789	3,183	5,730	3,820	3,820	3,183	3,061	5,509	3,673	3,673	3,061	2,487	4,476	2,984	2,984	2,487	Carbon steel Alloy steel (30HRC or less)
821	1,477	985	985	821	819	1,475	983	983	819	820	1,476	984	984	820	833	1,499	1,000	1,000	833	820	1,476	984	984	820	820	1,476	984	984	820	
95	266	133	115	73	101	283	141	122	78	97	269	134	116	74	97	272	135	117	74	94	261	130	112	72	101	283	141	122	78	
.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	
3,370	6,553	4,681	3,745	3,370	2,865	5,570	3,979	3,183	2,865	2,728	5,305	3,789	3,032	2,728	2,292	4,456	3,183	2,546	2,292	2,204	4,285	3,061	2,449	2,204	1,790	3,482	2,487	1,989	1,790	Carbon steel Alloy steel (30～45HRC)
591	1,149	821	657	591	590	1,147	819	655	590	590	1,148	820	656	590	600	1,166	833	666	600	591	1,148	820	656	591	590	1,148	820	656	590	
53	123	88	58	42	56	131	94	62	44	53	125	89	59	42	54	126	90	60	43	52	121	86	57	41	56	131	94	62	44	
.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	
2,247	3,745	3,370	2,809	2,247	1,910	3,183	2,865	2,387	1,910	1,819	3,032	2,728	2,274	1,819	1,528	2,546	2,292	1,910	1,528	1,469	2,449	2,204	1,836	1,469	1,194	1,989	1,790	1,492	1,194	Hardened steel (45～55HRC)
394	657	591	492	394	393	655	590	492	393	394	656	590	492	394	400	666	600	500	400	394	656	591	492	394	394	656	590	492	394	
35	58	53	35	28	37	62	56	37	30	35	59	53	35	28	36	60	54	36	28	34	57	52	34	27	37	62	56	37	30	
.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	
1,872	3,370	2,809	2,247	1,872	1,592	2,865	2,387	1,910	1,592	1,516	2,728	2,274	1,819	1,516	1,273	2,292	1,910	1,528	1,273	1,224	2,204	1,836	1,469	1,224	995	1,790	1,492	1,194	995	Hardened steel (55～62HRC)
328	591	492	394	328	328	590	492	393	328	328	590	492	394	328	333	600	500	400	333	328	591	492	394	328	328	590	492	394	328	
29	53	44	28	15	31	56	47	30	16	30	53	44	28	15	30	54	45	28	15	29	52	43	27	15	31	56	47	30	16	
.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	
4,681	8,426	5,617	5,617	4,681	3,979	7,162	4,775	4,775	3,979	3,789	6,821	4,547	4,547	3,789	3,183	5,730	3,820	3,820	3,183	3,061	5,509	3,673	3,673	3,061	2,487	4,476	2,984	2,984	2,487	Stainless steel
821	1,477	985	985	821	819	1,475	983	983	819	820	1,476	984	984	820	833	1,499	1,000	1,000	833	820	1,476	984	984	820	820	1,476	984	984	820	
73	199	133	106	73	78	211	141	112	78	74	201	134	107	74	74	203	135	108	74	72	195	130	104	72	78	211	141	112	78	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	
4,681	8,426	7,490	6,553	5,617	3,979	7,162	6,366	5,570	4,775	3,789	6,821	6,063	5,305	4,547	3,183	5,730	5,093	4,456	3,820	3,061	5,509	4,897	4,285	3,673	2,487	4,476	3,979	3,482	2,984	Cast iron
821	1,477	1,313	1,149	985	819	1,475	1,311	1,147	983	820	1,476	1,312	1,148	984	833	1,499	1,333	1,166	1,000	820	1,476	1,312	1,148	984	820	1,476	1,312	1,148	984	
73	199	177	123	88	78	211	188	131	93	74	201	179	125	89	74	203	180	126	89	72	195	173	121	86	78	211	188	131	93	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.032	.032	.032	.032	.032	
<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	<.008	

④ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑤ Due to fire risks do not use neat cutting oil as a coolant.

Polish Mill V type ASPVmini

Recommended cutting conditions : Side finishing

Metric

Work material	Recommended grade	Tool dia.DC	ϕ10mm ϕ.394" (2 Flutes)					ϕ11mm ϕ.433" (2 Flutes)					ϕ12mm ϕ.500" (3 Flutes)					ϕ13mm ϕ.512" (3 Flutes)					ϕ16mm ϕ.630" (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC
Mild steel (200HB or less)	TH308	n (min-1)	12,732	19,099	15,915	12,732	12,732	11,575	17,362	14,469	11,575	11,575	10,610	18,568	15,915	10,610	10,610	9,794	19,588	14,691	9,794	9,794	7,958	15,915	11,937	7,958	7,958
		Vc(m/min)	400	600	500	400	400	400	600	500	400	400	400	700	600	400	400	400	800	600	400	400	400	800	600	400	400
		Vf(mm/min)	2,546	5,730	4,775	3,056	2,546	2,315	5,209	4,341	2,778	2,315	3,183	8,356	7,162	3,820	3,183	2,938	8,815	6,611	3,526	2,938	3,183	9,549	7,162	3,820	3,183
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon steel Alloy steel (30HRC or less)	TH308	n (min-1)	9,549	19,099	12,732	12,732	9,549	8,681	17,362	11,575	11,575	8,681	7,958	15,915	10,610	10,610	7,958	7,346	14,691	9,794	9,794	7,346	5,968	11,937	7,958	7,958	5,968
		Vc(m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		Vf(mm/min)	1,910	5,730	3,820	3,056	1,910	1,736	5,209	3,472	2,778	1,736	2,387	7,162	4,775	3,820	2,387	2,204	6,611	4,407	3,526	2,204	2,387	7,162	4,775	3,820	2,387
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon steel Alloy steel (30～45HRC)	TH308	n (min-1)	6,366	15,915	11,141	9,549	9,549	5,787	14,469	10,128	8,681	8,681	5,305	13,263	9,284	7,958	7,958	4,897	12,243	8,570	7,346	7,346	3,979	9,947	6,963	5,968	5,968
		Vc(m/min)	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300
		Vf(mm/min)	1,273	3,820	2,674	1,910	1,528	1,157	3,472	2,431	1,736	1,389	1,592	4,775	3,342	2,387	1,910	1,469	4,407	3,085	2,204	1,763	1,592	4,775	3,342	2,387	1,910
		fz(mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hardened steel (45～55HRC)	TH308	n (min-1)	4,775	7,958	5,730	4,775	4,775	4,341	7,234	5,209	4,341	4,341	3,979	6,631	4,775	3,979	3,979	3,673	6,121	4,407	3,673	3,673	2,984	4,974	3,581	2,984	2,984
		Vc(m/min)	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150
		Vf(mm/min)	955	1,592	1,146	764	764	868	1,447	1,042	694	694	1,194	1,989	1,432	955	955	1,102	1,836	1,322	881	881	1,194	1,989	1,432	955	955
		fz(mm/t)	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hardened steel (55～62HRC)	TH308	n (min-1)	4,138	6,366	5,093	4,138	4,138	3,762	5,787	4,630	3,762	3,762	3,448	5,305	4,244	3,448	3,448	3,183	4,897	3,918	3,183	3,183	2,586	3,979	3,183	2,586	2,586
		Vc(m/min)	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130
		Vf(mm/min)	828	1,273	1,019	662	414	752	1,157	926	602	376	1,035	1,592	1,273	828	517	955	1,469	1,175	764	477	1,035	1,592	1,273	828	517
		fz(mm/t)	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Stainless steel	TH308	n (min-1)	9,549	19,099	12,732	12,732	9,549	8,681	17,362	11,575	11,575	8,681	7,958	15,915	10,610	10,610	7,958	7,346	14,691	9,794	9,794	7,346	5,968	11,937	7,958	7,958	5,968
		Vc(m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		Vf(mm/min)	1,910	5,730	3,820	3,056	1,910	1,736	5,209	3,472	2,778	1,736	2,387	7,162	4,775	3,820	2,387	2,204	6,611	4,407	3,526	2,204	2,387	7,162	4,775	3,820	2,387
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cast iron	TH308	n (min-1)	9,549	19,099	15,915	12,732	12,732	8,681	17,362	14,469	11,575	11,575	7,958	15,915	13,263	10,610	10,610	7,346	14,691	12,243	9,794	9,794	5,968	11,937	9,947	7,958	7,958
		Vc(m/min)	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400
		Vf(mm/min)	1,910	5,730	4,775	3,056	2,546	1,736	5,209	4,341	2,778	2,315	2,387	7,162	5,968	3,820	3,183	2,204	6,611	5,509	3,526	2,938	2,387	7,162	5,968	3,820	3,183
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

【Note】
① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ For slotting or ramping, feed rate should be set to 70% as general criteria.
④ Ensure to index the insert at the correct time to ensure safety of the tool-body.

Finishing

ϕ17mm ϕ.670" (4 Flutes)					ϕ20mm ϕ.787" (5 Flutes)					ϕ21mm ϕ.827" (5 Flutes)					ϕ25mm ϕ1.000" (6 Flutes)					ϕ26mm ϕ1.024" (6 Flutes)					ϕ32mm ϕ1.260" (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			
General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	
7,490	14,979	11,234	7,490	7,490	6,366	12,732	9,549	6,366	6,366	6,063	12,126	9,095	6,063	6,063	5,093	10,186	7,639	5,093	5,093	4,897	9,794	7,346	4,897	4,897	4,897	9,794	7,346	4,897	4,897	Mild steel (200HB or less)
400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	
2,996	8,988	6,741	3,595	2,996	3,183	9,549	7,162	3,820	3,183	3,032	9,095	6,821	3,638	3,032	3,056	9,167	6,875	3,667	3,056	2,938	8,815	6,611	3,526	2,938	2,938	8,815	6,611	3,526	2,938	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
5,617	11,234	7,490	7,490	5,617	4,775	9,549	6,366	6,366	4,775	4,547	9,095	6,063	6,063	4,547	3,820	7,639	5,093	5,093	3,820	3,673	7,346	4,897	4,897	3,673	2,984	5,968	3,979	3,979	2,984	Carbon steel Alloy steel (30HRC or less)
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
2,247	6,741	4,494	3,595	2,247	2,387	7,162	4,775	3,820	2,387	2,274	6,821	4,547	3,638	2,274	2,292	6,875	4,584	3,667	2,292	2,204	6,611	4,407	3,526	2,204	2,387	7,162	4,775	3,820	2,387	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
3,745	9,362	6,553	5,617	5,617	3,183	7,958	5,570	4,775	4,775	3,032	7,579	5,305	4,547	4,547	2,546	6,366	4,456	3,820	3,820	2,449	6,121	4,285	3,673	3,673	1,989	4,974	3,482	2,984	2,984	Carbon steel Alloy steel (30～45HRC)
200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	
1,498	4,494	3,146	2,247	1,798	1,592	4,775	3,342	2,387	1,910	1,516	4,547	3,183	2,274	1,819	1,528	4,584	3,209	2,292	1,833	1,469	4,407	3,085	2,204	1,763	1,592	4,775	3,342	2,387	1,910	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,809	4,681	3,370	2,809	2,809	2,387	3,979	2,865	2,387	2,387	2,274	3,789	2,728	2,274	2,274	1,910	3,183	2,292	1,910	1,910	1,836	3,061	2,204	1,836	1,836	1,492	2,487	1,790	1,492	1,492	Hardened steel (45～55HRC)
150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	
1,123	1,872	1,348	899	899	1,194	1,989	1,432	955	955	1,137	1,895	1,364	909	909	1,146	1,910	1,375	917	917	1,102	1,836	1,322	881	881	1,194	1,989	1,432	955	955	
0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,434	3,745	2,996	2,434	2,434	2,069	3,183	2,546	2,069	2,069	1,970	3,032	2,425	1,970	1,970	1,655	2,546	2,037	1,655	1,655	1,592	2,449	1,959	1,592	1,592	1,293	1,989	1,592	1,293	1,293	Hardened steel (55～62HRC)
130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	
974	1,498	1,198	779	487	1,035	1,592	1,273	828	517	985	1,516	1,213	788	493	993	1,528	1,222	795	497	955	1,469	1,175	764	477	1,035	1,592	1,273	828	517	
0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
5,617	11,234	7,490	7,490	5,617	4,775	9,549	6,366	6,366	4,775	4,547	9,095	6,063	6,063	4,547	3,820	7,639	5,093	5,093	3,820	3,673	7,346	4,897	4,897	3,673	2,984	5,968	3,979	3,979	2,984	Stainless steel
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
2,247	6,741	4,494	3,595	2,247	2,387	7,162	4,775	3,820	2,387	2,274	6,821	4,547	3,638	2,274	2,292	6,875	4,584	3,667	2,292	2,204	6,611	4,407	3,526	2,204	2,387	7,162	4,775	3,820	2,387	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
5,617	11,234	9,362	7,490	7,490	4,775	9,549	7,958	6,366	6,366	4,547	9,095	7,579	6,063	6,063	3,820	7,639	6,366	5,093	5,093	3,673	7,346	6,121	4,897	4,897	2,984	5,968	4,974	3,979	3,979	Cast iron
300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	
2,247	6,741	5,617	3,595	2,996	2,387	7,162	5,968	3,820	3,183	2,274	6,821	5,684	3,638	3,032	2,292	6,875	5,730	3,667	3,056	2,204	6,611	5,509	3,526	2,938	2,387	7,162	5,968	3,820	3,183	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	

⑤ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥ Due to fire risks do not use neat cutting oil as a coolant.

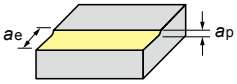
Polish Mill V type ASPVmini

Recommended cutting conditions : Bottom finishing

Metric

Work material	Recommended grade	Tool dia.DC	ϕ10mm ϕ.394" (2 Flutes)					ϕ11mm ϕ.433" (2 Flutes)					ϕ12mm ϕ.500" (3 Flutes)					ϕ13mm ϕ.512" (3 Flutes)					ϕ16mm ϕ.630" (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC
Mild steel (200HB or less)	TH308	n (min-1)	4,775	9,549	6,366	4,775	4,138	4,341	8,681	5,787	4,341	3,762	3,979	7,958	5,305	3,979	3,448	3,673	7,346	4,897	3,673	3,183	2,984	5,968	3,979	2,984	2,586
		Vc(m/min)	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130
		Vf(mm/min)	955	2,865	1,910	1,146	828	868	2,604	1,736	1,042	752	1,194	3,581	2,387	1,432	1,035	1,102	3,306	2,204	1,322	955	1,194	3,581	2,387	1,432	1,035
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16
Carbon steel Alloy steel (30HRC or less)	TH308	n (min-1)	4,775	7,958	5,730	4,138	3,183	4,341	7,234	5,209	3,762	2,894	3,979	6,631	4,775	3,448	2,653	3,673	6,121	4,407	3,183	2,449	2,984	4,974	3,581	2,586	1,989
		Vc(m/min)	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100
		Vf(mm/min)	955	2,387	1,719	993	637	868	2,170	1,563	903	579	1,194	2,984	2,149	1,241	796	1,102	2,755	1,983	1,146	735	1,194	2,984	2,149	1,241	796
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16
Carbon steel Alloy steel (30～45HRC)	TH308	n (min-1)	4,138	6,366	5,093	4,138	2,865	3,762	5,787	4,630	3,762	2,604	3,448	5,305	4,244	3,448	2,387	3,183	4,897	3,918	3,183	2,204	2,586	3,979	3,183	2,586	1,790
		Vc(m/min)	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90
		Vf(mm/min)	828	1,528	1,222	828	458	752	1,389	1,111	752	417	1,035	1,910	1,528	1,035	573	955	1,763	1,410	955	529	1,035	1,910	1,528	1,035	573
		fz(mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		ap(mm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16
Hardened steel (45～55HRC)	TH308	n (min-1)	2,546	3,820	3,183	2,546	2,546	2,315	3,472	2,894	2,315	2,315	2,122	3,183	2,653	2,122	2,122	1,959	2,938	2,449	1,959	1,959	1,592	2,387	1,989	1,592	1,592
		Vc(m/min)	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80
		Vf(mm/min)	509	764	637	407	407	463	694	579	370	370	637	955	796	509	509	588	881	735	470	470	637	955	796	509	509
		fz(mm/t)	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08
		ap(mm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16
Hardened steel (55～62HRC)	TH308	n (min-1)	1,592	3,183	2,228	1,592	1,592	1,447	2,894	2,026	1,447	1,447	1,326	2,653	1,857	1,326	1,326	1,224	2,449	1,714	1,224	1,224	995	1,989	1,393	995	995
		Vc(m/min)	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50
		Vf(mm/min)	318	637	446	255	159	289	579	405	231	145	398	796	557	318	199	367	735	514	294	184	398	796	557	318	199
		fz(mm/t)	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05
		ap(mm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16
Stainless steel	TH308	n (min-1)	4,775	7,958	5,730	4,138	3,183	4,341	7,234	5,209	3,762	2,894	3,979	6,631	4,775	3,448	2,653	3,673	6,121	4,407	3,183	2,449	2,984	4,974	3,581	2,586	1,989
		Vc(m/min)	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100
		Vf(mm/min)	955	2,387	1,719	993	637	868	2,170	1,563	903	579	1,194	2,984	2,149	1,241	796	1,102	2,755	1,983	1,146	735	1,194	2,984	2,149	1,241	796
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16
Cast iron	TH308	n (min-1)	4,775	7,958	6,366	4,775	4,138	4,341	7,234	5,787	4,341	3,762	3,979	6,631	5,305	3,979	3,448	3,673	6,121	4,897	3,673	3,183	2,984	4,974	3,979	2,984	2,586
		Vc(m/min)	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130
		Vf(mm/min)	955	2,387	1,910	1,146	828	868	2,170	1,736	1,042	752	1,194	2,984	2,387	1,432	1,035	1,102	2,755	2,204	1,322	955	1,194	2,984	2,387	1,432	1,035
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap(mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae(mm)	5-10	5-10	5-10	5-10	5-10	5.5-11	5.5-11	5.5-11	5.5-11	5.5-11	6-12	6-12	6-12	6-12	6-12	6.5-13	6.5-13	6.5-13	6.5-13	6.5-13	8-16	8-16	8-16	8-16	8-16

【Note】
① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ For slotting or ramping, feed rate should be set to 70% as general criteria.
④ Ensure to index the insert at the correct time to ensure safety of the tool-body.



Finishing

ϕ17mm ϕ.670" (4 Flutes)					ϕ20mm ϕ.787" (5 Flutes)					ϕ21mm ϕ.827" (5 Flutes)					ϕ25mm ϕ1.000" (6 Flutes)					ϕ26mm ϕ1.024" (6 Flutes)					ϕ32mm ϕ1.260" (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			
General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	
2,809	5,617	3,745	2,809	2,434	2,387	4,775	3,183	2,387	2,069	2,274	4,547	3,032	2,274	1,970	1,910	3,820	2,546	1,910	1,655	1,836	3,673	2,449	1,836	1,592	1,836	3,673	2,449	1,836	1,592	Mild steel (200HB or less)
150	300	200	150	130	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130	
1,123	3,370	2,247	1,348	974	1,194	3,581	2,387	1,432	1,035	1,137	3,410	2,274	1,364	985	1,146	3,438	2,292	1,375	993	1,102	3,306	2,204	1,322	955	1,102	3,306	2,204	1,322	955	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	
2,809	4,681	3,370	2,434	1,872	2,387	3,979	2,865	2,069	1,592	2,274	3,789	2,728	1,970	1,516	1,910	3,183	2,292	1,655	1,273	1,836	3,061	2,204	1,592	1,224	1,492	2,487	1,790	1,293	995	Carbon steel Alloy steel (30HRC or less)
150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	
1,123	2,809	2,022	1,168	749	1,194	2,984	2,149	1,241	796	1,137	2,842	2,046	1,182	758	1,146	2,865	2,063	1,192	764	1,102	2,755	1,983	1,146	735	1,194	2,984	2,149	1,241	796	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	
2,434	3,745	2,996	2,434	1,685	2,069	3,183	2,546	2,069	1,432	1,970	3,032	2,425	1,970	1,364	1,655	2,546	2,037	1,655	1,146	1,592	2,449	1,959	1,592	1,102	1,293	1,989	1,592	1,293	895	Carbon steel Alloy steel (30～45HRC)
130	200	160	130	90	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90	
974	1,798	1,438	974	539	1,035	1,910	1,528	1,035	573	985	1,819	1,455	985	546	993	1,833	1,467	993	550	955	1,763	1,410	955	529	1,035	1,910	1,528	1,035	573	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	
1,498	2,247	1,872	1,498	1,498	1,273	1,910	1,592	1,273	1,273	1,213	1,819	1,516	1,213	1,213	1,019	1,528	1,273	1,019	1,019	979	1,469	1,224	979	979	796	1,194	995	796	796	Hardened steel (45～55HRC)
80	120	100	80	80	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80	
599	899	749	479	479	637	955	796	509	509	606	909	758	485	485	611	917	764	489	489	588	881	735	470	470	637	955	796	509	509	
0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	
936	1,872	1,311	936	936	796	1,592	1,114	796	796	758	1,516	1,061	758	758	637	1,273	891	637	637	612	1,224	857	612	612	497	995	696	497	497	Hardened steel (55～62HRC)
50	100	70	50	50	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50	
374	749	524	300	187	398	796	557	318	199	379	758	531	303	189	382	764	535	306	191	367	735	514	294	184	398	796	557	318	199	
0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	
2,809	4,681	3,370	2,434	1,872	2,387	3,979	2,865	2,069	1,592	2,274	3,789	2,728	1,970	1,516	1,910	3,183	2,292	1,655	1,273	1,836	3,061	2,204	1,592	1,224	1,492	2,487	1,790	1,293	995	Stainless steel
150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100	
1,123	2,809	2,022	1,168	749	1,194	2,984	2,149	1,241	796	1,137	2,842	2,046	1,182	758	1,146	2,865	2,063	1,192	764	1,102	2,755	1,983	1,146	735	1,194	2,984	2,149	1,241	796	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	
2,809	4,681	3,745	2,809	2,434	2,387	3,979	3,183	2,387	2,069	2,274	3,789	3,032	2,274	1,970	1,910	3,183	2,546	1,910	1,655	1,836	3,061	2,449	1,836	1,592	1,492	2,487	1,989	1,492	1,293	Cast iron
150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	
1,123	2,809	2,247	1,348	974	1,194	2,984	2,387	1,432	1,035	1,137	2,842	2,274	1,364	985	1,146	2,865	2,292	1,375	993	1,102	2,755	2,204	1,322	955	1,194	2,984	2,387	1,432	1,035	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
8.5-17	8.5-17	8.5-17	8.5-17	8.5-17	10-20	10-20	10-20	10-20	10-20	10.5-21	10.5-21	10.5-21	10.5-21	10.5-21	12.5-25	12.5-25	12.5-25	12.5-25	12.5-25	13-26	13-26	13-26	13-26	13-26	16-32	16-32	16-32	16-32	16-32	

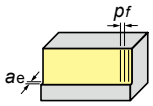
⑤ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑥ Due to fire risks do not use neat cutting oil as a coolant.

Polish Mill V type ASPVmini

Recommended cutting conditions : Vertical cutting (※ Use only in pushing-down direction.) Metric

Work material	Recommended grade	Tool dia.DC	ϕ10mm ϕ.394" (2 Flutes)					ϕ11mm ϕ.433" (2 Flutes)					ϕ12mm ϕ.500" (3 Flutes)					ϕ13mm ϕ.512" (3 Flutes)					ϕ16mm ϕ.630" (4 Flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC
Mild steel (200HB or less)	TH308	n (min-1)	9,549	19,099	12,732	12,732	9,549	8,681	17,362	11,575	11,575	8,681	7,958	15,915	10,610	10,610	7,958	7,346	14,691	9,794	9,794	7,346	5,968	11,937	7,958	7,958	5,968
		Vc(m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		Vf(mm/min)	2,483	7,639	3,820	3,310	1,910	2,257	6,945	3,472	3,009	1,736	3,104	9,549	4,775	4,138	2,387	2,865	8,815	4,407	3,820	2,204	3,104	9,549	4,775	4,138	2,387
		fz(mm/t)	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon steel Alloy steel (30HRC or less)	TH308	n (min-1)	7,958	14,324	9,549	9,549	7,958	7,234	13,022	8,681	8,681	7,234	6,631	11,937	7,958	7,958	6,631	6,121	11,018	7,346	7,346	6,121	4,974	8,952	5,968	5,968	4,974
		Vc(m/min)	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250
		Vf(mm/min)	2,069	5,730	2,865	2,483	1,592	1,881	5,209	2,604	2,257	1,447	2,586	7,162	3,581	3,104	1,989	2,387	6,611	3,306	2,865	1,836	2,586	7,162	3,581	3,104	1,989
		fz(mm/t)	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon steel Alloy steel (30～45HRC)	TH308	n (min-1)	5,730	11,141	7,958	6,366	5,730	5,209	10,128	7,234	5,787	5,209	4,775	9,284	6,631	5,305	4,775	4,407	8,570	6,121	4,897	4,407	3,581	6,963	4,974	3,979	3,581
		Vc(m/min)	180	350	250	200	180	180	350	250	200	180	180	350	250	200	180	180	350	250	200	180	180	350	250	200	180
		Vf(mm/min)	1,146	2,674	1,910	1,273	917	1,042	2,431	1,736	1,157	833	1,432	3,342	2,387	1,592	1,146	1,322	3,085	2,204	1,469	1,058	1,432	3,342	2,387	1,592	1,146
		fz(mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hardened steel (45～55HRC)	TH308	n (min-1)	3,820	6,366	5,730	4,775	3,820	3,472	5,787	5,209	4,341	3,472	3,183	5,305	4,775	3,979	3,183	2,938	4,897	4,407	3,673	2,938	2,387	3,979	3,581	2,984	2,387
		Vc(m/min)	120	200	180	150	120	120	200	180	150	120	120	200	180	150	120	120	200	180	150	120	120	200	180	150	120
		Vf(mm/min)	764	1,273	1,146	764	611	694	1,157	1,042	694	556	955	1,592	1,432	955	764	881	1,469	1,322	881	705	955	1,592	1,432	955	764
		fz(mm/t)	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hardened steel (55～62HRC)	TH308	n (min-1)	3,183	5,730	4,775	3,820	3,183	2,894	5,209	4,341	3,472	2,894	2,653	4,775	3,979	3,183	2,653	2,449	4,407	3,673	2,938	2,449	1,989	3,581	2,984	2,387	1,989
		Vc(m/min)	100	180	150	120	100	100	180	150	120	100	100	180	150	120	100	100	180	150	120	100	100	180	150	120	100
		Vf(mm/min)	637	1,146	955	611	318	579	1,042	868	556	289	796	1,432	1,194	764	398	735	1,322	1,102	705	367	796	1,432	1,194	764	398
		fz(mm/t)	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Stainless steel	TH308	n (min-1)	7,958	14,324	9,549	9,549	7,958	7,234	13,022	8,681	8,681	7,234	6,631	11,937	7,958	7,958	6,631	6,121	11,018	7,346	7,346	6,121	4,974	8,952	5,968	5,968	4,974
		Vc(m/min)	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250
		Vf(mm/min)	1,592	4,297	2,865	2,292	1,592	1,447	3,907	2,604	2,083	1,447	1,989	5,371	3,581	2,865	1,989	1,836	4,958	3,306	2,644	1,836	1,989	5,371	3,581	2,865	1,989
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cast iron	TH308	n (min-1)	7,958	14,324	12,732	11,141	9,549	7,234	13,022	11,575	10,128	8,681	6,631	11,937	10,610	9,284	7,958	6,121	11,018	9,794	8,570	7,346	4,974	8,952	7,958	6,963	5,968
		Vc(m/min)	250	450	400	350	300	250	450	400	350	300	250	450	400	350	300	250	450	400	350	300	250	450	400	350	300
		Vf(mm/min)	1,592	4,297	3,820	2,674	1,910	1,447	3,907	3,472	2,431	1,736	1,989	5,371	4,775	3,342	2,387	1,836	4,958	4,407	3,085	2,204	1,989	5,371	4,775	3,342	2,387
		fz(mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		pf(mm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ae(mm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

【Note】
① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ Ensure to index the insert at the correct time to ensure safety of the tool-body.



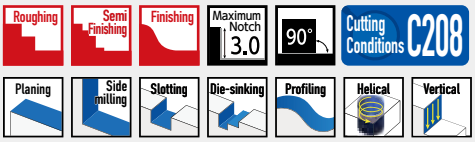
Finishing

ϕ17mm ϕ.670" (4 Flutes)					ϕ20mm ϕ.787" (5 Flutes)					ϕ21mm ϕ.827" (5 Flutes)					ϕ25mm ϕ1.000" (6 Flutes)					ϕ26mm ϕ1.024" (6 Flutes)					ϕ32mm ϕ1.260" (8 Flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank			
General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	General purpose	High-speed cutting	3DC -5DC	5DC -7DC	>7DC	
5,617	11,234	7,490	7,490	5,617	4,775	9,549	6,366	6,366	4,775	4,547	9,095	6,063	6,063	4,547	3,820	7,639	5,093	5,093	3,820	3,673	7,346	4,897	4,897	3,673	3,673	7,346	4,897	4,897	3,673	Mild steel (200HB or less)
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
2,921	8,988	4,494	3,895	2,247	3,104	9,549	4,775	4,138	2,387	2,956	9,095	4,547	3,941	2,274	2,979	9,167	4,584	3,973	2,292	2,865	8,815	4,407	3,820	2,204	2,865	8,815	4,407	3,820	2,204	
0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
4,681	8,426	5,617	5,617	4,681	3,979	7,162	4,775	4,775	3,979	3,789	6,821	4,547	4,547	3,789	3,183	5,730	3,820	3,820	3,183	3,061	5,509	3,673	3,673	3,061	2,487	4,476	2,984	2,984	2,487	Carbon steel Alloy steel (30HRC or less)
250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	
2,434	6,741	3,370	2,921	1,872	2,586	7,162	3,581	3,104	1,989	2,463	6,821	3,410	2,956	1,895	2,483	6,875	3,438	2,979	1,910	2,387	6,611	3,306	2,865	1,836	2,586	7,162	3,581	3,104	1,989	
0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
3,370	6,553	4,681	3,745	3,370	2,865	5,570	3,979	3,183	2,865	2,728	5,305	3,789	3,032	2,728	2,292	4,456	3,183	2,546	2,292	2,204	4,285	3,061	2,449	2,204	1,790	3,482	2,487	1,989	1,790	Carbon steel Alloy steel (30～45HRC)
180	350	250	200	180	180	350	250	200	180	180	350	250	200	180	180	350	250	200	180	180	350	250	200	180	180	350	250	200	180	
1,348	3,146	2,247	1,498	1,079	1,432	3,342	2,387	1,592	1,146	1,364	3,183	2,274	1,516	1,091	1,375	3,209	2,292	1,528	1,100	1,322	3,085	2,204	1,469	1,058	1,432	3,342	2,387	1,592	1,146	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
2,247	3,745	3,370	2,809	2,247	1,910	3,183	2,865	2,387	1,910	1,819	3,032	2,728	2,274	1,819	1,528	2,546	2,292	1,910	1,528	1,469	2,449	2,204	1,836	1,469	1,194	1,989	1,790	1,492	1,194	Hardened steel (45～55HRC)
120	200	180	150	120	120	200	180	150	120	120	200	180	150	120	120	200	180	150	120	120	200	180	150	120	120	200	180	150	120	
899	1,498	1,348	899	719	955	1,592	1,432	955	764	909	1,516	1,364	909	728	917	1,528	1,375	917	733	881	1,469	1,322	881	705	955	1,592	1,432	955	764	
0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
1,872	3,370	2,809	2,247	1,872	1,592	2,865	2,387	1,910	1,592	1,516	2,728	2,274	1,819	1,516	1,273	2,292	1,910	1,528	1,273	1,224	2,204	1,836	1,469	1,224	995	1,790	1,492	1,194	995	Hardened steel (55～62HRC)
100	180	150	120	100	100	180	150	120	100	100	180	150	120	100	100	180	150	120	100	100	180	150	120	100	100	180	150	120	100	
749	1,348	1,123	719	374	796	1,432	1,194	764	398	758	1,364	1,137	728	379	764	1,375	1,146	733	382	735	1,322	1,102	705	367	796	1,432	1,194	764	398	
0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
4,681	8,426	5,617	5,617	4,681	3,979	7,162	4,775	4,775	3,979	3,789	6,821	4,547	4,547	3,789	3,183	5,730	3,820	3,820	3,183	3,061	5,509	3,673	3,673	3,061	2,487	4,476	2,984	2,984	2,487	Stainless steel
250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	250	450	300	300	250	
1,872	5,056	3,370	2,696	1,872	1,989	5,371	3,581	2,865	1,989	1,895	5,116	3,410	2,728	1,895	1,910	5,157	3,438	2,750	1,910	1,836	4,958	3,306	2,644	1,836	1,989	5,371	3,581	2,865	1,989	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
4,681	8,426	7,490	6,553	5,617	3,979	7,162	6,366	5,570	4,775	3,789	6,821	6,063	5,305	4,547	3,183	5,730	5,093	4,456	3,820	3,061	5,509	4,897	4,285	3,673	2,487	4,476	3,979	3,482	2,984	Cast iron
250	450	400	350	300	250	450	400	350	300	250	450	400	350	300	250	450	400	350	300	250	450	400	350	300	250	450	400	350	300	
1,872	5,056	4,494	3,146	2,247	1,989	5,371	4,775	3,342	2,387	1,895	5,116	4,547	3,183	2,274	1,910	5,157	4,584	3,209	2,292	1,836	4,958	4,407	3,085	2,204	1,989	5,371	4,775	3,342	2,387	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	
<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	

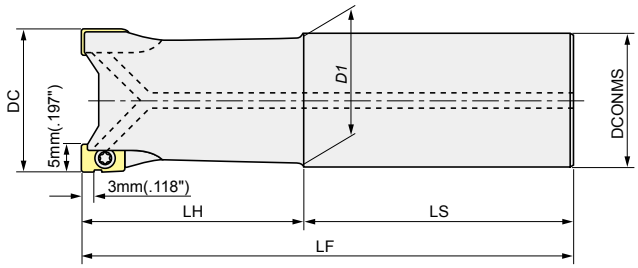
④ The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
⑤ Due to fire risks do not use neat cutting oil as a coolant.

Polish Mill V type ASPV

- Ideal cutter for applications finishing structural parts of bottom, side, etc.
- Multi-flute specifications enable higher feed rates for more efficient finishing.
- Vertical machining in which cutting feed is in the direction of the machine's main axis can also be performed.



Straight Shank Type



Inch IASPVS2◯◯◯R-◯

Numeric figure in a circle ◯.

	Item code	Stock	No.of flute	Size (inch) DC	LF	DCONMS	*D1*	LH	LS	Inserts
Shank type	IASPVS2010R-2	●	2	.625	4.0	.625	.567	1.25	2.75	MPHW0603◯◯ZEL MPHW06030◯ZEL-◯◯ MPHW0603◯◯ZFL MPNW0603◯◯ZEL
	IASPVS2012R-3	●	3	.750	5.0	.750	.673	2.00	3.00	
	IASPVS2016R-4	●	4	1.000	5.5	1.000	.921	2.50	3.00	
	IASPVS2020R-5	●	5	1.250	6.0	1.250	1.177	2.75	3.25	
	IASPVS2024R-4	●	6	1.500	6.0	1.500	1.343	1.75	4.25	

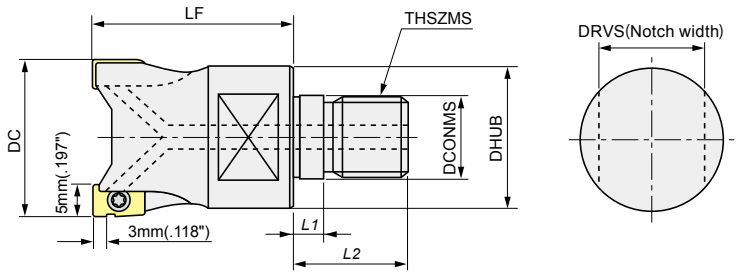
Metric ASPVS2◯◯◯R-◯

Numeric figure in a circle ◯.

	Item code	Stock	No.of flute	Size (mm) DC	LF	DCONMS	*D1*	LH	LS	Inserts
Shank type	ASPVS2016R-2	★	2	16	100	16	14.5	30	70	MPHW0603◯◯ZEL MPHW06030◯ZEL-◯◯ MPHW0603◯◯ZFL MPNW0603◯◯ZEL
	ASPVS2020R-3	★	3	20	110	20	18	30	80	
	ASPVS2025R-4	★	4	25	120	25	23	40	80	
	ASPVS2030R-4	★	4	30	150	32	28	50	100	
	ASPVS2032R-5	★	5	32	150	32	30	50	100	
	ASPVS2035R-5	★	5	35	150	32	31	50	100	
	ASPVS2040R-6	★	6	40	170	32	31	50	120	

●: Inventory maintained in US ★: Inventory maintained in Japan

Modular Type



Inch IASPVM20◯◯R-◯

Numeric figure in a circle ◯.

	Item code	Stock	No.of flute	Size (inch)								Inserts
				DC	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
Modular	IASPVM2010R-2	●	2	.625	.984	.335	8	.504	.217	.669	.394	MPHW0603◯◯ZEL MPHW06030◯ZEL-◯◯ MPHW0603◯◯ZFL MPNW0603◯◯ZEL
	IASPVM2012R-3	●	3	.750	1.181	.413	10	.701	.217	.748	.591	
	IASPVM2016R-4	●	4	1.000	1.378	.492	12	.819	.217	.866	.669	
	IASPVM2020R-5	●	5	1.250	1.575	.669	16	1.134	.236	.906	.866	
	IASPVM2024R-6	●	6	1.500	1.575	.669	16	1.134	.236	.906	.866	

Metric ASPVM20◯◯R-◯

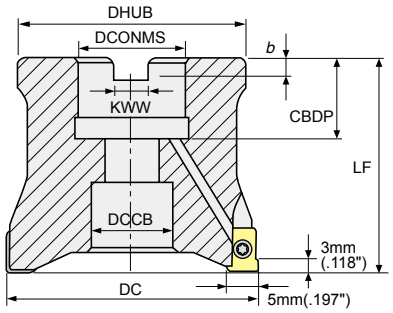
Numeric figure in a circle ◯.

	Item code	Stock	No.of flute	Size (mm)								Inserts
				DC	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
Modular	ASPVM2016R-2	★	2	16	25	8.5	M8	12.8	5.5	17	10	MPHW0603◯◯ZEL MPHW06030◯ZEL-◯◯ MPHW0603◯◯ZFL MPNW0603◯◯ZEL
	※ASPVM2018R-2	★	2	18	25	8.5	M8	14.5	5.5	17	10	
	ASPVM2020R-2	★	2	20	30	10.5	M10	17.8	5.5	19	15	
	ASPVM2020R-3	★	3	20	30	10.5	M10	17.8	5.5	19	15	
	※ASPVM2022R-3	★	3	22	30	10.5	M10	17.8	5.5	19	15	
	ASPVM2025R-4	★	4	25	35	12.5	M12	20.8	5.5	22	17	
	※ASPVM2028R-4	★	4	28	35	12.5	M12	23	5.5	22	17	
	ASPVM2030R-4	★	4	30	40	17	M16	28.8	6	23	22	
	ASPVM2032R-3	★	3	32	40	17	M16	28.8	6	23	22	
	ASPVM2032R-5	★	5	32	40	17	M16	28.8	6	23	22	
	※ASPVM2035R-5	★	5	35	40	17	M16	28.8	6	23	22	
	※ASPVM2040R-6	★	6	40	40	17	M16	28.8	6	23	22	

【Note】 When ※ and carbide shank are used together as a set, there is no interference.
Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "dedicated shanks" and "dedicated arbor".

Polish Mill V type ASPV

Bore Type



Inch IASPVB2◯◯◯R(M)-◯

Numeric figure in a circle ◯.

Item code	Stock	No.of flute	Size (inch)								Inserts
			DC	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB	
IASPVB2032R-7	●	7	**2.000**	1.800	2.000	19.05mm (.750")	.315	.917	.750	.670	MPHW0603◯◯ZEL MPHW06030◯ZEL-◯◯ MPHW0603◯◯ZFL MPNW0603◯◯ZEL
IASPVB2040R-8	●	8	**2.500**	2.260	2.000	19.05mm (.750")	.315	.917	.750	.670	

Metric ASPVB2◯◯◯R(M)-◯

Numeric figure in a circle ◯.

Item code		Stock	No.of flute	Size (mm)								Inserts
				DC	DHUB	LF	CBDP	KWW	*b*	DCONMS	DCCB	
Inside diameter inch size	**ASPVB2050R-7**	●	7	**50**	47	50	19	8.4	5	22.225	17	MPHW0603◯◯ZEL MPHW06030◯ZEL-◯◯ MPHW0603◯◯ZFL MPNW0603◯◯ZEL
	ASPVB2063R-8	●	8	**63**	60	50	19	8.4	5	22.225	17	
Inside diameter mm size	**ASPVB2050RM-7**	●	7	**50**	47	50	20	10.4	6.3	22	17	
	ASPVB2063RM-8	●	8	**63**	60	50	20	10.4	6.3	22	17	

【Note】 Arbor screw is not included.

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Inserts

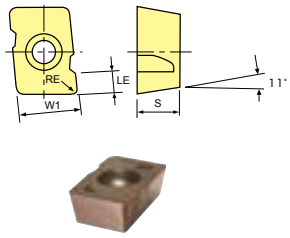


Fig-1

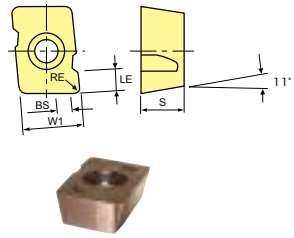


Fig-2

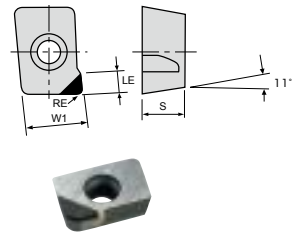


Fig-3 (CBN)

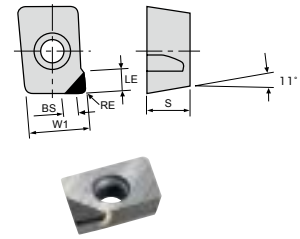


Fig-4 (CBN)

		AJ Coating			JS Coating	Coated Cermet	TH Coating	CBN	DLC Coating
		JP4105	JP4120	JM4160	JS4060	MZ1000	ATH08M	BH250	SD5010
P	Carbon steels	■	□		□	■	■	■	
M	SUS, etc.	■	■	■			□		
K	FC・FCD Cast irons	■	□		□		■	■	
N	Aluminum alloys								■
S	Titanium alloys	■	□				■		
H	Hardened steels	■	□				□		

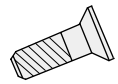
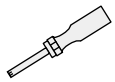
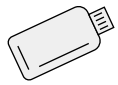
■ :General cutting, First recommended
□ :General cutting, Second recommended

Item code	Tolerance class	JP4105	JP4120	JM4160	JS4060	MZ1000	ATH08M	BH250	SD5010	Size (mm) W1	BS	S	LE	RE	Shape
MPHW060302ZEL	H					★				6.35	–	3.18	3	0.2	Fig-1
MPHW060302ZEL-0.5	H					★				6.35	0.5	3.18	3	0.2	Fig-2
MPHW060304ZEL	H	★				●	●			6.35	–	3.18	3	0.4	Fig-1
MPHW060304ZEL-0.5	H	★				★	★			6.35	0.5	3.18	3	0.4	Fig-2
MPHW060304ZFL	H								★	6.35	–	3.18	3	0.4	Fig-1
MPHW060308ZEL	H	★	●			●	●			6.35	–	3.18	3	0.8	Fig-1
MPHW060308ZEL-1.5	H	★	★			★	★	★		6.35	1.5	3.18	3	0.8	Fig-2,4
MPHW060308ZFL	H								★	6.35	–	3.18	3	0.8	Fig-1,3
MPHW060320ZEL	H	★				★	★	★		6.35	–	3.18	3	2	Fig-1,3
MPNW060308ZEL	N		★	★	★					6.35	–	3.18	3	0.8	Fig-1,3
MPNW060320ZEL	N		★	★	★					6.35	–	3.18	3	2	Fig-1,3

【Note】Please note that the JS Coating does not cause a reaction in conductive touch sensors.

Parts

Numeric figure in a circle ◌.

Parts		Clamp screw	Fastening torque (N・m)	Fastening torque (lbf・in)	Screw driver	Screw anti-seizure agent
Cutter body	Shape					
Modular	ASPVM20◌◌ R-◌	250-141	1.1	9.74	104-T8	P-37
Shank	ASPVS20◌◌ R-◌					
Bore	ASPVB20◌◌ R-◌					
Bore	ASPVB20◌◌ RM-◌					

【Note】

When supplying air and cutting agent to each flute, please use the arbor screws listed above.
The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.
One spare clamp screw is provided for cutter bodies with 3 or less flutes, and two for 4 or more flutes.

Polish Mill V type ASPV

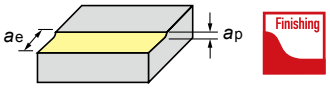
Recommended cutting conditions

Inch Standard cutting conditions for bottom finishing

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Mild Steel (200HB or less)	※ MZ1000 ATH08M JP4120 JS4060	n (min-1)	2,990	5,980	3,990	2,990	2,590	2,390	4,780	3,190	2,390	2,080	1,920	3,830	2,550	1,920	1,660
		Vc (SFM)	489	978	653	489	424	469	938	626	469	408	502	1,002	667	502	434
		Vf (IPM)	24	71	47	28	20	28	85	57	34	25	30	90	60	36	26
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	0.492 ~ 1.0	.492 ~ 1.0	.492
Carbon Steel Alloy Steel (30HRC or less)	MZ1000 ATH08M JP4120 JS4060	n (min-1)	2,990	4,980	3,590	2,590	2,000	2,390	3,990	2,870	2,080	1,600	1,920	3,190	2,300	1,660	1,280
		Vc (SFM)	489	814	587	424	327	469	783	563	408	314	502	835	602	434	335
		Vf (IPM)	24	59	42	24	16	28	71	51	29	19	30	75	54	31	20
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492
Carbon Steel Alloy Steel (30～45HRC)	ATH08M JP4120 JS4060	n (min-1)	2,590	3,990	3,190	2,590	1,800	2,080	3,190	2,550	2,080	1,440	1,660	2,550	2,040	1,660	1,150
		Vc (SFM)	424	653	522	424	294	408	626	500	408	283	434	667	534	434	301
		Vf (IPM)	20	38	30	20	14	25	45	36	25	17	26	48	39	26	18
		fz (IPT)	.004	.005	.005	.004	.004	.004	.005	.005	.004	.004	.004	.005	.005	.004	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	0.394~0.787	0.394~0.787	0.394~0.787	0.394	0.492~1.0	0.492~1.0	0.492~1.0	0.492~1.0	0.492
Stainless Steel	JP4120 JM4160 ATH08M	n (min-1)	2,990	4,980	3,590	2,590	2,000	2,390	3,990	2,870	2,080	1,600	1,920	3,190	2,300	1,660	1,280
		Vc (SFM)	489	814	587	424	327	469	783	563	408	314	502	835	602	434	335
		Vf (IPM)	24	59	42	24	16	28	71	51	29	19	30	75	54	31	20
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492
Cast iron	ATH08M JP4120 JS4060	n (min-1)	2,990	4,980	3,990	2,990	2,590	2,390	3,990	3,190	2,390	2,080	1,920	3,190	2,550	1,920	1,660
		Vc (SFM)	489	814	653	489	424	469	783	626	469	408	502	835	667	502	434
		Vf (IPM)	24	78	63	35	20	28	94	75	42	25	30	100	80	45	26
		fz (IPT)	.004	.008	.008	.006	.004	.004	.008	.008	.006	.004	.004	.008	.008	.006	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492
Aluminum alloy	SD5010	n (min-1)	11,950	23,890	15,930	11,950	11,950	9,560	19,110	12,740	9,560	9,560	7,650	15,290	10,200	7,650	7,650
		Vc (SFM)	1,954	3,907	2,605	1,954	1,954	1,876	3,750	2,500	1,876	1,876	2,002	4,001	2,669	2,002	2,002
		Vf (IPM)	94	282	188	113	94	113	339	226	135	113	120	361	241	145	120
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492
Titanium alloy Ti-6Al-4V (wet condition)	ATH08M JP4120	n (min-1)	600	1,200	1,000	600	600	480	960	800	480	480	390	770	640	390	390
		Vc (SFM)	98	196	164	98	98	94	188	157	94	94	102	201	167	102	102
		Vf (IPM)	5	14	12	5	5	6	17	14	6	6	6	18	15	6	6
		fz (IPT)	.004	.006	.006	.004	.004	.004	.006	.006	.004	.004	.004	.006	.006	.004	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492
Hardened Steel 45～55HRC	JP4105 ATH08M JP4120	n (min-1)	1,600	2,390	2,000	1,600	1,600	1,280	1,920	1,600	1,280	1,280	1,020	1,530	1,280	1,020	1,020
		Vc (SFM)	262	391	327	262	262	251	377	314	251	251	267	400	335	267	267
		Vf (IPM)	13	19	16	13	13	15	23	19	15	15	16	24	20	16	16
		fz (IPT)	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492
Hardened Steel 55～62HRC	JP4105 ATH08M JP4120	n (min-1)	1,000	2,000	1,400	1,000	1,000	800	1,600	1,120	800	800	640	1,280	900	640	640
		Vc (SFM)	164	327	229	164	164	157	314	220	157	157	167	335	236	167	167
		Vf (IPM)	4	11	8	4	4	5	13	9	5	5	5	14	10	5	5
		fz (IPT)	.002	.003	.003	.002	.002	.002	.003	.003	.002	.002	.002	.003	.003	.002	.002
		ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
		ae (inch)	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315 ~ .625	.315	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394 ~ .787	.394	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492 ~ 1.0	.492

【Note】
①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,500	2,990	2,000	1,500	1,300	1,200	2,390	1,600	1,200	1,040	960	1,600	1,280	960	830	760	1,270	1,020	760	660	Mild Steel (200HB or less)
491	978	654	491	425	471	938	628	471	408	502	837	670	502	434	497	831	667	497	432	
30	88	59	35	26	28	85	45	28	25	26	66	53	32	23	24	60	48	29	21	
.004	.006	.006	.005	.004	.004	.006	.005	.004	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
1,500	2,490	1,800	1,300	1,000	1,200	2,000	1,440	1,040	800	960	1,470	1,150	830	640	760	1,170	910	660	510	Carbon Steel Alloy Steel (30HRC or less)
491	814	589	425	327	471	785	565	408	314	502	769	602	434	335	497	765	595	432	334	
30	74	53	31	20	28	71	41	25	19	26	61	48	27	18	24	55	43	25	16	
.004	.006	.006	.005	.004	.004	.006	.005	.004	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
1,300	2,000	1,600	1,300	900	1,040	1,600	1,280	1,040	720	830	1,150	960	830	580	660	910	760	660	460	Carbon Steel Alloy Steel (30~45HRC)
425	654	523	425	294	408	628	502	408	283	434	602	502	434	304	432	595	497	432	301	
26	47	38	26	18	25	45	36	25	17	23	38	32	27	16	21	34	29	21	14	
.004	.005	.005	.004	.004	.004	.005	.005	.004	.004	.004	.005	.005	.005	.004	.004	.005	.005	.004	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
0.625~1.25	0.625~1.25	0.625~1.25	0.625~1.25	0.625~1.25	0.75~1.5	0.75~1.5	0.75~1.5	0.75~1.5	0.75~1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
1,500	2,490	1,800	1,300	1,000	1,200	2,000	1,440	1,040	800	960	1,470	1,150	830	640	760	1,170	910	660	510	Stainless Steel
491	814	589	425	327	471	785	565	408	314	502	769	602	434	335	497	765	595	432	334	
30	74	53	31	20	28	71	41	25	19	26	61	48	27	18	24	55	43	25	16	
.004	.006	.006	.005	.004	.004	.006	.005	.004	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
1,500	2,490	2,000	1,500	1,300	1,200	2,000	1,600	1,200	1,040	960	1,600	1,280	960	830	760	1,270	1,020	760	660	Cast iron
491	814	654	491	425	471	785	628	471	408	502	837	670	502	434	497	831	667	497	432	
30	98	79	44	26	28	94	76	43	25	26	88	71	40	23	24	80	64	36	21	
.004	.008	.008	.006	.004	.004	.008	.008	.006	.004	.004	.008	.008	.006	.004	.004	.008	.008	.006	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
5,980	11,950	7,970	5,980	5,980	4,780	9,560	6,370	4,780	4,780	3,830	9,560	6,370	3,830	3,830	3,040	7,590	5,060	3,040	3,040	Aluminum alloy
1,956	3,909	2,607	1,956	1,956	1,876	3,752	2,500	1,876	1,876	2,004	5,003	3,334	2,004	2,004	1,989	4,965	3,310	1,989	1,989	
118	353	235	141	118	113	339	226	135	113	106	395	263	127	127	96	359	239	115	115	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.005	.004	.006	.006	.005	.005	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
300	600	500	300	300	240	480	400	240	240	200	390	320	200	200	160	310	260	160	160	Titanium alloy Ti-6Al-4V (wet condition)
98	196	164	98	98	94	188	157	94	94	105	204	167	105	105	105	203	170	105	105	
6	18	15	6	6	6	17	14	6	6	6	16	13	7	6	5	15	12	6	5	
.004	.006	.006	.004	.004	.004	.006	.006	.004	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
800	1,200	1,000	800	800	640	960	800	640	640	390	640	510	390	390	310	510	410	310	310	Hardened Steel 45~55HRC
262	393	327	262	262	251	377	314	251	251	204	335	267	204	204	203	334	268	203	203	
16	24	20	16	16	15	23	19	15	15	11	18	14	11	11	10	16	13	10	10	
.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	
500	1,000	700	500	500	400	800	560	400	400	320	510	390	320	320	260	410	310	260	260	Hardened Steel 55~62HRC
164	327	229	164	164	157	314	220	157	157	167	267	204	167	167	170	268	203	170	170	
5	14	10	5	5	5	13	9	5	5	4	10	8	4	4	4	9	7	4	4	
.002	.003	.003	.002	.002	.002	.003	.003	.002	.002	.002	.003	.003	.002	.002	.002	.003	.003	.002	.002	
.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	
.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.625 ~ 1.25	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	.75 ~ 1.5	1~2	1~2	1~2	1~2	1~2	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	1.25~2.5	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*fz*).

Polish Mill V type ASPV

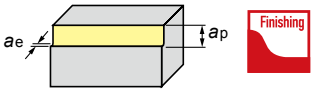
Recommended cutting conditions

Inch Standard cutting conditions for side finishing

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Mild steel (200HB or less)	※ MZ1000 ATH08M JP4120 JS4060	n (min-1)	7,970	15,930	11,950	7,970	7,970	6,370	12,740	9,560	6,370	6,370	5,100	10,200	7,650	5,100	5,100
		vc (SFM)	1,303	2,605	1,954	1,303	1,303	1,250	2,500	1,876	1,250	1,250	1,335	2,669	2,002	1,335	1,335
		vf (IPM)	63	188	141	75	63	75	226	169	90	75	80	241	181	96	80
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Carbon steel Alloy steel (30HRC or less)	MZ1000 ATH08M JP4120 JS4060	n (min-1)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		vc (SFM)	978	1,954	1,303	1,303	978	938	1,876	1,250	1,250	938	1,002	2,002	1,335	1,335	1,002
		vf (IPM)	47	141	94	75	47	56	169	113	90	56	60	181	120	96	60
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Carbon steel Alloy steel (30~45HRC)	ATH08M JP4120 JS4060	n (min-1)	3,990	9,960	6,970	5,980	5,980	3,190	7,970	5,580	4,780	4,780	2,550	6,370	4,460	3,830	3,830
		vc (SFM)	653	1,629	1,140	978	978	626	1,564	1,095	938	938	667	1,667	1,167	1,002	1,002
		vf (IPM)	31	94	66	47	38	38	113	79	56	45	40	120	84	60	48
		fz (IPT)	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Stainless steel	JP4120 JM4160 ATH08M	n (min-1)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		vc (SFM)	978	1,954	1,303	1,303	978	938	1,876	1,250	1,250	938	1,002	2,002	1,335	1,335	1,002
		vf (IPM)	47	141	94	75	47	56	169	113	90	56	60	181	120	96	60
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Cast iron	ATH08M JP4120 JS4060	n (min-1)	5,980	11,950	9,960	7,970	7,970	4,780	9,560	7,970	6,370	6,370	3,830	7,650	6,370	5,100	5,100
		vc (SFM)	978	1,954	1,629	1,303	1,303	938	1,876	1,564	1,250	1,250	1,002	2,002	1,667	1,335	1,335
		vf (IPM)	47	141	118	75	63	56	169	141	90	75	60	181	150	96	80
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Aluminum alloy	SD5010	n (min-1)	11,950	23,890	15,930	11,950	11,950	9,560	19,110	12,740	9,560	9,560	7,650	15,290	10,200	7,650	7,650
		vc (SFM)	1,954	3,907	2,605	1,954	1,954	1,876	3,750	2,500	1,876	1,876	2,002	4,001	2,669	2,002	2,002
		vf (IPM)	94	282	188	113	94	113	339	226	135	113	120	361	241	145	120
		fz (IPT)	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004
		ap (inch)	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Titanium alloy Ti-6Al-4V (wet condition)	ATH08M JP4120	n (min-1)	1,200	1,800	1,600	1,200	1,200	960	1,440	1,280	960	960	770	1,150	1,020	770	770
		vc (SFM)	196	294	262	196	196	188	283	251	188	188	201	301	267	201	201
		vf (IPM)	9	17	15	9	8	11	20	18	11	9	12	22	19	12	10
		fz (IPT)	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Hardened steel 45~55HRC	JP4105 ATH08M JP4120	n (min-1)	2,990	4,980	3,590	2,990	2,990	2,390	3,990	2,870	2,390	2,390	1,920	3,190	2,300	1,920	1,920
		vc (SFM)	489	814	587	489	489	469	783	563	469	469	502	835	602	502	502
		vf (IPM)	24	39	28	19	19	28	47	34	23	23	30	50	36	24	24
		fz (IPT)	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003
		ap (inch)	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.039	.028
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078
Hardened steel 55~62HRC	JP4105 ATH08M JP4120	n (min-1)	2,590	3,990	3,190	2,590	2,590	2,080	3,190	2,550	2,080	2,080	1,660	2,550	2,040	1,660	1,660
		vc (SFM)	424	653	522	424	424	408	626	500	408	408	434	667	534	434	434
		vf (IPM)	20	31	25	16	10	25	38	30	20	12	26	40	32	21	13
		fz (IPT)	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002
		ap (inch)	.059	.059	.039	.028	.020	.059	.059	.039	.028	.020	.059	.059	.039	.028	.020
		ae (inch)	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
3,990	7,970	5,980	3,990	3,990	3,190	6,370	4,780	3,190	3,190	2,550	5,100	3,830	2,550	2,550	2,030	4,050	3,040	2,030	2,030	Mild steel (200HB or less)
1,305	2,607	1,956	1,305	1,305	1,252	2,500	1,876	1,252	1,252	1,335	2,669	2,004	1,335	1,335	1,328	2,649	1,989	1,328	1,328	
79	235	177	94	79	75	226	169	90	75	70	211	158	84	70	64	191	144	77	64	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Carbon steel Alloy steel (30HRC or less)
978	1,956	1,305	1,305	978	938	1,876	1,252	1,252	938	1,005	2,004	1,335	1,335	1,005	994	1,989	1,328	1,328	994	
59	177	118	94	59	56	169	113	90	56	53	158	105	84	53	48	144	96	77	48	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
2,000	4,980	3,490	2,990	2,990	1,600	3,990	2,790	2,390	2,390	1,280	3,190	2,230	1,920	1,920	1,020	2,530	1,770	1,520	1,520	Carbon steel Alloy steel (30~45HRC)
654	1,629	1,142	978	978	628	1,566	1,095	938	938	670	1,669	1,167	1,005	1,005	667	1,655	1,158	994	994	
39	118	82	59	47	38	113	79	56	45	35	105	74	53	42	32	96	67	48	38	
.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Stainless steel
978	1,956	1,305	1,305	978	938	1,876	1,252	1,252	938	1,005	2,004	1,335	1,335	1,005	994	1,989	1,328	1,328	994	
59	177	118	94	59	56	169	113	90	56	53	158	105	84	53	48	144	96	77	48	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
2,990	5,980	4,980	3,990	3,990	2,390	4,780	3,990	3,190	3,190	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	Cast iron
978	1,956	1,629	1,305	1,305	938	1,876	1,566	1,252	1,252	1,005	2,004	1,669	1,335	1,335	994	1,989	1,655	1,328	1,328	
59	177	147	94	79	56	169	141	90	75	53	158	132	84	70	48	144	120	77	64	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
5,980	11,950	7,970	5,980	5,980	4,780	9,560	6,370	4,780	4,780	3,830	9,560	6,370	3,830	3,830	3,040	7,590	5,060	3,040	3,040	Aluminum alloy
1,956	3,909	2,607	1,956	1,956	1,876	3,752	2,500	1,876	1,876	2,004	5,003	3,334	2,004	2,004	1,989	4,965	3,310	1,989	1,989	
118	353	235	141	118	113	339	226	135	113	106	395	263	127	106	96	359	239	115	96	
.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	.004	.006	.006	.005	.004	
.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	.079	.079	.079	.079	.059	.079	.079	.079	.079	.059	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
600	900	800	600	600	480	720	640	480	480	390	580	510	390	390	310	460	410	310	310	Titanium alloy Ti-6Al-4V (wet condition)
196	294	262	196	196	188	283	251	188	188	204	304	267	204	204	203	301	268	203	203	
12	21	19	12	9	11	20	18	11	9	11	19	17	11	9	10	17	15	10	8	
.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	.004	.005	.005	.004	.003	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.079	.059	.039	.079	.079	.079	.059	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
1,500	2,490	1,800	1,500	1,500	1,200	2,000	1,440	1,200	1,200	960	1,600	1,150	960	960	760	1,270	910	760	760	Hardened steel 45~55HRC
491	814	589	491	491	471	785	565	471	471	502	837	602	502	502	497	831	595	497	497	
30	49	35	24	24	28	47	34	23	23	26	44	32	21	21	24	40	29	19	19	
.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	.004	.004	.004	.003	.003	
.079	.079	.059	.039	.028	.079	.079	.059	.039	.028	.079	.079	.059	.047	.039	.079	.079	.059	.047	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	
1,300	2,000	1,600	1,300	1,300	1,040	1,600	1,280	1,040	1,040	830	1,280	1,020	830	830	660	1,020	810	660	660	Hardened steel 55~62HRC
425	654	523	425	425	408	628	502	408	408	434	670	534	434	434	432	667	530	432	432	
26	39	31	20	13	25	38	30	20	12	23	35	28	18	11	21	32	26	15	10	
.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	.004	.004	.004	.003	.002	
.059	.059	.039	.028	.020	.059	.059	.039	.028	.020	.059	.059	.059	.039	.028	.059	.059	.059	.047	.039	
< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	< .0078	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*fz*).

Polish Mill V type ASPV

Recommended cutting conditions

Inch Standard cutting conditions for vertical side finishing

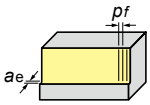
Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	※ ATH08M MZ1000 JP4120 JS4060	n (min-1)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		Vc (SFM)	978	1,954	1,303	1,303	978	938	1,876	1,250	1,250	938	1,002	2,002	1,335	1,335	1,002
		Vf (IPM)	61	189	94	81	47	73	227	113	97	56	90	242	145	120	72
		fz (IPT)	.005	.008	.006	.005	.004	.005	.008	.006	.005	.004	.006	.008	.007	.006	.005
		pf (inch)	.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028
		ae (inch)	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079
Cast iron	ATH08M JP4120 JS4060	n (min-1)	5,980	11,950	9,960	7,970	7,970	4,780	9,560	7,970	6,370	6,370	3,830	7,650	6,370	5,100	5,100
		Vc (SFM)	978	1,954	1,629	1,303	1,303	938	1,876	1,564	1,250	1,250	1,002	2,002	1,667	1,335	1,335
		Vf (IPM)	1,800	4,780	3,990	3,190	2,400	2,160	5,740	4,790	3,830	2,870	3,070	7,650	5,100	4,080	3,060
		fz (IPT)	.006	.008	.008	.008	.006	.006	.008	.008	.008	.006	.008	.010	.008	.008	.006
		pf (inch)	.020	.020	.020	.020	.020	.024	.024	.024	.024	.024	.028	.028	.028	.028	.028
		ae (inch)	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079

Inch Standard cutting conditions for vertical roughing

【Note】 Use nose corner radius *R*0.8 insert.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	※ JS4060 JP4120	n (min-1)	2,990	3,990	2,990	2,990	2,390	2,390	3,190	2,390	2,390	1,920	1,920	2,550	1,920	1,920	1,530
		Vc (SFM)	489	653	489	489	391	469	626	469	469	377	502	667	502	502	400
		Vf (IPM)	35	47	28	23	13	42	56	34	28	16	45	60	36	30	17
		fz (IPT)	.006	.006	.005	.004	.003	.006	.006	.005	.004	.003	.006	.006	.005	.004	.003
		pf (inch)	.142	.142	.142	.142	.118	.158	.158	.158	.158	.158	.177	.177	.177	.177	.177
		ae (inch)	<.1575	<.1575	<.1181	<.0787	<.0787	<.1575	<.1575	<.1181	<.0787	<.0787	<.1575	<.1575	<.1181	<.0787	<.0787
Cast iron	ATH08M JP4120 JS4060	n (min-1)	2,990	4,980	3,990	3,990	2,990	2,390	3,990	3,190	3,190	2,390	1,920	3,190	2,550	2,550	1,920
		Vc (SFM)	489	814	653	653	489	469	783	626	626	469	502	835	667	667	502
		Vf (IPM)	47	79	47	41	23	57	95	56	49	28	61	101	60	52	30
		fz (IPT)	.008	.008	.006	.005	.004	.008	.008	.006	.005	.004	.008	.008	.006	.005	.004
		pf (inch)	.142	.142	.142	.142	.142	.158	.158	.158	.158	.158	.177	.177	.177	.177	.177
		ae (inch)	<.1575	<.1575	<.1575	<.1575	<.1181	<.1575	<.1575	<.1575	<.1575	<.1181	<.1575	<.1575	<.1575	<.1575	<.1181

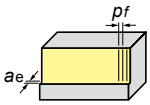
【Note】 ①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



Finishing

※Red indicates primary recommended grade.

ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Carbon steel Alloy steel (30HRC or less)
978	1,956	1,305	1,305	978	938	1,876	1,252	1,252	938	1,005	2,004	1,335	1,335	1,005	994	1,989	1,328	1,328	994	
88	236	142	118	70	85	227	136	113	67	79	212	127	105	69	72	192	115	96	62	
.006	.008	.007	.006	.005	.006	.008	.007	.006	.005	.006	.008	.007	.006	.005	.006	.008	.007	.006	.005	
.032	.032	.032	.032	.032	.035	.035	.035	.035	.035	.039	.039	.039	.039	.039	.044	.044	.044	.044	.044	
<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	
2,990	5,980	4,980	3,990	3,990	2,390	4,780	3,990	3,190	3,190	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	Cast iron
978	1,956	1,629	1,305	1,305	938	1,876	1,566	1,252	1,252	1,005	2,004	1,669	1,335	1,335	994	1,989	1,655	1,328	1,328	
2,990	7,480	4,980	3,990	3,000	2,870	7,170	4,790	3,830	2,880	2,690	6,710	4,920	3,570	3,220	2,440	6,080	4,460	3,250	2,930	
.008	.010	.008	.008	.006	.008	.010	.008	.008	.006	.008	.010	.009	.008	.007	.008	.010	.009	.008	.007	
.031	.031	.031	.031	.031	.035	.035	.035	.035	.035	.039	.039	.039	.039	.039	.044	.044	.044	.044	.044	
<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	<.0079	



Roughing

※Red indicates primary recommended grade.

ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,500	2,000	1,500	1,500	1,200	1,200	1,600	1,200	1,200	960	960	1,280	960	960	770	760	1,020	760	760	610	Carbon steel Alloy steel (30HRC or less)
491	654	491	491	393	471	628	471	471	377	502	670	502	502	403	497	667	497	497	399	
44	59	35	29	17	42	57	34	28	16	40	53	32	26	15	36	48	29	24	14	
.006	.006	.005	.004	.003	.006	.006	.005	.004	.003	.006	.006	.005	.004	.003	.006	.006	.005	.004	.003	
.197	.197	.197	.197	.197	.224	.224	.224	.224	.224	.248	.248	.248	.248	.248	.280	.280	.280	.280	.280	
<.1575	<.1575	<.1181	<.0787	<.0787	<.1575	<.1575	<.1181	<.0787	<.0787	<.1575	<.1575	<.1181	<.0787	<.0787	<.1575	<.1575	<.1181	<.0787	<.0787	
1,500	2,490	2,000	2,000	1,500	1,200	2,000	1,600	1,600	1,200	960	1,600	1,280	1,280	960	760	1,270	1,020	1,020	760	Cast iron
491	814	654	654	491	471	785	628	628	471	502	837	670	670	502	497	831	667	667	497	
59	122	79	79	44	57	118	76	76	42	53	110	71	71	40	48	100	64	64	36	
.008	.010	.008	.008	.006	.008	.010	.008	.008	.006	.008	.010	.008	.008	.006	.008	.010	.008	.008	.006	
.197	.197	.197	.197	.197	.224	.224	.224	.224	.224	.248	.248	.248	.248	.248	.280	.280	.280	.280	.280	
<.1575	<.1575	<.1575	<.1575	<.1181	<.1575	<.1575	<.1575	<.1575	<.1181	<.1575	<.1575	<.1575	<.1575	<.1181	<.1575	<.1575	<.1575	<.1575	<.1181	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*f*z).

Polish Mill V type ASPV

Recommended cutting conditions

Inch Standard cutting conditions for contour roughing

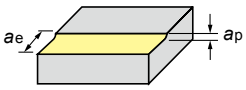
【Note】Use nose corner radius *R*2 insert.

Work material	Recommended grade	Tool dia. DC	ϕ16mm or 5/8" (2 flutes)					ϕ20mm or 3/4" (3 flutes)					ϕ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	※ JP4120 JS4060	*n* (min-1)	2,590	3,990	2,590	2,590	1,800	2,080	3,190	2,080	2,080	1,440	1,660	2,550	1,660	1,660	1,150
		vc (SFM)	424	653	424	424	294	408	626	408	408	283	434	667	434	434	301
		vf (IPM)	102	157	102	102	71	123	189	123	123	85	131	201	131	131	91
		fz (IPT)	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020
		ap (inch)	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010
		ae (inch)	.512	.512	.512	.512	.512	.630	.630	.630	.630	.630	.787	.787	.787	.787	.787
Carbon steel Alloy steel (30~45HRC)	JP4120 JS4060	*n* (min-1)	1,800	3,590	2,590	2,590	1,800	1,440	2,870	2,080	2,080	1,440	1,150	2,300	1,660	1,660	1,150
		vc (SFM)	294	587	424	424	294	283	563	408	408	283	301	602	434	434	301
		vf (IPM)	57	113	81	81	57	68	135	98	98	68	72	144	104	104	72
		fz (IPT)	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016
		ap (inch)	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010
		ae (inch)	.512	.512	.512	.512	.512	.630	.630	.630	.630	.630	.787	.787	.787	.787	.787
Stainless steel	JM4160	*n* (min-1)	2,590	3,990	2,590	2,590	1,800	2,080	3,190	2,080	2,080	1,440	1,660	2,550	1,660	1,660	1,150
		vc (SFM)	424	653	424	424	294	408	626	408	408	283	434	667	434	434	301
		vf (IPM)	102	157	102	102	71	123	189	123	123	85	131	201	131	131	91
		fz (IPT)	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.0 20
		ap (inch)	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010
		ae (inch)	.512	.512	.512	.512	.512	.630	.630	.630	.630	.630	.787	.787	.787	.787	.787
Cast iron	JP4120 JS4060	*n* (min-1)	2,990	3,990	2,590	2,590	1,800	2,390	3,190	2,080	2,080	1,440	1,920	2,550	1,660	1,660	1,150
		vc (SFM)	489	653	424	424	294	469	626	408	408	283	502	667	434	434	301
		vf (IPM)	165	220	143	143	99	198	264	172	172	119	212	282	183	183	127
		fz (IPT)	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028
		ap (inch)	.020	.020	.020	.016	.012	.020	.020	.020	.016	.012	.020	.020	.020	.016	.012
		ae (inch)	.512	.512	.512	.512	.512	.630	.630	.630	.630	.630	.787	.787	.787	.787	.787

Inch Standard cutting conditions for CBN bottom finishing

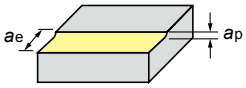
Work material	Recommended grade	Tool dia. DC	ϕ16mm or 5/8" (2 flutes)		ϕ20mm or 3/4" (3 flutes)		ϕ25mm or 1.0" (4 flutes)	
		Overhang	<3DC	Modular carbide shank	<3DC	Modular carbide shank	<3DC	Modular carbide shank
			High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC
Carbon steel Alloy steel (30HRC or less)	BH250	*n* (min-1)	11,950	9,960	9,560	7,970	7,650	6,370
		vc (SFM)	1,954	1,629	1,876	1,564	2,002	1,667
		vf (IPM)	93	62	112	74	119	79
		fz (IPT)	.004	.003	.004	.003	.004	.003
		ap (inch)	< .0039	< .0039	< .0039	< .0039	< .0039	< .0039
		ae (inch)	.315 ~ .630	.315 ~ .630	.394 ~ .787	.394 ~ .787	.492~ .984	.492 ~ .984
Cast iron	BH250	*n* (min-1)	15,930	11,950	12,740	9,560	11,470	8,920
		vc (SFM)	2,605	1,954	2,500	1,876	3,001	2,334
		vf (IPM)	150	112	180	135	216	168
		fz (IPT)	.005	.005	.005	.005	.005	.005
		ap (inch)	.004	.004	.004	.004	.004	.004
		ae (inch)	.315 ~ .630	.315 ~ .630	.394 ~ .787	.394 ~ .787	.492~ .984	.492 ~ .984

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



※Red indicates primary recommended grade.

φ32mm or 1.25" (5 flutes)					φ40mm or 1.5" (6 flutes)					φ50mm or 2.0" (7 flutes)					φ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,300	2,000	1,300	1,300	900	1,040	1,600	1,040	1,040	720	830	1,280	830	830	580	660	1,020	660	660	460	Carbon steel Alloy steel (30HRC or less)
425	654	425	425	294	408	628	408	408	283	434	670	434	434	304	432	667	432	432	301	
128	197	128	128	89	123	189	123	123	85	114	177	114	114	80	104	161	104	104	72	
.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	
.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	
1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0	
900	1,800	1,300	1,300	900	720	1,440	1,040	1,040	720	830	1,280	830	830	580	460	910	660	660	460	Carbon steel Alloy steel (30~45HRC)
294	589	425	425	294	283	565	408	408	283	434	670	434	434	304	301	595	432	432	301	
71	141	102	102	71	68	136	98	98	68	91	141	91	91	64	58	114	83	83	58	
.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016	
.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	
1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0	
1,300	2,000	1,300	1,300	900	1,040	1,600	1,040	1,040	720	960	1,470	1,150	830	640	660	1,020	660	660	460	Stainless steel
425	654	425	425	294	408	628	408	408	283	502	769	602	434	335	432	667	432	432	301	
128	197	128	128	89	123	189	123	123	85	132	203	159	114	88	104	161	104	104	72	
.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	.020	
.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	.020	.020	.016	.012	.010	
1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0	
1,500	2,000	1,300	1,300	900	1,200	1,600	1,040	1,040	720	960	1,280	830	830	580	760	1,020	660	660	460	Cast iron
491	654	425	425	294	471	628	408	408	283	502	670	434	434	304	497	667	432	432	301	
159	207	276	179	179	199	265	172	172	119	185	247	160	160	112	168	225	146	146	102	
.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	.028	
.020	.020	.020	.016	.012	.020	.020	.020	.016	.012	.020	.020	.020	.016	.012	.020	.020	.020	.016	.012	
1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0	



φ32mm or 1.25" (5 flutes)		φ40mm or 1.5" (6 flutes)		φ50mm or 2.0" (7 flutes)		φ63mm or 2.5" (8 flutes)		Work material
<3DC	Modular carbide shank	<3DC	Modular carbide shank	<3DC	3DC-5DC	<3DC	3DC-5DC	
High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC	High-speed cutting		High-speed cutting		
5,980	4,980	4,780	3,990	3,830	3,190	3,040	2,530	Carbon steel Alloy steel (30HRC or less)
1,956	1,629	1,876	1,566	2,004	1,669	1,989	1,655	
117	77	112	74	105	87	95	79	
.004	.003	.004	.003	.004	.004	.004	.004	
< .0039	< .0039	< .0039	< .0039	< .0039	< .0039	< .0039	< .0039	
.623 ~ 1.26	.623 ~ 1.26	.787 ~ 1.575	.787 ~ 1.575	.984 ~ 1.969	.984 ~ 1.969	1.221 ~ 2.480	1.221 ~ 2.480	
8,960	6,970	7,170	5,580	5,740	4,460	4,550	3,540	Cast iron
2,931	2,280	2,814	2,190	3,004	2,334	2,976	2,316	
211	164	202	157	189	147	171	133	
.005	.005	.005	.005	.005	.005	.005	.005	
.004	.004	.004	.004	.004	.004	.004	.004	
.623 ~ 1.26	.623 ~ 1.26	.787 ~ 1.575	.787 ~ 1.575	.984 ~ 1.969	.984 ~ 1.969	1.221 ~ 2.480	1.221 ~ 2.480	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*f*z).

Polish Mill V type ASPV

Recommended cutting conditions

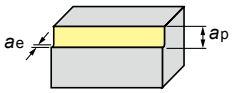
Inch Standard cutting conditions for CBN side finishing

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)				φ20mm or 3/4" (3 flutes)				φ25mm or 1.0" (4 flutes)			
		Overhang	<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	Modular carbide shank		
			High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	BH250	n (min^{-1})	15,930	15,930	11,950	11,950	12,740	12,740	9,560	9,560	10,200	10,200	7,650	7,650
		v_c (SFM)	2,605	2,605	1,954	1,954	2,500	2,500	1,876	1,876	2,669	2,669	2,002	2,002
		v_f (IPM)	88	88	66	47	150	150	79	79	161	161	84	84
		f_z (IPT)	.003	.003	.003	.002	.004	.004	.003	.003	.004	.004	.003	.003
		a_p (inch)	.079	.059	.039	.028	.079	.059	.039	.028	.079	.059	.039	.028
		a_e (inch)	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039
Cast iron	BH250	n (min^{-1})	19,910	15,930	15,930	15,930	15,930	12,740	12,740	12,740	12,740	10,200	10,200	10,200
		v_c (SFM)	3,256	2,605	2,605	2,605	3,126	2,500	2,500	2,500	3,334	2,669	2,669	2,669
		v_f (IPM)	188	151	125	125	226	181	150	150	241	193	161	161
		f_z (IPT)	.005	.005	.004	.004	.005	.005	.004	.004	.005	.005	.004	.004
		a_p (inch)	.079	.059	.039	.028	.079	.059	.039	.028	.079	.059	.039	.028
		a_e (inch)	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004

Inch Standard cutting conditions for CBN vertical side finishing

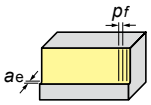
Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)				φ20mm or 3/4" (3 flutes)				φ25mm or 1.0" (4 flutes)			
		Overhang	<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	Modular carbide shank		
			High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	BH250	n (min^{-1})	15,930	15,930	11,950	11,950	12,740	12,740	9,560	9,560	10,200	10,200	7,650	7,650
		v_c (SFM)	2,605	2,605	1,954	1,954	2,500	2,500	1,876	1,876	2,669	2,669	2,002	2,002
		v_f (IPM)	88	88	66	47	150	150	79	79	161	161	84	84
		f_z (IPT)	.003	.003	.003	.002	.004	.004	.003	.003	.004	.004	.003	.003
		p_f (inch)	<.020	<.020	<.020	<.020	<.024	<.024	<.024	<.024	<.028	<.028	<.028	<.028
		a_e (inch)	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004
Cast iron	BH250	n (min^{-1})	19,910	15,930	15,930	15,930	15,930	12,740	12,740	12,740	12,740	10,200	10,200	10,200
		v_c (SFM)	3,256	2,605	2,605	2,605	3,126	2,500	2,500	2,500	3,334	2,669	2,669	2,669
		v_f (IPM)	188	151	125	125	226	181	150	150	241	193	161	161
		f_z (IPT)	.005	.005	.004	.004	.005	.005	.004	.004	.005	.005	.004	.004
		p_f (inch)	<.020	<.020	<.020	<.020	<.024	<.024	<.024	<.024	<.028	<.028	<.028	<.028
		a_e (inch)	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



Finishing

ϕ32mm or 1.25" (5 flutes)				ϕ40mm or 1.5" (6 flutes)				ϕ50mm or 2.0" (7 flutes)				ϕ63mm or 2.5" (8 flutes)				Work material
<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	3DC-5DC	5DC-7DC	>7DC	<3DC	3DC-5DC	5DC-7DC	>7DC	
High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting				High-speed cutting				
7,970	7,970	5,980	5,980	6,370	6,370	4,780	4,780	5,100	5,100	3,830	3,830	4,050	4,050	3,040	3,040	Carbon steel Alloy steel (30HRC or less)
2,607	2,607	1,956	1,956	2,500	2,500	1,876	1,876	2,669	2,669	2,004	2,004	2,649	2,649	1,989	1,989	
157	157	82	82	150	150	79	79	141	141	74	74	128	128	67	67	
.004	.004	.003	.003	.004	.004	.003	.003	.004	.004	.003	.003	.004	.004	.003	.003	
.079	.059	.039	.028	.079	.059	.039	.028	.079	.079	.059	.039	.079	.079	.059	.039	
<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	<.0039	
11,950	9,960	8,960	7,970	9,560	7,970	7,170	6,370	7,650	6,370	5,740	5,100	6,070	5,060	4,550	4,050	Cast iron
3,909	3,258	2,931	2,607	3,752	3,128	2,814	2,500	4,004	3,334	3,004	2,669	3,971	3,310	2,976	2,649	
282	235	176	157	271	226	169	150	253	211	158	141	229	191	143	128	
.005	.005	.004	.004	.005	.005	.004	.004	.005	.005	.004	.004	.005	.005	.004	.004	
.079	.059	.039	.028	.079	.059	.039	.028	.079	.059	.039	.028	.079	.059	.039	.028	
.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	.004	



Finishing

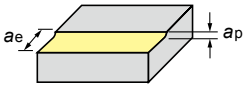
ϕ32mm or 1.25" (5 flutes)				ϕ40mm or 1.5" (6 flutes)				ϕ50mm or 2.0" (7 flutes)				ϕ63mm or 2.5" (8 flutes)				Work material
<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	3DC-5DC	5DC-7DC	>7DC	<3DC	3DC-5DC	5DC-7DC	>7DC	
High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting				High-speed cutting				
7,970	7,970	5,980	5,980	6,370	6,370	4,780	4,780	5,100	5,100	3,830	3,830	4,050	4,050	3,040	3,040	Carbon steel Alloy steel (30HRC or less)
2,607	2,607	1,956	1,956	2,500	2,500	1,876	1,876	2,669	2,669	2,004	2,004	2,649	2,649	1,989	1,989	
157	157	82	82	150	150	79	79	141	141	106	106	128	128	96	96	
.004	.004	.003	.003	.004	.004	.003	.003	.004	.004	.004	.004	.004	.004	.004	.004	
<.031	<.031	<.031	<.031	<.035	<.035	<.035	<.035	<.039	<.039	<.039	<.039	<.044	<.044	<.044	<.044	
<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	
11,950	9,960	8,960	7,970	9,560	7,970	7,170	6,370	7,650	6,370	5,740	5,100	6,070	5,060	4,550	4,050	Cast iron
3,909	3,258	2,931	2,607	3,752	3,128	2,814	2,500	4,004	3,334	3,004	2,669	3,971	3,310	2,976	2,649	
282	235	176	157	271	226	169	150	253	211	158	141	229	191	143	128	
.005	.005	.004	.004	.005	.005	.004	.004	.005	.005	.004	.004	.005	.005	.004	.004	
<.031	<.031	<.031	<.031	<.035	<.035	<.035	<.035	<.039	<.039	<.039	<.039	<.044	<.044	<.044	<.044	
<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	<.004	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*fz*).

Polish Mill V type ASPV

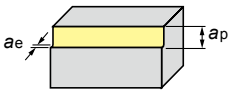
Recommended cutting conditions

Inch Cutting conditions for cutting aluminum alloy and copper using SD5010



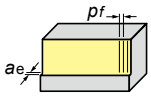
Cutting conditions for bottom finishing：a_e=0.5DC～0.7DC

Work material	Cutting conditions	ϕ16mm or 5/8" 2ft.	ϕ18mm or .71875" 2ft.	ϕ20mm or 3/4" 3ft.	ϕ22mm or 7/8" 3ft.	ϕ25mm or 1.0" 4ft.	ϕ28mm or 1.1024" 4ft.	ϕ30mm or 1.1811" 4ft.	ϕ32mm or 1.25" 5ft.	ϕ35mm or 1.3780" 5ft.	ϕ40mm or 1.5" 6ft.	ϕ50mm or 2.0" 7ft.	ϕ63mm or 2.4803" 8ft.
Expanded aluminum alloy material 5052,7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	15,900	15,900	15,900	15,900	15,900	13,640	13,640	11,940	10,910	9,550	7,640	7,640
	Cutting speed Vc (IPM)	125	125	188	188	250	215	215	188	172	180	126	144
	Feed rate fz (IPT)	.004	.004	.004	.004	.004	.004	.004	.003	.003	.003	.002	.002
	Feed speed Vf (SFM)	2600	2990	3120	3640	4161	3935	4216	3905	3934	3748	3998	4958
	Cutting depth ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
Cast aluminum alloy material 309,383.0, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	12,700	12,700	12,700	12,700	12,700	10,900	10,900	9,550	8,730	7,640	6,110	6,110
	Cutting speed Vc (IPM)	100	100	150	150	200	172	172	150	137	144	101	115
	Feed rate fz (IPT)	.004	.004	.004	.004	.004	.004	.004	.003	.003	.003	.002	.002
	Feed speed Vf (SFM)	2077	2389	2492	2908	3323	3144	3369	3124	3148	2999	3198	3965
	Cutting depth ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
Pure copper C11000,C10200, etc. (Wet: Water-soluble agent)	Revolution n (min-1)	5,970	5,300	5,300	4,340	4,340	3,410	3,410	2,980	2,730	2,390	1,910	1,910
	Cutting speed Vc (IPM)	47	42	63	51	68	54	54	47	43	45	32	36
	Feed rate fz (IPT)	.004	.004	.004	.004	.004	.004	.004	.003	.003	.003	.002	.002
	Feed speed Vf (SFM)	976	997	1040	994	1136	984	1054	975	984	938	1000	1240
	Cutting depth ap (inch)	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008



Cutting conditions for side finishing ：a_e≦0.2mm

Work material	Cutting conditions	ϕ16mm or 5/8" 2ft.	ϕ18mm or .71875" 2ft.	ϕ20mm or 3/4" 3ft.	ϕ22mm or 7/8" 3ft.	ϕ25mm or 1.0" 4ft.	ϕ28mm or 1.1024" 4ft.	ϕ30mm or 1.1811" 4ft.	ϕ32mm or 1.25" 5ft.	ϕ35mm or 1.3780" 5ft.	ϕ40mm or 1.5" 6ft.	ϕ50mm or 2.0" 7ft.	ϕ63mm or 2.4803" 8ft.
Expanded aluminum alloy material 5052,7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed Vc (IPM)	188	188	282	282	361	322	301	353	322	406	421	382
	Feed rate fz (IPT)	.006	.006	.006	.006	.006	.006	.006	.006	.006	.007	.008	.008
	Feed speed Vf (SFM)	2600	2990	3120	3640	4004	3935	3934	3905	3934	3748	3998	3933
	Cutting depth ap (inch)	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079
Cast aluminum alloy material 309,383.0, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed Vc (IPM)	150	150	225	225	288	257	241	282	258	325	337	306
	Feed rate fz (IPT)	.006	.006	.006	.006	.006	.006	.006	.006	.006	.007	.008	.008
	Feed speed Vf (SFM)	2077	2389	2492	2908	3192	3144	3149	3124	3148	2999	3198	3148
	Cutting depth ap (inch)	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079
Pure copper C11000,C10200, etc. (Wet: Water-soluble agent)	Revolution n (min-1)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed Vc (IPM)	71	63	85	77	90	81	75	88	107	113	132	120
	Feed rate fz (IPT)	.006	.006	.006	.006	.006	.006	.006	.006	.008	.008	.010	.010
	Feed speed Vf (SFM)	976	997	936	994	1000	984	983	975	984	938	1000	986
	Cutting depth ap (inch)	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079	.079



Cutting conditions for vertical roughing

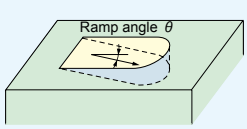
Work material	Cutting conditions	ϕ16mm or 5/8" 2ft.	ϕ18mm or .71875" 2ft.	ϕ20mm or 3/4" 3ft.	ϕ22mm or 7/8" 3ft.	ϕ25mm or 1.0" 4ft.	ϕ28mm or 1.1024" 4ft.	ϕ30mm or 1.1811" 4ft.	ϕ32mm or 1.25" 5ft.	ϕ35mm or 1.3780" 5ft.	ϕ40mm or 1.5" 6ft.	ϕ50mm or 2.0" 7ft.	ϕ63mm or 2.4803" 8ft.
Expanded aluminum alloy material 5052,7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution *n* (min-1)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed *Vc* (IPM)	188	188	282	282	361	322	301	353	322	338	316	286
	Feed rate *fz* (IPT)	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006
	Feed speed *Vf* (SFM)	2600	2990	3120	3640	4004	3935	3934	3905	3934	3748	3998	3933
	Pick feed *pf* (inch)	.138	.157	.157	.157	.177	.177	.197	.197	.217	.236	.256	.276
	Cutting width *ae* (inch)	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157
Cast aluminum alloy material 309,383.0, etc. (Air-blow or wet: Water-soluble agent)	Revolution *n* (min-1)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed *Vc* (IPM)	150	150	225	225	288	257	241	282	258	271	253	229
	Feed rate *fz* (IPT)	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006
	Feed speed *Vf* (SFM)	2077	2389	2492	2908	3192	3144	3149	3124	3148	2999	3198	3148
	Pick feed *pf* (inch)	.138	.157	.157	.157	.177	.177	.197	.197	.217	.236	.256	.276
	Cutting width *ae* (inch)	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157
Pure copper C11000,C10200, etc. (Wet: Water-soluble agent)	Revolution *n* (min-1)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed *Vc* (IPM)	71	63	85	77	90	81	75	88	81	85	79	72
	Feed rate *fz* (IPT)	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006	.006
	Feed speed *Vf* (SFM)	976	997	936	994	1000	984	983	975	984	938	1000	986
	Pick feed *pf* (inch)	.138	.157	.157	.157	.177	.177	.197	.197	.217	.236	.256	.276
	Cutting width *ae* (inch)	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157	.157

【Note】

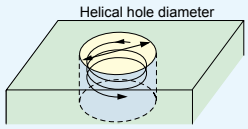
①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②When L/D = 4 or higher, reduce the rotation speed and feed rate by 60% (set them to 0.4 times the values shown above).
③Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
④When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the f_z value.
⑤Be sure to use this tool at rotation speeds within the acceptable range for the milling chuck being used. If the acceptable rotation speed range is below the rotation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the f_z value.

Cutting by direct milling is also possible.

Since the cutting flute do not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown right, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



Ramping



Helical milling

RAMPING/HELICAL MILLING - INCH DIAMETER

Inserts	MPN(H)W0603◌◌ZEL						
Tool dia. DC (inch)	.625"	.750"	1.000"	1.250"	1.500"	2.000"	2.500"
Recommended *θ*	2.5°	2.5°	2.0°	1.5°	1.2°	1.0°	0.5°
Hole Dia. (inch)	.856~1.171	1.106~1.421	1.606~1.921	2.106~2.421	2.606~2.921	3.606~3.921	4.606~4.921

【Note】① The ramp angle *θ* should be set within the ranges listed above. Use at ramp angles of 0.5° or less is recommended.
② For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Polish Mill V type ASPV

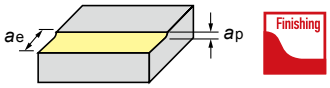
Recommended cutting conditions

Metric Standard cutting conditions for bottom finishing

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Mild Steel (200HB or less)	※ MZ1000 ATH08M JP4120 JS4060	n (min-1)	2,990	5,980	3,990	2,990	2,590	2,390	4,780	3,190	2,390	2,080	1,920	3,830	2,550	1,920	1,660
		Vc (m/min)	150	300	200	150	130	150	300	200	150	130	150	300	200	150	130
		Vf (mm/min)	600	1,800	1,200	720	520	720	2,160	1,440	870	630	770	2,300	1,530	930	670
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Carbon Steel Alloy Steel (30HRC or less)	MZ1000 ATH08M JP4120 JS4060	n (min-1)	2,990	4,980	3,590	2,590	2,000	2,390	3,990	2,870	2,080	1,600	1,920	3,190	2,300	1,660	1,280
		Vc (m/min)	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100
		Vf (mm/min)	600	1,500	1,080	630	400	720	1,800	1,300	750	480	770	1,920	1,380	800	520
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Carbon Steel Alloy Steel (30~45HRC)	ATH08M JP4120 JS4060	n (min-1)	2,590	3,990	3,190	2,590	1,800	2,080	3,190	2,550	2,080	1,440	1,660	2,550	2,040	1,660	1,150
		Vc (m/min)	130	200	160	130	90	130	200	160	130	90	130	200	160	130	90
		Vf (mm/min)	520	960	770	520	360	630	1,150	920	630	440	670	1,230	980	670	460
		fz (mm/t)	0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.1	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Stainless Steel	JP4120 JM4160 ATH08M	n (min-1)	2,990	4,980	3,590	2,590	2,000	2,390	3,990	2,870	2,080	1,600	1,920	3,190	2,300	1,660	1,280
		Vc (m/min)	150	250	180	130	100	150	250	180	130	100	150	250	180	130	100
		Vf (mm/min)	600	1,500	1,080	630	400	720	1,800	1,300	750	480	770	1,920	1,380	800	520
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Cast iron	ATH08M JP4120 JS4060	n (min-1)	2,990	4,980	3,990	2,990	2,590	2,390	3,990	3,190	2,390	2,080	1,920	3,190	2,550	1,920	1,660
		Vc (m/min)	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130
		Vf (mm/min)	600	2,000	1,600	900	520	720	2,400	1,920	1,080	630	770	2,560	2,040	1,160	670
		fz (mm/t)	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Aluminum alloy	SD5010	n (min-1)	11,950	23,890	15,930	11,950	11,950	9,560	19,110	12,740	9,560	9,560	7,650	15,290	10,200	7,650	7,650
		Vc (m/min)	600	1,200	800	600	600	600	1,200	800	600	600	600	1,200	800	600	600
		Vf (mm/min)	2,390	7,170	4,780	2,870	2,390	2,870	8,600	5,740	3,450	2,870	3,060	9,180	6,120	3,680	3,060
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Titanium alloy Ti-6Al-4V (wet condition)	ATH08M JP4120	n (min-1)	600	1,200	1,000	600	600	480	960	800	480	480	390	770	640	390	390
		Vc (m/min)	30	60	50	30	30	30	60	50	30	30	30	60	50	30	30
		Vf (mm/min)	120	360	300	120	120	150	440	360	150	150	160	470	390	160	160
		fz (mm/t)	0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.1	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Hardened Steel 45~55HRC	JP4105 ATH08M JP4120	n (min-1)	1,600	2,390	2,000	1,600	1,600	1,280	1,920	1,600	1,280	1,280	1,020	1,530	1,280	1,020	1,020
		Vc (m/min)	80	120	100	80	80	80	120	100	80	80	80	120	100	80	80
		Vf (mm/min)	320	480	400	320	320	390	580	480	390	390	410	620	520	410	410
		fz (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5
Hardened Steel 55~62HRC	JP4105 ATH08M JP4120	n (min-1)	1,000	2,000	1,400	1,000	1,000	800	1,600	1,120	800	800	640	1,280	900	640	640
		Vc (m/min)	50	100	70	50	50	50	100	70	50	50	50	100	70	50	50
		Vf (mm/min)	100	280	200	100	100	120	340	240	120	120	130	360	260	130	130
		fz (mm/t)	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05
		ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		ae (mm)	8~16	8~16	8~16	8~16	8	10~20	10~20	10~20	10~20	10	12.5~25	12.5~25	12.5~25	12.5~25	12.5

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,500	2,990	2,000	1,500	1,300	1,200	2,390	1,600	1,200	1,040	960	1,600	1,280	960	830	760	1,270	1,020	760	660	Mild Steel (200HB or less)
150	300	200	150	130	150	300	200	150	130	150	250	200	150	130	150	250	200	150	130	
750	2,250	1,500	900	650	720	2,160	1,160	720	630	680	1,680	1,350	810	590	610	1,530	1,230	730	530	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.12	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
1,500	2,490	1,800	1,300	1,000	1,200	2,000	1,440	1,040	800	960	1,470	1,150	830	640	760	1,170	910	660	510	Carbon Steel Alloy Steel (30HRC or less)
150	250	180	130	100	150	250	180	130	100	150	230	180	130	100	150	230	180	130	100	
750	1,870	1,350	780	500	720	1,800	1,040	630	480	680	1,550	1,210	700	450	610	1,410	1,100	640	410	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.12	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
1,300	2,000	1,600	1,300	900	1,040	1,600	1,280	1,040	720	830	1,150	960	830	580	660	910	760	660	460	Carbon Steel Alloy Steel (30~45HRC)
130	200	160	130	90	130	200	160	130	90	130	180	150	130	90	130	180	150	130	90	
650	1,200	960	650	450	630	1,160	930	630	440	590	970	810	700	410	530	880	730	530	370	
0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.1	0.1	0.1	0.12	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
1,500	2,490	1,800	1,300	1,000	1,200	2,000	1,440	1,040	800	960	1,470	1,150	830	640	760	1,170	910	660	510	Stainless Steel
150	250	180	130	100	150	250	180	130	100	150	230	180	130	100	150	230	180	130	100	
750	1,870	1,350	780	500	720	1,800	1,040	630	480	680	1,550	1,210	700	450	610	1,410	1,100	640	410	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.12	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
1,500	2,490	2,000	1,500	1,300	1,200	2,000	1,600	1,200	1,040	960	1,600	1,280	960	830	760	1,270	1,020	760	660	Cast iron
150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	150	250	200	150	130	
750	2,490	2,000	1,130	650	720	2,400	1,920	1,080	630	680	2,240	1,800	1,010	590	610	2,040	1,640	920	530	
0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	0.1	0.2	0.2	0.15	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
5,980	11,950	7,970	5,980	5,980	4,780	9,560	6,370	4,780	4,780	3,830	9,560	6,370	3,830	3,830	3,040	7,590	5,060	3,040	3,040	Aluminum alloy
600	1,200	800	600	600	600	1,200	800	600	600	600	1,500	1,000	600	600	600	1,500	1,000	600	600	
2,990	8,970	5,980	3,590	2,990	2,870	8,610	5,740	3,450	2,870	2,690	10,040	6,690	3,220	3,220	2,440	9,110	6,080	2,920	2,920	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.12	0.1	0.15	0.15	0.12	0.12	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
300	600	500	300	300	240	480	400	240	240	200	390	320	200	200	160	310	260	160	160	Titanium alloy Ti-6Al-4V (wet condition)
30	60	50	30	30	30	60	50	30	30	30	60	50	30	30	30	60	50	30	30	
150	450	380	150	150	150	440	360	150	150	140	410	340	170	140	130	380	320	160	130	
0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.1	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
800	1,200	1,000	800	800	640	960	800	640	640	390	640	510	390	390	310	510	410	310	310	Hardened Steel 45~55HRC
80	120	100	80	80	80	120	100	80	80	60	100	80	60	60	60	100	80	60	60	
400	600	500	400	400	390	580	480	390	390	280	450	360	280	280	250	410	330	250	250	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	
500	1,000	700	500	500	400	800	560	400	400	320	510	390	320	320	260	410	310	260	260	Hardened Steel 55~62HRC
50	100	70	50	50	50	100	70	50	50	50	80	60	50	50	50	80	60	50	50	
130	350	250	130	130	120	340	240	120	120	120	250	200	120	120	110	230	180	110	110	
0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	0.05	0.07	0.07	0.05	0.05	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
16~32	16~32	16~32	16~32	16	20~40	20~40	20~40	20~40	20	25~50	25~50	25~50	25~50	25	31~63	31~63	31~63	31~63	31	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*f*z).

Polish Mill V type ASPV

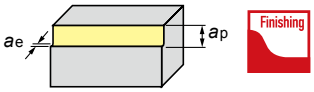
Recommended cutting conditions

Metric Standard cutting conditions for side finishing

※Red indicates primary recommended grade.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Mild steel (200HB or less)	※ MZ1000 ATH08M JP4120 JS4060	n (min-1)	7,970	15,930	11,950	7,970	7,970	6,370	12,740	9,560	6,370	6,370	5,100	10,200	7,650	5,100	5,100
		Vc (m/min)	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400
		Vf (mm/min)	1,600	4,780	3,590	1,920	1,600	1,920	5,740	4,310	2,300	1,920	2,040	6,120	4,590	2,450	2,040
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Carbon steel Alloy steel (30HRC or less)	MZ1000 ATH08M JP4120 JS4060	n (min-1)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		Vc (m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		Vf (mm/min)	1,200	3,590	2,400	1,920	1,200	1,440	4,310	2,870	2,300	1,440	1,540	4,590	3,060	2,450	1,540
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Carbon steel Alloy steel (30~45HRC)	ATH08M JP4120 JS4060	n (min-1)	3,990	9,960	6,970	5,980	5,980	3,190	7,970	5,580	4,780	4,780	2,550	6,370	4,460	3,830	3,830
		Vc (m/min)	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300
		Vf (mm/min)	800	2,400	1,680	1,200	960	960	2,870	2,010	1,440	1,150	1,020	3,060	2,150	1,540	1,230
		fz (mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Stainless steel	JP4120 JM4160 ATH08M	n (min-1)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		Vc (m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		Vf (mm/min)	1,200	3,590	2,400	1,920	1,200	1,440	4,310	2,870	2,300	1,440	1,540	4,590	3,060	2,450	1,540
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cast iron	ATH08M JP4120 JS4060	n (min-1)	5,980	11,950	9,960	7,970	7,970	4,780	9,560	7,970	6,370	6,370	3,830	7,650	6,370	5,100	5,100
		Vc (m/min)	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400
		Vf (mm/min)	1,200	3,590	2,990	1,920	1,600	1,440	4,310	3,590	2,300	1,920	1,540	4,590	3,830	2,450	2,040
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Aluminum alloy	SD5010	n (min-1)	11,950	23,890	15,930	11,950	11,950	9,560	19,110	12,740	9,560	9,560	7,650	15,290	10,200	7,650	7,650
		Vc (m/min)	600	1,200	800	600	600	600	1,200	800	600	600	600	1,200	800	600	600
		Vf (mm/min)	2,390	7,170	4,780	2,870	2,390	2,870	8,600	5,740	3,450	2,870	3,060	9,180	6,120	3,680	3,060
		fz (mm/t)	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1
		ap (mm)	2	2	2	1.5	1	2	2	2	1.5	1	2	2	2	1.5	1
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Titanium alloy Ti-6Al-4V (wet condition)	ATH08M JP4120	n (min-1)	1,200	1,800	1,600	1,200	1,200	960	1,440	1,280	960	960	770	1,150	1,020	770	770
		Vc (m/min)	60	90	80	60	60	60	90	80	60	60	60	90	80	60	60
		Vf (mm/min)	240	440	390	240	200	290	520	470	290	240	310	560	490	310	250
		fz (mm/t)	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hardened steel 45~55HRC	JP4105 ATH08M JP4120	n (min-1)	2,990	4,980	3,590	2,990	2,990	2,390	3,990	2,870	2,390	2,390	1,920	3,190	2,300	1,920	1,920
		Vc (m/min)	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150
		Vf (mm/min)	600	1,000	720	480	480	720	1,200	870	580	580	770	1,280	920	620	620
		fz (mm/t)	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08
		ap (mm)	2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hardened steel 55~62HRC	JP4105 ATH08M JP4120	n (min-1)	2,590	3,990	3,190	2,590	2,590	2,080	3,190	2,550	2,080	2,080	1,660	2,550	2,040	1,660	1,660
		Vc (m/min)	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130
		Vf (mm/min)	520	800	640	420	260	630	960	770	500	320	670	1,020	820	540	340
		fz (mm/t)	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05
		ap (mm)	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
3,990	7,970	5,980	3,990	3,990	3,190	6,370	4,780	3,190	3,190	2,550	5,100	3,830	2,550	2,550	2,030	4,050	3,040	2,030	2,030	Mild steel (200HB or less)
400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	400	800	600	400	400	
2,000	5,980	4,490	2,400	2,000	1,920	5,740	4,310	2,300	1,920	1,790	5,360	4,030	2,150	1,790	1,630	4,860	3,650	1,950	1,630	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Carbon steel Alloy steel (30HRC or less)
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
1,500	4,490	3,000	2,400	1,500	1,440	4,310	2,880	2,300	1,440	1,350	4,030	2,680	2,150	1,350	1,220	3,650	2,440	1,950	1,220	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	
2,000	4,980	3,490	2,990	2,990	1,600	3,990	2,790	2,390	2,390	1,280	3,190	2,230	1,920	1,920	1,020	2,530	1,770	1,520	1,520	Carbon steel Alloy steel (30~45HRC)
200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	200	500	350	300	300	
1,000	2,990	2,100	1,500	1,200	960	2,880	2,010	1,440	1,150	900	2,680	1,880	1,350	1,080	820	2,430	1,700	1,220	980	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Stainless steel
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
1,500	4,490	3,000	2,400	1,500	1,440	4,310	2,880	2,300	1,440	1,350	4,030	2,680	2,150	1,350	1,220	3,650	2,440	1,950	1,220	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
2,990	5,980	4,980	3,990	3,990	2,390	4,780	3,990	3,190	3,190	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	Cast iron
300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	
1,500	4,490	3,740	2,400	2,000	1,440	4,310	3,600	2,300	1,920	1,350	4,030	3,350	2,150	1,790	1,220	3,650	3,040	1,950	1,630	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
5,980	11,950	7,970	5,980	5,980	4,780	9,560	6,370	4,780	4,780	3,830	9,560	6,370	3,830	3,830	3,040	7,590	5,060	3,040	3,040	Aluminum alloy
600	1,200	800	600	600	600	1,200	800	600	600	600	1,500	1,000	600	600	600	1,500	1,000	600	600	
2,990	8,970	5,980	3,590	2,990	2,870	8,610	5,740	3,450	2,870	2,690	10,040	6,690	3,220	2,690	2,440	9,110	6,080	2,920	2,440	
0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	0.1	0.15	0.15	0.12	0.1	
2	2	2	1.5	1	2	2	2	1.5	1	2	2	2	2	1.5	2	2	2	2	1.5	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
600	900	800	600	600	480	720	640	480	480	390	580	510	390	390	310	460	410	310	310	Titanium alloy Ti-6Al-4V (wet condition)
60	90	80	60	60	60	90	80	60	60	60	90	80	60	60	60	90	80	60	60	
300	540	480	300	240	290	520	470	290	240	280	490	430	280	220	250	450	400	250	200	
0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	0.1	0.12	0.12	0.1	0.08	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	2	1.5	1	2	2	2	1.5	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
1,500	2,490	1,800	1,500	1,500	1,200	2,000	1,440	1,200	1,200	960	1,600	1,150	960	960	760	1,270	910	760	760	Hardened steel 45~55HRC
150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	150	250	180	150	150	
750	1,250	900	600	600	720	1,200	870	580	580	680	1,120	810	540	540	610	1,020	730	490	490	
0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	0.1	0.1	0.1	0.08	0.08	
2	2	1.5	1	0.7	2	2	1.5	1	0.7	2	2	1.5	1.2	1	2	2	1.5	1.2	1	
< 0.2	< 0.2	<0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	< 0.2	
1,300	2,000	1,600	1,300	1,300	1,040	1,600	1,280	1,040	1,040	830	1,280	1,020	830	830	660	1,020	810	660	660	Hardened steel 55~62HRC
130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	130	200	160	130	130	
650	1,000	800	520	330	630	960	770	500	320	590	900	720	470	300	530	820	650	370	270	
0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.08	0.05	0.1	0.1	0.1	0.07	0.05	
1.5	1.5	1	0.7	0.5	1.5	1.5	1	0.7	0.5	1.5	1.5	1.5	1	0.7	1.5	1.5	1.5	1.2	1	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*fz*).

Polish Mill V type ASPV

Recommended cutting conditions

Metric Standard cutting conditions for vertical side finishing

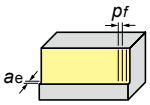
Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	※ ATH08M MZ1000 JP4120 JS4060	n (min-1)	5,980	11,950	7,970	7,970	5,980	4,780	9,560	6,370	6,370	4,780	3,830	7,650	5,100	5,100	3,830
		Vc (m/min)	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300
		Vf (mm/min)	1,560	4,780	2,400	2,080	1,200	1,870	5,740	2,870	2,490	1,440	2,300	6,120	3,680	3,060	1,840
		fz (mm/t)	0.13	0.2	0.15	0.13	0.1	0.13	0.2	0.15	0.13	0.1	0.15	0.2	0.18	0.15	0.12
		pf (mm)	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cast iron	ATH08M JP4120 JS4060	n (min-1)	5,980	11,950	9,960	7,970	7,970	4,780	9,560	7,970	6,370	6,370	3,830	7,650	6,370	5,100	5,100
		Vc (m/min)	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400
		Vf (mm/min)	1,800	4,780	3,990	3,190	2,400	2,160	5,740	4,790	3,830	2,870	3,070	7,650	5,100	4,080	3,060
		fz (mm/t)	0.15	0.2	0.2	0.2	0.15	0.15	0.2	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15
		pf (mm)	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
		ae (mm)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

Metric Standard cutting conditions for vertical roughing

【Note】 Use nose corner radius *R*0.8 insert.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	※ JS4060 JP4120	n (min-1)	2,990	3,990	2,990	2,990	2,390	2,390	3,190	2,390	2,390	1,920	1,920	2,550	1,920	1,920	1,530
		Vc (m/min)	150	200	150	150	120	150	200	150	150	120	150	200	150	150	120
		Vf (mm/min)	900	1,200	720	600	340	1,080	1,440	870	720	410	1,160	1,530	930	770	430
		fz (mm/t)	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07
		pf (mm)	3.6	3.6	3.6	3.6	3	4	4	4	4	4	4.5	4.5	4.5	4.5	4.5
		ae (mm)	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2
Cast iron	ATH08M JP4120 JS4060	n (min-1)	2,990	4,980	3,990	3,990	2,990	2,390	3,990	3,190	3,190	2,390	1,920	3,190	2,550	2,550	1,920
		Vc (m/min)	150	250	200	200	150	150	250	200	200	150	150	250	200	200	150
		Vf (mm/min)	1,200	2,000	1,200	1,040	600	1,440	2,400	1,440	1,250	720	1,540	2,560	1,530	1,330	770
		fz (mm/t)	0.2	0.2	0.15	0.13	0.1	0.2	0.2	0.15	0.13	0.1	0.2	0.2	0.15	0.13	0.1
		pf (mm)	3.6	3.6	3.6	3.6	3.6	4	4	4	4	4	4.5	4.5	4.5	4.5	4.5
		ae (mm)	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3

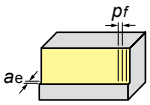
【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



Finishing

※Red indicates primary recommended grade.

ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
2,990	5,980	3,990	3,990	2,990	2,390	4,780	3,190	3,190	2,390	1,920	3,830	2,550	2,550	1,920	1,520	3,040	2,030	2,030	1,520	Carbon steel Alloy steel (30HRC or less)
300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	300	600	400	400	300	
2,250	5,980	3,600	3,000	1,800	2,160	5,740	3,450	2,880	1,730	2,020	5,370	3,220	2,680	1,750	1,830	4,870	2,930	2,440	1,590	
0.15	0.2	0.18	0.15	0.12	0.15	0.2	0.18	0.15	0.12	0.15	0.2	0.18	0.15	0.13	0.15	0.2	0.18	0.15	0.13	
0.8	0.8	0.8	0.8	0.8	0.88	0.88	0.88	0.88	0.88	1	1	1	1	1	1.12	1.12	1.12	1.12	1.12	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	
2,990	5,980	4,980	3,990	3,990	2,390	4,780	3,990	3,190	3,190	1,920	3,830	3,190	2,550	2,550	1,520	3,040	2,530	2,030	2,030	Cast iron
300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	300	600	500	400	400	
2,990	7,480	4,980	3,990	3,000	2,870	7,170	4,790	3,830	2,880	2,690	6,710	4,920	3,570	3,220	2,440	6,080	4,460	3,250	2,930	
0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.22	0.2	0.18	0.2	0.25	0.22	0.2	0.18	
0.8	0.8	0.8	0.8	0.8	0.88	0.88	0.88	0.88	0.88	1	1	1	1	1	1.12	1.12	1.12	1.12	1.12	
< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	



Roughing

※Red indicates primary recommended grade.

ϕ32mm or 1.25" (5 flutes)					ϕ40mm or 1.5" (6 flutes)					ϕ50mm or 2.0" (7 flutes)					ϕ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,500	2,000	1,500	1,500	1,200	1,200	1,600	1,200	1,200	960	960	1,280	960	960	770	760	1,020	760	760	610	Carbon steel Alloy steel (30HRC or less)
150	200	150	150	120	150	200	150	150	120	150	200	150	150	120	150	200	150	150	120	
1,130	1,500	900	750	420	1,080	1,440	870	720	410	1,010	1,350	810	680	380	920	1,230	730	610	350	
0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	0.15	0.15	0.12	0.1	0.07	
5	5	5	5	5	5.7	5.7	5.7	5.7	5.7	6.3	6.3	6.3	6.3	6.3	7.1	7.1	7.1	7.1	7.1	
< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	< 4	< 4	< 3	< 2	< 2	
1,500	2,490	2,000	2,000	1,500	1,200	2,000	1,600	1,600	1,200	960	1,600	1,280	1,280	960	760	1,270	1,020	1,020	760	Cast iron
150	250	200	200	150	150	250	200	200	150	150	250	200	200	150	150	250	200	200	150	
1,500	3,120	2,000	2,000	1,130	1,440	3,000	1,920	1,920	1,080	1,350	2,800	1,800	1,800	1,010	1,220	2,540	1,640	1,640	920	
0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	0.2	0.25	0.2	0.2	0.15	
5	5	5	5	5	5.7	5.7	5.7	5.7	5.7	6.3	6.3	6.3	6.3	6.3	7.1	7.1	7.1	7.1	7.1	
< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	< 4	< 4	< 4	< 4	< 3	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*f*z).

Polish Mill V type ASPV

Recommended cutting conditions

Metric Standard cutting conditions for contour roughing

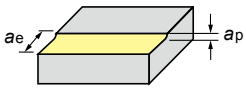
【Note】Use nose corner radius *R*2 insert.

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)					φ20mm or 3/4" (3 flutes)					φ25mm or 1.0" (4 flutes)				
		Overhang	<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		Modular carbide shank		
			General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	※ JP4120 JS4060	*n* (min⁻¹)	2,590	3,990	2,590	2,590	1,800	2,080	3,190	2,080	2,080	1,440	1,660	2,550	1,660	1,660	1,150
		vc (m/min)	130	200	130	130	90	130	200	130	130	90	130	200	130	130	90
		vf (mm/min)	2,590	3,990	2,590	2,590	1,800	3,120	4,790	3,120	3,120	2,160	3,320	5,100	3,320	3,320	2,300
		fz (mm/t)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ap (mm)	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25
		ae (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
Carbon steel Alloy steel (30~45HRC)	JP4120 JS4060	*n* (min⁻¹)	1,800	3,590	2,590	2,590	1,800	1,440	2,870	2,080	2,080	1,440	1,150	2,300	1,660	1,660	1,150
		vc (m/min)	90	180	130	130	90	90	180	130	130	90	90	180	130	130	90
		vf (mm/min)	1,440	2,880	2,080	2,080	1,440	1,730	3,450	2,500	2,500	1,730	1,840	3,680	2,660	2,660	1,840
		fz (mm/t)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		ap (mm)	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25
		ae (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
Stainless steel	JM4160	*n* (min⁻¹)	2,590	3,990	2,590	2,590	1,800	2,080	3,190	2,080	2,080	1,440	1,660	2,550	1,660	1,660	1,150
		vc (m/min)	130	200	130	130	90	130	200	130	130	90	130	200	130	130	90
		vf (mm/min)	2,590	3,990	2,590	2,590	1,800	3,120	4,790	3,120	3,120	2,160	3,320	5,100	3,320	3,320	2,300
		fz (mm/t)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		ap (mm)	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25
		ae (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20
Cast iron	JP4120 JS4060	*n* (min⁻¹)	2,990	3,990	2,590	2,590	1,800	2,390	3,190	2,080	2,080	1,440	1,920	2,550	1,660	1,660	1,150
		vc (m/min)	150	200	130	130	90	150	200	130	130	90	150	200	130	130	90
		vf (mm/min)	4,190	5,590	3,630	3,630	2,520	5,020	6,700	4,370	4,370	3,030	5,380	7,140	4,650	4,650	3,220
		fz (mm/t)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
		ap (mm)	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3
		ae (mm)	13	13	13	13	13	16	16	16	16	16	20	20	20	20	20

Metric Standard cutting conditions for CBN bottom finishing

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)		φ20mm or 3/4" (3 flutes)		φ25mm or 1.0" (4 flutes)	
		Overhang	<3DC	Modular carbide shank	<3DC	Modular carbide shank	<3DC	Modular carbide shank
			High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC
Carbon steel Alloy steel (30HRC or less)	BH250	*n* (min⁻¹)	11,950	9,960	9,560	7,970	7,650	6,370
		vc (m/min)	600	500	600	500	600	500
		vf (mm/min)	2,390	1,600	2,870	1,920	3,060	2,040
		fz (mm/t)	0.1	0.08	0.1	0.08	0.1	0.08
		ap (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
		ae (mm)	8~16	8~16	10~20	10~20	12.5~25	12.5~25
Cast iron	BH250	*n* (min⁻¹)	15,930	11,950	12,740	9,560	11,470	8,920
		vc (m/min)	800	600	800	600	900	700
		vf (mm/min)	3,830	2,870	4,590	3,450	5,510	4,290
		fz (mm/t)	0.12	0.12	0.12	0.12	0.12	0.12
		ap (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
		ae (mm)	8~16	8~16	10~20	10~20	12.5~25	12.5~25

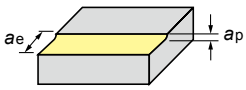
【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



Roughing

※Red indicates primary recommended grade.

φ32mm or 1.25" (5 flutes)					φ40mm or 1.5" (6 flutes)					φ50mm or 2.0" (7 flutes)					φ63mm or 2.5" (8 flutes)					Work material
<3DC		Modular carbide shank			<3DC		Modular carbide shank			<3DC		3DC-5DC	5DC-7DC	>7DC	<3DC		3DC-5DC	5DC-7DC	>7DC	
General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	General purpose	High-speed cutting				General purpose	High-speed cutting				
1,300	2,000	1,300	1,300	900	1,040	1,600	1,040	1,040	720	830	1,280	830	830	580	660	1,020	660	660	460	Carbon steel Alloy steel (30HRC or less)
130	200	130	130	90	130	200	130	130	90	130	200	130	130	90	130	200	130	130	90	
3,250	5,000	3,250	3,250	2,250	3,120	4,800	3,120	3,120	2,160	2,910	4,480	2,910	2,910	2,030	2,640	4,080	2,640	2,640	1,840	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	
900	1,800	1,300	1,300	900	720	1,440	1,040	1,040	720	830	1,280	830	830	580	460	910	660	660	460	Carbon steel Alloy steel (30～45HRC)
90	180	130	130	90	90	180	130	130	90	130	200	130	130	90	90	180	130	130	90	
1,800	3,600	2,600	2,600	1,800	1,730	3,460	2,500	2,500	1,730	2,330	3,590	2,330	2,330	1,630	1,480	2,920	2,120	2,120	1,480	
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	
1,300	2,000	1,300	1,300	900	1,040	1,600	1,040	1,040	720	960	1,470	1,150	830	640	660	1,020	660	660	460	Stainless steel
130	200	130	130	90	130	200	130	130	90	150	230	180	130	100	130	200	130	130	90	
3,250	5,000	3,250	3,250	2,250	3,120	4,800	3,120	3,120	2,160	3,360	5,150	4,030	2,910	2,240	2,640	4,080	2,640	2,640	1,840	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	0.5	0.5	0.4	0.3	0.25	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	
1,500	2,000	1,300	1,300	900	1,200	1,600	1,040	1,040	720	960	1,280	830	830	580	760	1,020	660	660	460	Cast iron
150	200	130	130	90	150	200	130	130	90	150	200	130	130	90	150	200	130	130	90	
5,250	7,000	4,550	4,550	3,150	5,040	6,720	4,370	4,370	3,030	4,710	6,280	4,070	4,070	2,850	4,260	5,720	3,700	3,700	2,580	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.4	0.3	
25	25	25	25	25	32	32	32	32	32	40	40	40	40	40	50	50	50	50	50	



Finishing

φ32mm or 1.25" (5 flutes)		φ40mm or 1.5" (6 flutes)		φ50mm or 2.0" (7 flutes)		φ63mm or 2.5" (8 flutes)		Work material
<3DC	Modular carbide shank	<3DC	Modular carbide shank	<3DC	3DC-5DC	<3DC	3DC-5DC	
High-speed cutting	3DC-5DC	High-speed cutting	3DC-5DC	High-speed cutting		High-speed cutting		
5,980	4,980	4,780	3,990	3,830	3,190	3,040	2,530	Carbon steel Alloy steel (30HRC or less)
600	500	600	500	600	500	600	500	
2,990	2,000	2,870	1,920	2,690	2,240	2,440	2,030	
0.1	0.08	0.1	0.08	0.1	0.1	0.1	0.1	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
16~32	16~32	20~40	20~40	25~50	25~50	31~63	31~63	
8,960	6,970	7,170	5,580	5,740	4,460	4,550	3,540	Cast iron
900	700	900	700	900	700	900	700	
5,380	4,190	5,170	4,020	4,830	3,750	4,370	3,400	
0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
16~32	16~32	20~40	20~40	25~50	25~50	31~63	31~63	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*f*z).

Polish Mill V type ASPV

Recommended cutting conditions

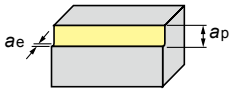
Metric Standard cutting conditions for CBN side finishing

Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)				φ20mm or 3/4" (3 flutes)				φ25mm or 1.0" (4 flutes)			
		Overhang	<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	Modular carbide shank		
			High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	BH250	n (min^{-1})	15,930	15,930	11,950	11,950	12,740	12,740	9,560	9,560	10,200	10,200	7,650	7,650
		v_c (m/min)	800	800	600	600	800	800	600	600	800	800	600	600
		v_f (mm/min)	2,240	2,240	1,680	1,200	3,830	3,830	2,010	2,010	4,080	4,080	2,150	2,150
		f_z (mm/t)	0.07	0.07	0.07	0.05	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07
		a_p (mm)	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cast iron	BH250	n (min^{-1})	19,910	15,930	15,930	15,930	15,930	12,740	12,740	12,740	12,740	10,200	10,200	10,200
		v_c (m/min)	1,000	800	800	800	1,000	800	800	800	1,000	800	800	800
		v_f (mm/min)	4,780	3,830	3,190	3,190	5,740	4,590	3,830	3,830	6,120	4,900	4,080	4,080
		f_z (mm/t)	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1
		a_p (mm)	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Metric Standard cutting conditions for CBN vertical side finishing

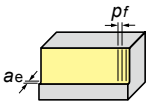
Work material	Recommended grade	Tool dia. DC	φ16mm or 5/8" (2 flutes)				φ20mm or 3/4" (3 flutes)				φ25mm or 1.0" (4 flutes)			
		Overhang	<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	Modular carbide shank		
			High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC
Carbon steel Alloy steel (30HRC or less)	BH250	n (min^{-1})	15,930	15,930	11,950	11,950	12,740	12,740	9,560	9,560	10,200	10,200	7,650	7,650
		v_c (m/min)	800	800	600	600	800	800	600	600	800	800	600	600
		v_f (mm/min)	2,240	2,240	1,680	1,200	3,830	3,830	2,010	2,010	4,080	4,080	2,150	2,150
		f_z (mm/t)	0.07	0.07	0.07	0.05	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07
		p_f (mm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	< 0.6	< 0.6	< 0.6	< 0.7	< 0.7	< 0.7	< 0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cast iron	BH250	n (min^{-1})	19,910	15,930	15,930	15,930	15,930	12,740	12,740	12,740	12,740	10,200	10,200	10,200
		v_c (m/min)	1,000	800	800	800	1,000	800	800	800	1,000	800	800	800
		v_f (mm/min)	4,780	3,830	3,190	3,190	5,740	4,590	3,830	3,830	6,120	4,900	4,080	4,080
		f_z (mm/t)	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1
		p_f (mm)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.6	< 0.6	< 0.6	< 0.6	< 0.7	< 0.7	< 0.7	< 0.7
		a_e (mm)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

【Note】①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
③The evacuation of swarf can cause burns, cuts or damage to the eyes please ensue the correct safety cover is fitted around the machine, and necessary personal protection equipment is worn by the machine operator.
④Please note that the JS Coating does not cause a reaction in conductive touch sensors.



Finishing

	ϕ32mm or 1.25" (5 flutes)				ϕ40mm or 1.5" (6 flutes)				ϕ50mm or 2.0" (7 flutes)				ϕ63mm or 2.5" (8 flutes)				Work material
	<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	3DC-5DC	5DC-7DC	>7DC	<3DC	3DC-5DC	5DC-7DC	>7DC	
	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting				High-speed cutting				
	7,970	7,970	5,980	5,980	6,370	6,370	4,780	4,780	5,100	5,100	3,830	3,830	4,050	4,050	3,040	3,040	Carbon steel Alloy steel (30HRC or less)
	800	800	600	600	800	800	600	600	800	800	600	600	800	800	600	600	
	3,990	3,990	2,100	2,100	3,830	3,830	2,010	2,010	3,570	3,570	1,880	1,880	3,240	3,240	1,710	1,710	
	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	
	2	1.5	1	0.7	2	1.5	1	0.7	2	2	1.5	1	2	2	1.5	1	
	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
	11,950	9,960	8,960	7,970	9,560	7,970	7,170	6,370	7,650	6,370	5,740	5,100	6,070	5,060	4,550	4,050	Cast iron
	1,200	1,000	900	800	1,200	1,000	900	800	1,200	1,000	900	800	1,200	1,000	900	800	
	7,170	5,980	4,480	3,990	6,890	5,740	4,310	3,830	6,430	5,360	4,020	3,570	5,830	4,860	3,640	3,240	
	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	
	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7	2	1.5	1	0.7	
	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	



Finishing

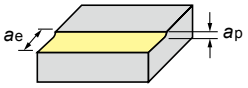
	ϕ32mm or 1.25" (5 flutes)				ϕ40mm or 1.5" (6 flutes)				ϕ50mm or 2.0" (7 flutes)				ϕ63mm or 2.5" (8 flutes)				Work material
	<3DC	Modular carbide shank			<3DC	Modular carbide shank			<3DC	3DC-5DC	5DC-7DC	>7DC	<3DC	3DC-5DC	5DC-7DC	>7DC	
	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting	3DC-5DC	5DC-7DC	>7DC	High-speed cutting				High-speed cutting				
	7,970	7,970	5,980	5,980	6,370	6,370	4,780	4,780	5,100	5,100	3,830	3,830	4,050	4,050	3,040	3,040	Carbon steel Alloy steel (30HRC or less)
	800	800	600	600	800	800	600	600	800	800	600	600	800	800	600	600	
	3,990	3,990	2,100	2,100	3,830	3,830	2,010	2,010	3,570	3,570	2,690	2,690	3,240	3,240	2,440	2,440	
	0.1	0.1	0.07	0.07	0.1	0.1	0.07	0.07	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	< 0.8	< 0.8	< 0.8	< 0.8	< 0.88	< 0.88	< 0.88	< 0.88	< 1	< 1	< 1	< 1	< 1.12	< 1.12	< 1.12	< 1.12	
	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
	11,950	9,960	8,960	7,970	9,560	7,970	7,170	6,370	7,650	6,370	5,740	5,100	6,070	5,060	4,550	4,050	Cast iron
	1,200	1,000	900	800	1200	1000	900	800	1200	1000	900	800	1,200	1,000	900	800	
	7,170	5,980	4,480	3,990	6,890	5,740	4,310	3,830	6,430	5,360	4,020	3,570	5,830	4,860	3,640	3,240	
	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	0.12	0.12	0.1	0.1	
	< 0.8	< 0.8	< 0.8	< 0.8	< 0.88	< 0.88	< 0.88	< 0.88	< 1	< 1	< 1	< 1	< 1.12	< 1.12	< 1.12	< 1.12	
	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	

⑤Ensure to index the insert at the correct time to ensure safety of the tool-body.
⑥Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
⑦MZ1000 and BH250 are not suitable for wet cutting. Use them for dry cutting (air blow).
⑧Due to fire risks do not use neat cutting oil as a coolant.
⑨When using the BT30 arbor for modular mills, determine the cutting conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the cutting conditions, adjust conditions by 1.reducing cutting depth (*a*p) or 2.reducing per-flute feed rate (*f*z).

Polish Mill V type ASPV

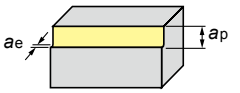
Recommended cutting conditions

Metric Cutting conditions for cutting aluminum alloy and copper using SD5010



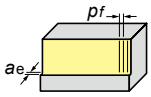
Cutting conditions for bottom finishing：a_e=0.5DC～0.7DC

Work material	Cutting conditions	ϕ16mm or 5/8" 2ft.	ϕ18mm or .71875" 2ft.	ϕ20mm or 3/4" 3ft.	ϕ22mm or 7/8" 3ft.	ϕ25mm or 1.0" 4ft.	ϕ28mm or 1.1024" 4ft.	ϕ30mm or 1.1811" 4ft.	ϕ32mm or 1.25" 5ft.	ϕ35mm or 1.3780" 5ft.	ϕ40mm or 1.5" 6ft.	ϕ50mm or 2.0" 7ft.	ϕ63mm or 2.4803" 8ft.
Expanded aluminum alloy material 5052,7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed Vc (m/min)	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Feed rate fz (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08	0.06	0.06
	Feed speed Vf (mm/min)	3,180	3,180	4,770	4,770	6,120	5,460	5,090	4,780	4,360	4,580	3,210	2,910
	Cutting depth ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cast aluminum alloy material 309,383.0, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed Vc (m/min)	640	720	800	880	960	960	960	960	960	960	960	960
	Feed rate fz (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08	0.06	0.06
	Feed speed Vf (mm/min)	2,540	2,540	3,810	3,810	4,900	4,360	4,080	3,820	3,490	3,670	2,570	2,330
	Cutting depth ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pure copper C11000,C10200, etc. (Wet: Water-soluble agent)	Revolution n (min-1)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed Vc (m/min)	300	300	300	300	300	300	300	300	300	300	300	300
	Feed rate fz (mm/t)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08	0.06	0.06
	Feed speed Vf (mm/min)	1,190	1,060	1,430	1,300	1,530	1,360	1,270	1,190	1,090	1,150	800	730
	Cutting depth ap (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2



Cutting conditions for side finishing ：a_e≦0.2mm

Work material	Cutting conditions	ϕ16mm or 5/8" 2ft.	ϕ18mm or .71875" 2ft.	ϕ20mm or 3/4" 3ft.	ϕ22mm or 7/8" 3ft.	ϕ25mm or 1.0" 4ft.	ϕ28mm or 1.1024" 4ft.	ϕ30mm or 1.1811" 4ft.	ϕ32mm or 1.25" 5ft.	ϕ35mm or 1.3780" 5ft.	ϕ40mm or 1.5" 6ft.	ϕ50mm or 2.0" 7ft.	ϕ63mm or 2.4803" 8ft.
Expanded aluminum alloy material 5052,7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed Vc (m/min)	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Feed rate fz (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.18	0.2	0.2
	Feed speed Vf (mm/min)	4,770	4,770	7,160	7,160	9,180	8,180	7,640	8,960	8,180	10,300	10,700	9,700
	Cutting depth ap (mm)	2	2	2	2	2	2	2	2	2	2	2	2
Cast aluminum alloy material 309,383.0, etc. (Air-blow or wet: Water-soluble agent)	Revolution n (min-1)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed Vc (m/min)	640	720	800	880	960	960	960	960	960	960	960	960
	Feed rate fz (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.18	0.2	0.2
	Feed speed Vf (mm/min)	3,810	3,810	5,720	5,720	7,320	6,540	6,100	7,160	6,550	8,250	8,550	7,760
	Cutting depth ap (mm)	2	2	2	2	2	2	2	2	2	2	2	2
Pure copper C11000,C10200, etc. (Wet: Water-soluble agent)	Revolution n (min-1)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed Vc (m/min)	300	300	300	300	300	300	300	300	300	300	300	300
	Feed rate fz (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.25	0.25
	Feed speed Vf (mm/min)	1,790	1,590	2,150	1,950	2,290	2,050	1,910	2,240	2,730	2,870	3,340	3,040
	Cutting depth ap (mm)	2	2	2	2	2	2	2	2	2	2	2	2



Cutting conditions for vertical roughing

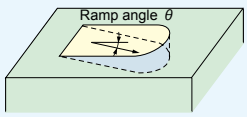
Work material	Cutting conditions	ϕ16mm or 5/8" 2ft.	ϕ18mm or .71875" 2ft.	ϕ20mm or 3/4" 3ft.	ϕ22mm or 7/8" 3ft.	ϕ25mm or 1.0" 4ft.	ϕ28mm or 1.1024" 4ft.	ϕ30mm or 1.1811" 4ft.	ϕ32mm or 1.25" 5ft.	ϕ35mm or 1.3780" 5ft.	ϕ40mm or 1.5" 6ft.	ϕ50mm or 2.0" 7ft.	ϕ63mm or 2.4803" 8ft.
Expanded aluminum alloy material 5052,7075, etc. (Air-blow or wet: Water-soluble agent)	Revolution *n* (min-1)	15,900	15,900	15,900	15,900	15,300	13,640	12,730	11,940	10,910	9,550	7,640	6,060
	Cutting speed *Vc* (m/min)	800	900	1,000	1,100	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Feed rate *fz* (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Feed speed *Vf* (mm/min)	4,770	4,770	7,160	7,160	9,180	8,180	7,640	8,960	8,180	8,600	8,020	7,270
	Pick feed *pf* (mm)	3.5	4	4	4	4.5	4.5	5	5	5.5	6	6.5	7
	Cutting width *ae* (mm)	4	4	4	4	4	4	4	4	4	4	4	4
Cast aluminum alloy material 309,383.0, etc. (Air-blow or wet: Water-soluble agent)	Revolution *n* (min-1)	12,700	12,700	12,700	12,700	12,200	10,900	10,190	9,550	8,730	7,640	6,110	4,850
	Cutting speed *Vc* (m/min)	640	720	800	880	960	960	960	960	960	960	960	960
	Feed rate *fz* (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Feed speed *Vf* (mm/min)	3,810	3,810	5,720	5,720	7,320	6,540	6,100	7,160	6,550	6,880	6,420	5,820
	Pick feed *pf* (mm)	3.5	4	4	4	4.5	4.5	5	5	5.5	6	6.5	7
	Cutting width *ae* (mm)	4	4	4	4	4	4	4	4	4	4	4	4
Pure copper C11000,C10200, etc. (Wet: Water-soluble agent)	Revolution *n* (min-1)	5,970	5,300	4,770	4,340	3,820	3,410	3,180	2,980	2,730	2,390	1,910	1,520
	Cutting speed *Vc* (m/min)	300	300	300	300	300	300	300	300	300	300	300	300
	Feed rate *fz* (mm/t)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Feed speed *Vf* (mm/min)	1,790	1,590	2,150	1,950	2,290	2,050	1,910	2,240	2,050	2,150	2,000	1,820
	Pick feed *pf* (mm)	3.5	4	4	4	4.5	4.5	5	5	5.5	6	6.5	7
	Cutting width *ae* (mm)	4	4	4	4	4	4	4	4	4	4	4	4

【Note】

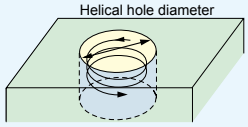
①These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
②When L/D = 4 or higher, reduce the rotation speed and feed rate by 60% (set them to 0.4 times the values shown above).
③Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safe environment.
④When using a machine that cannot provide the rotation speed shown above, set the highest rotation speed possible and calculate the feed rate using the f_z value.
⑤Be sure to use this tool at rotation speeds within the acceptable range for the milling chuck being used. If the acceptable rotation speed range is below the rotation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the f_z value.

Cutting by direct milling is also possible.

Since the cutting flute do not extend to the center, there are limitations on the ramp angle and hole diameter, but as shown right, cutting by direct milling without a pilot hole is possible for ramping and helical milling.



Ramping



Helical milling

RAMPING/HELICAL MILLING - METRIC DIAMETER

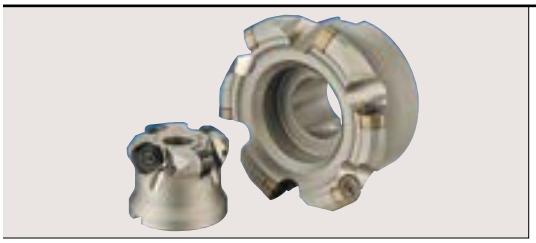
Inserts	MPN(H)W0603◯◯ZEL											
Tool dia. DC (mm)	ϕ16	ϕ18	ϕ20	ϕ22	ϕ25	ϕ28	ϕ30	ϕ32	ϕ35	ϕ40	ϕ50	ϕ63
Recommended θ	2.5°	2.5°	2.5°	2.5°	2.1°	1.8°	1.7°	1.6°	1.4°	1.2°	1.0°	0.5°
Hole Dia. (mm)	22~30	26~34	30~38	34~42	40~48	46~54	50~58	54~62	60~68	70~78	90~98	116~124

【Note】① The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 0.5° or less is recommended.
② For hole diameters outside the ranges listed above, a pilot hole should be drilled before milling.

Dual Face Mill ASDF

- High-feed-rate cutting (Maximum *fz*=2.5mm/t)
- Compatible with high-efficiency roughing that takes full advantage of machine capabilities.

Roughing | Maximum Notch 3.0 | 10~30° | Planing | Cutting Conditions C236



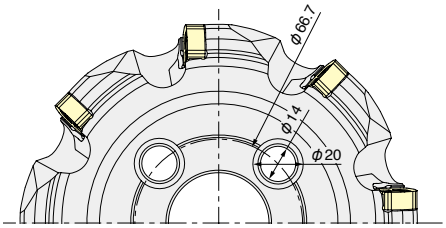


Fig.1 (With air hole)

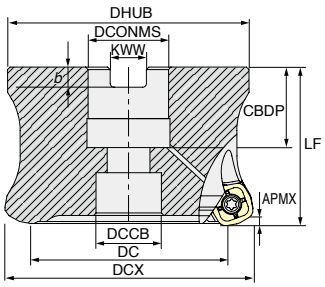


Fig.2 (Without air hole)

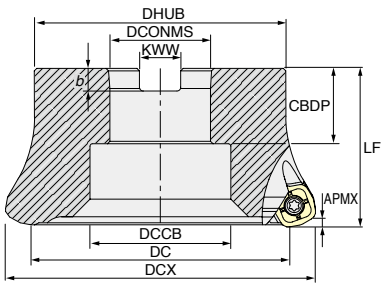
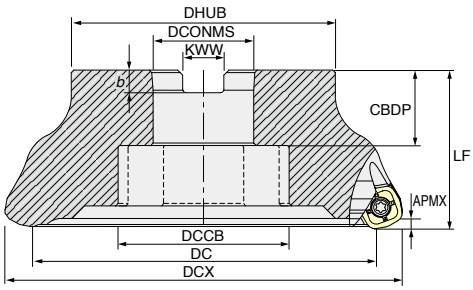


Fig.3 (Without air hole)



Inch IASDF50◯◯R-◯U

Numeric figure comes in a circle ◯.

	Item code	Stock	No.of flutes	Size (inch)													Inserts
				Tool dia.		DHUB	LF	CBDP	Key width		DCONMS	DCCB	APMX	Figure	Weight (kg)	Weight (lb)	
				DC	DCX				KWW	*b*							
Bore type	IASDF5040R-4U	●	4	1.690	2.500	2.362	1.969	1.024	.320	.197	.750	2.362	.118	Fig.1	0.7	1.54	SNMU1607EN-C SNGU1607EN-C SNMU1607EN-B
Bore type	IASDF5048R-4U	●	4	2.191	3.000	2.756	2.480	1.378	.380	.236	1.000	2.756	.118	Fig.1	1.2	2.64	
Bore type	IASDF5064R-5U	●	5	3.190	4.000	3.543	2.756	1.378	.630	.394	1.500	3.543	.118	Fig.1	2.4	5.29	
Bore type	IASDF5080R-6U	●	6	4.191	5.000	3.937	2.756	1.378	.630	.394	1.500	3.937	.118	Fig.2	3.6	7.93	
Bore type	IASDF5096R-8U	●	8	5.192	6.000	4.134	2.756	1.378	.630	.394	1.500	4.134	.118	Fig.2	4.9	10.79	

●: Inventory maintained in US ★: Inventory maintained in Japan

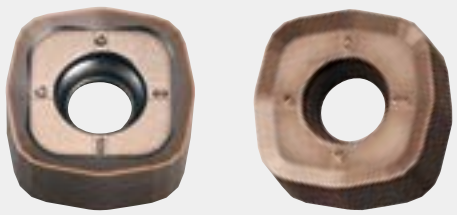
Metric ASDF5◌◌◌R(M)-◌(U)

Numeric figure comes in a circle ◌.

		Item code	Stock	No.of flutes	Size (mm) Tool dia. DC	DCX	DHUB	LF	CBDP	Key width KWW	b	DCONMS	DCCB	APMX	Figure	Weight (kg)	Inserts
Bore type	Internal diameter inch size	ASDF5063R-4	★	4	42	63	60	50	19	8.4	5	22.225	17	3	Fig.1	0.7	SNMU1607EN-C SNGU1607EN-C SNMU1607EN-B
		ASDF5063R-4U	★	4	42	63	60	50	19	8.4	5	22.225	17	3	Fig.1	0.7	
		ASDF5080R-4	★	4	59	80	76	63	32	12.7	8	31.75	26	3	Fig.1	1.3	
		ASDF5080R-4U	★	4	59	80	76	63	32	12.7	8	31.75	26	3	Fig.1	1.3	
		ASDF5100R-5	★	5	79	100	96	63	32	12.7	8	31.75	26	3	Fig.1	2.4	
		ASDF5100R-5U	★	5	79	100	96	63	32	12.7	8	31.75	26	3	Fig.1	2.4	
		ASDF5125R-6	★	6	104	125	100	63	38	15.9	10	38.1	60	3	Fig.2	3.0	
		ASDF5125R-6U	★	6	104	125	100	63	38	15.9	10	38.1	60	3	Fig.2	3.0	
		ASDF5125R-8U	★	8	104	125	100	63	38	15.9	10	38.1	60	3	Fig.2	3.0	
		ASDF5160R-8	★	8	139	160	105	63	38	19.1	11	50.8	80	3	Fig.3	4.3	
		ASDF5160R-8U	★	8	139	160	105	63	38	19.1	11	50.8	80	3	Fig.3	4.3	
		ASDF5160R-10U	★	10	139	160	105	63	38	19.1	11	50.8	80	3	Fig.3	4.3	
	Internal diameter mm size	ASDF5063RM-4	★	4	42	63	60	50	20	10.4	6.3	22	17	3	Fig.1	0.7	
		ASDF5063RM-4U	★	4	42	63	60	50	20	10.4	6.3	22	17	3	Fig.1	0.7	
		ASDF5080RM-4	★	4	59	80	76	63	22	12.4	7	27	20	3	Fig.1	1.5	
		ASDF5080RM-4U	★	4	59	80	76	63	22	12.4	7	27	20	3	Fig.1	1.5	
		ASDF5100RM-5	★	5	79	100	96	63	32	14.4	8	32	26	3	Fig.1	2.4	
		ASDF5100RM-5U	★	5	79	100	96	63	32	14.4	8	32	26	3	Fig.1	2.4	
		ASDF5125RM-6	★	6	104	125	100	63	30	16.4	9	40	56	3	Fig.2	3.0	
		ASDF5125RM-6U	★	6	104	125	100	63	30	16.4	9	40	56	3	Fig.2	3.0	
		ASDF5125RM-8U	★	8	104	125	100	63	30	16.4	9	40	56	3	Fig.2	3.0	
		ASDF5160RM-8	★	8	139	160	105	63	30	16.4	9	40	68	3	Fig.3	4.3	
		ASDF5160RM-8U	★	8	139	160	105	63	30	16.4	9	40	68	3	Fig.3	4.3	
		ASDF5160RM-10U	★	10	139	160	105	63	30	16.4	9	40	68	3	Fig.3	4.3	

Dual Face Mill ASDF

Inserts



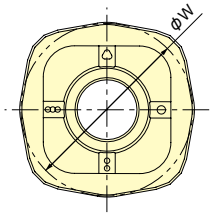
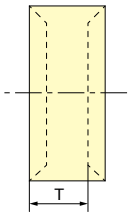


Fig.1 C Breaker



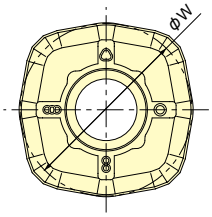


Fig.2 B Breaker

P	Carbon steels・Alloy steel	▟		✖		■
M	Stainless steel	■	▟			
K	Cast iron	▟		✖	■	
H	Hardened steel	▟				

■ Stable cutting (plane continious cutting)
▟ General cutting (light interrupted cutting)
✖ Unstable cutting (interrupted cutting)

Item code	Tolerance class	AJ Coating		JS Coating	GX Coating		Size(mm)		Shape
		JP4120	JM4160	JS4045	GX2120	GX2140	IC	*T*	
SNMU1607EN-C	M	★	★	●	●	★	φ16	6.6	Fig.1
SNMU1607EN-B	M	●	●	●	★	★			Fig.2
SNGU1607EN-C	G	★	★	★	★	★			Fig.1

【Note】 Please note that the GX Coating and JS Coating don't cause a reaction in conductive touch sensors.

How to select inserts

Numeric figure in a circle ◌.

	Breaker shape	Application
SN◌U1607EN-C	General purpose	Primary recommendation
SN◌U1607EN-B	Low cutting force	It is suitable for materials such as stainless steels.

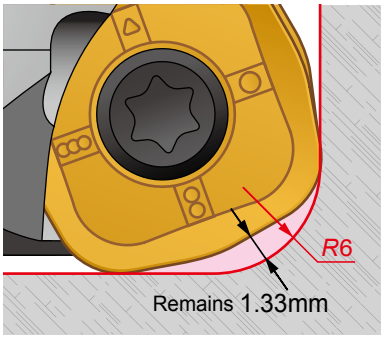
Parts

Numeric figure in a circle ◌.

Parts	Clamp screw			Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque				
		N・m	lbp・in	Less than φ160	Equal or more than φ160	
IASDF50◌◌R-◌U ASDF5◌◌◌R(M)-◌(U)	555-141	4.9	43.37	105-T20	105-T20L	P-37

●: Inventory maintained in US ★: Inventory maintained in Japan

When using ASDF type for shaping cutting

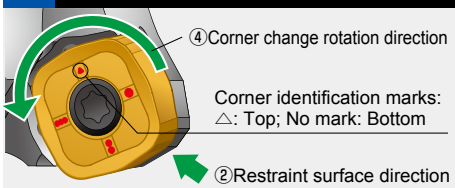


Refer to the following for the flute tip condition definitions for programming.

Programming *R* definition = *R*6mm (*R*.236″)
Remains 1.33mm (.052″)

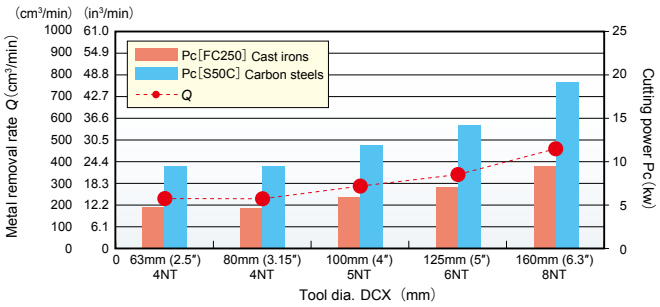
※For slanted cutting using ϕ63 or ϕ80, perform at 0.5° or less. Do not perform using ϕ100 or larger.
※When tool overhang length is long (L / D ≧ 3), adjust a_p.

Insert replacement procedure



① Clean the place where the insert will be attached so that there are no foreign materials such as cutting chip stuck on.
② Apply anti-seizure agent to the thread portion of the clamp screw, and while pressing the insert against the restraint surface, tighten the screw to the appropriate torque. (Recommended tightening torque: 4.9Nm)
③ After tightening, check that there are no gaps between the insert and the base or the restraint surface.
④ Change the insert corner by turning the insert counterclockwise direction.

Tool diameter and cutting power



Reference cutting condition	ASDF type (High-feed-rate type) V_c = 591 SFM f_z = .059" IPT $a_p \times a_e$ = .039" × 0.7DCX Air-blow

The chart shows the calculated results for required cutting power Pc for each tool diameter under the reference cutting conditions. Please use as criteria when selecting tool diameter.
These values are calculated from general machinery conditions, and may be different from actual values.

Anti-vibration body

ASDF5◯◯◯R(M)-◯U

Anti-vibration bodies by unequal pitch.

- Unequal pitch reduces a vibration which is a main factor of chattering.
- Less chatter vibration improve productivity.

Figure Comparison of the maximum depth of cut (L/D=6).

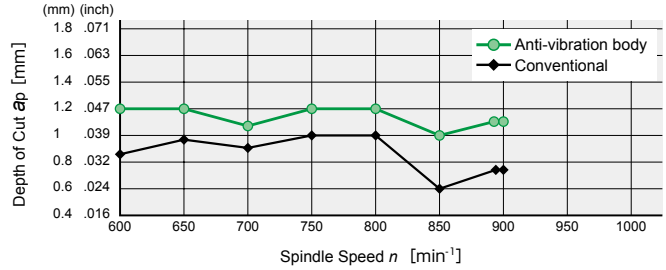


Figure 1. The maximum depth-of-cut evaluation L/D=6

Dual Face Mill ASDF

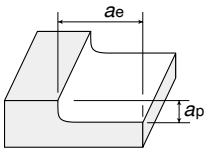
Recommended cutting conditions

Inch

Work material	Recommended grade	Vc(SFM) Cutting speed	fz(IPT) feed rate	φ63mm or 2.5" 4 flutes		φ80mm or 3" 4 flutes		φ100mm or 4" 5 flutes		φ125mm or 5" 6 flutes		φ160mm or 6" 8 flutes	
				Revolution n(min-1)	Feed speed Vf(IPM)	Revolution n(min-1)	Feed speed Vf(IPM)	Revolution n(min-1)	Feed speed Vf(IPM)	Revolution n(min-1)	Feed speed Vf(IPM)	Revolution n(min-1)	Feed speed Vf(IPM)
Mild steel (<200HB)	※ GX2140 JS4045	492～656	.039～.079	810	191	640	150	510	150	410	144	320	150
				vc=525 SFM fz= .059 IPT ap= .059 in ae= 0.7×DCX									
Carbon & Alloy steel (<30HRC)	GX2140 JS4045	328～590	.039～.079	710	167	560	131	450	131	360	126	280	131
				vc=525 SFM fz= .059 IPT ap= .059 in ae= 0.7×DCX									
Carbon & Alloy steel (30～40HRC)	JP4120 JS4045 GX2140	328～525	.039～.079	610	143	480	112	380	112	310	108	240	112
				vc=394 SFM fz= .09 IPT ap= .059 in ae= 0.7×DCX									
Carbon & Alloy steel (40～45HRC)	JP4120 JS4045	262～394	.016～.031	460	57	360	45	290	45	230	43	180	45
				vc=328 SFM fz= .059 IPT ap= .039 in ae= 0.7×DCX									
Stainless steel	JM4160 JP4120	262～328	.016～.031	460	72	360	56	290	56	230	54	180	56
				vc=295 SFM fz= .039 IPT ap= .039 in ae= 0.7×DCX									
Cast iron	JP4120 GX2120 JS4045	328～590	.039～.079	810	191	640	150	510	150	410	144	320	150
				vc=406 SFM fz= .059 IPT ap= .059 in ae= 0.7×DCX									
Hardened steel (45～50HRC)	JP4120	197～328	.012～.003	350	22	280	18	220	18	180	17	140	18
				vc=229 SFM fz= .016 IPT ap= .031in ae= 0.7×DCX									

【Note】

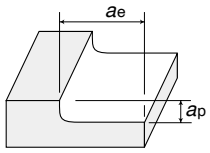
①Please note that the GX Coating and JS Coating don't cause a reaction in conductive touch sensors.
②Use the appropriate coolant for the work material and machining shape.
③These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④In order to avoid of insert breakage, please change insert earlier.
⑤The steel chips may cause cuts, burns or damages to eyes. Be sure to install the safty cover around the tool and wear the safty glasses when carring out any works.
⑥Please don't use cutting oil as coolant.(It may be cause of fire.)



Metric

Work material	Recommended grade	Vc(m/min) Cutting speed	fz(mm/t) feed rate	ϕ63mm or 2.5" 4 flutes		ϕ80mm or 3" 4 flutes		ϕ100mm or 4" 5 flutes		ϕ125mm or 5" 6 flutes		ϕ160mm or 6" 8 flutes	
				Revolution n(min-1)	Feed speed Vf(mm/min)	Revolution n(min-1)	Feed speed Vf(mm/min)	Revolution n(min-1)	Feed speed Vf(mm/min)	Revolution n(min-1)	Feed speed Vf(mm/min)	Revolution n(min-1)	Feed speed Vf(mm/min)
Mild steel (<200HB)	※ GX2140 JS4045	150～200	1.0～2.0	810	4,850	640	3,820	510	3,820	410	3,670	320	3,820
				vc=160m/min fz=1.5mm/t ap=1.5mm ae=0.7×DCX									
Carbon & Alloy steel (<30HRC)	GX2140 JS4045	100～180	1.0～2.0	710	4,240	560	3,340	450	3,340	360	3,210	280	3,340
				vc=140m/min fz=1.5mm/t ap=1.5mm ae=0.7×DCX									
Carbon & Alloy steel (30～40HRC)	JP4120 JS4045 GX2140	100～160	1.0～2.0	610	3,640	480	2,870	380	2,870	310	2,750	240	2,870
				vc=120m/min fz=1.5mm/t ap=1.5mm ae=0.7×DCX									
Carbon & Alloy steel (40～45HRC)	JP4120 JS4045	80～120	0.4～0.8	460	1,460	360	1,150	290	1,150	230	1,100	180	1,150
				vc=90m/min fz=0.8mm/t ap=1.0mm ae=0.7×DCX									
Stainless steel	JM4160 JP4120	80～100	0.8～1.2	460	1,820	360	1,430	290	1,430	230	1,380	180	1,430
				vc=90m/min fz=1mm/t ap=1.0mm ae=0.7×DCX									
Cast iron	JP4120 GX2120 JS4045	100～180	1.0～2.0	810	4,850	640	3,820	510	3,820	410	3,670	320	3,820
				vc=160m/min fz=1.5mm/t ap=1.5mm ae=0.7×DCX									
Hardened steel (45～50HRC)	JP4120	60～100	0.3～0.6	350	570	280	450	220	450	180	430	140	450
				vc=70m/min fz=0.4mm/t ap=0.8mm ae=0.7×DCX									

【Note】



①Please note that the GX Coating and JS Coating don't cause a reaction in conductive touch sensors.
②Use the appropriate coolant for the work material and machining shape.
③These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④In order to avoid of insert breakage, please change insert earlier.
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⑥Please don't use cutting oil as coolant.(It may be cause of fire.)

Face Mill ASF

- At higher-than-normal cutting feed rates, offers 3 to 5 times the cutting performance of conventional products, reducing cutting time and processing costs.
- Insert has a unique R shape to enable maximum cutting depth of 3mm.

Roughing | Semi Finishing | Maximum Notch 3.0 | 15° | Planing | Cutting Conditions C240

Fig.1

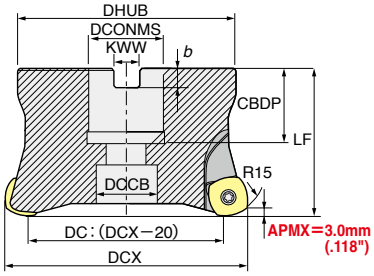


Fig.2

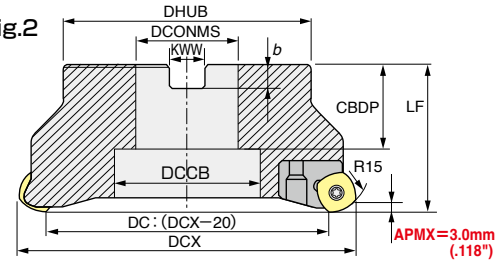


Fig.3

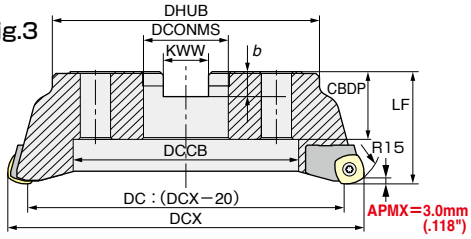
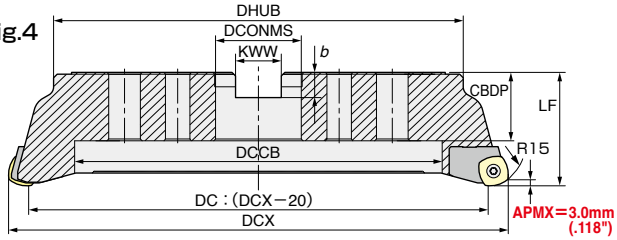


Fig.4



Inch IASF5○○○R

Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (inch) DCX	DC	LF	CBDP	KWW	b	DCONMS	DCCB	DHUB	Weight (kgf)	Weight (lb)	Type	Inserts
IASF5040R	●	4	2.500	1.713	1.575	1.024	.320	.197	.750	.630	2.362	0.5	1.1	Fig-1	N class SDNW1505ZDTN-R15
IASF5048R	●	4	3.000	2.213	1.969	1.378	.380	.236	1.000	.827	2.756	1.1	2.42		
IASF5064R	●	5	4.000	3.213	1.969	1.378	.630	.394	1.500	1.969	3.543	2	4.41		
IASF5080R	●	6	5.000	4.213	2.756	1.378	.630	.394	1.500	1.969	3.937	3.1	6.83	Fig-2	M class SDMT1505ZDTN-R/C15
IASF5096R	●	8	6.000	5.213	2.756	1.378	.630	.394	1.500	2.165	4.134	4.5	9.91		
IASF5128R	●	10	8.000	7.213	2.756	1.378	1.010	.551	2.500	4.134	5.118	7.5	16.52		E class SDEW1505ZDTN-R15
IASF5160R	●	12	10.000	9.213	2.756	1.378	1.010	.551	2.500	5.517	5.118	13.7	30.18		

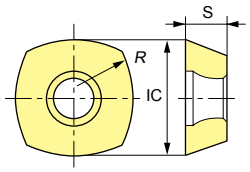
Metric ASF5○○○R(M)

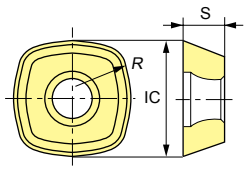
Numeric figure comes in a circle ○.

Item code	Stock	No.of flutes	Size (mm) DCX	DC	LF	CBDP	KWW	b	DCONMS	DCCB	DHUB	Weight (kgf)	Weight (lb)	Shape	Arbor screw (Hexagonal socket head bolt)	Inserts
ASF5063R	●	4	63	43	50	19	8.4	5	22.225	17	60	0.65	1.43	Fig.1	Fig.5 (M10 × 25)	N class SDNW1505ZDTN-R15
ASF5080R	●	4	80	60	63	32	12.7	8	31.75	26	70	1.35	2.97		Fig.7 (M16 × 35)	
ASF5100R	●	5	100	80	63	32	12.7	8	31.75	26	90	2.26	4.98			
ASF5125R	●	6	125	105	63	32	12.7	8	31.75	26	100	4.38	9.65	Fig.2		
ASF5160R	●	8	160	140	63	38	19.1	11	50.8	69	105	4.6	10.13		Commercial arbor parts	M class SDMT1505ZDTN-R/C15
ASF5200R	●	10	200	180	63	38	25.4	14	47.625	105	150	7.62	16.78	Fig.3		
ASF5250R	●	12	250	230	63	38	25.4	14	47.625	140	200	13.44	29.6			E class SDEW1505ZDTN-R15
ASF5063RM	●	4	63	43	50	20	10.4	6.3	22	17	60	0.65	1.43	Fig.1		
ASF5080RM	●	4	80	60	63	22	12.4	7	27	20	70	1.35	2.97			
ASF5100RM	●	5	100	80	63	25.5	14.4	8	32	26	90	2.26	4.98			
ASF5125RM	●	6	125	105	63	30	16.4	9	40	32	100	4.38	9.65	Fig.2		

●: Inventory maintained in US ★: Inventory maintained in Japan No Mark : Manufactured upon request only

Inserts





(With breaker)

		JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	CY250	CH550
P	Carbon steel		■		■	■	□		
M	Stainless steel, etc.			■					
K	Cast iron		■		■	■			
H	Hardened steel	■							

■ : General cutting, First recommended
□ : General cutting, Second recommended

Item code	Tolerance class	AJ Coating			GX Coating	JS Coating		C Coating	Cermet	Size (mm)		
		JP4105	JP4120	JM4160	GX2140	JS4045	JS4060	CY250	CH550	*R*	S	IC
SDNW1505ZDTN-R15	N	★	●	●	★	●	●	●		15	5.56	15.875
SDMT1505ZDTN-R15 (With breaker)	M	★	●	●	★	●	●					
SDMT1505ZDTN-C15 (With breaker & wiper)	M			★	★	★	★	●	★			
SDEW1505ZDTN-R15	E					★		★				

【Note】 Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.

Parts

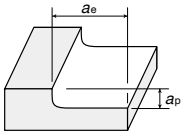
Parts	Clamp screw			Locater	Locater screw	Double screw	Wedge	Wrench		Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N·m)	Fastening torque (lbf·in)					A B	Shape	
IASF5040R ～IASF5064R ASF5063R/RM ～ASF5100R/RM	**555-141**	**4.9**	**43.37**	—	—	—	—	**105-T20**	**A**	**P-37**
IASF5080R ASF5125R/RM				**351-111**	**156-161** (Applicable Wrench 100-221)	**100-143** (Applicable Wrench 100-221)	**176-121**			
IASF5096R ～ IASF5160R ASF5160R/RM(-6) ～ASF5315R/RM								**105-T20L**	**B**	

【Note】
The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.
Two spare clamp screws are provided for ϕ125 or less, and four for ϕ160 or more.

Face Mill ASF

Recommended cutting conditions

Inch



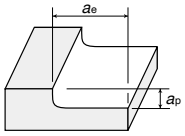
※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting speed *vc* (SFM)	Feed rate *fz* (IPT)	φ63 or 2.5" 4 flutes		φ100 or 4" 5 flutes		φ160 or 6" 8 flutes		φ200 or 8" 10 flutes		φ250 or 10" 12 flutes	
				Revolution *n* min-1	Feed speed *vf* IPM	Revolution *n* min-1	Feed speed *vf* IPM	Revolution *n* min-1	Feed speed *vf* IPM	Revolution *n* min-1	Feed speed *vf* IPM	Revolution *n* min-1	Feed speed *vf* IPM
Mild steel (<200HB)	※ GX2140 JS4045 JS4060	490～650	.039～.079	910	215	570	170	360	170	290	170	230	160
				vc=590 SFM *fz*= .059 IPT *ap*= .059 in *ae*= 0.7DC									
Carbon steel Alloy steel (<30HRC)		525～590		810	190	510	150	320	150	255	150	205	145
				vc=525 SFM *fz*= .0591 IPT *ap*= .059 in *ae*= 0.7DC									
Carbon steel Alloy steel (30～40HRC)	JP4120 GX2140 JS4045	525～590	.039～.079	810	190	510	150	320	150	255	150	205	145
				vc=525 SFM *fz*= .0591 IPT *ap*= .059 in *ae*= 0.7DC									
Carbon steel Alloy steel (40～45HRC)	JP4120 JS4045	262～395	.157～.032	505	64	320	50	200	50	160	50	127	50
				vc=330 SFM *fz*= .032 IPT *ap*= .059 in *ae*= 0.7DC									
Stainless steel	JM4160	328	.039～.787	455	72	286	56	180	56	143	56	115	56
				vc=295 SFM *fz*= .039 IPT *ap*= .787 in *ae*= 0.7DC									
Cast iron	GX2140 JS4045 JP4120	328～590	.039～.079	810	255	510	200	320	200	255	200	205	200
				vc=525 SFM *fz*= .079 IPT *ap*= .039 in *ae*= 1.0DC									
Hardened steel (45～50HRC)	JP4120 JP4105	260～395	.008～.016	455	21	286	17	180	17	143	17	115	16
				vc=295 SFM *fz*= .012 IPT *ap*= .059 in *ae*= 0.7DC									
Hardened stee (50～60HRC)	JP4105 JP4120	165～328	.002～.008	350	10	220	9	140	9	110	9	90	9
				vc=230 SFM *fz*= .008 IPT *ap*= .039 in *ae*= 0.7DC									

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④「JP4105」insert's grade specialized in High hardened steel is not suitable for Non-heat-treated steel material.

Metric



※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting speed Vc (m/min)	Feed rate fz (mm/t)	φ63 or 2.5" 4 flutes		φ100 or 4" 5 flutes		φ160 or 6" 8 flutes		φ200 or 8" 10 flutes		φ250 or 10" 12 flutes	
				Revolution n min-1	Feed speed Vf mm/min	Revolution n min-1	Feed speed Vf mm/min	Revolution n min-1	Feed speed Vf mm/min	Revolution n min-1	Feed speed Vf mm/min	Revolution n min-1	Feed speed Vf mm/min
Mild steel (<200HB)	※ GX2140 JS4045 JS4060	150～200	1.0～2.0	910	5,460	570	4,300	360	4,320	290	4,350	230	4,140
				Vc=180m/min fz=1.5mm/t ap=1.5mm ae=0.7DCX									
Carbon steel Alloy steel (<30HRC)		100～180		810	4,860	510	3,830	320	3,840	255	3,830	205	3,700
				Vc=160m/min fz=1.5mm/t ap=1.5mm ae=0.7DCX									
Carbon steel Alloy steel (30～40HRC)	JP4120 GX2140 JS4045	100～160	1.0～2.0	810	4,860	510	3,830	320	3,840	255	3,830	205	3,700
				Vc=160m/min fz=1.5mm/t ap=1.5mm ae=0.7DCX									
Carbon steel Alloy steel (40～45HRC)	JP4120 JS4045	80～120	0.4～0.8	505	1,620	320	1,280	200	1,280	160	1,280	127	1,220
				Vc=100m/min fz=0.8mm/t ap=1.5mm ae=0.7DCX									
Stainless steel	JM4160	100	1.0～2.0	455	1,820	286	1,430	180	1,430	143	1,430	115	1,400
				Vc=90m/min fz=1.0mm/t ap=2.0mm ae=0.7DCX									
Cast iron	GX2140 JS4045 JP4120	100～180	1.0～2.0	810	6,480	510	5,100	320	5,100	255	5,100	205	5,000
				Vc=160m/min fz=2.0mm/t ap=1.0mm ae=1.0DCX									
Hardened steel (45～50HRC)	JP4120 JP4105	80～120	0.2～0.4	455	550	286	430	180	430	143	430	115	415
				Vc=90m/min fz=0.3mm/t ap=1.5mm ae=0.7DCX									
Hardened stee (50～60HRC)	JP4105 JP4120	50～100	0.05～0.2	350	280	220	220	140	220	110	220	90	210
				Vc=70m/min fz=0.2mm/t ap=1.0mm ae=0.7DCX									

【Note】

① Use the appropriate coolant for the work material and machining shape.
② These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③ Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
④「JP4105」insert's grade specialized in High hardened steel is not suitable for Non-heat-treated steel material.

Designation of milling inserts

① Insert shape	
Symbol	Insert shape
T	Triangle 60°
S	Square 90°
R	Round
E	Diamond 75°
C	Diamond 80°
O	Octagonal 135°
A	Parallelogram 85°
L	Rectangular 90°
Z	For Ball & Precisions
X	For Ball End Mills
Y	For Ball End Mills

② Normal clearance	
Symbol	Clearance
C	7°
D	15°
E	20°
F	25°
N	0°
O	Negative, Positive
P	11°

③ Tolerance class			
Symbol	Tolerances (mm)		
	Inscribed circle (d)	Thickness (s)	Nose height (m)
A	±0.025	±0.025	±0.005
F	±0.013	±0.025	±0.005
C	±0.025	±0.025	±0.013
H	±0.013	±0.025	±0.013
E	±0.025	±0.025	±0.025
G(P)	±0.025	±0.13	±0.025
K	±0.05~0.13	±0.025	±0.013
M	±0.05~0.13	±0.13	±0.08~0.18
N	±0.05~0.13	±0.025	±0.08~0.18

	①	②	③				
Inch Series	S	E	E	○	4	2	○
Metric Series	S	E	E	N	12	03	AF
				④	⑤	⑥	⑦

④ Fixing and /or chip breaker		
Symbol	Fixing	Chip breaker
F	Nil	Both face
A	With hole	Nil
W※	With hole	Nil
G	With hole	Both face
T※	With hole	One face
M	With hole	One face
X	—	—
N	Nil	Nil
R	Nil	Both face

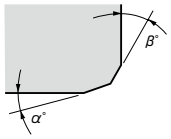
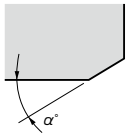
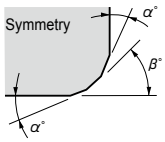
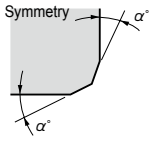
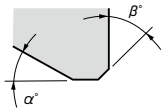
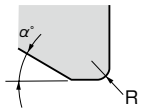
⑤ Edge length & diameter of inscribed circle (Matric series)									
R		S		C E・A・L		T		Inscribed circle (mm)	Inscribed circle symbol (Inch)
Symbol	Size (mm)	Symbol	Size (mm)	Symbol	Size (mm)	Symbol	Size (mm)		
		06	6.35	06	6.5	11	11.0	6.35	2
		07	7.94	08	8.1	13	13.8	7.94	
09	9.525	09	9.525	09	9.7	16	16.5	9.525	3
10	10.0							10.0	
12	12.0							12.0	
12	12.70	12	12.7	12	12.9	22	22.0	12.70	4
15	15.875	15	15.875	16	16.1	27	27.5	15.875	5
16	16.0							16.0	
19	19.05	19	19.05	19	19.3	33	33.0	19.05	6

※ With tapered hole on one side

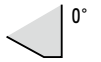
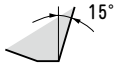
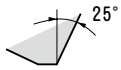
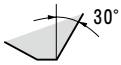
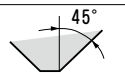
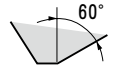
⑥ Thickness			
Symbol (Metric)	Thickness (mm)	Symbol (Inch)	
		Nomal Series	Small Size Series
01	1.59	—	2
02	2.38	—	3
T2	2.78	—	—
03	3.18	2	4
T3	3.97	—	5
04	4.76	3	6
06	6.35	4	—
07	7.94	5	—
09	9.52	6	—

The actual thickness might be shown with the closest symbol.

⑩ Wiper edge

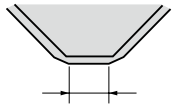
Symbol	A	B	C
Shape	 Two steped chamfered	 Chamferd	 Three steped chamfered
Symbol	**D**	**E**	**G**
Shape	 Two steped chamfered	 Two steped chamfered	 One steped chamfered and round

⑪ Cutting edge angle

Symbol	Shape
0	 0°
3	 15°
5	 25°
6	 30°
9	 45°
12	 60°

⑭ Width o wiper edge

Symbol	W:Size(mm)
1	1.0
2	1.2
3	1.4
4	1.6
5	1.8
6	2.0
7	2.2
8	2.5
9	2.8
0	3.2



W : Size

(If the width of wiper edge is special, fill in.)

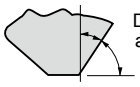
⑩	⑪	⑫				
T	N	–	G	9	○	A	2
T	N	–	G	9	○	A	2
⑧	⑨					⑬	⑭

⑫ Optional

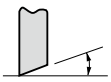
⑦ Corner coniguration (Metric series)

Corner radius

Corner angle / Depth angle

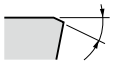
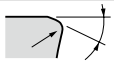


Wiper edge



Symbol	Corner radius R (mm)	Symbol	Corner angle	Depth angle	Symbol	Clearance
02	0.2	A	45°	45°	A	3°
04	0.4	D	30°	60°	B	5°
08	0.8	E	15°	75°	C	7°
12	1.2	F	5°	85°	D	15°
16	1.6	P	0°	90°	E	20°
20	2.0	Z	Others		F	25°
24	2.4				G	30°
Round top : 00 for inch-based diameter dimensions; M0 for metric dimensions. (Inch system uses 0.)					N	0°
					P	11°
					Z	Others

⑧ Cutting edge condition

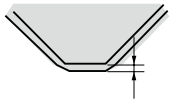
Symbol	Shape
T	 Chamfered cutting edges
E	Rounded cutting edges
F	Sharp cutting edges
S	 Chamfered and rounded cutting edges

⑨ Feed direction

Symbol	Feed direction
R	Right hand
L	Left hand
N	Neutral

⑬ Honing on wiper edge

Symbol	h:Size(mm)
A	0.06
B	0.10
C	0.15
D	0.20



h : Size (mm)

※ The actual specifications of inserts are not always same as defined above.

Milling Inserts

Shape	Item code	ISO (metric)	Tolerance class	Coating: AJ Coating JP4105	AJ Coating JP4120	AJ Coating JM4160	JS Coating JS4030	JS Coating JS4045	JS Coating JS4060	TH Coating TH308	TH Coating TH315	TH Coating	PN Coating PN215	PN Coating	PN Coating	C Coating CY250	C Coating	C Coating	GX Coating GX2140	GX Coating	GX Coating	G Coating GF30	G Coating	G Coating	Cutter Page
Special shape tools	XPHW0903R-20		H								●		●												GALLEA GF1 E5
	XPHW0903R-30										●		●												
	YPHW0903R-20										●		●												
	YPHW0903R-30										●		●												
	YPHW1203R-30		H								★		★												GALLEA GF2T E8
	TPHW0902-20		H								★		★												GALLEA GF3L E11
	TPHW1303-25										★		★												
	TPHW1403-30										★		★												
	ZPHW160-LB16		H							●			●												GALLEA GP1LB E14
	ZPHW160-LB16-R5									●			●												
	ZPHW200-LB20									●			●												
	ZPHW200-LB20-R6									●			●												
	ZPHW250-LB25									●			●												
	ZPHW250-LB25-R8									●			●												
	ZPHW300-LB30									★			★												
	ZPHW300-LB30-R10									★			★												
	ZDHW120-T43R1.2-30		H							★			★												GALLEA GP1T E17
	ZDHW160-T43R1.6-40									★			★												
	ZDHW200-T43R2-50									★			★												
	ZDHW250-T43R2.5-62.5									★			★												
	ZDHW300-T43R3-75									★			★												
High Feed Radius end mill	SDNW120520TR		N	●	●	●			●										●						TR4F/ITR4F C8
	SDNW120520TR-P				●	●																			
	SDMT120520TR		M		●	●			●										●						TR4D/ITR4D C28
	SDNW150525ZTR		N	●	●	●			●										●						
	SDMT150525ZTR		M		●	●			●										●						
	ENMU0603ER-B		M		●	●		●											●						TD4N/ITD4N C34
	ENMU0603ER-C				●	●		●											●						
	ENGU0603ER-C		G	●																					
	EPNW0803TN-10		N	★	★	★		●	★							●			★						ASR/IASR C40
	EDNW10T3TN-10		E	★	★	★		●	★							●			★			★			
	EDNW13T4TN-10			★	★			●	★							●			★						
	EDNW13T4TN-15			★	★	★		●	★							●			★			★			
	EDNW15T4TN-10			★	★			●	★							●			★						
	EDNW15T4TN-15			★	★	★		●	★							●			★			★			
	EDEW13T4TN-10							★								★									
	EDEW13T4TN-15							★								★									
	EDEW15T4TN-10							★								★									
	EDEW15T4TN-15							★								★									
	EDNW13T4TN-15Z		N		★	★		★	★																
	EDNW15T4TN-15Z				★	★		★	★																
	EDMT13T4TN-15		M			★		★	★							★			★						
	EDMT15T4TN-15					★		★	★							★			★						

●: Inventory maintained in US ★: Inventory maintained in Japan △: Discontined after stock run out No Mark: Manufactured upon request only

Shape	Item code	ISO (metric)	Tolerance class	Coating																	Non Coating			Cutter
				AJ Coating				JS Coating			TH Coating			C Coating			GX Coating			G Coating		Carbide K			Page
				JP4105	JP4115	JP4120	JM4160	JS4045	JS4060		PTH08M			CY100H	CY25	CY250	GX2140			GF30		WH10			
High Feed Radius end mill	WDNW09T320		N	★		★	★	★	★								★								ASRT/IASRT C48
	WDNW120420			●		●	●	●	★								★								
	WDNW140520			★		●	●	●	★								★								
	WDNT09T320							★	★								★								
	WDNT120420							●	★								★								
	WDNT140520							●	★								★								
	WDNT09T320-B					★	★	★	★								★								
	WDNT120420-B					★	★	★	★								★								
	WDNT140520-B					★	★	★	★								★								
	WDNW120420Z					★	★	★																	
	WDNW140520Z					★	★	★																	
	WDNT09T320ZH						★		★																
	WDNT120420ZH						★		★																
	WDNT140520ZH						★		★																
	WDNW150620					●	★	●	●																
	SDNW1205ZDTN-R15		N	★		●	●	●	●							★	★								ASRF/IASRF C56
	SDMT1205ZDTN-R15		M	★		●	●	●	●							●	★								
	SPNW07T2TR		N	●		●	●	●									●								ASRF mini IASRF mini C64
	SPMT07T2TR		M			●	●	●																	
	SPMT07T2ER-LF					●	●																		
	EPNW0603TN-8		N	★		●	●	●	●								★								ASR-Multi IASR-Multi C72
	EDNW12T3TN-10			★		★	★	★	★								★								
	EPMT0603TN-8		M	★		●	●	●	●								★								
	EDMT12T3TN-10			★		★	★	★	★								★								
	EPMT0603EN-8LF						●																		
Radius end mill	EPHW0402TN-2		H	●	●																				RH2P/IRH2P C86
	RDMW0501M0EN		M	★			★				★					★									AR/IAR C90
	RDMW0702M0EN			★			★				★					★									
	RDHW0802M0TN		H				★	●								●									
	RDMT0802M0TN		M	★		★	★	●	★						★	●									
	RDMT0802M0EN																					★			
	RDHW10T3M0TN		H					●								●									
	RDMT10T3M0TN		M	★		★	★	●	★						★	●				★					
	RDMT10T3M0EN													★								★			
	RDHW1204M0TN		H					●								●									
	RDMT1204M0TN		M	★		★	★	●	★							●									
	RDMT1204M0EN																								
	RDHW1604M0TN		H					●								●									
	RDMX1604M0TN		M																						
	RDMX1604M0EN																								
	RDMT1604M0TN			★		★	★	●	★							●						★			
	RDMT1604M0EN													★											
	RDHW1605M0TN		H					●								●									
	RDMT1605M0TN		M	★			★	●								●									
	RDMT1605M0EN																								

Milling Inserts

Shape	Item code	ISO (metric)	Tolerance class	Coating: AJ Coating JM4160			AX Coating AX2040			JS Coating JS1025			TH Coating TH308			PN Coating PN215		SD Coating SD5010		GX Coating GX2160		Non Coating Carbide K WH10			Cutter Page
Radius end mill	RPET10T3M0FN-A8		E	–			–			★								★		–					RV/IRV C110
	RPMT10T3M0EN-B8		M	★			★			–								–		★		–			
	RPMT10T3M0EN-C8			★			★			–								–		★		–			
	RPHT10T3M0EN-B8		H	★			★			★								–		★		–			
	RPHT10T3M0EN-C8			★			★			–								–		★		–			
	RPET1204M0FN-A8		E	–			–			●								●		–					
	RPMT1204M0EN-B8		M	●			★			–								–		●		–			
	RPMT1204M0EN-C8			●			★			–								–		●		–			
	RPHT1204M0EN-B8		H	●			★			●								–		●		–			
	RPHT1204M0EN-C8			●			★			–								–		●		–			
	IZCFG060SG-R0.8		F										●			●									IARPF C118
	IZCFG060SG-R1.6												●			●									
	IZCFG060SG-R3.2												●			●									
	IZCFG080SG-R0.8												●			●									
	IZCFG080SG-R1.6												●			●									
	IZCFG080SG-R3.2												●			●									
	IZCFG120SG-R0.8												●			●									
	IZCFG120SG-R1.6												●			●									
	IZCFG120SG-R3.2												●			●									
	IZCFG160SG-R0.8												●			●									
	IZCFG160SG-R1.6												●			●									
	IZCFG160SG-R3.2												●			●									
	IZCFG080SW-R0.8												●			●									
	IZCFG120SW-R0.8												●			●									
	ZCFG06NSG-R0.3		F										★			★									ARPF C118
	ZCFG06NSG-R0.5												★			★									
	ZCFG06NSG-R1.0												★			★									
	ZCFG080SG-R0.3												●			●									
	ZCFG080SG-R0.5												●			●									
	ZCFG080SG-R1.0												●			●									
	ZCFG080SG-R1.5												●			●									
	ZCFG080SG-R2.0												●			●									
	ZCFG100SG-R0.3												●			●									
	ZCFG100SG-R0.5												●			●									
	ZCFG100SG-R1.0												●			●									
	ZCFG100SG-R1.5												●			●									
	ZCFG100SG-R2.0												●			●									
	ZCFG100SG-R3.0												●			●									
	ZCFG120SG-R0.3												●			●									
	ZCFG120SG-R0.5												●			●									
	ZCFG120SG-R1.0												●			●									
	ZCFG120SG-R1.5												●			●									
	ZCFG120SG-R2.0												●			●									
	ZCFG120SG-R3.0												●			●									
	ZCFG130SG-R0.3												★			★									
	ZCFG130SG-R0.5												★			★									
	ZCFG130SG-R1.0												★			★									
	ZCFG130SG-R1.5												★			★									
	ZCFG130SG-R2.0												★			★									
	ZCFG130SG-R3.0												★			★									
	ZCFG160SG-R0.3												●			●									
	ZCFG160SG-R0.5												●			●									
	ZCFG160SG-R1.0												●			●									

●: Inventory maintained in US ★: Inventory maintained in Japan △: Discontined after stock run out No Mark: Manufactured upon request only

Shape	Item code	ISO (metric)	Tolerance class	Coating: TH Coating			PN Coating																		Cutter Page
				TH308			PN215																		
Radius end mill	ZCFG160SG-R1.5		F	●			●																		ARPF C118
	ZCFG160SG-R2.0			●			●																		
	ZCFG160SG-R3.0			●			●																		
	ZCFG170SG-R0.3			★			★																		
	ZCFG170SG-R0.5			★			★																		
	ZCFG170SG-R1.0			★			★																		
	ZCFG170SG-R1.5			★			★																		
	ZCFG170SG-R2.0			★			★																		
	ZCFG170SG-R3.0			★			★																		
	ZCFG200SG-R0.3			●			●																		
	ZCFG200SG-R0.5			●			●																		
	ZCFG200SG-R1.0			●			●																		
	ZCFG200SG-R1.5			●			●																		
	ZCFG200SG-R2.0			●			●																		
	ZCFG200SG-R3.0			●			●																		
	ZCFG210SG-R0.3			★			★																		
	ZCFG210SG-R0.5			★			★																		
	ZCFG210SG-R1.0			★			★																		
	ZCFG210SG-R1.5			★			★																		
	ZCFG210SG-R2.0			★			★																		
	ZCFG210SG-R3.0			★			★																		
	ZCFG250SG-R0.3			●			●																		
	ZCFG250SG-R0.5			●			●																		
	ZCFG250SG-R1.0			●			●																		
	ZCFG250SG-R1.5			●			●																		
	ZCFG250SG-R2.0			●			●																		
	ZCFG250SG-R3.0			●			●																		
	ZCFG260SG-R0.3			★			★																		
	ZCFG260SG-R0.5			★			★																		
	ZCFG260SG-R1.0			★			★																		
	ZCFG260SG-R1.5			★			★																		
	ZCFG260SG-R2.0			★			★																		
	ZCFG260SG-R3.0			★			★																		
	ZCFG300SG-R0.3			★			★																		
	ZCFG300SG-R0.5			★			★																		
	ZCFG300SG-R1.0			★			★																		
	ZCFG300SG-R1.5			★			★																		
	ZCFG300SG-R2.0			★			★																		
	ZCFG300SG-R3.0			★			★																		
	ZCFG320SG-R0.3			★			★																		
	ZCFG320SG-R0.5			★			★																		
	ZCFG320SG-R1.0			★			★																		
	ZCFG320SG-R1.5			★			★																		
	ZCFG320SG-R2.0			★			★																		
	ZCFG320SG-R3.0			★			★																		
	ZCFG06NSW-R0.3		F	★			★																		ARPF C118
	ZCFG06NSW-R0.5			★			★																		
	ZCFG080SW-R0.3			★			★																		
	ZCFG080SW-R0.5			★			★																		
	ZCFG080SW-R1.0			★			★																		
	ZCFG100SW-R0.3			★			★																		
	ZCFG100SW-R0.5			★			★																		
	ZCFG100SW-R1.0			★			★																		

—: Not manufactured

Milling Inserts

Shape	Item code	ISO (metric)	Tolerance class	Coating: TH Coating TH308	TH Coating ATH08M		PN Coating PN215			C Coating PCA12M														Cutter Page
Radius end mill	ZCFG120SW-R0.3		F	★			★																	ARPF C118
	ZCFG120SW-R0.5			●			●																	
	ZCFG120SW-R1.0			●			●																	
	ZCFG130SW-R0.3			★			★																	
	ZCFG130SW-R0.5			★			★																	
	ZCFG130SW-R1.0			★			★																	
	ZCFG160SW-R0.3			★			★																	
	ZCFG160SW-R0.5			●			●																	
	ZCFG160SW-R1.0			●			●																	
	ZCFG170SW-R0.3			★			★																	
	ZCFG170SW-R0.5			★			★																	
	ZCFG170SW-R1.0			★			★																	
	ZCFG200SW-R0.3			★			★																	
	ZCFG200SW-R0.5			●			●																	
	ZCFG200SW-R1.0			●			●																	
	ZCFG210SW-R0.3			★			★																	
	ZCFG210SW-R0.5			★			★																	
	ZCFG210SW-R1.0			★			★																	
	ZCFG250SW-R0.3			★			★																	
	ZCFG250SW-R0.5			●			●																	
	ZCFG250SW-R1.0			●			●																	
	ZCFG260SW-R0.3			★			★																	
	ZCFG260SW-R0.5			★			★																	
	ZCFG260SW-R1.0			★			★																	
	ZCFG300SW-R0.3			★			★																	
	ZCFG300SW-R0.5			★			★																	
	ZCFG300SW-R1.0			★			★																	
	ZCFG320SW-R0.3			★			★																	
	ZCFG320SW-R0.5			★			★																	
	ZCFG320SW-R1.0			★			★																	
	ZCFG080SQ		F				★																	ARPF C118
	ZCFG100SQ						★																	
	ZCFG120SQ						★																	
	ZCFG130SQ						★																	
	ZCFG160SQ						★																	
	ZCFG170SQ						★																	
	ZCFG200SQ						★																	
	ZCFG210SQ						★																	
	ZCFG250SQ						★																	
	ZCFG260SQ						★																	
	IZCFW060-R0.8		F		●					●														ARPF C118
	IZCFW060-R1.6				●					●														
	IZCFW060-R3.2				●					●														
	IZCFW080-R0.8				●					●														
	IZCFW080-R1.6				●					●														
	IZCFW080-R3.2				●					●														
	IZCFW120-R0.8				●					●														
	IZCFW120-R1.6				●					●														
	IZCFW120-R3.2				●					●														
	IZCFW160-R0.8				●					●														
	IZCFW160-R1.6				●					●														
	IZCFW160-R3.2				●					●														

●: Inventory maintained in US ★: Inventory maintained in Japan △: Discontined after stock run out No Mark: Manufactured upon request only

Shape	Item code	ISO (metric)	Tolerance class	Coating												Non Coating									Cutter
				TH Coating			HD Coating			C Coating						CBN									Page
				TH303	PTH08M		HD7010			PCA12M						BH250									
Radius end mill	ZCFW060-R0.3		F		★		★																		ARPF C118
	ZCFW060-R0.5				★																				
	ZCFW060-R1.0				★																				
	ZCFW080-R0.3				●		★			●															
	ZCFW080-R0.5				●					●															
	ZCFW080-R1.0				●					●															
	ZCFW100-R0.3				●		★			●															
	ZCFW100-R0.5				●					●															
	ZCFW100-R1.0				●					●															
	ZCFW100-R1.5				●					●															
	ZCFW100-R2.0				●					●															
	ZCFW100-R3.0				●					●															
	ZCFW120-R0.3				●		★			●															
	ZCFW120-R0.5				●					●															
	ZCFW120-R1.0				●					●															
	ZCFW120-R1.5				●					●															
	ZCFW120-R2.0				●					●															
	ZCFW120-R3.0				●					●															
	ZCFW160-R0.3				●		★			●															
	ZCFW160-R0.5				●					●															
	ZCFW160-R1.0				●					●						★									
	ZCFW160-R1.5				●					●															
	ZCFW160-R2.0				●					●						★									
	ZCFW160-R3.0				●					●															
	ZCFW200-R0.3				●		★			●															
	ZCFW200-R0.5				●					●															
	ZCFW200-R1.0				●					●						★									
	ZCFW200-R1.5				●					●															
	ZCFW200-R2.0				●					●						★									
	ZCFW200-R3.0				●					●															
	ZCFW250-R0.3				●					●															
	ZCFW250-R0.5				●					●															
	ZCFW250-R1.0				●					●						★									
	ZCFW250-R2.0				●					●						★									
	ZCFW250-R3.0				●					●															
	ZCFW300-R0.3				★					★															
	ZCFW300-R0.5				★					★															
	ZCFW300-R1.0				★					★						★									
	ZCFW300-R2.0				★					★						★									
	ZCFW300-R3.0				★					★															
	ZCFW320-R0.3				★					★															
	ZCFW320-R0.5				★					★															
	ZCFW320-R1.0				★					★															
	ZCFW320-R2.0				★					★															
	ZCFW320-R3.0				★					★															
Ball end mill	IZPFG050-SH		F	●																					IABPF C132
	IZPFG060-SH			●																					
	IZPFG080-SH			●																					
	IZPFG100-SH			●																					
	IZPFG120-SH			●																					
	IZPFG160-SH			●																					

Milling Inserts

Shape	Item code	ISO (metric)	Tolerance class	Coating: TH Coating ATH10E	TH Coating ATH80D	TH Coating TH303	PN Coating PN08M	PN Coating PN15M	HD Coating HD7010	C Coating PCA12M	Cutter Page
Ball end mill	ZPFG06N-SH		F			★					ABPF C132
	ZPFG080-SH					★					
	ZPFG100-SH					★					
	ZPFG120-SH					★					
	ZPFG160-SH					★					
	ZPFG200-SH					★					
	ZPFG250-SH					★					
	ZPFG300-SH					★					
	IZDFG050-ST		F			●		●			IABPF C132
	IZDFG060-ST					●		●			
	IZDFG080-ST					●		●			
	IZDFG100-ST					●		●			
	IZDFG120-ST					●		●			
	IZDFG160-ST					●		●			
	ZDFG06N-ST		F		★			★			ABPF C132
	ZDFG080-ST				●			●			
	ZDFG100-ST				●			●			
	ZDFG120-ST				●			●			
	ZDFG160-ST				●			●			
	ZDFG200-ST				●			●			
	ZDFG250-ST				●			●			
	ZDFG300-ST				★			★			
	IZDFG050-SC		F				●				IABPF C132
	IZDFG060-SC						●				
	IZDFG080-SC						●				
	IZDFG100-SC						●				
	IZDFG120-SC						●				
	IZDFG160-SC						●				
	ZDFG06N-SC		F				★				ABPF C132
	ZDFG080-SC						●				
	ZDFG100-SC						●				
	ZDFG120-SC						●				
	ZDFG160-SC						●				
	ZDFG200-SC						●				
	ZDFG250-SC						●				
	ZDFG300-SC						★				
	ZDFG06N-SF		F						★		
	ZDFG080-SF								★		
	ZDFG100-SF								★		
	ZDFG120-SF								★		
	ZDFG160-SF			★					★		
	ZDFG200-SF			★					★		
	ZDFG250-SF			★							
	ZDFG300-SF			★							
	IZPFG050		F							△	IABPF C132
	IZPFG060									△	
	IZPFG080									△	
	IZPFG100									△	
	IZPFG120									△	
	IZPFG160									△	

●: Inventory maintained in US ★: Inventory maintained in Japan △: Discontined after stock run out No Mark: Manufactured upon request only

Shape	Item code	ISO (metric)	Tolerance class	Coating												Non Coating									Cutter
				TH Coating			CS Coating			C Coating						CBN									Page
				ATH80D	PTH08M		ACS05E			PCA08M	PCA12M					BH200									
Ball end mill	ZPFG080		F													-									ABPF C132
	ZPFG100															-									
	ZPFG120															-									
	ZPFG160															★									
	ZPFG200															★									
	ZPFG250															★									
	ZPFG300															★									
	ZPFG320				△					△	△					-									
	IZDFG050-WF		F				△																		IABPF C132
	IZDFG050-WH			△																					
	IZDFG060-WF						△																		
	IZDFG060-WH			△																					
	IZDFG080-WF						△																		
	IZDFG080-WH			△																					
	IZDFG100-WF						△																		
	IZDFG100-WH			△																					
	IZDFG120-WF						△																		
	IZDFG120-WH			△																					
	IZDFG160-WF						△																		
	IZDFG160-WH			△																					
	ZDFG060-WF		F																						ABPF C132
	ZDFG060-WH																								
	ZDFG080-WF																								
	ZDFG080-WH																								
	ZDFG100-WF																								
	ZDFG100-WH																								
	ZDFG120-WF																								
	ZDFG120-WH																								
	ZDFG160-WF																								
	ZDFG160-WH																								
	ZDFG200-WF																								
	ZDFG200-WH																								
	ZDFG250-WF																								
	ZDFG250-WH																								
	ZDFG300-WF																								
	ZDFG300-WH																								
	ZDFG320-WF						△																		
	ZDFG320-WH			△																					

—: Not manufactured

Milling Inserts

Shape	Item code	ISO (metric)	Tolerance class	Coating: AJ Coating JP4105	AJ Coating JP4120	AJ Coating JM4160	JS Coating JS4045	JS Coating JS4060		TH Coating ATH10E	TH Coating ATH80D	TH Coating TH303	TH Coating PTH13S	TH Coating PTH30E	TH Coating PTH40H	PN Coating PN215	PN Coating PN15M	SD Coating SD5010		GX Coating GX2160					Cutter Page
Ball end mill	IZDFG040N-ST		F								●						●								IABPFN C146
	IZDFG050N-ST										●						●								
	IZDFG060N-ST										●						●								
	IZDFG080N-ST										●						●								
	IZDFG100N-ST										●						●								
	IZDFG120N-ST										●						●								
	IZDFG160N-ST										●						●								
	ZDFG06N-ST		F								●						●								ABPFN C146
	ZDFG08N-ST										●						●								
	ZDFG10N-ST										●						●								
	ZDFG12N-ST										●						●								
	ZDFG16N-ST										●						●								
	ZDFG20N-ST										●						●								
	ZDFG25N-ST										●						●								
	ZDFG30N-ST										★						★								
	IZDFG160SET		F								●						●								IABP4F C156
	ZDFG200CE		F							★															ABP4F C156
	ZDFG200CT										★	★				★	★								
	ZDFG250CE									★															
	ZDFG250CT										★	★				★	★								
	ZDFG300CE									★															
	ZDFG300CT										★	★				★	★								
	ZDFG200SE									★		★					★								
	ZDFG200SK										★					★									
	ZDFG250SE									★		★					★								
	ZDFG250SK										★					★									
	ZDFG300SE									★		★					★								
	ZDFG300SK										★	★				★	★								
	ZDFG200SET									●	●	★				★	●								
	ZDFG250SET									●	●	★				★	●								
	ZDFG300SET									●	●	★				★	●								
Square end mill	JDMT070202R		M	●	●	●								●				●							ASM C162
	JDMT070204R			●	●	●								●				●							
	JDMT070208R			●	●	●								●				●							
	EDMT070220R-T			●	●	●																			
	EDMT070220R			●	●	●																			
	JDMT100304R		M		★		★	★					★	★											AHU C174
	JDMT100308R				★		★	★					★	★	★										
	JDMT100320R				★		★	★						★											
	JDMT100332R				★	★	★	★						★											
	JDMT100304R-FW				★		★	★						★											
	JDMT100308R-FW				★	★	★	★						★											
	JDMT100308R-B5				★	★																			
	JDMT100308R-C5				★															★					
	JDMT100320R-B5				★	★																			
	JDMT100320R-C5				★															★					
	JDMT100330R-B5				★	★																			

●: Inventory maintained in US ★: Inventory maintained in Japan △: Discontinued after stock run out No Mark: Manufactured upon request only

Shape		Item code	ISO (metric)	Tolerance class	Coating																			Non Coating				Cutter
					AJ Coating			JS Coating		TH Coating					Cermet Coating	HD Coating		SD Coating		C Coating		GX Coating		CBN	Cermet	Carbide		
					JP4105	JP4120	JM4160	JS4045	JS4060	ATH08M	TH30B	PTH13S	PTH30E	PTH40H	MZ1000	HD7010		SD5010		CY250		GX2120	GX2140	GX2160	BH250	CH550	K WH10		Page
Square end mill		JDMT100330R-C5		M		★																		★			-		AHU/IAHU C174
		JDMT100332R-B5				★	★																				-		
		JDMT100332R-C5				★																		★			-		
		JDMT150504R		M		★			★			★	●														-		
		JDMT150508R				★		●	★			★	●	★													-		
		JDMT150520R				★		★	★				★														-		
		JDMT150530R				★		●	★				●	★													-		
		JDMT150504R-FW				★		★	★				★														-		
		JDMT150508R-FW				★	★	★	★				★														-		
		JDMT150508R-TFW				★	★	★	★				★														-		
		JDMT150508R-B7				●	●																				-		
		JDMT150508R-C7				●																		●			-		
		JDMT150520R-B7				●	●																				-		
		JDMT150520R-C7				●																		●			-		
		JDMT150530R-B7				●	●																				-		
		JDMT150530R-C7				●																		●			-		
		JDET100304R-FF		E				★					★			★													
		JDET100308R-FF						★					★			★													
		JDET150504R-FF						★					★			★													
		JDET150508R-FF						★					★			★													
		JDET100304R-FA		E														★									★		
		JDET150502R-FA																●									★		
		JDET150504R-FA																●									★		
		JDET150530R-FA																●									★		
		MPHT040202ZEL		H							★																		ASPV mini C190
		MPHT040202ZEL-0.5									★																		
		MPHT040205ZEL									★																		
		MPHT040205ZEL-0.5									★																		
		MPHT040210ZEL									★																		
		MPHT040210ZEL-0.5									★																		
		MPHW060302ZEL		H											★														ASPV IASPV C204
		MPHW060302ZEL-0.5													★														
		MPHW060304ZEL			★					●					●														
		MPHW060304ZEL-0.5			★					★					★														
		MPHW060304ZFL																★											
		MPHW060308ZEL			★	●				●					●														
		MPHW060308ZEL-1.5			★	★				★					★										★				
		MPHW060308ZFL																★											
		MPHW060320ZEL			★					★					★										★				
		MPNW060308ZEL		N		★	★		★																				
		MPNW060320ZEL				★	★		★																				
Face mill		SNGU1607EN-C		G		★	★	★														★	★						ASDF IASDF C232
		SNMU1607EN-B		M		●	●	●														★	★						
		SNMU1607EN-C				★	★	●														●	★						
		SDNW1505ZDTN-R15		N	★	★	★	●	●									–		●			★						ASF/IASF C238
		SDMT1505ZDTN-R15		M	★	★	★	●	●									–					★						
		SDMT1505ZDTN-C15					★	★	★									–		●			★			★			
		SDEW1505ZDTN-R15						★										–		★									

–: Not manufactured

C254

The Shanks for Modular Mill, Parts for Indexable Tools

Modular Mill

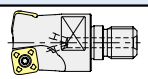
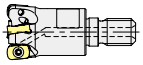
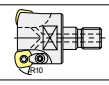
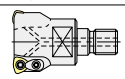
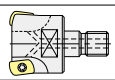
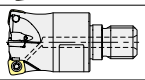
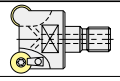
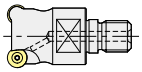
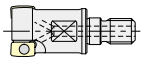
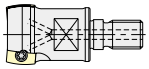
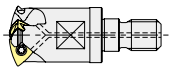
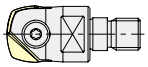
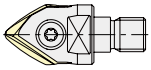
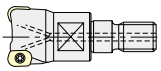
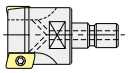
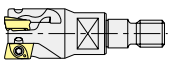
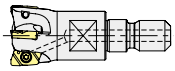
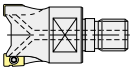
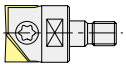
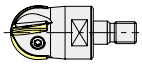
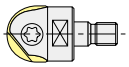
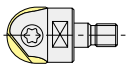
Features of Modular Mill ····· D2
The Shanks of Modular Mill ····· D4

Parts for Indexable Tools

Locater ····· D6
Wedge ····· D6
Screw ····· D7
Clamp piece ····· D8
Clamp piece set ····· D9
Spring ····· D9
Screw driver, Wrench ····· D10
Screw anti-seizure agent ····· D10

Features of Modular Mill

Cutter(head) and shank, cutter(head) and arbor combinations

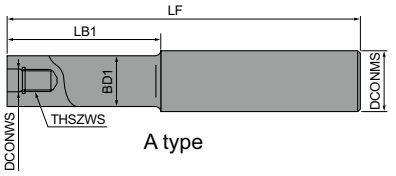
Process	Tools: Cutter	Shape		Tool dia. DC,DCX	Number of items	Cutting Applications
Roughing	TR4FM ITR4FM			ϕ32mm・ϕ40mm ϕ1.250"・ϕ1.500"	4	Planing, Slotting, Die-sinking, Profiling, Helical, Vertical
Roughing	TD4N-M ITD4N-M			ϕ16mm~ϕ42mm ϕ.625"~ϕ1.500"	15	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing	ASRM			ϕ20mm~ϕ40mm	6	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing	ASRTM			ϕ25mm~ϕ40mm	6	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing	ASRM Multi-flutes Type			ϕ16mm~ϕ40mm	9	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing	ASRFM IASRFM			ϕ20mm~ϕ40mm ϕ.750"~ϕ1.500"	11	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing, Semi-Finishing	ARM			ϕ12mm~ϕ40mm	11	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing, Semi-Finishing	RV-M			ϕ25mm~ϕ40mm	6	Planing, Slotting, Die-sinking, Profiling, Helical
Roughing, Semi-Finishing, Finishing	GF1			ϕ16mm~ϕ25mm	7	Side milling
Roughing, Semi-Finishing, Finishing	GF2T			ϕ20mm~ϕ40mm	4	Side milling
Roughing, Semi-Finishing, Finishing	GF3L			ϕ20mm~ϕ30mm	3	Profiling
Roughing, Semi-Finishing, Finishing	GP1LB			ϕ12mm~ϕ30mm	4	Planing, Side milling, Profiling
Roughing, Semi-Finishing, Finishing	GP1T			ϕ12mm~ϕ30mm	5	Profiling
Roughing, Semi-Finishing, Finishing	RH2P-M IRH2P-M			ϕ8mm~ϕ32mm ϕ.375"~ϕ1.250"	13	Planing, Side milling, Die-sinking, Helical
Roughing, Semi-Finishing, Finishing	AHUM			ϕ16mm~ϕ40mm	14	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical
Roughing, Semi-Finishing, Finishing	ASMM IASMM			ϕ8mm~ϕ32mm ϕ.375"~ϕ1.250"	14	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical
Roughing, Semi-Finishing, Finishing	ASPVM10			ϕ10mm~ϕ32mm	11	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical, Vertical
Roughing, Semi-Finishing, Finishing	ASPVM20			ϕ16mm~ϕ26mm	18	Planing, Side milling, Slotting, Die-sinking, Profiling, Helical, Vertical
Finishing	ARPFM IARPFM			ϕ10mm~ϕ32mm ϕ.375"~ϕ1.000"	18	Planing, Side milling, Die-sinking, Profiling, Helical
Semi-Finishing Finishing	ABP4FM IABP4FM			ϕ20mm~ϕ30mm ϕ1.000"	4	Planing, Side milling, Profiling, Radius
Finishing	ABPFM IABPFM			ϕ10mm~ϕ32mm ϕ.500"~ϕ1.000"	16	Planing, Side milling, Die-sinking, Profiling, Radius, Helical
Finishing	ABPFNM IABPFNM			ϕ10mm ϕ.375"~ϕ1.000"	6	Planing, Side milling, Die-sinking, Profiling, Radius, Helical

	Page
	C8
	C34
	C40
	C48
	C72
	C64
	C90
	C110
	E5
	E8
	E11
	E14
	E17
	C86
	C174
	C162
	C190
	C204
	C118
	C156
	C132
	C146

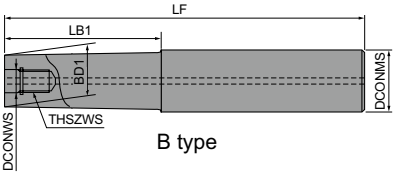
Shank, Arbor	Cutter body Tool diameter	Page
Carbide Shank	ϕ8～ϕ42mm ϕ3/8"～ϕ1.5"	D4

The Shanks for Modular Mill

Inch



A type

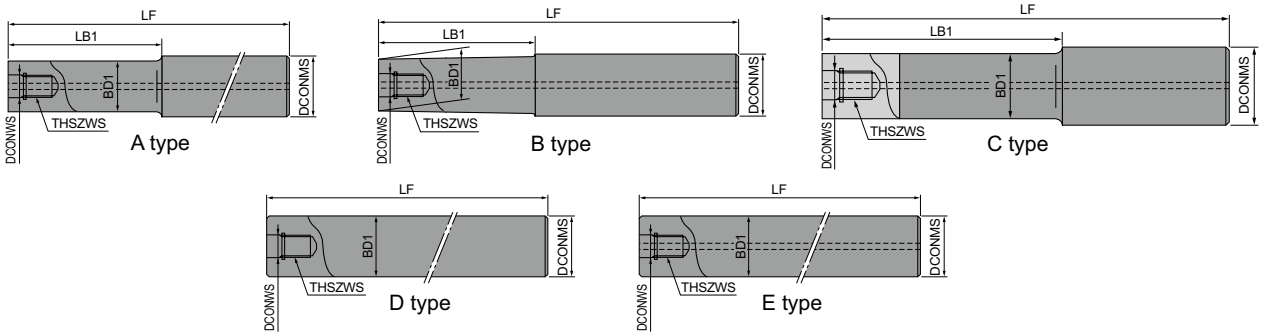


B type

Item code	Stock	Size (inch)						Type	Cutter body	Coolant hole
		DCONWS	THSZWS	LF	LB1	BD1	DCONMS			
IASC0.375-M6-3-1	●	6.5mm	M6	3	1	.366	.375	A	ϕ3/8″※1 ϕ1/2″ ϕ8mm※1 ϕ10mm※1 ϕ11mm※1 ϕ12mm※1	–
IASC0.5-M6-4-2	●		M6	4	2	.453	.500	A		–
IASC0.5-M6-6-3	●		M6	6	3	.453	.500	A		–
IASC0.625-M8-4-2	●	8.5mm	M8	4	2	.571	.625	B	ϕ5/8″※1 ϕ16mm ϕ18mm	○
IASC0.625-M8-6-3	●		M8	6	3	.571	.625	B		○
IASC0.75-M10-5-2.5Z	●	10.5mm	M10	5	2.5	.689	.750	B	ϕ3/4″※1 ϕ20mm ϕ22mm	○
IASC0.75-M10-8-4Z	●		M10	8	4	.689	.750	B		○
IASC1-M12-6-3Z	●	12.5mm	M12	6	3	.906	1.000	B	ϕ1″※1 ϕ25mm※1 ϕ28mm	○
IASC1-M12-8-4Z	●		M12	8	4	.906	1.000	B		○

○= Tool with coolant hole
※1 Cutter Dia. is same or smaller than the shank dia.. Interference may occures.

Metric



Item code	Stock	Size (mm) DCONWS	THSZWS	LF	LB1	BD1	DCONMS	Type	Cutter body	Coolant hole
ASC10-6.5-74-24Z	●	6.5	M6	74	24	9.3	10	A	ϕ8mm※1 ϕ10mm※1 ϕ11mm ϕ12mm ϕ3/8″※1 ϕ1/2″	○
ASC10-6.5-84-34Z	●			84	34			A		○
ASC10-6.5-114-49Z	★			114	49			A		○
ASC10-6.5-114-24Z	★				24			A		○
ASC12-6.5-74-24Z	●	6.5	M6	74	24	11	12	B	ϕ8mm※1 ϕ10mm※1 ϕ11mm※1 ϕ12mm※1 ϕ3/8″※1 ϕ1/2″	○
ASC12-6.5-94-44Z	●			94	44			B		○
ASC12-M6-100-0	●			100	-	12		D		–
ASC12-6.5-129-64Z	★			129	64	11		B		○
ASC12-6.5-129-24Z	★				24			B		○
ASC16-8.5-95-30Z	●	8.5	M8	95	30	14.5	16	B	ϕ16mm※1 ϕ17mm ϕ18mm ϕ5/8″※1	○
ASC16-8.5-120-55Z	●			120	55					
ASC16-8.5-140-75Z	●			140	75					
ASC16-8.5-160-95Z	★			160	95					
ASC16-8.5-160-30Z	★			160	30					
ASC18-M10-125-0Z	●	10.5	M10	125	-	18	18	E	ϕ20mm※1 ϕ22mm ϕ3/4″※1	○
ASC20-10.5-120-50Z	★			120	50	18.5	20	B		○
ASC20-10.5-170-90Z	●			170	90					
ASC20-10.5-220-120Z	●			220	120					
ASC20-10.5-270-150Z	★			270	150					
ASC20-10.5-220-50Z	★	10.5	M10	220	50	18.5	20	B		○
ASC20-10.5-270-50Z	★			270						
ASC25-12.5-145-65	★	12.5	M12	145	65	23	25	C	ϕ25mm※1 ϕ28mm ϕ1″	○
ASC25-M12-150-0Z	●			150	-	25		E		
ASC25-12.5-215-115	●			215	115	23		C		
ASC25-12.5-265-145	●			265	145					
ASC25-12.5-315-195	★			315	195					
ASC25-12.5-265-65	★	12.5	M12	265	65	23	25	C		○
ASC25-12.5-315-65	★			315						
ASC32-17-160-80	★	17	M16	160	80	28	32	C	ϕ30mm※1 ϕ32mm※1 ϕ35mm <ϕ40mm> <ϕ42mm> ϕ1.25″※1 <ϕ1.5″>	○
ASC32-17-210-110	●			210	110					
ASC32-17-260-140	●			260	140					
ASC32-17-310-190	★			310	190					
ASC32-17-360-240	★			360	240					
ASC32-17-260-80	★	17	M16	260	80	28	32	C		○
ASC32-17-310-80	★			310						
ASC32-17-360-80	★			360						

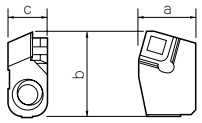
※1 Cutter Dia. is same or smaller than the shank dia.. Interference may occurs.

○= Tool with coolant hole

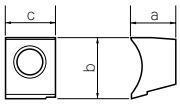
<ϕ40mm><ϕ42mm><ϕ1.5″> When using oversized screw on heads 40mm, 42mm and 1.5" diameter- maximum tool projection from holder is 200mm or 8″

Parts for Indexable Tools

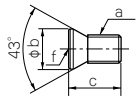
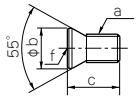
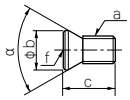
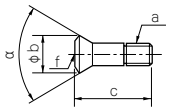
Locater

Shape	Item code	Size(mm)						Apply to tools
		a	b	c	d	e	f	
	351-111	20	31.05	12.2				ASF,IASF

Wedge

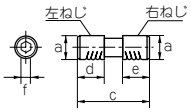
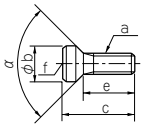
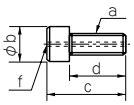
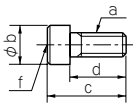
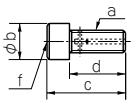
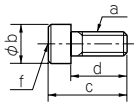
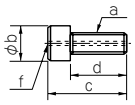
Shape	Item code	Size(mm)						Apply to tools
		a	b	c	d	e	f	
	176-121	10.0	13.5	14.6				ASF,IASF

Screw

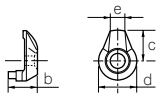
Shape	Item code	Fastening torque		Size(mm)					Apply to tools
		N・m	lbf・in	a	φb	c	α	f	
	261-140	1.1	9.74	M3×0.5	4.0	5.7	43°	T8	AR,IAR
	501-161	2.9	25.7	M4×0.7	5.1	7.5	43°	T15	
	240-140	0.5	4.43	M1.8×0.35	2.5	4.0	55°	T6	RH2P,IRH2P,AR,IAR,ASM,IASM,ASPVmini
	262-141	2.9	25.67	M4×0.7	5.5	10.5	55°	T15	TR4F,ITR4F,TR4D,ITR4D
	262-142	2.9	25.67	M4×0.7	5.5	9.5	55°	T15	ASRT,IASRT,ASRF,IASRF,AR,IAR,RV,IRV
	263-141	4.9	43.37	M5×0.8	7.2	12.5	55°	T20	AR,IAR
	265-141	2.0	17.70	M3×0.5	4.2	7.5	55°	T10	RV,IRV,ABP4F,IABP4F
	265-143	2.0	17.70	M3×0.5	4.2	6.3	55°	T10	GF2T,GF3L,ASRFmini,IASRFmini
	223-141	4.9	43.4	M5×0.8	7.0	11.5	60°	T20	AR,IAR
	242-141	2.9	25.7	M3.5×0.6	5.0	6.3	60°	T15	ASR,IASR,ASRT,IASRT
	250-140	0.5	4.4	M2×0.4	3.0	4.2	60°	T6	ABP4F,IABP4F
	250-141	1.1	9.7	M2.5×0.45	3.45	5.5	53°	T8	GF1,TD4N,ITD4N,ASR-Multi,IASR-Multi, AR,IAR,ABP4F,IABP4F,AHU,IAHU, ASPV,IASPV
	251-141	1.1	9.7	M2.5×0.45	3.45	6.0		T8	GF3L,AHU,IAHU
	412-141	2.9	25.7	M4×0.7	5.5	7.5	60°	T15	GF3L,ASR,IASR,ASR-Multi,IASR-Multi,AHU,IAHU
	555-141	4.9	43.4	M5×0.8	7.0	10.5	60°	T20	TR4F,ITR4F,ASR,IASR,ASRT,IASRT,ASDF IASDF,ASF,IASF
	581-140	0.5	4.4	M2×0.25	2.5	5.0	40°	T6	ARPF,IARPF,ABPF,IABPF,ABPFN,IABPFN
	581-141	1.1	9.7	M3×0.35	4.4	6.7	61°	T8	
	581-142	2.2	19.5	M3.5×0.35	5.7	8.1	61°	T10	ARPF,IARPF,ABPF,IABPF
	581-143	4.9	43.4	M5×0.5	6.8	9.8	61°	T20	GP1T,ARPF,IARPF,ABPF,IABPF
	581-144	4.9	43.4	M5×0.5	6.6	13.5	40°	T20	GP1LB,GP1T,ARPF,IARPF,ABPF,IABPF, ABPFN,IABPFN"
	581-145	6.9	61.1	M6×0.75	8.0	16.7	40°	T25	
	581-146	9.8	86.7	M6×0.75	9.5	21.8	40°	T30	
	581-147	9.8	86.7	M8×0.75	12.0	25.0	40°	T30	
	581-149	0.9	8.0	M2.5×0.35	3.3	6.7	40°	T7	ABPFN,IABPFN
	581-150	1.1	9.7	M3.0×0.35	3.8	7.6	40°	T8	
	581-151	2.2	19.5	M3.5×0.35	4.7	9.8	40°	T10	
	581-152	2.9	25.7	M4×0.5	5.7	13.5	40°	T15	
	155-158	2.2	19.5	M3.5×0.35	4.8	14.8	40°	T15	ABP4F,IABP4F
	155-159	2.9	25.7	M4×0.7	6.1	19.4	40°	T15	
	155-160	4.9	43.4	M5×0.5	6.6	22.9	40°	T20	

Parts for Indexable Tools

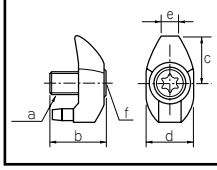
Screw

Shape	Item code	Size(mm)							Apply to tools
		a	φb	c	d	α	e	f	
	100-143	M8×1.0		17	6.5		6.5	4	ASF,IASF
	100-211	M10×1.5	16	45		60°	35	8	AR,IAR
	156-161	M5×0.8	8.5	15		90°	10	4	ASF,IASF
	200-150	M6×1.0	8.5	20.5		120°	17.5	T20	AR,IAR
	100-174	M10×1.5	16	35	25			8	ASR,IASR,ASRT,IASRT,ASRF,IASRF, ASR-Multi,IASR-Multi,ASF,IASF
	100-175	M10×1.5	16	35	25			8	AHU,IAHU,ASF,IASF
	100-176	M16×2.0	24	51	35			14	ASF,IASF
	100-177	M20×2.5	30	55	35			17	ASF,IASF
	100-178	M10×1.5	16	35	25			8	TR4F,ITR4F,TR4D,ITR4D,ASRT,IASRT,ASRF, IASRF,ASR-Multi,IASR-Multi,RV,IRV,ASPV,IASPV
	100-179	M12×1.75	18	42	30			10	TR4F,ITR4F,TR4D,ITR4D,ASRT,IASRT,ASRF,
	100-180	M16×2.0	24	51	35			14	IASRF,RV,IRV
	100-183	M8×1.25	13	33	25				RV,IRV
	100-212	M12×1.75	18	42	30			10	AHU,IAHU,ASF,IASF
	100-213	M16×2.0	24	51	35			14	ASR,IASR,ASRT,IASRT,ASRF,IASRF,ASF,IASF

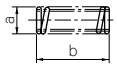
Clamp piece

Shape	Item code	Size(mm)						Apply to tools
		a	b	c	d	e	f	
	215-192		11.8	12.5	16	7.0		AR,IAR

Clamp piece set

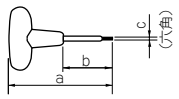
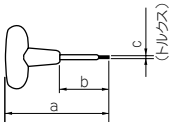
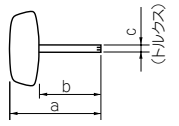
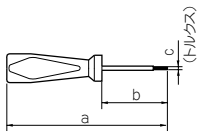
Shape	Item code	Fastening torque		Size(mm)						Apply to tools
		N・m	lbf・in	a	b	c	d	e	f	
	CM3.5-141	2.9	25.7	M3.5×0.6	9.7	6.5	7.6	3.0	T15	ASR,IASR,ASRT,IASRT, ASR-Multi,IASR-Multi,AR,IAR
	CM4-141	2.9	25.7	M4×0.7	12.7	8.0	8.2	3.0	T15	ASRT,IASRT,ASRF,IASRF,AR,IAR
	CM5-147	4.9	43.4	M5×0.8	13.0	9.0	9.0	3.0	T20	ASR,IASR,ASRT,IASRT,AR,IAR

Spring

Shape	Item code	Size(mm)						Apply to tools
		a	b	c	d	e	f	
	715-201	3.8	9.0					AR, IAR

Parts for Indexable Tools

Screw driver / Wrench

Shape	Item code	Size(mm)						Apply to tools
		a	b	c	d	e	f	
	100-221	83	33	4				ASF,IASF
	105-T20L	145	100	T20				ASDF,IASDF,ASDH,IASDH,ASF,IASF
	101-T25S	105	80	T25				GP1LB,GP1T,ARPF,IARPF,ABPF,IABPF
	105-T15	105	80	T15				TR4F,ITR4F,ASRT,IASRT,ASRF,IASRF,ASR-Multi IASR-Multi,AR,IAR,RV,IRV,AHU,IAHU
	105-T20	105	80	T20				TR4F,ITR4F,GP1LB,GP1T,ASR,IASR,ASRT IASRT,AR,IAR,ARPF,IARPF,ABPF,IABPF,ABPFN IABPFN,ABP4F,IABP4F,ASDF,IASDF,ASF,IASF
	105-T30A	132	101	T30				GP1LB,GP1T,ARPF,IARPF,ABPF,IABPF, ABPFN,IABPFN
	104-T6	115	45	T6				RH2P,IRH2P,AR,IAR,ARPF,IARPF,ABPF, IABPF,ABPFN,IABPFN,ABP4F,IABP4F,ASM, IASM,ASPVmini
	104-T7	164	64	T7				ABPFN,IABPFN
	104-T8	136	60	T8				GF1,GF3L,TD4N,ITD4N,ASR-Multi, IASR-Multi,AR,IAR,ARPF,IARPF,ABPF,IABPF, ABPFN,IABPFN,ABP4F,IABP4F,AHU,IAHU, ASPV,IASPV
	104-T10	176	80	T10				GF2T,GF3L,ASRFmini,IASRFmini,RV,IRV, ARPF,IARPF, ABPF,IABPF,ABPFN,IABPFN,ABP4F,IABP4F
	104-T15	176	80	T15				GF3L,ASR,IASR,ASRT,IASRT,AR,IAR,RV,IRV ABPFN,IABPFN,ABP4F,IABP4F,AHU,IAHU

Screw anti-seizure agent

Shape	Item code	Apply to tools
	P-37	GF1,GF2T,GF3L,GP1LB,GP1T,TR4F,ITR4F,TR4D,ITR4D,TD4N,ITD4N,ASR, IASR,ASRT,IASRT,ASRF,IASRF,ASRFmini,IASRFmini,ASR-Multi,IASR-Multi, RH2P,IRH2P,AR,IAR,RV,IRV,ARPF,IARPF,ABPF,IABPF,ABPFN,IABPFN,ABP4F, IABP4F,ASM,IASM,AHU,IAHU,ASPV-mini,ASPV,IASPV,ASDF,IASDF,ASF,IASF

Special Shape Tools

GALLEA

High Efficiency Finishing Special Shape Tool Series (Solid type)

GS4TN ····· E2

High Efficiency Finishing Indexable Special Shape Tool Series

GF1 ····· E5

GF2T ····· E8

GF3L ····· E11

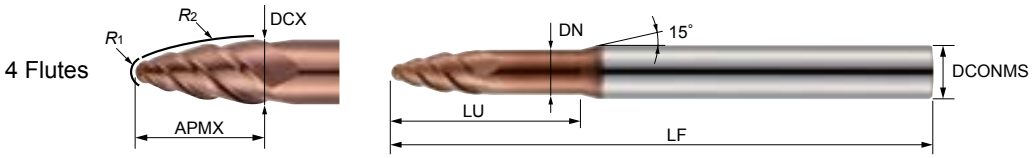
GP1LB ····· E14

GP1T ····· E17

GALLEA GS4TN

・Barrel R achieves high-efficiency and high-quality machining for tilted section
・Tip R can finish curved connecting faces to high quality
・Employs unique high helix shape and realizes low cutting force.

Carbide TH3 Helix angle 45° h5 Form tolerance : ±0.01 Cutting Conditions E3



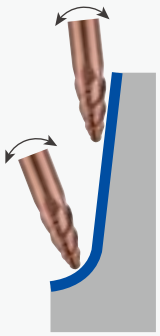
GS4TN○○.○○-○○.○○R-TH3

Item code	Stock	Size (mm)							
		Tip R	Barrel R	Tool dia.	Flute length	Under neck length	Neck dia.	Overall length	Shank dia.
		R_1	R_2	DCX	APMX	LU	DN	LF	DCONMS
GS4TN2.5-12.5R-TH3	●	0.5	12.5	2.5	4.68	10	2.4	50	4
GS4TN3.75-18.75R-TH3	●	0.75	18.75	3.75	7.01	15	3.65	50	4
GS4TN5-25R-TH3	●	1	25	5	9.35	20	4.8	60	6
GS4TN7.5-37.5R-TH3	●	1.5	37.5	7.5	14.03	30	7.3	75	8
GS4TN10-50R-TH3	●	2	50	10	18.70	40	9.5	100	12

・There is no regrinding compatibility for this tool. ・For the large diameter in size, use the indexable end mill "GP1T".
※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

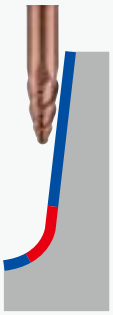
Machining method of GS4TN

When using with 5-axis machine



By using the barrel R with tilted tool axis, tilted section can be cut with large pitch.
Furthermore, it is possible to cut with less machining steps by using the tip R.

When using with 3-axis machine



Barrel R enables to cut steep face with large pitch.
However, it is necessary to process the bottom corner section with a separate tool.

Processable with GS4TN　Needs separate tool

Applicable work material

Carbon steel Alloy steel	Pre-hardened steel ≦ 45HRC	Hardened steel			Stainless steel	Titanium alloy Heat-resistant alloy	Copper alloy	Aluminum alloy
		> 45HRC ≦ 55HRC	> 55HRC ≦ 65HRC	> 65HRC				
○	◎	◎	◎	◎				

●：Inventory maintained in US

Recommended cutting conditions

Inch

●Barrel R cutting conditions

Work material		Carbon Steel, Alloy Steel (<35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～65HRC)				Hardened Steel (65～72HRC)			
Tip R R_1 (mm)	Barrel R R_2 (mm)	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch
0.5	12.5	23,550	120	.0087	.002～.0039	19,100	98	.0087	.002～.0039	17,830	77	.0087	.002～.0039	16,550	72	.0087	.004～.002	12,730	55	.0087	.004～.002
0.75	18.75	15,700	105	.0106	.002～.0039	13,840	97	.0106	.002～.0039	11,880	70	.0106	.002～.0039	11,370	65	.0106	.004～.002	8,570	48	.0106	.004～.002
1	25	11,780	100	.0126	.002～.0039	10,500	89	.0126	.002～.0039	9,130	66	.0126	.002～.0039	7,040	57	.0126	.004～.002	6,490	43	.0126	.004～.002
1.5	37.5	7,850	78	.0154	.002～.0039	6,930	70	.0154	.002～.0039	6,190	55	.0154	.002～.0039	4,460	48	.0154	.004～.002	4,290	36	.0154	.004～.002
2	50	5,890	66	.0177	.002～.0039	5,100	57	.0177	.002～.0039	4,510	44	.0177	.002～.0039	3,520	39	.0177	.004～.002	3,190	30	.0177	.004～.002

●Tip R cutting conditions

Work material		Carbon Steel, Alloy Steel (<35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～65HRC)				Hardened Steel (65～72HRC)			
Tip R R_1 (mm)	Barrel R R_2 (mm)	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch	Revolution n min^{-1}	Feed rate vf IPM	ap inch	ae inch
0.5	12.5	34,320	102	.0035	.0114	28,600	81	.0031	.0094	26,000	74	.0024	.0071	24,700	63	.0024	.0071	20,800	44	.0020	.0059
0.75	18.75	25,680	114	.0039	.0122	21,400	91	.0035	.0102	19,500	83	.0028	.0083	18,500	71	.0028	.0083	15,600	50	.0024	.0071
1	25	22,080	130	.0075	.0228	18,400	104	.0063	.0189	16,700	94	.0051	.0154	15,900	81	.0047	.0142	13,400	57	.0039	.0118
1.5	37.5	20,400	129	.0110	.0339	17,000	103	.0094	.0283	15,400	73	.0079	.0236	14,300	68	.0075	.0224	11,000	52	.0059	.0177
2	50	15,600	120	.0150	.0453	13,000	96	.0126	.0378	11,000	69	.0106	.0319	10,560	62	.0098	.0295	7,920	47	.0079	.0236

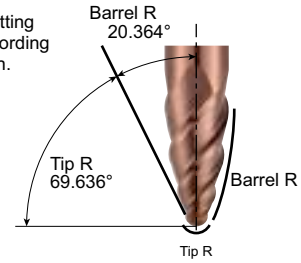
●Cutting conditions for using both barrel R and tip R

Work material		Carbon Steel, Alloy Steel (<35HRC)		Pre-hardened Steel (35～45HRC)		Hardened Steel (45～55HRC)		Hardened Steel (55～65HRC)		Hardened Steel (65～72HRC)	
Tip R R_1 (mm)	Barrel R R_2 (mm)	Revolution n min^{-1}	Feed rate vf IPM	Revolution n min^{-1}	Feed rate vf IPM	Revolution n min^{-1}	Feed rate vf IPM	Revolution n min^{-1}	Feed rate vf IPM	Revolution n min^{-1}	Feed rate vf IPM
0.5	12.5	28,940	111	23,850	89	21,920	76	20,630	67	16,770	50
0.75	18.75	20,690	109	17,620	94	15,690	77	14,940	68	12,090	49
1	25	16,930	115	14,450	97	12,920	80	11,470	69	9,950	50
1.5	37.5	14,130	104	11,970	87	10,800	64	9,380	58	7,650	44
2	50	10,750	93	9,050	77	7,760	57	7,040	51	5,560	39

※For cutting depth (ap, ae), refer to the above conditions for each section.

■Angle range of barrel R and tip R

Depending on the cutting shape, the contact section is divided into barrel R and tip R. Check the contact section and select the appropriate cutting conditions according to each section.

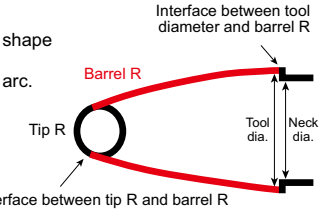


Determine the ap value based on the desired cusp height by selecting it from the table below.

Tool		Cusp height (inch)					
Order No.	Barrel R (mm)	.000004	.000012	.00002	.000039	.000118	.000197
GS4TN2.5-12.5R-TH3	12.5	.0039	.0067	.0087	.0126	.0217	.0280
GS4TN3.75-18.75R-TH3	18.75	.0047	.0083	.0106	.0154	.0264	.0343
GS4TN5-25R-TH3	25	.0055	.0094	.0126	.0177	.0303	.0394
GS4TN7.5-37.5R-TH3	37.5	.0067	.0118	.0154	.0217	.0374	.0480
GS4TN10-50R-TH3	50	.0079	.0138	.0177	.0248	.0433	.0555

■ About tool shape

"Barrel R" of GS4TN has a shape that connects "tip R" and "tool diameter" with double arc. See the figure on the right.



【Note】

①Use the appropriate coolant for the work material and machining shape.
②Use a machine having as high rigidity and high accuracy as possible.
③These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

GALLEA GS4TN

Recommended cutting conditions

Metric

●Barrel R cutting conditions

Work material		Carbon Steel, Alloy Steel (<35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～65HRC)				Hardened Steel (65～72HRC)			
Tip R R_1 (mm)	Barrel R R_2 (mm)	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm
0.5	12.5	23,550	3,060	0.22	0.05～0.1	19,100	2,480	0.22	0.05～0.1	17,830	1,960	0.22	0.05～0.1	16,550	1,820	0.22	0.01～0.05	12,730	1,400	0.22	0.01～0.05
0.75	18.75	15,700	2,670	0.27	0.05～0.1	13,840	2,460	0.27	0.05～0.1	11,880	1,780	0.27	0.05～0.1	11,370	1,640	0.27	0.01～0.05	8,570	1,230	0.27	0.01～0.05
1	25	11,780	2,540	0.32	0.05～0.1	10,500	2,260	0.32	0.05～0.1	9,130	1,670	0.32	0.05～0.1	7,040	1,440	0.32	0.01～0.05	6,490	1,100	0.32	0.01～0.05
1.5	37.5	7,850	1,990	0.39	0.05～0.1	6,930	1,780	0.39	0.05～0.1	6,190	1,390	0.39	0.05～0.1	4,460	1,230	0.39	0.01～0.05	4,290	920	0.39	0.01～0.05
2	50	5,890	1,680	0.45	0.05～0.1	5,100	1,460	0.45	0.05～0.1	4,510	1,130	0.45	0.05～0.1	3,520	1,000	0.45	0.01～0.05	3,190	770	0.45	0.01～0.05

●Tip R cutting conditions

Work material		Carbon Steel, Alloy Steel (<35HRC)				Pre-hardened Steel (35～45HRC)				Hardened Steel (45～55HRC)				Hardened Steel (55～65HRC)				Hardened Steel (65～72HRC)			
Tip R R_1 (mm)	Barrel R R_2 (mm)	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm	Revolution n min^{-1}	Feed rate vf mm/min	a_p mm	a_e mm
0.5	12.5	34,320	2,580	0.09	0.29	28,600	2,060	0.08	0.24	26,000	1,870	0.06	0.18	24,700	1,600	0.06	0.18	20,800	1,120	0.05	0.15
0.75	18.75	25,680	2,890	0.10	0.31	21,400	2,310	0.09	0.26	19,500	2,110	0.07	0.21	18,500	1,800	0.07	0.21	15,600	1,260	0.06	0.18
1	25	22,080	3,310	0.19	0.58	18,400	2,650	0.16	0.48	16,700	2,400	0.13	0.39	15,900	2,060	0.12	0.36	13,400	1,450	0.10	0.30
1.5	37.5	20,400	3,280	0.28	0.86	17,000	2,620	0.24	0.72	15,400	1,850	0.20	0.60	14,300	1,720	0.19	0.57	11,000	1,320	0.15	0.45
2	50	15,600	3,040	0.38	1.15	13,000	2,430	0.32	0.96	11,000	1,760	0.27	0.81	10,560	1,580	0.25	0.75	7,920	1,190	0.20	0.60

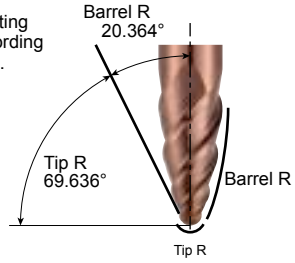
●Cutting conditions for using both barrel R and tip R

Work material		Carbon Steel, Alloy Steel (<35HRC)		Pre-hardened Steel (35～45HRC)		Hardened Steel (45～55HRC)		Hardened Steel (55～65HRC)		Hardened Steel (65～72HRC)	
Tip R R_1 (mm)	Barrel R R_2 (mm)	Revolution n min^{-1}	Feed rate vf mm/min	Revolution n min^{-1}	Feed rate vf mm/min	Revolution n min^{-1}	Feed rate vf mm/min	Revolution n min^{-1}	Feed rate vf mm/min	Revolution n min^{-1}	Feed rate vf mm/min
0.5	12.5	28,940	2,820	23,850	2,270	21,920	1,920	20,630	1,710	16,770	1,260
0.75	18.75	20,690	2,780	17,620	2,390	15,690	1,950	14,940	1,720	12,090	1,250
1	25	16,930	2,930	14,450	2,460	12,920	2,040	11,470	1,750	9,950	1,280
1.5	37.5	14,130	2,640	11,970	2,200	10,800	1,620	9,380	1,480	7,650	1,120
2	50	10,750	2,360	9,050	1,950	7,760	1,450	7,040	1,290	5,560	980

※For cutting depth (a_p, a_e), refer to the above conditions for each section.

■Angle range of barrel R and tip R

Depending on the cutting shape, the contact section is divided into barrel R and tip R. Check the contact section and select the appropriate cutting conditions according to each section.

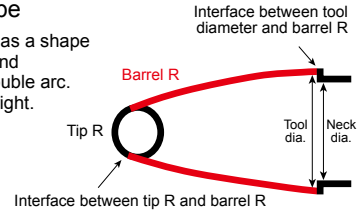


Determine the a_p value based on the desired cusp height by selecting it from the table below.

Tool		Cusp height (mm)					
Order No.	Barrel R (mm)	0.0001	0.0003	0.0005	0.001	0.003	0.005
GS4TN2.5-12.5R-TH3	12.5	0.10	0.17	0.22	0.32	0.55	0.71
GS4TN3.75-18.75R-TH3	18.75	0.12	0.21	0.27	0.39	0.67	0.87
GS4TN5-25R-TH3	25	0.14	0.24	0.32	0.45	0.77	1.00
GS4TN7.5-37.5R-TH3	37.5	0.17	0.30	0.39	0.55	0.95	1.22
GS4TN10-50R-TH3	50	0.20	0.35	0.45	0.63	1.10	1.41

■ About tool shape

"Barrel R" of GS4TN has a shape that connects "tip R" and "tool diameter" with double arc. See the figure on the right.



【Note】

①Use the appropriate coolant for the work material and machining shape.
②Use a machine having as high rigidity and high accuracy as possible.
③These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④If the rpm of the machine is low, lower the feed rate also to put the rpm and feed rate in the same ratio.

GALLEA GF1

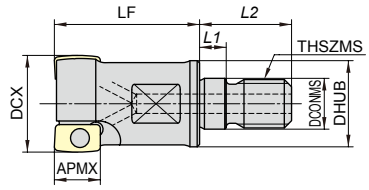
・A new proposal for reducing finishing time.
・Contour Z pitch can be set to larger values.

Semi Finishing | Finishing | Side milling | Cutting Conditions E6

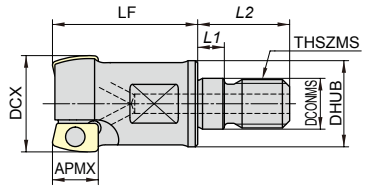
Modular type

GF1□20○○M-○-M○○

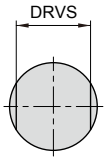
Numeric figure in a circle ◌ and Alphabetical character comes in a square □



Basic type



Offset type

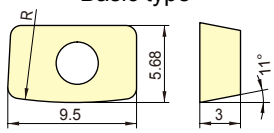


Type	Item code	Stock	No.of flutes	Size (mm) DCX	LF	APMX	DCONMS	THSZMS	DHUB	L1	L2	DRVS	Insert
Basic type	GF1G2016M-2-M8	●	2	16	25	9.5	8.5	M8	14	5.5	17	10	XPHW0903R-20 XPHW0903R-30
	GF1G2020M-3-M10	●	3	20	30	9.5	10.5	M10	17.8	5.5	19	15	
	GF1G2025M-4-M10	●	4	25	30	9.5	10.5	M10	17.8	5.5	19	15	
	GF1G2025M-4-M12	●	4	25	35	9.5	12.5	M12	22.5	5.5	22	17	
Offset type	GF1T2016M-2-M8	●	2	16	25	9.5	8.5	M8	14	5.5	17	10	YPHW0903R-20 YPHW0903R-30
	GF1T2020M-3-M10	●	3	20	30	9.5	10.5	M10	17.8	5.5	19	15	
	GF1T2025M-4-M12	●	4	25	35	9.5	12.5	M12	22.5	5.5	22	17	

【Note】Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".
※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

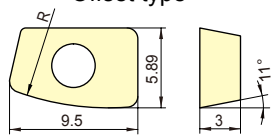
Inserts

Basic type



XPHW0903R-○○

Offset type



YPHW0903R-○○

P	Carbon steel, Alloy steel	■	□
M	SUS, etc.	■	
K	Cast iron	□	■
H	Hardened steel		■

■ : General cutting, First recommended
□ : General cutting, Second recommended

Type	Item code	Tolerance class	PN215	TH315	Size (mm) R
Basic type	XPHW0903R-20	H	●	●	20
	XPHW0903R-30		●	●	30
Offset type	YPHW0903R-20		●	●	20
	YPHW0903R-30		●	●	30

※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Parts

Shape / Cutter body	Clamp screw	Fastening torque (N·m)	Screw driver	Screw anti-seizure agent
GF1□20○○M-○-M○○	250-141	1.1	104-T8	P-37

【Note】The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

● : Inventory maintained in US

GALLEA GF1

Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

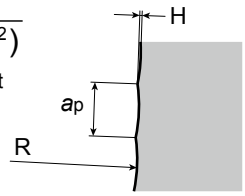
Work material	Recommended grade	Cutting condition	φ16mm	φ20mm	φ25mm
Carbon Steel Alloy Steel (<30HRC)	※ PN215	n (min-1)	11,950	9,560	7.650
		vc (SFM)	1,969	1,969	1,969
		vf (IPM)	188	226	241
		fz (IPT)	.0079	.0079	.0079
		ap (inch)	Refer right table		
		ae (inch)	~.0039	~.0039	~.0039
Carbon Steel Alloy Steel (30~45HRC)	PN215 TH315	n (min-1)	7,970	6,370	5.100
		vc (SFM)	1,312	1,312	1,312
		vf (IPM)	126	151	161
		fz (IPT)	.0079	.0079	.0079
		ap (inch)	Refer right table		
		ae (inch)	~.0039	~.0039	~.0039
Stainless Steel SUS	PN215	n (min-1)	9,960	7,970	6.370
		vc (SFM)	1,640	1,640	1,640
		vf (IPM)	157	189	201
		fz (IPT)	.0079	.0079	.0079
		ap (inch)	Refer right table		
		ae (inch)	~.0039	~.0039	~.0039
Cast Iron Ductile Cast Iron	TH315 PN215	n (min-1)	11,950	9.560	7.650
		vc (SFM)	1,969	1,969	1,969
		vf (IPM)	235	282	301
		fz (IPT)	.0098	.0098	.0098
		ap (inch)	Refer right table		
		ae (inch)	~.0039	~.0039	~.0039
Hardened Steel (45~55HRC)	TH315 PN215	n (min-1)	4,980	3.990	3.190
		vc (SFM)	820	820	820
		vf (IPM)	59	71	76
		fz (IPT)	.0059	.0059	.0059
		ap (inch)	Refer right table		
		ae (inch)	~.0032	~.0032	~.0032

Determine the ap value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert		Cusp height (inch)					
Item code	R (mm)	.00004	.00008	.00012	.00016	.0002	.00039
XPHW0903R-20	20	.015	.022	.027	.031	.035	.049
XPHW0903R-30	30	.019	.027	.033	.038	.043	.061

$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$

R : Tool R　H : Cusp height



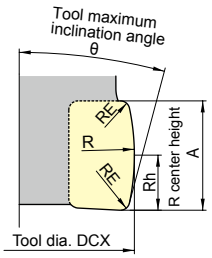
※When overhang length is 3DCX or greater, adjust the values shown in the table at left according to the table below.

Overhang ratio	vc (SFM)	vf (IPM)
<3DCX	100%	100%
3DCX ~ 5DCX	70%	70%
5DCX ~ 6DCX	60%	60%
6DCX ~ 7DCX	50%	50%
7DCX ~	45%	45%

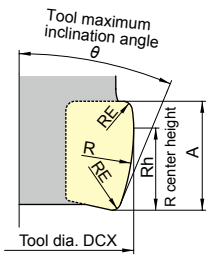
【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Flute tip shape definitions for programing



Basic type



Offset type

Rotation locus shape will be different depending on the combination of insert and tool diameter. Refer to the table below.

	Basic type						Offset type					
Insert item code	XPHW0903R-20			XPHW0903R-30			YPHW0903R-20			YPHW0903R-30		
Tool dia. DCX(mm)	φ16	φ20	φ25	φ16	φ20	φ25	φ16	φ20	φ25	φ16	φ20	φ25
R (inch)	.793	.787	.785	1.196	1.181	1.174	.795	.787	.784	1.194	1.181	1.174
Rh (inch)	.187	.187	.187	.187	.187	.187	.285	.285	.285	.285	.285	.285
RE (inch)	.032	.032	.032	.032	.032	.032	.032	.032	.032	.032	.032	.032
A (inch)	.374	.374	.374	.374	.374	.374	.374	.374	.374	.374	.374	.374
θ	11°	11°	11°	7°	7°	7°	19°	19°	19°	12°	12°	12°

【Note】

The numbers after the third decimal point are rounded off. When defining the shape parametrically, check the required dimensions from the DXF data.

Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

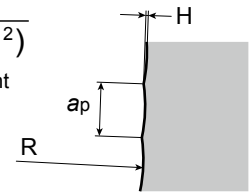
Work material	Recommended grade	Cutting condition	φ16mm	φ20mm	φ25mm
Carbon Steel Alloy Steel (<30HRC)	※ PN215	n (min^{-1})	11,950	9,560	7,650
		v_c (m/min)	600	600	600
		v_f (mm/min)	4,780	5,740	6,120
		f_z (mm/t)	0.2	0.2	0.2
		a_p (mm)	Refer right table		
		a_e (mm)	~0.1	~0.1	~0.1
Carbon Steel Alloy Steel (30~45HRC)	PN215 TH315	n (min^{-1})	7,970	6,370	5,100
		v_c (m/min)	400	400	400
		v_f (mm/min)	3,190	3,830	4,080
		f_z (mm/t)	0.2	0.2	0.2
		a_p (mm)	Refer right table		
		a_e (mm)	~0.1	~0.1	~0.1
Stainless Steel SUS	PN215	n (min^{-1})	9,960	7,970	6,370
		v_c (m/min)	500	500	500
		v_f (mm/min)	3,990	4,790	5,100
		f_z (mm/t)	0.2	0.2	0.2
		a_p (mm)	Refer right table		
		a_e (mm)	~0.1	~0.1	~0.1
Cast Iron Ductile Cast Iron	TH315 PN215	n (min^{-1})	11,950	9,560	7,650
		v_c (m/min)	600	600	600
		v_f (mm/min)	5,980	7,170	7,650
		f_z (mm/t)	0.25	0.25	0.25
		a_p (mm)	Refer right table		
		a_e (mm)	~0.1	~0.1	~0.1
Hardened Steel (45~55HRC)	TH315 PN215	n (min^{-1})	4,980	3,990	3,190
		v_c (m/min)	250	250	250
		v_f (mm/min)	1,500	1,800	1,920
		f_z (mm/t)	0.15	0.15	0.15
		a_p (mm)	Refer right table		
		a_e (mm)	~0.08	~0.08	~0.08

Determine the a_p value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert		Cusp height (mm)					
Item code	R (mm)	0.001	0.002	0.003	0.004	0.005	0.01
XPHW0903R-20	20	0.4	0.57	0.69	0.8	0.89	1.26
XPHW0903R-30	30	0.49	0.69	0.85	0.98	1.1	1.55

$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$

R : Tool R　H : Cusp height



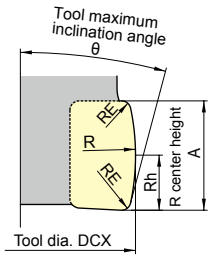
※When overhang length is 3DCX or greater, adjust the values shown in the table at left according to the table below.

Overhang ratio	v_c (m/min)	v_f (mm/min)
<3DCX	100%	100%
3DCX ~ 5DCX	70%	70%
5DCX ~ 6DCX	60%	60%
6DCX ~ 7DCX	50%	50%
7DCX ~	45%	45%

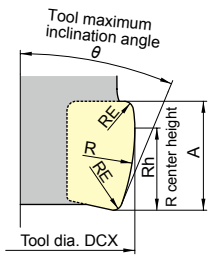
【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Flute tip shape definitions for programing



Basic type



Offset type

Rotation locus shape will be different depending on the combination of insert and tool diameter. Refer to the table below.

	Basic type						Offset type					
Insert item code	XPHW0903R-20			XPHW0903R-30			YPHW0903R-20			YPHW0903R-30		
Tool dia. DCX	φ16	φ20	φ25	φ16	φ20	φ25	φ16	φ20	φ25	φ16	φ20	φ25
R (mm)	20.14	20	19.93	30.38	30	29.82	20.18	20	19.91	30.33	30	29.81
Rh (mm)	4.75	4.75	4.75	4.75	4.75	4.75	7.25	7.25	7.25	7.25	7.25	7.25
RE (mm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
A (mm)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
θ	11°	11°	11°	7°	7°	7°	19°	19°	19°	12°	12°	12°

【Note】

The numbers after the third decimal point are rounded off. When defining the shape parametrically, check the required dimensions from the DXF data.

GALLEA GF2T

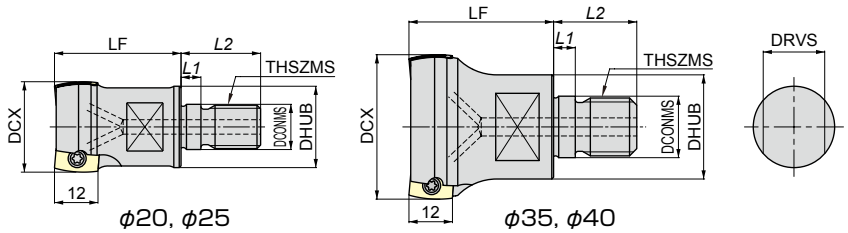
- High-performance tilted wall finishing! Enables machining at a larger pitch than ball end mills or radius end mills.
- Series expansion toward larger diameters
- Economical 2-corner specification. Unique insert holding surface enables realization of 2-corner specification

Semi Finishing | Finishing | Side milling | Cutting Conditions E9

Modular type

GF2T30○○M-○

Numeric figure in a circle ○ and Alphabetical character comes in a square ⬚

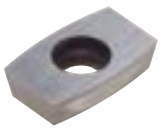


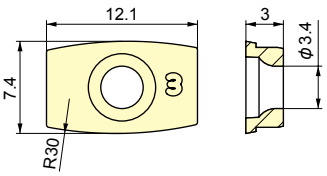
Type	Item code	Stock	No. of flutes	Size (mm)								Insert
				DCX	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
Offset type	**GF2T3020M-3**	★	3	20	30	10.5	M10	17.8	5.5	19	15	YPHW1203R-30
	GF2T3025M-4	★	4	25	35	12.5	M12	22.5	5.5	22	17	
	GF2T3035M-5	★	5	35	40	17	M16	28.8	6	23	22	
	GF2T3040M-6	★	6	40	40	17	M16	28.8	6	23	22	

【Note】 Do not apply lubricants such as grease, etc. to the “contact faces” and “modular screws” of the “modular mill”, “special shanks” and “special arbor”.

※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Inserts





P	Carbon steel, Alloy steel	■	⊔	■ : General cutting, First recommended
M	SUS, etc.	■		⊔ : General cutting, Second recommended
K	Cast iron	⊔	■	
H	Hardened steel		■	

Item code	Tolerance class	Grade		Size (mm)
		PN215	TH315	R
YPHW1203R-30	H	★	★	30

※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Parts

Shape / Cutter body	Clamp screw	Fastening torque (N·m)	Screw driver	Screw anti-seizure agent
GF2T30○○M-○	**265-143**	**2.0**	**104-T10**	**P-37**

【Note】 The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

★ : Inventory maintained in Japan

Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

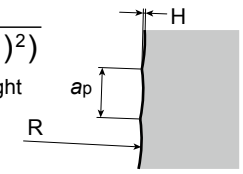
Work material	Recommended grade	Cutting conditions	ϕ20mm	ϕ25mm	ϕ35mm	ϕ40mm
Carbon Steel Alloy Steel (<30HRC)	PN215	n (min^{-1})	9,560	7,650	5,460	4,780
		v_c (SFM)	1,969	1,969	1,969	1,969
		v_f (IPM)	226	241	215	226
		f_z (IPT)	.0079	.0079	.0079	.0079
		a_p (inch)	Refer to the table at right.			
		a_e (inch)	<.0039	<.0039	<.0039	<.0039
Carbon Steel Alloy Steel (30~45HRC)	PN215 TH315	n (min^{-1})	6,370	5,100	3,640	3,190
		v_c (SFM)	1,312	1,312	1,312	1,312
		v_f (IPM)	151	161	143	151
		f_z (IPT)	.0079	.0079	.0079	.0079
		a_p (inch)	Refer to the table at right.			
		a_e (inch)	<.0039	<.0039	<.0039	<.0039
Stainless Steel	PN215	n (min^{-1})	7,970	6.370	4,550	3,990
		v_c (SFM)	1,640	1,640	1,640	1,640
		v_f (IPM)	189	201	179	189
		f_z (IPT)	.0079	.0079	.0079	.0079
		a_p (inch)	Refer to the table at right.			
		a_e (inch)	<.0039	<.0039	<.0039	<.0039
Cast Iron Ductile Cast Iron	TH315 PN215	n (min^{-1})	9,560	7,650	5,460	4,780
		v_c (SFM)	1,969	1,969	1,969	1,969
		v_f (IPM)	282	301	269	282
		f_z (IPT)	.0098	.0098	.0098	.0098
		a_p (inch)	Refer to the table at right.			
		a_e (inch)	<.0039	<.0039	<.0039	<.0039
Hardened Steel (45~55HRC)	TH315 PN215	n (min^{-1})	3,990	3,190	2.280	2,000
		v_c (SFM)	820	820	820	820
		v_f (IPM)	71	76	67	71
		f_z (IPT)	.0059	.0059	.0059	.0059
		a_p (inch)	Refer to the table at right.			
		a_e (inch)	<.0031	<.0031	<.0031	<.0031

Determine the a_p value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert		Cusp height (inch)					
Item code	R (mm)	.00004	.00008	.00012	.00016	.00020	.00039
YPHW1203R-30	30	.019	.027	.033	.039	.043	.061

$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$

R : Tool R　H : Cusp height



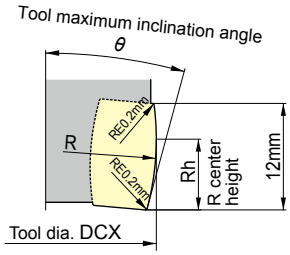
※When overhang length is 3DCX or more, adjust the values shown in the table at left according to the table below.

Overhang ratio	v_c (SFM)	v_f (IPM)
<3DCX	100%	100%
3DCX ~ 5DCX	70%	70%
5DCX ~ 6DCX	60%	60%
6DCX ~ 7DCX	50%	50%
7DCX ~	45%	45%

【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Flute tip shape definitions for programing



Offset type

Rotation locus shape will be different depending on the combination of insert and tool diameter. Refer to the table below.

	Offset type			
Insert item code	YPHW1203-R30			
Tool dia. DCX (mm)	ϕ20	ϕ25	ϕ35	ϕ40
R (inch)	1.19	1.18	1.17	1.17
Rh (inch)	.312	.315	.315	.315
θ	14.9°	15°	15.2°	15.3°

【Note】

The numbers after the third decimal point are rounded off. When defining the shape parametrically, check the required dimensions from the DXF data.

GALLEA GF2T

Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

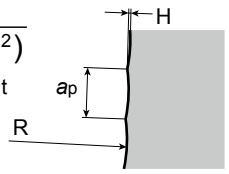
Work material	Recommended grade	Cutting conditions	ϕ20mm	ϕ25mm	ϕ35mm	ϕ40mm
Carbon Steel Alloy Steel (<30HRC)	**PN215**	*n* (min^{-1})	9,560	7,650	5,460	4,780
		vc (m/min)	600	600	600	600
		vf (mm/min)	5,740	6,120	5,460	5,740
		fz (mm/t)	0.2	0.2	0.2	0.2
		ap (mm)	Refer to the table at right.			
		ae (mm)	<0.1	<0.1	<0.1	<0.1
Carbon Steel Alloy Steel (30～45HRC)	**PN215** **TH315**	*n* (min^{-1})	6,370	5,100	3,640	3,190
		vc (m/min)	400	400	400	400
		vf (mm/min)	3,830	4,080	3,640	3,830
		fz (mm/t)	0.2	0.2	0.2	0.2
		ap (mm)	Refer to the table at right.			
		ae (mm)	<0.1	<0.1	<0.1	<0.1
Stainless Steel	**PN215**	*n* (min^{-1})	7,970	6,370	4,550	3,990
		vc (m/min)	500	500	500	500
		vf (mm/min)	4,790	5,100	4,550	4,790
		fz (mm/t)	0.2	0.2	0.2	0.2
		ap (mm)	Refer to the table at right.			
		ae (mm)	<0.1	<0.1	<0.1	<0.1
Cast Iron Ductile Cast Iron	**TH315** **PN215**	*n* (min^{-1})	9,560	7,650	5,460	4,780
		vc (m/min)	600	600	600	600
		vf (mm/min)	7,170	7,650	6,830	7,170
		fz (mm/t)	0.25	0.25	0.25	0.25
		ap (mm)	Refer to the table at right.			
		ae (mm)	<0.1	<0.1	<0.1	<0.1
Hardened Steel (45～55HRC)	**TH315** **PN215**	*n* (min^{-1})	3,990	3,190	2,280	2,000
		vc (m/min)	250	250	250	250
		vf (mm/min)	1,800	1,920	1,710	1,800
		fz (mm/t)	0.15	0.15	0.15	0.15
		ap (mm)	Refer to the table at right.			
		ae (mm)	<0.08	<0.08	<0.08	<0.08

Determine the *ap* value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert		Cusp height (mm)					
Item code	R (mm)	**0.001**	**0.002**	**0.003**	**0.004**	**0.005**	**0.01**
YPHW1203R-30	30	0.49	0.69	0.85	0.98	1.1	1.55

$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$

R : Tool R　H : Cusp height



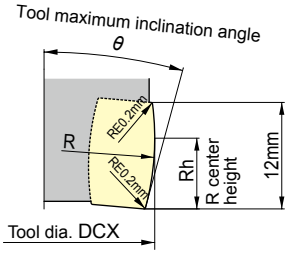
※When overhang length is 3DCX or more, adjust the values shown in the table at left according to the table below.

Overhang ratio	*vc* (m/min)	*vf* (mm/min)
<3DCX	100%	100%
3DCX ～ 5DCX	70%	70%
5DCX ～ 6DCX	60%	60%
6DCX ～ 7DCX	50%	50%
7DCX ～	45%	45%

【Note】

①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Flute tip shape definitions for programing



Offset type

Rotation locus shape will be different depending on the combination of insert and tool diameter. Refer to the table below.

	Offset type			
Insert item code	**YPHW1203-R30**			
Tool dia. DCX (mm)	**ϕ20**	**ϕ25**	**ϕ35**	**ϕ40**
R (mm)	30.24	30	29.84	29.78
Rh (mm)	7.92	8	8	8
θ	14.9°	15°	15.2°	15.3°

【Note】

The numbers after the third decimal point are rounded off. When defining the shape parametrically, check the required dimensions from the DXF data.

GALLEA GF3L

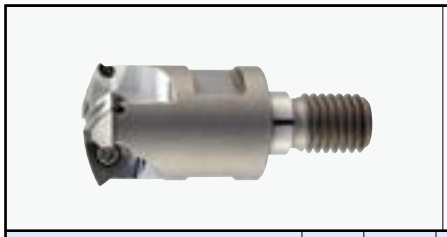
- Lens tool for semi-finishing to finishing machining on gentle curved surfaces and gentle sloped surfeces.
- Using GALLEA series together it is possible to process from semi-finishing to finishing with high efficiency
- Economical three corner specification insert tip

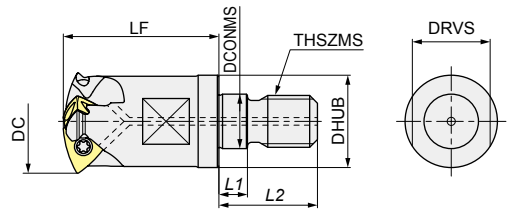
Semi Finishing | Finishing | Profiling | Cutting Conditions E12

Modular type

GF3L○○M-3-M○○

Numeric figure in a circle ◌

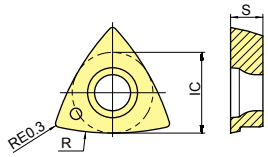




Item code	Stock	No. of Inserts	Size (mm)								Insert
			DC	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
GF3L20M-3-M10	★	3	**20**	30	10.5	M10	17.8	5.5	19	15	TPHW0902-20
GF3L25M-3-M12	★	3	**25**	35	12.5	M12	22.5	5.5	22	17	TPHW1303-25
GF3L30M-3-M16	★	3	**30**	40	17	M16	28.8	6	23	22	TPHW1403-30

【Note】 Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".
※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Inserts



P	Carbon Steel, Alloy Steel	■	□	■ : General cutting, First recommended
M	Stainless Steel, etc.	■		□ : General cutting, Second recommended
K	Cast Iron・Ductile Cast Iron	□	■	
H	Hardened Steel		■	

Order No.	Tolerance class	Grade		Size(mm)		
		PN215	TH315	IC	S	R
TPHW0902-20	H	★	★	6.5	2.6	20
TPHW1303-25		★	★	8.2	3.0	25
TPHW1403-30		★	★	9.8	3.2	30

※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

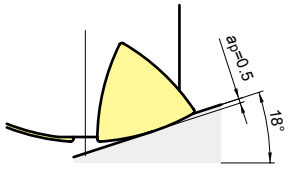
Parts

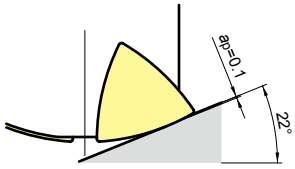
Parts / Shape / Cutter body	Clamp screw	Fastening torque (N·m)	Wrench	Screw anti-seizure agent
GF3L20M-3-M10	**251-141**	**1.1**	**104-T8**	**P-37**
GF3L25M-3-M12	**265-143**	**2.0**	**104-T10**	
GF3L30M-3-M16	**412-141**	**2.9**	**104-T15**	

【Note】 The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

Usable range of cutting edge for GF3L type

Semi-finishing | **Finishing**





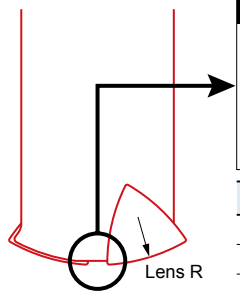
	a_p max finishing allowance	Available cutting range
Semi-finishing	0.5mm	18°
Finishing	0.1mm	22°

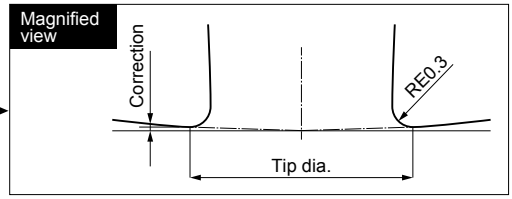
Because of GF3L type does not have a peripheral cutting edge, cutting range changes according to cutting depth (a_p).

★ : Inventory maintained in Japan

Correction of tool length measurement value

GF3L type does not have cutting edge in the tool center. When create toolpath with lens tool definition, correct the measurement value of tool length. When using a CAM that can define a tool shape with CAM and DXF data that can define a tool shape, it is unnecessary to correct the tool length measurement value.





	Correction (mm)	Tip dia.(mm)
GF3L20M-3-M10	0.058	3.0
GF3L25M-3-M12	0.056	3.3
GF3L30M-3-M16	0.062	3.9

GALLEA GF3L

Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting condition	Finishing			Semi-finishing		
			ϕ20mm	ϕ25mm	ϕ30mm	ϕ20mm	ϕ25mm	ϕ30mm
Carbon Steel Alloy Steel (<30HRC)	PN215	*n* (min^{-1})	11,470	9,180	7,650	4,780	3,830	3,190
		vc (SFM)	2,362	2,362	2,362	984	984	984
		vf (IPM)	271	217	181	282	226	189
		fz (IPT)	.0079	.0079	.0079	.0197	.0197	.0197
		ap (inch)	.0039	.0039	.0039	.0197	.0197	.0197
		ae (inch)	Refer below table			Refer below table		
Carbon Steel Alloy Steel (30～45HRC)	PN215 TH315	*n* (min^{-1})	8,290	6,630	5,530	3,190	2,550	2,130
		vc (SFM)	1,706	1,706	1,706	656	656	656
		vf (IPM)	196	157	131	189	151	126
		fz (IPT)	.0079	.0079	.0079	.0197	.0197	.0197
		ap (inch)	.0039	.0039	.0039	.0197	.0197	.0197
		ae (inch)	Refer below table			Refer below table		
Stainless Steel	PN215	*n* (min^{-1})	7,970	6,370	5,310	4,780	3,830	3,190
		vc (SFM)	1,640	1,640	1,640	984	984	984
		vf (IPM)	189	151	126	282	226	189
		fz (IPT)	.0079	.0079	.0079	.0197	.0197	.0197
		ap (inch)	.0039	.0039	.0039	.0197	.0197	.0197
		ae (inch)	Refer below table			Refer below table		
Cast Iron Ductile Cast Iron	TH315 PN215	*n* (min^{-1})	10,360	8,290	6,910	6,370	5,100	4,250
		vc (SFM)	2,133	2,133	2,133	1,312	1,312	1,312
		vf (IPM)	367	294	0	376	301	251
		fz (IPT)	.0118	.0118	.0118	.0197	.0197	.0197
		ap (inch)	.0039	.0039	.0039	.0197	.0197	.0197
		ae (inch)	Refer below table			Refer below table		
Hardened Steel (45～55HRC)	TH315	*n* (min^{-1})	3,990	3,190	2,660	1,920	1,530	1,280
		vc (SFM)	820	820	820	394	394	394
		vf (IPM)	94	76	63	23	18	15
		fz (IPT)	.0079	.0079	.0079	.0059	.0059	.0059
		ap (inch)	.0031	.0031	.0031	.0079	.0079	.0079
		ae (inch)	Refer below table			Refer below table		

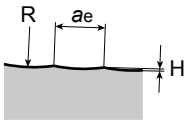
How to calculate "*ae*"

Determine the *ae* value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert	R (mm)	Cusp height (inch)						
		.00004	.00008	.00012	.00016	.00020	.00039	.00079
TPHW0902-20	20	.016	.022	.027	.031	.035	.050	.070
TPHW1303-25	25	.018	.025	.030	.035	.039	.056	.079
TPHW1403-30	30	.019	.027	.033	.039	.043	.061	.086

$$a_e = 2\sqrt{(R^2-(R-H)^2)}$$

R：Tool R　H：Cusp height



【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Ajustment ratio of cutting conditions by overhang length.

When overhang length is 3DC or more, please adjust the values in the above cutting condition table referring to the right table.

Overhang ratio	*Vc* (SFM)	*Vf* (IPM)
<3DC	100%	100%
3DC ～ 5DC	70%	70%
5DC ～ 6DC	60%	60%
6DC ～ 7DC	50%	50%
7DC ～	45%	45%

Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting condition	Finishing			Semi-finishing		
			φ20mm	φ25mm	φ30mm	φ20mm	φ25mm	φ30mm
Carbon Steel Alloy Steel (<30HRC)	PN215	n (min-1)	11,470	9,180	7,650	4,780	3,830	3,190
		vc (m/min)	720	720	720	300	300	300
		vf (mm/min)	6,890	5,510	4,590	7,170	5,750	4,790
		fz (mm/t)	0.2	0.2	0.2	0.5	0.5	0.5
		ap (mm)	0.1	0.1	0.1	0.5	0.5	0.5
		ae (mm)	Refer below table			Refer below table		
Carbon Steel Alloy Steel (30~45HRC)	PN215 TH315	n (min-1)	8,290	6,630	5,530	3,190	2,550	2,130
		vc (m/min)	520	520	520	200	200	200
		vf (mm/min)	4,980	3,980	3,320	4,790	3,830	3,200
		fz (mm/t)	0.2	0.2	0.2	0.5	0.5	0.5
		ap (mm)	0.1	0.1	0.1	0.5	0.5	0.5
		ae (mm)	Refer below table			Refer below table		
Stainless Steel	PN215	n (min-1)	7,970	6,370	5,310	4,780	3,830	3,190
		vc (m/min)	500	500	500	300	300	300
		vf (mm/min)	4,790	3,830	3,190	7,170	5,750	4,790
		fz (mm/t)	0.2	0.2	0.2	0.5	0.5	0.5
		ap (mm)	0.1	0.1	0.1	0.5	0.5	0.5
		ae (mm)	Refer below table			Refer below table		
Cast Iron Ductile Cast Iron	TH315 PN215	n (min-1)	10,360	8,290	6,910	6,370	5,100	4,250
		vc (m/min)	650	650	650	400	400	400
		vf (mm/min)	9,330	7,470	6,220	9,560	7,650	6,380
		fz (mm/t)	0.3	0.3	0.3	0.5	0.5	0.5
		ap (mm)	0.1	0.1	0.1	0.5	0.5	0.5
		ae (mm)	Refer below table			Refer below table		
Hardened Steel (45~55HRC)	TH315	n (min-1)	3,990	3,190	2,660	1,920	1,530	1,280
		vc (m/min)	250	250	250	120	120	120
		vf (mm/min)	2,400	1,920	1,600	580	460	390
		fz (mm/t)	0.2	0.2	0.2	0.15	0.15	0.15
		ap (mm)	0.08	0.08	0.08	0.2	0.2	0.2
		ae (mm)	Refer below table			Refer below table		

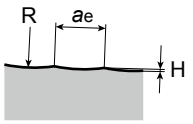
How to calculate "ae"

Determine the ae value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert	R (mm)	Cusp height (mm)						
		0.001	0.002	0.003	0.004	0.005	0.01	0.02
TPHW0902-20	20	0.4	0.57	0.69	0.8	0.89	1.26	1.79
TPHW1303-25	25	0.45	0.63	0.77	0.89	1	1.41	2
TPHW1403-30	30	0.49	0.69	0.85	0.98	1.1	1.55	2.19

$$a_e = 2\sqrt{(R^2-(R-H)^2)}$$

R：Tool R　H：Cusp height



【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Ajustment ratio of cutting conditions by overhang length.

When overhang length is 3DC or more, please adjust the values in the above cutting condition table referring to the right table.

Overhang ratio	Vc (m/min)	Vf (mm/min)
<3DC	100%	100%
3DC ~ 5DC	70%	70%
5DC ~ 6DC	60%	60%
6DC ~ 7DC	50%	50%
7DC ~	45%	45%

GALLEA GP1LB

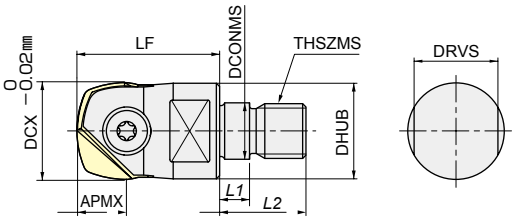
· Combination of lens tool and barrel tool. Precision type
· Can be machined with a single tool for gently curved surface and wall surface.

Finishing | Planing | Side milling | Profiling | Cutting Conditions E15

Modular type

GP1LB ◌◌M-M◌◌

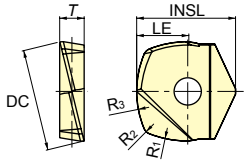
Numeric figure in a circle ◌ and Alphabetical character comes in a square ⬚



Item code	Stock	No. of Inserts	Size (mm)									Insert
			DCX	LF	APMX	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
GP1LB16M-M8	●	1	16	32	8	8.5	M8	12.8	5.5	17	10	ZPHW160-LB16
GP1LB20M-M10	●	1	20	38	10	10.5	M10	17.8	5.5	19	15	ZPHW200-LB20
GP1LB25M-M12	●	1	25	38	12.5	12.5	M12	20.8	5.5	22	17	ZPHW250-LB25
GP1LB30M-M16	★	1	30	43	15	17	M16	28.8	6	23	22	ZPHW300-LB30

【Note】Do not apply lubricants such as grease, etc. to the "contact faces" and "modular screws" of the "modular mill", "special shanks" and "special arbor".
※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Inserts



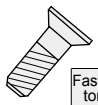
P	Carbon Steel, Alloy Steel	■	□
M	Stainless Steel, etc.	■	
K	Cast Iron・Ductile Cast Iron	□	■
H	Hardened Steel		■

■ : General cutting, First recommended
□ : General cutting, Second recommended

Item code	Tolerance class	Grade		Size (mm)						
		PN215	TH308	R_1	R_2	R_3	LE	INSL	DC	*T*
ZPHW160-LB16	H	●	●	16	1.5	16	8	16.6	16	4.2
ZPHW160-LB16-R5		●	●	16	5	16	8	16.6	16	4.2
ZPHW200-LB20		●	●	20	1.9	20	10	20.3	20	5.2
ZPHW200-LB20-R6		●	●	20	6	20	10	20.3	20	5.2
ZPHW250-LB25		●	●	25	2.38	25	12.5	24.1	25	6.2
ZPHW250-LB25-R8		●	●	25	8	25	12.5	24.1	25	6.2
ZPHW300-LB30		★	★	30	2.85	30	15	29.1	30	7.2
ZPHW300-LB30-R10		★	★	30	10	30	15	29.1	30	7.2

【Note】The numbers after the third decimal point are rounded off. When defining the shape parametrically, check the required dimensions from the DXF data.

Parts

Parts	Clamp screw		Wrench	Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N·m)		
GP1LB16M-M8	581-144	4.9	105-T20	P-37
GP1LB20M-M10	581-145	6.9	101-T25S	
GP1LB25M-M12	581-146	9.8	105-T30A	
GP1LB30M-M16	581-147	9.8		

※The insert can be attached to Ball Precision F (ABPF type) holders.
※For information on the detailed tool shape, download the DXF data fromthe MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database
TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

【Note】The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

How to select GP1LB inserts

Comparison of cutting efficiency of 3-axis machining with φ30mm tool. ※Set the cusp-height of each edge of barrel R, lens R and corner-connected R same as ball end mill

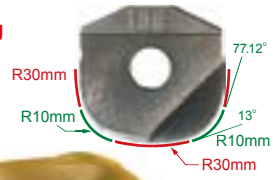
Ball end mill (φ30mm)

Ball end mill is recommended for shapes with large undulations

GP1LB ZPHW300-LB30-R10

1.4 times cutting efficiency than ball end mill

Cutting efficiency Compared with the ball end mill 0.8 times



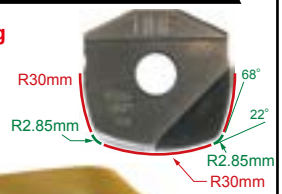
High efficiency machining on undulating curved surface.

If the barrel R and lens R can be used more than 47% of the whole machining, it's more efficient than ball end mill of same diameter.

GP1LB ZPHW300-LB30

1.4 times cutting efficiency than ball end mill

Cutting efficiency Compared with the ball end mill 0.4 times



High efficiency machining with gentle curved surface with less undulation.

If the barrel R and lens R can be used more than 84% of the whole machining, it's more efficient than ball end mill of same diameter.

※Checking the usage rate of barrel R edge and lens R edge in model shape to be processed and choosing an insert, more efficient machining is possible.

● : Inventory maintained in US ★ : Inventory maintained in Japan

Recommended cutting conditions

Inch

※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting condition	Lens part				Barrel part			
			φ16mm	φ20mm	φ25mm	φ30mm	φ16mm	φ20mm	φ25mm	φ30mm
Carbon Steel Alloy Steel (<30HRC)	PN215	n (min-1)	14,340	11,470	9,180	7,650	11.950	9,560	7,650	6,370
		vc (SFM)	2,362	2,362	2,362	2,362	1,969	1,969	1,969	1,969
		vf (IPM)	282	226	181	151	188	151	120	100
		fz (IPT)	.0098	.0098	.0098	.0098	.0079	.0079	.0079	.0079
		ap (inch)	.0039	.0039	.0039	.0039	Refer below table			
		ae (inch)	Refer below table				.0039	.0039	.0039	.0039
Carbon Steel Alloy Steel (30~45HRC)	PN215 TH308	n (min-1)	10,360	8.290	6,630	5,530	7,970	6,370	5.100	4,250
		vc (SFM)	1,706	1,706	1,706	1,706	1,312	1,312	1,312	1,312
		vf (IPM)	204	163	131	109	126	100	80	67
		fz (IPT)	.0098	.0098	.0098	.0098	.0079	.0079	.0079	.0079
		ap (inch)	.0039	.0039	.0039	.0039	Refer below table			
		ae (inch)	Refer below table				.0039	.0039	.0039	.0039
Stainless Steel	PN215	n (min-1)	12,940	10,360	8,290	6,910	9,960	7,970	6,370	5,310
		vc (SFM)	2,133	2,133	2,133	2,133	1,640	1,640	1,640	1,640
		vf (IPM)	255	204	163	136	157	126	100	84
		fz (IPT)	.0098	.0098	.0098	.0098	.0079	.0079	.0079	.0079
		ap (inch)	.0039	.0039	.0039	.0039	Refer below table			
		ae (inch)	Refer below table				.0039	.0039	.0039	.0039
Cast iron Ductile Cast Iron	TH308 PN215	n (min-1)	14,340	11,470	9,180	7,650	11,950	9,560	7,650	6.370
		vc (SFM)	2,362	2,362	2,362	2,362	1,969	1,969	1,969	1,969
		vf (IPM)	452	361	289	241	235	188	151	126
		fz (IPT)	.0157	.0157	.0157	.0157	.0098	.0098	.0098	.0098
		ap (inch)	.0039	.0039	.0039	.0039	Refer below table			
		ae (inch)	Refer below table				.0039	.0039	.0039	.0039
Hardened Steel (45~55HRC)	TH308	n (min-1)	6,370	5,100	4,080	3,400	4,980	3,990	3,190	2,660
		vc (SFM)	1,050	1,050	1,050	1,050	820	820	820	820
		vf (IPM)	100	80	65	54	59	47	38	31
		fz (IPT)	.0079	.0079	.0079	.0079	.0059	.0059	.0059	.0059
		ap (inch)	.0031	.0031	.0031	.0031	Refer below table			
		ae (inch)	Refer below table				.0031	.0031	.0031	.0031
Hardened steels (55~62HRC)	TH308	n (min-1)	5,580	4,460	3,570	2,980	4,380	3,510	2,810	2,340
		vc (SFM)	919	919	919	919	722	722	722	722
		vf (IPM)	88	70	56	47	52	42	33	28
		fz (IPT)	.0079	.0079	.0079	.0079	.0059	.0059	.0059	.0059
		ap (inch)	.0020	.0020	.0020	.0020	Refer below table			
		ae (inch)	Refer below table				.0020	.0020	.0020	.0020

- For machining shapes that make heavy use of lens R, refer to the "Lens part cutting conditions" in the above table.
- For machining shapes that make heavy use of barrel R, refer to the "Barrel part cutting conditions" in the above table.
- For machining shapes that use both lens R and barrel R, refer to the conditions for the higher usage ratio.

When overhang length is 3DCX or more, adjust the values shown in the below table according to the above table.

Overhang ratio	Vc (SFM)	Vf (IPM)
<3DCX	100%	100%
3DCX ~ 5DCX	70%	70%
5DCX ~ 6DCX	60%	60%
6DCX ~ 7DCX	50%	50%
7DCX ~	45%	45%

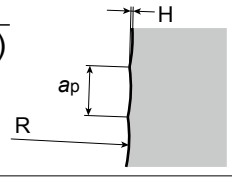
Determine the ap or ae value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert		Cusp height (inch)					
Item code	R(mm)	.00004	.00008	.00012	.00016	.0002	.0004
ZPHW160-LB16	16	.014	.020	.024	.028	.031	.044
ZPHW200-LB20	20	.016	.022	.027	.031	.035	.050
ZPHW250-LB25	25	.018	.025	.030	.035	.039	.056
ZPHW300-LB30	30	.019	.027	.033	.039	.043	.061

$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$

(ae)

R : Tool R H : Cusp height



【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Refer page E20 for set-up procedures of inserts.

GALLEA GP1LB

Recommended cutting conditions

Metric

※Red indicates primary recommended grade.

Work material	Recommended grade	Cutting condition	Lens part				Barrel part			
			φ16mm	φ20mm	φ25mm	φ30mm	φ16mm	φ20mm	φ25mm	φ30mm
Carbon Steel Alloy Steel (<30HRC)	PN215	n (min⁻¹)	14,340	11,470	9,180	7,650	11,950	9,560	7,650	6,370
		vc (m/min)	720	720	720	720	600	600	600	600
		vf (mm/min)	7,170	5,740	4,590	3,830	4780	3,830	3,060	2,550
		fz (mm/t)	0.25	0.25	0.25	0.25	0.2	0.2	0.2	0.2
		ap (mm)	0.1	0.1	0.1	0.1	Refer below table			
		ae (mm)	Refer below table				0.1	0.1	0.1	0.1
Carbon Steel Alloy Steel (30～45HRC)	PN215 TH308	n (min⁻¹)	10,360	8,290	6,630	5,530	7,970	6,370	5,100	4,250
		vc (m/min)	520	520	520	520	400	400	400	400
		vf (mm/min)	5,180	4,150	3,320	2,770	3,190	2,550	2,040	1,700
		fz (mm/t)	0.25	0.25	0.25	0.25	0.2	0.2	0.2	0.2
		ap (mm)	0.1	0.1	0.1	0.1	Refer below table			
		ae (mm)	Refer below table				0.1	0.1	0.1	0.1
Stainless Steel	PN215	n (min⁻¹)	12,940	10,360	8,290	6,910	9,960	7,970	6,370	5,310
		vc (m/min)	650	650	650	650	500	500	500	500
		vf (mm/min)	6,470	5,180	4,150	3,460	3,990	3,190	2,550	2,130
		fz (mm/t)	0.25	0.25	0.25	0.25	0.2	0.2	0.2	0.2
		ap (mm)	0.1	0.1	0.1	0.1	Refer below table			
		ae (mm)	Refer below table				0.1	0.1	0.1	0.1
Cast iron Ductile Cast Iron	TH308 PN215	n (min⁻¹)	14,340	11,470	9,180	7,650	11,950	9,560	7,650	6,370
		vc (m/min)	720	720	720	720	600	600	600	600
		vf (mm/min)	11,480	9,180	7,350	6,120	5,980	4,780	3,830	3,190
		fz (mm/t)	0.4	0.4	0.4	0.4	0.25	0.25	0.25	0.25
		ap (mm)	0.1	0.1	0.1	0.1	Refer below table			
		ae (mm)	Refer below table				0.1	0.1	0.1	0.1
Hardened Steel (45～55HRC)	TH308	n (min⁻¹)	6,370	5,100	4,080	3,400	4,980	3,990	3,190	2,660
		vc (m/min)	320	320	320	320	250	250	250	250
		vf (mm/min)	2,550	2,040	1,640	1,360	1,500	1,200	960	800
		fz (mm/t)	0.20	0.20	0.20	0.20	0.15	0.15	0.15	0.15
		ap (mm)	0.08	0.08	0.08	0.08	Refer below table			
		ae (mm)	Refer below table				0.08	0.08	0.08	0.08
Hardened steels (55～62HRC)	TH308	n (min⁻¹)	5,580	4,460	3,570	2,980	4,380	3,510	2,810	2,340
		vc (m/min)	280	280	280	280	220	220	220	220
		vf (mm/min)	2,240	1,790	1,430	1,200	1,320	1,060	850	710
		fz (mm/t)	0.20	0.20	0.20	0.20	0.15	0.15	0.15	0.15
		ap (mm)	0.05	0.05	0.05	0.05	Refer below table			
		ae (mm)	Refer below table				0.05	0.05	0.05	0.05

- For machining shapes that make heavy use of lens R, refer to the "Lens part cutting conditions" in the above table.
- For machining shapes that make heavy use of barrel R, refer to the "Barrel part cutting conditions" in the above table.
- For machining shapes that use both lens R and barrel R, refer to the conditions for the higher usage ratio.

When overhang length is 3DCX or more, adjust the values shown in the below table according to the above table.

Overhang ratio	Vc (m/min)	Vf (mm/min)
<3DCX	100%	100%
3DCX～5DCX	70%	70%
5DCX～6DCX	60%	60%
6DCX～7DCX	50%	50%
7DCX～	45%	45%

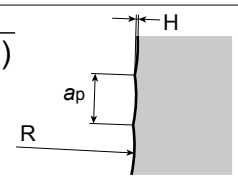
Determine the ap or ae value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert		Cusp height (mm)					
Item code	R(mm)	0.001	0.002	0.003	0.004	0.005	0.01
ZPHW160-LB16	16	0.36	0.51	0.62	0.72	0.8	1.13
ZPHW200-LB20	20	0.4	0.57	0.69	0.8	0.89	1.26
ZPHW250-LB25	25	0.45	0.63	0.77	0.89	1	1.41
ZPHW300-LB30	30	0.49	0.69	0.85	0.98	1.1	1.55

$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$

(ae)

R : Tool R　H : Cusp height



【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Refer page B20 for set-up procedures of inserts.

GALLEA GP1T

YouTube

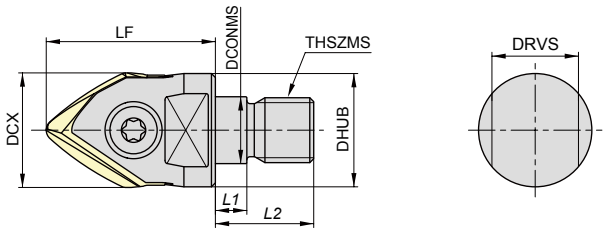
・Two types of process are possible with one tool that can fully utilize the merit of 5-axis machining
・Since it can work for 2 types of process without tool change, machining surface steps can be minimized.

Finishing Profiling Cutting Conditions E18

Modular type

GP1T ○○M-M○○

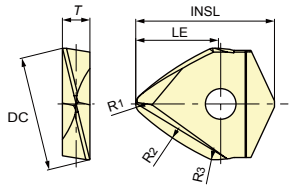
Numeric figure in a circle ◌ and Alphabetical character comes in a square ⬚



Item code	Stock	No. of flutes	Size (mm)								Insert
			DCX	LF	DCONMS	THSZMS	DHUB	*L1*	*L2*	DRVS	
GP1T12M-M6	★	1	12	26	6.5	M6	9.8	5.5	14.5	7	ZDHW120-T43R1.2-30
GP1T16M-M8	★	1	16	32	8.5	M8	12.8	5.5	17	10	ZDHW160-T43R1.6-40
GP1T20M-M10	★	1	20	38	10.5	M10	17.8	5.5	19	15	ZDHW200-T43R2-50
GP1T25M-M12	★	1	25	38	12.5	M12	20.8	5.5	22	17	ZDHW250-T43R2.5-62.5
GP1T30M-M16	★	1	30	43	17	M16	28.8	6	23	22	ZDHW300-T43R3-75

【Note】Do not apply lubricants such as grease, etc. to the “contact faces” and “modular screws” of the “modular mill”, “special shanks” and “special arbor”.
※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Inserts



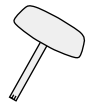
P	Carbon Steel, Alloy Steel	■	⬚
M	Stainless Steel, etc.	■	
K	Cast Iron・Ductile Cast Iron	⬚	■
H	Hardened Steel		■

■ : General cutting, First recommended
⬚ : General cutting, Second recommended

Order No.	Tolerance class	Grade		Size(mm)						
		PN215	TH308	R_1	R_2	R_3	LE	INSL	DC	*T*
ZDHW120-T43R1.2-30	H	★	★	1.2	30	0.98	8.6	17.6	12	3.2
ZDHW160-T43R1.6-40		★	★	1.6	40	1.3	11.3	20.6	16	4.2
ZDHW200-T43R2-50		★	★	2.0	50	1.63	14.3	25.4	20	5.2
ZDHW250-T43R2.5-62.5		★	★	2.5	62.5	2.04	17.9	30.1	25	6.2
ZDHW300-T43R3-75		★	★	3.0	75	2.45	21.6	36.3	30	7.2

・The insert can be set with "ABPF-type" cutter body ・Use solid barrel end mill, "GS4TN-type" for smaller diameter in size
【Note】 The numbers after the third decimal point are rounded off. When defining the shape parametrically, check the required dimensions from the DXF data.
※For information on the detailed tool shape, download the DXF data from the MOLDINO Tool Engineering home page.
(MOLDINO Tool Engineering tool selection database TOOL SEARCH: https://data.moldino.com/toolsearch/?lang=en)

Parts

Parts	Clamp screw		Wrench	Screw anti-seizure agent
Shape / Cutter body		Fastening torque (N·m)		
GP1T12M-M6	**581-143**	**4.9**	**105-T20**	**P-37**
GP1T16M-M8	**581-144**	**4.9**		
GP1T20M-M10	**581-145**	**6.9**	**101-T25S**	
GP1T25M-M12	**581-146**	**9.8**	**105-T30A**	
GP1T30M-M16	**581-147**	**9.8**		

【Note】 The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.
★ : Inventory maintained in Japan

GALLEA GP1T

Recommended cutting conditions

※Red indicates primary recommended grade.

Inch

Work material	Recommended grade	Cutting conditions	Tip R					Barrel R				
			ϕ12(R1.2)mm	ϕ16(R1.6)mm	ϕ20(R2)mm	ϕ25(R2.5)mm	ϕ30(R3)mm	ϕ12mm	ϕ16mm	ϕ20mm	ϕ25mm	ϕ30mm
Carbon Steel Alloy Steel (<30HRC)	PN215	n (min-1)	19,910	14,930	11.950	9.560	7,970	19.110	14,340	11.470	9.180	7.650
		vc (SFM)	2,461(492)	2,461(492)	2,461(492)	2,461(492)	2,461(492)	2,362	2,362	2,362	2,362	2,362
		vf (IPM)	63	59	57	53	50	226	170	136	109	91
		fz (IPT)	.0016	.0020	.0024	.0028	.0031	.0059	.0059	.0059	.0059	.0059
		ap (inch)	.0039	.0039	.0039	.0039	.0039	Refer below table				
		ae (inch)	Refer below table					.0039	.0039	.0039	.0039	.0039
Carbon Steel Alloy Steel (30～45HRC)	PN215 TH308	n (min-1)	18.580	13.940	11.150	8.920	7.440	13.810	10.360	8.290	6.630	5.530
		vc (SFM)	2,297(459)	2,297(459)	2,297(459)	2,297(459)	2,297(459)	1,706	1,706	1,706	1,706	1,706
		vf (IPM)	59	55	53	49	47	163	122	98	78	65
		fz (IPT)	.0016	.0020	.0024	.0028	.0031	.0059	.0059	.0059	.0059	.0059
		ap (inch)	.0039	.0039	.0039	.0039	.0039	Refer below table				
		ae (inch)	Refer below table					.0039	.0039	.0039	.0039	.0039
Stainless Steel	PN215	n (min-1)	19.910	14.930	11.950	9.560	7.970	17.260	12.940	10.360	8.290	6.910
		vc (SFM)	2,461(492)	2,461(492)	2,461(492)	2,461(492)	2,461(492)	2,133	2,133	2,133	2,133	2,133
		vf (IPM)	63	59	57	53	50	204	153	122	98	82
		fz (IPT)	.0016	.0020	.0024	.0028	.0031	.0059	.0059	.0059	.0059	.0059
		ap (inch)	.0039	.0039	.0039	.0039	.0039	Refer below table				
		ae (inch)	Refer below table					.0039	.0039	.0039	.0039	.0039
Cast Iron Ductile Cast Iron	TH308 PN215	n (min-1)	19.910	14.930	11,950	9.560	7.970	19.110	14.340	11,470	9,180	7.650
		vc (SFM)	2,461(492)	2,461(492)	2,461(492)	2,461(492)	2,461(492)	2,362	2,362	2,362	2,362	2,362
		vf (IPM)	63	59	57	53	50	301	226	181	145	120
		fz (IPT)	.0016	.0020	.0024	.0028	.0031	.0079	.0079	.0079	.0079	.0079
		ap (inch)	.0039	.0039	.0039	.0039	.0039	Refer below table				
		ae (inch)	Refer below table					.0039	.0039	.0039	.0039	.0039
Hardened Steel (45～55HRC)	TH308	n (min-1)	13.270	9.960	7.970	6,370	5.310	8.500	6.370	5,100	4.080	3.400
		vc (SFM)	1,640(328)	1,640(328)	1,640(328)	1,640(328)	1,640(328)	1,050	1,050	1,050	1,050	1,050
		vf (IPM)	42	39	38	35	33	67	50	40	32	27
		fz (IPT)	.0016	.0020	.0024	.0028	.0031	.0039	.0039	.0039	.0039	.0039
		ap (inch)	.0031	.0031	.0031	.0031	.0031	Refer below table				
		ae (inch)	Refer below table					.0031	.0031	.0031	.0031	.0031
Hardened Steel (55～62HRC)	TH308	n (min-1)	11.950	8.960	7.170	5.740	4.780	7.440	5.580	4.460	3.570	2.980
		vc (SFM)	1,476(295)	1,476(295)	1,476(295)	1,476(295)	1,476(295)	919	919	919	919	919
		vf (IPM)	38	35	34	32	30	59	44	35	28	24
		fz (IPT)	.0016	.0020	.0024	.0028	.0031	.0039	.0039	.0039	.0039	.0039
		ap (inch)	.0020	.0020	.0020	.0020	.0020	Refer below table				
		ae (inch)	Refer below table					.0020	.0020	.0020	.0020	.0020

※The ( ) values of vc indicate the cutting speed of the tip R part.

When overhang length is 3DCX or more, adjust the values shown in the table at right according to the above table.

Overhang ratio	Vc (SFM)	Vf (IPM)
<3DCX	100%	100%
3DCX～5DDCX	70%	70%
5DCX～6DDCX	60%	60%

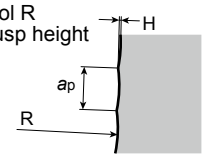
Overhang ratio	Vc (SFM)	Vf (IPM)
6DCX～7DCX	50%	50%
7DCX～	45%	45%

Determine the ap or ae value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert Item code	Cutting depth using barrel R ap(inch)								Cutting depth using tip R ae(inch)							
	Barrel R (mm)	Cusp height (inch)							Tip R (mm)	Cusp height (inch)						
		0.0005	0.001	0.002	0.003	0.004	0.005	0.01		0.0005	0.001	0.002	0.003	0.004	0.005	0.01
ZDHW120-T43R1.2-30	30	.014	.019	.027	.033	.039	.043	.061	1.2	.003	.004	.006	.007	.008	.009	.012
ZDHW160-T43R1.6-40	40	.016	.022	.031	.039	.044	.050	.070	1.6	.003	.004	.006	.008	.009	.010	.014
ZDHW200-T43R2-50	50	.018	.025	.035	.043	.050	.056	.079	2	.004	.005	.007	.009	.010	.011	.016
ZDHW250-T43R2.5-62.5	62.5	.020	.028	.039	.048	.056	.062	.088	2.5	.004	.006	.008	.009	.011	.013	.018
ZDHW300-T43R3-75	75	.022	.030	.043	.053	.061	.068	.096	3	.004	.006	.009	.011	.012	.014	.019

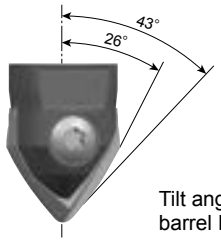
$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$
(a_e)

R: Tool R
H: Cusp height

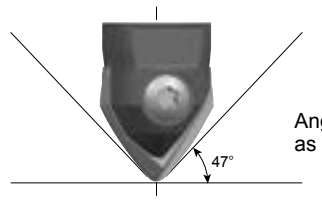


【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Angle range of barrel R and tip R



Tilt angle range when barrel R is used



Angle range that can be used as a ball end mill

Recommended cutting conditions

※Red indicates primary recommended grade.

Metric

Work material	Recommended grade	Cutting conditions	Tip R					Barrel R				
			ϕ12(R1.2)mm	ϕ16(R1.6)mm	ϕ20(R2)mm	ϕ25(R2.5)mm	ϕ30(R3)mm	ϕ12mm	ϕ16mm	ϕ20mm	ϕ25mm	ϕ30mm
Carbon Steel Alloy Steel (<30HRC)	PN215	n (min^{-1})	19,910	14,930	11,950	9,560	7,970	19,110	14,340	11,470	9,180	7,650
		v_c (m/min)	750(150)	750(150)	750(150)	750(150)	750(150)	720	720	720	720	720
		v_f (mm/min)	1,600	1,500	1,440	1,340	1,280	5,740	4,310	3,450	2,760	2,300
		f_z (mm/t)	0.04	0.05	0.06	0.07	0.08	0.15	0.15	0.15	0.15	0.15
		a_p (mm)	0.1	0.1	0.1	0.1	0.1	Refer below table				
		a_e (mm)	Refer below table					0.1	0.1	0.1	0.1	0.1
Carbon Steel Alloy Steel (30～45HRC)	PN215 TH308	n (min^{-1})	18,580	13,940	11,150	8,920	7,440	13,810	10,360	8,290	6,630	5,530
		v_c (m/min)	700(140)	700(140)	700(140)	700(140)	700(140)	520	520	520	520	520
		v_f (mm/min)	1,490	1,400	1,340	1,250	1,200	4,150	3,110	2,490	1,990	1,660
		f_z (mm/t)	0.04	0.05	0.06	0.07	0.08	0.15	0.15	0.15	0.15	0.15
		a_p (mm)	0.1	0.1	0.1	0.1	0.1	Refer below table				
		a_e (mm)	Refer below table					0.1	0.1	0.1	0.1	0.1
Stainless Steel	PN215	n (min^{-1})	19,910	14,930	11,950	9,560	7,970	17,260	12,940	10,360	8,290	6,910
		v_c (m/min)	750(150)	750(150)	750(150)	750(150)	750(150)	650	650	650	650	650
		v_f (mm/min)	1,600	1,500	1,440	1,340	1,280	5,180	3,890	3,110	2,490	2,080
		f_z (mm/t)	0.04	0.05	0.06	0.07	0.08	0.15	0.15	0.15	0.15	0.15
		a_p (mm)	0.1	0.1	0.1	0.1	0.1	Refer below table				
		a_e (mm)	Refer below table					0.1	0.1	0.1	0.1	0.1
Cast Iron Ductile Cast Iron	TH308 PN215	n (min^{-1})	19,910	14,930	11,950	9,560	7,970	19,110	14,340	11,470	9,180	7,650
		v_c (m/min)	750(150)	750(150)	750(150)	750(150)	750(150)	720	720	720	720	720
		v_f (mm/min)	1,600	1,500	1,440	1,340	1,280	7,650	5,740	4,590	3,680	3,060
		f_z (mm/t)	0.04	0.05	0.06	0.07	0.08	0.2	0.2	0.2	0.2	0.2
		a_p (mm)	0.1	0.1	0.1	0.1	0.1	Refer below table				
		a_e (mm)	Refer below table					0.1	0.1	0.1	0.1	0.1
Hardened Steel (45～55HRC)	TH308	n (min^{-1})	13,270	9,960	7,970	6,370	5,310	8,500	6,370	5,100	4,080	3,400
		v_c (m/min)	500(100)	500(100)	500(100)	500(100)	500(100)	320	320	320	320	320
		v_f (mm/min)	1,070	1,000	960	900	850	1,700	1,280	1,020	820	680
		f_z (mm/t)	0.04	0.05	0.06	0.07	0.08	0.1	0.1	0.1	0.1	0.1
		a_p (mm)	0.08	0.08	0.08	0.08	0.08	Refer below table				
		a_e (mm)	Refer below table					0.08	0.08	0.08	0.08	0.08
Hardened Steel (55～62HRC)	TH308	n (min^{-1})	11,950	8,960	7,170	5,740	4,780	7,440	5,580	4,460	3,570	2,980
		v_c (m/min)	450(90)	450(90)	450(90)	450(90)	450(90)	280	280	280	280	280
		v_f (mm/min)	960	900	870	810	770	1,490	1,120	900	720	600
		f_z (mm/t)	0.04	0.05	0.06	0.07	0.08	0.1	0.1	0.1	0.1	0.1
		a_p (mm)	0.05	0.05	0.05	0.05	0.05	Refer below table				
		a_e (mm)	Refer below table					0.05	0.05	0.05	0.05	0.05

※The ( ) values of v_c indicate the cutting speed of the tip R part.

When overhang length is 3DCX or more, adjust the values shown in the table at right according to the above table.

Overhang ratio	V_c (m/min)	V_f (mm/min)
<3DCX	100%	100%
3DCX～5DDCX	70%	70%
5DCX～6DDCX	60%	60%

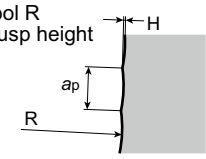
Overhang ratio	V_c (m/min)	V_f (mm/min)
6DCX～7DCX	50%	50%
7DCX～	45%	45%

Determine the a_p or a_e value based on the desired cusp height by selecting it from the table below or by calculating it using the equation below.

Insert Item code	Cutting depth using barrel R a_p(mm)								Cutting depth using tip R a_e(mm)							
	Barrel R (mm)	Cusp height (mm)							Tip R (mm)	Cusp height (mm)						
		0.0005	0.001	0.002	0.003	0.004	0.005	0.01		0.0005	0.001	0.002	0.003	0.004	0.005	0.01
ZDHW120-T43R1.2-30	30	0.35	0.49	0.69	0.85	0.98	1.1	1.55	1.2	0.07	0.1	0.14	0.17	0.2	0.22	0.31
ZDHW160-T43R1.6-40	40	0.4	0.57	0.8	0.98	1.13	1.26	1.79	1.6	0.08	0.11	0.16	0.2	0.23	0.25	0.36
ZDHW200-T43R2-50	50	0.45	0.63	0.89	1.1	1.26	1.41	2	2	0.09	0.13	0.18	0.22	0.25	0.28	0.4
ZDHW250-T43R2.5-62.5	62.5	0.5	0.71	1	1.22	1.41	1.58	2.24	2.5	0.1	0.14	0.2	0.24	0.28	0.32	0.45
ZDHW300-T43R3-75	75	0.55	0.77	1.1	1.34	1.55	1.73	2.45	3	0.11	0.15	0.22	0.27	0.31	0.35	0.49

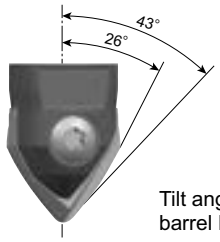
$$a_p = 2\sqrt{(R^2-(R-H)^2)}$$
(a_e)

R: Tool R
H: Cusp height

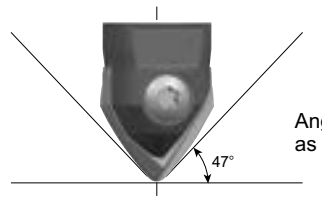


【Note】
①Use the appropriate coolant for the work material and machining shape.
②These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
③To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
④Ensure to index the insert at the correct time to ensure safety of the tool-body.

Angle range of barrel R and tip R



Tilt angle range when barrel R is used

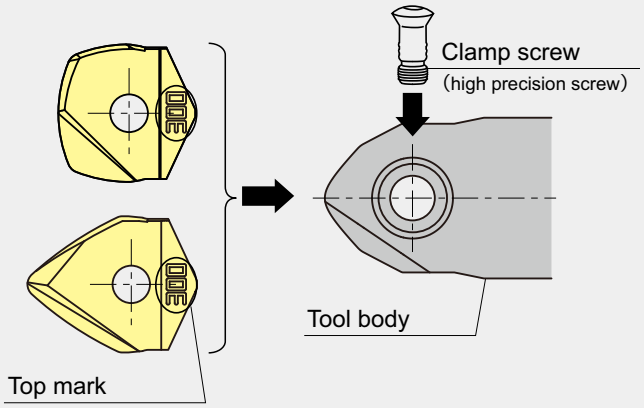


Angle range that can be used as a ball end mill

GALLEA GP1LB/GP1T

Set-up Procedures of Inserts

1. Clean the insert seat:
   Using air-blow or alike, clean the seat.
2. Put in the insert with its top positioned to the screw-tightening side of the tool body.
3. Tighten the clamp screw with the special wrench.
   Please do not press down the insert during this tightening process.
4. This is the end of insert set-up.



Attention

Never tighten the clamp screw without putting the insert. The tool body may be deformed, resulting in improper insert mounting or deterioration of mounting accuracy.

Do not tighten the screw without putting insert

Boring Tools

Selection standard table for Carbide NSB & Carbide Drills ····· F2

Quick dimension reference table by mill diameter ····· F6

Carbide Non Step Borer (NSB) ····· F18

Other Drills ····· F55

By type (catalog listing order)

Carbide Non Step Borer

03WHNSB-TH ····· F18
05WHNSB-TH ····· F20
08WHNSB-TH ····· F23
10WHNSB-TH ····· F26
15WHNSB-TH ····· F28
20WHNSB-TH ····· F29
25WHNSB-TH ····· F31
30WHNSB-TH ····· F32
40WHNSB-TH ····· F36
50WHNSB-TH ····· F37
02WNSB-TH ····· F40
04WNSB-TH ····· F41
03WHNSB-SD ····· F44
05WHNSB-SD ····· F45
15WHNSB-SD ····· F46
20WHNSB-SD ····· F46
25WHNSB-SD ····· F46
30WHNSB-SD ····· F46
NSBH-ATH ····· F48

Other Drills

WHSR-ATH ····· F55
WHMB-TH ····· F63
EMSBS-TH ····· F68
EMSBS-SD ····· F68
EMST-TH ····· F73
EMSBH-ATH ····· F76
EPDBEH-ATH ····· F81
EHSE-TH ····· F83
STBH-ATH ····· F85
STB-ATH ····· F86
ZPB-TH ····· F89
ZPBLS-TH ····· F91

By item code (alphabetical order)

02WNSB-TH ····· F40
03WHNSB-SD ····· F44
03WHNSB-TH ····· F18
04WNSB-TH ····· F41
05WHNSB-SD ····· F45
05WHNSB-TH ····· F20
08WHNSB-TH ····· F23
10WHNSB-TH ····· F26
15WHNSB-SD ····· F46
15WHNSB-TH ····· F28
20WHNSB-SD ····· F46
20WHNSB-TH ····· F29
25WHNSB-SD ····· F46
25WHNSB-TH ····· F31
30WHNSB-SD ····· F46
30WHNSB-TH ····· F32
40WHNSB-TH ····· F36
50WHNSB-TH ····· F37
EHSE-TH ····· F83
EMSBH-ATH ····· F76
EMSBS-SD ····· F68
EMSBS-TH ····· F68
EMST-TH ····· F73
EPDBEH-ATH ····· F81
NSBH-ATH ····· F48
STB-ATH ····· F86
STBH-ATH ····· F85
WHMB-TH ····· F63
WHSR-ATH ····· F55
ZPB-TH ····· F89
ZPBLS-TH ····· F91

Selection standard table for Carbide NSB & Carbide Drills

Carbide Non Step Borer

Product	Oil hole ○ With oil hole – Without oil hole	Tool dia DC	Item Code	Drilling depth ~2D ~3D ~4D ~5D ~8D ~10D ~15D ~20D ~25D ~30D ~40D ~50D ~100D
Carbide Oil Hole Non Step Borer	○	2.0mm~13.0mm 1/4" ~1/2"	03WHNSB-TH	3D
		2.0mm~13.0mm	05WHNSB-TH	5D
		2.0mm~13.0mm	08WHNSB-TH	8D
		2.0mm~13.0mm 1/4"～1/2"	10WHNSB-TH	10D
		2.0mm~13.0mm	15WHNSB-TH	15D
		2.0mm~13.0mm 1/4"～1/2"	20WHNSB-TH	20D
		2.0mm~13.0mm	25WHNSB-TH	25D
		2.0mm~12.0mm 1/4"～1/2"	30WHNSB-TH	30D
		2.5mm~10.0mm	40WHNSB-TH	40D
		2.5mm~8.0mm	50WHNSB-TH	50D
Carbide Non Step Borer	–	3.0mm~13.0mm	02WNSB-TH	2D
		1.0mm~13.0mm	04WNSB-TH	4D
Carbide Oil Hole Non Step Borer for Aluminium	○	3.0mm~10.03mm	03WHNSB-SD	3D
		2.0mm~10.03mm	05WHNSB-SD	5D
		3.0mm~10.0mm	15WHNSB-SD	15D

Work material													Shape	Coating	Page	
P					H		M	S	K		N					
Mild steels	Carbon steels	Alloy steels	Hardened steels	Tool steels	Hardened steels		Stainlesss steels	Ti Alloy, Heat resistant alloy	Cast iron	Ductile cast iron	Aluminium alloy	Copper alloy			Size List	Cutting Conditons
				~40 HRC	~45 HRC	45 HRC~		Inconel Ti Alloy			Al	Cu				
◎	◎	◎	◎	◎	◎		◎	○	○	○				TH	F18	F21
															F19	F21
◎	◎	◎	◎	◎	◎		◎	○	○	○				TH	F20	F21
◎	◎	◎	◎	◎	◎		◎	○	○	○				TH	F23	F24
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F26	F34
															F27	F34
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F28	F34
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F29	F34
															F30	F34
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F31	F34
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F32	F34
															F33	F34
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F36	F38
◎	◎	◎	◎	◎	○		◎	○	○	○				TH	F37	F38
◎	◎	◎	◎	◎	◎				○	○				TH	F40	F42
◎	◎	◎	◎	◎	◎				○	○				TH	F41	F42
											◎	◎		SD	F44	F47
											◎	◎		SD	F45	F47
											◎	◎		SD	F46	F47

Selection standard table for Carbide NSB & Carbide Drills

Other Drills

Product	Oil hole ○ With oil hole – Without oil hole	Tool dia DC (mm)	Item Code	Drilling depth ~2D ~3D ~4D ~5D ~8D ~10D ~15D ~20D ~25D ~30D ~40D ~50D ~100D
Carbide Oil Hole Non Step Borer for Aluminium	○	3.0mm~8.0mm	20WHNSB-SD	20D
		3.0mm~8.0mm	25WHNSB-SD	25D
		3.0mm~6.0mm	30WHNSB-SD	30D
Carbide Oil Hole Non Step Borer H for High Hardness Material	○	2.0mm~12.0mm	NSBH-ATH	25D
Carbide Drill for SR machining	○	3.0mm~12.0mm	WHSR-ATH	30D
MINIATURE DRILL WHMB	○	1.0mm~2.03mm	WHMB-TH	30D
Epoch Micro Step Borer S	–	0.04mm~1.00mm	EMSBS-TH	100D
Epoch Micro Step Borer S for Aluminium	–	0.04mm~1.00mm	EMSBS-SD	100D
Epoch Micro Starter	–	0.04mm~1.01mm	EMST-TH	0.6D Starter for EMSBS
Epoch Micro Step Borer H	–	0.1mm~2.02mm	EMSBH-ATH	30D
Epoch Deep Ball Evolution Hard	–	0.1mm~2.02mm	EPDBEH-ATH	0.6D Starter for EMSBH
Epoch TH Hard Drills	–	2.0mm~16.1mm	EHSE-TH	3D
Step Borer - Internal coolant type	○	3.4mm~10.3mm	STBH-ATH	3D
Step Borer - External coolant type	–	3.4mm~10.3mm	STB-ATH	3D
Z Plunging Borer -Regular	–	2.0mm~16.0mm	ZPB-TH	2D
Z Plunging Borer -Long shank	–	2.0mm~16.0mm	ZPBLS-TH	2D

Work material													Shape	Coating	Page	
P					H		M	S	K		N					
Mild steels	Carbon steels	Alloy steels	Hardened steels	Tool steels	Hardened steels		Stainlesss steels	Ti Alloy, Heat resistant alloy	Cast iron	Ductile cast iron	Aluminium alloy	Copper alloy			Size List	Cutting Conditons
				~40 HRC	~45 HRC	45 HRC~		Inconel Ti Alloy			Al	Cu				
											◎	◎		SD	F46	F47
											◎	◎		SD	F46	F47
											◎	◎		SD	F46	F47
					○	◎								ATH	F48	F53
○	○	◎	◎	◎	◎	○	○							ATH	F55	F57
◎	◎	◎	○	○			◎				○	○		TH	F63	F66
◎	○	◎	◎	◎	◎	○	◎	○	○	○	○	○		MICRO TH	F68	F71
											◎	◎		SD	F68	F71
◎	○	◎	◎	◎	◎	○	◎	○	○	○	○	○		TH	F73	F74
					○	◎								ATH	F76	F78
					○	◎								ATH	F81	F82
					○	◎								TH	F83	F84
○	◎	◎	◎	○	○		○	○	○	○	○			ATH	F85	F87
○	◎	◎	◎	○	○				○	○	○			ATH	F86	F88
○	◎	◎	◎	○	○				○		○			TH	F89	F93
○	◎	◎	◎	○	○				○		○			TH	F91	F93

Quick dimension reference table by tool diameter

φ 0.04～φ 1.62

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EMST0004-TH	★	0.04	0.04	45	3	F73
EMSBS0004-0.4-SD		0.04	0.2	40	3	F68
EMSBS0004-0.4-TH	★	0.04	0.2	40	3	F68
EMSBS0004-0.8-SD		0.04	0.2	40	3	F68
EMSBS0004-0.8-TH		0.04	0.2	40	3	F68
EMSBS0004-1.2-SD		0.04	0.2	40	3	F68
EMSBS0004-1.2-TH	★	0.04	0.2	40	3	F68
EMST0005-TH	★	0.05	0.05	45	3	F73
EMSBS0005-0.5-SD		0.05	0.25	40	3	F68
EMSBS0005-0.5-TH	★	0.05	0.25	40	3	F68
EMSBS0005-1.5-SD		0.05	0.25	40	3	F68
EMSBS0005-1.5-TH	★	0.05	0.25	40	3	F68
EMSBS0005-1-SD		0.05	0.25	40	3	F68
EMSBS0005-1-TH	★	0.05	0.25	40	3	F68
EMSBS0005-2.5-SD		0.05	0.25	40	3	F68
EMSBS0005-2.5-TH		0.05	0.25	40	3	F68
EMSBS0005-2-SD		0.05	0.25	40	3	F68
EMSBS0005-2-TH		0.05	0.25	40	3	F68
EMST0006-TH	★	0.06	0.06	45	3	F73
EMSBS0006-0.6-SD		0.06	0.3	40	3	F68
EMSBS0006-0.6-TH	★	0.06	0.3	40	3	F68
EMSBS0006-1.2-SD		0.06	0.3	40	3	F68
EMSBS0006-1.2-TH		0.06	0.3	40	3	F68
EMSBS0006-1.8-SD		0.06	0.3	40	3	F68
EMSBS0006-1.8-TH	★	0.06	0.3	40	3	F68
EMSBS0006-2.4-SD		0.06	0.3	40	3	F68
EMSBS0006-2.4-TH		0.06	0.3	40	3	F68
EMSBS0006-3-SD		0.06	0.3	40	3	F68
EMSBS0006-3-TH		0.06	0.3	40	3	F68
EMST0007-TH	★	0.07	0.07	45	3	F73
EMSBS0007-0.7-SD		0.07	0.35	40	3	F68
EMSBS0007-0.7-TH	★	0.07	0.35	40	3	F68
EMSBS0007-1.4-SD		0.07	0.35	40	3	F68
EMSBS0007-1.4-TH		0.07	0.35	40	3	F68
EMSBS0007-2.1-SD		0.07	0.35	40	3	F68
EMSBS0007-2.1-TH	★	0.07	0.35	40	3	F68
EMSBS0007-2.8-SD		0.07	0.35	40	3	F68
EMSBS0007-2.8-TH		0.07	0.35	40	3	F68
EMSBS0007-3.5-SD		0.07	0.35	40	3	F68
EMSBS0007-3.5-TH		0.07	0.35	40	3	F68
EMST0008-TH	★	0.08	0.08	45	3	F73
EMSBS0008-0.8-SD		0.08	0.4	40	3	F68
EMSBS0008-0.8-TH	★	0.08	0.4	40	3	F68
EMSBS0008-1.6-SD		0.08	0.4	40	3	F68
EMSBS0008-1.6-TH		0.08	0.4	40	3	F68
EMSBS0008-2.4-SD		0.08	0.4	40	3	F68
EMSBS0008-2.4-TH	★	0.08	0.4	40	3	F68
EMSBS0008-3.2-SD		0.08	0.4	40	3	F68
EMSBS0008-3.2-TH		0.08	0.4	40	3	F68
EMSBS0008-4-SD		0.08	0.4	40	3	F68
EMSBS0008-4-TH		0.08	0.4	40	3	F68
EMST0009-TH	★	0.09	0.09	45	3	F73
EMSBS0009-0.9-SD		0.09	0.45	40	3	F68
EMSBS0009-0.9-TH	★	0.09	0.45	40	3	F68
EMSBS0009-1.8-SD		0.09	0.45	40	3	F68
EMSBS0009-1.8-TH		0.09	0.45	40	3	F68
EMSBS0009-2.7-SD		0.09	0.45	40	3	F68
EMSBS0009-2.7-TH	★	0.09	0.45	40	3	F68
EMSBS0009-3.6-SD		0.09	0.45	40	3	F68
EMSBS0009-3.6-TH		0.09	0.45	40	3	F68
EMSBS0009-4.5-SD		0.09	0.45	40	3	F68
EMSBS0009-4.5-TH		0.09	0.45	40	3	F68
EMST0010-TH	★	0.1	0.1	45	3	F73
EMSBH0010-1-ATH	★	0.1	0.5	45	3	F76
EMSBH0010-2-ATH	★	0.1	0.5	45	3	F76
EMSBH0010-3-ATH	★	0.1	0.5	45	3	F76

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EMSBS0010-10-SD		0.1	0.5	45	3	F68
EMSBS0010-10-TH		0.1	0.5	45	3	F68
EMSBS0010-1-SD		0.1	0.5	45	3	F68
EMSBS0010-1-TH	★	0.1	0.5	45	3	F68
EMSBS0010-2-SD		0.1	0.5	45	3	F68
EMSBS0010-2-TH		0.1	0.5	45	3	F68
EMSBS0010-3-SD		0.1	0.5	45	3	F68
EMSBS0010-3-TH	★	0.1	0.5	45	3	F68
EMSBS0010-5-SD		0.1	0.5	45	3	F68
EMSBS0010-5-TH	★	0.1	0.5	45	3	F68
EMSBS0010-7.5-SD		0.1	0.5	45	3	F68
EMSBS0010-7.5-TH		0.1	0.5	45	3	F68
EMST0011-TH	★	0.11	0.11	45	3	F73
EMSBH0011-1-ATH		0.11	0.55	45	3	F76
EMSBH0011-2-ATH		0.11	0.55	45	3	F76
EMSBH0011-3-ATH		0.11	0.55	45	3	F76
EMST0012-TH	★	0.12	0.12	45	3	F73
EMSBH0012-1-ATH		0.12	0.6	45	3	F76
EMSBH0012-2-ATH		0.12	0.6	45	3	F76
EMSBH0012-3-ATH		0.12	0.6	45	3	F76
EMST0013-TH	★	0.13	0.13	45	3	F73
EMST0014-TH	★	0.14	0.14	45	3	F73
EMST0015-TH	★	0.15	0.15	45	3	F73
EMSBH0015-1.5-ATH		0.15	0.75	45	3	F76
EMSBH0015-3-ATH		0.15	0.75	45	3	F76
EMSBH0015-4.5-ATH		0.15	0.75	45	3	F76
EMSBS0015-1.5-SD		0.15	0.75	50	3	F68
EMSBS0015-1.5-TH	★	0.15	0.75	50	3	F68
EMSBS0015-11.25-SD		0.15	0.75	50	3	F68
EMSBS0015-11.25-TH		0.15	0.75	50	3	F68
EMSBS0015-15-SD		0.15	0.75	50	3	F68
EMSBS0015-15-TH		0.15	0.75	50	3	F68
EMSBS0015-3-SD		0.15	0.75	50	3	F68
EMSBS0015-3-TH		0.15	0.75	50	3	F68
EMSBS0015-4.5-SD		0.15	0.75	50	3	F68
EMSBS0015-4.5-TH	★	0.15	0.75	50	3	F68
EMSBS0015-7.5-SD		0.15	0.75	50	3	F68
EMSBS0015-7.5-TH	★	0.15	0.75	50	3	F68
EMST0016-TH	★	0.16	0.16	45	3	F73
EMST0017-TH	★	0.17	0.17	45	3	F73
EMST0018-TH	★	0.18	0.18	45	3	F73
EMST0019-TH	★	0.19	0.19	45	3	F73
EMST0020-TH	★	0.2	0.2	45	3	F73
EMSBH0020-2-ATH	★	0.2	1	45	3	F76
EMSBH0020-4-ATH	★	0.2	1	45	3	F76
EMSBH0020-6-ATH	★	0.2	1	45	3	F76
EMSBS0020-10-SD		0.2	1	45	3	F68
EMSBS0020-10-TH	★	0.2	1	45	3	F68
EMSBS0020-2-SD		0.2	1	45	3	F68
EMSBS0020-2-TH	★	0.2	1	45	3	F68
EMSBS0020-4-SD		0.2	1	45	3	F68
EMSBS0020-4-TH		0.2	1	45	3	F68
EMSBS0020-6-SD		0.2	1	45	3	F68
EMSBS0020-6-TH	★	0.2	1	45	3	F68
EMSBS0020-15-SD		0.2	1	55	3	F68
EMSBS0020-15-TH		0.2	1	55	3	F68
EMSBS0020-20-SD		0.2	1	55	3	F68
EMSBS0020-20-TH		0.2	1	55	3	F68
EMST0021-TH		0.21	0.21	45	3	F73
EMSBH0021-2-ATH		0.21	1.05	45	3	F76
EMSBH0021-4-ATH		0.21	1.05	45	3	F76
EMSBH0021-6-ATH		0.21	1.05	45	3	F76
EMSBH0022-2-ATH		0.22	1.1	45	3	F76
EMSBH0022-4-ATH		0.22	1.1	45	3	F76
EMSBH0022-6-ATH		0.22	1.1	45	3	F76
EMST0029-TH		0.29	0.29	45	3	F73

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EMST0030-TH	★	0.3	0.3	45	3	F73
EMSBH0030-3-ATH	★	0.3	1.5	45	3	F76
EMSBH0030-6-ATH	★	0.3	1.5	45	3	F76
EMSBH0030-9-ATH	★	0.3	1.5	45	3	F76
EMSBS0030-3-SD		0.3	1.5	45	3	F68
EMSBS0030-3-TH	★	0.3	1.5	45	3	F68
EMSBS0030-6-SD		0.3	1.5	45	3	F69
EMSBS0030-6-TH		0.3	1.5	45	3	F69
EMSBS0030-9-SD		0.3	1.5	45	3	F69
EMSBS0030-9-TH	★	0.3	1.5	45	3	F69
EMSBS0030-15-SD		0.3	1.5	55	3	F69
EMSBS0030-15-TH	★	0.3	1.5	55	3	F69
EMSBS0030-22.5-SD		0.3	1.5	65	3	F69
EMSBS0030-22.5-TH		0.3	1.5	65	3	F69
EMSBS0030-30-SD		0.3	1.5	65	3	F69
EMSBS0030-30-TH		0.3	1.5	65	3	F69
EMST0031-TH		0.31	0.31	45	3	F73
EMSBH0031-3-ATH		0.31	1.5	45	3	F76
EMSBH0031-6-ATH		0.31	1.5	45	3	F76
EMSBH0031-9-ATH		0.31	1.5	45	3	F76
EMSBH0032-3-ATH		0.32	1.5	45	3	F76
EMSBH0032-6-ATH		0.32	1.5	45	3	F76
EMSBH0032-9-ATH		0.32	1.5	45	3	F76
EMST0039-TH		0.39	0.39	45	3	F73
EMST0040-TH	★	0.4	0.4	45	3	F73
EMSBH0040-12-ATH	★	0.4	2	50	3	F76
EMSBH0040-4-ATH	★	0.4	2	50	3	F76
EMSBH0040-8-ATH	★	0.4	2	50	3	F76
EMSBS0040-12-SD		0.4	2	50	3	F69
EMSBS0040-12-TH	★	0.4	2	50	3	F69
EMSBS0040-4-SD		0.4	2	50	3	F69
EMSBS0040-4-TH	★	0.4	2	50	3	F69
EMSBS0040-8-SD		0.4	2	50	3	F69
EMSBS0040-8-TH		0.4	2	50	3	F69
EMSBS0040-20-SD		0.4	2	60	3	F69
EMSBS0040-20-TH	★	0.4	2	60	3	F69
EMSBS0040-30-SD		0.4	2	75	3	F69
EMSBS0040-30-TH		0.4	2	75	3	F69
EMSBS0040-40-SD		0.4	2	75	3	F69
EMSBS0040-40-TH		0.4	2	75	3	F69
EMST0041-TH		0.41	0.41	45	3	F73
EMSBH0041-12-ATH		0.41	2	50	3	F76
EMSBH0041-4-ATH		0.41	2	50	3	F76
EMSBH0041-8-ATH		0.41	2	50	3	F76
EMSBH0042-12-ATH		0.42	2	50	3	F76
EMSBH0042-4-ATH		0.42	2	50	3	F76
EMSBH0042-8-ATH		0.42	2	50	3	F76
EMST0049-TH		0.49	0.49	45	3	F73
EMST0050-TH	★	0.5	0.5	45	3	F73
EMSBH0050-10-ATH	★	0.5	2.5	50	3	F76
EMSBH0050-15-ATH	★	0.5	2.5	50	3	F76
EMSBH0050-5-ATH	★	0.5	2.5	50	3	F76
EMSBS0050-10-SD		0.5	2.5	50	3	F69
EMSBS0050-10-TH		0.5	2.5	50	3	F69
EMSBS0050-15-SD		0.5	2.5	50	3	F69
EMSBS0050-15-TH	★	0.5	2.5	50	3	F69
EMSBS0050-5-SD		0.5	2.5	50	3	F69
EMSBS0050-5-TH	★	0.5	2.5	50	3	F69
EMSBS0050-25-SD		0.5	2.5	65	3	F69
EMSBS0050-25-TH	★	0.5	2.5	65	3	F69
EMSBS0050-37.5-SD		0.5	2.5	85	3	F69
EMSBS0050-37.5-TH		0.5	2.5	85	3	F69
EMSBS0050-50-SD		0.5	2.5	85	3	F69
EMSBS0050-50-TH		0.5	2.5	85	3	F69
EMST0051-TH		0.51	0.51	45	3	F73
EMSBH0051-10-ATH		0.51	2.5	50	3	F76

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EMSBH0051-15-ATH		0.51	2.5	50	3	F76
EMSBH0051-5-ATH		0.51	2.5	50	3	F76
EMSBH0052-10-ATH		0.52	2.5	50	3	F76
EMSBH0052-15-ATH		0.52	2.5	50	3	F76
EMSBH0052-5-ATH		0.52	2.5	50	3	F76
EMST0059-TH		0.59	0.59	45	3	F73
EMST0060-TH	★	0.6	0.6	45	3	F73
EMSBH0060-12-ATH	★	0.6	3	55	3	F76
EMSBH0060-18-ATH	★	0.6	3	55	3	F76
EMSBH0060-6-ATH	★	0.6	3	55	3	F76
EMSBS0060-12-SD		0.6	3	55	3	F69
EMSBS0060-12-TH		0.6	3	55	3	F69
EMSBS0060-18-SD		0.6	3	55	3	F69
EMSBS0060-18-TH	★	0.6	3	55	3	F69
EMSBS0060-6-SD		0.6	3	55	3	F69
EMSBS0060-6-TH	★	0.6	3	55	3	F69
EMSBS0060-30-SD		0.6	3	75	3	F69
EMSBS0060-30-TH	★	0.6	3	75	3	F69
EMSBS0060-45-SD		0.6	3	95	3	F69
EMSBS0060-45-TH		0.6	3	95	3	F69
EMSBS0060-60-SD		0.6	3	95	3	F69
EMSBS0060-60-TH		0.6	3	95	3	F69
EMST0061-TH		0.61	0.61	45	3	F73
EMSBH0061-12-ATH		0.61	3	55	3	F76
EMSBH0061-18-ATH		0.61	3	55	3	F76
EMSBH0061-6-ATH		0.61	3	55	3	F76
EMSBH0062-12-ATH		0.62	3	55	3	F76
EMSBH0062-18-ATH		0.62	3	55	3	F76
EMSBH0062-6-ATH		0.62	3	55	3	F76
EMST0069-TH		0.69	0.69	45	3	F73
EMST0070-TH	★	0.7	0.7	45	4	F73
EMSBH0070-14-ATH	★	0.7	3.5	60	4	F76
EMSBH0070-21-ATH	★	0.7	3.5	60	4	F76
EMSBH0070-7-ATH	★	0.7	3.5	60	4	F76
EMSBS0070-14-SD		0.7	3.5	60	4	F69
EMSBS0070-14-TH		0.7	3.5	60	4	F69
EMSBS0070-21-SD		0.7	3.5	60	4	F69
EMSBS0070-21-TH	★	0.7	3.5	60	4	F69
EMSBS0070-7-SD		0.7	3.5	60	4	F69
EMSBS0070-7-TH	★	0.7	3.5	60	4	F69
EMSBS0070-35-SD		0.7	3.5	80	4	F69
EMSBS0070-35-TH	★	0.7	3.5	80	4	F69
EMSBS0070-52.5-SD		0.7	3.5	105	4	F69
EMSBS0070-52.5-TH		0.7	3.5	105	4	F69
EMSBS0070-70-SD		0.7	3.5	105	4	F69
EMSBS0070-70-TH		0.7	3.5	105	4	F69
EMST0071-TH		0.71	0.71	45	4	F73
EMSBH0071-14-ATH		0.71	3.5	60	4	F76
EMSBH0071-21-ATH		0.71	3.5	60	4	F76
EMSBH0071-7-ATH		0.71	3.5	60	4	F76
EMSBH0072-14-ATH		0.72	3.5	60	4	F76
EMSBH0072-21-ATH		0.72	3.5	60	4	F76
EMSBH0072-7-ATH		0.72	3.5	60	4	F76
EMST0079-TH		0.79	0.79	45	4	F73
EMST0080-TH	★	0.8	0.8	45	4	F73
EMSBH0080-16-ATH	★	0.8	4	60	4	F77
EMSBH0080-24-ATH	★	0.8	4	60	4	F77
EMSBH0080-8-ATH	★	0.8	4	60	4	F77
EMSBS0080-16-SD		0.8	4	60	4	F69
EMSBS0080-16-TH		0.8	4	60	4	F69
EMSBS0080-24-SD		0.8	4	60	4	F69
EMSBS0080-24-TH	★	0.8	4	60	4	F69
EMSBS0080-8-SD		0.8	4	60	4	F69
EMSBS0080-8-TH	★	0.8	4	60	4	F69
EMSBS0080-40-SD		0.8	4	85	4	F69
EMSBS0080-40-TH	★	0.8	4	85	4	F69

●：Inventory maintained in US　★：Inventory maintained in Japan　No Mark：Manufactured upon request only

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EMSBS0080-60-SD		0.8	4	115	4	F69
EMSBS0080-60-TH		0.8	4	115	4	F69
EMSBS0080-80-SD		0.8	4	115	4	F69
EMSBS0080-80-TH		0.8	4	115	4	F69
EMST0081-TH		0.81	0.81	45	4	F73
EMSBH0081-16-ATH		0.81	4	60	4	F77
EMSBH0081-24-ATH		0.81	4	60	4	F77
EMSBH0081-8-ATH		0.81	4	60	4	F77
EMSBH0082-16-ATH		0.82	4	60	4	F77
EMSBH0082-24-ATH		0.82	4	60	4	F77
EMSBH0082-8-ATH		0.82	4	60	4	F77
EMST0089-TH		0.89	0.89	45	4	F73
EMST0090-TH	★	0.9	0.9	45	4	F73
EMSBH0090-18-ATH	★	0.9	4.5	65	4	F77
EMSBH0090-27-ATH	★	0.9	4.5	65	4	F77
EMSBH0090-9-ATH	★	0.9	4.5	65	4	F77
EMSBS0090-18-SD		0.9	4.5	65	4	F69
EMSBS0090-18-TH		0.9	4.5	65	4	F69
EMSBS0090-27-SD		0.9	4.5	65	4	F69
EMSBS0090-27-TH	★	0.9	4.5	65	4	F69
EMSBS0090-9-SD		0.9	4.5	65	4	F69
EMSBS0090-9-TH	★	0.9	4.5	65	4	F69
EMSBS0090-45-SD		0.9	4.5	90	4	F69
EMSBS0090-45-TH	★	0.9	4.5	90	4	F69
EMSBS0090-67.5-SD		0.9	4.5	125	4	F69
EMSBS0090-67.5-TH		0.9	4.5	125	4	F69
EMSBS0090-90-SD		0.9	4.5	125	4	F69
EMSBS0090-90-TH		0.9	4.5	125	4	F69
EMST0091-TH		0.91	0.91	45	4	F73
EMSBH0091-18-ATH		0.91	4.5	65	4	F77
EMSBH0091-27-ATH		0.91	4.5	65	4	F77
EMSBH0091-9-ATH		0.91	4.5	65	4	F77
EMSBH0092-18-ATH		0.92	4.5	65	4	F77
EMSBH0092-27-ATH		0.92	4.5	65	4	F77
EMSBH0092-9-ATH		0.92	4.5	65	4	F77
EMST0099-TH		0.99	0.99	45	4	F73
EMST0100-TH	★	1	1	45	4	F73
EMSBH0100-10-ATH	★	1	5	70	4	F77
EMSBH0100-20-ATH	★	1	5	70	4	F77
EMSBH0100-30-ATH	★	1	5	70	4	F77
EMSBS0100-10-SD		1	5	70	4	F69
EMSBS0100-10-TH	★	1	5	70	4	F69
EMSBS0100-20-SD		1	5	70	4	F69
EMSBS0100-20-TH		1	5	70	4	F69
EMSBS0100-30-SD		1	5	70	4	F69
EMSBS0100-30-TH	★	1	5	70	4	F69
EMSBS0100-50-SD		1	5	100	4	F69
EMSBS0100-50-TH	★	1	5	100	4	F69
EMSBS0100-100-SD		1	5	135	4	F69
EMSBS0100-100-TH		1	5	135	4	F69
EMSBS0100-75-SD		1	5	135	4	F69
EMSBS0100-75-TH		1	5	135	4	F69
03WHMB0100-TH	★	1	6	55	3	F63
04WNSB0100-TH	★	1	8	50	3	F41
05WHMB0100-TH	★	1	10	55	3	F63
10WHMB0100-TH	★	1	15	55	3	F63
15WHMB0100-TH	★	1	20	60	3	F63
20WHMB0100-TH	★	1	24	65	3	F63
25WHMB0100-TH	★	1	28	65	3	F31
30WHMB0100-TH	★	1	33	70	3	F63
EMST0101-TH		1.01	1.01	45	4	F73
EMSBH0101-10-ATH		1.01	5	70	4	F77
EMSBH0101-20-ATH		1.01	5	70	4	F77
EMSBH0101-30-ATH		1.01	5	70	4	F77
03WHMB0101-TH		1.01	6	55	3	F63
05WHMB0101-TH		1.01	10	55	3	F63

Item code	Stock	DC	Flute length	LF	DCONMS	Page
10WHMB0101-TH		1.01	16	55	3	F63
20WHMB0101-TH		1.01	25	65	3	F63
30WHMB0101-TH		1.01	35	75	3	F63
EMSBH0102-10-ATH		1.02	5	70	4	F77
EMSBH0102-20-ATH		1.02	5	70	4	F77
EMSBH0102-30-ATH		1.02	5	70	4	F77
03WHMB0102-TH		1.02	6	55	3	F63
05WHMB0102-TH		1.02	10	55	3	F63
10WHMB0102-TH		1.02	16	55	3	F63
20WHMB0102-TH		1.02	25	65	3	F63
30WHMB0102-TH		1.02	35	75	3	F63
03WHMB0103-TH		1.03	6	55	3	F63
05WHMB0103-TH		1.03	10	55	3	F63
10WHMB0103-TH		1.03	16	55	3	F63
20WHMB0103-TH		1.03	25	65	3	F63
30WHMB0103-TH		1.03	35	75	3	F63
03WHMB0105-TH	★	1.05	6	55	3	F63
05WHMB0105-TH	★	1.05	10	55	3	F63
10WHMB0105-TH	★	1.05	16	55	3	F63
15WHMB0105-TH	★	1.05	20	60	3	F63
20WHMB0105-TH	★	1.05	25	65	3	F63
25WHMB0105-TH	★	1.05	30	70	3	F31
30WHMB0105-TH	★	1.05	35	75	3	F63
03WHMB0110-TH	★	1.1	6	55	3	F63
04WNSB0110-TH	★	1.1	9	50	3	F41
05WHMB0110-TH	★	1.1	11	55	3	F63
10WHMB0110-TH	★	1.1	17	55	3	F63
15WHMB0110-TH	★	1.1	22	60	3	F63
20WHMB0110-TH	★	1.1	26	65	3	F63
25WHMB0110-TH	★	1.1	32	70	3	F31
30WHMB0110-TH	★	1.1	37	75	3	F63
03WHMB0111-TH		1.11	6	55	3	F63
05WHMB0111-TH		1.11	11	55	3	F63
10WHMB0111-TH		1.11	18	60	3	F63
20WHMB0111-TH		1.11	28	70	3	F63
30WHMB0111-TH		1.11	38	75	3	F63
03WHMB0112-TH		1.12	6	6	3	F63
05WHMB0112-TH		1.12	11	11	3	F63
10WHMB0112-TH		1.12	18	18	3	F63
20WHMB0112-TH		1.12	28	28	3	F63
30WHMB0112-TH		1.12	38	38	3	F63
03WHMB0113-TH		1.13	6	6	3	F63
05WHMB0113-TH		1.13	11	11	3	F63
10WHMB0113-TH		1.13	18	18	3	F63
20WHMB0113-TH		1.13	28	28	3	F63
30WHMB0113-TH		1.13	38	38	3	F63
03WHMB0115-TH	★	1.15	6	55	3	F63
05WHMB0115-TH	★	1.15	11	55	3	F63
10WHMB0115-TH	★	1.15	18	60	3	F63
15WHMB0115-TH	★	1.15	23	60	3	F63
20WHMB0115-TH	★	1.15	28	70	3	F63
25WHMB0115-TH	★	1.15	33	70	3	F31
30WHMB0115-TH	★	1.15	38	75	3	F63
03WHMB0120-TH	★	1.2	6	55	3	F63
04WNSB0120-TH	★	1.2	9	50	3	F41
05WHMB0120-TH	★	1.2	12	55	3	F63
10WHMB0120-TH	★	1.2	18	60	3	F63
15WHMB0120-TH	★	1.2	23	60	3	F63
20WHMB0120-TH	★	1.2	29	70	3	F63
25WHMB0120-TH	★	1.2	35	75	3	F31
30WHMB0120-TH	★	1.2	40	80	3	F63
03WHMB0121-TH		1.21	7	7	3	F63
05WHMB0121-TH		1.21	13	13	3	F63
10WHMB0121-TH		1.21	20	20	3	F63
20WHMB0121-TH		1.21	31	31	3	F63
30WHMB0121-TH		1.21	42	42	3	F63

Item code	Stock	DC	Flute length	LF	DCONMS	Page
03WHMB0122-TH		1.22	7	7	3	F63
05WHMB0122-TH		1.22	13	13	3	F63
10WHMB0122-TH		1.22	20	20	3	F63
20WHMB0122-TH		1.22	31	31	3	F63
30WHMB0122-TH		1.22	42	42	3	F63
03WHMB0123-TH		1.23	7	7	3	F63
05WHMB0123-TH		1.23	13	13	3	F63
10WHMB0123-TH		1.23	20	20	3	F63
20WHMB0123-TH		1.23	31	31	3	F63
30WHMB0123-TH		1.23	42	42	3	F63
03WHMB0125-TH	★	1.25	7	55	3	F63
05WHMB0125-TH	★	1.25	13	55	3	F63
10WHMB0125-TH	★	1.25	20	60	3	F63
15WHMB0125-TH	★	1.25	24	60	3	F63
20WHMB0125-TH	★	1.25	31	70	3	F63
25WHMB0125-TH	★	1.25	36	75	3	F31
30WHMB0125-TH	★	1.25	42	80	3	F63
03WHMB0130-TH	★	1.3	7	55	3	F63
04WNSB0130-TH	★	1.3	10	50	3	F41
05WHMB0130-TH	★	1.3	14	55	3	F63
10WHMB0130-TH	★	1.3	21	60	3	F63
15WHMB0130-TH	★	1.3	25	70	3	F63
20WHMB0130-TH	★	1.3	32	70	3	F63
25WHMB0130-TH	★	1.3	37	75	3	F31
30WHMB0130-TH	★	1.3	43	80	3	F63
03WHMB0131-TH		1.31	7	55	3	F63
05WHMB0131-TH		1.31	14	55	3	F63
10WHMB0131-TH		1.31	21	60	3	F63
20WHMB0131-TH		1.31	33	70	3	F63
30WHMB0131-TH		1.31	45	85	3	F63
03WHMB0132-TH		1.32	7	55	3	F63
05WHMB0132-TH		1.32	14	55	3	F63
10WHMB0132-TH		1.32	21	60	3	F63
20WHMB0132-TH		1.32	33	70	3	F63
30WHMB0132-TH		1.32	45	85	3	F63
03WHMB0133-TH		1.33	7	55	3	F63
05WHMB0133-TH		1.33	14	55	3	F63
10WHMB0133-TH		1.33	21	60	3	F63
20WHMB0133-TH		1.33	33	70	3	F63
30WHMB0133-TH		1.33	45	85	3	F63
03WHMB0135-TH	★	1.35	7	55	3	F63
05WHMB0135-TH	★	1.35	14	55	3	F63
10WHMB0135-TH	★	1.35	21	60	3	F63
15WHMB0135-TH	★	1.35	26	70	3	F63
20WHMB0135-TH	★	1.35	33	70	3	F63
25WHMB0135-TH	★	1.35	37	75	3	F31
30WHMB0135-TH	★	1.35	45	85	3	F63
03WHMB0140-TH	★	1.4	7	55	3	F64
04WNSB0140-TH	★	1.4	10	50	3	F41
05WHMB0140-TH	★	1.4	15	55	3	F64
10WHMB0140-TH	★	1.4	22	60	3	F64
15WHMB0140-TH	★	1.4	27	70	3	F64
20WHMB0140-TH	★	1.4	33	70	3	F64
25WHMB0140-TH	★	1.4	38	75	3	F31
30WHMB0140-TH	★	1.4	47	85	3	F64
03WHMB0141-TH		1.41	7	55	3	F64
05WHMB0141-TH		1.41	15	55	3	F64
10WHMB0141-TH		1.41	23	60	3	F64
20WHMB0141-TH		1.41	35	75	3	F64
30WHMB0141-TH		1.41	49	85	3	F64
03WHMB0142-TH		1.42	7	55	3	F64
05WHMB0142-TH		1.42	15	55	3	F64
10WHMB0142-TH		1.42	23	60	3	F64
20WHMB0142-TH		1.42	35	75	3	F64
30WHMB0142-TH		1.42	49	85	3	F64
03WHMB0143-TH		1.43	7	55	3	F64

Item code	Stock	DC	Flute length	LF	DCONMS	Page
05WHMB0143-TH		1.43	15	55	3	F64
10WHMB0143-TH		1.43	23	60	3	F64
20WHMB0143-TH		1.43	35	75	3	F64
30WHMB0143-TH		1.43	49	85	3	F64
03WHMB0145-TH	★	1.45	7	55	3	F64
05WHMB0145-TH	★	1.45	15	55	3	F64
10WHMB0145-TH	★	1.45	23	60	3	F64
15WHMB0145-TH	★	1.45	30	70	3	F64
20WHMB0145-TH	★	1.45	35	75	3	F64
25WHMB0145-TH	★	1.45	42	80	3	F31
30WHMB0145-TH	★	1.45	49	85	3	F64
03WHMB0150-TH	★	1.5	8	55	3	F64
04WNSB0150-TH	★	1.5	12	50	3	F41
EMSBH0150-15-ATH	★	1.5	15	70	4	F77
EMSBH0150-30-ATH	★	1.5	15	70	4	F77
EMSBH0150-45-ATH	★	1.5	15	100	4	F77
05WHMB0150-TH	★	1.5	16	55	3	F64
10WHMB0150-TH	★	1.5	24	60	3	F64
15WHMB0150-TH	★	1.5	30	70	3	F64
20WHMB0150-TH	★	1.5	37	75	3	F64
25WHMB0150-TH	★	1.5	42	80	3	F31
30WHMB0150-TH	★	1.5	50	90	3	F64
03WHMB0151-TH		1.51	8	55	3	F64
EMSBH0151-15-ATH		1.51	15	70	4	F77
EMSBH0151-30-ATH		1.51	15	70	4	F77
EMSBH0151-45-ATH		1.51	15	100	4	F77
05WHMB0151-TH		1.51	16	55	3	F64
10WHMB0151-TH		1.51	22	60	3	F64
20WHMB0151-TH		1.51	37	75	3	F64
30WHMB0151-TH		1.51	52	90	3	F64
03WHMB0152-TH		1.52	8	55	3	F64
EMSBH0152-15-ATH		1.52	15	70	4	F77
EMSBH0152-30-ATH		1.52	15	70	4	F77
EMSBH0152-45-ATH		1.52	15	100	4	F77
05WHMB0152-TH		1.52	16	55	3	F64
10WHMB0152-TH		1.52	22	60	3	F64
20WHMB0152-TH		1.52	37	75	3	F64
30WHMB0152-TH		1.52	52	90	3	F64
03WHMB0153-TH		1.53	8	55	3	F64
05WHMB0153-TH		1.53	16	55	3	F64
10WHMB0153-TH		1.53	22	60	3	F64
20WHMB0153-TH		1.53	37	75	3	F64
30WHMB0153-TH		1.53	52	90	3	F64
03WHMB0155-TH	★	1.55	8	55	3	F64
05WHMB0155-TH	★	1.55	16	55	3	F64
10WHMB0155-TH	★	1.55	22	60	3	F64
15WHMB0155-TH	★	1.55	32	70	3	F64
20WHMB0155-TH	★	1.55	37	75	3	F64
25WHMB0155-TH	★	1.55	44	85	3	F31
30WHMB0155-TH	★	1.55	52	90	3	F64
03WHMB0160-TH	★	1.6	8	55	3	F64
04WNSB0160-TH	★	1.6	12	50	3	F41
05WHMB0160-TH	★	1.6	17	55	3	F64
10WHMB0160-TH	★	1.6	26	65	3	F64
15WHMB0160-TH	★	1.6	33	70	3	F64
20WHMB0160-TH	★	1.6	37	75	3	F64
25WHMB0160-TH	★	1.6	45	85	3	F31
30WHMB0160-TH	★	1.6	53	90	3	F64
03WHMB0161-TH		1.61	8	55	3	F64
05WHMB0161-TH		1.61	17	55	3	F64
10WHMB0161-TH		1.61	26	65	3	F64
20WHMB0161-TH		1.61	38	75	3	F64
30WHMB0161-TH		1.61	55	95	3	F64
03WHMB0162-TH		1.62	8	55	3	F64
05WHMB0162-TH		1.62	17	55	3	F64
10WHMB0162-TH		1.62	26	65	3	F64

Quick dimension reference table by tool diameter

φ 1.62～φ 3.8

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
20WHMB0162-TH		1.62	38	75	3	F64
30WHMB0162-TH		1.62	55	95	3	F64
03WHMB0163-TH		1.63	8	55	3	F64
05WHMB0163-TH		1.63	17	55	3	F64
10WHMB0163-TH		1.63	26	65	3	F64
20WHMB0163-TH		1.63	38	75	3	F64
30WHMB0163-TH		1.63	55	95	3	F64
03WHMB0165-TH	★	1.65	8	55	3	F64
05WHMB0165-TH	★	1.65	17	55	3	F64
10WHMB0165-TH	★	1.65	26	65	3	F64
15WHMB0165-TH	★	1.65	33	70	3	F64
20WHMB0165-TH	★	1.65	38	75	3	F64
25WHMB0165-TH	★	1.65	46	90	3	F31
30WHMB0165-TH	★	1.65	55	95	3	F64
03WHMB0170-TH	★	1.7	8	55	3	F64
04WNSB0170-TH	★	1.7	14	50	3	F41
05WHMB0170-TH	★	1.7	18	55	3	F64
10WHMB0170-TH	★	1.7	27	65	3	F64
15WHMB0170-TH	★	1.7	34	70	3	F64
20WHMB0170-TH	★	1.7	40	80	3	F64
25WHMB0170-TH	★	1.7	48	85	3	F31
30WHMB0170-TH	★	1.7	57	95	3	F64
03WHMB0171-TH		1.71	8	55	3	F64
05WHMB0171-TH		1.71	19	60	3	F64
10WHMB0171-TH		1.71	27	65	3	F64
20WHMB0171-TH		1.71	41	80	3	F64
30WHMB0171-TH		1.71	58	95	3	F64
03WHMB0172-TH		1.72	8	55	3	F64
05WHMB0172-TH		1.72	19	60	3	F64
10WHMB0172-TH		1.72	27	65	3	F64
20WHMB0172-TH		1.72	41	80	3	F64
30WHMB0172-TH		1.72	58	95	3	F64
03WHMB0173-TH		1.73	8	55	3	F64
05WHMB0173-TH		1.73	19	60	3	F64
10WHMB0173-TH		1.73	27	65	3	F64
20WHMB0173-TH		1.73	41	80	3	F64
30WHMB0173-TH		1.73	58	95	3	F64
03WHMB0175-TH	★	1.75	8	55	3	F64
05WHMB0175-TH	★	1.75	19	60	3	F64
10WHMB0175-TH	★	1.75	27	65	3	F64
15WHMB0175-TH	★	1.75	34	75	3	F64
20WHMB0175-TH	★	1.75	41	80	3	F64
25WHMB0175-TH	★	1.75	50	90	3	F31
30WHMB0175-TH	★	1.75	58	95	3	F64
03WHMB0180-TH	★	1.8	10	55	3	F65
04WNSB0180-TH	★	1.8	14	50	3	F41
05WHMB0180-TH	★	1.8	19	60	3	F65
10WHMB0180-TH	★	1.8	28	65	3	F65
15WHMB0180-TH	★	1.8	36	75	3	F65
20WHMB0180-TH	★	1.8	43	80	3	F65
25WHMB0180-TH	★	1.8	51	90	3	F31
30WHMB0180-TH	★	1.8	60	100	3	F65
03WHMB0181-TH		1.81	10	55	3	F65
05WHMB0181-TH		1.81	20	60	3	F65
10WHMB0181-TH		1.81	29	70	3	F65
20WHMB0181-TH		1.81	45	85	3	F65
30WHMB0181-TH		1.81	61	100	3	F65
03WHMB0182-TH		1.82	10	55	3	F65
05WHMB0182-TH		1.82	20	60	3	F65
10WHMB0182-TH		1.82	29	70	3	F65
20WHMB0182-TH		1.82	45	85	3	F65
30WHMB0182-TH		1.82	61	100	3	F65
03WHMB0183-TH		1.83	10	55	3	F65
05WHMB0183-TH		1.83	20	60	3	F65
10WHMB0183-TH		1.83	29	70	3	F65
20WHMB0183-TH		1.83	45	85	3	F65

Item code	Stock	DC	Flute length	LF	DCONMS	Page
30WHMB0183-TH		1.83	61	100	3	F65
03WHMB0185-TH	★	1.85	10	55	3	F65
05WHMB0185-TH	★	1.85	20	60	3	F65
10WHMB0185-TH	★	1.85	29	70	3	F65
15WHMB0185-TH	★	1.85	38	75	3	F65
20WHMB0185-TH	★	1.85	45	85	3	F65
25WHMB0185-TH	★	1.85	53	90	3	F31
30WHMB0185-TH	★	1.85	61	100	3	F65
03WHMB0190-TH	★	1.9	10	55	3	F65
04WNSB0190-TH	★	1.9	16	50	3	F41
05WHMB0190-TH	★	1.9	20	60	3	F65
10WHMB0190-TH	★	1.9	29	70	3	F65
15WHMB0190-TH	★	1.9	39	75	3	F65
20WHMB0190-TH	★	1.9	45	85	3	F65
25WHMB0190-TH	★	1.9	55	95	3	F31
30WHMB0190-TH	★	1.9	63	100	3	F65
03WHMB0191-TH		1.91	10	55	3	F65
05WHMB0191-TH		1.91	20	60	3	F65
10WHMB0191-TH		1.91	30	70	3	F65
20WHMB0191-TH		1.91	47	85	3	F65
30WHMB0191-TH		1.91	65	105	3	F65
03WHMB0192-TH		1.92	10	55	3	F65
05WHMB0192-TH		1.92	20	60	3	F65
10WHMB0192-TH		1.92	30	70	3	F65
20WHMB0192-TH		1.92	47	85	3	F65
30WHMB0192-TH		1.92	65	105	3	F65
03WHMB0193-TH		1.93	10	55	3	F65
05WHMB0193-TH		1.93	20	60	3	F65
10WHMB0193-TH		1.93	30	70	3	F65
20WHMB0193-TH		1.93	47	85	3	F65
30WHMB0193-TH		1.93	65	105	3	F65
03WHMB0195-TH	★	1.95	10	55	3	F65
05WHMB0195-TH	★	1.95	20	60	3	F65
10WHMB0195-TH	★	1.95	30	70	3	F65
15WHMB0195-TH	★	1.95	41	80	3	F65
20WHMB0195-TH	★	1.95	47	85	3	F65
25WHMB0195-TH	★	1.95	56	95	3	F31
30WHMB0195-TH	★	1.95	65	105	3	F65
ZPB0200-TH		2	8	50	4	F89
ZPBLS0200-TH		2	8	80	4	F91
03WHMB0200-TH	★	2	10	55	3	F65
NSBH0200-10-ATH	★	2	10	60	4	F48
EHSE2.0-TH	★	2	15	50	3	F83
04WNSB0200-TH	★	2	16	50	3	F41
03WHNSB0200-TH	●	2	16	69	3	F18
05WHMB0200-TH	★	2	20	60	3	F65
05WHNSB0200-SD	★	2	20	66	3	F45
05WHNSB0200-TH	●	2	20	66	3	F20
EMSBH0200-20-ATH	★	2	20	70	4	F77
NSBH0200-20-ATH	★	2	20	70	4	F48
EMSBH0200-40-ATH	★	2	20	100	4	F77
EMSBH0200-60-ATH	★	2	20	100	4	F77
08WHNSB0200-TH	●	2	25	75	3	F23
10WHMB0200-TH	★	2	30	70	3	F65
10WHNSB0200-TH	★	2	30	80	3	F26
15WHNSB0200-TH	★	2	40	83	3	F28
NSBH0200-40-ATH	★	2	40	90	4	F48
15WHMB0200-TH	★	2	41	80	3	F65
20WHMB0200-TH	★	2	47	85	3	F65
20WHNSB0200-TH	★	2	50	93	3	F29
25WHMB0200-TH	★	2	57	95	3	F31
25WHNSB0200-TH	★	2	57	100	3	F31
NSBH0200-60-ATH	★	2	60	110	4	F48
30WHMB0200-TH	★	2	67	105	3	F65
30WHNSB0200-TH	★	2	70	113	3	F32
03WHMB0201-TH		2.01	10	55	3	F65

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EMSBH0201-20-ATH		2.01	20	70	4	F77
EMSBH0201-40-ATH		2.01	20	100	4	F77
EMSBH0201-60-ATH		2.01	20	100	4	F77
05WHMB0201-TH		2.01	21	60	3	F65
10WHMB0201-TH		2.01	31	70	3	F65
20WHMB0201-TH		2.01	49	90	3	F65
30WHMB0201-TH		2.01	69	110	3	F65
03WHMB0202-TH		2.02	10	55	3	F65
EMSBH0202-20-ATH		2.02	20	70	4	F77
EMSBH0202-40-ATH		2.02	20	100	4	F77
EMSBH0202-60-ATH		2.02	20	100	4	F77
05WHMB0202-TH		2.02	21	60	3	F65
10WHMB0202-TH		2.02	31	70	3	F65
20WHMB0202-TH		2.02	49	90	3	F65
30WHMB0202-TH		2.02	69	110	3	F65
03WHMB0203-TH		2.03	10	55	3	F65
03WHNSB0203-TH	★	2.03	16	69	3	F18
05WHMB0203-TH		2.03	21	60	3	F65
05WHNSB0203-SD	★	2.03	24	74	3	F45
10WHMB0203-TH		2.03	31	70	3	F65
20WHMB0203-TH		2.03	49	90	3	F65
30WHMB0203-TH		2.03	69	110	3	F65
ZPB0210-TH		2.1	8	50	4	F89
ZPBLS0210-TH		2.1	8	80	4	F91
NSBH0210-10-ATH	★	2.1	10	60	4	F48
EHSE2.1-TH	★	2.1	15	50	3	F83
04WNSB0210-TH	★	2.1	17	50	3	F41
03WHNSB0210-TH	●	2.1	17	69	3	F18
NSBH0210-20-ATH		2.1	20	70	4	F48
05WHNSB0210-SD	★	2.1	24	74	3	F45
05WHNSB0210-TH	●	2.1	24	74	3	F20
08WHNSB0210-TH	●	2.1	25	75	3	F23
10WHNSB0210-TH	★	2.1	30	80	3	F26
NSBH0210-40-ATH		2.1	40	90	4	F48
15WHNSB0210-TH	★	2.1	44	87	3	F28
20WHNSB0210-TH	★	2.1	55	98	3	F29
NSBH0210-60-ATH		2.1	60	110	4	F48
25WHNSB0210-TH	★	2.1	62	105	3	F31
30WHNSB0210-TH	★	2.1	77	120	3	F32
03WHNSB0213-TH	★	2.13	17	69	3	F18
ZPB0220-TH		2.2	8	50	4	F89
ZPBLS0220-TH		2.2	8	80	4	F91
NSBH0220-10-ATH	★	2.2	10	60	4	F48
EHSE2.2-TH	★	2.2	16	50	3	F83
04WNSB0220-TH	★	2.2	17	50	3	F41
03WHNSB0220-TH	●	2.2	17	69	3	F18
NSBH0220-20-ATH		2.2	20	70	4	F48
05WHNSB0220-SD	★	2.2	24	74	3	F45
05WHNSB0220-TH	●	2.2	24	74	3	F20
08WHNSB0220-TH	●	2.2	25	75	3	F23
10WHNSB0220-TH	★	2.2	30	80	3	F26
NSBH0220-40-ATH		2.2	40	90	4	F48
15WHNSB0220-TH	★	2.2	44	87	3	F28
20WHNSB0220-TH	★	2.2	55	98	3	F29
NSBH0220-60-ATH		2.2	60	110	4	F48
25WHNSB0220-TH	★	2.2	62	105	3	F31
30WHNSB0220-TH	★	2.2	77	120	3	F32
03WHNSB0223-TH	★	2.23	17	69	3	F18
ZPB0230-TH		2.3	8	50	4	F89
ZPBLS0230-TH		2.3	8	80	4	F91
NSBH0230-10-ATH	★	2.3	10	60	4	F48
EHSE2.3-TH	★	2.3	16	50	3	F83
04WNSB0230-TH	★	2.3	17	50	3	F41
03WHNSB0230-TH	●	2.3	19	69	3	F18
NSBH0230-20-ATH		2.3	20	70	4	F48
05WHNSB0230-SD	★	2.3	24	74	3	F45

Item code	Stock	DC	Flute length	LF	DCONMS	Page
05WHNSB0230-TH	●	2.3	24	74	3	F20
08WHNSB0230-TH	●	2.3	28	75	3	F23
10WHNSB0230-TH	★	2.3	33	80	3	F26
NSBH0230-40-ATH		2.3	40	90	4	F48
15WHNSB0230-TH	★	2.3	50	93	3	F28
NSBH0230-60-ATH		2.3	60	110	4	F48
20WHNSB0230-TH	★	2.3	62	105	3	F29
25WHNSB0230-TH	★	2.3	71	114	3	F31
30WHNSB0230-TH	★	2.3	87	130	3	F32
03WHNSB0233-TH	★	2.33	19	69	3	F18
ZPB0240-TH		2.4	8	50	4	F89
ZPBLS0240-TH		2.4	8	80	4	F91
NSBH0240-10-ATH	★	2.4	10	60	4	F48
04WNSB0240-TH	★	2.4	17	50	3	F41
EHSE2.4-TH	★	2.4	17	50	3	F83
03WHNSB0240-TH	●	2.4	19	69	3	F18
NSBH0240-20-ATH		2.4	20	70	4	F48
05WHNSB0240-SD	★	2.4	24	74	3	F45
05WHNSB0240-TH	●	2.4	24	74	3	F20
08WHNSB0240-TH	●	2.4	28	75	3	F23
10WHNSB0240-TH	★	2.4	33	80	3	F26
NSBH0240-40-ATH		2.4	40	90	4	F48
15WHNSB0240-TH	★	2.4	50	93	3	F28
NSBH0240-60-ATH		2.4	60	110	4	F48
20WHNSB0240-TH	★	2.4	62	105	3	F29
25WHNSB0240-TH	★	2.4	71	114	3	F31
30WHNSB0240-TH	★	2.4	87	130	3	F32
03WHNSB0243-TH	★	2.43	19	69	3	F18
ZPB0250-TH		2.5	10	50	4	F89
NSBH0250-10-ATH	★	2.5	10	60	4	F48
ZPBLS0250-TH		2.5	10	80	4	F91
04WNSB0250-TH	★	2.5	17	50	3	F41
EHSE2.5-TH	★	2.5	17	55	3	F83
03WHNSB0250-TH	●	2.5	19	69	3	F18
NSBH0250-20-ATH	★	2.5	20	70	4	F48
05WHNSB0250-SD	★	2.5	24	74	3	F45
05WHNSB0250-TH	●	2.5	24	74	3	F20
08WHNSB0250-TH	●	2.5	28	75	3	F23
10WHNSB0250-TH	★	2.5	33	80	3	F26
NSBH0250-40-ATH		2.5	40	90	4	F48
15WHNSB0250-TH	★	2.5	50	93	3	F28
NSBH0250-60-ATH		2.5	60	110	4	F48
20WHNSB0250-TH	★	2.5	62	105	3	F29
25WHNSB0250-TH	★	2.5	71	114	3	F31
30WHNSB0250-TH	★	2.5	87	130	3	F32
40WHNSB0250-TH	★	2.5	108	159	3	F36
50WHNSB0250-TH		2.5	133	184	3	F37
03WHNSB0253-TH	★	2.53	19	69	3	F18
05WHNSB0253-SD	★	2.53	29	79	3	F45
ZPB0260-TH		2.6	10	50	4	F89
NSBH0260-10-ATH	★	2.6	10	60	4	F48
ZPBLS0260-TH		2.6	10	80	4	F91
EHSE2.6-TH	★	2.6	17	55	3	F83
04WNSB0260-TH	★	2.6	19	50	3	F41
03WHNSB0260-TH	●	2.6	19	69	3	F18
NSBH0260-20-ATH	★	2.6	20	70	4	F48
05WHNSB0260-SD	★	2.6	29	79	3	F45
05WHNSB0260-TH	●	2.6	29	79	3	F20
08WHNSB0260-TH	●	2.6	33	80	3	F23
10WHNSB0260-TH	★	2.6	35	85	3	F26
NSBH0260-40-ATH		2.6	40	90	4	F48
15WHNSB0260-TH	★	2.6	54	102	3	F28
NSBH0260-60-ATH		2.6	60	110	4	F48
20WHNSB0260-TH	★	2.6	67	110	3	F29
25WHNSB0260-TH	★	2.6	76	119	3	F31
30WHNSB0260-TH	★	2.6	94	137	3	F32

●：Inventory maintained in US　★：Inventory maintained in Japan　No Mark：Manufactured upon request only

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
40WHNSB0260-TH		2.6	117	168	3	F36
50WHNSB0260-TH		2.6	144	195	3	F37
03WHNSB0263-TH	★	2.63	19	69	3	F18
ZPB0270-TH		2.7	10	50	4	F89
NSBH0270-10-ATH	★	2.7	10	60	4	F48
ZPBLS0270-TH		2.7	10	80	4	F91
04WNSB0270-TH	★	2.7	19	50	3	F41
EHSE2.7-TH	★	2.7	19	55	3	F83
03WHNSB0270-TH	●	2.7	19	69	3	F18
NSBH0270-20-ATH		2.7	20	70	4	F48
05WHNSB0270-SD	★	2.7	29	79	3	F45
05WHNSB0270-TH	●	2.7	29	79	3	F20
08WHNSB0270-TH	●	2.7	33	80	3	F23
10WHNSB0270-TH	★	2.7	35	85	3	F26
NSBH0270-40-ATH		2.7	40	90	4	F48
15WHNSB0270-TH	★	2.7	54	102	3	F28
NSBH0270-60-ATH		2.7	60	110	4	F48
20WHNSB0270-TH	★	2.7	67	110	3	F29
25WHNSB0270-TH	★	2.7	76	119	3	F31
30WHNSB0270-TH	★	2.7	94	137	3	F32
40WHNSB0270-TH		2.7	117	168	3	F36
50WHNSB0270-TH		2.7	144	195	3	F37
03WHNSB0273-TH	★	2.73	19	69	3	F18
ZPB0280-TH		2.8	10	50	4	F89
NSBH0280-10-ATH	★	2.8	10	60	4	F48
ZPBLS0280-TH		2.8	10	80	4	F91
04WNSB0280-TH	★	2.8	19	50	3	F41
EHSE2.8-TH	★	2.8	19	55	3	F83
03WHNSB0280-TH	●	2.8	19	69	3	F18
NSBH0280-20-ATH		2.8	20	70	4	F48
05WHNSB0280-SD	★	2.8	29	79	3	F45
05WHNSB0280-TH	●	2.8	29	79	3	F20
08WHNSB0280-TH	●	2.8	35	83	3	F23
10WHNSB0280-TH	★	2.8	39	85	3	F26
NSBH0280-40-ATH		2.8	40	90	4	F48
15WHNSB0280-TH	★	2.8	54	102	3	F28
NSBH0280-60-ATH		2.8	60	110	4	F48
20WHNSB0280-TH	★	2.8	69	115	3	F29
25WHNSB0280-TH	★	2.8	84	132	3	F31
30WHNSB0280-TH	★	2.8	99	144	3	F32
40WHNSB0280-TH		2.8	129	180	3	F36
50WHNSB0280-TH		2.8	159	210	3	F37
03WHNSB0283-TH	★	2.83	19	69	3	F18
ZPB0290-TH		2.9	10	50	4	F89
NSBH0290-10-ATH	★	2.9	10	60	4	F48
ZPBLS0290-TH		2.9	10	80	4	F91
04WNSB0290-TH	★	2.9	19	50	3	F41
EHSE2.9-TH	★	2.9	19	55	3	F83
03WHNSB0290-TH	●	2.9	19	69	3	F18
NSBH0290-20-ATH		2.9	20	70	4	F48
05WHNSB0290-SD	★	2.9	29	79	3	F45
05WHNSB0290-TH	●	2.9	29	79	3	F20
08WHNSB0290-TH	●	2.9	35	83	3	F23
10WHNSB0290-TH	★	2.9	39	87	3	F26
NSBH0290-40-ATH		2.9	40	90	4	F48
15WHNSB0290-TH	★	2.9	54	102	3	F28
NSBH0290-60-ATH		2.9	60	110	4	F48
20WHNSB0290-TH	★	2.9	69	115	3	F29
25WHNSB0290-TH	★	2.9	84	132	3	F31
30WHNSB0290-TH	★	2.9	99	144	3	F32
40WHNSB0290-TH		2.9	129	180	3	F36
50WHNSB0290-TH		2.9	159	210	3	F37
03WHNSB0293-TH	★	2.93	19	69	3	F18
ZPB0300-TH	★	3	12	50	4	F89
ZPBLS0300-TH		3	12	100	6	F91
02WNSB0300-TH		3	15	47	3	F40

Item code	Stock	DC	Flute length	LF	DCONMS	Page
04WNSB0300-TH	★	3	19	50	3	F41
03WHNSB0300-SD	★	3	19	69	3	F44
03WHNSB0300-TH	●	3	19	69	3	F18
NSBH0300-20-ATH	★	3	20	70	4	F48
EHSE3.0-TH	★	3	21	60	3	F83
05WHNSB0300-SD	★	3	29	79	3	F45
05WHNSB0300-TH	●	3	29	79	3	F20
08WHNSB0300-TH	●	3	35	83	3	F23
08WHSR0300-ATH	★	3	37	85	4	F23
10WHNSB0300-TH	★	3	39	87	3	F26
NSBH0300-40-ATH	★	3	40	90	4	F48
15WHNSB0300-SD	★	3	54	102	3	F46
15WHNSB0300-TH	★	3	54	102	3	F28
NSBH0300-60-ATH	★	3	60	110	4	F48
20WHNSB0300-SD	★	3	69	117	3	F46
20WHNSB0300-TH	★	3	69	117	3	F29
20WHSR0300-ATH	★	3	71	119	4	F55
25WHNSB0300-SD	★	3	84	132	3	F46
25WHNSB0300-TH	★	3	84	132	3	F31
NSBH0300-90-ATH	★	3	90	140	4	F48
30WHNSB0300-SD	★	3	99	147	3	F46
30WHNSB0300-TH	★	3	99	147	3	F32
30WHSR0300-ATH	★	3	101	149	4	F55
40WHNSB0300-TH	★	3	129	180	3	F36
50WHNSB0300-TH	★	3	159	210	3	F37
03WHNSB0303-SD	★	3.03	23	73	4	F44
05WHNSB0303-SD	★	3.03	37	87	4	F45
03WHNSB0305-TH	★	3.05	23	73	4	F18
ZPB0310-TH		3.1	12	50	4	F89
ZPBLS0310-TH		3.1	12	100	6	F91
02WNSB0310-TH		3.1	18	52	4	F40
NSBH0310-20-ATH		3.1	20	70	4	F48
04WNSB0310-TH	★	3.1	23	58	4	F41
03WHNSB0310-SD		3.1	23	73	4	F44
03WHNSB0310-TH	●	3.1	23	73	4	F18
EHSE3.1-TH	★	3.1	24	60	4	F83
05WHNSB0310-SD		3.1	37	87	4	F45
05WHNSB0310-TH	●	3.1	37	87	4	F20
NSBH0310-40-ATH		3.1	40	90	4	F48
08WHNSB0310-TH	●	3.1	42	94	4	F23
10WHNSB0310-TH	★	3.1	46	94	4	F26
NSBH0310-60-ATH		3.1	60	110	4	F48
15WHNSB0310-TH	★	3.1	63	111	4	F28
20WHNSB0310-TH	★	3.1	81	129	4	F29
25WHNSB0310-TH	★	3.1	90	138	4	F31
NSBH0310-90-ATH		3.1	90	140	4	F48
30WHNSB0310-TH	★	3.1	116	164	4	F32
40WHNSB0310-TH		3.1	142	195	4	F36
50WHNSB0310-TH		3.1	175	228	4	F37
ZPB0320-TH		3.2	12	50	4	F89
ZPBLS0320-TH		3.2	12	100	6	F91
02WNSB0320-TH		3.2	18	52	4	F40
NSBH0320-20-ATH	★	3.2	20	70	4	F48
04WNSB0320-TH	★	3.2	23	58	4	F41
03WHNSB0320-SD		3.2	23	73	4	F44
03WHNSB0320-TH	●	3.2	23	73	4	F18
EHSE3.2-TH	★	3.2	24	60	4	F83
05WHNSB0320-SD		3.2	37	87	4	F45
05WHNSB0320-TH	●	3.2	37	87	4	F20
NSBH0320-40-ATH	★	3.2	40	90	4	F48
08WHNSB0320-TH	●	3.2	42	94	4	F23
10WHNSB0320-TH	★	3.2	46	94	4	F26
NSBH0320-60-ATH		3.2	60	110	4	F48
15WHNSB0320-TH	★	3.2	63	111	4	F28
20WHNSB0320-TH	★	3.2	81	129	4	F29
25WHNSB0320-TH	★	3.2	90	138	4	F31

Item code	Stock	DC	Flute length	LF	DCONMS	Page
NSBH0320-90-ATH		3.2	90	140	4	F48
30WHNSB0320-TH	★	3.2	116	164	4	F32
40WHNSB0320-TH		3.2	142	195	4	F36
50WHNSB0320-TH		3.2	175	228	4	F37
ZPB0330-TH		3.3	14	50	4	F89
ZPBLS0330-TH		3.3	14	100	6	F91
02WNSB0330-TH		3.3	18	52	4	F40
NSBH0330-20-ATH	★	3.3	20	70	4	F48
04WNSB0330-TH	★	3.3	23	58	4	F41
03WHNSB0330-SD		3.3	23	73	4	F44
03WHNSB0330-TH	●	3.3	23	73	4	F18
EHSE3.3-TH	★	3.3	24	60	4	F83
05WHNSB0330-SD		3.3	37	87	4	F45
05WHNSB0330-TH	●	3.3	37	87	4	F20
NSBH0330-40-ATH	★	3.3	40	90	4	F48
08WHNSB0330-TH	●	3.3	42	94	4	F23
10WHNSB0330-TH	★	3.3	46	94	4	F26
NSBH0330-60-ATH		3.3	60	110	4	F48
15WHNSB0330-TH	★	3.3	63	111	4	F28
20WHNSB0330-TH	★	3.3	81	129	4	F29
NSBH0330-90-ATH		3.3	90	140	4	F48
25WHNSB0330-TH	★	3.3	98	146	4	F31
30WHNSB0330-TH	★	3.3	116	164	4	F32
40WHNSB0330-TH		3.3	142	195	4	F36
50WHNSB0330-TH		3.3	175	228	4	F37
ZPB0340-TH		3.4	14	50	4	F89
ZPBLS0340-TH		3.4	14	100	6	F91
02WNSB0340-TH		3.4	18	52	4	F40
NSBH0340-20-ATH	★	3.4	20	70	4	F48
04WNSB0340-TH	★	3.4	23	58	4	F41
03WHNSB0340-SD		3.4	23	73	4	F44
03WHNSB0340-TH	●	3.4	23	73	4	F18
EHSE3.4-TH	★	3.4	24	60	4	F83
STB034S-ATH	★	3.4	25	80	6	F86
STBH034S-ATH	★	3.4	25	80	6	F85
STB034M-ATH	★	3.4	30	80	6	F86
STBH034M-ATH	★	3.4	30	80	6	F85
05WHNSB0340-SD		3.4	37	87	4	F45
05WHNSB0340-TH	●	3.4	37	87	4	F20
NSBH0340-40-ATH	★	3.4	40	90	4	F48
08WHNSB0340-TH	●	3.4	42	94	4	F23
10WHNSB0340-TH	★	3.4	46	94	4	F26
NSBH0340-60-ATH		3.4	60	110	4	F48
15WHNSB0340-TH	★	3.4	63	111	4	F28
20WHNSB0340-TH	★	3.4	81	129	4	F29
NSBH0340-90-ATH		3.4	90	140	4	F48
25WHNSB0340-TH	★	3.4	98	146	4	F31
30WHNSB0340-TH	★	3.4	116	164	4	F32
40WHNSB0340-TH		3.4	155	208	4	F36
50WHNSB0340-TH		3.4	191	244	4	F37
ZPB0350-TH		3.5	14	50	4	F89
ZPBLS0350-TH		3.5	14	100	6	F91
02WNSB0350-TH		3.5	18	52	4	F40
NSBH0350-20-ATH		3.5	20	70	4	F48
04WNSB0350-TH	★	3.5	23	58	4	F41
03WHNSB0350-SD		3.5	23	73	4	F44
03WHNSB0350-TH	●	3.5	23	73	4	F18
EHSE3.5-TH	★	3.5	24	60	4	F83
05WHNSB0350-SD	★	3.5	37	87	4	F45
05WHNSB0350-TH	●	3.5	37	87	4	F20
NSBH0350-40-ATH		3.5	40	90	4	F48
08WHNSB0350-TH	●	3.5	42	94	4	F23
10WHNSB0350-TH	★	3.5	46	94	4	F26
NSBH0350-60-ATH		3.5	60	110	4	F48
15WHNSB0350-SD		3.5	63	111	4	F46
15WHNSB0350-TH	★	3.5	63	111	4	F28

Item code	Stock	DC	Flute length	LF	DCONMS	Page
20WHNSB0350-SD		3.5	81	129	4	F46
20WHNSB0350-TH	★	3.5	81	129	4	F29
NSBH0350-90-ATH		3.5	90	140	4	F48
25WHNSB0350-SD		3.5	98	146	4	F46
25WHNSB0350-TH	★	3.5	98	146	4	F31
30WHNSB0350-SD		3.5	116	164	4	F46
30WHNSB0350-TH	★	3.5	116	164	4	F32
40WHNSB0350-TH		3.5	155	208	4	F36
50WHNSB0350-TH		3.5	191	244	4	F37
03WHNSB0353-SD		3.53	23	73	4	F44
05WHNSB0353-SD	★	3.53	37	87	4	F45
ZPB0360-TH		3.6	14	50	4	F89
ZPBLS0360-TH		3.6	14	100	6	F91
02WNSB0360-TH		3.6	20	52	4	F40
NSBH0360-20-ATH		3.6	20	70	4	F48
03WHNSB0360-SD		3.6	23	73	4	F44
03WHNSB0360-TH	●	3.6	23	73	4	F18
04WNSB0360-TH	★	3.6	26	58	4	F41
EHSE3.6-TH	★	3.6	27	60	4	F83
05WHNSB0360-SD		3.6	37	87	4	F45
05WHNSB0360-TH	●	3.6	37	87	4	F20
NSBH0360-40-ATH		3.6	40	90	4	F48
08WHNSB0360-TH	●	3.6	46	94	4	F23
10WHNSB0360-TH	★	3.6	52	101	4	F26
NSBH0360-60-ATH		3.6	60	110	4	F48
15WHNSB0360-TH	★	3.6	72	121	4	F28
NSBH0360-90-ATH		3.6	90	140	4	F48
20WHNSB0360-TH	★	3.6	92	141	4	F29
25WHNSB0360-TH	★	3.6	113	162	4	F31
NSBH0360-120-ATH		3.6	120	170	4	F48
30WHNSB0360-TH	★	3.6	132	181	4	F32
40WHNSB0360-TH		3.6	155	208	4	F36
50WHNSB0360-TH		3.6	191	244	4	F37
ZPB0370-TH		3.7	14	50	4	F89
ZPBLS0370-TH		3.7	14	100	6	F91
02WNSB0370-TH		3.7	20	52	4	F40
NSBH0370-20-ATH		3.7	20	70	4	F48
03WHNSB0370-SD		3.7	23	73	4	F44
03WHNSB0370-TH	●	3.7	23	73	4	F18
04WNSB0370-TH	★	3.7	26	58	4	F41
EHSE3.7-TH	★	3.7	27	60	4	F83
05WHNSB0370-SD		3.7	37	87	4	F45
05WHNSB0370-TH	●	3.7	37	87	4	F20
NSBH0370-40-ATH		3.7	40	90	4	F48
08WHNSB0370-TH	●	3.7	46	94	4	F23
10WHNSB0370-TH	★	3.7	52	101	4	F26
NSBH0370-60-ATH		3.7	60	110	4	F48
15WHNSB0370-TH	★	3.7	72	121	4	F28
NSBH0370-90-ATH		3.7	90	140	4	F48
20WHNSB0370-TH	★	3.7	92	141	4	F29
25WHNSB0370-TH	★	3.7	113	162	4	F31
NSBH0370-120-ATH		3.7	120	170	4	F48
30WHNSB0370-TH	★	3.7	132	181	4	F32
40WHNSB0370-TH		3.7	172	225	4	F36
50WHNSB0370-TH		3.7	212	265	4	F37
ZPB0380-TH		3.8	16	50	4	F89
ZPBLS0380-TH		3.8	16	100	6	F91
02WNSB0380-TH		3.8	20	52	4	F40
NSBH0380-20-ATH		3.8	20	70	4	F48
03WHNSB0380-SD		3.8	23	73	4	F44
03WHNSB0380-TH	●	3.8	23	73	4	F18
04WNSB0380-TH	★	3.8	26	58	4	F41
EHSE3.8-TH	★	3.8	27	60	4	F83
05WHNSB0380-SD		3.8	37	87	4	F45
05WHNSB0380-TH	●	3.8	37	87	4	F20
NSBH0380-40-ATH		3.8	40	90	4	F48

Quick dimension reference table by tool diameter

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unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
08WHNSB0380-TH	●	3.8	46	94	4	F23
10WHNSB0380-TH	★	3.8	52	101	4	F26
NSBH0380-60-ATH		3.8	60	110	4	F48
15WHNSB0380-TH	★	3.8	72	121	4	F28
NSBH0380-90-ATH		3.8	90	140	4	F48
20WHNSB0380-TH	★	3.8	92	141	4	F29
25WHNSB0380-TH	★	3.8	113	162	4	F31
NSBH0380-120-ATH		3.8	120	170	4	F48
30WHNSB0380-TH	★	3.8	132	181	4	F32
40WHNSB0380-TH		3.8	172	225	4	F36
50WHNSB0380-TH		3.8	212	265	4	F37
ZPB0390-TH		3.9	16	50	4	F89
ZPBLS0390-TH		3.9	16	100	6	F91
02WNSB0390-TH		3.9	20	52	4	F40
NSBH0390-20-ATH		3.9	20	70	4	F48
03WHNSB0390-SD		3.9	23	73	4	F44
03WHNSB0390-TH	●	3.9	23	73	4	F18
04WNSB0390-TH	★	3.9	26	58	4	F41
EHSE3.9-TH	★	3.9	27	60	4	F83
05WHNSB0390-SD		3.9	37	87	4	F45
05WHNSB0390-TH	●	3.9	37	87	4	F20
NSBH0390-40-ATH		3.9	40	90	4	F48
08WHNSB0390-TH	●	3.9	46	94	4	F23
10WHNSB0390-TH	★	3.9	52	101	4	F26
NSBH0390-60-ATH		3.9	60	110	4	F48
15WHNSB0390-TH	★	3.9	72	121	4	F28
NSBH0390-90-ATH		3.9	90	140	4	F48
20WHNSB0390-TH	★	3.9	92	141	4	F29
25WHNSB0390-TH	★	3.9	113	162	4	F31
NSBH0390-120-ATH		3.9	120	170	4	F48
30WHNSB0390-TH	★	3.9	132	181	4	F32
40WHNSB0390-TH		3.9	172	225	4	F36
50WHNSB0390-TH		3.9	212	265	4	F37
ZPB0400-TH	★	4	16	50	4	F89
ZPBLS0400-TH		4	16	100	6	F91
02WNSB0400-TH		4	20	52	4	F40
NSBH0400-20-ATH	★	4	20	70	6	F48
03WHNSB0400-SD	★	4	23	73	4	F44
03WHNSB0400-TH	●	4	23	73	4	F18
04WNSB0400-TH	★	4	26	58	4	F41
EHSE4.0-TH	★	4	27	60	4	F83
05WHNSB0400-SD	★	4	37	87	4	F45
05WHNSB0400-TH	●	4	37	87	4	F20
NSBH0400-40-ATH	★	4	40	90	6	F48
08WHNSB0400-TH	●	4	46	94	4	F23
08WHSR0400-ATH	★	4	48	97	4	F23
10WHNSB0400-TH	★	4	52	101	4	F26
NSBH0400-60-ATH	★	4	60	110	6	F48
15WHNSB0400-SD	★	4	72	121	4	F46
15WHNSB0400-TH	★	4	72	121	4	F28
NSBH0400-90-ATH	★	4	90	140	6	F48
20WHNSB0400-SD	★	4	92	141	4	F46
20WHNSB0400-TH	★	4	92	141	4	F29
20WHSR0400-ATH	★	4	94	143	4	F55
25WHNSB0400-SD	★	4	113	162	4	F46
25WHNSB0400-TH	★	4	113	162	4	F31
NSBH0400-120-ATH	★	4	120	170	6	F48
30WHNSB0400-SD	★	4	132	181	4	F46
30WHNSB0400-TH	★	4	132	181	4	F32
30WHSR0400-ATH	★	4	134	183	4	F55
40WHNSB0400-TH	★	4	172	225	4	F36
50WHNSB0400-TH	★	4	212	265	4	F37
03WHNSB0403-SD	★	4.03	29	82	5	F44
05WHNSB0403-SD	★	4.03	47	100	5	F45
03WHNSB0405-TH	★	4.05	29	82	5	F18
ZPB0410-TH		4.1	16	50	6	F89

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPBLS0410-TH		4.1	16	100	6	F91
NSBH0410-20-ATH	★	4.1	20	70	6	F48
02WNSB0410-TH		4.1	23	59	5	F40
EHSE4.1-TH	★	4.1	29	63	5	F83
04WNSB0410-TH	★	4.1	29	64	5	F41
03WHNSB0410-SD		4.1	29	82	5	F44
03WHNSB0410-TH	●	4.1	29	82	5	F18
NSBH0410-40-ATH		4.1	40	90	6	F48
05WHNSB0410-SD	★	4.1	47	100	5	F45
05WHNSB0410-TH	●	4.1	47	100	5	F20
08WHNSB0410-TH	●	4.1	55	110	5	F23
10WHNSB0410-TH	★	4.1	59	110	5	F26
NSBH0410-60-ATH		4.1	60	110	6	F48
15WHNSB0410-TH	★	4.1	81	132	5	F28
NSBH0410-90-ATH		4.1	90	140	6	F48
20WHNSB0410-TH	★	4.1	104	155	5	F29
NSBH0410-120-ATH		4.1	120	170	6	F48
25WHNSB0410-TH	★	4.1	127	178	5	F31
30WHNSB0410-TH	★	4.1	149	200	5	F32
40WHNSB0410-TH		4.1	185	238	5	F36
50WHNSB0410-TH		4.1	228	281	5	F37
ZPB0420-TH		4.2	16	50	6	F89
ZPBLS0420-TH		4.2	16	100	6	F91
NSBH0420-20-ATH	★	4.2	20	70	6	F48
02WNSB0420-TH		4.2	23	59	5	F40
EHSE4.2-TH	★	4.2	29	63	5	F83
04WNSB0420-TH	★	4.2	29	64	5	F41
03WHNSB0420-SD		4.2	29	82	5	F44
03WHNSB0420-TH	●	4.2	29	82	5	F18
NSBH0420-40-ATH	★	4.2	40	90	6	F48
05WHNSB0420-SD	★	4.2	47	100	5	F45
05WHNSB0420-TH	●	4.2	47	100	5	F20
08WHNSB0420-TH	●	4.2	55	110	5	F23
10WHNSB0420-TH	★	4.2	59	110	5	F26
NSBH0420-60-ATH		4.2	60	110	6	F48
15WHNSB0420-TH	★	4.2	81	132	5	F28
NSBH0420-90-ATH		4.2	90	140	6	F48
20WHNSB0420-TH	★	4.2	104	155	5	F29
NSBH0420-120-ATH		4.2	120	170	6	F48
25WHNSB0420-TH	★	4.2	127	178	5	F31
30WHNSB0420-TH	★	4.2	149	200	5	F32
40WHNSB0420-TH		4.2	185	238	5	F36
50WHNSB0420-TH		4.2	228	281	5	F37
ZPB0430-TH		4.3	18	50	6	F89
ZPBLS0430-TH		4.3	18	100	6	F91
NSBH0430-20-ATH	★	4.3	20	70	6	F48
02WNSB0430-TH		4.3	23	59	5	F40
EHSE4.3-TH	★	4.3	29	63	5	F83
04WNSB0430-TH	★	4.3	29	64	5	F41
03WHNSB0430-SD		4.3	29	82	5	F44
03WHNSB0430-TH	●	4.3	29	82	5	F18
STB043S-ATH	★	4.3	30	85	7	F86
STBH043S-ATH	★	4.3	30	85	7	F85
STB043M-ATH	★	4.3	35	85	7	F86
STBH043M-ATH	★	4.3	35	85	7	F85
NSBH0430-40-ATH	★	4.3	40	90	6	F48
05WHNSB0430-SD	★	4.3	47	100	5	F45
05WHNSB0430-TH	●	4.3	47	100	5	F20
08WHNSB0430-TH	●	4.3	55	110	5	F23
10WHNSB0430-TH	★	4.3	59	110	5	F26
NSBH0430-60-ATH		4.3	60	110	6	F48
15WHNSB0430-TH	★	4.3	81	132	5	F28
NSBH0430-90-ATH		4.3	90	140	6	F48
20WHNSB0430-TH	★	4.3	104	155	5	F29
NSBH0430-120-ATH		4.3	120	170	6	F48
25WHNSB0430-TH	★	4.3	127	178	5	F31

Item code	Stock	DC	Flute length	LF	DCONMS	Page
30WHNSB0430-TH	★	4.3	149	200	5	F32
40WHNSB0430-TH		4.3	185	238	5	F36
50WHNSB0430-TH		4.3	228	281	5	F37
ZPB0440-TH		4.4	18	50	6	F89
ZPBLS0440-TH		4.4	18	100	6	F91
NSBH0440-20-ATH		4.4	20	70	6	F48
02WNSB0440-TH		4.4	23	59	5	F40
EHSE4.4-TH	★	4.4	29	63	5	F83
04WNSB0440-TH	★	4.4	29	64	5	F41
03WHNSB0440-SD		4.4	29	82	5	F44
03WHNSB0440-TH	●	4.4	29	82	5	F18
NSBH0440-40-ATH		4.4	40	90	6	F48
05WHNSB0440-SD		4.4	47	100	5	F45
05WHNSB0440-TH	●	4.4	47	100	5	F20
08WHNSB0440-TH	●	4.4	55	110	5	F23
10WHNSB0440-TH	★	4.4	59	110	5	F26
NSBH0440-60-ATH		4.4	60	110	6	F48
15WHNSB0440-TH	★	4.4	81	132	5	F28
NSBH0440-90-ATH		4.4	90	140	6	F49
20WHNSB0440-TH	★	4.4	104	155	5	F29
NSBH0440-120-ATH		4.4	120	170	6	F48
25WHNSB0440-TH	★	4.4	127	178	5	F31
30WHNSB0440-TH	★	4.4	149	200	5	F32
40WHNSB0440-TH		4.4	198	251	5	F36
50WHNSB0440-TH		4.4	244	297	5	F37
ZPB0450-TH	★	4.5	18	60	6	F89
ZPBLS0450-TH		4.5	18	100	6	F91
NSBH0450-20-ATH		4.5	20	70	6	F48
02WNSB0450-TH		4.5	23	59	5	F40
EHSE4.5-TH	★	4.5	29	63	5	F83
04WNSB0450-TH	★	4.5	29	64	5	F41
03WHNSB0450-SD		4.5	29	82	5	F44
03WHNSB0450-TH	●	4.5	29	82	5	F18
NSBH0450-40-ATH		4.5	40	90	6	F48
05WHNSB0450-SD	★	4.5	47	100	5	F45
05WHNSB0450-TH	●	4.5	47	100	5	F20
08WHNSB0450-TH	●	4.5	55	110	5	F23
10WHNSB0450-TH	★	4.5	59	110	5	F26
NSBH0450-60-ATH		4.5	60	110	6	F48
15WHNSB0450-SD		4.5	81	132	5	F46
15WHNSB0450-TH	★	4.5	81	132	5	F28
NSBH0450-90-ATH		4.5	90	140	6	F48
20WHNSB0450-SD		4.5	104	155	5	F46
20WHNSB0450-TH	★	4.5	104	155	5	F29
NSBH0450-120-ATH		4.5	120	170	6	F49
25WHNSB0450-SD		4.5	127	178	5	F46
25WHNSB0450-TH	★	4.5	127	178	5	F31
30WHNSB0450-SD		4.5	149	200	5	F46
30WHNSB0450-TH	★	4.5	149	200	5	F32
40WHNSB0450-TH		4.5	198	251	5	F36
50WHNSB0450-TH		4.5	244	297	5	F37
03WHNSB0453-SD		4.53	29	82	5	F44
05WHNSB0453-SD	★	4.53	47	100	5	F45
ZPB0460-TH		4.6	18	50	6	F89
ZPBLS0460-TH		4.6	18	100	6	F91
NSBH0460-20-ATH		4.6	20	70	6	F49
02WNSB0460-TH		4.6	25	59	5	F40
03WHNSB0460-SD		4.6	29	82	5	F44
03WHNSB0460-TH	●	4.6	29	82	5	F18
04WNSB0460-TH	★	4.6	32	64	5	F41
EHSE4.6-TH	★	4.6	32	68	5	F83
NSBH0460-40-ATH		4.6	40	90	6	F49
05WHNSB0460-SD		4.6	47	100	5	F45
05WHNSB0460-TH	●	4.6	47	100	5	F20
08WHNSB0460-TH	●	4.6	59	110	5	F23
NSBH0460-60-ATH		4.6	60	110	6	F49

Item code	Stock	DC	Flute length	LF	DCONMS	Page
10WHNSB0460-TH	★	4.6	66	117	5	F26
NSBH0460-90-ATH		4.6	90	140	6	F49
15WHNSB0460-TH	★	4.6	91	142	5	F28
20WHNSB0460-TH	★	4.6	116	167	5	F29
NSBH0460-120-ATH		4.6	120	170	6	F49
25WHNSB0460-TH	★	4.6	141	192	5	F31
NSBH0460-150-ATH		4.6	150	205	6	F49
30WHNSB0460-TH	★	4.6	166	217	5	F32
40WHNSB0460-TH		4.6	198	251	5	F36
50WHNSB0460-TH		4.6	244	297	5	F37
ZPB0470-TH		4.7	18	50	6	F89
ZPBLS0470-TH		4.7	18	100	6	F91
NSBH0470-20-ATH		4.7	20	70	6	F49
02WNSB0470-TH		4.7	25	59	5	F40
03WHNSB0470-SD		4.7	29	82	5	F44
03WHNSB0470-TH	●	4.7	29	82	5	F18
04WNSB0470-TH	★	4.7	32	64	5	F41
EHSE4.7-TH	★	4.7	32	68	5	F83
NSBH0470-40-ATH		4.7	40	90	6	F49
05WHNSB0470-SD		4.7	47	100	5	F45
05WHNSB0470-TH	●	4.7	47	100	5	F20
08WHNSB0470-TH	●	4.7	59	110	5	F23
NSBH0470-60-ATH		4.7	60	110	6	F49
10WHNSB0470-TH	★	4.7	66	117	5	F26
NSBH0470-90-ATH		4.7	90	140	6	F49
15WHNSB0470-TH	★	4.7	91	142	5	F28
20WHNSB0470-TH	★	4.7	116	167	5	F29
NSBH0470-120-ATH		4.7	120	170	6	F49
25WHNSB0470-TH	★	4.7	141	192	5	F31
NSBH0470-150-ATH		4.7	150	205	6	F49
30WHNSB0470-TH	★	4.7	166	217	5	F32
40WHNSB0470-TH		4.7	215	268	5	F36
50WHNSB0470-TH		4.7	265	318	5	F37
ZPB0480-TH		4.8	20	60	6	F89
NSBH0480-20-ATH		4.8	20	70	6	F49
ZPBLS0480-TH		4.8	20	110	6	F91
02WNSB0480-TH		4.8	25	59	5	F40
03WHNSB0480-SD		4.8	29	82	5	F44
03WHNSB0480-TH	●	4.8	29	82	5	F18
04WNSB0480-TH	★	4.8	32	64	5	F41
EHSE4.8-TH	★	4.8	32	68	5	F83
NSBH0480-40-ATH		4.8	40	90	6	F49
05WHNSB0480-SD		4.8	47	100	5	F45
05WHNSB0480-TH	●	4.8	47	100	5	F20
08WHNSB0480-TH	●	4.8	59	110	5	F23
NSBH0480-60-ATH		4.8	60	110	6	F49
10WHNSB0480-TH	★	4.8	66	117	5	F26
NSBH0480-90-ATH		4.8	90	140	6	F49
15WHNSB0480-TH	★	4.8	91	142	5	F28
20WHNSB0480-TH	★	4.8	116	167	5	F29
NSBH0480-120-ATH		4.8	120	170	6	F49
25WHNSB0480-TH	★	4.8	141	192	5	F31
NSBH0480-150-ATH		4.8	150	205	6	F49
30WHNSB0480-TH	★	4.8	166	217	5	F32
40WHNSB0480-TH		4.8	215	268	5	F36
50WHNSB0480-TH		4.8	265	318	5	F37
ZPB0490-TH		4.9	20	60	6	F89
NSBH0490-20-ATH		4.9	20	70	6	F49
ZPBLS0490-TH		4.9	20	110	6	F91
02WNSB0490-TH		4.9	25	59	5	F40
03WHNSB0490-SD		4.9	29	82	5	F44
03WHNSB0490-TH	●	4.9	29	82	5	F18
04WNSB0490-TH	★	4.9	32	64	5	F41
EHSE4.9-TH	★	4.9	32	68	5	F83
NSBH0490-40-ATH		4.9	40	90	6	F49
05WHNSB0490-SD		4.9	47	100	5	F45

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
05WHNSB0490-TH	●	4.9	47	100	5	F20
08WHNSB0490-TH	●	4.9	59	110	5	F23
NSBH0490-60-ATH		4.9	60	110	6	F49
10WHNSB0490-TH	★	4.9	66	117	5	F26
NSBH0490-90-ATH		4.9	90	140	6	F49
15WHNSB0490-TH	★	4.9	91	142	5	F28
20WHNSB0490-TH	★	4.9	116	167	5	F29
NSBH0490-120-ATH		4.9	120	170	6	F49
25WHNSB0490-TH	★	4.9	141	192	5	F31
NSBH0490-150-ATH		4.9	150	205	6	F49
30WHNSB0490-TH	★	4.9	166	217	5	F32
40WHNSB0490-TH		4.9	215	268	5	F36
50WHNSB0490-TH		4.9	265	318	5	F37
ZPB0500-TH	★	5	20	60	6	F89
ZPBLS0500-TH		5	20	110	6	F91
02WNSB0500-TH	★	5	25	59	5	F40
NSBH0500-25-ATH	★	5	25	80	6	F49
03WHNSB0500-SD	★	5	29	82	5	F44
03WHNSB0500-TH	●	5	29	82	5	F18
04WNSB0500-TH	★	5	32	64	5	F41
EHSE5.0-TH	★	5	32	68	5	F83
NSBH0500-40-ATH	★	5	40	95	6	F49
05WHNSB0500-SD	★	5	47	100	5	F45
05WHNSB0500-TH	●	5	47	100	5	F20
08WHNSB0500-TH	●	5	59	110	5	F23
NSBH0500-60-ATH	★	5	60	115	6	F49
08WHSR0500-ATH	★	5	62	114	6	F23
10WHNSB0500-TH	★	5	66	117	5	F26
NSBH0500-90-ATH	★	5	90	145	6	F49
15WHNSB0500-SD	★	5	91	142	5	F46
15WHNSB0500-TH	★	5	91	142	5	F28
20WHNSB0500-SD	★	5	116	167	5	F46
20WHNSB0500-TH	★	5	116	167	5	F29
20WHSR0500-ATH	★	5	119	171	6	F55
NSBH0500-120-ATH	★	5	120	175	6	F49
25WHNSB0500-SD	★	5	141	192	5	F46
25WHNSB0500-TH	★	5	141	192	5	F31
NSBH0500-150-ATH	★	5	150	205	6	F49
30WHNSB0500-SD	★	5	166	217	5	F46
30WHNSB0500-TH	★	5	166	217	5	F32
30WHSR0500-ATH	★	5	169	221	6	F55
40WHNSB0500-TH	★	5	215	268	5	F36
50WHNSB0500-TH	★	5	265	318	5	F37
03WHNSB0503-SD	★	5.03	29	82	6	F44
05WHNSB0503-SD	★	5.03	47	100	6	F45
03WHNSB0505-TH	★	5.05	29	82	6	F18
ZPB0510-TH		5.1	20	60	6	F89
ZPBLS0510-TH		5.1	20	110	6	F91
02WNSB0510-TH	★	5.1	25	64	6	F40
03WHNSB0510-SD	★	5.1	29	82	6	F44
03WHNSB0510-TH	●	5.1	29	82	6	F18
NSBH0510-30-ATH	★	5.1	30	85	6	F49
EHSE5.1-TH	★	5.1	34	72	6	F83
STB051S-ATH	★	5.1	35	90	8	F86
STBH051S-ATH	★	5.1	35	90	8	F85
04WNSB0510-TH	★	5.1	36	78	6	F41
STB051M-ATH	★	5.1	40	90	8	F86
STBH051M-ATH	★	5.1	40	90	8	F85
05WHNSB0510-SD	★	5.1	47	100	6	F45
05WHNSB0510-TH	●	5.1	47	100	6	F20
NSBH0510-60-ATH	★	5.1	60	115	6	F49
08WHNSB0510-TH	●	5.1	62	118	6	F23
10WHNSB0510-TH	★	5.1	72	123	6	F26
NSBH0510-90-ATH		5.1	90	145	6	F49
15WHNSB0510-TH	★	5.1	100	151	6	F28
NSBH0510-120-ATH		5.1	120	175	6	F49

Item code	Stock	DC	Flute length	LF	DCONMS	Page
20WHNSB0510-TH	★	5.1	127	178	6	F29
NSBH0510-150-ATH		5.1	150	205	6	F49
25WHNSB0510-TH	★	5.1	155	206	6	F31
30WHNSB0510-TH	★	5.1	182	233	6	F32
40WHNSB0510-TH		5.1	237	290	6	F36
50WHNSB0510-TH		5.1	292	345	6	F37
ZPB0520-TH		5.2	20	60	6	F89
ZPBLS0520-TH		5.2	20	110	6	F91
02WNSB0520-TH	★	5.2	25	64	6	F40
03WHNSB0520-SD		5.2	29	82	6	F44
03WHNSB0520-TH	●	5.2	29	82	6	F18
NSBH0520-30-ATH		5.2	30	85	6	F49
EHSE5.2-TH	★	5.2	34	72	6	F83
04WNSB0520-TH	★	5.2	36	78	6	F41
05WHNSB0520-SD		5.2	47	100	6	F45
05WHNSB0520-TH	●	5.2	47	100	6	F20
NSBH0520-60-ATH		5.2	60	115	6	F49
08WHNSB0520-TH	●	5.2	62	118	6	F23
10WHNSB0520-TH	★	5.2	72	123	6	F26
NSBH0520-90-ATH		5.2	90	145	6	F49
15WHNSB0520-TH	★	5.2	100	151	6	F28
NSBH0520-120-ATH		5.2	120	175	6	F49
20WHNSB0520-TH	★	5.2	127	178	6	F29
NSBH0520-150-ATH		5.2	150	205	6	F49
25WHNSB0520-TH	★	5.2	155	206	6	F31
30WHNSB0520-TH	★	5.2	182	233	6	F32
40WHNSB0520-TH		5.2	237	290	6	F36
50WHNSB0520-TH		5.2	292	345	6	F37
ZPB0530-TH		5.3	20	60	6	F89
ZPBLS0530-TH		5.3	20	110	6	F91
02WNSB0530-TH		5.3	25	64	6	F40
03WHNSB0530-SD		5.3	29	82	6	F44
03WHNSB0530-TH	●	5.3	29	82	6	F18
NSBH0530-30-ATH		5.3	30	85	6	F49
EHSE5.3-TH	★	5.3	34	72	6	F83
04WNSB0530-TH	★	5.3	36	78	6	F41
05WHNSB0530-SD		5.3	47	100	6	F45
05WHNSB0530-TH	●	5.3	47	100	6	F20
NSBH0530-60-ATH		5.3	60	115	6	F49
08WHNSB0530-TH	●	5.3	62	118	6	F23
10WHNSB0530-TH	★	5.3	72	123	6	F26
NSBH0530-90-ATH		5.3	90	145	6	F49
15WHNSB0530-TH	★	5.3	100	151	6	F28
NSBH0530-120-ATH		5.3	120	175	6	F49
20WHNSB0530-TH	★	5.3	127	178	6	F29
NSBH0530-150-ATH		5.3	150	205	6	F49
25WHNSB0530-TH	★	5.3	155	206	6	F31
30WHNSB0530-TH	★	5.3	182	233	6	F32
40WHNSB0530-TH		5.3	237	290	6	F36
50WHNSB0530-TH		5.3	292	345	6	F37
ZPB0540-TH		5.4	20	60	6	F89
ZPBLS0540-TH		5.4	20	110	6	F91
02WNSB0540-TH	★	5.4	25	64	6	F40
03WHNSB0540-SD		5.4	29	82	6	F44
03WHNSB0540-TH	●	5.4	29	82	6	F18
NSBH0540-30-ATH		5.4	30	85	6	F49
EHSE5.4-TH	★	5.4	34	72	6	F83
04WNSB0540-TH	★	5.4	36	78	6	F41
05WHNSB0540-SD		5.4	47	100	6	F45
05WHNSB0540-TH	●	5.4	47	100	6	F20
NSBH0540-60-ATH		5.4	60	115	6	F49
08WHNSB0540-TH	●	5.4	62	118	6	F23
10WHNSB0540-TH	★	5.4	72	123	6	F26
NSBH0540-90-ATH		5.4	90	145	6	F49
15WHNSB0540-TH	★	5.4	100	151	6	F28
NSBH0540-120-ATH		5.4	120	175	6	F49

Item code	Stock	DC	Flute length	LF	DCONMS	Page
20WHNSB0540-TH	★	5.4	127	178	6	F29
NSBH0540-150-ATH		5.4	150	205	6	F49
25WHNSB0540-TH	★	5.4	155	206	6	F31
30WHNSB0540-TH	★	5.4	182	233	6	F32
40WHNSB0540-TH		5.4	237	290	6	F36
50WHNSB0540-TH		5.4	292	345	6	F37
ZPB0550-TH	★	5.5	22	60	6	F89
ZPBLS0550-TH		5.5	22	110	6	F91
02WNSB0550-TH	★	5.5	25	64	6	F40
03WHNSB0550-SD	★	5.5	29	82	6	F44
03WHNSB0550-TH	●	5.5	29	82	6	F18
NSBH0550-30-ATH		5.5	30	85	6	F49
EHSE5.5-TH	★	5.5	34	72	6	F83
04WNSB0550-TH	★	5.5	36	78	6	F41
05WHNSB0550-SD	★	5.5	47	100	6	F45
05WHNSB0550-TH	●	5.5	47	100	6	F20
NSBH0550-60-ATH		5.5	60	115	6	F49
08WHNSB0550-TH	●	5.5	62	118	6	F23
10WHNSB0550-TH	★	5.5	72	123	6	F26
NSBH0550-90-ATH		5.5	90	145	6	F49
15WHNSB0550-SD	★	5.5	100	151	6	F46
15WHNSB0550-TH	★	5.5	100	151	6	F28
NSBH0550-120-ATH		5.5	120	175	6	F49
20WHNSB0550-SD	★	5.5	127	178	6	F46
20WHNSB0550-TH	★	5.5	127	178	6	F29
NSBH0550-150-ATH		5.5	150	205	6	F49
25WHNSB0550-SD	★	5.5	155	206	6	F46
25WHNSB0550-TH	★	5.5	155	206	6	F31
30WHNSB0550-SD	★	5.5	182	233	6	F46
30WHNSB0550-TH	★	5.5	182	233	6	F32
40WHNSB0550-TH		5.5	237	290	6	F36
50WHNSB0550-TH		5.5	292	345	6	F37
03WHNSB0553-SD	★	5.53	29	82	6	F44
05WHNSB0553-SD	★	5.53	47	100	6	F45
03WHNSB0555-TH	★	5.55	29	82	6	F18
ZPB0560-TH		5.6	22	60	6	F89
ZPBLS0560-TH		5.6	22	110	6	F91
02WNSB0560-TH		5.6	25	64	6	F40
03WHNSB0560-SD		5.6	29	82	6	F44
03WHNSB0560-TH	●	5.6	29	82	6	F18
NSBH0560-30-ATH		5.6	30	85	6	F49
EHSE5.6-TH	★	5.6	36	74	6	F83
04WNSB0560-TH	★	5.6	39	78	6	F41
05WHNSB0560-SD		5.6	47	100	6	F45
05WHNSB0560-TH	●	5.6	47	100	6	F20
NSBH0560-60-ATH		5.6	60	115	6	F49
08WHNSB0560-TH	●	5.6	67	118	6	F23
10WHNSB0560-TH	★	5.6	79	130	6	F26
NSBH0560-90-ATH		5.6	90	145	6	F49
15WHNSB0560-TH	★	5.6	109	160	6	F28
NSBH0560-120-ATH		5.6	120	175	6	F49
20WHNSB0560-TH	★	5.6	139	190	6	F29
NSBH0560-150-ATH		5.6	150	205	6	F49
25WHNSB0560-TH	★	5.6	169	220	6	F31
30WHNSB0560-TH	★	5.6	199	250	6	F32
40WHNSB0560-TH		5.6	258	311	6	F36
50WHNSB0560-TH		5.6	318	371	6	F37
ZPB0570-TH		5.7	22	60	6	F89
ZPBLS0570-TH		5.7	22	110	6	F91
02WNSB0570-TH		5.7	25	64	6	F40
03WHNSB0570-SD		5.7	29	82	6	F44
03WHNSB0570-TH	●	5.7	29	82	6	F18
NSBH0570-30-ATH		5.7	30	85	6	F49
EHSE5.7-TH	★	5.7	36	74	6	F83
04WNSB0570-TH	★	5.7	39	78	6	F41
05WHNSB0570-SD		5.7	47	100	6	F45

Item code	Stock	DC	Flute length	LF	DCONMS	Page
05WHNSB0570-TH	●	5.7	47	100	6	F20
NSBH0570-60-ATH		5.7	60	115	6	F49
08WHNSB0570-TH	●	5.7	67	118	6	F23
10WHNSB0570-TH	★	5.7	79	130	6	F26
NSBH0570-90-ATH		5.7	90	145	6	F49
15WHNSB0570-TH	★	5.7	109	160	6	F28
NSBH0570-120-ATH		5.7	120	175	6	F49
20WHNSB0570-TH	★	5.7	139	190	6	F29
NSBH0570-150-ATH		5.7	150	205	6	F49
25WHNSB0570-TH	★	5.7	169	220	6	F31
30WHNSB0570-TH	★	5.7	199	250	6	F32
40WHNSB0570-TH		5.7	258	311	6	F36
50WHNSB0570-TH		5.7	318	371	6	F37
ZPB0580-TH		5.8	22	60	6	F89
ZPBLS0580-TH		5.8	22	110	6	F91
02WNSB0580-TH	★	5.8	25	64	6	F40
03WHNSB0580-SD		5.8	29	82	6	F44
03WHNSB0580-TH	●	5.8	29	82	6	F18
NSBH0580-30-ATH		5.8	30	85	6	F49
EHSE5.8-TH	★	5.8	36	74	6	F83
04WNSB0580-TH	★	5.8	39	78	6	F41
05WHNSB0580-SD		5.8	47	100	6	F45
05WHNSB0580-TH	●	5.8	47	100	6	F20
NSBH0580-60-ATH		5.8	60	115	6	F49
08WHNSB0580-TH	●	5.8	67	118	6	F23
10WHNSB0580-TH	★	5.8	79	130	6	F26
NSBH0580-90-ATH		5.8	90	145	6	F49
15WHNSB0580-TH	★	5.8	109	160	6	F28
NSBH0580-120-ATH		5.8	120	175	6	F49
20WHNSB0580-TH	★	5.8	139	190	6	F29
NSBH0580-150-ATH		5.8	150	205	6	F49
25WHNSB0580-TH	★	5.8	169	220	6	F31
30WHNSB0580-TH	★	5.8	199	250	6	F32
40WHNSB0580-TH		5.8	258	311	6	F36
50WHNSB0580-TH		5.8	318	371	6	F37
ZPB0590-TH		5.9	22	60	6	F89
ZPBLS0590-TH		5.9	22	110	6	F91
02WNSB0590-TH		5.9	25	64	6	F40
03WHNSB0590-SD		5.9	29	82	6	F44
03WHNSB0590-TH	●	5.9	29	82	6	F18
NSBH0590-30-ATH		5.9	30	85	6	F49
EHSE5.9-TH	★	5.9	36	74	6	F83
04WNSB0590-TH	★	5.9	39	78	6	F41
05WHNSB0590-SD		5.9	47	100	6	F45
05WHNSB0590-TH	●	5.9	47	100	6	F20
NSBH0590-60-ATH		5.9	60	115	6	F49
08WHNSB0590-TH	●	5.9	67	118	6	F23
10WHNSB0590-TH	★	5.9	79	130	6	F26
NSBH0590-90-ATH		5.9	90	145	6	F49
15WHNSB0590-TH	★	5.9	109	160	6	F28
NSBH0590-120-ATH		5.9	120	175	6	F49
20WHNSB0590-TH	★	5.9	139	190	6	F29
NSBH0590-150-ATH		5.9	150	205	6	F49
25WHNSB0590-TH	★	5.9	169	220	6	F31
30WHNSB0590-TH	★	5.9	199	250	6	F32
40WHNSB0590-TH		5.9	258	311	6	F36
50WHNSB0590-TH		5.9	318	371	6	F37
ZPB0600-TH	★	6	22	60	6	F89
ZPBLS0600-TH		6	22	120	6	F91
02WNSB0600-TH	★	6	25	64	6	F40
03WHNSB0600-SD	★	6	29	82	6	F44
03WHNSB0600-TH	●	6	29	82	6	F18
NSBH0600-30-ATH	★	6	30	85	8	F49
04WNSB0600-TH	★	6	39	78	6	F41
EHSE6.0-TH	★	6	41	81	6	F83
05WHNSB0600-SD	★	6	47	100	6	F45

Quick dimension reference table by tool diameter

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unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
05WHNSB0600-TH	●	6	47	100	6	F20
NSBH0600-60-ATH	★	6	60	115	8	F49
08WHNSB0600-TH	●	6	67	118	6	F23
08WHSR0600-ATH	★	6	70	123	6	F23
10WHNSB0600-TH	★	6	79	130	6	F26
NSBH0600-90-ATH	★	6	90	145	8	F49
15WHNSB0600-SD	★	6	109	160	6	F46
15WHNSB0600-TH	★	6	109	160	6	F28
NSBH0600-120-ATH	★	6	120	175	8	F49
20WHNSB0600-SD	★	6	139	190	6	F46
20WHNSB0600-TH	★	6	139	190	6	F29
20WHSR0600-ATH	★	6	142	195	6	F55
NSBH0600-150-ATH	★	6	150	205	8	F49
25WHNSB0600-SD	★	6	169	220	6	F46
25WHNSB0600-TH	★	6	169	220	6	F31
30WHNSB0600-SD	★	6	199	250	6	F46
30WHNSB0600-TH	★	6	199	250	6	F32
30WHSR0600-ATH	★	6	202	255	6	F55
40WHNSB0600-TH	★	6	258	311	6	F36
50WHNSB0600-TH	★	6	318	371	6	F37
03WHNSB0603-SD	★	6.03	34	89	7	F44
05WHNSB0603-SD	★	6.03	55	110	7	F45
03WHNSB0605-TH	★	6.05	34	89	7	F18
ZPB0610-TH		6.1	24	70	8	F89
ZPBLS0610-TH		6.1	24	120	6	F91
02WNSB0610-TH		6.1	29	71	7	F40
NSBH0610-30-ATH		6.1	30	85	8	F49
03WHNSB0610-SD		6.1	34	89	7	F44
03WHNSB0610-TH	●	6.1	34	89	7	F18
04WNSB0610-TH	★	6.1	41	83	7	F41
05WHNSB0610-SD		6.1	55	110	7	F45
05WHNSB0610-TH	●	6.1	55	110	7	F20
NSBH0610-60-ATH		6.1	60	115	8	F49
08WHNSB0610-TH	●	6.1	73	132	7	F23
10WHNSB0610-TH	★	6.1	85	138	7	F26
NSBH0610-90-ATH		6.1	90	145	8	F49
15WHNSB0610-TH	★	6.1	118	171	7	F28
NSBH0610-120-ATH		6.1	120	175	8	F49
20WHNSB0610-TH	★	6.1	150	203	7	F29
NSBH0610-150-ATH		6.1	150	205	8	F49
25WHNSB0610-TH	★	6.1	183	236	7	F31
30WHNSB0610-TH	★	6.1	215	268	7	F32
40WHNSB0610-TH		6.1	280	333	7	F36
50WHNSB0610-TH		6.1	345	398	7	F37
ZPB0620-TH		6.2	24	70	8	F89
ZPBLS0620-TH		6.2	24	120	6	F91
02WNSB0620-TH	★	6.2	29	71	7	F40
NSBH0620-30-ATH		6.2	30	85	8	F49
03WHNSB0620-SD		6.2	34	89	7	F44
03WHNSB0620-TH	●	6.2	34	89	7	F18
04WNSB0620-TH	★	6.2	41	83	7	F41
05WHNSB0620-SD		6.2	55	110	7	F45
05WHNSB0620-TH	●	6.2	55	110	7	F20
NSBH0620-60-ATH		6.2	60	115	8	F49
08WHNSB0620-TH	●	6.2	73	132	7	F23
10WHNSB0620-TH	★	6.2	85	138	7	F26
NSBH0620-90-ATH		6.2	90	145	8	F49
15WHNSB0620-TH	★	6.2	118	171	7	F28
NSBH0620-120-ATH		6.2	120	175	8	F49
20WHNSB0620-TH	★	6.2	150	203	7	F29
NSBH0620-150-ATH		6.2	150	205	8	F49
25WHNSB0620-TH	★	6.2	183	236	7	F31
30WHNSB0620-TH	★	6.2	215	268	7	F32
40WHNSB0620-TH		6.2	280	333	7	F36
50WHNSB0620-TH		6.2	345	398	7	F37
ZPB0630-TH		6.3	24	70	8	F89

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPBLS0630-TH		6.3	24	120	6	F91
02WNSB0630-TH		6.3	29	71	7	F40
NSBH0630-30-ATH		6.3	30	85	8	F49
03WHNSB0630-SD		6.3	34	89	7	F44
03WHNSB0630-TH	●	6.3	34	89	7	F18
04WNSB0630-TH	★	6.3	41	83	7	F41
05WHNSB0630-SD		6.3	55	110	7	F45
05WHNSB0630-TH	●	6.3	55	110	7	F20
NSBH0630-60-ATH		6.3	60	115	8	F49
08WHNSB0630-TH	●	6.3	73	132	7	F23
10WHNSB0630-TH	★	6.3	85	138	7	F26
NSBH0630-90-ATH		6.3	90	145	8	F49
15WHNSB0630-TH	★	6.3	118	171	7	F28
NSBH0630-120-ATH		6.3	120	175	8	F49
20WHNSB0630-TH	★	6.3	150	203	7	F29
NSBH0630-150-ATH		6.3	150	205	8	F49
25WHNSB0630-TH	★	6.3	183	236	7	F31
30WHNSB0630-TH	★	6.3	215	268	7	F32
40WHNSB0630-TH		6.3	280	333	7	F36
50WHNSB0630-TH		6.3	345	398	7	F37
ZPB0640-TH		6.4	24	70	8	F89
ZPBLS0640-TH		6.4	24	120	6	F91
02WNSB0640-TH		6.4	29	71	7	F40
NSBH0640-30-ATH		6.4	30	85	8	F49
03WHNSB0640-SD		6.4	34	89	7	F44
03WHNSB0640-TH	●	6.4	34	89	7	F18
04WNSB0640-TH	★	6.4	41	83	7	F41
05WHNSB0640-SD		6.4	55	110	7	F45
05WHNSB0640-TH	●	6.4	55	110	7	F20
NSBH0640-60-ATH		6.4	60	115	8	F49
08WHNSB0640-TH	●	6.4	73	132	7	F23
10WHNSB0640-TH	★	6.4	85	138	7	F26
NSBH0640-90-ATH		6.4	90	145	8	F49
15WHNSB0640-TH	★	6.4	118	171	7	F28
NSBH0640-120-ATH		6.4	120	175	8	F49
20WHNSB0640-TH	★	6.4	150	203	7	F29
NSBH0640-150-ATH		6.4	150	205	8	F49
25WHNSB0640-TH	★	6.4	183	236	7	F31
30WHNSB0640-TH	★	6.4	215	268	7	F32
40WHNSB0640-TH		6.4	280	333	7	F36
50WHNSB0640-TH		6.4	345	398	7	F37
ZPB0650-TH		6.5	26	70	8	F89
ZPBLS0650-TH		6.5	26	120	6	F91
02WNSB0650-TH	★	6.5	29	71	7	F40
NSBH0650-30-ATH		6.5	30	85	8	F49
03WHNSB0650-SD	★	6.5	34	89	7	F44
03WHNSB0650-TH	●	6.5	34	89	7	F18
EHSE6.5-TH	★	6.5	41	81	7	F83
04WNSB0650-TH	★	6.5	41	83	7	F41
05WHNSB0650-SD	★	6.5	55	110	7	F45
05WHNSB0650-TH	●	6.5	55	110	7	F20
NSBH0650-60-ATH		6.5	60	115	8	F49
08WHNSB0650-TH	●	6.5	73	132	7	F23
10WHNSB0650-TH	★	6.5	85	138	7	F26
NSBH0650-90-ATH		6.5	90	145	8	F49
15WHNSB0650-SD		6.5	118	171	7	F46
15WHNSB0650-TH	★	6.5	118	171	7	F28
NSBH0650-120-ATH		6.5	120	175	8	F49
20WHNSB0650-SD		6.5	150	203	7	F46
20WHNSB0650-TH	★	6.5	150	203	7	F29
NSBH0650-150-ATH		6.5	150	205	8	F49
25WHNSB0650-SD		6.5	183	236	7	F46
25WHNSB0650-TH	★	6.5	183	236	7	F31
30WHNSB0650-TH	★	6.5	215	268	7	F32
40WHNSB0650-TH		6.5	280	333	7	F36
50WHNSB0650-TH		6.5	345	398	7	F37

Item code	Stock	DC	Flute length	LF	DCONMS	Page
03WHNSB0653-SD	★	6.53	34	89	7	F44
05WHNSB0653-SD	★	6.53	55	110	7	F45
03WHNSB0655-TH	★	6.55	34	89	7	F18
ZPB0660-TH		6.6	26	70	8	F89
ZPBLS0660-TH		6.6	26	120	6	F91
NSBH0660-30-ATH		6.6	30	85	8	F49
02WNSB0660-TH		6.6	31	71	7	F40
03WHNSB0660-SD		6.6	34	89	7	F44
03WHNSB0660-TH	●	6.6	34	89	7	F18
04WNSB0660-TH	★	6.6	43	83	7	F41
05WHNSB0660-SD		6.6	55	110	7	F45
05WHNSB0660-TH	●	6.6	55	110	7	F20
NSBH0660-60-ATH		6.6	60	115	8	F49
08WHNSB0660-TH	●	6.6	77	132	7	F23
NSBH0660-90-ATH		6.6	90	145	8	F49
10WHNSB0660-TH	★	6.6	92	145	7	F26
NSBH0660-120-ATH		6.6	120	175	8	F49
15WHNSB0660-TH	★	6.6	127	180	7	F28
NSBH0660-150-ATH		6.6	150	205	8	F49
20WHNSB0660-TH	★	6.6	162	215	7	F29
25WHNSB0660-TH	★	6.6	197	250	7	F31
NSBH0660-200-ATH		6.6	200	255	8	F49
30WHNSB0660-TH	★	6.6	232	285	7	F32
40WHNSB0660-TH		6.6	301	354	7	F36
50WHNSB0660-TH		6.6	371	424	7	F37
ZPB0670-TH		6.7	26	70	8	F89
ZPBLS0670-TH		6.7	26	120	6	F91
NSBH0670-30-ATH		6.7	30	85	8	F50
02WNSB0670-TH		6.7	31	71	7	F40
03WHNSB0670-SD		6.7	34	89	7	F44
03WHNSB0670-TH	●	6.7	34	89	7	F18
04WNSB0670-TH	★	6.7	43	83	7	F41
05WHNSB0670-SD		6.7	55	110	7	F45
05WHNSB0670-TH	●	6.7	55	110	7	F20
NSBH0670-60-ATH		6.7	60	115	8	F50
08WHNSB0670-TH	●	6.7	77	132	7	F23
NSBH0670-90-ATH		6.7	90	145	8	F50
10WHNSB0670-TH	★	6.7	92	145	7	F26
NSBH0670-120-ATH		6.7	120	175	8	F50
15WHNSB0670-TH	★	6.7	127	180	7	F28
NSBH0670-150-ATH		6.7	150	205	8	F50
20WHNSB0670-TH	★	6.7	162	215	7	F29
25WHNSB0670-TH	★	6.7	197	250	7	F31
NSBH0670-200-ATH		6.7	200	255	8	F50
30WHNSB0670-TH	★	6.7	232	285	7	F32
40WHNSB0670-TH		6.7	301	354	7	F36
50WHNSB0670-TH		6.7	371	42	7	F37
ZPB0680-TH		6.8	26	70	8	F89
ZPBLS0680-TH		6.8	26	120	6	F91
NSBH0680-30-ATH	★	6.8	30	85	8	F50
02WNSB0680-TH	★	6.8	31	71	7	F40
03WHNSB0680-SD	★	6.8	34	89	7	F44
03WHNSB0680-TH	★	6.8	34	89	7	F18
04WNSB0680-TH	★	6.8	43	83	7	F41
EHSE6.8-TH	★	6.8	43	83	7	F83
STB068S-ATH	★	6.8	45	100	10	F86
STBH068S-ATH	★	6.8	45	100	10	F85
STB068M-ATH	★	6.8	50	105	10	F86
STBH068M-ATH	★	6.8	50	105	10	F85
05WHNSB0680-SD	★	6.8	55	110	7	F45
05WHNSB0680-TH	●	6.8	55	110	7	F20
NSBH0680-60-ATH	★	6.8	60	115	8	F50
08WHNSB0680-TH	●	6.8	77	132	7	F23
NSBH0680-90-ATH		6.8	90	145	8	F50
10WHNSB0680-TH	★	6.8	92	145	7	F26
NSBH0680-120-ATH		6.8	120	175	8	F50

Item code	Stock	DC	Flute length	LF	DCONMS	Page
15WHNSB0680-SD		6.8	127	180	7	F46
15WHNSB0680-TH	★	6.8	127	180	7	F28
NSBH0680-150-ATH		6.8	150	205	8	F50
20WHNSB0680-SD		6.8	162	215	7	F46
20WHNSB0680-TH	★	6.8	162	215	7	F29
25WHNSB0680-SD		6.8	191	244	7	F46
25WHNSB0680-TH	★	6.8	197	250	7	F31
NSBH0680-200-ATH		6.8	200	255	8	F50
30WHNSB0680-TH	★	6.8	232	285	7	F32
40WHNSB0680-TH		6.8	301	354	7	F36
50WHNSB0680-TH		6.8	371	424	7	F37
ZPB0690-TH		6.9	26	70	8	F89
ZPBLS0690-TH		6.9	26	120	6	F91
NSBH0690-30-ATH	★	6.9	30	85	8	F50
02WNSB0690-TH	★	6.9	31	71	7	F40
03WHNSB0690-SD		6.9	34	89	7	F44
03WHNSB0690-TH	●	6.9	34	89	7	F18
04WNSB0690-TH	★	6.9	43	83	7	F41
EHSE6.9-TH	★	6.9	43	83	7	F83
05WHNSB0690-SD		6.9	55	110	7	F45
05WHNSB0690-TH	●	6.9	55	110	7	F20
NSBH0690-60-ATH	★	6.9	60	115	8	F50
08WHNSB0690-TH	●	6.9	77	132	7	F23
NSBH0690-90-ATH		6.9	90	145	8	F50
10WHNSB0690-TH	★	6.9	92	145	7	F26
NSBH0690-120-ATH		6.9	120	175	8	F50
15WHNSB0690-TH	★	6.9	127	180	7	F28
NSBH0690-150-ATH		6.9	150	205	8	F50
20WHNSB0690-TH	★	6.9	162	215	7	F29
25WHNSB0690-TH	★	6.9	197	250	7	F31
NSBH0690-200-ATH		6.9	200	255	8	F50
30WHNSB0690-TH	★	6.9	232	285	7	F32
40WHNSB0690-TH		6.9	301	354	7	F36
50WHNSB0690-TH		6.9	371	424	7	F37
ZPB0700-TH	★	7	26	70	8	F89
ZPBLS0700-TH		7	26	120	6	F91
02WNSB0700-TH	★	7	31	71	7	F40
03WHNSB0700-SD		7	34	89	7	F44
03WHNSB0700-TH	●	7	34	89	7	F18
NSBH0700-35-ATH	★	7	35	90	8	F50
04WNSB0700-TH	★	7	43	83	7	F41
EHSE7.0-TH	★	7	43	83	7	F83
05WHNSB0700-SD	★	7	55	110	7	F45
05WHNSB0700-TH	●	7	55	110	7	F20
NSBH0700-60-ATH	★	7	60	115	8	F50
08WHNSB0700-TH	●	7	77	132	7	F23
08WHSR0700-ATH	★	7	81	133	8	F23
NSBH0700-90-ATH	★	7	90	145	8	F50
10WHNSB0700-TH	★	7	92	145	7	F26
NSBH0700-120-ATH	★	7	120	175	8	F50
15WHNSB0700-SD	★	7	127	180	7	F46
15WHNSB0700-TH	★	7	127	180	7	F28
NSBH0700-150-ATH	★	7	150	205	8	F50
20WHNSB0700-SD	★	7	162	215	7	F46
20WHNSB0700-TH	★	7	162	215	7	F29
20WHSR0700-ATH	★	7	166	218	8	F55
25WHNSB0700-SD	★	7	197	250	7	F46
25WHNSB0700-TH	★	7	197	250	7	F31
NSBH0700-200-ATH	★	7	200	255	8	F50
30WHNSB0700-TH	★	7	232	285	7	F32
30WHSR0700-ATH	★	7	236	288	8	F55
40WHNSB0700-TH		7	301	354	7	F36
50WHNSB0700-TH		7	371	424	7	F37
03WHNSB0703-SD	★	7.03	39	95	8	F44
05WHNSB0703-SD	★	7.03	63	119	8	F45
03WHNSB0705-TH	★	7.05	39	95	8	F18

●：Inventory maintained in US　★：Inventory maintained in Japan　No Mark：Manufactured upon request only

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPB0710-TH		7.1	26	70	8	F89
ZPBLS0710-TH		7.1	26	120	6	F91
02WNSB0710-TH		7.1	32	76	8	F40
NSBH0710-35-ATH		7.1	35	90	8	F50
03WHNSB0710-SD		7.1	39	95	8	F44
03WHNSB0710-TH	●	7.1	39	95	8	F18
04WNSB0710-TH	★	7.1	45	90	8	F41
NSBH0710-60-ATH		7.1	60	115	8	F50
05WHNSB0710-SD		7.1	63	119	8	F45
05WHNSB0710-TH	●	7.1	63	119	8	F20
08WHNSB0710-TH	●	7.1	84	144	8	F23
NSBH0710-90-ATH		7.1	90	145	8	F50
10WHNSB0710-TH	★	7.1	98	153	8	F26
NSBH0710-120-ATH		7.1	120	175	8	F50
15WHNSB0710-TH	★	7.1	136	191	8	F28
NSBH0710-150-ATH		7.1	150	205	8	F50
20WHNSB0710-TH	★	7.1	173	228	8	F29
NSBH0710-200-ATH		7.1	200	255	8	F50
25WHNSB0710-TH	★	7.1	211	266	8	F31
30WHNSB0710-TH	★	7.1	248	303	8	F32
40WHNSB0710-TH		7.1	323	380	8	F36
50WHNSB0710-TH		7.1	398	451	8	F37
ZPB0720-TH		7.2	26	70	8	F89
ZPBLS0720-TH		7.2	26	120	6	F91
02WNSB0720-TH		7.2	32	76	8	F40
NSBH0720-35-ATH		7.2	35	90	8	F50
03WHNSB0720-SD		7.2	39	95	8	F44
03WHNSB0720-TH	●	7.2	39	95	8	F18
04WNSB0720-TH	★	7.2	45	90	8	F41
NSBH0720-60-ATH		7.2	60	115	8	F50
05WHNSB0720-SD		7.2	63	119	8	F45
05WHNSB0720-TH	●	7.2	63	119	8	F20
08WHNSB0720-TH	●	7.2	84	144	8	F23
NSBH0720-90-ATH		7.2	90	145	8	F50
10WHNSB0720-TH	★	7.2	98	153	8	F26
NSBH0720-120-ATH		7.2	120	175	8	F50
15WHNSB0720-TH	★	7.2	136	191	8	F28
NSBH0720-150-ATH		7.2	150	205	8	F50
20WHNSB0720-TH	★	7.2	173	228	8	F29
NSBH0720-200-ATH		7.2	200	255	8	F50
25WHNSB0720-TH	★	7.2	211	266	8	F31
30WHNSB0720-TH	★	7.2	248	303	8	F32
40WHNSB0720-TH		7.2	323	380	8	F36
50WHNSB0720-TH		7.2	398	451	8	F37
ZPB0730-TH		7.3	26	70	8	F89
ZPBLS0730-TH		7.3	26	120	6	F91
02WNSB0730-TH	★	7.3	32	76	8	F40
NSBH0730-35-ATH		7.3	35	90	8	F50
03WHNSB0730-SD	★	7.3	39	95	8	F44
03WHNSB0730-TH	●	7.3	39	95	8	F18
04WNSB0730-TH	★	7.3	45	90	8	F41
NSBH0730-60-ATH		7.3	60	115	8	F50
05WHNSB0730-SD		7.3	63	119	8	F45
05WHNSB0730-TH	●	7.3	63	119	8	F20
08WHNSB0730-TH	●	7.3	84	144	8	F23
NSBH0730-90-ATH		7.3	90	145	8	F50
10WHNSB0730-TH	★	7.3	98	153	8	F26
NSBH0730-120-ATH		7.3	120	175	8	F50
15WHNSB0730-TH	★	7.3	136	191	8	F28
NSBH0730-150-ATH		7.3	150	205	8	F50
20WHNSB0730-TH	★	7.3	173	228	8	F29
NSBH0730-200-ATH		7.3	200	255	8	F50
25WHNSB0730-TH	★	7.3	211	266	8	F31
30WHNSB0730-TH	★	7.3	248	303	8	F32
40WHNSB0730-TH		7.3	323	380	8	F36
50WHNSB0730-TH		7.3	398	451	8	F37

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPB0740-TH		7.4	26	70	8	F89
ZPBLS0740-TH		7.4	26	120	6	F91
02WNSB0740-TH		7.4	32	76	8	F40
NSBH0740-35-ATH		7.4	35	90	8	F50
03WHNSB0740-SD		7.4	39	95	8	F44
03WHNSB0740-TH	●	7.4	39	95	8	F18
04WNSB0740-TH	★	7.4	45	90	8	F41
NSBH0740-60-ATH		7.4	60	115	8	F50
05WHNSB0740-SD		7.4	63	119	8	F45
05WHNSB0740-TH	●	7.4	63	119	8	F20
08WHNSB0740-TH	●	7.4	84	144	8	F23
NSBH0740-90-ATH		7.4	90	145	8	F50
10WHNSB0740-TH	★	7.4	98	153	8	F26
NSBH0740-120-ATH		7.4	120	175	8	F50
15WHNSB0740-TH	★	7.4	136	191	8	F28
NSBH0740-150-ATH		7.4	150	205	8	F50
20WHNSB0740-TH	★	7.4	173	228	8	F29
NSBH0740-200-ATH		7.4	200	255	8	F50
25WHNSB0740-TH	★	7.4	211	266	8	F31
30WHNSB0740-TH	★	7.4	248	303	8	F32
40WHNSB0740-TH		7.4	323	380	8	F36
50WHNSB0740-TH		7.4	398	451	8	F37
ZPB0750-TH		7.5	26	70	8	F89
ZPBLS0750-TH		7.5	26	120	6	F91
02WNSB0750-TH	★	7.5	32	76	8	F40
NSBH0750-35-ATH		7.5	35	90	8	F50
03WHNSB0750-SD	★	7.5	39	95	8	F44
03WHNSB0750-TH	●	7.5	39	95	8	F18
EHSE7.5-TH	★	7.5	45	87	8	F83
04WNSB0750-TH	★	7.5	45	90	8	F41
NSBH0750-60-ATH		7.5	60	115	8	F50
05WHNSB0750-SD	★	7.5	63	119	8	F45
05WHNSB0750-TH	●	7.5	63	119	8	F20
08WHNSB0750-TH	●	7.5	84	144	8	F23
NSBH0750-90-ATH		7.5	90	145	8	F50
10WHNSB0750-TH	★	7.5	98	153	8	F26
NSBH0750-120-ATH		7.5	120	175	8	F50
15WHNSB0750-SD		7.5	136	191	8	F46
15WHNSB0750-TH	★	7.5	136	191	8	F28
NSBH0750-150-ATH		7.5	150	205	8	F50
20WHNSB0750-SD		7.5	173	228	8	F46
20WHNSB0750-TH	★	7.5	173	228	8	F29
NSBH0750-200-ATH		7.5	200	255	8	F50
25WHNSB0750-SD		7.5	211	266	8	F46
25WHNSB0750-TH	★	7.5	211	266	8	F31
30WHNSB0750-TH	★	7.5	248	303	8	F32
40WHNSB0750-TH		7.5	323	380	8	F36
50WHNSB0750-TH		7.5	398	451	8	F37
03WHNSB0753-SD	★	7.53	39	95	8	F44
05WHNSB0753-SD	★	7.53	63	119	8	F45
ZPB0760-TH		7.6	28	70	8	F89
ZPBLS0760-TH		7.6	28	120	6	F91
02WNSB0760-TH		7.6	34	76	8	F40
NSBH0760-35-ATH		7.6	35	90	8	F50
03WHNSB0760-SD		7.6	39	95	8	F44
03WHNSB0760-TH	●	7.6	39	95	8	F18
04WNSB0760-TH	★	7.6	48	90	8	F41
NSBH0760-60-ATH		7.6	60	115	8	F50
05WHNSB0760-SD		7.6	63	119	8	F45
05WHNSB0760-TH	●	7.6	63	119	8	F20
08WHNSB0760-TH	●	7.6	88	144	8	F23
NSBH0760-90-ATH		7.6	90	145	8	F50
10WHNSB0760-TH	★	7.6	105	160	8	F26
NSBH0760-120-ATH		7.6	120	175	8	F50
15WHNSB0760-TH	★	7.6	145	200	8	F28
NSBH0760-150-ATH		7.6	150	205	8	F50

Item code	Stock	DC	Flute length	LF	DCONMS	Page
20WHNSB0760-TH	★	7.6	185	240	8	F29
NSBH0760-200-ATH		7.6	200	255	8	F50
25WHNSB0760-TH	★	7.6	225	280	8	F31
NSBH0760-250-ATH		7.6	250	305	8	F50
30WHNSB0760-TH	★	7.6	265	320	8	F32
40WHNSB0760-TH		7.6	344	401	8	F36
50WHNSB0760-TH		7.6	424	481	8	F37
ZPB0770-TH		7.7	28	70	8	F89
ZPBLS0770-TH		7.7	28	120	6	F91
02WNSB0770-TH		7.7	34	76	8	F40
NSBH0770-35-ATH		7.7	35	90	8	F50
03WHNSB0770-SD		7.7	39	95	8	F44
03WHNSB0770-TH	●	7.7	39	95	8	F18
04WNSB0770-TH	★	7.7	48	90	8	F41
NSBH0770-60-ATH		7.7	60	115	8	F50
05WHNSB0770-SD		7.7	63	119	8	F45
05WHNSB0770-TH	●	7.7	63	119	8	F20
08WHNSB0770-TH	●	7.7	88	144	8	F23
NSBH0770-90-ATH		7.7	90	145	8	F50
10WHNSB0770-TH	★	7.7	105	160	8	F26
NSBH0770-120-ATH		7.7	120	175	8	F50
15WHNSB0770-TH	★	7.7	145	200	8	F28
NSBH0770-150-ATH		7.7	150	205	8	F50
20WHNSB0770-TH	★	7.7	185	240	8	F29
NSBH0770-200-ATH		7.7	200	255	8	F50
25WHNSB0770-TH	★	7.7	225	280	8	F31
NSBH0770-250-ATH		7.7	250	305	8	F50
30WHNSB0770-TH	★	7.7	265	320	8	F32
40WHNSB0770-TH		7.7	344	401	8	F36
50WHNSB0770-TH		7.7	424	481	8	F37
ZPB0780-TH		7.8	28	70	8	F89
ZPBLS0780-TH		7.8	28	120	6	F91
02WNSB0780-TH	★	7.8	34	76	8	F40
NSBH0780-35-ATH		7.8	35	90	8	F50
03WHNSB0780-SD		7.8	39	95	8	F44
03WHNSB0780-TH	●	7.8	39	95	8	F18
04WNSB0780-TH	★	7.8	48	90	8	F41
EHSE7.8-TH	★	7.8	48	90	8	F83
NSBH0780-60-ATH		7.8	60	115	8	F50
05WHNSB0780-SD	★	7.8	63	119	8	F45
05WHNSB0780-TH	●	7.8	63	119	8	F20
08WHNSB0780-TH	●	7.8	88	144	8	F23
NSBH0780-90-ATH		7.8	90	145	8	F50
10WHNSB0780-TH	★	7.8	105	160	8	F26
NSBH0780-120-ATH		7.8	120	175	8	F50
15WHNSB0780-TH	★	7.8	145	200	8	F28
NSBH0780-150-ATH		7.8	150	205	8	F50
20WHNSB0780-TH	★	7.8	185	240	8	F29
NSBH0780-200-ATH		7.8	200	255	8	F50
25WHNSB0780-TH	★	7.8	225	280	8	F31
NSBH0780-250-ATH		7.8	250	305	8	F50
30WHNSB0780-TH	★	7.8	265	320	8	F32
40WHNSB0780-TH		7.8	344	401	8	F36
50WHNSB0780-TH		7.8	424	481	8	F37
ZPB0790-TH		7.9	28	70	8	F89
ZPBLS0790-TH		7.9	28	120	6	F91
02WNSB0790-TH	★	7.9	34	76	8	F40
NSBH0790-35-ATH		7.9	35	90	8	F50
03WHNSB0790-SD		7.9	39	95	8	F44
03WHNSB0790-TH	●	7.9	39	95	8	F18
04WNSB0790-TH	★	7.9	48	90	8	F41
NSBH0790-60-ATH		7.9	60	115	8	F50
05WHNSB0790-SD		7.9	63	119	8	F45
05WHNSB0790-TH	●	7.9	63	119	8	F20
08WHNSB0790-TH	●	7.9	88	144	8	F23
NSBH0790-90-ATH		7.9	90	145	8	F50

Item code	Stock	DC	Flute length	LF	DCONMS	Page
10WHNSB0790-TH	★	7.9	105	160	8	F26
NSBH0790-120-ATH		7.9	120	175	8	F50
15WHNSB0790-TH	★	7.9	145	200	8	F28
NSBH0790-150-ATH		7.9	150	205	8	F50
20WHNSB0790-TH	★	7.9	185	240	8	F29
NSBH0790-200-ATH		7.9	200	255	8	F50
25WHNSB0790-TH	★	7.9	225	280	8	F31
NSBH0790-250-ATH		7.9	250	305	8	F50
30WHNSB0790-TH	★	7.9	265	320	8	F32
40WHNSB0790-TH		7.9	344	401	8	F36
50WHNSB0790-TH		7.9	424	481	8	F37
ZPB0800-TH	★	8	28	70	8	F90
ZPBLS0800-TH		8	28	130	8	F92
02WNSB0800-TH	★	8	34	76	8	F40
03WHNSB0800-SD	★	8	39	95	8	F44
03WHNSB0800-TH	●	8	39	95	8	F18
NSBH0800-40-ATH	★	8	40	95	10	F50
04WNSB0800-TH	★	8	48	90	8	F41
EHSE8.0-TH	★	8	48	90	8	F83
NSBH0800-60-ATH	★	8	60	115	10	F50
05WHNSB0800-SD	★	8	63	119	8	F45
05WHNSB0800-TH	●	8	63	119	8	F20
08WHNSB0800-TH	●	8	88	144	8	F23
NSBH0800-90-ATH	★	8	90	145	10	F50
08WHSR0800-ATH	★	8	92	145	8	F23
10WHNSB0800-TH	★	8	105	160	8	F26
NSBH0800-120-ATH	★	8	120	175	10	F50
15WHNSB0800-SD	★	8	145	200	8	F46
15WHNSB0800-TH	★	8	145	200	8	F28
NSBH0800-150-ATH	★	8	150	205	10	F50
20WHNSB0800-SD	★	8	185	240	8	F46
20WHNSB0800-TH	★	8	185	240	8	F29
20WHSR0800-ATH	★	8	189	242	8	F55
NSBH0800-200-ATH	★	8	200	255	10	F50
25WHNSB0800-SD	★	8	225	280	8	F46
25WHNSB0800-TH	★	8	225	280	8	F31
NSBH0800-250-ATH	★	8	250	305	10	F50
30WHNSB0800-TH	★	8	265	320	8	F32
30WHSR0800-ATH	★	8	269	322	8	F55
40WHNSB0800-TH	★	8	344	401	8	F36
50WHNSB0800-TH	★	8	424	481	8	F37
03WHNSB0803-SD	★	8.03	44	101	9	F44
05WHNSB0803-SD	★	8.03	71	128	9	F45
03WHNSB0805-TH	★	8.05	44	101	9	F18
ZPB0810-TH		8.1	28	80	10	F90
ZPBLS0810-TH		8.1	28	130	8	F92
02WNSB0810-TH		8.1	36	80	9	F40
03WHNSB0810-SD		8.1	44	101	9	F44
03WHNSB0810-TH	●	8.1	44	101	9	F18
NSBH0810-45-ATH		8.1	45	105	10	F50
04WNSB0810-TH	★	8.1	52	96	9	F41
05WHNSB0810-SD		8.1	71	128	9	F45
05WHNSB0810-TH	●	8.1	71	128	9	F20
NSBH0810-90-ATH		8.1	90	150	10	F50
08WHNSB0810-TH		8.1	94	156	9	F23
10WHNSB0810-TH		8.1	111	166	9	F26
NSBH0810-120-ATH		8.1	120	180	10	F50
NSBH0810-150-ATH		8.1	150	210	10	F50
15WHNSB0810-TH		8.1	154	209	9	F28
20WHNSB0810-TH		8.1	196	251	9	F29
NSBH0810-200-ATH		8.1	200	260	10	F50
25WHNSB0810-TH		8.1	239	294	9	F31
NSBH0810-250-ATH		8.1	250	310	10	F50
30WHNSB0810-TH		8.1	281	336	9	F32
40WHNSB0810-TH		8.1	366	423	9	F36
ZPB0820-TH		8.2	28	80	10	F90

Quick dimension reference table by tool diameter

φ 8.2～φ 10.5

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPBLS0820-TH		8.2	28	130	8	F92
02WNSB0820-TH		8.2	36	80	9	F40
03WHNSB0820-SD		8.2	44	101	9	F44
03WHNSB0820-TH	●	8.2	44	101	9	F18
NSBH0820-45-ATH		8.2	45	105	10	F50
04WNSB0820-TH	★	8.2	52	96	9	F41
05WHNSB0820-SD		8.2	71	128	9	F45
05WHNSB0820-TH	●	8.2	71	128	9	F20
NSBH0820-90-ATH		8.2	90	150	10	F50
08WHNSB0820-TH		8.2	94	156	9	F23
10WHNSB0820-TH		8.2	111	166	9	F26
NSBH0820-120-ATH		8.2	120	180	10	F50
NSBH0820-150-ATH		8.2	150	210	10	F50
15WHNSB0820-TH		8.2	154	209	9	F28
20WHNSB0820-TH		8.2	196	251	9	F29
NSBH0820-200-ATH		8.2	200	260	10	F50
25WHNSB0820-TH		8.2	239	294	9	F31
NSBH0820-250-ATH		8.2	250	310	10	F50
30WHNSB0820-TH		8.2	281	336	9	F32
40WHNSB0820-TH		8.2	366	423	9	F36
ZPB0830-TH		8.3	28	80	10	F90
ZPBLS0830-TH		8.3	28	130	8	F92
02WNSB0830-TH		8.3	36	80	9	F40
03WHNSB0830-SD		8.3	44	101	9	F44
03WHNSB0830-TH	●	8.3	44	101	9	F18
NSBH0830-45-ATH		8.3	45	105	10	F50
04WNSB0830-TH	★	8.3	52	96	9	F41
05WHNSB0830-SD		8.3	71	128	9	F45
05WHNSB0830-TH	●	8.3	71	128	9	F20
NSBH0830-90-ATH		8.3	90	150	10	F50
08WHNSB0830-TH	★	8.3	94	156	9	F23
10WHNSB0830-TH	★	8.3	111	166	9	F26
NSBH0830-120-ATH		8.3	120	180	10	F50
NSBH0830-150-ATH		8.3	150	210	10	F50
15WHNSB0830-TH	★	8.3	154	209	9	F28
20WHNSB0830-TH	★	8.3	196	251	9	F29
NSBH0830-200-ATH		8.3	200	260	10	F50
25WHNSB0830-TH	★	8.3	239	294	9	F31
NSBH0830-250-ATH		8.3	250	310	10	F50
30WHNSB0830-TH	★	8.3	281	336	9	F32
40WHNSB0830-TH		8.3	366	423	9	F36
ZPB0840-TH		8.4	28	80	10	F90
ZPBLS0840-TH		8.4	28	130	8	F92
02WNSB0840-TH	★	8.4	36	80	9	F40
03WHNSB0840-SD		8.4	44	101	9	F44
03WHNSB0840-TH	●	8.4	44	101	9	F18
NSBH0840-45-ATH		8.4	45	105	10	F50
04WNSB0840-TH	★	8.4	52	96	9	F41
05WHNSB0840-SD		8.4	71	128	9	F45
05WHNSB0840-TH	●	8.4	71	128	9	F20
NSBH0840-90-ATH		8.4	90	150	10	F50
08WHNSB0840-TH	★	8.4	94	156	9	F23
10WHNSB0840-TH	★	8.4	111	166	9	F26
NSBH0840-120-ATH		8.4	120	180	10	F50
NSBH0840-150-ATH		8.4	150	210	10	F50
15WHNSB0840-TH	★	8.4	154	209	9	F28
20WHNSB0840-TH	★	8.4	196	251	9	F29
NSBH0840-200-ATH		8.4	200	260	10	F50
25WHNSB0840-TH	★	8.4	239	294	9	F31
NSBH0840-250-ATH		8.4	250	310	10	F50
30WHNSB0840-TH	★	8.4	281	336	9	F32
40WHNSB0840-TH		8.4	366	423	9	F36
ZPB0850-TH		8.5	28	80	10	F90
ZPBLS0850-TH		8.5	28	130	8	F92
02WNSB0850-TH	★	8.5	36	80	9	F40
03WHNSB0850-SD	★	8.5	44	101	9	F44

Item code	Stock	DC	Flute length	LF	DCONMS	Page
03WHNSB0850-TH	●	8.5	44	101	9	F18
NSBH0850-45-ATH	★	8.5	45	105	10	F50
STB085S-ATH	★	8.5	50	115	12	F86
STBH085S-ATH	★	8.5	50	115	12	F85
04WNSB0850-TH	★	8.5	52	96	9	F41
EHSE8.5-TH	★	8.5	53	96	9	F83
STB085M-ATH	★	8.5	60	125	12	F86
STBH085M-ATH	★	8.5	60	125	12	F85
05WHNSB0850-SD	★	8.5	71	128	9	F45
05WHNSB0850-TH	●	8.5	71	128	9	F20
NSBH0850-90-ATH	★	8.5	90	150	10	F50
08WHNSB0850-TH	●	8.5	94	156	9	F23
08WHSR0850-ATH	★	8.5	99	154	10	F23
10WHNSB0850-TH	★	8.5	111	166	9	F26
NSBH0850-120-ATH	★	8.5	120	180	10	F50
NSBH0850-150-ATH	★	8.5	150	210	10	F50
15WHNSB0850-SD		8.5	154	209	9	F46
15WHNSB0850-TH	★	8.5	154	209	9	F28
20WHNSB0850-TH	★	8.5	196	251	9	F29
NSBH0850-200-ATH	★	8.5	200	260	10	F50
20WHSR0850-ATH	★	8.5	201	256	10	F55
25WHNSB0850-TH	★	8.5	239	294	9	F31
NSBH0850-250-ATH	★	8.5	250	310	10	F50
30WHNSB0850-TH	★	8.5	281	336	9	F32
30WHSR0850-ATH	★	8.5	286	341	10	F55
40WHNSB0850-TH	★	8.5	366	423	9	F36
03WHNSB0853-SD	★	8.53	44	101	9	F44
05WHNSB0853-SD	★	8.53	71	128	9	F45
ZPB0860-TH		8.6	28	80	10	F90
ZPBLS0860-TH		8.6	28	130	8	F92
02WNSB0860-TH	★	8.6	38	80	9	F40
03WHNSB0860-SD	★	8.6	44	101	9	F44
03WHNSB0860-TH	●	8.6	44	101	9	F18
NSBH0860-45-ATH	★	8.6	45	105	10	F50
04WNSB0860-TH	★	8.6	54	96	9	F41
EHSE8.6-TH	★	8.6	55	98	9	F83
05WHNSB0860-SD	★	8.6	71	128	9	F45
05WHNSB0860-TH	●	8.6	71	128	9	F20
NSBH0860-90-ATH		8.6	90	150	10	F50
08WHNSB0860-TH		8.6	99	156	9	F23
10WHNSB0860-TH		8.6	118	173	9	F26
NSBH0860-120-ATH		8.6	120	180	10	F50
NSBH0860-150-ATH		8.6	150	210	10	F50
15WHNSB0860-SD		8.6	163	218	9	F46
15WHNSB0860-TH		8.6	163	218	9	F28
NSBH0860-200-ATH		8.6	200	260	10	F50
20WHNSB0860-TH		8.6	208	263	9	F29
NSBH0860-250-ATH		8.6	250	310	10	F50
25WHNSB0860-TH		8.6	254	309	9	F31
30WHNSB0860-TH		8.6	298	353	9	F32
40WHNSB0860-TH		8.6	387	444	9	F36
ZPB0870-TH		8.7	28	80	10	F90
ZPBLS0870-TH		8.7	28	130	8	F92
02WNSB0870-TH		8.7	38	80	9	F40
03WHNSB0870-SD		8.7	44	101	9	F44
03WHNSB0870-TH	●	8.7	44	101	9	F18
NSBH0870-45-ATH	★	8.7	45	105	10	F51
04WNSB0870-TH	★	8.7	54	96	9	F41
EHSE8.7-TH	★	8.7	55	98	9	F83
05WHNSB0870-SD		8.7	71	128	9	F45
05WHNSB0870-TH	●	8.7	71	128	9	F20
NSBH0870-90-ATH		8.7	90	150	10	F51
08WHNSB0870-TH		8.7	99	156	9	F23
10WHNSB0870-TH		8.7	118	173	9	F26
NSBH0870-120-ATH		8.7	120	180	10	F51
NSBH0870-150-ATH		8.7	150	210	10	F51

Item code	Stock	DC	Flute length	LF	DCONMS	Page
15WHNSB0870-TH		8.7	163	218	9	F28
NSBH0870-200-ATH		8.7	200	260	10	F51
20WHNSB0870-TH		8.7	208	263	9	F29
NSBH0870-250-ATH		8.7	250	310	10	F51
25WHNSB0870-TH		8.7	254	309	9	F31
30WHNSB0870-TH		8.7	298	353	9	F32
40WHNSB0870-TH		8.7	387	444	9	F36
ZPB0880-TH		8.8	28	80	10	F90
ZPBLS0880-TH		8.8	28	130	8	F92
02WNSB0880-TH	★	8.8	38	80	9	F40
03WHNSB0880-SD	★	8.8	44	101	9	F44
03WHNSB0880-TH	●	8.8	44	101	9	F18
NSBH0880-45-ATH	★	8.8	45	105	10	F51
04WNSB0880-TH	★	8.8	54	96	9	F41
EHSE8.8-TH	★	8.8	55	98	9	F83
05WHNSB0880-SD	★	8.8	71	128	9	F45
05WHNSB0880-TH	●	8.8	71	128	9	F20
NSBH0880-90-ATH		8.8	90	150	10	F51
08WHNSB0880-TH	★	8.8	99	156	9	F23
10WHNSB0880-TH	★	8.8	118	173	9	F26
NSBH0880-120-ATH		8.8	120	180	10	F51
NSBH0880-150-ATH		8.8	150	210	10	F51
15WHNSB0880-TH	★	8.8	163	218	9	F28
NSBH0880-200-ATH		8.8	200	260	10	F51
20WHNSB0880-TH	★	8.8	208	263	9	F29
NSBH0880-250-ATH		8.8	250	310	10	F51
25WHNSB0880-TH	★	8.8	254	309	9	F31
30WHNSB0880-TH	★	8.8	298	353	9	F32
40WHNSB0880-TH		8.8	387	444	9	F36
ZPB0890-TH		8.9	28	80	10	F90
ZPBLS0890-TH		8.9	28	130	8	F92
02WNSB0890-TH		8.9	38	80	9	F40
03WHNSB0890-SD		8.9	44	101	9	F44
03WHNSB0890-TH	●	8.9	44	101	9	F18
NSBH0890-45-ATH	★	8.9	45	105	10	F51
04WNSB0890-TH	★	8.9	54	96	9	F41
05WHNSB0890-SD		8.9	71	128	9	F45
05WHNSB0890-TH	●	8.9	71	128	9	F20
NSBH0890-90-ATH		8.9	90	150	10	F51
08WHNSB0890-TH	★	8.9	99	156	9	F23
10WHNSB0890-TH	★	8.9	118	173	9	F26
NSBH0890-120-ATH		8.9	120	180	10	F51
NSBH0890-150-ATH		8.9	150	210	10	F51
15WHNSB0890-TH	★	8.9	163	218	9	F28
NSBH0890-200-ATH		8.9	200	260	10	F51
20WHNSB0890-TH	★	8.9	208	263	9	F29
NSBH0890-250-ATH		8.9	250	310	10	F51
25WHNSB0890-TH	★	8.9	254	309	9	F31
30WHNSB0890-TH	★	8.9	298	353	9	F32
40WHNSB0890-TH		8.9	387	444	9	F36
ZPB0900-TH	★	9	28	80	10	F90
ZPBLS0900-TH		9	28	130	8	F92
02WNSB0900-TH	★	9	38	80	9	F40
03WHNSB0900-SD	★	9	44	101	9	F44
03WHNSB0900-TH	●	9	44	101	9	F18
NSBH0900-45-ATH	★	9	45	105	10	F51
04WNSB0900-TH	★	9	54	96	9	F41
EHSE9.0-TH	★	9	55	98	9	F83
05WHNSB0900-SD	★	9	71	128	9	F45
05WHNSB0900-TH	●	9	71	128	9	F20
NSBH0900-90-ATH	★	9	90	150	10	F51
08WHNSB0900-TH	●	9	99	156	9	F23
08WHSR0900-ATH	★	9	104	158	10	F23
10WHNSB0900-TH	★	9	118	173	9	F26
NSBH0900-120-ATH	★	9	120	180	10	F51
NSBH0900-150-ATH	★	9	150	210	10	F51

Item code	Stock	DC	Flute length	LF	DCONMS	Page
15WHNSB0900-SD	★	9	163	218	9	F46
15WHNSB0900-TH	★	9	163	218	9	F28
NSBH0900-200-ATH	★	9	200	260	10	F51
20WHNSB0900-TH	★	9	208	263	9	F29
20WHSR0900-ATH	★	9	213	267	10	F55
NSBH0900-250-ATH	★	9	250	310	10	F51
25WHNSB0900-TH	★	9	254	309	9	F31
30WHNSB0900-TH	★	9	298	353	9	F32
30WHSR0900-ATH	★	9	303	357	10	F55
40WHNSB0900-TH		9	387	444	9	F36
03WHNSB0903-SD	★	9.03	49	107	10	F44
05WHNSB0903-SD	★	9.03	79	137	10	F45
ZPB0910-TH		9.1	30	80	10	F90
ZPBLS0910-TH		9.1	30	130	8	F92
02WNSB0910-TH		9.1	40	85	10	F40
03WHNSB0910-SD		9.1	49	107	10	F44
03WHNSB0910-TH		9.1	49	107	10	F18
NSBH0910-50-ATH		9.1	50	110	10	F51
04WNSB0910-TH	★	9.1	57	104	10	F41
05WHNSB0910-SD		9.1	79	137	10	F45
05WHNSB0910-TH		9.1	79	137	10	F20
NSBH0910-90-ATH		9.1	90	150	10	F51
08WHNSB0910-TH		9.1	105	168	10	F23
NSBH0910-120-ATH		9.1	120	180	10	F51
10WHNSB0910-TH		9.1	124	179	10	F26
NSBH0910-150-ATH		9.1	150	210	10	F51
15WHNSB0910-TH		9.1	172	227	10	F28
NSBH0910-200-ATH		9.1	200	260	10	F51
20WHNSB0910-TH		9.1	219	274	10	F29
NSBH0910-250-ATH		9.1	250	310	10	F51
25WHNSB0910-TH		9.1	268	323	10	F31
NSBH0910-300-ATH		9.1	300	360	10	F51
30WHNSB0910-TH		9.1	314	369	10	F32
40WHNSB0910-TH		9.1	409	466	10	F36
ZPB0920-TH		9.2	30	80	10	F90
ZPBLS0920-TH		9.2	30	130	8	F92
02WNSB0920-TH		9.2	40	85	10	F40
03WHNSB0920-SD		9.2	49	107	10	F44
03WHNSB0920-TH		9.2	49	107	10	F18
NSBH0920-50-ATH		9.2	50	110	10	F51
04WNSB0920-TH	★	9.2	57	104	10	F41
05WHNSB0920-SD		9.2	79	137	10	F45
05WHNSB0920-TH		9.2	79	137	10	F20
NSBH0920-90-ATH		9.2	90	150	10	F51
08WHNSB0920-TH		9.2	105	168	10	F23
NSBH0920-120-ATH		9.2	120	180	10	F51
10WHNSB0920-TH		9.2	124	179	10	F26
NSBH0920-150-ATH		9.2	150	210	10	F51
15WHNSB0920-TH		9.2	172	227	10	F28
NSBH0920-200-ATH		9.2	200	260	10	F51
20WHNSB0920-TH		9.2	219	274	10	F29
NSBH0920-250-ATH		9.2	250	310	10	F51
25WHNSB0920-TH		9.2	268	323	10	F31
NSBH0920-300-ATH		9.2	300	360	10	F51
30WHNSB0920-TH		9.2	314	369	10	F32
40WHNSB0920-TH		9.2	409	466	10	F36
ZPB0930-TH		9.3	30	80	10	F90
ZPBLS0930-TH		9.3	30	130	8	F92
02WNSB0930-TH		9.3	40	85	10	F40
03WHNSB0930-SD		9.3	49	107	10	F44
03WHNSB0930-TH	★	9.3	49	107	10	F18
NSBH0930-50-ATH		9.3	50	110	10	F51
04WNSB0930-TH	★	9.3	57	104	10	F41
05WHNSB0930-SD		9.3	79	137	10	F45
05WHNSB0930-TH	★	9.3	79	137	10	F20
NSBH0930-90-ATH		9.3	90	150	10	F51

●：Inventory maintained in US　★：Inventory maintained in Japan　No Mark：Manufactured upon request only

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
08WHNSB0930-TH	★	9.3	105	168	10	F23
NSBH0930-120-ATH		9.3	120	180	10	F51
10WHNSB0930-TH	★	9.3	124	179	10	F26
NSBH0930-150-ATH		9.3	150	210	10	F51
15WHNSB0930-TH	★	9.3	172	227	10	F28
NSBH0930-200-ATH		9.3	200	260	10	F51
20WHNSB0930-TH	★	9.3	219	274	10	F29
NSBH0930-250-ATH		9.3	250	310	10	F51
25WHNSB0930-TH	★	9.3	268	323	10	F31
NSBH0930-300-ATH		9.3	300	360	10	F51
30WHNSB0930-TH	★	9.3	314	369	10	F32
40WHNSB0930-TH		9.3	409	466	10	F36
ZPB0940-TH		9.4	30	80	10	F90
ZPBLS0940-TH		9.4	30	130	8	F92
02WNSB0940-TH	★	9.4	40	85	10	F40
03WHNSB0940-SD		9.4	49	107	10	F44
03WHNSB0940-TH	★	9.4	49	107	10	F18
NSBH0940-50-ATH		9.4	50	110	10	F51
04WNSB0940-TH	★	9.4	57	104	10	F41
05WHNSB0940-SD		9.4	79	137	10	F45
05WHNSB0940-TH	★	9.4	79	137	10	F20
NSBH0940-90-ATH		9.4	90	150	10	F51
08WHNSB0940-TH	★	9.4	105	168	10	F23
NSBH0940-120-ATH		9.4	120	180	10	F51
10WHNSB0940-TH	★	9.4	124	179	10	F26
NSBH0940-150-ATH		9.4	150	210	10	F51
15WHNSB0940-TH	★	9.4	172	227	10	F28
NSBH0940-200-ATH		9.4	200	260	10	F51
20WHNSB0940-TH	★	9.4	219	274	10	F29
NSBH0940-250-ATH		9.4	250	310	10	F51
25WHNSB0940-TH	★	9.4	268	323	10	F31
NSBH0940-300-ATH		9.4	300	360	10	F51
30WHNSB0940-TH	★	9.4	314	369	10	F32
40WHNSB0940-TH		9.4	409	466	10	F36
ZPB0950-TH	★	9.5	29	80	10	F90
ZPBLS0950-TH		9.5	30	130	8	F92
02WNSB0950-TH	★	9.5	40	85	10	F40
03WHNSB0950-SD	★	9.5	49	107	10	F44
03WHNSB0950-TH	●	9.5	49	107	10	F18
NSBH0950-50-ATH		9.5	50	110	10	F51
04WNSB0950-TH	★	9.5	57	104	10	F41
EHSE9.5-TH	★	9.5	58	102	10	F83
05WHNSB0950-SD	★	9.5	79	137	10	F45
05WHNSB0950-TH	●	9.5	79	137	10	F20
NSBH0950-90-ATH		9.5	90	150	10	F51
08WHNSB0950-TH	●	9.5	105	168	10	F23
08WHSR0950-ATH	★	9.5	110	165	10	F23
NSBH0950-120-ATH		9.5	120	180	10	F51
10WHNSB0950-TH	★	9.5	124	179	10	F26
NSBH0950-150-ATH		9.5	150	210	10	F51
15WHNSB0950-SD		9.5	172	227	10	F46
15WHNSB0950-TH	★	9.5	172	227	10	F28
NSBH0950-200-ATH		9.5	200	260	10	F51
20WHNSB0950-TH	★	9.5	219	274	10	F29
20WHSR0950-ATH	★	9.5	224	279	10	F55
NSBH0950-250-ATH		9.5	250	310	10	F51
25WHNSB0950-TH	★	9.5	268	323	10	F31
NSBH0950-300-ATH		9.5	300	360	10	F51
30WHNSB0950-TH	★	9.5	314	369	10	F32
30WHSR0950-ATH	★	9.5	320	374	10	F55
40WHNSB0950-TH		9.5	409	466	10	F36
03WHNSB0953-SD	★	9.53	49	107	10	F44
05WHNSB0953-SD	★	9.53	79	137	10	F45
ZPB0960-TH		9.6	32	80	10	F90
ZPBLS0960-TH		9.6	32	130	8	F92
02WNSB0960-TH		9.6	41	85	10	F40

Item code	Stock	DC	Flute length	LF	DCONMS	Page
03WHNSB0960-SD		9.6	49	107	10	F44
03WHNSB0960-TH		9.6	49	107	10	F18
NSBH0960-50-ATH		9.6	50	110	10	F51
04WNSB0960-TH	★	9.6	60	104	10	F41
05WHNSB0960-SD		9.6	79	137	10	F45
05WHNSB0960-TH		9.6	79	137	10	F20
NSBH0960-90-ATH		9.6	90	150	10	F51
08WHNSB0960-TH		9.6	110	168	10	F23
NSBH0960-120-ATH		9.6	120	180	10	F51
10WHNSB0960-TH		9.6	131	186	10	F26
NSBH0960-150-ATH		9.6	150	210	10	F51
15WHNSB0960-TH		9.6	181	236	10	F28
NSBH0960-200-ATH		9.6	200	260	10	F51
20WHNSB0960-TH		9.6	231	286	10	F29
NSBH0960-250-ATH		9.6	250	310	10	F51
25WHNSB0960-TH		9.6	282	337	10	F31
NSBH0960-300-ATH		9.6	300	360	10	F51
30WHNSB0960-TH		9.6	331	386	10	F32
40WHNSB0960-TH		9.6	430	487	10	F36
ZPB0970-TH		9.7	32	80	10	F90
ZPBLS0970-TH		9.7	32	130	8	F92
02WNSB0970-TH		9.7	41	85	10	F40
03WHNSB0970-SD		9.7	49	107	10	F44
03WHNSB0970-TH		9.7	49	107	10	F18
NSBH0970-50-ATH		9.7	50	110	10	F51
04WNSB0970-TH	★	9.7	60	104	10	F41
05WHNSB0970-SD		9.7	79	137	10	F45
05WHNSB0970-TH		9.7	79	137	10	F20
NSBH0970-90-ATH		9.7	90	150	10	F51
08WHNSB0970-TH		9.7	110	168	10	F23
NSBH0970-120-ATH		9.7	120	180	10	F51
10WHNSB0970-TH		9.7	131	186	10	F26
NSBH0970-150-ATH		9.7	150	210	10	F51
15WHNSB0970-TH		9.7	181	236	10	F28
NSBH0970-200-ATH		9.7	200	260	10	F51
20WHNSB0970-TH		9.7	231	286	10	F29
NSBH0970-250-ATH		9.7	250	310	10	F51
25WHNSB0970-TH		9.7	282	337	10	F31
NSBH0970-300-ATH		9.7	300	360	10	F51
30WHNSB0970-TH		9.7	331	386	10	F32
40WHNSB0970-TH		9.7	430	487	10	F36
ZPB0980-TH		9.8	32	80	10	F90
ZPBLS0980-TH		9.8	32	130	8	F92
02WNSB0980-TH	★	9.8	41	85	10	F40
03WHNSB0980-SD		9.8	49	107	10	F44
03WHNSB0980-TH	●	9.8	49	107	10	F18
NSBH0980-50-ATH		9.8	50	110	10	F51
04WNSB0980-TH	★	9.8	60	104	10	F41
EHSE9.8-TH	★	9.8	60	105	10	F83
05WHNSB0980-SD	★	9.8	79	137	10	F45
05WHNSB0980-TH	●	9.8	79	137	10	F20
NSBH0980-90-ATH		9.8	90	150	10	F51
08WHNSB0980-TH	●	9.8	110	168	10	F23
NSBH0980-120-ATH		9.8	120	180	10	F51
10WHNSB0980-TH	★	9.8	131	186	10	F26
NSBH0980-150-ATH		9.8	150	210	10	F51
15WHNSB0980-TH	★	9.8	181	236	10	F28
NSBH0980-200-ATH		9.8	200	260	10	F51
20WHNSB0980-TH	★	9.8	231	286	10	F29
NSBH0980-250-ATH		9.8	250	310	10	F51
25WHNSB0980-TH	★	9.8	282	337	10	F31
NSBH0980-300-ATH		9.8	300	360	10	F51
30WHNSB0980-TH	★	9.8	331	386	10	F32
40WHNSB0980-TH		9.8	430	487	10	F36
ZPB0990-TH		9.9	32	80	10	F90
ZPBLS0990-TH		9.9	32	130	8	F92

Item code	Stock	DC	Flute length	LF	DCONMS	Page
02WNSB0990-TH		9.9	41	85	10	F40
03WHNSB0990-SD		9.9	49	107	10	F44
03WHNSB0990-TH	★	9.9	49	107	10	F18
NSBH0990-50-ATH		9.9	50	110	10	F51
04WNSB0990-TH	★	9.9	60	104	10	F41
05WHNSB0990-SD		9.9	79	137	10	F45
05WHNSB0990-TH	★	9.9	79	137	10	F20
NSBH0990-90-ATH		9.9	90	150	10	F51
08WHNSB0990-TH	★	9.9	110	168	10	F23
NSBH0990-120-ATH		9.9	120	180	10	F51
10WHNSB0990-TH	★	9.9	131	186	10	F26
NSBH0990-150-ATH		9.9	150	210	10	F51
15WHNSB0990-TH	★	9.9	181	236	10	F28
NSBH0990-200-ATH		9.9	200	260	10	F51
20WHNSB0990-TH	★	9.9	231	286	10	F29
NSBH0990-250-ATH		9.9	250	310	10	F51
25WHNSB0990-TH	★	9.9	282	337	10	F31
NSBH0990-300-ATH		9.9	300	360	10	F51
30WHNSB0990-TH	★	9.9	331	386	10	F32
40WHNSB0990-TH		9.9	430	487	10	F36
ZPB1000-TH	★	10	32	80	10	F90
ZPBLS1000-TH		10	32	150	10	F92
02WNSB1000-TH	★	10	41	85	10	F40
03WHNSB1000-SD	★	10	49	107	10	F44
03WHNSB1000-TH	●	10	49	107	10	F18
NSBH1000-50-ATH	★	10	50	110	12	F51
04WNSB1000-TH	★	10	60	104	10	F41
EHSE10.0-TH	★	10	60	105	10	F83
05WHNSB1000-SD	★	10	79	137	10	F45
05WHNSB1000-TH	●	10	79	137	10	F20
NSBH1000-90-ATH	★	10	90	150	12	F51
08WHNSB1000-TH	●	10	110	168	10	F23
08WHSR1000-ATH	★	10	115	170	10	F23
NSBH1000-120-ATH	★	10	120	180	12	F51
10WHNSB1000-TH	★	10	131	186	10	F26
NSBH1000-150-ATH	★	10	150	210	12	F51
15WHNSB1000-SD	★	10	181	236	10	F46
15WHNSB1000-TH	★	10	181	236	10	F28
NSBH1000-200-ATH	★	10	200	260	12	F51
20WHNSB1000-TH	★	10	231	286	10	F29
20WHSR1000-ATH	★	10	236	291	10	F55
NSBH1000-250-ATH	★	10	250	310	12	F51
25WHNSB1000-TH	★	10	282	337	10	F31
NSBH1000-300-ATH	★	10	300	360	12	F51
30WHNSB1000-TH	★	10	331	386	10	F32
30WHSR1000-ATH	★	10	336	391	10	F55
40WHNSB1000-TH	★	10	430	487	10	F36
03WHNSB1003-SD	★	10.03	54	117	11	F44
05WHNSB1003-SD	★	10.03	87	150	11	F45
ZPB1010-TH		10.1	33	90	12	F90
ZPBLS1010-TH		10.1	33	150	10	F92
02WNSB1010-TH		10.1	42	90	11	F40
NSBH1010-50-ATH		10.1	50	110	12	F51
03WHNSB1010-TH		10.1	54	117	11	F18
04WNSB1010-TH	★	10.1	63	112	11	F41
05WHNSB1010-TH		10.1	87	150	11	F20
NSBH1010-90-ATH		10.1	90	150	12	F51
08WHNSB1010-TH		10.1	116	184	11	F23
NSBH1010-120-ATH		10.1	120	180	12	F51
10WHNSB1010-TH		10.1	138	193	11	F26
NSBH1010-150-ATH		10.1	150	210	12	F51
15WHNSB1010-TH		10.1	190	245	11	F28
NSBH1010-200-ATH		10.1	200	260	12	F51
20WHNSB1010-TH		10.1	243	298	11	F29
NSBH1010-250-ATH		10.1	250	310	12	F51
25WHNSB1010-TH		10.1	297	358	11	F31

Item code	Stock	DC	Flute length	LF	DCONMS	Page
NSBH1010-300-ATH		10.1	300	360	12	F51
30WHNSB1010-TH		10.1	348	403	11	F32
ZPB1020-TH		10.2	33	90	12	F90
ZPBLS1020-TH		10.2	33	150	10	F92
02WNSB1020-TH	★	10.2	42	90	11	F40
NSBH1020-50-ATH		10.2	50	110	12	F51
03WHNSB1020-TH	●	10.2	54	117	11	F18
04WNSB1020-TH	★	10.2	63	112	11	F41
05WHNSB1020-TH	●	10.2	87	150	11	F20
NSBH1020-90-ATH		10.2	90	150	12	F51
08WHNSB1020-TH	●	10.2	116	184	11	F23
NSBH1020-120-ATH		10.2	120	180	12	F51
10WHNSB1020-TH		10.2	138	193	11	F26
NSBH1020-150-ATH		10.2	150	210	12	F51
15WHNSB1020-TH		10.2	190	245	11	F28
NSBH1020-200-ATH		10.2	200	260	12	F51
20WHNSB1020-TH		10.2	243	298	11	F29
NSBH1020-250-ATH		10.2	250	310	12	F51
25WHNSB1020-TH		10.2	297	358	11	F31
NSBH1020-300-ATH		10.2	300	360	12	F51
30WHNSB1020-TH		10.2	348	403	11	F32
ZPB1030-TH		10.3	33	90	12	F90
ZPBLS1030-TH		10.3	33	150	10	F92
02WNSB1030-TH	★	10.3	42	90	11	F40
NSBH1030-50-ATH	★	10.3	50	110	12	F51
03WHNSB1030-TH	●	10.3	54	117	11	F18
STB103S-ATH	★	10.3	60	125	14	F86
STBH103S-ATH	★	10.3	60	125	14	F85
04WNSB1030-TH	★	10.3	63	112	11	F41
EHSE10.3-TH	★	10.3	66	112	11	F83
STB103M-ATH	★	10.3	70	135	14	F86
STBH103M-ATH	★	10.3	70	135	14	F85
05WHNSB1030-TH	●	10.3	87	150	11	F20
NSBH1030-90-ATH		10.3	90	150	12	F51
08WHNSB1030-TH	●	10.3	116	184	11	F23
NSBH1030-120-ATH		10.3	120	180	12	F51
10WHNSB1030-TH	★	10.3	138	193	11	F26
NSBH1030-150-ATH		10.3	150	210	12	F51
15WHNSB1030-TH	★	10.3	190	245	11	F28
NSBH1030-200-ATH		10.3	200	260	12	F51
20WHNSB1030-TH	★	10.3	243	298	11	F29
NSBH1030-250-ATH		10.3	250	310	12	F51
25WHNSB1030-TH	★	10.3	297	358	11	F31
NSBH1030-300-ATH		10.3	300	360	12	F51
30WHNSB1030-TH	★	10.3	348	403	11	F32
ZPB1040-TH		10.4	33	90	12	F90
ZPBLS1040-TH		10.4	33	150	10	F92
02WNSB1040-TH		10.4	42	90	11	F40
NSBH1040-50-ATH	★	10.4	50	110	12	F51
03WHNSB1040-TH	★	10.4	54	117	11	F18
04WNSB1040-TH	★	10.4	63	112	11	F41
EHSE10.4-TH	★	10.4	66	112	11	F83
05WHNSB1040-TH	★	10.4	87	150	11	F20
NSBH1040-90-ATH		10.4	90	150	12	F51
08WHNSB1040-TH	★	10.4	116	184	11	F23
NSBH1040-120-ATH		10.4	120	180	12	F51
10WHNSB1040-TH	★	10.4	138	193	11	F26
NSBH1040-150-ATH		10.4	150	210	12	F51
15WHNSB1040-TH	★	10.4	190	245	11	F28
NSBH1040-200-ATH		10.4	200	260	12	F51
20WHNSB1040-TH	★	10.4	243	298	11	F29
NSBH1040-250-ATH		10.4	250	310	12	F51
25WHNSB1040-TH	★	10.4	297	358	11	F31
NSBH1040-300-ATH		10.4	300	360	12	F51
30WHNSB1040-TH	★	10.4	348	403	11	F32
ZPB1050-TH		10.5	33	90	12	F90

Quick dimension reference table by tool diameter

φ 10.5～φ 16.1

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPBLS1050-TH		10.5	33	150	10	F92
02WNSB1050-TH	★	10.5	42	90	11	F40
NSBH1050-50-ATH	★	10.5	50	110	12	F51
03WHNSB1050-TH	●	10.5	54	117	11	F18
04WNSB1050-TH	★	10.5	63	112	11	F41
EHSE10.5-TH	★	10.5	66	112	11	F83
05WHNSB1050-TH	●	10.5	87	150	11	F20
NSBH1050-90-ATH		10.5	90	150	12	F51
08WHNSB1050-TH	●	10.5	116	184	11	F23
NSBH1050-120-ATH		10.5	120	180	12	F51
08WHSR1050-ATH	★	10.5	122	181	12	F23
10WHNSB1050-TH	★	10.5	138	193	11	F26
NSBH1050-150-ATH		10.5	150	210	12	F51
15WHNSB1050-TH	★	10.5	190	245	11	F28
NSBH1050-200-ATH		10.5	200	260	12	F52
20WHNSB1050-TH	★	10.5	243	298	11	F29
20WHSR1050-ATH	★	10.5	249	308	12	F55
NSBH1050-250-ATH		10.5	250	310	12	F52
25WHNSB1050-TH	★	10.5	297	358	11	F31
NSBH1050-300-ATH		10.5	300	360	12	F52
30WHNSB1050-TH	★	10.5	348	403	11	F32
30WHSR1050-ATH	★	10.5	353	412	12	F55
ZPB1060-TH		10.6	33	90	12	F90
ZPBLS1060-TH		10.6	33	150	10	F92
02WNSB1060-TH	★	10.6	44	90	11	F40
NSBH1060-50-ATH	★	10.6	50	110	12	F52
03WHNSB1060-TH		10.6	54	117	11	F18
04WNSB1060-TH	★	10.6	66	112	11	F41
05WHNSB1060-TH		10.6	87	150	11	F20
NSBH1060-90-ATH		10.6	90	150	12	F52
NSBH1060-120-ATH		10.6	120	180	12	F52
08WHNSB1060-TH		10.6	121	184	11	F23
10WHNSB1060-TH		10.6	144	205	11	F26
NSBH1060-150-ATH		10.6	150	210	12	F52
15WHNSB1060-TH		10.6	199	260	11	F28
NSBH1060-200-ATH		10.6	200	260	12	F52
NSBH1060-250-ATH		10.6	250	310	12	F52
20WHNSB1060-TH		10.6	254	315	11	F29
NSBH1060-300-ATH		10.6	300	360	12	F52
25WHNSB1060-TH		10.6	310	371	11	F31
30WHNSB1060-TH		10.6	364	425	11	F32
ZPB1070-TH		10.7	33	90	12	F90
ZPBLS1070-TH		10.7	33	150	10	F92
02WNSB1070-TH		10.7	44	90	11	F40
NSBH1070-50-ATH		10.7	50	110	12	F52
03WHNSB1070-TH		10.7	54	117	11	F18
04WNSB1070-TH	★	10.7	66	112	11	F41
05WHNSB1070-TH		10.7	87	150	11	F20
NSBH1070-90-ATH		10.7	90	150	12	F52
NSBH1070-120-ATH		10.7	120	180	12	F52
08WHNSB1070-TH	●	10.7	121	184	11	F23
10WHNSB1070-TH		10.7	144	205	11	F26
NSBH1070-150-ATH		10.7	150	210	12	F52
15WHNSB1070-TH		10.7	199	260	11	F28
NSBH1070-200-ATH		10.7	200	260	12	F52
NSBH1070-250-ATH		10.7	250	310	12	F52
20WHNSB1070-TH		10.7	254	315	11	F29
NSBH1070-300-ATH		10.7	300	360	12	F52
25WHNSB1070-TH		10.7	310	371	11	F31
30WHNSB1070-TH		10.7	364	425	11	F32
ZPB1080-TH		10.8	33	90	12	F90
ZPBLS1080-TH		10.8	33	150	10	F92
02WNSB1080-TH	★	10.8	44	90	11	F40
NSBH1080-50-ATH	★	10.8	50	110	12	F52
03WHNSB1080-TH	●	10.8	54	117	11	F18
04WNSB1080-TH	★	10.8	66	112	11	F41

Item code	Stock	DC	Flute length	LF	DCONMS	Page
EHSE10.8-TH	★	10.8	68	114	11	F83
05WHNSB1080-TH	●	10.8	87	150	11	F20
NSBH1080-90-ATH		10.8	90	150	12	F52
NSBH1080-120-ATH		10.8	120	180	12	F52
08WHNSB1080-TH	●	10.8	121	184	11	F23
10WHNSB1080-TH	★	10.8	144	205	11	F26
NSBH1080-150-ATH		10.8	150	210	12	F52
15WHNSB1080-TH	★	10.8	199	260	11	F28
NSBH1080-200-ATH		10.8	200	260	12	F52
NSBH1080-250-ATH		10.8	250	310	12	F52
20WHNSB1080-TH	★	10.8	254	315	11	F29
NSBH1080-300-ATH		10.8	300	360	12	F52
25WHNSB1080-TH	★	10.8	310	371	11	F31
30WHNSB1080-TH	★	10.8	364	425	11	F32
ZPB1090-TH		10.9	33	90	12	F90
ZPBLS1090-TH		10.9	33	150	10	F92
02WNSB1090-TH		10.9	44	90	11	F40
NSBH1090-50-ATH	★	10.9	50	110	12	F52
03WHNSB1090-TH	★	10.9	54	117	11	F18
04WNSB1090-TH	★	10.9	66	112	11	F41
05WHNSB1090-TH	★	10.9	87	150	11	F20
NSBH1090-90-ATH		10.9	90	150	12	F52
NSBH1090-120-ATH		10.9	120	180	12	F52
08WHNSB1090-TH	★	10.9	121	184	11	F23
10WHNSB1090-TH	★	10.9	144	205	11	F26
NSBH1090-150-ATH		10.9	150	210	12	F52
15WHNSB1090-TH	★	10.9	199	260	11	F28
NSBH1090-200-ATH		10.9	200	260	12	F52
NSBH1090-250-ATH		10.9	250	310	12	F52
20WHNSB1090-TH	★	10.9	254	315	11	F29
NSBH1090-300-ATH		10.9	300	360	12	F52
25WHNSB1090-TH	★	10.9	310	371	11	F31
30WHNSB1090-TH	★	10.9	364	425	11	F32
ZPB1100-TH	★	11	33	90	12	F90
ZPBLS1100-TH		11	33	150	10	F92
02WNSB1100-TH	★	11	44	90	11	F40
03WHNSB1100-TH	●	11	54	117	11	F18
NSBH1100-55-ATH	★	11	55	120	12	F52
04WNSB1100-TH	★	11	66	112	11	F41
EHSE11.0-TH	★	11	68	114	11	F83
05WHNSB1100-TH	●	11	87	150	11	F20
NSBH1100-90-ATH	★	11	90	155	12	F52
NSBH1100-120-ATH	★	11	120	185	12	F52
08WHNSB1100-TH	●	11	121	184	11	F23
08WHSR1100-ATH	★	11	127	185	12	F23
10WHNSB1100-TH	★	11	144	205	11	F26
NSBH1100-150-ATH	★	11	150	215	12	F52
15WHNSB1100-TH	★	11	199	260	11	F28
NSBH1100-200-ATH	★	11	200	265	12	F52
NSBH1100-250-ATH	★	11	250	315	12	F52
20WHNSB1100-TH	★	11	254	315	11	F29
20WHSR1100-ATH	★	11	260	318	12	F55
NSBH1100-300-ATH	★	11	300	365	12	F52
25WHNSB1100-TH	★	11	310	371	11	F31
30WHNSB1100-TH	★	11	364	425	11	F32
30WHSR1100-ATH	★	11	370	429	12	F55
ZPB1110-TH		11.1	34	90	12	F90
ZPBLS1110-TH		11.1	34	150	10	F92
02WNSB1110-TH		11.1	46	94	12	F40
NSBH1110-55-ATH		11.1	55	120	12	F52
03WHNSB1110-TH		11.1	59	123	12	F18
04WNSB1110-TH	★	11.1	71	121	12	F41
NSBH1110-90-ATH		11.1	90	155	12	F52
05WHNSB1110-TH		11.1	93	156	12	F20
NSBH1110-120-ATH		11.1	120	185	12	F52
08WHNSB1110-TH		11.1	127	195	12	F23

Item code	Stock	DC	Flute length	LF	DCONMS	Page
NSBH1110-150-ATH		11.1	150	215	12	F52
10WHNSB1110-TH		11.1	151	212	12	F26
NSBH1110-200-ATH		11.1	200	265	12	F52
15WHNSB1110-TH		11.1	208	269	12	F28
NSBH1110-250-ATH		11.1	250	315	12	F52
20WHNSB1110-TH		11.1	266	327	12	F29
NSBH1110-300-ATH		11.1	300	365	12	F52
25WHNSB1110-TH		11.1	324	385	12	F31
30WHNSB1110-TH		11.1	381	442	12	F32
ZPB1120-TH		11.2	34	90	12	F90
ZPBLS1120-TH		11.2	34	150	10	F92
02WNSB1120-TH		11.2	46	94	12	F40
NSBH1120-55-ATH		11.2	55	120	12	F52
03WHNSB1120-TH		11.2	59	123	12	F18
04WNSB1120-TH	★	11.2	71	121	12	F41
NSBH1120-90-ATH		11.2	90	155	12	F52
05WHNSB1120-TH		11.2	93	156	12	F20
NSBH1120-120-ATH		11.2	120	185	12	F52
08WHNSB1120-TH		11.2	127	195	12	F23
NSBH1120-150-ATH		11.2	150	215	12	F52
10WHNSB1120-TH		11.2	151	212	12	F26
NSBH1120-200-ATH		11.2	200	265	12	F52
15WHNSB1120-TH		11.2	208	269	12	F28
NSBH1120-250-ATH		11.2	250	315	12	F52
20WHNSB1120-TH		11.2	266	327	12	F29
NSBH1120-300-ATH		11.2	300	365	12	F52
25WHNSB1120-TH		11.2	324	385	12	F31
30WHNSB1120-TH		11.2	381	442	12	F32
ZPB1130-TH		11.3	34	90	12	F90
ZPBLS1130-TH		11.3	34	150	10	F92
02WNSB1130-TH		11.3	46	94	12	F40
NSBH1130-55-ATH		11.3	55	120	12	F52
03WHNSB1130-TH	★	11.3	59	123	12	F18
04WNSB1130-TH	★	11.3	71	121	12	F41
NSBH1130-90-ATH		11.3	90	155	12	F52
05WHNSB1130-TH	★	11.3	93	156	12	F20
NSBH1130-120-ATH		11.3	120	185	12	F52
08WHNSB1130-TH	★	11.3	127	195	12	F23
NSBH1130-150-ATH		11.3	150	215	12	F52
10WHNSB1130-TH	★	11.3	151	212	12	F26
NSBH1130-200-ATH		11.3	200	265	12	F52
15WHNSB1130-TH	★	11.3	208	269	12	F28
NSBH1130-250-ATH		11.3	250	315	12	F52
20WHNSB1130-TH	★	11.3	266	327	12	F29
NSBH1130-300-ATH		11.3	300	365	12	F52
25WHNSB1130-TH	★	11.3	324	385	12	F31
30WHNSB1130-TH	★	11.3	381	442	12	F32
ZPB1140-TH		11.4	34	90	12	F90
ZPBLS1140-TH		11.4	34	150	10	F92
02WNSB1140-TH	★	11.4	46	94	12	F40
NSBH1140-55-ATH		11.4	55	120	12	F52
03WHNSB1140-TH	★	11.4	59	123	12	F18
04WNSB1140-TH	★	11.4	71	121	12	F41
NSBH1140-90-ATH		11.4	90	155	12	F52
05WHNSB1140-TH	★	11.4	93	156	12	F20
NSBH1140-120-ATH		11.4	120	185	12	F52
08WHNSB1140-TH	★	11.4	127	195	12	F23
NSBH1140-150-ATH		11.4	150	215	12	F52
10WHNSB1140-TH	★	11.4	151	212	12	F26
NSBH1140-200-ATH		11.4	200	265	12	F52
15WHNSB1140-TH	★	11.4	208	269	12	F28
NSBH1140-250-ATH		11.4	250	315	12	F52
20WHNSB1140-TH	★	11.4	266	327	12	F29
NSBH1140-300-ATH		11.4	300	365	12	F52
25WHNSB1140-TH	★	11.4	324	385	12	F31
30WHNSB1140-TH	★	11.4	381	442	12	F32

Item code	Stock	DC	Flute length	LF	DCONMS	Page
ZPB1150-TH		11.5	34	90	12	F90
ZPBLS1150-TH		11.5	34	150	10	F92
02WNSB1150-TH	★	11.5	46	94	12	F40
03WHNSB1150-TH	●	11.5	59	123	12	F18
NSBH1150-60-ATH	★	11.5	60	125	12	F52
EHSE11.5-TH	★	11.5	71	118	12	F83
04WNSB1150-TH	★	11.5	71	121	12	F41
NSBH1150-90-ATH	★	11.5	90	155	12	F52
05WHNSB1150-TH	●	11.5	93	156	12	F20
NSBH1150-120-ATH	★	11.5	120	185	12	F52
08WHNSB1150-TH	●	11.5	127	195	12	F23
08WHSR1150-ATH	★	11.5	133	192	12	F23
NSBH1150-150-ATH	★	11.5	150	215	12	F52
10WHNSB1150-TH	★	11.5	151	212	12	F26
NSBH1150-200-ATH	★	11.5	200	265	12	F52
15WHNSB1150-TH	★	11.5	208	269	12	F28
NSBH1150-250-ATH	★	11.5	250	315	12	F52
20WHNSB1150-TH	★	11.5	266	327	12	F29
20WHSR1150-ATH	★	11.5	272	331	12	F55
NSBH1150-300-ATH	★	11.5	300	365	12	F52
25WHNSB1150-TH	★	11.5	324	385	12	F31
30WHNSB1150-TH	★	11.5	381	442	12	F32
30WHSR1150-ATH	★	11.5	387	445	12	F55
ZPB1160-TH		11.6	38	90	12	F90
ZPBLS1160-TH		11.6	38	150	10	F92
02WNSB1160-TH	★	11.6	46	94	12	F40
03WHNSB1160-TH		11.6	59	123	12	F18
NSBH1160-60-ATH		11.6	60	125	12	F52
04WNSB1160-TH	★	11.6	73	121	12	F41
NSBH1160-90-ATH		11.6	90	155	12	F52
05WHNSB1160-TH		11.6	93	156	12	F20
NSBH1160-120-ATH		11.6	120	185	12	F52
08WHNSB1160-TH	●	11.6	132	195	12	F23
NSBH1160-150-ATH		11.6	150	215	12	F52
10WHNSB1160-TH		11.6	157	218	12	F26
NSBH1160-200-ATH		11.6	200	265	12	F52
15WHNSB1160-TH		11.6	217	278	12	F28
NSBH1160-250-ATH		11.6	250	315	12	F52
20WHNSB1160-TH		11.6	277	338	12	F29
NSBH1160-300-ATH		11.6	300	365	12	F52
25WHNSB1160-TH		11.6	338	399	12	F31
30WHNSB1160-TH		11.6	397	458	12	F32
ZPB1170-TH		11.7	38	90	12	F90
ZPBLS1170-TH		11.7	38	150	10	F92
02WNSB1170-TH		11.7	46	94	12	F40
03WHNSB1170-TH		11.7	59	123	12	F18
NSBH1170-60-ATH		11.7	60	125	12	F52
04WNSB1170-TH	★	11.7	73	121	12	F41
NSBH1170-90-ATH		11.7	90	155	12	F52
05WHNSB1170-TH		11.7	93	156	12	F20
NSBH1170-120-ATH		11.7	120	185	12	F52
08WHNSB1170-TH		11.7	132	195	12	F23
NSBH1170-150-ATH		11.7	150	215	12	F52
10WHNSB1170-TH		11.7	157	218	12	F26
NSBH1170-200-ATH		11.7	200	265	12	F52
15WHNSB1170-TH		11.7	217	278	12	F28
NSBH1170-250-ATH		11.7	250	315	12	F52
20WHNSB1170-TH		11.7	277	338	12	F29
NSBH1170-300-ATH		11.7	300	365	12	F52
25WHNSB1170-TH		11.7	338	399	12	F31
30WHNSB1170-TH		11.7	397	458	12	F32
ZPB1180-TH		11.8	38	90	12	F90
ZPBLS1180-TH		11.8	38	150	10	F92
02WNSB1180-TH	★	11.8	46	94	12	F40
03WHNSB1180-TH	●	11.8	59	123	12	F18
NSBH1180-60-ATH		11.8	60	125	12	F52

●：Inventory maintained in US　★：Inventory maintained in Japan　No Mark：Manufactured upon request only

unit : mm

Item code	Stock	DC	Flute length	LF	DCONMS	Page
04WNSB1180-TH	★	11.8	73	121	12	F41
EHSE11.8-TH	★	11.8	73	121	12	F83
NSBH1180-90-ATH		11.8	90	155	12	F52
05WHNSB1180-TH	●	11.8	93	156	12	F20
NSBH1180-120-ATH		11.8	120	185	12	F52
08WHNSB1180-TH	★	11.8	132	195	12	F23
NSBH1180-150-ATH		11.8	150	215	12	F52
10WHNSB1180-TH	★	11.8	157	218	12	F26
NSBH1180-200-ATH		11.8	200	265	12	F52
15WHNSB1180-TH	★	11.8	217	278	12	F28
NSBH1180-250-ATH		11.8	250	315	12	F52
20WHNSB1180-TH	★	11.8	277	338	12	F29
NSBH1180-300-ATH		11.8	300	365	12	F52
25WHNSB1180-TH	★	11.8	338	399	12	F31
30WHNSB1180-TH	★	11.8	397	458	12	F32
ZPB1190-TH		11.9	38	90	12	F90
ZPBLS1190-TH		11.9	38	150	10	F92
02WNSB1190-TH		11.9	46	94	12	F40
03WHNSB1190-TH	★	11.9	59	123	12	F18
NSBH1190-60-ATH		11.9	60	125	12	F52
04WNSB1190-TH	★	11.9	73	121	12	F41
NSBH1190-90-ATH		11.9	90	155	12	F52
05WHNSB1190-TH	★	11.9	93	156	12	F20
NSBH1190-120-ATH		11.9	120	185	12	F52
08WHNSB1190-TH	★	11.9	132	195	12	F23
NSBH1190-150-ATH		11.9	150	215	12	F52
10WHNSB1190-TH	★	11.9	157	218	12	F26
NSBH1190-200-ATH		11.9	200	265	12	F52
15WHNSB1190-TH	★	11.9	217	278	12	F28
NSBH1190-250-ATH		11.9	250	315	12	F52
20WHNSB1190-TH	★	11.9	277	338	12	F29
NSBH1190-300-ATH		11.9	300	365	12	F52
25WHNSB1190-TH	★	11.9	338	399	12	F31
30WHNSB1190-TH	★	11.9	397	458	12	F32
ZPB1200-TH	★	12	38	90	12	F90
ZPBLS1200-TH		12	38	150	12	F92
02WNSB1200-TH	★	12	46	94	12	F40
03WHNSB1200-TH	●	12	59	123	12	F18
NSBH1200-60-ATH	★	12	60	125	12	F52
04WNSB1200-TH	★	12	73	121	12	F41
EHSE12.0-TH	★	12	73	121	12	F83
NSBH1200-90-ATH	★	12	90	155	12	F52
05WHNSB1200-TH	●	12	93	156	12	F20
NSBH1200-120-ATH	★	12	120	185	12	F52
08WHNSB1200-TH	●	12	132	195	12	F23
08WHSR1200-ATH	★	12	138	197	12	F23
NSBH1200-150-ATH	★	12	150	215	12	F52
10WHNSB1200-TH	★	12	157	218	12	F26
NSBH1200-200-ATH	★	12	200	265	12	F52
15WHNSB1200-TH	★	12	217	278	12	F28
NSBH1200-250-ATH	★	12	250	315	12	F52
20WHNSB1200-TH	★	12	277	338	12	F29
20WHSR1200-ATH	★	12	283	342	12	F55
NSBH1200-300-ATH	★	12	300	365	12	F52
25WHNSB1200-TH	★	12	338	399	12	F31
30WHNSB1200-TH	★	12	397	458	12	F32
30WHSR1200-ATH	★	12	404	460	12	F55
02WNSB1210-TH		12.1	49	100	13	F40
03WHNSB1210-TH		12.1	64	129	13	F18
04WNSB1210-TH	★	12.1	76	128	13	F41
EHSE12.1-TH	★	12.1	76	135	13	F83
05WHNSB1210-TH		12.1	104	169	13	F20
08WHNSB1210-TH		12.1	138	208	13	F23
10WHNSB1210-TH		12.1	164	225	13	F26
15WHNSB1210-TH		12.1	226	287	13	F28
20WHNSB1210-TH		12.1	289	350	13	F29

Item code	Stock	DC	Flute length	LF	DCONMS	Page
25WHNSB1210-TH		12.1	353	414	13	F31
02WNSB1220-TH	★	12.2	49	100	13	F40
03WHNSB1220-TH		12.2	64	129	13	F18
04WNSB1220-TH	★	12.2	76	128	13	F41
EHSE12.2-TH	★	12.2	76	135	13	F83
05WHNSB1220-TH		12.2	104	169	13	F20
08WHNSB1220-TH		12.2	138	208	13	F23
10WHNSB1220-TH		12.2	164	225	13	F26
15WHNSB1220-TH		12.2	226	287	13	F28
20WHNSB1220-TH		12.2	289	350	13	F29
25WHNSB1220-TH		12.2	353	414	13	F31
02WNSB1230-TH		12.3	49	100	13	F40
03WHNSB1230-TH		12.3	64	129	13	F18
04WNSB1230-TH	★	12.3	76	128	13	F41
05WHNSB1230-TH		12.3	104	169	13	F20
08WHNSB1230-TH		12.3	138	208	13	F23
10WHNSB1230-TH		12.3	164	225	13	F26
15WHNSB1230-TH		12.3	226	287	13	F28
20WHNSB1230-TH		12.3	289	350	13	F29
25WHNSB1230-TH		12.3	353	414	13	F31
02WNSB1240-TH		12.4	49	100	13	F40
03WHNSB1240-TH		12.4	64	129	13	F18
04WNSB1240-TH	★	12.4	76	128	13	F41
05WHNSB1240-TH		12.4	104	169	13	F20
08WHNSB1240-TH		12.4	138	208	13	F23
10WHNSB1240-TH		12.4	164	225	13	F26
15WHNSB1240-TH		12.4	226	287	13	F28
20WHNSB1240-TH		12.4	289	350	13	F29
25WHNSB1240-TH		12.4	353	414	13	F31
ZPB1250-TH		12.5	40	100	12	F90
ZPBLS1250-TH		12.5	40	150	12	F92
02WNSB1250-TH	★	12.5	49	100	13	F40
03WHNSB1250-TH	●	12.5	64	129	13	F18
04WNSB1250-TH	★	12.5	76	128	13	F41
EHSE12.5-TH	★	12.5	76	135	13	F83
05WHNSB1250-TH	●	12.5	104	169	13	F20
08WHNSB1250-TH	●	12.5	138	208	13	F23
10WHNSB1250-TH	★	12.5	164	225	13	F26
15WHNSB1250-TH	★	12.5	226	287	13	F28
20WHNSB1250-TH	★	12.5	289	350	13	F29
25WHNSB1250-TH	★	12.5	353	414	13	F31
02WNSB1260-TH	★	12.6	49	100	13	F40
03WHNSB1260-TH		12.6	64	129	13	F18
04WNSB1260-TH	★	12.6	76	128	13	F41
EHSE12.6-TH	★	12.6	78	137	13	F83
05WHNSB1260-TH		12.6	104	169	13	F20
08WHNSB1260-TH		12.6	143	208	13	F23
10WHNSB1260-TH		12.6	170	236	13	F26
15WHNSB1260-TH		12.6	235	301	13	F28
20WHNSB1260-TH		12.6	300	366	13	F29
25WHNSB1260-TH		12.6	367	433	13	F31
02WNSB1270-TH		12.7	49	100	13	F40
03WHNSB1270-TH		12.7	64	129	13	F18
04WNSB1270-TH	★	12.7	76	128	13	F41
05WHNSB1270-TH		12.7	104	169	13	F20
08WHNSB1270-TH		12.7	143	208	13	F23
10WHNSB1270-TH		12.7	170	236	13	F26
15WHNSB1270-TH		12.7	235	301	13	F28
20WHNSB1270-TH		12.7	300	366	13	F29
25WHNSB1270-TH		12.7	367	433	13	F31
02WNSB1280-TH		12.8	49	100	13	F40
03WHNSB1280-TH		12.8	64	129	13	F18
04WNSB1280-TH	★	12.8	76	128	13	F41
05WHNSB1280-TH		12.8	104	169	13	F20
08WHNSB1280-TH		12.8	143	208	13	F23
10WHNSB1280-TH		12.8	170	236	13	F26

Item code	Stock	DC	Flute length	LF	DCONMS	Page
15WHNSB1280-TH		12.8	235	301	13	F28
20WHNSB1280-TH		12.8	300	366	13	F29
25WHNSB1280-TH		12.8	367	433	13	F31
02WNSB1290-TH		12.9	49	100	13	F40
03WHNSB1290-TH		12.9	64	129	13	F18
04WNSB1290-TH	★	12.9	76	128	13	F41
05WHNSB1290-TH		12.9	104	169	13	F20
08WHNSB1290-TH		12.9	143	208	13	F23
10WHNSB1290-TH		12.9	170	236	13	F26
15WHNSB1290-TH		12.9	235	301	13	F28
20WHNSB1290-TH		12.9	300	366	13	F29
25WHNSB1290-TH		12.9	367	433	13	F31
ZPB1300-TH		13	40	100	12	F90
ZPBLS1300-TH		13	40	150	12	F92
02WNSB1300-TH	★	13	49	100	13	F40
03WHNSB1300-TH	●	13	64	129	13	F18
04WNSB1300-TH	★	13	76	128	13	F41
EHSE13.0-TH	★	13	78	137	13	F83
05WHNSB1300-TH	●	13	104	169	13	F20
08WHNSB1300-TH	●	13	143	208	13	F23
10WHNSB1300-TH	★	13	170	236	13	F26
15WHNSB1300-TH	★	13	235	301	13	F28
20WHNSB1300-TH	★	13	300	366	13	F29
25WHNSB1300-TH	★	13	367	433	13	F31
ZPB1350-TH		13.5	40	100	12	F90
ZPBLS1350-TH		13.5	40	150	12	F92
EHSE13.5-TH		13.5	84	144	14	F83
ZPB1400-TH		14	40	100	12	F90
ZPBLS1400-TH		14	40	150	12	F92
EHSE14.0-TH		14	86	147	14	F83
EHSE14.1-TH	★	14.1	89	151	15	F83
EHSE14.2-TH		14.2	89	151	15	F83
ZPB1450-TH		14.5	40	105	12	F90
ZPBLS1450-TH		14.5	40	150	12	F92
EHSE14.5-TH		14.5	89	151	15	F83
EHSE14.6-TH	★	14.6	91	153	15	F83
ZPB1500-TH		15	40	105	12	F90
ZPBLS1500-TH		15	40	150	12	F92
EHSE15.0-TH		15	91	153	15	F83
ZPB1550-TH		15.5	42	110	12	F90
ZPBLS1550-TH		15.5	42	150	12	F92
EHSE15.5-TH		15.5	94	157	16	F83
EHSE15.6-TH	★	15.6	96	160	16	F83
ZPB1600-TH		16	42	110	16	F90
ZPBLS1600-TH		16	42	150	16	F92
EHSE16.0-TH		16	96	160	16	F83
EHSE16.1-TH	★	16.1	102	167	17	F83

1/4″～1/2″

unit : inch

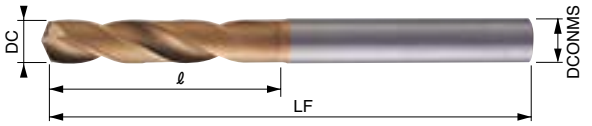
Item code	Stock	DC	Flute length	LF	DCONMS	Page
03WHNSB1/4X7.0-TH	●	1/4	1.496	3.740	.276	F19
10WHNSB1/4X7.0-TH	●	1/4	3.268	5.512	.276	F27
20WHNSB1/4X7.0-TH	●	1/4	5.748	7.874	.276	F30
30WHNSB1/4X7.0-TH	●	1/4	8.465	10.551	.276	F33
03WHNSB3/8X10.0-TH	●	3/8	2.244	4.528	.394	F19
10WHNSB3/8X10.0-TH	●	3/8	4.882	7.087	.394	F27
20WHNSB3/8X10.0-TH	●	3/8	8.622	10.827	.394	F30
30WHNSB3/8X10.0-TH	●	3/8	13.031	15.197	.394	F33
03WHNSB7/16X12.0-TH	●	7/16	2.638	4.724	.472	F19
10WHNSB7/16X12.0-TH	●	7/16	5.709	7.874	.472	F27
20WHNSB7/16X12.0-TH	●	7/16	10.079	12.205	.472	F30
30WHNSB7/16X12.0-TH	●	7/16	15.000	17.402	.472	F33
03WHNSB1/2X13.0-TH	●	1/2	2.992	5.118	.512	F19
10WHNSB1/2X13.0-TH	●	1/2	6.496	6.496	.512	F27
20WHNSB1/2X13.0-TH	●	1/2	11.496	13.780	.512	F30
30WHNSB1/2X13.0-TH	●	1/2	16.929	19.528	.512	F33

Carbide Oil Hole Non Step Borer 3D

Drilling | Carbide | TH | 140° | Normal helix 21°~34° | Integral no. shank | ~3D

h8 | Shank tolerance 0 ~ −0.01mm (0 ~ −.0004 inch)

Plane,
S-X thinning



Metric 03WHNSB○○○○-TH

Cutting Conditions F21

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHNSB0200-TH	●	2.0	.0787	16	69	3.0
03WHNSB0203-TH	★	2.03	.0799	16	69	3.0
03WHNSB0210-TH	●	2.10	.0827	17	69	3.0
03WHNSB0213-TH	★	2.13	.0839	17	69	3.0
03WHNSB0220-TH	●	2.2	.0866	17	69	3.0
03WHNSB0223-TH	★	2.23	.0878	17	69	3.0
03WHNSB0230-TH	●	2.3	.0906	19	69	3.0
03WHNSB0233-TH	★	2.33	.0917	19	69	3.0
03WHNSB0240-TH	●	2.4	.0945	19	69	3.0
03WHNSB0243-TH	★	2.43	.0957	19	69	3.0
03WHNSB0250-TH	●	2.5	.0984	19	69	3.0
03WHNSB0253-TH	★	2.53	.0996	19	69	3.0
03WHNSB0260-TH	●	2.6	.1024	19	69	3.0
03WHNSB0263-TH	★	2.63	.1035	19	69	3.0
03WHNSB0270-TH	●	2.7	.1063	19	69	3.0
03WHNSB0273-TH	★	2.73	.1075	19	69	3.0
03WHNSB0280-TH	●	2.8	.1102	19	69	3.0
03WHNSB0283-TH	★	2.83	.1114	19	69	3.0
03WHNSB0290-TH	●	2.9	.1142	19	69	3.0
03WHNSB0293-TH	★	2.93	.1154	19	69	3.0
03WHNSB0300-TH	●	3.0	.1181	19	69	3.0
03WHNSB0305-TH	★	3.05	.1201	23	73	4.0
03WHNSB0310-TH	●	3.1	.1221	23	73	4.0
03WHNSB0320-TH	●	3.2	.1260	23	73	4.0
03WHNSB0330-TH	●	3.3	.1299	23	73	4.0
03WHNSB0340-TH	●	3.4	.1339	23	73	4.0
03WHNSB0350-TH	●	3.5	.1378	23	73	4.0
03WHNSB0360-TH	●	3.6	.1417	23	73	4.0
03WHNSB0370-TH	●	3.7	.1457	23	73	4.0
03WHNSB0380-TH	●	3.8	.1496	23	73	4.0
03WHNSB0390-TH	●	3.9	.1535	23	73	4.0
03WHNSB0400-TH	●	4.0	.1575	23	73	4.0
03WHNSB0405-TH	★	4.05	.1595	29	82	5.0
03WHNSB0410-TH	●	4.1	.1614	29	82	5.0
03WHNSB0420-TH	●	4.2	.1654	29	82	5.0
03WHNSB0430-TH	●	4.3	.1693	29	82	5.0
03WHNSB0440-TH	●	4.4	.1732	29	82	5.0
03WHNSB0450-TH	●	4.5	.1772	29	82	5.0
03WHNSB0460-TH	●	4.6	.1811	29	82	5.0
03WHNSB0470-TH	●	4.7	.1850	29	82	5.0
03WHNSB0480-TH	●	4.8	.1890	29	82	5.0
03WHNSB0490-TH	●	4.9	.1929	29	82	5.0
03WHNSB0500-TH	●	5.0	.1969	29	82	5.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHNSB0505-TH	★	5.05	.1988	29	82	6.0
03WHNSB0510-TH	●	5.1	.2008	29	82	6.0
03WHNSB0520-TH	●	5.2	.2047	29	82	6.0
03WHNSB0530-TH	●	5.3	.2087	29	82	6.0
03WHNSB0540-TH	●	5.4	.2126	29	82	6.0
03WHNSB0550-TH	●	5.5	.2165	29	82	6.0
03WHNSB0555-TH	★	5.55	.2185	29	82	6.0
03WHNSB0560-TH	●	5.6	.2205	29	82	6.0
03WHNSB0570-TH	●	5.7	.2244	29	82	6.0
03WHNSB0580-TH	●	5.8	.2284	29	82	6.0
03WHNSB0590-TH	●	5.9	.2323	29	82	6.0
03WHNSB0600-TH	●	6.0	.2362	29	82	6.0
03WHNSB0605-TH	★	6.05	.2382	34	89	7.0
03WHNSB0610-TH	●	6.1	.2402	34	89	7.0
03WHNSB0620-TH	●	6.2	.2441	34	89	7.0
03WHNSB0630-TH	●	6.3	.2480	34	89	7.0
03WHNSB0640-TH	●	6.4	.2520	34	89	7.0
03WHNSB0650-TH	●	6.5	.2559	34	89	7.0
03WHNSB0655-TH	★	6.55	.2579	34	89	7.0
03WHNSB0660-TH	●	6.6	.2598	34	89	7.0
03WHNSB0670-TH	●	6.7	.2638	34	89	7.0
03WHNSB0680-TH	★	6.8	.2677	34	89	7.0
03WHNSB0690-TH	●	6.9	.2717	34	89	7.0
03WHNSB0700-TH	●	7.0	.2756	34	89	7.0
03WHNSB0705-TH	★	7.05	.2776	39	95	8.0
03WHNSB0710-TH	●	7.1	.2795	39	95	8.0
03WHNSB0720-TH	●	7.2	.2835	39	95	8.0
03WHNSB0730-TH	●	7.3	.2874	39	95	8.0
03WHNSB0740-TH	●	7.4	.2913	39	95	8.0
03WHNSB0750-TH	●	7.5	.2953	39	95	8.0
03WHNSB0760-TH	●	7.6	.2992	39	95	8.0
03WHNSB0770-TH	●	7.7	.3032	39	95	8.0
03WHNSB0780-TH	●	7.8	.3071	39	95	8.0
03WHNSB0790-TH	●	7.9	.3110	39	95	8.0
03WHNSB0800-TH	●	8.0	.3150	39	95	8.0
03WHNSB0805-TH	★	8.05	.3169	44	101	9.0
03WHNSB0810-TH	●	8.1	.3189	44	101	9.0
03WHNSB0820-TH	●	8.2	.3228	44	101	9.0
03WHNSB0830-TH	●	8.3	.3268	44	101	9.0
03WHNSB0840-TH	●	8.4	.3307	44	101	9.0
03WHNSB0850-TH	●	8.5	.3347	44	101	9.0
03WHNSB0860-TH	●	8.6	.3386	44	101	9.0
03WHNSB0870-TH	●	8.7	.3425	44	101	9.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHNSB0880-TH	●	8.8	.3465	44	101	9.0
03WHNSB0890-TH	●	8.9	.3504	44	101	9.0
03WHNSB0900-TH	●	9.0	.3543	44	101	9.0
03WHNSB0910-TH	★	9.1	.3583	49	107	10.0
03WHNSB0920-TH	★	9.2	.3622	49	107	10.0
03WHNSB0930-TH	★	9.3	.3661	49	107	10.0
03WHNSB0940-TH	★	9.4	.3701	49	107	10.0
03WHNSB0950-TH	●	9.5	.3740	49	107	10.0
03WHNSB0960-TH	★	9.6	.3780	49	107	10.0
03WHNSB0970-TH	★	9.7	.3819	49	107	10.0
03WHNSB0980-TH	●	9.8	.3858	49	107	10.0
03WHNSB0990-TH	★	9.9	.3898	49	107	10.0
03WHNSB1000-TH	●	10.0	.3937	49	107	10.0
03WHNSB1010-TH	★	10.1	.3976	54	117	11.0
03WHNSB1020-TH	●	10.2	.4016	54	117	11.0
03WHNSB1030-TH	●	10.3	.4055	54	117	11.0
03WHNSB1040-TH	★	10.4	.4095	54	117	11.0
03WHNSB1050-TH	●	10.5	.4134	54	117	11.0
03WHNSB1060-TH	★	10.6	.4173	54	117	11.0
03WHNSB1070-TH	★	10.7	.4213	54	117	11.0
03WHNSB1080-TH	●	10.8	.4252	54	117	11.0
03WHNSB1090-TH	★	10.9	.4291	54	117	11.0
03WHNSB1100-TH	●	11.0	.4331	54	117	11.0
03WHNSB1110-TH	★	11.1	.4370	59	123	12.0
03WHNSB1120-TH	★	11.2	.4409	59	123	12.0
03WHNSB1130-TH	★	11.3	.4449	59	123	12.0
03WHNSB1140-TH	★	11.4	.4488	59	123	12.0
03WHNSB1150-TH	●	11.5	.4528	59	123	12.0
03WHNSB1160-TH	★	11.6	.4567	59	123	12.0
03WHNSB1170-TH	★	11.7	.4606	59	123	12.0
03WHNSB1180-TH	●	11.8	.4646	59	123	12.0
03WHNSB1190-TH	★	11.9	.4685	59	123	12.0
03WHNSB1200-TH	●	12.0	.4724	59	123	12.0
03WHNSB1210-TH	★	12.1	.4764	64	129	13.0
03WHNSB1220-TH	★	12.2	.4803	64	129	13.0
03WHNSB1230-TH	★	12.3	.4843	64	129	13.0
03WHNSB1240-TH	★	12.4	.4882	64	129	13.0
03WHNSB1250-TH	●	12.5	.4921	64	129	13.0
03WHNSB1260-TH	★	12.6	.4961	64	129	13.0
03WHNSB1270-TH	★	12.7	.5000	64	129	13.0
03WHNSB1280-TH	★	12.8	.5039	64	129	13.0
03WHNSB1290-TH	★	12.9	.5079	64	129	13.0
03WHNSB1300-TH	●	13.0	.5118	64	129	13.0

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	◎		◎	○	○	○		

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Inch 03WHNSB○/○○X○○.○-TH

Cutting Conditions F21

Item code	Stock	Size (inch)			
		Tool dia.	Flute length	Overall length	Shank dia.
		DC	ℓ	LF	DCONMS
03WHNSB1/4X7.0-TH	●	1/4	1.496 (38mm)	3.740 (95mm)	.276 (7.0mm)
03WHNSB3/8X10.0-TH	●	3/8	2.244 (57mm)	4.528 (115mm)	.394 (10mm)
03WHNSB7/16X12.0-TH	●	7/16	2.638 (67mm)	4.724 (120mm)	.472 (12mm)
03WHNSB1/2X13.0-TH	●	1/2	2.992 (76mm)	5.118 (130mm)	.512 (13mm)

■ 03WHNSB Table of Tolerance on tool dia.

JIS B0401 : h8

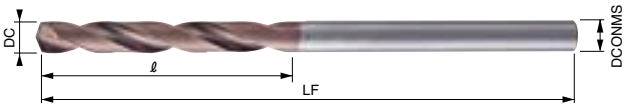
03WHNSB (Metric & Inch)				
mm	2.0<DC<3.0	3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
inch	.0787<DC<.1181	.1181<DC<.2362	.2362<DC<.3937	.3937<DC<=.5118
Line up DC	–	–	1/4" 3/8"	7/16" 1/2"
Max	0mm	0mm	0mm	0mm
	.0"	.0"	.0"	.0"
Min	-0.014mm	-0.018mm	-0.022mm	-0.027mm
	-.0006"	-.0007"	-.0009"	-.0011"

Carbide Oil Hole Non Step Borer 5D

Drilling | Carbide | TH | 140° | Normal helix 21°~34° | Integral no. shank | ~5D

h8 | Shank tolerance 0～−0.01mm (0～ −.0004 inch)

Plane, S-X thinning



05WHNSB○○○○-TH

Cutting Conditions F21

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
05WHNSB0200-TH	●	2.0	.0787	20	66	3.0
05WHNSB0210-TH	●	2.1	.0827	24	74	3.0
05WHNSB0220-TH	●	2.2	.0866	24	74	3.0
05WHNSB0230-TH	●	2.3	.0906	24	74	3.0
05WHNSB0240-TH	●	2.4	.0945	24	74	3.0
05WHNSB0250-TH	●	2.5	.0984	24	74	3.0
05WHNSB0260-TH	●	2.6	.1024	29	79	3.0
05WHNSB0270-TH	●	2.7	.1063	29	79	3.0
05WHNSB0280-TH	●	2.8	.1102	29	79	3.0
05WHNSB0290-TH	●	2.9	.1142	29	79	3.0
05WHNSB0300-TH	●	3.0	.1181	29	79	3.0
05WHNSB0310-TH	●	3.1	.1221	37	87	4.0
05WHNSB0320-TH	●	3.2	.1260	37	87	4.0
05WHNSB0330-TH	●	3.3	.1299	37	87	4.0
05WHNSB0340-TH	●	3.4	.1339	37	87	4.0
05WHNSB0350-TH	●	3.5	.1378	37	87	4.0
05WHNSB0360-TH	●	3.6	.1417	37	87	4.0
05WHNSB0370-TH	●	3.7	.1457	37	87	4.0
05WHNSB0380-TH	●	3.8	.1496	37	87	4.0
05WHNSB0390-TH	●	3.9	.1535	37	87	4.0
05WHNSB0400-TH	●	4.0	.1575	37	87	4.0
05WHNSB0410-TH	●	4.1	.1614	47	100	5.0
05WHNSB0420-TH	●	4.2	.1654	47	100	5.0
05WHNSB0430-TH	●	4.3	.1693	47	100	5.0
05WHNSB0440-TH	●	4.4	.1732	47	100	5.0
05WHNSB0450-TH	●	4.5	.1772	47	100	5.0
05WHNSB0460-TH	●	4.6	.1811	47	100	5.0
05WHNSB0470-TH	●	4.7	.1850	47	100	5.0
05WHNSB0480-TH	●	4.8	.1890	47	100	5.0
05WHNSB0490-TH	●	4.9	.1929	47	100	5.0
05WHNSB0500-TH	●	5.0	.1969	47	100	5.0
05WHNSB0510-TH	●	5.1	.2008	47	100	6.0
05WHNSB0520-TH	●	5.2	.2047	47	100	6.0
05WHNSB0530-TH	●	5.3	.2087	47	100	6.0
05WHNSB0540-TH	●	5.4	.2126	47	100	6.0
05WHNSB0550-TH	●	5.5	.2165	47	100	6.0
05WHNSB0560-TH	●	5.6	.2205	47	100	6.0
05WHNSB0570-TH	●	5.7	.2244	47	100	6.0
05WHNSB0580-TH	●	5.8	.2284	47	100	6.0
05WHNSB0590-TH	●	5.9	.2323	47	100	6.0
05WHNSB0600-TH	●	6.0	.2362	47	100	6.0
05WHNSB0610-TH	●	6.1	.2402	55	110	7.0
05WHNSB0620-TH	●	6.2	.2441	55	110	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
05WHNSB0630-TH	●	6.3	.2480	55	110	7.0
05WHNSB0640-TH	●	6.4	.2520	55	110	7.0
05WHNSB0650-TH	●	6.5	.2559	55	110	7.0
05WHNSB0660-TH	●	6.6	.2598	55	110	7.0
05WHNSB0670-TH	●	6.7	.2638	55	110	7.0
05WHNSB0680-TH	●	6.8	.2677	55	110	7.0
05WHNSB0690-TH	●	6.9	.2717	55	110	7.0
05WHNSB0700-TH	●	7.0	.2756	55	110	7.0
05WHNSB0710-TH	●	7.1	.2795	63	119	8.0
05WHNSB0720-TH	●	7.2	.2835	63	119	8.0
05WHNSB0730-TH	●	7.3	.2874	63	119	8.0
05WHNSB0740-TH	●	7.4	.2913	63	119	8.0
05WHNSB0750-TH	●	7.5	.2953	63	119	8.0
05WHNSB0760-TH	●	7.6	.2992	63	119	8.0
05WHNSB0770-TH	●	7.7	.3032	63	119	8.0
05WHNSB0780-TH	●	7.8	.3071	63	119	8.0
05WHNSB0790-TH	●	7.9	.3110	63	119	8.0
05WHNSB0800-TH	●	8.0	.3150	63	119	8.0
05WHNSB0810-TH	●	8.1	.3189	71	128	9.0
05WHNSB0820-TH	●	8.2	.3228	71	128	9.0
05WHNSB0830-TH	●	8.3	.3268	71	128	9.0
05WHNSB0840-TH	●	8.4	.3307	71	128	9.0
05WHNSB0850-TH	●	8.5	.3347	71	128	9.0
05WHNSB0860-TH	●	8.6	.3386	71	128	9.0
05WHNSB0870-TH	●	8.7	.3425	71	128	9.0
05WHNSB0880-TH	●	8.8	.3465	71	128	9.0
05WHNSB0890-TH	●	8.9	.3504	71	128	9.0
05WHNSB0900-TH	●	9.0	.3543	71	128	9.0
05WHNSB0910-TH		9.1	.3583	79	137	10.0
05WHNSB0920-TH		9.2	.3622	79	137	10.0
05WHNSB0930-TH	★	9.3	.3661	79	137	10.0
05WHNSB0940-TH	★	9.4	.3701	79	137	10.0
05WHNSB0950-TH	●	9.5	.3740	79	137	10.0
05WHNSB0960-TH		9.6	.3780	79	137	10.0
05WHNSB0970-TH		9.7	.3819	79	137	10.0
05WHNSB0980-TH	●	9.8	.3858	79	137	10.0
05WHNSB0990-TH	★	9.9	.3898	79	137	10.0
05WHNSB1000-TH	●	10.0	.3937	79	137	10.0
05WHNSB1010-TH		10.1	.3976	87	150	11.0
05WHNSB1020-TH	●	10.2	.4016	87	150	11.0
05WHNSB1030-TH	●	10.3	.4055	87	150	11.0
05WHNSB1040-TH	★	10.4	.4095	87	150	11.0
05WHNSB1050-TH	●	10.5	.4134	87	150	11.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
05WHNSB1060-TH		10.6	.4173	87	150	11.0
05WHNSB1070-TH		10.7	.4213	87	150	11.0
05WHNSB1080-TH	●	10.8	.4252	87	150	11.0
05WHNSB1090-TH	★	10.9	.4291	87	150	11.0
05WHNSB1100-TH	●	11.0	.4331	87	150	11.0
05WHNSB1110-TH		11.1	.4370	93	156	12.0
05WHNSB1120-TH		11.2	.4409	93	156	12.0
05WHNSB1130-TH	★	11.3	.4449	93	156	12.0
05WHNSB1140-TH	★	11.4	.4488	93	156	12.0
05WHNSB1150-TH	●	11.5	.4528	93	156	12.0
05WHNSB1160-TH		11.6	.4567	93	156	12.0
05WHNSB1170-TH		11.7	.4606	93	156	12.0
05WHNSB1180-TH	●	11.8	.4646	93	156	12.0
05WHNSB1190-TH	★	11.9	.4685	93	156	12.0
05WHNSB1200-TH	●	12.0	.4724	93	156	12.0
05WHNSB1210-TH		12.1	.4764	104	169	13.0
05WHNSB1220-TH		12.2	.4803	104	169	13.0
05WHNSB1230-TH		12.3	.4843	104	169	13.0
05WHNSB1240-TH		12.4	.4882	104	169	13.0
05WHNSB1250-TH	●	12.5	.4921	104	169	13.0
05WHNSB1260-TH		12.6	.4961	104	169	13.0
05WHNSB1270-TH		12.7	.5000	104	169	13.0
05WHNSB1280-TH		12.8	.5039	104	169	13.0
05WHNSB1290-TH		12.9	.5079	104	169	13.0
05WHNSB1300-TH	●	13.0	.5118	104	169	13.0

05WHNSB Table of Tolerance on tool dia.

JIS B0401 : h8

05WHNSB				
mm	2.0<DC<3.0	3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
inch	.0787<DC<.1181	.1181<DC<.2362	.2362<DC<.3937	.3937<DC<=.5118
Max	0mm	0mm	0mm	0mm
	.0"	.0"	.0"	.0"
Min	-0.014mm	-0.018mm	-0.022mm	-0.027mm
	-.0006"	-.0007"	-.0009"	-.0011"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	◎		◎	○	○	○		

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer 3D·5D

Recommended cutting conditions 03WHNSB-TH 05WHNSB-TH

Work material		Structural steel (～ 180HB)						Carbon steel (～ 200HB)						Alloy steel (～ 30HRC)					
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		50~120~180			50~120~180			50~120~180			50~120~180			50~120~180			50~120~180		
SFM		164~394~591			164~394~591			164~394~591			164~394~591			164~394~591			164~394~591		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ2.0mm	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1
Inch	.0787		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004
Metric	ϕ4.0	9,500	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16
Inch	.1575		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006
Metric	ϕ6.0	6,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24
Inch	.2362		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009
Metric	ϕ8.0	4,800	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3
Inch	.3150		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012
Metric	ϕ10.0	3,800	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35
Inch	.3937		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014
Metric	ϕ12.0	3,200	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4
Inch	.4724		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016

Work material		Stainless steel			Titanium alloy			Pre-hardened steel (~40HRC)						Pre-hardened steel (~50HRC)					
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		50~100~150			50~80~100			40~60~100			40~60~100			30~40~50			20~30~40		
SFM		164~328~492			164~262~328			131~197~328			131~197~328			98~131~164			66~98~131		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ2.0mm	11,000	mm/rev.	0.03~0.06	9,500	mm/rev.	0.02~0.04	9,500	mm/rev.	0.02~0.04	8,000	mm/rev.	0.04~0.06	6,500	mm/rev.	0.03~0.05	4,500	mm/rev.	0.03~0.05
Inch	.0787		IPR	.001~.002		IPR	.001~.002		IPR	.001~.002		IPR	.001~.002		IPR	.001~.002		IPR	.001~.002
Metric	ϕ4.0	8,000	mm/rev.	0.06~0.1	6,400	mm/rev.	0.06~0.08	4,800	mm/rev.	0.06~0.08	4,800	mm/rev.	0.08~0.13	3,200	mm/rev.	0.05~0.1	2,400	mm/rev.	0.05~0.1
Inch	.1575		IPR	.002~.004		IPR	.002~.003		IPR	.002~.003		IPR	.002~.003		IPR	.002~.003		IPR	.002~.003
Metric	ϕ6.0	5,300	mm/rev.	0.12~0.19	4,200	mm/rev.	0.09~0.12	3,200	mm/rev.	0.09~0.12	3,200	mm/rev.	0.12~0.19	2,100	mm/rev.	0.08~0.14	1,600	mm/rev.	0.08~0.14
Inch	.2362		IPR	.005~.007		IPR	.004~.005		IPR	.004~.005		IPR	.005~.007		IPR	.003~.006		IPR	.003~.006
Metric	ϕ8.0	4,000	mm/rev.	0.14~0.24	3,200	mm/rev.	0.12~0.16	2,400	mm/rev.	0.12~0.16	2,400	mm/rev.	0.14~0.24	1,600	mm/rev.	0.12~0.18	1,200	mm/rev.	0.12~0.18
Inch	.3150		IPR	.006~.009		IPR	.005~.006		IPR	.005~.006		IPR	.006~.009		IPR	.005~.007		IPR	.005~.007
Metric	ϕ10.0	3,200	mm/rev.	0.16~0.28	2,550	mm/rev.	0.13~0.2	1,900	mm/rev.	0.13~0.2	1,900	mm/rev.	0.16~0.28	1,300	mm/rev.	0.15~0.2	1,000	mm/rev.	0.15~0.2
Inch	.3937		IPR	.006~.011		IPR	.005~.008		IPR	.005~.008		IPR	.006~.011		IPR	.006~.008		IPR	.006~.008
Metric	ϕ12.0	2,650	mm/rev.	0.17~0.31	2,100	mm/rev.	0.14~0.24	1,600	mm/rev.	0.14~0.24	1,600	mm/rev.	0.18~0.32	1,050	mm/rev.	0.17~0.24	800	mm/rev.	0.17~0.24
Inch	.4724		IPR	.007~.012		IPR	.006~.009		IPR	.006~.009		IPR	.007~.013		IPR	.007~.009		IPR	.007~.009

Work material		Ductile iron						Casting						INCONEL718 Heatproof steel		
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant		
m/min		50~100~150			50~100~150			50~120~180			50~120~180			20~30~40		
SFM		164~328~492			164~328~492			164~394~591			164~394~591			66~98~131		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ2.0mm	13,000	mm/rev.	0.05~0.1	13,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	4,000	mm/rev.	0.02~0.03
Inch	.0787		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.001~.001
Metric	ϕ4.0	8,000	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	2,400	mm/rev.	0.06~0.08
Inch	.1575		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.002~.03
Metric	ϕ6.0	5,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	1,600	mm/rev.	0.09~0.12
Inch	.2362		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.004~.005
Metric	ϕ8.0	4,000	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	1,200	mm/rev.	0.12~0.16
Inch	.3150		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.005~.006
Metric	ϕ10.0	3,200	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	950	mm/rev.	0.13~0.2
Inch	.3937		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.005~.008
Metric	ϕ12.0	2,650	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	800	mm/rev.	0.14~0.24
Inch	.4724		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.006~.009

【Note】
Please refer to F22.

Carbide Oil Hole Non Step Borer 3D･5D

Setting of Cutting Conditions

※Use the appropriate coolant for the work material and machining shape.
※These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
※The above cutting conditions are based on the use of a water-soluble coolant diluted to a maximum of 20 times. When coolant dilution exceeds 20 times, decrease the cutting speed to the lowest in the specified range. When the tool diameter is ϕ5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over ϕ5.0, the pressure should be 1.5 MPa or higher.
※When performing MQL (mist) machining, depending on the amount or status of spray from the tool, it may be necessary to reduce the cutting speed in order to perform machining.
※When changing the tool, use collet free from flaws and stains and attach the tool firmly so that its runout is 0.02mm or less.
※The above conditions apply to a hole-depth of 5 times the diameter or less.
※When cutting fluid is used, reduce the cutting speed to a speed lower than the lowest speed in the specified range. Take the greatest care to avoid smoke or ignition due to heating of chips and the tool.
※Works should be gripped firmly to prevent deformation, deflection and vibration.
※You can use borers at a revolution speed lower than the above values.

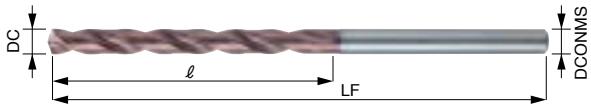
Carbide Oil Hole Non Step Borer 8D

Drilling | Carbide | TH | 140° | Normal helix 21°~34° | Integral no. shank | 8D

h8

Shank tolerance: 0 ~ −0.01mm (0 ~ −.0004 inch)

Plane, S-X thinning



08WHNSB○○○○○-TH

Cutting Conditions F24

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
08WHNSB0200-TH	●	2.0	.0787	25	75	3.0
08WHNSB0210-TH	●	2.1	.0827	25	75	3.0
08WHNSB0220-TH	●	2.2	.0866	25	75	3.0
08WHNSB0230-TH	●	2.3	.0906	28	75	3.0
08WHNSB0240-TH	●	2.4	.0945	28	75	3.0
08WHNSB0250-TH	●	2.5	.0984	28	75	3.0
08WHNSB0260-TH	●	2.6	.1024	33	80	3.0
08WHNSB0270-TH	●	2.7	.1063	33	80	3.0
08WHNSB0280-TH	●	2.8	.1102	35	83	3.0
08WHNSB0290-TH	●	2.9	.1142	35	83	3.0
08WHNSB0300-TH	●	3.0	.1181	35	83	3.0
08WHNSB0310-TH	●	3.1	.1221	42	94	4.0
08WHNSB0320-TH	●	3.2	.1260	42	94	4.0
08WHNSB0330-TH	●	3.3	.1299	42	94	4.0
08WHNSB0340-TH	●	3.4	.1339	42	94	4.0
08WHNSB0350-TH	●	3.5	.1378	42	94	4.0
08WHNSB0360-TH	●	3.6	.1417	46	94	4.0
08WHNSB0370-TH	●	3.7	.1457	46	94	4.0
08WHNSB0380-TH	●	3.8	.1496	46	94	4.0
08WHNSB0390-TH	●	3.9	.1535	46	94	4.0
08WHNSB0400-TH	●	4.0	.1575	46	94	4.0
08WHNSB0410-TH	●	4.1	.1614	55	110	5.0
08WHNSB0420-TH	●	4.2	.1654	55	110	5.0
08WHNSB0430-TH	●	4.3	.1693	55	110	5.0
08WHNSB0440-TH	●	4.4	.1732	55	110	5.0
08WHNSB0450-TH	●	4.5	.1772	55	110	5.0
08WHNSB0460-TH	●	4.6	.1811	59	110	5.0
08WHNSB0470-TH	●	4.7	.1850	59	110	5.0
08WHNSB0480-TH	●	4.8	.1890	59	110	5.0
08WHNSB0490-TH	●	4.9	.1929	59	110	5.0
08WHNSB0500-TH	●	5.0	.1969	59	110	5.0
08WHNSB0510-TH	●	5.1	.2008	62	118	6.0
08WHNSB0520-TH	●	5.2	.2047	62	118	6.0
08WHNSB0530-TH	●	5.3	.2087	62	118	6.0
08WHNSB0540-TH	●	5.4	.2126	62	118	6.0
08WHNSB0550-TH	●	5.5	.2165	62	118	6.0
08WHNSB0560-TH	●	5.6	.2205	67	118	6.0
08WHNSB0570-TH	●	5.7	.2244	67	118	6.0
08WHNSB0580-TH	●	5.8	.2284	67	118	6.0
08WHNSB0590-TH	●	5.9	.2323	67	118	6.0
08WHNSB0600-TH	●	6.0	.2362	67	118	6.0
08WHNSB0610-TH	●	6.1	.2402	73	132	7.0
08WHNSB0620-TH	●	6.2	.2441	73	132	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
08WHNSB0630-TH	●	6.3	.2480	73	132	7.0
08WHNSB0640-TH	●	6.4	.2520	73	132	7.0
08WHNSB0650-TH	●	6.5	.2559	73	132	7.0
08WHNSB0660-TH	●	6.6	.2598	77	132	7.0
08WHNSB0670-TH	●	6.7	.2638	77	132	7.0
08WHNSB0680-TH	●	6.8	.2677	77	132	7.0
08WHNSB0690-TH	●	6.9	.2717	77	132	7.0
08WHNSB0700-TH	●	7.0	.2756	77	132	7.0
08WHNSB0710-TH	●	7.1	.2795	84	144	8.0
08WHNSB0720-TH	●	7.2	.2835	84	144	8.0
08WHNSB0730-TH	●	7.3	.2874	84	144	8.0
08WHNSB0740-TH	●	7.4	.2913	84	144	8.0
08WHNSB0750-TH	●	7.5	.2953	84	144	8.0
08WHNSB0760-TH	●	7.6	.2992	88	144	8.0
08WHNSB0770-TH	●	7.7	.3032	88	144	8.0
08WHNSB0780-TH	●	7.8	.3071	88	144	8.0
08WHNSB0790-TH	●	7.9	.3110	88	144	8.0
08WHNSB0800-TH	●	8.0	.3150	88	144	8.0
08WHNSB0810-TH		8.1	.3189	94	156	9.0
08WHNSB0820-TH		8.2	.3228	94	156	9.0
08WHNSB0830-TH	★	8.3	.3268	94	156	9.0
08WHNSB0840-TH	★	8.4	.3307	94	156	9.0
08WHNSB0850-TH	●	8.5	.3347	94	156	9.0
08WHNSB0860-TH		8.6	.3386	99	156	9.0
08WHNSB0870-TH		8.7	.3425	99	156	9.0
08WHNSB0880-TH	★	8.8	.3465	99	156	9.0
08WHNSB0890-TH	★	8.9	.3504	99	156	9.0
08WHNSB0900-TH	●	9.0	.3543	99	156	9.0
08WHNSB0910-TH		9.1	.3583	105	168	10.0
08WHNSB0920-TH		9.2	.3622	105	168	10.0
08WHNSB0930-TH	★	9.3	.3661	105	168	10.0
08WHNSB0940-TH	★	9.4	.3701	105	168	10.0
08WHNSB0950-TH	●	9.5	.3740	105	168	10.0
08WHNSB0960-TH		9.6	.3780	110	168	10.0
08WHNSB0970-TH		9.7	.3819	110	168	10.0
08WHNSB0980-TH	●	9.8	.3858	110	168	10.0
08WHNSB0990-TH	★	9.9	.3898	110	168	10.0
08WHNSB1000-TH	●	10.0	.3937	110	168	10.0
08WHNSB1010-TH		10.1	.3976	116	184	11.0
08WHNSB1020-TH	●	10.2	.4016	116	184	11.0
08WHNSB1030-TH	●	10.3	.4055	116	184	11.0
08WHNSB1040-TH	★	10.4	.4095	116	184	11.0
08WHNSB1050-TH	●	10.5	.4134	116	184	11.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
08WHNSB1060-TH		10.6	.4173	121	184	11.0
08WHNSB1070-TH	●	10.7	.4213	121	184	11.0
08WHNSB1080-TH	●	10.8	.4252	121	184	11.0
08WHNSB1090-TH	★	10.9	.4291	121	184	11.0
08WHNSB1100-TH	●	11.0	.4331	121	184	11.0
08WHNSB1110-TH		11.1	.4370	127	195	12.0
08WHNSB1120-TH		11.2	.4409	127	195	12.0
08WHNSB1130-TH	★	11.3	.4449	127	195	12.0
08WHNSB1140-TH	★	11.4	.4488	127	195	12.0
08WHNSB1150-TH	●	11.5	.4528	127	195	12.0
08WHNSB1160-TH	●	11.6	.4567	132	195	12.0
08WHNSB1170-TH		11.7	.4606	132	195	12.0
08WHNSB1180-TH	★	11.8	.4646	132	195	12.0
08WHNSB1190-TH	★	11.9	.4685	132	195	12.0
08WHNSB1200-TH	●	12.0	.4724	132	195	12.0
08WHNSB1210-TH		12.1	.4764	138	208	13.0
08WHNSB1220-TH		12.2	.4803	138	208	13.0
08WHNSB1230-TH		12.3	.4843	138	208	13.0
08WHNSB1240-TH		12.4	.4882	138	208	13.0
08WHNSB1250-TH	●	12.5	.4921	138	208	13.0
08WHNSB1260-TH		12.6	.4961	143	208	13.0
08WHNSB1270-TH		12.7	.5000	143	208	13.0
08WHNSB1280-TH		12.8	.5039	143	208	13.0
08WHNSB1290-TH		12.9	.5079	143	208	13.0
08WHNSB1300-TH	●	13.0	.5118	143	208	13.0

08WHNSB Table of Tolerance on tool dia.

JIS B0401 : h8

	08WHNSB			
mm	2.0<DC<3.0	3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
inch	.0787<DC<.1181	.1181<DC<.2362	.2362<DC<.3937	.3937<DC<=.5118
Max	0mm	0mm	0mm	0mm
	.0"	.0"	.0"	.0"
Min	-0.014mm	-0.018mm	-0.022mm	-0.027mm
	-.0006"	-.0007"	-.0009"	-.0011"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	◎		◎	○	○	○		

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer 8D

Recommended cutting conditions O8WHNSB-TH

Work material		Structural steel (~180HB)						Carbon steel (~200HB)						Alloy steel (~30HRC)					
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		70~120~150			50~90~120			70~120~150			50~90~120			70~120~150			50~90~120		
SFM		231~396~495			165~297~396			231~396~495			165~297~396			231~396~495			165~297~396		
Tool dia.		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f	
Metric	ϕ2.0mm	16,000	mm/rev.	0.05~0.1	13,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	13,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	13,000	mm/rev.	0.05~0.1
Inch	.0787		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004		IPR	.002~.004
Metric	ϕ4.0	9,500	mm/rev.	0.1~0.16	7,200	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	7,200	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	7,200	mm/rev.	0.1~0.16
Inch	.1575		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006
Metric	ϕ6.0	6,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24
Inch	.2362		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009
Metric	ϕ8.0	4,800	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3
Inch	.3150		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012
Metric	ϕ10.0	3,800	mm/rev.	0.2~0.35	2,900	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	2,900	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	2,900	mm/rev.	0.2~0.35
Inch	.3937		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014
Metric	ϕ12.0	3,200	mm/rev.	0.22~0.4	2,400	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	2,400	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	2,400	mm/rev.	0.22~0.4
Inch	.4724		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016		IPR	.009~.016

Work material		Stainless steel			Titanium alloy			Pre-hardened steel (~40HRC)						Pre-hardened steel (~50HRC)					
vc Cutting speed		Internal coolant			Internal coolant			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		50~90~120			40~60~80			40~60~80			30~50~70			30~40~50			10~20~30		
SFM		165~297~396			132~198~264			132~198~264			99~165~231			231~132~165			33~66~99		
Tool dia.		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f	
Metric	ϕ2.0mm	11,000	mm/rev.	0.03~0.06	9,500	mm/rev.	0.02~0.04	9,500	mm/rev.	0.04~0.06	8,000	mm/rev.	0.04~0.06	6,500	mm/rev.	0.03~0.05	4,500	mm/rev.	0.03~0.05
Inch	.0787		IPR	.0012~.0024		IPR	.0008~.0016		IPR	.0016~.0024		IPR	.0016~.0024		IPR	.0012~.002		IPR	.0012~.002
Metric	ϕ4.0	7,200	mm/rev.	0.08~0.13	4,800	mm/rev.	0.06~0.08	4,800	mm/rev.	0.08~0.13	4,000	mm/rev.	0.08~0.13	3,200	mm/rev.	0.05~0.1	1,600	mm/rev.	0.05~0.1
Inch	.1575		IPR	.0031~.0051		IPR	.0024~.0031		IPR	.0031~.0051		IPR	.0031~.0051		IPR	.002~.0039		IPR	.002~.0039
Metric	ϕ6.0	4,800	mm/rev.	0.12~0.19	3,200	mm/rev.	0.09~0.12	3,200	mm/rev.	0.12~0.19	2,650	mm/rev.	0.12~0.19	2,100	mm/rev.	0.08~0.14	1,050	mm/rev.	0.08~0.14
Inch	.2362		IPR	.0047~.0075		IPR	.0035~.0047		IPR	.0047~.0075		IPR	.0047~.0075		IPR	.0031~.0055		IPR	.0031~.0055
Metric	ϕ8.0	3,600	mm/rev.	0.14~0.24	2,400	mm/rev.	0.12~0.16	2,400	mm/rev.	0.14~0.24	2,000	mm/rev.	0.14~0.24	1,600	mm/rev.	0.12~0.18	800	mm/rev.	0.12~0.18
Inch	.3150		IPR	.0055~.0094		IPR	.0047~.0063		IPR	.0055~.0094		IPR	.0055~.0094		IPR	.0047~.0071		IPR	.0047~.0071
Metric	ϕ10.0	2,900	mm/rev.	0.16~0.28	1,900	mm/rev.	0.13~0.2	1,900	mm/rev.	0.16~0.28	1,600	mm/rev.	0.16~0.28	1,300	mm/rev.	0.15~0.2	650	mm/rev.	0.15~0.2
Inch	.3937		IPR	.0063~.011		IPR	.0051~.0079		IPR	.0063~.011		IPR	.0063~.011		IPR	.0059~.0079		IPR	.0059~.0079
Metric	ϕ12.0	2,400	mm/rev.	0.17~0.31	1,600	mm/rev.	0.14~0.24	1,600	mm/rev.	0.18~0.32	1,350	mm/rev.	0.18~0.32	1,050	mm/rev.	0.17~0.22	550	mm/rev.	0.17~0.22
Inch	.4724		IPR	.0067~.0122		IPR	.0055~.0094		IPR	.0071~.0126		IPR	.0071~.0126		IPR	.0067~.0087		IPR	.0067~.0087

Work material		Ductile iron						Casting						INCONEL718 Heatproof steel		
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant		
m/min		70~100~120			50~90~120			70~120~150			50~90~120			20~30~40		
SFM		231~329~396			165~297~396			231~396~495			165~297~396			33~99~132		
Tool dia.		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f		n (min⁻¹)	f	
Metric	ϕ2.0mm	16,000	mm/rev.	0.05~0.1	13,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	13,000	mm/rev.	0.05~0.1	4,000	mm/rev.	0.02~0.03
Inch	.0787		IPR	.002~.0039		IPR	.002~.0039		IPR	.002~.0039		IPR	.002~.0039		IPR	.0008~.0012
Metric	ϕ4.0	8,000	mm/rev.	0.1~0.16	7,200	mm/rev.	0.1~0.16	9,500	mm/rev.	0.1~0.16	7,200	mm/rev.	0.1~0.16	2,400	mm/rev.	0.04~0.08
Inch	.1575		IPR	.0039~.0063		IPR	.0039~.0063		IPR	.0039~.0063		IPR	.0039~.0063		IPR	.0016~.0031
Metric	ϕ6.0	5,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24	6,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24	1,600	mm/rev.	0.06~0.12
Inch	.2362		IPR	.0059~.0094		IPR	.0059~.0094		IPR	.0059~.0094		IPR	.0059~.0094		IPR	.0024~.0047
Metric	ϕ8.0	4,000	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3	4,800	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3	1,200	mm/rev.	0.08~0.16
Inch	.3150		IPR	.0071~.0118		IPR	.0071~.0118		IPR	.0071~.0118		IPR	.0071~.0118		IPR	.0031~.0063
Metric	ϕ10.0	3,200	mm/rev.	0.2~0.35	2,900	mm/rev.	0.2~0.35	3,800	mm/rev.	0.2~0.35	2,900	mm/rev.	0.2~0.35	950	mm/rev.	0.1~0.2
Inch	.3937		IPR	.0079~.0138		IPR	.0079~.0138		IPR	.0079~.0138		IPR	.0079~.0138		IPR	.0039~.0079
Metric	ϕ12.0	2,600	mm/rev.	0.22~0.4	2,400	mm/rev.	0.22~0.4	3,200	mm/rev.	0.22~0.4	2,400	mm/rev.	0.22~0.4	800	mm/rev.	0.12~0.2
Inch	.4724		IPR	.0087~.0157		IPR	.0087~.0157		IPR	.0087~.0157		IPR	.0087~.0157		IPR	.0047~.0079

Setting of Cutting Conditions

※Use the appropriate coolant for the work material and machining shape.
※These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
※The above cutting conditions are based on the use of a water-soluble coolant diluted to a maximum of 20 times. When coolant dilution exceeds 20 times, decrease the cutting speed to the lowest in the specified range. When the tool diameter is ϕ5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over ϕ5.0, the pressure should be 1.5 MPa or higher.
※When performing MQL (mist) machining, depending on the amount or status of spray from the tool, it may be necessary to reduce the cutting speed in order to perform machining.
※When changing the tool, use collet free from flaws and stains and attach the tool firmly so that its runout is 0.02mm or less.
※The above conditions apply to a hole-depth of 8 times the diameter or less.
※When cutting fluid is used, reduce the cutting speed to a speed lower than the lowest speed in the specified range. Take the greatest care to avoid smoke or ignition due to heating of chips and the tool.
※Works should be gripped firmly to prevent deformation, deflection and vibration.
※You can use borers at a revolution speed lower than the above values.

Drilling Method

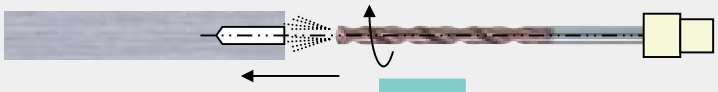
1 Drilling of pilot hole (guide hole) (03WHNSB-TH, 05WHNSB-TH)

- Hole depth : Tool diameter ×2~5 times
- Machining diameter : 08~30WHNSB diameter + 0.03~0.10mm
- Recommended tools : 0.3WHNSB-TH, Carbide stub type, MTO by customized allowance

2 Supplying coolant during low-speed revolution (08WHNSB-TH)

- Leading to the guide hole at low speed (n=0~500 min^{-1})
- Stop 2.0~5.0 mm before the end of the guide hole.

※When a long tool (200mm or longer) is used, position the tool to the guide hole at low revolution speed (n=200min^{-1} or less).



3 High-speed revolution for drilling feed (08~30WHNSB-TH)

- After confirming that the revolution speed is increasing at the specified rate, start feeding.

4 Machining completion

- Withdraw the tool at low speed. (n=0~500 min^{-1})

※When a long tool (200mm or longer) is used, withdraw the tool at low revolution speed (n=200min^{-1} or less).

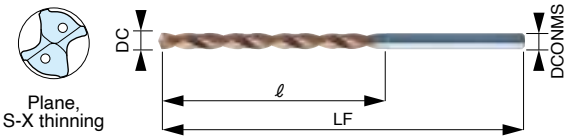
Refer P.F18～P.F20 about 03WHNSB-TH and 05WHNSB-TH

Carbide Oil Hole Non Step Borer 10D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | 10D

Dia. tolerance: Refer to under table | h6

※1 : Completely coated



Metric 10WHNSB○○○○-TH

Cutting Conditions F34

Item code	Stock	Size: Tool dia. DC (mm)	DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
※1 10WHNSB0200-TH	★	2.0	.0787	30	80	3.0
※1 10WHNSB0210-TH	★	2.1	.0827	30	80	3.0
※1 10WHNSB0220-TH	★	2.2	.0866	30	80	3.0
※1 10WHNSB0230-TH	★	2.3	.0906	33	80	3.0
※1 10WHNSB0240-TH	★	2.4	.0945	33	80	3.0
※1 10WHNSB0250-TH	★	2.5	.0984	33	80	3.0
※1 10WHNSB0260-TH	★	2.6	.1024	35	85	3.0
※1 10WHNSB0270-TH	★	2.7	.1063	35	85	3.0
※1 10WHNSB0280-TH	★	2.8	.1102	39	85	3.0
※1 10WHNSB0290-TH	★	2.9	.1142	39	87	3.0
※1 10WHNSB0300-TH	★	3.0	.1181	39	87	3.0
※1 10WHNSB0310-TH	★	3.1	.1221	46	94	4.0
※1 10WHNSB0320-TH	★	3.2	.1260	46	94	4.0
※1 10WHNSB0330-TH	★	3.3	.1299	46	94	4.0
※1 10WHNSB0340-TH	★	3.4	.1339	46	94	4.0
※1 10WHNSB0350-TH	★	3.5	.1378	46	94	4.0
※1 10WHNSB0360-TH	★	3.6	.1417	52	101	4.0
※1 10WHNSB0370-TH	★	3.7	.1457	52	101	4.0
※1 10WHNSB0380-TH	★	3.8	.1496	52	101	4.0
※1 10WHNSB0390-TH	★	3.9	.1535	52	101	4.0
※1 10WHNSB0400-TH	★	4.0	.1575	52	101	4.0
※1 10WHNSB0410-TH	★	4.1	.1614	59	110	5.0
※1 10WHNSB0420-TH	★	4.2	.1654	59	110	5.0
※1 10WHNSB0430-TH	★	4.3	.1693	59	110	5.0
※1 10WHNSB0440-TH	★	4.4	.1732	59	110	5.0
※1 10WHNSB0450-TH	★	4.5	.1772	59	110	5.0
※1 10WHNSB0460-TH	★	4.6	.1811	66	117	5.0
※1 10WHNSB0470-TH	★	4.7	.1850	66	117	5.0
※1 10WHNSB0480-TH	★	4.8	.1890	66	117	5.0
※1 10WHNSB0490-TH	★	4.9	.1929	66	117	5.0
※1 10WHNSB0500-TH	★	5.0	.1969	66	117	5.0
※1 10WHNSB0510-TH	★	5.1	.2008	72	123	6.0
※1 10WHNSB0520-TH	★	5.2	.2047	72	123	6.0
※1 10WHNSB0530-TH	★	5.3	.2087	72	123	6.0
※1 10WHNSB0540-TH	★	5.4	.2126	72	123	6.0
※1 10WHNSB0550-TH	★	5.5	.2165	72	123	6.0
※1 10WHNSB0560-TH	★	5.6	.2205	79	130	6.0
※1 10WHNSB0570-TH	★	5.7	.2244	79	130	6.0
※1 10WHNSB0580-TH	★	5.8	.2284	79	130	6.0
※1 10WHNSB0590-TH	★	5.9	.2323	79	130	6.0
※1 10WHNSB0600-TH	★	6.0	.2362	79	130	6.0
※1 10WHNSB0610-TH	★	6.1	.2402	85	138	7.0
※1 10WHNSB0620-TH	★	6.2	.2441	85	138	7.0

Item code	Stock	Size: Tool dia. DC (mm)	DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
※1 10WHNSB0630-TH	★	6.3	.2480	85	138	7.0
※1 10WHNSB0640-TH	★	6.4	.2520	85	138	7.0
※1 10WHNSB0650-TH	★	6.5	.2559	85	138	7.0
※1 10WHNSB0660-TH	★	6.6	.2598	92	145	7.0
※1 10WHNSB0670-TH	★	6.7	.2638	92	145	7.0
※1 10WHNSB0680-TH	★	6.8	.2677	92	145	7.0
※1 10WHNSB0690-TH	★	6.9	.2717	92	145	7.0
※1 10WHNSB0700-TH	★	7.0	.2756	92	145	7.0
※1 10WHNSB0710-TH	★	7.1	.2795	98	153	8.0
※1 10WHNSB0720-TH	★	7.2	.2835	98	153	8.0
※1 10WHNSB0730-TH	★	7.3	.2874	98	153	8.0
※1 10WHNSB0740-TH	★	7.4	.2913	98	153	8.0
※1 10WHNSB0750-TH	★	7.5	.2953	98	153	8.0
※1 10WHNSB0760-TH	★	7.6	.2992	105	160	8.0
※1 10WHNSB0770-TH	★	7.7	.3032	105	160	8.0
※1 10WHNSB0780-TH	★	7.8	.3071	105	160	8.0
※1 10WHNSB0790-TH	★	7.9	.3110	105	160	8.0
※1 10WHNSB0800-TH	★	8.0	.3150	105	160	8.0
※1 10WHNSB0810-TH		8.1	.3189	111	166	9.0
※1 10WHNSB0820-TH		8.2	.3228	111	166	9.0
※1 10WHNSB0830-TH	★	8.3	.3268	111	166	9.0
※1 10WHNSB0840-TH	★	8.4	.3307	111	166	9.0
※1 10WHNSB0850-TH	★	8.5	.3347	111	166	9.0
10WHNSB0860-TH		8.6	.3386	118	173	9.0
10WHNSB0870-TH		8.7	.3425	118	173	9.0
10WHNSB0880-TH	★	8.8	.3465	118	173	9.0
10WHNSB0890-TH	★	8.9	.3504	118	173	9.0
10WHNSB0900-TH	★	9.0	.3543	118	173	9.0
10WHNSB0910-TH		9.1	.3583	124	179	10.0
10WHNSB0920-TH		9.2	.3622	124	179	10.0
10WHNSB0930-TH	★	9.3	.3661	124	179	10.0
10WHNSB0940-TH	★	9.4	.3701	124	179	10.0
10WHNSB0950-TH	★	9.5	.3740	124	179	10.0
10WHNSB0960-TH		9.6	.3780	131	186	10.0
10WHNSB0970-TH		9.7	.3819	131	186	10.0
10WHNSB0980-TH	★	9.8	.3858	131	186	10.0
10WHNSB0990-TH	★	9.9	.3898	131	186	10.0
10WHNSB1000-TH	★	10.0	.3937	131	186	10.0
10WHNSB1010-TH		10.1	.3976	138	193	11.0
10WHNSB1020-TH		10.2	.4016	138	193	11.0
10WHNSB1030-TH	★	10.3	.4055	138	193	11.0
10WHNSB1040-TH	★	10.4	.4095	138	193	11.0
10WHNSB1050-TH	★	10.5	.4134	138	193	11.0

Item code	Stock	Size: Tool dia. DC (mm)	DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
10WHNSB1060-TH		10.6	.4173	144	205	11.0
10WHNSB1070-TH		10.7	.4213	144	205	11.0
10WHNSB1080-TH	★	10.8	.4252	144	205	11.0
10WHNSB1090-TH	★	10.9	.4291	144	205	11.0
10WHNSB1100-TH	★	11.0	.4331	144	205	11.0
10WHNSB1110-TH		11.1	.4370	151	212	12.0
10WHNSB1120-TH		11.2	.4409	151	212	12.0
10WHNSB1130-TH	★	11.3	.4449	151	212	12.0
10WHNSB1140-TH	★	11.4	.4488	151	212	12.0
10WHNSB1150-TH	★	11.5	.4528	151	212	12.0
10WHNSB1160-TH		11.6	.4567	157	218	12.0
10WHNSB1170-TH		11.7	.4606	157	218	12.0
10WHNSB1180-TH	★	11.8	.4646	157	218	12.0
10WHNSB1190-TH	★	11.9	.4685	157	218	12.0
10WHNSB1200-TH	★	12.0	.4724	157	218	12.0
10WHNSB1210-TH		12.1	.4764	164	225	13.0
10WHNSB1220-TH		12.2	.4803	164	225	13.0
10WHNSB1230-TH		12.3	.4843	164	225	13.0
10WHNSB1240-TH		12.4	.4882	164	225	13.0
10WHNSB1250-TH	★	12.5	.4921	164	225	13.0
10WHNSB1260-TH		12.6	.4961	170	236	13.0
10WHNSB1270-TH		12.7	.5000	170	236	13.0
10WHNSB1280-TH		12.8	.5039	170	236	13.0
10WHNSB1290-TH		12.9	.5079	170	236	13.0
10WHNSB1300-TH	★	13.0	.5118	170	236	13.0

10WHNSB (Metric) Table of Tolerance on tool dia.

h8 for diameters of 2.0 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 10.0, 11.0, 12.0, and 13.0. For other items, the diameter tolerance will be as in the table below.

10WHNSB (Metric)			
mm	3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
inch	.1181<DC<.2362	.2362<DC<.3937	.3937<DC<=.5118
Max	-0.020mm	-0.024mm	-0.030mm
	-.0008"	-.0009"	-.0012"
Min	-0.036mm	-0.045mm	-0.053mm
	-.0014"	-.0018"	-.0021"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Inch 10WHNSB○/○○X○○.○-TH

Cutting Conditions F34

Item code	Stock	Size (inch)			
		Tool dia.	Flute length	Overall length	Shank dia.
		DC	ℓ	LF	DCONMS
10WHNSB1/4X7.0-TH	●	1/4	3.268 (83mm)	5.512 (140mm)	.276 (7.0mm)
10WHNSB3/8X10.0-TH	●	3/8	4.882 (124mm)	7.087 (180mm)	.394 (10mm)
10WHNSB7/16X12.0-TH	●	7/16	5.709 (145mm)	7.874 (200mm)	.472 (12mm)
10WHNSB1/2X13.0-TH	●	1/2	6.496 (165mm)	8.661 (220mm)	.512 (13mm)

■ 10WHNSB (Inch) Table of Tolerance on tool dia.

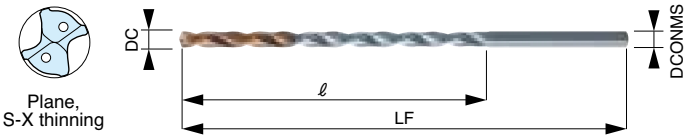
JIS B0401 : h8

10WHNSB (Inch)		
inch	.2362<DC<.3937	.3937<DC<=.5118
Line up DC	1/4" 3/8"	7/16" 1/2"
Max	0mm	0mm
	.0"	.0"
Min	-0.022mm	-0.027mm
	-.0009"	-.0011"

Carbide Oil Hole Non Step Borer 15D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | 15D

Dia. tolerance: Refer to under table | h6



15WHNSB○○○○-TH

Cutting Conditions F34

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
15WHNSB0200-TH	★	2.0	.0787	40	83	3.0
15WHNSB0210-TH	★	2.1	.0827	44	87	3.0
15WHNSB0220-TH	★	2.2	.0866	44	87	3.0
15WHNSB0230-TH	★	2.3	.0906	50	93	3.0
15WHNSB0240-TH	★	2.4	.0945	50	93	3.0
15WHNSB0250-TH	★	2.5	.0984	50	93	3.0
15WHNSB0260-TH	★	2.6	.1024	54	102	3.0
15WHNSB0270-TH	★	2.7	.1063	54	102	3.0
15WHNSB0280-TH	★	2.8	.1102	54	102	3.0
15WHNSB0290-TH	★	2.9	.1142	54	102	3.0
15WHNSB0300-TH	★	3.0	.1181	54	102	3.0
15WHNSB0310-TH	★	3.1	.1221	63	111	4.0
15WHNSB0320-TH	★	3.2	.1260	63	111	4.0
15WHNSB0330-TH	★	3.3	.1299	63	111	4.0
15WHNSB0340-TH	★	3.4	.1339	63	111	4.0
15WHNSB0350-TH	★	3.5	.1378	63	111	4.0
15WHNSB0360-TH	★	3.6	.1417	72	121	4.0
15WHNSB0370-TH	★	3.7	.1457	72	121	4.0
15WHNSB0380-TH	★	3.8	.1496	72	121	4.0
15WHNSB0390-TH	★	3.9	.1535	72	121	4.0
15WHNSB0400-TH	★	4.0	.1575	72	121	4.0
15WHNSB0410-TH	★	4.1	.1614	81	132	5.0
15WHNSB0420-TH	★	4.2	.1654	81	132	5.0
15WHNSB0430-TH	★	4.3	.1693	81	132	5.0
15WHNSB0440-TH	★	4.4	.1732	81	132	5.0
15WHNSB0450-TH	★	4.5	.1772	81	132	5.0
15WHNSB0460-TH	★	4.6	.1811	91	142	5.0
15WHNSB0470-TH	★	4.7	.1850	91	142	5.0
15WHNSB0480-TH	★	4.8	.1890	91	142	5.0
15WHNSB0490-TH	★	4.9	.1929	91	142	5.0
15WHNSB0500-TH	★	5.0	.1969	91	142	5.0
15WHNSB0510-TH	★	5.1	.2008	100	151	6.0
15WHNSB0520-TH	★	5.2	.2047	100	151	6.0
15WHNSB0530-TH	★	5.3	.2087	100	151	6.0
15WHNSB0540-TH	★	5.4	.2126	100	151	6.0
15WHNSB0550-TH	★	5.5	.2165	100	151	6.0
15WHNSB0560-TH	★	5.6	.2205	109	160	6.0
15WHNSB0570-TH	★	5.7	.2244	109	160	6.0
15WHNSB0580-TH	★	5.8	.2284	109	160	6.0
15WHNSB0590-TH	★	5.9	.2323	109	160	6.0
15WHNSB0600-TH	★	6.0	.2362	109	160	6.0
15WHNSB0610-TH	★	6.1	.2402	118	171	7.0
15WHNSB0620-TH	★	6.2	.2441	118	171	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
15WHNSB0630-TH	★	6.3	.2480	118	171	7.0
15WHNSB0640-TH	★	6.4	.2520	118	171	7.0
15WHNSB0650-TH	★	6.5	.2559	118	171	7.0
15WHNSB0660-TH	★	6.6	.2598	127	180	7.0
15WHNSB0670-TH	★	6.7	.2638	127	180	7.0
15WHNSB0680-TH	★	6.8	.2677	127	180	7.0
15WHNSB0690-TH	★	6.9	.2717	127	180	7.0
15WHNSB0700-TH	★	7.0	.2756	127	180	7.0
15WHNSB0710-TH	★	7.1	.2795	136	191	8.0
15WHNSB0720-TH	★	7.2	.2835	136	191	8.0
15WHNSB0730-TH	★	7.3	.2874	136	191	8.0
15WHNSB0740-TH	★	7.4	.2913	136	191	8.0
15WHNSB0750-TH	★	7.5	.2953	136	191	8.0
15WHNSB0760-TH	★	7.6	.2992	145	200	8.0
15WHNSB0770-TH	★	7.7	.3032	145	200	8.0
15WHNSB0780-TH	★	7.8	.3071	145	200	8.0
15WHNSB0790-TH	★	7.9	.3110	145	200	8.0
15WHNSB0800-TH	★	8.0	.3150	145	200	8.0
15WHNSB0810-TH		8.1	.3189	154	209	9.0
15WHNSB0820-TH		8.2	.3228	154	209	9.0
15WHNSB0830-TH	★	8.3	.3268	154	209	9.0
15WHNSB0840-TH	★	8.4	.3307	154	209	9.0
15WHNSB0850-TH	★	8.5	.3347	154	209	9.0
15WHNSB0860-TH		8.6	.3386	163	218	9.0
15WHNSB0870-TH		8.7	.3425	163	218	9.0
15WHNSB0880-TH	★	8.8	.3465	163	218	9.0
15WHNSB0890-TH	★	8.9	.3504	163	218	9.0
15WHNSB0900-TH	★	9.0	.3543	163	218	9.0
15WHNSB0910-TH		9.1	.3583	172	227	10.0
15WHNSB0920-TH		9.2	.3622	172	227	10.0
15WHNSB0930-TH	★	9.3	.3661	172	227	10.0
15WHNSB0940-TH	★	9.4	.3701	172	227	10.0
15WHNSB0950-TH	★	9.5	.3740	172	227	10.0
15WHNSB0960-TH		9.6	.3780	181	236	10.0
15WHNSB0970-TH		9.7	.3819	181	236	10.0
15WHNSB0980-TH	★	9.8	.3858	181	236	10.0
15WHNSB0990-TH	★	9.9	.3898	181	236	10.0
15WHNSB1000-TH	★	10.0	.3937	181	236	10.0
15WHNSB1010-TH		10.1	.3976	190	245	11.0
15WHNSB1020-TH		10.2	.4016	190	245	11.0
15WHNSB1030-TH	★	10.3	.4055	190	245	11.0
15WHNSB1040-TH	★	10.4	.4095	190	245	11.0
15WHNSB1050-TH	★	10.5	.4134	190	245	11.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
15WHNSB1060-TH		10.6	.4173	199	260	11.0
15WHNSB1070-TH		10.7	.4213	199	260	11.0
15WHNSB1080-TH	★	10.8	.4252	199	260	11.0
15WHNSB1090-TH	★	10.9	.4291	199	260	11.0
15WHNSB1100-TH	★	11.0	.4331	199	260	11.0
15WHNSB1110-TH		11.1	.4370	208	269	12.0
15WHNSB1120-TH		11.2	.4409	208	269	12.0
15WHNSB1130-TH	★	11.3	.4449	208	269	12.0
15WHNSB1140-TH	★	11.4	.4488	208	269	12.0
15WHNSB1150-TH	★	11.5	.4528	208	269	12.0
15WHNSB1160-TH		11.6	.4567	217	278	12.0
15WHNSB1170-TH		11.7	.4606	217	278	12.0
15WHNSB1180-TH	★	11.8	.4646	217	278	12.0
15WHNSB1190-TH	★	11.9	.4685	217	278	12.0
15WHNSB1200-TH	★	12.0	.4724	217	278	12.0
15WHNSB1210-TH		12.1	.4764	226	287	13.0
15WHNSB1220-TH		12.2	.4803	226	287	13.0
15WHNSB1230-TH		12.3	.4843	226	287	13.0
15WHNSB1240-TH		12.4	.4882	226	287	13.0
15WHNSB1250-TH	★	12.5	.4921	226	287	13.0
15WHNSB1260-TH		12.6	.4961	235	301	13.0
15WHNSB1270-TH		12.7	.5000	235	301	13.0
15WHNSB1280-TH		12.8	.5039	235	301	13.0
15WHNSB1290-TH		12.9	.5079	235	301	13.0
15WHNSB1300-TH	★	13.0	.5118	235	301	13.0

15WHNSB Table of Tolerance on tool dia.

h8 for diameters of 2.0 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 10.0, 11.0, 12.0 and 13.0. For other items, the diameter tolerance will be as in the table below.

(mm)

15WHNSB		3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
Max		-0.020mm	-0.024mm	-0.030mm
		-.0008"	-.0009"	-.0012"
Min		-0.036mm	-0.045mm	-0.053mm
		-.0014"	-.0018"	-.0021"

Applicable work material

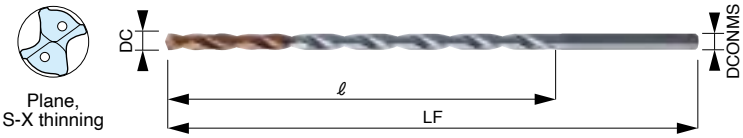
Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

★ : Inventory maintained in Japan　No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer 20D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | ~20D

Dia. tolerance — Refer to under table | h6



Metric 20WHNSB○○○○-TH

Cutting Conditions F34

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
20WHNSB0200-TH	★	2.0	.0787	50	93	3.0
20WHNSB0210-TH	★	2.1	.0827	55	98	3.0
20WHNSB0220-TH	★	2.2	.0866	55	98	3.0
20WHNSB0230-TH	★	2.3	.0906	62	105	3.0
20WHNSB0240-TH	★	2.4	.0945	62	105	3.0
20WHNSB0250-TH	★	2.5	.0984	62	105	3.0
20WHNSB0260-TH	★	2.6	.1024	67	110	3.0
20WHNSB0270-TH	★	2.7	.1063	67	110	3.0
20WHNSB0280-TH	★	2.8	.1102	69	115	3.0
20WHNSB0290-TH	★	2.9	.1142	69	115	3.0
20WHNSB0300-TH	★	3.0	.1181	69	117	3.0
20WHNSB0310-TH	★	3.1	.1221	81	129	4.0
20WHNSB0320-TH	★	3.2	.1260	81	129	4.0
20WHNSB0330-TH	★	3.3	.1299	81	129	4.0
20WHNSB0340-TH	★	3.4	.1339	81	129	4.0
20WHNSB0350-TH	★	3.5	.1378	81	129	4.0
20WHNSB0360-TH	★	3.6	.1417	92	141	4.0
20WHNSB0370-TH	★	3.7	.1457	92	141	4.0
20WHNSB0380-TH	★	3.8	.1496	92	141	4.0
20WHNSB0390-TH	★	3.9	.1535	92	141	4.0
20WHNSB0400-TH	★	4.0	.1575	92	141	4.0
20WHNSB0410-TH	★	4.1	.1614	104	155	5.0
20WHNSB0420-TH	★	4.2	.1654	104	155	5.0
20WHNSB0430-TH	★	4.3	.1693	104	155	5.0
20WHNSB0440-TH	★	4.4	.1732	104	155	5.0
20WHNSB0450-TH	★	4.5	.1772	104	155	5.0
20WHNSB0460-TH	★	4.6	.1811	116	167	5.0
20WHNSB0470-TH	★	4.7	.1850	116	167	5.0
20WHNSB0480-TH	★	4.8	.1890	116	167	5.0
20WHNSB0490-TH	★	4.9	.1929	116	167	5.0
20WHNSB0500-TH	★	5.0	.1969	116	167	5.0
20WHNSB0510-TH	★	5.1	.2008	127	178	6.0
20WHNSB0520-TH	★	5.2	.2047	127	178	6.0
20WHNSB0530-TH	★	5.3	.2087	127	178	6.0
20WHNSB0540-TH	★	5.4	.2126	127	178	6.0
20WHNSB0550-TH	★	5.5	.2165	127	178	6.0
20WHNSB0560-TH	★	5.6	.2205	139	190	6.0
20WHNSB0570-TH	★	5.7	.2244	139	190	6.0
20WHNSB0580-TH	★	5.8	.2284	139	190	6.0
20WHNSB0590-TH	★	5.9	.2323	139	190	6.0
20WHNSB0600-TH	★	6.0	.2362	139	190	6.0
20WHNSB0610-TH	★	6.1	.2402	150	203	7.0
20WHNSB0620-TH	★	6.2	.2441	150	203	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
20WHNSB0630-TH	★	6.3	.2480	150	203	7.0
20WHNSB0640-TH	★	6.4	.2520	150	203	7.0
20WHNSB0650-TH	★	6.5	.2559	150	203	7.0
20WHNSB0660-TH	★	6.6	.2598	162	215	7.0
20WHNSB0670-TH	★	6.7	.2638	162	215	7.0
20WHNSB0680-TH	★	6.8	.2677	162	215	7.0
20WHNSB0690-TH	★	6.9	.2717	162	215	7.0
20WHNSB0700-TH	★	7.0	.2756	162	215	7.0
20WHNSB0710-TH	★	7.1	.2795	173	228	8.0
20WHNSB0720-TH	★	7.2	.2835	173	228	8.0
20WHNSB0730-TH	★	7.3	.2874	173	228	8.0
20WHNSB0740-TH	★	7.4	.2913	173	228	8.0
20WHNSB0750-TH	★	7.5	.2953	173	228	8.0
20WHNSB0760-TH	★	7.6	.2992	185	240	8.0
20WHNSB0770-TH	★	7.7	.3032	185	240	8.0
20WHNSB0780-TH	★	7.8	.3071	185	240	8.0
20WHNSB0790-TH	★	7.9	.3110	185	240	8.0
20WHNSB0800-TH	★	8.0	.3150	185	240	8.0
20WHNSB0810-TH		8.1	.3189	196	251	9.0
20WHNSB0820-TH		8.2	.3228	196	251	9.0
20WHNSB0830-TH	★	8.3	.3268	196	251	9.0
20WHNSB0840-TH	★	8.4	.3307	196	251	9.0
20WHNSB0850-TH	★	8.5	.3347	196	251	9.0
20WHNSB0860-TH		8.6	.3386	208	263	9.0
20WHNSB0870-TH		8.7	.3425	208	263	9.0
20WHNSB0880-TH	★	8.8	.3465	208	263	9.0
20WHNSB0890-TH	★	8.9	.3504	208	263	9.0
20WHNSB0900-TH	★	9.0	.3543	208	263	9.0
20WHNSB0910-TH		9.1	.3583	219	274	10.0
20WHNSB0920-TH		9.2	.3622	219	274	10.0
20WHNSB0930-TH	★	9.3	.3661	219	274	10.0
20WHNSB0940-TH	★	9.4	.3701	219	274	10.0
20WHNSB0950-TH	★	9.5	.3740	219	274	10.0
20WHNSB0960-TH		9.6	.3780	231	286	10.0
20WHNSB0970-TH		9.7	.3819	231	286	10.0
20WHNSB0980-TH	★	9.8	.3858	231	286	10.0
20WHNSB0990-TH	★	9.9	.3898	231	286	10.0
20WHNSB1000-TH	★	10.0	.3937	231	286	10.0
20WHNSB1010-TH		10.1	.3976	243	298	11.0
20WHNSB1020-TH		10.2	.4016	243	298	11.0
20WHNSB1030-TH	★	10.3	.4055	243	298	11.0
20WHNSB1040-TH	★	10.4	.4095	243	298	11.0
20WHNSB1050-TH	★	10.5	.4134	243	298	11.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
20WHNSB1060-TH		10.6	.4173	254	315	11.0
20WHNSB1070-TH		10.7	.4213	254	315	11.0
20WHNSB1080-TH	★	10.8	.4252	254	315	11.0
20WHNSB1090-TH	★	10.9	.4291	254	315	11.0
20WHNSB1100-TH	★	11.0	.4331	254	315	11.0
20WHNSB1110-TH		11.1	.4370	266	327	12.0
20WHNSB1120-TH		11.2	.4409	266	327	12.0
20WHNSB1130-TH	★	11.3	.4449	266	327	12.0
20WHNSB1140-TH	★	11.4	.4488	266	327	12.0
20WHNSB1150-TH	★	11.5	.4528	266	327	12.0
20WHNSB1160-TH		11.6	.4567	277	338	12.0
20WHNSB1170-TH		11.7	.4606	277	338	12.0
20WHNSB1180-TH	★	11.8	.4646	277	338	12.0
20WHNSB1190-TH	★	11.9	.4685	277	338	12.0
20WHNSB1200-TH	★	12.0	.4724	277	338	12.0
20WHNSB1210-TH		12.1	.4764	289	350	13.0
20WHNSB1220-TH		12.2	.4803	289	350	13.0
20WHNSB1230-TH		12.3	.4843	289	350	13.0
20WHNSB1240-TH		12.4	.4882	289	350	13.0
20WHNSB1250-TH	★	12.5	.4921	289	350	13.0
20WHNSB1260-TH		12.6	.4961	300	366	13.0
20WHNSB1270-TH		12.7	.5000	300	366	13.0
20WHNSB1280-TH		12.8	.5039	300	366	13.0
20WHNSB1290-TH		12.9	.5079	300	366	13.0
20WHNSB1300-TH	★	13.0	.5118	300	366	13.0

20WHNSB (Metric) Table of Tolerance on tool dia.

h8 for diameters of 2.0 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 10.0, 11.0, 12.0 and 13.0. For other items, the diameter tolerance will be as in the table below.

(mm)

20WHNSB (Metric)		3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
Max		-0.020mm	-0.024mm	-0.030mm
		-.0008"	-.0009"	-.0012"
Min		-0.036mm	-0.045mm	-0.053mm
		-.0014"	-.0018"	-.0021"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

Carbide Oil Hole Non Step Borer 20D

Inch 20WHNSB○/○○X○○.○-TH

Cutting Conditions F34

Item code	Stock	Size (inch)			
		Tool dia.	Flute length	Overall length	Shank dia.
		DC	ℓ	LF	DCONMS
20WHNSB1/4X7.0-TH	●	1/4	5.748 (146mm)	7.874 (200mm)	.276 (7.0mm)
20WHNSB3/8X10.0-TH	●	3/8	8.622 (219mm)	10.827 (275mm)	.394 (10mm)
20WHNSB7/16X12.0-TH	●	7/16	10.079 (256mm)	12.205 (310mm)	.472 (12mm)
20WHNSB1/2X13.0-TH	●	1/2	11.496 (292mm)	13.780 (350mm)	.512 (13mm)

■ 20WHNSB (Inch) Table of Tolerance on tool dia.

JIS B0401 : h8

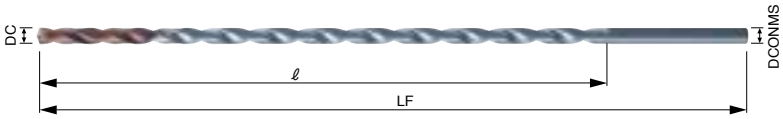
20WHNSB (Inch)		
inch	.2362<DC<.3937	.3937<DC<=.5118
Line up DC	1/4" 3/8"	7/16" 1/2"
Max	0mm	0mm
	.0"	.0"
Min	-0.022mm	-0.027mm
	-.0009"	-.0011"

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer 25D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | ~25D

Dia. tolerance — Refer to under table — h6



Plane, S-X thinning

25WHNSB○○○○-TH

Cutting Conditions F34

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
25WHNSB0200-TH	★	2.0	.0787	57	100	3.0
25WHNSB0210-TH	★	2.1	.0827	62	105	3.0
25WHNSB0220-TH	★	2.2	.0866	62	105	3.0
25WHNSB0230-TH	★	2.3	.0906	71	114	3.0
25WHNSB0240-TH	★	2.4	.0945	71	114	3.0
25WHNSB0250-TH	★	2.5	.0984	71	114	3.0
25WHNSB0260-TH	★	2.6	.1024	76	119	3.0
25WHNSB0270-TH	★	2.7	.1063	76	119	3.0
25WHNSB0280-TH	★	2.8	.1102	84	132	3.0
25WHNSB0290-TH	★	2.9	.1142	84	132	3.0
25WHNSB0300-TH	★	3.0	.1181	84	132	3.0
25WHNSB0310-TH	★	3.1	.1221	90	138	4.0
25WHNSB0320-TH	★	3.2	.1260	90	138	4.0
25WHNSB0330-TH	★	3.3	.1299	98	146	4.0
25WHNSB0340-TH	★	3.4	.1339	98	146	4.0
25WHNSB0350-TH	★	3.5	.1378	98	146	4.0
25WHNSB0360-TH	★	3.6	.1417	113	162	4.0
25WHNSB0370-TH	★	3.7	.1457	113	162	4.0
25WHNSB0380-TH	★	3.8	.1496	113	162	4.0
25WHNSB0390-TH	★	3.9	.1535	113	162	4.0
25WHNSB0400-TH	★	4.0	.1575	113	162	4.0
25WHNSB0410-TH	★	4.1	.1614	127	178	5.0
25WHNSB0420-TH	★	4.2	.1654	127	178	5.0
25WHNSB0430-TH	★	4.3	.1693	127	178	5.0
25WHNSB0440-TH	★	4.4	.1732	127	178	5.0
25WHNSB0450-TH	★	4.5	.1772	127	178	5.0
25WHNSB0460-TH	★	4.6	.1811	141	192	5.0
25WHNSB0470-TH	★	4.7	.1850	141	192	5.0
25WHNSB0480-TH	★	4.8	.1890	141	192	5.0
25WHNSB0490-TH	★	4.9	.1929	141	192	5.0
25WHNSB0500-TH	★	5.0	.1969	141	192	5.0
25WHNSB0510-TH	★	5.1	.2008	155	206	6.0
25WHNSB0520-TH	★	5.2	.2047	155	206	6.0
25WHNSB0530-TH	★	5.3	.2087	155	206	6.0
25WHNSB0540-TH	★	5.4	.2126	155	206	6.0
25WHNSB0550-TH	★	5.5	.2165	155	206	6.0
25WHNSB0560-TH	★	5.6	.2205	169	220	6.0
25WHNSB0570-TH	★	5.7	.2244	169	220	6.0
25WHNSB0580-TH	★	5.8	.2284	169	220	6.0
25WHNSB0590-TH	★	5.9	.2323	169	220	6.0
25WHNSB0600-TH	★	6.0	.2362	169	220	6.0
25WHNSB0610-TH	★	6.1	.2402	183	236	7.0
25WHNSB0620-TH	★	6.2	.2441	183	236	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
25WHNSB0630-TH	★	6.3	.2480	183	236	7.0
25WHNSB0640-TH	★	6.4	.2520	183	236	7.0
25WHNSB0650-TH	★	6.5	.2559	183	236	7.0
25WHNSB0660-TH	★	6.6	.2598	197	250	7.0
25WHNSB0670-TH	★	6.7	.2638	197	250	7.0
25WHNSB0680-TH	★	6.8	.2677	197	250	7.0
25WHNSB0690-TH	★	6.9	.2717	197	250	7.0
25WHNSB0700-TH	★	7.0	.2756	197	250	7.0
25WHNSB0710-TH	★	7.1	.2795	211	266	8.0
25WHNSB0720-TH	★	7.2	.2835	211	266	8.0
25WHNSB0730-TH	★	7.3	.2874	211	266	8.0
25WHNSB0740-TH	★	7.4	.2913	211	266	8.0
25WHNSB0750-TH	★	7.5	.2953	211	266	8.0
25WHNSB0760-TH	★	7.6	.2992	225	280	8.0
25WHNSB0770-TH	★	7.7	.3032	225	280	8.0
25WHNSB0780-TH	★	7.8	.3071	225	280	8.0
25WHNSB0790-TH	★	7.9	.3110	225	280	8.0
25WHNSB0800-TH	★	8.0	.3150	225	280	8.0
25WHNSB0810-TH		8.1	.3189	239	294	9.0
25WHNSB0820-TH		8.2	.3228	239	294	9.0
25WHNSB0830-TH	★	8.3	.3268	239	294	9.0
25WHNSB0840-TH	★	8.4	.3307	239	294	9.0
25WHNSB0850-TH	★	8.5	.3347	239	294	9.0
25WHNSB0860-TH		8.6	.3386	254	309	9.0
25WHNSB0870-TH		8.7	.3425	254	309	9.0
25WHNSB0880-TH	★	8.8	.3465	254	309	9.0
25WHNSB0890-TH	★	8.9	.3504	254	309	9.0
25WHNSB0900-TH	★	9.0	.3543	254	309	9.0
25WHNSB0910-TH		9.1	.3583	268	323	10.0
25WHNSB0920-TH		9.2	.3622	268	323	10.0
25WHNSB0930-TH	★	9.3	.3661	268	323	10.0
25WHNSB0940-TH	★	9.4	.3701	268	323	10.0
25WHNSB0950-TH	★	9.5	.3740	268	323	10.0
25WHNSB0960-TH		9.6	.3780	282	337	10.0
25WHNSB0970-TH		9.7	.3819	282	337	10.0
25WHNSB0980-TH	★	9.8	.3858	282	337	10.0
25WHNSB0990-TH	★	9.9	.3898	282	337	10.0
25WHNSB1000-TH	★	10.0	.3937	282	337	10.0
25WHNSB1010-TH		10.1	.3976	297	358	11.0
25WHNSB1020-TH		10.2	.4016	297	358	11.0
25WHNSB1030-TH	★	10.3	.4055	297	358	11.0
25WHNSB1040-TH	★	10.4	.4095	297	358	11.0
25WHNSB1050-TH	★	10.5	.4134	297	358	11.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
25WHNSB1060-TH		10.6	.4173	310	371	11.0
25WHNSB1070-TH		10.7	.4213	310	371	11.0
25WHNSB1080-TH	★	10.8	.4252	310	371	11.0
25WHNSB1090-TH	★	10.9	.4291	310	371	11.0
25WHNSB1100-TH	★	11.0	.4331	310	371	11.0
25WHNSB1110-TH		11.1	.4370	324	385	12.0
25WHNSB1120-TH		11.2	.4409	324	385	12.0
25WHNSB1130-TH	★	11.3	.4449	324	385	12.0
25WHNSB1140-TH	★	11.4	.4488	324	385	12.0
25WHNSB1150-TH	★	11.5	.4528	324	385	12.0
25WHNSB1160-TH		11.6	.4567	338	399	12.0
25WHNSB1170-TH		11.7	.4606	338	399	12.0
25WHNSB1180-TH	★	11.8	.4646	338	399	12.0
25WHNSB1190-TH	★	11.9	.4685	338	399	12.0
25WHNSB1200-TH	★	12.0	.4724	338	399	12.0
25WHNSB1210-TH		12.1	.4764	353	414	13.0
25WHNSB1220-TH		12.2	.4803	353	414	13.0
25WHNSB1230-TH		12.3	.4843	353	414	13.0
25WHNSB1240-TH		12.4	.4882	353	414	13.0
25WHNSB1250-TH	★	12.5	.4921	353	414	13.0
25WHNSB1260-TH		12.6	.4961	367	433	13.0
25WHNSB1270-TH		12.7	.5000	367	433	13.0
25WHNSB1280-TH		12.8	.5039	367	433	13.0
25WHNSB1290-TH		12.9	.5079	367	433	13.0
25WHNSB1300-TH	★	13.0	.5118	367	433	13.0

25WHNSB Table of Tolerance on tool dia.

h8 for diameters of 2.0 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0 ,10.0, 11.0, 12.0, and 13.0 For other items, the diameter tolerance will be as in the table below.

(mm)

25WHNSB		3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
Max		-0.020mm	-0.024mm	-0.030mm
		-.0008"	-.0009"	-.0012"
Min		-0.036mm	-0.045mm	-0.053mm
		-.0014"	-.0018"	-.0021"

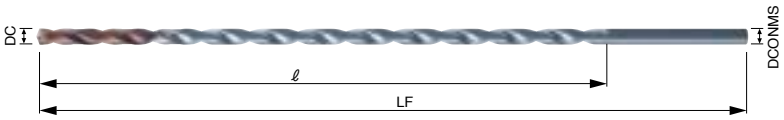
Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

Carbide Oil Hole Non Step Borer 30D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | 30D

Dia. tolerance — Refer to under table — h6



Plane, S-X thinning

Metric 30WHNSB○○○○-TH

Cutting Conditions F34

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
30WHNSB0200-TH	★	2.0	.0787	70	113	3.0
30WHNSB0210-TH	★	2.1	.0827	77	120	3.0
30WHNSB0220-TH	★	2.2	.0866	77	120	3.0
30WHNSB0230-TH	★	2.3	.0906	87	130	3.0
30WHNSB0240-TH	★	2.4	.0945	87	130	3.0
30WHNSB0250-TH	★	2.5	.0984	87	130	3.0
30WHNSB0260-TH	★	2.6	.1024	94	137	3.0
30WHNSB0270-TH	★	2.7	.1063	94	137	3.0
30WHNSB0280-TH	★	2.8	.1102	99	144	3.0
30WHNSB0290-TH	★	2.9	.1142	99	144	3.0
30WHNSB0300-TH	★	3.0	.1181	99	147	3.0
30WHNSB0310-TH	★	3.1	.1221	116	164	4.0
30WHNSB0320-TH	★	3.2	.1260	116	164	4.0
30WHNSB0330-TH	★	3.3	.1299	116	164	4.0
30WHNSB0340-TH	★	3.4	.1339	116	164	4.0
30WHNSB0350-TH	★	3.5	.1378	116	164	4.0
30WHNSB0360-TH	★	3.6	.1417	132	181	4.0
30WHNSB0370-TH	★	3.7	.1457	132	181	4.0
30WHNSB0380-TH	★	3.8	.1496	132	181	4.0
30WHNSB0390-TH	★	3.9	.1535	132	181	4.0
30WHNSB0400-TH	★	4.0	.1575	132	181	4.0
30WHNSB0410-TH	★	4.1	.1614	149	200	5.0
30WHNSB0420-TH	★	4.2	.1654	149	200	5.0
30WHNSB0430-TH	★	4.3	.1693	149	200	5.0
30WHNSB0440-TH	★	4.4	.1732	149	200	5.0
30WHNSB0450-TH	★	4.5	.1772	149	200	5.0
30WHNSB0460-TH	★	4.6	.1811	166	217	5.0
30WHNSB0470-TH	★	4.7	.1850	166	217	5.0
30WHNSB0480-TH	★	4.8	.1890	166	217	5.0
30WHNSB0490-TH	★	4.9	.1929	166	217	5.0
30WHNSB0500-TH	★	5.0	.1969	166	217	5.0
30WHNSB0510-TH	★	5.1	.2008	182	233	6.0
30WHNSB0520-TH	★	5.2	.2047	182	233	6.0
30WHNSB0530-TH	★	5.3	.2087	182	233	6.0
30WHNSB0540-TH	★	5.4	.2126	182	233	6.0
30WHNSB0550-TH	★	5.5	.2165	182	233	6.0
30WHNSB0560-TH	★	5.6	.2205	199	250	6.0
30WHNSB0570-TH	★	5.7	.2244	199	250	6.0
30WHNSB0580-TH	★	5.8	.2284	199	250	6.0
30WHNSB0590-TH	★	5.9	.2323	199	250	6.0
30WHNSB0600-TH	★	6.0	.2362	199	250	6.0
30WHNSB0610-TH	★	6.1	.2402	215	268	7.0
30WHNSB0620-TH	★	6.2	.2441	215	268	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
30WHNSB0630-TH	★	6.3	.2480	215	268	7.0
30WHNSB0640-TH	★	6.4	.2520	215	268	7.0
30WHNSB0650-TH	★	6.5	.2559	215	268	7.0
30WHNSB0660-TH	★	6.6	.2598	232	285	7.0
30WHNSB0670-TH	★	6.7	.2638	232	285	7.0
30WHNSB0680-TH	★	6.8	.2677	232	285	7.0
30WHNSB0690-TH	★	6.9	.2717	232	285	7.0
30WHNSB0700-TH	★	7.0	.2756	232	285	7.0
30WHNSB0710-TH	★	7.1	.2795	248	303	8.0
30WHNSB0720-TH	★	7.2	.2835	248	303	8.0
30WHNSB0730-TH	★	7.3	.2874	248	303	8.0
30WHNSB0740-TH	★	7.4	.2913	248	303	8.0
30WHNSB0750-TH	★	7.5	.2953	248	303	8.0
30WHNSB0760-TH	★	7.6	.2992	265	320	8.0
30WHNSB0770-TH	★	7.7	.3032	265	320	8.0
30WHNSB0780-TH	★	7.8	.3071	265	320	8.0
30WHNSB0790-TH	★	7.9	.3110	265	320	8.0
30WHNSB0800-TH	★	8.0	.3150	265	320	8.0
30WHNSB0810-TH		8.1	.3189	281	336	9.0
30WHNSB0820-TH		8.2	.3228	281	336	9.0
30WHNSB0830-TH	★	8.3	.3268	281	336	9.0
30WHNSB0840-TH	★	8.4	.3307	281	336	9.0
30WHNSB0850-TH	★	8.5	.3347	281	336	9.0
30WHNSB0860-TH		8.6	.3386	298	353	9.0
30WHNSB0870-TH		8.7	.3425	298	353	9.0
30WHNSB0880-TH	★	8.8	.3465	298	353	9.0
30WHNSB0890-TH	★	8.9	.3504	298	353	9.0
30WHNSB0900-TH	★	9.0	.3543	298	353	9.0
30WHNSB0910-TH		9.1	.3583	314	369	10.0
30WHNSB0920-TH		9.2	.3622	314	369	10.0
30WHNSB0930-TH	★	9.3	.3661	314	369	10.0
30WHNSB0940-TH	★	9.4	.3701	314	369	10.0
30WHNSB0950-TH	★	9.5	.3740	314	369	10.0
30WHNSB0960-TH		9.6	.3780	331	386	10.0
30WHNSB0970-TH		9.7	.3819	331	386	10.0
30WHNSB0980-TH	★	9.8	.3858	331	386	10.0
30WHNSB0990-TH	★	9.9	.3898	331	386	10.0
30WHNSB1000-TH	★	10.0	.3937	331	386	10.0
30WHNSB1010-TH		10.1	.3976	348	403	11.0
30WHNSB1020-TH		10.2	.4016	348	403	11.0
30WHNSB1030-TH	★	10.3	.4055	348	403	11.0
30WHNSB1040-TH	★	10.4	.4095	348	403	11.0
30WHNSB1050-TH	★	10.5	.4134	348	403	11.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
30WHNSB1060-TH		10.6	.4173	364	425	11.0
30WHNSB1070-TH		10.7	.4213	364	425	11.0
30WHNSB1080-TH	★	10.8	.4252	364	425	11.0
30WHNSB1090-TH	★	10.9	.4291	364	425	11.0
30WHNSB1100-TH	★	11.0	.4331	364	425	11.0
30WHNSB1110-TH		11.1	.4370	381	442	12.0
30WHNSB1120-TH		11.2	.4409	381	442	12.0
30WHNSB1130-TH	★	11.3	.4449	381	442	12.0
30WHNSB1140-TH	★	11.4	.4488	381	442	12.0
30WHNSB1150-TH	★	11.5	.4528	381	442	12.0
30WHNSB1160-TH		11.6	.4567	397	458	12.0
30WHNSB1170-TH		11.7	.4606	397	458	12.0
30WHNSB1180-TH	★	11.8	.4646	397	458	12.0
30WHNSB1190-TH	★	11.9	.4685	397	458	12.0
30WHNSB1200-TH	★	12.0	.4724	397	458	12.0

30WHNSB (Metric) Table of Tolerance on tool dia.

h8 for diameters of 2.0 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 10.0, 11.0, and 12.0. For other items, the diameter tolerance will be as in the table below.

(mm)

30WHNSB (Metric)	3.0<DC<6.0	6.0<DC<10.0	10.0<DC≦13.0
Max	-0.020mm	-0.024mm	-0.030mm
	-.0008"	-.0009"	-.0012"
Min	-0.036mm	-0.045mm	-0.053mm
	-.0014"	-.0018"	-.0021"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

● : Inventory maintained in US ★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Inch 30WHNSB○/○○X○○.○-TH

Cutting Conditions F34

Item code	Stock	Size (inch)			
		Tool dia.	Flute length	Overall length	Shank dia.
		DC	ℓ	LF	DCONMS
30WHNSB1/4X7.0-TH	●	1/4	8.465 (215mm)	10.551 (268mm)	.276 (7.0mm)
30WHNSB3/8X10.0-TH	●	3/8	13.031 (331mm)	15.197 (386mm)	.394 (10mm)
30WHNSB7/16X12.0-TH	●	7/16	15.000 (381mm)	17.402 (442mm)	.472 (12mm)
30WHNSB1/2X13.0-TH	●	1/2	16.929 (430mm)	19.528 (496mm)	.512 (13mm)

■ 30WHNSB (Inch) Table of Tolerance on tool dia.

JIS B0401 : h8

30WHNSB (Inch)		
inch	.2362<DC<.3937	.3937<DC<=.5118
Line up DC	1/4" 3/8"	7/16" 1/2"
Max	0mm	0mm
	.0"	.0"
Min	-0.022mm	-0.027mm
	-.0009"	-.0011"

Carbide Oil Hole Non Step Borer 10~30D

Recommended cutting conditions

10WHNSB-TH **15WHNSB-TH** **20WHNSB-TH** **25WHNSB-TH** **30WHNSB-TH**

Work material		Structural steel (~180HB)						Carbon steel (~200HB)						Alloy steel (~30HRC)					
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		40~120			40~110			40~120			40~110			40~100			40~90		
SFM		131~394			131~361			131~394			131~361			131~328			131~295		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ2.0mm	8,000	mm/rev.	0.05~0.08	8,000	mm/rev.	0.05~0.08	8,000	mm/rev.	0.05~0.1	8,000	mm/rev.	0.05~0.1	8,000	mm/rev.	0.05~0.08	8,000	mm/rev.	0.05~0.08
Inch	.0787		IPR	.002~.003		IPR	.002~.003		IPR	.002~.004		IPR	.002~.004		IPR	.002~.003		IPR	.002~.003
Metric	ϕ4.0	7,000	mm/rev.	0.1~0.16	5,500	mm/rev.	0.1~0.16	7,000	mm/rev.	0.1~0.16	5,500	mm/rev.	0.1~0.16	6,300	mm/rev.	0.08~0.12	5,000	mm/rev.	0.08~0.12
Inch	.1575		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.003~.005		IPR	.003~.005
Metric	ϕ6.0	4,800	mm/rev.	0.15~0.24	4,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24	4,300	mm/rev.	0.15~0.24	4,500	mm/rev.	0.12~0.20	3,700	mm/rev.	0.12~0.20
Inch	.2362		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.005~.008		IPR	.005~.008
Metric	ϕ8.0	3,600	mm/rev.	0.18~0.3	3,200	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3	3,200	mm/rev.	0.18~0.3	3,400	mm/rev.	0.16~0.24	2,900	mm/rev.	0.16~0.24
Inch	.3150		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.006~.009		IPR	.006~.009
Metric	ϕ10.0	2,900	mm/rev.	0.2~0.3	2,600	mm/rev.	0.2~0.3	2,900	mm/rev.	0.2~0.3	2,600	mm/rev.	0.2~0.3	2,700	mm/rev.	0.20~0.30	2,400	mm/rev.	0.20~0.30
Inch	.3937		IPR	.008~.012		IPR	.008~.012		IPR	.008~.012		IPR	.008~.012		IPR	.008~.012		IPR	.008~.012
Metric	ϕ12.0	2,400	mm/rev.	0.22~0.35	2,200	mm/rev.	0.22~0.35	2,400	mm/rev.	0.22~0.35	2,200	mm/rev.	0.22~0.35	2,400	mm/rev.	0.22~0.32	2,100	mm/rev.	0.22~0.32
Inch	.4724		IPR	.009~.014		IPR	.009~.014		IPR	.009~.014		IPR	.009~.014		IPR	.009~.013		IPR	.009~.013

Work material		Stainless steel			Pre-hardened steel			Ductile iron						Casting					
vc Cutting speed		Internal coolant			Internal coolant			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		30~100			20~50			40~120			40~100			40~150			40~120		
SFM		98~328			66~164			131~394			131~328			131~492			131~394		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ2.0mm	6,000	mm/rev.	0.03~0.05	4,500	mm/rev.	0.03~0.04	8,000	mm/rev.	0.05~0.08	8,000	mm/rev.	0.05~0.08	8,000	mm/rev.	0.05~0.1	8,000	mm/rev.	0.05~0.1
Inch	.0787		IPR	.001~.002		IPR	.001~.002		IPR	.002~.003		IPR	.002~.003		IPR	.002~.004		IPR	.002~.004
Metric	ϕ4.0	4,800	mm/rev.	0.08~0.12	2,400	mm/rev.	0.04~0.08	7,000	mm/rev.	0.1~0.16	6,300	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	7,000	mm/rev.	0.1~0.16
Inch	.1575		IPR	.003~.005		IPR	.002~.003		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006		IPR	.004~.006
Metric	ϕ6.0	3,700	mm/rev.	0.12~0.20	1,600	mm/rev.	0.06~0.09	4,800	mm/rev.	0.15~0.24	4,500	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	4,800	mm/rev.	0.15~0.24
Inch	.2362		IPR	.005~.008		IPR	.002~.004		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009		IPR	.006~.009
Metric	ϕ8.0	2,700	mm/rev.	0.16~0.24	1,200	mm/rev.	0.08~0.12	3,600	mm/rev.	0.18~0.3	3,400	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	3,600	mm/rev.	0.18~0.3
Inch	.3150		IPR	.006~.009		IPR	.003~.005		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012		IPR	.007~.012
Metric	ϕ10.0	2,200	mm/rev.	0.20~0.30	950	mm/rev.	0.1~0.15	2,900	mm/rev.	0.2~0.35	2,700	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	2,900	mm/rev.	0.2~0.35
Inch	.3937		IPR	.008~.012		IPR	.004~.006		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014		IPR	.008~.014
Metric	ϕ12.0	1,800	mm/rev.	0.22~0.32	800	mm/rev.	0.1~0.15	2,400	mm/rev.	0.22~0.35	2,400	mm/rev.	0.22~0.35	2,650	mm/rev.	0.22~0.35	2,400	mm/rev.	0.22~0.35
Inch	.4724		IPR	.009~.013		IPR	.004~.006		IPR	.009~.014		IPR	.009~.014		IPR	.009~.014		IPR	.009~.014

Setting of Cutting Conditions

※Use the appropriate coolant for the work material and machining shape.
※These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
※The above cutting conditions are based on the use of a water-soluble coolant diluted to a maximum of 20 times. When coolant dilution exceeds 20 times, decrease the cutting speed to the lowest in the specified range. When the tool diameter is ϕ5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over ϕ5.0, the pressure should be 1.5 MPa or higher.
※When performing MQL (mist) machining, depending on the amount or status of spray from the tool, it may be necessary to reduce the cutting speed in order to perform machining.
※When changing the tool, use collet free from flaws and stains and attach the tool firmly so that its runout is 0.02mm or less.
※When cutting fluid is used, reduce the cutting speed to a speed lower than the lowest speed in the specified range. Take the greatest care to avoid smoke or ignition due to heating of chips and the tool.
※Works should be gripped firmly to prevent deformation, deflection and vibration.

Drilling Method

1 Drilling of pilot hole (guide hole) (03WHNSB-TH, 05WHNSB-TH)

- Hole depth : Tool diameter ×2~5 times
- Machining diameter : 08~30WHNSB diameter + 0.03~0.10mm
- Recommended tools : 0.3WHNSB-TH, Carbide stub type, MTO by customized allowance

2 Supplying coolant during low-speed revolution (10~30WHNSB-TH)

- Leading to the guide hole at low speed (n=0~500 min^{-1})
- Stop 2.0~5.0 mm before the end of the guide hole.

※When a long tool (200mm or longer) is used, position the tool to the guide hole at low revolution speed (n=200min^{-1} or less).

3 High-speed revolution for drilling feed (10~30WHNSB-TH)

- After confirming that the revolution speed is increasing at the specified rate, start feeding.

4 Machining completion

- Withdraw the tool at low speed. (n=0~500 min^{-1})

※When a long tool (200mm or longer) is used, withdraw the tool at low revolution speed (n=200min^{-1} or less).

Refer P.F18～P.F20 about 03WHNSB-TH and 05WHNSB-TH

Carbide Oil Hole Non Step Borer 40D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | 40D

Dia. tolerance — Refer to under table — h6

Plane, S-X thinning

40WHNSB○○○○-TH

Cutting Conditions F38

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
40WHNSB0250-TH	★	2.5	.0984	108	159	3.0
40WHNSB0260-TH		2.6	.1024	117	168	3.0
40WHNSB0270-TH		2.7	.1063	117	168	3.0
40WHNSB0280-TH		2.8	.1102	129	180	3.0
40WHNSB0290-TH		2.9	.1142	129	180	3.0
40WHNSB0300-TH	★	3.0	.1181	129	180	3.0
40WHNSB0310-TH		3.1	.1221	142	195	4.0
40WHNSB0320-TH		3.2	.1260	142	195	4.0
40WHNSB0330-TH		3.3	.1299	142	195	4.0
40WHNSB0340-TH		3.4	.1339	155	208	4.0
40WHNSB0350-TH		3.5	.1378	155	208	4.0
40WHNSB0360-TH		3.6	.1417	155	208	4.0
40WHNSB0370-TH		3.7	.1457	172	225	4.0
40WHNSB0380-TH		3.8	.1496	172	225	4.0
40WHNSB0390-TH		3.9	.1535	172	225	4.0
40WHNSB0400-TH	★	4.0	.1575	172	225	4.0
40WHNSB0410-TH		4.1	.1614	185	238	5.0
40WHNSB0420-TH		4.2	.1654	185	238	5.0
40WHNSB0430-TH		4.3	.1693	185	238	5.0
40WHNSB0440-TH		4.4	.1732	198	251	5.0
40WHNSB0450-TH		4.5	.1772	198	251	5.0
40WHNSB0460-TH		4.6	.1811	198	251	5.0
40WHNSB0470-TH		4.7	.1850	215	268	5.0
40WHNSB0480-TH		4.8	.1890	215	268	5.0
40WHNSB0490-TH		4.9	.1929	215	268	5.0
40WHNSB0500-TH	★	5.0	.1969	215	268	5.0
40WHNSB0510-TH		5.1	.2008	237	290	6.0
40WHNSB0520-TH		5.2	.2047	237	290	6.0
40WHNSB0530-TH		5.3	.2087	237	290	6.0
40WHNSB0540-TH		5.4	.2126	237	290	6.0
40WHNSB0550-TH		5.5	.2165	237	290	6.0
40WHNSB0560-TH		5.6	.2205	258	311	6.0
40WHNSB0570-TH		5.7	.2244	258	311	6.0
40WHNSB0580-TH		5.8	.2284	258	311	6.0
40WHNSB0590-TH		5.9	.2323	258	311	6.0
40WHNSB0600-TH	★	6.0	.2362	258	311	6.0
40WHNSB0610-TH		6.1	.2402	280	333	7.0
40WHNSB0620-TH		6.2	.2441	280	333	7.0
40WHNSB0630-TH		6.3	.2480	280	333	7.0
40WHNSB0640-TH		6.4	.2520	280	333	7.0
40WHNSB0650-TH		6.5	.2559	280	333	7.0
40WHNSB0660-TH		6.6	.2598	301	354	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
40WHNSB0670-TH		6.7	.2638	301	354	7.0
40WHNSB0680-TH		6.8	.2677	301	354	7.0
40WHNSB0690-TH		6.9	.2717	301	354	7.0
40WHNSB0700-TH		7.0	.2756	301	354	7.0
40WHNSB0710-TH		7.1	.2795	323	380	8.0
40WHNSB0720-TH		7.2	.2835	323	380	8.0
40WHNSB0730-TH		7.3	.2874	323	380	8.0
40WHNSB0740-TH		7.4	.2913	323	380	8.0
40WHNSB0750-TH		7.5	.2953	323	380	8.0
40WHNSB0760-TH		7.6	.2992	344	401	8.0
40WHNSB0770-TH		7.7	.3032	344	401	8.0
40WHNSB0780-TH		7.8	.3071	344	401	8.0
40WHNSB0790-TH		7.9	.3110	344	401	8.0
40WHNSB0800-TH	★	8.0	.3150	344	401	8.0
40WHNSB0810-TH		8.1	.3189	366	423	9.0
40WHNSB0820-TH		8.2	.3228	366	423	9.0
40WHNSB0830-TH		8.3	.3268	366	423	9.0
40WHNSB0840-TH		8.4	.3307	366	423	9.0
40WHNSB0850-TH	★	8.5	.3347	366	423	9.0
40WHNSB0860-TH		8.6	.3386	387	444	9.0
40WHNSB0870-TH		8.7	.3425	387	444	9.0
40WHNSB0880-TH		8.8	.3465	387	444	9.0
40WHNSB0890-TH		8.9	.3504	387	444	9.0
40WHNSB0900-TH		9.0	.3543	387	444	9.0
40WHNSB0910-TH		9.1	.3583	409	466	10.0
40WHNSB0920-TH		9.2	.3622	409	466	10.0
40WHNSB0930-TH		9.3	.3661	409	466	10.0
40WHNSB0940-TH		9.4	.3701	409	466	10.0
40WHNSB0950-TH		9.5	.3740	409	466	10.0
40WHNSB0960-TH		9.6	.3780	430	487	10.0
40WHNSB0970-TH		9.7	.3819	430	487	10.0
40WHNSB0980-TH		9.8	.3858	430	487	10.0
40WHNSB0990-TH		9.9	.3898	430	487	10.0
40WHNSB1000-TH	★	10.0	.3937	430	487	10.0

40WHNSB Table of Tolerance on tool dia.

h8 for diameters of 2.5 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0 and 10.0 For other items, the diameter tolerance will be as in the table below. (mm)

40WHNSB	3.0<DC<6.0	6.0<DC<10.0
Max	-0.020mm	-0.024mm
	-.0008"	-.0009"
Min	-0.036mm	-0.045mm
	-.0014"	-.0018"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

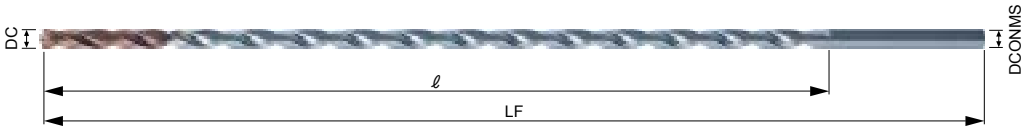
★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer 50D

Drilling | Carbide | TH | 135° | Normal helix 21°~34° | Integral no. shank | ~50D

Dia. tolerance — Refer to under table — h6

Plane,
S-X thinning



50WHNSB○○○○-TH

Cutting Conditions F38

Item code	Stock	Size				
		Tool dia.		Flute length	Overall length	Shank dia.
		DC (mm)	DC (inch)	ℓ (mm)	LF (mm)	DCONMS (mm)
50WHNSB0250-TH	★	2.5	.0984	133	184	3.0
50WHNSB0260-TH		2.6	.1024	144	195	3.0
50WHNSB0270-TH		2.7	.1063	144	195	3.0
50WHNSB0280-TH		2.8	.1102	159	210	3.0
50WHNSB0290-TH		2.9	.1142	159	210	3.0
50WHNSB0300-TH	★	3.0	.1181	159	210	3.0
50WHNSB0310-TH		3.1	.1221	175	228	4.0
50WHNSB0320-TH		3.2	.1260	175	228	4.0
50WHNSB0330-TH		3.3	.1299	175	228	4.0
50WHNSB0340-TH		3.4	.1339	191	244	4.0
50WHNSB0350-TH		3.5	.1378	191	244	4.0
50WHNSB0360-TH		3.6	.1417	191	244	4.0
50WHNSB0370-TH		3.7	.1457	212	265	4.0
50WHNSB0380-TH		3.8	.1496	212	265	4.0
50WHNSB0390-TH		3.9	.1535	212	265	4.0
50WHNSB0400-TH	★	4.0	.1575	212	265	4.0
50WHNSB0410-TH		4.1	.1614	228	281	5.0
50WHNSB0420-TH		4.2	.1654	228	281	5.0
50WHNSB0430-TH		4.3	.1693	228	281	5.0
50WHNSB0440-TH		4.4	.1732	244	297	5.0
50WHNSB0450-TH		4.5	.1772	244	297	5.0
50WHNSB0460-TH		4.6	.1811	244	297	5.0
50WHNSB0470-TH		4.7	.1850	265	318	5.0
50WHNSB0480-TH		4.8	.1890	265	318	5.0
50WHNSB0490-TH		4.9	.1929	265	318	5.0
50WHNSB0500-TH	★	5.0	.1969	265	318	5.0
50WHNSB0510-TH		5.1	.2008	292	345	6.0
50WHNSB0520-TH		5.2	.2047	292	345	6.0
50WHNSB0530-TH		5.3	.2087	292	345	6.0
50WHNSB0540-TH		5.4	.2126	292	345	6.0
50WHNSB0550-TH		5.5	.2165	292	345	6.0
50WHNSB0560-TH		5.6	.2205	318	371	6.0
50WHNSB0570-TH		5.7	.2244	318	371	6.0
50WHNSB0580-TH		5.8	.2284	318	371	6.0
50WHNSB0590-TH		5.9	.2323	318	371	6.0

Item code	Stock	Size				
		Tool dia.		Flute length	Overall length	Shank dia.
		DC (mm)	DC (inch)	ℓ (mm)	LF (mm)	DCONMS (mm)
50WHNSB0600-TH	★	6.0	.2362	318	371	6.0
50WHNSB0610-TH		6.1	.2402	345	398	7.0
50WHNSB0620-TH		6.2	.2441	345	398	7.0
50WHNSB0630-TH		6.3	.2480	345	398	7.0
50WHNSB0640-TH		6.4	.2520	345	398	7.0
50WHNSB0650-TH		6.5	.2559	345	398	7.0
50WHNSB0660-TH		6.6	.2598	371	424	7.0
50WHNSB0670-TH		6.7	.2638	371	424	7.0
50WHNSB0680-TH		6.8	.2677	371	424	7.0
50WHNSB0690-TH		6.9	.2717	371	424	7.0
50WHNSB0700-TH		7.0	.2756	371	424	7.0
50WHNSB0710-TH		7.1	.2795	398	451	8.0
50WHNSB0720-TH		7.2	.2835	398	451	8.0
50WHNSB0730-TH		7.3	.2874	398	451	8.0
50WHNSB0740-TH		7.4	.2913	398	451	8.0
50WHNSB0750-TH		7.5	.2953	398	451	8.0
50WHNSB0760-TH		7.6	.2992	424	481	8.0
50WHNSB0770-TH		7.7	.3032	424	481	8.0
50WHNSB0780-TH		7.8	.3071	424	481	8.0
50WHNSB0790-TH		7.9	.3110	424	481	8.0
50WHNSB0800-TH	★	8.0	.3150	424	481	8.0

■ 50WHNSB Table of Tolerance on tool dia.

h8 for diameters of 2.5 to 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5 and 8.0
For other items, the diameter tolerance will be as in the table below.

(mm)

50WHNSB		
	3.0<DC<6.0	6.0<DC<10.0
Max	-0.020mm	-0.024mm
	-.0008"	-.0009"
Min	-0.036mm	-0.045mm
	-.0014"	-.0018"

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	○		◎	○	○	○		

Carbide Oil Hole Non Step Borer 40~50D

Recommended cutting conditions

40WHNSB-TH 50WHNSB-TH

Work material		Structural steel (~200HB)					Alloy steel (~30HRC)					Tool steel (~35HRC)				
Vc Cutting speed	m/min	40~65~80					40~65~80					25~45~55				
	SFM	131~213~262					131~213~262					82~148~180				
Tool dia.		*n* (min⁻¹)	*vf*		*f*		*n* (min⁻¹)	*vf*		*f*		*n* (min⁻¹)	*vf*		*vf*	
Metric	ϕ2.5mm	8,300	mm/min	520	mm/rev.	0.05~0.08	8,300	mm/min	520	mm/rev.	0.05~0.08	5,700	mm/min	185	mm/rev.	0.025~0.04
Inch	.0984		IPM	21	IPR	.002~.0031		IPM	21	IPR	.002~.0031		IPM	7.4	IPR	.001~.0016
Metric	ϕ3	6,900	mm/min	520	mm/rev.	0.06~0.09	6,900	mm/min	520	mm/rev.	0.06~0.09	4,800	mm/min	185	mm/rev.	0.03~0.05
Inch	.1181		IPM	21	IPR	.0024~.0035		IPM	21	IPR	.0024~.0035		IPM	7.4	IPR	.0012~.002
Metric	ϕ4	5,200	mm/min	520	mm/rev.	0.08~0.12	5,200	mm/min	520	mm/rev.	0.08~0.12	3,600	mm/min	185	mm/rev.	0.04~0.07
Inch	.1575		IPM	21	IPR	.0031~.0047		IPM	21	IPR	.0031~.0047		IPM	7.4	IPR	.0016~.0028
Metric	ϕ5	4,100	mm/min	520	mm/rev.	0.10~0.15	4,100	mm/min	520	mm/rev.	0.10~0.15	2,900	mm/min	185	mm/rev.	0.05~0.08
Inch	.1969		IPM	21	IPR	.0039~.0059		IPM	21	IPR	.0039~.0059		IPM	7.4	IPR	.002~.0031
Metric	ϕ6	3,500	mm/min	520	mm/rev.	0.12~0.18	3,500	mm/min	520	mm/rev.	0.12~0.18	2,400	mm/min	185	mm/rev.	0.06~0.10
Inch	.2362		IPM	21	IPR	.0047~.0071		IPM	21	IPR	.0047~.0071		IPM	7.4	IPR	.0024~.0039
Metric	ϕ8	2,600	mm/min	520	mm/rev.	0.16~0.24	2,600	mm/min	520	mm/rev.	0.16~0.24	1,800	mm/min	185	mm/rev.	0.08~0.13
Inch	.315		IPM	21	IPR	.0063~.0094		IPM	21	IPR	.0063~.0094		IPM	7.4	IPR	.0031~.0051
Metric	ϕ8.5	2,400	mm/min	520	mm/rev.	0.17~0.26	2,400	mm/min	520	mm/rev.	0.17~0.26	1,700	mm/min	185	mm/rev.	0.09~0.14
Inch	.3346		IPM	21	IPR	.0067~.0102		IPM	21	IPR	.0067~.0102		IPM	7.4	IPR	.0035~.0055
Metric	ϕ10	2,100	mm/min	520	mm/rev.	0.20~0.30	2,100	mm/min	520	mm/rev.	0.20~0.30	1,400	mm/min	185	mm/rev.	0.10~0.16
Inch	.3937		IPM	21	IPR	.0079~.0118		IPM	21	IPR	.0079~.0118		IPM	7.4	IPR	.0039~.0063

Work material		Tool steel, Pre-hardened steel (35~45HRC)					Stainless steel					Cast iron, Ductile cast iron				
Vc Cutting speed	m/min	25~40~50					30~50~60					40~65~80				
	SFM	82~131~164					98~164~197					131~213~262				
Tool dia.		*n* (min⁻¹)	*vf*		*f*		*n* (min⁻¹)	*vf*		*f*		*n* (min⁻¹)	*vf*		*vf*	
Metric	ϕ2.5mm	5,100	mm/min	165	mm/rev.	0.025~0.04	6,400	mm/min	320	mm/rev.	0.04~0.06	8,300	mm/min	630	mm/rev.	0.06~0.09
Inch	.0984		IPM	6.6	IPR	.001~.0016		IPM	13	IPR	.0016~.0024		IPM	24	IPR	.0024~.0035
Metric	ϕ3	4,200	mm/min	165	mm/rev.	0.03~0.05	5,300	mm/min	320	mm/rev.	0.05~0.07	6,900	mm/min	630	mm/rev.	0.07~0.11
Inch	.1181		IPM	6.6	IPR	.0012~.002		IPM	13	IPR	.002~.0028		IPM	24	IPR	.0028~.0043
Metric	ϕ4	3,200	mm/min	165	mm/rev.	0.04~0.07	4,000	mm/min	320	mm/rev.	0.06~0.09	5,200	mm/min	630	mm/rev.	0.10~0.14
Inch	.1575		IPM	6.6	IPR	.0016~.0028		IPM	13	IPR	.0024~.0035		IPM	24	IPR	.0039~.0055
Metric	ϕ5	2,500	mm/min	165	mm/rev.	0.05~0.08	3,200	mm/min	320	mm/rev.	0.08~0.12	4,100	mm/min	630	mm/rev.	0.12~0.18
Inch	.1969		IPM	6.6	IPR	.002~.0031		IPM	13	IPR	.0031~.0047		IPM	24	IPR	.0047~.0071
Metric	ϕ6	2,100	mm/min	165	mm/rev.	0.06~0.10	2,700	mm/min	320	mm/rev.	0.10~0.14	3,500	mm/min	630	mm/rev.	0.15~0.21
Inch	.2362		IPM	6.6	IPR	.0024~.0039		IPM	13	IPR	.0039~.0055		IPM	24	IPR	.0059~.0083
Metric	ϕ8	1,600	mm/min	165	mm/rev.	0.08~0.13	2,000	mm/min	320	mm/rev.	0.13~0.18	2,600	mm/min	520	mm/rev.	0.16~0.24
Inch	.315		IPM	6.6	IPR	.0031~.0051		IPM	13	IPR	.0051~.0071		IPM	24	IPR	.0063~.0094
Metric	ϕ8.5	1,500	mm/min	165	mm/rev.	0.09~0.14	1,900	mm/min	320	mm/rev.	0.14~0.20	2,400	mm/min	520	mm/rev.	0.17~0.26
Inch	.3346		IPM	6.6	IPR	.0035~.0055		IPM	13	IPR	.0055~.0079		IPM	24	IPR	.0067~.0102
Metric	ϕ10	1,300	mm/min	165	mm/rev.	0.10~0.16	1,600	mm/min	320	mm/rev.	0.16~0.23	2,100	mm/min	520	mm/rev.	0.20~0.30
Inch	.3937		IPM	6.6	IPR	.0039~.0063		IPM	13	IPR	.0063~.0091		IPM	24	IPR	.0079~.0118

Setting of Cutting Conditions

- The cutting conditions provided in the Recommended Cutting Conditions table are guidelines. For actual machining, adjust conditions based on machining shape, purpose, and machine type.
- When changing the tool, use a collet free of flaws and stains. Attach the tool securely so that the runout is 0.02 mm or less.
- Make sure the workpiece is gripped firmly to prevent deformation, deflection, and vibration.
- We recommend using coolant when machining stainless steels, aluminum alloys, or hardened steels of 40HRC or greater.
- The cutting conditions assume use of water-soluble cutting fluid diluted not more than 20-fold (5%). If the cutting fluid is diluted more than 20-fold, reduce the cutting speed to the lowest in the specified range. If the tool diameter is φ5.0 or less, coolant pressure should be at least 2.0 MPa. If the tool diameter exceeds φ5.0, coolant pressure should be at least 1.5 MPa.
- For mist machining, depending on tool spray rate and actual conditions, you may need to reduce cutting speed.
- If you are using oil-based cutting fluid, set the cutting speed below the lowest value of the specified range. Watch for and take adequate steps to avoid fire or smoke generation due to overheating of the tool and chips.

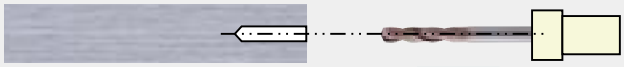
Machining Precautions

- To improve guiding characteristics, we recommend using 05WHNSB (as a guide, hole depth = diameter × 5) for the guide hole.
  Example: For 05WHNSB0500-TH, hole depth = φ5.0 × 5 = 25 mm.
  Tools used: ① guide: 05WHNSB0500-TH, ② long: 50WHNSB0500-TH
- Intermediate machining with the 10-20WHNSB (as a guide, hole depth = diameter × 10 - 20) before machining with the 40-50WHNSB will minimize hole bending and other problems.
  Example: Tools used: ① Guide: 05WHNSB0500-TH,
  ② Intermediate machining: 10WHNSB0500-TH,
  ③ Long: 50WHNSB0500-TH
- We recommend starting with step machining (starting with a step amount equal to diameter) to confirm there are no issues with coolant spray rate, cutting noise, chip evacuation, chip shape, or the load meter.
- As a general rule, adjust the feed rate to the minimum value for intersecting holes and through holes.

Drilling Method

1 Drilling of pilot hole (guide hole) (05WHNSB-TH)

- Hole depth ：Tool diameter ×5 times
- Machining diameter：40~50WHNSB-TH diameter 0~+0.03mm

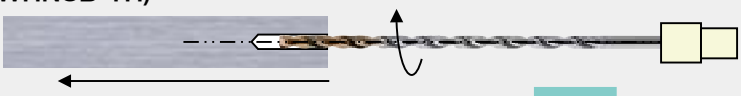


2 Supplying coolant during low-speed revolution (40~50WHNSB-TH)

- Leading to the guide hole at low speed (n=0~500 min^{-1})
- Stop feed 2.0~5.0 mm before the end of the guide hole.

3 High-speed revolution for drilling feed (40~50WHNSB-TH)

- After confirming that the revolution speed is increasing at the specified rate, start feeding.



4 Machining completion

- Withdraw the tool at low speed. (n=0~500 min^{-1})

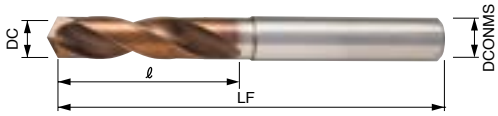
Refer P.F20 about 05WHNSB-TH

Carbide Non Step Borer 2D

Drilling | Carbide | TH | 140° | Normal helix 21°~34° | Integral no. shank | ~2D

h8 | Shank tolerance 0 ~ −0.01mm (0 ~ −.0004 inch)

Plane,
S-X thinning



02WNSB○○○○-TH

Cutting Conditions F42

Item code	Stock	Size: Tool dia. DC (mm)	DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
02WNSB0300-TH		3.0	.1181	15	47	3.0
02WNSB0310-TH		3.1	.1221	18	52	4.0
02WNSB0320-TH		3.2	.1260	18	52	4.0
02WNSB0330-TH		3.3	.1299	18	52	4.0
02WNSB0340-TH		3.4	.1339	18	52	4.0
02WNSB0350-TH		3.5	.1378	18	52	4.0
02WNSB0360-TH		3.6	.1417	20	52	4.0
02WNSB0370-TH		3.7	.1457	20	52	4.0
02WNSB0380-TH		3.8	.1496	20	52	4.0
02WNSB0390-TH		3.9	.1535	20	52	4.0
02WNSB0400-TH		4.0	.1575	20	52	4.0
02WNSB0410-TH		4.1	.1614	23	59	5.0
02WNSB0420-TH		4.2	.1654	23	59	5.0
02WNSB0430-TH		4.3	.1693	23	59	5.0
02WNSB0440-TH		4.4	.1732	23	59	5.0
02WNSB0450-TH		4.5	.1772	23	59	5.0
02WNSB0460-TH		4.6	.1811	25	59	5.0
02WNSB0470-TH		4.7	.1850	25	59	5.0
02WNSB0480-TH		4.8	.1890	25	59	5.0
02WNSB0490-TH		4.9	.1929	25	59	5.0
02WNSB0500-TH	★	5.0	.1969	25	59	5.0
02WNSB0510-TH	★	5.1	.2008	25	64	6.0
02WNSB0520-TH	★	5.2	.2047	25	64	6.0
02WNSB0530-TH		5.3	.2087	25	64	6.0
02WNSB0540-TH	★	5.4	.2126	25	64	6.0
02WNSB0550-TH	★	5.5	.2165	25	64	6.0
02WNSB0560-TH		5.6	.2205	25	64	6.0
02WNSB0570-TH		5.7	.2244	25	64	6.0
02WNSB0580-TH	★	5.8	.2284	25	64	6.0
02WNSB0590-TH		5.9	.2323	25	64	6.0
02WNSB0600-TH	★	6.0	.2362	25	64	6.0
02WNSB0610-TH		6.1	.2402	29	71	7.0
02WNSB0620-TH	★	6.2	.2441	29	71	7.0
02WNSB0630-TH		6.3	.2480	29	71	7.0
02WNSB0640-TH		6.4	.2520	29	71	7.0
02WNSB0650-TH	★	6.5	.2559	29	71	7.0
02WNSB0660-TH		6.6	.2598	31	71	7.0
02WNSB0670-TH		6.7	.2638	31	71	7.0
02WNSB0680-TH	★	6.8	.2677	31	71	7.0
02WNSB0690-TH	★	6.9	.2717	31	71	7.0
02WNSB0700-TH	★	7.0	.2756	31	71	7.0
02WNSB0710-TH		7.1	.2795	32	76	8.0
02WNSB0720-TH		7.2	.2835	32	76	8.0

Item code	Stock	Size: Tool dia. DC (mm)	DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
02WNSB0730-TH	★	7.3	.2874	32	76	8.0
02WNSB0740-TH		7.4	.2913	32	76	8.0
02WNSB0750-TH	★	7.5	.2953	32	76	8.0
02WNSB0760-TH		7.6	.2992	34	76	8.0
02WNSB0770-TH		7.7	.3032	34	76	8.0
02WNSB0780-TH	★	7.8	.3071	34	76	8.0
02WNSB0790-TH	★	7.9	.3110	34	76	8.0
02WNSB0800-TH	★	8.0	.3150	34	76	8.0
02WNSB0810-TH		8.1	.3189	36	80	9.0
02WNSB0820-TH		8.2	.3228	36	80	9.0
02WNSB0830-TH		8.3	.3268	36	80	9.0
02WNSB0840-TH	★	8.4	.3307	36	80	9.0
02WNSB0850-TH	★	8.5	.3347	36	80	9.0
02WNSB0860-TH	★	8.6	.3386	38	80	9.0
02WNSB0870-TH		8.7	.3425	38	80	9.0
02WNSB0880-TH	★	8.8	.3465	38	80	9.0
02WNSB0890-TH		8.9	.3504	38	80	9.0
02WNSB0900-TH	★	9.0	.3543	38	80	9.0
02WNSB0910-TH		9.1	.3583	40	85	10.0
02WNSB0920-TH		9.2	.3622	40	85	10.0
02WNSB0930-TH		9.3	.3661	40	85	10.0
02WNSB0940-TH	★	9.4	.3701	40	85	10.0
02WNSB0950-TH	★	9.5	.3740	40	85	10.0
02WNSB0960-TH		9.6	.3780	41	85	10.0
02WNSB0970-TH		9.7	.3819	41	85	10.0
02WNSB0980-TH	★	9.8	.3858	41	85	10.0
02WNSB0990-TH		9.9	.3898	41	85	10.0
02WNSB1000-TH	★	10.0	.3937	41	85	10.0
02WNSB1010-TH		10.1	.3976	42	90	11.0
02WNSB1020-TH	★	10.2	.4016	42	90	11.0
02WNSB1030-TH	★	10.3	.4055	42	90	11.0
02WNSB1040-TH		10.4	.4095	42	90	11.0
02WNSB1050-TH	★	10.5	.4134	42	90	11.0
02WNSB1060-TH	★	10.6	.4173	44	90	11.0
02WNSB1070-TH		10.7	.4213	44	90	11.0
02WNSB1080-TH	★	10.8	.4252	44	90	11.0
02WNSB1090-TH		10.9	.4291	44	90	11.0
02WNSB1100-TH	★	11.0	.4331	44	90	11.0
02WNSB1110-TH		11.1	.4370	46	94	12.0
02WNSB1120-TH		11.2	.4409	46	94	12.0
02WNSB1130-TH		11.3	.4449	46	94	12.0
02WNSB1140-TH	★	11.4	.4488	46	94	12.0
02WNSB1150-TH	★	11.5	.4528	46	94	12.0

Item code	Stock	Size: Tool dia. DC (mm)	DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
02WNSB1160-TH	★	11.6	.4567	46	94	12.0
02WNSB1170-TH		11.7	.4606	46	94	12.0
02WNSB1180-TH	★	11.8	.4646	46	94	12.0
02WNSB1190-TH		11.9	.4685	46	94	12.0
02WNSB1200-TH	★	12.0	.4724	46	94	12.0
02WNSB1210-TH		12.1	.4764	49	100	13.0
02WNSB1220-TH	★	12.2	.4803	49	100	13.0
02WNSB1230-TH		12.3	.4843	49	100	13.0
02WNSB1240-TH		12.4	.4882	49	100	13.0
02WNSB1250-TH	★	12.5	.4921	49	100	13.0
02WNSB1260-TH	★	12.6	.4961	49	100	13.0
02WNSB1270-TH		12.7	.5000	49	100	13.0
02WNSB1280-TH		12.8	.5039	49	100	13.0
02WNSB1290-TH		12.9	.5079	49	100	13.0
02WNSB1300-TH	★	13.0	.5118	49	100	13.0

Applicable work material

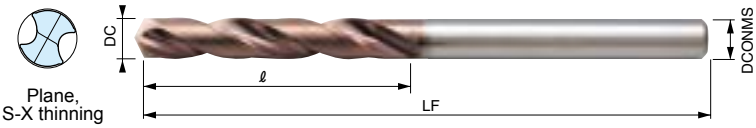
Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	◎				○	○		

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Non Step Borer 4D

Drilling | Carbide | TH | 140° | Normal helix 21°~34° | Integral no. shank | ~4D

h8 | Shank tolerance 0 ~ −0.01mm (0 ~ −.0004 inch)



04WNSB○○○○-TH

Cutting Conditions F42

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
04WNSB0100-TH	★	1.0	.0394	8	50	3.0
04WNSB0110-TH	★	1.1	.0433	9	50	3.0
04WNSB0120-TH	★	1.2	.0472	9	50	3.0
04WNSB0130-TH	★	1.3	.0512	10	50	3.0
04WNSB0140-TH	★	1.4	.0551	10	50	3.0
04WNSB0150-TH	★	1.5	.0591	12	50	3.0
04WNSB0160-TH	★	1.6	.0630	12	50	3.0
04WNSB0170-TH	★	1.7	.0669	14	50	3.0
04WNSB0180-TH	★	1.8	.0709	14	50	3.0
04WNSB0190-TH	★	1.9	.0748	16	50	3.0
04WNSB0200-TH	★	2.0	.0787	16	50	3.0
04WNSB0210-TH	★	2.1	.0827	17	50	3.0
04WNSB0220-TH	★	2.2	.0866	17	50	3.0
04WNSB0230-TH	★	2.3	.0906	17	50	3.0
04WNSB0240-TH	★	2.4	.0945	17	50	3.0
04WNSB0250-TH	★	2.5	.0984	17	50	3.0
04WNSB0260-TH	★	2.6	.1024	19	50	3.0
04WNSB0270-TH	★	2.7	.1063	19	50	3.0
04WNSB0280-TH	★	2.8	.1102	19	50	3.0
04WNSB0290-TH	★	2.9	.1142	19	50	3.0
04WNSB0300-TH	★	3.0	.1181	19	50	3.0
04WNSB0310-TH	★	3.1	.1221	23	58	4.0
04WNSB0320-TH	★	3.2	.1260	23	58	4.0
04WNSB0330-TH	★	3.3	.1299	23	58	4.0
04WNSB0340-TH	★	3.4	.1339	23	58	4.0
04WNSB0350-TH	★	3.5	.1378	23	58	4.0
04WNSB0360-TH	★	3.6	.1417	26	58	4.0
04WNSB0370-TH	★	3.7	.1457	26	58	4.0
04WNSB0380-TH	★	3.8	.1496	26	58	4.0
04WNSB0390-TH	★	3.9	.1535	26	58	4.0
04WNSB0400-TH	★	4.0	.1575	26	58	4.0
04WNSB0410-TH	★	4.1	.1614	29	64	5.0
04WNSB0420-TH	★	4.2	.1654	29	64	5.0
04WNSB0430-TH	★	4.3	.1693	29	64	5.0
04WNSB0440-TH	★	4.4	.1732	29	64	5.0
04WNSB0450-TH	★	4.5	.1772	29	64	5.0
04WNSB0460-TH	★	4.6	.1811	32	64	5.0
04WNSB0470-TH	★	4.7	.1850	32	64	5.0
04WNSB0480-TH	★	4.8	.1890	32	64	5.0
04WNSB0490-TH	★	4.9	.1929	32	64	5.0
04WNSB0500-TH	★	5.0	.1969	32	64	5.0
04WNSB0510-TH	★	5.1	.2008	36	78	6.0
04WNSB0520-TH	★	5.2	.2047	36	78	6.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
04WNSB0530-TH	★	5.3	.2087	36	78	6.0
04WNSB0540-TH	★	5.4	.2126	36	78	6.0
04WNSB0550-TH	★	5.5	.2165	36	78	6.0
04WNSB0560-TH	★	5.6	.2205	39	78	6.0
04WNSB0570-TH	★	5.7	.2244	39	78	6.0
04WNSB0580-TH	★	5.8	.2284	39	78	6.0
04WNSB0590-TH	★	5.9	.2323	39	78	6.0
04WNSB0600-TH	★	6.0	.2362	39	78	6.0
04WNSB0610-TH	★	6.1	.2402	41	83	7.0
04WNSB0620-TH	★	6.2	.2441	41	83	7.0
04WNSB0630-TH	★	6.3	.2480	41	83	7.0
04WNSB0640-TH	★	6.4	.2520	41	83	7.0
04WNSB0650-TH	★	6.5	.2559	41	83	7.0
04WNSB0660-TH	★	6.6	.2598	43	83	7.0
04WNSB0670-TH	★	6.7	.2638	43	83	7.0
04WNSB0680-TH	★	6.8	.2677	43	83	7.0
04WNSB0690-TH	★	6.9	.2717	43	83	7.0
04WNSB0700-TH	★	7.0	.2756	43	83	7.0
04WNSB0710-TH	★	7.1	.2795	45	90	8.0
04WNSB0720-TH	★	7.2	.2835	45	90	8.0
04WNSB0730-TH	★	7.3	.2874	45	90	8.0
04WNSB0740-TH	★	7.4	.2913	45	90	8.0
04WNSB0750-TH	★	7.5	.2953	45	90	8.0
04WNSB0760-TH	★	7.6	.2992	48	90	8.0
04WNSB0770-TH	★	7.7	.3032	48	90	8.0
04WNSB0780-TH	★	7.8	.3071	48	90	8.0
04WNSB0790-TH	★	7.9	.3110	48	90	8.0
04WNSB0800-TH	★	8.0	.3150	48	90	8.0
04WNSB0810-TH	★	8.1	.3189	52	96	9.0
04WNSB0820-TH	★	8.2	.3228	52	96	9.0
04WNSB0830-TH	★	8.3	.3268	52	96	9.0
04WNSB0840-TH	★	8.4	.3307	52	96	9.0
04WNSB0850-TH	★	8.5	.3347	52	96	9.0
04WNSB0860-TH	★	8.6	.3386	54	96	9.0
04WNSB0870-TH	★	8.7	.3425	54	96	9.0
04WNSB0880-TH	★	8.8	.3465	54	96	9.0
04WNSB0890-TH	★	8.9	.3504	54	96	9.0
04WNSB0900-TH	★	9.0	.3543	54	96	9.0
04WNSB0910-TH	★	9.1	.3583	57	104	10.0
04WNSB0920-TH	★	9.2	.3622	57	104	10.0
04WNSB0930-TH	★	9.3	.3661	57	104	10.0
04WNSB0940-TH	★	9.4	.3701	57	104	10.0
04WNSB0950-TH	★	9.5	.3740	57	104	10.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
04WNSB0960-TH	★	9.6	.3780	60	104	10.0
04WNSB0970-TH	★	9.7	.3819	60	104	10.0
04WNSB0980-TH	★	9.8	.3858	60	104	10.0
04WNSB0990-TH	★	9.9	.3898	60	104	10.0
04WNSB1000-TH	★	10.0	.3937	60	104	10.0
04WNSB1010-TH	★	10.1	.3976	63	112	11.0
04WNSB1020-TH	★	10.2	.4016	63	112	11.0
04WNSB1030-TH	★	10.3	.4055	63	112	11.0
04WNSB1040-TH	★	10.4	.4095	63	112	11.0
04WNSB1050-TH	★	10.5	.4134	63	112	11.0
04WNSB1060-TH	★	10.6	.4173	66	112	11.0
04WNSB1070-TH	★	10.7	.4213	66	112	11.0
04WNSB1080-TH	★	10.8	.4252	66	112	11.0
04WNSB1090-TH	★	10.9	.4291	66	112	11.0
04WNSB1100-TH	★	11.0	.4331	66	112	11.0
04WNSB1110-TH	★	11.1	.4370	71	121	12.0
04WNSB1120-TH	★	11.2	.4409	71	121	12.0
04WNSB1130-TH	★	11.3	.4449	71	121	12.0
04WNSB1140-TH	★	11.4	.4488	71	121	12.0
04WNSB1150-TH	★	11.5	.4528	71	121	12.0
04WNSB1160-TH	★	11.6	.4567	73	121	12.0
04WNSB1170-TH	★	11.7	.4606	73	121	12.0
04WNSB1180-TH	★	11.8	.4646	73	121	12.0
04WNSB1190-TH	★	11.9	.4685	73	121	12.0
04WNSB1200-TH	★	12.0	.4724	73	121	12.0
04WNSB1210-TH	★	12.1	.4764	76	128	13.0
04WNSB1220-TH	★	12.2	.4803	76	128	13.0
04WNSB1230-TH	★	12.3	.4843	76	128	13.0
04WNSB1240-TH	★	12.4	.4882	76	128	13.0
04WNSB1250-TH	★	12.5	.4921	76	128	13.0
04WNSB1260-TH	★	12.6	.4961	76	128	13.0
04WNSB1270-TH	★	12.7	.5000	76	128	13.0
04WNSB1280-TH	★	12.8	.5039	76	128	13.0
04WNSB1290-TH	★	12.9	.5079	76	128	13.0
04WNSB1300-TH	★	13.0	.5118	76	128	13.0

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	◎	◎	◎				○	○		

Carbide Non Step Borer 2D・4D

Recommended cutting conditions

02WNSB-TH 04WNSB-TH

Work material		Structural steel (~180HB)						Carbon steel (~200HB)						Alloy steel (~30HRC)					
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		70~100~150			70~100~150			70~100~150			70~100~150			70~100~150			50~80~130		
SFM		230~328~492			230~328~492			230~328~492			230~328~492			230~328~492			164~262~427		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ1.0mm	22,000	mm/rev.	0.03~0.06	22,000	mm/rev.	0.03~0.06	22,000	mm/rev.	0.03~0.06	22,000	mm/rev.	0.03~0.06	22,000	mm/rev.	0.03~0.05	16,000	mm/rev.	0.03~0.05
Inch	.0394		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.001 ~ .002
Metric	ϕ2.0	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.08	12,800	mm/rev.	0.05~0.08
Inch	.0787		IPR	.002 ~ .004		IPR	.002 ~ .004		IPR	.002 ~ .004		IPR	.002 ~ .004		IPR	.002 ~ .003		IPR	.002 ~ .003
Metric	ϕ4.0	8,000	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	6,400	mm/rev.	0.1~0.16
Inch	.1575		IPR	.004 ~ .006		IPR	.004 ~ .006		IPR	.004 ~ .006		IPR	.004 ~ .006		IPR	.004 ~ .006		IPR	.004 ~ .006
Metric	ϕ6.0	5,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	4,300	mm/rev.	0.15~0.24
Inch	.2362		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.006 ~ .009
Metric	ϕ8.0	4,000	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	3,200	mm/rev.	0.18~0.3
Inch	.3150		IPR	.007 ~ .012		IPR	.007 ~ .012		IPR	.007 ~ .012		IPR	.007 ~ .012		IPR	.007 ~ .012		IPR	.007 ~ .012
Metric	ϕ10.0	3,200	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	2,550	mm/rev.	0.2~0.35
Inch	.3937		IPR	.008 ~ .014		IPR	.008 ~ .014		IPR	.008 ~ .014		IPR	.008 ~ .014		IPR	.008 ~ .014		IPR	.008 ~ .014
Metric	ϕ12.0	2,650	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4	2,100	mm/rev.	0.22~0.4
Inch	.4724		IPR	.009 ~ .016		IPR	.009 ~ .016		IPR	.009 ~ .016		IPR	.009 ~ .016		IPR	.009 ~ .016		IPR	.009 ~ .016

Work material		Alloy steel (~30HRC) , Pre-hardened steel (~40HRC)						Pre-hardened steel		
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant		
m/min		30~50~80			20~40~60			20~30~40		
SFM		98~164~262			66~131~197			66~98~131		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ1.0mm	9,500	mm/rev.	0.02~0.04	6,300	mm/rev.	0.02~0.04	6,300	mm/rev.	0.01~0.03
Inch	.0394		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.0004 ~ .001
Metric	ϕ2.0	8,000	mm/rev.	0.04~0.07	6,400	mm/rev.	0.04~0.07	4,800	mm/rev.	0.03~0.05
Inch	.0787		IPR	.002 ~ .003		IPR	.002 ~ .003		IPR	.001 ~ .002
Metric	ϕ4.0	4,000	mm/rev.	0.08~0.13	3,200	mm/rev.	0.08~0.13	2,400	mm/rev.	0.05~0.1
Inch	.1575		IPR	.003 ~ .005		IPR	.003 ~ .005		IPR	.002 ~ .004
Metric	ϕ6.0	2,650	mm/rev.	0.12~0.19	2,100	mm/rev.	0.12~0.19	1,600	mm/rev.	0.08~0.14
Inch	.2362		IPR	.005 ~ .007		IPR	.005 ~ .007		IPR	.003 ~ .006
Metric	ϕ8.0	2,000	mm/rev.	0.14~0.24	1,600	mm/rev.	0.14~0.24	1,200	mm/rev.	0.12~0.18
Inch	.3150		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.005 ~ .007
Metric	ϕ10.0	1,600	mm/rev.	0.16~0.28	1,250	mm/rev.	0.16~0.28	1,000	mm/rev.	0.15~0.2
Inch	.3937		IPR	.006 ~ .011		IPR	.006 ~ .011		IPR	.006 ~ .008
Metric	ϕ12.0	1,300	mm/rev.	0.18~0.32	1,050	mm/rev.	0.18~0.32	800	mm/rev.	0.17~0.24
Inch	.4724		IPR	.007 ~ .013		IPR	.007 ~ .013		IPR	.007 ~ .009

Work material		Ductile iron						Casting					
vc Cutting speed		Internal coolant			MQL (mist)			Internal coolant			MQL (mist)		
m/min		50~80~130			50~80~130			70~100~150			70~100~150		
SFM		164~262~427			164~262~427			230~328~492			230~328~492		
Tool dia.		*n* (min^{-1})	*f*		*n* (min^{-1})	*f*		*n* (min^{-1})	*f*		*n* (min^{-1})	*f*	
Metric	ϕ1.0mm	16,000	mm/rev.	0.03~0.06	16,000	mm/rev.	0.03~0.06	22,000	mm/rev.	0.03~0.06	22,000	mm/rev.	0.03~0.06
Inch	.0394		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.001 ~ .002		IPR	.001 ~ .002
Metric	ϕ2.0	12,800	mm/rev.	0.05~0.1	12,800	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1	16,000	mm/rev.	0.05~0.1
Inch	.0787		IPR	.002 ~ .004		IPR	.002 ~ .004		IPR	.002 ~ .004		IPR	.002 ~ .004
Metric	ϕ4.0	6,400	mm/rev.	0.1~0.16	6,400	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16	8,000	mm/rev.	0.1~0.16
Inch	.1575		IPR	.004 ~ .006		IPR	.004 ~ .006		IPR	.004 ~ .006		IPR	.004 ~ .006
Metric	ϕ6.0	4,300	mm/rev.	0.15~0.24	4,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24	5,300	mm/rev.	0.15~0.24
Inch	.2362		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.006 ~ .009		IPR	.006 ~ .009
Metric	ϕ8.0	3,200	mm/rev.	0.18~0.3	3,200	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3	4,000	mm/rev.	0.18~0.3
Inch	.3150		IPR	.007 ~ .012		IPR	.007 ~ .012		IPR	.007 ~ .012		IPR	.007 ~ .012
Metric	ϕ10.0	2,550	mm/rev.	0.2~0.35	2,550	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35	3,200	mm/rev.	0.2~0.35
Inch	.3937		IPR	.008 ~ .014		IPR	.008 ~ .014		IPR	.008 ~ .014		IPR	.008 ~ .014
Metric	ϕ12.0	2,100	mm/rev.	0.22~0.4	2,100	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4	2,650	mm/rev.	0.22~0.4
Inch	.4724		IPR	.009 ~ .016		IPR	.009 ~ .016		IPR	.009 ~ .016		IPR	.009 ~ .016

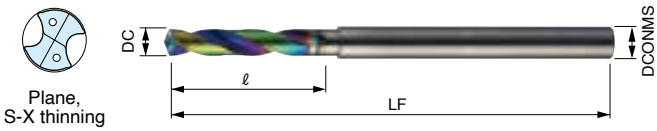
【Setting of Cutting Conditions】

※ Use the appropriate coolant for the work material and machining shape.
※ These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
※ The above cutting conditions are based on the use of a water-soluble coolant.
※ When performing MQL (mist) machining, depending on the amount or status of spray from the tool, the piping route, etc., it may be necessary to reduce the cutting speed in order to perform machining.
※ When changing the tool, use a collet free from flaws and stains, and attach the tool firmly so that its runout is 0.02mm or less.
※ The above conditions apply to a hole-depth of 4 times the diameter or less.
※ When cutting fluid is used, reduce the cutting speed to 70% of the lowest speed.
※ Adjust the cutting conditions according to work gripping conditions and rigidity of the machine.
※ You can use borers at a revolution speed lower than the above values.

Carbide Oil Hole Non Step Borer for Aluminium (3D)

Drilling | Carbide | SD | 135° | Normal helix 21°~34° | Integral no. shank | 3D

h8 | Shank tolerance: 0 ~ −0.01mm (0 ~ −.0004 inch)



03WHNSB○○○○-SD

Cutting Conditions F47

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHNSB0300-SD	★	3.0	.1181	19	69	3.0
03WHNSB0303-SD	★	3.03	.1193	23	73	4.0
03WHNSB0310-SD		3.1	.1221	23	73	4.0
03WHNSB0320-SD		3.2	.1260	23	73	4.0
03WHNSB0330-SD		3.3	.1299	23	73	4.0
03WHNSB0340-SD		3.4	.1339	23	73	4.0
03WHNSB0350-SD		3.5	.1378	23	73	4.0
03WHNSB0353-SD		3.53	.1390	23	73	4.0
03WHNSB0360-SD		3.6	.1417	23	73	4.0
03WHNSB0370-SD		3.7	.1457	23	73	4.0
03WHNSB0380-SD		3.8	.1496	23	73	4.0
03WHNSB0390-SD		3.9	.1535	23	73	4.0
03WHNSB0400-SD	★	4.0	.1575	23	73	4.0
03WHNSB0403-SD	★	4.03	.1587	29	82	5.0
03WHNSB0410-SD		4.1	.1614	29	82	5.0
03WHNSB0420-SD		4.2	.1654	29	82	5.0
03WHNSB0430-SD		4.3	.1693	29	82	5.0
03WHNSB0440-SD		4.4	.1732	29	82	5.0
03WHNSB0450-SD		4.5	.1772	29	82	5.0
03WHNSB0453-SD		4.53	.1784	29	82	5.0
03WHNSB0460-SD		4.6	.1811	29	82	5.0
03WHNSB0470-SD		4.7	.1850	29	82	5.0
03WHNSB0480-SD		4.8	.1890	29	82	5.0
03WHNSB0490-SD		4.9	.1929	29	82	5.0
03WHNSB0500-SD	★	5.0	.1969	29	82	5.0
03WHNSB0503-SD	★	5.03	.1980	29	82	6.0
03WHNSB0510-SD	★	5.1	.2008	29	82	6.0
03WHNSB0520-SD		5.2	.2047	29	82	6.0
03WHNSB0530-SD		5.3	.2087	29	82	6.0
03WHNSB0540-SD		5.4	.2126	29	82	6.0
03WHNSB0550-SD	★	5.5	.2165	29	82	6.0
03WHNSB0553-SD	★	5.53	.2177	29	82	6.0
03WHNSB0560-SD		5.6	.2205	29	82	6.0
03WHNSB0570-SD		5.7	.2244	29	82	6.0
03WHNSB0580-SD		5.8	.2284	29	82	6.0
03WHNSB0590-SD		5.9	.2323	29	82	6.0
03WHNSB0600-SD	★	6.0	.2362	29	82	6.0
03WHNSB0603-SD	★	6.03	.2374	34	89	7.0
03WHNSB0610-SD		6.1	.2402	34	89	7.0
03WHNSB0620-SD		6.2	.2441	34	89	7.0
03WHNSB0630-SD		6.3	.2480	34	89	7.0
03WHNSB0640-SD		6.4	.2520	34	89	7.0
03WHNSB0650-SD	★	6.5	.2559	34	89	7.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHNSB0653-SD	★	6.53	.2571	34	89	7.0
03WHNSB0660-SD		6.6	.2598	34	89	7.0
03WHNSB0670-SD		6.7	.2638	34	89	7.0
03WHNSB0680-SD	★	6.8	.2677	34	89	7.0
03WHNSB0690-SD		6.9	.2717	34	89	7.0
03WHNSB0700-SD	★	7.0	.2756	34	89	7.0
03WHNSB0703-SD	★	7.03	.2768	39	95	8.0
03WHNSB0710-SD		7.1	.2795	39	95	8.0
03WHNSB0720-SD		7.2	.2835	39	95	8.0
03WHNSB0730-SD	★	7.3	.2874	39	95	8.0
03WHNSB0740-SD		7.4	.2913	39	95	8.0
03WHNSB0750-SD	★	7.5	.2953	39	95	8.0
03WHNSB0753-SD	★	7.53	.2965	39	95	8.0
03WHNSB0760-SD		7.6	.2992	39	95	8.0
03WHNSB0770-SD		7.7	.3032	39	95	8.0
03WHNSB0780-SD		7.8	.3071	39	95	8.0
03WHNSB0790-SD		7.9	.3110	39	95	8.0
03WHNSB0800-SD	★	8.0	.3150	39	95	8.0
03WHNSB0803-SD	★	8.03	.3161	44	101	9.0
03WHNSB0810-SD		8.1	.3189	44	101	9.0
03WHNSB0820-SD		8.2	.3228	44	101	9.0
03WHNSB0830-SD		8.3	.3268	44	101	9.0
03WHNSB0840-SD		8.4	.3307	44	101	9.0
03WHNSB0850-SD	★	8.5	.3347	44	101	9.0
03WHNSB0853-SD	★	8.53	.3358	44	101	9.0
03WHNSB0860-SD	★	8.6	.3386	44	101	9.0
03WHNSB0870-SD		8.7	.3425	44	101	9.0
03WHNSB0880-SD	★	8.8	.3465	44	101	9.0
03WHNSB0890-SD		8.9	.3504	44	101	9.0
03WHNSB0900-SD	★	9.0	.3543	44	101	9.0
03WHNSB0903-SD	★	9.03	.3555	49	107	10.0
03WHNSB0910-SD		9.1	.3583	49	107	10.0
03WHNSB0920-SD		9.2	.3622	49	107	10.0
03WHNSB0930-SD		9.3	.3661	49	107	10.0
03WHNSB0940-SD		9.4	.3701	49	107	10.0
03WHNSB0950-SD	★	9.5	.3740	49	107	10.0
03WHNSB0953-SD	★	9.53	.3752	49	107	10.0
03WHNSB0960-SD		9.6	.3780	49	107	10.0
03WHNSB0970-SD		9.7	.3819	49	107	10.0
03WHNSB0980-SD		9.8	.3858	49	107	10.0
03WHNSB0990-SD		9.9	.3898	49	107	10.0
03WHNSB1000-SD	★	10.0	.3937	49	107	10.0
03WHNSB1003-SD	★	10.03	.3949	54	117	11.0

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
											◎	◎

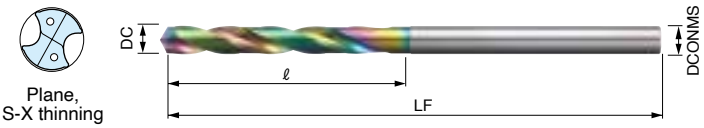
★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer for Aluminium (5D)

Drilling | Carbide | SD | 135° | Normal helix 21°~34° | Integral no. shank | ~5D

h8

Shank tolerance: 0 ~ −0.01mm (0 ~ −.0004 inch)



05WHNSB○○○○-SD

Cutting Conditions F47

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
05WHNSB0200-SD	★	2.0	.0787	20	66	3.0
05WHNSB0203-SD	★	2.03	.0799	24	74	3.0
05WHNSB0210-SD	★	2.1	.0827	24	74	3.0
05WHNSB0220-SD	★	2.2	.0866	24	74	3.0
05WHNSB0230-SD	★	2.3	.0906	24	74	3.0
05WHNSB0240-SD	★	2.4	.0945	24	74	3.0
05WHNSB0250-SD	★	2.5	.0984	24	74	3.0
05WHNSB0253-SD	★	2.53	.0996	29	79	3.0
05WHNSB0260-SD	★	2.6	.1024	29	79	3.0
05WHNSB0270-SD	★	2.7	.1063	29	79	3.0
05WHNSB0280-SD	★	2.8	.1102	29	79	3.0
05WHNSB0290-SD	★	2.9	.1142	29	79	3.0
05WHNSB0300-SD	★	3.0	.1181	29	79	3.0
05WHNSB0303-SD	★	3.03	.1193	37	87	4.0
05WHNSB0310-SD		3.1	.1221	37	87	4.0
05WHNSB0320-SD		3.2	.1260	37	87	4.0
05WHNSB0330-SD		3.3	.1299	37	87	4.0
05WHNSB0340-SD		3.4	.1339	37	87	4.0
05WHNSB0350-SD	★	3.5	.1378	37	87	4.0
05WHNSB0353-SD	★	3.53	.1390	37	87	4.0
05WHNSB0360-SD		3.6	.1417	37	87	4.0
05WHNSB0370-SD		3.7	.1457	37	87	4.0
05WHNSB0380-SD		3.8	.1496	37	87	4.0
05WHNSB0390-SD		3.9	.1535	37	87	4.0
05WHNSB0400-SD	★	4.0	.1575	37	87	4.0
05WHNSB0403-SD	★	4.03	.1587	47	100	5.0
05WHNSB0410-SD	★	4.1	.1614	47	100	5.0
05WHNSB0420-SD	★	4.2	.1654	47	100	5.0
05WHNSB0430-SD	★	4.3	.1693	47	100	5.0
05WHNSB0440-SD		4.4	.1732	47	100	5.0
05WHNSB0450-SD	★	4.5	.1772	47	100	5.0
05WHNSB0453-SD	★	4.53	.1784	47	100	5.0
05WHNSB0460-SD		4.6	.1811	47	100	5.0
05WHNSB0470-SD		4.7	.1850	47	100	5.0
05WHNSB0480-SD		4.8	.1890	47	100	5.0
05WHNSB0490-SD		4.9	.1929	47	100	5.0
05WHNSB0500-SD	★	5.0	.1969	47	100	5.0
05WHNSB0503-SD	★	5.03	.1980	47	100	6.0
05WHNSB0510-SD	★	5.1	.2008	47	100	6.0
05WHNSB0520-SD		5.2	.2047	47	100	6.0
05WHNSB0530-SD		5.3	.2087	47	100	6.0
05WHNSB0540-SD		5.4	.2126	47	100	6.0
05WHNSB0550-SD	★	5.5	.2165	47	100	6.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
05WHNSB0553-SD	★	5.53	.2177	47	100	6.0
05WHNSB0560-SD		5.6	.2205	47	100	6.0
05WHNSB0570-SD		5.7	.2244	47	100	6.0
05WHNSB0580-SD		5.8	.2284	47	100	6.0
05WHNSB0590-SD		5.9	.2323	47	100	6.0
05WHNSB0600-SD	★	6.0	.2362	47	100	6.0
05WHNSB0603-SD	★	6.03	.2374	55	110	7.0
05WHNSB0610-SD		6.1	.2402	55	110	7.0
05WHNSB0620-SD		6.2	.2441	55	110	7.0
05WHNSB0630-SD		6.3	.2480	55	110	7.0
05WHNSB0640-SD		6.4	.2520	55	110	7.0
05WHNSB0650-SD	★	6.5	.2559	55	110	7.0
05WHNSB0653-SD	★	6.53	.2571	55	110	7.0
05WHNSB0660-SD		6.6	.2598	55	110	7.0
05WHNSB0670-SD		6.7	.2638	55	110	7.0
05WHNSB0680-SD	★	6.8	.2677	55	110	7.0
05WHNSB0690-SD		6.9	.2717	55	110	7.0
05WHNSB0700-SD	★	7.0	.2756	55	110	7.0
05WHNSB0703-SD	★	7.03	.2768	63	119	8.0
05WHNSB0710-SD		7.1	.2795	63	119	8.0
05WHNSB0720-SD		7.2	.2835	63	119	8.0
05WHNSB0730-SD		7.3	.2874	63	119	8.0
05WHNSB0740-SD		7.4	.2913	63	119	8.0
05WHNSB0750-SD	★	7.5	.2953	63	119	8.0
05WHNSB0753-SD	★	7.53	.2965	63	119	8.0
05WHNSB0760-SD		7.6	.2992	63	119	8.0
05WHNSB0770-SD		7.7	.3032	63	119	8.0
05WHNSB0780-SD	★	7.8	.3071	63	119	8.0
05WHNSB0790-SD		7.9	.3110	63	119	8.0
05WHNSB0800-SD	★	8.0	.3150	63	119	8.0
05WHNSB0803-SD	★	8.03	.3161	71	128	9.0
05WHNSB0810-SD		8.1	.3189	71	128	9.0
05WHNSB0820-SD		8.2	.3228	71	128	9.0
05WHNSB0830-SD		8.3	.3268	71	128	9.0
05WHNSB0840-SD		8.4	.3307	71	128	9.0
05WHNSB0850-SD	★	8.5	.3347	71	128	9.0
05WHNSB0853-SD	★	8.53	.3358	71	128	9.0
05WHNSB0860-SD	★	8.6	.3386	71	128	9.0
05WHNSB0870-SD		8.7	.3425	71	128	9.0
05WHNSB0880-SD	★	8.8	.3465	71	128	9.0
05WHNSB0890-SD		8.9	.3504	71	128	9.0
05WHNSB0900-SD	★	9.0	.3543	71	128	9.0
05WHNSB0903-SD	★	9.03	.3555	79	137	10.0

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flutel length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
05WHNSB0910-SD		9.1	.3583	79	137	10.0
05WHNSB0920-SD		9.2	.3622	79	137	10.0
05WHNSB0930-SD		9.3	.3661	79	137	10.0
05WHNSB0940-SD		9.4	.3701	79	137	10.0
05WHNSB0950-SD	★	9.5	.3740	79	137	10.0
05WHNSB0953-SD	★	9.53	.3752	79	137	10.0
05WHNSB0960-SD		9.6	.3780	79	137	10.0
05WHNSB0970-SD		9.7	.3819	79	137	10.0
05WHNSB0980-SD	★	9.8	.3858	79	137	10.0
05WHNSB0990-SD		9.9	.3898	79	137	10.0
05WHNSB1000-SD	★	10.0	.3937	79	137	10.0
05WHNSB1003-SD	★	10.03	.3949	87	150	11.0

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
											◎	◎

Carbide Oil Hole Non Step Borer for Aluminium (15~30D)

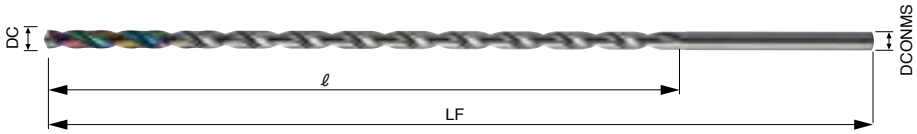
Drilling | Carbide | SD | 130° | Normal helix 21°~34° | Integral no. shank | Cutting Conditions F47

Dia. tolerance

φ3	:	0～−0.014mm (	0～−.0006 inch)
φ3.5～φ6	:	0～−0.018mm (	0～−.0007 inch)
φ6.5	:	0～−0.022mm (	0～−.0009 inch)
φ6.8	:	−0.024～−0.045mm (−.0009 inch	～−.0018 inch)
φ7～φ8.5	:	0～−0.022mm (	0～−.0009 inch)
φ8.6	:	−0.024～−0.045mm (−.0009 inch	～−.0018 inch)
φ9～φ10	:	0～−0.022mm (	0～−.0009 inch)

h6

Plane,
S-X thinning



15WHNSB○○○○-SD

~15D

Item code	Stock	Size				
		Tool dia.		Flute length	Overall length	Shank dia.
		DC (mm)	DC (inch)	ℓ (mm)	LF (mm)	DCONMS (mm)
15WHNSB0300-SD	★	3.0	.1181	54	102	3.0
15WHNSB0350-SD		3.5	.1378	63	111	4.0
15WHNSB0400-SD	★	4.0	.1575	72	121	4.0
15WHNSB0450-SD		4.5	.1772	81	132	5.0
15WHNSB0500-SD	★	5.0	.1969	91	142	5.0
15WHNSB0550-SD	★	5.5	.2165	100	151	6.0
15WHNSB0600-SD	★	6.0	.2362	109	160	6.0
15WHNSB0650-SD		6.5	.2559	118	171	7.0
15WHNSB0680-SD		6.8	.2677	127	180	7.0
15WHNSB0700-SD	★	7.0	.2756	127	180	7.0
15WHNSB0750-SD		7.5	.2953	136	191	8.0
15WHNSB0800-SD	★	8.0	.3150	145	200	8.0
15WHNSB0850-SD		8.5	.3347	154	209	9.0
15WHNSB0860-SD		8.6	.3386	163	218	9.0
15WHNSB0900-SD	★	9.0	.3543	163	218	9.0
15WHNSB0950-SD		9.5	.3740	172	227	10.0
15WHNSB1000-SD	★	10.0	.3937	181	236	10.0

20WHNSB○○○○-SD

~20D

Item code	Stock	Size				
		Tool dia.		Flute length	Overall length	Shank dia.
		DC (mm)	DC (inch)	ℓ (mm)	LF (mm)	DCONMS (mm)
20WHNSB0300-SD	★	3.0	.1181	69	117	3.0
20WHNSB0350-SD		3.5	.1378	81	129	4.0
20WHNSB0400-SD	★	4.0	.1575	92	141	4.0
20WHNSB0450-SD		4.5	.1772	104	155	5.0
20WHNSB0500-SD	★	5.0	.1969	116	167	5.0
20WHNSB0550-SD	★	5.5	.2165	127	178	6.0
20WHNSB0600-SD	★	6.0	.2362	139	190	6.0
20WHNSB0650-SD		6.5	.2559	150	203	7.0
20WHNSB0680-SD		6.8	.2677	162	215	7.0
20WHNSB0700-SD	★	7.0	.2756	162	215	7.0
20WHNSB0750-SD		7.5	.2953	173	228	8.0
20WHNSB0800-SD	★	8.0	.3150	185	240	8.0

25WHNSB○○○○-SD

~25D

Item code	Stock	Size				
		Tool dia.		Flute length	Overall length	Shank dia.
		DC (mm)	DC (inch)	ℓ (mm)	LF (mm)	DCONMS (mm)
25WHNSB0300-SD	★	3.0	.1181	84	132	3.0
25WHNSB0350-SD		3.5	.1378	98	146	4.0
25WHNSB0400-SD	★	4.0	.1575	113	162	4.0
25WHNSB0450-SD		4.5	.1772	127	178	5.0
25WHNSB0500-SD	★	5.0	.1969	141	192	5.0
25WHNSB0550-SD	★	5.5	.2165	155	206	6.0
25WHNSB0600-SD	★	6.0	.2362	169	220	6.0
25WHNSB0650-SD		6.5	.2559	183	236	7.0
25WHNSB0680-SD		6.8	.2677	191	244	7.0
25WHNSB0700-SD	★	7.0	.2756	197	250	7.0
25WHNSB0750-SD		7.5	.2953	211	266	8.0
25WHNSB0800-SD	★	8.0	.3150	225	280	8.0

30WHNSB○○○○-SD

~30D

Item code	Stock	Size				
		Tool dia.		Flute length	Overall length	Shank dia.
		DC (mm)	DC (inch)	ℓ (mm)	LF (mm)	DCONMS (mm)
30WHNSB0300-SD	★	3.0	.1181	99	147	3.0
30WHNSB0350-SD		3.5	.1378	116	164	4.0
30WHNSB0400-SD	★	4.0	.1575	132	181	4.0
30WHNSB0450-SD		4.5	.1772	149	200	5.0
30WHNSB0500-SD	★	5.0	.1969	166	217	5.0
30WHNSB0550-SD	★	5.5	.2165	182	233	6.0
30WHNSB0600-SD	★	6.0	.2362	199	250	6.0

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
											◎	◎

★ : Inventory maintained in Japan　No Mark : Manufactured upon request only

Carbide Oil Hole Non Step Borer for Aluminium

Recommended cutting conditions

03WHNSB-SD **05WHNSB-SD**

15WHNSB-SD **20WHNSB-SD** **25WHNSB-SD** **30WHNSB-SD**

Work material		Aluminium alloy material Mg(5052)				Aluminium alloy material Zn-Mg(7075)				Cast aluminium alloy material AC・ADC				Copper alloy			
Tool dia.		*vc*		*f*		*vc*		*f*		*vc*		*f*		*vc*		*f*	
Metric	ϕ2.0	m/min	80~180	mm/rev.	0.04~0.08	m/min	60~150	mm/rev.	0.06~0.10	m/min	80~160	mm/rev.	0.06~0.10	m/min	60~150	mm/rev.	0.04~0.08
Inch	.0787	SFM	262~591	in/rev	.002~.003	SFM	197~492	in/rev	.002~.004	SFM	262~525	in/rev	.002~.004	SFM	197~492	in/rev	.002~.003
Metric	ϕ4.0	m/min	80~200	mm/rev.	0.08~0.16	m/min	60~150	mm/rev.	0.12~0.20	m/min	80~160	mm/rev.	0.12~0.20	m/min	60~150	mm/rev.	0.08~0.16
Inch	.1575	SFM	262~656	in/rev	.003~.006	SFM	197~492	in/rev	.005~.008	SFM	262~525	in/rev	.005~.008	SFM	197~492	in/rev	.003~.006
Metric	ϕ6.0	m/min	80~200	mm/rev.	0.12~0.24	m/min	80~180	mm/rev.	0.18~0.30	m/min	80~180	mm/rev.	0.18~0.30	m/min	80~180	mm/rev.	0.12~0.24
Inch	.2362	SFM	262~656	in/rev	.005~.009	SFM	262~591	in/rev	.007~.012	SFM	262~591	in/rev	.007~.012	SFM	262~591	in/rev	.005~.009
Metric	ϕ8.0	m/min	80~200	mm/rev.	0.16~0.30	m/min	80~180	mm/rev.	0.24~0.40	m/min	80~180	mm/rev.	0.24~0.40	m/min	80~180	mm/rev.	0.16~0.30
Inch	.315	SFM	262~656	in/rev	.006~.012	SFM	262~591	in/rev	.009~.016	SFM	262~591	in/rev	.009~.016	SFM	262~591	in/rev	.006~.012
Metric	ϕ10.0	m/min	80~200	mm/rev.	0.18~0.35	m/min	80~180	mm/rev.	0.25~0.50	m/min	80~200	mm/rev.	0.25~0.50	m/min	80~180	mm/rev.	0.18~0.35
Inch	.3937	SFM	262~656	in/rev	.007~.014	SFM	262~591	in/rev	.01~.02	SFM	262~656	in/rev	.01~.02	SFM	262~591	in/rev	.007~.014

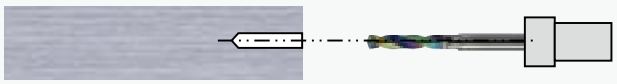
【Setting of Cutting Conditions】

- Use the appropriate coolant for the work material and machining shape.
- These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- Internal coolant cutting condition standards above are when water-soluble cutting lubricant is used. In addition, for ϕ5.0 or less, coolant pressure of 2.0MPa or more is required.
- For MQL (mist) machining, depending on the mist equipment and amount discharged by the tool, it may be necessary to reduce cutting speed in order to perform machining.
- For MQL (mist) machining of A7075, please consult us.
- When mounting the tool, use a collet without scratches or stains and suppress tool run out to 0.02mm or less.

How to use 15~30WHNSB-SD

1 Drilling of pilot hole (guide hole) (03~05WHNSB-SD)

●Machining depth : tool diameter ×2.0~4.0 times

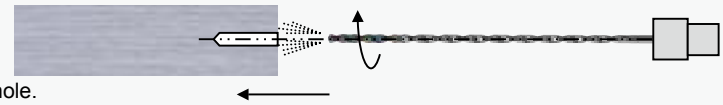


2 Supplying coolant during low-speed revolution (15~30WHNSB-SD)

●Leading to the guide hole at low speed (n=0~500 min^{-1})

●Stop feed 2.0~5.0 mm before the end of the guide hole.

※When a long tool (200mm or longer) is used, position the tool to the guide hole at low revolution speed (n=200min^{-1} or less).



3 High-speed revolution for drilling feed (15~30WHNSB-SD)

●After confirming that the revolution speed is increasing at the specified rate, start feeding.

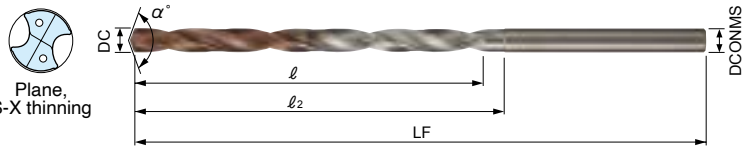
4 Machining completion

●Withdraw the tool at low speed. (n=0~500 min^{-1})

Carbide Oil Hole Non Step Borer H for High Hardness Material

Drilling | Carbide | ATH | 135° | 140° | Low helix 18°~22° | End mill shank

Dia. tolerance: Refer to right table | h6



■ Tool dia. tolerance -NSBH-ATH

Tool dia.	mm	2.0≦DC≦6.0	6.0<DC≦10.0	10.0<DC≦12.0
	inch	.0787≦DC≦.2362	.2362<DC≦.3937	.3937<DC≦.4724
Tolerance		+0.012	+0.015	+0.015
		+.0005"	+.0006"	+.0006"
		0mm	0mm	−0.003mm
		.0"	.0"	−.0001"

NSBH○○○○-○○○-ATH

Hole depth should be set to "under flute length-2xDC" as a general rule.

Cutting Conditions F53

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0200-10-ATH	★	2.0	.0787	10	60	14	4	140
NSBH0200-20-ATH	★			20	70	24	4	140
NSBH0200-40-ATH	★			40	90	44	4	135
NSBH0200-60-ATH	★			60	110	64	4	135
NSBH0210-10-ATH	★	2.1	.0827	10	60	14	4	140
NSBH0210-20-ATH				20	70	24	4	135
NSBH0210-40-ATH				40	90	44	4	135
NSBH0210-60-ATH				60	110	64	4	135
NSBH0220-10-ATH	★	2.2	.0866	10	60	14	4	140
NSBH0220-20-ATH				20	70	24	4	135
NSBH0220-40-ATH				40	90	44	4	135
NSBH0220-60-ATH				60	110	64	4	135
NSBH0230-10-ATH	★	2.3	.0906	10	60	14	4	140
NSBH0230-20-ATH				20	70	24	4	135
NSBH0230-40-ATH				40	90	44	4	135
NSBH0230-60-ATH				60	110	64	4	135
NSBH0240-10-ATH	★	2.4	.0945	10	60	14	4	140
NSBH0240-20-ATH				20	70	24	4	135
NSBH0240-40-ATH				40	90	44	4	135
NSBH0240-60-ATH				60	110	64	4	135
NSBH0250-10-ATH	★	2.5	.0984	10	60	14	4	140
NSBH0250-20-ATH	★			20	70	24	4	135
NSBH0250-40-ATH				40	90	44	4	135
NSBH0250-60-ATH				60	110	64	4	135
NSBH0260-10-ATH	★	2.6	.1024	10	60	14	4	140
NSBH0260-20-ATH	★			20	70	24	4	135
NSBH0260-40-ATH				40	90	44	4	135
NSBH0260-60-ATH				60	110	64	4	135
NSBH0270-10-ATH	★	2.7	.1063	10	60	14	4	140
NSBH0270-20-ATH				20	70	24	4	135
NSBH0270-40-ATH				40	90	44	4	135
NSBH0270-60-ATH				60	110	64	4	135
NSBH0280-10-ATH	★	2.8	.1102	10	60	14	4	140
NSBH0280-20-ATH				20	70	24	4	135
NSBH0280-40-ATH				40	90	44	4	135
NSBH0280-60-ATH				60	110	64	4	135
NSBH0290-10-ATH	★	2.9	.1142	10	60	14	4	140
NSBH0290-20-ATH				20	70	24	4	135
NSBH0290-40-ATH				40	90	44	4	135
NSBH0290-60-ATH				60	110	64	4	135
NSBH0300-20-ATH	★	3.0	.1181	20	70	23	4	140
NSBH0300-40-ATH	★			40	90	43	4	135
NSBH0300-60-ATH	★			60	110	63	4	135
NSBH0300-90-ATH	★			90	140	93	4	135
NSBH0310-20-ATH		3.1	.1221	20	70	23	4	140
NSBH0310-40-ATH				40	90	43	4	135
NSBH0310-60-ATH				60	110	63	4	135
NSBH0310-90-ATH				90	140	93	4	135
NSBH0320-20-ATH	★	3.2	.1260	20	70	23	4	140
NSBH0320-40-ATH	★			40	90	43	4	135
NSBH0320-60-ATH				60	110	63	4	135
NSBH0320-90-ATH				90	140	93	4	135
NSBH0330-20-ATH	★	3.3	.1299	20	70	23	4	140
NSBH0330-40-ATH	★			40	90	43	4	135
NSBH0330-60-ATH				60	110	63	4	135
NSBH0330-90-ATH				90	140	93	4	135

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0340-20-ATH	★	3.4	.1339	20	70	23	4	140
NSBH0340-40-ATH	★			40	90	43	4	135
NSBH0340-60-ATH				60	110	63	4	135
NSBH0340-90-ATH				90	140	93	4	135
NSBH0350-20-ATH		3.5	.1378	20	70	23	4	140
NSBH0350-40-ATH				40	90	43	4	135
NSBH0350-60-ATH				60	110	63	4	135
NSBH0350-90-ATH				90	140	93	4	135
NSBH0360-20-ATH		3.6	.1417	20	70	23	4	140
NSBH0360-40-ATH				40	90	43	4	135
NSBH0360-60-ATH				60	110	63	4	135
NSBH0360-90-ATH				90	140	93	4	135
NSBH0360-120-ATH				120	170	123	4	135
NSBH0370-20-ATH		3.7	.1457	20	70	23	4	140
NSBH0370-40-ATH				40	90	43	4	135
NSBH0370-60-ATH				60	110	63	4	135
NSBH0370-90-ATH				90	140	93	4	135
NSBH0370-120-ATH				120	170	123	4	135
NSBH0380-20-ATH		3.8	.1496	20	70	23	4	140
NSBH0380-40-ATH				40	90	43	4	135
NSBH0380-60-ATH				60	110	63	4	135
NSBH0380-90-ATH				90	140	93	4	135
NSBH0380-120-ATH				120	170	123	4	135
NSBH0390-20-ATH		3.9	.1535	20	70	23	4	140
NSBH0390-40-ATH				40	90	43	4	135
NSBH0390-60-ATH				60	110	63	4	135
NSBH0390-90-ATH				90	140	93	4	135
NSBH0390-120-ATH				120	170	123	4	135
NSBH0400-20-ATH	★	4.0	.1575	20	70	23	6	140
NSBH0400-40-ATH	★			40	90	43	6	135
NSBH0400-60-ATH	★			60	110	63	6	135
NSBH0400-90-ATH	★			90	140	93	6	135
NSBH0400-120-ATH	★			120	170	123	6	135
NSBH0410-20-ATH	★	4.1	.1614	20	70	23	6	140
NSBH0410-40-ATH				40	90	43	6	135
NSBH0410-60-ATH				60	110	63	6	135
NSBH0410-90-ATH				90	140	93	6	135
NSBH0410-120-ATH				120	170	123	6	135
NSBH0420-20-ATH	★	4.2	.1654	20	70	23	6	140
NSBH0420-40-ATH	★			40	90	43	6	135
NSBH0420-60-ATH				60	110	63	6	135
NSBH0420-90-ATH				90	140	93	6	135
NSBH0420-120-ATH				120	170	123	6	135
NSBH0430-20-ATH	★	4.3	.1693	20	70	23	6	140
NSBH0430-40-ATH	★			40	90	43	6	135
NSBH0430-60-ATH				60	110	63	6	135
NSBH0430-90-ATH				90	140	93	6	135
NSBH0430-120-ATH				120	170	123	6	135
NSBH0440-20-ATH		4.4	.1732	20	70	23	6	140
NSBH0440-40-ATH				40	90	43	6	135
NSBH0440-60-ATH				60	110	63	6	135
NSBH0440-90-ATH				90	140	93	6	135
NSBH0440-120-ATH				120	170	123	6	135
NSBH0450-20-ATH		4.5	.1772	20	70	23	6	140
NSBH0450-40-ATH				40	90	43	6	135
NSBH0450-60-ATH				60	110	63	6	135

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

NSBH○○○○-○○○-ATH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0450-90-ATH		4.5	.1772	90	140	93	6	135
NSBH0450-120-ATH				120	170	123	6	135
NSBH0460-20-ATH		4.6	.1811	20	70	23	6	140
NSBH0460-40-ATH				40	90	43	6	135
NSBH0460-60-ATH				60	110	63	6	135
NSBH0460-90-ATH				90	140	93	6	135
NSBH0460-120-ATH				120	170	123	6	135
NSBH0460-150-ATH				150	205	153	6	135
NSBH0470-20-ATH		4.7	.1850	20	70	23	6	140
NSBH0470-40-ATH				40	90	43	6	135
NSBH0470-60-ATH				60	110	63	6	135
NSBH0470-90-ATH				90	140	93	6	135
NSBH0470-120-ATH				120	170	123	6	135
NSBH0470-150-ATH				150	205	153	6	135
NSBH0480-20-ATH		4.8	.1890	20	70	23	6	140
NSBH0480-40-ATH				40	90	43	6	135
NSBH0480-60-ATH				60	110	63	6	135
NSBH0480-90-ATH				90	140	93	6	135
NSBH0480-120-ATH				120	170	123	6	135
NSBH0480-150-ATH				150	205	153	6	135
NSBH0490-20-ATH		4.9	.1929	20	70	23	6	140
NSBH0490-40-ATH				40	90	43	6	135
NSBH0490-60-ATH				60	110	63	6	135
NSBH0490-90-ATH				90	140	93	6	135
NSBH0490-120-ATH				120	170	123	6	135
NSBH0490-150-ATH				150	205	153	6	135
NSBH0500-25-ATH	★	5.0	.1969	25	80	28	6	140
NSBH0500-40-ATH	★			40	95	43	6	135
NSBH0500-60-ATH	★			60	115	63	6	135
NSBH0500-90-ATH	★			90	145	93	6	135
NSBH0500-120-ATH	★			120	175	123	6	135
NSBH0500-150-ATH	★			150	205	153	6	135
NSBH0510-30-ATH	★	5.1	.2008	30	85	33	6	140
NSBH0510-60-ATH	★			60	115	63	6	135
NSBH0510-90-ATH				90	145	93	6	135
NSBH0510-120-ATH				120	175	123	6	135
NSBH0510-150-ATH				150	205	153	6	135
NSBH0520-30-ATH		5.2	.2047	30	85	33	6	140
NSBH0520-60-ATH				60	115	63	6	135
NSBH0520-90-ATH				90	145	93	6	135
NSBH0520-120-ATH				120	175	123	6	135
NSBH0520-150-ATH				150	205	153	6	135
NSBH0530-30-ATH		5.3	.2087	30	85	33	6	140
NSBH0530-60-ATH				60	115	63	6	135
NSBH0530-90-ATH				90	145	93	6	135
NSBH0530-120-ATH				120	175	123	6	135
NSBH0530-150-ATH				150	205	153	6	135
NSBH0540-30-ATH		5.4	.2126	30	85	33	6	140
NSBH0540-60-ATH				60	115	63	6	135
NSBH0540-90-ATH				90	145	93	6	135
NSBH0540-120-ATH				120	175	123	6	135
NSBH0540-150-ATH				150	205	153	6	135
NSBH0550-30-ATH		5.5	.2165	30	85	33	6	140
NSBH0550-60-ATH				60	115	63	6	135
NSBH0550-90-ATH				90	145	93	6	135
NSBH0550-120-ATH				120	175	123	6	135
NSBH0550-150-ATH				150	205	153	6	135

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0560-30-ATH		5.6	.2205	30	85	33	6	140
NSBH0560-60-ATH				60	115	63	6	135
NSBH0560-90-ATH				90	145	93	6	135
NSBH0560-120-ATH				120	175	123	6	135
NSBH0560-150-ATH				150	205	153	6	135
NSBH0570-30-ATH		5.7	.2244	30	85	33	6	140
NSBH0570-60-ATH				60	115	63	6	135
NSBH0570-90-ATH				90	145	93	6	135
NSBH0570-120-ATH				120	175	123	6	135
NSBH0570-150-ATH				150	205	153	6	135
NSBH0580-30-ATH		5.8	.2284	30	85	33	6	140
NSBH0580-60-ATH				60	115	63	6	135
NSBH0580-90-ATH				90	145	93	6	135
NSBH0580-120-ATH				120	175	123	6	135
NSBH0580-150-ATH				150	205	153	6	135
NSBH0590-30-ATH		5.9	.2323	30	85	33	6	140
NSBH0590-60-ATH				60	115	63	6	135
NSBH0590-90-ATH				90	145	93	6	135
NSBH0590-120-ATH				120	175	123	6	135
NSBH0590-150-ATH				150	205	153	6	135
NSBH0600-30-ATH	★	6.0	.2362	30	85	33	8	140
NSBH0600-60-ATH	★			60	115	63	8	135
NSBH0600-90-ATH	★			90	145	93	8	135
NSBH0600-120-ATH	★			120	175	123	8	135
NSBH0600-150-ATH	★			150	205	153	8	135
NSBH0610-30-ATH		6.1	.2402	30	85	33	8	140
NSBH0610-60-ATH				60	115	63	8	135
NSBH0610-90-ATH				90	145	93	8	135
NSBH0610-120-ATH				120	175	123	8	135
NSBH0610-150-ATH				150	205	153	8	135
NSBH0620-30-ATH		6.2	.2441	30	85	33	8	140
NSBH0620-60-ATH				60	115	63	8	135
NSBH0620-90-ATH				90	145	93	8	135
NSBH0620-120-ATH				120	175	123	8	135
NSBH0620-150-ATH				150	205	153	8	135
NSBH0630-30-ATH		6.3	.2480	30	85	33	8	140
NSBH0630-60-ATH				60	115	63	8	135
NSBH0630-90-ATH				90	145	93	8	135
NSBH0630-120-ATH				120	175	123	8	135
NSBH0630-150-ATH				150	205	153	8	135
NSBH0640-30-ATH		6.4	.2520	30	85	33	8	140
NSBH0640-60-ATH				60	115	63	8	135
NSBH0640-90-ATH				90	145	93	8	135
NSBH0640-120-ATH				120	175	123	8	135
NSBH0640-150-ATH				150	205	153	8	135
NSBH0650-30-ATH		6.5	.2559	30	85	33	8	140
NSBH0650-60-ATH				60	115	63	8	135
NSBH0650-90-ATH				90	145	93	8	135
NSBH0650-120-ATH				120	175	123	8	135
NSBH0650-150-ATH				150	205	153	8	135
NSBH0660-30-ATH		6.6	.2598	30	85	33	8	140
NSBH0660-60-ATH				60	115	63	8	135
NSBH0660-90-ATH				90	145	93	8	135
NSBH0660-120-ATH				120	175	123	8	135
NSBH0660-150-ATH				150	205	153	8	135
NSBH0660-200-ATH				200	255	203	8	135

Carbide Oil Hole Non Step Borer H for High Hardness Material

NSBH○○○○-○○○-ATH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0670-30-ATH		6.7	.2638	30	85	33	8	140
NSBH0670-60-ATH				60	115	63	8	135
NSBH0670-90-ATH				90	145	93	8	135
NSBH0670-120-ATH				120	175	123	8	135
NSBH0670-150-ATH				150	205	153	8	135
NSBH0670-200-ATH				200	255	203	8	135
NSBH0680-30-ATH	★	6.8	.2677	30	85	33	8	140
NSBH0680-60-ATH	★			60	115	63	8	135
NSBH0680-90-ATH				90	145	93	8	135
NSBH0680-120-ATH				120	175	123	8	135
NSBH0680-150-ATH				150	205	153	8	135
NSBH0680-200-ATH				200	255	203	8	135
NSBH0690-30-ATH	★	6.9	.2717	30	85	33	8	140
NSBH0690-60-ATH	★			60	115	63	8	135
NSBH0690-90-ATH				90	145	93	8	135
NSBH0690-120-ATH				120	175	123	8	135
NSBH0690-150-ATH				150	205	153	8	135
NSBH0690-200-ATH				200	255	203	8	135
NSBH0700-35-ATH	★	7.0	.2756	35	90	38	8	140
NSBH0700-60-ATH	★			60	115	63	8	135
NSBH0700-90-ATH	★			90	145	93	8	135
NSBH0700-120-ATH	★			120	175	123	8	135
NSBH0700-150-ATH	★			150	205	153	8	135
NSBH0700-200-ATH	★			200	255	203	8	135
NSBH0710-35-ATH		7.1	.2795	35	90	38	8	140
NSBH0710-60-ATH				60	115	63	8	135
NSBH0710-90-ATH				90	145	93	8	135
NSBH0710-120-ATH				120	175	123	8	135
NSBH0710-150-ATH				150	205	153	8	135
NSBH0710-200-ATH				200	255	203	8	135
NSBH0720-35-ATH		7.2	.2835	35	90	38	8	140
NSBH0720-60-ATH				60	115	63	8	135
NSBH0720-90-ATH				90	145	93	8	135
NSBH0720-120-ATH				120	175	123	8	135
NSBH0720-150-ATH				150	205	153	8	135
NSBH0720-200-ATH				200	255	203	8	135
NSBH0730-35-ATH		7.3	.2874	35	90	38	8	140
NSBH0730-60-ATH				60	115	63	8	135
NSBH0730-90-ATH				90	145	93	8	135
NSBH0730-120-ATH				120	175	123	8	135
NSBH0730-150-ATH				150	205	153	8	135
NSBH0730-200-ATH				200	255	203	8	135
NSBH0740-35-ATH		7.4	.2913	35	90	38	8	140
NSBH0740-60-ATH				60	115	63	8	135
NSBH0740-90-ATH				90	145	93	8	135
NSBH0740-120-ATH				120	175	123	8	135
NSBH0740-150-ATH				150	205	153	8	135
NSBH0740-200-ATH				200	255	203	8	135
NSBH0750-35-ATH		7.5	.2953	35	90	38	8	140
NSBH0750-60-ATH				60	115	63	8	135
NSBH0750-90-ATH				90	145	93	8	135
NSBH0750-120-ATH				120	175	123	8	135
NSBH0750-150-ATH				150	205	153	8	135
NSBH0750-200-ATH				200	255	203	8	135
NSBH0760-35-ATH		7.6	.2992	35	90	38	8	140
NSBH0760-60-ATH				60	115	63	8	135
NSBH0760-90-ATH				90	145	93	8	135
NSBH0760-120-ATH				120	175	123	8	135
NSBH0760-150-ATH				150	205	153	8	135
NSBH0760-200-ATH				200	255	203	8	135
NSBH0760-250-ATH				250	305	253	8	135
NSBH0770-35-ATH		7.7	.3032	35	90	38	8	140
NSBH0770-60-ATH				60	115	63	8	135
NSBH0770-90-ATH				90	145	93	8	135
NSBH0770-120-ATH				120	175	123	8	135
NSBH0770-150-ATH				150	205	153	8	135
NSBH0770-200-ATH				200	255	203	8	135
NSBH0770-250-ATH				250	305	253	8	135
NSBH0780-35-ATH		7.8	.3071	35	90	38	8	140
NSBH0780-60-ATH				60	115	63	8	135
NSBH0780-90-ATH				90	145	93	8	135
NSBH0780-120-ATH				120	175	123	8	135
NSBH0780-150-ATH				150	205	153	8	135
NSBH0780-200-ATH				200	255	203	8	135
NSBH0780-250-ATH				250	305	253	8	135
NSBH0790-35-ATH		7.9	.3110	35	90	38	8	140
NSBH0790-60-ATH				60	115	63	8	135
NSBH0790-90-ATH				90	145	93	8	135
NSBH0790-120-ATH				120	175	123	8	135
NSBH0790-150-ATH				150	205	153	8	135
NSBH0790-200-ATH				200	255	203	8	135
NSBH0790-250-ATH				250	305	253	8	135
NSBH0800-40-ATH	★	8.0	.3150	40	95	43	10	140
NSBH0800-60-ATH	★			60	115	63	10	135
NSBH0800-90-ATH	★			90	145	93	10	135
NSBH0800-120-ATH	★			120	175	123	10	135
NSBH0800-150-ATH	★			150	205	153	10	135
NSBH0800-200-ATH	★			200	255	203	10	135
NSBH0800-250-ATH	★			250	305	253	10	135
NSBH0810-45-ATH		8.1	.3189	45	105	48	10	140
NSBH0810-90-ATH				90	150	93	10	135
NSBH0810-120-ATH				120	180	123	10	135
NSBH0810-150-ATH				150	210	153	10	135
NSBH0810-200-ATH				200	260	203	10	135
NSBH0810-250-ATH				250	310	253	10	135
NSBH0820-45-ATH		8.2	.3228	45	105	48	10	140
NSBH0820-90-ATH				90	150	93	10	135
NSBH0820-120-ATH				120	180	123	10	135
NSBH0820-150-ATH				150	210	153	10	135
NSBH0820-200-ATH				200	260	203	10	135
NSBH0820-250-ATH				250	310	253	10	135
NSBH0830-45-ATH		8.3	.3268	45	105	48	10	140
NSBH0830-90-ATH				90	150	93	10	135
NSBH0830-120-ATH				120	180	123	10	135
NSBH0830-150-ATH				150	210	153	10	135
NSBH0830-200-ATH				200	260	203	10	135
NSBH0830-250-ATH				250	310	253	10	135
NSBH0840-45-ATH		8.4	.3307	45	105	48	10	140
NSBH0840-90-ATH				90	150	93	10	135
NSBH0840-120-ATH				120	180	123	10	135
NSBH0840-150-ATH				150	210	153	10	135
NSBH0840-200-ATH				200	260	203	10	135
NSBH0840-250-ATH				250	310	253	10	135
NSBH0850-45-ATH	★	8.5	.3347	45	105	48	10	140
NSBH0850-90-ATH	★			90	150	93	10	135
NSBH0850-120-ATH	★			120	180	123	10	135
NSBH0850-150-ATH	★			150	210	153	10	135
NSBH0850-200-ATH	★			200	260	203	10	135
NSBH0850-250-ATH	★			250	310	253	10	135
NSBH0860-45-ATH	★	8.6	.3386	45	105	48	10	140
NSBH0860-90-ATH				90	150	93	10	135
NSBH0860-120-ATH				120	180	123	10	135
NSBH0860-150-ATH				150	210	153	10	135
NSBH0860-200-ATH				200	260	203	10	135
NSBH0860-250-ATH				250	310	253	10	135

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

NSBH○○○○-○○○-ATH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0870-45-ATH	★	8.7	.3425	45	105	48	10	140
NSBH0870-90-ATH	★			90	150	93	10	135
NSBH0870-120-ATH	★			120	180	123	10	135
NSBH0870-150-ATH	★			150	210	153	10	135
NSBH0870-200-ATH	★			200	260	203	10	135
NSBH0870-250-ATH	★			250	310	253	10	135
NSBH0880-45-ATH	★	8.8	.3465	45	105	48	10	140
NSBH0880-90-ATH				90	150	93	10	135
NSBH0880-120-ATH				120	180	123	10	135
NSBH0880-150-ATH				150	210	153	10	135
NSBH0880-200-ATH				200	260	203	10	135
NSBH0880-250-ATH				250	310	253	10	135
NSBH0890-45-ATH	★	8.9	.3504	45	105	48	10	140
NSBH0890-90-ATH				90	150	93	10	135
NSBH0890-120-ATH				120	180	123	10	135
NSBH0890-150-ATH				150	210	153	10	135
NSBH0890-200-ATH				200	260	203	10	135
NSBH0890-250-ATH				250	310	253	10	135
NSBH0900-45-ATH	★	9.0	.3543	45	105	48	10	140
NSBH0900-90-ATH	★			90	150	93	10	135
NSBH0900-120-ATH	★			120	180	123	10	135
NSBH0900-150-ATH	★			150	210	153	10	135
NSBH0900-200-ATH	★			200	260	203	10	135
NSBH0900-250-ATH	★			250	310	253	10	135
NSBH0910-50-ATH		9.1	.3583	50	110	53	10	140
NSBH0910-90-ATH				90	150	93	10	135
NSBH0910-120-ATH				120	180	123	10	135
NSBH0910-150-ATH				150	210	153	10	135
NSBH0910-200-ATH				200	260	203	10	135
NSBH0910-250-ATH				250	310	253	10	135
NSBH0910-300-ATH				300	360	303	10	135
NSBH0920-50-ATH		9.2	.3622	50	110	53	10	140
NSBH0920-90-ATH				90	150	93	10	135
NSBH0920-120-ATH				120	180	123	10	135
NSBH0920-150-ATH				150	210	153	10	135
NSBH0920-200-ATH				200	260	203	10	135
NSBH0920-250-ATH				250	310	253	10	135
NSBH0920-300-ATH				300	360	303	10	135
NSBH0930-50-ATH		9.3	.3661	50	110	53	10	140
NSBH0930-90-ATH				90	150	93	10	135
NSBH0930-120-ATH				120	180	123	10	135
NSBH0930-150-ATH				150	210	153	10	135
NSBH0930-200-ATH				200	260	203	10	135
NSBH0930-250-ATH				250	310	253	10	135
NSBH0930-300-ATH				300	360	303	10	135
NSBH0940-50-ATH		9.4	.3701	50	110	53	10	140
NSBH0940-90-ATH				90	150	93	10	135
NSBH0940-120-ATH				120	180	123	10	135
NSBH0940-150-ATH				150	210	153	10	135
NSBH0940-200-ATH				200	260	203	10	135
NSBH0940-250-ATH				250	310	253	10	135
NSBH0940-300-ATH				300	360	303	10	135
NSBH0950-50-ATH		9.5	.3740	50	110	53	10	140
NSBH0950-90-ATH				90	150	93	10	135
NSBH0950-120-ATH				120	180	123	10	135
NSBH0950-150-ATH				150	210	153	10	135
NSBH0950-200-ATH				200	260	203	10	135
NSBH0950-250-ATH				250	310	253	10	135
NSBH0950-300-ATH				300	360	303	10	135
NSBH0960-50-ATH		9.6	.3780	50	110	53	10	140
NSBH0960-90-ATH				90	150	93	10	135
NSBH0960-120-ATH				120	180	123	10	135
NSBH0960-150-ATH				150	210	153	10	135

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH0960-200-ATH		9.6	.3780	200	260	203	10	135
NSBH0960-250-ATH				250	310	253	10	135
NSBH0960-300-ATH				300	360	303	10	135
NSBH0970-50-ATH		9.7	.3819	50	110	53	10	140
NSBH0970-90-ATH				90	150	93	10	135
NSBH0970-120-ATH				120	180	123	10	135
NSBH0970-150-ATH				150	210	153	10	135
NSBH0970-200-ATH				200	260	203	10	135
NSBH0970-250-ATH				250	310	253	10	135
NSBH0970-300-ATH				300	360	303	10	135
NSBH0980-50-ATH		9.8	.3858	50	110	53	10	140
NSBH0980-90-ATH				90	150	93	10	135
NSBH0980-120-ATH				120	180	123	10	135
NSBH0980-150-ATH				150	210	153	10	135
NSBH0980-200-ATH				200	260	203	10	135
NSBH0980-250-ATH				250	310	253	10	135
NSBH0980-300-ATH				300	360	303	10	135
NSBH0990-50-ATH		9.9	.3898	50	110	53	10	140
NSBH0990-90-ATH				90	150	93	10	135
NSBH0990-120-ATH				120	180	123	10	135
NSBH0990-150-ATH				150	210	153	10	135
NSBH0990-200-ATH				200	260	203	10	135
NSBH0990-250-ATH				250	310	253	10	135
NSBH0990-300-ATH				300	360	303	10	135
NSBH1000-50-ATH	★	10.0	.3937	50	110	53	12	140
NSBH1000-90-ATH	★			90	150	93	12	135
NSBH1000-120-ATH	★			120	180	123	12	135
NSBH1000-150-ATH	★			150	210	153	12	135
NSBH1000-200-ATH	★			200	260	203	12	135
NSBH1000-250-ATH	★			250	310	253	12	135
NSBH1000-300-ATH	★			300	360	303	12	135
NSBH1010-50-ATH		10.1	.3976	50	110	53	12	140
NSBH1010-90-ATH				90	150	93	12	135
NSBH1010-120-ATH				120	180	123	12	135
NSBH1010-150-ATH				150	210	153	12	135
NSBH1010-200-ATH				200	260	203	12	135
NSBH1010-250-ATH				250	310	253	12	135
NSBH1010-300-ATH				300	360	303	12	135
NSBH1020-50-ATH		10.2	.4016	50	110	53	12	140
NSBH1020-90-ATH				90	150	93	12	135
NSBH1020-120-ATH				120	180	123	12	135
NSBH1020-150-ATH				150	210	153	12	135
NSBH1020-200-ATH				200	260	203	12	135
NSBH1020-250-ATH				250	310	253	12	135
NSBH1020-300-ATH				300	360	303	12	135
NSBH1030-50-ATH	★	10.3	.4055	50	110	53	12	140
NSBH1030-90-ATH				90	150	93	12	135
NSBH1030-120-ATH				120	180	123	12	135
NSBH1030-150-ATH				150	210	153	12	135
NSBH1030-200-ATH				200	260	203	12	135
NSBH1030-250-ATH				250	310	253	12	135
NSBH1030-300-ATH				300	360	303	12	135
NSBH1040-50-ATH	★	10.4	.4095	50	110	53	12	140
NSBH1040-90-ATH				90	150	93	12	135
NSBH1040-120-ATH				120	180	123	12	135
NSBH1040-150-ATH				150	210	153	12	135
NSBH1040-200-ATH				200	260	203	12	135
NSBH1040-250-ATH				250	310	253	12	135
NSBH1040-300-ATH				300	360	303	12	135
NSBH1050-50-ATH	★	10.5	.4134	50	110	53	12	140
NSBH1050-90-ATH				90	150	93	12	135
NSBH1050-120-ATH				120	180	123	12	135
NSBH1050-150-ATH				150	210	153	12	135

Carbide Oil Hole Non Step Borer H for High Hardness Material

NSBH○○○○-○○○-ATH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Under neck length ℓ2 (mm)	Shank dia. DCONMS (mm)	Point angle α
NSBH1050-200-ATH		10.5	.4134	200	260	203	12	135
NSBH1050-250-ATH				250	310	253	12	135
NSBH1050-300-ATH				300	360	303	12	135
NSBH1060-50-ATH	★	10.6	.4173	50	110	53	12	140
NSBH1060-90-ATH				90	150	93	12	135
NSBH1060-120-ATH				120	180	123	12	135
NSBH1060-150-ATH				150	210	153	12	135
NSBH1060-200-ATH				200	260	203	12	135
NSBH1060-250-ATH				250	310	253	12	135
NSBH1060-300-ATH				300	360	303	12	135
NSBH1070-50-ATH		10.7	.4213	50	110	53	12	140
NSBH1070-90-ATH				90	150	93	12	135
NSBH1070-120-ATH				120	180	123	12	135
NSBH1070-150-ATH				150	210	153	12	135
NSBH1070-200-ATH				200	260	203	12	135
NSBH1070-250-ATH				250	310	253	12	135
NSBH1070-300-ATH				300	360	303	12	135
NSBH1080-50-ATH	★	10.8	.4252	50	110	53	12	140
NSBH1080-90-ATH				90	150	93	12	135
NSBH1080-120-ATH				120	180	123	12	135
NSBH1080-150-ATH				150	210	153	12	135
NSBH1080-200-ATH				200	260	203	12	135
NSBH1080-250-ATH				250	310	253	12	135
NSBH1080-300-ATH				300	360	303	12	135
NSBH1090-50-ATH	★	10.9	.4291	50	110	53	12	140
NSBH1090-90-ATH				90	150	93	12	135
NSBH1090-120-ATH				120	180	123	12	135
NSBH1090-150-ATH				150	210	153	12	135
NSBH1090-200-ATH				200	260	203	12	135
NSBH1090-250-ATH				250	310	253	12	135
NSBH1090-300-ATH				300	360	303	12	135
NSBH1100-55-ATH	★	11.0	.4331	55	120	58	12	140
NSBH1100-90-ATH	★			90	155	93	12	135
NSBH1100-120-ATH	★			120	185	123	12	135
NSBH1100-150-ATH	★			150	215	153	12	135
NSBH1100-200-ATH	★			200	265	203	12	135
NSBH1100-250-ATH	★			250	315	253	12	135
NSBH1100-300-ATH	★			300	365	303	12	135
NSBH1110-55-ATH		11.1	.4370	55	120	58	12	140
NSBH1110-90-ATH				90	155	93	12	135
NSBH1110-120-ATH				120	185	123	12	135
NSBH1110-150-ATH				150	215	153	12	135
NSBH1110-200-ATH				200	265	203	12	135
NSBH1110-250-ATH				250	315	253	12	135
NSBH1110-300-ATH				300	365	303	12	135
NSBH1120-55-ATH		11.2	.4409	55	120	58	12	140
NSBH1120-90-ATH				90	155	93	12	135
NSBH1120-120-ATH				120	185	123	12	135
NSBH1120-150-ATH				150	215	153	12	135
NSBH1120-200-ATH				200	265	203	12	135
NSBH1120-250-ATH				250	315	253	12	135
NSBH1120-300-ATH				300	365	303	12	135
NSBH1130-55-ATH		11.3	.4449	55	120	58	12	140
NSBH1130-90-ATH				90	155	93	12	135
NSBH1130-120-ATH		11.3	.4449	120	185	123	12	135
NSBH1130-150-ATH				150	215	153	12	135
NSBH1130-200-ATH				200	265	203	12	135
NSBH1130-250-ATH				250	315	253	12	135
NSBH1130-300-ATH				300	365	303	12	135
NSBH1140-55-ATH		11.4	.4488	55	120	58	12	140
NSBH1140-90-ATH				90	155	93	12	135
NSBH1140-120-ATH				120	185	123	12	135
NSBH1140-150-ATH				150	215	153	12	135
NSBH1140-200-ATH				200	265	203	12	135
NSBH1140-250-ATH				250	315	253	12	135
NSBH1140-300-ATH				300	365	303	12	135
NSBH1150-60-ATH	★	11.5	.4528	60	125	63	12	140
NSBH1150-90-ATH	★			90	155	93	12	135
NSBH1150-120-ATH	★			120	185	123	12	135
NSBH1150-150-ATH	★			150	215	153	12	135
NSBH1150-200-ATH	★			200	265	203	12	135
NSBH1150-250-ATH	★			250	315	253	12	135
NSBH1150-300-ATH	★			300	365	303	12	135
NSBH1160-60-ATH		11.6	.4567	60	125	63	12	140
NSBH1160-90-ATH				90	155	93	12	135
NSBH1160-120-ATH				120	185	123	12	135
NSBH1160-150-ATH				150	215	153	12	135
NSBH1160-200-ATH				200	265	203	12	135
NSBH1160-250-ATH				250	315	253	12	135
NSBH1160-300-ATH				300	365	303	12	135
NSBH1170-60-ATH		11.7	.4606	60	125	63	12	140
NSBH1170-90-ATH				90	155	93	12	135
NSBH1170-120-ATH				120	185	123	12	135
NSBH1170-150-ATH				150	215	153	12	135
NSBH1170-200-ATH				200	265	203	12	135
NSBH1170-250-ATH				250	315	253	12	135
NSBH1170-300-ATH				300	365	303	12	135
NSBH1180-60-ATH		11.8	.4646	60	125	63	12	140
NSBH1180-90-ATH				90	155	93	12	135
NSBH1180-120-ATH				120	185	123	12	135
NSBH1180-150-ATH				150	215	153	12	135
NSBH1180-200-ATH				200	265	203	12	135
NSBH1180-250-ATH				250	315	253	12	135
NSBH1180-300-ATH				300	365	303	12	135
NSBH1190-60-ATH		11.9	.4685	60	125	63	12	140
NSBH1190-90-ATH				90	155	93	12	135
NSBH1190-120-ATH				120	185	123	12	135
NSBH1190-150-ATH				150	215	153	12	135
NSBH1190-200-ATH				200	265	203	12	135
NSBH1190-250-ATH				250	315	253	12	135
NSBH1190-300-ATH				300	365	303	12	135
NSBH1200-60-ATH	★	12.0	.4724	60	125	63	12	140
NSBH1200-90-ATH	★			90	155	93	12	135
NSBH1200-120-ATH	★			120	185	123	12	135
NSBH1200-150-ATH	★			150	215	153	12	135
NSBH1200-200-ATH	★			200	265	203	12	135
NSBH1200-250-ATH	★			250	315	253	12	135
NSBH1200-300-ATH	★			300	365	303	12	135

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
					○	◎						

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Recommended cutting conditions NSBH-ATH

Water base internal coolant

Work material		Pre-hardened steel (40~45HRC)				Hardened steel (45~55HRC)				Hardened steel (55~60HRC)			
Tool dia.		*vc*		*f*		*vc*		*f*		*vc*		*f*	
Metric	ϕ2.0mm	m/min SFM	20~60~80 66~197~262	mm/rev.	0.01~0.05	m/min SFM	20~40~60 66~131~197	mm/rev.	0.01~0.03	m/min SFM	10~20 33~66	mm/rev.	0.01~0.02
Inch	.0787			IPR	.0004~.002			IPR	.0004~.0012			IPR	.0004~.0008
Metric	ϕ4.0			mm/rev.	0.02~0.08			mm/rev.	0.01~0.06			mm/rev.	0.01~0.04
Inch	.1575			IPR	.0008~.0032			IPR	.0004~.0024			IPR	.0004~.0016
Metric	ϕ6.0			mm/rev.	0.08~0.15			mm/rev.	0.05~0.09			mm/rev.	0.03~0.06
Inch	.2362			IPR	.0032~.006			IPR	.002~.0035			IPR	.0012~.0024
Metric	ϕ8.0			mm/rev.	0.1~0.2			mm/rev.	0.06~0.12			mm/rev.	0.04~0.08
Inch	.3150			IPR	.0039~.0079			IPR	.0024~.0047			IPR	.0016~.0032
Metric	ϕ10.0			mm/rev.	0.12~0.25			mm/rev.	0.08~0.15			mm/rev.	0.06~0.1
Inch	.3937			IPR	.0047~.0098			IPR	.0032~.006			IPR	.0024~.0039
Metric	ϕ12.0			mm/rev.	0.13~0.25			mm/rev.	0.1~0.15			mm/rev.	0.06~0.1
Inch	.4724			IPR	.0051~.0098			IPR	.0039~.006			IPR	.0024~.0039

【Setting of Cutting Conditions】 Be sure to refer to the drilling process as follows when selecting a tool.

- These standard cutting conditions are intended as approximate values for cutting conditions. For actual drilling, cutting conditions should be adjusted according to the drilling shape, purpose, machine used, etc.
- NSBH-ATH series have positive tolerance on the diameter. Please select guide and long-hole drills out of NSBH-ATH series. Mixed use of conventional WHNSB-TH series harms drilling stability due to negative tolerance of WHNSB-TH series.
- When changing the tool, use collet free from flaws and stains and attach the tool firmly so that its runout is 0.02mm or less.
- Works should be gripped firmly to prevent deformation, deflection and vibration.
- Upon drilling hole, dwell time at the final depth helps chip removal.
- If cutting chips are not smoothly removed, perform step drilling at depth around the tool diameter.
- Upon matters in chip removal during drilling, please refer to following countermeasures;
  ①Keep *vc* and lower feed. (The thinner chip for better removal)
  ②Keep *f* and higher *vc*. (Higher rotation for better removal)
- At the time of through-hole reduce feed rate *f* to one-half or less.
- Internal supply of water based coolant is recommended.
- The above cutting conditions are based on the use of a water base coolant diluted to a maximum of 20 times. When coolant dilution exceeds 20 times, decrease the cutting speed to the lowest in the specified range. When the tool diameter is ϕ5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over ϕ5.0, the pressure should be 1.5 MPa or higher.
- When performing MQL (mist) machining, depending on the amount or conditions of spray from the tool, it may be necessary to reduce the cutting speed in order to drilling.
- When oil base coolant is used, reduce the cutting speed to a speed lower than the lowest speed in the specified range. Take the greatest care to avoid smoke or ignition due to heating of chips and the tool.
- Perform sufficient maintenance of coolant systems to prevent clogging of the oil hole.

Drilling process

1 Drilling of pilot hole (guide hole)

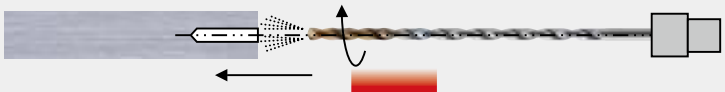
※Please refer to next page for attention for use

●Recommended tools ：
Use the product with the shortest flute length for each size of product.
(Point angle 140-degree NSBH-ATH)

●Hole depth：Tool diameter ×3.0 times
※When using a product for which the flute length is more than L/D=8, drilling a pilot hole first.

2 Supplying coolant during low-speed revolution

●Leading to the pilot hole at low speed (n=0~500 min^{-1})
●Stop feed 2.0~5.0 mm before the end of the pilot hole.
※When a long tool (200mm or longer) is used, position the tool to the pilot hole at low revolution speed (n=200min^{-1} or less).



3 High-speed revolution for drilling feed (NSBH-ATH)

●After confirming that the revolution speed is increasing at the specified rate, start cutting.

4 Finish drilling

●Withdraw the tool at low speed. (n=0~500 min^{-1})
※When a long tool (200mm or longer) is used, withdraw the tool at low revolution speed (n=200min^{-1} or less).

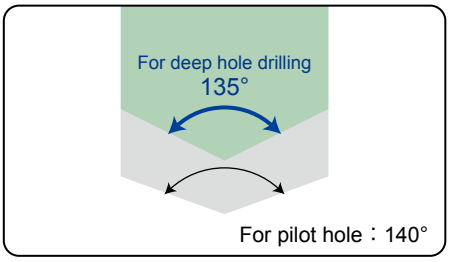
Carbide Oil Hole Non Step Borer H for High Hardness Material

Regarding pilot hole drilling for NSBH-ATH

The shortest NSBH-ATH among each diameter length series has point angle of 140˚ though others have that of 135˚. It is recommended first to drill a guide hole with NSBH-ATH of point angle 140˚ before deep boring.
+5˚ gives better tool edge allocation onto work material.

Example Hole size：φ6×100mm

①Pilot hole → **NSBH0600-30-ATH**
②Deep hole drilling → **NSBH0600-120-ATH**



Regarding tolerance of diameter for NSBH-ATH

Diameter of NSBH-ATH has a positive tolerance inorder to
(1) compensate hole shrink after boring, and (2) keep clearance for ejector pin of die mold. WHNSB and WNSB have negative tolerance of diameter.
Use of WHNSB or WNSB for pilot hole may cause diameter interference with NSBH-ATH.

【Diameter tolerance】

DC≦6mm	0～+0.012mm (0～+.0005")
6mm<DC≦10mm	0～+0.015mm (0～+.0006")
10mm<DC	−0.003mm～+0.015mm (−.0001"～+.0006")

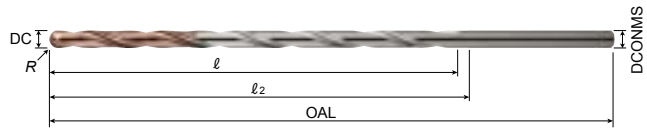
NSBH-ATH used for pilot hole before threading

Expanded lineup! For pilot hole of tapping products added. Tapping is possible by NSBH-ATH and carbide threading cutters combination easily.

Screw size		Item code	Stocks	Size (mm)				Adapted carbide threading cutters	Page
Nominal dia. (mm)	Pitch (mm)			Tool dia.	Flute length	Overall length	Under neck length		
M3	0.5	NSBH0240-10-ATH	★	2.4	10	60	14	ET-0.5-6-PN、ET0.5-7.5-PN	
		NSBH0250-10-ATH	★	2.5					
		NSBH0260-10-ATH	★	2.6					
M4	0.7	NSBH0320-20-ATH	★	3.2	20	70	23	ET-0.7-8-PN、ET-0.7-10-PN	
		NSBH0330-20-ATH	★	3.3					
		NSBH0340-20-ATH	★	3.4					
M5	0.8	NSBH0410-20-ATH	★	4.1	20	70	23	ET-0.8-10-PN、ET-0.8-12.5-PN	
		NSBH0420-20-ATH	★	4.2					
		NSBH0430-20-ATH	★	4.3					
M6	1	NSBH0490-20-ATH		4.9	20	70	23	ET-1.0-12-PN、ET-1.0-15-PN	
		NSBH0500-25-ATH	★	5.0	25	80	28		
		NSBH0510-30-ATH	★	5.1	30	85	33		
M8	1.25	NSBH0670-30-ATH		6.7	30	85	33	ET-1.25-16-PN、ET-1.25-20-PN	
		NSBH0680-30-ATH	★	6.8					
		NSBH0690-30-ATH	★	6.9					
M10	1.5	NSBH0850-45-ATH	★	8.5	45	105	48	ET-1.5-20-PN、ET-1.5-25-PN	
		NSBH0860-45-ATH	★	8.6					
		NSBH0870-45-ATH	★	8.7					
		NSBH0880-45-ATH	★	8.8					
M12	1.75	NSBH1030-50-ATH	★	10.3	50	110	53	ET-1.75-24-PN、ET-1.75-30-PN	
		NSBH1040-50-ATH	★	10.4					
		NSBH1050-50-ATH	★	10.5					
M14	2	NSBH1190-60-ATH		11.9	60	125	63	Not applicable	
		NSBH1200-60-ATH	★	12.0					

★：Inventory maintained in Japan　No Mark：Manufactured upon request only

Carbide Drill for SR machining



○○WHSR○○○○-ATH

	Item code	Stock	Size						
			Radius	Tool dia.		Flute length	Under neck length	Overall length	Shank dia.
			R (mm)	DC (mm)	DC (inch)	ℓ (mm)	ℓ2 (mm)	OAL (mm)	DCONMS (mm)
L/D=8	08WHSR0300-ATH	★	1.5	3	.1181	37	40	85	4
	08WHSR0400-ATH	★	2	4	.1575	48	51	97	4
	08WHSR0500-ATH	★	2.5	5	.1969	62	65	114	6
	08WHSR0600-ATH	★	3	6	.2362	70	73	123	6
	08WHSR0700-ATH	★	3.5	7	.2756	81	84	133	8
	08WHSR0800-ATH	★	4	8	.3150	92	95	145	8
	08WHSR0850-ATH	★	4.25	8.5	.3347	99	102	154	10
	08WHSR0900-ATH	★	4.5	9	.3543	104	107	158	10
	08WHSR0950-ATH	★	4.75	9.5	.3740	110	113	165	10
	08WHSR1000-ATH	★	5	10	.3937	115	118	170	10
	08WHSR1050-ATH	★	5.25	10.5	.4134	122	125	181	12
	08WHSR1100-ATH	★	5.5	11	.4331	127	130	185	12
	08WHSR1150-ATH	★	5.75	11.5	.4528	133	136	192	12
	08WHSR1200-ATH	★	6	12	.4724	138	141	197	12
L/D=20	20WHSR0300-ATH	★	1.5	3	.1181	71	74	119	4
	20WHSR0400-ATH	★	2	4	.1575	94	97	143	4
	20WHSR0500-ATH	★	2.5	5	.1969	119	122	171	6
	20WHSR0600-ATH	★	3	6	.2362	142	145	195	6
	20WHSR0700-ATH	★	3.5	7	.2756	166	169	218	8
	20WHSR0800-ATH	★	4	8	.3150	189	192	242	8
	20WHSR0850-ATH	★	4.25	8.5	.3347	201	204	256	10
	20WHSR0900-ATH	★	4.5	9	.3543	213	216	267	10
	20WHSR0950-ATH	★	4.75	9.5	.3740	224	227	279	10
	20WHSR1000-ATH	★	5	10	.3937	236	239	291	10
	20WHSR1050-ATH	★	5.25	10.5	.4134	249	252	308	12
	20WHSR1100-ATH	★	5.5	11	.4331	260	263	318	12
	20WHSR1150-ATH	★	5.75	11.5	.4528	272	275	331	12
	20WHSR1200-ATH	★	6	12	.4724	283	286	342	12
L/D=30	30WHSR0300-ATH	★	1.5	3	.1181	101	104	149	4
	30WHSR0400-ATH	★	2	4	.1575	134	137	183	4
	30WHSR0500-ATH	★	2.5	5	.1969	169	172	221	6
	30WHSR0600-ATH	★	3	6	.2362	202	205	255	6
	30WHSR0700-ATH	★	3.5	7	.2756	236	239	288	8
	30WHSR0800-ATH	★	4	8	.3150	269	272	322	8
	30WHSR0850-ATH	★	4.25	8.5	.3347	286	289	341	10
	30WHSR0900-ATH	★	4.5	9	.3543	303	306	357	10
	30WHSR0950-ATH	★	4.75	9.5	.3740	320	323	374	10
	30WHSR1000-ATH	★	5	10	.3937	336	339	391	10
	30WHSR1050-ATH	★	5.25	10.5	.4134	353	356	412	12
	30WHSR1100-ATH	★	5.5	11	.4331	370	373	429	12
	30WHSR1150-ATH	★	5.75	11.5	.4528	387	390	445	12
	30WHSR1200-ATH	★	6	12	.4724	404	407	460	12

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
○	○	◎	◎	◎	◎	○	○					

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Carbide Drill for SR machining

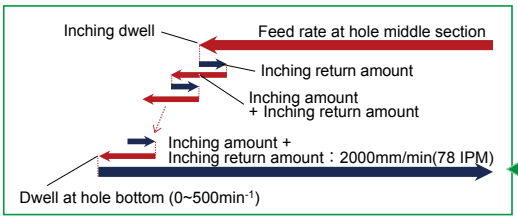
When finishing only the hole bottom

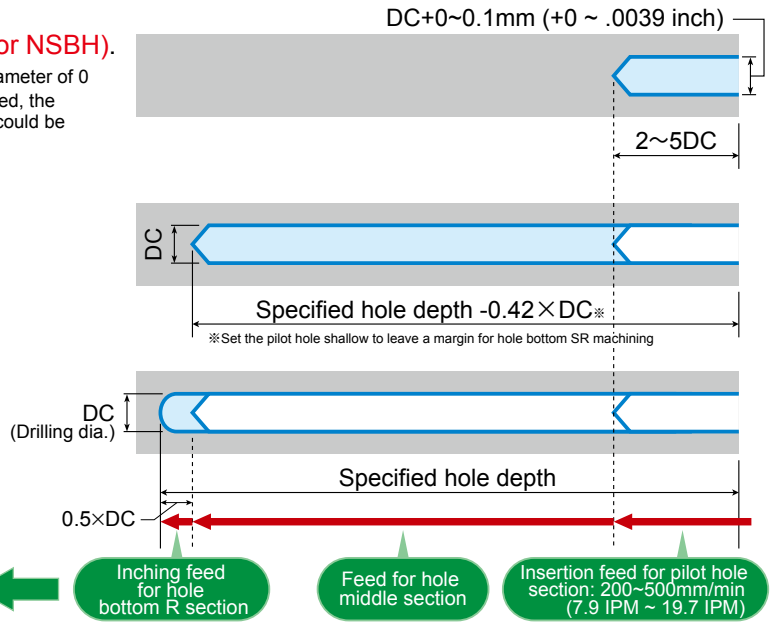
1 Machine a pilot hole using 03 to 05WHNSB (or NSBH).

※For the tool diameter when drilling guide holes, use the tool diameter of 0 to +0.1 mm used for SR machining. If the same diameter is used, the guiding property improves and the undulation of the hole wall could be suppressed.

2 Machine the long hole using WHNSB (or NSBH).

3 Machine the hole bottom using WHSR.





When finishing the hole walls and hole bottom

Finishing the hole walls further reduces stress corrosion cracking.

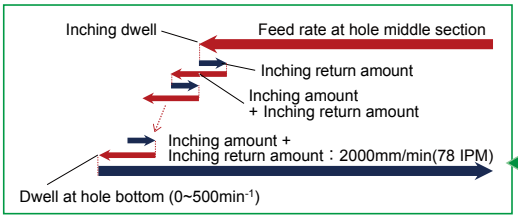
1 Machine a pilot hole using 03 to 05WHNSB (or NSBH).

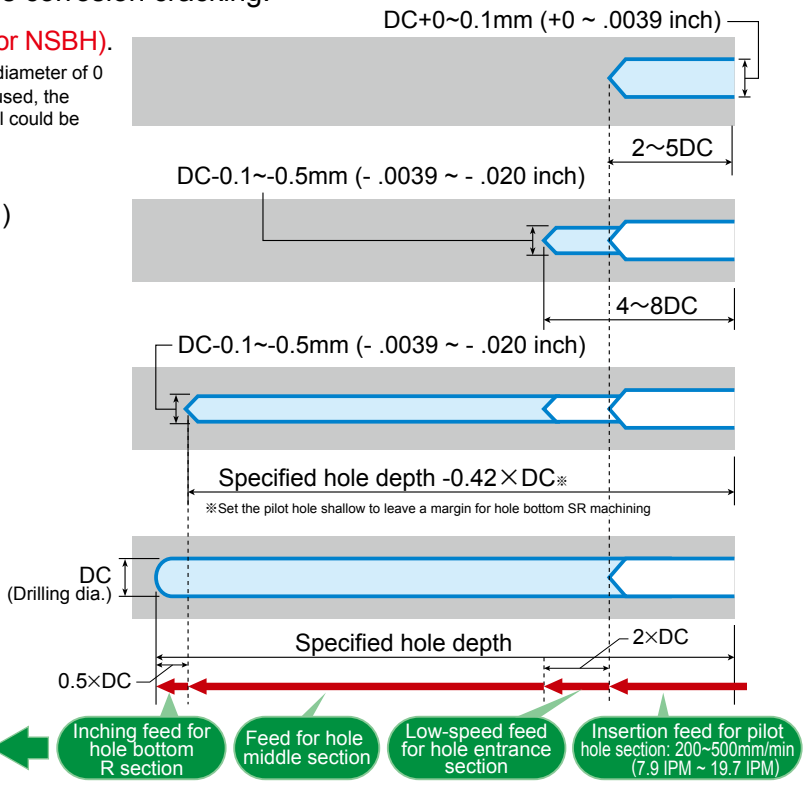
※For the tool diameter when drilling guide holes, use the tool diameter of 0 to +0.1 mm used for SR machining. If the same diameter is used, the guiding property improves and the undulation of the hole wall could be suppressed.

2 Machine a guide hole for WHNSB (or NSBH) using 05 to 08 WHNSB (or NSBH).

3 Machine the long hole using WHNSB (or NSBH).

4 Machine using WHSR.





When inserting into the pilot hole with WHSR, please set rpm as 0 ~ 500 min^{-1} to prevent breakage.
If the WHSR and the pilot hole have the same diameter and the wall of pilot hole has gurge, it might be improved by setting the rotation speed as 500 min^{-1} and the feed rate as 200 mm/min.

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Recommended cutting conditions WHSR-ATH

When finishing the hole walls and hole bottom

Work material	Cutting speed	Machined area	Cutting condition	General criteria	Tool dia. (mm)	3.0	4.0	6.0	8.0	8.5	10.0	11.5	12.0
					(in)	.1181	.1575	.2362	.3150	.3347	.3937	.4528	.4724
Pre-hardened steel Hardened steel (From before hardening to 45HRC)	Internal coolant 40~70~100 m/min 131~230~328 SFM		Revolution		min^{-1}	7431	5573	3715	2787	2623	2229	1939	1858
		Hole entrance section	Feed per rev	DCx(0.5~1~1.5)%	mm/rev.	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
					IPR	.0012	.0016	.0024	.0032	.0034	.0039	.0045	.0047
			Feed rate		mm/min	223	223	223	223	223	223	223	223
					IPM	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
		Middle section of hole	Feed per rev	DCx(0.5~1.2~2)%	mm/rev.	0.036	0.048	0.072	0.096	0.102	0.120	0.138	0.144
					IPR	.0014	.0019	.0028	.0038	.0040	.0047	.0054	.0057
			Feed rate		mm/min	268	268	268	268	268	268	268	268
					IPM	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
		R section of hole bottom	Inching feed per rev	DCx(0.2~0.3~0.5)%	mm/rev.	0.012	0.016	0.024	0.024	0.026	0.020	0.023	0.024
					IPR	.0005	.0006	.0009	.0009	.0010	.0008	.0009	.0009
			Inching feed rate		mm/min	89	89	89	67	67	45	45	45
					IPM	3.5	3.5	3.5	2.6	2.7	1.8	1.8	1.7
			Inching amount	DC×1%	(mm)	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
					(inch)	.0012	.0016	.0024	.0032	.0034	.0039	.0045	.0047

Inching return amount			Inching return rate			Inching dwell time			Hole bottom dwell time		
(mm)	0.2		mm/min	100		sec	0.1		sec	0.3	
(inch)	.0079		IPM	3.9							

Work material	Cutting speed	Machined area	Cutting condition	General criteria	Tool dia. (mm)	3.0	4.0	6.0	8.0	8.5	10.0	11.5	12.0
					(in)	.1181	.1575	.2362	.3150	.3347	.3937	.4528	.4724
Pre-hardened steel Hardened steel (40~50HRC)	Internal coolant 30~70~100 m/min 98~230~328 SFM		Revolution		min^{-1}	7431	5573	3715	2787	2623	2229	1939	1858
		Hole entrance section	Feed per rev	DCx(0.5~1~1.5)%	mm/rev.	0.015	0.020	0.030	0.040	0.043	0.050	0.058	0.060
					IPR	.0006	.0008	.0012	.0016	.0017	.0020	.0023	.0024
			Feed rate		mm/min	111	111	111	111	111	111	111	111
					IPM	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
		Middle section of hole	Feed per rev	DCx(0.5~1.2~2)%	mm/rev.	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
					IPR	.0012	.0016	.0024	.0032	.0034	.0039	.0045	.0047
			Feed rate		mm/min	223	223	223	223	223	223	223	223
					IPM	8.8	8.7	8.8	8.8	8.8	8.8	8.8	8.8
Stainless steel		R section of hole bottom	Inching feed per rev	DCx(0.2~0.3~0.5)%	mm/rev.	0.012	0.016	0.024	0.024	0.026	0.020	0.023	0.024
					IPR	.0005	.0006	.0009	.0009	.0010	.0008	.0009	.0009
			Inching feed rate		mm/min	89	89	89	67	67	45	45	45
					IPM	3.5	3.5	3.5	2.6	2.7	1.8	1.8	1.7
			Inching amount	DC×1%	(mm)	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
					(inch)	.0012	.0016	.0024	.0032	.0034	.0039	.0045	.0047

Inching return amount			Inching return rate			Inching dwell time			Hole bottom dwell time		
(mm)	0.2		mm/min	100		sec	0.1		sec	0.3	
(inch)	.0079		IPM	3.9							

Carbide Drill for SR machining

When finishing only the hole bottom

Work material	Cutting speed	Machined area	Cutting condition	General criteria	Tool dia.								
					(mm)	3.0	4.0	6.0	8.0	8.5	10.0	11.5	12.0
					(inch)	.1181	.1575	.2362	.3150	.3347	.3937	.4528	.4724
Pre-hardened steel Hardened steel (From before hardening to 50HRC)	Internal coolant 40~70~100 m/min 131~230~328 SFM		Revolution		min^{-1}	7431	5573	3715	2787	2623	2229	1939	1858
		Middle section of hole	Feed per rev	DC×(1～2～3)%	mm/rev.	0.060	0.080	0.120	0.160	0.170	0.200	0.230	0.240
					IPR	.0024	.0031	.0047	.0063	.0067	.0079	.0091	.0094
			Feed rate		mm/min	446	446	446	446	446	446	446	446
					IPM	17.8	17.3	17.5	17.6	17.6	17.6	17.6	17.5
		R section of hole bottom	Inching feed per rev	DC×(0.2~0.3~0.5)%	mm/rev.	0.012	0.016	0.024	0.024	0.026	0.020	0.023	0.024
					IPR	.0005	.0006	.0009	.0009	.0010	.0008	.0009	.0009
Stainless steel			Inching feed rate		mm/min	89	89	89	67	67	45	45	45
					IPM	3.5	3.5	3.5	2.6	2.7	1.8	1.8	1.7
			Inching amount	DC×1%	(mm)	0.030	0.040	0.060	0.080	0.085	0.100	0.115	0.120
					(inch)	.0012	.0016	.0024	.0032	.0034	.0039	.0045	.0047

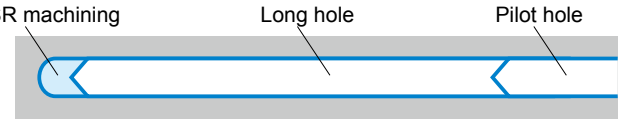
Inching return amount	(mm)	0.2	Inching return rate	mm/min	100	Inching dwell time	sec	0.1	Hole bottom dwell time	sec	0.3
	(inch)	.0079		IPM	3.9						

Setting of cutting conditions

- This standard cutting condition table is for general guidance regarding cutting conditions. The conditions should be adjusted according to the machining shape, application, machine used, etc. for the actual machining.
- When installing the tool, use a collet without scratches or dirt, and keep the tool runout to within 0.02 mm.
- Secure the work material firmly so that deformation, deflection, or vibration does not occur.
- Internal coolant is for when a water-soluble cutting fluid diluted up to 20 times is used. For dilutions of greater than 20 times, the cutting speed range should be used as a guide for adjustment. In addition, it is recommended that the coolant pressure be set to 2.0 MPa or higher if the tool diameter is Ø5.0 or less and to 1.5 MPa or higher if the tool diameter is greater than Ø5.0.
  Particularly in case of a vertical MC, chips tend not to be discharged easily. Better chip discharge is expected with higher coolant pressures- 3MPa or more is recommended.
- When using an oil-based cutting fluid, use conditions with speeds lower than the lower limit of the cutting speed range. Also, please be careful of smoke or fire caused by the hot cutting chips and tool.
- Be sure to sufficiently maintain the oil hole to prevent clogging.
- Please contact us about work materials not listed.

Tool selection example

※Cautions
- As a guide of the maximum hole depth, please set with groove length minus 2xDC.
- Even with the same tool diameter, shank diameter may be different for each tool. The size of the collet to use also varies, so please check carefully.
  (The shank diameter of the corresponding tool is indicated by red number.)
- Due to tolerance, the tool diameter for the guide hole and the long hole may be slightly smaller than WHSR-ATH. but the SR machining itself is not affected.



~45HRC When finishing only the hole bottom

Tool dia. (mm)	Tool dia. (inch)	Max. hole depth (mm)	Max. hole depth (inch)	Pilot hole Item code	Pilot hole Stock	Pilot hole Shank dia. (mm)	Pilot hole Flute length (mm)	Long hole Item code	Long hole Stock	Long hole Shank dia. (mm)	Long hole Flute length (mm)	for SR machining Item code	for SR machining Stock	for SR machining Shank dia. (mm)	for SR machining Flute length (mm)
3	.1181	31	1.2	Pilot hole is not required. However, when hole accuracy is necessary, using 03WHNSB is recommended.				08WHNSB0300-TH	●	3	35	08WHSR0300-ATH	★	4	37
4	.1575	40	1.6					08WHNSB0400-TH	●	4	46	08WHSR0400-ATH	★	4	48
5	.1969	52	2.0					08WHNSB0500-TH	●	5	59	08WHSR0500-ATH	★	6	62
6	.2362	58	2.3					08WHNSB0600-TH	●	6	67	08WHSR0600-ATH	★	6	70
7	.2756	67	2.6					08WHNSB0700-TH	●	7	77	08WHSR0700-ATH	★	8	81
8	.3150	76	3.0					08WHNSB0800-TH	●	8	88	08WHSR0800-ATH	★	8	92
8.5	.3347	82	3.2					08WHNSB0850-TH	●	9	94	08WHSR0850-ATH	★	10	99
9	.3543	86	3.4					08WHNSB0900-TH	●	9	99	08WHSR0900-ATH	★	10	104
9.5	.3740	91	3.6					08WHNSB0950-TH	●	10	105	08WHSR0950-ATH	★	10	110
10	.3937	95	3.7					08WHNSB1000-TH	●	10	110	08WHSR1000-ATH	★	10	115
10.5	.4134	101	4.0					08WHNSB1050-TH	●	11	116	08WHSR1050-ATH	★	12	122
11	.4331	105	4.1					08WHNSB1100-TH	●	11	121	08WHSR1100-ATH	★	12	127
11.5	.4528	110	4.3					08WHNSB1150-TH	●	12	127	08WHSR1150-ATH	★	12	133
12	.4724	114	4.5					08WHNSB1200-TH	●	12	132	08WHSR1200-ATH	★	12	138
3	.1181	65	2.6	05WHNSB0300-TH	●	3	29	20WHNSB0300-TH	★	3	69	20WHSR0300-ATH	★	4	71
4	.1575	86	3.4	05WHNSB0400-TH	●	4	37	20WHNSB0400-TH	★	4	92	20WHSR0400-ATH	★	4	94
5	.1969	109	4.3	05WHNSB0500-TH	●	5	47	20WHNSB0500-TH	★	5	116	20WHSR0500-ATH	★	6	119
6	.2362	130	5.1	05WHNSB0600-TH	●	6	47	20WHNSB0600-TH	★	6	139	20WHSR0600-ATH	★	6	142
7	.2756	152	6.0	05WHNSB0700-TH	●	7	55	20WHNSB0700-TH	★	7	162	20WHSR0700-ATH	★	8	166
8	.3150	173	6.8	05WHNSB0800-TH	●	8	63	20WHNSB0800-TH	★	8	185	20WHSR0800-ATH	★	8	189
8.5	.3347	184	7.2	05WHNSB0850-TH	●	9	71	20WHNSB0850-TH	★	9	196	20WHSR0850-ATH	★	10	201
9	.3543	195	7.7	05WHNSB0900-TH	●	9	71	20WHNSB0900-TH	★	9	208	20WHSR0900-ATH	★	10	213
9.5	.3740	205	8.1	05WHNSB0950-TH	●	10	79	20WHNSB0950-TH	★	10	219	20WHSR0950-ATH	★	10	224
10	.3937	216	8.5	05WHNSB1000-TH	●	10	79	20WHNSB1000-TH	★	10	231	20WHSR1000-ATH	★	10	236
10.5	.4134	228	9.0	05WHNSB1050-TH	●	11	87	20WHNSB1050-TH	★	11	243	20WHSR1050-ATH	★	12	249
11	.4331	238	9.4	05WHNSB1100-TH	●	11	87	20WHNSB1100-TH	★	11	254	20WHSR1100-ATH	★	12	260
11.5	.4528	249	9.8	05WHNSB1150-TH	●	12	93	20WHNSB1150-TH	★	12	266	20WHSR1150-ATH	★	12	272
12	.4724	259	10.2	05WHNSB1200-TH	●	12	93	20WHNSB1200-TH	★	12	277	20WHSR1200-ATH	★	12	283
3	.1181	95	3.7	05WHNSB0300-TH	●	3	29	30WHNSB0300-TH	★	3	99	30WHSR0300-ATH	★	4	101
4	.1575	126	5.0	05WHNSB0400-TH	●	4	37	30WHNSB0400-TH	★	4	132	30WHSR0400-ATH	★	4	134
5	.1969	159	6.3	05WHNSB0500-TH	●	5	47	30WHNSB0500-TH	★	5	166	30WHSR0500-ATH	★	6	169
6	.2362	190	7.5	05WHNSB0600-TH	●	6	47	30WHNSB0600-TH	★	6	199	30WHSR0600-ATH	★	6	202
7	.2756	222	8.7	05WHNSB0700-TH	●	7	55	30WHNSB0700-TH	★	7	232	30WHSR0700-ATH	★	8	236
8	.3150	253	10.0	05WHNSB0800-TH	●	8	63	30WHNSB0800-TH	★	8	265	30WHSR0800-ATH	★	8	269
8.5	.3347	269	10.6	05WHNSB0850-TH	●	9	71	30WHNSB0850-TH	★	9	281	30WHSR0850-ATH	★	10	286
9	.3543	285	11.2	05WHNSB0900-TH	●	9	71	30WHNSB0900-TH	★	9	298	30WHSR0900-ATH	★	10	303
9.5	.3740	301	11.9	05WHNSB0950-TH	●	10	79	30WHNSB0950-TH	★	10	314	30WHSR0950-ATH	★	10	320
10	.3937	316	12.4	05WHNSB1000-TH	●	10	79	30WHNSB1000-TH	★	10	331	30WHSR1000-ATH	★	10	336
10.5	.4134	332	13.1	05WHNSB1050-TH	●	11	87	30WHNSB1050-TH	★	11	348	30WHSR1050-ATH	★	12	353
11	.4331	348	13.7	05WHNSB1100-TH	●	11	87	30WHNSB1100-TH	★	11	364	30WHSR1100-ATH	★	12	370
11.5	.4528	364	14.3	05WHNSB1150-TH	●	12	93	30WHNSB1150-TH	★	12	381	30WHSR1150-ATH	★	12	387
12	.4724	380	15.0	05WHNSB1200-TH	●	12	93	30WHNSB1200-TH	★	12	397	30WHSR1200-ATH	★	12	404

● : Inventory maintained in US ★ : Inventory maintained in Japan

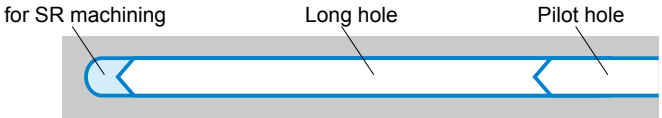
Details are mentioned on Page F55

Carbide Drill for SR machining

Tool selection example

※Cautions
- As a guide of the maximum hole depth, please set with groove length minus 2xDC.
- Even with the same tool diameter, shank diameter may be different for each tool. The size of the collet to use also varies, so please check carefully.
  (The shank diameter of the corresponding tool is indicated by red number.)
- Due to tolerance, the tool diameter for the guide hole and the long hole may be slightly smaller than WHSR-ATH. but the SR machining itself is not affected.

45HRC～ When finishing only the hole bottom



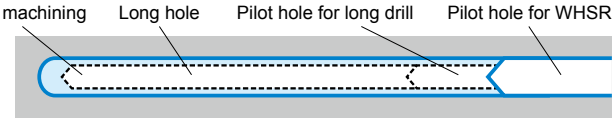
Tool dia.		Max. hole depth		Pilot hole				Long hole				for SR machining			
(mm)	(inch)	(mm)	(inch)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)
3	.1181	31	1.2	NSBH0300-20-ATH	★	4	20	NSBH0300-40-ATH	★	4	40	08WHSR0300-ATH	★	4	37
4	.1575	40	1.6	NSBH0400-20-ATH	★	6	20	NSBH0400-60-ATH	★	6	60	08WHSR0400-ATH	★	4	48
5	.1969	52	2.0	NSBH0500-25-ATH	★	6	25	NSBH0500-90-ATH	★	6	90	08WHSR0500-ATH	★	6	62
6	.2362	58	2.3	NSBH0600-30-ATH	★	8	30	NSBH0600-90-ATH	★	8	90	08WHSR0600-ATH	★	6	70
7	.2756	67	2.6	NSBH0700-35-ATH	★	8	35	NSBH0700-90-ATH	★	8	90	08WHSR0700-ATH	★	8	81
8	.3150	76	3.0	NSBH0800-40-ATH	★	10	40	NSBH0800-120-ATH	★	10	120	08WHSR0800-ATH	★	8	92
8.5	.3347	82	3.2	NSBH0850-45-ATH	★	10	45	NSBH0850-120-ATH	★	10	120	08WHSR0850-ATH	★	10	99
9	.3543	86	3.4	NSBH0900-45-ATH	★	10	45	NSBH0900-120-ATH	★	10	120	08WHSR0900-ATH	★	10	104
9.5	.3740	91	3.6	NSBH0950-50-ATH		10	50	NSBH0950-120-ATH		10	120	08WHSR0950-ATH	★	10	110
10	.3937	95	3.7	NSBH1000-50-ATH	★	12	50	NSBH1000-120-ATH	★	12	120	08WHSR1000-ATH	★	10	115
10.5	.4134	101	4.0	NSBH1050-50-ATH	★	12	50	NSBH1050-150-ATH		12	150	08WHSR1050-ATH	★	12	122
11	.4331	105	4.1	NSBH1100-55-ATH	★	12	55	NSBH1100-150-ATH	★	12	150	08WHSR1100-ATH	★	12	127
11.5	.4528	110	4.3	NSBH1150-60-ATH	★	12	60	NSBH1150-150-ATH	★	12	150	08WHSR1150-ATH	★	12	133
12	.4724	114	4.5	NSBH1200-60-ATH	★	12	60	NSBH1200-150-ATH	★	12	150	08WHSR1200-ATH	★	12	138
3	.1181	65	2.6	NSBH0300-20-ATH	★	4	20	NSBH0300-90-ATH	★	4	90	20WHSR0300-ATH	★	4	71
4	.1575	86	3.4	NSBH0400-20-ATH	★	6	20	NSBH0400-120-ATH	★	6	120	20WHSR0400-ATH	★	4	94
5	.1969	109	4.3	NSBH0500-25-ATH	★	6	25	NSBH0500-150-ATH	★	6	150	20WHSR0500-ATH	★	6	119
6	.2362	130	5.1	NSBH0600-30-ATH	★	8	30	NSBH0600-150-ATH	★	8	150	20WHSR0600-ATH	★	6	142
7	.2756	152	6.0	NSBH0700-35-ATH	★	8	35	NSBH0700-200-ATH	★	8	200	20WHSR0700-ATH	★	8	166
8	.3150	173	6.8	NSBH0800-40-ATH	★	10	40	NSBH0800-200-ATH	★	10	200	20WHSR0800-ATH	★	8	189
8.5	.3347	184	7.2	NSBH0850-45-ATH	★	10	45	NSBH0850-250-ATH	★	10	250	20WHSR0850-ATH	★	10	201
9	.3543	195	7.7	NSBH0900-45-ATH	★	10	45	NSBH0900-250-ATH	★	10	250	20WHSR0900-ATH	★	10	213
9.5	.3740	205	8.1	NSBH0950-50-ATH		10	50	NSBH0950-250-ATH		10	250	20WHSR0950-ATH	★	10	224
10	.3937	216	8.5	NSBH1000-50-ATH	★	12	50	NSBH1000-250-ATH	★	12	250	20WHSR1000-ATH	★	10	236
10.5	.4134	228	9.0	NSBH1050-50-ATH	★	12	50	NSBH1050-250-ATH		12	250	20WHSR1050-ATH	★	12	249
11	.4331	238	9.4	NSBH1100-55-ATH	★	12	55	NSBH1100-300-ATH	★	12	300	20WHSR1100-ATH	★	12	260
11.5	.4528	249	9.8	NSBH1150-60-ATH	★	12	60	NSBH1150-300-ATH	★	12	300	20WHSR1150-ATH	★	12	272
12	.4724	259	10.2	NSBH1200-60-ATH	★	12	60	NSBH1200-300-ATH	★	12	300	20WHSR1200-ATH	★	12	283
3	.1181	95	3.7	NSBH0300-20-ATH	★	4	20	NSBH0300-100-ATH	Manufactured upon request only			30WHSR0300-ATH	★	4	101
4	.1575	126	5.0	NSBH0400-20-ATH	★	6	20	NSBH0400-130-ATH				30WHSR0400-ATH	★	4	134
5	.1969	159	6.3	NSBH0500-25-ATH	★	6	25	NSBH0500-165-ATH				30WHSR0500-ATH	★	6	169
6	.2362	190	7.5	NSBH0600-30-ATH	★	8	30	NSBH0600-200-ATH				30WHSR0600-ATH	★	6	202
7	.2756	222	8.7	NSBH0700-35-ATH	★	8	35	NSBH0700-235-ATH				30WHSR0700-ATH	★	8	236
8	.3150	253	10.0	NSBH0800-40-ATH	★	10	40	NSBH0800-265-ATH				30WHSR0800-ATH	★	8	269
8.5	.3347	269	10.6	NSBH0850-45-ATH	★	10	45	NSBH0850-285-ATH				30WHSR0850-ATH	★	10	286
9	.3543	285	11.2	NSBH0900-45-ATH	★	10	45	NSBH0900-300-ATH				30WHSR0900-ATH	★	10	303
9.5	.3740	301	11.9	NSBH0950-50-ATH		10	50	NSBH0950-320-ATH				30WHSR0950-ATH	★	10	320
10	.3937	316	12.4	NSBH1000-50-ATH	★	12	50	NSBH1000-335-ATH				30WHSR1000-ATH	★	10	336
10.5	.4134	332	13.1	NSBH1050-50-ATH	★	12	50	NSBH1050-350-ATH				30WHSR1050-ATH	★	12	353
11	.4331	348	13.7	NSBH1100-55-ATH	★	12	55	NSBH1100-370-ATH				30WHSR1100-ATH	★	12	370
11.5	.4528	364	14.3	NSBH1150-60-ATH	★	12	60	NSBH1150-385-ATH				30WHSR1150-ATH	★	12	387
12	.4724	380	15.0	NSBH1200-60-ATH	★	12	60	NSBH1200-400-ATH				30WHSR1200-ATH	★	12	404

★ : Inventory maintained in Japan　No Mark : Manufactured upon request only

Details are mentioned on Page F55

※Cautions
- As a guide of the maximum hole depth, please set with groove length minus 2xDC.
- Even with the same tool diameter, shank diameter may be different for each tool. The size of the collet to use also varies, so please check carefully.
  (The shank diameter of the corresponding tool is indicated by red number.)
- Due to tolerance, the tool diameter for the guide hole and the long hole may be slightly smaller than WHSR-ATH. but the SR machining itself is not affected.

~45HRC When finishing the hole walls and hole bottom



Tool dia.		Max. hole depth		Pilot hole for WHSR				Pilot hole for long drill				Long hole				For SR machining			
(mm)	(inch)	(mm)	(inch)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)
3	.1181	31	1.2	03WHNSB0300-TH	●	3	19	Pilot hole for long drill is not required.				08WHNSB0290-TH	●	3	35	08WHSR0300-ATH	★	4	37
4	.1575	40	1.6	03WHNSB0400-TH	●	4	23					08WHNSB0390-TH	●	4	46	08WHSR0400-ATH	★	4	48
5	.1969	52	2.0	03WHNSB0500-TH	●	5	29					08WHNSB0490-TH	●	5	59	08WHSR0500-ATH	★	6	62
6	.2362	58	2.3	03WHNSB0600-TH	●	6	29					08WHNSB0590-TH	●	6	67	08WHSR0600-ATH	★	6	70
7	.2756	67	2.6	03WHNSB0700-TH	●	7	34					08WHNSB0690-TH	●	7	77	08WHSR0700-ATH	★	8	81
8	.3150	76	3.0	03WHNSB0800-TH	●	8	39					08WHNSB0790-TH	●	8	88	08WHSR0800-ATH	★	8	92
8.5	.3347	82	3.2	03WHNSB0850-TH	●	9	44					08WHNSB0840-TH	★	9	94	08WHSR0850-ATH	★	10	99
9	.3543	86	3.4	03WHNSB0900-TH	●	9	44					08WHNSB0890-TH	★	9	99	08WHSR0900-ATH	★	10	104
9.5	.3740	91	3.6	03WHNSB0950-TH	●	10	49					08WHNSB0940-TH	★	10	105	08WHSR0950-ATH	★	10	110
10	.3937	95	3.7	03WHNSB1000-TH	●	10	49					08WHNSB0990-TH	★	10	110	08WHSR1000-ATH	★	10	115
10.5	.4134	101	4.0	03WHNSB1050-TH	●	11	54					08WHNSB1040-TH	★	11	116	08WHSR1050-ATH	★	12	122
11	.4331	105	4.1	03WHNSB1100-TH	●	11	54					08WHNSB1090-TH	★	11	121	08WHSR1100-ATH	★	12	127
11.5	.4528	110	4.3	03WHNSB1150-TH	●	12	59					08WHNSB1140-TH	★	12	127	08WHSR1150-ATH	★	12	133
12	.4724	114	4.5	03WHNSB1200-TH	●	12	59					08WHNSB1190-TH	★	12	132	08WHSR1200-ATH	★	12	138
3	.1181	65	2.6	05WHNSB0300-TH	●	3	29	08WHNSB0290-TH	●	3	35	20WHNSB0290-TH	★	3	69	20WHSR0300-ATH	★	4	71
4	.1575	86	3.4	05WHNSB0400-TH	●	4	37	08WHNSB0390-TH	●	4	46	20WHNSB0390-TH	★	4	92	20WHSR0400-ATH	★	4	94
5	.1969	109	4.3	05WHNSB0500-TH	●	5	47	08WHNSB0490-TH	●	5	59	20WHNSB0490-TH	★	5	116	20WHSR0500-ATH	★	6	119
6	.2362	130	5.1	05WHNSB0600-TH	●	6	47	08WHNSB0590-TH	●	6	67	20WHNSB0590-TH	★	6	139	20WHSR0600-ATH	★	6	142
7	.2756	152	6.0	05WHNSB0700-TH	●	7	55	08WHNSB0690-TH	●	7	77	20WHNSB0690-TH	★	7	162	20WHSR0700-ATH	★	8	166
8	.3150	173	6.8	05WHNSB0800-TH	●	8	63	08WHNSB0790-TH	●	8	88	20WHNSB0790-TH	★	8	185	20WHSR0800-ATH	★	8	189
8.5	.3347	184	7.2	05WHNSB0850-TH	●	9	71	08WHNSB0840-TH	●	9	94	20WHNSB0840-TH	★	9	196	20WHSR0850-ATH	★	10	201
9	.3543	195	7.7	05WHNSB0900-TH	●	9	71	08WHNSB0890-TH	●	9	99	20WHNSB0890-TH	★	9	208	20WHSR0900-ATH	★	10	213
9.5	.3740	205	8.1	05WHNSB0950-TH	●	10	79	08WHNSB0940-TH	●	10	105	20WHNSB0940-TH	★	10	219	20WHSR0950-ATH	★	10	224
10	.3937	216	8.5	05WHNSB1000-TH	●	10	79	08WHNSB0990-TH	●	10	110	20WHNSB0990-TH	★	10	231	20WHSR1000-ATH	★	10	236
10.5	.4134	228	9.0	05WHNSB1050-TH	●	11	87	08WHNSB1040-TH	●	11	116	20WHNSB1040-TH	★	11	243	20WHSR1050-ATH	★	12	249
11	.4331	238	9.4	05WHNSB1100-TH	●	11	87	08WHNSB1090-TH	●	11	121	20WHNSB1090-TH	★	11	254	20WHSR1100-ATH	★	12	260
11.5	.4528	249	9.8	05WHNSB1150-TH	●	12	93	08WHNSB1140-TH	●	12	127	20WHNSB1140-TH	★	12	266	20WHSR1150-ATH	★	12	272
12	.4724	259	10.2	05WHNSB1200-TH	●	12	93	08WHNSB1190-TH	●	12	132	20WHNSB1190-TH	★	12	277	20WHSR1200-ATH	★	12	283
3	.1181	95	3.7	05WHNSB0300-TH	●	3	29	08WHNSB0290-TH	●	3	35	30WHNSB0290-TH	★	3	99	30WHSR0300-ATH	★	4	101
4	.1575	126	5.0	05WHNSB0400-TH	●	4	37	08WHNSB0390-TH	●	4	46	30WHNSB0390-TH	★	4	132	30WHSR0400-ATH	★	4	134
5	.1969	159	6.3	05WHNSB0500-TH	●	5	47	08WHNSB0490-TH	●	5	59	30WHNSB0490-TH	★	5	166	30WHSR0500-ATH	★	6	169
6	.2362	190	7.5	05WHNSB0600-TH	●	6	47	08WHNSB0590-TH	●	6	67	30WHNSB0590-TH	★	6	199	30WHSR0600-ATH	★	6	202
7	.2756	222	8.7	05WHNSB0700-TH	●	7	55	08WHNSB0690-TH	●	7	77	30WHNSB0690-TH	★	7	232	30WHSR0700-ATH	★	8	236
8	.3150	253	10.0	05WHNSB0800-TH	●	8	63	08WHNSB0790-TH	●	8	88	30WHNSB0790-TH	★	8	265	30WHSR0800-ATH	★	8	269
8.5	.3347	269	10.6	05WHNSB0850-TH	●	9	71	08WHNSB0840-TH	●	9	94	30WHNSB0840-TH	★	9	281	30WHSR0850-ATH	★	10	286
9	.3543	285	11.2	05WHNSB0900-TH	●	9	71	08WHNSB0890-TH	●	9	99	30WHNSB0890-TH	★	9	298	30WHSR0900-ATH	★	10	303
9.5	.3740	301	11.9	05WHNSB0950-TH	●	10	79	08WHNSB0940-TH	●	10	105	30WHNSB0940-TH	★	10	314	30WHSR0950-ATH	★	10	320
10	.3937	316	12.4	05WHNSB1000-TH	●	10	79	08WHNSB0990-TH	●	10	110	30WHNSB0990-TH	★	10	331	30WHSR1000-ATH	★	10	336
10.5	.4134	332	13.1	05WHNSB1050-TH	●	11	87	08WHNSB1040-TH	●	11	116	30WHNSB1040-TH	★	11	348	30WHSR1050-ATH	★	12	353
11	.4331	348	13.7	05WHNSB1100-TH	●	11	87	08WHNSB1090-TH	●	11	121	30WHNSB1090-TH	★	11	364	30WHSR1100-ATH	★	12	370
11.5	.4528	364	14.3	05WHNSB1150-TH	●	12	93	08WHNSB1140-TH	●	12	127	30WHNSB1140-TH	★	12	381	30WHSR1150-ATH	★	12	387
12	.4724	380	15.0	05WHNSB1200-TH	●	12	93	08WHNSB1190-TH	●	12	132	30WHNSB1190-TH	★	12	397	30WHSR1200-ATH	★	12	404

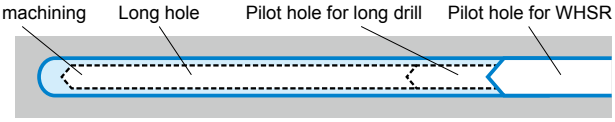
● : Inventory maintained in US ★ : Inventory maintained in Japan

Details are mentioned on Page F55

Carbide Drill for SR machining

Tool selection example

※Cautions
- As a guide of the maximum hole depth, please set with groove length minus 2xDC.
- Even with the same tool diameter, shank diameter may be different for each tool. The size of the collet to use also varies, so please check carefully.
  (The shank diameter of the corresponding tool is indicated by red number.)
- Due to tolerance, the tool diameter for the guide hole and the long hole may be slightly smaller than WHSR-ATH. but the SR machining itself is not affected.



45HRC～ When finishing the hole walls and hole bottom

Tool dia.		Max. hole depth		Pilot hole for WHSR				Pilot hole for long drill				Long hole				For SR machining			
(mm)	(inch)	(mm)	(inch)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)	Item code	Stock	Shank dia. (mm)	Flute length (mm)
3	.1181	31	1.2	NSBH0300-20-ATH	★	4	20	NSBH0290-20-ATH		4	20	NSBH0290-40-ATH		4	40	08WHSR0300-ATH	★	4	37
4	.1575	40	1.6	NSBH0400-20-ATH	★	6	20	NSBH0390-20-ATH		4	20	NSBH0390-60-ATH		4	60	08WHSR0400-ATH	★	4	48
5	.1969	52	2.0	NSBH0500-25-ATH	★	6	25	NSBH0490-20-ATH		6	20	NSBH0490-90-ATH		6	90	08WHSR0500-ATH	★	6	62
6	.2362	58	2.3	NSBH0600-30-ATH	★	8	30	NSBH0590-30-ATH		6	30	NSBH0590-90-ATH		6	90	08WHSR0600-ATH	★	6	70
7	.2756	67	2.6	NSBH0700-35-ATH	★	8	35	NSBH0690-30-ATH	★	8	30	NSBH0690-90-ATH		8	90	08WHSR0700-ATH	★	8	81
8	.3150	76	3.0	NSBH0800-40-ATH	★	10	40	NSBH0790-35-ATH		8	35	NSBH0790-120-ATH		8	120	08WHSR0800-ATH	★	8	92
8.5	.3347	82	3.2	NSBH0850-45-ATH	★	10	45	NSBH0840-45-ATH		10	45	NSBH0840-120-ATH		10	120	08WHSR0850-ATH	★	10	99
9	.3543	86	3.4	NSBH0900-45-ATH	★	10	45	NSBH0890-45-ATH	★	10	45	NSBH0890-120-ATH		10	120	08WHSR0900-ATH	★	10	104
9.5	.3740	91	3.6	NSBH0950-50-ATH		10	50	NSBH0940-50-ATH		10	50	NSBH0940-120-ATH		10	120	08WHSR0950-ATH	★	10	110
10	.3937	95	3.7	NSBH1000-50-ATH	★	12	50	NSBH0990-50-ATH		10	50	NSBH0990-120-ATH		10	120	08WHSR1000-ATH	★	10	115
10.5	.4134	101	4.0	NSBH1050-50-ATH	★	12	50	NSBH1040-50-ATH	★	12	50	NSBH1040-150-ATH		12	150	08WHSR1050-ATH	★	12	122
11	.4331	105	4.1	NSBH1100-55-ATH	★	12	55	NSBH1090-50-ATH	★	12	50	NSBH1090-150-ATH		12	150	08WHSR1100-ATH	★	12	127
11.5	.4528	110	4.3	NSBH1150-60-ATH	★	12	60	NSBH1140-55-ATH		12	55	NSBH1140-150-ATH		12	150	08WHSR1150-ATH	★	12	133
12	.4724	114	4.5	NSBH1200-60-ATH	★	12	60	NSBH1190-60-ATH		12	60	NSBH1190-150-ATH		12	150	08WHSR1200-ATH	★	12	138
3	.1181	65	2.6	NSBH0300-20-ATH	★	4	20	NSBH0290-20-ATH		4	20	NSBH0290-70-ATH	Manufactured upon request only			20WHSR0300-ATH	★	4	71
4	.1575	86	3.4	NSBH0400-20-ATH	★	6	20	NSBH0390-20-ATH		4	20	NSBH0390-120-ATH		4	120	20WHSR0400-ATH	★	4	94
5	.1969	109	4.3	NSBH0500-25-ATH	★	6	25	NSBH0490-20-ATH		6	20	NSBH0490-150-ATH		6	150	20WHSR0500-ATH	★	6	119
6	.2362	130	5.1	NSBH0600-30-ATH	★	8	30	NSBH0590-30-ATH		6	30	NSBH0590-150-ATH		6	150	20WHSR0600-ATH	★	6	142
7	.2756	152	6.0	NSBH0700-35-ATH	★	8	35	NSBH0690-30-ATH	★	8	30	NSBH0690-200-ATH		8	200	20WHSR0700-ATH	★	8	166
8	.3150	173	6.8	NSBH0800-40-ATH	★	10	40	NSBH0790-35-ATH		8	35	NSBH0790-200-ATH		8	200	20WHSR0800-ATH	★	8	189
8.5	.3347	184	7.2	NSBH0850-45-ATH	★	10	45	NSBH0840-45-ATH		10	45	NSBH0840-250-ATH		10	250	20WHSR0850-ATH	★	10	201
9	.3543	195	7.7	NSBH0900-45-ATH	★	10	45	NSBH0890-45-ATH	★	10	45	NSBH0890-250-ATH		10	250	20WHSR0900-ATH	★	10	213
9.5	.3740	205	8.1	NSBH0950-50-ATH		10	50	NSBH0940-50-ATH		10	50	NSBH0940-250-ATH		10	250	20WHSR0950-ATH	★	10	224
10	.3937	216	8.5	NSBH1000-50-ATH	★	12	50	NSBH0990-50-ATH		10	50	NSBH0990-250-ATH		10	250	20WHSR1000-ATH	★	10	236
10.5	.4134	228	9.0	NSBH1050-50-ATH	★	12	50	NSBH1040-50-ATH	★	12	50	NSBH1040-250-ATH		12	250	20WHSR1050-ATH	★	12	249
11	.4331	238	9.4	NSBH1100-55-ATH	★	12	55	NSBH1090-50-ATH	★	12	50	NSBH1090-300-ATH		12	300	20WHSR1100-ATH	★	12	260
11.5	.4528	249	9.8	NSBH1150-60-ATH	★	12	60	NSBH1140-55-ATH		12	55	NSBH1140-300-ATH		12	300	20WHSR1150-ATH	★	12	272
12	.4724	259	10.2	NSBH1200-60-ATH	★	12	60	NSBH1190-60-ATH		12	60	NSBH1190-300-ATH		12	300	20WHSR1200-ATH	★	12	283
3	.1181	95	3.7	NSBH0300-20-ATH	★	4	20	NSBH0290-20-ATH		4	20	NSBH0290-100-ATH	Manufactured upon request only			30WHSR0300-ATH	★	4	101
4	.1575	126	5.0	NSBH0400-20-ATH	★	6	20	NSBH0390-20-ATH		4	20	NSBH0390-130-ATH				30WHSR0400-ATH	★	4	134
5	.1969	159	6.3	NSBH0500-25-ATH	★	6	25	NSBH0490-20-ATH		6	20	NSBH0490-165-ATH				30WHSR0500-ATH	★	6	169
6	.2362	190	7.5	NSBH0600-30-ATH	★	8	30	NSBH0590-30-ATH		6	30	NSBH0590-200-ATH				30WHSR0600-ATH	★	6	202
7	.2756	222	8.7	NSBH0700-35-ATH	★	8	35	NSBH0690-30-ATH	★	8	30	NSBH0690-235-ATH				30WHSR0700-ATH	★	8	236
8	.3150	253	10.0	NSBH0800-40-ATH	★	10	40	NSBH0790-35-ATH		8	35	NSBH0790-265-ATH				30WHSR0800-ATH	★	8	269
8.5	.3347	269	10.6	NSBH0850-45-ATH	★	10	45	NSBH0840-45-ATH		10	45	NSBH0840-285-ATH				30WHSR0850-ATH	★	10	286
9	.3543	285	11.2	NSBH0900-45-ATH	★	10	45	NSBH0890-45-ATH	★	10	45	NSBH0890-300-ATH				30WHSR0900-ATH	★	10	303
9.5	.3740	301	11.9	NSBH0950-50-ATH		10	50	NSBH0940-50-ATH		10	50	NSBH0940-320-ATH				30WHSR0950-ATH	★	10	320
10	.3937	316	12.4	NSBH1000-50-ATH	★	12	50	NSBH0990-50-ATH		10	50	NSBH0990-335-ATH				30WHSR1000-ATH	★	10	336
10.5	.4134	332	13.1	NSBH1050-50-ATH	★	12	50	NSBH1040-50-ATH	★	12	50	NSBH1040-350-ATH				30WHSR1050-ATH	★	12	353
11	.4331	348	13.7	NSBH1100-55-ATH	★	12	55	NSBH1090-50-ATH	★	12	50	NSBH1090-370-ATH				30WHSR1100-ATH	★	12	370
11.5	.4528	364	14.3	NSBH1150-60-ATH	★	12	60	NSBH1140-55-ATH		12	55	NSBH1140-385-ATH				30WHSR1150-ATH	★	12	387
12	.4724	380	15.0	NSBH1200-60-ATH	★	12	60	NSBH1190-60-ATH		12	60	NSBH1190-400-ATH				30WHSR1200-ATH	★	12	404

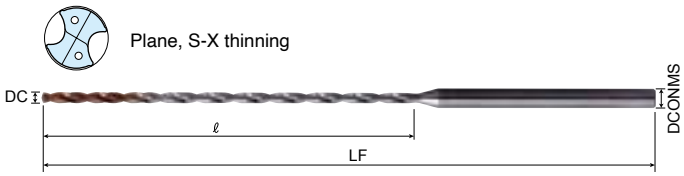
★ : Inventory maintained in Japan　No Mark : Manufactured upon request only

Details are mentioned on Page F55

MINIATURE DRILL WHMB

Drilling | Carbide | TH | 140° | 30D

h7 | h6



○○WHMB○○○○○-TH

Cutting Conditions F66

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0100-TH	★	1	.0394	6	55	3
05WHMB0100-TH	★			10	55	3
10WHMB0100-TH	★			15	55	3
15WHMB0100-TH	★			20	60	3
20WHMB0100-TH	★			24	65	3
25WHMB0100-TH	★			28	65	3
30WHMB0100-TH	★			33	70	3
03WHMB0101-TH		1.01	.0398	6	55	3
05WHMB0101-TH				10	55	3
10WHMB0101-TH				16	55	3
20WHMB0101-TH				25	65	3
30WHMB0101-TH				35	75	3
03WHMB0102-TH		1.02	.0402	6	55	3
05WHMB0102-TH				10	55	3
10WHMB0102-TH				16	55	3
20WHMB0102-TH				25	65	3
30WHMB0102-TH				35	75	3
03WHMB0103-TH		1.03	.0406	6	55	3
05WHMB0103-TH				10	55	3
10WHMB0103-TH				16	55	3
20WHMB0103-TH				25	65	3
30WHMB0103-TH				35	75	3
03WHMB0105-TH	★	1.05	.0413	6	55	3
05WHMB0105-TH	★			10	55	3
10WHMB0105-TH	★			16	55	3
15WHMB0105-TH	★			20	60	3
20WHMB0105-TH	★			25	65	3
25WHMB0105-TH	★			30	70	3
30WHMB0105-TH	★			35	75	3
03WHMB0110-TH	★	1.1	.0433	6	55	3
05WHMB0110-TH	★			11	55	3
10WHMB0110-TH	★			17	55	3
15WHMB0110-TH	★			22	60	3
20WHMB0110-TH	★			26	65	3
25WHMB0110-TH	★			32	70	3
30WHMB0110-TH	★			37	75	3
03WHMB0111-TH		1.11	.0437	6	55	3
05WHMB0111-TH				11	55	3
10WHMB0111-TH				18	60	3
20WHMB0111-TH				28	70	3
30WHMB0111-TH				38	75	3

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0112-TH		1.12	.0441	6	55	3
05WHMB0112-TH				11	55	3
10WHMB0112-TH				18	60	3
20WHMB0112-TH				28	70	3
30WHMB0112-TH				38	75	3
03WHMB0113-TH		1.13	.0445	6	55	3
05WHMB0113-TH				11	55	3
10WHMB0113-TH				18	60	3
20WHMB0113-TH				28	70	3
30WHMB0113-TH				38	75	3
03WHMB0115-TH	★	1.15	.0453	6	55	3
05WHMB0115-TH	★			11	55	3
10WHMB0115-TH	★			18	60	3
15WHMB0115-TH	★			23	60	3
20WHMB0115-TH	★			28	70	3
25WHMB0115-TH	★			33	70	3
30WHMB0115-TH	★			38	75	3
03WHMB0120-TH	★	1.2	.0472	6	55	3
05WHMB0120-TH	★			12	55	3
10WHMB0120-TH	★			18	60	3
15WHMB0120-TH	★			23	60	3
20WHMB0120-TH	★			29	70	3
25WHMB0120-TH	★			35	75	3
30WHMB0120-TH	★			40	80	3
03WHMB0121-TH		1.21	.0476	7	55	3
05WHMB0121-TH				13	55	3
10WHMB0121-TH				20	60	3
20WHMB0121-TH				31	70	3
30WHMB0121-TH				42	80	3
03WHMB0122-TH		1.22	.0480	7	55	3
05WHMB0122-TH				13	55	3
10WHMB0122-TH				20	60	3
20WHMB0122-TH				31	70	3
30WHMB0122-TH				42	80	3
03WHMB0123-TH		1.23	.0484	7	55	3
05WHMB0123-TH				13	55	3
10WHMB0123-TH				20	60	3
20WHMB0123-TH				31	70	3
30WHMB0123-TH				42	80	3

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0125-TH	★	1.25	.0492	7	55	3
05WHMB0125-TH	★			13	55	3
10WHMB0125-TH	★			20	60	3
15WHMB0125-TH	★			24	60	3
20WHMB0125-TH	★			31	70	3
25WHMB0125-TH	★			36	75	3
30WHMB0125-TH	★			42	80	3
03WHMB0130-TH	★	1.3	.0512	7	55	3
05WHMB0130-TH	★			14	55	3
10WHMB0130-TH	★			21	60	3
15WHMB0130-TH	★			25	70	3
20WHMB0130-TH	★			32	70	3
25WHMB0130-TH	★			37	75	3
30WHMB0130-TH	★			43	80	3
03WHMB0131-TH		1.31	.0516	7	55	3
05WHMB0131-TH				14	55	3
10WHMB0131-TH				21	60	3
20WHMB0131-TH				33	70	3
30WHMB0131-TH				45	85	3
03WHMB0132-TH		1.32	.0520	7	55	3
05WHMB0132-TH				14	55	3
10WHMB0132-TH				21	60	3
20WHMB0132-TH				33	70	3
30WHMB0132-TH				45	85	3
03WHMB0133-TH		1.33	.0524	7	55	3
05WHMB0133-TH				14	55	3
10WHMB0133-TH				21	60	3
20WHMB0133-TH				33	70	3
30WHMB0133-TH				45	85	3
03WHMB0135-TH	★	1.35	.0532	7	55	3
05WHMB0135-TH	★			14	55	3
10WHMB0135-TH	★			21	60	3
15WHMB0135-TH	★			26	70	3
20WHMB0135-TH	★			33	70	3
25WHMB0135-TH	★			37	75	3
30WHMB0135-TH	★			45	85	3

MINIATURE DRILL WHMB

○○WHMB○○○○-TH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0140-TH	★	1.4	.0551	7	55	3
05WHMB0140-TH	★			15	55	3
10WHMB0140-TH	★			22	60	3
15WHMB0140-TH	★			27	70	3
20WHMB0140-TH	★			33	70	3
25WHMB0140-TH	★			38	75	3
30WHMB0140-TH	★			47	85	3
03WHMB0141-TH		1.41	.0555	7	55	3
05WHMB0141-TH				15	55	3
10WHMB0141-TH				23	60	3
20WHMB0141-TH				35	75	3
30WHMB0141-TH				49	85	3
03WHMB0142-TH		1.42	.0559	7	55	3
05WHMB0142-TH				15	55	3
10WHMB0142-TH				23	60	3
20WHMB0142-TH				35	75	3
30WHMB0142-TH				49	85	3
03WHMB0143-TH		1.43	.0563	7	55	3
05WHMB0143-TH				15	55	3
10WHMB0143-TH				23	60	3
20WHMB0143-TH				35	75	3
30WHMB0143-TH				49	85	3
03WHMB0145-TH	★	1.45	.0571	7	55	3
05WHMB0145-TH	★			15	55	3
10WHMB0145-TH	★			23	60	3
15WHMB0145-TH	★			30	70	3
20WHMB0145-TH	★			35	75	3
25WHMB0145-TH	★			42	80	3
30WHMB0145-TH	★			49	85	3
03WHMB0150-TH	★	1.5	.0591	8	55	3
05WHMB0150-TH	★			16	55	3
10WHMB0150-TH	★			24	60	3
15WHMB0150-TH	★			30	70	3
20WHMB0150-TH	★			37	75	3
25WHMB0150-TH	★			42	80	3
30WHMB0150-TH	★			50	90	3
03WHMB0151-TH		1.51	.0595	8	55	3
05WHMB0151-TH				16	55	3
10WHMB0151-TH				22	60	3
20WHMB0151-TH				37	75	3
30WHMB0151-TH				52	90	3

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0152-TH		1.52	.0598	8	55	3
05WHMB0152-TH				16	55	3
10WHMB0152-TH				22	60	3
20WHMB0152-TH				37	75	3
30WHMB0152-TH				52	90	3
03WHMB0153-TH		1.53	.0602	8	55	3
05WHMB0153-TH				16	55	3
10WHMB0153-TH				22	60	3
20WHMB0153-TH				37	75	3
30WHMB0153-TH				52	90	3
03WHMB0155-TH	★	1.55	.0610	8	55	3
05WHMB0155-TH	★			16	55	3
10WHMB0155-TH	★			22	60	3
15WHMB0155-TH	★			32	70	3
20WHMB0155-TH	★			37	75	3
25WHMB0155-TH	★			44	85	3
30WHMB0155-TH	★			52	90	3
03WHMB0160-TH	★	1.6	.0630	8	55	3
05WHMB0160-TH	★			17	55	3
10WHMB0160-TH	★			26	65	3
15WHMB0160-TH	★			33	70	3
20WHMB0160-TH	★			37	75	3
25WHMB0160-TH	★			45	85	3
30WHMB0160-TH	★			53	90	3
03WHMB0161-TH		1.61	.0634	8	55	3
05WHMB0161-TH				17	55	3
10WHMB0161-TH				26	65	3
20WHMB0161-TH				38	75	3
30WHMB0161-TH				55	95	3
03WHMB0162-TH		1.62	.0638	8	55	3
05WHMB0162-TH				17	55	3
10WHMB0162-TH				26	65	3
20WHMB0162-TH				38	75	3
30WHMB0162-TH				55	95	3
03WHMB0163-TH		1.63	.0642	8	55	3
05WHMB0163-TH				17	55	3
10WHMB0163-TH				26	65	3
20WHMB0163-TH				38	75	3
30WHMB0163-TH				55	95	3

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0165-TH	★	1.65	.0650	8	55	3
05WHMB0165-TH	★			17	55	3
10WHMB0165-TH	★			26	65	3
15WHMB0165-TH	★			33	70	3
20WHMB0165-TH	★			38	75	3
25WHMB0165-TH	★			46	90	3
30WHMB0165-TH	★			55	95	3
03WHMB0170-TH	★	1.7	.0669	8	55	3
05WHMB0170-TH	★			18	55	3
10WHMB0170-TH	★			27	65	3
15WHMB0170-TH	★			34	70	3
20WHMB0170-TH	★			40	80	3
25WHMB0170-TH	★			48	85	3
30WHMB0170-TH	★			57	95	3
03WHMB0171-TH		1.71	.0673	8	55	3
05WHMB0171-TH				19	60	3
10WHMB0171-TH				27	65	3
20WHMB0171-TH				41	80	3
30WHMB0171-TH				58	95	3
03WHMB0172-TH		1.72	.0677	8	55	3
05WHMB0172-TH				19	60	3
10WHMB0172-TH				27	65	3
20WHMB0172-TH				41	80	3
30WHMB0172-TH				58	95	3
03WHMB0173-TH		1.73	.0681	8	55	3
05WHMB0173-TH				19	60	3
10WHMB0173-TH				27	65	3
20WHMB0173-TH				41	80	3
30WHMB0173-TH				58	95	3
03WHMB0175-TH		1.75	.0689	8	55	3
05WHMB0175-TH				19	60	3
10WHMB0175-TH				27	65	3
15WHMB0175-TH				34	75	3
20WHMB0175-TH				41	80	3
25WHMB0175-TH				50	90	3
30WHMB0175-TH				58	95	3

★：Inventory maintained in Japan　No Mark：Manufactured upon request only

○○WHMB○○○○-TH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0180-TH	★	1.8	.0709	10	55	3
05WHMB0180-TH	★			19	60	3
10WHMB0180-TH	★			28	65	3
15WHMB0180-TH	★			36	75	3
20WHMB0180-TH	★			43	80	3
25WHMB0180-TH	★			51	90	3
30WHMB0180-TH	★			60	100	3
03WHMB0181-TH		1.81	.0713	10	55	3
05WHMB0181-TH				20	60	3
10WHMB0181-TH				29	70	3
20WHMB0181-TH				45	85	3
30WHMB0181-TH				61	100	3
03WHMB0182-TH		1.82	.0717	10	55	3
05WHMB0182-TH				20	60	3
10WHMB0182-TH				29	70	3
20WHMB0182-TH				45	85	3
30WHMB0182-TH				61	100	3
03WHMB0183-TH		1.83	.0721	10	55	3
05WHMB0183-TH				20	60	3
10WHMB0183-TH				29	70	3
20WHMB0183-TH				45	85	3
30WHMB0183-TH				61	100	3
03WHMB0185-TH	★	1.85	.0728	10	55	3
05WHMB0185-TH	★			20	60	3
10WHMB0185-TH	★			29	70	3
15WHMB0185-TH	★			38	75	3
20WHMB0185-TH	★			45	85	3
25WHMB0185-TH	★			53	90	3
30WHMB0185-TH	★			61	100	3
03WHMB0190-TH	★	1.9	.0748	10	55	3
05WHMB0190-TH	★			20	60	3
10WHMB0190-TH	★			29	70	3
15WHMB0190-TH	★			39	75	3
20WHMB0190-TH	★			45	85	3
25WHMB0190-TH	★			55	95	3
30WHMB0190-TH	★			63	100	3

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0191-TH		1.91	.0752	10	55	3
05WHMB0191-TH				20	60	3
10WHMB0191-TH				30	70	3
20WHMB0191-TH				47	85	3
30WHMB0191-TH				65	105	3
03WHMB0192-TH		1.92	.0756	10	55	3
05WHMB0192-TH				20	60	3
10WHMB0192-TH				30	70	3
20WHMB0192-TH				47	85	3
30WHMB0192-TH				65	105	3
03WHMB0193-TH		1.93	.0760	10	55	3
05WHMB0193-TH				20	60	3
10WHMB0193-TH				30	70	3
20WHMB0193-TH				47	85	3
30WHMB0193-TH				65	105	3
03WHMB0195-TH	★	1.95	.0768	10	55	3
05WHMB0195-TH	★			20	60	3
10WHMB0195-TH	★			30	70	3
15WHMB0195-TH	★			41	80	3
20WHMB0195-TH	★			47	85	3
25WHMB0195-TH	★			56	95	3
30WHMB0195-TH	★			65	105	3
03WHMB0200-TH	★	2	.0787	10	55	3
05WHMB0200-TH	★			20	60	3
10WHMB0200-TH	★			30	70	3
15WHMB0200-TH	★			41	80	3
20WHMB0200-TH	★			47	85	3
25WHMB0200-TH	★			57	95	3
30WHMB0200-TH	★			67	105	3
03WHMB0201-TH		2.01	.0791	10	55	3
05WHMB0201-TH				21	60	3
10WHMB0201-TH				31	70	3
20WHMB0201-TH				49	90	3
30WHMB0201-TH				69	110	3

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
03WHMB0202-TH		2.02	.0795	10	55	3
05WHMB0202-TH				21	60	3
10WHMB0202-TH				31	70	3
20WHMB0202-TH				49	90	3
30WHMB0202-TH				69	110	3
03WHMB0203-TH		2.03	.0799	10	55	3
05WHMB0203-TH				21	60	3
10WHMB0203-TH				31	70	3
20WHMB0203-TH				49	90	3
30WHMB0203-TH				69	110	3

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	◎	◎	○	○			◎				○	○

MINIATURE DRILL WHMB

Recommended cutting conditions

Up to 5D

03WHMB-TH 05WHMB-TH

Tool dia.		Cutting condition		Carbon steel	Alloy steel	Stainless steel 304	Stainless steel 630	Aluminium alloys
Metric (Inch)	1.0mm (.0394")	Cutting speed (v_c)	m/min	30~40~50	30~40~50	20~30~40	20~30~40	40~60~80
			SFM	98~131~164	98~131~164	66~98~131	66~98~131	131~197~262
		Revolution (n)	min^{-1}	12,732	12,732	9,549	9,549	19,099
		Feed per rev (f)	mm/rev	0.01~0.04	0.01~0.04	0.01~0.04	0.01~0.03	0.01~0.05
			IPR	.0004~.002	.0004~.002	.0004~.002	.0004~.0012	.0004~.002
Metric (Inch)	1.5mm (.0591")	Cutting speed (v_c)	m/min	30~40~50	30~40~50	20~30~40	20~30~40	40~60~80
			SFM	98~131~164	98~131~164	66~98~131	66~98~131	131~197~262
		Revolution (n)	min^{-1}	8,488	8,488	6,366	6,366	12,732
		Feed per rev (f)	mm/rev	0.015~0.06	0.015~0.06	0.015~0.06	0.015~0.045	0.015~0.075
			IPR	.0006~.0024	.0006~.0024	.0006~.0024	.0006~.0024	.0006~.003
Metric (Inch)	2mm (.0787")	Cutting speed (v_c)	m/min	30~40~50	30~40~50	20~30~40	20~30~40	40~60~80
			SFM	98~131~164	98~131~164	66~98~131	66~98~131	131~197~262
		Revolution (n)	min^{-1}	6,366	6,366	4,775	4,775	9,549
		Feed per rev (f)	mm/rev	0.02~0.08	0.02~0.08	0.02~0.08	0.02~0.06	0.02~0.1
			IPR	.0008~.0031	.0008~.0031	.0008~.0031	.0008~.0024	.0008~.0039

10D or more

10WHMB-TH 15WHMB-TH 20WHMB-TH 25WHMB-TH 30WHMB-TH

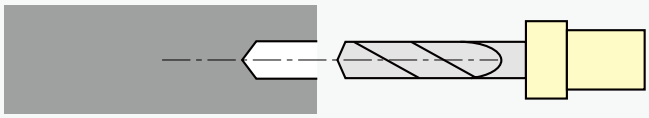
Tool dia.		Cutting condition		Carbon steel	Alloy steel	Stainless steel 304	Stainless steel 630	Aluminium alloys
Metric (Inch)	1.0mm (.0394")	Cutting speed (v_c)	m/min	30~40~50	30~40~50	20~30~40	20~30~40	30~40~60
			SFM	98~131~164	98~131~164	66~98~131	66~98~131	98~131~197
		Revolution (n)	min^{-1}	12,732	12,732	9,549	9,549	12,732
		Feed per rev (f)	mm/rev	0.01~0.03	0.01~0.03	0.01~0.03	0.01~0.015	0.01~0.04
			IPR	.0004~.0012	.0004~.0012	.0004~.0012	.0004~.0006	.0004~.0016
Metric (Inch)	1.5mm (.0591")	Cutting speed (v_c)	m/min	30~40~50	30~40~50	20~30~40	20~30~40	30~40~60
			SFM	98~131~164	98~131~164	66~98~131	66~98~131	131~164~197
		Revolution (n)	min^{-1}	8,488	8,488	6,366	6,366	8,488
		Feed per rev (f)	mm/rev	0.015~0.045	0.015~0.045	0.015~0.045	0.015~0.023	0.015~0.06
			IPR	.0006~.00118	.0006~.00118	.0006~.00118	.0006~.0009	.0006~.0024
Metric (Inch)	2mm (.0787")	Cutting speed (v_c)	m/min	30~40~50	30~40~50	20~30~40	20~30~40	30~40~60
			SFM	98~131~164	98~131~164	66~98~131	66~98~131	131~164~197
		Revolution (n)	min^{-1}	6,366	6,366	4,775	4,775	6,366
		Feed per rev (f)	mm/rev	0.02~0.06	0.02~0.06	0.02~0.06	0.02~0.03	0.02~0.08
			IPR	.0008~.0024	.0008~.0024	.0008~.0024	.0008~.0012	.0008~.0031

Setting of Cutting Conditions

- This standard cutting condition table is for general guidance regarding cutting conditions. The conditions should be adjusted according to the machining shape, application, machine used, etc. for the actual machining.
- For the cutting fluid, water-based cutting fluids are recommended.
- Internal coolant pressure of 1.5MPa or higher is recommended. (When pressure is less than 1.5MPa, performing step machining is recommended.)
- Use a mesh filter (3 μm to 5 μm) to prevent clogging of coolant hole.
- G81 is recommended as the machining cycle.
- When removal of chips is difficult, perform step machining of about the tool diameter. (G73, G83 cycle)
- When mounting the tool, use of a collet without scratches or dirt and tool deflection of 0.02 mm or less is recommended.
- When using 10D type or larger tools, it is recommended that a 3D type tool is used to create a pilot hole.
- When performing machining using a long drill (10D or more), perform machining at *vc*=80 m/min. or less. If the tool is rotated at high speed, it may be broken by centrifugal force.
- Please consult us regarding machining of materials other than those listed above.

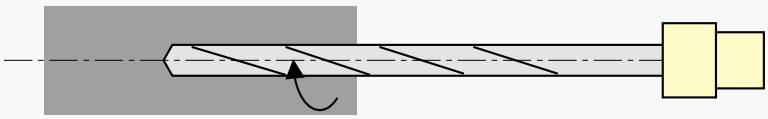
Machining method when using a long drill (10D type or longer)

1 Use 03WHMB-TH to machine a hole with a depth of 3 times the tool diameter.

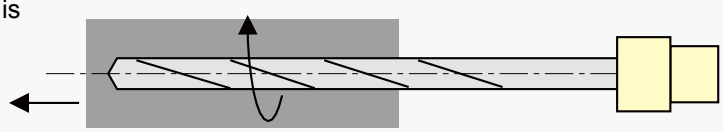


2 Machine using a long drill.

※When using a horizontal machine, low-speed rotation (n= 0 to 500 min^{-1}) while advancing is recommended.



3 Dwelling at the bottom of the hole for 0.3 s is recommended.

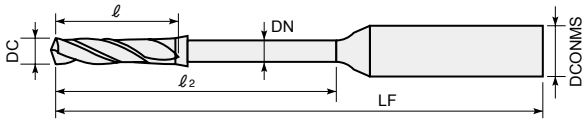


Epoch Micro Step Borer S

Drilling | Carbide | MICRO TH | SD | 140° | DEEP

Dia. tolerance: 0 ~ −0.005mm (0 ~ − .0002 inch) | h4

for Steels: MICRO TH | for Non-ferrous: SD



EMSBS○○○○-○○.○-TH/SD

Indicate the desired coating type by adding "-SD" for SD coating or "-TH" for TH coating at the end of the item code.

Cutting Conditions F71

Item code	TH Coating Stock	SD Coating Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Under neck length ℓ2 (mm)	L/D	Neck dia. DN (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EMSBS0004-0.4-□□	★		0.04	.0016	0.2	0.4	10	0.033	40	3
EMSBS0004-0.8-□□			0.04	.0016	0.2	0.8	20	0.033	40	3
EMSBS0004-1.2-□□	★		0.04	.0016	0.2	1.2	30	0.033	40	3
EMSBS0005-0.5-□□	★		0.05	.0020	0.25	0.5	10	0.04	40	3
EMSBS0005-1-□□	★		0.05	.0020	0.25	1	20	0.04	40	3
EMSBS0005-1.5-□□	★		0.05	.0020	0.25	1.5	30	0.04	40	3
EMSBS0005-2-□□			0.05	.0020	0.25	2	40	0.04	40	3
EMSBS0005-2.5-□□			0.05	.0020	0.25	2.5	50	0.04	40	3
EMSBS0006-0.6-□□	★		0.06	.0024	0.3	0.6	10	0.05	40	3
EMSBS0006-1.2-□□			0.06	.0024	0.3	1.2	20	0.05	40	3
EMSBS0006-1.8-□□	★		0.06	.0024	0.3	1.8	30	0.05	40	3
EMSBS0006-2.4-□□			0.06	.0024	0.3	2.4	40	0.05	40	3
EMSBS0006-3-□□			0.06	.0024	0.3	3	50	0.05	40	3
EMSBS0007-0.7-□□	★		0.07	.0028	0.35	0.7	10	0.06	40	3
EMSBS0007-1.4-□□			0.07	.0028	0.35	1.4	20	0.06	40	3
EMSBS0007-2.1-□□	★		0.07	.0028	0.35	2.1	30	0.06	40	3
EMSBS0007-2.8-□□			0.07	.0028	0.35	2.8	40	0.06	40	3
EMSBS0007-3.5-□□			0.07	.0028	0.35	3.5	50	0.06	40	3
EMSBS0008-0.8-□□	★		0.08	.0031	0.4	0.8	10	0.07	40	3
EMSBS0008-1.6-□□			0.08	.0031	0.4	1.6	20	0.07	40	3
EMSBS0008-2.4-□□	★		0.08	.0031	0.4	2.4	30	0.07	40	3
EMSBS0008-3.2-□□			0.08	.0031	0.4	3.2	40	0.07	40	3
EMSBS0008-4-□□			0.08	.0031	0.4	4	50	0.07	40	3
EMSBS0009-0.9-□□	★		0.09	.0035	0.45	0.9	10	0.08	40	3
EMSBS0009-1.8-□□			0.09	.0035	0.45	1.8	20	0.08	40	3
EMSBS0009-2.7-□□	★		0.09	.0035	0.45	2.7	30	0.08	40	3
EMSBS0009-3.6-□□			0.09	.0035	0.45	3.6	40	0.08	40	3
EMSBS0009-4.5-□□			0.09	.0035	0.45	4.5	50	0.08	40	3
EMSBS0010-1-□□	★		0.1	.0039	0.5	1	10	0.09	45	3
EMSBS0010-2-□□			0.1	.0039	0.5	2	20	0.09	45	3
EMSBS0010-3-□□	★		0.1	.0039	0.5	3	30	0.09	45	3
EMSBS0010-5-□□	★		0.1	.0039	0.5	5	50	0.09	45	3
EMSBS0010-7.5-□□			0.1	.0039	0.5	7.5	75	0.09	45	3
EMSBS0010-10-□□			0.1	.0039	0.5	10	100	0.09	45	3
EMSBS0015-1.5-□□	★		0.15	.0059	0.75	1.5	10	0.14	50	3
EMSBS0015-3-□□			0.15	.0059	0.75	3	20	0.14	50	3
EMSBS0015-4.5-□□	★		0.15	.0059	0.75	4.5	30	0.14	50	3
EMSBS0015-7.5-□□	★		0.15	.0059	0.75	7.5	50	0.14	50	3
EMSBS0015-11.25-□□			0.15	.0059	0.75	11.25	75	0.14	50	3
EMSBS0015-15-□□			0.15	.0059	0.75	15	100	0.14	50	3
EMSBS0020-2-□□	★		0.2	.0079	1	2	10	0.19	45	3
EMSBS0020-4-□□			0.2	.0079	1	4	20	0.19	45	3
EMSBS0020-6-□□	★		0.2	.0079	1	6	30	0.19	45	3
EMSBS0020-10-□□	★		0.2	.0079	1	10	50	0.19	45	3
EMSBS0020-15-□□			0.2	.0079	1	15	75	0.19	55	3
EMSBS0020-20-□□			0.2	.0079	1	20	100	0.19	55	3
EMSBS0030-3-□□	★		0.3	.0118	1.5	3	10	0.28	45	3

Under-neck length (ℓ2) conforms to through-hole drilling depth.

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

EMSBS○○○○-○○.○-TH/SD

Indicate the desired coating type by adding "-SD" for SD coating or "-TH" for TH coating at the end of the item code.

Item code	TH Coating	SD Coating	Size							
	Stock	Stock	Tool dia.		Flute length	Under neck length	L/D	Neck dia.	Overall length	Shank dia.
			DC (mm)	DC (inch)	ℓ (mm)	ℓ2 (mm)		DN (mm)	LF (mm)	DCONMS (mm)
EMSBS0030-6-□□			0.3	.0016	1.5	6	20	0.28	45	3
EMSBS0030-9-□□	★		0.3	.0016	1.5	9	30	0.28	45	3
EMSBS0030-15-□□	★		0.3	.0016	1.5	15	50	0.28	55	3
EMSBS0030-22.5-□□			0.3	.0020	1.5	22.5	75	0.28	65	3
EMSBS0030-30-□□			0.3	.0020	1.5	30	100	0.28	65	3
EMSBS0040-4-□□	★		0.4	.0020	2	4	10	0.38	50	3
EMSBS0040-8-□□			0.4	.0020	2	8	20	0.38	50	3
EMSBS0040-12-□□	★		0.4	.0020	2	12	30	0.38	50	3
EMSBS0040-20-□□	★		0.4	.0024	2	20	50	0.38	60	3
EMSBS0040-30-□□			0.4	.0024	2	30	75	0.38	75	3
EMSBS0040-40-□□			0.4	.0024	2	40	100	0.38	75	3
EMSBS0050-5-□□	★		0.5	.0024	2.5	5	10	0.48	50	3
EMSBS0050-10-□□			0.5	.0024	2.5	10	20	0.48	50	3
EMSBS0050-15-□□	★		0.5	.0028	2.5	15	30	0.48	50	3
EMSBS0050-25-□□	★		0.5	.0028	2.5	25	50	0.48	65	3
EMSBS0050-37.5-□□			0.5	.0028	2.5	37.5	75	0.48	85	3
EMSBS0050-50-□□			0.5	.0028	2.5	50	100	0.48	85	3
EMSBS0060-6-□□	★		0.6	.0028	3	6	10	0.57	55	3
EMSBS0060-12-□□			0.6	.0031	3	12	20	0.57	55	3
EMSBS0060-18-□□	★		0.6	.0031	3	18	30	0.57	55	3
EMSBS0060-30-□□	★		0.6	.0031	3	30	50	0.57	75	3
EMSBS0060-45-□□			0.6	.0031	3	45	75	0.57	95	3
EMSBS0060-60-□□			0.6	.0031	3	60	100	0.57	95	3
EMSBS0070-7-□□	★		0.7	.0035	3.5	7	10	0.67	60	4
EMSBS0070-14-□□			0.7	.0035	3.5	14	20	0.67	60	4
EMSBS0070-21-□□	★		0.7	.0035	3.5	21	30	0.67	60	4
EMSBS0070-35-□□	★		0.7	.0035	3.5	35	50	0.67	80	4
EMSBS0070-52.5-□□			0.7	.0035	3.5	52.5	75	0.67	105	4
EMSBS0070-70-□□			0.7	.0039	3.5	70	100	0.67	105	4
EMSBS0080-8-□□	★		0.8	.0039	4	8	10	0.76	60	4
EMSBS0080-16-□□			0.8	.0039	4	16	20	0.76	60	4
EMSBS0080-24-□□	★		0.8	.0039	4	24	30	0.76	60	4
EMSBS0080-40-□□	★		0.8	.0039	4	40	50	0.76	85	4
EMSBS0080-60-□□			0.8	.0039	4	60	75	0.76	115	4
EMSBS0080-80-□□			0.8	.0059	4	80	100	0.76	115	4
EMSBS0090-9-□□	★		0.9	.0059	4.5	9	10	0.85	65	4
EMSBS0090-18-□□			0.9	.0059	4.5	18	20	0.85	65	4
EMSBS0090-27-□□	★		0.9	.0059	4.5	27	30	0.85	65	4
EMSBS0090-45-□□	★		0.9	.0059	4.5	45	50	0.85	90	4
EMSBS0090-67.5-□□			0.9	.0059	4.5	67.5	75	0.85	125	4
EMSBS0090-90-□□			0.9	.0079	4.5	90	100	0.85	125	4
EMSBS0100-10-□□	★		1	.0079	5	10	10	0.95	70	4
EMSBS0100-20-□□			1	.0079	5	20	20	0.95	70	4
EMSBS0100-30-□□	★		1	.0079	5	30	30	0.95	70	4
EMSBS0100-50-□□	★		1	.0079	5	50	50	0.95	100	4
EMSBS0100-75-□□			1	.0079	5	75	75	0.95	135	4
EMSBS0100-100-□□			1	.0118	5	100	100	0.95	135	4

Under-neck length (ℓ2) conforms to through-hole drilling depth.

Applicable work material

Coating	Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
TH	◎	○	◎	◎	◎	◎	○	◎	○	○	○	○	○
SD												◎	◎

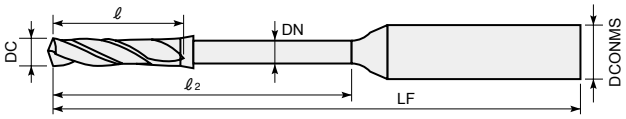
Epoch Micro Step Borer S

Drilling | Carbide | Micro TH | SD | DEEP

Dia. tolerance 0 ~ −0.005mm (0 ~ − .0002 inch) | h4

Manufactured upon request only.

We can deliver the size to match customer needs.
Manufactured upon request only.



EMSBS○○○○-○○-□□

ℓ2:Designation of under neck length;
(B) Designation of coating

Cutting Conditions F71

Order code	Kind of coating (B)	Size									
		ℓ2/DC	Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Neck dia. DN (mm)	Under neck length ℓ2 (mm)	Overall length LF ℓ2/DC<35	Overall length LF ℓ2/DC<65	Overall length LF ℓ2/DC≧65	Shank dia. DCONMS (mm)
EMSBS0004-(A)-(B)	**TH/SD**	Value of 30 or less	**0.04**	**.0016**	0.2	0.033	Value can be specified freely.	40			3
EMSBS0005-(A)-(B)	**TH/SD**	Value of 50 or less can be specified.	**0.05**	**.0020**	0.25	0.04		40			3
EMSBS0006-(A)-(B)	**TH/SD**		**0.06**	**.0024**	0.3	0.05		40			3
EMSBS0007-(A)-(B)	**TH/SD**		**0.07**	**.0028**	0.35	0.06		40			3
EMSBS0008-(A)-(B)	**TH/SD**		**0.08**	**.0032**	0.4	0.07		40			3
EMSBS0009-(A)-(B)	**TH/SD**		**0.09**	**.0035**	0.45	0.08		40			3
EMSBS0010-(A)-(B)	**TH/SD**	Value of 100 or less can be specified.	**0.1**	**.0039**	0.5	0.09		45			3
EMSBS0015-(A)-(B)	**TH/SD**		**0.15**	**.0059**	0.75	0.14		50			3
EMSBS0020-(A)-(B)	**TH/SD**		**0.2**	**.0079**	1	0.19		45		55	3
EMSBS0030-(A)-(B)	**TH/SD**		**0.3**	**.0118**	1.5	0.28		45	55	65	3
EMSBS0040-(A)-(B)	**TH/SD**		**0.4**	**.0158**	2	0.38		50	60	75	3
EMSBS0050-(A)-(B)	**TH/SD**		**0.5**	**.0197**	2.5	0.48		50	65	85	3
EMSBS0060-(A)-(B)	**TH/SD**		**0.6**	**.0236**	3	0.57		55	75	95	3
EMSBS0070-(A)-(B)	**TH/SD**		**0.7**	**.0276**	3.5	0.67		60	80	105	4
EMSBS0080-(A)-(B)	**TH/SD**		**0.8**	**.0315**	4	0.76		60	85	115	4
EMSBS0090-(A)-(B)	**TH/SD**		**0.9**	**.0354**	4.5	0.85		65	90	125	4
EMSBS0100-(A)-(B)	**TH/SD**		**1**	**.0394**	5	0.95		70	100	135	4

Ratio to cutting conditions for different L/D

Adjust cutting conditions according to the following ratios based on the cutting conditions for L/D=10 on next page.

L/D	Revolution	Feed rate	Step
20 times or less	100%	100%	100%
30 times or less	100%	100%	100%
40 times or less	90%	90%	100%
50 times or less	80%	80%	100%
60 times or less	65%	65%	100%

L/D	Revolution	Feed rate	Step
70 times or less	55%	55%	100%
80 times or less	40%	40%	100%
90 times or less	35%	35%	100%
100 times or less	30%	30%	100%

Ordering method

The under neck length and coating can be freely selected according to the application.

Selecting under neck length — Please specify the under neck length using (drilling depth + tool diameter) as criteria.

Selecting coating — In general, SD should be selected for non-ferrous materials, and TH should be selected for other materials.

【Example 1】 For example, when drilling a hole in SUS304 that is ϕ0.3mm in diameter with a drilling depth of 15mm, specify a tool with a diameter of ϕ0.3mm and a under neck length of 15.3mm (Drilling depth + tool diameter).

Order code : **EMSBS0030-15.3-TH**

(Note) For products with tool dimensions other than those listed above, separate consultation is needed. Please contact our sales office.

Recommended cutting conditions EMSBS-TH EMSBS-SD

Inch

Item Code	Tool dia.		Under neck length		L/D	1 Aluminium, Resin, Acrylic			2 Carbon steel (180～250HB)			3 Stainless steel (25～35HRC)			4 Pre-hardened steel (35～45HRC)			5 Hardened steel (45～55HRC)		
	(mm)	(inch)	(mm)	(inch)		Revolution n (min^{-1})	Feed rate v_f (IPM)	Step Feed (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Step Feed (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Step Feed (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Step Feed (inch)	Revolution n (min^{-1})	Feed rate v_f (IPM)	Step Feed (inch)
EMSBS0004-0.4-	0.04	.0016	0.4	.0158	10	39,789	3	.0002	35,810	3	.0002	31,831	3	.0002	27,852	2	.0001	23,873	1	.0001
EMSBS0004-1.2-	0.04	.0016	1.2	.0472	30	39,789	3	.0002	35,810	3	.0002	31,831	3	.0002	27,852	2	.0001	23,873	1	.0001
EMSBS0005-0.5-	0.05	.0020	0.5	.0197	10	38,197	3	.0002	31,831	3	.0002	28,648	2	.0002	25,465	2	.0001	22,282	1	.0001
EMSBS0005-1-	0.05	.0020	1	.0394	20	38,197	3	.0002	31,831	3	.0002	28,648	2	.0002	25,465	2	.0001	22,282	1	.0001
EMSBS0005-1.5-	0.05	.0020	1.5	.0591	30	38,197	3	.0002	25,465	2	.0002	22,918	2	.0002	20,372	2	.0001	17,825	1	.0001
EMSBS0006-0.6-	0.06	.0024	0.6	.0236	10	37,136	3	.0002	29,178	2	.0002	26,526	2	.0002	23,873	2	.0002	21,221	1	.0001
EMSBS0006-1.8-	0.06	.0024	1.8	.0709	30	37,136	3	.0002	29,178	2	.0002	26,526	2	.0002	23,873	2	.0002	21,221	1	.0001
EMSBS0007-0.7-	0.07	.0028	0.7	.0276	10	36,378	3	.0003	27,284	2	.0003	25,010	2	.0003	22,736	2	.0002	20,463	1	.0001
EMSBS0007-2.1-	0.07	.0028	2.1	.0827	30	36,378	3	.0003	27,284	2	.0003	25,010	2	.0003	22,736	2	.0002	20,463	1	.0001
EMSBS0008-0.8-	0.08	.0032	0.8	.0315	10	35,810	3	.0003	27,852	2	.0003	25,863	2	.0003	23,873	2	.0002	21,884	1	.0002
EMSBS0008-2.4-	0.08	.0032	2.4	.0945	30	35,810	3	.0003	27,852	2	.0003	25,863	2	.0003	23,873	2	.0002	21,884	1	.0002
EMSBS0009-0.9-	0.09	.0035	0.9	.0354	10	35,368	3	.0004	26,526	2	.0004	24,757	2	.0004	22,989	2	.0002	21,221	1	.0002
EMSBS0009-2.7-	0.09	.0035	2.7	.1063	30	35,368	3	.0004	26,526	2	.0004	24,757	2	.0004	22,989	2	.0002	21,221	1	.0002
EMSBS0010-1-	0.1	.0039	1	.0394	10	35,014	4	.0004	25,465	3	.0004	23,873	3	.0004	22,282	3	.0003	20,690	2	.0002
EMSBS0010-3-	0.1	.0039	3	.1181	30	35,014	4	.0004	25,465	3	.0004	23,873	3	.0004	22,282	3	.0003	20,690	2	.0002
EMSBS0010-5-	0.1	.0039	5	.1969	50	28,011	3	.0004	20,372	2	.0004	19,099	2	.0004	17,825	2	.0003	16,552	1	.0002
EMSBS0015-1.5-	0.15	.0059	1.5	.0591	10	25,465	3	.0006	23,343	3	.0006	21,221	3	.0006	20,160	2	.0004	19,099	1	.0003
EMSBS0015-4.5-	0.15	.0059	4.5	.1772	30	25,465	3	.0006	23,343	3	.0006	21,221	3	.0006	20,160	2	.0004	19,099	1	.0003
EMSBS0015-7.5-	0.15	.0059	7.5	.2953	50	20,372	2	.0006	18,674	2	.0006	16,977	2	.0006	16,128	2	.0004	15,279	1	.0003
EMSBS0020-2-	0.2	.0079	2	.0787	10	23,873	4	.0008	20,690	3	.0008	19,099	3	.0008	17,507	3	.0006	16,711	2	.0004
EMSBS0020-6-	0.2	.0079	6	.2362	30	23,873	4	.0008	20,690	3	.0008	19,099	3	.0008	17,507	3	.0006	16,711	2	.0004
EMSBS0020-10-	0.2	.0079	10	.3937	50	19,099	3	.0008	16,552	3	.0008	15,279	2	.0008	14,006	2	.0006	13,369	2	.0004
EMSBS0030-3-	0.3	.0118	3	.1181	10	15,915	3	.0012	14,854	2	.0012	13,793	2	.0012	12,732	2	.0008	12,202	1	.0006
EMSBS0030-9-	0.3	.0118	9	.3543	30	15,915	3	.0012	14,854	2	.0012	13,793	2	.0012	12,732	2	.0008	12,202	1	.0006
EMSBS0030-15-	0.3	.0118	15	.5906	50	12,732	2	.0012	11,884	2	.0012	11,035	2	.0012	10,186	2	.0008	9,762	1	.0006
EMSBS0040-4-	0.4	.0158	4	.1575	10	13,528	2	.0016	12,335	2	.0016	11,937	2	.0016	11,539	2	.0011	10,743	2	.0008
EMSBS0040-12-	0.4	.0158	12	.4724	30	13,528	2	.0016	12,335	2	.0016	11,937	2	.0016	11,539	2	.0011	10,743	2	.0008
EMSBS0040-20-	0.4	.0158	20	.7874	50	10,823	2	.0016	9,868	2	.0016	9,549	1	.0016	9,231	1	.0011	8,594	1	.0008
EMSBS0050-5-	0.5	.0197	5	.1969	10	10,823	2	.0020	9,868	2	.0020	9,549	2	.0020	9,231	2	.0014	8,594	2	.0010
EMSBS0050-15-	0.5	.0197	15	.5906	30	10,823	2	.0020	9,868	2	.0020	9,549	2	.0020	9,231	2	.0014	8,594	2	.0010
EMSBS0050-25-	0.5	.0197	25	.9843	50	8,658	2	.0020	7,894	2	.0020	7,639	1	.0020	7,385	1	.0014	6,875	1	.0010
EMSBS0060-6-	0.6	.0236	6	.2362	10	9,019	2	.0024	8,223	2	.0024	7,958	2	.0024	7,692	2	.0017	7,162	2	.0012
EMSBS0060-18-	0.6	.0236	18	.7087	30	9,019	2	.0024	8,223	2	.0024	7,958	2	.0024	7,692	2	.0017	7,162	2	.0012
EMSBS0060-30-	0.6	.0236	30	1.1811	50	7,215	2	.0024	6,578	2	.0024	6,366	1	.0024	6,154	1	.0017	5,730	1	.0012
EMSBS0070-7-	0.7	.0276	7	.2756	10	7,730	2	.0028	7,048	2	.0028	6,821	2	.0028	6,594	2	.0019	6,139	2	.0014
EMSBS0070-21-	0.7	.0276	21	.8268	30	7,730	2	.0028	7,048	2	.0028	6,821	2	.0028	6,594	2	.0019	6,139	2	.0014
EMSBS0070-35-	0.7	.0276	35	1.3780	50	6,184	2	.0028	5,639	2	.0028	5,457	1	.0028	5,275	1	.0019	4,911	1	.0014
EMSBS0080-8-	0.8	.0315	8	.3150	10	6,764	2	.0031	6,167	2	.0031	5,968	2	.0031	5,769	2	.0022	5,371	2	.0016
EMSBS0080-24-	0.8	.0315	24	.9449	30	6,764	2	.0031	6,167	2	.0031	5,968	2	.0031	5,769	2	.0022	5,371	2	.0016
EMSBS0080-40-	0.8	.0315	40	1.5748	50	5,411	2	.0031	4,934	2	.0031	4,775	1	.0031	4,615	1	.0022	4,297	1	.0016
EMSBS0090-9-	0.9	.0354	9	.3543	10	6,013	2	.0035	5,482	2	.0035	5,305	2	.0035	5,128	2	.0025	4,775	2	.0018
EMSBS0090-27-	0.9	.0354	27	1.0630	30	6,013	2	.0035	5,482	2	.0035	5,305	2	.0035	5,128	2	.0025	4,775	2	.0018
EMSBS0090-45-	0.9	.0354	45	1.7717	50	4,810	2	.0035	4,386	2	.0035	4,244	1	.0035	4,103	1	.0025	3,820	1	.0018
EMSBS0100-10-	1	.0394	10	.3937	10	5,411	2	.0039	4,934	2	.0039	4,775	2	.0039	4,615	2	.0028	4,297	2	.0020
EMSBS0100-30-	1	.0394	30	1.1811	30	5,411	2	.0039	4,934	2	.0039	4,775	2	.0039	4,615	2	.0028	4,297	2	.0020
EMSBS0100-50-	1	.0394	50	1.9685	50	4,329	2	.0039	3,947	2	.0039	3,820	1	.0039	3,692	1	.0028	3,438	1	.0020

- This standard cutting condition table is intended as reference cutting conditions.
  The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
- In general, water-soluble or oil-based coolant should be used to ensure chip removal.
- Always use with a G83 program (Peck drilling cycle).
- Under-neck length (ℓ_2) conforms to through-hole drilling depth.
- When drilling through holes, drill the through hole to a depth of between 20% and 30% of the diameter from the tip of the tool.
  Ex.: For work thickness T=4mm and tool= Ø0.5×5mm,
  drilling depth should be 4.14mm (from tip of tool).

Epoch Micro Step Borer S

Recommended cutting conditions EMSBS-TH EMSBS-SD

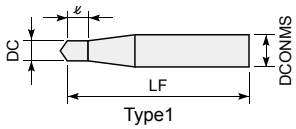
Metric

Item Code	Tool dia.		Under neck length		L/D	1 Aluminium, Resin, Acrylic			2 Carbon steel (180～250HB)			3 Stainless steel (25～35HRC)			4 Pre-hardened steel (35～45HRC)			5 Hardened steel (45～55HRC)		
	(mm)	(inch)	(mm)	(inch)		Revolution n (min⁻¹)	Feed rate vf (mm/min)	Step Feed (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Step Feed (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Step Feed (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Step Feed (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Step Feed (mm)
EMSBS0004-0.4-	0.04	.0016	0.4	.0158	10	39,789	80	0.004	35,810	72	0.004	31,831	64	0.004	27,852	56	0.0028	23,873	24	0.002
EMSBS0004-1.2-	0.04	.0016	1.2	.0472	30	39,789	80	0.004	35,810	72	0.004	31,831	64	0.004	27,852	56	0.0028	23,873	24	0.002
EMSBS0005-0.5-	0.05	.0020	0.5	.0197	10	38,197	76	0.005	31,831	64	0.005	28,648	57	0.005	25,465	51	0.0035	22,282	22	0.0025
EMSBS0005-1-	0.05	.0020	1	.0394	20	38,197	76	0.005	31,831	64	0.005	28,648	57	0.005	25,465	51	0.0035	22,282	22	0.0025
EMSBS0005-1.5-	0.05	.0020	1.5	.0591	30	38,197	76	0.005	25,465	51	0.005	22,918	46	0.005	20,372	41	0.0035	17,825	18	0.0025
EMSBS0006-0.6-	0.06	.0024	0.6	.0236	10	37,136	74	0.006	29,178	58	0.006	26,526	53	0.006	23,873	48	0.0042	21,221	21	0.003
EMSBS0006-1.8-	0.06	.0024	1.8	.0709	30	37,136	74	0.006	29,178	58	0.006	26,526	53	0.006	23,873	48	0.0042	21,221	21	0.003
EMSBS0007-0.7-	0.07	.0028	0.7	.0276	10	36,378	73	0.007	27,284	55	0.007	25,010	50	0.007	22,736	45	0.0049	20,463	20	0.0035
EMSBS0007-2.1-	0.07	.0028	2.1	.0827	30	36,378	73	0.007	27,284	55	0.007	25,010	50	0.007	22,736	45	0.0049	20,463	20	0.0035
EMSBS0008-0.8-	0.08	.0032	0.8	.0315	10	35,810	72	0.008	27,852	56	0.008	25,863	52	0.008	23,873	48	0.0056	21,884	22	0.004
EMSBS0008-2.4-	0.08	.0032	2.4	.0945	30	35,810	72	0.008	27,852	56	0.008	25,863	52	0.008	23,873	48	0.0056	21,884	22	0.004
EMSBS0009-0.9-	0.09	.0035	0.9	.0354	10	35,368	71	0.009	26,526	53	0.009	24,757	50	0.009	22,989	46	0.0063	21,221	21	0.0045
EMSBS0009-2.7-	0.09	.0035	2.7	.1063	30	35,368	71	0.009	26,526	53	0.009	24,757	50	0.009	22,989	46	0.0063	21,221	21	0.0045
EMSBS0010-1-	0.1	.0039	1	.0394	10	35,014	105	0.01	25,465	76	0.01	23,873	72	0.01	22,282	67	0.007	20,690	41	0.005
EMSBS0010-3-	0.1	.0039	3	.1181	30	35,014	105	0.01	25,465	76	0.01	23,873	72	0.01	22,282	67	0.007	20,690	41	0.005
EMSBS0010-5-	0.1	.0039	5	.1969	50	28,011	84	0.01	20,372	61	0.01	19,099	57	0.01	17,825	53	0.007	16,552	33	0.005
EMSBS0015-1.5-	0.15	.0059	1.5	.0591	10	25,465	76	0.015	23,343	70	0.015	21,221	64	0.015	20,160	60	0.0105	19,099	38	0.0075
EMSBS0015-4.5-	0.15	.0059	4.5	.1772	30	25,465	76	0.015	23,343	70	0.015	21,221	64	0.015	20,160	60	0.0105	19,099	38	0.0075
EMSBS0015-7.5-	0.15	.0059	7.5	.2953	50	20,372	61	0.015	18,674	56	0.015	16,977	51	0.015	16,128	48	0.0105	15,279	31	0.0075
EMSBS0020-2-	0.2	.0079	2	.0787	10	23,873	95	0.02	20,690	83	0.02	19,099	76	0.02	17,507	70	0.014	16,711	50	0.01
EMSBS0020-6-	0.2	.0079	6	.2362	30	23,873	95	0.02	20,690	83	0.02	19,099	76	0.02	17,507	70	0.014	16,711	50	0.01
EMSBS0020-10-	0.2	.0079	10	.3937	50	19,099	76	0.02	16,552	66	0.02	15,279	61	0.02	14,006	56	0.014	13,369	40	0.01
EMSBS0030-3-	0.3	.0118	3	.1181	10	15,915	64	0.03	14,854	59	0.03	13,793	55	0.03	12,732	51	0.021	12,202	37	0.015
EMSBS0030-9-	0.3	.0118	9	.3543	30	15,915	64	0.03	14,854	59	0.03	13,793	55	0.03	12,732	51	0.021	12,202	37	0.015
EMSBS0030-15-	0.3	.0118	15	.5906	50	12,732	51	0.03	11,884	48	0.03	11,035	44	0.03	10,186	41	0.021	9,762	29	0.015
EMSBS0040-4-	0.4	.0158	4	.1575	10	13,528	54	0.04	12,335	49	0.04	11,937	48	0.04	11,539	46	0.028	10,743	43	0.02
EMSBS0040-12-	0.4	.0158	12	.4724	30	13,528	54	0.04	12,335	49	0.04	11,937	48	0.04	11,539	46	0.028	10,743	43	0.02
EMSBS0040-20-	0.4	.0158	20	.7874	50	10,823	43	0.04	9,868	39	0.04	9,549	38	0.04	9,231	37	0.028	8,594	34	0.02
EMSBS0050-5-	0.5	.0197	5	.1969	10	10,823	54	0.05	9,868	49	0.05	9,549	48	0.05	9,231	46	0.035	8,594	43	0.025
EMSBS0050-15-	0.5	.0197	15	.5906	30	10,823	54	0.05	9,868	49	0.05	9,549	48	0.05	9,231	46	0.035	8,594	43	0.025
EMSBS0050-25-	0.5	.0197	25	.9843	50	8,658	43	0.05	7,894	39	0.05	7,639	38	0.05	7,385	37	0.035	6,875	34	0.025
EMSBS0060-6-	0.6	.0236	6	.2362	10	9,019	54	0.06	8,223	49	0.06	7,958	48	0.06	7,692	46	0.042	7,162	43	0.03
EMSBS0060-18-	0.6	.0236	18	.7087	30	9,019	54	0.06	8,223	49	0.06	7,958	48	0.06	7,692	46	0.042	7,162	43	0.03
EMSBS0060-30-	0.6	.0236	30	1.1811	50	7,215	43	0.06	6,578	39	0.06	6,366	38	0.06	6,154	37	0.042	5,730	34	0.03
EMSBS0070-7-	0.7	.0276	7	.2756	10	7,730	54	0.07	7,048	49	0.07	6,821	48	0.07	6,594	46	0.049	6,139	43	0.035
EMSBS0070-21-	0.7	.0276	21	.8268	30	7,730	54	0.07	7,048	49	0.07	6,821	48	0.07	6,594	46	0.049	6,139	43	0.035
EMSBS0070-35-	0.7	.0276	35	1.3780	50	6,184	43	0.07	5,639	39	0.07	5,457	38	0.07	5,275	37	0.049	4,911	34	0.035
EMSBS0080-8-	0.8	.0315	8	.3150	10	6,764	54	0.08	6,167	49	0.08	5,968	48	0.08	5,769	46	0.056	5,371	43	0.04
EMSBS0080-24-	0.8	.0315	24	.9449	30	6,764	54	0.08	6,167	49	0.08	5,968	48	0.08	5,769	46	0.056	5,371	43	0.04
EMSBS0080-40-	0.8	.0315	40	1.5748	50	5,411	43	0.08	4,934	39	0.08	4,775	38	0.08	4,615	37	0.056	4,297	34	0.04
EMSBS0090-9-	0.9	.0354	9	.3543	10	6,013	54	0.09	5,482	49	0.09	5,305	48	0.09	5,128	46	0.063	4,775	43	0.045
EMSBS0090-27-	0.9	.0354	27	1.0630	30	6,013	54	0.09	5,482	49	0.09	5,305	48	0.09	5,128	46	0.063	4,775	43	0.045
EMSBS0090-45-	0.9	.0354	45	1.7717	50	4,810	43	0.09	4,386	39	0.09	4,244	38	0.09	4,103	37	0.063	3,820	34	0.045
EMSBS0100-10-	1	.0394	10	.3937	10	5,411	54	0.1	4,934	49	0.1	4,775	48	0.1	4,615	46	0.07	4,297	43	0.05
EMSBS0100-30-	1	.0394	30	1.1811	30	5,411	54	0.1	4,934	49	0.1	4,775	48	0.1	4,615	46	0.07	4,297	43	0.05
EMSBS0100-50-	1	.0394	50	1.9685	50	4,329	43	0.1	3,947	39	0.1	3,820	38	0.1	3,692	37	0.07	3,438	34	0.05

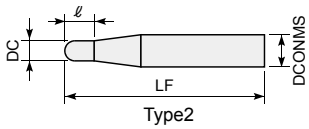
- This standard cutting condition table is intended as reference cutting conditions.
  The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
- In general, water-soluble or oil-based coolant should be used to ensure chip removal.
- Always use with a G83 program (Peck drilling cycle).
- Under-neck length (ℓ_2) conforms to through-hole drilling depth.
- When drilling through holes, drill the through hole to a depth of between 20% and 30% of the diameter from the tip of the tool.
  Ex.: For work thickness T=4mm and tool= Ø0.5×5mm,
  drilling depth should be 4.14mm (from tip of tool).

Epoch Micro Starter

Tolerance on dia. : DC<0.2mm : −0.005~−0.01mm (− .0002 ~− .0039 inch)
DC≧0.2mm : −0.005~−0.015mm (− .002 ~− .0006 inch)
Tolerance on shank : ϕ3mm : 0~−0.003mm (0 ~− .0001 inch)
ϕ4mm : 0~−0.005mm (0 ~− .0002 inch)



Type1



Type2

EMST○○○○-TH

Cutting Conditions F74 | Carbide | Micro TH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
EMST0004-TH	★	0.04	.0016	0.04	45	3	Type 1
EMST0005-TH	★	0.05	.0020	0.05	45	3	
EMST0006-TH	★	0.06	.0024	0.06	45	3	
EMST0007-TH	★	0.07	.0028	0.07	45	3	
EMST0008-TH	★	0.08	.0032	0.08	45	3	
EMST0009-TH	★	0.09	.0035	0.09	45	3	
EMST0010-TH	★	0.1	.0039	0.1	45	3	Type 2
EMST0011-TH	★	0.11	.0043	0.11	45	3	
EMST0012-TH	★	0.12	.0047	0.12	45	3	
EMST0013-TH	★	0.13	.0051	0.13	45	3	
EMST0014-TH	★	0.14	.0055	0.14	45	3	
EMST0015-TH	★	0.15	.0059	0.15	45	3	
EMST0016-TH	★	0.16	.0063	0.16	45	3	
EMST0017-TH	★	0.17	.0067	0.17	45	3	
EMST0018-TH	★	0.18	.0071	0.18	45	3	
EMST0019-TH	★	0.19	.0075	0.19	45	3	
EMST0020-TH	★	0.2	.0079	0.2	45	3	
EMST0021-TH		0.21	.0083	0.21	45	3	
EMST0029-TH		0.29	.0114	0.29	45	3	
EMST0030-TH	★	0.3	.0118	0.3	45	3	
EMST0031-TH		0.31	.0122	0.31	45	3	

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
EMST0039-TH		0.39	.0154	0.39	45	3	Type 2
EMST0040-TH	★	0.4	.0158	0.4	45	3	
EMST0049-TH		0.49	.0193	0.49	45	3	
EMST0050-TH	★	0.5	.0197	0.5	45	3	
EMST0059-TH		0.59	.0232	0.59	45	3	
EMST0060-TH	★	0.6	.0236	0.6	45	3	
EMST0069-TH		0.69	.0272	0.69	45	4	
EMST0070-TH	★	0.7	.0276	0.7	45	4	
EMST0079-TH		0.79	.0311	0.79	45	4	
EMST0080-TH	★	0.8	.0315	0.8	45	4	
EMST0081-TH		0.81	.0319	0.81	45	4	
EMST0089-TH		0.89	.0350	0.89	45	4	
EMST0090-TH	★	0.9	.0354	0.9	45	4	
EMST0091-TH		0.91	.0358	0.91	45	4	
EMST0099-TH		0.99	.0390	0.99	45	4	
EMST0100-TH	★	1	.0394	1	45	4	
EMST0101-TH		1.01	.0398	1.01	45	4	

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
◎	○	◎	◎	◎	◎	○	◎	◎	◎	◎	◎	◎

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Epoch Micro Starter

Recommended cutting conditions EMST-TH

Inch

Item Code	Tool dia. (mm)	Under neck length (inch)	Aluminium, Resin			Carbon steels (180～250HB)			Stainless steels (25～35HRC)			Pre-hardened steels (35～45HRC)			Hardened steels (45～55HRC)		
			Revolution n min-1	Feed rate v_f IPM	Step Feed (inch)	Revolution n min-1	Feed rate v_f IPM	Step Feed (inch)	Revolution n min-1	Feed rate v_f IPM	Step Feed (inch)	Revolution n min-1	Feed rate v_f IPM	Step Feed (inch)	Revolution n min-1	Feed rate v_f IPM	Step Feed (inch)
EMST0004-TH	0.04	.0009	39,789	.787	.00004	35,810	.709	.00004	31,831	.630	.00004	27,852	.551	.00004	23,873	.236	.00004
EMST0005-TH	0.05	.0012	38,197	.748	.00004	31,831	.630	.00004	28,648	.551	.00004	25,465	.512	.00004	22,282	.236	.00004
EMST0006-TH	0.06	.0014	37,136	.748	.00008	29,178	.591	.00008	26,526	.512	.00008	23,873	.472	.00004	21,221	.197	.00004
EMST0007-TH	0.07	.0017	36,378	.709	.00008	27,284	.551	.00008	25,010	.512	.00008	22,736	.433	.00004	20,463	.197	.00004
EMST0008-TH	0.08	.0019	35,810	.709	.00008	27,852	.551	.00008	25,863	.512	.00008	23,873	.472	.00004	21,884	.197	.00004
EMST0009-TH	0.09	.0021	35,368	.709	.00008	26,526	.512	.00008	24,757	.472	.00008	22,989	.433	.00008	21,221	.197	.00004
EMST0010-TH	0.1	.0024	35,014	1.024	.00012	25,465	.748	.00012	23,873	.709	.00012	22,282	.669	.00008	20,690	.394	.00004
EMST0015-TH	0.15	.0035	25,465	.748	.00016	23,343	.709	.00016	21,221	.630	.00016	20,160	.591	.00012	19,099	.394	.00008
EMST0020-TH	0.2	.0047	23,873	.945	.00020	20,690	.827	.00020	19,099	.748	.00020	17,507	.709	.00016	16,711	.512	.00012
EMST0030-TH	0.3	.0071	15,915	.630	.00031	14,854	.591	.00031	13,793	.551	.00031	12,732	.512	.00020	12,202	.354	.00016
EMST0040-TH	0.4	.0094	13,528	.551	.00039	12,335	.472	.00039	11,937	.472	.00039	11,539	.472	.00028	10,743	.433	.00020
EMST0050-TH	0.5	.0118	10,823	.551	.00051	9,868	.472	.00051	9,549	.472	.00051	9,231	.472	.00035	8,594	.433	.00024
EMST0060-TH	0.6	.0142	9,019	.551	.00059	8,223	.472	.00059	7,958	.472	.00059	7,692	.472	.00043	7,162	.433	.00031
EMST0070-TH	0.7	.0165	7,730	.551	.00071	7,048	.472	.00071	6,821	.472	.00071	6,594	.472	.00047	6,139	.433	.00035
EMST0080-TH	0.8	.0189	6,764	.551	.00079	6,167	.472	.00079	5,968	.472	.00079	5,769	.472	.00055	5,371	.433	.00039
EMST0090-TH	0.9	.0213	6,013	.551	.00091	5,482	.472	.00091	5,305	.472	.00091	5,128	.472	.00063	4,775	.433	.00043
EMST0100-TH	1	.0236	5,411	.551	.00098	4,934	.472	.00098	4,775	.472	.00098	4,615	.472	.00071	4,297	.433	.00051

Metric

Item Code	Tool dia. (mm)	Under neck length (mm)	Aluminium, Resin			Carbon steels (180～250HB)			Stainless steels (25～35HRC)			Pre-hardened steels (35～45HRC)			Hardened steels (45～55HRC)		
			Revolution n min-1	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min-1	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min-1	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min-1	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min-1	Feed rate v_f mm/min	Step Feed (mm)
EMST0004-TH	0.04	0.024	39,789	20	0.001	35,810	18	0.001	31,831	16	0.001	27,852	14	0.001	23,873	6	0.001
EMST0005-TH	0.05	0.03	38,197	19	0.001	31,831	16	0.001	28,648	14	0.001	25,465	13	0.001	22,282	6	0.001
EMST0006-TH	0.06	0.036	37,136	19	0.002	29,178	15	0.002	26,526	13	0.002	23,873	12	0.001	21,221	5	0.001
EMST0007-TH	0.07	0.042	36,378	18	0.002	27,284	14	0.002	25,010	13	0.002	22,736	11	0.001	20,463	5	0.001
EMST0008-TH	0.08	0.048	35,810	18	0.002	27,852	14	0.002	25,863	13	0.002	23,873	12	0.001	21,884	5	0.001
EMST0009-TH	0.09	0.054	35,368	18	0.002	26,526	13	0.002	24,757	12	0.002	22,989	11	0.002	21,221	5	0.001
EMST0010-TH	0.1	0.06	35,014	26	0.003	25,465	19	0.003	23,873	18	0.003	22,282	17	0.002	20,690	10	0.001
EMST0015-TH	0.15	0.09	25,465	19	0.004	23,343	18	0.004	21,221	16	0.004	20,160	15	0.003	19,099	10	0.002
EMST0020-TH	0.2	0.12	23,873	24	0.005	20,690	21	0.005	19,099	19	0.005	17,507	18	0.004	16,711	13	0.003
EMST0030-TH	0.3	0.18	15,915	16	0.008	14,854	15	0.008	13,793	14	0.008	12,732	13	0.005	12,202	9	0.004
EMST0040-TH	0.4	0.24	13,528	14	0.010	12,335	12	0.010	11,937	12	0.010	11,539	12	0.007	10,743	11	0.005
EMST0050-TH	0.5	0.3	10,823	14	0.013	9,868	12	0.013	9,549	12	0.013	9,231	12	0.009	8,594	11	0.006
EMST0060-TH	0.6	0.36	9,019	14	0.015	8,223	12	0.015	7,958	12	0.015	7,692	12	0.011	7,162	11	0.008
EMST0070-TH	0.7	0.42	7,730	14	0.018	7,048	12	0.018	6,821	12	0.018	6,594	12	0.012	6,139	11	0.009
EMST0080-TH	0.8	0.48	6,764	14	0.020	6,167	12	0.020	5,968	12	0.020	5,769	12	0.014	5,371	11	0.010
EMST0090-TH	0.9	0.54	6,013	14	0.023	5,482	12	0.023	5,305	12	0.023	5,128	12	0.016	4,775	11	0.011
EMST0100-TH	1	0.6	5,411	14	0.025	4,934	12	0.025	4,775	12	0.025	4,615	12	0.018	4,297	11	0.013

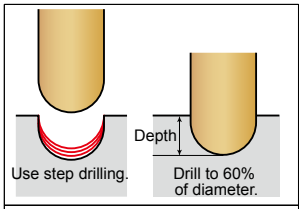
・These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
・In general, water-soluble or oil-based coolant should be used to ensure chip removal.
・Always use with a G83 program (Peck drilling cycle).
・Drilling depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For Ø0.1, depth=0.06mm)

How to use Epoch Micro Step Borer

Caution points when machining

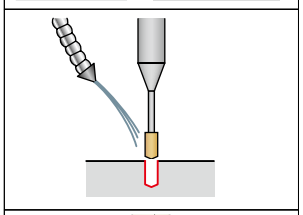
＜About pilot holes＞

Use of the special starter is recommended.
* Particularly when drilling high-accuracy holes, please use the special starter.
Always perform step drilling using a G83 program. Drilling depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For ϕ0.1, depth=0.06mm)



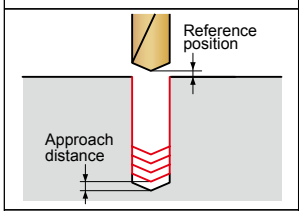
＜About coolants＞

In general, oil-based or water-soluble coolants are recommended.
When using, set it up so that the coolant hits the flute tips.



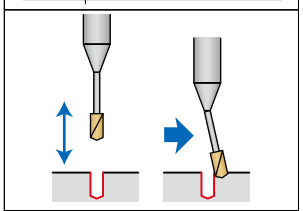
＜About machining programs＞

Always perform drilling using a G83 program (Peck drilling cycle).
Recommended reference position: 0.05 to 0.1mm. However, for aspect ratios of greater than 50D, the position should be set as 30% of the tool diameter below the surface of the work.
(Ex.: For ϕ1 × 100mm under neck length, reference position = -0.3mm)
Recommended approach distance: 0.05mm
*Change according to the machine parameter setting screen. If these values are large, machining time may become longer.



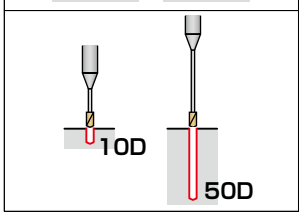
＜About fast feed rates＞

When the under neck length is long, if the fast feed rate is too fast, bit may be broken.
Recommended: 20m/min. or less (for greater than 30D, 5m/min. or less)



＜When focusing on accuracy for hole depths of 30D or greater＞

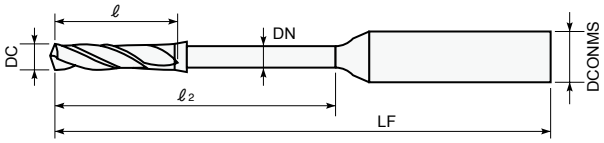
Drilling accuracy can be further improved by inserting 10D before drilling after drilling with a starter.
For aspect ratios of greater than 50D, always insert 10D before starting drilling.



Epoch Micro Step Borer H

Drilling | Carbide | ATH | 140° | Low helix ~20°

Dia. tolerance +0.006～+0.001mm (+ .0002 ～+ .0039 inch) | h4



EMSBH○○○○-○○-ATH

Cutting Conditions F78

Item code	Stocks	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Under neck length ℓ2 (mm)	Neck dia. DN (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EMSBH0010-1-ATH	★	0.1	.0039	0.50	1.0	0.09	45	3.0
EMSBH0010-2-ATH	★				2.0			
EMSBH0010-3-ATH	★				3.0			
EMSBH0011-1-ATH		0.11	.0043	0.55	1.0	0.1	45	3.0
EMSBH0011-2-ATH					2.0			
EMSBH0011-3-ATH					3.0			
EMSBH0012-1-ATH		0.12	.0047	0.60	1.0	0.11	45	3.0
EMSBH0012-2-ATH					2.0			
EMSBH0012-3-ATH					3.0			
EMSBH0015-1.5-ATH		0.15	.0059	0.75	1.5	0.14	45	3.0
EMSBH0015-3-ATH					3.0			
EMSBH0015-4.5-ATH					4.5			
EMSBH0020-2-ATH	★	0.2	.0079	1.00	2.0	0.19	45	3.0
EMSBH0020-4-ATH	★				4.0			
EMSBH0020-6-ATH	★				6.0			
EMSBH0021-2-ATH		0.21	.0083	1.05	2.0	0.19	45	3.0
EMSBH0021-4-ATH					4.0			
EMSBH0021-6-ATH					6.0			
EMSBH0022-2-ATH		0.22	.0087	1.10	2.0	0.2	45	3.0
EMSBH0022-4-ATH					4.0			
EMSBH0022-6-ATH					6.0			
EMSBH0030-3-ATH	★	0.3	.0118	1.5	3.0	0.28	45	3.0
EMSBH0030-6-ATH	★				6.0			
EMSBH0030-9-ATH	★				9.0			
EMSBH0031-3-ATH		0.31	.0122	1.5	3.0	0.29	45	3.0
EMSBH0031-6-ATH					6.0			
EMSBH0031-9-ATH					9.0			
EMSBH0032-3-ATH		0.32	.0126	1.5	3.0	0.3	45	3.0
EMSBH0032-6-ATH					6.0			
EMSBH0032-9-ATH					9.0			
EMSBH0040-4-ATH	★	0.4	.0158	2.0	4.0	0.38	50	3.0
EMSBH0040-8-ATH	★				8.0			
EMSBH0040-12-ATH	★				12.0			

Item code	Stocks	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Under neck length ℓ2 (mm)	Neck dia. DN (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EMSBH0041-4-ATH		0.41	.0161	2.0	4.0	0.39	50	3.0
EMSBH0041-8-ATH					8.0			
EMSBH0041-12-ATH					12.0			
EMSBH0042-4-ATH		0.42	.0165	2.0	4.0	0.4	50	3.0
EMSBH0042-8-ATH					8.0			
EMSBH0042-12-ATH					12.0			
EMSBH0050-5-ATH	★	0.5	.0197	2.5	5.0	0.48	50	3.0
EMSBH0050-10-ATH	★				10.0			
EMSBH0050-15-ATH	★				15.0			
EMSBH0051-5-ATH		0.51	.0201	2.5	5.0	0.48	50	3.0
EMSBH0051-10-ATH					10.0			
EMSBH0051-15-ATH					15.0			
EMSBH0052-5-ATH		0.52	.0205	2.5	5.0	0.49	50	3.0
EMSBH0052-10-ATH					10.0			
EMSBH0052-15-ATH					15.0			
EMSBH0060-6-ATH	★	0.6	.0236	3.0	6.0	0.57	55	3.0
EMSBH0060-12-ATH	★				12.0			
EMSBH0060-18-ATH	★				18.0			
EMSBH0061-6-ATH		0.61	.0240	3.0	6.0	0.58	55	3.0
EMSBH0061-12-ATH					12.0			
EMSBH0061-18-ATH					18.0			
EMSBH0062-6-ATH		0.62	.0244	3.0	6.0	0.59	55	3.0
EMSBH0062-12-ATH					12.0			
EMSBH0062-18-ATH					18.0			
EMSBH0070-7-ATH	★	0.7	.0276	3.5	7.0	0.67	60	4.0
EMSBH0070-14-ATH	★				14.0			
EMSBH0070-21-ATH	★				21.0			
EMSBH0071-7-ATH		0.71	.0280	3.5	7.0	0.67	60	4.0
EMSBH0071-14-ATH					14.0			
EMSBH0071-21-ATH					21.0			
EMSBH0072-7-ATH		0.72	.0284	3.5	7.0	0.68	60	4.0
EMSBH0072-14-ATH					14.0			
EMSBH0072-21-ATH					21.0			

(Note) For products with tool dimensions other than those listed above, separate consultation is needed. Please contact to sales office.

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

EMSBH○○○○-○○-ATH

Item code	Stocks	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Under neck length ℓ2 (mm)	Neck dia. DN (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EMSBH0080-8-ATH	★	0.8	.0315	4.0	8.0	0.76	60	4.0
EMSBH0080-16-ATH	★				16.0			
EMSBH0080-24-ATH	★				24.0			
EMSBH0081-8-ATH		0.81	.0319	4.0	8.0	0.76	60	4.0
EMSBH0081-16-ATH					16.0			
EMSBH0081-24-ATH					24.0			
EMSBH0082-8-ATH		0.82	.0323	4.0	8.0	0.77	60	4.0
EMSBH0082-16-ATH					16.0			
EMSBH0082-24-ATH					24.0			
EMSBH0090-9-ATH	★	0.9	.0354	4.5	9.0	0.85	65	4.0
EMSBH0090-18-ATH	★				18.0			
EMSBH0090-27-ATH	★				27.0			
EMSBH0091-9-ATH		0.91	.0358	4.5	9.0	0.86	65	4.0
EMSBH0091-18-ATH					18.0			
EMSBH0091-27-ATH					27.0			
EMSBH0092-9-ATH		0.92	.0362	4.5	9.0	0.87	65	4.0
EMSBH0092-18-ATH					18.0			
EMSBH0092-27-ATH					27.0			
EMSBH0100-10-ATH	★	1.0	.0394	5.0	10.0	0.95	70	4.0
EMSBH0100-20-ATH	★				20.0			
EMSBH0100-30-ATH	★				30.0			
EMSBH0101-10-ATH		1.01	.0398	5.0	10.0	0.97	70	4.0
EMSBH0101-20-ATH					20.0			
EMSBH0101-30-ATH					30.0			
EMSBH0102-10-ATH		1.02	.0402	5.0	10.0	0.98	70	4.0
EMSBH0102-20-ATH					20.0			
EMSBH0102-30-ATH					30.0			

Item code	Stocks	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Under neck length ℓ2 (mm)	Neck dia. DN (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EMSBH0150-15-ATH	★	1.5	.0591	15.0	15.0	–	70	4.0
EMSBH0150-30-ATH	★				30.0	1.44	70	
EMSBH0150-45-ATH	★				45.0		100	
EMSBH0151-15-ATH		1.51	.0595	15.0	15.0	–	70	4.0
EMSBH0151-30-ATH					30.0	1.45	70	
EMSBH0151-45-ATH					45.0		100	
EMSBH0152-15-ATH		1.52	.0598	15.0	15.0	–	70	4.0
EMSBH0152-30-ATH					30.0	1.46	70	
EMSBH0152-45-ATH					45.0		100	
EMSBH0200-20-ATH	★	2.0	.0787	20.0	20.0	–	70	4.0
EMSBH0200-40-ATH	★				40.0	1.92	100	
EMSBH0200-60-ATH	★				60.0		100	
EMSBH0201-20-ATH		2.01	.0791	20.0	20.0	–	70	4.0
EMSBH0201-40-ATH					40.0	1.93	100	
EMSBH0201-60-ATH					60.0		100	
EMSBH0202-20-ATH		2.02	.0795	20.0	20.0	–	70	4.0
EMSBH0202-40-ATH					40.0	1.94	100	
EMSBH0202-60-ATH					60.0		100	

(Note) For products with tool dimensions other than those listed above, separate consultation is needed. Please contact to sales office.

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
					○	◎						

Epoch Micro Step Borer H

Recommended cutting conditions EMSBH-ATH

Item code	Tool dia.		Under neck length		Step feed		Pre-hardened steels (35～45HRC)			Hardened steels (45～60HRC)		
	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)	*n* (min⁻¹)	*vf* (mm/min)	*vf* (IPM)	*n* (min⁻¹)	*vf* (mm/min)	*vf* (IPM)
EMSBH0010-1-ATH	0.1	.0039	1.0	.039	0.01	.00039	22,300	67	2.6	12,420	41	1.6
EMSBH0010-2-ATH			2.0	.079								
EMSBH0010-3-ATH			3.0	.118								
EMSBH0011-1-ATH	0.11	.0043	1.0	.039	0.011	.00043	22,300	67	2.6	12,420	41	1.6
EMSBH0011-2-ATH			2.0	.079								
EMSBH0011-3-ATH			3.0	.118								
EMSBH0012-1-ATH	0.12	.0047	1.0	.039	0.012	.00047	22,300	67	2.6	12,420	41	1.6
EMSBH0012-2-ATH			2.0	.079								
EMSBH0012-3-ATH			3.0	.118								
EMSBH0015-1.5-ATH	0.15	.0059	1.5	.059	0.015	.00059	22,300	65	2.6	12,420	45	1.8
EMSBH0015-3-ATH			3.0	.118								
EMSBH0015-4.5-ATH			4.5	.177								
EMSBH0020-2-ATH	0.2	.0079	2.0	.079	0.02	.00079	15,800	63	2.5	11,150	50	2.0
EMSBH0020-4-ATH			4.0	.158								
EMSBH0020-6-ATH			6.0	.236								
EMSBH0021-2-ATH	0.21	.0083	2.0	.079	0.021	.00083	15,800	63	2.5	11,150	50	2.0
EMSBH0021-4-ATH			4.0	.158								
EMSBH0021-6-ATH			6.0	.236								
EMSBH0022-2-ATH	0.22	.0087	2.0	.079	0.022	.00087	15,800	63	2.5	11,150	50	2.0
EMSBH0022-4-ATH			4.0	.158								
EMSBH0022-6-ATH			6.0	.236								
EMSBH0030-3-ATH	0.3	.0118	3.0	.118	0.03	.00118	13,000	51	2.0	11,150	43	1.7
EMSBH0030-6-ATH			6.0	.236								
EMSBH0030-9-ATH			9.0	.354								
EMSBH0031-3-ATH	0.31	.0122	3.0	.118	0.031	.00122	13,000	51	2.0	11,150	43	1.7
EMSBH0031-6-ATH			6.0	.236								
EMSBH0031-9-ATH			9.0	.354								
EMSBH0032-3-ATH	0.32	.0126	3.0	.118	0.032	.00126	13,000	51	2.0	11,150	43	1.7
EMSBH0032-6-ATH			6.0	.236								
EMSBH0032-9-ATH			9.0	.354								
EMSBH0040-4-ATH	0.4	.0158	4.0	.158	0.04	.00157	11,200	55	2.2	10,350	52	2.0
EMSBH0040-8-ATH			8.0	.315								
EMSBH0040-12-ATH			12.0	.472								
EMSBH0041-4-ATH	0.41	.0161	4.0	.158	0.041	.00161	11,200	55	2.2	10,350	52	2.0
EMSBH0041-8-ATH			8.0	.315								
EMSBH0041-12-ATH			12.0	.472								
EMSBH0042-4-ATH	0.42	.0165	4.0	.158	0.042	.00165	11,200	55	2.2	10,350	52	2.0
EMSBH0042-8-ATH			8.0	.315								
EMSBH0042-12-ATH			12.0	.472								
EMSBH0050-5-ATH	0.5	.0197	5.0	.197	0.05	.00197	10,500	52	2.0	10,000	50	2.0
EMSBH0050-10-ATH			10.0	.394								
EMSBH0050-15-ATH			15.0	.591								
EMSBH0051-5-ATH	0.51	.0201	5.0	.197	0.051	.00201	10,500	52	2.0	10,000	50	2.0
EMSBH0051-10-ATH			10.0	.394								
EMSBH0051-15-ATH			15.0	.591								
EMSBH0052-5-ATH	0.52	.0205	5.0	.197	0.052	.00205	10,500	52	2.0	10,000	50	2.0
EMSBH0052-10-ATH			10.0	.394								
EMSBH0052-15-ATH			15.0	.591								
EMSBH0060-6-ATH	0.6	.0236	6.0	.236	0.06	.00236	10,060	56	2.2	9,560	55	2.2
EMSBH0060-12-ATH			12.0	.472								
EMSBH0060-18-ATH			18.0	.709								
EMSBH0061-6-ATH	0.61	.0240	6.0	.236	0.061	.00240	10,060	56	2.2	9,560	55	2.2
EMSBH0061-12-ATH			12.0	.472								
EMSBH0061-18-ATH			18.0	.709								
EMSBH0062-6-ATH	0.62	.0244	6.0	.236	0.062	.00244	10,060	56	2.2	9,560	55	2.2
EMSBH0062-12-ATH			12.0	.472								
EMSBH0062-18-ATH			18.0	.709								

Item code	Tool dia.		Under neck length		Step feed		Pre-hardened steels (35~45HRC)			Hardened steels (45~60HRC)		
	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)	*n* (min^{-1})	*v*f (mm/min)	*v*f (IPM)	*n* (min^{-1})	*v*f (mm/min)	*v*f (IPM)
EMSBH0070-7-ATH	0.7	.0276	7.0	.276	0.07	.0028	9,600	59	2.3	9,100	54	2.1
EMSBH0070-14-ATH			14.0	.551								
EMSBH0070-21-ATH			21.0	.827								
EMSBH0071-7-ATH	0.71	.0280	7.0	.276	0.071	.0028	9,600	59	2.3	9,100	54	2.1
EMSBH0071-14-ATH			14.0	.551								
EMSBH0071-21-ATH			21.0	.827								
EMSBH0072-7-ATH	0.72	.0284	7.0	.276	0.072	.0028	9,600	59	2.3	9,100	54	2.1
EMSBH0072-14-ATH			14.0	.551								
EMSBH0072-21-ATH			21.0	.827								
EMSBH0080-8-ATH	0.8	.0315	8.0	.315	0.08	.0031	9,260	57	2.2	8,760	55	2.2
EMSBH0080-16-ATH			16.0	.630								
EMSBH0080-24-ATH			24.0	.945								
EMSBH0081-8-ATH	0.81	.0319	8.0	.315	0.081	.0032	9,260	57	2.2	8,760	55	2.2
EMSBH0081-16-ATH			16.0	.630								
EMSBH0081-24-ATH			24.0	.945								
EMSBH0082-8-ATH	0.82	.0323	8.0	.315	0.082	.0032	9,260	57	2.2	8,760	55	2.2
EMSBH0082-16-ATH			16.0	.630								
EMSBH0082-24-ATH			24.0	.945								
EMSBH0090-9-ATH	0.9	.0354	9.0	.354	0.09	.0035	9,000	60	2.4	8,500	56	2.2
EMSBH0090-18-ATH			18.0	.709								
EMSBH0090-27-ATH			27.0	1.063								
EMSBH0091-9-ATH	0.91	.0358	9.0	.354	0.091	.0036	9,000	60	2.4	8,500	56	2.2
EMSBH0091-18-ATH			18.0	.709								
EMSBH0091-27-ATH			27.0	1.063								
EMSBH0092-9-ATH	0.92	.0362	9.0	.354	0.092	.0036	9,000	60	2.4	8,500	56	2.2
EMSBH0092-18-ATH			18.0	.709								
EMSBH0092-27-ATH			27.0	1.063								
EMSBH0100-10-ATH	1.0	.0394	10.0	.394	0.1	.0039	8,500	63	2.5	8,000	56	2.2
EMSBH0100-20-ATH			20.0	.787								
EMSBH0100-30-ATH			30.0	1.181								
EMSBH0101-10-ATH	1.01	.0398	10.0	.394	0.101	.0040	8,500	63	2.5	8,000	56	2.2
EMSBH0101-20-ATH			20.0	.787								
EMSBH0101-30-ATH			30.0	1.181								
EMSBH0102-10-ATH	1.02	.0402	10.0	.394	0.102	.0040	8,500	63	2.5	8,000	56	2.2
EMSBH0102-20-ATH			20.0	.787								
EMSBH0102-30-ATH			30.0	1.181								
EMSBH0150-15-ATH	1.5	.0591	15.0	.591	0.15	.0059	5,750	60	2.4	4,250	43	1.7
EMSBH0150-30-ATH			30.0	1.181								
EMSBH0150-45-ATH			45.0	1.772								
EMSBH0151-15-ATH	1.51	.0595	15.0	.591	0.151	.0059	5,750	60	2.4	4,250	43	1.7
EMSBH0151-30-ATH			30.0	1.181								
EMSBH0151-45-ATH			45.0	1.772								
EMSBH0152-15-ATH	1.52	.0598	15.0	.591	0.152	.0060	5,750	60	2.4	4,250	43	1.7
EMSBH0152-30-ATH			30.0	1.181								
EMSBH0152-45-ATH			45.0	1.772								
EMSBH0200-20-ATH	2.0	.0787	20.0	.787	0.2	.0079	5,000	60	2.4	3,190	43	1.7
EMSBH0200-40-ATH			40.0	1.575								
EMSBH0200-60-ATH			60.0	2.362								
EMSBH0201-20-ATH	2.01	.0791	20.0	.787	0.201	.0079	5,000	60	2.4	3,190	43	1.7
EMSBH0201-40-ATH			40.0	1.575								
EMSBH0201-60-ATH			60.0	2.362								
EMSBH0202-20-ATH	2.02	.0795	20.0	.787	0.202	.0080	5,000	60	2.4	3,190	43	1.7
EMSBH0202-40-ATH			40.0	1.575								
EMSBH0202-60-ATH			60.0	2.362								

【Note】 Please understand “Drilling method and attentions” next page, and use EMSBH-ATH.

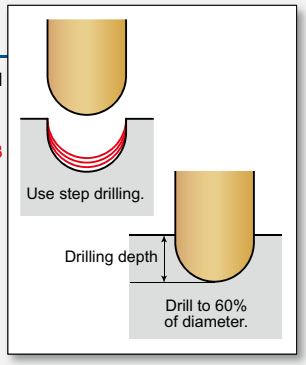
Epoch Micro Step Borer H

Setting of cutting conditions

・This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
・Please use EPDBEH-ATH as a starter.
・Please always use G83 mode (peck drilling cycle).
・For drilling hardened steel, when drilling holes with an L/D of 30D, it is recommended to use a 10D tool for pre-drilling. In addition, when the diameter is less than φ0.5, in addition to pre-drilling with a 10D tool, further pre-drilling with a 20D tool is also recommended.
Example: When drilling a φ0.1 × 30D hole in SKD11 (60HRC), etc.
・Under-neck length (ℓ_2) conforms to through-hole drilling depth.
・When drilling through holes, drill the through hole to a depth of between 20% and 30% of the diameter from the tip of the tool.
Ex.: For work thickness T=4mm and tool= Ø0.5×5mm,
drilling depth should be 4.14mm (from tip of tool).
・Water-soluble or oil-based coolant should be used to ensure chip removal.
・Please pay attention on the below “Drilling process and attentions on drilling”.

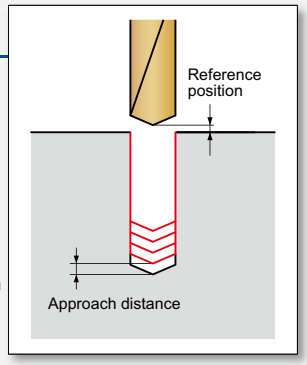
<About starter>

※Use of a special starter (Epoch Deep Ball Evolution Hard EPDBEH-ATH) is recommended.
Be sure to perform step drilling using a G83 program.
Drilling depth: Be sure to perform drilling to a depth of 60% of the tool diameter.
(For example, 0.06mm deep for a tool diameter of φ0.1mm)



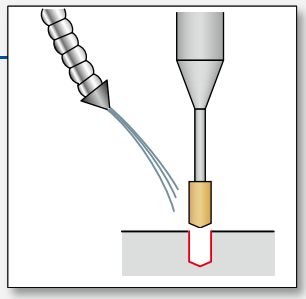
<About machining programs>

Always perform drilling using a G83 program (Peck drilling cycle).
Recommended reference position: 0.05 to 0.1mm
However, for aspect ratios of greater than 50D, the position should be set as 30% of the tool dia. below the surface of the work.
(Ex.: For Ø1 × 100mm below-neck length, reference position = -0.3mm)
Recommended approach distance: 0.05mm
※Change according to the machine parameter setting screen. If these values are large, machining time may become longer.



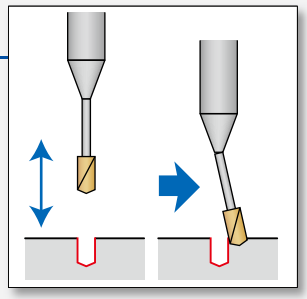
<About coolants>

Oil-based or water-soluble coolants are recommended.
When using, set it up so that the coolant hits the flute tips.



<About fast feed rates>

When the below-neck length is long, if the fast feed rate is too fast, bit may be broken.
Recommended: 20m/min. or less
(for greater than 30D, 5m/min. or less)



Regarding tolerance of diameter for EMSBH-ATH

Diameter of EMSBH-ATH has a positive tolerance inorder to
(1) compensate hole shrink after boring, and
(2) keep clearance for ejector pin of die mold.
Conventional EMSBS has negative tolerance of diameter.

【Diameter tolerance】
+0.006mm (+ .00024 inch)
+0.001mm (+ .00004 inch)

Special Starter

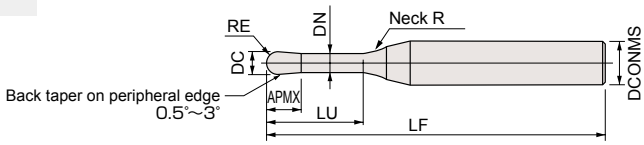
Carbide | ATH | Helix angle 30°

RE tolerance: RE≦0.25mm : ±0.003mm (± . 0001 inch)
0.25mm<RE : ±0.005mm (± . 0002 inch)

h5

Use of Epoch Deep Ball Evolution Hard (EPDBEH-ATH) is recommended for starter.

2 Flutes



EPDBEH2○○○○-○.○○-ATH

Cutting Conditions F82

Item code	Stock	Size								
		Tool dia.		Ball radius	Under neck length	Flute length	Neck dia.	Overall length	Shank dia.	Neck R
		DC (mm)	DC (inch)	RE (mm)	LU (mm)	APMX (mm)	DN (mm)	LF (mm)	DCONMS (mm)	
EPDBEH2001-0.2-ATH	★	0.1	.0039	0.05	0.2	0.08	0.08	45	4	1
EPDBEH20011-0.2-ATH		0.11	.0043	0.055	0.2	0.09	0.09	45	4	1
EPDBEH20012-0.2-ATH		0.12	.0047	0.06	0.2	0.1	0.1	45	4	1
EPDBEH20015-0.2-ATH		0.15	.0059	0.075	0.2	0.13	0.13	45	4	1
EPDBEH2002-0.5-ATH	★	0.2	.0079	0.1	0.5	0.15	0.17	50	4	1
EPDBEH20021-0.5-ATH		0.21	.0083	0.105	0.5	0.16	0.18	50	4	1
EPDBEH20022-0.5-ATH		0.22	.0087	0.11	0.5	0.17	0.19	50	4	1
EPDBEH2003-0.5-ATH	★	0.3	.0118	0.15	0.5	0.25	0.27	50	4	2
EPDBEH20031-0.5-ATH		0.31	.0122	0.155	0.5	0.26	0.28	50	4	2
EPDBEH20032-0.5-ATH		0.32	.0126	0.16	0.5	0.27	0.29	50	4	2
EPDBEH2004-0.75-ATH	★	0.4	.0157	0.2	0.75	0.3	0.37	50	4	2
EPDBEH20041-0.75-ATH		0.41	.0161	0.205	0.75	0.31	0.38	50	4	2
EPDBEH20042-0.75-ATH		0.42	.0165	0.21	0.75	0.32	0.39	50	4	2
EPDBEH2005-1-ATH	★	0.5	.0197	0.25	1	0.35	0.47	50	4	2
EPDBEH20051-1-ATH		0.51	.0201	0.255	1	0.36	0.48	50	4	2
EPDBEH20052-1-ATH		0.52	.0205	0.26	1	0.37	0.49	50	4	2
EPDBEH2006-1-ATH	★	0.6	.0236	0.3	1	0.4	0.57	50	4	4
EPDBEH20061-1-ATH		0.61	.0240	0.305	1	0.41	0.58	50	4	4
EPDBEH20062-1-ATH		0.62	.0244	0.31	1	0.42	0.59	50	4	4
EPDBEH2007-2-ATH	★	0.7	.0276	0.35	2	0.45	0.67	50	4	4
EPDBEH20071-2-ATH		0.71	.0280	0.355	2	0.46	0.68	50	4	4
EPDBEH20072-2-ATH		0.72	.0283	0.36	2	0.47	0.69	50	4	4
EPDBEH2008-2-ATH	★	0.8	.0315	0.4	2	0.5	0.77	50	4	4
EPDBEH20081-2-ATH		0.81	.0319	0.405	2	0.51	0.78	50	4	4
EPDBEH20082-2-ATH		0.82	.0323	0.41	2	0.52	0.79	50	4	4
EPDBEH2009-2-ATH	★	0.9	.0354	0.45	2	0.6	0.87	50	4	4
EPDBEH20091-2-ATH		0.91	.0358	0.455	2	0.61	0.88	50	4	4
EPDBEH20092-2-ATH		0.92	.0362	0.46	2	0.62	0.89	50	4	4
EPDBEH2010-2-ATH	★	1	.0394	0.5	2	0.8	0.96	50	4	4
EPDBEH20101-2-ATH		1.01	.0398	0.505	2	0.81	0.97	50	4	4
EPDBEH20102-2-ATH		1.02	.0402	0.51	2	0.82	0.98	50	4	4
EPDBEH2015-2-ATH	★	1.5	.0591	0.75	2	1.35	1.44	50	4	4
EPDBEH20151-2-ATH		1.51	.0594	0.755	2	1.36	1.45	50	4	4
EPDBEH20152-2-ATH		1.52	.0598	0.76	2	1.37	1.46	50	4	4
EPDBEH2020-3-ATH	★	2	.0787	1	3	1.7	1.92	50	4	4
EPDBEH20201-3-ATH		2.01	.0791	1.005	3	1.71	1.93	50	4	4
EPDBEH20202-3-ATH		2.02	.0795	1.01	3	1.72	1.94	50	4	4

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
					○	◎						

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Epoch Micro Step Borer H

Cutting condition for starter (EPDBEH-ATH)

Tool dia.		Drilling hole depth		Pre-hardened steel (35～45HRC)					Hardened steel (45～55HRC)					Hardened steel (55～60HRC)				
DC (mm)	DC (Inch)	(mm)	(Inch)	*n*	*vf*		Step feed		*n*	*vf*		Step feed		*n*	*vf*		Step feed	
				min^{-1}	mm/min	IPM	mm	inch	min^{-1}	mm/min	IPM	mm	inch	min^{-1}	mm/min	IPM	mm	inch
0.1	.0039	0.06	.0024															
0.11	.0043	0.066	.0026	13,369	33	1.3	0.003	.00012	12,414	21	.8	0.003	.00012	12,414	21	.8	0.003	.00012
0.12	.0047	0.072	.0028															
0.15	.0059	0.09	.0035	13,369	34	1.3	0.0045	.00018	12,414	23	.9	0.0045	.00018	12,414	23	.9	0.0045	.00018
0.2	.0079	0.12	.0047															
0.21	.0083	0.126	.0050	10,504	35	1.3	0.006	.00024	10,027	25	1.0	0.006	.00024	10,027	25	1.0	0.006	.00024
0.22	.0087	0.132	.0052															
0.3	.0118	0.18	.0071															
0.31	.0122	0.186	.0073	8,913	25	1.0	0.009	.00035	8,541	21	.8	0.009	.00035	8,541	21	.8	0.009	.00035
0.32	.0126	0.192	.0076															
0.4	.0157	0.24	.0094															
0.41	.0161	0.246	.0097	8,077	23	.9	0.012	.00047	7,520	21	.8	0.012	.00047	7,520	21	.8	0.012	.00047
0.42	.0165	0.252	.0099															
0.5	.0197	0.3	.0118															
0.51	.0201	0.306	.0120	6,462	23	.9	0.015	.00059	6,016	21	.8	0.015	.00059	6,016	21	.8	0.015	.00059
0.52	.0205	0.312	.0123															
0.6	.0236	0.36	.0142															
0.61	.0240	0.366	.0144	5,385	23	.9	0.018	.00071	5,013	21	.8	0.018	.00071	5,013	21	.8	0.018	.00071
0.62	.0244	0.372	.0146															
0.7	.0276	0.42	.0165															
0.71	.0280	0.426	.0168	4,615	23	.9	0.021	.0008	4,297	21	.8	0.021	.0008	4,297	21	.8	0.021	.0008
0.72	.0283	0.432	.0170															
0.8	.0315	0.48	.0189															
0.81	.0319	0.486	.0191	4,039	23	.9	0.024	.0009	3,760	21	.8	0.024	.0009	3,760	21	.8	0.024	.0009
0.82	.0323	0.492	.0194															
0.9	.0354	0.54	.0213															
0.91	.0358	0.546	.0215	3,590	23	.9	0.027	.0011	3,342	21	.8	0.027	.0011	3,342	21	.8	0.027	.0011
0.92	.0362	0.552	.0217															
1	.0394	0.6	.0236															
1.01	.0398	0.606	.0239	3,231	23	.9	0.045	.0018	3,008	21	.8	0.03	.0012	3,008	21	.8	0.03	.0012
1.02	.0402	0.612	.0241															
1.5	.0591	0.9	.0354															
1.51	.0594	0.906	.0357	2,154	23	.9	0.045	.0018	2,005	21	.8	0.045	.0018	2,005	21	.8	0.045	.0018
1.52	.0598	0.912	.0359															
2	.0787	1.2	.0472															
2.01	.0791	1.206	.0475	1,615	23	.9	0.06	.0024	1,504	21	.8	0.06	.0024	1,504	21	.8	0.06	.0024
2.02	.0795	1.212	.0477															

- These recommended cutting conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- Water-soluble or oil-based coolant should be used to ensure chip removal.
- Always use with a G83 program (Peck drilling cycle).
- Drilling depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For Ø0.1, depth=0.06mm)

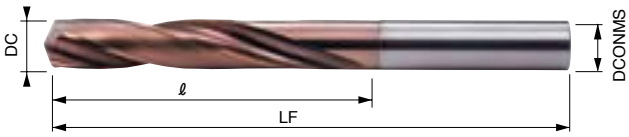
Epoch Hard Drills

TH Coating

Drilling | Carbide | TH | 140° | Low helix 20° | Integral no. shank | ~3D

h8 | Shank tolerance 0 ~ −0.01mm (0 ~ − .0039 inch)

Plane, S-X thinning



EHSE○○.○-TH

Cutting Conditions F84

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EHSE2.0-TH	★	2.0	.0787	15	50	3
EHSE2.1-TH	★	2.1	.0827	15	50	3
EHSE2.2-TH	★	2.2	.0866	16	50	3
EHSE2.3-TH	★	2.3	.0906	16	50	3
EHSE2.4-TH	★	2.4	.0945	17	50	3
EHSE2.5-TH	★	2.5	.0984	17	55	3
EHSE2.6-TH	★	2.6	.1024	17	55	3
EHSE2.7-TH	★	2.7	.1063	19	55	3
EHSE2.8-TH	★	2.8	.1102	19	55	3
EHSE2.9-TH	★	2.9	.1142	19	55	3
EHSE3.0-TH	★	3.0	.1181	21	60	3
EHSE3.1-TH	★	3.1	.1221	24	60	4
EHSE3.2-TH	★	3.2	.1260	24	60	4
EHSE3.3-TH	★	3.3	.1299	24	60	4
EHSE3.4-TH	★	3.4	.1339	24	60	4
EHSE3.5-TH	★	3.5	.1378	24	60	4
EHSE3.6-TH	★	3.6	.1417	27	60	4
EHSE3.7-TH	★	3.7	.1457	27	60	4
EHSE3.8-TH	★	3.8	.1496	27	60	4
EHSE3.9-TH	★	3.9	.1535	27	60	4
EHSE4.0-TH	★	4.0	.1575	27	60	4
EHSE4.1-TH	★	4.1	.1614	29	63	5
EHSE4.2-TH	★	4.2	.1654	29	63	5
EHSE4.3-TH	★	4.3	.1693	29	63	5
EHSE4.4-TH	★	4.4	.1732	29	63	5
EHSE4.5-TH	★	4.5	.1772	29	63	5
EHSE4.6-TH	★	4.6	.1811	32	68	5
EHSE4.7-TH	★	4.7	.1850	32	68	5
EHSE4.8-TH	★	4.8	.1890	32	68	5
EHSE4.9-TH	★	4.9	.1929	32	68	5
EHSE5.0-TH	★	5.0	.1969	32	68	5
EHSE5.1-TH	★	5.1	.2008	34	72	6
EHSE5.2-TH	★	5.2	.2047	34	72	6
EHSE5.3-TH	★	5.3	.2087	34	72	6
EHSE5.4-TH	★	5.4	.2126	34	72	6
EHSE5.5-TH	★	5.5	.2165	34	72	6
EHSE5.6-TH	★	5.6	.2205	36	74	6
EHSE5.7-TH	★	5.7	.2244	36	74	6
EHSE5.8-TH	★	5.8	.2284	36	74	6
EHSE5.9-TH	★	5.9	.2323	36	74	6

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)
EHSE6.0-TH	★	6.0	.2362	41	81	6
EHSE6.5-TH	★	6.5	.2559	41	81	7
EHSE6.8-TH	★	6.8	.2677	43	83	7
EHSE6.9-TH	★	6.9	.2717	43	83	7
EHSE7.0-TH	★	7.0	.2756	43	83	7
EHSE7.5-TH	★	7.5	.2953	45	87	8
EHSE7.8-TH	★	7.8	.3071	48	90	8
EHSE8.0-TH	★	8.0	.3150	48	90	8
EHSE8.5-TH	★	8.5	.3347	53	96	9
EHSE8.6-TH	★	8.6	.3386	55	98	9
EHSE8.7-TH	★	8.7	.3425	55	98	9
EHSE8.8-TH	★	8.8	.3465	55	98	9
EHSE9.0-TH	★	9.0	.3543	55	98	9
EHSE9.5-TH	★	9.5	.3740	58	102	10
EHSE9.8-TH	★	9.8	.3858	60	105	10
EHSE10.0-TH	★	10.0	.3937	60	105	10
EHSE10.3-TH	★	10.3	.4055	66	112	11
EHSE10.4-TH	★	10.4	.4095	66	112	11
EHSE10.5-TH	★	10.5	.4134	66	112	11
EHSE10.8-TH	★	10.8	.4252	68	114	11
EHSE11.0-TH	★	11.0	.4331	68	114	11
EHSE11.5-TH	★	11.5	.4528	71	118	12
EHSE11.8-TH	★	11.8	.4646	73	121	12
EHSE12.0-TH	★	12.0	.4724	73	121	12
EHSE12.1-TH	★	12.1	.4764	76	135	13
EHSE12.2-TH	★	12.2	.4803	76	135	13
EHSE12.5-TH	★	12.5	.4921	76	135	13
EHSE12.6-TH	★	12.6	.4961	78	137	13
EHSE13.0-TH	★	13.0	.5118	78	137	13
EHSE13.5-TH		13.5	.5315	84	144	14
EHSE14.0-TH		14.0	.5512	86	147	14
EHSE14.1-TH	★	14.1	.5551	89	151	15
EHSE14.2-TH		14.2	.5591	89	151	15
EHSE14.5-TH		14.5	.5709	89	151	15
EHSE14.6-TH	★	14.6	.5748	91	153	15
EHSE15.0-TH		15.0	.5906	91	153	15
EHSE15.5-TH		15.5	.6102	94	157	16
EHSE15.6-TH	★	15.6	.6142	96	160	16
EHSE16.0-TH		16.0	.6299	96	160	16
EHSE16.1-TH	★	16.1	.6339	102	167	17

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
					○	◎						

★ : Inventory maintained in Japan　No Mark : Manufactured upon request only

Epoch Hard Drills

Recommended Cutting Conditions for Wet (Dilution of less than 20times)

EHSE-TH

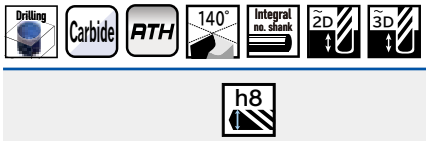
Work material		Hot working tool steel (50~55HRC)					Cold working tool steel (55~60HRC)					High speed steel (60~65HRC)				
Vc Cutting speed	m/min	15~20~30					10~15~20					8~10~12				
	SFM	49~66~98					33~49~66					26~33~39				
Tool dia.		*n* (min⁻¹)	*vf*		*f*		*n* (min⁻¹)	*vf*		*f*		*n* (min⁻¹)	*vf*		*vf*	
Metric	ϕ2	3,180	mm/min	64	mm/rev.	0.02	2,390	mm/min	48	mm/rev.	0.02	1,590	mm/min	20	mm/rev.	0.012
Inch	.0787		IPM	2.5	IPR	.0008		IPM	1.9	IPR	.0008		IPM	.8	IPR	.0005
Metric	ϕ4	1,600	mm/min	64	mm/rev.	0.04	1,200	mm/min	48	mm/rev.	0.04	800	mm/min	20	mm/rev.	0.025
Inch	.1575		IPM	2.5	IPR	.0016		IPM	1.9	IPR	.0016		IPM	.8	IPR	.0010
Metric	ϕ6	1,050	mm/min	64	mm/rev.	0.06	800	mm/min	48	mm/rev.	0.06	530	mm/min	20	mm/rev.	0.04
Inch	.2362		IPM	2.5	IPR	.0024		IPM	1.9	IPR	.0024		IPM	.8	IPR	.0016
Metric	ϕ8	800	mm/min	64	mm/rev.	0.08	600	mm/min	48	mm/rev.	0.08	400	mm/min	20	mm/rev.	0.05
Inch	.3150		IPM	2.5	IPR	.0031		IPM	1.9	IPR	.0031		IPM	.8	IPR	.0020
Metric	ϕ10	640	mm/min	64	mm/rev.	0.1	480	mm/min	43	mm/rev.	0.09	320	mm/min	20	mm/rev.	0.06
Inch	.3937		IPM	2.5	IPR	.0039		IPM	1.7	IPR	.0035		IPM	.8	IPR	.0024
Metric	ϕ12	530	mm/min	64	mm/rev.	0.12	400	mm/min	40	mm/rev.	0.1	270	mm/min	20	mm/rev.	0.07
Inch	.4724		IPM	2.5	IPR	.0047		IPM	1.6	IPR	.0039		IPM	.8	IPR	.0028
Metric	ϕ14	450	mm/min	64	mm/rev.	0.14	340	mm/min	37	mm/rev.	0.11	230	mm/min	20	mm/rev.	0.08
Inch	.5512		IPM	2.5	IPR	.0055		IPM	1.5	IPR	.0043		IPM	.8	IPR	.0031
Metric	ϕ16	400	mm/min	64	mm/rev.	0.16	300	mm/min	36	mm/rev.	0.12	200	mm/min	20	mm/rev.	0.1
Inch	.6299		IPM	2.5	IPR	.0063		IPM	1.4	IPR	.0047		IPM	.8	IPR	.0039

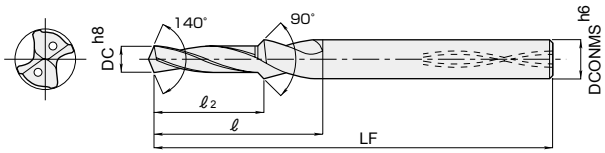
Selection of cutting conditions

- Use the appropriate coolant for the work material and machining shape.
- These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- The above conditions apply to a hole-depth of 3 times the diameter or less.
- Cutting performance may vary according to the material being cut and its hardness.
- Mount the drill on a collet without any flaws. Adjust the drill run out to 0.02mm or less.
- Use a machine with high rigidity.
- Supply a sufficient amount of cutting fluid (Water-soluble, dilution of 20 times or less) to machining points.
- Sufficient cutting fluid is not supplied in the case of a turning machine or other machine used in a longitudinal direction. Use values of 70% or less of those in the above chart.
- The drill can start drilling with high performance and accuracy. It is not recommended to conduct positioning using a center drill or a starting drill because it may cause chipping When conducting positioning, set the feeding length to one third of the value above.
- Non Step Borer is recommended for machining works of a hardness less than 45 HRC.
- When using oil-based cutting agent, use conditions below the lower limit of the cutting speed range. In addition, be careful of smoke or fire due to cutting chips or heating of tool.

Step Borer

Internal coolant type (with oil holes)





STBH○○○○□-ATH

Cutting Conditions F87

Item code	Stock	L/D	Size						
			Small dia.		Step length	Flute length	Overall length	Shank dia. (Large dia.)	Corresponding tap size
			DC (mm)	DC (inch)	ℓ2 (mm)	ℓ (mm)	LF (mm)	DCONMS (mm)	
STBH034S-ATH	★	2	3.4	.1339	8	25	80	6.0	M4
STBH034M-ATH	★	3			12	30	80	6.0	
STBH043S-ATH	★	2	4.3	.1693	10	30	85	7.0	M5
STBH043M-ATH	★	3			15	35	85	7.0	
STBH051S-ATH	★	2	5.1	.2008	12	35	90	8.0	M6
STBH051M-ATH	★	3			18	40	90	8.0	
STBH068S-ATH	★	2	6.8	.2677	16	45	100	10.0	M8
STBH068M-ATH	★	3			24	50	105	10.0	
STBH085S-ATH	★	2	8.5	.3346	20	50	115	12.0	M10
STBH085M-ATH	★	3			30	60	125	12.0	
STBH103S-ATH	★	2	10.3	.4055	24	60	125	14.0	M12
STBH103M-ATH	★	3			36	70	135	14.0	

- Chamfer width: for corresponding screw sizes of M4 to M6, processing to C1.0 is possible; for M8 to M12, processing to C1.5 is possible.
- Corresponding screw sizes are for metric coarse threads.

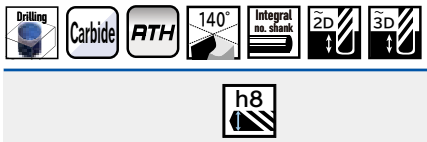
Applicable work material

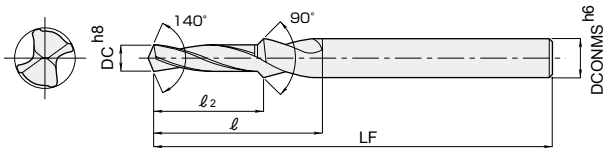
Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
○	◎	◎	◎	○	○		○	○	○	○	○	

★ : Inventory maintained in Japan

Step Borer

External coolant type (without oil hole)





STB○○○○□-ATH

Cutting Conditions F88

Item code	Stock	L/D	Size (mm)						
			Small dia.		Step length	Flute length	Overall length	Shank dia. (Large dia.)	Corresponding tap size
			DC (mm)	DC (inch)	ℓ2 (mm)	ℓ (mm)	LF (mm)	DCONMS (mm)	
STB034S-ATH	★	2	3.4	.1339	8	25	80	6.0	M4
STB034M-ATH	★	3			12	30	80	6.0	
STB043S-ATH	★	2	4.3	.1693	10	30	85	7.0	M5
STB043M-ATH	★	3			15	35	85	7.0	
STB051S-ATH	★	2	5.1	.2008	12	35	90	8.0	M6
STB051M-ATH	★	3			18	40	90	8.0	
STB068S-ATH	★	2	6.8	.2677	16	45	100	10.0	M8
STB068M-ATH	★	3			24	50	105	10.0	
STB085S-ATH	★	2	8.5	.3346	20	50	115	12.0	M10
STB085M-ATH	★	3			30	60	125	12.0	
STB103S-ATH	★	2	10.3	.4055	24	60	125	14.0	M12
STB103M-ATH	★	3			36	70	135	14.0	

- Chamfer width: for corresponding screw sizes of M4 to M6, processing to C1.0 is possible; for M8 to M12, processing to C1.5 is possible.
- Corresponding screw sizes are for metric coarse threads.

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
○	◎	◎	◎	○	○			○	○	○	○	

★ : Inventory maintained in Japan

Recommended Cutting Conditions

STBH-ATH Internal coolant type (with Oil holes)

Small dia.			Structual steel ~180HB	Carbon steel ~200HB	Alloy steel ~30HRC	Pre-hardened steel ~45HRC	Gray cast iron	Ductile cast iron	Aluminium alloy	Stainless steel	Heat-resistant alloys Inconel 718
ϕ3.0 ~ ϕ6.0 (mm)	Vc	m/min	80 (40~120)	80 (40~120)	80 (40~120)	40 (20~60)	80 (40~120)	60 (30~90)	100 (80~120)	40 (20~60)	20 (10~25)
		SFM	262 (131~394)	262 (131~394)	262 (131~394)	131 (66~197)	262 (131~394)	197 (98~295)	328 (262~394)	131 (66~197)	66 (33~82)
.118" ~ .236"	f	mm/rev.	0.07~0.2	0.07~0.2	0.07~0.2	0.05~0.12	0.07~0.2	0.07~0.2	0.07~0.2	0.05~0.2	0.05~0.15
		IPR	.0028~.0079	.0028~.0079	.0028~.0079	.002~.0047	.0028~.0079	.0028~.0079	.0028~.0079	.002~.0079	.002~.0059
ϕ6.1 ~ ϕ10.0 (mm)	Vc	m/min	80 (40~120)	80 (40~120)	80 (40~120)	40 (20~60)	80 (40~120)	60 (30~90)	100 (80~120)	40 (20~60)	25 (15~30)
		SFM	262 (131~394)	262 (131~394)	262 (131~394)	131 (66~197)	262 (131~394)	197 (98~295)	328 (262~394)	131 (66~197)	82(49~98)
.240" ~ .394"	f	mm/rev.	0.12~0.3	0.12~0.3	0.12~0.3	0.06~0.2	0.12~0.3	0.12~0.3	0.12~0.3	0.09~0.2	0.05~0.15
		IPR	.0047~.0118	.0047~.0118	.0047~.0118	.0024~.0079	.0047~.0118	.0047~.0118	.0047~.0118	.0035~.0079	.002~.0059
ϕ10.1 ~ ϕ13.0 (mm)	Vc	m/min	80 (40~120)	80 (40~120)	80 (40~120)	40 (20~60)	80 (40~120)	60 (30~90)	100 (80~120)	40 (20~60)	25 (15~30)
		SFM	262 (131~394)	262 (131~394)	262 (131~394)	131 (66~197)	262 (131~394)	197 (98~295)	328 (262~394)	131 (66~197)	82 (49~98)
.398" ~ .512"	f	mm/rev.	0.2~0.4	0.2~0.4	0.2~0.4	0.1~0.25	0.2~0.4	0.2~0.4	0.2~0.4	0.15~0.35	0.1~0.2
		IPR	.0079~.0157	.0079~.0157	.0079~.0157	.0039~.0098	.0079~.0157	.0079~.0157	.0079~.0157	.0059~.0138	.0039~.0079

【Attentions on use】

①This tool is a tool for drilling holes and chamfering the hole opening in a single process. It cannot be used for drilling holes with a large-diameter portion (stepped drilling, etc.)

②Since during chamfering chips may become long and interfere with drilling, it is recommended that chips be cut by performing inching processing, etc.
(If chips become long during processing when chamfering is not being performed, perform pecking or inching processing.)

③It is recommended that the feed rate be reduced to 30 to 70% during chamfering.

④For drilling of stainless steel or heat-resistant steel, select the internal coolant type (with oil holes). Use of external coolant type in such cases is not recommended.)

⑤The cutting conditions stated for the internal coolant type are when using water-based coolants at dilutions of up to 20:1 maximum or when using MQL (mist).

⑥The cutting conditions stated for the external coolant type are when using water-based coolants at dilutions of up to 20:1 maximum.

⑦If water-based coolant at dilutions greater than 20:1 is used, the lower limit of the cutting speed range should be used as a general criteria.

⑧When performing MQL (mist) drilling, it may be necessary in some cases to reduce the cutting conditions depending on the mist equipment or amounts discharged by the tool.

⑨When using an oil-based coolant, 70% of the lower limit for cutting speed should be used as a general criteria.

⑩Cutting conditions should be adjusted according to machine rigidity or work clamp conditions, shape of cutting area, etc.

Step Borer

Recommended Cutting Conditions

STB-ATH External coolant type (without oil hole)

Small dia.			Structual steel ~180HB	Carbon steel ~200HB	Alloy steel ~30HRC	Pre-hardened steel ~45HRC	Gray cast iron	Ductile cast iron	Aluminium alloy
ϕ3.0 ~ ϕ6.0 (mm) .118" ~ .236"	Vc	m/min	60 (40~80)	60 (40~80)	60 (40~80)	40 (20~60)	70 (40~100)	50 (30~70)	70 (50~90)
		SFM	197 (131~262)	197 (131~262)	197 (131~262)	131 (66~197)	230 (131~328)	164 (98~230)	230 (164~295)
	f	mm/rev.	0.07~0.2	0.07~0.2	0.07~0.2	0.05~0.12	0.07~0.2	0.07~0.2	0.07~0.2
		IPR	.0028~.0079	.0028~.0079	.0028~.0079	.002~.0047	.0028~.0079	.0028~.0079	.0028~.0079
ϕ6.1 ~ ϕ10.0 (mm) .240" ~ .394"	Vc	m/min	60 (40~80)	60 (40~80)	60 (40~80)	40 (20~60)	70 (40~100)	50 (30~70)	70 (50~90)
		SFM	197 (131~262)	197 (131~262)	197 (131~262)	131 (66~197)	230 (131~328)	164 (98~230)	230 (164~295)
	f	mm/rev.	0.12~0.3	0.12~0.3	0.12~0.3	0.06~0.2	0.12~0.3	0.12~0.3	0.12~0.3
		IPR	.0047~.0118	.0047~.0118	.0047~.0118	.0024~.0079	.0047~.0118	.0047~.0118	.0047~.0118
ϕ10.1 ~ ϕ13.0 (mm) .398" ~ .512"	Vc	m/min	60 (40~80)	60 (40~80)	60 (40~80)	40 (20~60)	70 (40~100)	50 (30~70)	70 (50~90)
		SFM	197 (131~262)	197 (131~262)	197 (131~262)	131 (66~197)	230 (131~328)	164 (98~230)	230 (164~295)
	f	mm/rev.	0.2~0.4	0.2~0.4	0.2~0.4	0.1~0.25	0.2~0.4	0.2~0.4	0.2~0.4
		IPR	.0079~.0157	.0079~.0157	.0079~.0157	.0039~.0098	.0079~.0157	.0079~.0157	.0079~.0157

【Attentions on use】

①This tool is a tool for drilling holes and chamfering the hole opening in a single process. It cannot be used for drilling holes with a large-diameter portion (stepped drilling, etc.)

②Since during chamfering chips may become long and interfere with drilling, it is recommended that chips be cut by performing inching processing, etc.
(If chips become long during processing when chamfering is not being performed, perform pecking or inching processing.)

③It is recommended that the feed rate be reduced to 30 to 70% during chamfering.

④For drilling of stainless steel or heat-resistant steel, select the internal coolant type (with oil holes). Use of external coolant type in such cases is not recommended.)

⑤The cutting conditions stated for the internal coolant type are when using water-based coolants at dilutions of up to 20:1 maximum or when using MQL (mist).

⑥The cutting conditions stated for the external coolant type are when using water-based coolants at dilutions of up to 20:1 maximum.

⑦If water-based coolant at dilutions greater than 20:1 is used, the lower limit of the cutting speed range should be used as a general criteria.

⑧When performing MQL (mist) drilling, it may be necessary in some cases to reduce the cutting conditions depending on the mist equipment or amounts discharged by the tool.

⑨When using an oil-based coolant, 70% of the lower limit for cutting speed should be used as a general criteria.

⑩Cutting conditions should be adjusted according to machine rigidity or work clamp conditions, shape of cutting area, etc.

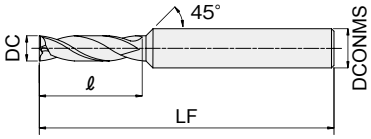
Z Plunging Borer

Regular

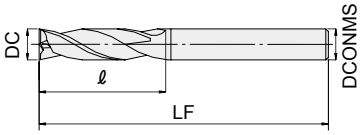
Drilling | Carbide | TH | 180° | Normal helix 30° | End mill shank | ~2D

h8

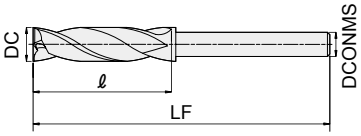
Shank tolerance: 0 ~ −0.01mm (0 ~ − .0039 inch)



Type A



Type B



Type C

ZPB○○○○-TH

Cutting Conditions F93

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPB0200-TH		2.0	.0787	8	50	4	A
ZPB0210-TH		2.1	.0827	8	50	4	A
ZPB0220-TH		2.2	.0866	8	50	4	A
ZPB0230-TH		2.3	.0906	8	50	4	A
ZPB0240-TH		2.4	.0945	8	50	4	A
ZPB0250-TH		2.5	.0984	10	50	4	A
ZPB0260-TH		2.6	.1024	10	50	4	A
ZPB0270-TH		2.7	.1063	10	50	4	A
ZPB0280-TH		2.8	.1102	10	50	4	A
ZPB0290-TH		2.9	.1142	10	50	4	A
ZPB0300-TH	★	3.0	.1181	12	50	4	A
ZPB0310-TH		3.1	.1221	12	50	4	A
ZPB0320-TH		3.2	.1260	12	50	4	A
ZPB0330-TH		3.3	.1299	14	50	4	A
ZPB0340-TH		3.4	.1339	14	50	4	A
ZPB0350-TH		3.5	.1378	14	50	4	A
ZPB0360-TH		3.6	.1417	14	50	4	A
ZPB0370-TH		3.7	.1457	14	50	4	A
ZPB0380-TH		3.8	.1496	16	50	4	A
ZPB0390-TH		3.9	.1535	16	50	4	A
ZPB0400-TH	★	4.0	.1575	16	50	4	B
ZPB0410-TH		4.1	.1614	16	50	6	A
ZPB0420-TH		4.2	.1654	16	50	6	A
ZPB0430-TH		4.3	.1693	18	50	6	A
ZPB0440-TH		4.4	.1732	18	50	6	A
ZPB0450-TH	★	4.5	.1772	18	50	6	A
ZPB0460-TH		4.6	.1811	18	50	6	A
ZPB0470-TH		4.7	.1850	18	50	6	A
ZPB0480-TH		4.8	.1890	20	60	6	A
ZPB0490-TH		4.9	.1929	20	60	6	A

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPB0500-TH	★	5.0	.1969	20	60	6	A
ZPB0510-TH		5.1	.2008	20	60	6	A
ZPB0520-TH		5.2	.2047	20	60	6	A
ZPB0530-TH		5.3	.2087	20	60	6	A
ZPB0540-TH		5.4	.2126	20	60	6	A
ZPB0550-TH	★	5.5	.2165	22	60	6	A
ZPB0560-TH		5.6	.2205	22	60	6	A
ZPB0570-TH		5.7	.2244	22	60	6	A
ZPB0580-TH		5.8	.2284	22	60	6	A
ZPB0590-TH		5.9	.2323	22	60	6	A
ZPB0600-TH	★	6.0	.2362	22	60	6	B
ZPB0610-TH		6.1	.2402	24	70	8	A
ZPB0620-TH		6.2	.2441	24	70	8	A
ZPB0630-TH		6.3	.2480	24	70	8	A
ZPB0640-TH		6.4	.2520	24	70	8	A
ZPB0650-TH		6.5	.2559	26	70	8	A
ZPB0660-TH		6.6	.2598	26	70	8	A
ZPB0670-TH		6.7	.2638	26	70	8	A
ZPB0680-TH		6.8	.2677	26	70	8	A
ZPB0690-TH		6.9	.2717	26	70	8	A
ZPB0700-TH	★	7.0	.2756	26	70	8	A
ZPB0710-TH		7.1	.2795	26	70	8	A
ZPB0720-TH		7.2	.2835	26	70	8	A
ZPB0730-TH		7.3	.2874	26	70	8	A
ZPB0740-TH		7.4	.2913	26	70	8	A
ZPB0750-TH		7.5	.2953	26	70	8	A
ZPB0760-TH		7.6	.2992	28	70	8	A
ZPB0770-TH		7.7	.3032	28	70	8	A
ZPB0780-TH		7.8	.3071	28	70	8	A
ZPB0790-TH		7.9	.3110	28	70	8	A

★ : Inventory maintained in Japan No Mark : Manufactured upon request only

Z Plunging Borer

ZPB○○○○-TH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPB0800-TH	★	8.0	.3150	28	70	8	B
ZPB0810-TH		8.1	.3189	28	80	10	A
ZPB0820-TH		8.2	.3228	28	80	10	A
ZPB0830-TH		8.3	.3268	28	80	10	A
ZPB0840-TH		8.4	.3307	28	80	10	A
ZPB0850-TH		8.5	.3347	28	80	10	A
ZPB0860-TH		8.6	.3386	28	80	10	A
ZPB0870-TH		8.7	.3425	28	80	10	A
ZPB0880-TH		8.8	.3465	28	80	10	A
ZPB0890-TH		8.9	.3504	28	80	10	A
ZPB0900-TH	★	9.0	.3543	28	80	10	A
ZPB0910-TH		9.1	.3583	30	80	10	A
ZPB0920-TH		9.2	.3622	30	80	10	A
ZPB0930-TH		9.3	.3661	30	80	10	A
ZPB0940-TH		9.4	.3701	30	80	10	A
ZPB0950-TH	★	9.5	.3740	30	80	10	A
ZPB0960-TH		9.6	.3780	32	80	10	A
ZPB0970-TH		9.7	.3819	32	80	10	A
ZPB0980-TH		9.8	.3858	32	80	10	A
ZPB0990-TH		9.9	.3898	32	80	10	A
ZPB1000-TH	★	10.0	.3937	32	80	10	B
ZPB1010-TH		10.1	.3976	33	90	12	A
ZPB1020-TH		10.2	.4016	33	90	12	A
ZPB1030-TH		10.3	.4055	33	90	12	A
ZPB1040-TH		10.4	.4095	33	90	12	A
ZPB1050-TH		10.5	.4134	33	90	12	A
ZPB1060-TH		10.6	.4173	33	90	12	A
ZPB1070-TH		10.7	.4213	33	90	12	A
ZPB1080-TH		10.8	.4252	33	90	12	A
ZPB1090-TH		10.9	.4291	33	90	12	A

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPB1100-TH	★	11.0	.4331	33	90	12	A
ZPB1110-TH		11.1	.4370	34	90	12	A
ZPB1120-TH		11.2	.4409	34	90	12	A
ZPB1130-TH		11.3	.4449	34	90	12	A
ZPB1140-TH		11.4	.4488	34	90	12	A
ZPB1150-TH		11.5	.4528	34	90	12	A
ZPB1160-TH		11.6	.4567	38	90	12	A
ZPB1170-TH		11.7	.4606	38	90	12	A
ZPB1180-TH		11.8	.4646	38	90	12	A
ZPB1190-TH		11.9	.4685	38	90	12	A
ZPB1200-TH	★	12.0	.4724	38	90	12	B
ZPB1250-TH		12.5	.4921	40	100	12	C
ZPB1300-TH		13.0	.5118	40	100	12	C
ZPB1350-TH		13.5	.5315	40	100	12	C
ZPB1400-TH		14.0	.5512	40	100	12	C
ZPB1450-TH		14.5	.5709	40	105	12	C
ZPB1500-TH		15.0	.5906	40	105	12	C
ZPB1550-TH		15.5	.6102	42	110	12	C
ZPB1600-TH		16.0	.6299	42	110	16	B

Applicable work material

Mild steel SS	Carbon steel S○○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
○	◎	◎	◎	○	○				○		○	

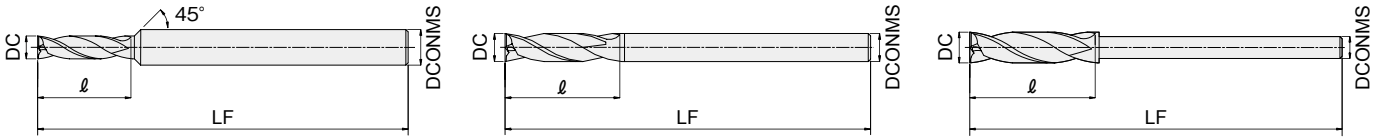
★：Inventory maintained in Japan　No Mark：Manufactured upon request only

Long Shank

Drilling | Carbide | TH | 180° | Normal helix 30° | End mill shank | ~2D

h8

Shank tolerance: 0 ~ −0.01mm (0 ~ − .0039 inch)



Type A | Type B | Type C

ZPBLS○○○○-TH

Cutting Conditions F93

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPBLS0200-TH		2.0	.0787	8	80	4	A
ZPBLS0210-TH		2.1	.0827	8	80	4	A
ZPBLS0220-TH		2.2	.0866	8	80	4	A
ZPBLS0230-TH		2.3	.0906	8	80	4	A
ZPBLS0240-TH		2.4	.0945	8	80	4	A
ZPBLS0250-TH		2.5	.0984	10	80	4	A
ZPBLS0260-TH		2.6	.1024	10	80	4	A
ZPBLS0270-TH		2.7	.1063	10	80	4	A
ZPBLS0280-TH		2.8	.1102	10	80	4	A
ZPBLS0290-TH		2.9	.1142	10	80	4	A
ZPBLS0300-TH		3.0	.1181	12	100	6	A
ZPBLS0310-TH		3.1	.1221	12	100	6	A
ZPBLS0320-TH		3.2	.1260	12	100	6	A
ZPBLS0330-TH		3.3	.1299	14	100	6	A
ZPBLS0340-TH		3.4	.1339	14	100	6	A
ZPBLS0350-TH		3.5	.1378	14	100	6	A
ZPBLS0360-TH		3.6	.1417	14	100	6	A
ZPBLS0370-TH		3.7	.1457	14	100	6	A
ZPBLS0380-TH		3.8	.1496	16	100	6	A
ZPBLS0390-TH		3.9	.1535	16	100	6	A
ZPBLS0400-TH		4.0	.1575	16	100	6	A
ZPBLS0410-TH		4.1	.1614	16	100	6	A
ZPBLS0420-TH		4.2	.1654	16	100	6	A
ZPBLS0430-TH		4.3	.1693	18	100	6	A
ZPBLS0440-TH		4.4	.1732	18	100	6	A
ZPBLS0450-TH		4.5	.1772	18	100	6	A
ZPBLS0460-TH		4.6	.1811	18	100	6	A
ZPBLS0470-TH		4.7	.1850	18	100	6	A
ZPBLS0480-TH		4.8	.1890	20	110	6	A
ZPBLS0490-TH		4.9	.1929	20	110	6	A

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPBLS0500-TH		5.0	.1969	20	110	6	A
ZPBLS0510-TH		5.1	.2008	20	110	6	A
ZPBLS0520-TH		5.2	.2047	20	110	6	A
ZPBLS0530-TH		5.3	.2087	20	110	6	A
ZPBLS0540-TH		5.4	.2126	20	110	6	A
ZPBLS0550-TH		5.5	.2165	22	110	6	A
ZPBLS0560-TH		5.6	.2205	22	110	6	A
ZPBLS0570-TH		5.7	.2244	22	110	6	A
ZPBLS0580-TH		5.8	.2284	22	110	6	A
ZPBLS0590-TH		5.9	.2323	22	110	6	A
ZPBLS0600-TH		6.0	.2362	22	120	6	B
ZPBLS0610-TH		6.1	.2402	24	120	6	C
ZPBLS0620-TH		6.2	.2441	24	120	6	C
ZPBLS0630-TH		6.3	.2480	24	120	6	C
ZPBLS0640-TH		6.4	.2520	24	120	6	C
ZPBLS0650-TH		6.5	.2559	26	120	6	C
ZPBLS0660-TH		6.6	.2598	26	120	6	C
ZPBLS0670-TH		6.7	.2638	26	120	6	C
ZPBLS0680-TH		6.8	.2677	26	120	6	C
ZPBLS0690-TH		6.9	.2717	26	120	6	C
ZPBLS0700-TH		7.0	.2756	26	120	6	C
ZPBLS0710-TH		7.1	.2795	26	120	6	C
ZPBLS0720-TH		7.2	.2835	26	120	6	C
ZPBLS0730-TH		7.3	.2874	26	120	6	C
ZPBLS0740-TH		7.4	.2913	26	120	6	C
ZPBLS0750-TH		7.5	.2953	26	120	6	C
ZPBLS0760-TH		7.6	.2992	28	120	6	C
ZPBLS0770-TH		7.7	.3032	28	120	6	C
ZPBLS0780-TH		7.8	.3071	28	120	6	C
ZPBLS0790-TH		7.9	.3110	28	120	6	C

Z Plunging Borer

ZPBLS○○○○-TH

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPBLS0800-TH		8.0	.3150	28	130	8	B
ZPBLS0810-TH		8.1	.3189	28	130	8	C
ZPBLS0820-TH		8.2	.3228	28	130	8	C
ZPBLS0830-TH		8.3	.3268	28	130	8	C
ZPBLS0840-TH		8.4	.3307	28	130	8	C
ZPBLS0850-TH		8.5	.3347	28	130	8	C
ZPBLS0860-TH		8.6	.3386	28	130	8	C
ZPBLS0870-TH		8.7	.3425	28	130	8	C
ZPBLS0880-TH		8.8	.3465	28	130	8	C
ZPBLS0890-TH		8.9	.3504	28	130	8	C
ZPBLS0900-TH		9.0	.3543	28	130	8	C
ZPBLS0910-TH		9.1	.3583	30	130	8	C
ZPBLS0920-TH		9.2	.3622	30	130	8	C
ZPBLS0930-TH		9.3	.3661	30	130	8	C
ZPBLS0940-TH		9.4	.3701	30	130	8	C
ZPBLS0950-TH		9.5	.3740	30	130	8	C
ZPBLS0960-TH		9.6	.3780	32	130	8	C
ZPBLS0970-TH		9.7	.3819	32	130	8	C
ZPBLS0980-TH		9.8	.3858	32	130	8	C
ZPBLS0990-TH		9.9	.3898	32	130	8	C
ZPBLS1000-TH		10.0	.3937	32	150	10	B
ZPBLS1010-TH		10.1	.3976	33	150	10	C
ZPBLS1020-TH		10.2	.4016	33	150	10	C
ZPBLS1030-TH		10.3	.4055	33	150	10	C
ZPBLS1040-TH		10.4	.4095	33	150	10	C
ZPBLS1050-TH		10.5	.4134	33	150	10	C
ZPBLS1060-TH		10.6	.4173	33	150	10	C
ZPBLS1070-TH		10.7	.4213	33	150	10	C
ZPBLS1080-TH		10.8	.4252	33	150	10	C
ZPBLS1090-TH		10.9	.4291	33	150	10	C

Item code	Stock	Size: Tool dia. DC (mm)	Tool dia. DC (inch)	Flute length ℓ (mm)	Overall length LF (mm)	Shank dia. DCONMS (mm)	Shape
ZPBLS1100-TH		11.0	.4331	33	150	10	C
ZPBLS1110-TH		11.1	.4370	34	150	10	C
ZPBLS1120-TH		11.2	.4409	34	150	10	C
ZPBLS1130-TH		11.3	.4449	34	150	10	C
ZPBLS1140-TH		11.4	.4488	34	150	10	C
ZPBLS1150-TH		11.5	.4528	34	150	10	C
ZPBLS1160-TH		11.6	.4567	38	150	10	C
ZPBLS1170-TH		11.7	.4606	38	150	10	C
ZPBLS1180-TH		11.8	.4646	38	150	10	C
ZPBLS1190-TH		11.9	.4685	38	150	10	C
ZPBLS1200-TH		12.0	.4724	38	150	12	B
ZPBLS1250-TH		12.5	.4921	40	150	12	C
ZPBLS1300-TH		13.0	.5118	40	150	12	C
ZPBLS1350-TH		13.5	.5315	40	150	12	C
ZPBLS1400-TH		14.0	.5512	40	150	12	C
ZPBLS1450-TH		14.5	.5709	40	150	12	C
ZPBLS1500-TH		15.0	.5906	40	150	12	C
ZPBLS1550-TH		15.5	.6102	42	150	12	C
ZPBLS1600-TH		16.0	.6299	42	150	16	B

Applicable work material

Mild steel SS	Carbon steel S○C	Alloy steel SCM, SCr	Heat-treated steel SKD SKS	Tool steel ~40HRC	Hardened steel ~45HRC	Hardened steel 45HRC~	Stainless steel SUS	Heat-resistant steel, Ti alloy Inconel	Cast iron	Ductile cast iron	Aluminum alloy Al	Copper alloy Cu
○	◎	◎	◎	○	○				○		○	

No Mark：Manufactured upon request only

Recommended Cutting Conditions

ZPB-TH Regular

Work material (Hardness)		Structural steel (~180HB)			Carbon steel (~200HB)			Alloy steel (~30HRC)			Pre-hardened steel (~45HRC)			Casting		
Vc Cutting speed	m/min	40~80			40~80m/min			30~70m/min			10~ 50m/min			40~80m/min		
	SFM	131~262			131~262			98~230			33~164			131~262		
Tool dia.		*n* (min⁻¹)		*f*	*n* (min⁻¹)		*f*	*n* (min⁻¹)		*f*	*n* (min⁻¹)		*vf*	*n* (min⁻¹)		*vf*
Metric	ϕ2.0mm	10,000	mm/rev.	0.02~0.05	10,000	mm/rev.	0.02~0.05	9,000	mm/rev.	0.02~0.05	6,000	mm/rev.	0.01~0.04	10,000	mm/rev.	0.02~0.05
Inch	.0787		IPR	.0008~.0020		IPR	.0008~.0020		IPR	.0008~.0020		IPR	.0004~.0016		IPR	.0008~.0020
Metric	ϕ3.0	7,950	mm/rev.	0.05~0.08	7,950	mm/rev.	0.05~0.08	6,900	mm/rev.	0.05~0.08	4,250	mm/rev.	0.03~0.06	7,950	mm/rev.	0.05~0.08
Inch	.1181		IPR	.0020~.0032		IPR	.0020~.0032		IPR	.0020~.0032		IPR	.0012~.0024		IPR	.0020~.0032
Metric	ϕ4.0	6,000	mm/rev.	0.06~0.1	6,000	mm/rev.	0.06~0.1	5,200	mm/rev.	0.06~0.1	3,200	mm/rev.	0.04~0.08	6,000	mm/rev.	0.06~0.1
Inch	.1575		IPR	.0024~.0039		IPR	.0024~.0039		IPR	.0024~.0039		IPR	.0016~.0032		IPR	.0024~.0039
Metric	ϕ5.0	4,800	mm/rev.	0.08~0.13	4,800	mm/rev.	0.08~0.13	4,150	mm/rev.	0.08~0.13	2,550	mm/rev.	0.05~0.1	4,800	mm/rev.	0.08~0.13
Inch	.1969		IPR	.0032~.0051		IPR	.0032~.0051		IPR	.0032~.0051		IPR	.002~.0039		IPR	.0032~.0051
Metric	ϕ6.0	4,000	mm/rev.	0.09~0.15	4,000	mm/rev.	0.09~0.15	3,450	mm/rev.	0.09~0.15	2,100	mm/rev.	0.06~0.12	4,000	mm/rev.	0.09~0.15
Inch	.2362		IPR	.0035~.0059		IPR	.0035~.0059		IPR	.0035~.0059		IPR	.0024~.0047		IPR	.0035~.0059
Metric	ϕ7.0	3,400	mm/rev.	0.11~0.18	3,400	mm/rev.	0.11~0.18	3,000	mm/rev.	0.11~0.18	1,800	mm/rev.	0.07~0.14	3,400	mm/rev.	0.11~0.18
Inch	.2756		IPR	.0043~.0071		IPR	.0043~.0071		IPR	.0043~.0071		IPR	.0028~.0055		IPR	.0043~.0071
Metric	ϕ8.0	3,000	mm/rev.	0.12~0.2	3,000	mm/rev.	0.12~0.2	2,600	mm/rev.	0.12~0.2	1,600	mm/rev.	0.08~0.16	3,000	mm/rev.	0.12~0.2
Inch	.3150		IPR	.0047~.0079		IPR	.0047~.0079		IPR	.0047~.0079		IPR	.0032~.0063		IPR	.0047~.0079
Metric	ϕ9.0	2,650	mm/rev.	0.14~0.23	2,650	mm/rev.	0.14~0.23	2,300	mm/rev.	0.14~0.23	1,400	mm/rev.	0.09~0.18	2,650	mm/rev.	0.14~0.23
Inch	.3543		IPR	.0055~.0098		IPR	.0055~.0098		IPR	.0055~.0098		IPR	.0035~.0071		IPR	.0055~.0098
Metric	ϕ10.0	2,400	mm/rev.	0.15~0.25	2,400	mm/rev.	0.15~0.25	2,100	mm/rev.	0.15~0.25	1,300	mm/rev.	0.1~0.2	2,400	mm/rev.	0.15~0.25
Inch	.3937		IPR	.0059~.0098		IPR	.0059~.0098		IPR	.0059~.0098		IPR	.0039~.0079		IPR	.0059~.0098
Metric	ϕ11.0	2,200	mm/rev.	0.17~0.28	2,200	mm/rev.	0.17~0.28	1,900	mm/rev.	0.17~0.28	1,150	mm/rev.	0.11~0.22	2,200	mm/rev.	0.17~0.28
Inch	.4331		IPR	.0067~.011		IPR	.0067~.011		IPR	.0067~.011		IPR	.0041~.0087		IPR	.0067~.011
Metric	ϕ12.0	2,000	mm/rev.	0.18~0.3	2,000	mm/rev.	0.18~0.3	1,750	mm/rev.	0.18~0.3	1,050	mm/rev.	0.12~0.24	2,000	mm/rev.	0.18~0.3
Inch	.4724		IPR	.0071~.0118		IPR	.0071~.0118		IPR	.0071~.0118		IPR	.0047~.0095		IPR	.0071~.0118
Metric	ϕ13.0	1,700	mm/rev.	0.13~0.26	1,700	mm/rev.	0.13~0.26	1,400	mm/rev.	0.13~0.26	1,000	mm/rev.	0.09~0.22	1,500	mm/rev.	0.17~0.26
Inch	.5118		IPR	.0051~.0102		IPR	.0051~.0102		IPR	.0051~.0102		IPR	.0035~.0087		IPR	.0051~.0102
Metric	ϕ14.0	1,500	mm/rev.	0.13~0.27	1,500	mm/rev.	0.13~0.27	1,250	mm/rev.	0.13~0.27	800	mm/rev.	0.08~0.23	1,250	mm/rev.	0.16~0.27
Inch	.5512		IPR	.0051~.0106		IPR	.0051~.0106		IPR	.0051~.0106		IPR	.0032~.0091		IPR	.0051~.0106
Metric	ϕ15.0	1,300	mm/rev.	0.12~0.27	1,300	mm/rev.	0.12~0.27	1,100	mm/rev.	0.12~0.27	650	mm/rev.	0.07~0.23	1,050	mm/rev.	0.15~0.27
Inch	.5906		IPR	.0047~.0106		IPR	.0047~.0106		IPR	.0047~.0106		IPR	.0028~.0091		IPR	.0047~.0106
Metric	ϕ16.0	1,200	mm/rev.	0.16~0.32	1,200	mm/rev.	0.16~0.32	1,200	mm/rev.	0.16~0.32	700	mm/rev.	0.13~0.24	1,200	mm/rev.	0.16~0.32
Inch	.6299		IPR	.0063~.0126		IPR	.0063~.0126		IPR	.0063~.0126		IPR	.0051~.0095		IPR	.0063~.0126

【Note】 Please refer to F94

Z Plunging Borer

Recommended Cutting Conditions

ZPB-TH Regular

Work material (Hardness)		Aluminum alloy			Aluminum alloy casting		
Vc Cutting speed	m/min	60~200			30~150		
	SFM	197~656			98~492		
Tool dia.		*n* (min⁻¹)	*f*		*n* (min⁻¹)	*f*	
Metric	ϕ2.0mm	20,000	mm/rev.	0.02~0.05	19,000	mm/rev.	0.02~0.04
Inch	.0787		IPR	.0008~.002		IPR	.0008~.0016
Metric	ϕ3.0	17,000	mm/rev.	0.05~0.08	12,700	mm/rev.	0.05~0.07
Inch	.1181		IPR	.002~.0032		IPR	.002~.0028
Metric	ϕ4.0	12,500	mm/rev.	0.06~0.1	9,550	mm/rev.	0.06~0.09
Inch	.1575		IPR	.0024~.0039		IPR	.0024~.0035
Metric	ϕ5.0	10,000	mm/rev.	0.08~0.13	7,650	mm/rev.	0.08~0.12
Inch	.1969		IPR	.0032~.0051		IPR	.0032~.0047
Metric	ϕ6.0	8,500	mm/rev.	0.09~0.15	6,350	mm/rev.	0.09~0.14
Inch	.2362		IPR	.0035~.0059		IPR	.0035~.0055
Metric	ϕ7.0	7,300	mm/rev.	0.11~0.18	5,450	mm/rev.	0.11~0.16
Inch	.2756		IPR	.0043~.0071		IPR	.0043~.0063
Metric	ϕ8.0	6,500	mm/rev.	0.12~0.2	4,800	mm/rev.	0.12~0.18
Inch	.3150		IPR	.0047~.0079		IPR	.0047~.0071
Metric	ϕ9.0	5,650	mm/rev.	0.14~0.23	4,250	mm/rev.	0.14~0.21
Inch	.3543		IPR	.0055~.0091		IPR	.0055~.0083
Metric	ϕ10.0	5,100	mm/rev.	0.15~0.25	3,800	mm/rev.	0.15~0.23
Inch	.3937		IPR	.0059~.0098		IPR	.0059~.0091
Metric	ϕ11.0	4,650	mm/rev.	0.17~0.28	3,500	mm/rev.	0.17~0.25
Inch	.4331		IPR	.0067~.011		IPR	.0067~.0098
Metric	ϕ12.0	4,250	mm/rev.	0.18~0.3	3,200	mm/rev.	0.18~0.28
Inch	.4724		IPR	.0071~.0118		IPR	.0071~.011
Metric	ϕ13.0	3,000	mm/rev.	0.18~0.28	2,700	mm/rev.	0.19~0.26
Inch	.5118		IPR	.0071~.011		IPR	.0075~.0102
Metric	ϕ14.0	2,500	mm/rev.	0.17~0.29	2,300	mm/rev.	0.18~0.27
Inch	.5512		IPR	.0067~.0114		IPR	.0071~.0106
Metric	ϕ15.0	2,000	mm/rev.	0.15~0.29	1,900	mm/rev.	0.15~0.27
Inch	.5906		IPR	.0059~.0114		IPR	.0059~.0106
Metric	ϕ16.0	2,300	mm/rev.	0.16~0.32	2,000	mm/rev.	0.16~0.32
Inch	.6299		IPR	.0063~.0126		IPR	.0063~.0126

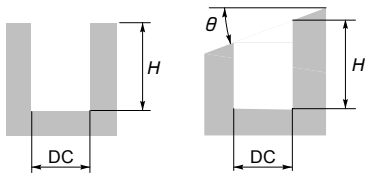
ZPBLS-TH Long shank

General rules for cutting conditions

Tool overhang ratio(L/D)	Cutting condition ratio
3 or less	70 ～ 90%
4 or less	10 ～ 70% Step feed 0.5D or less
5 or less	10% or less Step feed 0.05mm or less

Example:
When using the ZPBLS1100-TH to machine S50C with a tool overhang of 55mm (L/D=5), the rotation speed should be set to 2200 x 0.1 = 220min^{-1}, feed rate should be set to 0.17 x 0.1=0.017mm/rev., and step amount should be set to 0.05mm

Machined hole depth



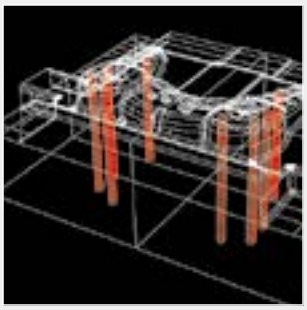
Tool dia. (DC)	Hole depth (*H*)
DC≦ϕ6	*H*≦2DC
DC>ϕ6	*H*≦1.5DC

【Note】

①Use the appropriate coolant for the work material and machining shape.
②These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
③This tool is for drilling holes and horizontal feeding cannot be performed.
④This tool is not suitable for machining stainless steel (SUS304, 316, etc.)
⑤If cutting chips cannot be broken up, step machining should be performed.
⑥These cutting conditions are for when the machining surface is flat and the cutting depth is 2DC or less.
⑦For machining of sloped surfaces or other non-flat surfaces, cutting conditions should be adjusted according to the machining surface slope (*θ*).
If the machining surface slope (*θ*) is 30° or less, reduce the feed rate to about 70 to 80% as a general rule.
If the machining surface slope (*θ*) is 50° or less, reduce the feed rate to less than 50% as a general rule.
⑧When attaching the tool, suppress flute tip runout as much as possible (to 10μm or less as a general rule).

Attention **This tool can't be used for milling process. Please apply only for drilling process.**

Technical Data



End Mills

Name of parts for end mills and shapes of end cutting edges ····· G2
Flute shape and cutting ability of end mills ····· G4
How to determine cutting conditions of end mills ····· G5
Precautions in handling an end mill ····· G6
Trouble shooting for end milling ····· G7

Indexable Tools

Names of parts and roles for milling tools ····· G8
Names of parts and roles for milling inserts ····· G11
How to select cutting conditions for milling ····· G13
Cutting condition formula (milling) and trouble shooting ····· G14
Table of corresponding materials from various companies for milling ····· G15

Drills

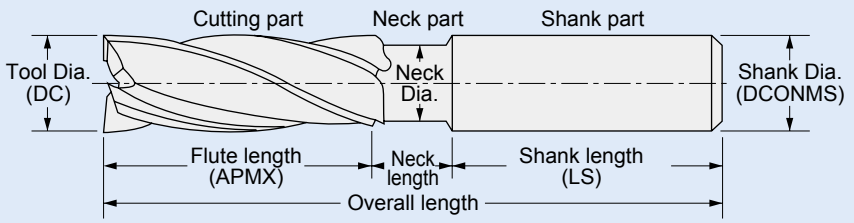
Name and function of each part of a drill ····· G17
Drill dia. equivalent to a hole size before tapping ····· G18
Drilling work equations ····· G18
Trouble shooting of drilling work ····· G19

Reference data

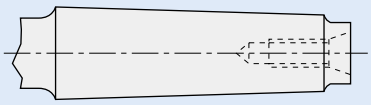
Standard tolerance grades and limit deviations for holes ····· G20
Dimension standard for screw threads ····· G21
Table of corresponding Tool Steels brands ····· G26
Surface roughness ····· G30
Machinability indices ····· G31
Hardness conversion table ····· G32

Name of parts for end mills and shapes of end cutting edges

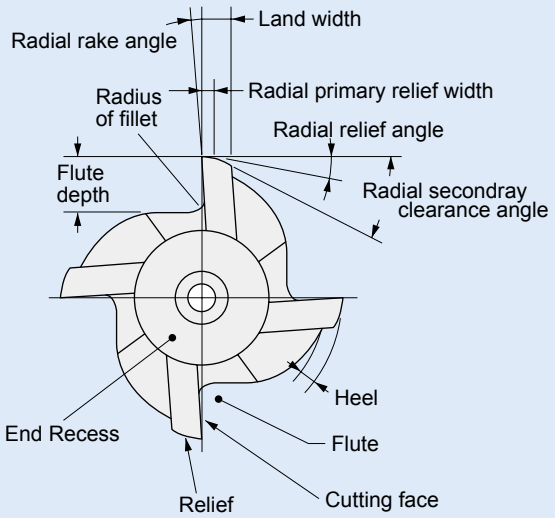
(1) Names of parts for end mills



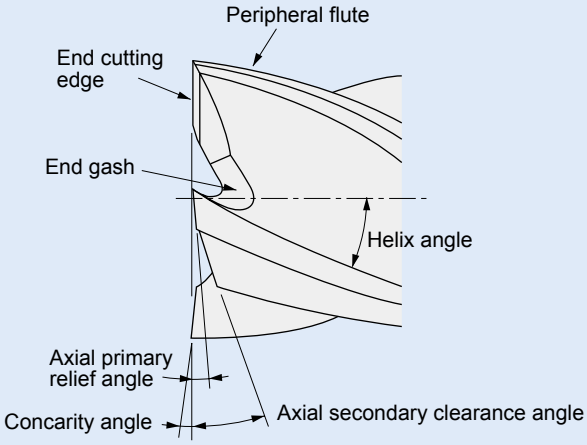
Straight shank



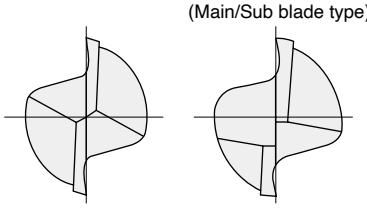
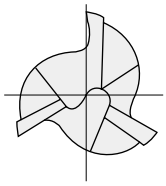
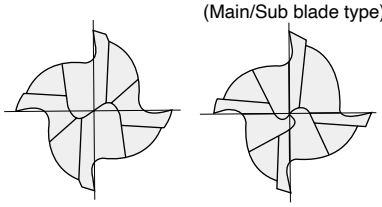
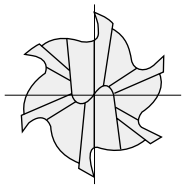
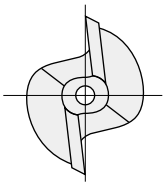
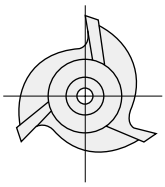
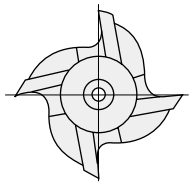
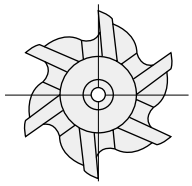
Drawing thread with Taper shank



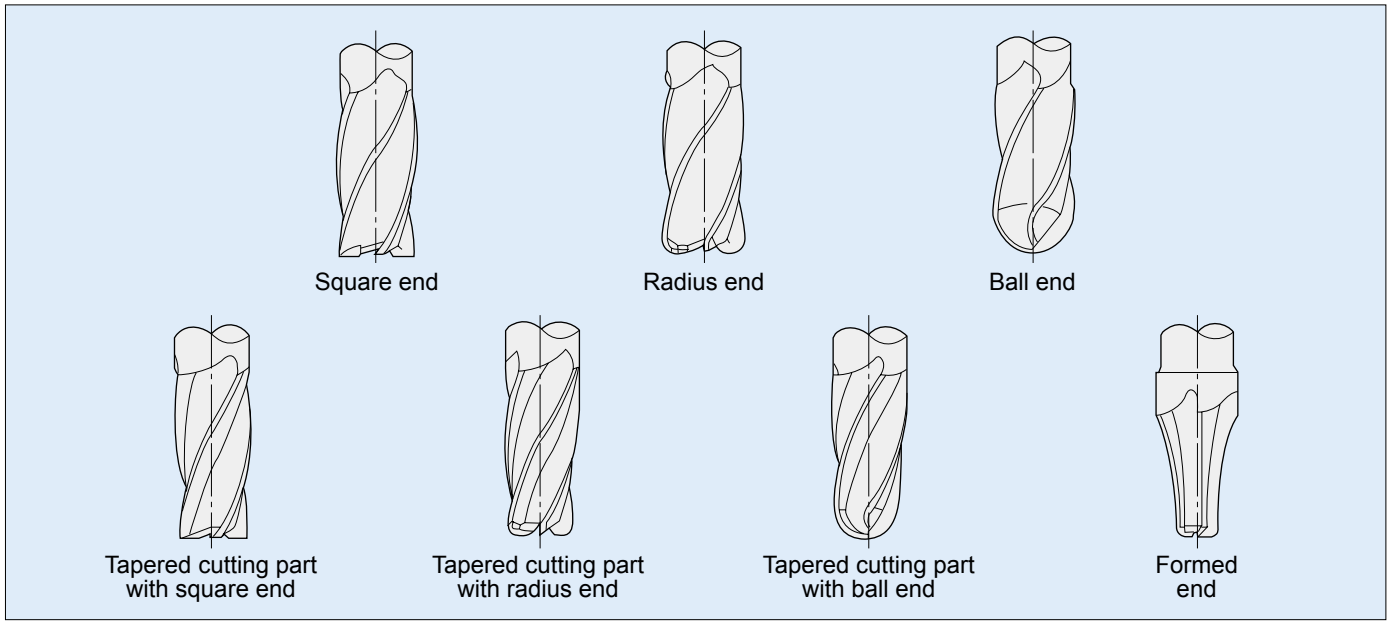
4Flutes center eyed type



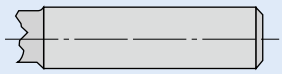
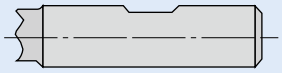
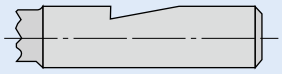
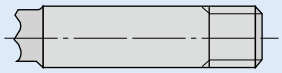
(2) Kinds of shapes of end cutting edges

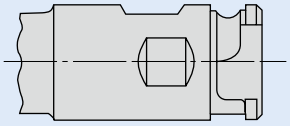
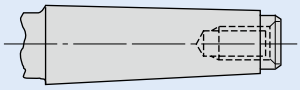
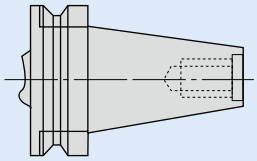
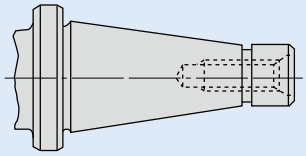
	2 Flutes	3 Flutes	4 Flutes	6 Flutes
Center cut	(Main/Sub blade type) 		(Main/Sub blade type) 	
Center eyed				

(3) Shape of end mills flute



(4) Kind of end mill shank

Kind of end mill shank	Name, features
	Straight shank (Plain shank) ・Shanks of ϕ6mm to ϕ42mm are usually used.
	Straight shank with flat (side lock shank) (Weldon shank) ・Popular in U.S.A. ・Products of ϕ 20mm or larger have double flats.
	Straight shank with sloped flat Straight shank ・With axial adjusting function
	Straight shank with screw ・Popular in Europe

Kind of end mill shank	Name, features
	Combination shank (Dyna shank) ・For shanks with a large diameter ・A shank of ϕ50.8mm is popular in Japan.
	Taper shank with drawing screw ・Available with Morse taper and B&S taper
	BT shank ・For a machining center ・For ATC
	7/24 taper shank (National taper shank) ・Directly attached to a machine.

Dimension of flat and outside screw, if not specified, should be in accordance with the stipulations. Please specify dimension of drawing screw in mm or inch.

Flute shape and cutting ability of end mills

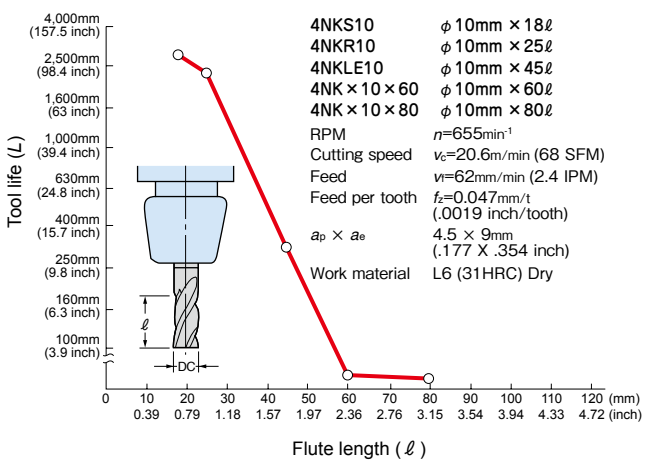
(1) Mill diameter (DC) and flute length (ℓ)

Cutting ability of cutting tools depends on sharpness of cutting edges and stiffness of cutting part. Particularly, stiffness is a significant factor in using an end mill. Low stiffness may cause vibration during cutting work due to a deflected end mill, resulting in poor machining precision and early wear of end mills. Therefore, low stiffness will not allow cutting conditions to be exploited to the full stiffness of an end mill is determined by the mill diameter, DC, and the flute length, ℓ. Deflection is practically given by the following formula :

$$\delta = C\frac{APMX^3}{DC^4}$$

where δ is deflection and C is constant.

In brief, deflection increases twice if the flute length increases by 25%, or itdecreases one-half if the mill diameter increases by 20%. The following shows the effect of flute length on cutting life of tools,indicating that it is recommended to use a tool with as high stiffness as possible to obtain high efficiency cutting. The long shank type end mill has short flute length and long shank with high stiffness compared with the long flute length type, and is suited to deep contouring.



Flute length and Tool life

(2) Helix angle

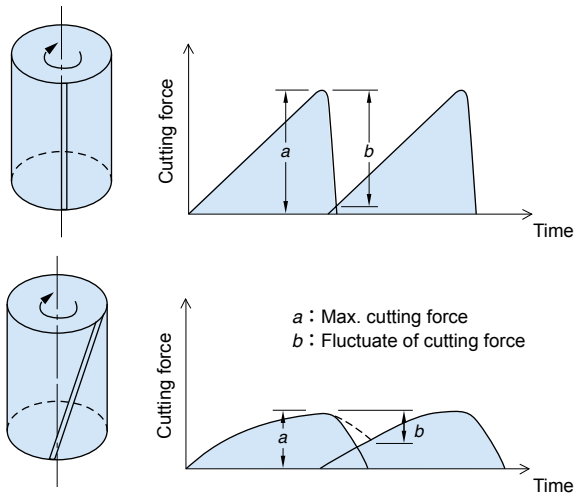
End mills usually adopt right-hand helix angle of approximately 30˚. Helix angle has the following effects :

① Helix angle relieves intermittent fluctuation of cutting resistance, lightens vibration, and prolongs cutting life of tools.

② Helix angle enables smooth bite into work material, and reduces necessary cutting force.

③ Helix angle allows chips to be discharged in axial direction, and becomes free from jamming of chips.

In the case of high helix angle, however, a tool must be held securely since cutting force is applied in the axial direction. Besides, care must be taken on the surface to be cut which is slightly inclined due to the relation between tool stiffness and clearance of main spindle. Manufactures end mills with high helix angle of 45˚to 60˚ at which high stiffness of tool is secured. As for key-way end mills for which strict machining precision is required, 12˚ of helix angle is adopted.



How to determine cutting conditions of end mills

(1) Cutting speed (v_c) and revolution number (n)

The revolution number (n) is calculated by the following formula using cutting speed and flute length of the tool to be used. When cutting work is performed by using only a ball end cutting part of a ball end mill, however, select a tool with the substantial flute length equal to the maximum diameter of the portion to be cut. In calculation, set DC to a smaller value according to the cutting condition.

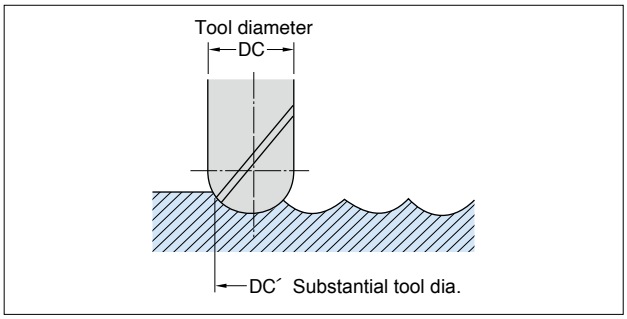
Metric

$$n = \frac{1000 \times v_c\ (\text{mm/min})}{\pi \times \text{DC}\ (\text{mm})}\ (\text{min}^{-1})$$

Inch

$$n = \frac{12 \times v_c\ (\text{SFM})}{\pi \times \text{DC}\ (\text{inch})}\ (\text{min}^{-1})$$

n : Revolution, min^{-1}
v_c : Cutting speed, m/min or SFM
DC : Tool diameter, mm or inch
π : Ratio of circumference of a circle to its diameter (3.14)



(2) Feed speed (v_f) and feed per tooth (f_z)

Working efficiency is determined by the table speed (v_f), but the feed per tooth should be fixed first of all in setting cutting conditions.
Other conditions should be determined considering dimension of a tool (mill diameter and flute length), number of flutes, work ability of work material to be used, machining precision, and capacity of a machine to be used.

Metric

$$v_f = f_z \times z \times n\ (\text{mm/min})$$

Inch

$$v_f = f_z \times z \times n\ (\text{IPM})$$

v_f : Feed speed, mm/min or IPM
f_z : Feed/tooth, mm/tooth or IPT
z : Number of flutes
n : Revolution, min^{-1}

(3) Depth of cut ($a_p \times a_e$)

Depth of cut ($a_p \times a_e$) is basically determined by the size of machining allowance.Please refer each item recommend cutting condition to match cutting purpose.

(4) Chip removal volume (Q)

Metric

$$Q = \frac{a_p \times a_e \times v_f}{1000}\ (\text{cm}^3/\text{min})$$

Inch

$$Q = a_p \times a_e \times v_f\ (\text{inch}^3/\text{min})$$

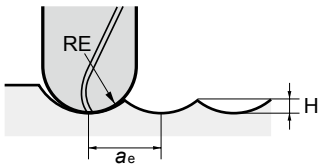
Q : Chip removal volume, cm^3 or inch^3
a_p : Cutting depth, mm or inch
a_e : Cutting width, mm or inch
v_f : Feed rate per minute of table, mm/min or IPM

Ball end mill pick feed and theoretical cusp height table

	mm	a_e (mm) Pick Feed 0.05	0.075	0.1	0.15	0.2	0.3	0.4	0.5
Ball Radius RE (mm)	0.5	0.63	1.41	2.51	5.66	10.10	23.03	41.74	66.99
	1.0	0.31	0.70	1.25	2.82	5.01	11.31	20.20	31.75
	2.0	0.16	0.35	0.63	1.41	2.50	5.63	10.03	15.69
	3.0	0.10	0.23	0.42	0.94	1.67	3.75	6.67	10.43
	4.0	0.08	0.18	0.31	0.70	1.25	2.81	5.00	7.82
	5.0	0.06	0.14	0.25	0.56	1.00	2.25	4.00	6.25
	6.0	0.05	0.12	0.21	0.47	0.83	1.88	3.33	5.21
	8.0	0.04	0.09	0.16	0.35	0.63	1.41	2.50	3.91
	10.0	0.03	0.07	0.13	0.28	0.50	1.13	2.00	3.13

Pick Feed and Cusp Height

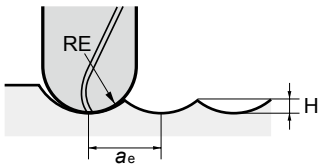
$$H = RE - \sqrt{RE^2 - a_e^2/4} \fallingdotseq a_e^2/8RE$$



	inch	a_e (inch) Pick Feed .002	.003	.004	.006	.008	.012	.016	.020
Ball Radius RE (inch)	.020	.025	.056	.099	.223	.398	.907	1.643	2.637
	.039	.012	.028	.049	.111	.197	.445	.795	1.250
	.079	.006	.014	.025	.056	.098	.222	.395	.618
	.118	.004	.009	.017	.037	.066	.148	.263	.411
	.157	.003	.007	.012	.028	.049	.111	.197	.308
	.197	.002	.006	.010	.022	.039	.089	.157	.246
	.236	.002	.005	.008	.019	.033	.074	.131	.205
	.315	.002	.004	.006	.014	.025	.056	.098	.154
	.394	.001	.003	.005	.011	.020	.044	.079	.123

Pick Feed and Cusp Height

$$H = RE - \sqrt{RE^2 - a_e^2/4} \fallingdotseq a_e^2/8RE$$



Precautions in handling an end mill

(1) Machine

- Select a machine consistent with the size of work piece to be used. It is important that the machine has enough power and mechanical stiffness to achieve necessary machining precision and machining efficiency.
- Check whether you can set the machine to the revolution number and feed speed suitable for the end mill to be used.

(2) Tooling

- Use an end mill holder with sufficient precision and grasping force. In using an end mill with a small mill diameter, select an end mill holder mainly considering deflection. When using an end mill with a large mill diameter or a roughing type end mill, it is important for an end mill holder to have sufficient grasping force.
- Fix the work piece securely. When using an end mill with high helix angle or when performing heavy duty cutting, be careful about shaking of the work piece and slipping of the tool.

(3) Selection of an end mill

- Be sure to use an end mill matching the working purpose. If you have any question, please make contact with us.
- It is recommended to use a short flute length type end mill with a large mill diameter and tool stiffness, when you consider cutting ability first. To obtain the maximum feed speed of the table, use an end mill with approximately 15 to 25 mm of mill diameter, because the feed speed is dependent on the feed per tooth. Carry out a detailed study in selecting an end mill in addition to allowance.

(4) Work

- Cutting conditions vary with the kind of work piece and change of working conditions. Refer to the table of standard conditions to select proper conditions.
- The overhang of the holder or the end mill should be as short as possible.
- Avoid dwelling because it may hasten wear of flanks.
- It is better to use cutting fluid, if possible.
- Apply a sufficient amount of cutting fluid to the place to be cut. In the case of large depth of cut, it is recommended to supply cutting fluid, mist, or air to the place at high pressure during cutting in order to discharge chips.
- Perform re-grinding of a worn-out end mill as early as possible after referring to the following table. There may be cases where, if depth of wear exceeds the limit, wear may proceed so rapidly that re-grinding may become impossible for re-utilization.
- As for carbide end mills, re-grind them when the depth of wear reaches 50% to 60% of the limit value of high speed steel end mills. Generally, it takes more time to re-grind the worn end mill than an unused one.
  Be careful of excessive abrasion because it may cause chipping.

Selection of standard cutting conditions

Use them as a guide in starting a new work. To select the optimum cutting conditions, take various factors into consideration in addition to the cautions described above :

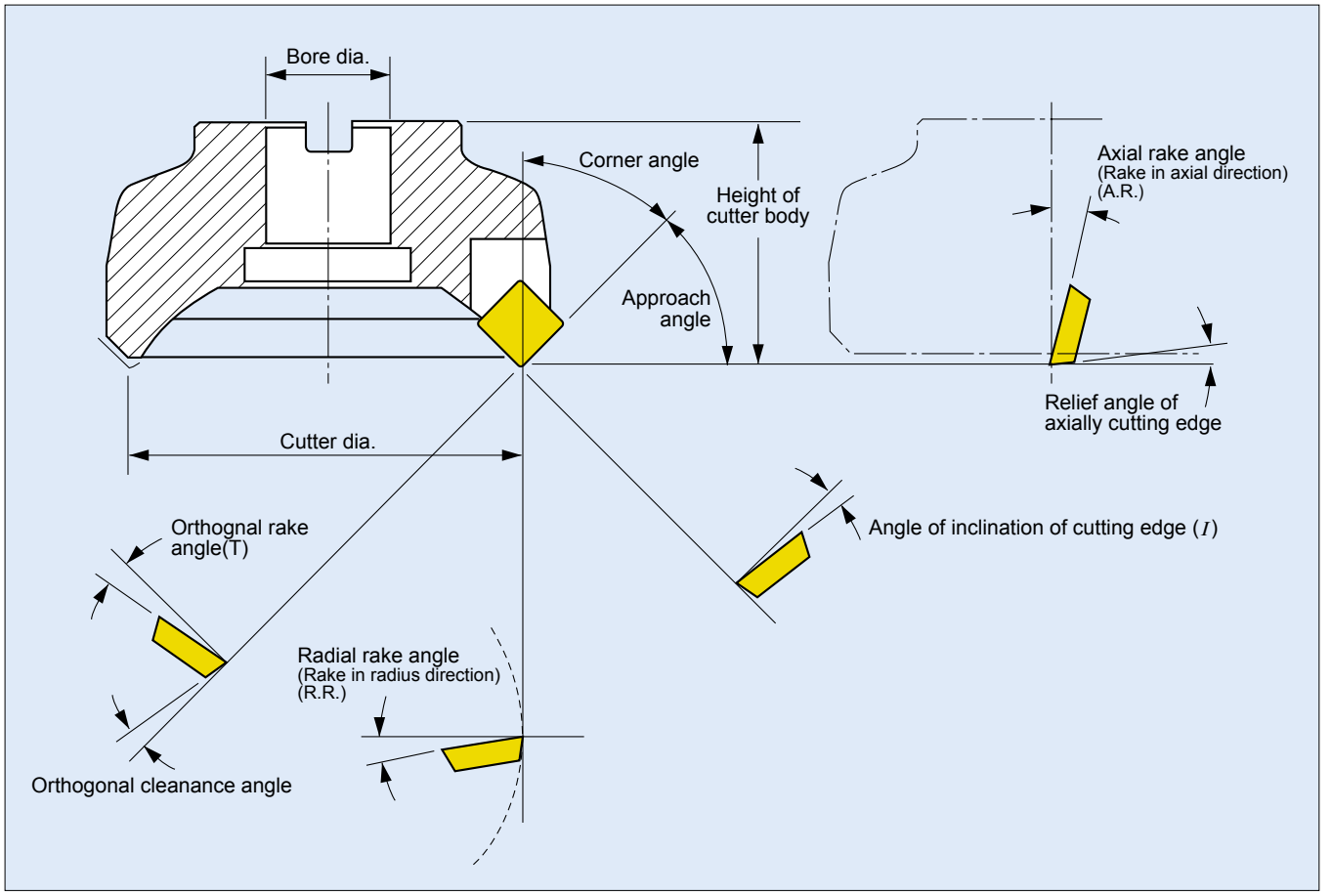
- When using hard work material, in the case of large depth of cut, or when using an end mill with long flute length, set the revolution number to the lower value.
- If high dimensional precision or excellent roughness of finished surface is significantly required, or when output of a machine to be used is low, set the feed speed to the lower value.
- Multi-flute end mills are generally suitable for cutting works requiring high precision.

Trouble shooting for end milling

Symptoms of troubles	Probable causes	Remedies
Chatter during cutting	· Low-angled cutting edge due to too high peripheral flank angle and rake angle · The work piece is not attached securely. · Insufficient stiffness of machine and chuck. · Too high cutting speed and feed speed.	· Mend the flank angle and rake angle properly. · Fix the work piece firmly. · Replace the machine and chuck with properones. · Change cutting conditions.
Breakage during cutting	· The end mill lacks firmness. · Too high feed speed. · Too large depth of cut. · Excessively long protrusion. · Worn-out cutting edge. · The flute is longer than it need to be.	· Use a tool designed to have high stiffness. · Decrease the feed rate. · Make small depth of cut. · Shorten the protrusion length. · Perform re-grinding in early stage of wear. · Replace the end mill with a new one having shorter flute length.
Broken cutting edge during cutting	· The work piece is not fixed firmly. · Too high feed speed. · Low-angled cutting edge. · Lack in tightening of chuck. · Too large depth of cut. · Insufficient stiffness of machine.	· Fix a work piece firmly. · Decrease the feed rate. · Grind the angle properly. · Perform chucking of a tool reliably. · Make small depth of cut. · Replace the machine with a proper one.
Serious wear and burning	· Too high cutting speed. · Excessively small peripheral flank angle. · Hardness of the work material is too high.	· Slow down the revolution number. · Modify the flank angle properly. · Apply surface treatment to a tool to be used.
Poor cutting quality	· Excessively worn-out cutting edge. · A tool to be used is not suited to the work material. · Too small rake angle.	· Perform re-grinding. · Use a tool specially designed for the work. · Modify the rake angle properly.
Chip clogging	· Too large amount of chips are produced. · Small chip pocket. · Insufficient application of cutting fluid. · Improper shape of chip pocket.	· Adjust the feed speed and depth of cut. · Use an end mill having less number of flutes. · Apply a large amount of cutting fluid to work mateial. · Modify the chip pocket to have a proper shape.
Burr on the finished surface	· Seriously worn-out peripheral flank. · Mistake in selection of cutting conditions. · Improper peripheral flank angle and rake angle.	· Perform re-grinding in early stage of wear. · Re-examine cutting conditions. · Modify the angle properly.
Insufficient roughness of finished surface	· Too high feed speed. · Too slow cutting speed. · Excessively worn-out cutting edge. · Chips bite the work material. · Too small medium to low gradient of end cutting edges.	· Decrease the feed rate. · Increase the revolution number. · Perform re-grinding. · Make small depth of cut. · Make the medium to low gradient greater.
Inclination of slot	· Too high feed speed. · Too large helix angle. · Too long overhang. · Too large depth of cut.	· Decrease the feed rate. · Use and end mill with smaller helix angle. · Shorten the protrusion length. · Make small depth of cut.
Poor dimensional precision	· Insufficient precision of machine and chuck. · Too long flute length. · Insufficient stiffness of machine and chuck.	· Repair the machine and chuck. · Use an end mill with proper flute length. · Change the machine and chuck.

Names of parts and roles for milling tools

Name of parts of milling tool body



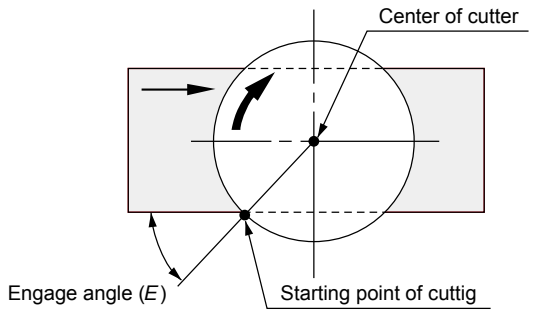
Relation between Orthognal Rake and Performance

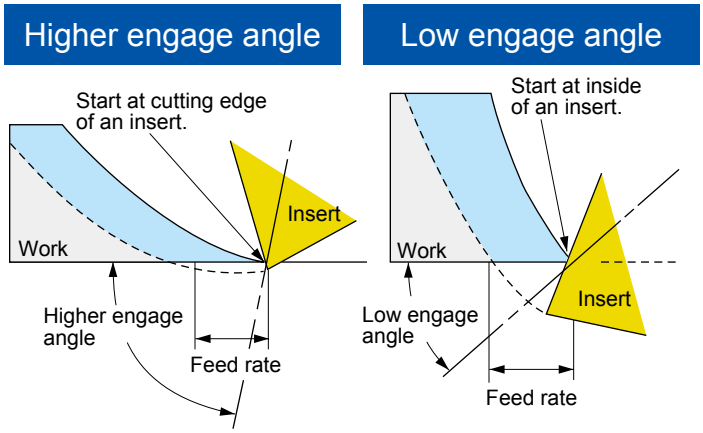
True rake	Sharpness	Cutting power	Toughness of cutting edge	Heating	Chips ejectability	Welding resistance
Positive (large)	Good	Small	Weark	Low	Bad. May be caught by cutter.	Good
↕						
Negative (small)	Bad	Large	Strong	High	Good. Ejected outside the cutter.	Bad

Effective rake angle is generally designed according to clerance of inserts used.
The larger the clerance of an inserts is,the largr effective rake angle may be designed.

Cutter dia. and engage angle

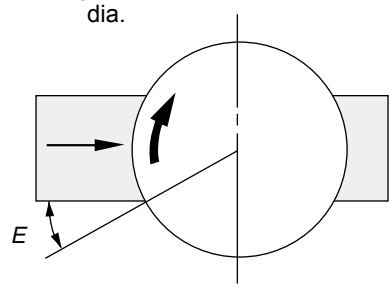
Lower engage angle shows short tool life, because engagment starts from cutting edge of inserts in milling operation.

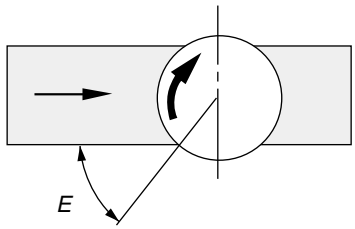




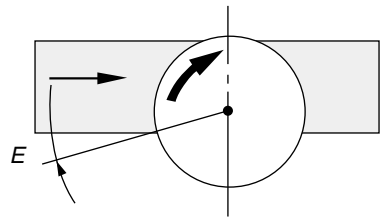
	Small ⇦	Engage angle (*E*)	⇨ Large*
	Long ⇦	Tool life	⇨ Short

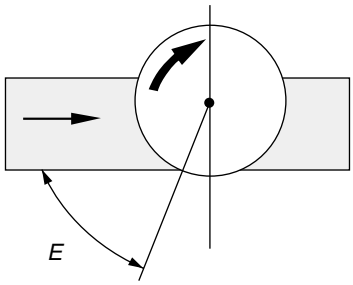
Cutter diamter and engage angle.



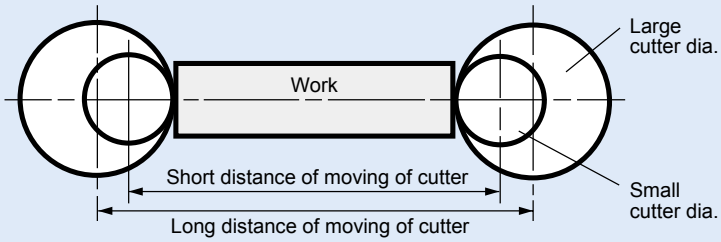


Cutter position and engage angle.





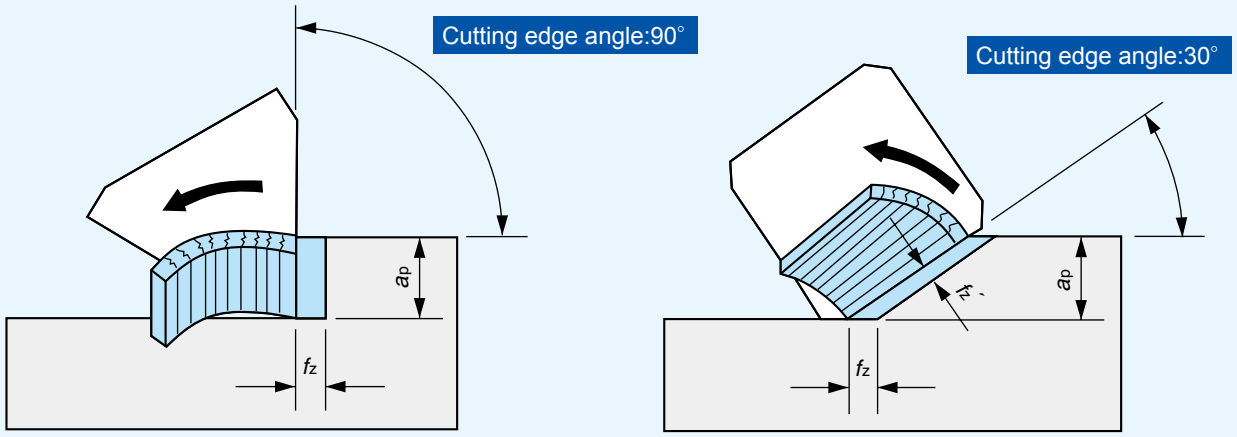
* Cutter bodies are reccomend with diameter 30-50% biger than width of work pieces.



Cutter with too large diamter shows lower machining efficiency, bacause talking cutter path longer.

Names of parts and roles for milling tools

Relation ship between cutting edge angle and Performance.



Chip thickness ≒ Feed rate per Tooth (f_z)
Chip width = Depth of cut (a_p)

Chip thickness ≒ Feed rate per Tooth ($f_z/2 = f_z'$)
Chip width = 2 times the Depth of cut ($2a_p$)

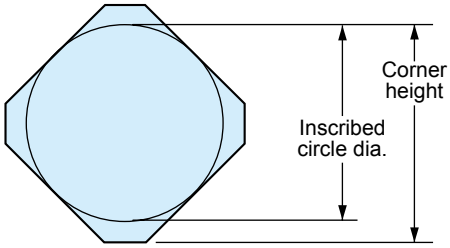
【Note】 Based on 0 ˚axial rake

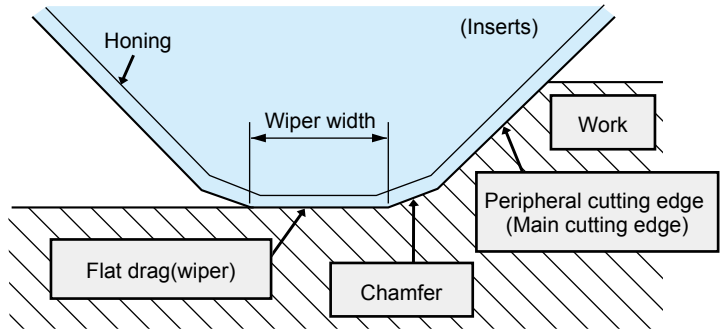
Relation ship between cutting edge angle and performance.

Cutting performance factor	Large ← Cutting edge angle → Small				
	90°	75°	65°	45°	30°
Chips shape	Thick and narrow ← → Thin and broad				
*Comparison of chips thickness	1	0.97	0.91	0.71	0.5
Cutting power	Small ← Depends on the cutting edge length that contacts. → Large				
Inserts abrasion	Hight ← Depends on chips thickness per unit length of cutting edge. → Low				
Vibration	Not likely ← Depends on bite per unit length of cutting edge. → Likely				
Effective depth of cut	Large ← Inserts falling difference → Small				
Vibration	Likely ← Differrence in the load that is applied transversely against the spindle. → Not likely				
Work pressurizing force	Small ← For thin plate, small cut-in angle causes work to chatter. → Large				
Chips flow	No good ← Caught horizontally → Ejected upward. → good				

＊ Comparison of chip thickness in various angles at a fixed feed rate (if 90°= 1 thick)

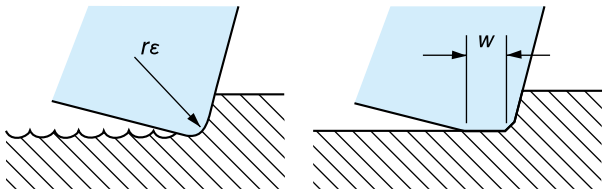
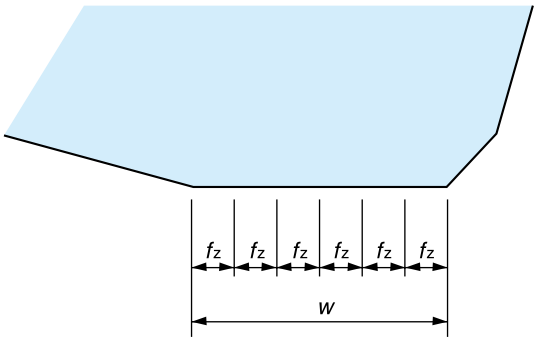
Names of parts and roles for milling inserts





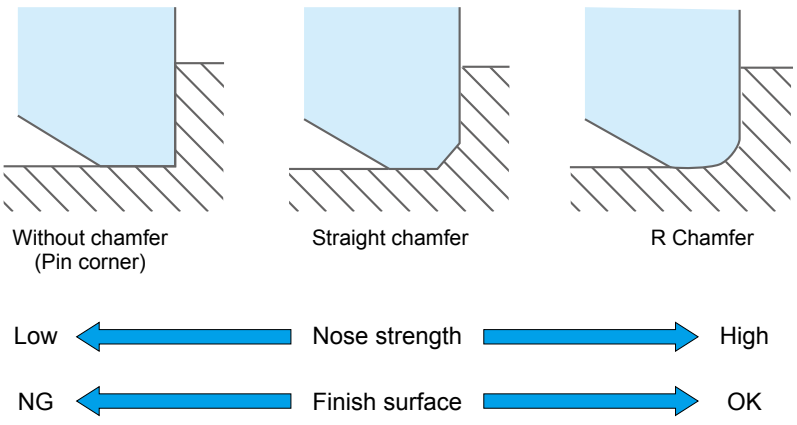
Role of flat drag

The flat drag is a dedicated finishing cutter.

	If cut with a corner R insert, cut surface is marked in wave form. But with a insert with a wiper, finish surface is flat.
	Set the width of flat drag (*w*) to the same or more size of feeding amount per rotation of the cutter. e.g. If a feed per cutter of 6 flutes is *fz*, the proper width can be calculated as : $w \geqq fz \times 6$ Even if the height of several inserts, each of which was reset according to the insert or cutter accuracy, differ from each other, a flat drag of the highest insert can produce a flat finish surface. Generally set the width of a flat drag to 1.2 to 2.0 mm.

Role of chamfer

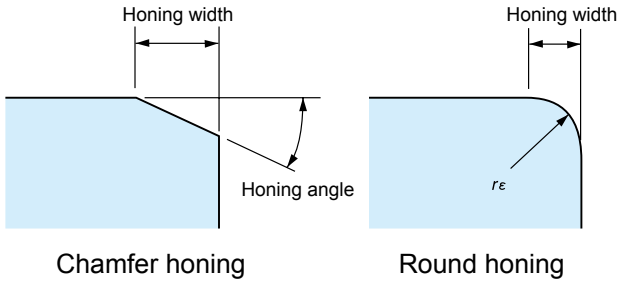
Chamfering is made to protect the surface from chipping and also to finish the surface well.

	Set an auxiliary cutting edge called chamfer between peripheral cutting edge and flat drag. Set 0.5 to 1.0mm width for straight type. Set R 0.8 to R 1.2 for R type.

Names of parts and roles for milling inserts

Role of honing

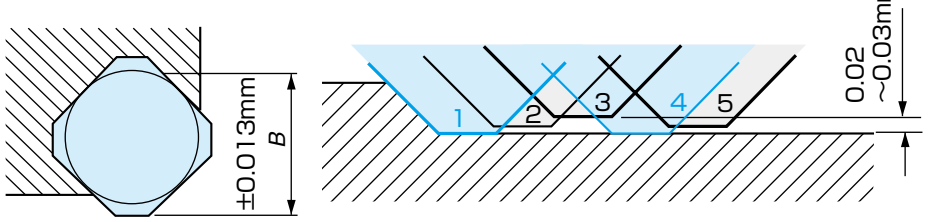
By honing , strenght of cutting edge is increased.



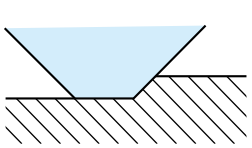
Nose honing can be divided into chamfer honing and round honing.
For milling insert, chamfer honing is mainly used.
A proper honing angle is 15 to 25° honing width is 0.1 to 0.2mm that is almost one half of feed per 1 cutting. In case of flat drag, which is for finish cutting, set its honing angle to 0.03 to 0.1mm.
No honing angle is required for cutter that is used for cutting any material that is easily welding, like aluminium or cast iron.

The corner height

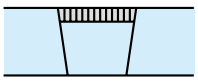
(*B*) from the inscribed circle is the height of nose when the insert is set to the cutter body.

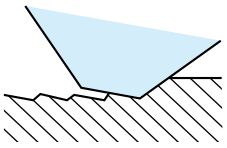


The difference of nose height (front run-out) likely to occur when setting the insert to the cutter body is 0.02 to 0.03mm.

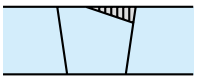


Abrasion in flat drag in normal cutting.





Abnormal abrasion in flat drag when insert setting is not proper.



If the insert contacting the finish surface of a work is inclined, the finishing is not done well.
Carefully set the insert allowing no dust to enter by the air blow or other.

How to select cutting conditions for milling

Cutting Speed (v_c) Metric

$$V_c = \frac{\pi \times DC \times n}{1000} \text{ (m/min)}$$

Revolution (n)

$$n = \frac{1000 \times v_c}{\pi \times DC} \text{ (min}^{-1}\text{)}$$

v_c : Cutting speed (m/min)
DC : Cutter diameter (mm)
n : revolution (min^{-1})
π : Circle ratio (3.14)

Cutting Speed (v_c) Inch

$$V_c = \frac{\pi \times DC \times n}{12} \text{ (SFM)}$$

Revolution (n)

$$n = \frac{12 \times v_c}{\pi \times DC} \text{ (min}^{-1}\text{)}$$

v_c : Cutting speed (SFM)
DC : Cutter diameter (inch)
n : revolution (min^{-1})
π : Circle ratio (3.14)

Feed rate (v_f) Metric

$$V_f = f_z \times z \times n \text{ (mm/min)}$$

Feed rate per tooth (f_z)

$$f_z = \frac{V_f}{z \times n} \text{ (mm/t)}$$

V_f : Feed rate (mm/min)
z : Number of flutes
n : Revolution (min^{-1})
f_z : Feed per tooth (mm/t)

Feed rate (v_f) Inch

$$V_f = f_z \times z \times n \text{ (IPM)}$$

Feed rate per tooth (f_z)

$$f_z = \frac{V_f}{z \times n} \text{ (IPT)}$$

V_f : Feed rate (IPM)
z : Number of flutes
n : Revolution (min^{-1})
f_z : Feed per tooth (IPT)

Cutting time (T_c)

$$T_c = \frac{L}{V_f} \text{ (min)}$$

T_c : Cutting time (min)
V_f : Feed rate per minute of table (mm/min or IPM)
L : Overall table feed length
(workpiece length + grinder dia.) (mm or inch)

Chip removal volume (Q) Metric

$$Q = \frac{a_p \times a_e \times V_f}{1000} \text{ (cm}^3\text{/min)}$$

Q : Chip removal volume (cm^3/min)
a_e : Cutting width (mm)
a_p : Cutting depth (mm)
V_f : Feed rate per minute of table (mm/min)

Chip removal volume (Q) Inch

$$Q = V_c \times a_p \times f_z \text{ (inch}^3\text{/min)}$$

Q : Chip removal volume (inch^3/min)
a_e : Cutting width (inch)
a_p : Cutting depth (inch)
V_f : Feed rate per minute of table (IPM)

Cutting power (P_c)

$$P_c = \frac{a_p \times a_e \times V_f \times k_c}{60 \times 10^6 \times n} \text{ (kW)}$$

P_c : Cutting power (horsepower) (kW)
a_e : Cutting width (mm)
n : Machanical efficiency (0.6 ~ 0.8)
a_p : Cutting depth (mm)
V_f : Feed rate per minute of table (mm/min)
k_c : Relative cutting resistance (N/mm^2)

k_c (Specific cutting resistance)

Work Materials	Tensile strength (N/m^2) or hardness	k_c: Specific cutting resistance (N/mm^2) for feed per tooth				
		0.1/t	0.2/t	0.3/t	0.4/t	0.6/t
Mild Steel	520	2200	1950	1820	1700	1580
Medium Steel	620	1980	1800	1730	1600	1570
Hard Steel	720	2520	2200	2040	1850	1740
Tool Steel	670	1980	1800	1730	1700	1600
	770	2030	1800	1750	1700	1580
Chrome manganese Steel	770	2300	2000	1880	1750	1660
	630	2750	2300	2060	1800	1780
Chrome molybdenum Steel	730	2540	2250	2140	2000	1800
	600	2180	2000	1860	1800	1670
Nickel chrome molybdenum Steels	940	2000	1800	1680	1600	1500
	352HB	2100	1900	1760	1700	1530
Cast Steels	520	2800	2500	2320	2200	2040
Hard Cast Steels	46HRC	3000	2700	2500	2400	2200
Meehanite Cast Steels	360	2180	2000	1750	1600	1470
Gray Cast Steels	200HB	1750	1400	1240	1050	970
Brass	500	1150	950	800	700	630
Light Alloy (Al-Mg)	160	580	480	400	350	320
Light Alloy (Al-Si)	200	700	600	490	450	390

Cutting condition formula (milling) and trouble shooting

〈Countermeasure〉
○: Very Effective
●: Effective
▼: Not Effective
⬆: Increase, Make it Large
⬇: Reduce, Make it Small

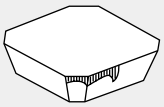
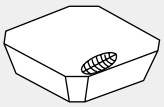
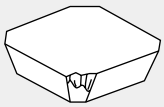
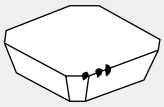
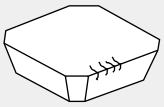
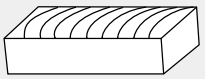
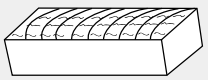
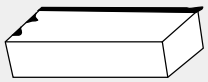
Troubles	Insert Grade				Tool Shape								Cutting Condition					
	Use Tough Grade	Use Abrasion Resistant Grade	Use Cermet Material	Use coated Grode	Change The Honing Amount	Change Rake	Change Relief Angle	Make Insert Thicker	Increase Corner R	Use Precision Class Inserts	Use Inserts of Different Flute Number	Attach Flat Drag	Change Cutting Speed	Change The Feed Rate	Change Cut-In Amount	Splash Cutting Fluid	Reduce The Engage Angle	
 Abraded Relief Surface (Flank)		○		○	● ⬇		⬆ ●		●				● ⬇					
 Abraded Rake Surface (Crater)		●	●	●		⬆ ●							● ⬇	● ⬇		●		
 Shock Chipping	○				⬆ ○	● ⬇	● ⬇	●	●					● ⬇			●	
 Welding Chipping	●		●	○	● ⬇	⬆ ●							⬆ ○			○		
 Thermal Crack	●							●					● ⬇			▼		
 Finish Surface			○		● ⬇	⬆ ●	⬆ ●			○		○	⬆ ●	● ⬇	● ⬇	○		
 Chattering Vibration					● ⬇	⬆ ●	⬆ ●				● ⬇		● ⬇	● ⬇	● ⬇			
 Edge Chipping, Burr					● ⬇	⬆ ●	⬆ ●		●		⬆ ●			● ⬇	● ⬇		●	

Table of corresponding materials from various companies for milling

Coated materials for milling

Application	Use classification	Grade	MOLDINO	DIAEDGE	Tungaloy	Sumitomo Electric Hard metal	Sandvik	Kyocera	Dijet	Kennametal	Seco Tools
Milling	P	P01	ATH80D ATH08M TH308 PN208 JP4105	MP8010 MP6120 VP15TF MP6130 UP20M VP20RT VP30RT F7010 FH7020 F7030	AH710 AH725 AH730 AH3035 AH3135 AH110 AH120 AH130 AH140 AH9030 GH130 AH330 GH330 T3130 T313W	ACP100 ACP200 ACP300	GC1010 GC1130 GC1030 GC2030 GC2040 GC3040 GC4220 GC4230 GC4240	PR1525 PR1225 PR1230 PR830	JC8003 JC730U JC8015 JC5015 JC5118 JC6235 JC5040 JC8050	KC715M KC725M KC792M KC994M	MP1500 MP2500 MP3000 T250M T15M T20M T25M F20M F25M F40M
		P10	PCA12M PN15M PN215 JP4115								
		P20	CY150 CY9020 JP4120								
		P30	HC844 CY25 CY250 CY250V JS4045								
		P40	PTH30E PTH40H JS4060 GX2140								
	M	M01	PN08M PN208	VP15TF MP9130 MP9030 UP20M VP20RT MP7140 VP30RT F7010 F7030	AH120 AH130 AH140 AH725 AH730 GH110 GH130 AH330 GH330 GH340 AH3135 T3130	ACM100 ACM200 ACM300 T250A T4500A A30N	GC1130 GC1030 GC2030 GC2040 GC1040 GC4230 GC4240	PR1525 PR1535 PR1225 PR830 CA6535	JC730U JC835S JC8015 JC5015 JC5118 JC8050	KC730M KC725M KC994M	MP2500 T250M T20M T25M F30M F40M
		M10	PN15M PN215								
		M20	JP4120								
		M30	HC844 CY250 JS4045								
		M40	PTH30E PTH40H JM4160 GX2160 AX2040								
	K	K01	ATH80D ATH08M TH308	MP8010 VP15TF VP20RT MC5020	GH110 AH110 AH725 AH120 GH130 AH330 T1115	ACK200 ACK300	GC1010 GC1020 GC3330 GC3040 GC3220 GC4220 GC4230 GC4240 K15W K20D K20W	PR1510 PR1210 CA420M	JC8003 JC605W JC600 JC608X JC6610 JC8015 JC5015 JC6235 JC5080	KC915M KC920M KC925M KC992M KC930M	MK1500 MK2000 MK3000 T150M T250M F15M MP1500
		K10	ATH10E TH315 CY100H								
		K20	CY9020 CY150 PTH13S JP4120 GX2120								
		K30	CY250 JS4045 GX2040								
	N	N01	PN08M PN208	LC15TF	DS1100 DS1200	DL1000 DA1000	GC1130 GC1030 CD10	PDL025 KPD001 KPD010 KPD230 KPD250	JDA30 JDA735 JDA10 JDA715		
		N10	CY100H PTH13S SD5010 HD7010								
		N20									
		N30									
	S	S01	PN08M PN208	MP9120 VP15TF MP9130 MP9030		ACM100 ACM200 ACM300	GC1130 GC1030 GC2030 GC2040	PR1535 PR1210 CA6535 KPD001 KPD010	JC8003 JC8015 JC5015 JC5118 JC835S JC8050		
		S10	JP4120 JS1025								
		S20	PTH30H								
		S30	JM4160								
	H	H01		MP8010 VP15TF			GC1010 GC1130 GC1030 GC3040 GC4220		DH102 DH103 JC6102 JC8003 JC8008 JC8015 JC5118		
		H10	ATH80D ATH08M PTH08M TH308 JP4105 BH200 BH250								
		H20	TH315 JP4115								
		H30	JP4120								

Note: This table has not been approved by the individual companies.

Table of corresponding materials from various companies for milling

Carbide alloy materials

Application	Grade	MOLDINO	DIAEDGE	Tungaloy	Sumitomo Electric Hard metal	Sandvik	Kyocera	Dijet	Kennametal	Seco Tools
P	P10	WS10	STi10T	TX10S	ST10P	S1P		SR10 SRT	K5H K45	S10M
	P20	EX35	STi10	TX20 TX25 UX25	ST20E	SMA		SRT SR20 DX30	K29 K45 K2885	S25M
	P30	EX35		TX30 UX30	A30 A30N	SM30	PW30	SR30 DX30 DX25	K420 KM K21	S25M
	P40	EX35		TX40	ST40E	S6		SR30 DX35	K420 KM GX	S60M
M	M10	WA10B		TU10	U10E	H10A		UMN UM10		S10M
	M20	EX35	UTi20T	TU20	U2	H13A		UM20 DX25 DTU	K313 K40 PVA	HX
	M30	EX35	UTi20T	UX30	A30 A30N	H10F	PW30	DTU UMS	K2885 K2S	HX
K	K01	WH01 WH05	HTi05T	TH03	H2 H1	H1P		KG03		
	K10	WH10	HTi10	TH10	EH10 EH510	H10 HM	KW10	KG10 KT9 CR1	K6 K313 K68 KM1	HX
	K20	WH20	HTi20T	G2 KS20	G10E EH20 EH520	H13A		KG20 KT9 CR1	K1 K8735	883
Ultra -molecular carbide alloy	Z01	NM08		F	F0 AF0 F1			FB10		
	Z10	NM15	MF10	M EM10	A1 AF1			FB10 FB15		
	Z20	EF20N	TF15 UF20	EM20 UM				FB15 FB20		
	Z30		UF30	UM				FB20		

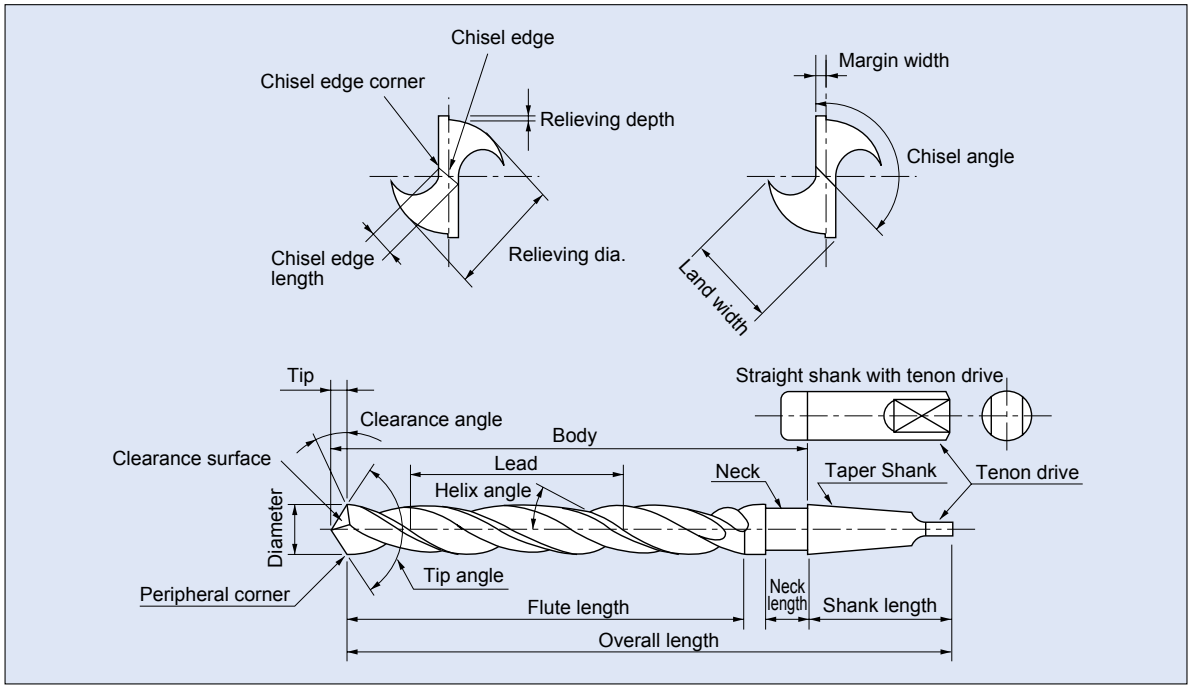
Cermet materials

Application	Grade	MOLDINO	DIAEDGE	Tungaloy	Sumitomo Electric Hard metal	Sandvik	Kyocera	Dijet	Kennametal	Seco Tools
for Milling	P10	CH550 MZ1000	NX2525	NS530	T12A		TN60	NIT CX75	KT530M KT195M	CM15
	P20	CH7030	NX2525	NS530	T250A	CT520	TN60 TN100M	NAT CX75 CX90 SUZ	KT530 HT7 KT605	CM15
	P30	CH7035	NX4545	NS540	T250A	CT530		CX90 CX99		CM15

Note: This table has not been approved by the individual companies.

Name and function of each part of a drill

Name of each part of a drill.



Performance of each part of a drill

❶ Diameter

The diameter of a tool is stipulated in the size range, from 0.2 up to 100mm in the JIS standard. Other than that, most tools are fabricated to meet various standard such as TAS (Tool Association Standard) and others. The tolerance values of diameter in each of these standards are based on h8 of JIS B 0401 (Dimensional tolerance and fitting). The drill tolerance is a figure measured at its tip. Actually, the drill diameter becomes narrower by 0.04 to 0.1mm per 100mm length. This is called back taper.

Size Class	mm	1.0<DC<=3.0	3.0<DC<=6.0	6.0<DC<=10.0	10.0<DC<=18.0
	inch	.0394<DC<= .1181	.1181<DC<= .2362	.2362<DC<= .3937	.3937<DC<=.5118
Tolerance	Max	0mm	0mm	0mm	0mm
		.0"	.0"	.0"	.0"
	Min	-0.014mm	-0.018mm	-0.022mm	-0.027mm
		-.0006"	-.0007"	-.0009"	-.0011"

Size Class	mm	18<DC<=30	30<DC<=50	50<DC<=80	80<DC
	inch	.708<DC<= 1.181	1.181<DC<= 1.968	1.968<DC<= 3.149	3.149<DC
Tolerance	Max	0mm	0mm	0mm	0mm
		.0"	.0"	.0"	.0"
	Min	-0.033mm	-0.039mm	-0.046mm	-0.054mm
		-.0013"	-.0015"	-.0018"	-.0021"

❷ Function of spiral grooves

Spiral grooves have the function of smoothly removing chips produced by cutting to the outside. Larger groove cross sections provide better chip removal, increases efficiency during cutting of deep holes.

❸ Web

The spiral grooves enable chips to be discharged smoothly outside the hole when the tip cuts the work. Larger the cross-sectional area of a groove, the more chips are discharged, enhancing the drilling efficiency in case of producing a deep hole.

❹ Relieving surface

The relieving surface means a clearance on a land secured by leaving a required margin width. The margin width or the relieving surface is determined by the drill diameter or the purpose of use. The relieving surface is provided to reduce abrasion between the drill peripheral and the hole surface of a work.

Drill dia. equivalent to a hole size before tapping

Meter coarse thread		Diameter (mm)	Thread ratio (%)
Designation	Pitch (mm)		
M1	0.25	0.75	92
M2	0.4	1.6	92
M3	0.5	2.5	92
M4	0.7	3.3	92
M5	0.8	4.2	92
M6	1	5	92
M8	1.25	6.8	89
M10	1.5	8.5	92
M12	1.75	10.3	90
M14	2	12	92
M16	2	14	92
M18	2.5	15.5	92
M20	2.5	17.5	92
M30	3.5	26.5	92
M42	4.5	37.5	92
M56	5.5	50.5	92

Drilling work equations

Cutting Speed (v_c) Metric

$$V_c = \frac{\pi \times DC \times n}{1000} \text{ (m/min)}$$

v_c : Cutting speed (m/min)
DC : Cutter diameter (mm)

Cutting Speed (v_c) Inch

$$V_c = \frac{\pi \times DC \times n}{12} \text{ (SFM)}$$

v_c : Cutting speed (SFM)
DC : Cutter diameter (inch)

Main axis feed (v_f) Metric

$$V_f = f \times n \text{ (mm/min)}$$

V_f : Main axis (Z axis) feed rate (mm/min)
f : Feed mount per revolution (mm/rev)
n : Revolution (min^{-1})

Main axis feed (v_f) Inch

$$V_f = f \times n \text{ (IPM)}$$

V_f : Main axis (Z axis) feed rate (IPM)
f : Feed mount per revolution (IPR)
n : Revolution (min^{-1})

Cutting time (T_c)

$$T_c = \frac{H \times i}{n \times f} \text{ (min)}$$

T_c : Machining time (min)
H : Drilling depth (mm or inch)
i : No. of hole
n : Revolution (min^{-1})
f : Feed mount per revolution (mm/rev or IPR)

Chip removal volume (Q) Metric

$$Q = \frac{\pi \times DC^2}{4} \times n \times f \div 1000$$

Q : Chip removal volume (cm^3/min)
π (3.14) : Circle ratio
DC : Drill dia.
f : Feed mount per revolution (mm/rev)

Chip removal volume (Q) Inch

$$Q = DC \times f \times V_c \times 3$$

Q : Chip removal volume ($inch^3$/min)
DC : Drill dia.
f : Feed mount per revolution (IPR)
v_c : Cutting speed (SFM)

Cutting power (P_c)

$$P_c = \frac{a_p \times a_e \times v_f \times k_c}{60 \times 10^6 \times n} \text{ (kW)}$$

P_c : Cutting power (horsepower) (kW)
a_e : Cutting width (mm)
n : Machanical efficiency (0.6 ~ 0.8)
a_p : Cutting depth (mm)
V_f : Feed rate per minute of table (mm/min)
k_c : Relative cutting resistance (N/mm^2)

Trouble shooting of drilling work

Broken drill

Cause (Remedy)		Remedy
・Cutting condition not suitable	(a,b,c)	a. Reduce feed rate.
・Regrinding failure	(d)	b. Reduce cutting speed.
・Machine rigidity short	(e,f)	c. Perform step feed.
・Chips clogging	(a,b,c)	d. Perform thinning or regrind the lip height properly.
・Work setting failure	(g)	e. Use a highly rigid spindle.
・Tool setting failure	(h,i,j)	f. Adjust backlash in the machine.
		g. Firmly clamp the work.
		h. Adjust the peripheral run-out of a drill after setting it to the machine.
		i. Steady the drill retainer.
		j. Use a guide bush.

Cracked cutting edge or chisel

・Cutting condition not suitable	(a,b)	a. Reduce feed rate.
・Regrinding failure	(c)	b. Reduce feed at the time of biting.
・Backlashing in the machine	(d)	c. Properly regrind biased thinning or lip height.
・Work setting failure	(e)	d. Adjust run-out of spindle or backlash in the machine.
・Tool setting failure	(f,g,h)	e. Firmly clamp the work.
・Use of a drill not suitable.	(i)	f. Adjust the peripheral run-out of a drill after setting it to the machine.
		g. Steady the drill retainer.
		h. Use a guide bush.
		i. Reduce a groove length of the drill to increase rigidity.

Drill abrasion

・Cutting condition not suitable	(a,b)	a. Lower the cutting speed.
・Cutting fluid level low	(c)	b. Perform step feed.
・Cutting fluid not suitable	(d,e)	c. Increase cutting fluid discharge rate.
・Chips discharge failure	(a,b,f)	d. Use extreme-pressure additives.
・Work material hardness uneven	(g)	e. Correct the oiling direction.
・Drill not suitable	(h)	f. Regrind and obtain a proper thinning and relieving angle.
		g. Select work material of even hardness.
		h. Change the drill material (to the one with higher abrasion resistance and heat resistance.)

Hole accuracy (hole enlargement, bend or falling)

・Backlash in the machine or spindle run-out	(a)	a. Adjust the machine and increase rigidity of the machine.
・Excessive feed	(b)	b. Adjust the feed.
・Biting failure	(f,g)	c. Preprocess with a starting drill.
・Drill run-out	(d,e)	d. Use a guide bush.
・Tooth edge accuracy failure	(f,g)	e. Correct drill setting.
・Insufficient drill rigidity	(h)	f. Regrind to get proper lip height and chisel centering.
		g. Perform thinning properly.
		h. Use a short and rigid drill.

Breakage in the shank

・A flaw on the taper of a taper shank	(a)	a. Eliminate the flaw on the taper.
・Abrasion or flaw in the sleeve	(b)	b. Regrind the sleeve or replace it.

Insufficient surface roughness of drilled hole

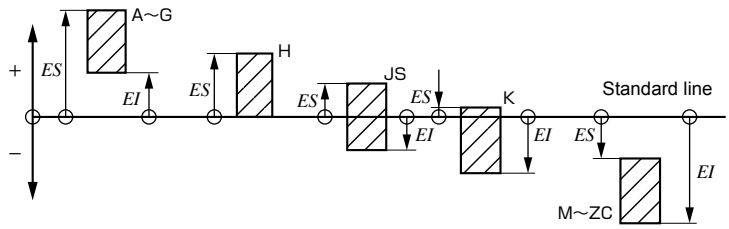
・Excessive feed	(a)	a. Adjust the feed.
・Cutting fluid level low or improper	(b)	b. Change oil feeding direction, method or type of cutting fluid.
・Work loading failure	(c)	c. Retighten the work clamp.

Standard tolerance grades and limit deviations for holes

From JIS B 0401-2:1998

Limit deviations for FG holes and H holes

Upper limit deviation= ES Lower limit deviation= EI



Hole(Internal shape)

Fig.1 Standard tolerance

Standard size (mm)		H												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Over X	X or less	Limit deviation												
		μm											mm	
–	3	+0.8 0	+ 1.2 0	+ 2 0	+ 3 0	+ 4 0	+ 6 0	+10 0	+14 0	+ 25 0	+ 40 0	+ 60 0	+0.1 0	+0.14 0
3	6	+1 0	+ 1.5 0	+ 2.5 0	+ 4 0	+ 5 0	+ 8 0	+12 0	+18 0	+ 30 0	+ 48 0	+ 75 0	+0.12 0	+0.18 0
6	10	+1 0	+ 1.5 0	+ 2.5 0	+ 4 0	+ 6 0	+ 9 0	+15 0	+22 0	+ 36 0	+ 58 0	+ 90 0	+0.15 0	+0.22 0
10	18	+1.2 0	+ 2 0	+ 3 0	+ 5 0	+ 8 0	+11 0	+18 0	+27 0	+ 43 0	+ 70 0	+110 0	+0.18 0	+0.27 0
18	30	+1.5 0	+ 2.5 0	+ 4 0	+ 6 0	+ 9 0	+13 0	+21 0	+33 0	+ 52 0	+ 84 0	+130 0	+0.21 0	+0.33 0
30	50	+1.5 0	+ 2.5 0	+ 4 0	+ 7 0	+11 0	+16 0	+25 0	+39 0	+ 62 0	+100 0	+160 0	+0.25 0	+0.39 0
50	80	+2 0	+ 3 0	+ 5 0	+ 8 0	+13 0	+19 0	+30 0	+46 0	+ 74 0	+120 0	+190 0	+0.3 0	+0.46 0
80	120	+2.5 0	+ 4 0	+ 6 0	+10 0	+15 0	+22 0	+35 0	+54 0	+ 87 0	+140 0	+220 0	+0.35 0	+0.54 0

Limit deviations for JS holes ※1

Upper limit deviation= ES Lower limit deviation= EI

Standard size (mm)		JS												
		1	2	3	4	5	6	7	8	9	10	11	12	13
Over X	X or less	Limit deviation												
		μm											mm	
–	3	±0.4	±0.6	±1	± 1.5	± 2	± 3	± 5	± 7	±12.5	± 20	± 30	±0.05	±0.07
3	6	±0.5	±0.75	±1.25	± 2	± 2.5	± 4	± 6	± 9	±15	± 24	± 37.5	±0.06	±0.09
6	10	±0.5	±0.75	±1.25	± 2	± 3	± 4.5	± 7.5	±11	±18	± 29	± 45	±0.075	±0.11
10	18	±0.6	±1	±1.5	± 2.5	± 4	± 5.5	± 9	±13.5	±21.5	± 35	± 55	±0.09	±0.135
18	30	±0.75	±1.25	±2	± 3	± 4.5	± 6.5	±10.5	±16.5	±26	± 42	± 65	±0.105	±0.165
30	50	±0.75	±1.25	±2	± 3.5	± 5.5	± 8	±12.5	±19.5	±31	± 50	± 80	±0.125	±0.195
50	80	±1	±1.5	±2.5	± 4	± 6.5	± 9.5	±15	±23	±37	± 60	± 95	±0.15	±0.23
80	120	±1.25	±2	±3	± 5	± 7.5	±11	±17.5	±27	±43.5	± 70	±110	±0.175	±0.27

【Note】※To avoid any duplication of same limit deviations, the numbers are described as "±x". It means ES=+x and EI=-x. For example, +0.23/-0.23 μm.

Dimension standard for screw threads

From JIS B 0123:1999

Designation system for screw threads

● Marks for types of thread

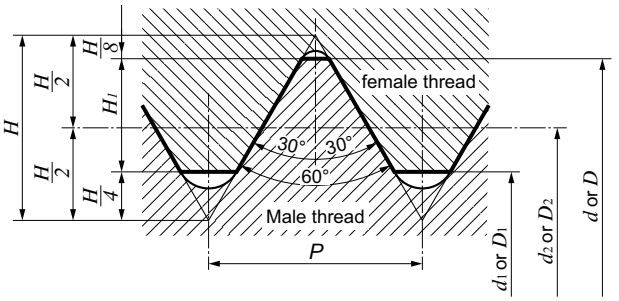
Pitch	Types of thread		Marks describing types of thread	Examples of thread types and diameter.s
Pitch described with mm	Metric Coarse Thread		M	M8
	Metric fine thread			M8×1
	Miniature thread		S	S0.5
	Metric acme thread		Tr	Tr10×2
Pitch described with number of thread	Taper thread for pipe	Taper male thread	R	R ¾
		Taper female thread	Rc	Rc ¾
		Parallel thread	Rp	Rp ¾
	Parallel thread for pipe		G	G ½
	Unified coarse thread		UNC	⅜−16UNC
	Unified fine thread		UNF	No.8−36UNF

Dimension standard for screw threads

From JIS B 0206:1973

Basic dimensions for unified coarse screw threads

Basic dimensions for unified screw threads



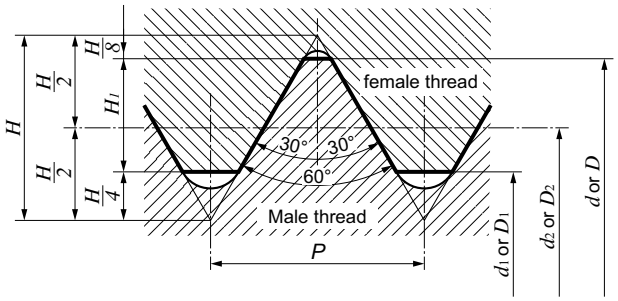
Unit : mm

Thread Diameter	No. of Thread /inch n	Pitch P (reference)	H_1	Female screw D / Male screw d	Female screw D_2 / Male screw d_2	Female screw D_1 / Male screw d_1
No. 1-64 UNC	64	0.3969	0.215	1.854	1.598	1.425
No. 2-56 UNC	56	0.4536	0.246	2.184	1.890	1.694
No. 3-48 UNC	48	0.5292	0.286	2.515	2.172	1.941
No. 4-40 UNC	40	0.6350	0.344	2.845	2.433	2.156
No. 5-40 UNC	40	0.6350	0.344	3.175	2.764	2.487
No. 6-32 UNC	32	0.7938	0.430	3.505	2.990	2.647
No. 8-32 UNC	32	0.7938	0.430	4.166	3.650	3.307
No. 10-24 UNC	24	1.0583	0.573	4.826	4.138	3.680
No. 12-24 UNC	24	1.0583	0.573	5.486	4.798	4.341
¼-20 UNC	20	1.2700	0.687	6.350	5.524	4.976
5/16-18 UNC	18	1.4111	0.764	7.938	7.021	6.411
⅜-16 UNC	16	1.5875	0.859	9.525	8.494	7.805
7/16-14 UNC	14	1.8143	0.982	11.112	9.934	9.149
½-13 UNC	13	1.9538	1.058	12.700	11.430	10.584
9/16-12 UNC	12	2.1167	1.146	14.288	12.913	11.996
⅝-11 UNC	11	2.3091	1.250	15.875	14.376	13.376
¾-10 UNC	10	2.5400	1.375	19.050	17.399	16.229
⅞- 9 UNC	9	2.8222	1.528	22.225	20.391	19.169
1 - 8 UNC	8	3.1750	1.719	25.400	23.338	21.963
1⅛- 7 UNC	7	3.6286	1.964	28.575	26.218	24.648
1¼- 7 UNC	7	3.6286	1.964	31.750	29.393	27.823
1⅜- 6 UNC	6	4.2333	2.291	34.925	32.174	30.343
1½- 6 UNC	6	4.2333	2.291	38.100	35.349	33.518
1¾- 5 UNC	5	5.0800	2.750	44.450	41.151	38.951
2 -4½ UNC	4½	5.6444	3.055	50.800	47.135	44.689
2¼-4½ UNC	4½	5.6444	3.055	57.150	53.485	51.039
2½- 4 UNC	4	6.3500	3.437	63.500	59.375	56.627
2¾- 4 UNC	4	6.3500	3.437	69.850	65.725	62.977
3 - 4 UNC	4	6.3500	3.437	76.200	72.075	69.327
3¼- 4 UNC	4	6.3500	3.437	82.550	78.425	75.677
3½- 4 UNC	4	6.3500	3.437	88.900	84.775	82.027
3¾- 4 UNC	4	6.3500	3.437	95.250	91.125	88.377
4 - 4 UNC	4	6.3500	3.437	101.600	97.475	94.727

From JIS B 0206:1973

Basic dimensions for unified fine screw threads

Basic dimensions for unified screw threads



Unit : mm

Thread Diameter	No. of Thread /inch n	Pitch P (reference)	H_1	Female screw D / Male screw d	Female screw D_2 / Male screw d_2	Female screw D_1 / Male screw d_1
No. 0-80 UNF	80	0.3175	0.172	1.524	1.318	1.181
No. 1-72 UNF	72	0.3528	0.191	1.854	1.626	1.473
No. 2-64 UNF	64	0.3969	0.215	2.184	1.928	1.755
No. 3-56 UNF	56	0.4536	0.246	2.515	2.220	2.024
No. 4-48 UNF	48	0.5292	0.286	2.845	2.502	2.271
No. 5-44 UNF	44	0.5773	0.312	3.175	2.799	2.550
No. 6-40 UNF	40	0.6350	0.344	3.505	3.094	2.817
No. 8-36 UNF	36	0.7056	0.382	4.166	3.708	3.401
No. 10-32 UNF	32	0.7938	0.430	4.826	4.310	3.967
No. 12-18 UNF	28	0.9071	0.491	5.486	4.897	4.503
¼-28 UNF	28	0.9071	0.491	6.350	5.761	5.367
5/16-24 UNF	24	1.0583	0.573	7.938	7.249	6.792
⅜-24 UNF	24	1.0583	0.573	9.525	8.837	8.379
7/16-20 UNF	20	1.2700	0.687	11.112	10.287	9.738
½-20 UNF	20	1.2700	0.687	12.700	11.874	11.326
9/16-18 UNF	18	1.4111	0.764	14.288	13.371	12.761
⅝-18 UNF	18	1.4111	0.764	15.875	14.958	14.348
¾- 16 UNF	16	1.5875	0.859	19.050	18.019	17.330
⅞-14 UNF	14	1.8143	0.982	22.225	21.046	20.262
1-12 UNF	12	2.1167	1.146	25.400	24.026	23.109
1⅛-12 UNF	12	2.1167	1.146	28.575	27.201	26.284
1¼-12 UNF	12	2.1167	1.146	31.750	30.376	29.459
1⅜-12 UNF	12	2.1167	1.146	34.925	33.551	32.634
1½-12 UNF	12	2.1167	1.146	38.100	36.726	35.809

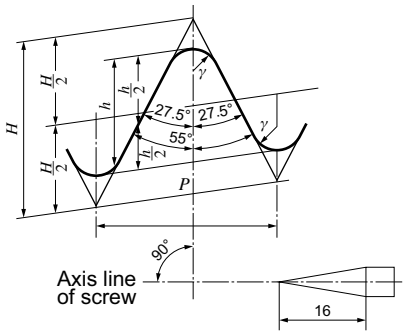
Dimension standard for screw threads

From JIS B 0203:1999

Taper Pipe Threads

● Standard Thread shape and Standard specifications

Standard thread shape for taper male screw and taper female scres



$$P = \frac{25.4}{n}$$

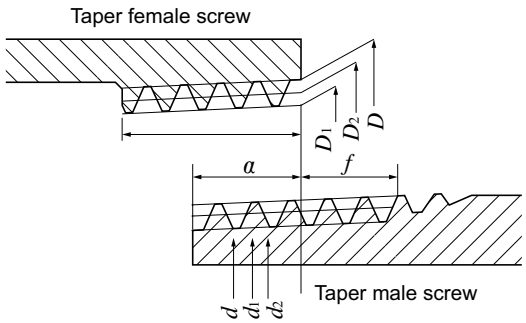
$$H = 0.960237P$$

$$h = 0.640327P$$

$$\gamma = 0.137278P$$

Bold line shows standard thread shape.

Fit of taper male screw and taper female screw



Unit : mm

Thread dia. ※1	Thread: Number of Thread /inch n	Thread: Pitch P (reference)	Thread: Thread height h	Thread: Roundness γ or γ'	Standard dia. Male Screw: External diameter d	Standard dia. Male Screw: Effective diameter d_2	Standard dia. Male Screw: Diameter of thread tale d_1	Standard dia. Female Screw: Diameter of thread tale D	Standard dia. Female Screw: Effective diameter D_2	Standard dia. Female Screw: Internal diameter D_1	Position of standard diameter: Male screw from Pipe end Standard length a	Position of standard diameter: Female screw Pipe end tolerance to direction of axis $\pm c$	Minimum effective screw length: Female screw: Any incomplete thread, Taper female screw: From position of standard diameter to minor diameter	Minimum effective screw length: Female screw: No incomplete thread, Taper female screw Parallel female screw: From standard diamter or the end of pipe or coupling
R 1/16	28	0.9071	0.581	0.12	7.723	7.142	6.561				3.97	1.13	6.2	4.4
R 1/8	28	0.9071	0.581	0.12	9.728	9.147	8.566				3.97	1.13	6.2	4.4
R 1/4	19	1.3368	0.856	0.18	13.157	12.301	11.445				6.01	1.67	9.4	6.7
R 3/8	19	1.3368	0.856	0.18	16.662	15.806	14.950				6.35	1.67	9.7	7.0
R 1/2	14	1.8143	1.162	0.25	20.955	19.793	18.631				8.16	2.27	12.7	9.1
R 3/4	14	1.8143	1.162	0.25	26.441	25.279	24.117				9.53	2.27	14.1	10.2
R 1	11	2.3091	1.479	0.32	33.249	31.770	30.291				10.39	2.89	16.2	11.6
R 1 1/4	11	2.3091	1.479	0.32	41.910	40.431	38.952				12.70	2.89	18.5	13.4
R 1 1/2	11	2.3091	1.479	0.32	47.803	46.324	44.845				12.70	2.89	18.5	13.4
R 2	11	2.3091	1.479	0.32	59.614	58.135	56.656				15.88	2.89	22.8	16.9
R 2 1/2	11	2.3091	1.479	0.32	75.184	73.705	72.226				17.46	3.46	26.7	18.6
R 3	11	2.3091	1.479	0.32	87.884	86.405	84.926				20.64	3.46	29.8	21.1
R 4	11	2.3091	1.479	0.32	113.030	111.551	110.072				25.40	3.46	35.8	25.9
R 5	11	2.3091	1.479	0.32	138.430	136.951	135.472				28.58	3.46	40.1	29.3
R 6	11	2.3091	1.479	0.32	163.830	162.351	160.872				28.58	3.46	40.1	29.3

※1 These thread diameters are for taper male screw. R for taper or parallel female screws are described as Rc or Rp.

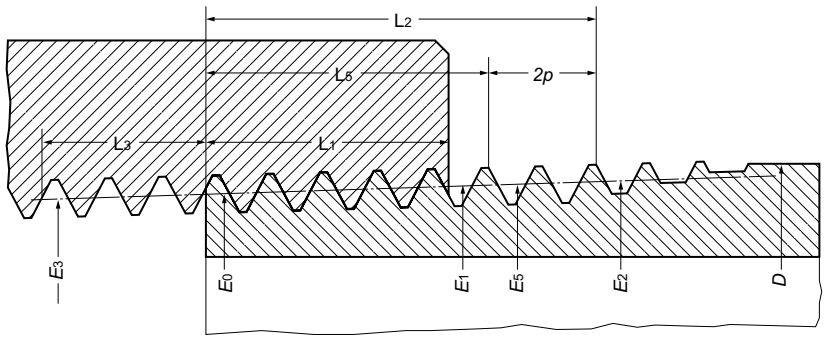
1. Threads are vertical to center axis line. Pitches are measured along the center axis line.
2. Effective screw length is screw length excluding incomplete thread. The faces of last few threads may remain on the pipe or the pipe coupling. If the end of pipe or the pipe coupling are chamfered, the effective screw length includes it.

American Pipe Threads, general purpose (Inch)

Example describing American Pipe Thread

3/8－18 NPT
- NPT type
- Number of thread/inch
- Pipe thread diamter

Standard size of American Pipe thread NPT



- Screw taper=1/16 (.75"/foot)
- Angle of thread=60°(vertical to axis)
- Fundamental triangle height H=0.866025p
- Thread height h=0.800000p

Unit : mm

Thread diameter ※1	External diameter of pipe D		Number of thread /inch	Pitch P	Set screw length by hand tighten			Effective length of male screw		Set screw length by wrench		Internal diameter of male screw at pipe end Ke
					L_1		Effective dia. E_1	L_2		L_3		
					Length	No. of thread		Length	No. of thread	Length	No. of thread	
1	2 (inch)	2	3	4	6	7	8	9	10	14	15	24
1/16	0.3125	7.938	27	0.94082	4.064	4.32	7.142	6.632	7.05	2.822	3	6.137
1/8	0.405	10.287	27	0.94082	4.102	4.36	9.489	6.703	7.12	2.822	3	8.481
1/4	0.540	13.716	18	1.41122	5.786	4.10	12.487	10.206	7.23	4.234	3	10.996
3/8	0.675	17.145	18	1.41122	6.096	4.32	15.926	10.358	7.34	4.234	3	14.417
1/2	0.840	21.336	14	1.81432	8.128	4.48	19.772	13.556	7.47	5.443	3	17.813
3/4	1.050	26.670	14	1.81432	8.611	4.75	25.117	13.861	7.64	5.443	3	23.127
1	1.315	33.401	11.5	2.20878	10.160	4.60	31.461	17.343	7.85	6.627	3	29.060
1 1/4	1.660	42.164	11.5	2.20878	10.668	4.83	40.218	17.953	8.13	6.627	3	37.785
1 1/2	1.900	48.260	11.5	2.20878	10.668	4.83	46.278	18.377	8.32	6.627	3	43.853
2	2.375	60.325	11.5	2.20878	11.074	5.01	58.325	19.215	8.70	6.627	3	55.867
2 1/2	2.875	73.025	8	3.17500	17.323	5.46	70.159	28.893	9.10	6.350	2	66.535
3	3.500	88.900	8	3.17500	19.456	6.13	86.068	30.480	9.60	6.350	2	82.311
3 1/2	4.000	101.600	8	3.17500	20.853	6.57	98.776	31.750	10.00	6.350	2	94.933
4	4.500	114.300	8	3.17500	21.438	6.75	111.433	33.020	10.40	6.350	2	107.554
5	5.563	141.300	8	3.17500	23.800	7.50	138.412	35.720	11.25	6.350	2	134.384
6	6.625	168.275	8	3.17500	24.333	7.66	165.252	38.418	12.10	6.530	2	161.191
8	8.625	219.075	8	3.17500	27.000	8.50	215.901	43.498	13.70	6.530	2	211.673
10	10.750	273.050	8	3.17500	30.734	9.68	269.772	48.895	15.40	6.350	2	265.311
12	12.750	323.850	8	3.17500	34.544	10.88	320.492	53.975	17.00	6.350	2	315.793
14 OD	14.000	355.600	8	3.17500	39.675	12.50	352.365	57.150	18.00	6.350	2	347.345
16 OD	16.000	406.400	8	3.17500	46.025	14.50	403.244	62.230	19.60	6.350	2	397.828
18 OD	18.000	457.200	8	3.17500	50.800	16.00	454.025	67.310	21.20	6.350	2	448.310
20 OD	20.000	508.000	8	3.17500	53.975	17.00	504.706	72.390	22.80	6.350	2	498.793
24 OD	24.000	609.600	8	3.17500	60.325	19.00	606.068	82.550	26.00	6.350	2	599.758

※1 Thread Diameter is as followed
3/8NPT or 0.675NPT
OD decimal diamet

Metric conversion from original chart (inch size) is rounded after 5 digit for pitch (P), everything else is rounded after 3 digit after decimal point.
Original chart has 24 columns including information in above chart, as well as effective diameter, L_2-L_1, L_4, L_5 thread height h, diameter increased per thread.

Table of corresponding Tool Steels brands

From "Website 2017 revised version of Special Steel Association of Japan"

Steels for cold molding

Group	Corresponding JIS class	Corresponding AISI class	Aich Steel	Sanyo Specia Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Udde Holm	Bohler
Carbon Tool Steels	SK105	W1-10		QK3	YK3					K990
Alloy Tool Steels	SKS93		SK301	QK3M	YK30	K3M	YCS3			
	SKS3		SKS3	QKS3	GOA	KS3	SGT		ARNE	K460
	SKD1	D3			DC1	KD1	CRD		SVERKER3	K100, K107
	SKD11	D2	SKD11	QC11	DC11	KD11	SLD SLD-i	CDS11	SVERKER21	K105 K110
	SKD11 (Modified)					KD11MAX KD11S				
	8% Cr steel		AUD15 AUD11	QCM7 QCM8	DC53	KD21	SLD8 SLD10	MDS9	SLEIPNER	K340
	Matrix type die steel		SXACE		DCMX	NOGA	ARK1		CALDIE UNIMAX	W360
	SKD12	A2			DC12	KD12			RIGOR	K305
	Pre-hardened steel				GO40F	KAP65	HPM-MAGIC		IMPAX HH	
	Flame-temprered steels		SX105V	QF3	GO5	KRCX	HMD5		FERMO	
	Low-temperature air-cooled steels				GO4	KSM	ACD37			
	Impact-resistant steels			QF1	GS5	KTV5	YSM			
	Others						SLD-MAGIC	ICS22	CALMAX ELMAX VANCRON40 VANADIS4E VANADIS10	K390 K490 K890
High-speed Tool Steels	SKH51	M2		QH51	MH51	H51	YXM1	SKH9		S600
	SKH51 type							SKH9D		
	SKH55 type					HM35	YXM4	HM35 HS53M		S705
	SKH57 type					MV10	XVC5	HS93R DURO-SP		S700
	Matrix type			QHZ	DRM1 DRM2 DRM3 MH85	KMX1 KMX2 KMX3	YXR3 YXR7 YXR33	DURO-FZ DURO-F1 DURO-F3 DURO-F7 DURO-V2 DURO-V5		
Sintered High-speed Tool Steels	SKH40			SPM30	DEX40		HAP40	FAX38	VANADIS30	S590
	Matrix type				DEX-M1 DEX-M3		HAP5R			
	Others			SPM23 SPM60 SPMR8 SPMV6 SPMX4N	DEX20 DEX60		HAP10 HAP50 HAP72	FAX31 FAX40 FAX55 FAXG2	VANADIS23 VANADIS60	S290 S390 S690 S790

From "Website 2017 revised version of Special Steel Association of Japan"

Steels for hot molding

Group	Corresponding JIS class	Corresponding AISI class	Aichi Steel	Sanyo Special Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Mitsubishi Steel	Udde Holm	Bohler
Alloy Tool Steels	SKD4				DH4	KD4					
	SKD5	H21			DH5	KD5					
	SKD6	H11			DH6	KD6				VIDAR	W300 W400
	SKD61	H13	SKD61	QD61	DHA DHA1	KDA	DAC			ORVAR-2M	W302
	SKD61 (Modified)		AUD61 AUD60A	QDA61 QDN QDX- HARMOTEX QDN1-R	DHA2 DH21 DHA- WORLD DH31-S DH31-EX	KDA1 KDA1S KDAMAX	DAC-S DAC3 DAC10 DAC55 DAC-MAGIC			ORVAR-S DIEVAR FORMVAR	W303 W403
	SKD61 (Free-Cutting)				DH2F	KAP90F	FDAC				
	SKD62	H12		QD62	DH62	KDB					
	SKD7	H10			DH72	KDH1					W320
	SKD7 (Modified)		AUD72	QDH	DH32 DH71 DH73		DAC40 YEM-K	DURO-N1			
	SKD8	H19			DH41	KDF					
	SKD8 (Modified)				DH42	KDF4	MDC-K				
	SKT4	L6	SKT4A	QT41- HARMOTEX	GFA	KTV	DM			ALVAR14	W500
	SKT4 (Modified)			QDT	GF78	TD3					
	Precipitation Hardening Steel		AUD91 MPH-K		DH76				HD22B		
	Others			QF5	DHA- Thermo					BURE BALDER	
High-speed Tool Steels	Matrix type			QHZ	DRM1 DRM2	KMX1	YXR33	DURO-FZ DURO-F1			W360

Table of corresponding Tool Steels brands

From "Website 2017 revised version of Special Steel Association of Japan"

Steels for plastic molds

Group	Group (HRC)	Corresponding JIS class	Corresponding AISI class	Aichi Steel	JFE Steel	Sanyo Special Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Udde Holm	Bohler
Pre-hardened Steels	13	SCtype	1055		JFE-MD1	PC55		KPM1 KPMAX				
	28	SCMtype	4140		JFE-MD3 JFE-MD5		PDS3					
	33	SCM (Modified)	P20			PCM30	PX5 PXA30	KPM30	HPM7			M200 M201 M238
		SUStype	S420 type				S-STAR D-STAR	GHX	HPM38	PROVA-400 PROVA-450	STAVAX	M303 M310
		SUStype (Free-Cutting)					G-STAR		HPM77		RoyAlloy	M315
	35	SUStype	S17400			QSH6	NAK101	U630	PSL		CORRAX	N700
	36	SCM (Modified)	P20					JHX			IMPAXHH	
	40	SUStype									EDRO400	M303HH
		SKD61 (Modified)	H13				DH2F	KAP90F	FDAC			
			P21			PCM40S	NAK80	KAP88	HPM-PRO			M461
			P21 (Free-Cutting)			PCM40	NAK55	KAP65	HPM1			M261
			P21 (Rust Resistance)						CENA1 CENA-V			
									HPM-MAGIC		NIMAX	
Quench-Tempered Steels	60	SKD11 (Modified)	D2	AUD11		QCM8 SPMR8 (P/M)	PD613	NOGA	HPM31 ZCD-M		RIGOR SLEIPNER CALDIE CALMAX	K105 K110 K340
	57	SUStype 440C	S44004			QPD5 SPC5 (P/M)	SUS440C	SUS440C	SUS440C	440C PROVA-500 (P/M)	ELMAX	M340 M390 N685 N690 N695
	52	SUStype 420	S420 type				S-STAR D-STAR G-STAR	GHX	HPM38 HPM38S HPM77	PROVA-400 PROVA-450	STAVAX POLMAX MIRRAX	M310 M333
Age-Hardened Steels	50 or more	Maraging Steel				QM300	MAS1C	KMS	YAG	EXEO-M21		V720 V721
		Others									CORRAX	
	40	Nonmagnetic Steel						NMS1	HPM75			

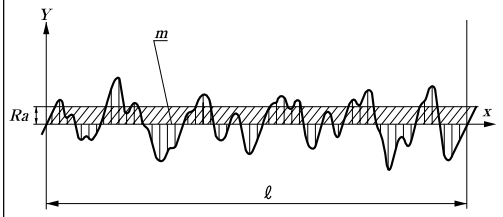
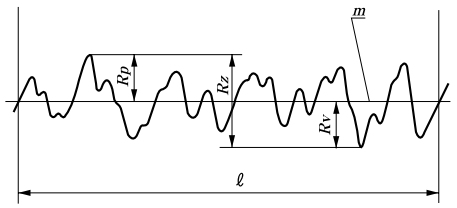
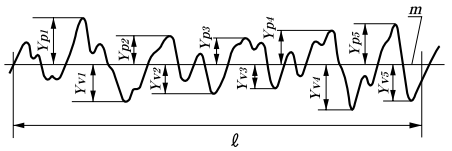
From "Website 2017 revised version of Special Steel Association of Japan"

High-speed Tool Steels

Group	Corresponding JIS class	Corresponding AISI class	Sanyo Special Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Udde Holm	Bohler
Tungsten type	SKH2	T1			H2	YHX2	SKH2		S200
	SKH3	T4			H3		SKH3		S305
	SKH4	T5			H4		SKH4		
	SKH10	T15			HV5				
Molybdenum type	SKH51	M2	QH51	MH51	H51	YXM1	SKH9		S600 S614 S401
	SKH52	M3-1			H52		HM31		
	SKH53	M3-2			HV1				S607
	SKH54	M4			HV2		HM4		
	SKH55				HM35	YXM4	HM35		S705
	SKH56	M36			HM36		HM36		
	SKH57				HV10	XVC5	HS93R		S700
	SKH58	M7			HM3		HM7NN		S400
	SKH59	M42			HM42	YXM42	HM42		S500
	Others				S70	YXM27 YXM60	HS53M HS97R HM1 HMT12 HM33 SKH9D DURO-SP		
Matrix type	Matrix type		QHZ	DRM1 DRM2 DRM3 MH85	KMX1 KMX2 KMX3	YXR3 YXR33 YXR7	DURO-FZ DURO-F1 DURO-F3 DURO-F7 DURO-V2 DURO-V5		W360
Powdered type	SKH40		SPM30	DEX40		HAP40	FAX38	VANADIS30	S590
	Others		SPM23 SPM60 SPMR8 SPMV6 SPMX4N	DEX20 DEX60 DEX-M1 DEX-M3		HAP10 HAP50 HAP72 HAP5R	FAX31 FAX40 FAX55 FAXG2	VANADIS23 VANADIS60	S290 S390 S690 S790

Surface roughness

Surface roughness

Type	Symbol	Method of determination	Example (diagram) of method of determination
Calculated average roughness	**Ra**	From the direction of the average line of the roughness curve of a sampled standard length, plot the direction of the average line of the sampled section on the X axis and the direction of the vertical magnification on the Y axis, and express the roughness curve using the equation y=f(x). The roughness value is then expressed in micrometers (μ m) as the value determined from the following expression. $$Ra=\frac{1}{\ell}\int_0^{\ell}\lvert f(x)\rvert\,dx$$	
Maximum height	**Rz**	From the direction of the average line of the roughness curve of a sampled standard length, measure the interval between the peak and valley lines of the sampled section in the direction of the vertical magnification of the roughness curve, and express the roughness as this value in micrometers (μ m). Note: When determining Rz, sample only the standard length where there are no parallel peaks or valleys which could be considered scratches. $$Rz=Rp+Rv$$	
10-point average roughness	**RZJIS**	From the direction of the average line of the roughness curve of a sampled standard length, determine the sum of the average of the absolute values of the 5 highest peak points (Yp) and the average of the absolute values of the 5 lowest valley points (Yv) in the sampled section, and express this value in micrometers (μ m). $$R_{ZJIS}=\frac{(Y_{p1}+Y_{p2}+Y_{p3}+Y_{p4}+Y_{p5})+(Y_{v1}+Y_{v2}+Y_{v3}+Y_{v4}+Y_{v5})}{5}$$	 $Y_{p1}, Y_{p2}, Y_{p3}, Y_{p4}, Y_{p5}$: The peak points from the highest to the 5th highest in the sampled section of the standard length (ℓ) $Y_{v1}, Y_{v2}, Y_{v3}, Y_{v4}, Y_{v5}$: The valley points from the lowest to the 5th lowest in the sampled section of the standard length (ℓ)

Relationship between calculated average roughness (Ra) and conventional labels (Reference data)

Calculated average roughness **Ra**		Maximum height **Rz**	10-point average roughness **RZJIS**	Standard length for RZ and RZJIS ℓ (mm)	Conventional finish label
Examples of standard values	Cutoff value λc(mm)	Examples of standard values			
0.012a	0.08	0.05s	0.05z	0.08	▽▽▽▽
0.025a	0.25	0.1 s	0.1 z		
0.05 a		0.2 s	0.2 z	0.25	
0.1 a	0.8	0.4 s	0.4 z		
0.2 a		0.8 s	0.8 z	0.8	
0.4 a		1.6 s	1.6 z		▽▽▽
0.8 a		3.2 s	3.2 z		
1.6 a		6.3 s	6.3 z		
3.2 a	2.5	12.5 s	12.5 z	2.5	▽▽
6.3 a		25 s	25 z		
12.5 a	8	50 s	50 z		▽
25 a		100 s	100 z	8	
50 a		200 s	200 z		–
100 a	–	400 s	400 z	–	

※Since the correlation between the 3 types are expressed as relations to the symbols, they are not precise.
※The evaluation lengths for Ra:Rz, RZJIS are 5 times the cutoff values and the standard lengths for each method.

Machinability indices

Type of steel	JIS grade	Machinability indices
Free-cutting sulfur Steels	SUM21	100
	SUM1B	113
	SUM32	82
	SUM5	73
Nickel-chrome-molybdenum Steels	SNCM431	58
	SNCM625	55
	SNCM630	50
	SNCM439	65
	SNCM220	67
	SNCM815	55
Carbon Steels for machine structures	S10C	73
	S15C	73
	S20C	73
	S30C	70
	S35C	70
	S45C	73
	S50C	70
Chrome Steels	SCr1	73
	SCr430	58
	SCr435	73
Manganese Steels for machine structures	SMn433	61
	SMn438	61
	SMn443	58
Chrome-molybdenum Steels	SCM432	73
	SCM430	70
	SCM440	67
	SCM421	49
Carbon Tool Steels	SK1	42
	SK5	42
	SK6	49
	SK7	51
Alloy Tool Steels	SKD11	30
	SKD61	48

Type of steel	JIS grade	Machinability indices
Martensite Stainless Steels	SUS403	45
	SUS410	45
	SUS416	81
	SUS420J1	45
	SUS420F	70
	SUS431	55
Ferrite Stainless Steels	SUS405	55
	SUS430	48
	SUS430F	90
Austenite Stainless Steels	SUS302	35
	SUS303	60
	SUS304	45
	SUS316	45
	SUS317	45
	SUS321	45
	SUS347	45
Gray Cast Iron	FC100	55
	FC150	85
	FC200	85
	FC250	65
	FC300	65
	FC350	65
Titanium Alloy (Ti-6Al-4V)		20
Inconel X (70Ni-7Fe-15Cr)		15
Stellite 21 (Co-3Ni-27Cr-5.5Mo)		6
Stellite 31 (Co-10Ni-25Cr-5.5Mo)		6

【Note】 The machinability indices are general criteria for machinability, and will vary according to various conditions.

Hardness conversion table

Approximate conversion value for Vickers hardness

Vickers Hardness HV	Brinell Hardness, 10 mm Ball, Load:3,000 kgf: Standard Ball	Brinell Hardness, 10 mm Ball, Load:3,000 kgf: Tungsten Carbide Ball HB	Rockwell Hardness: A Scale, Load:60 kgf, Diamond Point HRA	Rockwell Hardness: B Scale, Load:100 kgf, 1/16" Ball HRB	Rockwell Hardness: C Scale, Load:150 kgf, Diamond Point HRC	Rockwell Hardness: D Scale, Load:100 kfg, Diamond Point HRD	Shore Hardness HS	Tensile Strength (Approx.) MPa (kgf/mm²)
1900	–	–	93.1	–	80.5	–	–	–
1800	–	–	92.6	–	79.2	–	–	–
1700	–	–	91.9	–	77.9	–	–	–
1600	–	–	91.3	–	76.6	–	–	–
1500	–	–	90.5	–	75.3	–	–	–
1450	–	–	90.1	–	74.6	–	–	–
1400	–	–	89.6	–	74.0	–	–	–
1350	–	–	89.1	–	73.4	–	–	–
1300	–	–	88.7	–	72.7	–	–	–
1250	–	–	88.3	–	72.1	–	–	–
1200	–	–	87.9	–	71.5	–	–	–
1150	–	–	87.5	–	70.9	–	–	–
1100	–	–	87.1	–	70.3	–	–	–
1050	–	–	86.6	–	69.6	–	–	–
1000	–	–	86.2	–	68.9	–	–	–
940	–	–	85.6	–	68.0	76.9	97	–
920	–	–	85.3	–	67.5	76.5	96	–
900	–	–	85.0	–	67.0	76.1	95	–
880	–	(767)	84.7	–	66.4	75.7	93	–
860	–	(757)	84.4	–	65.9	75.3	92	–
840	–	(745)	84.1	–	65.3	74.8	91	–
820	–	(733)	83.8	–	64.7	74.3	90	–
800	–	(722)	83.4	–	64.0	73.8	88	–
780	–	(710)	83.0	–	63.3	73.3	87	–
760	–	(698)	82.6	–	62.5	72.6	86	–
740	–	(684)	82.2	–	61.8	72.1	84	–
720	–	(670)	81.8	–	61.0	71.5	83	–
700	–	(656)	81.3	–	60.1	70.8	81	–
690	–	(647)	81.1	–	59.7	70.5	–	–
680	–	(638)	80.8	–	59.2	70.1	80	–
670	–	630	80.6	–	58.8	69.8	–	–
660	–	620	80.3	–	58.3	69.4	79	–
650	–	611	80.0	–	57.8	69.0	–	–
640	–	601	79.8	–	57.3	68.7	77	–
630	–	591	79.5	–	56.8	68.3	–	–
620	–	582	79.2	–	56.3	67.9	75	–
610	–	573	78.6	–	55.7	67.5	–	–
600	–	564	78.9	–	55.2	67.0	74	–
590	–	554	78.4	–	54.7	66.7	–	2055(210)
580	–	545	78.0	–	54.1	66.2	72	2020(206)
570	–	535	77.8	–	53.6	65.8	–	1985(202)
560	–	525	77.4	–	53.0	65.4	71	1950(199)
550	(505)	517	77.0	–	52.3	64.8	–	1905(194)
540	(496)	507	76.7	–	51.7	64.4	69	1860(190)
530	(488)	497	76.4	–	51.1	63.9	–	1825(186)
520	(480)	498	76.1	–	50.5	63.5	67	1795(183)
510	(473)	479	75.7	–	49.8	62.9	–	1750(179)
500	(465)	471	75.3	–	49.1	62.2	66	1750(174)
490	(456)	460	74.9	–	48.4	61.6	–	1660(169)
480	448	452	74.5	–	47.7	61.3	64	1620(165)
470	441	442	74.1	–	46.9	60.7	–	1570(160)
460	433	433	73.6	–	46.1	60.1	62	1530(156)
450	425	425	73.3	–	45.3	59.4	–	1495(153)
440	415	415	72.8	–	44.5	58.8	59	1460(149)
430	405	405	72.3	–	43.6	58.2	–	1410(144)

Vickers Hardness HV	Brinell Hardness, 10 mm Ball, Load:3,000 kgf: Standard Ball	Brinell Hardness, 10 mm Ball, Load:3,000 kgf: Tungsten Carbide Ball HB	Rockwell Hardness: A Scale, Load:60 kgf, Diamond Point HRA	Rockwell Hardness: B Scale, Load:100 kgf, 1/16" Ball HRB	Rockwell Hardness: C Scale, Load:150 kgf, Diamond Point HRC	Rockwell Hardness: D Scale, Load:100 kfg, Diamond Point HRD	Shore Hardness HS	Tensile Strength (Approx.) MPa (kgf/mm²)
420	397	397	71.8	–	42.7	57.5	57	1370(140)
410	388	388	71.4	–	41.8	56.6	–	1330(136)
400	379	379	70.8	–	40.8	56.0	55	1290(131)
390	369	369	70.3	–	39.8	55.2	–	1240(127)
380	360	360	69.8	(110.0)	38.8	54.4	52	1205(123)
370	350	350	69.2	–	37.7	53.6	–	1170(120)
360	341	341	68.7	(119.0)	36.6	52.8	50	1130(115)
350	331	331	68.1	–	35.5	51.9	–	1095(112)
340	322	322	67.6	(108.0)	34.4	51.1	47	1070(109)
330	313	313	67.0	–	33.3	50.2	–	1035(105)
320	303	303	66.4	(107.0)	32.2	49.4	45	1005(103)
310	294	294	65.8	–	31.0	48.4	–	980(100)
300	284	284	65.2	(105.5)	29.8	47.5	42	950(97)
295	280	280	64.8	–	29.2	47.1	–	935(96)
290	275	275	64.5	(104.5)	28.5	46.5	41	915(94)
285	270	270	64.2	–	27.8	46.0	–	905(92)
280	265	265	63.8	(103.5)	27.1	45.3	40	890(91)
275	261	261	63.5	–	26.4	44.9	–	875(89)
270	256	256	63.1	(102.0)	25.6	44.3	38	855(87)
265	252	252	62.7	–	24.8	43.7	–	840(86)
260	247	247	62.4	(101.0)	24.0	43.1	37	825(84)
255	243	243	62.0	–	23.1	42.2	–	805(82)
250	238	238	61.6	99.5	22.2	41.7	36	795(81)
245	233	233	61.2	–	21.3	41.1	–	780(79)
240	228	228	60.7	98.1	20.3	40.3	34	765(78)
230	219	219	–	96.7	(18.0)	–	33	730(75)
220	209	209	–	95.0	(15.7)	–	32	695(71)
210	200	200	–	93.4	(13.4)	–	30	670(68)
200	190	190	–	91.5	(11.0)	–	29	635(65)
190	181	181	–	89.5	(8.5)	–	28	605(62)
180	171	171	–	87.1	(6.0)	–	26	580(59)
170	162	162	–	85.0	(3.0)	–	25	545(56)
160	152	152	–	81.7	(0.0)	–	24	515(53)
150	143	143	–	78.7	–	–	22	490(50)
140	133	133	–	75.0	–	–	21	455(46)
130	124	124		71.2	–	–	20	425(44)
120	114	114		66.7				390(40)
110	105	105		62.3				
100	95	95		56.2				
95	90	90		52.0				
90	86	86		48.0				
85	81	81		41.0				

The hardness conversion table shown here shows approximate conversion values for the Vickers hardness of steel.

Item Code Index

Item Code Index

Item code	Page	Product
A		
ABP4F○○S○○L○○○	C157	Ball Precision Multi Flutes ABP4F, Steel shank (Metric)
ABP4F○○S○○WL○○○	C156	Ball Precision Multi Flutes ABP4F, Carbide shank (Metric)
ABP4FM○○	C158	Ball Precision Multi Flutes ABP4F, Modular shank (Metric)
ABPF○○S○○(L/L○○○)	C133	Ball Precision F ABPF, Steel shank type (Metric)
ABPF○○S○○W(□/□○○○)	C135	Ball Precision F ABPF, Carbide shank type (Metric)
ABPFM○○	C136	Ball Precision F ABPF, Modular type (Metric)
ABPFM○○-M○○H	C136	Ball Precision F ABPF, Modular type with air hole (Metric)
ABPFN○○S○○(W)-○○○-○○○	C147	Ball Precision F ABPFN, Shank type (Metric)
ABPFNM10	C148	Ball Precision F ABPFN, Modular type (Metric)
AHU(L)○○○○R-○	C175	High Feed End Mill AHU, Shank type (Metric)
AHUB○○○○○R(M)-○	C176	High Feed End Mill AHU, Bore type (Metric)
AHUM○○○○R-○(-M○○)	C174	High Feed End Mill AHU, Modular type (Metric)
AR□○○○○R(42)	C91	Easy Cut Radius Mill AR, Shank type (Metric)
AR5○○○R	C93	Easy Cut Radius Mill AR, Bore type (Metric)
ARB○○○○R-○(M)	C93	Easy Cut Radius Mill AR, Bore type (Metric)
ARM○○○○R-○	C94	Easy Cut Radius Mill AR, Modular type (Metric)
ARPF○○S○○(□○○○)	C119	Radius Precision ARPF, Steel shank type (Metric)
ARPF○○S○○W(□○○)	C120	Radius Precision ARPF, Carbide shank type (Metric)
ARPFM○○	C121	Radius Precision ARPF, Modular type (Metric)
ARPFM○○-H	C122	Radius Precision ARPF, Modular type with air hole (Metric)
ASC○○-(M)○○.○-○○○-○○○(Z)	D5	The Shanks for Modular Mill (Metric)
ASDF5○○○R(M)-○(U)	C233	Dual Face Mill ASDF (Metric)
ASF5○○○R(M)	C238	Face Mill ASF (Metric)
ASM(L)07○○S○○R-○	C162	Super Excellent Mini ASM, Shank type (Metric)
ASMM07○○R-○	C163	Super Excellent Mini ASM, Modular type (Metric)
ASPV10○○R-○	C190	Polish Mill V type ASPVmini, Steel shank type (Metric)
ASPVB2○○○R(M)-○	C206	Polish Mill V type ASPV, Bore type (Metric)
ASPVM10○○R-○-M○○	C190	Polish Mill V type ASPVmini, Modular type (Metric)
ASPVM20○○R-○	C205	Polish Mill V type ASPV, Modular type (Metric)
ASPVS2○○○R-○	C204	Polish Mill V type ASPV, Shank type (Metric)
ASR□○○○○	C41	Radius Mill ASR, Shank type (Metric)
ASR□20○○(S○○)R-○	C72	Radius Mill ASR Multi-flutes, Shank type (Metric)
ASR○○○○(M)-○	C42	Radius Mill ASR, Bore type (Metric)
ASR○○○○R(M)-○	C73	Radius Mill ASR Multi-flutes, Bore type (Metric)
ASRF□30○○R-○	C64	Radius Mill 4 Corners ASRF mini, Shank type (Metric)
ASRF□40○○R	C56	Radius Mill 4 Corners ASRF, Shank type (Metric)
ASRF4○○○R(M)-○	C57	Radius Mill 4 Corners ASRF, Bore type (Metric)
ASRFB30○○R(M)-○-○○	C66	Radius Mill 4 Corners ASRF mini, Bore type (Metric)
ASRFM30○○R-○-M1○	C65	Radius Mill 4 Corners ASRF mini, Modular type (Metric)
ASRM00○○-○	C43	Radius Mill ASR, Modular type (Metric)
ASRM20○○R-○	C73	Radius Mill ASR Multi-flutes, Modular type (Metric)
ASRT□○○○○R-○	C48	Radius Mill 3 Corners ASRT, Shank type (Metric)
ASRT○○○○R(M)-○	C49	Radius Mill 3 Corners ASRT, Bore type (Metric)
ASRTM30○○R-○	C48	Radius Mill 3 Corners ASRT, Modular type (Metric)

Item code	Page	Product
C		
CBN-EHB2○○○-○○.○○	A145	Epoch CBN High Precision Ball End Mill
CBN-EPSB2○○○-○○.○-○○○-F	A151	Epoch CBN Super Ball End Mill, Fine type
CBN-EPSB2○○○-○○.○-○○○-S	A151	Epoch CBN Super Ball End Mill, Strong type
CBN-EPSR2○○○-○○.○-○○○	A298	Epoch CBN Super Radius End Mill
CEPH○○○○	A403	Epoch Hard
CEPL○○○○	A402	Epoch 21, Long
CEPL○○○○-TH	A397	Epoch TH Hard, Long
CEPLS○○○○(-○○)	A403	Epoch 21, Long Shank
CEPR○○○○	A402	Epoch 21, Regular
CEPR○○○○-TH	A397	Epoch TH Hard, Regular
CEPS○○○○-TH	A397	Epoch TH Hard, Short
CEPU4○○○	A403	Epoch Universal
CM3.5-141	D9	Clamp piece set
CM4-141	D9	Clamp piece set
CM5-147	D9	Clamp piece set
E		
EB4HR○○○○TN-○○-○○-ATH	A124	Taper Ball End Mill for High Accuracy Rib Slotting
ECRB○○○○-○○-PN	A130	Epoch Combination Rib Ball
EDEW	C44,C244	Inserts for ASR/IASR
EDMT	C44,C244	Inserts for ASR/IASR
EDMT	C74,C245	Inserts for ASR/IASR Multi
EDMT	C164,C252	Inserts for ASM/IASM
EDNW	C44,C244	Inserts for ASR/IASR
EDNW	C74,C245	Inserts for ASR/IASR Multi
EDT-○○-○○UNJ○-○.○-TH	B8	Epoch D Thread Mill, UNJ-Standard Thread type
EDT-NPT○○-○○-ATH	B12	Epoch D Thread Mill for NPT Threads
EDT-PT○○-○○-ATH	B12	Epoch D Thread Mill for PT Threads
EDT-U○○-○○.○-TH	B6	Epoch D Thread Mill, UN Screw Thread type
EDT○.○○-○○.○-TH	B7	Epoch D Thread Mill, Metric Screw Thread type
EGB2○○○-HD	A143	Epoch HD Coating Ball End Mill
EGDB2○○○-○○-HD	A140	Epoch HD Coating Deep Ball End Mill
EGDR2○○○-○○-○○-HD	A294	Epoch HD Coating Deep Radius End Mill
EGR2○○○-05-HD	A296	Epoch HD Coating Radius End Mill
EHHBE4○○○(-S○)-TH3	A119	Epoch High Hard Ball-TH3
EHHRE○○○○(-S○)-TH3	A290	Epoch High Hard Radius
EHSE○○.○-TH	F83	Epoch Hard Drills
EMBE3○○○(-S○)-ATH	A105	Epoch Mega Feed Ball Evolution, Straight type
EMBPE3○○○-○○○-○○-ATH	A106	Epoch Mega Feed Ball Evolution, Pencil neck
EMSBH○○○○-○○-ATH	F76	Epoch Micro Step Borer H
EMSBS○○○○-○○-□□	F70	Epoch Micro Step Borer S (Manufactured upon request only)
EMSBS○○○○-○○.○-SD	F68	Epoch Micro Step Borer S
EMSBS○○○○-○○.○-TH	F68	Epoch Micro Step Borer S
EMST○○○○-TH	F73	Epoch Micro Starter

Item code	Page	Product
EMXN4○○○-○○-○○-TH	A284	Epoch Mirus Type N, 4 flutes, Radius, Straight, 3DC
EMXN4○○○-SR-TH	A387	Epoch Mirus Type N, 4 flutes, Square, Semi long shank
EMXN4○○○-TH	A387	Epoch Mirus Type N, 4 flutes, Square, Straight
EMXR4○○○-○○-○○-TH	A283	Epoch Mirus Type R, 4 flutes, Radius, Straight
EMXR4○○○-SR-TH	A386	Epoch Mirus Type R, 4 flutes, Square, Semi long shank
EMXR4○○○-TH	A386	Epoch Mirus Type R, 4 flutes, Square, Straight
ENGU	C36,C244	Inserts for TD4N/ITD4N
ENMU	C36,C244	Inserts for TD4N/ITD4N
EPAB2○○○-SD	A137	Epoch SD(S-DLC) Ball
EPAS2○○○-SD	A429	Epoch SD(S-DLC) Square
EPBT2○○○(-○)	A88	Epoch TH Hard Ball
EPBTS2○○○-TH	A85	Epoch TH Hard Ball Strong
EPDB2○○○-○○-SD	A134	Epoch SD(S-DLC) Deep Ball
EPDBE2○○○-○○.○○-ATH	A54	Epoch Deep Ball Evolution, ATH Coating
EPDBE2○○○-○○.○○-PN	A57	Epoch Deep Ball Evolution, PN Coating
EPDBEH2○○○-○○.○○-(S6)-TH3	A32	Epoch Deep Ball Evolution Hard-TH3, Regular shank type
EPDBEH2○○○○-○.○○-ATH	F81	Epoch Deep Ball Evolution Hard
EPDBEH2○○○F-○○.○○ -TH3	A30	Epoch Deep Ball Evolution Hard-TH3, Short shank type
EPDBPE2○○○○-○○○.○-○○-ATH	A72	Epoch Pencil Deep Ball Evolution
EPDRE2○○○○-○○.○-○○○-ATH	A191	Epoch Deep Radius Evolution
EPDREH2○○○-○.○-○○○-TH3	A154	Epoch Deep Radius Evolution Hard-TH3, 2 Flutes
EPDREH4○○○-○.○-○○○-TH3	A156	Epoch Deep Radius Evolution Hard-TH3, 4 Flutes
EPDRF4○○○-○○-○○○-TH	A218	Epoch Deep Radius F
EPDS2○○○-○○-SD	A426	Epoch SD(S-DLC) Deep Square
EPDSE2○○○-○○.○-ATH	A301	Epoch Deep Square Evolution, ATH Coating
EPDSE2○○○-○○.○-PN	A304	Epoch Deep Square Evolution, PN Coating
EPHW	C87,C245	Inserts for RH2P/IRH2P
EPMT	C74,C245	Inserts for ASR/IASR Multi
EPNW	C44,C244	Inserts for ASR/IASR
EPNW	C74,C245	Inserts for ASR/IASR Multi
EPP3○○○-CS	A328	Epoch CS Power Mill 3flutes, Regular
EPP4○○○	A369	Epoch Power Mill, Regular
EPP4○○○-○○	A267	Epoch Power Mill, Regular, Corner radius
EPP4○○○-○○-TH	A264	Epoch TH Power Mill, Corner radius
EPP4○○○-CS	A362	Epoch CS Power Mill, Regular
EPP4○○○-P-CS	A362	Epoch CS Power Mill, SHARP EDGE Regular
EPP4○○○-TH	A355	Epoch TH Power Mill, Regular
EPPL4○○○	A370	Epoch Power Mill, Long
EPPL4○○○-○○	A267	Epoch Power Mill, Long, Corner radius
EPPL4○○○-TH	A355	Epoch TH Power Mill, Long
EPPLS4○○○	A370	Epoch Power Mill, Long shank
EPPLS4○○○-○○	A268	Epoch Power Mill, Long Shank, Corner radius
EPPM4○○○	A370	Epoch Power Mill, Medium
EPPM4○○○-TH	A355	Epoch TH Power Mill, Medium
EPPS4○○○	A369	Epoch Power Mill, Short
EPPS4○○○-P-CS	A362	Epoch CS Power Mill, SHARP EDGE Short
EPPS4○○○-TH	A355	Epoch TH Power Mill, Short
EPSF4○○○-PN	A331	Epoch SUS Finish, Regular
EPSFL4○○○-PN	A331	Epoch SUS Finish, Long
EPSFM4○○○-PN	A331	Epoch SUS Finish, Medium
EPSM4○○○-○○.○-PN	A335	Epoch SUS Multi, Under neck 3DC

Item code	Page	Product
EPSM4○○○-○○○-R○.○-PN	A250	Epoch SUS Multi, Under neck 5DC, Radius type
EPSM4○○○-○○○.○-PN	A336	Epoch SUS Multi, Under neck 5DC
EPSM4○○○-PN	A332	Epoch SUS Multi, Regular
EPSM4○○○-R○.○-PN	A249	Epoch SUS Multi, Regular, Radius type
EPSML4○○○-PN	A333	Epoch SUS Multi, Long
EPSMLS4○○○-PN	A334	Epoch SUS Multi, Long shank
EPSMM4○○○-PN	A333	Epoch SUS Multi, Medium
EPSW○○○○-○○-PN	A414	Epoch SUS Wave, Under neck 3DC type
EPSW○○○○-○○○-PN	A415	Epoch SUS Wave, Under neck 5DC type
EPSW○○○○-PN	A412	Epoch SUS Wave, Regular
EPSWL4○○○-PN	A413	Epoch SUS Wave, Long
ER5HS○○-PN	A280	End mill for adaptive milling
ER8WB○○○○LN(LS)-○○-R○○-ATH	A275	8-flutes End Mill for Vertical Wall/Bottom Face Finishing, Radius
ES8WB○○○○LN(LS)-○○-ATH	A383	8-flutes End Mill for Vertical Wall/Bottom Face Finishing , Square
ESHB2○○○-H-TH	A102	Epoch Shrink Master Ball, High-accuracy rating product
ESHB2○○○-N-TH	A102	Epoch Shrink Master Ball, Standard rating product
ET-(U)○○.○○-○○.○-PN	B2	Epoch Thread Mill
ETM4○○○-○○-TH	A223	Epoch Turbo Mill, Straight neck
ETMLN4○○○-○○○-○○-TH	A223	Epoch Turbo Mill, Long neck
ETMP4○○○-○○○-○○-TH	A234	Epoch Turbo Mill, Pencil neck
ETR4○○○○-○○-○○-TH	A227	Epoch Turbo Rib, Straight neck
ETRP4○○○○-○○-○○○○-TH	A228	Epoch Turbo Rib, Pencil neck
G		
GF1□20○○M-○-M○○	E5	GALLEA GF1
GF2T30○○M-○	E8	GALLEA GF2T
GF3L○○M-3-M○○	E11	GALLEA GF3L
GP1LB○○M-M○○	E14	GALLEA GP1LB
GP1T○M-M○○	E17	GALLEA GP1T
GS4TN○○.○○-○○.○○R-TH3	E2	GALLEA GS4TN

Item Code Index

Item code	Page	Product
H		
HGFB2○○○-TH	A99	Global Forging Ball
HGOB2○○○-TH	A92	Epoch Global Series Ball
HGOB2○○○(-○)-PN	A91	Epoch Global Series Ball, Panacea
HGOF2○○○-○○-TH	A243	Epoch G Turbo, 2 Flutes
HGOF4○○○-○○-TH	A243	Epoch G Turbo, 4 Flutes
HGOR4○○○-○○-TH	A247	Epoch G Radius
HGOS2○○○-PN	A319	Epoch G Square, 2 Flutes Panacea
HGOS4○○○-PN	A320	Epoch G Square, 4 Flutes Panacea
HGOSH4○○○-TH	A325	Epoch G Square, 4 Flutes TH Coating
I		
IABP4F16S16-○-○	C157	Ball Precision Multi Flutes ABP4F, Steel shank (Inch)
IABP4F16S16W-○-○	C156	Ball Precision Multi Flutes ABP4F, Carbide shank (Inch)
IABP4FM16	C158	Ball Precision Multi Flutes ABP4F, Modular shank (Inch)
IABPF○○S○○(L)	C132	Ball Precision F ABPF, Steel shank type (Inch)
IABPF○○S○○W(R/L)	C134	Ball Precision F ABPF, Carbide shank type (Inch)
IABPFM○○	C136	Ball Precision F ABPF, Modular type (Inch)
IABPFN○○S○○(W)-○.○-○.○○	C146	Ball Precision F ABPFN, Shank type (inch)
IABPFNM○○	C148	Ball Precision F ABPFN, Modular type (inch)
IAHU1516R-2	C175	High Feed End Mill AHU, Shank type (Inch)
IAHUB15○○R-○	C176	High Feed End Mill AHU, Bore type (Inch)
IAR□○○R	C90	Easy Cut Radius Mill AR, Shank type (Inch)
IARB○○○○R	C92	Easy Cut Radius Mill AR, Bore type (Inch)
IARPF○○S○○(□/□□)	C118	Radius Precision ARPF, Shank type (Inch)
IARPFM○○	C121	Radius Precision ARPF, Modular type (Inch)
IASC○.○○○-M○○-○-○(Z)	D4	The Shanks for Modular Mill (inch)
IASDF50○○R-○U	C232	Dual Face Mill ASDF (Inch)
IASF5○○○R	C238	Face Mill ASF (Inch)
IASM(L)07○○S○○R-○	C162	Super Excellent Mini ASM, Shank type (Inch)
IASMM07○○R-○	C163	Super Excellent Mini ASM, Modular type (Inch)
IASPVB2○○○R(M)-○	C206	Polish Mill V type ASPV, Bore type (Inch)
IASPVM20○○R-○	C205	Polish Mill V type ASPV, Modular type (Inch)
IASPVS2○○○R-○	C204	Polish Mill V type ASPV, Shank type (Inch)
IASR□○○○○R	C40	Radius Mill ASR, Shank type (Inch)
IASR□20○○R-○	C72	Radius Mill ASR Multi-flutes, Shank type (Inch)
IASR○○○○-○	C42	Radius Mill ASR, Bore type (Inch)
IASR20○○R-○	C73	Radius Mill ASR Multi-flutes, Bore type (Inch)
IASRF□30○○R-○	C64	Radius Mill 4 Corners ASRF mini, Shank type (Inch)
IASRF40○○-○	C57	Radius Mill 4 Corners ASRF, Bore type (Inch)
IASRFB30○○R-○	C66	Radius Mill 4 Corners ASRF mini, Bore type (Inch)
IASRFM30○○R-○-M1○	C65	Radius Mill 4 Corners ASRF mini, Modular type (Inch)
IASRFS402○R	C56	Radius Mill 4 Corners ASRF, Shank type (Inch)
IASRT○○○○R-○	C49	Radius Mill 3 Corners ASRT, Bore type (Inch)
IEMXR4○○○-TH	A386	Epoch Mirus Type R, 4 flutes, Square, Straight, Inch

Item code	Page	Product
IRH2P1○○○M-○	C87	High Hard Radius Mill RH2P, Modular type (Inch)
IRH2P1○○○S-○	C86	High Hard Radius Mill RH2P, Shank type (Inch)
IRV4B○○○R-○	C111	Radius Milll RV, Bore type (Inch)
ITD4N20○○□-○	C34	Radius Mill TD4N, Shank type (Inch)
ITD4N20○○B-6	C35	Radius Mill TD4N, Bore type (Inch)
ITD4N20○○M-○	C35	Radius Mill TD4N, Modular type (Inch)
ITR4D40○○B-○(-1.25)	C28	Radius Mill TR4D, Bore type (Inch)
ITR4F○○○○B-○○(-1.25)	C10	Radius Mill TR4F, Bore type (Inch)
ITR4F40○○□-○	C8	Radius Mill TR4F, Shank type (Inch)
ITR4F40○○M-○	C9	Radius Mill TR4F, Modular type (Inch)
IZCFG	C123,C246	Inserts for IARPF
IZCFW	C123,C248	Inserts for IARPF
IZDFG	C138,C250	Inserts for IABPF
IZDFG	C149,C252	Inserts for IABPFN
IZDFG	C159,C252	Inserts for IABP4F
IZPFG	C138,C249	Inserts for IABPF
JDMT	C164,C252	Inserts for ASM/IASM
JDMT	C177,C252	Inserts for AHU/IAHU
M		
MPHT	C191,C253	Inserts for ASPVmini
MPHW	C207,C253	Inserts for ASPV/IASPV
MPNW	C207,C253	Inserts for ASPV/IASPV
N		
NSBH○○○○-○○○-ATH	F48	Carbide Oil Hole Non Step Borer H for High Hardness Material
P		
P-37	D10	Screw anti-seizure agent

Item code	Page	Product
R		
RDHW	C95,C245	Inserts for AR/IAR
RDMT	C95,C245	Inserts for AR/IAR
RDMW	C95,C245	Inserts for AR/IAR
RH2P1○○○M-○	C87	High Hard Radius Mill RH2P, Modular type (Metric)
RH2P1○○○S(○○)-○	C86	High Hard Radius Mill RH2P, Shank type (Metric)
RPET	C112,C246	Inserts for RV/IRV
RPHT	C112,C246	Inserts for RV/IRV
RPMT	C112,C246	Inserts for RV/IRV
RV○B○○○R(M)-○	C111	Radius Milll RV, Bore type (Metric)
RV○M○○○R-○	C110	Radius Milll RV, Modular type (Metric)
RV○S○○○R-○	C110	Radius Milll RV, Shank type (Metric)
S		
SCE6○○○-R○.○○	A297	Ceramic End Mill, Corner Radius Type
SDEW	C239,C253	Inserts for ASF/IASF
SDMT	C12,C244	Inserts for TR4F/ITR4F
SDMT	C29,C244	Inserts for TR4D/ITR4D
SDMT	C58,C245	Inserts for ASRF/IASRF
SDMT	C239,C253	Inserts for ASF/IASF
SDNW	C12,C244	Inserts for TR4F/ITR4F
SDNW	C29,C244	Inserts for TR4D/ITR4D
SDNW	C58,C245	Inserts for ASRF/IASRF
SDNW	C239,C253	Inserts for ASF/IASF
SNGU	C234,C253	Inserts for ASDF/IASDF
SNMU	C234,C253	Inserts for ASDF/IASDF
SPMT	C67,C245	Inserts for ASRF/IASRF mini
SPNW	C67,C245	Inserts for ASRF/IASRF mini
STB○○○□-ATH	F86	External coolant type
STBH○○○□-ATH	F85	Step Borer, Internal coolant type
T		
TD4N20○○□(32)-○	C34	Radius Mill TD4N, Shank type (Metric)
TD4N20○○M-○	C35	Radius Mill TD4N, Modular type (Metric)
TPHW	E11,C242	Inserts for GF3L
TR4D4○○○BM-○	C28	Radius Mill TR4D, Bore type (Metric)
TR4F○○□32-○	C8	Radius Mill TR4F, Shank type (Metric)
TR4F○○○○B□-○	C11	Radius Mill TR4F, Bore type (Metric)
TR4F40○○M-○	C9	Radius Mill TR4F, Modular type (Metric)

Item code	Page	Product
W		
WDNT	C50,C245	Inserts for ASRT/IASRT
WDNW	C50,C245	Inserts for ASRT/IASRT
X		
XPHW	E5,C242	Inserts for GF1
Y		
YPHW	E5,C242	Inserts for GF1
YPHW	E8,C242	Inserts for GF2T
Z		
ZCFG	C123,C246	Inserts for ARPF
ZCFW	C127,C249	Inserts for ARPF
ZDFG	C139,C250	Inserts foe ABPF
ZDFG	C149,C252	Inserts for ABPFN
ZDFG	C159,C252	Inserts for ABP4F
ZDHW	E17,C242	Inserts for GP1T
ZPB○○○○-TH	F89	Z Plunging Borer, Regular
ZPBLS○○○○-TH	F91	Z Plunging Borer, Long shank
ZPFG	C139,C250	Inserts foe ABPF
ZPHW	E14,C242	Inserts for GP1LB

Item code	Page	Product
0		
02WNSB○○○○-TH	F40	Carbide Non Step Borer 2D
03WHMB○○○○-TH	F63	MINIATURE DRILL WHMB
03WHNSB○/○○X○○.○-TH	F19	Carbide Oil Hole Non Step Borer 3D (Inch)
03WHNSB○○○○-SD	F44	Carbide Oil Hole Non Step Borer for Aluminium (3D)
03WHNSB○○○○-TH	F18	Carbide Oil Hole Non Step Borer 3D (Metric)
04WNSB○○○○-TH	F41	Carbide Non Step Borer 4D
05WHMB○○○○-TH	F63	MINIATURE DRILL WHMB
05WHNSB○○○○-SD	A45	Carbide Oil Hole Non Step Borer for Aluminium (5D)
05WHNSB○○○○-TH	F20	Carbide Oil Hole Non Step Borer 5D
08WHNSB○○○○-TH	F23	Carbide Oil Hole Non Step Borer 8D
08WHSR○○○○-ATH	F55	Carbide Drill for SR machining
1		
100-143	D8	Screw
100-174	D8	Screw
100-175	D8	Screw
100-176	D8	Screw
100-177	D8	Screw
100-178	D8	Screw
100-179	D8	Screw
100-180	D8	Screw
100-183	D8	Screw
100-211	D8	Screw
100-212	D8	Screw
100-213	D8	Screw
100-221	D10	Wrench
101-T25S	D10	Wrench
104-T10	D10	Screw driver
104-T15	D10	Screw driver
104-T6	D10	Screw driver
104-T7	D10	Screw driver
104-T8	D10	Screw driver
105-T15	D10	Wrench
105-T20	D10	Wrench
105-T20L	D10	Wrench
105-T30A	D10	Wrench
10WHMB○○○○-TH	F63	MINIATURE DRILL WHMB
10WHNSB○/○○X○. -TH	F27	Carbide Oil Hole Non Step Borer 10D (Inch)
10WHNSB○○○○-TH	F26	Carbide Oil Hole Non Step Borer 10D (Metric)
155-158	D7	Screw
155-159	D7	Screw
155-160	D7	Screw
156-161	D8	Screw
15WHMB○○○○-TH	F63	MINIATURE DRILL WHMB

Item code	Page	Product
15WHNSB○○○○-SD	F46	Carbide Oil Hole Non Step Borer for Aluminium (15D)
15WHNSB○○○○-TH	F28	Carbide Oil Hole Non Step Borer 15D
176-121	D6	Wedge
2		
200-150	D8	Screw
20WHMB○○○○-TH	F63	MINIATURE DRILL WHMB
20WHNSB○/○○X○○.○-TH	F30	Carbide Oil Hole Non Step Borer 20D (Inch)
20WHNSB○○○○-SD	F46	Carbide Oil Hole Non Step Borer for Aluminium (20D)
20WHNSB○○○○-TH	F29	Carbide Oil Hole Non Step Borer 20D (Metric)
20WHSR○○○○-ATH	F55	Carbide Drill for SR machining
215-192	D8	Clamp piece
223-141	D7	Screw
240-140	D7	Screw
242-141	D7	Screw
250-140	D7	Screw
250-141	D7	Screw
251-141	D7	Screw
25WHMB○○○○-TH	F63	MINIATURE DRILL WHMB
25WHNSB○○○○-SD	F46	Carbide Oil Hole Non Step Borer for Aluminium (25D)
25WHNSB○○○○-TH	F31	Carbide Oil Hole Non Step Borer 25D
261-140	D7	Screw
262-141	D7	Screw
262-142	D7	Screw
263-141	D7	Screw
265-141	D7	Screw
265-143	D7	Screw
3		
30WHMB○○○○-TH	F63	MINIATURE DRILL WHMB
30WHNSB○/○○X○○.○-TH	F33	Carbide Oil Hole Non Step Borer 30D (Inch)
30WHNSB○○○○-SD	F46	Carbide Oil Hole Non Step Borer for Aluminium (30D)
30WHNSB○○○○-TH	F32	Carbide Oil Hole Non Step Borer 30D (Metric)
30WHSR○○○○-ATH	F55	Carbide Drill for SR machining
351-111	D6	Locater

Item code	Page	Product
4		
40WHNSB○○○○-TH	F36	Carbide Oil Hole Non Step Borer 40D
412-141	D7	Screw
5		
501-161	D7	Screw
50WHNSB○○○○-TH	F37	Carbide Oil Hole Non Step Borer 50D
555-141	D7	Screw
581-140	D7	Screw
581-141	D7	Screw
581-142	D7	Screw
581-143	D7	Screw
581-144	D7	Screw
581-145	D7	Screw
581-146	D7	Screw
581-147	D7	Screw
581-149	D7	Screw
581-150	D7	Screw
581-151	D7	Screw
581-152	D7	Screw
7		
715-201	D9	Spring

About safety when using cutting tool products

1. When using cutting tool products

In accordance with the Product Liability Law (PL) enforced on July 1, 1995 in Japan, our company has attached warning labels and caution labels to the packaging of our applicable products.
However, there are no specific caution notes, etc. displayed on the tools themselves. Before handling or using any cutting tool or cutting tool material, please read the sections "About safety when using cutting tool products" and "Cautions regarding the use of cutting tools" in this catalog. In addition, please teach the information stated in these sections to all workers as part of the safety education at your company.

2. Basic characteristics of cutting tool materials

Meanings of words used in this catalog

Cutting tool materials: General terms such as carbide alloy, cermet, ceramics, sintered CBN, sintered diamond, HSS, alloy steel, etc.

Physical characteristics

Appearance: Varies depending on material properties and material type. Example: Gray, black, gold, etc.
Odor : Odorless
Hardness : Carbide alloy, cermet: 5 to 30GPaHV; Ceramic: 10 to 40GPaHV; Sintered CBN: 20 to 50GPaHV; Sintered diamond: 80 to 120GPaHV; HSS: 2 to 12GPaHV; Alloy steel: 2 to 12GPaHV
Specific gravity: Carbide alloy: 9 to 16; Cermet: 5 to 9; Ceramic: 2 to 7; Sintered CBN: 3 to 5; Sintered diamond: 3 to 5; HSS: 7 to 9; Alloy steel: 7 to 9

Composition

Including carbides, nitrides, and sulfides of W, Ti, Al, Si, Ta, Nb, B, V, etc. as well as metal components of Fe, Co, Ni, Cr, Mo, etc.

3. Cautions regarding the handling of cutting tool materials

◇ Cutting tool materials have the characteristics of being extremely hard yet brittle. Therefore, they may be broken by impact or by overtightening.
◇ Since carbide tool materials have high specific gravities, be careful to handle large products or large quantities as heavy materials.
◇ The thermal expansion of carbide tool materials is different from that of metal materials. Because of this, for shrink-fit or cooling-fit products, if the usage temperature is slightly higher (lower) than the specified temperature, cracking may occur.
◇ If cutting tool materials become corroded due to cutting fluid, lubricating agents, or other moisture, their strength will be reduced. Care should be taken regarding storage conditions.

4. Cautions regarding machining of cutting tool products (materials)

◇ For carbide tool materials, the strength may be slightly reduced due to the surface conditions. For finishing, always use a diamond grinder.
◇ When cutting tool materials are ground or heated, dust or mist (smoke) occurs. If a lot of it is inhaled, swallowed, or comes in contact with the eyes or skin, it could result in injury to the body. When machining, be careful to avoid exposing your body to the dust or mist; it is recommended that localized ventilation equipment be used and that a protective mask, protective goggles, and protective gloves be worn. In addition, if the dust, etc. comes in contact with your hands, wash them thoroughly with soap and water.
Do not drink or eat in the work area, and wash your hands before drinking or eating.
Dust on clothes should not be shaken out; use a vacuum, etc. to remove the dust or wash the clothes in a washing machine.
If the cobalt contained in the cutting tool material is touched repeatedly or over a long period of time, it has been reported that it may affect the skin, respiratory organs, or heart, etc.
◇ When performing wet machining of carbide tool materials or brazed tool, the cutting fluid may contain heavy metals and must be disposed of properly.
◇ When a cutting tool product has been reground, check that there are no cracks after regrinding.
◇ If a laser or electric pen, etc. is used to mark carbide tool material or products, cracks may form.
Do not mark sections which may be subject to stress.

Precaution for using cutting tools

ITEM	Caution	Counter plan
General Cutting Tools	Direct touch to the sharp cutting edge may cause injury.	When you set up them to the machine or take them out of the case, please wear protective gloves.
	Misuse or mismatch of working conditions may cause tool breakage or dispersion of broken pieces.	1. Please equip safety items, such as safety glasses and protective gloves. 2. Please use them in the area of our recommended cutting condition. (See our catalog or instruction.)
	Excess impact or heavy wear will increase cutting resistance and may cause tool breakage and dispersion of broken pieces.	1. Please equip safety items, such as safety glasses and protective gloves. 2. Please change tools a bit early for its tool life.
	Dispersion of hearted or prolonged chips may cause injury or burn.	1. Please equip safety items, such as safety glasses and protective gloves. 2. When you get rid of chips, please stop machining at first, and equip protective items before doing it.
	During cutting operation, cutting tools get very hot. Direct touch to tools immediately after operation may cause burn.	Please equip safety items, such as safety glasses and protective gloves.
	Sparks, generation of heat or chips in high temperature during operation may cause fire.	1. Please don't operate around "Danger Zone", in which area there is some fear of fire or explosion. 2. When oil-coolant is used, please be sure to be enough system for fire-prevention around there.
	Lack of dynamic balance in high-speed revolution cause vibration and tool-broken.	1. Please equip safety items, such as safety glasses and protective gloves. 2. Please operate test-run before cutting, and confirm that there is no vibration or unusual sound.
	Direct contact to the rough surface on the work may cause injury.	Please don't touch work materials with bear hand.
	The cutting conditions in this catalog shown in the table above are reference cutting conditions, and should be adjusted according to the actual shape to be machined, the machine used, and purpose for machining.	
Indexable Cutting Tools	When inserts or parts are not clamped well, falling off or dispersion may occur and cause injury.	1. Please clean up the insert pocket or fastening parts before setting insert. 2. Please set up the inserts with supplied wrench only, and confirm that the inserts or parts are clamped completely.
	When clamped too tight by supplementary tools like pipe etc, inserts or body may be broken.	Please set up them with supplied wrench only.
	When indexable tools are used in high-speed revolution or parts may burst out of the body due to centrifugal force.	Please use them in the area of our recommended cutting condition. (See our catalog or instruction.)
Milling Cutters and Other Milling Tools	Since milling cutters have sharp edges, direct contact with bare hands may cause injury.	Please equip safety items, such as safety glasses and protective gloves.
	If cutter lacks dynamic balance, tool breakage or dispersion of broken pieces may occur by vibration.	1. Please use them in the area of our recommended cutting condition. (See our catalog or instruction.) 2. Rotating portion and dynamic balancing should be periodically checked to prevent from eccentric rotation or run out due to wear of bearing portion.
Drills	When drilling through hole with turning work, a kind of disk(reminder parts) sometimes flies out from the end of frilling very fast. It's very dangerous since the disc has sharp edge.	Please equip safety items, such as safety glasses, protective gloves and covers at the chucking.
	Some micro drills have sharp edge with the top. Direct touch to tools may cause injury.	Please equip safety items, such as safety glasses and protective gloves.
Brazed Tools	Dispersion of broken inserts by tools breakage or falling off body may cause injury.	1. Please confirm if they are firmly brazed. 2. Please don't use brazed tools in the condition that requires high cutting temperature.
Others	When brazing is carried out again and again, the strength of carbide insert is deteriorated and becomes easy to be broken during cutting.	Carbide tools which is brazed several times should not be used because its strength has deteriorated.
	It is dangerous to use tools except for the fixed application. It may cause damage of tool and machine.	Please use them in the area of our recommended cutting condition. (See our catalog or instruction.)

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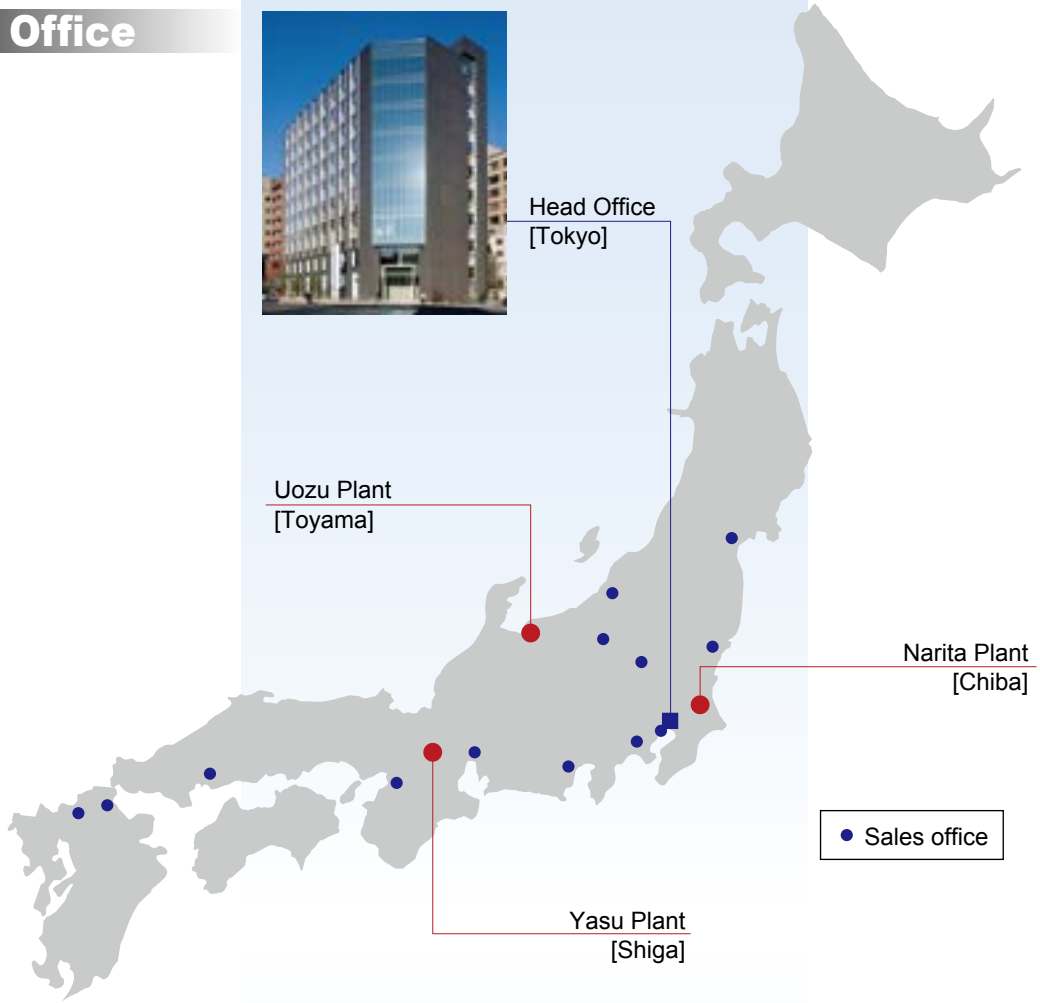
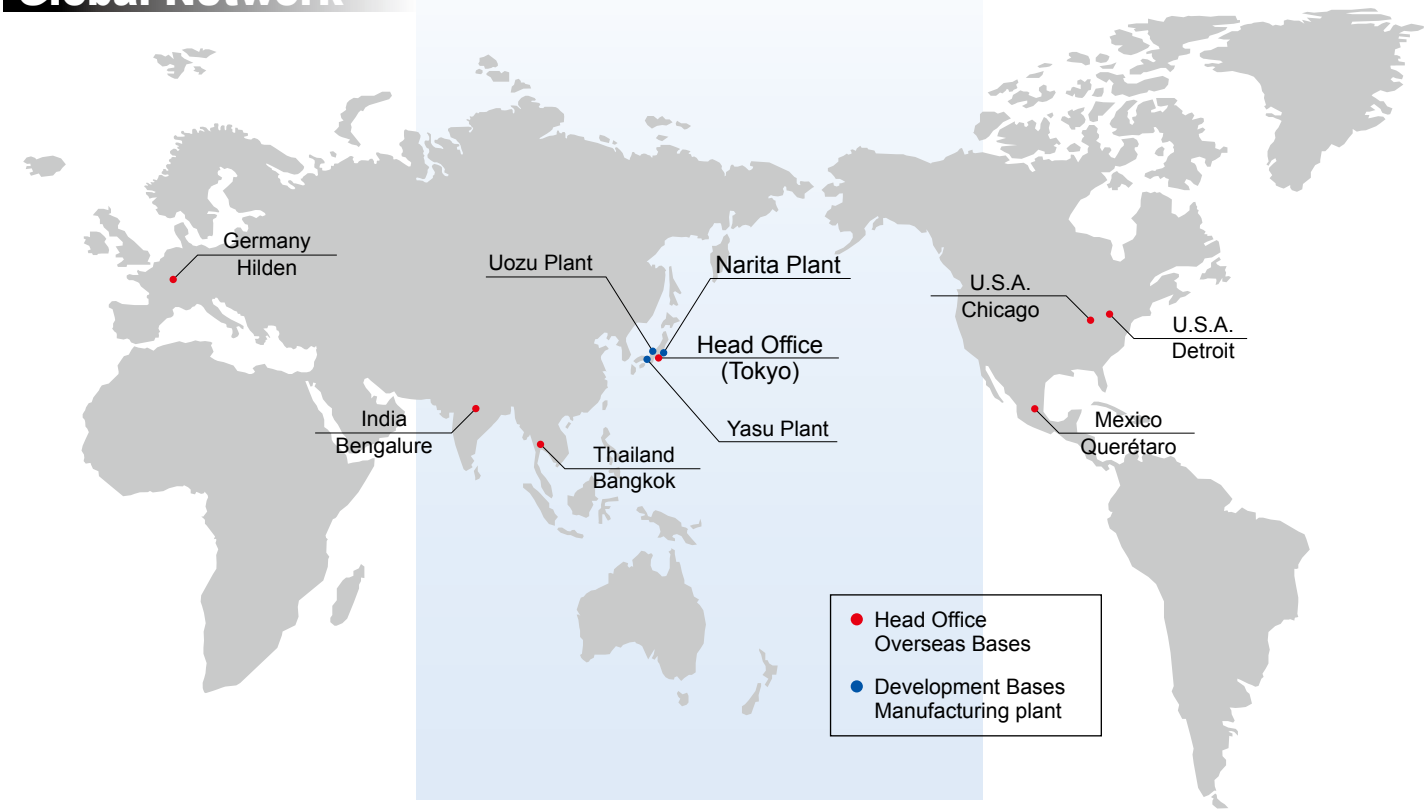


Global Network



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The diagrams and table data are examples of test results, and are not guaranteed values.
Specifications for the products listed in this catalog are subject to change without notice due to replacement or modification.

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