
# SOLID CARBIDE & INDEXABLE TOOLS

ENHANCED PRODUCTIVITY THROUGH ADVANCED ENGINEERING

Mitsubishi Hitachi Tool Engineering, Ltd.

# Mitsubishi Hitachi Tool Engineering, Ltd.

The steady rise in competitiveness in the manufacturing sector has accelerated in the past decade. In this environment, manufacturers that fail to increase productivity will cease to be in business. Through advanced engineering, Mitsubishi Hitachi Tool's Indexable and Solid Carbide Cutting Tools have helped our customers to increase efficiency, move to the forefront of their industries and, most importantly, remain profitable.

Innovations in substrates, cutting geometries and coatings allow our products to expand the limits of your machine's potential. Our indexable tools have raised metal removal rates to previously unattainable levels. Our sub-micrograin carbide tools effortlessly perform operations in hardened steels that could in the past only be achieved by costly EDM (Electrical Discharge Machining). Our cutting tools feature the highest precision of any cutting tool manufacturer.

Our dedication to Advanced Engineering will keep you on the cutting edge of manufacturing.

## ENHANCED PRODUCTIVITY THROUGH ADVANCED ENGINEERING.


### INDEXABLE TOOLS

**PAGES 3-165**

### SOLID CARBIDE TOOLS

**PAGES 166-344**

# APPLICATION TOOL LIST

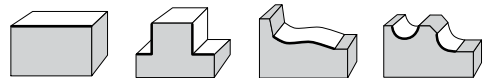
## NEW ITEMS

### IABPFN/ABPFN

L ▼▼▼ HRC


PAGE 10

| | | 0” – 10” |
|---|---|---|
| Shank Style | SIZE RANGE PROJECTION | 0.25” - 1.0” / 4.0” - 6.0” |
| Modular Style | SIZE RANGE PROJECTION | 0.375” - 1.0” / 2.0” - 7.0” |

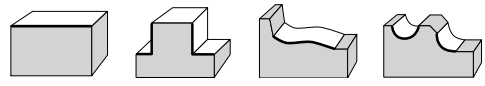


### IABPS/ABPS

L ▼▼▼ $

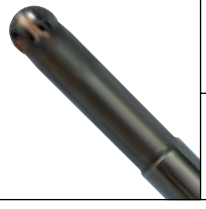

PAGE 22

| | | 0” – 10” |
|---|---|---|
| Shank Style | SIZE RANGE PROJECTION | 0.312” - 1.0” / 1.25” - 4.0” |



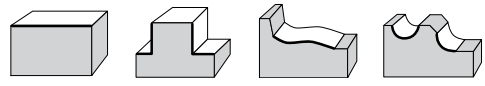
### ABP4F

L ▼▼▼ HRC



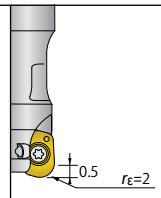

PAGE 28

| | | 0” – 10” |
|---|---|---|
| Shank Style | SIZE RANGE PROJECTION | 0.787” - 1.181” (20mm - 30mm) / 2.36” - 6.00” |



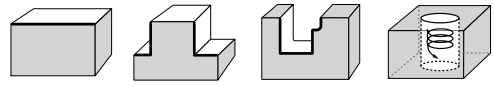
### IRH2P/RH2P

L ▼▼▼ HRC




PAGE 34

| | | 0” – 10” |
|---|---|---|
| Shank Style | SIZE RANGE PROJECTION | 0.375” - 1.25” / 3.0” - 5.5” |
| Modular Style | SIZE RANGE PROJECTION | 0.375” - 1.25” / 2.0” - 7.0” |



Multi Flute

High Feed Type

$ Economical Type

A&E Aerospace & Energy Machining

RADIUS 3.0 Programming Radius

L Long Projection

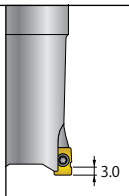
▼▼▼ High Precision

HRC High-Hardened Machining

# NEW ITEMS

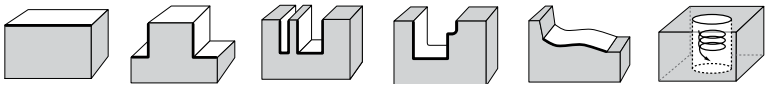
## IASPV/ASPV

L ▼▼▼ HRC



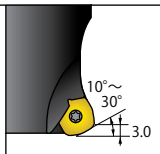

PAGE 39

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.0” - 2.5” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style | SIZE RANGE | 0.625” - 1.5” | |
| | PROJECTION | 1.25” - 2.0” | |
| Modular Style | SIZE RANGE | 0.625” - 1.5” | |
| | PROJECTION | 2.0” - 7.0” | |



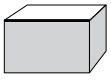
## IASDF

$ RADIUS 6.0



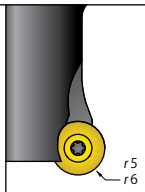

PAGE 49

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.5” - 6.0” | |
| | PROJECTION | 2.0” - 6.0” | |



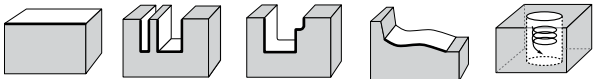
## IRV/RV

A&E L




PAGE 53

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 1.5” - 3.0” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style | SIZE RANGE | 1.0” - 1.5” | |
| | PROJECTION | 5.5” - 6.0” | |
| Modular Style metric only | SIZE RANGE | 1.0” - 1.5” | |
| | PROJECTION | 2.0” - 7.0” | |

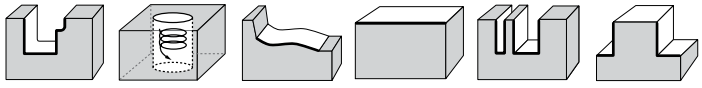


## IAHU/AHU

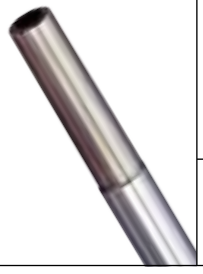
L A&E


PAGE 62

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.0” - 4.0” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style metric only | SIZE RANGE | 0.984” - 1.575” | |
| | PROJECTION | 1.0” - 4.0” | |
| Modular Style metric only | SIZE RANGE | 0.984” - 1.260” | |
| | PROJECTION | 5.5” - 7.0” | |



## MODULAR SHANK

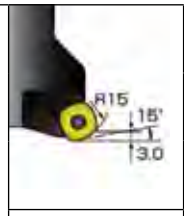


PAGE 163

| | | 0” | 10” |
|---|---|---|---|
| Modular Style | SIZE RANGE | 0.25” - 1.5” | |
| | PROJECTION | 3.0” - 8.0” | |

# FACE MILLING APPLICATION

## IASF/ASF




| | | 0” | 10” |
|---|---|---|---|
| **Face Mill Style** | SIZE RANGE | 2.5” - 10.0” | |
| | PROJECTION | 4.0” - 8.0” | |

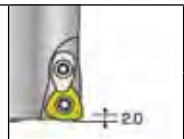
PAGE 70

## IASRF


| | | 0” | 10” |
|---|---|---|---|
| **Face Mill Style** | SIZE RANGE | 2.0” - 4.0” | |
| | PROJECTION | 2.0” - 6.0” | |
| **Shank Style** | SIZE RANGE | 1.25” - 1.5” | |
| | PROJECTION | 1.75” - 2.75” | |

PAGE 80

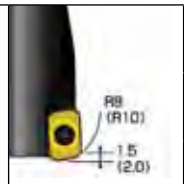
## IASRT




| | | 0” | 10” |
|---|---|---|---|
| **Face Mill Style** | SIZE RANGE | 2.0” - 4.0” | |
| | PROJECTION | 2.0” - 6.0” | |

PAGE 84

## IASR/ASR MULTI




| | | 0” | 10” |
|---|---|---|---|
| **Face Mill Style** | SIZE RANGE | 2.0” - 2.5” | |
| | PROJECTION | 2.0” - 6.0” | |
| **Shank Style** | SIZE RANGE | 0.625” - 1.5” | |
| | PROJECTION | 2.0” - 5.0” | |
| **Modular Style** metric only | SIZE RANGE | 0.630” - 1.575” | |
| | PROJECTION | 2.0” - 7.0” | |

PAGE 88

Multi Flute

High Feed Type

Economical Type

A&E Aerospace & Energy Machining

RADIUS 3.0 Programming Radius

L Long Projection

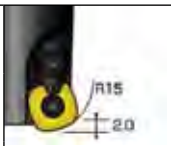
High Precision

HRC High-Hardened Machining

# POCKET MILLING APPLICATION

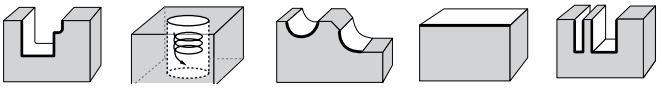
## IASRF

RADIUS 4.5



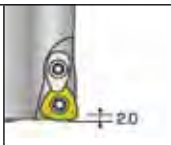

PAGE 80

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.0” - 4.0” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style | SIZE RANGE | 1.25” - 1.5” | |
| | PROJECTION | 1.75” - 2.75” | |



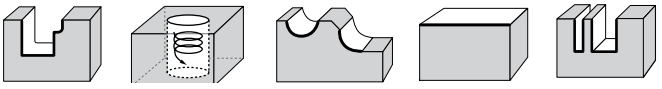
## IASRT

RADIUS 3.0




PAGE 84

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.0” - 4.0” | |
| | PROJECTION | 2.0” - 6.0” | |

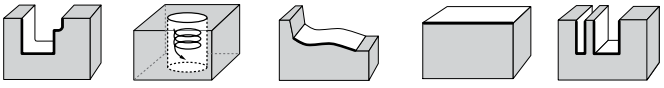


## IASR/ASR MULTI

L RADIUS 2.0


PAGE 88

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.0” - 2.5” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style | SIZE RANGE | 0.625” - 1.5” | |
| | PROJECTION | 2.0” - 5.0” | |
| Modular Style metric only | SIZE RANGE | 0.630” - 1.575” | |
| | PROJECTION | 2.0” - 7.0” | |

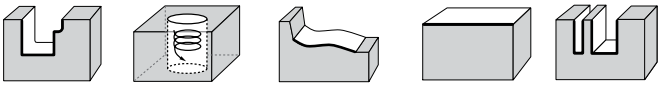


## IASR/ASR

L RADIUS 3.0


PAGE 104

| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2.0”- 4.0” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style | SIZE RANGE | 0.75”-1.5” | |
| | PROJECTION | 2.0” - 7.0” | |
| Modular Style metric only | SIZE RANGE | 0.787”-1.575” | |
| | PROJECTION | 2.0” - 7.0” | |

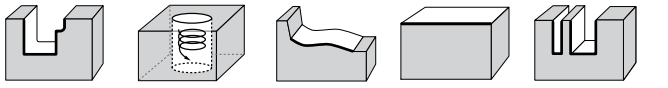


## IAR/AR

$


PAGE 129

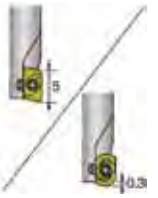
| | | 0” | 10” |
|---|---|---|---|
| Face Mill Style | SIZE RANGE | 2” | |
| | PROJECTION | 2.0” - 6.0” | |
| Shank Style | SIZE RANGE | 1.25” - 1.5” | |
| | PROJECTION | 1.75” - 2.75” | |
| Modular Style metric only | SIZE RANGE | 0.787”-1.575” | |
| | PROJECTION | 2.0” - 7.0” | |



# POCKET MILLING APPLICATION

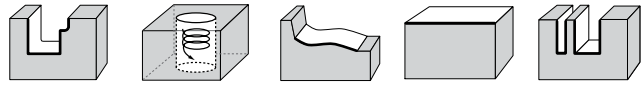
## IASM/ASM

L



PAGE 122

| | | 0” | 10” |
|---|---|---|---|
| **Shank Style** | SIZE RANGE | 0.375” - 0.75” | |
| | PROJECTION | 0.75” - 4.0” | |
| **Modular Style** metric only | SIZE RANGE | 0.394” - 0.787” | |
| | PROJECTION | 1.75” - 7.0” | |



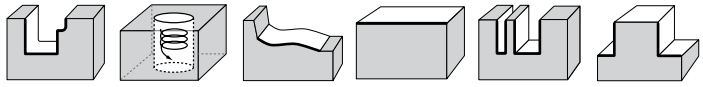
# SIDE MILLING APPLICATION

## IAHU/AHU

L A&E

PAGE 62

| | | 0” | 10” |
|---|---|---|---|
| **Face Mill Style** | SIZE RANGE | 1.969” - 3.937” | |
| | PROJECTION | 2.0” - 6.0” | |
| **Shank Style** | SIZE RANGE | 0.984” - 1.575” | |
| | PROJECTION | 1.0” - 4.0” | |
| **Modular Style** | SIZE RANGE | 0.984” - 1.260” | |
| | PROJECTION | 5.5” - 7.0” | |



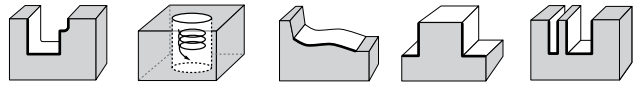
# FINISHING APPLICATION

## IARPF/ARPF

L HRC

PAGE 139

| | | 0” | 10” |
|---|---|---|---|
| **Shank Style** | SIZE RANGE | 0.375” - 1.0” | |
| | PROJECTION | 2.0” - 5.0” | |
| **Modular Style** metric only | SIZE RANGE | 0.787” - 0.984” | |
| | PROJECTION | 2.0” - 7.0” | |

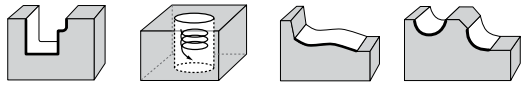


## IABPF/ABPF

L HRC

PAGE 151

| | | 0” | 10” |
|---|---|---|---|
| **Shank Style** | SIZE RANGE | 0.313” - 1.0” | |
| | PROJECTION | 2.0” - 7.0” | |
| **Modular Style** metric only | SIZE RANGE | 0.787”- 0.984” | |
| | PROJECTION | 2.0” - 7.0” | |



Multi Flute

High Feed Type

Economical Type

A&E Aerospace & Energy Machining

RADIUS 3.0 Programming Radius

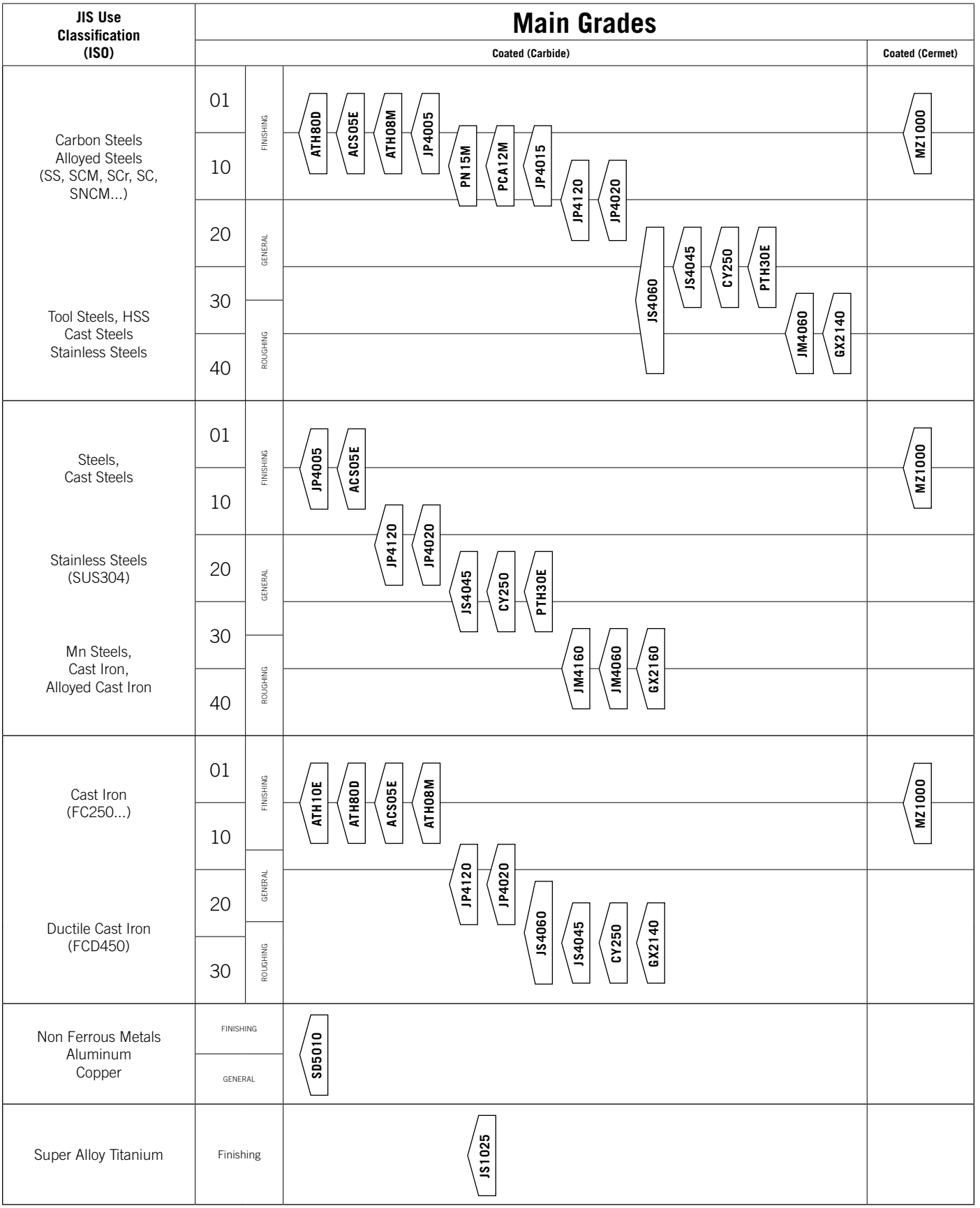
L Long Projection

High Precision

HRC High-Hardened Machining

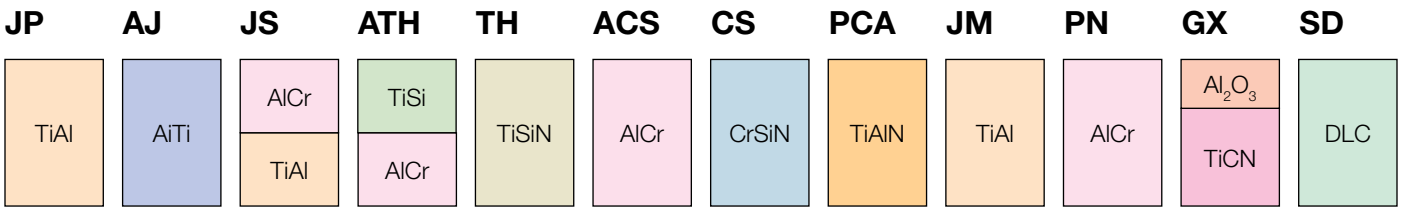
# INSERT GRADE SELECTIONS

Advanced Engineering



# COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4005**<br>P01-M01 | **JP Coating**<br>PVD | For hardened steel 50HRC or more | JP coating is optimized for cutting high-hardness materials. Uses substrate of ultrafine-particle cemented carbide. |
| **JP4015**<br>P10 | **JP Coating**<br>PVD | General purpose for steel and pre-hardened steel | Uses micro grain substrate and JP coating. Suitable for cutting of common steels through pre-hardened steels. |
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **JP4120**<br>P10-M10-K10 | **AJ Coating**<br>PVD | For pre-hardened steel (35-50HRC) and alloy steel | Uses fine grain substrate and AJ coating. Suitable for cutting of common steels through pre-hardened steels. |
| **GX2120**<br>K10 | **GX Coating**<br>CVD | For high-speed cutting of cast iron | Uses fine grain substrate and GX coating. Suitable for the continuous cutting of cast iron. |
| **JS1025**<br>S10 | **JS Coating**<br>PVD | For titanium alloys | A coating with excellent lubricating characteristics is used to reduce welding with cutting materials and extend tool life. |
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **CY250**<br>P30-M30-K30 | **PCA Coating**<br>PVD | General purpose for steel | Uses TiAlN Coating; has wide cutting region range |
| **GX2160**<br>M40 | **GX Coating**<br>CVD | For dry high speed stainless steel cutting | Uses CVD coating with excellent heat resistance to improve wear resistance and provide long tool life when dry-cutting stainless steel. |
| **JS4060**<br>P40 | **JS Coating**<br>PVD | For wet general purpose cutting of steel | Uses coating with excellent heat resistance and lubrication characteristics; has a wide range cutting |
| **PTH30E**<br>K30 | **TH Coating**<br>(TiSiN) PVD | General purpose for steel | Uses moderate substrate, multi purpose grade |
| **JM4060**<br>P40-M40 | **JM Coating**<br>PVD | For wet general cutting of steel, stainless steel | Newly developed PVD technology improves adhesion of membranes to reduce peeling of membranes due to welding |
| **JM4160**<br>M40 | **AJ Coating**<br>PVD | General purpose for stainless steel | Uses high toughness substrate and AJ coating. Suitable for cutting of stainless steels. |
| **ATH80D**<br>P01-K01 | **ATH Coating**<br>PVD | For hardened steels (45-65HRC) | Multi-layer structure provides improved adhesion strength, coating hardness, and oxidation resistance. |
| **PN08M**<br>P01-K01 | **PN Coating**<br>PVD | High-speed finishing of steel | It adopts PN coating which was excellent in heat resistance with higher hardness. Suitable for high-speed finishing of steel |
| **PTH08M**<br>P01-K01 | **TH Coating**<br>PVD | For high-speed finishing of steel | Uses nanocomposite coating; Excellent for high-speed cutting and finishing. |
| **ACS05E**<br>P10-K01 | **ACS Coating**<br>PVD | General purpose for steel | Multi-layer structure provides improved adhesion strength, coating hardness, and oxidation resistance. |
| **ATH10E**<br>K01 | **ATH Coating**<br>PVD | For cast iron | Multi-layer structure provides improved adhesion strength, coating hardness, and oxidation resistance. Suitable for finishing of cast iron. |
| **PN15M**<br>P10 | **PN Coating**<br>PVD | General purpose for steel | It adopts PN coating which was excellent in heat resistance with higher hardness. Suitable of finishing of common steels. |
| **PCA12M**<br>P10 | **PCA Coating**<br>PVD | General purpose for steel | Uses TiAlN Coating; for roughing to finishing |
| **MZ1000**<br>P20 | **TH Coating**<br>PVD | For finishing of steel | Cermet coating provides clean finished surfaces and is suitable for high-speed cutting. |
| **SD5010**<br>N10 | **SD Coating**<br>PVD | For aluminium alloys and nonferrous metals | The hydrogen-free DLC coating comes close to that of diamonds. Hardness: more than 60GPa |



# IABPFN/ABPFN

## High Precision Indexable Ball End Mills for Enhanced Efficiency

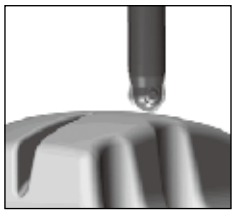
SHANK STYLE

MODULAR STYLE

## FEATURES

- High helix shape on inserts reduces chattering and improved surface finish
- Set up R accuracy of ±0.01mm (Insert R accuracy ±0.005mm)
- Multiple coating grades for machining a variety of materials
- Carbide and steel shank tools are available

## INTRODUCTION



The IABPFN/ABPFN High Precision Indexable Balls End Mills are ideal for high precision finishing in a wide range of materials. With a set up tool R accuracy of ±0.01mm and insert R accuracy of ±0.005mm with a high helix shape on the inserts, chattering is reduced and improved surface finishes are delivered.

## FEATURES

| 1. | The Effect of High Helix Insert Edge Shape |
|---|---|

**Typical Convention Problem**
Chattering happens frequently while cutting a curved shape or similar. The greater the cutting force, the more the chattering which makes cutting marks on the work surface.

**Reduced Cutting Force**
The high helix edge shape suppresses rapid growth of cutting force. This relieves chattering and improves surface finish.

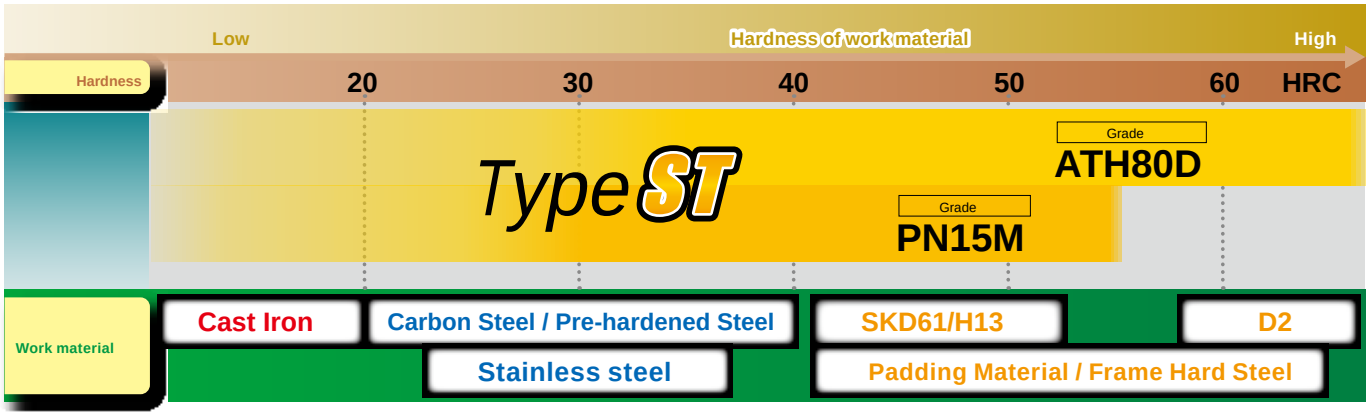
- Improved cutting surface finish.
- Less chattering on corner.

**Improved Tool Life**
Less cutting force reduces chipping due to wear and impact, and tool life is improved.

**LESS POST PROCESSING TIME RESULTS IN**

**COST REDUCTION** **TIME SAVINGS**

| 2. | Recommended Coating Grade Map |
|---|---|

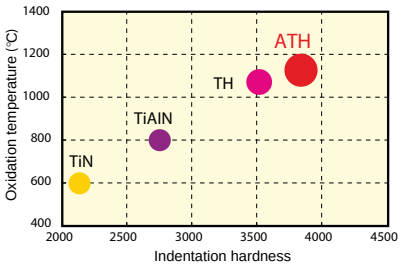


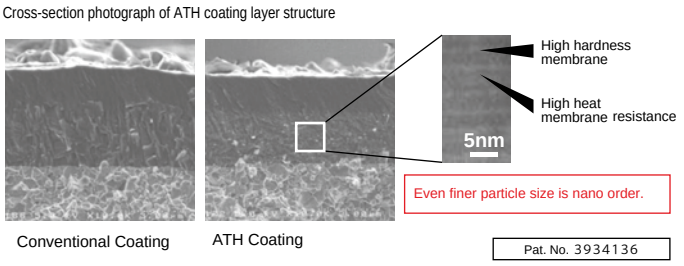
## 3. New PVD Nano Technology

**Advanced TH (ATH) Coating:** The multi-layer structure provides improved adhesion strength, film hardness, and oxidation resistance.

**Strengths:** Shows an extraordinary performance for high speed cutting and highly efficient machining of hardened steels and pre-hardened steels (machining efficiency is double).

- Hardened steels (45HRC-65HRC): D2, H13, HSS, 420 Stainless Steel etc.
- Pre-hardened steels: CENA1, HPM-MAGIC, NAK80, etc.



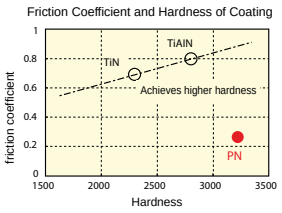



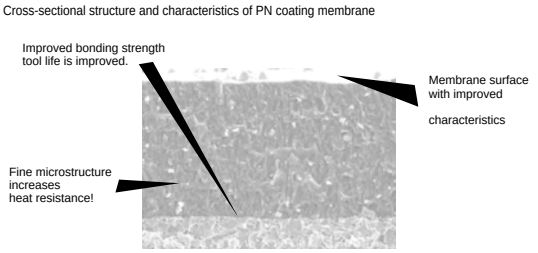

**PN Coating:** Industry's first multi-layer structure provides improved adhesion and surface hardness as well as improving the oxidation-resistance temperature. PN Coating improves the friction coefficient, reduces generation of heat while cutting.

**Strengths:** Exhibits stable tool life in cutting materials such as plastic injection molds etc. where tool seizure often occurs. Achieves longer tool life in cutting prehardened steel such as carbon steel, alloy steel, stainless steel, hot and cold tool steel, etc. PN15M adopts micro-grain substrate and PN coating. Improves the cutting performance for overhand cutting.

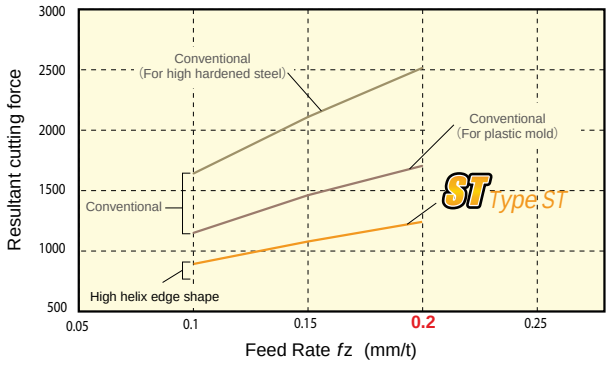
Comparison of Characteristics

| Characteristics | Conventional | PN |
|---|---|---|
| Hardness | 2800 HV | 3200HV |
| Friction coefficient | 0.4 | <0.3 |
| Oxidation temperature | 800 | 1100 |




## 4. Cutting Performance




**Cutting Conditions**

Work Material = Carbon Steel (220HB)

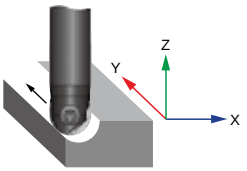
Cutter = Diameter ø30

Vc = 200m/min

fz = 0.1, 0.15, 0.2mm/t

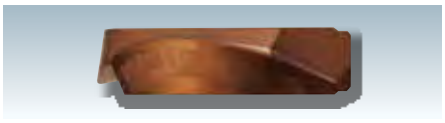
Axial Depth of Cut (ap) = 15mm

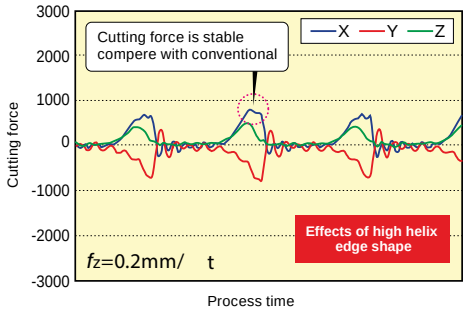
Radial Depth of Cut (ae) = 0.5mm



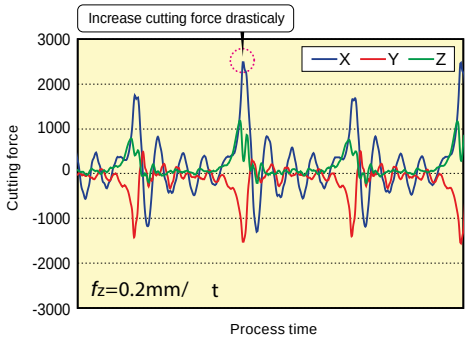
**Type ST**

High Helix edge shape

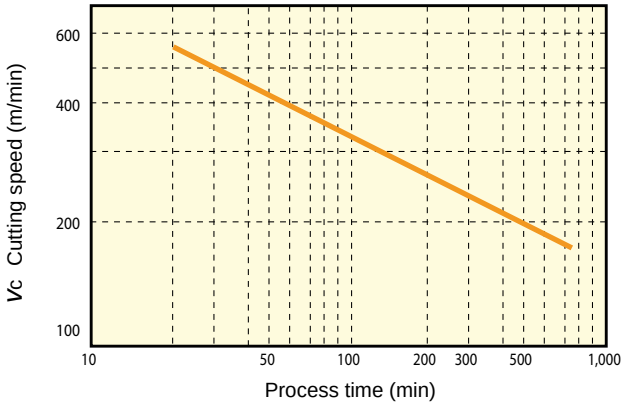




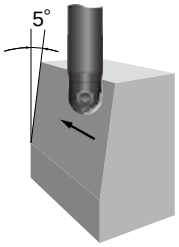

Conventional (For high hardness)




## 5. Field Data




**Cutting Conditions**




Work Material = D2 (60HRC)

Tool = ABPF30S32WL150

Insert = ZDFG300-ST (ATH80D)

Overhang = 150mm

Feed Rate fz = 0.3mm/t

Radial Depth of Cut apxae = 0.3x0.1mm

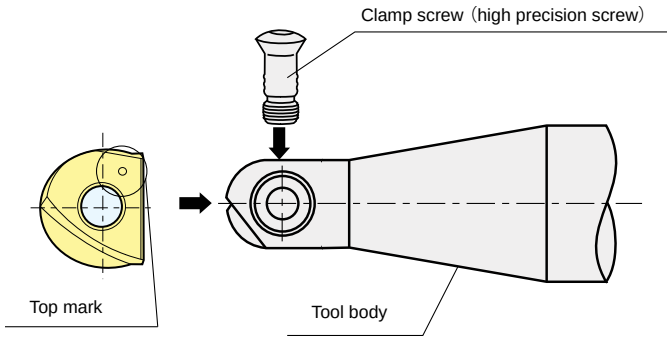
Machine Vertical Type = BT50

Cutting Shape = Contouring cutting on the sloped face 5°

## 6. Insert Installation

To meet the specification for precision of ±0.01mm, please follow this procedure:

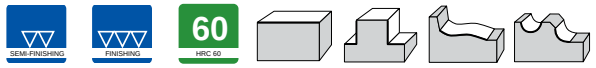
1. Clean the inseart seat: Using air-blow or alike, clean the seat.
2. Put in the insert with its top positioned to the screw-tightening side of the tool body.
3. Tighten the clamp screw with the special wrench. Please do not press down on the insert during this tightening process.
4. This is the end of insert set-up.

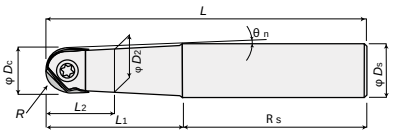


# IABPFN/ABPFN

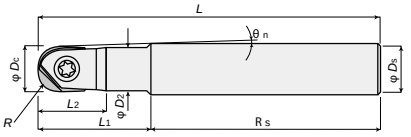
**Shank Style**
**Inch**

Advanced Engineering



Type A (Taper Neck)



Type B (Straight Neck)

| D | ±0.01mm |
|---|---|

**ABPFN-Inch (Shank Style)**

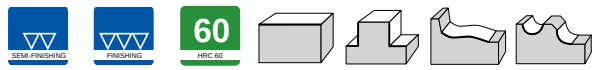
| | Part No. | øDc | R | L | øDs | L2 | L1 | øD2 | ls | θn | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steel Shank | **IABPFN04S06-4-1.25** | 0.250 | 0.125 | 4 | 0.375 | 0.591 | 1.250 | 0.213 | 2.750 | 3.18° | A | IZDFG040N-ST |
| | **IABPFN05S08-4-1.25** | 0.313 | 0.156 | 4 | 0.500 | 0.591 | 1.250 | 0.295 | 2.750 | 4.87° | A | IZDFG050N-ST |
| | **IABPFN06S06-4-1.25** | 0.375 | 0.188 | 4 | 0.375 | 0.709 | 1.250 | 0.354 | 2.750 | - | B | IZDFG060N-ST |
| | **IABPFN08S08-6-3** | 0.500 | 0.250 | 6 | 0.500 | 0.827 | 3.000 | 0.453 | 3.000 | - | B | IZDFG080N-ST |
| | **IABPFN10S10-6-3** | 0.625 | 0.313 | 6 | 0.625 | 1.063 | 3.000 | 0.583 | 3.000 | - | B | IZDFG100N-ST |
| | **IABPFN12S12-6-3** | 0.750 | 0.375 | 6 | 0.750 | 1.378 | 3.000 | 0.709 | 3.000 | - | B | IZDFG120N-ST |
| | **IABPFN16S16-6-3** | 1.000 | 0.500 | 6 | 1.000 | 1.693 | 3.000 | 0.945 | 3.000 | - | B | IZDFG160N-ST |
| Carbide Shank | **IABPFN04S06W-4-2** | 0.250 | 0.125 | 4 | 0.375 | 0.406 | 2.000 | 0.217 | 2.000 | - | B | IZDFG040N-ST |
| | **IABPFN05S08W-4-2** | 0.313 | 0.156 | 4 | 0.500 | 0.591 | 2.000 | 0.295 | 2.000 | - | B | IZDFG050N-ST |
| | **IABPFN06S08W-4-2** | 0.375 | 0.188 | 4 | 0.500 | 0.709 | 2.000 | 0.354 | 2.000 | - | B | IZDFG060N-ST |
| | **IABPFN08S10W-6-3** | 0.500 | 0.250 | 6 | 0.625 | 0.827 | 3.000 | 0.453 | 3.000 | - | B | IZDFG080N-ST |
| | **IABPFN10S10W-6-3** | 0.625 | 0.313 | 6 | 0.625 | 1.063 | 3.000 | 0.583 | 3.000 | - | B | IZDFG100N-ST |
| | **IABPFN12S12W-6-3** | 0.750 | 0.375 | 6 | 0.750 | 1.378 | 3.000 | 0.709 | 3.000 | - | B | IZDFG120N-ST |
| | **IABPFN12S12W-8-4** | 0.750 | 0.375 | 8 | 0.750 | 1.378 | 4.000 | 0.709 | 4.000 | - | B | IZDFG120N-ST |
| | **IABPFN16S16W-8-4** | 1.000 | 0.500 | 8 | 1.000 | 1.693 | 4.000 | 0.945 | 4.000 | - | B | IZDFG160N-ST |

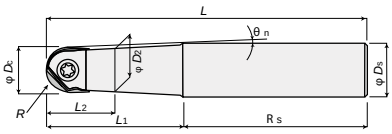
Inserts p. 17

# IABPFN/ABPFN

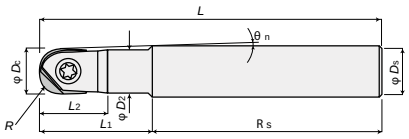
## Shank Style
## Metric

Advanced Engineering

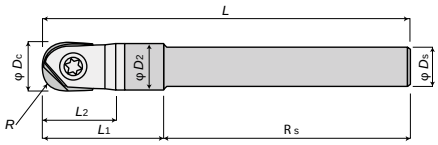



Type A (Taper Neck)




Type B (Straight Neck)




Type C

D ±0.01mm

### ABPFN-Metric (Shank Style)

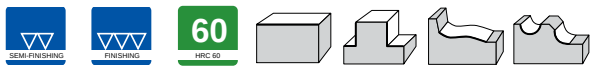
| | Part No. | øDc | R | L | øDs | L2 | L1 | øD2 | ls | θn | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steel Shank | ABPFN06S08-90-30 | 6 | 3.0 | 90 | 8 | 15.0 | 30 | 5.4 | 60 | 2.12 | A | ZDFG060N-ST |
| | ABPFN06S06-100-50 | 6 | 3.0 | 100 | 6 | 10.3 | 50 | 5.5 | 50 | – | B | ZDFG060N-ST |
| | ABPFN08S10-100-30 | 8 | 4.0 | 100 | 10 | 15.0 | 30 | 7.5 | 70 | 2.20 | A | ZDFG080N-ST |
| | ABPFN10S10-100-30 | 10 | 5.0 | 100 | 10 | 18.0 | 30 | 9.0 | 70 | – | B | ZDFG100N-ST |
| | ABPFN12S12-110-40 | 12 | 6.0 | 110 | 12 | 21.0 | 40 | 11.5 | 70 | – | B | ZDFG120N-ST |
| | ABPFN12S12-150-75 | 12 | 6.0 | 150 | 12 | 21.0 | 75 | 11.5 | 75 | – | B | ZDFG120N-ST |
| | ABPFN16S16-130-50 | 16 | 8.0 | 130 | 16 | 27.0 | 50 | 14.8 | 80 | – | B | ZDFG160N-ST |
| | ABPFN20S20-140-60 | 20 | 10.0 | 140 | 20 | 35.0 | 60 | 18.0 | 80 | – | B | ZDFG200N-ST |
| | ABPFN25S25-150-75 | 25 | 12.5 | 150 | 25 | 43.0 | 75 | 24.0 | 75 | – | B | ZDFG250N-ST |
| Carbide Shank | ABPFN06S06W-75-25 | 6 | 3.0 | 75 | 6 | 10.3 | 25 | 5.5 | 50 | – | B | ZDFG060N-ST |
| | ABPFN06S06W-100-50 | 6 | 3.0 | 100 | 6 | 10.3 | 50 | 5.5 | 50 | – | B | ZDFG060N-ST |
| | ABPFN08S08W-90-25 | 8 | 4.0 | 90 | 8 | 25.0 | 25 | 7.5 | 65 | – | B | ZDFG080N-ST |
| | ABPFN08S08W-140-75 | 8 | 4.0 | 140 | 8 | 75.0 | 75 | 7.5 | 65 | – | B | ZDFG080N-ST |
| | ABPFN10S10W-100-35 | 10 | 5.0 | 100 | 10 | 18.0 | 35 | 9.0 | 65 | – | B | ZDFG100N-ST |
| | ABPFN10S10W-140-75 | 10 | 5.0 | 140 | 10 | 18.0 | 75 | 9.0 | 65 | – | B | ZDFG100N-ST |
| | ABPFN12S12W-105-40 | 12 | 6.0 | 105 | 12 | 21.0 | 40 | 11.5 | 65 | – | B | ZDFG120N-ST |
| | ABPFN12S12W-120-55 | 12 | 6.0 | 120 | 12 | 21.0 | 55 | 11.5 | 65 | – | B | ZDFG120N-ST |
| | ABPFN12S12W-150-75 | 12 | 6.0 | 150 | 12 | 21.0 | 75 | 11.5 | 75 | – | B | ZDFG120N-ST |
| | ABPFN16S16W-115-45 | 16 | 8.0 | 115 | 16 | 27.0 | 45 | 14.8 | 70 | – | B | ZDFG160N-ST |
| | ABPFN16S16W-160-90 | 16 | 8.0 | 160 | 16 | 27.0 | 90 | 14.8 | 70 | – | B | ZDFG160N-ST |
| | ABPFNU20S18W-200-51 | 20 | 10.0 | 200 | 18 | 35.0 | 51 | 18.3 | 149 | – | C | ZDFG200N-ST |
| | ABPFN25S25W-140-65 | 25 | 12.5 | 140 | 25 | 43.0 | 65 | 24.0 | 75 | – | B | ZDFG250N-ST |
| | ABPFN25S25W-165-90 | 25 | 12.5 | 165 | 25 | 43.0 | 90 | 24.0 | 75 | – | B | ZDFG250N-ST |
| | ABPFN25S25W-200-100 | 25 | 12.5 | 200 | 25 | 43.0 | 100 | 24.0 | 100 | – | B | ZDFG250N-ST |

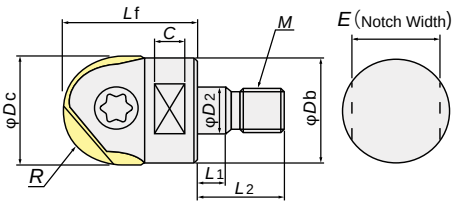
Inserts p. 17

# IABPFN/ABPFN

**Modular Style**
**Inch**

Advanced Engineering




| D | ±0.01mm |
|---|---|

**IABPFN-Inch (Modular Style)**

| Part No. | øDc | R | Lf | øD2 | M | øDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPFNM06** | 0.375 | 0.188 | 1.024 | 6.5mm | M6 | 0.386 | 5.5mm | 14.5mm | 5mm | 7mm | IZDFG040N-ST<br>ZDFG06N-ST |
| **IABPFNM08** | 0.500 | 0.250 | 1.024 | 6.5mm | M6 | 0.386 | 5.5mm | 14.5mm | 5mm | 7mm | IZDFG080N-ST<br>ZDFG12N-ST |
| **IABPFNM10** | 0.625 | 0.312 | 1.260 | 8.5mm | M8 | 0.504 | 5.5mm | 17.0mm | 8mm | 10mm | IZDFG100N-ST<br>ZDFG16N-ST |
| **IABPFNM12** | 0.750 | 0.375 | 1.496 | 10.5mm | M10 | 0.701 | 5.5mm | 19.0mm | 10mm | 15mm | IZDFG120N-ST<br>ZDFG20N-ST |
| **IABPFNM16** | 1.000 | 0.500 | 1.496 | 12.5mm | M12 | 0.819 | 5.5mm | 22.0mm | 10mm | 17mm | IZDFG160N-ST<br>ZDFG25N-ST |

**IABPFN-Inch (Modular Style)**

| Part No. | øDc | R | Lf | øD2 | M | øDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPFNM10** | 10 | 5 | 26 | 6.5 | M6 | 9.8 | 5.5 | 14.5 | 5 | 7 | IZDFG040N-ST<br>ZDFG06N-ST |

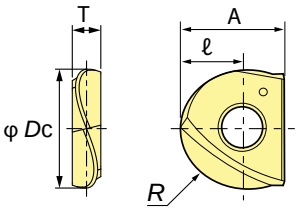
Inserts p. 17

Modular Shanks on p. 163

# IABPFN/ABPFN

**Inserts**

Advanced Engineering




## Inserts-Inch

| Part No. | øDc | R | I | A | T | Grade ATH80D | Grade PN15M | Accuracy |
|---|---|---|---|---|---|---|---|---|
| **IZDFG040N-ST** | 0.2500 | 0.125 | 0.137 | 0.204 | 2.0 | • | • | |
| **IZDFG050N-ST** | 0.3125 | 0.156 | 0.172 | 0.274 | 2.4 | • | • | |
| **IZDFG060N-ST** | 0.3750 | 0.187 | 0.211 | 0.325 | 2.6 | • | • | |
| **IZDFG080N-ST** | 0.5000 | 0.250 | 0.273 | 0.407 | 3.0 | • | • | F |
| **IZDFG100N-ST** | 0.6250 | 0.312 | 0.352 | 0.470 | 4.0 | • | • | |
| **IZDFG120N-ST** | 0.7500 | 0.375 | 0.434 | 0.572 | 5.0 | • | • | |
| **IZDFG160N-ST** | 1.0000 | 0.500 | 0.579 | 0.736 | 6.0 | • | • | |

## Inserts-Metric

| Part No. | øDc | R | I | A | T | Grade ATH80D | Grade PN15M | Accuracy |
|---|---|---|---|---|---|---|---|---|
| **ZDFG06N-ST** | 6 | 3.0 | 3.3 | 5.0 | 2.0 | • | • | |
| **ZDFG08N-ST** | 8 | 4.0 | 4.4 | 7.0 | 2.4 | • | • | |
| **ZDFG10N-ST** | 10 | 5.0 | 5.6 | 8.5 | 2.6 | • | • | |
| **ZDFG12N-ST** | 12 | 6.0 | 6.6 | 10.0 | 3.0 | • | • | F |
| **ZDFG16N-ST** | 16 | 8.0 | 9.0 | 12.0 | 4.0 | • | • | |
| **ZDFG20N-ST** | 20 | 10.0 | 11.5 | 15.0 | 5.0 | • | • | |
| **ZDFG25N-ST** | 25 | 12.5 | 14.5 | 18.5 | 6.0 | • | • | |

**• = Stocked items in US**

| Material Name<br>ISO Classification | Coating Name<br>Coating Type | Application | Feature |
|---|---|---|---|
| **PN15M**<br>P10 | **PN Coating**<br>PVD | General purpose for Steel (up to HRC 50) and Cast Iron | Combining of the AlCr coating layer with Si produces high hardness (3000HV) as well as good wear resistance. Good for Carbon Steel Alloy Steel and Hardened Steel. |
| **ATH80D**<br>P01-M01-K01 | **ATH Coating**<br>PVD | Hardened and Pre-hardened Steel | Extraordinary performance for high-speed and high-efficiency machining in hardened steel. |

| Part No. | Clamp Screw | Fastening Torque (N•m) | Wrench |
|---|---|---|---|
| **IABPFN04S ○○ (W)- ○ - ○** | 581-140 | 0.5 | 104-T6 |
| **IABPFN05S ○○ (W)- ○ - ○** | 581-149 | 0.9 | 104-T7 |
| **IABPFN06S ○○ (W)- ○ - ○**<br>**IABPFNM06** | 581-150 | 1.1 | 104-T8 |
| **IABPFN08S ○○ (W)- ○ - ○**<br>**IABPFNM08** | 581-151 | 2.2 | 104-T10 |
| **IABPFN10S ○○ (W)- ○ - ○**<br>**IABPFNM10** | 581-152 | 2.9 | 104-T15 |
| **IABPFN12S ○○ (W)- ○ - ○**<br>**IABPFNM12** | 581-144 | 4.9 | 105-T20 |
| **IABPFN16S ○○ (W)- ○ - ○**<br>**IABPFNM16** | 581-146 | 9.8 | 105-T30A |

| Part No. | Clamp Screw | Fastening Torque (N•m) | Wrench |
|---|---|---|---|
| **ABPFN06S ○○ (W)- ○ - ○** | 581-140 | 0.5 | 104-T6 |
| **ABPFN08S ○○ (W)- ○ - ○** | 581-149 | 0.9 | 104-T7 |
| **ABPFN10S ○○ (W)- ○ - ○**<br>**ABPFNM10** | 581-150 | 1.1 | 104-T8 |
| **ABPFN12S ○○ (W)- ○ - ○** | 581-151 | 2.2 | 104-T10 |
| **ABPFN16S ○○ (W)- ○ - ○** | 581-152 | 2.9 | 104-T15 |
| **ABPFN20S ○○ (W)- ○ - ○** | 581-144 | 4.9 | 105-T20 |
| **ABPFNU20S18W-200-51** | 581-144 | 4.9 | 105-T20 |
| **ABPFN25S ○○ (W)- ○ - ○** | 581-146 | 9.8 | 105-T30A |

***Wrenches, screw anti-seizure agent, and clamp screws are sold seperately.**

# IABPFN/ABPFN

## Cutting Conditions
## Inch

Advanced Engineering

| | ø | 1/4" | | | 5/16" | | | 3/8" | | | 1/2" | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) PN15M ATH80D | N(rpm) | 8030 | 15550 | 15550 | 6420 | 12440 | 12440 | 5350 | 9700 | 11710 | 4020 | 6780 | 9530 |
| | Vc(sfm) | 525 | 1017 | 1017 | 525 | 1017 | 1017 | 525 | 951 | 1148 | 525 | 886 | 1247 |
| | Vf(in/min) | 63 | 184 | 122 | 101 | 392 | 196 | 84 | 306 | 185 | 63 | 214 | 150 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.008 | 0.016 | 0.008 | 0.008 | 0.016 | 0.008 | 0.008 | 0.016 | 0.008 |
| | ap(in) | 0.004 | 0.002 | 0.002 | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ap(in) | 0.024 | 0.024 | 0.008 | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Carbon Steel Alloy Steel (30-45HRC) PN15M ATH80D | N(rpm) | 6020 | 13550 | 13550 | 4820 | 10840 | 10840 | 4020 | 8030 | 10040 | 3010 | 5770 | 8280 |
| | Vc(sfm) | 394 | 886 | 886 | 394 | 886 | 886 | 394 | 787 | 984 | 394 | 755 | 1083 |
| | Vf(in/min) | 48 | 160 | 107 | 76 | 342 | 171 | 63 | 253 | 158 | 48 | 182 | 131 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.008 | 0.016 | 0.008 | 0.008 | 0.016 | 0.008 | 0.008 | 0.016 | 0.008 |
| | ap(in) | 0.004 | 0.002 | 0.002 | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ap(in) | 0.024 | 0.024 | 0.008 | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Cast Iron FC, FCD ATH80D PN15M | N(rpm) | 8030 | 15550 | 15550 | 6420 | 12440 | 12440 | 5350 | 9700 | 11710 | 4020 | 6780 | 9530 |
| | Vc(sfm) | 525 | 1017 | 1017 | 525 | 1017 | 1017 | 525 | 951 | 1148 | 525 | 886 | 1247 |
| | Vf(in/min) | 63 | 245 | 122 | 152 | 588 | 196 | 126 | 458 | 277 | 95 | 320 | 225 |
| | fz(in/t) | 0.004 | 0.008 | 0.004 | 0.012 | 0.024 | 0.008 | 0.012 | 0.024 | 0.012 | 0.012 | 0.024 | 0.012 |
| | ap(in) | 0.004 | 0.002 | 0.002 | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ap(in) | 0.024 | 0.024 | 0.008 | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Hardened Steel (45-55HRC) ATH80D PN15M | N(rpm) | 5020 | 11540 | 11540 | 4020 | 9230 | 9230 | 3350 | 7030 | 8700 | 2510 | 5020 | 7280 |
| | Vc(sfm) | 328 | 755 | 755 | 328 | 755 | 755 | 328 | 689 | 853 | 328 | 656 | 951 |
| | Vf(in/min) | 32 | 91 | 91 | 32 | 146 | 146 | 26 | 111 | 137 | 20 | 79 | 115 |
| | fz(in/t) | 0.003 | 0.004 | 0.004 | 0.004 | 0.008 | 0.008 | 0.004 | 0.008 | 0.008 | 0.004 | 0.008 | 0.008 |
| | ap(in) | 0.004 | 0.002 | 0.002 | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ap(in) | 0.024 | 0.024 | 0.008 | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Hardened Steel (55-62HRC) ATH80D | N(rpm) | 4020 | 9030 | 9030 | 3210 | 7230 | 7230 | 2680 | 5690 | 6690 | 2010 | 4020 | 5770 |
| | Vc(sfm) | 262 | 591 | 591 | 262 | 591 | 591 | 262 | 558 | 656 | 262 | 525 | 755 |
| | Vf(in/min) | 26 | 71 | 71 | 26 | 114 | 114 | 21 | 90 | 106 | 16 | 63 | 91 |
| | fz(in/t) | 0.003 | 0.004 | 0.004 | 0.004 | 0.008 | 0.008 | 0.004 | 0.008 | 0.008 | 0.004 | 0.008 | 0.008 |
| | ap(in) | 0.004 | 0.002 | 0.002 | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ap(in) | 0.024 | 0.024 | 0.008 | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Maximum fz(in/t) | | < 0.008 | | | < 0.031 | | | < 0.031 | | | < 0.031 | | |
| Maximum ap(in) | | < 0.125 | | | < 0.156 | | | < 0.187 | | | < 0.25 | | |

| Overhang ratio | Vc (sfm) | Vf(in/min) |
|---|---|---|
| **<3 Dc** | 100% | 100% |
| **3Dc~5Dc** | 70% | 70% |
| **5Dc~8Dc** | 60% | 60% |
| **8Dc~10Dc** | 50% | 50% |

| | ø | 5/8" | | | 3/4" | | | 1" | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 3210 | 4220 | 10040 | 2680 | 3520 | 9530 | 2010 | 2640 | 7900 |
| | Vc(sfm) | 525 | 689 | 1640 | 525 | 689 | 1870 | 525 | 689 | 2067 |
| | Vf(in/min) | 63 | 166 | 237 | 53 | 139 | 300 | 40 | 104 | 311 |
| PN15M | fz(in/t) | 0.010 | 0.020 | 0.012 | 0.010 | 0.020 | 0.016 | 0.010 | 0.020 | 0.020 |
| ATH80D | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ap(in) | 0.063 | 0.043 | 0.014 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Carbon Steel Alloy Steel (30-45HRC) | N(rpm) | 2410 | 3010 | 7630 | 2010 | 2680 | 7030 | 1510 | 2010 | 5900 |
| | Vc(sfm) | 394 | 492 | 1247 | 394 | 525 | 1378 | 394 | 525 | 1542 |
| | Vf(in/min) | 48 | 119 | 180 | 40 | 106 | 222 | 30 | 79 | 232 |
| PN15M | fz(in/t) | 0.010 | 0.020 | 0.012 | 0.010 | 0.020 | 0.016 | 0.010 | 0.020 | 0.020 |
| ATH80D | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ap(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Cast Iron FC, FCD | N(rpm) | 3210 | 4220 | 10040 | 2680 | 3520 | 9530 | 2010 | 2640 | 7900 |
| | Vc(sfm) | 525 | 689 | 1640 | 525 | 689 | 1870 | 525 | 689 | 2067 |
| ATH80D | Vf(in/min) | 89 | 233 | 237 | 74 | 194 | 300 | 56 | 146 | 311 |
| PN15M | fz(in/t) | 0.014 | 0.028 | 0.012 | 0.014 | 0.028 | 0.016 | 0.014 | 0.028 | 0.020 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ap(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Hardened Steel (45-55HRC) | N(rpm) | 2010 | 3010 | 7030 | 1680 | 2510 | 6690 | 1260 | 1890 | 5650 |
| | Vc(sfm) | 328 | 492 | 1148 | 328 | 492 | 1312 | 328 | 492 | 1476 |
| ATH80D | Vf(in/min) | 19 | 57 | 166 | 16 | 48 | 211 | 12 | 36 | 222 |
| PN15M | fz(in/t) | 0.005 | 0.009 | 0.012 | 0.005 | 0.009 | 0.016 | 0.005 | 0.009 | 0.020 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ap(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Hardened Steel (55-62HRC) | N(rpm) | 1610 | 2410 | 5620 | 1340 | 2010 | 5350 | 1010 | 1510 | 4520 |
| | Vc(sfm) | 262 | 394 | 919 | 262 | 394 | 1050 | 262 | 394 | 1181 |
| ATH80D | Vf(in/min) | 15 | 46 | 133 | 13 | 38 | 169 | 10 | 29 | 178 |
| | fz(in/t) | 0.005 | 0.009 | 0.012 | 0.005 | 0.009 | 0.016 | 0.005 | 0.009 | 0.020 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ap(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Maximum fz(in/t) | | < 0.039 | | | < 0.039 | | | < 0.039 | | |
| Maximum ap(in) | | < 0.312 | | | < 0.375 | | | < 0.5 | | |

| Overhang ratio | Vc (sfm) | Vf(in/min) |
|---|---|---|
| <3 Dc | 100% | 100% |
| 3Dc~5Dc | 70% | 70% |
| 5Dc~8Dc | 60% | 60% |
| 8Dc~10Dc | 50% | 50% |

# IABPFN/ABPFN

## Cutting Conditions Metric

Advanced Engineering

| | ø | 6mm | | | 8mm | | | 10mm | | | 12mm | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) PN15M ATH80D | N(min⁻¹) | 8,500 | 16,460 | 16,460 | 6,370 | 12,350 | 12,350 | 5,100 | 9,240 | 11,150 | 4,250 | 7,170 | 10,090 |
| | Vc(m/min) | 160 | 310 | 310 | 160 | 310 | 310 | 160 | 290 | 350 | 160 | 270 | 380 |
| | Vf(mm/min) | 1,700 | 4,940 | 3,300 | 2,550 | 9,880 | 4,940 | 2,040 | 7,400 | 4,460 | 1,700 | 5,740 | 4,040 |
| | fz(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 |
| | ap(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 |
| | ap(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) PN15M ATH80D | N(min⁻¹) | 6,370 | 14,340 | 14,340 | 4,780 | 10,750 | 10,750 | 3,830 | 7,650 | 9,560 | 3,190 | 6,110 | 8,760 |
| | Vc(m/min) | 120 | 270 | 270 | 120 | 270 | 270 | 120 | 240 | 300 | 120 | 230 | 330 |
| | Vf(mm/min) | 1,280 | 4,310 | 2,870 | 1,920 | 8,600 | 4,300 | 1,540 | 6,120 | 3,830 | 1,280 | 4,890 | 3,510 |
| | fz(mm/t) | 0.1 | 0.15 | 0.10 | 0.2 | 0.4 | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 | 0.4 | 0.2 |
| | ap(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 |
| | ap(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 FC, FCD ATH80D PN15M | N(min⁻¹) | 8,500 | 16,460 | 16,460 | 6,370 | 12,350 | 12,350 | 5,100 | 9,240 | 11,150 | 4,250 | 7,170 | 10,090 |
| | Vc(m/min) | 160 | 310 | 310 | 160 | 310 | 310 | 160 | 290 | 350 | 160 | 270 | 380 |
| | Vf(mm/min) | 1,700 | 6,590 | 3,300 | 3,830 | 14,820 | 4,940 | 3,060 | 11,090 | 6,690 | 2,550 | 8,610 | 6,060 |
| | fz(mm/t) | 0.1 | 0.2 | 0.1 | 0.3 | 0.6 | 0.2 | 0.3 | 0.60 | 0.3 | 0.3 | 0.60 | 0.30 |
| | ap(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 |
| | ap(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 (45-55HRC) ATH80D PN15M | N(min⁻¹) | 5,310 | 12,210 | 12,210 | 3,990 | 9,160 | 9,160 | 3,190 | 6,690 | 8,290 | 2,660 | 5,310 | 7,700 |
| | Vc(m/min) | 100 | 230 | 230 | 100 | 230 | 230 | 100 | 210 | 260 | 100 | 200 | 290 |
| | Vf(mm/min) | 850 | 2,450 | 2,450 | 800 | 3,670 | 3,670 | 640 | 2,680 | 3,320 | 540 | 2,130 | 3,080 |
| | fz(mm/t) | 0.08 | 0.10 | 0.10 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 |
| | ap(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 |
| | ap(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) ATH80D | N(min⁻¹) | 4,250 | 9,560 | 9,560 | 3,190 | 7,170 | 7,170 | 2,550 | 5,420 | 6,370 | 2,130 | 4,250 | 6,110 |
| | Vc(m/min) | 80 | 180 | 180 | 80 | 180 | 180 | 80 | 170 | 200 | 80 | 160 | 230 |
| | Vf(mm/min) | 680 | 1,920 | 1,920 | 640 | 2,870 | 2,870 | 510 | 2,170 | 2,550 | 430 | 1,700 | 2,450 |
| | fz(mm/t) | 0.08 | 0.10 | 0.10 | 0.1 | 0.20 | 0.20 | 0.10 | 0.20 | 0.20 | 0.10 | 0.20 | 0.20 |
| | ap(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 |
| | ap(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 fz(mm/t) | | < 0.2 | | | < 0.8 | | | < 0.8 | | | < 0.8 | | |
| Maximum ap(mm) | | < 3.0 | | | < 4.0 | | | < 5.0 | | | < 6.0 | | |

| Overhang ratio | Vc (m/min) | Vf(mm/min) |
|---|---|---|
| <3 Dc | 100% | 100% |
| 3Dc~5Dc | 70% | 70% |
| 5Dc~8Dc | 60% | 60% |
| 8Dc~10Dc | 50% | 50% |

| | ø | 16mm | | | 20mm | | | 25mm | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) PN15M ATH80D | N(min⁻¹) | 3,190 | 4,180 | 9,960 | 2,550 | 3,350 | 9,080 | 2,040 | 2,680 | 8,030 |
| | Vc(m/min) | 160 | 210 | 500 | 160 | 210 | 570 | 160 | 210 | 630 |
| | Vf(mm/min) | 1,600 | 4,180 | 5,980 | 1,280 | 3,350 | 7,270 | 1,020 | 2,680 | 8,030 |
| | fz(mm/t) | 0.25 | 0.5 | 0.3 | 0.25 | 0.5 | 0.4 | 0.25 | 0.5 | 0.5 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.35 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Carbon Steel Alloy Steel (30-45HRC) PN15M ATH80D | N(min⁻¹) | 2,390 | 2,990 | 7,570 | 1,920 | 2,550 | 6,690 | 1,530 | 2,040 | 5,990 |
| | Vc(m/min) | 120 | 150 | 380 | 120 | 160 | 420 | 120 | 160 | 470 |
| | Vf(mm/min) | 1,200 | 2,990 | 4,550 | 960 | 2,550 | 5,360 | 770 | 2,040 | 5,990 |
| | fz(mm/t) | 0.25 | 0.5 | 0.3 | 0.25 | 0.50 | 0.40 | 0.25 | 0.50 | 0.50 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Cast Iron FC, FCD ATH80D PN15M | N(min⁻¹) | 3,190 | 4,180 | 9,960 | 2,550 | 3,350 | 9,080 | 2,040 | 2,680 | 8,030 |
| | Vc(m/min) | 160 | 210 | 500 | 160 | 210 | 570 | 160 | 210 | 630 |
| | Vf(mm/min) | 2,240 | 5,860 | 5,980 | 1,790 | 4,690 | 7,270 | 1,430 | 3,760 | 8,030 |
| | fz(mm/t) | 0.35 | 0.70 | 0.30 | 0.35 | 0.70 | 0.4 | 0.35 | 0.70 | 0.5 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Hardened Steel (45-55HRC) ATH80D PN15M | N(min⁻¹) | 2,000 | 2,990 | 6,970 | 1,600 | 2,390 | 6,370 | 1,280 | 1,920 | 5,740 |
| | Vc(m/min) | 100 | 150 | 350 | 100 | 150 | 400 | 100 | 150 | 450 |
| | Vf(mm/min) | 480 | 1,440 | 4,190 | 390 | 1,150 | 5,100 | 310 | 930 | 5,740 |
| | fz(mm/t) | 0.12 | 0.24 | 0.30 | 0.12 | 0.24 | 0.4 | 0.12 | 0.24 | 0.50 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Hardened Steel (55-62HRC) ATH80D | N(min⁻¹) | 1,600 | 2,390 | 5,580 | 1,280 | 1,920 | 5,100 | 1,020 | 1,530 | 4,590 |
| | Vc(m/min) | 80 | 120 | 280 | 80 | 120 | 320 | 80 | 120 | 360 |
| | Vf(mm/min) | 390 | 1,150 | 3,350 | 310 | 930 | 4,080 | 250 | 740 | 4,590 |
| | fz(mm/t) | 0.12 | 0.24 | 0.30 | 0.12 | 0.24 | 0.40 | 0.12 | 0.24 | 0.50 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Maximum fz(mm/t) | | < 1.0 | | | < 1.0 | | | < 1.0 | | |
| Maximum ap(mm) | | < 8.0 | | | < 10.0 | | | < 12.5 | | |

| Overhang ratio | Vc (m/min) | Vf(mm/min) |
|---|---|---|
| **<3 Dc** | 100% | 100% |
| **3Dc~5Dc** | 70% | 70% |
| **5Dc~8Dc** | 60% | 60% |
| **8Dc~10Dc** | 50% | 50% |

# IABPS/ABPS

## Indexable Ball End Mills for Semi-Finishing and Finishing

**SHANK STYLE**

## FEATURES

- Full radius ball inserts utilizes new PN08M coating
- Ideal for machining cast iron, soft to hardened steels
- Set up R accuracy ±0.015mm
- Insert R accuracy ±0.01mm

# INTRODUCTION

1. High accuracy is exhibited from the ball tip to the outer circumference – Set up R accuracy: ±0.015mm (Insert R accuracy ±0.01mm or less) –
2. Excellent cutting performance and beautiful cutting surface finish.
3. High-performance coated inserts provide long life.

# FEATURES

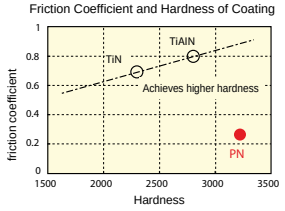
## 1. New PVD Nano Technology

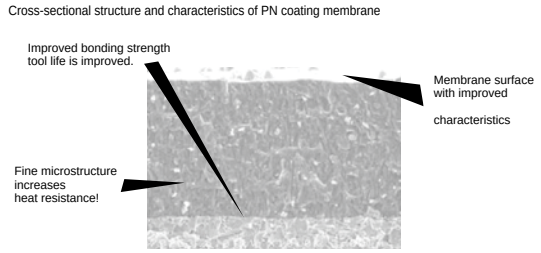
**PN Coating:** Industry's first multi-layer structure provides improved adhesion and membrane hardness as well as improving the oxidation-resistance temperature. PN Coating improves the friction coefficient, reduces generation of heat while cutting.

**Strengths:** Exhibits stable tool life in cutting materials such as plastic injection molds etc. where tool seizure often occurs. Achieves longer tool life in cutting prehardened steel such as carbon steel, alloy steel, stainless steel, hot and cold tool steel, etc. PN08M adopts micro-grain substrate and PN coating.

Comparison of Characteristics

| Characteristics | Conventional | PN |
|---|---|---|
| Hardness | 2800 HV | 3200HV |
| Friction coefficient | 0.4 | <0.3 |
| Oxidation temperature | 800 | 1100 |

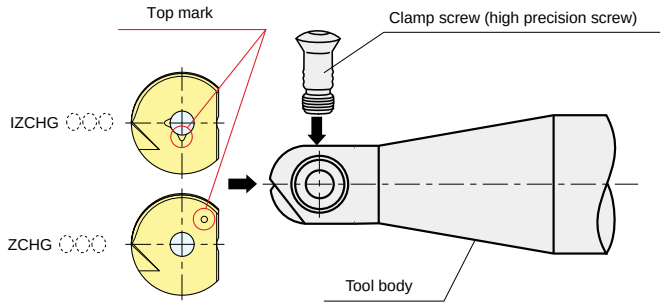



## 2. Insert Installation

To meet the specification for precision of ±0.015mm, please follow this procedure:

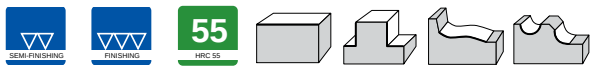
1. Clean the inseart seat: Using compressed air or similar, clean the seat.
2. Put in the insert with its top mark positioned to the screw-tightening side of the tool body.
3. Tighten the clamp screw with the special wrench. Please do not press down on the insert during this tightening process.
4. This is the end of insert set-up.

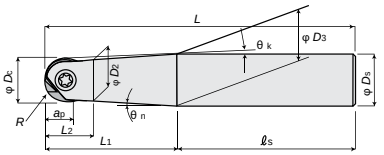



# IABPS/ABPS

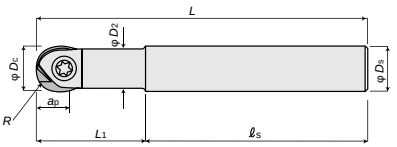
**Shank Style**
**Inch + Metric**

Advanced Engineering




Type A (Taper Neck)




Type B (Straight Neck)

D ±0.015mm

## IABPS-Inch (Shank Style)

| Part No. | øDc | R | L | øDs | L2 | L1 | øD2 | ls | θn | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPS05S08-4-1.25** | 0.312 | 0.156 | 4 | 0.500 | 0.394 | 1.250 | 0.283 | 2.750 | 4.9° | A | IZCHG050 |
| **IABPS06S06-4-1.25** | 0.375 | 0.188 | 4 | 0.375 | – | 1.250 | 0.335 | 2.750 | – | B | IZCHG060 |
| **IABPS08S08-6-3** | 0.500 | 0.250 | 6 | 0.500 | – | 3.000 | 0.433 | 3.000 | – | B | IZCHG080 |
| **IABPS10S10-6-3** | 0.625 | 0.313 | 6 | 0.625 | – | 3.000 | 0.559 | 3.000 | – | B | IZCHG100 |
| **IABPS12S12-6-3** | 0.750 | 0.375 | 6 | 0.750 | – | 3.000 | 0.669 | 3.000 | – | B | IZCHG120 |
| **IABPS16S16-6-3** | 1.000 | 0.500 | 6 | 1.000 | – | 3.000 | 0.886 | 3.000 | – | B | IZCHG160 |

## ABPS-Metric (Shank Style)

| Part No. | øDc | R | L | øDs | L2 | L1 | øD2 | ls | θn | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPS08S10-100-30** | 8 | 4 | 100 | 10 | 10 | 30 | 7.3 | 70 | 2.2° | A | ZCHG080 |
| **ABPS10S10-100-30** | 10 | 5 | 100 | 10 | – | 30 | 9.0 | 70 | – | B | ZCHG100 |
| **ABPS12S12-110-40** | 12 | 6 | 110 | 12 | – | 40 | 10.4 | 70 | – | B | ZCHG120 |
| **ABPS12S12-150-75** | 12 | 6 | 150 | 12 | – | 75 | 10.4 | 75 | – | B | ZCHG120 |
| **ABPS16S16-130-50** | 16 | 8 | 130 | 16 | – | 50 | 14.3 | 80 | – | B | ZCHG160 |
| **ABPS20S20-140-60** | 20 | 10 | 140 | 20 | – | 60 | 18.0 | 80 | – | B | ZCHG200 |
| **ABPS25S25-150-70** | 25 | 12.5 | 150 | 25 | – | 70 | 22.5 | 80 | – | B | ZCHG250 |
| **ABPS25S25-150-75** | 25 | 12.5 | 150 | 25 | – | 75 | 22.5 | 75 | – | B | ZCHG250 |

Inserts p. 25

| Part No. | Clamp Screw | Fastening Torque (N•m) | Wrench |
|---|---|---|---|
| **IABPS05S** ○○-○-○ | 581-141 | 1.1 | 104-T8 |
| **IABPS06S** ○○-○-○ | 581-142 | 2.2 | 104-T10 |
| **IABPS08S** ○○-○-○ | 581-143 | 4.9 | 105-T20 |
| **IABPS10S** ○○-○-○ | 581-144 | 4.9 | 105-T20 |
| **IABPS12S** ○○-○-○ | 581-144 | 4.9 | 105-T20 |
| **IABPS16S** ○○-○-○ | 581-146 | 9.8 | 105-T30A |

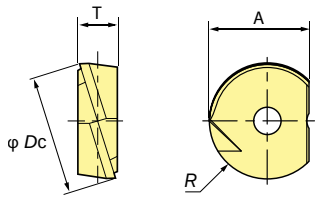
| Part No. | Clamp Screw | Fastening Torque (N•m) | Wrench |
|---|---|---|---|
| **ABPS08S** ○○-○○○-○○ | 581-141 | 1.1 | 104-T8 |
| **ABPS10S** ○○-○○○-○○ | 581-142 | 2.2 | 104-T10 |
| **ABPS12S** ○○-○○○-○○ | 581-143 | 4.9 | 105-T20 |
| **ABPS16S** ○○-○○○-○○ | 581-144 | 4.9 | 105-T20 |
| **ABPS20S** ○○-○○○-○○ | 581-144 | 4.9 | 105-T20 |
| **ABPS25S** ○○-○○○-○○ | 581-146 | 9.8 | 105-T30A |

***Wrenches, screw anti-seizure agent, and clamp screws are sold seperately.**

# IABPS/ABPS

Inserts

Advanced Engineering




## Inserts-Inch

| Part No. | øDc | R | A | T | Grade PN Coat (PN08M) | Accuracy |
|---|---|---|---|---|---|---|
| **IZCHG050** | 0.312 | 0.156 | 0.373 | 0.079 | • | |
| **IZCHG060** | 0.375 | 0.188 | 0.443 | 0.098 | • | |
| **IZCHG080** | 0.500 | 0.250 | 0.486 | 0.098 | • | H |
| **IZCHG100** | 0.625 | 0.313 | 0.549 | 0.118 | • | |
| **IZCHG120** | 0.750 | 0.375 | 0.611 | 0.118 | • | |
| **IZCHG160** | 1.000 | 0.500 | 0.854 | 0.157 | • | |

## Inserts-Metric

| Part No. | øDc | R | A | T | Grade PN Coat (PN08M) | Accuracy |
|---|---|---|---|---|---|---|
| **ZCHG080** | 8 | 4.0 | 9.5 | 2.0 | • | |
| **ZCHG100** | 10 | 5.0 | 11.5 | 2.5 | • | |
| **ZCHG120** | 12 | 6.0 | 12.0 | 2.5 | • | H |
| **ZCHG160** | 16 | 8.0 | 14.0 | 3.0 | • | |
| **ZCHG200** | 20 | 10.0 | 16.0 | 3.0 | • | |
| **ZCHG250** | 25 | 12.5 | 21.5 | 4.0 | • | |

**• = Stocked items in US**

| Material Name<br>ISO Classification | Coating Name<br>Coating Type | Application | Feature |
|---|---|---|---|
| **PN08M**<br>P01-M01-K01 | **PN Coating**<br>PVD | General purpose for Steel (up to HRC 50) and Cast Iron | Combining of the AlCr coating layer with SI produces high hardness (3000HV) as well as good wear resistance. Good for Carbon Steel Alloy Steel and Hardened Steel. |

# IABPS/ABPS

## Cutting Conditions
## Inch

Advanced Engineering

| ø | | 5/16" | | | 3/8" | | | 1/2" | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) PN08M | N(rpm) | 6,420 | 10,040 | 10,040 | 5,350 | 7,700 | 9,370 | 4,020 | 5,270 | 7,530 |
| | Vc(sfm) | 525 | 820 | 820 | 525 | 755 | 919 | 525 | 689 | 984 |
| | Vf(in/min) | 101 | 317 | 158 | 84 | 243 | 148 | 63 | 166 | 119 |
| | fz(in/t) | 0.008 | 0.016 | 0.008 | 0.008 | 0.016 | 0.008 | 0.008 | 0.016 | 0.008 |
| | ap(in) | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ae(in) | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Carbon Steel Alloy Steel (30-45HRC) PN08M | N(rpm) | 4,820 | 8,830 | 8,830 | 4,020 | 6,360 | 8,030 | 3,010 | 4,520 | 6,520 |
| | Vc(sfm) | 394 | 722 | 722 | 394 | 623 | 787 | 394 | 591 | 853 |
| | Vf(in/min) | 76 | 209 | 139 | 63 | 150 | 127 | 48 | 107 | 103 |
| | fz(in/t) | 0.008 | 0.012 | 0.008 | 0.008 | 0.012 | 0.008 | 0.008 | 0.012 | 0.008 |
| | ap(in) | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ae(in) | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Cast Iron FC, FCD PN08M | N(rpm) | 6,420 | 10,040 | 10,040 | 5,350 | 7,700 | 9,370 | 4,020 | 5,270 | 7,530 |
| | Vc(sfm) | 525 | 820 | 820 | 525 | 755 | 919 | 525 | 689 | 984 |
| | Vf(in/min) | 152 | 395 | 158 | 126 | 303 | 222 | 95 | 207 | 178 |
| | fz(in/t) | 0.012 | 0.020 | 0.008 | 0.012 | 0.020 | 0.012 | 0.012 | 0.020 | 0.012 |
| | ap(in) | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ae(in) | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Hardened Steel (45-55HRC) PN08M | N(rpm) | 4,020 | 6,020 | 7,230 | 3,350 | 5,020 | 7,030 | 2,510 | 3,770 | 5,770 |
| | Vc(sfm) | 328 | 492 | 591 | 328 | 492 | 689 | 328 | 492 | 755 |
| | Vf(in/min) | 32 | 95 | 114 | 26 | 79 | 111 | 20 | 59 | 91 |
| | fz(in/t) | 0.004 | 0.008 | 0.008 | 0.004 | 0.008 | 0.008 | 0.004 | 0.008 | 0.008 |
| | ap(in) | 0.008 | 0.004 | 0.004 | 0.010 | 0.006 | 0.004 | 0.012 | 0.008 | 0.004 |
| | ae(in) | 0.031 | 0.031 | 0.010 | 0.039 | 0.031 | 0.010 | 0.047 | 0.035 | 0.012 |
| Maximum fz(in/t) | | < 0.031 | | | < 0.031 | | | < 0.031 | | |
| Maximum ap(in) | | < 0.156 | | | < 0.187 | | | < 0.25 | | |

| ø | | 5/8" | | | 3/4" | | | 1" | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) PN08M | N(rpm) | 3,210 | 4,220 | 8,030 | 2,680 | 3,520 | 7,530 | 2,010 | 2,640 | 6,270 |
| | Vc(sfm) | 525 | 689 | 1,312 | 525 | 689 | 1476 | 525 | 689 | 1,640 |
| | Vf(in/min) | 63 | 133 | 190 | 53 | 139 | 237 | 40 | 104 | 247 |
| | fz(in/t) | 0.010 | 0.016 | 0.012 | 0.010 | 0.020 | 0.016 | 0.010 | 0.020 | 0.020 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ae(in) | 0.063 | 0.043 | 0.014 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Carbon Steel Alloy Steel (30-45HRC) PN08M | N(rpm) | 2,410 | 3,010 | 6,020 | 2,010 | 2,510 | 5,520 | 1,510 | 1,890 | 4,640 |
| | Vc(sfm) | 394 | 492 | 984 | 394 | 492 | 1083 | 394 | 492 | 1,214 |
| | Vf(in/min) | 48 | 83 | 143 | 40 | 79 | 174 | 30 | 60 | 146 |
| | fz(in/t) | 0.010 | 0.014 | 0.012 | 0.010 | 0.016 | 0.016 | 0.010 | 0.016 | 0.016 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ae(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Cast Iron FC, FCD PN08M | N(rpm) | 3,210 | 4,220 | 8,030 | 2,680 | 3,520 | 7,530 | 2,010 | 2,640 | 6,270 |
| | Vc(sfm) | 525 | 689 | 1312 | 525 | 689 | 1,476 | 525 | 689 | 1,640 |
| | Vf(in/min) | 89 | 200 | 190 | 74 | 167 | 237 | 56 | 125 | 247 |
| | fz(in/t) | 0.014 | 0.024 | 0.012 | 0.014 | 0.024 | 0.016 | 0.014 | 0.024 | 0.020 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ae(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Hardened Steel (45-55HRC) PN08M | N(rpm) | 2,010 | 2,610 | 5,620 | 1,680 | 2,180 | 5,350 | 1,260 | 1,630 | 4,520 |
| | Vc(sfm) | 328 | 427 | 919 | 328 | 427 | 1050 | 328 | 427 | 1,181 |
| | Vf(in/min) | 19 | 41 | 111 | 16 | 41 | 169 | 12 | 31 | 143 |
| | fz(in/t) | 0.005 | 0.008 | 0.010 | 0.005 | 0.009 | 0.016 | 0.005 | 0.009 | 0.016 |
| | ap(in) | 0.031 | 0.024 | 0.004 | 0.039 | 0.028 | 0.004 | 0.049 | 0.035 | 0.004 |
| | ae(in) | 0.063 | 0.043 | 0.012 | 0.079 | 0.059 | 0.016 | 0.098 | 0.071 | 0.020 |
| Maximum fz(in/t) | | < 0.039 | | | < 0.039 | | | < 0.039 | | |
| Maximum ap(in) | | < 0.312 | | | < 0.375 | | | < 0.5 | | |

| Overhang ratio | Vc (m/min) | Vf(mm/min) |
|---|---|---|
| <3 Dc | 100% | 100% |
| 3Dc~5Dc | 70% | 70% |
| 5Dc~8Dc | 60% | 60% |

| | ø | 8mm | | | 10mm | | | 12mm | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) | N(min⁻¹) | 6,370 | 9,960 | 9,960 | 5,100 | 7,330 | 8,920 | 4,250 | 5,580 | 7,970 |
| | Vc(m/min) | 160 | 250 | 250 | 160 | 230 | 280 | 160 | 210 | 300 |
| | Vf(mm/min) | 2,550 | 7,970 | 3,990 | 2,040 | 5,870 | 3,570 | 1,700 | 4,470 | 3,190 |
| PN08M | fz(mm/t) | 0.2 | 0.4 | 0.2 | 0.2 | 0.4 | 0.2 | 0.2 | 0.4 | 0.2 |
| | ap(mm) | 0.2 | 0.1 | 0.1 | 0.25 | 0.15 | 0.1 | 0.3 | 0.2 | 0.1 |
| | ap(mm) | 0.8 | 0.8 | 0.25 | 1 | 0.8 | 0.25 | 1.2 | 0.9 | 0.3 |
| Carbon Steel Alloy Steel (30-45HRC) | N(min⁻¹) | 4,780 | 8,760 | 8,760 | 3,830 | 6,060 | 7,650 | 3,190 | 4,780 | 6,910 |
| | Vc(m/min) | 120 | 220 | 220 | 120 | 190 | 240 | 120 | 180 | 260 |
| | Vf(mm/min) | 1,920 | 5,260 | 3,510 | 1,540 | 3,640 | 3,060 | 1,280 | 2,870 | 2,770 |
| PN08M | fz(mm/t) | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 |
| | ap(mm) | 0.2 | 0.1 | 0.1 | 0.25 | 0.15 | 0.1 | 0.3 | 0.2 | 0.1 |
| | ap(mm) | 0.8 | 0.8 | 0.25 | 1 | 0.8 | 0.25 | 1.2 | 0.9 | 0.3 |
| Cast Iron FC, FCD | N(min⁻¹) | 6,370 | 9,960 | 9,960 | 5,100 | 7,330 | 8,920 | 4,250 | 5,580 | 7,970 |
| | Vc(m/min) | 160 | 250 | 250 | 160 | 230 | 280 | 160 | 210 | 300 |
| PN08M | Vf(mm/min) | 3,830 | 9,960 | 3,990 | 3,060 | 7,330 | 5,360 | 2,550 | 5,580 | 4,790 |
| | fz(mm/t) | 0.3 | 0.5 | 0.2 | 0.3 | 0.5 | 0.3 | 0.3 | 0.5 | 0.3 |
| | ap(mm) | 0.2 | 0.1 | 0.1 | 0.25 | 0.15 | 0.1 | 0.3 | 0.2 | 0.1 |
| | ap(mm) | 0.8 | 0.8 | 0.25 | 1 | 0.8 | 0.25 | 1.2 | 0.9 | 0.3 |
| Hardened Steel (45-55HRC) | N(min⁻¹) | 3,990 | 5,980 | 7,170 | 3,190 | 4,780 | 6,690 | 2,660 | 3,990 | 6,110 |
| | Vc(m/min) | 100 | 150 | 180 | 100 | 150 | 210 | 100 | 150 | 230 |
| PN08M | Vf(mm/min) | 800 | 2,400 | 2,870 | 640 | 1,920 | 2,680 | 540 | 1,600 | 2,450 |
| | fz(mm/t) | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 |
| | ap(mm) | 0.2 | 0.1 | 0.1 | 0.25 | 0.15 | 0.1 | 0.3 | 0.2 | 0.1 |
| | ap(mm) | 0.8 | 0.8 | 0.25 | 1 | 0.8 | 0.25 | 1.2 | 0.9 | 0.3 |
| Maximum fz(mm/t) | | < 0.8 | | | < 0.8 | | | < 0.8 | | |
| Maximum ap(mm) | | < 4.0 | | | < 5.0 | | | < 6.0 | | |

| | ø | 16mm | | | 20mm | | | 25mm | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Semi-finishing | | Finishing | Semi-finishing | | Finishing | Semi-finishing | | Finishing |
| | | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Carbon Steel Alloy Steel (<30HRC) | N(min⁻¹) | 3,190 | 4,180 | 7,970 | 2,550 | 3,350 | 7,170 | 2,040 | 2,680 | 6,370 |
| | Vc(m/min) | 160 | 210 | 400 | 160 | 210 | 450 | 160 | 210 | 500 |
| | Vf(mm/min) | 1,600 | 3,350 | 4,790 | 1,280 | 3,350 | 5,740 | 1,020 | 2,680 | 6,370 |
| PN08M | fz(mm/t) | 0.25 | 0.4 | 0.3 | 0.25 | 0.5 | 0.4 | 0.25 | 0.5 | 0.5 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.35 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Carbon Steel Alloy Steel (30-45HRC) | N(min⁻¹) | 2,390 | 2,990 | 5,980 | 1,920 | 2,390 | 5,260 | 1,530 | 1,920 | 4,720 |
| | Vc(m/min) | 120 | 150 | 300 | 120 | 150 | 330 | 120 | 150 | 370 |
| | Vf(mm/min) | 1,200 | 2,100 | 3,590 | 960 | 1,920 | 4,210 | 770 | 1,540 | 3,780 |
| PN08M | fz(mm/t) | 0.25 | 0.35 | 0.3 | 0.25 | 0.4 | 0.4 | 0.25 | 0.4 | 0.4 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Cast Iron FC, FCD | N(min⁻¹) | 3,190 | 4,180 | 7,970 | 2,550 | 3,350 | 7,170 | 2,040 | 2,680 | 6,370 |
| | Vc(m/min) | 160 | 210 | 400 | 160 | 210 | 450 | 160 | 210 | 500 |
| PN08M | Vf(mm/min) | 2,240 | 5,020 | 4,790 | 1,790 | 4,020 | 5,740 | 1,430 | 3,220 | 6,370 |
| | fz(mm/t) | 0.35 | 0.6 | 0.3 | 0.35 | 0.6 | 0.4 | 0.35 | 0.6 | 0.5 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Hardened Steel (45-55HRC) | N(min⁻¹) | 2,000 | 2,590 | 5,580 | 1,600 | 2,080 | 5,100 | 1,280 | 1,660 | 4,590 |
| | Vc(m/min) | 100 | 130 | 280 | 100 | 130 | 320 | 100 | 130 | 360 |
| PN08M | Vf(mm/min) | 480 | 1,040 | 2,790 | 390 | 1,000 | 4,080 | 310 | 800 | 3,680 |
| | fz(mm/t) | 0.12 | 0.2 | 0.25 | 0.12 | 0.24 | 0.4 | 0.12 | 0.24 | 0.4 |
| | ap(mm) | 0.8 | 0.6 | 0.1 | 1 | 0.7 | 0.1 | 1.25 | 0.9 | 0.1 |
| | ap(mm) | 1.6 | 1.1 | 0.3 | 2 | 1.5 | 0.4 | 2.5 | 1.8 | 0.5 |
| Maximum fz(mm/t) | | < 1.0 | | | < 1.0 | | | < 1.0 | | |
| Maximum ap(mm) | | < 8.0 | | | < 10.0 | | | < 12.5 | | |

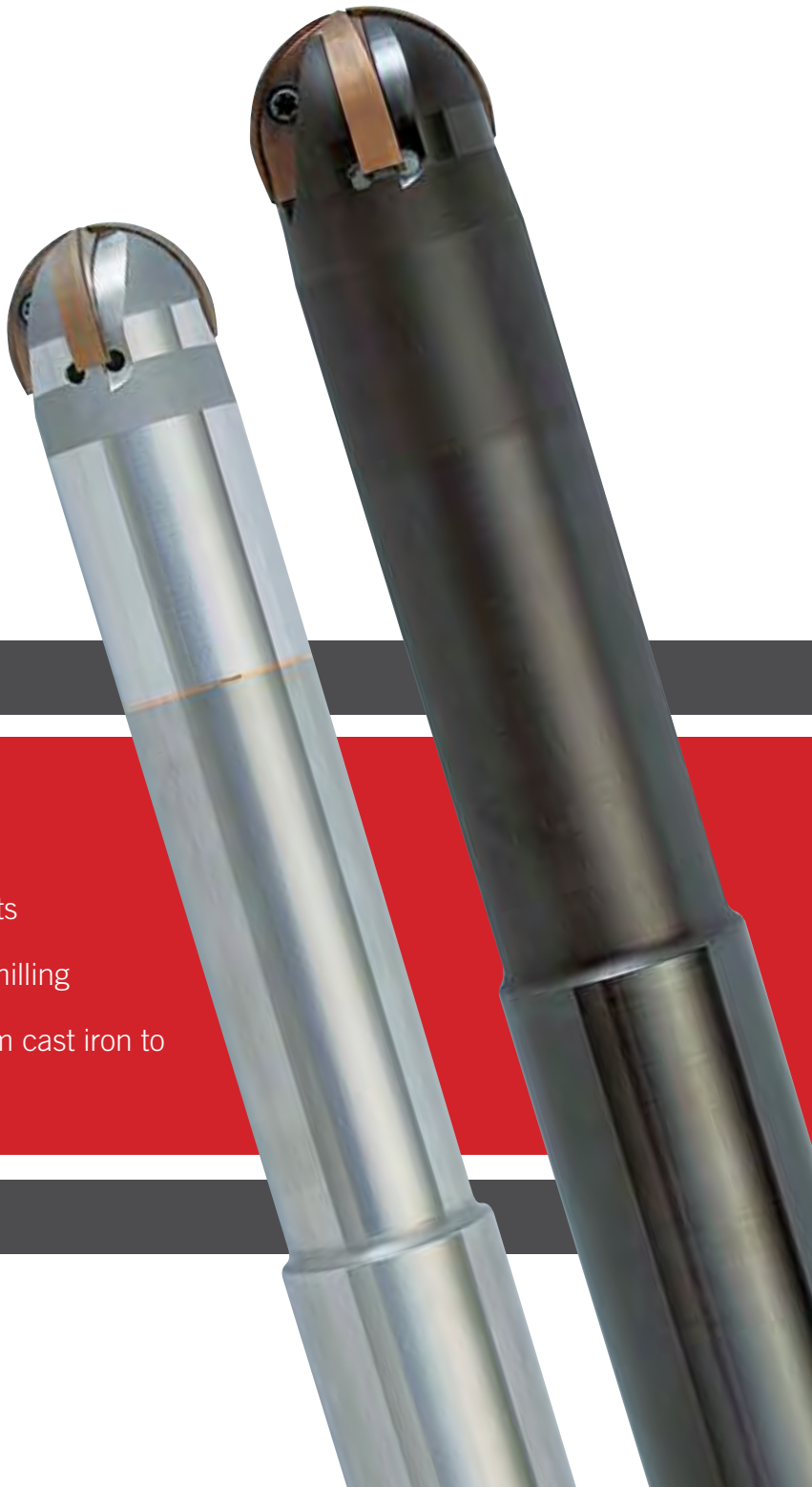
| Overhang ratio | Vc (m/min) | Vf(mm/min) |
|---|---|---|
| **<3 Dc** | 100% | 100% |
| **3Dc~5Dc** | 70% | 70% |
| **5Dc~8Dc** | 60% | 60% |

# ABP4F

Advanced Engineering

## Four Flute Indexable Ball End Mills for High Efficiency Finishing

**SHANK STYLE**



## FEATURES

Four flute design provides improved productivity compared to traditional two-flute design

Radius tolerance of ±0.01mm across three inserts

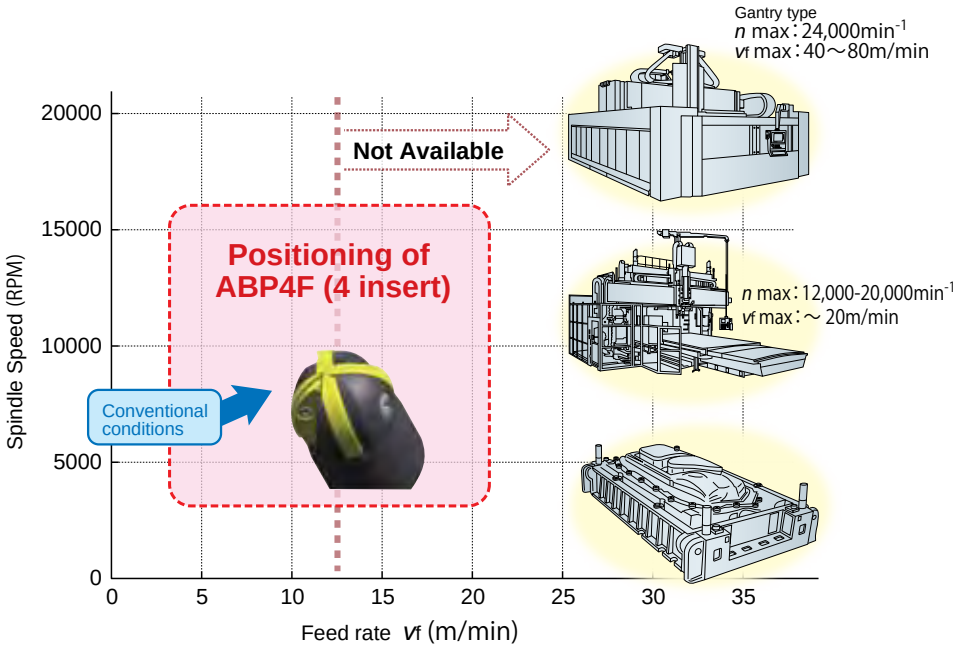
Extended gage lengths are ideal for deep cavity milling

Three insert grades for machining everything from cast iron to high-hardness steels.

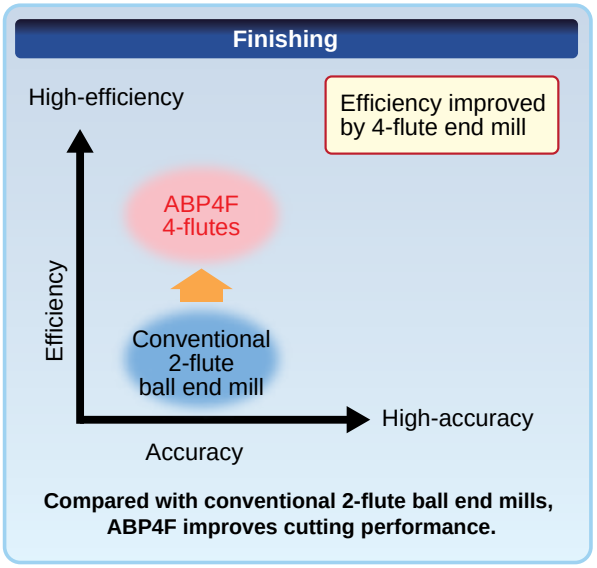
## 1. New Product

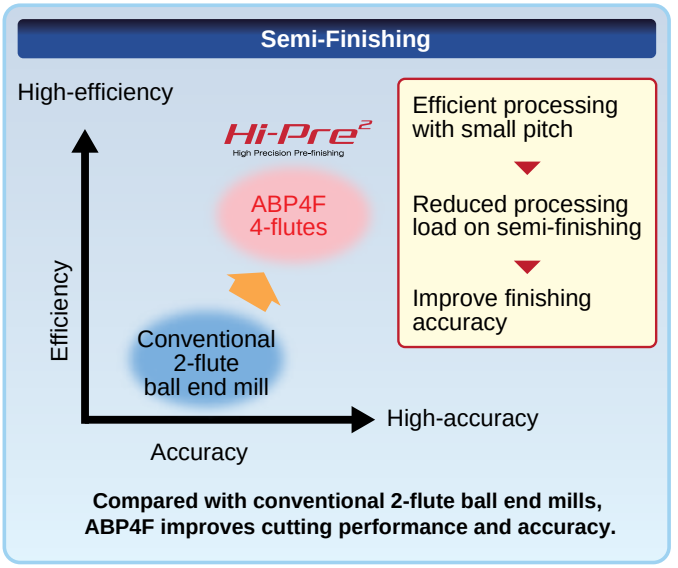
The ABP4F Four Flute Ball Nose Indexable End Mills are designed to improve semi-finishing and finishing productivity and accuracy. The unique four flute design delivers a Radius tolerance of ±0.01mm across all three inserts. Available in diameters of 20 – 30mm in a wide range of gauge lengths, these tools are ideal for deep cavity work in larger dies and molds.

**Example of large press die for automotive parts**

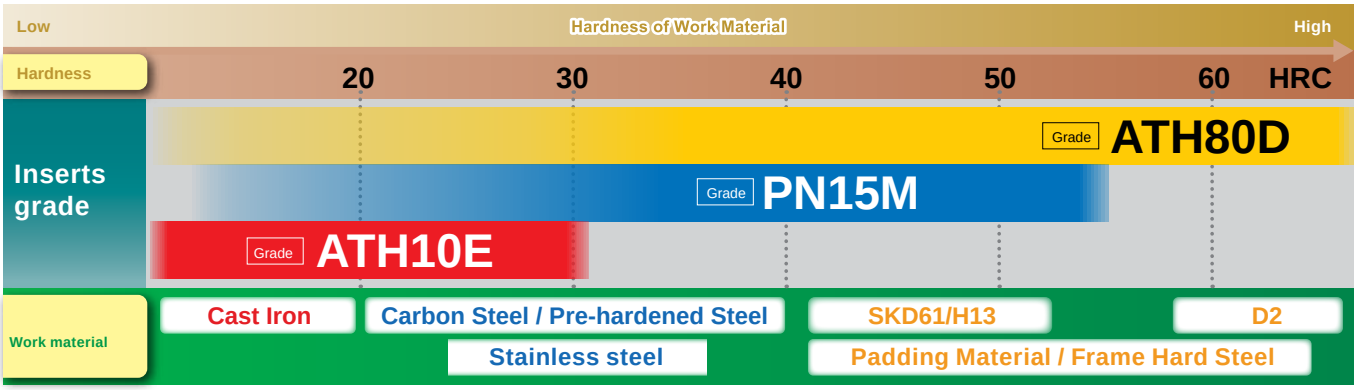



## 2. Advantage of Machining with Four Flute End Mills



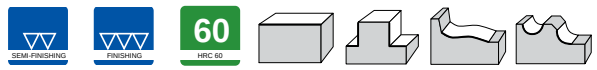
## 3. Recommended Coating Grade Map

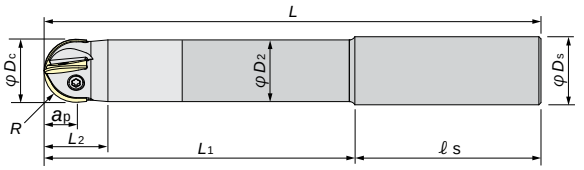


# ABP4F

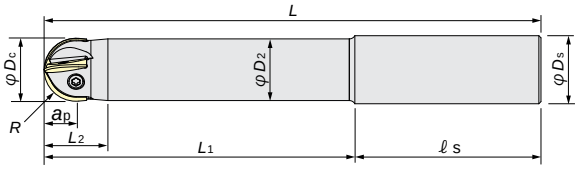
**Shank Style**
**Metric**

Advanced Engineering




Carbide Shank




Steel Shank

| D | ±0.01 |
|---|---|

**ABP4F-Metric (Shank Style)**

| | Part No. | øD | R | L | ap | L2 | L1 | ls | ød1 | ød2 | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbide Shank | **ABP4F20S20WL80** | 20 | 10.0 | 160 | 10.0 | 17.0 | 80 | 80 | 20 | 19 | ZDFG200** |
| | **ABP4F20S20WL100** | 20 | 10.0 | 180 | 10.0 | 17.0 | 100 | 80 | 20 | 19 | ZDFG200** |
| | **ABP4F20S20WL120** | 20 | 10.0 | 200 | 10.0 | 17.0 | 120 | 80 | 20 | 19 | ZDFG200** |
| | **ABP4F25S25WL100** | 25 | 12.5 | 180 | 12.5 | 23.5 | 100 | 80 | 25 | 24 | ZDFG250** |
| | **ABP4F25S25WL120** | 25 | 12.5 | 200 | 12.5 | 23.5 | 120 | 80 | 25 | 24 | ZDFG250** |
| | **ABP4F25S25WL150** | 25 | 12.5 | 230 | 12.5 | 23.5 | 150 | 80 | 25 | 24 | ZDFG250** |
| | **ABP4F30S32WL100** | 30 | 15.0 | 180 | 15.0 | 30.0 | 100 | 80 | 32 | 28 | ZDFG300** |
| | **ABP4F30S32WL120** | 30 | 15.0 | 200 | 15.0 | 30.0 | 120 | 80 | 32 | 28 | ZDFG300** |
| | **ABP4F30S32WL150** | 30 | 15.0 | 230 | 15.0 | 30.0 | 150 | 80 | 32 | 28 | ZDFG300** |
| Steel Shank | **ABP4F20S20L60** | 20 | 10.0 | 140 | 10.0 | 17.0 | 60 | 80 | 20 | 19 | ZDFG200** |
| | **ABP4F20S20L80** | 20 | 10.0 | 160 | 10.0 | 17.0 | 80 | 80 | 20 | 19 | ZDFG200** |
| | **ABP4F20S20L100** | 20 | 10.0 | 180 | 10.0 | 17.0 | 100 | 80 | 20 | 19 | ZDFG200** |
| | **ABP4F25S25L100** | 25 | 12.5 | 180 | 12.5 | 23.5 | 100 | 80 | 25 | 24 | ZDFG250** |
| | **ABP4F25S25L120** | 25 | 12.5 | 200 | 12.5 | 23.5 | 120 | 80 | 25 | 24 | ZDFG250** |
| | **ABP4F25S25L150** | 25 | 12.5 | 230 | 12.5 | 23.5 | 150 | 80 | 25 | 24 | ZDFG250** |
| | **ABP4F30S32L100** | 30 | 15.0 | 180 | 15.0 | 30.0 | 100 | 80 | 32 | 29 | ZDFG300** |
| | **ABP4F30S32L120** | 30 | 15.0 | 200 | 15.0 | 30.0 | 120 | 80 | 32 | 29 | ZDFG300** |
| | **ABP4F30S32L150** | 30 | 15.0 | 230 | 15.0 | 30.0 | 150 | 80 | 32 | 29 | ZDFG300** |

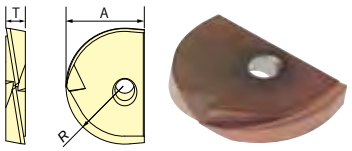
Inserts p. 32

| Part No. | Clamp Screw | Clamp Screw | Screwdriver / Wrench | | | | Screw Anti-Seizure Agent |
|---|---|---|---|---|---|---|---|
| |  |  |  A |  B | | |  |
| **ABP4F20S20 ○ L ○○○** | 155-158 | 250-140 | 104-T15 | A | 104-T6 | A | |
| **ABP4F25S25 ○ L ○○○** | 155-159 | 250-141 | 104-T15 | A | 104-T8 | A | P-37 |
| **ABP4F30S32 ○ L ○○○** | 155-160 | 265-141 | 105-T20 | B | 104-T10 | A | |

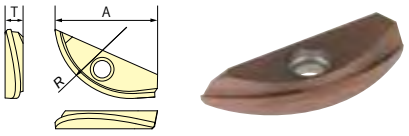
# ABP4F

**Inserts**

Advanced Engineering




Main Insert

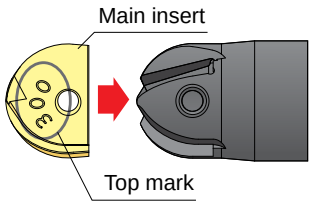


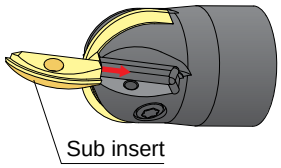

Secondary Insert

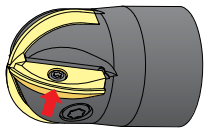
### ABP4F-Metric (Modular Style)

| Part No. | ATH10E | ATH80D | PN15M | R | A | T* | Set Items |
|---|---|---|---|---|---|---|---|
| **ZDFG200SET** | • | • | • | 10.0 | 13.8 | 3.2/2.4 | Inserts are packaged with one main insert and two sub inserts |
| **ZDFG250SET** | • | • | • | 12.5 | 16.8 | 4.0/3.0 | |
| **ZDFG300SET** | • | • | • | 15.0 | 20.0 | 5.0/3.6 | |

*Main insert / Secondary insert



**Set up Procedures of Inserts**

To meet the specification for radius tolerance of ±0.01mm, attach inserts according to this procedure.

Inserts must be set up in order of main insert then sub insert. Clean the insert seat by using compressed air. Apply the screw anti-seizure agent to the whole clamp screw. Excessive tightening torque applied to the screw can cause screw damage and seize the screw in place. *DO NOT exceed the recommended tightening torque*

**Set-up Procedure of Main Insert**

1. Place top mark of the insert as shown toward screw tightening side.
2. Tighten the insert screw while applying minimal pressure to insert.

**Set-up Procedure of Sub Insert**

3. Install sub insert along the restraining wall.
4. Tighten the insert screw while applying firm pressure to insert.

***Inserts must be removed in the order of Sub Insert then Main Insert.**

**Recommended Tightening Torque**

| Diameter (mm) | Main Insert (N•m) | Sub Insert (N•m) |
|---|---|---|
| ø20 | 2.2 | 0.5 |
| ø25 | 2.9 | 1.1 |
| ø30 | 4.9 | 2.0 |

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **ATH80D**<br>P01-K01 | **ATH Coating**<br>PVD | For hardened steels (45~65HRC) | Multi-layer structure provides improved adhesion strength, coating hardness, and oxidation resistance. |
| **ATH10E**<br>K01 | **ATH Coating**<br>PVD | For cast iron | Multi-layer structure provides improved adhesion strength, coating hardness, and oxidation resistance. Suitable for finishing of cast iron. |
| **PN15M**<br>P10 | **PN Coating**<br>PVD | General purpose for steel | It adopts PN coating which was excellent in heat resistance with higher hardness. Suitable of finishing of common steels. |

# ABP4F

## Cutting Conditions Inch

Advanced Engineering

| Work Materials | Insert Grade | | Cutting Condition | ø | ø20 | | | ø25 | | | ø30 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Finishing | | | Finishing | | | Finishing | | |
| | Semi-finishing | Finishing | | Semi-finishing | General | Hi-Speed | Semi-finishing | General | Hi-Speed | Semi-finishing | General | Hi-Speed |
| Carbon Steel Alloy Steel (<30HRC) | PN15M | PN15M | N(rpm) | 4,780 | 9,240 | 10,350 | 4,460 | 8,790 | 10,190 | 3,820 | 7,640 | 10,080 |
| | | | Vc(sfm) | 984 | 1902.4 | 2132 | 1148 | 2263.2 | 2624 | 1180.8 | 2361.6 | 3116 |
| | | | Vf(in/min) | 135 | 262 | 359 | 141 | 277 | 353 | 120 | 241 | 349 |
| | | | fz(in/t) | 0.007 | 0.007 | 0.009 | 0.008 | 0.008 | 0.009 | 0.008 | 0.008 | 0.009 |
| | | | ap(in) | 0.012 | 0.004 | 0.004 | 0.016 | 0.004 | 0.004 | 0.020 | 0.004 | 0.004 |
| | | | ae(in) | 0.047 | 0.016 | 0.016 | 0.055 | 0.018 | 0.018 | 0.059 | 0.020 | 0.020 |
| Carbon Steel Alloy Steel (30-45HRC) | PN15M ATH80D | PN15M ATH80D | N(rpm) | 3,670 | 6,850 | 7,960 | 3,060 | 6,880 | 8,280 | 2,650 | 6,050 | 8,490 |
| | | | Vc(sfm) | 754 | 1410 | 1640 | 787 | 1771 | 2132 | 820 | 1870 | 2624 |
| | | | Vf(in/min) | 104 | 194 | 251 | 96 | 217 | 261 | 83 | 191 | 267 |
| | | | fz(in/t) | 0.007 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | | | ap(in) | 0.012 | 0.004 | 0.004 | 0.016 | 0.004 | 0.004 | 0.020 | 0.004 | 0.004 |
| | | | ae(in) | 0.039 | 0.016 | 0.016 | 0.055 | 0.018 | 0.018 | 0.059 | 0.020 | 0.020 |
| Cast Iron | ATH80D PN15M | ATH10E ATH80D PN15M | N(rpm) | 6,690 | 10,190 | 11,150 | 5,930 | 10,570 | 11,460 | 5,940 | 9,550 | 11,670 |
| | | | Vc(sfm) | 1378 | 2099 | 2296 | 1525 | 2722 | 2952 | 1837 | 2952 | 3608 |
| | | | Vf(in/min) | 190 | 321 | 439 | 187 | 333 | 451 | 187 | 301 | 459 |
| | | | fz(in/t) | 0.007 | 0.008 | 0.010 | 0.008 | 0.008 | 0.010 | 0.008 | 0.008 | 0.010 |
| | | | ap(in) | 0.012 | 0.004 | 0.004 | 0.016 | 0.004 | 0.004 | 0.020 | 0.004 | 0.004 |
| | | | ae(in) | 0.047 | 0.016 | 0.016 | 0.055 | 0.018 | 0.018 | 0.059 | 0.020 | 0.020 |
| Hardened Steel (45-55HRC) | ATH80D PN15M | ATH80D PN15M | N(rpm) | 1,910 | 4,780 | 6,690 | 1,790 | 4,460 | 6,120 | 1,700 | 4,240 | 5,840 |
| | | | Vc(sfm) | 394 | 984 | 1378 | 459 | 1148 | 1574 | 525 | 1312 | 1804 |
| | | | Vf(in/min) | 54 | 135 | 211 | 51 | 141 | 193 | 48 | 134 | 184 |
| | | | fz(in/t) | 0.007 | 0.007 | 0.008 | 0.007 | 0.008 | 0.008 | 0.007 | 0.008 | 0.008 |
| | | | ap(in) | 0.008 | 0.004 | 0.004 | 0.012 | 0.004 | 0.004 | 0.016 | 0.004 | 0.004 |
| | | | ae(in) | 0.031 | 0.012 | 0.012 | 0.035 | 0.016 | 0.016 | 0.039 | 0.020 | 0.020 |
| Hardened Steel (55-62HRC) | ATH80D | ATH80D | N(rpm) | 1,600 | 3,190 | 5,420 | 1,410 | 3,570 | 5,230 | 1,270 | 3,820 | 5,200 |
| | | | Vc(sfm) | 328 | 656 | 1115 | 361 | 918 | 1345 | 394 | 1181 | 1607 |
| | | | Vf(in/min) | 45 | 91 | 170 | 40 | 113 | 165 | 36 | 120 | 164 |
| | | | fz(in/t) | 0.007 | 0.007 | 0.008 | 0.007 | 0.008 | 0.008 | 0.007 | 0.008 | 0.008 |
| | | | ap(in) | 0.008 | 0.004 | 0.004 | 0.012 | 0.004 | 0.004 | 0.016 | 0.004 | 0.004 |
| | | | ae(in) | 0.020 | 0.012 | 0.012 | 0.024 | 0.016 | 0.016 | 0.031 | 0.020 | 0.020 |
| | | | Maximum fz(in/t) | | < 0.020 | | | < 0.023 | | | < 0.027 | |
| | | | Maximum ap(in) | | < 0.4 | | | < 0.5 | | | < 0.6 | |

1. These conditions are for general gudance; 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 refering to the table at left

| Overhang ratio | Vc (sfm) | Vf(in/min) |
|---|---|---|
| <4 Dc | 100% | 100% |
| 4Dc~8Dc | 85% | 85% |

# IRH2P/RH2P

## High Accuracy Indexable Radius End Mills

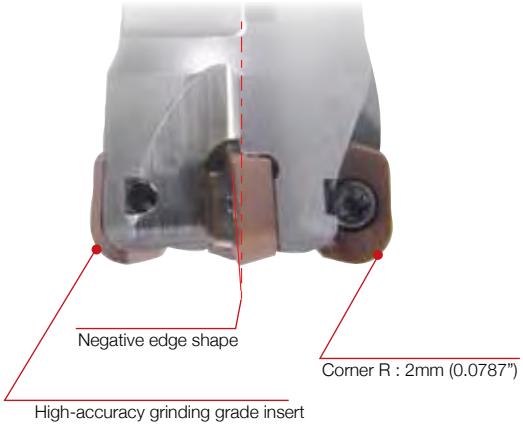
MODULAR STYLE

SHANK STYLE

## FEATURES

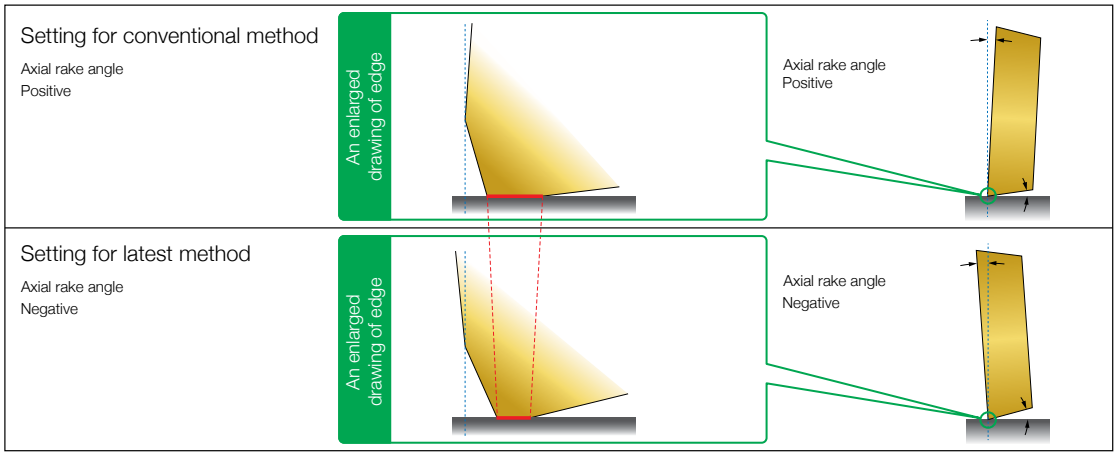
- High accuracy ground inserts paired with high accuracy cutter bodies
- Designed for improved runout accuracy and stable cutting performance
- 2mm (0.0787”) corner radius on inserts
- JP4005 coating for milling of hardened steels up to 62HRC

## 1. Key Product Details




- Combination of high-accuracy ground inserts (H grade) and high-accuracy bodies improves edge runout accuracy and stable cutting performance.
- RH2P adopts a corner radius of 2mm (0.0787″) to reduce the remains by approximately corner R.
- RH2P adopts an exclusive negative edge shape.
- By having a negative setting of the rake angle against teh axial direction, RH2P improves toughness of edges and reduces wear.

## 2. Wear reduction effect of negative edge shape



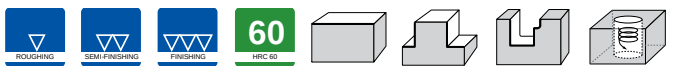

## 3. Comparison between ASM and RH2P

| ASM type | Category | RH2P type |
|---|---|---|
|  For high-feed processing  Sholder face milling processing | Inserts |  For high-feed processing |
| Type of low cutting resistancee with breaker | Edge shape | Flat type inserts high-toughness |
| M grade | Accuracy | H grade |
| • ASM can perform high-feed processing and sholder face milling processing.<br>• Low cutting force due to inserts has breaker.<br>• Economical inserts (M grade). | Features | • RH2P performs high-accuracy processing by combination of high-accuracy-ground inserts and hi-accuracy bodies.<br>• Edge toughness is fine, due to flat type inserts.<br>• RH2P reduces the wear of flank, by adopting the negative edge shape. |
| • For roughing process for carbon steel and stainless steel.<br>• Sholder face milling as depth of cut under 2mm (0.0787"). | Recommended cutting applications | • For roughing process and semi-finishing process of pre-hardened steel.<br>• For roughing process and semi-finishing process of hardened steel (over 55HRC).<br>• For unstable cutting (for example :nitrided materials). |

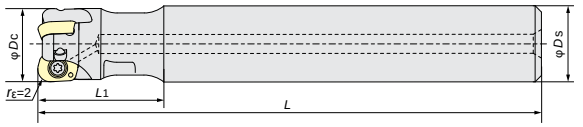
# IRH2P/RH2P

**Shank Style**
**Inch + Metric**

Advanced Engineering




*** Recommended fastening torque 0.5N•m**



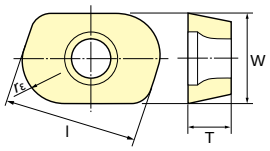

| D | -0.046/-0.096 |
|---|---|

### IRH2P-Inch (Shank Style)

| Part No. | Flutes | ØDc | L | ØDs | L1 | Insert |
|---|---|---|---|---|---|---|
| **IRH2P1006S-2** | 2 | 0.375 | 3.0 | 0.375 | 0.75 | EPHW0402TN-2 |
| **IRH2P1008S-3** | 3 | 0.500 | 3.0 | 0.500 | 0.75 | EPHW0402TN-2 |
| **IRH2P1010S-4** | 4 | 0.625 | 3.5 | 0.625 | 1.00 | EPHW0402TN-2 |
| **IRH2P1012S-5** | 5 | 0.750 | 4.0 | 0.750 | 1.00 | EPHW0402TN-2 |
| **IRH2P1016S-6** | 6 | 1.000 | 5.5 | 1.000 | 2.50 | EPHW0402TN-2 |

### RH2P-Metric (Shank Style)

| Part No. | Flutes | øDc | L | ØDs | L1 | Insert |
|---|---|---|---|---|---|---|
| **RH2P1010S-2** | 2 | 10 | 80 | 10 | 20 | EPHW0402TN-2 |
| **RH2P1012S-3** | 3 | 12 | 80 | 12 | 20 | EPHW0402TN-2 |
| **RH2P1016S-4** | 4 | 16 | 90 | 16 | 25 | EPHW0402TN-2 |
| **RH2P1020S-5** | 5 | 20 | 105 | 20 | 25 | EPHW0402TN-2 |




### Inserts

| Part No. | JP4015 | JP4005 | A(mm) | B(mm) | T(mm) | r(mm) |
|---|---|---|---|---|---|---|
| **EPHW0402TN-2** | • | • | 6.125 | 4.2 | 2 | 2 |

## COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4015**<br>P10 | **JP Coating**<br>PVD | General purpose for steel and pre-hardened steel | Uses micro grain substrate and JP coating. Suitable for cutting of common steels through pre-hardened steels. |
| **JP4005**<br>P01-M01 | **JP Coating**<br>PVD | For hardened steel 50HRC or more | JP coating is optimized for cutting high-hardness materials. Uses substrate of ultrafine-particle cemented carbide. |

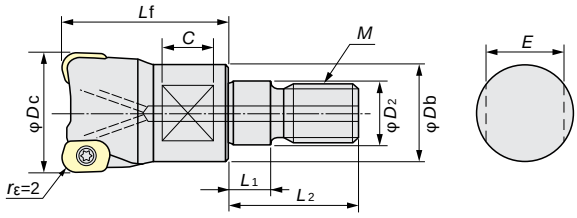
# IRH2P/RH2P

**Modular Style**
**Inch + Metric**

Advanced Engineering

ROUGHING | SEMI-FINISHING | FINISHING | 60 HRC 60

*** Recommended fastening torque 0.5N•m**




D -0.046/-0.096

### IRH2P-Inch (Modular Style)

| Part No. | Stock | Flutes | ØDc | Lf | ØD2 | M | ØDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IRH2P1006M-2** | • | 2 | 0.375 | 0.669 | 0.256 | 6 | 0.370 | 0.217 | 0.571 | 0.197 | 0.276 | EPHW0402TN-2 |
| **IRH2P1008M-3** | • | 3 | 0.500 | 0.669 | 0.256 | 6 | 0.386 | 0.217 | 0.571 | 0.197 | 0.276 | EPHW0402TN-2 |
| **IRH2P1010M-4** | • | 4 | 0.625 | 0.866 | 0.335 | 8 | 0.504 | 0.217 | 0.669 | 0.315 | 0.394 | EPHW0402TN-2 |
| **IRH2P1012M-5** | • | 5 | 0.750 | 0.984 | 0.413 | 10 | 0.701 | 0.217 | 0.748 | 0.394 | 0.591 | EPHW0402TN-2 |
| **IRH2P1016M-6** | • | 6 | 1.000 | 0.984 | 0.492 | 12 | 0.819 | 0.217 | 0.866 | 0.394 | 0.669 | EPHW0402TN-2 |
| **IRH2P1020M-8** | • | 8 | 1.250 | 1.063 | 0.669 | 16 | 1.134 | 0.236 | 0.906 | 0.472 | 0.866 | EPHW0402TN-2 |

### RH2P-Metric (Modular Style)

| Part No. | Stock | Flutes | ØDc | Lf | ØD2 | M | ØDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RH2P1010M-2** | ☐ | 2 | 10 | 17 | 6.5 | M6 | 9.4 | 5.5 | 14.5 | 5 | 7 | EPHW0402TN-2 |
| **RH2P1012M-3** | ☐ | 3 | 12 | 17 | 6.5 | M6 | 9.8 | 5.5 | 14.5 | 5 | 7 | EPHW0402TN-2 |
| **RH2P1016M-4** | ☐ | 4 | 16 | 22 | 8.5 | M8 | 12.8 | 5.5 | 17.0 | 8 | 10 | EPHW0402TN-2 |
| **RH2P1020M-5** | ☐ | 5 | 20 | 25 | 10.5 | M10 | 17.8 | 5.5 | 19.0 | 10 | 15 | EPHW0402TN-2 |
| **RH2P1025M-6** | ☐ | 6 | 25 | 25 | 12.5 | M12 | 20.8 | 5.5 | 22.0 | 10 | 17 | EPHW0402TN-2 |
| **RH2P1032M-8** | ☐ | 8 | 32 | 27 | 17.0 | M16 | 28.8 | 6.0 | 23.0 | 12 | 22 | EPHW0402TN-2 |

Modular Shanks on p. 163

Inserts p. 36

**☐ = Stocked items in Japan**

| Part No. | Clamp Screw | Screw Driver | Screw Anti-Seizure Agent |
|---|---|---|---|
| **(I)RH2P10** ○○○ | 240-140 | 104-T6 | P-37 |

# IRH2P/RH2P

## Cutting Conditions
## Inch

Advanced Engineering

| | ø | 0.375" or 10mm | 0.5" or 12mm | 0.625" or 16mm | 0.75" or 20mm | 1" or 25mm | 1.25" or 32mm |
|---|---|---|---|---|---|---|---|
| | No. of Flutes | 2 | 3 | 4 | 5 | 6 | 8 |
| Pre-Hardened Steel (<40HRC) JP4015 | Vc(sfm) | 426 | 426 | 426 | 426 | 426 | 426 |
| | N(rpm) | 4,140 | 3,450 | 2,590 | 2,070 | 1,660 | 1,290 |
| | fz(in/t) | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| | Vf(in/min) | 163 | 204 | 204 | 204 | 196 | 203 |
| | doc(in) | 0.014 | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 |
| | woc(in) | 0.197 | 0.275 | 0.374 | 0.472 | 0.591 | 0.748 |
| | Q(in³/min) | 0.45 | 0.90 | 1.22 | 1.54 | 1.85 | 2.43 |
| Pre-Hardened Steel Hardened Steel (40-50HRC) JP4015 | Vc(sfm) | 328 | 328 | 328 | 328 | 328 | 328 |
| | N(rpm) | 3,180 | 2,650 | 1,990 | 1,590 | 1,270 | 1,000 |
| | fz(in/t) | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| | Vf(in/min) | 125 | 156 | 157 | 156 | 150 | 157 |
| | doc(in) | 0.014 | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 |
| | woc(in) | 0.197 | 0.275 | 0.374 | 0.472 | 0.591 | 0.748 |
| | Q(in³/min) | 0.35 | 0.69 | 0.94 | 1.18 | 1.42 | 1.88 |
| Hardened Steel (50-55HRC) JP4005 JP4015 | Vc(sfm) | 295 | 295 | 295 | 295 | 295 | 295 |
| | N(rpm) | 2,870 | 2,390 | 1,790 | 1,430 | 1,150 | 900 |
| | fz(in/t) | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 |
| | Vf(in/min) | 90 | 113 | 113 | 113 | 109 | 113 |
| | doc(in) | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| | woc(in) | 0.197 | 0.275 | 0.374 | 0.472 | 0.591 | 0.748 |
| | Q(in³/min) | 0.21 | 0.37 | 0.51 | 0.64 | 0.77 | 1.02 |
| Hardened Steel (55-60HRC) JP4005 | Vc(sfm) | 246 | 246 | 246 | 246 | 246 | 246 |
| | N(rpm) | 2,390 | 1,990 | 1,490 | 1,190 | 960 | 750 |
| | fz(in/t) | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 |
| | Vf(in/min) | 75 | 94 | 94 | 94 | 90 | 94 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.157 | 0.196 | 0.256 | 0.315 | 0.394 | 0.512 |
| | Q(in³/min) | 0.09 | 0.15 | 0.19 | 0.24 | 0.28 | 0.39 |
| Hardened Steel (60-62HRC) JP4005 | Vc(sfm) | 213 | 213 | 213 | 213 | 213 | 213 |
| | N(rpm) | 2,070 | 1,730 | 1,290 | 1,040 | 830 | 650 |
| | fz(in/t) | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| | Vf(in/min) | 49 | 61 | 61 | 61 | 59 | 61 |
| | doc(in) | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| | woc(in) | 0.157 | 0.196 | 0.256 | 0.315 | 0.394 | 0.512 |
| | Q(in³/min) | 0.05 | 0.07 | 0.09 | 0.12 | 0.14 | 0.19 |

**Notes**

1. Use the appropriate coolant for the work material and machining shape.
2. These conditions are for general guidance; in actual cutting 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 recommended cutting conditions.
4. Ensure to exchange the insert at the correct time to ensure safety of the tool-body.
5. Multi-flute design enables more efficient finishing.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 cutting oil as a coolant.

## Ramping and Helical Milling Data

| Tool Diameter | 10mm or 3/8" | 12mm or 1/2" | 16mm or 5/8" | 20mm or 3/4" | 25mm or 1" | 32mm or 5/4" |
|---|---|---|---|---|---|---|
| **Max. Ramp Angle°** | Less than 0.5° (max 1.0°) | | | | | |
| **Helical Hole Diameter** | 13-19mm | 17-23mm | 25-31mm | 33-39mm | 43-49mm | 57-63mm |
| **Helical Hole Diameter** | 0.51-0.75" | 0.67-0.90" | 1.00-1.22" | 1.30-1.53" | 1.69-1.93" | 2.24-2.48" |

# IASPV/ASPV

Advanced Engineering

## Multi-Flute Indexable Tools for High-Speed Finishing

SHANK STYLE

MODULAR STYLE

FACE MILL STYLE

## FEATURES

Ideal for flat surface finishing as well as side wall finishing

Supplementary cutting edge allows for increased feed rates

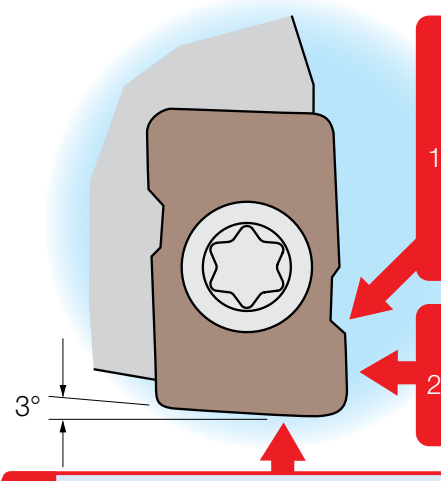
Multi-flute design enables more efficient finishing

Cutter bodies are PVD coated for enhanced abrasion resistance

## INTRODUCTION

- Ideal cutter for applications finishing structural parts of bottom, side, etc.
- Multi-flute design enables 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.
- Comprehensive lineup of insert materials enables machining of a wide range of materials from carbon steel to quenched steel, as well as aluminum and more.
- For small machines, use in combination with the modular arbor BT30 creates a highly rigid system and improves machining stability.
- Use in combination with a carbide shank improves machining accuracy when machining with long overhangs.
- In addition to improving durability by using special steel in the cutter body, a PVD coating is applied to the modular type and bore type holders to improve abrasion resistance.

## 1. Insert features 3 cutting edges

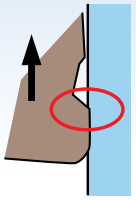



1

**Cutting edge for reciprocating machining**

Used as the cutting edge when performing reciprocating finishing vertical machining.

Feed direction

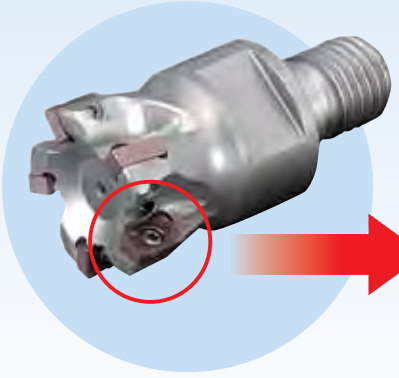


2

**Peripheral cutting edge** | Used as the peripheral cutting edge when performing side machining.

3

**Face cutting edge** | Used when bottom finishing. Used as the reciprocating cutting edge when performing vertical machining.



Insert with supplementary cutting edge

MPHW0603□□ZEL-0.5
MPHW0603□□ZEL-1.5

Insert without supplementary cutting edge

MPHW0603□□ZEL

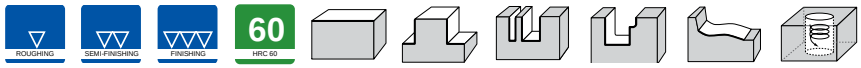
Supplementary cutting edge enables feed rate to be increased.
For bottom machining, suitable for long overhang (L/D=5 or greater) machining or for handling low rigidity in main axis direction.

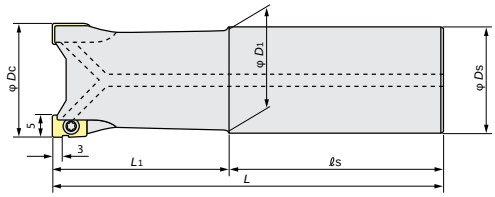
For vertical machining, inserts without supplementary cutting edge are recommended.

# IASPV/ASPV

**Shank Style**
**Inch + Metric**

Advanced Engineering




D -0.03/-0.1

**IASPVS-Inch (Shank Style)**

| Part No. | Stock | Flutes | ØDc | L | ØDs | ØD1 | L1 | ℓs | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **IASPVS2010R-2** | • | 2 | 0.625 | 4.0 | 0.625 | 0.567 | 1.25 | 2.75 | MPHW0603xxZEL<br>MPHW0603xZEL-xx |
| **IASPVS2012R-3** | • | 3 | 0.750 | 5.0 | 0.750 | 0.673 | 2.00 | 3.00 | |
| **IASPVS2016R-4** | • | 4 | 1.000 | 5.5 | 1.000 | 0.921 | 2.50 | 3.00 | |
| **IASPVS2020R-5** | • | 5 | 1.250 | 6.0 | 1.250 | 1.177 | 2.75 | 3.25 | |
| **IASPVS2024R-6** | • | 6 | 1.500 | 6.0 | 1.500 | 1.343 | 1.75 | 4.25 | |

**ASPVS-Metric (Shank Style)**

| Part No. | Stock | Flutes | ØDc | L | ØDs | ØD1 | L1 | ℓs | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **ASPVS2016R-2** | ☐ | 2 | 16 | 100 | 16 | 14.5 | 30 | 70 | MPHW0603xxZEL<br>MPHW0603xZEL-xx |
| **ASPVS2020R-3** | ☐ | 3 | 20 | 110 | 20 | 18.0 | 30 | 80 | |
| **ASPVS2025R-4** | ☐ | 4 | 25 | 120 | 25 | 23.0 | 40 | 80 | |
| **ASPVS2030R-4** | ☐ | 4 | 30 | 150 | 32 | 28.0 | 50 | 100 | |
| **ASPVS2032R-5** | ☐ | 5 | 32 | 150 | 32 | 30.0 | 50 | 100 | |
| **ASPVS2035R-5** | ☐ | 5 | 35 | 150 | 32 | 31.0 | 50 | 100 | |
| **ASPVS2040R-6** | ☐ | 6 | 40 | 170 | 32 | 31.0 | 50 | 120 | |

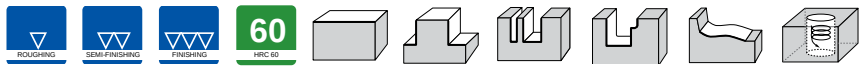
Inserts p. 44

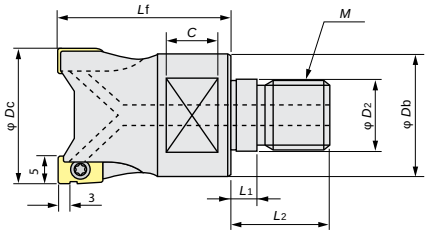
**☐ = Stocked items in Japan**

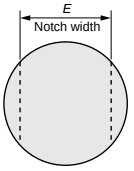
# IASPV/ASPV

**Modular Style**
**Inch + Metric**

Advanced Engineering




| D | -0.03/-0.1 |
|---|---|

**IASPVM-Inch (Modular Style)**

| Part No. | Stock | Flutes | ØDc | Lf | ØD2 | M | ØDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IASPVM2010R-2** | • | 2 | 0.625 | 0.984 | 0.335 | 8 | 0.504 | 0.217 | 0.669 | 0.315 | 0.394 | |
| **IASPVM2012R-3** | • | 3 | 0.750 | 1.181 | 0.413 | 10 | 0.701 | 0.217 | 0.748 | 0.394 | 0.591 | MPHW0603xxZEL |
| **IASPVM2016R-4** | • | 4 | 1.000 | 1.378 | 0.492 | 12 | 0.819 | 0.217 | 0.866 | 0.394 | 0.669 | MPHW0603xZEL-xx |
| **IASPVM2020R-5** | • | 5 | 1.250 | 1.575 | 0.669 | 16 | 1.134 | 0.236 | 0.906 | 0.472 | 0.866 | |
| **IASPVM2024R-6** | • | 6 | 1.500 | 1.575 | 0.669 | 16 | 1.134 | 0.236 | 0.906 | 0.472 | 0.866 | |

**ASPVM-Metric (Modular Style)**

| Part No. | Stock | Flutes | ØDc | Lf | ØD2 | M | ØDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASPVM2016R-2** | ☐ | 2 | 16 | 25 | 8.5 | M8 | 12.8 | 5.5 | 17 | 8 | 10 | |
| **ASPVM2020R-2** | ☐ | 2 | 20 | 30 | 10.5 | M10 | 17.8 | 5.5 | 19 | 10 | 15 | |
| **ASPVM2020R-3** | ☐ | 3 | 20 | 30 | 10.5 | M10 | 17.8 | 5.5 | 19 | 10 | 15 | MPHW0603xxZEL |
| **ASPVM2025R-4** | ☐ | 4 | 25 | 35 | 12.5 | M12 | 20.8 | 5.5 | 22 | 10 | 17 | MPHW0603xZEL-xxt |
| **ASPVM2032R-5** | ☐ | 5 | 32 | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | |
| **ASPVM2040R-6** | ☐ | 6 | 40 | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | |

Modular Shanks on p. 163

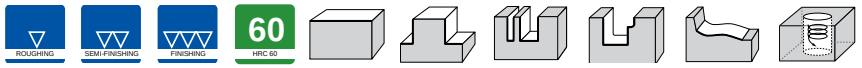
Inserts p. 44

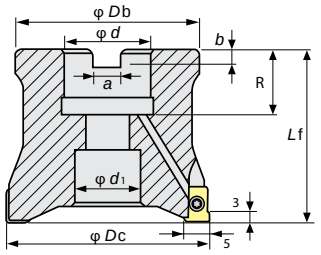
**☐ = Stocked items in Japan**

# IASPV/ASPV

**Face Mill Style**
**Inch + Metric**

Advanced Engineering




D -0.03/-0.1

**IASPVB-Inch (Face Mill Style)**

| Part No. | Stock | Flutes | ØDc | ØDb | Lf | L | a | b | Ød | Ød1 | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IASPVB2032R-7** | • | 7 | 2.000 | 1.80 | 2 | 0.75 | 0.315 | 0.917 | 0.75 | 0.67 | MPHW0603xxZEL |
| **IASPVB2040R-8** | • | 8 | 2.500 | 2.26 | 2 | 0.75 | 0.315 | 0.917 | 0.75 | 0.67 | MPHW0603xxZEL-xx |

**IASPVB-Metric (Face Mill Style)**

| Part No. | Stock | Flutes | ØDc | ØDb | Lf | L | a | b | ød | ød1 | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASPVB2050R-7** | ☐ | 7 | 50 | 47.0 | 50 | 19 | 8.4 | 5 | 22.225 | 17 | |
| **ASPVB2063R-8** | ☐ | 8 | 63 | 60.0 | 50 | 19 | 8.4 | 5 | 22.225 | 17 | MPHW0603xxZEL |
| **ASPVB2050RM-7** | ☐ | 7 | 50 | 47.0 | 50 | 20 | 10.4 | 6.3 | 22.000 | 17 | MPHW0603xZEL-xx |
| **ASPVB2063RM-8** | ☐ | 8 | 63 | 60.0 | 50 | 20 | 10.4 | 6.3 | 22.000 | 17 | |

**☐ = Stocked items in Japan**

Inserts p. 44

| Part No. | Clamp Screw | Arbor Screw | Screw Driver | Screw Anti-Seizure Agent |
|---|---|---|---|---|
| **(I)ASPVM20 ○○ R- ○** | 250-141 | - | 104-T8 | P-37 |
| **(I)ASPVS20 ○○ R- ○** | | | | |
| **(I)ASPVB20 ○○ R- ○** | | 100-178 | | |
| **(I)ASPVB20 ○○ RM- ○** | | | | |

# IASPV/ASPV

**Inserts**

Advanced Engineering

Fig-1

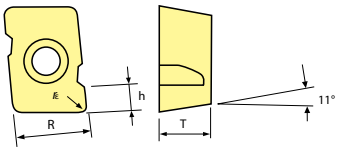
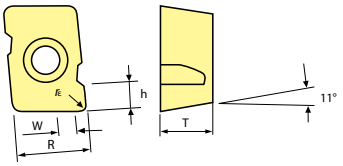



Fig-2 Chamfer Type




## Inserts

| Part No. | Shape | ATH08M | JP4020 | MZ1000 | l(mm) | W(mm) | T(mm) | h(mm) | r(mm) |
|---|---|---|---|---|---|---|---|---|---|
| **MPHW060302ZEL** | Fig-1 | | | □ | 6.35 | - | 3.18 | 3 | 0.2 |
| **MPHW060302ZEL-0.5** | Fig-2 | | | □ | 6.35 | 0.5 | 3.18 | 3 | 0.2 |
| **MPHW060304ZEL** | Fig-1 | • | | • | 6.35 | - | 3.18 | 3 | 0.4 |
| **MPHW060304ZEL-0.5** | Fig-2 | • | | □ | 6.35 | 0.5 | 3.18 | 3 | 0.4 |
| **MPHW060308ZEL** | Fig-1 | • | • | • | 6.35 | - | 3.18 | 3 | 0.8 |
| **MPHW060308ZEL-1.5** | Fig-2 | • | □ | □ | 6.35 | 1.5 | 3.18 | 3 | 0.8 |

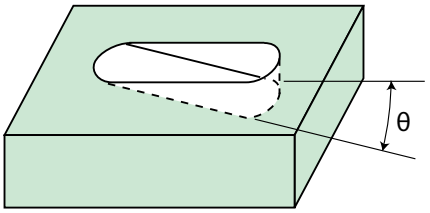
**□ = Stocked items in Japan**

## COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **ATH08M**<br>P01-M01 | **ATH Coating**<br>PVD | For hardened steel 50HRC or more | ATH coating is optimized for cutting high-hardness materials. Uses substrate of ultrafine-particle cemented carbide. |
| **MZ1000**<br>P20 | **TH Coating**<br>PVD | For finishing of steel | Cermet coating provides clean finished surfaces and is suitable for high-speed cutting. |

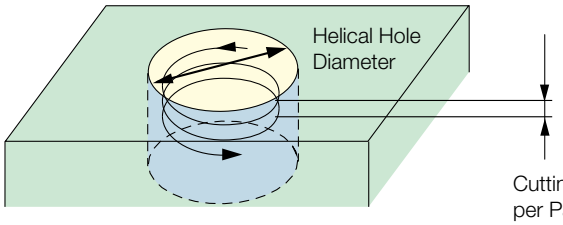
## Ramping and Helical Milling Data

**Ramping**




Ramp Milling Angle

**Helical Milling**




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.

| | Inserts | MPN(H)W0603○○ZEL | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric | **Tool Diameter** | ø16 | ø18 | ø20 | ø22 | ø25 | ø28 | ø30 | ø32 | ø35 | ø40 | ø50 | ø63 |
| | **Maximum Ramp Angle 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 Diameter** | 22-30 | 26-34 | 30-38 | 34-42 | 40-48 | 46-54 | 50-58 | 54-62 | 60-68 | 70-78 | 90-98 | 116-124 |
| Inch | **Tool Diameter** | 0.630 | 0.709 | 0.787 | 0.866 | 0.984 | 1.102 | 1.181 | 1.260 | 1.378 | 1.575 | 1.969 | 2.480 |
| | **Maximum Ramp Angle 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 Diameter** | 0.866-1.181 | 1.024-1.339 | 1.181-1.496 | 1.339-1.654 | 1.575-1.89 | 1.811-2.126 | 1.969-2.283 | 2.126-2.441 | 2.362-2.677 | 2.756-3.071 | 3.543-3.858 | 4.567-4.882 |

# IASPV/ASPV

## Cutting Conditions For Side Finishing Inch

Advanced Engineering

| ø | | 0.625" or 16mm | | 0.75" or 20mm | | 1" or 25mm | | 1.25" or 32mm | | 1.5" or 40mm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Flutes | | 2 | | 3 | | 4 | | 5 | | 6 | |
| | | <3Dc | | <3Dc | | <3Dc | | <3Dc | | <3Dc | |
| | | General | Hi-Speed | General | Hi-Speed | General | Hi-Speed | General | Hi-Speed | General | Hi-Speed |
| Mild Steel Carbon Steel (<200 HB) MZ1000 ATH08M | N(rpm) | 7,970 | 15,930 | 6,370 | 12,740 | 5,100 | 10,200 | 3,990 | 7,970 | 3,190 | 6,370 |
| | Vc(sfm) | 1312 | 2624 | 1312 | 2624 | 1312 | 2624 | 1312 | 2624 | 1312 | 2624 |
| | Vf(in/min) | 63 | 188 | 76 | 226 | 80 | 241 | 79 | 235 | 76 | 226 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (<30HRC) ATH08M | N(rpm) | 5,980 | 11,950 | 4,780 | 9,560 | 3,830 | 7,650 | 2,990 | 5,980 | 2,390 | 4,780 |
| | Vc(sfm) | 984 | 1968 | 984 | 1968 | 984 | 1968 | 984 | 1968 | 984 | 1968 |
| | Vf(in/min) | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 | 0.1 | 0.15 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (30-45HRC) ATH08M JP4020 | N(rpm) | 3,990 | 9,960 | 3,190 | 7,970 | 2,550 | 6,370 | 2,000 | 4,980 | 1,600 | 3,990 |
| | Vc(sfm) | 656 | 1640 | 656 | 1640 | 656 | 1640 | 656 | 1640 | 656 | 1640 |
| | Vf(in/min) | 31 | 94 | 38 | 113 | 40 | 120 | 39 | 118 | 38 | 113 |
| | fz(in/t) | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (45-55HRC) ATH08M JP4020 | N(rpm) | 2,990 | 4,980 | 2,390 | 3,990 | 1,920 | 3,190 | 1,500 | 2,490 | 1,200 | 2,000 |
| | Vc(sfm) | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 |
| | Vf(in/min) | 24 | 39 | 28 | 47 | 30 | 50 | 30 | 49 | 28 | 47 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (55-62HRC) ATH08M JP4020 | N(rpm) | 2,590 | 3,990 | 2,080 | 3,190 | 1,660 | 2,550 | 1,300 | 2,000 | 1,040 | 1,600 |
| | Vc(sfm) | 426 | 656 | 426 | 656 | 426 | 656 | 426 | 656 | 426 | 656 |
| | Vf(in/min) | 20 | 31 | 25 | 38 | 26 | 40 | 26 | 39 | 25 | 38 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| | doc(in) | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Stainless Steel SUS JP4020 | N(rpm) | 5,980 | 11,950 | 4,780 | 9,560 | 3,830 | 7,650 | 2,990 | 5,980 | 2,390 | 4,780 |
| | Vc(sfm) | 984 | 1968 | 984 | 1968 | 984 | 1968 | 984 | 1968 | 984 | 1968 |
| | Vf(in/min) | 47 | 141 | 57 | 170 | 61 | 181 | 59 | 177 | 57 | 170 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.009 | < 0.013 | < 0.014 | < 0.018 | < 0.019 | < 0.023 | < 0.024 | < 0.028 | < 0.029 |
| Cast Iron FC, FCD ATH08M JP4020 | N(rpm) | 5,980 | 11,950 | 4,780 | 9,560 | 3,830 | 7,650 | 2,990 | 5,980 | 2,390 | 4,780 |
| | Vc(sfm) | 984 | 1968 | 984 | 1968 | 984 | 1968 | 984 | 1968 | 984 | 1968 |
| | Vf(in/min) | 47 | 141 | 57 | 170 | 61 | 181 | 59 | 177 | 57 | 170 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Aluminum Alloy SD5010 | N(rpm) | 11,950 | 23,890 | 9,560 | 19,110 | 7,650 | 15,290 | 5,980 | 11,950 | 4,780 | 9,560 |
| | vc(m/min) | 600 | 1,200 | 600 | 1,200 | 600 | 1,200 | 600 | 1,200 | 600 | 1,200 |
| | Vc(sfm) | 1968 | 3936 | 1968 | 3936 | 1968 | 3936 | 1968 | 3936 | 1968 | 3936 |
| | Vf(in/min) | 94 | 282 | 113 | 339 | 120 | 361 | 118 | 353 | 113 | 339 |
| | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Titanium Alloy Ti-6Al-4V (wet condition) ATH08M JP4020 | N(rpm) | 1,200 | 1,800 | 960 | 1,440 | 770 | 1,150 | 600 | 900 | 480 | 720 |
| | Vc(sfm) | 197 | 295 | 197 | 295 | 197 | 295 | 197 | 295 | 197 | 295 |
| | Vf(in/min) | 9 | 17 | 11 | 20 | 12 | 22 | 12 | 21 | 11 | 20 |
| | fz(in/t) | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Maximum fz(in/t) | | < 0.014 | | < 0.014 | | < 0.014 | | < 0.014 | | < 0.014 | |
| Maximum woc(in) | | < 0.11 | | < 0.11 | | < 0.11 | | < 0.11 | | < 0.11 | |

**Notes**

1) These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
2) To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
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) Ensure to index the insert at the correct time to ensure safety of the tool-body.
5) Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
6) MZ1000 is not suitable for wet cutting. Use them for dry cutting (air blow).
7) Due to fire risks do not use neat cutting oil as a coolant.
8) When using the BT30 arbor for modular mills, determine the processing conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the processing conditions, adjust conditions by 1.reducing cutting depth or 2.reducing per-flute feed rate (fz).

# IASPV/ASPV

## Cutting Conditions For Side Finishing Inch

Advanced Engineering

| | ø | 2" or 50mm | | | | | 2.5" or 63mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Flutes | 7 | | | | | 8 | | | | |
| | | <3Dc | | | | | <3Dc | | | | |
| | | General | Hi-Speed | 3Dc-5Dc | 5Dc-7Dc | >7Dc | General | Hi-Speed | 3Dc-5Dc | 5Dc-7Dc | >7Dc |
| Mild Steel Carbon Steel (<200 HB) MZ1000 ATH08M | N(rpm) | 2,550 | 5,100 | 3,830 | 2,550 | 2,550 | 2,030 | 4,050 | 3,040 | 2,030 | 2,030 |
| | Vc(sfm) | 1312 | 2624 | 1968 | 1312 | 1312 | 1312 | 2624 | 1968 | 1312 | 1312 |
| | Vf(in/min) | 70 | 211 | 159 | 85 | 70 | 64 | 191 | 144 | 77 | 64 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (<30HRC) ATH08M | N(rpm) | 1,920 | 3,830 | 2,550 | 2,550 | 1,920 | 1,520 | 3,040 | 2,030 | 2,030 | 1,520 |
| | Vc(sfm) | 984 | 1968 | 1312 | 1312 | 984 | 984 | 1968 | 1312 | 1312 | 984 |
| | Vf(in/min) | 0.1 | 0.15 | 0.15 | 0.12 | 0.1 | 0.1 | 0.15 | 0.15 | 0.12 | 0.1 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (30-45HRC) ATH08M JP4020 | N(rpm) | 1,280 | 3,190 | 2,230 | 1,920 | 1,920 | 1,020 | 2,530 | 1,770 | 1,520 | 1,520 |
| | Vc(sfm) | 656 | 1640 | 1148 | 984 | 984 | 656 | 1640 | 1148 | 984 | 984 |
| | Vf(in/min) | 35 | 106 | 74 | 53 | 43 | 32 | 96 | 67 | 48 | 39 |
| | fz(in/t) | 0.004 | 0.005 | 0.005 | 0.004 | 0.003 | 0.004 | 0.005 | 0.005 | 0.004 | 0.003 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (45-55HRC) ATH08M JP4020 | N(rpm) | 960 | 1,600 | 1,150 | 960 | 960 | 760 | 1,270 | 910 | 760 | 760 |
| | Vc(sfm) | 492 | 820 | 590.4 | 492 | 492 | 492 | 820 | 590.4 | 492 | 492 |
| | Vf(in/min) | 27 | 44 | 32 | 21 | 21 | 24 | 40 | 29 | 19 | 19 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.003 | 0.003 | 0.004 | 0.004 | 0.004 | 0.003 | 0.003 |
| | doc(in) | 0.079 | 0.079 | 0.059 | 0.047 | 0.039 | 0.079 | 0.079 | 0.059 | 0.047 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Carbon Steel Alloy Steel (55-62HRC) ATH08M JP4020 | N(rpm) | 830 | 1,280 | 1,020 | 830 | 830 | 660 | 1,020 | 810 | 660 | 660 |
| | Vc(sfm) | 426 | 656 | 525 | 426 | 426 | 426 | 656 | 525 | 426 | 426 |
| | Vf(in/min) | 23 | 35 | 28 | 19 | 12 | 21 | 32 | 26 | 15 | 11 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.003 | 0.002 | 0.004 | 0.004 | 0.004 | 0.003 | 0.002 |
| | doc(in) | 0.059 | 0.059 | 0.059 | 0.039 | 0.028 | 0.059 | 0.059 | 0.059 | 0.047 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Stainless Steel SUS JP4020 | N(rpm) | 1,920 | 3,830 | 2,550 | 2,550 | 1,920 | 1,520 | 3,040 | 2,030 | 2,030 | 1,520 |
| | Vc(sfm) | 984 | 1968 | 1312 | 1312 | 984 | 984 | 1968 | 1312 | 1312 | 984 |
| | Vf(in/min) | 53 | 159 | 106 | 85 | 53 | 48 | 144 | 96 | 77 | 48 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 |
| | woc(in) | < 0.033 | < 0.034 | < 0.035 | < 0.036 | < 0.037 | < 0.038 | < 0.039 | < 0.040 | < 0.041 | < 0.042 |
| Cast Iron FC, FCD ATH08M JP4020 | N(rpm) | 1,920 | 3,830 | 3,190 | 2,550 | 2,550 | 1,520 | 3,040 | 2,530 | 2,030 | 2,030 |
| | Vc(sfm) | 984 | 1968 | 1640 | 1312 | 1312 | 984 | 1968 | 1640 | 1312 | 1312 |
| | Vf(in/min) | 53 | 159 | 132 | 85 | 70 | 48 | 144 | 120 | 77 | 64 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Aluminum Alloy SD5010 | N(rpm) | 3,830 | 9,560 | 6,370 | 3,830 | 3,830 | 3,040 | 7,590 | 5,060 | 3,040 | 3,040 |
| | vc(m/min) | 600 | 1,500 | 1,000 | 600 | 600 | 600 | 1,500 | 1,000 | 600 | 600 |
| | Vc(sfm) | 1968 | 4920 | 3280 | 1968 | 1968 | 1968 | 4920 | 3280 | 1968 | 1968 |
| | Vf(in/min) | 106 | 395 | 263 | 127 | 106 | 96 | 359 | 239 | 115 | 96 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.059 | 0.079 | 0.079 | 0.079 | 0.079 | 0.059 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Titanium Alloy Ti-6Al-4V (wet condition) ATH08M JP4020 | N(rpm) | 390 | 580 | 510 | 390 | 390 | 310 | 460 | 410 | 310 | 310 |
| | Vc(sfm) | 197 | 295 | 262 | 197 | 197 | 197 | 295 | 262 | 197 | 197 |
| | Vf(in/min) | 11 | 19 | 17 | 11 | 9 | 10 | 18 | 16 | 10 | 8 |
| | fz(in/t) | 0.004 | 0.005 | 0.005 | 0.004 | 0.003 | 0.004 | 0.005 | 0.005 | 0.004 | 0.003 |
| | doc(in) | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 | 0.079 | 0.079 | 0.079 | 0.059 | 0.039 |
| | woc(in) | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 | < 0.008 |
| Maximum fz(in/t) | | < 0.014 | | | | | < 0.014 | | | | |
| Maximum woc(in) | | < 0.11 | | | | | < 0.11 | | | | |

**Notes**

1) These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
2) To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
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) Ensure to index the insert at the correct time to ensure safety of the tool-body.
5) Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
6) MZ1000 is not suitable for wet cutting. Use them for dry cutting (air blow).
7) Due to fire risks do not use neat cutting oil as a coolant.
8) When using the BT30 arbor for modular mills, determine the processing conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the processing conditions, adjust conditions by 1.reducing cutting depth or 2.reducing per-flute feed rate (fz).

# IASPV/ASPV

## Cutting Conditions For Bottom Finishing Inch

Advanced Engineering

| ø | | 0.625" or 16mm | | 0.75" or 20mm | | 1" or 25mm | | 1.25" or 32mm | | 1.5" or 40mm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Flutes | | 2 | | 3 | | 4 | | 5 | | 6 | |
| | | <3Dc | | <3Dc | | <3Dc | | <3Dc | | <3Dc | |
| | | General | Hi-Speed | General | Hi-Speed | General | Hi-Speed | General | Hi-Speed | General | Hi-Speed |
| Mild Steel Carbon Steel (<200 HB) | N(rpm) | 2,990 | 5,980 | 2,390 | 4,780 | 1,920 | 3,830 | 1,500 | 2,990 | 1,200 | 2,390 |
| | Vc(sfm) | 492 | 984 | 492 | 984 | 492 | 984 | 492 | 984 | 492 | 984 |
| | Vf(in/min) | 24 | 71 | 28 | 85 | 30 | 91 | 30 | 89 | 28 | 85 |
| MZ1000 | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| ATH08M | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 2,990 | 4,980 | 2,390 | 3,990 | 1,920 | 3,190 | 1,500 | 2,490 | 1,200 | 2,000 |
| | Vc(sfm) | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 |
| | Vf(in/min) | 24 | 59 | 28 | 71 | 30 | 76 | 30 | 74 | 28 | 71 |
| ATH08M | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Carbon Steel Alloy Steel (30-45HRC) | N(rpm) | 2,590 | 3,990 | 2,080 | 3,190 | 1,660 | 2,550 | 1,300 | 2,000 | 1,040 | 1,600 |
| | Vc(sfm) | 426 | 656 | 426 | 656 | 426 | 656 | 426 | 656 | 426 | 656 |
| | Vf(in/min) | 20 | 38 | 25 | 45 | 26 | 48 | 26 | 47 | 25 | 46 |
| ATH08M | fz(in/t) | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 | 0.004 | 0.005 |
| JP4020 | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Carbon Steel Alloy Steel (45-55HRC) | N(rpm) | 1,600 | 2,390 | 1,280 | 1,920 | 1,020 | 1,530 | 800 | 1,200 | 640 | 960 |
| | Vc(sfm) | 262 | 394 | 262 | 394 | 262 | 394 | 262 | 394 | 262 | 394 |
| | Vf(in/min) | 13 | 19 | 15 | 23 | 16 | 24 | 16 | 24 | 15 | 23 |
| ATH08M | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| JP4020 | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Carbon Steel Alloy Steel (55-62HRC) | N(rpm) | 1,000 | 2,000 | 800 | 1,600 | 640 | 1,280 | 500 | 1,000 | 400 | 800 |
| | Vc(sfm) | 164 | 328 | 164 | 328 | 164 | 328 | 164 | 328 | 164 | 328 |
| | Vf(in/min) | 4 | 11 | 5 | 13 | 5 | 14 | 5 | 14 | 5 | 13 |
| ATH08M | fz(in/t) | 0.002 | 0.003 | 0.002 | 0.003 | 0.002 | 0.003 | 0.002 | 0.003 | 0.002 | 0.003 |
| JP4020 | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Stainless Steel SUS | N(rpm) | 2,990 | 4,980 | 2,390 | 3,990 | 1,920 | 3,190 | 1,500 | 2,490 | 1,200 | 2,000 |
| | Vc(sfm) | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 |
| | Vf(in/min) | 24 | 59 | 28 | 71 | 30 | 76 | 30 | 74 | 28 | 71 |
| JP4020 | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Cast Iron FC, FCD | N(rpm) | 2,990 | 4,980 | 2,390 | 3,990 | 1,920 | 3,190 | 1,500 | 2,490 | 1,200 | 2,000 |
| | Vc(sfm) | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 | 492 | 820 |
| | Vf(in/min) | 24 | 79 | 28 | 94 | 30 | 101 | 30 | 98 | 28 | 94 |
| ATH08M | fz(in/t) | 0.004 | 0.008 | 0.004 | 0.008 | 0.004 | 0.008 | 0.004 | 0.008 | 0.004 | 0.008 |
| JP4020 | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Aluminum Alloy | N(rpm) | 11,950 | 23,890 | 9,560 | 19,110 | 7,650 | 15,290 | 5,980 | 11,950 | 4,780 | 9,560 |
| | Vc(sfm) | 1968 | 3936 | 1968 | 3936 | 1968 | 3936 | 1968 | 3936 | 1968 | 3936 |
| | Vf(in/min) | 94 | 282 | 113 | 339 | 120 | 361 | 118 | 353 | 113 | 339 |
| SD5010 | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Titanium Alloy Ti-6Al-4V (wet condition) | N(rpm) | 600 | 1,200 | 480 | 960 | 390 | 770 | 300 | 600 | 240 | 480 |
| | Vc(sfm) | 98 | 197 | 98 | 197 | 98 | 197 | 98 | 197 | 98 | 197 |
| | Vf(in/min) | 5 | 14 | 6 | 17 | 6 | 19 | 6 | 18 | 6 | 17 |
| ATH08M | fz(in/t) | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 | 0.004 | 0.006 |
| JP4020 | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.315~0.63 | 0.315~0.63 | 0.394~0.787 | 0.394~0.787 | 0.492~0.984 | 0.492~0.984 | 0.63~1.26 | 0.63~1.26 | 0.787~1.575 | 0.787~1.575 |
| Maximum fz(in/t) | | < 0.014 | | < 0.014 | | < 0.014 | | < 0.014 | | < 0.014 | |
| Maximum woc(in) | | < 0.11 | | < 0.11 | | < 0.11 | | < 0.11 | | < 0.11 | |

**Notes**

1) These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
2) To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
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) Ensure to index the insert at the correct time to ensure safety of the tool-body.
5) Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
6) MZ1000 is not suitable for wet cutting. Use them for dry cutting (air blow).
7) Due to fire risks do not use neat cutting oil as a coolant.
8) When using the BT30 arbor for modular mills, determine the processing conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the processing conditions, adjust conditions by 1.reducing cutting depth or 2.reducing per-flute feed rate (fz).

# IASPV/ASPV

## Cutting Conditions For Bottom Finishing Inch

Advanced Engineering

| | ø | 2" or 50mm | | | | | 2.5" or 63mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Flutes | 7 | | | | | 8 | | | | |
| | | <3Dc | | | | | <3Dc | | | | |
| | | General | Hi-Speed | 3Dc-5Dc | 5Dc-7Dc | >7Dc | General | Hi-Speed | 3Dc-5Dc | 5Dc-7Dc | >7Dc |
| Mild Steel Carbon Steel (<200 HB) MZ1000 ATH08M | N(rpm) | 960 | 1,600 | 1,280 | 960 | 830 | 760 | 1,270 | 1,020 | 760 | 660 |
| | Vc(sfm) | 492 | 820 | 656 | 492 | 426.4 | 492 | 820 | 656 | 492 | 426.4 |
| | Vf(in/min) | 27 | 66 | 53 | 32 | 23 | 24 | 60 | 48 | 29 | 21 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Carbon Steel Alloy Steel (<30HRC) ATH08M | N(rpm) | 960 | 1,470 | 1,150 | 830 | 640 | 760 | 1,170 | 910 | 660 | 510 |
| | Vc(sfm) | 492 | 754 | 590 | 426 | 328 | 492 | 754 | 590 | 426 | 328 |
| | Vf(in/min) | 27 | 61 | 48 | 28 | 18 | 24 | 56 | 43 | 25 | 16 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Carbon Steel Alloy Steel (30-45HRC) ATH08M JP4020 | N(rpm) | 830 | 1,150 | 960 | 830 | 580 | 660 | 910 | 760 | 660 | 460 |
| | Vc(sfm) | 426 | 590 | 492 | 426 | 295 | 426 | 590 | 492 | 426 | 295 |
| | Vf(in/min) | 23 | 38 | 32 | 28 | 16 | 21 | 35 | 29 | 21 | 15 |
| | fz(in/t) | 0.004 | 0.005 | 0.005 | 0.005 | 0.004 | 0.004 | 0.005 | 0.005 | 0.004 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Carbon Steel Alloy Steel (45-55HRC) ATH08M JP4020 | N(rpm) | 390 | 640 | 510 | 390 | 390 | 310 | 510 | 410 | 310 | 310 |
| | Vc(sfm) | 197 | 328 | 262 | 197 | 197 | 197 | 328 | 262 | 197 | 197 |
| | Vf(in/min) | 11 | 18 | 14 | 11 | 11 | 10 | 16 | 13 | 10 | 10 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Carbon Steel Alloy Steel (55-62HRC) ATH08M JP4020 | N(rpm) | 320 | 510 | 390 | 320 | 320 | 260 | 410 | 310 | 260 | 260 |
| | Vc(sfm) | 164 | 262 | 197 | 164 | 164 | 164 | 262 | 197 | 164 | 164 |
| | Vf(in/min) | 5 | 10 | 8 | 5 | 5 | 4 | 9 | 7 | 4 | 4 |
| | fz(in/t) | 0.002 | 0.003 | 0.003 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.002 | 0.002 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Stainless Steel SUS JP4020 | N(rpm) | 960 | 1,470 | 1,150 | 830 | 640 | 760 | 1,170 | 910 | 660 | 510 |
| | Vc(sfm) | 492 | 754 | 590 | 426 | 328 | 492 | 754 | 590 | 426 | 328 |
| | Vf(in/min) | 27 | 61 | 48 | 28 | 18 | 24 | 56 | 43 | 25 | 16 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Cast Iron FC, FCD ATH08M JP4020 | N(rpm) | 960 | 1,600 | 1,280 | 960 | 830 | 760 | 1,270 | 1,020 | 760 | 660 |
| | Vc(sfm) | 492 | 820 | 656 | 492 | 426.4 | 492 | 820 | 656 | 492 | 426.4 |
| | Vf(in/min) | 27 | 88 | 71 | 40 | 23 | 24 | 80 | 65 | 36 | 21 |
| | fz(in/t) | 0.004 | 0.008 | 0.008 | 0.006 | 0.004 | 0.004 | 0.008 | 0.008 | 0.006 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Aluminum Alloy SD5010 | N(rpm) | 3,830 | 9,560 | 6,370 | 3,830 | 3,830 | 3,040 | 7,590 | 5,060 | 3,040 | 3,040 |
| | Vc(sfm) | 1968 | 4920 | 3280 | 1968 | 1968 | 1968 | 4920 | 3280 | 1968 | 1968 |
| | Vf(in/min) | 106 | 395 | 263 | 127 | 127 | 96 | 359 | 239 | 115 | 115 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.005 | 0.004 | 0.006 | 0.006 | 0.005 | 0.005 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Titanium Alloy Ti-6Al-4V (wet condition) ATH08M JP4020 | N(rpm) | 200 | 390 | 320 | 200 | 200 | 160 | 310 | 260 | 160 | 160 |
| | Vc(sfm) | 98 | 197 | 164 | 98 | 98 | 98 | 197 | 164 | 98 | 98 |
| | Vf(in/min) | 6 | 16 | 13 | 7 | 6 | 5 | 15 | 13 | 6 | 5 |
| | fz(in/t) | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 | 0.004 | 0.006 | 0.006 | 0.005 | 0.004 |
| | doc(in) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | woc(in) | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984~1.968 | 0.984 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22~2.48 | 1.22 |
| Maximum fz(in/t) | | < 0.014 | | | | | < 0.014 | | | | |
| Maximum woc(in) | | < 0.11 | | | | | < 0.11 | | | | |

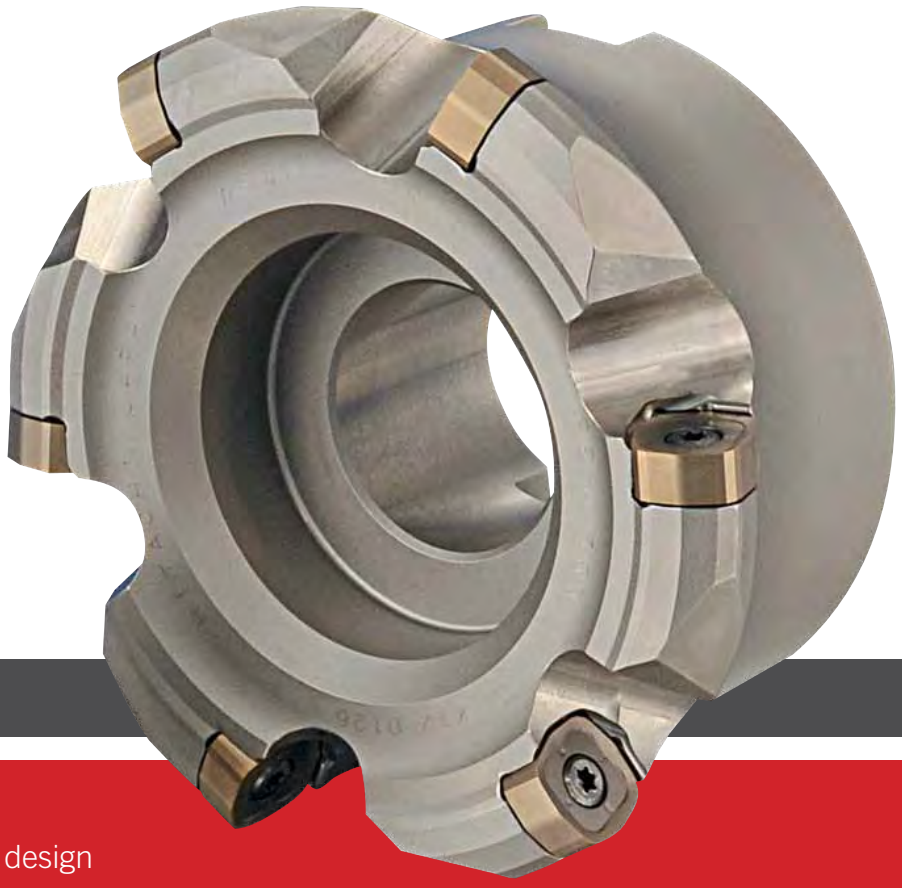
**Notes**

1) These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
2) To prevent tool breakage due to chips clogging tool flutes, always be sure to use an air blower, etc. to remove chips.
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) Ensure to index the insert at the correct time to ensure safety of the tool-body.
5) Make settings so that the cutting depth and per-flute feed rate do not exceed the maximum values.
6) MZ1000 is not suitable for wet cutting. Use them for dry cutting (air blow).
7) Due to fire risks do not use neat cutting oil as a coolant.
8) When using the BT30 arbor for modular mills, determine the processing conditions using the standard cutting conditions table as a general guide. If vibrations are a concern due to the processing conditions, adjust conditions by 1.reducing cutting depth or 2.reducing per-flute feed rate (fz).

# IASDF

## Face Mills Ideal for High-Feed Rate Machining

FACE MILL STYLE



## FEATURES

Inserts feature front/ back eight-corner design

One insert size fits all face mills from 2.5” to 6.0”

7mm thick inserts reduce breakage problems

Multiple insert coatings available for working in a wide range of materials

# IASDF

## Face Mill Style
## Inch

Advanced Engineering

ROUGHING | 50 HRC 50

Max ap
3mm (0.118")

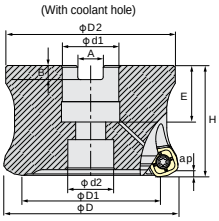


Fig. 1

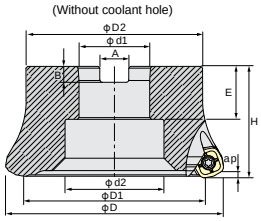


Fig. 2

| D | -0.15/-0.25 |
|---|---|

### IASDF-Inch (Face Mill Style)

| Part No. | Flutes | ØD | ØD1 | H | Ød1 | Ød2 | ØD2 | E | A | B | Fig | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IASDF5040R-4** | 4 | 2.5 | 1.690 | 1.969 | 0.75 | 0.630 | 2.362 | 1.024 | 0.32 | 0.197 | 1 | SNMU1607EN-C |
| **IASDF5048R-4** | 4 | 3.0 | 2.191 | 2.480 | 1.00 | 0.827 | 2.756 | 1.378 | 0.38 | 0.236 | 1 | SNMU1607EN-C |
| **IASDF5064R-5** | 5 | 4.0 | 3.190 | 2.756 | 1.50 | 1.240 | 3.543 | 1.378 | 0.63 | 0.394 | 1 | SNMU1607EN-C |
| **IASDF5080R-6** | 6 | 5.0 | 4.191 | 2.756 | 1.50 | 1.969 | 3.937 | 1.378 | 0.63 | 0.394 | 2 | SNMU1607EN-C |
| **IASDF5096R-8** | 8 | 6.0 | 5.192 | 2.756 | 1.50 | 2.165 | 4.134 | 1.378 | 0.63 | 0.394 | 2 | SNMU1607EN-C |

Inserts p. 51

| Part No. | Clamp Screw | Wrench | Wrench | Screw Anti-Seizure Agent |
|---|---|---|---|---|
| **IASDF5 ○○○ R- ○** | 555-141 | 105-T20 | 105-T20L | P-37 |

# IASDF

**Inserts**

Advanced Engineering

Fig. 1 C Breaker

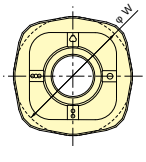



Fig. 2 B Breaker

**Inserts**

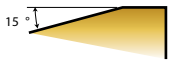
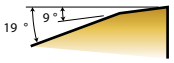
| Part No. | JP4120 | JM4160 | JP4020 | JS4045 | GX2120 | ØW(mm) | T(mm) | Fig |
|---|---|---|---|---|---|---|---|---|
| **SNMU1607EN-C** | | | • | • | • | 16 | 7 | 1 |
| **SNMU1607EN-B** | • | • | | • | | 16 | 7 | 2 |

## COATING MATERIALS FOR INSERTS

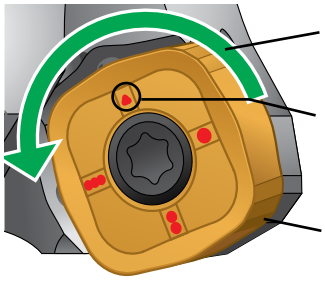
| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **JP4120**<br>P10-M10-K10 | **AJ Coating**<br>PVD | For pre-hardened steel (35-50HRC) and alloy steel | Uses fine grain substrate and AJ coating. Suitable for cutting of common steels through pre-hardened steels. |
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating<br>Suitable for general steel cutting |
| **GX2120**<br>K10 | **GX Coating**<br>CVD | For high-speed cutting of cast iron | Uses fine grain substrate and GX coating<br>Suitable for the continuous cutting of cast iron. |
| **JM4160**<br>M40 | **AJ Coating**<br>PVD | General purpose for stainless steel | Uses high toughness substrate and AJ coating. Suitable for cutting of stainless steels. |

## BREAKER SHAPES

B breaker for lower cutting force is now available.
- Positive edge geometry realizes 10% lower cutting force than before.
- B breaker has better performance in less rigidity set-up.

| | Item Code | Breaker Shape | Cross-section Shape | Application |
|---|---|---|---|---|
| **C Breaker** | SNMU1607EN-C |  |  | • Suitable for general machining in steels<br>• Interrupted machining |
| **B Breaker** | SNMU1607EN-B |  |  | • Machining with less rigidity set-up<br>• Parts-making in less rigidity cramping<br>• Suitable for stainless steel machining |

### 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 in a counterclockwise direction.

# IASDF

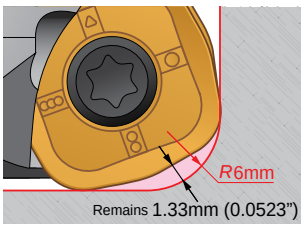
## Cutting Conditions Inch

Advanced Engineering

| INCH | ø No. of Flutes | | 2.5" 4 | | 3" 4 | | 4" 5 | | 5" 6 | | 6" 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material** | **Cutting Speed Vc(sfmn)** | **Feed Rate fz(in/t)** | **n(min-1)** | **Vf(in/min)** | **n(min-1)** | **Vf(in/min)** | **n(min-1)** | **Vf(in/min)** | **n(min-1)** | **Vf(in/min)** | **n(min-1)** | **Vf(in/min)** |
| Mild Steel (200 HB or less) JS4045 | 492 ~656 | 0.039 ~0.079 | 810 | 191 | 640 | 150 | 510 | 150 | 410 | 144 | 320 | 150 |
| | | | Vc=525sfm fz=0.059in/t ap=0.059in ae=0.7×øDc | | | | | | | | | |
| Carbon Steel Alloy Steel (<30HRC) JS4045 | 328 ~590 | 0.039 ~0.079 | 710 | 167 | 560 | 131 | 450 | 131 | 360 | 126 | 280 | 131 |
| | | | Vc=525sfm fz=0.059in/t ap=0.059in ae=0.7×øDc | | | | | | | | | |
| Carbon Steel Alloy Steel (30-40HRC) JP4045 JP4020 JP4120 | 328 ~525 | 0.039 ~0.079 | 610 | 143 | 480 | 112 | 380 | 112 | 310 | 108 | 240 | 112 |
| | | | Vc=394sfm fz=0.059in/t ap=0.059in ae=0.7×øDc | | | | | | | | | |
| Carbon Steel Alloy Steel (40-45HRC) JP4020 JP4120 JS4045 | 262 ~394 | 0.016 ~0.031 | 460 | 57 | 360 | 45 | 290 | 45 | 230 | 43 | 180 | 45 |
| | | | Vc=328sfm fz=0.031in/t ap=0.039in ae=0.7×øDc | | | | | | | | | |
| Stainless Steel SUS JM4160 JP4120 | 262 ~328 | 0.016 ~0.031 | 460 | 72 | 360 | 56 | 290 | 56 | 230 | 54 | 180 | 56 |
| | | | Vc=295sfm fz=0.039in/t ap=0.039 ae=0.7×øDc | | | | | | | | | |
| Cast Iron GX2120 JS4045 JP4120 JP4020 | 328 ~590 | 0.039 ~0.079 | 810 | 191 | 640 | 150 | 510 | 150 | 410 | 144 | 320 | 150 |
| | | | Vc=406sfm fz=0.059in/t ap=0.059in ae=0.7×øDc | | | | | | | | | |
| Hardened Steel (45-50HRC) JP4020 JP4120 | 197 ~328 | 197 ~328 | 350 | 22 | 280 | 18 | 220 | 18 | 180 | 17 | 140 | 18 |
| | | | Vc=229sfm fz=0.016in/t ap=0.031in ae=0.7×øDc | | | | | | | | | |

**Notes**
1) GX2120 are non-conductive coating which will not cause a response in conductive touch sensors.
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) In order to avoid of insert breakage, please change insert earlier.
5) 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.
6) Please don't use cutting oil as coolant. (It can cause a fire.)

## Programming Radius




When using ASDF type for Shaping cutting refer to the following for the flute tip condition definitions for programming.

Approximate *R* definition = *R6* (0.2362")
Remains 1.33mm (0.0523")

- For slanted cutting using ø2.5" or ø3", perform at 0.5° or less. Do not perform using ø4" or larger.
- When tool protusion length is long ( $L/øDc2 \geq 3$), adjust *ap*.

# IRV/RV

Advanced Engineering

## Indexable Tools for High-Speed, High-Performance Milling of Aerospace & Energy Materials

SHANK STYLE

MODULAR STYLE

FACE MILL STYLE

## FEATURES

Patent-pending rotation-prevention mechanism achieves secure indexing of inserts

Three types of chip breakers are available for different materials

Insert coatings are available for wet & dry machining of stainless steels, as well as aluminum, titanium and nickel based alloys

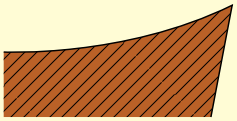
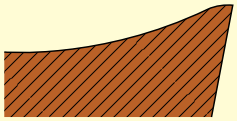
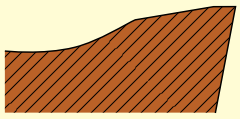
## INTRODUCTION

The RV Series of Indexable End Mills are designed for the high-speed, high-performance milling of stainless steels. The patent-pending rotation-prevention mechanism on the round insets allows for the secure indexing of the inserts. Two stainless steel specific insert coatings are available: JM4160 for wet milling and GX2160 for dry milling.

## FEATURES

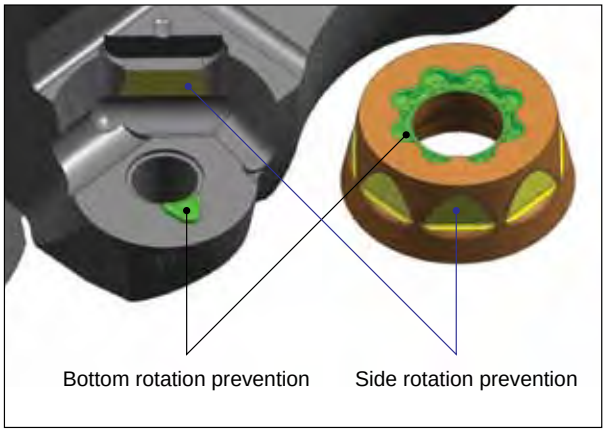
### 1. Line of breakers and coating materials suitable for difficult-to-cut materials

**Three types of breakers are available for cutting stainless steel materials, titanium alloys, nickel-based alloys, and aluminum alloys.**

| | | Sharp-edge A8 Type | Easy cutting breaker B8 Type | Strong-flute-tip breaker C8 Type |
|---|---|---|---|---|
| Insert cross section | |  |  |  |
| Grade | JM4160 | – | Stainless Steels materials (Wet Cutting) | |
| | GX2160 | – | Stainless Steels materials (Dry Cutting) | |
| | JS1025 | Titanium alloys (finishing) | Titanium alloys, nickel-based alloys | – |
| | SD5010 | Aluminum Alloy | – | – |

### 2. Rotation-prevention mechanism to secure inserts (Patent pending)

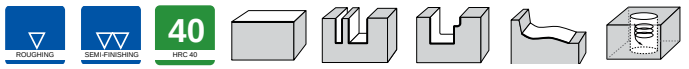
- **Secure insert indexing is achieved with rotation-prevention mechanisms in two locations.**
- **Improved attaching enables reliable error prevention.**

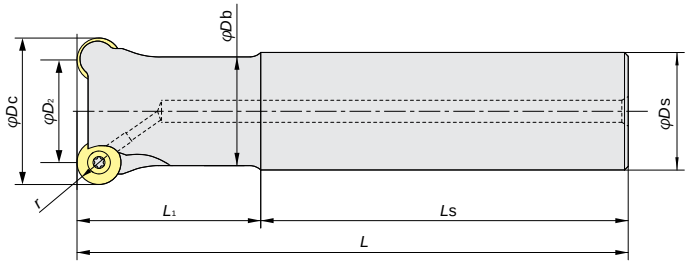


# IRV/RV

**Shank Style**
**Metric**

Advanced Engineering




D 0/-0.2

**RV-Metric (Shank Style)**

| Part No. | Stock | Flutes | r | ØDc | ØD2 | L | ØDs | L1 | Ls | ØDb | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **RV3S025R-3** | ☐ | 3 | 5 | 25 | 15 | 140 | 25 | 60 | 80 | 21 | |
| **RV3S032R-4** | ☐ | 4 | 5 | 32 | 22 | 150 | 32 | 70 | 80 | 28 | RP☐T10T3M0☐N-☐O |
| **RV3S040R-5** | ☐ | 5 | 5 | 40 | 30 | 150 | 32 | 70 | 80 | 30 | |
| **RV4S032R-3** | ☐ | 3 | 6 | 32 | 20 | 150 | 32 | 70 | 80 | 28 | |
| **RV4S040R-3** | ☐ | 3 | 6 | 40 | 28 | 150 | 32 | 50 | 100 | 30 | RP☐T1204M0☐N-☐O |
| **RV4S040R-4** | ☐ | 4 | 6 | 40 | 28 | 150 | 32 | 50 | 100 | 30 | |

Inserts p. 58

**☐ = Stocked items in Japan**

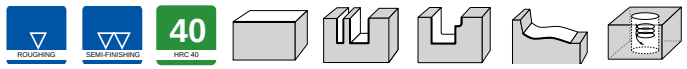
| Cutter Body | Part No. | Clamp Screw | Screw Driver | Screw Anti-Seizure Agent |
|---|---|---|---|---|
| | |  |  |  |
| **Shank** | RV3S0○○R-○ | 265-141 | 104-T10 | P-37 |
| | RV4S0○○R-○ | 262-142 | 104-T15 | |

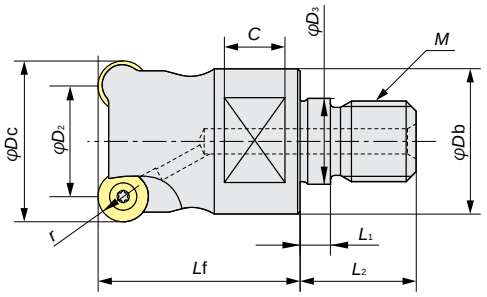
**Drivers/wrenches, screw anti-seizure agent, and arbor screws are sold seperately.**

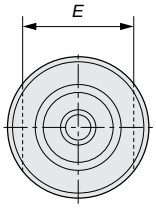
# IRV/RV

**Modular Style**
**Metric**

Advanced Engineering




| D | 0/-0.2 |
|---|---|

**RV-Metric (Modular Style)**

| Part No. | Stock | Flutes | r | ØDc | ØD2 | Lf | ØD3 | M | øDb | L1 | L2 | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RV3M025R-3** | ☐ | 3 | 5 | 25 | 15 | 35 | 12.5 | M12 | 20.8 | 5.5 | 22 | 10 | 17 | |
| **RV3M032R-4** | ☐ | 4 | 5 | 32 | 22 | 40 | 17 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | RP☐T10T3M0☐N-☐O |
| **RV3M040R-5** | ☐ | 5 | 5 | 40 | 30 | 40 | 17 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | |
| **RV4M032R-3** | ☐ | 3 | 6 | 32 | 20 | 40 | 17 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | |
| **RV4M040R-3** | ☐ | 3 | 6 | 40 | 28 | 40 | 17 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | RP☐T1204M0☐N-☐O |
| **RV4M040R-4** | ☐ | 4 | 6 | 40 | 28 | 40 | 17 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | |

Modular Shanks on p. 163

Inserts p. 58

**☐ = Stocked items in Japan**

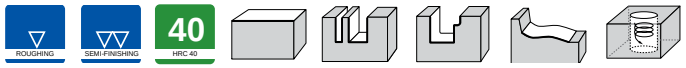
| Cutter Body | Part No. | Clamp Screw | Screw Driver | Screw Anti-Seizure Agent |
|---|---|---|---|---|
| | |  |  |  |
| **Modular** | RV3M0○○R-○ | 265-141 | 104-T10 | P-37 |
| | RV4M0○○R-○ | 262-142 | 104-T15 | |

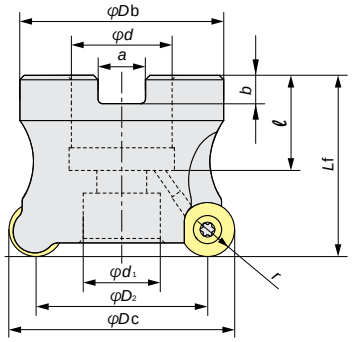
**Drivers/wrenches, screw anti-seizure agent, and arbor screws are sold seperately.**

# IRV/RV

**Face Mill +**
**Bore Style**
**Metric**

Advanced Engineering




| D | 0/-0.2 |
|---|---|

## IRV-Inch (Face Mill Style)

| Part No. | Stock | Flutes | r | øDc | øD2 | Lf | ød | ød1 | ℓ | a | b | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IRV4B032R-5** | • | 5 | 6mm | 2.0 | 1.606 | 1.575 | 0.750 | 0.67 | 0.748 | 0.315 | 0.197 | RP□T1204M0□N-□O |
| **IRV4B040R-6** | • | 6 | 6mm | 2.5 | 2.106 | 1.575 | 0.750 | 0.67 | 0.748 | 0.315 | 0.197 | |

## RV-Metric (Face Mill Style)

| Part No. | Stock | Flutes | r | ØDc | ØD2 | ØDb | Lf | ød | Ød1 | ℓ | a | b | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RV3B040RM-5** | □ | 5 | 5 | 40 | 30 | 35 | 40 | 16 | 13.2 | 8.4 | 5.6 | 19 | RP□T10T3M0□N-□O |
| **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 | |
| **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 | 17.0 | 10.4 | 6.3 | 20 | RP□T1204M0□N-□O |
| **RV4B063RM-6** | □ | 6 | 6 | 63 | 51 | 58 | 40 | 22 | 17.0 | 10.4 | 6.3 | 20 | |
| **RV4B080RM-7** | □ | 7 | 6 | 80 | 68 | 76 | 50 | 27 | 20.0 | 12.4 | 7.0 | 22 | |

## RV-Metric with Inch Pilot (Face Mill Style)

| Part No. | Stock | Flutes | r | ØDc | ØD2 | ØDb | Lf | ød | Ød1 | a | b | l | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RV4B050R-5** | □ | 5 | 6 | 50 | 38 | 45 | 40 | 22.225 | 17 | 8.4 | 5 | 19 | |
| **RV4B063R-6** | □ | 6 | 6 | 63 | 51 | 58 | 40 | 22.225 | 17 | 8.4 | 5 | 19 | RP□T1204M0□N-□O |
| **RV4B080R-7** | □ | 7 | 6 | 80 | 68 | 76 | 63 | 31.750 | 26 | 12.7 | 8 | 32 | |

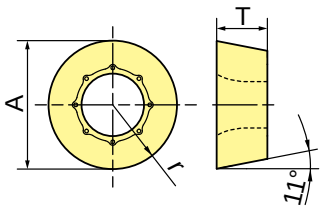
Inserts p. 58

**□ = Stocked items in Japan**

# IRV/RV

**Inserts**

Advanced Engineering




**Inserts**

| Part No. | JM4160 | GX2160 | JS1025 | SD5010 | R(mm) | A(mm) | T(mm) |
|---|---|---|---|---|---|---|---|
| RPET10T3M0FN-A8 | | | ☐ | ☐ | | | |
| RPMT10T3M0EN-B8 | ☐ | ☐ | | | | | |
| RPMT10T3M0EN-C8 | ☐ | ☐ | | | 5 | 10 | 3.97 |
| RPHT10T3M0EN-B8 | ☐ | ☐ | ☐ | | | | |
| RPHT10T3M0EN-C8 | ☐ | ☐ | | | | | |
| RPET1204M0FN-A8 | | | • | • | | | |
| RPMT1204M0EN-B8 | • | • | | | | | |
| RPMT1204M0EN-C8 | • | • | | | 6 | 12 | 4.76 |
| RPHT1204M0EN-B8 | • | • | • | | | | |
| RPHT1204M0EN-C8 | • | • | | | | | |

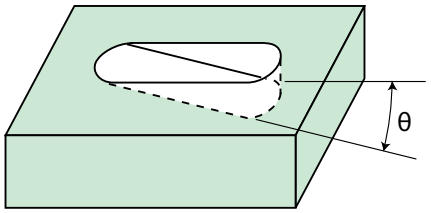
**☐ = Stocked items in Japan**

## COATING MATERIALS FOR INSERTS

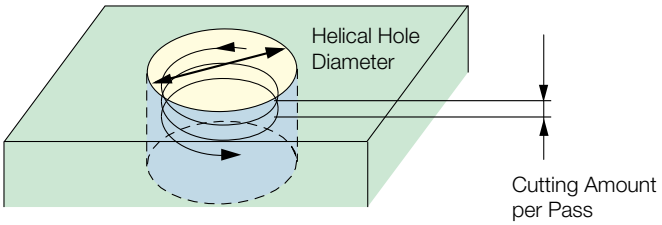
| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JS1025**<br>S10 | **JS Coating**<br>PVD | For titanium alloys | A coating with excellent lubricating characteristics is used to reduce welding with cutting materials and extend tool life. |
| **JM4160**<br>M40 | **AJ Coating**<br>PVD | General purpose for stainless steel | Uses high toughness substrate and AJ coating. Suitable for cutting of stainless steels. |
| **GX2160**<br>M40 | **GX Coating**<br>CVD | For dry high speed stainless steel cutting | Uses CVD coating with excellent heat resistance to improve wear resistance and provide long tool life when dry-cutting stainless steel. |
| **SD5010**<br>N10 | **SD Coating**<br>PVD | For aluminum alloys and non ferrous metals | The hydrogen-free DLC coating infinitely close to that of diamonds. Hardness: more than 60GPa |

## Ramping and Helical Milling Data

### Ramping




### Helical Milling




| Tool Diameter | | Ø25 | Ø32 | Ø40 | Ø42 | Ø40 | Ø42 | 2" or Ø50 | 2.5" or Ø63 | Ø80 |
|---|---|---|---|---|---|---|---|---|---|---|
| Inserts Size | | RPT10T3M0 | | | | RPT1204M0 | | | | |
| Ramp Angle | | 1° - 1.5° degrees (Less than 3° recommended) | | | | | | | | |
| Inch | Recommended Cutting Amount | 0.0393 - 0.0787 | 0.0591 - 0.0984 | 0.0591 - 0.0984 | 0.0591 - 0.0984 | 0.0787 - 0.1181 | 0.0787 - 0.1181 | 0.0787 - 0.1181 | 0.1181 | 0.1181 |
| Inch | Hole Diameter | 1.5748 - 1.4961 | 2.1260 - 2.4409 | 2.7559 - 3.0709 | 2.9134 - 3.2284 | 2.6772 - 3.0709 | 2.8347 - 3.2284 | 3.4646 - 3.8583 | 4.4882 - 4.9213 | 5.0394 - 6.2205 |
| Metric | Recommended Cutting Amount | 1 - 2 | 1.5 - 2.5 | 1.5 - 2.5 | 1.5 - 2.5 | 2 - 3 | 2 - 3 | 2 - 3 | 3 | 3 |
| Metric | Hole Diameter | 40 - 38 | 54 - 62 | 70 - 78 | 74 - 82 | 68 - 78 | 72 - 82 | 88 - 98 | 114 - 125 | 128 - 158 |

There are restrictions to ramp angle (θ) and adjust ($a_p$) because of designs of cutting edge. Note: Due to swarf evacuation wear safety glasses in the vicinity of the operation. For helical milling, since chips will accumulate inside the hole, use an air blower or supply coolant to remove chips.

| Cutter Body | Part No. | Clamp Screw | Arbor Screw* | Screw Driver | Wrench | Screw Anti-Seizure Agent |
|---|---|---|---|---|---|---|
| | |  |  |  |  |  |
| Bore (Inch) | IRV4B032R-5<br>RV4B050R-5<br>IRV4B040R-6<br>RV4B063R-6 | 262-142 | 100-178 | - | 105-T15 | |
| | RV4B080R-7 | | 100-180 | | | |
| Bore (mm) | RV3B0○○-R-○ | 265-151 | 100-183 | 104-T10 | - | P-37 |
| | RV4B040RM-4<br>RV4B042RM-4 | 262-142 | 100-183 | - | 105-T15 | |
| | RV4B050RM-5<br>RV4B063RM-6 | | 100-178 | | | |
| | RV4B080RM-7 | | 100-179 | | | |

**Drivers/wrenches, screw anti-seizure agent, and arbor screws are sold seperately.**
*** When supplying air or cutting oil to each cutting flute, please use the indicated arbor screw.**

| Inch + Metric / Work Material | Cutting Method | Recommended Grade | Breaker Shape | Cutting Speed Vc(m/min) | Depth of Cut ap(mm) | Feed Rate fz(mm/t) | (R5) Shank type (R5) Modular type: 1" or 25mm 3 — Rotation speed min-1 | Feed in/min | 1.25" or 32mm 4 — Rotation speed min-1 | Feed in/min | 1.5" or 40mm 5 — Rotation speed min-1 | Feed in/min | (R5) Bore type: 1.5" or 40mm/42mm 5 — Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austenite type Ferrite type Stainless Steel 304 316 430 etc | Dry Cutting | GX2160 | -C8 | 590 ~720 | 0.079~ | 0.004~0.008 | 2,546 | 60 | 1,989 | 63 | 1,592 | 63 | 1,592 | 63 | 1,516 | 60 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=656sfm, fz=0.008in/t | | | | | | vc=656sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| | Wet Cutting | JM4160 | -B8 | 295 ~361 | 0.079~ | 0.004~0.008 | 1,273 | 30 | 995 | 31 | 796 | 31 | 796 | 31 | 758 | 30 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=328sfm, fz=0.008in/t | | | | | | vc=328sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| Martensite type Stainless Steel 410 420 etc | Dry Cutting | GX2160 | -C8 | 656 ~787 | 0.079~ | 0.004~0.008 | 2,801 | 66 | 2,188 | 69 | 1,751 | 69 | 1,751 | 69 | 1,667 | 66 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=720sfm, fz=0.008in/t | | | | | | vc=722sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| | Wet Cutting | JM4160 | -B8 | 394 ~656 | 0.079~ | 0.004~0.008 | 2,037 | 48 | 1,592 | 50 | 1,273 | 50 | 1,273 | 50 | 1,213 | 48 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=525sfm, fz=0.008in/t | | | | | | vc=525sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| Precipitation-Hardened Steel Stainless Steel S17400 S17700 etc | Dry Cutting | GX2160 | -C8 | 525 ~656 | 0.079~ | 0.004~0.008 | 2,292 | 54 | 1,790 | 56 | 1,432 | 56 | 1,432 | 56 | 1,364 | 54 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=590sfm, fz=0.008in/t | | | | | | vc=590sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| | Wet Cutting | JM4160 | -B8 | 328 ~590 | 0.079~ | 0.004~0.008 | 1,528 | 36 | 1,194 | 38 | 955 | 38 | 955 | 38 | 909 | 36 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=394sfm, fz=0.008in/t | | | | | | vc=394sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| Aluminum Alloy 5052 etc | Dry Cutting Wet Cutting | SD5010 | -A8 | 984 ~1640 | 0.079~ | 0.004~0.008 | 3,820 | 90 | 2,984 | 94 | 2,387 | 94 | 2,387 | 94 | 2,274 | 90 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=984sfm, fz=0.008in/t | | | | | | vc=984sfm, fz=0.008in/t | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | |
| Titanium Alloy Ti-6AL-4V etc | Wet Cutting | JS1025 | -B8 (roughing) -A8 (finishing) | 98 ~164 | ~0.079 | 0.003~0.005 | 509 | 6 | 398 | 6 | 318 | 6 | 318 | 6 | 303 | 6 |
| | | | | | | | vc=131sfm, fz=0.004in/t | | | | | | vc=131sfm, fz=0.004in/t | | | |
| Nickel-based Alloys Inconel718 etc | Wet Cutting | JS1025 | -B8 | 98 ~164 | ~0.079 | 0.002~0.004 | 446 | 4 | 348 | 4 | 279 | 4 | 279 | 4 | 265 | 4 |
| | | | | | | | vc=115sfm, fz=0.003in/t | | | | | | vc=115sfm, fz=0.003in/t | | | |

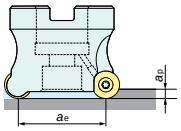
**Notes**

1) These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
2) GX2160 has an insulating coating which will not cause a response in conductive touch sensors.
3) In order to avoid of insert breakage, please change insert earlier.
4) Use the appropriate coolant for the work material and machining shape.

| | | Overhang ratio | | |
|---|---|---|---|---|
| | | <3 Dc | 3Dc~5Dc | 5Dc < |
| **Surfacing Shoulder Cutting** | **Rotatio speed** | **100%** | 70% | 50% |
| | **Feed rate** | **100%** | 70% | 50% |
| **Slotting** | **Rotatio speed** | **100%** | 70% | 50% |
| | **Feed rate** | **70%** | 50% | 35% |
| **Ramping** | **Rotatio speed** | **100%** | 70% | 50% |
| | **Feed rate** | **80%** | 55% | 40% |

**Depth of Cut**

- 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 refering to the table below.




| Insert Size | Recommended ap | Maximum ap | Recommended ae |
|---|---|---|---|
| **RP□T1204M0** | 0.039~0.118" (1~3mm) | 0.236" (6mm) | 0.3Dc~0.6Dc |
| **RP□T10T3M0** | 0.039~0.1" (1 - 2.5mm) | 0.196" (5mm) | |

# IRV/RV

## Cutting Conditions Inch + Metric

Advanced Engineering

| Inch + Metric / Work Material | Cutting Method | Recommended Grade | Breaker Shape | Cutting Speed Vc(m/min) | Depth of Cut ap(mm) | Ø No. of Flutes / Feed Rate fz(mm/t) | (R6mm) Shank type 1.25" or 32mm 3 | | 1.5" or 40mm 3 | | 1.5" or 40mm 4 | | (R6mm) Bore type 1.5" or 40mm 4 | | 1.65" or 42mm 4 | | 2" or 50mm 5 | | 2.5" or 63mm 6 | | 3.15" or 80mm 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min | Rotation speed min-1 | Feed in/min |
| Austenite type Ferrite type Stainless Steel 304 316 430 etc | Dry Cutting | GX2160 | -C8 | 590 ~720 | 0.079~ | 0.004~0.008 | 1,989 | 59 | 1,592 | 47 | 1,592 | 63 | 1,592 | 63 | 1,516 | 60 | 1,273 | 63 | 1,011 | 60 | 796 | 55 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=656sfm, fz=0.01in/t | | | | | | vc=656sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| | Wet Cutting | JM4160 | -B8 | 295 ~361 | 0.079~ | 0.004~0.008 | 995 | 29 | 796 | 24 | 796 | 31 | 796 | 31 | 758 | 30 | 637 | 31 | 505 | 30 | 398 | 27 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=328sfm, fz=0.01in/t | | | | | | vc=328sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| Martensite type Stainless Steel 410 420 etc | Dry Cutting | GX2160 | -C8 | 656 ~787 | 0.079~ | 0.004~0.008 | 2,188 | 65 | 1,751 | 52 | 1,751 | 69 | 1,751 | 69 | 1,667 | 66 | 1,401 | 69 | 1,112 | 66 | 875 | 60 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=722sfm, fz=0.01in/t | | | | | | vc=722sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| | Wet Cutting | JM4160 | -B8 | 394 ~656 | 0.079~ | 0.004~0.008 | 1,592 | 47 | 1,273 | 38 | 1,273 | 50 | 1,273 | 50 | 1,213 | 48 | 1,019 | 50 | 808 | 48 | 637 | 44 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=525sfm, fz=0.01in/t | | | | | | vc=525sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| Precipitation-Hardened Steel Stainless Steel S17400 S17700 etc | Dry Cutting | GX2160 | -C8 | 525 ~656 | 0.079~ | 0.004~0.008 | 1,790 | 53 | 1,432 | 42 | 1,432 | 56 | 1,432 | 56 | 1,364 | 54 | 1,146 | 56 | 909 | 54 | 716 | 49 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=590sfm, fz=0.01in/t | | | | | | vc=590sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| | Wet Cutting | JM4160 | -B8 | 328 ~590 | 0.079~ | 0.004~0.008 | 1,194 | 35 | 955 | 28 | 955 | 38 | 955 | 38 | 909 | 36 | 764 | 38 | 606 | 36 | 477 | 33 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=394sfm, fz=0.01in/t | | | | | | vc=394sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| Aluminum Alloy 5052 etc | Dry Cutting Wet Cutting | SD5010 | -A8 | 984 ~1640 | 0.079~ | 0.004~0.008 | 2,984 | 88 | 2,387 | 70 | 2,387 | 94 | 2,387 | 94 | 2,274 | 90 | 1,910 | 90 | 1,516 | 90 | 1,194 | 82 |
| | | | | | 0.039~0.079 | 0.008~0.012 | vc=984sfm, fz=0.01in/t | | | | | | vc=984sfm, fz=0.01in/t | | | | | | | | | |
| | | | | | ~0.039 | 0.016~0.020 | | | | | | | | | | | | | | | | |
| Titanium Alloy Ti-6AL-4V etc | Wet Cutting | JS1025 | -B8 (roughing) -A8 (finishing) | 98 ~164 | ~0.079 | 0.003~0.005 | 398 | 5 | 318 | 4 | 318 | 5 | 318 | 5 | 303 | 5 | 255 | 5 | 202 | 5 | 159 | 4 |
| | | | | | | | vc=131sfm, fz=0.004in/t | | | | | | vc=131sfm, fz=0.004in/t | | | | | | | | | |
| Nickel-based Alloys Inconel718 etc | Wet Cutting | JS1025 | -B8 | 98 ~164 | ~0.079 | 0.002~0.004 | 348 | 3 | 279 | 3 | 279 | 4 | 279 | 4 | 265 | 3 | 223 | 4 | 177 | 3 | 139 | 3 |
| | | | | | | | vc=89sfm, fz=0.003in/t | | | | | | vc=115sfm, fz=0.003in/t | | | | | | | | | |

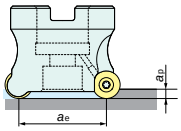
**Notes**

1) These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
2) GX2160 has an insulating coating which will not cause a response in conductive touch sensors.
3) In order to avoid of insert breakage, please change insert earlier.
4) Use the appropriate coolant for the work material and machining shape.

| | | Overhang ratio | | |
|---|---|---|---|---|
| | | <3 Dc | 3Dc~5Dc | 5Dc < |
| Surfacing Shoulder Cutting | Rotatio speed | 100% | 70% | 50% |
| | Feed rate | 100% | 70% | 50% |
| Slotting | Rotatio speed | 100% | 70% | 50% |
| | Feed rate | 70% | 50% | 35% |
| Ramping | Rotatio speed | 100% | 70% | 50% |
| | Feed rate | 80% | 55% | 40% |

**Depth of Cut**

- 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 refering to the table below.




| Insert Size | Recommended ap | Maximum ap | Recommended ae |
|---|---|---|---|
| RP□T1204M0 | 0.039~0.118" (1~3mm) | 0.236" (6mm) | 0.3Dc~0.6Dc |
| RP□T10T3M0 | 0.039~0.1" (1 - 2.5mm) | 0.196" (5mm) | |

# IAHU/AHU

Advanced Engineering

## Advanced Design End Mills and Face Mills Radically Reduce Cutting Forces

MODULAR STYLE

FACE MILL STYLE

## FEATURES

Unique high rake geometry reduces cutting forces

30% increased rigidity thanks to special steel material and chip pocket geometry

New insert coating grades JS, JP, JM, GX and SD improve efficiency and tool life

All tools feature coolant-thru the tool

## INTRODUCTION

The AHU High Feed Ultra Series Indexable Tools incorporate unique body design, advanced insert geometries and technologically advanced coatings to create an exceptionally tough line-up. AHU tools are available in End Mill styles ranging from 25mm to 40mm (0.984" to 1.575") in diameter and Face Mill styles of 50mm to 100mm (2.0" to 4.0").

Ideal for shoulder milling, the AHU Series can also perform direct ramping and slotting operations. All tools feature coolant-thru the tool, improving both tool life and cutting performance.

## FEATURES

| 1. | New Type Breakers |
|---|---|

Inserts join the ranks of tools for difficult-to-cut materials. Newly appear two kind of breakers

**B7 type breaker**

Strongly-raked low-cutting-force breaker

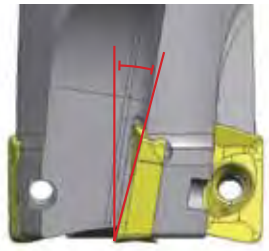
For cutting of stainless steel materials, machining of titanium alloys, and cutting of nickel-based alloys.

**C7 type breaker**

Mildly-raked low-cutting-force breaker

For machining of stainless steel materials and machining of nickel-based alloys.

Achieved low cutting force by larger axial rake angle.



**Conventional Insert**
15 degrees

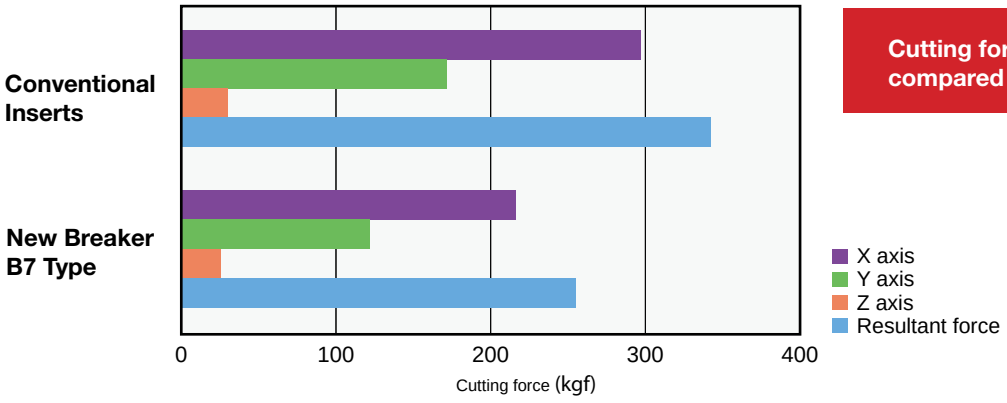
**New breaker B/C type**
18 degrees

The cutting flute length is shortened to suppress chattering vibrations during slotting, etc.

15 Type – Max $a_p$=7mm


When using B7/C7 breakers, there are restrictions on maximum cutting depth ap.
Please use after checking machining conditions beforehand.

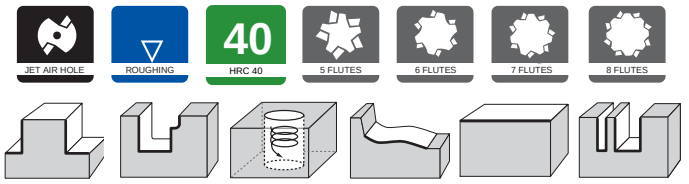
| 2. | Comparison of Cutting Force |
|---|---|

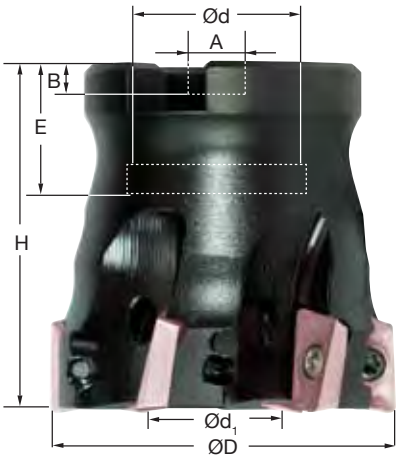



**Cutting force is reduced by 25% compared to conventional breakers**

# IAHU/AHU

**Face Mill Style**
**Inch + Metric**




| D | -0.1/-0.2 |
|---|---|

**IAHUB-Inch (Face Mill Style with Coolant Holes)**

| Part No. | Flutes | ØD | Ød | H | Ød1 | E | A | B | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **IAHUB1532R-5** | 5 | 2.0 | 0.750 | 1.969 | 0.65 | 0.748 | 0.315 | 0.197 | JDMT1505 |
| **IAHUB1540R-6** | 6 | 2.5 | 0.750 | 1.969 | 0.65 | 0.748 | 0.315 | 0.197 | JDMT1505 |
| **IAHUB1548R-7** | 7 | 3.0 | 1.000 | 2.480 | 0.83 | 1.378 | 0.354 | 0.236 | JDMT1505 |
| **IAHUB1564R-8** | 8 | 4.0 | 1.500 | 2.756 | 1.26 | 1.378 | 0.626 | 0.394 | JDMT1505 |

**AHUB-Metric (Face Mill Style without Coolant Holes)**

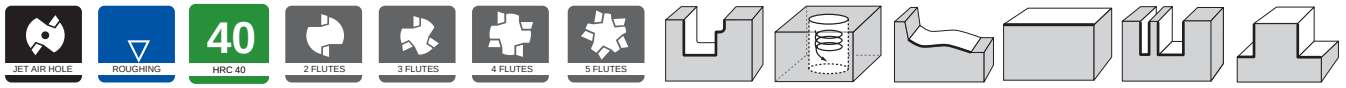
| Part No. | Flutes | ØD | Ød | H | Ød1 | E | A | B | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **AHUB1550RM-5** | 5 | 50 | 22.00 | 50 | 17 | 20 | 10.4 | 6.3 | JDMT1505 |
| **AHUB1563RM-6** | 6 | 63 | 22.00 | 50 | 17 | 20 | 10.4 | 6.3 | JDMT1505 |
| **AHUB1580R-7** | 7 | 80 | 25.40 | 50 | 20 | 26 | 9.5 | 6.0 | JDMT1505 |
| **AHUB15100R-8** | 8 | 100 | 31.75 | 50 | 45 | 32 | 12.7 | 8.0 | JDMT1505 |

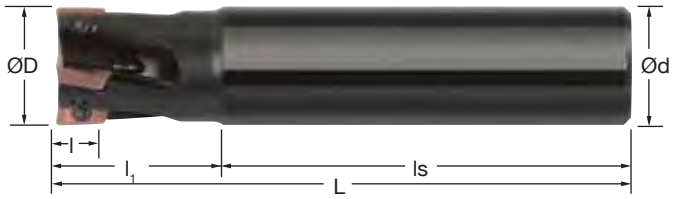
Inserts p. 67

# IAHU/AHU

**Shank Style**
**Inch + Metric**

Advanced Engineering




| D | -0.1/-0.2 |
|---|---|

**IAHU-Inch (Shank Style with Coolant Holes)**

| Part No. | Flutes | ØD | L | l | $l_1$ | ls | Ød | Insert |
|---|---|---|---|---|---|---|---|---|
| **IAHU1516R-2** | 2 | 1 | 4 | 0.551 | 1.5 | 2.5 | 1 | JDMT1505 |

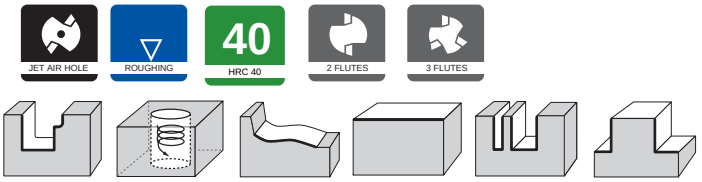
**AHU-Metric (Shank Style with Coolant Holes)**

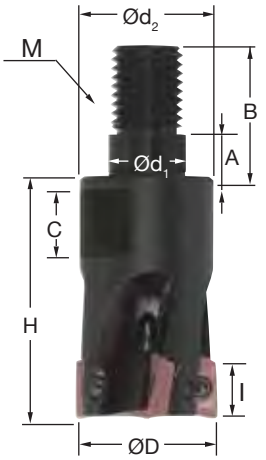
| Part No. | Flutes | ØD | L | l | $l_1$ | ls | Ød | Insert |
|---|---|---|---|---|---|---|---|---|
| **AHU1525R-2** | 2 | 25 | 100 | 14 | 40 | 85 | 25 | JDMT1505 |
| **AHU1532R-3** | 3 | 32 | 140 | 14 | 45 | 85 | 25 | JDMT1505 |
| **AHU1540R-4** | 4 | 40 | 140 | 14 | 45 | 95 | 32 | JDMT1505 |
| **AHUL1525R-2** | 2 | 25 | 180 | 14 | 75 | 105 | 25 | JDMT1505 |
| **AHUL1532R-3** | 3 | 32 | 200 | 14 | 90 | 110 | 32 | JDMT1505 |
| **AHUL1540R-5** | 5 | 40 | 220 | 14 | 45 | 175 | 32 | JDMT1505 |

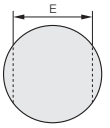
Inserts p. 67

# IAHU/AHU

## Modular Style




| D | -0.1/-0.2 |
|---|---|

**AHUM-Metric (Modular Style with Coolant Holes)**

| Part No. | Flutes | ØD | H | I | Ød$_1$ | M | Ød$_2$ | A | B | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AHUM1525R-2** | 2 | **25** | 35 | 14 | 12.5 | M12 | 21 | 5.5 | 22 | 10.0 | 17 | **JDMT1505** |
| **AHUM1532R-3** | 3 | **32** | 40 | 14 | 17.0 | M16 | 29 | 6.0 | 23 | 12.0 | 22 | **JDMT1505** |

Modular Shanks on p. 163

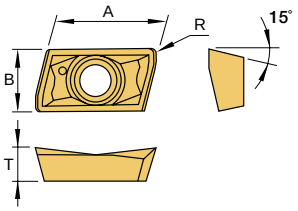
Inserts p. 67

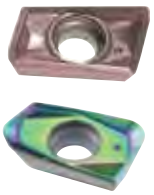
| Part No. | Clamp Screw | Wrench | Arbor Screw |
|---|---|---|---|
| |  |  |  |
| **AHU(L)15xxR-x** | 412-141 | 105-T15 | |
| **AHUB1550RM-5** | 412-141 | 105-T15 | 100-175 |
| **AHUB1563RM-6** | 412-141 | 105-T15 | 100-175 |
| **AHUB1580R-7** | 412-141 | 105-T15 | 100-212 |
| **AHUB15100R-8** | 412-141 | 105-T15 | |
| **IAHUB1532R-5** | 412-141 | 104-T15 | 100-178 |
| **IAHUB1540R-6** | 412-141 | 104-T15 | 100-178 |
| **IAHUB1548R-7** | 412-141 | 104-T15 | 100-179 |
| **IAHUB1564R-8** | 412-141 | 104-T15 | AP408004 |

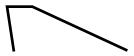
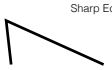
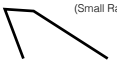
# IAHU/AHU

## Inserts

Advanced Engineering



| | Conventional | FA | B7 | C7 |
|---|---|---|---|---|
| Insert Cross-Section Shape |  |  Sharp Edge |  Positive Land (Large Rake) |  Positive Land (Small Rake) |
| Application | General Purpose | Aluminum Use | Stainless Steel (Wet Cutting) Titanium Inconel Use | Stainless Steel (Dry Cutting) Inconel Use |

### Inserts

| Part No. | JS4045 | PTH30E | JP4120 | JM4160 | GX2160 | SD5010 | R | A | B | T | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **JDMT150504R** | | • | | | | | 0.4 | 16.0 | 9.12 | 5.0 | Conventional |
| **JDMT150508R** | • | • | | | | | 0.8 | 16.0 | 9.12 | 5.0 | Conventional |
| **JDMT150520R** | • | • | | | | | 2.0 | 16.0 | 9.12 | 5.0 | Conventional |
| **JDMT150530R** | • | • | | | | | 3.0 | 16.0 | 9.12 | 5.0 | Conventional |
| **JDMT150508R-B7** | | | • | • | | | 0.8 | 16.0 | 9.12 | 5.0 | B7 |
| **JDMT150508R-C7** | | | • | | • | | 0.8 | 16.0 | 9.12 | 5.0 | C7 |
| **JDMT150520R-B7** | | | • | • | | | 2.0 | 16.0 | 9.12 | 5.0 | B7 |
| **JDMT150520R-C7** | | | • | | • | | 2.0 | 16.0 | 9.12 | 5.0 | C7 |
| **JDMT150530R-B7** | | | • | • | | | 3.0 | 16.0 | 9.12 | 5.0 | B7 |
| **JDMT150530R-C7** | | | • | | • | | 3.0 | 16.0 | 9.12 | 5.0 | C7 |
| **JDET150502R-FA** | | | | | | • | 0.2 | 16.0 | 9.12 | 5.0 | FA |
| **JDET150504R-FA** | | | | | | • | 0.4 | 16.0 | 9.12 | 5.0 | FA |
| **JDET150530R-FA** | | | | | | • | 3.0 | 16.0 | 9.12 | 5.0 | FA |

All inserts have two effective cutting edges

**Note:** When using inserts with a radius larger than R 2.0, it is necessary to carry out additional processing of the cutter body corner section.

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating<br>Suitable for general steel cutting |
| **JP4120**<br>P10-M10-K10 | **AJ Coating**<br>PVD | For pre-hardened steel (35~50HRC) and alloy steel | Uses fine grain substrate and AJ coating.<br>Suitable for cutting of common steels through pre-hardened steels. |
| **JM4160**<br>M40 | **AJ Coating**<br>PVD | General purpose for stainless steel | Uses high toughness substrate and AJ coating.<br>Suitable for cutting of stainless steels. |
| **GX2160**<br>M40 | **GX Coating**<br>CVD | For dry high speed stainless steel cutting | Uses CVD coating with excellent heat resistance to improve wear resistance and provide long tool life when dry-cutting stainless steel. |
| **SD5010**<br>N10 | **SD Coating**<br>PVD | For aluminum alloys and non ferrous metals | The hydrogen-free DLC coating infinitely close to that of diamonds. Hardness: more than 60GPa |
| **PTH30E**<br>K30 | **TH Coating (TiSiN)**<br>PVD | General purpose for steel | Uses moderate substrate, multi purpose grade |

# IAHU/AHU

## Cutting Conditions
## Inch

Advanced Engineering

| | ø<br>Flutes | 1" or 25mm<br>2 | | 1.25" or 32mm<br>3 | | 1.5" or 40mm<br>4 | | 2" or 50mm<br>5 | | 2.5" or 63mm<br>6 | | 3" or 80mm<br>7 | | 4" or 100mm<br>8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Work Material** | **Cutting Condition** | **Rotation Speed** | **Feed** | **Rotation Speed** | **Feed** | **Rotation Speed** | **Feed** | **Rotation Speed** | **Feed** | **Rotation Speed** | **Feed** | **Rotation Speed** | **Feed** | **Rotation Speed** | **Feed** |
| Carbon Steel Alloy Steel (<30HRC) | n(rpm) / vf(in/min) | 1,910 | 30 | 1,490 | 35 | 1,190 | 37 | 950 | 37 | 760 | 36 | 600 | 33 | 480 | 30 |
| | vc(sfm) | 394-590 (492) | | | | | | | | 394-590 (492) | | | | 394-590 (492) | |
| JS4045 | fz(in/t) | 0.006-0.01 (0.008) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |
| Tool Steel Alloy Steel (30-40HRC) | n(rpm) / vf(in/min) | 1,270 | 15 | 990 | 18 | 800 | 19 | 640 | 19 | 510 | 18 | 400 | 17 | 320 | 15 |
| | vc(sfm) | 262-394 (328) | | | | | | | | 262-394 (328) | | | | 262-394 (328) | |
| JS4045 | fz(in/t) | 0.004-0.008 (0.006) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |
| Stainless Steel (Dry Condition) | n(rpm) / vf(in/min) | 3,180 | 50 | 2,490 | 59 | 1,990 | 63 | 1,590 | 63 | 1,260 | 60 | 990 | 55 | 760 | 48 |
| | vc(sfm) | 656-984 (820) | | | | | | | | 656-984 (820) | | | | 656-918 (787) | |
| GX2160<br>JM4160 | fz(in/t) | 0.006-0.01 (0.008) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |
| Stainless Steel (Wet Condition) | n(rpm) / vf(in/min) | 1,270 | 20 | 990 | 24 | 800 | 25 | 640 | 25 | 510 | 24 | 400 | 22 | 320 | 20 |
| | vc(sfm) | 262-394 (328) | | | | | | | | 262-394 (328) | | | | 262-394 (328) | |
| JM4160<br>PTH30E | fz(in/t) | 0.006-0.01 (0.008) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | | 0.197/0.118 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |
| Cast Iron | n(rpm) / vf(in/min) | 1,780 | 28 | 1,390 | 33 | 1,110 | 35 | 890 | 35 | 710 | 33 | 560 | 31 | 450 | 28 |
| JS4045 | vc(sfm) | 394-525 (459) | | | | | | | | 394-525 (459) | | | | 394-525 (459) | |
| | fz(in/t) | 0.006-0.01 (0.008) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | | 0.551/0.394 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |
| Titanium Alloy (Wet Condition) Ti-6Al-4V | n(rpm) / vf(in/min) | 570 | 7 | 450 | 8 | 360 | 8 | 290 | 8 | 230 | 8 | 180 | 7 | 130 | 6 |
| | vc(sfm) | 98-197 (150) | | | | | | | | 98-197 (150) | | | | 98-157 (131) | |
| JP4120<br>PTH30E<br>JM4160 | fz(in/t) | 0.004-0.008 (0.006) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |
| Ni Based Alloy (Wet Condition) Inconel 718 | n(rpm) / vf(in/min) | 510 | 4 | 400 | 5 | 320 | 5 | 250 | 5 | 200 | 5 | 160 | 4 | 130 | 4 |
| | vc(sfm) | 98-164 (130) | | | | | | | | 98-164 (130) | | | | 98-164 (130) | |
| JP4120<br>JM4160 | fz(in/t) | 0.003-0.005 (0.004) | | | | | | | | | | | | | |
| | ap (in) side milling/slotting | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | | 0.118/0.079 | |
| | ae (in) side milling/slotting | 0.236/1Dc | | 0.315/1Dc | | 0.394/1Dc | | 0.669/1Dc | | 0.787/1Dc | | 0.984/1Dc | | 1.378/1Dc | |

# IAHU/AHU

## Cutting Conditions
## Inch

Advanced Engineering

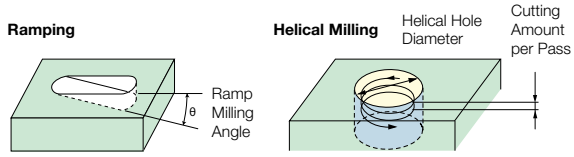
### Adjustment of cutting condition

- Feed rate and spindle revolution must be adjusted to correspond to tool projection and machining conditions.
- Please consider the standard cutting condition as 100% and adjust the machining conditions by reffering to the table below.

| | | Projection ratio | | |
|---|---|---|---|---|
| | | <3Dc | 3Dc-5Dc | 5Dc< |
| **Surfacing Shoulder Cutting** | rpm | 100% | 70% | 50% |
| | vf | 100% | 70% | 50% |
| **Slotting** | rpm | 100% | 70% | 50% |
| | vf | 70% | 50% | 35% |
| **Ramping** | rpm | 100% | 70% | 50% |
| | vf | 80% | 55% | 40% |

### Ramping and Helical Milling Data

Although ramp angle is limited due to cutting edge design, direct milling is possible without pre-hole with ramping and helical milling methods like next pictures.




| Tool Diameter | 1" or 25mm | 1.25" or 32mm | 1.5" or 40mm | 2" or 50mm |
|---|---|---|---|---|
| θ ramp angle | 5° | 4° | 3° | 2° |
| Hole Dia. (in) | 1.33-1.85 | 1.85-2.36 | 2.19-2.99 | 3.26-3.81 |
| Hole Dia. (mm) | 34-47 | 47-60 | 64-76 | 83-97 |

1. The ramp angle SI-TA should be set within 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.

| | ø<br>Flutes | 1" or 25mm<br>2 | 1.25" or 32mm<br>3 | 1.5" or 40mm<br>4 | 2" or 50mm<br>5 | 2.5" or 63mm<br>6 | 3" or 80mm<br>7 | 4" or 100mm<br>8 |
|---|---|---|---|---|---|---|---|---|
| Expanded Aluminum Alloy Material (Air-Blow or Wet: Water-Soluble Fluid)<br>SD5010 | n (min-1) | 12,000 | 9,950 | 9,500 | 7,640 | 6,060 | 5,970 | 4,770 |
| | vf (in/min) | 189 | 235 | 299 | 301 | 286 | 329 | 300 |
| | fz (in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | vc (sfm) | 3116 | 3,280 | 3,936 | 3,936 | 3,936 | 4,920 | 4,920 |
| | ap (in) | 0.2 | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 |
| Cast Aluminum Alloy Material (Air-Blow or Wet: Water-Soluble Fluid)<br>SD5010 | n (min-1) | 9,600 | 7,960 | 7,600 | 6,110 | 4,850 | 4,780 | 3,820 |
| | vf (in/min) | 151 | 188 | 239 | 241 | 229 | 263 | 240 |
| | fz (in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | vc (sfm) | 2492.8 | 2624 | 3148.8 | 3148.8 | 3148.8 | 3,936 | 3,936 |
| | ap (in) | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 |
| Pure Copper (Air-Blow or Wet: Water-Soluble Fluid).<br>SD5010 | n (min-1) | 3,820 | 2,980 | 2,390 | 1,910 | 1,520 | 1,190 | 955 |
| | vf (in/min) | 60 | 70 | 75 | 75 | 72 | 66 | 60 |
| | fz (in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | vc (sfm) | 984 | 984 | 984 | 984 | 984 | 984 | 984 |
| | ap (in) | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 | 0.197 |

**Shoulder cutting: $a_e$=0.5Dc**

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 machining and work-piece conditions.
3. When slotting, reduce the feed rate by 30% (set it to 0.7 times the value shown above).
4. When L/D=4 or higher, reduce the rotation speed and feed rate by 60% (set them to 0.4 times the values shown above).
5. Use on a machine equipped with splashguards. During use, be sure to wear protective equipment such as safety glasses, and always perform work in a safety environment.
6. When 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.
7. Be 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 roation speed shown above, set the highest acceptable rotation speed and calculate the feed rate using the fz value.

# IASF/ASF

Advanced Engineering

## New Generation Face Mill
## Dramatically Reduces Roughing Time

FACE MILL
STYLE

## FEATURES

2-5 times better roughing efficiency than conventional face mills

Very stable performace in interrupted cutting

Extraordinary metal removal and feed rates

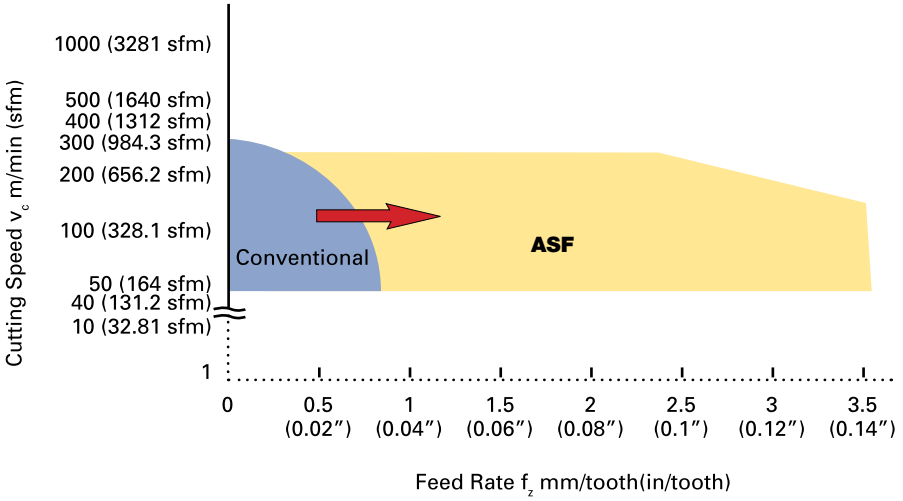
Economical four edged insert

# IASF/ASF

## INTRODUCTION

Hitachi Tool's ASF Face Mills achieve a level of performance that was previously unattainable. The special radius cutting edge allows for extraordinary metal removal rates and dramatically lower roughing times.

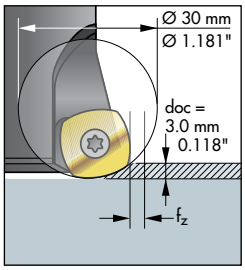
The chart on the right demonstrates the difference between conventional face mills and the new ASF. In most cases we are able to increase the feed (fz) up to five times without the need to increase the cutting speed (Vc) thus stabilizing or even increasing tool life.




## FEATURES

### 1. Unique Radius Cutting Edge

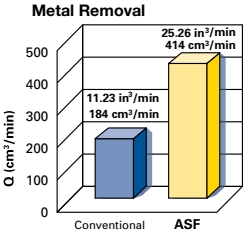
The shape of the special insert creates an advantage over round and traditional radius type inserts. The combination of the unique insert and large pockets that assist with chip evacuation allow the ASF Series Face Mills to achieve depths of cut of up to 3mm (0.118"). The inserts also feature four usable cutting edges, therefore increasing the cost efficiency of every insert.

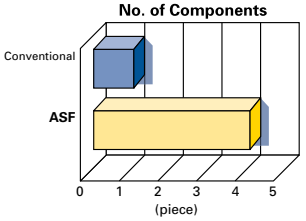



### 2. Field Data

Extraordinary feed rates of up to 3.5mm (0.138") per tooth in steel and 4.0mm (0.158") per tooth in cast iron are achievable. In addition, metal removal rates of 1000cm³ (61 in³) to 2000cm³ (122 in³) are possible. This example demonstrates the increased productivity of a 250mm (9.84") ASF Face Mill compared to a conventional radius cutter in stainless steel.

| Conventional | ASF5250R |
|---|---|
| Ø 250 mm (9.84") | Ø 250 mm (9.84") |
| 12 teeth | 12 teeth |
| **Cutting Conditions** | **Cutting Conditions** |
| N = 255 rpm | N = 115 rpm |
| Vc = 200 m/min (656 sfm) | Vc = 90 m/min (295 sfm) |
| Vf = 612 mm/min (24.09 ipm) | **Vf = 1,380 mm/min (54.33 ipm)** |
| fz = 0.2 mm/tooth (0.0079 in/tooth) | **fz = 1.0 mm/tooth (0.0394 in/tooth)** |
| doc = 2 mm (0.079") | doc = 2 mm (0.079") |
| woc = 150 mm (5.906") | woc = 150 mm (5.906") |
| Q = 184 cm3/min (11.23 in³/min) | **Q = 414 cm3/min (25.26 in³/min)** |

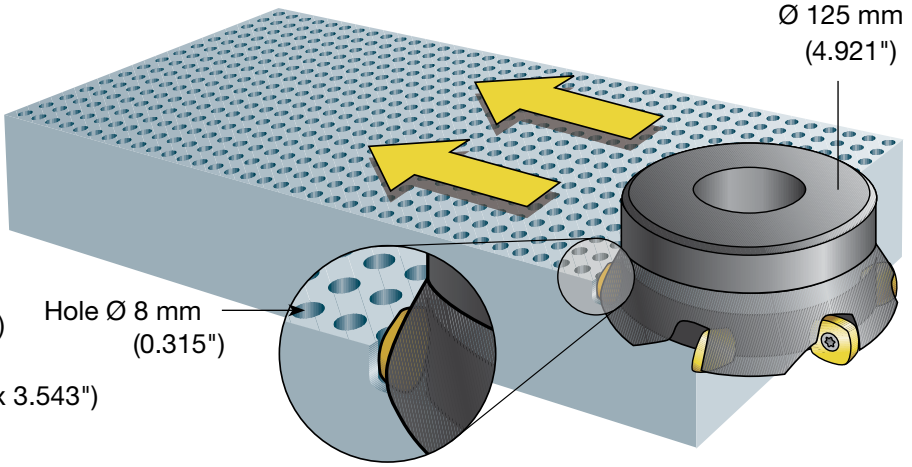



**Workpiece: AISI304 Stainless Steel**

## 3. Stable Performance Even in Interrupted Cuts

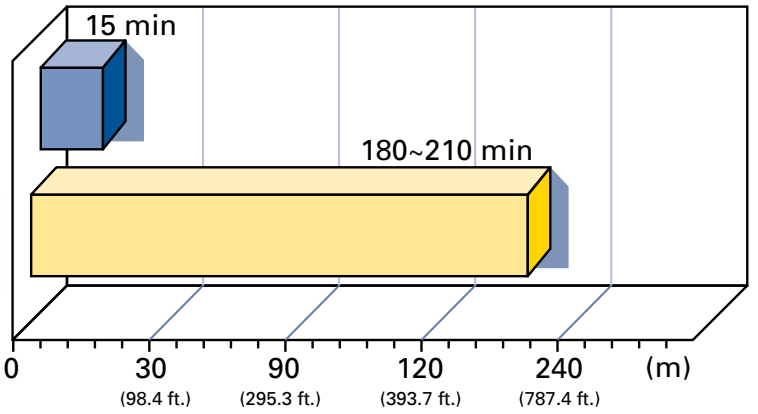
The highly rigid design of the ASF Face Mills and inserts provide exceptional performance even in interrupted cuts.
In the example below, stable machining of 30HRC prehardened mold steel populated with 8.0mm holes is achieved.




**Material: AISI P20**$V_c$
150 m/min (492.1 sfm)
N = 380 rpm
$f_z$ = 1.5 mm/tooth (0.0591 in/tooth)
$V_f$ = 540 mm/min (21.26 ipm)
doc x woc = 1.0 x 90 mm (0.0394" x 3.543")
dry cutting

Conventional radius mill  (P40)

**ASF** 



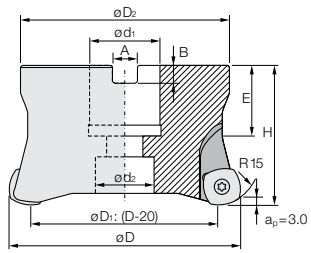

**Cutting Length L**

# IASF/ASF

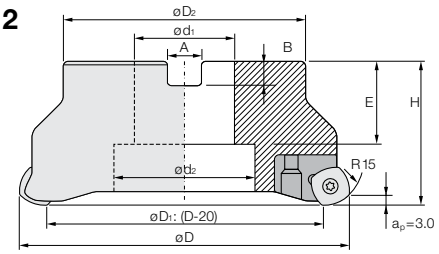
**Face Mill Style**




**1**




**2**




| D | 0/-0.2 |
|---|---|

## IASF - INCH

| Part No. | Flutes | ØD | ØD$_1$ | H | Ød$_1$ | Ød$_2$ | ØD2 | E | A | B | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IASF5040R** | 4 | **2.5** | 1.713 | 1.575 | 0.75 | 0.630 | 2.362 | 1.024 | 0.32 | 0.197 | 1 | **SDNW15, SDMT15, SDEW15** |
| **IASF5048R** | 4 | **3.0** | 2.213 | 1.969 | 1.00 | 0.827 | 2.756 | 1.378 | 0.38 | 0.236 | 1 | **SDNW15, SDMT15, SDEW15** |
| **IASF5064R** | 5 | **4.0** | 3.213 | 1.969 | 1.50 | 1.969 | 3.543 | 1.378 | 0.63 | 0.394 | 1 | **SDNW15, SDMT15, SDEW15** |
| **IASF5080R** | 6 | **5.0** | 4.213 | 2.756 | 1.50 | 1.969 | 3.937 | 1.378 | 0.63 | 0.394 | 2 | **SDNW15, SDMT15, SDEW15** |
| **IASF5096R** | 8 | **6.0** | 5.213 | 2.756 | 1.50 | 2.165 | 4.134 | 1.378 | 0.63 | 0.394 | 2 | **SDNW15, SDMT15, SDEW15** |
| **IASF5128R** | 10 | **8.0** | 7.213 | 2.756 | 2.50 | 4.134 | 5.118 | 1.378 | 1.01 | 0.551 | 2 | **SDNW15, SDMT15, SDEW15** |
| **IASF5160R** | 12 | **10.0** | 9.213 | 2.756 | 2.50 | 5.517 | 5.118 | 1.378 | 1.01 | 0.551 | 2 | **SDNW15, SDMT15, SDEW15** |

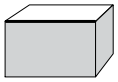
Inserts p. 75

| Part No. | Clamp Screw | Locator | Locator Screw | Wedge Screw | Wedge | Wrench |
|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| **IASF5040R** | 555-141 | | | | | 105-T20 |
| **IASF5048R** | 555-141 | | | | | 105-T20 |
| **IASF5064R** | 555-141 | | | | | 105-T20 |
| **IASF5080R** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20 |
| **IASF5096R** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20L |
| **IASF5128R** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20L |
| **IASF5160R** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20L |

# IASF/ASF

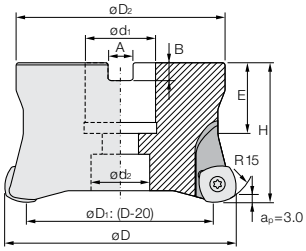
**Face Mill Style**

ROUGHING | FINISHING | 50 HRC 50

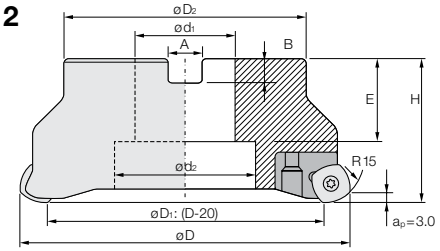


Advanced Engineering

1




2




| D | 0/-0.2 |
|---|---|

## ASF - METRIC

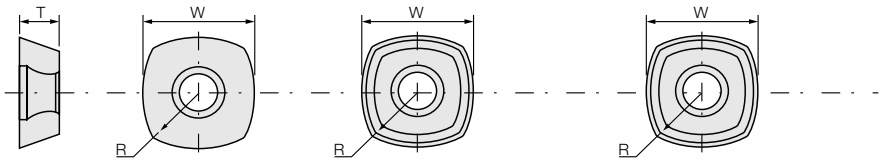
| Part No. | Flutes | ØD | $ØD_1$ | H | $Ød_1$ | $Ød_2$ | $ØD_2$ | E | A | B | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASF5063RM** | 4 | **63** | 43 | 50 | 22.000 | 17 | 60 | 20.0 | 10.4 | 6.3 | 1 | **SDNW15, SDMT15, SDEW15** |
| **ASF5080RM** | 4 | **80** | 60 | 63 | 27.000 | 20 | 70 | 22.0 | 12.4 | 7.0 | 1 | **SDNW15, SDMT15, SDEW15** |
| **ASF5100RM** | 5 | **100** | 80 | 63 | 32.000 | 26 | 90 | 25.5 | 14.4 | 8.0 | 1 | **SDNW15, SDMT15, SDEW15** |
| **ASF5125RM** | 6 | **125** | 105 | 63 | 40.000 | 32 | 100 | 30.0 | 16.4 | 9.0 | 2 | **SDNW15, SDMT15, SDEW15** |
| **ASF5160R** | 8 | **160** | 140 | 63 | 50.800 | 69 | 105 | 38.0 | 19.0 | 11.0 | 2 | **SDNW15, SDMT15, SDEW15** |
| **ASF5200R** | 10 | **200** | 180 | 63 | 47.625 | 105 | 150 | 38.0 | 25.4 | 14.0 | 2 | **SDNW15, SDMT15, SDEW15** |

Inserts p. 75

| Part No. | Clamp Screw | Locator | Locator Screw | Wedge Screw | Wedge | Wrench |
|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| **ASF5063RM** | 555-141 | | | | | 105-T20 |
| **ASF5080RM** | 555-141 | | | | | 105-T20 |
| **ASF5100RM** | 555-141 | | | | | 105-T20 |
| **ASF5125RM** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20 |
| **ASF5160R** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20L |
| **ASF5200R** | 555-141 | 351-111 | 156-161 | 100-143 | 176-121 | 105-T20L |

# IASF/ASF

## Inserts




| Part No. | JP4020 | JS4045 | CY250 | JS4060 | JM4060 | R | T | W | Type |
|---|---|---|---|---|---|---|---|---|---|
| **SDNW1505ZDTN-R15** | • | • | • | • | • | 15 | 5.56 | 15.875 | A |
| **SDMT1505ZDTN-C15** | | | • | | | 15 | 5.56 | 15.875 | C |
| **SDMT1505ZDTN-R15** | • | • | | • | • | 15 | 5.56 | 15.875 | B |

All inserts have four effective cutting edges

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **CY250**<br>P30-M30-K30 | **PCA Coating**<br>PVD | General purpose for steel | Uses TiAlN Coating; has wide cutting region range |
| **JS4060**<br>P40 | **JS Coating**<br>PVD | For wet general purpose cutting of steel | Uses coating with excellent heat resistance and lubrication characteristics; has a wide range cutting |
| **JM4060**<br>P40-M40 | **JM Coating**<br>PVD | For wet general cutting of steel, stainless steel | Newly developed PVD technology improves adhesion of membranes to reduce peeling of membranes due to welding |

# IASF/ASF

## Cutting Conditions
## Inch

Advanced Engineering

| Material | | Ø 2.5" or 63mm (4 Flutes) | | | 3" or 80mm (4 Flutes) | | | 4" or 100mm (5 Flutes) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Roughing (Machine Power) | | | Roughing (Machine Power) | | | Roughing (Machine Power) | | |
| | | Weak | Strong | Finishing | Weak | Strong | Finishing | Weak | Strong | Finishing |
| Mild Steel Carbon Steel (200HB) | N(rpm) | 900 | 900 | 1110 | 710 | 710 | 870 | 570 | 570 | 700 |
| | Vc(sfm) | 591 | 591 | 722 | 591 | 591 | 722 | 591 | 591 | 722 |
| | Vf(in/min) | 213 | 354 | 53 | 168 | 280 | 41 | 169 | 281 | 41 |
| | fz(in/t) | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 |
| JS4060 JS4045 CY250 | doc(in) | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 |
| | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 900 | 900 | 1010 | 710 | 710 | 790 | 570 | 570 | 630 |
| | Vc(sfm) | 591 | 591 | 656 | 591 | 591 | 656 | 591 | 591 | 656 |
| | Vf(in/min) | 213 | 354 | 48 | 168 | 280 | 37 | 169 | 281 | 37 |
| | fz(in/t) | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 |
| JS4060 JS4045 CY250 | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Carbon Steel Alloy Steel (30-40HRC) | N(rpm) | 800 | 800 | 900 | 630 | 630 | 710 | 500 | 500 | 570 |
| | Vc(sfm) | 525 | 525 | 591 | 525 | 525 | 591 | 525 | 525 | 591 |
| | Vf(in/min) | 189 | 252 | 43 | 149 | 198 | 34 | 148 | 197 | 34 |
| JP4020 JS4060 JS4045 CY250 | fz(in/t) | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 |
| | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Carbon Steel Alloy Steel (40-45HRC) | N(rpm) | 600 | 600 | 750 | 470 | 470 | 590 | 380 | 380 | 470 |
| | Vc(sfm) | 394 | 394 | 492 | 394 | 394 | 492 | 394 | 394 | 492 |
| | Vf(in/min) | 76 | 142 | 35 | 59 | 111 | 28 | 60 | 112 | 28 |
| | fz(in/t) | 0.031 | 0.059 | 0.012 | 0.031 | 0.059 | 0.012 | 0.031 | 0.059 | 0.012 |
| JP4020 JS4060 | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Carbon Steel Alloy Steel (45-50HRC) | N(rpm) | 450 | 450 | 600 | 350 | 350 | 470 | 280 | 280 | 380 |
| | Vc(sfm) | 295 | 295 | 394 | 295 | 295 | 394 | 295 | 295 | 394 |
| | Vf(in/min) | 21 | 35 | 19 | 17 | 28 | 15 | 17 | 28 | 15 |
| | fz(in/t) | 0.012 | 0.020 | 0.008 | 0.012 | 0.020 | 0.008 | 0.012 | 0.020 | 0.008 |
| | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| JP4020 | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Stainless Steel | N(rpm) | 450 | 450 | 600 | 350 | 350 | 470 | 280 | 280 | 380 |
| | Vc(sfm) | 295 | 295 | 394 | 295 | 295 | 394 | 295 | 295 | 394 |
| | Vf(in/min) | 71 | 106 | 28 | 55 | 83 | 22 | 55 | 83 | 22 |
| | fz(in/t) | 0.039 | 0.059 | 0.012 | 0.039 | 0.059 | 0.012 | 0.039 | 0.059 | 0.012 |
| | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| JM4060 | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Cast Iron | N(rpm) | 800 | 800 | 1110 | 630 | 630 | 870 | 500 | 500 | 700 |
| | Vc(sfm) | 525 | 525 | 722 | 525 | 525 | 722 | 525 | 525 | 722 |
| | Vf(in/min) | 252 | 378 | 53 | 198 | 298 | 41 | 197 | 295 | 41 |
| | fz(in/t) | 0.079 | 0.118 | 0.012 | 0.079 | 0.118 | 0.012 | 0.079 | 0.118 | 0.012 |
| JS4060 JP4020 | doc(in) | 0.079 | 0.079 | 0.012 | 0.079 | 0.079 | 0.012 | 0.079 | 0.079 | 0.012 |
| | woc(in) | 1.772 | 1.772 | 1.772 | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |

# IASF/ASF

## Cutting Conditions
## Inch

Advanced Engineering

| Material | | 6" or 160mm (8 Flutes) | | | 8" or 200mm (10 Flutes) | | | 10" or 250mm (12 Flutes) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Roughing (Machine Power) | | | Roughing (Machine Power) | | | Roughing (Machine Power) | | |
| | | Weak | Strong | Finishing | Weak | Strong | Finishing | Weak | Strong | Finishing |
| Mild Steel Carbon Steel (200HB) | N(rpm) | 350 | 350 | 430 | 280 | 280 | 350 | 220 | 220 | 280 |
| | Vc(sfm) | 591 | 591 | 722 | 591 | 591 | 722 | 591 | 591 | 722 |
| | Vf(in/min) | 165 | 276 | 41 | 165 | 276 | 41 | 156 | 260 | 40 |
| JS4060 | fz(in/t) | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 |
| JS4045 | doc(in) | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 |
| CY250 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 350 | 350 | 390 | 280 | 280 | 310 | 220 | 220 | 250 |
| | Vc(sfm) | 591 | 591 | 656 | 591 | 591 | 656 | 591 | 591 | 656 |
| | Vf(in/min) | 165 | 276 | 37 | 165 | 276 | 37 | 156 | 260 | 35 |
| JS4060 | fz(in/t) | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 | 0.059 | 0.098 | 0.012 |
| JS4045 | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| CY250 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |
| Carbon Steel Alloy Steel (30-40HRC) | N(rpm) | 310 | 310 | 350 | 250 | 250 | 280 | 200 | 200 | 220 |
| | Vc(sfm) | 525 | 525 | 591 | 525 | 525 | 591 | 525 | 525 | 591 |
| | Vf(in/min) | 146 | 195 | 33 | 148 | 197 | 33 | 142 | 189 | 31 |
| JP4020 | fz(in/t) | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 | 0.059 | 0.079 | 0.012 |
| JS4060 | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| JS4045 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |
| CY250 | | | | | | | | | | |
| Carbon Steel Alloy Steel (40-45HRC) | N(rpm) | 230 | 230 | 290 | 190 | 190 | 230 | 150 | 150 | 190 |
| | Vc(sfm) | 394 | 394 | 492 | 394 | 394 | 492 | 394 | 394 | 492 |
| | Vf(in/min) | 58 | 109 | 28 | 60 | 112 | 27 | 57 | 106 | 27 |
| | fz(in/t) | 0.031 | 0.059 | 0.012 | 0.031 | 0.059 | 0.012 | 0.031 | 0.059 | 0.012 |
| JP4020 | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| JS4060 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |
| Carbon Steel Alloy Steel (45-50HRC) | N(rpm) | 170 | 170 | 230 | 140 | 140 | 190 | 110 | 110 | 150 |
| | Vc(sfm) | 295 | 295 | 394 | 295 | 295 | 394 | 295 | 295 | 394 |
| | Vf(in/min) | 16 | 27 | 15 | 17 | 28 | 15 | 16 | 26 | 14 |
| | fz(in/t) | 0.012 | 0.020 | 0.008 | 0.012 | 0.020 | 0.008 | 0.012 | 0.020 | 0.008 |
| | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| JP4020 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |
| Stainless Steel | N(rpm) | 170 | 170 | 230 | 140 | 140 | 190 | 110 | 110 | 150 |
| | Vc(sfm) | 295 | 295 | 394 | 295 | 295 | 394 | 295 | 295 | 394 |
| | Vf(in/min) | 54 | 80 | 22 | 55 | 83 | 22 | 52 | 78 | 21 |
| | fz(in/t) | 0.039 | 0.059 | 0.012 | 0.039 | 0.059 | 0.012 | 0.039 | 0.059 | 0.012 |
| | doc(in) | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 | 0.059 | 0.059 | 0.012 |
| JM4060 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |
| Cast Iron | N(rpm) | 310 | 310 | 430 | 250 | 250 | 350 | 200 | 200 | 280 |
| | Vc(sfm) | 525 | 525 | 722 | 525 | 525 | 722 | 525 | 525 | 722 |
| | Vf(in/min) | 195 | 293 | 41 | 197 | 295 | 41 | 189 | 283 | 40 |
| | fz(in/t) | 0.079 | 0.118 | 0.012 | 0.079 | 0.118 | 0.012 | 0.079 | 0.118 | 0.012 |
| JS4060 | doc(in) | 0.079 | 0.079 | 0.012 | 0.079 | 0.079 | 0.012 | 0.079 | 0.079 | 0.012 |
| JP4020 | woc(in) | 4.409 | 4.409 | 4.409 | 5.512 | 5.512 | 5.512 | 6.890 | 6.890 | 6.890 |

# IASF/ASF

## Cutting Conditions Metric

Advanced Engineering

| Material | | Ø 2.5" or 63mm (4 Flutes) | | | 3" or 80mm (4 Flutes) | | | 4" or 100mm (5 Flutes) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Roughing (Machine Power) | | | Roughing (Machine Power) | | | Roughing (Machine Power) | | |
| | | Weak | Strong | Finishing | Weak | Strong | Finishing | Weak | Strong | Finishing |
| Mild Steel Carbon Steel (200HB) | N(rpm) | 900 | 900 | 1110 | 710 | 710 | 870 | 570 | 570 | 700 |
| | Vc(m/min) | 180 | 180 | 220 | 180 | 180 | 220 | 180 | 180 | 220 |
| | Vf(mm/min) | 5400 | 9000 | 1340 | 4260 | 7100 | 1050 | 4280 | 7130 | 1050 |
| | fz(mm/t) | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 |
| JS4060 JS4045 CY250 | doc(mm) | 1.5 | 2 | 0.3 | 1.5 | 2 | 0.3 | 1.5 | 2 | 0.3 |
| | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 900 | 900 | 1010 | 710 | 710 | 790 | 570 | 570 | 630 |
| | Vc(m/min) | 180 | 180 | 200 | 180 | 180 | 200 | 180 | 180 | 200 |
| | Vf(mm/min) | 5400 | 9000 | 1220 | 4260 | 7100 | 950 | 4280 | 7130 | 950 |
| | fz(mm/t) | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 |
| JS4060 JS4045 CY250 | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |
| Carbon Steel Alloy Steel (30-40HRC) | N(rpm) | 800 | 800 | 900 | 630 | 630 | 710 | 500 | 500 | 570 |
| | Vc(m/min) | 160 | 160 | 180 | 160 | 160 | 180 | 160 | 160 | 180 |
| | Vf(mm/min) | 4800 | 6400 | 1080 | 3780 | 5040 | 860 | 3750 | 5000 | 860 |
| JP4020 JS4060 JS4045 CY250 | fz(mm/t) | 1.50 | 2.00 | 0.30 | 1.50 | 2.00 | 0.30 | 1.50 | 2.00 | 0.30 |
| | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |
| Carbon Steel Alloy Steel (40-45HRC) | N(rpm) | 600 | 600 | 750 | 470 | 470 | 590 | 380 | 380 | 470 |
| | Vc(m/min) | 120 | 120 | 150 | 120 | 120 | 150 | 120 | 120 | 150 |
| | Vf(mm/min) | 1920 | 3600 | 900 | 1510 | 2820 | 710 | 1520 | 2850 | 710 |
| | fz(mm/t) | 0.80 | 1.50 | 0.30 | 0.80 | 1.50 | 0.30 | 0.80 | 1.50 | 0.30 |
| JP4020 JS4060 | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |
| Carbon Steel Alloy Steel (45-50HRC) | N(rpm) | 450 | 450 | 600 | 350 | 350 | 470 | 280 | 280 | 380 |
| | Vc(m/min) | 90 | 90 | 120 | 90 | 90 | 120 | 90 | 90 | 120 |
| | Vf(mm/min) | 540 | 900 | 480 | 420 | 700 | 380 | 420 | 700 | 380 |
| | fz(mm/t) | 0.30 | 0.50 | 0.20 | 0.30 | 0.50 | 0.20 | 0.30 | 0.50 | 0.20 |
| | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| JP4020 | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |
| Stainless Steel | N(rpm) | 450 | 450 | 600 | 350 | 350 | 470 | 280 | 280 | 380 |
| | Vc(m/min) | 90 | 90 | 120 | 90 | 90 | 120 | 90 | 90 | 120 |
| | Vf(mm/min) | 1800 | 2700 | 720 | 1400 | 2100 | 570 | 1400 | 2100 | 570 |
| | fz(mm/t) | 1.00 | 1.50 | 0.30 | 1.00 | 1.50 | 0.30 | 1.00 | 1.50 | 0.30 |
| | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| JM4060 | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |
| Cast Iron | N(rpm) | 800 | 800 | 1110 | 630 | 630 | 870 | 500 | 500 | 700 |
| | Vc(m/min) | 160 | 160 | 220 | 160 | 160 | 220 | 160 | 160 | 220 |
| | Vf(mm/min) | 6400 | 9600 | 1340 | 5040 | 7560 | 1050 | 5000 | 7500 | 1050 |
| | fz(mm/t) | 2.00 | 3.00 | 0.30 | 2.00 | 3.00 | 0.30 | 2.00 | 3.00 | 0.30 |
| JS4060 JP4020 | doc(mm) | 2 | 2 | 0.3 | 2 | 2 | 0.3 | 2 | 2 | 0.3 |
| | woc(mm) | 45 | 45 | 45 | 56 | 56 | 56 | 70 | 70 | 70 |

# IASF/ASF

## Cutting Conditions Metric

Advanced Engineering

| Material | | 6" or 160mm (8 Flutes) | | | 8" or 200mm (10 Flutes) | | | 10" or 250mm (12 Flutes) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Roughing (Machine Power) | | | Roughing (Machine Power) | | | Roughing (Machine Power) | | |
| | | Weak | Strong | Finishing | Weak | Strong | Finishing | Weak | Strong | Finishing |
| Mild Steel Carbon Steel (200HB) | N(rpm) | 350 | 350 | 430 | 280 | 280 | 350 | 220 | 220 | 280 |
| | Vc(m/min) | 180 | 180 | 220 | 180 | 180 | 220 | 180 | 180 | 220 |
| | Vf(mm/min) | 4200 | 7000 | 1040 | 4200 | 7000 | 1050 | 3960 | 6600 | 1010 |
| JS4060 | fz(mm/t) | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 |
| JS4045 | doc(mm) | 1.5 | 2 | 0.3 | 1.5 | 2 | 0.3 | 1.5 | 2 | 0.3 |
| CY250 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 350 | 350 | 390 | 280 | 280 | 310 | 220 | 220 | 250 |
| | Vc(m/min) | 180 | 180 | 200 | 180 | 180 | 200 | 180 | 180 | 200 |
| | Vf(mm/min) | 4200 | 7000 | 940 | 4200 | 7000 | 930 | 3960 | 6600 | 900 |
| JS4060 | fz(mm/t) | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 | 1.50 | 2.50 | 0.30 |
| JS4045 | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| CY250 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |
| Carbon Steel Alloy Steel (30-40HRC) | N(rpm) | 310 | 310 | 350 | 250 | 250 | 280 | 200 | 200 | 220 |
| | Vc(m/min) | 160 | 160 | 180 | 160 | 160 | 180 | 160 | 160 | 180 |
| | Vf(mm/min) | 3720 | 4960 | 840 | 3750 | 5000 | 840 | 3600 | 4800 | 800 |
| JP4020 | fz(mm/t) | 1.50 | 2.00 | 0.30 | 1.50 | 2.00 | 0.30 | 1.50 | 2.00 | 0.30 |
| JS4060 | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| JS4045 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |
| CY250 | | | | | | | | | | |
| Carbon Steel Alloy Steel (40-45HRC) | N(rpm) | 230 | 230 | 290 | 190 | 190 | 230 | 150 | 150 | 190 |
| | Vc(m/min) | 120 | 120 | 150 | 120 | 120 | 150 | 120 | 120 | 150 |
| | Vf(mm/min) | 1480 | 2760 | 700 | 1520 | 2850 | 690 | 1440 | 2700 | 690 |
| | fz(mm/t) | 0.80 | 1.50 | 0.30 | 0.80 | 1.50 | 0.30 | 0.80 | 1.50 | 0.30 |
| JP4020 | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| JS4060 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |
| Carbon Steel Alloy Steel (45-50HRC) | N(rpm) | 170 | 170 | 230 | 140 | 140 | 190 | 110 | 110 | 150 |
| | Vc(m/min) | 90 | 90 | 120 | 90 | 90 | 120 | 90 | 90 | 120 |
| | Vf(mm/min) | 410 | 680 | 370 | 420 | 700 | 380 | 400 | 660 | 360 |
| | fz(mm/t) | 0.30 | 0.50 | 0.20 | 0.30 | 0.50 | 0.20 | 0.30 | 0.50 | 0.20 |
| | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| JP4020 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |
| Stainless Steel | N(rpm) | 170 | 170 | 230 | 140 | 140 | 190 | 110 | 110 | 150 |
| | Vc(m/min) | 90 | 90 | 120 | 90 | 90 | 120 | 90 | 90 | 120 |
| | Vf(mm/min) | 1360 | 2040 | 560 | 1400 | 2100 | 570 | 1320 | 1980 | 540 |
| | fz(mm/t) | 1.00 | 1.50 | 0.30 | 1.00 | 1.50 | 0.30 | 1.00 | 1.50 | 0.30 |
| | doc(mm) | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 | 1.5 | 1.5 | 0.3 |
| JM4060 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |
| Cast Iron | N(rpm) | 310 | 310 | 430 | 250 | 250 | 350 | 200 | 200 | 280 |
| | Vc(m/min) | 160 | 160 | 220 | 160 | 160 | 220 | 160 | 160 | 220 |
| | Vf(mm/min) | 4960 | 7440 | 1040 | 5000 | 7500 | 1050 | 4800 | 7200 | 1010 |
| | fz(mm/t) | 2.00 | 3.00 | 0.30 | 2.00 | 3.00 | 0.30 | 2.00 | 3.00 | 0.30 |
| JS4060 | doc(mm) | 2 | 2 | 0.3 | 2 | 2 | 0.3 | 2 | 2 | 0.3 |
| JP4020 | woc(mm) | 112 | 112 | 112 | 140 | 140 | 140 | 175 | 175 | 175 |

# IASRF

## Radius Mill with Highly-Efficient Four-Corner Inserts

**FACE MILL STYLE**

## FEATURES

Economical four-corner inserts

Mill and inserts are designed for maximum cutting rigidity

New GX2030 insert coating provides up to 1.5 times longer tool life than previous generation coating

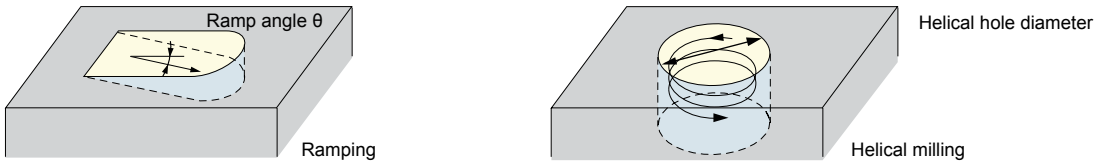
# FEATURES

## 1. Four Corner Design Maximes Productivity and Cost Efficiency

The new four corner design has an insert shape that is almost identical to the conventional IASR two corner design. This new shape has the rigidity and productivity of the previous insert and the four usable corners creates greater cost-efficiency.


## 2. Direct Milling

Since the cutting flutes do not extend to the center, there are limitations on the ramp angle and hole diameter. As shown below, processing by direct milling without a pilot hole is possible for both ramping and helical milling.



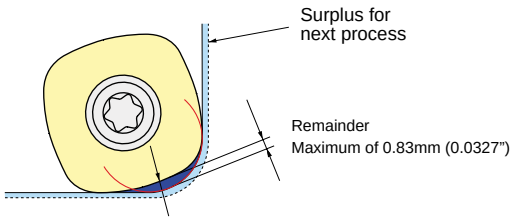

| Tool Diameter | 1.25 | 1.50 | 2.00 |
|---|---|---|---|
| Ramp angle | 7.0° | 4.5° | 3.0° |
| Helical Hole Diameter | 1.72 - 2.34 | 2.22 - 2.84 | 3.22 - 3.84 |

【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.

## 3. Programming Information

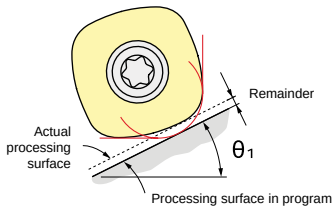
For rough milling, please create a program with corner radius values close to the reference values shown below.

**When the corner radius is set to R4.5mm (R0.177”):**



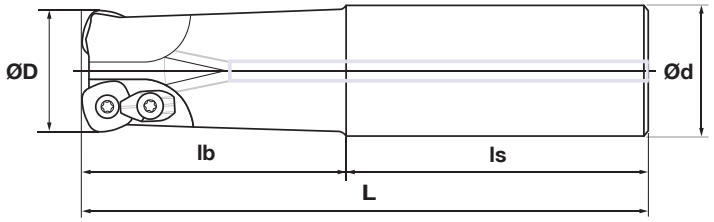

| | R4.5mm (0.0177”) |
|---|---|
| Remainder | Less than 0.83mm (R0.0327”) [$\theta_1$=22.1°] |
| Overcutting | None |

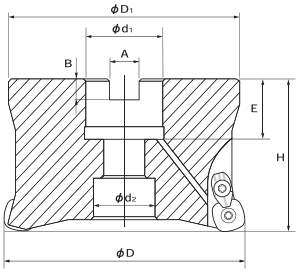
Normally, you should create a program with an input corner radius of approximately R4.5 (R0.177”). At an approximate corner radius of R4.5 (R0.177”), there is no overcutting.



# IASRF

**Shank + Bore Type**
**Inch**





| D | 0/-0.2 |
|---|---|

## Shank Style Inch

| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| IASRFS4020R | 2 | **1.25** | 6 | 1.25 | 2.75 | 3.25 | SDNW12/SDMT12 |
| IASRFS4024R | 3 | **1.50** | 6 | 1.50 | 1.75 | 4.25 | SDNW12/SDMT12 |

## Face Mill Style Inch

| Part No. | Flutes | ØD | $ØD_1$ | H | E | A | B | $Ød_1$ | $Ød_2$ | Insert |
|---|---|---|---|---|---|---|---|---|---|---|
| IASRF4032-4 | 4 | **2.00** | 1.85 | 1.969 | 0.748 | 0.315 | 0.197 | 0.75 | 0.630 | SDNW12/SDMT12 |
| IASRF4048-5 | 5 | **3.00** | 2.99 | 2.480 | 1.378 | 0.374 | 0.236 | 1.00 | 0.827 | SDNW12/SDMT12 |
| IASRF4064-6 | 6 | **4.00** | 3.78 | 2.756 | 1.378 | 0.626 | 0.394 | 1.50 | 1.236 | SDNW12/SDMT12 |

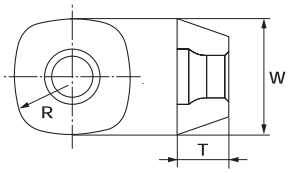
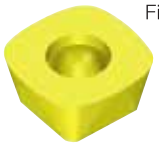



Fig-1



Standard Insert

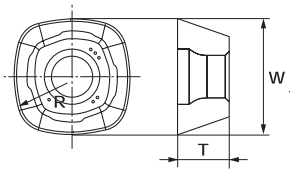



Fig-2

Insert with Chip Breaker

| Part No. | JP4020 | JS4045 | CY250 | JS4060 | JM4060 | R (mm) | T (mm) | W (mm) | Shape |
|---|---|---|---|---|---|---|---|---|---|
| SDNW1205ZDTN-R15 | • | • | | • | • | 15 | 5.56 | 12.7 | Fig-1 |
| SDMT1205ZDTN-R15 | • | • | • | • | • | 15 | 5.56 | 12.7 | Fig-2 |

All Inserts have four effective cutting edges

| | Clamp Screw | Clamp Piece Set | Wrench |
|---|---|---|---|
| |  |  |  |
| **ALL SIZES** | 262-142 | CM4-141 | 105-T15 |

# IASRF

## Cutting Conditions
## Inch + Metric

Advanced Engineering

| INCH | Ø | 1.25 | 1.5 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| Material | Number of flute | 2 | 3 | 4 | 5 | 6 |
| Mild Steel Carbon Steel <200HB | N(rpm) | 1800 | 1500 | 1120 | 750 | 560 |
| | Vc(sfm) | 591 | 591 | 591 | 591 | 591 |
| | Vf(in/min) | 213 | 266 | 265 | 221 | 198 |
| JS4060 | fz(in/t) | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 |
| JS4045 | ap(in) | 0.039 | 0.039 | 0.059 | 0.059 | 0.059 |
| CY250 | ae(in) | 0.866 | 1.024 | 1.378 | 2.087 | 2.756 |
| Carbon Steel Alloy Steel <30HRC | N(rpm) | 1500 | 1250 | 940 | 620 | 470 |
| | Vc(sfm) | 492 | 492 | 492 | 492 | 492 |
| | Vf(in/min) | 177 | 221 | 222 | 183 | 167 |
| JS4060 | fz(in/t) | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 |
| JS4045 | ap(in) | 0.039 | 0.039 | 0.059 | 0.059 | 0.059 |
| CY250 | ae(in) | 0.866 | 1.024 | 1.378 | 2.087 | 2.756 |
| Tool Steel Alloy Steel 30-45HRC | N(rpm) | 1200 | 1000 | 750 | 500 | 370 |
| | Vc(sfm) | 394 | 394 | 394 | 394 | 394 |
| | Vf(in/min) | 76 | 94 | 94 | 79 | 70 |
| JP4020 | fz(in/t) | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 |
| JS4045 | ap(in) | 0.039 | 0.039 | 0.059 | 0.059 | 0.059 |
| JS4060 | ae(in) | 0.866 | 1.024 | 1.378 | 2.087 | 2.756 |
| CY250 | | | | | | |
| Tool Steel Alloy Steel 45-50HRC | N(rpm) | 800 | 660 | 500 | 330 | 250 |
| | Vc(sfm) | 262 | 262 | 262 | 262 | 262 |
| | Vf(in/min) | 25 | 31 | 31 | 26 | 24 |
| | fz(in/t) | 0.016 | 0.016 | 0.016 | 0.016 | 0.016 |
| | ap(in) | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 |
| JP4020 | ae(in) | 0.866 | 1.024 | 1.378 | 2.087 | 2.756 |
| Stainless Steel | N(rpm) | 1200 | 1000 | 750 | 500 | 370 |
| | Vc(sfm) | 394 | 394 | 394 | 394 | 394 |
| | Vf(in/min) | 76 | 94 | 94 | 79 | 70 |
| | fz(in/t) | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 |
| | ap(in) | 0.039 | 0.039 | 0.059 | 0.059 | 0.059 |
| JM4060 | ae(in) | 0.866 | 1.024 | 1.378 | 2.087 | 2.756 |
| Cast Iron | N(rpm) | 1800 | 1500 | 1120 | 750 | 560 |
| | Vc(sfm) | 591 | 591 | 591 | 591 | 591 |
| | Vf(in/min) | 283 | 354 | 353 | 295 | 265 |
| | fz(in/t) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| JS4045 | ap(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| JP4020 | ae(in) | 0.866 | 1.024 | 1.378 | 2.087 | 2.756 |

| METRIC | Ø | 31.75 | 38.1 | 50.8 | 76.2 | 101.6 |
|---|---|---|---|---|---|---|
| Material | Number of flute | 2 | 3 | 4 | 5 | 6 |
| Mild Steel Carbon Steel <200HB | N(rpm) | 1800 | 1500 | 1120 | 750 | 560 |
| | Vc(m/min) | 180 | 180 | 180 | 180 | 180 |
| | Vf(mm/min) | 5400 | 6750 | 6720 | 5625 | 5040 |
| JS4060 | fz(mm/t) | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| JS4045 | ap(mm) | 1 | 1 | 1.5 | 1.5 | 1.5 |
| CY250 | ae(mm) | 22 | 26 | 35 | 53 | 70 |
| Carbon Steel Alloy Steel <30HRC | N(rpm) | 1500 | 1250 | 940 | 620 | 470 |
| | Vc(m/min) | 150 | 150 | 150 | 150 | 150 |
| | Vf(mm/min) | 4500 | 5625 | 5640 | 4650 | 4230 |
| JS4060 | fz(mm/t) | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| JS4045 | ap(mm) | 1 | 1 | 1.5 | 1.5 | 1.5 |
| CY250 | ae(mm) | 22 | 26 | 35 | 53 | 70 |
| Tool Steel Alloy Steel 30-45HRC | N(rpm) | 1200 | 1000 | 750 | 500 | 370 |
| | Vc(m/min) | 120 | 120 | 120 | 120 | 120 |
| | Vf(mm/min) | 1920 | 2400 | 2400 | 2000 | 1776 |
| JP4020 | fz(mm/t) | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| JS4045 | ap(mm) | 1 | 1 | 1.5 | 1.5 | 1.5 |
| JS4060 | ae(mm) | 22 | 26 | 35 | 53 | 70 |
| CY250 | | | | | | |
| Tool Steel Alloy Steel 45-50HRC | N(rpm) | 800 | 660 | 500 | 330 | 250 |
| | Vc(m/min) | 80 | 80 | 80 | 80 | 80 |
| | Vf(mm/min) | 640 | 792 | 800 | 660 | 600 |
| | fz(mm/t) | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 |
| | ap(mm) | 1 | 1 | 1 | 1 | 1 |
| JP4020 | ae(mm) | 22 | 26 | 35 | 53 | 70 |
| Stainless Steel | N(rpm) | 1200 | 1000 | 750 | 500 | 370 |
| | Vc(m/min) | 120 | 120 | 120 | 120 | 120 |
| | Vf(mm/min) | 1920 | 2400 | 2400 | 2000 | 1776 |
| | fz(mm/t) | 1 | 1.0 | 1.0 | 1.0 | 1.0 |
| | ap(mm) | 1 | 1.0 | 1.5 | 1.5 | 1.5 |
| JM4060 | ae(mm) | 22 | 26 | 35 | 53 | 70 |
| Cast Iron | N(rpm) | 1800 | 1500 | 1120 | 750 | 560 |
| | Vc(m/min) | 180 | 180 | 180 | 180 | 180 |
| | Vf(mm/min) | 7200 | 9000 | 8960 | 7500 | 6720 |
| | fz(mm/t) | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| JS4045 | ap(mm) | 2 | 2 | 2 | 2 | 2 |
| JP4020 | ae(mm) | 22 | 26 | 35 | 53 | 70 |

## COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **CY250**<br>P30-M30-K30 | **PCA Coating**<br>PVD | General purpose for steel | Uses TiAlN Coating; has wide cutting region range |
| **JS4060**<br>P40 | **JS Coating**<br>PVD | For wet general purpose cutting of steel | Uses coating with excellent heat resistance and lubrication characteristics; has a wide range cutting |
| **JM4060**<br>P40-M40 | **JM Coating**<br>PVD | For wet general cutting of steel, stainless steel | Newly developed PVD technology improves adhesion of membranes to reduce peeling of membranes due to welding |

# IASRT

Advanced Engineering

## New Generation Face Mill
## Dramatically Reduces Roughing Time

FACE MILL
STYLE

## FEATURES

Highly rigid body design for trouble-free machining

JX Coated inserts feature enhanced lubricating characteristics
as well as improved hardness, heat-resistance and chipping resistance

Ideal for machining a wide range of materials including mild steels, cast iron,
stainless steels and hardened steels up to 55HRC

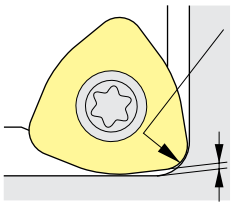
Two insert types: standard and with chip breaker

# FEATURES

## 1. Worry-Free High-Efficient Machining Achieved by Incresing Body Rigidity

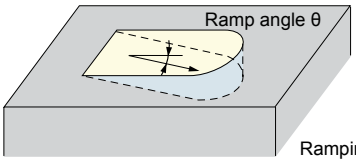

## 2. Programming Information

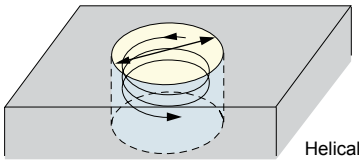
Please program the approximate radius as indicated.




| Insert Item | Approximate Radius | Remaining Stock | Maximum Depth of Cut |
|---|---|---|---|
| WDNW/T120420 | 0.118 inch | 0.0248 inch | 0.078 inch |
| WDNW/T140520 | 0.118 inch | 0.0252 inch | 0.078 inch |

## 3. Direct Milling



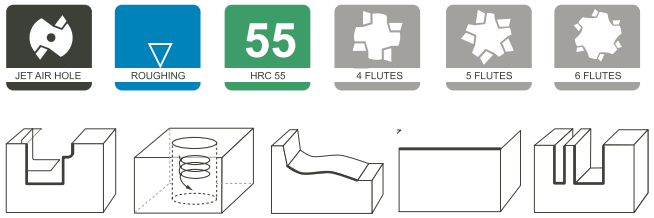



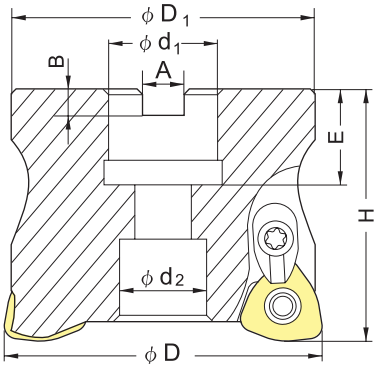

| Tool Diameter | 2.00 | 3.00 | 4.00 |
|---|---|---|---|
| Ramp angle | 2.0° | 1.5° | 1.0° |
| Helical Hole Diameter | 3.10 - 3.78 | 5.05 - 6.00 | 6.80 - 7.75 |

【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.

# IASRT/ASRT

## Bore Style

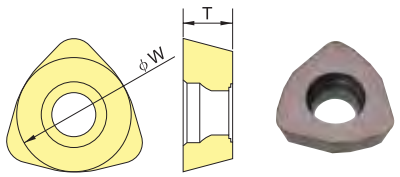


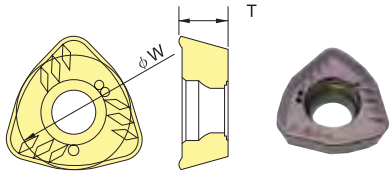

| D | 0/-0.2 |
|---|---|

### IASRT - INCH

| Part No. | Flutes | ØD | $ØD_1$ | H | E | A | B | $Ød_1$ | $Ød_2$ | Insert |
|---|---|---|---|---|---|---|---|---|---|---|
| IASRT4032-4 | 4 | **2.0** | **1.850** | 1.969 | 0.748 | 0.315 | 0.197 | 0.75 | 0.630 | WDNW120420, WDNT120420 |
| IASRT5048-5 | 5 | **3.0** | **2.992** | 2.480 | 1.378 | 0.374 | 0.236 | 1.00 | 0.827 | WDNW140520, WDNT140520 |
| IASRT5064-6 | 6 | **4.0** | **3.780** | 2.756 | 1.378 | 0.626 | 0.394 | 1.50 | 1.260 | WDNW140520, WDNT140520 |




TYPE A




TYPE B

| Part No. | JP4020 | JS4045 | JS4060 | JM4060 | Type | ØW | T | Body |
|---|---|---|---|---|---|---|---|---|
| WDNW120420 | • | • | • | • | A | 0.472 | 0.187 | IASRT4032-4 |
| WDNT120420 | • | • | • | • | B | 0.472 | 0.187 | |
| WDNW140520 | • | • | • | • | A | 0.551 | 0.219 | IASRT5048-5 |
| WDNT140520 | • | • | • | • | B | 0.551 | 0.219 | IASRT5064-6 |

All Inserts have four effective cutting edges

| Part No. | Clamp Screw | Clamp Piece Set | Wrench |
|---|---|---|---|
| |  |  |  |
| **IASRT4032** | 262-142 | CM4-141 | 105-T15 |
| **IASRT5048** | 555-141 | CM5-147 | 105-T20 |
| **IASRT5064** | 555-141 | CM5-147 | 105-T20 |

# IASRT/ASRT

## Cutting Conditions
## Inch

Advanced Engineering

| Ø | | 2" | | | 3" | | | 4" | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. of Flutes | | 4 | | | 5 | | | 6 | | |
| | | <3D | | 3D-5D | <3D | | 3D-5D | <3D | | 3D-5D |
| Material | Conditions | General | Hi-Speed | | General | Hi-Speed | | General | Hi-Speed | |
| Mild Steel Carbon Steel <200HRC | N(rpm) | 960 | 1280 | 960 | 627 | 835 | 627 | 480 | 640 | 480 |
| | Vf(in/min) | 227 | 302 | 227 | 185 | 247 | 185 | 170 | 227 | 170 |
| | fz(in/t) | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 |
| JS4060 | doc(in) | 0.059 | 0.050 | 0.040 | 0.059 | 0.050 | 0.040 | 0.059 | 0.050 | 0.040 |
| JS4045 | woc(in) | 1.575 | 1.575 | 1.575 | 2.440 | 2.440 | 2.440 | 3.150 | 3.150 | 3.150 |
| Tool Steel Alloy Steel 30-45HRC | N(rpm) | 640 | 960 | 640 | 418 | 627 | 418 | 320 | 480 | 320 |
| | Vf(in/min) | 90 | 192 | 82 | 73 | 157 | 67 | 67 | 144 | 61 |
| | fz(in/t) | 0.035 | 0.050 | w0.032 | 0.035 | 0.050 | 0.032 | 0.035 | 0.050 | 0.032 |
| JP4020 | doc(in) | 0.059 | 0.059 | 0.040 | 0.059 | 0.059 | 0.040 | 0.059 | 0.059 | 0.040 |
| JS4045 | woc(in) | 1.575 | 1.575 | 1.575 | 2.440 | 2.440 | 2.440 | 3.150 | 3.150 | 3.150 |
| JS4060 | | | | | | | | | | |
| Tool Steel Alloy Steel 45-55HRC | N(rpm) | 510 | 770 | 510 | 334 | 502 | 334 | 260 | 390 | 260 |
| | Vf(in/min) | 61 | 123 | 51 | 50 | 100 | 42 | 47 | 94 | 39 |
| | fz(in/t) | 0.030 | 0.040 | 0.025 | 0.030 | 0.040 | 0.025 | 0.030 | 0.040 | 0.025 |
| | doc(in) | 0.059 | 0.059 | 0.040 | 0.059 | 0.059 | 0.040 | 0.059 | 0.059 | 0.040 |
| JP4020 | woc(in) | 1.575 | 1.575 | 1.575 | 2.440 | 2.440 | 2.440 | 3.150 | 3.150 | 3.150 |
| Stainless Steel | N(rpm) | 640 | 1280 | 640 | 418 | 752 | 418 | 320 | 573 | 320 |
| | Vf(in/min) | 80 | 161 | 80 | 63 | 94 | 58 | 58 | 138 | 54 |
| | fz(in/t) | 0.030 | 0.040 | 0.028 | 0.030 | 0.040 | 0.028 | 0.030 | 0.040 | 0.028 |
| | doc(in) | 0.059 | 0.059 | 0.040 | 0.059 | 0.059 | 0.040 | 0.059 | 0.059 | 0.040 |
| JM4060 | woc(in) | 1.575 | 1.575 | 1.575 | 2.440 | 2.440 | 2.440 | 3.150 | 3.150 | 3.150 |
| Cast Iron | N(rpm) | 960 | 1280 | 960 | 627 | 836 | 627 | 480 | 640 | 480 |
| | Vf(in/min) | 227 | 404 | 192 | 185 | 330 | 157 | 170 | 303 | 144 |
| | fz(in/t) | 0.059 | 0.079 | 0.050 | 0.059 | 0.079 | 0.050 | 0.059 | 0.079 | 0.050 |
| JS4045 | doc(in) | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 |
| JP4020 | woc(in) | 1.575 | 1.575 | 1.575 | 2.440 | 2.440 | 2.440 | 3.150 | 3.150 | 3.150 |

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **JS4060**<br>P40 | **JS Coating**<br>PVD | For wet general purpose cutting of steel | Uses coating with excellent heat resistance and lubrication characteristics; has a wide range cutting |
| **JM4060**<br>P40-M40 | **JM Coating**<br>PVD | For wet general cutting of steel, stainless steel | Newly developed PVD technology improves adhesion of membranes to reduce peeling of membranes due to welding |

# IASR/ASR MULTI

## Innovative Indexable Multi-Flute Mills for High-Efficiency Machining

MODULAR STYLE

SHANK STYLE

## FEATURES

Extraordinary metal removal and feed rates

JX coated inserts feature the world's first hybrid-coating technology and provide unparalleled lubricity

Mill and inserts are designed for maximum cutting rigidity

One size insert fits all diameters 3/8" to 2.5" (16mm to 66mm)

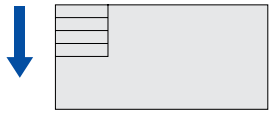
## FEATURES

### 1. Small Inserts Increase Breakage Resistance and Feed Rates

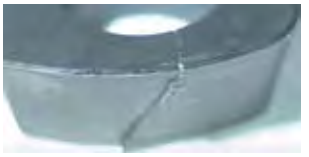
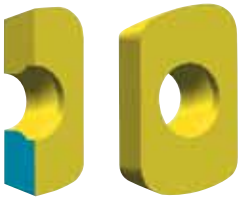
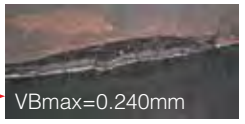
Even though the inserts for the IASR/ASR-Mutli are smaller than conventional tools, breakage resistance has been greatly improved. This allows for feed rates as high as 1.5mm per tooth (0.059" per tooth).

**Cutting Conditions**

Material: S50C (AISI 1049)
Cutting Tool: Ø50mm (1.969") Single Insert
Vc = 200m/min (656sfm) at 1,300RPM
fz = 1.0mm/tooth (0.039"/tooth)
Vf = 1300mm/min (51ipm)
Dry OH = 210mm (8.268")



Shoulder plunge milling

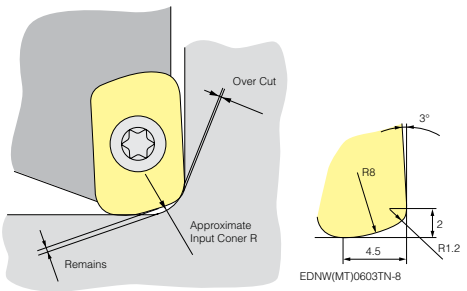
| Shape | Cutting Length |
|---|---|
| Conventional  | 15m(11.5min) Heat cracks occur, and the insert breaks.  Limit:fz≦0.6mm/tooth |
| New Products  | 75m(60min) Normal Wear  Limit:fz≦1.5mm/tooth (doc=0.3mm fz≦3.6mm/tooth)   |

### 2. Programming Information

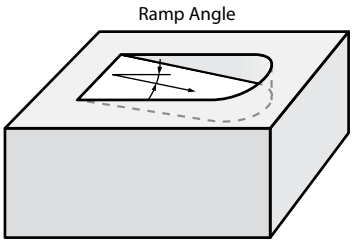
When programming insert shape, please refer to the approximate R in the diagram below.

**Programming Information**

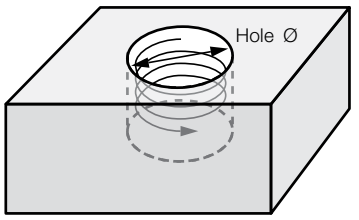
| | Approximate Input Corner R | | Over Cut | | Remains | |
|---|---|---|---|---|---|---|
| | mm | inch | mm | inch | mm | inch |
| EPNW(MT) 0603TN-8 | 2.0 | 0.0787 | 0.000 | 0.0000 | 0.497 | 0.0196 |



## 3. Direct Milling




Slant Milling

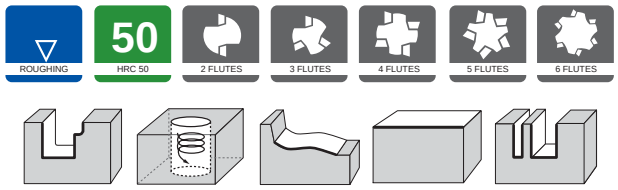



Helical Milling

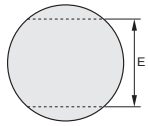
| Tool Diameter | 16mm or 0.625” | 20mm or 0.750” | 25mm or 1.00” | 30mm | 32mm or 1.25” | 4.00mm or 1.50” |
|---|---|---|---|---|---|---|
| Ramp Angle | 4.0° | 3.0° | 2.0° | 2.0° | 2.0° | 1.5° |
| Helical Hole Diameter | 22 - 30mm | 30 - 38mm | 40 - 48mm | 50 - 58mm | 54 - 62mm | 70 - 78mm |
| Helical Hole Diameter | 0.87 - 1.18” | 1.18 - 1.42” | 1.57 - 1.89” | 2.00 - 2.28” | 2.12 - 2.43” | 2.60 - 2.91” |

# IASR/ASR MULTI

## Modular Style








| D | 0/-0.2 |
|---|---|

### ASRM - METRIC

| Part No. | Flutes | ØD | H | Ød1 | M | Ød2 | A | B | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASRM2016R-2** | 2 | **16** | 25 | 8.5 | M8 | 12.8 | 5.5 | 17 | 8 | 10 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRM2020R-3** | 3 | **20** | 30 | 10.5 | M10 | 17.8 | 5.5 | 19 | 10 | 15 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRM2025R-4** | 4 | **25** | 35 | 12.5 | M12 | 20.8 | 5.5 | 22 | 10 | 17 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRM2030R-4** | 4 | **30** | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRM2032R-5** | 5 | **32** | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRM2040R-6** | 6 | **40** | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | **EPNW0603TN-8, EPMT0603TN-8** |

Modular Shanks on p. 163

Inserts p. 95

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ALL SIZES** | 250-141 | 104-T8 |

# IASR/ASR MULTI

**Shank Style**
**Regular Length**

Advanced Engineering

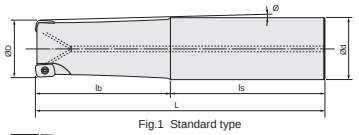


Fig.1 Standard type

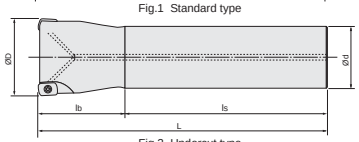


Fig.2 Undercut type



| D | 0/-0.2 |
|---|---|

## IASRS-Inch

| Part No. | Flutes | ØD | L | Ød | lb | ls | Shape | Insert |
|---|---|---|---|---|---|---|---|---|
| **IASRS2010R-2** | 2 | **0.625** | 4.0 | 0.625 | 1.25 | 2.75 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRS2012R-3** | 3 | **0.750** | 5.0 | 0.750 | 2.00 | 3.00 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRS2016R-4** | 4 | **1.000** | 5.5 | 1.000 | 2.50 | 3.00 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRS2020R-5** | 5 | **1.250** | 6.0 | 1.250 | 2.75 | 3.25 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRS2024R-6** | 6 | **1.500** | 6.0 | 1.500 | 1.75 | 4.25 | Fig. 2 | **EPNW0603TN-8, EPMT0603TN-8** |

## ASRS-Metric

| Part No. | Flutes | ØD | L | Ød | lb | ls | Shape | Insert |
|---|---|---|---|---|---|---|---|---|
| **ASRS2016R-2** | 2 | **16** | 100 | 16 | 30 | 70 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRS2020R-3** | 3 | **20** | 130 | 20 | 50 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRS2025R-4** | 4 | **25** | 140 | 25 | 60 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRS2030R-4** | 4 | **30** | 150 | 32 | 70 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRS2032R-5** | 5 | **32** | 150 | 32 | 70 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRS2040R-6** | 6 | **40** | 150 | 32 | 45 | 105 | Fig. 2 | **EPNW0603TN-8, EPMT0603TN-8** |

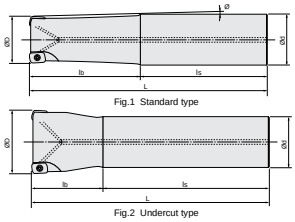
Inserts p. 95

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ALL SIZES** | 250-141 | 104-T8 |

# IASR/ASR MULTI

**Shank Style**
**Long Length**

Advanced Engineering






| D | 0/-0.2 |
|---|---|

## IASRL-Inch

| Part No. | Flutes | ØD | L | Ød | lb | ls | Shape | Insert |
|---|---|---|---|---|---|---|---|---|
| **IASRL2010R-2** | 2 | **0.625** | 6.00 | 0.625 | 2.00 | 4.00 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRL2012R-3** | 3 | **0.750** | 6.25 | 0.750 | 3.25 | 3.00 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRL2016R-4** | 4 | **1.000** | 7.00 | 1.000 | 4.00 | 3.00 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRL2020R-5** | 5 | **1.250** | 8.00 | 1.250 | 5.00 | 3.00 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASRL2024R-6** | 6 | **1.500** | 9.00 | 1.500 | 1.75 | 7.25 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |

## ASRL-Metric

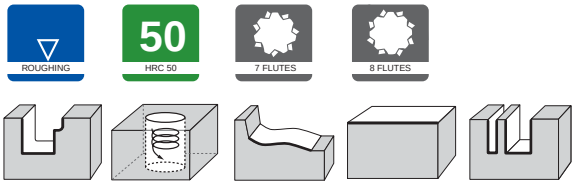
| Part No. | Flutes | ØD | L | Ød | lb | ls | Shape | Insert |
|---|---|---|---|---|---|---|---|---|
| **ASRL2016R-2** | 2 | **16** | 150 | 16 | 50 | 100 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRL2020R-3** | 3 | **20** | 160 | 20 | 80 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRL2025R-4** | 4 | **25** | 180 | 25 | 100 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRL2030R-4** | 4 | **30** | 200 | 32 | 120 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRL2032R-5** | 5 | **32** | 200 | 32 | 120 | 80 | Fig. 1 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASRL2040R-6** | 6 | **40** | 220 | 32 | 45 | 175 | Fig. 2 | **EPNW0603TN-8, EPMT0603TN-8** |

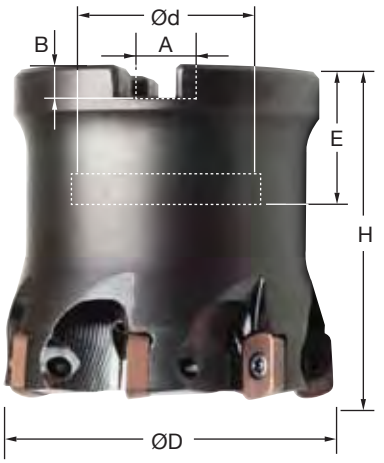
Inserts p. 95

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ALL SIZES** | 250-141 | 104-T8 |

# IASR/ASR MULTI

## Face Mill Style




Advanced Engineering

| D | 0/-0.2 |
|---|---|

### IASR Face Mill Style-Inch

| Part No. | Flutes | ØD | H | E | A | B | Ød | Insert |
|---|---|---|---|---|---|---|---|---|
| **IASR2032R-7** | 7 | **2.0** | 2 | 0.75 | 0.315 | 0.197 | 0.75 | **EPNW0603TN-8, EPMT0603TN-8** |
| **IASR2040R-8** | 8 | **2.5** | 2 | 0.75 | 0.315 | 0.197 | 0.75 | **EPNW0603TN-8, EPMT0603TN-8** |

### ASR Face Mill Style-Metric

| Part No. | Flutes | ØD | H | E | A | B | Ød | Insert |
|---|---|---|---|---|---|---|---|---|
| **ASR2052RS-7** | 7 | **52** | 50 | 19 | 8.4 | 5 | 19.05 | **EPNW0603TN-8, EPMT0603TN-8** |
| **ASR2066RS-8** | 8 | **66** | 50 | 19 | 8.4 | 5 | 19.05 | **EPNW0603TN-8, EPMT0603TN-8** |

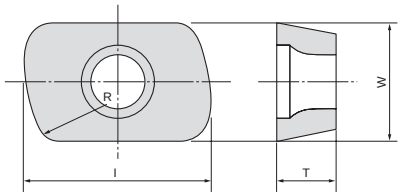
Inserts p. 95

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ALL SIZES** | 250-141 | 104-T8 |

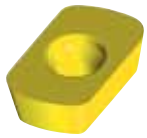
# IASR/ASR MULTI

## Inserts

Advanced Engineering




Type A



Standard Insert

Type B

Insert with Chip Breaker

Type C

Spiral Shape
(low cutting force)

| Part No. | JP4020 | JS4045 | JS4060 | JM4060 | R (mm) | l (mm) | T (mm) | W (mm) | Type |
|---|---|---|---|---|---|---|---|---|---|
| **EPNW0603TN-8** | • | • | • | • | 8.0 | 10.0 | 3.18 | 6.35 | A |
| **EPMT0603TN-8** | • | • | • | • | 8.0 | 10.0 | 3.18 | 6.35 | B |
| **EPMT0603EN-8LF** | | | | • | 8.0 | 10.0 | 3.18 | 6.35 | C |

All Inserts have two effective cutting edges

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel. |
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **JS4060**<br>P40 | **JS Coating**<br>PVD | For wet general purpose cutting of steel | Uses coating with excellent heat resistance and lubrication characteristics; has a wide range cutting |
| **JM4060**<br>P40-M40 | **JM Coating**<br>PVD | For wet general cutting of steel, stainless steel | Newly developed PVD technology improves adhesion of membranes to reduce peeling of membranes due to welding |

| | Ø | 16mm or 5/8" | | | | | 20mm or 3/4" | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Flutes | 2 | | | | | 3 | | | | |
| | | <3D | | | | | <3D | | | | |
| | | General | Hi-Speed | 3D-5D | 5D-7D | >7D | General | Hi-Speed | 3D-5D | 5D-7D | >7D |
| Carbonsteel Alloy Steel <30HRC | N(rpm) | 2980 | 3580 | 2580 | 2580 | 1790 | 2380 | 2860 | 2070 | 2070 | 1430 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 187 | 394 | 162 | 122 | 56 | 225 | 473 | 195 | 146 | 67 |
| | fz(in/t) | 0.031 | 0.055 | 0.031 | 0.024 | 0.016 | 0.031 | 0.055 | 0.031 | 0.024 | 0.016 |
| | doc(in) | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 |
| JS4060 | woc(in) | 0.512 | 0.512 | 0.512 | 0.512 | 0.512 | 0.630 | 0.630 | 0.630 | 0.630 | 0.630 |
| JS4045 | Q(in³/min) | 2.97 | 4.84 | 1.99 | 1.25 | 0.34 | 4.39 | 7.15 | 2.95 | 1.84 | 0.51 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 2580 | 3580 | 2580 | 2580 | 1790 | 2070 | 2860 | 2070 | 2070 | 1430 |
| | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 162 | 394 | 162 | 122 | 56 | 195 | 473 | 195 | 146 | 67 |
| | fz(in/t) | 0.031 | 0.055 | 0.031 | 0.024 | 0.016 | 0.031 | 0.055 | 0.031 | 0.024 | 0.016 |
| JP4020 | doc(in) | 0.031 | 0.020 | 0.024 | 0.020 | 0.012 | 0.039 | 0.020 | 0.031 | 0.020 | 0.012 |
| JS4045 | woc(in) | 0.512 | 0.512 | 0.512 | 0.512 | 0.512 | 0.630 | 0.630 | 0.630 | 0.630 | 0.630 |
| JS4060 | Q(in³/min) | 2.57 | 4.03 | 1.99 | 1.25 | 0.34 | 4.79 | 5.96 | 3.81 | 1.84 | 0.51 |
| Tool Steel Pre-hard-ened 40-50HRC | N(rpm) | 1790 | 2580 | 1790 | 1790 | 1790 | 1430 | 2070 | 1430 | 1430 | 1430 |
| | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | Vf(in/min) | 84 | 244 | 84 | 84 | 56 | 101 | 293 | 101 | 101 | 67 |
| | fz(in/t) | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 |
| | doc(in) | 0.020 | 0.014 | 0.020 | 0.016 | 0.012 | 0.024 | 0.014 | 0.020 | 0.016 | 0.012 |
| | woc(in) | 0.512 | 0.512 | 0.512 | 0.512 | 0.512 | 0.630 | 0.630 | 0.630 | 0.630 | 0.630 |
| JP4020 | Q(in³/min) | 0.86 | 1.75 | 0.86 | 0.69 | 0.34 | 1.53 | 2.58 | 1.27 | 1.02 | 0.51 |
| Tool Steel Pre-hard-ened 50-55HRC | N(rpm) | 990 | 1390 | 990 | 990 | 990 | 790 | 1110 | 790 | 790 | 790 |
| | Vc(sfm) | 164 | 230 | 164 | 164 | 164 | 164 | 230 | 164 | 164 | 164 |
| | Vf(in/min) | 15 | 22 | 15 | 15 | 15 | 19 | 26 | 19 | 19 | 19 |
| | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | doc(in) | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 |
| | woc(in) | 0.512 | 0.512 | 0.512 | 0.512 | 0.512 | 0.630 | 0.630 | 0.630 | 0.630 | 0.630 |
| JP4020 | Q(in³/min) | 0.12 | 0.18 | 0.11 | 0.08 | 0.05 | 0.19 | 0.26 | 0.17 | 0.12 | 0.07 |
| Stainless Steel | N(rpm) | 2580 | 3580 | 2980 | 1790 | 1790 | 2070 | 2860 | 2380 | 1430 | 1430 |
| | Vc(sfm) | 427 | 591 | 492 | 295 | 295 | 427 | 591 | 492 | 295 | 295 |
| | Vf(in/min) | 102 | 282 | 117 | 70 | 56 | 122 | 338 | 141 | 84 | 67 |
| | fz(in/t) | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 |
| | doc(in) | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| | woc(in) | 0.512 | 0.512 | 0.512 | 0.512 | 0.512 | 0.630 | 0.630 | 0.630 | 0.630 | 0.630 |
| JM4060 | Q(in³/min) | 1.62 | 3.47 | 1.44 | 0.72 | 0.34 | 3.00 | 4.26 | 2.75 | 1.06 | 0.68 |
| Cast Iron | N(rpm) | 2980 | 3580 | 2580 | 2580 | 1790 | 2380 | 2860 | 2070 | 2070 | 1430 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 281 | 451 | 244 | 244 | 141 | 337 | 540 | 293 | 293 | 169 |
| | fz(in/t) | 0.047 | 0.063 | 0.047 | 0.047 | 0.039 | 0.047 | 0.063 | 0.047 | 0.047 | 0.039 |
| | doc(in) | 0.039 | 0.031 | 0.031 | 0.024 | 0.020 | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | woc(in) | 0.512 | 0.512 | 0.512 | 0.512 | 0.512 | 0.630 | 0.630 | 0.630 | 0.630 | 0.630 |
| JP4020 | Q(in³/min) | 5.61 | 7.16 | 3.87 | 3.00 | 1.44 | 10.40 | 13.27 | 5.72 | 4.43 | 1.70 |
| Maxmum fz(mm/tooth) | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | |
| Maxmum doc(mm) | | <0.049in (General use: doc<0.039in) | | | | | <0.049in (General use: doc<0.039in) | | | | |

# IASR/ASR MULTI

## Modular and Shank Style
## Cutting Conditions
## Inch

Advanced Engineering

| | | Ø | 25mm or 1" | | | | | 30mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | 4 | | | | | 4 | | | | |
| | | | <3D | | | | | <3D | | | | |
| | | | General | Hi-Speed | 3D-5D | 5D-7D | >7D | General | Hi-Speed | 3D-5D | 5D-7D | >7D |
| Carbon Steel Alloy Steel <30HRC | | N(rpm) | 1910 | 2290 | 1650 | 1650 | 1140 | 1590 | 1910 | 1380 | 1380 | 950 |
| | | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 301 | 577 | 260 | 208 | 72 | 250 | 481 | 217 | 174 | 60 |
| | | fz(in/t) | 0.039 | 0.063 | 0.039 | 0.031 | 0.016 | 0.039 | 0.063 | 0.039 | 0.031 | 0.016 |
| | | doc(in) | 0.039 | 0.028 | 0.031 | 0.020 | 0.016 | 0.039 | 0.028 | 0.031 | 0.020 | 0.016 |
| JS4060 | | woc(in) | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 |
| JS4045 | | Q(in³/min) | 9.24 | 12.71 | 6.34 | 3.27 | 0.91 | 9.59 | 13.25 | 6.62 | 3.42 | 0.94 |
| Tool Steel Alloy Steel 30-40HRC | | N(rpm) | 1650 | 2290 | 1650 | 1650 | 1140 | 1380 | 1910 | 1380 | 1380 | 950 |
| | | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 260 | 577 | 260 | 156 | 72 | 217 | 481 | 217 | 130 | 60 |
| | | fz(in/t) | 0.039 | 0.063 | 0.039 | 0.024 | 0.016 | 0.039 | 0.063 | 0.039 | 0.024 | 0.016 |
| JP4020 | | doc(in) | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| JS4045 | | woc(in) | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 |
| JS4060 | | Q(in³/min) | 7.98 | 9.08 | 6.34 | 2.46 | 0.91 | 8.33 | 9.47 | 6.62 | 2.56 | 0.94 |
| Tool Steel Pre-hardened 40-50HRC | | N(rpm) | 1140 | 1650 | 1140 | 1140 | 1140 | 950 | 1380 | 950 | 950 | 950 |
| | | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | | Vf(in/min) | 107 | 312 | 107 | 107 | 72 | 90 | 261 | 90 | 90 | 60 |
| | | fz(in/t) | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 |
| | | doc(in) | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 |
| | | woc(in) | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 |
| JP4020 | | Q(in³/min) | 2.02 | 3.93 | 1.68 | 1.35 | 0.68 | 2.13 | 4.11 | 1.77 | 1.42 | 0.71 |
| Tool Steel Pre-hardened 50-55HRC | | N(rpm) | 630 | 890 | 630 | 630 | 630 | 530 | 740 | 530 | 530 | 530 |
| | | Vc(sfm) | 164 | 230 | 164 | 164 | 164 | 164 | 230 | 164 | 164 | 164 |
| | | Vf(in/min) | 20 | 28 | 20 | 20 | 20 | 17 | 23 | 17 | 17 | 17 |
| | | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | | doc(in) | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 |
| | | woc(in) | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 |
| JP4020 | | Q(in³/min) | 0.25 | 0.35 | 0.22 | 0.16 | 0.09 | 0.27 | 0.36 | 0.23 | 0.17 | 0.10 |
| Stainless Steel | | N(rpm) | 1650 | 2290 | 1910 | 1140 | 1140 | 1380 | 1910 | 1590 | 950 | 950 |
| | | Vc(sfm) | 427 | 591 | 492 | 295 | 295 | 427 | 591 | 492 | 295 | 295 |
| | | Vf(in/min) | 130 | 361 | 150 | 90 | 72 | 109 | 301 | 125 | 75 | 60 |
| | | fz(in/t) | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 |
| | | doc(in) | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| | | woc(in) | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 |
| JM4060 | | Q(in³/min) | 3.99 | 5.68 | 3.66 | 1.42 | 0.91 | 4.18 | 5.92 | 3.81 | 1.48 | 0.94 |
| Cast Iron | | N(rpm) | 1910 | 2290 | 1650 | 1650 | 1140 | 1590 | 1910 | 1380 | 1380 | 950 |
| | | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 421 | 649 | 364 | 208 | 72 | 350 | 541 | 304 | 174 | 60 |
| | | fz(in/t) | 0.055 | 0.071 | 0.055 | 0.031 | 0.016 | 0.055 | 0.071 | 0.055 | 0.031 | 0.016 |
| | | doc(in) | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | | woc(in) | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 |
| JP4020 | | Q(in³/min) | 16.24 | 19.92 | 8.88 | 3.93 | 0.91 | 16.88 | 20.76 | 9.27 | 4.11 | 0.94 |
| Maxmum fz(mm/tooth) | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | |
| Maxmum doc(mm) | | | <0.059in (General use: doc<0.039in) | | | | | <0.059in (General use: doc<0.039in) | | | | |

# IASR/ASR MULTI

## Modular and Shank Style
## Cutting Conditions
## Inch

Advanced Engineering

| | | Ø | 32mm or 1.25" | | | | | 40mm or 1.5" | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | 5 | | | | | 6 | | | | |
| | | | <3D | | | | | <3D | | | | |
| | | | General | Hi-Speed | 3D-5D | 5D-7D | >7D | General | Hi-Speed | 3D-5D | 5D-7D | >7D |
| Carbon Steel Alloy Steel <30HRC | | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 293 | 564 | 254 | 203 | 70 | 281 | 540 | 243 | 194 | 67 |
| | | fz(in/t) | 0.039 | 0.063 | 0.039 | 0.031 | 0.016 | 0.039 | 0.063 | 0.039 | 0.031 | 0.016 |
| | | doc(in) | 0.039 | 0.028 | 0.031 | 0.020 | 0.016 | 0.039 | 0.028 | 0.031 | 0.020 | 0.016 |
| JS4060 | | woc(in) | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 | 1.260 | 1.260 | 1.260 | 1.260 | 1.260 |
| JS4045 | | Q(in³/min) | 11.24 | 15.54 | 7.75 | 4.00 | 1.10 | 13.81 | 19.05 | 9.49 | 4.89 | 1.35 |
| Tool Steel Alloy Steel 30-40HRC | | N(rpm) | 1290 | 1790 | 1290 | 1290 | 890 | 1030 | 1430 | 1030 | 1030 | 710 |
| | | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 254 | 564 | 254 | 152 | 70 | 243 | 540 | 243 | 146 | 67 |
| | | fz(in/t) | 0.039 | 0.063 | 0.039 | 0.024 | 0.016 | 0.039 | 0.063 | 0.039 | 0.024 | 0.016 |
| JP4020 | | doc(in) | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| JS4045 | | woc(in) | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 | 1.260 | 1.260 | 1.260 | 1.260 | 1.260 |
| JS4060 | | Q(in³/min) | 9.75 | 11.10 | 7.75 | 2.99 | 1.10 | 11.94 | 13.61 | 9.49 | 3.68 | 1.35 |
| Tool Steel Pre-hardened 40-50HRC | | N(rpm) | 890 | 1290 | 890 | 890 | 890 | 710 | 1030 | 710 | 710 | 710 |
| | | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | | Vf(in/min) | 105 | 305 | 105 | 105 | 70 | 100 | 292 | 100 | 100 | 67 |
| | | fz(in/t) | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 |
| | | doc(in) | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 |
| | | woc(in) | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 | 1.260 | 1.260 | 1.260 | 1.260 | 1.260 |
| JP4020 | | Q(in³/min) | 2.48 | 4.80 | 2.07 | 1.65 | 0.83 | 3.02 | 5.89 | 2.52 | 2.02 | 1.01 |
| Tool Steel Pre-hardened 50-55HRC | | N(rpm) | 490 | 690 | 490 | 490 | 490 | 390 | 550 | 390 | 390 | 390 |
| | | Vc(sfm) | 164 | 230 | 164 | 164 | 164 | 164 | 230 | 164 | 164 | 164 |
| | | Vf(in/min) | 19 | 27 | 19 | 19 | 19 | 18 | 26 | 18 | 18 | 18 |
| | | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | | doc(in) | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 |
| | | woc(in) | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 | 1.260 | 1.260 | 1.260 | 1.260 | 1.260 |
| JP4020 | | Q(in³/min) | 0.30 | 0.43 | 0.26 | 0.19 | 0.11 | 0.36 | 0.52 | 0.32 | 0.23 | 0.14 |
| Stainless Steel | | N(rpm) | 1290 | 1790 | 1490 | 890 | 890 | 1030 | 1430 | 1190 | 710 | 710 |
| | | Vc(sfm) | 427 | 591 | 492 | 295 | 295 | 427 | 591 | 492 | 295 | 295 |
| | | Vf(in/min) | 127 | 352 | 146 | 87 | 70 | 122 | 338 | 141 | 84 | 67 |
| | | fz(in/t) | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 |
| | | doc(in) | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| | | woc(in) | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 | 1.260 | 1.260 | 1.260 | 1.260 | 1.260 |
| JM4060 | | Q(in³/min) | 4.87 | 6.93 | 4.45 | 1.71 | 1.10 | 6.00 | 8.52 | 5.51 | 2.12 | 1.35 |
| Cast Iron | | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 411 | 634 | 356 | 203 | 70 | 393 | 608 | 341 | 194 | 67 |
| | | fz(in/t) | 0.055 | 0.071 | 0.055 | 0.031 | 0.016 | 0.055 | 0.071 | 0.055 | 0.031 | 0.016 |
| | | doc(in) | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | | woc(in) | 0.984 | 0.984 | 0.984 | 0.984 | 0.984 | 1.260 | 1.260 | 1.260 | 1.260 | 1.260 |
| JP4020 | | Q(in³/min) | 19.82 | 24.33 | 10.86 | 4.79 | 1.10 | 24.26 | 29.88 | 13.32 | 5.87 | 1.35 |
| Maxmum fz(mm/tooth) | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | |
| Maxmum doc(mm) | | | <0.059in (General use: doc<0.039in) | | | | | <0.059in (General use: doc<0.039in) | | | | |

# IASR/ASR MULTI

## Modular and Shank Style
## Cutting Conditions
## Inch

Advanced Engineering

| | | Ø | 52mm or 2" | | | | | 66mm or 2.5" | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | 7 | | | | | 8 | | | | |
| | | | <3D | | 3D-5D | 5D-7D | >7D | <3D | | 3D-5D | 5D-7D | >7D |
| | | | General | Hi-Speed | | | | General | Hi-Speed | | | |
| Carbon Steel Alloy Steel <30HRC | | N(rpm) | 910 | 1100 | 790 | 790 | 550 | 720 | 860 | 620 | 620 | 430 |
| | | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 251 | 485 | 218 | 174 | 61 | 227 | 433 | 195 | 156 | 54 |
| | | fz(in/t) | 0.039 | 0.063 | 0.039 | 0.031 | 0.016 | 0.039 | 0.063 | 0.039 | 0.031 | 0.016 |
| | | doc(in) | 0.039 | 0.028 | 0.031 | 0.020 | 0.016 | 0.039 | 0.028 | 0.031 | 0.020 | 0.016 |
| JS4060 | | woc(in) | 1.575 | 1.575 | 1.575 | 1.575 | 1.575 | 1.969 | 1.969 | 1.969 | 1.969 | 1.969 |
| JS4045 | | Q(in3/min) | 15.42 | 21.39 | 10.64 | 5.48 | 1.54 | 17.43 | 23.87 | 11.90 | 6.14 | 1.70 |
| Tool Steel Alloy Steel 30-40HRC | | N(rpm) | 790 | 1100 | 790 | 790 | 550 | 620 | 860 | 620 | 620 | 430 |
| | | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 218 | 485 | 218 | 130 | 61 | 195 | 433 | 195 | 117 | 54 |
| | | fz(in/t) | 0.039 | 0.063 | 0.039 | 0.024 | 0.016 | 0.039 | 0.063 | 0.039 | 0.024 | 0.016 |
| JP4020 | | doc(in) | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| JS4045 | | woc(in) | 1.575 | 1.575 | 1.575 | 1.575 | 1.575 | 1.969 | 1.969 | 1.969 | 1.969 | 1.969 |
| JS4060 | | Q(in3/min) | 13.39 | 15.28 | 10.64 | 4.10 | 1.54 | 14.97 | 17.05 | 11.90 | 4.61 | 1.70 |
| Tool Steel Pre-hard-ened 40-50HRC | | N(rpm) | 550 | 790 | 550 | 550 | 550 | 430 | 620 | 430 | 430 | 430 |
| | | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | | Vf(in/min) | 91 | 261 | 91 | 91 | 61 | 81 | 234 | 81 | 81 | 54 |
| | | fz(in/t) | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 | 0.024 | 0.047 | 0.024 | 0.024 | 0.016 |
| | | doc(in) | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 |
| | | woc(in) | 1.575 | 1.575 | 1.575 | 1.575 | 1.575 | 1.969 | 1.969 | 1.969 | 1.969 | 1.969 |
| JP4020 | | Q(in3/min) | 3.44 | 6.58 | 2.87 | 2.29 | 1.15 | 3.83 | 7.37 | 3.19 | 2.55 | 1.28 |
| Tool Steel Pre-hard-ened 50-55HRC | | N(rpm) | 300 | 420 | 300 | 300 | 300 | 240 | 330 | 240 | 240 | 240 |
| | | Vc(sfm) | 164 | 230 | 164 | 164 | 164 | 164 | 230 | 164 | 164 | 164 |
| | | Vf(in/min) | 17 | 23 | 17 | 17 | 17 | 15 | 20 | 15 | 15 | 15 |
| | | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| | | doc(in) | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 | 0.016 | 0.016 | 0.014 | 0.010 | 0.006 |
| | | woc(in) | 1.575 | 1.575 | 1.575 | 1.575 | 1.575 | 1.969 | 1.969 | 1.969 | 1.969 | 1.969 |
| JP4020 | | Q(in3/min) | 0.43 | 0.58 | 0.37 | 0.27 | 0.16 | 0.47 | 0.63 | 0.41 | 0.30 | 0.18 |
| Stainless Steel | | N(rpm) | 790 | 1100 | 910 | 550 | 550 | 620 | 860 | 720 | 430 | 430 |
| | | Vc(sfm) | 427 | 591 | 492 | 295 | 295 | 427 | 591 | 492 | 295 | 295 |
| | | Vf(in/min) | 109 | 303 | 125 | 76 | 61 | 98 | 271 | 113 | 68 | 54 |
| | | fz(in/t) | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 | 0.020 | 0.039 | 0.020 | 0.020 | 0.016 |
| | | doc(in) | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 | 0.039 | 0.020 | 0.031 | 0.020 | 0.016 |
| | | woc(in) | 1.575 | 1.575 | 1.575 | 1.575 | 1.575 | 1.969 | 1.969 | 1.969 | 1.969 | 1.969 |
| JM4060 | | Q(in3/min) | 6.70 | 9.54 | 6.10 | 2.39 | 1.54 | 7.53 | 10.67 | 6.90 | 2.68 | 1.70 |
| Cast Iron | | N(rpm) | 910 | 1100 | 790 | 790 | 550 | 720 | 860 | 620 | 620 | 430 |
| | | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | | Vf(in/min) | 351 | 546 | 305 | 174 | 61 | 317 | 487 | 273 | 156 | 54 |
| | | fz(in/t) | 0.055 | 0.071 | 0.055 | 0.031 | 0.016 | 0.055 | 0.071 | 0.055 | 0.031 | 0.016 |
| | | doc(in) | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 | 0.049 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | | woc(in) | 1.575 | 1.575 | 1.575 | 1.575 | 1.575 | 1.969 | 1.969 | 1.969 | 1.969 | 1.969 |
| JP4020 | | Q(in3/min) | 27.09 | 33.54 | 14.89 | 6.58 | 1.54 | 30.58 | 37.40 | 16.66 | 7.37 | 1.70 |
| Maxmum fz(mm/tooth) | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | |
| Maxmum doc(mm) | | | <0.059in (General use: doc<0.039in) | | | | | <0.059in (General use: doc<0.039in) | | | | |

# IASR/ASR MULTI

## Modular and Shank Style
## Cutting Conditions
## Metric

Advanced Engineering

| | | Ø | | | | | 16mm or 5/8" | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | | | | | 2 | | | | |
| | | <3D | | | | | <3D | | | | |
| | | General | Hi-Speed | 3D-5D | 5D-7D | >7D | General | Hi-Speed | 3D-5D | 5D-7D | >7D |
| Carbonsteel Alloy Steel <30HRC | N(rpm) | 2980 | 3580 | 2580 | 2580 | 1790 | 2380 | 2860 | 2070 | 2070 | 1430 |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 4760 | 10020 | 4120 | 3090 | 1430 | 5710 | 12010 | 4960 | 3720 | 1710 |
| | fz(mm/t) | 0.80 | 1.40 | 0.80 | 0.60 | 0.40 | 0.80 | 1.40 | 0.80 | 0.60 | 0.40 |
| | doc(mm) | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 |
| JS4060 | woc(mm) | 13 | 13 | 13 | 13 | 13 | 16 | 16 | 16 | 16 | 16 |
| JS4045 | Q(cm³/min) | 50 | 78 | 32 | 20 | 6 | 73 | 115 | 48 | 30 | 8 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 2580 | 3580 | 2580 | 2580 | 1790 | 2070 | 2860 | 2070 | 2070 | 1430 |
| | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 4120 | 10020 | 4120 | 3090 | 1430 | 4960 | 12010 | 4960 | 3720 | 1710 |
| | fz(mm/t) | 0.80 | 1.40 | 0.80 | 0.60 | 0.40 | 0.80 | 1.40 | 0.80 | 0.60 | 0.40 |
| JP4020 | doc(mm) | 0.8 | 0.5 | 0.6 | 0.5 | 0.3 | 1 | 0.5 | 0.8 | 0.5 | 0.3 |
| JS4045 | woc(mm) | 13 | 13 | 13 | 13 | 13 | 16 | 16 | 16 | 16 | 16 |
| JS4060 | Q(cm³/min) | 43 | 65 | 32 | 20 | 6 | 79 | 96 | 63 | 30 | 8 |
| Tool Steel Pre-hard-ened 40-50HRC | N(rpm) | 1790 | 2580 | 1790 | 1790 | 1790 | 1430 | 2070 | 1430 | 1430 | 1430 |
| | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 |
| | Vf(mm/min) | 2140 | 6190 | 2140 | 2140 | 1430 | 2570 | 7450 | 2570 | 2570 | 1710 |
| | fz(mm/t) | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 |
| | doc(mm) | 0.5 | 0.35 | 0.5 | 0.4 | 0.3 | 0.6 | 0.35 | 0.5 | 0.4 | 0.3 |
| | woc(mm) | 13 | 13 | 13 | 13 | 13 | 16 | 16 | 16 | 16 | 16 |
| JP4020 | Q(cm³/min) | 14 | 28 | 14 | 11 | 6 | 25 | 42 | 21 | 16 | 8 |
| Tool Steel Pre-hard-ened 50-55HRC | N(rpm) | 990 | 1390 | 990 | 990 | 990 | 790 | 1110 | 790 | 790 | 790 |
| | Vc(m/min) | 50 | 70 | 50 | 50 | 50 | 50 | 70 | 50 | 50 | 50 |
| | Vf(mm/min) | 390 | 550 | 390 | 390 | 390 | 470 | 660 | 470 | 470 | 470 |
| | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| | doc(mm) | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 |
| | woc(mm) | 13 | 13 | 13 | 13 | 13 | 16 | 16 | 16 | 16 | 16 |
| JP4020 | Q(cm³/min) | 2 | 3 | 2 | 1 | 1 | 3 | 4 | 3 | 2 | 1 |
| Stainless Steel | N(rpm) | 2580 | 3580 | 2980 | 1790 | 1790 | 2070 | 2860 | 2380 | 1430 | 1430 |
| | Vc(m/min) | 130 | 180 | 150 | 90 | 90 | 130 | 180 | 150 | 90 | 90 |
| | Vf(mm/min) | 2580 | 7160 | 2980 | 1790 | 1430 | 3100 | 8580 | 3570 | 2140 | 1710 |
| | fz(mm/t) | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 |
| | doc(mm) | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| | woc(mm) | 13 | 13 | 13 | 13 | 13 | 16 | 16 | 16 | 16 | 16 |
| JM4060 | Q(cm³/min) | 27 | 56 | 23 | 12 | 6 | 50 | 69 | 46 | 17 | 11 |
| Cast Iron | N(rpm) | 2980 | 3580 | 2580 | 2580 | 1790 | 2380 | 2860 | 2070 | 2070 | 1430 |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 7150 | 11450 | 6190 | 6190 | 3580 | 8560 | 13720 | 7450 | 7450 | 4290 |
| | fz(mm/t) | 1.20 | 1.60 | 1.20 | 1.20 | 1.00 | 1.20 | 1.60 | 1.20 | 1.20 | 1.00 |
| | doc(mm) | 1 | 0.8 | 0.8 | 0.6 | 0.5 | 1.25 | 1 | 0.8 | 0.6 | 0.4 |
| JS4045 | woc(mm) | 13 | 13 | 13 | 13 | 13 | 16 | 16 | 16 | 16 | 16 |
| JP4020 | Q(cm³/min) | 93 | 119 | 64 | 48 | 23 | 171 | 220 | 95 | 72 | 27 |
| Maxmum fz(mm/tooth) | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | |
| Maxmum doc(mm) | | <1.25mm (General use: ap<1.0mm) | | | | | <1.25mm (General use: ap<1.0mm) | | | | |

# IASR/ASR MULTI

## Modular and Shank Style
## Cutting Conditions
## Metric

Advanced Engineering

| | | Ø | 25mm or 1" | | | | | 30mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | 4 | | | | | 4 | | | | |
| | | | <3D | | | | | <3D | | | | |
| | | | General | Hi-Speed | 3D-5D | 5D-7D | >7D | General | Hi-Speed | 3D-5D | 5D-7D | >7D |
| Carbonsteel Alloy Steel <30HRC | | N(rpm) | 1910 | 2290 | 1650 | 1650 | 1140 | 1590 | 1910 | 1380 | 1380 | 950 |
| | | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 7640 | 14650 | 6600 | 5280 | 1820 | 6360 | 12220 | 5520 | 4410 | 1520 |
| | | fz(mm/t) | 1.00 | 1.60 | 1.00 | 0.80 | 0.40 | 1.00 | 1.60 | 1.00 | 0.80 | 0.40 |
| | | doc(mm) | 1 | 0.7 | 0.8 | 0.5 | 0.4 | 1 | 0.7 | 0.8 | 0.5 | 0.4 |
| JS4060 | | woc(mm) | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 |
| JS4045 | | Q(cm³/min) | 153 | 205 | 106 | 53 | 15 | 159 | 214 | 110 | 55 | 15 |
| Tool Steel Alloy Steel 30-40HRC | | N(rpm) | 1650 | 2290 | 1650 | 1650 | 1140 | 1380 | 1910 | 1380 | 1380 | 950 |
| | | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 6600 | 14650 | 6600 | 3960 | 1820 | 5520 | 12220 | 5520 | 3310 | 1520 |
| | | fz(mm/t) | 1.00 | 1.60 | 1.00 | 0.60 | 0.40 | 1.00 | 1.60 | 1.00 | 0.60 | 0.40 |
| JP4020 | | doc(mm) | 1 | 0.5 | 0.8 | 0.5 | 0.4 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| JS4045 | | woc(mm) | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 |
| JS4060 | | Q(cm³/min) | 132 | 147 | 106 | 40 | 15 | 138 | 153 | 110 | 41 | 15 |
| Tool Steel Pre-hard-ened 40-50HRC | | N(rpm) | 1140 | 1650 | 1140 | 1140 | 1140 | 950 | 1380 | 950 | 950 | 950 |
| | | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 |
| | | Vf(mm/min) | 2730 | 7920 | 2730 | 2730 | 1820 | 2280 | 6620 | 2280 | 2280 | 1520 |
| | | fz(mm/t) | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 |
| | | doc(mm) | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 |
| | | woc(mm) | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 |
| JP4020 | | Q(cm³/min) | 33 | 63 | 27 | 22 | 11 | 34 | 66 | 29 | 23 | 11 |
| Tool Steel Pre-hard-ened 50-55HRC | | N(rpm) | 630 | 890 | 630 | 630 | 630 | 530 | 740 | 530 | 530 | 530 |
| | | Vc(m/min) | 50 | 70 | 50 | 50 | 50 | 50 | 70 | 50 | 50 | 50 |
| | | Vf(mm/min) | 500 | 710 | 500 | 500 | 500 | 420 | 590 | 420 | 420 | 420 |
| | | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| | | doc(mm) | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 |
| | | woc(mm) | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 |
| JP4020 | | Q(cm³/min) | 4 | 6 | 4 | 3 | 2 | 4 | 6 | 4 | 3 | 2 |
| Stainless Steel | | N(rpm) | 1650 | 2290 | 1910 | 1140 | 1140 | 1380 | 1910 | 1590 | 950 | 950 |
| | | Vc(m/min) | 130 | 180 | 150 | 90 | 90 | 130 | 180 | 150 | 90 | 90 |
| | | Vf(mm/min) | 3300 | 9160 | 3820 | 2280 | 1820 | 2760 | 7640 | 3180 | 1900 | 1520 |
| | | fz(mm/t) | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 |
| | | doc(mm) | 1 | 0.5 | 0.8 | 0.5 | 0.4 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| | | woc(mm) | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 |
| JM4060 | | Q(cm³/min) | 66 | 92 | 61 | 23 | 15 | 69 | 96 | 64 | 24 | 15 |
| Cast Iron | | N(rpm) | 1910 | 2290 | 1650 | 1650 | 1140 | 1590 | 1910 | 1380 | 1380 | 950 |
| | | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 10690 | 16480 | 9240 | 5280 | 1820 | 8900 | 13750 | 7720 | 4410 | 1520 |
| | | fz(mm/t) | 1.40 | 1.80 | 1.40 | 0.80 | 0.40 | 1.40 | 1.80 | 1.40 | 0.80 | 0.40 |
| | | doc(mm) | 1.25 | 1 | 0.8 | 0.6 | 0.4 | 1.25 | 1 | 0.8 | 0.6 | 0.4 |
| JS4045 | | woc(mm) | 20 | 20 | 20 | 20 | 20 | 25 | 25 | 25 | 25 | 25 |
| JP4020 | | Q(cm³/min) | 267 | 330 | 148 | 63 | 15 | 278 | 344 | 154 | 66 | 15 |
| Maxmum fz(mm/tooth) | | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | |
| Maxmum doc(mm) | | | <1.5mm (General use: ap<1.0mm) | | | | | <1.5mm (General use: ap<1.0mm) | | | | |

# IASR/ASR MULTI

**Face Mill Style**
**Cutting Conditions**
**Metric**

Advanced Engineering

| | | Ø | 32mm or 1.25" | | | | | 40mm or 1.5" | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | 5 | | | | | 6 | | | | |
| | | | <3D | | | | | <3D | | | | |
| | | | General | Hi-Speed | 3D-5D | 5D-7D | >7D | General | Hi-Speed | 3D-5D | 5D-7D | >7D |
| Carbonsteel<br>Alloy Steel<br><30HRC | | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 7450 | 14320 | 6450 | 5160 | 1780 | 7140 | 13720 | 6180 | 4940 | 1700 |
| | | fz(mm/t) | 1.00 | 1.60 | 1.00 | 0.80 | 0.40 | 1.00 | 1.60 | 1.00 | 0.80 | 0.40 |
| | | doc(mm) | 1 | 0.7 | 0.8 | 0.5 | 0.4 | 1 | 0.7 | 0.8 | 0.5 | 0.4 |
| JS4060 | | woc(mm) | 25 | 25 | 25 | 25 | 25 | 32 | 32 | 32 | 32 | 32 |
| JS4045 | | Q(cm³/min) | 186 | 251 | 129 | 65 | 18 | 228 | 307 | 158 | 79 | 22 |
| Tool Steel<br>Alloy Steel<br>30-40HRC | | N(rpm) | 1290 | 1790 | 1290 | 1290 | 890 | 1030 | 1430 | 1030 | 1030 | 710 |
| | | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 6450 | 14320 | 6450 | 3870 | 1780 | 6180 | 13720 | 6180 | 3700 | 1700 |
| | | fz(mm/t) | 1.00 | 1.60 | 1.00 | 0.60 | 0.40 | 1.00 | 1.60 | 1.00 | 0.60 | 0.40 |
| JP4020 | | doc(mm) | 1 | 0.5 | 0.8 | 0.5 | 0.4 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| JS4045 | | woc(mm) | 25 | 25 | 25 | 25 | 25 | 32 | 32 | 32 | 32 | 32 |
| JS4060 | | Q(cm³/min) | 161 | 179 | 129 | 48 | 18 | 198 | 220 | 158 | 59 | 22 |
| Tool Steel<br>Pre-hardened<br>40-50HRC | | N(rpm) | 890 | 1290 | 890 | 890 | 890 | 710 | 1030 | 710 | 710 | 710 |
| | | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 |
| | | Vf(mm/min) | 2670 | 7740 | 2670 | 2670 | 1780 | 2550 | 7410 | 2550 | 2550 | 1700 |
| | | fz(mm/t) | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 |
| | | doc(mm) | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 |
| | | woc(mm) | 25 | 25 | 25 | 25 | 25 | 32 | 32 | 32 | 32 | 32 |
| JP4020 | | Q(cm³/min) | 40 | 77 | 33 | 27 | 13 | 49 | 95 | 41 | 33 | 16 |
| Tool Steel<br>Pre-hardened<br>50-55HRC | | N(rpm) | 490 | 690 | 490 | 490 | 490 | 390 | 550 | 390 | 390 | 390 |
| | | Vc(m/min) | 50 | 70 | 50 | 50 | 50 | 50 | 70 | 50 | 50 | 50 |
| | | Vf(mm/min) | 490 | 690 | 490 | 490 | 490 | 460 | 660 | 460 | 460 | 460 |
| | | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| | | doc(mm) | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 |
| | | woc(mm) | 25 | 25 | 25 | 25 | 25 | 32 | 32 | 32 | 32 | 32 |
| JP4020 | | Q(cm³/min) | 5 | 7 | 4 | 3 | 2 | 6 | 8 | 5 | 4 | 2 |
| Stainless Steel | | N(rpm) | 1290 | 1790 | 1490 | 890 | 890 | 1030 | 1430 | 1190 | 710 | 710 |
| | | Vc(m/min) | 130 | 180 | 150 | 90 | 90 | 130 | 180 | 150 | 90 | 90 |
| | | Vf(mm/min) | 3220 | 8950 | 3720 | 2220 | 1780 | 3090 | 8580 | 3570 | 2130 | 1700 |
| | | fz(mm/t) | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 |
| | | doc(mm) | 1 | 0.5 | 0.8 | 0.5 | 0.4 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| | | woc(mm) | 25 | 25 | 25 | 25 | 25 | 32 | 32 | 32 | 32 | 32 |
| JM4060 | | Q(cm³/min) | 81 | 112 | 74 | 28 | 18 | 99 | 137 | 91 | 34 | 22 |
| Cast Iron | | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 10430 | 16110 | 9030 | 5160 | 1780 | 9990 | 15440 | 8650 | 4940 | 1700 |
| | | fz(mm/t) | 1.40 | 1.80 | 1.40 | 0.80 | 0.40 | 1.40 | 1.80 | 1.40 | 0.80 | 0.40 |
| | | doc(mm) | 1.25 | 1 | 0.8 | 0.6 | 0.4 | 1.25 | 1 | 0.8 | 0.6 | 0.4 |
| JS4045 | | woc(mm) | 25 | 25 | 25 | 25 | 25 | 32 | 32 | 32 | 32 | 32 |
| JP4020 | | Q(cm³/min) | 326 | 403 | 181 | 77 | 18 | 400 | 494 | 221 | 95 | 22 |
| Maxmum fz(mm/tooth) | | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | |
| Maxmum doc(mm) | | | <1.5mm (General use: ap<1.0mm) | | | | | <1.5mm (General use: ap<1.0mm) | | | | |

# IASR/ASR MULTI

**Face Mill Style**
**Cutting Conditions**
**Metric**

Advanced Engineering

| | | Ø | 52mm or 2" | | | | | 66mm or 2.5" | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | 7 | | | | | 8 | | | | |
| | | | <3D | | 3D-5D | 5D-7D | >7D | <3D | | 3D-5D | 5D-7D | >7D |
| | | | General | Hi-Speed | | | | General | Hi-Speed | | | |
| Carbon Steel Alloy Steel <30HRC | | N(rpm) | 910 | 1100 | 790 | 790 | 550 | 720 | 860 | 620 | 620 | 430 |
| | | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 6370 | 12320 | 5530 | 4420 | 1540 | 5760 | 11000 | 4960 | 3960 | 1370 |
| | | fz(mm/t) | 1.00 | 1.60 | 1.00 | 0.80 | 0.40 | 1.00 | 1.60 | 1.00 | 0.80 | 0.40 |
| | | doc(mm) | 1 | 0.7 | 0.8 | 0.5 | 0.4 | 1 | 0.7 | 0.8 | 0.5 | 0.4 |
| JS4060 | | woc(mm) | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 |
| JS4045 | | Q(cm³/min) | 255 | 345 | 177 | 88 | 25 | 288 | 385 | 198 | 99 | 27 |
| Tool Steel Alloy Steel 30-40HRC | | N(rpm) | 790 | 1100 | 790 | 790 | 550 | 620 | 860 | 620 | 620 | 430 |
| | | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 5530 | 12320 | 5530 | 3310 | 1540 | 4960 | 11000 | 4960 | 2970 | 1370 |
| | | fz(mm/t) | 1.00 | 1.60 | 1.00 | 0.60 | 0.40 | 1.00 | 1.60 | 1.00 | 0.60 | 0.40 |
| | | doc(mm) | 1 | 0.5 | 0.8 | 0.5 | 0.4 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| JP4020 | | woc(mm) | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 |
| JS4045 | | Q(cm³/min) | 221 | 246 | 177 | 66 | 25 | 248 | 275 | 198 | 74 | 27 |
| JS4060 | | | | | | | | | | | | |
| Tool Steel Pre-hard-ened 40-50HRC | | N(rpm) | 550 | 790 | 550 | 550 | 550 | 430 | 620 | 430 | 430 | 430 |
| | | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 |
| | | Vf(mm/min) | 2310 | 6630 | 2310 | 2310 | 1540 | 2060 | 5950 | 2060 | 2060 | 1370 |
| | | fz(mm/t) | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 | 0.60 | 1.20 | 0.60 | 0.60 | 0.40 |
| | | doc(mm) | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 |
| | | woc(mm) | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 |
| JP4020 | | Q(cm³/min) | 55 | 106 | 46 | 37 | 18 | 62 | 119 | 52 | 41 | 21 |
| Tool Steel Pre-hard-ened 50-55HRC | | N(rpm) | 300 | 420 | 300 | 300 | 300 | 240 | 330 | 240 | 240 | 240 |
| | | Vc(m/min) | 50 | 70 | 50 | 50 | 50 | 50 | 70 | 50 | 50 | 50 |
| | | Vf(mm/min) | 420 | 580 | 420 | 420 | 420 | 380 | 520 | 380 | 380 | 380 |
| | | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| | | doc(mm) | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 | 0.4 | 0.4 | 0.35 | 0.25 | 0.15 |
| | | woc(mm) | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 |
| JP4020 | | Q(cm³/min) | 7 | 9 | 6 | 4 | 3 | 8 | 10 | 7 | 5 | 3 |
| Stainless Steel | | N(rpm) | 790 | 1100 | 910 | 550 | 550 | 620 | 860 | 720 | 430 | 430 |
| | | Vc(m/min) | 130 | 180 | 150 | 90 | 90 | 130 | 180 | 150 | 90 | 90 |
| | | Vf(mm/min) | 2760 | 7700 | 3180 | 1920 | 1540 | 2480 | 6880 | 2880 | 1720 | 1370 |
| | | fz(mm/t) | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 | 0.50 | 1.00 | 0.50 | 0.50 | 0.40 |
| | | doc(mm) | 1 | 0.5 | 0.8 | 0.5 | 0.4 | 1 | 0.5 | 0.8 | 0.5 | 0.4 |
| | | woc(mm) | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 |
| JM4060 | | Q(cm³/min) | 110 | 154 | 102 | 38 | 25 | 124 | 172 | 115 | 43 | 27 |
| Cast Iron | | N(rpm) | 910 | 1100 | 790 | 790 | 550 | 720 | 860 | 620 | 620 | 430 |
| | | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | | Vf(mm/min) | 8910 | 13860 | 7740 | 4420 | 1540 | 8060 | 12380 | 6940 | 3960 | 1370 |
| | | fz(mm/t) | 1.40 | 1.80 | 1.40 | 0.80 | 0.40 | 1.40 | 1.80 | 1.40 | 0.80 | 0.40 |
| | | doc(mm) | 1.25 | 1 | 0.8 | 0.6 | 0.4 | 1.25 | 1 | 0.8 | 0.6 | 0.4 |
| JS4045 | | woc(mm) | 40 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 | 50 |
| JP4020 | | Q(cm³/min) | 446 | 554 | 248 | 106 | 25 | 504 | 619 | 278 | 119 | 27 |
| Maxmum fz(mm/tooth) | | | <0.071in/tooth (General use: fz<0.039in/tooth) | | | | | < 1.8mm/tooth (General use: fz<1.0mm/tooth) | | | | |
| Maxmum doc(mm) | | | <0.059in (General use: doc<0.039in) | | | | | <1.5mm (General use: ap<1.0mm) | | | | |

# IASR/ASR

Advanced Engineering

## Special Radius Cutting Edge for Highest-Efficiency Milling

MODULAR STYLE

FACE MILL STYLE

## FEATURES

- Extraordinary metal removal and feed rates
- Dramatic reduction in cutting deflection and force
- 2-5 times better performance than conventional radius cutters
- Reduced radial deflection even with long overhauls

## INTRODUCTION

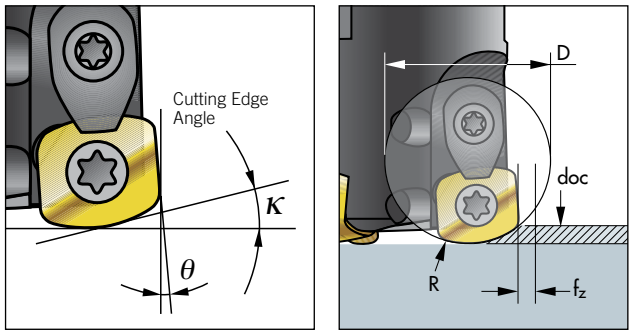
Hitachi Tool is pleased to present a cutter for the new millennium: the ASR. This addition to the Hitachi Die/Mold Tooling Line is able to achieve extraordinary feeds and metal removal rates in roughing applications on both new and old machines.

The chart below demonstrates the performance difference between standard round insert style cutters and the new ASR. In most cases we are able to increase the feed (fz) up to five times without the need to increase the cutting speed (Vc) thus stabilizing or even increasing tool life.

## FEATURES

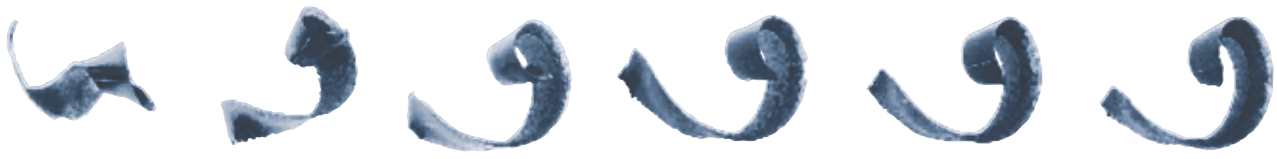
### 1. Specialized Radius Cutting Edge for Highest-Efficiency Machining

Thanks to the combination of the shortened cutting edge and special angle, deflection and force during the cutting process are dramatically reduced compared to round insert style cutters. This stabilizes the load and makes high-feed machining possible.




### 2. Extraordinary Feed Rates

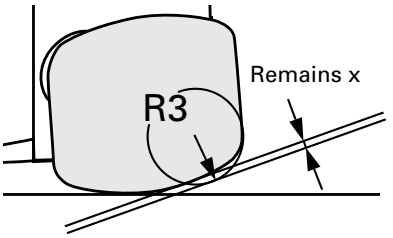
The ASR's low cut structure enables increases in feed per tooth of up to five times. When cutting steel, a feed per tooth of 0.6 to 3.5mm (0.024" to 0.138") is achievable and already being successfully used. Feed per tooth in cast iron is 0.8 to 4.0mm (0.032" to 0.160"). The data below compares shape and weight of steel chips at different feeds per tooth.



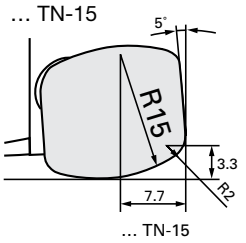
**$f_z$= 0.4mm – 0.29 g** | **$f_z$= 0.8mm – 0.59 g** | **$f_z$= 1.5mm – 1.10 g** | **$f_z$= 2.0mm – 1.47 g** | **$f_z$= 3.0mm – 2.21 g** | **$f_z$= 3.5mm – 2.58 g**

## 3. Programming Information

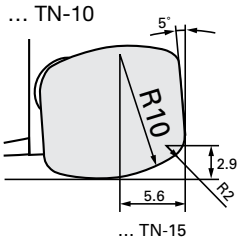
By programming R3 (theoretic) as the tool radius, the maximum difference between programming and the final shape is shown. These small remains will be left in some corners, and will be corrected later by semi-finishing or finishing operations.




Approximate Input Corner R : R3
(for all Inserts)



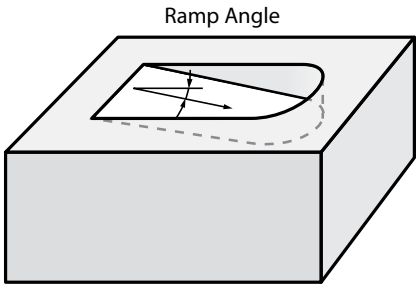

x = approx. 0.6 mm
(0.0236")



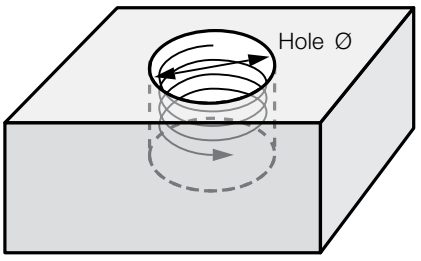

x = approx. 0.5 mm
(0.0197")

## 4. Direct Milling

Even though the ramp angle is limited due to the cutting edge design, both ramping and helical milling are possible. Please use the following recommendations:




Slant Milling




Helical Milling

| Tool Diameter | 20mm or 0.75” | 25mm or 1.00” | 30mm | 32mm or 1.25” | 40mm or 1.50” | 50mm or 2.00” | 60mm | 63mm or 2.50” | 80mm or 3.00” | 100mm or 4.00” |
|---|---|---|---|---|---|---|---|---|---|---|
| Ramp Angle | 2° | 2° | 3° | 2.5° | 2° | 1.5° | 1° | 1° | 0.5° | 0.5° |
| Helical Hole Diameter | 27-38mm | 37-48mm | 38-58mm | 42-62mm | 58-78mm | 78-98mm | 98 - 118mm | 101-124mm | 136-158mm | 176-198mm |
| Helical Hole Diameter | 1.06-1.50” | 1.46-1.89” | 1.50-2.28” | 1.65-2.44” | 2.28-3.07” | 3.07-3.89” | 3.89-4.65” | 3.98-4.88” | 5.35-6.22” | 6.93-7.80” |

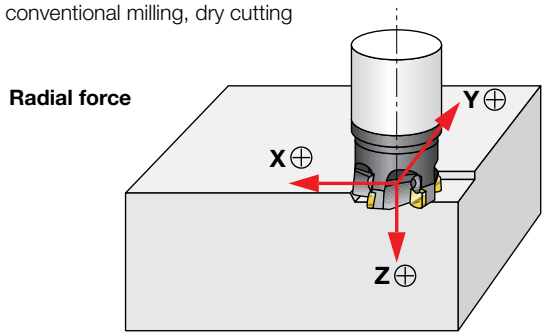
## 5. Reduced Radial Deflection Even With Long Overhangs

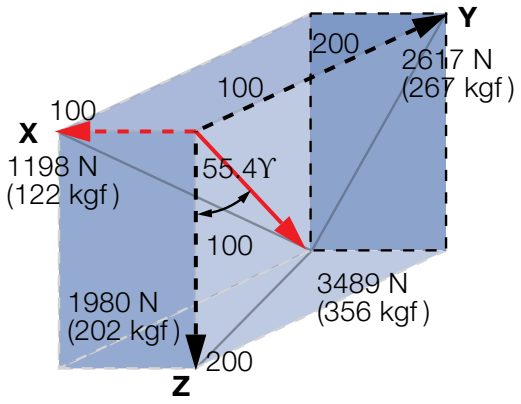
When horizontal (x,y axis) machining with the ASR, radial forces are kept to an equal level to slant or helical milling, where the main force is in the z axis. This allows the ASR to achieve higher feed rates with less deflection and vibration. This table shows the directional forces.

ASR5080-5 (dia 3.15")

| | | |
|---|---|---|
| N | = | 720 rpm |
| Vc | = | 180 m/min (591 sfm) |
| Vf | = | 1500 mm/min (59.06 ipm) |
| fz | = | 0.42 mm/tooth (0.0165 in/tooth) |
| doc x woc | = | 1.5 x 60 mm (0.059" x 2.362") |

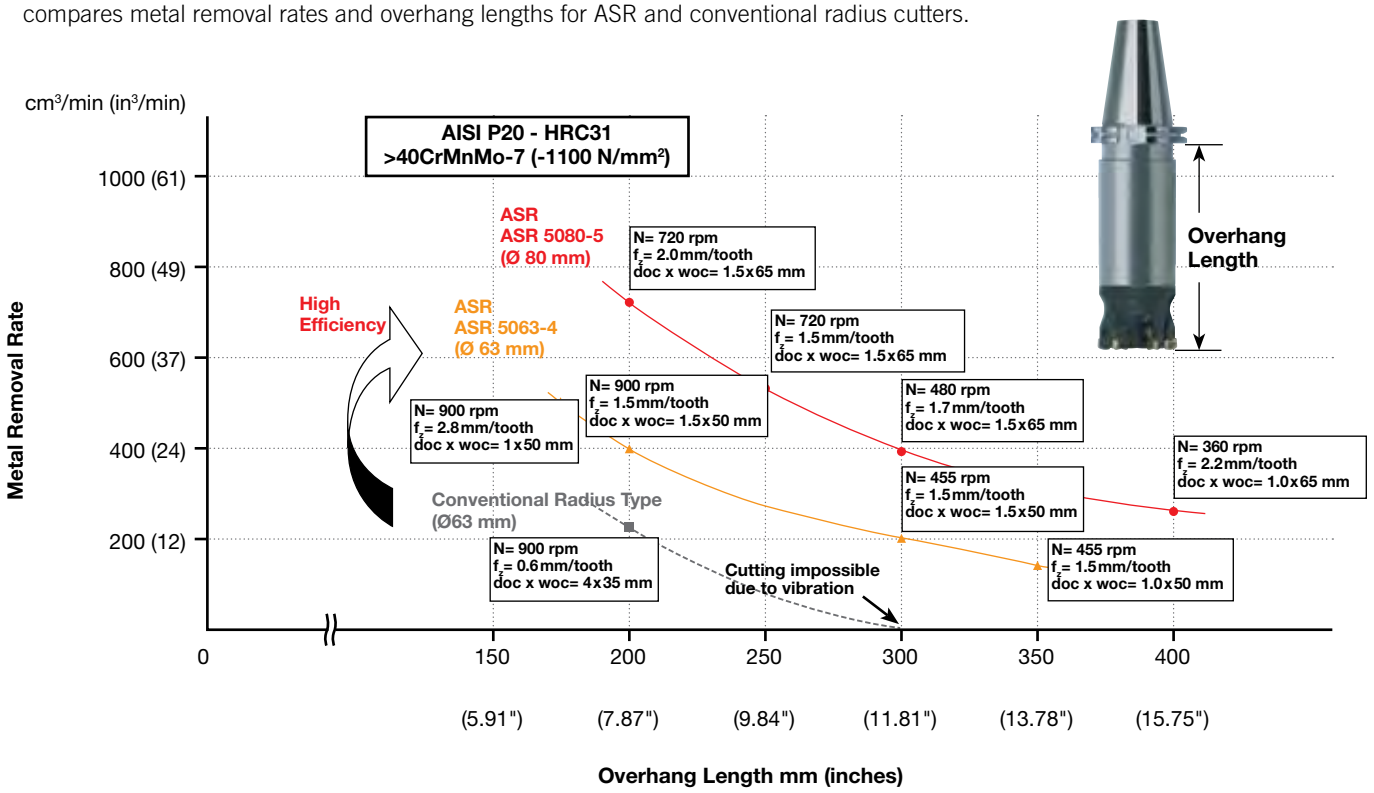
conventional milling, dry cutting



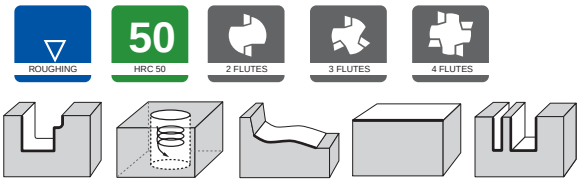

## 6. Two to Five Times Greater Efficiency Compared to Conventional Radius Cutters

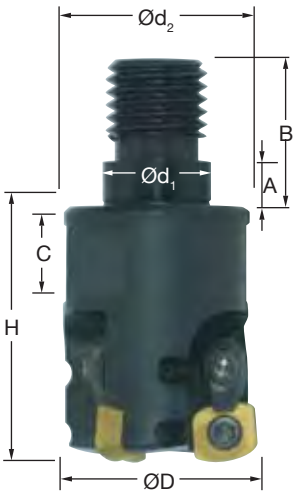
The ASR is capable of achieving 4 to 5 times greater efficiency in deep milling with an overhang of 3D or more, and 2 to 3 times for shallow milling of 3D or less. This enables faster production resulting in quicker turnaround of components. The chart below compares metal removal rates and overhang lengths for ASR and conventional radius cutters.



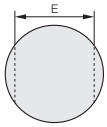
# IASR/ASR

## Modular Style




Advanced Engineering




| D | 0/-0.2 |
|---|---|

### ASRM - METRIC

| Part No. | Flutes | ØD | H | Ød1 | M | Ød2 | A | B | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASRM0020-2** | 2 | **20** | 30 | 10.5 | M10 | 17.8 | 5.5 | 19 | 10 | 15 | **EPNW08/EPEW08** |
| **ASRM0025-2** | 2 | **25** | 35 | 12.5 | M12 | 20.8 | 5.5 | 22 | 10 | 17 | **EDNW10/EDEW10** |
| **ASRM0032-3** | 3 | **32** | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | **EDNW10/EDEW10** |
| **ASRM0040-4** | 4 | **40** | 40 | 17.0 | M16 | 28.8 | 6.0 | 23 | 12 | 22 | **EDNW10/EDEW10** |

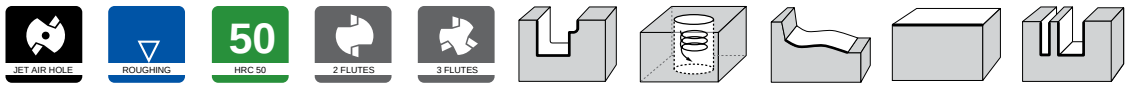
Modular Shanks on p. 163

Inserts p. 113

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **ASRM0020-2** | 242-141 | | 104-T15 |
| **ASRM0025-2** | 412-141 | CM3.5-141 | 104-T15 |
| **ASRM0032-3** | 412-141 | CM3.5-141 | 104-T15 |
| **ASRM0040-4** | 412-141 | CM3.5-141 | 104-T15 |

# IASR/ASR

**Shank Style**
**Regular Length**


| D | 0/-0.2 |
|---|---|

## IASRS - INCH

| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| **IASRS0012R** | 2 | **0.750** | 5.118 | 0.750 | 1.969 | 3.150 | **EPNW08/EPEW08** |
| **IASRS0016R** | 2 | **1.000** | 5.512 | 1.000 | 2.362 | 3.150 | **EDNW10/EDEW10** |
| **IASRS4020R** | 2 | **1.250** | 5.906 | 1.250 | 2.756 | 3.150 | **EDNW13/EDEW13/EDMT13** |
| **IASRS4024R** | 3 | **1.500** | 5.906 | 1.500 | 1.969 | 3.937 | **EDNW13/EDEW13/EDMT13** |

## ASRS - METRIC

| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| **ASRS0020** | 2 | **20** | 130 | 20 | 50 | 80 | **EPNW08/EPEW08** |
| **ASRS0025** | 2 | **25** | 140 | 25 | 60 | 80 | **EDNW10/EDEW10** |
| **ASRS4032** | 2 | **32** | 150 | 32 | 70 | 80 | **EDNW13/EDEW13/EDMT13** |
| **ASRS4040** | 3 | **40** | 150 | 42 | 50 | 100 | **EDNW13/EDEW13/EDMT13** |

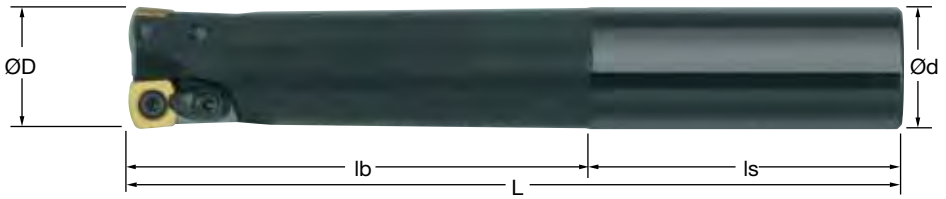
Inserts p. 113

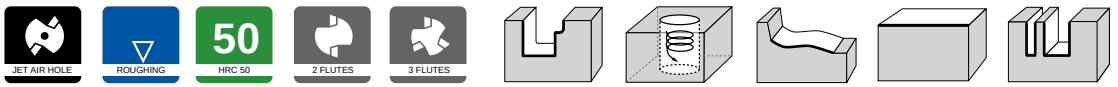
| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| **IASRS0012R** | 242-141 | | 104-T15 |
| **IASRS0016R** | 412-141 | CM3.5-141 | 104-T15 |
| **IASRS4020R** | 555-141 | CM5-147 | 105-T20 |
| **IASRS4024R** | 555-141 | CM5-147 | 105-T20 |
| **ASRS0020** | 242-141 | | 104-T15 |
| **ASRS0025** | 412-141 | CM3.5-141 | 104-T15 |
| **ASRS4032** | 555-141 | CM5-147 | 105-T20 |
| **ASRS4040** | 555-141 | CM5-147 | 105-T20 |

# IASR/ASR

**Shank Style**
**Long Length**

Advanced Engineering




| D | 0/-0.2 |
|---|---|

## IASRL - INCH

| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| **IASRL0012R** | 2 | **0.75** | 7.087 | 0.75 | 3.937 | 3.150 | **EPNW08/EPEW08** |
| **IASRL0016R** | 2 | **1.00** | 7.874 | 1.00 | 4.724 | 3.150 | **EDNW10/EDEW10** |
| **IASRL4020R** | 2 | **1.25** | 7.874 | 1.25 | 4.724 | 3.150 | **EDNW13/EDEW13/EDMT13** |
| **IASRL4024R** | 3 | **1.50** | 9.843 | 1.50 | 1.969 | 7.874 | **EDNW13/EDEW13/EDMT13** |

## ASRL - METRIC

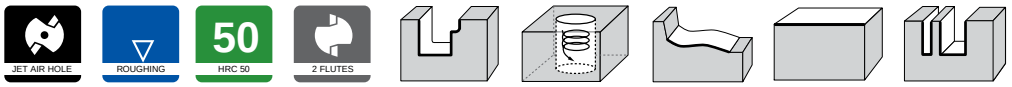
| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| **ASRL0020** | 2 | **20** | 180 | 20 | 100 | 80 | **EPNW08/EPEW08** |
| **ASRL0025** | 2 | **25** | 200 | 25 | 120 | 80 | **EDNW10/EDEW10** |
| **ASRL4032** | 2 | **32** | 200 | 32 | 120 | 80 | **EDNW13/EDEW13/EDMT13** |
| **ASRL4040** | 3 | **40** | 250 | 42 | 50 | 200 | **EDNW13/EDEW13/EDMT13** |

Inserts p. 113

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **IASRL0012R** | 242-141 | | 104-T15 |
| **IASRL0016R** | 412-141 | CM3.5-141 | 104-T15 |
| **IASRL4020R** | 555-141 | CM5-147 | 105-T20 |
| **IASRL4024R** | 555-141 | CM5-147 | 105-T20 |
| **ASRL0020** | 242-141 | | 104-T15 |
| **ASRL0025** | 412-141 | CM3.5-141 | 104-T15 |
| **ASRL4032** | 555-141 | CM5-147 | 105-T20 |
| **ASRL4040** | 555-141 | CM5-147 | 105-T20 |

# IASR/ASR

**Shank Style**
**Extra Long Length**


| D | 0/-0.2 |
|---|---|

## IASRE - INCH

| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| **IASRE0012R** | 2 | **0.750** | 9.843 | 0.750 | 5.118 | 4.724 | **EPNW08/EPEW08** |
| **IASRE0016R** | 2 | **1.000** | 11.811 | 1.000 | 7.087 | 4.724 | **EDNW10/EDEW10** |
| **IASRE4020R** | 2 | **1.250** | 11.811 | 1.250 | 7.087 | 4.724 | **EDNW13/EDEW13/EDMT13** |
| **IASRE4024R** | 2 | **1.500** | 11.811 | 1.500 | 1.969 | 9.843 | **EDNW13/EDEW13/EDMT13** |

## ASRE - METRIC

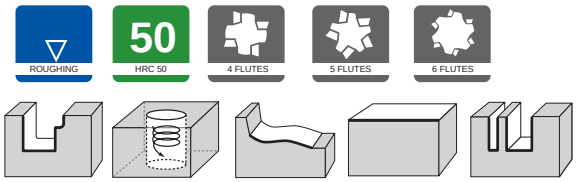
| Part No. | Flutes | ØD | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|
| **ASRE0020** | 2 | **20** | 250 | 20 | 130 | 120 | **EPNW08/EPEW08** |
| **ASRE0025** | 2 | **25** | 300 | 25 | 180 | 120 | **EDNW10/EDEW10** |
| **ASRE4032** | 2 | **32** | 300 | 32 | 180 | 120 | **EDNW13/EDEW13/EDMT13** |
| **ASRE4040** | 2 | **40** | 300 | 42 | 50 | 250 | **EDNW13/EDEW13/EDMT13** |

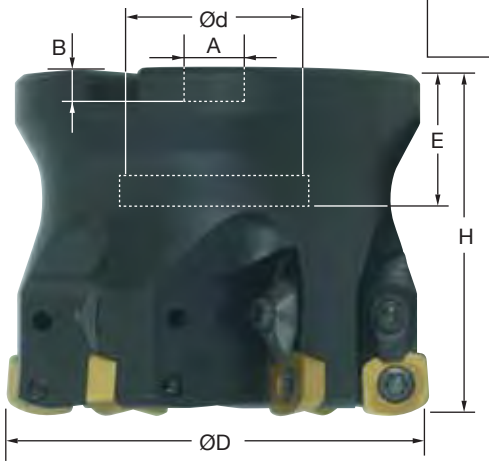
Inserts p. 113

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **IASRE0012R** | 242-141 | | 104-T15 |
| **IASRE0016R** | 412-141 | CM3.5-141 | 104-T15 |
| **IASRE4020R** | 555-141 | CM5-147 | 105-T20 |
| **IASRE4024R** | 555-141 | CM5-147 | 105-T20 |
| **ASRE0020** | 242-141 | | 104-T15 |
| **ASRE0025** | 412-141 | CM3.5-141 | 104-T15 |
| **ASRE4032** | 555-141 | CM5-147 | 105-T20 |
| **ASRE4040** | 555-141 | CM5-147 | 105-T20 |

# IASR/ASR

## Face Mill Style




Advanced Engineering

| D | 0/-0.2 |
|---|---|

### IASR-B - INCH

| Part No. | Flutes | ØD | H | R | Ød | E | A | B | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **IASR4032-4** | 4 | **2.0** | 1.969 | 0.591 | 0.75 | 0.748 | 0.32 | 0.197 | **EDNW13/EDEW13** |
| **IASR5040-4** | 4 | **2.5** | 1.969 | 0.591 | 0.75 | 1.024 | 0.32 | 0.197 | **EDNW15/EDEW15** |
| **IASR5048-5** | 5 | **3.0** | 1.969 | 0.591 | 1.00 | 1.378 | 0.38 | 0.236 | **EDNW15/EDEW15** |
| **IASR5064-6** | 6 | **4.0** | 1.969 | 0.591 | 1.50 | 1.378 | 0.63 | 0.394 | **EDNW15/EDEW15** |

### ASR-B - METRIC

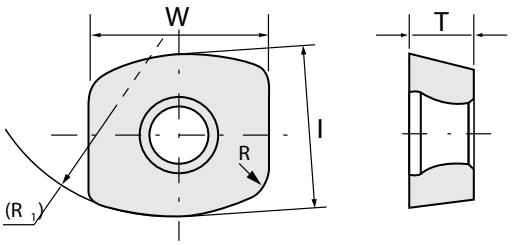
| Part No. | Flutes | ØD | H | R | Ød | E | A | B | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **ASR4050M-4** | 4 | **50** | 50 | 15 | 22 | 20.0 | 10.4 | 6.3 | **EDNW13/EDEW13** |
| **ASR5063M-4** | 4 | **63** | 50 | 15 | 22 | 20.0 | 10.4 | 6.3 | **EDNW15/EDEW15** |
| **ASR5080M-5** | 5 | **80** | 70 | 15 | 27 | 22.0 | 12.4 | 7.0 | **EDNW15/EDEW15** |
| **ASR5100M-6** | 6 | **100** | 70 | 15 | 32 | 25.5 | 14.4 | 8.0 | **EDNW15/EDEW15** |

Inserts p. 113

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **IASR4032-4** | 555-141 | CM5-147 | 105-T20 |
| **IASR5040-4** | 555-141 | CM5-147 | 105-T20 |
| **IASR5048-5** | 555-141 | CM5-147 | 105-T20 |
| **IASR5064-6** | 555-141 | CM5-147 | 105-T20 |
| **ASR4050M-4** | 555-141 | CM5-147 | 105-T20 |
| **ASR5063M-4** | 555-141 | CM5-147 | 105-T20 |
| **ASR5080M-5** | 555-141 | CM5-147 | 105-T20 |
| **ASR5100M-6** | 555-141 | CM5-147 | 105-T20 |

# IASR/ASR

## Inserts




| Part No. | JS4045 | CY250 | R | $R_1$ (mm) | l (mm) | T (mm) | W (mm) |
|---|---|---|---|---|---|---|---|
| **EPNW0803TN-10** | • | • | **3** | 10.0 | 8.1 | 3.2 | 7.94 |
| **EDNW10T3TN-10** | • | • | **3** | 10.0 | 10.0 | 4.0 | 10.00 |
| **EDNW13T4TN-10** | • | • | **3** | 10.0 | 13.5 | 5.6 | 12.70 |
| **EDNW13T4TN-15** | • | • | **3** | 15.0 | 13.5 | 5.6 | 12.70 |
| **EDNW15T4TN-10** | • | • | **3** | 10.0 | 15.0 | 5.6 | 14.00 |
| **EDNW15T4TN-15** | • | • | **3** | 15.0 | 15.0 | 5.6 | 14.00 |

All Inserts have two effective cutting edges

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **CY250**<br>P30-M30-K30 | **PCA Coating**<br>PVD | General purpose for steel | Uses TiAlN Coating; has wide cutting region range |

# IASR/ASR

## Cutting Conditions Modular + Shank Styles Inch

Advanced Engineering

| | | Ø | | | | 3/4" or 20mm | | | | 1" or 25mm |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | | | | 2 | | | | 2 |
| | | 3D | | | | | 3D | | | |
| | | General | Highspeed | 3D-5D | 5D-7D | 7D | General | Highspeed | 3D-5D | 5D-7D | 7D |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 2380 | 2860 | 2070 | 2070 | 1430 | 1910 | 2290 | 1650 | 1650 | 1140 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 150 | 225 | 130 | 98 | 45 | 120 | 180 | 104 | 78 | 36 |
| | fz(in/t) | 0.031 | 0.039 | 0.031 | 0.024 | 0.016 | 0.031 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | doc(in) | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 | 0.031 | 0.024 | 0.024 | 0.020 | 0.016 |
| CY250 | woc(in) | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 2070 | 2860 | 2070 | 2070 | 1430 | 1650 | 2290 | 1650 | 1650 | 1140 |
| | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 130 | 225 | 130 | 98 | 45 | 104 | 180 | 104 | 78 | 36 |
| | fz(in/t) | 0.031 | 0.039 | 0.031 | 0.024 | 0.016 | 0.031 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | doc(in) | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 | 0.024 | 0.016 | 0.020 | 0.016 | 0.012 |
| CY250 | woc(in) | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 1430 | 2070 | 1430 | 1430 | 1430 | 1140 | 1650 | 1140 | 1140 | 1140 |
| | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | Vf(in/min) | 67 | 130 | 67 | 67 | 45 | 54 | 104 | 54 | 54 | 36 |
| | fz(in/t) | 0.024 | 0.031 | 0.024 | 0.024 | 0.016 | 0.024 | 0.031 | 0.024 | 0.024 | 0.016 |
| JS4045 | doc(in) | 0.020 | 0.014 | 0.016 | 0.012 | 0.008 | 0.020 | 0.014 | 0.016 | 0.012 | 0.008 |
| CY250 | woc(in) | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 |
| Cast Iron | N(rpm) | 2380 | 2860 | 2070 | 2070 | 1430 | 1910 | 2290 | 1650 | 1650 | 1140 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 150 | 225 | 130 | 98 | 45 | 120 | 180 | 104 | 78 | 36 |
| | fz(in/t) | 0.031 | 0.039 | 0.031 | 0.024 | 0.016 | 0.031 | 0.039 | 0.031 | 0.024 | 0.016 |
| JS4045 | doc(in) | 0.039 | 0.031 | 0.031 | 0.024 | 0.020 | 0.039 | 0.031 | 0.031 | 0.024 | 0.020 |
| CY250 | woc(in) | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.787 | 0.787 | 0.787 | 0.787 | 0.787 |

# IASR/ASR

## Cutting Conditions Modular + Shank Styles Inch

Advanced Engineering

| | | Ø | | | | 1.25" or 32mm | | | | | 1.50" or 40mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | | | | 2 | | | | | 3 | | | | |
| | | 3D | | | | | 3D | | | | | | | | |
| | | General | Highspeed | 3D-5D | 5D-7D | 7D | General | Highspeed | 3D-5D | 5D-7D | 7D |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 176 | 282 | 122 | 81 | 28 | 211 | 338 | 146 | 97 | 33 |
| | fz(in/t) | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 |
| | doc(in) | 0.047 | 0.031 | 0.039 | 0.024 | 0.016 | 0.047 | 0.031 | 0.039 | 0.024 | 0.016 |
| JS4045 CY250 | woc(in) | 0.866 | 0.866 | 0.866 | 0.866 | 0.866 | 1.102 | 1.102 | 1.102 | 1.102 | 1.102 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 1290 | 1790 | 1290 | 1290 | 890 | 1030 | 1430 | 1030 | 1030 | 710 |
| | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 122 | 211 | 102 | 61 | 28 | 146 | 253 | 122 | 73 | 33 |
| | fz(in/t) | 0.047 | 0.059 | 0.039 | 0.024 | 0.016 | 0.047 | 0.059 | 0.039 | 0.024 | 0.016 |
| | doc(in) | 0.039 | 0.024 | 0.031 | 0.024 | 0.016 | 0.039 | 0.024 | 0.031 | 0.024 | 0.016 |
| JS4045 CY250 | woc(in) | 0.866 | 0.866 | 0.866 | 0.866 | 0.866 | 1.102 | 1.102 | 1.102 | 1.102 | 1.102 |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 890 | 1290 | 890 | 890 | 890 | 710 | 1030 | 710 | 710 | 710 |
| | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | Vf(in/min) | 56 | 102 | 42 | 42 | 28 | 67 | 122 | 50 | 50 | 33 |
| | fz(in/t) | 0.031 | 0.039 | 0.024 | 0.024 | 0.016 | 0.031 | 0.039 | 0.024 | 0.024 | 0.016 |
| | doc(in) | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 |
| JS4045 CY250 | woc(in) | 0.866 | 0.866 | 0.866 | 0.866 | 0.866 | 1.102 | 1.102 | 1.102 | 1.102 | 1.102 |
| Cast Iron | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 176 | 282 | 122 | 81 | 28 | 211 | 338 | 146 | 97 | 33 |
| | fz(in/t) | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 |
| | doc(in) | 0.059 | 0.047 | 0.039 | 0.024 | 0.016 | 0.059 | 0.047 | 0.039 | 0.024 | 0.016 |
| JS4045 CY250 | woc(in) | 0.866 | 0.866 | 0.866 | 0.866 | 0.866 | 1.102 | 1.102 | 1.102 | 1.102 | 1.102 |

# IASR/ASR

**Cutting Conditions**
**Face Mill Style**
**Inch**

Advanced Engineering

| | Ø | | | | | 2" or 50mm | | | | | 2.5" or 63mm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Flutes | | | | | 4 | | | | | 4 |
| | | 3D | | | | | 3D | | | | |
| | | General | Highspeed | 3D-5D | 5D-7D | 7D | General | Highspeed | 3D-5D | 5D-7D | 7D |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 950 | 1140 | 820 | 820 | 570 | 750 | 900 | 650 | 650 | 450 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 224 | 359 | 155 | 103 | 36 | 177 | 283 | 123 | 82 | 28 |
| | fz(in/t) | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 |
| | doc(in) | 0.059 | 0.047 | 0.039 | 0.024 | 0.016 | 0.059 | 0.047 | 0.039 | 0.024 | 0.016 |
| JS4045 CY250 | woc(in) | 1.378 | 1.378 | 1.378 | 1.378 | 1.378 | 1.772 | 1.772 | 1.772 | 1.772 | 1.772 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 820 | 1140 | 820 | 820 | 570 | 650 | 900 | 650 | 650 | 450 |
| | Vc(sfm) | 427 | 591 | 427 | 427 | 295 | 427 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 129 | 215 | 129 | 77 | 36 | 102 | 170 | 102 | 61 | 28 |
| | fz(in/t) | 0.039 | 0.047 | 0.039 | 0.024 | 0.016 | 0.039 | 0.047 | 0.039 | 0.024 | 0.016 |
| | doc(in) | 0.059 | 0.047 | 0.031 | 0.024 | 0.016 | 0.059 | 0.047 | 0.031 | 0.024 | 0.016 |
| JS4045 CY250 | woc(in) | 1.378 | 1.378 | 1.378 | 1.378 | 1.378 | 1.772 | 1.772 | 1.772 | 1.772 | 1.772 |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 570 | 820 | 570 | 570 | 570 | 450 | 650 | 450 | 450 | 450 |
| | Vc(sfm) | 295 | 427 | 295 | 295 | 295 | 295 | 427 | 295 | 295 | 295 |
| | Vf(in/min) | 72 | 129 | 54 | 54 | 36 | 57 | 102 | 43 | 43 | 28 |
| | fz(in/t) | 0.031 | 0.039 | 0.024 | 0.024 | 0.016 | 0.031 | 0.039 | 0.024 | 0.024 | 0.016 |
| | doc(in) | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 | 0.031 | 0.024 | 0.024 | 0.020 | 0.012 |
| JS4045 CY250 | woc(in) | 1.378 | 1.378 | 1.378 | 1.378 | 1.378 | 1.772 | 1.772 | 1.772 | 1.772 | 1.772 |
| Cast Iron | N(rpm) | 950 | 1140 | 820 | 820 | 570 | 750 | 900 | 650 | 650 | 450 |
| | Vc(sfm) | 492 | 591 | 427 | 427 | 295 | 492 | 591 | 427 | 427 | 295 |
| | Vf(in/min) | 224 | 359 | 155 | 103 | 36 | 177 | 283 | 123 | 82 | 28 |
| | fz(in/t) | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 | 0.059 | 0.079 | 0.047 | 0.031 | 0.016 |
| | doc(in) | 0.079 | 0.079 | 0.039 | 0.024 | 0.016 | 0.079 | 0.079 | 0.039 | 0.024 | 0.016 |
| JS4045 CY250 | woc(in) | 1.378 | 1.378 | 1.378 | 1.378 | 1.378 | 1.772 | 1.772 | 1.772 | 1.772 | 1.772 |

| | Ø | 3" or 80mm | | | 4" or 100mm | | |
|---|---|---|---|---|---|---|---|
| | No. of Flutes | 5 | | | 6 | | |
| | | 3D | | | 3D | | |
| | | General | Highspeed | 3D-5D | General | Highspeed | 3D-5D |
| Carbon Steel<br>Alloy Steel<br>30HRC | N(rpm) | 590 | 710 | 510 | 470 | 570 | 410 |
| | Vc(sfm) | 492 | 591 | 427 | 492 | 591 | 427 |
| | Vf(in/min) | 174 | 280 | 120 | 167 | 269 | 116 |
| | fz(in/t) | 0.059 | 0.079 | 0.047 | 0.059 | 0.079 | 0.047 |
| JS4045 | doc(in) | 0.059 | 0.047 | 0.039 | 0.059 | 0.047 | 0.039 |
| CY250 | woc(in) | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Tool Steel<br>Alloy Steel<br>30-40HRC | N(rpm) | 510 | 710 | 510 | 410 | 570 | 410 |
| | Vc(sfm) | 427 | 591 | 427 | 427 | 591 | 427 |
| | Vf(in/min) | 100 | 168 | 100 | 97 | 161 | 97 |
| | fz(in/t) | 0.039 | 0.047 | 0.039 | 0.039 | 0.047 | 0.039 |
| JS4045 | doc(in) | 0.059 | 0.047 | 0.031 | 0.059 | 0.047 | 0.031 |
| CY250 | woc(in) | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Tool Steel<br>Pre-hardened<br>40-50HRC | N(rpm) | 350 | 510 | 350 | 280 | 410 | 280 |
| | Vc(sfm) | 295 | 427 | 295 | 295 | 427 | 295 |
| | Vf(in/min) | 55 | 100 | 41 | 53 | 97 | 39 |
| | fz(in/t) | 0.031 | 0.039 | 0.024 | 0.031 | 0.039 | 0.024 |
| JS4045 | doc(in) | 0.031 | 0.024 | 0.024 | 0.031 | 0.024 | 0.024 |
| CY250 | woc(in) | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |
| Cast Iron | N(rpm) | 590 | 710 | 510 | 470 | 570 | 410 |
| | Vc(sfm) | 492 | 591 | 427 | 492 | 591 | 427 |
| | Vf(in/min) | 174 | 280 | 120 | 167 | 269 | 116 |
| | fz(in/t) | 0.059 | 0.079 | 0.047 | 0.059 | 0.079 | 0.047 |
| JS4045 | doc(in) | 0.079 | 0.079 | 0.039 | 0.079 | 0.079 | 0.039 |
| CY250 | woc(in) | 2.205 | 2.205 | 2.205 | 2.756 | 2.756 | 2.756 |

# IASR/ASR

## Cutting Conditions Modular + Shank Styles Metric

Advanced Engineering

| | Ø | 3/4" or 20mm | | | | | 1" or 25mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. of Flutes | 2 | | | | | 2 | | | | |
| | | 3D | | | | | 3D | | | | |
| | | General | Highspeed | 3D-5D | 5D-7D | 7D | General | Highspeed | 3D-5D | 5D-7D | 7D |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 2380 | 2860 | 2070 | 2070 | 1430 | 1910 | 2290 | 1650 | 1650 | 1140 |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 3800 | 5720 | 3310 | 2480 | 1140 | 3050 | 4580 | 2640 | 1980 | 910 |
| | fz(mm/t) | 0.80 | 1.00 | 0.80 | 0.60 | 0.40 | 0.80 | 1.00 | 0.80 | 0.60 | 0.40 |
| JS4045 | doc(mm) | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 | 0.8 | 0.6 | 0.6 | 0.5 | 0.4 |
| CY250 | woc(mm) | 15 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 20 | 20 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 2070 | 2860 | 2070 | 2070 | 1430 | 1650 | 2290 | 1650 | 1650 | 1140 |
| | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 3310 | 5720 | 3310 | 2480 | 1140 | 2640 | 4580 | 2640 | 1980 | 910 |
| | fz(mm/t) | 0.80 | 1.00 | 0.80 | 0.60 | 0.40 | 0.80 | 1.00 | 0.80 | 0.60 | 0.40 |
| JS4045 | doc(mm) | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 |
| CY250 | woc(mm) | 15 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 20 | 20 |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 1430 | 2070 | 1430 | 1430 | 1430 | 1140 | 1650 | 1140 | 1140 | 1140 |
| | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 |
| | Vf(mm/min) | 1710 | 3310 | 1710 | 1710 | 1140 | 1360 | 2640 | 1360 | 1360 | 910 |
| | fz(mm/t) | 0.60 | 0.80 | 0.60 | 0.60 | 0.40 | 0.60 | 0.80 | 0.60 | 0.60 | 0.40 |
| JS4045 | doc(mm) | 0.5 | 0.35 | 0.4 | 0.3 | 0.2 | 0.5 | 0.35 | 0.4 | 0.3 | 0.2 |
| CY250 | woc(mm) | 15 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 20 | 20 |
| Cast Iron | N(rpm) | 2380 | 2860 | 2070 | 2070 | 1430 | 1910 | 2290 | 1650 | 1650 | 1140 |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 3800 | 5720 | 3310 | 2480 | 1140 | 3050 | 4580 | 2640 | 1980 | 910 |
| | fz(mm/t) | 0.80 | 1.00 | 0.80 | 0.60 | 0.40 | 0.80 | 1.00 | 0.80 | 0.60 | 0.40 |
| JS4045 | doc(mm) | 1 | 0.8 | 0.8 | 0.6 | 0.5 | 1 | 0.8 | 0.8 | 0.6 | 0.5 |
| CY250 | woc(mm) | 15 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 20 | 20 |

| | | Ø | | | | 1.25" or 32mm | | | | | 1.50" or 40mm | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | | | | 2 | | | | | 3 | | | | |
| | | 3D | | | | | 3D | | | | | | | | |
| | | General | Highspeed | 3D-5D | 5D-7D | 7D | General | Highspeed | 3D-5D | 5D-7D | 7D |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 4470 | 7160 | 3090 | 2060 | 710 | 5350 | 8580 | 3700 | 2470 | 850 |
| | fz(mm/t) | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 |
| JS4045 | doc(mm) | 1.2 | 0.8 | 1 | 0.6 | 0.4 | 1.2 | 0.8 | 1 | 0.6 | 0.4 |
| CY250 | woc(mm) | 22 | 22 | 22 | 22 | 22 | 28 | 28 | 28 | 28 | 28 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 1290 | 1790 | 1290 | 1290 | 890 | 1030 | 1430 | 1030 | 1030 | 710 |
| | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 3090 | 5370 | 2580 | 1540 | 710 | 3700 | 6430 | 3090 | 1850 | 850 |
| | fz(mm/t) | 1.20 | 1.50 | 1.00 | 0.60 | 0.40 | 1.20 | 1.50 | 1.00 | 0.60 | 0.40 |
| JS4045 | doc(mm) | 1 | 0.6 | 0.8 | 0.6 | 0.4 | 1 | 0.6 | 0.8 | 0.6 | 0.4 |
| CY250 | woc(mm) | 22 | 22 | 22 | 22 | 22 | 28 | 28 | 28 | 28 | 28 |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 890 | 1290 | 890 | 890 | 890 | 710 | 1030 | 710 | 710 | 710 |
| | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 |
| | Vf(mm/min) | 1420 | 2580 | 1060 | 1060 | 710 | 1700 | 3090 | 1270 | 1270 | 850 |
| | fz(mm/t) | 0.80 | 1.00 | 0.60 | 0.60 | 0.40 | 0.80 | 1.00 | 0.60 | 0.60 | 0.40 |
| JS4045 | doc(mm) | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 |
| CY250 | woc(mm) | 22 | 22 | 22 | 22 | 22 | 28 | 28 | 28 | 28 | 28 |
| Cast Iron | N(rpm) | 1490 | 1790 | 1290 | 1290 | 890 | 1190 | 1430 | 1030 | 1030 | 710 |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 |
| | Vf(mm/min) | 4470 | 7160 | 3090 | 2060 | 710 | 5350 | 8580 | 3700 | 2470 | 850 |
| | fz(mm/t) | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 |
| JS4045 | doc(mm) | 1.5 | 1.2 | 1 | 0.6 | 0.4 | 1.5 | 1.2 | 1 | 0.6 | 0.4 |
| CY250 | woc(mm) | 22 | 22 | 22 | 22 | 22 | 28 | 28 | 28 | 28 | 28 |

# IASR/ASR

**Cutting Conditions**
**Face Mill Style**
**Metric**

Advanced Engineering

| | | Ø | | | | 2" or 50mm | | | | | 2.5" or 63mm | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Flutes | | | | 4 | | | | | 4 | |
| | | 3D | | | | | 3D | | | | | |
| | | General | Highspeed | 3D-5D | 5D-7D | 7D | General | Highspeed | 3D-5D | 5D-7D | 7D | |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 950 | 1140 | 820 | 820 | 570 | 750 | 900 | 650 | 650 | 450 | |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 | |
| | Vf(mm/min) | 5700 | 9120 | 3930 | 2620 | 910 | 4500 | 7200 | 3120 | 2080 | 720 | |
| | fz(mm/t) | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 | |
| JS4045 | doc(mm) | 1.5 | 1.2 | 1 | 0.6 | 0.4 | 1.5 | 1.2 | 1 | 0.6 | 0.4 | |
| CY250 | woc(mm) | 35 | 35 | 35 | 35 | 35 | 45 | 45 | 45 | 45 | 45 | |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 820 | 1140 | 820 | 820 | 570 | 650 | 900 | 650 | 650 | 450 | |
| | Vc(m/min) | 130 | 180 | 130 | 130 | 90 | 130 | 180 | 130 | 130 | 90 | |
| | Vf(mm/min) | 3280 | 5470 | 3280 | 1960 | 910 | 2600 | 4320 | 2600 | 1560 | 720 | |
| | fz(mm/t) | 1.00 | 1.20 | 1.00 | 0.60 | 0.40 | 1.00 | 1.20 | 1.00 | 0.60 | 0.40 | |
| JS4045 | doc(mm) | 1.5 | 1.2 | 0.8 | 0.6 | 0.4 | 1.5 | 1.2 | 0.8 | 0.6 | 0.4 | |
| CY250 | woc(mm) | 35 | 35 | 35 | 35 | 35 | 45 | 45 | 45 | 45 | 45 | |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 570 | 820 | 570 | 570 | 570 | 450 | 650 | 450 | 450 | 450 | |
| | Vc(m/min) | 90 | 130 | 90 | 90 | 90 | 90 | 130 | 90 | 90 | 90 | |
| | Vf(mm/min) | 1820 | 3280 | 1360 | 1360 | 910 | 1440 | 2600 | 1080 | 1080 | 720 | |
| | fz(mm/t) | 0.80 | 1.00 | 0.60 | 0.60 | 0.40 | 0.80 | 1.00 | 0.60 | 0.60 | 0.40 | |
| JS4045 | doc(mm) | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 | 0.8 | 0.6 | 0.6 | 0.5 | 0.3 | |
| CY250 | woc(mm) | 35 | 35 | 35 | 35 | 35 | 45 | 45 | 45 | 45 | 45 | |
| Cast Iron | N(rpm) | 950 | 1140 | 820 | 820 | 570 | 750 | 900 | 650 | 650 | 450 | |
| | Vc(m/min) | 150 | 180 | 130 | 130 | 90 | 150 | 180 | 130 | 130 | 90 | |
| | Vf(mm/min) | 5700 | 9120 | 3930 | 2620 | 910 | 4500 | 7200 | 3120 | 2080 | 720 | |
| | fz(mm/t) | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 | 1.50 | 2.00 | 1.20 | 0.80 | 0.40 | |
| JS4045 | doc(mm) | 2 | 2 | 1 | 0.6 | 0.4 | 2 | 2 | 1 | 0.6 | 0.4 | |
| CY250 | woc(mm) | 35 | 35 | 35 | 35 | 35 | 45 | 45 | 45 | 45 | 45 | |

## Cutting Conditions
## Face Mill Style
## Metric



| | Ø | 3" or 80mm | | | 4" or 100mm | | |
|---|---|---|---|---|---|---|---|
| | No. of Flutes | 5 | | | 6 | | |
| | | 3D | | | 3D | | |
| | | General | Highspeed | 3D-5D | General | Highspeed | 3D-5D |
| Carbon Steel Alloy Steel 30HRC | N(rpm) | 590 | 710 | 510 | 470 | 570 | 410 |
| | Vc(m/min) | 150 | 180 | 130 | 150 | 180 | 130 |
| | Vf(mm/min) | 4420 | 7100 | 3060 | 4230 | 6840 | 2950 |
| | fz(mm/t) | 1.50 | 2.00 | 1.20 | 1.50 | 2.00 | 1.20 |
| JS4045 CY250 | doc(mm) | 1.5 | 1.2 | 1 | 1.5 | 1.2 | 1 |
| | woc(mm) | 56 | 56 | 56 | 70 | 70 | 70 |
| Tool Steel Alloy Steel 30-40HRC | N(rpm) | 510 | 710 | 510 | 410 | 570 | 410 |
| | Vc(m/min) | 130 | 180 | 130 | 130 | 180 | 130 |
| | Vf(mm/min) | 2550 | 4260 | 2550 | 2460 | 4100 | 2460 |
| | fz(mm/t) | 1.00 | 1.20 | 1.00 | 1.00 | 1.20 | 1.00 |
| JS4045 CY250 | doc(mm) | 1.5 | 1.2 | 0.8 | 1.5 | 1.2 | 0.8 |
| | woc(mm) | 56 | 56 | 56 | 70 | 70 | 70 |
| Tool Steel Pre-hardened 40-50HRC | N(rpm) | 350 | 510 | 350 | 280 | 410 | 280 |
| | Vc(m/min) | 90 | 130 | 90 | 90 | 130 | 90 |
| | Vf(mm/min) | 1400 | 2550 | 1050 | 1340 | 2460 | 1000 |
| | fz(mm/t) | 0.80 | 1.00 | 0.60 | 0.80 | 1.00 | 0.60 |
| JS4045 CY250 | doc(mm) | 0.8 | 0.6 | 0.6 | 0.8 | 0.6 | 0.6 |
| | woc(mm) | 56 | 56 | 56 | 70 | 70 | 70 |
| Cast Iron | N(rpm) | 590 | 710 | 510 | 470 | 570 | 410 |
| | Vc(m/min) | 150 | 180 | 130 | 150 | 180 | 130 |
| | Vf(mm/min) | 4420 | 7100 | 3060 | 4230 | 6840 | 2950 |
| | fz(mm/t) | 1.50 | 2.00 | 1.20 | 1.50 | 2.00 | 1.20 |
| JS4045 CY250 | doc(mm) | 2 | 2 | 1 | 2 | 2 | 1 |
| | woc(mm) | 56 | 56 | 56 | 70 | 70 | 70 |

# IASM/ASM

## Small Diameter, Ultra High-Efficiency Indexable End Mills

SHANK STYLE

MODULAR STYLE

## FEATURES

Small diameter sizes from 3/8” to 3/4” (10mm to 20mm) can be used instead of solid end mills

JDMT inserts are ideal for shoulder cutting

EDMT-type inserts are ideal for low-depth, high feed rate machining

All body styles can utilize both styles of inserts

# FEATURES

## 1. EDMT-Type Insert for Machining Efficiency

Utilizes R2.0 cutting edge shape.

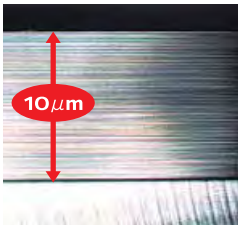
- Does not leave excess at edges
- Low cutting resistance

Work ：S50C
Tools ：ASMM0710R-2(ϕ10-2NT)
+ASC10-6.5-114-49
Cutting Conditions：Vc=160m/min
Vf=6115mm/min
ap×ae=0.25×5mm
Tool overhang：80mm

## 2. JDMT-Type Insert for High-Grade Machined Surfaces

Utilizes Fine Wall (FW) shape

- Low unevenness of machined surfaces
- Low burning



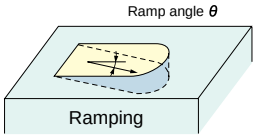

Work ：S50C
Tools ：ASM0712S12R-2(ϕ12-3NT)
Cutting Conditions：Vc=200m/min
Vf=800mm/min
ap×ae=5×0.5mm×2
Tool overhang：25mm

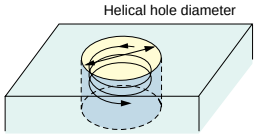
## 3. Direct Milling

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.

| | EDMT | | | | JDMT | | | |
|---|---|---|---|---|---|---|---|---|
| **Dia** | 10mm | 12mm | 16mm | 20mm | 10mm | 12mm | 16mm | 20mm |
| | 0.375in | 0.5in | 0.625in | 0.75in | 0.375in | 0.5in | 0.625in | 0.75in |
| **Max. Ramp Angle** | 6.6° | 4.1° | 2.2° | 1.4° | 7.3° | 5.0° | 2.9° | 2.0° |
| **Helical Hole Dia** | 13-19mm | 17-23mm | 25-31mm | 33-39mm | 13-19mm | 17-23mm | 25-31mm | 33-39mm |
| | 0.493 - 0.729in | 0.697- 0.905in | 0.979- 1.215in | 1.262- 1.498in | 0.493- 0.729in | 0.697- 0.905in | 0.979- 1.215in | 1.262- 1.498in |

【Note】●The ramp angle θ should be set within the ranges listed above. Use at ramp angles of 1° or less is recommended.



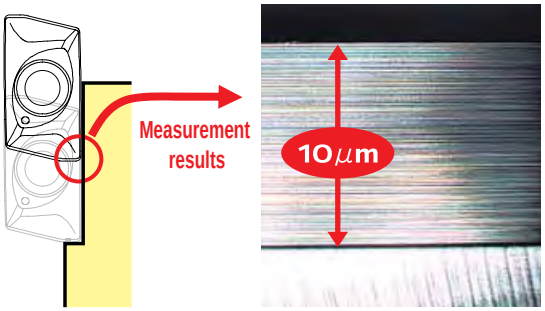



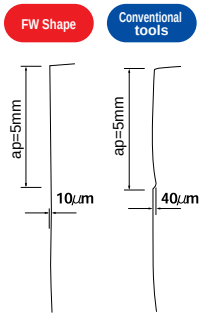

Helical milling

## 4. Wall Surface Grade

By using the Fine Wall (FW) shape, a smooth machined wall surface can be achieved by a multi step cutting.

Work ： S50C
Tool ： ASM0712S12R-2 (ϕ12-3NT)
Cutting Conditions ： Vc=200m/min
Vf=800mm/min
ap × ae=5 × 0.5mm × 2
Tool overhang: 25mm, Dry



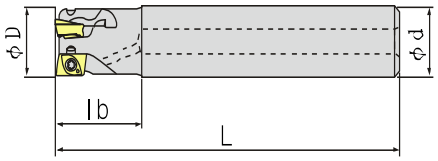



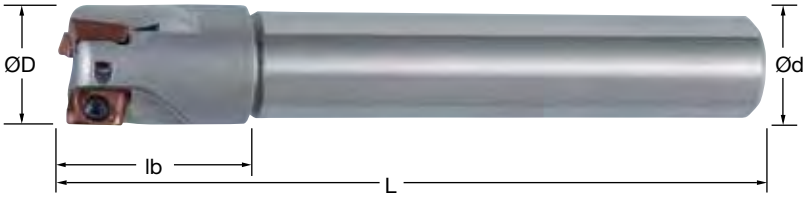

(Length:Width ratio=1:5)

# IASM/ASM

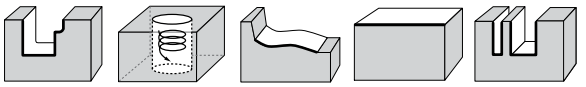
**Shank Style**
**Regular Length**

Advanced Engineering







| D | 0/-0.2 |
|---|---|

## IASM-Inch

| Part No. | Flutes | ØD | L | Ød | lb | Insert |
|---|---|---|---|---|---|---|
| **IASM0706S06R-2** | 2 | **0.375** | 3.000 | 0.375 | 0.750 | JDMT0702xxR, EDMT070220R(-T) |
| **IASM0708S08R-3** | 3 | **0.500** | 3.000 | 0.500 | 0.750 | JDMT0702xxR, EDMT070220R(-T) |
| **IASM0710S10R-4** | 4 | **0.625** | 3.500 | 0.625 | 1.000 | JDMT0702xxR, EDMT070220R(-T) |
| **IASM0712S12R-5** | 5 | **0.750** | 4.000 | 0.750 | 1.000 | JDMT0702xxR, EDMT070220R(-T) |
| **IASML0710S10R-4** | 4 | **0.625** | 4.500 | 0.625 | 2.000 | JDMT0702xxR, EDMT070220R(-T) |
| **IASML0712S12R-5** | 5 | **0.750** | 5.500 | 0.750 | 2.500 | JDMT0702xxR, EDMT070220R(-T) |

## ASM-Metric

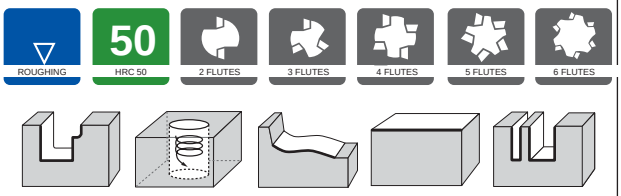
| Part No. | Flutes | ØD | L | Ød | lb | Insert |
|---|---|---|---|---|---|---|
| **ASM0710S10R-2** | 2 | **10** | 80 | 10 | 20 | JDMT0702xxR, EDMT070220R(-T) |
| **ASM0712S12R-3** | 3 | **12** | 80 | 12 | 20 | JDMT0702xxR, EDMT070220R(-T) |
| **ASM0716S16R-4** | 4 | **16** | 90 | 16 | 25 | JDMT0702xxR, EDMT070220R(-T) |
| **ASM0720S20R-5** | 5 | **20** | 105 | 20 | 25 | JDMT0702xxR, EDMT070220R(-T) |
| **ASML0716S16R-4** | 4 | **16** | 115 | 16 | 50 | JDMT0702xxR, EDMT070220R(-T) |
| **ASML0720S20R-5** | 5 | **20** | 140 | 20 | 60 | JDMT0702xxR, EDMT070220R(-T) |

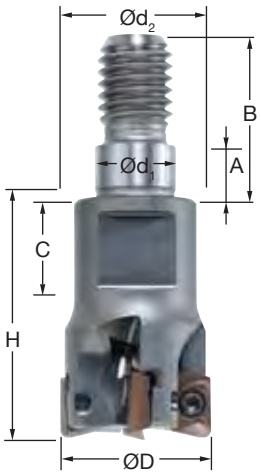
Inserts p. 126

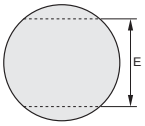
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ALL SIZES** | 240-140 | 104-T6 |

# IASM/ASM

## Modular Style




| D | 0/-0.2 |
|---|---|

**ASRM - METRIC**

| Part No. | Flutes | ØD | H | Ød1 | M | Ød2 | A | B | C | E | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASMM0710R-2** | 2 | **10** | 20 | 6.5 | M6 | 9.4 | 5.5 | 14.5 | 5 | 7 | JDMT0702xxR, EDMT070220R(-T) |
| **ASMM0712R-3** | 3 | **12** | 20 | 6.5 | M6 | 9.8 | 5.5 | 14.5 | 5 | 7 | JDMT0702xxR, EDMT070220R(-T) |
| **ASMM0716R-4** | 4 | **16** | 25 | 8.5 | M8 | 12.8 | 5.5 | 17 | 8 | 10 | JDMT0702xxR, EDMT070220R(-T) |
| **ASMM0720R-5** | 5 | **20** | 30 | 10.5 | M10 | 17.8 | 5.5 | 19 | 10 | 15 | JDMT0702xxR, EDMT070220R(-T) |

Modular Shanks on p. 163

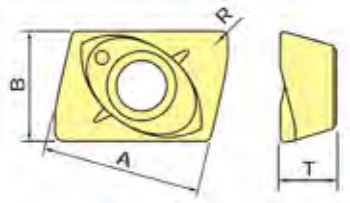
Inserts p. 126

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ALL SIZES** | 240-140 | 104-T6 |

# IASM/ASM

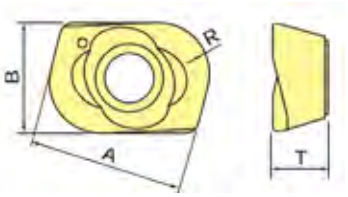
## Inserts

Advanced Engineering




Type A

JDMT07020XR
Insert with 5mm flute length for shoulder milling




Type B

EDMT070220R(-T) Insert with 2mm corner R for high feed cutting.

| Part No. | JX1020 | JP4020 | PTH30E | JM4060 | SD5010 | A (mm) | B (mm) | R (mm) | T (mm) | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| JDMT070202R | △ | • | • | • | • | 6.4 | 4.3 | **0.2** | 2.45 | A |
| JDMT070204R | △ | • | • | • | • | 6.4 | 4.3 | **0.4** | 2.45 | A |
| JDMT070204R | △ | • | • | • | • | 6.4 | 4.3 | **0.8** | 2.45 | A |
| EDMT070220R-T | △ | • | | • | | 6.4 | 4.3 | **2.0** | 2.5 | B |
| EDMT070220R | △ | • | | • | | 6.4 | 4.3 | **2.0** | 2.5 | B |

All inserts have two effective cutting edges

There are two types of EDMT Inserts:
– Standard Type (EDMT070220R-T)
– Low-Resistance Type (EDMT070220R) which reduces cutting resistance by approximately 10%

△ = **Item will be discontinued when the stock is out**

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JX1020**<br>P10-M10-K10 | **JX Coating**<br>PVD | High speed machining for steel | Excellent for high speed machining of steel |
| **JP4020**<br>P10-M10-K10 | **JP Coating**<br>PVD | For pre-hardened steel (40-50HRC) | Uses coating with excellent shock resistance, making it superior for cutting prehardened steel |
| **PTH30E**<br>K30 | **TH Coating**<br>(TiSiN) PVD | General purpose for steel | Uses moderate substrate, multi purpose grade |
| **JM4060**<br>P40-M40 | **JM Coating**<br>PVD | For wet general cutting of steel, stainless steel | Newly developed PVD technology improves adhesion of membranes to reduce peeling of membranes due to welding |
| **SD5010**<br>N10 | **SD Coating**<br>PVD | For aluminium alloys and nonferrous metals | The hydrogen-free DLC coating comes close to that of diamonds. Hardness: more than 60GPa |

# IASM/ASM

## Cutting Conditions
## Inch + Metric
## EDMT (High Feed MIlling)

Advanced Engineering

### Inch

| | | φØ | 0.375 | 0.5 | 0.625 | 0.75 |
|---|---|---|---|---|---|---|
| | | Flutes | 2 | 3 | 4 | 5 |
| Carboh Steel<br>Alloy Steel<br>< 30HRc | | Vc range | | | | 328 - 590 sfm |
| | | N(rpm) | 4020 | 3010 | 2410 | 2010 |
| | | Vc(sfm) | 394 | 394 | 394 | 394 |
| | | Vf(in/min) | 189 | 213 | 302 | 315 |
| | | fz(in/t) | 0.0236 | 0.0236 | 0.0314 | 0.0314 |
| JP4020 | | doc(in) | 0.012 | 0.012 | 0.012 | 0.012 |
| JX1020 | | woc(in) | 0.197 | 0.276 | 0.394 | 0.433 |
| Pre-hardened Steel<br>Alloy Steel<br>Die Tool Steel<br>30-40HRc | | Vc range | | | | 328 - 525 sfm |
| | | N(rpm) | 3680 | 2760 | 2210 | 1840 |
| | | Vc(sfm) | 361 | 361 | 361 | 361 |
| | | Vf(in/min) | 173 | 195 | 277 | 288 |
| | | fz(in/t) | 0.0236 | 0.0236 | 0.0314 | 0.0314 |
| JP4020 | | doc(in) | 0.012 | 0.012 | 0.012 | 0.012 |
| JX1020 | | woc(in) | 0.197 | 0.276 | 0.394 | 0.433 |
| Pre-hardened Steel<br>Alloy Steel<br>Die Tool Steel<br>40-50HRc | | Vc range | | | | 262 - 394 sfm |
| | | N(rpm) | 3010 | 2260 | 1810 | 1510 |
| | | Vc(sfm) | 295 | 295 | 295 | 295 |
| | | Vf(in/min) | 94 | 106 | 170 | 178 |
| | | fz(in/t) | 0.0157 | 0.0157 | 0.0236 | 0.0236 |
| JP4020 | | doc(in) | 0.012 | 0.012 | 0.012 | 0.012 |
| JX1020 | | woc(in) | 0.197 | 0.276 | 0.394 | 0.433 |
| Stainless Steel | | Vc range | | | | 328 - 590 sfm |
| | | N(rpm) | 4020 | 3010 | 2410 | 2010 |
| | | Vc(sfm) | 394 | 394 | 394 | 394 |
| | | Vf(in/min) | 189 | 213 | 302 | 315 |
| | | fz(in/t) | 0.0236 | 0.0236 | 0.0314 | 0.0314 |
| JM4060 | | doc(in) | 0.012 | 0.012 | 0.012 | 0.012 |
| JP4020 | | woc(in) | 0.197 | 0.276 | 0.394 | 0.433 |
| Cast Iron | | Vc range | | | | 394 - 722 sfm |
| | | N(rpm) | 5020 | 3770 | 3010 | 2510 |
| | | Vc(sfm) | 492 | 492 | 492 | 492 |
| | | Vf(in/min) | 236 | 266 | 378 | 394 |
| | | fz(in/t) | 0.0236 | 0.0236 | 0.0314 | 0.0314 |
| JP4020 | | doc(in) | 0.012 | 0.012 | 0.012 | 0.012 |
| JX1020 | | woc(in) | 0.197 | 0.276 | 0.394 | 0.433 |

### Metric

| | φØ | 10 | 12 | 16 | 20 |
|---|---|---|---|---|---|
| | Flutes | 2 | 3 | 4 | 5 |
| | Vc range | | | | 100 - 180 m/min |
| | N(rpm) | 3830 | 3190 | 2390 | 1920 |
| | Vc(m/min) | 120 | 120 | 120 | 120 |
| | Vf(mm/min) | 4600 | 5740 | 7650 | 7680 |
| | fz(mm/t) | 0.60 | 0.60 | 0.80 | 0.80 |
| | doc(mm) | 0.3 | 0.3 | 0.3 | 0.3 |
| | woc(mm) | 5 | 7 | 10 | 11 |
| | Vc range | | | | 100 - 160 m/min |
| | N(rpm) | 3510 | 2920 | 2190 | 1760 |
| | Vc(m/min) | 110 | 110 | 110 | 110 |
| | Vf(mm/min) | 4210 | 5260 | 7010 | 7040 |
| | fz(mm/t) | 0.60 | 0.60 | 0.80 | 0.80 |
| | doc(mm) | 0.3 | 0.3 | 0.3 | 0.3 |
| | woc(mm) | 5 | 7 | 10 | 11 |
| | Vc range | | | | 80 - 120 m/min |
| | N(rpm) | 2870 | 2390 | 1800 | 1440 |
| | Vc(m/min) | 90 | 90 | 90 | 90 |
| | Vf(mm/min) | 2300 | 2870 | 4320 | 4320 |
| | fz(mm/t) | 0.40 | 0.40 | 0.60 | 0.60 |
| | doc(mm) | 0.3 | 0.3 | 0.3 | 0.3 |
| | woc(mm) | 5 | 7 | 10 | 11 |
| | Vc range | | | | 100 - 180 m/min |
| | N(rpm) | 3830 | 3190 | 2390 | 1920 |
| | Vc(m/min) | 120 | 120 | 120 | 120 |
| | Vf(mm/min) | 4600 | 5740 | 7650 | 7680 |
| | fz(mm/t) | 0.60 | 0.60 | 0.80 | 0.80 |
| | doc(mm) | 0.3 | 0.3 | 0.3 | 0.3 |
| | woc(mm) | 5 | 7 | 10 | 11 |
| | Vc range | | | | 120 - 220 m/min |
| | N(rpm) | 4780 | 3990 | 2990 | 2390 |
| | Vc(m/min) | 150 | 150 | 150 | 150 |
| | Vf(mm/min) | 5740 | 7180 | 9570 | 9560 |
| | fz(mm/t) | 0.60 | 0.60 | 0.80 | 0.80 |
| | doc(mm) | 0.3 | 0.3 | 0.3 | 0.3 |
| | woc(mm) | 5 | 7 | 10 | 11 |

# IASM/ASM

**Cutting Conditions**
**Inch + Metric**
**JDMT (Side MIlling)**

Advanced Engineering

## Inch

| | | φØ | 0.375 | 0.5 | 0.625 | 0.75 |
|---|---|---|---|---|---|---|
| | | Flutes | 2 | 3 | 4 | 5 |
| Carboh Steel<br>Alloy Steel<br>< 30HRc | | Vc,fz range | Vc=492-656sfm, fz=0.0016-0.0035in/t | | | |
| | | N(rpm) | 6020 | 4520 | 3620 | 3010 |
| | | Vc(sfm) | 591 | 591 | 591 | 591 |
| | | Vf(in/min) | 32 | 36 | 39 | 40 |
| JP4020 | | fz(in/t) | 0.0027 | 0.0027 | 0.0027 | 0.0027 |
| JX1020 | | doc(in) | 0.118 | 0.118 | 0.157 | 0.157 |
| PTH30E | | woc(in) | 0.079 | 0.079 | 0.079 | 0.079 |
| Pre-hardened Steel<br>Alloy Steel<br>Die Tool Steel<br>30-40HRc | | Vc,fz range | Vc=328-492sfm, fz=0.0016-0.0028in/t | | | |
| | | N(rpm) | 4020 | 3010 | 2410 | 2010 |
| | | Vc(sfm) | 394 | 394 | 394 | 394 |
| | | Vf(in/min) | 18 | 20 | 22 | 23 |
| JP4020 | | fz(in/t) | 0.0023 | 0.0023 | 0.0023 | 0.0023 |
| JX1020 | | doc(in) | 0.118 | 0.118 | 0.157 | 0.157 |
| PTH30E | | woc(in) | 0.079 | 0.079 | 0.079 | 0.079 |
| Pre-hardened Steel<br>Alloy Steel<br>Die Tool Steel<br>40-50HRc | | Vc,fz range | Vc=262-394sfm, fz=0.0016-0.0028in/t | | | |
| | | N(rpm) | 3010 | 2260 | 1810 | 1510 |
| | | Vc(sfm) | 295 | 295 | 295 | 295 |
| | | Vf(in/min) | 13 | 15 | 16 | 17 |
| JP4020 | | fz(in/t) | 0.0023 | 0.0023 | 0.0023 | 0.0023 |
| JX1020 | | doc(in) | 0.118 | 0.118 | 0.157 | 0.157 |
| PTH30E | | woc(in) | 0.079 | 0.079 | 0.079 | 0.079 |
| Stainless Steel | | Vc,fz range | Vc=426-590sfm, fz=0.0016-0.0035in/t | | | |
| | | N(rpm) | 5020 | 3770 | 3010 | 2510 |
| | | Vc(sfm) | 492 | 492 | 492 | 492 |
| | | Vf(in/min) | 23 | 26 | 27 | 28 |
| PTH30E | | fz(in/t) | 0.0023 | 0.0023 | 0.0023 | 0.0023 |
| JM4060 | | doc(in) | 0.118 | 0.118 | 0.157 | 0.157 |
| JP4020 | | woc(in) | 0.079 | 0.079 | 0.079 | 0.079 |
| Cast Iron | | Vc,fz range | Vc=426-590sfm, fz=0.0016-0.0047in/t | | | |
| | | N(rpm) | 5020 | 3770 | 3010 | 2510 |
| | | Vc(sfm) | 492 | 492 | 492 | 492 |
| | | Vf(in/min) | 27 | 30 | 32 | 33 |
| | | fz(in/t) | 0.0027 | 0.0027 | 0.0027 | 0.0027 |
| JP4020 | | doc(in) | 0.118 | 0.118 | 0.157 | 0.157 |
| PTH30E | | woc(in) | 0.079 | 0.079 | 0.079 | 0.079 |
| Aluminum Alloy<br>(wet condition) | | Vc, fz range | Vc=655-1638sfm/min, fz=0.0016-0.0047in/t | | | |
| | | N(rpm) | 10040 | 7540 | 6020 | 5020 |
| | | Vc(sfm) | 984 | 984 | 984 | 984 |
| | | Vf(in/min) | 54 | 60 | 64 | 66 |
| | | fz(in/t) | 0.0027 | 0.0027 | 0.0027 | 0.0027 |
| | | doc(in) | 0.118 | 0.118 | 0.157 | 0.157 |
| SD5010 | | woc(in) | 0.079 | 0.079 | 0.079 | 0.079 |

## Metric

| | | φØ | 10 | 12 | 16 | 20 |
|---|---|---|---|---|---|---|
| | | Flutes | 2 | 3 | 4 | 5 |
| | | Vc,fz range | Vc=150-200m/min, fz=0.04-0.09mm/t | | | |
| | | N(rpm) | 5740 | 4780 | 3590 | 2870 |
| | | Vc(m/min) | 180 | 180 | 180 | 180 |
| | | Vf(mm/min) | 800 | 1000 | 1010 | 1000 |
| | | fz(mm/t) | 0.07 | 0.07 | 0.07 | 0.07 |
| | | doc(mm) | 3 | 3 | 4 | 4 |
| | | woc(mm) | 2 | 2 | 2 | 2 |
| | | Vc,fz range | Vc=100-150m/min, fz=0.04-0.07 m/t | | | |
| | | N(rpm) | 3830 | 3190 | 2390 | 1920 |
| | | Vc(m/min) | 120 | 120 | 120 | 120 |
| | | Vf(mm/min) | 460 | 570 | 570 | 580 |
| | | fz(mm/t) | 0.06 | 0.06 | 0.06 | 0.06 |
| | | doc(mm) | 3 | 3 | 4 | 4 |
| | | woc(mm) | 2 | 2 | 2 | 2 |
| | | Vc,fz range | Vc=80-120m/min, fz=0.04-0.07mm/t | | | |
| | | N(rpm) | 2870 | 2390 | 1800 | 1440 |
| | | Vc(m/min) | 90 | 90 | 90 | 90 |
| | | Vf(mm/min) | 340 | 430 | 430 | 430 |
| | | fz(mm/t) | 0.06 | 0.06 | 0.06 | 0.06 |
| | | doc(mm) | 3 | 3 | 4 | 4 |
| | | woc(mm) | 2 | 2 | 2 | 2 |
| | | Vc,fz range | Vc=130-180m/min, fz=0.04-0.09mm/t | | | |
| | | N(rpm) | 4780 | 3990 | 2990 | 2390 |
| | | Vc(m/min) | 150 | 150 | 150 | 150 |
| | | Vf(mm/min) | 570 | 720 | 720 | 720 |
| | | fz(mm/t) | 0.06 | 0.06 | 0.06 | 0.06 |
| | | doc(mm) | 3 | 3 | 4 | 4 |
| | | woc(mm) | 2 | 2 | 2 | 2 |
| | | Vc,fz range | Vc=130-180m/min, fz=0.04-0.12mm/t | | | |
| | | N(rpm) | 4780 | 3990 | 2990 | 2390 |
| | | Vc(m/min) | 150 | 150 | 150 | 150 |
| | | Vf(mm/min) | 670 | 840 | 840 | 840 |
| | | fz(mm/t) | 0.07 | 0.07 | 0.07 | 0.07 |
| | | doc(mm) | 3 | 3 | 4 | 4 |
| | | woc(mm) | 2 | 2 | 2 | 2 |
| | | Vc, fz range | Vc=200-500m/min, fz=0.04-0.12mm/t | | | |
| | | N(rpm) | 9550 | 7960 | 5970 | 4780 |
| | | Vc(m/min) | 300 | 300 | 300 | 300 |
| | | Vf(mm/min) | 1530 | 1910 | 1910 | 1910 |
| | | fz(mm/t) | 0.08 | 0.08 | 0.08 | 0.08 |
| | | doc(mm) | 3 | 3 | 4 | 4 |
| | | woc(mm) | 2 | 2 | 2 | 2 |

# IAR/AR

Advanced Engineering

## Ideal for Three-Dimensional Rough Milling and Direct Milling

SHANK STYLE

FACE MILL STYLE

MODULAR STYLE

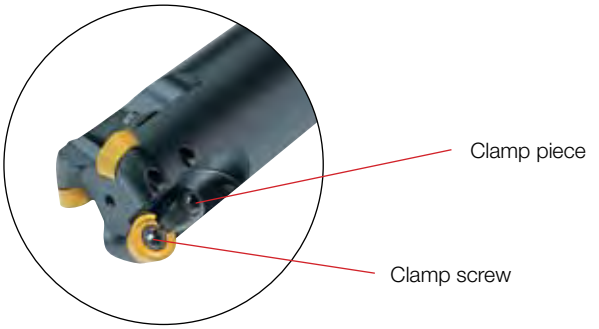
## FEATURES

- 2-3 times greater performance over conventional indexable mills
- Round insert for high-feed machining
- Wide chip pockets for excellent chip evacuation
- Available in straight shank, modular and face mill styles, with sizes up to ø6.00”

# FEATURES

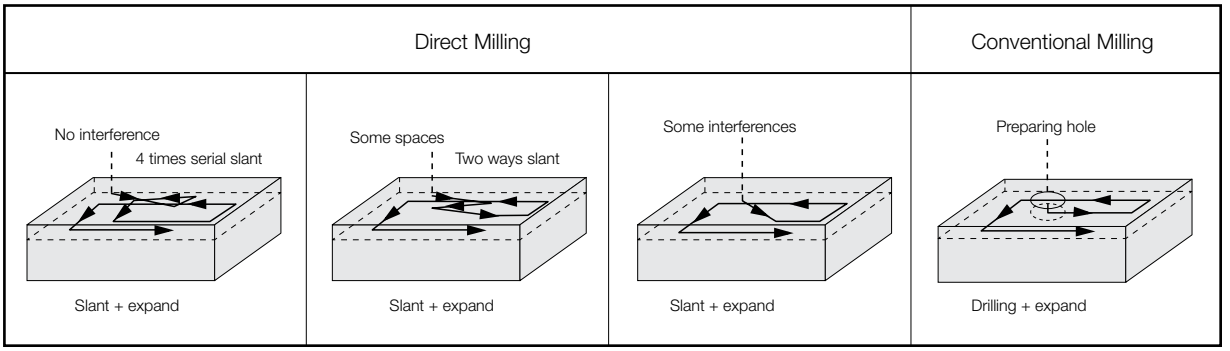
## 1. Strong Double Clamping System

With traditional single clamping systems, there can be trouble with inserts moving or screws loosening, especially during heavy milling. The IAR/AR Series features an easy-to-use but strong double clamping system that prevents inserts from moving.



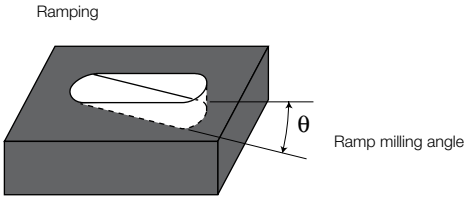

## 2. Direct Milling

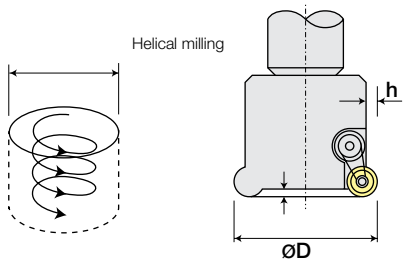
Direct Milling is possible by applying ramp milling, therefore eliminating the need for pre-drilling a pilot hole. Consequently, fewer tools are required and cycle times are reduced.




## 3. Ramping, Helical Milling, Feeding Towards the Z-Axis

Due to the design of the cutting edge, there are restrictions to the ramp angle (θ) and the cutting depth (g).



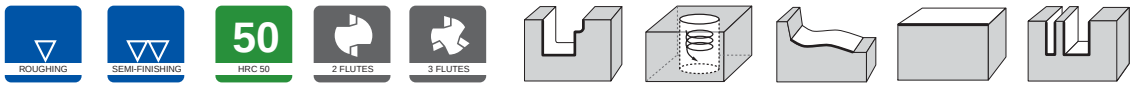




| ØD | 20mm 0.787" | 25mm 0.984" | 32mm 1.260" | 40mm 1.575" | 50mm 1.969" | 63mm 2.480" | 80mm 3.150" | 100mm 3.937" | 125mm 4.921" |
|---|---|---|---|---|---|---|---|---|---|
| θ | Below 3 degrees | | | | | | | | Below 2 degrees |
| Helical Hole Diameter | 28-38mm | 34-38mm | 48-62mm | 60-78mm | 75-98mm | 101-124mm | 135-158mm | 175-198mm | 248-255mm |
| | 1.102"-1.496" | 1.339"-1.496" | 1.890"-2.441" | 2.362"-3.071" | 2.953"-3.858" | 3.976"-4.882" | 5.315"-6.220" | 6.890"-7.795" | 9.764"-10.039" |

# IAR/AR

## Straight Shank Style

Advanced Engineering


| D | 0/-0.2 |
|---|---|

### IAR- INCH

| Part No. | Flutes | ØD | $ØD_1$ | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|---|
| **IARS16R** | 2 | **1.000** | 0.528 | 5.512 | 1.000 | 2.362 | 3.150 | **RDHW12/RDMT12** |
| **IARS20R** | 2 | **1.250** | 0.778 | 5.906 | 1.250 | 2.756 | 3.150 | **RDHW12/RDMT12** |
| **IARS24R** | 3 | **1.500** | 1.028 | 6.299 | 1.500 | 3.150 | 3.150 | **RDHW12/RDMT12** |
| **IARL16R** | 2 | **1.000** | 0.528 | 7.874 | 1.000 | 4.724 | 3.150 | **RDHW12/RDMT12** |
| **IARL20R** | 2 | **1.250** | 0.778 | 8.268 | 1.250 | 5.118 | 3.150 | **RDHW12/RDMT12** |
| **IARL24R** | 3 | **1.500** | 1.028 | 8.661 | 1.500 | 5.512 | 3.150 | **RDHW12/RDMT12** |
| **IARE16R** | 2 | **1.000** | 0.528 | 11.811 | 1.000 | 7.087 | 4.724 | **RDHW12/RDMT12** |
| **IARE20R** | 2 | **1.250** | 0.778 | 12.205 | 1.250 | 7.480 | 4.724 | **RDHW12/RDMT12** |
| **IARE24R** | 3 | **1.500** | 1.028 | 12.598 | 1.500 | 7.874 | 4.724 | **RDHW12/RDMT12** |

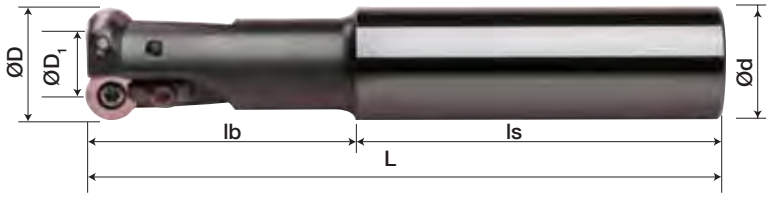
Inserts p. 136

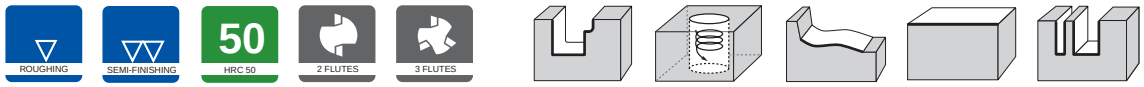
| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **IARS16R** | 262-142 | CM4-141 | 104-T15 |
| **IARS20R** | 262-142 | CM4-141 | 104-T15 |
| **IARS24R** | 262-142 | CM4-141 | 104-T15 |
| **IARL16R** | 262-142 | CM4-141 | 104-T15 |
| **IARL20R** | 262-142 | CM4-141 | 104-T15 |
| **IARL24R** | 262-142 | CM4-141 | 104-T15 |
| **IARE16R** | 262-142 | CM4-141 | 104-T15 |
| **IARE20R** | 262-142 | CM4-141 | 104-T15 |
| **IARE24R** | 262-142 | CM4-141 | 104-T15 |

# IAR/AR

## Straight Shank Style

Advanced Engineering




| D | 0/-0.2 |
|---|---|

### AR- METRIC

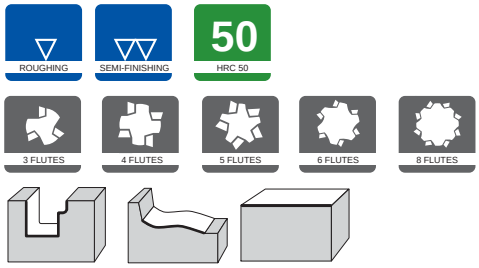
| Part No. | Flutes | ØD | $ØD_1$ | L | Ød | lb | ls | Insert |
|---|---|---|---|---|---|---|---|---|
| **ARS0020R** | 2 | **20** | 12 | 130 | 20 | 50 | 80 | **RDHW08/ RDMT08** |
| **ARS3025R** | 2 | **25** | 15 | 140 | 25 | 60 | 80 | **RDHW10/ RDMT10** |
| **ARS3032R** | 3 | **32** | 22 | 150 | 32 | 70 | 80 | **RDHW10/ RDMT10** |
| **ARS4040R** | 3 | **40** | 28 | 150 | 32 | 50 | 100 | **RDHW12/ RDMT12** |
| **ARL0020R** | 2 | **20** | 12 | 180 | 20 | 100 | 80 | **RDHW08/ RDMT08** |
| **ARL3025R** | 2 | **25** | 15 | 200 | 25 | 120 | 80 | **RDHW10/ RDMT10** |
| **ARL3032R** | 3 | **32** | 22 | 200 | 32 | 120 | 80 | **RDHW10/ RDMT10** |
| **ARL4040R** | 3 | **40** | 28 | 250 | 32 | 50 | 200 | **RDHW12/ RDMT12** |
| **ARE0020R** | 2 | **20** | 12 | 250 | 20 | 130 | 120 | **RDHW08/ RDMT08** |
| **ARE3025R** | 2 | **25** | 15 | 300 | 25 | 180 | 120 | **RDHW10/ RDMT10** |
| **ARE3032R** | 3 | **32** | 22 | 300 | 32 | 180 | 120 | **RDHW10/ RDMT10** |
| **ARE4040R** | 2 | **40** | 28 | 300 | 32 | 50 | 250 | **RDHW12/ RDMT12** |

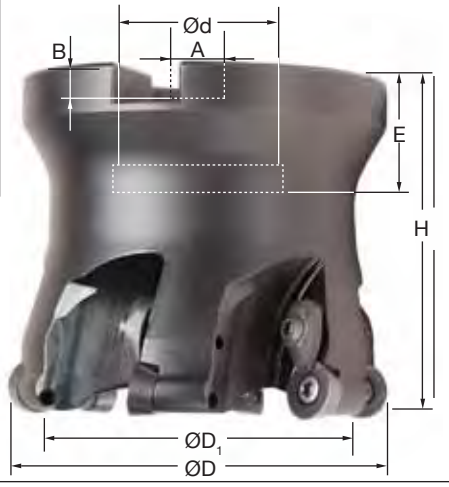
Inserts p. 136

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **ARS0020R** | 261-140 | CM3.5-141 | 104-T15 |
| **ARS3025R** | 501-161 | CM3.5-141 | 104-T15 |
| **ARS3032R** | 501-161 | CM3.5-141 | 104-T15 |
| **ARS4040R** | 262-142 | CM4-141 | 104-T15 |
| **ARL0020R** | 261-140 | CM3.5-141 | 104-T15 |
| **ARL3025R** | 501-161 | CM3.5-141 | 104-T15 |
| **ARL3032R** | 501-161 | CM3.5-141 | 104-T15 |
| **ARL4040R** | 262-142 | CM4-141 | 104-T15 |
| **ARE0020R** | 261-140 | CM3.5-141 | 104-T15 |
| **ARE3025R** | 501-161 | CM3.5-141 | 104-T15 |
| **ARE3032R** | 501-161 | CM3.5-141 | 104-T15 |
| **ARE4040R** | 262-142 | CM4-141 | 104-T15 |

# IAR/AR

## Face Mill Style




Advanced Engineering

| D | 0/-0.2 |
|---|---|

### IAR-INCH

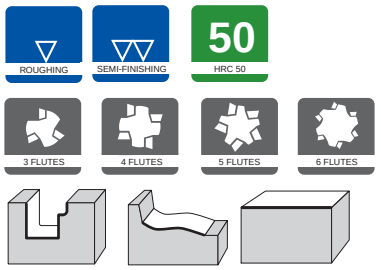
| Part No. | Flutes | ØD | ØD$_1$ | H | Ød | E | A | B | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **IARB4032R-4** | 4 | **2.000** | 1.370 | 1.969 | 0.750 | 0.748 | 0.315 | 0.197 | **RDHW12/ RDMT12** |
| **IARB5040R-3** | 3 | **2.500** | 1.870 | 1.969 | 0.750 | 1.024 | 0.315 | 0.197 | **RDHW16/ RDMT16** |
| **IARB5048R-4** | 4 | **3.000** | 2.370 | 2.480 | 1.000 | 1.378 | 0.374 | 0.236 | **RDHW16/ RDMT16** |
| **IARB5064R-5** | 5 | **4.000** | 3.370 | 2.480 | 1.500 | 1.378 | 0.626 | 0.394 | **RDHW16/ RDMT16** |
| **IARB5080R-6** | 6 | **5.000** | 4.370 | 2.480 | 1.500 | 1.378 | 0.626 | 0.394 | **RDHW16/ RDMT16** |
| **IARB5096R-8** | 8 | **6.000** | 5.370 | 2.480 | 1.500 | 1.378 | 0.626 | 0.394 | **RDHW16/ RDMT16** |

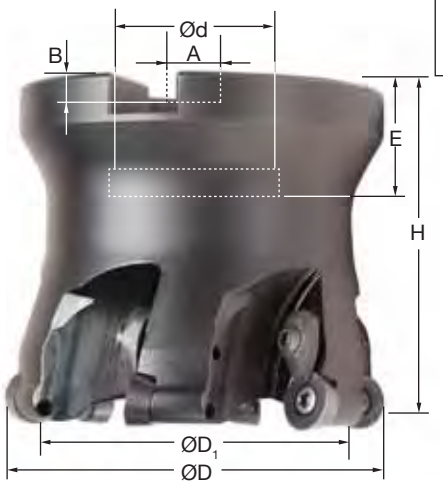
Inserts p. 136

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **IARB4032R-4** | 262-142 | CM4-141 | 105-T15 |
| **IARB5040R-3** | 263-141 | CM5-147 | 105-T20 |
| **IARB5048R-4** | 263-141 | CM5-147 | 105-T20 |
| **IARB5064R-5** | 263-141 | CM5-147 | 105-T20 |
| **IARB5080R-6** | 263-141 | CM5-147 | 105-T20 |
| **IARB5096R-8** | 263-141 | CM5-147 | 105-T20 |

# IAR/AR

## Face Mill Style




Advanced Engineering

| D | 0/-0.2 |
|---|---|

### AR-METRIC

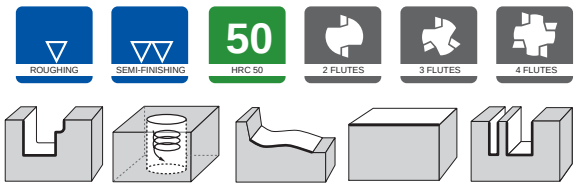
| Part No. | Flutes | ØD | $ØD_1$ | H | Ød | E | A | B | Insert |
|---|---|---|---|---|---|---|---|---|---|
| **ARB4050R-5M** | 5 | **50** | 38 | 50 | 22.000 | 20 | 10.4 | 5.0 | **RDHW12/ RDMT12** |
| **ARB4063R-6M** | 6 | **63** | 51 | 50 | 22.000 | 20 | 10.4 | 6.3 | **RDHW12/ RDMT12** |
| **ARB5063R-3** | 3 | **63** | 47 | 50 | 22.225 | 19 | 8.4 | 5.0 | **RDHW16/RDMT16** |
| **ARB4080R-6** | 6 | **80** | 68 | 70 | 31.750 | 32 | 12.7 | 8.0 | **RDHW12/ RDMT12** |
| **ARB5080R-4** | 4 | **80** | 64 | 70 | 31.750 | 32 | 12.7 | 8.0 | **RDHW16/RDMT16** |
| **ARB4100R-5** | 5 | **100** | 88 | 70 | 31.750 | 32 | 12.7 | 8.0 | **RDHW12/ RDMT12** |
| **ARB5100R-5** | 5 | **100** | 84 | 70 | 31.750 | 32 | 12.7 | 8.0 | **RDHW16/RDMT16** |

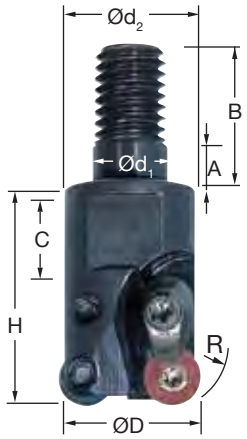
Inserts p. 136

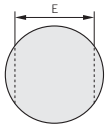
| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **ARB4050R-5M** | 262-142 | CM4-141 | 105-T15 |
| **ARB4063R-6M** | 262-142 | CM4-141 | 105-T15 |
| **ARB5063R-3** | 263-141 | CM5-147 | 105-T20 |
| **ARB4080R-6** | 262-142 | CM4-141 | 105-T15 |
| **ARB5080R-4** | 263-141 | CM5-147 | 105-T20 |
| **ARB4100R-5** | 262-142 | CM4-141 | 105-T15 |
| **ARB5100R-5** | 263-141 | CM5-147 | 105-T20 |

# IAR/AR

## Modular Style




| D | 0/-0.2 |
|---|---|

### ARM- Modular Type

| Part No. | Flutes | ØD | H | Ød$_1$ | M | Ød$_2$ | A | B | C | E | R | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARM0020R-2** | 2 | **20.0** | 30.0 | 10.5 | M10 | 18.0 | 5.5 | 19.0 | 10.0 | 15.0 | 4.0 | **RDMT08/RDHW08** |
| **ARM3025R-2** | 2 | **25.0** | 35.0 | 12.5 | M12 | 21.0 | 5.5 | 22.0 | 10.0 | 17.0 | 5.0 | **RDMT10/RDHW10** |
| **ARM3032R-3** | 3 | **32.0** | 40.0 | 17.0 | M16 | 29.0 | 6.0 | 23.0 | 12.0 | 22.0 | 5.0 | **RDMT10/RDHW10** |
| **ARM3040R-4** | 4 | **40.0** | 40.0 | 17.0 | M16 | 29.0 | 6.0 | 23.0 | 12.0 | 22.0 | 5.0 | **RDMT10/RDHW10** |

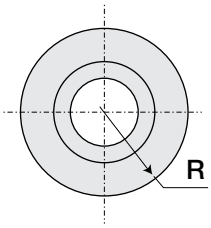
Modular Shanks on p. 163

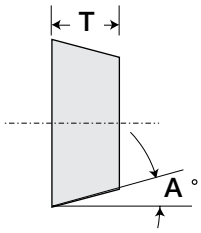
Inserts p. 136

| Part No. | Clamp Screw | Clamp Assembly | Wrench |
|---|---|---|---|
| |  |  |  |
| **ARM0020R-2** | 261-140 | CM3.5-141 | 104-T15 |
| **ARM3025R-2** | 501-161 | CM3.5-141 | 104-T15 |
| **ARM3032R-3** | 501-161 | CM3.5-141 | 104-T15 |
| **ARM3040R-4** | 501-161 | CM3.5-141 | 104-T15 |

# IAR/AR

## Inserts




| Part No. | JS4045 | CY250 | R | T (mm) | A (°) |
|---|---|---|---|---|---|
| **RDMT0802M0TN** | • | • | 4.0 | 2.38 | 15.0 |
| **RDMT10T3M0TN** | • | • | 5.0 | 3.97 | 15.0 |
| **RDMT1204M0TN** | • | • | 6.0 | 4.76 | 15.0 |
| **RDMT1605M0TN** | • | • | 8.0 | 5.56 | 15.0 |
| **RDHW0802M0TN** | • | • | 4.0 | 2.38 | 15.0 |
| **RDHW10T3M0TN** | • | • | 5.0 | 3.97 | 15.0 |
| **RDHW1204M0TN** | • | • | 6.0 | 4.76 | 15.0 |
| **RDHW1605M0TN** | • | • | 8.0 | 5.56 | 15.0 |

### COATING MATERIALS FOR INSERTS

| Material name<br>ISO Classification | Coating Name<br>Coating Type | Application | Features |
|---|---|---|---|
| **JS4045**<br>P30-K30 | **JS Coating**<br>PVD | General purpose for steel | Uses rough grain substrate and JS coating. Suitble for general steel cutting |
| **CY250**<br>P30-M30-K30 | **PCA Coating**<br>PVD | General purpose for steel | Uses TiAlN Coating; has wide cutting region range |

# IAR/AR

## Cutting Conditions
## Shank + Modular Styles
## Inch + Metric

Advanced Engineering

**Inch**

| | | Ø mm | 20 (R4) | 25 (R5) | 32 (R5) | 40 (R5) | 40 (R6) |
|---|---|---|---|---|---|---|---|
| | | Ø inch | 3/4" | 1" | 1" | 1.5" | 1.5" |
| | | Flutes | 2 | 2 | 3 | 4 | 3 |
| Mild Steel <200HB | N(rpm) | | 3980 | 3180 | 2480 | 1990 | 1990 |
| | Vc(sfm) | | 820 | 820 | 820 | 820 | 820 |
| | Vf(in/min) | | 125 | 100 | 146 | 157 | 188 |
| | fz(in/t) | | 0.016 | 0.016 | 0.020 | 0.020 | 0.031 |
| JS4045 CY250 | doc(in) | | 0.059 | 0.059 | 0.059 | 0.059 | 0.079 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |
| Carbon Steel Alloy Steel <30HRC | N(rpm) | | 3180 | 2540 | 1990 | 1590 | 1590 |
| | Vc(sfm) | | 656 | 656 | 656 | 656 | 656 |
| | Vf(in/min) | | 100 | 80 | 117 | 125 | 113 |
| | fz(in/t) | | 0.016 | 0.016 | 0.020 | 0.020 | 0.024 |
| JS4045 CY250 | doc(in) | | 0.059 | 0.059 | 0.059 | 0.059 | 0.079 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |
| Carbon Steel Alloy Steel 30-40HRC | N(rpm) | | 2380 | 1910 | 1490 | 1190 | 1190 |
| | Vc(sfm) | | 492 | 492 | 492 | 492 | 492 |
| | Vf(in/min) | | 56 | 45 | 61 | 65 | 49 |
| | fz(in/t) | | 0.012 | 0.012 | 0.014 | 0.014 | 0.014 |
| JS4045 CY250 | doc(in) | | 0.059 | 0.059 | 0.059 | 0.059 | 0.079 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |
| Carbon Steel Alloy Steel 40-45HRC | N(rpm) | | 1590 | 1270 | 990 | 790 | 790 |
| | Vc(sfm) | | 328 | 328 | 328 | 328 | 328 |
| | Vf(in/min) | | 25 | 20 | 29 | 31 | 23 |
| | fz(in/t) | | 0.008 | 0.008 | 0.010 | 0.010 | 0.010 |
| JS4045 CY250 | doc(in) | | 0.039 | 0.039 | 0.039 | 0.039 | 0.059 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |
| Carbon Steel Alloy Steel 45-50HRC | N(rpm) | | 1270 | 1010 | 790 | 630 | 630 |
| | Vc(sfm) | | 262 | 262 | 262 | 262 | 262 |
| | Vf(in/min) | | 15 | 12 | 16 | 17 | 13 |
| | fz(in/t) | | 0.006 | 0.006 | 0.007 | 0.007 | 0.007 |
| JS4045 CY250 | doc(in) | | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |
| Stainless Steel | N(rpm) | | 2860 | 2290 | 1790 | 1430 | 1430 |
| | Vc(sfm) | | 591 | 591 | 591 | 591 | 591 |
| | Vf(in/min) | | 67 | 54 | 74 | 79 | 67 |
| | fz(in/t) | | 0.012 | 0.012 | 0.014 | 0.014 | 0.016 |
| JS4045 CY250 | doc(in) | | 0.059 | 0.059 | 0.059 | 0.059 | 0.079 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |
| Cast Iron | N(rpm) | | 3180 | 2540 | 1990 | 1590 | 1590 |
| | Vc(sfm) | | 656 | 656 | 656 | 656 | 656 |
| | Vf(in/min) | | 125 | 100 | 141 | 150 | 150 |
| | fz(in/t) | | 0.020 | 0.020 | 0.024 | 0.024 | 0.031 |
| JS4045 CY250 | doc(in) | | 0.059 | 0.059 | 0.059 | 0.059 | 0.079 |
| | woc(in) | | 0.394 | 0.512 | 0.630 | 0.787 | 0.787 |

**Metric**

| | Ø mm | 20 (R4) | 25 (R5) | 32 (R5) | 40 (R5) | 40 (R6) |
|---|---|---|---|---|---|---|
| | Ø inch | 3/4" | 1" | 1" | 1.5" | 1.5" |
| | Flutes | 2 | 2 | 3 | 4 | 3 |
| N(rpm) | | 3980 | 3180 | 2480 | 1990 | 1990 |
| Vc(m/min) | | 250 | 250 | 250 | 250 | 250 |
| Vf(mm/min) | | 3180 | 2540 | 3720 | 3980 | 4770 |
| fz(mm/t) | | 0.40 | 0.40 | 0.50 | 0.50 | 0.80 |
| doc(mm) | | 1.5 | 1.5 | 1.5 | 1.5 | 2 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |
| N(rpm) | | 3180 | 2540 | 1990 | 1590 | 1590 |
| Vc(m/min) | | 200 | 200 | 200 | 200 | 200 |
| Vf(mm/min) | | 2540 | 2030 | 2980 | 3180 | 2860 |
| fz(mm/t) | | 0.40 | 0.40 | 0.50 | 0.50 | 0.60 |
| doc(mm) | | 1.5 | 1.5 | 1.5 | 1.5 | 2 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |
| N(rpm) | | 2380 | 1910 | 1490 | 1190 | 1190 |
| Vc(m/min) | | 150 | 150 | 150 | 150 | 150 |
| Vf(mm/min) | | 1420 | 1140 | 1560 | 1660 | 1240 |
| fz(mm/t) | | 0.30 | 0.30 | 0.35 | 0.35 | 0.35 |
| doc(mm) | | 1.5 | 1.5 | 1.5 | 1.5 | 2 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |
| N(rpm) | | 1590 | 1270 | 990 | 790 | 790 |
| Vc(m/min) | | 100 | 100 | 100 | 100 | 100 |
| Vf(mm/min) | | 630 | 500 | 740 | 790 | 590 |
| fz(mm/t) | | 0.20 | 0.20 | 0.25 | 0.25 | 0.25 |
| doc(mm) | | 1 | 1 | 1 | 1 | 1.5 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |
| N(rpm) | | 1270 | 1010 | 790 | 630 | 630 |
| Vc(m/min) | | 80 | 80 | 80 | 80 | 80 |
| Vf(mm/min) | | 380 | 300 | 400 | 420 | 320 |
| fz(mm/t) | | 0.15 | 0.15 | 0.17 | 0.17 | 0.17 |
| doc(mm) | | 1 | 1 | 1 | 1 | 1 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |
| N(rpm) | | 2860 | 2290 | 1790 | 1430 | 1430 |
| Vc(m/min) | | 180 | 180 | 180 | 180 | 180 |
| Vf(mm/min) | | 1710 | 1370 | 1870 | 2000 | 1710 |
| fz(mm/t) | | 0.30 | 0.30 | 0.35 | 0.35 | 0.40 |
| doc(mm) | | 1.5 | 1.5 | 1.5 | 1.5 | 2 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |
| N(rpm) | | 3180 | 2540 | 1990 | 1590 | 1590 |
| Vc(m/min) | | 200 | 200 | 200 | 200 | 200 |
| Vf(mm/min) | | 3180 | 2540 | 3580 | 3810 | 3810 |
| fz(mm/t) | | 0.50 | 0.50 | 0.60 | 0.60 | 0.80 |
| doc(mm) | | 1.5 | 1.5 | 1.5 | 1.5 | 2 |
| woc(mm) | | 10 | 13 | 16 | 20 | 20 |

# IAR/AR

## Cutting Conditions
## Face Mill Style
## Inch + Metric

Advanced Engineering

| | Inch | | | | | | | Metric | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ø mm | 50 (R6) | 63 (R6) | 80 (R6) | 100 (R6) | 80 (R8) | 100 (R8) | Ø mm | 50 (R6) | 63 (R6) | 80 (R6) | 100 (R6) | 80 (R8) | 100 (R8) |
| | Ø inch | 2.0" | 2.5" | 3.0" | 4.0" | 3.0" | 4.0" | Ø inch | 2.0" | 2.5" | 3.0" | 4.0" | 3.0" | 4.0" |
| | Flutes | 5 | 6 | 6 | 5 | 4 | 5 | Flutes | 5 | 6 | 6 | 5 | 4 | 5 |
| Mild Steel <200HB | N(rpm) | 1590 | 1260 | 990 | 790 | 990 | 790 | N(rpm) | 1590 | 1260 | 990 | 790 | 990 | 790 |
| | Vc(sfm) | 820 | 820 | 820 | 820 | 820 | 820 | Vc(m/min) | 250 | 250 | 250 | 250 | 250 | 250 |
| | Vf(in/min) | 250 | 238 | 187 | 124 | 124 | 124 | Vf(mm/min) | 6360 | 6040 | 4750 | 3160 | 3160 | 3160 |
| | fz(in/t) | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 | fz(mm/t) | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| JS4045 | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.098 | 0.098 | doc(mm) | 2 | 2 | 2 | 2 | 2.5 | 2.5 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |
| Carbon Steel Alloy Steel <30HRC | N(rpm) | 1270 | 1010 | 790 | 630 | 790 | 630 | N(rpm) | 1270 | 1010 | 790 | 630 | 790 | 630 |
| | Vc(sfm) | 656 | 656 | 656 | 656 | 656 | 656 | Vc(m/min) | 200 | 200 | 200 | 200 | 200 | 200 |
| | Vf(in/min) | 150 | 143 | 112 | 74 | 87 | 87 | Vf(mm/min) | 3810 | 3630 | 2840 | 1890 | 2210 | 2200 |
| | fz(in/t) | 0.024 | 0.024 | 0.024 | 0.024 | 0.028 | 0.028 | fz(mm/t) | 0.60 | 0.60 | 0.60 | 0.60 | 0.70 | 0.70 |
| JS4045 | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.098 | 0.098 | doc(mm) | 2 | 2 | 2 | 2 | 2.5 | 2.5 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |
| Carbon Steel Alloy Steel 30-40HRC | N(rpm) | 950 | 750 | 590 | 470 | 590 | 470 | N(rpm) | 950 | 750 | 590 | 470 | 590 | 470 |
| | Vc(sfm) | 492 | 492 | 492 | 492 | 492 | 492 | Vc(m/min) | 150 | 150 | 150 | 150 | 150 | 150 |
| | Vf(in/min) | 56 | 53 | 42 | 28 | 37 | 37 | Vf(mm/min) | 1420 | 1350 | 1060 | 700 | 940 | 940 |
| | fz(in/t) | 0.012 | 0.012 | 0.012 | 0.012 | 0.016 | 0.016 | fz(mm/t) | 0.30 | 0.30 | 0.30 | 0.30 | 0.40 | 0.40 |
| JS4045 | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.098 | 0.098 | doc(mm) | 2 | 2 | 2 | 2 | 2.5 | 2.5 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |
| Carbon Steel Alloy Steel 40-45HRC | N(rpm) | 630 | 500 | 390 | 310 | 390 | 310 | N(rpm) | 630 | 500 | 390 | 310 | 390 | 310 |
| | Vc(sfm) | 328 | 328 | 328 | 328 | 328 | 328 | Vc(m/min) | 100 | 100 | 100 | 100 | 100 | 100 |
| | Vf(in/min) | 25 | 24 | 18 | 12 | 15 | 15 | Vf(mm/min) | 630 | 600 | 460 | 310 | 390 | 380 |
| | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.010 | 0.010 | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.25 | 0.25 |
| JS4045 | doc(in) | 0.059 | 0.059 | 0.059 | 0.059 | 0.079 | 0.079 | doc(mm) | 1.5 | 1.5 | 1.5 | 1.5 | 2 | 2 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |
| Carbon Steel Alloy Steel 45-50HRC | N(rpm) | 500 | 400 | 310 | 250 | 310 | 250 | N(rpm) | 500 | 400 | 310 | 250 | 310 | 250 |
| | Vc(sfm) | 262 | 262 | 262 | 262 | 262 | 262 | Vc(m/min) | 80 | 80 | 80 | 80 | 80 | 80 |
| | Vf(in/min) | 20 | 19 | 15 | 10 | 12 | 12 | Vf(mm/min) | 500 | 480 | 370 | 250 | 310 | 310 |
| | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.010 | 0.010 | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.25 | 0.25 |
| JS4045 | doc(in) | 0.039 | 0.039 | 0.039 | 0.039 | 0.059 | 0.059 | doc(mm) | 1 | 1 | 1 | 1 | 1.5 | 1.5 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |
| Stainless Steel | N(rpm) | 1140 | 900 | 710 | 570 | 710 | 570 | N(rpm) | 1140 | 900 | 710 | 570 | 710 | 570 |
| | Vc(sfm) | 591 | 591 | 591 | 591 | 591 | 591 | Vc(m/min) | 180 | 180 | 180 | 180 | 180 | 180 |
| | Vf(in/min) | 112 | 106 | 84 | 56 | 67 | 67 | Vf(mm/min) | 2850 | 2700 | 2130 | 1420 | 1700 | 1710 |
| | fz(in/) | 0.020 | 0.020 | 0.020 | 0.020 | 0.024 | 0.024 | fz(mm/t) | 0.50 | 0.50 | 0.50 | 0.50 | 0.60 | 0.60 |
| JS4045 | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.098 | 0.098 | doc(mm) | 2 | 2 | 2 | 2 | 2.5 | 2.5 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |
| Cast Iron | N(rpm) | 1270 | 1010 | 790 | 630 | 790 | 630 | N(rpm) | 1270 | 1010 | 790 | 630 | 790 | 630 |
| | Vc(sfm) | 656 | 656 | 656 | 656 | 656 | 656 | Vc(m/min) | 200 | 200 | 200 | 200 | 200 | 200 |
| | Vf(in/min) | 200 | 191 | 149 | 99 | 99 | 99 | Vf(mm/min) | 5080 | 4840 | 3790 | 2520 | 2520 | 2520 |
| | fz(in/) | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 | fz(mm/t) | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| JS4045 | doc(in) | 0.079 | 0.079 | 0.079 | 0.079 | 0.098 | 0.098 | doc(mm) | 2 | 2 | 2 | 2 | 2.5 | 2.5 |
| CY250 | woc(in) | 0.984 | 1.260 | 1.575 | 1.969 | 1.575 | 1.969 | woc(mm) | 25 | 32 | 40 | 50 | 40 | 50 |

# IARPF/ARPF

Advanced Engineering

## Indexable Corner Radius for High-Precision Finishing

SHANK STYLE

MODULAR STYLE

## FEATURES

TH coated inserts are ideal for high-speed and high-efficiency machining of hardened steels

High-precision inserts provide long tool life and improved part finish

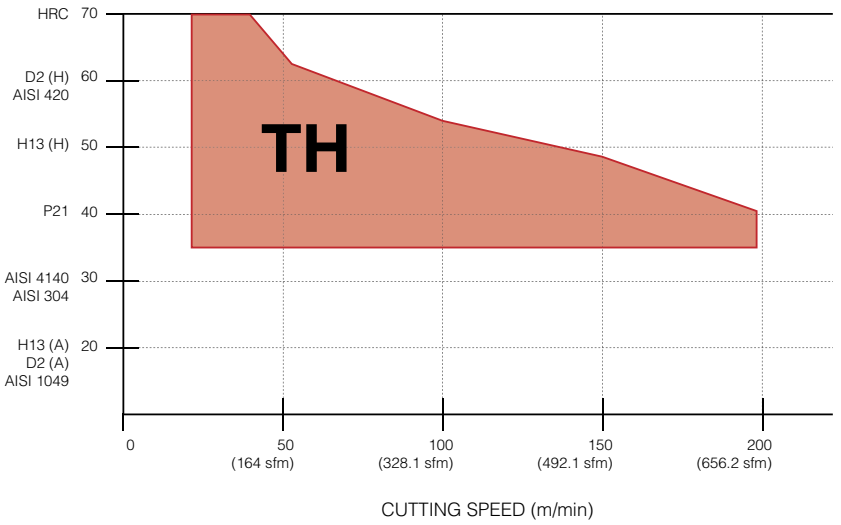
Wide variety of sizes and corner radius geometries are available

Available carbide shanks provide increased damping and reduced vibration

## INTRODUCTION

The Precision Finishing Indexable End Mill Series combines high precision inserts with revolutionary new coatings to provide higher machining efficiency and longer tool life. A variety of inch and metric inserts in both Ball Nose and Corner Radius styles are available, and holders are stocked in a variety of lengths in either steel or solid carbide shanks.

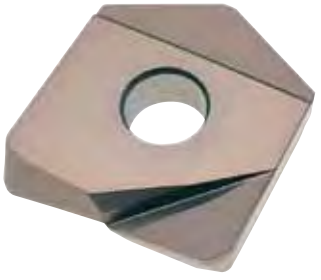
Corner radius style inserts are available in Hitachi's revolutionary TH coatings. The TH coating provides unrivaled performance in hardened steels.




## FEATURES

### 1. High Precision Inserts

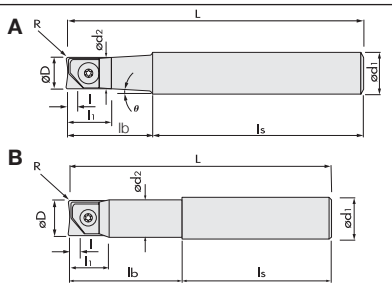
The high-precision Corner Radius inserts for the IARPF/ARPF feature an insert tolerance of ±0.015mm (0.0006") and set-up accuracy of ±0.02mm (0.0008").

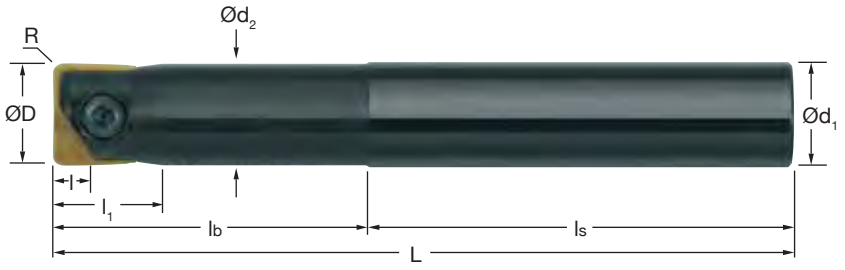


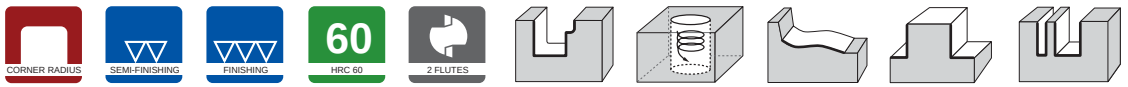
# IARPF/ARPF

## Corner Radius Style
## Regular Length

Advanced Engineering




| D | 0/-0.2 |
|---|---|

### IARPFS - INCH

| Part No. | Flutes | ØD | L | l | $l_1$ | lb | ls | Ød$_1$ | Ød$_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IARPF06S08** | 2 | **0.375** | 3.937 | 0.118 | 0.512 | 0.984 | 2.953 | 0.500 | 0.354 | A | **IZCFW060-Rx.x** |
| **IARPF08S08** | 2 | **0.500** | 4.331 | 0.157 | 0.591 | 1.181 | 3.150 | 0.500 | 0.480 | B | **IZCFW080-Rx.x** |
| **IARPF12S12** | 2 | **0.750** | 5.512 | 0.236 | 0.827 | 2.362 | 3.150 | 0.750 | 0.728 | B | **IZCFW120-Rx.x** |
| **IARPF16S16** | 2 | **1.000** | 5.906 | 0.315 | 0.945 | 2.756 | 3.150 | 1.000 | 0.980 | B | **IZCFW160-Rx.x** |

### ARPFS - METRIC

| Part No. | Flutes | ØD | L | l | $l_1$ | lb | ls | Ød$_1$ | Ød$_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARPF08S12** | 2 | 8 | 100 | 2.5 | 10 | 22 | 78 | 12 | 7.5 | A | **ZCFW080-Rx.x** |
| **ARPF10S12** | 2 | 10 | 100 | 3.0 | 13 | 25 | 75 | 12 | 9.5 | A | **ZCFW100-Rx.x** |
| **ARPF12S12** | 2 | 12 | 110 | 4.0 | 15 | 30 | 80 | 12 | 11.5 | B | **ZCFW120-Rx.x** |
| **ARPF16S16** | 2 | 16 | 130 | 5.0 | 17 | 50 | 80 | 16 | 15.5 | B | **ZCFW160-Rx.x** |
| **ARPF20S20** | 2 | 20 | 140 | 6.0 | 21 | 60 | 80 | 20 | 19.5 | B | **ZCFW200-Rx.x** |
| **ARPF25S25** | 2 | 25 | 150 | 8.0 | 24 | 70 | 80 | 25 | 24.5 | B | **ZCFW250-Rx.x** |

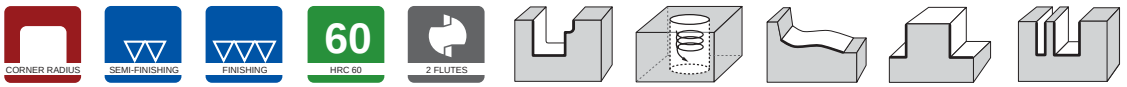
Inserts p. 146

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **IARPF06S08** | 581-142 | 104-T10 |
| **IARPF08S08** | 581-143 | 105-T20 |
| **IARPF12S12** | 581-148 | 101-T25S |
| **IARPF16S16** | 581-146 | 105-T30A |
| **ARPF08S12** | 581-141 | 104-T8 |
| **ARPF10S12** | 581-142 | 104-T10 |
| **ARPF12S12** | 581-143 | 105-T20 |
| **ARPF16S16** | 581-144 | 105-T20 |
| **ARPF20S20** | 581-145 | 101-T25S |
| **ARPF25S25** | 581-146 | 105-T30A |

# IARPF/ARPF

## Corner Radius Style
## Long Length

Advanced Engineering


| D | 0/-0.2 |
|---|---|

### IARPFL - INCH

| Part No. | Flutes | ØD | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IARPF06S08L** | 2 | **0.375** | 5.906 | 0.118 | 0.512 | 1.969 | 3.937 | 0.500 | 0.354 | A | **IZCFW060-Rx.x** |
| **IARPF08S10L** | 2 | **0.500** | 6.299 | 0.157 | 0.591 | 2.362 | 3.937 | 0.625 | 0.480 | A | **IZCFW080-Rx.x** |
| **IARPF12S16L** | 2 | **0.750** | 7.087 | 0.236 | 0.827 | 3.150 | 3.937 | 1.000 | 0.728 | A | **IZCFW120-Rx.x** |
| **IARPF16S20L** | 2 | **1.000** | 7.874 | 0.315 | 0.945 | 3.543 | 4.331 | 1.250 | 0.980 | A | **IZCFW160-Rx.x** |

### ARPFL - METRIC

| Part No. | Flutes | ØD | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARPF08S12L** | 2 | **8** | 130 | 2.5 | 10 | 50 | 80 | 12 | 7.5 | A | **ZCFW080-Rx.x** |
| **ARPF10S16L** | 2 | **10** | 150 | 3.0 | 13 | 50 | 100 | 16 | 9.5 | A | **ZCFW100-Rx.x** |
| **ARPF12S16L** | 2 | **12** | 160 | 4.0 | 15 | 60 | 100 | 16 | 11.5 | A | **ZCFW120-Rx.x** |
| **ARPF16S16L** | 2 | **16** | 165 | 5.0 | 17 | 65 | 100 | 16 | 15.5 | B | **ZCFW160-Rx.x** |
| **ARPF20S20L** | 2 | **20** | 180 | 6.0 | 21 | 80 | 100 | 20 | 19.5 | B | **ZCFW200-Rx.x** |
| **ARPF25S25L** | 2 | **25** | 200 | 8.0 | 24 | 90 | 110 | 25 | 24.5 | B | **ZCFW250-Rx.x** |

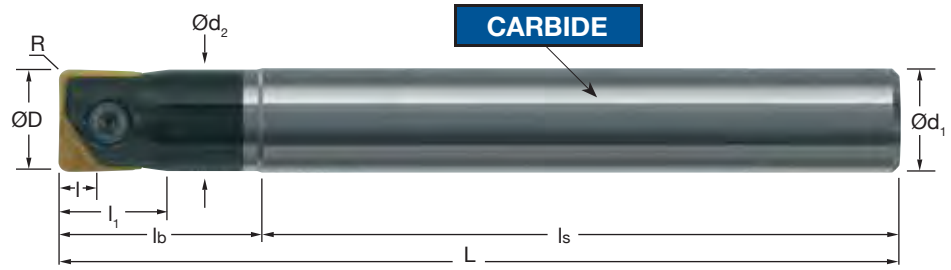
Inserts p. 146

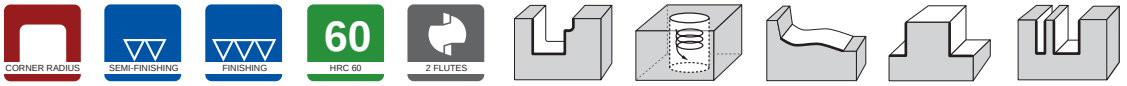
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **IARPF06S08L** | 581-142 | 104-T10 |
| **IARPF08S10L** | 581-143 | 105-T20 |
| **IARPF12S16L** | 581-148 | 101-T25S |
| **IARPF16S20L** | 581-146 | 105-T30A |
| **ARPF08S12L** | 581-141 | 104-T8 |
| **ARPF10S16L** | 581-142 | 104-T10 |
| **ARPF12S16L** | 581-143 | 105-T20 |
| **ARPF16S16L** | 581-144 | 105-T20 |
| **ARPF20S20L** | 581-145 | 101-T25S |
| **ARPF25S25L** | 581-146 | 105-T30A |

# IARPF/ARPF

**Corner Radius Style**
**Carbide Shank**
**Regular Length**

Advanced Engineering




| D | 0/-0.2 |
|---|---|

## IARPFW - INCH

| Part No. | Flutes | ØD | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IARPF06S06W** | 2 | **0.375** | 3.937 | 0.118 | 0.906 | 1.378 | 2.559 | 0.375 | 0.366 | B | **IZCFW060-Rx.x** |
| **IARPF08S08W** | 2 | **0.500** | 4.331 | 0.157 | 1.024 | 1.772 | 2.559 | 0.500 | 0.492 | B | **IZCFW080-Rx.x** |
| **IARPF12S12W** | 2 | **0.750** | 6.299 | 0.236 | 0.866 | 2.165 | 4.134 | 0.750 | 0.728 | B | **IZCFW120-Rx.x** |
| **IARPF16S16W** | 2 | **1.000** | 7.087 | 0.315 | 0.984 | 2.500 | 4.528 | 1.000 | 0.980 | B | **IZCFW160-Rx.x** |

## IARPFWR - INCH

| Part No. | Flutes | ØD | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IARPF06S06WR** | 2 | **0.375** | 5.512 | 0.118 | 0.906 | 2.953 | 2.559 | 0.375 | 0.366 | B | **IZCFW060-Rx.x** |
| **IARPF08S08WR** | 2 | **0.500** | 5.906 | 0.157 | 1.024 | 3.346 | 2.559 | 0.500 | 0.492 | B | **IZCFW080-Rx.x** |

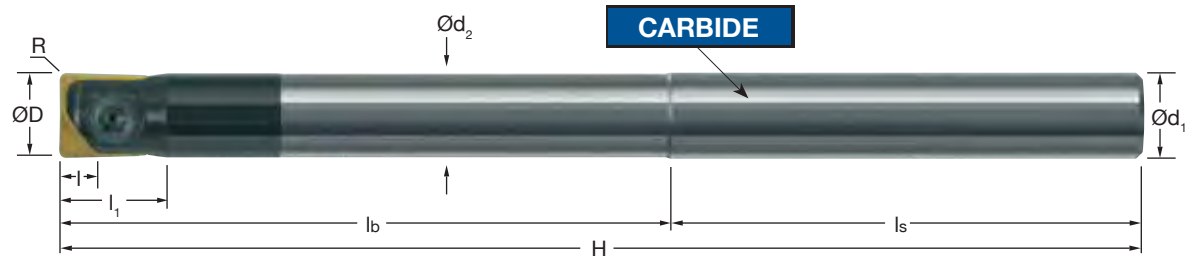
Inserts p. 146

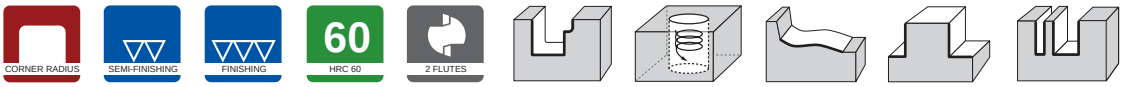
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **IARPF06S06W** | 581-142 | 104-T10 |
| **IARPF08S08W** | 581-143 | 105-T20 |
| **IARPF12S12W** | 581-148 | 101-T25S |
| **IARPF16S16W** | 581-146 | 105-T30A |
| **IARPF06S06WR** | 581-142 | 104-T10 |
| **IARPF08S08WR** | 581-143 | 105-T20 |

# IARPF/ARPF

**Corner Radius Style**
**Carbide Shank**
**Long Length /**
**Extra Long Length**

Advanced Engineering




| D | 0/-0.2 |
|---|---|

## IARPFWL - INCH

| Part No. | Flutes | ØD | H | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IARPF06S06WL** | 2 | **0.375** | 7.087 | 0.118 | 0.512 | 1.378 | 5.709 | 0.375 | 0.366 | B | **IZCFW060-Rx.x** |
| **IARPF08S08WL** | 2 | **0.500** | 7.087 | 0.157 | 0.591 | 1.772 | 5.315 | 0.500 | 0.492 | B | **IZCFW080-Rx.x** |
| **IARPF12S12WL** | 2 | **0.750** | 9.843 | 0.236 | 0.827 | 3.150 | 6.693 | 0.750 | 0.728 | B | **IZCFW120-Rx.x** |
| **IARPF16S16WL** | 2 | **1.000** | 9.843 | 0.315 | 0.945 | 3.150 | 6.693 | 1.000 | 0.980 | B | **IZCFW160-Rx.x** |
| **IARPF16S20WL** | 2 | **1.000** | 11.811 | 0.315 | 0.945 | 7.480 | 4.331 | 1.250 | 0.980 | B | **IZCFW160-Rx.x** |

## ARPFWL - METRIC

| Part No. | Flutes | ØD | H | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARPF08S08WL** | 2 | **8** | 130 | 2.5 | 18 | 65 | 65 | 8 | 7.8 | B | **ZCFW080-Rx.x** |
| **ARPF10S10WL** | 2 | **10** | 140 | 3.0 | 23 | 75 | 65 | 10 | 9.8 | B | **ZCFW100-Rx.x** |
| **ARPF12S12WL** | 2 | **12** | 150 | 4.0 | 26 | 85 | 65 | 12 | 11.8 | B | **ZCFW120-Rx.x** |

## ARPFWE - METRIC

| Part No. | Flutes | ØD | H | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARPF16S16WE** | 2 | **16** | 200 | 5 | 29 | 120 | 80 | 16 | 15.8 | B | **ZCFW160-Rx.x** |
| **ARPF20S20WE** | 2 | **20** | 250 | 6 | 36 | 150 | 100 | 20 | 19.8 | B | **ZCFW200-Rx.x** |
| **ARPF25S25WE** | 2 | **25** | 300 | 8 | 41 | 190 | 110 | 25 | 24.8 | B | **ZCFW250-Rx.x** |

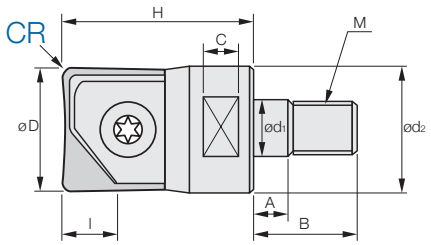
Inserts p. 146

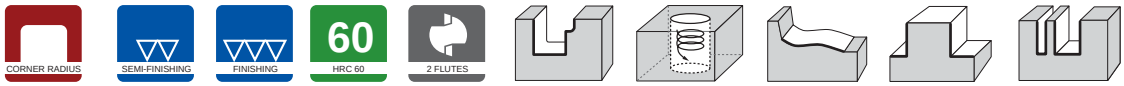
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **IARPF06S06WL** | 581-142 | 104-T10 |
| **IARPF08S08WL** | 581-143 | 105-T20 |
| **IARPF12S12WL** | 581-148 | 101-T25S |
| **IARPF16S16WL** | 581-146 | 105-T30A |
| **ARPF08S08WL** | 581-141 | 104-T8 |
| **ARPF10S10WL** | 581-142 | 104-T10 |
| **ARPF12S12WL** | 581-143 | 105-T20 |

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ARPF16S16WE** | 581-144 | 105-T20 |
| **ARPF20S20WE** | 581-145 | 101-T25S |
| **ARPF25S25WE** | 581-146 | 105-T30A |

# IARPF/ARPF

## Corner Radius Style Modular




| D | 0/-0.2 |
|---|---|

### ARPF-M - METRIC

| Part No. | Flutes | ØD | H | l | $Ød_1$ | $Ød_2$ | A | B | C | E | M | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARPFM20** | 2 | **20** | 38 | 6 | 10.5 | 17.8 | 5.5 | 19 | 10 | 15 | M10 | 15 | **ZCFW200-Rx.x** |
| **ARPFM25** | 2 | **25** | 38 | 8 | 12.5 | 20.8 | 5.5 | 22 | 10 | 17 | M12 | 17 | **ZCFW250-Rx.x** |

Modular Shanks on p. 163

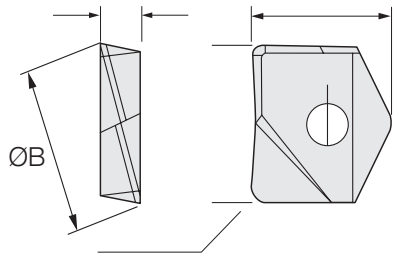
Inserts p. 146

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ARPFM20** | 581-145 | 101-T25S |
| **ARPFM25** | 581-146 | 105-T30A |

# IARPF/ARPF

## Inserts

Advanced Engineering




| METRIC Part No. | PCA12M | PTH08M | R (mm) | A (mm) | T (mm) | ØB (mm) |
|---|---|---|---|---|---|---|
| ZCFW080-R0.3 | • | • | 0.3 | 9.7 | 2.1 | 8 |
| ZCFW080-R0.5 | • | • | 0.5 | | | |
| ZCFW080-R1.0 | • | • | 1.0 | | | |
| ZCFW100-R0.3 | • | • | 0.3 | 12 | 2.7 | 10 |
| 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 | | | |
| ZCFW120-R0.3 | • | • | 0.3 | 14.6 | 4.2 | 12 |
| 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 | • | • | 0.3 | 16.6 | 4.2 | 16 |
| 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 | | | |

| Part No. | PCA12M | PTH08M | ATH08M | R (mm) | A (mm) | T (mm) | ØB (mm) |
|---|---|---|---|---|---|---|---|
| ZCFW200-R0.3 | • | • | | 0.3 | 19.9 | 5.2 | 20 |
| 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 | • | • | | 0.3 | 22.6 | 6.2 | 25 |
| ZCFW250-R0.5 | • | • | | 0.5 | | | |
| ZCFW250-R1.0 | • | • | | 1.0 | | | |
| ZCFW250-R2.0 | • | • | | 2.0 | | | |
| ZCFW250-R3.0 | • | • | | 3.0 | | | |
| **INCH** | | | | **R (in)** | **A (in)** | **T (in)** | **ØB (in)** |
| IZCFW060-R0.8 | • | | • | 0.031 | 0.474 | 0.106 | 0.375 |
| IZCFW060-R1.6 | • | | • | 0.063 | | | |
| IZCFW060-R3.2 | • | | • | 0.126 | | | |
| IZCFW080-R0.8 | • | | • | 0.031 | 0.574 | 0.126 | 0.500 |
| IZCFW080-R1.6 | • | | • | 0.063 | | | |
| IZCFW080-R3.2 | • | | • | 0.126 | | | |
| IZCFW120-R0.8 | • | | • | 0.031 | 0.784 | 0.205 | 0.750 |
| IZCFW120-R1.6 | • | | • | 0.063 | | | |
| IZCFW120-R3.2 | • | | • | 0.126 | | | |
| IZCFW160-R0.8 | • | | • | 0.031 | 0.889 | 0.244 | 1.000 |
| IZCFW160-R1.6 | • | | • | 0.063 | | | |
| IZCFW160-R3.2 | • | | • | 0.126 | | | |

### COATING MATERIALS FOR INSERTS

| Material name ISO Classification | Coating Name Coating Type | Application | Features |
|---|---|---|---|
| **ATH08M** P01-K01 | **ATH Coating** PVD | For hardened steel 50HRC or more | Multi-layer structure provides improved adhesion strength, coating hardness, and oxidation resistance |
| **PTH08M** P01-K01 | **TH Coating** PVD | For high-speed finishing of steel | Uses nanocomposite coating; Excellent for high-speed cutting and finishing. |
| **PCA12M** P10 | **PCA Coating** PVD | General purpose for steel | Uses TiAlN Coating; for roughing to finishing |

# IARPF/ARPF

## Cutting Conditions Inch

Advanced Engineering

| | Ø | | 5/16" or 8mm | | 3/8" or 10mm | | 1/2" or 12mm | |
|---|---|---|---|---|---|---|---|---|
| | No.of flutes | | 2 | | 2 | | 2 | |
| | Operation | General | High Feed | General | High Feed | General | High Feed |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 6360 | 7960 | 5090 | 6360 | 4240 | 5300 |
| | Vc(sfm) | 525 | 656 | 525 | 656 | 525 | 656 |
| | Vf(in/min) | 100 | 125 | 80 | 100 | 67 | 83 |
| ATH08M | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| PTH08M | doc(in) | 0.008 | 0.008 | 0.010 | 0.010 | 0.012 | 0.012 |
| PCA12M | woc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.047 | 0.047 |
| Tool Steel Alloy Steel (30-40HRC) | N(rpm) | 4770 | 5970 | 3820 | 4770 | 3180 | 3980 |
| | Vc(sfm) | 394 | 492 | 394 | 492 | 394 | 492 |
| | Vf(in/min) | 75 | 94 | 60 | 75 | 50 | 63 |
| ATH08M | fz(in/t) | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| PTH08M | doc(in) | 0.008 | 0.008 | 0.010 | 0.010 | 0.012 | 0.012 |
| PCA12M | woc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.047 | 0.047 |
| Tool Steel Pre-hardened (40-50HRC) | N(rpm) | 3980 | 5970 | 3180 | 4770 | 2650 | 3980 |
| | Vc(sfm) | 328 | 492 | 328 | 492 | 328 | 492 |
| | Vf(in/min) | 31 | 47 | 25 | 37 | 21 | 31 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| ATH08M | doc(in) | 0.008 | 0.008 | 0.010 | 0.010 | 0.012 | 0.012 |
| PTH08M | woc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.047 | 0.047 |
| Tool Steel (55-65HRC) | N(rpm) | 3180 | 5170 | 2540 | 4140 | 2120 | 3450 |
| | Vc(sfm) | 262 | 427 | 262 | 427 | 262 | 427 |
| | Vf(in/min) | 25 | 41 | 20 | 32 | 17 | 27 |
| | fz(in/t) | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| ATH08M | doc(in) | 0.004 | 0.004 | 0.004 | 0.004 | 0.005 | 0.005 |
| PTH08M | woc(in) | 0.008 | 0.008 | 0.010 | 0.010 | 0.012 | 0.012 |
| Cast Iron | N(rpm) | 6360 | 7960 | 5090 | 6360 | 4240 | 5300 |
| | Vc(sfm) | 525 | 656 | 525 | 656 | 525 | 656 |
| | Vf(in/min) | 150 | 188 | 120 | 150 | 100 | 125 |
| ATH08M | fz(in/t) | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| PTH08M | doc(in) | 0.008 | 0.008 | 0.010 | 0.010 | 0.012 | 0.012 |
| PCA12M | woc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.047 | 0.047 |

# IARPF/ARPF

## Cutting Conditions Inch

Advanced Engineering

| | Ø | | 5/8" or 16mm | | 3/4" or 20mm | | 1" or 25mm | |
|---|---|---|---|---|---|---|---|---|
| | No.of flutes | | 2 | | 2 | | 2 | |
| | Operation | | General | High Feed | General | High Feed | General | High Feed |
| Carbon Steel Alloy Steel (<30HRC) | | N(rpm) | 2540 | 3180 | 2540 | 3180 | 2030 | 2540 |
| | | Vc(sfm) | 525 | 656 | 525 | 656 | 525 | 656 |
| | | Vf(in/min) | 50 | 63 | 50 | 63 | 40 | 50 |
| ATH08M | | fz(in/t) | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 |
| PTH08M | | doc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.049 | 0.049 |
| PCA12M | | woc(in) | 0.063 | 0.063 | 0.079 | 0.079 | 0.098 | 0.098 |
| Tool Steel Alloy Steel (30-40HRC) | | N(rpm) | 1910 | 2380 | 1910 | 2380 | 1520 | 1910 |
| | | Vc(sfm) | 394 | 492 | 394 | 492 | 394 | 492 |
| | | Vf(in/min) | 37 | 47 | 37 | 47 | 30 | 37 |
| ATH08M | | fz(in/t) | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 |
| PTH08M | | doc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.049 | 0.049 |
| PCA12M | | woc(in) | 0.063 | 0.063 | 0.079 | 0.079 | 0.098 | 0.098 |
| Tool Steel Pre-hardened (40-50HRC) | | N(rpm) | 1590 | 2380 | 1590 | 2380 | 1270 | 1910 |
| | | Vc(sfm) | 328 | 492 | 328 | 492 | 328 | 492 |
| | | Vf(in/min) | 15 | 22 | 15 | 22 | 12 | 18 |
| | | fz(in/t) | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| ATH08M | | doc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.049 | 0.049 |
| PTH08M | | woc(in) | 0.063 | 0.063 | 0.079 | 0.079 | 0.098 | 0.098 |
| Tool Steel (55-65HRC) | | N(rpm) | 1270 | 2070 | 1270 | 2070 | 1010 | 1650 |
| | | Vc(sfm) | 262 | 427 | 262 | 427 | 262 | 427 |
| | | Vf(in/min) | 12 | 19 | 12 | 19 | 9 | 15 |
| | | fz(in/t) | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| ATH08M | | doc(in) | 0.006 | 0.006 | 0.008 | 0.008 | 0.010 | 0.010 |
| PTH08M | | woc(in) | 0.014 | 0.014 | 0.016 | 0.016 | 0.020 | 0.020 |
| Cast Iron | | N(rpm) | 2540 | 3180 | 2540 | 3180 | 2030 | 2540 |
| | | Vc(sfm) | 525 | 656 | 525 | 656 | 525 | 656 |
| | | Vf(in/min) | 70 | 87 | 70 | 87 | 56 | 70 |
| ATH08M | | fz(in/t) | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 |
| PTH08M | | doc(in) | 0.031 | 0.031 | 0.039 | 0.039 | 0.049 | 0.049 |
| PCA12M | | woc(in) | 0.063 | 0.063 | 0.079 | 0.079 | 0.098 | 0.098 |

# IARPF/ARPF

## Cutting Conditions Metric

Advanced Engineering

| | Ø | 5/16" or 8mm | | 3/8" or 10mm | | 1/2" or 12mm | |
|---|---|---|---|---|---|---|---|
| | No.of flutes | 2 | | 2 | | 2 | |
| | Operation | General | High Feed | General | High Feed | General | High Feed |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 6360 | 7960 | 5090 | 6360 | 4240 | 5300 |
| | Vc(m/min) | 160 | 200 | 160 | 200 | 160 | 200 |
| | Vf(mm/min) | 2540 | 3180 | 2030 | 2540 | 1690 | 2120 |
| ATH08M | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| PTH08M | doc(mm) | 0.2 | 0.2 | 0.25 | 0.25 | 0.3 | 0.3 |
| PCA12M | woc(mm) | 0.8 | 0.8 | 1 | 1 | 1.2 | 1.2 |
| Tool Steel Alloy Steel (30-40HRC) | N(rpm) | 4770 | 5970 | 3820 | 4770 | 3180 | 3980 |
| | Vc(m/min) | 120 | 150 | 120 | 150 | 120 | 150 |
| | Vf(mm/min) | 1900 | 2380 | 1520 | 1900 | 1270 | 1590 |
| ATH08M | fz(mm/t) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| PTH08M | doc(mm) | 0.2 | 0.2 | 0.25 | 0.25 | 0.3 | 0.3 |
| PCA12M | woc(mm) | 0.8 | 0.8 | 1 | 1 | 1.2 | 1.2 |
| Tool Steel Pre-hardened (40-50HRC) | N(rpm) | 3980 | 5970 | 3180 | 4770 | 2650 | 3980 |
| | Vc(m/min) | 100 | 150 | 100 | 150 | 100 | 150 |
| | Vf(mm/min) | 790 | 1190 | 630 | 950 | 530 | 790 |
| | fz(mm/t) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| ATH08M | doc(mm) | 0.2 | 0.2 | 0.25 | 0.25 | 0.3 | 0.3 |
| PTH08M | woc(mm) | 0.8 | 0.8 | 1 | 1 | 1.2 | 1.2 |
| Tool Steel (55-65HRC) | N(rpm) | 3180 | 5170 | 2540 | 4140 | 2120 | 3450 |
| | Vc(m/min) | 80 | 130 | 80 | 130 | 80 | 130 |
| | Vf(mm/min) | 630 | 1030 | 500 | 820 | 420 | 690 |
| | fz(mm/t) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| ATH08M | doc(mm) | 0.1 | 0.1 | 0.1 | 0.1 | 0.12 | 0.12 |
| PTH08M | woc(mm) | 0.2 | 0.2 | 0.25 | 0.25 | 0.3 | 0.3 |
| Cast Iron | N(rpm) | 6360 | 7960 | 5090 | 6360 | 4240 | 5300 |
| | Vc(m/min) | 160 | 200 | 160 | 200 | 160 | 200 |
| | Vf(mm/min) | 3810 | 4770 | 3050 | 3810 | 2540 | 3180 |
| ATH08M | fz(mm/t) | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| PTH08M | doc(mm) | 0.2 | 0.2 | 0.25 | 0.25 | 0.3 | 0.3 |
| PCA12M | woc(mm) | 0.8 | 0.8 | 1 | 1 | 1.2 | 1.2 |

# IARPF/ARPF

## Cutting Conditions Metric

Advanced Engineering

| | Ø<br>No.of flutes<br>Operation | 5/8" or 16mm<br>2<br>General | <br><br>High Feed | 3/4" or 20mm<br>2<br>General | <br><br>High Feed | 1" or 25mm<br>2<br>General | <br><br>High Feed |
|---|---|---|---|---|---|---|---|
| Carbon Steel<br>Alloy Steel<br>(<30HRC) | N(rpm) 0.8 | 2540 | 3180 | 2540 | 3180 | 2030 | 2540 |
| | Vc(m/min) | 160 | 200 | 160 | 200 | 160 | 200 |
| | Vf(mm/min) | 1270 | 1590 | 1270 | 1590 | 1010 | 1270 |
| ATH08M | fz(mm/t) | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| PTH08M | doc(mm) | 0.8 | 0.8 | 1 | 1 | 1.25 | 1.25 |
| PCA12M | woc(mm) | 1.6 | 1.6 | 2 | 2 | 2.5 | 2.5 |
| Tool Steel<br>Alloy Steel<br>(30-40HRC) | N(rpm) | 1910 | 2380 | 1910 | 2380 | 1520 | 1910 |
| | Vc(m/min) | 120 | 150 | 120 | 150 | 120 | 150 |
| | Vf(mm/min) | 950 | 1190 | 950 | 1190 | 760 | 950 |
| ATH08M | fz(mm/t) | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| PTH08M | doc(mm) | | 0.8 | 1 | 1 | 1.25 | 1.25 |
| PCA12M | woc(mm) | 1.6 | 1.6 | 2 | 2 | 2.5 | 2.5 |
| Tool Steel<br>Pre-hardened<br>(40-50HRC) | N(rpm) | 1590 | 2380 | 1590 | 2380 | 1270 | 1910 |
| | Vc(m/min) | 100 | 150 | 100 | 150 | 100 | 150 |
| | Vf(mm/min) | 380 | 570 | 380 | 570 | 300 | 450 |
| | fz(mm/t) | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| ATH08M | doc(mm) | 0.8 | 0.8 | 1 | 1 | 1.25 | 1.25 |
| PTH08M | woc(mm) | 1.6 | 1.6 | 2 | 2 | 2.5 | 2.5 |
| Tool Steel<br>(55-65HRC) | N(rpm) | 1270 | 2070 | 1270 | 2070 | 1010 | 1650 |
| | Vc(m/min) | 80 | 130 | 80 | 130 | 80 | 130 |
| | Vf(mm/min) | 300 | 490 | 300 | 490 | 240 | 390 |
| | fz(mm/t) | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| ATH08M | doc(mm) | 0.16 | 0.16 | 0.2 | 0.2 | 0.25 | 0.25 |
| PTH08M | woc(mm) | 0.35 | 0.35 | 0.4 | 0.4 | 0.5 | 0.5 |
| Cast Iron | N(rpm) | 2540 | 3180 | 2540 | 3180 | 2030 | 2540 |
| | Vc(m/min) | 160 | 200 | 160 | 200 | 160 | 200 |
| | Vf(mm/min) | 1770 | 2220 | 1770 | 2220 | 1420 | 1770 |
| ATH08M | fz(mm/t) | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| PTH08M | doc(mm) | 0.8 | 0.8 | 1 | 1 | 1.25 | 1.25 |
| PCA12M | woc(mm) | 1.6 | 1.6 | 2 | 2 | 2.5 | 2.5 |

# IABPF/ABPF

Advanced Engineering

## Indexable Ball End Mills for High-Precision Finishing

SHANK STYLE

MODULAR STYLE

## FEATURES

ATH Coated Inserts are ideal for high-speed and high-efficiency machining of hardened steels

ACS Coated Inserts are ideal for increased performance and tool life in carbon and alloy steels

New W-Type insert geometry features full-radius flute for vertical wall machining

Available carbide shanks provide increased clamping and reduced vibration

# IABPF/ABPF

Advanced Engineering

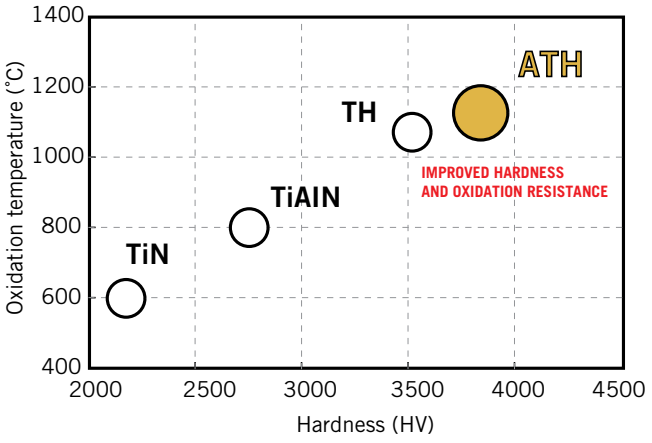
## FEATURES

### 1. Coated Inserts for Enhanced Productivity

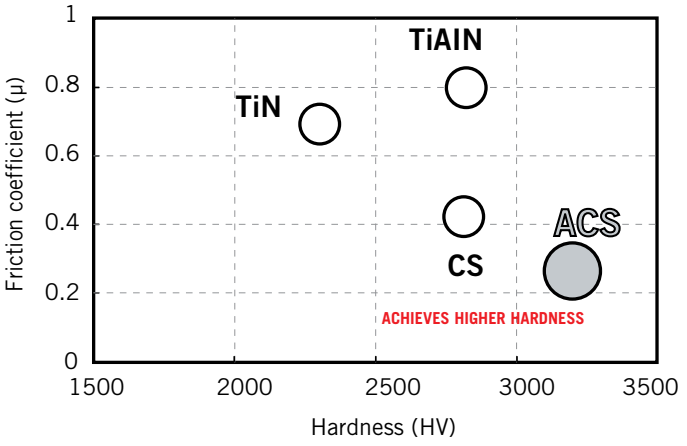
- **WH (ATH80D): For increased tool life in hardened steels**
  - – Multi-layer structure for improved adhesion strength, coating hardness and oxidation resistance.
  - – Ideal for hardened steels (45HRC-65HRC) such as D2, H13, M4, and 420 stainless as well as pre-hardened steels.

- **WF (ACS05E): For increased tool life in carbon and alloy steels (up to HRC50) and cast iron**
  - – Industry's first multi-layer structure provides improved adhesion and coating hardness as well as improving the oxidation-resistance temperature.
  - – Improved coefficient of friction reduces heat during machining.

**Oxidation Temperature and Hardness of Coating**

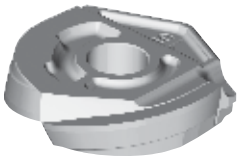



**Friction Coefficient and Hardness of Coating**




### 2. New Geometries

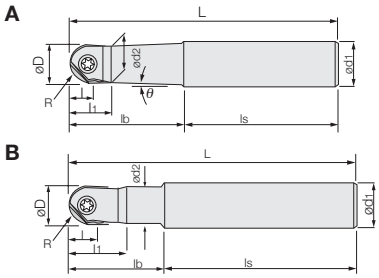
- **W-Type: Full radius flute and sharper cutting edge**
  - – Full radius flute for smooth vertical wall machining.
  - – Sharper cutting edge for improved surface finish.



# IABPF/ABPF

## Ball End Style
## Regular Length

Advanced Engineering






| D | ±0.01 |
|---|---|

### IABPFS - INCH

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | θ | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPF05S08** | 2 | **0.313** | 0.156 | 3.937 | 0.156 | 0.394 | 0.984 | 2.953 | 6.5° | 0.500 | 0.291 | Aw | **IZxFG050** |
| **IABPF06S08** | 2 | **0.375** | 0.188 | 3.937 | 0.187 | 0.512 | 0.984 | 2.953 | 4.5° | 0.500 | 0.335 | A | **IZxFG060** |
| **IABPF08S08** | 2 | **0.500** | 0.250 | 4.331 | 0.250 | 0.591 | 1.181 | 3.150 | - | 0.500 | 0.480 | B | **IZxFG080** |
| **IABPF10S10** | 2 | **0.625** | 0.313 | 5.118 | 0.312 | 0.748 | 1.969 | 3.150 | - | 0.625 | 0.602 | B | **IZxFG100** |
| **IABPF12S12** | 2 | **0.750** | 0.375 | 5.512 | 0.375 | 0.866 | 2.362 | 3.150 | - | 0.750 | 0.728 | B | **IZxFG120** |
| **IABPF16S16** | 2 | **1.000** | 0.500 | 5.906 | 0.500 | 0.984 | 2.756 | 3.150 | - | 1.000 | 0.980 | B | **IZxFG160** |

### ABPFS - METRIC

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | θ | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPF08S12** | 2 | **8** | 4.0 | 100 | 5.0 | 10 | 22 | 78 | 9.5° | 12 | 7.5 | A | **ZxFG080** |
| **ABPF10S12** | 2 | **10** | 5.0 | 100 | 7.0 | 13 | 25 | 75 | 5.0° | 12 | 9.5 | A | **ZxFG100** |
| **ABPF12S12** | 2 | **12** | 6.0 | 110 | 8.0 | 15 | 30 | 80 | - | 12 | 11.5 | B | **ZxFG120** |
| **ABPF16S20** | 2 | **16** | 8.0 | 130 | 10.0 | 19 | 50 | 80 | 2.5° | 20 | 15.5 | A | **ZxFG160** |
| **ABPF20S25** | 2 | **20** | 10.0 | 140 | 12.5 | 22 | 60 | 80 | 2.5° | 25 | 19.5 | A | **ZxFG200** |
| **ABPF25S32** | 2 | **25** | 12.5 | 150 | 15.0 | 25 | 70 | 80 | 3.0° | 32 | 24.5 | A | **ZxFG250** |

Inserts p. 158

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **IABPF05S08** | 581-141 | 104-T8 |
| **IABPF06S08** | 581-142 | 104-T10 |
| **IABPF08S08** | 581-143 | 105-T20 |
| **IABPF10S10** | 581-144 | 105-T20 |
| **IABPF12S12** | 581-148 | 101-T25S |
| **IABPF16S16** | 581-146 | 105-T30A |

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| **ABPF08S12** | 581-141 | 104-T8 |
| **ABPF10S12** | 581-142 | 104-T10 |
| **ABPF12S12** | 581-143 | 105-T20 |
| **ABPF16S20** | 581-144 | 105-T20 |
| **ABPF20S25** | 581-145 | 101-T25S |
| **ABPF25S32** | 581-146 | 105-T30A |

# IABPF/ABPF

## Ball End Style
## Long Length

Advanced Engineering



| D | ±0.01 |
|---|---|

### IABPFL - INCH

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | θ | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPF05S08L** | 2 | **0.313** | 0.156 | 5.906 | 0.156 | 0.394 | 1.969 | 3.937 | 3.0° | 0.500 | 0.291 | A | **IZxFG050** |
| **IABPF06S08L** | 2 | **0.375** | 0.188 | 5.906 | 0.187 | 0.512 | 1.969 | 3.937 | 2.0° | 0.500 | 0.335 | A | **IZxFG060** |
| **IABPF08S10L** | 2 | **0.500** | 0.250 | 6.299 | 0.250 | 0.591 | 2.362 | 3.937 | 1.7° | 0.625 | 0.480 | A | **IZxFG080** |
| **IABPF10S12L** | 2 | **0.625** | 0.313 | 6.496 | 0.312 | 0.748 | 2.559 | 3.937 | 1.6° | 0.750 | 0.602 | A | **IZxFG100** |
| **IABPF12S16L** | 2 | **0.750** | 0.375 | 7.087 | 0.375 | 0.866 | 3.150 | 3.937 | 2.6° | 1.000 | 0.728 | A | **IZxFG120** |
| **IABPF16S20L** | 2 | **1.000** | 0.500 | 7.874 | 0.500 | 0.984 | 3.543 | 4.331 | 2.4° | 1.250 | 0.980 | A | **IZxFG160** |

### ABPFL - METRIC

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | θ | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPF08S12L** | 2 | **8** | 4.0 | 130 | 5.0 | 10 | 50 | 80 | 3.0° | 12 | 7.5 | A | **ZxFG080** |
| **ABPF10S16L** | 2 | **10** | 5.0 | 150 | 7.0 | 13 | 50 | 100 | 5.0° | 16 | 9.5 | A | **ZxFG100** |
| **ABPF12S16L** | 2 | **12** | 6.0 | 160 | 8.0 | 20 | 60 | 100 | 3.0° | 16 | 10.8 | A | **ZxFG120** |
| **ABPF16S20L** | 2 | **16** | 8.0 | 160 | 10.0 | 19 | 65 | 95 | 2.0° | 20 | 15.5 | A | **ZxFG160** |
| **ABPF20S25L** | 2 | **20** | 10.0 | 180 | 12.5 | 22 | 80 | 100 | 2.0° | 25 | 19.5 | A | **ZxFG200** |
| **ABPF25S32L** | 2 | **25** | 12.5 | 200 | 15.0 | 25 | 90 | 110 | 3.0° | 32 | 24.5 | A | **ZxFG250** |

Inserts p. 158

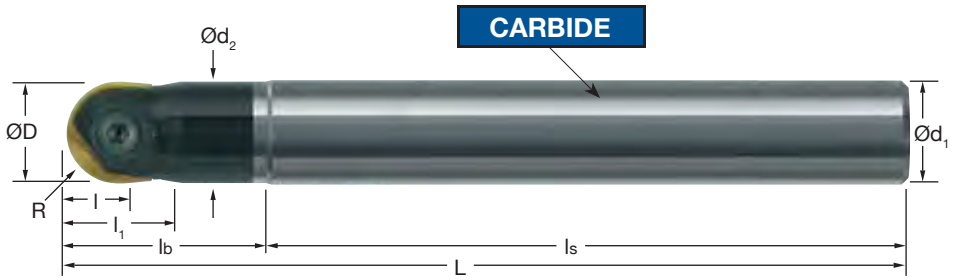
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **IABPF05S08L** | 581-141 | 104-T8 |
| **IABPF06S08L** | 581-142 | 104-T10 |
| **IABPF08S10L** | 581-143 | 105-T20 |
| **IABPF10S12L** | 581-144 | 105-T20 |
| **IABPF12S16L** | 581-148 | 101-T25S |
| **IABPF16S20L** | 581-146 | 105-T30A |

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **ABPF08S12L** | 581-141 | 104-T8 |
| **ABPF10S16L** | 581-142 | 104-T10 |
| **ABPF12S16L** | 581-143 | 105-T20 |
| **ABPF16S20L** | 581-144 | 105-T20 |
| **ABPF20S25L** | 581-145 | 101-T25S |
| **ABPF25S32L** | 581-146 | 105-T30A |

# IABPF/ABPF

**Ball End Style**
**Carbide Shank**
**Short / Regular Length**

Advanced Engineering





| D | ±0.01 |
|---|---|

## IABPFW - INCH

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPF05S05W** | 2 | **0.313** | 0.156 | 3.937 | 0.156 | 0.709 | 1.181 | 2.756 | 0.313 | 0.303 | B | **IZxFG050** |
| **IABPF06S06W** | 2 | **0.375** | 0.188 | 3.937 | 0.187 | 0.906 | 1.378 | 2.559 | 0.375 | 0.366 | B | **IZxFG060** |
| **IABPF08S08W** | 2 | **0.500** | 0.250 | 4.331 | 0.250 | 1.024 | 1.772 | 2.559 | 0.500 | 0.472 | B | **IZxFG080** |
| **IABPF10S10W** | 2 | **0.625** | 0.313 | 5.512 | 0.312 | 0.748 | 1.575 | 3.937 | 0.625 | 0.602 | B | **IZxFG100** |
| **IABPF12S12W** | 2 | **0.750** | 0.375 | 4.724 | 0.375 | 0.866 | 2.165 | 2.559 | 0.750 | 0.728 | B | **IZxFG120** |
| **IABPF16S16W** | 2 | **1.000** | 0.500 | 5.315 | 0.500 | 0.984 | 2.559 | 2.756 | 1.000 | 0.980 | B | **IZxFG160** |

## IABPFWR - INCH

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPF05S05WR** | 2 | **0.313** | 0.156 | 5.118 | 0.156 | 0.394 | 2.559 | 2.559 | 0.313 | 0.303 | B | **IZxFG050** |
| **IABPF06S06WR** | 2 | **0.375** | 0.188 | 5.512 | 0.187 | 0.512 | 2.953 | 2.559 | 0.375 | 0.366 | B | **IZxFG060** |
| **IABPF08S08WR** | 2 | **0.500** | 0.250 | 5.906 | 0.250 | 0.591 | 3.346 | 2.559 | 0.500 | 0.472 | B | **IZxFG080** |
| **IABPF12S12WR** | 2 | **0.750** | 0.375 | 6.299 | 0.375 | 0.709 | 2.165 | 4.134 | 0.750 | 0.728 | B | **IZxFG120** |
| **IABPF16S16WR** | 2 | **1.000** | 0.500 | 7.087 | 0.500 | 0.709 | 1.651 | 4.528 | 1.000 | 0.980 | B | **IZxFG160** |

## ABPFW - METRIC

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPF08S08W** | 2 | **8** | 4 | 100 | 5 | 18 | 30 | 70 | 8 | 7.8 | B | **ZxFG080** |
| **ABPF10S10W** | 2 | **10** | 5 | 100 | 7 | 23 | 35 | 65 | 10 | 9.8 | B | **ZxFG100** |
| **ABPF12S12W** | 2 | **12** | 6 | 110 | 8 | 26 | 45 | 65 | 12 | 11.8 | B | **ZxFG120** |

Inserts p. 158

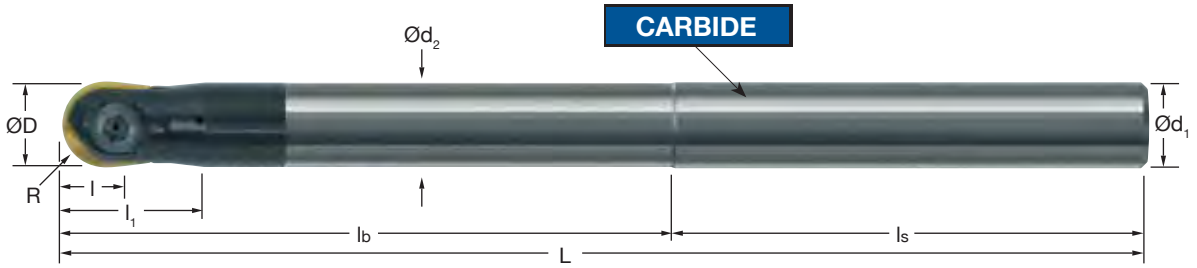
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **IABPF05S05W(R)** | 581-141 | 104-T8 |
| **IABPF06S06W(R)** | 581-142 | 104-T10 |
| **IABPF08S08W(R)** | 581-143 | 105-T20 |
| **IABPF10S10W** | 581-144 | 105-T20 |
| **IABPF12S12W(R)** | 581-148 | 101-T25S |
| **IABPF16S16W(R)** | 581-146 | 105-T30A |

| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **ABPF08S08W** | 581-141 | 104-T8 |
| **ABPF10S10W** | 581-142 | 104-T10 |
| **ABPF12S12W** | 581-143 | 105-T20 |

# IABPF/ABPF

**Ball End Style**
**Carbide Shank**
**Long Length /**
**Extra Long Length**

Advanced Engineering





| D | ±0.01 |
|---|---|

## IABPFWL - INCH

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IABPF05S05WL** | 2 | **0.313** | 0.156 | 7.087 | 0.156 | 0.394 | 1.378 | 5.709 | 0.313 | 0.303 | B | **IZxFG050** |
| **IABPF06S06WL** | 2 | **0.375** | 0.188 | 7.087 | 0.187 | 0.512 | 1.378 | 5.709 | 0.375 | 0.366 | B | **IZxFG060** |
| **IABPF08S08WL** | 2 | **0.500** | 0.250 | 7.087 | 0.250 | 0.591 | 1.772 | 5.315 | 0.500 | 0.472 | B | **IZxFG080** |
| **IABPF10S10WL** | 2 | **0.625** | 0.313 | 7.874 | 0.312 | 0.787 | 2.559 | 5.315 | 0.625 | 0.602 | B | **IZxFG100** |
| **IABPF12S12WL** | 2 | **0.750** | 0.375 | 9.843 | 0.375 | 0.866 | 3.150 | 6.693 | 0.750 | 0.728 | B | **IZxFG120** |
| **IABPF16S16WL** | 2 | **1.000** | 0.500 | 9.843 | 0.500 | 0.984 | 3.150 | 6.693 | 1.000 | 0.980 | B | **IZxFG160** |

## ABPFWL - METRIC

| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPF08W08WL** | 2 | **8** | 4 | 130 | 5 | 18 | 65 | 65 | 8 | 7.8 | B | **ZxFG080** |
| **ABPF10S10WL** | 2 | **10** | 5 | 140 | 7 | 23 | 75 | 65 | 10 | 9.8 | B | **ZxFG100** |
| **ABPF12S12WL** | 2 | **12** | 6 | 150 | 8 | 26 | 85 | 65 | 12 | 11.8 | B | **ZxFG120** |

## ABPFWE - METRIC

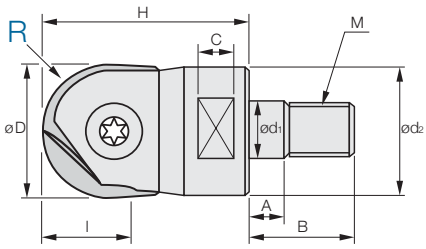
| Part No. | Flutes | ØD | R | L | l | $l_1$ | lb | ls | $Ød_1$ | $Ød_2$ | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPF16S16WE** | 2 | **16** | 8.0 | 200 | 10.0 | 19 | 120 | 80 | 16 | 15.8 | B | **ZxFG160** |
| **ABPF20S20WE** | 2 | **20** | 10.0 | 250 | 12.5 | 22 | 150 | 100 | 20 | 19.8 | B | **ZxFG200** |
| **ABPF25S25WE** | 2 | **25** | 12.5 | 300 | 15.0 | 25 | 190 | 110 | 25 | 24.8 | B | **ZxFG250** |

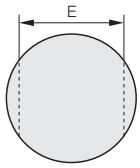
Inserts p. 158

| Part No. | Clamp Screw | Wrench | Part No. | Clamp Screw | Wrench |
|---|---|---|---|---|---|
| |  |  | |  |  |
| **IABPF05S05WL** | 581-141 | 104-T8 | **ABPF08S08WL** | 581-141 | 104-T8 |
| **IABPF06S06WL** | 581-142 | 104-T10 | **ABPF10S10WL** | 581-142 | 104-T10 |
| **IABPF08S08WL** | 581-143 | 105-T20 | **ABPF12S12WL** | 581-143 | 105-T20 |
| **IABPF10S10WL** | 581-144 | 105-T20 | **ABPF16S16WE** | 581-144 | 105-T20 |
| **IABPF12S12WL** | 581-148 | 101-T25S | **ABPF20S20WE** | 581-145 | 101-T25S |
| **IABPF16S16WL** | 581-146 | 105-T30A | **ABPF25S25WE** | 581-146 | 105-T30A |

# IABPF/ABPF

## Ball End Style
## Modular





| D | ±0.01 |
|---|---|

### ABPFM - METRIC

| Part No. | Flutes | ØD | R | H | l | Ød$_1$ | Ød$_2$ | A | B | C | E | M | Type | Insert |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ABPFM20** | 2 | **20** | 10.0 | 38 | 12.5 | 10.5 | 17.8 | 5.5 | 19 | 10.0 | 10 | M10 | 15 | **ZxFG200** |
| **ABPFM25** | 2 | **25** | 12.5 | 38 | 15.0 | 12.5 | 20.8 | 5.5 | 22 | 10.0 | 10 | M12 | 17 | **ZxFG250** |

Modular Shanks on p. 163

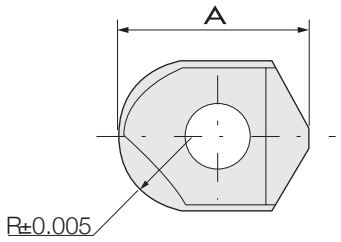
Inserts p. 158

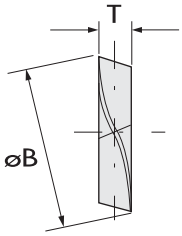
| Part No. | Clamp Screw | Wrench |
|---|---|---|
| |  |  |
| **ABPFM20** | 581-145 | 101-T25S |
| **ABPFM25** | 581-146 | 105-T30A |

# IABPF/ABPF

## Inserts

Advanced Engineering




| METRIC Part No. | PN08M | ATH80D | PN15M | R (mm) | A (mm) | T (mm) | ØB (mm) |
|---|---|---|---|---|---|---|---|
| **ZDFG080-SC** | • | | | 4.0 | 9.7 | 2.1 | 8.0 |
| **ZDFG080-ST** | | • | | 4.0 | 9.7 | 2.1 | 8.0 |
| **ZDFG080-ST** | | | • | 4.0 | 9.7 | 2.1 | 8.0 |
| **ZDFG100-SC** | • | | | 5.0 | 12.1 | 2.7 | 10.0 |
| **ZDFG100-ST** | | • | | 5.0 | 12.1 | 2.7 | 10.0 |
| **ZDFG100-ST** | | | • | 5.0 | 12.1 | 2.7 | 10.0 |
| **ZDFG120-SC** | • | | | 6.0 | 14.6 | 3.2 | 12.0 |
| **ZDFG120-ST** | | • | | 6.0 | 14.6 | 3.2 | 12.0 |
| **ZDFG120-ST** | | | • | 6.0 | 14.6 | 3.2 | 12.0 |
| **ZDFG160-SC** | • | | | 8.0 | 16.6 | 4.2 | 16.0 |
| **ZDFG160-ST** | | • | | 8.0 | 16.6 | 4.2 | 16.0 |
| **ZDFG160-ST** | | | • | 8.0 | 16.6 | 4.2 | 16.0 |
| **ZDFG200-SC** | • | | | 10.0 | 20.3 | 5.2 | 20.0 |
| **ZDFG200-ST** | | • | | 10.0 | 20.3 | 5.2 | 20.0 |
| **ZDFG200-ST** | | | • | 10.0 | 20.3 | 5.2 | 20.0 |
| **ZDFG250-SC** | • | | | 12.5 | 24.1 | 6.2 | 25.0 |
| **ZDFG250-ST** | | • | | 12.5 | 24.1 | 6.2 | 25.0 |
| **ZDFG250-ST** | | | • | 12.5 | 24.1 | 6.2 | 25.0 |

| INCH Part No. | ACS05E | ATH80D | PCA12M | R (in) | A (in) | T (in) | ØB (in) |
|---|---|---|---|---|---|---|---|
| **IZDFG050-WF** | • | | | 0.156 | 0.381 | 0.083 | 0.312 |
| **IZDFG050-WF** | | • | | 0.156 | 0.381 | 0.083 | 0.312 |
| **IZDFG050-WF** | | | • | 0.156 | 0.381 | 0.083 | 0.312 |
| **IZDFG060-WF** | • | | | 0.188 | 0.478 | 0.106 | 0.375 |
| **IZDFG060-WH** | | • | | 0.188 | 0.478 | 0.106 | 0.375 |
| **IZDFG060** | | | • | 0.188 | 0.478 | 0.106 | 0.375 |
| **IZDFG080-WF** | • | | | 0.250 | 0.574 | 0.126 | 0.500 |
| **IZDFG080-WH** | | • | | 0.250 | 0.574 | 0.126 | 0.500 |
| **IZDFG080** | | | • | 0.250 | 0.574 | 0.126 | 0.500 |
| **IZDFG100-WF** | • | | | 0.313 | 0.653 | 0.165 | 0.625 |
| **IZDFG100-WH** | | • | | 0.313 | 0.653 | 0.165 | 0.625 |
| **IZDFG100** | | | • | 0.313 | 0.653 | 0.165 | 0.625 |
| **IZDFG120-WF** | • | | | 0.375 | 0.800 | 0.205 | 0.750 |
| **IZDFG120-WH** | | • | | 0.375 | 0.800 | 0.205 | 0.750 |
| **IZDFG120** | | | • | 0.375 | 0.800 | 0.205 | 0.750 |
| **IZDFG160-WF** | • | | | 0.500 | 0.948 | 0.244 | 1.000 |
| **IZDFG160-WH** | | • | | 0.500 | 0.948 | 0.244 | 1.000 |
| **IZDFG160** | | | • | 0.500 | 0.948 | 0.244 | 1.000 |

### COATING MATERIALS FOR INSERTS

| Material name ISO Classification | Coating Name Coating Type | Application | Features |
|---|---|---|---|
| **ACS05E** P01-K01 | **ACS Coating** PVD | General purpose for steel (up to HRC50) and cast iron | Reduced friction and sharp edge achieve excellent |
| **PN08M** P01-K01 | **PN Coating** PVD | High speed finishing for steel (up to 45HRC) | PN coating has excellent heat resistance with higher hardness. Suitable for high-speed finishing of steel |
| **ATH80D** P01-M01-K01 | **ATH Coating** PVD | Hardened and pre-hardened steels | Extraordinary performance for high-speed and |
| **PCA12M** P10 | **PCA Coating** PVD | General purpose for steel | Uses TiAlN coating; for roughing to finishing |
| **PN15M** P10 | **PN Coating** PVD | General purpose for steel | It adopts PN coating which was excellent in heat resistance with higher hardness. Suitable of finishing of common steels. |

# IABPF/ABPF

## Cutting Conditions
## Inch

Advanced Engineering

| | Ø | 5/16" or 8mm | | 3/8" or 10mm | | 1/2" or 12mm | |
|---|---|---|---|---|---|---|---|
| | No.of flutes | 2 | | 2 | | 2 | |
| | Operation | General | High Feed | General | High Feed | General | High Feed |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 7960 | 11940 | 6360 | 9550 | 5300 | 7960 |
| | Vc(sfm) | 656 | 984 | 656 | 984 | 656 | 984 |
| | Vf(in/min) | 125 | 376 | 100 | 301 | 83 | 250 |
| AC505E PN08M PN15M PCA12M | fz(in/t) | 0.008 | 0.016 | 0.008 | 0.016 | 0.008 | 0.016 |
| | doc(in) | 0.008 | 0.004 | 0.010 | 0.006 | 0.012 | 0.008 |
| | woc(in) | 0.031 | 0.031 | 0.039 | 0.031 | 0.047 | 0.035 |
| Tool Steel Alloy Steel (30-40HRC) | N(rpm) | 7160 | 9950 | 5730 | 7960 | 4770 | 6630 |
| | Vc(sfm) | 591 | 820 | 591 | 820 | 591 | 820 |
| | Vf(in/min) | 113 | 313 | 90 | 250 | 75 | 209 |
| AC505E PN08M PN15M PCA12M | fz(in/t) | 0.008 | 0.016 | 0.008 | 0.016 | 0.008 | 0.016 |
| | doc(in) | 0.008 | 0.004 | 0.010 | 0.006 | 0.012 | 0.008 |
| | woc(in) | 0.031 | 0.031 | 0.039 | 0.031 | 0.047 | 0.035 |
| Tool Steel Pre-hardened (40-50HRC) | N(rpm) | 5970 | 7960 | 4770 | 6360 | 3980 | 5300 |
| | Vc(sfm) | 492 | 656 | 492 | 656 | 492 | 656 |
| | Vf(in/min) | 70 | 157 | 56 | 125 | 47 | 104 |
| ATH80D PN08M PN15M PCA12M | fz(in/t) | 0.006 | 0.010 | 0.006 | 0.010 | 0.006 | 0.010 |
| | doc(in) | 0.008 | 0.004 | 0.010 | 0.006 | 0.012 | 0.008 |
| | woc(in) | 0.031 | 0.031 | 0.039 | 0.031 | 0.047 | 0.035 |
| Tool Steel (55-65HRC) | N(rpm) | 7160 | 9950 | 5730 | 7960 | 4770 | 6630 |
| | Vc(sfm) | 591 | 820 | 591 | 820 | 591 | 820 |
| | Vf(in/min) | 113 | 235 | 90 | 188 | 75 | 156 |
| | fz(in/t) | 0.008 | 0.012 | 0.008 | 0.012 | 0.008 | 0.012 |
| | doc(in) | 0.003 | 0.003 | 0.004 | 0.004 | 0.005 | 0.005 |
| ATH80D | woc(in) | 0.006 | 0.006 | 0.008 | 0.008 | 0.010 | 0.010 |
| Cast Iron | N(rpm) | 7960 | 11940 | 6360 | 9550 | 5300 | 7960 |
| | Vc(sfm) | 656 | 984 | 656 | 984 | 656 | 984 |
| | Vf(in/min) | 188 | 376 | 150 | 376 | 125 | 376 |
| AC505E PN08M PN15M PCA12M | fz(in/t) | 0.012 | 0.016 | 0.012 | 0.020 | 0.012 | 0.024 |
| | doc(in) | 0.008 | 0.004 | 0.010 | 0.006 | 0.012 | 0.008 |
| | woc(in) | 0.031 | 0.031 | 0.039 | 0.031 | 0.047 | 0.035 |

# IABPF/ABPF

## Cutting Conditions Inch

Advanced Engineering

| | Ø<br>No.of flutes<br>Operation | 5/8" or 16mm<br>2<br>General | <br><br>High Feed | 3/4" or 20mm<br>2<br>General | <br><br>High Feed | 1" or 25mm<br>2<br>General | <br><br>High Feed |
|---|---|---|---|---|---|---|---|
| Carbon Steel<br>Alloy Steel<br>(<30HRC)<br><br>AC505E<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 3180 | 4770 | 3180 | 4770 | 2540 | 3830 |
| | Vc(sfm) | 656 | 984 | 656 | 984 | 656 | 984 |
| | Vf(in/min) | 63 | 188 | 63 | 188 | 50 | 151 |
| | fz(in/t) | 0.010 | 0.020 | 0.010 | 0.020 | 0.010 | 0.020 |
| | doc(in) | 0.031 | 0.016 | 0.039 | 0.020 | 0.049 | 0.024 |
| | woc(in) | 0.063 | 0.043 | 0.079 | 0.059 | 0.098 | 0.071 |
| Tool Steel<br>Alloy Steel<br>(30-40HRC)<br><br>AC505E<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 2860 | 3980 | 2860 | 3980 | 2290 | 3180 |
| | Vc(sfm) | 591 | 820 | 591 | 820 | 591 | 820 |
| | Vf(in/min) | 56 | 157 | 56 | 157 | 45 | 125 |
| | fz(in/t) | 0.010 | 0.020 | 0.010 | 0.020 | 0.010 | 0.020 |
| | doc(in) | 0.031 | 0.016 | 0.039 | 0.020 | 0.049 | 0.024 |
| | woc(in) | 0.063 | 0.043 | 0.079 | 0.059 | 0.098 | 0.071 |
| Tool Steel<br>Pre-hardened<br>(40-50HRC)<br><br>ATH80D<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 2380 | 3180 | 2380 | 3180 | 1910 | 2540 |
| | Vc(sfm) | 492 | 656 | 492 | 656 | 492 | 656 |
| | Vf(in/min) | 28 | 63 | 28 | 63 | 22 | 50 |
| | fz(in/t) | 0.006 | 0.010 | 0.006 | 0.010 | 0.006 | 0.010 |
| | doc(in) | 0.031 | 0.016 | 0.039 | 0.020 | 0.049 | 0.024 |
| | woc(in) | 0.063 | 0.043 | 0.079 | 0.059 | 0.098 | 0.071 |
| Tool Steel<br>(55-65HRC)<br><br><br><br><br>ATH80D | N(rpm) | 2860 | 3980 | 2860 | 3980 | 2290 | 3180 |
| | Vc(sfm) | 591 | 820 | 591 | 820 | 591 | 820 |
| | Vf(in/min) | 45 | 94 | 45 | 94 | 36 | 75 |
| | fz(in/t) | 0.008 | 0.012 | 0.008 | 0.012 | 0.008 | 0.012 |
| | doc(in) | 0.006 | 0.006 | 0.008 | 0.008 | 0.010 | 0.010 |
| | woc(in) | 0.013 | 0.013 | 0.016 | 0.016 | 0.020 | 0.020 |
| Cast Iron<br><br><br><br>AC505E<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 3180 | 4770 | 3180 | 4770 | 2540 | 3820 |
| | Vc(sfm) | 656 | 984 | 656 | 984 | 656 | 984 |
| | Vf(in/min) | 87 | 225 | 87 | 225 | 70 | 180 |
| | fz(in/t) | 0.014 | 0.024 | 0.014 | 0.024 | 0.014 | 0.024 |
| | doc(in) | 0.031 | 0.016 | 0.039 | 0.020 | 0.049 | 0.024 |
| | woc(in) | 0.063 | 0.043 | 0.079 | 0.059 | 0.098 | 0.071 |

# IABPF/ABPF

## Cutting Conditions Metric

Advanced Engineering

| | Ø | | 5/16" or 8mm | | 3/8" or 10mm | | 1/2" or 12mm | |
|---|---|---|---|---|---|---|---|---|
| | No.of flutes | | 2 | | 2 | | 2 | |
| | Operation | General | High Feed | General | High Feed | General | High Feed |
| Carbon Steel Alloy Steel (<30HRC) | N(rpm) | 7960 | 11940 | 6360 | 9550 | 5300 | 7960 |
| | Vc(m/min) | 200 | 300 | 200 | 300 | 200 | 300 |
| | Vf(mm/min) | 3180 | 9550 | 2540 | 7640 | 2120 | 6360 |
| AC505E PN08M PN15M PCA12M | fz(mm/t) | 0.20 | 0.40 | 0.20 | 0.40 | 0.20 | 0.40 |
| | doc(mm) | 0.2 | 0.1 | 0.25 | 0.15 | 0.3 | 0.2 |
| | woc(mm) | 0.8 | 0.8 | 1 | 0.8 | 1.2 | 0.9 |
| Tool Steel Alloy Steel (30-40HRC) | N(rpm) | 7160 | 9950 | 5730 | 7960 | 4770 | 6630 |
| | Vc(m/min) | 180 | 250 | 180 | 250 | 180 | 250 |
| | Vf(mm/min) | 2860 | 7960 | 2290 | 6360 | 1900 | 5300 |
| AC505E PN08M PN15M PCA12M | fz(mm/t) | 0.20 | 0.40 | 0.20 | 0.40 | 0.20 | 0.40 |
| | doc(mm) | 0.2 | 0.1 | 0.25 | 0.15 | 0.3 | 0.2 |
| | woc(mm) | 0.8 | 0.8 | 1 | 0.8 | 1.2 | 0.9 |
| Tool Steel Pre-hardened (40-50HRC) | N(rpm) | 5970 | 7960 | 4770 | 6360 | 3980 | 5300 |
| | Vc(m/min) | 150 | 200 | 150 | 200 | 150 | 200 |
| | Vf(mm/min) | 1790 | 3980 | 1430 | 3180 | 1190 | 2650 |
| ATH80D PN08M PN15M PCA12M | fz(mm/t) | 0.15 | 0.25 | 0.15 | 0.25 | 0.15 | 0.25 |
| | doc(mm) | 0.2 | 0.1 | 0.25 | 0.15 | 0.3 | 0.2 |
| | woc(mm) | 0.8 | 0.8 | 1 | 0.8 | 1.2 | 0.9 |
| Tool Steel (55-65HRC) | N(rpm) | 7160 | 9950 | 5730 | 7960 | 4770 | 6630 |
| | Vc(m/min) | 180 | 250 | 180 | 250 | 180 | 250 |
| | Vf(mm/min) | 2860 | 5970 | 2290 | 4770 | 1900 | 3970 |
| | fz(mm/t) | 0.20 | 0.30 | 0.20 | 0.30 | 0.20 | 0.30 |
| | doc(mm) | 0.08 | 0.08 | 0.1 | 0.1 | 0.12 | 0.12 |
| ATH80D | woc(mm) | 0.16 | 0.16 | 0.2 | 0.2 | 0.25 | 0.25 |
| Cast Iron | N(rpm) | 7960 | 11940 | 6360 | 9550 | 5300 | 7960 |
| | Vc(m/min) | 200 | 300 | 200 | 300 | 200 | 300 |
| | Vf(mm/min) | 4770 | 9550 | 3810 | 9550 | 3180 | 9550 |
| AC505E PN08M PN15M PCA12M | fz(mm/t) | 0.30 | 0.40 | 0.30 | 0.50 | 0.30 | 0.60 |
| | doc(mm) | 0.2 | 0.1 | 0.25 | 0.15 | 0.3 | 0.2 |
| | woc(mm) | 0.8 | 0.8 | 1 | 0.8 | 1.2 | 0.9 |

# IABPF/ABPF

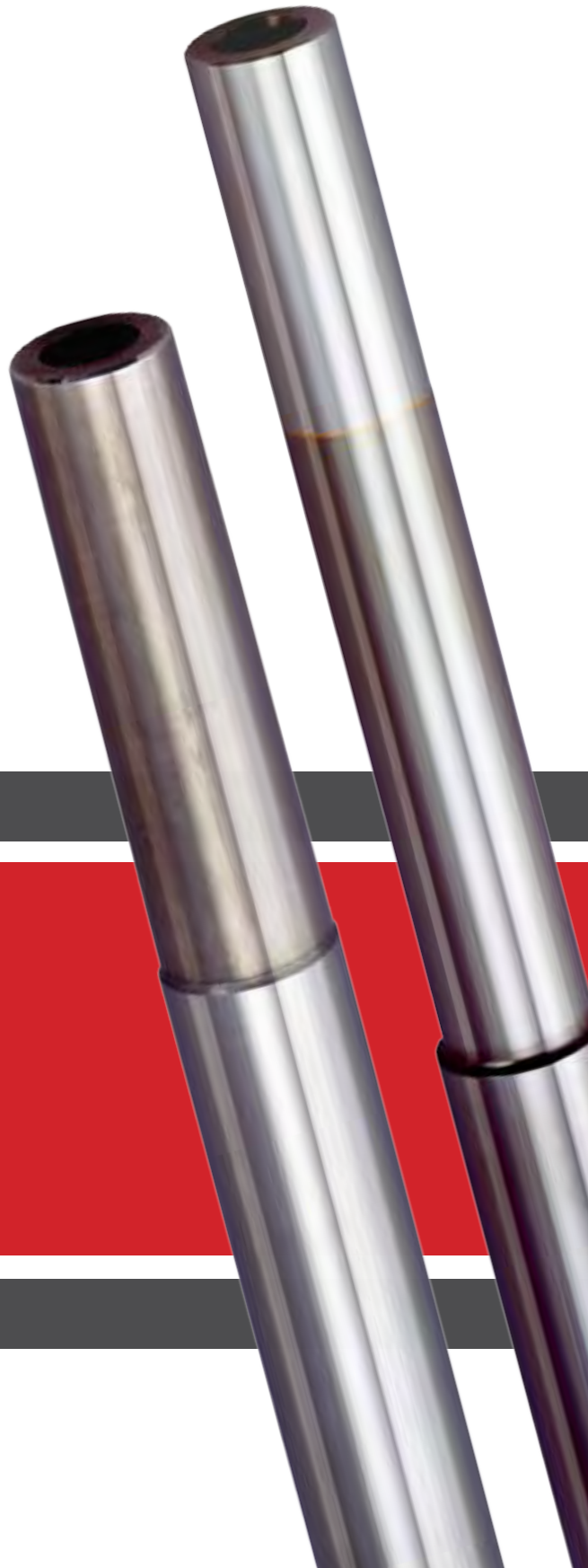
## Cutting Conditions Metric

Advanced Engineering

| | Ø<br>No.of flutes<br>Operation | 5/8" or 16mm<br>2<br>General | <br><br>High Feed | 3/4" or 20mm<br>2<br>General | <br><br>High Feed | 1" or 25mm<br>2<br>General | <br><br>High Feed |
|---|---|---|---|---|---|---|---|
| Carbon Steel<br>Alloy Steel<br>(<30HRC)<br><br>AC505E<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 3180 | 4770 | 3180 | 4770 | 2540 | 3830 |
| | Vc(m/min) | 200 | 300 | 200 | 300 | 200 | 300 |
| | Vf(mm/min) | 1590 | 4770 | 1590 | 4770 | 1270 | 3830 |
| | fz(mm/t) | 0.25 | 0.50 | 0.25 | 0.50 | 0.25 | 0.50 |
| | doc(mm) | 0.8 | 0.4 | 1 | 0.5 | 1.25 | 0.6 |
| | woc(mm) | 1.6 | 1.1 | 2 | 1.5 | 2.5 | 1.8 |
| Tool Steel<br>Alloy Steel<br>(30-40HRC)<br><br>AC505E<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 2860 | 3980 | 2860 | 3980 | 2290 | 3180 |
| | Vc(m/min) | 180 | 250 | 180 | 250 | 180 | 250 |
| | Vf(mm/min) | 1430 | 3980 | 1430 | 3980 | 1140 | 3180 |
| | fz(mm/t) | 0.25 | 0.50 | 0.25 | 0.50 | 0.25 | 0.50 |
| | doc(mm) | 0.8 | 0.4 | 1 | 0.5 | 1.25 | 0.6 |
| | woc(mm) | 1.6 | 1.1 | 2 | 1.5 | 2.5 | 1.8 |
| Tool Steel<br>Pre-hardened<br>(40-50HRC)<br><br>ATH80D<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 2380 | 3180 | 2380 | 3180 | 1910 | 2540 |
| | Vc(m/min) | 150 | 200 | 150 | 200 | 150 | 200 |
| | Vf(mm/min) | 710 | 1590 | 710 | 1590 | 570 | 1270 |
| | fz(mm/t) | 0.15 | 0.25 | 0.15 | 0.25 | 0.15 | 0.25 |
| | doc(mm) | 0.8 | 0.4 | 1 | 0.5 | 1.25 | 0.6 |
| | woc(mm) | 1.6 | 1.1 | 2 | 1.5 | 2.5 | 1.8 |
| Tool Steel<br>(55-65HRC)<br><br><br><br><br>ATH80D | N(rpm) | 2860 | 3980 | 2860 | 3980 | 2290 | 3180 |
| | Vc(m/min) | 180 | 250 | 180 | 250 | 180 | 250 |
| | Vf(mm/min) | 1140 | 2380 | 1140 | 2380 | 910 | 1900 |
| | fz(mm/t) | 0.20 | 0.30 | 0.20 | 0.30 | 0.20 | 0.30 |
| | doc(mm) | 0.16 | 0.16 | 0.2 | 0.2 | 0.25 | 0.25 |
| | woc(mm) | 0.32 | 0.32 | 0.4 | 0.4 | 0.5 | 0.5 |
| Cast Iron<br><br><br><br>AC505E<br>PN08M<br>PN15M<br>PCA12M | N(rpm) | 3180 | 4770 | 3180 | 4770 | 2540 | 3820 |
| | Vc(m/min) | 200 | 300 | 200 | 300 | 200 | 300 |
| | Vf(mm/min) | 2220 | 5720 | 2220 | 5720 | 1770 | 4580 |
| | fz(mm/t) | 0.35 | 0.60 | 0.35 | 0.60 | 0.35 | 0.60 |
| | doc(mm) | 0.8 | 0.4 | 1 | 0.5 | 1.25 | 0.6 |
| | woc(mm) | 1.6 | 1.1 | 2 | 1.5 | 2.5 | 1.8 |

# MODULAR SHANK

## Advanced Design Shank for Use with Modular Style



## FEATURES

Designed for use with modular tools

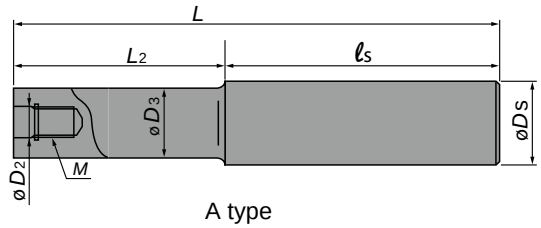
Solid carbide design provides improved damping

Inch overall lengths: 3” – 8”

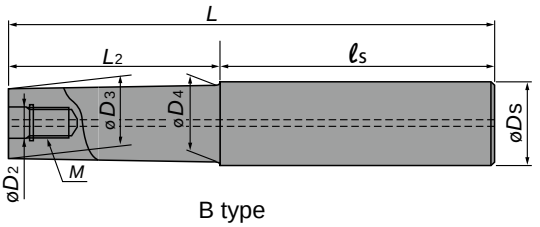
Metric overall lengths: 74mm – 360mm

# MODULAR SHANK

**Modular Shank**
**Inch**




A type




B type

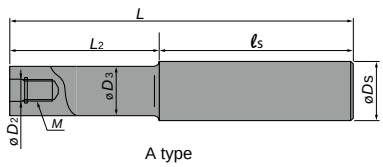
## Carbide Shank-Inch

| Part No. | Stock | ØD2 | M | L | $L_2$ | ℓs | øD3 | øDs | øD4 | Type | Cutter Body | Coolant Thru |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IASC0.375-M6-3-1** | • | 6.5mm | M6 | 3 | 1 | 2 | – | 0.375 | – | A | ø3/8" ø1/2" | – |
| **IASC0.5-M6-4-2** | • | 6.5mm | M6 | 4 | 2 | 2 | 0.453 | 0.5 | 0.453 | | ø3/8" ø1/2" | – |
| **IASC0.5-M6-6-3** | • | 6.5mm | M6 | 6 | 3 | 3 | 0.453 | 0.5 | 0.453 | | | – |
| **IASC0.625-M8-4-2** | • | 8.5mm | M8 | 4 | 2 | 2 | 0.571 | 0.625 | 0.591 | B | ø5/8" | ○ |
| **IASC0.625-M8-6-3** | • | 8.5mm | M8 | 6 | 3 | 3 | 0.571 | 0.625 | 0.591 | | | ○ |
| **IASC0.75-M10-5-2.5Z** | • | 10.5mm | M10 | 5 | 3 | 3 | 0.689 | 0.75 | 0.728 | | ø3/4" | ○ |
| **IASC0.75-M10-8-8-4Z** | • | 10.5mm | M10 | 8 | 4 | 4 | 0.689 | 0.75 | 0.728 | | | ○ |
| **IASC1-M12-6-3Z** | • | 12.5mm | M12 | 6 | 3 | 3 | 0.906 | 1 | 0.945 | | ø1" | ○ |
| **IASC1-M12-8-4Z** | • | 12.5mm | M12 | 8 | 4 | 4 | 0.906 | 1 | 0.945 | | | ○ |

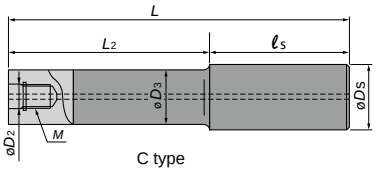
**• = Stocked items in US** **□ = Stocked items in Japan** **○ = Tool With Air Hole**

# MODULAR SHANK

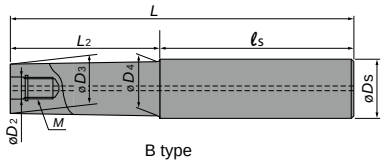
## Modular Shank Metric



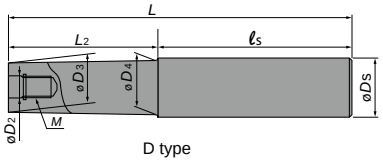
A type



C type



B type



D type

### Carbide Shank-Metric

| Part No. | Stock | ØD2 | M | L | $L_2$ | ℓs | øD3 | øDs | øD4 | Type | Cutter Body | Coolant Thru |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASC10-6.5-74-24 | • | 6.5 | M6 | 74 | 24 | 50 | 9.3 | 10 | - | A | ø8<br>ø10<br>ø12 | – |
| ASC10-6.5-84-34 | • | | | 84 | 34 | 50 | | | | | | |
| ASC10-6.5-114-49 | ☐ | | | 114 | 49 | 65 | | | | | | |
| ASC10-6.5-114-24 | ☐ | | | 114 | 24 | 90 | | | | | | |
| ASC12-6.5-74-24 | • | 6.5 | M6 | 74 | 24 | 50 | 11 | 12 | 11.5 | D | ø1/2"<br>ø8<br>ø10<br>ø12 | – |
| ASC12-6.5-94-44 | • | | | 94 | 44 | 50 | | | | | | |
| ASC12-6.5-129-64 | ☐ | | | 129 | 64 | 65 | | | | | | |
| ASC12-6.5-129-24 | ☐ | | | 129 | 24 | 105 | | | | | | |
| ASC16-8.5-95-30 | • | 8.5 | M8 | 95 | 30 | 65 | 14.5 | 16 | 15.5 | B | ø16 | ○ |
| ASC16-8.5-120-55 | • | | | 120 | 55 | 65 | | | | | | |
| ASC16-8.5-140-75 | • | | | 140 | 75 | 65 | | | | | | |
| ASC16-8.5-160-95 | ☐ | | | 160 | 95 | 65 | | | | | | |
| ASC16-8.5-160-30 | ☐ | | | 160 | 30 | 130 | | | | | | |
| ASC18-M10-125-0Z | • | 10.5 | M10 | 125 | - | 125 | 18 | 18 | - | B | ø20 | ○ |
| ASC20-10.5-120-50Z | ☐ | | | 120 | 50 | 70 | 18.5 | 20 | 19.5 | | | |
| ASC20-10.5-170-90Z | • | | | 170 | 90 | 80 | | | | | | |
| ASC20-10.5-220-120Z | • | | | 220 | 120 | 100 | | | | | | |
| ASC20-10.5-270-150Z | ☐ | | | 270 | 150 | 120 | | | | | | |
| ASC20-10.5-220-50Z | ☐ | | | 220 | 50 | 170 | | | | | | |
| ASC20-10.5-270-50Z | ☐ | | | 270 | | 220 | | | | | | |
| ASC25-12.5-145-65 | ☐ | 12.5 | M12 | 145 | 65 | 80 | 23 | 25 | - | C | ø25 | ○ |
| ASC25-M12-150-0Z | • | | | 150 | - | 159 | 25 | | | | | |
| ASC25-12.5-215-115 | • | | | 215 | 115 | 100 | 23 | | | | | |
| ASC25-12.5-265-145 | • | | | 265 | 145 | 120 | | | | | | |
| ASC25-12.5-315-195 | ☐ | | | 315 | 195 | 120 | | | | | | |
| ASC25-12.5-265-65 | ☐ | | | 265 | 65 | 200 | | | | | | |
| ASC25-12.5-315-65 | ☐ | | | 315 | | 250 | | | | | | |
| ASC32-17-160-80 | ☐ | 17 | M16 | 160 | 80 | 80 | 28 | 32 | - | C | ø30<br>ø32<br>ø35<br>ø40 | ○ |
| ASC32-17-210-110 | • | | | 210 | 110 | 100 | | | | | | |
| ASC32-17-260-140 | • | | | 260 | 140 | 120 | | | | | | |
| ASC32-17-310-190 | ☐ | | | 310 | 190 | 120 | | | | | | |
| ASC32-17-360-240 | ☐ | | | 360 | 240 | 120 | | | | | | |
| ASC32-17-260-80 | ☐ | 17 | M16 | 260 | 80 | 180 | 28 | 32 | - | C | ø30<br>ø32<br>ø35<br>ø40 | ○ |
| ASC32-17-310-80 | ☐ | | | 310 | | 230 | | | | | | |
| ASC32-17-360-80 | ☐ | | | 360 | | 280 | | | | | | |

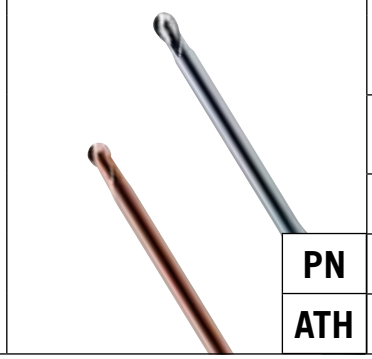
• = Stocked items in US ☐ = Stocked items in Japan ○ = Tool With Air Hole

# APPLICATION TOOL LIST

## End Mill > Miniature > Carbide > Ball

Advanced Engineering

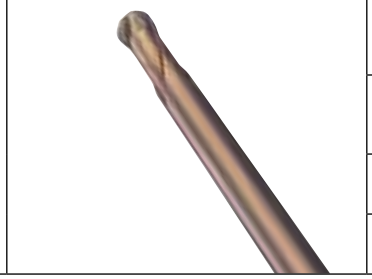
### EPDBE



PAGE 173

| | | | | | | |
|---|---|---|---|---|---|---|
| Size Range | 0 — 5 — 10 | 0.1mm - 6.0mm | | | | |
| Under Neck | 0 — 50 — 100 | 0.2mm - 50.0mm | | | | |
| PN ATH M U | R ≤ 0.25 ± 0.003 | | | | R > 0.25 ± 0.005 | |
| | Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
| PN | ◎ | ◎ | ◎ | ○ | | ◎ |
| ATH | ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### EPDBP



PAGE 186

| | | | | | | |
|---|---|---|---|---|---|---|
| Size Range | 0 — 5 — 10 | 0.2mm - 6.0mm | | | | |
| Under Neck | 0 — 50 — 100 | 0.5mm - 70mm | | | | |
| TH M | R ≤ 0.25 ± 0.003 | | | | R > 0.25 ± 0.005 | |
| | Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
| | ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### EPSBE

PAGE 191

| | | | | | | |
|---|---|---|---|---|---|---|
| Size Range | 0 — 2.5 — 5 | 0.1mm - 2.0mm | | | | |
| Under Neck | 0 — 25 — 50 | 0.15mm - 20.0mm | | | | |
| ATH M | R +0.003 -0.007 | | | | | |
| | Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
| | ◎ | ◎ | ◎ | ◎ | ◎ | ○ |

PN PN Coating

TH TH Coating

M Metric Only

Combination Neck

U Long Under Neck (more than 5D

CS CS Coating

ATH ATH Coating

Double Face Effect

Back Draft Effect

V Pencil Neck Available

◎ Recommended

# APPLICATION TOOL LIST

## End Mill > Miniature > Carbide > Radius

Advanced Engineering

### EPDRE

PAGE 195

| | |
|---|---|
| Size Range | 0 – 5 – 10 : 0.2mm - 6.0mm |
| Corner Radius | 0 – 2.5 – 5 : 0.05mm - 1.0mm |
| Under Neck | 0 – 50 – 100 : 0.5mm - 55mm |

ATH | M | R Tolerance ±0.005 (Central Axis)

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### EPDRF

PAGE 217

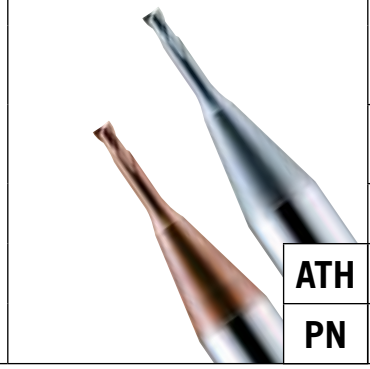
| | |
|---|---|
| Size Range | 0 – 5 – 10 : 1.0mm - 6.0mm |
| Corner Radius | 0 – 0.5 – 1 : 0.05mm - 0.5mm |
| Under Neck | 0 – 50 – 100 : 4.0mm - 72.0mm |

ATH | M | R Tolerance ±0.005 (Central Axis)

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

## End Mill > Miniature > Carbide > Square

### EPDSE



PAGE 228

| | |
|---|---|
| Size Range | 0 – 5 – 10 : 0.1mm - 6.0mm |
| Under Neck | 0 – 50 – 100 : 0.3mm - 50.0mm |

PN | ATH | M | Ø0.1~0.5 0, -0.007 / Ø0.6~0.9 0, -0.01 / Ø1~6 0, -0.015

| | Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|---|
| ATH | ◎ | ◎ | ◎ | ◎ | ○ | ○ |
| PN | ◎ | ◎ | ◎ | ○ | | ◎ |

PN PN Coating

ATH ATH Coating

M Metric Only

Combination Neck

Back Draft Effect

Long Under Neck (more than 5D

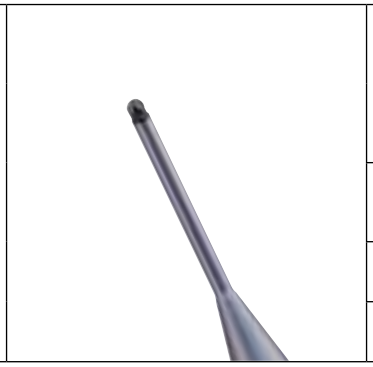
◎ Recommended

# APPLICATION TOOL LIST

## End Mill > Miniature > Carbide > CBN > Ball

Advanced Engineering

**CBN-EPSB**



**PAGE 240**

| | |
|---|---|
| Size Range | 0 – 5 – 10 : 0.2mm - 2.0mm |
| Under Neck | 0 – 25 – 50 : 0.5mm - 20.0mm |

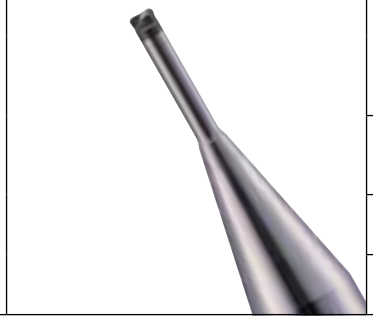
M | Double Face Effect | Combination Neck

R ±0.005

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ◎ | ○ |

## End Mill > Miniature > Carbide > CBN > Radius

**CBN-EPSR**



**PAGE 245**

| | |
|---|---|
| Size Range | 0 – 2.5 – 5 : 0.2mm - 3.0mm |
| Corner Radius | 0 – 0.5 – 1 : 0.05mm - 0.5mm |
| Under Neck | 0 – 5 – 10 : 0.5mm - 6.0mm |

M | Combination Neck

R Tolerance ±0.005 (Central Axis)

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ◎ | ○ |

M Metric Only

Combination Neck

Double Face Effect

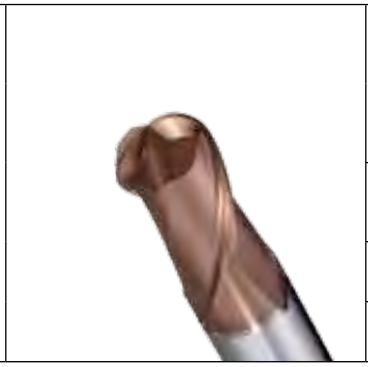
◎ Recommended

# APPLICATION TOOL LIST

## End Mill > General > Ball

Advanced Engineering

### EPBTS/EPBT



PAGE 250

| Size Range | 0 – 10 – 20 | 1.0mm - 12.0mm |
|---|---|---|
| Radius | 0 – 5 – 10 | 0.5mm - 6.0mm |

ATH TH M

±0.005

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ◎ | ○ |

### EHHB

PAGE 256

| Size Range | 0 – 10 – 20 | 1.0mm - 12.0mm |
|---|---|---|
| Radius | 0 – 5 – 10 | 0.5mm - 6.0mm |

ATH M

R 0.5~1.5 0, -0.010
R 2~3 0, -0.014
R 4~6 0, -0.02

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ○ | ◎ | ◎ | ◎ | ◎ | |

### HGOB-PN

PAGE 263

| Size Range | 0 – 25 – 50 | 0.3mm - 20.0mm |
|---|---|---|
| Radius | 0 – 10 – 20 | 0.15mm - 10.0mm |

PN M

R ≤0.6 ±0.005
R>0.6 ±0.010

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | Aluminium Alloy | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | | ◎ | ○ |

PN PN Coating

ATH ATH Coating

◎ Recommended

TH TH Coating

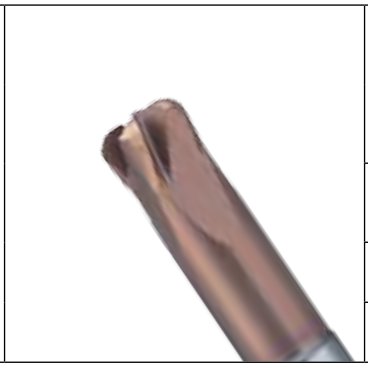
M Metric Only

# APPLICATION TOOL LIST

## End Mill > General > Radius (High Feed)

Advanced Engineering

### HGOF4



PAGE 268

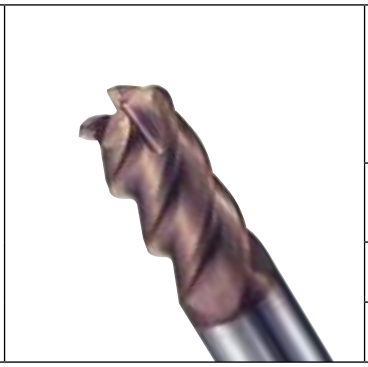
| | |
|---|---|
| Size Range | 0 – 10 – 20 : 2.0mm - 12.0mm |
| Corner Radius | 0 – 2.5 – 5 : 0.5mm - 2.0mm |

ATH M

0 / -0.03

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### ETM



PAGE 272

| | |
|---|---|
| Size Range | 0 – 10 : 2.0mm - 12.0mm |
| Corner Radius | 0 – 5 : 0.5mm - 2.0mm |

TH M

0 / -0.015

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

## End Mill > General > Square/Radius

### Mirus

PAGE 278

| | |
|---|---|
| Size Range | 0 – 10 – 20 : 6.0mm - 12.0mm |
| Flute Length | 0 – 50 – 100 : 9mm - 18mm |

TH

Type R 0, -0.05
Type N 0, -0.03

| | Cast Iron, Carbon Steel, Alloy Steel | Stainless Steel | Titanium Alloy | Pre-Hardened Steels (32 - 45 HRC) | Hardened Steels (45 - 55 HRC) |
|---|---|---|---|---|---|
| Type R | ◎ | | | ◎ | ◎ |
| Type N | ◎ | ○ | ○ | ○ | ○ |

TH TH Coating

ATH ATH Coating

M Metric Only

Waving Peripheral & Unequal Phase

Chip Breaker Style & Unequal Phase

Double Gash

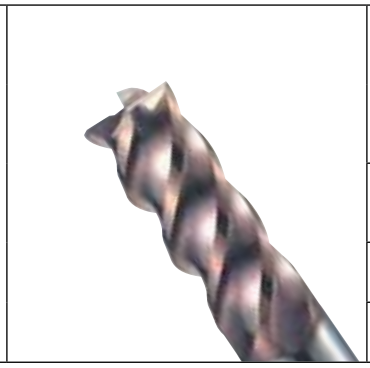
◎ Recommended

# APPLICATION TOOL LIST

## End Mill > General > Square/Radius

Advanced Engineering

### EPP4-TH



PAGE 286

TH M

| Size Range | 0 | 10 | 20 |
|---|---|---|---|
| | 3.0mm - 12.0mm | | |

| Flute Length | 0 | 50 | 100 |
|---|---|---|---|
| | 8.0mm - 26.0mm | | |

Ø3 -0.014 -0.028 | Ø4-6 -0.020 -0.038 | Ø8-12 -0.025 -0.047

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### EPP3-CS

PAGE 286

CS M

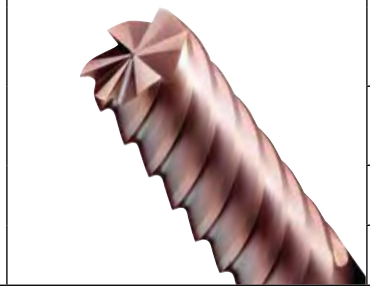
| Size Range | 0 | 10 | 20 |
|---|---|---|---|
| | 3.0mm - 12.0mm | | |

| Flute Length | 0 | 50 | 100 |
|---|---|---|---|
| | 8.0mm - 26.0mm | | |

0 -0.010

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | Aluminum Alloy | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ○ | ◎ | ◎ |

### CEPR



PAGE 293

TH M

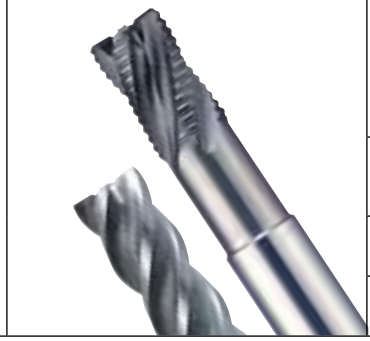
| Size Range | 0 | 10 | 20 |
|---|---|---|---|
| | 1.0mm - 12.0mm | | |

| Flute Length | 0 | 50 | 100 |
|---|---|---|---|
| | 3.5mm - 30.0mm | | |

Ø1-6 0 -0.015 | Ø8-12 0 -0.02

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | High-Hardened Steel < HRC 55 | High-Hardened Steel < HRC 65 | High-Hardened Steel > HRC 65 | Stainless Steel |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### EPSM/EPSW



PAGE 297

PN M

| Size Range | 0 | 25 | 50 |
|---|---|---|---|
| | 1.0mm - 20.0mm | | |

| Flute Length | 0 | 50 | 100 |
|---|---|---|---|
| | 2.5mm - 50.0mm | | |

EPSM Ø1~6 0, -0.015 Ø7-20 0, -0.02 | EPSW 0 -0.05

| Carbon Steel Alloy Steel | Pre-Hardened Steel < HRC 45 | Stainless Steel | Titanium Alloy | Heat-Resistant Alloy | Aluminium Alloy |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ◎ | ◎ |

PN PN Coating | CS CS Coating | TH TH Coating | M Metric Only | Double Gash | ◎ Recommended

# APPLICATION TOOL LIST

## Drill

Advanced Engineering

### WHNSB & WNSB

PAGE 310

TH SD

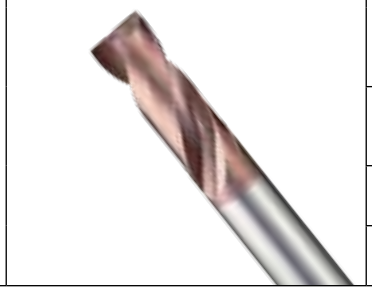
Size Range: 0 — 10 — 20 | 2.0mm - 13.0mm

Drilling Depth: 0 — 25 — 50 | 2xD - 30xD

h8

| Carbon Steel Alloy Steel | Tool Steel < HRC 40 | Pre-Hardened Steel < HRC 45 | Stainless Steel | Heat-Resistant Steel | Cast Iron |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

### ZPB



PAGE 333

TH M

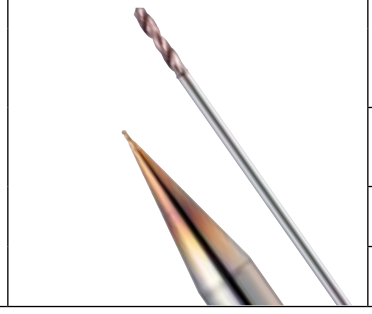
Size Range: 0 — 10 — 20 | 3.0mm - 12.0mm

Drilling Depth: 0 — 2.5 — 5 | 2xD

h8

| Carbon Steel Alloy Steel | Tool Steel < HRC 40 | Pre-Hardened Steel < HRC 45 | Stainless Steel | Cast Iron | Aluminium Alloy |
|---|---|---|---|---|---|
| ◎ | ○ | ○ | | ○ | ○ |

### EMSBS/EMST



PAGE 337

TH M

Size Range: 0 — 2.5 — 5 | 0.04mm - 1.0mm

Drilling Depth: 0 — 50 — 100 | 2xD - 50xD

0 -0.005

| Alloy Steel | Tool Steel < HRC 40 | Pre-Hardened Steel < HRC 45 | Stainless Steel | Heat-Resistant Steel | Aluminium Alloy |
|---|---|---|---|---|---|
| ◎ | ◎ | ◎ | ◎ | ○ | ○ |

TH TH Coating

SD SD Coating

M Metric Only

◎ Recommended

# EPDBE

## High-Precision Ball End Mills for Deep Machining

## FEATURES

Improved compound neck design for reduced chatter and increased strength

New flute shape increases resistance to breakage

Stronger R flute helix angle improves cutting performance

ATH and PN Coatings for maximum efficiency and tool life

# EPDBE

## INTRODUCTION

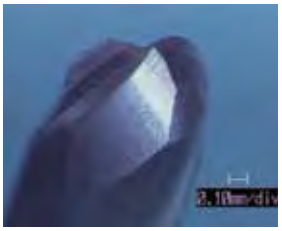
The EPDBE Epoch Series Ball End Mills have been designed for cutting deep ribs and slots in molds, as well as machining deep corners and precision features that were previously possible only by EDM (electrical discharge machining).

Featuring an improved compound neck design, these end mills exhibit greater breakage resistance and less vibration during high speed machining than competitors' tools. New cutting geometries as well as the advanced ATH and PN Coatings help to maximize machining performance as well as tool life.

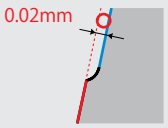
## FEATURES

### 1. Innovative Ball Nose Geometry

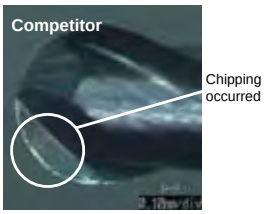
High-strength flute shape with high chip removal characteristics. Stronger R flute helix angle improves cutting performance.



Tool : EPDBE2010-10-ATH
(R0.5 Under neck 10mm)

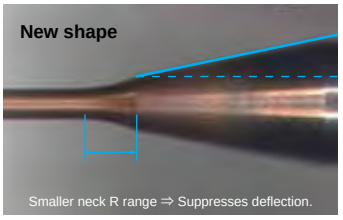


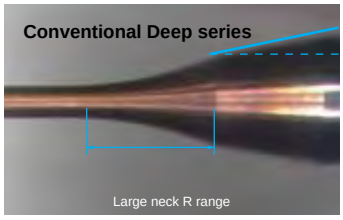

Work material: SUS420J2H 52HRC
Holder: HSK-F63
Coolant: Air Blow
$n$=16,000min$^{-1}$($vc$=50.2m/min)
$vf$=1000mm/min
($fz$=0.03mm/t)
$ap$×$ae$=0.02mm×0.02mm
OH=18mm

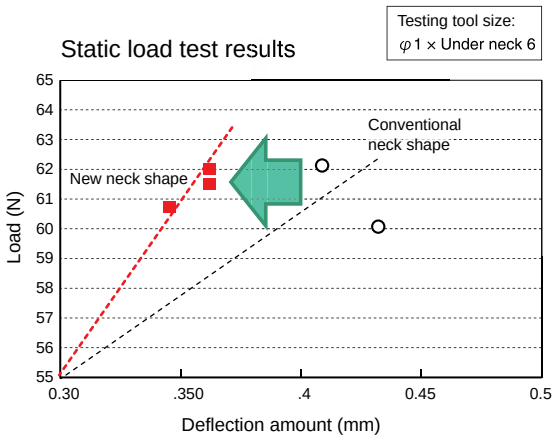

### 2. Improved Compound Neck Shape

Further improves the conventional compound shape of R and taper to both resist breakage and suppress deflection.




**Caution:** The interference region has changed due to changes in the neck shape. Be sure to check for interference before starting machining.

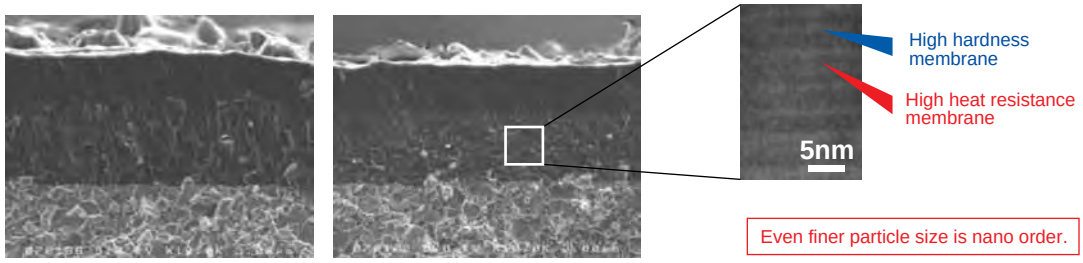



Deflection suppression effect is high even under the same load.
Enables machining with even higher accuracy.

## 3. New PVD Coating Technology

**Advanced TH (ATH) Coating:** With a hardness of 3800Hv and oxidation temperature of 1200°, our new ATH Coating enables longer life and higher efficiency when cutting high-hardness materials (55HRC or higher). Compared with our previous generation coating, double the tool life and more than double the machining efficiency can be achieved. The ATH Coating is ideal for both dry cutting and wet cutting in a variety of materials including cold-worked die steel, HSS, tool steel, composite materials, carbide alloys and more.

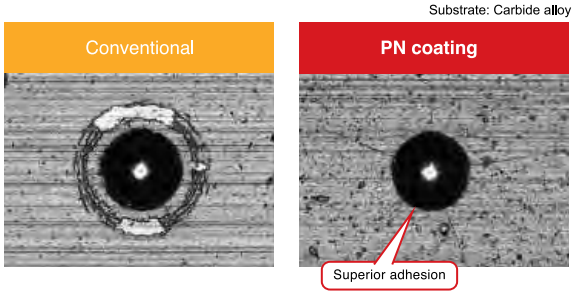
Cross-section photograph of ATH coating layer structure



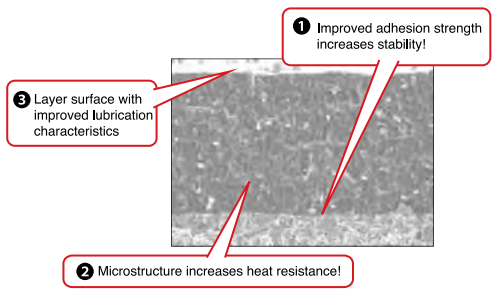

Pat.No. 3 9 3 4 1 3 6

**PN Coating:** By optimizing the Al content, the multi-layer PN Coating exhibits both excellent heat-resistance and adhesion to the tool substrate. Combining of the AlCr coating layer with Si produces high hardness (3000HV) as well as good wear resistance. PN Coating provides extended cutting tool life in both wet and dry machining of materials including pre-hardened steel, carbon steel, alloy steel, stainless steel, H13, D2 and more.

Adhesion of PN coating

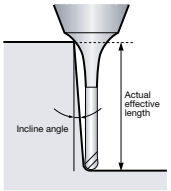


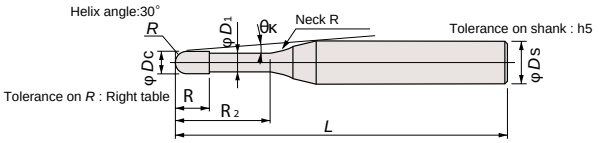

Cross-section photograph of PN coating layer structure



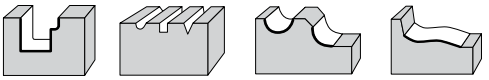
# EPDBE

Advanced Engineering







| Helix Angle | 30° | ϕDs | h5 |
|---|---|---|---|
| R (R≤0.25) | ±0.003 | | |
| R (0.25<R) | ±0.005 | | |

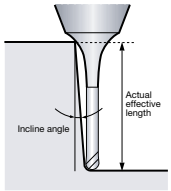
| | Stock | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | R | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDBE2001-0.2-□□□ | ● | ● | 0.05 | 0.1 | 0.20 | 0.08 | 0.08 | 45 | 4 | 1 | 11.76 | 0.35 | 0.37 | 0.39 | 0.41 | 0.44 |
| EPDBE2001-0.3-□□□ | ● | ● | 0.05 | 0.1 | 0.30 | 0.08 | 0.08 | 45 | 4 | 1 | 11.64 | 0.46 | 0.48 | 0.50 | 0.52 | 0.57 |
| EPDBE2001-0.5-□□□ | □ | ● | 0.05 | 0.1 | 0.50 | 0.08 | 0.08 | 45 | 4 | 1 | 11.40 | 0.67 | 0.70 | 0.73 | 0.76 | 0.81 |
| EPDBE2002-0.5-□□□ | ● | ● | 0.10 | 0.2 | 0.50 | 0.15 | 0.17 | 50 | 4 | 1 | 11.42 | 0.70 | 0.72 | 0.75 | 0.77 | 0.82 |
| EPDBE2002-0.75-□□□ | ● | ● | 0.10 | 0.2 | 0.75 | 0.15 | 0.17 | 50 | 4 | 1 | 11.13 | 0.96 | 0.99 | 1.02 | 1.05 | 1.11 |
| EPDBE2002-1-□□□ | ● | ● | 0.10 | 0.2 | 1.00 | 0.15 | 0.17 | 50 | 4 | 1 | 10.86 | 1.22 | 1.26 | 1.30 | 1.33 | 1.39 |
| EPDBE2002-1.25-□□□ | □ | ● | 0.10 | 0.2 | 1.25 | 0.15 | 0.17 | 50 | 4 | 1 | 10.60 | 1.48 | 1.52 | 1.57 | 1.61 | 1.72 |
| EPDBE2002-1.5-□□□ | □ | ● | 0.10 | 0.2 | 1.50 | 0.15 | 0.17 | 50 | 4 | 1 | 10.35 | 1.74 | 1.79 | 1.84 | 1.88 | 2.05 |
| EPDBE2002-2-□□□ | □ | ● | 0.10 | 0.2 | 2.00 | 0.15 | 0.17 | 50 | 4 | 1 | 9.88 | 2.25 | 2.32 | 2.37 | 2.45 | 2.71 |
| EPDBE2002-2.5-□□□ | □ | □ | 0.10 | 0.2 | 2.50 | 0.15 | 0.17 | 50 | 4 | 1 | 9.46 | 2.77 | 2.84 | 2.91 | 3.05 | 3.37 |
| EPDBE2002-3-□□□ | □ | □ | 0.10 | 0.2 | 3.00 | 0.15 | 0.17 | 50 | 4 | 1 | 9.07 | 3.28 | 3.37 | 3.48 | 3.65 | 4.04 |
| EPDBE2003-0.5-□□□ | ● | ● | 0.15 | 0.3 | 0.50 | 0.25 | 0.27 | 50 | 4 | 2 | 11.47 | 0.78 | 0.82 | 0.86 | 0.90 | 0.98 |
| EPDBE2003-0.75-□□□ | ● | ● | 0.15 | 0.3 | 0.75 | 0.25 | 0.27 | 50 | 4 | 2 | 11.17 | 1.05 | 1.10 | 1.15 | 1.20 | 1.29 |
| EPDBE2003-1-□□□ | ● | ● | 0.15 | 0.3 | 1.00 | 0.25 | 0.27 | 50 | 4 | 2 | 10.89 | 1.31 | 1.38 | 1.43 | 1.49 | 1.59 |
| EPDBE2003-1.25-□□□ | ● | ● | 0.15 | 0.3 | 1.25 | 0.25 | 0.27 | 50 | 4 | 2 | 10.62 | 1.58 | 1.65 | 1.72 | 1.78 | 1.89 |
| EPDBE2003-1.5-□□□ | □ | ● | 0.15 | 0.3 | 1.50 | 0.25 | 0.27 | 50 | 4 | 2 | 10.36 | 1.84 | 1.92 | 1.99 | 2.06 | 2.18 |
| EPDBE2003-2-□□□ | □ | ● | 0.15 | 0.3 | 2.00 | 0.25 | 0.27 | 50 | 4 | 2 | 9.88 | 2.36 | 2.46 | 2.55 | 2.62 | 2.76 |
| EPDBE2003-2.5-□□□ | □ | □ | 0.15 | 0.3 | 2.50 | 0.25 | 0.27 | 50 | 4 | 2 | 9.45 | 2.89 | 3.00 | 3.10 | 3.18 | 3.36 |
| EPDBE2003-3-□□□ | □ | □ | 0.15 | 0.3 | 3.00 | 0.25 | 0.27 | 50 | 4 | 2 | 9.05 | 3.41 | 3.53 | 3.64 | 3.73 | 4.02 |
| EPDBE2004-0.75-□□□ | ● | ● | 0.20 | 0.4 | 0.75 | 0.30 | 0.37 | 50 | 4 | 2 | 11.21 | 1.04 | 1.09 | 1.14 | 1.19 | 1.28 |
| EPDBE2004-1-□□□ | ● | ● | 0.20 | 0.4 | 1.00 | 0.30 | 0.37 | 50 | 4 | 2 | 10.91 | 1.31 | 1.37 | 1.43 | 1.48 | 1.58 |
| EPDBE2004-1.5-□□□ | ● | ● | 0.20 | 0.4 | 1.50 | 0.30 | 0.37 | 50 | 4 | 2 | 10.37 | 1.84 | 1.92 | 1.99 | 2.06 | 2.17 |
| EPDBE2004-2-□□□ | ● | ● | 0.20 | 0.4 | 2.00 | 0.30 | 0.37 | 50 | 4 | 2 | 9.88 | 2.36 | 2.46 | 2.54 | 2.62 | 2.75 |
| EPDBE2004-2.5-□□□ | □ | ● | 0.20 | 0.4 | 2.50 | 0.30 | 0.37 | 50 | 4 | 2 | 9.43 | 2.89 | 3.00 | 3.09 | 3.18 | 3.34 |
| EPDBE2004-3-□□□ | □ | ● | 0.20 | 0.4 | 3.00 | 0.30 | 0.37 | 50 | 4 | 2 | 9.03 | 3.41 | 3.53 | 3.63 | 3.73 | 4.01 |
| EPDBE2004-3.5-□□□ | □ | □ | 0.20 | 0.4 | 3.50 | 0.30 | 0.37 | 50 | 4 | 2 | 8.65 | 3.93 | 4.06 | 4.18 | 4.27 | 4.67 |
| EPDBE2004-4-□□□ | □ | ● | 0.20 | 0.4 | 4.00 | 0.30 | 0.37 | 50 | 4 | 2 | 8.30 | 4.45 | 4.59 | 4.71 | 4.83 | 5.33 |
| EPDBE2004-4.5-□□□ | □ | □ | 0.20 | 0.4 | 4.50 | 0.30 | 0.37 | 50 | 4 | 2 | 7.99 | 4.97 | 5.12 | 5.25 | 5.43 | 6.00 |
| EPDBE2005-1-□□□ | ● | ● | 0.25 | 0.5 | 1.00 | 0.35 | 0.47 | 50 | 4 | 2 | 10.94 | 1.31 | 1.37 | 1.42 | 1.47 | 1.57 |
| EPDBE2005-1.5-□□□ | ● | ● | 0.25 | 0.5 | 1.50 | 0.35 | 0.47 | 50 | 4 | 2 | 10.39 | 1.83 | 1.91 | 1.98 | 2.05 | 2.17 |

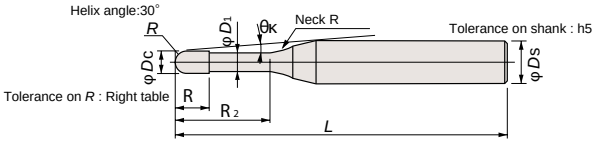
*For the last 3 digits of the part no. enter the coating type (PN, ATH)

□ = Stocked items in Japan

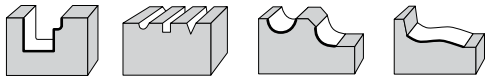
# EPDBE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| R (R≤0.25) | ±0.003 | | |
| R (0.25<R) | ±0.005 | | |

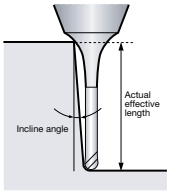
| | Stock | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | R | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDBE2005-2-□□□ | ● | ● | 0.25 | 0.5 | 2.00 | 0.35 | 0.47 | 50 | 4 | 2 | 9.88 | 2.36 | 2.45 | 2.54 | 2.61 | 2.75 |
| EPDBE2005-2.5-□□□ | ● | ● | 0.25 | 0.5 | 2.50 | 0.35 | 0.47 | 50 | 4 | 2 | 9.42 | 2.88 | 2.99 | 3.09 | 3.17 | 3.33 |
| EPDBE2005-3-□□□ | ● | ● | 0.25 | 0.5 | 3.00 | 0.35 | 0.47 | 50 | 4 | 2 | 9.00 | 3.41 | 3.53 | 3.63 | 3.72 | 3.99 |
| EPDBE2005-4-□□□ | ● | ● | 0.25 | 0.5 | 4.00 | 0.35 | 0.47 | 50 | 4 | 2 | 8.27 | 4.45 | 4.59 | 4.71 | 4.82 | 5.32 |
| EPDBE2005-5-□□□ | □ | ● | 0.25 | 0.5 | 5.00 | 0.35 | 0.47 | 50 | 4 | 2 | 7.64 | 5.48 | 5.65 | 5.78 | 6.01 | 6.65 |
| EPDBE2005-5.5-□□□ | □ | □ | 0.25 | 0.5 | 5.50 | 0.35 | 0.47 | 50 | 4 | 2 | 7.36 | 6.00 | 6.17 | 6.31 | 6.61 | 7.31 |
| EPDBE2005-6-□□□ | □ | ● | 0.25 | 0.5 | 6.00 | 0.35 | 0.47 | 50 | 4 | 2 | 7.10 | 6.52 | 6.70 | 6.88 | 7.21 | 7.97 |
| EPDBE2005-8-□□□ | □ | ● | 0.25 | 0.5 | 8.00 | 0.35 | 0.47 | 50 | 4 | 2 | 6.23 | 8.58 | 8.79 | 9.16 | 9.60 | 10.63 |
| EPDBE2006-1-□□□ | ● | ● | 0.30 | 0.6 | 1.00 | 0.40 | 0.57 | 50 | 4 | 4 | 10.98 | 1.44 | 1.54 | 1.63 | 1.71 | 1.88 |
| EPDBE2006-2-□□□ | ● | ● | 0.30 | 0.6 | 2.00 | 0.40 | 0.57 | 50 | 4 | 4 | 9.88 | 2.52 | 2.66 | 2.79 | 2.91 | 3.13 |
| EPDBE2006-2.5-□□□ | ● | ● | 0.30 | 0.6 | 2.50 | 0.40 | 0.57 | 50 | 4 | 4 | 9.41 | 3.05 | 3.22 | 3.36 | 3.49 | 3.73 |
| EPDBE2006-3-□□□ | ● | ● | 0.30 | 0.6 | 3.00 | 0.40 | 0.57 | 50 | 4 | 4 | 8.98 | 3.58 | 3.77 | 3.93 | 4.07 | 4.32 |
| EPDBE2006-3.5-□□□ | □ | ● | 0.30 | 0.6 | 3.50 | 0.40 | 0.57 | 50 | 4 | 4 | 8.58 | 4.12 | 4.32 | 4.49 | 4.64 | 4.91 |
| EPDBE2006-4-□□□ | □ | ● | 0.30 | 0.6 | 4.00 | 0.40 | 0.57 | 50 | 4 | 4 | 8.22 | 4.64 | 4.86 | 5.04 | 5.20 | 5.48 |
| EPDBE2006-4.5-□□□ | □ | □ | 0.30 | 0.6 | 4.50 | 0.40 | 0.57 | 50 | 4 | 4 | 7.89 | 5.17 | 5.40 | 5.59 | 5.76 | 6.06 |
| EPDBE2006-5-□□□ | □ | ● | 0.30 | 0.6 | 5.00 | 0.40 | 0.57 | 50 | 4 | 4 | 7.59 | 5.70 | 5.94 | 6.14 | 6.32 | 6.63 |
| EPDBE2006-5.5-□□□ | □ | □ | 0.30 | 0.6 | 5.50 | 0.40 | 0.57 | 50 | 4 | 4 | 7.31 | 6.22 | 6.48 | 6.69 | 6.87 | 7.29 |
| EPDBE2006-6-□□□ | □ | ● | 0.30 | 0.6 | 6.00 | 0.40 | 0.57 | 50 | 4 | 4 | 7.04 | 6.75 | 7.02 | 7.23 | 7.42 | 7.96 |
| EPDBE2006-7-□□□ | □ | □ | 0.30 | 0.6 | 7.00 | 0.40 | 0.57 | 50 | 4 | 4 | 6.57 | 7.79 | 8.08 | 8.32 | 8.52 | 9.28 |
| EPDBE2006-8-□□□ | □ | ● | 0.30 | 0.6 | 8.00 | 0.40 | 0.57 | 50 | 4 | 4 | 6.16 | 8.84 | 9.15 | 9.40 | 9.61 | 10.61 |
| EPDBE2006-9-□□□ | □ | □ | 0.30 | 0.6 | 9.00 | 0.40 | 0.57 | 50 | 4 | 4 | 5.79 | 9.88 | 10.21 | 10.47 | 10.79 | 11.94 |
| EPDBE2006-10-□□□ | □ | ● | 0.30 | 0.6 | 10.00 | 0.40 | 0.57 | 50 | 4 | 4 | 5.47 | 10.92 | 11.26 | 11.54 | 11.99 | 13.27 |
| EPDBE2006-12-□□□ | □ | □ | 0.30 | 0.6 | 12.00 | 0.40 | 0.57 | 50 | 4 | 4 | 4.92 | 12.99 | 13.37 | 13.72 | 14.38 | 15.92 |
| EPDBE2007-2-□□□ | □ | □ | 0.35 | 0.7 | 2.00 | 0.45 | 0.67 | 50 | 4 | 4 | 9.88 | 2.52 | 2.66 | 2.79 | 2.90 | 3.12 |
| EPDBE2007-4-□□□ | □ | □ | 0.35 | 0.7 | 4.00 | 0.45 | 0.67 | 50 | 4 | 4 | 8.18 | 4.64 | 4.86 | 5.04 | 5.20 | 5.48 |
| EPDBE2007-6-□□□ | □ | □ | 0.35 | 0.7 | 6.00 | 0.45 | 0.67 | 50 | 4 | 4 | 6.98 | 6.74 | 7.01 | 7.23 | 7.42 | 7.94 |
| EPDBE2007-8-□□□ | □ | □ | 0.35 | 0.7 | 8.00 | 0.45 | 0.67 | 50 | 4 | 4 | 6.09 | 8.83 | 9.14 | 9.39 | 9.61 | 10.60 |
| EPDBE2008-2-□□□ | ● | ● | 0.40 | 0.8 | 2.00 | 0.50 | 0.77 | 50 | 4 | 4 | 9.87 | 2.51 | 2.65 | 2.78 | 2.89 | 3.11 |
| EPDBE2008-4-□□□ | ● | ● | 0.40 | 0.8 | 4.00 | 0.50 | 0.77 | 50 | 4 | 4 | 8.14 | 4.64 | 4.85 | 5.03 | 5.19 | 5.47 |
| EPDBE2008-5-□□□ | ● | ● | 0.40 | 0.8 | 5.00 | 0.50 | 0.77 | 50 | 4 | 4 | 7.48 | 5.69 | 5.93 | 6.13 | 6.31 | 6.61 |

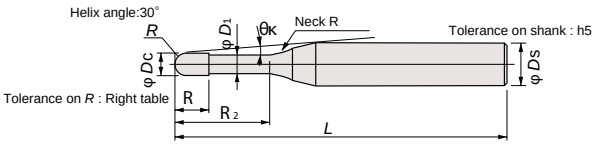
*For the last 3 digits of the part no. enter the coating type (PN, ATH)

□ = Stocked items in Japan

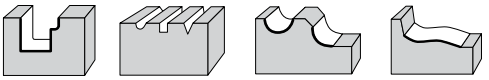
# EPDBE

Advanced Engineering







| Helix Angle | 30° | ϕDs | h5 |
|---|---|---|---|
| R (R≤0.25) | ±0.003 | | |
| R (0.25<R) | ±0.005 | | |

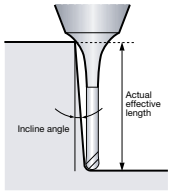
| | Stock | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | R | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDBE2008-6-□□□ | ● | ● | 0.40 | 0.8 | 6.00 | 0.50 | 0.77 | 50 | 4 | 4 | 6.92 | 6.74 | 7.01 | 7.23 | 7.41 | 7.92 |
| EPDBE2008-8-□□□ | □ | ● | 0.40 | 0.8 | 8.00 | 0.50 | 0.77 | 50 | 4 | 4 | 6.01 | 8.83 | 9.14 | 9.39 | 9.60 | 10.58 |
| EPDBE2008-10-□□□ | □ | ● | 0.40 | 0.8 | 10.00 | 0.50 | 0.77 | 50 | 4 | 4 | 5.32 | 10.91 | 11.26 | 11.53 | 11.97 | 13.23 |
| EPDBE2009-2-□□□ | □ | □ | 0.45 | 0.9 | 2.00 | 0.60 | 0.87 | 50 | 4 | 4 | 9.87 | 2.51 | 2.65 | 2.77 | 2.89 | 3.10 |
| EPDBE2009-4-□□□ | □ | □ | 0.45 | 0.9 | 4.00 | 0.60 | 0.87 | 50 | 4 | 4 | 8.09 | 4.64 | 4.85 | 5.03 | 5.18 | 5.46 |
| EPDBE2009-6-□□□ | □ | □ | 0.45 | 0.9 | 6.00 | 0.60 | 0.87 | 50 | 4 | 4 | 6.85 | 6.74 | 7.00 | 7.22 | 7.41 | 7.91 |
| EPDBE2009-8-□□□ | □ | □ | 0.45 | 0.9 | 8.00 | 0.60 | 0.87 | 50 | 4 | 4 | 5.94 | 8.83 | 9.14 | 9.38 | 9.60 | 10.56 |
| EPDBE2010-2-□□□ | ● | ● | 0.50 | 1.0 | 2.00 | 0.80 | 0.96 | 50 | 4 | 4 | 9.84 | 2.54 | 2.67 | 2.79 | 2.90 | 3.11 |
| EPDBE2010-3-□□□ | ● | ● | 0.50 | 1.0 | 3.00 | 0.80 | 0.96 | 50 | 4 | 4 | 8.84 | 3.61 | 3.78 | 3.93 | 4.06 | 4.30 |
| EPDBE2010-4-□□□ | ● | ● | 0.50 | 1.0 | 4.00 | 0.80 | 0.96 | 50 | 4 | 4 | 8.02 | 4.66 | 4.87 | 5.04 | 5.20 | 5.47 |
| EPDBE2010-5-□□□ | ● | ● | 0.50 | 1.0 | 5.00 | 0.80 | 0.96 | 50 | 4 | 4 | 7.34 | 5.72 | 5.95 | 6.14 | 6.31 | 6.61 |
| EPDBE2010-6-□□□ | ● | ● | 0.50 | 1.0 | 6.00 | 0.80 | 0.96 | 50 | 4 | 4 | 6.77 | 6.76 | 7.02 | 7.23 | 7.42 | 7.92 |
| EPDBE2010-7-□□□ | □ | ● | 0.50 | 1.0 | 7.00 | 0.80 | 0.96 | 50 | 4 | 4 | 6.28 | 7.81 | 8.09 | 8.32 | 8.52 | 9.25 |
| EPDBE2010-8-□□□ | ● | ● | 0.50 | 1.0 | 8.00 | 0.80 | 0.96 | 50 | 4 | 4 | 5.85 | 8.85 | 9.15 | 9.40 | 9.61 | 10.58 |
| EPDBE2010-9-□□□ | □ | ● | 0.50 | 1.0 | 9.00 | 0.80 | 0.96 | 50 | 4 | 4 | 5.48 | 9.89 | 10.21 | 10.47 | 10.78 | 11.91 |
| EPDBE2010-10-□□□ | ● | ● | 0.50 | 1.0 | 10.00 | 0.80 | 0.96 | 50 | 4 | 4 | 5.15 | 10.93 | 11.27 | 11.54 | 11.98 | 13.23 |
| EPDBE2010-12-□□□ | □ | ● | 0.50 | 1.0 | 12.00 | 0.80 | 0.96 | 55 | 4 | 4 | 4.60 | 13.00 | 13.37 | 13.72 | 14.37 | 15.89 |
| EPDBE2010-13-□□□ | □ | ● | 0.50 | 1.0 | 13.00 | 0.80 | 0.96 | 55 | 4 | 4 | 4.37 | 14.04 | 14.42 | 14.86 | 15.57 | 17.21 |
| EPDBE2010-14-□□□ | □ | ● | 0.50 | 1.0 | 14.00 | 0.80 | 0.96 | 55 | 4 | 4 | 4.16 | 15.07 | 15.47 | 16.00 | 16.76 | 18.54 |
| EPDBE2010-16-□□□ | □ | ● | 0.50 | 1.0 | 16.00 | 0.80 | 0.96 | 55 | 4 | 4 | 3.79 | 17.13 | 17.56 | 18.28 | 19.16 | 21.20 |
| EPDBE2010-18-□□□ | □ | □ | 0.50 | 1.0 | 18.00 | 0.80 | 0.96 | 60 | 4 | 4 | 3.49 | 19.19 | 19.66 | 20.56 | 21.55 | 23.85 |
| EPDBE2010-20-□□□ | □ | ● | 0.50 | 1.0 | 20.00 | 0.80 | 0.96 | 60 | 4 | 4 | 3.23 | 21.25 | 21.84 | 22.84 | 23.94 | 26.51 |
| EPDBE2011-2-□□□ | □ | □ | 0.55 | 1.1 | 2.00 | 1.00 | 1.05 | 50 | 4 | 4 | 9.81 | 2.58 | 2.70 | 2.81 | 2.92 | 3.12 |
| EPDBE2011-4-□□□ | □ | □ | 0.55 | 1.1 | 4.00 | 1.00 | 1.05 | 50 | 4 | 4 | 7.95 | 4.69 | 4.89 | 5.06 | 5.21 | 5.48 |
| EPDBE2011-6-□□□ | □ | □ | 0.55 | 1.1 | 6.00 | 1.00 | 1.05 | 50 | 4 | 4 | 6.68 | 6.79 | 7.04 | 7.25 | 7.43 | 7.94 |
| EPDBE2011-8-□□□ | □ | □ | 0.55 | 1.1 | 8.00 | 1.00 | 1.05 | 50 | 4 | 4 | 5.76 | 8.87 | 9.17 | 9.41 | 9.61 | 10.59 |
| EPDBE2011-10-□□□ | □ | □ | 0.55 | 1.1 | 10.00 | 1.00 | 1.05 | 50 | 4 | 4 | 5.06 | 10.95 | 11.28 | 11.55 | 12.00 | 13.25 |
| EPDBE2012-4-□□□ | □ | ● | 0.60 | 1.2 | 4.00 | 1.10 | 1.15 | 50 | 4 | 4 | 7.89 | 4.69 | 4.88 | 5.05 | 5.20 | 5.47 |
| EPDBE2012-8-□□□ | □ | ● | 0.60 | 1.2 | 8.00 | 1.10 | 1.15 | 50 | 4 | 4 | 5.67 | 8.87 | 9.16 | 9.40 | 9.61 | 10.58 |
| EPDBE2012-10-□□□ | □ | □ | 0.60 | 1.2 | 10.00 | 1.10 | 1.15 | 50 | 4 | 4 | 4.97 | 10.95 | 11.28 | 11.54 | 11.99 | 13.23 |

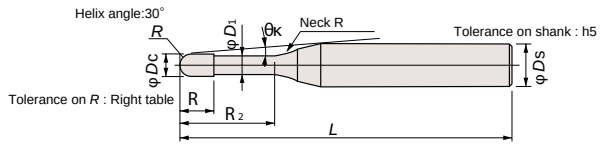
*For the last 3 digits of the part no. enter the coating type (PN, ATH)

□ = Stocked items in Japan

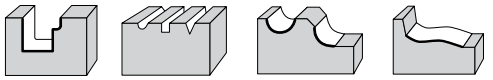
# EPDBE

Advanced Engineering







| Helix Angle | 30° | ϕDs | h5 |
|---|---|---|---|
| R (R≤0.25) | ±0.003 | | |
| R (0.25<R) | ±0.005 | | |

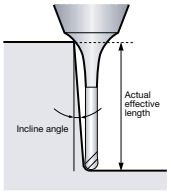
| | Stock | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | R | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDBE2012-12-□□□ | □ | □ | 0.60 | 1.2 | 12.00 | 1.10 | 1.15 | 55 | 4 | 4 | 4.43 | 13.02 | 13.38 | 13.73 | 14.38 | 15.89 |
| EPDBE2014-8-□□□ | □ | ● | 0.70 | 1.4 | 8.00 | 1.30 | 1.34 | 50 | 4 | 4 | 5.48 | 8.89 | 9.18 | 9.41 | 9.61 | 10.58 |
| EPDBE2014-12-□□□ | □ | ● | 0.70 | 1.4 | 12.00 | 1.30 | 1.34 | 55 | 4 | 4 | 4.24 | 13.04 | 13.39 | 13.74 | 14.39 | 15.89 |
| EPDBE2014-16-□□□ | □ | □ | 0.70 | 1.4 | 16.00 | 1.30 | 1.34 | 55 | 4 | 4 | 3.46 | 17.16 | 17.57 | 18.31 | 19.17 | 21.20 |
| EPDBE2015-4-□□□ | ● | ● | 0.75 | 1.5 | 4.00 | 1.35 | 1.44 | 50 | 4 | 4 | 7.68 | 4.71 | 4.89 | 5.06 | 5.20 | 5.46 |
| EPDBE2015-6-□□□ | ● | ● | 0.75 | 1.5 | 6.00 | 1.35 | 1.44 | 50 | 4 | 4 | 6.33 | 6.81 | 7.04 | 7.25 | 7.42 | 7.91 |
| EPDBE2015-8-□□□ | ● | ● | 0.75 | 1.5 | 8.00 | 1.35 | 1.44 | 50 | 4 | 4 | 5.39 | 8.89 | 9.17 | 9.41 | 9.61 | 10.56 |
| EPDBE2015-10-□□□ | ● | ● | 0.75 | 1.5 | 10.00 | 1.35 | 1.44 | 50 | 4 | 4 | 4.68 | 10.96 | 11.29 | 11.55 | 11.98 | 13.22 |
| EPDBE2015-12-□□□ | ● | ● | 0.75 | 1.5 | 12.00 | 1.35 | 1.44 | 55 | 4 | 4 | 4.14 | 13.03 | 13.39 | 13.74 | 14.38 | 15.87 |
| EPDBE2015-14-□□□ | □ | □ | 0.75 | 1.5 | 14.00 | 1.35 | 1.44 | 55 | 4 | 4 | 3.72 | 15.10 | 15.48 | 16.02 | 16.77 | 18.52 |
| EPDBE2015-16-□□□ | ● | ● | 0.75 | 1.5 | 16.00 | 1.35 | 1.44 | 55 | 4 | 4 | 3.77 | 17.16 | 17.57 | 18.30 | 19.16 | 21.18 |
| EPDBE2015-18-□□□ | □ | ● | 0.75 | 1.5 | 18.00 | 1.35 | 1.44 | 60 | 4 | 4 | 3.08 | 19.22 | 19.69 | 20.58 | 21.56 | 23.83 |
| EPDBE2015-20-□□□ | ● | ● | 0.75 | 1.5 | 20.00 | 1.35 | 1.44 | 60 | 4 | 4 | 2.84 | 21.27 | 21.87 | 22.86 | 23.95 | - |
| EPDBE2016-8-□□□ | □ | ● | 0.80 | 1.6 | 8.00 | 1.40 | 1.54 | 50 | 4 | 4 | 5.28 | 8.89 | 9.17 | 9.40 | 9.60 | 10.55 |
| EPDBE2016-12-□□□ | □ | ● | 0.80 | 1.6 | 12.00 | 1.40 | 1.54 | 55 | 4 | 4 | 4.05 | 13.03 | 13.39 | 13.73 | 14.37 | 15.85 |
| EPDBE2016-16-□□□ | □ | ● | 0.80 | 1.6 | 16.00 | 1.40 | 1.54 | 55 | 4 | 4 | 3.28 | 17.16 | 17.57 | 18.29 | 19.15 | 21.16 |
| EPDBE2016-20-□□□ | □ | ● | 0.80 | 1.6 | 20.00 | 1.40 | 1.54 | 60 | 4 | 4 | 2.75 | 21.27 | 21.87 | 22.86 | 23.94 | - |
| EPDBE2018-8-□□□ | □ | □ | 0.90 | 1.8 | 8.00 | 1.60 | 1.73 | 50 | 4 | 4 | 5.06 | 8.91 | 9.18 | 9.41 | 9.61 | 10.54 |
| EPDBE2018-12-□□□ | □ | □ | 0.90 | 1.8 | 12.00 | 1.60 | 1.73 | 55 | 4 | 4 | 3.83 | 13.05 | 13.40 | 13.74 | 14.38 | 15.85 |
| EPDBE2018-16-□□□ | □ | □ | 0.90 | 1.8 | 16.00 | 1.60 | 1.73 | 55 | 4 | 4 | 3.09 | 17.17 | 17.58 | 18.31 | 19.16 | 21.16 |
| EPDBE2018-20-□□□ | □ | □ | 0.90 | 1.8 | 20.00 | 1.60 | 1.73 | 60 | 4 | 4 | 2.58 | 21.28 | 21.88 | 22.87 | 23.95 | - |
| EPDBE2020-3-□□□ | ● | ● | 1.00 | 2.0 | 3.00 | 1.70 | 1.92 | 50 | 4 | 4 | 8.26 | 3.71 | 3.84 | 3.96 | 4.07 | 4.29 |
| EPDBE2020-4-□□□ | ● | ● | 1.00 | 2.0 | 4.00 | 1.70 | 1.92 | 50 | 4 | 4 | 7.23 | 4.75 | 4.92 | 5.07 | 5.21 | 5.45 |
| EPDBE2020-6-□□□ | ● | ● | 1.00 | 2.0 | 6.00 | 1.70 | 1.92 | 50 | 4 | 4 | 5.78 | 6.84 | 7.07 | 7.26 | 7.43 | 7.89 |
| EPDBE2020-8-□□□ | ● | ● | 1.00 | 2.0 | 8.00 | 1.70 | 1.92 | 50 | 4 | 4 | 4.81 | 8.92 | 9.19 | 9.42 | 9.61 | 10.54 |
| EPDBE2020-10-□□□ | ● | ● | 1.00 | 2.0 | 10.00 | 1.70 | 1.92 | 50 | 4 | 4 | 4.12 | 11.00 | 11.30 | 11.56 | 11.99 | 13.20 |
| EPDBE2020-12-□□□ | ● | ● | 1.00 | 2.0 | 12.00 | 1.70 | 1.92 | 55 | 4 | 4 | 3.61 | 13.06 | 13.41 | 13.76 | 14.39 | 15.85 |
| EPDBE2020-13-□□□ | □ | ● | 1.00 | 2.0 | 13.00 | 1.70 | 1.92 | 55 | 4 | 4 | 3.39 | 14.10 | 14.45 | 14.90 | 15.58 | 17.18 |
| EPDBE2020-14-□□□ | □ | ● | 1.00 | 2.0 | 14.00 | 1.70 | 1.92 | 55 | 4 | 4 | 3.20 | 15.13 | 15.50 | 16.04 | 16.78 | 18.51 |
| EPDBE2020-16-□□□ | ● | ● | 1.00 | 2.0 | 16.00 | 1.70 | 1.92 | 55 | 4 | 4 | 2.88 | 17.19 | 17.59 | 18.32 | 19.17 | - |

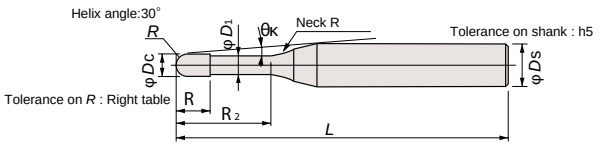
*For the last 3 digits of the part no. enter the coating type (PN, ATH)

□ = Stocked items in Japan

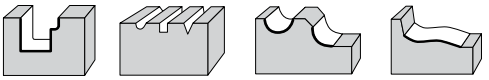
# EPDBE

Advanced Engineering







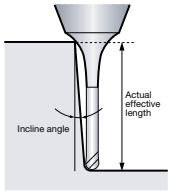
| Helix Angle | 30° | ϕDs | h5 |
|---|---|---|---|
| R (R≤0.25) | ±0.003 | | |
| R (0.25<R) | ±0.005 | | |

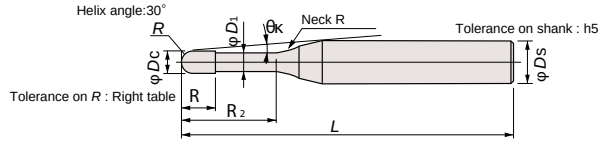
| | Stock | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | R | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDBE2020-18-□□□ | □ | ● | 1.00 | 2.0 | 18.00 | 1.70 | 1.92 | 60 | 4 | 4 | 2.62 | 19.24 | 19.72 | 20.60 | 21.57 | - |
| EPDBE2020-20-□□□ | ● | ● | 1.00 | 2.0 | 20.00 | 1.70 | 1.92 | 60 | 4 | 4 | 2.40 | 21.30 | 21.90 | 22.88 | 23.96 | - |
| EPDBE2020-22-□□□ | □ | ● | 1.00 | 2.0 | 22.00 | 1.70 | 1.92 | 60 | 4 | 4 | 2.22 | 23.35 | 24.08 | 25.16 | 26.35 | - |
| EPDBE2020-25-□□□ | ● | ● | 1.00 | 2.0 | 25.00 | 1.70 | 1.92 | 65 | 4 | 4 | 1.99 | 26.42 | 27.35 | 28.58 | - | - |
| EPDBE2020-30-□□□ | ● | ● | 1.00 | 2.0 | 30.00 | 1.70 | 1.92 | 70 | 4 | 4 | 1.70 | 31.53 | 32.80 | 34.29 | - | - |
| EPDBE2020-35-□□□ | □ | □ | 1.00 | 2.0 | 35.00 | 1.70 | 1.92 | 75 | 4 | 4 | 1.48 | 36.65 | 38.24 | - | - | - |
| EPDBE2020-40-□□□ | □ | □ | 1.00 | 2.0 | 40.00 | 1.70 | 1.92 | 80 | 4 | 4 | 1.31 | 41.86 | 43.69 | - | - | - |
| EPDBE2025-6-□□□ | □ | □ | 1.25 | 2.5 | 6.00 | 2.00 | 2.40 | 50 | 4 | 4 | 5.04 | 6.88 | 7.09 | 7.27 | 7.43 | 7.87 |
| EPDBE2025-10-□□□ | □ | □ | 1.25 | 2.5 | 10.00 | 2.00 | 2.40 | 50 | 4 | 4 | 3.43 | 11.03 | 11.32 | 11.56 | 12.00 | 13.18 |
| EPDBE2025-15-□□□ | □ | □ | 1.25 | 2.5 | 15.00 | 2.00 | 2.40 | 55 | 4 | 4 | 2.46 | 16.18 | 16.56 | 17.20 | 17.98 | - |
| EPDBE2025-20-□□□ | □ | □ | 1.25 | 2.5 | 20.00 | 2.00 | 2.40 | 60 | 4 | 4 | 1.91 | 21.32 | 21.93 | 22.90 | - | - |
| EPDBE2025-25-□□□ | □ | □ | 1.25 | 2.5 | 25.00 | 2.00 | 2.40 | 65 | 4 | 4 | 1.57 | 26.44 | 27.38 | 28.60 | - | - |
| EPDBE2025-30-□□□ | □ | □ | 1.25 | 2.5 | 30.00 | 2.00 | 2.40 | 70 | 4 | 4 | 1.33 | 31.55 | 32.82 | - | - | - |
| EPDBE2030-8-□□□ | ● | ● | 1.50 | 3.0 | 8.00 | 2.50 | 2.88 | 55 | 6 | 4 | 6.19 | 8.99 | 9.23 | 9.44 | 9.62 | 10.51 |
| EPDBE2030-10-□□□ | ● | ● | 1.50 | 3.0 | 10.00 | 2.50 | 2.88 | 55 | 6 | 4 | 5.41 | 11.06 | 11.34 | 11.57 | 12.01 | 13.16 |
| EPDBE2030-13-□□□ | ● | ● | 1.50 | 3.0 | 13.00 | 2.50 | 2.88 | 60 | 6 | 4 | 4.56 | 14.15 | 14.48 | 14.94 | 15.60 | 17.15 |
| EPDBE2030-16-□□□ | ● | ● | 1.50 | 3.0 | 16.00 | 2.50 | 2.88 | 60 | 6 | 4 | 3.93 | 17.24 | 17.61 | 18.36 | 19.19 | 21.13 |
| EPDBE2030-20-□□□ | ● | ● | 1.50 | 3.0 | 20.00 | 2.50 | 2.88 | 65 | 6 | 4 | 3.33 | 21.34 | 21.96 | 22.92 | 23.97 | 26.44 |
| EPDBE2030-25-□□□ | ● | ● | 1.50 | 3.0 | 25.00 | 2.50 | 2.88 | 70 | 6 | 4 | 2.79 | 26.46 | 27.41 | 28.62 | 29.96 | - |
| EPDBE2030-30-□□□ | ● | ● | 1.50 | 3.0 | 30.00 | 2.50 | 2.88 | 75 | 6 | 4 | 2.40 | 31.57 | 32.85 | 34.32 | 35.94 | - |
| EPDBE2030-35-□□□ | ● | ● | 1.50 | 3.0 | 35.00 | 2.50 | 2.88 | 80 | 6 | 4 | 2.11 | 36.72 | 38.30 | 40.03 | 41.92 | - |
| EPDBE2035-15-□□□ | □ | □ | 1.75 | 3.5 | 15.00 | 2.75 | 3.35 | 60 | 6 | 4 | 3.68 | 16.25 | 16.60 | 17.26 | 18.03 | 19.81 |
| EPDBE2035-25-□□□ | □ | □ | 1.75 | 3.5 | 25.00 | 2.75 | 3.35 | 70 | 6 | 4 | 2.43 | 26.49 | 27.46 | 28.67 | 29.99 | - |
| EPDBE2035-35-□□□ | □ | □ | 1.75 | 3.5 | 35.00 | 2.75 | 3.35 | 80 | 6 | 4 | 1.82 | 36.79 | 38.36 | 40.07 | - | - |
| EPDBE2035-45-□□□ | □ | □ | 1.75 | 3.5 | 45.00 | 2.75 | 3.35 | 90 | 6 | 4 | 1.45 | 47.22 | 49.25 | - | - | - |
| EPDBE2040-10-□□□ | ● | ● | 2.00 | 4.0 | 10.00 | 3.00 | 3.85 | 55 | 6 | 4 | 4.38 | 11.10 | 11.36 | 11.58 | 12.00 | 13.10 |
| EPDBE2040-13-□□□ | ● | ● | 2.00 | 4.0 | 13.00 | 3.00 | 3.85 | 60 | 6 | 4 | 3.57 | 14.19 | 14.50 | 14.95 | 15.59 | 17.08 |
| EPDBE2040-16-□□□ | ● | ● | 2.00 | 4.0 | 16.00 | 3.00 | 3.85 | 60 | 6 | 4 | 3.01 | 17.27 | 17.63 | 18.37 | 19.18 | - |
| EPDBE2040-20-□□□ | ● | ● | 2.00 | 4.0 | 20.00 | 3.00 | 3.85 | 65 | 6 | 4 | 2.49 | 21.37 | 21.99 | 22.93 | 23.96 | - |
| EPDBE2040-25-□□□ | ● | ● | 2.00 | 4.0 | 25.00 | 3.00 | 3.85 | 70 | 6 | 4 | 2.05 | 26.49 | 27.44 | 28.63 | 29.95 | - |

*For the last 3 digits of the part no. enter the coating type (PN, ATH)

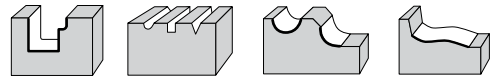
# EPDBE

Advanced Engineering




BALL NOSE | SEMI-FINISHING | FINISHING | 65 HRC 65 | 2 FLUTES | PN COATING | ATH COATING



| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| R (R≤0.25) | ±0.003 | | |
| R (0.25<R) | ±0.005 | | |

| Part No.* | Stock PN | Stock ATH | R | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDBE2040-30-□□□ | ● | ● | 2.00 | 4.0 | 30.00 | 3.00 | 3.85 | 75 | 6 | 4 | 1.74 | 31.59 | 32.89 | 34.34 | - | - |
| EPDBE2040-35-□□□ | ● | ● | 2.00 | 4.0 | 35.00 | 3.00 | 3.85 | 80 | 6 | 4 | 1.51 | 36.78 | 38.33 | 40.04 | - | - |
| EPDBE2040-40-□□□ | ● | ● | 2.00 | 4.0 | 40.00 | 3.00 | 3.85 | 80 | 6 | 4 | 1.34 | 41.99 | 43.78 | - | - | - |
| EPDBE2040-45-□□□ | ● | ● | 2.00 | 4.0 | 45.00 | 3.00 | 3.85 | 90 | 6 | 4 | 1.20 | 47.20 | 49.23 | - | - | - |
| EPDBE2040-50-□□□ | ● | ● | 2.00 | 4.0 | 50.00 | 3.00 | 3.85 | 100 | 6 | 4 | 1.08 | 52.42 | 54.68 | - | - | - |
| EPDBE2050-20-□□□ | ● | ● | 2.50 | 5.0 | 20.00 | 3.50 | 4.85 | 65 | 6 | 4 | 1.42 | 21.36 | 21.95 | - | - | - |
| EPDBE2050-25-□□□ | ● | ● | 2.50 | 5.0 | 25.00 | 3.50 | 4.85 | 70 | 6 | 4 | 1.14 | 26.48 | 27.39 | - | - | - |
| EPDBE2050-30-□□□ | ● | ● | 2.50 | 5.0 | 30.00 | 3.50 | 4.85 | 75 | 6 | 4 | 0.95 | 31.58 | - | - | - | - |
| EPDBE2050-40-□□□ | ● | ● | 2.50 | 5.0 | 40.00 | 3.50 | 4.85 | 80 | 6 | 4 | 0.72 | 41.97 | - | - | - | - |
| EPDBE2060-12-□□□ | ● | ● | 3.00 | 6.0 | 12.00 | 6.00 | 5.85 | 60 | 6 | - | 0.00 | - | - | - | - | - |
| EPDBE2060-20-□□□ | ● | ● | 3.00 | 6.0 | 20.00 | 6.00 | 5.85 | 65 | 6 | - | 0.00 | - | - | - | - | - |
| EPDBE2060-30-□□□ | ● | ● | 3.00 | 6.0 | 30.00 | 6.00 | 5.85 | 75 | 6 | - | 0.00 | - | - | - | - | - |
| EPDBE2060-50-□□□ | ● | ● | 3.00 | 6.0 | 50.00 | 6.00 | 5.85 | 100 | 6 | - | 0.00 | - | - | - | - | - |

*For the last 3 digits of the part no. enter the coating type (PN, ATH)

# EPDBE

**EPDBE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ATH Coating | | | | | |
| | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| R | Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.05** | **0.1** | 0.20 | 0.008 | 50,000 | 300 | 50,000 | 250 | 50,000 | 250 | 50,000 | 225 | 50,000 | 200 | 50,000 | 188 |
| **0.05** | **0.1** | 0.30 | 0.006 | 50,000 | 300 | 50,000 | 250 | 50,000 | 250 | 50,000 | 225 | 50,000 | 200 | 50,000 | 188 |
| **0.05** | **0.1** | 0.50 | 0.004 | 50,000 | 300 | 50,000 | 250 | 50,000 | 250 | 50,000 | 225 | 50,000 | 200 | 50,000 | 188 |
| **0.10** | **0.2** | 0.50 | 0.020 | 50,000 | 420 | 50,000 | 350 | 50,000 | 350 | 50,000 | 325 | 45,500 | 273 | 42,000 | 210 |
| **0.10** | **0.2** | 0.75 | 0.017 | 50,000 | 420 | 50,000 | 350 | 50,000 | 350 | 50,000 | 325 | 45,500 | 273 | 42,000 | 210 |
| **0.10** | **0.2** | 1.00 | 0.014 | 50,000 | 420 | 50,000 | 350 | 50,000 | 350 | 50,000 | 325 | 45,500 | 273 | 42,000 | 210 |
| **0.10** | **0.2** | 1.25 | 0.011 | 50,000 | 378 | 50,000 | 315 | 48,600 | 306 | 45,900 | 269 | 40,500 | 219 | 37,800 | 170 |
| **0.10** | **0.2** | 1.50 | 0.008 | 50,000 | 378 | 50,000 | 315 | 48,600 | 306 | 45,900 | 269 | 40,500 | 219 | 37,800 | 170 |
| **0.10** | **0.2** | 2.00 | 0.008 | 50,000 | 378 | 50,000 | 315 | 48,600 | 306 | 45,900 | 269 | 40,500 | 219 | 37,800 | 170 |
| **0.10** | **0.2** | 2.50 | 0.006 | 48,000 | 323 | 48,000 | 269 | 43,200 | 242 | 40,800 | 212 | 36,000 | 173 | 33,600 | 134 |
| **0.10** | **0.2** | 3.00 | 0.004 | 48,000 | 323 | 48,000 | 269 | 43,200 | 242 | 40,800 | 212 | 36,000 | 173 | 33,600 | 134 |
| **0.15** | **0.3** | 0.50 | 0.027 | 50,000 | 600 | 50,000 | 500 | 50,000 | 500 | 50,000 | 450 | 45,000 | 383 | 42,000 | 336 |
| **0.15** | **0.3** | 0.75 | 0.024 | 50,000 | 600 | 50,000 | 500 | 50,000 | 500 | 50,000 | 450 | 45,000 | 383 | 42,000 | 336 |
| **0.15** | **0.3** | 1.00 | 0.021 | 50,000 | 600 | 50,000 | 500 | 50,000 | 500 | 50,000 | 450 | 45,000 | 383 | 42,000 | 336 |
| **0.15** | **0.3** | 1.25 | 0.019 | 50,000 | 600 | 50,000 | 500 | 50,000 | 500 | 50,000 | 450 | 45,000 | 383 | 42,000 | 336 |
| **0.15** | **0.3** | 1.50 | 0.016 | 50,000 | 600 | 50,000 | 500 | 50,000 | 500 | 50,000 | 450 | 45,000 | 383 | 42,000 | 336 |
| **0.15** | **0.3** | 2.00 | 0.012 | 50,000 | 540 | 50,000 | 450 | 48,600 | 437 | 45,900 | 372 | 40,500 | 310 | 37,800 | 272 |
| **0.15** | **0.3** | 2.50 | 0.010 | 50,000 | 540 | 50,000 | 450 | 48,600 | 437 | 45,900 | 372 | 40,500 | 310 | 37,800 | 272 |
| **0.15** | **0.3** | 3.00 | 0.008 | 50,000 | 540 | 50,000 | 450 | 48,600 | 437 | 45,900 | 372 | 40,500 | 310 | 37,800 | 272 |
| **0.20** | **0.4** | 0.75 | 0.043 | 50,000 | 967 | 50,000 | 840 | 50,000 | 839 | 50,000 | 770 | 46,800 | 655 | 43,680 | 612 |
| **0.20** | **0.4** | 1.00 | 0.040 | 50,000 | 967 | 50,000 | 840 | 50,000 | 839 | 50,000 | 770 | 46,800 | 655 | 43,680 | 612 |
| **0.20** | **0.4** | 1.50 | 0.034 | 50,000 | 829 | 50,000 | 720 | 50,000 | 719 | 50,000 | 660 | 46,800 | 468 | 43,680 | 437 |
| **0.20** | **0.4** | 2.00 | 0.028 | 50,000 | 691 | 50,000 | 600 | 50,000 | 600 | 50,000 | 550 | 46,800 | 468 | 43,680 | 437 |
| **0.20** | **0.4** | 2.50 | 0.022 | 50,000 | 560 | 43,200 | 467 | 38,880 | 420 | 36,720 | 364 | 32,400 | 292 | 36,288 | 272 |
| **0.20** | **0.4** | 3.00 | 0.016 | 50,000 | 560 | 43,200 | 467 | 38,880 | 420 | 36,720 | 364 | 32,400 | 292 | 36,288 | 272 |
| **0.20** | **0.4** | 3.50 | 0.012 | 50,000 | 560 | 43,200 | 467 | 38,880 | 420 | 36,720 | 364 | 32,400 | 292 | 36,288 | 272 |
| **0.20** | **0.4** | 4.00 | 0.010 | 50,000 | 560 | 43,200 | 467 | 38,880 | 420 | 36,720 | 364 | 32,400 | 292 | 36,288 | 272 |
| **0.20** | **0.4** | 4.50 | 0.008 | 46,080 | 470 | 38,400 | 392 | 34,560 | 353 | 32,640 | 305 | 28,800 | 245 | 26,880 | 228 |
| **0.25** | **0.5** | 1.00 | 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 |
| **0.25** | **0.5** | 1.50 | 0.040 | 50,000 | 1,500 | 50,000 | 1,500 | 46,800 | 1,404 | 44,200 | 1,193 | 39,000 | 1,053 | 36,400 | 681 |
| **0.25** | **0.5** | 2.00 | 0.035 | 50,000 | 1,200 | 50,000 | 1,200 | 46,800 | 1,123 | 44,200 | 955 | 39,000 | 842 | 36,400 | 681 |
| **0.25** | **0.5** | 2.50 | 0.033 | 50,000 | 1,081 | 50,000 | 1,000 | 42,120 | 758 | 39,780 | 645 | 35,100 | 568 | 32,760 | 502 |
| **0.25** | **0.5** | 3.00 | 0.030 | 50,000 | 900 | 46,800 | 842 | 42,120 | 758 | 39,780 | 645 | 35,100 | 568 | 25,200 | 386 |
| **0.25** | **0.5** | 4.00 | 0.020 | 43,200 | 778 | 36,000 | 648 | 32,400 | 583 | 30,600 | 496 | 32,400 | 524 | 25,200 | 386 |
| **0.25** | **0.5** | 5.00 | 0.018 | 43,200 | 778 | 36,000 | 648 | 32,400 | 583 | 30,600 | 496 | 32,400 | 524 | 25,200 | 386 |
| **0.25** | **0.5** | 5.50 | 0.015 | 38,400 | 653 | 32,000 | 544 | 28,800 | 490 | 27,200 | 416 | 24,000 | 367 | 22,400 | 324 |
| **0.25** | **0.5** | 6.00 | 0.013 | 38,400 | 653 | 32,000 | 544 | 28,800 | 490 | 27,200 | 416 | 24,000 | 367 | 22,400 | 324 |
| **0.25** | **0.5** | 8.00 | 0.008 | 38,400 | 653 | 32,000 | 544 | 28,800 | 490 | 27,200 | 416 | 24,000 | 367 | 22,400 | 324 |
| **0.30** | **0.6** | 1.00 | 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 |
| **0.30** | **0.6** | 2.00 | 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 |
| **0.30** | **0.6** | 2.50 | 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 |

# EPDBE

**EPDBE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ATH Coating | | | | | | | |
| | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| R | Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.30** | **0.6** | 3.0 | 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 |
| **0.30** | **0.6** | 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 |
| **0.30** | **0.6** | 4.0 | 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 |
| **0.30** | **0.6** | 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 |
| **0.30** | **0.6** | 5.0 | 0.020 | 50,000 | 1,350 | 46,800 | 1,264 | 42,120 | 1,138 | 39,780 | 931 | 35,100 | 758 | 32,760 | 590 |
| **0.30** | **0.6** | 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 |
| **0.30** | **0.6** | 6.0 | 0.015 | 50,000 | 1,350 | 46,800 | 1,264 | 42,120 | 1,138 | 39,780 | 931 | 35,100 | 758 | 32,760 | 590 |
| **0.30** | **0.6** | 7.0 | 0.015 | 38,400 | 979 | 32,000 | 816 | 28,800 | 881 | 27,200 | 601 | 24,000 | 490 | 22,400 | 495 |
| **0.30** | **0.6** | 8.0 | 0.015 | 38,400 | 979 | 32,000 | 816 | 28,800 | 734 | 27,200 | 601 | 24,000 | 490 | 22,400 | 381 |
| **0.30** | **0.6** | 9.0 | 0.012 | 38,400 | 979 | 32,000 | 816 | 28,800 | 734 | 27,200 | 601 | 24,000 | 490 | 22,400 | 381 |
| **0.30** | **0.6** | 10.0 | 0.009 | 33,600 | 857 | 28,000 | 714 | 25,200 | 643 | 23,800 | 526 | 21,000 | 428 | 19,600 | 333 |
| **0.30** | **0.6** | 12.0 | 0.007 | 28,800 | 691 | 24,000 | 576 | 21,600 | 518 | 20,400 | 424 | 18,000 | 346 | 16,800 | 269 |
| **0.40** | **0.8** | 2.0 | 0.120 | 50,000 | 2,700 | 50,000 | 2,700 | 50,000 | 2,700 | 50,000 | 2,400 | 48,000 | 2,592 | 44,800 | 1,882 |
| **0.40** | **0.8** | 4.0 | 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 |
| **0.40** | **0.8** | 5.0 | 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 |
| **0.40** | **0.8** | 6.0 | 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 |
| **0.40** | **0.8** | 8.0 | 0.020 | 49,920 | 1,617 | 41,600 | 1,348 | 37,440 | 1,213 | 35,360 | 1,018 | 31,200 | 842 | 29,120 | 733 |
| **0.40** | **0.8** | 10.0 | 0.020 | 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 | 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 |
| **0.45** | **0.9** | 4.0 | 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 |
| **0.45** | **0.9** | 6.0 | 0.050 | 50,000 | 2,302 | 47,880 | 2,020 | 43,092 | 1,818 | 40,698 | 1,515 | 35,910 | 1,253 | 33,516 | 1,111 |
| **0.45** | **0.9** | 8.0 | 0.036 | 43,776 | 1,679 | 36,480 | 1,399 | 32,832 | 1,259 | 31,008 | 1,049 | 27,360 | 868 | 25,536 | 770 |
| **0.50** | **1.0** | 2.0 | 0.200 | 50,000 | 3,750 | 50,000 | 3,750 | 48,600 | 3,645 | 45,900 | 3,098 | 43,200 | 2,722 | 37,800 | 2,268 |
| **0.50** | **1.0** | 3.0 | 0.200 | 50,000 | 3,750 | 50,000 | 3,750 | 48,600 | 3,645 | 45,900 | 3,098 | 43,200 | 2,722 | 37,800 | 2,268 |
| **0.50** | **1.0** | 4.0 | 0.140 | 50,000 | 3,750 | 50,000 | 3,750 | 48,600 | 3,645 | 45,900 | 3,098 | 43,200 | 2,722 | 37,800 | 2,268 |
| **0.50** | **1.0** | 5.0 | 0.090 | 50,000 | 3,500 | 46,800 | 3,276 | 42,120 | 2,948 | 39,780 | 2,596 | 43,200 | 2,540 | 32,760 | 1,835 |
| **0.50** | **1.0** | 6.0 | 0.060 | 50,000 | 3,151 | 42,120 | 2,654 | 40,824 | 2,558 | 38,556 | 2,319 | 38,880 | 2,353 | 29,484 | 1,379 |
| **0.50** | **1.0** | 7.0 | 0.060 | 46,656 | 2,100 | 38,880 | 1,750 | 34,992 | 1,574 | 33,048 | 1,338 | 31,590 | 1,323 | 27,216 | 1,061 |
| **0.50** | **1.0** | 8.0 | 0.060 | 46,656 | 2,100 | 38,880 | 1,750 | 34,992 | 1,574 | 33,048 | 1,338 | 31,590 | 1,323 | 27,216 | 979 |
| **0.50** | **1.0** | 9.0 | 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 |
| **0.50** | **1.0** | 10.0 | 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 |
| **0.50** | **1.0** | 12.0 | 0.025 | 34,560 | 1,469 | 28,800 | 1,224 | 25,920 | 1,102 | 24,480 | 936 | 21,600 | 771 | 20,160 | 685 |
| **0.50** | **1.0** | 13.0 | 0.023 | 34,560 | 1,469 | 28,800 | 1,224 | 25,920 | 1,102 | 24,480 | 936 | 21,600 | 771 | 20,160 | 685 |
| **0.50** | **1.0** | 14.0 | 0.020 | 34,560 | 1,469 | 28,800 | 1,224 | 25,920 | 1,102 | 24,480 | 936 | 21,600 | 771 | 20,160 | 685 |
| **0.50** | **1.0** | 16.0 | 0.015 | 34,560 | 1,469 | 28,800 | 1,224 | 25,920 | 1,102 | 24,480 | 936 | 21,600 | 771 | 20,160 | 685 |
| **0.50** | **1.0** | 18.0 | 0.012 | 30,240 | 1,210 | 25,200 | 1,008 | 22,680 | 907 | 21,420 | 771 | 18,900 | 635 | 17,640 | 564 |
| **0.50** | **1.0** | 20.0 | 0.010 | 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 | 0.200 | 50,000 | 3,924 | 50,000 | 3,924 | 45,360 | 3,560 | 42,840 | 2,927 | 37,800 | 2,452 | 35,280 | 2,176 |
| **0.55** | **1.1** | 4.0 | 0.140 | 50,000 | 3,924 | 50,000 | 3,924 | 45,360 | 3,560 | 42,840 | 2,927 | 37,800 | 2,452 | 35,280 | 2,176 |
| **0.55** | **1.1** | 6.0 | 0.060 | 47,736 | 2,767 | 39,780 | 2,306 | 35,802 | 2,075 | 33,813 | 1,706 | 29,835 | 1,430 | 27,846 | 1,268 |
| **0.55** | **1.1** | 8.0 | 0.060 | 47,736 | 2,306 | 39,780 | 2,306 | 35,802 | 1,729 | 31,212 | 1,312 | 27,540 | 1,100 | 25,704 | 975 |
| **0.55** | **1.1** | 10.0 | 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 |

# EPDBE

**EPDBE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ATH Coating | | | | | | | |
| | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| R | Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.60** | **1.2** | 4 | 0.160 | 50,000 | 3,924 | 46,154 | 3,743 | 41,538 | 3,260 | 39,230 | 2,717 | 36,923 | 2,555 | 32,307 | 1,860 |
| **0.60** | **1.2** | 8 | 0.060 | 44,928 | 2,570 | 37,440 | 2,142 | 33,696 | 2,103 | 31,824 | 2,069 | 30,240 | 2,062 | 26,208 | 1,048 |
| **0.60** | **1.2** | 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 |
| **0.60** | **1.2** | 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 |
| **0.70** | **1.4** | 8 | 0.110 | 39,312 | 2,830 | 32,760 | 2,359 | 29,484 | 2,123 | 27,846 | 1,805 | 24,570 | 1,533 | 22,932 | 1,376 |
| **0.70** | **1.4** | 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 |
| **0.70** | **1.4** | 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 | 0.200 | 50,000 | 4,951 | 42,000 | 4,158 | 37,800 | 3,742 | 35,700 | 3,213 | 31,500 | 2,552 | 29,400 | 2,205 |
| **0.75** | **1.5** | 6 | 0.200 | 50,000 | 4,951 | 42,000 | 4,158 | 37,800 | 3,742 | 35,700 | 3,213 | 31,500 | 2,552 | 29,400 | 2,205 |
| **0.75** | **1.5** | 8 | 0.090 | 39,312 | 2,802 | 32,760 | 2,627 | 29,484 | 2,101 | 27,846 | 1,805 | 24,570 | 1,434 | 22,932 | 1,239 |
| **0.75** | **1.5** | 10 | 0.090 | 36,288 | 2,586 | 30,240 | 2,156 | 27,216 | 1,940 | 25,704 | 1,666 | 22,680 | 1,323 | 21,168 | 1,143 |
| **0.75** | **1.5** | 12 | 0.090 | 36,288 | 2,155 | 30,240 | 1,796 | 27,216 | 1,616 | 25,704 | 1,388 | 22,680 | 1,103 | 21,168 | 953 |
| **0.75** | **1.5** | 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 |
| **0.75** | **1.5** | 16 | 0.038 | 26,880 | 1,508 | 22,400 | 1,257 | 20,160 | 1,131 | 19,040 | 971 | 16,800 | 771 | 15,680 | 666 |
| **0.75** | **1.5** | 18 | 0.038 | 26,880 | 1,508 | 22,400 | 1,257 | 20,160 | 1,131 | 19,040 | 971 | 16,800 | 771 | 15,680 | 666 |
| **0.75** | **1.5** | 20 | 0.038 | 26,880 | 1,508 | 22,400 | 1,257 | 20,160 | 1,131 | 19,040 | 971 | 16,800 | 771 | 15,680 | 666 |
| **0.80** | **1.6** | 8 | 0.220 | 43,680 | 3,669 | 36,400 | 3,058 | 32,760 | 2,752 | 30,940 | 2,493 | 27,300 | 2,129 | 23,660 | 1,590 |
| **0.80** | **1.6** | 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 |
| **0.80** | **1.6** | 16 | 0.060 | 33,696 | 2,123 | 28,080 | 1,769 | 25,272 | 1,592 | 23,868 | 1,332 | 21,060 | 1,138 | 19,656 | 991 |
| **0.80** | **1.6** | 20 | 0.040 | 24,960 | 1,485 | 20,800 | 1,238 | 18,720 | 1,114 | 17,680 | 932 | 15,600 | 796 | 14,560 | 693 |
| **0.90** | **1.8** | 8 | 0.260 | 40,560 | 3,894 | 33,800 | 3,245 | 30,420 | 2,920 | 28,730 | 2,413 | 25,350 | 2,008 | 23,660 | 1,704 |
| **0.90** | **1.8** | 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 |
| **0.90** | **1.8** | 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 |
| **0.90** | **1.8** | 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 |
| **1.00** | **2.0** | 3 | 0.400 | 37,800 | 5,670 | 31,500 | 4,725 | 28,350 | 4,253 | 26,775 | 3,616 | 23,625 | 3,049 | 22,050 | 2,646 |
| **1.00** | **2.0** | 4 | 0.400 | 37,800 | 5,670 | 31,500 | 4,725 | 28,350 | 4,253 | 26,775 | 3,616 | 23,625 | 3,049 | 22,050 | 2,646 |
| **1.00** | **2.0** | 6 | 0.400 | 37,800 | 5,103 | 31,500 | 4,253 | 28,350 | 3,827 | 26,775 | 3,213 | 23,625 | 2,693 | 22,050 | 2,381 |
| **1.00** | **2.0** | 8 | 0.280 | 37,800 | 5,103 | 31,500 | 4,253 | 28,350 | 3,827 | 26,775 | 3,213 | 23,625 | 2,693 | 22,050 | 2,381 |
| **1.00** | **2.0** | 10 | 0.210 | 35,280 | 4,234 | 29,400 | 3,528 | 26,460 | 3,175 | 24,990 | 2,699 | 22,050 | 2,249 | 19,110 | 1,468 |
| **1.00** | **2.0** | 12 | 0.120 | 31,752 | 3,809 | 26,460 | 3,175 | 23,814 | 2,858 | 22,491 | 2,430 | 19,845 | 2,051 | 17,199 | 1,321 |
| **1.00** | **2.0** | 13 | 0.120 | 31,752 | 3,809 | 26,460 | 3,175 | 23,814 | 2,858 | 22,491 | 2,430 | 19,845 | 2,024 | 15,876 | 1,016 |
| **1.00** | **2.0** | 14 | 0.120 | 31,752 | 3,301 | 26,460 | 2,752 | 23,814 | 2,477 | 22,491 | 2,106 | 18,428 | 1,629 | 15,876 | 1,016 |
| **1.00** | **2.0** | 16 | 0.120 | 29,484 | 2,123 | 24,570 | 1,769 | 22,113 | 1,593 | 20,885 | 1,353 | 18,428 | 1,467 | 15,876 | 914 |
| **1.00** | **2.0** | 18 | 0.090 | 27,216 | 1,960 | 22,680 | 1,633 | 20,412 | 1,470 | 19,278 | 1,249 | 18,428 | 1,354 | 15,876 | 914 |
| **1.00** | **2.0** | 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 |
| **1.00** | **2.0** | 22 | 0.050 | 21,420 | 1,457 | 17,850 | 1,214 | 16,065 | 1,092 | 15,173 | 929 | 13,388 | 774 | 14,994 | 816 |
| **1.00** | **2.0** | 25 | 0.050 | 20,160 | 1,371 | 16,800 | 1,142 | 15,120 | 1,028 | 14,280 | 874 | 12,600 | 728 | 14,112 | 768 |
| **1.00** | **2.0** | 30 | 0.030 | 20,160 | 1,371 | 16,800 | 1,142 | 15,120 | 1,028 | 14,280 | 874 | 12,600 | 728 | 14,112 | 768 |
| **1.00** | **2.0** | 35 | 0.025 | 17,640 | 1,129 | 14,700 | 941 | 13,230 | 847 | 12,495 | 720 | 11,025 | 600 | 10,290 | 527 |
| **1.00** | **2.0** | 40 | 0.022 | 15,120 | 968 | 12,600 | 806 | 11,340 | 726 | 10,710 | 617 | 9,450 | 514 | 8,820 | 452 |

# EPDBE

**EPDBE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ATH Coating | | | | | | | |
| | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| R | Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **1.25** | **2.5** | 6 | 0.500 | 33,300 | 6,075 | 27,750 | 5,063 | 24,975 | 4,556 | 23,588 | 3,797 | 20,813 | 3,088 | 19,425 | 2,531 |
| **1.25** | **2.5** | 10 | 0.340 | 33,300 | 6,075 | 27,750 | 5,063 | 24,975 | 4,556 | 23,588 | 3,797 | 20,813 | 3,088 | 19,425 | 2,531 |
| **1.25** | **2.5** | 15 | 0.150 | 25,974 | 3,411 | 21,645 | 2,842 | 19,481 | 2,558 | 18,398 | 2,132 | 16,234 | 2,023 | 15,152 | 1,421 |
| **1.25** | **2.5** | 20 | 0.120 | 23,976 | 2,624 | 19,980 | 2,186 | 17,982 | 1,968 | 16,983 | 1,640 | 16,234 | 1,445 | 13,986 | 1,093 |
| **1.25** | **2.5** | 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 |
| **1.25** | **2.5** | 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 |
| **1.50** | **3.0** | 8 | 0.600 | 28,800 | 6,480 | 24,000 | 5,400 | 21,600 | 4,860 | 20,400 | 4,100 | 18,000 | 3,402 | 16,800 | 3,024 |
| **1.50** | **3.0** | 10 | 0.420 | 28,800 | 6,480 | 24,000 | 5,400 | 21,600 | 4,860 | 20,400 | 4,100 | 18,000 | 3,402 | 16,800 | 3,024 |
| **1.50** | **3.0** | 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 |
| **1.50** | **3.0** | 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 |
| **1.50** | **3.0** | 20 | 0.180 | 22,464 | 3,033 | 18,720 | 2,527 | 16,848 | 2,275 | 15,912 | 1,919 | 14,040 | 1,593 | 12,096 | 1,307 |
| **1.50** | **3.0** | 25 | 0.120 | 22,464 | 3,033 | 18,720 | 2,527 | 16,848 | 2,275 | 15,912 | 1,919 | 14,040 | 1,593 | 12,096 | 1,307 |
| **1.50** | **3.0** | 30 | 0.120 | 20,736 | 2,800 | 17,280 | 2,333 | 15,552 | 2,100 | 14,688 | 1,771 | 12,960 | 1,470 | 12,096 | 1,307 |
| **1.50** | **3.0** | 35 | 0.080 | 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 | 0.360 | 21,450 | 4,399 | 17,875 | 3,666 | 16,088 | 3,299 | 15,194 | 2,750 | 13,406 | 2,236 | 12,513 | 1,833 |
| **1.75** | **3.5** | 25 | 0.210 | 17,820 | 2,736 | 14,850 | 2,280 | 13,365 | 2,052 | 12,623 | 1,710 | 11,138 | 1,391 | 10,395 | 1,140 |
| **1.75** | **3.5** | 35 | 0.090 | 17,820 | 2,736 | 14,850 | 2,280 | 13,365 | 2,052 | 12,623 | 1,710 | 11,138 | 1,391 | 10,395 | 1,140 |
| **1.75** | **3.5** | 45 | 0.090 | 13,200 | 1,918 | 11,000 | 1,598 | 9,900 | 1,438 | 9,350 | 1,199 | 8,250 | 975 | 7,700 | 799 |
| **2.00** | **4.0** | 10 | 0.600 | 20,700 | 6,210 | 17,250 | 5,175 | 15,525 | 4,658 | 14,663 | 3,960 | 12,938 | 3,299 | 12,075 | 2,898 |
| **2.00** | **4.0** | 13 | 0.480 | 20,700 | 6,210 | 17,250 | 5,175 | 15,525 | 4,658 | 14,663 | 3,960 | 12,938 | 3,299 | 12,075 | 2,898 |
| **2.00** | **4.0** | 16 | 0.420 | 20,700 | 6,210 | 17,250 | 5,175 | 15,525 | 4,658 | 14,663 | 3,960 | 12,938 | 3,299 | 12,075 | 2,898 |
| **2.00** | **4.0** | 20 | 0.420 | 17,940 | 4,306 | 14,950 | 3,588 | 13,455 | 3,229 | 12,708 | 2,746 | 11,213 | 2,287 | 10,465 | 2,009 |
| **2.00** | **4.0** | 25 | 0.240 | 16,146 | 3,488 | 13,455 | 2,906 | 12,110 | 2,616 | 11,437 | 2,223 | 10,092 | 2,162 | 9,419 | 1,627 |
| **2.00** | **4.0** | 30 | 0.160 | 14,904 | 2,683 | 12,420 | 2,236 | 11,178 | 2,012 | 10,558 | 1,710 | 9,316 | 1,426 | 8,694 | 1,252 |
| **2.00** | **4.0** | 35 | 0.100 | 14,904 | 2,683 | 12,420 | 2,236 | 11,178 | 2,012 | 10,558 | 1,710 | 9,316 | 1,426 | 8,694 | 1,252 |
| **2.00** | **4.0** | 40 | 0.100 | 14,904 | 2,683 | 12,420 | 2,236 | 11,178 | 2,012 | 10,558 | 1,710 | 9,316 | 1,426 | 8,694 | 1,252 |
| **2.00** | **4.0** | 45 | 0.100 | 11,040 | 1,877 | 9,200 | 1,564 | 8,280 | 1,408 | 7,820 | 1,196 | 6,900 | 997 | 6,440 | 876 |
| **2.00** | **4.0** | 50 | 0.100 | 11,040 | 1,877 | 9,200 | 1,564 | 8,280 | 1,408 | 7,820 | 1,196 | 6,900 | 997 | 6,440 | 876 |
| **2.50** | **5.0** | 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 |
| **2.50** | **5.0** | 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 |
| **2.50** | **5.0** | 30 | 0.300 | 12,636 | 4,549 | 10,530 | 2,780 | 9,477 | 3,413 | 8,951 | 2,685 | 7,898 | 2,369 | 7,371 | 1,991 |
| **2.50** | **5.0** | 40 | 0.200 | 11,664 | 2,520 | 9,720 | 2,100 | 8,748 | 1,890 | 8,262 | 1,487 | 7,290 | 1,313 | 6,804 | 1,103 |
| **3.00** | **6.0** | 12 | 0.600 | 16,200 | 6,804 | 13,500 | 5,670 | 12,150 | 5,103 | 11,475 | 4,253 | 10,125 | 3,459 | 9,450 | 2,835 |
| **3.00** | **6.0** | 20 | 0.500 | 15,300 | 5,967 | 12,750 | 4,973 | 11,475 | 4,475 | 10,838 | 3,729 | 9,563 | 3,033 | 8,925 | 2,486 |
| **3.00** | **6.0** | 30 | 0.420 | 12,480 | 3,594 | 10,400 | 2,995 | 9,360 | 2,696 | 8,840 | 2,122 | 7,800 | 2,028 | 7,280 | 1,572 |
| **3.00** | **6.0** | 50 | 0.150 | 10,368 | 2,687 | 8,640 | 2,239 | 7,776 | 2,016 | 7,344 | 1,587 | 6,480 | 1,400 | 6,048 | 1,175 |

# EPDBP

## High-Precision Ball End Mills for Deep Machining

## FEATURES

Revolutionary neck design for improved breakage resistance and reduced vibration

Newly developed cutting edge & flute geometry for stability in long overhang machining

Ideal for precision machining conventionally done by EDM

EPDBP Pencil Neck Series features even greater reach and “Back Draft Effect”

# EPDBP

## INTRODUCTION

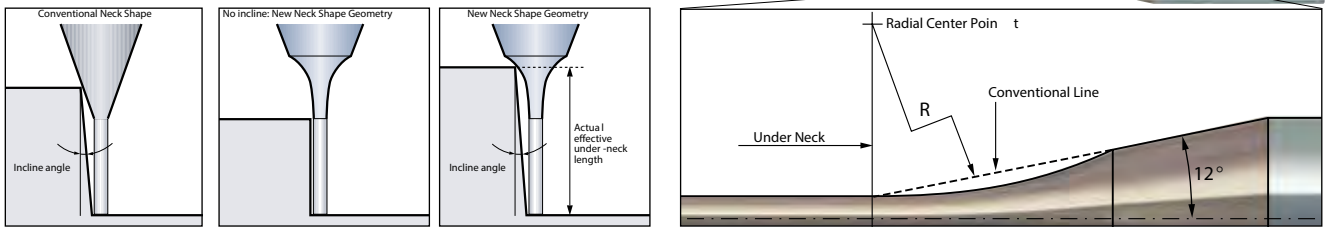
The EPDBP Epoch Series Ball End Mills have been designed for cutting deep ribs and slots in molds, as well as machining deep corners and precision features that were previously performed by EDM (electrical discharge machining).

Featuring a revolutionary neck design, these end mills exhibit greater breakage resistance and less vibration during high-speed machining than competitors' tools. New cutting geometries as well as the revolutionary TH Coatings help to maximize machining performance as well as tool life.

## FEATURES

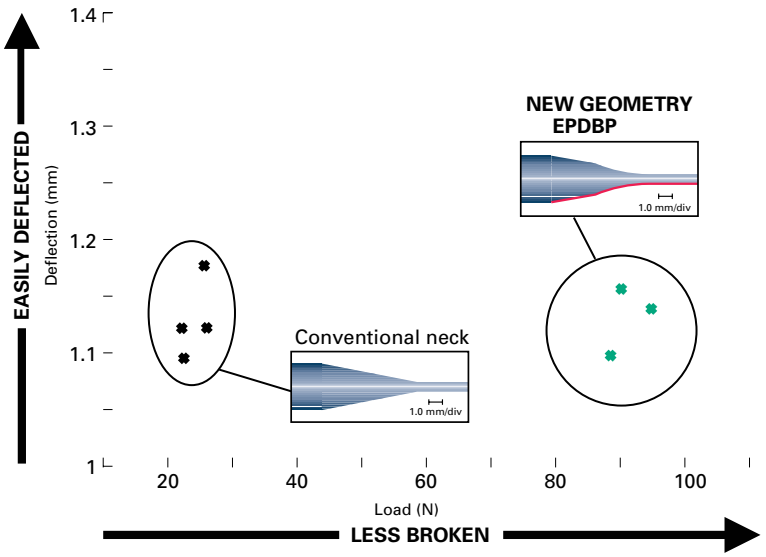
### 1. New Neck Shape Eliminates Contact Against the Workpiece

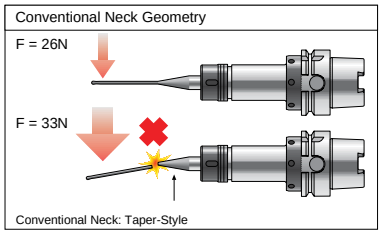
The new neck shape of the EPDBP End Mills gives them a longer effective reach in mold with draft angles. For example, when machining a draft angle of 1˚ using an R0.5mm end mill with a 10mm under neck length, the actual effective reach with the new neck shape is 12.03mm, compared to 10.8mm with the conventional neck shape.

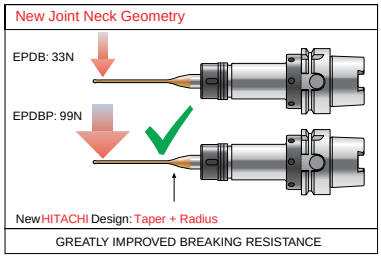



### 2. New Neck Shape Improves Breakage Resistance

As shown in the chart, the neck shape of the EPDBP provides increased breakage resistance without taking on the poor deflection capabilities of traditional full radius neck style end mills.

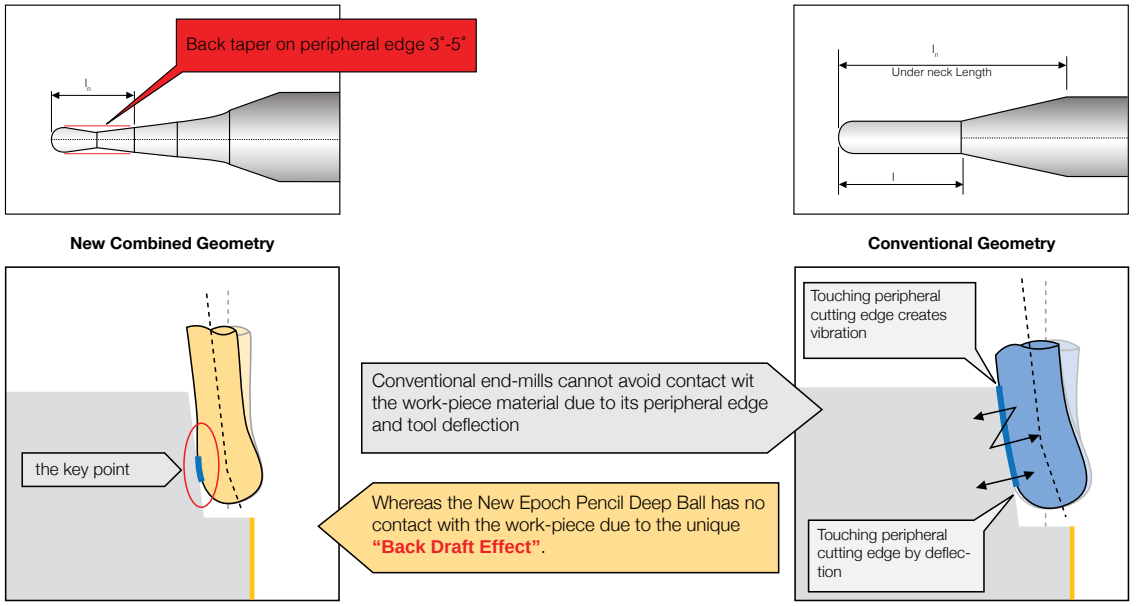


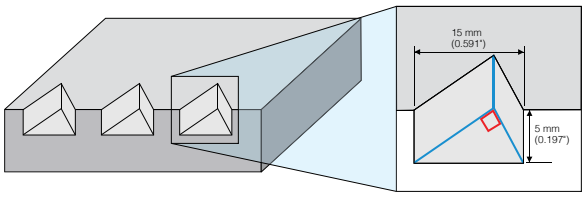



## 3. Back Taper and Back Draft Effect

The EPDBP End Mills feature a 3˚ - 5˚ back taper on their peripheral edges, allowing them to avoid contact with the workpiece (also known as the Back Draft Effect). Conventional end mills cannot avoid contact with the workpiece, leading to tool deflection, chatter and vibration.




Designed for long reach, steep side wall applications, the EPDBP end mills are capable of twice the speed of competitive end mills.

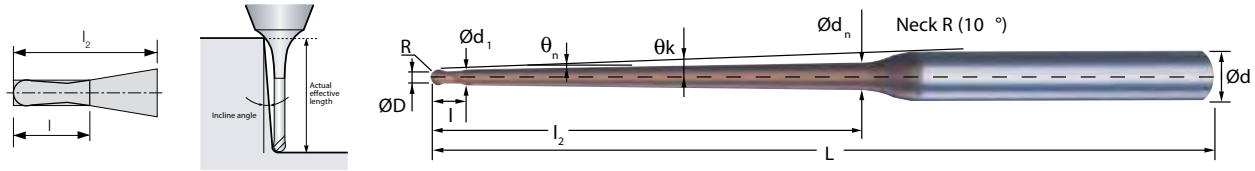



**Dia 1 x 10 mm H13**

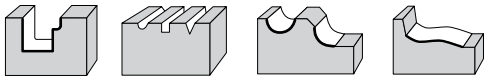
| | Competitor | EPDBP Condition |
|---|---|---|
| N rpm | 20,000 | 20,000 |
| $v_f$ mm/min | 800 (31.496 ipm) | 1,600 (62.992 ipm) |
| doc mm | 0.02 (0.0008") | 0.01 (0.0004") |
| woc mm | 0.06 (0.0024") | 0.05 (0.0020") |

# EPDBP

Advanced Engineering







| Helix Angle | 20° | d | h5 |
|---|---|---|---|
| R (R≤0.25) | ±0.003 | D (R≤0.25) | 0/-0.006 |
| R (R>0.25) | ±0.005 | D (R>0.25) | 0/-0.10 |

**EPDBP**

| Part No. | ØD | R | $\theta_n$ | $l_2$ | l | $Ød_1$ | $Ød_n$ | L | Ød | l' | θk | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDBP2002-2-09-TH | 0.20 | 0.10 | 0.9° | 2.0 | 0.15 | 0.17 | 0.228 | 50 | 4 | 1.10 | 10.01 | 2.81 | 3.14 | 3.42 | 3.92 |
| EPDBP2002-2.5-09-TH | 0.20 | 0.10 | 0.9° | 2.5 | 0.15 | 0.17 | 0.244 | 50 | 4 | 1.10 | 9.60 | 3.32 | 3.70 | 4.01 | 4.54 |
| EPDBP2004-4-09-TH | 0.40 | 0.20 | 0.9° | 4.0 | 0.30 | 0.37 | 0.486 | 50 | 4 | 1.25 | 8.49 | 4.87 | 5.35 | 5.72 | 6.34 |
| EPDBP2004-5-09-TH | 0.40 | 0.20 | 0.9° | 5.0 | 0.30 | 0.37 | 0.518 | 50 | 4 | 1.25 | 7.89 | 5.90 | 6.44 | 6.85 | 7.53 |
| EPDBP2006-6-09-TH | 0.60 | 0.30 | 0.9° | 6.0 | 0.40 | 0.57 | 0.746 | 50 | 4 | 1.35 | 7.26 | 6.92 | 7.52 | 7.96 | 8.68 |
| EPDBP2006-8-09-TH | 0.60 | 0.30 | 0.9° | 8.0 | 0.40 | 0.57 | 0.809 | 50 | 4 | 1.35 | 6.38 | 8.96 | 9.67 | 10.18 | 10.98 |
| EPDBP2006-10-09-TH | 0.60 | 0.30 | 0.9° | 10.0 | 0.40 | 0.57 | 0.872 | 50 | 4 | 1.35 | 5.70 | 11.01 | 11.81 | 12.37 | 13.25 |
| EPDBP2006-12-09-TH | 0.60 | 0.30 | 0.9° | 12.0 | 0.40 | 0.57 | 0.934 | 55 | 4 | 1.35 | 5.14 | 13.05 | 13.94 | 14.54 | 15.49 |
| EPDBP2006-15-09-TH | 0.60 | 0.30 | 0.9° | 15.0 | 0.40 | 0.57 | 1.029 | 55 | 4 | 1.35 | 4.49 | 16.10 | 17.11 | 17.78 | 18.81 |
| EPDBP2010-10-09-TH | 1.00 | 0.50 | 0.9° | 10.0 | 0.80 | 0.94 | 1.229 | 55 | 6 | 2.70 | 6.88 | 11.20 | 11.91 | 12.44 | 13.28 |
| EPDBP2010-15-09-TH | 1.00 | 0.50 | 0.9° | 15.0 | 0.80 | 0.94 | 1.386 | 60 | 6 | 2.70 | 5.64 | 16.28 | 17.19 | 17.84 | 18.84 |
| EPDBP2010-20-09-TH | 1.00 | 0.50 | 0.9° | 20.0 | 0.80 | 0.94 | 1.543 | 65 | 6 | 2.70 | 4.77 | 21.35 | 22.44 | 23.18 | 24.68 |
| EPDBP2010-25-09-TH | 1.00 | 0.50 | 0.9° | 25.0 | 0.80 | 0.94 | 1.700 | 70 | 6 | 2.70 | 4.14 | 26.42 | 27.66 | 28.48 | 30.83 |
| EPDBP2010-30-09-TH | 1.00 | 0.50 | 0.9° | 30.0 | 0.80 | 0.94 | 1.875 | 75 | 6 | 2.70 | 3.65 | 31.49 | 32.86 | 33.75 | 36.98 |
| EPDBP2010-35-09-TH | 1.00 | 0.50 | 0.9° | 35.0 | 0.80 | 0.94 | 2.015 | 80 | 6 | 2.70 | 3.27 | 36.55 | 38.04 | 39.00 | 43.12 |
| EPDBP2015-15-09-TH | 1.50 | 0.75 | 0.9° | 15.0 | 1.35 | 1.42 | 1.849 | 60 | 6 | 3.89 | 5.36 | 16.40 | 17.25 | 17.88 | 18.86 |
| EPDBP2015-20-09-TH | 1.50 | 0.75 | 0.9° | 20.0 | 1.35 | 1.42 | 2.006 | 65 | 6 | 3.89 | 4.50 | 21.47 | 22.49 | 23.21 | 24.72 |
| EPDBP2015-30-09-TH | 1.50 | 0.75 | 0.9° | 30.0 | 1.35 | 1.42 | 2.320 | 75 | 6 | 3.89 | 3.40 | 31.59 | 32.90 | 33.78 | 37.01 |
| EPDBP2020-20-09-TH | 2.00 | 1.00 | 0.9° | 20.0 | 1.70 | 1.92 | 2.495 | 65 | 6 | 4.24 | 4.20 | 21.48 | 22.49 | 23.20 | 24.68 |
| EPDBP2020-25-09-TH | 2.00 | 1.00 | 0.9° | 25.0 | 1.70 | 1.92 | 2.652 | 65 | 6 | 4.24 | 3.60 | 26.54 | 27.70 | 28.50 | 30.82 |
| EPDBP2020-30-09-TH | 2.00 | 1.00 | 0.9° | 30.0 | 1.70 | 1.92 | 2.809 | 70 | 6 | 4.24 | 3.14 | 31.60 | 32.90 | 33.77 | 36.97 |
| EPDBP2020-35-09-TH | 2.00 | 1.00 | 0.9° | 35.0 | 1.70 | 1.92 | 2.966 | 75 | 6 | 4.24 | 2.79 | 36.66 | 38.08 | 39.02 | - |
| EPDBP2020-40-09-TH | 2.00 | 1.00 | 0.9° | 40.0 | 1.70 | 1.92 | 3.123 | 80 | 6 | 4.24 | 2.51 | 41.72 | 43.25 | 44.50 | - |
| EPDBP2020-50-09-TH | 2.00 | 1.00 | 0.9° | 50.0 | 1.70 | 1.92 | 3.438 | 90 | 6 | 4.24 | 2.09 | 51.82 | 53.56 | 55.58 | - |
| EPDBP2030-30-09-TH | 3.00 | 1.50 | 0.9° | 30.0 | 2.50 | 2.86 | 3.724 | 70 | 6 | 6.95 | 2.54 | 31.82 | 33.00 | 33.84 | - |
| EPDBP2030-40-09-TH | 3.00 | 1.50 | 0.9° | 40.0 | 2.50 | 2.86 | 4.038 | 80 | 6 | 6.95 | 2.00 | 41.92 | 43.34 | - | - |
| EPDBP2030-50-09-TH | 3.00 | 1.50 | 0.9° | 50.0 | 2.50 | 2.86 | 4.352 | 90 | 6 | 6.95 | 1.64 | 52.01 | 53.65 | - | - |
| EPDBP2030-60-09-TH | 3.00 | 1.50 | 0.9° | 60.0 | 2.50 | 2.86 | 4.667 | 100 | 6 | 6.95 | 1.39 | 62.10 | - | - | - |
| EPDBP2030-70-09-TH | 3.00 | 1.50 | 0.9° | 70.0 | 2.50 | 2.86 | 4.981 | 110 | 6 | 6.95 | 1.20 | 72.19 | - | - | - |

# EPDBP

## EDPBP Cutting Conditions (Metric)

Advanced Engineering

| | | | | | | Carbon steels Alloy Steel 180 250HB | | Stainless steels Tool steels 25 35HRC | | Pre-harden steels 35 45HRC | | Hardened steels 45 55HRC | | Hardened steels 55 65HRC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | | | 100% | | 90% | | 80% | | 65% | | 60% | |
| R | Mill dia. | Under neck length | Neck Angle | Standard Step Down | Standard Step Over | N (RPM) | Vf (mm/ min) | N (RPM) | Vf (mm/ min) | N (RPM) | Vf (mm/ min) | N (RPM) | Vf (mm/ min) | N (RPM) | Vf (mm/ min) |
| 0.1 | **0.2** | 2.0 | 0.9 | 0.007 | 0.021 | 32,000 | 461 | 27,200 | 392 | 22,400 | 323 | 20,800 | 266 | 20,800 | 233 |
| 0.1 | **0.2** | 2.5 | 0.9 | 0.004 | 0.012 | 26,000 | 333 | 22,100 | 283 | 18,200 | 204 | 16,900 | 189 | 16,900 | 162 |
| 0.2 | **0.4** | 4.0 | 0.9 | 0.009 | 0.027 | 32,000 | 922 | 27,200 | 783 | 22,400 | 645 | 20,800 | 532 | 20,800 | 466 |
| 0.2 | **0.4** | 5.0 | 0.9 | 0.007 | 0.021 | 26,000 | 666 | 22,100 | 566 | 18,200 | 408 | 16,900 | 379 | 16,900 | 324 |
| 0.3 | **0.6** | 6.0 | 0.9 | 0.020 | 0.060 | 32,000 | 1,382 | 27,200 | 1,175 | 22,400 | 968 | 20,800 | 799 | 20,800 | 699 |
| 0.3 | **0.6** | 8.0 | 0.9 | 0.020 | 0.060 | 26,000 | 998 | 22,100 | 849 | 18,200 | 612 | 16,900 | 568 | 16,900 | 487 |
| 0.3 | **0.6** | 10.0 | 0.9 | 0.015 | 0.045 | 26,000 | 874 | 22,100 | 743 | 18,200 | 535 | 16,900 | 497 | 16,900 | 426 |
| 0.3 | **0.6** | 12.0 | 0.9 | 0.010 | 0.030 | 26,000 | 874 | 22,100 | 743 | 18,200 | 535 | 16,900 | 497 | 16,900 | 426 |
| 0.3 | **0.6** | 15.0 | 0.9 | 0.006 | 0.018 | 22,400 | 753 | 19,040 | 640 | 15,680 | 461 | 14,560 | 367 | 14,560 | 367 |
| 0.5 | **1.0** | 10.0 | 0.9 | 0.035 | 0.105 | 20,800 | 1,872 | 17,680 | 1,591 | 14,560 | 1,310 | 13,520 | 1,082 | 13,520 | 946 |
| 0.5 | **1.0** | 15.0 | 0.9 | 0.028 | 0.084 | 16,640 | 1,331 | 14,144 | 1,132 | 11,648 | 874 | 10,816 | 757 | 10,816 | 649 |
| 0.5 | **1.0** | 20.0 | 0.9 | 0.020 | 0.060 | 16,640 | 1,331 | 14,144 | 1,132 | 11,648 | 874 | 10,816 | 757 | 10,816 | 649 |
| 0.5 | **1.0** | 25.0 | 0.9 | 0.017 | 0.051 | 14,560 | 1,165 | 12,376 | 990 | 10,192 | 764 | 9,464 | 662 | 9,464 | 568 |
| 0.5 | **1.0** | 30.0 | 0.9 | 0.017 | 0.051 | 12,480 | 874 | 10,608 | 743 | 8,736 | 568 | 8,112 | 487 | 8,112 | 406 |
| 0.5 | **1.0** | 35.0 | 0.9 | 0.010 | 0.030 | 10,400 | 728 | 8,840 | 619 | 7,280 | 473 | 6,760 | 406 | 6,760 | 338 |
| 0.75 | **1.5** | 15.0 | 0.9 | 0.045 | 0.135 | 13,568 | 1,832 | 11,533 | 1,557 | 9,498 | 1,282 | 8,819 | 1,058 | 8,819 | 926 |
| 0.75 | **1.5** | 20.0 | 0.9 | 0.040 | 0.120 | 11,024 | 1,323 | 9,370 | 1,124 | 7,717 | 810 | 7,166 | 752 | 7,166 | 645 |
| 0.75 | **1.5** | 30.0 | 0.9 | 0.028 | 0.084 | 11,024 | 1,323 | 9,370 | 1,124 | 7,717 | 810 | 7,166 | 752 | 7,166 | 645 |
| 1.0 | **2.0** | 20.0 | 0.9 | 0.070 | 0.210 | 12,160 | 2,189 | 10,336 | 1,860 | 8,512 | 1,532 | 7,904 | 1,265 | 7,904 | 1,107 |
| 1.0 | **2.0** | 25.0 | 0.9 | 0.070 | 0.210 | 9,880 | 1,581 | 8,398 | 1,344 | 6,916 | 968 | 6,422 | 899 | 6,422 | 771 |
| 1.0 | **2.0** | 30.0 | 0.9 | 0.045 | 0.135 | 9,880 | 1,581 | 8,398 | 1,344 | 6,916 | 968 | 6,422 | 899 | 6,422 | 771 |
| 1.0 | **2.0** | 35.0 | 0.9 | 0.045 | 0.135 | 9,880 | 1,581 | 8,398 | 1,344 | 6,916 | 968 | 6,422 | 899 | 6,422 | 771 |
| 1.0 | **2.0** | 40.0 | 0.9 | 0.035 | 0.105 | 9,880 | 1,581 | 8,398 | 1,344 | 6,916 | 968 | 6,422 | 899 | 6,422 | 771 |
| 1.0 | **2.0** | 50.0 | 0.9 | 0.017 | 0.051 | 8,512 | 1,192 | 7,235 | 1,013 | 5,958 | 775 | 5,533 | 664 | 5,533 | 553 |
| 1.5 | **3.0** | 30.0 | 0.9 | 0.090 | 0.270 | 10,176 | 2,748 | 8,650 | 2,335 | 7,123 | 1,496 | 6,614 | 1,389 | 6,614 | 1,191 |
| 1.5 | **3.0** | 40.0 | 0.9 | 0.070 | 0.210 | 8,268 | 1,984 | 7,028 | 1,687 | 5,788 | 1,215 | 5,374 | 1,129 | 5,374 | 967 |
| 1.5 | **3.0** | 50.0 | 0.9 | 0.050 | 0.150 | 8,268 | 1,984 | 7,028 | 1,687 | 5,788 | 1,215 | 5,374 | 1,129 | 5,374 | 967 |
| 1.5 | **3.0** | 60.0 | 0.9 | 0.030 | 0.090 | 7,123 | 1,710 | 6,055 | 1,453 | 4,986 | 1,047 | 4,630 | 972 | 4,630 | 833 |
| 1.5 | **3.0** | 70.0 | 0.9 | 0.020 | 0.060 | 6,233 | 1,496 | 5,298 | 1,271 | 4,363 | 916 | 4,051 | 851 | 4,051 | 729 |

# EPSBE

## Super-Hard Ball Nose End Mills for Maximum Tool Life

## FEATURES

Double face (two-stage flank) prevents radius from deteriorating while machining

Extremely accurate radius tolerance: +0.003mm to -0.007mm

Wide variety of neck length variations

Long tool life is possible even when machining materials with a hardness
of greater than 60 HRC

# EPSBE

Advanced Engineering

## INTRODUCTION

Hitachi Tool's new EPSBE Super Hard Ball Nose End Mills feature our newly developed ATH Coating to enable high-efficient machining of high-hardness materials. This new coating, coupled with the highly rigid tool geometry, provide exceptionally long tool life and excellent cost performance.

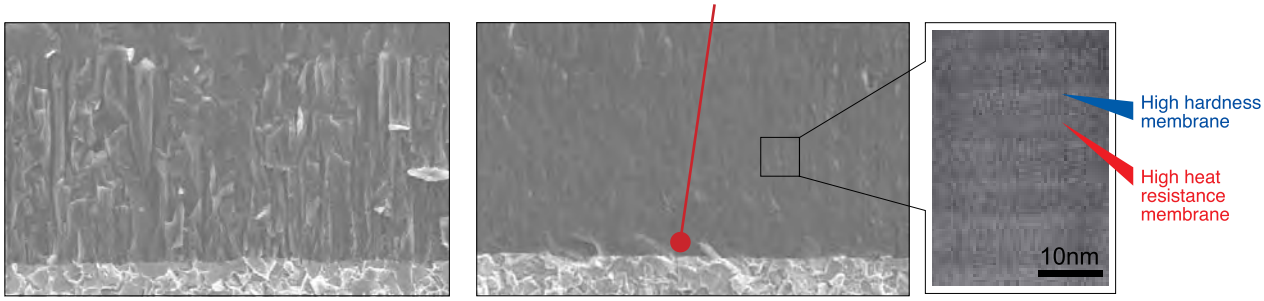
## FEATURES

### 1. Advanced TH (ATH) Coating

With a hardness of 3800Hv and oxidation temperature of 1200°, our new ATH Coating enables longer life and higher efficiency when cutting high-hardness materials (55HRC or higher). Compared with our previous generation coating, double the tool life and more than double the machining efficiency can be achieved. The ATH Coating is ideal for both dry cutting and wet cutting in a variety of materials including cold-worked die steel, HSS, tool steel, composite materials, carbide alloys and more.

Cross-section electron microscope photograph

Adhesion is markedly improved to provide more stable machining.

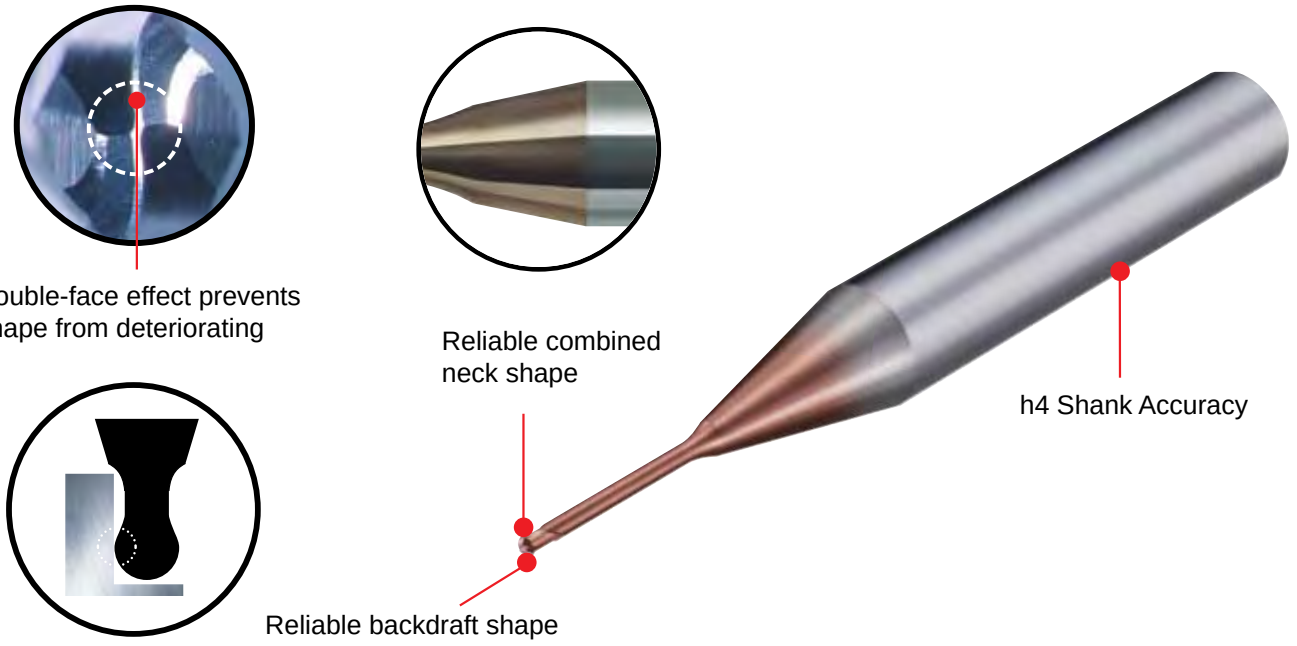



Conventional TH Coating

New TH Coaring for hard material

Even finer particle size is nano order. Provides high heat resistance and high hardness.

### 2. Unique Tool Geometry for Maximum Performance



Double-face effect prevents shape from deteriorating

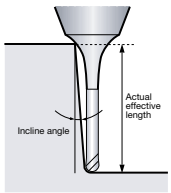
Reliable combined neck shape

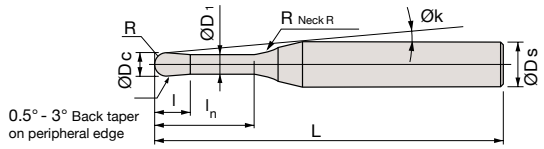
h4 Shank Accuracy

Reliable backdraft shape

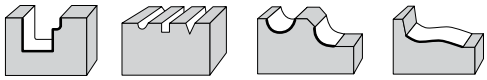
# EPSBE

Advanced Engineering




BALL NOSE | SEMI-FINISHING | FINISHING | 70 HRC 70 | 2 FLUTES | ATH COATING

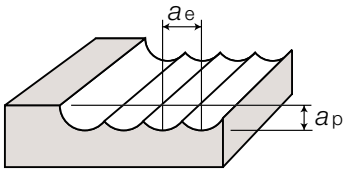


| | | | |
|---|---|---|---|
| Helix Angle | 30° | d | h4 |
| R | +0.003, -0.007 | | |

| | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | R | $D_c$ | l | $D_1$ | $l_2$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPSBE2001-0.15-TH | 0.05 | 0.1 | 0.08 | 0.08 | 0.15 | 45 | 4 | 1 | 11.82 | 0.30 | 0.32 | 0.33 | 0.35 | 0.38 |
| EPSBE2001-0.3-TH | 0.05 | 0.1 | 0.08 | 0.08 | 0.30 | 45 | 4 | 1 | 11.64 | 0.46 | 0.48 | 0.50 | 0.52 | 0.57 |
| EPSBE2002-0.3-TH | 0.10 | 0.2 | 0.15 | 0.17 | 0.30 | 45 | 4 | 1 | 11.66 | 0.49 | 0.50 | 0.52 | 0.54 | 0.58 |
| EPSBE2002-0.6-TH | 0.10 | 0.2 | 0.15 | 0.17 | 0.60 | 45 | 4 | 1 | 11.30 | 0.80 | 0.83 | 0.86 | 0.88 | 0.93 |
| EPSBE2003-0.45-TH | 0.15 | 0.3 | 0.25 | 0.27 | 0.45 | 45 | 4 | 2 | 11.53 | 0.73 | 0.77 | 0.80 | 0.84 | 0.91 |
| EPSBE2003-0.9-TH | 0.15 | 0.3 | 0.25 | 0.27 | 0.90 | 45 | 4 | 2 | 11.00 | 1.21 | 1.27 | 1.32 | 1.37 | 1.47 |
| EPSBE2003-1.5-TH | 0.15 | 0.3 | 0.25 | 0.27 | 1.50 | 45 | 4 | 2 | 10.36 | 1.84 | 1.92 | 1.99 | 2.06 | 2.18 |
| EPSBE2003-2-TH | 0.15 | 0.3 | 0.25 | 0.27 | 2.00 | 45 | 4 | 2 | 9.88 | 2.36 | 2.46 | 2.55 | 2.62 | 2.76 |
| EPSBE2004-0.6-TH | 0.20 | 0.4 | 0.30 | 0.37 | 0.60 | 45 | 4 | 2 | 11.39 | 0.88 | 0.93 | 0.97 | 1.01 | 1.09 |
| EPSBE2004-1.2-TH | 0.20 | 0.4 | 0.30 | 0.37 | 1.20 | 45 | 4 | 2 | 10.69 | 1.52 | 1.59 | 1.65 | 1.71 | 1.82 |
| EPSBE2004-2-TH | 0.20 | 0.4 | 0.30 | 0.37 | 2.00 | 45 | 4 | 2 | 9.88 | 2.36 | 2.46 | 2.54 | 2.62 | 2.75 |
| EPSBE2004-3-TH | 0.20 | 0.4 | 0.30 | 0.37 | 3.00 | 45 | 4 | 2 | 9.03 | 3.41 | 3.53 | 3.63 | 3.73 | 4.01 |
| EPSBE2005-0.75-TH | 0.25 | 0.5 | 0.35 | 0.47 | 0.75 | 45 | 4 | 2 | 11.25 | 1.04 | 1.09 | 1.13 | 1.18 | 1.27 |
| EPSBE2005-1.5-TH | 0.25 | 0.5 | 0.35 | 0.47 | 1.50 | 45 | 4 | 2 | 10.39 | 1.83 | 1.91 | 1.98 | 2.05 | 2.17 |
| EPSBE2005-3-TH | 0.25 | 0.5 | 0.35 | 0.47 | 3.00 | 45 | 4 | 2 | 9.00 | 3.41 | 3.53 | 3.63 | 3.72 | 3.99 |
| EPSBE2005-5-TH | 0.25 | 0.5 | 0.35 | 0.47 | 5.00 | 45 | 4 | 2 | 7.64 | 5.48 | 5.65 | 5.78 | 6.01 | 6.65 |
| EPSBE2006-0.9-TH | 0.30 | 0.6 | 0.40 | 0.57 | 0.90 | 45 | 4 | 4 | 11.10 | 1.33 | 1.42 | 1.51 | 1.59 | 1.75 |
| EPSBE2006-1.8-TH | 0.30 | 0.6 | 0.40 | 0.57 | 1.80 | 45 | 4 | 4 | 10.08 | 2.30 | 2.44 | 2.56 | 2.68 | 2.88 |
| EPSBE2006-3-TH | 0.30 | 0.6 | 0.40 | 0.57 | 3.00 | 45 | 4 | 4 | 8.98 | 3.58 | 3.77 | 3.93 | 4.07 | 4.32 |
| EPSBE2006-5-TH | 0.30 | 0.6 | 0.40 | 0.57 | 5.00 | 45 | 4 | 4 | 7.59 | 5.70 | 5.94 | 6.14 | 6.32 | 6.63 |
| EPSBE2008-1.2-TH | 0.40 | 0.8 | 0.50 | 0.77 | 1.20 | 45 | 4 | 4 | 10.79 | 1.65 | 1.75 | 1.84 | 1.93 | 2.11 |
| EPSBE2008-2.4-TH | 0.40 | 0.8 | 0.50 | 0.77 | 2.40 | 45 | 4 | 4 | 9.47 | 2.94 | 3.10 | 3.24 | 3.36 | 3.59 |
| EPSBE2010-1.5-TH | 0.50 | 1.0 | 0.80 | 0.96 | 1.50 | 45 | 6 | 4 | 11.01 | 2.01 | 2.12 | 2.21 | 2.31 | 2.49 |
| EPSBE2010-3-TH | 0.50 | 1.0 | 0.80 | 0.96 | 3.00 | 45 | 6 | 4 | 9.88 | 3.61 | 3.78 | 3.93 | 4.06 | 4.30 |
| EPSBE2010-4-TH | 0.50 | 1.0 | 0.80 | 0.96 | 4,00 | 45 | 6 | 4 | 9.25 | 4.66 | 4.87 | 5.00 | 5.20 | 5.47 |
| EPSBE2010-6-TH | 0.50 | 1.0 | 0.80 | 0.96 | 6.00 | 45 | 6 | 4 | 8.20 | 6.76 | 7.02 | 7.23 | 7.42 | 7.92 |
| EPSBE2010-8-TH | 0.50 | 1.0 | 0.80 | 0.96 | 8.00 | 45 | 6 | 4 | 7.36 | 8.85 | 9.15 | 9.40 | 9.61 | 10.58 |
| EPSBE2010-10-TH | 0.50 | 1.0 | 0.80 | 0.96 | 10.00 | 50 | 6 | 4 | 6.68 | 10.93 | 11.27 | 11.54 | 11.98 | 13.23 |
| EPSBE2012-1.8-TH | 0.60 | 1.2 | 1.10 | 1.15 | 1.80 | 45 | 6 | 4 | 10.78 | 2.36 | 2.47 | 2.58 | 2.68 | 2.86 |
| EPSBE2012-3.6-TH | 0.60 | 1.2 | 1.10 | 1.15 | 3.60 | 45 | 6 | 4 | 9.46 | 4.27 | 4.45 | 4.61 | 4.75 | 5.01 |
| EPSBE2015-2.25-TH | 0.75 | 1.5 | 1.35 | 1.44 | 2.25 | 45 | 6 | 4 | 10.43 | 2.87 | 2.99 | 3.10 | 3.20 | 3.40 |
| EPSBE2015-4.5-TH | 0.75 | 1.5 | 1.35 | 1.44 | 4.50 | 45 | 6 | 4 | 8.84 | 5.24 | 5.43 | 5.61 | 5.76 | 6.03 |
| EPSBE2015-8-TH | 0.75 | 1.5 | 1.35 | 1.44 | 8.00 | 45 | 6 | 4 | 7.14 | 8.89 | 9.17 | 9.41 | 9.61 | 10.56 |
| EPSBE2015-12-TH | 0.75 | 1.5 | 1.35 | 1.44 | 12.00 | 50 | 6 | 4 | 5.85 | 13.03 | 13.39 | 13.74 | 14.38 | 15.87 |
| EPSBE2020-3-TH | 1.00 | 2.0 | 1.70 | 1.92 | 3.00 | 45 | 6 | 4 | 9.79 | 3.71 | 3.84 | 3.96 | 4.07 | 4.29 |
| EPSBE2020-4-TH | 1.00 | 2.0 | 1.70 | 1.92 | 4.00 | 45 | 6 | 4 | 9.03 | 4.75 | 4.92 | 5.07 | 5.21 | 5.45 |
| EPSBE2020-6-TH | 1.00 | 2.0 | 1.70 | 1.92 | 6.00 | 45 | 6 | 4 | 7.81 | 6.84 | 7.07 | 7.26 | 7.43 | 7.89 |
| EPSBE2020-8-TH | 1.00 | 2.0 | 1.70 | 1.92 | 8.00 | 45 | 6 | 4 | 6.88 | 8.92 | 9.19 | 9.42 | 9.61 | 10.54 |
| EPSBE2020-12-TH | 1.00 | 2.0 | 1.70 | 1.92 | 12.00 | 50 | 6 | 4 | 5.55 | 13.06 | 13.41 | 13.76 | 14.39 | 15.85 |
| EPSBE2020-16-TH | 1.00 | 2.0 | 1.70 | 1.92 | 16.00 | 50 | 6 | 4 | 4.65 | 17.19 | 17.59 | 18.32 | 19.17 | 21.16 |
| EPSBE2020-20-TH | 1.00 | 2.0 | 1.70 | 1.92 | 20.00 | 55 | 6 | 4 | 4.01 | 21.30 | 21.90 | 22.88 | 23.96 | 26.47 |

# EPSBE

## EPSBE
## Cutting Conditions
## Semi-finishing
## (Metric)




| Work Material | | | | | Pre-Harden Steels (35 - 45HRC) | | Hardened Steels (45 - 55HRC) | | Hardened Steels (55 - 65HRC) | | Hardened Steels (65 - 68HRC) | | Hardened Steels (68 - 72HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | | 100% | | 85% | | 80% | | 65% | | 55% | |
| R | Mill dia. | Under neck length | Standard Depth of cut $a_p$ | Standard Depth of cut $a_e$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.05** | **0.1** | 0.15 | 0.006 | 0.018 | 59,500 | 360 | 54,100 | 320 | 51,400 | 280 | 46,000 | 250 | 43,300 | 190 |
| **0.05** | **0.1** | 0.30 | 0.005 | 0.015 | 59,500 | 360 | 50,000 | 320 | 51,400 | 280 | 46,000 | 250 | 43,300 | 190 |
| **0.10** | **0.2** | 0.30 | 0.016 | 0.048 | 55,400 | 660 | 50,400 | 600 | 47,900 | 520 | 42,800 | 460 | 40,300 | 360 |
| **0.10** | **0.2** | 0.60 | 0.014 | 0.042 | 55,400 | 660 | 50,400 | 600 | 47,900 | 520 | 42,800 | 460 | 40,300 | 360 |
| **0.15** | **0.3** | 0.45 | 0.017 | 0.051 | 50,600 | 910 | 46,000 | 830 | 43,700 | 710 | 39,100 | 630 | 36,800 | 500 |
| **0.15** | **0.3** | 0.90 | 0.017 | 0.051 | 50,600 | 910 | 46,000 | 830 | 43,700 | 710 | 39,100 | 630 | 36,800 | 500 |
| **0.15** | **0.3** | 1.50 | 0.013 | 0.039 | 37,900 | 610 | 34,500 | 560 | 32,800 | 480 | 29,300 | 430 | 27,600 | 340 |
| **0.15** | **0.3** | 2.00 | 0.010 | 0.030 | 30,300 | 470 | 27,600 | 430 | 26,200 | 370 | 23,400 | 330 | 22,100 | 260 |
| **0.20** | **0.4** | 0.60 | 0.035 | 0.105 | 43,800 | 1,050 | 39,800 | 960 | 37,800 | 820 | 33,800 | 730 | 31,800 | 570 |
| **0.20** | **0.4** | 1.20 | 0.032 | 0.096 | 43,800 | 1,050 | 39,800 | 960 | 37,800 | 820 | 33,800 | 730 | 31,800 | 570 |
| **0.20** | **0.4** | 2.00 | 0.022 | 0.066 | 35,000 | 840 | 31,800 | 760 | 30,200 | 650 | 27,100 | 590 | 25,500 | 460 |
| **0.20** | **0.4** | 3.00 | 0.013 | 0.039 | 28,000 | 630 | 25,500 | 570 | 24,200 | 490 | 21,600 | 440 | 20,400 | 340 |
| **0.25** | **0.5** | 0.75 | 0.036 | 0.108 | 37,300 | 1,190 | 34,000 | 1,090 | 32,300 | 930 | 28,900 | 830 | 27,200 | 650 |
| **0.25** | **0.5** | 1.50 | 0.036 | 0.108 | 37,300 | 1,190 | 34,000 | 1,090 | 32,300 | 930 | 28,900 | 830 | 27,200 | 650 |
| **0.25** | **0.5** | 3.00 | 0.024 | 0.072 | 28,000 | 840 | 25,500 | 770 | 24,200 | 650 | 21,600 | 580 | 20,400 | 460 |
| **0.30** | **0.6** | 0.90 | 0.040 | 0.120 | 35,000 | 1,430 | 31,800 | 1,300 | 30,200 | 1,110 | 27,100 | 1,000 | 25,500 | 780 |
| **0.30** | **0.6** | 1.80 | 0.036 | 0.108 | 35,000 | 1,430 | 31,800 | 1,300 | 30,200 | 1,110 | 27,100 | 1,000 | 25,500 | 780 |
| **0.30** | **0.6** | 3.00 | 0.028 | 0.084 | 27,000 | 1,100 | 24,500 | 1,000 | 23,300 | 860 | 20,900 | 770 | 19,600 | 600 |
| **0.30** | **0.6** | 5.00 | 0.018 | 0.054 | 22,200 | 910 | 20,200 | 820 | 19,200 | 710 | 17,100 | 630 | 16,100 | 490 |
| **0.30** | **0.6** | 6.00 | 0.013 | 0.039 | 22,200 | 830 | 20,200 | 750 | 19,200 | 640 | 17,100 | 570 | 16,100 | 450 |
| **0.40** | **0.8** | 1.20 | 0.065 | 0.195 | 29,200 | 1,680 | 26,500 | 1,530 | 25,200 | 1,310 | 22,500 | 1,170 | 21,200 | 920 |
| **0.40** | **0.8** | 2.40 | 0.065 | 0.195 | 29,200 | 1,680 | 26,500 | 1,530 | 25,200 | 1,310 | 22,500 | 1,170 | 21,200 | 920 |
| **0.50** | **1.0** | 1.50 | 0.080 | 0.240 | 28,600 | 2,060 | 26,000 | 1,870 | 24,700 | 1,600 | 22,100 | 1,430 | 20,800 | 1,120 |
| **0.50** | **1.0** | 3.00 | 0.080 | 0.240 | 28,600 | 2,060 | 26,000 | 1,870 | 24,700 | 1,600 | 22,100 | 1,430 | 20,800 | 1,120 |
| **0.50** | **1.0** | 4.00 | 0.060 | 0.180 | 25,500 | 1,840 | 23,200 | 1,670 | 22,000 | 1,430 | 19,700 | 1,270 | 18,500 | 1,000 |
| **0.50** | **1.0** | 6.00 | 0.035 | 0.105 | 22,300 | 1,610 | 20,300 | 1,460 | 19,300 | 1,250 | 17,200 | 1,110 | 16,200 | 870 |
| **0.50** | **1.0** | 8.00 | 0.035 | 0.105 | 19,300 | 1,350 | 17,500 | 1,230 | 16,600 | 1,050 | 14,900 | 940 | 14,000 | 740 |
| **0.50** | **1.0** | 10.00 | 0.022 | 0.066 | 19,300 | 1,270 | 17,500 | 1,160 | 16,600 | 990 | 14,900 | 890 | 14,000 | 690 |
| **0.60** | **1.2** | 1.80 | 0.080 | 0.240 | 25,300 | 2,190 | 23,000 | 1,990 | 21,800 | 1,700 | 19,500 | 1,520 | 18,400 | 1,190 |
| **0.60** | **1.2** | 3.60 | 0.080 | 0.240 | 25,300 | 2,190 | 23,000 | 1,990 | 21,800 | 1,700 | 19,500 | 1,520 | 18,400 | 1,190 |
| **0.75** | **1.5** | 2.25 | 0.085 | 0.255 | 21,400 | 2,310 | 19,500 | 2,110 | 18,500 | 1,800 | 16,500 | 1,600 | 15,600 | 1,260 |
| **0.75** | **1.5** | 4.50 | 0.080 | 0.240 | 21,400 | 2,310 | 19,500 | 2,110 | 18,500 | 1,800 | 16,500 | 1,600 | 15,600 | 1,260 |
| **0.75** | **1.5** | 8.00 | 0.050 | 0.150 | 18,300 | 1,870 | 16,700 | 1,700 | 15,800 | 1,450 | 14,200 | 1,300 | 13,300 | 1,020 |
| **0.75** | **1.5** | 12.00 | 0.050 | 0.150 | 16,600 | 1,590 | 15,100 | 1,450 | 14,400 | 1,240 | 12,900 | 1,110 | 12,100 | 870 |
| **1.00** | **2.0** | 3.00 | 0.160 | 0.480 | 18,400 | 2,650 | 16,700 | 2,400 | 15,900 | 2,060 | 14,200 | 1,840 | 13,400 | 1,450 |
| **1.00** | **2.0** | 4.00 | 0.160 | 0.480 | 18,400 | 2,650 | 16,700 | 2,400 | 15,900 | 2,060 | 14,200 | 1,840 | 13,400 | 1,450 |
| **1.00** | **2.0** | 6.00 | 0.160 | 0.480 | 18,400 | 2,650 | 16,700 | 2,400 | 15,900 | 2,060 | 14,200 | 1,840 | 13,400 | 1,450 |
| **1.00** | **2.0** | 8.00 | 0.130 | 0.390 | 18,400 | 2,650 | 16,700 | 2,400 | 15,900 | 2,060 | 14,200 | 1,840 | 13,400 | 1,450 |
| **1.00** | **2.0** | 12.00 | 0.070 | 0.210 | 15,300 | 1,960 | 13,900 | 1,780 | 13,200 | 1,520 | 11,800 | 1,360 | 11,100 | 1,070 |
| **1.00** | **2.0** | 16.00 | 0.070 | 0.210 | 14,600 | 1,750 | 13,300 | 1,600 | 12,600 | 1,360 | 11,300 | 1,220 | 10,600 | 950 |
| **1.00** | **2.0** | 20.00 | 0.045 | 0.135 | 13,500 | 1,620 | 12,300 | 1,480 | 11,600 | 1,250 | 10,400 | 1,120 | 9,800 | 880 |

# EPDRE

## High-Precision Corner Radius End Mills for Deep Machining

## FEATURES

Flute shape with increased flute tip strength provides improved stability

Improved compound neck design for reduced chatter and increased strength

Stronger R flute helix angle improves cutting performance

ATH and PN Coatings for maximum efficiency and tool life

# EPDRE

Advanced Engineering

## INTRODUCTION

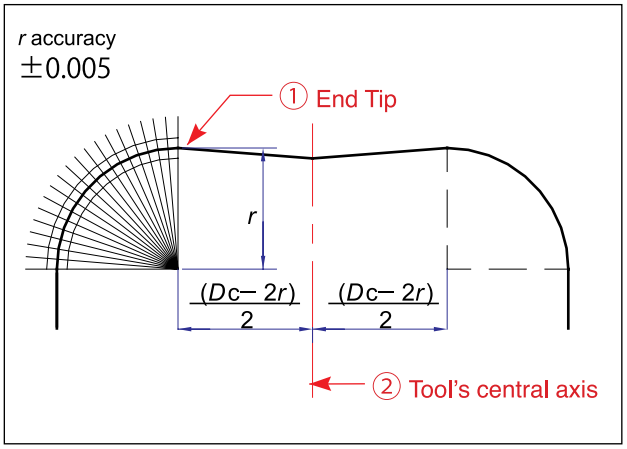
The EPDRE Epoch Series Square End Mills have been designed for cutting deep ribs and slots in molds, as well as machining deep corners and precision features that were previously possible only by EDM (electrical discharge machining).

Featuring an improved compound neck design, these end mills exhibit greater breakage resistance and less vibration during high speed machining than competitors' tools. New cutting geometries as well as the advanced ATH and PN Coatings help to maximize machining performance as well as tool life.

## FEATURES

### 1. Guaranteed R Accuracy for High-Accuracy Machining

Corner R accuracy guaranteed with tool center as reference point. Enables more accurate finishing when finishing molds.



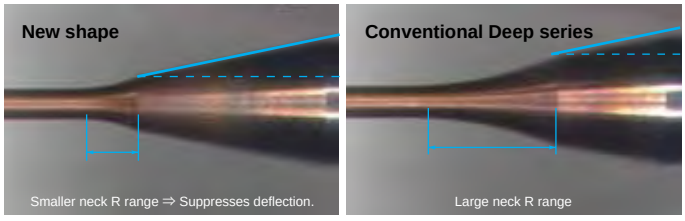

Accuracy basis

① End Tip ② Tool's central axis

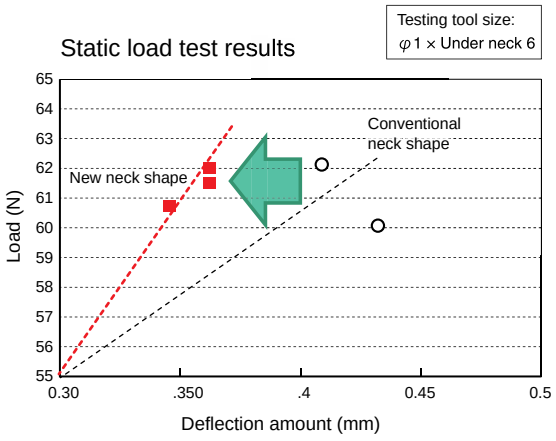
Like ball end mills, corner radius accuracy is kept to within ±0.005mm relative to the tool's central axis, achieving a high corner radius accuracy. This enables high-accuracy finish machining to be performed, something which has been difficult to do with previous corner radius end mills.

### 2. Improved Compound Neck Shape

Further improves the conventional compound shape of R and taper to both resist breakage and suppress deflection.




**Caution:** The interference region has changed due to changes in the neck shape. Be sure to check for interference before starting machining.

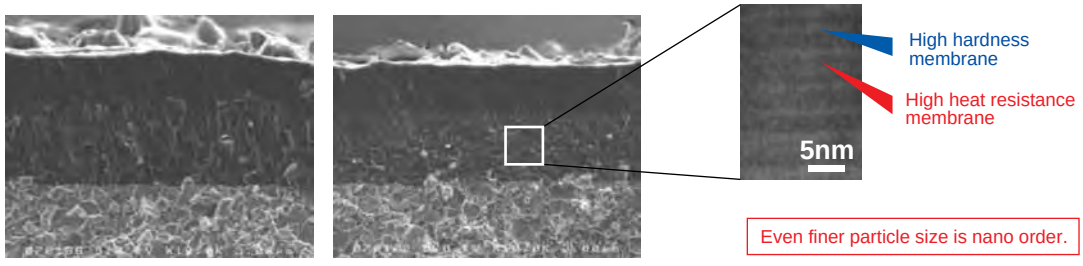



Deflection suppression effect is high even under the same load. Enables machining with even higher accuracy.

## 3. New PVD Coating Technology

**Advanced TH (ATH) Coating:** With a hardness of 3800Hv and oxidation temperature of 1200°, our new ATH Coating enables longer life and higher efficiency when cutting high-hardness materials (55HRC or higher). Compared with our previous generation coating, double the tool life and more than double the machining efficiency can be achieved. The ATH Coating is ideal for both dry cutting and wet cutting in a variety of materials including cold-worked die steel, HSS, tool steel, composite materials, carbide alloys and more.

Cross-section photograph of ATH coating layer structure

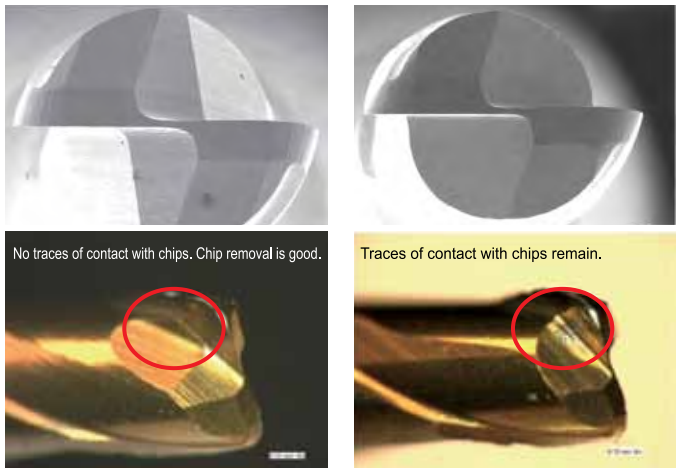



Pat.No. 3 9 3 4 1 3 6

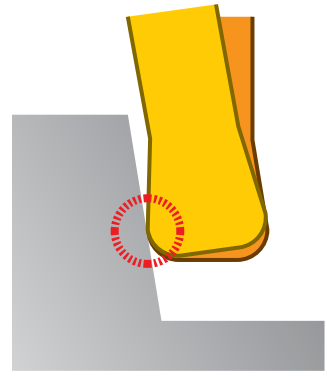
## 4. Flute Shape Increases Stability

**High chip removal characteristics effective when performing deep cutting.**

Double-gash shape | Conventional gash shape



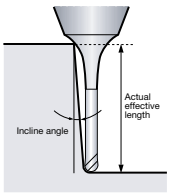

**Inherits the reliable backdraft shape (Strong backtaper)! Can reduce chattering when doing point cutting.**

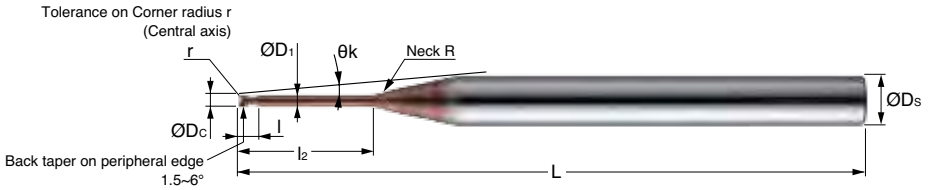


Back draft effect

# EPDRE

Advanced Engineering

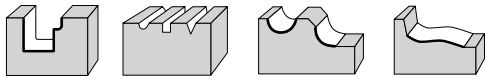








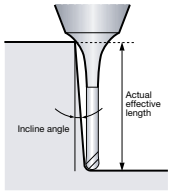
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

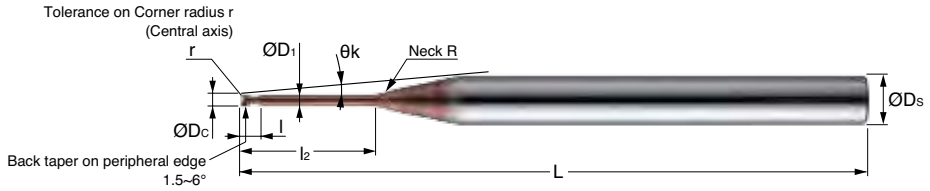
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | Θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2002-0.5-002-ATH | □ | 0.20 | 0.02 | 0.5 | 0.15 | 0.17 | 50 | 4 | 1 | 11.33 | 0.70 | 0.73 | 0.75 | 0.78 | 0.83 |
| EPDRE2002-1-002-ATH | □ | 0.20 | 0.02 | 1.0 | 0.15 | 0.17 | 50 | 4 | 1 | 10.77 | 1.22 | 1.26 | 1.30 | 1.34 | 1.41 |
| EPDRE2002-2-002-ATH | □ | 0.20 | 0.02 | 2.0 | 0.15 | 0.17 | 50 | 4 | 1 | 9.81 | 2.26 | 2.32 | 2.38 | 2.47 | 2.74 |
| EPDRE2002-0.5-005-ATH | ● | 0.20 | 0.05 | 0.5 | 0.15 | 0.17 | 50 | 4 | 1 | 11.36 | 0.70 | 0.73 | 0.75 | 0.78 | 0.82 |
| EPDRE2002-1-005-ATH | ● | 0.20 | 0.05 | 1.0 | 0.15 | 0.17 | 50 | 4 | 1 | 10.81 | 1.22 | 1.26 | 1.30 | 1.34 | 1.40 |
| EPDRE2002-1.5-005-ATH | □ | 0.20 | 0.05 | 1.5 | 0.15 | 0.17 | 50 | 4 | 1 | 10.30 | 1.74 | 1.79 | 1.84 | 1.89 | 2.06 |
| EPDRE2002-2-005-ATH | ● | 0.20 | 0.05 | 2.0 | 0.15 | 0.17 | 50 | 4 | 1 | 9.84 | 2.25 | 2.32 | 2.38 | 2.46 | 2.73 |
| EPDRE2003-1-002-ATH | □ | 0.30 | 0.02 | 1.0 | 0.25 | 0.27 | 50 | 4 | 2 | 10.74 | 1.32 | 1.39 | 1.45 | 1.51 | 1.62 |
| EPDRE2003-2-002-ATH | □ | 0.30 | 0.02 | 2.0 | 0.25 | 0.27 | 50 | 4 | 2 | 9.77 | 2.37 | 2.47 | 2.56 | 2.64 | 2.78 |
| EPDRE2003-3-002-ATH | □ | 0.30 | 0.02 | 3.0 | 0.25 | 0.27 | 50 | 4 | 2 | 8.95 | 3.42 | 3.54 | 3.65 | 3.74 | 4.06 |
| EPDRE2003-1-005-ATH | ● | 0.30 | 0.05 | 1.0 | 0.25 | 0.27 | 50 | 4 | 2 | 10.78 | 1.32 | 1.39 | 1.45 | 1.50 | 1.61 |
| EPDRE2003-1.5-005-ATH | □ | 0.30 | 0.05 | 1.5 | 0.25 | 0.27 | 50 | 4 | 2 | 10.26 | 1.84 | 1.93 | 2.01 | 2.07 | 2.20 |
| EPDRE2003-2-005-ATH | ● | 0.30 | 0.05 | 2.0 | 0.25 | 0.27 | 50 | 4 | 2 | 9.79 | 2.37 | 2.47 | 2.56 | 2.64 | 2.77 |
| EPDRE2003-2.5-005-ATH | □ | 0.30 | 0.05 | 2.5 | 0.25 | 0.27 | 50 | 4 | 2 | 9.36 | 2.89 | 3.01 | 3.10 | 3.19 | 3.39 |
| EPDRE2003-3-005-ATH | ● | 0.30 | 0.05 | 3.0 | 0.25 | 0.27 | 50 | 4 | 2 | 8.97 | 3.41 | 3.54 | 3.65 | 3.74 | 4.05 |
| EPDRE2004-1-002-ATH | □ | 0.40 | 0.02 | 1.0 | 0.30 | 0.37 | 50 | 4 | 2 | 10.71 | 1.32 | 1.39 | 1.45 | 1.51 | 1.62 |
| EPDRE2004-2-002-ATH | □ | 0.40 | 0.02 | 2.0 | 0.30 | 0.37 | 50 | 4 | 2 | 9.72 | 2.37 | 2.47 | 2.56 | 2.64 | 2.78 |
| EPDRE2004-3-002-ATH | □ | 0.40 | 0.02 | 3.0 | 0.30 | 0.37 | 50 | 4 | 2 | 8.89 | 3.42 | 3.54 | 3.65 | 3.74 | 4.06 |
| EPDRE2004-4-002-ATH | □ | 0.40 | 0.02 | 4.0 | 0.30 | 0.37 | 50 | 4 | 2 | 8.19 | 4.46 | 4.60 | 4.73 | 4.86 | 5.39 |
| EPDRE2004-1-005-ATH | ● | 0.40 | 0.05 | 1.0 | 0.30 | 0.37 | 50 | 4 | 2 | 10.75 | 1.32 | 1.39 | 1.45 | 1.50 | 1.61 |
| EPDRE2004-1.5-005-ATH | □ | 0.40 | 0.05 | 1.5 | 0.30 | 0.37 | 50 | 4 | 2 | 10.22 | 1.84 | 1.93 | 2.01 | 2.07 | 2.20 |
| EPDRE2004-2-005-ATH | ● | 0.40 | 0.05 | 2.0 | 0.30 | 0.37 | 50 | 4 | 2 | 9.74 | 2.37 | 2.47 | 2.56 | 2.64 | 2.77 |
| EPDRE2004-2.5-005-ATH | □ | 0.40 | 0.05 | 2.5 | 0.30 | 0.37 | 50 | 4 | 2 | 9.31 | 2.89 | 3.01 | 3.10 | 3.19 | 3.39 |
| EPDRE2004-3-005-ATH | ● | 0.40 | 0.05 | 3.0 | 0.30 | 0.37 | 50 | 4 | 2 | 8.91 | 3.41 | 3.54 | 3.65 | 3.74 | 4.05 |
| EPDRE2004-3.5-005-ATH | □ | 0.40 | 0.05 | 3.5 | 0.30 | 0.37 | 50 | 4 | 2 | 8.54 | 3.93 | 4.07 | 4.19 | 4.29 | 4.72 |
| EPDRE2004-4-005-ATH | ● | 0.40 | 0.05 | 4.0 | 0.30 | 0.37 | 50 | 4 | 2 | 8.21 | 4.45 | 4.60 | 4.72 | 4.86 | 5.38 |
| EPDRE2004-1-01-ATH | □ | 0.40 | 0.10 | 1.0 | 0.30 | 0.37 | 50 | 4 | 2 | 10.80 | 1.31 | 1.38 | 1.44 | 1.50 | 1.60 |
| EPDRE2004-2-01-ATH | ● | 0.40 | 0.10 | 2.0 | 0.30 | 0.37 | 50 | 4 | 2 | 9.79 | 2.37 | 2.47 | 2.55 | 2.63 | 2.77 |
| EPDRE2004-3-01-ATH | ● | 0.40 | 0.10 | 3.0 | 0.30 | 0.37 | 50 | 4 | 2 | 8.95 | 3.41 | 3.54 | 3.64 | 3.74 | 4.04 |
| EPDRE2004-4-01-ATH | ● | 0.40 | 0.10 | 4.0 | 0.30 | 0.37 | 50 | 4 | 2 | 8.24 | 4.45 | 4.60 | 4.72 | 4.85 | 5.37 |

□ = Stocked items in Japan

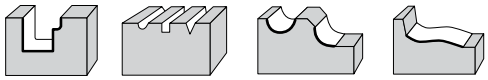
# EPDRE

Advanced Engineering







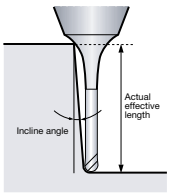
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

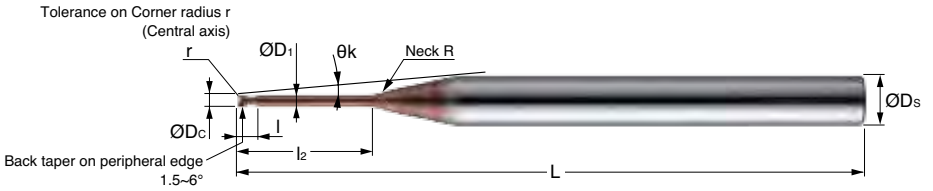
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2005-1-002-ATH | □ | 0.50 | 0.02 | 1 | 0.35 | 0.47 | 50 | 4 | 2 | 10.68 | 1.32 | 1.39 | 1.45 | 1.51 | 1.62 |
| EPDRE2005-2-002-ATH | □ | 0.50 | 0.02 | 2 | 0.35 | 0.47 | 50 | 4 | 2 | 9.66 | 2.37 | 2.47 | 2.56 | 2.64 | 2.78 |
| EPDRE2005-3-002-ATH | □ | 0.50 | 0.02 | 3 | 0.35 | 0.47 | 50 | 4 | 2 | 8.82 | 3.42 | 3.54 | 3.65 | 3.74 | 4.06 |
| EPDRE2005-4-002-ATH | □ | 0.50 | 0.02 | 4 | 0.35 | 0.47 | 50 | 4 | 2 | 8.11 | 4.46 | 4.60 | 4.73 | 4.86 | 5.39 |
| EPDRE2005-6-002-ATH | □ | 0.50 | 0.02 | 6 | 0.35 | 0.47 | 50 | 4 | 2 | 6.99 | 6.53 | 6.71 | 6.92 | 7.26 | 8.05 |
| EPDRE2005-1-005-ATH | ● | 0.50 | 0.05 | 1 | 0.35 | 0.47 | 50 | 4 | 2 | 10.71 | 1.32 | 1.39 | 1.45 | 1.50 | 1.61 |
| EPDRE2005-2-005-ATH | ● | 0.50 | 0.05 | 2 | 0.35 | 0.47 | 50 | 4 | 2 | 9.69 | 2.37 | 2.47 | 2.56 | 2.64 | 2.77 |
| EPDRE2005-3-005-ATH | ● | 0.50 | 0.05 | 3 | 0.35 | 0.47 | 50 | 4 | 2 | 8.84 | 3.41 | 3.54 | 3.65 | 3.74 | 4.05 |
| EPDRE2005-4-005-ATH | ● | 0.50 | 0.05 | 4 | 0.35 | 0.47 | 50 | 4 | 2 | 8.13 | 4.45 | 4.60 | 4.72 | 4.86 | 5.38 |
| EPDRE2005-5-005-ATH | ● | 0.50 | 0.05 | 5 | 0.35 | 0.47 | 50 | 4 | 2 | 7.53 | 5.49 | 5.66 | 5.79 | 6.05 | 6.71 |
| EPDRE2005-6-005-ATH | ● | 0.50 | 0.05 | 6 | 0.35 | 0.47 | 50 | 4 | 2 | 7.00 | 6.53 | 6.71 | 6.91 | 7.25 | 8.04 |
| EPDRE2005-1-01-ATH | ● | 0.50 | 0.10 | 1 | 0.35 | 0.47 | 50 | 4 | 2 | 10.77 | 1.31 | 1.38 | 1.44 | 1.50 | 1.60 |
| EPDRE2005-2-01-ATH | ● | 0.50 | 0.10 | 2 | 0.35 | 0.47 | 50 | 4 | 2 | 9.74 | 2.37 | 2.47 | 2.55 | 2.63 | 2.77 |
| EPDRE2005-3-01-ATH | ● | 0.50 | 0.10 | 3 | 0.35 | 0.47 | 50 | 4 | 2 | 8.88 | 3.41 | 3.54 | 3.64 | 3.74 | 4.04 |
| EPDRE2005-4-01-ATH | ● | 0.50 | 0.10 | 4 | 0.35 | 0.47 | 50 | 4 | 2 | 8.17 | 4.45 | 4.60 | 4.72 | 4.85 | 5.37 |
| EPDRE2005-5-01-ATH | ● | 0.50 | 0.10 | 5 | 0.35 | 0.47 | 50 | 4 | 2 | 7.55 | 5.49 | 5.66 | 5.79 | 6.04 | 6.69 |
| EPDRE2005-6-01-ATH | ● | 0.50 | 0.10 | 6 | 0.35 | 0.47 | 50 | 4 | 2 | 7.03 | 6.52 | 6.71 | 6.90 | 7.24 | 8.02 |
| EPDRE2006-2-002-ATH | □ | 0.60 | 0.02 | 2 | 0.40 | 0.57 | 50 | 4 | 4 | 9.61 | 2.54 | 2.70 | 2.83 | 2.96 | 3.19 |
| EPDRE2006-4-002-ATH | □ | 0.60 | 0.02 | 4 | 0.40 | 0.57 | 50 | 4 | 4 | 8.04 | 4.66 | 4.88 | 5.07 | 5.24 | 5.52 |
| EPDRE2006-6-002-ATH | □ | 0.60 | 0.02 | 6 | 0.40 | 0.57 | 50 | 4 | 4 | 6.90 | 6.76 | 7.03 | 7.26 | 7.45 | 8.05 |
| EPDRE2006-2-005-ATH | ● | 0.60 | 0.05 | 2 | 0.40 | 0.57 | 50 | 4 | 4 | 9.64 | 2.54 | 2.69 | 2.83 | 2.95 | 3.18 |
| EPDRE2006-4-005-ATH | ● | 0.60 | 0.05 | 4 | 0.40 | 0.57 | 50 | 4 | 4 | 8.06 | 4.66 | 4.88 | 5.07 | 5.23 | 5.52 |
| EPDRE2006-6-005-ATH | □ | 0.60 | 0.05 | 6 | 0.40 | 0.57 | 50 | 4 | 4 | 6.92 | 6.76 | 7.03 | 7.26 | 7.45 | 8.04 |
| EPDRE2006-8-005-ATH | □ | 0.60 | 0.05 | 8 | 0.40 | 0.57 | 50 | 4 | 4 | 6.06 | 8.85 | 9.16 | 9.41 | 9.64 | 10.69 |
| EPDRE2006-10-005-ATH | □ | 0.60 | 0.05 | 10 | 0.40 | 0.57 | 50 | 4 | 4 | 5.39 | 10.93 | 11.28 | 11.55 | 12.04 | 13.35 |
| EPDRE2006-2-01-ATH | ● | 0.60 | 0.10 | 2 | 0.40 | 0.57 | 50 | 4 | 4 | 9.68 | 2.53 | 2.69 | 2.82 | 2.95 | 3.17 |
| EPDRE2006-4-01-ATH | ● | 0.60 | 0.10 | 4 | 0.40 | 0.57 | 50 | 4 | 4 | 8.09 | 4.65 | 4.88 | 5.06 | 5.23 | 5.51 |
| EPDRE2006-6-01-ATH | ● | 0.60 | 0.10 | 6 | 0.40 | 0.57 | 50 | 4 | 4 | 6.94 | 6.76 | 7.03 | 7.25 | 7.44 | 8.02 |
| EPDRE2006-8-01-ATH | ● | 0.60 | 0.10 | 8 | 0.40 | 0.57 | 50 | 4 | 4 | 6.08 | 8.85 | 9.16 | 9.41 | 9.63 | 10.67 |
| EPDRE2006-10-01-ATH | □ | 0.60 | 0.10 | 10 | 0.40 | 0.57 | 50 | 4 | 4 | 5.41 | 10.92 | 11.27 | 11.55 | 12.03 | 13.33 |

□ = Stocked items in Japan

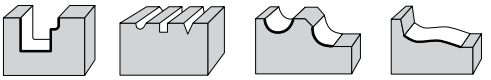
# EPDRE

Advanced Engineering







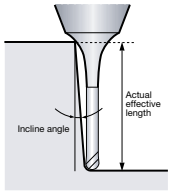
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

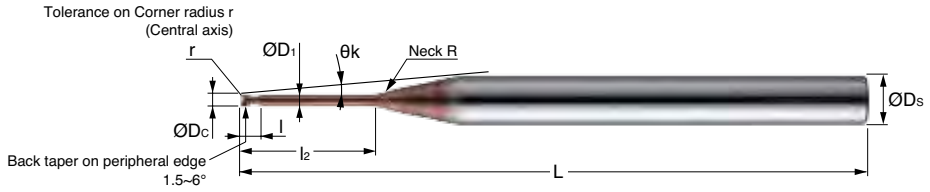
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2007-4-005-ATH | □ | 0.70 | 0.05 | 4 | 0.45 | 0.67 | 50 | 4 | 4 | 7.98 | 4.66 | 4.88 | 5.07 | 5.23 | 5.52 |
| EPDRE2007-6-005-ATH | □ | 0.70 | 0.05 | 6 | 0.45 | 0.67 | 50 | 4 | 4 | 6.83 | 6.76 | 7.03 | 7.26 | 7.45 | 8.04 |
| EPDRE2007-4-01-ATH | □ | 0.70 | 0.10 | 4 | 0.45 | 0.67 | 50 | 4 | 4 | 8.01 | 4.65 | 4.88 | 5.06 | 5.23 | 5.51 |
| EPDRE2007-6-01-ATH | □ | 0.70 | 0.10 | 6 | 0.45 | 0.67 | 50 | 4 | 4 | 6.86 | 6.76 | 7.03 | 7.25 | 7.44 | 8.02 |
| EPDRE2008-4-002-ATH | □ | 0.80 | 0.02 | 4 | 0.50 | 0.77 | 50 | 4 | 4 | 7.87 | 4.66 | 4.88 | 5.07 | 5.24 | 5.52 |
| EPDRE2008-6-002-ATH | □ | 0.80 | 0.02 | 6 | 0.50 | 0.77 | 50 | 4 | 4 | 6.73 | 6.76 | 7.03 | 7.26 | 7.45 | 8.05 |
| EPDRE2008-4-005-ATH | ● | 0.80 | 0.05 | 4 | 0.50 | 0.77 | 50 | 4 | 4 | 7.89 | 4.66 | 4.88 | 5.07 | 5.23 | 5.52 |
| EPDRE2008-6-005-ATH | ● | 0.80 | 0.05 | 6 | 0.50 | 0.77 | 50 | 4 | 4 | 6.74 | 6.76 | 7.03 | 7.26 | 7.45 | 8.04 |
| EPDRE2008-8-005-ATH | □ | 0.80 | 0.05 | 8 | 0.50 | 0.77 | 50 | 4 | 4 | 5.88 | 8.85 | 9.16 | 9.41 | 9.64 | 10.69 |
| EPDRE2008-12-005-ATH | □ | 0.80 | 0.05 | 12 | 0.50 | 0.77 | 55 | 4 | 4 | 4.68 | 13.00 | 13.38 | 13.75 | 14.43 | 16.00 |
| EPDRE2008-4-01-ATH | ● | 0.80 | 0.10 | 4 | 0.50 | 0.77 | 50 | 4 | 4 | 7.93 | 4.65 | 4.88 | 5.06 | 5.23 | 5.51 |
| EPDRE2008-6-01-ATH | ● | 0.80 | 0.10 | 6 | 0.50 | 0.77 | 50 | 4 | 4 | 6.77 | 6.76 | 7.03 | 7.25 | 7.44 | 8.02 |
| EPDRE2008-8-01-ATH | ● | 0.80 | 0.10 | 8 | 0.50 | 0.77 | 50 | 4 | 4 | 5.90 | 8.85 | 9.16 | 9.41 | 9.63 | 10.67 |
| EPDRE2008-12-01-ATH | □ | 0.80 | 0.10 | 12 | 0.50 | 0.77 | 55 | 4 | 4 | 4.70 | 13.00 | 13.38 | 13.75 | 14.42 | 15.98 |
| EPDRE2008-4-02-ATH | ● | 0.80 | 0.20 | 4 | 0.50 | 0.77 | 50 | 4 | 4 | 8.00 | 4.65 | 4.87 | 5.05 | 5.21 | 5.50 |
| EPDRE2008-6-02-ATH | ● | 0.80 | 0.20 | 6 | 0.50 | 0.77 | 50 | 4 | 4 | 6.82 | 6.75 | 7.02 | 7.24 | 7.43 | 7.99 |
| EPDRE2008-8-02-ATH | □ | 0.80 | 0.20 | 8 | 0.50 | 0.77 | 50 | 4 | 4 | 5.94 | 8.84 | 9.15 | 9.40 | 9.62 | 10.64 |
| EPDRE2008-12-02-ATH | □ | 0.80 | 0.20 | 12 | 0.50 | 0.77 | 55 | 4 | 4 | 4.72 | 12.99 | 13.37 | 13.73 | 14.40 | 15.95 |
| EPDRE2010-2-002-ATH | □ | 1.00 | 0.02 | 2 | 0.80 | 0.94 | 50 | 4 | 4 | 9.29 | 2.64 | 2.78 | 2.91 | 3.03 | 3.24 |
| EPDRE2010-4-002-ATH | □ | 1.00 | 0.02 | 4 | 0.80 | 0.94 | 50 | 4 | 4 | 7.65 | 4.75 | 4.95 | 5.13 | 5.29 | 5.56 |
| EPDRE2010-6-002-ATH | □ | 1.00 | 0.02 | 6 | 0.80 | 0.94 | 50 | 4 | 4 | 6.50 | 6.84 | 7.09 | 7.31 | 7.49 | 8.14 |
| EPDRE2010-8-002-ATH | □ | 1.00 | 0.02 | 8 | 0.80 | 0.94 | 50 | 4 | 4 | 5.65 | 8.92 | 9.21 | 9.46 | 9.73 | 10.79 |
| EPDRE2010-10-002-ATH | □ | 1.00 | 0.02 | 10 | 0.80 | 0.94 | 50 | 4 | 4 | 5.00 | 10.99 | 11.32 | 11.59 | 12.13 | 13.45 |
| EPDRE2010-12-002-ATH | □ | 1.00 | 0.02 | 12 | 0.80 | 0.94 | 55 | 4 | 4 | 4.48 | 13.06 | 13.42 | 13.84 | 14.52 | 16.10 |
| EPDRE2010-2-005-ATH | ● | 1.00 | 0.05 | 2 | 0.80 | 0.94 | 50 | 4 | 4 | 9.32 | 2.64 | 2.78 | 2.91 | 3.02 | 3.24 |
| EPDRE2010-3-005-ATH | □ | 1.00 | 0.05 | 3 | 0.80 | 0.94 | 50 | 4 | 4 | 8.41 | 3.70 | 3.87 | 4.02 | 4.16 | 4.41 |
| EPDRE2010-4-005-ATH | ● | 1.00 | 0.05 | 4 | 0.80 | 0.94 | 50 | 4 | 4 | 7.67 | 4.75 | 4.95 | 5.13 | 5.28 | 5.56 |
| EPDRE2010-5-005-ATH | □ | 1.00 | 0.05 | 5 | 0.80 | 0.94 | 50 | 4 | 4 | 7.04 | 5.79 | 6.02 | 6.22 | 6.39 | 6.80 |
| EPDRE2010-6-005-ATH | ● | 1.00 | 0.05 | 6 | 0.80 | 0.94 | 50 | 4 | 4 | 6.51 | 6.84 | 7.09 | 7.30 | 7.49 | 8.13 |
| EPDRE2010-8-005-ATH | ● | 1.00 | 0.05 | 8 | 0.80 | 0.94 | 50 | 4 | 4 | 5.66 | 8.92 | 9.21 | 9.46 | 9.73 | 10.78 |

□ = Stocked items in Japan

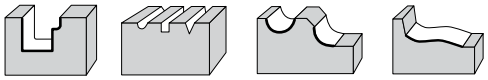
# EPDRE

Advanced Engineering







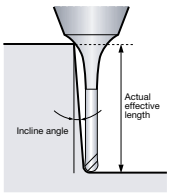
| Helix Angle | 30° | ϕDs | h5 |
|---|---|---|---|
| r | ±0.005 | | |

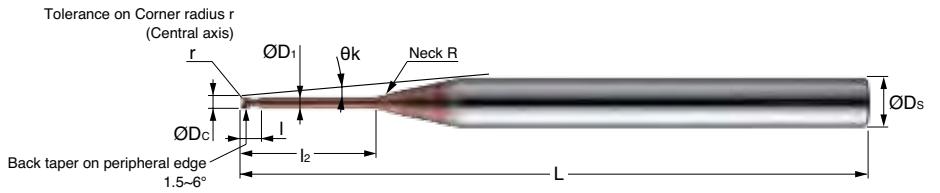
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2010-10-005-ATH | □ | 1.00 | 0.05 | 10 | 0.8 | 0.94 | 50 | 4 | 4 | 5.00 | 10.99 | 11.32 | 11.59 | 12.12 | 13.44 |
| EPDRE2010-12-005-ATH | □ | 1.00 | 0.05 | 12 | 0.8 | 0.94 | 55 | 4 | 4 | 4.48 | 13.06 | 13.42 | 13.84 | 14.51 | 16.09 |
| EPDRE2010-16-005-ATH | □ | 1.00 | 0.05 | 16 | 0.8 | 0.94 | 60 | 4 | 4 | 3.71 | 17.18 | 17.60 | 18.40 | 19.30 | 21.40 |
| EPDRE2010-20-005-ATH | □ | 1.00 | 0.05 | 20 | 0.8 | 0.94 | 60 | 4 | 4 | 3.17 | 21.29 | 21.93 | 22.96 | 24.09 | 26.71 |
| EPDRE2010-2-01-ATH | □ | 1.00 | 0.10 | 2 | 0.8 | 0.94 | 50 | 4 | 4 | 9.37 | 2.64 | 2.78 | 2.90 | 3.01 | 3.23 |
| EPDRE2010-3-01-ATH | □ | 1.00 | 0.10 | 3 | 0.8 | 0.94 | 50 | 4 | 4 | 8.45 | 3.69 | 3.87 | 4.02 | 4.15 | 4.40 |
| EPDRE2010-4-01-ATH | ● | 1.00 | 0.10 | 4 | 0.8 | 0.94 | 50 | 4 | 4 | 7.70 | 4.74 | 4.95 | 5.12 | 5.28 | 5.55 |
| EPDRE2010-5-01-ATH | □ | 1.00 | 0.10 | 5 | 0.8 | 0.94 | 50 | 4 | 4 | 7.07 | 5.79 | 6.02 | 6.21 | 6.39 | 6.79 |
| EPDRE2010-6-01-ATH | ● | 1.00 | 0.10 | 6 | 0.8 | 0.94 | 50 | 4 | 4 | 6.54 | 6.83 | 7.09 | 7.30 | 7.49 | 8.11 |
| EPDRE2010-8-01-ATH | ● | 1.00 | 0.10 | 8 | 0.8 | 0.94 | 50 | 4 | 4 | 5.68 | 8.91 | 9.21 | 9.45 | 9.72 | 10.77 |
| EPDRE2010-10-01-ATH | ● | 1.00 | 0.10 | 10 | 0.8 | 0.94 | 50 | 4 | 4 | 5.02 | 10.99 | 11.32 | 11.59 | 12.11 | 13.42 |
| EPDRE2010-12-01-ATH | ● | 1.00 | 0.10 | 12 | 0.8 | 0.94 | 55 | 4 | 4 | 4.50 | 13.06 | 13.42 | 13.83 | 14.50 | 16.08 |
| EPDRE2010-16-01-ATH | □ | 1.00 | 0.10 | 16 | 0.8 | 0.94 | 60 | 4 | 4 | 3.72 | 17.18 | 17.60 | 18.39 | 19.29 | 21.39 |
| EPDRE2010-20-01-ATH | □ | 1.00 | 0.10 | 20 | 0.8 | 0.94 | 60 | 4 | 4 | 3.17 | 21.29 | 21.93 | 22.95 | 24.08 | 26.70 |
| EPDRE2010-2-02-ATH | □ | 1.00 | 0.20 | 2 | 0.8 | 0.94 | 50 | 4 | 4 | 9.47 | 2.63 | 2.77 | 2.89 | 3.00 | 3.21 |
| EPDRE2010-3-02-ATH | □ | 1.00 | 0.20 | 3 | 0.8 | 0.94 | 50 | 4 | 4 | 8.54 | 3.69 | 3.86 | 4.01 | 4.14 | 4.39 |
| EPDRE2010-4-02-ATH | ● | 1.00 | 0.20 | 4 | 0.8 | 0.94 | 50 | 4 | 4 | 7.77 | 4.74 | 4.94 | 5.11 | 5.27 | 5.54 |
| EPDRE2010-5-02-ATH | □ | 1.00 | 0.20 | 5 | 0.8 | 0.94 | 50 | 4 | 4 | 7.13 | 5.79 | 6.01 | 6.21 | 6.38 | 6.75 |
| EPDRE2010-6-02-ATH | ● | 1.00 | 0.20 | 6 | 0.8 | 0.94 | 50 | 4 | 4 | 6.59 | 6.83 | 7.08 | 7.29 | 7.48 | 8.08 |
| EPDRE2010-8-02-ATH | ● | 1.00 | 0.20 | 8 | 0.8 | 0.94 | 50 | 4 | 4 | 5.72 | 8.91 | 9.20 | 9.45 | 9.70 | 10.74 |
| EPDRE2010-10-02-ATH | ● | 1.00 | 0.20 | 10 | 0.8 | 0.94 | 50 | 4 | 4 | 5.05 | 10.98 | 11.32 | 11.58 | 12.09 | 13.39 |
| EPDRE2010-12-02-ATH | ● | 1.00 | 0.20 | 12 | 0.8 | 0.94 | 55 | 4 | 4 | 4.52 | 13.05 | 13.42 | 13.81 | 14.48 | 16.05 |
| EPDRE2010-16-02-ATH | □ | 1.00 | 0.20 | 16 | 0.8 | 0.94 | 60 | 4 | 4 | 3.74 | 17.18 | 17.59 | 18.38 | 19.27 | 21.35 |
| EPDRE2010-20-02-ATH | □ | 1.00 | 0.20 | 20 | 0.8 | 0.94 | 60 | 4 | 4 | 3.19 | 21.29 | 21.92 | 22.94 | 24.06 | 26.66 |
| EPDRE2010-2-03-ATH | □ | 1.00 | 0.30 | 2 | 0.8 | 0.94 | 50 | 4 | 4 | 9.57 | 2.63 | 2.76 | 2.87 | 2.98 | 3.19 |
| EPDRE2010-3-03-ATH | □ | 1.00 | 0.30 | 3 | 0.8 | 0.94 | 50 | 4 | 4 | 8.62 | 3.68 | 3.85 | 3.99 | 4.13 | 4.37 |
| EPDRE2010-4-03-ATH | □ | 1.00 | 0.30 | 4 | 0.8 | 0.94 | 50 | 4 | 4 | 7.84 | 4.73 | 4.93 | 5.10 | 5.25 | 5.53 |
| EPDRE2010-5-03-ATH | □ | 1.00 | 0.30 | 5 | 0.8 | 0.94 | 50 | 4 | 4 | 7.19 | 5.78 | 6.01 | 6.20 | 6.37 | 6.72 |
| EPDRE2010-6-03-ATH | ● | 1.00 | 0.30 | 6 | 0.8 | 0.94 | 50 | 4 | 4 | 6.64 | 6.82 | 7.07 | 7.28 | 7.47 | 8.05 |
| EPDRE2010-8-03-ATH | □ | 1.00 | 0.30 | 8 | 0.8 | 0.94 | 50 | 4 | 4 | 5.75 | 8.91 | 9.20 | 9.44 | 9.68 | 10.70 |

□ = Stocked items in Japan

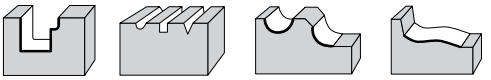
# EPDRE

Advanced Engineering







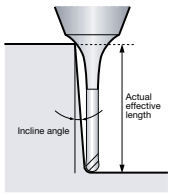
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

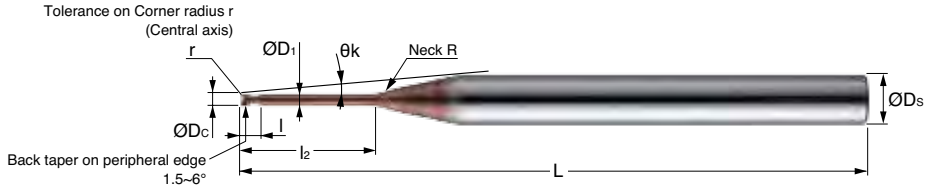
| | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | Stock | $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDRE2010-10-03-ATH | ● | 1.00 | 0.3 | 10 | 0.80 | 0.94 | 50 | 4 | 4 | 5.08 | 10.98 | 11.31 | 11.58 | 12.07 | 13.36 |
| EPDRE2010-12-03-ATH | □ | 1.00 | 0.3 | 12 | 0.80 | 0.94 | 55 | 4 | 4 | 4.54 | 13.05 | 13.41 | 13.80 | 14.46 | 16.01 |
| EPDRE2010-16-03-ATH | □ | 1.00 | 0.3 | 16 | 0.80 | 0.94 | 60 | 4 | 4 | 3.75 | 17.17 | 17.59 | 18.36 | 19.25 | 21.32 |
| EPDRE2010-20-03-ATH | □ | 1.00 | 0.3 | 20 | 0.80 | 0.94 | 60 | 4 | 4 | 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 | □ | 1.25 | 0.1 | 10 | 1.15 | 1.18 | 50 | 4 | 4 | 4.76 | 11.01 | 11.34 | 11.60 | 12.14 | 13.45 |
| EPDRE20125-15-01-ATH | □ | 1.25 | 0.1 | 15 | 1.15 | 1.18 | 55 | 4 | 4 | 3.66 | 16.17 | 16.57 | 17.28 | 18.12 | 20.09 |
| EPDRE20125-20-01-ATH | □ | 1.25 | 0.1 | 20 | 1.15 | 1.18 | 60 | 4 | 4 | 2.97 | 21.30 | 21.95 | 22.98 | 24.10 | - |
| EPDRE20125-5-02-ATH | □ | 1.25 | 0.2 | 5 | 1.15 | 1.18 | 50 | 4 | 4 | 6.86 | 5.81 | 6.03 | 6.22 | 6.39 | 6.79 |
| EPDRE20125-10-02-ATH | □ | 1.25 | 0.2 | 10 | 1.15 | 1.18 | 50 | 4 | 4 | 4.79 | 11.00 | 11.33 | 11.59 | 12.12 | 13.42 |
| EPDRE20125-15-02-ATH | □ | 1.25 | 0.2 | 15 | 1.15 | 1.18 | 55 | 4 | 4 | 3.68 | 16.16 | 16.56 | 17.26 | 18.10 | 20.06 |
| EPDRE20125-20-02-ATH | □ | 1.25 | 0.2 | 20 | 1.15 | 1.18 | 60 | 4 | 4 | 2.98 | 21.30 | 21.95 | 22.97 | 24.09 | - |
| EPDRE20125-5-03-ATH | □ | 1.25 | 0.3 | 5 | 1.15 | 1.18 | 50 | 4 | 4 | 6.92 | 5.81 | 6.03 | 6.21 | 6.38 | 6.75 |
| EPDRE20125-10-03-ATH | □ | 1.25 | 0.3 | 10 | 1.15 | 1.18 | 50 | 4 | 4 | 4.82 | 11.00 | 11.32 | 11.59 | 12.10 | 13.39 |
| EPDRE20125-15-03-ATH | □ | 1.25 | 0.3 | 15 | 1.15 | 1.18 | 55 | 4 | 4 | 3.69 | 16.16 | 16.56 | 17.25 | 18.08 | 20.03 |
| EPDRE20125-20-03-ATH | □ | 1.25 | 0.3 | 20 | 1.15 | 1.18 | 60 | 4 | 4 | 2.99 | 21.30 | 21.94 | 22.95 | 24.07 | - |
| EPDRE2015-4-01-ATH | ● | 1.50 | 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 | □ | 1.50 | 0.1 | 6 | 1.35 | 1.42 | 50 | 4 | 4 | 5.97 | 6.88 | 7.12 | 7.33 | 7.51 | 8.18 |
| EPDRE2015-8-01-ATH | ● | 1.50 | 0.1 | 8 | 1.35 | 1.42 | 50 | 4 | 4 | 5.12 | 8.96 | 9.24 | 9.48 | 9.77 | 10.83 |
| EPDRE2015-12-01-ATH | ● | 1.50 | 0.1 | 12 | 1.35 | 1.42 | 55 | 4 | 4 | 3.98 | 13.09 | 13.45 | 13.88 | 14.56 | 16.14 |
| EPDRE2015-15-01-ATH | ● | 1.50 | 0.1 | 15 | 1.35 | 1.42 | 55 | 4 | 4 | 3.42 | 16.18 | 16.58 | 17.30 | 18.15 | 20.12 |
| EPDRE2015-20-01-ATH | ● | 1.50 | 0.1 | 20 | 1.35 | 1.42 | 60 | 4 | 4 | 2.76 | 21.32 | 21.98 | 23.01 | 24.13 | - |
| EPDRE2015-4-02-ATH | ● | 1.50 | 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 | □ | 1.50 | 0.2 | 6 | 1.35 | 1.42 | 50 | 4 | 4 | 6.02 | 6.88 | 7.12 | 7.32 | 7.50 | 8.14 |
| EPDRE2015-8-02-ATH | ● | 1.50 | 0.2 | 8 | 1.35 | 1.42 | 50 | 4 | 4 | 5.16 | 8.95 | 9.24 | 9.47 | 9.75 | 10.80 |
| EPDRE2015-12-02-ATH | ● | 1.50 | 0.2 | 12 | 1.35 | 1.42 | 55 | 4 | 4 | 4.01 | 13.09 | 13.44 | 13.87 | 14.54 | 16.11 |
| EPDRE2015-15-02-ATH | ● | 1.50 | 0.2 | 15 | 1.35 | 1.42 | 55 | 4 | 4 | 3.43 | 16.18 | 16.58 | 17.29 | 18.13 | 20.09 |
| EPDRE2015-20-02-ATH | ● | 1.50 | 0.2 | 20 | 1.35 | 1.42 | 60 | 4 | 4 | 2.77 | 21.32 | 21.97 | 22.99 | 24.11 | - |
| EPDRE2015-4-03-ATH | □ | 1.50 | 0.3 | 4 | 1.35 | 1.42 | 50 | 4 | 4 | 7.30 | 4.79 | 4.97 | 5.14 | 5.29 | 5.55 |
| EPDRE2015-6-03-ATH | □ | 1.50 | 0.3 | 6 | 1.35 | 1.42 | 50 | 4 | 4 | 6.07 | 6.87 | 7.11 | 7.31 | 7.49 | 8.11 |

□ = Stocked items in Japan

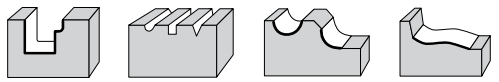
# EPDRE

Advanced Engineering




CORNER RADIUS | SEMI-FINISHING | FINISHING | 65 HRC 65 | 2 FLUTES | ATH COATING



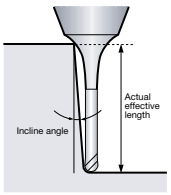
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

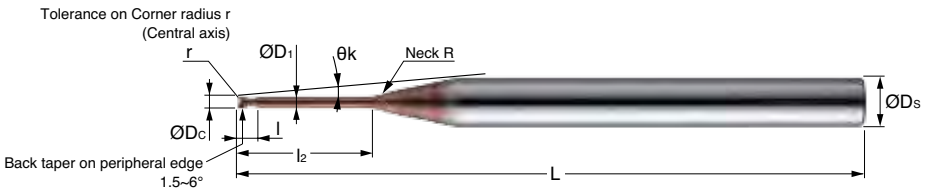
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2015-8-03-ATH | ● | 1.50 | 0.3 | 8 | 1.35 | 1.42 | 50 | 4 | 4 | 5.19 | 8.95 | 9.23 | 9.47 | 9.73 | 10.77 |
| EPDRE2015-12-03-ATH | □ | 1.50 | 0.3 | 12 | 1.35 | 1.42 | 55 | 4 | 4 | 4.03 | 13.09 | 13.44 | 13.85 | 14.52 | 16.08 |
| EPDRE2015-15-03-ATH | ● | 1.50 | 0.3 | 15 | 1.35 | 1.42 | 55 | 4 | 4 | 3.45 | 16.18 | 16.57 | 17.28 | 18.11 | 20.06 |
| EPDRE2015-20-03-ATH | ● | 1.50 | 0.3 | 20 | 1.35 | 1.42 | 60 | 4 | 4 | 2.78 | 21.31 | 21.96 | 22.98 | 24.09 | - |
| EPDRE2015-4-05-ATH | □ | 1.50 | 0.5 | 4 | 1.35 | 1.42 | 50 | 4 | 4 | 7.45 | 4.78 | 4.96 | 5.12 | 5.26 | 5.53 |
| EPDRE2015-6-05-ATH | □ | 1.50 | 0.5 | 6 | 1.35 | 1.42 | 50 | 4 | 4 | 6.17 | 6.86 | 7.10 | 7.30 | 7.48 | 8.05 |
| EPDRE2015-8-05-ATH | □ | 1.50 | 0.5 | 8 | 1.35 | 1.42 | 50 | 4 | 4 | 5.27 | 8.94 | 9.22 | 9.45 | 9.70 | 10.70 |
| EPDRE2015-12-05-ATH | □ | 1.50 | 0.5 | 12 | 1.35 | 1.42 | 55 | 4 | 4 | 4.07 | 13.08 | 13.43 | 13.83 | 14.48 | 16.01 |
| EPDRE2015-15-05-ATH | □ | 1.50 | 0.5 | 15 | 1.35 | 1.42 | 55 | 4 | 4 | 3.48 | 16.17 | 16.56 | 17.25 | 18.07 | 19.99 |
| EPDRE2015-20-05-ATH | □ | 1.50 | 0.5 | 20 | 1.35 | 1.42 | 60 | 4 | 4 | 2.80 | 21.31 | 21.95 | 22.95 | 24.06 | - |
| 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 | □ | 1.75 | 0.1 | 10 | 1.55 | 1.67 | 50 | 4 | 4 | 4.19 | 11.03 | 11.35 | 11.61 | 12.17 | 13.49 |
| EPDRE20175-15-01-ATH | □ | 1.75 | 0.1 | 15 | 1.55 | 1.67 | 55 | 4 | 4 | 3.16 | 16.18 | 16.58 | 17.30 | 18.15 | 20.12 |
| EPDRE20175-20-01-ATH | □ | 1.75 | 0.1 | 20 | 1.55 | 1.67 | 60 | 4 | 4 | 2.54 | 21.32 | 21.98 | 23.01 | 24.13 | - |
| EPDRE20175-5-02-ATH | □ | 1.75 | 0.2 | 5 | 1.55 | 1.67 | 50 | 4 | 4 | 6.25 | 5.84 | 6.05 | 6.24 | 6.41 | 6.82 |
| EPDRE20175-10-02-ATH | □ | 1.75 | 0.2 | 10 | 1.55 | 1.67 | 50 | 4 | 4 | 4.22 | 11.02 | 11.34 | 11.61 | 12.15 | 13.45 |
| EPDRE20175-15-02-ATH | □ | 1.75 | 0.2 | 15 | 1.55 | 1.67 | 55 | 4 | 4 | 3.18 | 16.18 | 16.58 | 17.29 | 18.13 | 20.09 |
| EPDRE20175-20-02-ATH | □ | 1.75 | 0.2 | 20 | 1.55 | 1.67 | 60 | 4 | 4 | 2.55 | 21.32 | 21.97 | 22.99 | 24.11 | - |
| EPDRE20175-5-03-ATH | □ | 1.75 | 0.3 | 5 | 1.55 | 1.67 | 50 | 4 | 4 | 6.31 | 5.83 | 6.05 | 6.23 | 6.40 | 6.79 |
| EPDRE20175-10-03-ATH | □ | 1.75 | 0.3 | 10 | 1.55 | 1.67 | 50 | 4 | 4 | 4.24 | 11.02 | 11.34 | 11.60 | 12.13 | 13.42 |
| EPDRE20175-15-03-ATH | □ | 1.75 | 0.3 | 15 | 1.55 | 1.67 | 55 | 4 | 4 | 3.20 | 16.18 | 16.57 | 17.28 | 18.11 | 20.06 |
| EPDRE20175-20-03-ATH | □ | 1.75 | 0.3 | 20 | 1.55 | 1.67 | 60 | 4 | 4 | 2.56 | 21.31 | 21.96 | 22.98 | 24.09 | - |
| EPDRE2020-4-01-ATH | □ | 2.00 | 0.1 | 4 | 1.70 | 1.92 | 50 | 4 | 4 | 6.49 | 4.80 | 4.99 | 5.16 | 5.31 | 5.58 |
| EPDRE2020-6-01-ATH | □ | 2.00 | 0.1 | 6 | 1.70 | 1.92 | 50 | 4 | 4 | 5.30 | 6.88 | 7.12 | 7.33 | 7.51 | 8.18 |
| EPDRE2020-8-01-ATH | □ | 2.00 | 0.1 | 8 | 1.70 | 1.92 | 50 | 4 | 4 | 4.47 | 8.96 | 9.24 | 9.48 | 9.77 | 10.83 |
| EPDRE2020-12-01-ATH | □ | 2.00 | 0.1 | 12 | 1.70 | 1.92 | 55 | 4 | 4 | 3.41 | 13.09 | 13.45 | 13.88 | 14.56 | 16.14 |
| EPDRE2020-16-01-ATH | □ | 2.00 | 0.1 | 16 | 1.70 | 1.92 | 55 | 4 | 4 | 2.76 | 17.21 | 17.62 | 18.44 | 19.35 | - |
| EPDRE2020-20-01-ATH | □ | 2.00 | 0.1 | 20 | 1.70 | 1.92 | 60 | 4 | 4 | 2.31 | 21.32 | 21.98 | 23.01 | 24.13 | - |
| EPDRE2020-25-01-ATH | □ | 2.00 | 0.1 | 25 | 1.70 | 1.92 | 65 | 4 | 4 | 1.93 | 26.44 | 27.43 | 28.71 | - | - |
| EPDRE2020-30-01-ATH | □ | 2.00 | 0.1 | 30 | 1.70 | 1.92 | 70 | 4 | 4 | 1.65 | 31.55 | 32.88 | 34.41 | - | - |

□ = Stocked items in Japan

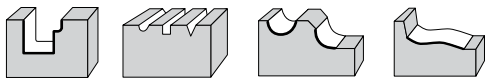
# EPDRE

Advanced Engineering




CORNER RADIUS | SEMI-FINISHING | FINISHING | 65 HRC 65 | 2 FLUTES | ATH COATING



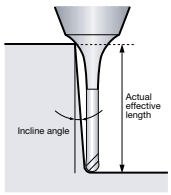
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

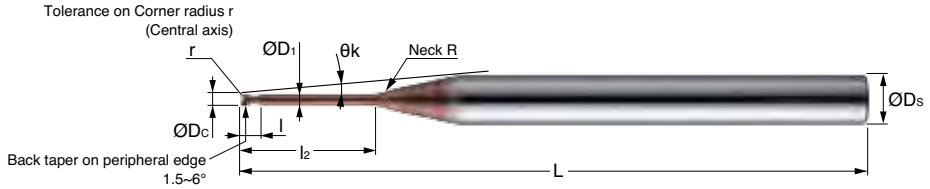
| | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | Stock | $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDRE2020-4-02-ATH | □ | 2.00 | 0.2 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.57 | 4.79 | 4.98 | 5.15 | 5.30 | 5.57 |
| EPDRE2020-6-02-ATH | ● | 2.00 | 0.2 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.35 | 6.88 | 7.12 | 7.32 | 7.50 | 8.14 |
| EPDRE2020-8-02-ATH | ● | 2.00 | 0.2 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.51 | 8.95 | 9.24 | 9.47 | 9.75 | 10.80 |
| EPDRE2020-12-02-ATH | ● | 2.00 | 0.2 | 12 | 1.7 | 1.92 | 55 | 4 | 4 | 3.43 | 13.09 | 13.44 | 13.87 | 14.54 | 16.11 |
| EPDRE2020-16-02-ATH | ● | 2.00 | 0.2 | 16 | 1.7 | 1.92 | 55 | 4 | 4 | 2.77 | 17.21 | 17.62 | 18.43 | 19.33 | - |
| EPDRE2020-20-02-ATH | ● | 2.00 | 0.2 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.32 | 21.32 | 21.97 | 22.99 | 24.11 | - |
| EPDRE2020-25-02-ATH | ● | 2.00 | 0.2 | 25 | 1.7 | 1.92 | 65 | 4 | 4 | 1.93 | 26.44 | 27.42 | 28.69 | - | - |
| EPDRE2020-30-02-ATH | □ | 2.00 | 0.2 | 30 | 1.7 | 1.92 | 70 | 4 | 4 | 1.66 | 31.55 | 32.87 | 34.40 | - | - |
| EPDRE2020-4-03-ATH | □ | 2.00 | 0.3 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.64 | 4.79 | 4.97 | 5.14 | 5.29 | 5.55 |
| EPDRE2020-6-03-ATH | □ | 2.00 | 0.3 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.40 | 6.87 | 7.11 | 7.31 | 7.49 | 8.11 |
| EPDRE2020-8-03-ATH | ● | 2.00 | 0.3 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.55 | 8.95 | 9.23 | 9.47 | 9.73 | 10.77 |
| EPDRE2020-12-03-ATH | □ | 2.00 | 0.3 | 12 | 1.7 | 1.92 | 55 | 4 | 4 | 3.45 | 13.09 | 13.44 | 13.85 | 14.52 | 16.08 |
| EPDRE2020-16-03-ATH | ● | 2.00 | 0.3 | 16 | 1.7 | 1.92 | 55 | 4 | 4 | 2.79 | 17.21 | 17.61 | 18.42 | 19.31 | - |
| EPDRE2020-20-03-ATH | ● | 2.00 | 0.3 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.33 | 21.31 | 21.96 | 22.98 | 24.09 | - |
| EPDRE2020-25-03-ATH | □ | 2.00 | 0.3 | 25 | 1.7 | 1.92 | 65 | 4 | 4 | 1.94 | 26.43 | 27.41 | 28.68 | - | - |
| EPDRE2020-30-03-ATH | □ | 2.00 | 0.3 | 30 | 1.7 | 1.92 | 70 | 4 | 4 | 1.66 | 31.55 | 32.86 | 34.38 | - | - |
| EPDRE2020-6-05-ATH | ● | 2.00 | 0.5 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.50 | 6.86 | 7.10 | 7.30 | 7.48 | 8.05 |
| EPDRE2020-8-05-ATH | ● | 2.00 | 0.5 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.62 | 8.94 | 9.22 | 9.45 | 9.70 | 10.70 |
| EPDRE2020-12-05-ATH | ● | 2.00 | 0.5 | 12 | 1.7 | 1.92 | 55 | 4 | 4 | 3.50 | 13.08 | 13.43 | 13.83 | 14.48 | 16.01 |
| EPDRE2020-16-05-ATH | ● | 2.00 | 0.5 | 16 | 1.7 | 1.92 | 55 | 4 | 4 | 2.81 | 17.20 | 17.61 | 18.39 | 19.27 | - |
| EPDRE2020-20-05-ATH | ● | 2.00 | 0.5 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.35 | 21.31 | 21.95 | 22.95 | 24.06 | - |
| EPDRE2020-25-05-ATH | ● | 2.00 | 0.5 | 25 | 1.7 | 1.92 | 65 | 4 | 4 | 1.95 | 26.43 | 27.39 | 28.65 | - | - |
| EPDRE2020-30-05-ATH | □ | 2.00 | 0.5 | 30 | 1.7 | 1.92 | 70 | 4 | 4 | 1.67 | 31.54 | 32.84 | 34.36 | - | - |
| EPDRE2020-6-08-ATH | □ | 2.00 | 0.8 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.66 | 6.85 | 7.08 | 7.27 | 7.45 | 7.95 |
| EPDRE2020-8-08-ATH | ● | 2.00 | 0.8 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.73 | 8.93 | 9.20 | 9.43 | 9.64 | 10.61 |
| EPDRE2020-12-08-ATH | □ | 2.00 | 0.8 | 12 | 1.7 | 1.92 | 55 | 4 | 4 | 3.56 | 13.07 | 13.41 | 13.78 | 14.42 | 15.92 |
| EPDRE2020-16-08-ATH | ● | 2.00 | 0.8 | 16 | 1.7 | 1.92 | 55 | 4 | 4 | 2.85 | 17.19 | 17.59 | 18.35 | 19.21 | - |
| EPDRE2020-20-08-ATH | ● | 2.00 | 0.8 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.38 | 21.30 | 21.92 | 22.91 | 24.00 | - |
| EPDRE2020-25-08-ATH | □ | 2.00 | 0.8 | 25 | 1.7 | 1.92 | 65 | 4 | 4 | 1.97 | 26.42 | 27.37 | 28.61 | - | - |
| EPDRE2020-30-08-ATH | □ | 2.00 | 0.8 | 30 | 1.7 | 1.92 | 70 | 4 | 4 | 1.69 | 31.53 | 32.81 | 34.31 | - | - |

□ = Stocked items in Japan

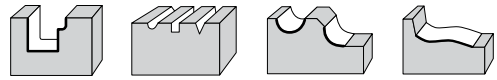
# EPDRE

Advanced Engineering




CORNER RADIUS | SEMI-FINISHING | FINISHING | 65 HRC 65 | 2 FLUTES | ATH COATING



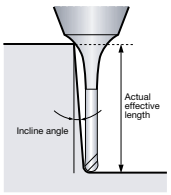
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

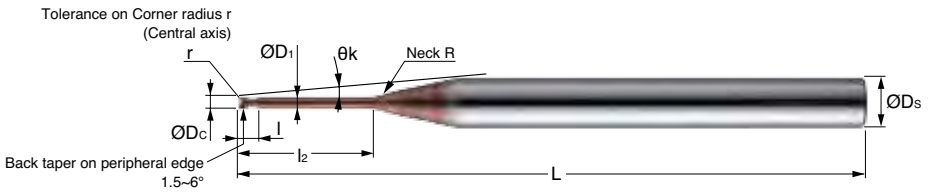
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2025-10-01-ATH | □ | 2.50 | 0.1 | 10 | 2.0 | 2.39 | 50 | 4 | 4 | 3.14 | 11.08 | 11.39 | 11.68 | 12.25 | 13.58 |
| EPDRE2025-20-01-ATH | □ | 2.50 | 0.1 | 20 | 2.0 | 2.39 | 60 | 4 | 4 | 1.82 | 21.36 | 22.06 | 23.09 | - | - |
| EPDRE2025-30-01-ATH | □ | 2.50 | 0.1 | 30 | 2.0 | 2.39 | 70 | 4 | 4 | 1.28 | 31.59 | 32.95 | - | - | - |
| EPDRE2025-10-02-ATH | □ | 2.50 | 0.2 | 10 | 2.0 | 2.39 | 50 | 4 | 4 | 3.16 | 11.08 | 11.39 | 11.67 | 12.23 | 13.55 |
| EPDRE2025-20-02-ATH | □ | 2.50 | 0.2 | 20 | 2.0 | 2.39 | 60 | 4 | 4 | 1.83 | 21.36 | 22.05 | 23.07 | - | - |
| EPDRE2025-30-02-ATH | □ | 2.50 | 0.2 | 30 | 2.0 | 2.39 | 70 | 4 | 4 | 1.28 | 31.58 | 32.94 | - | - | - |
| EPDRE2025-10-03-ATH | □ | 2.50 | 0.3 | 10 | 2.0 | 2.39 | 50 | 4 | 4 | 3.19 | 11.08 | 11.38 | 11.65 | 12.21 | 13.52 |
| EPDRE2025-20-03-ATH | □ | 2.50 | 0.3 | 20 | 2.0 | 2.39 | 60 | 4 | 4 | 1.83 | 21.36 | 22.04 | 23.06 | - | - |
| EPDRE2025-30-03-ATH | □ | 2.50 | 0.3 | 30 | 2.0 | 2.39 | 70 | 4 | 4 | 1.29 | 31.58 | 32.93 | - | - | - |
| EPDRE2025-10-05-ATH | □ | 2.50 | 0.5 | 10 | 2.0 | 2.39 | 50 | 4 | 4 | 3.24 | 11.07 | 11.37 | 11.63 | 12.17 | 13.45 |
| EPDRE2025-20-05-ATH | □ | 2.50 | 0.5 | 20 | 2.0 | 2.39 | 60 | 4 | 4 | 1.85 | 21.35 | 22.02 | 23.03 | - | - |
| EPDRE2025-30-05-ATH | □ | 2.50 | 0.5 | 30 | 2.0 | 2.39 | 70 | 4 | 4 | 1.30 | 31.58 | 32.92 | - | - | - |
| EPDRE2030-6-01-ATH | □ | 3.00 | 0.1 | 6 | 2.5 | 2.86 | 50 | 6 | 4 | 6.45 | 7.01 | 7.23 | 7.42 | 7.59 | 8.36 |
| EPDRE2030-8-01-ATH | □ | 3.00 | 0.1 | 8 | 2.5 | 2.86 | 55 | 6 | 4 | 5.61 | 9.07 | 9.34 | 9.56 | 9.94 | 11.02 |
| EPDRE2030-12-01-ATH | □ | 3.00 | 0.1 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.45 | 13.20 | 13.53 | 14.04 | 14.73 | 16.33 |
| EPDRE2030-16-01-ATH | □ | 3.00 | 0.1 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.69 | 17.30 | 17.78 | 18.60 | 19.52 | 21.64 |
| EPDRE2030-18-01-ATH | □ | 3.00 | 0.1 | 18 | 2.5 | 2.86 | 65 | 6 | 4 | 3.40 | 19.35 | 19.96 | 20.89 | 21.91 | 24.29 |
| EPDRE2030-20-01-ATH | □ | 3.00 | 0.1 | 20 | 2.5 | 2.86 | 65 | 6 | 4 | 3.15 | 21.40 | 22.13 | 23.17 | 24.30 | 26.95 |
| EPDRE2030-30-01-ATH | □ | 3.00 | 0.1 | 30 | 2.5 | 2.86 | 75 | 6 | 4 | 2.31 | 31.62 | 33.03 | 34.57 | 36.27 | - |
| EPDRE2030-35-01-ATH | □ | 3.00 | 0.1 | 35 | 2.5 | 2.86 | 80 | 6 | 4 | 2.04 | 36.83 | 38.48 | 40.27 | 42.25 | - |
| EPDRE2030-6-02-ATH | □ | 3.00 | 0.2 | 6 | 2.5 | 2.86 | 50 | 6 | 4 | 6.49 | 7.00 | 7.22 | 7.41 | 7.58 | 8.33 |
| EPDRE2030-8-02-ATH | ● | 3.00 | 0.2 | 8 | 2.5 | 2.86 | 55 | 6 | 4 | 5.65 | 9.07 | 9.33 | 9.55 | 9.92 | 10.99 |
| EPDRE2030-12-02-ATH | ● | 3.00 | 0.2 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.48 | 13.19 | 13.52 | 14.03 | 14.71 | 16.30 |
| EPDRE2030-16-02-ATH | ● | 3.00 | 0.2 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.71 | 17.30 | 17.77 | 18.59 | 19.50 | 21.60 |
| EPDRE2030-18-02-ATH | □ | 3.00 | 0.2 | 18 | 2.5 | 2.86 | 65 | 6 | 4 | 3.41 | 19.35 | 19.95 | 20.87 | 21.89 | 24.26 |
| EPDRE2030-20-02-ATH | ● | 3.00 | 0.2 | 20 | 2.5 | 2.86 | 65 | 6 | 4 | 3.16 | 21.40 | 22.13 | 23.15 | 24.28 | 26.91 |
| EPDRE2030-30-02-ATH | ● | 3.00 | 0.2 | 30 | 2.5 | 2.86 | 75 | 6 | 4 | 2.31 | 31.62 | 33.02 | 34.56 | 36.25 | - |
| EPDRE2030-35-02-ATH | ● | 3.00 | 0.2 | 35 | 2.5 | 2.86 | 80 | 6 | 4 | 2.04 | 36.83 | 38.47 | 40.26 | 42.23 | - |
| EPDRE2030-6-03-ATH | □ | 3.00 | 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 | ● | 3.00 | 0.3 | 8 | 2.5 | 2.86 | 55 | 6 | 4 | 5.68 | 9.07 | 9.33 | 9.54 | 9.90 | 10.95 |

□ = Stocked items in Japan

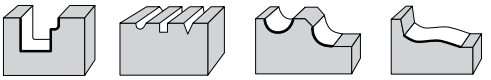
# EPDRE

Advanced Engineering







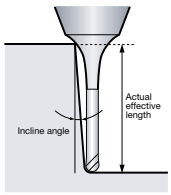
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

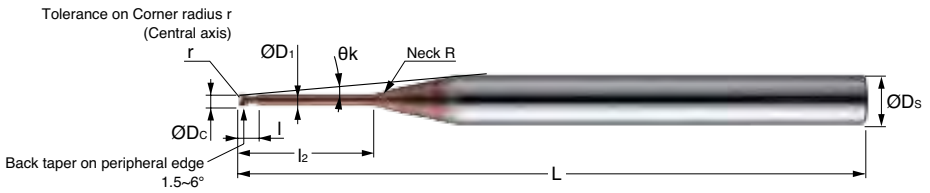
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2030-12-03-ATH | □ | 3.00 | 0.3 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.50 | 13.19 | 13.52 | 14.02 | 14.69 | 16.26 |
| EPDRE2030-16-03-ATH | ● | 3.00 | 0.3 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.72 | 17.30 | 17.76 | 18.58 | 19.48 | 21.57 |
| EPDRE2030-18-03-ATH | □ | 3.00 | 0.3 | 18 | 2.5 | 2.86 | 65 | 6 | 4 | 3.43 | 19.35 | 19.94 | 20.86 | 21.87 | 24.23 |
| EPDRE2030-20-03-ATH | ● | 3.00 | 0.3 | 20 | 2.5 | 2.86 | 65 | 6 | 4 | 3.17 | 21.40 | 22.12 | 23.14 | 24.26 | 26.88 |
| EPDRE2030-30-03-ATH | ● | 3.00 | 0.3 | 30 | 2.5 | 2.86 | 75 | 6 | 4 | 2.32 | 31.62 | 33.01 | 34.54 | 36.23 | - |
| EPDRE2030-35-03-ATH | □ | 3.00 | 0.3 | 35 | 2.5 | 2.86 | 80 | 6 | 4 | 2.05 | 36.82 | 38.46 | 40.25 | 42.21 | - |
| EPDRE2030-8-05-ATH | ● | 3.00 | 0.5 | 8 | 2.5 | 2.86 | 55 | 6 | 4 | 5.76 | 9.06 | 9.31 | 9.53 | 9.87 | 10.89 |
| EPDRE2030-12-05-ATH | ● | 3.00 | 0.5 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.55 | 13.18 | 13.51 | 13.99 | 14.65 | 16.20 |
| EPDRE2030-16-05-ATH | ● | 3.00 | 0.5 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.75 | 17.29 | 17.74 | 18.55 | 19.44 | 21.51 |
| EPDRE2030-18-05-ATH | □ | 3.00 | 0.5 | 18 | 2.5 | 2.86 | 65 | 6 | 4 | 3.45 | 19.34 | 19.92 | 20.83 | 21.83 | 24.16 |
| EPDRE2030-20-05-ATH | ● | 3.00 | 0.5 | 20 | 2.5 | 2.86 | 65 | 6 | 4 | 3.20 | 21.39 | 22.10 | 23.11 | 24.22 | 26.82 |
| EPDRE2030-30-05-ATH | ● | 3.00 | 0.5 | 30 | 2.5 | 2.86 | 75 | 6 | 4 | 2.33 | 31.61 | 32.99 | 34.52 | 36.19 | - |
| EPDRE2030-35-05-ATH | ● | 3.00 | 0.5 | 35 | 2.5 | 2.86 | 80 | 6 | 4 | 2.06 | 36.82 | 38.44 | 40.22 | 42.17 | - |
| EPDRE2030-8-1-ATH | □ | 3.00 | 1.0 | 8 | 2.5 | 2.86 | 55 | 6 | 4 | 5.96 | 9.05 | 9.29 | 9.50 | 9.77 | 10.73 |
| EPDRE2030-12-1-ATH | □ | 3.00 | 1.0 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.67 | 13.17 | 13.49 | 13.92 | 14.55 | 16.04 |
| EPDRE2030-16-1-ATH | □ | 3.00 | 1.0 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.84 | 17.28 | 17.70 | 18.48 | 19.34 | 21.35 |
| EPDRE2030-18-1-ATH | □ | 3.00 | 1.0 | 18 | 2.5 | 2.86 | 65 | 6 | 4 | 3.52 | 19.33 | 19.88 | 20.76 | 21.73 | 24.00 |
| EPDRE2030-20-1-ATH | □ | 3.00 | 1.0 | 20 | 2.5 | 2.86 | 65 | 6 | 4 | 3.26 | 21.38 | 22.05 | 23.04 | 24.13 | 26.66 |
| EPDRE2030-30-1-ATH | □ | 3.00 | 1.0 | 30 | 2.5 | 2.86 | 75 | 6 | 4 | 2.37 | 31.60 | 32.95 | 34.45 | 36.09 | - |
| EPDRE2030-35-1-ATH | □ | 3.00 | 1.0 | 35 | 2.5 | 2.86 | 80 | 6 | 4 | 2.08 | 36.79 | 38.40 | 40.15 | 42.08 | - |
| EPDRE2040-8-01-ATH | □ | 4.00 | 0.1 | 8 | 3.5 | 3.80 | 55 | 6 | 4 | 4.38 | 9.18 | 9.42 | 9.64 | 10.11 | 11.21 |
| EPDRE2040-12-01-ATH | □ | 4.00 | 0.1 | 12 | 3.5 | 3.80 | 60 | 6 | 4 | 3.36 | 13.29 | 13.60 | 14.20 | 14.90 | 16.51 |
| EPDRE2040-16-01-ATH | □ | 4.00 | 0.1 | 16 | 3.5 | 3.80 | 60 | 6 | 4 | 2.72 | 17.39 | 17.93 | 18.77 | 19.68 | - |
| EPDRE2040-20-01-ATH | □ | 4.00 | 0.1 | 20 | 3.5 | 3.80 | 65 | 6 | 4 | 2.29 | 21.48 | 22.29 | 23.33 | 24.47 | - |
| EPDRE2040-30-01-ATH | □ | 4.00 | 0.1 | 30 | 3.5 | 3.80 | 75 | 6 | 4 | 1.64 | 31.77 | 33.18 | 34.73 | - | - |
| EPDRE2040-35-01-ATH | □ | 4.00 | 0.1 | 35 | 3.5 | 3.80 | 80 | 6 | 4 | 1.43 | 36.98 | 38.63 | - | - | - |
| EPDRE2040-45-01-ATH | □ | 4.00 | 0.1 | 45 | 3.5 | 3.80 | 90 | 6 | 4 | 1.15 | 47.41 | 49.52 | - | - | - |
| EPDRE2040-8-02-ATH | □ | 4.00 | 0.2 | 8 | 3.5 | 3.80 | 55 | 6 | 4 | 4.41 | 9.18 | 9.42 | 9.63 | 10.09 | 11.17 |
| EPDRE2040-12-02-ATH | □ | 4.00 | 0.2 | 12 | 3.5 | 3.80 | 60 | 6 | 4 | 3.38 | 13.29 | 13.59 | 14.19 | 14.88 | 16.48 |
| EPDRE2040-16-02-ATH | □ | 4.00 | 0.2 | 16 | 3.5 | 3.80 | 60 | 6 | 4 | 2.73 | 17.39 | 17.92 | 18.75 | 19.66 | - |

□ = Stocked items in Japan

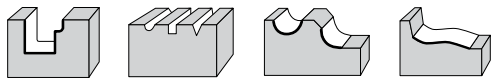
# EPDRE

Advanced Engineering




CORNER RADIUS | SEMI-FINISHING | FINISHING | 65 HRC 65 | 2 FLUTES | ATH COATING



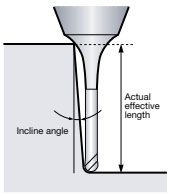
| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

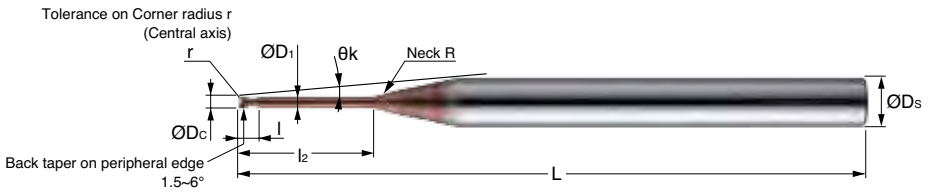
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | Θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRE2040-20-02-ATH | ☐ | 4.00 | 0.2 | 20 | 3.5 | 3.80 | 65 | 6 | 4 | 2.30 | 21.48 | 22.28 | 23.31 | 24.45 | - |
| EPDRE2040-30-02-ATH | ☐ | 4.00 | 0.2 | 30 | 3.5 | 3.80 | 75 | 6 | 4 | 1.64 | 31.76 | 33.17 | 34.72 | - | - |
| EPDRE2040-35-02-ATH | ☐ | 4.00 | 0.2 | 35 | 3.5 | 3.80 | 80 | 6 | 4 | 1.44 | 36.98 | 38.62 | - | - | - |
| EPDRE2040-45-02-ATH | ☐ | 4.00 | 0.2 | 45 | 3.5 | 3.80 | 90 | 6 | 4 | 1.15 | 47.40 | 49.52 | - | - | - |
| EPDRE2040-8-03-ATH | ☐ | 4.00 | 0.3 | 8 | 3.5 | 3.80 | 55 | 6 | 4 | 4.45 | 9.17 | 9.41 | 9.62 | 10.07 | 11.14 |
| EPDRE2040-12-03-ATH | ☐ | 4.00 | 0.3 | 12 | 3.5 | 3.80 | 60 | 6 | 4 | 3.40 | 13.28 | 13.59 | 14.18 | 14.86 | 16.45 |
| EPDRE2040-16-03-ATH | ☐ | 4.00 | 0.3 | 16 | 3.5 | 3.80 | 60 | 6 | 4 | 2.75 | 17.38 | 17.91 | 18.74 | 19.65 | - |
| EPDRE2040-20-03-ATH | ☐ | 4.00 | 0.3 | 20 | 3.5 | 3.80 | 65 | 6 | 4 | 2.31 | 21.48 | 22.27 | 23.30 | 24.43 | - |
| EPDRE2040-30-03-ATH | ☐ | 4.00 | 0.3 | 30 | 3.5 | 3.80 | 75 | 6 | 4 | 1.65 | 31.76 | 33.16 | 34.71 | - | - |
| EPDRE2040-35-03-ATH | ☐ | 4.00 | 0.3 | 35 | 3.5 | 3.80 | 80 | 6 | 4 | 1.44 | 36.97 | 38.61 | - | - | - |
| EPDRE2040-45-03-ATH | ☐ | 4.00 | 0.3 | 45 | 3.5 | 3.80 | 90 | 6 | 4 | 1.15 | 47.40 | 49.51 | - | - | - |
| EPDRE2040-12-05-ATH | ☐ | 4.00 | 0.5 | 12 | 3.5 | 3.80 | 60 | 6 | 4 | 3.44 | 13.28 | 13.58 | 14.15 | 14.82 | 16.39 |
| EPDRE2040-16-05-ATH | ☐ | 4.00 | 0.5 | 16 | 3.5 | 3.80 | 60 | 6 | 4 | 2.77 | 17.38 | 17.89 | 18.71 | 19.61 | - |
| EPDRE2040-20-05-ATH | ☐ | 4.00 | 0.5 | 20 | 3.5 | 3.80 | 65 | 6 | 4 | 2.33 | 21.47 | 22.25 | 23.27 | 24.39 | - |
| EPDRE2040-30-05-ATH | ☐ | 4.00 | 0.5 | 30 | 3.5 | 3.80 | 75 | 6 | 4 | 1.66 | 31.75 | 33.15 | 34.68 | - | - |
| EPDRE2040-35-05-ATH | ☐ | 4.00 | 0.5 | 35 | 3.5 | 3.80 | 80 | 6 | 4 | 1.45 | 36.96 | 38.59 | - | - | - |
| EPDRE2040-45-05-ATH | ☐ | 4.00 | 0.5 | 45 | 3.5 | 3.80 | 90 | 6 | 4 | 1.16 | 47.39 | 49.49 | - | - | - |
| EPDRE2040-12-1-ATH | ☐ | 4.00 | 1.0 | 12 | 3.5 | 3.80 | 60 | 6 | 4 | 3.54 | 13.27 | 13.56 | 14.08 | 14.72 | 16.23 |
| EPDRE2040-16-1-ATH | ☐ | 4.00 | 1.0 | 16 | 3.5 | 3.80 | 60 | 6 | 4 | 2.84 | 17.37 | 17.85 | 18.64 | 19.51 | - |
| EPDRE2040-20-1-ATH | ☐ | 4.00 | 1.0 | 20 | 3.5 | 3.80 | 65 | 6 | 4 | 2.37 | 21.46 | 22.21 | 23.20 | 24.30 | - |
| EPDRE2040-30-1-ATH | ☐ | 4.00 | 1.0 | 30 | 3.5 | 3.80 | 75 | 6 | 4 | 1.68 | 31.73 | 33.10 | 34.61 | - | - |
| EPDRE2040-35-1-ATH | ☐ | 4.00 | 1.0 | 35 | 3.5 | 3.80 | 80 | 6 | 4 | 1.47 | 36.94 | 38.55 | - | - | - |
| EPDRE2040-45-1-ATH | ☐ | 4.00 | 1.0 | 45 | 3.5 | 3.80 | 90 | 6 | 4 | 1.17 | 47.37 | 49.44 | - | - | - |
| EPDRE2050-20-01-ATH | ☐ | 5.00 | 0.1 | 20 | 4.0 | 4.75 | 65 | 6 | 4 | 1.26 | 21.54 | 22.42 | - | - | - |
| EPDRE2050-40-01-ATH | ☐ | 5.00 | 0.1 | 40 | 4.0 | 4.75 | 85 | 6 | 4 | 0.67 | 42.32 | - | - | - | - |
| EPDRE2050-20-02-ATH | ☐ | 5.00 | 0.2 | 20 | 4.0 | 4.75 | 65 | 6 | 4 | 1.26 | 21.54 | 22.41 | - | - | - |
| EPDRE2050-40-02-ATH | ☐ | 5.00 | 0.2 | 40 | 4.0 | 4.75 | 85 | 6 | 4 | 0.68 | 42.31 | - | - | - | - |
| EPDRE2050-20-03-ATH | ☐ | 5.00 | 0.3 | 20 | 4.0 | 4.75 | 65 | 6 | 4 | 1.27 | 21.54 | 22.40 | - | - | - |
| EPDRE2050-40-03-ATH | ☐ | 5.00 | 0.3 | 40 | 4.0 | 4.75 | 85 | 6 | 4 | 0.68 | 42.31 | - | - | - | - |
| EPDRE2050-20-05-ATH | ☐ | 5.00 | 0.5 | 20 | 4.0 | 4.75 | 65 | 6 | 4 | 1.28 | 21.54 | 22.38 | - | - | - |

☐ = Stocked items in Japan

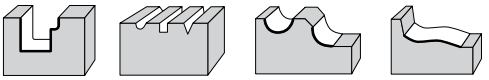
# EPDRE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | ϕDs | h5 |
| r | ±0.005 | | |

| | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | Stock | $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDRE2050-40-05-ATH | ☐ | 5.00 | 0.5 | 40 | 4 | 4.75 | 85 | 6 | 4 | 0.68 | 42.30 | - | - | - | - |
| EPDRE2050-20-1-ATH | ☐ | 5.00 | 1.0 | 20 | 4 | 4.75 | 65 | 6 | 4 | 1.31 | 21.53 | 22.34 | - | - | - |
| EPDRE2050-40-1-ATH | ☐ | 5.00 | 1.0 | 40 | 4 | 4.75 | 85 | 6 | 4 | 0.69 | 42.28 | - | - | - | - |
| EPDRE2060-12-01-ATH | ☐ | 6.00 | 0.1 | 12 | 5 | 5.70 | 50 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-18-01-ATH | ☐ | 6.00 | 0.1 | 18 | 5 | 5.70 | 60 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-24-01-ATH | ☐ | 6.00 | 0.1 | 24 | 5 | 5.70 | 70 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-35-01-ATH | ☐ | 6.00 | 0.1 | 35 | 5 | 5.70 | 80 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-55-01-ATH | ☐ | 6.00 | 0.1 | 55 | 5 | 5.70 | 100 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-12-02-ATH | ☐ | 6.00 | 0.2 | 12 | 5 | 5.70 | 50 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-18-02-ATH | ☐ | 6.00 | 0.2 | 18 | 5 | 5.70 | 60 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-24-02-ATH | ☐ | 6.00 | 0.2 | 24 | 5 | 5.70 | 70 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-35-02-ATH | ☐ | 6.00 | 0.2 | 35 | 5 | 5.70 | 80 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-55-02-ATH | ☐ | 6.00 | 0.2 | 55 | 5 | 5.70 | 100 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-12-03-ATH | ☐ | 6.00 | 0.3 | 12 | 5 | 5.70 | 50 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-18-03-ATH | ☐ | 6.00 | 0.3 | 18 | 5 | 5.70 | 60 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-24-03-ATH | ☐ | 6.00 | 0.3 | 24 | 5 | 5.70 | 70 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-35-03-ATH | ☐ | 6.00 | 0.3 | 35 | 5 | 5.70 | 80 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-55-03-ATH | ☐ | 6.00 | 0.3 | 55 | 5 | 5.70 | 100 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-18-05-ATH | ☐ | 6.00 | 0.5 | 18 | 5 | 5.70 | 60 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-24-05-ATH | ☐ | 6.00 | 0.5 | 24 | 5 | 5.70 | 70 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-35-05-ATH | ☐ | 6.00 | 0.5 | 35 | 5 | 5.70 | 80 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-55-05-ATH | ☐ | 6.00 | 0.5 | 55 | 5 | 5.70 | 100 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-18-1-ATH | ☐ | 6.00 | 1.0 | 18 | 5 | 5.70 | 60 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-24-1-ATH | ☐ | 6.00 | 1.0 | 24 | 5 | 5.70 | 70 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-35-1-ATH | ☐ | 6.00 | 1.0 | 35 | 5 | 5.70 | 80 | 6 | - | 0.01 | - | - | - | - | - |
| EPDRE2060-55-1-ATH | ☐ | 6.00 | 1.0 | 55 | 5 | 5.70 | 100 | 6 | - | 0.01 | - | - | - | - | - |

☐ = Stocked items in Japan

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | 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 |
| **0.2** | **0.02** | 1.0 | 0.011 | 50,000 | 922 | 50,000 | 922 | 45,000 | 829 | 42,500 | 705 | 37,500 | 553 | 35,000 | 452 |
| **0.2** | **0.02** | 2.0 | 0.007 | 50,000 | 809 | 42,000 | 774 | 40,500 | 746 | 38,250 | 635 | 33,750 | 498 | 31,500 | 406 |
| **0.2** | **0.05** | 0.5 | 0.020 | 50,000 | 922 | 50,000 | 922 | 45,000 | 829 | 42,500 | 705 | 37,500 | 553 | 35,000 | 452 |
| **0.2** | **0.05** | 1.0 | 0.014 | 50,000 | 922 | 50,000 | 922 | 45,000 | 829 | 42,500 | 705 | 37,500 | 553 | 35,000 | 452 |
| **0.2** | **0.05** | 1.5 | 0.008 | 50,000 | 809 | 47,000 | 866 | 42,750 | 788 | 40,375 | 670 | 35,625 | 525 | 33,250 | 429 |
| **0.2** | **0.05** | 2.0 | 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 | 0.016 | 50,000 | 1,208 | 48,000 | 1,161 | 43,200 | 1,045 | 40,800 | 733 | 36,000 | 547 | 33,600 | 441 |
| **0.3** | **0.02** | 2.0 | 0.011 | 45,000 | 998 | 38,880 | 860 | 34,992 | 774 | 33,048 | 594 | 29,160 | 443 | 27,216 | 357 |
| **0.3** | **0.02** | 3.0 | 0.007 | 42,750 | 881 | 36,936 | 760 | 33,242 | 684 | 31,396 | 525 | 27,702 | 392 | 25,855 | 316 |
| **0.3** | **0.05** | 1.0 | 0.021 | 50,000 | 1,208 | 48,000 | 1,161 | 43,200 | 1,045 | 40,800 | 733 | 36,000 | 547 | 33,600 | 441 |
| **0.3** | **0.05** | 1.5 | 0.016 | 47,500 | 1,147 | 45,600 | 1,103 | 41,040 | 993 | 38,760 | 697 | 34,200 | 520 | 31,920 | 419 |
| **0.3** | **0.05** | 2.0 | 0.012 | 45,000 | 998 | 38,880 | 860 | 34,992 | 774 | 33,048 | 594 | 29,160 | 443 | 27,216 | 357 |
| **0.3** | **0.05** | 2.5 | 0.010 | 45,000 | 998 | 38,880 | 860 | 34,992 | 774 | 33,048 | 594 | 29,160 | 443 | 27,216 | 357 |
| **0.3** | **0.05** | 3.0 | 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 | 0.016 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.4** | **0.02** | 2.0 | 0.013 | 46,080 | 1,115 | 38,300 | 929 | 34,560 | 836 | 32,256 | 714 | 28,800 | 557 | 26,726 | 457 |
| **0.4** | **0.02** | 3.0 | 0.010 | 35,250 | 780 | 29,325 | 649 | 26,437 | 585 | 24,675 | 499 | 22,031 | 390 | 20,445 | 320 |
| **0.4** | **0.02** | 4.0 | 0.007 | 29,029 | 642 | 24,150 | 535 | 21,772 | 481 | 20,320 | 411 | 18,143 | 321 | 16,837 | 263 |
| **0.4** | **0.05** | 1.0 | 0.025 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.4** | **0.05** | 1.5 | 0.020 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.4** | **0.05** | 2.0 | 0.016 | 46,080 | 1,115 | 38,300 | 929 | 34,560 | 836 | 32,256 | 714 | 28,800 | 557 | 26,726 | 457 |
| **0.4** | **0.05** | 2.5 | 0.015 | 43,200 | 1,062 | 36,000 | 885 | 32,400 | 796 | 30,600 | 677 | 27,000 | 531 | 25,200 | 434 |
| **0.4** | **0.05** | 3.0 | 0.014 | 35,250 | 780 | 29,325 | 649 | 26,437 | 585 | 24,675 | 499 | 22,031 | 390 | 20,445 | 320 |
| **0.4** | **0.05** | 3.5 | 0.012 | 33,048 | 731 | 27,540 | 609 | 24,786 | 548 | 23,409 | 467 | 20,655 | 365 | 19,278 | 299 |
| **0.4** | **0.05** | 4.0 | 0.008 | 29,029 | 642 | 24,150 | 535 | 21,772 | 481 | 20,320 | 411 | 18,143 | 321 | 16,837 | 263 |
| **0.4** | **0.10** | 1.0 | 0.033 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.4** | **0.10** | 2.0 | 0.028 | 46,080 | 1,115 | 38,300 | 929 | 34,560 | 836 | 32,256 | 714 | 28,800 | 557 | 26,726 | 457 |
| **0.4** | **0.10** | 3.0 | 0.016 | 35,250 | 780 | 29,325 | 649 | 26,437 | 585 | 24,675 | 499 | 22,031 | 390 | 20,445 | 320 |
| **0.4** | **0.10** | 4.0 | 0.010 | 29,029 | 642 | 24,150 | 535 | 21,772 | 481 | 20,320 | 411 | 18,143 | 321 | 16,837 | 263 |
| **0.5** | **0.02** | 1.0 | 0.016 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.5** | **0.02** | 2.0 | 0.013 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.5** | **0.02** | 3.0 | 0.010 | 37,325 | 1,000 | 31,104 | 839 | 27,994 | 750 | 26,438 | 634 | 23,328 | 473 | 21,773 | 381 |
| **0.5** | **0.02** | 4.0 | 0.008 | 33,178 | 889 | 27,648 | 746 | 24,883 | 666 | 23,501 | 563 | 20,736 | 420 | 19,354 | 339 |
| **0.5** | **0.02** | 6.0 | 0.006 | 25,805 | 666 | 21,504 | 555 | 19,354 | 499 | 18,278 | 320 | 16,128 | 282 | 15,053 | 222 |
| **0.5** | **0.05** | 1.0 | 0.030 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.5** | **0.05** | 2.0 | 0.023 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.5** | **0.05** | 3.0 | 0.017 | 37,325 | 1,000 | 31,104 | 839 | 27,994 | 750 | 26,438 | 634 | 23,328 | 473 | 21,773 | 381 |
| **0.5** | **0.05** | 4.0 | 0.017 | 33,178 | 889 | 27,648 | 746 | 24,883 | 666 | 23,501 | 563 | 20,736 | 420 | 19,354 | 339 |
| **0.5** | **0.05** | 5.0 | 0.011 | 29,030 | 778 | 24,192 | 653 | 21,773 | 583 | 20,563 | 493 | 18,144 | 368 | 16,934 | 297 |
| **0.5** | **0.05** | 6.0 | 0.008 | 25,805 | 666 | 21,504 | 555 | 19,354 | 499 | 18,278 | 320 | 16,128 | 282 | 15,053 | 222 |

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.5** | **0.10** | 1 | 0.035 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.5** | **0.10** | 2 | 0.030 | 46,080 | 1,239 | 38,300 | 1,032 | 34,560 | 929 | 32,256 | 793 | 28,800 | 620 | 26,726 | 508 |
| **0.5** | **0.10** | 3 | 0.020 | 37,325 | 1,000 | 31,104 | 839 | 27,994 | 750 | 26,438 | 634 | 23,328 | 473 | 21,773 | 381 |
| **0.5** | **0.10** | 4 | 0.020 | 33,178 | 889 | 27,648 | 746 | 24,883 | 666 | 23,501 | 563 | 20,736 | 420 | 19,354 | 339 |
| **0.5** | **0.10** | 5 | 0.013 | 29,030 | 778 | 24,192 | 653 | 21,773 | 583 | 20,563 | 493 | 18,144 | 368 | 16,934 | 297 |
| **0.5** | **0.10** | 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 |
| **0.6** | **0.02** | 4 | 0.013 | 37,325 | 1,376 | 31,104 | 1,147 | 27,994 | 1,032 | 26,438 | 792 | 23,328 | 591 | 21,773 | 477 |
| **0.6** | **0.02** | 6 | 0.010 | 29,030 | 1,070 | 24,192 | 892 | 21,773 | 803 | 20,563 | 616 | 18,144 | 460 | 16,934 | 371 |
| **0.6** | **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 |
| **0.6** | **0.05** | 4 | 0.019 | 37,325 | 1,376 | 31,104 | 1,147 | 27,994 | 1,032 | 26,438 | 792 | 23,328 | 591 | 21,773 | 477 |
| **0.6** | **0.05** | 6 | 0.012 | 29,030 | 1,070 | 24,192 | 892 | 21,773 | 803 | 20,563 | 616 | 18,144 | 460 | 16,934 | 371 |
| **0.6** | **0.05** | 8 | 0.010 | 27,579 | 1,017 | 22,982 | 847 | 20,684 | 763 | 19,535 | 585 | 17,237 | 437 | 16,088 | 352 |
| **0.6** | **0.05** | 10 | 0.007 | 24,676 | 814 | 20,563 | 678 | 18,507 | 610 | 17,479 | 489 | 15,422 | 355 | 14,394 | 287 |
| **0.6** | **0.10** | 2 | 0.035 | 46,080 | 1,751 | 38,300 | 1,455 | 34,560 | 1,313 | 32,256 | 991 | 28,800 | 774 | 26,726 | 635 |
| **0.6** | **0.10** | 4 | 0.024 | 37,325 | 1,376 | 31,104 | 1,147 | 27,994 | 1,032 | 26,438 | 792 | 23,328 | 591 | 21,773 | 477 |
| **0.6** | **0.10** | 6 | 0.015 | 29,030 | 1,070 | 24,192 | 892 | 21,773 | 803 | 20,563 | 616 | 18,144 | 460 | 16,934 | 371 |
| **0.6** | **0.10** | 8 | 0.013 | 27,579 | 1,017 | 22,982 | 847 | 20,684 | 763 | 19,535 | 585 | 17,237 | 437 | 16,088 | 352 |
| **0.6** | **0.10** | 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** | 4 | 0.024 | 37,325 | 1,376 | 31,104 | 1,147 | 27,994 | 1,032 | 26,438 | 792 | 23,328 | 591 | 21,773 | 477 |
| **0.7** | **0.05** | 6 | 0.015 | 29,030 | 1,070 | 24,192 | 892 | 21,773 | 803 | 20,563 | 616 | 18,144 | 460 | 16,934 | 371 |
| **0.7** | **0.10** | 4 | 0.029 | 37,325 | 1,376 | 31,104 | 1,147 | 27,994 | 1,032 | 26,438 | 792 | 23,328 | 591 | 21,773 | 477 |
| **0.7** | **0.10** | 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** | 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 |
| **0.8** | **0.02** | 6 | 0.013 | 36,720 | 1,218 | 30,600 | 1,015 | 27,540 | 914 | 26,010 | 863 | 22,950 | 677 | 21,420 | 553 |
| **0.8** | **0.05** | 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 |
| **0.8** | **0.05** | 6 | 0.015 | 36,720 | 1,218 | 30,600 | 1,015 | 27,540 | 914 | 26,010 | 863 | 22,950 | 677 | 21,420 | 553 |
| **0.8** | **0.05** | 8 | 0.012 | 29,376 | 906 | 24,480 | 755 | 22,032 | 680 | 20,808 | 642 | 18,360 | 504 | 17,136 | 411 |
| **0.8** | **0.05** | 12 | 0.010 | 26,438 | 759 | 22,032 | 632 | 19,829 | 569 | 18,727 | 537 | 16,524 | 421 | 15,422 | 344 |
| **0.8** | **0.10** | 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 |
| **0.8** | **0.10** | 6 | 0.019 | 36,720 | 1,218 | 30,600 | 1,015 | 27,540 | 914 | 26,010 | 863 | 22,950 | 677 | 21,420 | 553 |
| **0.8** | **0.10** | 8 | 0.015 | 29,376 | 906 | 24,480 | 755 | 22,032 | 680 | 20,808 | 642 | 18,360 | 504 | 17,136 | 411 |
| **0.8** | **0.10** | 12 | 0.012 | 26,438 | 759 | 22,032 | 632 | 19,829 | 569 | 18,727 | 537 | 16,524 | 421 | 15,422 | 344 |
| **0.8** | **0.20** | 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 |
| **0.8** | **0.20** | 6 | 0.032 | 36,720 | 1,218 | 30,600 | 1,015 | 27,540 | 914 | 26,010 | 863 | 22,950 | 677 | 21,420 | 553 |
| **0.8** | **0.20** | 8 | 0.018 | 29,376 | 906 | 24,480 | 755 | 22,032 | 680 | 20,808 | 642 | 18,360 | 504 | 17,136 | 411 |
| **0.8** | **0.20** | 12 | 0.015 | 26,438 | 759 | 22,032 | 632 | 19,829 | 569 | 18,727 | 537 | 16,524 | 421 | 15,422 | 344 |
| **1.0** | **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 |
| **1.0** | **0.02** | 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 |
| **1.0** | **0.02** | 6 | 0.010 | 34,992 | 1,887 | 29,160 | 1,572 | 29,299 | 1,757 | 24,786 | 1,336 | 21,870 | 1,048 | 20,412 | 856 |
| **1.0** | **0.02** | 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 |

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **1** | **0.02** | 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 |
| **1** | **0.02** | 12 | 0.005 | 24,192 | 1,159 | 20,160 | 966 | 20,412 | 1,100 | 17,136 | 719 | 15,120 | 634 | 14,112 | 507 |
| **1** | **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 |
| **1** | **0.05** | 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 |
| **1** | **0.05** | 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 |
| **1** | **0.05** | 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 |
| **1** | **0.05** | 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 |
| **1** | **0.05** | 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 |
| **1** | **0.05** | 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 |
| **1** | **0.05** | 12 | 0.010 | 24,192 | 1,159 | 20,160 | 966 | 18,144 | 870 | 17,136 | 719 | 15,120 | 634 | 14,112 | 507 |
| **1** | **0.05** | 16 | 0.006 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1** | **0.05** | 20 | 0.004 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |
| **1** | **0.10** | 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 |
| **1** | **0.10** | 3 | 0.050 | 47,770 | 2,866 | 39,490 | 2,369 | 35,668 | 2,140 | 33,439 | 1,805 | 29,617 | 1,421 | 27,707 | 1,163 |
| **1** | **0.10** | 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 |
| **1** | **0.10** | 5 | 0.030 | 39,808 | 2,388 | 31,847 | 1,910 | 29,299 | 1,757 | 27,707 | 1,496 | 24,522 | 1,177 | 22,929 | 963 |
| **1** | **0.10** | 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 |
| **1** | **0.10** | 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 |
| **1** | **0.10** | 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 |
| **1** | **0.10** | 12 | 0.015 | 24,192 | 1,159 | 20,160 | 966 | 18,144 | 870 | 17,136 | 719 | 15,120 | 634 | 14,112 | 507 |
| **1** | **0.10** | 16 | 0.009 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1** | **0.10** | 20 | 0.006 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |
| **1** | **0.20** | 2 | 0.110 | 47,770 | 2,866 | 39,490 | 2,369 | 35,668 | 2,140 | 33,439 | 1,805 | 29,617 | 1,421 | 27,707 | 1,163 |
| **1** | **0.20** | 3 | 0.090 | 47,770 | 2,866 | 39,490 | 2,369 | 35,668 | 2,140 | 33,439 | 1,805 | 29,617 | 1,421 | 27,707 | 1,163 |
| **1** | **0.20** | 4 | 0.070 | 43,200 | 2,588 | 36,000 | 2,157 | 32,400 | 1,941 | 30,600 | 1,650 | 27,000 | 1,294 | 25,200 | 1,057 |
| **1** | **0.20** | 5 | 0.050 | 39,808 | 2,388 | 31,847 | 1,910 | 29,299 | 1,757 | 27,707 | 1,496 | 24,522 | 1,177 | 22,929 | 963 |
| **1** | **0.20** | 6 | 0.040 | 34,992 | 1,887 | 29,160 | 1,572 | 26,244 | 1,415 | 24,786 | 1,336 | 21,870 | 1,048 | 20,412 | 856 |
| **1** | **0.20** | 8 | 0.040 | 31,104 | 1,677 | 25,920 | 1,397 | 23,328 | 1,258 | 22,032 | 1,188 | 19,440 | 932 | 18,144 | 761 |
| **1** | **0.20** | 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 |
| **1** | **0.20** | 12 | 0.025 | 24,192 | 1,159 | 20,160 | 966 | 18,144 | 870 | 17,136 | 719 | 15,120 | 634 | 14,112 | 507 |
| **1** | **0.20** | 16 | 0.015 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1** | **0.20** | 20 | 0.010 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |
| **1** | **0.30** | 2 | 0.110 | 47,770 | 2,866 | 39,490 | 2,369 | 35,668 | 2,140 | 33,439 | 1,805 | 29,617 | 1,421 | 27,707 | 1,163 |
| **1** | **0.30** | 3 | 0.090 | 47,770 | 2,866 | 39,490 | 2,369 | 35,668 | 2,140 | 33,439 | 1,805 | 29,617 | 1,421 | 27,707 | 1,163 |
| **1** | **0.30** | 4 | 0.070 | 43,200 | 2,588 | 36,000 | 2,157 | 32,400 | 1,941 | 30,600 | 1,650 | 27,000 | 1,294 | 25,200 | 1,057 |
| **1** | **0.30** | 5 | 0.050 | 39,808 | 2,388 | 31,847 | 1,910 | 29,299 | 1,757 | 27,707 | 1,496 | 24,522 | 1,177 | 22,929 | 963 |
| **1** | **0.30** | 6 | 0.040 | 34,992 | 1,887 | 29,160 | 1,572 | 26,244 | 1,415 | 24,786 | 1,336 | 21,870 | 1,048 | 20,412 | 856 |
| **1** | **0.30** | 8 | 0.040 | 31,104 | 1,677 | 25,920 | 1,397 | 23,328 | 1,258 | 22,032 | 1,188 | 19,440 | 932 | 18,144 | 761 |
| **1** | **0.30** | 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 |
| **1** | **0.30** | 12 | 0.025 | 24,192 | 1,159 | 20,160 | 966 | 18,144 | 870 | 17,136 | 719 | 15,120 | 634 | 14,112 | 507 |
| **1** | **0.30** | 16 | 0.015 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1** | **0.30** | 20 | 0.010 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **1.25** | **0.1** | 5 | 0.030 | 39,808 | 2,388 | 31,847 | 1,910 | 29,299 | 1,757 | 27,707 | 1,496 | 24,522 | 1,177 | 22,929 | 963 |
| **1.25** | **0.1** | 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 |
| **1.25** | **0.1** | 15 | 0.010 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1.25** | **0.1** | 20 | 0.006 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |
| **1.25** | **0.2** | 5 | 0.050 | 39,808 | 2,388 | 31,847 | 1,910 | 29,299 | 1,757 | 27,707 | 1,496 | 24,522 | 1,177 | 22,929 | 963 |
| **1.25** | **0.2** | 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 |
| **1.25** | **0.2** | 15 | 0.016 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1.25** | **0.2** | 20 | 0.010 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |
| **1.25** | **0.3** | 5 | 0.050 | 39,808 | 2,388 | 31,847 | 1,910 | 29,299 | 1,757 | 27,707 | 1,496 | 24,522 | 1,177 | 22,929 | 963 |
| **1.25** | **0.3** | 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 |
| **1.25** | **0.3** | 15 | 0.016 | 24,192 | 1,014 | 20,160 | 845 | 18,144 | 761 | 17,136 | 667 | 15,120 | 543 | 14,112 | 423 |
| **1.25** | **0.3** | 20 | 0.010 | 18,144 | 761 | 15,120 | 634 | 13,608 | 571 | 12,852 | 500 | 11,340 | 408 | 10,584 | 317 |
| **1.50** | **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 |
| **1.50** | **0.1** | 6 | 0.040 | 31,847 | 2,057 | 26,539 | 1,714 | 23,779 | 1,536 | 22,505 | 1,332 | 19,957 | 1,033 | 18,471 | 845 |
| **1.50** | **0.1** | 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 |
| **1.50** | **0.1** | 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 |
| **1.50** | **0.1** | 15 | 0.023 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.50** | **0.1** | 20 | 0.018 | 18,816 | 978 | 15,680 | 815 | 14,112 | 733 | 13,328 | 613 | 11,760 | 540 | 10,976 | 428 |
| **1.50** | **0.2** | 4 | 0.070 | 33,264 | 2,153 | 27,700 | 1,793 | 24,948 | 1,614 | 23,285 | 1,378 | 20,790 | 1,076 | 19,293 | 883 |
| **1.50** | **0.2** | 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 |
| **1.50** | **0.2** | 8 | 0.060 | 30,240 | 1,956 | 25,200 | 1,630 | 22,680 | 1,467 | 21,420 | 1,268 | 18,900 | 979 | 17,640 | 807 |
| **1.50** | **0.2** | 12 | 0.060 | 24,192 | 1,565 | 20,160 | 1,304 | 18,144 | 1,174 | 17,136 | 1,014 | 15,120 | 783 | 14,112 | 646 |
| **1.50** | **0.2** | 15 | 0.038 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.50** | **0.2** | 20 | 0.030 | 18,816 | 978 | 15,680 | 815 | 14,112 | 733 | 13,328 | 613 | 11,760 | 540 | 10,976 | 428 |
| **1.50** | **0.3** | 4 | 0.070 | 33,264 | 2,153 | 27,700 | 1,793 | 24,948 | 1,614 | 23,285 | 1,378 | 20,790 | 1,076 | 19,293 | 883 |
| **1.50** | **0.3** | 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 |
| **1.50** | **0.3** | 8 | 0.060 | 30,240 | 1,956 | 25,200 | 1,630 | 22,680 | 1,467 | 21,420 | 1,268 | 18,900 | 979 | 17,640 | 807 |
| **1.50** | **0.3** | 12 | 0.060 | 24,192 | 1,565 | 20,160 | 1,304 | 18,144 | 1,174 | 17,136 | 1,014 | 15,120 | 783 | 14,112 | 646 |
| **1.50** | **0.3** | 15 | 0.038 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.50** | **0.3** | 20 | 0.030 | 18,816 | 978 | 15,680 | 815 | 14,112 | 733 | 13,328 | 613 | 11,760 | 540 | 10,976 | 428 |
| **1.50** | **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 |
| **1.50** | **0.5** | 6 | 0.080 | 31,847 | 2,057 | 26,539 | 1,714 | 23,779 | 1,536 | 22,505 | 1,332 | 19,957 | 1,033 | 18,471 | 845 |
| **1.50** | **0.5** | 8 | 0.070 | 30,240 | 1,956 | 25,200 | 1,630 | 22,680 | 1,467 | 21,420 | 1,268 | 18,900 | 979 | 17,640 | 807 |
| **1.50** | **0.5** | 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 |
| **1.50** | **0.5** | 15 | 0.045 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.50** | **0.5** | 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 | 0.040 | 31,847 | 2,057 | 26,539 | 1,714 | 23,779 | 1,536 | 22,505 | 1,332 | 19,957 | 1,033 | 18,471 | 845 |
| **1.75** | **0.1** | 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 |
| **1.75** | **0.1** | 15 | 0.023 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.75** | **0.1** | 20 | 0.018 | 18,816 | 978 | 15,680 | 815 | 14,112 | 733 | 13,328 | 613 | 11,760 | 540 | 10,976 | 428 |
| **1.75** | **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 |
| **1.75** | **0.2** | 10 | 0.060 | 24,192 | 1,565 | 20,160 | 1,304 | 18,144 | 1,174 | 17,136 | 1,014 | 15,120 | 783 | 14,112 | 646 |

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **1.75** | **0.2** | 15 | 0.038 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.75** | **0.2** | 20 | 0.030 | 18,816 | 978 | 15,680 | 815 | 14,112 | 733 | 13,328 | 613 | 11,760 | 540 | 10,976 | 428 |
| **1.75** | **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 |
| **1.75** | **0.3** | 10 | 0.060 | 24,192 | 1,565 | 20,160 | 1,304 | 18,144 | 1,174 | 17,136 | 1,014 | 15,120 | 783 | 14,112 | 646 |
| **1.75** | **0.3** | 15 | 0.038 | 18,816 | 1,082 | 15,680 | 902 | 14,112 | 812 | 13,328 | 671 | 11,760 | 592 | 10,976 | 473 |
| **1.75** | **0.3** | 20 | 0.030 | 18,816 | 978 | 15,680 | 815 | 14,112 | 733 | 13,328 | 613 | 11,760 | 540 | 10,976 | 428 |
| **1.75** | **0.1** | 4 | 0.080 | 28,662 | 3,221 | 24,203 | 2,720 | 21,815 | 2,452 | 20,541 | 2,308 | 18,152 | 1,630 | 17,038 | 1,339 |
| **1.75** | **0.1** | 6 | 0.070 | 27,720 | 3,114 | 23,100 | 2,595 | 20,790 | 2,335 | 19,635 | 2,205 | 17,325 | 1,557 | 16,170 | 1,271 |
| **1.75** | **0.1** | 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 |
| **1.75** | **0.1** | 12 | 0.030 | 20,412 | 2,063 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **1.75** | **0.1** | 16 | 0.030 | 18,144 | 1,834 | 15,120 | 1,528 | 13,608 | 1,376 | 12,852 | 1,299 | 11,340 | 1,019 | 10,584 | 832 |
| **1.75** | **0.1** | 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 |
| **1.75** | **0.1** | 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 |
| **1.75** | **0.1** | 30 | 0.010 | 15,082 | 1,525 | 12,569 | 1,271 | 11,312 | 1,143 | 10,683 | 1,080 | 9,426 | 761 | 8,798 | 621 |
| **2.00** | **0.2** | 4 | 0.100 | 28,662 | 3,221 | 24,203 | 2,720 | 21,815 | 2,452 | 20,541 | 2,308 | 18,152 | 1,630 | 17,038 | 1,339 |
| **2.00** | **0.2** | 6 | 0.080 | 27,720 | 3,114 | 23,100 | 2,595 | 20,790 | 2,335 | 19,635 | 2,205 | 17,325 | 1,557 | 16,170 | 1,271 |
| **2.00** | **0.2** | 8 | 0.070 | 25,200 | 2,830 | 21,000 | 2,359 | 18,900 | 2,123 | 17,850 | 2,005 | 15,750 | 1,415 | 14,700 | 1,156 |
| **2.00** | **0.2** | 12 | 0.040 | 20,412 | 2,063 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.00** | **0.2** | 16 | 0.040 | 18,144 | 1,834 | 15,120 | 1,528 | 13,608 | 1,376 | 12,852 | 1,299 | 11,340 | 1,019 | 10,584 | 832 |
| **2.00** | **0.2** | 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 |
| **2.00** | **0.2** | 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 |
| **2.00** | **0.2** | 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 |
| **2.00** | **0.3** | 4 | 0.130 | 28,662 | 3,221 | 24,203 | 2,720 | 21,815 | 2,452 | 20,541 | 2,308 | 18,152 | 1,630 | 17,038 | 1,339 |
| **2.00** | **0.3** | 6 | 0.110 | 27,720 | 3,114 | 23,100 | 2,595 | 20,790 | 2,335 | 19,635 | 2,205 | 17,325 | 1,557 | 16,170 | 1,271 |
| **2.00** | **0.3** | 8 | 0.090 | 25,200 | 2,830 | 21,000 | 2,359 | 18,900 | 2,123 | 17,850 | 2,005 | 15,750 | 1,415 | 14,700 | 1,156 |
| **2.00** | **0.3** | 12 | 0.060 | 20,412 | 2,063 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.00** | **0.3** | 16 | 0.060 | 18,144 | 1,834 | 15,120 | 1,528 | 13,608 | 1,376 | 12,852 | 1,299 | 11,340 | 1,019 | 10,584 | 832 |
| **2.00** | **0.3** | 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 |
| **2.00** | **0.3** | 25 | 0.030 | 15,876 | 1,605 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.00** | **0.3** | 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 |
| **2.00** | **0.5** | 6 | 0.170 | 27,720 | 3,114 | 23,100 | 2,595 | 20,790 | 2,335 | 19,635 | 2,205 | 17,325 | 1,557 | 16,170 | 1,271 |
| **2.00** | **0.5** | 8 | 0.140 | 25,200 | 2,830 | 21,000 | 2,359 | 18,900 | 2,123 | 17,850 | 2,005 | 15,750 | 1,415 | 14,700 | 1,156 |
| **2.00** | **0.5** | 12 | 0.080 | 20,412 | 2,063 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.00** | **0.5** | 16 | 0.080 | 18,144 | 1,834 | 15,120 | 1,528 | 13,608 | 1,376 | 12,852 | 1,299 | 11,340 | 1,019 | 10,584 | 832 |
| **2.00** | **0.5** | 20 | 0.050 | 15,876 | 1,605 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.00** | **0.5** | 25 | 0.050 | 15,876 | 1,605 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.00** | **0.5** | 30 | 0.030 | 15,082 | 1,525 | 12,569 | 1,271 | 11,312 | 1,143 | 10,683 | 1,080 | 9,426 | 761 | 8,798 | 621 |
| **2.00** | **0.8** | 6 | 0.220 | 27,720 | 3,114 | 23,100 | 2,595 | 20,790 | 2,335 | 19,635 | 2,205 | 17,325 | 1,557 | 16,170 | 1,271 |
| **2.00** | **0.8** | 8 | 0.200 | 25,200 | 2,830 | 21,000 | 2,359 | 18,900 | 2,123 | 17,850 | 2,005 | 15,750 | 1,415 | 14,700 | 1,156 |
| **2.00** | **0.8** | 12 | 0.130 | 20,412 | 2,063 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.00** | **0.8** | 16 | 0.100 | 18,144 | 1,834 | 15,120 | 1,528 | 13,608 | 1,376 | 12,852 | 1,299 | 11,340 | 1,019 | 10,584 | 832 |
| **2.00** | **0.8** | 20 | 0.060 | 15,876 | 1,605 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **2.0** | **0.8** | 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 |
| **2.0** | **0.8** | 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 |
| **2.5** | **0.1** | 10 | 0.050 | 20,412 | 2,293 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.5** | **0.1** | 20 | 0.030 | 15,876 | 1,783 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.5** | **0.1** | 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 |
| **2.5** | **0.2** | 10 | 0.070 | 20,412 | 2,293 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.5** | **0.2** | 20 | 0.040 | 15,876 | 1,783 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.5** | **0.2** | 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 |
| **2.5** | **0.3** | 10 | 0.090 | 20,412 | 2,293 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.5** | **0.3** | 20 | 0.060 | 15,876 | 1,783 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.5** | **0.3** | 30 | 0.030 | 15,082 | 1,525 | 12,569 | 1,271 | 11,312 | 1,143 | 10,683 | 1,080 | 9,426 | 761 | 8,798 | 621 |
| **2.5** | **0.5** | 10 | 0.120 | 20,412 | 2,293 | 17,010 | 1,720 | 15,309 | 1,548 | 14,459 | 1,462 | 12,758 | 1,146 | 11,907 | 936 |
| **2.5** | **0.5** | 20 | 0.080 | 15,876 | 1,783 | 13,230 | 1,337 | 11,907 | 1,204 | 11,246 | 1,137 | 9,923 | 801 | 9,261 | 653 |
| **2.5** | **0.5** | 30 | 0.050 | 15,082 | 1,525 | 12,569 | 1,271 | 11,312 | 1,143 | 10,683 | 1,080 | 9,426 | 761 | 8,798 | 621 |
| **3.0** | **0.1** | 6 | 0.080 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.1** | 8 | 0.070 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.1** | 12 | 0.050 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.1** | 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 |
| **3.0** | **0.1** | 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 |
| **3.0** | **0.1** | 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 |
| **3.0** | **0.1** | 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 |
| **3.0** | **0.1** | 35 | 0.020 | 12,096 | 1,524 | 10,080 | 1,270 | 9,072 | 1,143 | 8,568 | 1,079 | 7,560 | 771 | 7,056 | 621 |
| **3.0** | **0.2** | 6 | 0.100 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.2** | 8 | 0.090 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.2** | 12 | 0.070 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.2** | 16 | 0.050 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.2** | 18 | 0.050 | 16,985 | 2,384 | 14,331 | 2,012 | 12,738 | 1,788 | 12,208 | 1,714 | 10,615 | 1,193 | 10,084 | 992 |
| **3.0** | **0.2** | 20 | 0.050 | 15,552 | 2,184 | 12,960 | 1,820 | 11,664 | 1,638 | 11,016 | 1,547 | 9,720 | 1,092 | 9,072 | 892 |
| **3.0** | **0.2** | 30 | 0.040 | 12,096 | 1,524 | 10,080 | 1,270 | 9,072 | 1,143 | 8,568 | 1,079 | 7,560 | 771 | 7,056 | 621 |
| **3.0** | **0.2** | 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 |
| **3.0** | **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 |
| **3.0** | **0.3** | 8 | 0.130 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.3** | 12 | 0.100 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.3** | 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 |
| **3.0** | **0.3** | 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 |
| **3.0** | **0.3** | 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 |
| **3.0** | **0.3** | 30 | 0.060 | 12,096 | 1,524 | 10,080 | 1,270 | 9,072 | 1,143 | 8,568 | 1,079 | 7,560 | 771 | 7,056 | 621 |
| **3.0** | **0.3** | 35 | 0.050 | 12,096 | 1,524 | 10,080 | 1,270 | 9,072 | 1,143 | 8,568 | 1,079 | 7,560 | 771 | 7,056 | 621 |
| **3.0** | **0.5** | 8 | 0.180 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.5** | 12 | 0.130 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.5** | 16 | 0.100 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3.0** | **0.5** | 18 | 0.100 | 16,985 | 2,384 | 14,331 | 2,012 | 12,738 | 1,788 | 13,600 | 1,909 | 10,615 | 1,193 | 10,084 | 992 |

# EPDRE

**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **3** | **0.5** | 20 | 0.100 | 15,552 | 2,184 | 12,960 | 1,820 | 11,664 | 1,638 | 11,016 | 1,547 | 9,720 | 1,092 | 9,072 | 892 |
| **3** | **0.5** | 30 | 0.080 | 12,096 | 1,524 | 10,080 | 1,270 | 9,072 | 1,143 | 8,568 | 1,079 | 7,560 | 771 | 7,056 | 621 |
| **3** | **0.5** | 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 |
| **3** | **1.0** | 8 | 0.200 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3** | **1.0** | 12 | 0.150 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3** | **1.0** | 16 | 0.120 | 19,200 | 2,696 | 16,000 | 2,246 | 14,400 | 2,022 | 13,600 | 1,909 | 12,000 | 1,348 | 11,200 | 1,101 |
| **3** | **1.0** | 18 | 0.110 | 16,985 | 2,384 | 14,331 | 2,012 | 12,738 | 1,788 | 13,600 | 1,909 | 10,615 | 1,193 | 10,084 | 992 |
| **3** | **1.0** | 20 | 0.110 | 15,552 | 2,184 | 12,960 | 1,820 | 11,664 | 1,638 | 11,016 | 1,547 | 9,720 | 1,092 | 9,072 | 892 |
| **3** | **1.0** | 30 | 0.090 | 12,096 | 1,524 | 10,080 | 1,270 | 9,072 | 1,143 | 8,568 | 1,079 | 7,560 | 771 | 7,056 | 621 |
| **3** | **1.0** | 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 | 0.080 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **0.1** | 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 |
| **4** | **0.1** | 16 | 0.060 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.1** | 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 |
| **4** | **0.1** | 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 |
| **4** | **0.1** | 35 | 0.040 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.1** | 45 | 0.030 | 8,789 | 1,100 | 7,324 | 917 | 6,592 | 825 | 6,226 | 780 | 5,494 | 554 | 5,127 | 446 |
| **4** | **0.2** | 8 | 0.160 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **0.2** | 12 | 0.140 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **0.2** | 16 | 0.130 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.2** | 20 | 0.110 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.2** | 30 | 0.100 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.2** | 35 | 0.080 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.2** | 45 | 0.060 | 8,789 | 1,100 | 7,324 | 917 | 6,592 | 825 | 6,226 | 780 | 5,494 | 554 | 5,127 | 446 |
| **4** | **0.3** | 8 | 0.240 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **0.3** | 12 | 0.220 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **0.3** | 16 | 0.200 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.3** | 20 | 0.180 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.3** | 30 | 0.160 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.3** | 35 | 0.140 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.3** | 45 | 0.120 | 8,789 | 1,100 | 7,324 | 917 | 6,592 | 825 | 6,226 | 780 | 5,494 | 554 | 5,127 | 446 |
| **4** | **0.5** | 12 | 0.350 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **0.5** | 16 | 0.250 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.5** | 20 | 0.200 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **0.5** | 30 | 0.150 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.5** | 35 | 0.100 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **0.5** | 45 | 0.050 | 8,789 | 1,100 | 7,324 | 917 | 6,592 | 825 | 6,226 | 780 | 5,494 | 554 | 5,127 | 446 |
| **4** | **1.0** | 12 | 0.400 | 16,560 | 2,880 | 13,800 | 2,400 | 12,420 | 2,160 | 11,730 | 2,040 | 10,350 | 1,440 | 9,660 | 1,176 |
| **4** | **1.0** | 16 | 0.290 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **1.0** | 20 | 0.230 | 13,733 | 2,388 | 11,445 | 1,990 | 10,071 | 1,751 | 9,613 | 1,671 | 8,240 | 1,146 | 7,782 | 947 |
| **4** | **1.0** | 30 | 0.170 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **1.0** | 35 | 0.120 | 10,985 | 1,719 | 9,154 | 1,433 | 8,239 | 1,290 | 7,781 | 1,218 | 6,866 | 860 | 6,408 | 702 |
| **4** | **1.0** | 45 | 0.060 | 8,789 | 1,100 | 7,324 | 917 | 6,592 | 825 | 6,226 | 780 | 5,494 | 554 | 5,127 | 446 |

# EPDRE

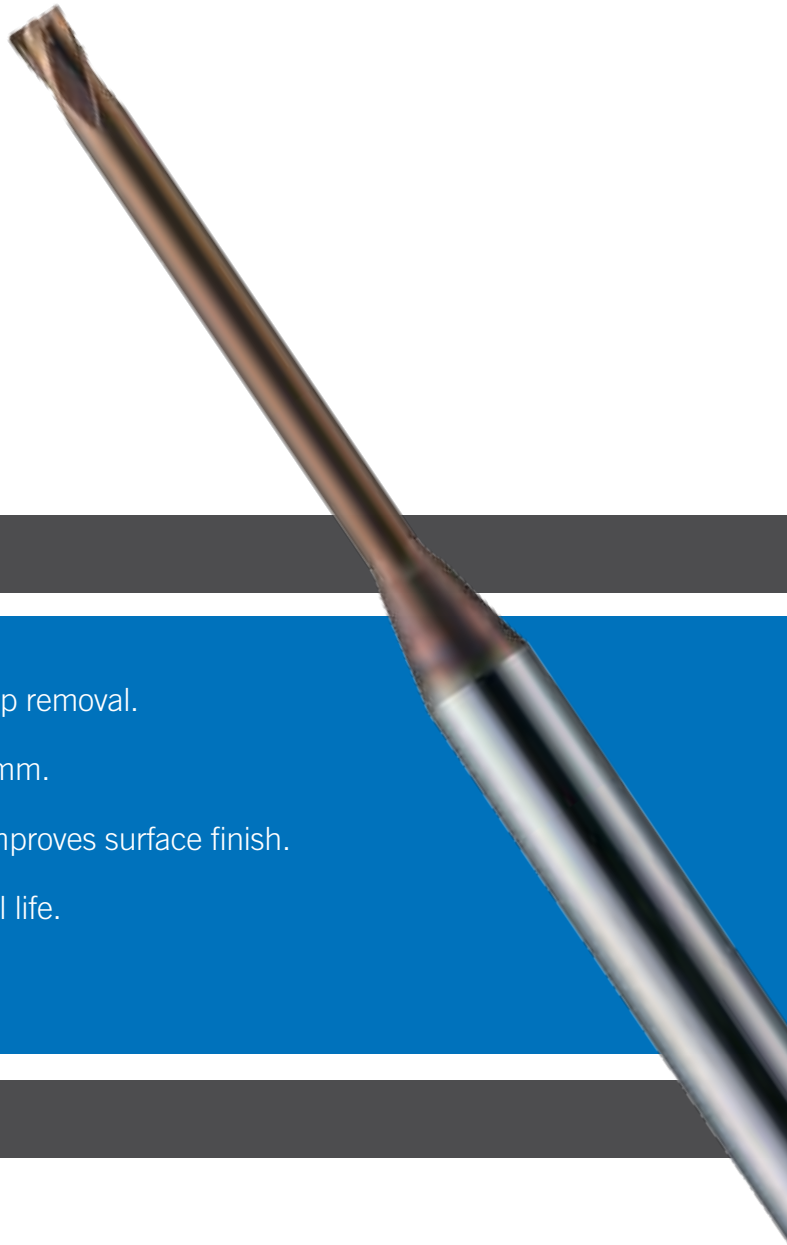
**EPDRE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **5** | **0.1** | 20 | 0.080 | 13,179 | 2,865 | 10,983 | 2,388 | 9,884 | 2,149 | 9,336 | 2,029 | 8,237 | 1,433 | 7,688 | 1,170 |
| **5** | **0.1** | 40 | 0.060 | 11,868 | 2,312 | 9,890 | 1,926 | 8,901 | 1,734 | 8,407 | 1,637 | 7,418 | 1,156 | 6,923 | 944 |
| **5** | **0.2** | 20 | 0.160 | 13,179 | 2,865 | 10,983 | 2,388 | 9,884 | 2,149 | 9,336 | 2,029 | 8,237 | 1,433 | 7,688 | 1,170 |
| **5** | **0.2** | 40 | 0.130 | 11,868 | 2,312 | 9,890 | 1,926 | 8,901 | 1,734 | 8,407 | 1,637 | 7,418 | 1,156 | 6,923 | 944 |
| **5** | **0.3** | 20 | 0.240 | 13,179 | 2,865 | 10,983 | 2,388 | 9,884 | 2,149 | 9,336 | 2,029 | 8,237 | 1,433 | 7,688 | 1,170 |
| **5** | **0.3** | 40 | 0.200 | 11,868 | 2,312 | 9,890 | 1,926 | 8,901 | 1,734 | 8,407 | 1,637 | 7,418 | 1,156 | 6,923 | 944 |
| **5** | **0.5** | 20 | 0.350 | 13,179 | 2,865 | 10,983 | 2,388 | 9,884 | 2,149 | 9,336 | 2,029 | 8,237 | 1,433 | 7,688 | 1,170 |
| **5** | **0.5** | 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 |
| **5** | **1.0** | 20 | 0.400 | 13,179 | 2,865 | 10,983 | 2,388 | 9,884 | 2,149 | 9,336 | 2,029 | 8,237 | 1,433 | 7,688 | 1,170 |
| **5** | **1.0** | 40 | 0.150 | 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 | 0.080 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.1** | 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 |
| **6** | **0.1** | 24 | 0.060 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.1** | 35 | 0.050 | 9,881 | 2,320 | 8,234 | 1,933 | 7,411 | 1,740 | 6,999 | 1,643 | 6,176 | 1,160 | 5,764 | 947 |
| **6** | **0.1** | 55 | 0.040 | 7,687 | 1,805 | 6,406 | 1,504 | 5,765 | 1,354 | 5,445 | 1,278 | 4,805 | 902 | 4,484 | 737 |
| **6** | **0.2** | 12 | 0.160 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.2** | 18 | 0.140 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.2** | 24 | 0.130 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.2** | 35 | 0.110 | 9,881 | 2,320 | 8,234 | 1,933 | 7,411 | 1,740 | 6,999 | 1,643 | 6,176 | 1,160 | 5,764 | 947 |
| **6** | **0.2** | 55 | 0.080 | 7,687 | 1,805 | 6,406 | 1,504 | 5,765 | 1,354 | 5,445 | 1,278 | 4,805 | 902 | 4,484 | 737 |
| **6** | **0.3** | 12 | 0.240 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.3** | 18 | 0.220 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.3** | 24 | 0.200 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.3** | 35 | 0.180 | 9,881 | 2,320 | 8,234 | 1,933 | 7,411 | 1,740 | 6,999 | 1,643 | 6,176 | 1,160 | 5,764 | 947 |
| **6** | **0.3** | 55 | 0.140 | 7,687 | 1,805 | 6,406 | 1,504 | 5,765 | 1,354 | 5,445 | 1,278 | 4,805 | 902 | 4,484 | 737 |
| **6** | **0.5** | 18 | 0.350 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.5** | 24 | 0.290 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **0.5** | 35 | 0.240 | 9,881 | 2,320 | 8,234 | 1,933 | 7,411 | 1,740 | 6,999 | 1,643 | 6,176 | 1,160 | 5,764 | 947 |
| **6** | **0.5** | 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 |
| **6** | **1.0** | 18 | 0.400 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **1.0** | 24 | 0.350 | 10,985 | 2,866 | 9,154 | 2,388 | 8,239 | 2,149 | 7,781 | 2,030 | 6,866 | 1,433 | 6,408 | 1,170 |
| **6** | **1.0** | 35 | 0.280 | 9,881 | 2,320 | 8,234 | 1,933 | 7,411 | 1,740 | 6,999 | 1,643 | 6,176 | 1,160 | 5,764 | 947 |
| **6** | **1.0** | 55 | 0.200 | 7,687 | 1,805 | 6,406 | 1,504 | 5,765 | 1,354 | 5,445 | 1,278 | 4,805 | 902 | 4,484 | 737 |

# EPDRF

## High-Precision Four Flute Corner Radius End Mills for Deep Machining



## FEATURES

Flute shape provides both rigidity and excellent chip removal.

Unprecedented corner radius accuracy of ±0.005mm.

Bottom flute wiper effect reduces chattering and improves surface finish.

TH Coating provides cutting efficiency and long tool life.

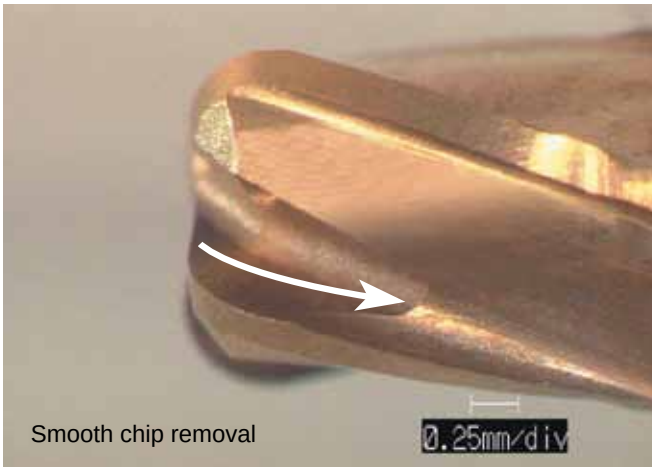
# EPDRF

## INTRODUCTION

Our EPDRF Corner Radius Deep End Mills are designed to deep machine flat surfaces in hardened steels while providing excellent surface finish. The new flute geometry is designed for excellent chip removal and high rigidity, while the bottom flute wiper blade improves the surface roughness of the finished part. Hitachi Tool's own PVD nano-technology TH Coating leads to unprecedented heat resistance and longer tool life.

## FEATURES

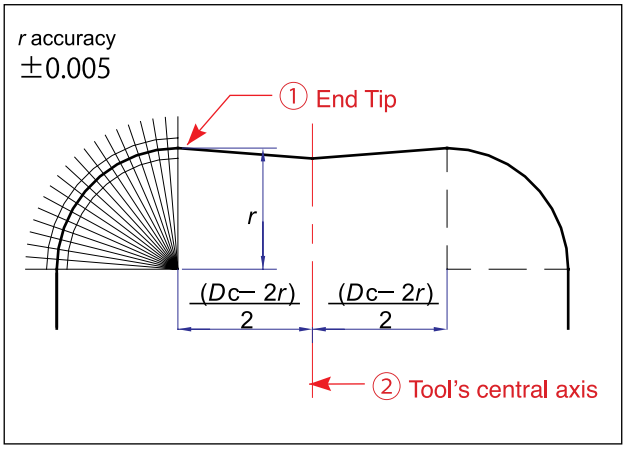
### 1. New Flute Geometry Provides Excellent Chip Removal And High Rigidity




By using a flute shape with both good chip removal characteristics and rigidity, highly efficient deep machining can be performed. Chip jamming is prevented and chattering is suppressed, contributing to a smooth machined surface.

### 2. Unprecedented High Corner Radius Accuracy

Corner R accuracy guaranteed with tool center as reference point. Enables more accurate finishing when finishing molds.

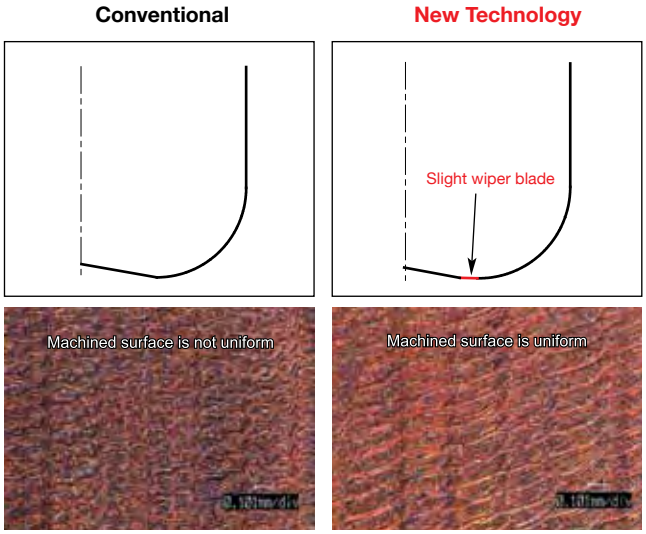



Accuracy basis

① End Tip ② Tool's central axis

Like ball end mills, corner radius accuracy is kept to within ±0.005mm relative to the tool's central axis, achieving a high corner radius accuracy. This enables high-accuracy finish machining to be performed, something which has been difficult to do with previous corner radius end mills.

## 3. Bottom Flute Wiper Effect




By designing the bottom blade to have a slight wiper blade, it's possible to machine an excellent surface finish of the bottom surface even during high-efficiency machining. Particularly for tools with long below-the-neck lengths (for which chattering is likely to occur), good surface roughness can be achieved for bottom finish machining, such as for deep rib grooves, etc.

**Cutting data**

**Tool size:** ϕ2×r 0.5×20 (under neck length)
**Work piece:** Pre-harden steel (38HRC)
n=12,700min$^{-1}$ vf=1778mm/min fz=0.035mm/tooth
ap=0.05mm ae=0.5mm Wet

## 4. Backdraft Shape

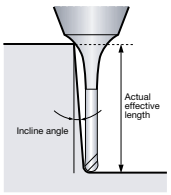
**Reliable backdraft shape**

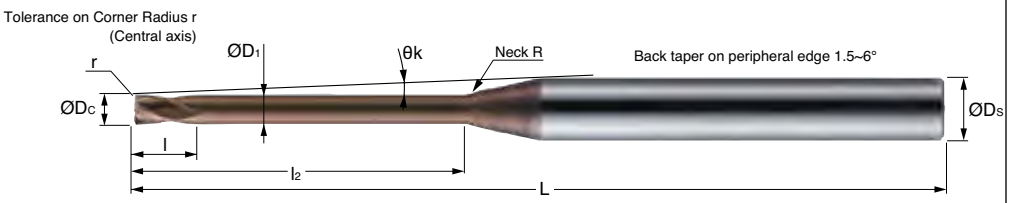
Note: Mill diameter: 3mm or less

By employing the backdraft shape that has provided good results for Epoch Deep series, chattering vibrations are suppressed even when machining deep areas, so that a good machined surface can be achieved.

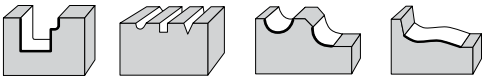
# EPDRF

Advanced Engineering







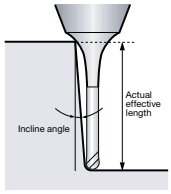
| | | | |
|---|---|---|---|
| Helix Angle | 20° | d | h5 |
| r | ±0.005 | Dc | 0/-0.1 |

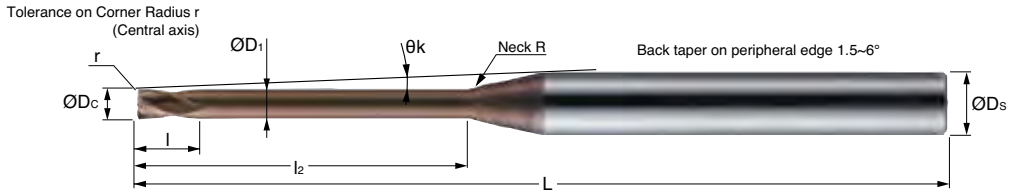
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRF4010-4-005-TH | ● | 1.0 | 0.05 | 4 | 0.8 | 0.94 | 50 | 4 | 4 | 7.67 | 4.75 | 4.95 | 5.13 | 5.28 | 5.56 |
| EPDRF4010-6-005-TH | ● | 1.0 | 0.05 | 6 | 0.8 | 0.94 | 50 | 4 | 4 | 6.51 | 6.84 | 7.09 | 7.30 | 7.49 | 8.13 |
| EPDRF4010-8-005-TH | □ | 1.0 | 0.05 | 8 | 0.8 | 0.94 | 50 | 4 | 4 | 5.66 | 8.92 | 9.21 | 9.46 | 9.73 | 10.78 |
| EPDRF4010-10-005-TH | □ | 1.0 | 0.05 | 10 | 0.8 | 0.94 | 50 | 4 | 4 | 5 | 10.99 | 11.32 | 11.59 | 12.12 | 13.44 |
| EPDRF4010-12-005-TH | □ | 1.0 | 0.05 | 12 | 0.8 | 0.94 | 60 | 4 | 4 | 4.48 | 13.06 | 13.42 | 13.84 | 14.51 | 16.09 |
| EPDRF4010-16-005-TH | □ | 1.0 | 0.05 | 16 | 0.8 | 0.94 | 60 | 4 | 4 | 3.71 | 17.18 | 17.60 | 18.40 | 19.30 | 21.40 |
| EPDRF4010-20-005-TH | □ | 1.0 | 0.05 | 20 | 0.8 | 0.94 | 60 | 4 | 4 | 3.17 | 21.29 | 21.93 | 22.96 | 24.09 | 26.71 |
| EPDRF4010-4-01-TH | ● | 1.0 | 0.10 | 4 | 0.8 | 0.94 | 50 | 4 | 4 | 7.7 | 4.74 | 4.95 | 5.12 | 5.28 | 5.55 |
| EPDRF4010-6-01-TH | ● | 1.0 | 0.10 | 6 | 0.8 | 0.94 | 50 | 4 | 4 | 6.54 | 6.83 | 7.09 | 7.30 | 7.49 | 8.11 |
| EPDRF4010-8-01-TH | □ | 1.0 | 0.10 | 8 | 0.8 | 0.94 | 50 | 4 | 4 | 5.68 | 8.91 | 9.21 | 9.45 | 9.72 | 10.77 |
| EPDRF4010-10-01-TH | □ | 1.0 | 0.10 | 10 | 0.8 | 0.94 | 50 | 4 | 4 | 5.02 | 10.99 | 11.32 | 11.59 | 12.11 | 13.42 |
| EPDRF4010-12-01-TH | □ | 1.0 | 0.10 | 12 | 0.8 | 0.94 | 60 | 4 | 4 | 4.5 | 13.06 | 13.42 | 13.83 | 14.50 | 16.08 |
| EPDRF4010-16-01-TH | □ | 1.0 | 0.10 | 16 | 0.8 | 0.94 | 60 | 4 | 4 | 3.72 | 17.18 | 17.60 | 18.39 | 19.29 | 21.39 |
| EPDRF4010-20-01-TH | □ | 1.0 | 0.10 | 20 | 0.8 | 0.94 | 60 | 4 | 4 | 3.17 | 21.29 | 21.93 | 22.95 | 24.08 | 26.70 |
| EPDRF4015-4-005-TH | ● | 1.5 | 0.05 | 4 | 1.35 | 1.42 | 50 | 4 | 4 | 7.12 | 4.80 | 4.99 | 5.16 | 5.31 | 5.59 |
| EPDRF4015-8-005-TH | ● | 1.5 | 0.05 | 8 | 1.35 | 1.42 | 50 | 4 | 4 | 5.1 | 8.96 | 9.25 | 9.48 | 9.78 | 10.85 |
| EPDRF4015-12-005-TH | □ | 1.5 | 0.05 | 12 | 1.35 | 1.42 | 60 | 4 | 4 | 3.97 | 13.09 | 13.45 | 13.89 | 14.57 | 16.16 |
| EPDRF4015-15-005-TH | □ | 1.5 | 0.05 | 15 | 1.35 | 1.42 | 60 | 4 | 4 | 3.41 | 16.18 | 16.58 | 17.31 | 18.16 | 20.14 |
| EPDRF4015-20-005-TH | □ | 1.5 | 0.05 | 20 | 1.35 | 1.42 | 60 | 4 | 4 | 2.76 | 21.32 | 21.98 | 23.01 | 24.14 | – |
| EPDRF4015-4-01-TH | ● | 1.5 | 0.10 | 4 | 1.35 | 1.42 | 50 | 4 | 4 | 7.15 | 4.80 | 4.99 | 5.16 | 5.31 | 5.58 |
| EPDRF4015-8-01-TH | ● | 1.5 | 0.10 | 8 | 1.35 | 1.42 | 50 | 4 | 4 | 5.12 | 8.96 | 9.24 | 9.48 | 9.77 | 10.83 |
| EPDRF4015-12-01-TH | □ | 1.5 | 0.10 | 12 | 1.35 | 1.42 | 60 | 4 | 4 | 3.98 | 13.09 | 13.45 | 13.88 | 14.56 | 16.14 |
| EPDRF4015-15-01-TH | □ | 1.5 | 0.10 | 15 | 1.35 | 1.42 | 60 | 4 | 4 | 3.42 | 16.18 | 16.58 | 17.30 | 18.15 | 20.12 |
| EPDRF4015-20-01-TH | □ | 1.5 | 0.10 | 20 | 1.35 | 1.42 | 60 | 4 | 4 | 2.76 | 21.32 | 21.98 | 23.01 | 24.13 | – |
| EPDRF4020-4-005-TH | ● | 2.0 | 0.05 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.46 | 4.80 | 4.99 | 5.16 | 5.31 | 5.59 |
| EPDRF4020-6-005-TH | ● | 2.0 | 0.05 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.27 | 6.88 | 7.13 | 7.33 | 7.52 | 8.19 |
| EPDRF4020-8-005-TH | ● | 2.0 | 0.05 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.46 | 8.96 | 9.25 | 9.48 | 9.78 | 10.85 |
| EPDRF4020-12-005-TH | ● | 2.0 | 0.05 | 12 | 1.7 | 1.92 | 60 | 4 | 4 | 3.4 | 13.09 | 13.45 | 13.89 | 14.57 | 16.16 |
| EPDRF4020-16-005-TH | ● | 2.0 | 0.05 | 16 | 1.7 | 1.92 | 60 | 4 | 4 | 2.75 | 17.21 | 17.63 | 18.45 | 19.36 | – |
| EPDRF4020-20-005-TH | □ | 2.0 | 0.05 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.31 | 21.32 | 21.98 | 23.01 | 24.14 | – |

□ = Stocked items in Japan

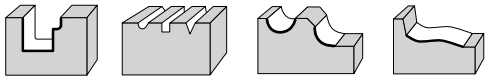
# EPDRF

Advanced Engineering







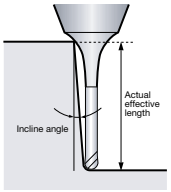
| | | | |
|---|---|---|---|
| Helix Angle | 20° | d | h5 |
| r | ±0.005 | Dc | 0/-0.1 |

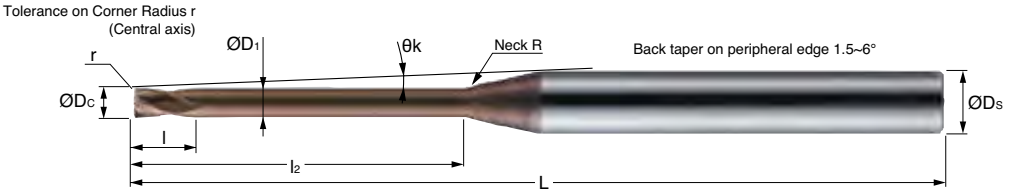
| | | | Size (mm) | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | Stock | $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDRF4020-4-01-TH | ● | 2.0 | 0.1 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.49 | 4.80 | 4.99 | 5.16 | 5.31 | 5.58 |
| EPDRF4020-6-01-TH | ● | 2.0 | 0.1 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.3 | 6.88 | 7.12 | 7.33 | 7.51 | 8.18 |
| EPDRF4020-8-01-TH | ● | 2.0 | 0.1 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.47 | 8.96 | 9.24 | 9.48 | 9.77 | 10.83 |
| EPDRF4020-12-01-TH | ● | 2.0 | 0.1 | 12 | 1.7 | 1.92 | 60 | 4 | 4 | 3.41 | 13.09 | 13.45 | 13.88 | 14.56 | 16.14 |
| EPDRF4020-16-01-TH | ● | 2.0 | 0.1 | 16 | 1.7 | 1.92 | 60 | 4 | 4 | 2.76 | 17.21 | 17.62 | 18.44 | 19.35 | – |
| EPDRF4020-20-01-TH | □ | 2.0 | 0.1 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.31 | 21.32 | 21.98 | 23.01 | 24.13 | – |
| EPDRF4020-4-02-TH | ● | 2.0 | 0.2 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.57 | 4.79 | 4.98 | 5.15 | 5.30 | 5.57 |
| EPDRF4020-6-02-TH | ● | 2.0 | 0.2 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.35 | 6.88 | 7.12 | 7.32 | 7.50 | 8.14 |
| EPDRF4020-8-02-TH | ● | 2.0 | 0.2 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.51 | 8.95 | 9.24 | 9.47 | 9.75 | 10.8 |
| EPDRF4020-12-02-TH | ● | 2.0 | 0.2 | 12 | 1.7 | 1.92 | 60 | 4 | 4 | 3.43 | 13.09 | 13.44 | 13.87 | 14.54 | 16.11 |
| EPDRF4020-16-02-TH | ● | 2.0 | 0.2 | 16 | 1.7 | 1.92 | 60 | 4 | 4 | 2.77 | 17.21 | 17.62 | 18.43 | 19.33 | – |
| EPDRF4020-20-02-TH | □ | 2.0 | 0.2 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.32 | 21.32 | 21.97 | 22.99 | 24.11 | – |
| EPDRF4020-25-02-TH | ● | 2.0 | 0.2 | 25 | 1.7 | 1.92 | 70 | 4 | 4 | 1.93 | 26.44 | 27.42 | 28.69 | – | – |
| EPDRF4020-30-02-TH | □ | 2.0 | 0.2 | 30 | 1.7 | 1.92 | 70 | 4 | 4 | 1.66 | 31.55 | 32.87 | 34.40 | – | – |
| EPDRF4020-4-03-TH | □ | 2.0 | 0.2 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.64 | 4.79 | 4.97 | 5.14 | 5.29 | 5.55 |
| EPDRF4020-8-03-TH | □ | 2.0 | 0.3 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.55 | 8.95 | 9.23 | 9.47 | 9.73 | 10.77 |
| EPDRF4020-12-03-TH | □ | 2.0 | 0.3 | 12 | 1.7 | 1.92 | 60 | 4 | 4 | 3.45 | 13.09 | 13.44 | 13.85 | 14.52 | 16.08 |
| EPDRF4020-16-03-TH | □ | 2.0 | 0.3 | 16 | 1.7 | 1.92 | 60 | 4 | 4 | 2.79 | 17.21 | 17.61 | 18.42 | 19.31 | – |
| EPDRF4020-20-03-TH | □ | 2.0 | 0.3 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.33 | 21.31 | 21.96 | 22.98 | 24.09 | – |
| EPDRF4020-4-05-TH | □ | 2.0 | 0.5 | 4 | 1.7 | 1.92 | 50 | 4 | 4 | 6.80 | 4.78 | 4.96 | 5.12 | 5.26 | 5.53 |
| EPDRF4020-6-05-TH | □ | 2.0 | 0.5 | 6 | 1.7 | 1.92 | 50 | 4 | 4 | 5.50 | 6.86 | 7.10 | 7.30 | 7.48 | 8.05 |
| EPDRF4020-8-05-TH | ● | 2.0 | 0.5 | 8 | 1.7 | 1.92 | 50 | 4 | 4 | 4.62 | 8.94 | 9.22 | 9.45 | 9.70 | 10.70 |
| EPDRF4020-12-05-TH | □ | 2.0 | 0.5 | 12 | 1.7 | 1.92 | 60 | 4 | 4 | 3.50 | 13.08 | 13.43 | 13.83 | 14.48 | 16.01 |
| EPDRF4020-16-05-TH | ● | 2.0 | 0.5 | 16 | 1.7 | 1.92 | 60 | 4 | 4 | 2.81 | 17.2 | 17.61 | 18.39 | 19.27 | – |
| EPDRF4020-20-05-TH | ● | 2.0 | 0.5 | 20 | 1.7 | 1.92 | 60 | 4 | 4 | 2.35 | 21.31 | 21.95 | 22.95 | 24.06 | – |
| EPDRF4020-25-05-TH | ● | 2.0 | 0.5 | 25 | 1.7 | 1.92 | 70 | 4 | 4 | 1.95 | 26.43 | 27.39 | 28.65 | – | – |
| EPDRF4020-30-05-TH | ● | 2.0 | 0.5 | 30 | 1.7 | 1.92 | 70 | 4 | 4 | 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 | 9.00 | 9.27 | 9.51 | 9.83 | 10.89 |
| EPDRF4025-16-01-TH | ● | 2.5 | 0.1 | 16 | 2 | 2.4 | 60 | 4 | 4 | 2.19 | 17.24 | 17.67 | 18.50 | 19.40 | – |
| EPDRF4025-20-01-TH | ● | 2.5 | 0.1 | 20 | 2 | 2.4 | 60 | 4 | 4 | 1.82 | 21.35 | 22.03 | 23.06 | – | – |

□ = Stocked items in Japan

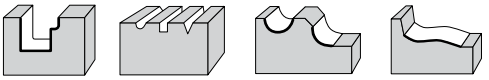
# EPDRF

Advanced Engineering







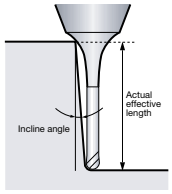
| | | | |
|---|---|---|---|
| Helix Angle | 20° | d | h5 |
| r | ±0.005 | Dc | 0/-0.1 |

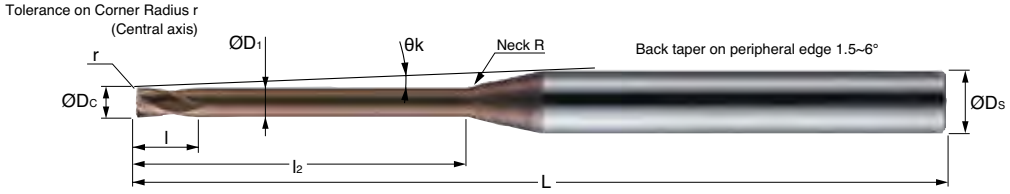
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EPDRF4025-8-02-TH** | ● | 2.5 | 0.2 | 8 | 2 | 2.4 | 50 | 4 | 4 | 3.72 | 8.99 | 9.27 | 9.50 | 9.81 | 10.86 |
| **EPDRF4025-16-02-TH** | ● | 2.5 | 0.2 | 16 | 2 | 2.4 | 60 | 4 | 4 | 2.2 | 17.24 | 17.67 | 18.48 | 19.38 | – |
| **EPDRF4025-20-02-TH** | ● | 2.5 | 0.2 | 20 | 2 | 2.4 | 60 | 4 | 4 | 1.83 | 21.34 | 22.02 | 23.05 | – | – |
| **EPDRF4025-12-03-TH** | □ | 2.5 | 0.3 | 12 | 2 | 2.4 | 60 | 4 | 4 | 2.78 | 13.12 | 13.47 | 13.91 | 14.58 | – |
| **EPDRF4025-20-03-TH** | □ | 2.5 | 0.3 | 20 | 2 | 2.4 | 60 | 4 | 4 | 1.84 | 21.34 | 22.01 | 23.03 | – | – |
| **EPDRF4025-12-05-TH** | □ | 2.5 | 0.5 | 12 | 2 | 2.4 | 60 | 4 | 4 | 2.82 | 13.12 | 13.46 | 13.88 | 14.54 | – |
| **EPDRF4025-20-05-TH** | □ | 2.5 | 0.5 | 20 | 2 | 2.4 | 60 | 4 | 4 | 1.85 | 21.34 | 22.00 | 23.00 | – | – |
| **EPDRF4030-8-01-TH** | ● | 3.0 | 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** | ● | 3.0 | 0.1 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.69 | 17.30 | 17.78 | 18.60 | 19.52 | 21.64 |
| **EPDRF4030-25-01-TH** | □ | 3.0 | 0.1 | 25 | 2.5 | 2.86 | 70 | 6 | 4 | 2.67 | 26.52 | 27.58 | 28.87 | 30.28 | – |
| **EPDRF4030-30-01-TH** | □ | 3.0 | 0.1 | 30 | 2.5 | 2.86 | 80 | 6 | 4 | 2.31 | 31.62 | 33.03 | 34.57 | 36.27 | – |
| **EPDRF4030-8-02-TH** | ● | 3.0 | 0.2 | 8 | 2.5 | 2.86 | 60 | 6 | 4 | 5.65 | 9.07 | 9.33 | 9.55 | 9.92 | 10.99 |
| **EPDRF4030-12-02-TH** | ● | 3.0 | 0.2 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.48 | 13.19 | 13.52 | 14.03 | 14.71 | 16.30 |
| **EPDRF4030-16-02-TH** | ● | 3.0 | 0.2 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.71 | 17.30 | 17.77 | 18.59 | 19.50 | 21.60 |
| **EPDRF4030-20-02-TH** | ● | 3.0 | 0.2 | 20 | 2.5 | 2.86 | 70 | 6 | 4 | 3.16 | 21.40 | 22.13 | 23.15 | 24.28 | 26.91 |
| **EPDRF4030-25-02-TH** | □ | 3.0 | 0.2 | 25 | 2.5 | 2.86 | 70 | 6 | 4 | 2.67 | 26.51 | 27.57 | 28.86 | 30.27 | – |
| **EPDRF4030-30-02-TH** | □ | 3.0 | 0.2 | 30 | 2.5 | 2.86 | 80 | 6 | 4 | 2.31 | 31.62 | 33.02 | 34.56 | 36.25 | – |
| **EPDRF4030-8-03-TH** | ● | 3.0 | 0.3 | 8 | 2.5 | 2.86 | 60 | 6 | 4 | 5.68 | 9.07 | 9.33 | 9.54 | 9.90 | 10.95 |
| **EPDRF4030-16-03-TH** | ● | 3.0 | 0.3 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.72 | 17.30 | 17.76 | 18.58 | 19.48 | 21.57 |
| **EPDRF4030-20-03-TH** | ● | 3.0 | 0.3 | 20 | 2.5 | 2.86 | 70 | 6 | 4 | 3.17 | 21.40 | 22.12 | 23.14 | 24.26 | 26.88 |
| **EPDRF4030-25-03-TH** | □ | 3.0 | 0.3 | 25 | 2.5 | 2.86 | 70 | 6 | 4 | 2.68 | 26.51 | 27.56 | 28.84 | 30.25 | – |
| **EPDRF4030-30-03-TH** | □ | 3.0 | 0.3 | 30 | 2.5 | 2.86 | 80 | 6 | 4 | 2.32 | 31.62 | 33.01 | 34.54 | 36.23 | – |
| **EPDRF4030-8-05-TH** | ● | 3.0 | 0.5 | 8 | 2.5 | 2.86 | 60 | 6 | 4 | 5.76 | 9.06 | 9.31 | 9.53 | 9.87 | 10.89 |
| **EPDRF4030-12-05-TH** | ● | 3.0 | 0.5 | 12 | 2.5 | 2.86 | 60 | 6 | 4 | 4.55 | 13.18 | 13.51 | 13.99 | 14.65 | 16.20 |
| **EPDRF4030-16-05-TH** | ● | 3.0 | 0.5 | 16 | 2.5 | 2.86 | 60 | 6 | 4 | 3.75 | 17.29 | 17.74 | 18.55 | 19.44 | 21.51 |
| **EPDRF4030-20-05-TH** | ● | 3.0 | 0.5 | 20 | 2.5 | 2.86 | 70 | 6 | 4 | 3.2 | 21.39 | 22.1 | 23.11 | 24.22 | 26.82 |
| **EPDRF4030-25-05-TH** | ● | 3.0 | 0.5 | 25 | 2.5 | 2.86 | 70 | 6 | 4 | 2.7 | 26.51 | 27.55 | 28.81 | 30.21 | – |
| **EPDRF4030-30-05-TH** | ● | 3.0 | 0.5 | 30 | 2.5 | 2.86 | 80 | 6 | 4 | 2.33 | 31.61 | 32.99 | 34.52 | 36.19 | – |
| **EPDRF4030-35-05-TH** | □ | 3.0 | 0.5 | 35 | 2.5 | 2.86 | 80 | 6 | 4 | 2.06 | 36.82 | 38.44 | 40.22 | 42.17 | – |
| **EPDRF4040-12-01-TH** | □ | 4.0 | 0.1 | 12 | 4 | 3.9 | 60 | 6 | 4 | 3.4 | 13.13 | 13.47 | 13.94 | 14.62 | 16.20 |

□ = Stocked items in Japan

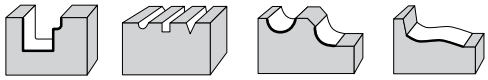
# EPDRF

Advanced Engineering







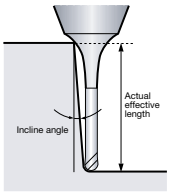
| | | | |
|---|---|---|---|
| Helix Angle | 20° | d | h5 |
| r | ±0.005 | Dc | 0/-0.1 |

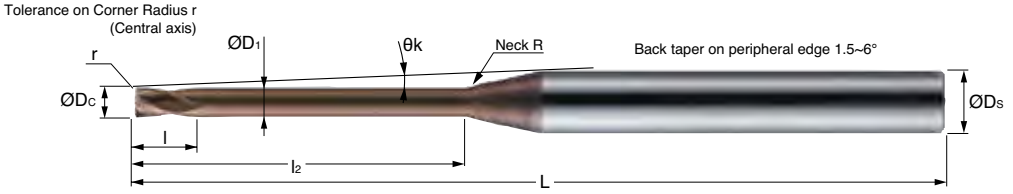
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDRF4040-20-01-TH | ● | 4.0 | 0.1 | 20 | 4 | 3.9 | 60 | 6 | 4 | 2.31 | 21.35 | 22.03 | 23.06 | 24.19 | – |
| EPDRF4040-30-01-TH | □ | 4.0 | 0.1 | 30 | 4 | 3.9 | 80 | 6 | 4 | 1.65 | 31.57 | 32.93 | 34.46 | – | – |
| EPDRF4040-40-01-TH | □ | 4.0 | 0.1 | 40 | 4 | 3.9 | 80 | 6 | 4 | 1.28 | 41.95 | 43.82 | – | – | – |
| EPDRF4040-12-02-TH | ● | 4.0 | 0.2 | 12 | 4 | 3.9 | 60 | 6 | 4 | 3.42 | 13.12 | 13.47 | 13.92 | 14.6 | 16.17 |
| EPDRF4040-20-02-TH | ● | 4.0 | 0.2 | 20 | 4 | 3.9 | 60 | 6 | 4 | 2.32 | 21.34 | 22.02 | 23.05 | 24.17 | – |
| EPDRF4040-30-02-TH | ● | 4.0 | 0.2 | 30 | 4 | 3.9 | 80 | 6 | 4 | 1.65 | 31.57 | 32.92 | 34.45 | – | – |
| EPDRF4040-40-02-TH | □ | 4.0 | 0.2 | 40 | 4 | 3.9 | 80 | 6 | 4 | 1.29 | 41.94 | 43.81 | – | – | – |
| EPDRF4040-12-03-TH | ● | 4.0 | 0.3 | 12 | 4 | 3.9 | 60 | 6 | 4 | 3.44 | 13.12 | 13.47 | 13.91 | 14.58 | 16.14 |
| EPDRF4040-20-03-TH | ● | 4.0 | 0.3 | 20 | 4 | 3.9 | 60 | 6 | 4 | 2.33 | 21.34 | 22.01 | 23.03 | 24.15 | – |
| EPDRF4040-30-03-TH | □ | 4.0 | 0.3 | 30 | 4 | 3.9 | 80 | 6 | 4 | 1.66 | 31.57 | 32.91 | 34.44 | – | – |
| EPDRF4040-40-03-TH | □ | 4.0 | 0.3 | 40 | 4 | 3.9 | 80 | 6 | 4 | 1.29 | 41.94 | 43.80 | – | – | – |
| EPDRF4040-12-05-TH | ● | 4.0 | 0.5 | 12 | 4 | 3.9 | 60 | 6 | 4 | 3.49 | 13.12 | 13.46 | 13.88 | 14.54 | 16.07 |
| EPDRF4040-20-05-TH | ● | 4.0 | 0.5 | 20 | 4 | 3.9 | 60 | 6 | 4 | 2.35 | 21.34 | 22.00 | 23 | 24.11 | – |
| EPDRF4040-30-05-TH | ● | 4.0 | 0.5 | 30 | 4 | 3.9 | 80 | 6 | 4 | 1.67 | 31.57 | 32.89 | 34.41 | – | – |
| EPDRF4040-40-05-TH | ● | 4.0 | 0.5 | 40 | 4 | 3.9 | 80 | 6 | 4 | 1.29 | 41.93 | 43.79 | – | – | – |
| EPDRF4050-20-01-TH | ● | 5.0 | 0.1 | 20 | 5 | 4.9 | 70 | 6 | 4 | 1.28 | 21.35 | 22.03 | – | – | – |
| EPDRF4050-40-01-TH | □ | 5.0 | 0.1 | 40 | 5 | 4.9 | 90 | 6 | 4 | 0.68 | 41.95 | – | – | – | – |
| EPDRF4050-20-02-TH | ● | 5.0 | 0.2 | 20 | 5 | 4.9 | 70 | 6 | 4 | 1.28 | 21.34 | 22.02 | – | – | – |
| EPDRF4050-40-02-TH | ● | 5.0 | 0.2 | 40 | 5 | 4.9 | 90 | 6 | 4 | 0.68 | 41.94 | – | – | – | – |
| EPDRF4050-20-03-TH | □ | 5.0 | 0.3 | 20 | 5 | 4.9 | 70 | 6 | 4 | 1.29 | 21.34 | 22.01 | – | – | – |
| EPDRF4050-40-03-TH | □ | 5.0 | 0.3 | 40 | 5 | 4.9 | 90 | 6 | 4 | 0.68 | 41.94 | – | – | – | – |
| EPDRF4050-20-05-TH | ● | 5.0 | 0.5 | 20 | 5 | 4.9 | 70 | 6 | 4 | 1.3 | 21.34 | 22.00 | – | – | – |
| EPDRF4050-40-05-TH | □ | 5.0 | 0.5 | 40 | 5 | 4.9 | 90 | 6 | 4 | 0.69 | 41.93 | – | – | – | – |
| EPDRF4050-20-10-TH | □ | 5.0 | 1 | 20 | 5 | 4.9 | 70 | 6 | 4 | 1.33 | 21.32 | 21.95 | – | – | – |
| EPDRF4050-40-10-TH | □ | 5.0 | 1 | 40 | 5 | 4.9 | 90 | 6 | 4 | 0.69 | 41.91 | – | – | – | – |
| EPDRF4060-30-02-TH | ● | 6.0 | 0.2 | 30 | 6 | 5.9 | 80 | 6 | 4 | 0 | – | – | – | – | – |
| EPDRF4060-54-02-TH | □ | 6.0 | 0.2 | 54 | 6 | 5.9 | 100 | 6 | 4 | 0 | – | – | – | – | – |
| EPDRF4060-72-02-TH | □ | 6.0 | 0.2 | 72 | 6 | 5.9 | 120 | 6 | 4 | 0 | – | – | – | – | – |
| EPDRF4060-30-03-TH | ● | 6.0 | 0.3 | 30 | 6 | 5.9 | 80 | 6 | 4 | 0 | – | – | – | – | – |
| EPDRF4060-54-03-TH | □ | 6.0 | 0.3 | 54 | 6 | 5.9 | 100 | 6 | 4 | 0 | – | – | – | – | – |

□ = Stocked items in Japan

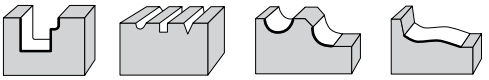
# EPDRF

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 20° | d | h5 |
| r | ±0.005 | Dc | 0/-0.1 |

| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EPDRF4060-72-03-TH** | □ | 6.0 | 0.3 | 72 | 6 | 5.9 | 120 | 6 | 4 | 0 | – | – | – | – | – |
| **EPDRF4060-30-05-TH** | ● | 6.0 | 0.5 | 30 | 6 | 5.9 | 80 | 6 | 4 | 0 | – | – | – | – | – |
| **EPDRF4060-54-05-TH** | □ | 6.0 | 0.5 | 54 | 6 | 5.9 | 100 | 6 | 4 | 0 | – | – | – | – | – |
| **EPDRF4060-72-05-TH** | □ | 6.0 | 0.5 | 72 | 6 | 5.9 | 120 | 6 | 4 | 0 | – | – | – | – | – |
| **EPDRF4060-30-10-TH** | ● | 6.0 | 1 | 30 | 6 | 5.9 | 80 | 6 | 4 | 0 | – | – | – | – | – |
| **EPDRF4060-54-10-TH** | □ | 6.0 | 1 | 54 | 6 | 5.9 | 100 | 6 | 4 | 0 | – | – | – | – | – |
| **EPDRF4060-72-10-TH** | □ | 6.0 | 1 | 72 | 6 | 5.9 | 120 | 6 | 4 | 0 | – | – | – | – | – |

□ = Stocked items in Japan

# EPDRF

**EPDRF**
**Cutting Conditions**
**(Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | Standard depth of cut | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (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 |
| 1 | 0.05 | 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 |
| 1 | 0.05 | 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 |
| 1 | 0.05 | 10 | 0.005 | 24,500 | 1,390 | 19,600 | 1,112 | 17,640 | 1,001 | 16,758 | 951 | 15,082 | 770 | 14,328 | 630 |
| 1 | 0.05 | 12 | 0.004 | 21,800 | 1,100 | 17,440 | 880 | 15,696 | 792 | 14,911 | 752 | 13,420 | 600 | 12,749 | 480 |
| 1 | 0.05 | 16 | 0.003 | 21,800 | 960 | 17,440 | 768 | 15,696 | 691 | 14,911 | 657 | 13,420 | 510 | 12,749 | 400 |
| 1 | 0.05 | 20 | 0.002 | 16,300 | 720 | 13,040 | 576 | 11,736 | 518 | 11,149 | 492 | 10,034 | 385 | 9,533 | 300 |
| 1 | 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 |
| 1 | 0.1 | 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 |
| 1 | 0.1 | 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 |
| 1 | 0.1 | 10 | 0.01 | 24,500 | 1,390 | 19,600 | 1,112 | 17,640 | 1,001 | 16,758 | 951 | 15,082 | 770 | 14,328 | 630 |
| 1 | 0.1 | 12 | 0.008 | 21,800 | 1,100 | 17,440 | 880 | 15,696 | 792 | 14,911 | 752 | 13,420 | 600 | 12,749 | 480 |
| 1 | 0.1 | 16 | 0.006 | 21,800 | 960 | 17,440 | 768 | 15,696 | 691 | 14,911 | 657 | 13,420 | 510 | 12,749 | 400 |
| 1 | 0.1 | 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 |
| 1.5 | 0.05 | 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 |
| 1.5 | 0.05 | 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 |
| 1.5 | 0.05 | 15 | 0.006 | 16,900 | 1,020 | 13,520 | 816 | 12,168 | 734 | 11,560 | 698 | 10,404 | 560 | 9,883 | 450 |
| 1.5 | 0.05 | 20 | 0.004 | 16,900 | 1,020 | 13,520 | 816 | 12,168 | 734 | 11,560 | 698 | 10,404 | 560 | 9,883 | 450 |
| 1.5 | 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 |
| 1.5 | 0.1 | 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 |
| 1.5 | 0.1 | 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 |
| 1.5 | 0.1 | 15 | 0.014 | 16,900 | 1,020 | 13,520 | 816 | 12,168 | 734 | 11,560 | 698 | 10,404 | 560 | 9,883 | 450 |
| 1.5 | 0.1 | 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 |
| 2 | 0.05 | 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 |
| 2 | 0.05 | 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 |
| 2 | 0.05 | 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 |
| 2 | 0.05 | 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 |
| 2 | 0.05 | 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 |
| 2 | 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 |
| 2 | 0.1 | 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 |
| 2 | 0.1 | 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 |
| 2 | 0.1 | 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 |
| 2 | 0.1 | 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 |
| 2 | 0.1 | 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 |
| 2 | 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 |
| 2 | 0.2 | 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 |
| 2 | 0.2 | 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 |
| 2 | 0.2 | 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 |
| 2 | 0.2 | 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 |
| 2 | 0.2 | 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 |
| 2 | 0.2 | 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 |
| 2 | 0.2 | 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 |

# EPDRF

**EPDRF**
**Cutting Conditions (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | Standard depth of cut | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **2** | **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 |
| **2** | **0.3** | 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 |
| **2** | **0.3** | 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 |
| **2** | **0.3** | 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 |
| **2** | **0.3** | 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 |
| **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 |
| **2** | **0.5** | 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 |
| **2** | **0.5** | 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 |
| **2** | **0.5** | 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 |
| **2** | **0.5** | 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 |
| **2** | **0.5** | 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 |
| **2** | **0.5** | 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 |
| **2** | **0.5** | 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 |
| **2.5** | **0.1** | 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 |
| **2.5** | **0.1** | 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 |
| **2.5** | **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 |
| **2.5** | **0.2** | 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 |
| **2.5** | **0.2** | 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 |
| **2.5** | **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 |
| **2.5** | **0.3** | 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 |
| **2.5** | **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 |
| **2.5** | **0.5** | 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 |
| **3** | **0.1** | 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 |
| **3** | **0.1** | 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 |
| **3** | **0.1** | 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 |
| **3** | **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 |
| **3** | **0.2** | 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 |
| **3** | **0.2** | 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 |
| **3** | **0.2** | 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 |
| **3** | **0.2** | 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 |
| **3** | **0.2** | 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 |
| **3** | **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 |
| **3** | **0.3** | 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 |
| **3** | **0.3** | 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 |
| **3** | **0.3** | 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 |
| **3** | **0.3** | 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 |
| **3** | **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 |
| **3** | **0.5** | 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 |
| **3** | **0.5** | 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 |
| **3** | **0.5** | 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 |
| **3** | **0.5** | 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 |
| **3** | **0.5** | 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 |
| **3** | **0.5** | 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 |

# EPDRF

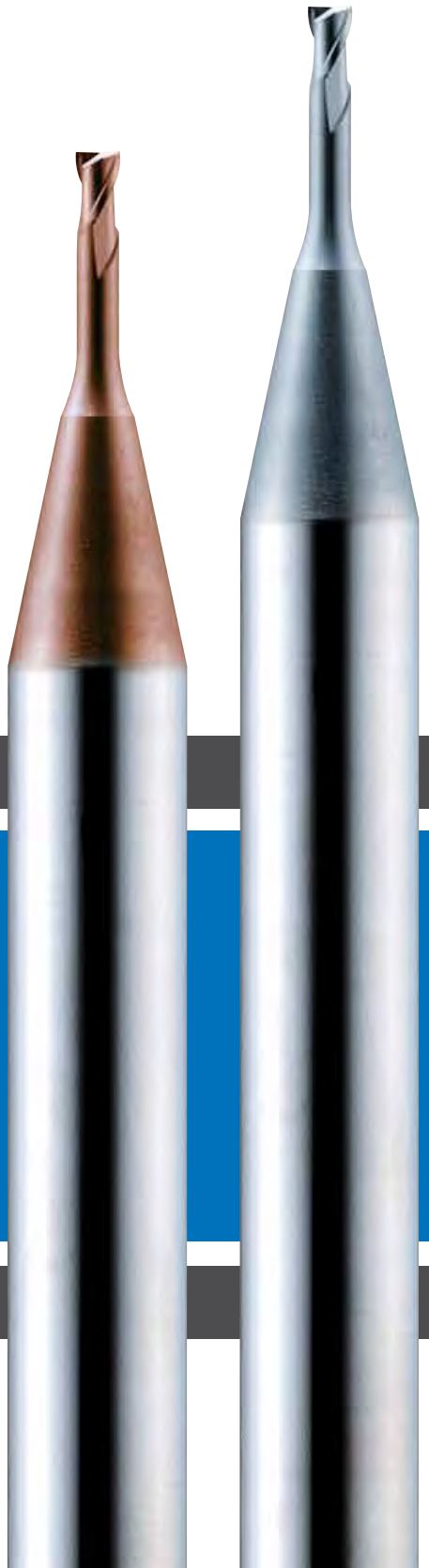
**EPDRF**
**Cutting Conditions (Metric)**

Advanced Engineering

| Work Material | | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | 120% | | 100% | | 90% | | 80% | | 65% | | 60% | |
| Mill dia. | r | Under neck length | Standard depth of cut | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **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 |
| **4** | **0.1** | 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 |
| **4** | **0.1** | 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 |
| **4** | **0.1** | 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 |
| **4** | **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 |
| **4** | **0.2** | 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 |
| **4** | **0.2** | 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 |
| **4** | **0.2** | 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 |
| **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 |
| **4** | **0.3** | 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 |
| **4** | **0.3** | 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 |
| **4** | **0.3** | 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 |
| **4** | **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 |
| **4** | **0.5** | 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 |
| **4** | **0.5** | 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 |
| **4** | **0.5** | 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 |
| **5** | **0.1** | 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 |
| **5** | **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 |
| **5** | **0.2** | 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 |
| **5** | **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 |
| **5** | **0.3** | 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 |
| **5** | **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 |
| **5** | **0.5** | 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 |
| **5** | **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 |
| **5** | **1** | 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 |
| **6** | **0.2** | 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 |
| **6** | **0.2** | 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 |
| **6** | **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 |
| **6** | **0.3** | 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 |
| **6** | **0.3** | 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 |
| **6** | **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 |
| **6** | **0.5** | 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 |
| **6** | **0.5** | 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 |
| **6** | **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 |
| **6** | **1** | 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 |
| **6** | **1** | 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 |

# EPDSE

## High-Precision Square End Mills for Deep Machining



## FEATURES

High strength end shape improves cutting stability

Improved compound neck design for reduced chatter and increased strength

New flute shape increases resistance to breakage

ATH and PN Coatings for maximum efficiency and tool life

# EPDSE

Advanced Engineering

## INTRODUCTION

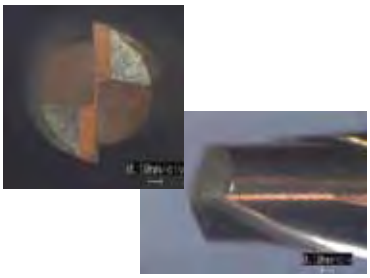
The EPDSE Epoch Series Ball End Mills have been designed for cutting deep ribs and slots in molds, as well as machining deep corners and precision features that were previously possible only by EDM (electrical discharge machining).

Featuring an improved compound neck design, these end mills exhibit greater breakage resistance and less vibration during high speed machining than competitors' tools. New cutting geometries as well as the advanced ATH and PN Coatings help to maximize machining performance as well as tool life.

## FEATURES

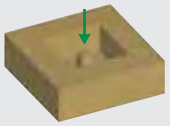
### 1. Innovative Square Nose Geometry

Flute shape with high flute tip strength and high cutting performance provides improved stability.



Tool : EPDSE2010-4-ATH
(φ1 Under neck 4mm)

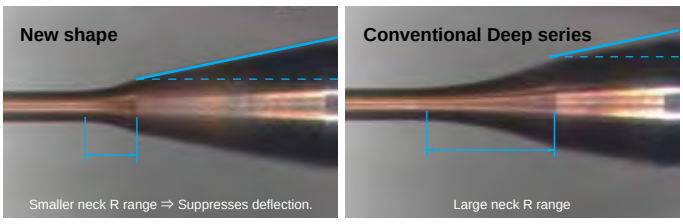
1.5mm square island (90° standing walls)



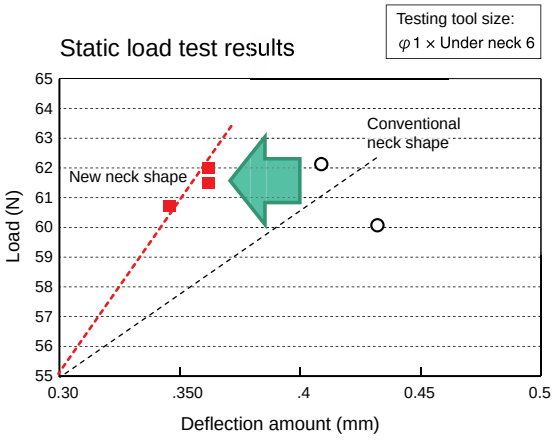
Work material: HPM-MAGIC 40HRC
Holder: HSK-F63
Coolant: Wet
$n$=15,000min$^{-1}$(vc=47m/min)
$vf$=1,000mm/min
($fz$=0.03mm/t)
$ap$×$ae$=0.1mm×0.1mm

### 2. Improved Compound Neck Shape

Further improves the conventional compound shape of R and taper to both resist breakage and suppress deflection.



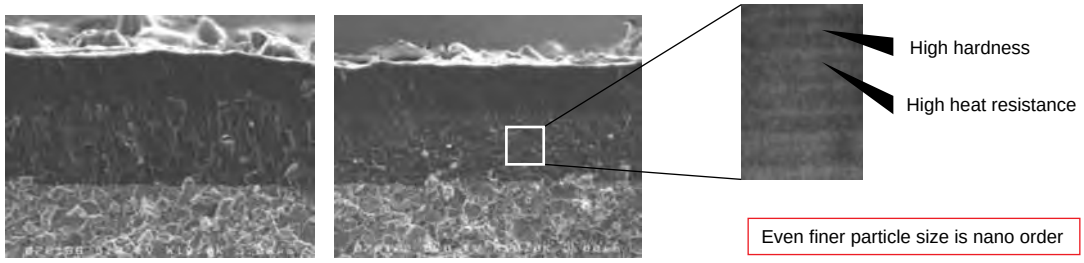

**Caution:** The interference region has changed due to changes in the neck shape. Be sure to check for interference before starting machining.




Deflection suppression effect is high even under the same load.
Enables machining with even higher accuracy.

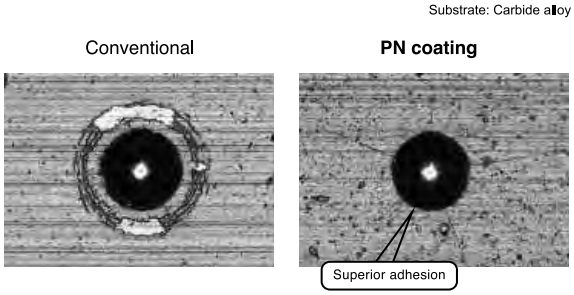
## 3. New PVD Coating Technology

**Advanced TH (ATH) Coating:** With a hardness of 3800Hv and oxidation temperature of 1200°, our new ATH Coating enables longer life and higher efficiency when cutting high-hardness materials (55HRC or higher). Compared with our previous generation coating, double the tool life and more than double the machining efficiency can be achieved. The ATH Coating is ideal for both dry cutting and wet cutting in a variety of materials including cold-worked die steel, HSS, tool steel, composite materials, carbide alloys and more.

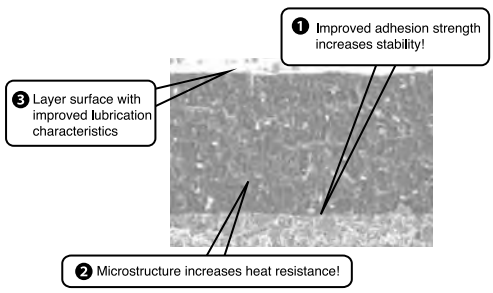



**PN Coating:** By optimizing the Al content, the multi-layer PN Coating exhibits both excellent heat-resistance and adhesion to the tool substrate. Combining of the AlCr coating layer with Si produces high hardness (3000HV) as well as good wear resistance. PN Coating provides extended cutting tool life in both wet and dry machining of materials including pre-hardened steel, carbon steel, alloy steel, stainless steel, H13, D2 and more.

Adhesion of PN coating

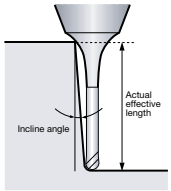


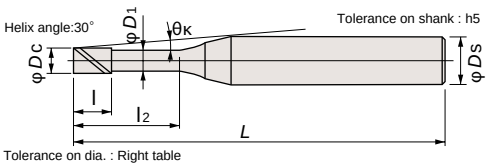

Cross-section photograph of PN coating layer structure



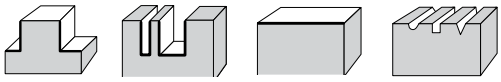
# EPDSE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | Dc (Ø0.1 – Ø0.5) | 0/-0.007 |
| ϕDs | h5 | Dc (Ø0.6 – Ø0.9) | 0/-0.01 |
| | | Dc (Ø1– Ø6) | 0/-0.015 |

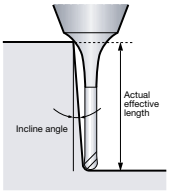
| Part No.* | Stock PN | Stock ATH | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDSE2001-0.3-□□□ | □ | ● | 0.1 | 0.3 | 0.15 | 0.08 | 45 | 4 | 1 | 11.58 | 0.46 | 0.49 | 0.51 | 0.53 | 0.58 |
| EPDSE2001-0.5-□□□ | □ | ● | 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-□□□ | □ | □ | 0.1 | 1.0 | 0.15 | 0.08 | 45 | 4 | 1 | 10.81 | 1.20 | 1.25 | 1.29 | 1.33 | 1.39 |
| EPDSE2002-0.5-□□□ | □ | ● | 0.2 | 0.5 | 0.30 | 0.17 | 50 | 4 | 1 | 11.30 | 0.70 | 0.73 | 0.76 | 0.78 | 0.83 |
| EPDSE2002-1-□□□ | □ | ● | 0.2 | 1.0 | 0.30 | 0.17 | 50 | 4 | 1 | 10.75 | 1.22 | 1.27 | 1.31 | 1.34 | 1.42 |
| EPDSE2002-1.5-□□□ | □ | □ | 0.2 | 1.5 | 0.30 | 0.17 | 50 | 4 | 1 | 10.25 | 1.74 | 1.80 | 1.85 | 1.89 | 2.08 |
| EPDSE2002-2-□□□ | □ | □ | 0.2 | 2.0 | 0.30 | 0.17 | 50 | 4 | 1 | 9.80 | 2.26 | 2.32 | 2.38 | 2.47 | 2.74 |
| EPDSE2002-3-□□□ | □ | □ | 0.2 | 3.0 | 0.30 | 0.17 | 50 | 4 | 1 | 9.00 | 3.29 | 3.37 | 3.50 | 3.67 | 4.07 |
| EPDSE2003-1-□□□ | □ | ● | 0.3 | 1.0 | 0.45 | 0.27 | 50 | 4 | 2 | 10.72 | 1.32 | 1.39 | 1.45 | 1.51 | 1.62 |
| EPDSE2003-1.5-□□□ | □ | ● | 0.3 | 1.5 | 0.45 | 0.27 | 50 | 4 | 2 | 10.21 | 1.85 | 1.93 | 2.01 | 2.08 | 2.21 |
| EPDSE2003-2-□□□ | □ | □ | 0.3 | 2.0 | 0.45 | 0.27 | 50 | 4 | 2 | 9.75 | 2.37 | 2.47 | 2.56 | 2.64 | 2.78 |
| EPDSE2003-2.5-□□□ | □ | □ | 0.3 | 2.5 | 0.45 | 0.27 | 50 | 4 | 2 | 9.32 | 2.89 | 3.01 | 3.11 | 3.20 | 3.41 |
| EPDSE2003-3-□□□ | □ | □ | 0.3 | 3.0 | 0.45 | 0.27 | 50 | 4 | 2 | 8.93 | 3.42 | 3.54 | 3.65 | 3.75 | 4.07 |
| EPDSE2004-1-□□□ | □ | ● | 0.4 | 1.0 | 0.60 | 0.37 | 50 | 4 | 2 | 10.69 | 1.32 | 1.39 | 1.45 | 1.51 | 1.62 |
| EPDSE2004-1.5-□□□ | □ | ● | 0.4 | 1.5 | 0.60 | 0.37 | 50 | 4 | 2 | 10.17 | 1.85 | 1.93 | 2.01 | 2.08 | 2.21 |
| EPDSE2004-2-□□□ | □ | ● | 0.4 | 2.0 | 0.60 | 0.37 | 50 | 4 | 2 | 9.70 | 2.37 | 2.47 | 2.56 | 2.64 | 2.78 |
| EPDSE2004-2.5-□□□ | □ | □ | 0.4 | 2.5 | 0.60 | 0.37 | 50 | 4 | 2 | 9.27 | 2.89 | 3.01 | 3.11 | 3.20 | 3.41 |
| EPDSE2004-3-□□□ | □ | ● | 0.4 | 3.0 | 0.60 | 0.37 | 50 | 4 | 2 | 8.87 | 3.42 | 3.54 | 3.65 | 3.75 | 4.07 |
| EPDSE2004-3.5-□□□ | □ | □ | 0.4 | 3.5 | 0.60 | 0.37 | 50 | 4 | 2 | 8.51 | 3.94 | 4.08 | 4.19 | 4.29 | 4.73 |
| EPDSE2004-4-□□□ | □ | ● | 0.4 | 4.0 | 0.60 | 0.37 | 50 | 4 | 2 | 8.17 | 4.46 | 4.61 | 4.73 | 4.87 | 5.40 |
| EPDSE2004-5-□□□ | □ | □ | 0.4 | 5.0 | 0.60 | 0.37 | 50 | 4 | 2 | 7.58 | 5.49 | 5.66 | 5.79 | 6.06 | 6.72 |
| EPDSE2004-6-□□□ | □ | □ | 0.4 | 6.0 | 0.60 | 0.37 | 50 | 4 | 2 | 7.06 | 6.53 | 6.71 | 6.92 | 7.26 | 8.05 |
| EPDSE2004-8-□□□ | □ | □ | 0.4 | 8.0 | 0.60 | 0.37 | 50 | 4 | 2 | 6.22 | 8.59 | 8.80 | 9.20 | 9.65 | 10.71 |
| EPDSE2004-10-□□□ | □ | □ | 0.4 | 10.0 | 0.60 | 0.37 | 50 | 4 | 2 | 5.55 | 10.64 | 10.97 | 11.48 | 12.05 | 13.36 |
| EPDSE2005-1-□□□ | □ | ● | 0.5 | 1.0 | 0.75 | 0.47 | 50 | 4 | 2 | 10.66 | 1.32 | 1.39 | 1.45 | 1.51 | 1.62 |
| EPDSE2005-1.5-□□□ | □ | ● | 0.5 | 1.5 | 0.75 | 0.47 | 50 | 4 | 2 | 10.13 | 1.85 | 1.93 | 2.01 | 2.08 | 2.21 |
| EPDSE2005-2-□□□ | □ | ● | 0.5 | 2.0 | 0.75 | 0.47 | 50 | 4 | 2 | 9.64 | 2.37 | 2.47 | 2.56 | 2.64 | 2.78 |
| EPDSE2005-2.5-□□□ | □ | ● | 0.5 | 2.5 | 0.75 | 0.47 | 50 | 4 | 2 | 9.21 | 2.89 | 3.01 | 3.11 | 3.20 | 3.41 |
| EPDSE2005-3-□□□ | □ | ● | 0.5 | 3.0 | 0.75 | 0.47 | 50 | 4 | 2 | 8.81 | 3.42 | 3.54 | 3.65 | 3.75 | 4.07 |
| EPDSE2005-4-□□□ | □ | ● | 0.5 | 4.0 | 0.75 | 0.47 | 50 | 4 | 2 | 8.10 | 4.46 | 4.61 | 4.73 | 4.87 | 5.40 |

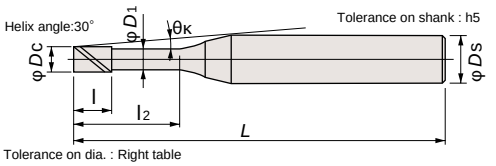
*For the last 3 digits of the part nr. enter the coating type (PN, ATH)

□ = Stocked items in Japan

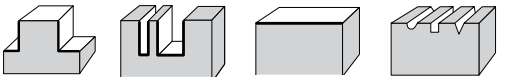
# EPDSE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | Dc (Ø0.1 – Ø0.5) | 0/-0.007 |
| ϕDs | h5 | Dc (Ø0.6 – Ø0.9) | 0/-0.01 |
| | | Dc (Ø1– Ø6) | 0/-0.015 |

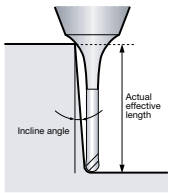
| | Stock | | Size (mm) | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDSE2005-5-□□□ | □ | □ | 0.5 | 5 | 0.75 | 0.47 | 50 | 4 | 2 | 7.50 | 5.49 | 5.66 | 5.79 | 6.06 | 6.72 |
| EPDSE2005-6-□□□ | □ | □ | 0.5 | 6 | 0.75 | 0.47 | 50 | 4 | 2 | 6.98 | 6.53 | 6.71 | 6.92 | 7.26 | 8.05 |
| EPDSE2005-8-□□□ | □ | □ | 0.5 | 8 | 0.75 | 0.47 | 50 | 4 | 2 | 6.13 | 8.59 | 8.80 | 9.20 | 9.65 | 10.71 |
| EPDSE2005-10-□□□ | □ | □ | 0.5 | 10 | 0.75 | 0.47 | 50 | 4 | 2 | 5.47 | 10.64 | 10.97 | 11.48 | 12.05 | 13.36 |
| EPDSE2006-2-□□□ | □ | ● | 0.6 | 2 | 0.90 | 0.57 | 50 | 4 | 4 | 9.59 | 2.54 | 2.70 | 2.84 | 2.96 | 3.19 |
| EPDSE2006-3-□□□ | □ | ● | 0.6 | 3 | 0.90 | 0.57 | 50 | 4 | 4 | 8.74 | 3.60 | 3.80 | 3.96 | 4.11 | 4.37 |
| EPDSE2006-4-□□□ | □ | ● | 0.6 | 4 | 0.90 | 0.57 | 50 | 4 | 4 | 8.02 | 4.66 | 4.89 | 5.07 | 5.24 | 5.53 |
| EPDSE2006-5-□□□ | □ | □ | 0.6 | 5 | 0.90 | 0.57 | 50 | 4 | 4 | 7.42 | 5.71 | 5.96 | 6.17 | 6.35 | 6.72 |
| EPDSE2006-6-□□□ | □ | □ | 0.6 | 6 | 0.90 | 0.57 | 50 | 4 | 4 | 6.90 | 6.76 | 7.04 | 7.26 | 7.45 | 8.05 |
| EPDSE2006-7-□□□ | □ | □ | 0.6 | 7 | 0.90 | 0.57 | 50 | 4 | 4 | 6.44 | 7.81 | 8.10 | 8.34 | 8.55 | 9.38 |
| EPDSE2006-8-□□□ | □ | □ | 0.6 | 8 | 0.90 | 0.57 | 50 | 4 | 4 | 6.04 | 8.85 | 9.17 | 9.42 | 9.65 | 10.71 |
| EPDSE2006-9-□□□ | □ | □ | 0.6 | 9 | 0.90 | 0.57 | 50 | 4 | 4 | 5.69 | 9.89 | 10.22 | 10.49 | 10.85 | 12.03 |
| EPDSE2006-10-□□□ | □ | □ | 0.6 | 10 | 0.90 | 0.57 | 50 | 4 | 4 | 5.38 | 10.93 | 11.28 | 11.56 | 12.05 | 13.36 |
| EPDSE2007-2-□□□ | □ | □ | 0.7 | 2 | 1.05 | 0.67 | 50 | 4 | 4 | 9.53 | 2.54 | 2.70 | 2.84 | 2.96 | 3.19 |
| EPDSE2007-4-□□□ | □ | □ | 0.7 | 4 | 1.05 | 0.67 | 50 | 4 | 4 | 7.94 | 4.66 | 4.89 | 5.07 | 5.24 | 5.53 |
| EPDSE2007-6-□□□ | □ | □ | 0.7 | 6 | 1.05 | 0.67 | 50 | 4 | 4 | 6.81 | 6.76 | 7.04 | 7.26 | 7.45 | 8.05 |
| EPDSE2007-8-□□□ | □ | □ | 0.7 | 8 | 1.05 | 0.67 | 50 | 4 | 4 | 5.95 | 8.85 | 9.17 | 9.42 | 9.65 | 10.71 |
| EPDSE2007-10-□□□ | □ | □ | 0.7 | 10 | 1.05 | 0.67 | 50 | 4 | 4 | 5.29 | 10.93 | 11.28 | 11.56 | 12.05 | 13.36 |
| EPDSE2008-4-□□□ | □ | ● | 0.8 | 4 | 1.20 | 0.77 | 50 | 4 | 4 | 7.86 | 4.66 | 4.89 | 5.07 | 5.24 | 5.53 |
| EPDSE2008-6-□□□ | □ | ● | 0.8 | 6 | 1.20 | 0.77 | 50 | 4 | 4 | 6.72 | 6.76 | 7.04 | 7.26 | 7.45 | 8.05 |
| EPDSE2008-8-□□□ | □ | □ | 0.8 | 8 | 1.20 | 0.77 | 50 | 4 | 4 | 5.86 | 8.85 | 9.17 | 9.42 | 9.65 | 10.71 |
| EPDSE2008-10-□□□ | □ | □ | 0.8 | 10 | 1.20 | 0.77 | 50 | 4 | 4 | 5.20 | 10.93 | 11.28 | 11.56 | 12.05 | 13.36 |
| EPDSE2008-12-□□□ | □ | □ | 0.8 | 12 | 1.20 | 0.77 | 55 | 4 | 4 | 4.67 | 13.00 | 13.38 | 13.76 | 14.44 | 16.02 |
| EPDSE2009-6-□□□ | □ | □ | 0.9 | 6 | 1.35 | 0.86 | 50 | 4 | 4 | 6.61 | 6.79 | 7.06 | 7.28 | 7.47 | 8.08 |
| EPDSE2009-8-□□□ | □ | □ | 0.9 | 8 | 1.35 | 0.86 | 50 | 4 | 4 | 5.76 | 8.87 | 9.18 | 9.43 | 9.68 | 10.74 |
| EPDSE2009-10-□□□ | □ | □ | 0.9 | 10 | 1.35 | 0.86 | 50 | 4 | 4 | 5.10 | 10.95 | 11.30 | 11.57 | 12.07 | 13.39 |
| EPDSE2009-12-□□□ | □ | □ | 0.9 | 12 | 1.35 | 0.86 | 55 | 4 | 4 | 4.58 | 13.02 | 13.40 | 13.79 | 14.47 | 16.05 |
| EPDSE2010-2-□□□ | □ | ● | 1.0 | 2 | 1.50 | 0.96 | 50 | 4 | 4 | 9.31 | 2.58 | 2.73 | 2.86 | 2.98 | 3.21 |
| EPDSE2010-3-□□□ | □ | ● | 1.0 | 3 | 1.50 | 0.96 | 50 | 4 | 4 | 8.41 | 3.64 | 3.82 | 3.99 | 4.13 | 4.39 |
| EPDSE2010-4-□□□ | □ | ● | 1.0 | 4 | 1.50 | 0.96 | 50 | 4 | 4 | 7.67 | 4.69 | 4.91 | 5.09 | 5.26 | 5.54 |

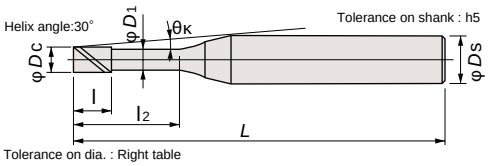
*For the last 3 digits of the part nr. enter the coating type (PN, ATH)

□ = Stocked items in Japan

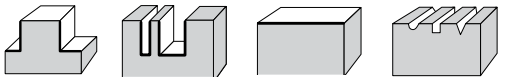
# EPDSE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | Dc (Ø0.1 – Ø0.5) | 0/-0.007 |
| ϕDs | h5 | Dc (Ø0.6 – Ø0.9) | 0/-0.01 |
| | | Dc (Ø1– Ø6) | 0/-0.015 |

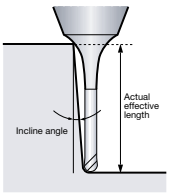
| | Stock | | Size (mm) | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDSE2010-5-□□□ | □ | ● | 1.0 | 5 | 1.50 | 0.96 | 50 | 4 | 4 | 7.04 | 5.74 | 5.99 | 6.19 | 6.37 | 6.76 |
| EPDSE2010-6-□□□ | □ | ● | 1.0 | 6 | 1.50 | 0.96 | 50 | 4 | 4 | 6.51 | 6.79 | 7.06 | 7.28 | 7.47 | 8.08 |
| EPDSE2010-7-□□□ | □ | ● | 1.0 | 7 | 1.50 | 0.96 | 50 | 4 | 4 | 6.06 | 7.83 | 8.12 | 8.36 | 8.56 | 9.41 |
| EPDSE2010-8-□□□ | □ | ● | 1.0 | 8 | 1.50 | 0.96 | 50 | 4 | 4 | 5.66 | 8.87 | 9.18 | 9.43 | 9.68 | 10.74 |
| EPDSE2010-9-□□□ | □ | ● | 1.0 | 9 | 1.50 | 0.96 | 50 | 4 | 4 | 5.31 | 9.91 | 10.24 | 10.50 | 10.88 | 12.07 |
| EPDSE2010-10-□□□ | □ | ● | 1.0 | 10 | 1.50 | 0.96 | 50 | 4 | 4 | 5.00 | 10.95 | 11.30 | 11.57 | 12.07 | 13.39 |
| EPDSE2010-12-□□□ | □ | □ | 1.0 | 12 | 1.50 | 0.96 | 55 | 4 | 4 | 4.48 | 13.02 | 13.40 | 13.79 | 14.47 | 16.05 |
| EPDSE2010-14-□□□ | □ | □ | 1.0 | 14 | 1.50 | 0.96 | 55 | 4 | 4 | 4.06 | 15.09 | 15.49 | 16.07 | 16.86 | 18.70 |
| EPDSE2010-16-□□□ | □ | □ | 1.0 | 16 | 1.50 | 0.96 | 55 | 4 | 4 | 3.71 | 17.15 | 17.58 | 18.35 | 19.25 | 21.36 |
| EPDSE2010-20-□□□ | □ | □ | 1.0 | 20 | 1.50 | 0.96 | 60 | 4 | 4 | 3.17 | 21.26 | 21.89 | 22.91 | 24.04 | 26.66 |
| EPDSE2010-25-□□□ | □ | □ | 1.0 | 25 | 1.50 | 0.96 | 65 | 4 | 4 | 2.68 | 26.39 | 27.33 | 28.61 | 30.02 | - |
| EPDSE2012-6-□□□ | □ | □ | 1.2 | 6 | 1.80 | 1.15 | 50 | 4 | 4 | 6.29 | 6.81 | 7.08 | 7.29 | 7.48 | 8.11 |
| EPDSE2012-8-□□□ | □ | □ | 1.2 | 8 | 1.80 | 1.15 | 50 | 4 | 4 | 5.44 | 8.90 | 9.20 | 9.45 | 9.71 | 10.77 |
| EPDSE2012-10-□□□ | □ | □ | 1.2 | 10 | 1.80 | 1.15 | 50 | 4 | 4 | 4.80 | 10.97 | 11.31 | 11.58 | 12.10 | 13.42 |
| EPDSE2012-12-□□□ | □ | □ | 1.2 | 12 | 1.80 | 1.15 | 55 | 4 | 4 | 4.29 | 13.04 | 13.41 | 13.82 | 14.49 | 16.08 |
| EPDSE2012-16-□□□ | □ | □ | 1.2 | 16 | 1.80 | 1.15 | 55 | 4 | 4 | 3.53 | 17.16 | 17.59 | 18.38 | 19.28 | 21.39 |
| EPDSE2014-6-□□□ | □ | □ | 1.4 | 6 | 2.10 | 1.34 | 50 | 4 | 4 | 6.06 | 6.84 | 7.09 | 7.31 | 7.50 | 8.15 |
| EPDSE2014-12-□□□ | □ | □ | 1.4 | 12 | 2.10 | 1.34 | 55 | 4 | 4 | 4.08 | 13.06 | 13.43 | 13.84 | 14.52 | 16.11 |
| EPDSE2015-4-□□□ | □ | ● | 1.5 | 4 | 2.25 | 1.44 | 50 | 4 | 4 | 7.11 | 4.75 | 4.95 | 5.13 | 5.29 | 5.57 |
| EPDSE2015-6-□□□ | □ | ● | 1.5 | 6 | 2.25 | 1.44 | 50 | 4 | 4 | 5.94 | 6.84 | 7.09 | 7.31 | 7.50 | 8.15 |
| EPDSE2015-8-□□□ | □ | ● | 1.5 | 8 | 2.25 | 1.44 | 50 | 4 | 4 | 5.10 | 8.92 | 9.22 | 9.46 | 9.74 | 10.80 |
| EPDSE2015-10-□□□ | □ | ● | 1.5 | 10 | 2.25 | 1.44 | 50 | 4 | 4 | 4.47 | 10.99 | 11.33 | 11.59 | 12.13 | 13.45 |
| EPDSE2015-12-□□□ | □ | □ | 1.5 | 12 | 2.25 | 1.44 | 55 | 4 | 4 | 3.97 | 13.06 | 13.43 | 13.84 | 14.52 | 16.11 |
| EPDSE2015-14-□□□ | □ | □ | 1.5 | 14 | 2.25 | 1.44 | 55 | 4 | 4 | 3.58 | 15.12 | 15.52 | 16.12 | 16.92 | 18.76 |
| EPDSE2015-16-□□□ | □ | □ | 1.5 | 16 | 2.25 | 1.44 | 55 | 4 | 4 | 3.25 | 17.18 | 17.60 | 18.40 | 19.31 | 21.42 |
| EPDSE2015-18-□□□ | □ | □ | 1.5 | 18 | 2.25 | 1.44 | 60 | 4 | 4 | 2.98 | 19.24 | 19.76 | 20.69 | 21.70 | - |
| EPDSE2015-20-□□□ | □ | □ | 1.5 | 20 | 2.25 | 1.44 | 60 | 4 | 4 | 2.76 | 21.29 | 21.94 | 22.97 | 24.10 | - |
| EPDSE2015-25-□□□ | □ | □ | 1.5 | 25 | 2.25 | 1.44 | 65 | 4 | 4 | 2.31 | 26.42 | 27.39 | 28.67 | 30.08 | - |
| EPDSE2015-30-□□□ | □ | □ | 1.5 | 30 | 2.25 | 1.44 | 70 | 4 | 4 | 1.99 | 31.53 | 32.83 | 34.37 | - | - |
| EPDSE2015-35-□□□ | □ | □ | 1.5 | 35 | 2.25 | 1.44 | 75 | 4 | 4 | 1.75 | 36.64 | 38.28 | 40.07 | - | - |

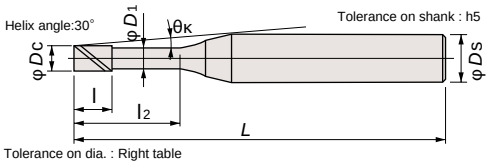
*For the last 3 digits of the part nr. enter the coating type (PN, ATH)

□ = Stocked items in Japan

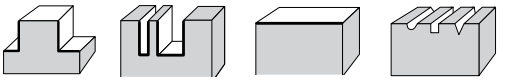
# EPDSE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | Dc (Ø0.1 – Ø0.5) | 0/-0.007 |
| ϕDs | h5 | Dc (Ø0.6 – Ø0.9) | 0/-0.01 |
| | | Dc (Ø1– Ø6) | 0/-0.015 |

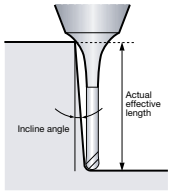
| | Stock | | Size (mm) | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDSE2015-40-□□□ | □ | □ | 1.5 | 40 | 2.25 | 1.44 | 80 | 4 | 4 | 1.56 | 41.85 | 43.73 | 45.78 | - | - |
| EPDSE2016-6-□□□ | □ | □ | 1.6 | 6 | 2.40 | 1.54 | 50 | 4 | 4 | 5.82 | 6.84 | 7.09 | 7.31 | 7.50 | 8.15 |
| EPDSE2016-8-□□□ | □ | □ | 1.6 | 8 | 2.40 | 1.54 | 50 | 4 | 4 | 4.98 | 8.92 | 9.22 | 9.46 | 9.74 | 10.80 |
| EPDSE2018-6-□□□ | □ | □ | 1.8 | 6 | 2.70 | 1.73 | 50 | 4 | 4 | 5.55 | 6.86 | 7.11 | 7.32 | 7.51 | 8.18 |
| EPDSE2018-8-□□□ | □ | □ | 1.8 | 8 | 2.70 | 1.73 | 50 | 4 | 4 | 4.72 | 8.94 | 9.23 | 9.47 | 9.76 | 10.83 |
| EPDSE2020-4-□□□ | □ | ● | 2.0 | 4 | 3.00 | 1.92 | 50 | 4 | 4 | 6.42 | 4.80 | 5.00 | 5.17 | 5.32 | 5.59 |
| EPDSE2020-6-□□□ | □ | ● | 2.0 | 6 | 3.00 | 1.92 | 50 | 4 | 4 | 5.25 | 6.88 | 7.13 | 7.34 | 7.52 | 8.21 |
| EPDSE2020-8-□□□ | □ | ● | 2.0 | 8 | 3.00 | 1.92 | 50 | 4 | 4 | 4.44 | 8.96 | 9.25 | 9.49 | 9.79 | 10.86 |
| EPDSE2020-10-□□□ | □ | ● | 2.0 | 10 | 3.00 | 1.92 | 50 | 4 | 4 | 3.85 | 11.03 | 11.35 | 11.62 | 12.19 | 13.52 |
| EPDSE2020-12-□□□ | □ | ● | 2.0 | 12 | 3.00 | 1.92 | 55 | 4 | 4 | 3.39 | 13.10 | 13.45 | 13.90 | 14.58 | 16.17 |
| EPDSE2020-14-□□□ | □ | ● | 2.0 | 14 | 3.00 | 1.92 | 55 | 4 | 4 | 3.03 | 15.16 | 15.54 | 16.18 | 16.97 | 18.83 |
| EPDSE2020-16-□□□ | □ | □ | 2.0 | 16 | 3.00 | 1.92 | 55 | 4 | 4 | 2.75 | 17.21 | 17.63 | 18.46 | 19.37 | - |
| EPDSE2020-18-□□□ | □ | □ | 2.0 | 18 | 3.00 | 1.92 | 60 | 4 | 4 | 2.51 | 19.27 | 19.81 | 20.74 | 21.76 | - |
| EPDSE2020-20-□□□ | □ | □ | 2.0 | 20 | 3.00 | 1.92 | 60 | 4 | 4 | 2.31 | 21.32 | 21.99 | 23.02 | 24.15 | - |
| EPDSE2020-25-□□□ | □ | □ | 2.0 | 25 | 3.00 | 1.92 | 65 | 4 | 4 | 1.92 | 26.44 | 27.44 | 28.72 | - | - |
| EPDSE2020-30-□□□ | □ | □ | 2.0 | 30 | 3.00 | 1.92 | 70 | 4 | 4 | 1.65 | 31.55 | 32.88 | 34.42 | - | - |
| EPDSE2020-35-□□□ | □ | □ | 2.0 | 35 | 3.00 | 1.92 | 75 | 4 | 4 | 1.44 | 36.69 | 38.33 | - | - | - |
| EPDSE2020-40-□□□ | □ | □ | 2.0 | 40 | 3.00 | 1.92 | 80 | 4 | 4 | 1.28 | 41.90 | 43.78 | - | - | - |
| EPDSE2020-50-□□□ | □ | □ | 2.0 | 50 | 3.00 | 1.92 | 90 | 4 | 4 | 1.05 | 52.33 | 54.67 | - | - | - |
| EPDSE2025-8-□□□ | □ | □ | 2.5 | 8 | 3.75 | 2.40 | 50 | 4 | 4 | 3.65 | 9.00 | 9.28 | 9.51 | 9.85 | 10.93 |
| EPDSE2025-12-□□□ | □ | □ | 2.5 | 12 | 3.75 | 2.40 | 55 | 4 | 4 | 2.73 | 13.13 | 13.48 | 13.95 | 14.64 | - |
| EPDSE2025-16-□□□ | □ | □ | 2.5 | 16 | 3.75 | 2.40 | 55 | 4 | 4 | 2.18 | 17.25 | 17.68 | 18.51 | 19.42 | - |
| EPDSE2025-20-□□□ | □ | □ | 2.5 | 20 | 3.75 | 2.40 | 60 | 4 | 4 | 1.81 | 21.35 | 22.04 | 23.07 | - | - |
| EPDSE2025-30-□□□ | □ | □ | 2.5 | 30 | 3.75 | 2.40 | 70 | 4 | 4 | 1.28 | 31.58 | 32.94 | - | - | - |
| EPDSE2025-40-□□□ | □ | □ | 2.5 | 40 | 3.75 | 2.40 | 80 | 4 | 4 | 0.99 | 41.95 | - | - | - | - |
| EPDSE2025-50-□□□ | □ | □ | 2.5 | 50 | 3.75 | 2.40 | 90 | 4 | 4 | 0.80 | 52.38 | - | - | - | - |
| EPDSE2030-8-□□□ | □ | ● | 3.0 | 8 | 4.50 | 2.88 | 55 | 6 | 4 | 5.59 | 9.04 | 9.31 | 9.54 | 9.91 | 10.99 |
| EPDSE2030-12-□□□ | □ | ● | 3.0 | 12 | 4.50 | 2.88 | 60 | 6 | 4 | 4.44 | 13.16 | 13.50 | 14.00 | 14.69 | 16.30 |
| EPDSE2030-16-□□□ | □ | ● | 3.0 | 16 | 4.50 | 2.88 | 60 | 6 | 4 | 3.68 | 17.28 | 17.73 | 18.57 | 19.48 | 21.61 |
| EPDSE2030-20-□□□ | □ | □ | 3.0 | 20 | 4.50 | 2.88 | 65 | 6 | 4 | 3.15 | 21.38 | 22.09 | 23.13 | 24.26 | 26.91 |

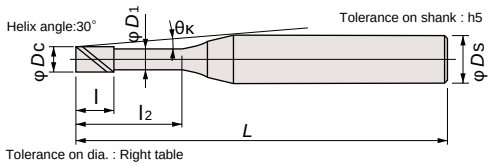
*For the last 3 digits of the part nr. enter the coating type (PN, ATH)

□ = Stocked items in Japan

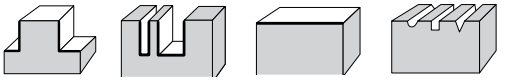
# EPDSE

Advanced Engineering







| | | | |
|---|---|---|---|
| Helix Angle | 30° | Dc (Ø0.1 – Ø0.5) | 0/-0.007 |
| ϕDs | h5 | Dc (Ø0.6 – Ø0.9) | 0/-0.01 |
| | | Dc (Ø1– Ø6) | 0/-0.015 |

| | Stock | | Size (mm) | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No.* | PN | ATH | $D_c$ | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| EPDSE2030-25-□□□ | □ | □ | 3.0 | 25 | 4.5 | 2.88 | 70 | 6 | 4 | 2.66 | 26.49 | 27.54 | 28.83 | 30.25 | - |
| EPDSE2030-30-□□□ | □ | □ | 3.0 | 30 | 4.5 | 2.88 | 75 | 6 | 4 | 2.31 | 31.60 | 32.99 | 34.53 | 36.23 | - |
| EPDSE2030-40-□□□ | □ | □ | 3.0 | 40 | 4.5 | 2.88 | 90 | 6 | 4 | 1.82 | 42.00 | 43.88 | 45.94 | - | - |
| EPDSE2030-50-□□□ | □ | □ | 3.0 | 50 | 4.5 | 2.88 | 100 | 6 | 4 | 1.50 | 52.43 | 54.78 | - | - | - |
| EPDSE2040-12-□□□ | □ | ● | 4.0 | 12 | 6.0 | 3.85 | 60 | 6 | 4 | 3.36 | 13.21 | 13.54 | 14.08 | 14.78 | 16.39 |
| EPDSE2040-16-□□□ | □ | ● | 4.0 | 16 | 6.0 | 3.85 | 60 | 6 | 4 | 2.72 | 17.32 | 17.81 | 18.65 | 19.56 | - |
| EPDSE2040-20-□□□ | □ | ● | 4.0 | 20 | 6.0 | 3.85 | 70 | 6 | 4 | 2.29 | 21.42 | 22.17 | 23.21 | 24.35 | - |
| EPDSE2040-25-□□□ | □ | □ | 4.0 | 25 | 6.0 | 3.85 | 70 | 6 | 4 | 1.91 | 26.53 | 27.62 | 28.91 | - | - |
| EPDSE2040-30-□□□ | □ | □ | 4.0 | 30 | 6.0 | 3.85 | 80 | 6 | 4 | 1.64 | 31.65 | 33.06 | 34.61 | - | - |
| EPDSE2040-35-□□□ | □ | □ | 4.0 | 35 | 6.0 | 3.85 | 80 | 6 | 4 | 1.44 | 36.86 | 38.51 | - | - | - |
| EPDSE2040-40-□□□ | □ | □ | 4.0 | 40 | 6.0 | 3.85 | 90 | 6 | 4 | 1.28 | 42.08 | 43.96 | - | - | - |
| EPDSE2040-50-□□□ | □ | □ | 4.0 | 50 | 6.0 | 3.85 | 100 | 6 | 4 | 1.05 | 52.50 | 54.85 | - | - | - |
| EPDSE2050-20-□□□ | □ | ● | 5.0 | 20 | 7.5 | 4.85 | 70 | 6 | 4 | 1.27 | 21.42 | 22.17 | - | - | - |
| EPDSE2050-25-□□□ | □ | ● | 5.0 | 25 | 7.5 | 4.85 | 70 | 6 | 4 | 1.04 | 26.53 | 27.62 | - | - | - |
| EPDSE2050-30-□□□ | □ | □ | 5.0 | 30 | 7.5 | 4.85 | 80 | 6 | 4 | 0.88 | 31.65 | - | - | - | - |
| EPDSE2050-40-□□□ | □ | □ | 5.0 | 40 | 7.5 | 4.85 | 90 | 6 | 4 | 0.68 | 42.08 | - | - | - | - |
| EPDSE2050-50-□□□ | □ | □ | 5.0 | 50 | 7.5 | 4.85 | 100 | 6 | 4 | 0.55 | 52.50 | - | - | - | - |
| EPDSE2060-20-□□□ | □ | ● | 6.0 | 20 | 9.0 | 5.85 | 70 | 6 | - | 0.00 | - | - | - | - | - |
| EPDSE2060-30-□□□ | □ | ● | 6.0 | 30 | 9.0 | 5.85 | 80 | 6 | - | 0.00 | - | - | - | - | - |
| EPDSE2060-40-□□□ | □ | □ | 6.0 | 40 | 9.0 | 5.85 | 90 | 6 | - | 0.00 | - | - | - | - | - |
| EPDSE2060-50-□□□ | □ | □ | 6.0 | 50 | 9.0 | 5.85 | 100 | 6 | - | 0.00 | - | - | - | - | - |

*For the last 3 digits of the part nr. enter the coating type (PN, ATH)

□ = Stocked items in Japan

# EPDSE

**EPDSE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ATH Coating | | | | | |
| | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | 120% | | 100% | | 90% | | 70% | | 50% | | 45% | |
| Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | 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 |
| **0.1** | **0.5** | 0.004 | 50,000 | 500 | 50,000 | 500 | 50,000 | 475 | 48,600 | 348 | 42,750 | 255 | 40,050 | 208 |
| **0.1** | **1.0** | 0.003 | 50,000 | 455 | 50,000 | 455 | 48,600 | 430 | 43,700 | 315 | 38,500 | 232 | 36,050 | 187 |
| **0.2** | **0.5** | 0.020 | 50,000 | 708 | 45,000 | 638 | 40,500 | 574 | 38,250 | 403 | 33,750 | 301 | 31,500 | 242 |
| **0.2** | **1.0** | 0.014 | 50,000 | 708 | 45,000 | 638 | 40,500 | 574 | 38,250 | 403 | 33,750 | 301 | 31,500 | 242 |
| **0.2** | **1.5** | 0.008 | 48,600 | 630 | 40,500 | 525 | 36,450 | 472 | 34,425 | 362 | 30,375 | 271 | 28,350 | 218 |
| **0.2** | **2.0** | 0.005 | 43,200 | 504 | 36,000 | 420 | 32,400 | 378 | 30,600 | 286 | 27,000 | 214 | 25,200 | 172 |
| **0.2** | **3.0** | 0.003 | 43,200 | 454 | 36,000 | 378 | 32,400 | 340 | 30,600 | 257 | 27,000 | 193 | 25,200 | 155 |
| **0.3** | **1.0** | 0.021 | 48,000 | 680 | 40,000 | 567 | 36,000 | 510 | 34,000 | 358 | 30,000 | 267 | 28,000 | 216 |
| **0.3** | **1.5** | 0.021 | 48,000 | 680 | 40,000 | 567 | 36,000 | 510 | 34,000 | 358 | 30,000 | 267 | 28,000 | 216 |
| **0.3** | **2.0** | 0.012 | 43,200 | 560 | 36,000 | 467 | 32,400 | 420 | 30,600 | 322 | 27,000 | 241 | 25,200 | 194 |
| **0.3** | **2.5** | 0.010 | 43,200 | 560 | 36,000 | 467 | 32,400 | 420 | 30,600 | 322 | 27,000 | 241 | 25,200 | 194 |
| **0.3** | **3.0** | 0.008 | 43,200 | 560 | 36,000 | 467 | 32,400 | 420 | 30,600 | 322 | 27,000 | 241 | 25,200 | 194 |
| **0.4** | **1.0** | 0.040 | 38,400 | 847 | 32,000 | 706 | 28,800 | 635 | 27,200 | 446 | 24,000 | 333 | 22,400 | 268 |
| **0.4** | **1.5** | 0.028 | 38,400 | 847 | 32,000 | 706 | 28,800 | 635 | 27,200 | 446 | 24,000 | 333 | 22,400 | 268 |
| **0.4** | **2.0** | 0.028 | 38,400 | 847 | 32,000 | 706 | 28,800 | 635 | 27,200 | 446 | 24,000 | 333 | 22,400 | 268 |
| **0.4** | **2.5** | 0.022 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 401 | 21,600 | 299 | 20,160 | 241 |
| **0.4** | **3.0** | 0.016 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 401 | 21,600 | 299 | 20,160 | 241 |
| **0.4** | **3.5** | 0.012 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 401 | 21,600 | 299 | 20,160 | 241 |
| **0.4** | **4.0** | 0.010 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 401 | 21,600 | 299 | 20,160 | 241 |
| **0.4** | **5.0** | 0.010 | 30,720 | 542 | 25,600 | 452 | 23,040 | 406 | 21,760 | 260 | 19,200 | 230 | 17,920 | 181 |
| **0.4** | **6.0** | 0.006 | 30,720 | 542 | 25,600 | 452 | 23,040 | 406 | 21,760 | 260 | 19,200 | 230 | 17,920 | 181 |
| **0.4** | **8.0** | 0.003 | 26,880 | 413 | 22,400 | 344 | 20,160 | 310 | 19,040 | 200 | 16,800 | 172 | 15,680 | 131 |
| **0.4** | **10.0** | 0.002 | 23,040 | 304 | 19,200 | 253 | 17,280 | 228 | 16,320 | 147 | 14,400 | 127 | 13,440 | 96 |
| **0.5** | **1.0** | 0.050 | 38,400 | 847 | 32,000 | 706 | 28,800 | 635 | 27,200 | 535 | 24,000 | 333 | 22,400 | 268 |
| **0.5** | **1.5** | 0.050 | 38,400 | 847 | 32,000 | 706 | 28,800 | 635 | 27,200 | 535 | 24,000 | 333 | 22,400 | 268 |
| **0.5** | **2.0** | 0.035 | 38,400 | 847 | 32,000 | 706 | 28,800 | 635 | 27,200 | 535 | 24,000 | 333 | 22,400 | 268 |
| **0.5** | **2.5** | 0.030 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 441 | 21,600 | 299 | 20,160 | 241 |
| **0.5** | **3.0** | 0.020 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 441 | 21,600 | 299 | 20,160 | 241 |
| **0.5** | **4.0** | 0.020 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 401 | 21,600 | 299 | 20,160 | 241 |
| **0.5** | **5.0** | 0.013 | 34,560 | 697 | 28,800 | 581 | 25,920 | 523 | 24,480 | 401 | 21,600 | 299 | 20,160 | 241 |
| **0.5** | **6.0** | 0.013 | 30,720 | 542 | 25,600 | 452 | 23,040 | 406 | 21,760 | 260 | 19,200 | 230 | 17,920 | 181 |
| **0.5** | **8.0** | 0.008 | 30,720 | 464 | 25,600 | 387 | 23,040 | 348 | 21,760 | 247 | 19,200 | 194 | 17,920 | 147 |
| **0.5** | **10.0** | 0.004 | 26,880 | 360 | 22,400 | 300 | 20,160 | 270 | 19,040 | 174 | 16,800 | 150 | 15,680 | 114 |
| **0.6** | **2.0** | 0.042 | 38,400 | 1,210 | 32,000 | 1,008 | 28,800 | 907 | 27,200 | 636 | 24,000 | 475 | 22,400 | 383 |
| **0.6** | **3.0** | 0.035 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.6** | **4.0** | 0.024 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.6** | **5.0** | 0.020 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.6** | **6.0** | 0.015 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.6** | **7.0** | 0.015 | 30,720 | 859 | 25,600 | 716 | 23,040 | 644 | 21,760 | 494 | 19,200 | 369 | 17,920 | 298 |
| **0.6** | **8.0** | 0.015 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.6** | **9.0** | 0.012 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.6** | **10.0** | 0.009 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |

# EPDSE

**EPDSE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ATH Coating | | | | | |
| | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | 120% | | 100% | | 90% | | 70% | | 50% | | 45% | |
| Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.7** | **2** | 0.070 | 38,400 | 1,210 | 32,000 | 1,008 | 28,800 | 907 | 27,200 | 636 | 24,000 | 475 | 22,400 | 384 |
| **0.7** | **4** | 0.049 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.7** | **6** | 0.018 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.7** | **8** | 0.018 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.7** | **10** | 0.018 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.8** | **4** | 0.056 | 38,400 | 1,210 | 32,000 | 1,008 | 28,800 | 907 | 27,200 | 780 | 24,000 | 688 | 22,400 | 422 |
| **0.8** | **6** | 0.032 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 678 | 24,000 | 665 | 20,160 | 379 |
| **0.8** | **8** | 0.020 | 34,560 | 995 | 28,800 | 829 | 25,920 | 746 | 24,480 | 573 | 21,600 | 428 | 20,160 | 345 |
| **0.8** | **10** | 0.020 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.8** | **12** | 0.012 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.9** | **6** | 0.036 | 34,560 | 1094 | 28,800 | 994 | 25,920 | 895 | 24,480 | 687 | 21,600 | 556 | 20,160 | 414 |
| **0.9** | **8** | 0.023 | 34,560 | 1094 | 28,800 | 911 | 25,920 | 820 | 24,480 | 630 | 21,600 | 513 | 20,160 | 379 |
| **0.9** | **10** | 0.023 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **0.9** | **12** | 0.023 | 30,720 | 774 | 25,600 | 645 | 23,040 | 581 | 21,760 | 372 | 19,200 | 328 | 17,920 | 258 |
| **1.0** | **2** | 0.100 | 34,560 | 1,628 | 28,800 | 1,356 | 25,920 | 1,220 | 24,480 | 1150 | 22,930 | 1008 | 20,160 | 846 |
| **1.0** | **3** | 0.085 | 34,560 | 1,628 | 28,800 | 1,356 | 25,920 | 1,220 | 24,480 | 1150 | 22,930 | 1008 | 20,160 | 846 |
| **1.0** | **4** | 0.070 | 34,560 | 1,628 | 28,800 | 1,356 | 25,920 | 1,220 | 24,480 | 1077 | 22,930 | 963 | 20,160 | 766 |
| **1.0** | **5** | 0.055 | 34,560 | 1,628 | 28,800 | 1,356 | 25,920 | 1,220 | 24,480 | 1028 | 22,930 | 871 | 20,160 | 685 |
| **1.0** | **6** | 0.040 | 31,104 | 1,344 | 25,920 | 1,120 | 23,328 | 1,008 | 22,032 | 903 | 20,700 | 745 | 18,144 | 465 |
| **1.0** | **7** | 0.040 | 31,104 | 1,344 | 25,920 | 1,120 | 23,328 | 1,008 | 22,032 | 837 | 20,700 | 703 | 18,144 | 465 |
| **1.0** | **8** | 0.040 | 31,104 | 1,344 | 25,920 | 1,120 | 23,328 | 1,008 | 22,032 | 837 | 20,700 | 622 | 18,144 | 465 |
| **1.0** | **9** | 0.033 | 31,104 | 1,344 | 25,920 | 1,120 | 23,328 | 1,008 | 22,032 | 773 | 19,440 | 577 | 18,144 | 465 |
| **1.0** | **10** | 0.025 | 31,104 | 1,344 | 25,920 | 1,120 | 23,328 | 1,008 | 22,032 | 773 | 19,440 | 577 | 18,144 | 465 |
| **1.0** | **12** | 0.025 | 27,648 | 1,045 | 23,040 | 871 | 20,736 | 784 | 19,584 | 502 | 17,280 | 443 | 16,128 | 348 |
| **1.0** | **14** | 0.025 | 27,648 | 1,045 | 23,040 | 871 | 20,736 | 784 | 19,584 | 502 | 17,280 | 443 | 16,128 | 348 |
| **1.0** | **16** | 0.015 | 27,648 | 896 | 23,040 | 746 | 20,736 | 672 | 19,584 | 476 | 17,280 | 373 | 16,128 | 283 |
| **1.0** | **20** | 0.010 | 24,828 | 732 | 20,690 | 610 | 22,345 | 549 | 17,587 | 348 | 15,518 | 305 | 14,483 | 226 |
| **1.0** | **25** | 0.005 | 21,000 | 569 | 17,500 | 474 | 18,900 | 427 | 14,875 | 270 | 13,125 | 237 | 12,250 | 175 |
| **1.2** | **6** | 0.084 | 30,720 | 1,452 | 25,600 | 1,210 | 23,040 | 1,089 | 21,760 | 870 | 19,200 | 570 | 17,920 | 460 |
| **1.2** | **8** | 0.048 | 27,648 | 1,194 | 23,040 | 995 | 20,736 | 896 | 19,584 | 783 | 17,280 | 513 | 16,128 | 414 |
| **1.2** | **10** | 0.030 | 27,648 | 1,194 | 23,040 | 995 | 20,736 | 896 | 19,584 | 744 | 17,280 | 513 | 16,128 | 414 |
| **1.2** | **12** | 0.030 | 27,648 | 1,194 | 23,040 | 995 | 20,736 | 896 | 19,584 | 687 | 17,280 | 513 | 16,128 | 414 |
| **1.2** | **16** | 0.020 | 24,576 | 1,061 | 20,480 | 884 | 18,432 | 796 | 17,408 | 611 | 15,360 | 456 | 14,336 | 368 |
| **1.4** | **6** | 0.100 | 26,880 | 1,270 | 22,400 | 1,058 | 20,160 | 953 | 19,040 | 668 | 16,800 | 499 | 15,680 | 403 |
| **1.4** | **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** | 0.110 | 26,880 | 1,397 | 22,400 | 1,163 | 20,160 | 1048 | 19,040 | 801 | 16,800 | 648 | 15,680 | 482 |
| **1.5** | **6** | 0.110 | 26,880 | 1,397 | 22,400 | 1,163 | 20,160 | 1048 | 19,040 | 801 | 16,800 | 623 | 15,680 | 482 |
| **1.5** | **8** | 0.080 | 24,192 | 1,149 | 20,160 | 958 | 18,144 | 940 | 17,136 | 721 | 15,120 | 538 | 14,112 | 416 |
| **1.5** | **10** | 0.060 | 24,192 | 1,149 | 20,160 | 871 | 18,144 | 862 | 17,136 | 721 | 15,120 | 538 | 14,112 | 416 |
| **1.5** | **12** | 0.060 | 24,192 | 1,045 | 20,160 | 871 | 18,144 | 784 | 17,136 | 721 | 15,120 | 449 | 14,112 | 362 |
| **1.5** | **14** | 0.038 | 24,192 | 1,045 | 20,160 | 871 | 18,144 | 784 | 17,136 | 721 | 15,120 | 449 | 14,112 | 362 |
| **1.5** | **16** | 0.038 | 21,504 | 813 | 17,920 | 677 | 16,128 | 610 | 15,232 | 391 | 13,440 | 345 | 12,544 | 271 |

# EPDSE

**EPDSE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ATH Coating | | | | | |
| | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | 120% | | 100% | | 90% | | 70% | | 50% | | 45% | |
| Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **1.5** | **18** | 0.038 | 21,504 | 813 | 17,920 | 677 | 16,128 | 610 | 15,232 | 391 | 13,440 | 345 | 12,544 | 271 |
| **1.5** | **20** | 0.038 | 21,504 | 813 | 17,920 | 677 | 16,128 | 610 | 15,232 | 391 | 13,440 | 345 | 12,544 | 271 |
| **1.5** | **25** | 0.023 | 16,128 | 523 | 13,440 | 435 | 12,096 | 392 | 11,424 | 278 | 10,080 | 218 | 9,408 | 165 |
| **1.5** | **30** | 0.015 | 13,440 | 355 | 11,200 | 296 | 12,096 | 266 | 9,520 | 178 | 8,400 | 139 | 7,840 | 112 |
| **1.5** | **35** | 0.010 | 13,440 | 355 | 11,200 | 296 | 12,096 | 266 | 9,520 | 178 | 8,400 | 139 | 7,840 | 112 |
| **1.5** | **40** | 0.005 | 10,752 | 190 | 8,960 | 158 | 8,064 | 142 | 7,616 | 95 | 6,720 | 74 | 6,272 | 60 |
| **1.6** | **6** | 0.110 | 24,960 | 1,310 | 20,800 | 1,201 | 18,720 | 1130 | 17,680 | 759 | 15,600 | 566 | 14,560 | 456 |
| **1.6** | **8** | 0.110 | 24,960 | 1,310 | 20,800 | 1,201 | 18,720 | 983 | 17,680 | 690 | 15,600 | 566 | 14,560 | 456 |
| **1.8** | **6** | 0.130 | 24,960 | 1,310 | 20,800 | 1,201 | 18,720 | 1179 | 17,680 | 759 | 15,600 | 618 | 14,560 | 498 |
| **1.8** | **8** | 0.130 | 24,960 | 1,310 | 20,800 | 1,201 | 18,720 | 1081 | 17,680 | 690 | 15,600 | 618 | 14,560 | 498 |
| **2.0** | **4** | 0.200 | 20,160 | 1,397 | 16,800 | 1,174 | 15,120 | 1048 | 14,280 | 734 | 12,600 | 548 | 11,760 | 443 |
| **2.0** | **6** | 0.200 | 20,160 | 1,397 | 16,800 | 1,174 | 15,120 | 1048 | 14,280 | 734 | 12,600 | 548 | 11,760 | 443 |
| **2.0** | **8** | 0.140 | 20,160 | 1,397 | 16,800 | 1,174 | 15,120 | 1048 | 14,280 | 734 | 12,600 | 548 | 11,760 | 443 |
| **2.0** | **10** | 0.140 | 20,160 | 1,397 | 16,800 | 1,174 | 15,120 | 1048 | 14,280 | 734 | 12,600 | 548 | 11,760 | 443 |
| **2.0** | **12** | 0.100 | 18,144 | 1,149 | 15,120 | 958 | 13,608 | 862 | 12,852 | 661 | 11,340 | 493 | 10,584 | 398 |
| **2.0** | **14** | 0.080 | 18,144 | 1,149 | 15,120 | 958 | 13,608 | 862 | 12,852 | 661 | 11,340 | 493 | 10,584 | 362 |
| **2.0** | **16** | 0.080 | 18,144 | 1,045 | 15,120 | 914 | 13,608 | 862 | 12,852 | 601 | 11,340 | 449 | 10,584 | 362 |
| **2.0** | **18** | 0.050 | 18,144 | 1,045 | 15,120 | 914 | 13,608 | 862 | 12,852 | 601 | 11,340 | 449 | 10,584 | 362 |
| **2.0** | **20** | 0.050 | 18,144 | 1,045 | 15,120 | 871 | 13,608 | 784 | 12,852 | 601 | 11,340 | 449 | 10,584 | 362 |
| **2.0** | **25** | 0.050 | 16,128 | 813 | 13,440 | 677 | 12,096 | 610 | 11,424 | 391 | 10,080 | 345 | 9,408 | 271 |
| **2.0** | **30** | 0.030 | 16,128 | 813 | 13,440 | 677 | 12,096 | 610 | 11,424 | 391 | 10,080 | 345 | 9,408 | 271 |
| **2.0** | **35** | 0.020 | 14,112 | 583 | 11,760 | 486 | 10,584 | 437 | 9,996 | 282 | 8,820 | 228 | 8,232 | 185 |
| **2.0** | **40** | 0.010 | 14,112 | 583 | 11,760 | 486 | 10,584 | 437 | 9,996 | 282 | 8,820 | 228 | 8,232 | 185 |
| **2.0** | **50** | 0.005 | 12,096 | 355 | 10,080 | 296 | 9,072 | 266 | 8,568 | 172 | 7,560 | 139 | 7,056 | 112 |
| **2.5** | **8** | 0.180 | 17,280 | 1,497 | 14,400 | 1,247 | 12,960 | 1,123 | 12,240 | 787 | 10,800 | 642 | 10,080 | 474 |
| **2.5** | **12** | 0.180 | 17,280 | 1,260 | 14,400 | 1,247 | 12,960 | 1,123 | 12,240 | 716 | 10,800 | 588 | 10,080 | 431 |
| **2.5** | **16** | 0.100 | 15,552 | 1,120 | 12,960 | 1073 | 11,664 | 966 | 11,016 | 644 | 9,720 | 529 | 9,072 | 388 |
| **2.5** | **20** | 0.100 | 15,552 | 1,120 | 12,960 | 933 | 11,664 | 840 | 11,016 | 644 | 9,720 | 529 | 9,072 | 388 |
| **2.5** | **30** | 0.060 | 13,824 | 870 | 11,520 | 725 | 10,368 | 653 | 9,792 | 435 | 8,640 | 341 | 8,064 | 276 |
| **2.5** | **40** | 0.030 | 12,096 | 625 | 10,080 | 521 | 9,072 | 469 | 8,568 | 313 | 7,560 | 245 | 7,056 | 198 |
| **2.5** | **50** | 0.010 | 12,096 | 625 | 10,080 | 521 | 9,072 | 469 | 8,568 | 313 | 7,560 | 245 | 7,056 | 198 |
| **3.0** | **8** | 0.300 | 15,360 | 1,331 | 12,800 | 1,108 | 11,520 | 997 | 10,880 | 699 | 10,600 | 570 | 8,960 | 422 |
| **3.0** | **12** | 0.210 | 15,360 | 1,331 | 12,800 | 1,108 | 11,520 | 997 | 10,880 | 699 | 10,600 | 570 | 8,960 | 422 |
| **3.0** | **16** | 0.150 | 13,824 | 1144 | 11,520 | 994 | 10,368 | 820 | 9,792 | 630 | 9,450 | 513 | 8,064 | 379 |
| **3.0** | **20** | 0.120 | 13,824 | 995 | 11,520 | 911 | 10,368 | 820 | 9,792 | 630 | 9,450 | 513 | 8,064 | 379 |
| **3.0** | **25** | 0.080 | 13,824 | 995 | 11,520 | 911 | 10,368 | 820 | 9,792 | 630 | 9,450 | 513 | 8,064 | 379 |
| **3.0** | **30** | 0.080 | 13,824 | 995 | 11,520 | 829 | 10,368 | 746 | 9,792 | 630 | 9,450 | 513 | 8,064 | 347 |
| **3.0** | **40** | 0.050 | 12,288 | 884 | 10,240 | 737 | 9,216 | 663 | 8,704 | 509 | 7,680 | 380 | 7,168 | 307 |
| **3.0** | **50** | 0.020 | 10,752 | 556 | 8,960 | 463 | 8,064 | 417 | 7,616 | 278 | 6,720 | 218 | 6,272 | 176 |

# EPDSE

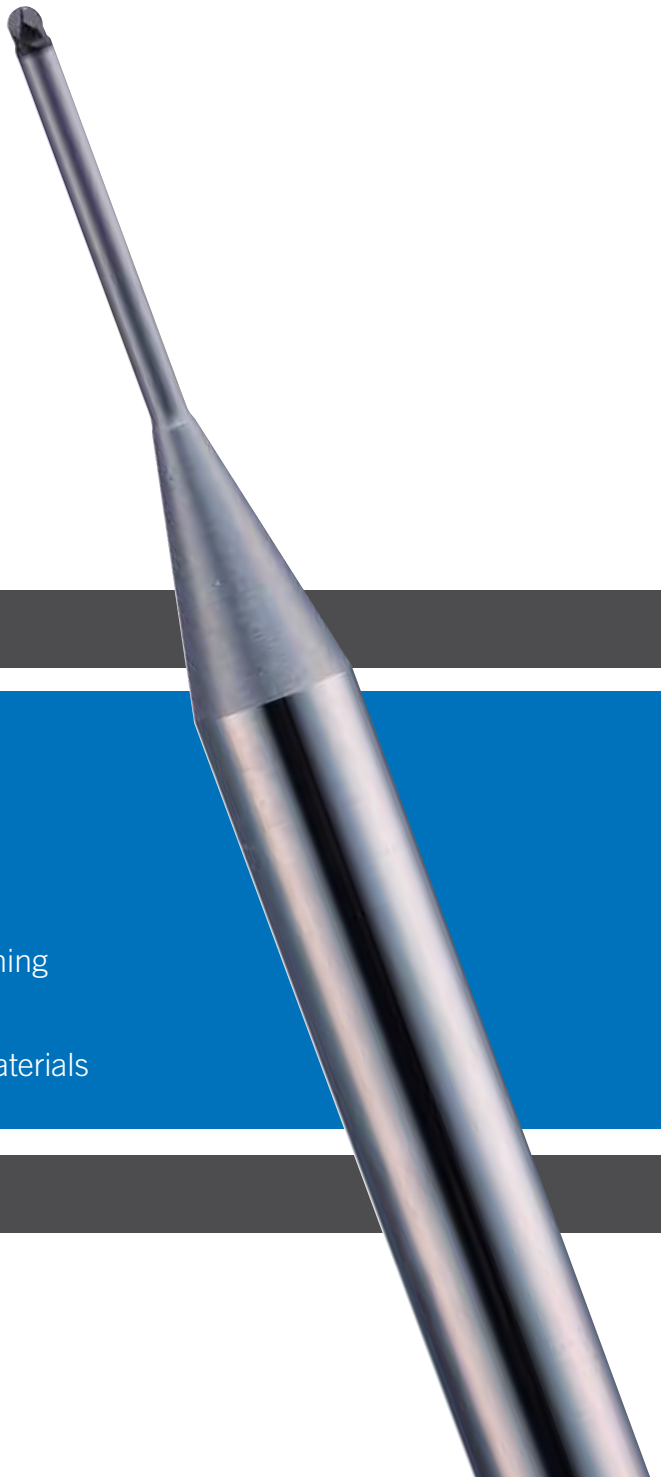
**EPDSE**
**Cutting Conditions**
**High Efficiency (Metric)**

Advanced Engineering

| | | | PN Coating | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ATH Coating | | | | | |
| | | | Copper (Cu) | | Carbon steels Alloy steel (180 - 250HB) | | Stainless steels Tool steels (25 - 35HRC) | | Pre-harden steels (35 - 45HRC) | | Hardened steel (45 - 55HRC) | | Hardened steel (55 - 65HRC) | |
| Ratio to standard depth of cut | | | 120% | | 100% | | 90% | | 70% | | 50% | | 45% | |
| Mill dia. | Under neck length | $a_p$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **4** | **12** | 0.40 | 11,500 | 2,300 | 9,400 | 1,880 | 8,460 | 1,524 | 7,990 | 1,358 | 7,050 | 902 | 6,580 | 728 |
| **4** | **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 |
| **4** | **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 |
| **4** | **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 |
| **4** | **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 |
| **4** | **35** | 0.10 | 9,137 | 1,645 | 7,614 | 1,371 | 6,853 | 1,110 | 6,472 | 990 | 5,711 | 731 | 5,330 | 589 |
| **4** | **40** | 0.10 | 9,137 | 1,645 | 7,614 | 1,371 | 6,853 | 1,110 | 6,472 | 990 | 5,711 | 731 | 5,330 | 589 |
| **4** | **50** | 0.06 | 7,896 | 1,128 | 6,580 | 940 | 5,922 | 846 | 5,593 | 658 | 4,935 | 442 | 4,606 | 357 |
| **5** | **20** | 0.30 | 9,014 | 1,802 | 7,512 | 1,652 | 6,761 | 1,487 | 6,385 | 1,051 | 5,634 | 706 | 5,258 | 571 |
| **5** | **25** | 0.30 | 8,112 | 1,621 | 6,760 | 1,351 | 6,084 | 1,216 | 5,746 | 946 | 5,070 | 635 | 4,732 | 513 |
| **5** | **30** | 0.20 | 8,112 | 1,461 | 6,760 | 1,217 | 6,084 | 1,094 | 5,746 | 851 | 5,070 | 573 | 4,732 | 462 |
| **5** | **40** | 0.15 | 7,301 | 1,315 | 6,084 | 1,096 | 5,476 | 986 | 5,171 | 767 | 4,563 | 515 | 4,259 | 416 |
| **5** | **50** | 0.10 | 7,301 | 1,315 | 6,084 | 1,096 | 5,476 | 986 | 5,171 | 767 | 4,563 | 515 | 4,259 | 416 |
| **6** | **20** | 0.50 | 7,418 | 1,629 | 6,182 | 1,481 | 5,564 | 1,333 | 5,255 | 1036 | 4,637 | 766 | 4,327 | 562 |
| **6** | **30** | 0.40 | 6,744 | 1,480 | 5,620 | 1,346 | 5,058 | 1,212 | 4,777 | 942 | 4,215 | 696 | 3,934 | 511 |
| **6** | **40** | 0.30 | 6,744 | 1,332 | 5,620 | 1,109 | 5,058 | 998 | 4,777 | 847 | 4,215 | 625 | 3,934 | 459 |
| **6** | **50** | 0.20 | 6,000 | 1,090 | 5,000 | 986 | 4,500 | 887 | 4,250 | 690 | 3,750 | 515 | 3,500 | 379 |

# CBN-EPSB-F/S

## Ball Nose CBN End Mills for Ultra High Hardness Materials



## FEATURES

Two flute types are available: Fine and Strong

Long tool life even when direct cutting high hardness materials of 60HRC or higher

Cutting edge shape resists chipping, enabling stable finishing for extended periods

Ideal for machining small workpieces of high hardness materials

# CBN-EPSB-F/S

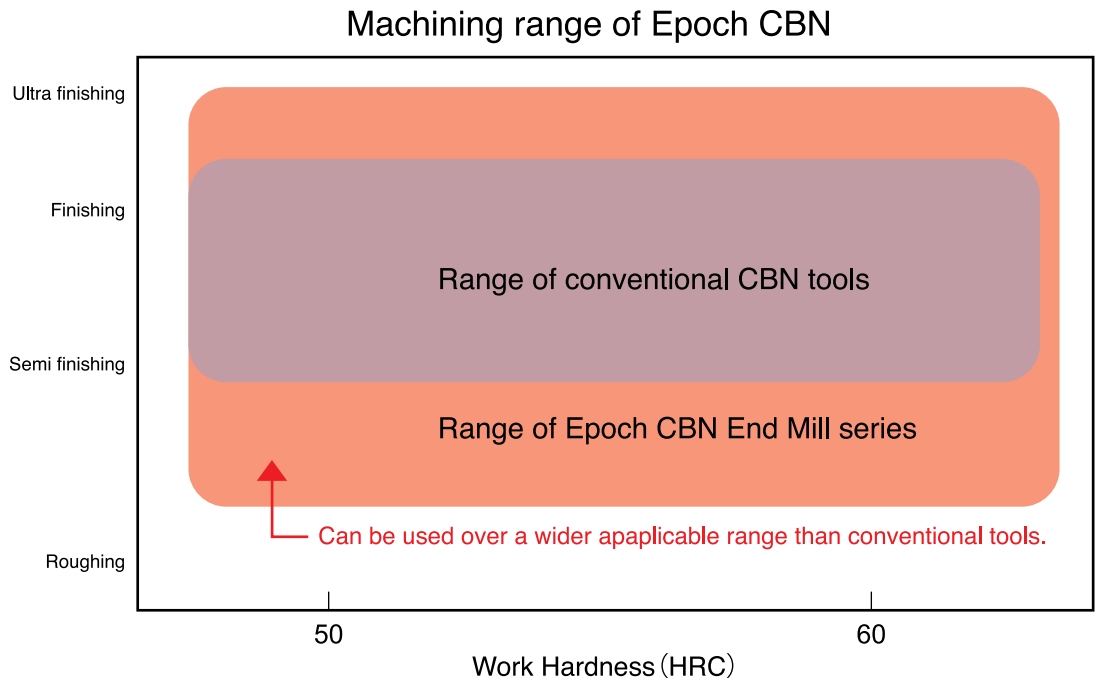
## INTRODUCTION

Recently, the trend in moldmaking has been toward harder and harder materials, and cutting these materials is increasingly difficult. In order to respond to the demands for ultra-high precision, tool wear resistance is more critical, and recently alternative to carbide such as CBN are becoming more widely used.

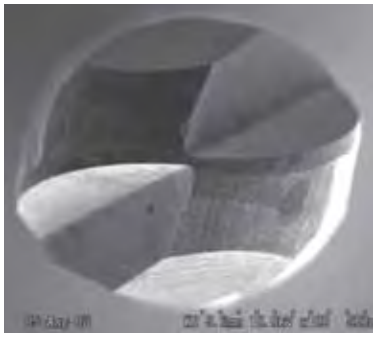
Unlike the conventional geometry commonly seen on most CBN tools which focuses on rigidity, the geometry of this newly developed Epoch CBN End Mill series achieves both rigidity and cutting edge sharpness. This enables high-precisionfinishing machining over a long period of time in high-hardness materials.

## FEATURES

| 1. | Machining Range of CBN Series |
|---|---|



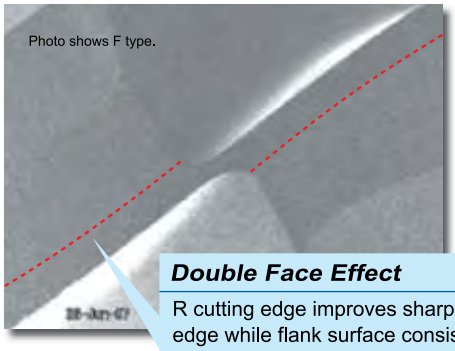
## 2. Two Flute Types: Fine and Strong



| Fine Type | | Strong Type |
|---|---|---|
| Priority on high-accuracy machining geometry | Applications | Priority on deep machining |
| Geometry with priority on cutting performance enables higher machining accuracy. | Features | Enables stable machining even in environments where vibrations are likely. |
| L/D ≤ 5 | Basic Recommendation | L/D > 5 |

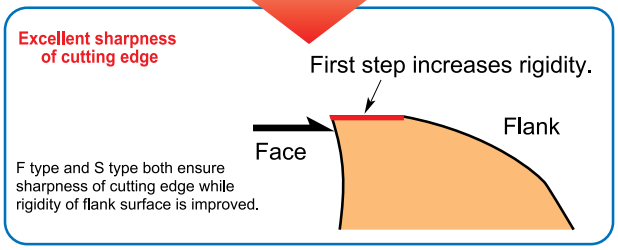
## 3. Double Face Shape of Cutting Edge

Double Face Shape

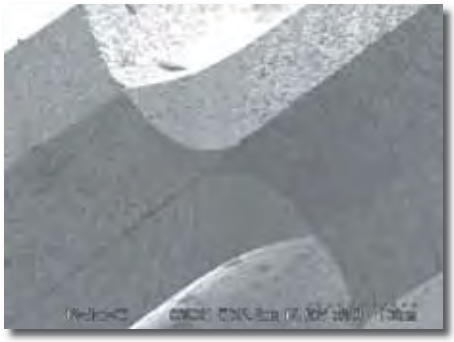


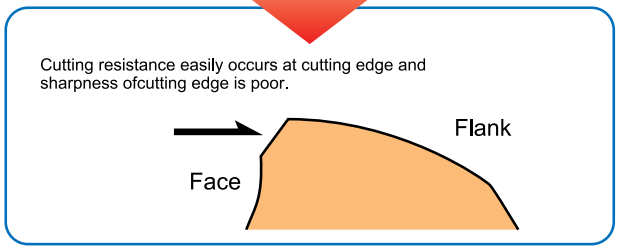

***Double Face Effect***

R cutting edge improves sharpness of cutting edge while flank surface consists of 2 surfaces to ensure rigidity.



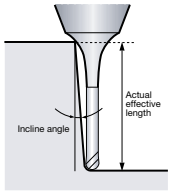

General CBN Tool

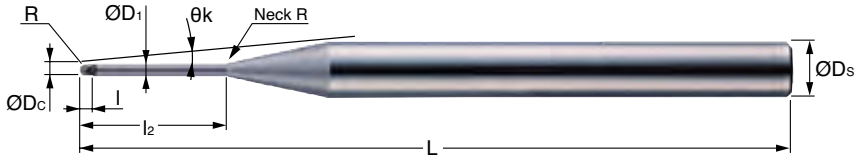




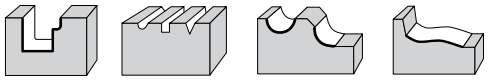
# CBN-EPSB-F/S

Advanced Engineering







| Part No. | Stock F | Stock S | Size (mm) $D_c$ | R | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBN-EPSB2002-0.5-☐ | ● | ☐ | 0.2 | 0.10 | 0.50 | 0.12 | 0.18 | 50 | 4 | 1 | 11.45 | 0.67 | 0.70 | 0.72 | 0.75 | 0.80 |
| CBN-EPSB2002-1-☐ | ● | ☐ | 0.2 | 0.10 | 1.00 | 0.12 | 0.18 | 50 | 4 | 1 | 10.88 | 1.19 | 1.24 | 1.28 | 1.32 | 1.38 |
| CBN-EPSB2003-0.75-☐ | ● | ☐ | 0.3 | 0.15 | 0.75 | 0.18 | 0.27 | 50 | 4 | 1 | 11.17 | 0.95 | 0.99 | 1.02 | 1.05 | 1.10 |
| CBN-EPSB2003-1.5-☐ | ● | ☐ | 0.3 | 0.15 | 1.50 | 0.18 | 0.27 | 50 | 4 | 1 | 10.36 | 1.73 | 1.79 | 1.83 | 1.88 | 2.03 |
| CBN-EPSB2004-1-☐ | ● | ☐ | 0.4 | 0.20 | 1.00 | 0.24 | 0.37 | 50 | 4 | 1 | 10.91 | 1.21 | 1.25 | 1.29 | 1.32 | 1.38 |
| CBN-EPSB2004-2-☐ | ● | ☐ | 0.4 | 0.20 | 2.00 | 0.24 | 0.37 | 50 | 4 | 1 | 9.88 | 2.25 | 2.31 | 2.37 | 2.43 | 2.68 |
| CBN-EPSB2005-1.5-☐ | ● | ☐ | 0.5 | 0.25 | 1.50 | 0.30 | 0.47 | 50 | 4 | 1 | 10.39 | 1.73 | 1.78 | 1.83 | 1.87 | 2.00 |
| CBN-EPSB2005-3-☐ | ● | ☐ | 0.5 | 0.25 | 3.00 | 0.30 | 0.47 | 50 | 4 | 1 | 9.00 | 3.28 | 3.36 | 3.46 | 3.62 | 3.99 |
| CBN-EPSB2006-1.5-☐ | ● | ☐ | 0.6 | 0.30 | 1.50 | 0.36 | 0.57 | 50 | 4 | 1 | 10.40 | 1.73 | 1.78 | 1.82 | 1.86 | 1.98 |
| CBN-EPSB2006-3-☐ | ● | ☐ | 0.6 | 0.30 | 3.00 | 0.36 | 0.57 | 50 | 4 | 1 | 8.98 | 3.28 | 3.36 | 3.46 | 3.61 | 3.97 |
| CBN-EPSB2008-2.5-☐ | ● | ☐ | 0.8 | 0.40 | 2.50 | 0.48 | 0.77 | 50 | 4 | 1 | 9.37 | 2.76 | 2.83 | 2.89 | 2.99 | 3.28 |
| CBN-EPSB2008-5-☐ | ● | ☐ | 0.8 | 0.40 | 5.00 | 0.48 | 0.77 | 50 | 4 | 1 | 7.48 | 5.33 | 5.48 | 5.72 | 5.99 | 6.60 |
| CBN-EPSB2010-2.5-☐ | ● | ☐ | 1.0 | 0.50 | 2.50 | 0.60 | 0.96 | 50 | 4 | 1 | 9.31 | 2.77 | 2.84 | 2.89 | 3.00 | 3.28 |
| CBN-EPSB2010-5-☐ | ● | ☐ | 1.0 | 0.50 | 5.00 | 0.60 | 0.96 | 50 | 4 | 1 | 7.34 | 5.34 | 5.50 | 5.74 | 5.99 | 6.60 |
| CBN-EPSB2010-10-☐ | ● | ☐ | 1.0 | 0.50 | 10.00 | 0.60 | 0.96 | 50 | 4 | 1 | 5.15 | 10.50 | 10.95 | 11.44 | 11.98 | 13.23 |
| CBN-EPSB2015-5-☐ | ● | ☐ | 1.5 | 0.75 | 5.00 | 0.90 | 1.44 | 50 | 4 | 1 | 6.94 | 5.36 | 5.53 | 5.75 | 6.00 | 6.58 |
| CBN-EPSB2015-10-☐ | ● | ☐ | 1.5 | 0.75 | 10.00 | 0.90 | 1.44 | 50 | 4 | 1 | 4.68 | 10.54 | 10.98 | 11.46 | 11.98 | 13.22 |
| CBN-EPSB2020-5-☐ | ● | ☐ | 2.0 | 1.00 | 5.00 | 1.20 | 1.92 | 50 | 4 | 1 | 6.42 | 5.38 | 5.56 | 5.77 | 6.01 | 6.56 |
| CBN-EPSB2020-10-☐ | ● | ☐ | 2.0 | 1.00 | 10.00 | 1.20 | 1.92 | 50 | 4 | 1 | 4.12 | 10.58 | 11.01 | 11.48 | 11.99 | 13.20 |
| CBN-EPSB2020-20-☐ | ● | ☐ | 2.0 | 1.00 | 20.00 | 1.20 | 1.92 | 55 | 4 | 1 | 2.40 | 21.00 | 21.90 | 22.88 | 23.96 | - |

*For the last digit of the part no. enter the type (F, S)

**Actual measured mill diameter value is shown on case**

☐ = Stocked items in Japan

# CBN-EPSB-F/S

## CBN-EPSB-F/S Cutting Condition (Metric)

Advanced Engineering

### Semi-Finishing to Finishing

| Work Material | | | | | Hardened Steels (-55HRC) HPM1, SKD61, SKT4 | | Hardened Steels (55-65HRC) SKD11,SKH51 | | Hardened Steels (65-68HRC) SKH,Welded HSS | | Hardened Steels (68-72HRC) HAP, Powdered HSS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | | 100% | | 85% | | 70% | | 60% | |
| | | | Depth of cut | | | | | | | | | |
| $D_c$ | R | $l_2$ | $a_p$ | $a_e$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.2** | **0.10** | 0.50 | 0.006 | 0.018 | 50,000 | 1,800 | 48,000 | 1,510 | 45,000 | 1,220 | 43,000 | 970 |
| **0.2** | **0.10** | 1.00 | 0.005 | 0.015 | 46,000 | 1,660 | 44,000 | 1,390 | 42,000 | 1,130 | 39,000 | 880 |
| **0.3** | **0.15** | 0.75 | 0.01 | 0.030 | 50,000 | 1,800 | 47,000 | 1,480 | 45,000 | 1,220 | 42,000 | 950 |
| **0.3** | **0.15** | 1.50 | 0.008 | 0.024 | 45,000 | 1,620 | 42,000 | 1,320 | 40,000 | 1,080 | 38,000 | 860 |
| **0.4** | **0.20** | 1.00 | 0.015 | 0.045 | 46,000 | 2,210 | 44,000 | 1,850 | 42,000 | 1,510 | 39,000 | 1,170 |
| **0.4** | **0.20** | 2.00 | 0.012 | 0.036 | 41,000 | 1,970 | 39,000 | 1,640 | 37,000 | 1,330 | 35,000 | 1,050 |
| **0.5** | **0.25** | 1.50 | 0.025 | 0.075 | 46,000 | 2,480 | 44,000 | 2,080 | 41,000 | 1,660 | 39,000 | 1,320 |
| **0.5** | **0.25** | 3.00 | 0.02 | 0.060 | 41,000 | 2,210 | 39,000 | 1,840 | 37,000 | 1,500 | 35,000 | 1,180 |
| **0.6** | **0.30** | 1.50 | 0.03 | 0.090 | 42,000 | 2,520 | 40,000 | 2,100 | 38,000 | 1,710 | 36,000 | 1,350 |
| **0.6** | **0.30** | 3.00 | 0.025 | 0.075 | 38,000 | 2,280 | 36,000 | 1,890 | 34,000 | 1,530 | 32,000 | 1,200 |
| **0.8** | **0.40** | 2.50 | 0.04 | 0.120 | 42,000 | 2,770 | 40,000 | 2,310 | 38,000 | 1,880 | 36,000 | 1,490 |
| **0.8** | **0.40** | 5.00 | 0.032 | 0.096 | 38,000 | 2,510 | 36,000 | 2,080 | 34,000 | 1,680 | 32,000 | 1,320 |
| **1.0** | **0.50** | 2.50 | 0.05 | 0.150 | 38,200 | 2,750 | 36,300 | 2,290 | 34,000 | 1,840 | 32,000 | 1,440 |
| **1.0** | **0.50** | 5.00 | 0.04 | 0.120 | 34,400 | 2,480 | 32,700 | 2,060 | 31,000 | 1,670 | 29,000 | 1,310 |
| **1.0** | **0.50** | 10.00 | 0.01 | 0.030 | 26,700 | 1,550 | 25,400 | 1,290 | 24,000 | 1,040 | 23,000 | 830 |
| **1.5** | **0.75** | 5.00 | 0.07 | 0.210 | 32,000 | 2,560 | 30,400 | 2,130 | 29,000 | 1,740 | 27,000 | 1,350 |
| **1.5** | **0.75** | 10.00 | 0.02 | 0.060 | 22,500 | 1,440 | 21,400 | 1,200 | 20,000 | 960 | 19,000 | 760 |
| **2.0** | **1.00** | 5.00 | 0.08 | 0.240 | 28,000 | 2,910 | 26,600 | 2,420 | 25,000 | 1,950 | 24,000 | 1,560 |
| **2.0** | **1.00** | 10.00 | 0.065 | 0.195 | 25,100 | 2,610 | 23,900 | 2,170 | 23,000 | 1,790 | 21,000 | 1,370 |
| **2.0** | **1.00** | 20.00 | 0.017 | 0.051 | 19,600 | 1,650 | 18,600 | 1,370 | 18,000 | 1,130 | 17,000 | 890 |

### Ultra Finishing

| Work Material | | | | | Hardened Steels (-55HRC) HPM1, SKD61, SKT4 | | Hardened Steels (55-65HRC) SKD11,SKH51 | | Hardened Steels (65-68HRC) SKH, Welded HSS | | Hardened Steels (68-72HRC) HAP, Powdered HSS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | | 100% | | 90% | | 80% | | 70% | |
| | | | Depth of cut | | | | | | | | | |
| $D_c$ | R | $l_2$ | $a_p$ | $a_e$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.2** | **0.10** | 0.50 | 0.005 | 0.015 | 58,000 | 1,450 | 55,000 | 1,310 | 52,000 | 1,110 | 49,000 | 920 |
| **0.2** | **0.10** | 1.00 | 0.005 | 0.015 | 53,000 | 1,330 | 50,000 | 1,190 | 47,000 | 1,000 | 45,000 | 840 |
| **0.3** | **0.15** | 0.75 | 0.005 | 0.015 | 58,000 | 1,450 | 55,000 | 1,310 | 53,000 | 1,130 | 50,000 | 940 |
| **0.3** | **0.15** | 1.50 | 0.005 | 0.015 | 53,000 | 1,330 | 50,000 | 1,190 | 48,000 | 1,020 | 45,000 | 840 |
| **0.4** | **0.20** | 1.00 | 0.005 | 0.015 | 54,000 | 1,350 | 51,000 | 1,210 | 49,000 | 1,040 | 46,000 | 860 |
| **0.4** | **0.20** | 2.00 | 0.005 | 0.015 | 49,000 | 1,230 | 46,000 | 1,090 | 44,000 | 940 | 41,000 | 770 |
| **0.5** | **0.25** | 1.50 | 0.008 | 0.024 | 54,000 | 2,160 | 51,000 | 1,940 | 49,000 | 1,670 | 46,000 | 1,380 |
| **0.5** | **0.25** | 3.00 | 0.008 | 0.024 | 48,000 | 1,920 | 46,000 | 1,750 | 44,000 | 1,500 | 41,000 | 1,230 |
| **0.6** | **0.30** | 1.50 | 0.008 | 0.024 | 48,000 | 1,920 | 46,000 | 1,750 | 43,000 | 1,460 | 41,000 | 1,230 |
| **0.6** | **0.30** | 3.00 | 0.008 | 0.024 | 44,000 | 1,760 | 41,000 | 1,560 | 39,000 | 1,330 | 37,000 | 1,110 |
| **0.8** | **0.40** | 2.50 | 0.008 | 0.024 | 48,000 | 2,880 | 45,000 | 2,570 | 43,000 | 2,190 | 41,000 | 1,850 |
| **0.8** | **0.40** | 5.00 | 0.008 | 0.024 | 43,000 | 2,580 | 41,000 | 2,340 | 39,000 | 1,990 | 37,000 | 1,670 |
| **1.0** | **0.50** | 2.50 | 0.01 | 0.030 | 44,000 | 2,640 | 42,000 | 2,390 | 40,000 | 2,040 | 38,000 | 1,710 |
| **1.0** | **0.50** | 5.00 | 0.01 | 0.030 | 40,000 | 2,400 | 38,000 | 2,170 | 36,000 | 1,840 | 34,000 | 1,530 |
| **1.0** | **0.50** | 10.00 | 0.01 | 0.030 | 31,000 | 1,490 | 29,000 | 1,320 | 28,000 | 1,140 | 26,000 | 940 |
| **1.5** | **0.75** | 5.00 | 0.01 | 0.030 | 38,000 | 3,040 | 36,000 | 2,740 | 34,000 | 2,310 | 32,000 | 1,920 |
| **1.5** | **0.75** | 10.00 | 0.01 | 0.030 | 27,000 | 1,730 | 25,000 | 1,520 | 24,000 | 1,310 | 23,000 | 1,100 |
| **2.0** | **1.00** | 5.00 | 0.01 | 0.030 | 34,000 | 3,400 | 33,000 | 3,140 | 31,000 | 2,640 | 29,000 | 2,180 |
| **2.0** | **1.00** | 10.00 | 0.01 | 0.030 | 31,000 | 3,100 | 29,000 | 2,760 | 28,000 | 2,380 | 26,000 | 1,950 |
| **2.0** | **1.00** | 20.00 | 0.01 | 0.030 | 24,000 | 1,920 | 23,000 | 1,750 | 21,000 | 1,430 | 20,000 | 1,200 |

# CBN-EPSR

## Corner Radius CBN End Mills for Ultra High Hardness Materials

## FEATURES

Radial rake is positive for excellent sharpness

Axial rake is negative for high rigidity

Cutting edge shape resists chipping, enabling stable finishing for extended periods

Ideal for machining small workpieces of high hardness materials

# CBN-EPSR

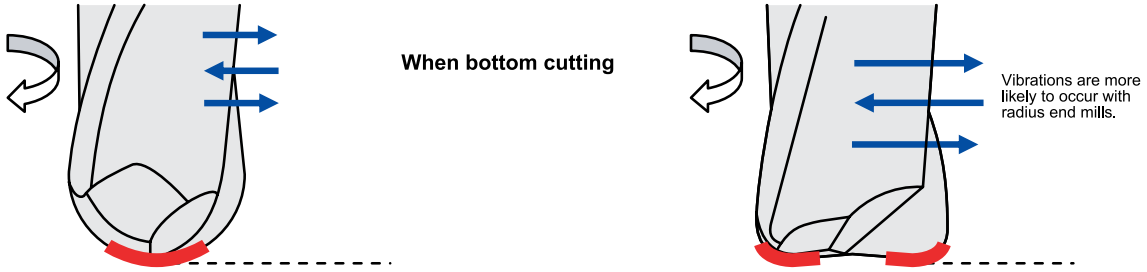
## INTRODUCTION

Recently, the trend in moldmaking has been toward harder and harder materials, and cutting these materials is increasingly difficult. In order to respond to the demands for ultra-high precision, tool wear resistance is more critical, and recently alternative to carbide such as CBN are becoming more widely used.

Unlike the conventional geometry commonly seen on most CBN tools which focuses on rigidity, the geometry of this newly developed Epoch CBN End Mill series achieves both rigidity and cutting edge sharpness. This enables high-precision finishing machining over a long period of time in high-hardness materials.

## FEATURES

### 1. Designed for High Performance



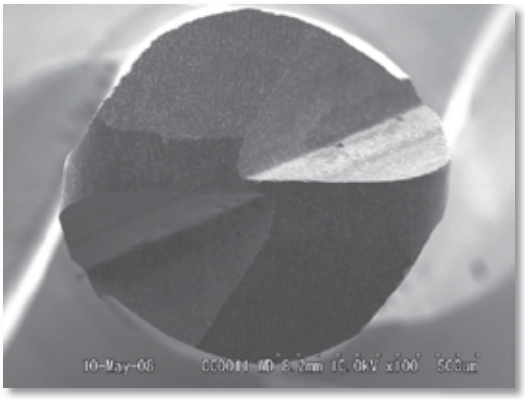

Cutting is performed near tool axis, so there are few outside vibrations.

When cutting, vibrations tend to become stronger at the outside.

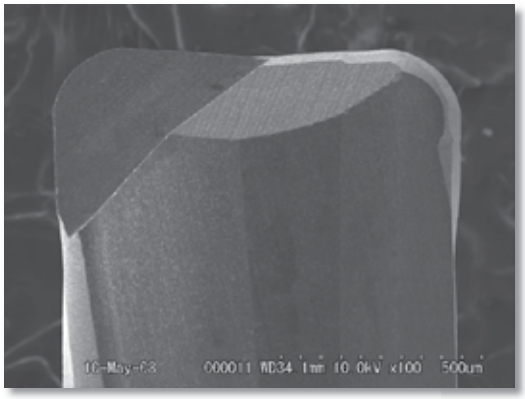
Because of this, with a radius end mill, even if priority is just placed on sharpness of cutting edge, chipping is likely to occur due to vibrations. On the other hand, if sharpness of cutting edge is sacrificed and priority is placed on rigidity, vibrations become remarkable, resulting in unstable cutting.

Epoch CBN Super Radius End Mill uses a geometry that provides benefits of both.

### 2. Cutting edge provides sharpness and rigidity



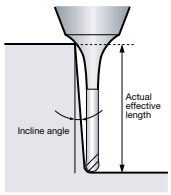
Flute shape with negative face angle in axial direction increases rigidity and improves cutting performance in the radial direction!



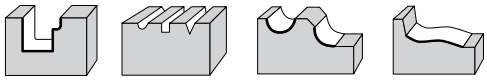
Flute geometry achieves both cutting performance and rigidity!

# CBN-EPSR

Advanced Engineering





| | | | |
|---|---|---|---|
| CR | ±0.005 | ϕDc | 0/-0.01 |
| ϕDs | h4 | | |

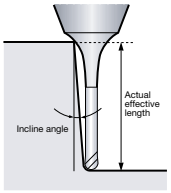
| Part No. | Stock | Size (mm) $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | Neck R | θk | Actual Effective Length in Incline Angles 0.5° | 1° | 1.5° | 2° | 3° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBN-EPSR2002-0.5-005 | ☐ | 0.2 | 0.05 | 0.50 | 0.07 | 0.18 | 50 | 4 | 1 | 11.39 | 0.67 | 0.70 | 0.73 | 0.76 | 0.81 |
| CBN-EPSR2002-1-005 | ☐ | 0.2 | 0.05 | 1.00 | 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 | 0.50 | 0.11 | 0.27 | 50 | 4 | 1 | 11.35 | 0.70 | 0.73 | 0.75 | 0.78 | 0.82 |
| CBN-EPSR2003-0.75-005 | ☐ | 0.3 | 0.05 | 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 | ☐ | 0.3 | 0.05 | 1.50 | 0.11 | 0.27 | 50 | 4 | 1 | 10.26 | 1.74 | 1.79 | 1.84 | 1.89 | 2.06 |
| CBN-EPSR2003-2-005 | ☐ | 0.3 | 0.05 | 2.00 | 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 | 0.50 | 0.14 | 0.37 | 50 | 4 | 1 | 11.33 | 0.70 | 0.73 | 0.75 | 0.78 | 0.82 |
| CBN-EPSR2004-1-005 | ☐ | 0.4 | 0.05 | 1.00 | 0.14 | 0.37 | 50 | 4 | 1 | 10.75 | 1.22 | 1.26 | 1.30 | 1.34 | 1.40 |
| CBN-EPSR2004-2-005 | ☐ | 0.4 | 0.05 | 2.00 | 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 | 0.50 | 0.18 | 0.47 | 50 | 4 | 1 | 11.31 | 0.70 | 0.73 | 0.75 | 0.78 | 0.82 |
| CBN-EPSR2005-1.5-005 | ☐ | 0.5 | 0.05 | 1.50 | 0.18 | 0.47 | 50 | 4 | 1 | 10.18 | 1.74 | 1.79 | 1.84 | 1.89 | 2.06 |
| CBN-EPSR2005-3-005 | ☐ | 0.5 | 0.05 | 3.00 | 0.18 | 0.47 | 50 | 4 | 1 | 8.84 | 3.29 | 3.37 | 3.49 | 3.66 | 4.05 |
| CBN-EPSR2005-0.5-01 | ☐ | 0.5 | 0.10 | 0.50 | 0.18 | 0.47 | 50 | 4 | 1 | 11.37 | 0.70 | 0.72 | 0.75 | 0.77 | 0.82 |
| CBN-EPSR2005-1.5-01 | ☐ | 0.5 | 0.10 | 1.50 | 0.18 | 0.47 | 50 | 4 | 1 | 10.23 | 1.74 | 1.79 | 1.84 | 1.88 | 2.05 |
| CBN-EPSR2005-3-01 | ☐ | 0.5 | 0.10 | 3.00 | 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 | 0.10 | 1.50 | 0.21 | 0.57 | 50 | 4 | 1 | 10.18 | 1.74 | 1.79 | 1.84 | 1.88 | 2.05 |
| CBN-EPSR2006-3-01 | ☐ | 0.6 | 0.10 | 3.00 | 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 | 0.10 | 2.50 | 0.28 | 0.77 | 50 | 4 | 1 | 9.10 | 2.77 | 2.84 | 2.91 | 3.05 | 3.37 |
| CBN-EPSR2008-5-01 | ☐ | 0.8 | 0.10 | 5.00 | 0.28 | 0.77 | 50 | 4 | 1 | 7.30 | 5.34 | 5.51 | 5.76 | 6.04 | 6.69 |
| CBN-EPSR2010-1-005 | ☐ | 1.0 | 0.05 | 1.00 | 0.35 | 0.96 | 50 | 4 | 1 | 10.50 | 1.24 | 1.28 | 1.32 | 1.35 | 1.43 |
| CBN-EPSR2010-2.5-005 | ☐ | 1.0 | 0.05 | 2.50 | 0.35 | 0.96 | 50 | 4 | 1 | 8.88 | 2.79 | 2.86 | 2.95 | 3.09 | 3.42 |
| CBN-EPSR2010-5-005 | ☐ | 1.0 | 0.05 | 5.00 | 0.35 | 0.96 | 50 | 4 | 1 | 7.07 | 5.35 | 5.54 | 5.80 | 6.08 | 6.74 |
| CBN-EPSR2010-1-01 | ☐ | 1.0 | 0.10 | 1.00 | 0.35 | 0.96 | 50 | 4 | 1 | 10.56 | 1.24 | 1.28 | 1.31 | 1.35 | 1.42 |
| CBN-EPSR2010-2.5-01 | ☐ | 1.0 | 0.10 | 2.50 | 0.35 | 0.96 | 50 | 4 | 1 | 8.93 | 2.79 | 2.86 | 2.94 | 3.08 | 3.41 |
| CBN-EPSR2010-5-01 | ☐ | 1.0 | 0.10 | 5.00 | 0.35 | 0.96 | 50 | 4 | 1 | 7.10 | 5.35 | 5.54 | 5.79 | 6.07 | 6.72 |
| CBN-EPSR2010-2.5-02 | ☐ | 1.0 | 0.20 | 2.50 | 0.35 | 0.96 | 50 | 4 | 1 | 9.02 | 2.78 | 2.85 | 2.93 | 3.06 | 3.37 |
| CBN-EPSR2010-5-02 | ☐ | 1.0 | 0.20 | 5.00 | 0.35 | 0.96 | 50 | 4 | 1 | 7.16 | 5.35 | 5.53 | 5.78 | 6.05 | 6.69 |
| CBN-EPSR2010-10-02 | ☐ | 1.0 | 0.20 | 10.00 | 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 | 2.00 | 0.53 | 1.44 | 50 | 4 | 1 | 8.92 | 2.31 | 2.36 | 2.43 | 2.55 | 2.82 |
| CBN-EPSR2015-5-005 | ☐ | 1.5 | 0.05 | 5.00 | 0.53 | 1.44 | 50 | 4 | 1 | 6.50 | 5.38 | 5.59 | 5.85 | 6.14 | 6.80 |

**Actual measured mill diameter value is shown on case**

☐ = Stocked items in Japan

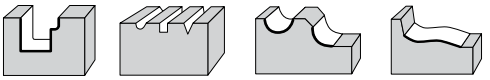
# CBN-EPSR

Advanced Engineering





CORNER RADIUS | SEMI-FINISHING | FINISHING | 72 HRC 72 | 2 FLUTES



| | | | |
|---|---|---|---|
| CR | ±0.005 | ϕDc | 0/-0.01 |
| ϕDs | h4 | | |

| | | Size (mm) | | | | | | | Neck | | Actual Effective Length in Incline Angles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Part No. | Stock | $D_c$ | r | $l_2$ | l | $D_1$ | L | $D_s$ | R | θk | 0.5° | 1° | 1.5° | 2° | 3° |
| CBN-EPSR2015-2-01 | ☐ | 1.5 | 0.10 | 2.00 | 0.53 | 1.44 | 50 | 4 | 1 | 8.97 | 2.31 | 2.36 | 2.42 | 2.54 | 2.80 |
| CBN-EPSR2015-5-01 | ☐ | 1.5 | 0.10 | 5.00 | 0.53 | 1.44 | 50 | 4 | 1 | 6.53 | 5.38 | 5.59 | 5.84 | 6.13 | 6.79 |
| CBN-EPSR2015-5-02 | ☐ | 1.5 | 0.20 | 5.00 | 0.53 | 1.44 | 50 | 4 | 1 | 6.59 | 5.38 | 5.58 | 5.83 | 6.11 | 6.75 |
| CBN-EPSR2015-10-02 | ☐ | 1.5 | 0.20 | 10.00 | 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 | 0.05 | 3.00 | 0.70 | 1.92 | 50 | 4 | 1 | 7.27 | 3.36 | 3.46 | 3.62 | 3.80 | 4.21 |
| CBN-EPSR2020-5-005 | ☐ | 2.0 | 0.05 | 5.00 | 0.70 | 1.92 | 50 | 4 | 1 | 5.81 | 5.40 | 5.64 | 5.91 | 6.19 | 6.87 |
| CBN-EPSR2020-10-005 | ☐ | 2.0 | 0.05 | 10.00 | 0.70 | 1.92 | 50 | 4 | 1 | 3.86 | 10.62 | 11.09 | 11.61 | 12.18 | 13.50 |
| CBN-EPSR2020-3-01 | ☐ | 2.0 | 0.10 | 3.00 | 0.70 | 1.92 | 50 | 4 | 1 | 7.32 | 3.36 | 3.46 | 3.62 | 3.79 | 4.19 |
| CBN-EPSR2020-5-01 | ☐ | 2.0 | 0.10 | 5.00 | 0.70 | 1.92 | 50 | 4 | 1 | 5.84 | 5.40 | 5.64 | 5.90 | 6.18 | 6.85 |
| CBN-EPSR2020-10-01 | ☐ | 2.0 | 0.10 | 10.00 | 0.70 | 1.92 | 50 | 4 | 1 | 3.87 | 10.62 | 11.09 | 11.60 | 12.17 | 13.49 |
| CBN-EPSR2020-5-02 | ☐ | 2.0 | 0.20 | 5.00 | 0.70 | 1.92 | 50 | 4 | 1 | 5.90 | 5.40 | 5.63 | 5.88 | 6.16 | 6.82 |
| CBN-EPSR2020-10-02 | ☐ | 2.0 | 0.20 | 10.00 | 0.70 | 1.92 | 50 | 4 | 1 | 3.90 | 10.61 | 11.08 | 11.59 | 12.15 | 13.45 |
| CBN-EPSR2020-20-02 | ☐ | 2.0 | 0.20 | 20.00 | 0.70 | 1.92 | 55 | 4 | 1 | 2.32 | 21.04 | 21.97 | 22.99 | 24.11 | - |
| CBN-EPSR2030-6-005 | ☐ | 3.0 | 0.05 | 6.00 | 1.05 | 2.86 | 50 | 4 | 1 | 3.32 | 6.59 | 6.89 | 7.21 | 7.56 | 8.38 |
| CBN-EPSR2030-6-01 | ☐ | 3.0 | 0.10 | 6.00 | 1.05 | 2.86 | 50 | 4 | 1 | 3.34 | 6.59 | 6.88 | 7.20 | 7.55 | 8.36 |
| CBN-EPSR2030-6-05 | ☐ | 3.0 | 0.50 | 6.00 | 1.05 | 2.86 | 50 | 4 | 1 | 3.50 | 6.57 | 6.85 | 7.14 | 7.47 | 8.24 |

**Actual measured mill diameter value is shown on case**

☐ = Stocked items in Japan

# CBN-EPSR

**CBN-EPSR**
**Cutting Conditions**
**(Metric)**

Advanced Engineering

| Work Material | | | | | Hardened Steels (~55HRC) HPM1, SKD61, SKT4 | | Hardened Steels (55~65HRC) SKD11,SKH51 | | Hardened Steels (65~68HRC) SKH, Welded HSS | | Hardened Steels (68~72HRC) HAP, Powdered HSS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ratio to standard depth of cut | | | | | 100% | | 90% | | 80% | | 70% | |
| | | | Depth of cut | | | | | | | | | |
| $D_c$ | r | $l_2$ | $a_p$ | $a_e$ | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| **0.2** | **0.05** | 0.50 | 0.004 | 0.05 | 50,000 | 400 | 48,000 | 350 | 45,000 | 290 | 43,000 | 240 |
| **0.2** | **0.05** | 1.00 | 0.003 | 0.05 | 45,000 | 340 | 43,000 | 290 | 41,000 | 250 | 38,000 | 200 |
| **0.2** | **0.05** | 0.50 | 0.006 | 0.10 | 50,000 | 600 | 48,000 | 520 | 45,000 | 430 | 43,000 | 360 |
| **0.3** | **0.05** | 0.75 | 0.006 | 0.10 | 50,000 | 600 | 48,000 | 520 | 45,000 | 430 | 43,000 | 360 |
| **0.3** | **0.05** | 1.50 | 0.005 | 0.10 | 45,000 | 510 | 43,000 | 440 | 41,000 | 370 | 38,000 | 300 |
| **0.3** | **0.05** | 2.00 | 0.003 | 0.10 | 40,000 | 430 | 38,000 | 370 | 36,000 | 310 | 34,000 | 260 |
| **0.4** | **0.05** | 0.50 | 0.008 | 0.15 | 46,000 | 740 | 44,000 | 630 | 41,000 | 520 | 39,000 | 440 |
| **0.4** | **0.05** | 1.00 | 0.008 | 0.15 | 46,000 | 740 | 44,000 | 630 | 41,000 | 520 | 39,000 | 440 |
| **0.4** | **0.05** | 2.00 | 0.006 | 0.15 | 41,000 | 620 | 39,000 | 530 | 37,000 | 450 | 35,000 | 370 |
| **0.5** | **0.05** | 0.50 | 0.010 | 0.20 | 46,000 | 920 | 44,000 | 790 | 41,000 | 660 | 39,000 | 550 |
| **0.5** | **0.05** | 1.50 | 0.010 | 0.20 | 46,000 | 920 | 44,000 | 790 | 41,000 | 660 | 39,000 | 550 |
| **0.5** | **0.05** | 3.00 | 0.005 | 0.20 | 37,000 | 670 | 35,000 | 570 | 33,000 | 480 | 31,000 | 390 |
| **0.5** | **0.10** | 0.50 | 0.010 | 0.15 | 46,000 | 920 | 44,000 | 790 | 41,000 | 660 | 39,000 | 550 |
| **0.5** | **0.10** | 1.50 | 0.010 | 0.15 | 46,000 | 920 | 44,000 | 790 | 41,000 | 660 | 39,000 | 550 |
| **0.5** | **0.10** | 3.00 | 0.005 | 0.15 | 37,000 | 670 | 35,000 | 570 | 33,000 | 480 | 31,000 | 390 |
| **0.6** | **0.10** | 1.50 | 0.012 | 0.20 | 42,000 | 1,010 | 40,000 | 860 | 38,000 | 730 | 36,000 | 600 |
| **0.6** | **0.10** | 3.00 | 0.009 | 0.20 | 38,000 | 870 | 36,000 | 740 | 34,000 | 620 | 32,000 | 510 |
| **0.8** | **0.10** | 2.50 | 0.012 | 0.30 | 42,000 | 1,280 | 40,000 | 1,090 | 38,000 | 920 | 36,000 | 770 |
| **0.8** | **0.10** | 5.00 | 0.008 | 0.30 | 38,000 | 1,090 | 36,000 | 930 | 34,000 | 780 | 32,000 | 650 |
| **1.0** | **0.05** | 1.00 | 0.020 | 0.45 | 38,000 | 1,520 | 36,000 | 1,300 | 34,000 | 1,090 | 32,000 | 900 |
| **1.0** | **0.05** | 2.50 | 0.020 | 0.45 | 38,000 | 1,520 | 36,000 | 1,300 | 34,000 | 1,090 | 32,000 | 900 |
| **1.0** | **0.05** | 5.00 | 0.015 | 0.45 | 34,000 | 1,290 | 32,000 | 1,090 | 31,000 | 940 | 29,000 | 770 |
| **1.0** | **0.10** | 1.00 | 0.020 | 0.40 | 38,000 | 1,520 | 36,000 | 1,300 | 34,000 | 1,090 | 32,000 | 900 |
| **1.0** | **0.10** | 2.50 | 0.020 | 0.40 | 38,000 | 1,520 | 36,000 | 1,300 | 34,000 | 1090 | 32,000 | 900 |
| **1.0** | **0.10** | 5.00 | 0.015 | 0.40 | 34,000 | 1,290 | 32,000 | 1,090 | 31,000 | 940 | 29,000 | 770 |
| **1.0** | **0.20** | 2.50 | 0.020 | 0.30 | 38,000 | 1,520 | 36,000 | 1,300 | 34,000 | 1090 | 32,000 | 900 |
| **1.0** | **0.20** | 5.00 | 0.015 | 0.30 | 34,000 | 1,290 | 32,000 | 1,090 | 31,000 | 940 | 29,000 | 770 |
| **1.0** | **0.20** | 10.00 | 0.005 | 0.30 | 27,000 | 920 | 26,000 | 800 | 24,000 | 650 | 23,000 | 550 |
| **1.5** | **0.05** | 2.00 | 0.020 | 0.70 | 32,000 | 1,920 | 30,000 | 1,620 | 29,000 | 1,390 | 27,000 | 1130 |
| **1.5** | **0.05** | 5.00 | 0.020 | 0.70 | 29,000 | 1,650 | 28,000 | 1,440 | 26,000 | 1,190 | 25,000 | 1,000 |
| **1.5** | **0.10** | 2.00 | 0.020 | 0.65 | 32,000 | 1,920 | 30,000 | 1,620 | 29,000 | 1,390 | 27,000 | 1,130 |
| **1.5** | **0.10** | 5.00 | 0.020 | 0.65 | 29,000 | 1,650 | 28,000 | 1,440 | 26,000 | 1,190 | 25,000 | 1,000 |
| **1.5** | **0.20** | 5.00 | 0.020 | 0.55 | 29,000 | 1,650 | 28,000 | 1,440 | 26,000 | 1,190 | 25,000 | 1,000 |
| **1.5** | **0.20** | 10.00 | 0.015 | 0.55 | 26,000 | 1,400 | 25,000 | 1,220 | 23,000 | 990 | 22,000 | 830 |
| **2.0** | **0.05** | 3.00 | 0.020 | 0.95 | 28,000 | 2,240 | 27,000 | 1,940 | 25,000 | 1,600 | 24,000 | 1,340 |
| **2.0** | **0.05** | 5.00 | 0.020 | 0.95 | 28,000 | 2,240 | 27,000 | 1,940 | 25,000 | 1,600 | 24,000 | 1340 |
| **2.0** | **0.05** | 10.00 | 0.020 | 0.95 | 25,000 | 1,900 | 24,000 | 1,640 | 23,000 | 1,400 | 21,000 | 1,120 |
| **2.0** | **0.10** | 3.00 | 0.020 | 0.90 | 28,000 | 2,240 | 27,000 | 1,940 | 25,000 | 1,600 | 24,000 | 1340 |
| **2.0** | **0.10** | 5.00 | 0.020 | 0.90 | 28,000 | 2,240 | 27,000 | 1,940 | 25,000 | 1,600 | 24,000 | 1,340 |
| **2.0** | **0.10** | 10.00 | 0.020 | 0.90 | 25,000 | 1,900 | 24,000 | 1,640 | 23,000 | 1,400 | 21,000 | 1,120 |
| **2.0** | **0.20** | 5.00 | 0.020 | 0.80 | 28,000 | 2,240 | 27,000 | 1,940 | 25,000 | 1,600 | 24,000 | 1,340 |
| **2.0** | **0.20** | 10.00 | 0.020 | 0.80 | 25,000 | 1,900 | 24,000 | 1,640 | 23,000 | 1,400 | 21,000 | 1,120 |
| **2.0** | **0.20** | 20.00 | 0.010 | 0.80 | 20,000 | 1,360 | 19,000 | 1,160 | 18,000 | 980 | 17,000 | 810 |
| **3.0** | **0.05** | 6.00 | 0.020 | 1.45 | 24,000 | 2,450 | 23,000 | 2,110 | 22,000 | 1,800 | 20,000 | 1,430 |
| **3.0** | **0.10** | 6.00 | 0.020 | 1.40 | 24,000 | 2,450 | 23,000 | 2,110 | 22,000 | 1,800 | 20,000 | 1430 |
| **3.0** | **0.50** | 6.00 | 0.020 | 1.00 | 24,000 | 2,450 | 23,000 | 2,110 | 22,000 | 1,800 | 20,000 | 1,430 |

# EPBTS/EPBT

## High-Precision Ball End Mills for Maximum Efficiency and Tool Life

## FEATURES

Newly designed flute geometry increases rigidity and improves chip evaluation

EPBTS and EPBT Ball End Mills feature radius tolerance of ± 0.005mm (EPBT under ø6mm)

EPBTS features new ATH Coating for maximum performance in cutting high-hardness materials

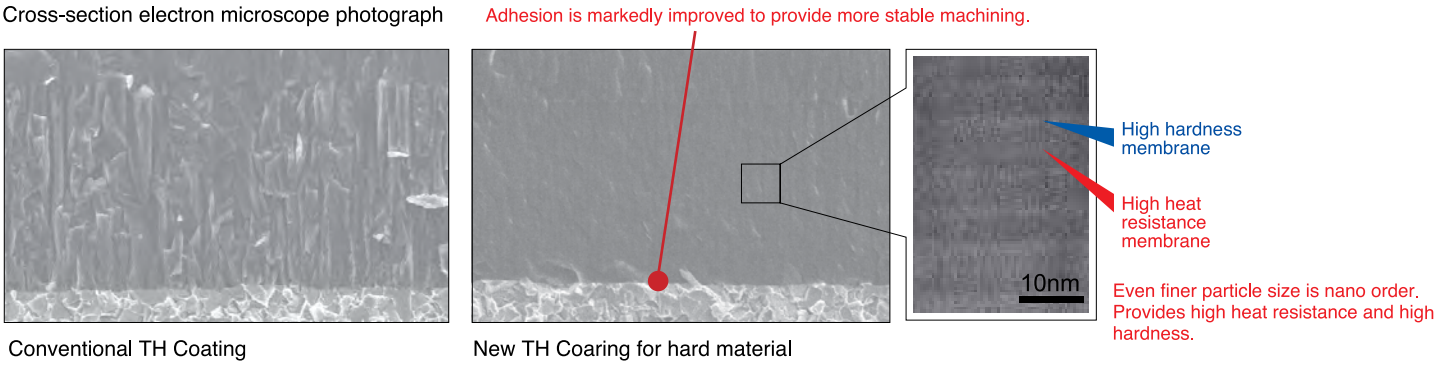
EPBT features TH Coating has excellent hardness and heat resistance properties

## FEATURES

### 1. Advanced TH (ATH) Coating

With a hardness of 3800Hv and oxidation temperature of 1200°, our new ATH Coating enables longer life and higher efficiency when cutting high-hardness materials (55HRC or higher). Compared with our previous generation coating, double the tool life and more than double the machining efficiency can be achieved. The ATH Coating is ideal for both dry cutting and wet cutting in a variety of materials including cold-worked die steel, HSS, tool steel, composite materials, carbide alloys and more.

Cross-section electron microscope photograph



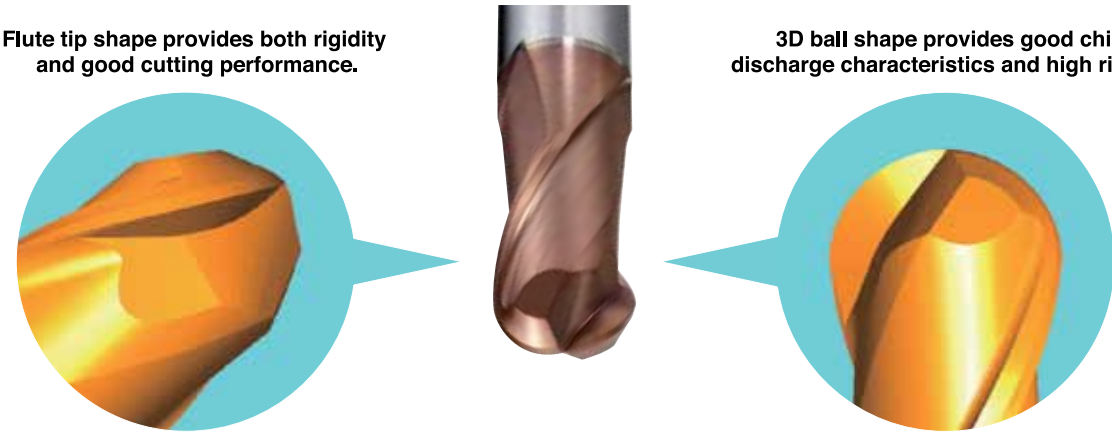

Conventional TH Coating

New TH Coaring for hard material

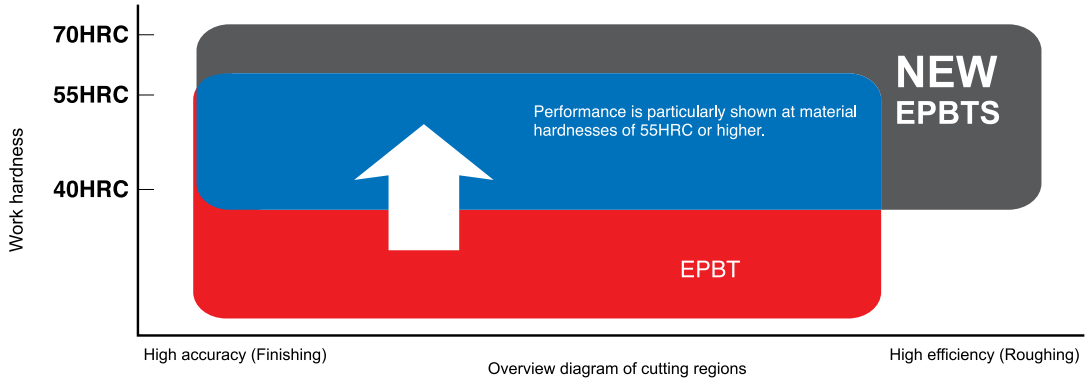
### 2. Advanced Tool Geometry for Ridigity and Performance

**Flute tip shape provides both rigidity and good cutting performance.**

**3D ball shape provides good chip discharge characteristics and high rigidity.**



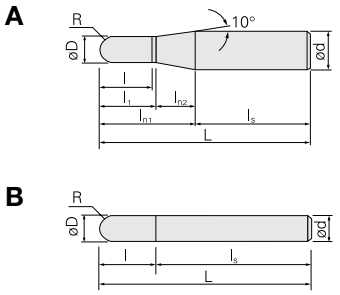
### 3. Application Recommendations



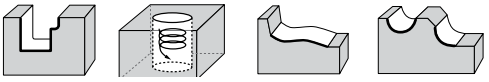

Overview diagram of cutting regions

# EPBTS/EPBT

Advanced Engineering





| | | | |
|---|---|---|---|
| Helix Angle | 30° | d | h5 |
| R | ±0.005 | D | 0/-0.010 |

## EPBTS - METRIC

| | | | Size (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Part No.** | **Stock** | **Flutes** | **ØD** | **R** | **l** | **$l_1$** | **$l_{n1}$** | **$l_{n2}$** | **L** | **Ød** | **Type** |
| **EPBTS2030-TH** | ● | 2 | 3 | 1.5 | 4.5 | 5.5 | 14.0 | 8.5 | 70 | 6 | A |
| **EPBTS2040-TH** | ● | 2 | 4 | 2.0 | 6.0 | 7.0 | 12.7 | 5.7 | 70 | 6 | A |
| **EPBTS2060-TH** | ● | 2 | 6 | 3.0 | 9.0 | | | | 90 | 6 | B |
| **EPBTS2080-TH** | ● | 2 | 8 | 4.0 | 12.0 | | | | 100 | 8 | B |
| **EPBTS2100-TH** | ● | 2 | 10 | 5.0 | 15.0 | | | | 100 | 10 | B |
| **EPBTS2120-TH** | ● | 2 | 12 | 6.0 | 18.0 | | | | 110 | 12 | B |

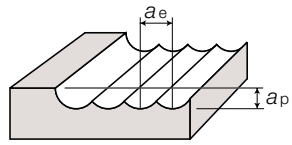
## EPBT - METRIC

| | | | Size (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Part No.** | **Stock** | **Flutes** | **ØD** | **R** | **l** | **$l_1$** | **$l_{n1}$** | **$l_{n2}$** | **L** | **Ød** | **Type** |
| **EPBT2010** | ● | 2 | 1.0 | 0.50 | 1.5 | 2.5 | 11.0 | 8.5 | 50 | 4 | A |
| **EPBT2015** | ● | 2 | 1.5 | 0.75 | 2.5 | 3.5 | 10.6 | 7.1 | 50 | 4 | A |
| **EPBT2020** | ● | 2 | 2.0 | 1.00 | 3.0 | 4.0 | 15.3 | 11.3 | 50 | 6 | A |
| **EPBT2030** | ● | 2 | 3.0 | 1.50 | 4.5 | 5.5 | 14.0 | 8.5 | 70 | 6 | A |
| **EPBT2040** | ● | 2 | 4.0 | 2.00 | 6.0 | 7.0 | 12.7 | 5.7 | 70 | 6 | A |
| **EPBT2060** | ● | 2 | 6.0 | 3.00 | 9.0 | | | | 90 | 6 | B |
| **EPBT2080** | ● | 2 | 8.0 | 4.00 | 12.0 | | | | 100 | 8 | B |
| **EPBT2100** | ● | 2 | 10.0 | 5.00 | 15.0 | | | | 100 | 10 | B |
| **EPBT2120** | ● | 2 | 12.0 | 6.00 | 18.0 | | | | 110 | 12 | B |

# EPBTS/EPBT

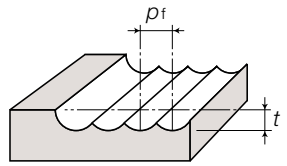
**EPBTS**
**Cutting Conditions**
**(Metric)**

Advanced Engineering



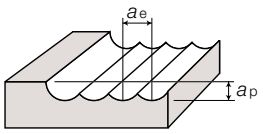

## Roughing

| Work Material (Hardness) | Cutting Range | Depth of cut | Cutting Cond. | R x Tool Dia. (mm) R1.5×3 | R2×4 | R3×6 | R4×8 | R5×10 | R6×12 |
|---|---|---|---|---|---|---|---|---|---|
| Pre-hardened steel (35-45HRC) | High Speed | ap=0.12Dc ae=0.36Dc | N (RPM) | 37,700 | 28,300 | 19,200 | 14,700 | 11,800 | 9,800 |
| | | | Vf (mm/min) | 3,620 | 3,620 | 3,690 | 3,760 | 3,780 | 3,650 |
| | General | ap=0.12Dc ae=0.36Dc | N (RPM) | 17,300 | 13,000 | 8,800 | 6,800 | 5,400 | 4,500 |
| | | | Vf (mm/min) | 1,560 | 1,560 | 1,580 | 1,630 | 1,620 | 1,570 |
| Hardened steel (45-55HRC) | High Speed | ap=0.1Dc ae=0.3Dc | N (RPM) | 27,500 | 20,600 | 14,000 | 10,700 | 8,600 | 7,200 |
| | | | Vf (mm/min) | 2,810 | 2,800 | 2,860 | 2,910 | 2,920 | 2,850 |
| | General | ap=0.1Dc ae=0.3Dc | N (RPM) | 14,300 | 10,700 | 7,300 | 5,600 | 4,500 | 3,700 |
| | | | Vf (mm/min) | 1,030 | 1,030 | 1,050 | 1,080 | 1,080 | 1,030 |
| Hardened steel (55-65HRC) | High Speed | ap=0.06Dc ae=0.18Dc | N (RPM) | 22,400 | 16,800 | 11,400 | 8,800 | 7,000 | 5,800 |
| | | | Vf (mm/min) | 2,280 | 2,280 | 2,330 | 2,390 | 2,380 | 2,300 |
| | General | ap=0.08Dc ae=0.24Dc | N (RPM) | 12,200 | 9,200 | 6,200 | 4,800 | 3,800 | 3,200 |
| | | | Vf (mm/min) | 730 | 740 | 740 | 770 | 760 | 740 |
| Hardened steel (65-72HRC) | High Speed | ap=0.05Dc ae=0.15Dc | N (RPM) | 13,200 | 9,900 | 6,800 | 5,200 | 4,100 | 3,400 |
| | | | Vf (mm/min) | 1,110 | 1,110 | 1,140 | 1,160 | 1,150 | 1,110 |
| | General | ap=0.07Dc ae=0.21Dc | N (RPM) | 7,100 | 5,300 | 3,600 | 2,800 | 2,200 | 1,900 |
| | | | Vf (mm/min) | 340 | 340 | 350 | 360 | 350 | 350 |

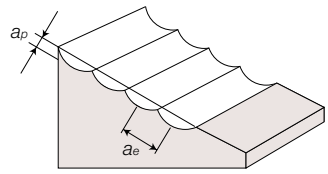



## Finishing

| Work Material (Hardness) | Cutting Range | Depth of cut | Cutting Cond. | R x Tool Dia. (mm) R1.5×3 | R2×4 | R3×6 | R4×8 | R5×10 | R6×12 |
|---|---|---|---|---|---|---|---|---|---|
| Pre-hardened steel (35-45HRC) | High Speed | t=0.05-0.1 pf=0.02Dc | N (RPM) | 27,500 | 24,200 | 17,600 | 13,200 | 11,000 | 8,800 |
| | | | Vf (mm/min) | 3,890 | 4,150 | 3,910 | 3,200 | 2,890 | 2,400 |
| | General | t=0.05-0.1 pf=0.02Dc | N (RPM) | 17,000 | 13,000 | 8,500 | 6,400 | 5,100 | 4,200 |
| | | | Vf (mm/min) | 2,620 | 2,430 | 2,060 | 1,690 | 1,460 | 1,240 |
| Hardened steel (45-55HRC) | High Speed | t=0.05-0.1 pf=0.02Dc | N (RPM) | 26,400 | 22,000 | 14,300 | 11,000 | 8,800 | 7,260 |
| | | | Vf (mm/min) | 3,200 | 3,550 | 3,030 | 2,550 | 2,220 | 1,910 |
| | General | t=0.05-0.1 pf=0.02Dc | N (RPM) | 15,400 | 11,000 | 7,590 | 5,720 | 4,510 | 3,850 |
| | | | Vf (mm/min) | 1,850 | 1,760 | 1,600 | 1,320 | 1,130 | 1,000 |
| Hardened steel (55-65HRC) | High Speed | t=0.05-0.1 pf=0.02Dc | N (RPM) | 23,100 | 17,600 | 12,100 | 8,800 | 7,040 | 5,830 |
| | | | Vf (mm/min) | 2,800 | 2,660 | 2,440 | 1,680 | 1,640 | 1,490 |
| | General | t=0.05-0.1 pf=0.02Dc | N (RPM) | 14,300 | 10,560 | 5,280 | 4,180 | 3,520 | 2,640 |
| | | | Vf (mm/min) | 1,720 | 1,580 | 1,410 | 1,170 | 1,000 | 880 |
| Hardened steel (65-72HRC) | High Speed | t=0.05-0.1 pf=0.02Dc | N (RPM) | 17,600 | 13,200 | 8,800 | 6,600 | 5,280 | 4,400 |
| | | | Vf (mm/min) | 2,130 | 2,000 | 1,780 | 1,470 | 1,280 | 1,110 |
| | General | t=0.05-0.1 pf=0.02Dc | N (RPM) | 11,000 | 7,920 | 5,280 | 3,960 | 3,190 | 2,640 |
| | | | Vf (mm/min) | 1,320 | 1,190 | 1,060 | 870 | 770 | 660 |




| Work Material | Range | Step down/ Step over D: Dia mm | Conditions | R x Tool Dia. (mm) R0.5×1 | R1×2 | R1.5×3 | R2×4 | R3×6 | R4×8 | R5×10 | R6×12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tool steel (25 - 35HRC) | High Speed | ap=0.1D | N (RPM) | 50,000 | 48,000 | 32,000 | 24,000 | 16,000 | 12,000 | 10,000 | 8,000 |
| | | ae=0.3D | Vf (mm/min) | 1,800 | 3,170 | 3,260 | 3,360 | 3,360 | 3,600 | 3,600 | 3,100 |
| | General | ap=0.1D | N (RPM) | 20,000 | 20,000 | 16,000 | 12,000 | 8,000 | 6,000 | 4,800 | 4,000 |
| | | ae=0.3D | Vf (mm/min) | 720 | 1,320 | 1,630 | 1,680 | 1,680 | 1,800 | 1,730 | 1,550 |
| Pre-hardened steel (35 - 45HRC) | High Speed | ap=0.1D | N (RPM) | 50,000 | 48,000 | 32,000 | 24,000 | 16,000 | 12,000 | 10,000 | 8,000 |
| | | ae=0.3D | Vf (mm/min) | 1,600 | 2,780 | 2,880 | 2,930 | 2,940 | 3,020 | 3,120 | 2,690 |
| | General | ap=0.1D | N (RPM) | 20,000 | 20,000 | 16,000 | 12,000 | 8,000 | 6,000 | 4,800 | 4,000 |
| | | ae=0.3D | Vf (mm/min) | 640 | 1,160 | 1,440 | 1,460 | 1,470 | 1,510 | 1,500 | 1,340 |
| Hardened steel (45 - 55HRC) | High Speed | ap=0.08D | N (RPM) | 50,000 | 38,000 | 25,000 | 19,000 | 13,000 | 10,000 | 7,600 | 6,400 |
| | | ae=0.24D | Vf (mm/min) | 1,500 | 1,980 | 2,100 | 2,170 | 2,240 | 2,320 | 2,170 | 1,970 |
| | General | ap=0.1D | N (RPM) | 20,000 | 16,000 | 11,000 | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 |
| | | ae=0.3D | Vf (mm/min) | 540 | 750 | 830 | 820 | 820 | 840 | 820 | 750 |
| Hardened steel (55 - 65HRC) | High Speed | ap=0.05D | N (RPM) | 50,000 | 29,000 | 19,000 | 14,000 | 9,600 | 7,200 | 5,700 | 4,800 |
| | | ae=0.15D | Vf (mm/min) | 1,300 | 1,390 | 1,440 | 1,460 | 1,500 | 1,510 | 1,480 | 1,340 |
| | General | ap=0.07D | N (RPM) | 20,000 | 13,000 | 8,500 | 6,400 | 4,200 | 3,200 | 2,500 | 2,100 |
| | | ae=0.21D | Vf (mm/min) | 470 | 560 | 580 | 600 | 590 | 600 | 590 | 530 |
| Hardened steel (65 - 70HRC) | High Speed | ap=0.05D | N (RPM) | 38,000 | 19,000 | 13,000 | 10,000 | 6,400 | 4,800 | 3,800 | 3,200 |
| | | ae=0.15D | Vf (mm/min) | 990 | 910 | 990 | 1,040 | 1,000 | 1,010 | 990 | 900 |
| | General | ap=0.07D | N (RPM) | 16,000 | 8,000 | 5,300 | 4,000 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | ae=0.21D | Vf (mm/min) | 370 | 350 | 360 | 370 | 380 | 380 | 370 | 330 |




| Work Material | Range | Step down/ Step over D: Dia mm | Conditions | R x Tool Dia. (mm) R0.5×1 | R1×2 | R1.5×3 | R2×4 | R3×6 | R4×8 | R5×10 | R6×12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tool steel (25 - 35HRC) | High Speed | ap=0.05~0.1 | N (RPM) | 50,000 | 32,000 | 25,000 | 22,000 | 16,000 | 12,000 | 10,000 | 8,000 |
| | | ae=0.02D | Vf (mm/min) | 5,000 | 3,840 | 3,500 | 3,740 | 3,520 | 2,880 | 2,600 | 2,160 |
| | General | ap=0.05~0.1 | N (RPM) | 20,000 | 20,000 | 17,000 | 13,000 | 8,500 | 6,400 | 5,100 | 4,200 |
| | | ae=0.02D | Vf (mm/min) | 2,000 | 2,400 | 2,380 | 2,210 | 1,870 | 1,540 | 1,330 | 1,130 |
| Pre-hardened steel (35 - 45HRC) | High Speed | ap=0.05~0.1 | N (RPM) | 50,000 | 32,000 | 25,000 | 22,000 | 16,000 | 12,000 | 10,000 | 8,000 |
| | | ae=0.02D | Vf (mm/min) | 5,000 | 3,840 | 3,500 | 3,740 | 3,520 | 2,880 | 2,600 | 2,160 |
| | General | ap=0.05~0.1 | N (RPM) | 20,000 | 20,000 | 17,000 | 13,000 | 8,500 | 6,400 | 5,100 | 4,200 |
| | | ae=0.02D | Vf (mm/min) | 2,000 | 2,400 | 2,380 | 2,210 | 1,870 | 1,540 | 1,330 | 1,130 |
| Hardened steel (45 - 55HRC) | High Speed | ap=0.05~0.1 | N (RPM) | 50,000 | 32,000 | 24,000 | 20,000 | 13,000 | 10,000 | 8,000 | 6,600 |
| | | ae=0.02D | Vf (mm/min) | 4,000 | 3,200 | 2,880 | 3,200 | 2,730 | 2,300 | 2,000 | 1,720 |
| | General | ap=0.05~0.1 | N (RPM) | 20,000 | 20,000 | 14,000 | 10,000 | 6,900 | 5,200 | 4,100 | 3,500 |
| | | ae=0.02D | Vf (mm/min) | 1,600 | 2,000 | 1,680 | 1,600 | 1,450 | 1,200 | 1,030 | 910 |
| Hardened steel (55 - 65HRC) | High Speed | ap=0.05~0.1 | N (RPM) | 50,000 | 32,000 | 21,000 | 16,000 | 11,000 | 8,000 | 6,400 | 5,300 |
| | | ae=0.02D | Vf (mm/min) | 2,500 | 2,880 | 2,520 | 2,400 | 2,200 | 1,760 | 1,540 | 1,330 |
| | General | ap=0.05~0.1 | N (RPM) | 15,000 | 15,000 | 13,000 | 9,600 | 6,400 | 4,800 | 3,800 | 3,200 |
| | | ae=0.02D | Vf (mm/min) | 750 | 1,350 | 1,560 | 1,440 | 1,280 | 1,060 | 910 | 800 |
| Hardened steel (65 - 70HRC) | High Speed | ap=0.05~0.1 | N (RPM) | 48,000 | 24,000 | 16,000 | 12,000 | 8,000 | 6,000 | 4,800 | 4,000 |
| | | ae=0.02D | Vf (mm/min) | 2,400 | 2,160 | 1,920 | 1,800 | 1,600 | 1,320 | 1,150 | 1,000 |
| | General | ap=0.05~0.1 | N (RPM) | 15,000 | 14,000 | 10,000 | 7,200 | 4,800 | 3,600 | 2,900 | 2,400 |
| | | ae=0.02D | Vf (mm/min) | 750 | 1,260 | 1,200 | 1,080 | 960 | 790 | 700 | 600 |

# EHHB

## High Hardness Four Flute Ball End Mills

## FEATURES

Highly efficient cutting with four flutes.

Varibale flute geometry enables vibration suppresion.

Wide chip pocket improves chip removal for stable cutting.

ATH Coating provides long tool life even in hardened steels.

# EHHB

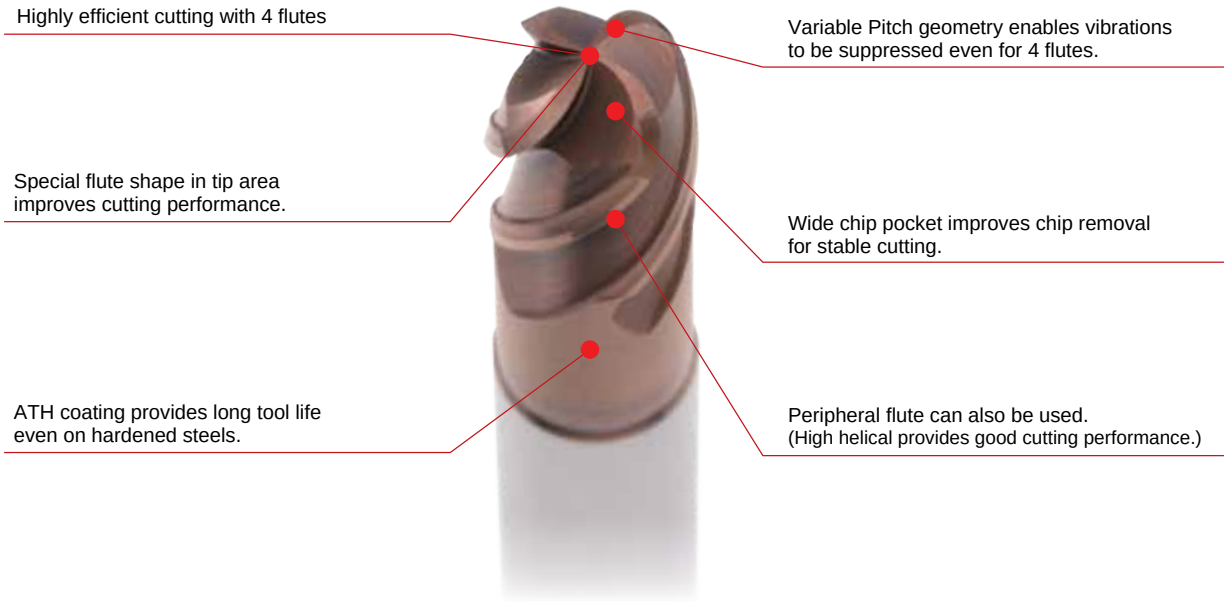
Advanced Engineering

## INTRODUCTION

EHHB High Hard Four Flute Ball End Mills are designed for the high-efficiency direct milling of hardened steels up to 72HRC. The variable pitch geometry suppresses vibration during machining, resulting in better surface finishes and longer tool life. The wide chip pocket provides superior chip evacuation, further improving stable cutting.

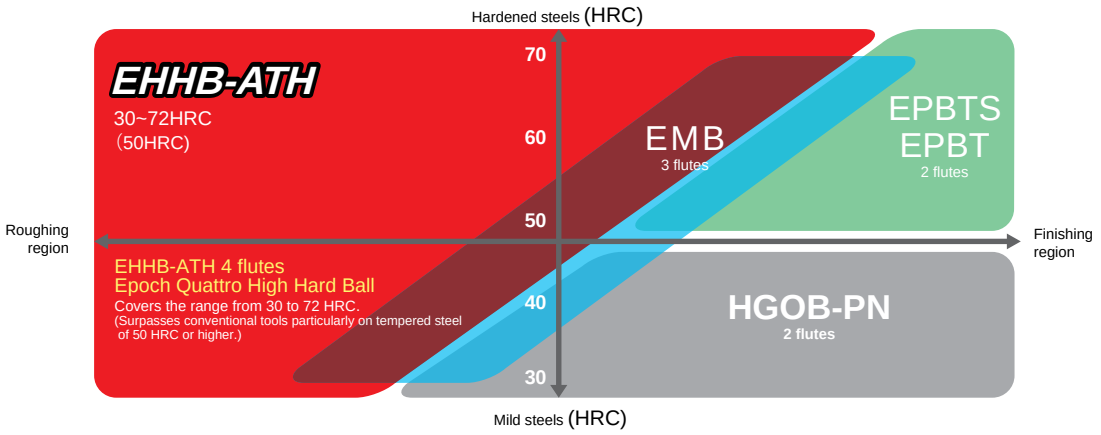
## FEATURES

### 1. Features of Epoch High Hard Ball End Mill




Achieves high-efficiency direct milling of hardened steels!

### 2. Performance and Positioning

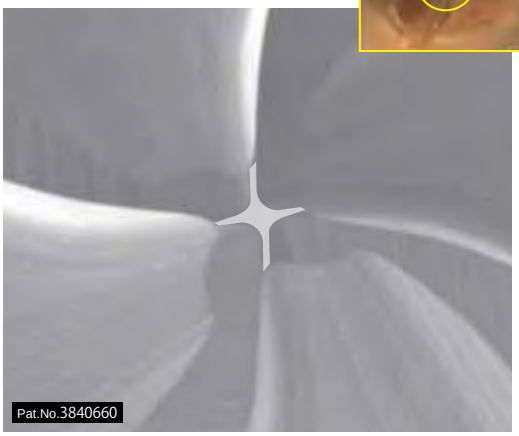



1 Feed rate can be increased to achieve high-efficiency cutting.
Example: Performing improved efficiency by adjusting override factor of the same cutting program.

2 Exhibits its effect particularly for semi-finishing of materials after heat-treatment.

## 3. Special Tip Shape

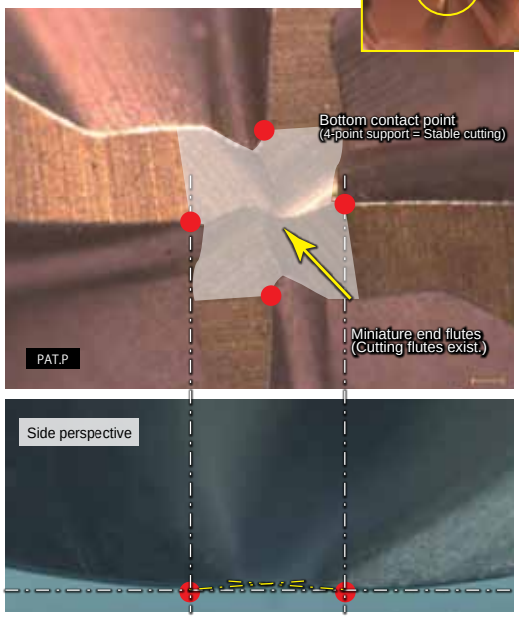
### φ1～φ3




**Features and effects**

By creating a special flank face with a tiny relief angle at the very tip section, R accuracy is improved even with 4 flutes.
This realizes stable cutting due to improved tip rigidity.

### φ4～φ12

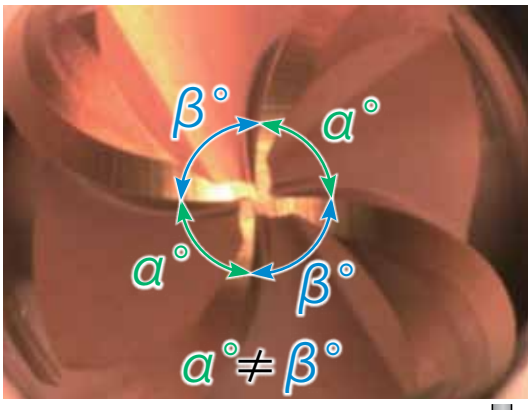



**Features and effects**

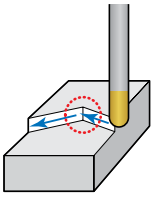
Features: Zero cutting point at the center is isolated from the cutting point.

Effects: Chipping due to jamming of cutting chips at center area is suppressed.

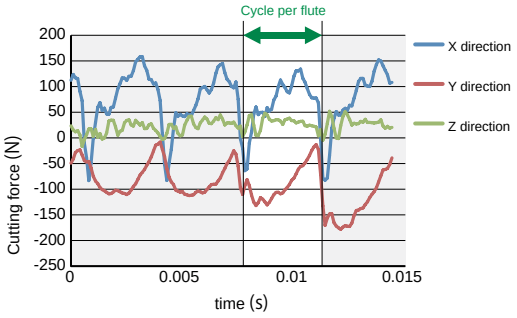
## 4. Suppresed Vibration With Variable Pitch Geometry



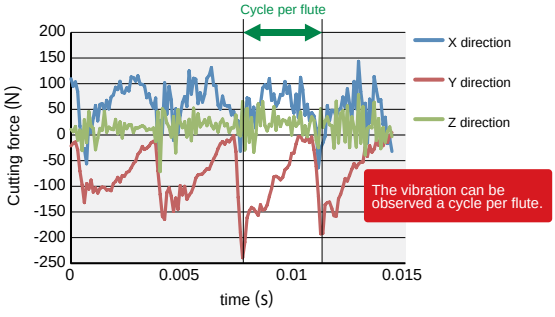

Work material: YXR3(58HRC)
Tool: φ8(R4) × 4 flutes
n =4,000min$^{-1}$ (vc=100m/min)
vf =1,920mm/min (fz=0.12mm/t)
ap=0.3mm ae=0.1mm
Dry Air-blow
Machine: HSK-A6 Overhang: 332mm



**EHHB-ATH**
4 flutes
Variable Pitch



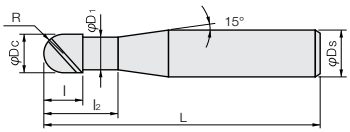

**Conventional**
4 flutes
Equal pitch



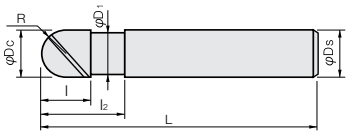
# EHHB

Advanced Engineering

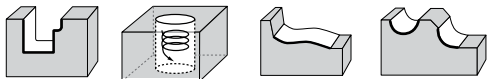
A type




B type







Helix Angle: 40°

Ds: h5

| Part No. | Stock | Size (mm) R | $D_C$ | l | $l_2$ | $D_1$ | L | $D_S$ | Type |
|---|---|---|---|---|---|---|---|---|---|
| **EHHB4010-S4-ATH** | □ | 0.50 | 1.0 | 1.5 | 3.0 | 0.95 | 50 | 4 | A |
| **EHHB4010-S6-ATH** | ● | | | | | | | 6 | A |
| **EHHB4015-S4-ATH** | □ | 0.75 | 1.5 | 2.5 | 4.5 | 1.43 | 50 | 4 | A |
| **EHHB4015-S6-ATH** | ● | | | | | | | 6 | A |
| **EHHB4020-S4-ATH** | □ | 1.00 | 2.0 | 3.0 | 6.0 | 1.90 | 50 | 4 | A |
| **EHHB4020-S6-ATH** | ● | | | | | | | 6 | A |
| **EHHB4025-S4-ATH** | □ | 1.25 | 2.5 | 4.0 | 7.5 | 2.38 | 50 | 4 | A |
| **EHHB4025-S6-ATH** | □ | | | | | | | 6 | A |
| **EHHB4030-S4-ATH** | □ | 1.50 | 3.0 | 4.5 | 9.0 | 2.90 | 70 | 4 | A |
| **EHHB4030-S6-ATH** | ● | | | | | | | 6 | A |
| **EHHB4040-S4-ATH** | □ | 2.00 | 4.0 | 6.0 | 12.0 | 3.90 | 70 | 4 | B |
| **EHHB4040-S6-ATH** | ● | | | | | | | 6 | A |
| **EHHB4050-ATH** | ● | 2.50 | 5.0 | 7.5 | 15.0 | 4.70 | 80 | 6 | A |
| **EHHB4060-ATH** | ● | 3.00 | 6.0 | 9.0 | 18.0 | 5.70 | 90 | 6 | B |
| **EHHB4080-ATH** | ● | 4.00 | 8.0 | 12.0 | 24.0 | 7.60 | 100 | 8 | B |
| **EHHB4100-ATH** | ● | 5.00 | 10.0 | 15.0 | 30.0 | 9.50 | 100 | 10 | B |
| **EHHB4120-ATH** | ● | 6.00 | 12.0 | 18.0 | 36.0 | 11.50 | 110 | 12 | B |

| R | Tolerance on R | Tolerance on Dia. |
|---|---|---|
| R0.5-1.5 | ±0.005 | 0~-0.010 |
| R2-3 | ±0.007 | 0~-0.014 |
| R4-6 | ±0.010 | 0~-0.020 |

□ = Stocked items in Japan

# EHHB

## Table of standard cutting conditions (Roughing)

Advanced Engineering

| | | Alloy Steels (25~35HRC) | | | | Pre-hardened Steels (35~45HRC) | | | | Hardened Steels (45~55HRC) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $v_c$=200m/min | | | | $v_c$=170m/min | | | | $v_c$=140m/min | | | |
| R | $D_c$ | n $min^{-1}$ | Vf (mm/min)` | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) |
| **0.50** | **1.0** | 60,000 | 5,610 | 0.11 | 0.33 | 54,100 | 4,610 | 0.10 | 0.30 | 44,600 | 3,430 | 0.09 | 0.27 |
| **0.75** | **1.5** | 42,500 | 5,420 | 0.17 | 0.50 | 36,100 | 4,200 | 0.15 | 0.45 | 29,700 | 3,120 | 0.14 | 0.41 |
| **1.00** | **2.0** | 31,800 | 5,410 | 0.22 | 0.66 | 27,100 | 4,200 | 0.20 | 0.60 | 22,300 | 3,120 | 0.18 | 0.54 |
| **1.25** | **2.5** | 25,500 | 5,090 | 0.28 | 0.83 | 21,700 | 3,950 | 0.25 | 0.75 | 17,800 | 2,930 | 0.23 | 0.68 |
| **1.50** | **3.0** | 21,200 | 5,080 | 0.33 | 0.99 | 18,000 | 3,930 | 0.30 | 0.90 | 14,900 | 2,940 | 0.27 | 0.81 |
| **2.00** | **4.0** | 15,900 | 5,140 | 0.44 | 1.32 | 13,500 | 3,980 | 0.40 | 1.20 | 11,100 | 2,950 | 0.36 | 1.08 |
| **2.50** | **5.0** | 12,700 | 5,240 | 0.55 | 1.65 | 10,800 | 4,060 | 0.50 | 1.50 | 8,900 | 3,020 | 0.45 | 1.35 |
| **3.00** | **6.0** | 10,600 | 5,240 | 0.66 | 1.98 | 9,000 | 4,060 | 0.60 | 1.80 | 7,400 | 3,010 | 0.54 | 1.62 |
| **4.00** | **8.0** | 8,000 | 5,440 | 0.88 | 2.64 | 6,800 | 4,220 | 0.80 | 2.40 | 5,600 | 3,140 | 0.72 | 2.16 |
| **5.00** | **10.0** | 6,400 | 5,440 | 1.10 | 3.30 | 5,400 | 4,190 | 1.00 | 3.00 | 4,500 | 3,150 | 0.90 | 2.70 |
| **6.00** | **12.0** | 5,300 | 5,140 | 1.32 | 3.96 | 4,500 | 3,980 | 1.20 | 3.60 | 3,700 | 2,950 | 1.08 | 3.24 |

| | | Hardened Steels (55~62HRC) | | | | Hardened Steels (62~66HRC) | | | | Hardened Steels (66~72HRC) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $v_c$=110m/min | | | | $v_c$=90m/min | | | | $v_c$=70m/min | | | |
| R | $D_c$ | n $min^{-1}$ | Vf (mm/min)` | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) |
| **0.50** | **1.0** | 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 |
| **1.00** | **2.0** | 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 |
| **1.50** | **3.0** | 11,700 | 1,650 | 0.23 | 0.68 | 9,600 | 1,150 | 0.18 | 0.54 | 7,400 | 730 | 0.14 | 0.41 |
| **2.00** | **4.0** | 8,800 | 1,670 | 0.30 | 0.90 | 7,200 | 1,160 | 0.24 | 0.72 | 5,600 | 740 | 0.18 | 0.54 |
| **2.50** | **5.0** | 7,000 | 1,700 | 0.38 | 1.13 | 5,700 | 1,170 | 0.30 | 0.90 | 4,500 | 760 | 0.23 | 0.68 |
| **3.00** | **6.0** | 5,800 | 1,690 | 0.45 | 1.35 | 4,800 | 1,190 | 0.36 | 1.08 | 3,700 | 750 | 0.27 | 0.81 |
| **4.00** | **8.0** | 4,400 | 1,760 | 0.60 | 1.80 | 3,600 | 1,220 | 0.48 | 1.44 | 2,800 | 780 | 0.36 | 1.08 |
| **5.00** | **10.0** | 3,500 | 1,750 | 0.75 | 2.25 | 2,900 | 1,230 | 0.60 | 1.80 | 2,200 | 770 | 0.45 | 1.35 |
| **6.00** | **12.0** | 2,900 | 1,650 | 0.90 | 2.70 | 2,400 | 1,160 | 0.72 | 2.16 | 1,900 | 760 | 0.54 | 1.62 |

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 vadjust 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.

# EHHB

## Table of standard cutting conditions (Finishing)

Advanced Engineering

| R | $D_C$ | Alloy Steels (25~35HRC) $v_c$=280m/min n min$^{-1}$ | Vf (mm/min)` | $a_p$ (mm) | $a_e$ (mm) | Pre-hardened Steels (35~45HRC) $v_c$=250m/min n min$^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | Hardened Steels (45~55HRC) $v_c$=210m/min n min$^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.50** | **1.0** | 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 |
| **1.00** | **2.0** | 44,600 | 4,820 | 0.02~0.10 | 0.04 | 39,800 | 3,940 | 0.02~0.10 | 0.04 | 33,400 | 3,010 | 0.02~0.10 | 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 |
| **1.50** | **3.0** | 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 |
| **2.00** | **4.0** | 22,300 | 5,080 | 0.05~0.20 | 0.08 | 19,900 | 4,160 | 0.05~0.20 | 0.08 | 16,700 | 3,170 | 0.05~0.20 | 0.08 |
| **2.50** | **5.0** | 17,800 | 5,180 | 0.05~0.25 | 0.10 | 15,900 | 4,240 | 0.05~0.25 | 0.10 | 13,400 | 3,250 | 0.05~0.25 | 0.10 |
| **3.00** | **6.0** | 14,900 | 5,200 | 0.05~0.30 | 0.12 | 13,300 | 4,260 | 0.05~0.30 | 0.12 | 11,100 | 3,230 | 0.05~0.30 | 0.12 |
| **4.00** | **8.0** | 11,100 | 5,330 | 0.05~0.40 | 0.16 | 10,000 | 4,400 | 0.05~0.40 | 0.16 | 8,400 | 3,360 | 0.05~0.40 | 0.16 |
| **5.00** | **10.0** | 8,900 | 5,340 | 0.05~0.50 | 0.20 | 8,000 | 4,400 | 0.05~0.50 | 0.20 | 6,700 | 3,350 | 0.05~0.50 | 0.20 |
| **6.00** | **12.0** | 7,400 | 5,060 | 0.05~0.60 | 0.24 | 6,600 | 4,140 | 0.05~0.60 | 0.24 | 5,600 | 3,190 | 0.05~0.60 | 0.24 |

| R | $D_C$ | Hardened Steels (55~62HRC) $v_c$=160m/min n min$^{-1}$ | Vf (mm/min)` | $a_p$ (mm) | $a_e$ (mm) | Hardened Steels (62~66HRC) $v_c$=140m/min n min$^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | Hardened Steels (66~72HRC) $v_c$=120m/min n min$^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.50** | **1.0** | 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 |
| **1.00** | **2.0** | 25,500 | 1,840 | 0.02~0.10 | 0.04 | 22,300 | 1,300 | 0.02~0.10 | 0.04 | 19,100 | 950 | 0.02~0.10 | 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 |
| **1.50** | **3.0** | 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 |
| **2.00** | **4.0** | 12,700 | 1,930 | 0.05~0.20 | 0.08 | 11,100 | 1,370 | 0.05~0.20 | 0.08 | 9,600 | 1000 | 0.05~0.20 | 0.08 |
| **2.50** | **5.0** | 10,200 | 1,980 | 0.05~0.25 | 0.10 | 8,900 | 1,400 | 0.05~0.25 | 0.10 | 7,600 | 1010 | 0.05~0.25 | 0.10 |
| **3.00** | **6.0** | 8,500 | 1,980 | 0.05~0.30 | 0.12 | 7,400 | 1,400 | 0.05~0.30 | 0.12 | 6,400 | 1020 | 0.05~0.30 | 0.12 |
| **4.00** | **8.0** | 6,400 | 2,050 | 0.05~0.40 | 0.16 | 5,600 | 1,460 | 0.05~0.40 | 0.16 | 4,800 | 1060 | 0.05~0.40 | 0.16 |
| **5.00** | **10.0** | 5,100 | 2,040 | 0.05~0.50 | 0.20 | 4,500 | 1,460 | 0.05~0.50 | 0.20 | 3,800 | 1050 | 0.05~0.50 | 0.20 |
| **6.00** | **12.0** | 4,200 | 1,920 | 0.05~0.60 | 0.24 | 3,700 | 1,370 | 0.05~0.60 | 0.24 | 3,200 | 1000 | 0.05~0.60 | 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 vadjust 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.

# EHHB

**Table of standard cutting conditions (Side Milling)**

Advanced Engineering

| | | Alloy Steels (25~35HRC) | | | | Pre-hardened Steels (35~45HRC) | | | | Hardened Steels (45~55HRC) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $v_c$=240m/min | | | | $v_c$=210m/min | | | | $v_c$=180m/min | | | |
| R | $D_C$ | n $min^{-1}$ | Vf (mm/min)` | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) |
| **0.50** | **1.0** | 60,000 | 5,280 | 1.0 | 0.06 | 60,000 | 4,620 | 1.0 | 0.04 | 57,300 | 3,780 | 1.0 | 0.03 |
| **0.75** | **1.5** | 51,000 | 6,120 | 1.5 | 0.09 | 44,600 | 4,680 | 1.5 | 0.06 | 38,200 | 3,440 | 1.5 | 0.05 |
| **1.00** | **2.0** | 38,200 | 6,110 | 2.0 | 0.12 | 33,400 | 4,680 | 2.0 | 0.08 | 28,700 | 3,440 | 2.0 | 0.06 |
| **1.25** | **2.5** | 30,600 | 5,750 | 2.5 | 0.15 | 26,800 | 4,410 | 2.5 | 0.10 | 22,900 | 3,230 | 2.5 | 0.08 |
| **1.50** | **3.0** | 25,500 | 5,750 | 3.0 | 0.18 | 22,300 | 4,400 | 3.0 | 0.12 | 19,100 | 3,230 | 3.0 | 0.09 |
| **2.00** | **4.0** | 19,100 | 5,810 | 4.0 | 0.24 | 16,700 | 4,440 | 4.0 | 0.16 | 14,300 | 3,260 | 4.0 | 0.12 |
| **2.50** | **5.0** | 15,300 | 5,940 | 5.0 | 0.30 | 13,400 | 4,550 | 5.0 | 0.20 | 11,500 | 3,350 | 5.0 | 0.15 |
| **3.00** | **6.0** | 12,700 | 5,910 | 6.0 | 0.36 | 11,100 | 4,520 | 6.0 | 0.24 | 9,600 | 3,350 | 6.0 | 0.18 |
| **4.00** | **8.0** | 9,600 | 6,140 | 8.0 | 0.48 | 8,400 | 4,700 | 8.0 | 0.32 | 7,200 | 3,460 | 8.0 | 0.24 |
| **5.00** | **10.0** | 7,600 | 6,080 | 10.0 | 0.60 | 6,700 | 4,690 | 10.0 | 0.40 | 5,700 | 3,420 | 10.0 | 0.30 |
| **6.00** | **12.0** | 6,400 | 5,840 | 12.0 | 0.72 | 5,600 | 4,470 | 12.0 | 0.48 | 4,800 | 3,280 | 12.0 | 0.36 |

| | | Hardened Steels (55~62HRC) | | | | Hardened Steels (62~66HRC) | | | | Hardened Steels (66~72HRC) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $v_c$=150m/min | | | | $v_c$=125m/min | | | | $v_c$=100m/min | | | |
| R | $D_C$ | n $min^{-1}$ | Vf (mm/min)` | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | n $min^{-1}$ | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) |
| **0.50** | **1.0** | 47,800 | 2,630 | 1.0 | 0.02 | 39,800 | 1,750 | 1.0 | 0.02 | 31,800 | 1050 | 1.0 | 0.01 |
| **0.75** | **1.5** | 31,800 | 2,390 | 1.5 | 0.03 | 26,500 | 1,590 | 1.5 | 0.02 | 21,200 | 950 | 1.5 | 0.02 |
| **1.00** | **2.0** | 23,900 | 2,390 | 2.0 | 0.04 | 19,900 | 1,590 | 2.0 | 0.03 | 15,900 | 950 | 2.0 | 0.02 |
| **1.25** | **2.5** | 19,100 | 2,240 | 2.5 | 0.05 | 15,900 | 1,490 | 2.5 | 0.04 | 12,700 | 900 | 2.5 | 0.03 |
| **1.50** | **3.0** | 15,900 | 2,240 | 3.0 | 0.06 | 13,300 | 1,500 | 3.0 | 0.05 | 10,600 | 900 | 3.0 | 0.03 |
| **2.00** | **4.0** | 11,900 | 2,260 | 4.0 | 0.08 | 10,000 | 1,520 | 4.0 | 0.06 | 8,000 | 910 | 4.0 | 0.04 |
| **2.50** | **5.0** | 9,600 | 2,330 | 5.0 | 0.10 | 8,000 | 1,550 | 5.0 | 0.08 | 6,400 | 930 | 5.0 | 0.05 |
| **3.00** | **6.0** | 8,000 | 2,330 | 6.0 | 0.12 | 6,600 | 1,540 | 6.0 | 0.09 | 5,300 | 930 | 6.0 | 0.06 |
| **4.00** | **8.0** | 6,000 | 2,400 | 8.0 | 0.16 | 5,000 | 1,600 | 8.0 | 0.12 | 4,000 | 960 | 8.0 | 0.08 |
| **5.00** | **10.0** | 4,800 | 2,400 | 10.0 | 0.20 | 4,000 | 1,600 | 10.0 | 0.15 | 3,200 | 960 | 10.0 | 0.10 |
| **6.00** | **12.0** | 4,000 | 2,280 | 12.0 | 0.24 | 3,300 | 1,500 | 12.0 | 0.18 | 2,700 | 920 | 12.0 | 0.12 |

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 vadjust 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.

# HGOB-PN

## PN Coated Ball Nose End Mills for Wide Range of Materials

## FEATURES

New PN Coating features amazing adhesion and wear resistance

Flute shape designed for excellent chip removal

Combination of coating and new geometries are ideal for stable machining, even under aggressive cutting conditions.

# HGOB-PN

## INTRODUCTION

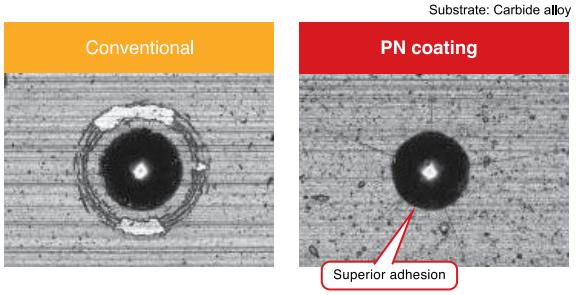
Our newly developed PN Coating enables high-efficiency machining in a wide variety of materials over a range of applications from roughing to finishing. Designed for high-performance machining in mild steels, alloy steels, pre-hardened steels, stainless steels, cast-iron and aluminum alloys, the HGOB-PN Ball Nose End Mills can easily replace multiple cutting tools in your tool cart.

## FEATURES

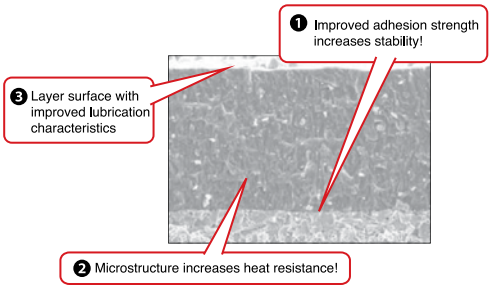
### 1. PN Coating for Maximum Efficiency and Tool Life

**PN Coating:** By optimizing the Al content, the multi-layer PN Coating exhibits both excellent heat-resistance and adhesion to the tool substrate. Combining of the AlCr coating layer with Si produces high hardness (3000HV) as well as good wear resistance. PN Coating provides extended cutting tool life in both wet and dry machining of materials including pre-hardened steel, carbon steel, alloy steel, SUS, SKD61, SKD11, and more.

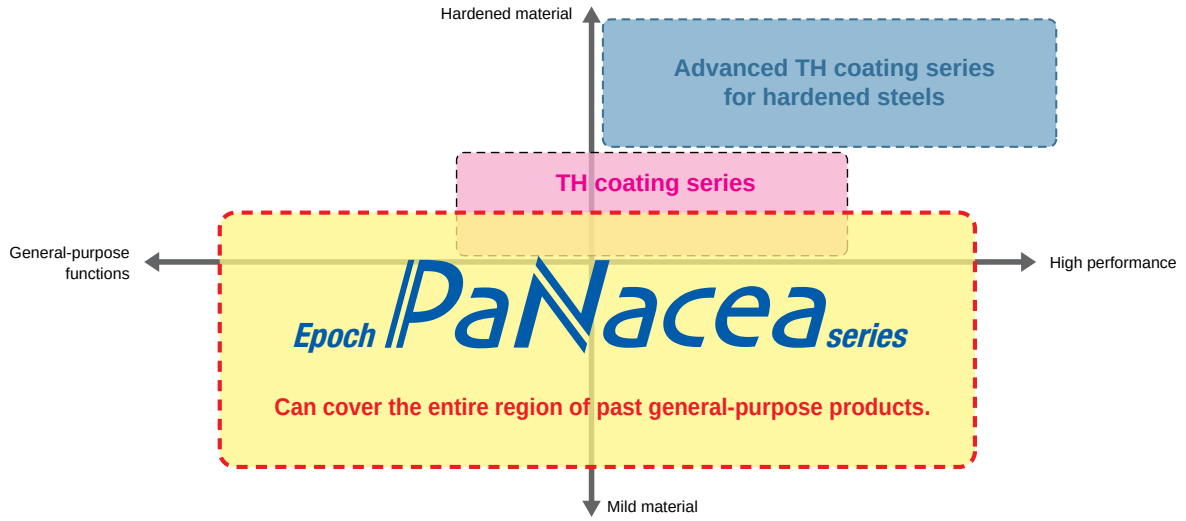
Adhesion of PN coating




Cross-section photograph of PN coating layer structure




### 2. Cutting Area



# HGOB-PN



| | | | |
|---|---|---|---|
| Helix Angle | 30° | Ds | h5 |
| R(R>8) | ±0.005 | R(R≤8) | ±0.01 |

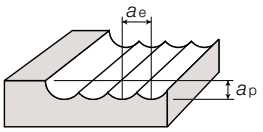
| Part No. | Stock | Size (mm) R | $D_c$ | l | L | $D_s$ | Flutes |
|---|---|---|---|---|---|---|---|
| **HGOB2003-PN** | □ | 0.15 | 0.3 | 0.6 | 50 | 4 | 2 |
| **HGOB2004-PN** | □ | 0.20 | 0.4 | 0.8 | 50 | 4 | 2 |
| **HGOB2005-PN** | □ | 0.25 | 0.5 | 1.0 | 50 | 4 | 2 |
| **HGOB2006-PN** | □ | 0.30 | 0.6 | 1.2 | 50 | 4 | 2 |
| **HGOB2008-PN** | □ | 0.40 | 0.8 | 1.6 | 50 | 4 | 2 |
| **HGOB2010-PN** | ● | 0.50 | 1.0 | 2.5 | 50 | 4 | 2 |
| **HGOB2015-PN** | ● | 0.75 | 1.5 | 4.0 | 50 | 4 | 2 |
| **HGOB2020-PN** | ● | 1.00 | 2.0 | 5.0 | 50 | 6 | 2 |
| **HGOB2025-PN** | ● | 1.25 | 2.5 | 7.0 | 50 | 6 | 2 |
| **HGOB2030-PN** | ● | 1.50 | 3.0 | 8.0 | 70 | 6 | 2 |
| **HGOB2040-4-PN** | ● | 2.00 | 4.0 | 8.0 | 70 | 4 | 2 |
| **HGOB2040-PN** | ● | 2.00 | 4.0 | 8.0 | 70 | 6 | 2 |
| **HGOB2050-PN** | ● | 2.50 | 5.0 | 10.0 | 80 | 6 | 2 |
| **HGOB2060-PN** | ● | 3.00 | 6.0 | 12.0 | 90 | 6 | 2 |
| **HGOB2080-PN** | ● | 4.00 | 8.0 | 14.0 | 100 | 8 | 2 |
| **HGOB2100-PN** | ● | 5.00 | 10.0 | 18.0 | 100 | 10 | 2 |
| **HGOB2120-PN** | ● | 6.00 | 12.0 | 22.0 | 110 | 12 | 2 |
| **HGOB2160-PN** | □ | 8.00 | 16.0 | 30.0 | 140 | 16 | 2 |
| **HGOB2200-PN** | □ | 10.00 | 20.0 | 38.0 | 160 | 20 | 2 |

□ = Stocked items in Japan

# HGOB-PN

**HGOB-PN**
**Cutting Conditions**
**(Metric)**

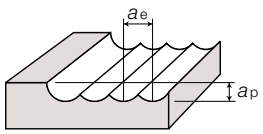
Advanced Engineering




| | | | | Copper Alloy, Aluminium Alloy | | | | Cast Iron, Carbon Steels (150~200HB | | | | Stainless Steels (25~35HRC) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | $D_c$ | l | RPM | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | RPM | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | RPM | Vf (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 |
| | **0.20** | **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** | 1.0 | 35,032 | 2,102 | 0.065 | 0.195 | 31,847 | 1,911 | 0.065 | 0.195 | 28,662 | 1,720 | 0.063 | 0.187 |
| | **0.30** | **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 |
| | **0.40** | **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 |
| | **0.50** | **1.0** | 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** | 4.0 | 25,690 | 3,083 | 0.195 | 0.585 | 23,355 | 2,803 | 0.195 | 0.585 | 21,019 | 2,522 | 0.188 | 0.562 |
| | **1.00** | **2.0** | 5.0 | 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** | 7.0 | 22,420 | 3,587 | 0.325 | 0.975 | 20,382 | 3,261 | 0.325 | 0.975 | 18,344 | 2,935 | 0.313 | 0.937 |
| | **1.50** | **3.0** | 8.0 | 21,019 | 3,783 | 0.390 | 1.170 | 19,108 | 3,439 | 0.390 | 1.170 | 17,197 | 3,096 | 0.375 | 1.125 |
| | **2.00** | **4.0** | 8.0 | 20,143 | 4,029 | 0.520 | 1.560 | 18,312 | 3,662 | 0.520 | 1.560 | 16,481 | 3,296 | 0.500 | 1.500 |
| | **2.00** | **4.0** | 8.0 | 20,143 | 4,834 | 0.520 | 1.560 | 18,312 | 4,395 | 0.520 | 1.560 | 16,481 | 3,955 | 0.500 | 1.500 |
| | **2.50** | **5.0** | 10.0 | 18,217 | 5,101 | 0.650 | 1.950 | 16,561 | 4,637 | 0.650 | 1.950 | 14,904 | 4,173 | 0.625 | 1.875 |
| | **3.00** | **6.0** | 12.0 | 15,764 | 5,045 | 0.780 | 2.340 | 14,331 | 4,586 | 0.780 | 2.340 | 12,898 | 4,127 | 0.750 | 2.250 |
| | **4.00** | **8.0** | 14.0 | 12,699 | 4,572 | 1.040 | 3.120 | 11,545 | 4,156 | 1.040 | 3.120 | 10,390 | 3,740 | 1.000 | 3.000 |
| | **5.00** | **10.0** | 18.0 | 10,860 | 4,344 | 1.300 | 3.900 | 9,873 | 3,949 | 1.300 | 3.900 | 8,885 | 3,554 | 1.250 | 3.750 |
| | **6.00** | **12.0** | 22.0 | 9,634 | 4,239 | 1.560 | 4.680 | 8,758 | 3,854 | 1.560 | 4.680 | 7,882 | 3,468 | 1.500 | 4.500 |
| | **8.00** | **16.0** | 30.0 | 7,444 | 3,573 | 2.080 | 6.240 | 6,768 | 3,248 | 2.080 | 6.240 | 6,091 | 2,924 | 2.000 | 6.000 |
| | **10.00** | **20.0** | 38.0 | 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 | 3,715 | 0.015 | 0.015 | 33,439 | 3,010 | 0.015 | 0.015 |
| | **0.20** | **0.4** | 0.8 | 42,994 | 1,720 | 0.020 | 0.020 | 35,828 | 3,583 | 0.020 | 0.020 | 32,245 | 2,902 | 0.020 | 0.020 |
| | **0.25** | **0.5** | 1.0 | 42,038 | 1,682 | 0.025 | 0.025 | 35,032 | 3,503 | 0.025 | 0.025 | 31,529 | 2,838 | 0.025 | 0.025 |
| | **0.30** | **0.6** | 1.2 | 35,032 | 2,102 | 0.030 | 0.030 | 29,193 | 2,919 | 0.030 | 0.030 | 26,274 | 2,365 | 0.030 | 0.030 |
| | **0.40** | **0.8** | 1.6 | 31,051 | 1,863 | 0.040 | 0.040 | 25,876 | 2,588 | 0.040 | 0.040 | 23,288 | 2,096 | 0.040 | 0.040 |
| | **0.50** | **1.0** | 2.5 | 30,573 | 1,834 | 0.050 | 0.050 | 25,478 | 3,057 | 0.050 | 0.050 | 22,930 | 2,476 | 0.050 | 0.050 |
| | **0.75** | **1.5** | 4.0 | 29,299 | 1,758 | 0.075 | 0.075 | 24,416 | 3,418 | 0.075 | 0.075 | 21,975 | 2,769 | 0.075 | 0.075 |
| | **1.00** | **2.0** | 5.0 | 29,618 | 2,369 | 0.100 | 0.100 | 24,682 | 3,455 | 0.100 | 0.100 | 22,213 | 2,799 | 0.100 | 0.100 |
| | **1.25** | **2.5** | 7.0 | 28,280 | 2,262 | 0.125 | 0.125 | 23,567 | 3,771 | 0.125 | 0.125 | 21,210 | 3,054 | 0.125 | 0.125 |
| | **1.50** | **3.0** | 8.0 | 26,115 | 2,089 | 0.150 | 0.150 | 21,762 | 3,482 | 0.150 | 0.150 | 19,586 | 2,820 | 0.150 | 0.150 |
| | **2.00** | **4.0** | 8.0 | 24,363 | 1,949 | 0.200 | 0.200 | 20,303 | 2,842 | 0.200 | 0.200 | 18,272 | 2,302 | 0.200 | 0.200 |
| | **2.00** | **4.0** | 8.0 | 24,363 | 2,436 | 0.200 | 0.200 | 20,303 | 2,842 | 0.200 | 0.200 | 18,272 | 2,302 | 0.200 | 0.200 |
| | **2.50** | **5.0** | 10.0 | 22,548 | 2,255 | 0.250 | 0.250 | 18,790 | 3,006 | 0.250 | 0.250 | 16,911 | 2,435 | 0.250 | 0.250 |
| | **3.00** | **6.0** | 12.0 | 19,427 | 2,331 | 0.300 | 0.300 | 16,189 | 2,590 | 0.300 | 0.300 | 14,570 | 2,098 | 0.300 | 0.300 |
| | **4.00** | **8.0** | 14.0 | 16,003 | 1,920 | 0.400 | 0.400 | 13,336 | 2,400 | 0.400 | 0.400 | 12,002 | 1,944 | 0.400 | 0.400 |
| | **5.00** | **10.0** | 18.0 | 14,713 | 2,060 | 0.500 | 0.500 | 12,261 | 2,207 | 0.500 | 0.500 | 11,035 | 1,788 | 0.500 | 0.500 |
| | **6.00** | **12.0** | 22.0 | 13,535 | 2,436 | 0.600 | 0.600 | 11,279 | 2,256 | 0.600 | 0.600 | 10,151 | 1,827 | 0.600 | 0.600 |
| | **8.00** | **16.0** | 30.0 | 10,868 | 2,174 | 0.800 | 0.800 | 9,057 | 2,174 | 0.800 | 0.800 | 8,151 | 1,761 | 0.800 | 0.800 |
| | **10.00** | **20.0** | 38.0 | 7,739 | 1,548 | 1.000 | 1.000 | 6,449 | 1,677 | 1.000 | 1.000 | 5,804 | 1,358 | 1.000 | 1.000 |

# HGOB-PN

**HGOB-PN**
**Cutting Conditions**
**Metric**




| | | | | | Alloy Steels (25~35HRC) | | | | Pre-hardened Steels (35~45HRC) | | | | Hardened Steels (45~52HRC) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | $D_c$ | l | RPM | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | RPM | Vf (mm/min) | $a_p$ (mm) | $a_e$ (mm) | RPM | Vf (mm/min) | $a_p$ (mm) | $a_e$ (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 |
| | **0.20** | **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** | 1.0 | 28,662 | 1,634 | 0.060 | 0.180 | 25,796 | 1,393 | 0.058 | 0.172 | 22,930 | 1,176 | 0.055 | 0.165 |
| | **0.30** | **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 |
| | **0.40** | **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 |
| | **0.50** | **1.0** | 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** | 4.0 | 21,019 | 2,396 | 0.180 | 0.540 | 18,917 | 2,043 | 0.173 | 0.517 | 16,815 | 1,725 | 0.165 | 0.495 |
| | **1.00** | **2.0** | 5.0 | 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** | 7.0 | 18,344 | 2,788 | 0.300 | 0.900 | 16,510 | 2,377 | 0.288 | 0.862 | 14,675 | 2,008 | 0.275 | 0.825 |
| | **1.50** | **3.0** | 8.0 | 17,197 | 2,941 | 0.360 | 1.080 | 15,478 | 2,507 | 0.345 | 1.035 | 13,758 | 2,117 | 0.330 | 0.990 |
| | **2.00** | **4.0** | 8.0 | 16,481 | 3,131 | 0.480 | 1.440 | 14,833 | 2,670 | 0.460 | 1.380 | 13,185 | 2,255 | 0.440 | 1.320 |
| | **2.00** | **4.0** | 8.0 | 16,481 | 3,758 | 0.480 | 1.440 | 14,833 | 3,204 | 0.460 | 1.380 | 13,185 | 2,706 | 0.440 | 1.320 |
| | **2.50** | **5.0** | 10.0 | 14,904 | 3,965 | 0.600 | 1.800 | 13,414 | 3,380 | 0.575 | 1.725 | 11,924 | 2,855 | 0.550 | 1.650 |
| | **3.00** | **6.0** | 12.0 | 12,898 | 3,921 | 0.720 | 2.160 | 11,608 | 3,343 | 0.690 | 2.070 | 10,318 | 2,823 | 0.660 | 1.980 |
| | **4.00** | **8.0** | 14.0 | 10,390 | 3,553 | 0.960 | 2.880 | 9,351 | 3,030 | 0.920 | 2.760 | 8,312 | 2,558 | 0.880 | 2.640 |
| | **5.00** | **10.0** | 18.0 | 8,885 | 3,376 | 1.200 | 3.600 | 7,997 | 2,879 | 1.150 | 3.450 | 7,108 | 2,431 | 1.100 | 3.300 |
| | **6.00** | **12.0** | 22.0 | 7,882 | 3,295 | 1.440 | 4.320 | 7,094 | 2,809 | 1.380 | 4.140 | 6,306 | 2,372 | 1.320 | 3.960 |
| | **8.00** | **16.0** | 30.0 | 6,091 | 2,777 | 1.920 | 5.760 | 5,482 | 2,368 | 1.840 | 5.520 | 4,873 | 2,000 | 1.760 | 5.280 |
| | **10.00** | **20.0** | 38.0 | 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 | 3,010 | 0.012 | 0.012 | 30,096 | 2,438 | 0.009 | 0.009 | 26,752 | 1,926 | 0.009 | 0.009 |
| | **0.20** | **0.4** | 0.8 | 32,245 | 2,902 | 0.016 | 0.016 | 29,021 | 2,351 | 0.012 | 0.012 | 25,796 | 1,857 | 0.012 | 0.012 |
| | **0.25** | **0.5** | 1.0 | 31,529 | 2,838 | 0.020 | 0.020 | 28,376 | 2,298 | 0.015 | 0.015 | 25,223 | 1,816 | 0.015 | 0.015 |
| | **0.30** | **0.6** | 1.2 | 26,274 | 2,365 | 0.024 | 0.024 | 23,646 | 1,915 | 0.018 | 0.018 | 21,019 | 1,513 | 0.018 | 0.018 |
| | **0.40** | **0.8** | 1.6 | 23,288 | 2,096 | 0.032 | 0.032 | 20,959 | 1,698 | 0.024 | 0.024 | 18,631 | 1,341 | 0.024 | 0.024 |
| | **0.50** | **1.0** | 2.5 | 22,930 | 2,476 | 0.040 | 0.040 | 20,637 | 2,006 | 0.030 | 0.030 | 18,344 | 1,585 | 0.030 | 0.030 |
| | **0.75** | **1.5** | 4.0 | 21,975 | 2,769 | 0.060 | 0.060 | 19,777 | 2,243 | 0.045 | 0.045 | 17,580 | 1,772 | 0.045 | 0.045 |
| | **1.00** | **2.0** | 5.0 | 22,213 | 2,799 | 0.080 | 0.080 | 19,992 | 2,267 | 0.060 | 0.060 | 17,771 | 1,791 | 0.060 | 0.060 |
| | **1.25** | **2.5** | 7.0 | 21,210 | 3,054 | 0.100 | 0.100 | 19,089 | 2,474 | 0.075 | 0.075 | 16,968 | 1,955 | 0.075 | 0.075 |
| | **1.50** | **3.0** | 8.0 | 19,586 | 2,820 | 0.120 | 0.120 | 17,627 | 2,285 | 0.090 | 0.090 | 15,669 | 1,805 | 0.090 | 0.090 |
| | **2.00** | **4.0** | 8.0 | 18,272 | 2,302 | 0.160 | 0.160 | 16,445 | 1,865 | 0.120 | 0.120 | 14,618 | 1,473 | 0.120 | 0.120 |
| | **2.00** | **4.0** | 8.0 | 18,272 | 2,302 | 0.160 | 0.160 | 16,445 | 1,865 | 0.120 | 0.120 | 14,618 | 1,473 | 0.120 | 0.120 |
| | **2.50** | **5.0** | 10.0 | 16,911 | 2,435 | 0.200 | 0.200 | 15,220 | 1,972 | 0.150 | 0.150 | 13,529 | 1,559 | 0.150 | 0.150 |
| | **3.00** | **6.0** | 12.0 | 14,570 | 2,098 | 0.240 | 0.240 | 13,113 | 1,699 | 0.180 | 0.180 | 11,656 | 1,343 | 0.180 | 0.180 |
| | **4.00** | **8.0** | 14.0 | 12,002 | 1,944 | 0.320 | 0.320 | 10,802 | 1,575 | 0.240 | 0.240 | 9,602 | 1,244 | 0.240 | 0.240 |
| | **5.00** | **10.0** | 18.0 | 11,035 | 1,788 | 0.400 | 0.400 | 9,932 | 1,448 | 0.300 | 0.300 | 8,828 | 1,144 | 0.300 | 0.300 |
| | **6.00** | **12.0** | 22.0 | 10,151 | 1,827 | 0.480 | 0.480 | 9,136 | 1,480 | 0.360 | 0.360 | 8,121 | 1,169 | 0.360 | 0.360 |
| | **8.00** | **16.0** | 30.0 | 8,151 | 1,761 | 0.640 | 0.640 | 7,336 | 1,426 | 0.480 | 0.480 | 6,521 | 1,127 | 0.480 | 0.480 |
| | **10.00** | **20.0** | 38.0 | 5,804 | 1,358 | 0.800 | 0.800 | 5,224 | 1,100 | 0.600 | 0.600 | 4,643 | 869 | 0.600 | 0.600 |

# HGOF4-TH

## Corner Radius End Mills for High Hardness Materials

## FEATURES

Low-resistance flute shape enables high-efficiency roughing of high-hardness materials

Four flute design is ideal for high feed rates and low depths of cut

Strong back taper suppresses chatter

New Advanced TH (ATH) Coating provides long tool life in both wet and dry machining

# HGOF4-TH

Advanced Engineering

## INTRODUCTION

The HGOF4-TH Corner Radius End Mills utilize a low-resistance flute shape to enable high-efficiency roughing of high-hardness materials. The strong back taper suppresses chatter, and the four flute design is optimized for low depth of cut, high feed rate machining.

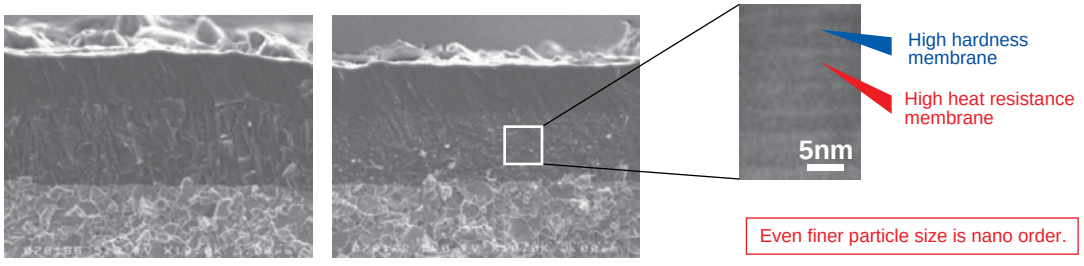
The Advanced TH (ATH) coating on the HGOF4-TH End Mills features a hardness of 3800HV, and an oxidation temperature of 1200°C. This coating exhibits amazing performance in ultra-high-efficiency machining, and provides log tool life in both wet and dry applications.

## FEATURES

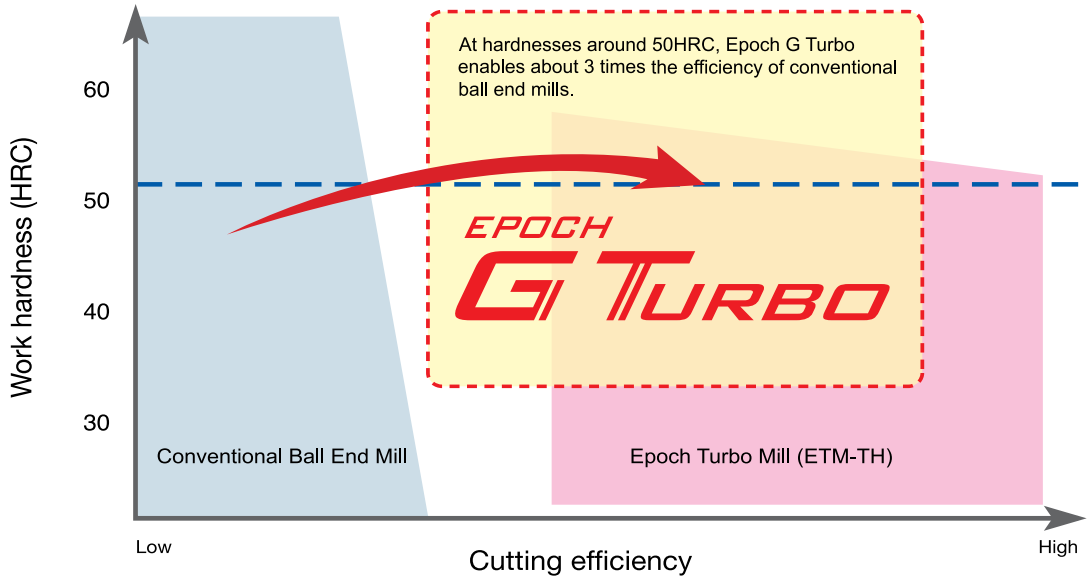
### 1. New PVD Coating Technology

**Advanced TH (ATH) Coating:** With a hardness of 3800Hv and oxidation temperature of 1200°, our new ATH Coating enables longer life and higher efficiency when cutting high-hardness materials (55HRC or higher). Compared with our previous generation coating, double the tool life and more than double the machining efficiency can be achieved. The ATH Coating is ideal for both dry cutting and wet cutting in a variety of materials including cold-worked die steel, HSS, tool steel, composite materials, carbide alloys and more.

Cross-section photograph of ATH coating layer structure




### 2. Designed for high-efficiency machining of hard materials

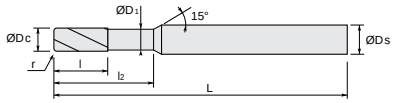



Positioning that covers the roughing of high-hardness materials with conventional tools.

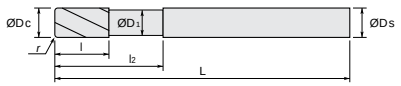
# HGOF4-TH

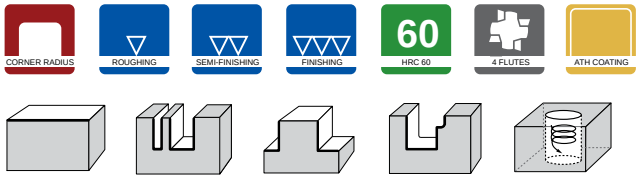
Advanced Engineering

A




B




| | | | |
|---|---|---|---|
| Helix Angle | 15° | Dc | 0/-0.03 |
| Ds | h5 | CR | ±0.01 |

**Size (mm)**

| Part No. | Stock | $D_c$ | r | l | $l_2$ | $D_1$ | L | $D_s$ | Flutes | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **HGOF4020-05-TH** | ● | 2 | 0.5 | 1.0 | 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 | 1.0 | 2.0 | 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 | 3.0 | 18 | 5.7 | 60 | 6 | 4 | B |
| **HGOF4080-20-TH** | ● | 8 | 2.0 | 4.0 | 24 | 7.6 | 75 | 8 | 4 | B |
| **HGOF4100-20-TH** | ● | 10 | 2.0 | 5.0 | 30 | 9.5 | 80 | 10 | 4 | B |
| **HGOF4120-20-TH** | ● | 12 | 2.0 | 6.0 | 36 | 11.5 | 100 | 12 | 4 | B |

# HGOF4-TH

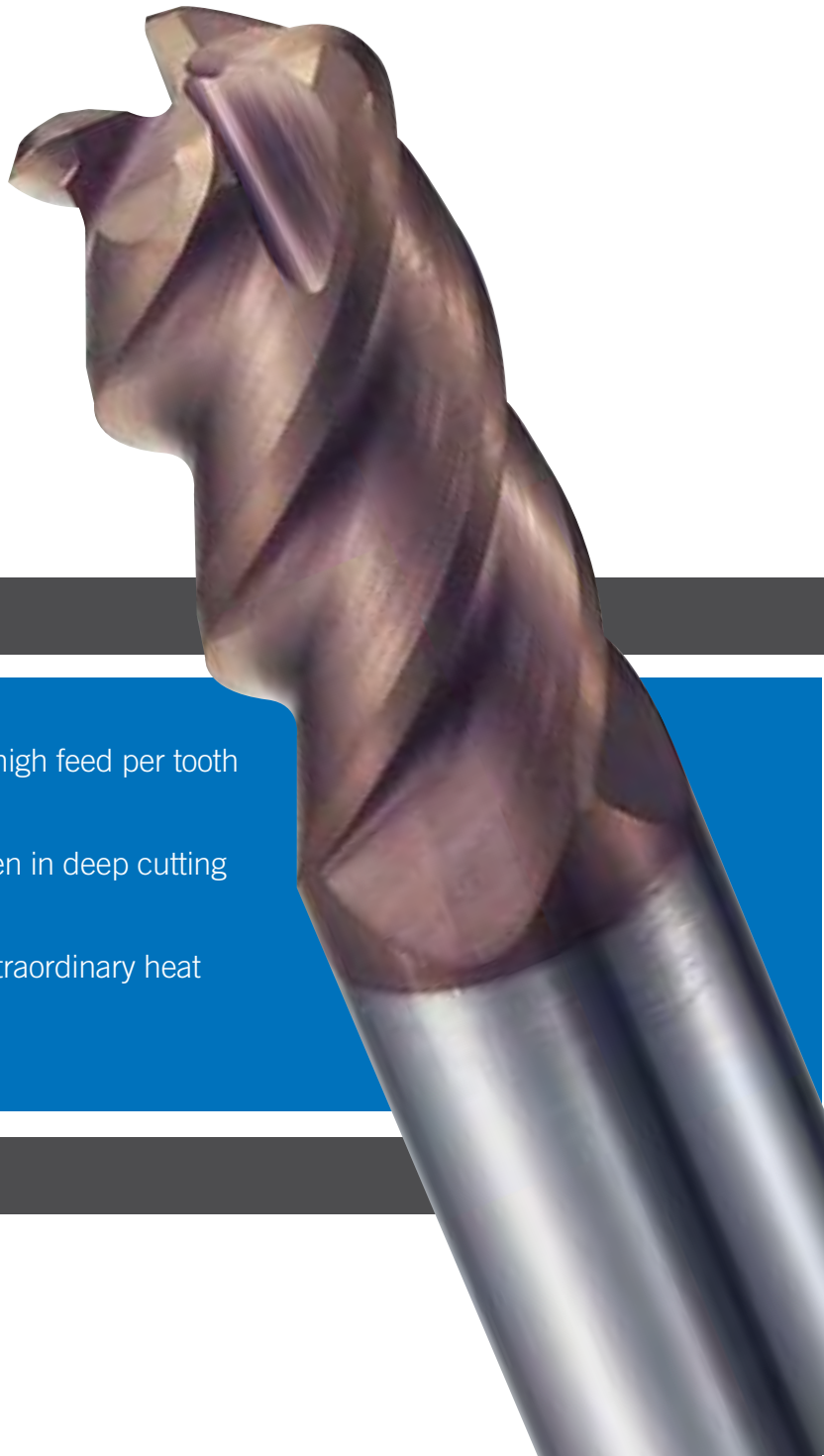
**HGOF4-TH**
**Cutting Conditions**
**(Metric)**

Advanced Engineering

| Work Material | Cutting Range | Cutting Conditions | Mill Dia. × Corner radius (mm) Ø2×r0.5 | Ø3×r0.8 | Ø4×r1 | Ø5×r1.2 | Ø6×r1.5 | Ø8×r2 | Ø10×r2 | Ø12×r2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cast iron, Carbon steels, Alloy steels (150-250HB) | General | N (RPM) | 12,000 | 8,000 | 6,000 | 4,800 | 4,000 | 3,000 | 2,400 | 2,000 |
| | | Vf (mm/min) | 5,380 | 6,050 | 6,380 | 6,380 | 6,720 | 6,720 | 6,720 | 6,380 |
| | | ap (mm) | 0.12 | 0.19 | 0.24 | 0.29 | 0.36 | 0.48 | 0.48 | 0.48 |
| | | ae (mm) | 0.5 | 0.7 | 1.0 | 1.3 | 1.5 | 2.0 | 3.0 | 4.0 |
| | High Speed | N (RPM) | 27,000 | 18,000 | 13,500 | 10,800 | 9,000 | 6,800 | 5,400 | 4,500 |
| | | Vf (mm/min) | 12,100 | 13,610 | 14,360 | 14,360 | 15,120 | 15,230 | 15,120 | 14,360 |
| | | ap (mm) | 0.05 | 0.08 | 0.10 | 0.12 | 0.15 | 0.20 | 0.20 | 0.20 |
| | | ae (mm) | 1.0 | 1.4 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 |
| Tool Steels (25-35HRC) | General | N (RPM) | 11,000 | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | | Vf (mm/min) | 4,510 | 5,110 | 5,450 | 5,470 | 5,680 | 5,730 | 5,630 | 5,540 |
| | | ap (mm) | 0.12 | 0.19 | 0.24 | 0.29 | 0.36 | 0.48 | 0.48 | 0.48 |
| | | ae (mm) | 0.5 | 0.7 | 1.0 | 1.3 | 1.5 | 2.0 | 3.0 | 4.0 |
| | High Speed | N (RPM) | 27,100 | 18,000 | 13,500 | 10,800 | 9,000 | 6,800 | 5,400 | 4,500 |
| | | Vf (mm/min) | 11,100 | 12,440 | 13,130 | 13,130 | 13,820 | 13,930 | 13,820 | 13,130 |
| | | ap (mm) | 0.05 | 0.08 | 0.10 | 0.12 | 0.15 | 0.20 | 0.20 | 0.20 |
| | | ae (mm) | 1.0 | 1.4 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 |
| Pre-hardened steels (35-45HRC) | General | N (RPM) | 10,000 | 6,900 | 5,200 | 4,100 | 3,400 | 2,600 | 2,100 | 1,700 |
| | | Vf (mm/min) | 3,200 | 3,730 | 3,950 | 3,900 | 4,080 | 4,160 | 4,200 | 3,880 |
| | | ap (mm) | 0.12 | 0.19 | 0.24 | 0.29 | 0.36 | 0.48 | 0.48 | 0.48 |
| | | ae (mm) | 0.5 | 0.7 | 1.0 | 1.3 | 1.5 | 2.0 | 3.0 | 4.0 |
| | High Speed | N (RPM) | 25,500 | 17,000 | 12,700 | 10,200 | 8,500 | 6,400 | 5,100 | 4,200 |
| | | Vf (mm/min) | 8,160 | 9,180 | 9,650 | 9,690 | 10,200 | 10,240 | 10,200 | 9,580 |
| | | ap (mm) | 0.05 | 0.08 | 0.10 | 0.12 | 0.15 | 0.20 | 0.20 | 0.20 |
| | | ae (mm) | 1.0 | 1.4 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 |
| Hardened Steels (45-55HRC) | General | N (RPM) | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | Vf (mm/min) | 2,560 | 2,860 | 3,040 | 3,040 | 3,240 | 3,200 | 3,200 | 2,960 |
| | | ap (mm) | 0.08 | 0.13 | 0.17 | 0.20 | 0.25 | 0.34 | 0.34 | 0.34 |
| | | ae (mm) | 0.5 | 0.7 | 1.0 | 1.3 | 1.5 | 2.0 | 3.0 | 4.0 |
| | High Speed | N (RPM) | 22,300 | 14,900 | 11,100 | 8,900 | 7,400 | 5,600 | 4,500 | 3,700 |
| | | Vf (mm/min) | 7,140 | 8,050 | 8,440 | 8,460 | 8,880 | 8,960 | 9,000 | 8,440 |
| | | ap (mm) | 0.04 | 0.06 | 0.08 | 0.10 | 0.12 | 0.16 | 0.16 | 0.16 |
| | | ae (mm) | 1.0 | 1.4 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 |
| Hardened Steels (55-60HRC) | General | N (RPM) | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | Vf (mm/min) | 1,275 | 1,425 | 1,525 | 1,525 | 1,625 | 1,600 | 1,600 | 1,488 |
| | | ap (mm) | 0.06 | 0.10 | 0.12 | 0.14 | 0.18 | 0.24 | 0.24 | 0.24 |
| | | ae (mm) | 0.5 | 0.7 | 1.0 | 1.3 | 1.5 | 2.0 | 3.0 | 4.0 |
| | High Speed | N (RPM) | 14,300 | 9,500 | 7,200 | 5,700 | 4,800 | 3,600 | 2,900 | 2,400 |
| | | Vf (mm/min) | 1,830 | 2,050 | 2,190 | 2,170 | 2,300 | 2,300 | 2,320 | 2,190 |
| | | ap (mm) | 0.03 | 0.05 | 0.06 | 0.07 | 0.09 | 0.12 | 0.12 | 0.12 |
| | | ae (mm) | 1.0 | 1.4 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 |

# ETM

## High Feed Corner Radius End Mills for Hardened Steels



## FEATURES

The unique high strength cutting radius enables high feed per tooth feed rates

The special oval flute shape reduces vibration even in deep cutting operations

The new nano-composite TH Coating provides extraordinary heat resistance and hardness

# ETM

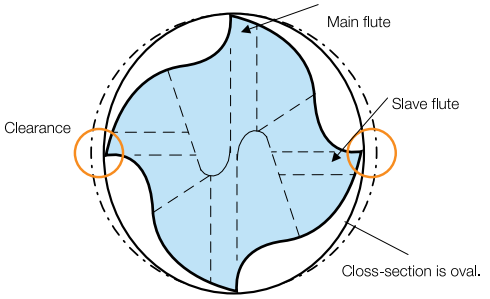
## INTRODUCTION

The ETM End mills are designed for low RPM, high-feed applications. Even though it has four flutes, it maintains sufficient chip pockets for superior chip removal at high feed rates. Roughing and semi-finishing can be performced at highly accelerated rates, improving your overall machining efficiency.

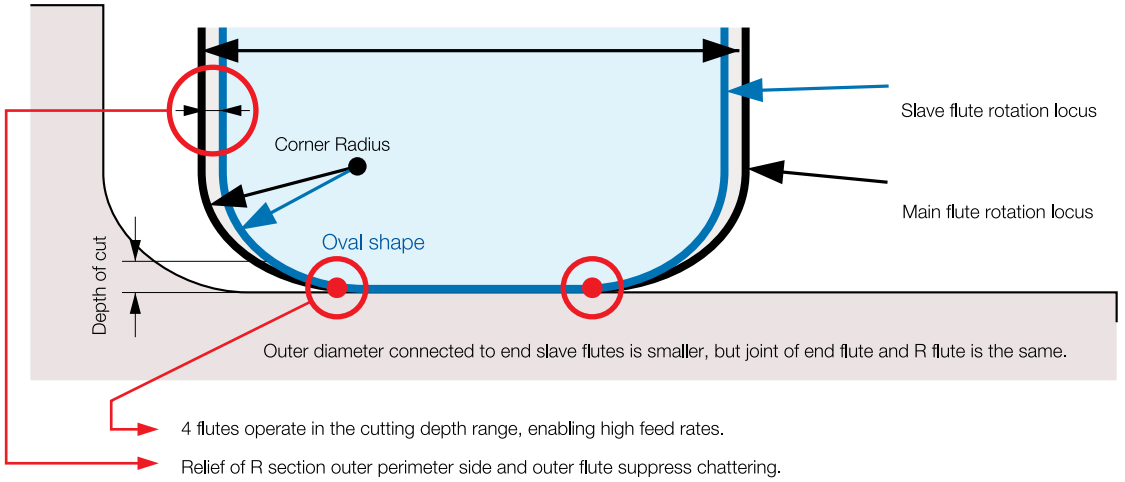
## FEATURES

| 1. | Oval Effect |
|---|---|

To suppress chattering during deep milling or the machining of unstable corner sections, ETM end mills incorporate a "double oval" shape. The two slave flutes are shorter than the main flutes, and the cutting tool appears as an oval when viewed as a cross section.




Turbo mill axial cross-section diagram




The different cutting amount of the main flutes and slave flutes produce two types of chips, varying the periodicity of cutting resistance and suppressing chattering. (Chatter occurs due to uniform cutting periodicity.)

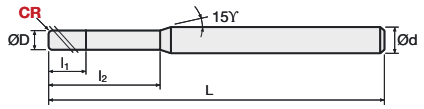
Epoch Turbo Mill

Competitor's 4 flutes Radius End Mill

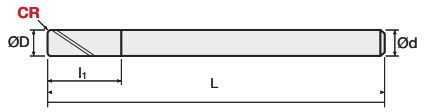
# ETM

Advanced Engineering

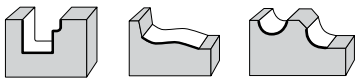
A




B




SQUARE NOSE | ROUGHING | SEMI-FINISHING | 60 HRC 60 | 4 FLUTES | TH COATING



| | | | |
|---|---|---|---|
| Helix Angle | 45° | D | 0/-0.015 |
| R | ±0.015 | d | h5 |

| Part No. | Stock | Size (mm) ØD | Corner Radius | $l_2$ | $l_1$ | L | Ød | Type |
|---|---|---|---|---|---|---|---|---|
| **ETM4020-05-TH** | ● | 2 | **0.5** | 6 | 4 | 70 | 6 | A |
| **ETM4030-08-TH** | ● | 3 | **0.8** | 9 | 6 | 70 | 6 | A |
| **ETM4040-10-TH** | ● | 4 | **1.0** | 12 | 8 | 70 | 6 | A |
| **ETM4050-12-TH** | ● | 5 | **1.2** | 15 | 10 | 70 | 6 | A |
| **ETM4060-15-TH** | ● | 6 | **1.5** | - | 12 | 90 | 6 | B |
| **ETM4080-20-TH** | ● | 8 | **2.0** | - | 16 | 100 | 8 | B |
| **ETM4100-20-TH** | ● | 10 | **2.0** | - | 20 | 110 | 10 | B |
| **ETM4120-20-TH** | ● | 12 | **2.0** | - | 24 | 120 | 12 | B |

# ETM

**ETM**
**Cutting Conditions**
**(Metric)**

Advanced Engineering

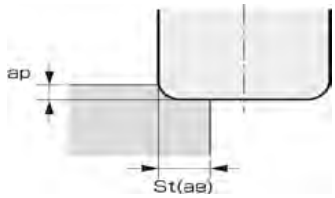
## Standard Conditions (Low RPM/High Feed)

| Work Material | Cutting Conditions | Ratio to standard DOC | Mill Dia. (D) × Radius (mm) 2×R0.5 | 3×R0.8 | 4×R1 | 5×R1.2 | 6×R1.5 | 8×R2 | 10×R2 | 12×R2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cast Iron / Carbon Steel / Alloy Steel (150 - 250HB) | N (RPM) | 1.0 | 12,000 | 8,000 | 6,000 | 4,800 | 4,000 | 3,000 | 2,400 | 2,000 |
| | fz (mm/tooth) | | 0.11 | 0.19 | 0.27 | 0.33 | 0.42 | 0.56 | 0.70 | 0.80 |
| | Vf (mm/min) | | 5,380 | 6,050 | 6,380 | 6,380 | 6,720 | 6,720 | 6,720 | 6,380 |
| Tool Steel (25 - 35HRC) | N (RPM) | 1.0 | 11,000 | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | fz (mm/tooth) | | 0.10 | 0.17 | 0.24 | 0.30 | 0.38 | 0.51 | 0.64 | 0.73 |
| | Vf (mm/min) | | 4,510 | 5,110 | 5,450 | 5,470 | 5,680 | 5,730 | 5,630 | 5,540 |
| Pre-hardened steels (35 - 45HRC) | N (RPM) | 1.0 | 10,000 | 6,900 | 5,200 | 4,100 | 3,400 | 2,600 | 2,100 | 1,700 |
| | fz (mm/tooth) | | 0.08 | 0.14 | 0.19 | 0.24 | 0.30 | 0.40 | 0.50 | 0.57 |
| | Vf (mm/min) | | 3,200 | 3,730 | 3,950 | 3,900 | 4,080 | 4,160 | 4,200 | 3,880 |
| Hardened steels (45 - 55HRC) | N (RPM) | 0.7 | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | fz (mm/tooth) | | 0.08 | 0.14 | 0.19 | 0.24 | 0.30 | 0.40 | 0.50 | 0.57 |
| | Vf (mm/min) | | 2,560 | 2,860 | 3,040 | 3,040 | 3,240 | 3,200 | 3,200 | 2,960 |
| Hardened steels (55 - 60HRC) | N (RPM) | 0.5 | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | fz (mm/tooth) | | 0.03 | 0.05 | 0.08 | 0.10 | 0.12 | 0.16 | 0.20 | 0.23 |
| | Vf (mm/min) | | 1,020 | 1,140 | 1,220 | 1,220 | 1,300 | 1,280 | 1,280 | 1,190 |

## Standard Conditions (Low RPM/High Feed)

| Work Material | Cutting Conditions | Ratio to standard DOC | Mill Dia. (D) × Radius (mm) 2×R0.5 | 3×R0.8 | 4×R1 | 5×R1.2 | 6×R1.5 | 8×R2 | 10×R2 | 12×R2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cast Iron / Carbon Steel / Alloy Steel (150 - 250HB) | N (RPM) | 0.8 | 20,000 | 13,300 | 9,900 | 8,000 | 6,600 | 5,000 | 4,000 | 3,300 |
| | fz (mm/tooth) | | 0.11 | 0.19 | 0.27 | 0.33 | 0.42 | 0.56 | 0.70 | 0.80 |
| | Vf (mm/min) | | 8,960 | 10,050 | 10,530 | 10,640 | 11,090 | 11,200 | 11,200 | 10,530 |
| Tool Steel (25 - 35HRC) | N (RPM) | 0.8 | 18,000 | 11,700 | 8,800 | 7,000 | 5,800 | 4,400 | 3,500 | 2,900 |
| | fz (mm/tooth) | | 0.10 | 0.17 | 0.24 | 0.30 | 0.38 | 0.51 | 0.64 | 0.73 |
| | Vf (mm/min) | | 7,370 | 8,090 | 8,560 | 8,510 | 8,910 | 9,010 | 8,960 | 8,460 |
| Pre-hardened steels (35 - 45HRC) | N (RPM) | 0.7 | 16,000 | 10,600 | 8,000 | 6,400 | 5,300 | 4,000 | 3,200 | 2,700 |
| | fz (mm/tooth) | | 0.08 | 0.14 | 0.19 | 0.24 | 0.30 | 0.40 | 0.50 | 0.57 |
| | Vf (mm/min) | | 5,120 | 5,720 | 6,080 | 6,080 | 6,360 | 6,400 | 6,400 | 6,160 |
| Hardened steels (45 - 55HRC) | N (RPM) | 0.6 | 12,700 | 8,500 | 6,400 | 5,100 | 4,200 | 3,200 | 2,500 | 2,100 |
| | fz (mm/tooth) | | 0.08 | 0.14 | 0.19 | 0.24 | 0.30 | 0.40 | 0.50 | 0.57 |
| | Vf (mm/min) | | 4,060 | 4,590 | 4,860 | 4,850 | 5,040 | 5,120 | 5,000 | 4,790 |
| Hardened steels (55 - 60HRC) | N (RPM) | 0.4 | 11,100 | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | fz (mm/tooth) | | 0.03 | 0.05 | 0.08 | 0.10 | 0.12 | 0.16 | 0.20 | 0.23 |
| | Vf (mm/min) | | 1,420 | 1,600 | 1,700 | 1,710 | 1,780 | 1,790 | 1,760 | 1,730 |

## Ratio to Depth of Cut and Projection




**St : Step over**
**ae = Radius at end = (Mill Dia/2) – Radius (mm)**
**ap : Table below**

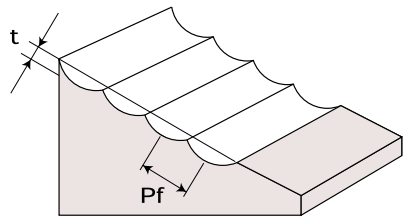
| Ratio to Projection | ap : Step down | Ratio to Projection | ap : Step down |
|---|---|---|---|
| 5D or less | 0.3×R×Ration to standard depth of cut | 8D | 0.23×R ×Ratio to standard depth of cut |
| 6D | 0.27×R×Ration to standard depth of cut | 9D | 0.19×R ×Ratio to standard depth of cut |
| 7D | 0.25×R×Ration to standard depth of cut | 10D | 0.15×R ×Ratio to standard depth of cut |

### Large Depth of Cut (Low RPM • Large Depth of Cut)

| Work Material | Cutting Conditions | Ratio to standard DOC | Mill Dia. (D) × Radius (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2×R0.5 | 3×R0.8 | 4×R1 | 5×R1.2 | 6×R1.5 | 8×R2 | 10×R2 | 12×R2 |
| Cast Iron / Carbon Steel / Alloy Steel (150 - 250HB) | N (RPM) | 2.0 | 12,000 | 8,000 | 6,000 | 4,800 | 4,000 | 3,000 | 2,400 | 2,000 |
| | fz (mm/tooth) | | 0.05 | 0.09 | 0.12 | 0.15 | 0.19 | 0.26 | 0.32 | 0.36 |
| | Vf (mm/min) | | 2,460 | 2,760 | 2,920 | 2,920 | 3,070 | 3,070 | 3,070 | 2,920 |
| Tool Steel (25 - 35HRC) | N (RPM) | 1.8 | 11,000 | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | fz (mm/tooth) | | 0.05 | 0.08 | 0.11 | 0.14 | 0.18 | 0.24 | 0.30 | 0.34 |
| | Vf (mm/min) | | 2,110 | 2,400 | 2,550 | 2,570 | 2,660 | 2,690 | 2,640 | 2,600 |
| Pre-hardened steels (35 - 45HRC) | N (RPM) | 1.6 | 10,000 | 6,900 | 5,200 | 4,100 | 3,400 | 2,600 | 2,100 | 1,700 |
| | fz (mm/tooth) | | 0.04 | 0.07 | 0.10 | 0.12 | 0.15 | 0.20 | 0.25 | 0.29 |
| | Vf (mm/min) | | 1,600 | 1,860 | 1,980 | 1,950 | 2,040 | 2,080 | 2,100 | 1,940 |
| Hardened steels (45 - 55HRC) | N (RPM) | 1.2 | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | fz (mm/tooth) | | 0.04 | 0.07 | 0.10 | 0.12 | 0.15 | 0.20 | 0.25 | 0.29 |
| | Vf (mm/min) | | 1,280 | 1,430 | 1,520 | 1,520 | 1,620 | 1,600 | 1,600 | 1,480 |
| Hardened steels (55 - 60HRC) | N (RPM) | 0.7 | 8,000 | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | fz (mm/tooth) | | 0.02 | 0.03 | 0.05 | 0.06 | 0.07 | 0.10 | 0.12 | 0.14 |
| | Vf (mm/min) | | 610 | 690 | 730 | 730 | 780 | 770 | 770 | 710 |

### High Speed Conditions (High RPM • High Feed)

| Work Material | Cutting Conditions | Ratio to standard DOC | Mill Dia. (D) × Radius (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2×R0.5 | 3×R0.8 | 4×R1 | 5×R1.2 | 6×R1.5 | 8×R2 | 10×R2 | 12×R2 |
| Cast Iron / Carbon Steel / Alloy Steel (150 - 250HB) | N (RPM) | 1.0 | 15,000 | 10,100 | 7,600 | 6,000 | 5,000 | 3,800 | 3,000 | 2,500 |
| | fz (mm/tooth) | | 0.09 | 0.15 | 0.21 | 0.26 | 0.32 | 0.43 | 0.54 | 0.62 |
| | Vf (mm/min) | | 5,180 | 5,890 | 6,240 | 6,160 | 6,480 | 6,570 | 6,480 | 6,160 |
| Tool Steel (25 - 35HRC) | N (RPM) | 1.0 | 14,000 | 9,500 | 7,200 | 5,700 | 4,800 | 3,600 | 2,900 | 2,400 |
| | fz (mm/tooth) | | 0.08 | 0.13 | 0.18 | 0.23 | 0.29 | 0.38 | 0.48 | 0.55 |
| | Vf (mm/min) | | 4,300 | 4,920 | 5,250 | 5,200 | 5,530 | 5,530 | 5,570 | 5,250 |
| Pre-hardened steels (35 - 45HRC) | N (RPM) | 1.0 | 14,000 | 9,000 | 6,800 | 5,400 | 4,500 | 3,400 | 2,700 | 2,300 |
| | fz (mm/tooth) | | 0.06 | 0.10 | 0.14 | 0.18 | 0.23 | 0.30 | 0.38 | 0.43 |
| | Vf (mm/min) | | 3,400 | 3,690 | 3,930 | 3,900 | 4,100 | 4,130 | 4,100 | 3,990 |
| Hardened steels (45 - 55HRC) | N (RPM) | 0.7 | 10,300 | 6,900 | 5,200 | 4,100 | 3,400 | 2,600 | 2,100 | 1,700 |
| | fz (mm/tooth) | | 0.06 | 0.09 | 0.13 | 0.17 | 0.21 | 0.28 | 0.35 | 0.40 |
| | Vf (mm/min) | | 2,310 | 2,610 | 2,770 | 2,730 | 2,860 | 2,910 | 2,940 | 2,710 |
| Hardened steels (55 - 60HRC) | N (RPM) | 0.5 | 9,500 | 6,400 | 4,800 | 3,800 | 3,200 | 2,400 | 1,900 | 1,600 |
| | fz (mm/tooth) | | 0.02 | 0.04 | 0.06 | 0.07 | 0.09 | 0.12 | 0.15 | 0.17 |
| | Vf (mm/min) | | 910 | 1,040 | 1,090 | 1,080 | 1,150 | 1,150 | 1,140 | 1,090 |




t =0.05 mm~0.1 mm
Pf=0.1R

## Finishing

| Work Material | Cutting Conditions | Mill Dia. (D) × Radius (mm) 2×R0.5 | 3×R0.8 | 4×R1 | 5×R1.2 | 6×R1.5 | 8×R2 | 10×R2 | 12×R2 |
|---|---|---|---|---|---|---|---|---|---|
| Cast Iron / Carbon Steel / Alloy Steel (150 - 250HB) | N (RPM) | 29,000 | 19,100 | 14,300 | 11,500 | 9,500 | 7,200 | 5,700 | 4,800 |
| | fz (mm/tooth) | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.10 | 0.11 |
| | Vf (mm/min) | 1,860 | 2,060 | 2,170 | 2,190 | 2,280 | 2,300 | 2,280 | 2,190 |
| Tool Steel (25 - 35HRC) | N (RPM) | 24,000 | 15,900 | 11,900 | 9,500 | 8,000 | 6,000 | 4,800 | 4,000 |
| | fz (mm/tooth) | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.09 |
| | Vf (mm/min) | 1,230 | 1,370 | 1,450 | 1,440 | 1,540 | 1,540 | 1,540 | 1,460 |
| Pre-hardened steels (35 - 45HRC) | N (RPM) | 19,000 | 12,700 | 9,500 | 7,600 | 6,400 | 4,800 | 3,800 | 3,200 |
| | fz (mm/tooth) | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 |
| | Vf (mm/min) | 730 | 820 | 870 | 870 | 920 | 920 | 910 | 880 |
| Hardened steels (45 - 55HRC) | N (RPM) | 14,300 | 9,500 | 7,200 | 5,700 | 4,800 | 3,600 | 2,900 | 2,400 |
| | fz (mm/tooth) | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 |
| | Vf (mm/min) | 460 | 510 | 550 | 540 | 580 | 580 | 580 | 550 |
| Hardened steels (55 - 60HRC) | N (RPM) | 11,100 | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | fz (mm/tooth) | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 |
| | Vf (mm/min) | 280 | 320 | 340 | 340 | 360 | 360 | 350 | 350 |

# Mirus

## Square End Mills for Ultra-High Efficiency Roughing and Semi-Finishing

## FEATURES

New TH Coating for long tool life in both dry and wet machining

Double gash guarantees high performance in both vertical and horizontal feed applications.

Type R: Wave peripheral form for reduced cutting force

Type N: Chip-breaker peripheral form for enhanced chipping resistance

# Mirus

## INTRODUCTION

The Mirus Series Square End Mills are designed to outperform conventional end mills in roughing and semi-finishing applications across a wide variety of materials including carbon and alloy steels, stainless steels, titanium alloys, pre-hardened steels and hardened steels.

The Mirus Type R End Mills feature a wave peripheral form for reduced cutting force, making them ideal for roughing applications in die & mold materials. The Mirus Type N End Mills feature a chip-breaker peripheral form for enhanced chipping resistance, making them well suited for semi-finishing in gummy materials such as stainless steels and titanium alloys.

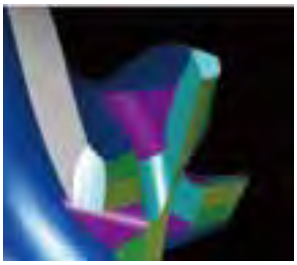
## FEATURES

### 1. Double Gash Guarantees High Performance in Both Vertical and Horizontal Feed Applications

**Double Gash achieves perfect balance in rigidity and chip evacuation!**

First gash around tip of cutter for high rigidity. Secondary gash near peripheral for enhanced chip-evacuation.

Conventional gash



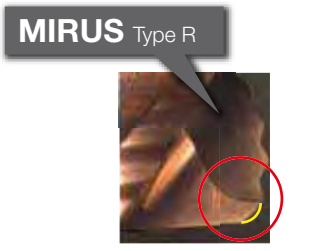
**Double gash**

### 2. New TH Coating for Long Tool Life

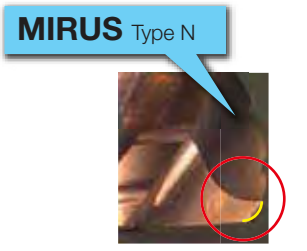
The hardness and oxidation resistance of our popular TH Coating has been further improved, enabling longer tool life and higher efficiency when cutting high-hardness materials. With a hardness of 3800HV and oxidation temperature of 1200°C, long tool life is possible in both dry and wet machining applications.

### 3. Programming Radius

To increase chipping resistance, a special geometry is adopted on the tip of the square type tools. Please set up the tool corner R with approximate radius as listed in the following table.

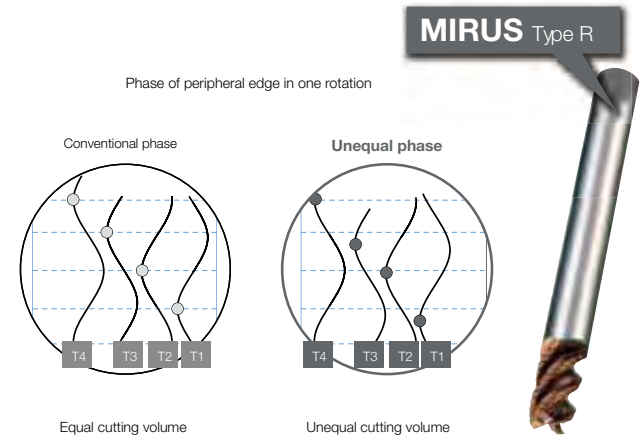


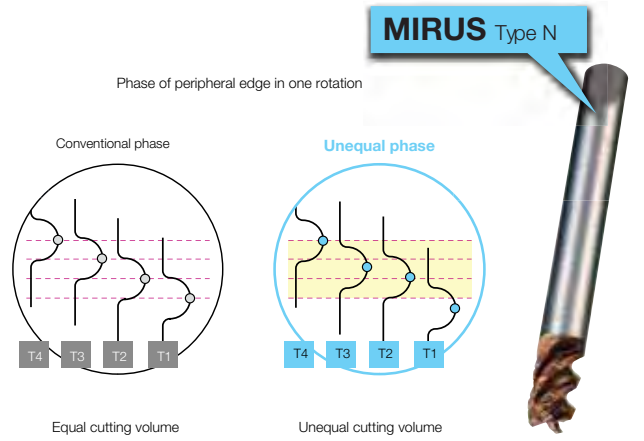

| **MIRUS** Type R | Approx radius |
|---|---|
| Ø6 | 0.4mm |
| Ø8 ~ Ø12 | 0.5mm |

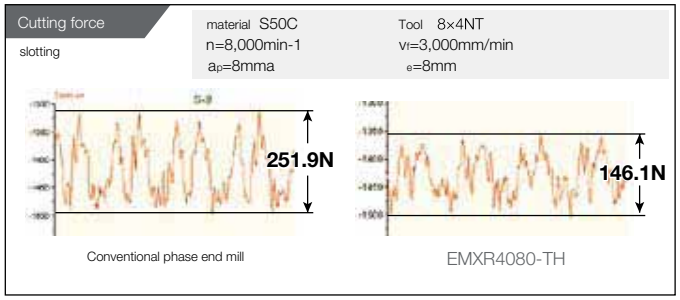


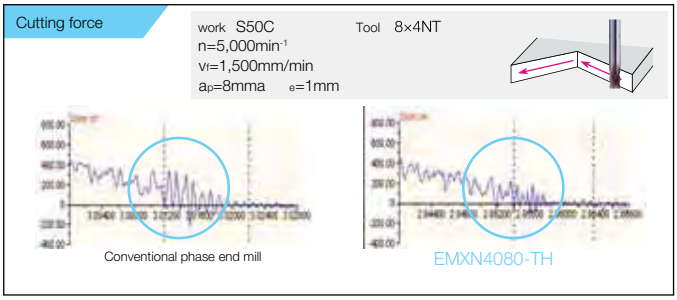

| **MIRUS** Type N | Approx radius |
|---|---|
| Ø6 | 0.4mm |
| Ø8 ~ Ø12 | 0.5mm |

## 4. Unequal Phase Effectively Reduces Vibration and Achieves High Efficiency

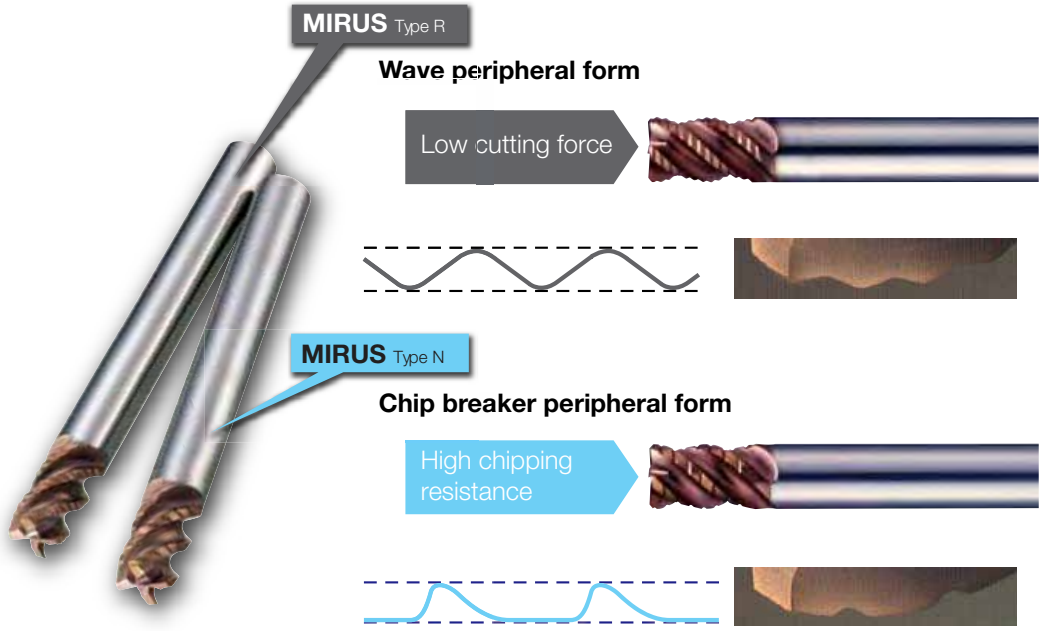


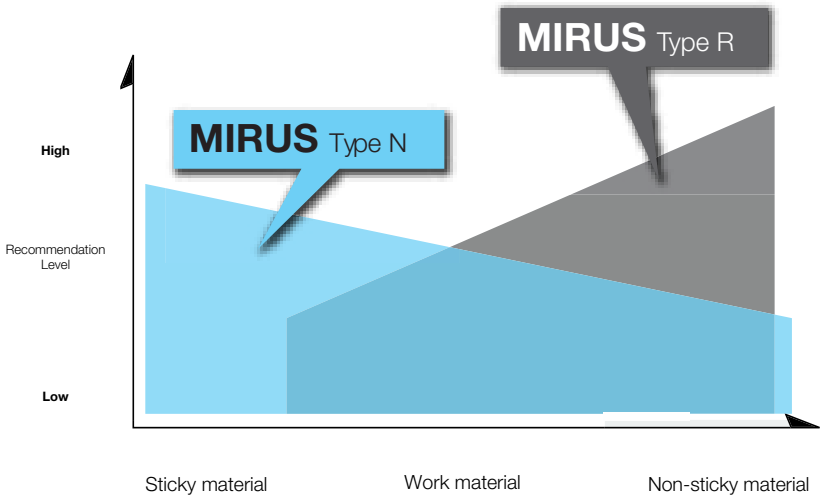




## 5. Different Peripheral Forms for Different Applications



## 6. Work Material Recommendations



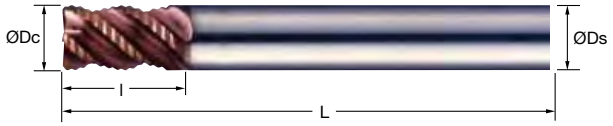

◎ Best ○ Better △ Acceptable — Most recommended application

| Work material | Recommendation items | Type R | | Type N | |
|---|---|---|---|---|---|
| Cast iron, Carbon steel Alloy steel (150-250HB) | Suitability | ◎ | | ◎ | |
| | Process | roughing | semi-finishing | roughing | semi-finishing |
| | Slotting | ○ | | ○ | |
| | Side milling | ○ | | ○ | |
| | Z plunging | ○ | | ○ | |
| | Max ramping angle | 30° or less | | 20° or less | |
| Stainless steels (25-35HRC) | Suitability | × | | ○ | |
| | Process | roughing | semi-finishing | roughing | semi-finishing |
| | Slotting | — | | △ | |
| | Side milling | — | | ○ | |
| | Z plunging | — | | × | |
| | Max ramping angle | — | | 5° or less | |
| Titanium alloy | Suitability | × | | ○ | |
| | Process | roughing | semi-finishing | roughing | semi-finishing |
| | Slotting | — | | ○ | |
| | Side milling | — | | ○ | |
| | Z plunging | — | | △ | |
| | Max ramping angle | — | | 10° or less | |
| Pre-hardened steels (32-45HRC) | Suitability | ◎ | | ○ | |
| | Process | roughing | semi-finishing | roughing | semi-finishing |
| | Slotting | ○ | | ○ | |
| | Side milling | ○ | | ○ | |
| | Z plunging | △ | | ○ | |
| | Max ramping angle | 15° or less | | 10° or less | |
| Hardened steels (45-55HRC) | Suitability | ◎ | | ○ | |
| | Process | roughing | semi-finishing | roughing | semi-finishing |
| | Slotting | △ | | △ | |
| | Side milling | ○ | | ○ | |
| | Z plunging | × | | × | |
| | Max ramping angle | 5° or less | | 5° or less | |

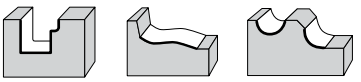
# Mirus

## Mirus
## Square End Mill

Advanced Engineering







| | |
|---|---|
| Helix Angle | 45° |
| Dc (Ø6) | 0/-0.015 |
| Dc (Ø8-12) | 0/-0.02 |
| Ds | h5 |

### EMXR-TH (Type R)

| | | Size (mm) | | | | |
|---|---|---|---|---|---|---|
| Part No. | Stock | Dc | l | L | Ds | Approx Radius |
| **EMXR4060-TH** | ● | **6** | 9 | 60 | 6 | 0.4* |
| **EMXR4080-TH** | ● | **8** | 12 | 75 | 8 | 0.5* |
| **EMXR4100-TH** | ● | **10** | 15 | 80 | 10 | 0.5* |
| **EMXR4120-TH** | ● | **12** | 18 | 100 | 12 | 0.5* |

### EMXN-TH (Type N)

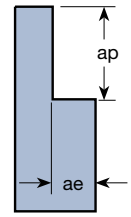
| | | Size (mm) | | | | |
|---|---|---|---|---|---|---|
| Part No. | Stock | Dc | l | L | Ds | Approx Radius |
| **EMXN4060-TH** | ● | **6** | 9 | 60 | 6 | 0.4* |
| **EMXN4080-TH** | ● | **8** | 12 | 75 | 8 | 0.5* |
| **EMXN4100-TH** | ● | **10** | 15 | 80 | 10 | 0.5* |
| **EMXN4120-TH** | ● | **12** | 18 | 100 | 12 | 0.5* |

### EMXR-TH Inch (Type R)

| Part No. | Stock | Dc | l | L | Ds | Approx Radius |
|---|---|---|---|---|---|---|
| **IEMXR4080-TH** | ● | 1/4" | 3/8" | 2.953" | 1/4" | .0157" |
| **IEMXR4120-TH** | ● | 3/8" | 9/16" | 3.150" | 3/8" | .0196" |
| **IEMXR4160-TH** | ● | 1/2" | 3/4" | 3.937" | 1/2" | .0275" |

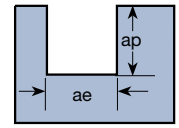
## Type R – Side Milling

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Depth of cut (mm) | ae | ap | ae | ap | ae | ap | ae | ap |
| | 0.5Dc | 1.0Dc | 0.375Dc | 1.0Dc | 0.25Dc | 1.0Dc | 0.125Dc | 1.0Dc |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 8,000 | 1,730 | 7,200 | 1,240 | 6,400 | 970 | 5,600 | 730 |
| 8 | 6,000 | 1,820 | 5,400 | 1,310 | 4,800 | 1,020 | 4,200 | 770 |
| 10 | 4,800 | 1,820 | 4,300 | 1,310 | 3,800 | 1,010 | 3,300 | 750 |
| 12 | 4,000 | 1,730 | 3,600 | 1,240 | 3,200 | 970 | 2,800 | 730 |



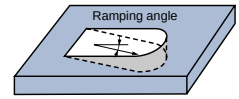

## Type R – Slotting

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Depth of cut (mm) | ae | ap | ae | ap | ae | ap | ae | ap |
| | 1.0Dc | 1.0Dc | 1.0Dc | 0.8Dc | 1.0Dc | 0.5Dc | 1.0Dc | 0.2Dc |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 6,900 | 1,190 | 6,100 | 840 | 5,300 | 640 | 4,500 | 470 |
| 8 | 5,200 | 1,260 | 4,600 | 890 | 4,000 | 680 | 3,400 | 500 |
| 10 | 4,100 | 1,250 | 3,700 | 900 | 3,200 | 680 | 2,700 | 490 |
| 12 | 3,400 | 1,180 | 3,100 | 860 | 2,700 | 650 | 2,300 | 480 |




## Type R – Ramping

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Max. ramping angle | 30° or less | | 15° or less | | 15° or less | | 5° or less | |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 6,900 | 890 | 6,100 | 790 | 5,300 | 570 | 4,500 | 490 |
| 8 | 5,200 | 950 | 4,600 | 840 | 4,000 | 610 | 3,400 | 520 |
| 10 | 4,100 | 930 | 3,700 | 840 | 3,200 | 610 | 2,700 | 510 |
| 12 | 3,400 | 880 | 3,100 | 800 | 2,700 | 580 | 2,300 | 500 |




## Type R – Two-way profiling

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Depth of cut (mm) | Max. ae | | Max. ae | | Max. ae | | Max. ae | |
| | 0.5Dc | | 0.375Dc | | 0.25Dc | | 0.125Dc | |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 8,000 | 2,070 | 7,200 | 1,560 | 6,400 | 1,240 | 5,600 | 970 |
| 8 | 6,000 | 2,190 | 5,400 | 1,640 | 4,800 | 1,310 | 4,200 | 1,020 |
| 10 | 4,800 | 2,190 | 4,300 | 1,630 | 3,800 | 1,300 | 3,300 | 1,000 |
| 12 | 4,000 | 2,070 | 3,600 | 1,560 | 3,200 | 1,240 | 2,800 | 970 |

# Mirus

**Mirus EMXR**
**Type – R**
**Cutting Conditions**
**(Inch)**

Advanced Engineering

### Side Milling (Cat-40)

| Inch | Mild Steel & Cast Iron | | | | P20-PX5 (25-35HRc) | | | | Pre-Hardened Steel (35-45HRc) | | | | 45-52HRc | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Diameter* | *RPM* | *Feed* | *Step Down* | *Step Over* | *RPM* | *Feed* | *Step Down* | *Step Over* | *RPM* | *Feed* | *Step Down* | *Step Over* | *RPM* | *Feed* | *Step Down* | *Step Over* |
| 1/4" | 7500 | 50 ipm | .250" | .125" | 6750 | 36 ipm | .250" | .094" | 6000 | 25 ipm | .250" | .063" | 5250 | 18 ipm | .250" | .031" |
| 3/8" | 5000 | 60 ipm | .281" | .188" | 4500 | 43 ipm | .281" | .141" | 4000 | 30 ipm | .281" | .094" | 3500 | 22 ipm | .281" | .047" |
| 1/2" | 3750 | 50 ipm | .250" | .250" | 3375 | 36 ipm | .250" | .188" | 3000 | 25 ipm | .250" | .125" | 2625 | 18 ipm | .250" | .063" |

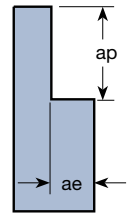
### Slotting (Cat-40)

| Inch | Mild Steel & Cast Iron | | | | P20-PX5 (25-35HRc) | | | | Pre-Hardened Steel (35-45HRc) | | | | 45-52HRc | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Diameter* | *RPM* | *Feed* | *Step Down* | *Step Over* | *RPM* | *Feed* | *Step Down* | *Step Over* | *RPM* | *Feed* | *Step Down* | *Step Over* | *RPM* | *Feed* | *Step Down* | *Step Over* |
| 1/4" | 6500 | 35 ipm | .250" | .250" | 5850 | 25 ipm | .200" | .250" | 5200 | 18 ipm | .125" | .250" | 4550 | 12 ipm | .050" | .250" |
| 3/8" | 4350 | 40 ipm | .281" | .375" | 3915 | 29 ipm | .225" | .375" | 3480 | 20 ipm | .141" | .375" | 3045 | 13 ipm | .056" | .375" |
| 1/2" | 3250 | 35 ipm | .250" | .500" | 2925 | 25 ipm | .200" | .500" | 2600 | 18 ipm | .125" | .500" | 2275 | 12 ipm | .050" | .500" |

| Max Ramp Angle |
|---|
| -20HRc = less 30deg |
| 25-30HRc = less 15deg |
| 35-45HRc = less 15deg |
| 45-55HRc = less 5deg |

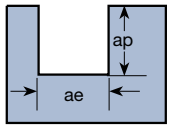
## Type N – Side Milling

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels , Stainless steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Depth of cut (mm) | ae | ap | ae | ap | ae | ap | ae | ap |
| | 0.5Dc | 1.0Dc | 0.375Dc | 1.0Dc | 0.25Dc | 1.0Dc | 0.125Dc | 1.0Dc |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 7,400 | 1,600 | 6,600 | 1,140 | 5,800 | 880 | 5,000 | 650 |
| 8 | 5,600 | 1,700 | 5,000 | 1,220 | 4,400 | 940 | 3,800 | 690 |
| 10 | 4,500 | 1,710 | 4,000 | 1,220 | 3,500 | 930 | 3,000 | 680 |
| 12 | 3,700 | 1,600 | 3,300 | 1,140 | 2,900 | 880 | 2,500 | 650 |



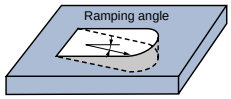

## Type N – Slotting

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels , Stainless steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Depth of cut (mm) | ae | ap | ae | ap | ae | ap | ae | ap |
| | 1.0Dc | 1.0Dc | 1.0Dc | 0.8Dc | 1.0Dc | 0.5Dc | 1.0Dc | 0.2Dc |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 6,400 | 1,110 | 5,600 | 770 | 4,800 | 580 | 4,000 | 4.1 |
| 8 | 4,800 | 1,170 | 4,200 | 820 | 3,600 | 610 | 3,000 | 440 |
| 10 | 3,800 | 1,160 | 3,300 | 800 | 2,900 | 620 | 2,400 | 440 |
| 12 | 3,200 | 1,110 | 2,800 | 770 | 2,400 | 580 | 2,000 | 410 |




## Type N – Ramping

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels , Stainless steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Max. ramping angle | 20° or less | | 15° or less (5° or less for Sainless Steels) | | 10° or less | | 5° or less | |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 6,400 | 830 | 5,600 | 730 | 4,800 | 520 | 4,000 | 430 |
| 8 | 4,800 | 880 | 4,200 | 770 | 3,600 | 550 | 3,000 | 460 |
| 10 | 3,800 | 870 | 3,300 | 750 | 2,900 | 550 | 2,400 | 460 |
| 12 | 3,200 | 830 | 2,800 | 730 | 2,400 | 520 | 2,000 | 430 |



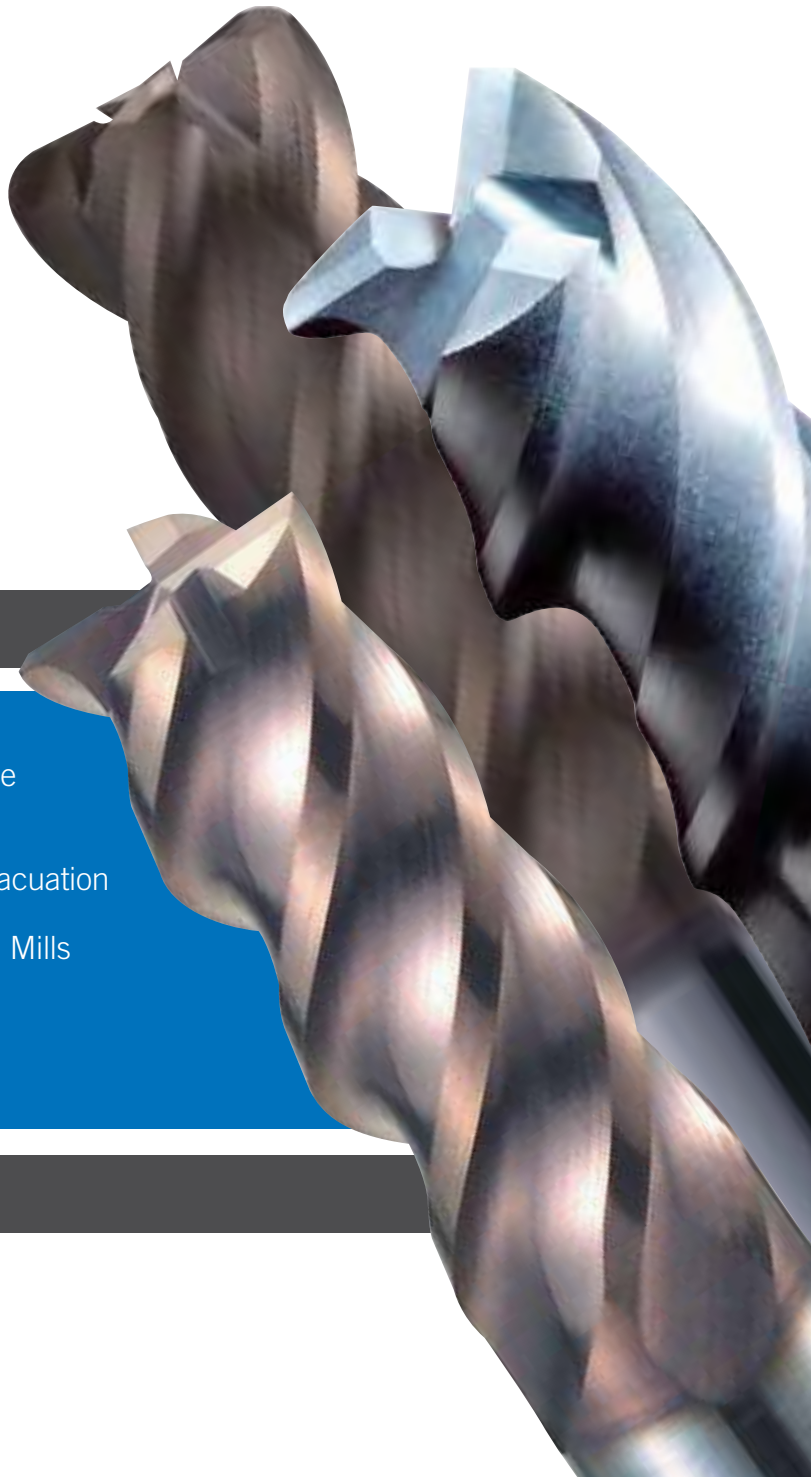

## Type N – Two-way profiling

| | Cast iron, Carbon steels, Alloy steels (150-250HB) | | Tool steels , Stainless steels (25-35HRC) | | Pre-hardened steels (35-45HRC) | | Hardened steels (45-55HRC) | |
|---|---|---|---|---|---|---|---|---|
| Depth of cut (mm) | Max. ae | | Max. ae | | Max. ae | | Max. ae | |
| | 0.5Dc | | 0.375Dc | | 0.25Dc | | 0.125Dc | |
| Mill dia. (mm) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) | N (RPM) | Vf (mm/min) |
| 6 | 7,400 | 1,920 | 6,600 | 1,430 | 5,800 | 1,130 | 5,000 | 860 |
| 8 | 5,600 | 2,040 | 5,000 | 1,520 | 4,400 | 1,200 | 3,800 | 920 |
| 10 | 4,500 | 2,050 | 4,000 | 1,520 | 3,500 | 1,200 | 3,000 | 910 |
| 12 | 3,700 | 1,920 | 3,300 | 1,430 | 2,900 | 1,130 | 2,500 | 860 |

Please use Type N for Stainless Steel applications and reduce the feed rate 30-50% from the values shown in the table above.

# EPP Series

## High Performance, High Reliability Square & Corner Radius End Mills



## FEATURES

Extremely rigid design and thin coating layer provide highly accurate finishes

Improved flute design provides exceptional chip evacuation

EPP-CR: Four Flute, TH Coated Corner Radius End Mills

EPP4: Four Flute, TH Coated Square End Mills

EPP3: Three Flute, CS Coated Square End Mills

# EPP Series

Advanced Engineering

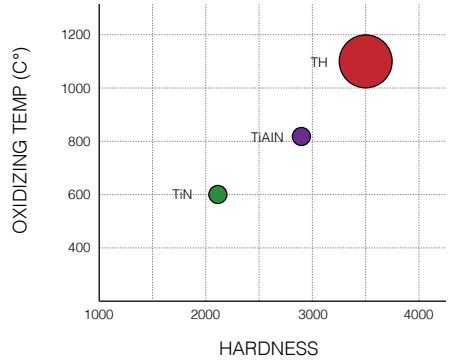
## INTRODUCTION

The EPP Series End Mills are ideal for the high-speed roughing, semi-finishing and finishing of a wide variety of materials, especially from pre-hardened steels (35HRC) to hardened steels. Their rigid design efficiently evacuates chips and provides excellent workpiece finishes.

## FEATURES

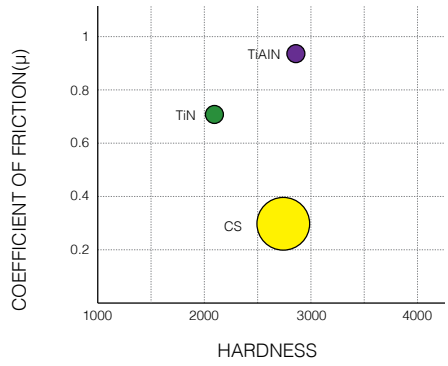
### 1. TH Coated EPP-CR and EPP4 for High-Speed, High-Efficiency Machining of Hardened Steels

The high hardness and oxidation resistance of the revolutionary TH Coating ensure excellent performance and long tool life in 40-55HRC hardened steels such as H13, D2, and A2 as well as pre-hardened steels. High heat resistance makes TH Coated tools suitable for dry cutting.

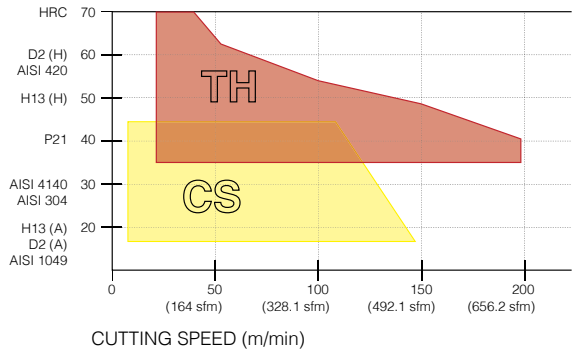



### 2. CS Coated EPP3 for High-Efficiency Machining of Carbon and Alloy Steels

Nano-crystal technology helps to reduce the friction-resistance of the coating while maintaining the hardness. This reduction in friction decreases tool wear and also makes dry cutting possible.



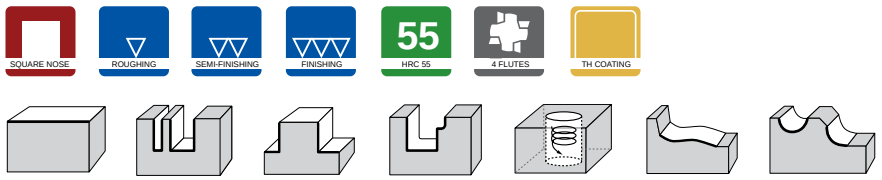

### 3. Range



# EPP Series

**EPP-CR-TH**
**Four Flute**

Advanced Engineering


| | |
|---|---|
| Helix Angle | 43° |
| D (Ø3-6) | 0/-0.015 |
| D (Ø8-10) | 0/-0.02 |
| d | h6 |

## EPP-CR

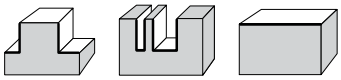
| Part No. | Stock | Flutes | Corner Radius | Size (mm) ØD | l | L | Ød |
|---|---|---|---|---|---|---|---|
| **EPP4030-02-TH** | ● | 4 | 0.2 | **3** | 8 | 60 | 6 |
| **EPP4030-05-TH** | ● | 4 | 0.5 | **3** | 8 | 60 | 6 |
| **EPP4040-02-TH** | ● | 4 | 0.2 | **4** | 11 | 60 | 6 |
| **EPP4040-05-TH** | ● | 4 | 0.5 | **4** | 11 | 60 | 6 |
| **EPP4040-10-TH** | ● | 4 | 1.0 | **4** | 11 | 60 | 6 |
| **EPP4050-02-TH** | □ | 4 | 0.2 | **5** | 13 | 60 | 6 |
| **EPP4050-05-TH** | ● | 4 | 0.5 | **5** | 13 | 60 | 6 |
| **EPP4050-10-TH** | □ | 4 | 1.0 | **5** | 13 | 60 | 6 |
| **EPP4060-03-TH** | □ | 4 | 0.3 | **6** | 13 | 60 | 6 |
| **EPP4060-05-TH** | ● | 4 | 0.5 | **6** | 13 | 60 | 6 |
| **EPP4060-10-TH** | ● | 4 | 1.0 | **6** | 13 | 60 | 6 |
| **EPP4060-15-TH** | ● | 4 | 1.5 | **6** | 13 | 60 | 6 |
| **EPP4080-03-TH** | □ | 4 | 0.3 | **8** | 19 | 75 | 8 |
| **EPP4080-05-TH** | □ | 4 | 0.5 | **8** | 19 | 75 | 8 |
| **EPP4080-10-TH** | ● | 4 | 1.0 | **8** | 19 | 75 | 8 |
| **EPP4080-15-TH** | ● | 4 | 1.5 | **8** | 19 | 75 | 8 |
| **EPP4080-20-TH** | □ | 4 | 2.0 | **8** | 19 | 75 | 8 |
| **EPP4100-03-TH** | □ | 4 | 0.3 | **10** | 22 | 80 | 10 |
| **EPP4100-05-TH** | □ | 4 | 0.5 | **10** | 22 | 80 | 10 |
| **EPP4100-10-TH** | ● | 4 | 1.0 | **10** | 22 | 80 | 10 |
| **EPP4100-15-TH** | ● | 4 | 1.5 | **10** | 22 | 80 | 10 |
| **EPP4100-20-TH** | ● | 4 | 2.0 | **10** | 22 | 80 | 10 |
| **EPP4120-05-TH** | □ | 4 | 0.5 | **12** | 26 | 100 | 12 |
| **EPP4120-10-TH** | □ | 4 | 1.0 | **12** | 26 | 100 | 12 |
| **EPP4120-15-TH** | □ | 4 | 1.5 | **12** | 26 | 100 | 12 |
| **EPP4120-20-TH** | □ | 4 | 2.0 | **12** | 26 | 100 | 12 |
| **EPP4120-30-TH** | □ | 4 | 3.0 | **12** | 26 | 100 | 12 |

□ = Stocked items in Japan

# EPP Series

**EPP4-TH**
**Four Flute**

Advanced Engineering

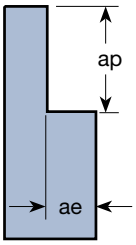



| | |
|---|---|
| Helix Angle | 43° |
| D (Ø3-6) | 0/-0.015 |
| D (Ø8-12) | 0/-0.02 |
| d | h6 |

## EPP4-TH - METRIC

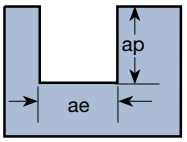
| Part No. | Stock | Flutes | ØD | Size (mm) l | L | Ød |
|---|---|---|---|---|---|---|
| **EPP4030-TH** | ● | 4 | **3** | 8 | 60 | 6 |
| **EPP4040-TH** | ● | 4 | **4** | 11 | 60 | 6 |
| **EPP4050-TH** | □ | 4 | **5** | 13 | 60 | 6 |
| **EPP4060-TH** | ● | 4 | **6** | 13 | 60 | 6 |
| **EPP4070-TH** | □ | 4 | **7** | 16 | 70 | 8 |
| **EPP4080-TH** | ● | 4 | **8** | 19 | 75 | 8 |
| **EPP4090-TH** | □ | 4 | **9** | 19 | 80 | 10 |
| **EPP4100-TH** | ● | 4 | **10** | 22 | 80 | 10 |
| **EPP4110-TH** | □ | 4 | **11** | 22 | 100 | 12 |
| **EPP4120-TH** | ● | 4 | **12** | 26 | 100 | 12 |

□ = Stocked items in Japan




## Side Milling

| Work Material (Hardness) | Cutting Range | Step down/ Step over D: Dia mm | Cutting Conditions | Tool Dia. Ø3 | Ø4 | Ø5 | Ø6 | Ø8 | Ø10 |
|---|---|---|---|---|---|---|---|---|---|
| Alloy Steel (200-250HB) | High Speed | ap=1.5D | N (RPM) | 16,000 | 12,000 | 9,600 | 8,000 | 6,000 | 4,800 |
| | | ae=0.1D | Vf (mm/min) | 1,800 | 1,900 | 2,100 | 2,200 | 2,400 | 2,200 |
| | General | ap=1.5D | N (RPM) | 9,600 | 7,200 | 5,700 | 4,800 | 3,600 | 2,900 |
| | | ae=0.15D | Vf (mm/min) | 860 | 920 | 1,000 | 1,080 | 1,150 | 1,070 |
| Alloy Steel (25-35HRC) | High Speed | ap=1.5D | N (RPM) | 14,000 | 10,000 | 8,300 | 6,900 | 5,200 | 4,100 |
| | | ae=0.05D | Vf (mm/min) | 1,400 | 1,400 | 1,600 | 1,700 | 1,900 | 1,700 |
| | General | ap=1.5D | N (RPM) | 9,600 | 7,200 | 5,700 | 4,800 | 3,600 | 2,900 |
| | | ae=0.1D | Vf (mm/min) | 770 | 830 | 900 | 970 | 1,040 | 960 |
| Pre-Hardened Steel (35-45HRC) | High Speed | ap=1.5D | N (RPM) | 12,000 | 8,800 | 7,000 | 5,800 | 4,400 | 3,500 |
| | | ae=0.05D | Vf (mm/min) | 1,100 | 1,100 | 1,200 | 1,300 | 1,400 | 1,300 |
| | General | ap=1.5D | N (RPM) | 8,500 | 6,400 | 5,100 | 4,200 | 3,200 | 2,500 |
| | | ae=0.07D | Vf (mm/min) | 610 | 660 | 720 | 750 | 820 | 740 |
| Hardened Steel (45-55HRC) | High Speed | ap=1.5D | N (RPM) | 11,000 | 8,000 | 6,400 | 5,300 | 4,000 | 3,200 |
| | | ae=0.02D | Vf (mm/min) | 860 | 900 | 990 | 1,040 | 1,120 | 1,030 |
| | General | ap=1.5D | N (RPM) | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 |
| | | ae=0.05D | Vf (mm/min) | 460 | 500 | 550 | 580 | 630 | 570 |




## Slotting

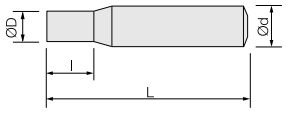
| Work Material (Hardness) | Cutting Range | Step down/ Step over D: Dia mm | Cutting Conditions | Tool Dia. Ø3 | Ø4 | Ø5 | Ø6 | Ø8 | Ø10 |
|---|---|---|---|---|---|---|---|---|---|
| Alloy Steel (200-250HB) | High Speed | ap≤0.5D | N (RPM) | 8,500 | 6,400 | 5,100 | 4,200 | 3,200 | 2,500 |
| | | ae=1D | Vf (mm/min) | 820 | 920 | 980 | 1,010 | 1,090 | 950 |
| | General | ap≤1D | N (RPM) | 6,400 | 4,800 | 3,800 | 3,200 | 2,400 | 1,900 |
| | | ae=1D | Vf (mm/min) | 490 | 550 | 580 | 610 | 650 | 580 |
| Alloy Steel (25-35HRC) | General | ap≤0.5D | N (RPM) | 6,400 | 4,800 | 3,800 | 3,200 | 2,400 | 1,900 |
| | | ae=1D | Vf (mm/min) | 440 | 500 | 530 | 550 | 590 | 520 |
| Pre-Hardened Steel (35-45HRC) | General | ap≤0.5D | N (RPM) | 5,800 | 4,400 | 3,500 | 2,900 | 2,200 | 1,800 |
| | | ae=1D | Vf (mm/min) | 360 | 410 | 430 | 450 | 480 | 440 |
| Hardened Steel (45-55HRC) | General | ap≤0.2D | N (RPM) | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 |
| | | ae=1D | Vf (mm/min) | 240 | 280 | 290 | 310 | 330 | 290 |

# EPP Series

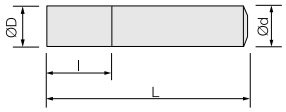
**EPP3-CS**
**Three Flute**

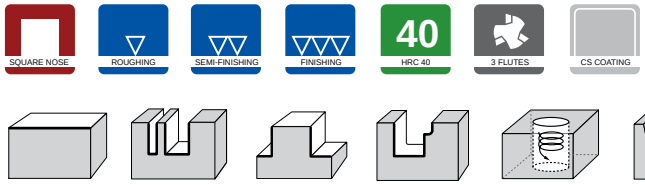
Advanced Engineering

A




B




| | |
|---|---|
| Helix Angle | 43° |
| D (Ø3-6) | 0/-0.015 |
| D (Ø8-12) | 0/-0.02 |
| d | h5 |

## EPP3-CS - METRIC

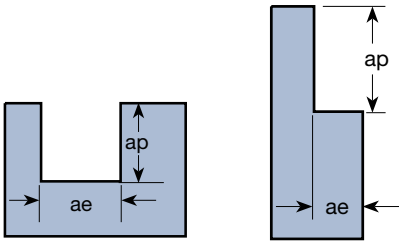
| Part No. | Stock | Flutes | Size (mm) ØD | l | L | Ød | Type |
|---|---|---|---|---|---|---|---|
| **EPP3030-CS** | ☐ | 3 | **3** | 8 | 60 | 6 | **A** |
| **EPP3040-CS** | ☐ | 3 | **4** | 11 | 60 | 6 | **A** |
| **EPP3050-CS** | ☐ | 3 | **5** | 13 | 60 | 6 | **A** |
| **EPP3060-CS** | ☐ | 3 | **6** | 13 | 60 | 6 | **B** |
| **EPP3080-CS** | ☐ | 3 | **8** | 19 | 75 | 8 | **B** |
| **EPP3100-CS** | ☐ | 3 | **10** | 22 | 80 | 10 | **B** |
| **EPP3120-CS** | ☐ | 3 | **12** | 26 | 100 | 12 | **B** |

☐ = Stocked items in Japan

# EPP Series

**EPP3-CS**
**Cutting Conditions**
**(Metric)**

Advanced Engineering

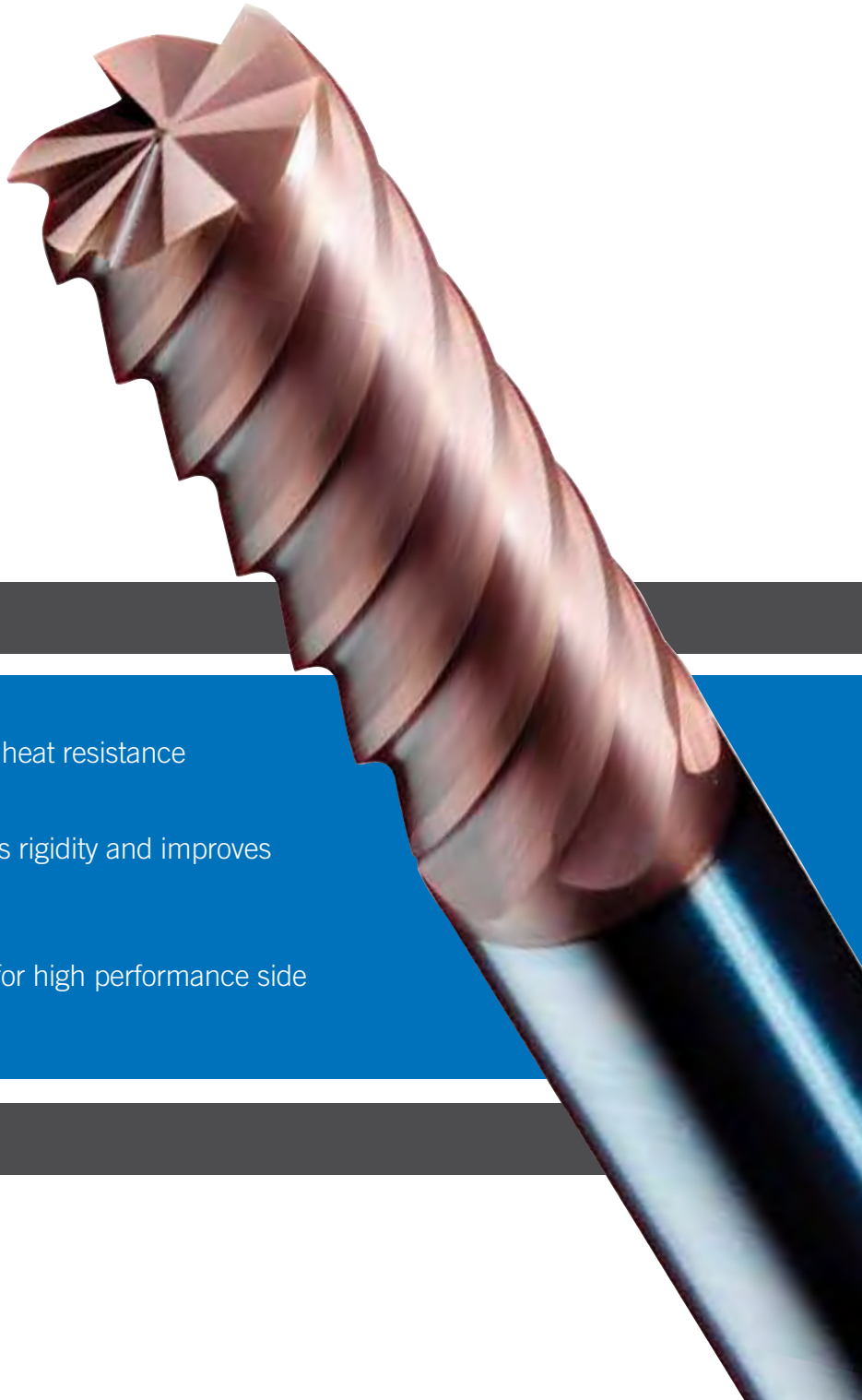



| Work Material (Hardness) | Cutting Range | Slotting Dia. (mm) | Side Milling Dia. (mm) | Cutting Conditions | Tool Dia. Ø3 | Ø4 | Ø5 | Ø6 | Ø8 | Ø10 | Ø12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium Alloy Wrought A7075, A5052 | High Speed | ap≤0.5D | ap=1.5D | N (RPM) | 37,000 | 28,000 | 22,000 | 19,000 | 14,000 | 11,000 | 9,300 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 2,800 | 2,900 | 3,200 | 3,500 | 3,600 | 3,300 | 3,100 |
| | General | ap≤1D | ap=1.5D | N (RPM) | 21,000 | 16,000 | 13,000 | 11,000 | 8,000 | 6,400 | 5,300 |
| | | ae=1D | ae=0.2D | Vf (mm/min) | 1,600 | 1,700 | 1,900 | 2,000 | 2,000 | 1,900 | 1,700 |
| Cast Iron (150-200HB) | High Speed | ap≤0.5D | ap=1.5D | N (RPM) | 6,400 | 4,800 | 3,800 | 3,200 | 2,400 | 1,900 | 1,600 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 480 | 500 | 550 | 600 | 610 | 570 | 530 |
| | General | ap≤1D | ap=1.5D | N (RPM) | 4,200 | 3,200 | 2,500 | 2,100 | 1,600 | 1,300 | 1,100 |
| | | ae=1D | ae=0.2D | Vf (mm/min) | 320 | 340 | 360 | 390 | 410 | 390 | 360 |
| Carbon Steel (180-220HB) | High Speed | ap≤0.5D | ap=1.5D | N (RPM) | 9,600 | 7,200 | 5,700 | 4,800 | 3,600 | 2,900 | 2,400 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 860 | 860 | 940 | 1,010 | 1,030 | 1,000 | 900 |
| | General | ap≤1D | ap=1.5D | N (RPM) | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | | ae=1D | ae=0.2D | Vf (mm/min) | 560 | 590 | 650 | 690 | 710 | 660 | 630 |
| Alloy Steel (200-250HB) | High Speed | ap≤0.5D | ap=1.5D | N (RPM) | 7,400 | 5,600 | 4,500 | 3,700 | 2,800 | 2,200 | 1,900 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 670 | 670 | 740 | 780 | 800 | 760 | 710 |
| | General | ap≤1D | ap=1.5D | N (RPM) | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | ae=1D | ae=0.15D | Vf (mm/min) | 400 | 420 | 460 | 500 | 510 | 480 | 430 |
| Pre-hardened Steel (25-40HRC) | General | ap≤0.5D | ap=1.5D | N (RPM) | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 360 | 360 | 400 | 430 | 430 | 410 | 370 |
| Stainless Steel | General | ap≤0.5D | ap=1.5D | N (RPM) | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 290 | 290 | 320 | 340 | 340 | 330 | 290 |
| Titanium Alloys Ti-6Al-4V | General | ap≤0.2D | ap=1.5D | N (RPM) | 5,300 | 4,000 | 3,200 | 2,700 | 2,000 | 1,600 | 1,300 |
| | | ae=1D | ae=0.1D | Vf (mm/min) | 360 | 360 | 400 | 430 | 430 | 410 | 370 |
| High Heat Resistant Alloys Inconel, Hasteloy | General | ap≤0.2D | ap=1.5D | N (RPM) | 2,100 | 1,600 | 1,300 | 1,100 | 800 | 640 | 530 |
| | | ae=1D | ae=0.05D | Vf (mm/min) | 90 | 100 | 110 | 120 | 110 | 110 | 100 |

- For slotting, please refer to the chart above regarding the depth of cut for slotting.
- For side milling, please increase RPM to 1~1.3 times and Feed Rate to 1~1.5 times of the figures in the chart above.
- The RPM generally used for slotting is used for spot facing, just lower the feed rate by about 20%.

# CEPR

## High Precision Multi-Flute End Mills for Maximum Efficiency and Tool Life



## FEATURES

TH Coating has excellent hardness and heat resistance properties

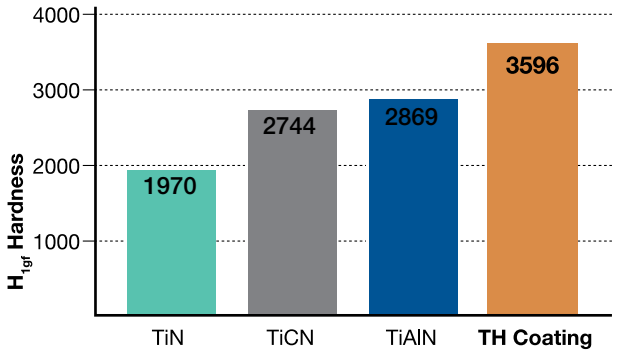
Newly designed flute geometry increases rigidity and improves chip
evacuation

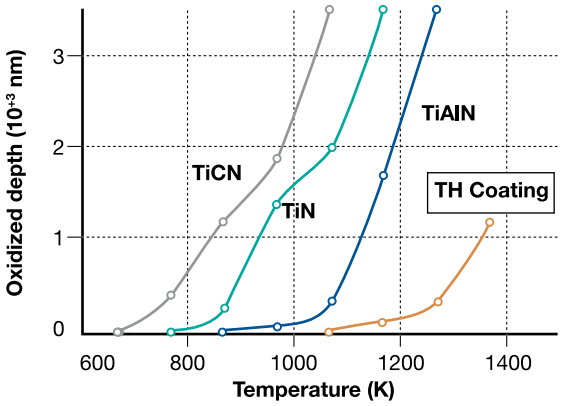
CEPR-TH Multi-Flute Square End Mills for high performance side milling & finishing

## FEATURES

### 1. TH Coating's Hardness and Oxidation Resistance

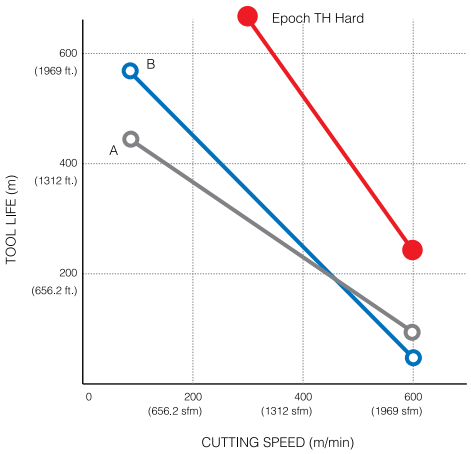
As the charts demonstrate, the revolutionary TH Coating has excellent hardness and oxidation resistance compared to conventional coatings. These properties allow the Epoch Series End Mills to offer greater performance in hard steels and show a vast improvement in cutting tool life.



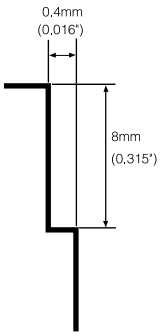




### 2. Cutting Performance: CEPR

The data below shows that the CEPR achieved double the tool life of competitors' cutting tools in the dry machining of die steel.

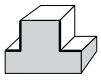



| | |
|---|---|
| **Cutting Tool** | Ø8mm (0.315") 6 Flute CEPR6080-TH |
| **Working Material** | H13 (52HRC) |
| **Cutting Speed** | Vc= 300 – 500m/min (984-1640 sfm) |
| **Feed** | fz= 0.07mm/tooth (0.0028 in/tooth) |
| **Depth of Cut** | doc 8mm x woc 0.4mm (0.315" x 0.0158") |
| **Cutting Method** | Straight down cut, air blow |



# CEPR

**CEPR**
**Square Multi-Flute Style**

| | |
|---|---|
| D (Ø1-6) | 0/-0.015 |
| D (Ø8-12) | 0/-0.02 |

**CEPR**

| Part No. | Stock | Flutes | Size (mm) ØD | l | L | Ød |
|---|---|---|---|---|---|---|
| CEPR4010-TH | ● | 4 | 1 | 3.5 | 60 | 6 |
| CEPR4015-TH | □ | 4 | 1.5 | 5 | 60 | 6 |
| CEPR4020-TH | ● | 4 | 2 | 7 | 60 | 6 |
| CEPR4025-TH | □ | 4 | 2.5 | 8 | 60 | 6 |
| CEPR4030-TH | ● | 4 | 3 | 10 | 60 | 6 |
| CEPR4035-TH | □ | 4 | 3.5 | 12 | 60 | 6 |
| CEPR4040-TH | ● | 4 | 4 | 12 | 60 | 6 |
| CEPR4045-TH | □ | 4 | 4.5 | 15 | 60 | 6 |
| CEPR4050-TH | ● | 4 | 5 | 15 | 60 | 6 |
| CEPR4055-TH | □ | 4 | 5.5 | 15 | 60 | 6 |
| CEPR6060-TH | ● | 6 | 6 | 15 | 60 | 6 |
| CEPR6065-TH | □ | 6 | 6.5 | 20 | 75 | 8 |
| CEPR6070-TH | □ | 6 | 7 | 20 | 75 | 8 |
| CEPR6075-TH | □ | 6 | 7.5 | 20 | 75 | 8 |
| CEPR6080-TH | ● | 6 | 8 | 20 | 75 | 8 |
| CEPR6085-TH | □ | 6 | 8.5 | 25 | 80 | 10 |
| CEPR6090-TH | □ | 6 | 9 | 25 | 80 | 10 |
| CEPR6095-TH | □ | 6 | 9.5 | 25 | 80 | 10 |
| CEPR6100-TH | ● | 6 | 10 | 25 | 80 | 10 |
| CEPR6105-TH | □ | 6 | 10.5 | 30 | 100 | 12 |
| CEPR6110-TH | □ | 6 | 11 | 30 | 100 | 12 |
| CEPR6115-TH | □ | 6 | 11.5 | 30 | 100 | 12 |
| CEPR6120-TH | ● | 6 | 12 | 30 | 100 | 12 |

**CEPR-CR**

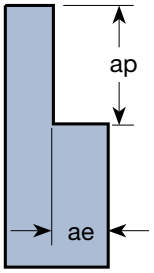
| Part No. | Stock | Flutes | Size (mm) Corner Radius | ØD | l | L | Ød |
|---|---|---|---|---|---|---|---|
| CEPR6060-03-TH | □ | 6 | 0.3 | 6 | 15 | 60 | 6 |
| CEPR6060-05-TH | □ | 6 | 0.5 | 6 | 15 | 60 | 6 |
| CEPR6060-10-TH | □ | 6 | 1.0 | 6 | 15 | 60 | 6 |
| CEPR6080-03-TH | □ | 6 | 0.3 | 8 | 20 | 75 | 8 |
| CEPR6080-05-TH | □ | 6 | 0.5 | 8 | 20 | 75 | 8 |
| CEPR6080-10-TH | □ | 6 | 1.0 | 8 | 20 | 75 | 8 |
| CEPR6100-05-TH | □ | 6 | 0.5 | 10 | 25 | 80 | 10 |
| CEPR6100-10-TH | □ | 6 | 1.0 | 10 | 25 | 80 | 10 |
| CEPR6100-15-TH | □ | 6 | 1.5 | 10 | 25 | 80 | 10 |
| CEPR6100-20-TH | □ | 6 | 2.0 | 10 | 25 | 80 | 10 |
| CEPR6120-05-TH | □ | 6 | 0.5 | 12 | 30 | 100 | 12 |
| CEPR6120-10-TH | □ | 6 | 1.0 | 12 | 30 | 100 | 12 |
| CEPR6120-15-TH | □ | 6 | 1.5 | 12 | 30 | 100 | 12 |
| CEPR6120-20-TH | □ | 6 | 2.0 | 12 | 30 | 100 | 12 |

□ = Stocked items in Japan

# CEPR

**CEPR**
**Cutting Conditions**
**Side Milling**
**(Metric)**

Advanced Engineering




| Work Material (Hardness) | Cutting Range | Depth of cut | Cutting Cond. | Tool Dia. (mm) 1 | 2 | 3 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tool Steel (25-35HRC) | High Speed | ap=1.5 ae=0.1D | Vc (m/min) | 250 | 250 | 250 | 280 | 280 | 280 | 280 | 280 |
| | | | N (RPM) | 79600 | 39800 | 26500 | 22300 | 14900 | 11100 | 8900 | 7400 |
| | | | fz (mm/t) | 0.008 | 0.018 | 0.029 | 0.042 | 0.060 | 0.080 | 0.100 | 0.110 |
| | | | Vf (mm/min) | 2550 | 2870 | 3070 | 3750 | 5360 | 5330 | 5340 | 4880 |
| | General | ap=1.5 ae=0.1D | Vc (m/min) | 60 | 120 | 120 | 140 | 140 | 140 | 140 | 140 |
| | | | N (RPM) | 19100 | 19100 | 12700 | 11100 | 7400 | 5600 | 4500 | 3700 |
| | | | fz (mm/t) | 0.008 | 0.018 | 0.029 | 0.042 | 0.065 | 0.085 | 0.100 | 0.110 |
| | | | Vf (mm/min) | 610 | 1380 | 1470 | 1860 | 2890 | 2860 | 2700 | 2440 |
| Pre-hardened steel (35-45HRC) | High Speed | ap=1.5 ae=0.05D | Vc (m/min) | 250 | 250 | 250 | 260 | 260 | 260 | 260 | 260 |
| | | | N (RPM) | 79600 | 39800 | 26500 | 20700 | 13800 | 10300 | 8300 | 6900 |
| | | | fz (mm/t) | 0.008 | 0.016 | 0.026 | 0.038 | 0.055 | 0.075 | 0.090 | 0.100 |
| | | | Vf (mm/min) | 2550 | 2550 | 2760 | 3150 | 4550 | 4640 | 4480 | 4140 |
| | General | ap=1.5D ae=0.1D | Vc (m/min) | 60 | 100 | 100 | 120 | 120 | 120 | 120 | 120 |
| | | | N (RPM) | 19100 | 15900 | 10600 | 9500 | 6400 | 4800 | 3800 | 3200 |
| | | | fz (mm/t) | 0.005 | 0.011 | 0.018 | 0.026 | 0.040 | 0.055 | 0.065 | 0.070 |
| | | | Vf (mm/min) | 380 | 700 | 760 | 990 | 1540 | 1580 | 1480 | 1340 |
| Hardened steel (45-55HRC) | High Speed | ap=1.5 ae=0.03D | Vc (m/min) | 200 | 200 | 200 | 230 | 230 | 230 | 230 | 230 |
| | | | N (RPM) | 63700 | 31800 | 21200 | 18300 | 12200 | 9200 | 7300 | 6100 |
| | | | fz (mm/t) | 0.007 | 0.014 | 0.023 | 0.033 | 0.050 | 0.065 | 0.080 | 0.090 |
| | | | Vf (mm/min) | 1780 | 1780 | 1950 | 2420 | 3660 | 3590 | 3500 | 3290 |
| | General | ap=1.5 ae=0.06D | Vc (m/min) | 60 | 80 | 80 | 100 | 100 | 100 | 100 | 100 |
| | | | N (RPM) | 19100 | 12700 | 8500 | 8000 | 5300 | 4000 | 3200 | 2700 |
| | | | fz (mm/t) | 0.005 | 0.010 | 0.016 | 0.023 | 0.035 | 0.045 | 0.055 | 0.060 |
| | | | Vf (mm/min) | 380 | 510 | 540 | 740 | 1110 | 1080 | 1060 | 970 |
| Hardened steel (55-65HRC) | High Speed | ap=1.5D ae=0.02D | Vc (m/min) | 150 | 150 | 150 | 180 | 180 | 180 | 180 | 180 |
| | | | N (RPM) | 47700 | 23900 | 15900 | 14300 | 9500 | 7200 | 5700 | 4800 |
| | | | fz (mm/t) | 0.006 | 0.013 | 0.021 | 0.030 | 0.045 | 0.060 | 0.070 | 0.080 |
| | | | Vf (mm/min) | 1140 | 1240 | 1340 | 1720 | 2570 | 2590 | 2390 | 2300 |
| | General | ap=1.5D ae=0.04D | Vc (m/min) | 60 | 60 | 60 | 80 | 80 | 80 | 80 | 80 |
| | | | N (RPM) | 19100 | 9500 | 6400 | 6400 | 4200 | 3200 | 2500 | 2100 |
| | | | fz (mm/t) | 0.004 | 0.009 | 0.015 | 0.021 | 0.030 | 0.040 | 0.050 | 0.055 |
| | | | Vf (mm/min) | 310 | 340 | 380 | 540 | 760 | 770 | 750 | 690 |
| Hardened steel (65-70HRC) | High Speed | ap=1.5D ae=0.02D | Vc (m/min) | 100 | 100 | 100 | 130 | 130 | 130 | 130 | 130 |
| | | | N (RPM) | 31800 | 15900 | 10600 | 10300 | 6900 | 5200 | 4100 | 3400 |
| | | | fz (mm/t) | 0.005 | 0.012 | 0.019 | 0.027 | 0.040 | 0.055 | 0.065 | 0.070 |
| | | | Vf (mm/min) | 640 | 760 | 810 | 1110 | 1660 | 1720 | 1600 | 1430 |
| | General | ap=1.5D ae=0.04D | Vc (m/min) | 40 | 40 | 40 | 60 | 60 | 60 | 60 | 60 |
| | | | N (RPM) | 12700 | 6400 | 4200 | 4800 | 3200 | 2400 | 1900 | 1600 |
| | | | fz (mm/t) | 0.004 | 0.008 | 0.013 | 0.019 | 0.030 | 0.040 | 0.045 | 0.050 |
| | | | Vf (mm/min) | 200 | 200 | 220 | 360 | 580 | 580 | 510 | 480 |

# EPSM / EPSW

## PN Coated End Mills for Machining of Stainless Steels

## FEATURES

Innovative cutting edge design increases tool life

New PN coating exhibits excellent adhesion and wear resistance

EPSM: For both roughing and finishing applications in high-rigidity set-ups

EPSW: Features wave form peripheral edges for stable machining even in low-rigidity set-ups

# EPSM / EPSW

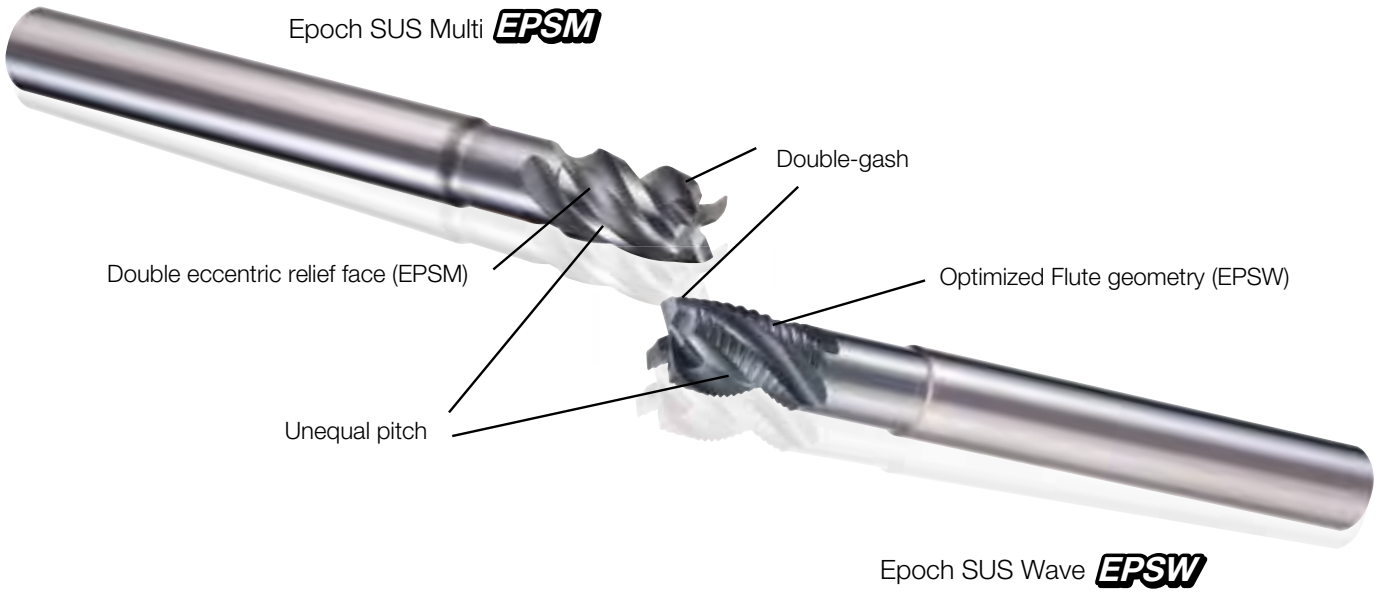
Advanced Engineering

## INTRODUCTION

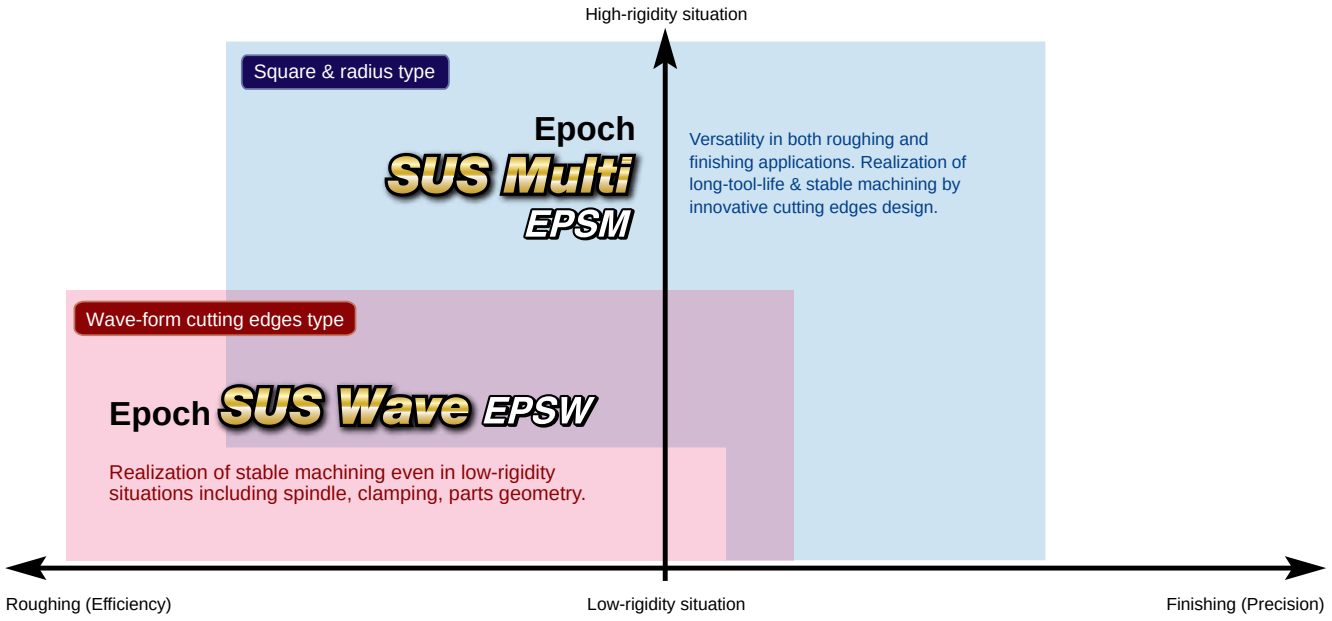
In the EPSM and EPSW End Mills, advanced cutting geometries combine with Hitachi Tool's superior coating technology to deliver enhanced performance in the machining of stainless steels. The unequal pitch geometry dramatically suppresses vibration, while the double gash provides smooth chip evacuation. Our new PN Coating exhibits excellent adhesion and wear resistance, delivering excellent tool life in stainless steels.

## FEATURES

| 1. | Unique Design for Maximum Performance in Stainless Steels |
|---|---|




| 2. | Overview of Epoch SUS Series |
|---|---|

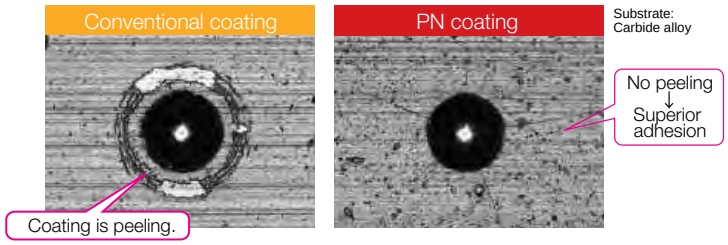


## 3. PN Coating Improves Wear Resistance and Tool Life in Stainless Steels

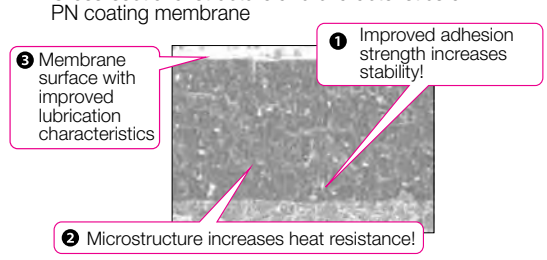
- A heat resistant coating material with excellent adhesion to the tool substrate was achieved by optimizing the Al content.
- Exhibits high hardness (3000HV) with good wear resistance due to doping of hte AlCr coating layer with Si (TiAlN: 2800HV)
- Exhibits excellent cutting life for cutting materials 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, H13, D2 and more.

Note: This product obtains less electric conductivity. Therefore, please caution of using electric transmitted measuring systems.

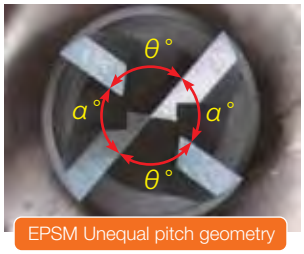
Adhesion of PN coating

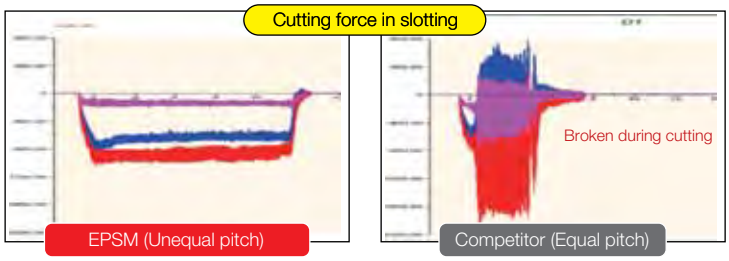


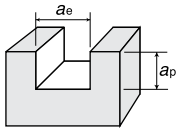

Cross-sectional structure and characteristics of PN coating membrane



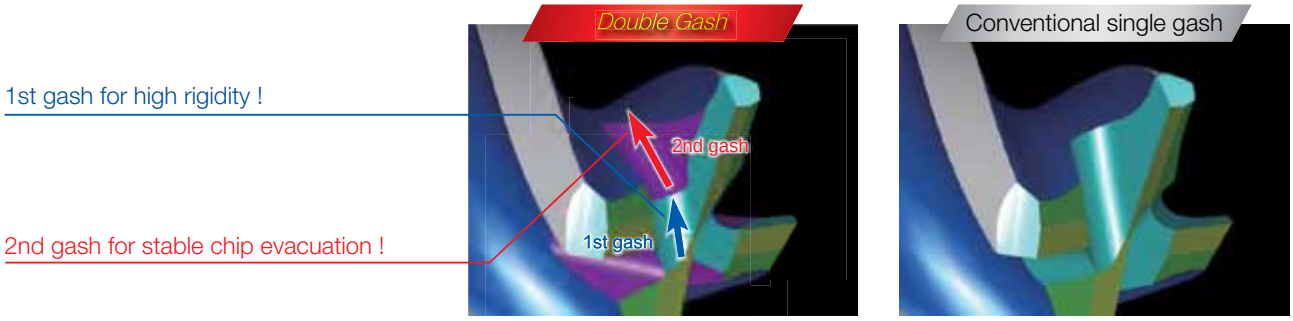

## 4. Unequal Pitch Geometry Dramatically Suppresses Vibration



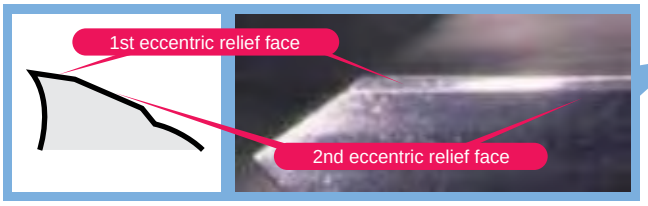




## 5. Double Gash Provides Smooth Chip Evacuation



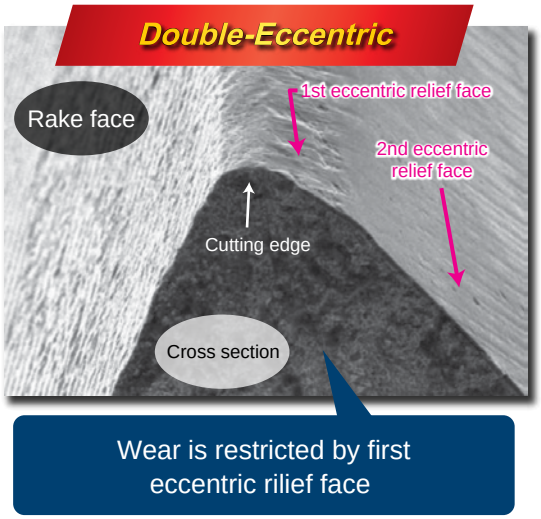

"Double Gash" achieves perfect balance with rigitity and chip evacuation! It guarantees high performance in vertical and horizontal milling!

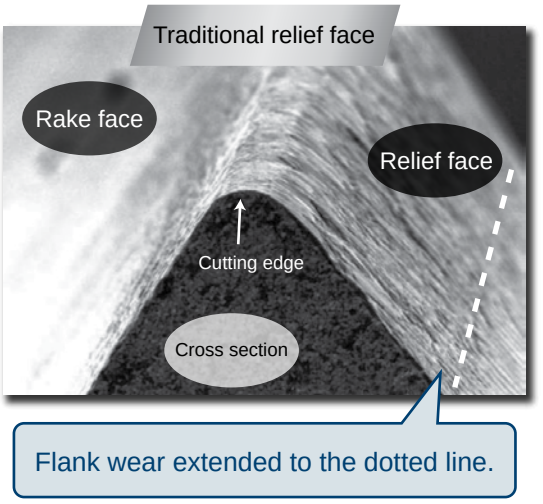
## 6. Double-Eccentric Relief Face



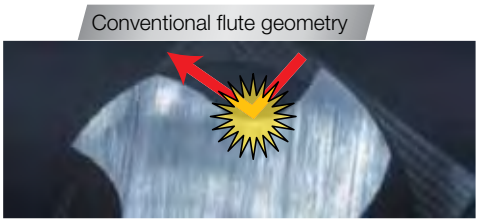

Double-eccentric relief face realize a stable and small wear when guaranteeing higher cutting edge rigidity,

Wear status after SUS side milling




## 7. EPSW Features Improved Wave From Design

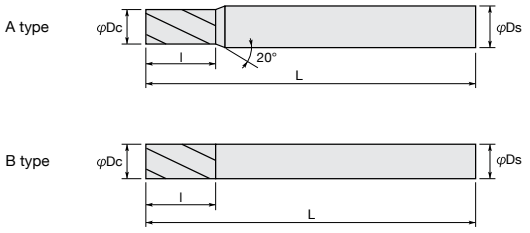

EPSW optimized flute geometry dramatically improves chip-disposal of wave-form cutter

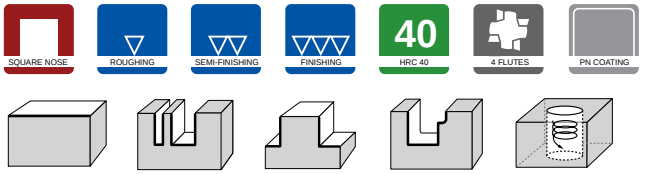
## 8. Available for Versatile machining

| Side Milling | Slotting | Bore-expanding | Blind Slotting (Plunging→Slotting) | Pocketting (Ramping→Side milling) | Pocketting (Plunging→Side milling) |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

# EPSM

## EPSM4-PN




| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc (Ø1-6) | 0/-0.015 |
| Ds (16-20) | h6 | Dc (Ø7-20) | 0/-0.02 |
| Helix Angle | 40° | | |

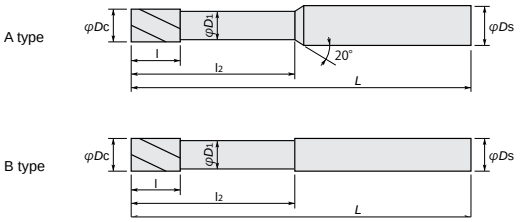
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ | Type |
|---|---|---|---|---|---|---|
| **EPSM4010-PN** | ● | 1.00 | **2.5** | 56 | 6 | A |
| **EPSM4020-PN** | ● | 2.00 | **5.0** | 56 | 6 | A |
| **EPSM4030-PN** | ● | 3.00 | **7.5** | 56 | 6 | A |
| **EPSM4040-PN** | ● | 4.00 | **10.0** | 56 | 6 | A |
| **EPSM4050-PN** | □ | 5.00 | **12.5** | 56 | 6 | A |
| **EPSM4060-PN** | ● | 6.00 | **15.0** | 56 | 6 | B |
| **EPSM4070-PN** | □ | 7.00 | **17.5** | 63 | 8 | A |
| **EPSM4080-PN** | ● | 8.00 | **20.0** | 63 | 8 | B |
| **EPSM4090-PN** | □ | 9.00 | **22.5** | 74 | 10 | A |
| **EPSM4100-PN** | ● | 10.00 | **25.0** | 74 | 10 | B |
| **EPSM4110-PN** | □ | 11.00 | **27.5** | 86 | 12 | A |
| **EPSM4120-PN** | ● | 12.00 | **30.0** | 86 | 12 | B |
| **EPSM4160-PN** | □ | 16.00 | **40.0** | 110 | 16 | B |
| **EPSM4200-PN** | □ | 20.00 | **50.0** | 125 | 20 | B |

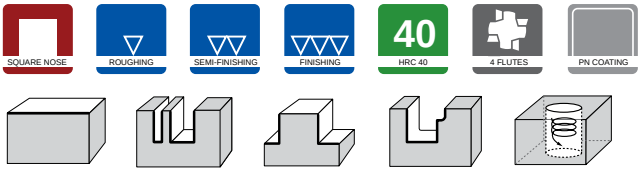
□ = Stocked items in Japan

# EPSM

## EPSM4-PN
## 3Dc & 5Dc Neck

Advanced Engineering




| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc (Ø1-6) | 0/-0.015 |
| Ds (16-20) | h6 | Dc (Ø7-20) | 0/-0.02 |
| Helix Angle | 40° | | |

### 3Dc Neck

| Part No. | Stock | Size (mm) $D_c$ | l | $l_2$ | $D_1$ | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|---|
| EPSM4010-3-PN | ☐ | 1.0 | 1.5 | 3.0 | 0.96 | 56 | 6 | A |
| EPSM4020-6-PN | ☐ | 2.0 | 3.0 | 6.0 | 1.92 | 56 | 6 | A |
| EPSM4030-9-PN | ☐ | 3.0 | 4.5 | 9.0 | 2.88 | 56 | 6 | A |
| EPSM4040-12-PN | ☐ | 4.0 | 6.0 | 12.0 | 3.70 | 56 | 6 | A |
| EPSM4050-15-PN | ☐ | 5.0 | 7.5 | 15.0 | 4.60 | 56 | 6 | A |
| EPSM4060-18-PN | ☐ | 6.0 | 9.0 | 18.0 | 5.50 | 56 | 6 | B |
| EPSM4070-21-PN | ☐ | 7.0 | 10.5 | 21.0 | 6.40 | 63 | 8 | A |
| EPSM4080-24-PN | ☐ | 8.0 | 12.0 | 24.0 | 7.30 | 63 | 8 | B |
| EPSM4090-27-PN | ☐ | 9.0 | 13.5 | 27.0 | 8.30 | 74 | 10 | A |
| EPSM4100-30-PN | ☐ | 10.0 | 15.0 | 30.0 | 9.10 | 74 | 10 | B |
| EPSM4110-33-PN | ☐ | 11.0 | 16.5 | 33.0 | 10.20 | 86 | 12 | A |
| EPSM4120-36-PN | ☐ | 12.0 | 18.0 | 36.0 | 11.00 | 86 | 12 | B |
| EPSM4160-48-PN | ☐ | 16.0 | 24.0 | 48.0 | 14.50 | 110 | 16 | B |
| EPSM4200-60-PN | ☐ | 20.0 | 30.0 | 60.0 | 18.20 | 125 | 20 | B |

### 5Dc Neck

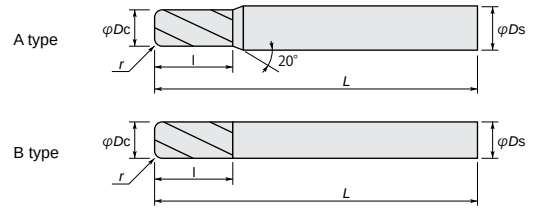
| Part No. | Stock | Size (mm) $D_c$ | l | $l_2$ | $D_1$ | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|---|
| EPSM4010-5-PN | ☐ | 1.0 | 1.5 | 5.0 | 0.96 | 68 | 6 | A |
| EPSM4020-10-PN | ☐ | 2.0 | 3.0 | 10.0 | 1.92 | 68 | 6 | A |
| EPSM4030-15-PN | ☐ | 3.0 | 4.5 | 15.0 | 2.88 | 68 | 6 | A |
| EPSM4040-20-PN | ☐ | 4.0 | 6.0 | 20.0 | 3.70 | 68 | 6 | A |
| EPSM4050-25-PN | ☐ | 5.0 | 7.5 | 25.0 | 4.60 | 68 | 6 | A |
| EPSM4060-30-PN | ☐ | 6.0 | 9.0 | 30.0 | 5.50 | 68 | 6 | B |
| EPSM4070-35-PN | ☐ | 7.0 | 10.5 | 35.0 | 6.40 | 80 | 8 | A |
| EPSM4080-40-PN | ☐ | 8.0 | 12.0 | 40.0 | 7.30 | 80 | 8 | B |
| EPSM4090-45-PN | ☐ | 9.0 | 13.5 | 45.0 | 8.30 | 94 | 10 | A |
| EPSM4100-50-PN | ☐ | 10.0 | 15.0 | 50.0 | 9.10 | 94 | 10 | B |
| EPSM4110-55-PN | ☐ | 11.0 | 16.5 | 55.0 | 10.20 | 110 | 12 | A |
| EPSM4120-60-PN | ☐ | 12.0 | 18.0 | 60.0 | 11.00 | 110 | 12 | B |
| EPSM4160-80-PN | ☐ | 16.0 | 24.0 | 80.0 | 14.50 | 135 | 16 | B |
| EPSM4200-100-PN | ☐ | 20.0 | 30.0 | 100.0 | 18.20 | 155 | 20 | B |

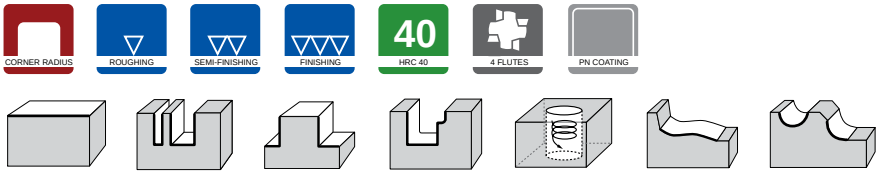
☐ = Stocked items in Japan

# EPSM

## EPSM4-R-PN

Advanced Engineering




| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc (Ø1-6) | 0/-0.015 |
| Ds (16-20) | h6 | Dc (Ø7-20) | 0/-0.02 |
| Helix Angle | 40° | | |

| Part No. | Stock | Size (mm) $D_c$ | r | l | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|
| EPSM4010-R0.1-PN | ● | 1 | 0.1 | 2.5 | 56 | 6 | A |
| EPSM4020-R0.1-PN | ● | 2 | 0.1 | 5.0 | 56 | 6 | A |
| EPSM4020-R0.2-PN | ● | | 0.2 | | | | |
| EPSM4030-R0.2-PN | ● | 3 | 0.2 | 7.5 | 56 | 6 | A |
| EPSM4030-R0.5-PN | ● | | 0.5 | | | | |
| EPSM4040-R0.2-PN | ● | 4 | 0.2 | 10.0 | 56 | 6 | A |
| EPSM4040-R0.5-PN | ● | | 0.5 | | | | |
| EPSM4040-R1.0-PN | ● | | 1.0 | | | | |
| EPSM4050-R0.2-PN | □ | 5 | 0.2 | 12.5 | 56 | 6 | A |
| EPSM4050-R0.5-PN | □ | | 0.5 | | | | |
| EPSM4050-R1.0-PN | □ | | 1.0 | | | | |
| EPSM4060-R0.3-PN | ● | 6 | 0.3 | 15.0 | 56 | 6 | B |
| EPSM4060-R0.5-PN | ● | | 0.5 | | | | |
| EPSM4060-R1.0-PN | ● | | 1.0 | | | | |
| EPSM4060-R1.5-PN | ● | | 1.5 | | | | |
| EPSM4070-R0.3-PN | □ | 7 | 0.3 | 17.5 | 63 | 8 | A |
| EPSM4070-R0.5-PN | □ | | 0.5 | | | | |
| EPSM4070-R1.0-PN | □ | | 1.0 | | | | |
| EPSM4080-R0.3-PN | ● | 8 | 0.3 | 20.0 | 63 | 8 | B |
| EPSM4080-R0.5-PN | ● | | 0.5 | | | | |
| EPSM4080-R1.0-PN | ● | | 1.0 | | | | |
| EPSM4080-R1.5-PN | ● | | 1.5 | | | | |
| EPSM4080-R2.0-PN | ● | | 2.0 | | | | |
| EPSM4090-R0.3-PN | □ | 9 | 0.3 | 22.5 | 74 | 10 | A |
| EPSM4090-R0.5-PN | □ | | 0.5 | | | | |
| EPSM4090-R1.0-PN | □ | | 1.0 | | | | |

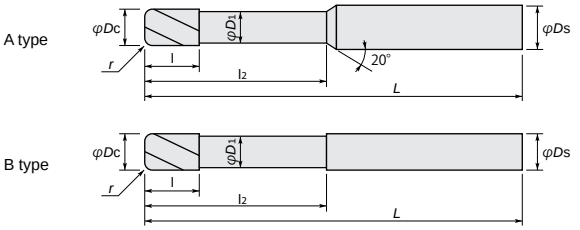
| Part No. | Stock | Size (mm) $D_c$ | r | l | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|
| EPSM4100-R0.3-PN | ● | 10 | 0.3 | 25.0 | 74 | 10 | B |
| EPSM4100-R0.5-PN | ● | | 0.5 | | | | |
| EPSM4100-R1.0-PN | ● | | 1.0 | | | | |
| EPSM4100-R1.5-PN | ● | | 1.5 | | | | |
| EPSM4100-R2.0-PN | ● | | 2.0 | | | | |
| EPSM4110-R0.3-PN | □ | 11 | 0.3 | 27.5 | 86 | 12 | A |
| EPSM4110-R0.5-PN | □ | | 0.5 | | | | |
| EPSM4110-R1.0-PN | □ | | 1.0 | | | | |
| EPSM4120-R0.3-PN | ● | 12 | 0.3 | 30.0 | 86 | 12 | B |
| EPSM4120-R0.5-PN | ● | | 0.5 | | | | |
| EPSM4120-R1.0-PN | ● | | 1.0 | | | | |
| EPSM4120-R1.5-PN | ● | | 1.5 | | | | |
| EPSM4120-R2.0-PN | ● | | 2.0 | | | | |
| EPSM4120-R2.5-PN | □ | | 2.5 | | | | |
| EPSM4120-R3.0-PN | □ | | 3.0 | | | | |
| EPSM4160-R0.5-PN | □ | 16 | 0.5 | 40.0 | 110 | 16 | B |
| EPSM4160-R1.0-PN | □ | | 1.0 | | | | |
| EPSM4160-R1.5-PN | □ | | 1.5 | | | | |
| EPSM4160-R2.0-PN | □ | | 2.0 | | | | |
| EPSM4160-R3.0-PN | □ | | 3.0 | | | | |
| EPSM4200-R0.5-PN | □ | 20 | 0.5 | 50.0 | 125 | 20 | B |
| EPSM4200-R1.0-PN | □ | | 1.0 | | | | |
| EPSM4200-R1.5-PN | □ | | 1.5 | | | | |
| EPSM4200-R2.0-PN | □ | | 2.0 | | | | |
| EPSM4200-R3.0-PN | □ | | 3.0 | | | | |
| EPSM4200-R5.0-PN | □ | | 5.0 | | | | |

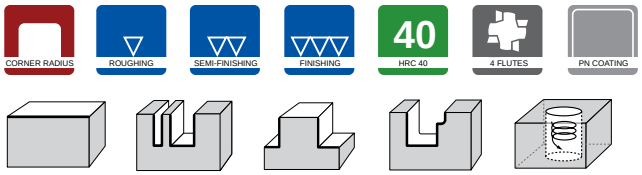
□ = Stocked items in Japan

# EPSM

## EPSM4-R-PN
## 5Dc Neck

Advanced Engineering




| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc (Ø1-6) | 0/-0.015 |
| Ds (16-20) | h6 | Dc (Ø7-20) | 0/-0.02 |
| Helix Angle | 40° | | |

| Part No. | Stock | Size (mm) $D_c$ | r | l | $l_2$ | $D_1$ | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|---|---|
| **EPSM4010-5-R0.1-PN** | ☐ | 1 | 0.1 | 1.5 | 5 | 0.96 | 68 | 6 | A |
| **EPSM4020-10-R0.1-PN** | ☐ | 2 | 0.1 | 3.0 | 10 | 1.92 | 68 | 6 | A |
| **EPSM4020-10-R0.2-PN** | ☐ | | 0.2 | | | | | | |
| **EPSM4030-15-R0.2-PN** | ☐ | 3 | 0.2 | 4.5 | 15 | 2.88 | 68 | 6 | A |
| **EPSM4030-15-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4040-20-R0.2-PN** | ☐ | 4 | 0.2 | 6.0 | 20 | 3.70 | 68 | 6 | A |
| **EPSM4040-20-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4040-20-R1.0-PN** | ☐ | | 1.0 | | | | | | |
| **EPSM4050-25-R0.2-PN** | ☐ | 5 | 0.2 | 7.5 | 25 | 4.60 | 68 | 6 | A |
| **EPSM4050-25-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4050-25-R1.0-PN** | ☐ | | 1.0 | | | | | | |
| **EPSM4060-30-R0.3-PN** | ☐ | 6 | 0.3 | 9.0 | 30 | 5.50 | 68 | 6 | B |
| **EPSM4060-30-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4060-30-R1.0-PN** | ☐ | | 1.0 | | | | | | |
| **EPSM4060-30-R1.5-PN** | ☐ | | 1.5 | | | | | | |
| **EPSM4070-35-R0.3-PN** | ☐ | 7 | 0.3 | 10.5 | 35 | 6.40 | 80 | 8 | A |
| **EPSM4070-35-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4070-35-R1.0-PN** | ☐ | | 1.0 | | | | | | |
| **EPSM4080-40-R0.3-PN** | ☐ | 8 | 0.3 | 12.0 | 40 | 7.30 | 80 | 8 | B |
| **EPSM4080-40-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4080-40-R1.0-PN** | ☐ | | 1.0 | | | | | | |
| **EPSM4080-40-R1.5-PN** | ☐ | | 1.5 | | | | | | |
| **EPSM4080-40-R2.0-PN** | ☐ | | 2.0 | | | | | | |
| **EPSM4090-45-R0.3-PN** | ☐ | 9 | 0.3 | 13.5 | 45 | 8.30 | 94 | 10 | A |
| **EPSM4090-45-R0.5-PN** | ☐ | | 0.5 | | | | | | |
| **EPSM4090-45-R1.0-PN** | ☐ | | 1.0 | | | | | | |

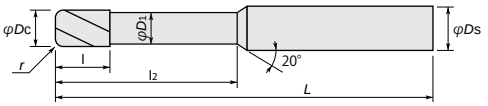
☐ = Stocked items in Japan

# EPSM

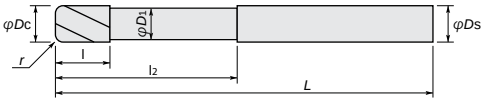
## EPSM4-R-PN
## 5Dc Neck

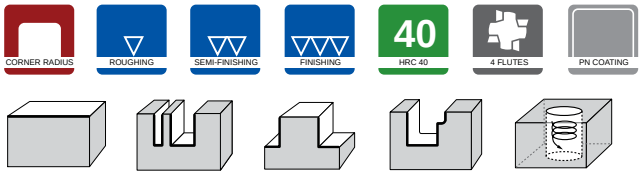
Advanced Engineering

A type




B type



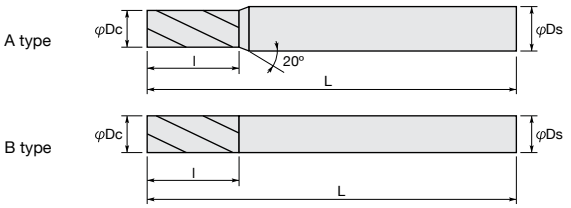

| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc (Ø1-6) | 0/-0.015 |
| Ds (16-20) | h6 | Dc (Ø7-20) | 0/-0.02 |
| Helix Angle | 40° | | |

| Part No. | Stock | Size (mm) $D_c$ | r | l | $l_2$ | $D_1$ | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|---|---|
| **EPSM4100-50-R0.3-PN** | □ | | 0.3 | | | | | | |
| **EPSM4100-50-R0.5-PN** | □ | | 0.5 | | | | | | |
| **EPSM4100-50-R1.0-PN** | □ | 10 | 1.0 | 15.0 | 50 | 9.10 | 94 | 10 | B |
| **EPSM4100-50-R1.5-PN** | □ | | 1.5 | | | | | | |
| **EPSM4100-50-R2.0-PN** | □ | | 2.0 | | | | | | |
| **EPSM4110-55-R0.3-PN** | □ | | 0.3 | | | | | | |
| **EPSM4110-55-R0.5-PN** | □ | 11 | 0.5 | 16.5 | 55 | 10.20 | 110 | 12 | A |
| **EPSM4110-55-R1.0-PN** | □ | | 1.0 | | | | | | |
| **EPSM4120-60-R0.3-PN** | □ | | 0.3 | | | | | | |
| **EPSM4120-60-R0.5-PN** | □ | | 0.5 | | | | | | |
| **EPSM4120-60-R1.0-PN** | □ | | 1.0 | | | | | | |
| **EPSM4120-60-R1.5-PN** | □ | 12 | 1.5 | 18.0 | 60 | 11.00 | 110 | 12 | B |
| **EPSM4120-60-R2.0-PN** | □ | | 2.0 | | | | | | |
| **EPSM4120-60-R2.5-PN** | □ | | 2.5 | | | | | | |
| **EPSM4120-60-R3.0-PN** | □ | | 3.0 | | | | | | |
| **EPSM4160-80-R0.5-PN** | □ | | 0.5 | | | | | | |
| **EPSM4160-80-R1.0-PN** | □ | | 1.0 | | | | | | |
| **EPSM4160-80-R1.5-PN** | □ | 16 | 1.5 | 24.0 | 80 | 14.50 | 135 | 16 | B |
| **EPSM4160-80-R2.0-PN** | □ | | 2.0 | | | | | | |
| **EPSM4160-80-R3.0-PN** | □ | | 3.0 | | | | | | |
| **EPSM4200-100-R0.5-PN** | □ | | 0.5 | | | | | | |
| **EPSM4200-100-R1.0-PN** | □ | | 1.0 | | | | | | |
| **EPSM4200-100-R1.5-PN** | □ | 20 | 1.5 | 30.0 | 100 | 18.20 | 155 | 20 | B |
| **EPSM4200-100-R2.0-PN** | □ | | 2.0 | | | | | | |
| **EPSM4200-100-R3.0-PN** | □ | | 3.0 | | | | | | |
| **EPSM4200-100-R5.0-PN** | □ | | 5.0 | | | | | | |

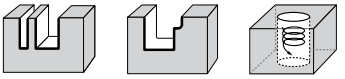
□ = Stocked items in Japan

# EPSW

## EPSW-PN
## Regular Length







| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc | 0/-0.05 |
| Ds (16-20) | h6 | | |
| Helix Angle | 30° | | |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ | Chamfer Width | Flutes | Type |
|---|---|---|---|---|---|---|---|---|
| **EPSW3040-PN** | ● | 4.0 | 10.0 | 56 | 6 | 0.3 | 3 | A |
| **EPSW3050-PN** | □ | 5.0 | 12.5 | 56 | 6 | 0.3 | 3 | A |
| **EPSW4060-PN** | ● | 6.0 | 15.0 | 56 | 6 | 0.4 | 4 | B |
| **EPSW4070-PN** | □ | 7.0 | 17.5 | 63 | 8 | 0.4 | 4 | A |
| **EPSW4080-PN** | ● | 8.0 | 20.0 | 63 | 8 | 0.5 | 4 | B |
| **EPSW4090-PN** | □ | 9.0 | 22.5 | 74 | 10 | 0.5 | 4 | A |
| **EPSW4100-PN** | ● | 10.0 | 25.0 | 74 | 10 | 0.5 | 4 | B |
| **EPSW4110-PN** | □ | 11.0 | 27.5 | 86 | 12 | 0.5 | 4 | A |
| **EPSW4120-PN** | ● | 12.0 | 30.0 | 86 | 12 | 0.5 | 4 | B |
| **EPSW4160-PN** | □ | 16.0 | 40.0 | 110 | 16 | 0.7 | 4 | B |
| **EPSW4200-PN** | □ | 20.0 | 50.0 | 125 | 20 | 0.7 | 4 | B |

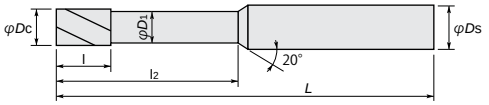
□ = Stocked items in Japan

# EPSW

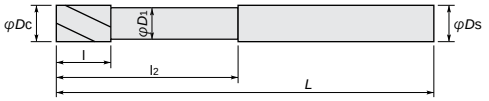
## EPSW4-PN
## 3Dc & 5Dc Neck

Advanced Engineering

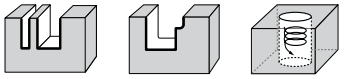
A type




B type







| | | | |
|---|---|---|---|
| Ds (6-12) | h5 | Dc | 0/-0.05 |
| Ds (16-20) | h6 | | |
| Helix Angle | 30° | | |

### 3Dc Neck

| Part No. | Stock | Size (mm) $D_c$ | l | $l_2$ | $D_1$ | L | $D_s$ | Chamfer Width | Flutes | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **EPSW3040-12-PN** | | 4 | 6.0 | 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 | 9.0 | 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 | 12.0 | 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 | 15.0 | 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 | 18.0 | 36 | 11.0 | 86 | 12 | 0.5 | 4 | B |
| **EPSW4160-48-PN** | | 16 | 24.0 | 48 | 14.5 | 110 | 16 | 0.7 | 4 | B |
| **EPSW4200-60-PN** | | 20 | 30.0 | 60 | 18.2 | 125 | 20 | 0.7 | 4 | B |

### 5Dc Neck

| Part No. | Stock | Size (mm) $D_c$ | l | $l_2$ | $D_1$ | L | $D_s$ | Chamfer Width | Flutes | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **EPSW3040-20-PN** | ☐ | 4 | 6.0 | 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 | 9.0 | 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 | 12.0 | 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 | 15.0 | 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 | 18.0 | 60 | 11.0 | 110 | 12 | 0.5 | 4 | B |
| **EPSW4160-80-PN** | ☐ | 16 | 24.0 | 80 | 14.5 | 135 | 16 | 0.7 | 4 | B |
| **EPSW4200-100-PN** | ☐ | 20 | 30.0 | 100 | 18.2 | 155 | 20 | 0.7 | 4 | B |

☐ = Stocked items in Japan

# EPSM / EPSW

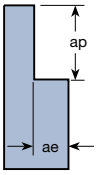
## Recommended Cutting Conditions
## Side Milling

Advanced Engineering

General Side milling condition

| EPSM | EPSM-CR | EPSM-3Dc | EPSW | EPSW-3Dc |
|---|---|---|---|---|
| Regular | Regular, Corner radius | Under neck 3Dc | Regular, Roughing | Under neck 3Dc, Roughing |

| Dc | Cast Iron • Carbon Steel • Alloy Steel (~30HRC) | | Pre-hardened Steel • Tool Steel (30~40HRC) | | Stainless Steel | | Titanium Alloy | | Super Heat-Resistant Steel | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $a_p$=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 $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min |
| **1.0** | 31,800 | 760 | 22,300 | 360 | 19,100 | 310 | 12,700 | 150 | 9,500 | 76 |
| **2.0** | 15,900 | 810 | 11,100 | 380 | 9,500 | 320 | 6,400 | 160 | 4,800 | 82 |
| **3.0** | 10,600 | 860 | 7,400 | 400 | 6,400 | 350 | 4,200 | 170 | 3,200 | 86 |
| **4.0** | 8,000 | 910• | 5,600 | 430• | 4,800 | 360• | 3,200 | 180• | 2,400 | 91• |
| **5.0** | 6,400 | 960• | 4,500 | 450• | 3,800 | 380• | 2,500 | 190• | 1,900 | 95• |
| **6.0** | 5,300 | 950 | 3,700 | 440 | 3,200 | 380 | 2,100 | 190 | 1,600 | 96 |
| **7.0** | 4,500 | 940 | 3,200 | 450 | 2,700 | 380 | 1,800 | 190 | 1,400 | 98 |
| **8.0** | 4,000 | 960 | 2,800 | 450 | 2,400 | 380 | 1,600 | 190 | 1,200 | 96 |
| **9.0** | 3,500 | 940 | 2,500 | 450 | 2,100 | 380 | 1,400 | 190 | 1,100 | 99 |
| **10.0** | 3,200 | 960 | 2,200 | 440 | 1,900 | 380 | 1,300 | 200 | 1,000 | 100 |
| **11.0** | 2,900 | 910 | 2,000 | 420 | 1,700 | 360 | 1,200 | 190 | 900 | 94 |
| **12.0** | 2,700 | 870 | 1,900 | 410 | 1,600 | 350 | 1,100 | 180 | 800 | 86 |
| **16.0** | 2,000 | 820 | 1,400 | 380 | 1,200 | 330 | 800 | 160 | 600 | 82 |
| **20.0** | 1,600 | 770 | 1,100 | 350 | 1,000 | 320 | 600 | 140 | 500 | 80 |




Side finishing condition

| EPSM | EPSM-CR | EPSM-3Dc | EPSM-5Dc •3 |
|---|---|---|---|
| Regular | Regular, Corner radius | Under neck 3Dc | Under neck 5Dc |

| Dc | Cast Iron • Carbon Steel • Alloy Steel (~30HRC) | | Pre-hardened Steel • Tool Steel (30~40HRC) | | Stainless Steel | | Titanium Alloy | | Super Heat-Resistant Steel | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $a_p$=1Dc, $a_e$=0.001~0.02Dc | | $a_p$=1Dc, $a_e$=0.001~0.02Dc | | $a_p$=1Dc, $a_e$=0.001~0.02Dc | | $a_p$=1Dc, $a_e$=0.001~0.02Dc | | $a_p$=1Dc, $a_e$=0.001~0.02Dc | |
| | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min |
| **1.0** | 45,500 | 980 | 35,000 | 500 | 31,500 | 450 | 21,000 | 230 | 17,500 | 130 |
| **2.0** | 22,800 | 1,050 | 17,500 | 540 | 15,800 | 480 | 10,500 | 240 | 8,800 | 130 |
| **3.0** | 15,200 | 1,110 | 11,700 | 570 | 10,500 | 510 | 7,000 | 260 | 5,800 | 140 |
| **4.0** | 11,400 | 1,170 | 8,800 | 600 | 7,900 | 540 | 5,300 | 270 | 4,400 | 150 |
| **5.0** | 9,100 | 1,230 | 7,000 | 630 | 6,300 | 570 | 4,200 | 280 | 3,500 | 160 |
| **6.0** | 7,600 | 1,230 | 5,800 | 630 | 5,300 | 570 | 3,500 | 280 | 2,900 | 160 |
| **7.0** | 6,500 | 1,230 | 5,000 | 630 | 4,500 | 570 | 3,000 | 280 | 2,500 | 160 |
| **8.0** | 5,700 | 1,230 | 4,400 | 630 | 3,900 | 560 | 2,600 | 280 | 2,200 | 160 |
| **9.0** | 5,100 | 1,240 | 3,900 | 630 | 3,500 | 570 | 2,300 | 280 | 1,900 | 150 |
| **10.0** | 4,600 | 1,240 | 3,500 | 630 | 3,200 | 580 | 2,100 | 280 | 1,800 | 160 |
| **11.0** | 4,100 | 1,160 | 3,200 | 600 | 2,900 | 550 | 1,900 | 270 | 1,600 | 150 |
| **12.0** | 3,800 | 1,110 | 2,900 | 560 | 2,600 | 510 | 1,800 | 260 | 1,500 | 150 |
| **16.0** | 2,800 | 1,030 | 2,200 | 540 | 2,000 | 490 | 1,300 | 240 | 1,100 | 130 |
| **20.0** | 2,300 | 990 | 1,800 | 520 | 1,600 | 460 | 1,100 | 240 | 900 | 130 |

- Please reduce feed rate to 75% because EPSW with dia. 4, 4,5, 5 and 5.5 are 3 flutes type.
- •2 The table above indicates cutting parameter for regular type and 3Dc type, please reduce both rotation and feed rate to 1.1 times when using short type.

**Note** Use the appropriate coolant for the work material and machining shape.
Use the high-rigidity and high accuracy machine as possible.
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 it if chatter or abnormal vibration occurs.

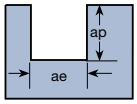
# EPSM / EPSW

## Recommended Cutting Conditions
## Slotting

Advanced Engineering

General Slotting condition

| EPSM | EPSM-CR | EPSM-3Dc | EPSW | EPSW-3Dc |
|---|---|---|---|---|
| Regular | Regular, Corner radius | Under neck 3Dc | Regular, Roughing | Under neck 3Dc, Roughing |




| Dc | Cast Iron • Carbon Steel • Alloy Steel (~30HRC) | | Pre-hardened Steel • Tool Steel (30~40HRC) | | Stainless Steel | | Titanium Alloy | | Super Heat-Resistant Steel | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $a_p$=1Dc | | $a_p$=1Dc | | $a_p$=1Dc | | $a_p$=0.5Dc | | $a_p$=0.5Dc | |
| | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min | revolution $min^{-1}$ | feed rate mm/min |
| **1.0** | 28,600 | 360 | 19,100 | 190 | 17,500 | 130 | 11,100 | 60 | 6,400 | 19 |
| **2.0** | 14,300 | 430 | 9,500 | 230 | 8,800 | 160 | 5,600 | 70 | 3,200 | 23 |
| **3.0** | 9,500 | 500 | 6,400 | 270 | 5,800 | 180 | 3,700 | 80 | 2,100 | 26 |
| **4.0** | 7,200 | 580• | 4,800 | 310• | 4,400 | 210• | 2,800 | 90• | 1,600 | 31• |
| **5.0** | 5,700 | 640• | 3,800 | 340• | 3,500 | 240• | 2,200 | 100• | 1,300 | 35• |
| **6.0** | 4,800 | 720 | 3,200 | 380 | 2,900 | 260 | 1,900 | 110 | 1,100 | 40 |
| **7.0** | 4,100 | 720 | 2,700 | 380 | 2,500 | 260 | 1,600 | 110 | 900 | 38 |
| **8.0** | 3,600 | 720 | 2,400 | 380 | 2,200 | 260 | 1,400 | 110 | 800 | 38 |
| **9.0** | 3,200 | 720 | 2,100 | 380 | 1,900 | 260 | 1,200 | 110 | 700 | 38 |
| **10.0** | 2,900 | 730 | 1,900 | 380 | 1,800 | 270 | 1,100 | 110 | 600 | 36 |
| **11.0** | 2,600 | 680 | 1,700 | 360 | 1,600 | 250 | 1,000 | 100 | 600 | 38 |
| **12.0** | 2,400 | 650 | 1,600 | 350 | 1,500 | 240 | 900 | 100 | 500 | 32 |
| **16.0** | 1,800 | 610 | 1,200 | 330 | 1,100 | 220 | 700 | 100 | 400 | 33 |
| **20.0** | 1,400 | 560 | 1,000 | 320 | 900 | 220 | 600 | 100 | 300 | 29 |

- Please reduce feed rate to 75% because EPSW with dia. 4, 4,5, 5 and 5.5 are 3 flutes type.
- $_2$ The table above indicates cutting parameter for regular type and 3Dc type, please reduce both rotation and feed rate to 1.1 times when using short type.

**Note** Use the appropriate coolant for the work material and machining shape.
Use the high-rigidity and high accuracy machine as possible.
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 it if chatter or abnormal vibration occurs.

# WHNSB & WNSB

## TH Coated Non-Step Drills for Deep Hole Drilling

## FEATURES

- Designed for deep hole drilling up to 30xD
- Special flute geometry evacuates chips efficiently
- WNSB: Deep hole drills with TH Coating
- WHNSB: Deep hole TH Coated drills with coolant holes
- WHNSB-SD: Deep hole drills with coolant holes for aluminum

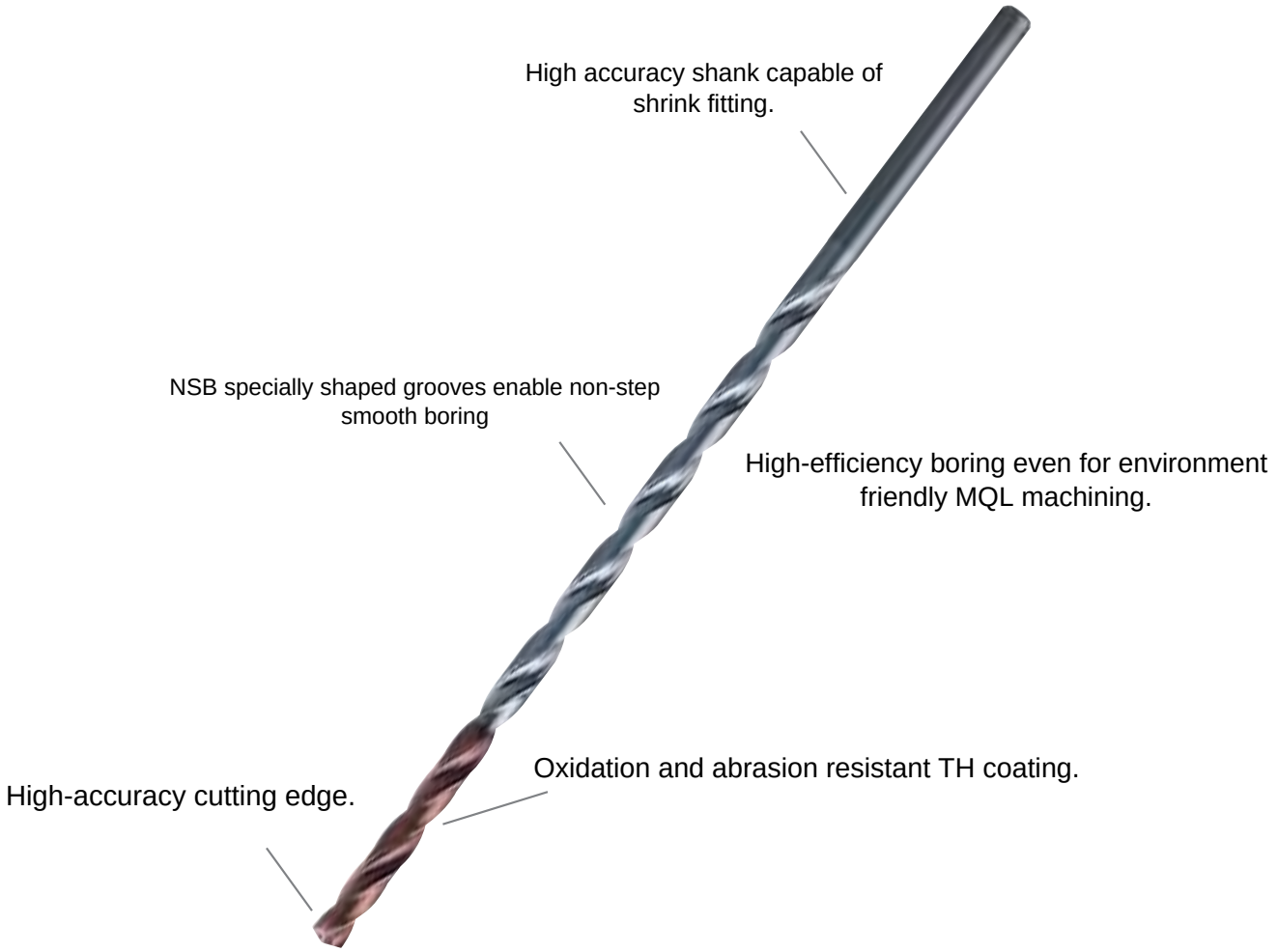
# WHNSB & WNSB

## INTRODUCTION

Our latest deep hole drills drastically improve drilling performance in holes up to 30xD. The combination of cutting edge geometry, special flute design and Hitachi Tool's unique coatings provides high-efficiency drilling and extended tool life. Two coatings are available: TH Coating for materials up to 50HRC and SD Coating specifically developed for aluminum applications. WHNSB and WHNSB-SD Drills feature coolant holes, and are suitable for environmentally-friendly MQL (Minimum Quantity Lubrication) drilling.

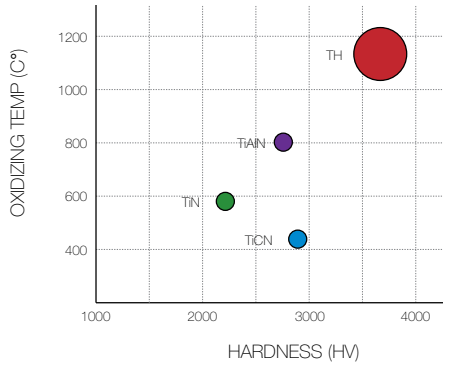
## FEATURES

| | |
|---|---|
| 1. | Designed for Ultimate Drilling Efficiency |

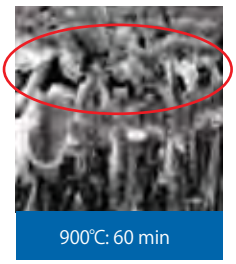


## 2. TH Coating Improves Drilling Performance

**Oxidizing Temperature and Coating Hardness**

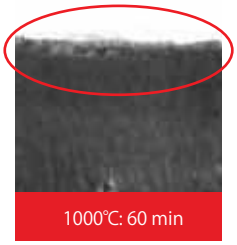



Fragile oxide develops peeling and wear.




TiAl N

Fine, solid oxide with tight adhesion prevents wear.



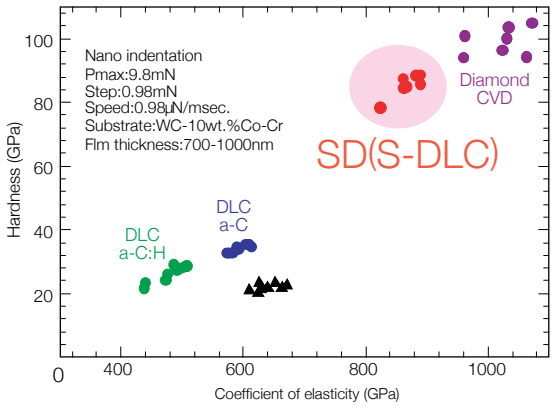

TH

## 3. SD (S-DLC) Coating Developed for Aluminum Applications

A phenomenal new coating with hardness exceeding 60GPa

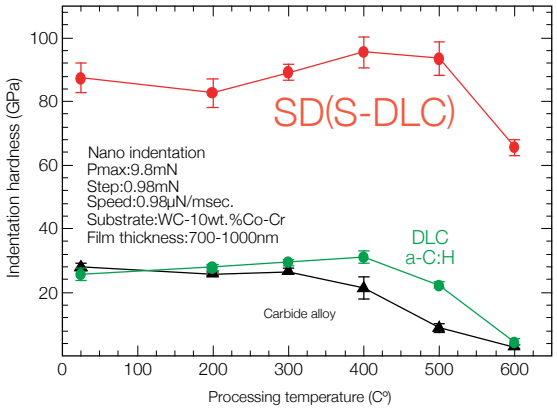
### High hardness

The hydrogen-free DLC coating infinitely close to that of diamond.
Hardness: More than 60GPa




### High heat-resistance temperature

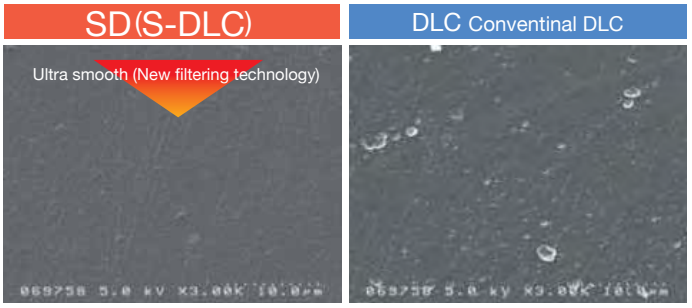
Impurities are low, providing high heat resistance and enabling high-efficiency machining. Withstand temperature: 600°C



## 4. SD (S-DLC) Coating Developed for Aluminum Applications

Ultra smooth

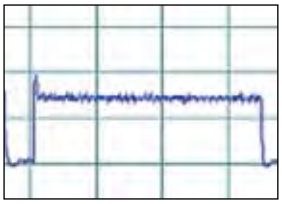
A new filtering technology is utilized to remove abnormal particles from the coating to provide the extremely smooth DLC coating.




## 5. Special Flute Geometry Evacuates Chips Efficiently

Tool ：20WHNSB0600-TH　Cutting conditions ： vc＝100m/min　f＝0.15mm/rev　H＝120mm　Work ：S50C

Carbide Non Step Borer

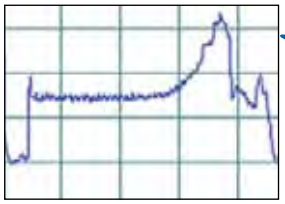


Fragile oxide develops peeling and wear.

Well-shaped chips

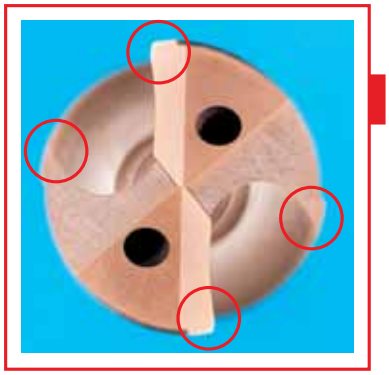
NSB specially formed groove discharges chips effectively.

Other manufacturer's product



Chip clogging causes unstable machining and tool breakage.

## 6. Double Margins Enable Stable Drilling



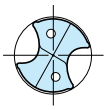
Four guides with double margins

Double margins enable stable boring even in the last stage of boring a through hole.

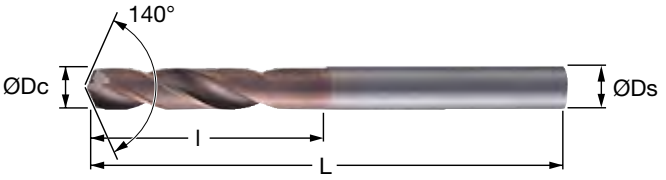
# WHNSB
## Coolant Thru Drills

**03WHNSB-TH**
**L/D=3 with oil hole**

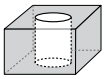
Advanced Engineering



Plane, S-X thinning







| | |
|---|---|
| Drill point: 140° | Ds: +0 / -0.01 |
| | Dc: h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 03WHNSB0200-TH | ● | 2.0 | 16 | 69 | 3 |
| 03WHNSB0203-TH | □ | 2.03 | 16 | 69 | 3 |
| 03WHNSB0210-TH | ● | 2.10 | 17 | 69 | 3 |
| 03WHNSB0213-TH | □ | 2.13 | 17 | 69 | 3 |
| 03WHNSB0220-TH | ● | 2.2 | 17 | 69 | 3 |
| 03WHNSB0223-TH | □ | 2.23 | 17 | 69 | 3 |
| 03WHNSB0230-TH | ● | 2.3 | 19 | 69 | 3 |
| 03WHNSB0233-TH | □ | 2.33 | 19 | 69 | 3 |
| 03WHNSB0240-TH | ● | 2.4 | 19 | 69 | 3 |
| 03WHNSB0243-TH | □ | 2.43 | 19 | 69 | 3 |
| 03WHNSB0250-TH | ● | 2.5 | 19 | 69 | 3 |
| 03WHNSB0253-TH | □ | 2.53 | 19 | 69 | 3 |
| 03WHNSB0260-TH | ● | 2.6 | 19 | 69 | 3 |
| 03WHNSB0263-TH | □ | 2.63 | 19 | 69 | 3 |
| 03WHNSB0270-TH | ● | 2.7 | 19 | 69 | 3 |
| 03WHNSB0273-TH | □ | 2.73 | 19 | 69 | 3 |
| 03WHNSB0280-TH | ● | 2.8 | 19 | 69 | 3 |
| 03WHNSB0283-TH | □ | 2.83 | 19 | 69 | 3 |
| 03WHNSB0290-TH | ● | 2.9 | 19 | 69 | 3 |
| 03WHNSB0293-TH | □ | 2.93 | 19 | 69 | 3 |
| 03WHNSB0300-TH | ● | 3 | 19 | 69 | 3 |
| 03WHNSB0305-TH | □ | 3.05 | 23 | 73 | 4 |
| 03WHNSB0310-TH | ● | 3.1 | 23 | 73 | 4 |
| 03WHNSB0320-TH | ● | 3.2 | 23 | 73 | 4 |
| 03WHNSB0330-TH | ● | 3.3 | 23 | 73 | 4 |
| 03WHNSB0340-TH | ● | 3.4 | 23 | 73 | 4 |
| 03WHNSB0350-TH | ● | 3.5 | 23 | 73 | 4 |
| 03WHNSB0360-TH | ● | 3.6 | 23 | 73 | 4 |
| 03WHNSB0370-TH | ● | 3.7 | 23 | 73 | 4 |
| 03WHNSB0380-TH | ● | 3.8 | 23 | 73 | 4 |
| 03WHNSB0390-TH | ● | 3.9 | 23 | 73 | 4 |
| 03WHNSB0400-TH | ● | 4 | 23 | 73 | 4 |

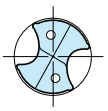
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 03WHNSB0405-TH | □ | 4.05 | 29 | 82 | 5 |
| 03WHNSB0410-TH | ● | 4.1 | 29 | 82 | 5 |
| 03WHNSB0420-TH | ● | 4.2 | 29 | 82 | 5 |
| 03WHNSB0430-TH | ● | 4.3 | 29 | 82 | 5 |
| 03WHNSB0440-TH | ● | 4.4 | 29 | 82 | 5 |
| 03WHNSB0450-TH | ● | 4.5 | 29 | 82 | 5 |
| 03WHNSB0460-TH | ● | 4.6 | 29 | 82 | 5 |
| 03WHNSB0470-TH | ● | 4.7 | 29 | 82 | 5 |
| 03WHNSB0480-TH | ● | 4.8 | 29 | 82 | 5 |
| 03WHNSB0490-TH | ● | 4.9 | 29 | 82 | 5 |
| 03WHNSB0500-TH | ● | 5 | 29 | 82 | 5 |
| 03WHNSB0505-TH | □ | 5.05 | 29 | 82 | 6 |
| 03WHNSB0510-TH | ● | 5.1 | 29 | 82 | 6 |
| 03WHNSB0520-TH | ● | 5.2 | 29 | 82 | 6 |
| 03WHNSB0530-TH | ● | 5.3 | 29 | 82 | 6 |
| 03WHNSB0540-TH | ● | 5.4 | 29 | 82 | 6 |
| 03WHNSB0550-TH | ● | 5.5 | 29 | 82 | 6 |
| 03WHNSB0555-TH | □ | 5.55 | 29 | 82 | 6 |
| 03WHNSB0560-TH | ● | 5.6 | 29 | 82 | 6 |
| 03WHNSB0570-TH | ● | 5.7 | 29 | 82 | 6 |
| 03WHNSB0580-TH | ● | 5.8 | 29 | 82 | 6 |
| 03WHNSB0590-TH | ● | 5.9 | 29 | 82 | 6 |
| 03WHNSB0600-TH | ● | 6 | 29 | 82 | 6 |
| 03WHNSB0605-TH | □ | 6.05 | 34 | 89 | 7 |
| 03WHNSB0610-TH | ● | 6.1 | 34 | 89 | 7 |
| 03WHNSB0620-TH | ● | 6.2 | 34 | 89 | 7 |
| 03WHNSB0630-TH | ● | 6.3 | 34 | 89 | 7 |
| 03WHNSB0640-TH | ● | 6.4 | 34 | 89 | 7 |
| 03WHNSB0650-TH | ● | 6.5 | 34 | 89 | 7 |
| 03WHNSB0655-TH | □ | 6.55 | 34 | 89 | 7 |
| 03WHNSB0660-TH | ● | 6.6 | 34 | 89 | 7 |
| 03WHNSB0670-TH | ● | 6.7 | 34 | 89 | 7 |

□ = Stocked items in Japan

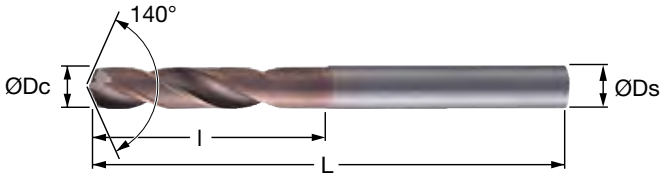
# WHNSB
## Coolant Thru Drills

**03WHNSB-TH**
**L/D=3 with oil hole**

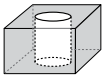
Advanced Engineering



Plane, S-X thinning







| | | | |
|---|---|---|---|
| Drill point: | 140° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 03WHNSB0680-TH | □ | 6.8 | 34 | 89 | 7 |
| 03WHNSB0690-TH | • | 6.9 | 34 | 89 | 7 |
| 03WHNSB0700-TH | • | 7 | 34 | 89 | 7 |
| 03WHNSB0705-TH | □ | 7.05 | 39 | 95 | 8 |
| 03WHNSB0710-TH | • | 7.1 | 39 | 95 | 8 |
| 03WHNSB0720-TH | • | 7.2 | 39 | 95 | 8 |
| 03WHNSB0730-TH | • | 7.3 | 39 | 95 | 8 |
| 03WHNSB0740-TH | • | 7.4 | 39 | 95 | 8 |
| 03WHNSB0750-TH | • | 7.5 | 39 | 95 | 8 |
| 03WHNSB0760-TH | • | 7.6 | 39 | 95 | 8 |
| 03WHNSB0770-TH | • | 7.7 | 39 | 95 | 8 |
| 03WHNSB0780-TH | • | 7.8 | 39 | 95 | 8 |
| 03WHNSB0790-TH | • | 7.9 | 39 | 95 | 8 |
| 03WHNSB0800-TH | • | 8 | 39 | 95 | 8 |
| 03WHNSB0805-TH | □ | 8.05 | 44 | 101 | 9 |
| 03WHNSB0810-TH | • | 8.1 | 44 | 101 | 9 |
| 03WHNSB0820-TH | • | 8.2 | 44 | 101 | 9 |
| 03WHNSB0830-TH | • | 8.3 | 44 | 101 | 9 |
| 03WHNSB0840-TH | • | 8.4 | 44 | 101 | 9 |
| 03WHNSB0850-TH | • | 8.5 | 44 | 101 | 9 |
| 03WHNSB0860-TH | • | 8.6 | 44 | 101 | 9 |
| 03WHNSB0870-TH | • | 8.7 | 44 | 101 | 9 |
| 03WHNSB0880-TH | • | 8.8 | 44 | 101 | 9 |
| 03WHNSB0890-TH | • | 8.9 | 44 | 101 | 9 |
| 03WHNSB0900-TH | • | 9 | 44 | 101 | 9 |
| 03WHNSB0950-TH | • | 9.5 | 49 | 107 | 10 |
| 03WHNSB0980-TH | • | 9.8 | 49 | 107 | 10 |
| 03WHNSB1000-TH | • | 10 | 49 | 107 | 10 |
| 03WHNSB1020-TH | • | 10.2 | 54 | 117 | 11 |
| 03WHNSB1030-TH | • | 10.3 | 54 | 117 | 11 |
| 03WHNSB1050-TH | • | 10.5 | 54 | 117 | 11 |
| 03WHNSB1080-TH | • | 10.8 | 54 | 117 | 11 |

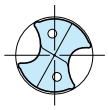
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 03WHNSB1100-TH | • | 11 | 54 | 117 | 11 |
| 03WHNSB1150-TH | • | 11.5 | 59 | 123 | 12 |
| 03WHNSB1180-TH | • | 11.8 | 59 | 123 | 12 |
| 03WHNSB1200-TH | • | 12 | 59 | 123 | 12 |
| 03WHNSB1250-TH | • | 12.5 | 64 | 129 | 13 |
| 03WHNSB1300-TH | • | 13 | 64 | 129 | 13 |

□ = Stocked items in Japan

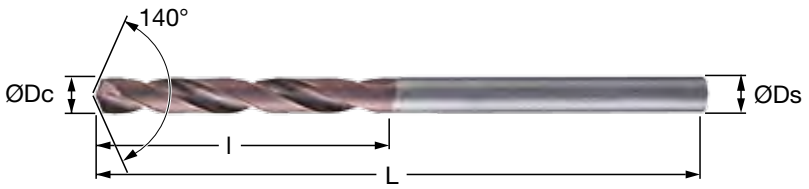
# WHNSB
## Coolant Thru Drills

**05WHNSB-TH**
**L/D=5 with oil hole**

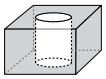
Advanced Engineering



Plane, S-X thinning







| | | | |
|---|---|---|---|
| Drill point: | 140° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 05WHNSB0200-TH | • | 2 | 20 | 66 | 3 |
| 05WHNSB0210-TH | • | 2.1 | 24 | 74 | 3 |
| 05WHNSB0220-TH | • | 2.2 | 24 | 74 | 3 |
| 05WHNSB0230-TH | • | 2.3 | 24 | 74 | 3 |
| 05WHNSB0240-TH | • | 2.4 | 24 | 74 | 3 |
| 05WHNSB0250-TH | • | 2.5 | 24 | 74 | 3 |
| 05WHNSB0260-TH | • | 2.6 | 29 | 79 | 3 |
| 05WHNSB0270-TH | • | 2.7 | 29 | 79 | 3 |
| 05WHNSB0280-TH | • | 2.8 | 29 | 79 | 3 |
| 05WHNSB0290-TH | • | 2.9 | 29 | 79 | 3 |
| 05WHNSB0300-TH | • | 3 | 29 | 79 | 3 |
| 05WHNSB0310-TH | • | 3.1 | 37 | 87 | 4 |
| 05WHNSB0320-TH | • | 3.2 | 37 | 87 | 4 |
| 05WHNSB0330-TH | • | 3.3 | 37 | 87 | 4 |
| 05WHNSB0340-TH | • | 3.4 | 37 | 87 | 4 |
| 05WHNSB0350-TH | • | 3.5 | 37 | 87 | 4 |
| 05WHNSB0360-TH | • | 3.6 | 37 | 87 | 4 |
| 05WHNSB0370-TH | • | 3.7 | 37 | 87 | 4 |
| 05WHNSB0380-TH | • | 3.8 | 37 | 87 | 4 |
| 05WHNSB0390-TH | • | 3.9 | 37 | 87 | 4 |
| 05WHNSB0400-TH | • | 4 | 37 | 87 | 4 |
| 05WHNSB0410-TH | • | 4.1 | 47 | 100 | 5 |
| 05WHNSB0420-TH | • | 4.2 | 47 | 100 | 5 |
| 05WHNSB0430-TH | • | 4.3 | 47 | 100 | 5 |
| 05WHNSB0440-TH | • | 4.4 | 47 | 100 | 5 |
| 05WHNSB0450-TH | • | 4.5 | 47 | 100 | 5 |
| 05WHNSB0460-TH | • | 4.6 | 47 | 100 | 5 |
| 05WHNSB0470-TH | • | 4.7 | 47 | 100 | 5 |
| 05WHNSB0480-TH | • | 4.8 | 47 | 100 | 5 |
| 05WHNSB0490-TH | • | 4.9 | 47 | 100 | 5 |
| 05WHNSB0500-TH | • | 5 | 47 | 100 | 5 |
| 05WHNSB0510-TH | • | 5.1 | 47 | 100 | 6 |

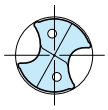
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 05WHNSB0520-TH | • | 5.2 | 47 | 100 | 6 |
| 05WHNSB0530-TH | • | 5.3 | 47 | 100 | 6 |
| 05WHNSB0540-TH | • | 5.4 | 47 | 100 | 6 |
| 05WHNSB0550-TH | • | 5.5 | 47 | 100 | 6 |
| 05WHNSB0560-TH | • | 5.6 | 47 | 100 | 6 |
| 05WHNSB0570-TH | • | 5.7 | 47 | 100 | 6 |
| 05WHNSB0580-TH | • | 5.8 | 47 | 100 | 6 |
| 05WHNSB0590-TH | • | 5.9 | 47 | 100 | 6 |
| 05WHNSB0600-TH | • | 6 | 47 | 100 | 6 |
| 05WHNSB0610-TH | • | 6.1 | 55 | 110 | 7 |
| 05WHNSB0620-TH | • | 6.2 | 55 | 110 | 7 |
| 05WHNSB0630-TH | • | 6.3 | 55 | 110 | 7 |
| 05WHNSB0640-TH | • | 6.4 | 55 | 110 | 7 |
| 05WHNSB0650-TH | • | 6.5 | 55 | 110 | 7 |
| 05WHNSB0660-TH | • | 6.6 | 55 | 110 | 7 |
| 05WHNSB0670-TH | • | 6.7 | 55 | 110 | 7 |
| 05WHNSB0680-TH | • | 6.8 | 55 | 110 | 7 |
| 05WHNSB0690-TH | • | 6.9 | 55 | 110 | 7 |
| 05WHNSB0700-TH | • | 7 | 55 | 110 | 7 |
| 05WHNSB0710-TH | • | 7.1 | 63 | 119 | 8 |
| 05WHNSB0720-TH | • | 7.2 | 63 | 119 | 8 |
| 05WHNSB0730-TH | • | 7.3 | 63 | 119 | 8 |
| 05WHNSB0740-TH | • | 7.4 | 63 | 119 | 8 |
| 05WHNSB0750-TH | • | 7.5 | 63 | 119 | 8 |
| 05WHNSB0760-TH | • | 7.6 | 63 | 119 | 8 |
| 05WHNSB0770-TH | • | 7.7 | 63 | 119 | 8 |
| 05WHNSB0780-TH | • | 7.8 | 63 | 119 | 8 |
| 05WHNSB0790-TH | • | 7.9 | 63 | 119 | 8 |
| 05WHNSB0800-TH | • | 8 | 63 | 119 | 8 |
| 05WHNSB0810-TH | • | 8.1 | 71 | 128 | 9 |
| 05WHNSB0820-TH | • | 8.2 | 71 | 128 | 9 |
| 05WHNSB0830-TH | • | 8.3 | 71 | 128 | 9 |

☐ = Stocked items in Japan

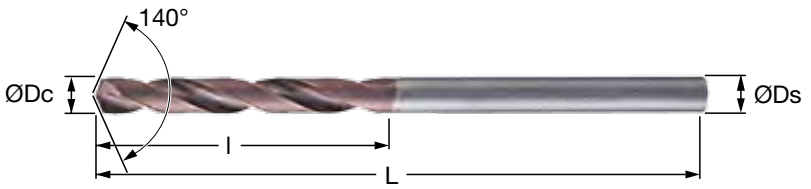
# WHNSB
## Coolant Thru Drills

**05WHNSB-TH**
**L/D=5 with oil hole**

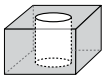
Advanced Engineering



Plane, S-X thinning







| | | | |
|---|---|---|---|
| Drill point: | 140° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

**Size (mm)**

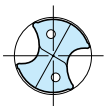
| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| **05WHNSB0840-TH** | • | 8.4 | 71 | 128 | 9 |
| **05WHNSB0850-TH** | • | 8.5 | 71 | 128 | 9 |
| **05WHNSB0860-TH** | • | 8.6 | 71 | 128 | 9 |
| **05WHNSB0870-TH** | • | 8.7 | 71 | 128 | 9 |
| **05WHNSB0880-TH** | • | 8.8 | 71 | 128 | 9 |
| **05WHNSB0890-TH** | • | 8.9 | 71 | 128 | 9 |
| **05WHNSB0900-TH** | • | 9 | 71 | 128 | 9 |
| **05WHNSB0950-TH** | • | 9.5 | 79 | 137 | 10 |
| **05WHNSB0980-TH** | • | 9.8 | 79 | 137 | 10 |
| **05WHNSB1000-TH** | • | 10 | 79 | 137 | 10 |
| **05WHNSB1020-TH** | • | 10.2 | 87 | 150 | 11 |
| **05WHNSB1030-TH** | • | 10.3 | 87 | 150 | 11 |
| **05WHNSB1050-TH** | • | 10.5 | 87 | 150 | 11 |
| **05WHNSB1080-TH** | • | 10.8 | 87 | 150 | 11 |
| **05WHNSB1100-TH** | • | 11 | 87 | 150 | 11 |
| **05WHNSB1150-TH** | • | 11.5 | 93 | 156 | 12 |
| **05WHNSB1180-TH** | • | 11.8 | 93 | 156 | 12 |
| **05WHNSB1200-TH** | • | 12 | 93 | 156 | 12 |
| **05WHNSB1250-TH** | • | 12.5 | 104 | 169 | 13 |
| **05WHNSB1300-TH** | • | 13 | 104 | 169 | 13 |

☐ = Stocked items in Japan

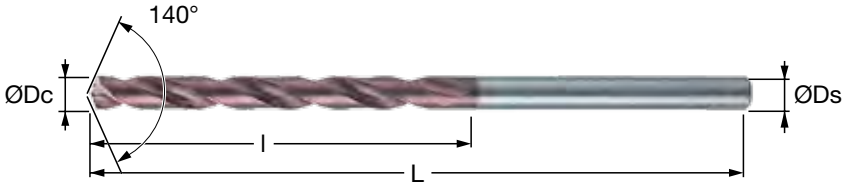
# WHNSB
## Coolant Thru Drills

**08WHNSB-TH**
**L/D=8 with oil hole**

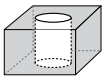
Advanced Engineering



Plane, S-X thinning







| | | | |
|---|---|---|---|
| Drill point: | 140° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 08WHNSB0200-TH | • | 2 | 25 | 75 | 3 |
| 08WHNSB0210-TH | • | 2.1 | 25 | 75 | 3 |
| 08WHNSB0220-TH | • | 2.2 | 25 | 75 | 3 |
| 08WHNSB0230-TH | • | 2.3 | 28 | 75 | 3 |
| 08WHNSB0240-TH | • | 2.4 | 28 | 75 | 3 |
| 08WHNSB0250-TH | • | 2.5 | 28 | 75 | 3 |
| 08WHNSB0260-TH | • | 2.6 | 33 | 80 | 3 |
| 08WHNSB0270-TH | • | 2.7 | 33 | 80 | 3 |
| 08WHNSB0280-TH | • | 2.8 | 35 | 83 | 3 |
| 08WHNSB0290-TH | • | 2.9 | 35 | 83 | 3 |
| 08WHNSB0300-TH | • | 3 | 35 | 83 | 3 |
| 08WHNSB0310-TH | • | 3.1 | 42 | 94 | 4 |
| 08WHNSB0320-TH | • | 3.2 | 42 | 94 | 4 |
| 08WHNSB0330-TH | • | 3.3 | 42 | 94 | 4 |
| 08WHNSB0340-TH | • | 3.4 | 42 | 94 | 4 |
| 08WHNSB0350-TH | • | 3.5 | 42 | 94 | 4 |
| 08WHNSB0360-TH | • | 3.6 | 46 | 94 | 4 |
| 08WHNSB0370-TH | • | 3.7 | 46 | 94 | 4 |
| 08WHNSB0380-TH | • | 3.8 | 46 | 94 | 4 |
| 08WHNSB0390-TH | • | 3.9 | 46 | 94 | 4 |
| 08WHNSB0400-TH | • | 4 | 46 | 94 | 4 |
| 08WHNSB0410-TH | • | 4.1 | 55 | 110 | 5 |
| 08WHNSB0420-TH | • | 4.2 | 55 | 110 | 5 |
| 08WHNSB0430-TH | • | 4.3 | 55 | 110 | 5 |
| 08WHNSB0440-TH | • | 4.4 | 55 | 110 | 5 |
| 08WHNSB0450-TH | • | 4.5 | 55 | 110 | 5 |
| 08WHNSB0460-TH | • | 4.6 | 59 | 110 | 5 |
| 08WHNSB0470-TH | • | 4.7 | 59 | 110 | 5 |
| 08WHNSB0480-TH | • | 4.8 | 59 | 110 | 5 |
| 08WHNSB0490-TH | • | 4.9 | 59 | 110 | 5 |
| 08WHNSB0500-TH | • | 5 | 59 | 110 | 5 |
| 08WHNSB0510-TH | • | 5.1 | 62 | 118 | 6 |
| 08WHNSB0520-TH | • | 5.2 | 62 | 118 | 6 |
| 08WHNSB0530-TH | • | 5.3 | 62 | 118 | 6 |
| 08WHNSB0540-TH | • | 5.4 | 62 | 118 | 6 |
| 08WHNSB0550-TH | • | 5.5 | 62 | 118 | 6 |
| 08WHNSB0560-TH | • | 5.6 | 67 | 118 | 6 |
| 08WHNSB0570-TH | • | 5.7 | 67 | 118 | 6 |
| 08WHNSB0580-TH | • | 5.8 | 67 | 118 | 6 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 08WHNSB0590-TH | • | 5.9 | 67 | 118 | 6 |
| 08WHNSB0600-TH | • | 6 | 67 | 118 | 6 |
| 08WHNSB0610-TH | • | 6.1 | 73 | 132 | 7 |
| 08WHNSB0620-TH | • | 6.2 | 73 | 132 | 7 |
| 08WHNSB0630-TH | • | 6.3 | 73 | 132 | 7 |
| 08WHNSB0640-TH | • | 6.4 | 73 | 132 | 7 |
| 08WHNSB0650-TH | • | 6.5 | 73 | 132 | 7 |
| 08WHNSB0660-TH | • | 6.6 | 77 | 132 | 7 |
| 08WHNSB0670-TH | • | 6.7 | 77 | 132 | 7 |
| 08WHNSB0680-TH | • | 6.8 | 77 | 132 | 7 |
| 08WHNSB0690-TH | • | 6.9 | 77 | 132 | 7 |
| 08WHNSB0700-TH | • | 7 | 77 | 132 | 7 |
| 08WHNSB0710-TH | • | 7.1 | 84 | 144 | 8 |
| 08WHNSB0720-TH | • | 7.2 | 84 | 144 | 8 |
| 08WHNSB0730-TH | • | 7.3 | 84 | 144 | 8 |
| 08WHNSB0740-TH | • | 7.4 | 84 | 144 | 8 |
| 08WHNSB0750-TH | • | 7.5 | 84 | 144 | 8 |
| 08WHNSB0760-TH | • | 7.6 | 88 | 144 | 8 |
| 08WHNSB0770-TH | • | 7.7 | 88 | 144 | 8 |
| 08WHNSB0780-TH | • | 7.8 | 88 | 144 | 8 |
| 08WHNSB0790-TH | • | 7.9 | 88 | 144 | 8 |
| 08WHNSB0800-TH | • | 8 | 88 | 144 | 8 |
| 08WHNSB0850-TH | • | 8.5 | 94 | 156 | 9 |
| 08WHNSB0900-TH | • | 9 | 99 | 156 | 9 |
| 08WHNSB0950-TH | • | 9.5 | 105 | 168 | 10 |
| 08WHNSB0980-TH | • | 9.8 | 110 | 168 | 10 |
| 08WHNSB1000-TH | • | 10 | 110 | 168 | 10 |
| 08WHNSB1020-TH | • | 10.2 | 116 | 184 | 11 |
| 08WHNSB1030-TH | • | 10.3 | 116 | 184 | 11 |
| 08WHNSB1050-TH | • | 10.5 | 116 | 184 | 11 |
| 08WHNSB1070-TH | • | 10.7 | 121 | 184 | 11 |
| 08WHNSB1080-TH | • | 10.8 | 121 | 184 | 11 |
| 08WHNSB1100-TH | • | 11 | 121 | 184 | 11 |
| 08WHNSB1150-TH | • | 11.5 | 127 | 195 | 12 |
| 08WHNSB1160-TH | • | 11.6 | 132 | 195 | 12 |
| 08WHNSB1200-TH | • | 12 | 132 | 195 | 12 |
| 08WHNSB1250-TH | • | 12.5 | 138 | 208 | 13 |
| 08WHNSB1300-TH | • | 13 | 143 | 208 | 13 |

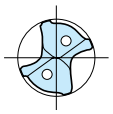
☐ = Stocked items in Japan

# WHNSB
## Coolant Thru Drills

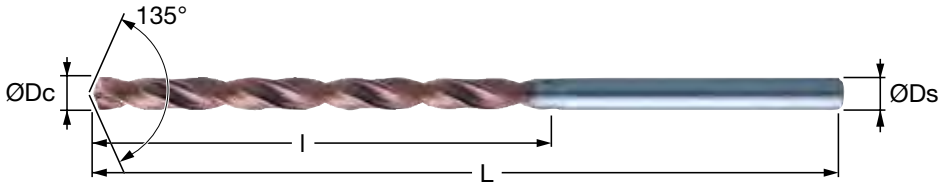
**10WHNSB-TH**
**L/D=10 with oil hole**

**15WHNSB-TH**
**L/D=15 with oil hole**

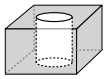
Advanced Engineering



Plane, S-X thinning







| Drill point: | 135° | Ds: | h6 |
|---|---|---|---|
| | | Dc: | h8 |

### 10WHNSB-TH
### L/D=10 with oil hole

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 10WHNSB0300-TH | ☐ | 3.00 | 39 | 87 | 3 |
| 10WHNSB0350-TH | ☐ | 3.50 | 46 | 94 | 4 |
| 10WHNSB0400-TH | ☐ | 4.00 | 52 | 101 | 4 |
| 10WHNSB0450-TH | ☐ | 4.50 | 59 | 110 | 5 |
| 10WHNSB0500-TH | ☐ | 5.00 | 66 | 117 | 5 |
| 10WHNSB0550-TH | ☐ | 5.50 | 72 | 123 | 6 |
| 10WHNSB0600-TH | ☐ | 6.00 | 79 | 130 | 6 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 10WHNSB0650-TH | ☐ | 6.50 | 85 | 138 | 7 |
| 10WHNSB0700-TH | ☐ | 7.00 | 92 | 145 | 7 |
| 10WHNSB0750-TH | ☐ | 7.50 | 98 | 153 | 8 |
| 10WHNSB0800-TH | ☐ | 8.00 | 105 | 160 | 8 |
| 10WHNSB0850-TH | ☐ | 8.50 | 111 | 166 | 9 |
| 10WHNSB0900-TH | ☐ | 9.00 | 118 | 173 | 9 |

### 15WHNSB-TH
### L/D=15 with oil hole

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 15WHNSB0200-TH | ☐ | 2.00 | 40 | 83 | 3 |
| 15WHNSB0210-TH | ☐ | 2.10 | 44 | 87 | 3 |
| 15WHNSB0220-TH | ☐ | 2.20 | 44 | 87 | 3 |
| 15WHNSB0230-TH | ☐ | 2.30 | 50 | 93 | 3 |
| 15WHNSB0240-TH | ☐ | 2.40 | 50 | 93 | 3 |
| 15WHNSB0250-TH | ☐ | 2.50 | 50 | 93 | 3 |
| 15WHNSB0260-TH | ☐ | 2.60 | 54 | 102 | 3 |
| 15WHNSB0270-TH | ☐ | 2.70 | 54 | 102 | 3 |
| 15WHNSB0280-TH | ☐ | 2.80 | 54 | 102 | 3 |
| 15WHNSB0290-TH | ☐ | 2.90 | 54 | 102 | 3 |
| 15WHNSB0300-TH | ☐ | 3.00 | 54 | 102 | 3 |
| 15WHNSB0350-TH | ☐ | 3.50 | 63 | 111 | 4 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 15WHNSB0400-TH | ☐ | 4.00 | 72 | 121 | 4 |
| 15WHNSB0450-TH | ☐ | 4.50 | 81 | 132 | 5 |
| 15WHNSB0500-TH | ☐ | 5.00 | 91 | 142 | 5 |
| 15WHNSB0550-TH | ☐ | 5.50 | 100 | 151 | 6 |
| 15WHNSB0600-TH | ☐ | 6.00 | 109 | 160 | 6 |
| 15WHNSB0650-TH | ☐ | 6.50 | 118 | 171 | 7 |
| 15WHNSB0700-TH | ☐ | 7.00 | 127 | 180 | 7 |
| 15WHNSB0750-TH | ☐ | 7.50 | 136 | 191 | 8 |
| 15WHNSB0800-TH | ☐ | 8.00 | 145 | 200 | 8 |
| 15WHNSB0850-TH | ☐ | 8.50 | 154 | 209 | 9 |
| 15WHNSB0900-TH | ☐ | 9.00 | 163 | 218 | 9 |
| 15WHNSB1000-TH | ☐ | 10.00 | 181 | 236 | 10 |

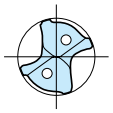
☐ = Stocked items in Japan

# WHNSB
## Coolant Thru Drills

**20WHNSB-TH**
**L/D=20 with oil hole**

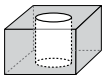
**30WHNSB-TH**
**L/D=30 with oil hole**

Advanced Engineering



Plane, S-X thinning





| | |
|---|---|
| Drill point: 135° | Ds: h6 |
| | Dc: h8 |

### 20WHNSB-TH
### L/D=20 with oil hole

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 20WHNSB0200-TH | ☐ | 2.00 | 50 | 93 | 3 |
| 20WHNSB0210-TH | ☐ | 2.10 | 55 | 98 | 3 |
| 20WHNSB0220-TH | ☐ | 2.20 | 55 | 98 | 3 |
| 20WHNSB0230-TH | ☐ | 2.30 | 62 | 105 | 3 |
| 20WHNSB0240-TH | ☐ | 2.40 | 62 | 105 | 3 |
| 20WHNSB0250-TH | ☐ | 2.50 | 62 | 105 | 3 |
| 20WHNSB0260-TH | ☐ | 2.60 | 67 | 110 | 3 |
| 20WHNSB0270-TH | ☐ | 2.70 | 67 | 110 | 3 |
| 20WHNSB0280-TH | ☐ | 2.80 | 69 | 115 | 3 |
| 20WHNSB0290-TH | ☐ | 2.90 | 69 | 115 | 3 |
| 20WHNSB0300-TH | ☐ | 3.00 | 69 | 117 | 3 |
| 20WHNSB0350-TH | ☐ | 3.50 | 81 | 129 | 4 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 20WHNSB0400-TH | ☐ | 4.00 | 92 | 141 | 4 |
| 20WHNSB0450-TH | ☐ | 4.50 | 104 | 155 | 5 |
| 20WHNSB0500-TH | ☐ | 5.00 | 116 | 167 | 5 |
| 20WHNSB0550-TH | ☐ | 5.50 | 127 | 178 | 6 |
| 20WHNSB0600-TH | ☐ | 6.00 | 139 | 190 | 6 |
| 20WHNSB0650-TH | ☐ | 6.50 | 150 | 203 | 7 |
| 20WHNSB0700-TH | ☐ | 7.00 | 162 | 215 | 7 |
| 20WHNSB0750-TH | ☐ | 7.50 | 173 | 228 | 8 |
| 20WHNSB0800-TH | ☐ | 8.00 | 185 | 240 | 8 |
| 20WHNSB0850-TH | ☐ | 8.50 | 196 | 251 | 9 |
| 20WHNSB0900-TH | ☐ | 9.00 | 208 | 263 | 9 |

### 30WHNSB-TH
### L/D=30 with oil hole

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 30WHNSB0200-TH | ☐ | 2.00 | 70 | 113 | 3 |
| 30WHNSB0210-TH | ☐ | 2.10 | 77 | 120 | 3 |
| 30WHNSB0220-TH | ☐ | 2.20 | 77 | 120 | 3 |
| 30WHNSB0230-TH | ☐ | 2.30 | 87 | 130 | 3 |
| 30WHNSB0240-TH | ☐ | 2.40 | 87 | 130 | 3 |
| 30WHNSB0250-TH | ☐ | 2.50 | 87 | 130 | 3 |
| 30WHNSB0260-TH | ☐ | 2.60 | 94 | 137 | 3 |
| 30WHNSB0270-TH | ☐ | 2.70 | 94 | 137 | 3 |
| 30WHNSB0280-TH | ☐ | 2.80 | 99 | 144 | 3 |

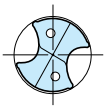
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 30WHNSB0290-TH | ☐ | 2.90 | 99 | 144 | 3 |
| 30WHNSB0300-TH | ☐ | 3.00 | 99 | 147 | 3 |
| 30WHNSB0350-TH | ☐ | 3.50 | 116 | 164 | 4 |
| 30WHNSB0400-TH | ☐ | 4.00 | 132 | 181 | 4 |
| 30WHNSB0450-TH | ☐ | 4.50 | 149 | 200 | 5 |
| 30WHNSB0500-TH | ☐ | 5.00 | 166 | 217 | 5 |
| 30WHNSB0550-TH | ☐ | 5.50 | 182 | 233 | 6 |
| 30WHNSB0600-TH | ☐ | 6.00 | 199 | 250 | 6 |

☐ = Stocked items in Japan

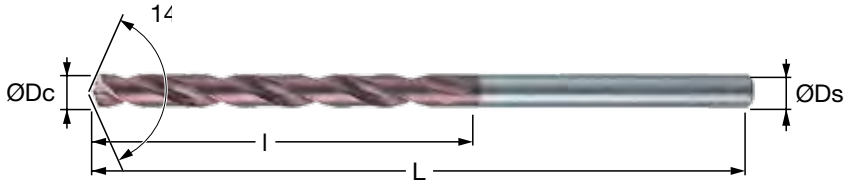
# WHNSB
## Coolant Thru Drills

**WHNSB**
**Inch Sizes**

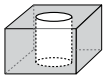
Advanced Engineering



Plane, S-X thinning







| | | | |
|---|---|---|---|
| Drill point 3D: | 140° | Ds 3D: | +0 / -0.01 |
| Drill Point 10-30D: | 135° | Ds 10-30D: | h6 |
| | | Dc: | h8 |

### L/D=3 with oil hole

| Part No. | Stock | $D_c$ (Size mm) | l | L | $D_s$ |
|---|---|---|---|---|---|
| 03WHNSB1/4X7.0-TH | ● | 1/4" | 38 | 95 | 7 |
| 03WHNSB3/8X10.0-TH | ● | 3/8" | 57 | 115 | 10 |
| 03WHNSB7/16X12.0-TH | ● | 7/16" | 67 | 120 | 12 |
| 03WHNSB1/2X13.0-TH | ● | 1/2" | 76 | 130 | 13 |

### L/D=10 with oil hole

| Part No. | Stock | $D_c$ (Size mm) | l | L | $D_s$ |
|---|---|---|---|---|---|
| 10WHNSB1/4X7.0-TH | ● | 1/4" | 83 | 140 | 7 |
| 10WHNSB3/8X10.0-TH | ● | 3/8" | 124 | 180 | 10 |
| 10WHNSB7/16X12.0-TH | ● | 7/16" | 145 | 200 | 12 |
| 10WHNSB1/2X13.0-TH | ● | 1/2" | 165 | 165 | 13 |

### L/D=20 with oil hole

| Part No. | Stock | $D_c$ (Size mm) | l | L | $D_s$ |
|---|---|---|---|---|---|
| 20WHNSB1/4X7.0-TH | ● | 1/4" | 146 | 200 | 7 |
| 20WHNSB3/8X10.0-TH | ● | 3/8" | 219 | 275 | 10 |
| 20WHNSB7/16X12.0-TH | ● | 7/16" | 256 | 310 | 12 |
| 20WHNSB1/2X13.0-TH | ● | 1/2" | 292 | 350 | 13 |

### L/D=30 with oil hole

| Part No. | Stock | $D_c$ (Size mm) | l | L | $D_s$ |
|---|---|---|---|---|---|
| 30WHNSB1/4X7.0-TH | ● | 1/4" | 215 | 268 | 7 |
| 30WHNSB3/8X10.0-TH | ● | 3/8" | 331 | 386 | 10 |
| 30WHNSB7/16X12.0-TH | ● | 7/16" | 381 | 442 | 12 |
| 30WHNSB1/2X13.0-TH | ● | 1/2" | 430 | 496 | 13 |

# WHNSB
## Coolant Thru Drills

**03WHNSB-TH**
**05WHNSB-TH**
**Cutting Conditions (Metric)**

Advanced Engineering

| Work Material (Hardness) | Cutting Speed ($v_c$) m/min | Cutting Conditions | Tool Dia. (mm) 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|---|
| **Structural Steel (~180HB)** | Internal coolant 50~120~180 | N (RPM) | 16000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~120~180 | N (RPM) | 13000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Carbon Steel (~200HB)** | Internal coolant 50~120~180 | N (RPM) | 16000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~120~180 | N (RPM) | 13000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Alloy Steel (~30HRC)** | Internal coolant 50~120~180 | N (RPM) | 16000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~120~180 | N (RPM) | 13000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Stainless Steel** | Internal coolant 50~100~150 | N (RPM) | 11000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.06-0.1 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.17-0.31 |
| **Titanium Alloy** | Internal coolant 50~80~100 | N (RPM) | 9500 | 6400 | 4200 | 3200 | 2550 | 2100 |
| | | f (Feed per Rev) | 0.02-0.04 | 0.06-0.08 | 0.09-0.12 | 0.12-0.16 | 0.13-0.2 | 0.14-0.24 |
| **Prehardened Steel (~40HRC)** | Internal coolant 40~60~100 | N (RPM) | 9500 | 4800 | 3200 | 2400 | 1900 | 1600 |
| | | f (Feed per Rev) | 0.04-0.06 | 0.08-0.13 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.18-0.32 |
| | MQL (mist) 40~60~100 | N (RPM) | 8000 | 4800 | 3200 | 2400 | 1900 | 1600 |
| | | f (Feed per Rev) | 0.04-0.06 | 0.08-0.13 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.18-0.32 |
| **Prehardened Steel (~50HRC)** | Internal coolant 30~40~50 | N (RPM) | 6500 | 3200 | 2100 | 1600 | 1300 | 1050 |
| | | f (Feed per Rev) | 0.03-0.05 | 0.05-0.1 | 0.08-0.14 | 0.12-0.18 | 0.15-0.2 | 0.17-0.24 |
| | MQL (mist) 20~30~40 | N (RPM) | 4500 | 2400 | 1600 | 1200 | 1000 | 800 |
| | | f (Feed per Rev) | 0.03-0.05 | 0.05-0.1 | 0.08-0.14 | 0.12-0.18 | 0.05-0.2 | 0.17-0.24 |
| **Ductile Iron** | Internal coolant 50~120~150 | N (RPM) | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~120~150 | N (RPM) | 13000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Casting** | Internal coolant 50~120~180 | N (RPM) | 16000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~120~180 | N (RPM) | 13000 | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Heatproof Steel** | Internal coolant 20~30~40 | N (RPM) | 4000 | 2400 | 1600 | 1200 | 950 | 800 |
| | | f (Feed per Rev) | 0.02-0.03 | 0.06-0.08 | 0.09-0.12 | 0.12-0.16 | 0.13-0.2 | 0.14-0.24 |

### 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 $\phi$5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over $\phi$5.0, 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.

# WHNSB
## Coolant Thru Drills

**O8WHNSB-TH**
**Cutting Conditions**
**(Metric)**

Advanced Engineering

| Work Material (Hardness) | Cutting Speed (vc) m/min | Cutting Conditions | Tool Dia. (mm) 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|
| **Structural Steel (~180HB)** | Internal coolant 70~120~150 | N (RPM) | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~90~120 | N (RPM) | 7200 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Carbon Steel (~200HB)** | Internal coolant 70~120~150 | N (RPM) | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~90~120 | N (RPM) | 7200 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Alloy Steel (~30HRC)** | Internal coolant 70~120~150 | N (RPM) | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 7200 | 4800 | 3600 | 2900 | 2400 |
| | MQL (mist) 50~90~120 | N (RPM) | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Stainless Steel** | Internal coolant 50~90~120 | N (RPM) | 7200 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.06-0.1 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.17-0.31 |
| **Titanium Alloy** | Internal coolant 40~60~80 | N (RPM) | 4800 | 3200 | 2400 | 1900 | 1600 |
| | | f (Feed per Rev) | 0.06-0.08 | 0.09-0.12 | 0.12-0.16 | 0.13-0.2 | 0.14-0.24 |
| **Prehardened Steel (~40HRC)** | Internal coolant 40~60~80 | N (RPM) | 4800 | 3200 | 2400 | 1900 | 1600 |
| | | f (Feed per Rev) | 0.08-0.13 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.18-0.32 |
| | MQL (mist) 30~50~700 | N (RPM) | 4000 | 2650 | 2000 | 1600 | 1350 |
| | | f (Feed per Rev) | 0.08-0.13 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.18-0.32 |
| **Prehardened Steel (~50HRC)** | Internal coolant 30~40~50 | N (RPM) | 3200 | 2100 | 1600 | 1300 | 1050 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.08-0.14 | 0.12-0.18 | 0.15-0.2 | 0.17-0.24 |
| | MQL (mist) 10~20~30 | N (RPM) | 1600 | 1050 | 800 | 650 | 550 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.08-0.14 | 0.12-0.18 | 0.05-0.2 | 0.17-0.24 |
| **Ductile Iron** | Internal coolant 70~100~120 | N (RPM) | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~90~120 | N (RPM) | 7200 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Casting** | Internal coolant 70~120~150 | N (RPM) | 9500 | 6300 | 4800 | 3800 | 3200 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~90~120 | N (RPM) | 7200 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Heatproof Steel** | Internal coolant 20~30~40 | N (RPM) | 2400 | 1600 | 1200 | 950 | 800 |
| | | f (Feed per Rev) | 0.06-0.08 | 0.09-0.12 | 0.12-0.16 | 0.13-0.2 | 0.14-0.24 |

### 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 $\phi$5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over $\phi$5.0, 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.

# WHNSB
## Coolant Thru Drills

**10WHNSB-TH, 15WHNSB-TH**
**20WHNSB-TH, 30WHNSB-TH**
**Cutting Conditions**
**(Metric)**

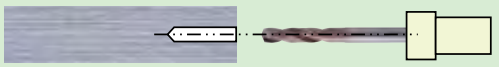
Advanced Engineering

| Work Material (Hardness) | Cutting Speed ($v_c$) m/min | Cutting Conditions | Tool Dia. (mm) 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|---|
| **Structural Steel (~180HB)** | Internal coolant 40~120 | N (RPM) | 8000 | 7000 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.05-0.08 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.3 | 0.22-0.35 |
| | MQL (mist) 40~110 | N (RPM) | 8000 | 5500 | 4300 | 3200 | 2600 | 2200 |
| | | f (Feed per Rev) | 0.05-0.08 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.30 | 0.22-0.35 |
| **Carbon Steel (~200HB)** | Internal coolant 40~120 | N (RPM) | 8000 | 7000 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.3 | 0.22-0.35 |
| | MQL (mist) 40~110 | N (RPM) | 8000 | 5500 | 4700 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.05-0.01 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.30 | 0.22-0.35 |
| **Alloy Steel (~30HRC)** | Internal coolant 40~100 | N (RPM) | 8000 | 6300 | 4500 | 3400 | 2700 | 2400 |
| | | f (Feed per Rev) | 0.05-0.08 | 0.08-0.12 | 0.12-0.20 | 0.16-0.24 | 0.20-0.30 | 0.22-0.32 |
| | MQL (mist) 40~90 | N (RPM) | 8000 | 5000 | 3700 | 2900 | 2400 | 2100 |
| | | f (Feed per Rev) | 0.05-0.08 | 0.08-0.12 | 0.12-0.20 | 0.16-0.24 | 0.20-0.30 | 0.22-0.32 |
| **Stainless Steel** | Internal coolant 30~100 | N (RPM) | 6000 | 4800 | 3700 | 2700 | 2200 | 1800 |
| | | f (Feed per Rev) | 0.03-0.05 | 0.08-0.12 | 0.12-0.20 | 0.16-0.24 | 0.20-0.30 | 0.22-0.32 |
| **Pre-hardened Steel** | Internal coolant 20~50 | N (RPM) | 4500 | 2400 | 1600 | 1200 | 950 | 800 |
| | | f (Feed per Rev) | 0.03-0.04 | 0.06-0.08 | 0.09-0.12 | 0.08-0.16 | 0.1-0.15 | 0.1-0.15 |
| **Ductile Iron** | Internal coolant 40~120 | N (RPM) | 8000 | 7000 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.05-0.08 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.35 |
| | MQL (mist) 40~100 | N (RPM) | 8000 | 6300 | 4500 | 3400 | 2700 | 2400 |
| | | f (Feed per Rev) | 0.05-0.08 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.35 |
| **Casting** | Internal coolant 40~150 | N (RPM) | 8000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.35 |
| | MQL (mist) 40~120 | N (RPM) | 8000 | 7000 | 4800 | 3600 | 2900 | 2400 |
| | | f (Feed per Rev) | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.35 |

## ■ Drilling Method

### 1 Drilling of pilot hole (guide hole) (03WHNSB-TH)

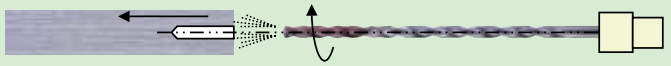
- Machining depth：tool diameter ×2.0~4.0 times
- Machining diameter：10~30FWHNSB diameter + 0.03~0.10mm
- Recommended tools： 03WHNSB-TH, Carbide stub type, MTO by customized allowance



### 2 Supplying coolant during low-speed revolution (10~30WHNSB-TH)

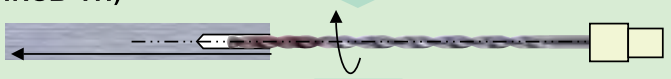
- Leading to the guide hole at low speed ($n$=0~500 min$^{-1}$)
- Stop 2.0~5.0 mm before the end of the guide hole.

※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

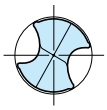
- Withdraw the tool at low speed. ($n$=0~500 min$^{-1}$)

※When a long tool (200mm or longer) is used, withdraw the tool at low revolution speed ($n$=200min$^{-1}$ or less).

# WNSB
## Solid Carbide Drills

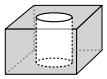
**02WNSB-TH**
**L/D=2 without oil hole**

Advanced Engineering



Plane, S-X thinning





| Drill point: | 140° | Ds: | +0 / -0.01 |
|---|---|---|---|
| | | Dc: | h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 02WNSB0500-TH | ☐ | 5 | 25 | 59 | 5 |
| 02WNSB0510-TH | ☐ | 5.1 | 25 | 64 | 6 |
| 02WNSB0520-TH | ☐ | 5.2 | 25 | 64 | 6 |
| 02WNSB0540-TH | ☐ | 5.4 | 25 | 64 | 6 |
| 02WNSB0550-TH | ☐ | 5.5 | 25 | 64 | 6 |
| 02WNSB0580-TH | ☐ | 5.8 | 25 | 64 | 6 |
| 02WNSB0600-TH | ☐ | 6 | 25 | 64 | 6 |
| 02WNSB0620-TH | ☐ | 6.2 | 29 | 71 | 7 |
| 02WNSB0650-TH | ☐ | 6.5 | 29 | 71 | 7 |
| 02WNSB0680-TH | ☐ | 6.8 | 31 | 71 | 7 |
| 02WNSB0690-TH | ☐ | 6.9 | 31 | 71 | 7 |
| 02WNSB0700-TH | ☐ | 7 | 31 | 71 | 7 |
| 02WNSB0730-TH | ☐ | 7.3 | 32 | 76 | 8 |
| 02WNSB0750-TH | ☐ | 7.5 | 32 | 76 | 8 |
| 02WNSB0780-TH | ☐ | 7.8 | 34 | 76 | 8 |
| 02WNSB0790-TH | ☐ | 7.9 | 34 | 76 | 8 |
| 02WNSB0800-TH | ☐ | 8 | 34 | 76 | 8 |
| 02WNSB0840-TH | ☐ | 8.4 | 36 | 80 | 9 |
| 02WNSB0850-TH | ☐ | 8.5 | 36 | 80 | 9 |
| 02WNSB0860-TH | ☐ | 8.6 | 38 | 80 | 9 |
| 02WNSB0880-TH | ☐ | 8.8 | 38 | 80 | 9 |
| 02WNSB0900-TH | ☐ | 9 | 38 | 80 | 9 |
| 02WNSB0940-TH | ☐ | 9.4 | 40 | 85 | 10 |
| 02WNSB0950-TH | ☐ | 9.5 | 40 | 85 | 10 |
| 02WNSB0980-TH | ☐ | 9.8 | 41 | 85 | 10 |
| 02WNSB1000-TH | ☐ | 10 | 41 | 85 | 10 |
| 02WNSB1020-TH | ☐ | 10.2 | 42 | 90 | 11 |
| 02WNSB1030-TH | ☐ | 10.3 | 42 | 90 | 11 |
| 02WNSB1050-TH | ☐ | 10.5 | 42 | 90 | 11 |
| 02WNSB1060-TH | ☐ | 10.6 | 44 | 90 | 11 |
| 02WNSB1080-TH | ☐ | 10.8 | 44 | 90 | 11 |
| 02WNSB1100-TH | ☐ | 11 | 44 | 90 | 11 |

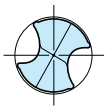
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 02WNSB1140-TH | ☐ | 11.4 | 46 | 94 | 12 |
| 02WNSB1150-TH | ☐ | 11.5 | 46 | 94 | 12 |
| 02WNSB1160-TH | ☐ | 11.6 | 46 | 94 | 12 |
| 02WNSB1180-TH | ☐ | 11.8 | 46 | 94 | 12 |
| 02WNSB1200-TH | ☐ | 12 | 46 | 94 | 12 |
| 02WNSB1220-TH | ☐ | 12.2 | 49 | 100 | 13 |
| 02WNSB1250-TH | ☐ | 12.5 | 49 | 100 | 13 |
| 02WNSB1260-TH | ☐ | 12.6 | 49 | 100 | 13 |
| 02WNSB1300-TH | ☐ | 13 | 49 | 100 | 13 |

☐ = Stocked items in Japan

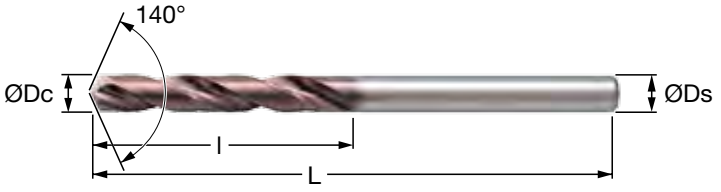
# WNSB
## Solid Carbide Drills

**04WNSB-TH**
**L/D=4 without oil hole**

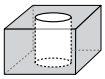
Advanced Engineering



Plane, S-X thinning







| Drill point: | 140° | Ds: | +0 / -0.01 |
|---|---|---|---|
| | | Dc: | h8 |

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 04WNSB0100-TH | ☐ | 1.0 | 8 | 50 | 3 |
| 04WNSB0110-TH | ☐ | 1.1 | 9 | 50 | 3 |
| 04WNSB0120-TH | ☐ | 1.2 | 9 | 50 | 3 |
| 04WNSB0130-TH | ☐ | 1.3 | 10 | 50 | 3 |
| 04WNSB0140-TH | ☐ | 1.4 | 10 | 50 | 3 |
| 04WNSB0150-TH | ☐ | 1.5 | 12 | 50 | 3 |
| 04WNSB0160-TH | ☐ | 1.6 | 12 | 50 | 3 |
| 04WNSB0170-TH | ☐ | 1.7 | 14 | 50 | 3 |
| 04WNSB0180-TH | ☐ | 1.8 | 14 | 50 | 3 |
| 04WNSB0190-TH | ☐ | 1.9 | 16 | 50 | 3 |
| 04WNSB0200-TH | ☐ | 2.0 | 16 | 50 | 3 |
| 04WNSB0210-TH | ☐ | 2.1 | 17 | 50 | 3 |
| 04WNSB0220-TH | ☐ | 2.2 | 17 | 50 | 3 |
| 04WNSB0230-TH | ☐ | 2.3 | 17 | 50 | 3 |
| 04WNSB0240-TH | ☐ | 2.4 | 17 | 50 | 3 |
| 04WNSB0250-TH | ☐ | 2.5 | 17 | 50 | 3 |
| 04WNSB0260-TH | ☐ | 2.6 | 19 | 50 | 3 |
| 04WNSB0270-TH | ☐ | 2.7 | 19 | 50 | 3 |
| 04WNSB0280-TH | ☐ | 2.8 | 19 | 50 | 3 |
| 04WNSB0290-TH | ☐ | 2.9 | 19 | 50 | 3 |
| 04WNSB0300-TH | ☐ | 3.0 | 19 | 50 | 3 |
| 04WNSB0310-TH | ☐ | 3.1 | 23 | 58 | 4 |
| 04WNSB0320-TH | ☐ | 3.2 | 23 | 58 | 4 |
| 04WNSB0330-TH | ☐ | 3.3 | 23 | 58 | 4 |
| 04WNSB0340-TH | ☐ | 3.4 | 23 | 58 | 4 |
| 04WNSB0350-TH | ☐ | 3.5 | 23 | 58 | 4 |
| 04WNSB0360-TH | ☐ | 3.6 | 26 | 58 | 4 |
| 04WNSB0370-TH | ☐ | 3.7 | 26 | 58 | 4 |
| 04WNSB0380-TH | ☐ | 3.8 | 26 | 58 | 4 |
| 04WNSB0390-TH | ☐ | 3.9 | 26 | 58 | 4 |
| 04WNSB0400-TH | ☐ | 4.0 | 26 | 58 | 4 |
| 04WNSB0410-TH | ☐ | 4.1 | 29 | 64 | 5 |
| 04WNSB0420-TH | ☐ | 4.2 | 29 | 64 | 5 |
| 04WNSB0430-TH | ☐ | 4.3 | 29 | 64 | 5 |
| 04WNSB0440-TH | ☐ | 4.4 | 29 | 64 | 5 |

Size (mm)

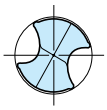
| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 04WNSB0450-TH | | 4.5 | 29 | 64 | 5 |
| 04WNSB0460-TH | | 4.6 | 32 | 64 | 5 |
| 04WNSB0470-TH | | 4.7 | 32 | 64 | 5 |
| 04WNSB0480-TH | | 4.8 | 32 | 64 | 5 |
| 04WNSB0490-TH | | 4.9 | 32 | 64 | 5 |
| 04WNSB0500-TH | | 5.0 | 32 | 64 | 5 |
| 04WNSB0510-TH | | 5.1 | 36 | 78 | 6 |
| 04WNSB0520-TH | | 5.2 | 36 | 78 | 6 |
| 04WNSB0530-TH | | 5.3 | 36 | 78 | 6 |
| 04WNSB0540-TH | | 5.4 | 36 | 78 | 6 |
| 04WNSB0550-TH | | 5.5 | 36 | 78 | 6 |
| 04WNSB0560-TH | | 5.6 | 39 | 78 | 6 |
| 04WNSB0570-TH | | 5.7 | 39 | 78 | 6 |
| 04WNSB0580-TH | | 5.8 | 39 | 78 | 6 |
| 04WNSB0590-TH | | 5.9 | 39 | 78 | 6 |
| 04WNSB0600-TH | | 6.0 | 39 | 78 | 6 |
| 04WNSB0610-TH | | 6.1 | 41 | 83 | 7 |
| 04WNSB0620-TH | | 6.2 | 41 | 83 | 7 |
| 04WNSB0630-TH | | 6.3 | 41 | 83 | 7 |
| 04WNSB0640-TH | | 6.4 | 41 | 83 | 7 |
| 04WNSB0650-TH | | 6.5 | 41 | 83 | 7 |
| 04WNSB0660-TH | | 6.6 | 43 | 83 | 7 |
| 04WNSB0670-TH | | 6.7 | 43 | 83 | 7 |
| 04WNSB0680-TH | | 6.8 | 43 | 83 | 7 |
| 04WNSB0690-TH | | 6.9 | 43 | 83 | 7 |
| 04WNSB0700-TH | | 7.0 | 43 | 83 | 7 |
| 04WNSB0710-TH | | 7.1 | 45 | 90 | 8 |
| 04WNSB0720-TH | | 7.2 | 45 | 90 | 8 |
| 04WNSB0730-TH | | 7.3 | 45 | 90 | 8 |
| 04WNSB0740-TH | | 7.4 | 45 | 90 | 8 |
| 04WNSB0750-TH | | 7.5 | 45 | 90 | 8 |
| 04WNSB0760-TH | | 7.6 | 48 | 90 | 8 |

☐ = Stocked items in Japan

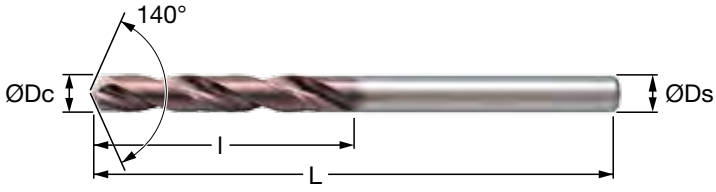
# WNSB
## Solid Carbide Drills

**04WNSB-TH**
**L/D=4 without oil hole**

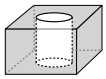
Advanced Engineering



Plane, S-X thinning







| | | | |
|---|---|---|---|
| Drill point: | 140° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 04WNSB0770-TH | □ | 7.7 | 48 | 90 | 8 |
| 04WNSB0780-TH | □ | 7.8 | 48 | 90 | 8 |
| 04WNSB0790-TH | □ | 7.9 | 48 | 90 | 8 |
| 04WNSB0800-TH | □ | 8.0 | 48 | 90 | 8 |
| 04WNSB0810-TH | □ | 8.1 | 52 | 96 | 9 |
| 04WNSB0820-TH | □ | 8.2 | 52 | 96 | 9 |
| 04WNSB0830-TH | □ | 8.3 | 52 | 96 | 9 |
| 04WNSB0840-TH | □ | 8.4 | 52 | 96 | 9 |
| 04WNSB0850-TH | □ | 8.5 | 52 | 96 | 9 |
| 04WNSB0860-TH | □ | 8.6 | 54 | 96 | 9 |
| 04WNSB0870-TH | □ | 8.7 | 54 | 96 | 9 |
| 04WNSB0880-TH | □ | 8.8 | 54 | 96 | 9 |
| 04WNSB0890-TH | □ | 8.9 | 54 | 96 | 9 |
| 04WNSB0900-TH | □ | 9.0 | 54 | 96 | 9 |
| 04WNSB0910-TH | □ | 9.1 | 57 | 104 | 10 |
| 04WNSB0920-TH | □ | 9.2 | 57 | 104 | 10 |
| 04WNSB0930-TH | □ | 9.3 | 57 | 104 | 10 |
| 04WNSB0940-TH | □ | 9.4 | 57 | 104 | 10 |
| 04WNSB0950-TH | □ | 9.5 | 57 | 104 | 10 |
| 04WNSB0960-TH | □ | 9.6 | 60 | 104 | 10 |
| 04WNSB0970-TH | □ | 9.7 | 60 | 104 | 10 |
| 04WNSB0980-TH | □ | 9.8 | 60 | 104 | 10 |
| 04WNSB0990-TH | □ | 9.9 | 60 | 104 | 10 |
| 04WNSB1000-TH | □ | 10.0 | 60 | 104 | 10 |
| 04WNSB1010-TH | □ | 10.1 | 63 | 112 | 11 |
| 04WNSB1020-TH | □ | 10.2 | 63 | 112 | 11 |
| 04WNSB1030-TH | □ | 10.3 | 63 | 112 | 11 |
| 04WNSB1040-TH | □ | 10.4 | 63 | 112 | 11 |
| 04WNSB1050-TH | □ | 10.5 | 63 | 112 | 11 |
| 04WNSB1060-TH | □ | 10.6 | 66 | 112 | 11 |
| 04WNSB1070-TH | □ | 10.7 | 66 | 112 | 11 |
| 04WNSB1080-TH | □ | 10.8 | 66 | 112 | 11 |
| 04WNSB1090-TH | □ | 10.9 | 66 | 112 | 11 |
| 04WNSB1100-TH | □ | 11.0 | 66 | 112 | 11 |
| 04WNSB1110-TH | □ | 11.1 | 71 | 121 | 12 |

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 04WNSB1120-TH | | 11.2 | 71 | 121 | 12 |
| 04WNSB1130-TH | | 11.3 | 71 | 121 | 12 |
| 04WNSB1140-TH | | 11.4 | 71 | 121 | 12 |
| 04WNSB1150-TH | | 11.5 | 71 | 121 | 12 |
| 04WNSB1160-TH | | 11.6 | 73 | 121 | 12 |
| 04WNSB1170-TH | | 11.7 | 73 | 121 | 12 |
| 04WNSB1180-TH | | 11.8 | 73 | 121 | 12 |
| 04WNSB1190-TH | | 11.9 | 73 | 121 | 12 |
| 04WNSB1200-TH | | 12.0 | 73 | 121 | 12 |
| 04WNSB1210-TH | | 12.1 | 76 | 128 | 13 |
| 04WNSB1220-TH | | 12.2 | 76 | 128 | 13 |
| 04WNSB1230-TH | | 12.3 | 76 | 128 | 13 |
| 04WNSB1240-TH | | 12.4 | 76 | 128 | 13 |
| 04WNSB1250-TH | | 12.5 | 76 | 128 | 13 |
| 04WNSB1260-TH | | 12.6 | 76 | 128 | 13 |
| 04WNSB1270-TH | | 12.7 | 76 | 128 | 13 |
| 04WNSB1280-TH | | 12.8 | 76 | 128 | 13 |
| 04WNSB1290-TH | | 12.9 | 76 | 128 | 13 |
| 04WNSB1300-TH | | 13.0 | 76 | 128 | 13 |

□ = Stocked items in Japan

# WNSB
## Solid Carbide Drills

**02WNSB-TH**
**04WNSB-TH**
**Cutting Conditions**

Advanced Engineering

| Work Material (Hardness) | Cutting Speed ($v_c$) m/min | Cutting Conditions | Tool Dia. (mm) 1 | 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|---|---|
| **Structural Steel (~180HB)** | Coolant 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Carbon Steel (~200HB)** | Coolant 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Alloy Steel (~30HRC)** | Coolant 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.05 | 0.05-0.08 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~80~130 | N (RPM) | 16000 | 12800 | 6400 | 4300 | 3200 | 2550 | 2100 |
| | | f (Feed per Rev) | 0.03-0.05 | 0.05-0.08 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **SKD61 Alloy Steel (~30HRC) (~40HRC)** | Coolant 30~50~80 | N (RPM) | 9500 | 8000 | 4000 | 2650 | 2000 | 1600 | 1300 |
| | | f (Feed per Rev) | 0.02-0.04 | 0.04-0.07 | 0.08-0.13 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.18-0.32 |
| | MQL (mist) 20~40~80 | N (RPM) | 6300 | 6400 | 3200 | 2100 | 1600 | 1250 | 1050 |
| | | f (Feed per Rev) | 0.02-0.04 | 0.04-0.07 | 0.08-0.13 | 0.12-0.19 | 0.14-0.24 | 0.16-0.28 | 0.18-0.32 |
| **Prehardened Steel (~50HRC)** | Coolant 20~30~40 | N (RPM) | 6300 | 4800 | 2400 | 1600 | 1200 | 1000 | 800 |
| | | f (Feed per Rev) | 0.01-0.03 | 0.03-0.05 | 0.05-0.1 | 0.08-0.14 | 0.12-0.18 | 0.15-0.2 | 0.17-0.24 |
| **Ductile Iron** | Coolant 50~80~130 | N (RPM) | 16000 | 12800 | 6400 | 4300 | 3200 | 2550 | 2100 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 50~80~130 | N (RPM) | 16000 | 12000 | 6400 | 4300 | 3200 | 2550 | 2100 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| **Casting** | Coolant 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |
| | MQL (mist) 70~100~150 | N (RPM) | 22000 | 16000 | 8000 | 5300 | 4000 | 3200 | 2650 |
| | | f (Feed per Rev) | 0.03-0.06 | 0.05-0.1 | 0.1-0.16 | 0.15-0.24 | 0.18-0.3 | 0.2-0.35 | 0.22-0.4 |

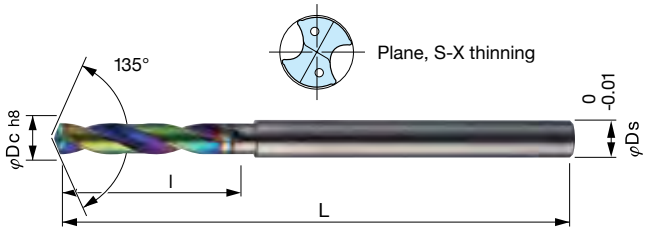
### Setting of Cutting Conditions

※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 $\phi$5.0 or less, the coolant pressure should be 2.0 MPa or higher, and when the diameter is over $\phi$5.0, 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.

# WHNSB-SD
## Coolant Thru Drills for Aluminum

**03WHNSB-SD**
**L/D=3**

Advanced Engineering





| | | | |
|---|---|---|---|
| Drill point: | 135° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

**Size (mm)**

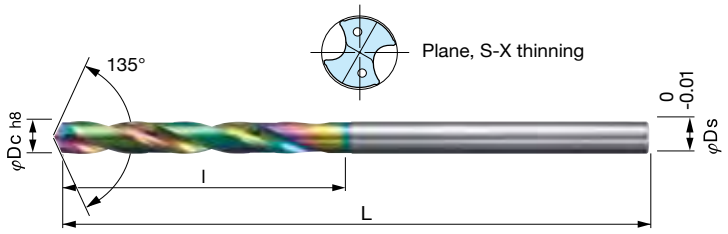
| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 03WHNSB0300-SD | ☐ | 3 | 19 | 69 | 3 |
| 03WHNSB0303-SD | ☐ | 3.03 | 23 | 73 | 4 |
| 03WHNSB0400-SD | ☐ | 4 | 23 | 73 | 4 |
| 03WHNSB0403-SD | ☐ | 4.03 | 29 | 82 | 5 |
| 03WHNSB0500-SD | ☐ | 5 | 29 | 82 | 5 |
| 03WHNSB0503-SD | ☐ | 5.03 | 29 | 82 | 6 |
| 03WHNSB0510-SD | ☐ | 5.1 | 29 | 82 | 6 |
| 03WHNSB0550-SD | ☐ | 5.5 | 29 | 82 | 6 |
| 03WHNSB0553-SD | ☐ | 5.53 | 29 | 82 | 6 |
| 03WHNSB0600-SD | ☐ | 6 | 29 | 82 | 6 |
| 03WHNSB0603-SD | ☐ | 6.03 | 34 | 89 | 7 |
| 03WHNSB0650-SD | ☐ | 6.5 | 34 | 89 | 7 |
| 03WHNSB0653-SD | ☐ | 6.53 | 34 | 89 | 7 |
| 03WHNSB0680-SD | ☐ | 6.8 | 34 | 89 | 7 |
| 03WHNSB0700-SD | ☐ | 7 | 34 | 89 | 7 |
| 03WHNSB0703-SD | ☐ | 7.03 | 39 | 95 | 8 |
| 03WHNSB0730-SD | ☐ | 7.3 | 39 | 95 | 8 |
| 03WHNSB0750-SD | ☐ | 7.5 | 39 | 95 | 8 |
| 03WHNSB0753-SD | ☐ | 7.53 | 39 | 95 | 8 |
| 03WHNSB0800-SD | ☐ | 8 | 39 | 95 | 8 |
| 03WHNSB0803-SD | ☐ | 8.03 | 44 | 101 | 9 |
| 03WHNSB0850-SD | ☐ | 8.5 | 44 | 101 | 9 |
| 03WHNSB0853-SD | ☐ | 8.53 | 44 | 101 | 9 |
| 03WHNSB0860-SD | ☐ | 8.6 | 44 | 101 | 9 |
| 03WHNSB0880-SD | ☐ | 8.8 | 44 | 101 | 9 |
| 03WHNSB0900-SD | ☐ | 9 | 44 | 101 | 9 |
| 03WHNSB0903-SD | ☐ | 9.03 | 49 | 107 | 10 |
| 03WHNSB0950-SD | ☐ | 9.5 | 49 | 107 | 10 |
| 03WHNSB0953-SD | ☐ | 9.53 | 49 | 107 | 10 |
| 03WHNSB1000-SD | ☐ | 10 | 49 | 107 | 10 |
| 03WHNSB1003-SD | ☐ | 10.03 | 54 | 117 | 11 |

= Stocked items in Japan

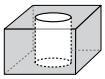
# WHNSB-SD
## Coolant Thru Drills for Aluminum

**05WHNSB-SD**
**L/D=5**

Advanced Engineering







| | | | |
|---|---|---|---|
| Drill point: | 135° | Ds: | +0 / -0.01 |
| | | Dc: | h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 05WHNSB0200-SD | ☐ | 2 | 20 | 66 | 3 |
| 05WHNSB0203-SD | ☐ | 2.03 | 24 | 74 | 3 |
| 05WHNSB0210-SD | ☐ | 2.1 | 24 | 74 | 3 |
| 05WHNSB0220-SD | ☐ | 2.2 | 24 | 74 | 3 |
| 05WHNSB0230-SD | ☐ | 2.3 | 24 | 74 | 3 |
| 05WHNSB0240-SD | ☐ | 2.4 | 24 | 74 | 3 |
| 05WHNSB0250-SD | ☐ | 2.5 | 24 | 74 | 3 |
| 05WHNSB0253-SD | ☐ | 2.53 | 29 | 79 | 3 |
| 05WHNSB0260-SD | ☐ | 2.6 | 29 | 79 | 3 |
| 05WHNSB0270-SD | ☐ | 2.7 | 29 | 79 | 3 |
| 05WHNSB0280-SD | ☐ | 2.8 | 29 | 79 | 3 |
| 05WHNSB0290-SD | ☐ | 2.9 | 29 | 79 | 3 |
| 05WHNSB0300-SD | ☐ | 3 | 29 | 79 | 3 |
| 05WHNSB0303-SD | ☐ | 3.03 | 37 | 87 | 4 |
| 05WHNSB0350-SD | ☐ | 3.5 | 37 | 87 | 4 |
| 05WHNSB0353-SD | ☐ | 3.53 | 37 | 87 | 4 |
| 05WHNSB0400-SD | ☐ | 4 | 37 | 87 | 4 |
| 05WHNSB0403-SD | ☐ | 4.03 | 47 | 100 | 5 |
| 05WHNSB0410-SD | ☐ | 4.1 | 47 | 100 | 5 |
| 05WHNSB0420-SD | ☐ | 4.2 | 47 | 100 | 5 |
| 05WHNSB0430-SD | ☐ | 4.3 | 47 | 100 | 5 |
| 05WHNSB0450-SD | ☐ | 4.5 | 47 | 100 | 5 |
| 05WHNSB0453-SD | ☐ | 4.53 | 47 | 100 | 5 |
| 05WHNSB0500-SD | ☐ | 5 | 47 | 100 | 5 |
| 05WHNSB0503-SD | ☐ | 5.03 | 47 | 100 | 6 |
| 05WHNSB0510-SD | ☐ | 5.1 | 47 | 100 | 6 |
| 05WHNSB0550-SD | ☐ | 5.5 | 47 | 100 | 6 |
| 05WHNSB0553-SD | ☐ | 5.53 | 47 | 100 | 6 |
| 05WHNSB0600-SD | ☐ | 6 | 47 | 100 | 6 |
| 05WHNSB0603-SD | ☐ | 6.03 | 55 | 110 | 7 |
| 05WHNSB0650-SD | ☐ | 6.5 | 55 | 110 | 7 |
| 05WHNSB0653-SD | ☐ | 6.53 | 55 | 110 | 7 |

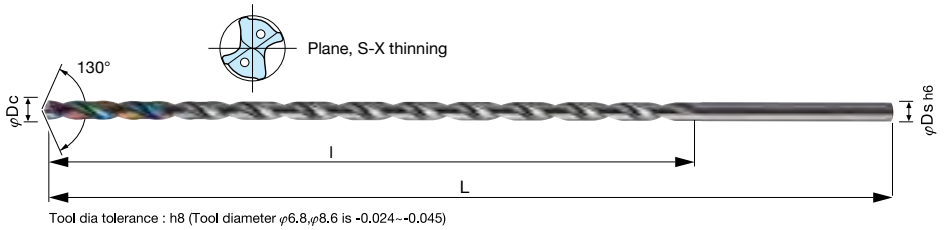
| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 05WHNSB0680-SD | ☐ | 6.8 | 55 | 110 | 7 |
| 05WHNSB0700-SD | ☐ | 7 | 55 | 110 | 7 |
| 05WHNSB0703-SD | ☐ | 7.03 | 63 | 119 | 8 |
| 05WHNSB0750-SD | ☐ | 7.5 | 63 | 119 | 8 |
| 05WHNSB0753-SD | ☐ | 7.53 | 63 | 119 | 8 |
| 05WHNSB0780-SD | ☐ | 7.8 | 63 | 119 | 8 |
| 05WHNSB0800-SD | ☐ | 8 | 63 | 119 | 8 |
| 05WHNSB0803-SD | ☐ | 8.03 | 71 | 128 | 9 |
| 05WHNSB0850-SD | ☐ | 8.5 | 71 | 128 | 9 |
| 05WHNSB0853-SD | ☐ | 8.53 | 71 | 128 | 9 |
| 05WHNSB0860-SD | ☐ | 8.6 | 71 | 128 | 9 |
| 05WHNSB0880-SD | ☐ | 8.8 | 71 | 128 | 9 |
| 05WHNSB0900-SD | ☐ | 9 | 71 | 128 | 9 |
| 05WHNSB0903-SD | ☐ | 9.03 | 79 | 137 | 10 |
| 05WHNSB0950-SD | ☐ | 9.5 | 79 | 137 | 10 |
| 05WHNSB0953-SD | ☐ | 9.53 | 79 | 137 | 10 |
| 05WHNSB0980-SD | ☐ | 9.8 | 79 | 137 | 10 |
| 05WHNSB1000-SD | ☐ | 10 | 79 | 137 | 10 |
| 05WHNSB1003-SD | ☐ | 10.03 | 87 | 150 | 11 |

☐ = Stocked items in Japan

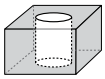
# WHNSB-SD
## Coolant Thru Drills for Aluminum

15WHNSB-SD L/D=15
20WHNSB-SD L/D=20
25WHNSB-SD L/D=25
30WHNSB-SD L/D=30

Advanced Engineering




Tool dia tolerance : h8 (Tool diameter φ6.8,φ8.6 is -0.024~-0.045)

| Drill point: | 130° | Ds: | h6 |
|---|---|---|---|
| | | Dc: | h8 |

### 15WHNSB-SD L/D=15

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 15WHNSB0300-SD | □ | 3 | 54 | 102 | 3 |
| 15WHNSB0400-SD | □ | 4 | 72 | 121 | 4 |
| 15WHNSB0500-SD | □ | 5 | 91 | 142 | 5 |
| 15WHNSB0550-SD | □ | 5.5 | 100 | 151 | 6 |
| 15WHNSB0600-SD | □ | 6 | 109 | 160 | 6 |
| 15WHNSB0700-SD | □ | 7 | 127 | 180 | 7 |
| 15WHNSB0800-SD | □ | 8 | 145 | 200 | 8 |
| 15WHNSB0900-SD | □ | 9 | 163 | 218 | 9 |
| 15WHNSB1000-SD | □ | 10 | 181 | 236 | 10 |

### 20WHNSB-SD L/D=20

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 20WHNSB0300-SD | □ | 3 | 69 | 117 | 3 |
| 20WHNSB0400-SD | □ | 4 | 92 | 141 | 4 |
| 20WHNSB0500-SD | □ | 5 | 116 | 167 | 5 |
| 20WHNSB0550-SD | □ | 5.5 | 127 | 178 | 6 |
| 20WHNSB0600-SD | □ | 6 | 139 | 190 | 6 |
| 20WHNSB0700-SD | □ | 7 | 162 | 215 | 7 |
| 20WHNSB0800-SD | □ | 8 | 185 | 240 | 8 |

### 25WHNSB-SD L/D=25

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 25WHNSB0300-SD | □ | 3 | 84 | 132 | 3 |
| 25WHNSB0400-SD | □ | 4 | 113 | 162 | 4 |
| 25WHNSB0500-SD | □ | 5 | 141 | 192 | 5 |
| 25WHNSB0550-SD | □ | 5.5 | 155 | 206 | 6 |
| 25WHNSB0600-SD | □ | 6 | 169 | 220 | 6 |
| 25WHNSB0700-SD | □ | 7 | 197 | 250 | 7 |
| 25WHNSB0800-SD | □ | 8 | 225 | 280 | 8 |

### 30WHNSB-SD L/D=30

Size (mm)

| Part No. | Stock | $D_c$ | l | L | $D_s$ |
|---|---|---|---|---|---|
| 30WHNSB0300-SD | □ | 3 | 99 | 147 | 3 |
| 30WHNSB0400-SD | □ | 4 | 132 | 181 | 4 |
| 30WHNSB0500-SD | □ | 5 | 166 | 217 | 5 |
| 30WHNSB0550-SD | □ | 5.5 | 182 | 233 | 6 |
| 30WHNSB0600-SD | □ | 6 | 199 | 250 | 6 |

□ = Stocked items in Japan

# WHNSB-SD
## Coolant Thru Drills for Aluminum

**Internal Coolant Water Soluble Cutting Conditions**

Advanced Engineering

| Work Material (Hardness) | Cutting condition | Size(mm) Ø2.0 | Ø4.0 | Ø6.0 | Ø8.0 | Ø10.0 |
|---|---|---|---|---|---|---|
| **Aluminum Alloy System Mg (5052)** | Cutting speed (vc)m/min | 80~180 | 80~200 | 80~200 | 80~200 | 80~200 |
| | The amount of feed (f)mm/rev | 0.04~0.08 | 0.08~0.16 | 0.12~0.24 | 0.16~0.30 | 0.18~0.35 |
| **Aluminum Alloy System Zn-Mg (7075)** | Cutting speed (vc)m/min | 60~150 | 60~150 | 80~180 | 80~180 | 80~180 |
| | The amount of feed (f)mm/rev | 0.06~0.10 | 0.12~0.20 | 0.18~0.30 | 0.24~0.40 | 0.25~0.50 |
| **Casting alloy aluminum AC••, ADC** | Cutting speed (vc)m/min | 80~160 | 80~160 | 80~180 | 80~180 | 80~200 |
| | The amount of feed (f)mm/rev | 0.06~0.10 | 0.12~0.20 | 0.18~0.30 | 0.24~0.40 | 0.25~0.50 |
| **Copper alloy** | Cutting speed (vc)m/min | 60~150 | 60~150 | 80~180 | 80~180 | 80~180 |
| | The amount of feed (f)mm/rev | 0.04~0.08 | 0.08~0.16 | 0.12~0.24 | 0.16~0.30 | 0.18~0.35 |

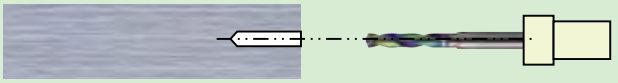
## Setting of Cutting Conditions

- 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 $\phi$5.0 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 vibration to 0.02mm or less.

## ■ How to use 15~30WHNSB-SD

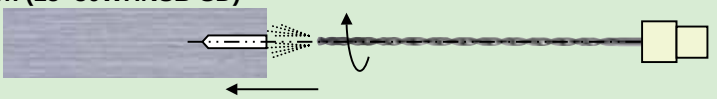
**1 Drilling of pilot hole (guide hole) (03~05WHNSB-SD)**

- Machining depth : tool diameter ×2.0~4.0 times



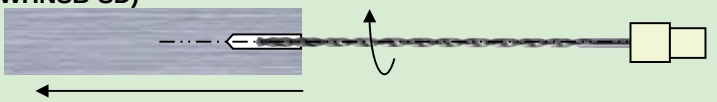
**2 Supplying coolant during low-speed revolution (15~30WHNSB-SD)**

- Leading to the guide hole at low speed (n=0~500 min-1)



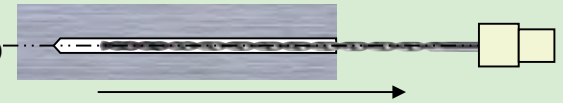
**3 High-speed revolution for drilling feed (15~30WHNSB-SD)**

- 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)



# ZPB

## TH Coated Plunging Borers for Flat and Angled Surfaces

## FEATURES

180° tip angle enables plunge boring of flat and sloped surfaces.

Special flute shape reduces breakage and chipping of cutting edge.

Special groove shape provides smooth chip evacuation.

Regular (ZPB) and Long Shank (ZPBLS) versions available.

# ZPB
# Plunging Borer

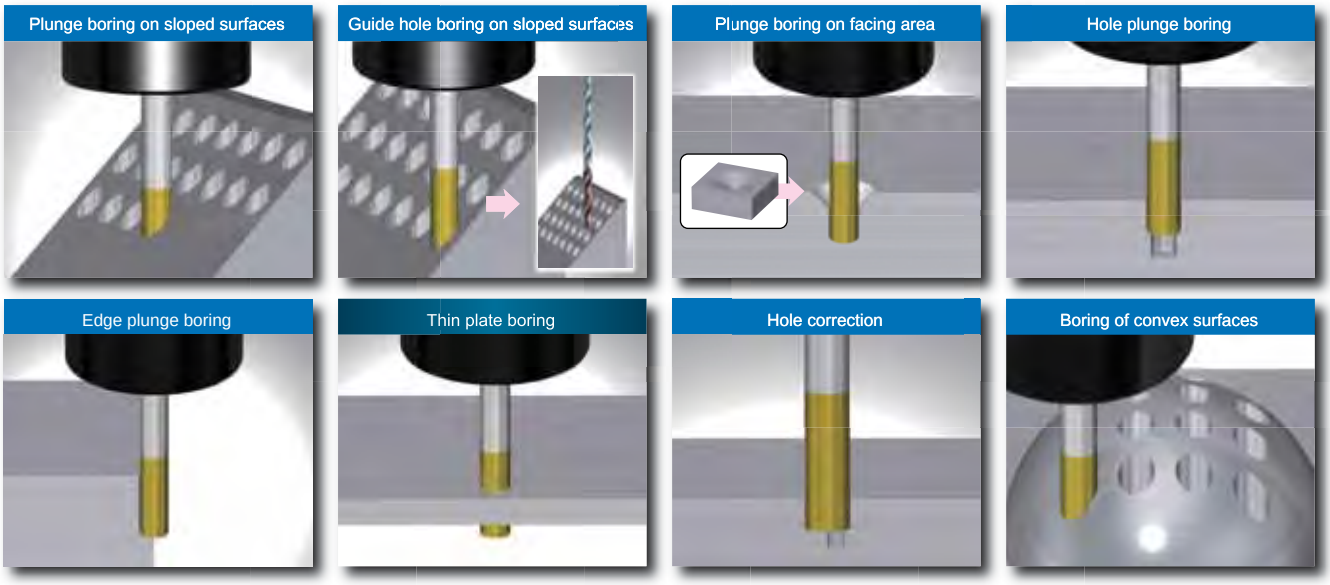
Advanced Engineering

## INTRODUCTION

Our ZPB Plunging Borers are a versatile tool that can perform a wide range of boring applications, including plunge hole boring on sloped surfaces, hole correction, and boring of convex surfaces. Hitachi Tool's own TH Coating provides extended tool life, and the special flute shape reduces breakage and chipping of cutting edge.

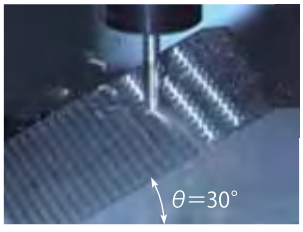
## FEATURES

### 1. Main Applications




### 2. Field Data

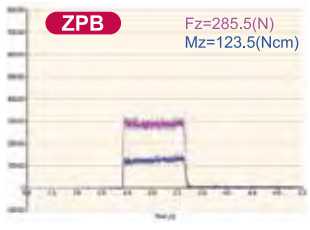
**Z plunging on 30° sloped surface - S50CA**

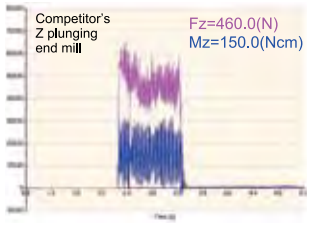




Drill Dia. = φ 6
*vc*=75m/min (*n*=4000min$^{-1}$) *vf*=360mm/min (*f* =0.09mm/rev.)
*H*=12mm Coolant = Dry
Machine = Vertical M/C

**Comparison of cutting resistance when Z plunging a flat surface - S50CA**



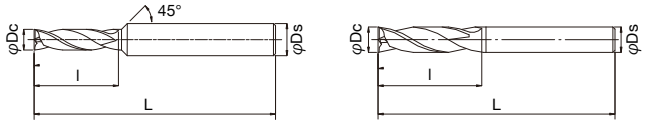




Drill Dia. = φ 6
*vc*=75m/min (*n*=4000min$^{-1}$) *vf*=360mm/min (*f* =0.09mm/rev.)
*H*=9mm Coolant = Dry
Machine = Horizontal M/C

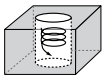
# ZPB
# Plunging Borer

**ZPB-TH**

Advanced Engineering







| Drill point: | 180° | Ds: | 0/-0.01 |
|---|---|---|---|
| | | Dc: | h8 |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ | Type |
|---|---|---|---|---|---|---|
| **ZPB0300-TH** | □ | 3.0 | **12** | 50 | 4 | A |
| **ZPB0400-TH** | □ | 4.0 | **16** | 50 | 4 | B |
| **ZPB0450-TH** | □ | 4.5 | **18** | 50 | 6 | A |
| **ZPB0500-TH** | □ | 5.0 | **20** | 60 | 6 | A |
| **ZPB0550-TH** | □ | 5.5 | **22** | 60 | 6 | A |
| **ZPB0600-TH** | □ | 6.0 | **22** | 60 | 6 | B |
| **ZPB0700-TH** | □ | 7.0 | **26** | 70 | 8 | A |
| **ZPB0800-TH** | □ | 8.0 | **28** | 70 | 8 | B |
| **ZPB0900-TH** | □ | 9.0 | **28** | 80 | 10 | A |
| **ZPB0950-TH** | □ | 9.5 | **30** | 80 | 10 | A |
| **ZPB1000-TH** | □ | 10.0 | **32** | 80 | 10 | B |
| **ZPB1100-TH** | □ | 11.0 | **33** | 90 | 12 | A |
| **ZPB1200-TH** | □ | 12.0 | **38** | 90 | 12 | B |

□ = Stocked items in Japan

# ZPB
# Plunging Borer

## Table of Standard Cutting Conditions

Advanced Engineering

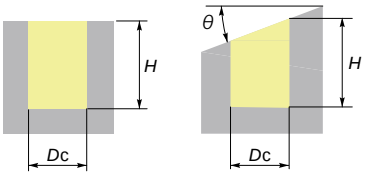
Regular | ZPB-TH

| Workpiece (Hardness) | Structural steel (~ 180HB) SS | | Carbon steel (~ 200HB) S○○C | | Steel alloy (~ 30HRC) SCM | | Pre-hardened steel (~ 45HRC) | | Gray cast iron FC | | Aluminum alloy A5052, A7075 | | Aluminum alloy casting AC, ADC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cutting speed (Vc) m / min | 40~80m/min | | 40~80m/min | | 30~70m/min | | 10~50m/min | | 40~80m/min | | 60~200m/min | | 30~150m/min | |
| Tool diameter (mm) | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. | Revolution (n) min$^{-1}$ | Feed amount (f) mm / rev. |
| Ø2 | 10,000 | 0.02~0.05 | 10,000 | 0.02~0.05 | 9,000 | 0.02~0.05 | 6,000 | 0.01~0.04 | 10,000 | 0.02~0.05 | 20,000 | 0.02~0.05 | 19,000 | 0.02~0.04 |
| Ø3 | 7,950 | 0.05~0.08 | 7,950 | 0.05~0.08 | 6,900 | 0.05~0.08 | 4,250 | 0.03~0.06 | 7,950 | 0.05~0.08 | 17,000 | 0.05~0.08 | 12,700 | 0.05~0.07 |
| Ø4 | 6,000 | 0.06~0.1 | 6,000 | 0.06~0.1 | 5,200 | 0.06~0.1 | 3,200 | 0.04~0.08 | 6,000 | 0.06~0.1 | 12,500 | 0.06~0.1 | 9,550 | 0.06~0.09 |
| Ø5 | 4,800 | 0.08~0.13 | 4,800 | 0.08~0.13 | 4,150 | 0.08~0.13 | 2,550 | 0.05~0.1 | 4,800 | 0.08~0.13 | 10,000 | 0.08~0.13 | 7,650 | 0.08~0.12 |
| Ø6 | 4,000 | 0.09~0.15 | 4,000 | 0.09~0.15 | 3,450 | 0.09~0.15 | 2,100 | 0.06~0.12 | 4,000 | 0.09~0.15 | 8,500 | 0.09~0.15 | 6,350 | 0.09~0.14 |
| Ø7 | 3,400 | 0.11~0.18 | 3,400 | 0.11~0.18 | 3,000 | 0.11~0.18 | 1,800 | 0.07~0.14 | 3,400 | 0.11~0.18 | 7,300 | 0.11~0.18 | 5,450 | 0.11~0.16 |
| Ø8 | 3,000 | 0.12~0.2 | 3,000 | 0.12~0.2 | 2,600 | 0.12~0.2 | 1,600 | 0.08~0.16 | 3,000 | 0.12~0.2 | 6,500 | 0.12~0.2 | 4,800 | 0.12~0.18 |
| Ø9 | 2,650 | 0.14~0.23 | 2,650 | 0.14~0.23 | 2,300 | 0.14~0.23 | 1,400 | 0.09~0.18 | 2,650 | 0.14~0.23 | 5,650 | 0.14~0.23 | 4,250 | 0.14~0.21 |
| Ø10 | 2,400 | 0.15~0.25 | 2,400 | 0.15~0.25 | 2,100 | 0.15~0.25 | 1,300 | 0.1~0.2 | 2,400 | 0.15~0.25 | 5,100 | 0.15~0.25 | 3,800 | 0.15~0.23 |
| Ø11 | 2,200 | 0.17~0.28 | 2,200 | 0.17~0.28 | 1,900 | 0.17~0.28 | 1,150 | 0.11~0.22 | 2,200 | 0.17~0.28 | 4,650 | 0.17~0.28 | 3,500 | 0.17~0.25 |
| Ø12 | 2,000 | 0.18~0.3 | 2,000 | 0.18~0.3 | 1,750 | 0.18~0.3 | 1,050 | 0.12~0.24 | 2,000 | 0.18~0.3 | 4,250 | 0.18~0.3 | 3,200 | 0.18~0.28 |
| Ø13 | 1,700 | 0.13~0.26 | 1,700 | 0.13~0.26 | 1,400 | 0.13~0.26 | 1,000 | 0.09~0.22 | 1,500 | 0.17~0.26 | 3,000 | 0.18~0.28 | 2,700 | 0.19~0.26 |
| Ø14 | 1,500 | 0.13~0.27 | 1,500 | 0.13~0.27 | 1,250 | 0.13~0.27 | 800 | 0.08~0.23 | 1,250 | 0.16~0.27 | 2,500 | 0.17~0.29 | 2,300 | 0.18~0.27 |
| Ø15 | 1,300 | 0.12~0.27 | 1,300 | 0.12~0.27 | 1,100 | 0.12~0.27 | 650 | 0.07~0.23 | 1,050 | 0.15~0.27 | 2,000 | 0.15~0.29 | 1,900 | 0.15~0.27 |
| Ø16 | 1,200 | 0.16~0.32 | 1,200 | 0.16~0.32 | 1,200 | 0.16~0.32 | 700 | 0.13~0.24 | 1,200 | 0.16~0.32 | 2,300 | 0.16~0.32 | 2,000 | 0.16~0.32 |

### 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. This tool is for boring holes and horizontal feeding cannot be performed.
4. This tool is not suitable for machining stainless steel (SUS304, 316, etc.)
5. If cutting chips cannot be broken up, step machining should be performed.
6. These cutting conditions are for when the machining surface is flat and the cutting depth is 2Dc or less.
7. For 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.
8. When attaching the tool, suppress flute tip runout as much as possible (to 10μm or less as a general rule).

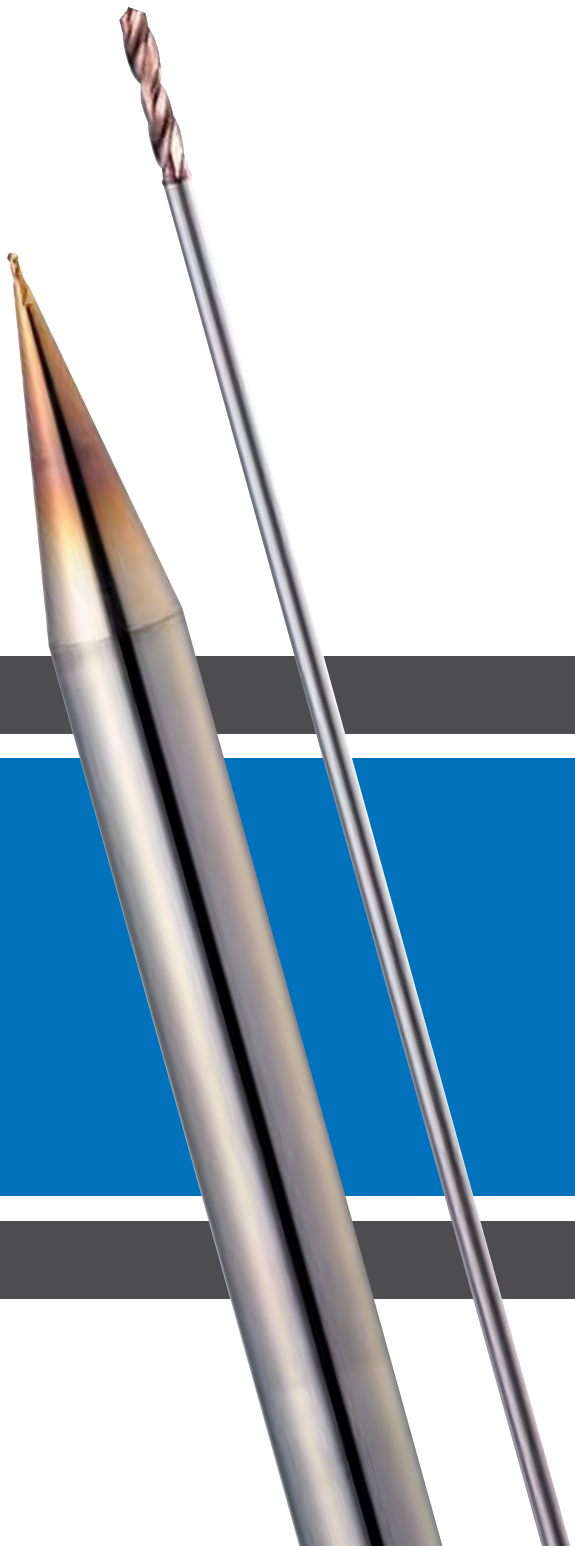
**Machine hole depth**




| Drill dia | Hole deph |
|---|---|
| Dc ≦ 6 | H ≦ 2Dc |
| Dc > 6 | H ≦ 1.5Dc |

# EMSBS/EMST

## Drill For Machining Ultra-Deep Minute Holes



## FEATURES

For ultra-deep drilling of miniature holes.

New chip stopper controls chip flow.

EMSBS: Deep hole mirco-drills with TH Coating.

EMST: Micro- starter drills with TH Coating

# EMSBS / EMST

Advanced Engineering

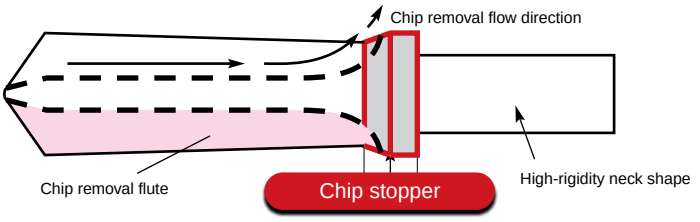
## INTRODUCTION

For micro holes less than 1mm in diameter, nothing beats Hitachi Tool's EMSBS Non-Step Micro Drills. When coupled with the EMST Micro Starter Drills, the EMSBS are capable of high-aspect ratio deep drilling of tiny holes. While there are a variety of items available as standards, drills capable of drilling up to 100xD are available as special made-to-order products.

## FEATURES

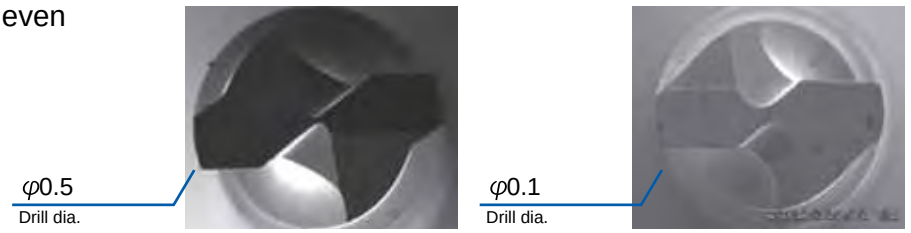
### 1. Chip Stopper for High Accuracy Drilling

New chip-removal stopper technology
+ high-rigidity neck shape enables
high-accuracy drilling of minute holes.




### 2. Special Thinning Shape

Thinning flute shape achieves even
higher machining accuracy
(Thinning: Drill diameter > Ø0.1)




### 3. Enables High-Aspect Ratio Deep Drilling of Minute Holes

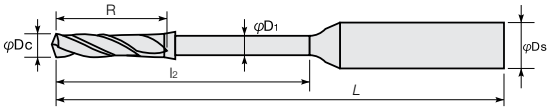
### 4. Combined With A Special Starter, It Enables Stable Deep Drilling Of Minute Holes

Appearance of Epoch Micro Starter

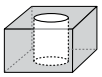
(φ0.1 or more)

# EMSBS

Advanced Engineering




Tip angle : 140°

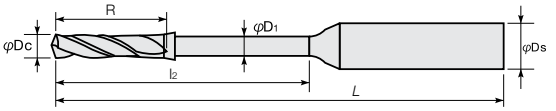
| Drill point: 140° | Ds: h4 |
|---|---|
| | Dc: 0/-0.005mm |

| Part No. | Stock | Size (mm) $D_c$ | l | $l_2$ | L/D | $D_1$ | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|---|---|
| **EMSBS0004-0.4-TH** | ☐ | 0.04 | 0.20 | 0.4 | 10 | 0.033 | 40 | 3 | TH |
| **EMSBS0004-1.2-TH** | ☐ | 0.04 | 0.20 | 1.2 | 30 | 0.033 | 40 | 3 | TH |
| **EMSBS0005-0.5-TH** | ☐ | 0.05 | 0.25 | 0.5 | 10 | 0.043 | 40 | 3 | TH |
| **EMSBS0005-1-TH** | ☐ | 0.05 | 0.25 | 1.0 | 20 | 0.043 | 40 | 3 | TH |
| **EMSBS0005-1.5-TH** | ☐ | 0.05 | 0.25 | 1.5 | 30 | 0.043 | 40 | 3 | TH |
| **EMSBS0006-0.6-TH** | ☐ | 0.06 | 0.30 | 0.6 | 10 | 0.053 | 40 | 3 | TH |
| **EMSBS0006-1.8-TH** | ☐ | 0.06 | 0.30 | 1.8 | 30 | 0.053 | 40 | 3 | TH |
| **EMSBS0007-0.7-TH** | ☐ | 0.07 | 0.35 | 0.7 | 10 | 0.063 | 40 | 3 | TH |
| **EMSBS0007-2.1-TH** | ☐ | 0.07 | 0.35 | 2.1 | 30 | 0.063 | 40 | 3 | TH |
| **EMSBS0008-0.8-TH** | ☐ | 0.08 | 0.40 | 0.8 | 10 | 0.073 | 40 | 3 | TH |
| **EMSBS0008-2.4-TH** | ☐ | 0.08 | 0.40 | 2.4 | 30 | 0.073 | 40 | 3 | TH |
| **EMSBS0009-0.9-TH** | ☐ | 0.09 | 0.45 | 0.9 | 10 | 0.083 | 40 | 3 | TH |
| **EMSBS0009-2.7-TH** | ☐ | 0.09 | 0.45 | 2.7 | 30 | 0.083 | 40 | 3 | TH |
| **EMSBS0010-1-TH** | ☐ | 0.10 | 0.50 | 1.0 | 10 | 0.090 | 45 | 3 | TH |
| **EMSBS0010-3-TH** | ☐ | 0.10 | 0.50 | 3.0 | 30 | 0.090 | 45 | 3 | TH |
| **EMSBS0010-5-TH** | ☐ | 0.10 | 0.50 | 5.0 | 50 | 0.090 | 45 | 3 | TH |
| **EMSBS0015-1.5-TH** | ☐ | 0.15 | 0.75 | 1.5 | 10 | 0.140 | 50 | 3 | TH |
| **EMSBS0015-4.5-TH** | ☐ | 0.15 | 0.75 | 4.5 | 30 | 0.140 | 50 | 3 | TH |
| **EMSBS0015-7.5-TH** | ☐ | 0.15 | 0.75 | 7.5 | 50 | 0.140 | 50 | 3 | TH |
| **EMSBS0020-2-TH** | ☐ | 0.20 | 1.00 | 2.0 | 10 | 0.190 | 45 | 3 | TH |
| **EMSBS0020-6-TH** | ☐ | 0.20 | 1.00 | 6.0 | 30 | 0.190 | 45 | 3 | TH |
| **EMSBS0020-10-TH** | ☐ | 0.20 | 1.00 | 10.0 | 50 | 0.190 | 45 | 3 | TH |
| **EMSBS0030-3-TH** | ☐ | 0.30 | 1.50 | 3.0 | 10 | 0.280 | 45 | 3 | TH |
| **EMSBS0030-9-TH** | ☐ | 0.30 | 1.50 | 9.0 | 30 | 0.280 | 45 | 3 | TH |
| **EMSBS0030-15-TH** | ☐ | 0.30 | 1.50 | 15.0 | 50 | 0.280 | 55 | 3 | TH |
| **EMSBS0040-4-TH** | ☐ | 0.40 | 2.00 | 4.0 | 10 | 0.380 | 50 | 3 | TH |
| **EMSBS0040-12-TH** | ☐ | 0.40 | 2.00 | 12.0 | 30 | 0.380 | 50 | 3 | TH |
| **EMSBS0040-20-TH** | ☐ | 0.40 | 2.00 | 20.0 | 50 | 0.380 | 60 | 3 | TH |
| **EMSBS0050-5-TH** | ☐ | 0.50 | 2.50 | 5.0 | 10 | 0.480 | 50 | 3 | TH |
| **EMSBS0050-15-TH** | ☐ | 0.50 | 2.50 | 15.0 | 30 | 0.480 | 50 | 3 | TH |

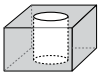
☐ = Stocked items in Japan

# EMSBS

Advanced Engineering




Tip angle : 140°

| Drill point: 140° | Ds: h4 |
|---|---|
| | Dc: 0/-0.005mm |

| Part No. | Stock | Size (mm) $D_c$ | l | $l_2$ | L/D | $D_1$ | L | $D_s$ | Type |
|---|---|---|---|---|---|---|---|---|---|
| **EMSBS0050-25-TH** | ☐ | 0.50 | 2.50 | 25.0 | 50 | 0.480 | 65 | 3 | TH |
| **EMSBS0060-6-TH** | ☐ | 0.60 | 3.00 | 6.0 | 10 | 0.570 | 55 | 3 | TH |
| **EMSBS0060-18-TH** | ☐ | 0.60 | 3.00 | 18.0 | 30 | 0.570 | 55 | 3 | TH |
| **EMSBS0060-30-TH** | ☐ | 0.60 | 3.00 | 30.0 | 50 | 0.570 | 75 | 3 | TH |
| **EMSBS0070-7-TH** | ☐ | 0.70 | 3.50 | 7.0 | 10 | 0.670 | 60 | 4 | TH |
| **EMSBS0070-21-TH** | ☐ | 0.70 | 3.50 | 21.0 | 30 | 0.670 | 60 | 4 | TH |
| **EMSBS0070-35-TH** | ☐ | 0.70 | 3.50 | 35.0 | 50 | 0.670 | 80 | 4 | TH |
| **EMSBS0080-8-TH** | ☐ | 0.80 | 4.00 | 8.0 | 10 | 0.760 | 60 | 4 | TH |
| **EMSBS0080-24-TH** | ☐ | 0.80 | 4.00 | 24.0 | 30 | 0.760 | 60 | 4 | TH |
| **EMSBS0080-40-TH** | ☐ | 0.80 | 4.00 | 40.0 | 50 | 0.760 | 85 | 4 | TH |
| **EMSBS0090-9-TH** | ☐ | 0.90 | 4.50 | 9.0 | 10 | 0.850 | 65 | 4 | TH |
| **EMSBS0090-27-TH** | ☐ | 0.90 | 4.50 | 27.0 | 30 | 0.850 | 65 | 4 | TH |
| **EMSBS0090-45-TH** | ☐ | 0.90 | 4.50 | 45.0 | 50 | 0.850 | 90 | 4 | TH |
| **EMSBS0100-10-TH** | ☐ | 1.00 | 5.00 | 10.0 | 10 | 0.950 | 70 | 4 | TH |
| **EMSBS0100-30-TH** | ☐ | 1.00 | 5.00 | 30.0 | 30 | 0.950 | 70 | 4 | TH |
| **EMSBS0100-50-TH** | ☐ | 1.00 | 5.00 | 50.0 | 50 | 0.950 | 100 | 4 | TH |

☐ = Stocked items in Japan

# EMSBS

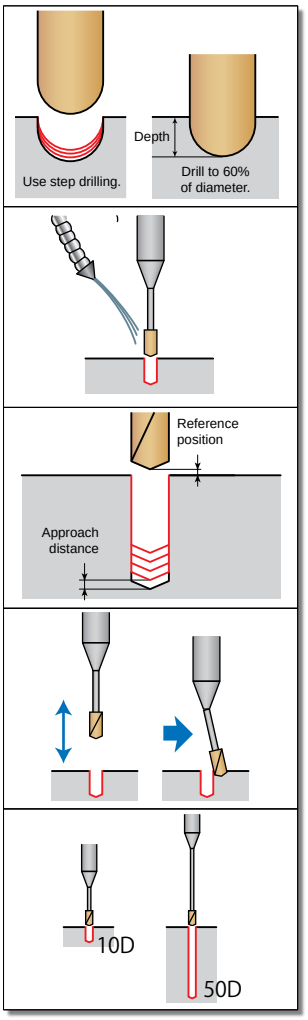
Advanced Engineering

| Part No. | D | L | L/D | 1 Aluminum resin n min-1 | 1 Vf mm/min | 1 (mm) Step feed | 2 Carbon Steel (180~250HB) n min-1 | 2 Vf mm/min | 2 (mm) Step feed | 3 Stainless Steel (25~35HRC) n min-1 | 3 Vf mm/min | 3 (mm) Step feed | 4 Pre-hardened Steel (35~45HRC) n min-1 | 4 Vf mm/min | 4 (mm) Step feed | 5 Hardened Steel (45~55HRC) n min-1 | 5 Vf mm/min | 5 (mm) Step feed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMSBS0004-0.4-TH | 0.04 | 0.4 | 10 | 39,789 | 80 | 0.004 | 35,810 | 72 | 0.004 | 31,831 | 64 | 0.004 | 27,852 | 56 | 0.003 | 23,873 | 24 | 0.002 |
| EMSBS0004-1.2-TH | 0.04 | 1.2 | 30 | 39,789 | 80 | 0.004 | 35,810 | 72 | 0.004 | 31,831 | 64 | 0.004 | 27,852 | 56 | 0.003 | 23,873 | 24 | 0.002 |
| EMSBS0005-0.5-TH | 0.05 | 0.5 | 10 | 38,197 | 76 | 0.005 | 31,831 | 64 | 0.005 | 28,648 | 57 | 0.005 | 25,465 | 51 | 0.004 | 22,282 | 22 | 0.003 |
| EMSBS0005-1-TH | 0.05 | 1.0 | 20 | 38,197 | 76 | 0.005 | 31,831 | 64 | 0.005 | 28,648 | 57 | 0.005 | 25,465 | 51 | 0.004 | 22,282 | 22 | 0.003 |
| EMSBS0005-1.5-TH | 0.05 | 1.5 | 30 | 38,197 | 76 | 0.005 | 25,465 | 51 | 0.005 | 22,918 | 46 | 0.005 | 20,372 | 41 | 0.004 | 17,825 | 18 | 0.003 |
| EMSBS0006-0.6-TH | 0.06 | 0.6 | 10 | 37,136 | 74 | 0.006 | 29,178 | 58 | 0.006 | 26,526 | 53 | 0.006 | 23,873 | 48 | 0.004 | 21,221 | 21 | 0.003 |
| EMSBS0006-1.8-TH | 0.06 | 1.8 | 30 | 37,136 | 74 | 0.006 | 29,178 | 58 | 0.006 | 26,526 | 53 | 0.006 | 23,873 | 48 | 0.004 | 21,221 | 21 | 0.003 |
| EMSBS0007-0.7-TH | 0.07 | 0.7 | 10 | 36,378 | 73 | 0.007 | 27,284 | 55 | 0.007 | 25,010 | 50 | 0.007 | 22,736 | 45 | 0.005 | 20,463 | 20 | 0.004 |
| EMSBS0007-2.1-TH | 0.07 | 2.1 | 30 | 36,378 | 73 | 0.007 | 27,284 | 55 | 0.007 | 25,010 | 50 | 0.007 | 22,736 | 45 | 0.005 | 20,463 | 20 | 0.004 |
| EMSBS0008-0.8-TH | 0.08 | 0.8 | 10 | 35,810 | 72 | 0.008 | 27,852 | 56 | 0.008 | 25,863 | 52 | 0.008 | 23,873 | 48 | 0.006 | 21,884 | 22 | 0.004 |
| EMSBS0008-2.4-TH | 0.08 | 2.4 | 30 | 35,810 | 72 | 0.008 | 27,852 | 56 | 0.008 | 25,863 | 52 | 0.008 | 23,873 | 48 | 0.006 | 21,884 | 22 | 0.004 |
| EMSBS0009-0.9-TH | 0.09 | 0.9 | 10 | 35,368 | 71 | 0.009 | 26,526 | 53 | 0.009 | 24,757 | 50 | 0.009 | 22,989 | 46 | 0.006 | 21,221 | 21 | 0.005 |
| EMSBS0009-2.7-TH | 0.09 | 2.7 | 30 | 35,368 | 71 | 0.009 | 26,526 | 53 | 0.009 | 24,757 | 50 | 0.009 | 22,989 | 46 | 0.006 | 21,221 | 21 | 0.005 |
| EMSBS0010-1-TH | 0.10 | 1.0 | 10 | 35,014 | 105 | 0.010 | 25,465 | 76 | 0.010 | 23,873 | 72 | 0.01 | 22,282 | 67 | 0.007 | 20,690 | 41 | 0.005 |
| EMSBS0010-3-TH | 0.10 | 3.0 | 30 | 35,014 | 105 | 0.010 | 25,465 | 76 | 0.010 | 23,873 | 72 | 0.01 | 22,282 | 67 | 0.007 | 20,690 | 41 | 0.005 |
| EMSBS0010-5-TH | 0.10 | 5.0 | 50 | 28,011 | 84 | 0.010 | 20,372 | 61 | 0.010 | 19,099 | 57 | 0.01 | 17,825 | 53 | 0.007 | 16,552 | 33 | 0.005 |
| EMSBS0015-1.5-TH | 0.15 | 1.5 | 10 | 25,465 | 76 | 0.015 | 23,343 | 70 | 0.015 | 21,221 | 64 | 0.015 | 20,160 | 60 | 0.011 | 19,099 | 38 | 0.008 |
| EMSBS0015-4.5-TH | 0.15 | 4.5 | 30 | 25,465 | 76 | 0.015 | 23,343 | 70 | 0.015 | 21,221 | 64 | 0.015 | 20,160 | 60 | 0.011 | 19,099 | 38 | 0.008 |
| EMSBS0015-7.5-TH | 0.15 | 7.5 | 50 | 20,372 | 61 | 0.015 | 18,674 | 56 | 0.015 | 16,977 | 51 | 0.015 | 16,128 | 48 | 0.011 | 15,279 | 31 | 0.008 |
| EMSBS0020-2-TH | 0.20 | 2.0 | 10 | 23,873 | 95 | 0.020 | 20,690 | 83 | 0.020 | 19,099 | 76 | 0.02 | 17,507 | 70 | 0.014 | 16,711 | 50 | 0.010 |
| EMSBS0020-6-TH | 0.20 | 6.0 | 30 | 23,873 | 95 | 0.020 | 20,690 | 83 | 0.020 | 19,099 | 76 | 0.02 | 17,507 | 70 | 0.014 | 16,711 | 50 | 0.010 |
| EMSBS0020-10-TH | 0.20 | 10.0 | 50 | 19,099 | 76 | 0.020 | 16,552 | 66 | 0.020 | 15,279 | 61 | 0.02 | 14,006 | 56 | 0.014 | 13,369 | 40 | 0.010 |
| EMSBS0030-3-TH | 0.30 | 3.0 | 10 | 15,915 | 64 | 0.030 | 14,854 | 59 | 0.030 | 13,793 | 55 | 0.03 | 12,732 | 51 | 0.021 | 12,202 | 37 | 0.015 |
| EMSBS0030-9-TH | 0.30 | 9.0 | 30 | 15,915 | 64 | 0.030 | 14,854 | 59 | 0.030 | 13,793 | 55 | 0.03 | 12,732 | 51 | 0.021 | 12,202 | 37 | 0.015 |
| EMSBS0030-15-TH | 0.30 | 15.0 | 50 | 12,732 | 51 | 0.030 | 11,884 | 48 | 0.030 | 11,035 | 44 | 0.03 | 10,186 | 41 | 0.021 | 9,762 | 29 | 0.015 |
| EMSBS0040-4-TH | 0.40 | 4.0 | 10 | 13,528 | 54 | 0.040 | 12,335 | 49 | 0.040 | 11,937 | 48 | 0.04 | 11,539 | 46 | 0.028 | 10,743 | 43 | 0.020 |
| EMSBS0040-12-TH | 0.40 | 12.0 | 30 | 13,528 | 54 | 0.040 | 12,335 | 49 | 0.040 | 11,937 | 48 | 0.04 | 11,539 | 46 | 0.028 | 10,743 | 43 | 0.020 |
| EMSBS0040-20-TH | 0.40 | 20.0 | 50 | 10,823 | 43 | 0.040 | 9,868 | 39 | 0.040 | 9,549 | 38 | 0.04 | 9,231 | 37 | 0.028 | 8,594 | 34 | 0.020 |
| EMSBS0050-5-TH | 0.50 | 5.0 | 10 | 10,823 | 54 | 0.050 | 9,868 | 49 | 0.050 | 9,549 | 48 | 0.05 | 9,231 | 46 | 0.035 | 8,594 | 43 | 0.025 |
| EMSBS0050-15-TH | 0.50 | 15.0 | 30 | 10,823 | 54 | 0.050 | 9,868 | 49 | 0.050 | 9,549 | 48 | 0.05 | 9,231 | 46 | 0.035 | 8,594 | 43 | 0.025 |
| EMSBS0050-25-TH | 0.50 | 25.0 | 50 | 8,658 | 43 | 0.050 | 7,894 | 39 | 0.050 | 7,639 | 38 | 0.05 | 7,385 | 37 | 0.035 | 6,875 | 34 | 0.025 |
| EMSBS0060-6-TH | 0.60 | 6.0 | 10 | 9,019 | 54 | 0.060 | 8,223 | 49 | 0.060 | 7,958 | 48 | 0.06 | 7,692 | 46 | 0.042 | 7,162 | 43 | 0.030 |
| EMSBS0060-18-TH | 0.60 | 18.0 | 30 | 9,019 | 54 | 0.060 | 8,223 | 49 | 0.060 | 7,958 | 48 | 0.06 | 7,692 | 46 | 0.042 | 7,162 | 43 | 0.030 |
| EMSBS0060-30-TH | 0.60 | 30.0 | 50 | 7,215 | 43 | 0.060 | 6,578 | 39 | 0.060 | 6,366 | 38 | 0.06 | 6,154 | 37 | 0.042 | 5,730 | 34 | 0.030 |
| EMSBS0070-7-TH | 0.70 | 7.0 | 10 | 7,730 | 54 | 0.070 | 7,048 | 49 | 0.070 | 6,821 | 48 | 0.07 | 6,594 | 46 | 0.049 | 6,139 | 43 | 0.035 |
| EMSBS0070-21-TH | 0.70 | 21.0 | 30 | 7,730 | 54 | 0.070 | 7,048 | 49 | 0.070 | 6,821 | 48 | 0.07 | 6,594 | 46 | 0.049 | 6,139 | 43 | 0.035 |
| EMSBS0070-35-TH | 0.70 | 35.0 | 50 | 6,184 | 43 | 0.070 | 5,639 | 39 | 0.070 | 5,457 | 38 | 0.07 | 5,275 | 37 | 0.049 | 4,911 | 34 | 0.035 |
| EMSBS0080-8-TH | 0.80 | 8.0 | 10 | 6,764 | 54 | 0.080 | 6,167 | 49 | 0.080 | 5,968 | 48 | 0.08 | 5,769 | 46 | 0.056 | 5,371 | 43 | 0.040 |
| EMSBS0080-24-TH | 0.80 | 24.0 | 30 | 6,764 | 54 | 0.080 | 6,167 | 49 | 0.080 | 5,968 | 48 | 0.08 | 5,769 | 46 | 0.056 | 5,371 | 43 | 0.040 |
| EMSBS0080-40-TH | 0.80 | 40.0 | 50 | 5,411 | 43 | 0.080 | 4,934 | 39 | 0.080 | 4,775 | 38 | 0.08 | 4,615 | 37 | 0.056 | 4,297 | 34 | 0.040 |
| EMSBS0090-9-TH | 0.90 | 9.0 | 10 | 6,013 | 54 | 0.090 | 5,482 | 49 | 0.090 | 5,305 | 48 | 0.09 | 5,128 | 46 | 0.063 | 4,775 | 43 | 0.045 |
| EMSBS0090-27-TH | 0.90 | 27.0 | 30 | 6,013 | 54 | 0.090 | 5,482 | 49 | 0.090 | 5,305 | 48 | 0.09 | 5,128 | 46 | 0.063 | 4,775 | 43 | 0.045 |
| EMSBS0090-45-TH | 0.90 | 45.0 | 50 | 4,810 | 43 | 0.090 | 4,386 | 39 | 0.090 | 4,244 | 38 | 0.09 | 4,103 | 37 | 0.063 | 3,820 | 34 | 0.045 |
| EMSBS0100-10-TH | 1.00 | 10.0 | 10 | 5,411 | 54 | 0.100 | 4,934 | 49 | 0.100 | 4,775 | 48 | 0.1 | 4,615 | 46 | 0.070 | 4,297 | 43 | 0.050 |
| EMSBS0100-30-TH | 1.00 | 30.0 | 30 | 5,411 | 54 | 0.100 | 4,934 | 49 | 0.100 | 4,775 | 48 | 0.1 | 4,615 | 46 | 0.070 | 4,297 | 43 | 0.050 |
| EMSBS0100-50-TH | 1.00 | 50.0 | 50 | 4,329 | 43 | 0.100 | 3,947 | 39 | 0.100 | 3,820 | 38 | 0.1 | 3,692 | 37 | 0.070 | 3,438 | 34 | 0.050 |

- 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 (R2) 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=5mm and tool= Ø0.5×5mm, drilling depth should be 5.14mm (from tip of tool).

# 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.
Hole depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For Ø0.1, 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 Ø1 × 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)

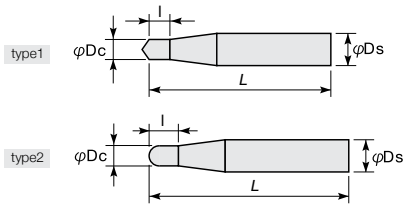
### When focusing on accuracy for hole depths of 30D or greater

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.

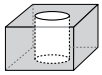
# EMST

## Special Starter for EMSBS

Advanced Engineering







| | |
|---|---|
| Dc<0.2: | -0.005~-0.01mm |
| Dc≧0.2: | -0.005~-0.015mm |

| Part No. | Stock | Size (mm) $D_c$ | l | L | $D_s$ | Type |
|---|---|---|---|---|---|---|
| **EMST0004-TH** | □ | 0.04 | **0.04** | 45 | 3 | 1 |
| **EMST0005-TH** | □ | 0.05 | **0.05** | 45 | 3 | 1 |
| **EMST0006-TH** | □ | 0.06 | **0.06** | 45 | 3 | 1 |
| **EMST0007-TH** | □ | 0.07 | **0.07** | 45 | 3 | 1 |
| **EMST0008-TH** | □ | 0.08 | **0.08** | 45 | 3 | 1 |
| **EMST0009-TH** | □ | 0.09 | **0.09** | 45 | 3 | 1 |
| **EMST0010-TH** | □ | 0.10 | **0.10** | 45 | 3 | 2 |
| **EMST0012-TH** | □ | 0.12 | **0.12** | 45 | 3 | 2 |
| **EMST0013-TH** | □ | 0.13 | **0.13** | 45 | 3 | 2 |
| **EMST0014-TH** | □ | 0.14 | **0.14** | 45 | 3 | 2 |
| **EMST0015-TH** | □ | 0.15 | **0.15** | 45 | 3 | 2 |
| **EMST0016-TH** | □ | 0.16 | **0.16** | 45 | 3 | 2 |
| **EMST0017-TH** | □ | 0.17 | **0.17** | 45 | 3 | 2 |
| **EMST0018-TH** | □ | 0.18 | **0.18** | 45 | 3 | 2 |
| **EMST0019-TH** | □ | 0.19 | **0.19** | 45 | 3 | 2 |
| **EMST0020-TH** | □ | 0.20 | **0.20** | 45 | 3 | 2 |
| **EMST0030-TH** | □ | 0.30 | **0.30** | 45 | 3 | 2 |
| **EMST0040-TH** | □ | 0.40 | **0.40** | 45 | 3 | 2 |
| **EMST0050-TH** | □ | 0.50 | **0.50** | 45 | 3 | 2 |
| **EMST0060-TH** | □ | 0.60 | **0.60** | 45 | 3 | 2 |
| **EMST0070-TH** | □ | 0.70 | **0.70** | 45 | 4 | 2 |
| **EMST0080-TH** | □ | 0.80 | **0.80** | 45 | 4 | 2 |
| **EMST0090-TH** | □ | 0.90 | **0.90** | 45 | 4 | 2 |
| **EMST0100-TH** | □ | 1.00 | **1.00** | 45 | 4 | 2 |

□ = Stocked items in Japan

# EMST

Advanced Engineering

| Part No. | D | L | 1 Aluminum resin n min$^{-1}$ | Vf mm/min | (mm) Step feed | 2 Carbon Steel (180~250HB) n min$^{-1}$ | Vf mm/min | (mm) Step feed |
|---|---|---|---|---|---|---|---|---|
| **EMST0004-TH** | **0.04** | **0.4** | 39,789 | 20 | 0.001 | 35,810 | 18 | 0.001 |
| **EMST0005-TH** | **0.05** | **0.5** | 38,197 | 19 | 0.001 | 31,831 | 16 | 0.001 |
| **EMST0006-TH** | **0.06** | **0.6** | 37,136 | 19 | 0.002 | 29,178 | 15 | 0.002 |
| **EMST0007-TH** | **0.07** | **0.7** | 36,378 | 18 | 0.002 | 27,284 | 14 | 0.002 |
| **EMST0008-TH** | **0.08** | **0.8** | 35,810 | 18 | 0.002 | 27,852 | 14 | 0.002 |
| **EMST0009-TH** | **0.09** | **0.9** | 35,368 | 18 | 0.002 | 26,526 | 13 | 0.002 |
| **EMST0010-TH** | **0.10** | **1.0** | 35,014 | 26 | 0.003 | 25,465 | 19 | 0.003 |
| **EMST0015-TH** | **0.15** | **1.5** | 25,465 | 19 | 0.004 | 23,343 | 18 | 0.004 |
| **EMST0020-TH** | **0.20** | **2.0** | 23,873 | 24 | 0.005 | 20,690 | 21 | 0.005 |
| **EMST0030-TH** | **0.30** | **3.0** | 15,915 | 16 | 0.008 | 14,854 | 15 | 0.008 |
| **EMST0040-TH** | **0.40** | **4.0** | 13,528 | 14 | 0.010 | 12,335 | 12 | 0.010 |
| **EMST0050-TH** | **0.50** | **5.0** | 10,823 | 14 | 0.013 | 9,868 | 12 | 0.013 |
| **EMST0060-TH** | **0.60** | **6.0** | 9,019 | 14 | 0.015 | 8,223 | 12 | 0.015 |
| **EMST0070-TH** | **0.70** | **7.0** | 7,730 | 14 | 0.018 | 7,048 | 12 | 0.018 |
| **EMST0080-TH** | **0.80** | **8.0** | 6,764 | 14 | 0.020 | 6,167 | 12 | 0.020 |
| **EMST0090-TH** | **0.90** | **9.0** | 6,013 | 14 | 0.023 | 5,482 | 12 | 0.023 |
| **EMST0100-TH** | **1.00** | **10.0** | 5,411 | 14 | 0.025 | 4,934 | 12 | 0.025 |

| Part No. | 3 Stainless Steel (25~35HRC) n min$^{-1}$ | Vf mm/min | (mm) Step feed | 4 Pre-hardened Steel (35~45HRC) n min$^{-1}$ | Vf mm/min | (mm) Step feed | 5 Hardened Steel (45~55HRC) n min$^{-1}$ | Vf mm/min | (mm) Step feed |
|---|---|---|---|---|---|---|---|---|---|
| **EMST0004-TH** | 31,831 | 16 | 0.001 | 27,852 | 14 | 0.001 | 23,873 | 6 | 0.001 |
| **EMST0005-TH** | 28,648 | 14 | 0.001 | 25,465 | 13 | 0.001 | 22,282 | 6 | 0.001 |
| **EMST0006-TH** | 26,526 | 13 | 0.002 | 23,873 | 12 | 0.001 | 21,221 | 5 | 0.001 |
| **EMST0007-TH** | 25,010 | 13 | 0.002 | 22,736 | 11 | 0.001 | 20,463 | 5 | 0.001 |
| **EMST0008-TH** | 25,863 | 13 | 0.002 | 23,873 | 12 | 0.001 | 21,884 | 5 | 0.001 |
| **EMST0009-TH** | 24,757 | 12 | 0.002 | 22,989 | 11 | 0.002 | 21,221 | 5 | 0.001 |
| **EMST0010-TH** | 23,873 | 18 | 0.003 | 22,282 | 17 | 0.002 | 20,690 | 10 | 0.001 |
| **EMST0015-TH** | 21,221 | 16 | 0.004 | 20,160 | 15 | 0.003 | 19,099 | 10 | 0.002 |
| **EMST0020-TH** | 19,099 | 19 | 0.005 | 17,507 | 18 | 0.004 | 16,711 | 13 | 0.003 |
| **EMST0030-TH** | 13,793 | 14 | 0.008 | 12,732 | 13 | 0.005 | 12,202 | 9 | 0.004 |
| **EMST0040-TH** | 11,937 | 12 | 0.010 | 11,539 | 12 | 0.007 | 10,743 | 11 | 0.005 |
| **EMST0050-TH** | 9,549 | 12 | 0.013 | 9,231 | 12 | 0.009 | 8,594 | 11 | 0.006 |
| **EMST0060-TH** | 7,958 | 12 | 0.015 | 7,692 | 12 | 0.011 | 7,162 | 11 | 0.008 |
| **EMST0070-TH** | 6,821 | 12 | 0.018 | 6,594 | 12 | 0.012 | 6,139 | 11 | 0.009 |
| **EMST0080-TH** | 5,968 | 12 | 0.020 | 5,769 | 12 | 0.014 | 5,371 | 11 | 0.010 |
| **EMST0090-TH** | 5,305 | 12 | 0.023 | 5,128 | 12 | 0.016 | 4,775 | 11 | 0.011 |
| **EMST0100-TH** | 4,775 | 12 | 0.025 | 4,615 | 12 | 0.018 | 4,297 | 11 | 0.013 |

- 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).
- Hole depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For Ø0.1, depth=0.06mm)

# Notes

# Notes

# Notes

# Notes

# Notes

# Notes

# Notes

# Notes

# Notes

# Notes

MITSUBISHI MATERIALS U.S.A. CORPORATION

## LOS ANGELES HEAD OFFICE

11250 Slater Avenue
Fountain Valley, CA 92708, USA
Tel: 714 352 6100
Fax: 714 352 6190

## HT DIVISION (CUSTOMER SERVICE)

41700 Gardenbrook Road, Suite 120
Novi, MI 48375, USA
Tel: 248 308 2620
Fax: 248 308 2627
Email: rfqHTdiv@mmus.com

## DISTRIBUTED BY:

**Mitsubishi Hitachi Tool Engineering, Ltd.**
www.mmc-hitachitool.co.jp/e/

(Manufacturer)
2015 1st Edition

Advanced Engineering