OSG PHOENIX®

综合样本 2017

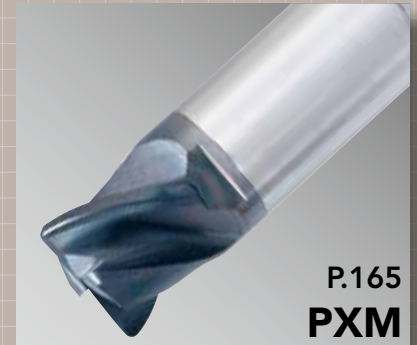
Catalog 2017

OSG Corporation

钻头加工
Drilling

INDEX

铣刀加工
Milling



» 铝材用精加工铣刀
Finishing Cutter for Aluminum

- **铝制刀体实现惊人的轻量化**
  即使是小型加工中心也能使用的丰富的产品尺寸
  Incredibly light weight with aluminum body construction!
  Broad size lineup to accommodate various cutting environment even small machining centers.

- **部件数少，方便刀具管理及装卸**
  Few required components makes easy setup and simple tool management!

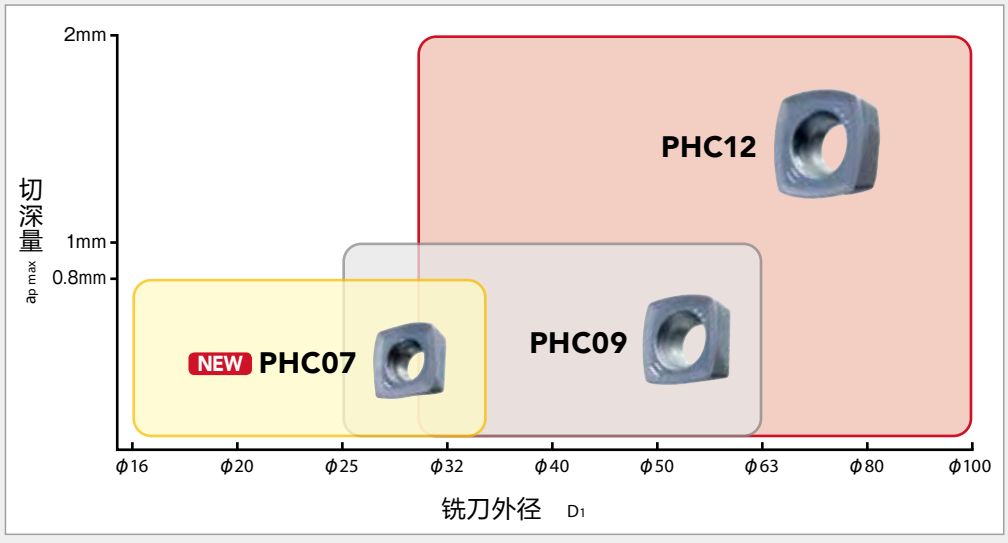
» 6角方肩铣刀 PSTW
6-corner Shoulder Cutter

•两面6角(90°)刀片
Double-sided 6-corner (90°) insert

对应重切削加工的高效率6角方肩铣刀。
提高了自身刚性且具厚度的刀片和正前角的设计，可以对应易发生振动的、L/D=5D的悬伸较长的加工。
The PSTW is a 6-corner shoulder cutter series designed for high efficiency heavy milling. Engineered to effectively process long overhang length applications with strong chattering resistance by a high rigidity and positive rake angle geometry.

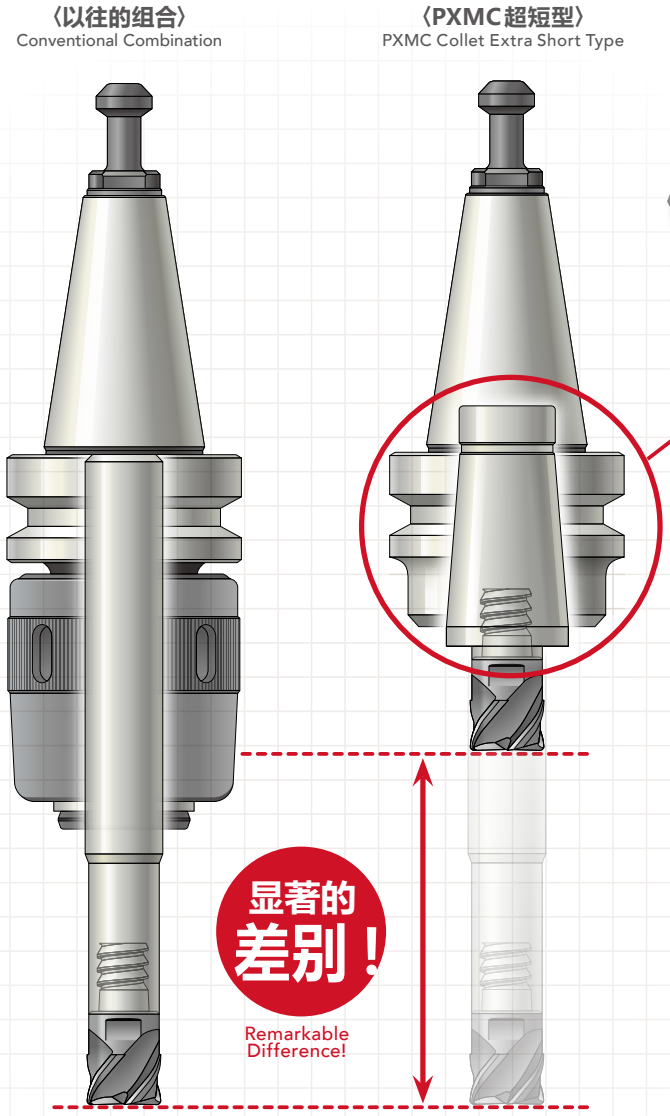
» 四角刀片高进给铣刀 PHC 小径07型
High Feed Cutter Small Diameter 07 Type
for PHC07

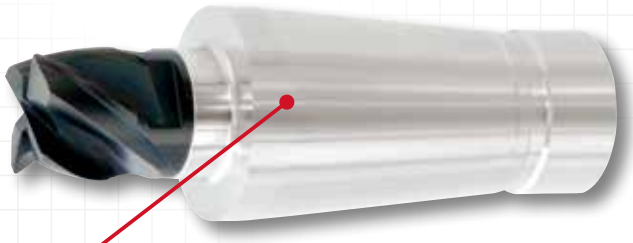
•增加小径(φ16~φ35)！能应对更广泛领域的加工。
Expanded with small diameter sizes (ϕ16- ϕ35) to accommodate an even broader machining range!



» 可换头式铣刀 PXM专用夹具
Collet for PXM Exchangeable Head End Mill

能更好地发挥机器的性能！
Further brings out your machine's full potential!





特点 Features

1 小型加工中心也能取得惊人的排屑性
Powerful chip evacuation unthinkable by a small machining center

2 大幅缩短悬伸长度，实现高刚性
Improves rigidity with significantly reduced overhang length

3 丰富的刀头品种
·对应铝材、不锈钢、钢材
·可以实现从粗加工到精加工的广泛加工
A wide variety of exchangeable heads
· Suitable for steel, stainless steel and aluminum
· Wide processing range from roughing to finishing

4 与一体式刀柄相比，发生问题时只需更换夹具，具有超高性价比
Greater cost performance compared to monoblock type holders, only need to change the collet in case of trouble.

Designation (Body)

刀体的表示方法

PHC	12	R	050	SS	42	-	4	S
①	②	③	④	⑤	⑥		⑦	⑧

①缩写 Abbreviation

例:
PHC=
高进给刀具
High Feed Cutter

③方向 Cutting Direction

R=右手 Right hand
L=左手 Left hand

⑥装夹直径 Mounting Diameter

例:
42=42mm

⑦刃数 No. of Flute

例:
4=4刃 Flute

②刀片尺寸 Insert Size

例:
12=12mm

④刀盘直径 Cutter Diameter

例:
050=50mm

⑤装夹方式 Mounting Type

A	刀座型（英寸） Bore Type (Inch)
M	刀座型（毫米） Bore Type (Metric)
SA	直柄型（英寸） Straight Shank (Inch)
SS	直柄型（毫米） Straight Shank (Metric)
MT	莫氏锥柄 Morse Taper Shank
SF	刀头交换式铣刀 Screw Fit Type
FS	侧固式 Flat Shank

⑧柄型 Shank Type

S	短柄型 Short
L	长柄型 Long
LL	超长柄型 Extra Long

Designation (Insert)

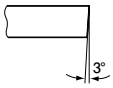
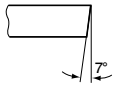
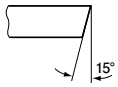
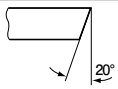
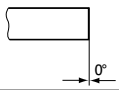
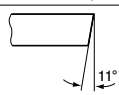
刀片的表示方法

Z	D	K	T
①	②	③	④

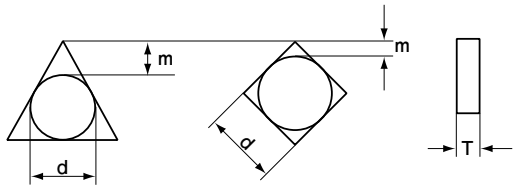
① 形状 Shape of Insert

C	菱形80° Diamond apex 80°	
D	菱形55° Diamond apex 55°	
O	正八角形 Octagon	
R	圆形 Round	
S	正方形 Square	
T	正三角形 Triangle	
V	菱形35° Diamond apex 35°	
W	不等角六角型 Axonometric hexagon	
Z	其他形状 Other shapes	–

② 后角 Clearance Angle

A	3°	
C	7°	
D	15°	
E	20°	
N	0°	
P	11°	
X	特殊形状 Special Dimension	

③ 公差 Tolerance

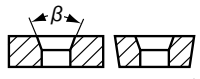
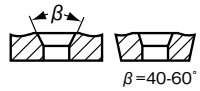
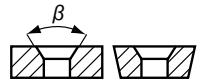
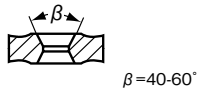
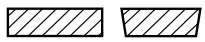


记号 Symbol	内接圆 许容差 ϕd (mm) Inscribed circle tolerance	圆弧 许容差 m (mm) Corner height tolerance	厚度 许容差 T (mm) Thickness tolerance
A	±0.025	±0.005	±0.025
C	±0.025	±0.013	±0.025
E	±0.025	±0.025	±0.025
H	±0.013	±0.013	±0.025
K※	±0.05～±0.15	±0.013	±0.025
M※	±0.05～±0.15	±0.08～±0.18	±0.13
N※	±0.05～±0.15	±0.08～±0.18	±0.025

※印 :为刀片侧面烧结处理 Sintered insert shown on the side

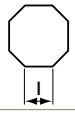
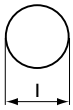
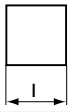
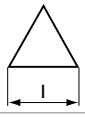
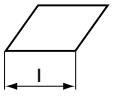
注 :视产品而定，有不同的情况。 Note: Above values may vary depend on product

④ 断屑槽形状 Feature of Insert

记号 Symbol	孔形状 Shape of Hole	有无断屑槽 With or without Breaker	刀片横截面 Insert cross section
W	上部倒角，下部圆筒 (40°～60°) Partial cylindrical hole	无 No breaker	 β=40-60°
T		单面 One side	 β=40-60°
B	上部倒角，下部圆筒 (70°～90°) Partial cylindrical hole	无 No breaker	 β=70-90°
U	部分圆筒(柱)孔片面取 (40°～60°) Partial cylindrical hole, both sides	两面 Both side	 β=40-60°
N	–	无 No breaker	
R	–	单面 One side	

15	05	08	S	R	-	GM
⑤	⑥	⑦	⑧	⑨	-	⑩

⑤ 切削刃长度 l Length of Cutting Edge

O	
R	
S	
T	
Z	

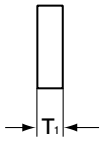
⑦圆弧记号 Corner Radius

记号 Symbol	圆弧半径 r
02	R0.2
04	R0.4
08	R0.8
12	R1.2
16	R1.6
24	R2.4

⑨刀片方向 Cutting Direction

记号 Symbol	刀片方向 Cutting Direction
R	右手 Right hand
L	左手 Left hand
N	左右共用 Both ways

⑥厚度 T Thickness of Insert



记号 Symbol	厚度T1 (mm) Thickness
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35

⑧主切削刃记号 Type of Cutting Edge

記号 Symbol	形状 Appearance
F	 尖刃 Sharp edge
E	 圆刃 Round honing
T	 倒角刃 Chamfer honing
S	 复合刃 Combination honing

⑩断屑槽记号 Type of Insert Breaker

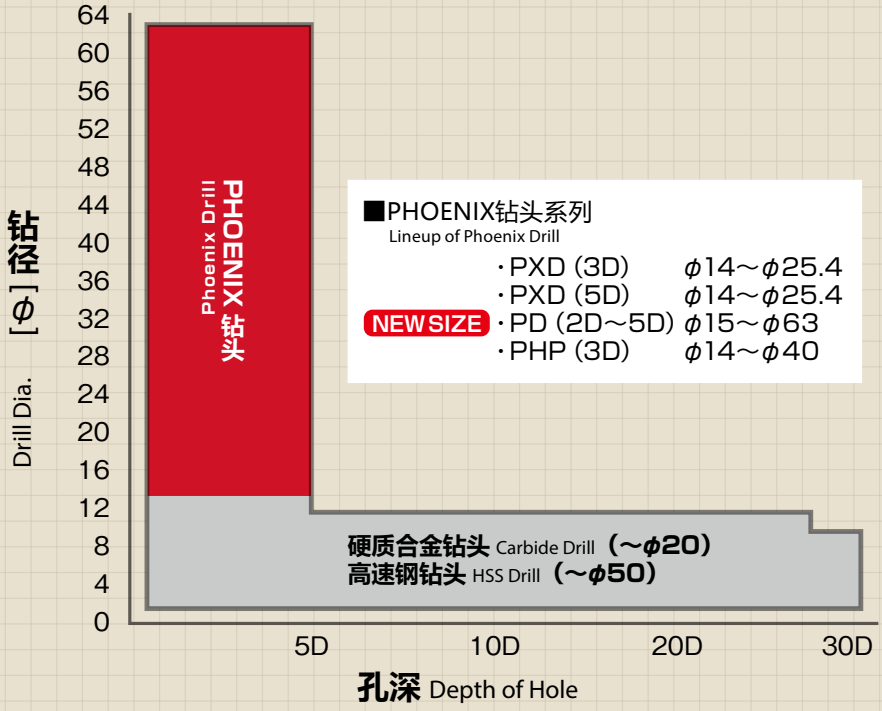
记号 Symbol	名称 Name
DN	DN断屑槽 breaker
DM	DM断屑槽 breaker
DR	DR断屑槽 breaker
NM	NM断屑槽 breaker
GL	GL断屑槽 breaker
GM	GM断屑槽 breaker
GR	GR断屑槽 breaker
HR	HR断屑槽 breaker
SM	SM断屑槽 breaker

Phoenix Drills

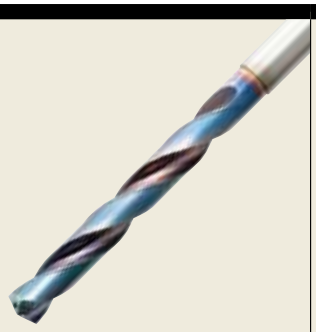
钻头的区分使用 Drill Selection

覆盖大径孔加工
OSG's Comprehensive Product Lineup for Drilling Application

孔加工对应示意图
Product Guideline



■各种钻头的区分使用 Drill Type by Application

			
高速钢钻头 HSS Drill	**硬质合金钻头** Carbide Drill	**可换头式钻头** Exchangeable Head Drill (PXD)	**可转位式钻头** Indexable Drill (PD・PHP)
●稳定的加工 Stable drilling ●适用于低功率机器 For low horsepower machines	●高速、高效率加工 High speed, high efficiency ●寿命长 Long tool life ●高精度孔 High hole accuracy	●高速、高效率加工 High speed, high efficiency ●寿命长 Long tool life ●成本低于硬质合金钻头 Lower cost than carbide drills ●较高的孔精度 Relatively high hole accuracy	●高性价比 High cost performance ●高效率加工 High efficiency operation

Features

PXD

可换头式钻头　3D/5D
Exchangeable Head Drill for 3D and 5D

- **●与硬质合金钻头相同的效率**
- **●对应高精度孔加工**
  - **・对应挤压丝锥底孔加工(仅3D型)**
- **● 一把刀体可对应多种加工尺寸**
- **● 比硬质合金钻头性价比高**
- **● 装卸简单**
  - **・不使用螺纹，简单且牢固**

- ● Efficiency: equivalent to carbide drills.
- ● For drilling holes that require accuracy.
  - · Optimal for tap drill holes for forming taps (3D only)
- ● A single cutter body is applicable for multiple drilling diameters.
- ● Cost performance: higher than carbide drills.
- ● Easy attachment and removal.
  - · Screwless, simple but firm fastening.

P.13 ~

PD

可转位式钻头
Indexable Drill

- **●槽面的精加工处理使其能在高进给的条件下加工！**
- **●外周刃、中心刃采用同规格刀片，方便刀具管理！**

- ● Finishing treatment on flute surface enables high feed machining.
- ● Using same insert to both center and peripheral cutting edges simplify tool management.

P.29 ~

PHP

可转位式钻头3D用
Indexable Drill for 3D

- **●先端角形状可对应困难的加工形状**
  - **・倾斜面，铸肌面，多层板**
- **●高速钢钻头在低速领域也可加工**

- ● Shaped corner tips for unstable drilling shapes.
  - · Inclined surface, cast surface and stacked plates.
- ● Possible to drill even in low-speed HSS areas.

P.49 ~

Tap Pilot Hole Size Chart

丝锥底孔径・推荐丝锥一览表 Recommended taps and size chart

■ PXD用 for PXD

■切削丝锥用 for Cutting Tap

螺纹名称 Thread Size	推荐底孔径 Recommended tap drill hole dia.	最小底孔径 Min. drill hole dia.	最大底孔径 Max. drill hole dia.		适用PXD刀头 Applicable PXD head	推荐丝锥商品号 Recommended Tap No.	
		各精度共通	前JIS2级用	6H 用		A-SFT	A-POT
M 15 × 1	14	13.95	14.15	14.15	PXDH1400···	8325356	8325156
M 16 × 2	14	13.9	14.2	14.21	PXDH1400···	8325357	8325157
M 16 × 1.5	14.5	14.4	14.6	14.67	PXDH1450···	8325360	8325160
M 16 × 1	15	14.95	15.15	15.15	PXDH1500···	8325362	8325162
M 17 × 1.5	15.5	15.4	15.68	15.67	PXDH1550···	8325364	8325164
M 17 × 1	16	15.95	16.15	16.15	PXDH1600···	8325366	8325166
M 18 × 2.5	15.5	15.3	15.7	15.74	PXDH1550···	8325367	3825167
M 18 × 2	16	15.9	16.2	16.21	PXDH1600···	8325369	8325169
M 18 × 1.5	16.5	16.4	16.6	16.67	PXDH1650···	8325370	8325170
M 18 × 1	17	16.95	17.15	17.15	PXDH1700···	8325372	8325172
M 20 × 2.5	17.5	17.3	17.7	17.74	PXDH1750···	8325377	8325177
M 20 × 2	18	17.9	18.2	18.21	PXDH1800···	8325379	8325179
M 20 × 1.5	18.5	18.4	18.6	18.67	PXDH1850···	8325380	8325180
M 20 × 1	19	18.95	19.15	19.15	PXDH1900···	8325382	8325182
M 22 × 2.5	19.5	19.3	19.7	19.74	PXDH1950···	8325387	8325187
M 22 × 2	20	19.9	20.2	20.21	PXDH2000···	8325389	8325189
M 22 × 1.5	20.5	20.4	20.6	20.67	PXDH2050···	8325390	8325190
M 22 × 1	21	20.95	21.15	21.15	PXDH2100···	8325392	8325192
M 24 × 3	21	20.8	21.2	21.25	PXDH2100···	8325397	8325197
M 24 × 2	22	21.9	22.2	22.21	PXDH2200···	8325399	8325199
M 24 × 1.5	22.5	22.4	22.6	22.67	PXDH2250···	8325400	8325200
M 24 × 1	23	22.95	23.15	23.15	PXDH2300···	8325402	8325202
M 27 × 3	24	23.8	24.2	24.25	PXDH2400···	8326605	–

※关于铣刀柄、长柄型的商品号，请参阅「高效率·多功能丝锥 A-TAP」样本
※ For additional sizes and styles, please refer to the high efficiency, multi-purpose A-Tap series catalog.

■挤压丝锥用底孔径(3D型) for Forming Tap (PXD 3D Type)

螺纹名称 Thread Size	推荐底孔径 Recommended tap drill hole dia.	前JIS2级用				适用PXD刀头 Applicable PXD head	推荐丝锥商品号 Recommended Tap No.
		精度 Grade	丝锥精度 RH Limit	最小底孔径 Min. drill hole dia.	最大底孔径 Max. drill hole dia.		S-XPF
M 16 × 2	14.95	STD	RH10	14.92	15.04	PXDH1495···	8322245
M 16 × 1.5	15.25	STD	RH 9	15.21	15.3	PXDH1525···	8322255
M 18 × 2.5	16.7	STD	RH11	16.63	16.78	PXDH1670···	8322263
M 18 × 1.5	17.25	STD	RH10	17.22	17.31	PXDH1725···	8322267
M 20 × 2.5	18.7	STD	RH11	18.63	18.78	PXDH1870···	8322273
M 20 × 1.5	19.25	STD	RH10	19.22	19.31	PXDH1925···	8322277
M 22 × 2.5	20.7	STD	RH11	20.63	20.78	PXDH2070···	8322283
M 22 × 1.5	21.25	STD	RH10	21.22	21.31	PXDH2125···	8322287
M 24 × 3	22.4	STD	RH13	22.36	22.53	PXDH2240···	8322295
M 24 × 1.5	23.25	STD	RH10	23.22	23.31	PXDH2325···	8322299
M 27 × 3	25.4	STD	RH13	25.36	25.53	PXDH2540···	8322305

※请使用PXD 3D型。PD、PXD 5D型不推荐进行挤压丝锥底孔加工。
※无法对应S-XPF挤压丝锥长柄型(LT-S-XPF)的底孔加工。
※ For tap drill hole of forming tap, PXD 3D should be used. PD and PXD 5D are not recommended.
※ Not compatible with the XPF long shank forming tap (LT-S-XPF).

■P2D/P3D・PHP用 for P2D/P3D and PHP

■切削丝锥用 for Cutting Tap

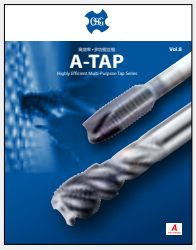
螺纹名称 Thread Size	推荐底孔径 Recommended tap drill hole diameter	最小底孔径 Min. drill hole dia.	最大底孔径 Max. drill hole dia.		适用刀体 Applicable Body			推荐丝锥商品号 Recommended Tap No.	
		各精度共通	前JIS 2级用	6H用	P2D	P3D	PHP	A-SFT	A-POT
M 17 × 1.5	15.5	15.4	15.68	15.67	P2D1550FS20M04	P3D1550FS20M04	PHP155FS20M04-3D	8325364	8325164
M 18 × 2.5	15.5	15.3	15.7	15.74				8325367	3825167
M 18 × 2	16	15.9	16.2	16.21	P2D1600FS20M04	P3D1600FS20M04	PHP160FS20M04-3D	8325369	8325169
M 18 × 1.5	16.5	16.4	16.6	16.67	P2D1650FS20M04	P3D1650FS20M04	PHP165FS20M05-3D	8325370	8325170
M 20 × 2.5	17.5	17.3	17.7	17.74	P2D1750FS20M05	P3D1750FS20M05	PHP175FS25M05-3D	8325377	8325177
					P2D1750FS25M05	P3D1750FS25M05			
M 20 × 2	18	17.9	18.2	18.21	P2D1800FS25M05	P3D1800FS25M05	PHP180FS25M05-3D	8325379	8325179
M 20 × 1.5	18.5	18.4	18.6	18.67	P2D1850FS25M05	P3D1850FS25M05	PHP185FS25M06-3D	8325380	8325180
M 22 × 2.5	19.5	19.3	19.7	19.74	P2D1950FS25M06	P3D1950FS25M06	PHP195FS25M06-3D	8325387	8325187
M 22 × 2	20	19.9	20.2	20.21	P2D2000FS25M06	P3D2000FS25M06	PHP200FS25M06-3D	8325389	8325189
M 22 × 1.5	20.5	20.4	20.6	20.67	P2D2050FS20M06	P3D2050FS20M06	PHP205FS25M06-3D	8325390	8325190
M 24 × 3	21	20.8	21.2	21.25	P2D2100FS25M07	P3D2100FS25M07	PHP210FS25M07-3D	8325397	8325197
M 24 × 2	22	21.9	22.2	22.21	P2D2200FS25M07	P3D2200FS25M07	PHP220FS25M07-3D	8325399	8325199
M 24 × 1.5	22.5	22.4	22.6	22.67	P2D2250FS25M07	P3D2250FS25M07	PHP225FS25M07-3D	8325400	8325200
M 27 × 3	24	23.8	24.2	24.25	P2D2400FS25M07	P3D2400FS25M07	PHP240FS32M07-3D	8326605	–
					P2D2400FS32M07	P3D2400FS32M07			
M 27 × 1.5	25.5	25.4	25.6	25.67	P2D2550FS25M08	P3D2550FS25M08	PHP255FS32M08-3D	8326608	
					P2D2550FS32M08	P3D2550FS32M08			
M 30 × 3.5	26.5	26.3	26.7	26.77	P2D2650FS32M08	P3D2650FS32M08	PHP265FS32M08-3D	8326614	
M 30 × 3	27	26.8	27.2	27.25	P2D2700FS32M08	P3D2700FS32M08	PHP270FS32M08-3D	8326615	
M 30 × 1.5	28.5	28.4	28.6	28.67	P2D2850FS32M08	P3D2850FS32M08	–	8326618	
M 33 × 3.5	29.5	29.3	29.7	29.77	–	P3D2950FS32M09	–	8326624	
M 33 × 3	30	29.8	30.2	30.25	P2D3000FS32M09	P3D3000FS32M09	PHP300FS32M10-3D	8326625	
M 33 × 1.5	31.5	31.5	31.4	31.6	–	P3D3150FS32M09	–	8326628	
M 36 × 4	32	31.7	32.2	32.27	P2D3200FS32M09	P3D3200FS32M09	PHP320FS32M10-3D	8326633	
					P2D3200FS40M09	P3D3200FS40M09			
M 36 × 3	33	32.8	33.2	33.25	P2D3300FS40M09	P3D3300FS40M09	PHP330FS40M10-3D	8326635	
M 36 × 1.5	34.5	34.4	34.6	34.67	–	P3D3450FS40M10	–	8326638	
M 39 × 4	35	34.7	35.2	35.27	P2D3500FS40M10	P3D3500FS40M10	PHP350FS40M12-3D	8326643	
M 42 × 4.5	37.5	37.5	37.7	37.79	–	P3D3750FS40M10	–	8326652	
M 42 × 3	39	38.8	39.2	39.25	P2D3900FS40M12	P3D3900FS40M12	PHP390FS40M12-3D	8326655	
M 42 × 1.5	40.5	40.4	40.6	40.67	–	P3D4050FS40M12	–	8326658	
M 45 × 4.5	40.5	40.2	40.7	40.79			–	8326659	
M 48 × 5	43	42.6	43.2	43.29	P2D4300FS40M12	P3D4300FS40M12	–	8326661	
M 48 × 3	45	44.8	45.2	45.25	P2D4500FS40M13	P3D4500FS40M13	–	8326665	
M 56 × 5.5	50.5	50.1	50.7	50.7	–	P3D5050FS40M14	–	8326670	

※关于铣刀柄、长柄型的商品号，请参阅「高效率·多功能丝锥 A-TAP」样本。
For additional sizes and styles, please refer to the high efficiency, multi-purpose A-Tap series catalog.

Tap Recommendations

■使用OSG Phoenix钻头进行钻孔加工后，请试用A-TAP・XPF。
Please give the A-Tap and XPF a try after drilling with the OSG Phoenix drills.

■A-Tap系列 A-Tap Series



切削丝锥中稳定加工的新标准

The new industry standard for stable threading.

■XPF系列 XPF Series

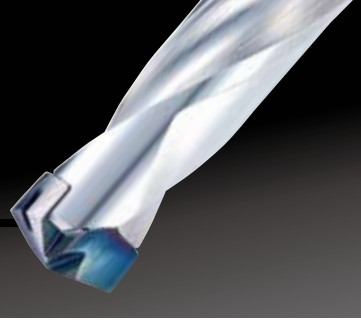
无切屑的进化型挤压丝锥

Superior forming taps that stably make threads without creating chips.

» Phoenix PXD

可换头式钻头3D/5D
Exchangeable Head Drill for 3D, 5D.

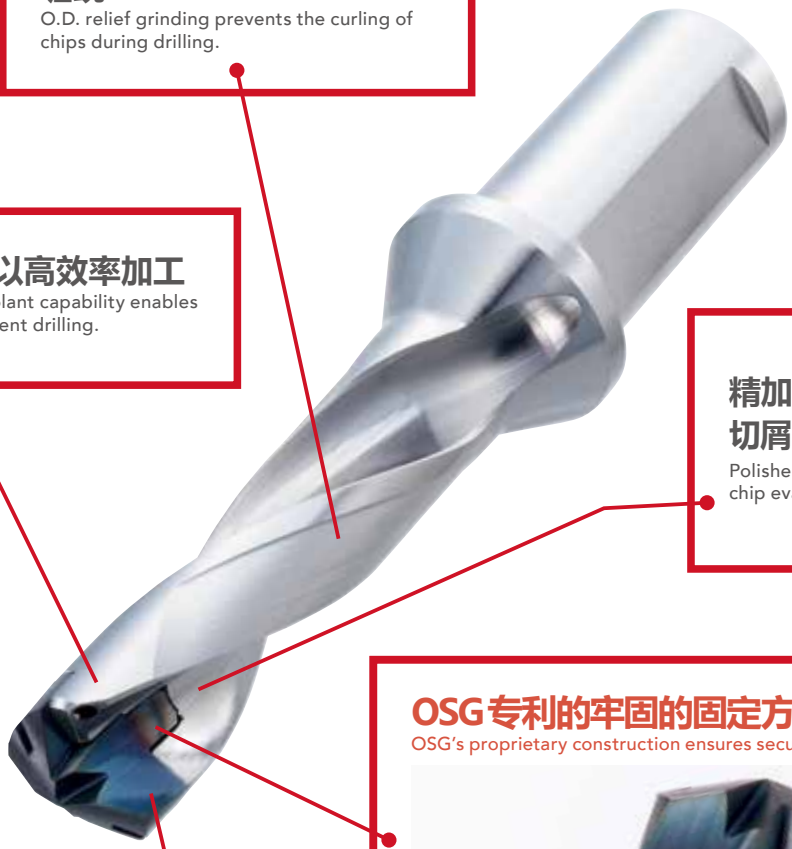
Phoenix Exchangeable Drill



特点 Features

防止加工过程中切屑的卷曲缠绕
O.D. relief grinding prevents the curling of chips during drilling.

内冷可以高效率加工
Internal coolant capability enables highly efficient drilling.



精加工槽提供良好的切屑排除性
Polished flutes enable smooth chip evacuation.

OSG专利的牢固的固定方式 PAT. in Japan
OSG's proprietary construction ensures secure mounting.

- OSG 专利的固定方法在不使用螺纹的情况下实现了牢固固定。
- 没有螺纹强度等不稳定因素，装卸方便。
- With OSG's proprietary mounting system, the exchangeable head can be securely mounted without screws.
- Eliminates loose screw problems. Easy attachment and removal system.

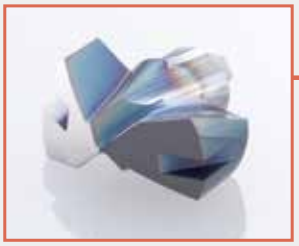
最适合大径加工的刃形
Cutting edges designed optimally for large-diameter drilling.

■根据加工材料的不同选择刀头
Exchangeable head selection based on work material

钢用(PC) For steel

○ 专为钢加工设计的刀头
Exchangeable head designed for steel

○ 最适用于软钢～低、中碳素钢的加工
Suitable for mild steel and low to medium carbon steel



铸铁用(KC) For cast iron

○ 专为铸铁加工设计的刀头
Exchangeable head designed for cast iron

○ 最适用于铸铁、球墨铸铁的加工
Suitable for cast iron and ductile cast iron

非铁用(NC) For non-ferrous metal

○ 专为非铁金属加工设计的刀头
Exchangeable head designed for non-ferrous metals

○ 最适用于铝合金铸件等的加工
Suitable for aluminum alloy casting

	低碳素钢 Low Carbon Steel	中碳素钢 Medium Carbon Steel	高碳素钢 High Carbon Steel	合金钢 Alloy Steel	调质钢 Hardened Steel		铸铁 Cast Iron	球墨铸铁 Ductile Cast Iron	铜合金 Copper Alloy	铝合金铸件 Aluminum Alloy Casting
	C～0.25%	C0.25～0.45%	C0.45%～	SCM	～35HRC	35～45HRC	FC	FCD	Cu	AC·ADC
PC(钢用) for Steel	◎	◎	◎	○	○		○	○		
KC(铸铁用) for Cast Iron	○	○	○	○	○		◎	◎		
NC(非铁用) for Non-ferrous Metal									○	◎

◎第一推荐奖材质 Best ○第二推荐奖材质 Good

■PXD专用WDI 涂层(PC·KC)
OSG's proprietary WDI coating engineered exclusively for PXD

○ 采用PXD专用WDI涂层，抑制了外周刃带的磨损。在高速领域中实现长寿命。
The WDI coating on the PXD prevents margin wear, thereby enabling high speed drilling and prolonging tool life.

	涂层构造 Coating Structure	厚度 Thickness (μm)	硬度 Surface Hardness (HV)	氧化开始温度 Oxidation Temperature (℃)
PXD专用 WDI®涂层 WDI coating exclusive for PXD	多层 Multiple Layer	7	3,300	1,100
TiAlN涂层 TiAlN Coating	2层 Dual Layer	4	2,700	800

WDI为OSG株式会社的注册商标。
WDI is a registered trademark of OSG Corporation.

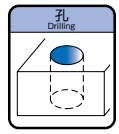
■只需更换刀头，一把刀体就能对应多种加工径
A single cutter body applicable for multiple drilling diameters.

PXD刀体型号 PXD Body Designation	加工径 (mm) Drilling Dia.	
	最小 Min.	最大 Max.
PXDZ140-····	14	14.49
PXDZ145-····	14.5	14.99
PXDZ150-····	15	15.99
PXDZ160-····	16	16.99
PXDZ170-····	17	17.99
PXDZ180-····	18	18.99
PXDZ190-····	19	19.99
PXDZ200-····	20	20.99
PXDZ210-····	21	21.99
PXDZ220-····	22	22.99
PXDZ230-····	23	23.99
PXDZ240-····	24	24.99
PXDZ250-····	25	25.99

Phoenix

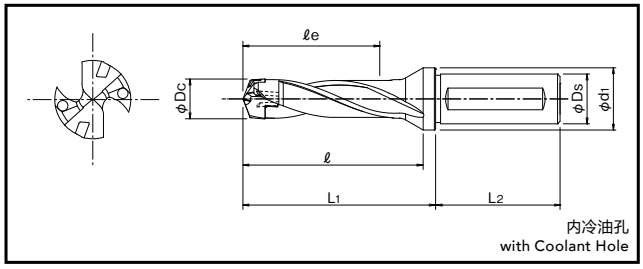
可换头式钻头
Exchangeable Head Drill

PXDZ 3D/5D



Specification

■形状尺寸表 Specification



3D类型 3D Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	加工径 Drilling Diameter 最小 Min	加工径 Drilling Diameter 最大 Max	有效加工深度 ℓe	槽长 ℓ	L1	L2	柄径 Ds	d1	螺丝刀 Driver	适用刀头 Applicable Head
7831015	PXDZ140-3D-113.5-16	14	14.49	43	63.4	69.9	48	16	20	❶	①
7831016	PXDZ145-3D-115.5-16	14.5	14.99	44.5	65.5	72	48	16	20		②
7831017	PXDZ150-3D-119.5-20	15	15.99	46.5	67.1	73.6	50	20	25		③
7831018	PXDZ160-3D-123.5-20	16	16.99	49.5	71.7	78.2	50	20	25		④
7831019	PXDZ170-3D-128.5-20	17	17.99	52.5	76.8	83.3	50	20	25		⑤
7831020	PXDZ180-3D-138.5-25	18	18.99	55.5	81.4	87.9	56	25	32		⑥
7831021	PXDZ190-3D-142.5-25	19	19.99	58.5	85.4	91.9	56	25	32	❷	⑦
7831022	PXDZ200-3D-146.5-25	20	20.99	61.5	90.1	96.6	56	25	32		⑧
7831023	PXDZ210-3D-154.5-32	21	21.99	64.5	94.7	101.2	60	32	42		⑨
7831024	PXDZ220-3D-158.5-32	22	22.99	67.5	98.8	105.3	60	32	42		⑩
7831025	PXDZ230-3D-162.5-32	23	23.99	70.5	103.4	109.9	60	32	42	❸	⑪
7831026	PXDZ240-3D-167.5-32	24	24.99	73.5	108.4	114.9	60	32	42		⑫
7831027	PXDZ250-3D-170.5-32	25	25.99	76.5	112	118.5	60	32	42		⑬

PXDZ的名称中标明了刀体的全长(刀头未安装时的长度。
例)商品号 : 7831015
名称 : PXDZ140-3D-113.5-16
└刀体全长

PXDZ designation includes the total length of body (without head).
ex) EDP No. : 7831015
Designation : PXDZ140-3D-113.5-16
└total length of body

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

5D类型 5D Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	加工径 Drilling Diameter 最小 Min	加工径 Drilling Diameter 最大 Max	有效加工深度 ℓe	槽长 ℓ	L1	L2	柄径 Ds	d1	螺丝刀 Driver	适用刀头 Applicable Head
7831065	PXDZ140-5D-141.5-16	14	14.49	71.2	92.9	97.9	48	16	20	❶	①
7831066	PXDZ145-5D-144.5-16	14.5	14.99	73.7	96	101	48	16	20		②
7831067	PXDZ150-5D-149.5-20	15	15.99	77.5	97.1	103.6	50	20	25		③
7831068	PXDZ160-5D-155.5-20	16	16.99	82.5	103.7	110.2	50	20	25		④
7831069	PXDZ170-5D-162.5-20	17	17.99	87.5	110.8	117.3	50	20	25		⑤
7831070	PXDZ180-5D-174.5-25	18	18.99	92.5	117.4	123.9	56	25	32		⑥
7831071	PXDZ190-5D-180.5-25	19	19.99	97.5	123.4	129.9	56	25	32	❷	⑦
7831072	PXDZ200-5D-186.5-25	20	20.99	102.5	130.1	136.6	56	25	32		⑧
7831073	PXDZ210-5D-196.5-32	21	21.99	107.5	136.7	143.2	60	32	42		⑨
7831074	PXDZ220-5D-202.5-32	22	22.99	112.5	142.8	149.3	60	32	42		⑩
7831075	PXDZ230-5D-208.5-32	23	23.99	117.5	149.4	155.9	60	32	42	❸	⑪
7831076	PXDZ240-5D-215.5-32	24	24.99	122.5	156.4	162.9	60	32	42		⑫
7831077	PXDZ250-5D-220.5-32	25	25.99	127.5	162	168.5	60	32	42		⑬

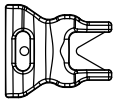
PXDZ的名称中标明了刀体的全长(刀头未安装时的长度。
例)商品号 :7831015
名称 : PXDZ140-3D-113.5-16
↑刀体全长

PXDZ designation includes the total length of body (without head).
ex) EDP No. : 7831015
Designation : PXDZ140-3D-113.5-16
↑total length of body

Accessories

单位:mm Unit:mm

■零件 Accessories

		商品号 EDP No.	名称 Designation	板厚 Sheet Thickness	适用刀头 Applicable Head
 螺丝刀 Driver	❶	7808282	PXDP1400-1899	1.5	① ~ ⑥
	❷	7808283	PXDP1900-2299	1.8	⑦ ~ ⑩
	❸	7808284	PXDP2300-2699	2	⑪ ~ ⑬

螺丝刀请另购。 The drivers are sold separately from the cutters.

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

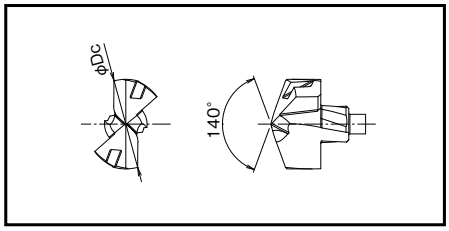
Phoenix

可换头式钻头
Exchangeable Head Drill

PXD刀头
Head

Heads

■适用刀头 Heads



钢用(PC) For steel (PC)　　販売単価：1個 Sales price: per piece

単位:mm　Unit:mm

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831140		PXDH1400-PC	14	XP3425	C
		PXDH1410-PC	14.1	XP3425	※
	①	PXDH1420-PC	14.2	XP3425	※
		PXDH1430-PC	14.3	XP3425	※
		PXDH1440-PC	14.4	XP3425	※
7831145		PXDH1450-PC	14.5	XP3425	C
		PXDH1460-PC	14.6	XP3425	※
	②	PXDH1470-PC	14.7	XP3425	※
		PXDH1480-PC	14.8	XP3425	※
		PXDH1490-PC	14.9	XP3425	※
7831351		PXDH1495-PC	14.95	XP3425	C
7831150		PXDH1500-PC	15	XP3425	C
		PXDH1510-PC	15.1	XP3425	※
		PXDH1520-PC	15.2	XP3425	※
7831352		PXDH1525-PC	15.25	XP3425	C
		PXDH1530-PC	15.3	XP3425	※
	③	PXDH1540-PC	15.4	XP3425	※
7831155		PXDH1550-PC	15.5	XP3425	C
		PXDH1560-PC	15.6	XP3425	※
		PXDH1570-PC	15.7	XP3425	※
		PXDH1580-PC	15.8	XP3425	※
		PXDH1590-PC	15.9	XP3425	※
7831160		PXDH1600-PC	16	XP3425	C
		PXDH1610-PC	16.1	XP3425	※
		PXDH1620-PC	16.2	XP3425	※
	④	PXDH1630-PC	16.3	XP3425	※
		PXDH1640-PC	16.4	XP3425	※
7831165		PXDH1650-PC	16.5	XP3425	C
		PXDH1660-PC	16.6	XP3425	※
7831167		PXDH1670-PC	16.7	XP3425	C

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
		PXDH1680-PC	16.8	XP3425	※
	④	PXDH1690-PC	16.9	XP3425	※
7831170		PXDH1700-PC	17	XP3425	C
		PXDH1710-PC	17.1	XP3425	※
		PXDH1720-PC	17.2	XP3425	※
7831353		PXDH1725-PC	17.25	XP3425	C
		PXDH1730-PC	17.3	XP3425	※
	⑤	PXDH1740-PC	17.4	XP3425	※
7831175		PXDH1750-PC	17.5	XP3425	C
		PXDH1760-PC	17.6	XP3425	※
		PXDH1770-PC	17.7	XP3425	※
		PXDH1780-PC	17.8	XP3425	※
		PXDH1790-PC	17.9	XP3425	※
7831180		PXDH1800-PC	18	XP3425	C
		PXDH1810-PC	18.1	XP3425	※
		PXDH1820-PC	18.2	XP3425	※
		PXDH1830-PC	18.3	XP3425	※
	⑥	PXDH1840-PC	18.4	XP3425	※
7831185		PXDH1850-PC	18.5	XP3425	C
		PXDH1860-PC	18.6	XP3425	※
7831187		PXDH1870-PC	18.7	XP3425	C
		PXDH1880-PC	18.8	XP3425	※
		PXDH1890-PC	18.9	XP3425	※
7831190		PXDH1900-PC	19	XP3425	C
		PXDH1910-PC	19.1	XP3425	※
		PXDH1920-PC	19.2	XP3425	※
7831354	⑦	PXDH1925-PC	19.25	XP3425	C
		PXDH1930-PC	19.3	XP3425	※
		PXDH1940-PC	19.4	XP3425	※
7831195		PXDH1950-PC	19.5	XP3425	C

C=标准库存品　C=Standard stock item　※=受注对应品　※=Special order item

NEXT

FROM

单位:mm Unit:mm

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
	⑦	PXDH1960-PC	19.6	XP3425	※
		PXDH1970-PC	19.7	XP3425	※
		PXDH1980-PC	19.8	XP3425	※
		PXDH1990-PC	19.9	XP3425	※
7831200	⑧	PXDH2000-PC	20	XP3425	C
		PXDH2010-PC	20.1	XP3425	※
		PXDH2020-PC	20.2	XP3425	※
		PXDH2030-PC	20.3	XP3425	※
		PXDH2040-PC	20.4	XP3425	※
7831205		PXDH2050-PC	20.5	XP3425	C
		PXDH2060-PC	20.6	XP3425	※
7831207		PXDH2070-PC	20.7	XP3425	C
		PXDH2080-PC	20.8	XP3425	※
		PXDH2090-PC	20.9	XP3425	※
7831210	⑨	PXDH2100-PC	21	XP3425	C
		PXDH2110-PC	21.1	XP3425	※
		PXDH2120-PC	21.2	XP3425	※
7831355		PXDH2125-PC	21.25	XP3425	C
		PXDH2130-PC	21.3	XP3425	※
		PXDH2140-PC	21.4	XP3425	※
7831215		PXDH2150-PC	21.5	XP3425	C
		PXDH2160-PC	21.6	XP3425	※
		PXDH2170-PC	21.7	XP3425	※
		PXDH2180-PC	21.8	XP3425	※
		PXDH2190-PC	21.9	XP3425	※
7831220	⑩	PXDH2200-PC	22	XP3425	C
		PXDH2210-PC	22.1	XP3425	※
		PXDH2220-PC	22.2	XP3425	※
		PXDH2230-PC	22.3	XP3425	※
7831224		PXDH2240-PC	22.4	XP3425	C
7831225		PXDH2250-PC	22.5	XP3425	C

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
	⑩	PXDH2260-PC	22.6	XP3425	※
		PXDH2270-PC	22.7	XP3425	※
		PXDH2280-PC	22.8	XP3425	※
		PXDH2290-PC	22.9	XP3425	※
7831230	⑪	PXDH2300-PC	23	XP3425	C
		PXDH2310-PC	23.1	XP3425	※
		PXDH2320-PC	23.2	XP3425	※
7831356		PXDH2325-PC	23.25	XP3425	C
		PXDH2330-PC	23.3	XP3425	※
		PXDH2340-PC	23.4	XP3425	※
7831235		PXDH2350-PC	23.5	XP3425	C
		PXDH2360-PC	23.6	XP3425	※
		PXDH2370-PC	23.7	XP3425	※
		PXDH2380-PC	23.8	XP3425	※
		PXDH2390-PC	23.9	XP3425	※
7831240	⑫	PXDH2400-PC	24	XP3425	C
		PXDH2410-PC	24.1	XP3425	※
		PXDH2420-PC	24.2	XP3425	※
		PXDH2430-PC	24.3	XP3425	※
		PXDH2440-PC	24.4	XP3425	※
7831245		PXDH2450-PC	24.5	XP3425	C
		PXDH2460-PC	24.6	XP3425	※
		PXDH2470-PC	24.7	XP3425	※
		PXDH2480-PC	24.8	XP3425	※
		PXDH2490-PC	24.9	XP3425	※
7831250	⑬	PXDH2500-PC	25	XP3425	C
		PXDH2510-PC	25.1	XP3425	※
		PXDH2520-PC	25.2	XP3425	※
		PXDH2530-PC	25.3	XP3425	※
7831254		PXDH2540-PC	25.4	XP3425	C

蓝字 = 切削底孔 Blue = tap drill hole for cutting taps
红字 = 挤压底孔 Red = tap drill hole for forming taps
当用来加工挤压丝锥底孔时，请使用3D型。 For tap drill hole of forming tap, 3D type should be used. (5D is not recommended)

对应螺纹名称推荐的底孔径请参照 P.11。
Please see p.11 for recommended tap pilot hole size.

C=标准库存品 C=Standard stock item ※=受注对应品 ※=Special order item

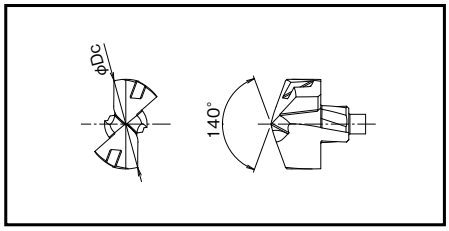
Phoenix

可换头式钻头
Exchangeable Head Drill

PXD刀头
Head

Heads

■适用刀头 Heads



铸铁用(KC) For cast iron (KC)

单位:mm Unit:mm

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831440		PXDH1400-KC	14	XP1425	C
		PXDH1410-KC	14.1	XP1425	※
	①	PXDH1420-KC	14.2	XP1425	※
		PXDH1430-KC	14.3	XP1425	※
		PXDH1440-KC	14.4	XP1425	※
7831445		PXDH1450-KC	14.5	XP1425	C
		PXDH1460-KC	14.6	XP1425	※
	②	PXDH1470-KC	14.7	XP1425	※
		PXDH1480-KC	14.8	XP1425	※
		PXDH1490-KC	14.9	XP1425	※
7831450		PXDH1500-KC	15	XP1425	C
		PXDH1510-KC	15.1	XP1425	※
		PXDH1520-KC	15.2	XP1425	※
		PXDH1530-KC	15.3	XP1425	※
		PXDH1540-KC	15.4	XP1425	※
7831455	③	PXDH1550-KC	15.5	XP1425	C
		PXDH1560-KC	15.6	XP1425	※
		PXDH1570-KC	15.7	XP1425	※
		PXDH1580-KC	15.8	XP1425	※
		PXDH1590-KC	15.9	XP1425	※
7831460		PXDH1600-KC	16	XP1425	C
		PXDH1610-KC	16.1	XP1425	※
		PXDH1620-KC	16.2	XP1425	※
		PXDH1630-KC	16.3	XP1425	※
		PXDH1640-KC	16.4	XP1425	※
7831465	④	PXDH1650-KC	16.5	XP1425	C
		PXDH1660-KC	16.6	XP1425	※
7831467		PXDH1670-KC	16.7	XP1425	C
		PXDH1680-KC	16.8	XP1425	※
		PXDH1690-KC	16.9	XP1425	※

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831470		PXDH1700-KC	17	XP1425	C
		PXDH1710-KC	17.1	XP1425	※
		PXDH1720-KC	17.2	XP1425	※
		PXDH1730-KC	17.3	XP1425	※
		PXDH1740-KC	17.4	XP1425	※
7831475	⑤	PXDH1750-KC	17.5	XP1425	C
		PXDH1760-KC	17.6	XP1425	※
		PXDH1770-KC	17.7	XP1425	※
		PXDH1780-KC	17.8	XP1425	※
		PXDH1790-KC	17.9	XP1425	※
7831480		PXDH1800-KC	18	XP1425	C
		PXDH1810-KC	18.1	XP1425	※
		PXDH1820-KC	18.2	XP1425	※
		PXDH1830-KC	18.3	XP1425	※
		PXDH1840-KC	18.4	XP1425	※
7831485	⑥	PXDH1850-KC	18.5	XP1425	C
		PXDH1860-KC	18.6	XP1425	※
7831487		PXDH1870-KC	18.7	XP1425	C
		PXDH1880-KC	18.8	XP1425	※
		PXDH1890-KC	18.9	XP1425	※
7831490		PXDH1900-KC	19	XP1425	C
		PXDH1910-KC	19.1	XP1425	※
		PXDH1920-KC	19.2	XP1425	※
		PXDH1930-KC	19.3	XP1425	※
		PXDH1940-KC	19.4	XP1425	※
7831495	⑦	PXDH1950-KC	19.5	XP1425	C
		PXDH1960-KC	19.6	XP1425	※
		PXDH1970-KC	19.7	XP1425	※
		PXDH1980-KC	19.8	XP1425	※
		PXDH1990-KC	19.9	XP1425	※

C=标准库存品 C=Standard stock item ※=受注对应品 ※=Special order item

NEXT

FROM

单位:mm Unit:mm

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831500	⑧	PXDH2000-KC	20	XP1425	C
		PXDH2010-KC	20.1	XP1425	※
		PXDH2020-KC	20.2	XP1425	※
		PXDH2030-KC	20.3	XP1425	※
		PXDH2040-KC	20.4	XP1425	※
7831505		PXDH2050-KC	20.5	XP1425	C
		PXDH2060-KC	20.6	XP1425	※
7831507		PXDH2070-KC	20.7	XP1425	C
		PXDH2080-KC	20.8	XP1425	※
		PXDH2090-KC	20.9	XP1425	※
7831510	⑨	PXDH2100-KC	21	XP1425	C
		PXDH2110-KC	21.1	XP1425	※
		PXDH2120-KC	21.2	XP1425	※
		PXDH2130-KC	21.3	XP1425	※
		PXDH2140-KC	21.4	XP1425	※
7831515		PXDH2150-KC	21.5	XP1425	C
		PXDH2160-KC	21.6	XP1425	※
		PXDH2170-KC	21.7	XP1425	※
		PXDH2180-KC	21.8	XP1425	※
		PXDH2190-KC	21.9	XP1425	※
7831520	⑩	PXDH2200-KC	22	XP1425	C
		PXDH2210-KC	22.1	XP1425	※
		PXDH2220-KC	22.2	XP1425	※
		PXDH2230-KC	22.3	XP1425	※
7831524		PXDH2240-KC	22.4	XP1425	C
7831525		PXDH2250-KC	22.5	XP1425	C
		PXDH2260-KC	22.6	XP1425	※
		PXDH2270-KC	22.7	XP1425	※

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
	⑩	PXDH2280-KC	22.8	XP1425	※
		PXDH2290-KC	22.9	XP1425	※
7831530	⑪	PXDH2300-KC	23	XP1425	C
		PXDH2310-KC	23.1	XP1425	※
		PXDH2320-KC	23.2	XP1425	※
		PXDH2330-KC	23.3	XP1425	※
		PXDH2340-KC	23.4	XP1425	※
7831535		PXDH2350-KC	23.5	XP1425	C
		PXDH2360-KC	23.6	XP1425	※
		PXDH2370-KC	23.7	XP1425	※
		PXDH2380-KC	23.8	XP1425	※
		PXDH2390-KC	23.9	XP1425	※
7831540	⑫	PXDH2400-KC	24	XP1425	C
		PXDH2410-KC	24.1	XP1425	※
		PXDH2420-KC	24.2	XP1425	※
		PXDH2430-KC	24.3	XP1425	※
		PXDH2440-KC	24.4	XP1425	※
7831545		PXDH2450-KC	24.5	XP1425	C
		PXDH2460-KC	24.6	XP1425	※
		PXDH2470-KC	24.7	XP1425	※
		PXDH2480-KC	24.8	XP1425	※
		PXDH2490-KC	24.9	XP1425	※
7831550	⑬	PXDH2500-KC	25	XP1425	C
		PXDH2510-KC	25.1	XP1425	※
		PXDH2520-KC	25.2	XP1425	※
		PXDH2530-KC	25.3	XP1425	※
7831554		PXDH2540-KC	25.4	XP1425	C

蓝字 = 切削底孔　Blue = tap drill hole for cutting taps

对应螺纹名称推荐的底孔径请参照 P.11。
Please see p.11 for recommended tap pilot hole size.

C=标准库存品　C=Standard stock item　※=受注对应品　※=Special order item

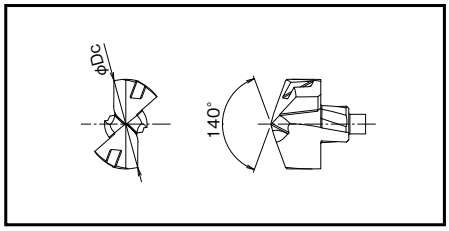
Phoenix

刀头交换钻头
Exchangeable Head Drill

PXD刀头
Head

Heads

■适用刀头 Heads



非铁用(NC) For non-ferrous metal (NC)

单位:mm Unit:mm

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831740		PXDH1400-NC	14	CF225	C
		PXDH1410-NC	14.1	CF225	※
	①	PXDH1420-NC	14.2	CF225	※
		PXDH1430-NC	14.3	CF225	※
		PXDH1440-NC	14.4	CF225	※
7831745		PXDH1450-NC	14.5	CF225	C
		PXDH1460-NC	14.6	CF225	※
	②	PXDH1470-NC	14.7	CF225	※
		PXDH1480-NC	14.8	CF225	※
		PXDH1490-NC	14.9	CF225	※
7831750		PXDH1500-NC	15	CF225	C
		PXDH1510-NC	15.1	CF225	※
		PXDH1520-NC	15.2	CF225	※
		PXDH1530-NC	15.3	CF225	※
		PXDH1540-NC	15.4	CF225	※
7831755	③	PXDH1550-NC	15.5	CF225	C
		PXDH1560-NC	15.6	CF225	※
		PXDH1570-NC	15.7	CF225	※
		PXDH1580-NC	15.8	CF225	※
		PXDH1590-NC	15.9	CF225	※
7831760		PXDH1600-NC	16	CF225	C
		PXDH1610-NC	16.1	CF225	※
		PXDH1620-NC	16.2	CF225	※
		PXDH1630-NC	16.3	CF225	※
		PXDH1640-NC	16.4	CF225	※
7831765	④	PXDH1650-NC	16.5	CF225	C
		PXDH1660-NC	16.6	CF225	※
7831767		PXDH1670-NC	16.7	CF225	C
		PXDH1680-NC	16.8	CF225	※
		PXDH1690-NC	16.9	CF225	※

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831770		PXDH1700-NC	17	CF225	C
		PXDH1710-NC	17.1	CF225	※
		PXDH1720-NC	17.2	CF225	※
		PXDH1730-NC	17.3	CF225	※
	⑤	PXDH1740-NC	17.4	CF225	※
7831775		PXDH1750-NC	17.5	CF225	C
		PXDH1760-NC	17.6	CF225	※
		PXDH1770-NC	17.7	CF225	※
		PXDH1780-NC	17.8	CF225	※
		PXDH1790-NC	17.9	CF225	※
7831780		PXDH1800-NC	18	CF225	C
		PXDH1810-NC	18.1	CF225	※
		PXDH1820-NC	18.2	CF225	※
		PXDH1830-NC	18.3	CF225	※
	⑥	PXDH1840-NC	18.4	CF225	※
7831785		PXDH1850-NC	18.5	CF225	C
		PXDH1860-NC	18.6	CF225	※
7831787		PXDH1870-NC	18.7	CF225	C
		PXDH1880-NC	18.8	CF225	※
		PXDH1890-NC	18.9	CF225	※
7831790		PXDH1900-NC	19	CF225	C
		PXDH1910-NC	19.1	CF225	※
		PXDH1920-NC	19.2	CF225	※
		PXDH1930-NC	19.3	CF225	※
	⑦	PXDH1940-NC	19.4	CF225	※
7831795		PXDH1950-NC	19.5	CF225	C
		PXDH1960-NC	19.6	CF225	※
		PXDH1970-NC	19.7	CF225	※
		PXDH1980-NC	19.8	CF225	※
		PXDH1990-NC	19.9	CF225	※

C=标准库存品 C=Standard stock item ※=受注对应品 ※=Special order item

NEXT

FROM

单位:mm Unit:mm

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
7831800	⑧	PXDH2000-NC	20	CF225	C
		PXDH2010-NC	20.1	CF225	※
		PXDH2020-NC	20.2	CF225	※
		PXDH2030-NC	20.3	CF225	※
		PXDH2040-NC	20.4	CF225	※
7831805		PXDH2050-NC	20.5	CF225	C
		PXDH2060-NC	20.6	CF225	※
7831807		PXDH2070-NC	20.7	CF225	C
		PXDH2080-NC	20.8	CF225	※
		PXDH2090-NC	20.9	CF225	※
7831810	⑨	PXDH2100-NC	21	CF225	C
		PXDH2110-NC	21.1	CF225	※
		PXDH2120-NC	21.2	CF225	※
		PXDH2130-NC	21.3	CF225	※
		PXDH2140-NC	21.4	CF225	※
7831815		PXDH2150-NC	21.5	CF225	C
		PXDH2160-NC	21.6	CF225	※
		PXDH2170-NC	21.7	CF225	※
		PXDH2180-NC	21.8	CF225	※
		PXDH2190-NC	21.9	CF225	※
7831820	⑩	PXDH2200-NC	22	CF225	C
		PXDH2210-NC	22.1	CF225	※
		PXDH2220-NC	22.2	CF225	※
		PXDH2230-NC	22.3	CF225	※
7831824		PXDH2240-NC	22.4	CF225	C
7831825		PXDH2250-NC	22.5	CF225	C
		PXDH2260-NC	22.6	CF225	※
		PXDH2270-NC	22.7	CF225	※

商品号 EDP No.		名称 Designation	直径 Dc	材质 Grades	库存 Stock
	⑩	PXDH2280-NC	22.8	CF225	※
		PXDH2290-NC	22.9	CF225	※
7831830	⑪	PXDH2300-NC	23	CF225	C
		PXDH2310-NC	23.1	CF225	※
		PXDH2320-NC	23.2	CF225	※
		PXDH2330-NC	23.3	CF225	※
		PXDH2340-NC	23.4	CF225	※
7831835		PXDH2350-NC	23.5	CF225	C
		PXDH2360-NC	23.6	CF225	※
		PXDH2370-NC	23.7	CF225	※
		PXDH2380-NC	23.8	CF225	※
		PXDH2390-NC	23.9	CF225	※
7831840	⑫	PXDH2400-NC	24	CF225	C
		PXDH2410-NC	24.1	CF225	※
		PXDH2420-NC	24.2	CF225	※
		PXDH2430-NC	24.3	CF225	※
		PXDH2440-NC	24.4	CF225	※
7831845		PXDH2450-NC	24.5	CF225	C
		PXDH2460-NC	24.6	CF225	※
		PXDH2470-NC	24.7	CF225	※
		PXDH2480-NC	24.8	CF225	※
		PXDH2490-NC	24.9	CF225	※
7831850	⑬	PXDH2500-NC	25	CF225	C
		PXDH2510-NC	25.1	CF225	※
		PXDH2520-NC	25.2	CF225	※
		PXDH2530-NC	25.3	CF225	※
7831854		PXDH2540-NC	25.4	CF225	C

蓝字 = 切削底孔　Blue = tap drill hole for cutting taps

对应螺纹名称推荐的底孔径请参照P.11。
Please see p.11 for recommended tap pilot hole size.

C=标准库存品　C=Standard stock item　※=受注对应品　※=Special order item

Phoenix

可换头式钻头
Exchangeable Head Drill

PXD

Cutting Conditions

■切削条件基准表 Cutting Conditions

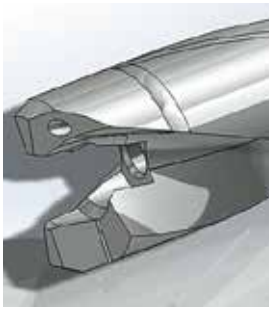
加工材料 Work Material	PC(钢用) For Steel						KC(铸铁用) For Cast Iron				NC(非铁用) For Non-ferrous Metal	
	软钢·低碳素钢 Mild Steel· Low Carbon Steel SS400, S10C ~ 150HB (~ 500N/mm²)		碳素钢 Carbon Steel S35C, S50C ~ 210HB (~ 710N/mm²)		合金钢 Alloy Steel SCM, SCr, SNCM 16 ~ 30HRC (710 ~ 950N/mm²)		铸铁 Cast Iron FC250 (~ 350N/mm²)		球墨铸铁 Ductile Cast Iron FCD450, FCD600 (400 ~ 600N/mm²)		铸造铝合金 Aluminum Alloy Casting AC4A, ADC	
切削速度 Cutting Speed	80~120m/min		80~120m/min		60~120m/min		80~120m/min		60~100m/min		80~180m/min	
直径 Drill Dia. (mm)	回转速度 Speed (min⁻¹)	进给量 Feed (mm/rev)	回转速度 Speed (min⁻¹)	进给量 Feed (mm/rev)	回转速度 Speed (min⁻¹)	进给量 Feed (mm/rev)	回转速度 Speed (min⁻¹)	进给量 Feed (mm/rev)	回转速度 Speed (min⁻¹)	进给量 Feed (mm/rev)	回转速度 Speed (min⁻¹)	进给量 Feed (mm/rev)
14	2,300	0.21 ~ 0.35	2,300	0.21 ~ 0.35	2,000	0.21 ~ 0.35	2,300	0.21 ~ 0.35	1,800	0.21 ~ 0.35	3,000	0.28 ~ 0.42
15	2,100	0.23 ~ 0.38	2,100	0.23 ~ 0.38	1,900	0.23 ~ 0.38	2,100	0.23 ~ 0.38	1,700	0.23 ~ 0.38	2,800	0.3 ~ 0.45
16	2,000	0.24 ~ 0.4	2,000	0.24 ~ 0.4	1,800	0.24 ~ 0.4	2,000	0.24 ~ 0.4	1,600	0.24 ~ 0.4	2,600	0.32 ~ 0.48
17	1,900	0.26 ~ 0.43	1,900	0.26 ~ 0.43	1,700	0.26 ~ 0.43	1,900	0.26 ~ 0.43	1,500	0.26 ~ 0.43	2,400	0.34 ~ 0.51
18	1,800	0.27 ~ 0.45	1,800	0.27 ~ 0.45	1,600	0.27 ~ 0.45	1,800	0.27 ~ 0.45	1,400	0.27 ~ 0.45	2,300	0.36 ~ 0.54
19	1,700	0.29 ~ 0.48	1,700	0.29 ~ 0.48	1,500	0.29 ~ 0.48	1,700	0.29 ~ 0.48	1,300	0.29 ~ 0.48	2,200	0.38 ~ 0.57
20	1,600	0.3 ~ 0.5	1,600	0.3 ~ 0.5	1,400	0.3 ~ 0.5	1,600	0.3 ~ 0.5	1,300	0.3 ~ 0.5	2,100	0.4 ~ 0.6
21	1,500	0.32 ~ 0.53	1,500	0.32 ~ 0.53	1,400	0.32 ~ 0.53	1,500	0.32 ~ 0.53	1,200	0.32 ~ 0.53	2,000	0.42 ~ 0.63
22	1,400	0.33 ~ 0.55	1,400	0.33 ~ 0.55	1,300	0.33 ~ 0.55	1,400	0.33 ~ 0.55	1,200	0.33 ~ 0.55	1,900	0.44 ~ 0.66
23	1,400	0.35 ~ 0.58	1,400	0.35 ~ 0.58	1,200	0.35 ~ 0.58	1,400	0.35 ~ 0.58	1,100	0.35 ~ 0.58	1,800	0.46 ~ 0.69
24	1,300	0.36 ~ 0.6	1,300	0.36 ~ 0.6	1,200	0.36 ~ 0.6	1,300	0.36 ~ 0.6	1,100	0.36 ~ 0.6	1,700	0.48 ~ 0.72
25	1,300	0.38 ~ 0.63	1,300	0.38 ~ 0.63	1,100	0.38 ~ 0.63	1,300	0.38 ~ 0.63	1,000	0.38 ~ 0.63	1,700	0.5 ~ 0.75

1. 这张切削条件基准表是以水溶性切屑油剂作为内部供油。
2. 请使用稀释倍率20倍以下的优质水溶性切屑油剂。
3. 这张切削条件基准表的数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
4. 请牢牢固定加工材料，确保在没有变形，倾斜，震动的情况下加工。
5. 油孔堵塞是造成折损问题的原因，请务必安装供油装置的过滤器。
6. 刀头的安装方式及使用注意事项请参照P.24。

1. The indicated speeds and feeds are for using water-soluble oil with inner supply.
2. Suitable cutting fluid is water-soluble in high density (less than 20 times dilution).
3. The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.
4. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
5. A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.
6. Please see p.24 for mounting procedure and precaution for machining.

■ 关于可换头式钻头的安装 Mounting Procedure

■ 安装顺序 Procedure



第一步1 Step 1

请用气枪等清除接口处的污渍。

Clean attachment area with an air blower.

※如有残留切屑等，则无法正确安装导致刀头破损。

Any leftover cutting chips may prevent the head from being mounted properly and may cause damages to the tool.

第二步2 Step 2

将刀头安装在接口处。

Attach the head manually.

第三步3 Step 3

将专用螺丝刀的金属部分嵌入刀头的槽中。

Insert the flat metal portion of the designated driver into the groove of the head.

※请将专用螺丝刀完全嵌入槽的内部。如深度不够的情况下有可能会导致槽部破损。

Insert the designated driver firmly into the groove. If the insertion of the designated driver is shallow, it could damage the flutes.

第四步4 Step 4

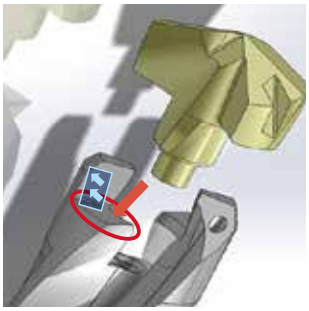
将螺丝刀顺时针旋转，使刀头固定于刀体。

Turn the designated driver clockwise and mount the head onto the body.

※安装时，请确保刀头与刀体连接处没有间隙。

Mount head firmly and make sure that there is no gap between the head and the body.

■ 安装后的确认 After mounting



安装完成后，请用厚度计（20μm）确认标记部位（蓝、红）的间隙。

Make sure no clearance gap is found at places marked blue and red by using thickness gauges of 20μm.

如图、安装后出现间隙的情况下，请使用气枪清除接口处的污渍、再进行安装 · 确认。

If clearance gap is found, please mount and check again after cleaning the mounting area by air blow.

※刀体的嵌合力在一定程度以后将会到达使用寿命。如产生间隙、用手可直接拔出刀头的话，也已达到使用寿命。

If the clearance gap still remains or head can be took off without driver, body must be changed.

■ 使用上的注意 Precaution

■ 由于PXD未使用紧固螺纹，因此必须用于接口处不易松动的加工环境。

The machining environment that won't loosen the mounting area is essential for PXD because no clamping screws are used.

孔加工贯穿时请特别注意。

Extra caution is necessary for through holes.

·在加工难以固定的薄板材料及易引起回弹的材料时，退刀时的回转进给请下调30%左右。

·贯穿时的深度位置设定请参考右图。

· Reduce feed rate by 30% when pulling the drill out from the hole of thin plate without enough holding or material tend to spring back easily.

· Please refer photos on right for setting of through holes.

贯穿时的深度位置请设定在钻肩部2mm以下。

Head should be penetrated no more than 2mm from the shoulder of PXD.

Phoenix

可换头式钻头
Exchangeable Head Drill

PXD

■比以往的加工速度更快！ Achieves faster feeds than ever before!

加工效率2倍以上！ Double the efficiency!

	直径 Drill Dia.	加工材料 Work Material	切深量 Depth of Hole	切削速度 Cutting Speed (m/min)	回转速度 Speed (min⁻¹)	进给量 Feed Rate (mm/rev)	进给速度 Feed (mm/min)	切削油剂 Coolant	使用机械 Machine
内冷油孔高速钢钻头 HSS Drill with Oil Hole	ø16	S50C	50mm	30	600	0.4	240	水溶性切削油剂 Water-Soluble	卧式加工中心 Horizontal Machining Center
可转位式钻头 Indexable Drill				160	3,200	0.09	288		
PXD				100	1,990	0.3	**597**		

加工效率3倍以上！ Triple the efficiency!

	直径 Drill Dia.	加工材料 Work Material	切深量 Depth of Hole	切削速度 Cutting Speed (m/min)	回转速度 Speed (min⁻¹)	进给量 Feed Rate (mm/rev)	进给速度 Feed (mm/min)	切削油剂 Coolant	使用机械 Machine
内冷油空高速钢钻头 HSS Drill with Oil Hole	ø25	S50C	75mm	25	320	0.5	160	水溶性切削油剂 Water-Soluble	卧式加工中心 Horizontal Machining Center
可转位式钻头 Indexable Drill				160	2,000	0.13	260		
PXD				100	1,270	0.5	**635**		

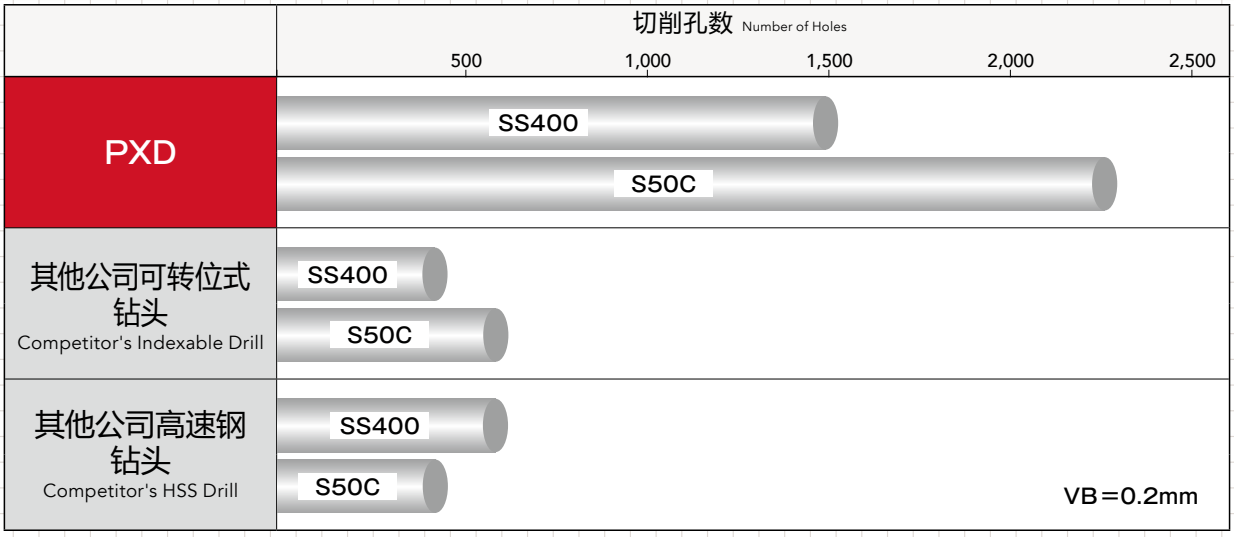
■加工效率·使用寿命提高！加工成本大幅下降！

Greater tool life and efficiency while significantly lowering cost!

直径：ϕ16
Drill Diameter
使用机械：卧式加工中心
Machine Horizontal Machining Center

切削量：50mm
Depth of Hole
切削油剂：水溶性切削油剂
Coolant Water-Soluble

加工材料 Work Material	SS400		S50C	
	切削速度 Cutting Speed (m/min)	进给量 Feed Rate (mm/rev)	切削速度 Cutting Speed (m/min)	进给量 Feed Rate (mm/rev)
PXD	100	0.3	100	0.3
其他公司可转位式钻头 Competitor's Indexable Drill	200	0.1	160	0.1
其他公司高速钢钻头 Competitor's HSS Drill	30	0.3	30	0.3



Cutting Data

■加工数据 Cutting Data

挤压丝锥的底孔也可用PXD 3D！ PXD 3D drill adequate pilot holes for forming taps

■钻孔 Drilling

使用工具 Tool	PXDZ220-3D-158.5-32
使用刀头(材质) Head (grade)	PXDH2240-PC
加工材料 Work Material	S50C
切削速度 Cutting Speed	70m/min (995min^{-1})
进给速度 Feed	597mm/min (0.6mm/rev)
切深量 Depth of Hole	112mm（盲孔） (Blind)
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心 Horizontal Machining Center

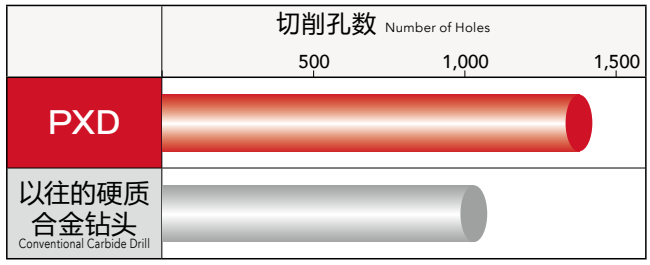
■攻丝 Tapping

使用工具 Tool	挤压丝锥 S-XPF M24×3 Forming Tap
加工材料 Work Material	S50C
攻丝深度 Tapping Length	48mm（2D）（盲孔） (Blind)
切削速度 Cutting Speed	15m/min (199min^{-1})
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心 Horizontal Machining Center

※请使用PXD 3D加工挤压丝锥底孔。
For tap drill hole of forming tap, 3D type should be used (5D is not recommended).

SS400的长寿命加工 Long tool life in SS400

使用工具 Tool	PXDZ160-3D-123.5-20
使用刀头(材质) Head (grade)	PXDH1600-PC
加工材料 Work Material	SS400
切削速度 Cutting Speed	100m/min (1,990min^{-1})
进给速度 Feed	597mm/min (0.3mm/rev)
切深量 Depth of Hole	45mm（通孔） (Through)
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心 Horizontal Machining Center



大径加工时，根据加工环境，可以得到整体硬质合金钻头以上的寿命。合理区分使用整体硬质合金钻头和可换头式钻头可有效的降低加工成本。

Higher durability may be achieved than conventional carbide drills depending on the working environment. Optimal, low-cost drilling is possible by properly selected carbide solid drills and exchangeable head drills.

Cutting Data

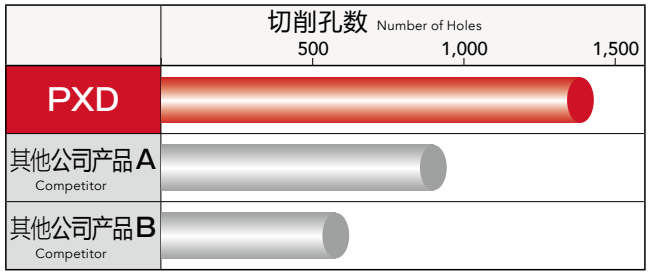
■加工数据 Cutting Data

SS400的长寿命加工 Long tool life in SS400

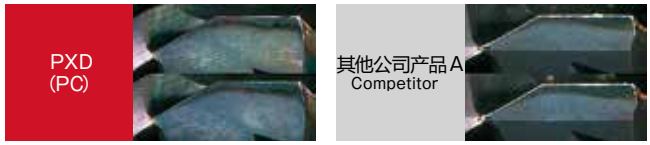
使用工具 Tool	PXDZ160-3D-123.5-20
使用刀头(材质) Head (grade)	PXDH1600-PC
加工材料 Work Material	SS400
切削速度 Cutting Speed	100m/min (1,990min^{-1})
进给速度 Feed	597mm/min (0.3mm/rev)
切深量 Depth of Hole	45mm (通孔) (Through)
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心 Horizontal Machining Center

在加工SS400时，专有的WDI涂层能抑制磨损、溶着，使用寿命约为其他公司产品的1.8倍。

When drilling in SS400, OSG's proprietary WDI coating minimized tool wear and permitting 1.8 times the tool life versus the competition.



加工900孔时的磨损比较 Wear comparison after 900 holes of drilling

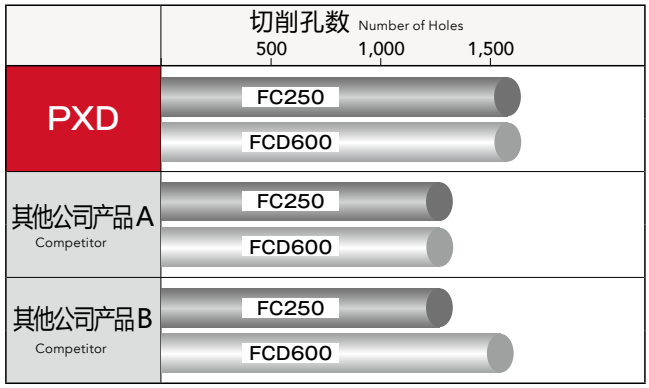


专用刀头的铸件加工 Exchangeable head for cast iron

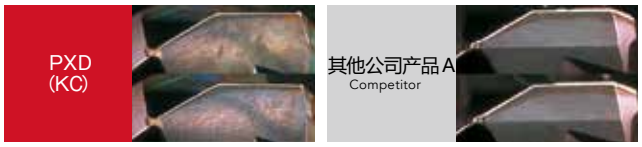
使用工具 Tool	PXDZ160-3D-123.5-20	
使用刀头(材质) Head (grade)	PXDH1600-KC	
加工材料 Work Material	FC250	FCD600
切削速度 Cutting Speed	100m/min (1,990min^{-1})	80m/min (1,600min^{-1})
进给速度 Feed	796mm/min (0.4mm/rev)	480mm/min (0.3mm/rev)
切深量 Depth of Hole	45mm (通孔) (Through)	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心 Horizontal Machining Center	

使用铸铁专用刀头可实现较长使用寿命。

This exchangeable head is designated for cast iron and can maintain long tool life.



【FC250】加工1,280孔时的磨损比较 Wear comparison after 1,280 holes of drilling



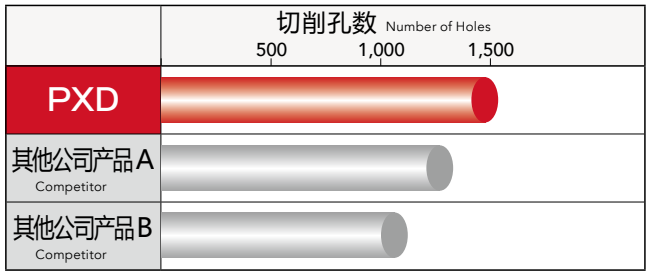
【FCD600】加工1,600孔时的磨损比较 Wear comparison after 1,600 holes of drilling

φ20的高效率加工 Highly efficient drilling at ø20

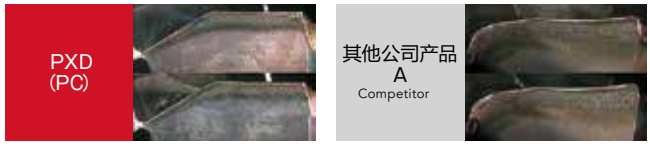
使用工具 Tool	PXDZ200-3D-146.5-25
使用刀头(材质) Head (grade)	PXDH2000-PC
加工材料 Work Material	S50C
切削速度 Cutting Speed	100m/min (1,590min^{-1})
进给速度 Feed	637mm/min (0.4mm/rev)
切深量 Depth of Hole	50mm (通孔) (Through)
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心 Horizontal Machining Center

即使是φ20，也能高效率加工，因专用WDI涂层的效果得以实现较长的使用寿命。

OSG's WDI coating has enabled the PXD to achieve long tool life and high efficiency when drilling holes of ø20.



加工1,000孔时的磨损比较 Wear comparison after 1,000 holes of drilling

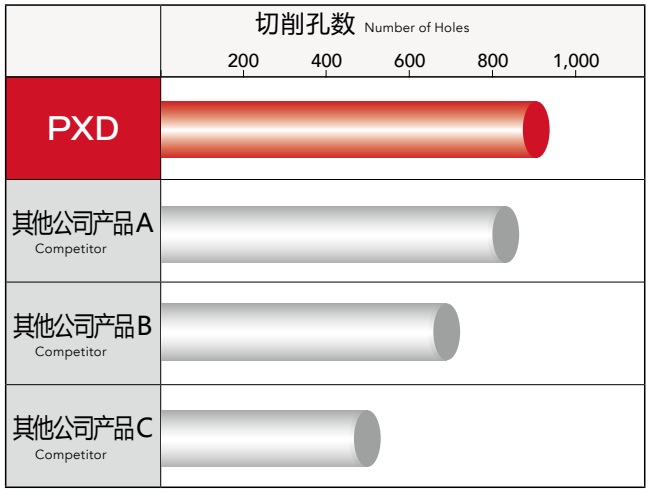


S50C 的高能率加工(孔深5D) Highly efficient drilling in S50C (drilling depth 5xD)

使用工具 Tool	PXDZ160-5D-155.5-20
使用刀头(材质) Head (grade)	PXDH1600-PC
加工材料 Work Material	S50C
切削速度 Cutting Speed	100m/min (1,990min^{-1})
进给速度 Feed	597mm/min (0.3mm/rev)
切深量 Depth of Hole	80mm（盲孔） (Blind)
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心 Horizontal Machining Center

即使是5D的深孔加工时 ,也能实现与硬质合金钻头相同的加工效率。另、与其他公司产品相比，使用寿命更长。

Even when drilling hole depth of 5xD, the PXD achieved at the same level of efficiency as a carbide drill. Moreover, it had the best tool life versus the competitions.



加工700孔时的磨损比较 Wear comparison after 750 holes of drilling

■可定制带沉孔、带倒角等结合加工环境的非标品。详情请咨询本公司销售。

Custom tooling with specifications such as counterboring and chamfering are available upon request.
Please contact your local sales representative for details.

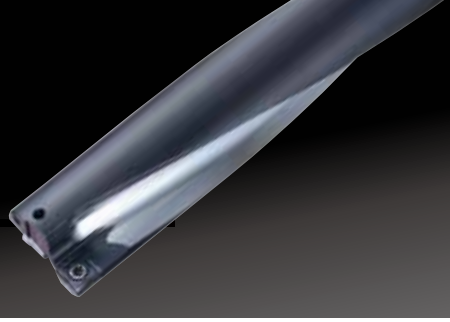
带沉孔 PXD 钻头(非标品)
PXD with Counterboring (Special)

带倒角 PXD 钻头(非标品)
PXD with Chamfering (Special)

Phoenix PD

可转位式钻头
Indexable Drill

Phoenix Drill



特点 Features

槽面高精度精加工提高了切屑的排出性 PAT. in Japan
High precision finishing on flute improves rigidity, chip ejection and reduces cutting force!

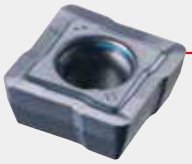
刀体含有断屑槽，可将切屑细小分断
With an attached breaker to the cutter body, cutting chips can be broken into small pieces.

内部给油可以提高加工效率
The internal coolant system enables highly efficient drilling.

外周刃·中心刃使用同一款四角式样刀片，经济且管理便利。
Economical 4-corner insert design maximizes cost efficiency, with the same insert applicable to both center and peripheral cutting edge.

最优化的刀片排列方式，实现高进给条件
High feed drilling is possible by sequential balance of inserts.

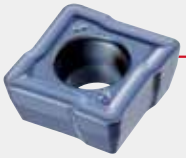
■3种刀片可对应广泛的加工材料。
3 types of breakers are available for variety of work materials



钢用·不锈钢加工用(DM)
for Steel and Stainless Steel

XP9020

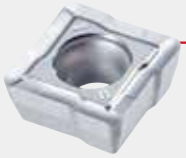
○锋利性及强度兼备的形状
○钢材、不锈钢加工发挥优异性能
○Well balanced insert with sharpness and rigidity
○Optimal for steel and stainless steels



铸铁用(DR)
for Cast Iron

XP1010

○刃尖强度优良的形状
○铸铁加工发挥优异性能
○Strong cutting edge acquired by rake angle and land
○Optimal for cast iron



铝合金·非铁合金用(DN)
for Aluminum Alloy and Non-ferrous Metal

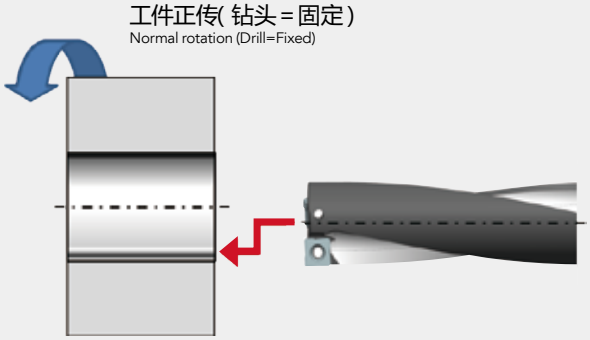
CK110

○锋利的切削刃和抛光处理，排屑性优良的形状
○铝合金·非铁合金加工发挥优异性能
○Excellent chip evacuation is acquired by sharp cutting edges and polishing treatment
○Optimal for aluminum alloy and non-ferrous metal

■可进行车削粗加工 Rough process of turning is also possible

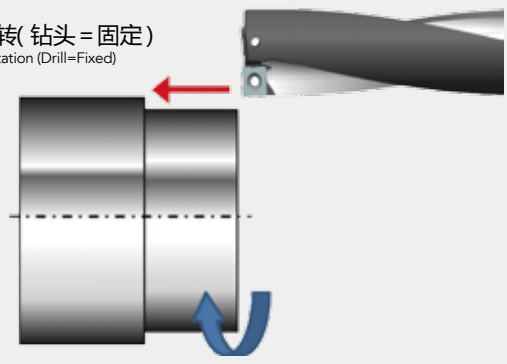
■车内圆加工
Turning internal diameter

工件正传(钻头=固定)
Normal rotation (Drill=Fixed)



■车外圆加工
Turning outer diameter

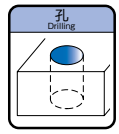
工件逆转(钻头=固定)
Reverse rotation (Drill=Fixed)



Phoenix

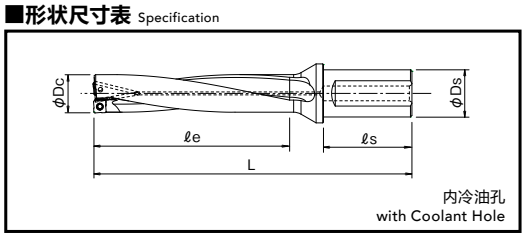
可转位式钻头
Indexable Drill

P2D

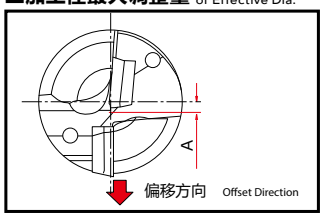


Specification

■形状尺寸表 Specification



■加工径最大调整量 Max Offset Amount of Effective Dia.



单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7803117	P2D1500FS20M04	15	95	30	20	50	0.4	15.8	①
7803118	P2D1550FS20M04	15.5	96	31	20	50	0.3	16.1	
7803119	P2D1600FS20M04	16	97	32	20	50	0.3	16.6	
7803120	P2D1650FS20M04	16.5	98	33	20	50	0.3	17.1	
7803121	P2D1700FS20M05	17	102	34	20	50	0.6	18.2	②
7803122	P2D1750FS20M05	17.5	103	35	20	50	0.5	18.5	
7803190	P2D1750FS25M05		109		25	56			
7803123	P2D1800FS25M05	18	110	36	25	56	0.5	19.0	
7803124	P2D1850FS25M05	18.5	111	37	25	56	0.4	19.3	
7803125	P2D1900FS25M06	19	112	38	25	56	0.6	20.2	③
7803126	P2D1950FS25M06	19.5	113	39	25	56	0.5	20.5	
7803127	P2D2000FS25M06	20	114	40	25	56	0.4	20.8	
7803128	P2D2050FS25M06	20.5	115	41	25	56	0.4	21.3	
7803129	P2D2100FS25M07	21	121	42	25	56	1.0	23.0	④
7803130	P2D2150FS25M07	21.5	122	43	25	56	0.9	23.3	
7803131	P2D2200FS25M07	22	123	44	25	56	0.8	23.6	
7803132	P2D2250FS25M07	22.5	124	45	25	56	0.7	23.9	
7803133	P2D2300FS25M07	23	125	46	25	56	0.5	24.0	
7803191	P2D2350FS25M07	23.5	126	47	25	56	0.4	24.3	
7803134	P2D2350FS32M07		130		32	60			
7803192	P2D2400FS25M07	24	127	48	25	56	0.3	24.6	
7803135	P2D2400FS32M07		131		32	60			
7803193	P2D2450FS25M07	24.5	128	49	25	56	0.2	24.9	
7803136	P2D2450FS32M07		132		32	60			
7803194	P2D2500FS25M08	25	129	50	25	56	1.1	27.2	⑤
7803137	P2D2500FS32M08		133		32	60			
7803195	P2D2550FS25M08	25.5	130	51	25	56	0.9	27.3	
7803138	P2D2550FS32M08		134		32	60			
7803139	P2D2600FS32M08	26	135	52	32	60	0.8	27.6	
7803140	P2D2650FS32M08	26.5	136	53	32	60	0.7	27.9	
7803141	P2D2700FS32M08	27	137	54	32	60	0.6	28.2	
7803142	P2D2800FS32M08	28	139	56	32	60	0.3	28.6	
7803143	P2D2850FS32M08	28.5	140	57	32	60	0.2	28.9	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

NEXT

FROM

单位:mm Unit:mm

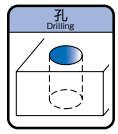
商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7803144	P2D2900FS32M09	29	141	58	32	60	1.3	31.6	⑥
7803145	P2D3000FS32M09	30	143	60	32	60	1.1	32.2	
7803146	P2D3100FS32M09	31	145	62	32	60	0.8	32.6	
7803196	P2D3100FS40M09		155		40	70			
7803147	P2D3200FS32M09	32	147	64	32	60	0.6	33.2	
7803197	P2D3200FS40M09		157		40	70			
7803148	P2D3300FS40M09	33	159	66	40	70	0.3	33.6	
7803149	P2D3350FS40M09	33.5	160	67	40	70	0.2	33.9	
7803150	P2D3400FS40M10	34	161	68	40	70	1.1	36.2	⑦
7803151	P2D3500FS40M10	35	163	70	40	70	0.8	36.6	
7803152	P2D3600FS40M10	36	165	72	40	70	0.8	37.6	
7803153	P2D3700FS40M10	37	167	74	40	70	0.6	38.2	
7803154	P2D3800FS40M10	38	169	76	40	70	0.3	38.6	
7803155	P2D3900FS40M12	39	178	78	40	70	1.0	41.0	⑧
7803156	P2D4000FS40M12	40	180	80	40	70	0.9	41.8	
7803157	P2D4100FS40M12	41	182	82	40	70	0.8	42.6	
7803158	P2D4200FS40M12	42	184	84	40	70	0.6	43.2	
7803159	P2D4300FS40M12	43	186	86	40	70	0.5	44.0	
7803160	P2D4400FS40M12	44	188	88	40	70	0.3	44.6	
7803161	P2D4500FS40M13	45	190	90	40	70	0.9	46.8	⑨
7803162	P2D4600FS40M13	46	192	92	40	70	0.8	47.6	
7803163	P2D4700FS40M13	47	194	94	40	70	0.7	48.4	
7803164	P2D4800FS40M13	48	196	96	40	70	0.5	49.0	
7803165	P2D4900FS40M13	49	198	98	40	70	0.3	49.6	
7803166	P2D5000FS40M14	50	200	100	40	70	1.1	52.2	⑩
7803167	P2D5100FS40M14	51	202	102	40	70	1.0	53.0	
7803168	P2D5200FS40M14	52	204	104	40	70	0.8	53.6	
7803169	P2D5300FS40M14	53	206	106	40	70	0.7	54.4	
7803170	P2D5400FS40M14	54	208	108	40	70	0.6	55.2	
7803171	P2D5500FS40M14	55	210	110	40	70	0.4	55.8	
7803172	P2D5600FS40M14	56	212	112	40	70	0.1	56.2	
7803173	P2D5700FS40M16	57	214	114	40	70	1.1	59.2	⑪
7803174	P2D5800FS40M16	58	216	116	40	70	1.0	60.0	
7803175	P2D5900FS40M16	59	218	118	40	70	0.9	60.8	
7803176	P2D6000FS40M16	60	220	120	40	70	0.8	61.6	
7803177	P2D6100FS40M16	61	222	122	40	70	0.6	62.2	
7803178	P2D6200FS40M16	62	224	124	40	70	0.4	62.8	
7803179	P2D6300FS40M16	63	226	126	40	70	0.2	63.4	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

Phoenix

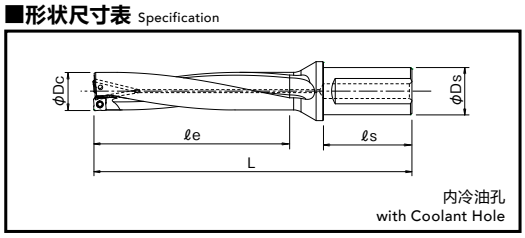
可转位式钻头
Indexable Drill

P3D

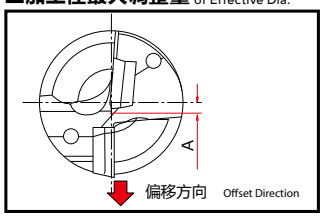


Specification

■形状尺寸表 Specification



■加工径最大调整量 Max Offset Amount of Effective Dia.



单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7803217	P3D1500FS20M04	15	110	45	20	50	0.4	15.8	①
7803218	P3D1550FS20M04	15.5	112	47	20	50	0.3	16.1	
7803219	P3D1600FS20M04	16	113	48	20	50	0.3	16.6	
7803220	P3D1650FS20M04	16.5	115	50	20	50	0.3	17.1	
7803221	P3D1700FS20M05	17	119	51	20	50	0.6	18.2	②
7803222	P3D1750FS20M05	17.5	121	53	20	50	0.5	18.5	
7803290	P3D1750FS25M05		127		25	56			
7803223	P3D1800FS25M05	18	128	54	25	56	0.5	19.0	
7803224	P3D1850FS25M05	18.5	130	56	25	56	0.4	19.3	
7803225	P3D1900FS25M06	19	131	57	25	56	0.6	20.2	③
7803226	P3D1950FS25M06	19.5	133	59	25	56	0.5	20.5	
7803227	P3D2000FS25M06	20	134	60	25	56	0.4	20.8	
7803228	P3D2050FS25M06	20.5	136	62	25	56	0.4	21.3	
7803229	P3D2100FS25M07	21	142	63	25	56	1.0	23.0	④
7803230	P3D2150FS25M07	21.5	144	65	25	56	0.9	23.3	
7803231	P3D2200FS25M07	22	145	66	25	56	0.8	23.6	
7803232	P3D2250FS25M07	22.5	147	68	25	56	0.7	23.9	
7803233	P3D2300FS25M07	23	148	69	25	56	0.5	24.0	
7803291	P3D2350FS25M07	23.5	150	71	25	56	0.4	24.3	
7803234	P3D2350FS32M07		154		32	60			
7803292	P3D2400FS25M07	24	151	72	25	56	0.3	24.6	
7803235	P3D2400FS32M07		155		32	60			
7803293	P3D2450FS25M07	24.5	153	74	25	56	0.2	24.9	
7803236	P3D2450FS32M07		157		32	60			
7803294	P3D2500FS25M08	25	154	75	25	56	1.1	27.2	⑤
7803237	P3D2500FS32M08		158		32	60			
7803295	P3D2550FS25M08	25.5	156	77	25	56	0.9	27.3	
7803238	P3D2550FS32M08		160		32	60			
7803239	P3D2600FS32M08	26	161	78	32	60	0.8	27.6	
7803240	P3D2650FS32M08	26.5	163	80	32	60	0.7	27.9	
7803241	P3D2700FS32M08	27	164	81	32	60	0.6	28.2	
NEW 7803300	P3D2750FS32M08	27.5	166	83	32	60	0.4	28.3	
7803242	P3D2800FS32M08	28	167	84	32	60	0.3	28.6	
7803243	P3D2850FS32M08	28.5	169	86	32	60	0.2	28.9	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

NEXT

NEW

FROM

单位:mm Unit:mm

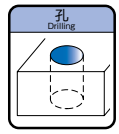
	商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
	7803244	P3D2900FS32M09	29	170	87	32	60	1.3	31.6	⑥
NEW	7803301	P3D2950FS32M09	29.5	172	89	32	60	1.2	31.9	
	7803245	P3D3000FS32M09	30	173	90	32	60	1.1	32.2	
NEW	7803302	P3D3050FS32M09	30.5	175	92	32	60	1.0	32.5	
	7803246	P3D3100FS32M09	31	176	93	32	60	0.8	32.6	
	7803296	P3D3100FS40M09		186		40	70			
NEW	7803303	P3D3150FS32M09	31.5	178	95	32	60	0.7	32.9	
	7803247	P3D3200FS32M09	32	179	96	32	60	0.6	33.2	
	7803297	P3D3200FS40M09		189		40	70			
NEW	7803304	P3D3250FS40M09	32.5	191	98	40	70	0.4	33.3	
	7803248	P3D3300FS40M09	33	192	99	40	70	0.3	33.6	
	7803249	P3D3350FS40M09	33.5	194	101	40	70	0.2	33.9	
	7803250	P3D3400FS40M10	34	195	102	40	70	1.1	36.2	⑦
NEW	7803305	P3D3450FS40M10	34.5	197	104	40	70	0.9	36.3	
	7803251	P3D3500FS40M10	35	198	105	40	70	0.8	36.6	
NEW	7803306	P3D3550FS40M10	35.5	200	107	40	70	0.7	36.9	
	7803252	P3D3600FS40M10	36	201	108	40	70	0.8	37.6	
	7803253	P3D3700FS40M10	37	204	111	40	70	0.6	38.2	
NEW	7803307	P3D3750FS40M10	37.5	206	113	40	70	0.4	38.3	
	7803254	P3D3800FS40M10	38	207	114	40	70	0.3	38.6	
	7803255	P3D3900FS40M12	39	217	117	40	70	1.0	41.0	⑧
	7803256	P3D4000FS40M12	40	220	120	40	70	0.9	41.8	
NEW	7803308	P3D4050FS40M12	40.5	222	122	40	70	0.8	42.1	
	7803257	P3D4100FS40M12	41	223	123	40	70	0.8	42.6	
	7803258	P3D4200FS40M12	42	226	126	40	70	0.6	43.2	
	7803259	P3D4300FS40M12	43	229	129	40	70	0.5	44.0	
	7803260	P3D4400FS40M12	44	232	132	40	70	0.3	44.6	
	7803261	P3D4500FS40M13	45	235	135	40	70	0.9	46.8	⑨
	7803262	P3D4600FS40M13	46	238	138	40	70	0.8	47.6	
	7803263	P3D4700FS40M13	47	241	141	40	70	0.7	48.4	
	7803264	P3D4800FS40M13	48	244	144	40	70	0.5	49.0	
	7803265	P3D4900FS40M13	49	247	147	40	70	0.3	49.6	
	7803266	P3D5000FS40M14	50	250	150	40	70	1.1	52.2	⑩
NEW	7803309	P3D5050FS40M14	50.5	252	152	40	70	1.0	52.5	
	7803267	P3D5100FS40M14	51	253	153	40	70	1.0	53.0	
	7803268	P3D5200FS40M14	52	256	156	40	70	0.8	53.6	
	7803269	P3D5300FS40M14	53	259	159	40	70	0.7	54.4	
	7803270	P3D5400FS40M14	54	262	162	40	70	0.6	55.2	
	7803271	P3D5500FS40M14	55	265	165	40	70	0.4	55.8	
	7803272	P3D5600FS40M14	56	268	168	40	70	0.1	56.2	
	7803273	P3D5700FS40M16	57	271	171	40	70	1.1	59.2	⑪
	7803274	P3D5800FS40M16	58	274	174	40	70	1.0	60.0	
	7803275	P3D5900FS40M16	59	277	177	40	70	0.9	60.8	
	7803276	P3D6000FS40M16	60	280	180	40	70	0.8	61.6	
	7803277	P3D6100FS40M16	61	283	183	40	70	0.6	62.2	
	7803278	P3D6200FS40M16	62	286	186	40	70	0.4	62.8	
	7803279	P3D6300FS40M16	63	289	189	40	70	0.2	63.4	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

Phoenix

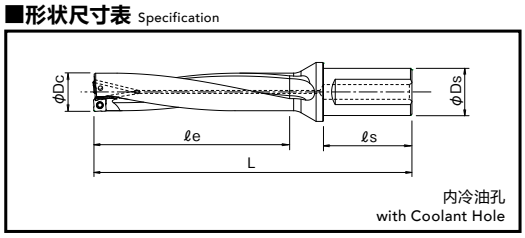
可转位式钻头
Indexable Drill

P4D

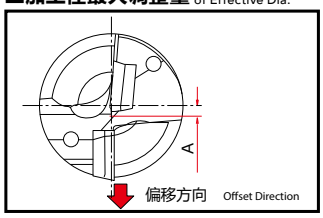


Specification

■形状尺寸表 Specification



■加工径最大调整量 Max Offset Amount of Effective Dia.



单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7803317	P4D1500FS20M04	15	125	60	20	50	0.4	15.8	①
7803318	P4D1550FS20M04	15.5	127	62	20	50	0.3	16.1	
7803319	P4D1600FS20M04	16	129	64	20	50	0.3	16.6	
7803320	P4D1650FS20M04	16.5	131	66	20	50	0.3	17.1	
7803321	P4D1700FS20M05	17	136	68	20	50	0.6	18.2	②
7803322	P4D1750FS20M05	17.5	138	70	20	50	0.5	18.5	
7803390	P4D1750FS25M05		144		25	56			
7803323	P4D1800FS25M05	18	146	72	25	56	0.5	19.0	
7803324	P4D1850FS25M05	18.5	148	74	25	56	0.4	19.3	
7803325	P4D1900FS25M06	19	150	76	25	56	0.6	20.2	③
7803326	P4D1950FS25M06	19.5	152	78	25	56	0.5	20.5	
7803327	P4D2000FS25M06	20	154	80	25	56	0.4	20.8	
7803328	P4D2050FS25M06	20.5	156	82	25	56	0.4	21.3	
7803329	P4D2100FS25M07	21	163	84	25	56	1.0	23.0	④
7803330	P4D2150FS25M07	21.5	165	86	25	56	0.9	23.3	
7803331	P4D2200FS25M07	22	167	88	25	56	0.8	23.6	
7803332	P4D2250FS25M07	22.5	169	90	25	56	0.7	23.9	
7803333	P4D2300FS25M07	23	171	92	25	56	0.5	24.0	
7803391	P4D2350FS25M07	23.5	173	94	25	56	0.4	24.3	
7803334	P4D2350FS32M07		177		32	60			
7803392	P4D2400FS25M07	24	175	96	25	56	0.3	24.6	
7803335	P4D2400FS32M07		179		32	60			
7803393	P4D2450FS25M07	24.5	177	98	25	56	0.2	24.9	
7803336	P4D2450FS32M07		181		32	60			
7803394	P4D2500FS25M08	25	179	100	25	56	1.1	27.2	⑤
7803337	P4D2500FS32M08		183		32	60			
7803395	P4D2550FS25M08	25.5	181	102	25	56	0.9	27.3	
7803338	P4D2550FS32M08		185		32	60			
7803339	P4D2600FS32M08	26	187	104	32	60	0.8	27.6	
7803340	P4D2650FS32M08	26.5	189	106	32	60	0.7	27.9	
7803341	P4D2700FS32M08	27	191	108	32	60	0.6	28.2	
7803342	P4D2800FS32M08	28	195	112	32	60	0.3	28.6	
7803343	P4D2850FS32M08	28.5	197	114	32	60	0.2	28.9	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

NEXT

FROM

单位:mm Unit:mm

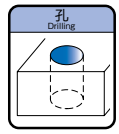
商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7803344	P4D2900FS32M09	29	199	116	32	60	1.3	31.6	⑥
7803345	P4D3000FS32M09	30	203	120	32	60	1.1	32.2	
7803346	P4D3100FS32M09	31	207	124	32	60	0.8	32.6	
7803396	P4D3100FS40M09		217		40	70			
7803347	P4D3200FS32M09	32	211	128	32	60	0.6	33.2	
7803397	P4D3200FS40M09		221		40	70			
7803348	P4D3300FS40M09	33	225	132	40	70	0.3	33.6	
7803349	P4D3350FS40M09	33.5	227	134	40	70	0.2	33.9	
7803350	P4D3400FS40M10	34	229	136	40	70	1.1	36.2	⑦
7803351	P4D3500FS40M10	35	233	140	40	70	0.8	36.6	
7803352	P4D3600FS40M10	36	237	144	40	70	0.8	37.6	
7803353	P4D3700FS40M10	37	241	148	40	70	0.6	38.2	
7803354	P4D3800FS40M10	38	245	152	40	70	0.3	38.6	
7803355	P4D3900FS40M12	39	256	156	40	70	1.0	41.0	⑧
7803356	P4D4000FS40M12	40	260	160	40	70	0.9	41.8	
7803357	P4D4100FS40M12	41	264	164	40	70	0.8	42.6	
7803358	P4D4200FS40M12	42	268	168	40	70	0.6	43.2	
7803359	P4D4300FS40M12	43	272	172	40	70	0.5	44.0	
7803360	P4D4400FS40M12	44	276	176	40	70	0.3	44.6	
7803361	P4D4500FS40M13	45	280	180	40	70	0.9	46.8	⑨
7803362	P4D4600FS40M13	46	284	184	40	70	0.8	47.6	
7803363	P4D4700FS40M13	47	288	188	40	70	0.7	48.4	
7803364	P4D4800FS40M13	48	292	192	40	70	0.5	49.0	
7803365	P4D4900FS40M13	49	296	196	40	70	0.3	49.6	
7803366	P4D5000FS40M14	50	300	200	40	70	1.1	52.2	⑩
7803367	P4D5100FS40M14	51	304	204	40	70	1.0	53.0	
7803368	P4D5200FS40M14	52	308	208	40	70	0.8	53.6	
7803369	P4D5300FS40M14	53	312	212	40	70	0.7	54.4	
7803370	P4D5400FS40M14	54	316	216	40	70	0.6	55.2	
7803371	P4D5500FS40M14	55	320	220	40	70	0.4	55.8	
7803372	P4D5600FS40M14	56	324	224	40	70	0.1	56.2	
7803373	P4D5700FS40M16	57	328	228	40	70	1.1	59.2	⑪
7803374	P4D5800FS40M16	58	332	232	40	70	1.0	60.0	
7803375	P4D5900FS40M16	59	336	236	40	70	0.9	60.8	
7803376	P4D6000FS40M16	60	340	240	40	70	0.8	61.6	
7803377	P4D6100FS40M16	61	344	244	40	70	0.6	62.2	
7803378	P4D6200FS40M16	62	348	248	40	70	0.4	62.8	
7803379	P4D6300FS40M16	63	352	252	40	70	0.2	63.4	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

Phoenix

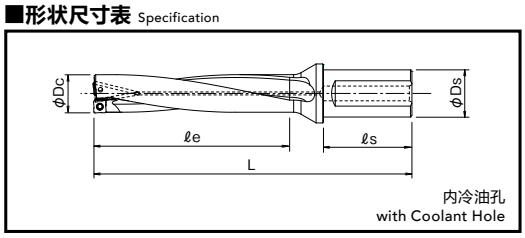
可转位式钻头
Indexable Drill

P5D

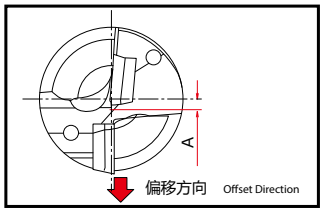


Specification

■形状尺寸表 Specification



■加工径最大调整量 Max Offset Amount of Effective Dia.



单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7802717	P5D1500FS20M04	15	140	75	20	50	0.4	15.8	①
7802718	P5D1550FS20M04	15.5	143	78	20	50	0.3	16.1	
7802719	P5D1600FS20M04	16	145	80	20	50	0.3	16.6	
7802720	P5D1650FS20M04	16.5	148	83	20	50	0.3	17.1	
7802721	P5D1700FS20M05	17	153	85	20	50	0.6	18.2	②
7802722	P5D1750FS20M05	17.5	156	88	20	50	0.5	18.5	
7802790	P5D1750FS25M05		162		25	56			
7802723	P5D1800FS25M05	18	164	90	25	56	0.5	19.0	
7802724	P5D1850FS25M05	18.5	167	93	25	56	0.4	19.3	
7802725	P5D1900FS25M06	19	169	95	25	56	0.6	20.2	③
7802726	P5D1950FS25M06	19.5	172	98	25	56	0.5	20.5	
7802727	P5D2000FS25M06	20	174	100	25	56	0.4	20.8	
7802728	P5D2050FS25M06	20.5	177	103	25	56	0.4	21.3	
7802729	P5D2100FS25M07	21	184	105	25	56	1.0	23.0	④
7802730	P5D2150FS25M07	21.5	187	108	25	56	0.9	23.3	
7802731	P5D2200FS25M07	22	189	110	25	56	0.8	23.6	
7802732	P5D2250FS25M07	22.5	192	113	25	56	0.7	23.9	
7802733	P5D2300FS25M07	23	194	115	25	56	0.5	24.0	
7802791	P5D2350FS25M07	23.5	197	118	25	56	0.4	24.3	
7802734	P5D2350FS32M07		201		32	60			
7802792	P5D2400FS25M07	24	199	120	25	56	0.3	24.6	
7802735	P5D2400FS32M07		203		32	60			
7802793	P5D2450FS25M07	24.5	202	123	25	56	0.2	24.9	
7802736	P5D2450FS32M07		206		32	60			
7802794	P5D2500FS25M08	25	204	125	25	56	1.1	27.2	⑤
7802737	P5D2500FS32M08		208		32	60			
7802795	P5D2550FS25M08	25.5	207	128	25	56	0.9	27.3	
7802738	P5D2550FS32M08		211		32	60			
7802739	P5D2600FS32M08	26	213	130	32	60	0.8	27.6	
7802740	P5D2650FS32M08	26.5	216	133	32	60	0.7	27.9	
7802741	P5D2700FS32M08	27	218	135	32	60	0.6	28.2	
7802742	P5D2800FS32M08	28	223	140	32	60	0.3	28.6	
7802743	P5D2850FS32M08	28.5	226	143	32	60	0.2	28.9	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

NEXT

FROM

单位:mm Unit:mm

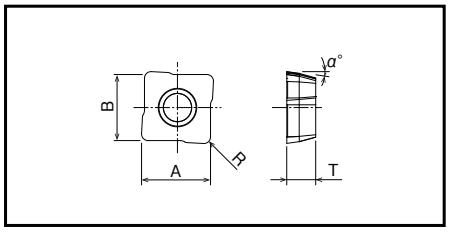
商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效加工深度 ℓe	柄径 Ds	柄长 ℓs	最大偏移量 A	最大加工径 Dc+A	适用刀头 Applicable Inserts
7802744	P5D2900FS32M09	29	228	145	32	60	1.3	31.6	⑥
7802745	P5D3000FS32M09	30	233	150	32	60	1.1	32.2	
7802746	P5D3100FS32M09	31	238	155	32	60	0.8	32.6	
7802796	P5D3100FS40M09		248		40	70			
7802747	P5D3200FS32M09	32	243	160	32	60	0.6	33.2	
7802797	P5D3200FS40M09		253		40	70			
7802748	P5D3300FS40M09	33	258	165	40	70	0.3	33.6	
7802749	P5D3350FS40M09	33.5	261	168	40	70	0.2	33.9	
7802750	P5D3400FS40M10	34	263	170	40	70	1.1	36.2	⑦
7802751	P5D3500FS40M10	35	268	175	40	70	0.8	36.6	
7802752	P5D3600FS40M10	36	273	180	40	70	0.8	37.6	
7802753	P5D3700FS40M10	37	278	185	40	70	0.6	38.2	
7802754	P5D3800FS40M10	38	283	190	40	70	0.3	38.6	
7802755	P5D3900FS40M12	39	295	195	40	70	1.0	41.0	⑧
7802756	P5D4000FS40M12	40	300	200	40	70	0.9	41.8	
7802757	P5D4100FS40M12	41	305	205	40	70	0.8	42.6	
7802758	P5D4200FS40M12	42	310	210	40	70	0.6	43.2	
7802759	P5D4300FS40M12	43	315	215	40	70	0.5	44.0	
7802760	P5D4400FS40M12	44	320	220	40	70	0.3	44.6	
7802761	P5D4500FS40M13	45	325	225	40	70	0.9	46.8	⑨
7802762	P5D4600FS40M13	46	330	230	40	70	0.8	47.6	
7802763	P5D4700FS40M13	47	335	235	40	70	0.7	48.4	
7802764	P5D4800FS40M13	48	340	240	40	70	0.5	49.0	
7802765	P5D4900FS40M13	49	345	245	40	70	0.3	49.6	
7802766	P5D5000FS40M14	50	350	250	40	70	1.1	52.2	⑩
7802767	P5D5100FS40M14	51	355	255	40	70	1.0	53.0	
7802768	P5D5200FS40M14	52	360	260	40	70	0.8	53.6	
7802769	P5D5300FS40M14	53	365	265	40	70	0.7	54.4	
7802770	P5D5400FS40M14	54	370	270	40	70	0.6	55.2	
7802771	P5D5500FS40M14	55	375	275	40	70	0.4	55.8	
7802772	P5D5600FS40M14	56	380	280	40	70	0.1	56.2	
7802773	P5D5700FS40M16	57	385	285	40	70	1.1	59.2	⑪
7802774	P5D5800FS40M16	58	390	290	40	70	1.0	60.0	
7802775	P5D5900FS40M16	59	395	295	40	70	0.9	60.8	
7802776	P5D6000FS40M16	60	400	300	40	70	0.8	61.6	
7802777	P5D6100FS40M16	61	405	305	40	70	0.6	62.2	
7802778	P5D6200FS40M16	62	410	310	40	70	0.4	62.8	
7802779	P5D6300FS40M16	63	415	315	40	70	0.2	63.4	

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

Phoenix

可转位式钻头
Indexable Drill

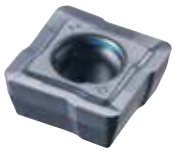
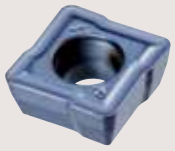
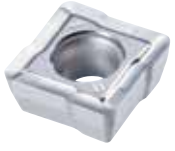
刀片
Inserts



Inserts

■适用刀头 Inserts

单位:mm Unit:mm

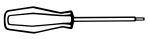
	式样 Specification		名称 Designation	切削刃数 Number of Cutting Edges	适用刀片 Applicable Body	刀片尺寸 Insert Size				超硬 Uncoated	涂层种类 Grade of Coated Materials	
						A×B	厚度 T	后角 α°	R	CK110	XP9020	XP1010
	钢 不锈钢 for Steel & Stainless Steel	①	XCMT042204ER-DM	4	φ15~16.5	5.0	2.2	8	0.4		7823064	
		②	XCMT052404ER-DM	4	φ17~18.5	5.83	2.4	8	0.4		7823065	
		③	XCMT062706ER-DM	4	φ19~20.5	6.46	2.7	8	0.6		7823066	
		④	XCMT073106ER-DM	4	φ21~24.5	7.11	3.1	8	0.6		7823067	
		⑤	XCMT083508ER-DM	4	φ25~28.5	8.36	3.5	8	0.8		7823068	
		⑥	XCMT094008ER-DM	4	φ29~33.5	9.62	4.0	8	0.8		7823069	
		⑦	XCMT104608ER-DM	4	φ34~38	10.89	4.6	8	0.8		7823097	
		⑧	XCMT125010ER-DM	4	φ39~44	12.57	5.0	8	1.0		7823071	
		⑨	XCMT135212ER-DM	4	φ45~49	14.05	5.2	8	1.2		7823072	
		⑩	XCMT145612ER-DM	4	φ50~56	15.58	5.6	8	1.2		7823073	
		⑪	XCMT165912ER-DM	4	φ57~63	17.28	5.9	8	1.2		7823075	
	铸铁 for Cast Iron	①	XCMT042204ER-DR	4	φ15~16.5	5.0	2.2	8	0.4			7823164
		②	XCMT052404ER-DR	4	φ17~18.5	5.83	2.4	8	0.4			7823165
		③	XCMT062706ER-DR	4	φ19~20.5	6.46	2.7	8	0.6			7823166
		④	XCMT073106ER-DR	4	φ21~24.5	7.11	3.1	8	0.6			7823167
		⑤	XCMT083508ER-DR	4	φ25~28.5	8.36	3.5	8	0.8			7823168
		⑥	XCMT094008ER-DR	4	φ29~33.5	9.62	4.0	8	0.8			7823169
		⑦	XCMT104608ER-DR	4	φ34~38	10.89	4.6	8	0.8			7823197
		⑧	XCMT125010ER-DR	4	φ39~44	12.57	5.0	8	1.0			7823171
		⑨	XCMT135212ER-DR	4	φ45~49	14.05	5.2	8	1.2			7823172
		⑩	XCMT145612ER-DR	4	φ50~56	15.58	5.6	8	1.2			7823173
		⑪	XCMT165912ER-DR	4	φ57~63	17.28	5.9	8	1.2			7823175
	アルミニウム 非鉄 for Aluminum(alloy) and Non-ferrous Metal	①	XCMT042204ER-DN	4	φ15~16.5	5.0	2.2	8	0.4	7823264		
		②	XCMT052404ER-DN	4	φ17~18.5	5.83	2.4	8	0.4	7823265		
		③	XCMT062706ER-DN	4	φ19~20.5	6.46	2.7	8	0.6	7823266		
		④	XCMT073106ER-DN	4	φ21~24.5	7.11	3.1	8	0.6	7823267		
		⑤	XCMT083508ER-DN	4	φ25~28.5	8.36	3.5	8	0.8	7823268		
		⑥	XCMT094008ER-DN	4	φ29~33.5	9.62	4.0	8	0.8	7823269		
		⑦	XCMT104608ER-DN	4	φ34~38	10.89	4.6	8	0.8	7823297		
		⑧	XCMT125010ER-DN	4	φ39~44	12.57	5.0	8	1.0	7823271		
		⑨	XCMT135212ER-DN	4	φ45~49	14.05	5.2	8	1.2	7823272		
		⑩	XCMT145612ER-DN	4	φ50~56	15.58	5.6	8	1.2	7823273		
		⑪	XCMT165912ER-DN	4	φ57~63	17.28	5.9	8	1.2	7823275		

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

Accessories

■零件 Accessories

	形状 EDP No.	名称 Designation	适用刀片 Applicable Inserts					
 固定螺丝 Clamping Screw	7808139	FS20543P	①	XCMT0422···	②	XCMT0524···	–	–
	7808138	FS22550P	③	XCMT0627···	–	–	–	–
	7808136	FS25560P	④	XCMT0731···	–	–	–	–
	7808135	FS30570P	⑤	XCMT0835···	⑥	XCMT0940···	–	–
	7808137	FS35586P	⑦	XCMT1046···	⑧	XCMT1250···	–	–
	7808114	FS45510P	⑨	XCMT1352···	⑩	XCMT1456···	⑪	XCMT1659···

	形状 EDP No.	名称 Designation	适用刀片 Applicable Inserts					
 扳手 Wrench	7808223	6IP-D (Torx 6IP)	①	XCMT0422···	②	XCMT0524···	–	–
	7808224	7IP-D (Torx 7IP)	③	XCMT0627···	–	–	–	–
	7808225	8IP-D (Torx 8IP)	④	XCMT0731···	–	–	–	–
	7808226	9IP-D (Torx 9IP)	⑤	XCMT0835···	⑥	XCMT0940···	–	–
	7808228	15IP-D (Torx 15IP)	⑦	XCMT1046···	⑧	XCMT1250···	–	–
	7808229	20IP-D (Torx 20IP)	⑨	XCMT1352···	⑩	XCMT1456···	⑪	XCMT1659···

扳手请另购。 The wrenches are sold separately from the cutters.

Phoenix

可转位式钻头
Indexable Drill

PD

Cutting Conditions

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	进给量 f (mm/rev) Feed							
				P2D·P3D							
				ø15~ø16.5	ø17~ø18.5	ø19~ø20.5	ø21~ø24.5	ø25~ø28.5	ø29~ø33.5	ø34~ø63	
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	200 (150~250)	0.06 (0.04~0.1)	0.06 (0.04~0.1)	0.07 (0.04~0.1)	0.08 (0.04~0.12)	0.08 (0.04~0.12)	0.1 (0.05~0.15)	0.1 (0.05~0.18)	
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	150 (100~220)	0.08 (0.04~0.14)	0.09 (0.04~0.16)	0.1 (0.04~0.18)	0.14 (0.04~0.2)	0.18 (0.06~0.25)	0.2 (0.08~0.3)	0.2 (0.08~0.35)	
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	120 (80~180)	0.06 (0.04~0.1)	0.07 (0.04~0.1)	0.08 (0.04~0.12)	0.12 (0.04~0.15)	0.14 (0.06~0.2)	0.18 (0.08~0.25)	0.18 (0.08~0.25)	
M	不锈钢 Stainless Steel (SUS304, SUS420)	~250HB	130 (80~180)	0.07 (0.04~0.1)	0.08 (0.04~0.1)	0.09 (0.04~0.12)	0.1 (0.04~0.15)	0.13 (0.06~0.2)	0.15 (0.08~0.25)	0.15 (0.08~0.25)	
K	铸铁 Cast Iron (FC250)	~350N/mm²	200 (150~280)	0.08 (0.04~0.14)	0.1 (0.04~0.16)	0.12 (0.04~0.2)	0.16 (0.08~0.25)	0.2 (0.06~0.3)	0.2 (0.08~0.3)	0.2 (0.08~0.35)	
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	160 (100~220)	0.08 (0.04~0.12)	0.09 (0.04~0.14)	0.1 (0.04~0.18)	0.14 (0.04~0.2)	0.18 (0.06~0.25)	0.18 (0.08~0.25)	0.18 (0.08~0.25)	
N	铝合金 Aluminum Alloy	~13%Si	200 (100~800)	0.08 (0.04~0.12)	0.1 (0.04~0.16)	0.12 (0.04~0.2)	0.16 (0.04~0.25)	0.2 (0.06~0.3)	0.2 (0.08~0.3)	0.2 (0.08~0.3)	
S	超耐热合金 Supperalloy (Inconel® 718)	–	30 (15~50)	0.04 (0.02~0.06)	0.05 (0.03~0.06)	0.05 (0.03~0.06)	0.06 (0.04~0.08)	0.08 (0.06~0.1)	0.1 (0.06~0.12)	0.1 (0.06~0.12)	
S	钛合金 Titanium Alloy (Ti-6Al-4V)	–	60 (30~100)	0.05 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.08 (0.04~0.15)	0.1 (0.06~0.2)	0.14 (0.08~0.2)	0.14 (0.08~0.2)	
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	100 (60~120)	0.06 (0.04~0.1)	0.06 (0.04~0.12)	0.07 (0.04~0.12)	0.08 (0.04~0.12)	0.1 (0.06~0.15)	0.1 (0.06~0.15)	0.1 (0.06~0.15)	
H	调质钢 Hardened Steel (SKD11)	50~55HRC	60 (40~80)	0.05 (0.04~0.08)	0.05 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.08 (0.04~0.1)	0.08 (0.04~0.1)	0.08 (0.04~0.1)	

1. 这张切削条件基准表是以水溶性切屑油剂作为内部供油。
2. 请使用稀释倍率20倍以下的优质水溶性切屑油剂。
3. 不推荐使用不水溶性切屑油剂。
4. 这张切削条件基准表的数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
5. 请确保整洁干净后紧紧地安装刀片。
6. 请牢牢固定加工材料，确保在没有变形，弯曲，震动的情况下加工。
7. 油孔堵塞是造成折损问题的原因，请务必安装供油装置的过滤器。

■加工材料推荐

Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片材质 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
XP9020	DM	有 Wet	◎	◎	○	○	○	○
XP1010	DR	有 Wet	○		◎			
CK110	DN	有 Wet				◎		

DM:钢·不锈钢用　DR:铸铁用　DN:铝合金·非鉄用
DM:for Steel & Stainless Steel　DR:for Cast Iron　DN:for Aluminum Alloy & Non-ferrous Metal

■加工孔径的参考值

Reference Value of Hole Diameter　　单位:mm　Unit:mm

外径 Dc	P2D·P3D	P4D·P5D
φ15~φ20.5	+0.25 0	+0.3 0
φ21~φ49	+0.3 0	+0.4 0
φ50~φ63	+0.35 0	+0.5 0

上述推荐数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above values are general recommendation and may differ based on actual machining condition.

	进给量 f (mm/rev) Feed													
	P4D							P5D						
	ø15~ø16.5	ø17~ø18.5	ø19~ø20.5	ø21~ø24.5	ø25~ø28.5	ø29~ø33.5	ø34~ø63	ø15~ø16.5	ø17~ø18.5	ø19~ø20.5	ø21~ø24.5	ø25~ø28.5	ø29~ø33.5	ø34~ø63
	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.07 (0.04~0.1)	0.08 (0.04~0.12)	0.08 (0.04~0.12)	0.1 (0.05~0.15)	0.1 (0.05~0.18)	0.05 (0.04~0.08)	0.06 (0.04~0.08)	0.07 (0.04~0.1)	0.08 (0.04~0.12)	0.08 (0.04~0.12)	0.1 (0.05~0.15)	0.1 (0.05~0.18)
	0.08 (0.04~0.14)	0.08 (0.04~0.16)	0.09 (0.04~0.18)	0.12 (0.04~0.15)	0.18 (0.06~0.25)	0.2 (0.08~0.25)	0.2 (0.08~0.3)	0.06 (0.04~0.09)	0.08 (0.04~0.12)	0.08 (0.04~0.14)	0.12 (0.04~0.15)	0.15 (0.06~0.2)	0.18 (0.08~0.2)	0.18 (0.08~0.25)
	0.06 (0.04~0.1)	0.07 (0.04~0.1)	0.08 (0.04~0.12)	0.1 (0.04~0.13)	0.14 (0.06~0.2)	0.18 (0.08~0.25)	0.18 (0.08~0.25)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.07 (0.04~0.1)	0.1 (0.04~0.13)	0.12 (0.06~0.15)	0.15 (0.08~0.18)	0.16 (0.08~0.22)
	0.06 (0.04~0.08)	0.07 (0.04~0.1)	0.08 (0.04~0.1)	0.08 (0.04~0.1)	0.13 (0.06~0.2)	0.15 (0.08~0.2)	0.15 (0.08~0.2)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.07 (0.04~0.09)	0.08 (0.04~0.1)	0.1 (0.06~0.15)	0.12 (0.06~0.18)	0.12 (0.06~0.2)
	0.08 (0.04~0.14)	0.09 (0.04~0.16)	0.1 (0.04~0.2)	0.12 (0.04~0.15)	0.2 (0.06~0.3)	0.2 (0.08~0.3)	0.2 (0.08~0.3)	0.06 (0.04~0.1)	0.08 (0.04~0.12)	0.08 (0.04~0.13)	0.12 (0.04~0.15)	0.15 (0.06~0.2)	0.18 (0.08~0.2)	0.18 (0.08~0.25)
	0.08 (0.04~0.1)	0.08 (0.04~0.12)	0.09 (0.04~0.15)	0.12 (0.04~0.15)	0.15 (0.06~0.25)	0.18 (0.08~0.25)	0.18 (0.08~0.25)	0.06 (0.04~0.09)	0.08 (0.04~0.12)	0.08 (0.04~0.12)	0.1 (0.04~0.13)	0.12 (0.06~0.15)	0.15 (0.08~0.18)	0.18 (0.08~0.25)
	0.07 (0.04~0.12)	0.09 (0.04~0.12)	0.12 (0.04~0.2)	0.14 (0.04~0.2)	0.2 (0.06~0.3)	0.2 (0.08~0.3)	0.2 (0.08~0.3)	0.06 (0.04~0.1)	0.09 (0.04~0.12)	0.1 (0.04~0.15)	0.12 (0.04~0.15)	0.15 (0.06~0.25)	0.2 (0.08~0.3)	0.2 (0.08~0.3)
	0.04 (0.02~0.06)	0.04 (0.02~0.06)	0.04 (0.02~0.06)	0.05 (0.04~0.08)	0.07 (0.06~0.1)	0.08 (0.06~0.12)	0.08 (0.06~0.12)	0.04 (0.02~0.06)	0.04 (0.02~0.06)	0.04 (0.02~0.06)	0.04 (0.02~0.06)	0.07 (0.06~0.08)	0.07 (0.06~0.08)	0.07 (0.06~0.08)
	0.05 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.08 (0.04~0.1)	0.1 (0.06~0.2)	0.14 (0.08~0.2)	0.14 (0.08~0.2)	0.05 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.1)	0.08 (0.06~0.15)	0.1 (0.08~0.15)	0.1 (0.08~0.15)
	0.06 (0.04~0.1)	0.06 (0.04~0.1)	0.06 (0.04~0.1)	0.08 (0.04~0.12)	0.08 (0.06~0.12)	0.1 (0.06~0.13)	0.1 (0.06~0.13)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.08 (0.04~0.1)	0.08 (0.06~0.12)	0.1 (0.06~0.12)	0.1 (0.06~0.12)
	0.05 (0.04~0.08)	0.05 (0.04~0.08)	0.06 (0.04~0.08)	0.06 (0.04~0.08)	0.08 (0.04~0.1)	0.08 (0.04~0.1)	0.08 (0.04~0.1)	0.05 (0.04~0.07)	0.05 (0.04~0.07)	0.06 (0.04~0.07)	0.06 (0.04~0.08)	0.07 (0.04~0.1)	0.08 (0.04~0.1)	0.08 (0.04~0.1)

1. The indicated speeds and feeds are for using water-soluble oil with inner supply.
2. Suitable cutting fluid is water-soluble in high density (less than 20 times dilution).
3. Using non-water-soluble oil is not recommended.
4. The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.
5. Inserts should be attached to the holder tightly in a very neat condition.
6. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
7. A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.

Performance Evaluation & Cutting Data

■性能评价及加工数据 Performance Evaluation & Cutting Data

■即使是苛刻的5D深孔也能稳定加工

Achieves stable drilling, even when making rigorous, 5xD deep holes

加工材料：S50C
Work Material

刀具径：φ25
Drill Diameter

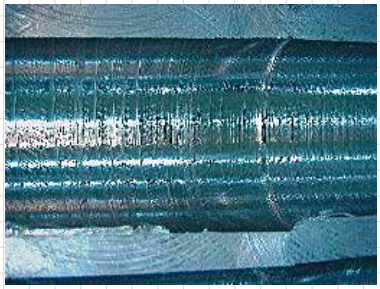
切深量：125mm
Depth of Hole

使用机械：卧式加工中心
Machine　Horizontal Machining Center

切削油剂：水溶性切削油剂
Coolant　Water-Soluble

切削条件：Vc=150m/min、f=0.12mm/rev
Cutting Conditions

■以往产品 Conventional Indexable Drill



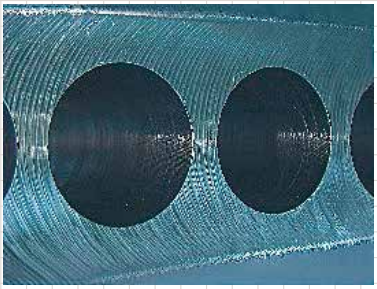
横截面照片 Cross-sectional

○以往的可转位式钻头加工5D深孔非常困难。

○可转位式钻头是双槽单刃，径向负荷平衡较差，容易导致横向负荷过大。对于深孔加工影响更大。

○5xD deep hole drilling was an extremely difficult process for conventional indexable drills.
○Since conventional indexable drills are constructed of two flutes and a cutting edge, its load balance is relatively poor especially when drilling deep holes.

■P5D



○可实现面精度优良的稳定加工！

○以5D深孔加工为基准的专用设计，可实现稳定加工。

○Achieves stable drilling with minimal irregularity!
○The P5D is designed specifically for stable drilling of 5xD deep holes.

■稳定的切削负荷 Stable cutting load

加工材料：S50C
Work Material

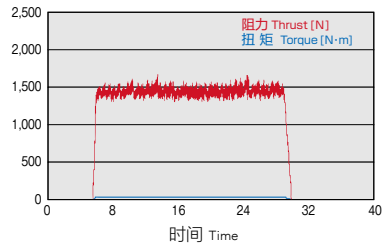
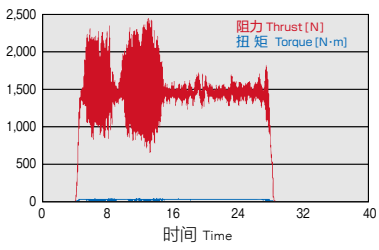
刀具径：φ21
Drill Diameter

切深量：50mm
Depth of Hole

使用机械：卧式加工中心(BT50)
Machine　Horizontal Machining Center

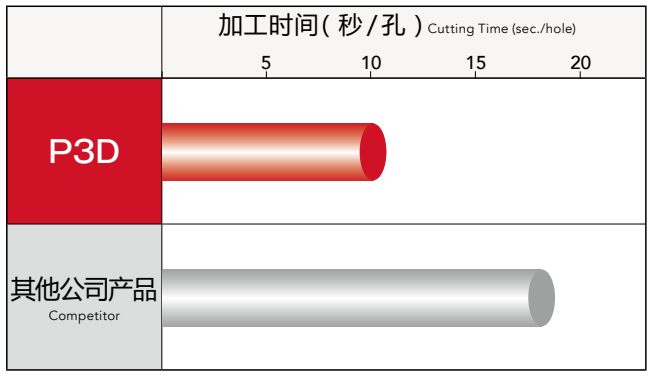
切削油剂：水溶性切削油剂
Coolant　Water-Soluble

切削条件：Vc=120m/min、f=0.12mm/rev
Cutting Conditions

	P5D	其他公司产品 Competitor
		
阻力平均值 Average thrust	1,400N	1,500N
扭矩平均值 Average torque	19N·m	18N·m

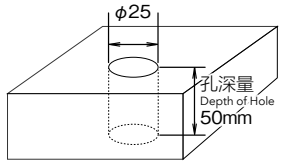
金属模具零件的高效率钻孔加工(P3D) High efficiency drilling in mold parts (P3D)

使用工具 Tool	P3D2500FS32M08 (ϕ25)	其他公司可转位式钻头 (ϕ25) Competitor's Indexable Drill
使用刀片(材质) Insert (grade)	XCMT083508ER-DM (XP9020)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S50C	
切削速度 Cutting Speed	200m/min (2,550min^{-1})	167m/min (2,100min^{-1})
进给速度 Feed	300mm/min (0.12mm/rev)	170mm/min (0.08mm/rev)
切深量 Depth of Hole	50mm(通孔) (Through)	
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	



其他公司产品如果加大加工条件的话，会切屑堵塞导致加工困难。P3D即使加大加工条件，也能通过细小分断切屑拥有良好的排屑性，大幅缩短加工时间。

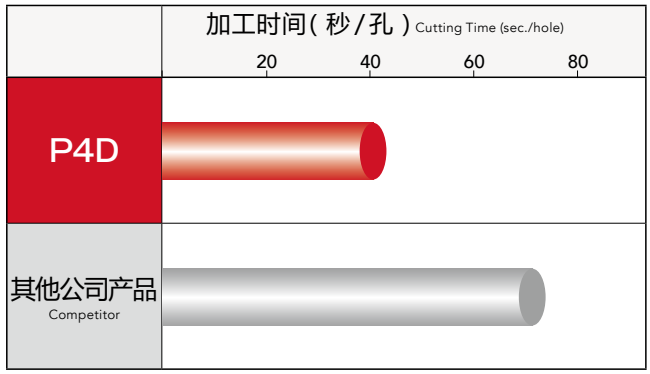
The competitor product exhibited difficulties in the separation of cutting chips, whereas the P3D was able to break chips into small pieces for trouble-free evacuation, reducing processing time significantly.



P3D的切屑 Cutting Chips of P3D

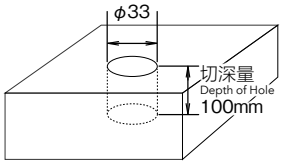
结构物的高效率钻孔加工(P4D) High efficiency drilling of structural part (P4D)

使用工具 Tool	P4D3300FS40M09 (ϕ33)	其他公司可转位式钻头 (ϕ33) Competitor's Indexable Drill
使用刀片(材质) Insert (grade)	XCMT094008ER-DM (XP9020)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SS400	
切削速度 Cutting Speed	220m/min (2,100min^{-1})	165m/min (1,600min^{-1})
进给速度 Feed	150mm/min (0.07mm/rev)	110mm/min (0.07mm/rev)
切深量 Depth of Hole	100mm(盲孔) (Blind)	
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	



以往，加工深度超过70mm的话，由于切屑堵塞只能进行2mm的阶梯式加工。使用即使深孔加工也能有优异排屑性的P4D的话，无需阶梯式加工，而且可以加大加工条件，单孔加工时间缩短45%。

To prevent chip clogging, 2mm step-drilling was commonly required for applications with a depth of over 70mm. The P4D, however, was able to demonstrate excellent chip evacuation even in deep-hole with no step processing required, improving performance with the reduction of machining time by 45% per hole.



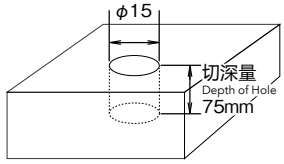
Cutting Data

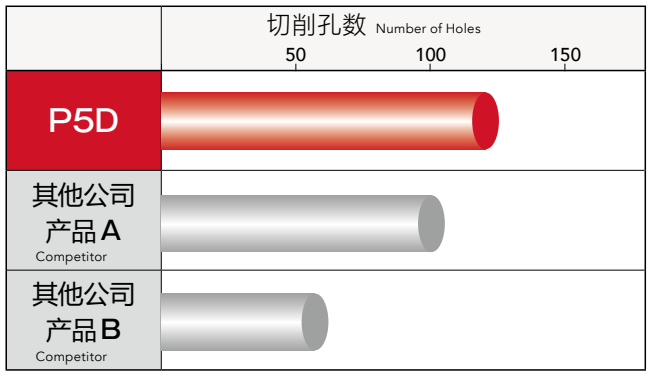
■加工数据 Cutting Data

即使SUS304也能稳定加工(P5D) Stable performance even in SUS304 (P5D)

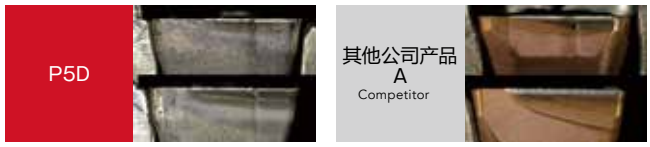
使用工具 Tool	P5D1500FS20M04 (ϕ15)	其他公司产品A Competitor	其他公司产品B Competitor
使用刀片(材质) Insert (grade)	XCMT042204ER-DM (XP9020)	硬质合金涂层刀片 Coated Carbide Insert	
加工材料 Work Material	SUS304		
切削速度 Cutting Speed	120m/min (2,550min^{-1})		
进给速度 Feed	150mm/min (0.06mm/rev)		
切深量 Depth of Hole	75mm(盲孔) (Blind)		
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)		
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center		

SUS304加工实现长寿命。
The P5D was able to achieve long tool life by drilling SUS304.





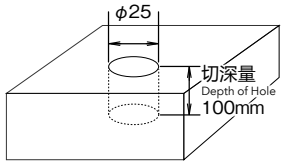
加工9m时的磨损比较 Wear comparison after 9m of drilling

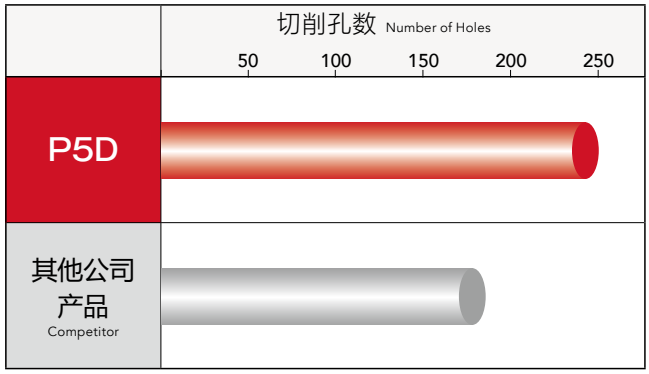


FC250的长寿命加工(P5D) Drilling with long tool life in FC250 (P5D)

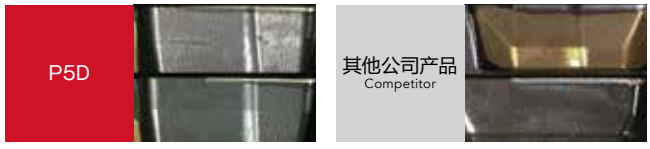
使用工具 Tool	P5D2500FS32M08 (ϕ25)	其他公司可转位式钻头 (ϕ25) Competitor's Indexable Drill
使用刀片(材质) Insert (grade)	XCMT083508ER-DR (XP1010)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FC250	
切削速度 Cutting Speed	150m/min (1,910min^{-1})	
进给速度 Feed	200mm/min (0.1mm/rev)	
切深量 Depth of Hole	100mm(盲孔) (Blind)	
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

是其他公司产品寿命的1.3倍，250孔也能稳定的加工。
P5D achieved stable drilling of 250 holes, which was over 1.3 times, versus the competition.





加工150孔时的磨损比较 Wear comparison after 150 holes of drilling



ADC12的长寿命加工(P5D) Drilling with long tool life in ADC12 (P5D)

使用工具 Tool	P5D2500FS32M08 (φ25)	其他公司可转位式钻头 (φ25) Competitor's Indexable Drill
使用刀片(材质) Insert (grade)	XCMT083508ER-DN (CK110)	超硬合金刀片 Carbide Insert
加工材料 Work Material	ADC12	
切削速度 Cutting Speed	250m/min (3,185min^{-1})	
进给速度 Feed	320mm/min (0.1mm/rev)	
切深量 Depth of Hole	100mm(盲孔) (Blind)	
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

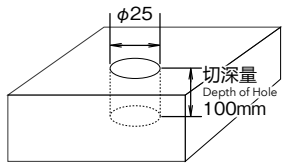
加工200孔时的磨损比较 Wear comparison after 200 holes of drilling

磨损量：0.117mm
Width of Wear

磨损量：0.153mm
Width of Wear

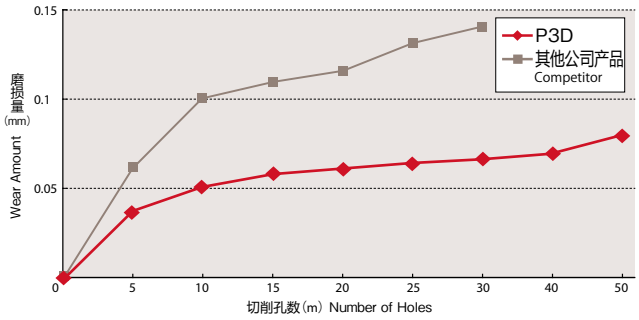
使用铝合金·非铁用刀片加工ADC12时实现长寿命。

Long tool life was achieved in machining ADC12 by using inserts for aluminum alloy and non-ferrous materials.



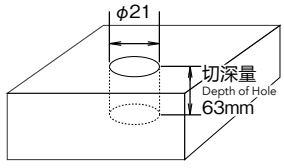
高硬度材料的长寿命加工(P3D) Drilling with long tool life in high-hardened material (P3D)

使用工具 Tool	P3D2100FS25M07 (φ21)	其他公司可转位式钻头 (φ21) Competitor's Indexable Drill
使用刀片(材质) Insert (grade)	XCMT073106ER-DM (XP9020)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SKD61 (50HRC)	
切削速度 Cutting Speed	80m/min (1,200min^{-1})	
进给速度 Feed	100mm/min (0.08mm/rev)	
切深量 Depth of Hole	63mm(盲孔) (Blind)	
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)	
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center	

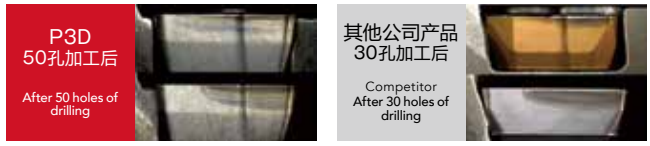


加工HRC50的高硬度材料时，其他公司产品加工30孔就会中心刃崩刃，P3D的话加工50孔后只有轻微磨损，可以继续加工。

The competitor product exhibited chipping of the center blade after processing 30 holes in a high hardness material of HRC50. The P3D, on the other hand, was able to continue processing even after 50 holes with minimal wear.



磨损比较 Wear comparison



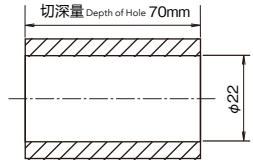
工程机件的车削孔加工(P4D) Turning of building component (P4D)

使用工具 Tool	P4D2200FS25M07 (φ22)	其他公司可转位式钻头 (φ22) Competitor's Indexable Drill
使用刀片(材质) Insert (grade)	XCMT073106ER-DM (XP9020)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SCM415	
切削速度 Cutting Speed	104m/min (1,500min^{-1})	
进给速度 Feed	300mm/min (0.2mm/rev)	
切深量 Depth of Hole	70mm(通孔) (Through)	
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)	
使用机械 Machine	卧式NC车床 Horizontal NC Lathe	

加工150孔后的磨损情况 Wear compaison after 150 holes of drilling

孔深70mm的车削孔加工时，相对于其他公司产品刀片崩刃来说，P4D能稳定加工深孔，不崩刃，只产生轻微磨损，可以继续使用。

The insert of the competitor tool exhibited chipping during the processing of a 70mm deep-hole turning application while the P4D was able to continue processing with minimal wear shown.



Tap Pilot Hole Size Chart

丝锥底孔径·推荐丝锥一览表 Recommended taps and size chart

■P2D/P3D用 for P2D/P3D

■切削丝锥用 for Cutting Tap

螺纹名称 Thread Size	推荐底孔径 Recommended tap drill hole diameter	最小底孔径 Min. drill hole dia.	最大底孔径 Max. drill hole dia.		适用刀体 Applicable Body		推荐丝锥 商品号 Recommended Tap No.	
		各精度共通	前JIS 2级用	6H用	P2D	P3D	A-SFT	A-POT
M 17 × 1.5	15.5	15.4	15.68	15.67	P2D1550FS20M04	P3D1550FS20M04	8325364	8325164
M 18 × 2.5	15.5	15.3	15.7	15.74			8325367	3825167
M 18 × 2	16	15.9	16.2	16.21	P2D1600FS20M04	P3D1600FS20M04	8325369	8325169
M 18 × 1.5	16.5	16.4	16.6	16.67	P2D1650FS20M04	P3D1650FS20M04	8325370	8325170
M 20 × 2.5	17.5	17.3	17.7	17.74	P2D1750FS20M05	P3D1750FS20M05	8325377	8325177
					P2D1750FS25M05	P3D1750FS25M05		
M 20 × 2	18	17.9	18.2	18.21	P2D1800FS25M05	P3D1800FS25M05	8325379	8325179
M 20 × 1.5	18.5	18.4	18.6	18.67	P2D1850FS25M05	P3D1850FS25M05	8325380	8325180
M 22 × 2.5	19.5	19.3	19.7	19.74	P2D1950FS25M06	P3D1950FS25M06	8325387	8325187
M 22 × 2	20	19.9	20.2	20.21	P2D2000FS25M06	P3D2000FS25M06	8325389	8325189
M 22 × 1.5	20.5	20.4	20.6	20.67	P2D2050FS20M06	P3D2050FS20M06	8325390	8325190
M 24 × 3	21	20.8	21.2	21.25	P2D2100FS25M07	P3D2100FS25M07	8325397	8325197
M 24 × 2	22	21.9	22.2	22.21	P2D2200FS25M07	P3D2200FS25M07	8325399	8325199
M 24 × 1.5	22.5	22.4	22.6	22.67	P2D2250FS25M07	P3D2250FS25M07	8325400	8325200
M 27 × 3	24	23.8	24.2	24.25	P2D2400FS25M07	P3D2400FS25M07	8326605	–
					P2D2400FS32M07	P3D2400FS32M07		
M 27 × 1.5	25.5	25.4	25.6	25.67	P2D2550FS25M08	P3D2550FS25M08	8326608	
					P2D2550FS32M08	P3D2550FS32M08		
M 30 × 3.5	26.5	26.3	26.7	26.77	P2D2650FS32M08	P3D2650FS32M08	8326614	
M 30 × 3	27	26.8	27.2	27.25	P2D2700FS32M08	P3D2700FS32M08	8326615	
M 30 × 1.5	28.5	28.4	28.6	28.67	P2D2850FS32M08	P3D2850FS32M08	8326618	
M 33 × 3.5	29.5	29.3	29.7	29.77	–	P3D2950FS32M09	8326624	
M 33 × 3	30	29.8	30.2	30.25	P2D3000FS32M09	P3D3000FS32M09	8326625	
M 33 × 1.5	31.5	31.5	31.4	31.6	–	P3D3150FS32M09	8326628	
M 36 × 4	32	31.7	32.2	32.27	P2D3200FS32M09	P3D3200FS32M09	8326633	
					P2D3200FS40M09	P3D3200FS40M09		
M 36 × 3	33	32.8	33.2	33.25	P2D3300FS40M09	P3D3300FS40M09	8326635	
M 36 × 1.5	34.5	34.4	34.6	34.67	–	P3D3450FS40M10	8326638	
M 39 × 4	35	34.7	35.2	35.27	P2D3500FS40M10	P3D3500FS40M10	8326643	
M 42 × 4.5	37.5	37.5	37.7	37.79	–	P3D3750FS40M10	8326652	
M 42 × 3	39	38.8	39.2	39.25	P2D3900FS40M12	P3D3900FS40M12	8326655	
M 42 × 1.5	40.5	40.4	40.6	40.67	–	P3D4050FS40M12	8326658	
M 45 × 4.5	40.5	40.2	40.7	40.79			8326659	
M 48 × 5	43	42.6	43.2	43.29	P2D4300FS40M12	P3D4300FS40M12	8326661	
M 48 × 3	45	44.8	45.2	45.25	P2D4500FS40M13	P3D4500FS40M13	8326665	
M 56 × 5.5	50.5	50.1	50.7	50.7	–	P3D5050FS40M14	8326670	

※关于铣刀柄、长柄型的商品号，请参阅「高效率·多功能丝锥 A-TAP」样本。
For additional sizes and styles, please refer to the high efficiency, multi-purpose A-Tap series catalog.

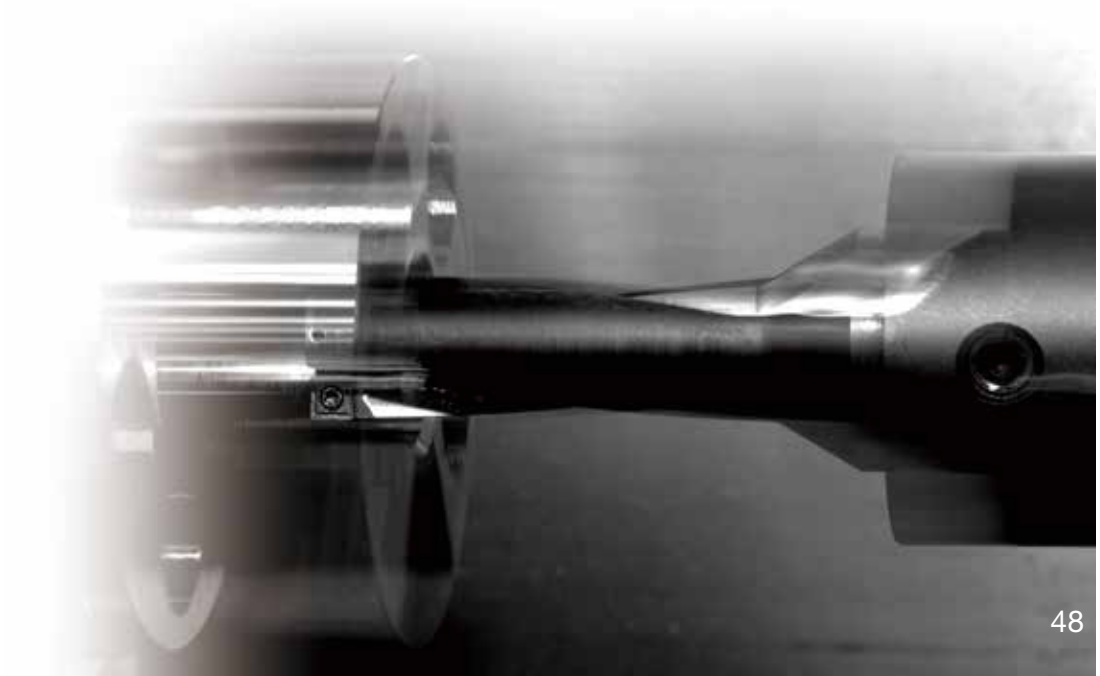
■可定制带倒角等结合加工环境的非标品。详情请咨询本公司销售。

Custom tooling with specifications such as chamfering are available upon request.
Please contact your local sales representative for details.

带倒角 PD 钻头(非标品)
PD with Chamfering (Special)

带沉孔 PD 钻头(非标品)
PD with Counterbore (Special)

大径(Dc>φ63) PD 钻头(非标品)
PD for large diameter (Dc > ϕ63, Special)



Phoenix PHP

可转位式钻头3D用
Indexable Drill for 3D

Phoenix High Performance drill

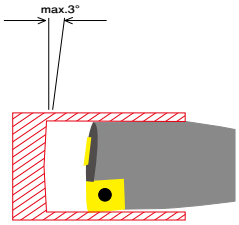
■OSG专利的形状可对应各式加工形态
Unique design supports many types of machining

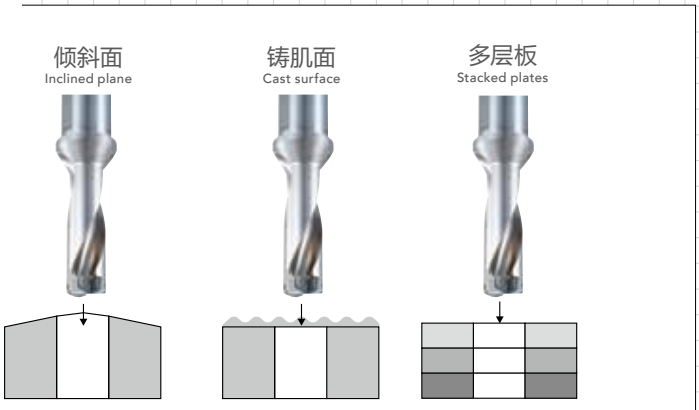
■刀片的排列 Insert arrangement

- 可减少吃入抵抗的先端角形状
  Point angle shape reduces bite resistance
- 可实现高效率加工的平衡排列
  Balanced arrangement to achieve high efficiency machining
- 中心、外周刃上可以使用相同刀片，易于管理
  The center and the peripheral edge of the same insert can be used, simplifying insert management.

■最适合槽形 Ideal flute form
控制切屑的排出方向 Controls the flow of chips

■先端角形状可对应困难的加工形状
Shaped corner tips for difficult drilling shapes

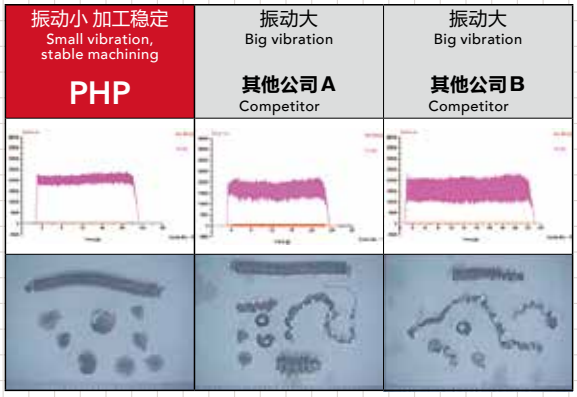




■高刚性刀体 High rigidity of body
提高刀具寿命 High rigidity improves tool durability

■稳定的扭矩 The stable torque

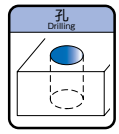
使用工具 Tool	PHP210FS25M07-3D (ø21)
使用刀片(材质) Insert(grade)	SCMT073206-DM(XP9040)
加工材料 Work Material	S50C
切削速度 Cutting Speed	150m/min (2,275min^{-1})
进给速度 Feed	341mm/min (0.15mm/rev)
切深量 Depth of Hole	50mm
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)
使用机械 Machine	立式加工中心(BT50) (26kW/30kW) Vertical Machining Center



稳定的扭矩，减少对机械的负荷。
Stable torque minimizes the load imparted on the machine.

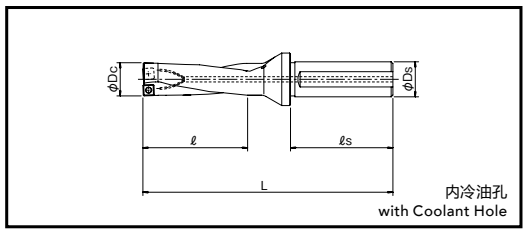
可转位式钻头 3D用 Indexable Drill for 3D

PHP



Specification

■形状尺寸表 Specification



单位:mm Unit:mm

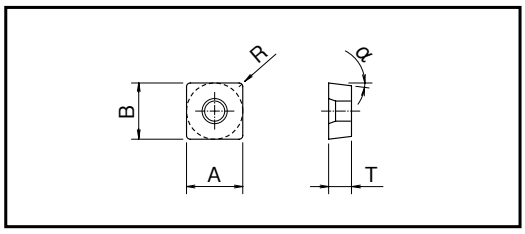
商品号 EDP No.	名称 Designation	外径 Dc	全长 L	槽长 ℓ	柄径 Ds	柄长 ℓs	适用刀片 Applicable Inserts
7800100	PHP140FS20M04-3D	14	116	42	20	50	①
7800101	PHP145FS20M04-3D	14.5	119	45	20	50	
7800102	PHP150FS20M04-3D	15	119	45	20	50	
7800103	PHP155FS20M04-3D	15.5	122	48	20	50	
7800104	PHP160FS20M04-3D	16	122	48	20	50	
7800105	PHP165FS20M05-3D	16.5	125	51	20	50	②
7800106	PHP170FS20M05-3D	17	125	51	20	50	
7800107	PHP175FS25M05-3D	17.5	134	54	25	56	
7800108	PHP180FS25M05-3D	18	134	54	25	56	
7800109	PHP185FS25M06-3D	18.5	137	57	25	56	③
7800110	PHP190FS25M06-3D	19	137	57	25	56	
7800111	PHP195FS25M06-3D	19.5	140	60	25	56	
7800112	PHP200FS25M06-3D	20	140	60	25	56	
7800113	PHP205FS25M06-3D	20.5	143	63	25	56	
7800114	PHP210FS25M07-3D	21	143	63	25	56	④
7800115	PHP215FS25M07-3D	21.5	146	66	25	56	
7800116	PHP220FS25M07-3D	22	146	66	25	56	
7800117	PHP225FS25M07-3D	22.5	149	69	25	56	
7800118	PHP230FS25M07-3D	23	149	69	25	56	
7800119	PHP235FS32M07-3D	23.5	156	72	32	60	
7800120	PHP240FS32M07-3D	24	156	72	32	60	
7800121	PHP245FS32M08-3D	24.5	159	75	32	60	⑤
7800122	PHP250FS32M08-3D	25	159	75	32	60	
7800123	PHP255FS32M08-3D	25.5	162	78	32	60	
7800124	PHP260FS32M08-3D	26	162	78	32	60	
7800125	PHP265FS32M08-3D	26.5	165	81	32	60	
7800126	PHP270FS32M08-3D	27	165	81	32	60	
7800127	PHP280FS32M08-3D	28	168	84	32	60	
7800128	PHP290FS32M10-3D	29	171	87	32	60	⑥
7800130	PHP300FS32M10-3D	30	179	90	32	60	
7800131	PHP310FS32M10-3D	31	182	93	32	60	
7800132	PHP320FS32M10-3D	32	185	96	32	60	
7800133	PHP330FS40M10-3D	33	196	99	40	68	
7800134	PHP340FS40M10-3D	34	199	102	40	68	
7800135	PHP350FS40M12-3D	35	202	105	40	68	⑦
7800136	PHP360FS40M12-3D	36	205	108	40	68	
7800137	PHP370FS40M12-3D	37	218	111	40	68	
7800138	PHP380FS40M12-3D	38	221	114	40	68	
7800139	PHP390FS40M12-3D	39	224	117	40	68	
7800140	PHP400FS40M12-3D	40	227	120	40	68	

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

可转位式钻头 3D用
Indexable Drill for 3D

PHP 刀片
Inserts



Inserts

■适用刀片 Inserts

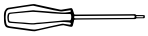
单位:mm Unit:mm

	名称 Designation	切削刃数 Number of Cutting Edges	适用刀体 Applicable Cutters	刀片尺寸 Insert Size				涂层种类 Grade of Coated Materials	
				A×B	厚度 T	后角 α°	R	XP9040	XC9025
①	SCMT042204-DM	4	ϕ14~16	4.8×4.8	2.2	7	0.4	7818001	7817001
②	SCMT052404-DM	4	ϕ16.5~18	5.4×5.4	2.4	7	0.4	7818002	7817002
③	SCMT062806-DM	4	ϕ18.5~20.5	6.2×6.2	2.8	7	0.6	7818003	7817003
④	SCMT073206-DM	4	ϕ21~24	7.2×7.2	3.2	7	0.6	7818004	7817004
⑤	SCMT083608-DM	4	ϕ24.5~28	8.6×8.6	3.6	7	0.8	7818005	7817005
⑥	SCMT104208-DM	4	ϕ29~34	10×10	4.2	7	0.8	7818006	7817006
⑦	SCMT125008-DM	4	ϕ35~40	12.3×12.3	5	7	0.8	7818007	7817007

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts	
 固定螺丝 Clamping Screw	7808100	FS18538 (Torx 6)	①	SCMT042204-DM
	7808102	FS20540 (Torx 6)	②	SCMT052404-DM
	7808104	FS22550 (Torx 7)	③	SCMT062806-DM
	7808108	FS25560 (Torx 8)	④	SCMT073206-DM
	7808110	FS30573 (Torx 8)	⑤	SCMT083608-DM
	7808111	FS35572 (Torx 15)	⑥	SCMT104208-DM
	7808113	FS45510 (Torx 20)	⑦	SCMT125008-DM

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts			
 扳手 Wrench	7808203	T6-D (Torx 6)	①	SCMT042204-DM	②	SCMT052404-DM
	7808204	T7-D (Torx 7)	③	SCMT062806-DM	–	–
	7808205	T8-D (Torx 8)	④	SCMT073206-DM	⑤	SCMT083608-DM
	7808208	T15-D (Torx 15)	⑥	SCMT104208-DM	–	–
	7808209	T20-D (Torx 20)	⑦	SCMT125008-DM	–	–

扳手请另购。 The wrenches are sold separately from the cutters.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

可转位式钻头 3D用
Indexable Drill for 3D

PHP

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
XP9040	DM	有 Wet	◎	◎		◎	○	
XC9025	DM	有 Wet	○	○	◎	○		

Cutting Conditions

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	进给量 f (mm/rev) Feed			
				ø14~ø20.5	ø21~ø28	ø29~ø34	ø35~ø40
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	200 (60 ~ 250)	0.09 (0.06 ~ 0.13)	0.13 (0.1 ~ 0.18)	0.18 (0.13 ~ 0.21)	0.25 (0.2 ~ 0.27)
	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	160 (40 ~ 220)	0.09 (0.06 ~ 0.13)	0.13 (0.1 ~ 0.18)	0.18 (0.13 ~ 0.21)	0.25 (0.2 ~ 0.27)
	模具钢 Die Steel (SKD11, SKD61)	~280HB	140 (40 ~ 180)	0.08 (0.05 ~ 0.12)	0.12 (0.06 ~ 0.15)	0.14 (0.09 ~ 0.18)	0.15 (0.1 ~ 0.2)
M	不锈钢 Stainless Steel (SUS304, SUS420)	~250HB	150 (60 ~ 180)	0.08 (0.05 ~ 0.12)	0.1 (0.06 ~ 0.12)	0.15 (0.1 ~ 0.17)	0.18 (0.15 ~ 0.2)
K	铸铁 Cast Iron (FC250)	~350N/mm²	150 (60 ~ 180)	0.09 (0.06 ~ 0.13)	0.13 (0.1 ~ 0.18)	0.18 (0.13 ~ 0.21)	0.25 (0.2 ~ 0.27)
	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	130 (40 ~ 150)	0.09 (0.06 ~ 0.13)	0.12 (0.08 ~ 0.16)	0.16 (0.1 ~ 0.2)	0.2 (0.15 ~ 0.25)
N	铝合金 Aluminum Alloy	~13%Si	220 (100 ~ 800)	0.09 (0.06 ~ 0.2)	0.13 (0.1 ~ 0.25)	0.18 (0.13 ~ 0.3)	0.25 (0.2 ~ 0.35)
S	超耐热合金(湿式) Superalloy (Wet) (Inconel® 718)	–	30 (15 ~ 50)	0.04 (0.02 ~ 0.06)	0.06 (0.03 ~ 0.1)	0.08 (0.04 ~ 0.12)	0.1 (0.06 ~ 0.14)
	钛合金(湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	60 (30 ~ 100)	0.06 (0.04 ~ 0.08)	0.08 (0.06 ~ 0.12)	0.1 (0.08 ~ 0.15)	0.12 (0.1 ~ 0.15)

1. 这张切削条件基准表是以水溶性切屑油剂作为内部供油。
2. 请使用稀释倍率20倍以下的优质水溶性切屑油剂。
3. 不推荐使用不水溶性切屑油剂。
4. 这张切削条件基准表适用于孔深3D以下。
5. 这张切削条件基准表的数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
6. 请确保整洁干净后紧紧地安装刀片。
7. 请牢牢固定加工材料，确保在没有变形，弯曲，震动的情况下加工。
8. 油孔堵塞是造成折损问题的原因，请务必安装供油装置的过滤器。

1. The indicated speeds and feeds are for using water-soluble oil.
2. Suitable cutting fluid is water-soluble in high density (less than 20 times dilution).
3. Using non-water-soluble oil is not recommended.
4. These conditions are for drilling depth less than 3 times the drill diameter.
5. The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.
6. Inserts should be attached to the holder tightly in a very neat condition.
7. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
8. A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.

Cutting Data

■加工数据 Cutting Data

Inconel® 718 (28HRC)的高效率加工 High efficiency machining of Inconel® 718 (28HRC)

使用工具 Tool	PHP200FS25M06-3D (ϕ20)
使用刀头(材质) Insert (grade)	SCMT062806-DM (XP9040)
加工材料 Work Material	Inconel® 718 (28HRC)
切削速度 Cutting Speed	60m/min (955min^{-1})
进给速度 Feed	57mm/min (0.06mm/rev)
切深量 Depth of Hole	50mm（2.5D 通孔） (Through)
切削油剂 Coolant	水溶性切削油剂(内部给油) Water-Soluble (Internal)
使用机械 Machine	多用途加工机(工件旋转) Multifunction milling machine (rotating workpiece)

使用车床Inconel®718 (28HRC) 孔加工案例。加工10 孔后，PHP 可将切屑细小的分断，实现稳定的加工。

While drilling holes in Inconel® 718 (28HRC) on a lathe, 10 holes were completed, breaking up chips into small pieces and resulting in stable milling.

刀片磨损情况的照片(加工5个孔时) Photo of insert wear width (after 5 holes)

0.147mm

0.113mm

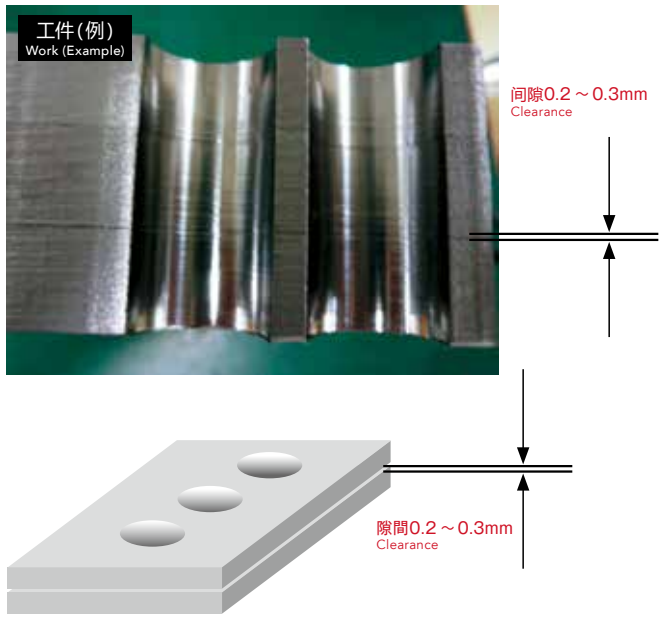
切屑 Chips

SS400的多层板加工 Stacked milling of SS400

使用工具 Tool	PHP260FS32M08-3D (ϕ26)	其他公司(高速钢钻头) Competitor (HSS Drill)
使用刀头(材质) Insert (grade)	SCMT083608-DM (XP9040)	–
加工材料 Work Material	SS400	
切削速度 Cutting Speed	80m/min (980min^{-1})	20m/min (245min^{-1})
进给速度 Feed	118mm/min (0.12mm/rev)	25mm/min (0.1mm/rev)
切深量 Depth of Hole	30mm（厚度 20mm×10mm 通孔） (Thickness Through)	
切削油剂 Coolant	水溶性切削油剂(外部给油) Water-Soluble (External)	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	

厚度为20mm×10mm 的多层板加工案例。过去，其他公司可转位式钻头在加工多层板时经常发生刀片刀体崩刃折损。因此放弃使用可转位式钻头，而使用高速钢钻头以低速加工替代。然而PHP 采用不易在过孔时发生盘状切屑的前角形状，无论有无外部供油均可稳定加工。

Stacked milling consisted of 20mm × 10mm sheets. In the past, tests using a competitor's indexable drills resulted in the frequent breakage of inserts and bodies. Therefore, high-speed drills at low speeds were used instead of idexable drills. Because the chip of the PHP is shaped with an angle, it suppresses the creation of discs, allowing it to mill in a stable manner even when coolant was fed externally.

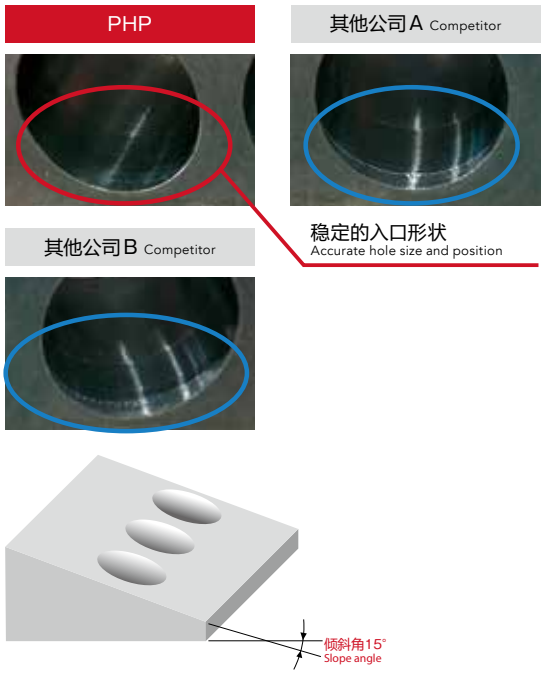


15°倾斜面的加工 Milling of a 15° inclined plane

使用工具 Tool	PHP210FS25M07-3D (ϕ21)	其他公司A、B Competitor
使用刀片(材质) Insert (grade)	SCMT073206-DM (XP9040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S50C	
切削速度 Cutting Speed	200m/min (3,033min^{-1})	
进给速度 Feed	364mm/min (0.12mm/rev) [入口 : 152mm/min (0.05mm/rev)]	
孔深量 Depth of Hole	45mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

15度斜面加工案例，其他公司产品在入口处会晃动造成扩孔(蓝圈部分)。PHP 可以承受断续加工的高刚性，可以抑制入口处的扩孔(红圈部分)

When milling a 15° inclined plane, a competitor's product wobbled at entry and enlarged the hole entry (as indicated by the blue circle). Because the PHP has the rigidity to withstand intermittent milling, it inhibits the enlargement of the hole entry (as indicated by the red circle).



风力发电(回转支承) 的孔加工 Drilling holes in a wind power generator (rotating wheel)

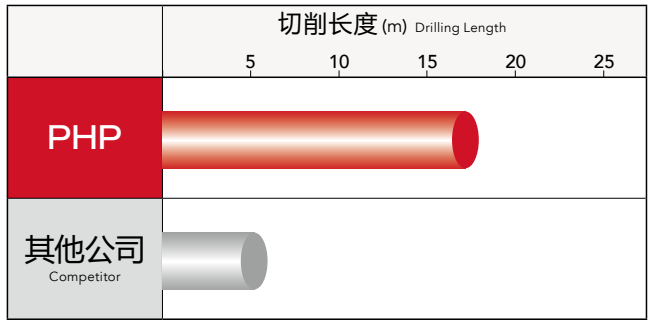
使用工具 Tool	PHP210FS25M07-3D (ϕ21)	其他公司产品 Competitor
使用刀片(材质) Insert (grade)	SCMT073206-DM (XP9040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S45C 相当品 Equivalent	
切削速度 Cutting Speed	165m/min (2,502min^{-1})	
进给速度 Feed	300mm/min (0.12mm/rev)	
切深量 Depth of Hole	57mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式专机 Horizontal Dedicated Machine	

是其他公司产品寿命的1.3 倍，PHP 在加工128 孔后仍可以稳定的加工。

The PHP drilled 128 holes and exhibited stable milling performance. Its durability was 1.3 times that of a competitor's product.

零部件的孔加工 Drilling holes in parts

使用工具 Tool	PHP210FS25M07-3D (ϕ21)	其他公司产品 Competitor
使用刀片(材质) Insert (grade)	SCMT073206-DM (XP9040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	150m/min (2,275min^{-1})	
进给速度 Feed	272mm/min (0.12mm/rev)	
切深量 Depth of Hole	50mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	



其他公司的产品由于切屑问题而致使不能稳定耐久的加工。PHP 在加工时排屑性好，并能将切屑细小的分断，可以达到其他公司产品2倍的寿命。

A competitor's product could not provide stable durability due to chipping. Our product, however, breaks up chips into small pieces and evacuates them properly, which inhibits durability variances and provides double the durability.

Phoenix PAS

四角刀片面铣刀
45° Face Milling Square Insert Type

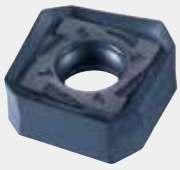
Phoenix 45° Square

■刀片形状 Insert form

正前角断屑槽实现高刚性，并且减轻加工时的切削阻力
Positive breaker enables high rigidity and reduces cutting force resistance

○ 规格为表里4角(共8角)。最大切深量6.5mm。
4 cutting edges per side (a total of 8 corners) specifications, 6.5 mm maximum depth of cut.

○ 从粗加工到精加工，适用范围广泛。
Applicable in a wide range of work stages, from rough milling to finishing.

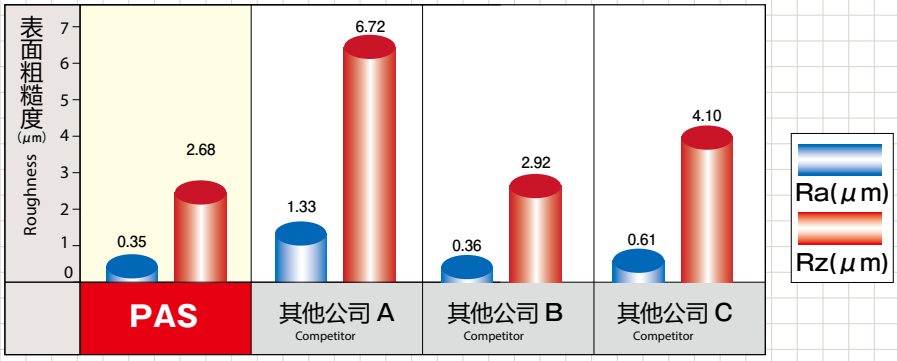


正前角刃形减轻切削阻力
The positive edge reduces cutting resistance

■高精度精加工面 High precision surface finishing

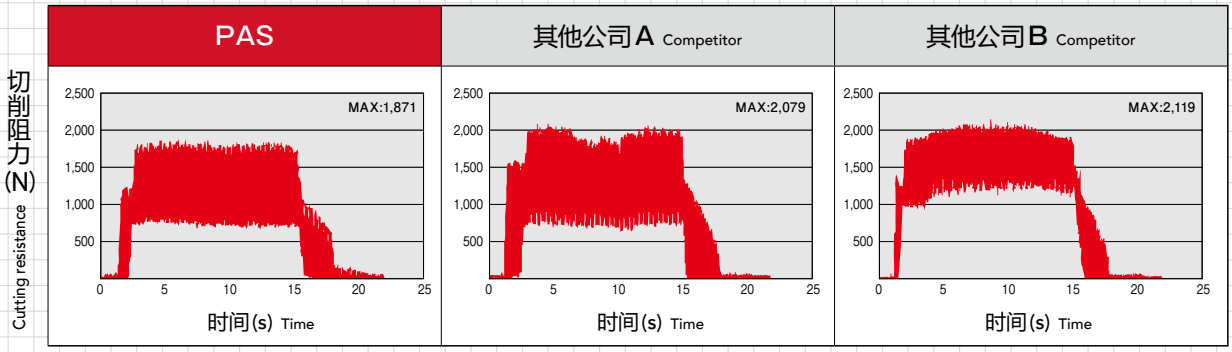
工具 Tool：PAS15R080M25.4-6 (SNKU1505AZER-GR XC1015)
使用机械 Machine：立式加工中心 (BT50) Vertical Machining Center　加工材料 Work Material：FCD500
切削条件 Cutting Conditions：Vc=250m/min (n=995min⁻¹) Vf=597mm/min (fz=0.1mm/t) ap=0.2mm ae=50mm 干式 Dry

底面粗糙度 Bottom roughness



■低阻力加工 Low resistance machining

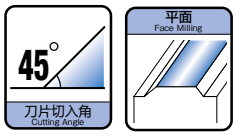
工具 Tool：PAS15R080M25.4-6 (SNKU1505AZER-GR XC1015)
使用机械 Machine：立式加工中(BT50) Vertical Machining Center　加工材料 Work Material：FCD500
切削条件 Cutting Conditions：Vc=180m/min (n=716min⁻¹) Vf=860mm/min (fz=0.2mm/t) ap=3mm ae=50mm 干式 Dry



四角刀片面铣刀(方形刀片)

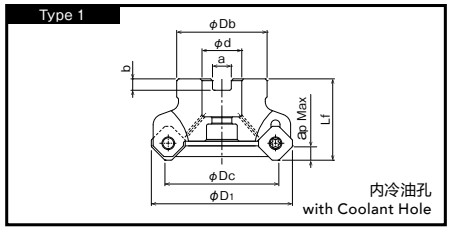
45° Face Milling Square Insert Type with Bore Type

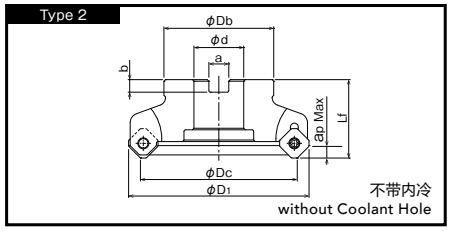
PAS BORE



Specification

■形状尺寸表 Specification

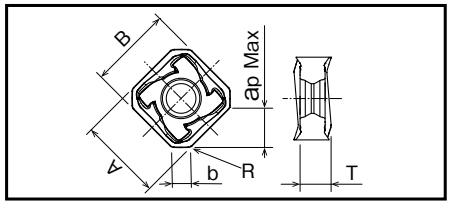


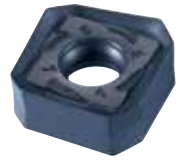


单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	直径 D1	刃数 z	刃高 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot		ap Max	重量 (kg)	形状类型 Type
								端面槽宽 a	端面槽深 b			
7802000	PAS15R050M22-4	50	65	4	45	45	22	10.4	6.3	6.5	0.41	1
7802001	PAS15R063M22-5	63	78	5	45	50	22	10.4	6.3	6.5	0.59	1
7802002	PAS15R080M25.4-6	80	95	6	50	60	25.4	9.5	6	6.5	1.06	1
7802003	PAS15R100M31.7-7	100	115	7	50	70	31.75	12.7	8	6.5	1.52	2
7802004	PAS15R125M38.1-8	125	140	8	63	90	38.1	15.9	10	6.5	3.25	2

Inserts





■适用刀片 Inserts

单位:mm Unit:mm

名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size					涂层种类 Grade of Coated Materials			
		A×B	厚度 T	R	副切削刃 b	ap Max	XC3025	XP3035	XP2040	XC1015
SNKU1505AZER-GM	8	15.88×15.88	7.18	1.0	3.65	6.5	7819061	7814061	7813061	
SNKU1505AZER-GR	8	15.88×15.88	7.18	1.0	3.65	6.5				7812060

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 固定螺丝 Clamping Screw	7808131	FS45513P (Torx 20IP)	PAS BORE ϕ50~125

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 T型扳手 T-Handle Wrench	7808000	20IP-T (Torx 20IP)	PAS BORE ϕ50~125

扳手请另购。 The wrenches are sold separately from the cutters.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

四角刀片面铣刀
45° Face Milling Square Insert Type

PAS

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
XC3025	GM	无 Dry	◎		○			
XP3035	GM	无 Dry	◎	○	○			
		有 Wet						
XP2040	GM	无 Dry	○	○				○
		有 Wet	○	◎			○	
XC1015	GR	无 Dry			◎			

GM:中切削用　GR:重切削用
GM:Middle Cutting　GR:Heavy Cutting

Cutting Conditions

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength·Hardness	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	180 (100 ~ 250)	0.18 (0.15 ~ 0.35)	3
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180 (100 ~ 250)	0.18 (0.15 ~ 0.35)	3
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150 (80 ~ 200)	0.15 (0.1 ~ 0.3)	3
M	不锈钢(湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	120 (80 ~ 180)	0.12 (0.08 ~ 0.25)	3
K	铸铁 Cast Iron (FC250)	~300N/mm^2	180 (100 ~ 350)	0.2 (0.15 ~ 0.35)	4
K	球墨铸铁 Ductile Cast Iron (FCD400)	~600N/mm^2	180 (100 ~ 270)	0.2 (0.1 ~ 0.3)	3
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	100 (60 ~ 150)	0.12 (0.08 ~ 0.2)	1.5
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	80 (40 ~ 120)	0.1 (0.05 ~ 0.15)	0.5
H	调质钢 Hardened Steel (SKD11)	50~60HRC	60 (40 ~ 90)	0.08 (0.05 ~ 0.15)	0.5

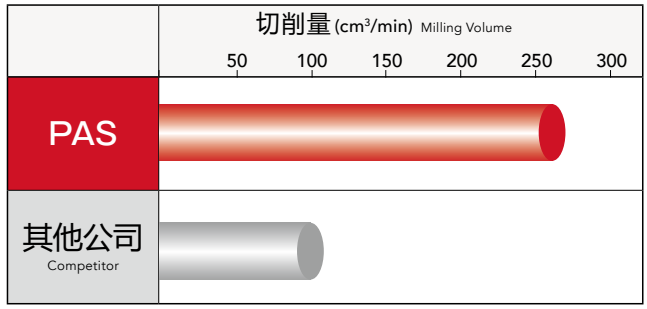
· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.

Cutting Data

■加工数据 Cutting Data

冲压模具基准面 粗加工 Die mold surface, rough milling

使用工具 Tool	PAS15R100M31.7-7 (φ100×7刃)	其他公司 φ63 Competitor
使用刀头(材质) Insert (grade)	SNKU1505AZER-GR(XC1015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FCD500	
切削速度 Cutting Speed	200m/min (637min^{-1})	120m/min (600min^{-1})
进给速度 Feed	1,500mm/min (0.37mm/t)	2,700mm/min (0.9mm/t)
切削深度 Depth of Cut	3mm	1mm
切削宽度 Width of Cut	MAX 60mm	MAX 40mm
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center	

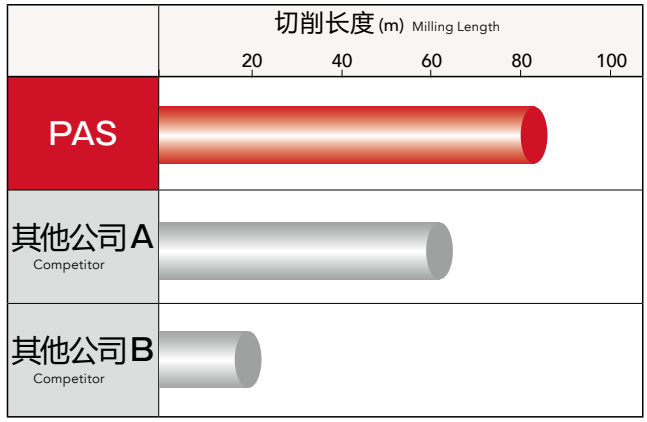


以往使用其他公司的高速进给工具时，由于其切深量不大，所以对余量不均匀的工件大多造成空切，但使用PAS 后由于其切深量大，可以减少空切的次数，且切削量也增多2.5倍，加工时间可以减少60%。

In the past, due to the limited depth of cut, competitor's high feed cutters often leave a large amount of work material uncut, creating a need for aircut. This challenge has been overcome with the introduction of the PAS, which is capable of milling difficult-to-reach areas, thus eliminating 2.5 times more work materials than competitor's high feed cutters and decreasing machining time by 60 %.

零部件的粗加工 Rough milling of parts

使用工具 Tool	PAS15R080M25.4-6 (φ80×6刃)	其他公司A、B Competitor
使用刀片(材质) Insert (grade)	SNKU1505AZER-GM (XP3035)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S50C	
切削速度 Cutting Speed	200m/min (796min^{-1})	
进给速度 Feed	955mm/min (0.2mm/t)	
切削深度 Depth of Cut	ap=2mm ae=50mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



使用各家厂家的产品对零部件进行粗加工并做比较，其他公司的产品较早开始磨损和崩刃，但是PAS 的磨损是正常磨损，耐久是1.4倍以上。

Competitors' products and the PAS were compared in the rough milling stage under identical conditions. The competitors' tools had large chippings and were worn out at early stages. The PAS, in contrast, showed normal cutting wear and attained more than 1.4 times the durability.

照片为加工80m后的刀片 After 80m of milling

» Phoenix PAO

八角刀片面铣刀
45° Face Milling Octagon Insert Type

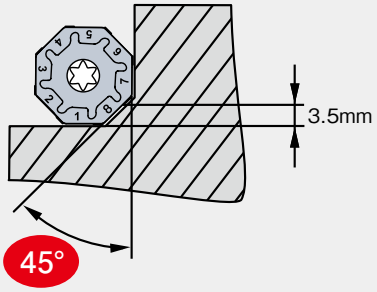
Phoenix 45° Octagon

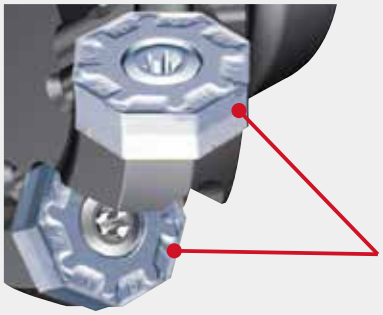
■刀片形状 Insert form

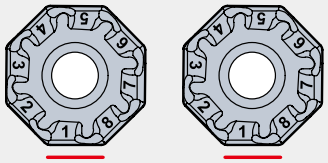
负前角刃型及正后角兼备，刚性更高，切削锋利性更好。
Achieves high rigidity and ultra sharp cutting edge with the negative cutter form and positive relief angle

○ 规格为经济性很好的里外**8**角(共16角)。最大的切深量为**3.5**mm。
An economical 8 corners per side (16 corners in total) specification, 3.5 mm maximum depth of cut.

○ 由于副切削刃形状，提供了表面精度。
副切削刃为 2mm
The new cutting edge geometry of the secondary blade further improves surface roughness.
Secondary cutting blade : 2mm.







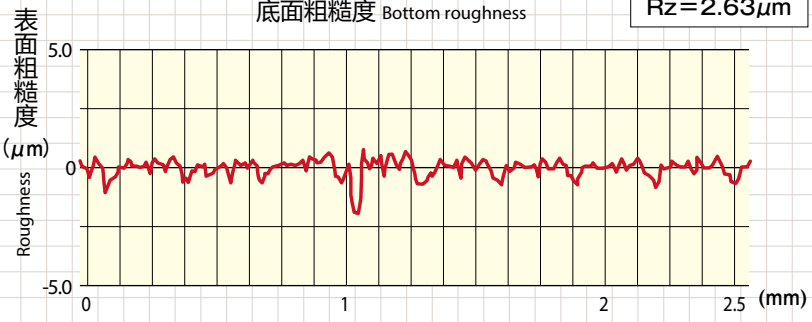
○ 每个刀片的数字可合起来后安装，
所以能抑制不均匀的情况。
Each insert edge is individually numbered.
By matching the numbers during setup,
runout can be minimized.

■高精度精加工面(修光刃)
High precision surface finishing (Wiper Insert)

工具 Tool : PAO06R160M50.8W-20 (OZKU060508SR-GM XC1015)
修光刃 Wiper Insert : XAHT060525SR-GM XP3035
使用机械 Machine : 立式加工中心(BT50) Vertical Machining Center
加工材料 Work Material : FCD500
切削条件 Cutting Conditions : Vc=250m/min (n=500min⁻¹) Vf=1,500mm/min (fz=0.15mm/t) ap=0.2mm ae=120mm 干式 Dry

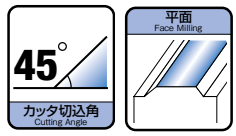
Ra=0.43μm
Rz=2.63μm

底面粗糙度 Bottom roughness



八角刀片面铣刀
45° Face Milling Octagon Insert Type with Bore Type

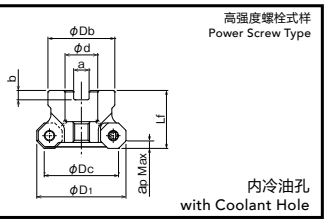
PAO BORE



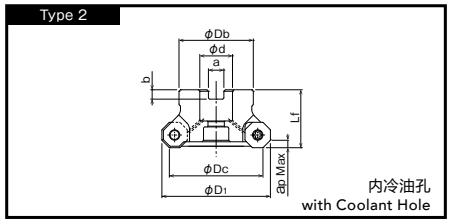
Specification

■形状尺寸表 Specification

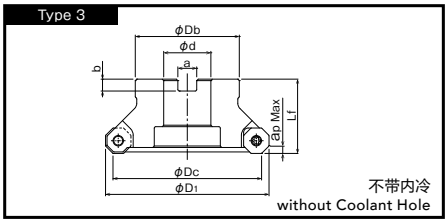
Type 1



Type 2



Type 3

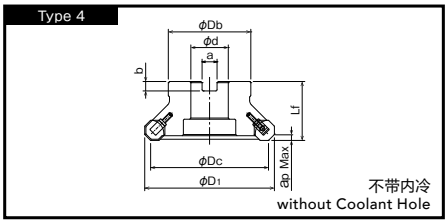


螺纹紧锁型 Screw type

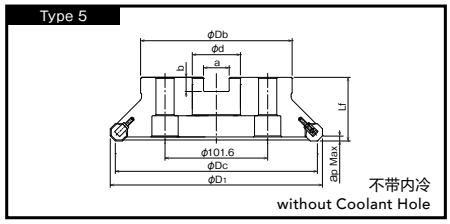
单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	直径 D1	刃数 z	刃高 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot 端面槽宽 a	端面槽深 b	ap Max	重量 (kg)	形状类型 Type
7802020	PAO06R050M22-5	50	60.2	5	40	45	22	10.4	6.3	3.5	0.35	1
7802021	PAO06R063M22-7	63	73.2	7	40	50	22	10.4	6.3	3.5	0.51	2
7802022	PAO06R080M25.4-8	80	90.2	8	50	60	25.4	9.5	6	3.5	1.05	2
7802023	PAO06R100M31.7-10	100	110.2	10	50	70	31.75	12.7	8	3.5	1.51	3
7802024	PAO06R125M38.1-12	125	135.2	12	63	90	38.1	15.9	10	3.5	2.98	3

Type 4



Type 5



楔子紧锁型 Wedge type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	直径 D1	刃数 z	刃高 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot 端面槽宽 a	端面槽深 b	ap Max	重量 (kg)	形状类型 Type
7802089	PAO06R100M31.7W-14	100	110.2	14	50	70	31.75	12.7	8	3.5	1.37	4
7802091	PAO06R125M38.1W-17	125	135.2	17	63	90	38.1	15.9	10	3.5	2.81	4
7802093	PAO06R160M50.8W-20	160	170.2	20	63	100	50.8	19	11	3.5	4.50	4
7802095	PAO06R200M47.6W-25	200	210.2	25	63	150	47.625	25.4	14	3.5	7.75	5

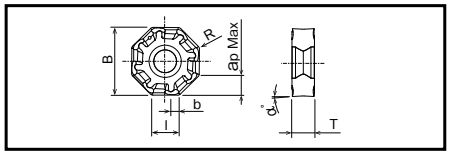
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

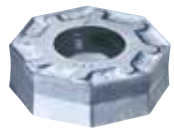
Phoenix

八角刀片面铣刀
45° Face Milling Octagon Insert Type

PAO刀片
Inserts

Inserts



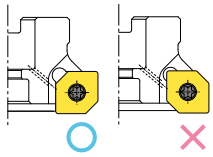


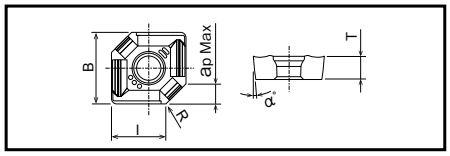
■适用刀片 Inserts

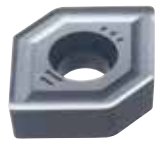
单位:mm Unit:mm

名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size							涂层种类 Grade of Coated Materials						
		内接圆径 B	厚度 T	切削刃长度 l	后角 α°	R	副切削刃 b	ap Max	XC3030	XP3035	XP2025	XP2040	XC1015	XP1020	XC5040
OZKU060508SR-GM	16	17.1	5.66	6	3	0.8	2	3.5	7825062	7814062	7826062	7813062	7812062	7821062	
OZKU060508SR-GR	16	17.1	5.66	6	3	0.8	2	3.5					7812086		
OZKU060508ER-SM	16	17.1	5.66	6	3	0.8	2	3.5							7816085

修光刃安装示意图
How to install wiper inserts







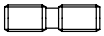
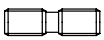
■修光刃刀片 Wiper Insert

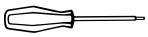
单位:mm Unit:mm

名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size						涂层种类 Grade of Coated Materials	
		内接圆径 B	厚度 T	切削刃长度 l	后角 α°	R	ap Max	XP3035	XC1015
XAHT060525SR-GM	2	17.1	5.56	10	3	2.5	3.5	7814064	7812064

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 固定螺丝 Clamping Screw	7808130	FS50614 (Torx 20)	PAO BORE ϕ50~125
 高强度螺栓 Power Screw	7808151	PS1031 (M10×31)	PAO BORE ϕ50
 楔子 Wedge	7808141	W12F-06N (M6)	PAO BORE (W) ϕ100~200
 楔用紧固螺纹 Clamping Screw for Wedge	7808140	WS0621T (M6×21)	PAO BORE (W) ϕ100~200

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 扳手 Wrench	7808208	T15-D (Torx 15)	PAO BORE (W) ϕ100~200
	7808209	T20-D (Torx 20)	PAO BORE ϕ50~125

扳手请另购。 The wrenches are sold separately from the cutters.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Cutting Conditions

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K		N	S	H
					FC	FCD			
XC3030	GM	无 Dry	◎		○				
XP3035	GM	无 Dry	◎	○	○				
		有 Wet							
XP2025	GM	有 Wet	○	◎				○	
XP2040	GM	无 Dry	○	○					○
		有 Wet	○	◎				○	
XC1015	GM GR	无 Dry			◎	○			
XP1020	GM	无 Dry			○	◎			
XC5040	SM	有 Wet		○				◎	

GM:中切削用 GR:重切削用 SM:耐热合金用
GM:Middle Cutting GR:Heavy Cutting SM:Heat Resistant Alloy

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	180 (100 ~ 250)	0.25 (0.2 ~ 0.5)	2
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180 (100 ~ 250)	0.25 (0.2 ~ 0.5)	2
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150 (80 ~ 200)	0.25 (0.15 ~ 0.4)	2
M	不锈钢(湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	120 (80 ~ 180)	0.2 (0.15 ~ 0.4)	2
K	铸铁 Cast Iron (FC250)	~300N/mm²	200 (100 ~ 350)	0.3 (0.2 ~ 0.5)	2
K	球墨铸铁 Ductile Cast Iron (FCD400)	~600N/mm²	180 (100 ~ 270)	0.28 (0.15 ~ 0.4)	2
S	耐热合金 Heat Resistant Alloy (Inconel® 718)	–	35 (25 ~ 60)	0.12 (0.05 ~ 0.2)	1
S	钛合金 Titanium Alloy (Ti-6Al-4V)	–	40 (30 ~ 120)	0.15 (0.1 ~ 0.25)	1.5
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	100 (60 ~ 150)	0.15 (0.1 ~ 0.25)	1.5
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	80 (40 ~ 120)	0.12 (0.05 ~ 0.2)	0.5
H	调质钢 Hardened Steel (SKD11)	50~60HRC	60 (40 ~ 90)	0.1 (0.05 ~ 0.2)	0.5

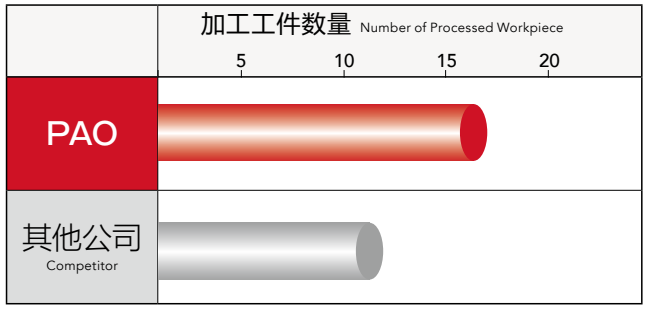
· 上述数值是实际切削速度的标准数据，请根据加工环境适当调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.

Cutting Data

■加工数据 Cutting Data

液压阀的粗加工 Rough milling of hydraulic valve parts

使用工具 Tool	PAO06R160M50.8W-20 (φ160×20刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	OZKU060508SR-GM (XC1015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FCD600	
切削速度 Cutting Speed	250m/min (500min^{-1})	
进给速度 Feed	3,000mm/min (0.3mm/t)	
切削深度 Depth of Cut	ap=3mm ae=120mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



加工件上存在许多孔，是条件较苛刻的断续性加工。在如此苛刻条件下也能进行很稳定的高速加工，每一个角的耐久性也大幅度地提高，加工结果令人期待能降低成本。

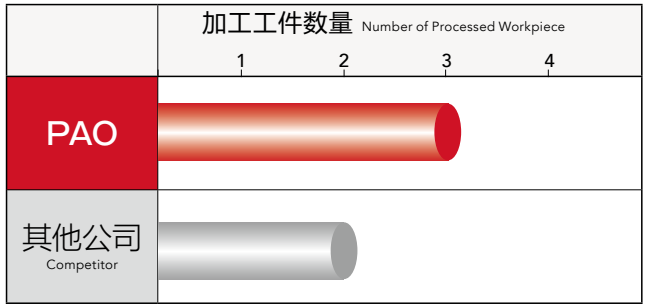
The workpiece, on which had multiple holes, required intermitted machining. However, this product enabled stable machining under the high speed condition and better durability per cutting edge, which will contribute to cost reduction.

加工16个工件后刀片的照片 After 16 workpieces of milling

主切削刃部磨损 Wear on main cutting edge

机床零部件的粗加工 Roughing of machinery parts

使用工具 Tool	PAO06R125M38.1-12 (φ125×12刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	OZKU060508SR-GM (XC1015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FC250	
切削速度 Cutting Speed	200m/min (500min^{-1})	157m/min (400min^{-1})
进给速度 Feed	1,800mm/min (0.3mm/t)	1,000mm/min (0.3mm/t)
切削深度 Depth of Cut	ap=2mm ae=90mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center	

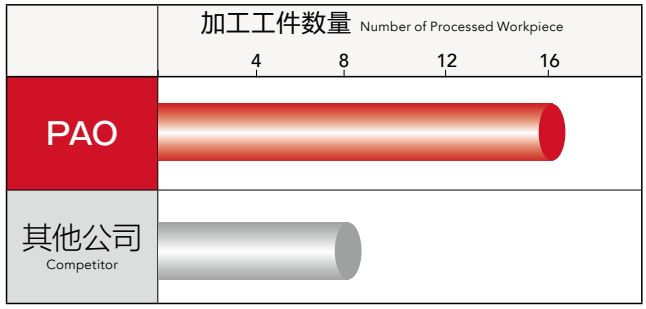


由于能抑制切削抵抗，所以即使切削条件增加1.8 倍也能进行稳定加工，并且寿命达到其他公司的1.5倍。

By reducing cutting resistance, efficiency can be increased by 1.8 times and tool life can be prolonged 1.5 times.

液压阀的粗加工 Roughing of oil pressure valve

使用工具 Tool	PAO06R125M38.1-12 (φ125×12刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	OZKU060508SR-GM (XC1015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FCD500	
切削速度 Cutting Speed	150m/min (380min^{-1})	150m/min (300min^{-1})
进给速度 Feed	900mm/min (0.2mm/t)	720mm/min (0.27mm/t)
切削深度 Depth of Cut	ap=3mm ae=50~80mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center	



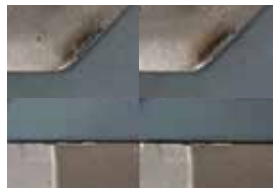
以往使用的刀具为单面8角规格，但是PAO 能使用的角数增多了2倍，减少了每个角的单价。并且切削量也增加了25%，寿命提高了2倍。

The 8-corner type has been used previously, but with the PAO, the amount of milled materials can be increased by 25 percent, with twice as much tool life. In addition, the number of corners has also doubled, leading to a decrease in tooling cost.

Inconel®718的长寿命加工 Long tool life on Inconel® 718

使用工具 Tool	PAO06R125M38.1-12 (φ125×12刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	OZKU060508ER-SM (XC5040)	双面式样刀片 Double-sided Insert
加工材料 Work Material	Inconel® 718	
切削速度 Cutting Speed	40m/min (100min^{-1})	
进给速度 Feed	120mm/min (0.1mm/t)	
切削深度 Depth of Cut	ap=1.5mm ae=50mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	

2m加工后
After 2 meters of milling



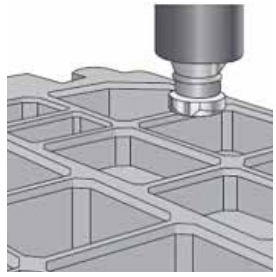
切削
Chips

其他公司产品在很早就发生崩刃· 磨损 , PAO(XC5040)可以抑制磨损并提高约4倍寿命。

The competitor tool exhibited chipping and breakage at an early stage. In contrast, the PAO (XC5040) demonstrated strong resistance to wear and achieved four times the durability versus the competition.

冲压模具基准面粗加工 Die mold surface, rough milling

使用工具 Tool	PAO06R100M31.7-10 (φ100×10刃)
使用刀片(材质) Insert (grade)	OZKU060508SR-GR (XC1015)
加工材料 Work Material	FCD500相当 Equivalent
切削速度 Cutting Speed	150m/min (477min^{-1})
进给速度 Feed	1,400mm/min (0.3mm/t)
切削深度 Depth of Cut	ap=3mm ae=60mm
切削油剂 Coolant	气冷式 Air Blow
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center
加工时间 Milling Time	2小时30分 Hours Minutes



加工2小时30分钟后
After 150min of milling

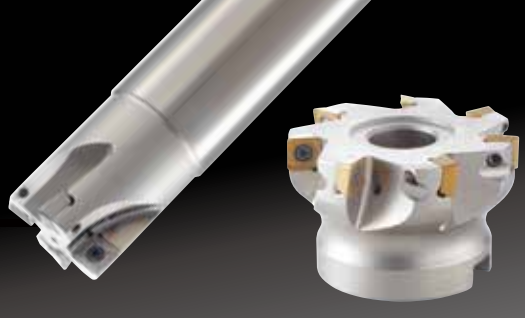
以往产品因切削性不足发生激烈的断续加工造成多处磨损。而高刚性的GR 断屑槽则可以稳定加工并提高寿命。

Excessive tool wear is a challenge for demanding intermittent milling and difficult-to-machine materials. OSG's rigid GR insert breaker ensures stable milling and prolongs durability.

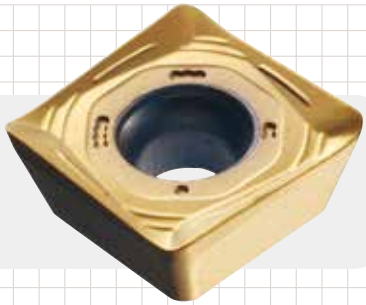
» Phoenix PSF

4角刀片方肩铣刀
4-corner Shoulder Cutter Series

Phoenix Shoulder Face Milling



■刀片形状 Insert form



○ 4圆弧角式样 ：正方形刀片
Four-corner type : Positive square type insert

○ 适合低切深的小型刀片(9.07x9.07mm)
Compact size insert for low depth of cut

○ 高锋利性的三维断屑槽刀片实现的低阻力的加工！
The sharpness of the three-dimensional breaker insert enables low-resistance milling!

■最适合小型加工中心的加工
Optimal for milling with compact machining center

—低切深(ap=3mm 以下)的领域中发挥优越性能
Superior performance for short cutting depths (ap = 3mm or less).

·长寿命 Long tool life
·高效率 High efficiency

—多圆弧角体现其高性价比 Multiple corners for high cost performance

·使用4圆弧角时，最大切深5mm Using 4 corners - maximum cutting depth 5mm
(使用2圆弧角时，最大切深8mm) (Using 2 corners - maximum cutting depth 8mm)

■与 PSE 的区别 Difference in use from the PSE

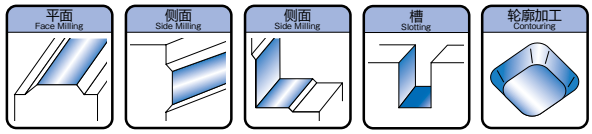
	圆弧角数 Number of Corners	成本 Cost	加工精度(侧面) Milling Accuracy (side)	多功能性 Multiple Functions
 **PSF** 最适合平面加工 Optimal for plane milling	4	◎	△	○
 **PSE** ※1 最适合多功能加工 (螺旋线加工，斜线加工等) Optimal for multiple functions (helical, ramping, etc.)	2	△	○	◎

※1 方肩铣刀(PSE)的详情请参照P.69。 ※1 For details on the Phoenix shoulder cutters (PSE), please refer to p.69

■丰富的刀片种类 A wide variety of Inserts

断屑槽 Insert Breaker	NM	GL	GM	GR
前角 Rake Angle	30°	25°	15°	7°
用途 Application	铝合金·非铁金属加工 Aluminum alloy & Non-ferrous metal	低阻力加工 耐热合金·难削材加工 Low-resistance machining·Heat-resistant alloy & Difficult-to-machine material	通用加工 一般钢加工 Multi-purpose machining & General steel milling	断续加工 铸铁加工 Intermitted machining & Cast iron machining
				

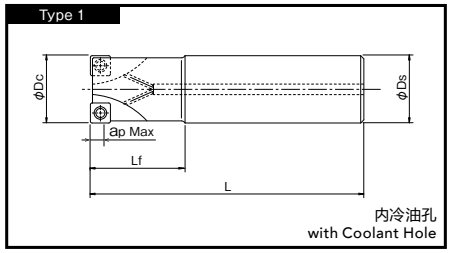
Phoenix
Specification

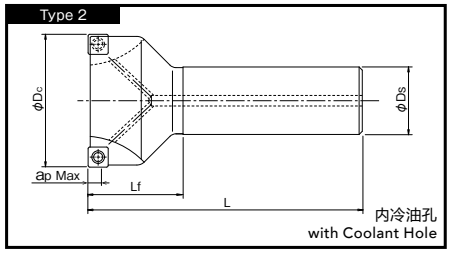


■形状尺寸表 Specification

4角刀片方肩铣刀 直柄型
4-corner Shoulder Cutter with Straight Shank

PSF SS



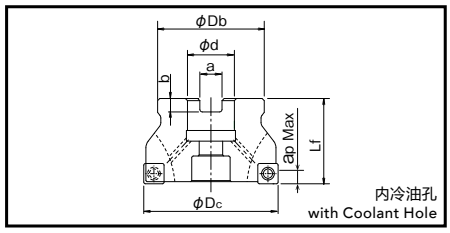


单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	ap Max	重量 (kg)	形状类型 Type
7803001	PSF09R025SS25-3S	25	3	25	120	35	5	0.40	1
7803002	PSF09R032SS32-4S	32	4	32	130	45	5	0.72	1
7803003	PSF09R040SS32-5S	40	5	32	140	50	5	0.88	2

4角刀片方肩铣刀 刀盘型
4-corner Shoulder Cutter with Bore Type

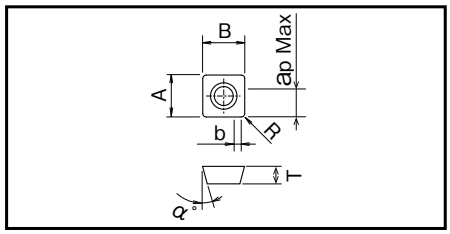
PSF BORE



单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot		ap Max	重量 (kg)
							端面槽宽 a	端面槽深 b		
7803011	PSF09R050M22-6	50	6	40	45	22	10.4	6.3	5	0.30
7803012	PSF09R063M22-7	63	7	40	50	22	10.4	6.3	5	0.50
7803013	PSF09R080M25.4-9	80	9	50	60	25.4	9.5	6	5	1.02

Inserts



单位:mm Unit:mm

■适用刀片 Inserts

名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size						超硬 Uncoated	涂层种类 Grade of Coated Materials			
		A×B	厚度 T	后角 α°	R	副切削刃 b	ap Max	CK010	XP3035	XP2040	XC1015	XC5040
SDHT09T308FR-NM	4	9.07×9.07	3.97	15	0.8	2.5	5	7811076	–	–	–	–
SDKT09T308SR-GL	4	9.07×9.07	3.97	15	0.8	2.5	5	–	7814073	7813073	–	7816073
SDKT09T308SR-GM	4	9.07×9.07	3.97	15	0.8	2.5	5	–	7814074	7813074	–	–
SDKT09T308SR-GR	4	9.07×9.07	3.97	15	0.8	2.5	5	–	–	–	7812075	–

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

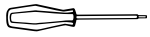
4角刀片方肩铣刀
4-corner Shoulder Cutter Series

PSF

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 固定螺丝 Clamping Screw	7808110	FS30573 (Torx 8)	PSF SS ϕ25~40 PSF BORE ϕ50~80

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 扳手 Wrench	7808205	T8-D (Torx 8)	PSF SS ϕ25~40 PSF BORE ϕ50~80

扳手请另购。 The wrenches are sold separately from the cutters.

Cutting Conditions

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
CK010	NM	有 Wet				◎		
XP3035	GL GM	无 Dry	◎	○	○			
		有 Wet						
XP2040	GL GM	无 Dry	○	○				○
		有 Wet	○	◎			○	
XC1015	GR	无 Dry			◎			
XC5040	GL	有 Wet		○			◎	

NM:铝合金用 GL:轻切削用 GM:中切削用 GR:重切削用
NM:Aluminum Alloy GL:Light Cutting GM:Middle Cutting GR:Heavy Cutting

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	180 (100 ~ 250)	0.12 (0.05 ~ 0.2)	3
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180 (100 ~ 250)	0.12 (0.05 ~ 0.2)	3
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150 (80 ~ 200)	0.1 (0.05 ~ 0.18)	3
M	不锈钢(干式) Stainless Steel (Dry) (SUS304, SUS420)	~250HB	150 (80 ~ 200)	0.1 (0.05 ~ 0.18)	2
M	不锈钢(湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	80 (60 ~ 120)	0.1 (0.05 ~ 0.18)	2
K	铸铁 Cast Iron (FC250)	~350N/mm²	180 (100 ~ 350)	0.12 (0.05 ~ 0.2)	3
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	180 (100 ~ 270)	0.12 (0.05 ~ 0.2)	3
N	铝合金 Aluminum Alloy	~13%Si	300 (200 ~ 1,500)	0.15 (0.1 ~ 0.25)	3
S	超耐热合金(湿式) Superalloy (Wet) (Inconel® 718)	–	35 (25 ~ 60)	0.1 (0.05 ~ 0.15)	1.5
S	钛合金(湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	40 (30 ~ 120)	0.1 (0.05 ~ 0.18)	1.5
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	90 (40 ~ 150)	0.1 (0.08 ~ 0.2)	1.5
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	70 (40 ~ 120)	0.08 (0.06 ~ 0.15)	0.5
H	调质钢 Hardened Steel (SKD11)	50~55HRC	50 (40 ~ 90)	0.06 (0.05 ~ 0.1)	0.5

· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.

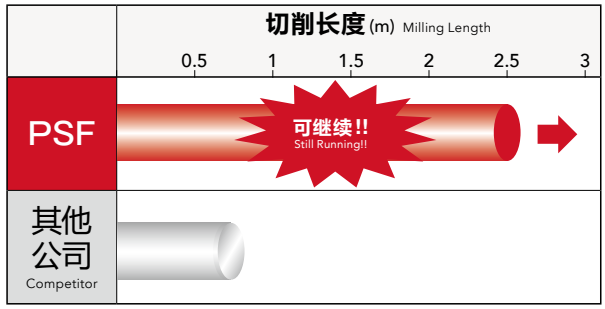
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Cutting Data

■加工数据 Cutting Data

耐蚀装置(双相不锈钢)加工 Anticorrosion equipment (duplex stainless steel) milling

使用工具 Tool	PSF09R025SS25-3S (φ25×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SDKT09T308SR-GL (XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	双相不锈钢 Duplex Stainless Steel	
切削速度 Cutting Speed	80m/min (800min^{-1})	
进给速度 Feed	300mm/min (0.1mm/t)	
切削深度 Depth of Cut	ap=2mm ae=15mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



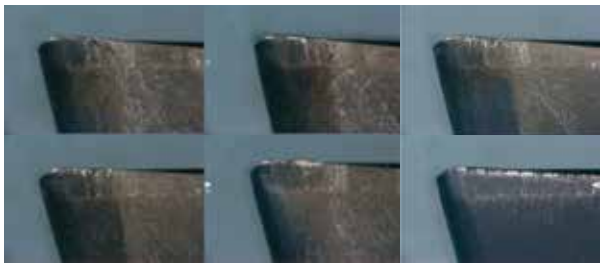
其他公司过早发生崩刃，加工非常困难。PSF(XC5040)则可以稳定长寿命的加工。

The competitor's product became chipped early on, making it difficult to mill. However, the PSF (XC5040) could mill in a stable manner, resulting in a long tool life.

半导体装置部件(SUS304)加工 Semi-conductor equipment parts (SUS304) milling

使用工具 Tool	PSF09R050M22-6 (φ50×6刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SDKT09T308SR-GL (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	160m/min (1,000min^{-1})	
进给速度 Feed	1,200mm/min (0.2mm/t)	
切削深度 Depth of Cut	ap=2mm ae=30mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	

PSF 加工10m 后，后角面平均磨损VB :0.073mm
After 10 meters of milling Average relief wear VB : 0.073mm

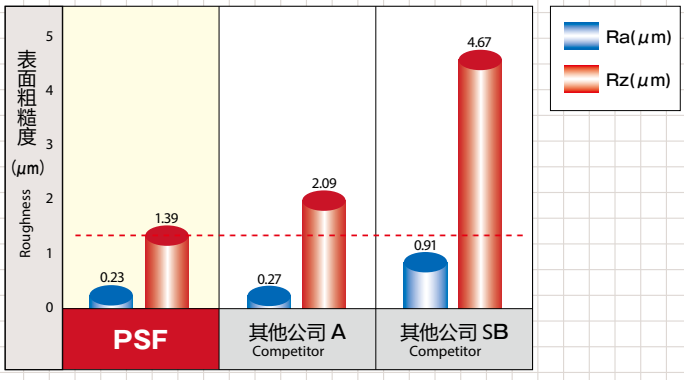


加工10m 时，其他公司刀具发生缠屑不能继续加工。PSF 因为正常磨损(小)可以继续加工，与其他产品相比寿命提高50% 以上。

After milling 10 meters, the competitor's product became chipped, without being able to continue milling. The PSF exhibited normal (slight) wear, was able to continue milling, with durability increased by 50%.

■优良的加工面粗度
Superior milling surface roughness

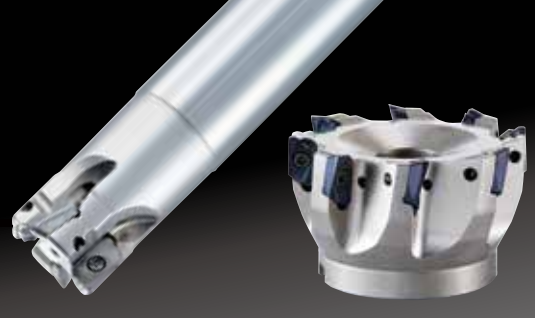
使用工具 Tool	PSF09R050M22-6 (φ50×6刃)
使用刀片(材质) Insert (grade)	SDKT09T308SR-GL (XP2040)
加工材料 Work Material	SUS304
切削速度 Cutting Speed	150m/min (955min^{-1})
进给速度 Feed	570mm/min (0.1mm/t)
切削深度 Depth of Cut	ap=0.2mm ae=32mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center



Phoenix PSE

方肩铣刀系列
Shoulder Cutter Series

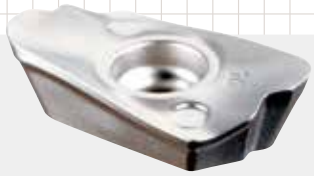
Phoenix Shoulder End mill



■底部槽口的效果 Bottom notch

○ 由于底部槽口，能将切屑细小的分断。
The bottom notch breaks chips into small pieces.

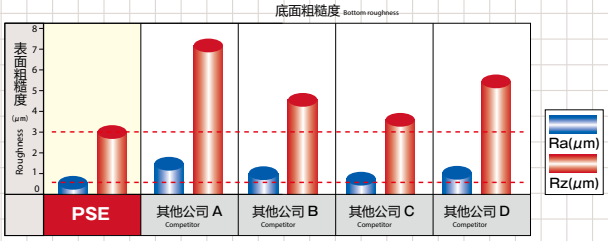
○ 能抑制切屑的卡住，能顺利地进行斜面加工和螺旋线加工。
Prevents the jamming or wrapping of chips, enabling the tool to perform ramping and helical milling in a smooth manner.



■高精度刀片 High precision insert

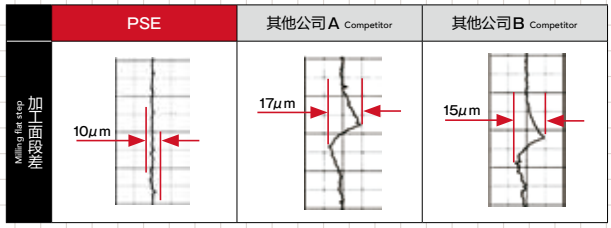
—底面粗糙— Bottom roughness

工具(Tool)：PSE11R032SS32-5S (ZDKT11T304SR-GM XP3035)　加工材料(Work Material)：S50C
切削条件(Cutting Conditions)：Vc=180m/min　fz=0.1mm/t　ap=0.1mm　ae=25.6mm
结果：Ra：0.5μm以下　Rz：4μm底面粗糙度可控制在4μm以下。
Result : PSE showed an improvement at the bottom flat surface finish Rz 4μm and under.



—侧面加工高低差异— Side Milling Offset

工具(Tool)：PSE15R032SS32-3S (ZDKT150508SR-GM XP3035)　加工材(Work Material)：S50C
切削条件(Cutting Conditions)：Vc=180m/min　fz=0.1mm/t　ap=5mm　ae=0.2mm
结果：高低差距10μm(实际值)及侧面加工高低差异上可发挥其性能。
Result : Showed improvement at side step machining as (measured) step as 10 μm

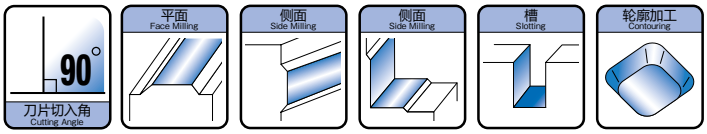


■丰富的种类 Wide variety of inserts

断屑槽 Insert Breaker	NM	GL	SM	GM	GR	HR
前角 Rake Angle	30°	25°	15°	15°	7°	3°
用途 Application	铝合金·非铁金属加工 Aluminum alloy & Non-ferrous metal	低阻力加工 Low-resistance machining	耐热合金·难削材加工 Superalloy & Difficult-to-machine material	通用加工 Multi-purpose machining	断续加工·长悬长加工 Interrupted machining & Long overhang machining	高硬度材加工 High-hardened material
						

方肩铣刀 直柄型
Shoulder Cutter with Straight Shank

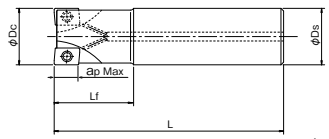
PSE SS



Specification

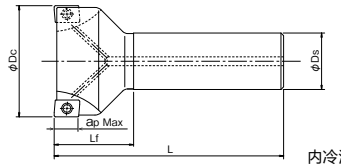
■形状尺寸表 Specification

Type 1



内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	ap Max	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7801100	PSE11R016SS16-2S	16	2	16	90	25	10	0.12		1
7801121	PSE11R016SS16-2L	16	2	16	150	50	10	0.21		1
7801139	PSE11R017SS16-2L	17	2	16	150	25	10	0.22		2
7801116	PSE11R018SS16-2S	18	2	16	90	25	10	0.13		2
7801122	PSE11R018SS16-2L	18	2	16	150	25	10	0.21		2
7801101	PSE11R020SS20-2S	20	2	20	100	30	10	0.21		1
7801115	PSE11R020SS20-3S	20	3	20	100	30	10	0.21		1
7801123	PSE11R020SS20-3L	20	3	20	160	60	10	0.34		1
7801140	PSE11R021SS20-3L	21	3	20	160	30	10	0.35		2
7801117	PSE11R022SS20-3S	22	3	20	110	30	10	0.24		2
7801124	PSE11R022SS20-3L	22	3	20	160	30	10	0.35		2
7801102	PSE11R025SS25-3S	25	3	25	120	35	10	0.40		1
7801125	PSE11R025SS25-3L	25	3	25	170	70	10	0.57	①	1
7801104	PSE11R025SS25-4S	25	4	25	120	35	10	0.40		1
7801141	PSE11R026SS25-3L	26	3	25	170	35	10	0.59		2
7801126	PSE11R028SS25-3L	28	3	25	170	35	10	0.59		2
7801118	PSE11R028SS25-4S	28	4	25	120	35	10	0.42		2
7801127	PSE11R030SS32-3L	30	3	32	190	90	10	1.01		1
7801119	PSE11R030SS32-4S	30	4	32	130	45	10	0.69		1
7801103	PSE11R032SS32-3S	32	3	32	130	45	10	0.73		1
7801128	PSE11R032SS32-3L	32	3	32	190	90	10	1.08		1
7801105	PSE11R032SS32-5S	32	5	32	125	40	10	0.70		1
7801142	PSE11R033SS32-3L	33	3	32	190	35	10	1.09		2
7801129	PSE11R035SS32-3L	35	3	32	190	35	10	1.11		2
7801120	PSE11R035SS32-5S	35	5	32	130	35	10	0.75		2

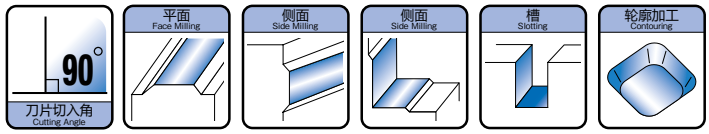
NEXT

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

台阶加工用立铣刀直柄型
Shoulder Cutter with Straight Shank

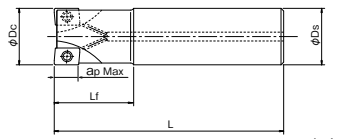
PSE SS



Specification

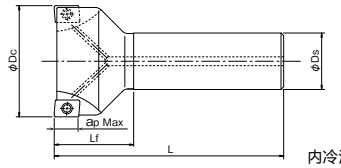
■形状尺寸表 Specification

Type 1



内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

FROM

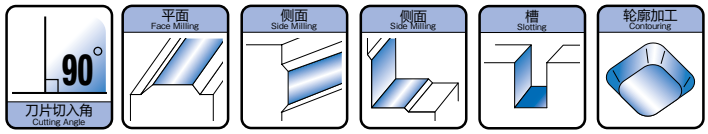
单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	ap Max	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7801106	PSE15R025SS25-2S	25	2	25	120	35	14	0.38		1
7801133	PSE15R025SS25-2L	25	2	25	170	70	14	0.55		1
7801143	PSE15R026SS25-2L	26	2	25	170	35	14	0.57		2
7801130	PSE15R028SS25-2S	28	2	25	120	35	14	0.40		2
7801134	PSE15R028SS25-2L	28	2	25	170	35	14	0.58		2
7801131	PSE15R030SS32-3S	30	3	32	130	45	14	0.67		1
7801135	PSE15R030SS32-3L	30	3	32	190	90	14	0.98		1
7801107	PSE15R032SS32-2S	32	2	32	130	45	14	0.70		1
7801111	PSE15R032SS32-3S	32	3	32	130	45	14	0.69		1
7801136	PSE15R032SS32-3L	32	3	32	190	90	14	1.04	②	1
7801144	PSE15R033SS32-3L	33	3	32	190	45	14	1.07		2
7801132	PSE15R035SS32-3S	35	3	32	130	35	14	0.72		2
7801137	PSE15R035SS32-3L	35	3	32	190	45	14	1.08		2
7801108	PSE15R040SS32-3S	40	3	32	140	50	14	0.82		2
7801138	PSE15R040SS32-3L	40	3	32	190	45	14	1.11		2
7801112	PSE15R040SS32-4S	40	4	32	140	50	14	0.83		2
7801109	PSE15R050SS32-3S	50	3	32	130	45	14	0.88		2
7801113	PSE15R050SS32-5S	50	5	32	130	45	14	0.87		2
7801110	PSE15R063SS32-4S	63	4	32	130	45	14	1.04		2
7801114	PSE15R063SS32-6S	63	6	32	130	45	14	1.04		2

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

方肩铣刀 刀盘型
Shoulder Cutter with Bore Type

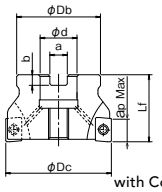
PSE BORE



Specification

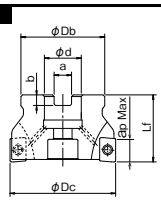
■形状尺寸表 Specification

Type 1 传导螺杆 Power Screw Type



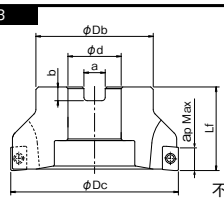
内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

Type 3



不带内冷
without Coolant Hole

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot 端面槽宽 a	端面槽深 b	ap Max	重量 (kg)	适用片 Applicable Inserts	形状类型 Type
7801000	PSE11R040M16-4	40	4	40	38	16	8.4	5.6	10	0.21	①	1
7801004	PSE11R040M16-6	40	6	40	38	16	8.4	5.6	10	0.22		1
7801001	PSE11R050M22-5	50	5	40	45	22	10.4	6.3	10	0.30		1
7801005	PSE11R050M22-7	50	7	40	45	22	10.4	6.3	10	0.33		1
7801002	PSE11R063M22-6	63	6	40	50	22	10.4	6.3	10	0.50		2
7801006	PSE11R063M22-8	63	8	40	50	22	10.4	6.3	10	1.07		2
7801020	PSE11R080M25.4-7	80	7	50	60	25.4	9.5	6	10	1.05		2
7801003	PSE11R080M27-7	80	7	50	60	27	12.4	7	10	1.04		2
7801021	PSE11R080M25.4-10	80	10	50	60	25.4	9.5	6	10	1.04		2
7801007	PSE11R080M27-10	80	10	50	60	27	12.4	7	10	1.03		2
7801008	PSE15R040M16-3	40	3	40	38	16	8.4	5.6	14	0.19	②	1
7801014	PSE15R040M16-4	40	4	40	38	16	8.4	5.6	14	0.19		1
7801009	PSE15R050M22-3	50	3	40	45	22	10.4	6.3	14	0.30		1
7801015	PSE15R050M22-5	50	5	40	45	22	10.4	6.3	14	0.28		1
7801010	PSE15R063M22-4	63	4	40	50	22	10.4	6.3	14	0.47		2
7801016	PSE15R063M22-6	63	6	40	50	22	10.4	6.3	14	0.46		2
7801022	PSE15R080M25.4-5	80	5	50	60	25.4	9.5	6	14	1.00		2
7801011	PSE15R080M27-5	80	5	50	60	27	12.4	7	14	0.99		2
7801025	PSE15R080M25.4-8	80	8	50	60	25.4	9.5	6	14	1.01		2
7801017	PSE15R080M27-8	80	8	50	60	27	12.4	7	14	1.00		2
7801023	PSE15R100M31.7-7	100	7	50	70	31.75	12.7	8	14	1.45		3
7801012	PSE15R100M32-7	100	7	50	70	32	14.4	8	14	1.58		2
7801026	PSE15R100M31.7-10	100	10	50	70	31.75	12.7	8	14	1.50		3
7801018	PSE15R100M32-10	100	10	50	70	32	14.4	8	14	1.63		2
7801024	PSE15R125M38.1-8	125	8	63	90	38.1	15.9	10	14	3.13		3
7801027	PSE15R125M38.1-11	125	11	63	90	38.1	15.9	10	14	3.15		3

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

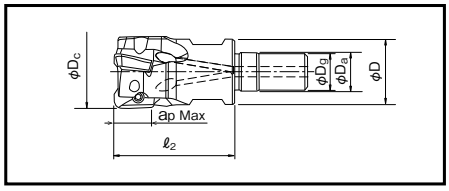
Phoenix

方肩铣刀 螺纹安装型
Shoulder Cutter with Screw Fit Type

PSE SF

Specification

■形状尺寸表 Specification



PSE 螺纹安装型 Screw Fit Type

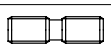
单位:mm Unit:mm

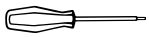
商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	端面直径 D	ap Max	重量 (kg)	适用刀片 Applicable Inserts
7801600	PSE11R016SF8-2	16	2	8.5	8	10	27	14.5	10	0.03	
7801612	PSE11R017SF8-2	17	2	8.5	8	10	27	14.5	10	0.03	
7801613	PSE11R018SF8-2	18	2	8.5	8	10	27	14.5	10	0.03	
7801601	PSE11R020SF10-3	20	3	10.5	10	14	33	18	10	0.06	
7801614	PSE11R021SF10-3	21	3	10.5	10	14	33	18	10	0.06	
7801615	PSE11R022SF10-3	22	3	10.5	10	14	33	18	10	0.06	
7801602	PSE11R025SF12-4	25	4	12.5	12	17	35	23	10	0.10	①
7801616	PSE11R026SF12-3	26	3	12.5	12	17	35	23	10	0.10	
7801603	PSE11R028SF12-4	28	4	12.5	12	17	35	23	10	0.11	
7801604	PSE11R032SF16-5	32	5	17	16	22	40	28	10	0.19	
7801617	PSE11R033SF16-3	33	3	17	16	22	40	28	10	0.20	
7801605	PSE11R035SF16-5	35	5	17	16	22	40	28	10	0.20	
7801606	PSE11R040SF16-6	40	6	17	16	22	40	28	10	0.22	
7801607	PSE15R025SF12-2	25	2	12.5	12	17	35	23	14	0.09	
7801618	PSE15R026SF12-2	26	2	12.5	12	17	35	23	14	0.10	
7801608	PSE15R028SF12-2	28	2	12.5	12	17	35	23	14	0.10	
7801609	PSE15R032SF16-3	32	3	17	16	22	40	28	14	0.17	②
7801619	PSE15R033SF16-3	33	3	17	16	22	40	28	14	0.18	
7801610	PSE15R035SF16-3	35	3	17	16	22	40	28	14	0.18	
7801611	PSE15R040SF16-4	40	4	17	16	22	40	28	14	0.20	

刀具夹具，刀柄请参考P.162~
Please see p.162- for shank holders.

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
 固定螺丝 Clamping Screw	7808107	FS25656P (Torx 8IP)	①	ZD*T11···	PSE SS/SF φ16~40
	7808109	FS25673P (Torx 8IP)			PSE BORE φ40~80
	7808115	FS35686P (Torx 15IP)	②	ZDKT15···	PSE SS/SF φ25~63 PSE BORE φ40~125
 高强度螺栓 Power Screw	7808150	PS0830 (M8×30)	①	ZD*T11···	PSE BORE φ40
			②	ZDKT15···	
	7808151	PS1031 (M10×31)	①	ZD*T11···	PSE BORE φ50
			②	ZDKT15···	

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
 扳手 Wrench	7808225	8IP-D (Torx 8IP)	①	ZD*T11···	PSE SS/SF φ16~40 PSE BORE φ40~80
	7808228	15IP-D (Torx 15IP)	②	ZDKT15···	PSE SS/SF φ25~63 PSE BORE φ40~125

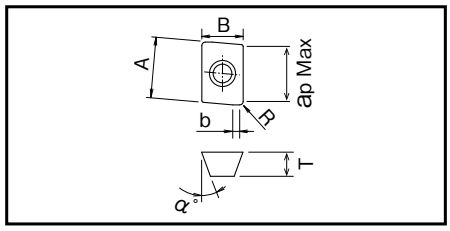
扳手请另购。 The wrenches are sold separately from the cutters.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

方肩铣刀系列
Shoulder Cutter Series

PSE 刀片
Inserts

Inserts



■适用刀片 Inserts

单位:mm Unit:mm

	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size A×B	厚度 T	后角 α°	R	副刃 b	ap Max	超硬 Uncoated CK010	涂层种类 Grade of Coated Materials XC3030	XP3035	XP2025	XP2040	XC1015	XC5035	XC5040	XP6015
	ZDKT11T302FR-NM	2	11×6.8	3.8	15	0.2	2.0	10	7811048								
	ZDKT11T304FR-NM	2	11×6.8	3.8	15	0.4	1.8	10	7811049								
	ZDHT11T304FR-NM	2	11×6.8	3.5	15	0.4	1.8	10	7811024								
	ZDKT11T308SR-GL	2	11×6.8	3.8	15	0.8	1.4	10		7825026	7814026	7826026	7813026				
	ZDKT11T304SR-GM	2	11×6.8	3.8	15	0.4	1.8	10		7825025	7814025	7826025	7813025	7812025			
	ZDKT11T308SR-GM	2	11×6.8	3.8	15	0.8	1.4	10		7825032	7814032	7826032	7813032				
	ZDKT11T312SR-GM	2	11×6.8	3.8	15	1.2	1.0	10			7814053						
①	ZDKT11T320SR-GM	2	11×6.8	3.8	15	2.0	2.1	10			7814038						
	ZDKT11T330SR-GM	2	11×6.8	3.8	15	3.0	1.5	10			7814054						
	ZDKT11T340SR-GM	2	11×6.8	3.8	15	4.0	–	10			7814055						
	ZDKT11T308SR-GR	2	11×6.8	3.8	15	0.8	1.4	10		7825033	7814033		7813033	7812033			
	ZDKT11T308SR-HR	2	11×6.8	3.8	15	0.8	1.4	10									7824035
	ZDKT11T304ER-SM	2	11×6.8	3.8	15	0.4	1.8	10								7816034	
	ZDKT11T308ER-SM	2	11×6.8	3.8	15	0.8	1.4	10							7815031	7816031	
	ZDKT11T316ER-SM	2	11×6.8	3.8	15	1.6	0.8	10							7815027	7816027	
	ZDKT150508FR-NM	2	15×9.3	5.56	15	0.8	1.6	14	7811046								
	ZDKT150508SR-GL	2	15×9.3	5.56	15	0.8	1.6	14		7825057	7814057	7826057	7813057				
	ZDKT150508SR-GM	2	15×9.3	5.56	15	0.8	1.6	14		7825029	7814029	7826029	7813028	7812029			
	ZDKT150512SR-GM	2	15×9.3	5.56	15	1.2	1.2	14			7814077						
	ZDKT150516SR-GM	2	15×9.3	5.56	15	1.6	0.8	14			7814078						
②	ZDKT150520SR-GM	2	15×9.3	5.56	15	2.0	2.1	14			7814079						
	ZDKT150530SR-GM	2	15×9.3	5.56	15	3.0	1.9	14			7814080						
	ZDKT150540SR-GM	2	15×9.3	5.56	15	4.0	1.1	14			7814081						
	ZDKT150550SR-GM	2	15×9.3	5.56	15	5.0	0.7	14			7814082						
	ZDKT150508SR-GR	2	15×9.3	5.56	15	0.8	1.6	14		7825058	7814058		7813058	7812058			
	ZDKT150508SR-HR	2	15×9.3	5.56	15	0.8	1.6	14									7824036
	ZDKT150508ER-SM	2	15×9.3	5.56	15	0.8	1.6	14							7815056	7816056	

・使用圆弧角R = R2以上的刀片时，需要调整刀体的倒角部
刀体的圆弧角R =刀片的R-1（ 例如 ；刀片R3的话，刀体的倒角要R2）
※如需修正的情况下属于受注对应品，请咨询营业人员。

・When using an insert with a corner radius of R2 or greater, the corner of the cutter body must be modified.
The body corner radius should be equal to insert radius minus 1 (example: if insert radius is R3, body radius should be R2).
※ Please contact us for modification service if necessary.

R修正 Modification of R

库存种类都为C(即标准库存品）。 Stock are categorized as C (Standard stock item).

Phoenix

方肩铣刀系列
Shoulder Cutter Series

PSE

Cutting Conditions

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

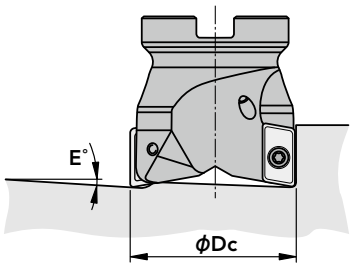
刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
CK010	NM	有 Wet				◎		
XC3030	GL GM GR	无 Dry	◎		○			
XP3035	GL GM GR	无 Dry	◎	○	○			
		有 Wet						
XP2025	GL GM	有 Wet	○	◎			○	
XP2040	GL GM GR	无 Dry	○	○				○
		有 Wet	○	◎			○	
XC1015	GM GR	无 Dry			◎			
XC5035	SM	无 Dry		◎				
		有 Wet		○			○	
XC5040	SM	有 Wet		○			◎	
XP6015	HR	无 Dry	○		○			◎

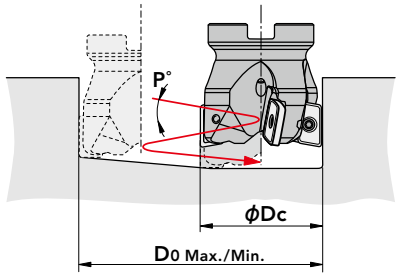
NM:铝合金用 GL:轻切削用 GM:中切削用 GR:重切削用 HR:高硬度钢用 SM:耐热合金用
NM:Aluminum Alloy GL:Light Cutting GM:Middle Cutting GR:Heavy Cutting HR:High Hardened Steel SM:Heat Resistance Alloy

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	刀片尺寸 Insert Size							
			ZD*T11…				ZDKT15…			
			切削深度 ap:10mm 切 削 宽度 ae:0.2D		切削深度 ap:3mm 切 削 宽度 ae:1.0D		切削深度 ap:14mm 切 削 宽度 ae:0.2D		切削深度 ap:5mm 切 削 宽度 ae:1.0D	
			切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz(mm/t) Feed per Tooth	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz(mm/t) Feed per Tooth	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz(mm/t) Feed per Tooth	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz(mm/t) Feed per Tooth
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	180 (100 ~ 250)	0.25 (0.2 ~ 0.5)	180 (100 ~ 250)	0.12 (0.05~ 0.2)	180 (100 ~ 250)	0.3 (0.2 ~ 0.6)	180 (100 ~ 250)	0.15 (0.05~ 0.25)
P	炭素钢、合金钢 Carbon Stee, Alloy Steel (S50C, SCM440)	~280HB	180 (100 ~ 250)	0.2 (0.15~ 0.4)	180 (100 ~ 250)	0.11 (0.05~ 0.2)	180 (100 ~ 250)	0.25 (0.15~ 0.5)	180 (100 ~ 250)	0.12 (0.05~ 0.2)
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150 (80 ~ 200)	0.2 (0.15~ 0.4)	150 (80 ~ 200)	0.1 (0.05~ 0.18)	150 (80 ~ 200)	0.25 (0.15~ 0.5)	150 (80 ~ 200)	0.12 (0.05~ 0.2)
M	不锈钢(干式) Stainless Steel (Dry) (SUS304, SUS420)	~250HB	150 (80 ~ 200)	0.18 (0.15~ 0.4)	150 (80 ~ 200)	0.1 (0.05~ 0.18)	150 (80 ~ 200)	0.2 (0.15~ 0.45)	150 (80 ~ 200)	0.12 (0.05~ 0.2)
M	不锈钢(湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	80 (60 ~ 120)	0.18 (0.15~ 0.4)	80 (60 ~ 120)	0.1 (0.05~ 0.18)	80 (60 ~ 120)	0.2 (0.15~ 0.45)	80 (60 ~ 120)	0.12 (0.05~ 0.2)
K	铸铁 Cast Iron (FC250)	~350N/mm²	180 (100 ~ 300)	0.25 (0.15~ 0.5)	180 (100 ~ 300)	0.12 (0.05~ 0.2)	180 (100 ~ 300)	0.3 (0.2 ~ 0.6)	180 (100 ~ 300)	0.15 (0.05~ 0.25)
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	180 (100 ~ 250)	0.15 (0.1 ~ 0.4)	180 (100 ~ 250)	0.12 (0.05~ 0.2)	180 (100 ~ 250)	0.2 (0.15~ 0.5)	180 (100 ~ 250)	0.15 (0.05~ 0.25)
N	铝合金 Aluminum Alloy	~13%Si	300 (200 ~ 1,500)	0.3 (0.2 ~ 0.5)	300 (200 ~1,500)	0.15 (0.1 ~ 0.25)	300 (200 ~1,500)	0.35 (0.2 ~ 0.6)	300 (200 ~ 1,500)	0.18 (0.1 ~ 0.3)
S	超耐热合金(湿式) Superalloy (Wet) (Inconel® 718)	–	35 (25 ~ 60)	0.15 (0.1 ~ 0.3)	35 (25 ~ 60)	0.1 (0.05~ 0.15)	35 (25 ~ 60)	0.2 (0.1 ~ 0.3)	35 (25 ~ 60)	0.12 (0.05~ 0.15)
S	钛合金(湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	40 (30 ~ 120)	0.18 (0.1 ~ 0.35)	40 (30 ~ 120)	0.1 (0.08~ 0.25)	40 (30 ~ 120)	0.22 (0.1 ~ 0.35)	40 (30 ~ 120)	0.12 (0.08~ 0.25)
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	100 (40 ~ 150)	0.18 (0.1 ~ 0.3)	90 (40 ~ 150)	0.1 (0.08~ 0.2)	100 (40 ~ 150)	0.22 (0.1 ~ 0.35)	90 (40 ~ 150)	0.12 (0.08~ 0.25)
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	80 (40 ~ 120)	0.12 (0.08~ 0.2)	70 (40 ~ 120)	0.08 (0.06~ 0.15)	80 (40 ~ 120)	0.15 (0.08~ 0.25)	70 (40 ~ 120)	0.1 (0.06~ 0.2)
H	调质钢 Hardened Steel (SKD11)	50~55HRC	60 (40 ~ 90)	0.1 (0.05~ 0.2)	50 (40 ~ 90)	0.06 (0.05~ 0.1)	60 (40 ~ 90)	0.12 (0.05~ 0.2)	50 (40 ~ 90)	0.08 (0.05~ 0.12)

・槽加工时推荐使用短刃型。 ・上述的参数表仅适合短柄型
・上述数值是根据切削速度的标准数值，请根据加工环境适当调整。
・Course pitch is recommended for Slotting. ・Above recommended speed is for Short Shank Type.
・The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.





Maximum Ramping (E) & Helical (P) Angle

■斜线加工·螺旋线加工时的最大倾斜角(E) Maximum Ramping (E) & Helical (P) Angle

刀片尺寸 Insert Size	ZD*T11···				ZDKT15···			
外径(mm) Dc	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm)		螺旋角度 Helical Angle P°	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm)		螺旋角度 Helical Angle P°
		最小径 D0 Min.	最大径 D0 Max.			最小径 D0 Min.	最大径 D0 Max.	
16	10.8	18	29	9.5	–	–	–	–
17	9.8	22	31	7.0	–	–	–	–
18	9.8	22	33	7.0	–	–	–	–
20	9.8	30	37	7.0	–	–	–	–
21	8.5	32	39	4.5	–	–	–	–
22	7.5	34	41	4.5	–	–	–	–
25	7.5	40	47	4.5	9.5	37	48	7.5
26	6.8	42	49	4.2	8.3	38	50	6.0
28	6.3	46	53	3.9	8.3	39	54	5.6
30	5.5	50	57	3.4	7.4	43	58	5.3
32	4.8	53	61	3.2	6.8	47	62	5.0
33	4.5	56	63	3.0	6.3	49	64	4.2
35	3.2	60	67	2.5	5.9	53	68	3.8
40	2.9	72	77	2.2	5.1	63	78	3.2
50	2.2	93	98	1.7	2.5	86	98	2.5
63	1.8	118	123	1.5	2.5	111	124	1.5
80	1.4	152	157	1.0	2.0	147	158	1.3
100	–	–	–	–	1.5	190	198	1.1
125	–	–	–	–	0.9	240	248	0.9

Cutting Data

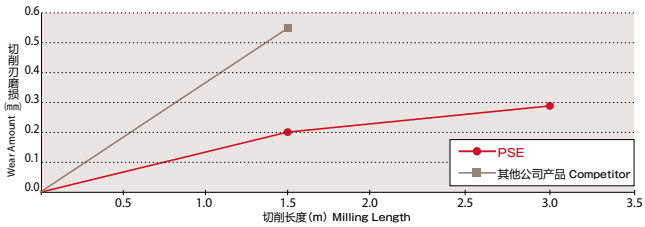
■加工数据 Cutting Data

Inconel® 718 (45HRC)的寿命加工 Long tool life on Inconel® 718

使用工具 Tool	PSE11R032SS32-5S (φ32×5刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308ER-SM (XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	Inconel® 718 (45HRC)	
切削速度 Cutting Speed	30m/min (298min^{-1})	25m/min (248min^{-1})
进给速度 Feed	120mm/min (0.08mm/t)	80mm/min (0.08mm/t)
切削深度 Depth of Cut	ap=1mm ae=20mm	ap=1mm ae=20mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	

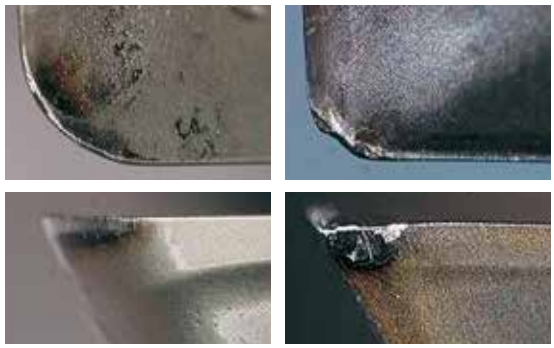
与以往刀具相比，切削参数提高50%后仍可继续加工，耐久性提高2倍，且为正常磨损，仍可继续加工。

Our product was able to mill at conditions that were 50% higher than those for competitors' tools. It provided double the durability with normal wear and was able to continue milling.



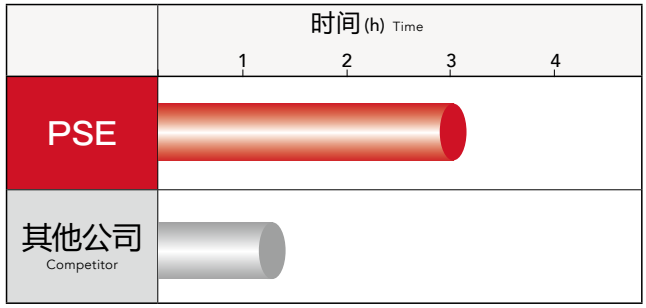
加工1.5m后照片 After 1.5m of milling

PSE 其他公司 Competitor



NAK80 (40HRC)的寿命加工 Long tool life on NAK80 (40HRC)

使用工具 Tool	PSE11R020SS20-3S (φ20×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308SR-GL (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	NAK80 (40HRC)	
切削速度 Cutting Speed	130m/min (2,070min^{-1})	
进给速度 Feed	1,400mm/min (0.23mm/t)	
切削深度 Depth of Cut	ap=0.3mm ae=10mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	

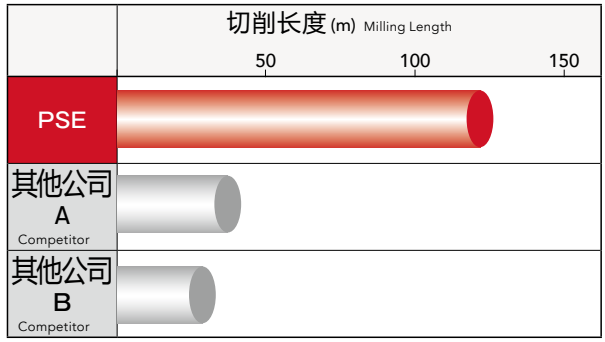


在相同的切削条件下，其他公司的产品已经发生崩刃，但是PSE 没有发生任何的崩损，仍可稳定加工，耐久性也约为2倍。

The competitor's tool chipped, but under the same conditions, the PSE did not exhibit any chipping, performed stably, and provided approximately double the durability.

粗加工的长寿命化 Long tool life in roughing

使用工具 Tool	PSE15R032SS32-3S (φ32×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT150508SR-GM (XC3030)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S50C	
切削速度 Cutting Speed	180m/min (1,790min^{-1})	
进给速度 Feed	1,000mm/min (0.2mm/t)	
切削深度 Depth of Cut	ap=3mm ae=25.2mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	



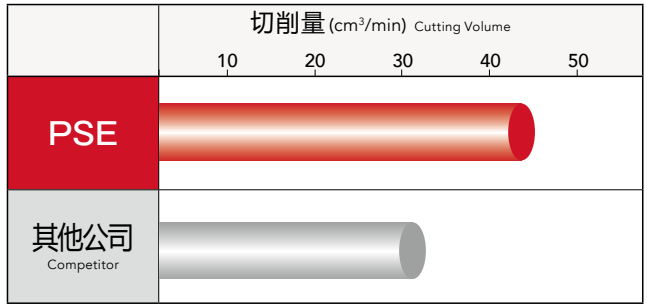
与其他公司产品相比，耐磨损性能更强。
抑制磨损，可大幅提高使用寿命。

In comparison to the competitors, the PSE (XC3030) has much great wear resistance, which leads to longer tool life.

PSE加工128m后的照片 Photo after milling 128m

机械零部件的正面加工 Face milling of machine parts

使用工具 Tool	PSE15R100M31.7-10 (φ100×10刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT150508SR-GM (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	150m/min (478min^{-1})	
进给速度 Feed	720mm/min (0.15mm/t)	500mm/min (0.15mm/t)
切削深度 Depth of Cut	ap=1mm ae=60mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center	
切削量 Cutting Volume	43.2cm^3/min	30cm^3/min



断续加工等孔较多的正面加工情况下，可以得到比其他公司产品1.4倍的效率。而且能进一步抑制发热，与其他公司产品相比，可抑制工件变形，改善对后续工序的影响。

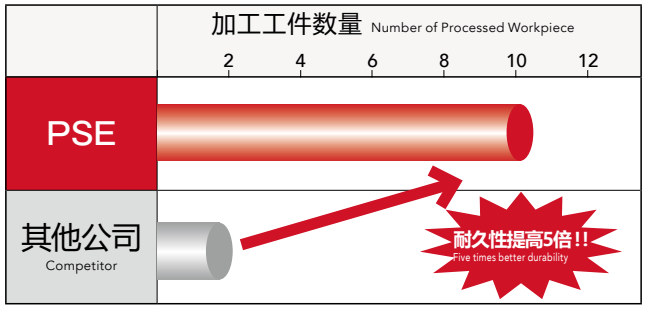
This process consisted of intermittent face milling a surface with multiple holes, and our product was able to mill with 1.4 times the efficiency of the competitor's tool. Moreover, it inhibited the generation of heat, reducing the distortion of the workpiece as well as the effects passed on to the subsequent process.

Cutting Data

■加工数据 Cutting Data

喷嘴的槽加工 Groove milling of a nozzle piece

使用工具 Tool	PSE11R020SS20-3S (φ20×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308ER-SM (XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS630	
切削速度 Cutting Speed	160m/min (2,548min^{-1})	
进给速度 Feed	510mm/min (0.07mm/t)	
切削深度 Depth of Cut	ap=2mm ae=20mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	复合加工机 Compound Machine	

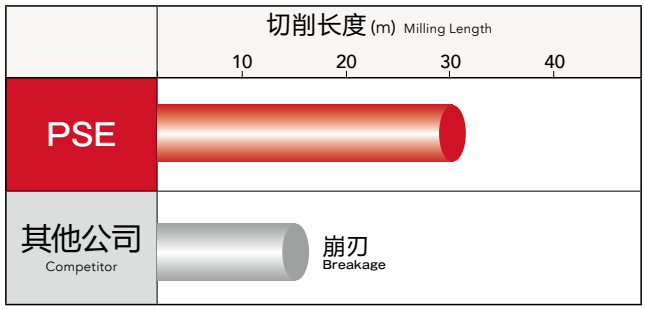


不锈钢的槽加工案例。其他公司的产品由于切屑堵塞，过早发生崩刃而无法加工。而PSE 切屑由于排出稳定，可加工10个工件，性能非常好。

This process consists of groove milling in stainless steel. The competitor's tool caused the chips to jam, resulting in premature breakage of the tool. The PSE, in contrast, evacuated chips in a stable manner and could mill 10 workpieces, a significant improvement.

容器长寿命加工 Long life milling of a chamber

使用工具 Tool	PSE15R080M25.4-8 (φ80×8刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT150508SR-GM (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	180m/min (717min^{-1})	
进给速度 Feed	700mm/min (0.12mm/t)	
切削深度 Depth of Cut	ap=1mm ae=60mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

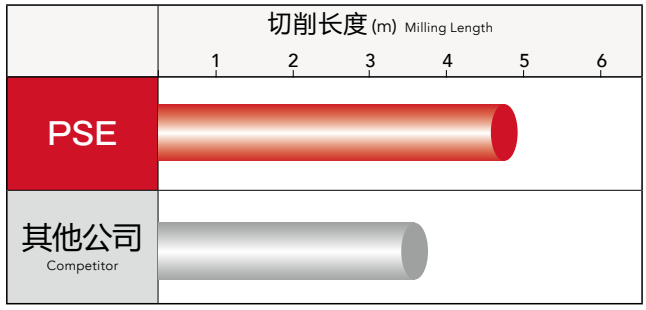


不锈钢干式加工案例。型腔开口部的正面加工，在相同条件下，传统的工具过早崩刃，不可继续加工，而PSE 可得到2倍以上的耐久性。

This process consisted of dry milling in stainless steel. A competitor's tool and the PSE were compared in face milling the surface of a chamber opening under identical conditions. The competitor's tool broke prematurely, and was not able to continue. However, the PSE was able to attain more than double the durability.

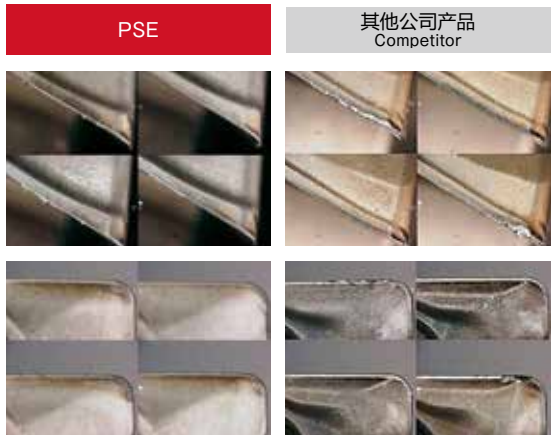
飞机零部件粗加工 Rough milling of aircraft parts

使用工具 Tool	PSE11R025SS25-4S (φ25×4刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308ER-SM(XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	β-Titanium alloy	
切削速度 Cutting Speed	40m/min (510min^{-1})	
每刃进给量 Feed	160mm/min (0.08mm/t)	
切削深度 Depth of Cut	ap=5mm ae=10mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center	



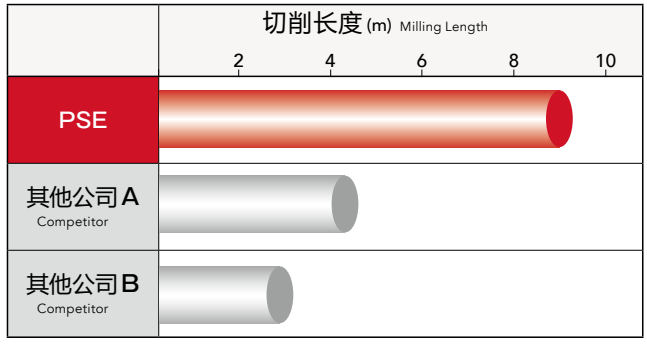
飞机零部件的粗加工案例，在同等条件下的加工比较。其他公司产品发生崩刃，但是PSE为正常磨损，为其他公司产品耐久性的1.5倍。

A competitor's product and the PSE were compared in the rough milling of aircraft parts under identical conditions. The competitor's product chipped, but the PSE wore normally and attained 1.5 times the durability.



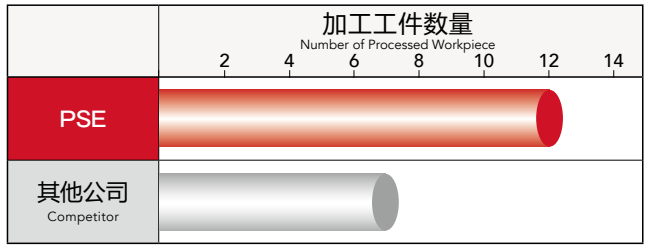
社内测试 DH31S (48HRC) Internal test DH31S (48HRC)

使用工具 Tool	PSE11R032SS32-3S (φ32×3刃)	其他公司A、B Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308SR-HR (XP6015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	DH31S (48HRC)	
切削速度 Cutting Speed	50m/min (497min^{-1})	
进给速度 Feed	150mm/min (0.1mm/t)	
切削深度 Depth of Cut	ap=5mm ae=1mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	



熔覆部的稳定加工 Stable machining of padding

使用工具 Tool	PSE15R032SS32-3S (φ32×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308SR-HR (XP6015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	熔覆部 (56HRC) Padding	
切削速度 Cutting Speed	30m/min (300min^{-1})	
进给速度 Feed	110mm/min (0.12mm/t)	
切削深度 Depth of Cut	ap=11mm ae=5~20mm	
切削油剂 Coolant	气冷式 Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



其他公司的刀片多易磨损，寿命不稳定。
PSE(XP6015)的寿命稳定，约可提高1.5倍的寿命。

The competitor tool exhibited frequent insert breakage, which is an indicator for instability. OSG's PSE (XP6015), on the other hand, demonstrated consistent performance with 1.7 times the durability versus the competition.

» Phoenix PSEL

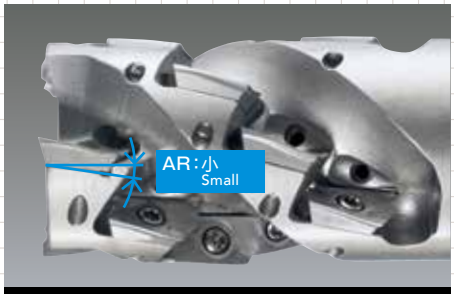
玉米铣刀系列
Roughing End Mill Series

Phoenix Roughing End Mill

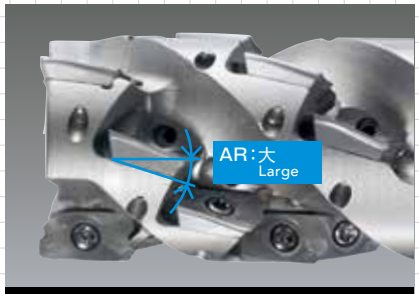
■最适合化的刀片排列 Optimized insert arrangement

由于轴方向前刀角规格抑制振动，能实现低抵抗加工

Variable axial rake angle (AR) suppress vibration which enables low-resistance machining.



第一段 ：重视耐磨损性
1st step: for high chipping resistance



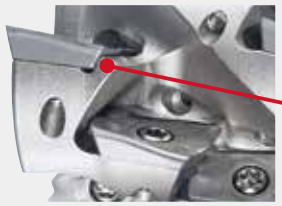
第二段以后 ：重视锋利性
2nd and subsequent steps: for high sharpness

■很牢固的先端刃刀片装夹

Securely clamped inserts at the tip

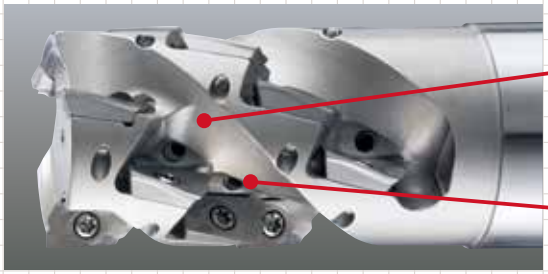
抑制突发性崩刃，能实现很稳定的加工

Avoids sudden chipping and enables stable machining



■由于特殊导程槽形状和每个刀片架的油孔，能实现良好的排屑性

A special lead groove and oil hole for every insert seat enable excellent chip ejection



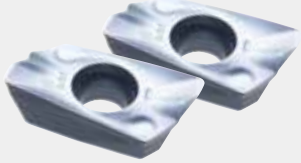
■可以使用与PSE 共同刀片，便于管理

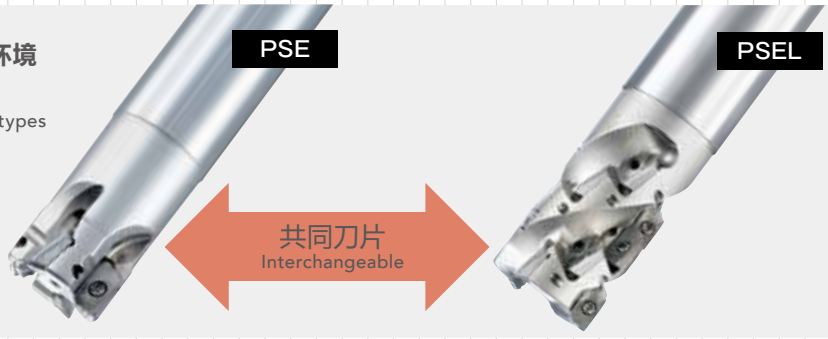
Enables to simplify tool management, as inserts for PSEL are interchangeable with those for PSE.

刀片种类很丰富，能对应各种加工环境

（参照p.69）

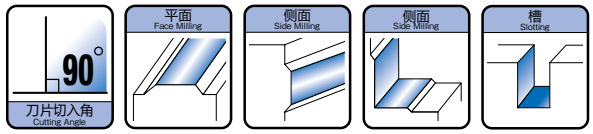
A wide variety of inserts cover the various types of machining (see p.69)





玉米铣刀 直柄型
Roughing End Mill with Straight Shank

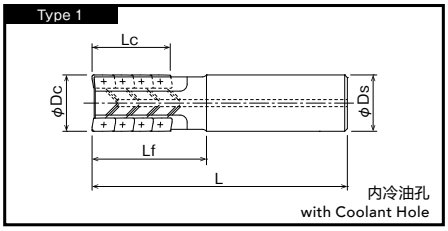
PSEL SS



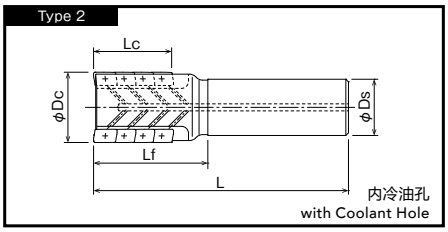
Specification

■形状尺寸表 Specification

Type 1



Type 2



单位:mm Unit:mm

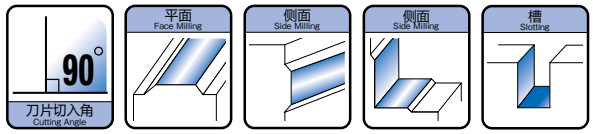
商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	刃段数 No. of Insert per Flute	总刀片数 Total No. of Inserts	刃长 Lc	柄径 Ds	全长 L	颈长 Lf	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7802900	PSEL11R025SS25-2-27	25	2	3	6	27	25	125	50	0.39		1
7802901	PSEL11R032SS32-2-37	32	2	4	8	37	32	140	60	0.71		1
7802902	PSEL11R032SS32-3-45	32	3	5	15	45.5	32	140	60	0.70	①	1
7802903	PSEL11R040SS42-3-37	40	3	4	12	37	42	140	60	1.20		1
7802904	PSEL11R040SS42-4-45	40	4	5	20	45.5	42	140	60	1.18		1
7802905	PSEL15R040SS42-2-38	40	2	3	6	38	42	140	60	1.13	②	1
7802906	PSEL15R050SS42-3-50	50	3	4	12	50.5	42	144	64	1.31		2

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

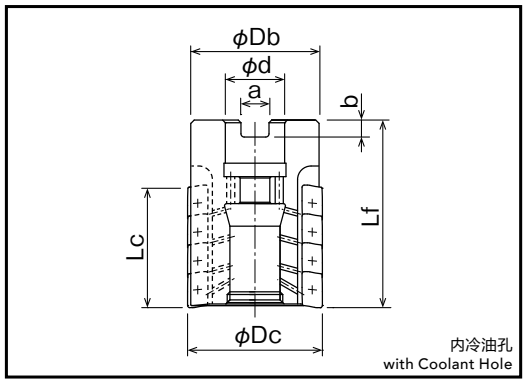
玉米铣刀 刀盘型
Roughing End Mill with Bore Type

PSEL BORE



Specification

■形状尺寸表 Specification



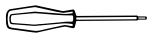
单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	刃段数 No. of Insert per Flute	总刀片数 Total No. of Inserts	刃长 Lc	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot 宽度 a	端面键槽 Key Slot 深度 b	重量 (kg)	适用刀片 Applicable Inserts
7802850	PSEL15R050M22-3-50	50	3	4	12	50.5	74	45	22	10.4	6.3	0.47	②
7802851	PSEL15R063M27-3-50	63	3	4	12	50.5	74	60	27	12.4	7	0.83	
7802852	PSEL15R080M32-4-63	80	4	5	20	63	88	76	32	14.4	8	1.82	

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
 固定螺丝 Clamping Screw	7808107	FS25656P (Torx 8IP)	①	ZD*T11···	PSEL SS ϕ25
	7808109	FS25673P (Torx 8IP)			PSEL SS ϕ32～40
	7808115	FS35686P (Torx 15IP)	②	ZDKT15···	PSEL SS ϕ40～50 PSEL BORE ϕ50～80
 止冷却螺钉 Coolant cap bolt	7808132	OCB-M20-08			PSEL BORE ϕ50
	7808133	OCB-M24-10			PSEL BORE ϕ63
	7808134	OCB-M30-14			PSEL BORE ϕ80

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
 扳手 Wrench	7808225	8IP-D (Torx 8IP)	①	ZD*T11···	PSEL SS ϕ25～40
	7808228	15IP-D (Torx 15IP)	②	ZDKT15···	PSEL SS ϕ40～50 PSEL BORE ϕ50～80

扳手请另购。 The wrenches are sold separately from the cutters.

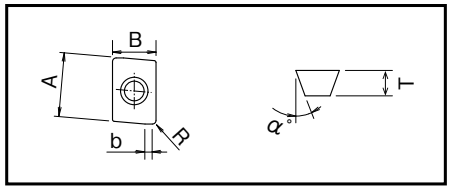
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

玉米铣刀系列
Roughing End Mill Series

PSEL 刀片
Inserts

Inserts

■适用刀片 Inserts



单位:mm Unit:mm

	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size A×B	厚度 T	后角 α°	R	副切削刃 b	超硬 Uncoated CK010	涂层种类 Grade of Coated Materials XC3030	XP3035	XP2025	XP2040	XC1015	XC5035	XC5040	XP6015
	ZDKT11T302FR-NM	2	11×6.8	3.8	15	0.2	2.0	7811048								
	ZDKT11T304FR-NM	2	11×6.8	3.8	15	0.4	1.8	7811049								
	ZDHT11T304FR-NM	2	11×6.8	3.5	15	0.4	1.8	7811024								
	ZDKT11T308SR-GL	2	11×6.8	3.8	15	0.8	1.4		7825026	7814026	7826026	7813026				
	ZDKT11T304SR-GM	2	11×6.8	3.8	15	0.4	1.8		7825025	7814025	7826025	7813025	7812025			
	ZDKT11T308SR-GM	2	11×6.8	3.8	15	0.8	1.4		7825032	7814032	7826032	7813032				
	ZDKT11T312SR-GM	2	11×6.8	3.8	15	1.2	1.0			7814053						
①	ZDKT11T320SR-GM	2	11×6.8	3.8	15	2.0	2.1			7814038						
	ZDKT11T330SR-GM	2	11×6.8	3.8	15	3.0	1.5			7814054						
	ZDKT11T340SR-GM	2	11×6.8	3.8	15	4.0	–			7814055						
	ZDKT11T308SR-GR	2	11×6.8	3.8	15	0.8	1.4		7825033	7814033		7813033	7812033			
	ZDKT11T308SR-HR	2	11×6.8	3.8	15	0.8	1.4									7824035
	ZDKT11T304ER-SM	2	11×6.8	3.8	15	0.4	1.8								7816034	
	ZDKT11T308ER-SM	2	11×6.8	3.8	15	0.8	1.4							7815031	7816031	
	ZDKT11T316ER-SM	2	11×6.8	3.8	15	1.6	0.8							7815027	7816027	
	ZDKT150508FR-NM	2	15×9.3	5.56	15	0.8	1.6	7811046								
	ZDKT150508SR-GL	2	15×9.3	5.56	15	0.8	1.6		7825057	7814057	7826057	7813057				
	ZDKT150508SR-GM	2	15×9.3	5.56	15	0.8	1.6		7825029	7814029	7826029	7813028	7812029			
	ZDKT150512SR-GM	2	15×9.3	5.56	15	1.2	1.2			7814077						
	ZDKT150516SR-GM	2	15×9.3	5.56	15	1.6	0.8			7814078						
②	ZDKT150520SR-GM	2	15×9.3	5.56	15	2.0	2.1			7814079						
	ZDKT150530SR-GM	2	15×9.3	5.56	15	3.0	1.9			7814080						
	ZDKT150540SR-GM	2	15×9.3	5.56	15	4.0	1.1			7814081						
	ZDKT150550SR-GM	2	15×9.3	5.56	15	5.0	0.7			7814082						
	ZDKT150508SR-GR	2	15×9.3	5.56	15	0.8	1.6		7825058	7814058		7813058	7812058			
	ZDKT150508SR-HR	2	15×9.3	5.56	15	0.8	1.6									7824036
	ZDKT150508ER-SM	2	15×9.3	5.56	15	0.8	1.6							7815056	7816056	

・第2行后面，请使用R0.8以下的刀片。
・使用圆弧角R = R2以上的刀片时，需要调整刀体的倒角部。
刀体的圆弧角R =刀片的R-1（例如：刀片R3的话，刀体的倒角要R2）
※ 如需修正的情况下属于受注对应品，请咨询营业人员。

・For the 2nd and subsequent steps, use the inserts with R0.8 or smaller.
・When using an insert with a corner radius of R2 or greater, the corner of the cutter body must be modified.
The body corner radius should be equal to insert radius minus 1 (example: if insert radius is R3, body radius should be R2).
※ Please contact us for modification service if necessary.

R修正 Modification of R

库存种类都为C（即标准库存品）。 Stock are categorized as C (Standard stock item).

Phoenix

玉米铣刀系列
Roughing End Mill Series

PSEL

Cutting Conditions

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
CK010	NM	有 Wet				◎		
XC3030	GL GM GR	无 Dry	◎		○			
XP3035	GL GM GR	无 Dry	◎	○	○			
		有 Wet						
XP2025	GL GM	有 Wet	○	◎			○	
XP2040	GL GM GR	无 Dry	○	○				○
		有 Wet	○	◎			○	
XC1015	GM GR	无 Dry			◎			
XC5035	SM	无 Dry		◎				
		有 Wet		○			○	
XC5040	SM	有 Wet		○			◎	
XP6015	HR	无 Dry	○		○			◎

NM:铝合金用 GL:轻切削用 GM:中切削用 GR:重切削用 HR:高硬度钢用 SM:耐热合金用
NM:Aluminum Alloy GL:Light Cutting GM:Middle Cutting GR:Heavy Cutting HR:High Hardened Steel SM:Heat Resistance Alloy

切削深度(ap) 1.1～1.5D、
切削幅度于0.1D以下时的参数表。
The chart below is based on the following condition:
·Depth of Cut (ap) : between 1.1D to 1.5D
·Cutting Width (ae)≦0.1D

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度成分等 Tensile Strength · Hardness	刀片尺寸 Insert Size ZD*T11… 切削速度 Vc (m/min) Cutting Speed	ZD*T11… 每刃进给量 fz (mm/t) Feed Per Tooth	ZDKT15… 切削速度 Vc (m/min) Cutting Speed	ZDKT15… 每刃进给量 fz (mm/t) Feed Per Tooth
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	160 (100 ~ 200)	0.25 (0.2 ~ 0.4)	160 (100 ~ 200)	0.3 (0.2 ~ 0.4)
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	150 (100 ~ 200)	0.2 (0.15 ~ 0.3)	150 (100 ~ 200)	0.25 (0.15 ~ 0.3)
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	130 (80 ~ 180)	0.2 (0.15 ~ 0.3)	130 (80 ~ 180)	0.25 (0.15 ~ 0.3)
M	不锈钢(干式) Stainless Steel (Dry) (SUS304, SUS420)	~250HB	150 (100 ~ 200)	0.12 (0.1 ~ 0.3)	150 (100 ~ 200)	0.15 (0.1 ~ 0.3)
M	不锈钢(湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	80 (60 ~ 120)	0.12 (0.1 ~ 0.3)	80 (60 ~ 120)	0.15 (0.1 ~ 0.3)
K	铸铁 Cast Iron (FC250)	~350N/mm²	160 (100 ~ 300)	0.2 (0.2 ~ 0.35)	160 (100 ~ 300)	0.25 (0.2 ~ 0.35)
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	160 (100 ~ 250)	0.15 (0.2 ~ 0.3)	160 (100 ~ 250)	0.2 (0.2 ~ 0.3)
N	铝合金 Aluminum Alloy	~13%Si	300 (200 ~ 1,000)	0.25 (0.1 ~ 0.4)	300 (200 ~ 1,000)	0.3 (0.1 ~ 0.4)
S	超耐热合金(湿式) Superalloy (Wet) (Inconel® 718)	–	35 (25 ~ 60)	0.15 (0.1 ~ 0.3)	35 (25 ~ 60)	0.18 (0.1 ~ 0.3)
S	钛合金(湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	40 (30 ~ 120)	0.15 (0.1 ~ 0.3)	40 (30 ~ 120)	0.18 (0.1 ~ 0.3)
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	100 (40 ~ 150)	0.15 (0.1 ~ 0.3)	100 (40 ~ 150)	0.18 (0.1 ~ 0.3)
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	60 (40 ~ 120)	0.12 (0.05 ~ 0.2)	60 (40 ~ 120)	0.15 (0.05 ~ 0.2)

·上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.

■切削深度变更时的参数变更的参考数 Ratio of cutting condition by cutting depth to the above standard condition

切削深度 Depth of Cut ap (mm)	最大切入端面槽宽度 Maximum width of Cut ae (mm)	切削速度係数 Ratio to adjust cutting speed VP	进给系数 Ratio to adjust feed rate fP
~ 0.2D	1D	0.8	0.5
0.25 ~ 0.3D	0.7D	0.8	0.6
0.4 ~ 0.5D	0.5D	0.9	0.7
0.6 ~ 0.7D	0.3D	0.9	0.8
0.8 ~ 1D	0.2D	1	0.9
1.1 ~ 1.5D	0.1D	1	1

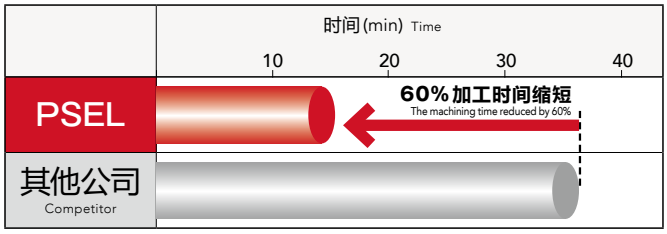
例 Example
刀片尺寸 ZD*T11…、侧面切削
φ32、ap＝30mm、S50C切削时
Insert size ZD*T11…, for cutting ø32, ap=30, side milling, for carbon steel (S50C) machining
・150m/min(Vc)×1.0(VP)＝150m/min
・0.2mm/t(fz)×0.9(fP)＝0.18mm/t
・ae:0.2×φ32＝6.4mm以下 or less

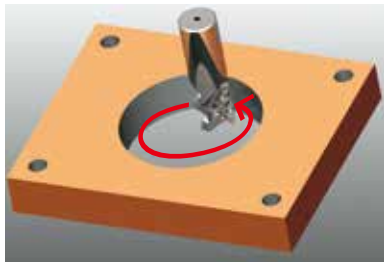
Cutting Data

■加工数据 Cutting Data

FCD450机械性零部件的铸件小径侧面加工 Side milling of the internal circumference of FCD450 machine parts with casting surface

使用工具 Tool	PSEL11R032SS32-3-45 (φ32×3刃)	其他公司(φ32×2刃) Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308SR-GR (XP3035)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FCD450	
切削速度 Cutting Speed	100m/min (995min^{-1})	80m/min (795min^{-1})
进给速度 Feed	600mm/min (0.2mm/t)	240mm/min (0.15mm/t)
切削深度 Depth of Cut	ap=33mm ae=5mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
刀具悬伸 Overhang Length	200mm	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



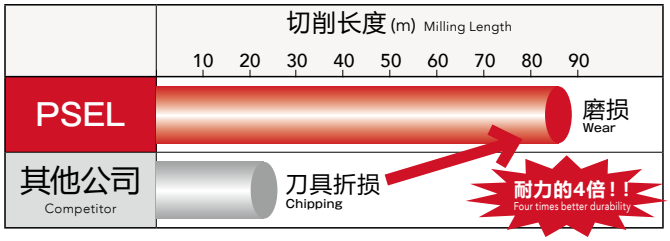


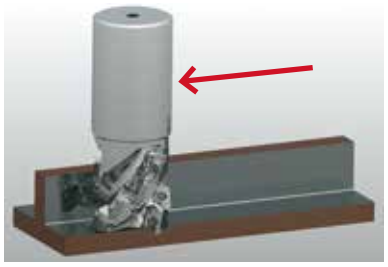
与其他公司产品相比，加工时间缩短了60%。加工杂音极小，加工很稳定，加工完30个加工件后的磨损量也很少。另外，使用其他公司产品时多发生的突发性崩刃也很少发生。

The machining time was reduced by 60% compared with the competitor's product. The sound was low with the stable machining. Its wear after machining 30 workpieces was minimal, and sudden chipping, which was occurred by the competitor's product, was unlikely to happen.

预硬钢机械性零部件的侧面加工 Side milling of pre-hardened steel machine parts

使用工具 Tool	PSEL11R040SS42-3-37 (φ40×3刃)	其他公司(φ40×2刃) Competitor
使用刀片(材质) Insert (grade)	ZDKT11T308SR-GR (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	NAK80 (45HRC)	
切削速度 Cutting Speed	150m/min (1,200min^{-1})	
进给速度 Feed	450mm/min (0.13mm/t)	240mm/min (0.1mm/t)
切削深度 Depth of Cut	ap=25mm ae=5mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
刀具悬伸 Overhang Length	180mm	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	



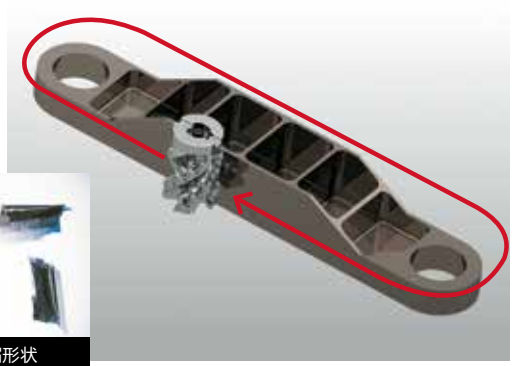


与其他公司产品相比，加工时间缩短了47%(PSEL :加工1个加工件的时间为10分8秒，其他公司产品：同比19分钟)。而且工具寿命能延长约4倍，使用其他公司产品时多发生的突发性崩刃也很少发生。

The machining time was reduced by 47% (PSEL: 10min. 8sec. per workpiece; the competitor's product: 19 min. per workpiece). Furthermore, the tool life became approximately 4 times, and sudden chipping, which was occurred by the competitor's product, was unlikely to happen.

钛合金飞机零部件的大径侧面加工 Side milling of the outer circumference of titanium alloy aircraft parts

使用工具 Tool	PSEL15R063M27-3-50 (φ63×3刃)	其他公司(φ63×4刃) Competitor
使用刀片(材质) Insert (grade)	ZDKT150508ER-SM (XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	Ti-6Al-4V (35HRC)	
切削速度 Cutting Speed	50m/min (250min^{-1})	
进给速度 Feed	150mm/min (0.2mm/t)	150mm/min (0.15mm/t)
切削深度 Depth of Cut	ap=21~45mm ae=7.5~25mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
刀具悬伸 Overhang Length	300mm	
使用机械 Machine	卧式加工中心(HSK100A) Horizontal Machining Center	



良好的切屑形状
Favorable shape of ejected chips

PSEL 能加工3个加工件(加工276分钟时溶着磨损)，其他公司产品只加工1个加工件(92分钟时发生崩刃)，PSEL的工具寿命比其他产品长约3倍。使用其他公司产品时多发生的突发性崩刃也很少发生，而且切屑形状也很良好。

The PSEL achieved 3 times longer tool life (3 workpieces and welding wear after 276 mins) than the competitor tool (1 workpiece and chipping after 92 mins). Moreover, the PSEL was able to maintain consistent chip shape and minimize the risk of sudden chipping.

Phoenix PSTW NEW

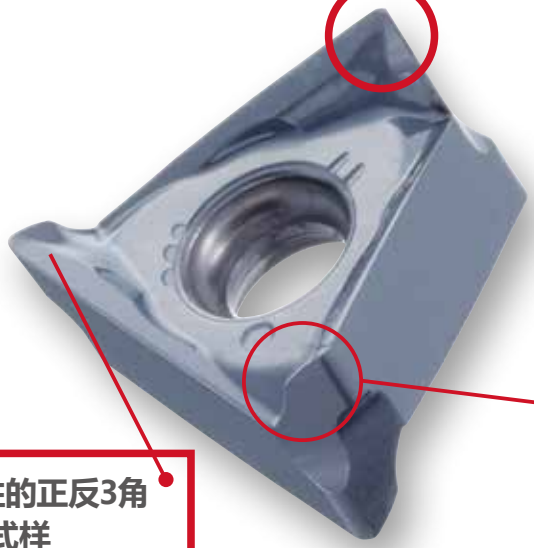
6角方肩铣刀系列
6-corner Shoulder Cutter Series

Phoenix Shoulder Cutter Triangle W-sided Insert Type

■两面6角(90°)刀片
Double-sided 6-corner (90°) insert

提高了自身刚性厚度结合低阻力的正前角设计，可以对应易发生振动的悬伸较长的加工。

Engineered to effectively process long overhang length applications with strong chattering resistance by a high rigidity and positive rake angle geometry



具有经济性的正反3角(双面6角)式样

Economical 3-corner per side
(6 corners in total) specification

副切削刃设计实现优良的精加工面

Flat cutting edge to enable excellent surface finish

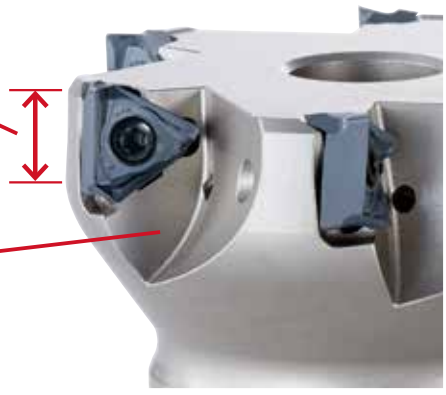
■实现高效率加工的刀体设计
A body design engineered for high efficiency machining

最大切深量12mm

Maximum 12mm depth of cut

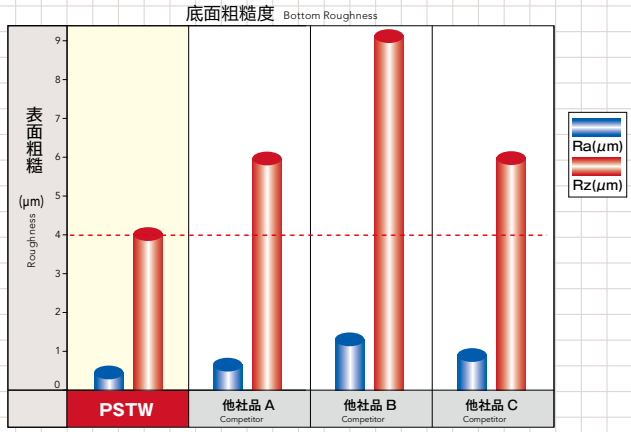
对应重切削加工的容屑槽设计可以进行高效率加工

Chip pocket uniquely designed for heavy machining to enable maximum efficiency



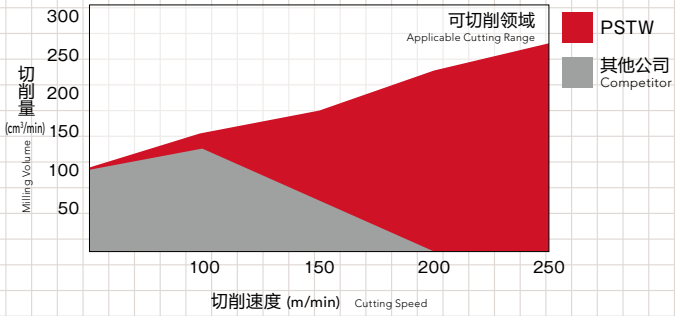
■优良的加工面粗度 Excellent surface roughness

使用工具 Tool	PSTW12R050M22-4(φ50×4刃) Flutes
使用刀片(材质) Insert (grade)	TNKU120608ER-GM (XP3035)
加工材料 Work Material	S50C
切削速度 Cutting Speed	200m/min (1,274min^{-1})
进给速度 Feed	510mm/min (0.1mm/t)
切削深度 Depth of Cut	ap=0.2mm ae=32mm
切削油剂 Coolant	无(气冷) Air Blow
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center

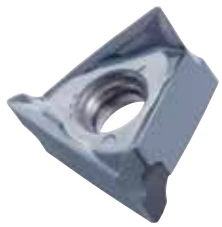
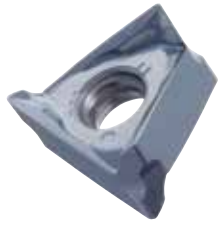
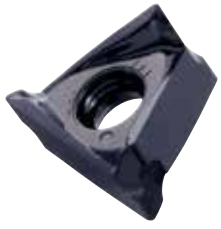
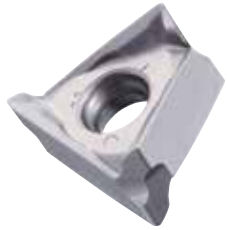


■悬长较长的加工也能高效率 High efficiency even in long overhang length applications

使用工具 Tool	PSTW12R050M22-4 (φ50×4刃) Flutes	其他公司方肩铣刀 (φ50×5刃) Flutes Competitor's Single Sided Insert Cutter
使用刀片(材质) Insert (grade)	TNKU120608ER-GM (XP3035)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S50C	
切削方法 Cutting Method	槽加工 Slot Milling	
切削深度 Depth of Cut	ap=3mm ae=50mm	
悬伸 Overhang Length	190mm (3.8D)	
切削油剂 Coolant	气冷式(エアブロー) Air Blow	
使用机械 Machine	横式加工中心(BT50) Horizontal Machining Center	



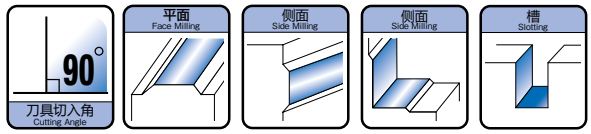
■结合加工用途的刀片种类
Variations of application based inserts

断屑槽 Insert Breaker	GL	GM	GR	SM
用途 Application	低阻力加工 Low-resistance machining	通用加工 一般钢加工 Multi-purpose machining & General steel milling	断续加工 铸铁加工 Intermitted machining & Cast iron machining	超耐热合金 难削材加工 Superalloy & Difficult-to-machine material
				

Phoenix

6角方肩铣刀 刀盘型
6-corner Shoulder Cutter Bore Type

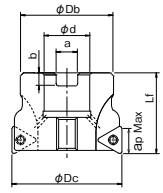
PSTW BORE NEW



Specification

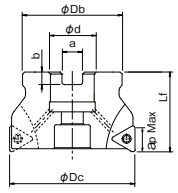
■形状尺寸表 Specification

Type 1



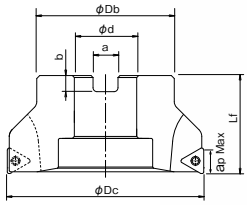
高强度螺栓式样 Power Screw Type
带内冷 with Coolant Hole

Type 2



带内冷 with Coolant Hole

Type 3

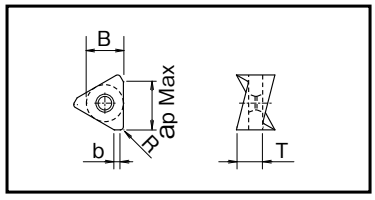


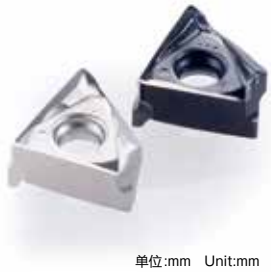
不带内冷 without Coolant Hole

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot		ap Max	重量 (kg)	形状类型 Type
							端面槽宽 a	端面槽深 b			
7803100	PSTW12R050M22-3	50	3	40	45	22	10.4	6.3	12	0.30	1
7803101	PSTW12R050M22-4	50	4	40	45	22	10.4	6.3	12	0.30	1
7803102	PSTW12R063M22-3	63	3	40	50	22	10.4	6.3	12	0.48	2
7803103	PSTW12R063M22-5	63	5	40	50	22	10.4	6.3	12	0.46	2
7803104	PSTW12R080M25.4-5	80	5	50	60	25.4	9.5	6	12	1.08	2
7803110	PSTW12R080M27-5	80	5	50	60	27	12.4	7	12	1.07	2
7803105	PSTW12R080M25.4-6	80	6	50	60	25.4	9.5	6	12	1.06	2
7803111	PSTW12R080M27-6	80	6	50	60	27	12.4	7	12	1.04	2
7803106	PSTW12R100M31.7-5	100	5	50	70	31.75	12.7	8	12	1.50	3
7803112	PSTW12R100M32-5	100	5	50	70	32	14.4	8	12	1.57	2
7803107	PSTW12R100M31.7-7	100	7	50	70	31.75	12.7	8	12	1.50	3
7803113	PSTW12R100M32-7	100	7	50	70	32	14.4	8	12	1.56	2
7803108	PSTW12R125M38.1-7	125	7	63	90	38.1	15.9	10	12	3.03	3
7803114	PSTW12R125M40-7	125	7	63	90	40	16.4	9	12	2.96	2
7803109	PSTW12R125M38.1-9	125	9	63	90	38.1	15.9	10	12	3.01	3
7803115	PSTW12R125M40-9	125	9	63	90	40	16.4	9	12	2.93	2

Inserts





■适用刀片 Inserts

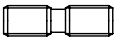
单位:mm Unit:mm

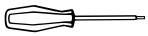
名称 Designation	切削刃数 Number of Cutting Edges	刀片尺寸 Insert Size					涂层种类 Grade of Coated Materials					
		内接圆径 B	厚度 T	R	副切削刃 b	ap Max	XC3030	XP3035	XP2040	XC1015	XP1020	XC5040
TNKU120608ER-GL	6	10.8	6.55	0.8	1.5	12			7813089			
TNKU120608ER-GM	6	10.8	6.55	0.8	1.5	12	7825088	7814088				
TNKU120608ER-GR	6	10.8	6.55	0.8	1.5	12				7812090	7821090	
TNKU120608ER-SM	6	10.8	6.55	0.8	1.5	12						7816091

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 固定螺丝 Clamping Screw	7808129	FS40511 (Torx 15)	PSTW ϕ50~125
 高强度螺栓 Power Screw	7808151	PS1031 (M10×31)	PSTW ϕ50

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Cutters
 扳手 Wrench	7808208	T15-D (Torx 15)	PSTW ϕ50~125

扳手请另购。 The wrenches are sold separately from the cutters.

Cutting Conditions

■加工材料推荐

Recommended Materials by Insert Type

◎第一推荐材质 Best
○第二推荐材质 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K		N	S	H
					FC	FCD			
XC3030	GM	无 Dry	◎		○				
XP3035	GM	无 Dry	◎	○	○				
		有 Wet							
XP2040	GL	无 Dry	○	○					○
		有 Wet	○	◎				○	
XC1015	GR	无 Dry			◎	○			
XP1020	GR	无 Dry			○	◎			
XC5040	SM	有 Wet		○				◎	

GL:轻切削用 GM:中切削用 GR:重切削用 SM:超耐热合金用
GL:Light Cutting GM:Middle Cutting GR:Heavy Cutting SM:Superalloy

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	180 (100 ~ 250)	0.15 (0.05 ~ 0.25)	3
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180 (100 ~ 250)	0.15 (0.05 ~ 0.25)	3
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150 (80 ~ 200)	0.12 (0.05 ~ 0.2)	3
M	不锈钢 (干式) Stainless Steel (Dry) (SUS304, SUS420)	~250HB	150 (80 ~ 200)	0.1 (0.05 ~ 0.18)	2
M	不锈钢 (湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	80 (60 ~ 120)	0.1 (0.05 ~ 0.18)	2
K	铸铁 Cast Iron (FC250)	~350N/mm²	200 (100 ~ 350)	0.2 (0.1 ~ 0.3)	3
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	180 (100 ~ 270)	0.15 (0.05 ~ 0.25)	3
S	超耐热合金(湿式) Superalloy (Wet) (Inconel® 718)	–	35 (25 ~ 60)	0.08 (0.05 ~ 0.15)	1
S	钛合金(湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	40 (30 ~ 120)	0.08 (0.05 ~ 0.15)	1.5
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	100 (50 ~ 150)	0.1 (0.08 ~ 0.2)	1.5
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	80 (40 ~ 120)	0.08 (0.06 ~ 0.15)	1
H	调质钢 Hardened Steel (SKD11)	50~55HRC	60 (40 ~ 90)	0.06 (0.05 ~ 0.1)	0.5

・上述数值是实际切削速度的标准数据，请根据加工环境适当调整。
・ The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Cutting Data

■加工数据 Cutting Data

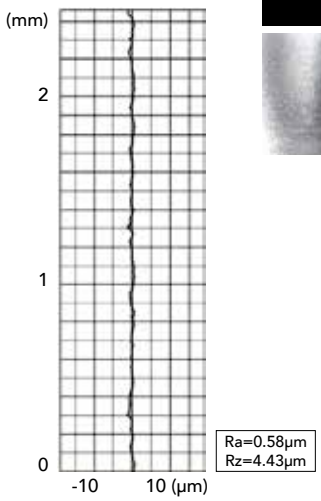
冲压模具构件滑面的高精度加工 High-precision machining of press mold slide surface

使用工具 Tool	PSTW12R050M22-4(φ50×4刃) Flutes
使用刀片(材质) Insert (grade)	TNKU120608ER-GR (XP1020)
加工材料 Work Material	FCD500
切削速度 Cutting Speed	300m/min (1,910min^{-1})
进给速度 Feed	1,700mm/min (0.2mm/t)
切削深度 Depth of Cut	ap=0.5mm ae=0.3mm
悬伸 Overhang Length	240mm
切削油剂 Coolant	无(气冷) Air Blow
使用机械 Machine	龙门加工中心 (BT50) Double Column Machining Center

侧面精加工,满足偏移量在10μm的要求精度,并获得良好的加工面精度。

The PSTW was able to achieve excellent surface precision during side finishing, satisfying the required run-out accuracy of under 10μm.

侧面粗度 Side Roughness



加工面 Milling Surface

SUS304的高效率加工 High efficiency machining of SUS304

使用工具 Tool	PSTW12R050M22-4 (φ50×4刃) Flutes	其他公司方肩铣刀(φ50×5刃) Competitor's Single Sided Insert Cutter Flutes
使用刀片(材质) Insert (grade)	TNKU120608ER-GL (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	150m/min (955min^{-1})	
进给速度 Feed	700mm/min (0.18mm/t)	700mm/min (0.15mm/t)
切削深度 Depth of Cut	ap=5mm ae=35mm	ap=3mm ae=35mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center	

其他公司产品随着切深量(ap)的上升,发生振动,效率得不到提升。更严重的则会产生毛刺。而PSTW在少一刃的前提下,可以提高67%的加工效率。

With the increase of depth of cut (ap), the competitor tool exhibited chattering and burrs, which hindered further efficiency improvement. Whereas the PSTW, even with one less corner, was able to increase machining efficiency by 67%, allowing high productivity.

PSTW:其他公司:产生毛刺(大) Small amount of burrs

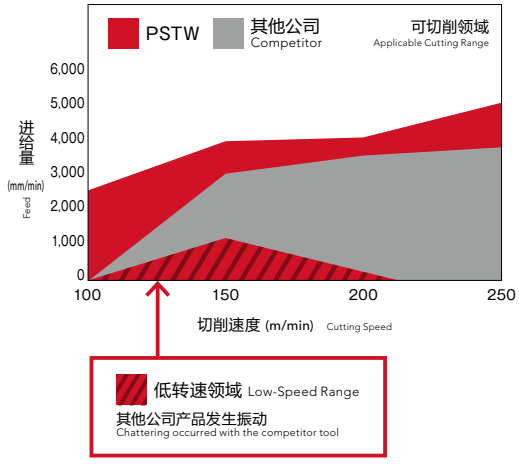
其他公司:产生毛刺(大) Competitor: Large amount of burrs

悬伸300mm(5D)的高效率稳定加工 Highly efficient stable processing of long overhang length of 300 mm (5D)

使用工具 Tool	PSTW12R063M22-5 (φ63×5刃) Flutes	其他公司方肩铣刀(φ63×4刃) Competitor's Double Sided Insert Cutter Flutes
使用刀片(材质) Insert (grade)	TNKU120608ER-GM (XC3030)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FC250	
切削深度 Depth of Cut	ap=2mm ae=44mm	
悬伸 Overhang Length	300mm (5D)	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

L/D=5的长悬伸加工中,与其他公司产品相比可高效率加工。另外其他公司产品在低转速领域,由于锋利性不足导致工件吃入性不好而发生振动(图表斜线部分)。切削锋利性优良的PSTW在低转速领域也能稳定加工。

In this test, the PSTW achieved higher efficiency versus the competitor tool in the processing of long overhang length of L/D=5. Furthermore, due to the lack of sharpness in the cutting edge, the competitor tool had poor contact with the workpiece in the low-speed machining range, resulting in chattering (lined area on graph). With an ultra sharp cutting edge, the PSTW was able to achieve stable performance even in the low-speed cutting range.

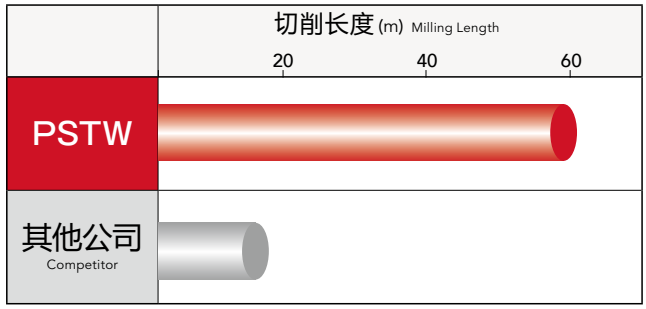


建机控制阀粗加工 Rough milling of construction machinery control valve

使用工具 Tool	PSTW12R063M22-5 (φ63×5刃) Flutes	其他公司方肩铣刀 (φ63×5刃) Flutes Competitor's Double Sided Insert Cutter
使用刀片(材质) Insert (grade)	TNKU120608ER-GR (XP1020)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FCD500	
切削速度 Cutting Speed	180m/min (910min^{-1})	
进给速度 Feed	1,000mm/min (0.22mm/t)	
切削深度 Depth of Cut	ap=3mm ae=45mm	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

其他公司产品相比，耐磨损性优良。特别是切入时可以抑制磨损进行，可实现约3.5倍耐久。

The PSTW demonstrated much greater wear resistance versus the competitor tool. In particular, it was able to effectively suppress wear progress of the cutting edge and achieved 3.5 times the durability versus the competitor.



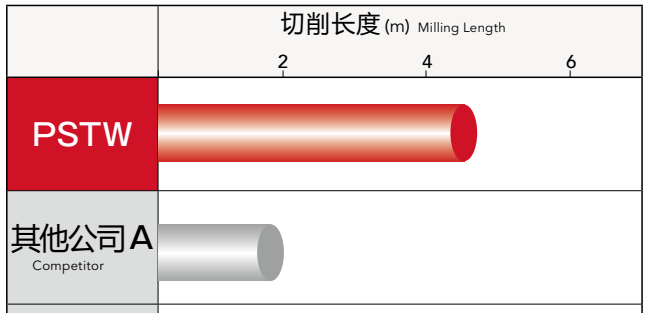
加工17m时的照片
After machining 17m

Ti-6Al-4V的長寿命加工 Long tool life in Ti-6Al-4V

使用工具 Tool	PSTW12R050M22-4 (φ50×4刃) Flutes	其他公司方肩铣刀A、B (φ50×4刃) Flutes Competitors' Double Sided Insert Cutter
使用刀片(材质) Insert (grade)	TNKU120608ER-SM (XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	Ti-6Al-4V	
切削速度 Cutting Speed	40m/min (255min^{-1})	
进给速度 Feed	82mm/min (0.08mm/t)	
切削深度 Depth of Cut	ap=1.5mm ae=20mm	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

其他公司(表里3角式样)在加工开始时就发生磨损·崩刃。PSTW(XC5040)可以有效抑制磨损提高寿命。

The PSTW (XC5040) was able to suppress wear resistance to prolong durability whereas the competitor equivalent product (double sided triangle insert) exhibited early wear and chipping.



PSTW (4m加工时)
After machining 4m

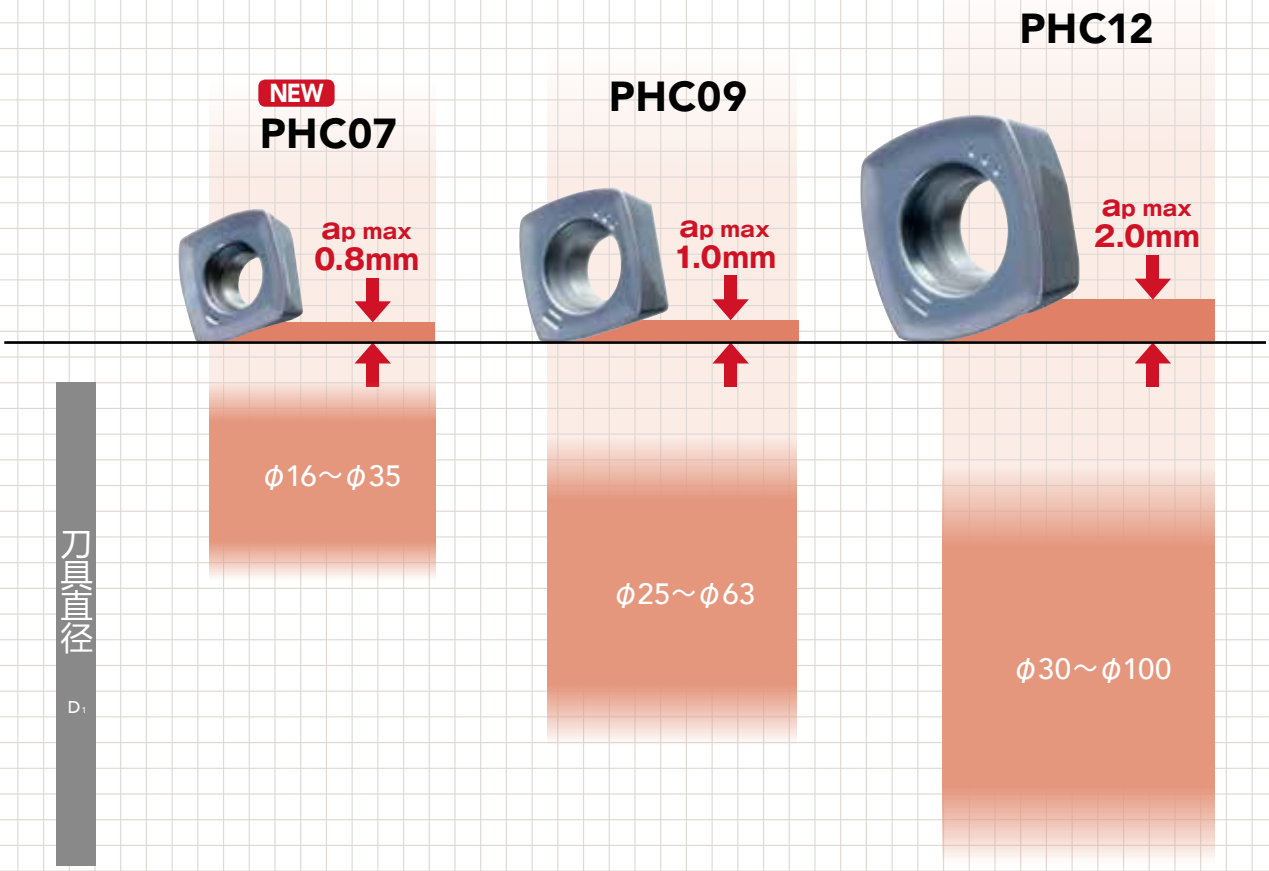
其他公司A (2m加工时)
Competitor (After machining 2m)

Phoenix PHC

四角刀片高进给铣刀
High Feed Radius Cutter Series

Phoenix High feed Cutter

■丰富的产品种类 Broad Product Variations



■小径～大径的丰富种类，可对应广泛的加工领域。
Broad product variations and sizes to accommodate a wide range of machining needs

■粗加工时实现加工时间缩短
Achieves processing time reduction in roughing

■低阻力式样，即使小型加工中心也可高效率加工
High efficiency processing is possible even on small machining centers with low resistance specifications

■适用于粗加工
Ideal configuration for rough milling

○ 经济的**4角**规格。
Economical 4-corner type

○ 既保持刃尖的刚性，又重视锋利性的断屑槽形状。
A breaker shape that enhances cutting performance while ensuring the rigidity of the cutter

○ 顺畅的切屑处理，具良好的排屑性
Trouble-free chip evacuation capability with smooth chip control

■根据切深量(ae)变化的切削 —低阻力刃形—

Cutting force is reduced by changing the depth of cut (ae)

与其他公司产品相比低阻力！

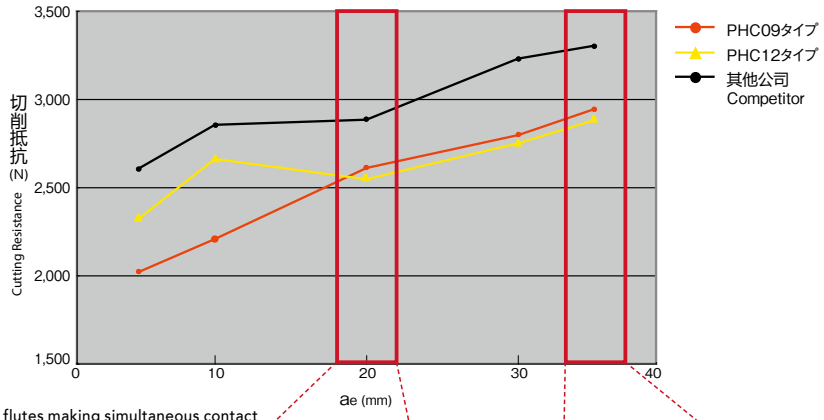
The PHC exhibited a lower cutting force versus the competitor's product!

【分别使用】 Proper tool selection

- PHC09型　由于多刃规格，能进行高效率加工 Multiple cutters for highly efficient milling
- PHC12型　适合进行断续加工或长悬长加工 For milling intermittently or with a long overhang length

■PHC φ50 切削数据 Processing data of PHC φ50

使用工具 Tool	PHC09R050M22-5（5刃）	PHC12R050M22-4（4刃）
使用刀片（材质） Insert (grade)	SDMT09T308SR-GM (XP3035)	SXMT120410SR-GM (XP3035)
加工材料 Work Material	S50C	
切削速度 Cutting Speed	180m/min (1,150min^{-1})	
进给速度 Feed	5,000mm/min	
切削深度 Depth of Cut	ap=1mm ae=5, 10, 20, 30, 35mm	
悬伸 Overhang Length	200mm	
切削油剂 Coolant	无（气冷） Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



■同时接触刃数 Number of flutes making simultaneous contact

切込み(ae)	5mm	10mm	20mm	30mm	35mm
PHC09型	1刃 Flutes	2刃 Flutes	3刃 Flutes	3刃 Flutes	4刃 Flutes
PHC12型	1刃 Flutes	2刃 Flutes	2刃 Flutes	3刃 Flutes	3刃 Flutes

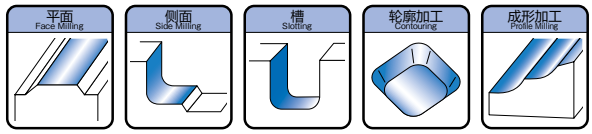
由于多刃规格的PHC09型的刃尖设计为低阻力，所以即使切深量(ae)提高，也能抑制切削阻力。因此也能抑制机械负荷、振动，从而实现高效率加工。

Even if the depth of cut (ae) is increased for the PHC09 with close pitch, the design of the cutting edge suppresses the cutting force. This suppresses the load and vibrations imparted on the machine, which enables high efficiency machining.

Phoenix

四角刀片高进给铣刀 直柄型
High Feed Radius Cutter with Straight Shank

PHC SS

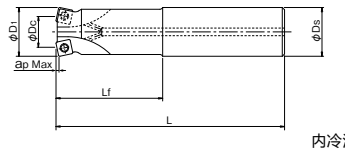


NEW 预定2017年春发售 Available from Spring 2017

Specification

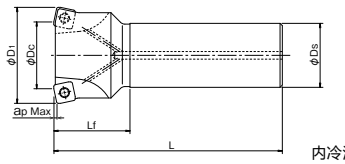
■形状尺寸表 Specification

Type 1



内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

PHC07型 PHC07 Type NEW

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	ap Max	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7800750	PHC07R016SS16-2S	16	7.4	2	16	100	30	0.8	0.13		1
7800755	PHC07R016SS16-2L	16	7.4	2	16	150	50	0.8	0.20		1
7800756	PHC07R017SS16-2L	17	8.4	2	16	150	25	0.8	0.21		2
7800757	PHC07R018SS16-2L	18	9.4	2	16	150	25	0.8	0.21		2
7800751	PHC07R020SS20-3S	20	11.4	3	20	130	50	0.8	0.27		1
7800758	PHC07R020SS20-3L	20	11.4	3	20	160	80	0.8	0.33		1
7800759	PHC07R021SS20-3L	21	12.4	3	20	160	30	0.8	0.35		2
7800760	PHC07R022SS20-3L	22	13.4	3	20	160	30	0.8	0.35		2
7800752	PHC07R025SS25-4S	25	16.4	4	25	140	60	0.8	0.47		1
7800761	PHC07R025SS25-4L	25	16.4	4	25	200	100	0.8	0.67	①	1
7800762	PHC07R026SS25-4L	26	17.4	4	25	200	40	0.8	0.67		2
7800763	PHC07R028SS25-4L	28	19.4	4	25	200	40	0.8	0.67		2
7800753	PHC07R030SS32-4S	30	21.4	4	32	150	70	0.8	0.79		1
7800764	PHC07R030SS32-4L	30	21.4	4	32	200	120	0.8	1.05		1
7800754	PHC07R032SS32-5S	32	23.4	5	32	150	70	0.8	0.83		1
7800765	PHC07R032SS32-5L	32	23.4	5	32	200	120	0.8	1.11		1
7800766	PHC07R033SS32-5L	33	24.4	5	32	200	50	0.8	1.15		2
7800767	PHC07R035SS32-5L	35	26.4	5	32	200	50	0.8	1.17		2

NEXT

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

FROM

PHC09型 PHC09 Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	直径 D_1	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	ap Max	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7800700	PHC09R025SS25-2S	25	13.2	2	25	140	60	1	0.43		1
7800704	PHC09R025SS25-2L	25	13.2	2	25	200	120	1	0.61		1
7800724	PHC09R025SS25-2LL	25	13.2	2	25	300	180	1	0.97		1
7800701	PHC09R025SS25-3S	25	13.2	3	25	140	60	1	0.43		1
7800705	PHC09R025SS25-3L	25	13.2	3	25	200	120	1	0.61		1
7800742	PHC09R026SS25-2LL	26	14.2	2	25	300	40	1	1.03		2
7800740	PHC09R026SS25-3L	26	14.2	3	25	200	40	1	0.65		2
7800725	PHC09R028SS25-2LL	28	16.2	2	25	300	40	1	1.01		2
7800716	PHC09R028SS25-3S	28	16.2	3	25	140	40	1	0.45		2
7800720	PHC09R028SS25-3L	28	16.2	3	25	200	40	1	0.66		2
7800726	PHC09R030SS32-2LL	30	18.2	2	32	300	180	1	1.54		1
7800717	PHC09R030SS32-3S	30	18.2	3	32	150	70	1	0.76		1
7800721	PHC09R030SS32-3L	30	18.2	3	32	200	120	1	1.00		1
7800727	PHC09R032SS32-2LL	32	20.2	2	32	300	180	1	1.66	②	1
7800702	PHC09R032SS32-3S	32	20.2	3	32	150	70	1	0.79		1
7800706	PHC09R032SS32-3L	32	20.2	3	32	200	120	1	1.05		1
7800743	PHC09R033SS32-2LL	33	21.2	2	32	300	50	1	1.71		2
7800741	PHC09R033SS32-3L	33	21.2	3	32	200	50	1	1.11		2
7800728	PHC09R035SS32-2LL	35	23.2	2	32	300	50	1	1.73		2
7800718	PHC09R035SS32-3S	35	23.2	3	32	150	50	1	0.83		2
7800722	PHC09R035SS32-3L	35	23.2	3	32	200	50	1	1.12		2
7800729	PHC09R040SS42-2LL	40	28.2	2	42	300	70	1	2.91		1
7800723	PHC09R040SS42-3L	40	28.2	3	42	250	70	1	2.37		1
7800703	PHC09R040SS32-4S	40	28.2	4	32	150	50	1	0.86		2
7800719	PHC09R040SS42-4S	40	28.2	4	42	150	50	1	1.38		1
7800707	PHC09R040SS32-4L	40	28.2	4	32	250	50	1	1.45		2

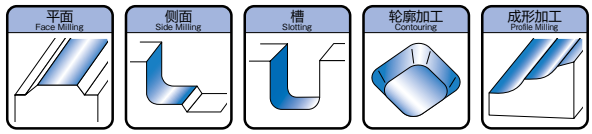
NEXT

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

四角刀片高进给铣刀 直柄型
High Feed Radius Cutter with Straight Shank

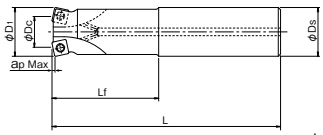
PHC SS



Specification

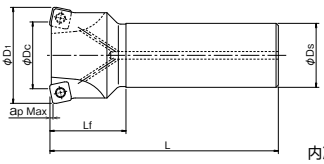
■形状尺寸表 Specification

Type 1



内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

FROM

PHC12型 PHC12 Type

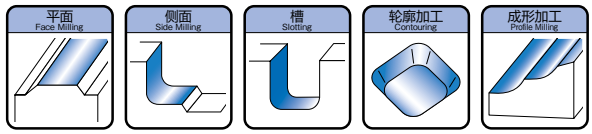
单位:mm Unit:mm

商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	ap Max	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7800730	PHC12R030SS32-2S	30	13.4	2	32	150	70	2	0.74		1
7800733	PHC12R030SS32-2L	30	13.4	2	32	200	120	2	0.97		1
7800736	PHC12R030SS32-2LL	30	13.4	2	32	300	180	2	1.52		1
7800708	PHC12R032SS32-2S	32	15.4	2	32	150	70	2	0.80		1
7800712	PHC12R032SS32-2L	32	15.4	2	32	200	120	2	1.06		1
7800737	PHC12R032SS32-2LL	32	15.4	2	32	300	180	2	1.65		1
7800744	PHC12R033SS32-2L	33	16.4	2	32	200	50	2	1.11		2
7800745	PHC12R033SS32-2LL	33	16.4	2	32	300	50	2	1.70		2
7800738	PHC12R035SS32-2LL	35	18.4	2	32	300	50	2	1.71		2
7800731	PHC12R035SS32-3S	35	18.4	3	32	150	50	2	0.81		2
7800734	PHC12R035SS32-3L	35	18.4	3	32	200	50	2	1.11	③	2
7800739	PHC12R040SS42-2LL	40	23.4	2	42	300	70	2	2.88		1
7800709	PHC12R040SS32-3S	40	23.4	3	32	150	50	2	0.85		2
7800732	PHC12R040SS42-3S	40	23.4	3	42	150	50	2	1.37		1
7800713	PHC12R040SS32-3L	40	23.4	3	32	250	50	2	1.44		2
7800735	PHC12R040SS42-3L	40	23.4	3	42	250	70	2	2.36		1
7800710	PHC12R050SS42-4S	50	33.4	4	42	150	50	2	1.50		2
7800714	PHC12R050SS42-4L	50	33.4	4	42	250	50	2	2.55		2
7800711	PHC12R063SS42-5S	63	46.4	5	42	150	50	2	1.67		2
7800715	PHC12R063SS42-5L	63	46.4	5	42	250	50	2	2.71		2

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

四角刀片高进给铣刀 刀盘型
High Feed Radius Cutter with Bore Type

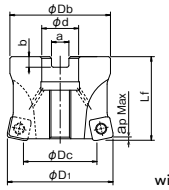
PHC BORE



Specification

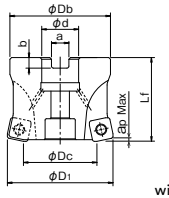
■形状尺寸表 Specification

Type 1 动力螺杆式样 Power Screw Type



内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot 端面槽宽 a	端面槽深 b	ap Max	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7800600	PHC09R040M16-4	40	28.2	4	40	38	16	8.4	5.6	1	0.23	②	1
7800601	PHC09R050M22-5	50	38.2	5	50	47	22	10.4	6.3	1	0.43		2
7800605	PHC09R050M22.2-5	50	38.2	5	50	47	22.225	8.4	5	1	0.44		2
7800603	PHC09R063M22-6	63	51.2	6	50	60	22	10.4	6.3	1	0.79		2
7800606	PHC09R063M22.2-6	63	51.2	6	50	60	22.225	8.4	5	1	0.79		2
7800607	PHC12R040M16-3	40	23.4	3	40	38	16	8.4	5.6	2	0.21	③	1
7800608	PHC12R050M22-4	50	33.4	4	50	47	22	10.4	6.3	2	0.41		2
7800614	PHC12R050M22.2-4	50	33.4	4	50	47	22.225	8.4	5	2	0.41		2
7800610	PHC12R063M22-5	63	46.4	5	50	60	22	10.4	6.3	2	0.75		2
7800615	PHC12R063M22.2-5	63	46.4	5	50	60	22.225	8.4	5	2	0.75		2
7800618	PHC12R080M31.7-5	80	63.4	5	63	76	31.75	12.7	8	2	1.54		2
7800612	PHC12R080M27-7	80	63.4	7	50	76	27	12.4	7	2	1.24		2
7800616	PHC12R080M31.7-7	80	63.4	7	63	76	31.75	12.7	8	2	1.50		2
7800617	PHC12R100M31.7-8	100	83.4	8	63	96	31.75	12.7	8	2	2.72		2
7800613	PHC12R100M32-8	100	83.4	8	63	96	32	14.4	8	2	2.72		2

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

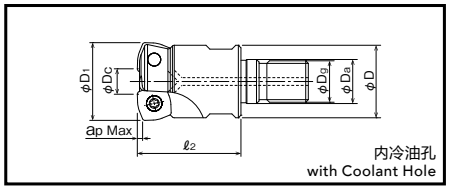
四角刀片高进给铣刀 螺纹安装型
High Feed Radius Cutter with Screw Fit Type

PHC SF

NEW 预定2017年春发售 Available from Spring 2017

Specification

■形状尺寸表 Specification



PHC 螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	刀具直径 D1	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	端面直径 D	ap Max	重量 (kg)	适用刀片 Applicable Inserts
NEW 7801520	PHC07R016SF8-2	16	7.4	2	8.5	8	10	27	14.5	0.8	0.03	
NEW 7801521	PHC07R017SF8-2	17	8.4	2	8.5	8	10	27	14.5	0.8	0.03	
NEW 7801522	PHC07R018SF8-2	18	9.4	2	8.5	8	10	27	14.5	0.8	0.03	
NEW 7801523	PHC07R020SF10-3	20	11.4	3	10.5	10	14	33	18	0.8	0.06	
NEW 7801524	PHC07R021SF10-3	21	12.4	3	10.5	10	14	33	18	0.8	0.06	
NEW 7801525	PHC07R022SF10-3	22	13.4	3	10.5	10	14	33	18	0.8	0.06	
NEW 7801526	PHC07R025SF12-4	25	16.4	4	12.5	12	17	35	23	0.8	0.10	①
NEW 7801527	PHC07R026SF12-4	26	17.4	4	12.5	12	17	35	23	0.8	0.10	
NEW 7801528	PHC07R028SF12-4	28	19.4	4	12.5	12	17	35	23	0.8	0.11	
NEW 7801529	PHC07R030SF16-4	30	21.4	4	17	16	22	40	28	0.8	0.20	
NEW 7801530	PHC07R032SF16-5	32	23.4	5	17	16	22	40	28	0.8	0.18	
NEW 7801531	PHC07R033SF16-5	33	24.4	5	17	16	22	40	28	0.8	0.18	
NEW 7801532	PHC07R035SF16-5	35	26.4	5	17	16	22	40	28	0.8	0.20	
7801500	PHC09R025SF12-3	25	13.2	3	12.5	12	17	35	23	1	0.10	
7801510	PHC09R026SF12-3	26	14.2	3	12.5	12	17	35	23	1	0.11	
7801501	PHC09R028SF12-3	28	16.2	3	12.5	12	17	35	23	1	0.11	
7801502	PHC09R030SF16-3	30	18.2	3	17	16	22	40	28	1	0.17	
7801503	PHC09R032SF16-3	32	20.2	3	17	16	22	40	28	1	0.18	②
7801511	PHC09R033SF16-3	33	21.2	3	17	16	22	40	28	1	0.19	
7801504	PHC09R035SF16-3	35	23.2	3	17	16	22	40	28	1	0.19	
7801505	PHC09R040SF16-4	40	28.2	4	17	16	22	40	28	1	0.22	
7801506	PHC12R030SF16-2	30	13.4	2	17	16	22	40	28	2	0.17	
7801507	PHC12R032SF16-2	32	15.4	2	17	16	22	40	28	2	0.18	
7801512	PHC12R033SF16-2	33	16.4	2	17	16	22	40	28	2	0.19	③
7801508	PHC12R035SF16-3	35	18.4	3	17	16	22	40	28	2	0.18	
7801509	PHC12R040SF16-3	40	23.4	3	17	16	22	40	28	2	0.22	

刀具夹具，刀柄请参考P.162~
Please see p.162- for shank holders.

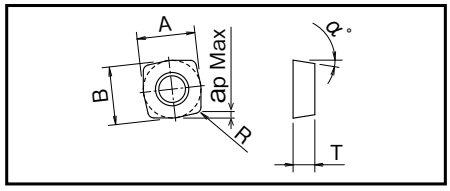
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

四角刀片高进给铣刀系列
High Feed Radius Cutter Series

PHC刀片
Inserts

NEW 预定2017年春发售 Available from Spring 2017

Inserts



■适用刀片 Inserts

单位:mm Unit:mm

		名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size					涂层种类 Grade of Coated Materials								
				A×B	厚度 T	后角 α°	R	ap Max	NEW XC3020	NEW XP3025	XC3030	XP3035	XP2025	XP2040	XC1015	XC5035	XC5040
NEW	①	SPMT070305SR-GM	4	7.0×7.0	2.75	11	0.5	0.8	7827092	7828092	7825092	7814092	7826092	7813092	7812092		
NEW		SPMT070305ER-SM	4	7.0×7.0	2.75	11	0.5	0.8									7816093
	②	SDMT09T308SR-GM	4	9.52×9.52	3.97	15	0.8	1			7825020	7814020	7826020	7813020	7812020		
		SDMT09T308ER-SM	4	9.52×9.52	3.97	15	0.8	1								7815021	7816021
	③	SXMT120410SR-GM	4	12.7×12.7	4.76	9	1	2			7825022	7814022	7826022	7813022	7812022		
		SXMT120410ER-SM	4	12.7×12.7	4.76	9	1	2								7815023	7816023

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
固定螺丝 Clamping Screw	NEW 7808105	FS25550 (Torx 8)	①	SPMT07···	PHCSS/SF ϕ16~35
	7808111	FS35572 (Torx 15)	②	SDMT09···	PHC SS/SF ϕ25~35
	7808112	FS35586 (Torx 15)			PHC SS/SF ϕ40 PHC BORE ϕ40~63
	7808113	FS45510 (Torx 20)	③	SXMT12···	PHC SS/SF ϕ30~63 PHC BORE ϕ40~100
高强度螺栓 Power Screw	7808150	PS0830 (M8×30)	②	SDMT09···	PHC BORE ϕ40
			③	SXMT12···	

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
扳手 Wrench	NEW 7808205	T8-D (Torx 8)	①	SPMT07···	PHCSS/SF ϕ16~35
	7808208	T15-D (Torx 15)	②	SDMT09···	PHC SS/SF ϕ25~40 PHC BORE ϕ40~63
	7808209	T20-D (Torx 20)	③	SXMT12···	PHC SS/SF ϕ30~63 PHC BORE ϕ40~100

扳手请另购。 The wrenches are sold separately from the cutters.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

四角刀片高进给铣刀系列
High Feed Radius Cutter Series

PHC

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材质 Best
○第二推荐材质 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
XC3020	GM	无 Dry	◎		○			
XP3025	GM	有 Wet	◎		○			
XC3030	GM	无 Dry	◎		○			
XP3035	GM	无 Dry	◎	○	○			
		有 Wet						
XP2025	GM	有 Wet	○	◎			○	
XP2040	GM	无 Dry	○	○				○
		有 Wet	○	◎			○	
XC1015	GM	无 Dry			◎			
XC5035	SM	无 Dry		◎				
		有 Wet		○			○	
XC5040	SM	有 Wet		○			◎	

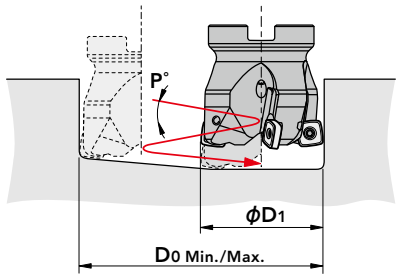
GM: 中切削用　SM: 耐热合金用
GM: Middle Cutting　SM: Heat Resistance Alloy

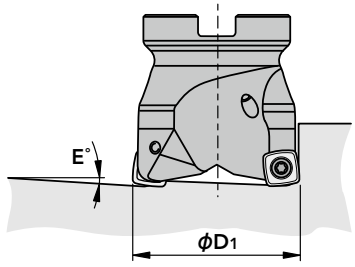
Cutting Conditions

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength·Hardness	切削速度 Vc (m/min) Cutting Speed	刀片尺寸 Insert Size											
				SDMT07…				SDMT09…				SXMT12…			
				每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut			每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut			每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut		
					L/D=2	L/D=3	L/D=4		L/D=2	L/D=3	L/D=4		L/D=2	L/D=3	L/D=4
P	软钢、低炭素钢 Mild Steel, Low Carbon Steel (SS400, S10C)	~180HB	180 (60 ~ 250)	0.7 (0.3 ~ 1.5)	0.8	0.6	0.4	0.8 (0.3 ~ 1.8)	1	0.8	0.5	1.25 (0.5 ~ 3.2)	1.2	1.2	1
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180 (60 ~ 250)	0.7 (0.3 ~ 1.3)	0.8	0.6	0.4	0.8 (0.3 ~ 1.5)	1	0.8	0.5	1.25 (0.5 ~ 3)	1.2	1.2	1
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	180 (60 ~ 250)	0.7 (0.3 ~ 1.3)	0.6	0.5	0.3	0.8 (0.3 ~ 1.5)	0.8	0.6	0.4	1.25 (0.5 ~ 3)	1.2	1.2	1
M	不锈钢 (干式) Stainless Steel (Dry) (SUS304, SUS420)	~250HB	160 (80 ~ 200)	0.4 (0.3 ~ 1.2)	0.6	0.5	0.3	0.5 (0.3 ~ 1.5)	0.8	0.6	0.4	1 (0.5 ~ 2.5)	1.2	1	1
M	不锈钢 (湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	120 (60 ~ 180)	0.4 (0.3 ~ 1.2)	0.6	0.5	0.3	0.5 (0.3 ~ 1.5)	0.8	0.6	0.4	1 (0.5 ~ 2.5)	1.2	1	1
K	铸铁 Cast Iron (FC250)	~350N/mm²	200 (100 ~ 300)	0.8 (0.4 ~ 1.5)	0.8	0.6	0.4	1 (0.5 ~ 1.8)	1	0.8	0.5	1.5 (0.5 ~ 3.5)	1.5	1.5	1
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	180 (100 ~ 250)	0.7 (0.3 ~ 1.3)	0.8	0.6	0.4	0.9 (0.5 ~ 1.5)	1	0.8	0.5	1.35 (0.5 ~ 3)	1.2	1.2	0.9
S	超耐热合金 (湿式) Superalloy (Wet) (Inconel® 718)	–	30 (25 ~ 60)	0.3 (0.2 ~ 0.7)	0.4	0.4	0.3	0.4 (0.2 ~ 0.8)	0.5	0.5	0.4	0.5 (0.2 ~ 1)	1	1	0.8
S	钛合金 (湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	80 (50 ~ 120)	0.4 (0.3 ~ 0.8)	0.4	0.4	0.3	0.5 (0.3 ~ 1)	0.5	0.5	0.3	0.7 (0.3 ~ 1.2)	0.8	0.8	0.4
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	120 (40 ~ 150)	0.4 (0.2 ~ 0.8)	0.4	0.4	0.3	0.5 (0.2 ~ 1)	0.5	0.5	0.3	0.8 (0.3 ~ 1.5)	1	1	0.5
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	90 (40 ~ 120)	0.3 (0.2 ~ 0.6)	0.4	0.4	0.3	0.4 (0.2 ~ 0.8)	0.5	0.5	0.3	0.7 (0.3 ~ 1.2)	0.7	0.7	0.5
H	调质钢 Hardened Steel (SKD11)	50~55HRC	60 (40 ~ 90)	0.2 (0.2 ~ 0.5)	0.3	0.3	0.2	0.3 (0.2 ~ 0.7)	0.3	0.3	0.2	0.5 (0.3 ~ 0.8)	0.5	0.5	0.4

· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.





Maximum Ramping Angle (E)

■斜线加工时的最大倾斜角(E) Maximum Ramping Angle (E)

刀片尺寸 Insert Size	SPMT07…				SDMT09…				SXMT12…			
刀具直径 (mm) D1	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling(mm) 最小径 Do Min.	螺旋线开孔 Helical Milling(mm) 最大径 Do Max.	螺旋角度 Helical Angle P°	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm) 最小径 Do Min.	螺旋线开孔 Helical Milling (mm) 最大径 Do Max.	螺旋角度 Helical Angle P°	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm) 最小径 Do Min.	螺旋线开孔 Helical Milling (mm) 最大径 Do Max.	螺旋角度 Helical Angle P°
16	5.9	22	31	4.5	–	–	–	–	–	–	–	–
17	4.9	24	33	3.6	–	–	–	–	–	–	–	–
18	4.2	26	35	3.1	–	–	–	–	–	–	–	–
20	3.2	30	39	2.3	–	–	–	–	–	–	–	–
21	2.8	32	41	2.0	–	–	–	–	–	–	–	–
22	2.6	34	43	1.8	–	–	–	–	–	–	–	–
25	2.0	40	49	1.3	3.6	35	48	3.1	–	–	–	–
26	1.8	42	51	1.1	3.1	37	50	2.6	–	–	–	–
28	1.6	46	55	1.0	2.6	41	54	2.1	–	–	–	–
30	1.4	50	59	0.8	2.2	45	58	1.9	7.9	40	58	6.5
32	1.3	54	63	0.7	2.0	49	62	1.7	7.2	44	62	6.1
33	1.2	56	65	0.6	1.8	51	64	1.5	6.4	46	64	4.4
35	1.1	60	69	0.5	1.6	55	68	1.4	4.4	50	68	3.7
40	–	–	–	–	1.2	65	78	1.0	2.9	60	78	2.5
50	–	–	–	–	0.9	85	98	0.8	1.5	80	98	1.3
63	–	–	–	–	0.8	111	124	0.7	1.1	106	124	0.9
80	–	–	–	–	–	–	–	–	1.3	140	158	1.1
100	–	–	–	–	–	–	–	–	0.7	180	198	0.6

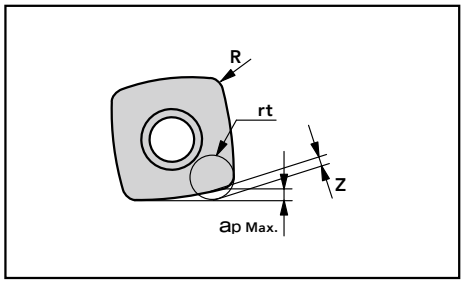
■程序编写时的刃尖形状设定

Flute shape definitions for the purpose of creating a program

单位:mm Unit:mm

刀片尺寸 Insert Size	R	最大切深 ap Max.	疑似R rt	切削余量 Z
SPMT07…	0.5	0.8	1.2	0.35
SDMT09…	0.8	1	2	0.7
SXMT12…	1	2	3	1.15

加工时请将程序依照类似圆弧角铣刀的条件编写。
During machining, please program the milling paths according to the recommended simulated R (rt) respective to the individual cutter diameter.



Cutting Data

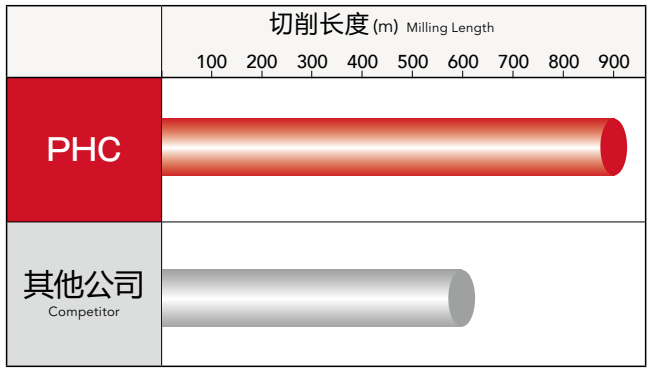
■加工数据 Cutting Data

模座粗加工 Rough milling of mold base

使用工具 Tool	PHC07R020SS20-3S (φ20×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SPMT070305SR-GM (XC3020)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	S50C	
切削速度 Cutting Speed	157m/min (2,500min^{-1})	
进给速度 Feed	6,000mm/min (0.8mm/t)	
切削深度 Depth of Cut	ap=0.5mm ae=14mm	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	

耐磨损性高的XC3020可抑制磨损进行，约可延长1.5倍的使用寿命。

XC3020 with high wear resistance properties was able to suppress wear and achieve 1.5 times the durability.



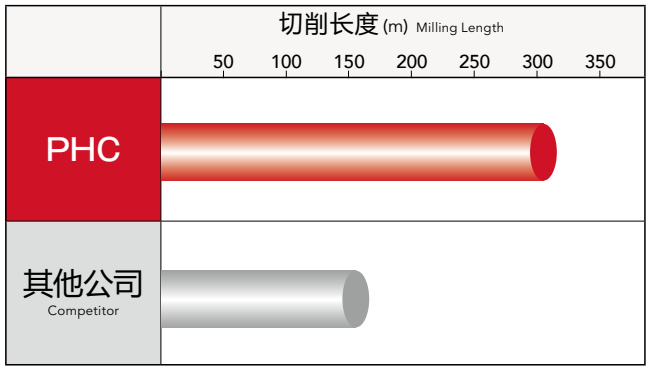
PHC 900m加工时的照片
After 900 of milling

压铸模具粗加工 Rough milling of die-casting dies

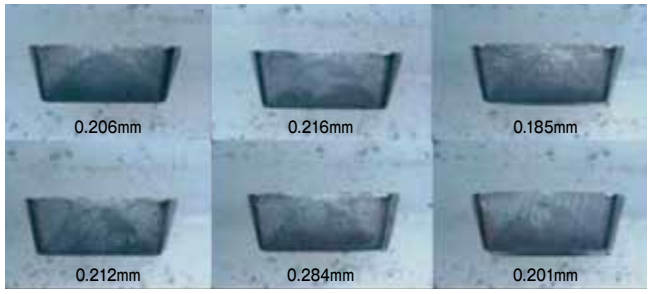
使用工具 Tool	PHC09R063M22-6 (φ63×6刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SDMT09T308SR-GM (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	DAC55 (48HRC)	
切削速度 Cutting Speed	75m/min (379min^{-1})	118m/min (596min^{-1})
进给速度 Feed	1,250mm/min (0.55mm/t)	600mm/min (0.25mm/t)
切削深度 Depth of Cut	ap=0.7mm ae=25.5mm	
切削油剂 Coolant	无(气冷) Air Blow	
悬伸 Overhang Length	145mm	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	

压铸模具粗加工。与其他公司产品相比，能以2 倍的效率进行加工，而且能得到2 倍的耐久寿命。另外，由于低抵抗规格能抑制发热量，所以切屑的颜色为棕色，很稳定。

This product was able to mill at double the efficiency of a competitor's product while doubling the durability. Due to its low-resistance construction, it minimizes heat generation, resulting in a stable discharge of brownish chips.

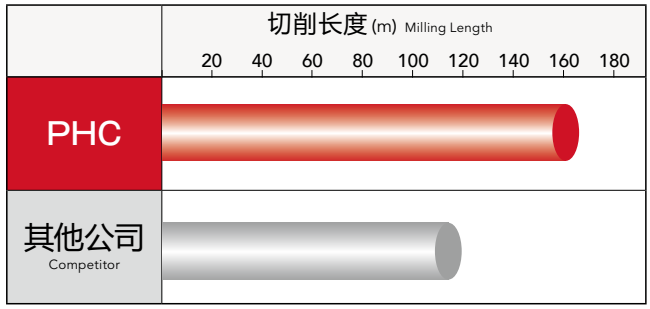


刀片磨损量
Wear Width of the Insert



压铸模具粗加工 Rough milling of die-casting dies

使用工具 Tool	PHC09R050M22-5 (φ50×5刃)	其他公司 Competitor
使用刀片(材质)Insert (grade)	SDMT09T308SR-GM (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SKD61 (48HRC)	
切削速度 Cutting Speed	80m/min (510min^{-1})	110m/min (700min^{-1})
进给速度 Feed	1,360mm/min (0.53mm/t)	800mm/min (0.28mm/t)
切削深度 Depth of Cut	ap=0.5mm ae=25mm	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

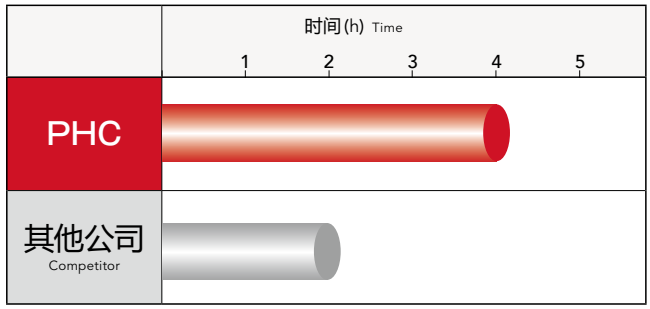


由于低抵抗刃形，与其他公司产品相比，能以1.7倍的效率进行加工，而且能得到1.4倍的耐久度寿命。另外，使用其他公司产品时，由于加工发热导致加工件的变形，使用PHC的加工能抑制发热量，能改善加工件的变形。

Due to its low-resistance edge form, this product was able to mill at 1.7 times the efficiency of the competitor's tool, and achieved 1.4 times the durability. Additionally, the heat generated by the competitor's tool created a distortion in the workpiece, while the PHC was able to improve the process by suppressing the generation of heat.

注塑模具粗加工 Rough milling of plastic dies

使用工具 Tool	PHC12R050M22-4 (φ50×4刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SXMT120410SR-GM (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	PX5 (30HRC)	
切削速度 Cutting Speed	157m/min (1,000min^{-1})	
进给速度 Feed	3,000mm/min (0.75mm/t)	
切削深度 Depth of Cut	ap=0.75mm ae=25mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(HSK-A100) Vertical Machining Center	



与其他公司产品一样参数进行模具外形粗加工时,能得到2倍的耐久寿命。

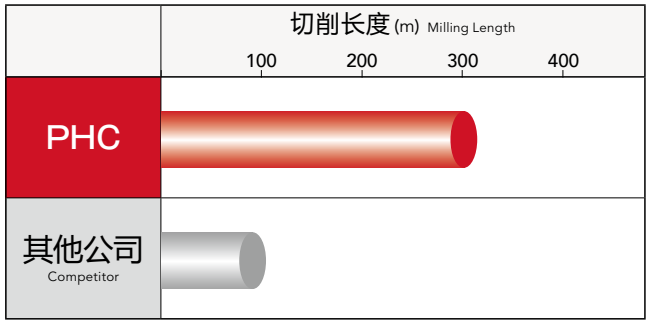
While rough milling a die using the same conditions as the competitor's tools, this product has doubled the durability.

Cutting Data

■加工数据 Cutting Data

注塑模具粗加工 Rough milling of plastic dies

使用工具 Tool	PHC12R063M22-5 (φ63×5刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SXMT120410SR-GM (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	HPM7 (33HRC)	
切削速度 Cutting Speed	100m/min (505min^{-1})	
进给速度 Feed	2,500mm/min (1mm/t)	
切削深度 Depth of Cut	ap=1.5mm ae=40mm	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



使用其他公司产品时很早就发生崩刃，但是使用PHC 的话能进行稳定加工，在同样参数使用的情况下，切削长度为其他公司产品的3倍。

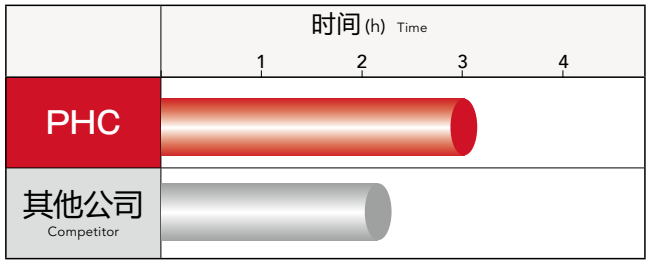
A competitor's product chipped prematurely, but the PHC exhibited minimum resistance, inhibiting chipping and allowing it to mill three times the distance under the same conditions.

冲压模具的粗加工 Rough milling of press dies

使用工具 Tool	PHC12R050M22-4 (φ50×4刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SXMT120410SR-GM (XP2040)	硬质合金涂层的刀片 Coated Carbide Insert
加工材料 Work Material	SKD11相当品 Equivalent	
切削速度 Cutting Speed	112m/min (713min^{-1})	
进给量 Feed	2,400mm/min (0.84mm/t)	2,000mm/min (0.7mm/t)
切削深度 Depth of Cut	ap=1.25mm ae=32.2mm	
切削油剂 Coolant	无(气冷) Air Blow	
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center	

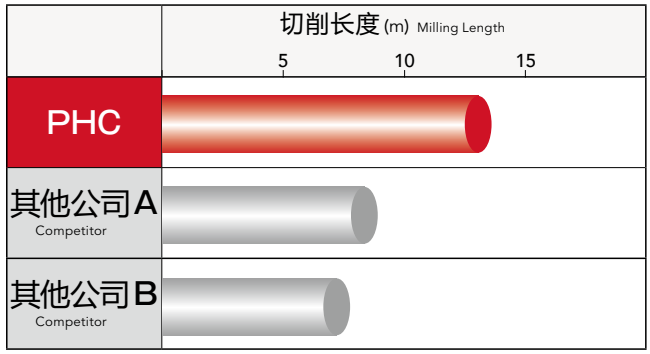
对冲压模具的钢材进行粗加工。使用其他公司产品时因为发生崩刃，所以不能提高进给量，但是使用PHC 是在把参数提高20% 的状态也能进行稳定加工，而且能得到1.5倍的寿命。

This process consisted of rough-milling of steel for a press die. A competitor's product could not increase the feed rate due to chipping. The PHC was able to mill with stability while increasing the conditions by 20%, and also provided 1.5 times the durability.



Inconel® 718的长寿命加工 Long tool life in Inconel® 718

使用工具 Tool	PHC07R025SS25-4S (φ25×4刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SPMT070305ER-SM (XC5040)	硬纸盒合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	Inconel® 718 (41HRC)	
切削速度 Cutting Speed	30m/min (382min^{-1})	
进给速度 Feed	764mm/min (0.5mm/t)	
切削深度 Depth of Cut	ap=0.5mm ae=25mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	横式加工中心(BT50) Horizontal Machining Center	



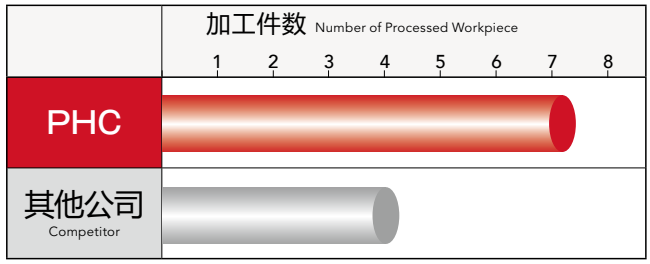
PHC(XC5040)能抑制磨损延长使用寿命。另，槽加工时无切屑卷曲缠绕的情况，具优良的排屑性，呈现精良的加工面。

PHC (XC5040) was able to suppress wear to prolong durability. Furthermore, its unique flute geometry enables smooth chip evacuation, which contributed to an excellent surface finish.

PHC (13.2m 加工时)
After 13.2m of milling

叶片粗加工 Rough milling of blades

使用工具 Tool	PHC09R032SS32-3S (φ32×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	SDMT09T308ER-SM (XC5040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS630	
切削速度 Cutting Speed	80m/min (796min^{-1})	
进给量 Feed	800mm/min (0.33mm/t)	
切削深度 Depth of Cut	ap=0.5mm ae= ~ 32mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	



根据同样参数进行叶片粗加工时，能得到1.75 倍的寿命。刀片的磨损是正常磨损，能进行稳定的加工，也能继续加工。

A blade was rough-milled under the same conditions for comparison. This tool provided 1.75 times the durability, and milled in a stable manner with inserts exhibiting normal wear. Moreover, it was capable of continued milling.

PHC

其他公司
Competitor

Phoenix PRC

圆刀片铣刀系列
Radius Cutter Series

Phoenix Radius Cutter

特点 Features

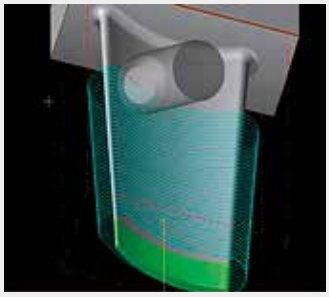
因为不需要压块，能顺利地排出切屑
Because it does not need a pressure bar, it can evacuate chips smoothly.

宽容屑槽，提高切屑排屑性
Chip ejection is improved by wide chip pockets.

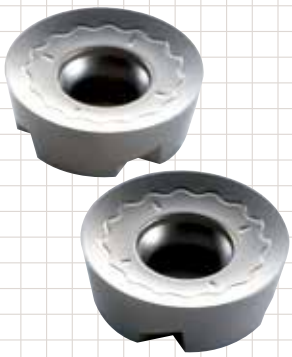
刀片回转螺纹固定
Insert rotation stopper

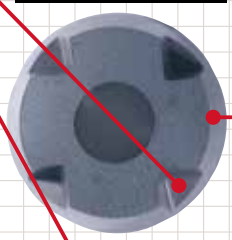
配合刀片的切槽设计
Cutout is set to the insert rotation stopper of body.

对应三维加工的刀体后刀形状
Body relief shape support 3 dimensional machining.



[里侧 Back side]





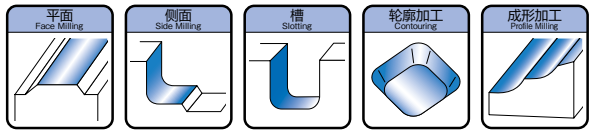
4圆弧角型
4 corner type

8圆弧角型
8 corner type

根据切深量设定，可以选择圆弧角的数量(4或8)
Either 4 or 8 corner can be selected by depending on the depth of cut.

圆刀片铣刀 直柄型
Radius Cutter with Straight Shank

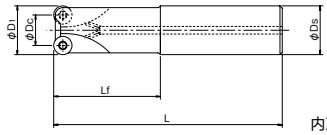
PRC SS



Specification

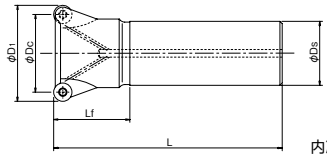
■形状尺寸表 Specification

Type 1



内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

单位:mm Unit:mm

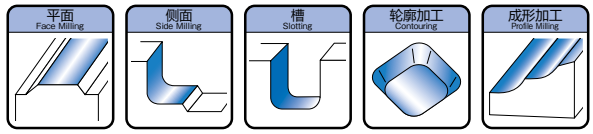
商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
7800300	PRC10R020SS20-2S	20	10	2	20	130	50	0.27	①	1
7800303	PRC10R020SS20-2L	20	10	2	20	180	80	0.38		1
7800301	PRC10R025SS25-3S	25	15	3	25	140	60	0.44		1
7800304	PRC10R025SS25-3L	25	15	3	25	200	120	0.62		1
7800302	PRC10R032SS32-4S	32	22	4	32	150	70	0.80		1
7800305	PRC10R032SS32-4L	32	22	4	32	200	120	1.05		1
7800322	PRC12R024SS25-2S	24	12	2	25	140	60	0.44	②	1
7800323	PRC12R024SS25-2L	24	12	2	25	180	100	0.56		1
7800318	PRC12R030SS32-2S	30	18	2	32	150	70	0.75		1
7800319	PRC12R030SS32-2L	30	18	2	32	200	120	0.96		1
7800306	PRC12R032SS32-2S	32	20	2	32	150	70	0.79		1
7800309	PRC12R032SS32-2L	32	20	2	32	200	120	1.04		1
7800320	PRC12R032SS32-3S	32	20	3	32	150	70	0.78		1
7800321	PRC12R032SS32-3L	32	20	3	32	200	120	1.02		1
7800307	PRC12R040SS32-3S	40	28	3	32	150	50	0.88		2
7800310	PRC12R040SS32-3L	40	28	3	32	250	50	1.49		2
7800308	PRC12R050SS42-4S	50	38	4	42	150	50	1.52		2
7800311	PRC12R050SS42-4L	50	38	4	42	250	50	2.58		2
7800324	PRC16R032SS32-2S	32	16	2	32	150	70	0.78	③	1
7800325	PRC16R032SS32-2L	32	16	2	32	200	120	1.05		1
7800312	PRC16R040SS32-2S	40	24	2	32	150	50	0.85		2
7800315	PRC16R040SS32-2L	40	24	2	32	250	50	1.46		2
7800313	PRC16R050SS42-3S	50	34	3	42	150	50	0.49		2
7800316	PRC16R050SS42-3L	50	34	3	42	250	50	2.55		2
7800314	PRC16R063SS42-4S	63	47	4	42	150	50	1.63		2
7800317	PRC16R063SS42-4L	63	47	4	42	250	50	2.69		2

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

圆刀片铣刀 刀盘型
Radius Cutter with Bore Type

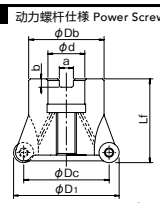
PRC BORE



Specification

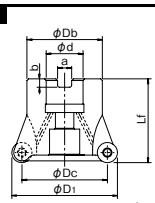
■形状尺寸表 Specification

Type 1 动力螺杆仕様 Power Screw Type



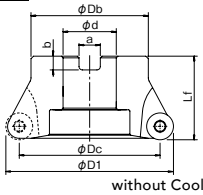
内冷油孔
with Coolant Hole

Type 2



内冷油孔
with Coolant Hole

Type 3



不带内冷
without Coolant Hole

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot		重量 (kg)	适用刀片 Applicable Inserts	形状类型 Type
								端面槽宽 a	端面槽深 b			
7800200	PRC12R050M22-4	50	38	4	40	45	22	10.4	6.3	0.27	②	2
7800204	PRC12R050M22-5	50	38	5	40	45	22	10.4	6.3	0.79		2
7800201	PRC12R063M22-4	63	51	4	40	50	22	10.4	6.3	0.43		2
7800206	PRC12R063M22-6	63	51	6	40	50	22	10.4	6.3	0.44		2
7800209	PRC12R080M25.4-5	80	68	5	50	60	25.4	9.5	6	0.85		2
7800202	PRC12R080M27-5	80	68	5	50	60	27	12.4	7	0.83		2
7800211	PRC12R080M25.4-8	80	68	8	50	60	25.4	9.5	6	0.93		2
7800207	PRC12R080M27-8	80	68	8	50	60	27	12.4	7	0.92		2
7800210	PRC12R100M31.7-6	100	88	6	50	70	31.75	12.7	8	1.22		3
7800203	PRC12R100M32-6	100	88	6	50	70	32	14.4	8	1.36		2
7800212	PRC12R100M31.7-10	100	88	10	50	70	31.75	12.7	8	1.29		3
7800208	PRC12R100M32-10	100	88	10	50	70	32	14.4	8	1.43		2
7800213	PRC16R050M22-3	50	34	3	40	45	22	10.4	6.3	0.28	③	1
7800214	PRC16R063M22-5	63	47	5	40	50	22	10.4	6.3	0.37		2
7800218	PRC16R080M25.4-6	80	64	6	50	60	25.4	9.5	6	0.84		2
7800216	PRC16R080M27-6	80	64	6	50	60	27	12.4	7	0.83		2
7800219	PRC16R100M31.7-7	100	84	7	50	70	31.75	12.7	8	1.20		3
7800217	PRC16R100M32-7	100	84	7	50	70	32	14.4	8	1.32		2

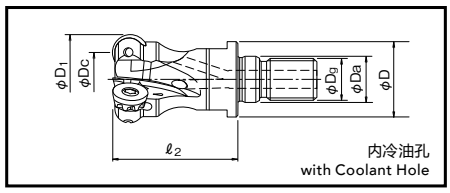
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

圆刀片铣刀 螺纹安装型
Radius Cutter with Screw Fit Type

PRC SF

Specification

■形状尺寸表 Specification



PRC 螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	端面直径 D	重量 (kg)	适用刀片 Applicable Inserts
7801700	PRC10R020SF10-2	20	10	2	10.5	10	14	33	18	0.06	
7801701	PRC10R025SF12-3	25	15	3	12.5	12	17	35	23	0.09	
7801702	PRC10R030SF16-3	30	20	3	17	16	22	40	28	0.16	①
7801703	PRC10R032SF16-4	32	22	4	17	16	22	40	28	0.17	
7801704	PRC10R040SF16-4	40	30	4	17	16	22	40	28	0.21	
7801705	PRC12R030SF16-2	30	18	2	17	16	22	40	28	0.16	
7801706	PRC12R032SF16-3	32	20	3	17	16	22	40	28	0.16	②
7801707	PRC12R040SF16-3	40	28	3	17	16	22	40	28	0.22	

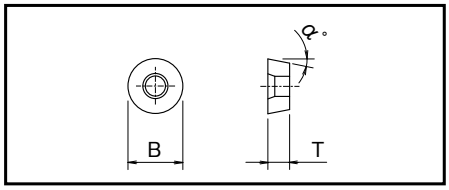
刀具夹具，刀柄请参考P.162~
Please see p.162- for shank holders.

Phoenix

圆刀片铣刀系列
Radius Cutter Series

PRC刀片
Inserts

Inserts



■适用刀片 Inserts

单位:mm Unit:mm

	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size 内径 B	厚度 T	后角 α°	超硬 Uncoated CK010	涂层种类 Grade of Coated Materials XC3030	XP3035	XP2025	XP2040	XC1015	XC5035	XC5040	XP6015
①	RPHT10T3MOFN-NM	8	10	3.97	11	7811009								
	RPHW10T3MOSN	8	10	3.97	11		7825017							
								7814030						
	RPHW10T3MOEN	8	10	3.97	11						7812017			
	RPHT10T3MOEN-GL	8	10	3.97	11				7826008	7813008				
	RPHT10T3MOEN-SM	4	10	3.97	11							7815010*		
	RPHT10T3M8EN-SM	8	10	3.97	11							7815050	7816050	
	RPMT10T3M8EN-HR	8	10	3.97	11									7824083
②	RPHT1204MOFN-NM	8	12	4.76	11	7811013								
	RPHW1204MOSN	8	12	4.76	11		7825018				7812018			
								7814018						
	RPHT1204MOEN-GL	8	12	4.76	11				7826011	7813011				
	RPHT1204MOEN-SM	4	12	4.76	11							7815012*		
	RPHT1204M8EN-SM	8	12	4.76	11							7815051	7816051	
	RPMT1204M8EN-HR	8	12	4.76	11									7824084
③	RPHT1605MOFN-NM	8	16	5.56	11	7811016								
	RPHW1605MOSN	8	16	5.56	11		7825019				7812019			
								7814019						
	RPHT1605MOEN-GL	8	16	5.56	11				7826014	7813014				
	RPHT1605MOEN-SM	4	16	5.56	11							7815015*		
	RPHT1605M8EN-SM	8	16	5.56	11							7815052	7816052	

*标记的产品库存为零时，产品废番。 *Marked insert will be discontinued when it is out of stock.

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
固定螺丝 Clamping Screw	7808116	FS30573A (Torx 10)	①	RPH*10…	PRC SS/SF ϕ20～40
	7808112	FS35586 (Torx 15)	②	RPH*12…	PRC SS/SF ϕ32～50 PRC BORE ϕ50～100
	7808113	FS45510 (Torx 20)	③	RPH*16…	PRC SS/SF ϕ40～63 PRC BORE ϕ50～100
高强度螺栓 Power Screw	7808151	PS1031 (M10×31)	③	RPH*16…	PRC BORE ϕ50

	商品号 EDP No.	名称 Designation	适用刀片 Applicable Inserts		适用刀具 Applicable Cutters
扳手 Wrench	7808207	T10-D (Torx 10)	①	RPH*10…	PRC SS/SF ϕ20～40
	7808208	T15-D (Torx 15)	②	RPH*12…	PRC SS/SF ϕ32～50 PRC BORE ϕ50～100
	7808209	T20-D (Torx 20)	③	RPH*16…	PRC SS/SF ϕ40～63 PRC BORE ϕ50～100

扳手请另购。 The wrenches are sold separately from the cutters.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

圆刀片铣刀系列
Radius Cutter Series

PRC

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材质 Best
○第二推荐材质 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
CK010	NM	有 Wet				◎		
XC3030	–	无 Dry	◎		○			
XP3035	–	无 Dry	◎	○	○			
		有 Wet						
XP2025	GL	有 Wet	○	◎			○	
XP2040	GL	无 Dry	○	○				○
		有 Wet	○	◎			○	
XC1015	–	无 Dry			◎			
XP6015	HR	无 Dry	○		○			◎
XC5035	SM	无 Dry		◎				
		有 Wet		○			○	
XC5040	SM	有 Wet		○			◎	

NM:铝合金　GL:轻·中切削用　HR:高硬度钢用　SM:耐热合金用
NM:Aluminum Alloy　GL:Light・Middle Cutting　HR:High Hardened Steel　SM:Heat Resistance Alloy

Cutting Conditions

■切削条件基准表 Cutting Conditions

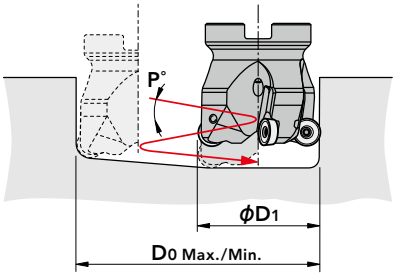
	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	刀片尺寸 Insert Size RPH*10… 每刃进给量 fz (mm/t) Feed per Tooth	RPH*10… 切削深度 ap (mm) Depth of Cut	RPH*12… 每刃进给量 fz (mm/t) Feed per Tooth	RPH*12… 切削深度 ap (mm) Depth of Cut	RPH*16… 每刃进给量 fz (mm/t) Feed per Tooth	RPH*16… 切削深度 ap (mm) Depth of Cut
P	软钢、低炭素钢 Mild Steel, Carbon Steel (SS400, S10C)	~180HB	200 (100 ~ 300)	0.25 (0.1 ~ 0.35)	2	0.3 (0.1 ~ 0.4)	2.4	0.35 (0.1 ~ 0.5)	3.2
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180 (100 ~ 250)	0.2 (0.1 ~ 0.3)	2	0.25 (0.1 ~ 0.35)	2.4	0.3 (0.1 ~ 0.45)	3.2
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150 (80 ~ 200)	0.2 (0.1 ~ 0.3)	2	0.25 (0.1 ~ 0.35)	2.4	0.3 (0.1 ~ 0.45)	3.2
M	不锈钢(干式) Stainless Steel (Dry) (SUS304, SUS420)	~250HB	160 (80 ~ 200)	0.25 (0.1 ~ 0.35)	2	0.3 (0.1 ~ 0.4)	2.4	0.35 (0.1 ~ 0.5)	3.2
M	不锈钢(湿式) Stainless Steel (Wet) (SUS304, SUS420)	~250HB	120 (60 ~ 180)	0.25 (0.1 ~ 0.35)	2	0.3 (0.1 ~ 0.4)	2.4	0.35 (0.1 ~ 0.5)	3.2
K	铸铁 Cast Iron (FC250)	~350N/mm²	220 (100 ~ 350)	0.25 (0.05 ~ 0.4)	2	0.3 (0.1 ~ 0.5)	2.4	0.35 (0.1 ~ 0.6)	3.2
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	150 (100 ~ 220)	0.2 (0.1 ~ 0.3)	2	0.25 (0.1 ~ 0.35)	2.4	0.3 (0.1 ~ 0.45)	3.2
N	铝合金 Aluminum Alloy	~13%Si	600 (300 ~ 1,500)	0.4 (0.2 ~ 0.8)	2	0.6 (0.2 ~ 1)	2.4	0.8 (0.3 ~ 1.5)	3.2
S	超耐热合金(湿式) Superalloy (Wet) (Inconel® 718)	–	40 (25 ~ 60)	0.15 (0.05 ~ 0.25)	2	0.2 (0.05 ~ 0.3)	2.4	0.25 (0.05 ~ 0.4)	3.2
S	钛合金(湿式) Titanium Alloy (Wet) (Ti-6Al-4V)	–	80 (50 ~ 120)	0.2 (0.1 ~ 0.3)	2	0.25 (0.1 ~ 0.35)	2.4	0.3 (0.1 ~ 0.45)	3.2
H	预硬钢 Pre-hardened Steel (NAK80)	40~43HRC	120 (40 ~ 150)	0.15 (0.05 ~ 0.25)	1.5	0.2 (0.05 ~ 0.3)	1.5	0.25 (0.05 ~ 0.4)	1.5
H	铸件用钢 Steel for Die Casting (DAC-MAGIC, DH31)	43~48HRC	80 (40 ~ 120)	0.15 (0.05 ~ 0.25)	1	0.2 (0.05 ~ 0.3)	1	0.25 (0.05 ~ 0.4)	1
H	调质钢 Hardened Steel (SKD11)	50~55HRC	60 (30 ~ 90)	0.15 (0.05 ~ 0.25)	0.5	0.2 (0.05 ~ 0.3)	0.5	0.25 (0.05 ~ 0.4)	0.5

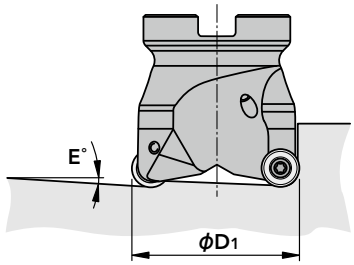
・上述参数表仅适合短柄型。
・上述推荐数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
・ Above recommended speed is for Short Shank Type.
・ The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.

Phoenix

圆刀铣刀系列
Radius Cutter Series

PRC





Maximum Ramping Angle (E)

■斜线加工时的最大倾斜角(E) Maximum Ramping Angle (E)

刀片尺寸 Insert Size	RPH*10…				RPH*12…				RPH*16…			
刀具直径(mm) D1	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling(mm) 最小径 D0 Min.	螺旋线开孔 Helical Milling(mm) 最大径 D0 Max.	螺旋角度 Helical Angle P°	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm) 最小径 D0 Min.	螺旋线开孔 Helical Milling (mm) 最大径 D0 Max.	螺旋角度 Helical Angle P°	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm) 最小径 D0 Min.	螺旋线开孔 Helical Milling (mm) 最大径 D0 Max.	螺旋角度 Helical Angle P°
20	1.3	26	30	1.3	–	–	–	–	–	–	–	–
24	–	–	–	–	6.0	30	36	2.2	–	–	–	–
25	2.0	37	40	1.8	–	–	–	–	–	–	–	–
30	2.5	46	50	1.6	5.3	42	48	1.9	–	–	–	–
32	3.0	50	54	1.5	4.0	46	52	1.7	7.0	39	48	2.1
40	–	–	–	–	2.8	62	68	1.4	4.8	55	64	1.8
50	–	–	–	–	2.6	81	88	1.1	4.0	75	84	1.5
63	–	–	–	–	1.9	107	114	0.9	2.8	101	110	1.1
80	–	–	–	–	1.3	142	148	0.7	2.0	135	144	0.9
100	–	–	–	–	1.0	181	188	0.5	1.5	175	184	0.7

Cutting Data

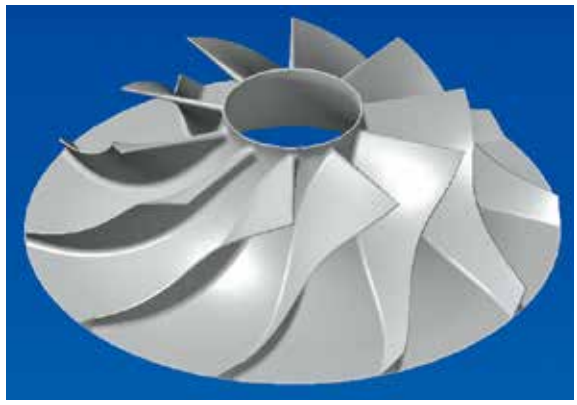
■加工数据 Cutting Data

Inconel® 718(45HRC)的长寿命加工 Long-life milling of Inconel® 718 (45HRC)

使用工具 Tool	PRC12R050M22-5 (φ50×5刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	RPHT1204MOEN-SM (XC5035)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	Inconel® 718 (45HRC)	
切削速度 Cutting Speed	40m/min (255min^{-1})	60m/min (382min^{-1})
进给速度 Feed	270mm/min (0.21mm/t)	270mm/min (0.14mm/t)
切削深度 Depth of Cut	ap=0.5mm ae=30mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	
耐久度 Durability	10m	2m

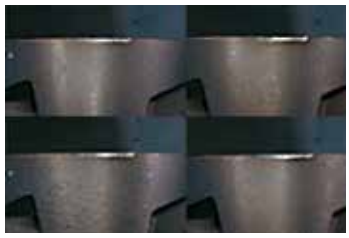
其他公司产品加工2m 后磨损大，并且刀片的其他刃角也无法使用。与之相较，PRC 可加工10m 大大提升了寿命。

The competitor's tool broke extensively after milling 2m, and the damage extended to other corners, rendering the tool unusable. In contrast, the PRC was able to mill 10m, resulting in a considerably longer tool life.

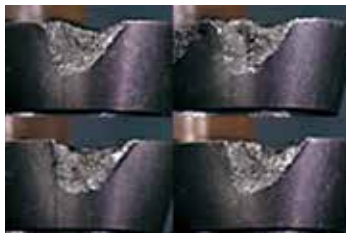


2m加工後の写真 After 2m of milling

PRC

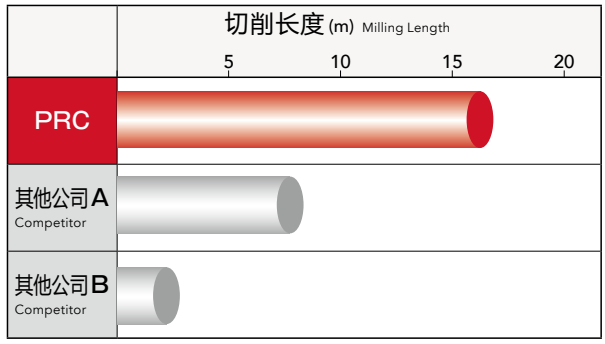


其他公司 Competitor



SUS304加工的长寿命化 Long tool life in SUS304

使用工具 Tool	PRC12R040SS32-3S (φ40×3刃)	其他公司 Competitor
使用刀片(材质) Insert (grade)	RPHT1204MOEN-GL (XP2025)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	120m/min (955min^{-1})	
进给速度 Feed	860mm/min (0.3mm/t)	
切削深度 Depth of Cut	ap=3mm ae=24mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	



以往的产品较早出现崩刃、磨损，使用寿命不稳定。而PRC(XP2025)无崩刃等现象，可稳定加工，延长使用寿命。

The PRC (XP2025) is able to achieve stable, chipping-free machining whereas the competitor tools had failed due to early chipping and wear.

Cutting Data

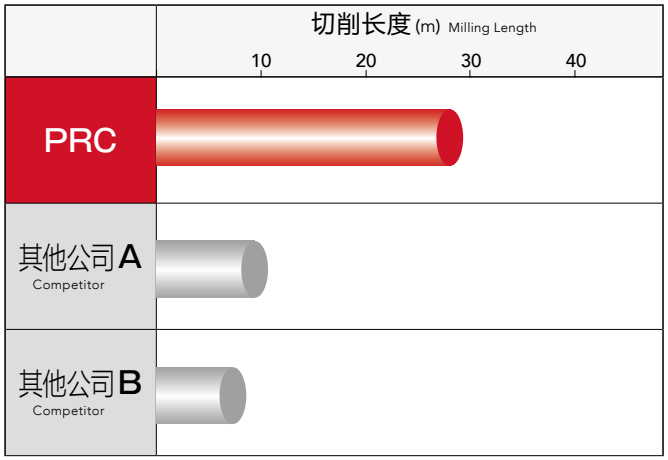
■加工データ Cutting Data

零部件的粗加工(工具奥运会) Rough milling of parts (Tool Olympics)

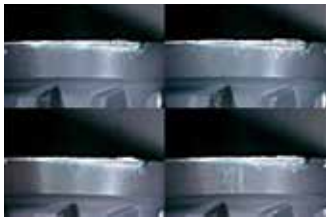
使用工具 Tool	PRC12R040SS32-3S (φ40×3刃)	其他公司A、B Competitor
使用刀片 (材质) Insert (grade)	RPHW1204MOSN(XC1015)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	FC250	
切削速度 Cutting Speed	180m/min (1,433min^{-1})	
进给速度 Feed	2,300mm/min (0.5mm/t)	
切削深度 Depth of Cut	ap=3mm ae=25mm	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

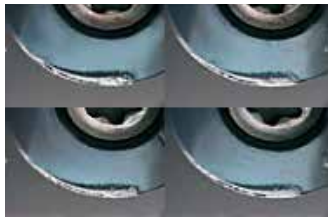
各个公司针对零部件粗加工的比较结果。由于刚性高，耐磨损性好，我们的刀片是其他公司耐久性的3倍。

Each company's products were compared in the rough milling of parts. Having higher rigidity and wear resistance, our inserts provided three times the durability versus competitors'.



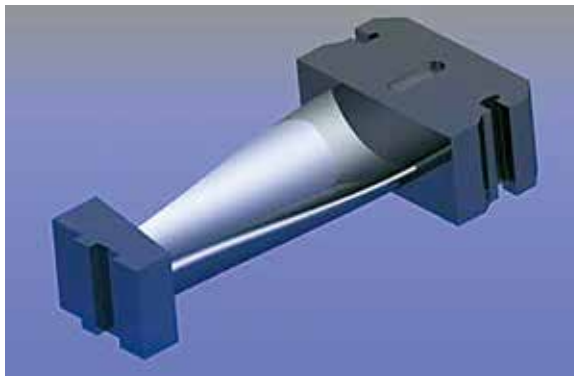
加工29m后的刀片照片 After 29m of milling





叶片粗加工 Rough milling of blade

使用工具 Tool	PRC10R032SS32-4S (φ32×4刃)	其他公司 Competitor
使用刀片 (材质) Insert (grade)	RPHT10T3MOEN-SM(XC5035)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	13Cr相当品 Equivalent	
切削速度 Cutting Speed	90m/min (896min^{-1})	
进给速度 Feed	1,100mm/min (0.3mm/t)	
切削深度 Depth of Cut	ap=0.5mm ae=22mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center	



叶片粗加工，可以实现耐久度性1.5倍的稳定加工。

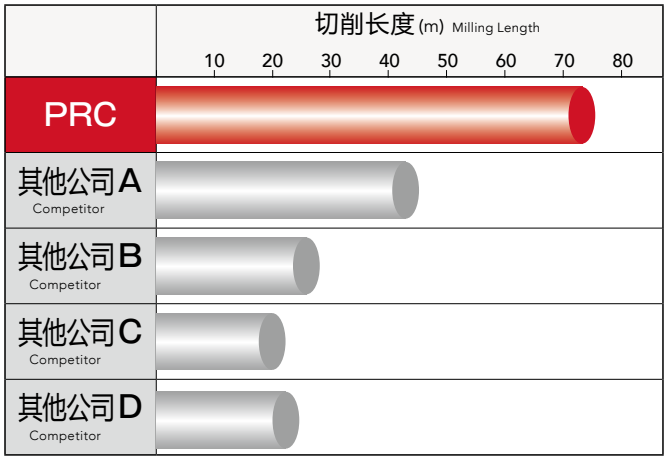
In the rough milling with PRC, blade in a stable manner and durability was increased by 1.5 times versus the competition.

零部件的粗加工(工具奥运会) Rough milling of parts (Tool Olympics)

使用工具 Tool	PRC12R050M22-5 (φ50×5刃)	其他公司A、B、C、D Competitor
使用刀片 (材质) Insert (grade)	RPHT1204MOEN-GL (XP2040)	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	SUS304	
切削速度 Cutting Speed	100m/min (637min^{-1})	
进给速度 Feed	800mm/min (0.25mm/t)	
切削深度 Depth of Cut	ap=1mm ae=25mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

各个公司针对零部件粗加工的比较结果。其他公司的刀具过早的崩刃及折损了，但是PRC 仍然是正常磨损状态，与其他公司A 相比，耐久性为他们产品的1.7倍以上。

Each company's products were compared in the rough milling of parts. Competitors' tools resulted in premature chipping and breakage, but the PRC wore normally, resulting in 1.7 times the durability versus Competitors.



加工67.2m后的刀片照片 After 67.2m of milling

Phoenix PDR

高进给圆弧角铣刀
High Feed Radius Cutter Series

Phoenix Deep feed Radius

■解决以往的加工问题
Solves traditional machining problems

以往的高效率工具的问题点
Issues with traditional high-efficiency cutting tools

- ○ 没有能够大切深加工的圆弧角铣刀
  There is not enough radius tool that can perform large depths of cut.
- ○ 外皮的切削量大，因此导致工具的破损
  Large variances in removal damage the tool.
- ○ 黑皮部分的切深量很少，因此导致空切的情况增加
  The depth of cut is so small for black surface areas that air cutting becomes common.

保证切深量的同时，不降低效率
More cutting depth is needed without dropping the efficiency...

低切深量高进给刀圆弧角形粗加工工具
Leading low depth of cut, high feed radius roughing tools.

考虑到刃尖刚性的可变动负角形状
Variable negative form for edge rigidity

➡防止崩刃
→prevent breakage

螺旋刃形
Spiral tool form

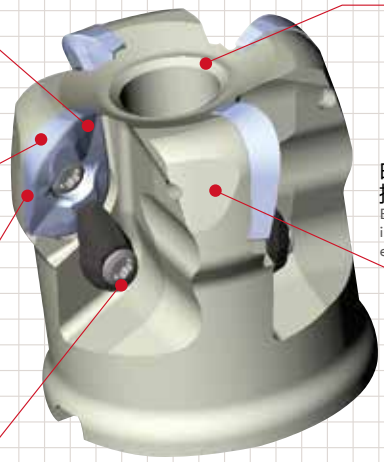
➡降低切削抵抗
→reducte cutting force

可用于精加工的修光刃
A cutting tool capable of finish milling, thanks to the wiping edge

切深量2-5mm 时为最适合的刀片形状（圆弧角R10）
Ideal insert formation for depth of cut between 2-5mm (corner radius 10)

对应侧面加工的刃形
A cutting tool capable of side machining

采用双重装夹
Uses double clamping



底部内凹形状（3. 5mm）针对粗糙的铸件表面
Bottom relief (3.5mm) prevents rough surfaces

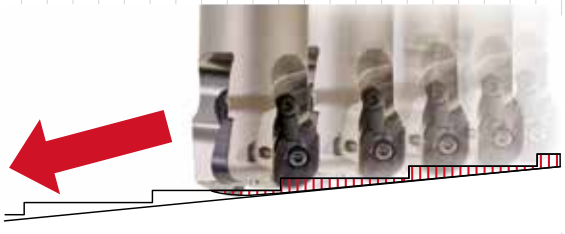
由于刀架的增大，提高了刀体的刚性
Body rigidity has been increased because of the enlarged back metal

■用圆弧角铣刀来替代球头铣刀加工！
The work of a ball, cut by a radius!

一直被认为只能使用球头型铣刀的加工，PDR 的话也能进行。

The PDR can cut which was considered the work of ball end mills until now.

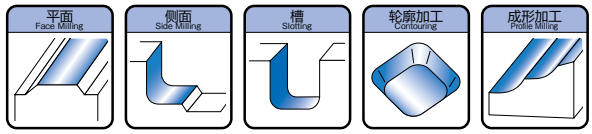
进行等高线加工时，随着切深量的增大，加工出的高低差异随之变大。一般来说，对于后工序工具的影响较大，最终加工工程间的总加工时间会增多。但是PDR 采用球头铣刀相同作用的刃型设计，仍然保持着圆弧角的有效工具刚性，能进行走差线加工。等高线粗加工时限于ap3mm 以下。建议使用直径π50以下。



In heavy roughing (contoured machining), machining steps become larger based on the depth of cut. Usually, the effect on the next cutting tool is great, and as machining processes are added, the overall production time increases. However, the tool form of the PDR is designed to increase the removal and leave stepovers similar to ball end mills while still maintaining the rigidity of a radius end mill. Roughing of contoured lines is restricted to ap3mm. Also, a diameter of ϕ 50 or less is recommended.

高进给圆弧角铣刀
High Feed Radius Cutter with Shank Type

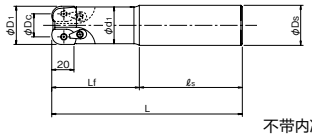
PDR SS/MT/CN



Specification

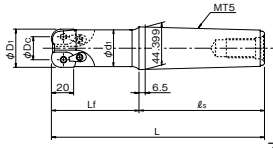
■形状尺寸表 Specification

Type 1



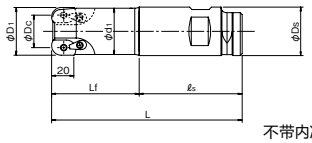
不带内冷
without Coolant Hole

Type 2



不带内冷
without Coolant Hole

Type 3



不带内冷
without Coolant Hole

单位:mm Unit:mm

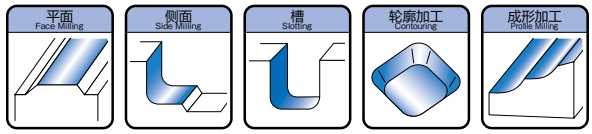
商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	柄径 Ds	全长 L	颈长 Lf	颈径 d1	柄长 ℓs	重量 (kg)	形状类型 Type
7800000	PDR20R040SS42-2S	40	20	2	42	150	50	38.9	100	1.46	1
7800001	PDR20R040MT5M16-2S	40	20	2	MT5-M16	256	120	38.9	136	2.48	2
7800003	PDR20R040MT5M24-2S	40	20	2	MT5-M24	256	120	38.9	136	2.30	2
7800009	PDR20R040SS42-2L	40	20	2	42	250	150	38.9	100	2.44	1
7800010	PDR20R040MT5M16-2L	40	20	2	MT5-M16	306	170	38.9	136	2.97	2
7800012	PDR20R040MT5M24-2L	40	20	2	MT5-M24	306	170	38.9	136	2.82	2
7800004	PDR20R050SS42-3S	50	30	3	42	150	50	48.5	100	1.55	1
7800008	PDR20R050CN50.8-3S	50	30	3	CN50.8	150	65	48.5	85	2.05	3
7800005	PDR20R050MT5M16-3S	50	30	3	MT5-M16	256	120	48.5	136	2.92	2
7800007	PDR20R050MT5M24-3S	50	30	3	MT5-M24	256	120	48.5	136	2.71	2
7800013	PDR20R050SS42-3L	50	30	3	42	250	150	48.5	100	3.03	1
7800017	PDR20R050CN50.8-3L	50	30	3	CN50.8	250	165	48.5	85	3.50	3
7800014	PDR20R050MT5M16-3L	50	30	3	MT5-M16	306	170	48.5	136	3.63	2
7800016	PDR20R050MT5M24-3L	50	30	3	MT5-M24	306	170	48.5	136	3.49	2

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

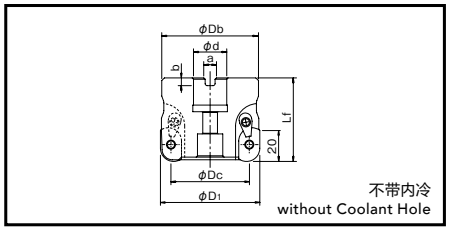
高进给圆弧角铣刀 刀盘型
High Feed Radius Cutter with Bore Type

PDR BORE



Specification

■形状尺寸表 Specification



单位:mm Unit:mm

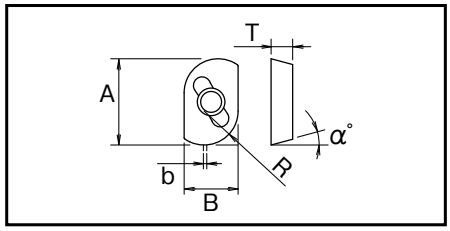
商品号 EDP No.	名称 Designation	直径 D1	外径 Dc	刃数 z	刀具高度 Lf	刀盘径 Db	孔径 d	端面键槽 Key Slot		重量 (kg)
								端面槽宽 a	端面槽深 b	
7800057	PDR20R063M22-3	63	43	3	63	60	22	10.4	6.3	0.97
7800050	PDR20R063M22.2-3	63	43	3	63	60	22.225	8	5	0.97
7800058	PDR20R063M22-4	63	43	4	63	60	22	10.4	6.3	0.88
7800051	PDR20R063M22.2-4	63	43	4	63	60	22.225	8	5	0.88
7800059	PDR20R080M27-4	80	60	4	63	76	27	12.4	7	1.60
7800052	PDR20R080M31.7-4	80	60	4	63	76	31.75	12.7	8	1.49
7800060	PDR20R080M27-5	80	60	5	63	76	27	12.4	7	1.51
7800053	PDR20R080M31.7-5	80	60	5	63	76	31.75	12.7	8	1.39
7800054	PDR20R100M31.7-5	100	80	5	63	96	31.75	12.7	8	2.55
7800061	PDR20R100M32-5	100	80	5	63	96	32	14.4	8	2.56
7800055	PDR20R100M31.7-6	100	80	6	63	96	31.75	12.7	8	2.46
7800062	PDR20R100M32-6	100	80	6	63	96	32	14.4	8	2.46
7800056	PDR20R125M31.7-6	125	105	6	63	100	31.75	12.7	8	3.78
7800063	PDR20R125M40-6	125	105	6	63	100	40	16.4	9	3.58

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

高进给圆弧角铣刀系列
High Feed Radius Cutter Series

PDR 刀片
Inserts

Inserts



■适用刀片 Inserts

单位:mm Unit:mm

名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size					涂层种类 Grade of Coated Materials
		A×B	厚度 T	后角 α°	R	副切削刃 b	XP3930
ADMT2006100PDR-GM	2	24.18×16	6.35	15	10	1	7810000

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation
 固定螺丝 Clamping Screw	7808001	CSPB-5 (Torx 20IP)
压板 (压板、刀垫、固定螺丝) Clamping set (clamp, washer, and clamping screw)	7808002	CSY-20

	商品号 EDP No.	名称 Designation
 T型扳手 T-Wrench	7808000	20IP-T

扳手请另购。 The wrenches are sold separately from the cutters.

Phoenix

高进给圆弧角铣刀
High Feed Radius Cutter Series

PDR

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材质 Best
○第二推荐材质 Good

刀片型号 Insert Grades	断屑槽 Insert Breaker	切削油剂 Coolant	P	M	K	N	S	H
XP3930	GM	无 Dry	◎		◎			

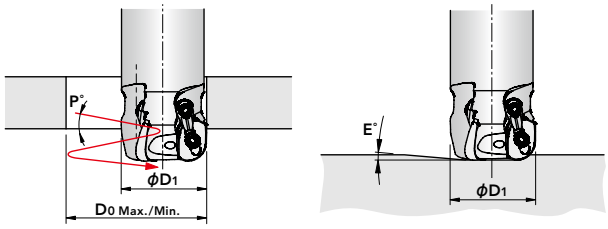
GM:通用 GM:General use

Cutting Conditions

■切削条件基准表 Cutting Conditions

	加工材料 Work Material	抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	PDR SS/MT/CN			PDR BORE				
				每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut		每刃进给量 fz (mm/t) Feed per Tooth	切削深度 ap (mm) Depth of Cut			
					120	170		100	200	300	400
P	软钢、低炭素钢 Mild Steel, Low Carbon Steel (SS400, S10C)	~180HB	180(90 ~ 220)	0.7(0.3 ~ 1)	3	2	0.6(0.3 ~ 1)	3	3	2	2
P	炭素钢、合金钢 Carbon Steel, Alloy Steel (S50C, SCM440)	~280HB	180(90 ~ 220)	0.7(0.3 ~ 1)	3	2	0.6(0.3 ~ 1)	3	3	2	2
P	模具钢 Die Steel (SKD11, SKD61)	~280HB	150(90 ~ 180)	0.6(0.3 ~ 1)	3	2	0.5(0.3 ~ 1)	3	2	2	2
K	铸铁 Cast Iron (FC250)	~350N/mm²	180(100 ~ 250)	0.8(0.3 ~ 1.5)	3	3	0.7(0.3 ~ 1.5)	3	3	2	2
K	球墨铸铁 Ductile Cast Iron (FCD400)	~800N/mm²	150(100 ~ 250)	0.7(0.3 ~ 1.2)	3	3	0.6(0.3 ~ 1.2)	3	3	2	2

·上述推荐数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting condition.



Maximum Ramping Angle (E)

■斜线加工时最大倾斜角(E) Maximum Ramping Angle (E)

刀具直径 (mm) D1	倾斜角 Ramping Angle E°	螺旋线开孔 Helical Milling (mm)		螺旋角度 Helical Angle P°	轴进刀量 Plunging (mm)
		最小径 D0 Min.	最大径 D0 Max.		
40	5	50	78	1.4	3
50	3	70	98	1.1	3
63	2	96	124	0.9	3
80	1	130	158	0.7	3
100	0.5	170	198	0.5	3
125	0.5	220	248	0.4	3

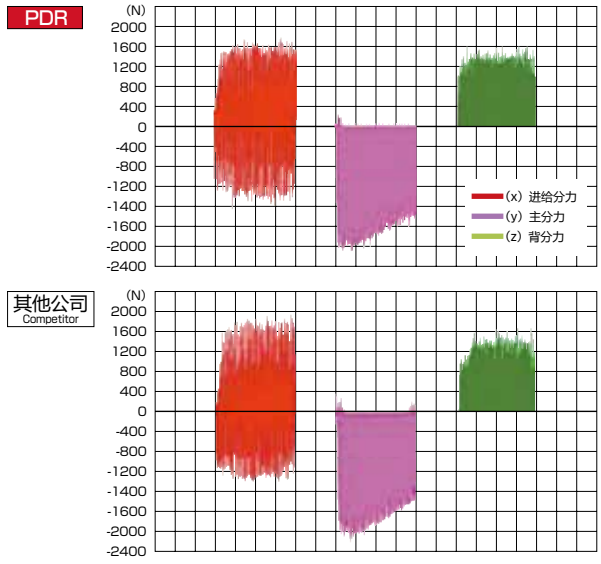
1.切削初始会产生较长的铁屑，请注意。
2. 进给速度设定为基准条件表的40~70%。
3.角度1°以下时可不用降低进给速度进行加工。
4. 推荐使用气冷。
1. Long chips may occur in the beginning of the milling process.
2. Feed rate should be set within 40-70% of the recommended milling condition.
3. To advance without dropping the feed rate, set an angle of less than 1°.
4. Using air blow is highly recommended.

Cutting Data

■加工数据 Cutting Data

刃尖刚性与锋利性并存的刃型设计 Cutting edge is designed for both rigidity and sharpness

使用工具 Tool	PDR20R050MT5M16-3L (φ50×3刃)
使用刀片(材质) Insert (grade)	ADMT2006100PDR-GM (XP3930)
加工材料 Work Material	FC250
切削速度 Cutting Speed	150m/min (955min^{-1})
进给速度 Feed	1,500mm/min (0.52mm/t)
切削深度 Depth of Cut	ap=3mm ae=25mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	立式加工中心(8.5/11kW) Vertical Machining Center



(单位：N) (unit : N)

	x进给分力 Feed force	y主分力 Principal cutting force	z背分力 Thrust force	合力 Resultant force
PDR	1651	2082	1433	3019
其他公司(有断屑槽) Competitor (with breaker)	1725	2095	1455	3079

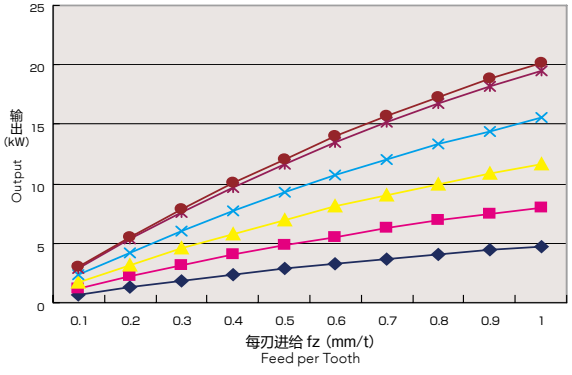
采用强化刃形，合力与断屑槽(效果)相同！
With the strengthened cutting edge, resultant force is as with a breaker!

为了有效利用机器主轴用电机(输出)… Using the spindle load meter more effectively

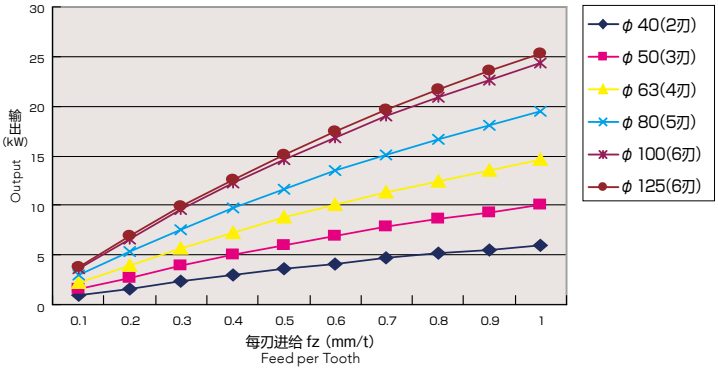
切削速度 Cutting Speed	150m/min
切削深度 Depth of Cut	ap=3mm ae=(Dc-20)+5 (切深量3mm刀具直径) Tool diameter for 3mm cut depth

PDR 推荐使用 2～5mm 的切深量。
这跟机械主轴用电机(输出)有很大关系。
所以请根据电机的马力来决定刀具直径和加工条件。
For PDR, a 2-5mm of depth of cut is recommended. This is largely related to the spindle load meter.
Please select the tool diameter and cutting conditions that are suited to your spindle load meter.

■ FC250 机械主轴用电机(输出)表
Spindle load meter reference table



■ S50C 机械主轴用电机(输出)表
Spindle load meter reference table

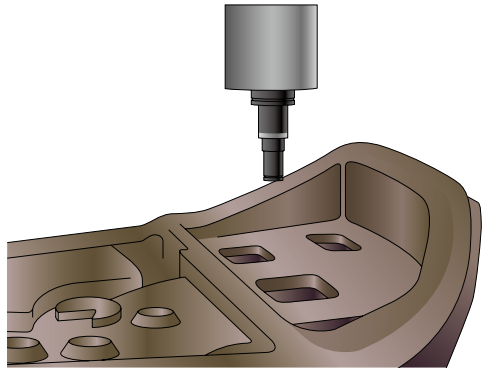


Cutting Data

■加工数据 Cutting Data

提高加工效率 + 长寿命的达成 Achieving efficient machining and longer tool life

使用工具 Tool	PDR20R050MT5M24-3S (φ50×3刃)
使用刀片 (材质) Insert (grade)	ADMT2006100PDR-GM (XP3930)
加工材料 Work Material	FC250
加工工件 Work	冲压模具 Press Dies
切削速度 Cutting Speed	150m/min (955min^{-1})
进给速度 Feed	2,000mm/min (0.7mm/t)
切削深度 Depth of Cut	ap=3mm ae=30mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	龙门加工中心(18.5/22kW) Double Column Machining Center
耐久度时间 Durability	4小时 Hours

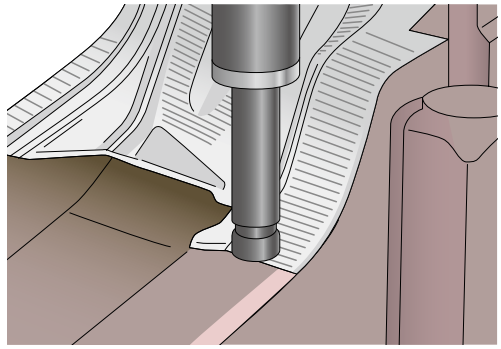


效率是球头铣刀的2倍，主轴负荷值降低。主轴最大负荷55%。

While efficiency is twice as great as ball end mills, spindle loads are also reduced! The maximum spindle load is 55%.

高效率加工的实现 Highly efficient machining

使用工具 Tool	PDR20R040MT5M24-2S (φ40×2刃)
使用刀片 (材质) Insert (grade)	ADMT2006100PDR-GM (XP3930)
加工材料 Work Material	高强度铸铁 Meehanite Cast Iron
加工工件 Work	冲压模具 Press Dies
切削速度 Cutting Speed	170m/min (1,350min^{-1})
进给量 Feed	2,430mm/min (0.9mm/t)
切削深度 Depth of Cut	ap=3mm ae=20mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	龙门加工中心(18.5/22kW) Double Column Machining Center
加工时间 Machining Time	4时间 Hours

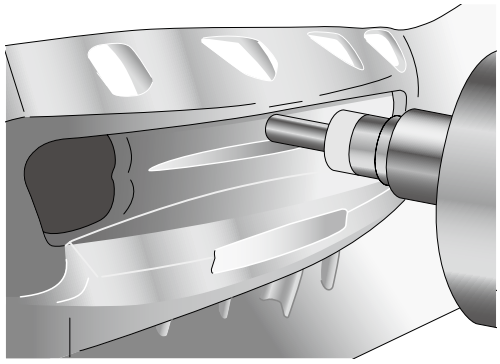


其他公司刀具的进给速度为1,500mm/min。PDR 加工4小时后，工具没有损伤，仍可继续稳定加工。

The feed rate was 1,500mm/min for the competitor's tool. The machining time of PDR was 4 hours with stable machining without tool damage.

切深量增大，效率提高 Increased efficiency by the depth of cut increases

使用工具 Tool	PDR20R050SS42-3S (φ50×3刃)
使用刀片（材质） Insert (grade)	ADMT2006100PDR-GM (XP3930)
加工材料 Work Material	S50C
加工工件 Work	树脂模具 Plastic Dies
切削速度 Cutting Speed	150m/min (955min^{-1})
进给速度 Feed	3,000mm/min (1mm/t)
切削深度 Depth of Cut	ap=3mm ae=30mm
悬伸 Overhang Length	100mm
切削油剂 Coolant	无（气冷式） Air Blow
使用机械 Machine	卧式加工中心(37/45kW) Horizontal Machining Center
加工时间 Machining Time	2小时 Hours



与现有工具相比，效率为1.5倍。

Efficiency was improved 1.5 times compared to current tools.

Phoenix PFAL NEW

铝材用精加工铣刀
Finishing Cutter for Aluminum

Phoenix Finishing Cutter for Aluminum

■铝制刀体实现惊人的轻量化
→即使是小型加工中心也能使用的丰富的产品尺寸

Incredibly Lightweight with Aluminum Body Construction
→Broad size lineup to accommodate various cutting environment, even small machining centers.

高平衡性 Excellent Balance
- 实现高速回转加工
- 刀体(安装刀片)保证平衡精度等级6.3G

Enables high-speed milling
Cutter (with blades mounted) with guaranteed balancing grade to G6.3

高效率 High Efficiency
- 多刃式样配合采用修光刃的标准刀片即使是在高进给的加工下也能获得良好的精加工面

Excellent surface finish even in high-feed milling with adoption of multiple blades and wiper blade standardization

高平衡精度 High Precision Balancing
- 刀体在芯轴上装夹状态也能保证高平衡精度

High precision balancing can be performed even when cutter is mounted onto the arbor

PCD一体式的刀片
PCD Integrated Blades
- 可再研磨
  最大化性价比

PCD can be reground for maximum cost performance

■在BT30上可以使用φ160的PFAL PFAL ϕ160 with BT30

φ160的标准内径为φ25.4、27
Bore diameters of ϕ25.4 and 27 are standard offering in the PFAL ϕ160 cutter lineup.

面铣芯轴 Face Mill Arbor
BT30-FMA25.4-45
重量 0.90kg
Weight

＋

PFAL ϕ160 刃数(z)20
PFAL04R160M25.4-20
重量 1.98kg
Weight

＝

总重量
Total Weight
2.88kg

加工情报请参考P.129。 Please see p.129 for cutting data.

Features

■特点 Features

■部件数少，方便刀具管理及装卸
Few Required Components Makes Easy Setup and Simple Tool Management

○采用标准 PCD 修光刃刀片 Standardized Wiper Blade

修光刃确认标识
Wiper Blade Indicator

修光刃刀片安装标识
Wiper Blade Position Indicator

修光刃刀片 Wiper Blade

- **实现优良的加工面粗度**
  Enables superior surface finish
- **每把刀体一枚，在有安装标识处装卸**
  One wiper blade per cutter body; for mounting in the designated position
- **刀片上也有修光刃确认标识**
  Wiper blade also comes with identifiable indicator

一般刀片 Normal Blade

- **多刃设计能稳定加工**
  Enables stable milling with multiple blades configuration
- **在安装标识以外的都用一般刀片装夹**
  For mounting in any cutter body slots with exception of wiper blade position

○采用所有刀体通用的部件 Spare Parts Compatible with All Cutter Sizes

刀片用紧固螺纹
Clamping Screw for Blade

楔子
Wedge

楔用夹紧螺纹
Clamping Screw for Wedge

- **尺寸大的紧固螺纹(M6)刚性提升**
  Improved rigidity with large size clamping screw (M6)
- **简易的刃尖调整缩短装卸时间**
  Easy cutting edge adjustment reduces required setup time

刃尖高度调整顺序请参照P.131、P.132。
Please see p.131 and p.132 for cutting edge height adjustment instructions.

■主要零部件案例 PFAL Component Solution Examples

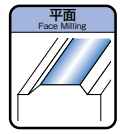
汽车铝制零部件
Aluminum Components in Automotive

- **离合器壳**
  Clutch Housing
- **变速箱体**
  Transmission Case
- **缸盖**
  Cylinder Head
- **缸体**
  Cylinder Block
- **其他所有铝制零部件**
  And more

Phoenix

铝材用精加工铣刀 刀盘型
Finishing Cutter for Aluminum, Bore Type

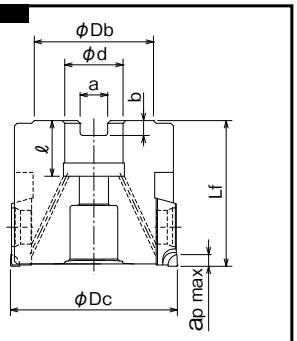
PFAL BORE NEW



Specification

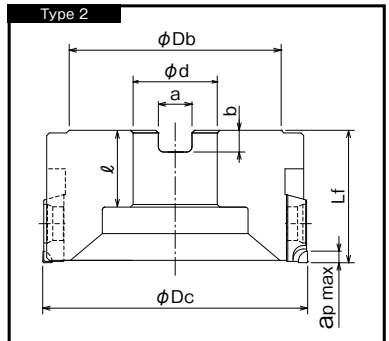
■形状尺寸表 Specification

Type 1



内冷油孔 with Coolant Hole

Type 2



不带内冷 without Coolant Hole

Type2:使用内冷型时请使用市面上带内冷油孔的夹紧螺栓。
For the use of internal coolant, please use a clamping bolt with coolant holes sold in the market.

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	刀具高度 Lf	安装孔高度 ℓ	刀盘径 Db	孔径 d	端面键槽 Key Slot 宽度a	端面键槽 Key Slot 深度b	最大转速 Max Speed (min⁻¹)	重量 Weight (kg)	形状类型 Type
7803600	PFAL04R050M16-5	50	5	55	20	40	16	8.4	5.6	32,000	0.27	1
7803601	PFAL04R063M22-6	63	6	55	21	45	22	10.4	6.3	25,000	0.40	1
7803602	PFAL04R063M22-8	63	8	55	21	45	22	10.4	6.3	25,000	0.43	1
7803603	PFAL04R080M25.4-8	80	8	50	28	70	25.4	9.5	6	19,800	0.53	2
7803604	PFAL04R080M27-8	80	8	50	28	70	27	12.4	7	19,800	0.52	2
7803605	PFAL04R080M25.4-10	80	10	50	28	70	25.4	9.5	6	19,800	0.55	2
7803606	PFAL04R080M27-10	80	10	50	28	70	27	12.4	7	19,800	0.54	2
7803607	PFAL04R100M25.4-8	100	8	50	28	80	25.4	9.5	6	15,800	0.86	2
7803608	PFAL04R100M27-8	100	8	50	28	80	27	12.4	7	15,800	0.83	2
7803609	PFAL04R100M31.7-8	100	8	50	32	72	31.75	12.7	8	15,800	0.86	2
7803610	PFAL04R100M32-8	100	8	50	28	80	32	14.4	8.2	15,800	0.78	2
7803611	PFAL04R100M25.4-12	100	12	50	28	80	25.4	9.5	6	15,800	0.90	2
7803612	PFAL04R100M27-12	100	12	50	28	80	27	12.4	7	15,800	0.87	2
7803613	PFAL04R100M31.7-12	100	12	50	32	80	31.75	12.7	8	15,800	0.90	2
7803614	PFAL04R100M32-12	100	12	50	28	80	32	14.4	8.2	15,800	0.82	2
7803615	PFAL04R125M25.4-10	125	10	50	28	80	25.4	9.5	6	12,600	1.35	2
7803616	PFAL04R125M27-10	125	10	50	28	80	27	12.4	7	12,600	1.33	2
7803617	PFAL04R125M38.1-10	125	10	63	36	80	38.1	15.9	10	12,600	1.30	2
7803618	PFAL04R125M40-10	125	10	63	30	85	40	16.4	9.2	12,600	1.26	2
7803619	PFAL04R125M25.4-16	125	16	50	27	80	25.4	9.5	6	12,600	1.42	2
7803620	PFAL04R125M27-16	125	16	50	28	80	27	12.4	7	12,600	1.41	2
7803621	PFAL04R125M38.1-16	125	16	63	36	80	38.1	15.9	10	12,600	1.38	2
7803622	PFAL04R125M40-16	125	16	63	30	85	40	16.4	9.2	12,600	1.33	2
7803623	PFAL04R160M25.4-12	160	12	50	28	80	25.4	9.5	6	10,000	1.98	2
7803624	PFAL04R160M27-12	160	12	50	28	80	27	12.4	7	10,000	1.98	2
7803625	PFAL04R160M40-12	160	12	63	30	85	40	16.4	9.2	10,000	2.10	2
7803626	PFAL04R160M50.8-12	160	12	63	38	100	50.8	19.1	11	10,000	2.15	2
7803629	PFAL04R160M25.4-20	160	20	50	28	80	25.4	9.5	6	10,000	1.98	2
7803630	PFAL04R160M27-20	160	20	50	28	80	27	12.4	7	10,000	1.98	2
7803627	PFAL04R160M40-20	160	20	63	30	85	40	16.4	9.2	10,000	2.20	2
7803628	PFAL04R160M50.8-20	160	20	63	38	100	50.8	19.1	11	10,000	2.24	2

·请根据测定器来调整刃尖高度。
·关于ap max 请在P.128确认。

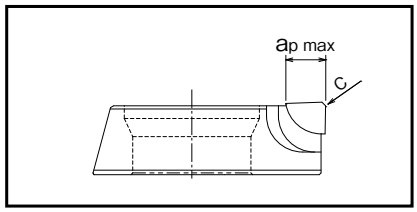
Adjust cutting edge height with a tool presetter.
Please see p.128 for information on ap max.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Blade

·修光刃刀片每把刀体一枚，请在安装标识部装卸。
One wiper blade is required per cutter body and should be mounted in the designated position.
·刀片（普通/修光刃）发注单位为1个。
Order unit for blade (normal/wiper) = 1 piece

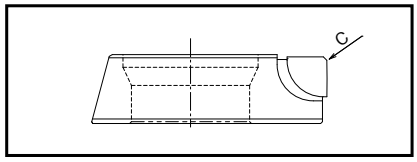
■ノーマルブレード Normal Blade



最适合铝制油口部分加工的切削刃长（ap）6mm型也上线了。（FR1206）
Blade with 6mm cutting edge width (FR1206) suitable for milling of aluminum pouring gates is also available.

名称 Designation	刀片尺寸 Blade Size			PCD材质 PCD Grade
	切削刃数 Number of Cutting Edges	圆弧形状 C	ap max (mm)	DP010
FR1204	1	0.4×45°	4	7820500
FR1206	1	0.4×45°	6	7820502

■修光刃刀片 Wiper Blade



修光刃刀片（FR1204-W）可以通用在FR1204・FR1206。
The FR1204-W wiper blade can be used with both the FR1204 and FR1206 normal blades.

名称 Designation	刀片尺寸 Blade Size		PCD材质 PCD Grade
	切削刃数 Number of Cutting Edges	圆弧形状 C	DP010
FR1204-W	1	0.4×45°	7820501

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation
 刀片用紧固螺纹 Clamping Screw for Blade	7808125	FS60620 (Torx25)
 楔子 Wedge	7808143	W12-06
 楔用紧固螺纹 Clamping Screw for Wedge	7808142	WS0617

	商品号 EDP No.	名称 Designation
 T型扳手（刀片用紧固螺纹用） T-Wrench (for blade clamp screw)	7808211	T25-T
 L型扳手（楔用紧固螺纹用） L-Wrench (for wedge screw)	7808231	3MM-L

所有部件（包括扳手）都与刀体配套。
All accessories (including wrenches) come with the cutter body.

Cutting Conditions

■切削条件基准表 Cutting Conditions

加工材料 Work Material		成分 Component	材质记号 Material Symbol	用途 Application	切削速度 Vc(m/min) Cutting Speed		每刃进给量 fz(mm/t) Feed per Tooth	切削深度 ap(mm) Depth of Cut
					BT30	BT40, BT50 HSK-63		
N	铝合金 Aluminum Alloy	~12% Si	A7075・A5052・A2017等 ADC12等 etc.	半精加工 Semi-finishing	1,000 (800~2,000)	2,000 (1,000~5,000)	0.08 (0.05 ~ 0.10)	1.5 (1.0 ~ 2.0)
				精加工 Finishing			0.06 (0.05 ~ 0.08)	0.5 (0.3 ~ 1.0)
		13% Si ~	AC9A・AC9B等 etc.	半精加工 Semi-finishing	600 (400~800)		0.08 (0.05 ~ 0.10)	1.5 (1.0 ~ 2.0)
				精加工 Finishing			0.06 (0.05 ~ 0.08)	0.5 (0.3 ~ 1.0)

库存种类都为C（即标准库存品）。 Stock are categorized as C (Standard stock item).

Cutting Data

■加工数据 Cutting Data

BT30上使用φ160的刀具进行高效率加工 High efficiency milling on BT30 with PFAL ϕ160

使用工具 Tool	PFAL04R160M25.4-20 (ϕ160×20刃) Flutes	
用途 Application	半精加工 Semi-finishing	精加工 Finishing
加工材料 Work Material	ADC12	
切削速度 Cutting Speed	1,000m/min (2,000min^{-1})	2,000m/min (4,000min^{-1})
进给速度 Feed	3,200mm/min (0.08mm/t)	6,400mm/min (0.08mm/t)
切削深度 Depth of Cut	ap=2mm ae=100mm	ap=0.2mm ae=100mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(BT30) Vertical Machining Center	
加工面粗度 Surface Roughness	Ra=0.25μm Rz=1.22μm	Ra=0.12μm Rz=0.96μm

使用大径刀具可以得到没有接缝的加工面。BT30D 小型加工中心上使用，在半精加工、精加工上都能稳定加工并且加工面良好。

The use of a large-diameter cutter allows processing of a wide area in one pass with no overlap marks. Stable and high quality surface finish was achieved for semi-finishing and finishing even in small machining centers such as the BT30.

铝制零部件的高精度加工 High precision milling of aluminum component

使用工具 Tool	PFAL04R080M25.4-10 (ϕ80×10刃) Flutes	其他公司产品 (ϕ80×6刃) Competitor Flutes
加工材料 Work Material	ADC12	
切削速度 Cutting Speed	3,000m/min (12,000min^{-1})	
进给速度 Feed	14,400mm/min (0.12mm/t)	7,200mm/min (0.1mm/t)
切削深度 Depth of Cut	ap=0.5mm ae=53mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center	

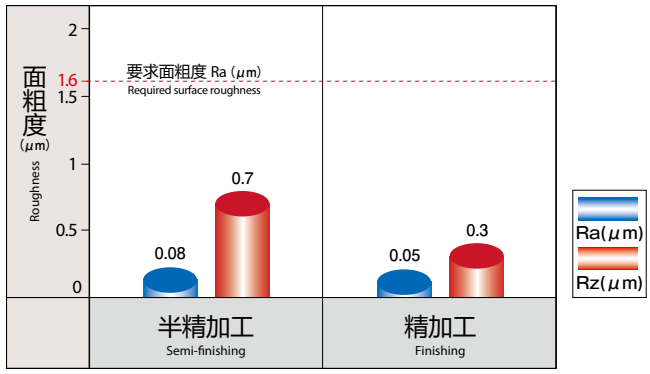
加工面粗度 Surface Roughness
Ra=0.17 ~ 0.22μm Rz=1.08 ~ 1.24μm

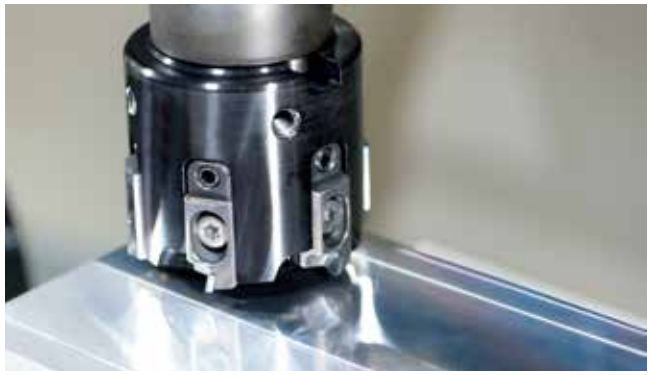
使用多刃式样的刀具，加工效率可以翻倍，并且可以得到没有抖动的良好加工面。

The PFAL cutter had doubled milling efficiency with no chattering, enabling an excellent surface finish.

铝制零部件的高效率・高精度加工 High efficiency and high precision milling of aluminum component

使用工具 Tool	PFAL04R063M22-6 (ϕ63×6刃) Flutes	
用途 Application	半精加工 Semi-finishing	精加工 Finishing
加工材料 Work Material	ADC12	
切削速度 Cutting Speed	1,000m/min (5,000min^{-1})	1,500m/min (7,500min^{-1})
进给速度 Feed	3,000mm/min (0.1mm/t)	4,500mm/min (0.1mm/t)
切削深度 Depth of Cut	ap=2mm ae=34mm	ap=0.2mm ae=34mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT30) Horizontal Machining Center	
加工面粗度 Surface Roughness	Ra=0.08μm Rz=0.7μm	Ra=0.05μm Rz=0.3μm





在BT30的小型加工中心上进行半精加工、精加工。两种加工出的面精度都在要求以内。并且可以将半精加工、精加工的两刀缩减为一刀，从而缩短加工时间。

Semi-finishing and finishing took place with the BT30 small machining center. The PFAL cutter was able to meet the required surface roughness in both processes. Moreover, the number of passes was reduced from 2 to 1 during both semi-finishing and finishing, shortening machining time.

■切切屑形状解析 Analysis of Cutting Chip Shape

正因为是铝制刀体，所以想要防止切屑与刀体接触

The aluminum cutter body must avoid direct contact with cutting chips

排屑的示意图 Image of chip evacuation

切屑与刀体不接触!
The cutting chip does not come in direct contact with the body!

在刀片的容屑槽内处理切屑，与铝制刀体无接触。

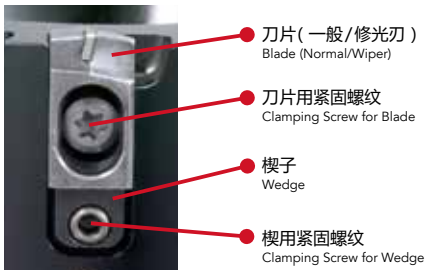
Cutting chips are processed through the blade's chip pocket to prevent them from coming into contact with the aluminum cutter body.

Technical Data

■技术资料 Technical Data

■ 刀尖高度调整顺序 Instructions for Adjusting the Cutting Edge Height

■各部位名称
Names of Components



Ⓐ T型扳手 (T25-T)
T-Wrench

Ⓑ L型扳手 (3MM-L)
L-Wrench

❶确认楔子
Confirm Wedge Position

确认楔子的表面与刀体外周面对齐。
Check and ensure that all wedges are in the correct position. Make adjustments when necessary.

○ 正 Correct

× 誤 Incorrect

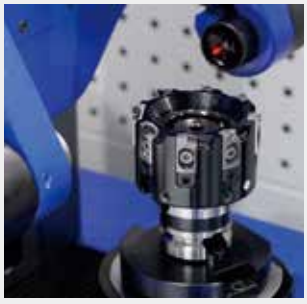
❷普通刀片/修光刃刀片的装卸
Mounting of Blades

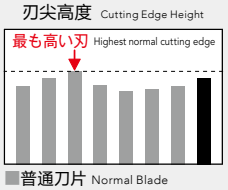
2种刀片用10N·m的扭矩拧紧。
修光刃刀片在刀体上有安装标记的地方装夹。
Mount one wiper blade (FR1204-W) to the wiper blade position indicator and the normal blades (FR1204 or FR1206) to the remaining positions.
Using the T-Wrench (Ⓐ), tighten the clamp screw completely to 10N·m.

※使用附件T型扳手(A)。确保刀体接触面与楔子紧贴，边用手指压住刀片边拧紧。

❸刃尖高度的测定
Measurement of Cutting Edge Height

测定所有的刃尖高度，
确认普通刀片中最高的刀片。
Measure all of the cutting edge heights and determine the highest normal cutting edge.

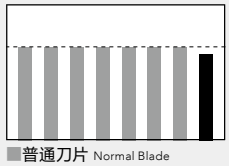




❹普通刀片的刃尖高度调整
Adjustment of Normal Blades

以最高刃为基准，配合其他普通刀片的刃尖高度进行调整(推荐0.005mm以内)
Adjust all other normal cutting edges to match the highest normal cutting edge height. The offset should be within 0.005mm. To lift the wedges, use the L-Wrench (Ⓑ) to turn the wedge screw clockwise.

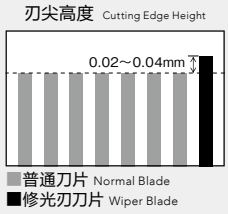
※使用附件的L型扳手(B)。



❺修光刃刀片的刃尖高度调整
Adjustment of Wiper Blade

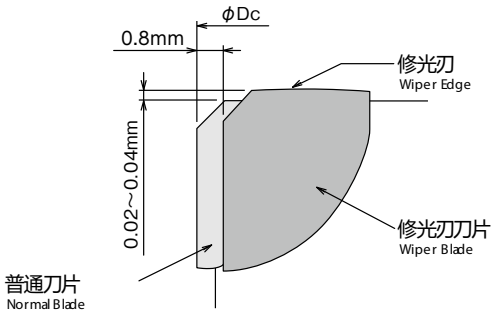
比普通刀片的刃尖高度调高0.02~0.04mm。
Use the L-Wrench(Ⓑ) to adjust the wiper blade so that it is 0.02 - 0.04mm higher than the other normal blades.

※使用附件的L型扳手(B)。



修光刃刀片的刃尖位置 Cutting Edge Position of the Wiper Blade

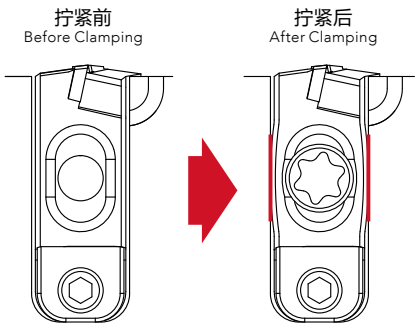
修光刃刀片相较于普通刀片，设定上缩进去月0.8mm 左右。这样可以使得底刃即使在高切深也能在提高精加工面上发挥效果。
The wiper blade is automatically set to be 0.8mm closer to the interior than the normal blade. Based on this design, only the bottom of the wiper edge is used during processing, thus enabling a high quality surface finish even in high depth (ap) milling.



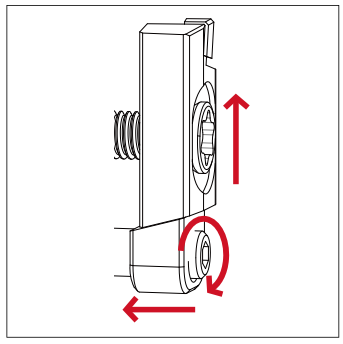
注意事项
Cautions during use

·只可在提高刃尖高度方向上调整
·可调整范围在0.6mm。
·接近调整范围上限，难以提高刃尖高度。这时，一旦取下刀片，请将楔子调回初始位置处再进行调整。(①楔子的确认)
·接触式探针触碰刃尖时，请注意不要破坏PCD刀片。
· Blades can be adjusted by lifting upward only.
· Maximum adjustment is 0.6mm.
· When the maximum adjustment limit is reached, remove the blade and start over from step ①.
· When measuring the edge height using a contact tool presetter with a touch probe, please be cautious to not damage the PCD edge.

■不要临时拧紧，在完全拧紧后就能调整刃尖高度，这样可以缩短调试时间。
Temporary tightening is not required. Cutting edge height can be adjusted after complete tightening of the clamping screw, making the setup process quick and effortless.



完全拧紧时，刀片两侧会鼓起将刀片与刀体多面固定。
The tightening of the clamping screw pushes sides of the blade outward, locking it tightly in place with the cutter body

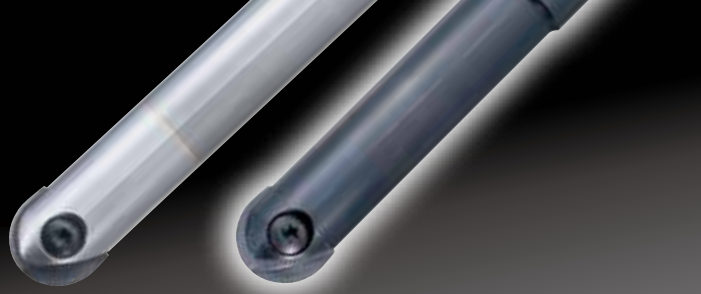


完全拧紧后，保证刀片锁死的状态下通过楔子顶部把刀片顶上去。由于刀片被下面的楔子顶着，所以在加工中不会晃动。
After tightening the clamping screw, the blade is locked into position secured by the wedge taper. The wedge assures a fix and unmovable blade position during machining.

Phoenix PFB

精加工用球头铣刀
Finishing Ball End Mill

Phoenix Finishing Ball

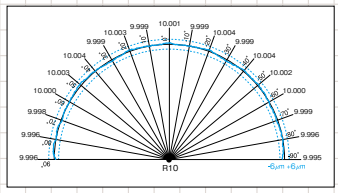


可转位式的精加工用球头型铣刀。
安装精度很高，所以能实现良好的加工面和长寿命。

The high precision mounting of the insert into the body enables a superior milling surface and long tool life.

■刀片特点
Features of Insert

- 高R精度　±6μm　High radius precision
- 锋利性良好的螺旋刃型　Spiral cutting edge with excellent sharpness



PFB-SP

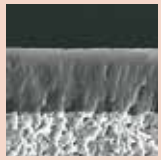
○ 对应从软钢到耐热合金广泛的加工材料
○ 锋利性与刃尖刚性兼备
○ 优良的耐崩刃损性

○ Applicable to a wide variety of work materials from mild steel to HRSA
○ Sharp but rigid cutting edge
○ Excellent chipping resistance

XP3320材质 Grade

- 面向钢材·不锈钢·铸铁的干式加工
- 对应耐热合金(湿式)

- For dry milling of steel, stainless steel, and cast iron
- For wet milling of HRSA



➡耐热性涂层
→Heat resistant coating
➡耐磨损性涂层
→Wear resistant coating

PFB-Q

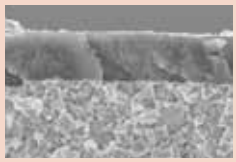
○ 有效切削刃角220°对应底切
○ 最外周部无直槽部，能对应易发生振动的深壁加工

○ Applicable to undercuts with 220° effective cutting edge angle
○ No straight cutting edge at the outer peripheral surface, which is applicable to standing wall milling that occurs chattering

XP3225材质 Grade

- 广泛加工材料的稳定加工
- 优良的润滑性，耐磨损性
- 钢·不锈钢的湿式加工

- For stable milling of a wide variety of work materials
- Excellent lubricity and wear resistance
- For wet milling of steel and stainless steel



PFB-SH

○ 最适于铸铁·球墨铸铁·高硬度钢的高刚性刃型
○ 刃尖的特殊处理提高强度
○ 采用耐磨损性高的硬质合金母材

○ For milling cast iron, ductuile iron and HRSA
○ Strong cutting edge by the special processing
○ Highly resistant carbide material

XP3310材质 Grade

- 最适于高硬度钢·铸铁的干式加工
- 优良的耐热性，耐磨损性

- Ideal for dry milling of high hardened steel and cast iron
- Excellent heat and wear resistance

PFB-D

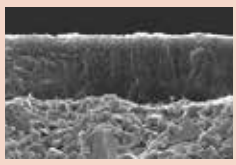
○ 最适于石墨加工的重视锋利性的专用刃型
○ 采用附着度优良的金刚石涂层专用硬质合金母材

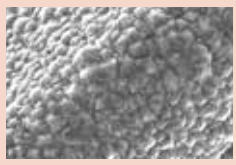
○ Sharp cutting edge specialized for milling graphite
○ Highly adhesive carbide material for diamond coating

XC4505材质 Grade

- 非铁金属加工
- 最适于石墨加工的金刚石涂层

- For milling nonferrous material
- Optimal diamond coating for milling graphite





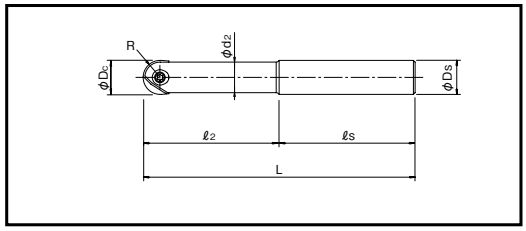
精加工用球头铣刀
Finishing Ball End Mill

PFB

成形加工 Profile Milling

Specification

■形状尺寸表 Specification



钢制刀柄 Steel Shank

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	全长 L	有效长		刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
					颈长 ℓ2	L/D					
7801400	PFB-R080SS08-S120	8	4	120	36	4.5	2	8	84	7	②
7801401	PFB-R100SS10-S130	10	5	130	45	4.5	2	10	85	9	③
7801402	PFB-R120SS12-S130	12	6	130	54	4.5	2	12	76	11	④
7801403	PFB-R160SS16-S140	16	8	140	64	4	2	16	76	14	⑤
7801404	PFB-R200SS20-S160	20	10	160	80	4	2	20	80	18	⑥
7801405	PFB-R250SS25-S160	25	12.5	160	75	3	2	25	85	22	⑦
7801406	PFB-R300SS32-S170	30	15	170	90	3	2	32	80	27	⑧
7801407	PFB-R320SS32-S180	32	16	180	96	3	2	32	84	29	⑨

硬质合金刀柄 短刃型 Carbide Shank, Short Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	全长 L	有效长		刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
					颈长 ℓ2	L/D					
7801429	PFB-R060SS06-S80CS	6	3	80	15	2.5	2	6	65	5.4	①
7801430	PFB-R080SS08-S100CS	8	4	100	20	2.5	2	8	80	7	②
7801431	PFB-R100SS10-S100CS	10	5	100	25	2.5	2	10	75	9	③
7801432	PFB-R120SS12-S110CS	12	6	110	30	2.5	2	12	80	11	④
7801433	PFB-R160SS16-S140CS	16	8	140	40	2.5	2	16	100	14	⑤
7801434	PFB-R200SS20-S160CS	20	10	160	50	2.5	2	20	110	18	⑥
7801435	PFB-R250SS25-S160CS	25	12.5	160	62.5	2.5	2	25	97.5	22	⑦
7801436	PFB-R300SS32-S170CS	30	15	170	75	2.5	2	32	95	27	⑧
7801437	PFB-R320SS32-S180CS	32	16	180	80	2.5	2	32	100	29	⑨

NEXT

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix

精加工用球头铣刀

Finishing Ball End Mill

PFB

Specification

FROM

硬质合金刀柄 长刃型 Carbide Shank, Long Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	全长 L	有效长		刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
					颈长 ℓ2	L/D					
7801439	PFB-R060SS06-L100CS	6	3	100	30	5	2	6	70	5.4	①
7801440	PFB-R080SS08-L120CS	8	4	120	40	5	2	8	80	7	②
7801441	PFB-R100SS10-L130CS	10	5	130	50	5	2	10	80	9	③
7801442	PFB-R120SS12-L140CS	12	6	140	60	5	2	12	80	11	④
7801443	PFB-R160SS16-L160CS	16	8	160	72	4.5	2	16	88	14	⑤
7801444	PFB-R200SS20-L180CS	20	10	180	90	4.5	2	20	90	18	⑥
7801445	PFB-R250SS25-L200CS	25	12.5	200	100	4	2	25	100	22	⑦
7801446	PFB-R300SS32-L220CS	30	15	220	120	4	2	32	100	27	⑧
7801447	PFB-R320SS32-L230CS	32	16	230	128	4	2	32	102	29	⑨

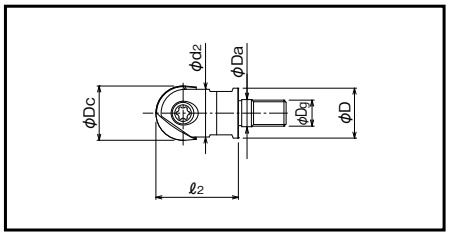
硬质合金刀柄 超长刃型 Carbide Shank, Extra Long Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	全长 L	有效长		刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
					颈长 ℓ2	L/D					
7801419	PFB-R060SS06-LL120CS	6	3	120	42	7	2	6	78	5.4	①
7801420	PFB-R080SS08-LL140CS	8	4	140	56	7	2	8	84	7	②
7801421	PFB-R100SS10-LL150CS	10	5	150	70	7	2	10	80	9	③
7801422	PFB-R120SS12-LL160CS	12	6	160	84	7	2	12	76	11	④
7801423	PFB-R160SS16-LL200CS	16	8	200	96	6	2	16	104	14	⑤
7801424	PFB-R200SS20-LL240CS	20	10	240	120	6	2	20	120	18	⑥
7801425	PFB-R250SS25-LL260CS	25	12.5	260	137.5	5.5	2	25	122.5	22	⑦
7801426	PFB-R300SS32-LL290CS	30	15	290	165	5.5	2	32	125	27	⑧
7801427	PFB-R320SS32-LL300CS	32	16	300	176	5.5	2	32	124	29	⑨

NEXT

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).



FROM

螺纹安装型 Screw Fit Type

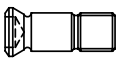
单位:mm Unit:mm

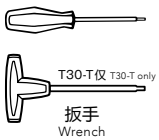
商品号 EDP No.	名称 Designation	外径 Dc	刃数 Z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	颈径 d2	端面直径 D	刀体尺寸 Body Size
7801490	PFB-R100SF6	10	2	6.5	6	7	26	9	9	③
7801491	PFB-R120SF6	12	2	6.5	6	7	26	11	11	④
7801492	PFB-R160SF8	16	2	8.5	8	10	32	14	14.5	⑤
7801493	PFB-R200SF10	20	2	10.5	10	14	38	18	18	⑥
7801494	PFB-R250SF12	25	2	12.5	12	17	38	22	23	⑦
7801495	PFB-R300SF16	30	2	17	16	22	43	27	28	⑧

刀具夹具，刀柄请参考 P.162~
Please see p.162- for shank holders.

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀体尺寸 Applicable Body	推荐连接扭矩 Recommended Tightening Torque
 固定螺丝 Clamping Screw	7808124	FS20652RB	①	0.8 N·m
	7808123	FS25669RB	②	1N·m
	7808117	FS30686RB	③	1.2 N·m
	7808118	FS35610RB	④	2N·m
	7808119	FS40613RB	⑤	3N·m
	7808120	FS50615RB	⑥	5N·m
	7808121	FS60620RB	⑦	5N·m
	7808122	FS80624RB	⑧, ⑨	6N·m

	商品号 EDP No.	名称 Designation	适用刀体尺寸 Applicable Body
 T30-T仅 T30-T only 扳手 Wrench	7808203	T6-D	①
	7808204	T7-D	②
	7808205	T8-D	③
	7808207	T10-D	④
	7808208	T15-D	⑤
	7808209	T20-D	⑥, ⑦
	7808212	T30-T	⑧, ⑨

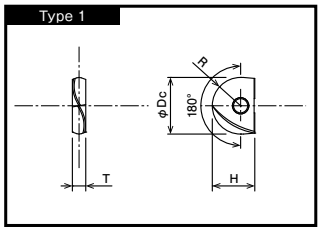
扳手请另购。 The wrenches are sold separately from the cutters.

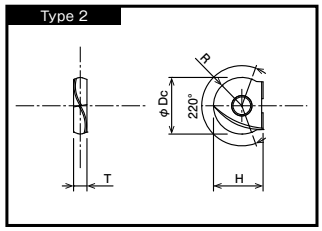
Phoenix

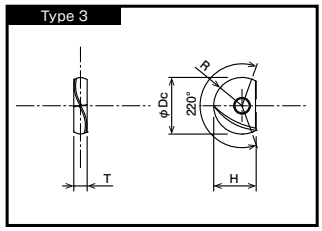
精加工用球头铣刀
Finishing Ball End Mill

PFB刀片
Inserts

Inserts

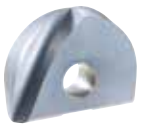






■适用刀片 Inserts

单位:mm Unit:mm

形状 Appearance	名称 Designation	切削刃数 No. of Cutting Edges	有效R角度 Range Deg°	刀片尺寸 Insert Size 外径 Dc	球半径 R	厚度 T	高度 H	形状类型 Type	库存 Stock	涂层种类 Grade of Coated Materials XP3225	XP3310	XP3320	XC4505
 螺旋槽型 Spiral Type	PFB080-SP	2	180	8	4	2.4	7	1	②	7820030		7820010	
	PFB100-SP			10	5	2.6	8.5		③	7820031		7820011	
	PFB120-SP			12	6	3	10		④	7820032		7820012	
	PFB160-SP			16	8	4	12		⑤	7820033		7820013	
	PFB200-SP			20	10	5	15		⑥	7820034		7820014	
	PFB250-SP			25	12.5	6	18.5		⑦	7820035		7820015	
	PFB300-SP			30	15	7	22.5		⑧	7820036		7820016	
 螺旋槽型（球形状） Spiral Type (Full Radius Type)	PFB060-Q	2	220	6	3	2	5	2	①	7820048			
	PFB070-Q			7	3.5	2	5.5		①	7820049			
	PFB080-Q			8	4	2.4	7		②	7820050			
	PFB100-Q			10	5	2.6	8.5		③	7820051			
	PFB120-Q			12	6	3	10		④	7820052			
	PFB160-Q			16	8	4	12	3	⑤	7820053			
	PFB200-Q			20	10	5	15		⑥	7820054			
	PFB250-Q			25	12.5	6	18.5		⑦	7820055			
	PFB300-Q			30	15	7	22.5		⑧	7820056			
 螺旋槽型（刃尖强化） Spiral Type (Reinforced Edge Type)	PFB060-SH	2	220	6	3	2	5	2	①		7820039		
	PFB080-SH		180	8	4	2.4	7	1	②		7820040		
	PFB100-SH			10	5	2.6	8.5		③		7820041		
	PFB120-SH			12	6	3	10		④		7820042		
	PFB160-SH			16	8	4	12		⑤		7820043		
	PFB200-SH			20	10	5	15		⑥		7820044		
	PFB250-SH			25	12.5	6	18.5		⑦		7820045		
	PFB300-SH			30	15	7	22.5		⑧		7820046		
	PFB320-SH			32	16	7	23.5		⑨		7820047		
 螺旋槽型（金刚石涂层） Spiral Type (Diamond Coated)	PFB060-D	2	220	6	3	2	5	2	①				7820018
	PFB070-D			7	3.5	2	5.5		①				7820019
	PFB080-D		180	8	4	2.4	7	1	②				7820020
	PFB100-D			10	5	2.6	8.5		③				7820021
	PFB120-D			12	6	3	10		④				7820022
	PFB160-D			16	8	4	12		⑤				7820023
	PFB200-D			20	10	5	15		⑥				7820024
	PFB250-D			25	12.5	6	18.5		⑦				7820025
	PFB300-D			30	15	7	22.5		⑧				7820026

库存种类都为C（即标准库存品）。 Stock are categorized as C (Standard stock item).

精加工用球头铣刀
Finishing Ball End Mill

PFB

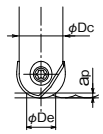
Cutting Conditions

■切削深度及实际加工直径(φDe)基准表 Chart of cutting depth and actual cutting diameter

单位:mm Unit:mm

ap(切削深度) Depth of cut		实际加工直径（φDe) Actual cutting diameter														
外径 Dc	球半径 R	0.1	0.2	0.3	0.4	0.5	0.8	1	1.5	2	2.5	3	3.5	4	4.5	5
6	3	1.5	2.2	2.6	3	3.3	4.1									
7	3.5	1.6	2.3	2.8	3.3	3.6	4.5									
8	4	1.8	2.5	3	3.5	3.9	4.8									
10	5	2	2.8	3.4	3.9	4.4	5.4	6	7.1							
12	6	2.2	3.1	3.7	4.3	4.8	6	6.6	7.9	8.9						
16	8	2.5	3.6	4.3	5	5.6	7	7.7	9.3	10.6	11.6					
20	10	2.8	4	4.9	5.6	6.2	7.8	8.7	10.5	12	13.2	14.3	15.2			
25	12.5	3.2	4.5	5.4	6.3	7	8.8	9.8	11.9	13.6	15	16.2	17.3	18.3		
30	15	3.5	4.9	6	6.9	7.7	9.7	10.8	13.1	15	16.6	18	19.3	20.4	21.4	22.4
32	16	3.6	5	6.2	7.1	7.9	10	11.1	13.5	15.5	17.2	18.7	20	21.2	22.2	23.2

●实际加工直径 How to determine actual cutting diameter



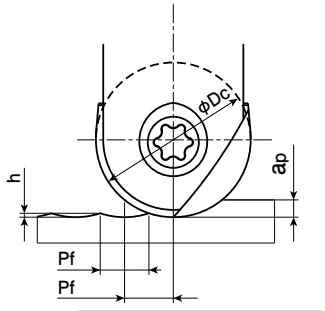
$$De=2\sqrt{ap\times(Dc-ap)}$$

■推荐的进给量及表面加工粗糙度 Recommended pick feed and milling surface roughness

单位:mm Unit:mm

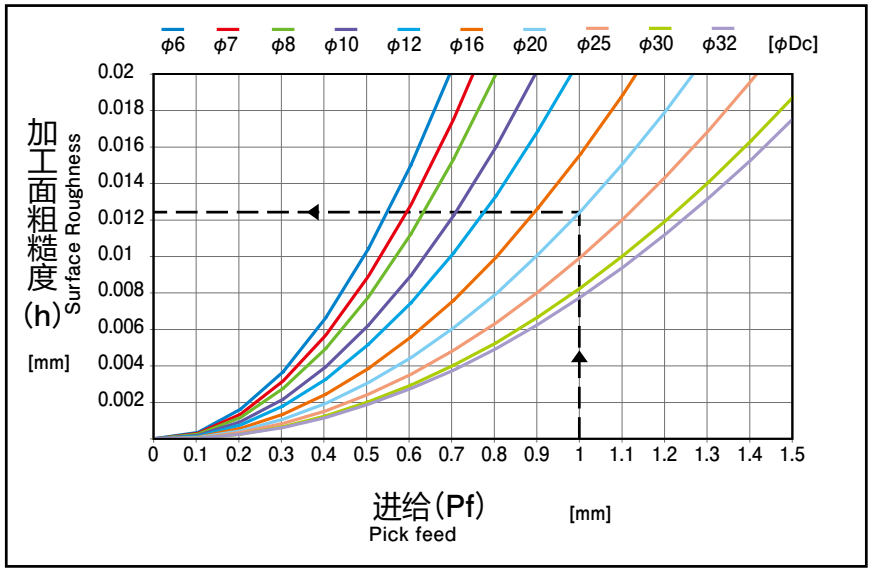
外径 Dc	6	7	8	10	12	16	20	25	30	32
进给 Pf	0.4	0.45	0.5	0.6	0.7	0.8	1	1.2	1.3	1.4
表面加工粗糙度 h	0.007	0.007	0.008	0.009	0.01	0.01	0.012	0.014	0.014	0.015

■理论上的加工面粗糙度 Theoretical milling surface roughness



$$h=0.5\times(Dc-\sqrt{Dc^2-Pf^2})$$

例） Dc=20mm
Pf= 1mm
→h=0.0125mm



Phoenix

精加工用球头铣刀
Finishing Ball End Mill

PFB

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片材质 Insert Grades	形状 Appearance	P	M	K	N	S	H
XP3320	PFB-SP	○	○	○		◎	○
XP3225	PFB-Q	◎	◎		◎*1	○	
XP3310	PFB-SH			◎			◎
XC4505	PFB-D				◎*2		

*1 铝合金,铜合金的第一推荐 Best recommended for aluminum and copper alloy applications
*2 石墨,CFRP的第一推荐 Best recommended for graphite and CFRP applications

■切削条件基准表 Cutting Conditions

PFB-SP · PFB-Q · PFB-SH

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	切深量 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 直径 Dc			
						φ6, 8	φ10, 12	φ16, 20	φ25~32
P	软钢、低炭素钢 Mild Steel, Carbon Steel	(SS400, S10C)	~ 180HB	300 (200~400)	0.02Dc	0.1	0.12	0.14	0.18
P	炭素钢、合金钢 Carbon Steel, Alloy Steel	(S50C, SCM440)	~ 280HB	300 (200~400)	0.02Dc	0.07	0.1	0.12	0.14
P	模具钢 Die Steel	(SKD61, SKD11)	~ 280HB	250 (150~350)	0.02Dc	0.07	0.1	0.12	0.14
M	不锈钢 Stainless Steel	(SUS304, SUS420)	~ 250HB	250 (150~350)	0.02Dc	0.07	0.12	0.14	0.17
K	铸铁 Cast Iron	(FC250)	~ 300N/mm²	400 (300~500)	0.02Dc	0.12	0.14	0.18	0.22
K	球墨铸铁 Ductile Cast Iron	(FCD400)	~ 600N/mm²	300 (200~400)	0.02Dc	0.1	0.12	0.14	0.18
N	铝合金 Aluminum Alloy		~ 13%Si	500 (400~600)	0.03Dc	0.12	0.14	0.18	0.22
N	铜合金 Copper Alloy	(C1100)	–	300 (200~400)	0.03Dc	0.11	0.13	0.17	0.2
S	超耐热合金(湿式) Superalloy (Wet)	(Inconel® 718)	–	50 (25~ 80)	0.015Dc	0.04	0.05	0.06	0.06
S	钛合金(湿式) Titanium Alloy (Wet)	(Ti-6Al-4V)	–	90 (40~120)	0.02Dc	0.06	0.08	0.11	0.13
H	预硬钢 Pre-hardened Steel	(NAK80, STAVAX)	40 ~ 43HRC	200 (100~300)	0.015Dc	0.06	0.07	0.08	0.1
H	铸件用钢 Die Cast Steel	(DAC-MAGIC, DH31)	43 ~ 48HRC	180 (90~200)	0.015Dc	0.05	0.06	0.07	0.07
H	调质钢 Hardened Steel	(SKD11)	50 ~ 60HRC	150 (100~250)	0.01Dc	0.05	0.06	0.07	0.07

· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting conditions.

PFB-D

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	切深量 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 直径 Dc			
						φ6, 8	φ10, 12	φ16, 20	φ25~32
N	石墨 Graphite		–	500 (400~600)	0.03Dc	0.14	0.17	0.21	0.25
N	复合材料 Carbon Fiber Reinforced Plastic	(CFRP)	–	400 (300~500)	0.03Dc	0.11	0.13	0.17	0.2

·上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting conditions.

Cutting Data

■加工数据 Cutting Data

叶片的翼面精加工 现场数据 Field data of finish milling of turbine blades

使用工具 Tool	PFB-R120SS12-LL160CS (R6×2刃)
使用刀片(材质) Insert (grade)	PFB120-Q (XP3225)
零件名 Work	叶片 Turbine Blade
加工材料 Work Material	SUS410J1相当 Equivalent
切削速度 Cutting Speed	120m/min (3,185min^{-1})
进给速度 Feed	1,911mm/min (0.3mm/t)
加工方法 Milling Method	仿型加工 Profiling Milling
切削深度 Depth of Cut	ap=0.12mm Pf=0.7mm
切削油剂 Coolant	不水溶性切削油剂 Non-Water-Soluble
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center

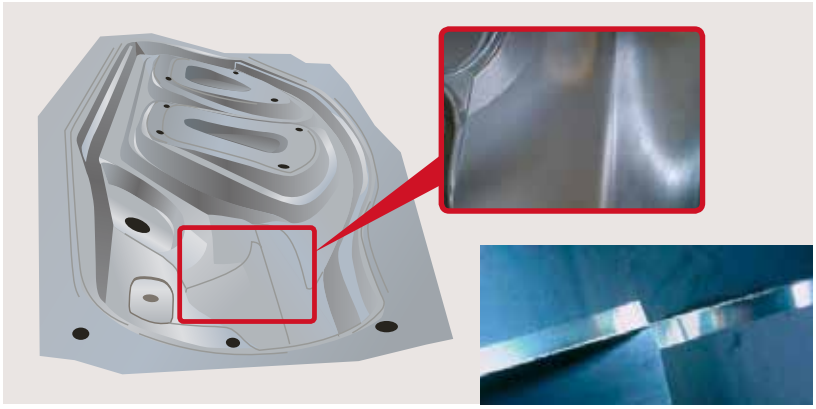
加工1,248分钟后的刃尖状态
Cutting edge after 1,248 minutes of milling.

1248分钟加工后的后刀面的磨损量为0.06mm，从加工开始到结束，其加工面没有任何变化，一直能得到很光泽的良好加工面。

The amount of flank wear after 1,248 minutes. milling was 0.02mm. The machined face had been stably favorable and bright during the operation.

相当于FCD700材质的大型冲压模具精加工 现场数据 Field data of finishing milling on large press die of FCD700

使用工具 Tool	PFB-R300SS32-LL290CS (R15×2刃)
使用刀片(材质) Insert (grade)	PFB300-SH (XP3310)
零件名 Work	侧板 Side panel outer
加工材料 Work Material	GGG70L (FCD700相当) Equivalent
切削速度 Cutting Speed	565m/min (6,000min^{-1})
进给速度 Feed	5,600mm/min (0.47mm/t)
加工方法 Milling Method	仿型加工 Profiling Milling
切削深度 Depth of Cut	ap=0.17mm Pf=0.5mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	龙门加工中心(BT50) Double Column Machining Center



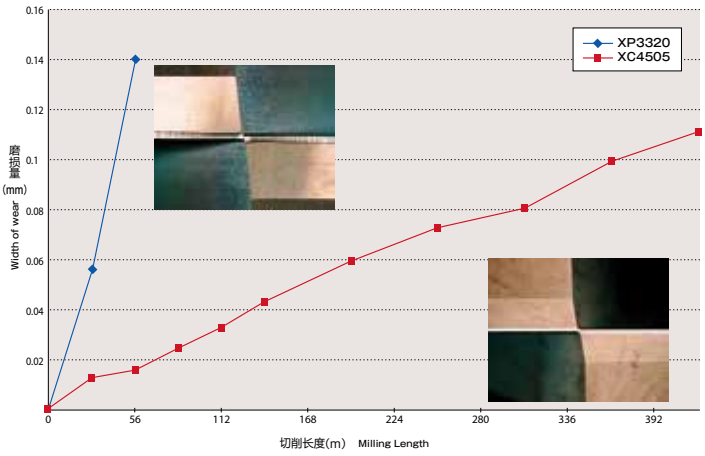
加工51小时后的刃尖状态
Cutting edge after 51 hours of milling

51个小时加工后的刃部没有崩刃，磨损状态良好。检测工件所有部分都满足形状和精度的要求，加工面的光洁度良好。

Reasonable wear and no chipping of cutting edge occurred after 51 hours of machining. All points of the work material met the required form accuracy, and the shiny machined surface was achieved.

金刚石涂层令人震撼的耐久性 Surprising durability of the diamond coating

使用工具 Tool	PFB-R250SS25-S160 (R12.5×2刃)	
使用刀片(材质) Insert (grade)	PFB250-SP (XP3320)	PFB250-D (XC4505)
加工材料 Work Material	石墨 Graphite	
切削速度 Cutting Speed	220m/min (2,800min^{-1})	
进给速度 Feed	560mm/min (0.1mm/t)	
加工方法 Milling Method	啄钻加工 Pick Milling	
切削深度 Depth of Cut	ap=12.5mm Pf=0.2mm	
切削油剂 Coolant	无 None	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	



可以体现出石墨加工中金刚石涂层的优势。

Diamond coating showed its superiority in machining graphite.

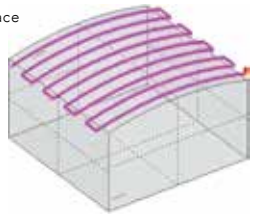
Cutting Data

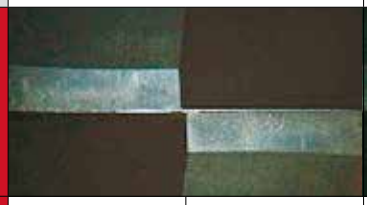
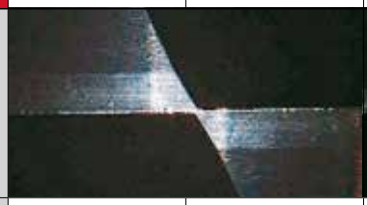
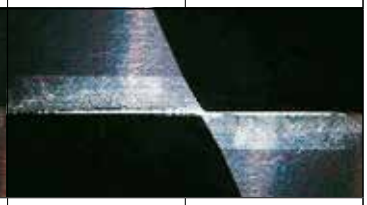
■加工数据 Cutting Data

SUH600的叶片加工(磨损量的比较) Milling of a SUH600 blade (Comparison of tool wear)

使用工具 Tool	PFB-R200SS20-S160 (R10×2刃)
使用刀片(材质) Insert (grade)	PFB200-SP (XP3320)
零件名 Work	叶片模架 Blade Sample Model
加工材料 Work Material	SUH600相当品 Equivalent
刀具悬伸 Overhang Length	110mm
切削速度 Cutting Speed	94m/min (1,500min^{-1})
进给速度 Feed	2,000mm/min (0.67mm/t)
加工方法 Milling Method	仿型加工 Profiling Milling
切削深度 Depth of Cut	ap=0.2mm Pf=1mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

工件表面 R300
Workpiece top surface



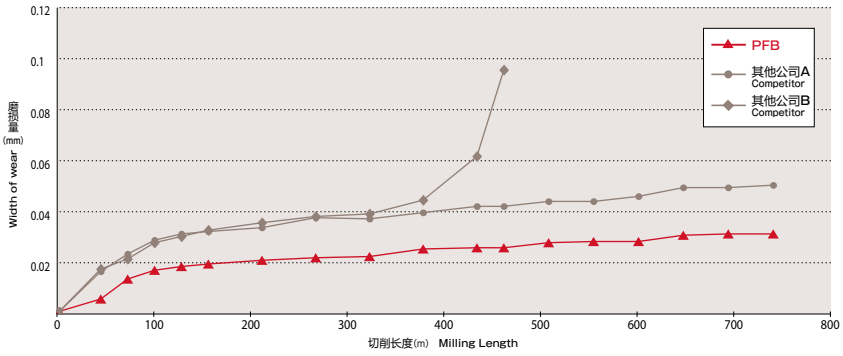
加工时间 Time	70分钟 minutes		140分钟 minutes	
切削长度 Milling Length	100m		200m	
PFB				
磨损量(mm) Wear amount	0.033	0.030	0.041	0.043
其他公司 Competitor				
磨损量(mm) Wear amount	0.032	0.033	0.070	0.071

200m 加工结束时,PFB 的磨损量比其他公司产品少1/2
In comparison to competitor products, the PFB has half the amount of tooling wear after machining 200m.

S50C的30°倾斜面加工 S50C at 30°inclined surface machining

使用工具 Tool	PFB-R200SS20-S160 (R10×2刃)
使用刀片(材质) Insert (grade)	PFB200-SP (XP3225)
加工材料 Work Material	S50C
刀具悬伸 Ovehang Length	80mm
切削速度 Cutting Speed	300m/min (4,800min^{-1})
进给速度 Feed	1,344mm/min (0.14mm/t)
加工方法 Milling Method	直线加工 倾斜度30° Straight line pick 30-degree inclination
切削深度 Depth of Cut	ap=0.1mm Pf=0.5mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center

XP3225刚开始加工时的磨损量比其他公司产品小,也没有突发性的崩刃,加工很稳定。
The XP3225 is capable of achieving stable machining without abrupt interruptions and tool chipping. In comparison to competitor products, tooling wear on the XP3225 in the initial machining stage was minimal.



PFB	其他公司A 462m Competitor	其他公司B 836m Competitor
		
		

FC250的模具镶块加工 Machining die insert with FC250

使用工具 Tool	PFB-R200SS20-LL240CS (R10×2刃)
使用刀片(材质) Insert (grade)	PFB200-SH (XP3310)
零件名 Work	模具镶块 Die Insert
加工材料 Work Material	FC250
刀具悬伸 Overhang Length	160mm
切削速度 Cutting Speed	345m/min (5,500min^{-1})
进给速度 Feed	4,000mm/min (0.36mm/t)
加工方法 Cutting Method	仿型加工、等高线加工 Profile Milling, Contour Milling
切削深度 Depth of Cut	ap=0.2mm Pf=0.25mm
切削油剂 Coolant	无(气冷式) Air Brow
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center

加工完成后的刃尖状态
Cutting edge after milling

与其他公司产品相比，光泽面和加工工件精度都得到提高。
The finished surface and accuracy increased compared by the competition.

PFB-D的石墨电极加工 Machining graphite electrode with PFB-D

使用工具 Tool	PFB-R160SS16-LL200CS (R8×2刃)	PFB-R080SS08-LL140CS (R4×2刃)
使用刀片(材质) Insert (grade)	PFB160-D (XC4505)	PFB080-D (XC4505)
加工材料 Work Material	模具镶块 Graphite electrode	
刀具悬伸 Overhang Length	120mm (7.5D)	110mm (13.75D)
切削速度 Cutting Speed	400m/min (8,000min^{-1})	100m/min (4,000min^{-1})
进给速度 Feed	8,000mm/min (0.5mm/t)	2,160mm/min (0.27mm/t)
加工方法 Cutting Method	仿型加工、等高线加工 Profile and Contour Milling	
切削深度 Depth of Cut	ap=8mm Pf=12mm	ap=0.3mm Pf=0.24mm
切削油剂 Coolant	无 None	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	

YouTube
OSGJAPAN PFB 検索

SKD11的模具镶块加工 Die insert with SKD11

使用工具 Tool	PFB-R100SS10-LL150CS (R5×2刃)
使用刀片(材质) Insert (grade)	PFB100-SP (XP3320)
零件名 Work	金型入れ子 Die Insert
加工材料 Work Material	SKD11相当品 (58HRC) Equivalent
工具悬长 Overhang Length	80mm
切削速度 Cutting Speed	200m/min (8,000min^{-1})
切削速度 Feed	2,000mm/min (0.125mm/t)
加工方法 Cutting Method	仿型加工、等高线加工 Profile Milling, Contour Milling
切削深度 Depth of Cut	ap=0.1mm Pf=0.2mm
切削油剂 Coolant	无(气冷式) Air Brow
使用机械 Machine	立式加工中心(HSK40) Vertical Machining Center

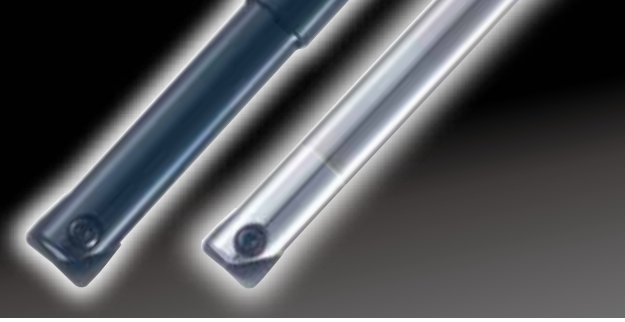
加工7小时后的刃尖状况
Cutting edge after 7 hours of milling

加工后刃尖无异常损伤。加工面也比其他公司产品好。
Cutting edge had normal wear without abnormal damage after finishing 7 hours of machining. Finished surface was much smoother and consistant versus competiton.

Phoenix PFR

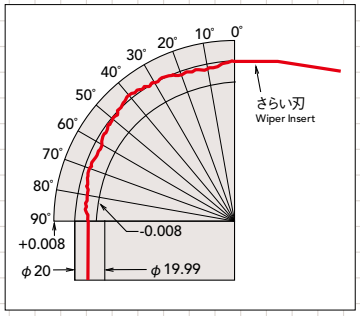
精加工用圆弧角铣刀
Finishing Radius End Mill

Phoenix Finishing Radius End Mill



■刀片特点
Features of Insert

- 高圆弧角R精度 ±8μm
  High corner radius precision
- 外径许容差 −0.02mm
  Tolerance for outer diameter
- 底刃处有修光刃
  Wiper insert at the end cutting edge
- 特殊处理使得刃尖强度得到提高
  Strong cutting edge by the special processing



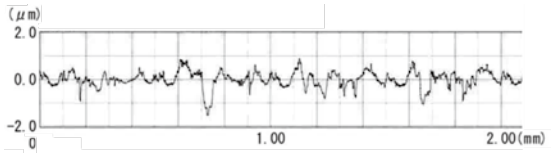
■高刚性刀身
Highly rigid cutter body

○ 实现稳定加工的高精度·高刚性刀身
Highly accurate and rigid cutter body for stable milling

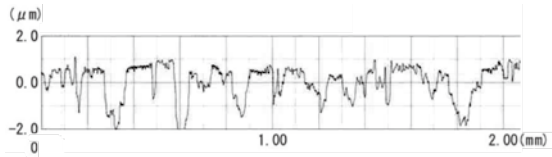
○ 与PFB刀身可通用(容易发生切屑缠绕的壁铣等加工，推荐使用后角较大的PFB刀身)
Inserts can be attached to PFB cutter body (For milling standing wall, PFB body, which has a bigger clearance, is recommended).

【精加工面粗度曲线】Finished surface roughness curve

PFR



其他公司 Competitor



PFR-ST

○ 对应从软钢到耐热合金广泛的加工材料
○ 最适于悬长长的加工
○ 锋利性及吃入性良好的正前角刃型

○ Applicable to a wide variety of work materials from mild steel to HRSA
○ Ideal for milling with long overhangs (L/D≧5)
○ Positive rake angle with excellent sharpness and bite

XP3225材種 Grade

・面向广泛加工材料的稳定加工
・优良的润滑性、耐磨损性

・For stable milling of a wide variety of work materials
・Excellent lubricity and wear resistance

PFR-SH

○ 最适于铸铁、球墨铸铁、高硬度钢加工
○ 底刃有副刃可提高刃尖强度，并在不稳定的环境下稳定加工
○ 采用耐磨损性高的硬质合金母材

○ For milling cast iron, ductuile iron and HRSA
○ High rigid cutting edge with two-dimensional negative chamfer, which is applicable to unstable machining conditions
○ Highly resistant carbide material

XP3310材種 Grade

・最适于高硬度钢·铸铁的干式加工
・优良的耐热性、耐磨损性

・Ideal for dry milling of high hardened steel and cast iron
・Excellent heat resistance and wear resistance

PFR-D

○ 重视锋利性、最适于石墨加工专用刃型
○ 采用附着力优良的金刚石涂层专用硬质合金母材

○ Sharp cutting edge specialized for milling graphite
○ Highly adhesive carbide material for diamond coating

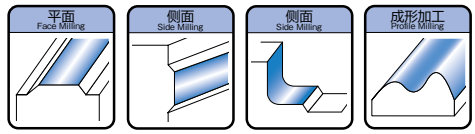
XC4505材種 Grade

・面向非铁金属
・最适于石墨加工的金刚石涂层

・For milling nonferrous material
・Optimal diamond coating for milling graphite

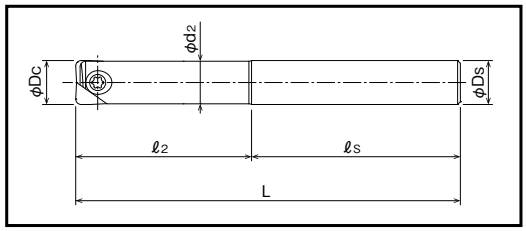
精加工用圆弧角铣刀
Finishing Radius End Mill

PFR



Specification

■形状尺寸表 Specification



钢制刀柄 Steel Shank

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效长		刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
				颈长 ℓ2	L/D					
7832000	PFR-R080SS08-S120	8	120	36	4.5	2	8	84	7.5	②
7832001	PFR-R100SS10-S130	10	130	45	4.5	2	10	85	9.5	③
7832002	PFR-R120SS12-S130	12	130	54	4.5	2	12	76	11.5	④
7832003	PFR-R160SS16-S140	16	140	64	4	2	16	76	15.5	⑤
7832004	PFR-R200SS20-S160	20	160	80	4	2	20	80	19.5	⑥
7832005	PFR-R250SS25-S160	25	160	75	3	2	25	85	24.5	⑦
7832006	PFR-R300SS32-S170	30	170	90	3	2	32	80	29.5	⑧
7832007	PFR-R320SS32-S180	32	180	96	3	2	32	84	31.5	⑨

硬质合金刀柄 短刃型 Carbide Shank, Short Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效长		刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
				颈长 ℓ2	L/D					
NEW 7832029	PFR-R060SS06-S80CS	6	80	15	2.5	2	6	65	5.4	①
7832030	PFR-R080SS08-S100CS	8	100	20	2.5	2	8	80	7.5	②
7832031	PFR-R100SS10-S100CS	10	100	25	2.5	2	10	75	9.5	③
7832032	PFR-R120SS12-S110CS	12	110	30	2.5	2	12	80	11.5	④
7832033	PFR-R160SS16-S140CS	16	140	40	2.5	2	16	100	15.5	⑤
7832034	PFR-R200SS20-S160CS	20	160	50	2.5	2	20	110	19.5	⑥
7832035	PFR-R250SS25-S160CS	25	160	62.5	2.5	2	25	97.5	24.5	⑦
7832036	PFR-R300SS32-S170CS	30	170	75	2.5	2	32	95	29.5	⑧
7832037	PFR-R320SS32-S180CS	32	180	80	2.5	2	32	100	31.5	⑨

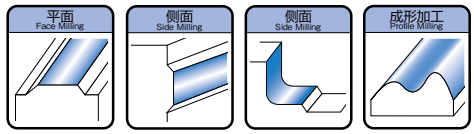
NEXT

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

Phoenix

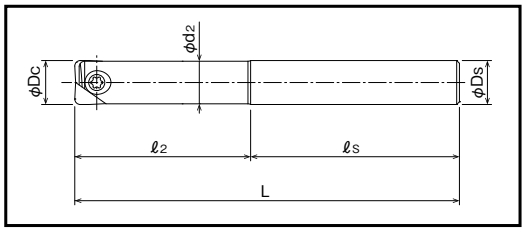
精加工用圆弧角铣刀
Finishing Radius End Mill

PFR



Specification

■形状尺寸表 Specification



FROM

硬质合金刀柄 长刃型 Carbide Shank, Long Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效长 颈长 ℓ2	有效长 L/D	刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
NEW 7832039	PFR-R060SS06-L100CS	6	100	30	5	2	6	70	5.4	①
7832040	PFR-R080SS08-L120CS	8	120	40	5	2	8	80	7.5	②
7832041	PFR-R100SS10-L130CS	10	130	50	5	2	10	80	9.5	③
7832042	PFR-R120SS12-L140CS	12	140	60	5	2	12	80	11.5	④
7832043	PFR-R160SS16-L160CS	16	160	72	4.5	2	16	88	15.5	⑤
7832044	PFR-R200SS20-L180CS	20	180	90	4.5	2	20	90	19.5	⑥
7832045	PFR-R250SS25-L200CS	25	200	100	4	2	25	100	24.5	⑦
7832046	PFR-R300SS32-L220CS	30	220	120	4	2	32	100	29.5	⑧
7832047	PFR-R320SS32-L230CS	32	230	128	4	2	32	102	31.5	⑨

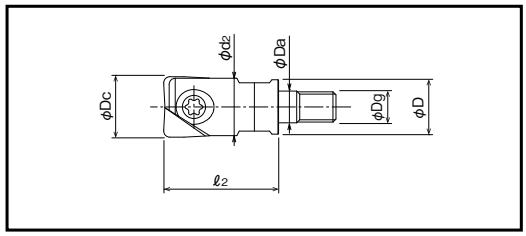
硬质合金刀柄 超长刃型 Carbide Shank, Extra Long Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	全长 L	有效长 颈长 ℓ2	有效长 L/D	刃数 z	柄径 Ds	柄长 ℓs	颈径 d2	刀体尺寸 Body Size
NEW 7832019	PFR-R060SS06-LL120CS	6	120	42	7	2	6	78	5.4	①
7832020	PFR-R080SS08-LL140CS	8	140	56	7	2	8	84	7.5	②
7832021	PFR-R100SS10-LL150CS	10	150	70	7	2	10	80	9.5	③
7832022	PFR-R120SS12-LL160CS	12	160	84	7	2	12	76	11.5	④
7832023	PFR-R160SS16-LL200CS	16	200	96	6	2	16	104	15.5	⑤
7832024	PFR-R200SS20-LL240CS	20	240	120	6	2	20	120	19.5	⑥
7832025	PFR-R250SS25-LL260CS	25	260	137.5	5.5	2	25	122.5	24.5	⑦
7832026	PFR-R300SS32-LL290CS	30	290	165	5.5	2	32	125	29.5	⑧
7832027	PFR-R320SS32-LL300CS	32	300	175	5.5	2	32	125	31.5	⑨

库存种类都为C(即标准库存品) Stock are categorized as C (Standard stock item).

■形状尺寸表 Specification



螺纹安装型 Screw Fit Type

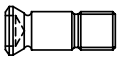
单位:mm Unit:mm

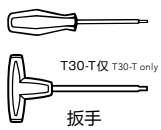
商品号 EDP No.	名称 Designation	外径 Dc	刃数 Z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	颈径 d2	端面直径 D	刀体尺寸 Body Size
7832090	PFR-R100SF6	10	2	6.5	6	7	26	9	9	③
7832091	PFR-R120SF6	12	2	6.5	6	7	26	11	11	④
7832092	PFR-R160SF8	16	2	8.5	8	10	32	15	14.5	⑤
7832093	PFR-R200SF10	20	2	10.5	10	14	38	19	18	⑥
7832094	PFR-R250SF12	25	2	12.5	12	17	38	24	23	⑦
7832095	PFR-R300SF16	30	2	17	16	22	43	29	28	⑧
7832096	PFR-R320SF16	32	2	17	16	22	43	31	28	⑨

刀柄夹具请参考 p.162
Please see p.162- for shank holders.

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Body	连接扭矩 Recommended Tightening Torque
 固定螺纹 Clamping Screw	7808124	FS20652RB	①	0.8 N·m
	7808123	FS25669RB	②	1N·m
	7808117	FS30686RB	③	1.2 N·m
	7808118	FS35610RB	④	2N·m
	7808119	FS40613RB	⑤	3N·m
	7808120	FS50615RB	⑥	5N·m
	7808121	FS60620RB	⑦	5N·m
	7808122	FS80624RB	⑧, ⑨	6N·m

	商品号 EDP No.	名称 Designation	适用刀具 Applicable Body
 T30-T仅 T30-T only 扳手 Wrench	7808203	T6-D	①
	7808204	T7-D	②
	7808205	T8-D	③
	7808207	T10-D	④
	7808208	T15-D	⑤
	7808209	T20-D	⑥, ⑦
	7808212	T30-T	⑧, ⑨

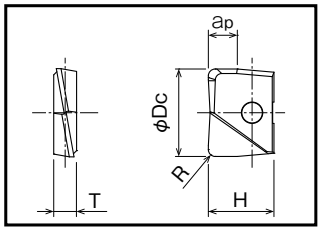
扳手请另购。 The wrenches are sold separately from the cutters.

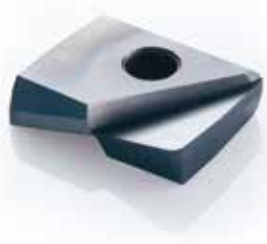
Phoenix

精加工用圆弧角铣刀
Finishing Radius End Mill

PFR 刀片
Inserts

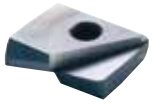
Inserts





■适用刀片(PFR-ST) Inserts

单位:mm Unit:mm

形状 Appearance	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size 外径 Dc	球半径 R	外周刃长 ap	厚度 T	高度 H	适用刀体类型 Applicable Body	涂层种类 Grade of Coated Materials XP3225	库存 Stock
 通用型 Multi-purpose Type	NEW PFR060R03-ST	2	6	0.3	2	2	5	①	7820350	C
	NEW PFR060R05-ST		6	0.5					7820351	C
	NEW PFR060R10-ST		6	1					7820352	C
	NEW PFR070R03-ST		7	0.3			5.5		7820353	C
	NEW PFR070R05-ST		7	0.5					7820354	C
	NEW PFR070R10-ST		7	1					7820355	C
	PFR080R03-ST		8	0.3	2.7	2.4	7	②	7820200	C
	PFR080R05-ST		8	0.5					7820201	C
	PFR080R10-ST		8	1					7820202	C
	PFR080R20-ST		8	2					7820203	C
	PFR100R03-ST		10	0.3	3.3	2.6	8.5	③	7820204	C
	PFR100R05-ST		10	0.5					7820205	C
	PFR100R10-ST		10	1					7820206	C
	PFR100R20-ST		10	2					7820207	C
	NEW PFR110R03-ST		11	0.3					7820356	C
	NEW PFR110R05-ST		11	0.5					7820357	C
	NEW PFR110R10-ST		11	1					7820358	C
	NEW PFR110R20-ST		11	2					7820359	C
	PFR120R03-ST		12	0.3	4	3	10	④	7820208	C
	PFR120R05-ST		12	0.5					7820209	C
	PFR120R10-ST		12	1					7820210	C
	PFR120R20-ST		12	2					7820211	C
	PFR120R30-ST		12	3					7820212	C
	NEW PFR130R03-ST		13	0.3					7820360	C
	NEW PFR130R05-ST		13	0.5					7820361	C
	NEW PFR130R10-ST		13	1					7820362	C
	NEW PFR130R20-ST		13	2					7820363	C

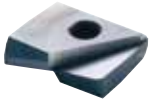
NEXT

C=标准库存品 C=Standard stock item

FROM

■适用刀片(PFR-ST) Inserts

单位:mm Unit:mm

形状 Appearance	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size 外径 Dc	球半径 R	外周刃长 ap	厚度 T	高度 H	适用刀体类型 Applicable Body	涂层种类 Grade of Coated Materials XP3225	库存 Stock
 通用加工 Multi-purpose Type	PFR160R03-ST	2	16	0.3	5.3	4	12	⑤	7820213	C
	PFR160R05-ST		16	0.5					7820214	C
	PFR160R10-ST		16	1					7820215	C
	PFR160R20-ST		16	2					7820216	C
	PFR160R30-ST		16	3					7820217	C
	NEW PFR170R03-ST		17	0.3					7820364	C
	NEW PFR170R05-ST		17	0.5					7820365	C
	NEW PFR170R10-ST		17	1					7820366	C
	NEW PFR170R20-ST		17	2					7820367	C
	PFR200R03-ST		20	0.3	6.7	5	15	⑥	7820218	C
	PFR200R05-ST		20	0.5					7820219	C
	PFR200R10-ST		20	1					7820220	C
	PFR200R20-ST		20	2					7820221	C
	PFR200R30-ST		20	3					7820222	C
	NEW PFR210R03-ST		21	0.3					7820368	C
	NEW PFR210R05-ST		21	0.5					7820369	C
	NEW PFR210R10-ST		21	1					7820370	C
	NEW PFR210R20-ST		21	2					7820371	C
	PFR250R03-ST		25	0.3	8.3	6	18.5	⑦	7820223	C
	PFR250R05-ST		25	0.5					7820224	C
	PFR250R10-ST		25	1					7820225	C
	PFR250R20-ST		25	2					7820226	C
	PFR250R30-ST		25	3					7820227	C
	NEW PFR260R03-ST		26	0.3					7820372	C
	NEW PFR260R05-ST		26	0.5					7820373	C
	NEW PFR260R10-ST		26	1					7820374	C
	NEW PFR260R20-ST		26	2					7820375	C
	PFR300R03-ST		30	0.3	10	7	22.5	⑧	7820228	C
	PFR300R05-ST		30	0.5					7820229	C
	PFR300R10-ST		30	1					7820230	C
	PFR300R20-ST		30	2					7820231	C
	PFR300R30-ST		30	3					7820232	C
	PFR320R03-ST		32	0.3	10.3	7	23.5	⑨	7820233	C
	PFR320R05-ST		32	0.5					7820234	C
	PFR320R10-ST		32	1					7820235	C
	PFR320R20-ST		32	2					7820236	C
	PFR320R30-ST		32	3					7820237	C

NEXT

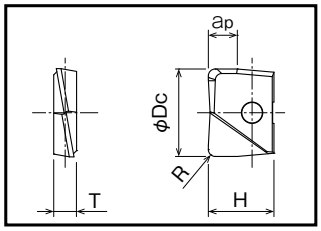
C=标准库存品 C=Standard stock item

Phoenix

精加工用圆弧角铣刀
Finishing Radius End Mill

PFR 刀片
Inserts

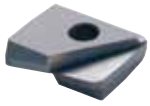
Inserts



FROM

■适用刀片(PFR-SH) Inserts

单位:mm Unit:mm

形状 Appearance	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size 外径 Dc	球半径 R	外周刃长 ap	厚度 T	高度 H	适用刀体类型 Applicable Body	涂层种类 Grade of Coated Materials XP3310	库存 Stock
 刃尖强化型 Reinforced Edge Type	NEW PFR060R03-SH	2	6	0.3	2	2	5	①	7820400	C
	NEW PFR060R05-SH		6	0.5					7820401	C
	NEW PFR060R10-SH		6	1					7820402	C
	NEW PFR070R03-SH		7	0.3			5.5		7820403	C
	NEW PFR070R05-SH		7	0.5					7820404	C
	NEW PFR070R10-SH		7	1					7820405	C
	PFR080R03-SH		8	0.3	2.7	2.4	7	②	7820250	C
	PFR080R05-SH		8	0.5					7820251	C
	PFR080R10-SH		8	1					7820252	C
	PFR080R20-SH		8	2					7820253	C
	PFR100R03-SH		10	0.3	3.3	2.6	8.5	③	7820254	C
	PFR100R05-SH		10	0.5					7820255	C
	PFR100R10-SH		10	1					7820256	C
	PFR100R20-SH		10	2					7820257	C
	NEW PFR110R03-SH		11	0.3					7820406	C
	NEW PFR110R05-SH		11	0.5					7820407	C
	NEW PFR110R10-SH		11	1					7820408	C
	NEW PFR110R20-SH		11	2					7820409	C
	PFR120R03-SH		12	0.3	4	3	10	④	7820258	C
	PFR120R05-SH		12	0.5					7820259	C
	PFR120R10-SH		12	1					7820260	C
	PFR120R20-SH		12	2					7820261	C
	PFR120R30-SH		12	3					7820262	C
	NEW PFR130R03-SH		13	0.3					7820410	C
	NEW PFR130R05-SH		13	0.5					7820411	C
	NEW PFR130R10-SH		13	1					7820412	C
	NEW PFR130R20-SH		13	2					7820413	C

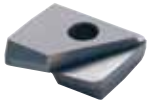
NEXT

C=标准库存品 C=Standard stock item

FROM

■适用刀片(PFR-SH) Inserts

单位:mm Unit:mm

形状 Appearance	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size 外径 Dc	球半径 R	外周刃长 ap	厚度 T	高度 H	适用刀体类型 Applicable Body	涂层种类 Grade of Coated Materials XP3310	库存 Stock
 刃尖强化型 Reinforced Edge Type	PFR160R03-SH	2	16	0.3	5.3	4	12	⑤	7820263	C
	PFR160R05-SH		16	0.5					7820264	C
	PFR160R10-SH		16	1					7820265	C
	PFR160R20-SH		16	2					7820266	C
	PFR160R30-SH		16	3					7820267	C
	NEW PFR170R03-SH		17	0.3					7820414	C
	NEW PFR170R05-SH		17	0.5					7820415	C
	NEW PFR170R10-SH		17	1					7820416	C
	NEW PFR170R20-SH		17	2					7820417	C
	PFR200R03-SH		20	0.3	6.7	5	15	⑥	7820268	C
	PFR200R05-SH		20	0.5					7820269	C
	PFR200R10-SH		20	1					7820270	C
	PFR200R20-SH		20	2					7820271	C
	PFR200R30-SH		20	3					7820272	C
	NEW PFR210R03-SH		21	0.3					7820418	C
	NEW PFR210R05-SH		21	0.5					7820419	C
	NEW PFR210R10-SH		21	1					7820420	C
	NEW PFR210R20-SH		21	2					7820421	C
	PFR250R03-SH		25	0.3	8.3	6	18.5	⑦	7820273	C
	PFR250R05-SH		25	0.5					7820274	C
	PFR250R10-SH		25	1					7820275	C
	PFR250R20-SH		25	2					7820276	C
	PFR250R30-SH		25	3					7820277	C
	NEW PFR260R03-SH		26	0.3					7820422	C
	NEW PFR260R05-SH		26	0.5					7820423	C
	NEW PFR260R10-SH		26	1					7820424	C
	NEW PFR260R20-SH		26	2					7820425	C
	PFR300R03-SH		30	0.3	10	7	22.5	⑧	7820278	C
	PFR300R05-SH		30	0.5					7820279	C
	PFR300R10-SH		30	1					7820280	C
	PFR300R20-SH		30	2					7820281	C
	PFR300R30-SH		30	3					7820282	C
	PFR320R03-SH		32	0.3	10.3	7	23.5	⑨	7820283	C
	PFR320R05-SH		32	0.5					7820284	C
	PFR320R10-SH		32	1					7820285	C
	PFR320R20-SH		32	2					7820286	C
	PFR320R30-SH		32	3					7820287	C

NEXT

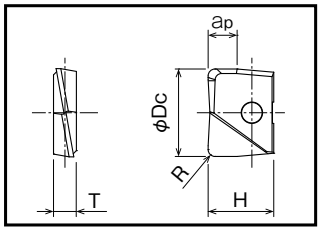
C=标准库存品 C=Standard stock item

Phoenix

精加工用圆弧角铣刀
Finishing Radius End Mill

PFR 刀片
Inserts

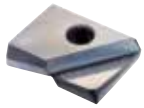
Inserts



FROM

■适用刀片(PFR-D) Inserts

单位:mm Unit:mm

形状 Appearance	名称 Designation	切削刃数 No. of Cutting Edges	刀片尺寸 Insert Size					适用刀体类型 Applicable Body	涂层种类 Grade of Coated Materials	库存 Stock
			外径 Dc	球半径 R	外周刃长 ap	厚度 T	高度 H		XP3310	
	NEW PFR060R03-D		6	0.3					7820450	C
	NEW PFR060R05-D		6	0.5	2	2	5	①	7820451	C
	NEW PFR060R10-D		6	1					7820452	C
	PFR080R03-D		8	0.3					7820300	C
	PFR080R05-D		8	0.5					7820301	C
	PFR080R10-D		8	1	2.7	2.4	7	②	7820302	C
	PFR080R20-D		8	2						※
	PFR100R03-D		10	0.3					7820303	C
	PFR100R05-D		10	0.5					7820304	C
	PFR100R10-D		10	1	3.3	2.6	8.5	③	7820305	C
	PFR100R20-D		10	2						※
	PFR120R03-D		12	0.3					7820306	C
	PFR120R05-D		12	0.5					7820307	C
	PFR120R10-D		12	1					7820308	C
 金刚石涂层 Diamond Coated	PFR120R20-D	2	12	2	4	3	10	④		※
	PFR120R30-D		12	3						※
	PFR160R03-D		16	0.3					7820309	C
	PFR160R05-D		16	0.5					7820310	C
	PFR160R10-D		16	1					7820311	C
	PFR160R20-D		16	2	5.3	4	12	⑤		※
	PFR160R30-D		16	3						※
	PFR200R03-D		20	0.3					7820312	C
	PFR200R05-D		20	0.5					7820313	C
	PFR200R10-D		20	1					7820314	C
	PFR200R20-D		20	2	6.7	5	15	⑥		※
	PFR200R30-D		20	3						※
	PFR250R10-D		25	1	8.3	6	18.5	⑦		※
	PFR300R10-D		30	1	10	7	22.5	⑧		※
	PFR320R10-D		32	1	10.3	7	23.5	⑨		※

C=标准库存品 C=Standard stock item ※=交货期及价格请咨询本公司营业人员。 ※=Please contact our sales department for price and lead time.

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精加工用圆弧角铣刀
Finishing Radius End Mill

PFR

Cutting Conditions

■加工材料推荐
Recommended Materials by Insert Type

◎第一推荐材料 Best
○第二推荐材料 Good

刀片型号 Insert Grades	形状 Appearance	P	M	K	N	S	H
XP3225	PFR-ST	◎	◎	○	◎*1	◎	○
XP3310	PFR-SH	○	○	◎			◎
XC4505	PFR-D				◎*2		

＊L/D≥5以上推荐XP3225 XP3225 is recommended when L/D ≥ 5
＊断续切削推荐XP3310 XP3310 is recommended for intermittent milling
*1 铝合金的第一推荐 Best recommended for aluminum alloy
*2 石墨、CFRP的第一推荐 Best recommended for graphite and CFRP applications

■切削条件基准表 Cutting Conditions

标准条件 Standard Condition

PFR-ST, PFR-SH

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed 悬伸 $l/_D$ 基准2.5D	悬伸 $l/_D$ 5D	悬伸 $l/_D$ 8D	切削量 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 刀片外径 Dc Insert φ6, 7	φ8～11	φ12～17	φ20～32
P	软钢、低炭素钢 Mild Steel, Carbon Steel	(SS400, S10C)	～180HB	200 （150～250）	80%	60%	0.05Dc	0.12	0.2	0.22	0.25
P	炭素钢、合金钢 Carbon Steel, Alloy Steel	(S50C, SCM440)	～280HB	180 （150～250）			0.05Dc	0.15	0.18	0.22	0.25
P	模具钢 Die Steel	(SKD61, SKD11)	～280HB	150 （120～200）			0.05Dc	0.1	0.15	0.18	0.2
M	不锈钢 Stainless Steel	(SUS304, SUS420)	～250HB	150 （100～200）			0.03Dc	0.08	0.12	0.15	0.18
K	铸铁 Cast Iron	(FC250)	～300N/mm²	200 （150～250）			0.05Dc	0.15	0.2	0.25	0.3
K	球墨铸铁 Ductile Cast Iron	(FCD400)	～600N/mm²	150 （100～200）			0.05Dc	0.12	0.15	0.2	0.25
N	铝合金 Aluminum Alloy		～13%Si	300 （200～400）			0.05Dc	0.2	0.25	0.3	0.35
S	超耐热合金(湿式) Superalloy (Wet)	(Inconel® 718)	–	30 （ 20～ 40）			0.02Dc	0.04	0.05	0.08	0.12
S	钛合金(湿式) Titanium Alloy (Wet)	(Ti-6Al-4V)	–	50 （ 40～ 60）			0.02Dc	0.05	0.08	0.1	0.15
H	预硬钢 Pre-hardened Steel	(NAK80, STAVAX)	40～43HRC	120 （100～150）			0.03Dc	0.08	0.1	0.12	0.18
H	铸件用钢 Die Cast Steel	(DAC-MAGIC, DH31)	43～48HRC	80 （ 50～100）			0.025Dc	0.05	0.08	0.1	0.15
H	调质钢 Hardened Steel	(SKD11)	50～60HRC	60 （ 40～ 80）			0.02Dc	0.04	0.05	0.08	0.1

PFR-D

	加工材料 Work Material		切削速度 Vc (m/min) Cutting Speed 悬伸 $l/_D$ 基准2.5D	悬伸 $l/_D$ 5D	悬伸 $l/_D$ 8D	切削量 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 刀片外径 Dc Insert φ6, 7	φ8～11	φ12～17	φ20～32
N	石墨 Graphite		250 （150～350）	80%	60%	0.1Dc	0.25	0.4	0.5	0.5
N	复合材料 Carbon Fiber Reinforced Plastic	(CFRP)	200 （150～250）			0.5Dc	0.05	0.1	0.15	0.2

· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting conditions.

Phoenix

精加工用圆弧角铣刀
Finishing Radius End Mill

PFR

Cutting Conditions

■切削条件基准表 Cutting Conditions

高速精加工条件 High-speed finishing conditions

钢制刀柄 Steel Shank

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	切削量 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 刀片外径 Dc Insert			
						φ6～8	φ10～13	φ16～21	φ25～32
P	软钢、低炭素钢 Mild Steel, Carbon Steel	(SS400, S10C)	～180HB	450	0.02Dc	0.1	0.12	0.14	0.18
P	炭素钢、合金钢 Carbon Steel, Alloy Steel	(S50C, SCM440)	～280HB	450	0.02Dc	0.07	0.1	0.12	0.14
P	模具钢 Die Steel	(SKD61, SKD11)	～280HB	375	0.02Dc	0.07	0.1	0.12	0.14
M	不锈钢 Stainless Steel	(SUS304, SUS420)	～250HB	375	0.02Dc	0.07	0.12	0.14	0.17
K	铸铁 Cast Iron	(FC250)	～300N/mm²	600	0.02Dc	0.12	0.14	0.18	0.22
K	球墨铸铁 Ductile Cast Iron	(FCD400)	～600N/mm²	450	0.02Dc	0.1	0.12	0.14	0.18
N	铝合金 Aluminum Alloy		～13%Si	750	0.03Dc	0.12	0.14	0.18	0.22
S	超耐热合金(湿式) Superalloy (Wet)	(Inconel® 718)	–	70	0.015Dc	0.04	0.05	0.06	0.06
S	钛合金(湿式) Titanium Alloy (Wet)	(Ti-6Al-4V)	–	120	0.02Dc	0.06	0.08	0.11	0.13
H	预硬钢 Pre-hardened Steel	(NAK80, STAVAX)	40～43HRC	300	0.015Dc	0.06	0.07	0.08	0.1
H	铸件用钢 Die Cast Steel	(DAC-MAGIC, DH31)	43～48HRC	270	0.015Dc	0.05	0.06	0.07	0.07
H	调质钢 Hardened Steel	(SKD11)	50～60HRC	220	0.01Dc	0.05	0.06	0.07	0.07

硬质合金刀柄 短刃型 Carbide Shank Short Type

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	切削深度 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 刀片外径 Dc Insert			
						φ6～8	φ10～13	φ16～21	φ25～32
P	软钢、低炭素钢 Mild Steel, Carbon Steel	(SS400, S10C)	～180HB	540	0.02Dc	0.1	0.12	0.14	0.18
P	炭素钢、合金钢 Carbon Steel, Alloy Steel	(S50C, SCM440)	～280HB	540	0.02Dc	0.07	0.1	0.12	0.14
P	模具钢 Die Steel	(SKD61, SKD11)	～280HB	450	0.02Dc	0.07	0.1	0.12	0.14
M	不锈钢 Stainless Steel	(SUS304, SUS420)	～250HB	450	0.02Dc	0.07	0.12	0.14	0.17
K	铸铁 Cast Iron	(FC250)	～300N/mm²	720	0.02Dc	0.12	0.14	0.18	0.22
K	球墨铸铁 Ductile Cast Iron	(FCD400)	～600N/mm²	540	0.02Dc	0.1	0.12	0.14	0.18
N	铝合金 Aluminum Alloy		～13%Si	600	0.03Dc	0.12	0.14	0.18	0.22
S	超耐热合金(湿式) Superalloy (Wet)	(Inconel® 718)	–	80	0.015Dc	0.04	0.05	0.06	0.06
S	钛合金(湿式) Titanium Alloy (Wet)	(Ti-6Al-4V)	–	150	0.02Dc	0.06	0.08	0.11	0.13
H	预硬钢 Pre-hardened Steel	(NAK80, STAVAX)	40～43HRC	340	0.015Dc	0.06	0.07	0.08	0.1
H	铸件用钢 Die Cast Steel	(DAC-MAGIC, DH31)	43～48HRC	290	0.015Dc	0.05	0.06	0.07	0.07
H	调质钢 Hardened Steel	(SKD11)	50～60HRC	260	0.01Dc	0.05	0.06	0.07	0.07

· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting conditions.

■切削条件基准表 Cutting Conditions

高速精加工条件 High-speed finishing conditions

硬质合金刀柄 长刃型 Carbide Shank Long Type

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	切削深度 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 刀片外径 Dc Insert			
						φ6～8	φ10～13	φ16～21	φ25～32
P	软钢、低炭素钢 Mild Steel, Carbon Steel	(SS400, S10C)	～180HB	480	0.02Dc	0.1	0.12	0.14	0.18
	炭素钢、合金钢 Carbon Steel, Alloy Steel	(S50C, SCM440)	～280HB	480	0.02Dc	0.07	0.1	0.12	0.14
	模具钢 Die Steel	(SKD61, SKD11)	～280HB	400	0.02Dc	0.07	0.1	0.12	0.14
M	不锈钢 Stainless Steel	(SUS304, SUS420)	～250HB	400	0.02Dc	0.07	0.12	0.14	0.17
K	铸铁 Cast Iron	(FC250)	～300N/mm²	640	0.02Dc	0.12	0.14	0.18	0.22
	球墨铸铁 Ductile Cast Iron	(FCD400)	～600N/mm²	480	0.02Dc	0.1	0.12	0.14	0.18
N	铝合金 Aluminum Alloy		～13%Si	800	0.03Dc	0.12	0.14	0.18	0.22
S	超耐热合金(湿式) Superalloy (Wet)	(Inconel® 718)	–	80	0.015Dc	0.04	0.05	0.06	0.06
	钛合金(湿式) Titanium Alloy (Wet)	(Ti-6Al-4V)	–	144	0.02Dc	0.06	0.08	0.11	0.13
H	预硬钢 Pre-hardened Steel	(NAK80, STAVAX)	40～43HRC	320	0.015Dc	0.06	0.07	0.08	0.1
	铸件用钢 Die Cast Steel	(DAC-MAGIC, DH31)	43～48HRC	288	0.015Dc	0.05	0.06	0.07	0.07
	调质钢 Hardened Steel	(SKD11)	50～60HRC	240	0.01Dc	0.05	0.06	0.07	0.07

硬质合金刀柄 超长刃型 Carbide Shank Extra Long Type

	加工材料 Work Material		抗损强度·硬度 Tensile Strength· Hardness	切削速度 Vc (m/min) Cutting Speed	切削深度 ap (mm) Depth of Cut	每刃进给量 fz (mm/t) 刀片外径 Dc Insert			
						φ6～8	φ10～13	φ16～21	φ25～32
P	软钢、低炭素钢 Mild Steel, Carbon Steel	(SS400, S10C)	～180HB	360	0.02Dc	0.1	0.12	0.14	0.18
	炭素钢、合金钢 Carbon Steel, Alloy Steel	(S50C, SCM440)	～280HB	360	0.02Dc	0.07	0.1	0.12	0.14
	模具钢 Die Steel	(SKD61, SKD11)	～280HB	300	0.02Dc	0.07	0.1	0.12	0.14
M	不锈钢 Stainless Steel	(SUS304, SUS420)	～250HB	300	0.02Dc	0.07	0.12	0.14	0.17
K	铸铁 Cast Iron	(FC250)	～300N/mm²	480	0.02Dc	0.12	0.14	0.18	0.22
	球墨铸铁 Ductile Cast Iron	(FCD400)	～600N/mm²	360	0.02Dc	0.1	0.12	0.14	0.18
N	铝合金 Aluminum Alloy		～13%Si	600	0.03Dc	0.12	0.14	0.18	0.22
S	超耐热合金(湿式) Superalloy (Wet)	(Inconel® 718)	–	60	0.015Dc	0.04	0.05	0.06	0.06
	钛合金(湿式) Titanium Alloy (Wet)	(Ti-6Al-4V)	–	110	0.02Dc	0.06	0.08	0.11	0.13
H	预硬钢 Pre-hardened Steel	(NAK80, STAVAX)	40～43HRC	240	0.015Dc	0.06	0.07	0.08	0.1
	铸件用钢 Die Cast Steel	(DAC-MAGIC, DH31)	43～48HRC	220	0.015Dc	0.05	0.06	0.07	0.07
	调质钢 Hardened Steel	(SKD11)	50～60HRC	180	0.01Dc	0.05	0.06	0.07	0.07

· 上述数值是根据实际切削速度的标准数据。请根据加工环境适当的调整。
The above cutting conditions are to be used as general guidelines. Adjustments may be necessary depending on actual cutting conditions.

Cutting Data

■加工数据 Cutting Data

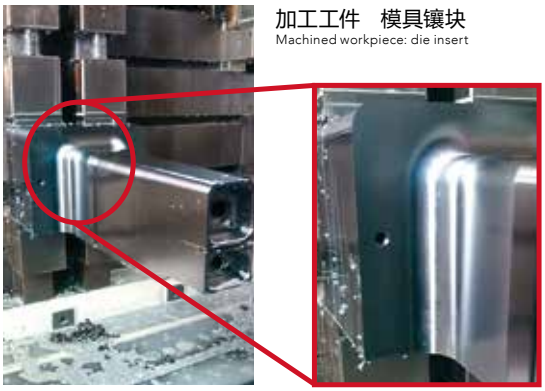
PX5（塑料模具钢　33HRC）的侧面、底面精加工 Side and bottom finish for PX5 (plastic mold steel 33HRC)

使用工具 Tool	PFR-R250SS25-LL260CS
使用刀片（材质） Insert (grade)	PFR250R20-ST (XP3225)
加工材料 Work Material	PX5 (33HRC)
切削速度 Cutting Speed	82m/min (1,050min^{-1})
进给速度 Feed	500mm/min (0.24mm/t)
切削深度 Depth of Cut	ap=0.5mm　ae=0.5~1mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center

虽说是可转位式工具，但可以达到与整体式工具同等高精度加工。比原有的工具锋利性更好，即使提高切深量也能稳定加工，如果将工程变为半精加工，则加工时间可以大大缩短。

PFR enabled high precision machining as well as solid carbide tool. With the sharper cutting edge than conventional tools, PFR could be operated stably with deeper depth of cut. As a result, machining time was shortened by reducing semi-finishing process.

客户案例 Field Data



加工工件　模具镶块
Machined workpiece: die insert

加工88m（3小时）后的刃尖磨损情况
Cutting edge after 88m (3 hours) of milling

前角面 Rake

后角面 Flank

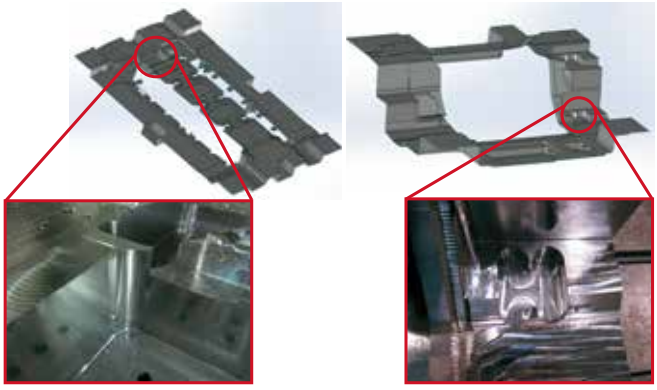
注塑模具用钢的侧面及底面精加工 Side and bottom finish for plastic mold steel

使用工具 Tool	PFB-R200SS20-LL240CS（更换PFB刀体） (substituting PFB Body)	
使用刀片（材质） Insert (grade)	PFR200R10-ST (XP3225)	
加工材料 Work Material	SD18(S55C 改良材) (enhanced S55C)	
切削速度 Cutting Speed	侧面精加工部 Side finish section 330m/min (5,250min^{-1})	底面精加工部 Bottom finish section 100m/min (1,600min^{-1})
进给速度 Feed	2,100mm/min (0.2mm/t)	400mm/min (0.125mm/t)
切削深度 Depth of Cut	ap=1.5mm ae=0.05～0.3mm	半精加工 Semi-finish　ap=0.15mm 最终精加工 Final finish　ap=0.05mm
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	立式加工中心(HSK A100) Vertical Machining Center	

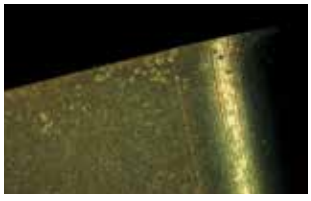
以前半精加工，最终精加工各需要1个刀片，由于PFR 的耐久性良好，所以可以只用一片刀片加工到底。另外加工面精度也非常不错。

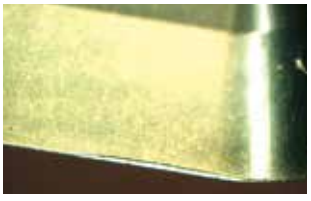
With the conventional tool, one insert for semi-finishing and another insert for finishing were consumed. With PFR, one insert could be last until the final finishing process. Furthermore, better finished surface was achieved.

客户案例 Field Data



总共加工（90分钟）后的刃尖磨损情况
Cutting edge after 90 minutes of milling

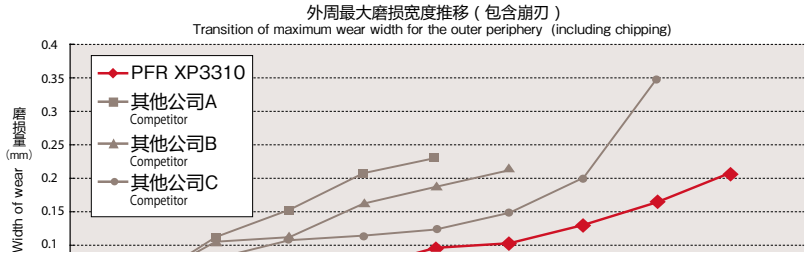




即便是悬长长的加工也可做到无崩刃的正常磨损。
The cutting edge shows normal wear, and there is no chipping despite the long overhang length.

加工 FCD600的耐久性能评价测试 Durability performance evaluation test with FCD600

使用工具 Tool	PFR-R200SS20-S160
使用刀片 (材质) Insert (grade)	PFR200R10-SH (XP3310)
加工材料 Work Material	FCD600
切削速度 Cutting Speed	200m/min (3,200min^{-1})
进给速度 Feed	1,280mm/min (0.2mm/t)
切削深度 Depth of Cut	ap=1mm ae=2mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center



PFR是从切削初期开始磨损就比较缓慢，从而可以达到稳定加工。

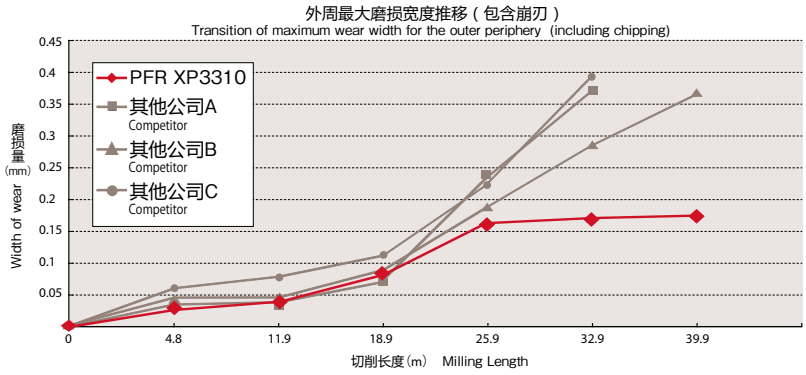
PFR enabled stable machining, and the wear progress had been slow since the early stage.

加工DH31 (48 HRC)的耐久性能评价测试 Durability performance evaluation test with DH31 (hot-die steel 48HRC)

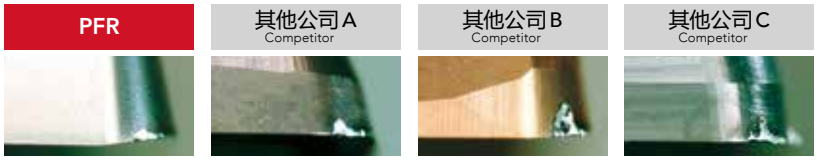
使用工具 Tool	PFR-R200SS20-S160
使用刀片 (材质) Insert (grade)	PFR200R10-SH (XP3310)
加工材料 Work Material	DH31 (48HRC)
切削速度 Cutting Speed	60m/min (955min^{-1})
进给速度 Feed	191mm/min (0.1mm/t)
切削深度 Depth of Cut	ap=0.5mm ae=1mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center

PFR(XP3310)的刀尖设有倒角所以耐磨损性较高，应对热轧工具钢(48HRC)也能稳定加工。

With the special chamfer on the cutting edge, PFR's insert XP3310 have a high chipping resistance. It enabled stable operation in machining hot work tool steel.



加工32.9m 时的磨损情况 State of damage after 32.9m of machining



Cutting Data

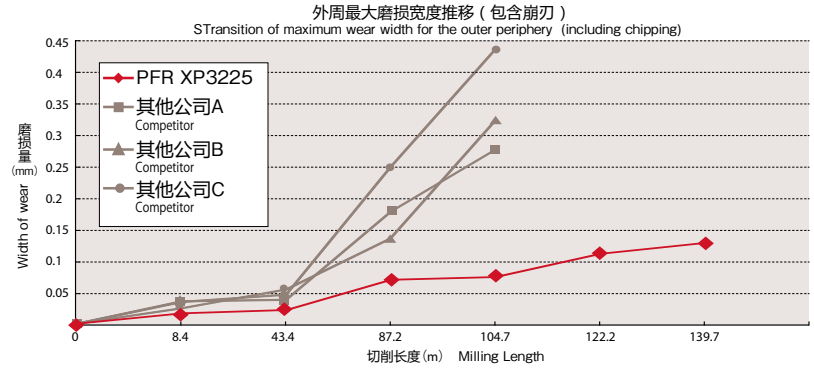
■加工数据 Cutting Data

加工S50C 耐久性能评价测试 Durability performance evaluation test with S50C

使用工具 Tool	PFR-R200SS20-S160
使用刀片(材质) Insert (grade)	PFR200R10-ST (XP3225)
加工材料 Work Material	S50C
切削速度 Cutting Speed	200m/min (3,200min^{-1})
进给速度 Feed	1,280mm/min (0.2mm/t)
切削深度 Depth of Cut	ap=0.1mm ae=2mm
切削油剂 Coolant	水溶性切削油剂 Water-Soluble
使用机械 Machine	卧式加工中心(BT40) Horizontal Machining Center

其他公司的产品无论哪款都无法超越43m 就发生较严重的磨损。PFR(XP3225)是加工到140m 时磨损量较少，还可以继续使用。

Competitors' products showed significant wear when exceeding 43m of milling length. PFR's insert XP3225, however, showed only little wear even after 140m length and remained good.



104.7m 加工时的磨损情况 State of damage after 104.7m of machining

PFR	其他公司A Competitor	其他公司B Competitor	其他公司C Competitor
			

PFR-D加工石墨电极测试 Field data of machining graphite electrode with PFR-D

使用工具 Tool	PFR-R200SS20-S160CS
使用刀片(材质) Insert (grade)	PFR200R20-D [R2特殊] (XC4505) Special
加工材料 Work Material	石墨 Graphite
切削速度 Cutting Speed	125m/min (2,000min^{-1})
进给速度 Feed	1,000mm/min (0.25mm/t)
加工方法 Milling Method	等高线加工 Contour Milling
切削深度 Depth of Cut	ap=1mm ae=0.5mm
切削油剂 Coolant	无 None
使用机械 Machine	立式石墨加工械(BT40) Vertical Graphite Milling Machine

	外周刃 Peripheral Cutting Edge	底刃 End Teeth	前角 Rake Angle
加工17小时后的磨损情况 State of damage after 17 hours of machining			
后刃面磨损量 Frank wear	0.049mm	0.021mm	

可以获得与其他公司整体硬质合金刀具同等加工面精度。且由于是可转位式刀具，也可以削减成本。

PFR-B achieved fair finishing surface accuracy versus the competition. Also machining cost was reduced by applying PFB instead of using solid carbide end mills.

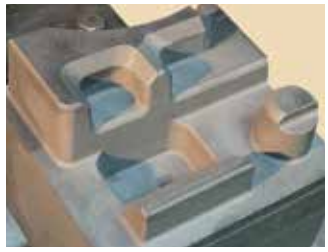
PFR-D加工石墨电极测试 Field data of machining graphite electrode with PFR-D

使用工具 Tool	PFR-R160SS-S140CS
使用刀片(材质) Insert (grade)	PFR160R10-D (XC4505)
加工材料 Work Material	石墨 Graphite
刀具悬伸 Overhang Length	50mm (2.5D)
切削速度 Cutting Speed	135m/min (2,700min^{-1})
进给速度 Feed	3,330mm/min (0.62mm/t)
加工方法 Cutting Method	等高线加工 Contour Milling
切削深度 Depth of Cut	ap=0.22~0.5mm ae=2~8mm
切削油剂 Coolant	无 None
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center

	外周刃 Peripheral Cutting Edge	底刃 End Teeth	前角 Rake Angle
加工10小时后的磨损情况 State of damage after 10 hours of machining			
后角面磨损量 Frank wear	0.062mm	0.087mm	

测试结束后(10小时),刃尖无异常剥离,保持良好的磨损状态。与其他公司金刚石涂层球头铣刀相比,可大幅度缩短加工时间。

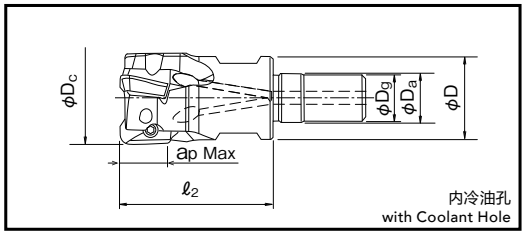
After finish machining of 10 hours, cutting edge was in good shape with normal wear. No abonormal peel off of coating was found. By applying PFR-D, machining time was drastically reduced versus the competitor's diamond coated ball end mill.



测试工件形状
Shape of Test Piece

Specification

■形状尺寸表 Specification



PSE 螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	端面直径 D	ap Max	重量 (kg)	适用夹具尺寸 Holder Size
7801600	PSE11R016SF8-2	16	2	8.5	8	10	27	14.5	10	0.03	❸
7801612	PSE11R017SF8-2	17	2	8.5	8	10	27	14.5	10	0.03	
7801613	PSE11R018SF8-2	18	2	8.5	8	10	27	14.5	10	0.03	
7801601	PSE11R020SF10-3	20	3	10.5	10	14	33	18	10	0.06	❹
7801614	PSE11R021SF10-3	21	3	10.5	10	14	33	18	10	0.06	
7801615	PSE11R022SF10-3	22	3	10.5	10	14	33	18	10	0.06	
7801602	PSE11R025SF12-4	25	4	12.5	12	17	35	23	10	0.10	❺
7801616	PSE11R026SF12-3	26	3	12.5	12	17	35	23	10	0.10	
7801603	PSE11R028SF12-4	28	4	12.5	12	17	35	23	10	0.11	
7801604	PSE11R032SF16-5	32	5	17	16	22	40	28	10	0.19	❻
7801617	PSE11R033SF16-3	33	3	17	16	22	40	28	10	0.20	
7801605	PSE11R035SF16-5	35	5	17	16	22	40	28	10	0.20	
7801606	PSE11R040SF16-6	40	6	17	16	22	40	28	10	0.22	
7801607	PSE15R025SF12-2	25	2	12.5	12	17	35	23	14	0.09	❺
7801618	PSE15R026SF12-2	26	2	12.5	12	17	35	23	14	0.10	
7801608	PSE15R028SF12-2	28	2	12.5	12	17	35	23	14	0.10	
7801609	PSE15R032SF16-3	32	3	17	16	22	40	28	14	0.17	❻
7801619	PSE15R033SF16-3	33	3	17	16	22	40	28	14	0.18	
7801610	PSE15R035SF16-3	35	3	17	16	22	40	28	14	0.18	
7801611	PSE15R040SF16-4	40	4	17	16	22	40	28	14	0.20	

刀片及零部件请查阅P.73~P.74。 See p.73-p.74 for inserts and accessories.

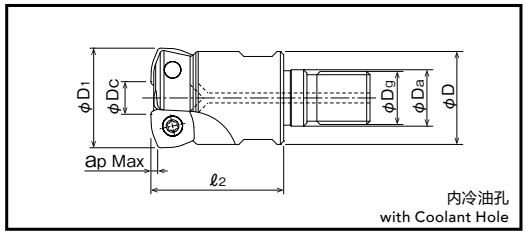
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

螺纹安装型
Screw Fit Type

SF

NEW 预定2017年春发售 Available from Spring 2017

■形状尺寸表 Specification



PHC 螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	刀具直径 D1	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	端面直径 D	ap Max	重量 (kg)	适用夹具尺寸 Holder Size
NEW 7801520	PHC07R016SF8-2	16	7.4	2	8.5	8	10	27	14.5	0.8	0.3	❸
NEW 7801521	PHC07R017SF8-2	17	8.4	2	8.5	8	10	27	14.5	0.8	0.3	
NEW 7801522	PHC07R018SF8-2	18	9.4	2	8.5	8	10	27	14.5	0.8	0.3	
NEW 7801523	PHC07R020SF10-3	20	11.4	3	10.5	10	14	33	18	0.8	0.6	❹
NEW 7801524	PHC07R021SF10-3	21	12.4	3	10.5	10	14	33	18	0.8	0.6	
NEW 7801525	PHC07R022SF10-3	22	13.4	3	10.5	10	14	33	18	0.8	0.6	
NEW 7801526	PHC07R025SF12-4	25	16.4	4	12.5	12	17	35	23	0.8	0.10	❺
NEW 7801527	PHC07R026SF12-4	26	17.4	4	12.5	12	17	35	23	0.8	0.10	
NEW 7801528	PHC07R028SF12-4	28	19.4	4	12.5	12	17	35	23	0.8	0.11	
NEW 7801529	PHC07R030SF16-4	30	21.4	4	17	16	22	40	28	0.8	0.20	❻
NEW 7801530	PHC07R032SF16-5	32	23.4	5	17	16	22	40	28	0.8	0.18	
NEW 7801531	PHC07R033SF16-5	33	24.4	5	17	16	22	40	28	0.8	0.18	
NEW 7801532	PHC07R035SF16-5	35	26.4	5	17	16	22	40	28	0.8	0.20	
7801500	PHC09R025SF12-3	25	13.2	3	12.5	12	17	35	23	1	0.10	❺
7801510	PHC09R026SF12-3	26	14.2	3	12.5	12	17	35	23	1	0.11	
7801501	PHC09R028SF12-3	28	16.2	3	12.5	12	17	35	23	1	0.11	
7801502	PHC09R030SF16-3	30	18.2	3	17	16	22	40	28	1	0.17	❻
7801503	PHC09R032SF16-3	32	20.2	3	17	16	22	40	28	1	0.18	
7801511	PHC09R033SF16-3	33	21.2	3	17	16	22	40	28	1	0.19	
7801504	PHC09R035SF16-3	35	23.2	3	17	16	22	40	28	1	0.19	
7801505	PHC09R040SF16-4	40	28.2	4	17	16	22	40	28	1	0.22	
7801506	PHC12R030SF16-2	30	13.4	2	17	16	22	40	28	2	0.17	❻
7801507	PHC12R032SF16-2	32	15.4	2	17	16	22	40	28	2	0.18	
7801512	PHC12R033SF16-2	33	16.4	2	17	16	22	40	28	2	0.19	
7801508	PHC12R035SF16-3	35	18.4	3	17	16	22	40	28	2	0.18	
7801509	PHC12R040SF16-3	40	23.4	3	17	16	22	40	28	2	0.22	

刀片及零部件请查阅P.100 See p.100 for inserts and accessories.

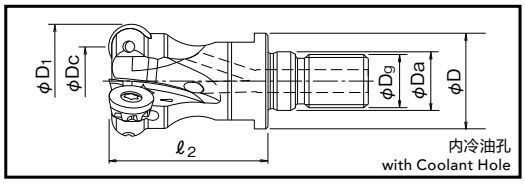
Phoenix

螺纹安装型
Screw Fit Type

SF

Specification

■形状尺寸表 Specification

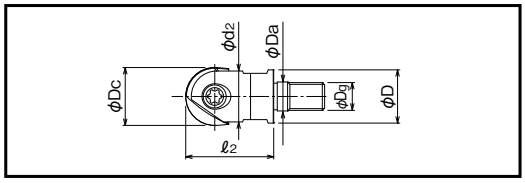


PRC螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	刀具直径 D1	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	端面直径 D	重量 (kg)	通用夹具尺寸 Holder Size
7801700	PRC10R020SF10-2	20	10	2	10.5	10	14	33	18	0.06	❹
7801701	PRC10R025SF12-3	25	15	3	12.5	12	17	35	23	0.09	❺
7801702	PRC10R030SF16-3	30	20	3	17	16	22	40	28	0.16	
7801703	PRC10R032SF16-4	32	22	4	17	16	22	40	28	0.17	❻
7801704	PRC10R040SF16-4	40	30	4	17	16	22	40	28	0.21	
7801705	PRC12R030SF16-2	30	18	2	17	16	22	40	28	0.16	
7801706	PRC12R032SF16-3	32	20	3	17	16	22	40	28	0.16	❻
7801707	PRC12R040SF16-3	40	28	3	17	16	22	40	28	0.22	

刀片及零部件请查阅P.111 See p.111 for inserts and accessories.

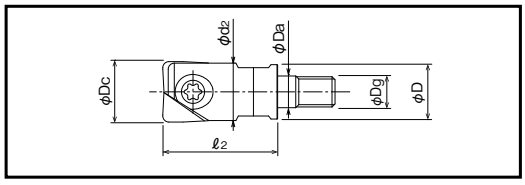


PFB螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	首径 d2	端面直径 D	通用夹具尺寸 Holder Size
7801490	PFB-R100SF6	10	2	6.5	6	7	26	9	9	❶
7801491	PFB-R120SF6	12	2	6.5	6	7	26	11	11	❷
7801492	PFB-R160SF8	16	2	8.5	8	10	32	14	14.5	❸
7801493	PFB-R200SF10	20	2	10.5	10	14	38	18	18	❹
7801494	PFB-R250SF12	25	2	12.5	12	17	38	22	23	❺
7801495	PFB-R300SF16	30	2	17	16	22	43	27	28	❻

刀片及零部件请查阅P.136~P.137 See p.136-p.137 for inserts and accessories.



PFR螺纹安装型 Screw Fit Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	刃数 z	装夹直径 Da	螺纹尺寸 Dg	扳手尺寸 Spanner Size	全长 ℓ2	首径 d2	端面直径 D	通用夹具尺寸 Holder Size
7832090	PFR-R100SF6	10	2	6.5	6	7	26	9	9	❶
7832091	PFR-R120SF6	12	2	6.5	6	7	26	11	11	❷
7832092	PFR-R160SF8	16	2	8.5	8	10	32	15	14.5	❸
7832093	PFR-R200SF10	20	2	10.5	10	14	38	19	18	❹
7832094	PFR-R250SF12	25	2	12.5	12	17	38	24	23	❺
7832095	PFR-R300SF16	30	2	17	16	22	43	29	28	❻
7832096	PFR-R320SF16	32	2	17	16	22	43	31	28	❻

刀片及零部件请查阅P.146~P.151 See p.146-p.151 for inserts and accessories.

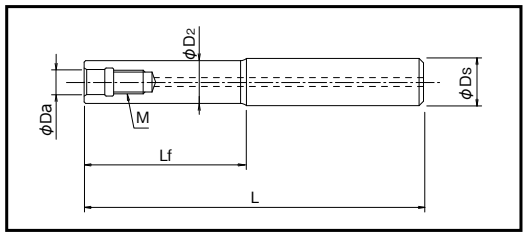
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

螺纹安装型专用夹具
Holder for Screw Fit Type

OP-SFA

Specification

■形状尺寸表 Specification



螺纹安装型专用直柄夹具 Straight Shank Holder for Screw Fit Type

钢制刀柄 Steel Shank

单位:mm Unit:mm

	商品号 EDP No.	名称 Designation	柄径 Ds	颈径 D2	螺纹尺寸 M	装夹直径 Da	全长 L	颈长 Lf
❶	7801904	SF-M06SS10-4	10	9	6	6.5	104	4
❷	7801905	SF-M06SS12-10	12	11	6	6.5	104	10
❸	7801900	SF-M08SS16-15	16	14.5	8	8.5	95	15
❹	7801901	SF-M10SS20-20	20	18	10	10.5	120	20
❺	7801902	SF-M12SS25-35	25	23	12	12.5	135	35
❻	7801903	SF-M16SS32-35	32	28	16	17	155	35

整体硬质合金刀柄 All Carbide Shank

单位:mm Unit:mm

	商品号 EDP No.	名称 Designation	柄径 Ds	颈径 D2	螺纹尺寸 M	装夹直径 Da	全长 L	颈长 Lf
❶	7801918	SF-M06SS10-24CS	10	9	6	6.5	124	24
❷	7801919	SF-M06SS12-34CS	12	11	6	6.5	134	34
❸	7801910	SF-M08SS16-55CS	16	14.5	8	8.5	115	55
	7801911	SF-M08SS16-85CS					145	85
❹	7801912	SF-M10SS20-70CS	20	18	10	10.5	140	70
	7801913	SF-M10SS20-110CS					180	110
❺	7801914	SF-M12SS25-90CS	25	23	12	12.5	170	90
	7801915	SF-M12SS25-140CS					220	140
❻	7801916	SF-M16SS32-120CS	32	28	16	17	220	120
	7801917	SF-M16SS32-190CS					290	190

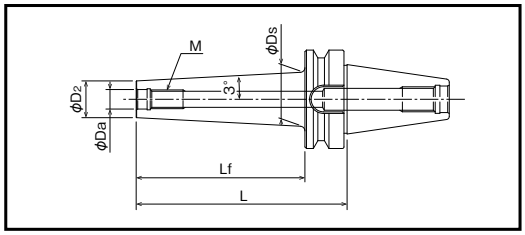
Phoenix

螺纹安装型专用夹具
Holder for Screw Fit Type

OP-SFA

Specification

■形状尺寸表 Specification



BT刀柄夹具 BT Shank Holder

单位:mm Unit:mm

	商品号 EDP No.	名称 Designation	颈径 D2	螺纹尺寸 M	装夹直径 Da	全长 L	颈长 Lf	颈口径 Ds	库存 Stock
❸	7802500	BT30-SFA8-45	14.5	8	8.5	45	23	16	※
	7802501	BT30-SFA8-85				85	63	21.1	※
❹	7802502	BT30-SFA10-45	18.5	10	10.5	45	23	20	※
	7802503	BT30-SFA10-85				85	63	25.1	※
❺	7802504	BT30-SFA12-45	23.5	12	12.5	45	23	25	※
	7802505	BT30-SFA12-85				85	63	30.1	※
❻	7802506	BT30-SFA16-45	29	16	17	45	23	32	※
	7802507	BT30-SFA16-85				85	63	32	※
❸	7802508	BT40-SFA8-45	14.5	8	8.5	45	18	16	※
	7802509	BT40-SFA8-85				85	58	20.5	※
❹	7802510	BT40-SFA10-45	18.5	10	10.5	45	18	20	※
	7802511	BT40-SFA10-85				85	58	24.5	※
❺	7802512	BT40-SFA12-45	23.5	12	12.5	45	18	25	※
	7802513	BT40-SFA12-85				85	58	29.5	※
	7802514	BT40-SFA12-135				135	108	34.8	※
❻	7802515	BT40-SFA16-45	29	16	17	45	18	32	※
	7802516	BT40-SFA16-85				85	58	35	※
	7802517	BT40-SFA16-135				135	108	40.3	※
❸	7802518	BT50-SFA8-85	14.5	8	8.5	85	47	19.4	※
	7802519	BT50-SFA8-135				135	97	24.6	※
❹	7802520	BT50-SFA10-85	18.5	10	10.5	85	47	20	※
	7802521	BT50-SFA10-135				135	97	28.6	※
❺	7802522	BT50-SFA12-85	23.5	12	12.5	85	47	25	※
	7802523	BT50-SFA12-135				135	97	33.6	※
	7802524	BT50-SFA12-185				185	147	38.9	※
	7802525	BT50-SFA12-250				250	212	45.7	※
	7802526	BT50-SFA12-300				300	262	50.9	※
❻	7802527	BT50-SFA16-85	29	16	17	85	47	32	※
	7802528	BT50-SFA16-135				135	97	39.1	※
	7802529	BT50-SFA16-185				185	147	44.4	※
	7802530	BT50-SFA16-250				250	212	51.2	※
	7802531	BT50-SFA16-300				300	262	56.4	※

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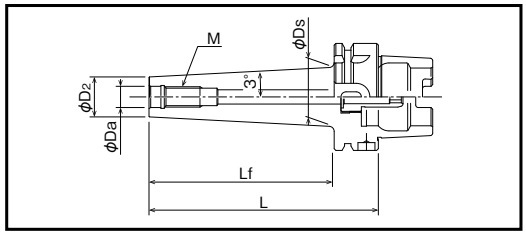
■形状尺寸表 Specification



HSK 刀柄夹具 HSK Shank Holder

单位:mm Unit:mm

	商品号 EDP No.	名称 Designation	颈径 D2	螺纹尺寸 M	装夹直径 Da	全长 L	颈长 Lf	颈口径 Ds	库存 Stock
❸	7802550	A63-SFA8-45	14.5	8	8.5	45	19	16	※
	7802551	A63-SFA8-85				85	59	20.6	※
❹	7802552	A63-SFA10-60	18.5	10	10.5	60	34	20	※
	7802553	A63-SFA10-85				85	59	24.6	※
❺	7802554	A63-SFA12-60	23.5	12	12.5	60	34	25	※
	7802555	A63-SFA12-85				85	59	29.6	※
	7802556	A63-SFA12-135				135	109	34.9	※
❻	7802557	A63-SFA16-60	29	16	17	60	34	32	※
	7802558	A63-SFA16-85				85	59	32	※
	7802559	A63-SFA16-135				135	109	40.4	※
❸	7802560	A100-SFA8-85	14.5	8	8.5	85	50	19.7	※
	7802561	A100-SFA8-135				135	100	24.9	※
❹	7802562	A100-SFA10-85	18.5	10	10.5	85	50	23.7	※
	7802563	A100-SFA10-135				135	100	28.9	※
❺	7802564	A100-SFA12-85	23.5	12	12.5	85	50	28.7	※
	7802565	A100-SFA12-135				135	100	33.9	※
	7802566	A100-SFA12-185				185	150	39.2	※
	7802567	A100-SFA12-250				250	221	46.6	※
	7802568	A100-SFA12-300				300	271	51.9	※
❻	7802569	A100-SFA16-85	29	16	17	85	50	34.2	※
	7802570	A100-SFA16-135				135	106	40.1	※
	7802571	A100-SFA16-185				185	156	45.3	※
	7802572	A100-SFA16-250				250	221	52.1	※
	7802573	A100-SFA16-300				300	271	57.4	※

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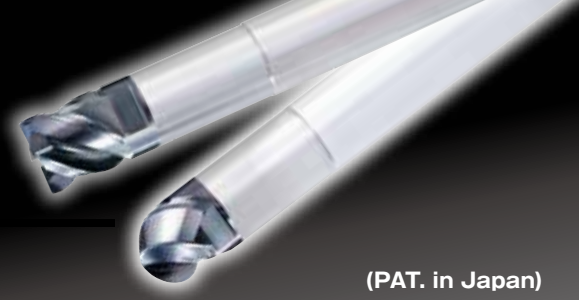
Phoenix PXM

可交换刀头式铣刀
Exchangeable Head End Mill

Phoenix Exchangeable Milling



(PAT. in Japan)

特长 Features

将整体硬质合金铣刀的设计·实绩·技术有效利用于可换头式铣刀的刃型
- ·可对应各种加工

All the knowledge and know-how acquired by designing solid carbide end mills are found in these exchangeable heads.
·Various types are available to meet variety of machining methods.

端面＋锥部＝双面紧固
- ·确保高刚性和精度
- ·外周刃振动精度 :0.015mm 以下
- ·刀头交换精度(轴向) ±0.03mm

End Face + Tapper = Double Face Clamping
·High rigidity and accuracy of tightening
·High precision of run out≦0.015mm
·High head replacing accuracy = ±0.03mm

PXVC

使用 PXM 专用扳手紧固
Tighten by the spanner exclusive for PXM.
(Sold separately from the cutters)

采用锯齿螺纹
- ·刀头装卸方便
- ·缩短刀具更换时间

Applying buttress screw makes easy and reduces time to desorb heads.

与整体式刀具的对比 Compared to solid tools	在大径方面很具性价比。只需交换头部即可，可缩短换刀时间 The large diameter offers cost advantages. To reduce the tool changing time, only the cutter chip needs to be replaced.	与可转位式刀具的对比 Compared to indexable tools	由于刃数优势，提高了生产性。刃尖的自由度。初期成本、运转成本上有很大优势。 It provides flute quantity advantages to improve productivity, as well as a selection of cutter chips. It offers additional advantages in terms of initial costs and running costs.

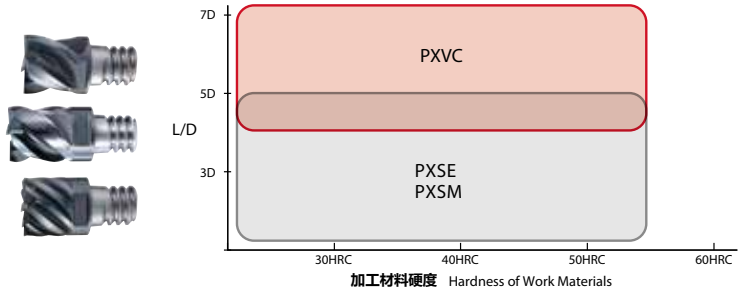
刀头类型
Line up of exchangeable heads

PXSE	不等分割 4刃 平头·圆弧角型 Unequal Spacing, Four Flutes, Square·Corner Radius Type	作为通用工具使用，从槽加工到侧面加工，可以进行重切削。 As a general-purpose tool, it can be used for heavy cutting from grooves to side faces.
PXVC	不等导程 4刃 大螺旋角 平头·圆弧角型 Variable Lead, Four Flutes, High Helix, Square·Corner Radius Type	稳定加工悬长长的工件。 Stable machining with long overhang length.
PXSM	不等分割　多刃　平头·圆弧角型 Unequal Spacing, Multiple Flutes, Square·Corner Radius Type	作为通用工具使用，能利用多刃优势进行加工。 As a general-purpose tool, it can bring the advantages of multiple cutters into full play.
PXNH	不等导程 4刃 大螺旋角 粗加工型 Variable Lead, Four Flutes, High Helix, Roughing Type	在广泛的切削领域能进行粗加工。 Suitable for rough milling in a wide range of cutting conditions.
PXNL	不等导程 4刃 小螺旋角 粗加工型 Variable Lead, Four Flutes, Low Helix, Roughing Type	能进行长寿命的粗加工。 Suitable for rough milling with a long tool life.
PXRE	直刃 圆弧角型 Straight Flutes, Corner Radius Type	可针对高硬度材料加工。 It can mill high hardness materials.
PXDR-P	3刃 多功能型 圆弧角型 Three Flutes, Multi-purpose, Corner Radius Type	稳定加工悬长长的工件。 Suitable for machining work which requires long overhang length.
PXDR-N	3刃 耐久型 圆弧角型 Three Flutes, Heavy-duty, Corner Radius Type	仿形加工长寿命。 Suitable for profile milling with long tool life.
PXBE-P	3刃 多功能型 球头型 Three Flutes, Multi-purpose, Ball Type	稳定加工悬长长的工件。 Suitable for machining work which requires long overhang length.
PXBE-N	3刃 耐久型 球头型 Three Flutes, Heavy-duty, Ball Type	仿形加工长寿命。 Suitable for profile milling with long tool life.
PXBM	多刃 球头型 Multiple Flutes, Ball Type	可进行中粗加工及精加工。 It can be used for intermediate-finish and finish milling.

■PXM系列 按形状分类导览图
Group map by types of exchangeable heads

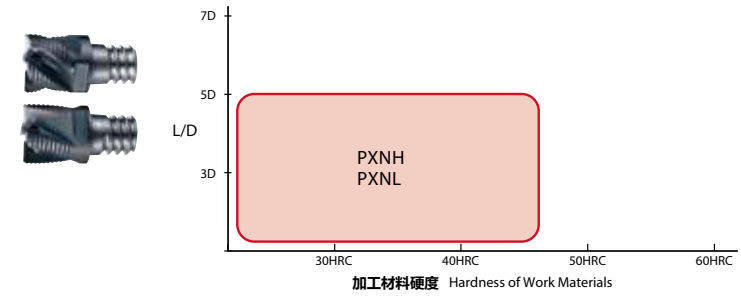
■平头型
Square Type

PXSE
PXVC
PXSM



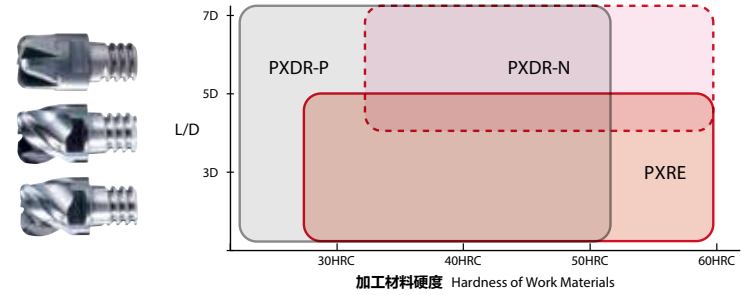
■粗加工型
Roughing Type

PXNH
PXNL



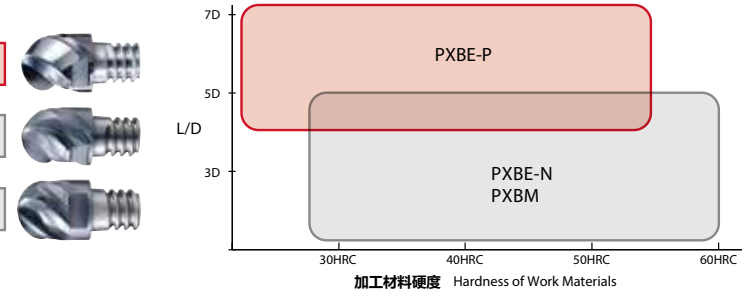
■圆弧角型
Corner Radius Type

PXRE
PXDR-P
PXDR-N



■球头型
Ball Type

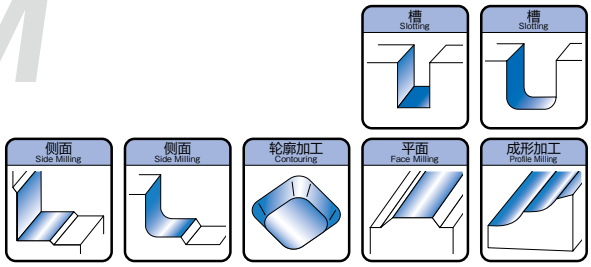
PXBE-P
PXBE-N
PXBM



Phoenix PXM

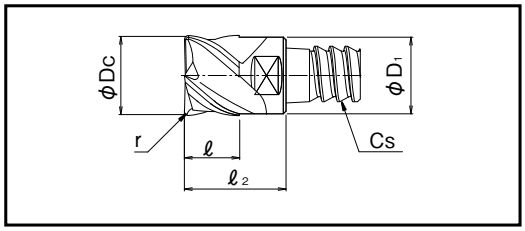
平头・圆弧角型
Square・Corner Radius Type

PXSE



Specification

■形状尺寸表 Specification



PXSE 不等分割 4刃 平头・圆弧角型 Unequal Spacing, Four Flutes, Square・Corner Radius Type

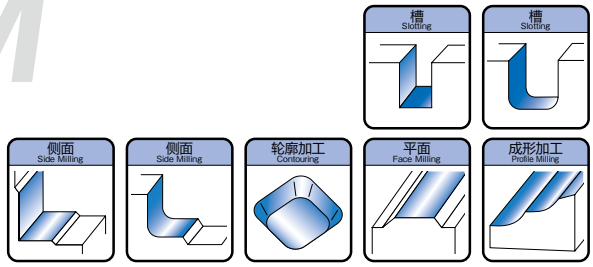
单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	圆弧半径 r	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830004	PXSE120C12-04R000	12	0	4	8.4	14.4	11.7	38	C12	XP3225
7830005	PXSE120C12-04R005		0.5							
7830006	PXSE120C12-04R010		1							
7830007	PXSE120C12-04R020		2							
7830008	PXSE120C12-04R030		3							
7830009	PXSE160C16-04R000	16	0	4	11.2	18.7	15.7	38	C16	XP3225
7830010	PXSE160C16-04R005		0.5							
7830011	PXSE160C16-04R010		1							
7830012	PXSE160C16-04R015		1.5							
7830013	PXSE160C16-04R020		2							
7830014	PXSE160C16-04R030		3							
7830015	PXSE200C20-04R000	20	0	4	14	21.5	19.6	38	C20	XP3225
7830016	PXSE200C20-04R005		0.5							
7830017	PXSE200C20-04R010		1							
7830018	PXSE200C20-04R020		2							
7830019	PXSE200C20-04R030		3							
7830020	PXSE250C25-04R000	25	0	4	17.5	27.5	24	38	C25	XP3225
7830021	PXSE250C25-04R010		1							
7830022	PXSE250C25-04R020		2							
7830023	PXSE250C25-04R030		3							

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

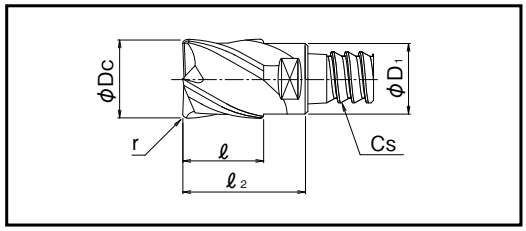
平头·圆弧角型
Square - Corner Radius Type

PXVC



Specification

■形状尺寸表 Specification



PXVC 不等导程 4刃 大螺旋角 平头·圆弧角型 Variable Lead, Four Flutes, High helix, Square · Corner Radius Type

单位:mm Unit:mm

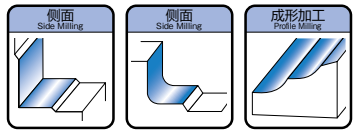
商品号 EDP No.	名称 Designation	外径 Dc	圆弧半径 r	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7835004	PXVC120C12-04R000	12	0	4	12	18	11.7	45/48	C12	XP3225
7835005	PXVC120C12-04R005		0.5							
7835006	PXVC120C12-04R010		1							
7835007	PXVC120C12-04R020		2							
7835008	PXVC120C12-04R030		3							
7835009	PXVC140C12-04R000	14	0	4	14	20	11.7	45/48	C12	XP3225
7835010	PXVC140C12-04R005		0.5							
7835011	PXVC140C12-04R010		1							
7835012	PXVC140C12-04R020		2							
7835013	PXVC140C12-04R030		3							
7835014	PXVC160C16-04R000	16	0	4	16	23.5	15.7	45/48	C16	XP3225
7835015	PXVC160C16-04R005		0.5							
7835016	PXVC160C16-04R010		1							
7835017	PXVC160C16-04R015		1.5							
7835018	PXVC160C16-04R020		2							
7835019	PXVC160C16-04R030		3							
7835020	PXVC180C16-04R000	18	0	4	18	25.5	15.7	45/48	C16	XP3225
7835021	PXVC180C16-04R005		0.5							
7835022	PXVC180C16-04R010		1							
7835023	PXVC180C16-04R020		2							
7835024	PXVC180C16-04R030		3							
7835025	PXVC200C20-04R000	20	0	4	20	27.5	19.6	45/48	C20	XP3225
7835026	PXVC200C20-04R005		0.5							
7835027	PXVC200C20-04R010		1							
7835028	PXVC200C20-04R020		2							
7835029	PXVC200C20-04R030		3							
7835030	PXVC220C20-04R000	22	0	4	22	29.5	19.6	45/48	C20	XP3225
7835038	PXVC220C20-04R005		0.5							
7835031	PXVC220C20-04R010		1							
7835032	PXVC220C20-04R020		2							
7835033	PXVC220C20-04R030		3							
7835034	PXVC250C25-04R000	25	0	4	25	35	24	45/48	C25	XP3225
7835035	PXVC250C25-04R010		1							
7835036	PXVC250C25-04R020		2							
7835037	PXVC250C25-04R030		3							

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix PXM

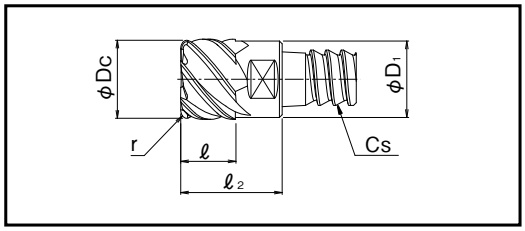
平头·圆弧角型
Square · Corner Radius Type

PXSM



Specification

■形状尺寸表 Specification



PXSM 不等分割 多刃 平头·圆弧角型 Unequal Spacing, Multiple Flutes, Square · Corner Radius Type

单位:mm Unit:mm

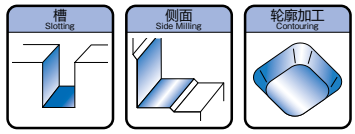
商品号 EDP No.	名称 Designation	外径 Dc	圆弧半径 r	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830104	PXSM120C12-06R000	12	0	6	8.4	14.4	11.7	38	C12	XP3225
7830105	PXSM120C12-06R005		0.5							
7830106	PXSM120C12-06R010		1							
7830107	PXSM120C12-06R020		2							
7830108	PXSM120C12-06R030		3							
7830109	PXSM160C16-06R000	16	0	6	11.2	18.7	15.7	38	C16	XP3225
7830110	PXSM160C16-06R005		0.5							
7830111	PXSM160C16-06R010		1							
7830112	PXSM160C16-06R015		1.5							
7830113	PXSM160C16-06R020		2							
7830114	PXSM160C16-06R030		3							
7830115	PXSM160C16-08R000		0	8				42		
7830116	PXSM160C16-08R005		0.5							
7830117	PXSM160C16-08R010		1							
7830118	PXSM160C16-08R015		1.5							
7830119	PXSM160C16-08R020		2							
7830120	PXSM160C16-08R030		3							
7830121	PXSM200C20-10R000	20	0	10	14	21.5	19.6	42	C20	XP3225
7830122	PXSM200C20-10R005		0.5							
7830123	PXSM200C20-10R010		1							
7830124	PXSM200C20-10R020		2							
7830125	PXSM200C20-10R030		3							
7830126	PXSM250C25-10R000	25	0	10	17.5	27.5	24	42	C25	XP3225
7830127	PXSM250C25-10R010		1							
7830128	PXSM250C25-10R020		2							
7830129	PXSM250C25-10R030		3							

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

粗加工型
Roughing Type

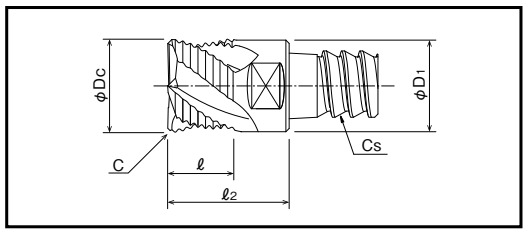
PXNH/PXNL

PXNH/PXNL



Specification

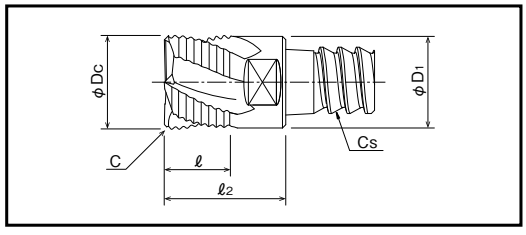
■形状尺寸表 Specification



PXNH 不等导程 4刃 大螺旋角 粗加工型 Variable Lead, Four Flutes, High Helix, Roughing Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	圆弧倒角宽度 Chamfer Width	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle	缩结规格 Cs	材质 Grades
7830451	PXNH120C12-04C005	12	0.5	4	8.4	14.4	11.7	40/42	C12	XP3225
7830452	PXNH160C16-04C006	16	0.6	4	11.2	18.7	15.7	40/42	C16	XP3225
7830453	PXNH200C20-04C006	20	0.6	4	14	21.5	19.6	40/42	C20	XP3225
7830454	PXNH250C25-04C006	25	0.6	4	17.5	27.5	24	40/42	C25	XP3225



PXNL 不等导程 4刃 小螺旋角 粗加工型 Variable Lead, Four Flutes, Low Helix, Roughing Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	圆弧倒角宽度 Chamfer Width	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缩结规格 Cs	材质 Grades
7830401	PXNL120C12-04C005	12	0.5	4	8.4	14.4	11.7	19/21	C12	XP3225
7830402	PXNL160C16-04C006	16	0.6	4	11.2	18.7	15.7	19/21	C16	XP3225
7830403	PXNL200C20-04C006	20	0.6	4	14	21.5	19.6	19/21	C20	XP3225
7830404	PXNL250C25-04C006	25	0.6	4	17.5	27.5	24	19/21	C25	XP3225

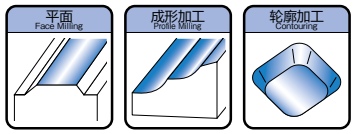
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

Phoenix PXM

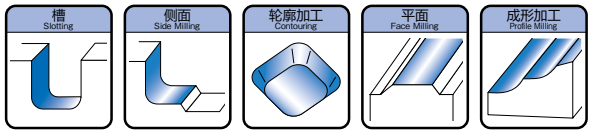
圆弧形
Corner Radius Type

PXRE/PXDR

PXRE

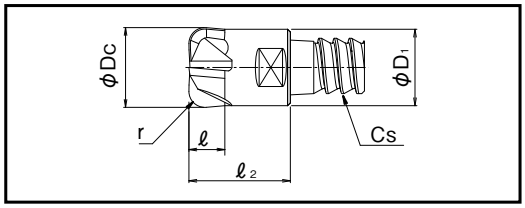


PXDR



Specification

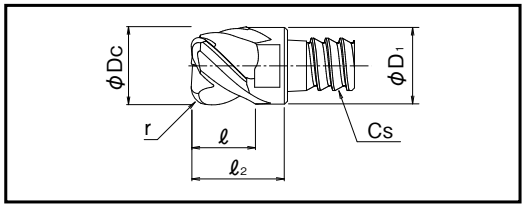
■形状尺寸表 Specification



PXRE 直刃 圆弧角型 Straight Flutes, Corner Radius Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	圆弧半径 r	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830201	PXRE120C12-04R020	12	2	4	5	14.4	11.7	—	C12	XP6305
7830202	PXRE160C16-06R030	16	3	6	7	18.7	15.7	—	C16	XP6305
7830203	PXRE200C20-06R030	20	3	6	10	21.5	19.6	—	C20	XP6305



PXDR-P 3刃 多功能型 圆弧角型 Three Flutes, Multi-purpose, Corner Radius Type

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	圆弧半径 r	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830351	PXDR120C12-03R015-P	12	1.5	3	8.4	14.4	11.7	45	C12	XP3225
7830352	PXDR120C12-03R020-P		2							
7830353	PXDR160C16-03R020-P	16	2	3	11.2	18.7	15.7	45	C16	XP3225
7830354	PXDR160C16-03R030-P		3							
7830355	PXDR200C20-03R020-P	20	2	3	14	21.5	19.6	45	C20	XP3225
7830356	PXDR200C20-03R030-P		3							

PXDR-N 3刃 耐久型 圆弧角型 Three Flutes, Heavy-duty, Corner Radius Type

单位:mm Unit:mm

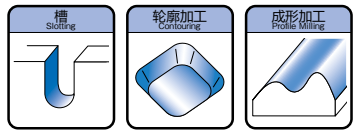
商品号 EDP No.	名称 Designation	外径 Dc	圆弧半径 r	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830371	PXDR120C12-03R015-N	12	1.5	3	8.4	14.4	11.7	45	C12	XP6305
7830372	PXDR120C12-03R020-N		2							
7830373	PXDR160C16-03R020-N	16	2	3	11.2	18.7	15.7	45	C16	XP6305
7830374	PXDR160C16-03R030-N		3							
7830375	PXDR200C20-03R020-N	20	2	3	14	21.5	19.6	45	C20	XP6305
7830376	PXDR200C20-03R030-N		3							

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

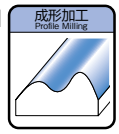
球头型
Ball Type

PXBE/PXBM

PXBE

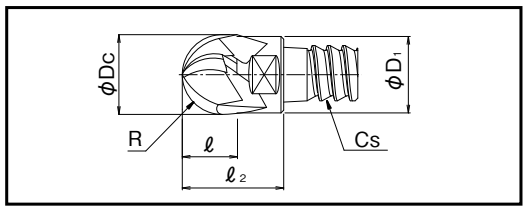


PXBM



Specification

■形状尺寸表 Specification



PXBE-P　3刃 多功能型 球头型 Three Flutes, Multi-purpose, Ball Type

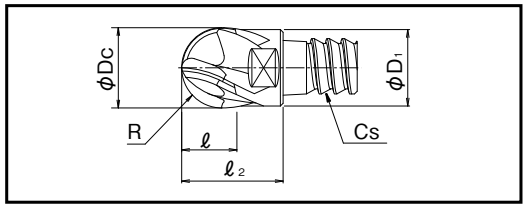
单位:mm　Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830271	PXBE120C12-03R060-P	12	6	3	8.4	14.4	11.7	45	C12	XP3320
7830272	PXBE160C16-03R080-P	16	8	3	11.2	18.7	15.7	45	C16	XP3320
7830273	PXBE200C20-03R100-P	20	10	3	14	21.5	19.6	45	C20	XP3320

PXBE-N　3刃　耐久型　球头形 Three Flutes, Heavy-duty, Ball Type

单位:mm　Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	刃数 z	刃长 ℓ	全长 ℓ2	颈径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830251	PXBE120C12-03R060-N	12	6	3	8.4	14.4	11.7	45	C12	XP3320
7830252	PXBE160C16-03R080-N	16	8	3	11.2	18.7	15.7	45	C16	XP3320
7830253	PXBE200C20-03R100-N	20	10	3	14	21.5	19.6	45	C20	XP3320



PXBM　多刃 球头型 Multiple Flutes, Ball Type

单位:mm　Unit:mm

商品号 EDP No.	名称 Designation	外径 Dc	球半径 R	刃数 z	刃长 ℓ	全长 ℓ2	首径 D1	螺旋角 Helix Angle Deg.°	缔结规格 Cs	材质 Grades
7830301	PXBM120C12-04R060	12	6	4	8.4	14.4	11.7	45	C12	XP3320
7830302	PXBM160C16-06R080	16	8	6	11.2	18.7	15.7	45	C16	XP3320
7830303	PXBM200C20-06R100	20	10	6	14	21.5	19.6	45	C20	XP3320

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

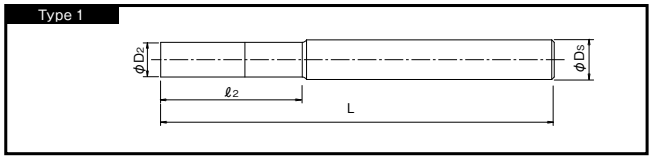
Phoenix PXM

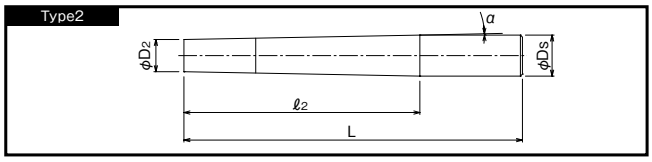
PXM用 直柄夹具
Straight Shank Holder for PXM

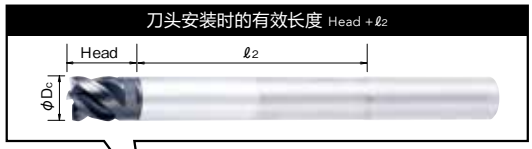
PXMZ

Specification

■形状尺寸表 Specification







硬质合金刀柄 Carbide Shank

单位:mm　Unit:mm

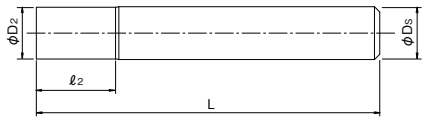
商品号 EDP No.	名称 Designation	颈径 D2	柄径 Ds	角度 α°	全长 L	颈长 ℓ2	刀头安装时的有效长度 Head +ℓ2			缔结规格 Cs	形状 Type
							PXVC以外 Except PXVC	PXVC外径 Dc			
								φ12, 16, 20, 25	φ14, 18, 22		
7801831	PXMZ-C12SS12-S075CS	11.7	12	0	75	24	38.4	42	44	C12	1
7801811	PXMZ-C12SS12-L100CS		12	0	100	45.9	60.3	63.9	65.9		1
7801832	PXMZ-C12SS12-L115CS		12	0	115	64.2	78.6	82.2	84.2		1
7801841	PXMZ-C12TP16-LL135CS		16	1.3	135	83.8	98.2	101.8	103.8		2
7801833	PXMZ-C16SS16-S090CS	15.7	16	0	90	39.2	57.9	62.7	64.7	C16	1
7801812	PXMZ-C16SS16-L130CS		16	0	130	61.2	79.9	84.7	86.7		1
7801834	PXMZ-C16SS16-L135CS		16	0	135	84.2	102.9	107.7	109.7		1
7801842	PXMZ-C16TP20-LL165CS		20	1.1	165	115	136.5	138.5	140.5		2
7801835	PXMZ-C20SS20-S090CS	19.6	20	0	90	39.1	60.6	66.6	68.6	C20	1
7801813	PXMZ-C20SS20-L150CS		20	0	150	78.4	99.9	105.9	107.9		1
7801836	PXMZ-C20SS20-L180CS		20	0	180	109.1	130.6	136.6	138.6		1
7801843	PXMZ-C20TP25-LL200CS		25	1.1	200	140	161.5	167.5	169.5		2
7801814	PXMZ-C25SS25-L200CS	24	25	0	200	96.6	124.1	131.6	—	C25	1

1. 请适当调整冷却喷嘴的位置，以免切屑卷曲缠绕。
1. Adjust the position of the coolant nozzles accordingly so that the chips do not get tangled.

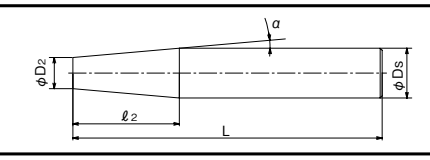
库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

■形状尺寸表 Specification

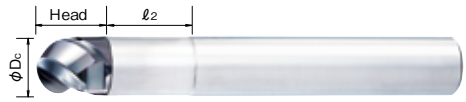
Type 1



Type2



刀头安装时的有效长度 Head + ℓ2



钢制刀体 Steel Shank

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	颈径 D2	柄径 Ds	角度 α°	全长 L	颈长 ℓ2	刀头安装时的有效长度 Head + ℓ2			缔结规格 Cs	形状 Type
							PXVC以外 Except PXVC	PXVC外径 Dc			
								φ12, 16, 20, 25	φ14, 18, 22		
7801801	PXMZ-C12SS12-S100	11.7	12	0	100	18	32.4	36	38	C12	1
7801821	PXMZ-C12TP20-S145		20	5	145	47.4	61.8	65.4	67.4		2
7801802	PXMZ-C16SS16-S100	15.7	16	0	100	23	41.7	46.5	48.5	C16	1
7801822	PXMZ-C16TP25-S155		25	5	155	53.1	71.8	76.6	78.6		2
7801803	PXMZ-C20SS20-S120	19.6	20	0	120	28	49.5	55.5	57.5	C20	1
7801823	PXMZ-C20TP32-S170		32	5	170	70.8	92.3	98.3	100.3		2
7801804	PXMZ-C25SS25-S140	24	25	0	140	34.5	62	69.5	—	C25	1

1. 请适当调整冷却喷嘴的位置，以免切屑卷曲缠绕。
1. Adjust the position of the coolant nozzles accordingly so that the chips do not get tangled.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

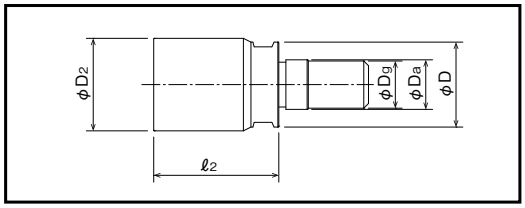
Phoenix PXM

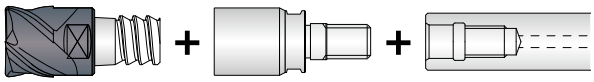
PXM用安装头
Joint for PXM

PXMJ

Specification

■形状尺寸表 Specification





PXM系列
PXM Series

PXMJ

OP-SFA

原有的刀柄(OP-SFA)与PXMJ组合 ,PXM系列也可以使用。
PXM series can be used with the shank holder (OP-SFA) by connecting the joint holder (PXMJ) .

PXMJ 安装头 Joint

单位:mm Unit:mm

商品号 EDP No.	名称 Designation	适用刀头外径 Applicable Head Dia.	内螺纹侧端面直径 D_2	外螺纹侧装夹直径 Da	外螺纹尺寸 Dg	适用扳手 Spanner	全长 ℓ_2	外螺纹侧端面直径 D	締结规格 Cs
7801893	PXMJ-C12SF06	12	11.7	6.5	6	PXMP8-10	18	11	C12
7801894	PXMJ-C16SF08	16	15.7	8.5	8	PXMP13-16	21.8	14.5	C16
7801895	PXMJ-C20SF10	20	19.6	10.5	10	PXMP13-16	26.5	18	C20
7801896	PXMJ-C25SF12	25	24	12.5	12	PXMP21	34	23	C25

Accessories

■零件 Accessories

	商品号 EDP No.	名称 Designation	适用刀头外径 Applicable Head Dia.	締结规格 Cs	连接扭矩 Recommended Tightening Torque
适用扳手 Spanner	7801890	PXMP8-10	φ12, φ14	C12	12N・m
	7801891	PXMP13-16	φ16, φ18	C16	30N・m
			φ20, φ22	C20	50N・m
	7801892	PXMP21	φ25	C25	60N・m

PXM 专用扳手，扳手请另购。
There spanner are specifically for PXM, and sold separately from the cutters.

1.使用注意事项请参阅P.190
2.连接扭矩请参考上表。
3.专用扭矩扳手请咨询本公司营业人员。
1.Please refer to p.190 for cautions during use.
2.Please refer to the table above for tightening torque.
3.Contact your nearest OSG sales representative for details of our dedicated adjustable torque wrench for tightening inserts.

库存种类都为C(即标准库存品)。 Stock are categorized as C (Standard stock item).

平头·圆弧角型
Square · Corner Radius Type

PXSE

Cutting Conditions

■切削条件基准表 Cutting Conditions

PXSE 侧面切削 Side Milling L/D≦3.5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel· Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)		超耐热合金(湿式) 镍合金®718 Superalloy (Wet) Inconel®718	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,180	760	2,650	640	1,700	400	1,700	350	650	100
16	2,390	570	1,950	470	1,250	300	1,250	250	500	80
20	1,910	460	1,550	370	1,000	250	1,000	200	400	65
25	1,530	370	1,240	300	800	200	800	160	320	50
切削深度 Depth of Cut	ap=0.5Dc ae=0.15Dc				ap=0.5Dc ae=0.1Dc		ap=0.5Dc ae=0.05Dc		ap=0.5Dc ae=0.05Dc	

PXSE 槽切削 Slot Milling L/D≦3.5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel· Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)		超耐热合金(湿式) 镍合金® 718 Superalloy (Wet) Inconel® 718	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	2,500	500	1,550	300	1,300	250	1,300	250	650	100
16	1,850	350	1,150	250	1,000	200	1,000	200	500	80
20	1,500	300	950	200	750	160	750	160	400	65
25	1,200	240	760	160	600	130	600	130	320	50
切削深度 Depth of Cut	ap≦0.35Dc				ap≦0.3Dc		ap≦0.2Dc		ap≦0.1Dc	

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具

1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

Phoenix PXM

平头·圆弧角型
Square - Corner Radius Type

PXVC

Cutting Conditions

■切削条件基准表 Cutting Conditions

可换头式铣刀 PXVC　侧面切削 Side Milling **L/D≦5**

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,980	960	3,190	770	2,660	640	2,130	520
14	3,420	830	2,730	660	2,280	550	1,820	440
16	2,990	720	2,390	580	1,990	480	1,600	390
18	2,660	640	2,130	520	1,770	430	1,420	350
20	2,390	580	1,910	460	1,600	390	1,280	310
22	2,180	530	1,740	420	1,450	350	1,160	280
25	1,910	460	1,530	370	1,280	310	1,020	250
切削深度 Depth of Cut	ap=0.5Dc ae=0.2Dc				ap=0.5Dc ae=0.1Dc		ap=0.5Dc ae=0.05Dc	

可换头式铣刀 PXVC　侧面切削 Side Milling **5<L/D≦6**

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,590	870	2,920	710	2,390	580	1,860	450
14	3,070	740	2,510	610	2,050	500	1,600	390
16	2,690	650	2,190	530	1,800	440	1,400	340
18	2,390	580	1,950	470	1,600	390	1,240	300
20	2,150	520	1,760	430	1,440	350	1,120	270
22	1,960	480	1,600	390	1,310	320	1,020	250
25	1,720	420	1,410	340	1,150	280	900	220
切削深度 Depth of Cut	ap=0.5Dc ae=0.2Dc				ap=0.5Dc ae=0.1Dc		ap=0.5Dc ae=0.05Dc	

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。
1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

可换头式铣刀 PXVC　侧面切削 Side Milling 6<L/D≦7

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45 ～ 55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,190	770	2,660	640	2,130	520	1,600	390
14	2,730	660	2,280	550	1,820	440	1,370	330
16	2,390	580	1,990	480	1,600	390	1,200	290
18	2,130	520	1,770	430	1,420	350	1,070	260
20	1,910	460	1,600	390	1,280	310	960	240
22	1,740	420	1,450	350	1,160	280	870	210
25	1,530	370	1,280	310	1,020	250	770	190
切削深度 Depth of Cut	ap=0.5Dc ae=0.2Dc				ap=0.5Dc ae=0.1Dc		ap=0.5Dc ae=0.05Dc	

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。

1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

Phoenix PXM

平头·圆弧角型
Square - Corner Radius Type

PXVC

Cutting Conditions

■切削条件基准表 Cutting Conditions

可换头式铣刀 PXVC　槽切削 Slot Milling **L/D≦5**

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质刚 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质刚·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,980	800	3,180	640	2,650	530	1,990	400
14	3,410	680	2,730	550	2,270	450	1,710	340
16	2,980	600	2,390	480	1,990	400	1,490	300
18	2,650	530	2,120	420	1,770	350	1,330	270
20	2,390	480	1,910	380	1,590	320	1,190	240
22	2,170	430	1,740	350	1,450	290	1,090	220
25	1,910	380	1,530	310	1,270	250	950	190
切削深度 Depth of Cut	ap≦0.5Dc		ap≦0.4Dc		ap≦0.3Dc		ap≦0.3Dc	

可换头式铣刀 PXVC　槽切削 Slot Milling **5<L/D≦6**

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质刚 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质刚·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,190	640	2,660	540	2,130	430	1,730	350
14	2,730	550	2,280	460	1,820	370	1,480	300
16	2,390	480	1,990	400	1,600	320	1,300	260
18	2,130	430	1,770	360	1,420	290	1,150	230
20	1,910	390	1,600	320	1,280	260	1,040	210
22	1,740	350	1,450	290	1,160	240	950	190
25	1,530	310	1,280	260	1,020	210	830	170
切削深度 Depth of Cut	ap≦0.5Dc		ap≦0.4Dc		ap≦0.3Dc		ap≦0.3Dc	

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。
1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

可换头式铣刀 PXVC　槽切削 Slot Milling 6<L/D≦7

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45 ～ 55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	2,660	540	2,130	430	1,860	380	1,600	320
14	2,280	460	1,820	370	1,600	320	1,370	280
16	1,990	400	1,600	320	1,400	280	1,200	240
18	1,770	360	1,420	290	1,240	250	1,070	220
20	1,600	320	1,280	260	1,120	230	960	200
22	1,450	290	1,160	240	1,020	210	870	180
25	1,280	260	1,020	210	900	180	770	160
切削深度 Depth of Cut	ap≦0.3Dc		ap≦0.3Dc		ap≦0.25Dc		ap≦0.2Dc	

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。

1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

Phoenix PXM

平头·圆弧角型
Square - Corner Radius Type

PXSM

Cutting Conditions

■切削条件基准表 Cutting Conditions

PXSM 侧面切削 Side Milling **L/D≦3.5**

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel· Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)		超耐热合金(湿式) 镍合金 ® 718 Superalloy (Wet) Inconel®718	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	4,750	1,750	3,950	1,150	3,150	950	2,650	800	1,550	350
16-6F	3,550	1,310	2,950	860	2,350	710	1,950	600	1,150	260
16-8F	3,550	1,750	2,950	1,150	2,350	950	1,950	800	1,150	350
20	2,850	1,750	2,350	1,150	1,900	950	1,550	800	950	350
25	2,280	1,400	1,880	920	1,520	760	1,240	640	760	280
切削深度 Depth of Cut	ap≦0.5Dc ae≦0.05Dc				ap≦0.5Dc ae≦0.02Dc		ap≦0.3Dc ae≦0.02Dc			

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。
1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

粗加工型
Roughing Type

PXNH/PXNL

Cutting Conditions

■切削条件基准表 Cutting Conditions

PXNH· PXNL侧面切削 Side Milling L/D≦3.5

加工材料 Work Material	铸铁 Cast Iron FC250		炭素钢 Carbon Steel		合金钢 Alloy Steel		调质钢·预硬钢(快削) Hardened Steel Pre-hardened Steel (Free-Cutting)		不锈钢 Stainless Steel SUS304	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	2,390	600	3,180	700	2,650	440	2,390	290	2,120	230
16	1,790	620	2,390	720	1,990	450	1,790	300	1,590	240
20	1,430	660	1,910	760	1,590	480	1,430	310	1,270	250
25	890	450	1,270	560	1,020	340	890	220	760	170
切削深度 Depth of Cut	ap=0.5Dc ae=0.3Dc				ap=0.5Dc ae=0.2Dc					

PXNH·PXNL 槽切削 Slot Milling L/D≦3.5

加工材料 Work Material	铸铁 Cast Iron FC250		炭素钢 Carbon Steel		合金钢 Alloy Steel		调质钢·预硬钢(快削) Hardened Steel Pre-hardened Steel (Free-Cutting)		不锈钢 Stainless Steel SUS304	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	1,860	300	2,650	370	2,120	220	1,860	140	1,590	110
16	1,390	320	1,990	400	1,590	240	1,390	150	1,190	120
20	1,110	360	1,590	450	1,270	270	1,110	170	950	130
25	760	280	1,150	370	890	210	760	130	640	100
切削深度 Depth of Cut	ap=0.5Dc									

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。
1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

Phoenix PXM

圆弧角型
Corner Radius Type

PXRE/PXDR

Cutting Conditions

■切削条件基准表 Cutting Conditions

PXRE L/D≦3.5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel·Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel·Tool Steel SCM, SKT, SKS, SKD (～30HRC)		调质钢(38～45HRC) 预硬钢 Hardened Steel·Pre-hardened Steel SKD, NAK80, HPM50		调质钢 Hardened Steel (45～55HRC)		调质钢 Hardened Steel (55～60HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	5,800	10,600	4,000	6,500	3,200	4,900	2,700	3,300	2,300	2,200
16	4,000	11,900	3,000	7,700	2,400	5,900	2,000	3,900	1,700	2,700
20	3,200	9,550	2,400	6,500	1,900	4,900	1,600	3,300	1,400	2,200
切削深度 Depth of Cut	ap=0.1×圆弧半径(r) Corner Radius ae=0.3Dc								ap=0.1×圆弧半径(r) Corner Radius ae=0.3Dc	

PXDR-P L/D≦5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel·Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel·Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel·Hardened Steel SUS304, SKD (～45HRC)		调质钢 Hardened Steel (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,980	2,980	3,980	2,390	3,980	1,790	3,980	1,190
16	2,980	2,240	2,980	1,790	2,980	1,340	2,980	900
20	2,390	1,790	2,390	1,430	2,390	1,070	2,390	720
切削深度 Depth of Cut	ap=0.05Dc ae=0.25Dc						ap=0.03Dc ae=0.25Dc	

PXDR-N L/D≦5

加工材料 Work Material	合金钢·工具钢 Alloy Steel·Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel·Hardened Steel SUS304, SKD (～45HRC)		调质钢 Hardened Steel (45～55HRC)		调质钢 Hardened Steel (55～60HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,980	2,980	3,180	1,910	2,650	950	2,650	800
16	2,980	2,240	2,390	1,430	1,990	720	1,990	600
20	2,390	1,790	1,910	1,150	1,590	570	1,590	480
切削深度 Depth of Cut	ap=0.03Dc ae=0.25Dc						ap=0.02Dc ae=0.2Dc	

1. 请使用刚性好、精度高的设备和家具。
2. 请根据切深量、机械钢性等使用状况调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。
1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

球头形状
Ball Type

PXBE/PXBM

Cutting Conditions

■切削条件基准表 Cutting Conditions

PXBE-P L/D≦5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel·Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金 Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,980	1,790	3,180	1,430	2,650	1,190	2,650	800
16	2,980	1,340	2,390	1,070	1,990	900	1,990	600
20	2,390	1,070	1,910	860	1,590	720	1,590	480
切削深度 Depth of Cut	ap=0.07Dc Pf=0.15Dc						ap=0.04Dc Pf=0.1Dc	

PXBE-N L/D≦3.5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel·Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金 Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)		调质刚 Hardened Steel (55～60HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	6,630	2,980	6,630	2,980	5,310	1,910	3,980	1,190	2,650	400
16	4,970	2,240	4,970	2,240	3,980	1,430	2,980	900	1,990	300
20	3,980	1,790	3,980	1,790	3,180	1,150	2,390	720	1,590	240
切削深度 Depth of Cut	ap=0.05Dc Pf=0.15Dc						ap=0.04Dc Pf=0.1Dc		ap=0.03Dc Pf=0.05Dc	

PXBM L/D≦3.5

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)		调质钢 Hardened Steel (55～60HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	6,600	3,900	6,600	3,900	5,300	2,500	3,950	1,500	2,600	550
16	4,950	4,500	4,950	4,500	3,950	2,900	2,950	1,800	1,900	600
20	3,950	3,500	3,950	3,500	3,150	2,300	2,350	1,500	1,600	500
切削深度 Depth of Cut	ap=0.02Dc Pf=0.05Dc									

1. 请使用刚性好、精度高的设备和家具。
2. 根据切深量、机械刚性等使用情况，请调整转速及进给速度。
3. 当悬长过长时，易发生振动，请适当调整回转速度、进给速度和切削深度。
4. 请考虑被夹具夹持的柄部突出部长度(PXMZ)与刀头全长(l2)加在一起来选定刀具。

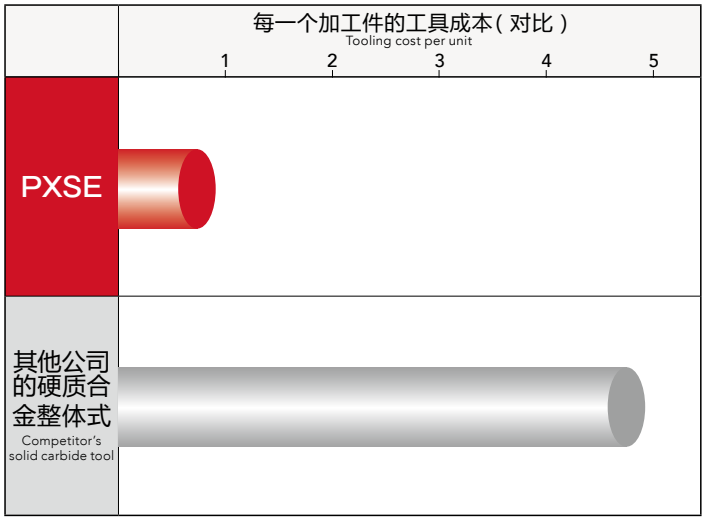
1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the depth of cut is large or when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.

Cutting Data

■加工数据 Cutting Data

[PXSE]寿命1.6倍，工具成本却1/5 ～零部件加工～ 1.6 times durability and 1/5 of tooling cost achieved in parts machining

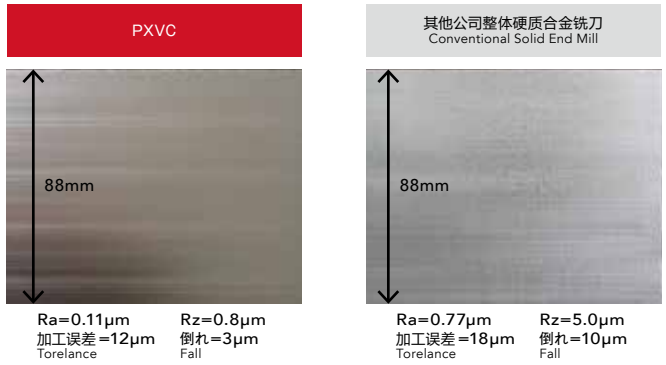
使用工具 Tool	刀头：PXSE200C20-04R010 Head 刀夹：PXMZ-C20SS20-S120 Holder	其他公司整体硬质合金铣刀 Competitor's Solid Carbide End Mill
尺寸 Size	φ20×R1 4刃 Flutes	
加工工件 Work	机械零件 Machine Parts	
加工材料 Work Material	S25C	
切削速度 Cutting Speed	60m/min (1,000min⁻¹)	
进给速度 Feed	400mm/min (0.1mm/t)	
切削方法 Cutting Method	槽切削 Slotting	
切削深度 Depth of Cut	ap=3mm ae=20mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	
加工工件数 Number of Processed Workpiece	5个 PCS	3个 PCS



与整体式工具相比寿命长1.6倍，每一个加工件的工具成本为1/5。
The tool achieved 1.6 times durability. Tooling cost per unit was reduced to 1/5.

[PXVC]加工面粗度及加工精度都比整体式工具好 Achieved better surface roughness and accuracy versus competitor

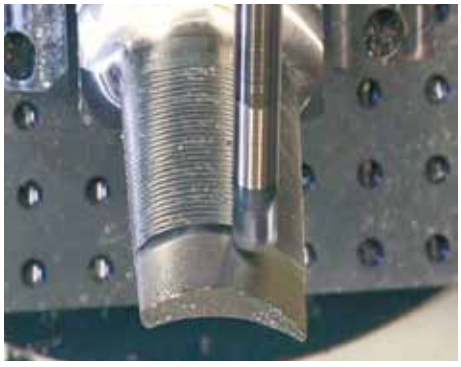
使用工具 Tool	刀头：PXVC220C20-04R005 Head 刀夹：PXMZ-C20SS20-L150L Holder	其他公司整体硬质合金铣刀 Conventional Solid End Mill
尺寸 Size	φ22×R0.5	φ20
加工材料 Work Material	SKD61（40HRC）	
切削速度 Cutting Speed	50m/min (723min⁻¹)	50m/min (796min⁻¹)
进给速度 Feed	300mm/min (0.104mm/t)	60mm/min (0.019mm/t)
切削方法 Cutting Method	侧面加工 Side Milling	
切削深度 Depth of Cut	ap=17.6mm (0.8D) ae=0.05mm	ap=88mm (4.4D) ae=0.05mm
切削油剂 Coolant	无（气冷式） Air Blow	
使用机械 Machine	立式加工中心(BT50) Vertical Machining Center	



PXVC 可以与以往整体铣刀相同加工效率下获得更好的加工精度及加工面粗度。
PXVC achieved better accuracy and finished surface in same machining efficiency versus the competition.

[PXSM]由于多刃化，加工效率提高2倍 ～涡轮叶片加工～ The multiple edge design helps double efficiency in the milling of blades

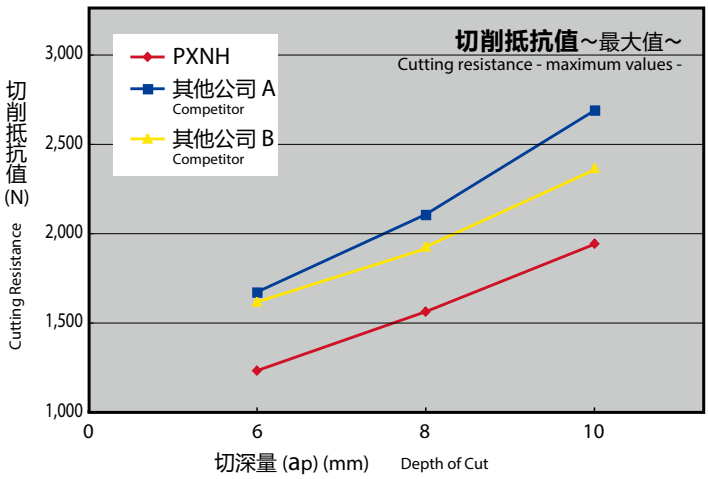
使用工具 Tool	刀头：PXSM160C16-06R005 Head 刀夹：PXMZ-C16SS16-L130CS Holder	其他公司圆刀片铣刀 Competitor's Radius Cutter
尺寸 Size	φ16×R0.5 6刃 Flutes	φ16×R2.5 2刃 Flutes
材质 Grades	XP3225	硬质合金涂层刀片 Coated Carbide Insert
加工材料 Work Material	13Cr相当品 Equivalent	
切削速度 Cutting Speed	125m/min (2,500min⁻¹)	
进给速度 Feed	690mm/min (0.046mm/t)	350mm/min (0.07mm/t)
切削速度 Depth of Cut	ap=1mm ae=0.25mm	
切削油剂 Coolant	无（气冷式） Air Blow	
使用机械 Machine	立式5轴加工中心 5-Axis Vertical Machining Center	



进行很难提高参数的精加工时，替代圆弧角铣刀使用PXSM，效率能提高2倍。
In finishing operations with settings that are difficult to modify, switching to the Phoenix Radius Cutter can double milling efficiency.

[PXNH]由于不等距导程的效果，能实现低抵抗的加工 The variable lead enables low-resistance machining

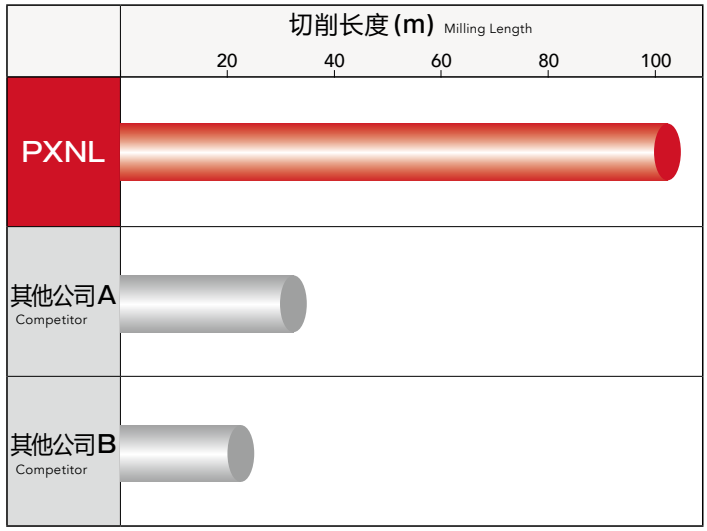
使用工具 Tool	刀头：PXNH200C20-04C006 Head 刀夹：PXMZC20SS20-S120 Holder	其他公司可转位式粗加工型 Competitors' indexable roughing cutter
尺寸 Size	ϕ20 4刃 Flutes	ϕ20 6刃 Flutes
加工材料 Work Material	S50C	
切削速度 Cutting Speed	100m/min (1,590min^{-1})	
进给速度 Feed	450mm/min (0.07mm/t)	450mm/min (0.047mm/t)
切削方法 Cutting Method	槽切削 Slotting	
切削深度 Depth of Cut	ap=6mm, 8mm, 10mm	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	



实现比其他公司产品低20% 的抵抗值。
The resistance value can be reduced by more than 20% from the competitors' products.

[PXNL]由于不等距导程形状，能实现稳定、长寿命的加工 The variable lead enables stable machining and a long tool life

使用工具 Tool	刀头：PXNL200C20-04C006 Head 刀夹：PXMZC20SS20-S120 Holder	其他公司可转位式粗加工型 Competitors' indexable roughing cutter
尺寸 Size	ϕ20 4刃 Flutes	ϕ20 6刃 Flutes
加工材料 Work Material	S50C	
切削速度 Cutting Speed	120m/min (1,910min^{-1})	
进给速度 Feed	764mm/min (0.1mm/t)	764mm/min (0.066mm/t)
切削方法 Cutting Method	侧面切削 Side Milling	
切削深度 Depth of Cut	ap=10mm (0.5D) ae=6mm (0.3D)	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	



实现比其他公司产品多2倍的寿命。
More than twice the durability of the competitors' products.

Cutting Data

■加工数据 Cutting Data

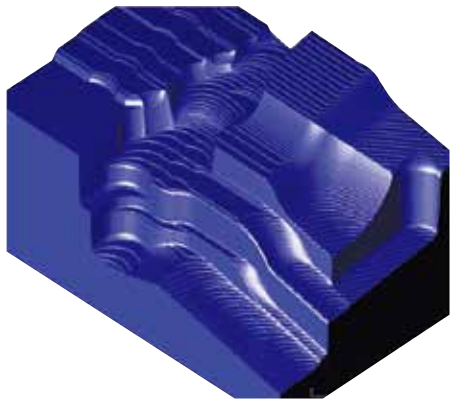
[PXRE]由于多刃化，加工效率提高1.8倍 ~模具半粗加工~ The multiple edge design helps increase efficiency by 1.8 times in die mold roughing processes

使用工具 Tool	刀头：PXRE200C20-06R030 Head 刀夹：PXMZ-C20SS20-S120 Holder	其他公司高进给圆弧角铣刀 硬质合金涂层刀片 Competitor's High Feed Radius CutterCoated Carbide Insert
尺寸 Size	φ20×R3 6刃 Flutes	φ20×R3 2刃 Flutes
加工材料 Work Material	SKD61 (43HRC)	
切削速度 Cutting Speed	230m/min (3,700min^{-1})	120m/min (1,900min^{-1})
进给速度 Feed	6,700mm/min (0.3mm/t)	3,100mm/min (0.8mm/t)
切削深度 Depth of Cut	0.4mm	0.5mm
切削宽度 Width of Cut	10mm	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

在使用高进给圆弧角刀具粗加工时，在编写程序时会输入R值，这导致加工时产生很大残余量。而PXRE的圆弧角R是高精度，其残余量很少，在进行后续加工时，加工负荷稳定，工具寿命以及加工精度都提高了。

替代半粗加工用的高进给圆弧角铣刀使用PXRE，可以提高加工效率1.8倍

By replacing the high feed radius cutter with the PXRE, milling efficiency can be increased by 1.8 times



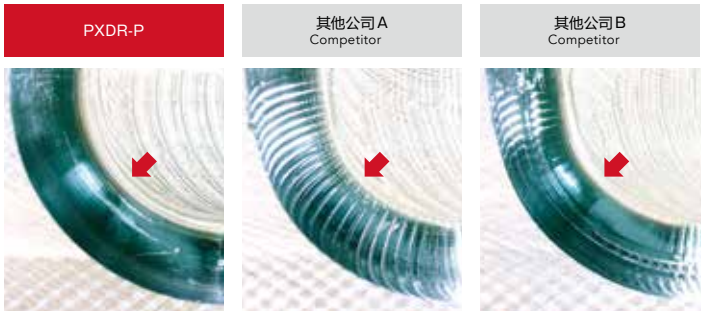
With high feed radius cutters, a simulated R value is inputted in the program during rough milling, resulting in large amounts of uncut areas. In contrast, with the high precision Corner R form PXRE, there are fewer uncut areas, which reduce the load of the next process, thereby increasing tool life and the precision of cut.

[PXDR-P]易发生振动的L/D=7也能稳定加工 Stable machining was achieved in easily chatter L/D=7

使用工具 Tool	刀头：PXDR160C16-03R030-P Head 刀夹：PXMZ-C16SS16-L135CS Holder	其他公司 Competitor
尺寸 Size	φ16×R3 3刃 Flutes	φ16×R3 4刃 Flutes
加工材料 Work Material	NAK80 40HRC	
切削速度 Cutting Speed	30m/min (597min^{-1})	
进给速度 Feed	537mm/min (0.30mm/t)	537mm/min (0.22mm/t)
切削方法 Cutting Method	L字加工 L-shaped machining	
切削深度 Depth of Cut	ap=0.4mm (0.025Dc) ae=8mm (0.5Dc)	
刀具悬伸 Overhang Length	112mm (L/D=7)	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	

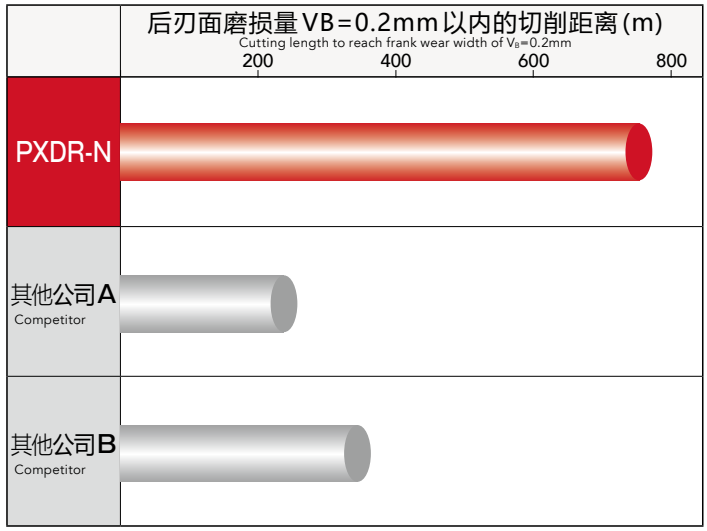
PXDR-P 相较于其他公司产品振动较小，转角处加工面良好。

PXDR-P achieved fair finished surface with less chattering at the corner of work versus the competition.



[PXDR-N]在容易发生振动的L/D=7的环境下也能实现长寿命 Long tool life was achieved machining in L/D=7, which chatters easily

使用工具 Tool	刀头：PXDR160C16-03R030-N Head 刀夹：PXMZ-C16SS16-L135CS Holder	其他公司 Competitor 4刃 Flutes
尺寸 Size	φ16×R3 3刃 Flutes	
加工材料 Work Material	SKD61 (40HRC)	
切削速度 Cutting Speed	120m/min (2,387min^{-1})	
进给速度 Feed	2,149mm/min (0.30mm/t)	2,149mm/min (0.22mm/t)
切削方法 Cutting Method	平面加工 Face Milling	
切削深度 Depth of Cut	ap=0.4mm (0.025Dc) ae=8mm (0.5Dc)	
刀具悬伸 Overhang Length	112mm (L/D=7)	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	

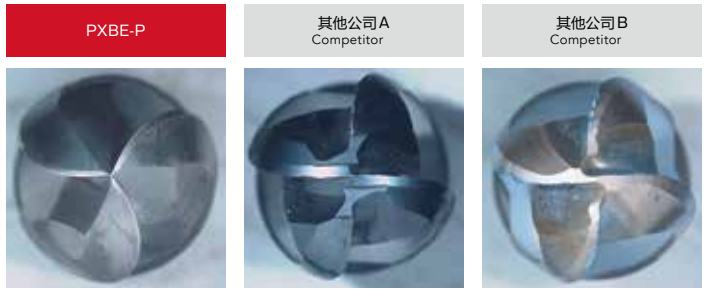


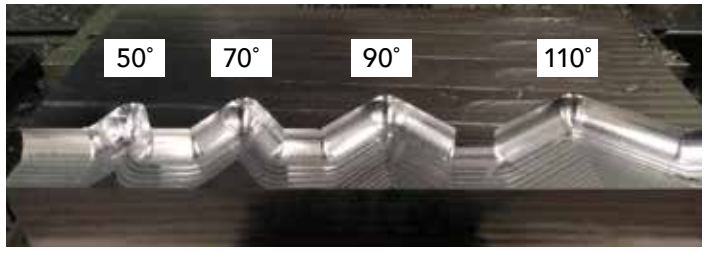
PXDR-N 可以获得其他公司产品2倍以上的耐久度。
PXDR-N was capable to achieve twice the durability versus the competition.

[PXBE-P]刀具悬长长的复杂形状加工时，3刃PXBE-P 表现非凡 The 3-flutes PXBE-P was more capable versus 4-flutes in machining work with complicated shape

使用工具 Tool	刀头：PXBE160C16-03R080-P Head 刀夹：PXMZ-C16SS16-L130CS Holder	其他公司 Competitor 4刃 Flutes
尺寸 Size	φ16×R8 3刃 Flutes	
加工材料 Work Material	SKD61 (40HRC)	
切削速度 Cutting Speed	75m/min (1,492min^{-1})	
进给速度 Feed	224mm/min (0.05mm/t)	298mm/min (0.05mm/t)
切削深度 Depth of Cut	ap=0.8mm (0.05Dc) ae=2.4mm (0.15Dc)	
刀具悬伸 Overhang Length	78mm (L/D=4.9)	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	

加工锐角时，3刃PXBE-P 不易发生振动，刀具磨损较少。
The 3-flutes PXBE-P was less damaged versus the competitors' 4-flutes tool by machining wok required paths with acute angles.



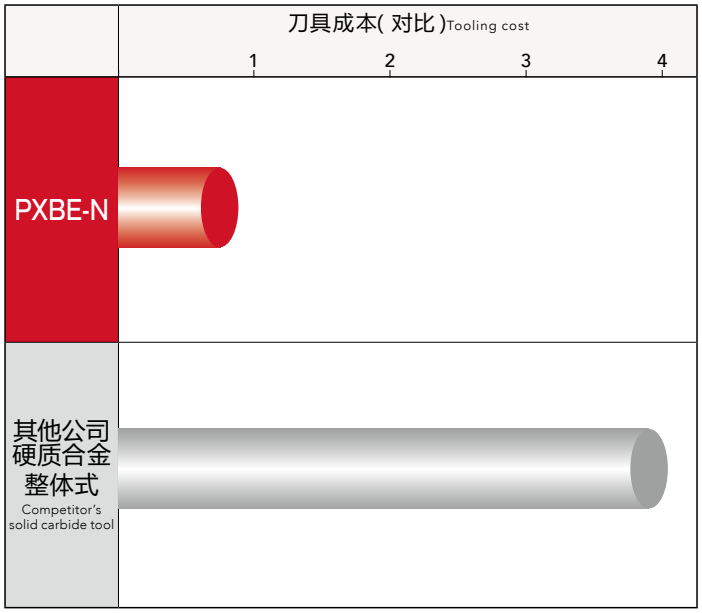


Cutting Data

■加工数据 Cutting Data

[PXBE-N]替换整体式工具，可减少成本 ~模具加工~ Tooling cost reduced by switching from solid tools in die casting machining

使用工具 Tool	刀头：PXBE160C16-03R080-N Head 刀夹：PXMZ-C16SS16-L130CS Holder	其他公司整体硬质合金刀具 Competitor's solid carbide tool
尺寸 Size	φ16×R8 3刃 Flutes	φ16×R8 4刃 Flutes
加工工件 Work	冲压模具 Press Dies	
加工材料 Work Material	SKD11 (60HRC)	
切削速度 Cutting Speed	90m/min (1,800min^{-1})	
进给速度 Feed	810mm/min (0.15mm/t)	810mm/min (0.11mm/t)
切削方法 Cutting Method	啄钻加工 Pick Milling	
切削速度 Depth of Cut	ap=0.32mm ae=0.8mm	
切削油剂 Coolant	水溶性切削油剂 Water-Soluble	
使用机械 Machine	立式加工中心(BT40) Vertical Machining Center	
切削长度 Milling Length	330m	

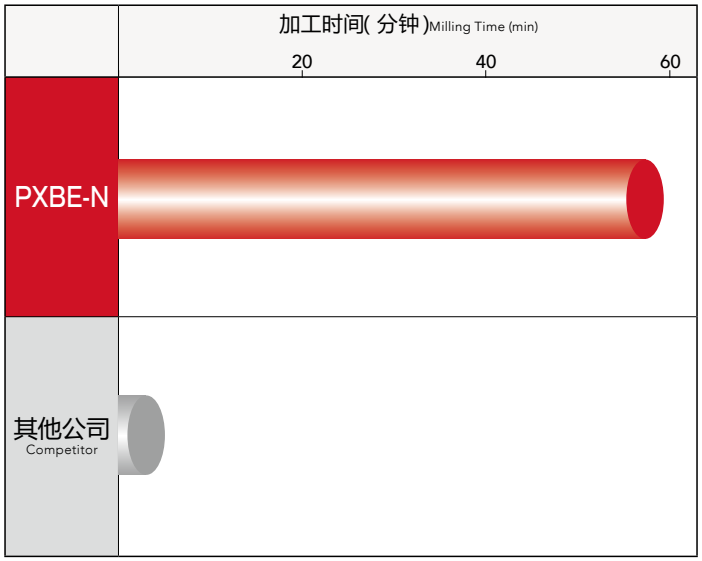


切削长度330m，可实现与整体刀具同等的加工效率。刀具费用则为1/4。

PXBE-N achieved the same machining efficiency and the cutting length of 330m as the solid end mill.

[PXBE-N]替换可转位式效率UP ~焊接部加工~ Machining efficiency improved by switching from indexable tools in welding parts machining

使用工具 Tool	刀头：PXBE200C20-03R100-N Head 刀夹：PXMZ-C20SS20-L150CS Holder	其他公司可转位式精加工球头型铣刀 Competitor's indexable finishing ball nose end mill
尺寸 Size	φ20×R10 3刃 Flutes	φ20×R10 2刃 Flutes
加工工件 Work	压铸模具 Die-casting Die	
加工材料 Work Material	SKD61 (52HRC)+修焊部 Weld overlay	
切削速度 Cutting Speed	75m/min (1,200min^{-1})	
进给速度 Feed	420mm/min (0.12mm/t)	420mm/min (0.17mm/t)
切削方法 Cutting Method	啄钻加工 Pick Milling	
切削速度 Depth of Cut	ap=10mm ae=1mm	
切削油剂 Coolant	无(气冷式) Air Blow	
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center	

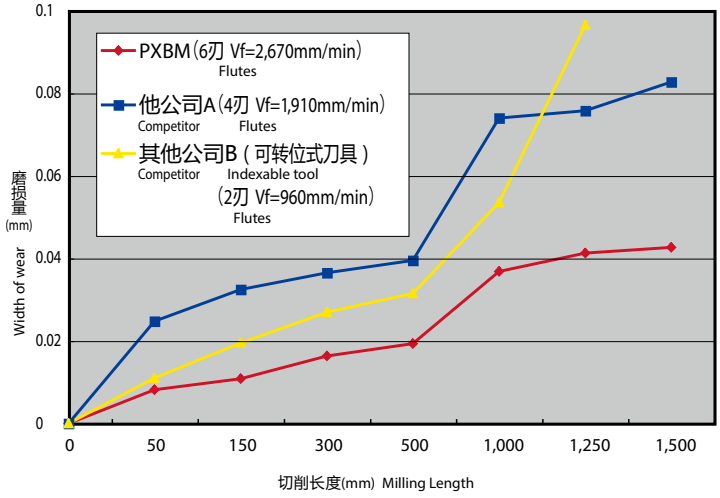


相对于可转位式，耐用性提高12倍。刀具的更换时间缩短可以大幅提高加工效率。

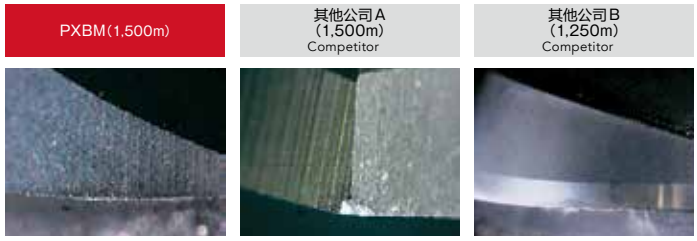
Twelve times durability was achieved than the competitor indexable tool. Machining efficiency was highly improved, which was partly due to the shortened tool-change time.

[PXBM] NAK80的斜面加工(每刃进给相同时的比较) NAK80 machining at slop face (comparison in the same feed rate)

使用工具 Tool	刀头 : PXBM160C16-06R080 Head 刀夹 : PXMZ-C16SS16-S100 Holder
尺寸 Size	φ16×R8 6刃 Flutes
加工材料 Work Material	NAK80 (40HRC)
切削速度 Cutting Speed	200m/min (3,980min^{-1})
每刃进给量 Feed Per Tooth	0.12mm/t
切削方法 Cutting Method	啄钻加工 Pick Milling
切削深度 Depth of Cut	ap=0.32mm Pf=0.8mm
切削油剂 Coolant	无(气冷式) Air Blow
使用机械 Machine	卧式加工中心(BT50) Horizontal Machining Center



6刃设计可提高效率，优良的耐磨损性可实现高寿命。
Materialized by more cutting edges for better productivity, longer tool life with superb durability.



锁紧顺序 Tightening procedure

①清洗 Cleaning
将刀头和柄部之间的垃圾以及污垢擦干净
Remove dirt and chips from the connecting thread and shank

②暂锁 Initial Tightening
手动锁紧
Tighten by hand

③最终锁紧
Final Tightening
使用专用扳手锁紧
Tighten with a spanner wrench

④确认
Confirmation
确认有否空隙
Confirm that there is no gap

使用注意 Cautions during use

- 安装刀头时请使用 PXM 专用扳手。(非专用扳手不能使用。)
- 推荐安装扭矩请参考 P.175。
- 刀头与夹具端面安装时，请确认无间隙。
- 安装部脱油会使得安装更加困难，有可能达不到端面。所以请勿脱油。
- 请将扳手插入刀头凹槽处，慢慢回转。

· Only use the spanner wrenches that are designed specifically for the PXM (p.175) for attaching PXM heads. Please do not use alternative spanner wrenches sold on the market as a replacement.
· Please refer to p.8 for tightening torque.
· Please tighten until the head and the shank holder faces meet. Confirm that there is no gap.
· Degreasing the connecting thread may result in over tightening or a possible separation of the faces. Please do not degrease.
· Please make sure that the spanner wrench is inserted properly and turn it slowly during use.

Phoenix PXMC

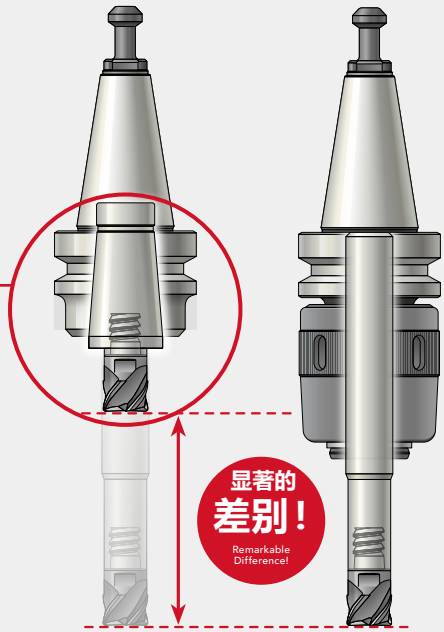
可换头式铣刀 PXM 专用夹具
Collet for PXM Exchangeable Head End Mill

PXMC NEW

特点
Features

PXMC 夹具特点
PXMC Collet Features

〈〈PXMC 超短型〉〉 PXMC Collet Extra Short Type　　〈以往的组合〉 Conventional Combination



小型 M/C 也能取得惊人的排屑性

Powerful chip evacuation even on small machining center

实现短悬长，刚性 UP 与理想的回转平衡性

The reduction of overhang length improves rigidity and rotational balance

丰富的刀头品种

·对应钢材、不锈钢、铝材
·实现从粗加工到精加工的广泛加工

A wide variety of exchangeable heads
· Suitable for steel, stainless steel and aluminum
· Wide processing range from roughing to finishing

与一体式刀柄相比，发生问题时只需更换夹具，具有超高性价比

Greater cost performance compared to monoblock type holders, only need to change the collet in case of trouble.

PXM 刀头特点
PXM Exchangeable Head Features

端面 + 锥形 = 双面固定

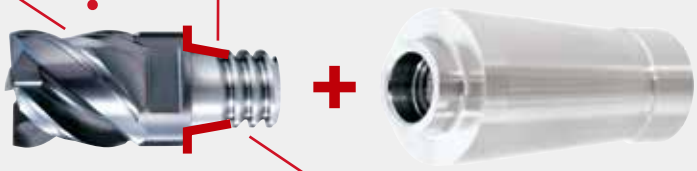
·确保高刚性与精度
·外周刃的振动精度 :0.015mm 以下
·刀头交换精度(轴向) ±0.03mm

End Face + Taper = Double Face Clamping
·High rigidity and accuracy of tightening
·High precision of run out ≦ 0.015mm
·High head replacing accuracy = ±0.03mm

活用整体铣刀的设计·实绩·专业技术的刃形

·可对应各式各样的加工

All the knowledge and know-how acquired by designing solid carbide end mills are found in these exchangeable heads.
·Various types are available to meet variety of machining methods.



采用偏梯形螺纹

·刀头的装卸更方便
·刀具交换时间的短缩

Applying buttress screw makes easy and reduces time to desorb heads

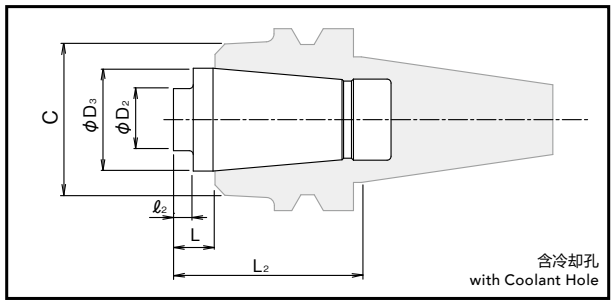
Specification

短型
Short

超短型
Extra Short

夹具B型
Holder Type B

■形状尺寸表 Specification



NEW

单位:mm Unit:mm

类别 Type	商品号 EDP No.	名称 Designation	首径 D2	D3	L	悬长 ℓ2	刀头安装时的有效长 Head + ℓ2			安装规格 Cs
							PXVC以外*1 Except PXVC	PXVC外径 Dc		
								φ12, 16, 20, 25	φ14, 18, 22	
超短型 Extra Short	7834001	PXMC-C1205	11.7	26	10.5	5	19.4	23	25	C12
	7834002	PXMC-C1605	15.7	26	10.5	5	23.7	28.5	30.5	C16
	7834003	PXMC-C2005	19.6	26	10.5	5	26.5	32.5	34.5	C20
	7834004	PXMC-C2505	24.0	26	10.5	5	32.5	40	—	C25
短型 Short	7834011	PXMC-C1230	11.7	26	35.5	30	44.4	48	50	C12
	7834012	PXMC-C1630	15.7	26	35.5	30	48.7	53.5	55.5	C16
	7834013	PXMC-C2030	19.6	26	35.5	30	51.5	57.5	59.5	C20
	7834014	PXMC-C2530	24.0	26	35.5	30	57.5	65	—	C25

・PXMC 是"OSG PHOENIX PXM 系列"刀头专用夹具。
・*1 :可装卸的刀头 :PXNH、PXNL、PXSE、PXSM、PXDR、PXRE、PXBE、PXBM
The PXMC exchangeable head is designed specifically for the "OSG PHOENIX PXM" series.
· Applicable exchangeable heads: PXNH, PXNL, PXSE, PXSM, PXDR, PXRE, PXBE, PXBM.

■PXMC 对应HYPRO 热胀刀柄 产品一览 Product Listing of PXMC corresponding to the HYPRO Shrink System

单位:mm Unit:mm

类型 Type	商品号 EDP No.	名称 Designation	C	L2	
				超短型 Extra Short	短型 Short
夹具B型 Holder Type B	8910000	BT30-SLK12-35 P30T-1(MAS1)	38	45.5	70.5
	8910001	BT30-SLK12-35 P30T-2(MAS2)	38	45.5	70.5
	8910002	BT40-SLK12-45	38	55.5	80.5
	8910003	BT40-SLK12-75	38	85.5	110.5
	8910005	A63-SLK12-75	38	85.5	110.5
	8910006	A63-SLK12-135	38	145.5	170.5

·价格请咨询我司营业。
・PXMC 夹具可与HYPRO 热胀刀柄互换。
· Contact your local OSG sales representative for information regarding pricing.
· The PXMC collet is compatible with the HYPRO Shrink Collet System.

Phoenix PXMC

可换头式铣刀
Exchangeable Head End Mill

PXVC+PXMC

Cutting Conditions

■切削条件基准表 Cutting Conditions

侧面切削 PXVC + PXMC 超短型 Side Milling, PXVC+PXMC Extra Short Type

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45 ～ 55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	5,570	1,720	4,460	1,380	3,720	1,020	2,760	720
14	4,780	1,490	3,820	1,180	3,190	880	2,360	610
16	4,180	1,290	3,340	1,040	2,780	760	2,080	540
18	3,720	1,150	2,980	930	2,470	680	1,840	490
20	3,340	1,040	2,670	820	2,240	620	1,660	430
22	3,050	950	2,430	750	2,030	560	1,500	390
25	2,670	820	2,140	660	1,790	490	1,320	350
切削深度 Depth of Cut	ap=0.5Dc ae=0.25Dc				ap=0.5Dc ae=0.12Dc		ap=0.5Dc ae=0.075Dc	

侧面切削 PXVC + PXMC 短型 Side Milling, PXVC+PXMC Short Type

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel·Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45 ～ 55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	4,770	1,240	3,820	1,000	3,190	800	2,130	620
14	4,100	1,070	3,270	850	2,730	680	1,820	520
16	3,580	930	2,860	750	2,380	600	1,600	460
18	3,190	830	2,550	670	2,120	530	1,420	420
20	2,860	750	2,290	590	1,920	480	1,280	370
22	2,610	680	2,080	540	1,740	430	1,160	330
25	2,290	590	1,830	480	1,530	380	1,020	300
切削深度 Depth of Cut	ap=0.5Dc ae=0.2Dc				ap=0.5Dc ae=0.1Dc		ap=0.5Dc ae=0.05Dc	

1. 根据切深量、机械刚性等使用情况，请调整转速及进给速度。
1. Please adjust speed and feed when the depth of cut is large or machines with low rigidity are used.

槽切削　PXVC + PXMC　超短型 Slot Milling, PXVC+PXMC Extra Short Type

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	4,770	1,200	3,810	960	3,180	630	2,180	440
14	4,090	1,020	3,270	820	2,720	540	1,880	370
16	3,570	900	2,860	720	2,380	480	1,630	330
18	3,180	790	2,540	630	2,120	420	1,460	290
20	2,860	720	2,290	570	1,900	380	1,300	260
22	2,600	640	2,080	520	1,740	340	1,190	240
25	2,290	570	1,830	460	1,520	300	1,040	200
切削深度 Depth of Cut	ap≦0.5Dc		ap≦0.4Dc		ap≦0.3Dc		ap≦0.3Dc	

槽切削　PXVC + PXMC　短型 Slot Milling, PXVC+PXMC Short Type

加工材料 Work Material	一般构造用钢·炭素钢·铸铁 Mild Steel· Carbon Steel Cast Iron SS400, S55C, FC250 (～750N/mm²)		合金钢·工具钢 Alloy Steel Tool Steel SCM, SKT, SKS, SKD (～30HRC)		不锈钢·调质钢 Stainless Steel Hardened Steel SUS304, SKD (～45HRC)		调质钢·钛合金(湿式) Hardened Steel Titanium Alloy (Wet) Ti-6Al-4V (45～55HRC)	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,980	1,040	3,180	830	2,650	630	1,990	400
14	3,410	880	2,730	710	2,270	540	1,710	340
16	2,980	780	2,390	620	1,990	480	1,490	300
18	2,650	680	2,120	540	1,770	420	1,330	270
20	2,390	620	1,910	490	1,590	380	1,190	240
22	2,170	550	1,740	450	1,450	340	1,090	220
25	1,910	490	1,530	400	1,270	300	950	190
切削深度 Depth of Cut	ap≦0.5Dc		ap≦0.4Dc		ap≦0.3Dc		ap≦0.3Dc	

1. 根据切深量、机械刚性等使用情况，请调整转速及进给速度。
1. Please adjust speed and feed when the depth of cut is large or machines with low rigidity are used.

Phoenix PXMC

可换头式铣刀
Exchangeable Head End Mill

PXNH+PXMC

Cutting Conditions

■切削条件基准表 Cutting Conditions

侧面切削　PXNH + PXMC　超短型 Side Milling, PXNH+PXMC Extra Short Type

加工材料 Work Material	铸铁 Cast Iron FC250		炭素钢 Carbon Steel		合金钢 Alloy Steel		调质钢·预硬钢(快削) Hardened Steel Pre-hardened Steel (Free-Cutting)		不锈钢 Stainless Steel SUS304	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	4,300	1,200	5,720	1,400	4,770	880	3,580	430	2,540	270
16	3,220	1,240	4,300	1,440	3,580	900	2,680	450	1,900	280
20	2,570	1,320	3,430	1,520	2,860	960	2,140	460	1,520	300
25	1,600	900	2,280	1,120	1,830	680	1,330	330	910	200
切削深度 Depth of Cut	ap=0.5Dc ae=0.4Dc						ap=0.5Dc ae=0.3Dc		ap=0.5Dc ae=0.2Dc	

侧面切削　PXNH + PXMC　短型 Side Milling, PXNH+PXMC Short Type

加工材料 Work Material	铸铁 Cast Iron FC250		炭素钢 Carbon Steel		合金钢 Alloy Steel		调质钢·预硬钢(快削) Hardened Steel Pre-hardened Steel (Free-Cutting)		不锈钢 Stainless Steel SUS304	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,580	1,080	4,770	1,260	3,970	790	3,100	340	2,750	250
16	2,680	1,110	3,580	1,290	2,980	810	2,320	360	2,060	260
20	2,140	1,180	2,860	1,360	2,380	860	1,850	370	1,650	270
25	1,330	810	1,900	1,000	1,530	610	1,150	260	980	180
切削深度 Depth of Cut	ap=0.5Dc ae=0.4Dc						ap=0.5Dc ae=0.3Dc		ap=0.5Dc ae=0.2Dc	

1. 根据切深量、机械刚性等使用情况，请调整转速及进给速度。
1. Please adjust speed and feed when the depth of cut is large or machines with low rigidity are used.

槽切削　PXNH + PXMC　超短型 Slot Milling, PXNH+PXMC Extra Short Type

加工材料 Work Material	铸铁 Cast Iron FC250		炭素钢 Carbon Steel		合金钢 Alloy Steel		调质钢·预硬钢(快削) Hardened Steel Pre-hardened Steel (Free-Cutting)		不锈钢 Stainless Steel SUS304	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	3,720	1,050	5,300	1,290	4,240	770	2,970	220	2,220	160
16	2,780	1,120	3,980	1,400	3,180	840	2,220	240	1,660	180
20	2,070	1,040	2,980	1,320	2,380	800	1,590	220	1,210	160
25	1,520	980	2,300	1,290	1,780	730	1,210	200	890	150
切削深度 Depth of Cut	$a_p \leqq 0.5Dc$									

槽切削　PXNH + PXMC　短型 Slot Milling, PXNH+PXMC Short Type

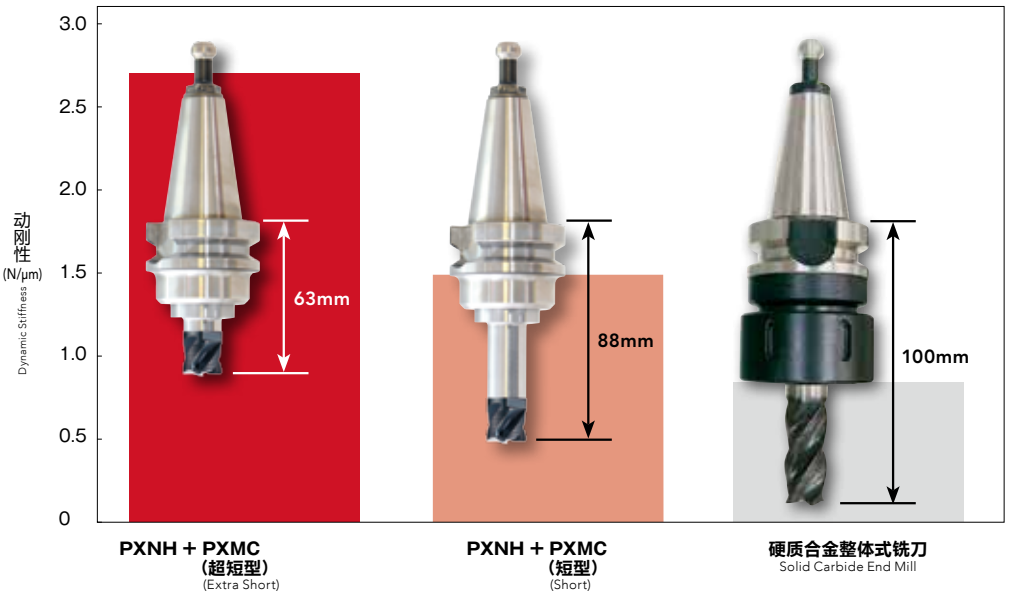
加工材料 Work Material	铸铁 Cast Iron FC250		炭素钢 Carbon Steel		合金钢 Alloy Steel		调质钢·预硬钢(快削) Hardened Steel Pre-hardened Steel (Free-Cutting)		不锈钢 Stainless Steel SUS304	
外径 Mill Dia. (mm)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)	回转速度 Speed (min^{-1})	进给速度 Feed (mm/min)
12	2,790	900	3,970	1,110	3,180	660	2,410	190	1,900	140
16	2,080	960	2,980	1,200	2,380	720	1,800	210	1,420	150
20	1,470	890	2,190	1,150	1,800	760	1,310	200	1,020	140
25	1,140	840	1,720	1,110	1,330	630	980	180	760	130
切削深度 Depth of Cut	$a_p \leqq 0.5Dc$									

1. 根据切深量、机械刚性等使用情况，请调整转速及进给速度。
1. Please adjust speed and feed when the depth of cut is large or machines with low rigidity are used.

Cutting Data

■加工数据 Cutting Data

刀具刚性比较(悬长不同) Tool Rigidity Comparison (by overhang length)



■ PXMC 夹具 Collet
·超短型 Extra Short Type

·短型 Short Type

■ PXM 刀头 Head
· PXNH

硬质合金整体式铣刀相比，PXMC 短型可以达到1.5倍、超长型可以达到3倍的动刚性，可以减轻振动、实现广泛的切削领域。所谓动刚性是动载荷下抵抗变形的特性。切削时动刚性越大加工越稳定。

In comparison to the solid carbide end mill, the PXMC short type holder demonstrated 1.5 times the dynamic rigidity, while the extra short type holder demonstrated 3 times the dynamic rigidity. Both had exhibited minimal vibration, making them applicable to accommodate a wide machining range.
Chatter vibration is commonly caused by the lack of sufficient dynamic rigidity to stabilize parts in a dynamic cutting force. Vibration can change as the result of a change in force, a change in rigidity, or both. The greater the dynamic rigidity the more machining stability can be achieved.

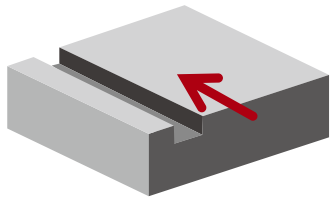
工具不同，加工领域的区别 Applicable Cutting Range Difference by Tooling Holders

■ 槽加工 Slot Milling

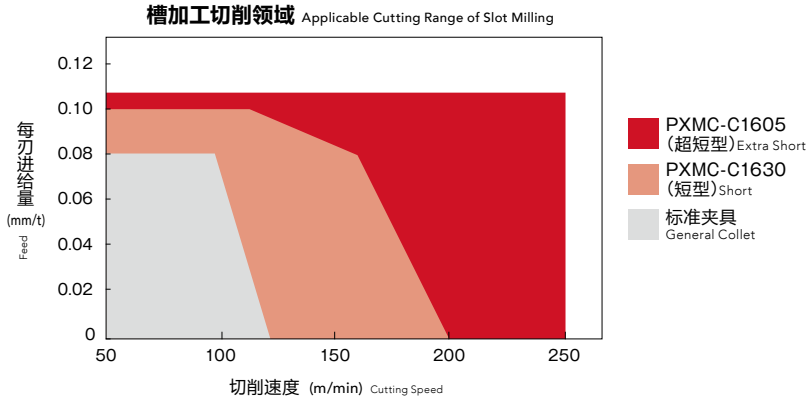
使用工具 Tool	刀头 Head	PXNH160C16-04C006	PXNH160C16-04C006	硬质合金整体式铣刀 Solid Carbide End Mill
	夹具 Collet	PXMC-C1605 (超短型) Extra Short	PXMC-C1630 (短型) Short	标准夹具 General Collet
尺寸 Size		φ16 4刃 flutes		
加工材料 Work Material		S50C		
切削方法 Cutting Method		槽加工 Slot Milling		
切削深度 Depth of Cut		ap=8mm (0.5D)		
切削油剂 Coolant		无(气冷式) Air Blow		
使用机械 Machine		立式加工中心(BT30) Vertical Machining Center		

在负荷较大的沟槽加工中，超短型能实现高效率加工。超短型的效率可以达到整体硬质合金铣刀的321%的结果。

Short overhang length is ideal in order to achieve high-efficiency in heavy-duty operations such as slot milling. The extra short type holder was able to demonstrate 321% the efficiency versus a solid end mill tool.



槽加工切削领域 Applicable Cutting Range of Slot Milling

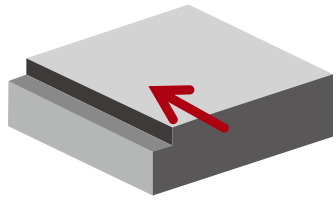


■ 侧面加工 Side Milling

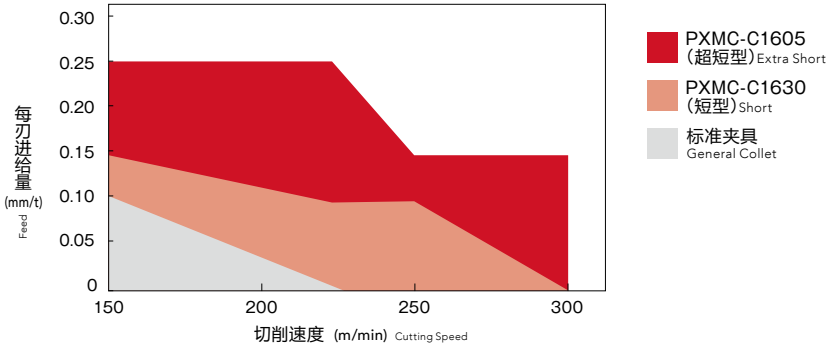
使用工具 Tool	刀头 Head	PXNH160C16-04C006	PXNH160C16-04C006	硬质合金整体式铣刀 Solid Carbide End Mill
	夹具 Collet	PXMC-C1605 (超短型) Extra Short	PXMC-C1630 (短型) Short	标准夹具 General Collet
尺寸 Size		ϕ16 4刃 flutes		
加工材料 Work Material		S50C		
切削方法 Cutting Method		侧面加工 Side Milling		
切削深度 Depth of Cut		ap=10mm (0.63D) ae=6.4mm (0.4D)		
切削油剂 Coolant		无(气冷式) Air Blow		
使用机械 Machine		立式加工中心(BT30) Vertical Machining Center		

排屑性优良，超短型·短型都可以稳定加工。相比下来，超短型更加适合高条件加工。

Although both of the extra short and short type holders were able to achieve good chip evacuation, the extra short holder, which has the shortest overhang length, is the most ideal for high efficiency machining.



侧面加工切削领域 Applicable Cutting Range of Side Milling

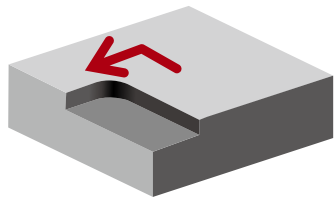


■ 形状加工 Profile Milling

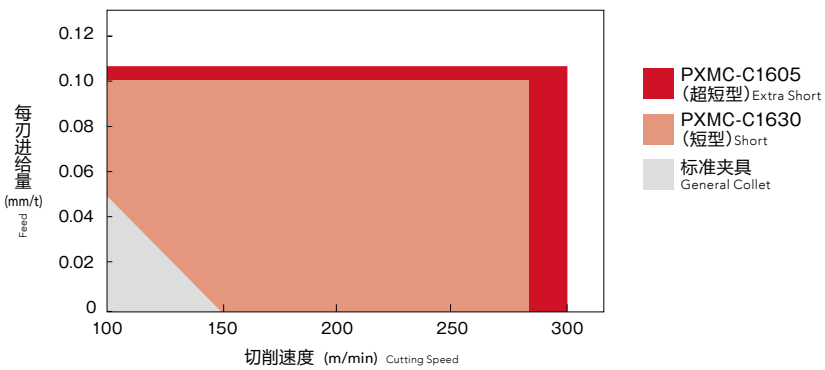
使用工具 Tool	刀头 Head	PXNH160C16-04C006	PXNH160C16-04C006	硬质合金整体式铣刀 Solid Carbide End Mill
	夹具 Collet	PXMC-C1605 (超短型) Extra Short	PXMC-C1630 (短型) Short	标准夹具 General Collet
尺寸 Size		ϕ16 4刃 flutes		
加工材料 Work Material		S50C		
切削方法 Cutting Method		形状加工 Profile Milling		
切削深度 Depth of Cut		ap=8mm (0.5D) ae=4.8mm (0.3D)		
切削油剂 Coolant		无(气冷式) Air Blow		
使用机械 Machine		立式加工中心(BT30) Vertical Machining Center		

硬质合金整体铣刀其承受加工负荷的圆弧角部发生较大的噪音。另一边PXMC 超短型·短型可以稳定加工。

For heavy-duty operations with significant load on the cutter corners, the solid carbide end mill exhibited chattering while both the PXMC extra short and short type holders were able to achieve stable performance.



形状加工切削领域 Applicable Cutting Range of Profile Milling



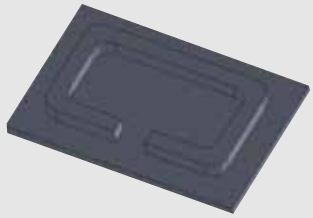
Performance Evaluation

■性能评价 Performance Evaluation

现状 Problem

在小型加工中心中高效加工右图所示工件时，出现下述问题
- **·大径刀具···锋利性与重量**
- **·小径铣刀···切深量的极限**
- **·中等尺寸···效率可以，但成本高**

To machine a work piece (such as figure shown on right) at high-efficiency settings on a small-size machining center, common problems include the following:
- · Large diameter cutter: inferior in terms of sharpness and weight
- · Small diameter cutter: Limited by output and efficiency
- · Mid-size cutter: Ideal efficiency but expensive



解决后 Solution

使用 PXMC 实现轻量化。解决了悬长引起的问题、实现前所未有的加工效率。
The PXMC was able to resolve the problem by reducing the overhang length, tool weight, while achieving highly efficient performance.

■不同种类道具的特点 Features by Diameter Size

《现状 Problem》

	小径铣刀 Small diameter cutter	中等尺寸 Mid-size cutter	大径刀具 Large diameter cutter
成本 Cost	△	×	○
效率 Efficiency	×	○	△
安定加工 Stability	○	△	×
悬长 Overhang Length	○	×	△
重量 Weight	○	△	×

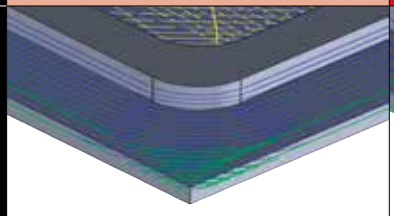
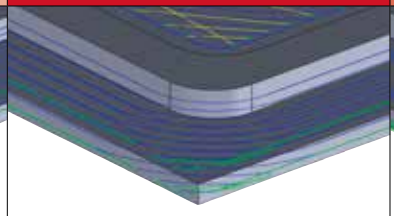
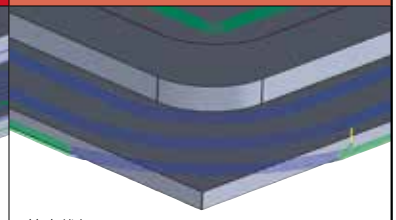
《解决后 Solution》 By changing Solid mid-size end mill to exchangeable head end mill with PXMC collet

中等尺寸铣刀换成可换头式+PXMC 的结果

	小径铣刀 Small diameter cutter	PXMC	大径刀具 Large diameter cutter
成本 Cost	△	○	○
效率 Efficiency	×	◎	△
安定加工 Stability	○	○	×
悬长 Overhang Length	○	○	△
重量 Weight	○	○	×

◎=很好 ○=良好 △=普通 ×=差
◎=Very Good ○=Good △=Fair ×=Bad

■总排屑量在1,000cm³ 时加工时间与损伤情况的对比例 Machining time and tool wear comparison after total chip emission of 1,000cm³/min.

使用工具 Tool / 工具 Tool	小径硬质合金整体式铣刀 φ8 4刃 Solid Carbide End Mill flutes	PXNH160C16-04C006 φ16 4刃 flutes	可转位式刀具 φ32 4刃 Indexable Tool flutes
夹具 Holder	弹簧夹头 Collet Chuck	PXMC-C1605	ミーリングチャック Milling Chuck
工件 材质·尺寸 Work: Material · Size S50C (250×300×18mm)	 侧铣 Thrust side milling	 侧铣 Thrust side milling	 等高线加工 Contour milling
加工条件 Cutting Condtion	n=1,800min⁻¹、Vf=5,370mm/min ap=9mm×2段 Stages、ae=1.6mm	n=5,970min⁻¹、Vf=4,770mm/min ap=9mm×2段 Stages、ae=3.2mm	n=1,900min⁻¹、Vf=600mm/min ap=0.5mm×36段 Stages、ae=16mm
悬长 Overhang Length	95mm	63mm	150mm
排屑量 M.R.R.	25.9cm³/min	173.3cm³/min	4.8cm³/min
加工时间 Time	38分37秒 38min. 37sec.	7分17秒 7min. 17sec.	208分20秒 208min. 20sec.
损伤 Damage	细小崩刃 Small Chipping	初期磨损 Initial Wear	磨损大 Large Wear
评价 Evaluation	△	◎	×

■ 装卸顺序 Mounting Procedure


①临时拧紧(BT30) Initial Tightening

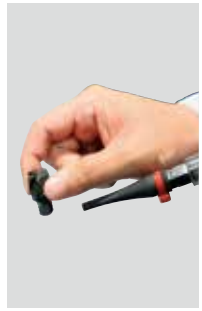
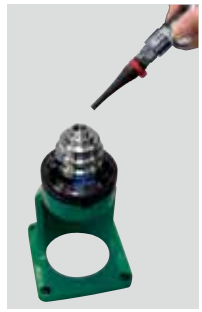
清扫夹具柄的安装部分，并插入。
转动牵引螺栓，使其临时拧紧。
※BT30以外的请参考下面。

Make sure the fastening portion of the collet is clean then insert it into the holder. Turn the pull stud to tighten.
*For models other than BT30 please refer to the instructions below.

②最终拧紧 Final Tightening

用扳手拧紧

Tighten with a spanner wrench

③清扫 Cleaning

清除刀头、夹具安装部的垃圾及污垢。

Remove dirt and chips from the connecting thread and collet


④安装刀头 Mounting the Head

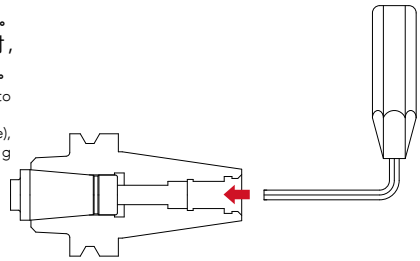
用手拧紧后，再用 PXM 专用扳手拧紧。

After screwing the head in by hand, use the PXM spanner wrench to tighten.

※BT30以外的安装顺序 Mounting procedure for holders other than BT30

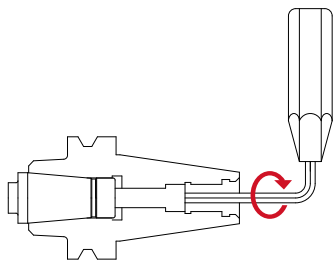
①在螺纹六角部插入六角扳手。
※有孔的牵引螺栓(Φ6 以上)时，可将牵引螺栓安装着进行操作。

Insert the hexagon socket wrench into the pull screw hexagonal section.
*For pull studs with holes (ϕ6 or above), it is operational with the stud being attached.



②不转动夹具，在夹具的先端处握住扳手进行转动(右转)。按指定扭矩进行安装。
※推荐安装扭矩 :18N · m

To prevent the collet from rotating, support the tip of the collet by hand, tighten with the wrench by turning to the right, then fastening to the required torque.
*Recommended tightening torque: 18N·m



使用上的注意 Cautions during use

·安装刀头时请使用 PXM 专用扳手。(非专用扳手不能使用。)
·推荐安装扭矩请参考 P.175。
·刀头与夹具端面安装时，请确认无间隙。
·安装部脱油会使得安装更加困难，有可能达不到端面。所以请勿脱油。
·请将扳手插入刀头凹槽处，慢慢回转。

· Only use the spanner wrenches that are designed specifically for the PXM (p.175) for attaching PXM heads. Please do not use alternative spanner wrenches sold on the market as a replacement.
· Please refer to p.8 for tightening torque.
· Please tighten until the head and the collet faces meet. Confirm that there is no gap.
· Degreasing the connecting thread may result in over tightening or a possible separation of the faces. Please do not degrease.
· Please make sure that the spanner wrench is inserted properly and turn it slowly during use.

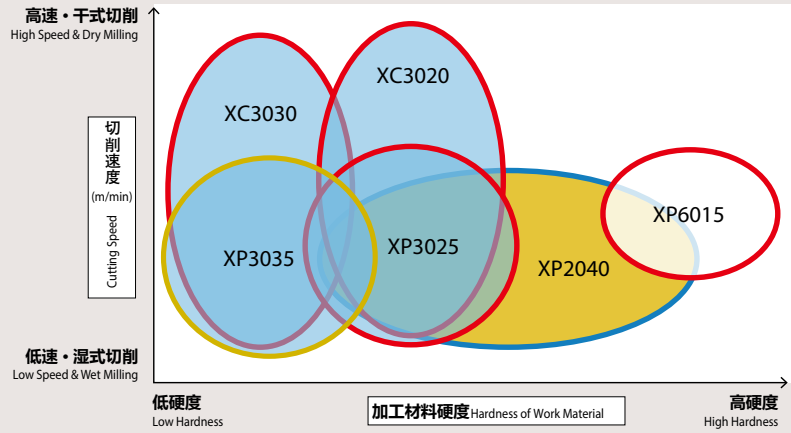
Type of Inserts

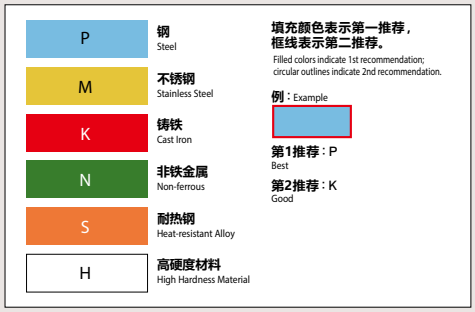
刀片材质一览

分类 Classification	材质 Grades	涂层方法 Coating Method	母材硬度 (HRA) Hardness	表面处理 Surface Treatment		特长 Features
				主成分 Main Component	厚度 Coating Thickness	
P	NEW XC3020	CVD	90.5	TiCN+Al_2O_3	10μm	**钢用·铸铁加工用** For steel and cast iron 高硬度高韧性的硬质合金母材与耐磨损性优异的涂层 High-strength and tough material, wear-resistant coating
	NEW XP3025	PVD	90.5	TiAlN系	5μm	**钢用·铸铁加工用** For steel and cast iron 高硬度高韧性的硬质合金母材与耐磨损性优异的涂层 High-strength and tough material, wear-resistant coating
	XC3025	CVD	90.8	TiCN+TiN+Al_2O_3	4μm	**钢用·不锈钢用·铸铁加工用** For steel, stainless steel, and cast iron 强韧的硬质合金母材和耐磨损性优异的涂层 High-strength material, excellent wear-resistant coating
	XC3030	CVD	89.5	TiCN+Al_2O_3	10μm	**钢用·铸铁加工用** For steel and cast iron 高硬度高韧性的硬质合金母材与耐磨损性优异的涂层 High-strength and tough material, wear-resistant coating
	XP3035	PVD	89.5	TiAlN系	5μm	**钢用·不锈钢用·铸铁加工用** For steel, stainless steel, and cast iron 高硬度高韧性的硬质合金母材和耐崩刃及耐磨损性优良的通用型铣刀用涂层及材质 High-strength and tough material, chipping-resistant and wear-resistant coating, for general purpose milling operation
	XP3225	PVD	91.5	Cr系	3μm	**钢用·不锈钢用·铸铁加工用** For steel, stainless steel, and cast iron 强韧的硬质合金母材和广泛通用型优质涂层 High-strength material, excellent coating for general purpose
	XP3310	PVD	92.5	SiC含有耐热 强化涂层 Silicon-based heat-resistant coating	3μm	**钢用·铸铁加工用** For steel and cast iron 高硬度高韧性的硬质合金材料与耐磨损性优异的涂层以及铸铁，高硬度钢专用材质 High-strength and tough material, wear-resistant coating
	XP3320	PVD	91.5	SiC含有耐热 强化涂层 Silicon-based heat-resistant coating	3μm	**钢用·不锈钢用·铸铁加工用** For steel, stainless steel, and cast iron 高硬度高韧性的硬质合金母材与耐磨损性优异涂层的铸铁，高硬度钢专用材质 High-strength material, heat-resistant and wear-resistant coating
	XP3425	PVD	91.8	Cr系 复合多层 Composite multilayer	7μm	**鋼加工用材质** For steel 使用厚膜的涂层，耐磨损性优良的PXD 专用材质 Thick-film coating, wear-resistant material, for PXD operation
	XP3930	PVD	90.8	TiAlN	3μm	**钢·铸铁·不锈钢加工用材质** For steel, cast iron, and stainless steel 平衡性能优异，加工材料范围广泛 For a wide variety of work material
	XP9020	PVD	91.9	TiAlN系	3μm	**钢·不锈钢加工用材质** For steel and stainless steel 对应用途及领域广泛，耐崩刃及耐磨损性相平衡的孔加工专用材质 Wide range of applications and areas, well-balanced wear resistance and defect resistance, for drilling operation
	XP9040	PVD	91.9	TiAlN	3μm	**钢·不锈钢加工用材质** For steel and stainless steel 强韧的硬质合金母材，耐崩刃及耐磨损性优异涂层的孔加工专用材质 High-strength material, chipping-resistant and wear-resistant coating, for drilling operation
M	XP2025	PVD	91.0	TiAlN系	5μm	**不锈钢·钢加工用材质** For stainless steel and steel 耐磨损性优异的硬质合金母材和涂层 Composed of a tough carbide material with a wear resistant coating
	XP2040	PVD	89.6	TiAlN系	5μm	**不锈钢·钢加工用材质** For stainless steel and steel 强韧的硬质合金母材和耐崩刃及耐磨损性优良的通用型铣刀用涂层及材质 High-strength material, chipping-resistant and wear-resistant coating, for general purpose milling operation
K	XC1015	CVD	91.5	TiCN+Al_2O_3	10μm	**铸铁加工用材质** For cast iron 高硬度高韧性的硬质合金材料与耐磨损性优异的涂层以及铸铁，高硬度钢专用材质 High-strength and tough material, wear-resistant coating, for milling operation
	XP1010	PVD	91.4	TiAlN系	6μm	**铸铁加工用材质** For cast iron 刀尖优良的铸铁加工用材质 High rigidity of cutting edge is acquired by optimal land width and rake angle.
	XP1020	PVD	91.5	TiAlN系	5μm	**铸铁加工用材质** For cast iron 高硬度高韧性的硬质合金材料与耐磨损性优异的涂层以及铸铁，高硬度钢专用材质 High-strength and tough material, wear-resistant coating, for milling operation
	XP1425	PVD	91.8	Cr系 复合多层 Composite multilayer	7μm	**铸铁加工用材质** For cast iron 强韧母材，耐磨损性优良的厚膜涂层，PXD 专用材质 Non-coated fine grain hard metal with high strengtn and toughness, specifically for PXD operation
	XC9025	CVD	90.8	TiCN+Al_2O_3	6μm	**铸铁加工用材质** For cast iron 高硬度高韧性的硬质合金母材和耐磨损性优异的涂层及铸铁孔加工用专用材质 High-strength and tough material, wear-resistant coating, for drilling operation
N	CK010	—	92.0	–	–	**非铁金属加工用材质** For non-ferrous material 耐崩刃性及耐磨损性高的超硬、无涂层材质 Chipping-resistant, wear-resistant material and no coating
	CK110	—	92.2	–	–	**铝合金·非铁用材质** For aluminum alloy and non-ferrous material 锋利的切削刃及抛光处理的非铁金属加工用材质 Sharp cutting edge with polish treatment
	CF225	—	91.8	–	–	**非铁金属加工用材质** For non-ferrous material 高强度与高硬度兼备的无涂层的超微粒子硬质合金，PXD 专用材质 High-strength and tough non-coat fine grain hard metal, for PXD operation
	XC4505	CVD	93.0	DIA	12μm	**非铁金属加工用材质** For non-ferrous material 超微结晶金刚石涂层，高强度涂层的表面处理 High-strength coating of fine diamond
S	XC5035	CVD	89.3	TiN+Ti(CN)+Al_2O_3+Ti(BN)	6μm	**耐热钢·不锈钢加工用材质** For heat-resistant alloy and stainless steel 强韧的超硬母材，耐氧化性好，润滑度高的涂层及耐热钢加工用材质 High-strength material, oxidation-resistant and high-lubricity coating
	XC5040	CVD	89.3	TiN+TiB_2	4μm	**耐热钢·不锈钢加工用材质** For heat-resistant alloy and stainless steel 强韧的超硬母材，耐氧化性好，润滑度高的涂层、可湿式加工及耐热钢加工用材质 High-strength material, oxidation-resistant and high-lubricity coating, for wet machining
H	XP6015	PVD	92.2	TiAlN	4μm	**高硬度钢用材质** For high-hardness steel 高强度高韧性的硬质合金母材，耐磨损性优良涂层的高硬度刚铣削专用材质 A grade designed for milling high-hardness steel, made of tough, high-strength carbide material with a wear-resistant coating
	XP6305	PVD	93.0	SiC含有耐热 强化涂层 Silicon-based heat-resistant coating	3μm	**高硬度钢用材质** For high hardness material 高温硬度及热传导率优良的高硬度材加工用材质 High temperature strength and excellent thermal conductivity

Application Chart

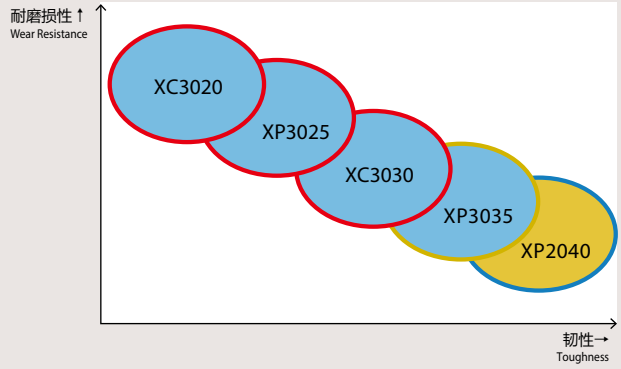
刀片材质适用图 Inserts Application Chart



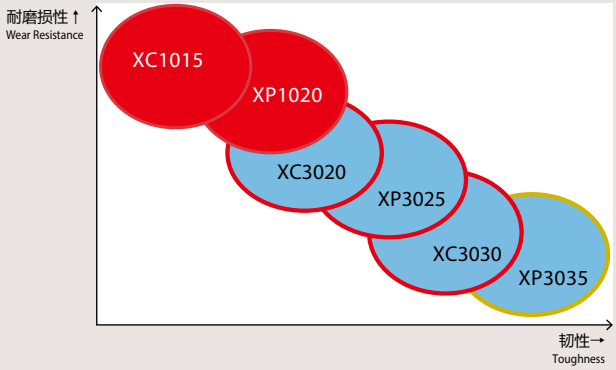


加工材料适用材质 Application Chart of Insert Material

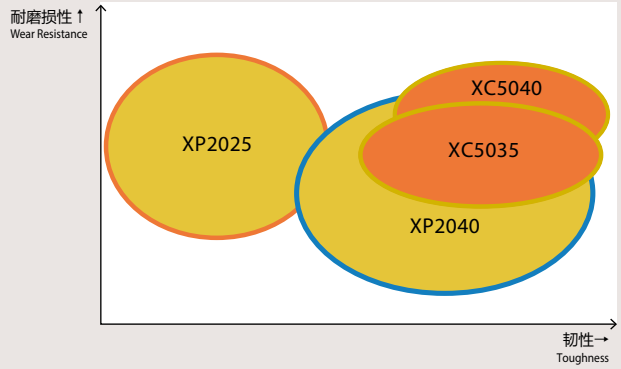
钢系(软钢·一般钢·调质钢)
Steel-based Work Material (Mild Steel, Steel, Hardened Steel)

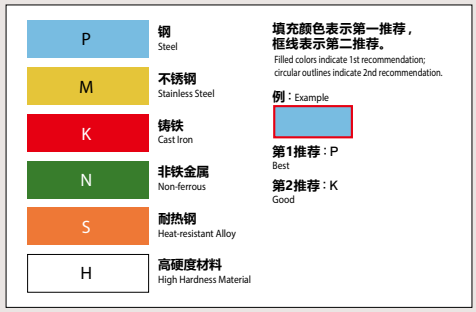


铸铁·球墨铸铁
Cast Iron, Ductile Iron



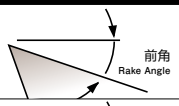
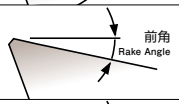
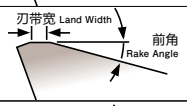
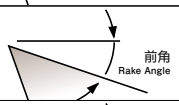
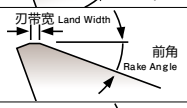
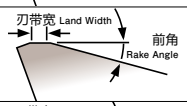
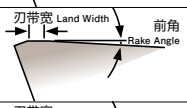
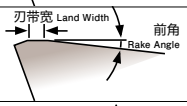
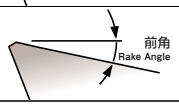
不锈钢
Stainless Steel





Type of Insert Breakers

断屑槽种类和用途

	断屑槽名称 Insert Breaker	切削刃横截面形状 Cutting edge cross-section (approximate)	用途 Application
钻孔用 For Drilling	DN		锋利的切削刃及抛光处理，排屑性优良的非铁金属加工用断屑槽 For drilling non-ferrous material: a breaker with sharp cutting edge and polish treatment for excellent chip evacuation.
	DM		最适合于钢～铸铁加工的前角设计，孔加工专用断屑槽 For machining various materials from steel to cast iron: a general-purpose breaker with an ideal rake angle.
	DR		刃尖强度优良的铸铁加工用断屑槽 For drilling cast iron: a breaker with high rigidity acquired by optimal land width and rake angle.
铣削用 For Milling	NM		锋利的切削刃与大前角相结合，抑制溶着，提高被加工面的光洁度，防止毛刺产生的非铁金属加工专用断屑槽 For machining nonferrous materials: a breaker with a sharp cutting edge and a large rake angle to suppress welding, improve the milling surface and prevent burrs.
	GL		大前角，窄刃带，能够减小切削抵抗的低抵抗型断屑槽 For milling stainless-steel: a breaker with a large rake angle and a small flat land to reduce cutting force.
	GM		前角与刃带的平衡性设计，可加工钢～铸铁的通用型断屑槽。 For drilling various materials from steel to cast iron: a breaker with a superior balance of rake angle and flat land.
	GR		由于前刀角和平底刃刃带，刃尖强度很高，适合铸铁及高硬度材料加工用的高刚性断屑槽。 For machining various materials from steel to cast iron: a highly rigid breaker with large rake angle and flat land to provide a sharp cutting edge and efficient milling.
	HR		锋利性及刚性兼备的高硬度钢加工用断屑槽 For milling high hardened steel: a breaker with sharpness and rigidity on the cutting edge.
	SM		锋利的切削刃，可减少切削抵抗，使切屑流畅排出的难加工材料专用断屑槽 For machining difficult materials: a breaker with a sharp cutting edge to reduce cutting force and provide smooth chip evacuation.

Accessories

■零件 Accessories

固定螺丝、推荐安装扭矩 Clamping Screw·Tightening Torque

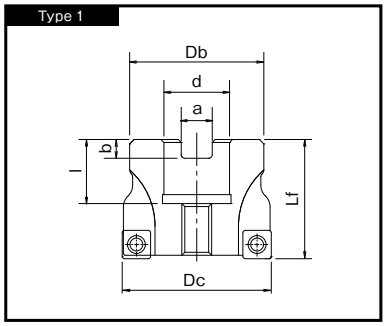
商品号 EDP No.	名称 Designation	螺纹尺寸 Thread Size	梅花尺寸 Torx size	安装扭矩 Tightening Torque	适用刀具(适用刀片) Applicable Cutters(Applicable Inserts)
7808100	FS18538	M 1.8 × 3.8	T06	0.7 N·m	PHP ϕ 14-16 (SCMT04···)
7808102	FS20540	M 2 × 4	T06		PHP ϕ 16.5-18 (SCMT05···)
7808104	FS22550	M 2.2 × 5	T07	1.0 N·m	PHP ϕ 18.5-20.5 (SCMT06···)
7808105	FS25550	M 2.5 × 5	T08	1.6 N·m	PHC07···
7808107	FS25656P	M 2.5 × 5.6	08IP		PSE11··· SS/SF PSEL11··· SS ϕ 25
7808108	FS25560	M 2.5 × 6	T08		PHP ϕ 21-24 (SCMT07···)
7808109	FS25673P	M 2.5 × 7.3	08IP		PSE11··· BORE PSEL11··· SS ϕ 32-40
7808110	FS30573	M 3 × 7.3	T08		PHP ϕ 24.5-28 (SCMT08···) PSF···
7808116	FS30573A	M 3 × 7.3	T10	2.0 N·m	PRC10···
7808111	FS35572	M 3.5 × 7.2	T15	3.2 N·m	PHP ϕ 29-34 (SCMT10···) PHC09··· SS/SF ϕ 25-35
7808112	FS35586	M 3.5 × 8.6	T15		PHC09··· SS/SF ϕ 40, PHC09··· BORE PRC12···
7808115	FS35686P	M 3.5 × 8.6	15IP		PSE15··· PSEL15···
7808129	FS40511	M 4.0 × 11	T15	5.0 N·m	PSTW···
7808113	FS45510	M 4.5 × 10.5	T20		PHP ϕ 35-40 (SCMT12···) PHC12··· PRC16···
7808130	FS50614	M 5 × 14	T20		PAO···
7808131	FS45513P	M 4.5 × 13	20IP		PAS···
7808125	FS60620	M 6 × 17	T25	10.0 N·m	PFAL···

PD用固定螺丝 Clamping Screw for PD

商品号 EDP No.	名称 Designation	螺纹尺寸 Thread Size	梅花尺寸 Torx size	安装扭矩 Tightening Torque	刀具外径(适用刀片) Tool Outer Diameter (Applicable Inserts)
7808139	FS20543P	M 2 × 4.3	06IP	0.7 N·m	ϕ 15-18.5 (XCMT04···, XCMT05···)
7808138	FS22550P	M 2.2 × 5	07IP	1.0 N·m	ϕ 19-20.5 (XCMT06···)
7808136	FS25560P	M 2.5 × 6	08IP	1.6 N·m	ϕ 21-24.5 (XCMT07···)
7808135	FS30570P	M 3 × 7	09IP	2.2 N·m	ϕ 25-33.5 (XCMT08···, XCMT09···)
7808137	FS35586P	M 3.5 × 8.6	15IP	3.2 N·m	ϕ 34-44 (XCMT10···, XCMT12···)
7808114	FS45510P	M 4.5 × 10.5	20IP	5.0 N·m	ϕ 45-63 (XCMT13···, XCMT14···, XCMT16···)

■安装部尺寸表 Dimensions

Type 1



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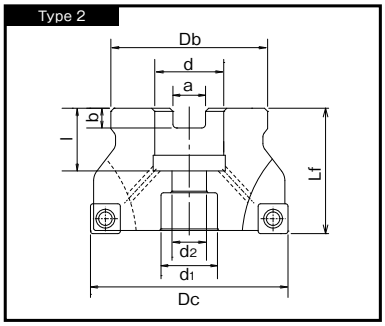
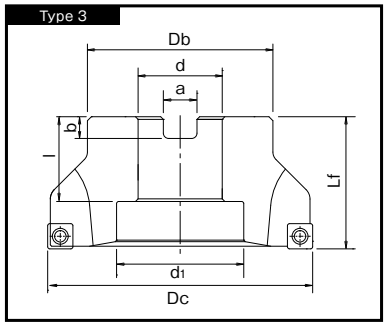
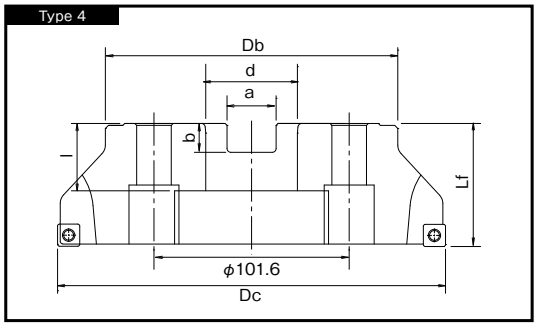


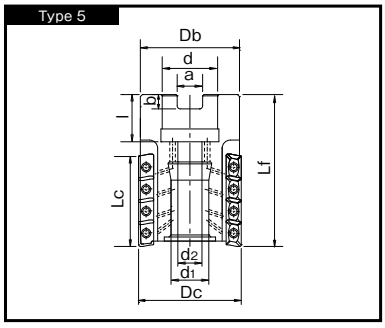
Type 3



Type 4



Type 5



刀盘型刀具 Bore Type Cutter

外径 Dc	孔径 d	刀盘径 Db	d2	d1	安装孔高 ℓ	端面键槽 Key Slot 端面槽宽 a	端面键槽 Key Slot 端面槽深 b	刀具高度 Lf	形状 Type	使用螺纹 Clamping Screw	适用刀具 Applicable Cutters	推荐芯轴规格 Recommended Arbor Specification
40	16	38	PS	PS	20	8.4	5.6	40	①	Power Screw	PSE11···, PSE15··· PHC09···, PHC12···	FMC16
50	22	45	PS	PS	21	10.4	6.3	40	①	Power Screw	PSE11···, PSE15··· PAO···, PRC16···, PSTW	FMC22
			11	17				45	②	M10 × 30	PSF, PRC12···, PRC16···	
											PAS	
		50						50			PHC09···, PHC12···	
	22.225	47				8.4	5				PHC09···, PHC12···	FMA22.225
63	22	50	11	18	21	10.4	6.3	40	②	M10 × 30	PAS, PAO, PSF, PSTW PSE11···, PSE15··· PRC12···, PRC16···	FMC22
								50			PHC09···, PHC12···	
	22.225	60									PHC09···, PHC12···	FMA22.225
80	25.4	60	13.3	20.5	23	9.5	6	50	②	M12 × 40	PAS, PAO, PSF, PSTW PSE11···, PSE15··· PRC12···, PRC16···	FMC25.4
	27		13	20	22	12.4	7				PSE11···, PSE15···, PSTW PRC12···, PRC16···	FMC27
		76									PHC12···	
	31.75		16.5	26	32	12.7	8	63		M16 × 40	PHC12···	FMA31.75
100	31.75	70	-	44.45	32	12.7	8	50	③	MBA-M16	PAS, PAO, PSE15···, PSTW PRC12···, PRC16···	FMA31.75
		96	16.5	26				63	②	M16 × 40	PHC12···	
	32	70			25	14.4		50			PAS, PAO, PSE15··· PRC12···, PRC16···	FMC32
			18	27	26						PSTW	
		96	17					63			PHC12···	
125	38.1	90	-	53.85	38	15.9	10	63	③	MBA-M20	PAS, PAO, PSE15···, PSTW	FMA38.1
	40		22	56	28	16.4	9		②		PSTW	FMB40
160	50.8	100	-	74.42	38	19	11	63	③	MBA-M24	PAO	FMA50.8
200	47.625	150	-	-	38	25.4	14	63	④	M16 × 40 (4本)	PAO	FMA47.625

粗加工型铣刀 刀盘型 Roughing End Mill Bore Type

外径 Dc	孔径 d	刀盘径 Db	d2	d1	安装孔高 ℓ	端面槽宽 a	端面槽深 b	刀具高度 Lf	形状 Type	使用螺纹 Clamping Screw	适用刀具 Applicable Cutters	推荐芯轴规格 Recommended Arbor Specification
50	22	45	11	18.4	21	10.4	6.3	74	⑤	M10 × 25	PSEL15···	FMC22
63	27	60	13	21.8	23	12.4	7.0	74	⑤	M12 × 30	PSEL15···	FMC27
80	32	76	18	28	28	14.4	8.0	88	⑤	M16 × 70	PSEL15···	FMC32

MEMO

MEMO

MEMO

MEMO

Cutter Body Selection Guide

根据刀片/断屑槽名称检索刀体 Search by Alphabetical Order of Insert Designation

刀片名称 Insert Designation	刀体 Body	加工方法 Method	页码 Page
ADMT···	PDR SS, MT, CN, BORE	铣削加工 Milling	P. 117 - P. 124
FR1204, FR1206, FR1204-W	PFAL		P. 125 - P. 132
OZKU···	PAO BORE		P. 59 - P. 64
PFB···	PFB, SF		P. 133 - P.142
PFR···	PFR, SF		P. 143 - P. 158
RPHT···	PRC SS, BORE, SF		P. 107 - P. 116
RPHW···			
RPMT···			
SCMT···	PHP	钻孔加工 Drilling	P. 49 - P. 54
SDKT···, SDHT···	PSF SS, BORE	铣削加工 Milling	P. 65 - P. 68
SDMT···, SPMT···, SXMT···	PHC SS, BORE, SF		P. 93 - P.106
SNKU···	PAS BORE		P. 55 - P. 58
TNKU···	PSTW		P. 87 - P. 92
XAHT···	PAO BORE		P. 59 - P. 64
XCMT···	PD	钻孔加工 Drilling	P. 29 - P. 48
ZDKT···	PSE SS, BORE, SF / PSEL SS, BORE	铣削加工 Milling	P. 69 - P. 86

根据刀体检索刀片 Search by Listed Order

加工方法 Method	刀体 Body	刀片名称 Insert Designation	页码 Page
钻孔加工 Drilling	PD	XCMT···	P. 29 - P. 48
	PHP	SCMT···	P. 49 - P. 54
铣削加工 Milling	PAS BORE	SNKU···	P. 55 - P. 58
	PAO BORE	OZKU···	P. 59 - P. 64
		XAHT···	
	PSF SS, BORE	SDKT···, SDHT···	P. 65 - P. 68
	PSE SS, BORE, SF PSEL SS, BORE	ZDKT···	P. 69 - P. 86
	PSTW	TNKU···	P. 87 - P. 92
	PHC SS, BORE, SF	SDMT···, SPMT···, SXMT···	P. 93 - P. 106
	PRC SS, BORE, SF	RPHT···	P. 107 - P. 116
		RPHW···	
		RPMT···	
	PDR SS, MT, CN, BORE	ADMT···	P. 117 - P. 124
	PFAL	FR1204, FR1206, FR1204-W	P. 125 - P. 132
	PFB, SF	PFB···	P. 133 - P. 142
	PFR, SF	PFR···	P. 143 - P. 158

欧士机（上海）精密工具有限公司

OSG Corporation

欧士机（上海）本部
地址：上海市浦东新区浦东南路360号新上海国际大厦17楼
电话：021-58886600；　传真：021-58883300；　邮编：200120

欧士机（上海）无锡事务所
地址：无锡市湖滨壹号花园1-2蠡湖大厦1004室
电话：0510-82739271；　传真：0510-82739220；　邮编：214000

欧士机（上海）芜湖事务所
地址：芜湖市镜湖区汇金广场B座1801室
电话：0553-5868160；　传真：0553-5868190；　邮编：241000

欧士机（上海）苏州事务所
地址：苏州工业园区翠园路181号商旅大厦1511室
电话：0512-62388327；　传真：0512-62388320；　邮编：215028

欧士机（上海）杭州萧山事务所
地址：杭州市萧山区建设一路66号华瑞中心3幢1703室
电话：0571-82757757；　传真：0571-82757767；　邮编：311215

欧士机（上海）广州分公司
地址：广州市天河区林和西路157号保利中汇大厦A1701房
电话：020-38210423；　传真：020-38210425；　邮编：510600

欧士机（上海）深圳事务所
地址：深圳市福田区福民路福民佳园2129C室（福民地铁站A出口）
电话：0755-83566532；　传真：0755-83558854；　邮编：518048

欧士机（上海）柳州事务所
地址：广西柳州市桂中大道南端阳光壹佰城市广场第2幢第23层第4号房
电话：0772-8250338；　传真：0772-8250328；　邮编：545006

欧士机（上海）北京分公司
地址：北京市朝阳区建国门外大街19号国际大厦A座18-05C
电话：010-85261018；　传真：010-85261016；　邮编：100004

欧士机（上海）天津分公司
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电话：022-23037566；　传真：022-23037577；　邮编：300020

欧士机（上海）郑州事务所
地址：郑州市管城区紫荆山路与二里岗南街蓝海港湾芙蓉湾1号楼1单元804
电话：0371-86237251；　传真：0371-8623725；　邮编：450016

欧士机（上海）西安事务所
地址：西安市未央区凤城五路雅荷春天13号楼3单元301室
电话：029-88860594；　传真：029-88860594；　邮编：710000

欧士机（上海）大连分公司
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电话：0411-87655185；　传真：0411-87655186；　邮编：116600

欧士机（上海）青岛分公司
地址：青岛市市北区龙城路30号万达广场3号楼1单元2803室
电话：0532-66775787；　传真：0532-66775797；　邮编：266034

欧士机（上海）沈阳事务所
地址：沈阳市铁西区 兴华北街55号 华润置地广场南N号楼32-04
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欧士机（上海）长春事务所
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欧士机（上海）成都事务所
地址：成都市武侯区人民南路四段27号商鼎国际2栋1单元803号
电话：028-65783992；　传真：028-85005292；　邮编：610042

欧士机（上海）重庆分公司
地址：重庆市渝北区龙溪街道金山路18号 中渝都会首站　4幢12-1
电话：023-65001315；　邮编：401120

欧士机（上海）武汉事务所
地址：武汉市江汉区菱角湖万达广场A3写字楼1209室
电话：027-85557360；　传真：027-85557350；　邮编：430000

欧士机（上海）长沙事务所
地址：湖南长沙市天心区湘江中路36号华远SOHO 1613
电话：0731-88620770；　传真：0731-88620770；　邮编：410000

Http://www.chinaosg.com

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