

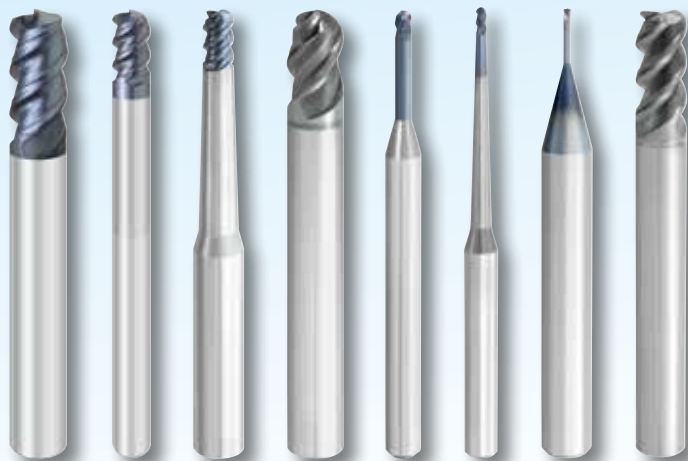
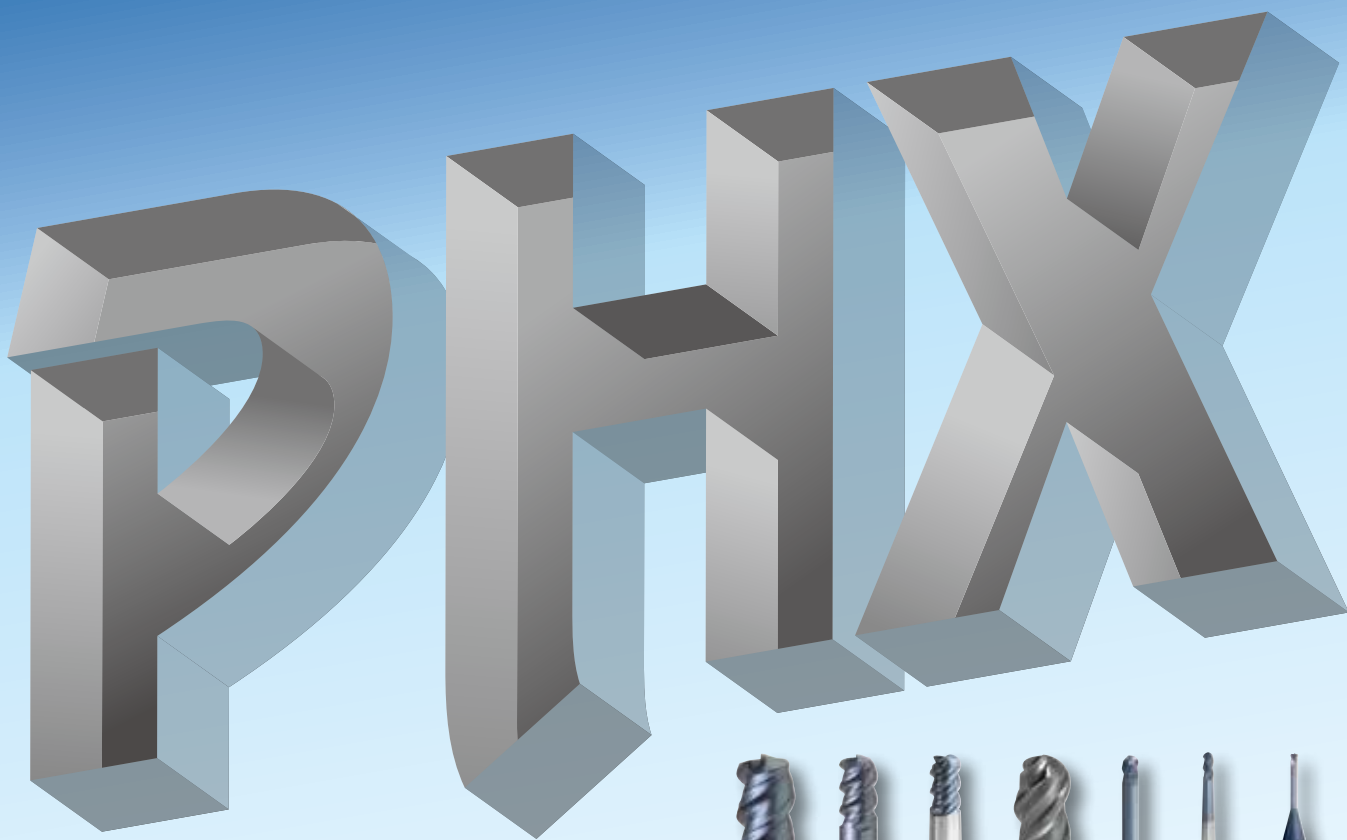


PHOENIX 铣刀系列

Vol.10

PHX

Phoenix End Mill Series



PHX End Mill Series

产品系列 Lineup

大进给圆弧角铣刀

Deep feeder bull nose end mill

切深量大的强力圆弧角型

Heavy-duty type for deep milling

PHX-DFR (P.9)



锥颈大进给圆弧角铣刀

Pencil neck deep feeder bull nose end mill

强力型 PHX-DFR 的锥颈型

Pencil neck version of PHX-DFR

PHX-PC-DFR (P.10)



长颈大进给圆弧角铣刀

Long neck deep feeder bull nose end mill

强力型 PHX-DFR 的长颈型

Long neck version of PHX-DFR

PHX-LN-DFR (P.15)



4 刃小径长颈圆弧角铣刀

4-flute long neck small bull nose end mill

即使是高硬度材料的高进给加工，也能实现卓越精加工面的圆弧角型

Provides excellent surface finish under high feed rate condition

PHX-LN-CRE (P.17)



大进给球头铣刀

Deep feeder ball nose end mill

切深量大的强力球头型

Heavy-duty type for deep milling

PHX-DBT (P.18)



锥颈大进给球头铣刀

Pencil neck deep feeder ball nose end mill

强力型 PHX-DBT 的锥颈型

Pencil neck version of PHX-DBT

PHX-PC-DBT (P.19)



长颈型球头铣刀

3-flute long neck ball nose end mill

可进行稳定的粗加工和细槽加工的长颈型

Applicable to rough milling and rib milling

PHX-LN-DBT (P.27)



高进给圆弧角铣刀

High feeder bull nose end mill

专为高进给加工设计的圆弧角型

High-feed type

PHX-CRT (P.28)



PHX铣刀可显著缩短时间!

Dramatically shorten machining time with the PHX end mill!

一般的深槽加工...
Deep milling in general ...

需刀具悬伸量长
Requires long overhang length

↓

为了不降低加工条件, 必须使用大径工具(例: φ20~) 来确保刚性。
Large diameter tools (e.g. φ20 or above) are used to ensure rigidity in order to maintain normal cutting condition

↓

加工残余量增多, 给下道工序增加负担
Large diameter end mills leave behind many uncut regions, placing more burden on the next process

↓

工序数、刀具数量增加, 导致加工时间也增长
The number of processes and tools required are increased, resulting in long processing time

PHX...
In the case of PHX ...

即使刀具悬伸量长, 通过设置最佳加工条件也可在不降低效率的情况下进行加工
Normal cutting condition can be applied even with long overhang length

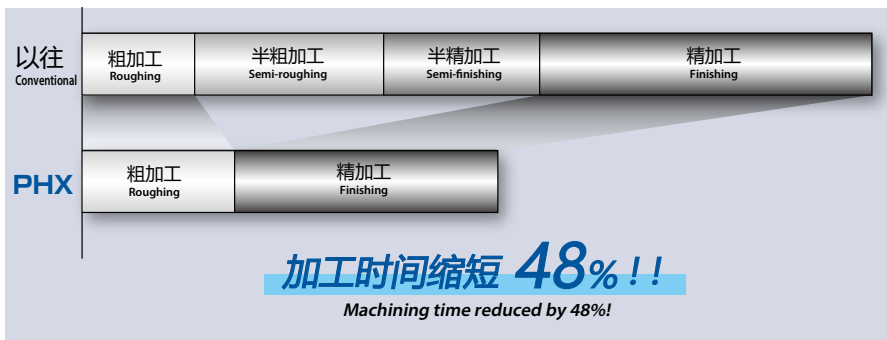
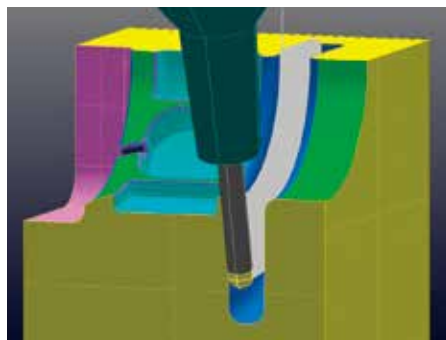
↓

刀具直径可从φ10开始, 加工残余量也可变少
Sizes as small as φ10 can be used, which can reduce the amount of uncut regions

↓

可大幅减少工序数、刀具数量、加工时间!
The number of processes, tools used and machining time are drastically reduced!

其秘诀在下一页!!
Discover the secrets to the PHX's superior performance on the next page!



加工材料: NAK80(40HRC)

Work Material

使用机械: 5轴加工机
Machine: Five-axis Machining Center

主轴类型: HSK A63型
Main Spindle

切削油剂: 无(气冷式)
Coolant: Air Blow

最高转速: 18,000min⁻¹
Maximum RPM

刀柄: 热缩刀柄
Holder: Shrink Fit

工序编号 Process	加工内容 Milling Process	使用工具 Tool	悬伸量 Overhang Length	转速 (min ⁻¹) Speed	进给速度 (mm/min) Feed	轴方向切深量 (mm) ap	径方向切深量 (mm) pf	残余量 (mm) Stock to Leave	切削距离 (m) Milling Length	切削时间 Milling Time
1	等高线粗加工 (粉色部分) Contour roughing (pink)	PHX-DFR 10×R2	25.0	3,800	2,100	0.50	2.50	0.1	15.4	0:07:16
2	侧铣精加工 (粉色部分) Side finish milling (pink)	↓	25.0	3,800	600	—	2.40	0	376.0	0:00:50
3	等高线粗加工 (绿色部分) Contour roughing (green)	↓	25.0	2,400	2,100	0.50	2.50	0.05	20.1	0:08:37
4	沿倾斜轴固定面加工 (绿色部分) Fixed inclined-axis surface milling (green)	↓	25.0	3,800	1,000	—	0.20	0	8.9	0:10:42
5	沿表面等高线粗加工 (蓝色部分) Contour surface roughing (blue)	PHX-LN-DBT R2×20	23.0	7,600	1,550	0.25	1.00	0.01	17.5	0:13:46
6	沿表面等高线精加工 (蓝色部分) Contour surface finish milling (blue)	↓	23.0	5,500	1,350	0.12	0.10	0	16.2	0:10:40
7	沿表面等高线粗加工 (天蓝色部分) Contour surface roughing (cyan)	PHX-LN-DBT R1.5×12	14.0	12,000	1,700	0.30	0.70	0.05	14.0	0:09:26
8	沿表面等高线精加工 (天蓝色部分) Contour surface finish milling (cyan)	↓	14.0	11,000	2,050	0.09	0.10	0	9.5	0:04:31
9	沿表面外轮廓精加工 (天蓝色部分) Circumferential surface finish milling (cyan)	↓	14.0	11,000	2,050	—	0.08	0	5.4	0:02:49
10	沿表面加工 (圆弧角R部) (天蓝色部分) Surface milling (rounded corners)(cyan)	↓	14.0	11,000	2,050	—	0.08	0	5.4	0:03:12
11	残余量加工 (天蓝色部分) Milling of remaining areas (cyan)	PHX-LN-DBT R0.75×6	13.0	16,000	960	0.04	0.04	0	18.4	0:24:54
12	沿表面等高线粗加工 (灰色部分) Contour surface roughing (gray)	PHX-LN-DBT R0.5×4	12.0	18,000	1,000	0.05	0.16	0	9.0	0:09:45
13	沿表面等高线精加工 (灰色部分) Contour surface finish milling (gray)	↓	12.0	18,000	900	—	0.03	0	339.0	0:00:29

总加工时间 1:46:57
Total operation time



对应广泛的加工!

圆弧角系列! PHX-DFR

Compatible with a wide range of applications! Deep Feeder Bull Nose Series!

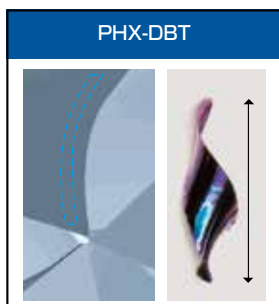
以往产品高进给圆弧角(PHX-CRT)的**三维负前角形状**, 加上大进给球头系列的**Thermolysis效果!** 终极的圆弧角在易振动的深加工或难加工材料的加工中, 实现更高的效率!

In addition to the negative shape of the conventional PHX-CRT high feeder bull nose, it achieves the thermolysis effect. The superior bull nose performs exceptionally well when making deep cuts that are ordinarily susceptible to chattering or when working in materials that are difficult to machine.

高进给圆弧角(PHX-CRT)的R精度为 $\pm 0.01\text{mm}$, 大进给圆弧角系列为 $\pm 0.03\text{mm}$ 。
请根据所需R精度区分使用大进给圆弧角系列和高进给圆弧角(PHX-CRT)。

The precision of the PHX-CRT high feeder bull nose is $\pm 0.01\text{ mm}$, and the deep feeder bull nose series is $\pm 0.03\text{ mm}$.
Use the deep feeder bull nose series or the PHX-CRT high feeder bull nose to suit your radius precision requirements.

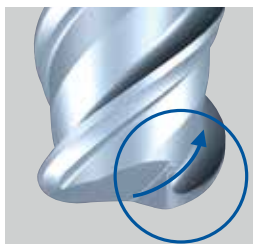
Thermolysis效果是 The Thermolysis Effects are...



大螺旋月牙槽使切削刃变长, 厚度变薄, 易传递切削热, 在刀具刃尖或加工材料上难以残留热量。

Due to the strong spiral gash, the cutting edge becomes longer and thinner. It becomes easier to dissipate cutting heat and the cutting edge and workpiece are less effected by heat buildup.

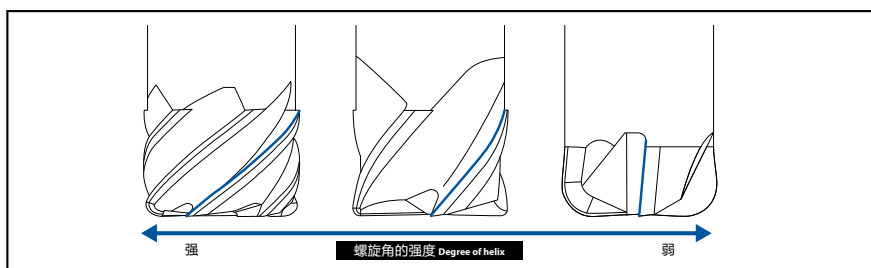
三维负前角形状是 A Three-Dimensional Negative Form is...



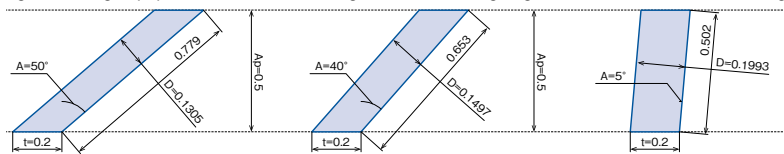
- ①加强前角为了使中心部具有锋利性, 减弱前角为了使外周部具有刚性。
- ②提高切屑的流动性, 降低切削热, 实现刀具长寿命化。

1. A form where the weaker central portion of the cutting edge has a slight negative angle, and the easily broken outer portion has a strong negative angle.
2. Designed for long tool life by increasing chip evacuation and reducing heat buildup.

螺旋角的效果(相同切深量相比) Effect based on helix angle (comparison of cut length)

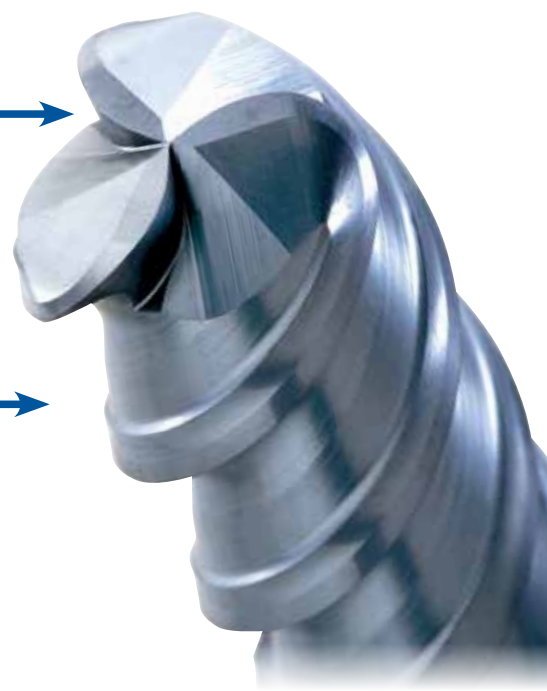


例 一切切深量为 0.2mm ($t=0.2$)时的刃尖螺旋角产生的切屑图像 ※忽略R形状
Ex. Images of cutting chips produced based on helix angle where the cutting length is 0.2 mm ($t=0.2\text{ mm}$) ※ Radius ignored



以上只是二维的分析, 与实际加工会有差异。
The above is strictly a conceptual analysis. Result may vary based on actual milling.

当切削条件相同时, 切屑的体积不变, 但由于切屑的形状变化, 发热量和阻力均会变化。
Even if are milling conditions identical, the volume of the cutting chips are the same, but the amount of resistance and heat released will differ based on the change in chip shape.



大进给圆弧角系列扩大曲面加工范围, 通过避免振动的高精度粗加工, 挑战进一步提高生产效率。

Use the deep feeder bull nose series to expand the scope of your mold milling work, and improve your productivity further more through high-precision roughing without chattering.

大进给圆弧角系列有三款可供选择。可对应广泛的加工!

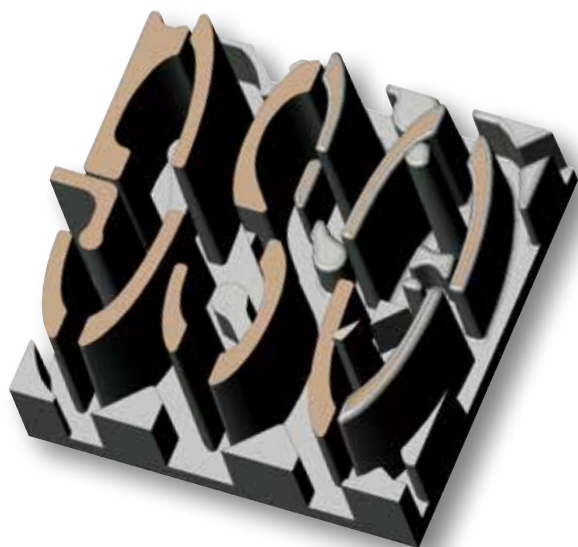
Three types of deep feeder bull nose series are available for a wide range of milling work.

- 标准型 PHX-DFR
Standard shape
- 长颈型 PHX-LN-DFR
Long neck shape
- 锥颈型 PHX-PC-DFR
Pencil neck shape



使用 PHX-DFR 进行深细槽加工 L/D=20以上

Deep rib milling by the PHX-DFR L/D=over 20



工件尺寸：80×80×45mm
Work Size

加工材料：SKD61 (50HRC)
Work Material

使用机械：3轴加工机
Machine: Three-axis Machining Center

主轴类型：HSK A63型
Main Spindle

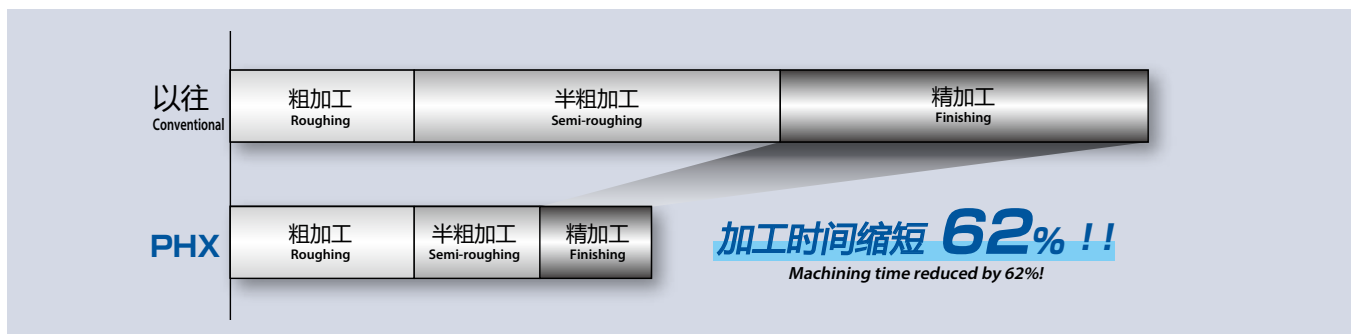
切削油剂：无(气冷式)
Coolant: Air Blow

最高转速：20,000min⁻¹
Maximum RPM

刀柄：热缩刀柄
Holder: Shrink Fit

工序编号 Process	加工内容 Milling Process	使用工具 Tool	悬伸量 Overhang Length	转速 (min ⁻¹) Speed	进给速度 (mm/min) Feed	轴方向切深量 (mm) ap	径方向切深量 (mm) pf	残余量 (mm) Stock to Leave	切削距离 (m) Milling Length	切削时间 Milling Time
1	3D 等高线粗加工 3D Arbitrary Stock Roughing	PHX-DFR φ10×R2	40	1,770	2,000	0.3	3.0	0.2	371	3:39:49
2	等高线半粗加工 Arbitrary Stock Semi-roughing	PHX-LN-DFR φ6×R1.5×30	30	1,700	1,060	0.104	1.5	0.03	67	8:33:40
3	等高线半粗加工 Arbitrary Stock Semi-roughing	PHX-PC-DFR φ3×R0.8×1°×40	45	3,200	680	0.045	0.7	0.03	192	21:07:50
4	等高线半粗加工 Arbitrary Stock Semi-roughing	PHX-PC-DFR φ2×R0.5×1°×40	47	1,830	220	0.014	0.5	0.03	585	23:56:50
5	等高线精加工 Z-Level Finishing	↓	47	2,320	180	0.1	0.03	0	583	45:05:05

总加工时间 102:23:14
Total operation time



缩短粗加工时间!

PHX长颈球头型 PHX-LN-DBT

Time required for roughing can be greatly reduced with the PHX long neck ball nose end mill!

特点 Features

● 短刃长 Short length of cut

0.75D 的短刃长，刚性高。
以低阻力进行深壁加工。

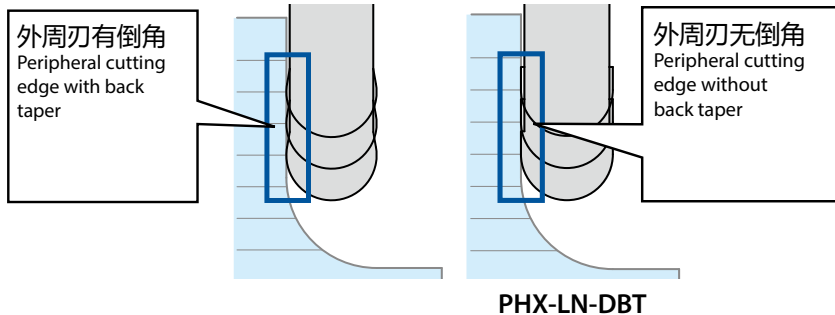
Highly rigid 0.75D short length of cut geometry enables low resistance vertical wall milling.



● 深壁加工的精度提高

Improved accuracy in vertical wall milling

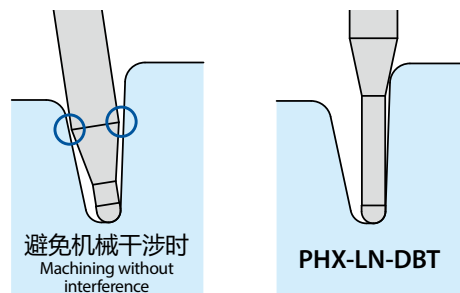
使用外周刃加工深壁
可以提高精度。
Without back taper, the
PHX-LN-DBT's peripheral
cutting edge is able to
achieve flat milling to improve
accuracy.



● 颈部的形状细长

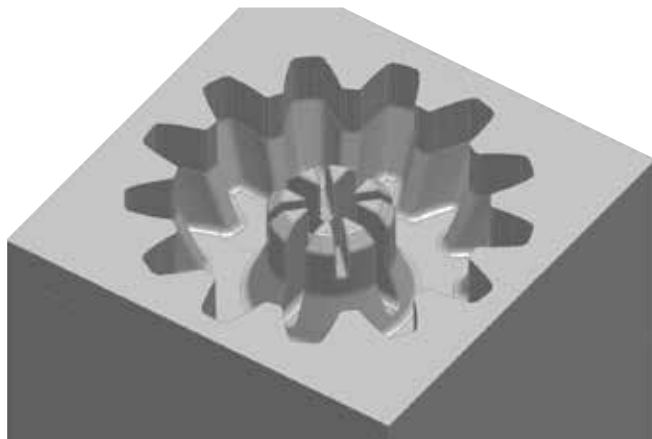
Slim neck shape

特别是在颈长短的5轴加工中发挥效果。
Performs particularly well in five-axis milling
with neck length limitation.



PHX-LN-DBT 的缩短时间案例

Case study on the PHX-LN-DBT's superior processing efficiency



工件尺寸：50×50×50mm 加工材料：NAK80(40HRC)
Work Size Work Material

使用机械：5轴加工机
Machine: Five-axis Machining Center

主轴类型：HSK A63型
Main Spindle

切削油剂：无(气冷式)
Coolant: Air Blow

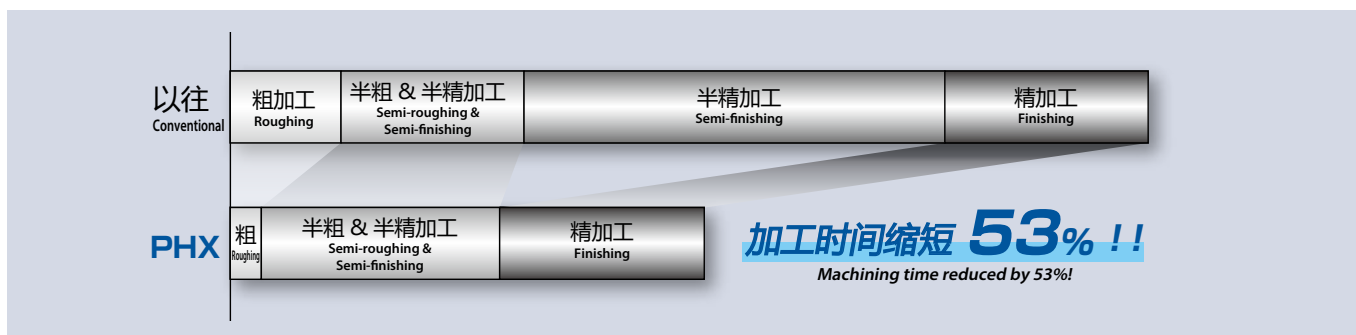
最高转速：18,000min⁻¹
Maximum RPM

刀柄：热缩刀柄
Holder: Shrink Fit

工序编号 Process	加工内容 Milling Process	使用工具 Tool	悬伸量 Overhang Length	转速 Speed	进给速度 Feed	轴方向切深量 (mm) ap	径方向切深量 (mm) pf	残余量 (mm) Stock to Leave	切削距离 (m) Milling Length	切削时间 Milling Time
1	3D 等高线粗加工 3D Arbitrary Stock Roughing	PHX-LN-DBT R3×20	22	8,000	4,500	0.50	1.5	0.1	10.1	0:06:27
2	等高线粗加工 Arbitrary Stock Roughing	PHX-LN-DBT R1×12	20	12,000	1,200	0.15	0.8	0.05	28.3	0:43:19
3 ^{※1}	3D 等高线优化加工 3D Complete Machining	↓	20	12,000	1,200	—	0.4	0.05	782.0	
4	3D 等高线精加工 3D Z-Level Finishing	↓	20	12,000	2,000	0.12	—	0	33.4	
5	3D 走查线精加工 3D Plofile Finishing	↓	20	12,000	2,000	—	0.12	0	4.4	0:31:31
6	3D 残余量加工 3D Rest Machining	↓	20	12,000	2,000	0.12	0.12	0	2.5	
7	3D 等高线精加工 3D Z-Level Finishing	PHX-LN-DBT R0.5×6	15	12,000	600	0.06	—	0	8.3	
8	3D 等高线精加工 3D Z-Level Finishing	↓	15	12,000	800	0.06	—	0	6.7	0:36:58
9	3D 走查线精加工 3D Plofile Finishing	↓	15	12,000	800	—	0.06	0	433.0	

※1 仅平面部 For flat surface milling

总加工时间 1:58:15
Total operation time



细槽加工

4刃小径长颈圆弧角型 PHX-LN-CRE

4-flute Long Neck Small Bull Nose End Mill

特点 Features

● 兼具切削阻力和刃尖刚性的圆弧角 R 形状

The corner radius shape provides both cutting force and cutting edge rigidity.

● 抑制振动的外周刃和底刃式样

Radial and end edge configurations suppress the generation of chattering vibration.

● 特殊刃型防止过切

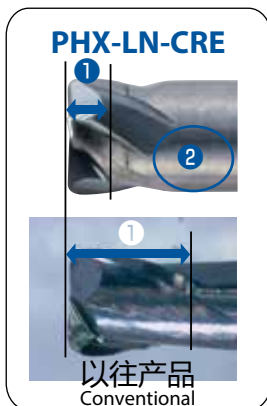
Special edge lines prevent biting.

● 最佳的排屑槽具有优良的排屑性

An ideal chip pocket for superior chip evacuation.

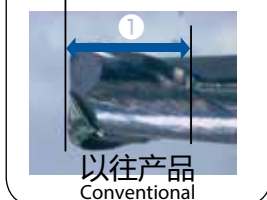
① 短刃长

Length of cut



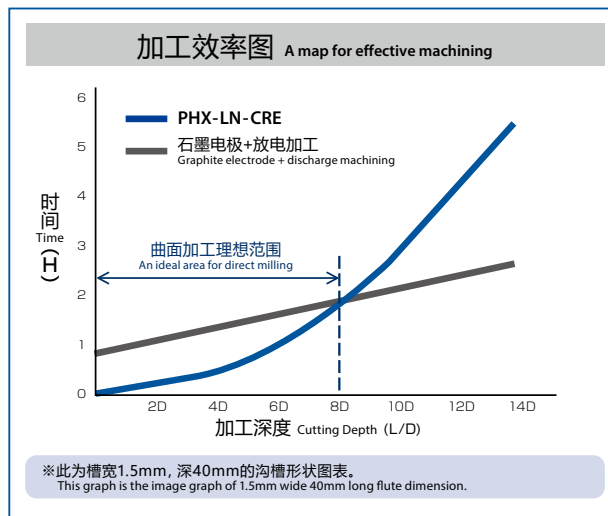
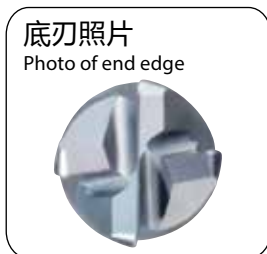
② 短槽长

Short flute length



③ 不等分割

Unequal spacing



塑料模具的细槽加工

Lib operation on plastic mold

使用工具 Tool	PHX-LN-CRE $\phi 1 \times R0.2 \times 6$
加工材料 Work Material	STAVAX (52HRC)
切削方法 Milling Method	细槽加工 Lib Groove Operation
切削速度 Cutting Speed	63m/min (20,000min ⁻¹)
进给速度 Feed	840mm/min (0.0105mm/t)
切深量 Depth of Cut	$a_p=0.02\text{mm}$
切削油剂 Coolant	无 (气冷式) Air Blow
使用机械 Machine	立式加工中心 (HSK-E32) Vertical Machining Center
切削长度 Milling Length	120m



以高硬度材料STAVAX(52HRC) 等为目的的槽加工专用刀具

能轻松完成曲面加工的专用刀具! 特殊刀尖形状实现稳定切削! 也可进行浅槽的超高效率加工。

A special designed tool for slot milling on high hardness steel as STAVAX(52HRC)

A special tool for easy direct milling operations! A special cutting edge design enabled a stable operation! Capable even on shallow flute milling with ultra high speed!

齿轮形状 HPM38 (53HRC) 高精度加工

High precision machining on HPM38(53HRC) with gear shape

使用工具 Tool	PHX-LN-CRE $\phi 2 \times R0.5 \times 10$
加工材料 Work Material	HPM38 (53HRC)
切削方法 Milling Method	等高线加工 Countour Line Operation
切削速度 Cutting Speed	113m/min (18,000min ⁻¹)
进给速度 Feed	2,500mm/min (0.035mm/t)
切深量 Depth of Cut	$a_p=0.1\text{mm}$ $a_e=0.8\text{mm}$
切削油剂 Coolant	无 (气冷式) Air Blow
使用机械 Machine	立式加工中心 (HSK-A63) Vertical Machining Center
切削长度 Milling Length	80m



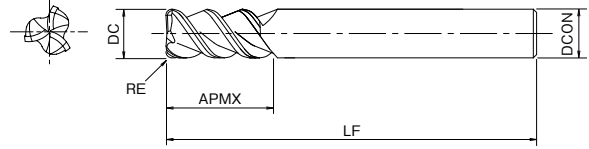
从半粗加工到精加工! 狭窄部分也可高进给加工!

From semi-finish to finishing operation! Capable with high feed rate even at narrow area!

Phoenix 大进给圆弧角铣刀

Phoenix Deep Feeder Bull Nose End Mill

PHX-DFR



单位:mm Unit:mm

商品号 EDP No.	外径 × 圆弧角半径 DC × RE	全长 LF	刃长 APMX	柄径 DCON	刃数 ZEFP	库存 Stock
3090512	6 × R1.5	80	12	6	3	○
3090516	8 × R2	90	16	8	3	
3090520	10 × R2	100	20	10	3	
3090522	12 × R2	120	24	12	3	
3090526	16 × R3	130	32	16	3	
3090530	20 × R3	150	40	20	3	

○ = 标准库存品 ○ = Standard stock item

标识种类 Guide for Icons

1 材质 Tool Materials

CARBIDE 硬质合金
Tungsten Carbide

2 表面处理 Surface Treatment

WXS WXS 涂层
WX Super Coating

FX FX 涂层
FX (TiAlN) Coating

3 螺旋角 Helix Angle

45° 表示铣刀沟槽的螺旋角
Helix angle of flute for end mills

4 R许容差 Tolerance of Radius

R ±0.07 表示铣刀的 R 许容差
Identifies the tolerance of the radius for end mills

5 外径的许容差 Tolerance for milling diameter

±0.01 表示铣刀的外径
Tolerance for milling diameter

6 热缩 Shrink

SHRINK FIT 推荐热膨胀刀具系列
Suitable for the shrink holder system

7 切削条件 Cutting Conditions

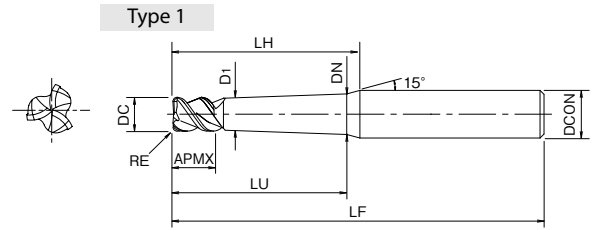
SPEED FEED 表示切削条件基准表所在页面
Indicates page number for cutting conditions



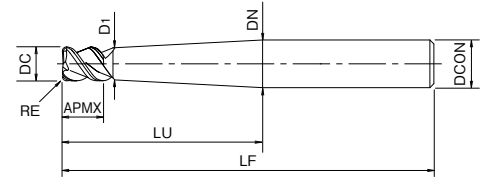
Phoenix 锥颈大进给圆弧角铣刀

Phoenix Pencil Neck Deep Feeder Bull Nose End Mill

PHX-PC-DFR



Type 2



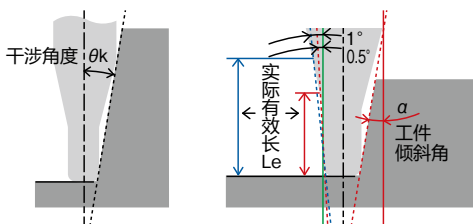
单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	外径 × 圆弧半径 × 颈部锥半角 × 颈长 DC × RE × θ_n × LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _i	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长 (Le) ^{注1}					刃数 Z/EFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3097222	0.29°	2 × R0.5 × 0.5° × 15	22.9	60	3	6	1.95	2.15	5.16°	15.21	15.74	16.31	16.92	18.29	3	1	○
3097223	0.36°	2 × R0.5 × 0.5° × 20	27.7					2.25	4.24°	20.19	20.89	21.64	22.46	24.28			
3097224	0.39°	2 × R0.5 × 0.5° × 25	32.6	70	3	6	1.95	2.33	3.6°	25.2	26.08	27.02	28.03	30.31	3	1	○
3097225	0.41°	2 × R0.5 × 0.5° × 30	37.4					2.42	3.13°	30.19	31.25	32.38	33.59	36.32			
3097226	0.42°	2 × R0.5 × 0.5° × 35	42.2	80	3	6	1.95	2.51	2.76°	35.19	36.42	37.73	39.15	3	1	○	
3097227	0.43°	2 × R0.5 × 0.5° × 40	47.1					2.6	2.48°	40.18	41.58	43.09	44.7				
3097241	0.59°	2 × R0.5 × 1° × 10	17.8	60	3	6	1.95	2.19	6.67°	9.08	10.31	10.69	11.09	3	1	○	
3097242	0.73°	2 × R0.5 × 1° × 15	22.5					2.37	5.25°	8.83	15.3	15.85	16.45				17.78
3097243	0.8°	2 × R0.5 × 1° × 20	27.1	70	3	6	1.95	2.54	4.33°	8.93	20.31	21.04	21.83	23.61	3	1	○
3097244	0.84°	2 × R0.5 × 1° × 25	31.8					2.72	3.68°	8.83	25.3	26.21	27.2	29.4			
3097245	0.87°	2 × R0.5 × 1° × 30	36.5	80	3	6	1.95	2.89	3.2°	8.9	30.31	31.4	32.58	35.22	3	1	○
3097246	0.89°	2 × R0.5 × 1° × 35	41.2					3.07	2.83°	8.83	35.3	36.57	37.94				
3097247	0.9°	2 × R0.5 × 1° × 40	45.8	100	3	6	1.95	3.24	2.54°	8.88	40.31	41.76	43.33	3	1	○	
3097248	0.91°	2 × R0.5 × 1° × 45	50.5					3.42	2.3°	8.83	45.3	46.93	48.69				
3097249	0.92°	2 × R0.5 × 1° × 50	55.2	110	3	6	1.95	3.59	2.11°	8.87	50.31	52.12	54.08	3	1	○	
3097250	0.92°	2 × R0.5 × 1° × 60	64.6					3.92	1.8°	8.98	60.34	62.52	—				
3097251	1.37°	2 × R0.5 × 1.5° × 40	44.6	80	3	6	1.95	3.89	2.61°	5.93	11.83	40.42	41.93	3	1	○	
3097252	1.4°	2 × R0.5 × 1.5° × 60	62.8					4.91	1.85°	5.97	12.09	60.48	—				
3097253	1.41°	2 × R0.5 × 1.5° × 81.6	—	120	3	6	1.95	6	1.41°	6	12.31	—	—	3	2	○	
3097262	1.92°	2 × R0.5 × 2° × 60.3	—						1.9°	4.92	7.33	14.31	—				
3097263	1.91°	2 × R0.5 × 2° × 80	82.1	120	3	6	1.95	7.29	2.12°	4.97	7.49	15.2	80.63	3	1	○	
3097273	2.81°	2 × R0.5 × 3° × 41.2	—					100	6	6	2.78°	4.16	5.18				6.86

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○ = 标准库存品 ○ = Standard stock item

注 1: 相对于工件倾斜角 α 的实际有效长 (Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

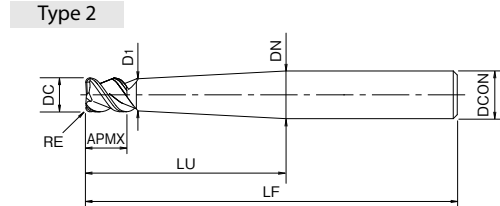
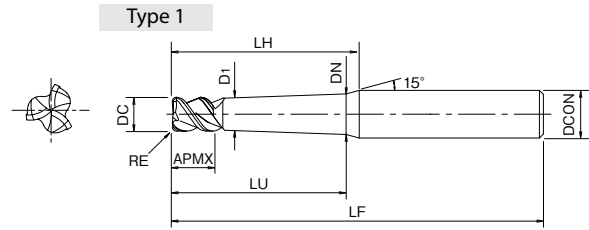
NEXT



Phoenix 锥颈大进给圆弧角铣刀

Phoenix Pencil Neck Deep Feeder Bull Nose End Mill

PHX-PC-DFR



CARBIDE WXS ±0.03 0~0.015 SHRINK FIT 55° SPEED FEED P29-32

FROM

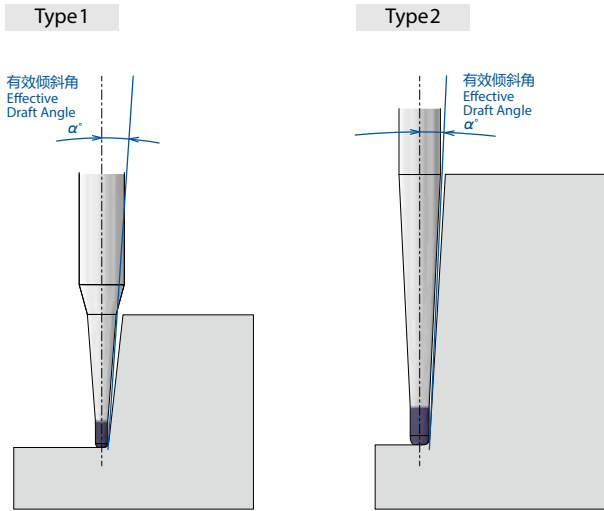
单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	外径×圆弧半径×颈部锥半角×颈长 DC×RE× θ_n ×LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 Di	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le)注1					刃数 ZEPF	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3097281	0.46°	2.5×R0.8×0.75°×16	22.8	70	3.8	6	2.45	2.74	4.54°	16.07	16.63	17.23	17.88	19.33	3	1	○
3097282	0.52°	2.5×R0.8×0.75°×20	26.6					2.85	3.87°	19.87	20.69	21.44	22.24	24.05			
3097283	0.56°	2.5×R0.8×0.75°×24	30.4					2.95	3.38°	19.74	24.77	25.66	26.63	28.79			
3097284	0.6°	2.5×R0.8×0.75°×30	36.1					3.11	2.84°	18.83	30.87	31.98	33.18	—			
3097285	0.64°	2.5×R0.8×0.75°×40	45.6					3.37	2.24°	18.41	41.05	42.53	44.12	—			
3097286	0.66°	2.5×R0.8×0.75°×50	55.1					3.63	1.85°	18.18	51.22	53.07	—	—			
3097291	1.01°	2.5×R0.8×1.5°×16	22.3	70	4.5	2.9	3.04	4.65°	7.56	16.03	16.61	17.23	18.63	3	1	○	
3097292	1.11°	2.5×R0.8×1.5°×20	25.9				3.25	3.99°	7.44	16.42	20.61	21.38	23.12				
3097293	1.18°	2.5×R0.8×1.5°×24	29.5				3.46	3.49°	7.37	15.9	24.61	25.53	27.6				
3097294	1.25°	2.5×R0.8×1.5°×30	34.9				3.77	2.94°	7.33	15.61	30.62	31.77	—				
3097295	1.31°	2.5×R0.8×1.5°×40	43.9				4.3	2.33°	7.26	15.08	40.6	42.13	—				
3097296	1.35°	2.5×R0.8×1.5°×50	52.9				4.82	1.93°	7.24	14.95	50.61	—	—				
3097297	1.38°	2.5×R0.8×1.5°×60	62	5.34	1.64°	7.22	14.86	60.62	—	—	—						
3097314	0.79°	3×R0.5×1°×40	44.3	80	8	6	2.9	4.09	1.98°	15.61	40.61	42.07	—	—	3	1	○
3097316	0.86°	3×R0.5×1°×60	63					4.79	1.39°	15.26	60.6	—	—	—			
3097321	0.25°	3×R0.8×0.5°×20	26					3.17	3.4°	20.34	21.05	21.81	22.63	24.46			
3097324	0.36°	3×R0.8×0.5°×40	45.4					3.5	1.93°	40.38	41.78	43.29	—	—			
3097341	0.66°	3×R0.8×1°×20	25.5					3.44	3.47°	14.77	20.51	21.25	22.05	23.84			
3097342	0.73°	3×R0.8×1°×25	30.1					3.62	2.92°	14.61	25.5	26.42	27.41	—			
3097343	0.78°	3×R0.8×1°×30	34.8	3.79	2.52°	14.73	30.51	31.61	32.8	—							
3097344	0.83°	3×R0.8×1°×40	44.2	4.14	1.98°	14.72	40.51	41.97	—	—							
3097345	0.87°	3×R0.8×1°×50	53.5	4.49	1.63°	14.71	50.51	52.33	—	—							
3097346	0.89°	3×R0.8×1°×60	62.9	4.84	1.39°	14.7	60.5	—	—	—							
3097347	0.9°	3×R0.8×1°×80	81.4	5.48	1.07°	15.18	80.62	—	—	—							
3097348	0.92°	3×R0.8×1°×100	104.1	6.19	1.39°	15	100.6	—	—	—							
3097356	1.43°	3×R0.8×1.5°×60.8	—	100	6	8	6	1.42°	9.25	17.26	—	—	3	2	○		
3097365	1.88°	3×R0.8×2°×46.5	—					1.85°	7.67	11.11	20.16	—				—	
3097368	1.81°	3×R0.8×2°×80	—					8	1.79°	8.06	12.38	26.62				—	—
3097374	2.74°	3×R0.8×3°×32.1	—					6	2.68°	6.38	7.82	10.1				14.25	—

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○=标准库存品 ○= Standard stock item





※根据切削状态，可能会出现刀具弯曲，倾斜部干涉的情况。
The tool may be deflected and may interfere with the draft area depending on milling condition.

※为了方便起见，颈部锥半角 (θn°) 与有效倾斜角 (α°) 相同标记，但实际上不同。(以不干涉有效倾斜角 (α°) 的角度设定)
For convenience, the draft angle (θn°) is illustrated the same as the effective draft angle (α°), but they are not identical. The effective draft angle (α°) is configured without interference.

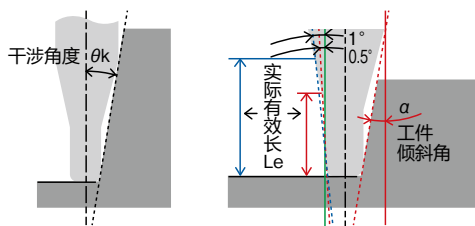
FROM

单位 :mm Unit:mm

商品号 EDP No.	有效倾斜角 α	外径 × 圆弧半径 × 颈部锥半角 × 颈长 DC × RE × θn × LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _n	颈口径 DN	干涉角度 θk	相对于工件倾斜角 α 的实际有效长 (Le) ^{注1}					刃数 Z/EFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3097401	0.67°	4 × R0.5 × 1° × 30	33.1	80				4.69	1.77°	19.24	30.71	31.82					
3097402	0.83°	4 × R0.5 × 1° × 60	60.9	100				5.73	0.95°	18.46	—	—					
3097421	0.28°	4 × R1 × 0.5° × 25	29					4.23	2.03°	25.39	26.28	27.23	28.25				
3097422	0.31°	4 × R1 × 0.5° × 30	33.9					4.32	1.73°	30.39	31.45	32.58					
3097423	0.34°	4 × R1 × 0.5° × 35	38.7	80				4.41	1.51°	35.38	36.62	37.94					
3097424	0.36°	4 × R1 × 0.5° × 40	43.5					4.49	1.34°	40.4	41.8				1		
3097425	0.38°	4 × R1 × 0.5° × 45	48.4					4.58	1.21°	45.39	46.97	—					
3097426	0.39°	4 × R1 × 0.5° × 50	53.2	100				4.67	1.1°	50.39	52.14						
3097441	0.73°	4 × R1 × 1° × 30	33					4.74	1.78°		30.61	31.71					
3097442	0.8°	4 × R1 × 1° × 40	42.4	80				5.09	1.38°	17.67	40.61				3	○	
3097443	0.84°	4 × R1 × 1° × 50	51.8	100				5.44	1.13°		50.6						
3097444	0.95°	4 × R1 × 1° × 61.3	—					6	0.94°	15.98	—				2		
3097445	0.88°	4 × R1 × 1° × 80	83.6	120				6.44	1.39°	18.13	80.7				1		
3097453	1.39°	4 × R1 × 1.5° × 42.2	—	80				6	1.36°	11.05	19.4				2		
3097454	1.44°	4 × R1 × 1.5° × 80.4	—	120				8	1.43°	11.44	21.32						
3097455	1.38°	4 × R1 × 1.5° × 100	103	150				8.76	1.68°	11.98	24.43	100.98			1		
3097456	1.39°	4 × R1 × 1.5° × 120	120.8	160				9.78	1.43°	12	24.57	—					
3097461	1.81°	4 × R1 × 2° × 32.6	—	80				6	1.76°	9.33	13.03	21.59					
3097462	1.9°	4 × R1 × 2° × 61.3	—	120				8	1.87°	9.61	13.89	25.03			2		
3097472	2.78°	4 × R1 × 3° × 42.2	—	100				8	2.72°	8.14	9.95	12.8	17.95				

注 1：相对于工件倾斜角 α 的实际有效长 (Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.

○ = 标准库存品 ○ = Standard stock item



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

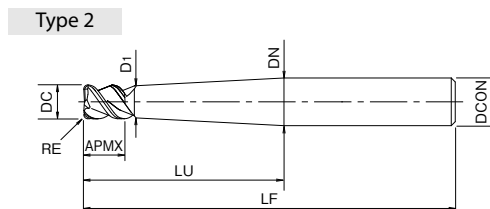
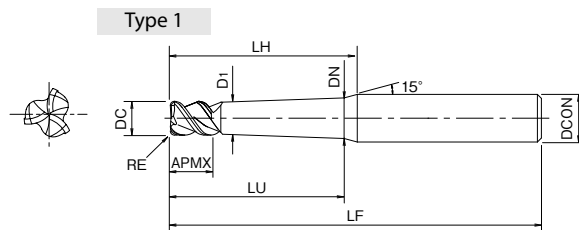
NEXT



Phoenix 锥颈大进给圆弧角铣刀

Phoenix Pencil Neck Deep Feeder Bull Nose End Mill

PHX-PC-DFR



FROM

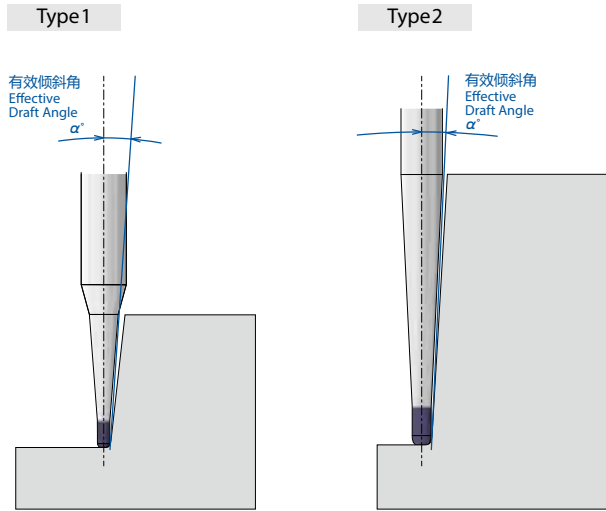
单位 :mm Unit:mm

商品号 EDP No.	有效倾斜角 α	外径 × 圆弧半径 × 颈部锥半角 × 颈长 DC × RE × θ_n × LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _i	颈口径 D _N	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长 (Le) 注1					刃数 ZEFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3097602	0.93°	6 × R0.8 × 1° × 62.3	—	130	—	8	—	8	0.92°	20.71	—	—	—	—	2	○	
3097603	0.89°	6 × R0.8 × 1° × 120	120.9	160	—	10	—	9.72	0.96°	24.16	—	—	—	—	2		
3097627	0.39°	6 × R1.5 × 0.5° × 60	63	130	—	8	—	6.79	0.93°	60.49	—	—	—	—	1		
3097641	0.73°	6 × R1.5 × 1° × 40	42.6	100	—			6.98	1.37°	23.79	40.83	—	—	—	—		2
3097642	0.79°	6 × R1.5 × 1° × 50	51.9	—	—	8	—	7.33	1.12°	23.75	50.82	—	—	—	2		
3097643	0.94°	6 × R1.5 × 1° × 62.3	—	130	—	10	5.9	8	0.92°	20.71	—	—	—	—	3		
3097644	0.85°	6 × R1.5 × 1° × 80	83.8	120	—			8.33	1.38°	24.33	80.92	—	—	—	—		1
3097645	0.88°	6 × R1.5 × 1° × 100	102.5	150	—	9.03	1.13°	24.17	100.92	—	—	—	—	2			
3097646	0.9°	6 × R1.5 × 1° × 120	120.9	160	—	9.72	0.96°	24.16	—	—	—	—	—	1			
3097651	1.37°	6 × R1.5 × 1.5° × 43.2	—	100	—	8	—	8	1.33°	14.85	24.63	—	—	2			
3097653	1.43°	6 × R1.5 × 1.5° × 81.4	—	130	—	10	—	10	1.41°	15.56	28.07	—	—	1			
3097654	1.36°	6 × R1.5 × 1.5° × 120	121.1	160	—	12	—	11.63	1.43°	16.52	33.78	—	—	2			
3097661	1.78°	6 × R1.5 × 2° × 33.6	—	100	—	8	—	8	1.71°	12.79	17.21	26.32	—	2			
3097662	1.88°	6 × R1.5 × 2° × 62.3	—	130	—	10	—	10	1.84°	13.32	18.86	32.27	—	2			
3097814	0.92°	8 × R1 × 1° × 63.3	—	120	—	10	—	10	0.91°	25.18	—	—	—	2			
3097817	0.96°	8 × R1 × 1° × 120.6	—	180	—	12	—	12	0.96°	27.24	—	—	—	1			
3097826	0.4°	8 × R2 × 0.5° × 80	82.6	150	—	10	7.9	9.09	0.71°	80.59	—	—	—	—	2		
3097841	0.73°	8 × R2 × 1° × 50	52.3	120	—			9.23	1.12°	29.64	51.02	—	—	—	—		1
3097842	0.93°	8 × R2 × 1° × 63.3	—	150	—	10	—	10	0.91°	25.18	—	—	—	2			
3097844	0.97°	8 × R2 × 1° × 120.6	—	180	—	12	—	12	0.96°	27.24	—	—	—	1			
3097851	1.36°	8 × R2 × 1.5° × 44.2	—	120	—	10	—	10	1.3°	18.48	29.12	—	—	3			
3097853	1.42°	8 × R2 × 1.5° × 82.4	—	150	—	12	—	12	1.4°	19.59	34.24	—	—	2			
3097855	1.33°	8 × R2 × 1.5° × 120	125.4	160	—	16	—	13.49	1.84°	21.02	42.8	121.64	—	—	1		
3097856	1.37°	8 × R2 × 1.5° × 160	161.3	200	—			15.57	1.43°	21	42.68	—	—	—	2		
3097861	1.76°	8 × R2 × 2° × 34.6	—	120	—	10	—	10	1.66°	16.1	20.95	29.97	—	1			
3097862	1.87°	8 × R2 × 2° × 63.3	—	120	—	12	—	12	1.81°	16.95	23.53	38.44	—	2			

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○ = 标准库存品 ○ = Standard stock item





※根据切削状态，可能会出现刀具弯曲，倾斜部干涉的情况。
The tool may be deflected and may interfere with the draft area depending on milling condition.

※为了方便起见，颈部锥半角 (θn°) 与有效倾斜角 (α°) 相同标记，但实际上不同。(以不干涉有效倾斜角 (α°) 的角度设定)
For convenience, the draft angle (θn°) is illustrated the same as the effective draft angle (α°), but they are not identical. The effective draft angle (α°) is configured without interference.

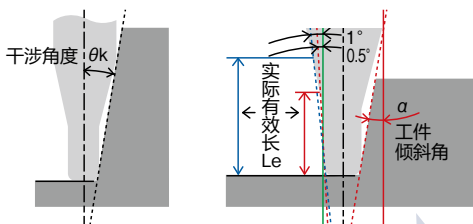
FROM

单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	外径 × 圆弧半径 × 颈部锥半角 × 颈长 DC × RE × θn × LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _n	颈口径 DN	干涉角度 θk	相对于工件倾斜角 α 的实际有效长 (Le) ^{注1}					刃数 Z/EFP	形状 Type	库存 Stock							
										0.5°	1°	1.5°	2°	3°										
3098026	0.4°	10 × R2 × 0.5° × 100	102	150	15	12	9.9	11.38	0.57°	100.7					1									
3098041	0.92°	10 × R2 × 1° × 64.3	—	120				12	12	0.9°	29.39							2						
3098042	0.8°	10 × R2 × 1° × 80	88	160				16	9.9	12.17	1.98°	35.71	81.24	84.17			1	3						
3098043	0.84°	10 × R2 × 1° × 100	106.7							106.7	12.87	1.63°	35.69	101.23	104.89									
3098044	0.87°	10 × R2 × 1° × 120	125.4	180						13.57	1.38°	35.68	121.23											
3098045	0.88°	10 × R2 × 1° × 140	144.1	200						14.26	1.2°	35.76	141.25											
3098046	0.9°	10 × R2 × 1° × 160	162.7	220						14.96	1.07°	35.74	161.24											
3098051	1.33°	10 × R2 × 1.5° × 45.2	—	120						12	12	1.27°	21.95	33.01						2				
3098052	1.19°	10 × R2 × 1.5° × 80	85.9	140						16	13.24	2.02°	25.66	52.86	81.96	85.03				1				
3098053	1.44°	10 × R2 × 1.5° × 121.6	—	180						16	16	1.42°	24.1	42.95										
3098061	1.7°	10 × R2 × 2° × 35.6	—	120						12	12	1.61°	19.28	24.3	32.87					2				
3098064	1.89°	10 × R2 × 2° × 92.9	—	220						16	16	1.85°	20.95	29.37	49.15									
3098224	0.41°	12 × R2 × 0.5° × 120	125.2	180						18	16	11.9	13.68	0.93°	120.79						3	1		
3098241	0.67°	12 × R2 × 1° × 60	65.8	120									13.37	1.77°	41.6	61.44	63.66							
3098242	0.81°	12 × R2 × 1° × 100	103.2	180									14.76	1.12°	41.77	101.45								
3098243	0.95°	12 × R2 × 1° × 122.6	—		16	16	0.94°						37.05											
3098244	0.88°	12 × R2 × 1° × 160	166.7	220	16.86	1.39°	41.7						161.44							1				
3098254	1.44°	12 × R2 × 1.5° × 160.8	—		20	20	1.43°	28.55	51.39								2							

注1: 相对于工件倾斜角 α 的实际有效长 (Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.

○ = 标准库存品 ○ = Standard stock item

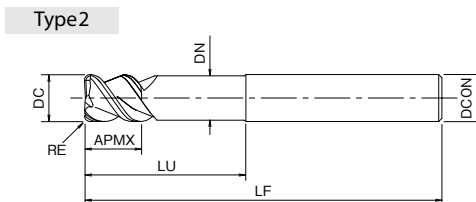
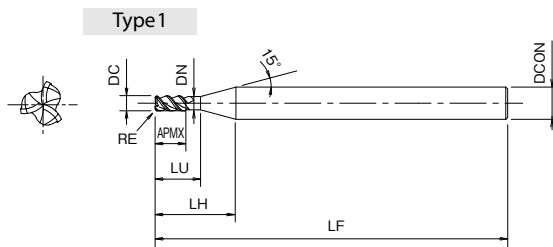


上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

Phoenix长颈大进给圆弧角铣刀

Phoenix Long Neck Deep Feeder Bull Nose End Mill

PHX-LN-DFR



±0.01

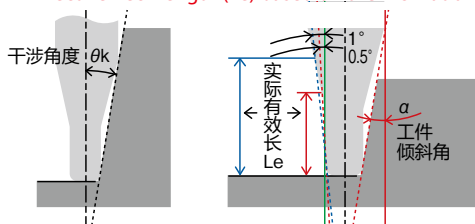
单位:mm Unit:mm

商品号 EDP No.	外径 × 圆弧半径 × 颈长 - 柄径 DC × RE × LU - DCON	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _r	干涉角度 θ _k	相对于工件倾斜角α的实际有效长(Le) 注1					刃数 ZEPF	形状 Type	库存 Stock						
								0.5°	1°	1.5°	2°	3°									
3091021	2 × R0.5 × 16	24	50	3	6	1.89	4.83°	16.75	17.33	17.96	18.63	20.14	3	1							
3091022	2 × R0.5 × 20	28	60				4.14°	20.88	21.61	22.39	23.23	25.11									
3091023	2 × R0.5 × 24	32	60				3.62°	25.02	25.89	26.82	27.83	30.09									
3091031	3 × R0.8 × 16	22	50	4	6	2.85	3.93°	16.82	17.41	18.04	18.71	20.23	3	1							
3091032	3 × R0.8 × 20	26	60				3.32°	20.96	21.69	22.47	23.31	25.21									
3091033	3 × R0.8 × 24	30	70				2.88°	25.09	25.97	26.9	27.91	—									
3091034	3 × R0.8 × 28	34					2.54°	29.23	30.25	31.34	32.51	—									
3091035	3 × R0.8 × 32	38					3.44°	33.36	34.52	35.77	37.11	40.12									
3091040	4 × R1 × 16	20.1	50	6	6	3.8	4.8°	16.92	17.51	18.14	18.82	20.35	3	1	○						
3092041	4 × R1 × 20	—	70		4		—	—	—	—	—	—				—	—	—	—	—	
3091043	4 × R1 × 20 - 6	24.1			6		5.43°	21.05	21.79	22.57	23.42	25.32				—	—	—	—	—	
3091044	4 × R1 × 24	28.1	90		6		4.83°	25.19	26.07	27.01	28.02	30.29				—	—	—	—	—	
3092042	4 × R1 × 28	—			4		—	—	—	—	—	—				—	—	—	—	—	
3091045	4 × R1 × 28 - 6	32.1	90		6		4.34°	29.32	30.35	31.44	32.62	35.27				—	—	—	—	—	
3091046	4 × R1 × 32	36.1					6	3.94°	33.46	34.62	35.87	37.22				40.24	—	—	—	—	—
3091047	4 × R1 × 36	40.1					6	3.61°	37.59	38.9	40.31	41.82				45.21	—	—	—	—	—
3091048	4 × R1 × 40	44.1	90		6		3.33°	41.73	43.18	44.74	46.42	50.18				—	—	—	—	—	
3091051	5 × R1 × 20	22.2	70		7.5		6	4.8	1.29°	21.05	21.79	—				—	—	—	—	—	
3091052	5 × R1 × 30	32.2		0.89°		31.39			—	—	—	—	—	—	—	—	—	—			
3091053	5 × R1 × 40	42.2		90		0.68°			41.73	—	—	—	—	—	—	—	—	—			

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○=标准库存品 ○= Standard stock item

注1：相对于工件倾斜角α的实际有效长(Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.



FROM

单位: mm Unit: mm

商品号 EDP No.	外径 × 圆弧半径 × 颈长 - 柄径 DC × RE × LU - DCON	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 Di	干涉角度 θk	相对于工件倾斜角α的实际有效长(Le) ^{注1}					刃数 ZEFP	形状 Type	库存 Stock
								0.5°	1°	1.5°	2°	3°			
3091064	6 × R1 × 20	—	70	9	6	5.8	—	—	—	—	—	—	3	2	○
3091065	6 × R1 × 40		90												
3091066	6 × R1.5 × 20		70												
3092061	6 × R1.5 × 30		80												
3092062	6 × R1.5 × 42		90												
3092063	6 × R1.5 × 54		100												
3091067	6 × R1.5 × 66		110												
3092081	8 × R2 × 40	—	85	12	8	7.7	—	—	—	—	—	3	2	○	
3092082	8 × R2 × 56		100												
3092083	8 × R2 × 72		120												
3091100	10 × R2 × 30	—	80	15	10	9.7	—	—	—	—	—	3	2	○	
3091104	10 × R2 × 40		90												
3092101	10 × R2 × 50		100												
3091105	10 × R2 × 60		110												
3092102	10 × R2 × 70		120												
3091106	10 × R2 × 80		130												
3092103	10 × R2 × 90		140												
3091107	10 × R2 × 100	150													
3091120	12 × R2 × 40	—	90	18	12	11.7	—	—	—	—	—	3	2	○	
3092121	12 × R2 × 60		110												
3092122	12 × R2 × 84		135												
3092123	12 × R2 × 108		160												
3091126	12 × R2 × 120		170												
3092161	16 × R3 × 80	—	140	24	16	15.5	—	—	—	—	—	3	2	○	
3092162	16 × R3 × 120		175												

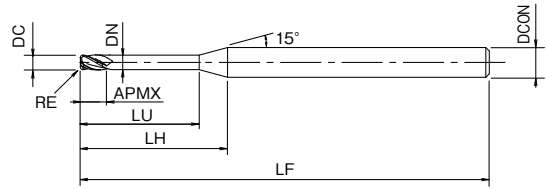
○=标准库存品 ○= Standard stock item



Phoenix 小径长颈圆弧角铣刀

4-flute Long Neck Small Bull Nose End Mill

PHX-LN-CRE



CARBIDE **WXS** ± 0.007 R **SHRINK FIT** 54° 30° **SPEED FEED P33**

0~0.015 DC=0.8 1 ≤ DC

颈长公差：0 ~ 0.1mm
Neck Length Tolerance

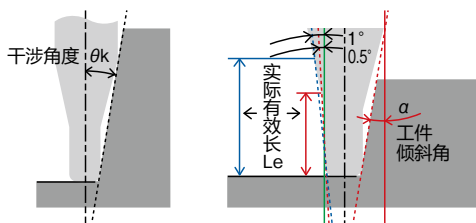
单位:mm Unit:mm

商品号 EDP No.	外径 × 圆弧半径 × 颈长 DC × RE × LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) ^{注1}					刃数 ZEPF	库存 Stock						
								0.5°	1°	1.5°	2°	3°								
3190800	0.8 × R0.1 × 2	8.1	50	0.32	4	0.72	11.15°	2.22	2.29	2.38	2.47	2.67	4							
3190801	0.8 × R0.1 × 4	10.1					8.99°	4.28	4.43	4.59	4.77	5.15								
3190802	0.8 × R0.1 × 6	12.1					7.52°	6.35	6.57	6.81	7.07	7.64								
3190803	0.8 × R0.1 × 8	14.1					6.47°	8.42	8.71	9.03	9.37	10.13								
3191006	1 × R0.1 × 4	9.7	50	0.4	4	0.93	8.77°	4.26	4.41	4.57	4.74	5.13	4							
3191007	1 × R0.1 × 6	11.7					7.29°	6.33	6.55	6.79	7.04	7.62								
3191008	1 × R0.1 × 8	13.7					6.24°	8.4	8.69	9.01	9.34	10.1								
3191009	1 × R0.1 × 10	15.7					5.45°	10.47	10.83	11.22	11.64	12.59								
3191010	1 × R0.1 × 12	17.7					4.84°	12.53	12.97	13.44	13.94	15.08								
3191011	1 × R0.2 × 4	9.7					8.77°	4.26	4.41	4.57	4.74	5.13								
3191012	1 × R0.2 × 6	11.7					7.29°	6.33	6.55	6.79	7.04	7.62								
3191013	1 × R0.2 × 8	13.7					6.24°	8.4	8.69	9.01	9.34	10.1								
3191014	1 × R0.2 × 10	15.7					5.45°	10.47	10.83	11.22	11.64	12.59								
3191015	1 × R0.2 × 12	17.7					4.84°	12.53	12.97	13.44	13.94	15.08								
3191018	1 × R0.3 × 4	9.7					8.77°	4.26	4.41	4.57	4.74	5.13								
3191019	1 × R0.3 × 6	11.7					7.29°	6.33	6.55	6.79	7.04	7.62								
3191501	1.5 × R0.1 × 4	8.8	50	0.6	4	1.41	8.06°	4.3	4.45	4.61	4.79	5.18	4	○						
3191503	1.5 × R0.1 × 8	12.8					5.57°	8.44	8.73	9.05	9.39	10.15								
3191505	1.5 × R0.1 × 12	16.8					4.25°	12.57	13.01	13.48	13.99	15.12								
3191506	1.5 × R0.2 × 4	8.8					8.06°	4.3	4.45	4.61	4.79	5.18								
3191507	1.5 × R0.2 × 6	10.8					6.59°	6.37	6.59	6.83	7.09	7.66								
3191508	1.5 × R0.2 × 8	12.8					5.57°	8.44	8.73	9.05	9.39	10.15								
3192001	2 × R0.1 × 8	12.1	50	0.8	4	1.89	4.79°	8.48	8.77	9.09	9.43	10.2	4							
3192002	2 × R0.1 × 10	14.1					4.11°	10.54	10.91	11.31	11.73	12.68								
3192003	2 × R0.1 × 12	16.1					3.6°	12.61	13.05	13.52	14.03	15.17								
3192004	2 × R0.1 × 16	20.1					2.88°	16.75	17.33	17.96	18.63	—								
3192013	2 × R0.3 × 8	12.1					4.79°	8.48	8.77	9.09	9.43	10.2								
3192015	2 × R0.3 × 12	16.1					3.6°	12.61	13.05	13.52	14.03	15.17								
3192019	2 × R0.5 × 6	10.1					5.75°	6.41	6.63	6.87	7.13	7.71								
3192020	2 × R0.5 × 8	12.1					4.79°	8.48	8.77	9.09	9.43	10.2								
3192021	2 × R0.5 × 10	14.1					4.11°	10.54	10.91	11.31	11.73	12.68								
3192022	2 × R0.5 × 12	16.1					3.6°	12.61	13.05	13.52	14.03	15.17								
3193008	3 × R0.3 × 12	14.2					50	1.2	4	2.85	2.03°	12.69			13.13	13.6	14.12	—	4	

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○=标准库存品 ○= Standard stock item

注1：相对于工件倾斜角 α 的实际有效长(Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

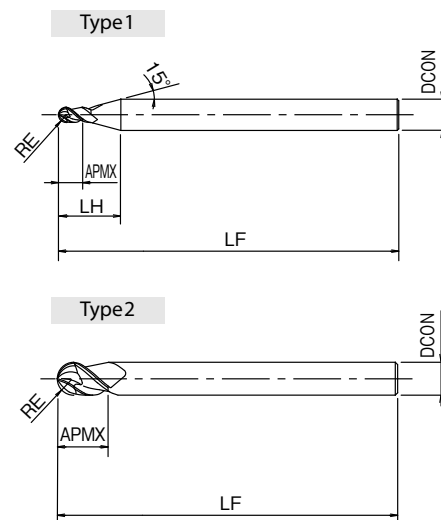


Phoenix 大进给球头铣刀

Phoenix Deep Feeder Ball Nose End Mill

PAT. in Japan

PHX-DBT



CARBIDE **FX** **R ±0.01** **SHRINK FIT** **45°** **SPEED FEED P34-38**

单位 :mm Unit:mm

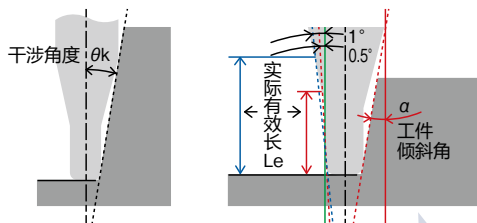
商品号 EDP No.	球半径 × 全长 RE × LF	LH	刃长 APMX	柄径 DCON	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长 (Le) 注1					刃数 ZEPF	形状 Type	库存 Stock
						0.5°	1°	1.5°	2°	3°			
3090202	R 0.5 × 60	12	1.5	6	13.53°	1.53	1.56	1.6	1.65	1.74	3	1	○
3090204	R 1 × 60	12.3	3	6	11.81°	3.06	3.13	3.21	3.3	3.49	3	1	
3090206	R 1.5 × 70	12.6	4.5	6	9.76°	4.6	4.7	4.82	4.95	5.23	3	1	
3090208	R 2 × 70	12.2	6	6	7.26°	6.13	6.27	6.43	6.6	6.98	3	1	
3090210	R 2.5 × 70	12.1	7.5	6	4.12°	7.66	7.84	8.04	8.25	8.73	3	1	
3090212	R 3 × 80	—	9	6	—	—	—	—	—	—	3	2	
3090312	R 3 × 110	—	12	8	—	—	—	—	—	—	3	2	
3090216	R 4 × 90	—	12	8	—	—	—	—	—	—	3	2	
3090316	R 4 × 120	—	15	10	—	—	—	—	—	—	3	2	
3090220	R 5 × 100	—	15	10	—	—	—	—	—	—	3	2	
3090320	R 5 × 130	—	18	12	—	—	—	—	—	—	3	2	
3090222	R 6 × 100	—	18	12	—	—	—	—	—	—	3	2	
3090322	R 6 × 140	—	24	16	—	—	—	—	—	—	3	2	
3090226	R 8 × 150	—	24	16	—	—	—	—	—	—	3	2	
3090230	R 10 × 150	—	30	20	—	—	—	—	—	—	3	2	
3090330	R 10 × 200	—	30	20	—	—	—	—	—	—	3	2	

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○ = 标准库存品 ○ = Standard stock item

注 1 : 相对于工件倾斜角 α 的实际有效长 (Le)

Effective neck length (Le) based on the inclination angle (α) of workpiece.



上表中实际有效栏里无数值时意味着加工时不存在干涉。

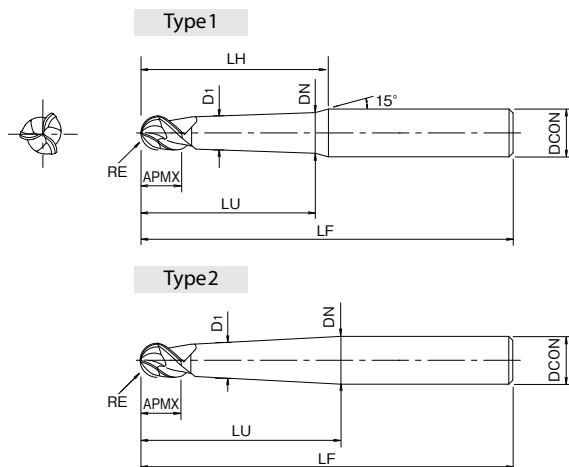
No numerical value means no interference with the workpiece.



Phoenix 锥颈大进给球头铣刀

Phoenix Pencil Neck Deep Feeder Ball Nose End Mill

PHX-PC-DBT



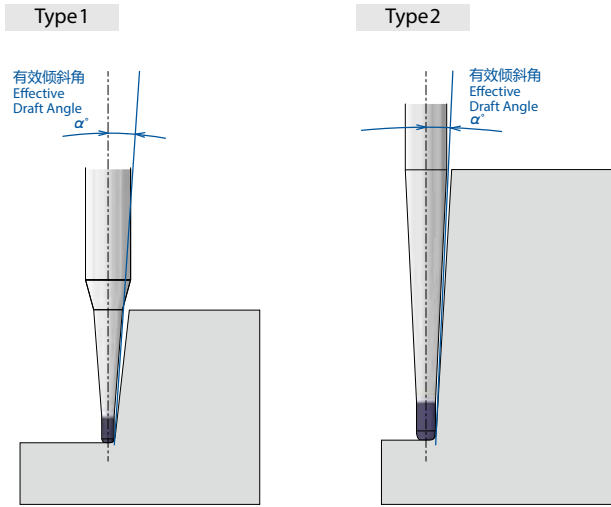
单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈锥半角 × 颈长 × 全长 $RE \times \theta_n \times LU \times LF$	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D_i	颈口径 D_N	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le)注1					刃数 ZEFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3094000	0.25°	R0.5 × 0.5° × 8	17.9	60	1.5	6	0.95	1.06	8.49°	8.13	8.4	8.68	8.99	9.68	3	1	○
3094001	0.34°	R0.5 × 0.5° × 12	21.8					1.13	6.92°	12.13	12.54	12.97	13.44	14.49			
3095125	0.38°	R0.5 × 0.5° × 16	25.6					1.2	5.84°	16.13	16.68	17.26	17.89	19.3			
3094002	0.41°	R0.5 × 0.5° × 20	29.5					1.27	5.04°	20.13	20.82	21.55	22.34	24.11			
3095141	0.56°	R0.5 × 1° × 6	15.7					1.1	9.67°	5.75	6.18	6.38	6.61	7.1			
3095142	0.68°	R0.5 × 1° × 8	17.6					1.17	8.59°	5.62	6.18	6.38	6.61	7.1			
3095143	0.75°	R0.5 × 1° × 10	19.5					1.24	7.74°	5.55	6.18	6.38	6.61	7.1			
3095144	0.79°	R0.5 × 1° × 12	21.4					1.31	7.03°	5.51	6.18	6.38	6.61	7.1			
3094003	0.83°	R0.5 × 1° × 14	23.3					1.39	6.45°	5.3	6.18	6.38	6.61	7.1			
3095145	0.85°	R0.5 × 1° × 16	25.1					1.45	5.95°	5.46	6.18	6.38	6.61	7.1			
3094004	0.87°	R0.5 × 1° × 18	27.1					1.53	5.53°	5.31	6.18	6.38	6.61	7.1			
3095146	0.88°	R0.5 × 1° × 20	28.8					1.59	5.15°	5.44	6.18	6.38	6.61	7.1			
3094005	0.89°	R0.5 × 1° × 22	30.8					1.67	4.83°	5.32	6.18	6.38	6.61	7.1			
3094006	0.9°	R0.5 × 1° × 24	32.7	1.74	4.55°	5.32	6.18	6.38	6.61	7.1							
3095147	0.91°	R0.5 × 1° × 25	33.5	1.77	4.42°	5.37	6.18	6.38	6.61	7.1							
3094007	0.91°	R0.5 × 1° × 26	34.5	1.81	4.29°	5.32	6.18	6.38	6.61	7.1							
3094008	0.92°	R0.5 × 1° × 28	36.4	1.88	4.07°	5.32	6.18	6.38	6.61	7.1							
3094009	0.92°	R0.5 × 1° × 30	38.3	1.95	3.86°	5.32	6.18	6.38	6.61	7.1							
3094010	0.93°	R0.5 × 1° × 32	40.1	2.02	3.68°	5.33	6.18	6.38	6.61	7.1							
3094011	0.93°	R0.5 × 1° × 34	42	2.09	3.51°	5.33	6.18	6.38	6.61	7.1							
3094012	0.94°	R0.5 × 1° × 36	43.9	2.16	3.36°	5.33	6.18	6.38	6.61	7.1							
3095155	1.3°	R0.5 × 1.5° × 15	23.7	1.65	6.3°	3.46	6.52	15.22	15.77	17.02							
3094013	1.31°	R0.5 × 1.5° × 16	24.7	1.71	6.07°	3.46	6.52	15.22	15.77	17.02							
3094014	1.35°	R0.5 × 1.5° × 20	28.3	1.92	5.27°	3.43	6.35	20.21	20.94	22.61							
3094015	1.38°	R0.5 × 1.5° × 24	31.9	2.13	4.65°	3.43	6.35	24.2	25.09	27.09							
3095157	1.39°	R0.5 × 1.5° × 25	32.7	2.18	4.52°	3.43	6.35	25.21	26.14	28.22							
3094016	1.4°	R0.5 × 1.5° × 30	37.4	2.44	3.96°	3.44	6.4	30.21	31.33	33.83							
3094017	1.43°	R0.5 × 1.5° × 40	46.4	2.97	3.17°	3.44	6.34	40.2	41.69	45.03							
3094018	1.44°	R0.5 × 1.5° × 50	55.4	3.49	2.65°	3.43	6.37	50.21	52.07	—							
3094019	1.45°	R0.5 × 1.5° × 60	64.4	4.02	2.27°	3.43	6.34	60.19	62.43	—							
3095191	4.3°	R0.5 × 4.5° × 30	31.6	5.43	4.68°	1.98	2.2	2.48	2.88	4.48							

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○ = 标准库存品 ○ = Standard stock item





※根据切削状态,可能会出现刀具弯曲,倾斜部干涉的情况。
The tool may be deflected and may interfere with the draft area depending on milling condition.

※为了方便起见,颈部锥半角(θ_n)与有效倾斜角(α°)相同标记,但实际上不同。(以不干涉有效倾斜角(α°)的角度设定)
For convenience, the draft angle(θ_n°) is illustrated the same as the effective draft angle(α°), but they are not identical. The effective draft angle(α°) is configured without interference.

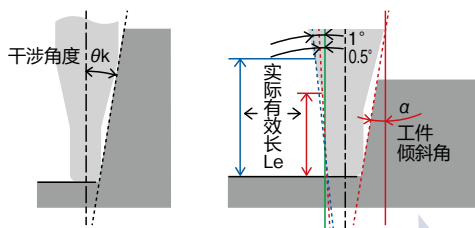
FROM

单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈部锥半角 × 颈长 × 全长 RE × θ_n × LU × LF	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _n	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) ^{注1}					刃数 Z/EFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3094020	0.45°	R0.75 × 0.7° × 12	20.8	60	2.25	6	1.45	1.67	6.63°	12.05	12.44	12.86	13.32	14.34	3	1	○
3094021	0.52°	R0.75 × 0.7° × 16	24.6					1.77	5.55°	15.35	16.52	17.09	17.7	19.08			
3094022	0.56°	R0.75 × 0.7° × 20	28.4					1.87	4.77°	14.53	20.6	21.32	22.09	23.82			
3094023	0.61°	R0.75 × 0.7° × 30	38					2.11	3.53°	14.29	30.82	31.9	33.07	35.7			
3095211	0.45°	R0.75 × 1° × 6	14.8					1.58	9.43°	6.02	6.2	6.4	6.61	7.09			
3094024	0.49°	R0.75 × 1° × 8	16.9					1.63	8.29°	7.75	8.24	8.51	8.8	9.46			
3095212	0.65°	R0.75 × 1° × 9	17.6					1.68	7.83°	6.84	9.21	9.52	9.85	10.59			
3094025	0.62°	R0.75 × 1° × 10	18.7					1.7	7.41°	7.4	10.24	10.58	10.95	11.78			
3095213	0.74°	R0.75 × 1° × 12	20.4					1.79	6.71°	6.63	12.2	12.61	13.06	14.06			
3094026	0.74°	R0.75 × 1° × 14	22.5					1.84	6.11°	7.09	14.24	14.73	15.25	16.43			
3095214	0.8°	R0.75 × 1° × 15	23.2					1.89	5.86°	6.72	15.21	15.73	16.3	17.56			
3094027	0.77°	R0.75 × 1° × 16	24.3					1.91	5.61°	7.01	16.24	16.8	17.4	18.76			
3094028	0.8°	R0.75 × 1° × 18	26.2	1.98	5.19°	6.96	18.24	18.87	19.55	21.08							
3094029	0.82°	R0.75 × 1° × 20	28.1	2.05	4.83°	6.91	20.24	20.94	21.7	23.4							
3095215	0.86°	R0.75 × 1° × 21	28.8	2.1	4.67°	6.68	21.21	21.95	22.74	24.53							
3094030	0.86°	R0.75 × 1° × 26	33.7	2.26	4°	6.83	26.24	27.16	28.15	30.38							
3095216	0.9°	R0.75 × 1° × 30	37.3	2.41	3.58°	6.7	30.22	31.28	32.43	35							
3094031	0.92°	R0.75 × 1° × 40	46.8	2.75	2.85°	6.74	40.24	41.66	43.2	—							
3094032	0.93°	R0.75 × 1° × 50	56.1	3.1	2.36°	6.71	50.23	52.02	53.94	—							

注1: 相对于工件倾斜角 α 的实际有效长(Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.

○ = 标准库存品 ○ = Standard stock item



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.



NEXT

特点 Features
圆弧角型 Bull Nose PHX-DFR
圆弧角型 Bull Nose PHX-PC-DFR
圆弧角型 Bull Nose PHX-LN-DFR
圆弧角型 Bull Nose PHX-LN-CRE
球头型 Bull Nose PHX-DBT
球头型 Bull Nose PHX-PC-DBT
球头型 Bull Nose PHX-LN-DBT
圆弧角型 Bull Nose PHX-CRT

切削条件 Cutting Conditions

Phoenix 锥颈大进给球头铣刀

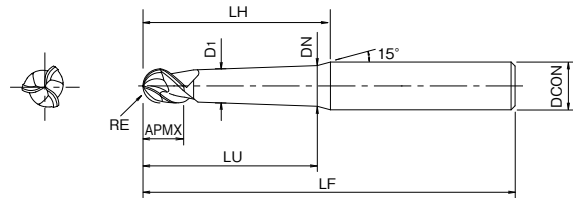
Phoenix Pencil Neck Deep Feeder Ball Nose End Mill

PHX-PC-DBT

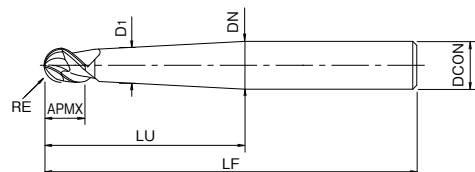


FROM

Type1



Type2



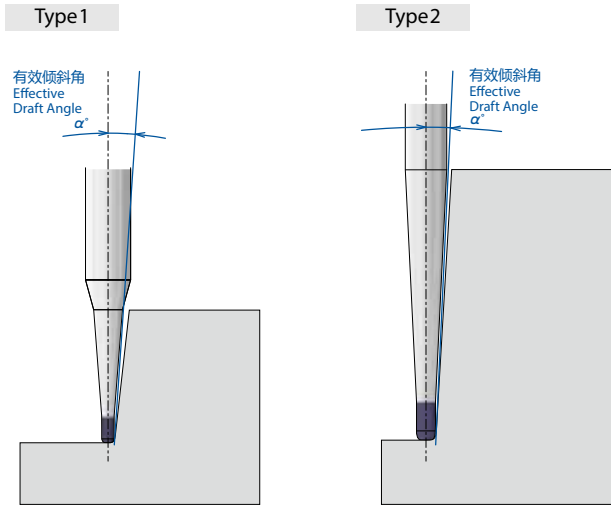
单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈部锥半角 × 颈长 × 全长 $R_1 \times \theta_n \times LU \times LF$	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D_i	颈口径 D_N	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) ^{注1}					刃数 ZEFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3094033	0.21°	R1 × 0.5° × 10	18	60	3	6	1.95	2.06	6.95°	10.18	10.5	10.85	11.22	12.05	3	1	○
3095223	0.38°	R1 × 0.5° × 20	27.6					2.24	4.39°	20.17	20.84	21.56	22.33	24.06			
3094034	0.41°	R1 × 0.5° × 30	37.4	70	3	6	1.95	2.41	3.21°	30.18	31.2	32.29	33.46	36.1	3	1	○
3095241	0.62°	R1 × 1° × 10	17.7	2.19				7.06°	8.05	10.24	10.58	10.94	11.75				
3094035	0.64°	R1 × 1° × 12	19.7	60	3	6	1.95	2.24	6.32°	8.75	12.28	12.69	13.13	14.12	3	1	○
3094036	0.69°	R1 × 1° × 14	21.6					2.31	5.73°	8.56	14.28	14.76	15.28	16.44			
3095242	0.76°	R1 × 1° × 15	22.4	70	3	6	1.95	2.36	5.49°	8.08	15.25	15.77	16.32	17.57	3	1	○
3094037	0.74°	R1 × 1° × 16	23.5					2.38	5.25°	8.44	16.28	16.84	17.43	18.77			
3094038	0.77°	R1 × 1° × 18	25.3	80	3	6	1.95	2.45	4.84°	8.35	18.28	18.91	19.58	21.09	3	1	○
3095243	0.82°	R1 × 1° × 20	27					2.54	4.49°	7.93	20.24	20.94	21.69	23.37			
3094039	0.83°	R1 × 1° × 24	30.9	100	3	6	1.95	2.66	3.91°	8.2	24.28	25.12	26.03	28.06	3	1	○
3095244	0.86°	R1 × 1° × 25	31.7					2.71	3.8°	7.97	25.25	26.13	27.07	29.19			
3094040	0.84°	R1 × 1° × 26	32.8	80	3	6	1.95	2.73	3.68°	8.16	26.28	27.19	28.18	30.39	3	1	○
3095245	0.89°	R1 × 1° × 30	36.4					2.89	3.29°	7.9	30.24	31.3	32.43	34.99			
3095246	0.92°	R1 × 1° × 40	45.7	60	3	6	1.95	3.24	2.6°	7.88	40.24	41.66	43.18	3	1	○	
3095247	0.93°	R1 × 1° × 50	55.1					3.59	2.15°	7.87	50.24	52.02	53.93				—
3094041	1.15°	R1 × 1.5° × 16	23.1	80	3	6	1.95	2.6	5.35°	5.61	10.96	16.38	16.96	18.26	3	1	○
3094042	1.22°	R1 × 1.5° × 20	26.7					2.81	4.58°	5.56	10.66	20.38	21.11	22.74			
3094043	1.27°	R1 × 1.5° × 24	30.3	100	3	6	1.95	3.02	4.01°	5.54	10.49	24.38	25.26	27.23	3	1	○
3094044	1.32°	R1 × 1.5° × 30	35.7					3.33	3.37°	5.52	10.41	30.39	31.49	33.97			
3095251	1.39°	R1 × 1.5° × 40	44.5	80	3	6	1.95	3.88	2.67°	5.45	9.96	40.33	41.81	3	1	○	
3094045	1.40°	R1 × 1.5° × 50	53.7					4.38	2.21°	5.48	10.15	50.38	52.23				—
3094046	1.41°	R1 × 1.5° × 60	62.8	100	3	6	1.95	—	1.85°	6.38	18.56	61.46	—	3	1	○	
3095262	1.93°	R1 × 2° × 60.3	—					—	1.94°	4.6	6.36	11.49	—				—
3095273	2.85°	R1 × 3° × 41.2	—	80	3	6	1.95	2.85°	3.96	4.69	5.9	8.28	3	2	○		
3095281	3.94°	R1 × 4° × 30	—					3.95°	3.64	4.04	4.59	5.38				8.81	

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○ = 标准库存品 ○ = Standard stock item





※根据切削状态,可能会出现刀具弯曲,倾斜部干涉的情况。
The tool may be deflected and may interfere with the draft area depending on milling condition.

※为了方便起见,颈部锥半角(θ_n°)与有效倾斜角(α°)相同标记,但实际上不同。(以不干涉有效倾斜角(α°)的角度设定)
For convenience, the draft angle(θ_n°) is illustrated the same as the effective draft angle(α°), but they are not identical. The effective draft angle(α°) is configured without interference.

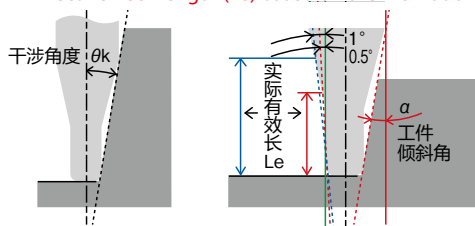
FROM

单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈部锥半角 × 颈长 × 全长 RE × θ_n × LU × LF	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _n	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) ^{注1}					刃数 Z/EFP	形状 Type	库存 Stock							
										0.5°	1°	1.5°	2°	3°										
3094047	0.44°	R1.25 × 0.7° × 16	22.8	60	3.8	6	2.45	2.72	4.79°	16.07	16.58	17.14	17.74	19.08	3	1								
3094048	0.5°	R1.25 × 0.7° × 20	26.6					2.82	4.05°	20.01	20.66	21.37	22.12	23.82										
3094049	0.53°	R1.25 × 0.7° × 24	30.4					2.92	3.51°	20.07	24.74	25.59	26.51	28.56										
3094050	0.57°	R1.25 × 0.7° × 30	36.2					3.07	2.93°	19.03	30.86	31.93	33.08											
3094051	0.83°	R1.25 × 1° × 30	35.7					3.33	2.97°	9.66	30.34	31.39	32.53											
3094052	0.88°	R1.25 × 1° × 40	45					3.68	2.33°	9.53	40.34	41.75	43.27											
3094053	0.9°	R1.25 × 1° × 50	54.4					4.03	1.92°	9.45	50.34	52.11	—	—										
3094054	1.33°	R1.25 × 1.5° × 40	43.9					4.3	2.39°	6.61	12.41	40.47	41.94											
3094055	1.39°	R1.25 × 1.5° × 60	65.7					5.34	2.48°	6.58	12.24	60.49	62.71											
3094056	1.42°	R1.25 × 1.5° × 80	83.7					6.39	1.93°	6.56	12.1	80.48	—	—										
3095321	0.27°	R1.5 × 0.5° × 20	26					80	4.5	6	2.9	3.17	3.61°	20.29				20.95	21.65	22.41	24.11	3	1	○
3094057	0.51°	R1.5 × 1° × 16	21.8									3.26	4.37°	15.51				16.49	17.03	17.61	18.93			
3095341	0.69°	R1.5 × 1° × 20	25.5									3.44	3.68°	13.27				20.41	21.09	21.83	23.48			
3094058	0.69°	R1.5 × 1° × 24	29.3									3.54	3.17°	14.42				24.49	25.32	26.21	28.22			
3095342	0.76°	R1.5 × 1° × 25	30.1									3.61	3.07°	13.37				25.42	26.28	27.21	29.3			
3094059	0.71°	R1.5 × 1° × 26	31.2	3.79	2.97°	14.29	26.49					27.39	28.36											
3095343	0.8°	R1.5 × 1° × 30	34.8	4.13	2.63°	13.24	30.4					31.45	32.57											
3095344	0.85°	R1.5 × 1° × 40	44.2	4.48	2.05°	13.37	40.42					41.83	43.34											
3095345	0.88°	R1.5 × 1° × 50	53.5	4.83	1.68°	13.33	50.42					52.19	—	—										
3095346	0.9°	R1.5 × 1° × 60	62.9	5.14	1.42°	13.3	60.42					—	—	—										
3094060	0.9°	R1.5 × 1° × 70	72.3	5.14	1.23°	13.61	70.5					—	—	—										
3095356	1.45°	R1.5 × 1.5° × 60.8	—	6	1.45°	8.55	14.68					—	—	—										
3095365	1.91°	R1.5 × 2° × 46.5	—	6	1.91°	7.21	9.77					16.54	—	—										
3095374	2.8°	R1.5 × 3° × 32.1	—	6	2.81°	6.11	7.15					8.81	11.83	—										
3094061	2.6°	R1.5 × 3° × 40	43.6	8	6.49	3.46°	6.32					7.6	9.79	14.45	41.27	2	1							
3094062	2.69°	R1.5 × 3° × 50	55.4	10	7.54	3.77°	6.3	7.56	9.7	14.19	51.27													
3094063	2.78°	R1.5 × 3° × 70	75.2	12	9.64	3.53°	6.28	7.52	9.61	13.92	71.26													
3094064	2.83°	R1.5 × 3° × 90	91.3	130	11.74	2.9°	6.27	7.5	9.56	13.78	—													

注1: 相对于工件倾斜角 α 的实际有效长(Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.

○ = 标准库存品 ○ = Standard stock item



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

NEXT

特点 Features
圆弧形球头 PHX-CRE
圆弧形球头 PHX-PC-DFR
圆弧形球头 PHX-LN-DFR
圆弧形球头 PHX-LN-CRE
球头型球头 PHX-DBT
球头型球头 PHX-PC-DBT
球头型球头 PHX-LN-DBT
圆弧形球头 PHX-CRT
切削条件 Cutting Conditions

Phoenix 锥颈大进给球头铣刀

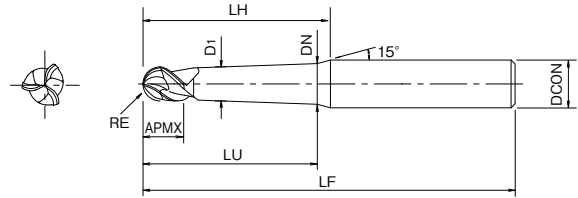
Phoenix Pencil Neck Deep Feeder Ball Nose End Mill

PHX-PC-DBT

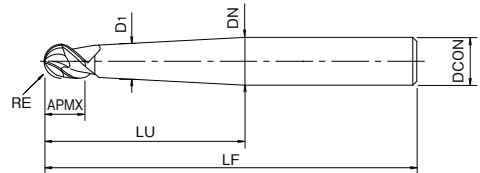


FROM

Type1



Type2



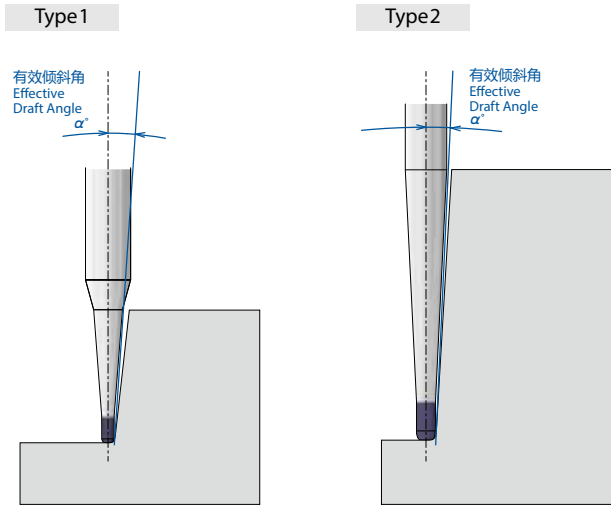
单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈锥半角 × 颈长 × 全长 $RE \times \theta_n \times LU \times LF$	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 Di	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) 注1					刃数 ZEFP	形状 Type	库存 Stock		
										0.5°	1°	1.5°	2°	3°					
3094065	0.58°	R1.75 × 1° × 20	24.7	80	5.3	6	3.4	3.87	3.22°	16.46	20.53	21.21	21.94	23.59	3	1	○		
3094066	0.73°	R1.75 × 1° × 30	34					4.22	2.27°	15.6	30.53	31.57	32.69						
3094067	0.8°	R1.75 × 1° × 40	43.4					4.57	1.75°	15.27	40.53	41.93							
3094068	0.85°	R1.75 × 1° × 50	52.7					4.92	1.43°	15.09	50.52								
3094069	1.33°	R1.75 × 1.5° × 60	64.1					6.2	2.1°	10.1	19.09	60.72	62.94						
3094070	1.38°	R1.75 × 1.5° × 80	82.1					7.25	1.62°	10.06	18.8	80.72							
3094071	1.4°	R1.75 × 1.5° × 100	103.9					8.29	1.84°	10.04	18.72	100.73							
3095421	0.29°	R2 × 0.5° × 25	29	80	6	3.9	4.23	2.18°	25.33	26.14	27.01	27.95		3	1	○			
3095441	0.76°	R2 × 1° × 30	33				4.73	1.89°	15.92	30.49	31.52								
3095442	0.82°	R2 × 1° × 40	42.4				5.08	1.45°	15.85	40.49									
3095443	0.86°	R2 × 1° × 50	51.8				5.43	1.17°	15.81	50.49									
3094072	0.86°	R2 × 1° × 60	61.2				5.74	0.98°	16.23										
3095444	0.97°	R2 × 1° × 61.3	—				6	0.97°	14.28										
3094073	0.89°	R2 × 1° × 70	74.3				6.09	1.61°	16.14	70.56	73.04								
3095445	0.92°	R2 × 1° × 80	83.5				6.48	1.42°	15.76	80.48									
3095453	1.42°	R2 × 1.5° × 42.2	—				6	1.43°	10.19	16.4									
3094074	1.32°	R2 × 1.5° × 60	63.2				6.66	1.9°	11.05	20.83	60.78								
3095454	1.46°	R2 × 1.5° × 80.4	—	8	1.47°	10.51	17.9												
3094075	1.4°	R2 × 1.5° × 100	103	8.76	1.72°	10.96	20.31	100.77											
3094076	1.53°	R2 × 2° × 30	35.4	5.49	3.5°	9.48	13.67	28.4	31	33.36									
3095462	1.93°	R2 × 2° × 61.3	—	8	1.94°	9	12.12	20.28											
3094077	1.78°	R2 × 2° × 66.7 × 140	—	8	1.77°	9.39	13.36	26.49											
3094078	1.78°	R2 × 2° × 66.7 × 160	—	8															
3094079	2.35°	R2 × 3° × 30	34	6.29	3.67°	8.07	9.71	12.58	18.84	31.5									
3095472	2.84°	R2 × 3° × 42.2	—	8	2.85°	7.77	9.07	11.11	14.79										
3094080	2.54°	R2 × 3° × 47.1 × 120	—	8															
3094081	2.54°	R2 × 3° × 47.1 × 140	—	8															
3094082	2.54°	R2 × 3° × 47.1 × 160	—	8															
3094083	2.54°	R2 × 3° × 47.1 × 200	—	8	2.54°	8.07	9.7	12.56	18.76										

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○=标准库存品 ○= Standard stock item





※根据切削状态，可能会出现刀具弯曲，倾斜部干涉的情况。
The tool may be deflected and may interfere with the draft area depending on milling condition.

※为了方便起见，颈部锥半角 (θ_n) 与有效倾斜角 (α°) 相同标记，但实际上不同。(以不干涉有效倾斜角 (α°) 的角度设定)
For convenience, the draft angle (θ_n°) is illustrated the same as the effective draft angle (α°), but they are not identical. The effective draft angle (α°) is configured without interference.

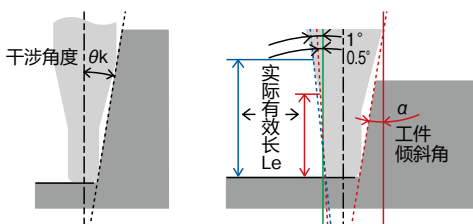
FROM

单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈部锥半角 × 颈长 × 全长 RE × θ_n × LU × LF	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _n	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长 (Le) 注1					刃数 Z/EFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3094084	0.67°	R2.5 × 1° × 30	35.1	80	7.5	8	4.9	5.64	2.69°	19.64	30.64	31.65	32.75	3	1	○	
3095541	0.76°	R2.5 × 1° × 35	39.7	100				5.86	2.36°	18.24	35.54	36.74	38.03				
3094085	0.76°	R2.5 × 1° × 40	44.5	80				5.99	2.09°	19.15	40.63	42.01	43.5				
3095542	0.84°	R2.5 × 1° × 50	53.7	100				6.38	1.7°	18.29	50.55	52.29	—				
3094086	0.85°	R2.5 × 1° × 60	63.2					6.69	1.44°	18.76	60.63						
3095543	0.89°	R2.5 × 1° × 70	72.4	130				7.08	1.25°	18.26	70.55	—					
3094087	0.89°	R2.5 × 1° × 80	81.9					7.39	1.1°	18.6	80.63						
3095544	0.98°	R2.5 × 1° × 90.4	—					8	0.98°	16.9	—						
3095553	1.45°	R2.5 × 1.5° × 61.8	—	1.45°					12.23	19.91							
3094088	1.36°	R2.5 × 1.5° × 90	92.3	—				10	9.15	1.61°	13	24.08	90.89				—
3095562	1.91°	R2.5 × 2° × 47.5	—	—	8	8	1.91°	10.62	13.96	21.97	—	—	—	—	2		
3095641	0.77°	R3 × 1° × 40	42.6	100	8	5.9	6.98	1.48°	20.79	40.62	—	—	—	3	1	○	
3095642	0.82°	R3 × 1° × 50	51.9				7.33	1.19°	20.76	50.62							
3094089	0.83°	R3 × 1° × 60	65.1				10	7.64	1.87°	21.3							60.7
3095643	0.97°	R3 × 1° × 62.3	—	130	8	8	8	0.97°	18.34	—	—	—	—	2	—		
3095644	0.9°	R3 × 1° × 90	93.1				10	8.72	1.29°	20.81						90.63	
3095651	1.42°	R3 × 1.5° × 43.2	—	100	8	8	1.43°	13.66	20.72	—	—	—	—	1	—		
3095653	1.46°	R3 × 1.5° × 81.4	—	130	10	10	1.47°	14.23	23.29								
3095661	1.87°	R3 × 2° × 33.6	—	100	8	8	1.87°	12.02	15.15	21.62	—	—	—	3	—		
3095662	1.93°	R3 × 2° × 62.3	—	130	10	10	1.94°	12.45	16.39	25.96							
3094090	1.72°	R3 × 2° × 69.7 × 130	—	130	10	10	1.72°	13.09	18.51	36.44	—	—	—	2	—		
3094091	1.72°	R3 × 2° × 69.7 × 160	—	160			2.43°	11.49	13.79	17.79						26.47	
3094092	2.44°	R3 × 3° × 50.1 × 130	—	130													
3094093	2.44°	R3 × 3° × 50.1 × 160	—	160													
3094094	2.44°	R3 × 3° × 50.1 × 200	—	200													

注1: 相对于工件倾斜角 α 的实际有效长 (Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.

○ = 标准库存品 ○ = Standard stock item



上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

NEXT



特点 Features
圆弧形型 Ball Nose PHX-CRE
圆弧形型 Ball Nose PHX-PC-DFR
圆弧形型 Ball Nose PHX-LN-DFR
圆弧形型 Ball Nose PHX-LN-CRE
球头型 Ball Nose PHX-DBT
球头型 Ball Nose PHX-PC-DBT
球头型 Ball Nose PHX-LN-DBT
圆弧形型 Ball Nose PHX-CRT
切削条件 Cutting Conditions

Phoenix 锥颈大进给球头铣刀

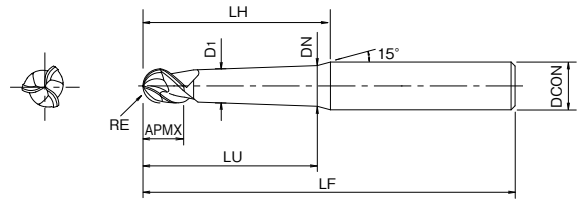
Phoenix Pencil Neck Deep Feeder Ball Nose End Mill

PHX-PC-DBT

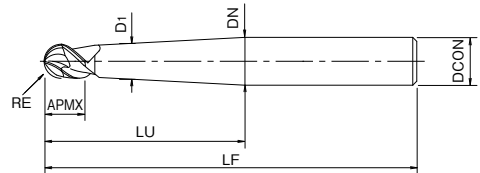


FROM

Type1



Type2



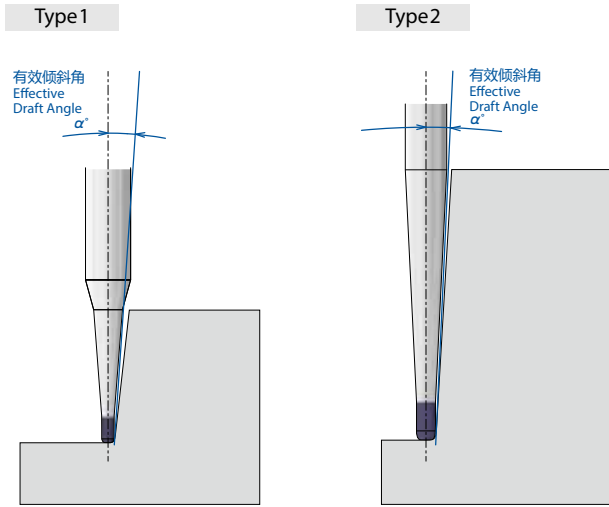
单位:mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈部锥半角 × 颈长 × 全长 RE × θ_n × LU × LF	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 Di	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) ^{注1}					刃数 ZEFP	形状 Type	库存 Stock						
										0.5°	1°	1.5°	2°	3°									
3094095	0.67°	R4 × 1° × 40	42.9	100	12	10	7.9	8.83	1.5°	27.22	40.85	—	—	—	3	1	○						
3095841	0.77°	R4 × 1° × 50	52.3	120				10	7.9	9.22	1.21°					25.88		50.77	—	—	—	3	2
3095842	0.97°	R4 × 1° × 63.3	—							150	10					7.9		10					0.97°
3094096	0.82°	R4 × 1° × 70	70.9	120				12	9.9									9.88	0.87°	26.38	—	—	—
3094097	0.85°	R4 × 1° × 80	84							150	12					9.9		10.23	1.45°	26.27	80.84		
3095843	0.88°	R4 × 1° × 90	93.4	120				12	9.9									10.62	1.3°	25.78	90.76	—	—
3094098	0.88°	R4 × 1° × 100	102.7			150	10			7.9	10.93	1.17°	26.13	100.84	—	—		—	3				
3095844	0.98°	R4 × 1° × 120.6	—	120				10	7.9		12	0.99°	23.82	—						—	—	—	3
3095851	1.42°	R4 × 1.5° × 44.2	—			150	12			9.9	10	1.43°	17.02	24.55	—	—		—	3				
3094099	1.21°	R4 × 1.5° × 60	63.8	120				12	9.9		10.35	1.94°	19.14	35.59						61.21	—	—	—
3095853	1.46°	R4 × 1.5° × 82.4	—			150	12			9.9	12	1.47°	17.88	28.31	—	—		—	—	3			
3094100	1.3°	R4 × 1.5° × 92.3	—	120				12	9.9			12	1.3°	19.14	35.56						—	—	—
3095862	1.93°	R4 × 2° × 63.3	—		150	12	9.9			12	1.93°		15.84	20.45	30.94	—	—	—	3				
3094101	1.67°	R4 × 2° × 72.7 × 150	—	160				12	9.9		12	1.67°	16.79	23.66	46.38					—	—	—	3
3094102	1.67°	R4 × 2° × 72.7 × 160	—		120	12	9.9			12		11.08	1.23°	31.91	50.98	—	—	—	3				
3094103	0.69°	R5 × 1° × 50	52.4	160				12	9.9		12	12	0.97°	25.93	—					—	—	—	3
3096041	0.97°	R5 × 1° × 64.3	—		180	16	9.9			12		12.16	2.09°	30.88	80.91	83.66	86.61	—	3				
3096042	0.83°	R5 × 1° × 80	88	200				16	9.9		12	12.86	1.71°	30.83	100.91	104.38	—			—	3		
3096043	0.87°	R5 × 1° × 100	106.7		220	16	9.9			12		13.56	1.44°	30.8	120.91	—	—	—	3				
3096044	0.89°	R5 × 1° × 120	125.4	120				12	9.9		12	14.26	1.25°	30.78	140.9	—				—	—	3	
3096045	0.91°	R5 × 1° × 140	144.1		160	16	9.9			12		14.96	1.1°	30.76	160.9	—	—	—	3				
3096046	0.92°	R5 × 1° × 160	162.8	180				12	9.9		12	12	1.43°	20.28	28.01	—				—	—	3	
3096051	1.42°	R5 × 1.5° × 45.2	—		120	16	9.9			12		13.24	2.15°	23.1	42.35		81.42	84.3	—				—
3094104	1.24°	R5 × 1.5° × 80	85.9	160				16	9.9		12	16	1.48°	21.91	35.2	—	—	—		3			
3096053	1.47°	R5 × 1.5° × 121.6	—		120	12	9.9			12		12	1.87°	18.25	21.72	27.65			—		—	3	
3096061	1.87°	R5 × 2° × 35.6	—	160				16	9.9		16	16	1.96°	19.52	25.38	39.18	—	—		3			
3096064	1.95°	R5 × 2° × 92.9	—																				

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○ = 标准库存品 ○ = Standard stock item





※根据切削状态,可能会出现刀具弯曲, 倾斜部干涉的情况。
The tool may be deflected and may interfere with the draft area depending on milling condition.

※为了方便起见, 颈部锥半角 (θ_n°) 与有效倾斜角 (α°) 相同标记, 但实际上不同。(以不干涉有效倾斜角 (α°) 的角度设定)
For convenience, the draft angle (θ_n°) is illustrated the same as the effective draft angle (α°), but they are not identical. The effective draft angle (α°) is configured without interference.

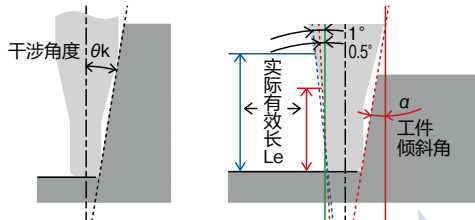
FROM

单位 :mm Unit:mm

商品号 EDP No.	有效倾斜角 α	球半径 × 颈部锥半角 × 颈长 × 全长 $RE \times \theta_n \times LU \times LF$	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 D _n	颈口径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长 (Le) ^{注1}					刃数 Z/EFP	形状 Type	库存 Stock
										0.5°	1°	1.5°	2°	3°			
3096241	0.73°	R6 × 1° × 60	65.8	120	18	16	11.9	13.36	1.95°	35.9	61.05	63.04	3	1	○		
3094105	0.77°	R6 × 1° × 80	84.5	160				13.98	1.48°	37.25	81.2						
3096242	0.85°	R6 × 1° × 100	103.2	180				14.76	1.19°	35.79	101.04						
3096243	0.98°	R6 × 1° × 122.6	—	—				16	0.99°	32.25	—						
3096244	0.91°	R6 × 1° × 160	166.7	220				16.85	1.44°	35.8	161.05						
3094106	1.18°	R6 × 1.5° × 80	90	130				15.03	2.75°	27.38	51.44	81.75				84.6	
3096254	1.48°	R6 × 1.5° × 160.8	—	220	20	1.48°	25.89	41.87	—	—							

注 1: 相对于工件倾斜角 α 的实际有效长 (Le)
Effective neck length (Le) based on the inclination angle (α) of workpiece.

○ = 标准库存品 ○ = Standard stock item

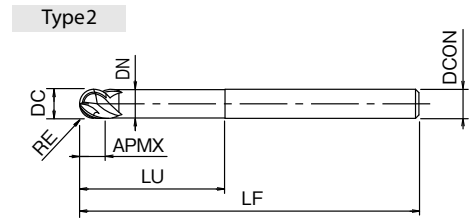
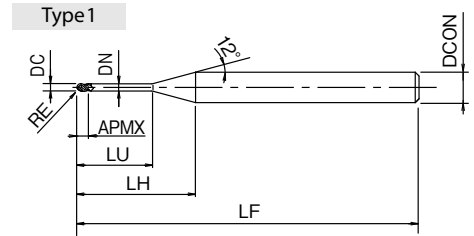


上表中实际有效栏里无数值时意味着加工时不存在干涉。
No numerical value means no interference with the workpiece.

Phoenix 长颈球头铣刀

Phoenix Long Neck Ball Nose End Mill

PHX-LN-DBT



CARBIDE	WXS	R ±0.007	SHRINK FIT	45°	SPEED FEED P39
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单位 :mm Unit:mm

商品号 EDP No.	球半径 × 颈长 RE × LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长 (Le) ^{注1}					刃数 ZEPF	形状 Type	库存 Stock			
								0.5°	1°	1.5°	2°	3°						
3194901	R 0.3 × 1	9.1	50	0.45	4	0.55	10.89°	1.15	1.19	1.23	1.27	1.38	3	1				
3194902	R 0.3 × 2	10.1					9.81°	2.19	2.28	2.37	2.47	2.71						
3194903	R 0.3 × 3	11.1					8.92°	3.23	3.36	3.51	3.67	4.04						
3194904	R 0.3 × 4	12.1					8.18°	4.28	4.45	4.65	4.86	5.36						
3194906	R 0.3 × 6	14.1					7.01°	6.36	6.63	6.93	7.26	8.02						
3195004	R 0.5 × 4	11.2	50	0.75	4	0.95	7.98°	4.27	4.44	4.62	4.83	5.3	3	1				
3195006	R 0.5 × 6	13.2					6.74°	6.35	6.62	6.9	7.22	7.96						
3195008	R 0.5 × 8	15.2					5.83°	8.44	8.79	9.18	9.61	10.61						
3195010	R 0.5 × 10	17.2					5.14°	10.52	10.97	11.46	12.01	13.26						
3195012	R 0.5 × 12	19.2					4.59°	12.61	13.15	13.75	14.4	15.92						
3195014	R 0.5 × 14	21.2	50	1.13	4	1.45	4.15°	14.7	15.33	16.03	16.79	18.57	3	1				
3195016	R 0.5 × 16	23.2					3.79°	16.78	17.51	18.31	19.18	21.23						
3195106	R 0.75 × 6	12					6.32°	6.34	6.59	6.87	7.17	7.88						
3195108	R 0.75 × 8	14					5.38°	8.43	8.77	9.15	9.56	10.53						
3195110	R 0.75 × 10	16					4.68°	10.51	10.95	11.43	11.96	13.18						
3195112	R 0.75 × 12	18	50	1.5	4	1.95	4.14°	12.6	13.13	13.71	14.35	15.84	3	1				
3195116	R 0.75 × 16	22					3.37°	16.77	17.49	18.27	19.14	21.15						
3195206	R 1 × 6	11					5.79°	6.33	6.57	6.83	7.12	7.8				3	1	○
3195208	R 1 × 8	13					4.82°	8.42	8.75	9.11	9.52	10.45						
3195210	R 1 × 10	15					4.13°	10.5	10.93	11.4	11.91	13.1						
3195212	R 1 × 12	17	3.61°	12.59	13.11	13.68	14.3	15.76										
3195214	R 1 × 14	19	3.21°	14.67	15.29	15.96	16.69	18.41										
3195216	R 1 × 16	21	60	2.25	4	2.85	2.89°	16.76	17.47	18.24	19.09	3	1					
3195218	R 1 × 18	23					2.63°	18.85	19.64	20.52	21.48							
3195220	R 1 × 20	25					2.41°	20.93	21.82	22.8	23.87							
3195222	R 1 × 22	27					2.22°	23.02	24	25.08	26.27							
3195312	R 1.5 × 12	14.5					2.17°	12.81	13.32	13.88	14.49				3	1		
3195316	R 1.5 × 16	18.5	1.67°	16.98	17.68	18.44	—											
3195320	R 1.5 × 20	22.5	1.35°	21.16	22.04	—												
3195325	R 1.5 × 25	27.5	1.1°	26.37	27.48			—										
3195416	R 2 × 16	—	60	3	4	3.85	—	—	—	—	—	3	2					
3195420	R 2 × 20	—					—	—	—	—	—							
3195425	R 2 × 25	—					—	—	—	—	—							
3195520	R 3 × 20	—	70	4.5	6	5.85	—	—	—	—	—	3	2					
3195530	R 3 × 30	—					—	—	—	—	—							

· 标识说明请参考P.9。 See p.9 for explanation of icons.

○=标准库存品 ○= Standard stock item

注 1 : 相对于工件倾斜角 α 的实际有效长 (Le) : 请参考 P.28.

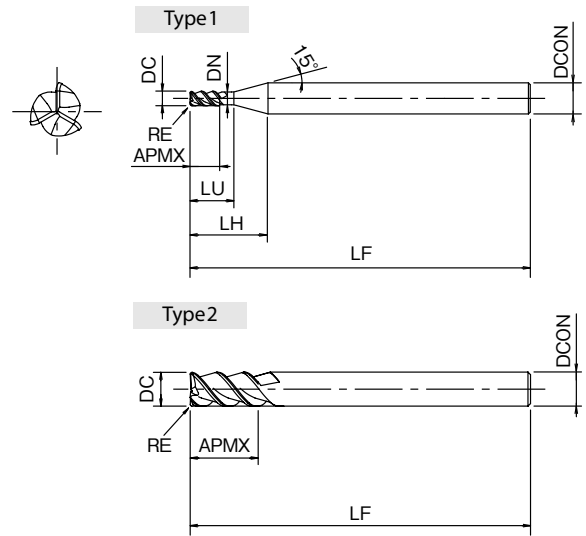
Please see p.28 for effective neck length (Le) based on the inclination angle (α) of workpiece.



Phoenix 高进给圆弧角铣刀

Phoenix High Feeder Bull Nose End Mill

PHX-CRT



CARBIDE **FX** ± 0.01 **SHRINK** **FIT** **55°** **SPEED FEED P29-32**

DC ≤ 5 0~0.015
6 ≤ DC 0.01~0.005

单位:mm Unit:mm

商品号 EDP No.	外径 × 圆弧角半径 DC × RE	颈长 LU	LH	全长 LF	刃长 APMX	柄径 DCON	颈径 DN	干涉角度 θ_k	相对于工件倾斜角 α 的实际有效长(Le) 注1					刃数 ZEPF	形状 Type	库存 Stock
									0.5°	1°	1.5°	2°	3°			
3090002	1 × R 0.3	4	13.9	60	2	6	0.95	10.55°	4.23	4.37	4.53	4.7	5.08	3	1	○
3090003	1.5 × R 0.3	4.5	12.9	60	3	6	1.45	9.83°	4.74	4.91	5.09	5.28	5.71	3	1	
3090004	2 × R 0.5	6	14.0	60	4	6	1.95	8.4°	6.29	6.51	6.75	7	7.57	3	1	
3090006	3 × R 0.8	9	14.9	70	6	6	2.85	5.76°	9.59	9.92	10.28	10.67	11.53	3	1	
3090008	4 × R 1	12	16.1	70	8	6	3.85	3.58°	12.69	13.13	13.6	14.12	15.26	3	1	
3090010	5 × R 1	15	17.2	70	10	6	4.85	1.68°	15.79	16.34	16.93	—	—	3	1	
3090012	6 × R 1.5	—	—	80	12	6	—	—	—	—	—	—	—	3	2	▲
3090016	8 × R 2	—	—	90	16	8	—	—	—	—	—	—	—	3	2	▲
3090020	10 × R 2	—	—	100	20	10	—	—	—	—	—	—	—	3	2	▲
3090022	12 × R 2	—	—	120	24	12	—	—	—	—	—	—	—	3	2	▲
3090026	16 × R 3	—	—	130	32	16	—	—	—	—	—	—	—	3	2	▲
3090030	20 × R 3	—	—	150	40	20	—	—	—	—	—	—	—	3	2	▲

▲ = 此产品已经停产，由 PHX-DFR(P.9) 来代替。(请确认库存。)

▲ = These products have been stopped producing and replaced by PHX-DFR (p.9)

· 标识说明请参考 P.9。See p.9 for explanation of icons.

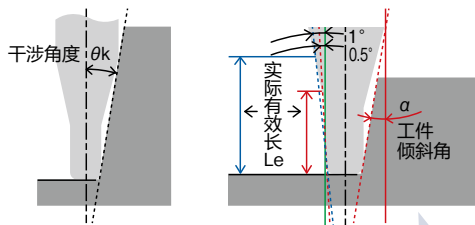
○ = 标准库存品 ○ = Standard stock item

▲ = 由新产品及后续产品取代(请确认库存)

▲ = Scheduled to be replaced by new product or successor item

注 1: 相对于工件倾斜角 α 的实际有效长 (Le)

Effective neck length (Le) based on the inclination angle (α) of workpiece.



上表中实际有效栏里无数值时意味着加工时不存在干涉。

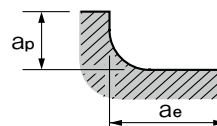
No numerical value means no interference with the workpiece.



特点 Features
圆弧角型 Bull Nose PHX-CRT
圆弧角型 Bull Nose PHX-PC-DFR
圆弧角型 Bull Nose PHX-LN-DFR
圆弧角型 Bull Nose PHX-LN-CRE
球头型 Bull Nose PHX-DBT
球头型 Bull Nose PHX-PC-DBT
球头型 Bull Nose PHX-LN-DBT
切削条件 Cutting Conditions

加工材料 Work Material				易削材料 高效率粗加工条件 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions										
						高韧性金属模具材料 半粗加工 38~53HRC Semi-roughing in high toughness mold materials					精加工条件 ~55HRC Machining Conditions For Finishing					
外径 DC	RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
						ap	ae			ap	ae			ap	ae	
1				R0.3				调质钢·预硬钢 Hardened Steel · Prehardened Steel				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
								DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
1	R0.3	10	0.3°	16,000	900	0.03	0.14	16,000	900	0.03	0.14	16,000	900	0.04	0.14	0.05
				8,000	450	0.03	0.14	8,000	450	0.02	0.14	8,000	450	0.04	0.14	0.05
				6,000	350	0.02	0.14	6,000	350	0.02	0.14	6,000	350	0.04	0.14	0.03
				6,000	300	0.01	0.13	6,000	300	0.01	0.13	6,000	300	0.04	0.14	0.03
				6,000	250	0.01	0.12	6,000	250	0.01	0.12	6,000	250	0.04	0.14	0.03
1.5	R0.3	10	0.3°	16,000	1,400	0.05	0.3	16,000	1,200	0.05	0.3	16,000	1,400	0.04	0.35	0.07
				8,000	800	0.05	0.3	8,000	600	0.05	0.3	8,000	800	0.04	0.35	0.05
				5,500	550	0.04	0.3	5,500	500	0.04	0.3	5,500	550	0.04	0.35	0.05
				5,000	500	0.04	0.3	5,000	450	0.04	0.3	5,000	500	0.04	0.35	0.03
				4,500	450	0.04	0.3	4,500	400	0.04	0.3	4,500	450	0.04	0.35	0.03
2	R0.5	10	0.3°	12,000	1,450	0.15	0.4	12,000	1,100	0.15	0.4	12,000	1,100	0.06	0.4	0.07
				7,800	900	0.12	0.4	7,800	700	0.1	0.4	7,800	700	0.06	0.4	0.07
				6,200	750	0.1	0.3	6,200	600	0.07	0.3	6,200	600	0.06	0.4	0.05
				4,700	550	0.07	0.3	4,700	500	0.06	0.3	4,700	500	0.06	0.4	0.05
				3,500	400	0.07	0.3	3,500	400	0.05	0.3	3,500	400	0.06	0.4	0.05
				3,500	400	0.07	0.2	3,500	400	0.04	0.2	3,500	400	0.06	0.4	0.03
				3,500	300	0.07	0.2	3,500	300	0.04	0.2	3,500	300	0.06	0.4	0.03
				3,500	200	0.07	0.2	3,500	200	0.03	0.2	3,500	200	0.06	0.4	0.03
				3,500	150	0.06	0.1	3,500	150	0.03	0.1	3,500	200	0.06	0.4	0.03
				3,500	150	0.05	0.1	3,500	150	0.03	0.1	3,500	200	0.06	0.4	0.03
2.5	R0.8	15	0.3°	8,900	800	0.15	0.4	8,900	800	0.15	0.4	8,900	800	0.08	0.4	0.07
				6,300	570	0.15	0.4	6,300	570	0.15	0.4	6,300	570	0.08	0.4	0.07
				5,100	460	0.12	0.3	5,100	460	0.12	0.3	5,100	460	0.08	0.4	0.05
				3,800	340	0.12	0.3	3,800	340	0.12	0.3	3,800	340	0.08	0.4	0.03
				2,800	250	0.1	0.3	2,800	250	0.1	0.3	2,800	250	0.08	0.4	0.03
				2,800	250	0.08	0.2	2,800	250	0.08	0.2	2,800	250	0.08	0.4	0.03
				2,800	250	0.08	0.2	2,800	250	0.08	0.2	2,800	250	0.08	0.4	0.03
				2,800	250	0.08	0.2	2,800	250	0.08	0.2	2,800	250	0.08	0.4	0.03

1. 上述按悬长区分的条件为参考值。请根据实际加工条件调整。
2. 请使用刚性较高的机床和刀柄。
3. 请将刀具的振动精度控制在最小限度。
4. 请选定适合加工材料，且发烟量少的切削油剂。通常推荐气冷。
5. 走查线加工时，不使用ae数值，请参考ap的数值。
6. 设定CAM及设备侧角部的R角插补或减速，可以得到更稳定的高进给加工。
7. 角部等切削负荷变动较大以及加工精度较高的情况下，请降低转速使用。
8. 当切入角度大于推荐倾斜切入角度时，请降低进给速度。
9. 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
10. 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。



FROM

加工材料 Work Material				易削材料 高效率粗加工条件 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions										
				高韧性金属模具材料 半粗加工 38 ~ 53HRC Semi-roughing in high toughness mold materials				精加工条件 ~55HRC Machining Conditions For Finishing								
				调质钢·预硬钢 Hardened Steel · Prehardened Steel												
				SKT4 · SKD61 · NAK80 · HPM1 · DH**				DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
外径 DC	RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
						ap	ae			ap	ae			ap	ae	
3	R0.5	40	0.3°	2,600	450	0.08	0.3	2,600	400	0.08	0.3	2,600	550	0.1	0.5	0.03
		60		2,200	350	0.04	0.3	2,200	300	0.04	0.3	2,200	450	0.1	0.5	0.03
	R0.8	10		11,000	1,650	0.13	0.6	8,000	1,200	0.13	0.6	11,000	2,100	0.1	0.5	0.1
		15		10,000	1,500	0.13	0.6	8,000	1,200	0.13	0.6	10,000	1,900	0.1	0.5	0.07
		20		7,500	1,100	0.12	0.5	7,200	1,000	0.12	0.5	7,500	1,400	0.1	0.5	0.07
		25		4,800	700	0.12	0.4	4,600	650	0.12	0.4	4,800	900	0.1	0.5	0.05
		30		3,800	550	0.1	0.4	3,400	500	0.1	0.4	3,800	750	0.1	0.5	0.03
		40		2,600	450	0.08	0.3	2,600	400	0.08	0.3	2,600	550	0.1	0.5	0.03
		50		2,200	350	0.06	0.3	2,200	300	0.06	0.3	2,200	450	0.1	0.5	0.03
		60		2,200	350	0.04	0.3	2,200	300	0.04	0.3	2,200	450	0.1	0.5	0.03
	80	1,060		100	0.03	0.2	1,060	100	0.03	0.2	1,060	160	0.07	0.35	0.03	
	100	1,060		100	0.03	0.2	1,060	100	0.03	0.2	1,060	160	0.07	0.35	0.03	
4	R0.5	30	0.5°	4,500	1,150	0.15	0.7	4,500	900	0.09	0.7	4,500	1,100	0.12	0.7	0.07
		60		2,100	700	0.08	0.5	2,100	450	0.06	0.5	2,100	500	0.12	0.7	0.03
	R1	10		9,500	2,100	0.2	0.9	6,000	1,250	0.2	0.9	9,500	2,250	0.12	0.8	0.1
		15		9,000	2,000	0.2	0.8	6,000	1,250	0.2	0.8	9,000	2,150	0.12	0.8	0.1
		20		8,200	1,700	0.2	0.7	6,000	1,250	0.14	0.7	8,200	2,000	0.12	0.7	0.1
		25		5,500	1,400	0.15	0.7	5,500	1,150	0.11	0.7	5,500	1,350	0.12	0.7	0.07
		30		4,500	1,150	0.15	0.7	4,500	900	0.09	0.7	4,500	1,100	0.12	0.7	0.07
		35		3,600	1,100	0.12	0.6	3,600	750	0.09	0.6	3,600	900	0.12	0.7	0.05
		40		3,000	900	0.12	0.6	3,000	650	0.09	0.6	3,000	800	0.12	0.7	0.05
		45		2,700	850	0.1	0.5	2,700	600	0.08	0.5	2,700	750	0.12	0.7	0.03
	50	2,500		800	0.1	0.5	2,500	550	0.08	0.5	2,500	600	0.12	0.7	0.03	
	60	2,100		700	0.08	0.5	2,100	450	0.06	0.5	2,100	500	0.12	0.7	0.03	
	80	1,600		480	0.06	0.4	1,600	340	0.06	0.4	1,600	380	0.1	0.5	0.03	
	100	1,200		360	0.05	0.3	1,200	250	0.05	0.3	1,200	290	0.1	0.5	0.03	
120	1,200	360	0.05	0.3	1,200	250	0.05	0.3	1,200	290	0.1	0.5	0.03			

1. The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
2. Use a rigid and precise machine and holder.
3. Tool vibrations should be kept at a minimum level for maximum accuracy.
4. Under general machining condition, air-blow cutting method is recommended.
5. In the case of linear machining, do not use the ae value, instead refer to the ap value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or deceleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.
9. When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
10. When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.

NEXT



切削条件
Cutting Conditions

特点
Features

圆弧角型
Ball Nose
PHX-CRT

圆弧角型
Ball Nose
PHX-PC-DFR

圆弧角型
Ball Nose
PHX-LN-DFR

圆弧角型
Ball Nose
PHX-LN-CRE

球头型
Ball Nose
PHX-DBT

球头型
Ball Nose
PHX-PC-DBT

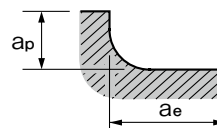
球头型
Ball Nose
PHX-LN-DBT

球头型
Ball Nose
PHX-CRT

FROM

加工材料 Work Material				易削材料 高效率粗加工条件 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions										
						高韧性金属模具材料 半粗加工 38 ~ 53HRC Semi-roughing in high toughness mold materials				精加工条件 ~55HRC Machining Conditions For Finishing						
				调质钢·预硬钢 Hardened Steel · Prehardened Steel												
				SKT4 · SKD61 · NAK80 · HPM1 · DH**				DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
外径 DC	RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
						ap	ae			ap	ae			ap	ae	
5	R1	10	0.5°	7,700	2,500	0.2	1.2	4,800	3,600	0.2	1.2	7,700	1,800	0.12	1.2	0.1
		15		7,700	2,400	0.2	1.2	4,800	3,400	0.16	1.2	6,100	1,450	0.12	1.2	0.1
		20		7,700	2,400	0.2	1.2	4,800	3,400	0.16	1.2	6,100	1,450	0.12	1.2	0.1
		25		5,100	2,200	0.17	1	4,800	3,000	0.13	1	5,100	1,200	0.12	1.2	0.07
		30		5,100	2,200	0.17	1	4,800	3,000	0.13	1	5,100	1,200	0.12	1.2	0.07
		35		4,400	1,700	0.15	1	4,400	2,400	0.09	1	4,400	1,000	0.12	1.2	0.05
		40		3,100	1,100	0.15	1	3,100	1,500	0.08	1	3,100	750	0.12	1.2	0.05
6	R0.8	62.3	0.5°	1,900	700	0.08	0.9	1,900	700	0.08	0.9	1,900	550	0.15	1.2	0.03
		120		800	240	0.04	0.7	800	240	0.04	0.7	800	200	0.12	1	0.03
	R1	20		6,500	2,100	0.35	1.3	4,000	1,700	0.24	1.3	6,500	1,900	0.15	1.2	0.1
		40		3,700	1,500	0.15	1	3,700	1,400	0.14	1	3,700	1,100	0.15	1.2	0.07
	R1.5	24		6,500	2,100	0.35	1.3	4,000	1,700	0.24	1.3	6,500	1,900	0.15	1.2	0.1
		30		5,100	2,000	0.24	1.2	4,000	1,700	0.23	1.2	5,100	1,500	0.15	1.2	0.1
		36		4,200	1,800	0.2	1	4,000	1,700	0.19	1	4,200	1,250	0.15	1.2	0.07
		42		3,700	1,500	0.15	1	3,700	1,400	0.14	1	3,700	1,100	0.15	1.2	0.07
		48		2,600	1,000	0.13	0.9	2,600	900	0.14	0.9	2,600	800	0.15	1.2	0.05
		54		2,100	800	0.1	0.9	2,100	800	0.1	0.9	2,100	650	0.15	1.2	0.05
		66		1,900	700	0.08	0.9	1,900	700	0.08	0.9	1,900	550	0.15	1.2	0.03
		80		1,700	600	0.05	0.9	1,700	600	0.05	0.9	1,700	450	0.15	1.2	0.03
		100		1,100	330	0.04	0.7	1,100	330	0.04	0.7	1,100	260	0.12	1	0.03
		120		800	240	0.04	0.7	800	240	0.04	0.7	800	200	0.12	1	0.03
160	800	200	0.04	0.7	800	200	0.04	0.7	800	160	0.12	1	0.03			
8	R1	63.3	0.5°	1,900	880	0.2	1.3	1,900	800	0.2	1.3	1,900	700	0.18	1.6	0.05
		120.6		1,000	550	0.1	1.3	1,000	550	0.1	1.3	1,000	450	0.18	1.6	0.03
	R2	30		4,800	2,000	0.5	1.7	3,000	1,250	0.3	1.6	4,800	1,800	0.18	1.6	0.1
		40		3,800	1,900	0.4	1.6	3,000	1,250	0.3	1.6	3,800	1,400	0.18	1.6	0.1
		48		3,200	1,700	0.27	1.4	3,000	1,250	0.26	1.4	3,200	1,150	0.18	1.6	0.07
		56		2,700	1,300	0.2	1.4	2,700	1,100	0.2	1.4	2,700	1,000	0.18	1.6	0.07
		64		1,900	880	0.2	1.3	1,900	800	0.2	1.3	1,900	700	0.18	1.6	0.05
		80		1,500	700	0.15	1.3	1,500	700	0.15	1.3	1,500	550	0.18	1.6	0.03
		100		1,200	650	0.15	1.3	1,200	650	0.15	1.3	1,200	500	0.18	1.6	0.03
		120		1,000	550	0.1	1.3	1,000	550	0.1	1.3	1,000	450	0.18	1.6	0.03
		160		800	360	0.1	1.3	800	360	0.1	1.3	800	300	0.18	1.6	0.03

1. 上述按悬长区分的条件为参考值。请根据实际加工条件调整。
2. 请使用刚性较高的机床和刀柄。
3. 请将刀具的振动精度控制在最小限度。
4. 请选定适合加工材料，且发烟量少的切削油剂。通常推荐气冷。
5. 走直线加工时，不使用ae数值，请参考ap的数值。
6. 设定CAM及设备侧角部的R角插补或减速，可以得到更稳定的高进给加工。
7. 角部等切削负荷变动较大以及加工精度较高的情况下，请降低转速使用。
8. 当切入角度大于推荐倾斜切入角度时，请降低进给速度。
9. 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
10. 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。



FROM

加工材料 Work Material				易削材料 高效率粗加工条件 ~40HRC High feed roughing of free-cutting materials				抑制振动条件 Vibration control conditions								
				高韧性金属模具材料 半粗加工 38 ~ 53HRC Semi-roughing in high toughness mold materials				精加工条件 ~55HRC Machining Conditions For Finishing								
				调质钢·预硬钢 Hardened Steel · Prehardened Steel												
				SKT4 · SKD61 · NAK80 · HPM1 · DH**				DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
外径 DC	RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
						ap	ae			ap	ae			ap	ae	
10	R2	0.5°	35	3,800	2,100	0.5	2.5	2,400	1,000	0.3	1.6	3,800	1,500	0.2	2.4	0.1
			50	3,100	1,950	0.4	2.4	2,400	1,000	0.3	1.6	3,100	1,200	0.2	2.4	0.1
			60	2,500	1,750	0.27	2	2,400	1,000	0.27	1.6	2,500	1,000	0.2	2.4	0.1
			70	2,200	1,350	0.2	2	2,200	900	0.2	1.6	2,200	900	0.2	2.4	0.07
			80	1,500	900	0.19	2	1,500	680	0.19	1.6	1,500	600	0.2	2.4	0.07
			100	1,200	720	0.16	2	1,200	550	0.16	1.6	1,200	450	0.2	2.4	0.05
			120	1,050	650	0.13	2	1,000	500	0.13	1.6	1,050	400	0.2	2.4	0.05
			140	850	550	0.1	1.5	800	450	0.1	1.4	850	350	0.2	2.4	0.03
			160	700	500	0.07	1.5	700	400	0.07	1.4	700	300	0.2	2.4	0.03
200	640	380	0.07	1.5	640	380	0.07	1.5	640	300	0.2	2.4	0.03			
12	R2	0.5°	45	3,200	2,200	0.6	3.4	2,000	840	0.3	1.6	3,200	1,500	0.24	3.2	0.15
			60	2,500	2,100	0.5	3.2	2,000	840	0.3	1.6	2,500	1,200	0.24	3.2	0.15
			70	2,100	1,900	0.4	2.8	2,000	840	0.28	1.6	2,100	1,000	0.24	3.2	0.1
			85	1,800	1,500	0.3	2.7	1,500	630	0.22	1.6	1,800	870	0.24	3.2	0.1
			100	1,300	1,000	0.2	2.6	1,200	500	0.2	1.6	1,300	630	0.24	3.2	0.1
			120	1,000	700	0.15	2.5	1,000	500	0.15	1.6	1,000	480	0.24	3.2	0.05
			140	900	600	0.15	2	900	400	0.1	1.6	900	440	0.24	3.2	0.05
			160	700	500	0.1	2	700	400	0.1	1.6	700	380	0.24	3.2	0.05
16	R3	0.5°	55	2,400	2,000	0.5	4.2	1,500	630	0.3	1.6	2,400	1,350	0.3	4	0.2
			80	1,900	1,900	0.47	4	1,500	630	0.3	1.6	1,900	1,100	0.3	4	0.15
			90	1,600	1,700	0.4	3.4	1,500	630	0.3	1.6	1,600	900	0.3	4	0.1
			105	1,400	1,300	0.29	3.3	1,400	580	0.28	1.6	1,400	800	0.3	4	0.07
			120	1,000	850	0.2	3.2	1,000	450	0.2	1.6	1,000	600	0.3	4	0.05
20	R3	0.5°	70	1,900	2,000	0.5	5.5	1,200	500	0.3	1.6	1,900	1,550	0.42	5.5	0.2
			90	1,500	1,900	0.47	5.3	1,200	500	0.3	1.6	1,500	1,200	0.42	5.5	0.15
			110	1,300	1,700	0.42	4.2	1,200	500	0.3	1.6	1,300	1,050	0.42	5.5	0.1
			130	1,100	1,300	0.31	3.8	1,100	450	0.3	1.6	1,100	900	0.42	5.5	0.07
			150	760	870	0.25	3.4	760	350	0.23	1.6	760	600	0.42	5.5	0.05

1. The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
2. Use a rigid and precise machine and holder.
3. Tool vibrations should be kept at a minimum level for maximum accuracy.
4. Under general machining condition, air-blow cutting method is recommended.
5. In the case of linear machining, do not use the ae value, instead refer to the ap value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or deceleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.
9. When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
10. When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.



特点
Features

圆弧角型
Ball Nose

圆弧角型
Ball Nose

圆弧角型
Ball Nose

圆弧角型
Ball Nose

圆弧角型
Ball Nose

球头型
Ball Nose

球头型
Ball Nose

球头型
Ball Nose

球头型
Ball Nose

圆弧角型
Ball Nose

切削条件
Cutting Conditions

加工材料 Work Material			深细槽铣削 Lib Groove Milling								等高线精加工 Contour Line Finishing		
			槽 Slotting				等高偏移量 Contour Offset						
			CENA1, STAVAX, HPM38, SKD61 42 ~ 55HRC										
外径 DC	RE	颈长 LU	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut
					a _p	a _e			a _p	a _e			
0.8	0.1	2	18,000	720	0.02	0.2	18,000	930	0.02	0.2	18,000	1,150	0.015
		4	18,000	720	0.02	0.2	18,000	930	0.02	0.2	18,000	1,150	0.015
		6	18,000	720	0.02	0.2	18,000	930	0.02	0.2	18,000	1,150	0.015
		8	15,000	540	0.013	0.2	15,000	630	0.013	0.2	16,000	700	0.013
1	0.1	4	18,000	830	0.03	0.23	18,000	880	0.03	0.23	18,000	1,440	0.015
		6	18,000	830	0.024	0.23	18,000	880	0.024	0.23	18,000	1,440	0.015
		8	15,000	750	0.013	0.23	15,000	800	0.013	0.23	15,000	1,200	0.015
		10	12,000	300	0.007	0.2	12,000	400	0.007	0.2	12,000	960	0.015
		12	10,500	220	0.006	0.18	10,500	288	0.006	0.18	10,500	840	0.015
1	0.2	4	18,000	830	0.03	0.23	18,000	880	0.03	0.23	18,000	1,440	0.018
		6	18,000	830	0.024	0.23	18,000	880	0.024	0.23	18,000	1,440	0.018
		8	15,000	750	0.013	0.23	15,000	800	0.013	0.23	15,000	1,200	0.018
		10	12,000	300	0.007	0.2	12,000	400	0.007	0.2	12,000	960	0.018
		12	10,500	220	0.006	0.18	10,500	290	0.006	0.18	10,500	840	0.018
1	0.3	4	18,000	830	0.03	0.23	18,000	1,000	0.03	0.23	18,000	1,440	0.022
		6	18,000	830	0.024	0.23	18,000	890	0.024	0.23	18,000	1,440	0.022
1.5	0.1	4	16,000	1,230	0.03	0.34	16,000	1,300	0.03	0.34	18,000	1,620	0.015
		8	16,000	1,230	0.026	0.34	16,000	1,300	0.026	0.34	18,000	1,620	0.015
		12	10,000	480	0.013	0.3	10,000	750	0.013	0.3	10,000	900	0.015
1.5	0.2	4	16,000	1,230	0.03	0.34	16,000	1,300	0.03	0.34	18,000	1,620	0.018
		6	16,000	1,230	0.029	0.34	16,000	1,300	0.029	0.34	18,000	1,620	0.018
		8	16,000	1,230	0.026	0.34	16,000	1,300	0.026	0.34	18,000	1,620	0.018
2	0.1	8	12,000	1,300	0.03	0.46	12,000	1,760	0.03	0.46	18,000	1,620	0.015
		10	12,000	1,200	0.03	0.46	12,000	1,620	0.03	0.46	15,000	1,350	0.015
		12	12,000	1,150	0.024	0.46	12,000	1,320	0.024	0.46	13,000	1,170	0.015
		16	7,600	780	0.012	0.46	7,600	750	0.012	0.46	7,000	630	0.015
2	0.3	8	12,000	1,300	0.05	0.46	12,000	1,620	0.05	0.46	18,000	1,620	0.022
		12	12,000	1,150	0.04	0.46	12,000	1,320	0.04	0.46	13,000	1,170	0.022
2	0.5	6	12,000	1,300	0.08	0.45	12,000	1,760	0.08	0.45	18,000	1,620	0.025
		8	12,000	1,300	0.075	0.45	12,000	1,760	0.075	0.45	18,000	1,620	0.025
		10	12,000	1,200	0.07	0.45	12,000	1,620	0.07	0.45	15,000	1,350	0.025
		12	12,000	1,150	0.06	0.45	12,000	1,320	0.06	0.45	13,000	1,170	0.025
3	0.3	12	8,000	1,200	0.046	0.7	8,000	1,400	0.046	0.7	13,000	1,170	0.022

- 根据加工形状、机械刚性、刀柄刚性、工件固定等使用情况，请适当调节转速、进给速度、切深量。
- 转速、进给速度由于机械性能无法上调的情况下，请将转速、进给速度同比下调使用。
- 高切削速度、高进给是可能造成刀具磨损及加工精度不良的原因，如必要的话请下调进给速度。
- 加工形状有时会导致加工时振动，请适当同比下调转速及进给速度。
- 精密、精细加工请使用静音性优良的机械。
- 加工时刀具刃尖振动请控制在0.005mm以下。
- 在进行高效率精加工时，请将转速、进给速度控制在2倍以下。
- 平面精加工时，进给速度请控制在机械振动少的范围内进行加工。
- 刀具圆弧角半径部曲面形状精加工时，请改变加工螺距使用。
- 倾斜切入角度，请设定参考值0.3°~0.5°。
- 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
- 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。

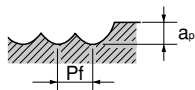
- Adjust the speed, feed, and depth of cut in according to the operating conditions, including the machining shape, machine and, holder rigidity, and workholding force.
- If the speed and feed rates cannot be increased due to equipment capability, operate by reducing the speed and feed rates at the same ratio.
- High cutting speeds and feed rates can cause wear and/or reduce machining precision. Therefore, please reduce the feed as needed.
- Chattering may occur depending on the shape of the part, which can damages. Reduce the speed and feed rate at the same ratio to avoid chattering.
- For precise, detailed machining, use a dedicated machine that operates less chattering.
- Keep the runout at the tip of the end mill below 0.005mm.
- To perform finish machining with a high level of efficiency, keep the speed and feed rates below 2 times.
- To finish a flat surface, remain speed range in a minimal amount of equipment vibration and feed rate not causing the equipment to wobble.
- To finish machining a curved surface using the corner radius of the tool, operate by changing the machining pitch.
- Set the inclined cut angle between approximately 0.3° to 0.5°
- When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
- When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.



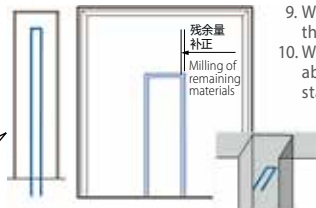
加工材料 Work Material		易削材料 高效率粗加工 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions															
				高韧性金属模具材料 半粗 38 ~ 53HRC Semi-roughing in high toughness mold materials				槽加工条件 ~53HRC Machining Conditions For Slotting				精加工条件 ~55HRC Machining Conditions For Finishing							
				调质钢·预硬钢 Hardened Steel · Prehardened Steel															
RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	SKT4 · SKD61 · NAK80 · HPM1 · DH**				DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
			转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 Clearance (mm)
			a _p	P _f	a _p	P _f	a _p	P _f	a _p	P _f	a _p	P _f	a _p	P _f	a _p	P _f			
R0.5	0.3°	6	18,000	1,000	0.05	0.16	18,000	900	0.05	0.16	18,000	280	0.007	0.03	18,000	1,200	0.03	0.03	0.05
		10	16,000	800	0.04	0.16	16,000	800	0.04	0.16	16,000	120	0.003	0.3	16,000	1,000	0.03	0.03	0.03
		15	8,000	420	0.03	0.16	8,000	420	0.03	0.16	-	-	-	-	8,000	500	0.03	0.03	0.03
		20	6,000	300	0.02	0.12	6,000	300	0.02	0.12	-	-	-	-	6,000	380	0.03	0.03	0.03
		25	6,000	130	0.02	0.08	6,000	130	0.02	0.08	-	-	-	-	6,000	350	0.03	0.03	0.03
		30	6,000	90	0.01	0.05	6,000	90	0.01	0.05	-	-	-	-	6,000	250	0.03	0.03	0.03
		35	6,000	90	0.01	0.05	6,000	90	0.01	0.05	-	-	-	-	6,000	250	0.03	0.03	0.03
		40	4,800	45	0.007	0.02	4,800	45	0.007	0.02	-	-	-	-	4,800	140	0.03	0.03	0.03
		50	4,800	45	0.007	0.02	4,800	45	0.007	0.02	-	-	-	-	4,800	140	0.03	0.03	0.03
		60	4,800	30	0.005	0.015	4,800	30	0.005	0.015	-	-	-	-	4,800	90	0.03	0.03	0.03
R0.75	0.3°	6	18,000	1,500	0.1	0.3	16,000	1,300	0.1	0.3	16,000	650	0.07	0.15	18,000	1,100	0.04	0.04	0.05
		10	15,000	1,100	0.06	0.25	15,000	950	0.06	0.25	15,000	320	0.01	0.1	15,000	900	0.04	0.04	0.03
		16	7,500	230	0.02	0.2	7,500	200	0.02	0.2	7,500	300	0.007	0.05	7,500	450	0.04	0.04	0.03
		20	5,300	130	0.02	0.2	5,300	130	0.02	0.2	6,300	200	0.007	0.05	5,300	250	0.04	0.04	0.03
		25	5,300	130	0.02	0.2	5,300	130	0.02	0.2	-	-	-	-	5,300	250	0.04	0.04	0.03
		30	4,200	60	0.01	0.15	4,200	60	0.01	0.15	-	-	-	-	4,200	100	0.04	0.04	0.03
		40	4,200	60	0.01	0.15	4,200	60	0.01	0.15	-	-	-	-	4,200	100	0.04	0.03	0.02
		50	4,200	60	0.01	0.15	4,200	60	0.01	0.15	-	-	-	-	4,200	100	0.04	0.03	0.02

1. 上述按悬长区分的条件为参考值。请根据实际加工条件调整。
2. R0.5~R2.5的标准状态下，颈口处夹持后刀具悬长为基准的加工条件。
3. 请使用刚性较高的机床和刀柄。
4. 请将刀具的振动精度控制在最小限度。
5. 走查线加工时，不使用 pf 数值，请参照 ap 数值。
6. 设定 CAM 及设备侧角部的 R 角插补或减速，可以得到更稳定的高进给加工。
7. 角部等切削负荷变动较大以及加工精度较高的情况下，请降低转速使用。
8. 当切入角度大于推荐倾斜切入角度时，请降低进给速度。
9. 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
10. 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。

1. The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
2. For 0.5R-2.5R, the machining conditions are based on chucking the tool up to the base of the neck.
3. Use a rigid and precise machine and holder.
4. Tool vibrations should be kept at a minimum level for maximum accuracy.
5. In the case of linear machining, do not use the Pf value, instead refer to the ap value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or deceleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.
9. When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
10. When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.



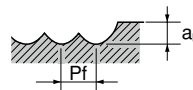
使用球头铣刀时，与相同工具直径的圆弧角铣刀相比，每刀切削残余量较大，粗·精加工分2次进行等高线加工可提高槽铣精度。
In comparison to the same tool diameters of radius end mill, ball end mill machine less material per pass (large corner radius generate cutting resistance which tilt ball end mill largely). In order to improve the precision of the ribs, please separate the contour milling (correction of unmachined area) and finishing (shown as double lined area in figure on right) procedure.



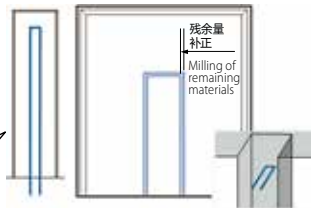
FROM

加工材料 Work Material		易削材料 高效率粗加工 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions															
				高韧性金属模具材料 半粗 38~53HRC Semi-roughing in high toughness mold materials				槽加工条件 ~53HRC Machining Conditions For Slotting				精加工条件 ~55HRC Machining Conditions For Finishing							
				调质钢·预硬钢 Hardened Steel · Prehardened Steel															
RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	SKT4 · SKD61 · NAK80 · HPM1 · DH**				DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
			转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
				ap	Pf			ap	Pf			ap	Pf			ap	Pf		
R1	6	0.3°	18,000	1,600	0.2	0.6	15,000	1,400	0.2	0.4	12,000	600	0.15	0.15	15,000	1,800	0.06	0.05	0.1
	10		12,000	1,250	0.14	0.4	12,000	1,100	0.14	0.4	12,000	600	0.1	0.05	12,000	1,500	0.06	0.05	0.07
	15		7,800	820	0.14	0.4	7,800	780	0.14	0.4	7,800	450	0.07	0.05	7,800	980	0.06	0.05	0.07
	20		6,200	650	0.13	0.4	6,200	600	0.13	0.3	6,200	340	0.05	0.05	6,200	600	0.06	0.05	0.05
	25		4,700	500	0.12	0.3	4,700	500	0.12	0.3	-	-	-	-	4,700	450	0.06	0.05	0.05
	30		3,500	400	0.1	0.3	3,500	400	0.1	0.3	-	-	-	-	3,500	450	0.06	0.05	0.05
	35		3,500	400	0.07	0.3	3,500	400	0.07	0.3	-	-	-	-	3,500	450	0.06	0.05	0.03
	40		3,500	300	0.07	0.25	3,500	300	0.07	0.25	-	-	-	-	3,500	450	0.06	0.05	0.03
	45		3,500	200	0.07	0.2	3,500	200	0.07	0.2	-	-	-	-	3,500	450	0.06	0.05	0.03
	50		3,500	150	0.06	0.1	3,500	150	0.06	0.1	-	-	-	-	3,500	450	0.06	0.05	0.03
60	3,500	150	0.05	0.1	3,500	150	0.05	0.1	-	-	-	-	3,500	450	0.06	0.05	0.03		
R1.25	16	0.3°	10,200	1,070	0.16	0.5	10,200	1,070	0.16	0.5	10,200	750	0.08	0.07	10,200	1,500	0.07	0.06	0.1
	20		10,200	920	0.16	0.5	10,200	920	0.16	0.5	10,200	650	0.05	0.05	10,200	1,500	0.07	0.06	0.07
	30		5,100	460	0.12	0.5	5,100	460	0.12	0.5	5,100	350	0.03	0.03	5,100	700	0.07	0.06	0.07
	40		5,100	460	0.1	0.4	5,100	460	0.1	0.4	-	-	-	-	5,100	700	0.07	0.06	0.05
	50		2,500	150	0.06	0.3	2,500	150	0.06	0.3	-	-	-	-	2,500	300	0.06	0.05	0.03
	60		1,900	110	0.04	0.3	1,900	110	0.04	0.3	-	-	-	-	1,900	200	0.06	0.05	0.03
80	1,900	110	0.04	0.3	1,900	110	0.04	0.3	-	-	-	-	1,900	200	0.06	0.05	0.03		
R1.5	10	0.3°	12,000	1,900	0.21	0.5	8,000	1,200	0.21	0.5	8,000	700	0.13	0.1	11,000	2,050	0.09	0.08	0.1
	15		10,000	1,550	0.2	0.5	8,000	1,200	0.2	0.5	8,000	550	0.1	0.1	10,000	1,900	0.09	0.08	0.07
	20		7,500	1,150	0.19	0.5	7,200	1,100	0.19	0.5	7,200	480	0.06	0.07	7,500	1,400	0.09	0.08	0.07
	25		4,800	750	0.19	0.5	4,600	700	0.19	0.5	4,600	320	0.04	0.05	4,800	900	0.09	0.08	0.05
	30		4,000	630	0.16	0.4	3,400	500	0.16	0.4	3,400	240	0.02	0.03	3,800	720	0.09	0.08	0.03
	40		2,800	440	0.13	0.4	2,600	400	0.13	0.4	-	-	-	-	2,600	500	0.09	0.08	0.03
	50		2,200	350	0.1	0.4	2,200	300	0.1	0.4	-	-	-	-	2,200	400	0.09	0.08	0.03
	60		2,200	350	0.07	0.4	2,200	300	0.07	0.4	-	-	-	-	2,200	400	0.09	0.08	0.03
	70		2,100	250	0.07	0.4	2,100	210	0.07	0.4	-	-	-	-	2,100	270	0.09	0.08	0.03
90	2,100	250	0.05	0.3	2,100	210	0.05	0.3	-	-	-	-	2,100	270	0.07	0.06	0.03		

1. 上述按悬长区分的条件为参考值。请根据实际加工条件调整。
2. R0.5~R2.5的标准状态下，颈口处夹持后刀具悬长为基准的加工条件。
3. 请使用刚性较高的机床和刀柄。
4. 请将刀具的振动精度控制在最小限度。
5. 走查线加工时，不使用pf数值，请参照ap数值。
6. 设定CAM及设备侧角部的R角插补或减速，可以得到更稳定的高进给加工。
7. 角部等切削负荷变动较大以及加工精度较高的情况下，请降低转速使用。
8. 当切入角度大于推荐倾斜切入角度时，请降低进给速度。
9. 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
10. 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。



使用球头铣刀时，与相同工具径的圆弧角铣刀相比，每刃切削残余量较大，粗·精加工分2次进行等高线加工可提高槽铣精度。
In comparison to the same tool diameters of radius end mill, ball end mill machine less material per pass (large corner radius generate cutting resistance which tilt ball end mill largely). In order to improve the precision of the ribs, please separate the contour milling in roughing (correction of unmachined area) and finishing (shown as double lined area in figure on right) procedure.



NEXT



FROM

加工材料 Work Material			易削材料 高效率粗加工 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions														
					高韧性金属模具材料 半粗 38~53HRC Semi-roughing in high toughness mold materials				槽加工条件 ~53HRC Machining Conditions For Slotting				精加工条件 ~55HRC Machining Conditions For Finishing						
			调质钢·预硬钢 Hardened Steel · Prehardened Steel																
			SKT4 · SKD61 · NAK80 · HPM1 · DH**					DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				SKT4 · SKD61 · NAK80 · HPM1 · DH**			
RE	颈长 LU	推荐槽斜 切入角度 Recommended Cutting Angle	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
					ap	Pf			ap	Pf			ap	Pf			ap	Pf	
R1.75	0.5°	20	7,280	1,310	0.22	0.5	6,370	960	0.22	0.5	6,370	570	0.08	0.07	8,190	1,720	0.1	0.09	0.08
		30	4,550	820	0.18	0.5	3,640	550	0.18	0.5	3,640	330	0.02	0.03	5,000	1,050	0.1	0.09	0.03
		40	3,180	570	0.13	0.5	2,730	410	0.13	0.5	-	-	-	-	2,730	570	0.1	0.09	0.04
		50	2,730	500	0.1	0.4	2,280	340	0.1	0.4	-	-	-	-	2,280	480	0.1	0.08	0.03
		60	2,280	410	0.07	0.4	2,280	340	0.07	0.4	-	-	-	-	2,280	480	0.1	0.08	0.03
		80	1,820	330	0.06	0.3	1,820	270	0.06	0.3	-	-	-	-	1,820	380	0.1	0.07	0.03
		100	1,820	330	0.06	0.3	1,820	270	0.06	0.3	-	-	-	-	1,820	380	0.1	0.07	0.03
R2	0.5°	10	9,600	2,000	0.3	0.6	6,000	1,250	0.3	0.6	6,000	800	0.15	0.1	9,500	2,400	0.12	0.1	0.1
		15	9,300	1,900	0.27	0.6	6,000	1,200	0.27	0.6	6,000	800	0.12	0.1	9,000	2,250	0.12	0.1	0.1
		20	7,600	1,550	0.25	0.6	6,000	1,150	0.25	0.6	6,000	700	0.1	0.07	8,200	2,050	0.12	0.1	0.1
		25	6,100	1,250	0.23	0.6	5,500	1,100	0.23	0.6	5,500	450	0.05	0.07	5,500	1,350	0.12	0.1	0.07
		30	5,000	1,050	0.2	0.6	4,500	800	0.2	0.6	4,500	350	0.03	0.05	4,500	1,100	0.12	0.1	0.07
		35	3,600	750	0.16	0.5	3,600	650	0.16	0.5	3,600	280	0.01	0.03	3,600	900	0.12	0.1	0.05
		40	3,000	630	0.12	0.5	3,000	550	0.12	0.5	3,000	150	0.007	0.01	3,000	750	0.12	0.1	0.05
		45	2,700	550	0.1	0.4	2,700	500	0.1	0.4	-	-	-	-	2,700	680	0.12	0.1	0.03
		50	2,500	520	0.1	0.4	2,500	450	0.1	0.4	-	-	-	-	2,500	630	0.12	0.1	0.03
		60	2,100	430	0.08	0.4	2,100	400	0.08	0.4	-	-	-	-	2,100	530	0.12	0.1	0.03
		70	1,600	240	0.08	0.4	1,600	220	0.08	0.4	-	-	-	-	1,600	280	0.12	0.1	0.03
		90	1,600	240	0.08	0.4	1,600	220	0.08	0.4	-	-	-	-	1,600	280	0.12	0.1	0.03
		100	1,600	240	0.07	0.3	1,600	220	0.07	0.3	-	-	-	-	1,600	280	0.1	0.08	0.03
		120	1,200	140	0.05	0.3	1,200	130	0.05	0.3	-	-	-	-	1,200	170	0.1	0.08	0.03
		150	1,200	140	0.05	0.3	1,200	130	0.05	0.3	-	-	-	-	1,200	170	0.1	0.08	0.03
R2.5	0.5°	10	7,700	1,900	0.35	0.8	4,800	1,100	0.35	0.8	4,800	900	0.2	0.1	7,700	2,400	0.15	1.2	0.1
		15	7,700	1,900	0.3	0.8	4,800	1,000	0.3	0.8	4,800	850	0.16	0.1	6,100	1,900	0.15	1.2	0.1
		20	7,700	1,800	0.3	0.8	4,800	950	0.3	0.8	4,800	700	0.12	0.07	6,100	1,900	0.15	1.2	0.1
		25	5,100	1,300	0.25	0.8	4,800	900	0.25	0.8	4,800	650	0.06	0.05	5,100	1,600	0.15	1.2	0.07
		30	5,100	1,200	0.2	0.6	4,800	850	0.2	0.6	4,800	500	0.03	0.05	5,100	1,600	0.15	1.2	0.07
		35	4,400	1,100	0.14	0.6	4,400	750	0.14	0.6	4,400	400	0.015	0.03	4,400	1,350	0.15	1.2	0.05
		40	3,100	750	0.1	0.6	3,100	650	0.1	0.6	3,100	260	0.007	0.03	3,100	950	0.15	1.2	0.05
		60	2,200	430	0.1	0.6	2,200	400	0.08	0.5	-	-	-	-	2,200	600	0.15	1.2	0.05
		80	1,600	250	0.1	0.5	1,600	240	0.08	0.5	-	-	-	-	1,600	430	0.15	1.2	0.05
		90	1,600	250	0.1	0.5	1,600	240	0.08	0.5	-	-	-	-	1,600	430	0.15	1.2	0.05

- The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
- For 0.5R-2.5R, the machining conditions are based on chucking the tool up to the base of the neck.
- Use a rigid and precise machine and holder.
- Tool vibrations should be kept at a minimum level for maximum accuracy.
- In the case of linear machining, do not use the Pf value, instead refer to the ap value.
- More stable high-feed machining in the corners can be attained by setting an R insertion or deceleration on the CAM or machine side.
- When cutting load fluctuates (in the corners, etc.) or when high precision is required, be sure to control the rotational speed.
- When cutting at greater than the recommended cutting angle, reduce the feed.
- When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
- When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.

NEXT

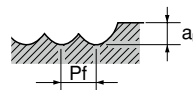
特点
Features圆弧角型
Ball Nose
PHX-DFR圆弧角型
Ball Nose
PHX-PC-DFR圆弧角型
Ball Nose
PHX-LN-DFR圆弧角型
Ball Nose
PHX-LN-CRE球头型
Ball Nose
PHX-DBT球头型
Ball Nose
PHX-PC-DBT球头型
Ball Nose
PHX-LN-DBT圆弧角型
Ball Nose
PHX-CRT切削条件
Cutting Conditions

36

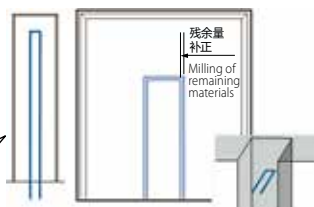
FROM

加工材料 Work Material		易削材料 高效率粗加工 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions															
				高韧性金属模具材料 半粗 38~53HRC Semi-roughing in high toughness mold materials				槽加工条件 ~53HRC Machining Conditions For Slotting				精加工条件 ~55HRC Machining Conditions For Finishing							
				调质钢·预硬钢 Hardened Steel · Prehardened Steel															
RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	SKT4 · SKD61 · NAK80 · HPM1 · DH**				DH** · DAC**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				SKT4 · SKD61 · NAK80 · HPM1 · DH**				
			转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance
				a _p	P _f			a _p	P _f			a _p	P _f			a _p	P _f		
R3	24	0.5°	6,400	1,900	0.43	1.2	4,000	1,200	0.3	1	4,000	900	0.3	0.1	6,500	1,950	0.18	0.16	0.1
	30		5,100	1,500	0.34	1.2	4,000	1,150	0.3	1	4,000	900	0.25	0.1	5,100	1,950	0.18	0.16	0.1
	36		4,200	1,250	0.38	1.2	4,000	1,100	0.3	1	4,000	750	0.2	0.07	4,200	1,580	0.18	0.16	0.07
	42		3,700	1,050	0.2	0.9	3,700	1,000	0.2	1	3,700	500	0.15	0.05	3,700	1,400	0.18	0.16	0.07
	48		3,600	750	0.15	0.9	2,600	700	0.15	0.8	2,600	400	0.1	0.03	2,600	980	0.18	0.16	0.05
	54		2,100	630	0.1	0.8	2,100	600	0.1	0.8	2,100	240	0.05	0.03	2,100	800	0.18	0.16	0.05
	66		1,900	550	0.08	0.7	1,900	500	0.08	0.7	-	-	-	-	1,900	700	0.18	0.16	0.03
	80		1,700	450	0.08	0.6	1,700	400	0.08	0.6	-	-	-	-	1,700	650	0.18	0.16	0.03
	90		1,600	380	0.08	0.6	1,600	380	0.08	0.6	-	-	-	-	1,600	580	0.18	0.16	0.03
	120		1,300	280	0.08	0.5	1,300	280	0.07	0.4	-	-	-	-	1,300	460	0.15	0.13	0.03
150	1,300	280	0.08	0.5	1,300	280	0.07	0.4	-	-	-	-	1,300	460	0.15	0.13	0.03		
R4	30	0.5°	4,800	2,300	0.45	1.5	3,000	1,260	0.3	1.5	3,000	1,050	0.3	0.15	4,800	2,400	0.24	0.21	0.1
	40		3,800	1,800	0.38	1.3	3,000	1,200	0.3	1.3	3,000	1,050	0.3	0.1	3,800	1,900	0.24	0.21	0.1
	48		3,200	1,500	0.28	1.2	3,000	1,100	0.25	1.2	3,000	900	0.25	0.1	3,200	1,600	0.24	0.21	0.07
	56		2,700	1,300	0.2	1.1	2,700	1,000	0.2	1.1	2,700	800	0.2	0.07	2,700	1,350	0.24	0.21	0.07
	64		1,900	900	0.2	1	1,900	700	0.17	1	1,900	500	0.17	0.07	1,900	950	0.24	0.21	0.05
	80		1,500	700	0.15	0.8	1,500	550	0.14	0.8	-	-	-	-	1,500	750	0.24	0.21	0.03
	90		1,400	670	0.15	0.8	1,400	500	0.12	0.8	-	-	-	-	1,400	700	0.24	0.21	0.03
	100		1,200	600	0.15	0.8	1,200	400	0.1	0.8	-	-	-	-	1,200	600	0.24	0.21	0.03
120	1,000	500	0.1	0.7	1,000	350	0.07	0.7	-	-	-	-	1,000	500	0.24	0.21	0.03		
R5	35	0.5°	3,800	2,300	0.65	1.8	2,400	1,000	0.4	1.6	2,400	850	0.4	0.15	3,800	2,400	0.3	0.27	0.1
	50		3,100	1,900	0.55	1.8	2,400	1,000	0.3	1.6	2,400	850	0.3	0.15	3,100	1,950	0.3	0.27	0.1
	60		2,500	1,500	0.46	1.6	2,400	1,000	0.3	1.5	2,400	850	0.3	0.1	2,500	1,550	0.3	0.27	0.1
	70		2,200	1,300	0.34	1.6	2,200	900	0.3	1.5	2,200	800	0.3	0.1	2,200	1,350	0.3	0.27	0.07
	80		1,500	800	0.24	1.6	1,500	600	0.2	1.5	1,500	600	0.2	0.07	1,500	950	0.3	0.27	0.07
	100		1,200	600	0.15	1.5	1,200	500	0.12	1.5	1,200	500	0.12	0.07	1,200	750	0.3	0.27	0.05
	120		1,050	500	0.1	1.3	1,000	400	0.1	1.3	-	-	-	-	1,050	650	0.3	0.27	0.05
	140		850	400	0.07	1.3	800	350	0.07	1.3	-	-	-	-	850	500	0.3	0.27	0.03
160	700	320	0.07	1	700	300	0.07	1	-	-	-	-	700	450	0.3	0.27	0.03		

1. 上述按悬长区分的条件为参考值。请根据实际加工条件调整。
2. R0.5~R2.5的标准状态下，颈口处夹持后刀具悬长为基准的加工条件。
3. 请使用刚性较高的机床和刀柄。
4. 请将刀具的振动精度控制在最小限度。
5. 走直线加工时，不使用pf数值，请参照ap数值。
6. 设定CAM及设备侧角部的R角插补或减速，可以得到更稳定的高进给加工。
7. 角部等切削负荷变动较大以及加工精度较高的情况下，请降低转速使用。
8. 当切入角度大于推荐倾斜切入角度时，请降低进给速度。
9. 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
10. 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。



使用球头铣刀时，与相同工具径的圆弧角铣刀相比，每刃切削残余量较大。粗·精加工分2次进行等高线加工可提高槽铣精度。
In comparison to the same tool diameters of radius end mill, ball end mill machine less material per pass (large corner radius generate cutting resistance which tilt ball end mill largely). In order to improve the precision of the ribs, please separate the contour milling in roughing (correction of unmachined area) and finishing (shown as double lined area in figure on right) procedure.



NEXT



FROM

加工材料 Work Material			易削材料 高效率粗加工 ~40HRC High feed roughing of free-cutting materials		抑制振动条件 Vibration control conditions																	
			高韧性金属模具材料 半粗 38 ~ 53HRC Semi-roughing in high toughness mold materials					槽加工条件 ~53HRC Machining Conditions For Slotting					精加工条件 ~55HRC Machining Conditions For Finishing									
			调质钢·预硬钢 Hardened Steel · Prehardened Steel																			
			SKT4 · SKD61 · NAK80 · HPM1 · DH**					DH** · DAC**					SKT4 · SKD61 · NAK80 · HPM1 · DH**					SKT4 · SKD61 · NAK80 · HPM1 · DH**				
RE	颈长 LU	推荐倾斜 切入角度 Recommended Cutting Angle	转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		转速 Speed (min ⁻¹)	进给速度 Feed (mm/min)	切深量 (mm) Depth of Cut		精加工量 (mm) Clearance			
					ap	Pf			ap	Pf			ap	Pf			ap	Pf				
R6	45	0.5°	3,200	1,700	0.8	2	2,000	800	0.8	1.8	2,000	800	0.6	0.15	3,200	2,400	0.36	0.32	0.15			
	60		2,500	1,300	0.65	2	2,000	800	0.65	1.8	2,000	800	0.5	0.15	2,500	1,900	0.36	0.32	0.15			
	70		2,100	1,100	0.57	2	2,000	800	0.57	1.8	2,000	800	0.5	0.1	2,100	1,600	0.36	0.32	0.1			
	85		1,800	950	0.42	1.8	1,500	600	0.42	1.7	1,500	600	0.4	0.1	1,800	1,350	0.36	0.32	0.1			
	100		1,300	690	0.3	1.8	1,200	500	0.3	1.7	1,200	500	0.3	0.1	1,300	980	0.36	0.32	0.1			
	120		1,000	530	0.25	1.5	1,000	420	0.25	1.5	-	-	-	-	1,000	750	0.36	0.32	0.05			
	140		900	470	0.2	1.5	900	380	0.2	1.5	-	-	-	-	900	680	0.36	0.32	0.05			
	160		700	370	0.15	1.3	700	300	0.15	1.3	-	-	-	-	700	530	0.36	0.32	0.05			
R8	55	0.5°	2,400	1,600	1	2.2	1,500	600	1	1.8	1,500	600	0.8	0.15	2,400	2,400	0.48	0.4	0.2			
	80		1,900	1,250	0.9	2.2	1,500	600	0.9	1.8	1,500	600	0.8	0.15	1,900	1,900	0.48	0.4	0.15			
	90		1,600	1,050	0.75	2.2	1,500	600	0.75	1.8	1,500	600	0.7	0.1	1,600	1,600	0.48	0.4	0.1			
	105		1,400	900	0.55	2	1,400	570	0.55	1.7	1,400	570	0.5	0.07	1,400	1,400	0.48	0.4	0.07			
	120		1,000	650	0.4	2	1,000	420	0.4	1.7	1,000	420	0.4	0.05	1,000	1,000	0.48	0.4	0.05			
	150		800	500	0.4	2	800	340	0.4	1.7	800	340	0.4	0.05	800	720	0.48	0.4	0.05			
R10	70	0.5°	1,900	1,500	1.2	3.6	1,200	500	1.2	1.8	1,200	500	0.8	0.15	1,900	2,400	0.6	0.5	0.2			
	90		1,500	1,200	1.1	3.6	1,200	500	1.1	1.8	1,200	500	0.8	0.15	1,500	1,900	0.6	0.5	0.15			
	110		1,300	1,000	0.9	3.5	1,200	500	0.9	1.8	1,200	500	0.8	0.1	1,300	1,600	0.6	0.5	0.1			
	130		1,100	850	0.7	3.4	1,100	450	0.7	1.8	1,100	450	0.7	0.1	1,100	1,400	0.6	0.5	0.07			
	150		760	600	0.5	3.3	760	320	0.5	1.8	760	320	0.5	0.07	760	950	0.6	0.5	0.05			

1. The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
2. For 0.5R-2.5R, the machining conditions are based on chucking the tool up to the base of the neck.
3. Use a rigid and precise machine and holder.
4. Tool vibrations should be kept at a minimum level for maximum accuracy.
5. In the case of linear machining, do not use the Pf value, instead refer to the ap value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or deceleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.
9. When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
10. When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.



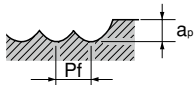
Table with columns for Work Material, Machining Conditions (e.g., High speed roughing, Semi-roughing, Machining for slotting, Machining for finishing), and detailed cutting parameters (Speed, Feed, Depth of Cut, etc.) for various RE and R values.

*1 Last Pitch 是在加工沟槽，型腔时候，考虑到向侧面方向的切削阻力，在编写后角，出入的路径时设定“最终轮廓间距”的参考值。

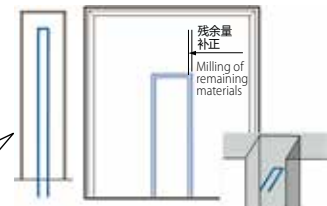
*1 The "Last Pitch" is the standard final contour pitch value calculated based on slotting and pocket milling paths including runout and overcut caused by lateral cutting forces.

- 1. 上述按悬长区分条件为参考值。请根据实际加工条件调整。
2. 有效长度为夹持后的刀具悬长加工条件。
3. 请使用刚性较高的机床和刀柄。
4. 请将刀具的振动精度控制在最小限度。
5. 走直线加工时，不使用pf数值，请参照ap数值。
6. 设定CAM及设备侧角部的R角插补或减速，可以得到更稳定的高进给加工。
7. 角部等切削负荷变动较大以及加工精度较高的情况下，请降低转速使用。
8. 当切入角度大于推荐倾斜切入角度时，请降低进给速度。
9. 切深量比切削条件表小的情况，可将进给速度调整到150%进行加工。
10. 切深量比切削条件表大的情况，进给速度可降低至60%，以保证稳定加工。

- 1. The above cutting conditions based on overhang length are to be used as general guideline. Adjustments may be necessary depending on actual milling condition.
2. Overhang cutting conditions based on the effective length of the tool attached to the holder.
3. Use a rigid and precise machine and holder.
4. Tool vibrations should be kept at a minimum level for maximum accuracy.
5. In the case of linear machining, do not use the Pf value, instead refer to the ap value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or deceleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.
9. When the depth of cut is less than the specified amount as listed above, the feed rate can be increased up to 150%.
10. When the depth of cut is greater than the specified amount as listed above, the feed rate can be reduced by no more than 60% to ensure stable milling.



使用球头铣刀时，与相同工具径的圆弧角铣刀相比，每刃切削残余量较大。粗加工分2次进行等高线加工可提高槽铣精度。
In comparison to the same tool diameters of radius end mill, ball end mill machine less material per pass (large corner radius generate cutting resistance which tilt ball end mill largely). In order to improve the precision of the ribs, please separate the contour milling in roughing (correction of unmachined area) and finishing (shown as double lined area in figure on right) procedure.



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To maximize performance of the Phoenix Series

■ 切削条件的计算公式 How to calculate cutting conditions

计算切削条件时，使用以下公式会更方便！
When you calculate the cutting conditions, it is much more convenient if you use the following equations!

[计算公式]

n = 转速 (min⁻¹)

$$n = Vc \div 3.14 \div DC \times 1,000$$

*DC为外径
DC=diameter

Vc = 切削速度 (m/min)

$$Vc = n \times 3.14 \times DC \div 1,000$$

*DC为外径
DC=diameter

Vf = 进给速度 (mm/min)

$$Vf = n \times ZFPP \times fz$$

*ZFPP为刃数
ZFPP= number of flute

fz = 每刃进给量 (mm/t)

$$fz = Vf \div ZFPP \div n$$

*ZFPP为刃数
ZFPP= number of flute

另外，还需考虑牙尖高度和周期进给。
牙尖高度和周期进给请参考以下内容。
Also take the cusp height and pick feed into account.
The cusp height and pick feed are indicated as below.

例 使用计算器计算 PHX-DRF φ10×R2 时
Calculating the PHX-DRF φ10×R2 with a calculator



使用工具 Tool	PHX-DRF φ10×R2
切削速度 Cutting Speed	39.25m/min (1,250min ⁻¹)
进给速度 Feed	1,500mm/min (0.4mm/t)

$$\begin{aligned} n &= Vc \div 3.14 \div DC \times 1,000 \\ &= 39.25 \text{m/min} \div 3.14 \div \phi 10 \times 1,000 \\ &= 1,250 \text{min}^{-1} \end{aligned}$$

$$\begin{aligned} Vc &= n \times 3.14 \times DC \div 1,000 \\ &= 1,250 \text{min}^{-1} \times 3.14 \times \phi 10 \div 1,000 \\ &= 39.25 \text{m/min} \end{aligned}$$

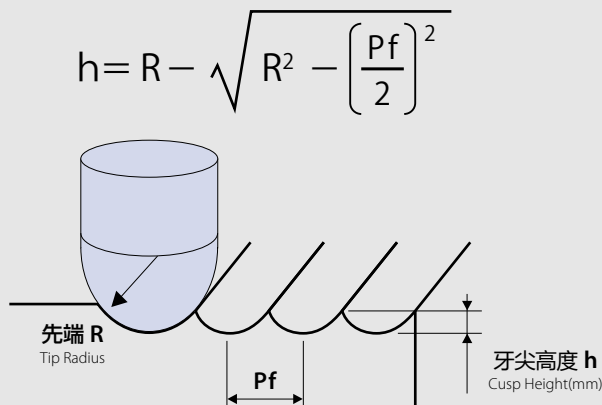
$$\begin{aligned} Vf &= n \times ZFPP \times fz \\ &= 1,250 \text{min}^{-1} \times 3 \text{刃} \times 0.4 \text{mm/t} \\ &= 1,500 \text{mm/min} \end{aligned}$$

$$\begin{aligned} fz &= Vf \div ZFPP \div n \\ &= 1,500 \text{mm/min} \div 3 \text{刃} \div 1,250 \text{min}^{-1} \\ &= 0.4 \text{mm/t} \end{aligned}$$

■ 牙尖高度的计算方法 (mm) The value of cusp height (mm)

[计算公式]

h = 牙尖高度 (mm)



例 使用计算器计算 PHX-DBT R5×100, Pf 为 0.3mm 时
Calculating the PHX-DBT R5×100 with a calculator

$$\begin{aligned} h &= R - \sqrt{R^2 - \left(\frac{Pf}{2}\right)^2} \\ &= 5 - \sqrt{5 \times 5 - \left(\frac{0.3}{2}\right)^2} \\ &= 5 - \sqrt{25 - 0.0225} \\ &= 5 - \sqrt{24.9775} \\ &= 5 - 4.99775 \\ h &= 0.00225 \text{mm} \end{aligned}$$

■ 半精、精加工切入量的参考值 (mm) Approximate depth of cut for semi-finishing and finishing

· 半精加工的切入量参考值
Approximate depth of cut for semi-finishing

$$R \times ap0.13$$

· 精加工的切入量参考值
Approximate depth of cut for finishing

$$R \times ap0.06$$



特点 Features
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-DRF
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-PC-DRF
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-LN-DRF
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-LN-CRE
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-LN-DBT
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-PC-DBT
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-LN-DBT
球头型 Ball Nose
圆弧角型 Ball Nose
PHX-CRT
切削条件 Cutting Conditions

为了更好地发挥 Phoenix 系列的能力

To maximize performance of the Phoenix Series

PHX-PC(锥颈) 系列的悬长换算表 Overhang conversion table of the PHX-PC (Pencil Neck) Series

这是根据锥颈形状的刚性提高作为悬长换算的表。
使用下表计算出悬长，作为切削条件的参考。

The following table is to calculate the new overhang length, since rigidity has been improved with the use of Pencil Neck.
Please use below as a reference for your cutting condition.

[公式] **步骤1** 工具悬长度 ÷ 工具刃径 = L/D **步骤2** 工具悬长度 × 百分比 = 直柄换算的悬长
Step1 Overhang Length Mill. Diameter Step2 Overhang Length Percentage Converted overhang length for straight shank

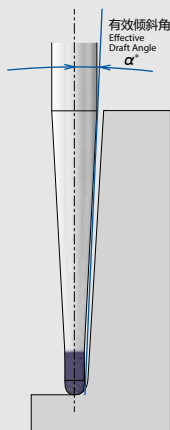
例) PHX-PC-DBT R3×2° × 62.3、悬长65mm 加工时(红圈部分) Ex.) PHX-PC-DBT R3×2° × 62.3, milling with an overhang of 65 mm

步骤1 (工具悬长度: 65mm) ÷ (工具刃径: φ6) = 10.83D → 约11D 确认下表中“11D的2°”的百分比(63.8%)
Step1 Overhang Length Mill. Diameter Approximately 11D: confirm the percentage from the below table "11D and 2°"(63.8%)

步骤2 (工具悬长度: 65mm) × (百分比: 63.8%) = 41.47mm → 通过直柄换算设定悬长为45mm的切削条件
Step2 Overhang Length Percentage Based on this straight shank conversion, the overhang is calculated to be 45 mm. Please refer to it as the new cutting condition.

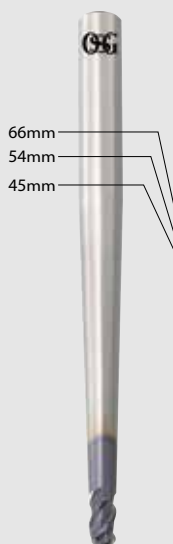
使用锥颈，即使悬长为65mm，也可在相当于直柄的45mm的切削条件下进行加工，从而**确保刚性**。
By utilizing the Pencil Neck, even if the overhang is 65 mm, the milling condition can be set equivalent to a 45mm straight shank tool while keeping the same rigidity.

注) 上述为仅根据工具刚性计算出的百分比。实际请根据使用刀柄、机械等的刚性进行调整。
Note: The above percentages are calculated based on the rigidity of the tool only. Please make necessary adjustments based on the conditions of your tool holder and machining center.



工具悬长度 L/D 颈部锥半角 θn	有效倾斜角															
	3D	4D	5D	6D	7D	8D	9D	10D	11D	12D	13D	14D	15D	16D	20D	
0.5°	99.7%	98.3%	96.6%	95.2%	93.6%	92.1%	90.7%	89.3%	88.0%	86.7%	85.4%	84.1%	82.9%	81.8%	77.4%	
1°	98.3%	95.5%	92.6%	89.8%	87.1%	84.6%	82.2%	80.0%	77.9%	75.9%	74.0%	72.2%	70.5%	68.8%	62.9%	
1.5°	97.0%	93.0%	88.8%	85.2%	81.6%	78.4%	75.4%	72.7%	70.1%	67.7%	65.5%	63.4%	61.4%	59.6%	53.2%	
2°	95.7%	90.5%	85.6%	81.0%	76.9%	73.1%	69.8%	66.7%	63.8%	61.3%	58.8%	56.6%	54.6%	52.7%	46.2%	

此表适用于2°以下刚性较低的尺寸。超过2°的尺寸，请根据加工条件进行设定。
Please use this chart for sizes under 2° with low rigidity. For sizes over 2°, please adjust accordingly based on milling condition.



即使悬长较长，每刃进给量也不会降低。
单颈式通过改变悬长，就可以使用同一工具进行加工。
Even with a long overhang length, feed per cutting edge will not decrease.
Single-neck type offers continuous machining with the same tool by simply changing the overhang length.

使用 PHX-PC-DBT (R3×1.5° × 43.2) 的中精加工工序 Semi-finishing process using PHX-PC-DBT (R3×1.5° × 43.2)

工具悬长度 Overhang Length		转速 Speed (min ⁻¹)	切削速度 Cutting Speed (m/min)	进给速度 Feed (mm/min)	每刃进给量 Feed per Tooth (mm/t)	切深量 Depth of Cut (mm)	
mm	L/D					ap	Pf
45	7.5	4,300	80	3,600	0.28	0.5	1.3
54	9	2,670	50	3,240	0.4	0.34	1
66	11	1,660	30	2,590	0.52	0.23	1



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- 对应柄径 $\phi 3 \sim \phi 50$ 的刀具*¹

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*¹ Standard Plus及Premium配套产品时。
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*¹ For Standard Plus and Premium package. Please refer to the OSG-HAIMER catalog for details.



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