NS TOOL

CORE LINE

「匠」心创先

CBN

CBN END MILL SERIES Vol.4

CORNER RADIUS END MILL

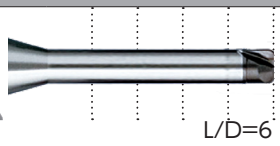
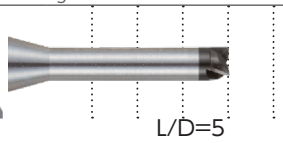
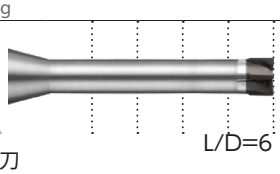
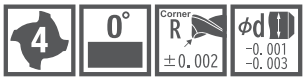
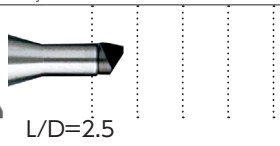
CBN 铣刀系列 Vol.4
圆鼻系列

规格种类丰富，可对高硬度钢进行长时间加工

Various lineup optimize a long time machining on hardened steel

CBN圆鼻铣刀

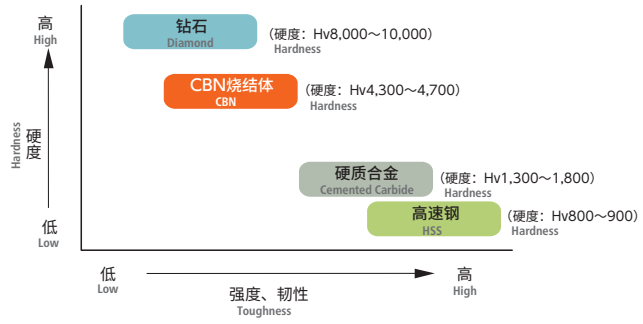
CBN corner radius end mill

类型 Type	型号 Model	最大加工深度 Maximum cutting depth (2D 3D 4D 5D 6D)	规格 Size 刃数・螺旋角・精度 Number of flute/ Helix angle / Tolerance	加工用途 Applications
全能 Multi purpose	**SSR200**  最小 R 角为 R0.02mm， 丰富的规格尺寸是针对微细加工的全能造型 All-round type with minimum corner R of 0.02mm and a wide variety of sizes to support micro precision machining	 L/D=6	φ 0.1 × R0.02 ～ φ 2 × R0.5  2 · 0° · Corner R ±0.002 (R≦0.03) · Corner R ±0.005 (R>0.03) · φd h4	共有 172 种规格 Total 172 sizes Slot Face
高效率 High efficiency	**SHR320**  螺旋 R 角造型 实现了刀刃刚性的同时高效率加工 The spiral corner R achieves both cutting edge rigidity and cutting ability for high efficiency machining	 L/D=5	φ 0.5 × R0.1 ～ φ 2 × R0.3  3 · 20° · Corner R ±0.005 · φd h4	共有 14 种规格 Total 14 sizes Slot Face
高精度 High precision	**SHPR400**  最小刃径 φ0.1 起的 4 刃圆鼻铣刀 追求加工精度的 R 角公差 ±0.002mm 的高精度造型 4-flute type from the smallest diameter of φ 0.1 High precision type pursues machining accuracy with Corner R tolerance of ± 0.002mm	 L/D=6	φ 0.1 × R0.01 ～ φ 3 × R0.2  4 · 0° · Corner R ±0.002 · φd -0.001 -0.003	共有 142 种规格 Total 142 sizes Slot Face
平面 For flat surface	**SSF120**  平面加工专用 没有底刃振刀影响，单刃造型实现高品质加工面 Specialized for plane surface machining Single-flute that is not affected by chattering of the end cutting edge achieves incredible surface roughness	 L/D=2.5	φ 0.2 × R0.05 ～ φ 2 × R0.1  1 · -20° · Corner R ±0.005 · φd h4	共有 9 种规格 Total 9 sizes Face

特长 Features

延长刀具寿命
Long tool life

CBN 烧结体
CBN(Cubic Boron Nitride) sintered alloy



CBN（Cubic Boron Nitride ／立方氮化硼）烧结体，硬度仅次于钻石，约为硬质合金的 3 倍，是具有更高耐热性、热传导性的刀具材料。但是，同时也有强度和韧性低，易崩刃的缺点。在刀具刀尖阻力较大的粗加工中，容易出现崩刀的情况，所以 CBN 刀具不适合用于粗加工。但在切削阻力小的精加工中，由于 CBN 优异的硬度和耐热性，可降低刀具磨损，持久度刀具使用寿命，尤其适用于高硬度材料的加工。

CBN(Cubic Boron Nitride) sintered alloy is 3 times harder than Tungsten carbide, second hardest material next to diamond, Moreover strong heat-resistant and high thermal conductivity. However less tough characteristic of CBN often causes chipping of tool edge easily. Accordingly, CBN is recommended for finishing of hard materials with less cutting load on the tool edge, which guarantees extra long tool life.

与涂层钨钢铣刀的寿命比较
Tool life comparison with solid carbide end mill

■ 小径尺寸的CBN铣刀与涂层钨钢铣刀针对高硬度钢加工的比较
Comparison of small diameter CBN end mill and coated solid carbide end mill for hardened steel machining

使用工具: CBN圆鼻铣刀 φ0.1 × R0.02 × 0.5
涂层钨钢平底铣刀 φ0.1 × 0.5
Tool CBN corner radius end mill
Coated carbide square end mill

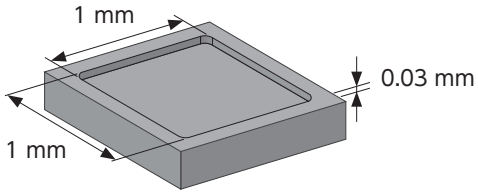
加工材料: DC53 (59HRC) SKD11相当
Work material as the same as SKD11

主轴转速 n:50,000 min^{-1}
Spindle speed

进给速度 vf:100 mm/min
Feed

切深量:ap 0.001 × ae 0.01 mm
Depth of cut

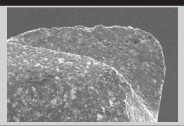
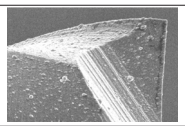
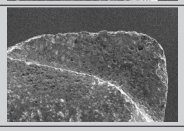
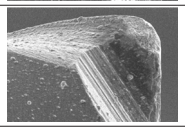
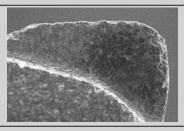
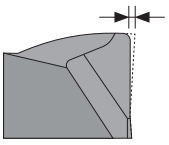
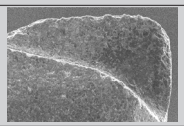
冷却方式: 油雾
Coolant Oil mist



加工尺寸 1 × 1 × 深度 0.03 mm
Machined size depth

内角R尺寸 : R0.05 mm
In-corner R size

同样是φ0.1的小径尺寸、CBN铣刀在针对高硬度钢加工5小时后依然可以继续加工
Even the small diameter of φ0.1mm, cBN tool is able to continue to use on hardened steel even after 5hrs machining

	CBN铣刀 SSR200 CBN end mill	涂层钨钢铣刀 Coated carbide end mill
加工前 Before		
1 小时后 After 1hr		
底刃后退量 (mm) Bottom edge retreat amount	0.0015	0.0080
3 小时后 After 3hrs		加工至 1 小时 15 分钟时崩损 Tool broken at 1hr 15min during machining
底刃后退量 (mm) Bottom edge retreat amount	0.0020	底刃后退量 Bottom edge retreat amount 
5 小时后 After 5hrs		
底刃后退量 (mm) Bottom edge retreat amount	0.0025	

■ CBN铣刀与涂层钨钢铣刀的加工比较
Comparison of surface roughness between CBN end mills and coated carbide end mills

使用工具: 圆鼻铣刀 φ0.5 × R0.05 × 1
Tool Corner radius end mill

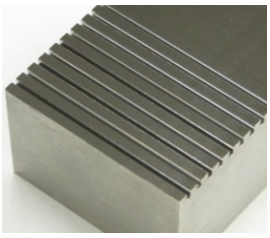
加工材料: ELMAX (58HRC)
Work material

主轴转速 n: 30,000 min^{-1}
Spindle speed

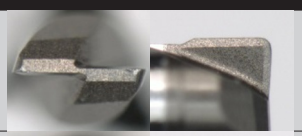
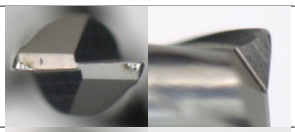
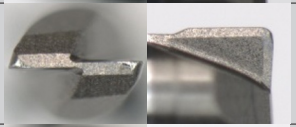
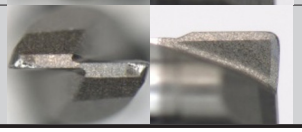
进给速度 vf: 300 mm/min
Feed

切深量: ap 0.005 mm
Depth of cut

冷却方式: 油雾
Coolant Oil mist



加工尺寸 宽0.5 × 长20 × 深1mm
Machined size width length depth

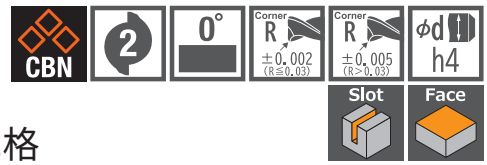
	CBN铣刀 SSR200 CBN end mill	涂层钨钢铣刀 Coated carbide end mill
加工1个沟槽后 After 1 grooving 切削距离 约 4 m Cutting length approx. 4m		
加工3个沟槽后 After 3 grooving 切削距离 约 12 m Cutting length approx. 12m		
加工6个沟槽后 After 6 grooving 切削距离 约 24m Cutting length approx. 24m		刀具达到寿命，加工结束 End of machining due to tool life

即使是高切削负荷的沟槽加工CBN铣刀也可实现长时间加工
Even in grooving with high cutting load, CBN tools can be used for a long time

规格尺寸丰富的全能造型
All-round type with a wide variety size lineup

CBN超高速加工用圆鼻铣刀
CBN Super Speed Radius End Mill

SSR200



φ 0.1 × R0.02 ～ φ 2 × R0.5　　共有 172 种规格
Total 172 sizes

特长 Features

精密微细 Fine precision	最小 R 角尺寸 R0.02mm 起的全能造型 All-round type from a minimum corner R of 0.02 mm

最小R角R0.02
The minimum corner R0.02mm

SSR200
φ 1 × R0.02 × 2

底刃至外周刃流畅的刀尖设计
强化了刀尖刚性
Chamfering design connects smoothly from end cutting edge to peripheral cutting edge

■ 加工后R角R0.02mm的状态
Corner condition of corner R0.02 mm after machining

使用工具：SSR200 φ0.1 × R0.02 × 0.5
Tool

加工材料：STAVAX (52HRC)
Work material :

工件尺寸：10×5mm
Work size :　(加工深度0.5mm)
Machining depth

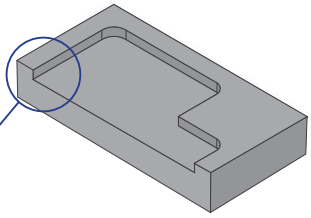
冷却方式：油雾
Coolant : Oil mist

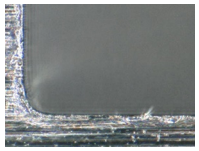
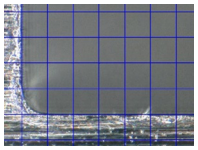
总加工时间：4小时
Total machining time : 4 hr

主轴转数：50,000 min^{-1}
Spindle speed

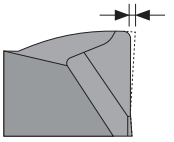
进给速度：150 mm/min
Feed

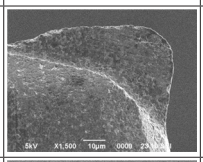
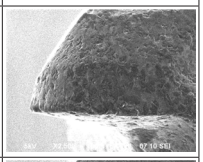
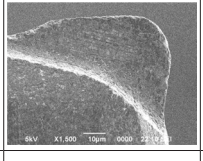
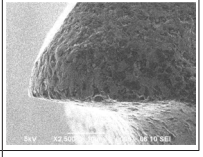
切深量：ap 0.002 × ae 0.015 mm
Depth of cut



加工后的工件 R 角部状态 Corner condition after machining	
	
R 角精度 Actual corner R R0.023 mm	尺度□ Scale 0.02 mm

底刃后退量
Bottom edge retreat amount



	前刀面 Rake	底刃 End cutting edge
加工前 Before		
加工后 After		
底刃后退量 (mm) Bottom edge retreat amount	0.0015	

YXR7（63HRC） 齿轮 YXR7 (63HRC) Gear

对于要求长时间加工的高硬度钢
精加工12小时以上仍能保持较高的加工精度

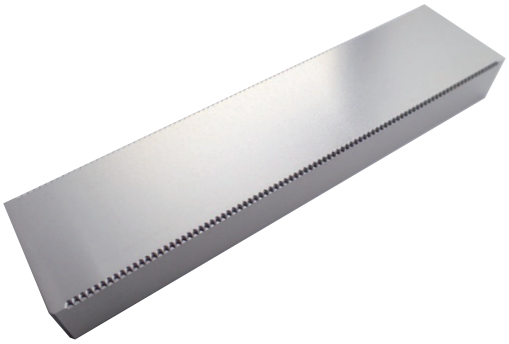
For hardened steel machining that requires long tool life
CBN end mill can maintain high accuracy even over 12 hours finishing

加工材料：YXR7 (63HRC)
Work material

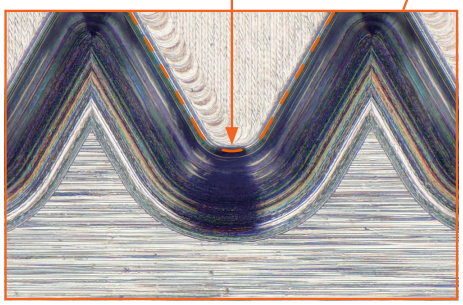
工件尺寸：85 × 20 mm
Work size （加工深度 0.65 mm）
Machining depth

冷却方式：油雾
Coolant : Oil mist

总加工时间：43小时 58分钟
Total machining time : 43 hr 58 min



R 部 测定位置
Measuring position R



加工精度 Accuracy

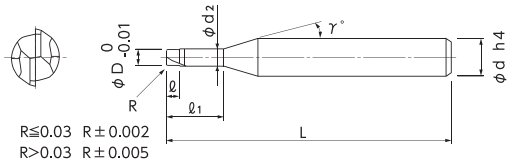
单位 [mm] Unit

测定位置 Measuring position	目标值 Target	实际值 Actual	误差 Error
A	0.075	0.077	+ 0.002
B		0.073	- 0.002
C		0.079	+ 0.004
D		0.077	+ 0.002

加工工序 Process	粗加工 Roughing	清角加工 ① Stock removal	清角加工 ② Stock removal	清角加工 ③ Stock removal	精加工 Finishing
使用工具 Tool	SSPB220 R0.3 × 1.2	SSPB220 R0.2 × 0.5	SSR200 ϕ0.2 × R0.03 × 0.3	SSR200 ϕ0.2 × R0.03 × 0.3	SSR200 ϕ0.15 × R0.03 × 0.3
主轴转速 [min^{-1}] Spindle speed	40,000	40,000	40,000	40,000	40,000
进给速度 [mm/min] Feed	600	300	180	180	120
切深量 ap × ae [mm] Depth of cut	0.01 × 0.01	0.004 × 0.008	0.003 × 0.006	0.002 × 0.01	0.005 × 0.003
余量 [mm] Stock	0.005	0.005	0.005	0.003	-
加工时间 Machining time	16小时 44分钟 16hr 44 min	8小时 40分钟 8hr 40 min	4小时 50分钟 4hr 50 min	58分钟 58 min	12小时 46分钟 12hr 46 min

刀刃采用CBN材质的圆鼻铣刀 共有172个规格，适用于加工各种形状

Corner radius end mill with CBN material at the cutting edge
Total 172 sizes. Applicable for various machining profiles



- CBN 超群的耐磨性实现了对角部 R 的高效加工。
- 整个切削刃为连续平滑的刀刃设计！实现高品质的加工表面精度。
- 适用于～70HRC 的高硬度钢。
- 从 φ0.1 起共有 172 个规格。

- Realized high efficient machining with radius flute along with excellent wear resistance of CBN.
- Realized excellent surface roughness by introducing smooth tangent on all over flute.
- Compatible with hardened steels up to 70HRC.
- Lineup from Dia.0.1mm. 172 sizes in total.

刀刃形状
Cutting edge shape

加工材料 Work Material

高硬度钢 (～70HRC) Hardened Steel	H
◎	

★返修对应（柄长须在 15mm 以上。详情请咨询本公司。）

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00490-01022	0.1	R0.02	0.2	0.04	0.09	15°	4	50	40,200
01-00490-01023			0.3	0.04	0.09	15°	4	50	40,800
01-00490-01024			0.5	0.04	0.09	15°	4	50	42,000
01-00490-01032		R0.03	0.2	0.04	0.09	15°	4	50	38,400
01-00490-01033			0.3	0.04	0.09	15°	4	50	39,000
01-00490-01034			0.5	0.04	0.09	15°	4	50	40,200
01-00490-01522	0.15	R0.02	0.2	0.06	0.14	15°	4	50	40,200
01-00490-01523			0.3	0.06	0.14	15°	4	50	40,800
01-00490-01524			0.5	0.06	0.14	15°	4	50	42,000
01-00490-01532		R0.03	0.2	0.06	0.14	15°	4	50	38,400
01-00490-01533			0.3	0.06	0.14	15°	4	50	39,000
01-00490-01534			0.5	0.06	0.14	15°	4	50	40,200
01-00490-02020	0.2	R0.02	0.3	0.08	0.19	15°	4	50	30,600
01-00490-02021			0.5	0.08	0.19	15°	4	50	30,600
01-00490-02022			1	0.08	0.19	15°	4	50	31,500
01-00490-02030		R0.03	0.3	0.08	0.19	15°	4	50	27,500
01-00490-02031			0.5	0.08	0.19	15°	4	50	27,500
01-00490-02032			1	0.08	0.19	15°	4	50	28,300
01-00490-02050		R0.05	0.3	0.08	0.19	15°	4	50	27,500
01-00490-02051			0.5	0.08	0.19	15°	4	50	27,500
01-00490-02052			1	0.08	0.19	15°	4	50	28,300
01-00490-03021	0.3	R0.02	0.5	0.13	0.28	15°	4	50	30,200
01-00490-03020			0.75	0.13	0.28	15°	4	50	30,400
01-00490-03022			1	0.13	0.28	15°	4	50	30,600
01-00490-03023			1.5	0.13	0.28	15°	4	50	31,000
01-00490-03024			2	0.13	0.28	15°	4	50	31,500

订购方法 How to Order

请指定SSR200 外径(D)×角半径(R)×颈长(ℓ1)。
When you order, indicate SSR200 (D)×(R)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

CBN超高速加工用圆鼻铣刀
CBN Super Speed Radius End Mill

单位［规格：mm / 价格：日元］
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00490-03031	0.3	R0.03	0.5	0.13	0.28	15°	4	50	27,200
01-00490-03030			0.75	0.13	0.28	15°	4	50	27,400
01-00490-03032			1	0.13	0.28	15°	4	50	27,500
01-00490-03033			1.5	0.13	0.28	15°	4	50	27,900
01-00490-03034			2	0.13	0.28	15°	4	50	28,300
01-00490-03051		R0.05	0.5	0.13	0.28	15°	4	50	27,200
01-00490-03050			0.75	0.13	0.28	15°	4	50	27,400
01-00490-03052			1	0.13	0.28	15°	4	50	27,500
01-00490-03053			1.5	0.13	0.28	15°	4	50	27,900
01-00490-03054			2	0.13	0.28	15°	4	50	28,300
★ 01-00490-04021	0.4	R0.02	0.5	0.24	0.37	15°	4	50	28,700
★ 01-00490-04022			1	0.24	0.37	15°	4	50	28,900
★ 01-00490-04023			1.5	0.24	0.37	15°	4	50	29,200
★ 01-00490-04024			2	0.24	0.37	15°	4	50	29,600
★ 01-00490-04031		R0.03	0.5	0.24	0.37	15°	4	50	25,800
★ 01-00490-04032			1	0.24	0.37	15°	4	50	26,000
★ 01-00490-04033			1.5	0.24	0.37	15°	4	50	26,200
★ 01-00490-04034			2	0.24	0.37	15°	4	50	26,600
★ 01-00490-04051		R0.05	0.5	0.24	0.37	15°	4	50	25,800
★ 01-00490-04052			1	0.24	0.37	15°	4	50	26,000
★ 01-00490-04053			1.5	0.24	0.37	15°	4	50	26,000
★ 01-00490-04054			2	0.24	0.37	15°	4	50	26,600
★ 01-00490-04101		R0.1	0.5	0.24	0.37	15°	4	50	25,800
★ 01-00490-04102			1	0.24	0.37	15°	4	50	26,000
★ 01-00490-04103			1.5	0.24	0.37	15°	4	50	26,000
★ 01-00490-04104			2	0.24	0.37	15°	4	50	26,000
★ 01-00490-05020	0.5	R0.02	0.5	0.3	0.46	15°	4	48	23,600
★ 01-00490-05022			1	0.3	0.46	15°	4	50	23,800
★ 01-00490-05021			1.5	0.3	0.46	15°	4	50	24,000
★ 01-00490-05023			2.5	0.3	0.46	15°	4	50	26,300
★ 01-00490-05030		R0.03	0.5	0.3	0.46	15°	4	48	21,200
★ 01-00490-05032			1	0.3	0.46	15°	4	50	21,400
★ 01-00490-05031			1.5	0.3	0.46	15°	4	50	21,600
★ 01-00490-05033			2.5	0.3	0.46	15°	4	50	23,600
★ 01-00490-05050		R0.05	0.5	0.3	0.46	15°	4	48	21,200
★ 01-00490-05052			1	0.3	0.46	15°	4	50	21,400
★ 01-00490-05051			1.5	0.3	0.46	15°	4	50	21,600
★ 01-00490-05053			2.5	0.3	0.46	15°	4	50	23,600
★ 01-00490-05100		R0.1	0.5	0.3	0.46	15°	4	48	21,200
★ 01-00490-05102			1	0.3	0.46	15°	4	50	21,400
★ 01-00490-05101			1.5	0.3	0.46	15°	4	50	21,600
★ 01-00490-05103			2.5	0.3	0.46	15°	4	50	23,600
★ 01-00490-06021	0.6	R0.02	0.5	0.3	0.56	15°	4	48	23,600
★ 01-00490-06022			1	0.3	0.56	15°	4	50	23,800
★ 01-00490-06023			1.5	0.3	0.56	15°	4	50	24,000
★ 01-00490-06024			2.5	0.3	0.56	15°	4	50	26,300
★ 01-00490-06031		R0.03	0.5	0.3	0.56	15°	4	48	21,200
★ 01-00490-06032			1	0.3	0.56	15°	4	50	21,400
★ 01-00490-06033			1.5	0.3	0.56	15°	4	50	21,600
★ 01-00490-06034			2.5	0.3	0.56	15°	4	50	23,600
★ 01-00490-06051		R0.05	0.5	0.3	0.56	15°	4	48	21,200
★ 01-00490-06052			1	0.3	0.56	15°	4	50	21,400
★ 01-00490-06053			1.5	0.3	0.56	15°	4	50	21,600
★ 01-00490-06054			2.5	0.3	0.56	15°	4	50	23,600
★ 01-00490-06101		R0.1	0.5	0.3	0.56	15°	4	48	21,200
★ 01-00490-06102			1	0.3	0.56	15°	4	50	21,400
★ 01-00490-06103			1.5	0.3	0.56	15°	4	50	21,600
★ 01-00490-06104			2.5	0.3	0.56	15°	4	50	23,600

SSR200

CBN超高速加工用圆鼻铣刀
CBN Super Speed Radius End Mill

★返修对应（柄长须在 15mm 以上。详情请咨询本公司。）

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
★ 01-00490-08021	0.8	R0.02	1.5	0.56	0.76	15°	4	50	24,000
★ 01-00490-08022			2.5	0.56	0.76	15°	4	50	26,300
★ 01-00490-08023			5	0.56	0.76	15°	4	53	27,200
★ 01-00490-08031		R0.03	1.5	0.56	0.76	15°	4	50	21,600
★ 01-00490-08032			2.5	0.56	0.76	15°	4	50	23,600
★ 01-00490-08033			5	0.56	0.76	15°	4	53	24,400
★ 01-00490-08051		R0.05	1.5	0.56	0.76	15°	4	50	21,600
★ 01-00490-08052			2.5	0.56	0.76	15°	4	50	23,600
★ 01-00490-08053			5	0.56	0.76	15°	4	53	24,400
★ 01-00490-08101		R0.1	1.5	0.56	0.76	15°	4	50	21,600
★ 01-00490-08102			2.5	0.56	0.76	15°	4	50	23,600
★ 01-00490-08103			5	0.56	0.76	15°	4	53	24,400
★ 01-00490-10020	1	R0.02	1	0.7	0.95	15°	4	49	22,000
★ 01-00490-10022			2	0.7	0.95	15°	4	50	22,000
★ 01-00490-10021			3	0.7	0.95	15°	4	50	22,000
★ 01-00490-10023			5	0.7	0.95	15°	4	53	24,900
★ 01-00490-10030		R0.03	1	0.7	0.95	15°	4	49	19,800
★ 01-00490-10032			2	0.7	0.95	15°	4	50	19,800
★ 01-00490-10031			3	0.7	0.95	15°	4	50	19,800
★ 01-00490-10033			5	0.7	0.95	15°	4	53	22,400
★ 01-00490-10050		R0.05	1	0.7	0.95	15°	4	49	19,800
★ 01-00490-10052			2	0.7	0.95	15°	4	50	19,800
★ 01-00490-10051			3	0.7	0.95	15°	4	50	19,800
★ 01-00490-10053			5	0.7	0.95	15°	4	53	22,400
★ 01-00490-10100		R0.1	1	0.7	0.95	15°	4	49	19,800
★ 01-00490-10102			2	0.7	0.95	15°	4	50	19,800
★ 01-00490-10101			3	0.7	0.95	15°	4	50	19,800
★ 01-00490-10103			5	0.7	0.95	15°	4	53	22,400
★ 01-00490-10200		R0.2	1	0.7	0.95	15°	4	49	19,800
★ 01-00490-10202			2	0.7	0.95	15°	4	50	19,800
★ 01-00490-10201			3	0.7	0.95	15°	4	50	19,800
★ 01-00490-10203			5	0.7	0.95	15°	4	53	22,400
★ 01-00490-10300		R0.3	1	0.7	0.95	15°	4	49	19,800
★ 01-00490-10302			2	0.7	0.95	15°	4	50	19,800
★ 01-00490-10301			3	0.7	0.95	15°	4	50	19,800
★ 01-00490-10303			5	0.7	0.95	15°	4	53	22,400
★ 01-00490-15022	1.5	R0.02	2	1	1.45	15°	4	52	25,900
★ 01-00490-15020			3	1	1.45	15°	4	52	25,900
★ 01-00490-15021			4.5	1	1.45	15°	4	52	25,900
★ 01-00490-15023			7.5	1	1.45	15°	4	52	29,400
★ 01-00490-15032		R0.03	2	1	1.45	15°	4	52	23,300
★ 01-00490-15030			3	1	1.45	15°	4	52	23,300
★ 01-00490-15031			4.5	1	1.45	15°	4	52	23,300
★ 01-00490-15033			7.5	1	1.45	15°	4	52	26,400
★ 01-00490-15052		R0.05	2	1	1.45	15°	4	52	23,300
★ 01-00490-15050			3	1	1.45	15°	4	52	23,300
★ 01-00490-15051			4.5	1	1.45	15°	4	52	23,300
★ 01-00490-15053			7.5	1	1.45	15°	4	52	26,400
★ 01-00490-15102		R0.1	2	1	1.45	15°	4	52	23,300
★ 01-00490-15100			3	1	1.45	15°	4	52	23,300
★ 01-00490-15101			4.5	1	1.45	15°	4	52	23,300
★ 01-00490-15103			7.5	1	1.45	15°	4	52	26,400

订购方法 How to Order

请指定SSR200 外径(D)×角半径(R)×颈长(ℓ1)。
When you order, indicate SSR200 (D)×(R)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

CBN超高速加工用圆鼻铣刀
CBN Super Speed Radius End Mill

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
★ 01-00490-15202	1.5	R0.2	2	1	1.45	15°	4	52	23,300
★ 01-00490-15200			3	1	1.45	15°	4	52	23,300
★ 01-00490-15201			4.5	1	1.45	15°	4	52	23,300
★ 01-00490-15203			7.5	1	1.45	15°	4	52	26,400
★ 01-00490-15302		R0.3	2	1	1.45	15°	4	52	23,300
★ 01-00490-15300			3	1	1.45	15°	4	52	23,300
★ 01-00490-15301			4.5	1	1.45	15°	4	52	23,300
★ 01-00490-15303			7.5	1	1.45	15°	4	52	26,400
★ 01-00490-20022	2	R0.02	3	1.2	1.94	15°	4	53	26,700
★ 01-00490-20020			4	1.2	1.94	15°	4	53	26,700
★ 01-00490-20021			6	1.2	1.94	15°	4	53	26,700
★ 01-00490-20023			10	1.2	1.94	15°	4	53	29,800
★ 01-00490-20032		R0.03	3	1.2	1.94	15°	4	53	24,000
★ 01-00490-20030			4	1.2	1.94	15°	4	53	24,000
★ 01-00490-20031			6	1.2	1.94	15°	4	53	24,000
★ 01-00490-20033			10	1.2	1.94	15°	4	53	26,800
★ 01-00490-20052		R0.05	3	1.2	1.94	15°	4	53	24,000
★ 01-00490-20050			4	1.2	1.94	15°	4	53	24,000
★ 01-00490-20051			6	1.2	1.94	15°	4	53	24,000
★ 01-00490-20053			10	1.2	1.94	15°	4	53	26,800
★ 01-00490-20102		R0.1	3	1.2	1.94	15°	4	53	24,000
★ 01-00490-20100			4	1.2	1.94	15°	4	53	24,000
★ 01-00490-20101			6	1.2	1.94	15°	4	52	24,000
★ 01-00490-20103			10	1.2	1.94	15°	4	52	26,800
★ 01-00490-20202		R0.2	3	1.2	1.94	15°	4	53	24,000
★ 01-00490-20200			4	1.2	1.94	15°	4	53	24,000
★ 01-00490-20201			6	1.2	1.94	15°	4	52	24,000
★ 01-00490-20203			10	1.2	1.94	15°	4	52	26,700
★ 01-00490-20302		R0.3	3	1.2	1.94	15°	4	53	24,000
★ 01-00490-20300			4	1.2	1.94	15°	4	53	24,000
★ 01-00490-20301			6	1.2	1.94	15°	4	52	24,000
★ 01-00490-20303			10	1.2	1.94	15°	4	52	26,700
★ 01-00490-20502		R0.5	3	1.2	1.94	15°	4	53	24,000
★ 01-00490-20500			4	1.2	1.94	15°	4	53	24,000
★ 01-00490-20501			6	1.2	1.94	15°	4	52	24,000
★ 01-00490-20503			10	1.2	1.94	15°	4	52	26,700

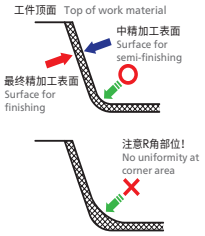
使用注意事项
Points in Use

加工环境 *Advice on Cutting Environment*

- 刀具偏摆量越小越好。
  Minimize the deflection of cutting edge.
- 掌握机床主轴的伸缩量以及机床的水平状态，需要时采取恰当的措施。
  To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

精加工量(余量) *Advice on Finishing Allowance (stock amount)*

- 使用小径CBN铣刀时，**精加工量(余量)均匀性非常重要**。
  When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- 粗加工・中精加工使用刀具磨损过大时，中精加工和精加工的余量会变大，从而影响刀具寿命和加工精度，所以**预加工时留有均匀的加工余量非常重要**。
  When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy. Therefore, it is important to get uniform stock amount in the pre-stage cutting.



切削参数参考表 Recommended Milling Conditions

加工材料 Work Material			高硬度钢 Hardened Steels SKD61・STAVAX (～52HRC)				高硬度钢 Hardened Steels DC53・ELMAX・PD613 (～62HRC)				高速钢 High Speed Steels DRM3・YXR3 (～68HRC)			
外径 Dia.	角半径 Corner Radius	颈长 Under Neck Length	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.1	0.02・0.03	0.2	0.002	0.015	200	50,000	0.002	0.01	150	50,000	0.001	0.01	100	50,000
		0.3	0.002	0.015	150	50,000	0.001	0.01	100	50,000	0.001	0.01	50	50,000
		0.5	0.002	0.01	150	50,000	0.001	0.01	100	50,000	0.001	0.01	50	50,000
0.15	0.02・0.03	0.2	0.003	0.02	250	50,000	0.003	0.02	200	50,000	0.002	0.015	150	50,000
		0.3	0.003	0.02	200	50,000	0.003	0.02	150	50,000	0.002	0.015	100	50,000
		0.5	0.002	0.02	200	50,000	0.002	0.02	150	50,000	0.001	0.015	100	50,000
0.2	0.02・0.03・0.05	0.3	0.003	0.03	400	50,000	0.003	0.03	350	50,000	0.002	0.02	250	50,000
		0.5	0.003	0.03	300	50,000	0.003	0.03	300	50,000	0.002	0.02	200	50,000
		1	0.003	0.02	200	50,000	0.003	0.02	200	50,000	0.002	0.01	100	50,000
0.3	0.02・0.03・0.05	0.5・0.75・1	0.003	0.05	500	50,000	0.003	0.05	400	50,000	0.002	0.03	300	50,000
		1.5・2	0.003	0.03	400	50,000	0.003	0.03	300	50,000	0.002	0.02	200	50,000
0.4	0.02・0.03・0.05・0.1	0.5・1	0.005	0.1	700	50,000	0.005	0.1	600	50,000	0.003	0.03	400	50,000
		1.5・2	0.005	0.05	500	50,000	0.005	0.05	400	50,000	0.003	0.02	300	50,000
0.5	0.02・0.03	0.5・1・1.5	0.005	0.2	600	50,000	0.005	0.2	600	50,000	0.003	0.1	500	50,000
		2.5	0.005	0.1	600	50,000	0.005	0.1	600	50,000	0.003	0.05	500	50,000
	0.05	0.5・1・1.5	0.01	0.2	600	50,000	0.01	0.2	600	50,000	0.005	0.2	500	50,000
		2.5	0.01	0.1	600	50,000	0.01	0.1	600	50,000	0.005	0.1	500	50,000
	0.1	0.5・1・1.5	0.02	0.2	800	50,000	0.02	0.2	800	50,000	0.01	0.1	700	50,000
		2.5	0.01	0.1	800	50,000	0.01	0.1	800	50,000	0.01	0.05	700	50,000
0.6	0.02・0.03	0.5・1・1.5	0.005	0.2	600	50,000	0.005	0.2	600	50,000	0.003	0.1	500	50,000
		2.5	0.005	0.1	600	50,000	0.005	0.1	600	50,000	0.003	0.05	500	50,000
	0.05	0.5・1・1.5	0.01	0.2	600	50,000	0.01	0.2	600	50,000	0.005	0.2	500	50,000
		2.5	0.01	0.1	600	50,000	0.01	0.1	600	50,000	0.005	0.1	500	50,000
	0.1	0.5・1・1.5	0.02	0.2	1,000	50,000	0.02	0.2	1,000	50,000	0.01	0.1	700	50,000
		2.5	0.01	0.1	1,000	50,000	0.01	0.1	1,000	50,000	0.01	0.05	700	50,000
0.8	0.02・0.03	1.5・2.5	0.005	0.2	800	50,000	0.005	0.2	800	50,000	0.003	0.1	600	40,000
		5	0.005	0.1	800	50,000	0.005	0.1	800	50,000	0.003	0.05	600	40,000
	0.05	1.5・2.5	0.02	0.3	1,000	50,000	0.02	0.2	1,000	50,000	0.01	0.1	700	40,000
		5	0.01	0.2	1,000	50,000	0.01	0.1	1,000	50,000	0.01	0.05	700	40,000
	0.1	1.5・2.5	0.02	0.3	1,400	50,000	0.02	0.2	1,200	50,000	0.01	0.1	1,000	40,000
		5	0.01	0.2	1,400	50,000	0.01	0.1	1,200	50,000	0.01	0.05	1,000	40,000

加工材料 Work Material			高硬度钢 Hardened Steels SKD61・STAVAX (～52HRC)				高硬度钢 Hardened Steels DC53・ELMAX・PD613 (～62HRC)				高速钢 High Speed Steels DRM3・YXR3 (～68HRC)			
外径 Dia.	角半径 Corner Radius	颈长 Under Neck Length	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
			ap mm	ae mm	mm/min	min-1	ap mm	ae mm	mm/min	min-1	ap mm	ae mm	mm/min	min-1
1	0.02・0.03	1・2	0.005	0.4	800	48,000	0.005	0.3	800	48,000	0.005	0.2	600	32,000
	0.05		0.01	0.4	1,000	48,000	0.01	0.3	1,000	48,000	0.01	0.2	800	32,000
	0.1・0.2・0.3		0.03	0.4	1,500	48,000	0.03	0.3	1,200	48,000	0.01	0.2	1,000	32,000
	0.02・0.03	3・5	0.005	0.3	800	48,000	0.005	0.2	800	48,000	0.005	0.1	600	32,000
	0.05		0.01	0.3	1,000	48,000	0.01	0.2	1,000	48,000	0.01	0.1	800	32,000
	0.1・0.2・0.3		0.02	0.3	1,500	48,000	0.02	0.2	1,200	48,000	0.01	0.1	1,000	32,000
1.5	0.02・0.03	2	0.005	0.7	1,200	32,000	0.005	0.6	1,100	32,000	0.005	0.3	900	20,000
	0.05		0.02	0.7	1,200	32,000	0.01	0.6	1,100	32,000	0.01	0.3	900	20,000
	0.1・0.2・0.3		0.04	0.7	2,400	32,000	0.04	0.6	1,800	32,000	0.01	0.3	1,300	20,000
	0.02・0.03	3・4.5	0.005	0.7	1,000	32,000	0.005	0.6	1,000	32,000	0.005	0.3	800	20,000
	0.05		0.02	0.7	1,000	32,000	0.01	0.6	1,000	32,000	0.01	0.3	800	20,000
	0.1・0.2・0.3		0.04	0.7	2,000	32,000	0.04	0.6	1,500	32,000	0.01	0.3	1,200	20,000
	0.02・0.03	7.5	0.005	0.5	1,000	32,000	0.005	0.4	1,000	32,000	0.005	0.2	800	20,000
	0.05		0.02	0.5	1,000	32,000	0.01	0.4	1,000	32,000	0.01	0.2	800	20,000
	0.1・0.2・0.3		0.03	0.5	2,000	32,000	0.03	0.4	1,500	32,000	0.01	0.2	1,200	20,000
2	0.02・0.03	3	0.005	0.8	1,200	24,000	0.005	0.7	1,100	24,000	0.005	0.5	900	16,000
	0.05		0.02	0.8	1,200	24,000	0.01	0.7	1,100	24,000	0.01	0.5	900	16,000
	0.1・0.2・0.3・0.5		0.05	0.8	2,400	24,000	0.05	0.7	1,800	24,000	0.01	0.5	1,300	16,000
	0.02・0.03	4・6	0.005	0.8	1,000	24,000	0.005	0.7	1,000	24,000	0.005	0.5	800	16,000
	0.05		0.02	0.8	1,000	24,000	0.01	0.7	1,000	24,000	0.01	0.5	800	16,000
	0.1・0.2・0.3・0.5		0.05	0.8	2,000	24,000	0.05	0.7	1,500	24,000	0.01	0.5	1,200	16,000
	0.02・0.03	10	0.005	0.6	1,000	24,000	0.005	0.5	1,000	24,000	0.005	0.3	800	16,000
	0.05		0.02	0.6	1,000	24,000	0.01	0.5	1,000	24,000	0.01	0.3	800	16,000
	0.1・0.2・0.3・0.5		0.03	0.6	2,000	24,000	0.03	0.5	1,500	24,000	0.01	0.3	1,200	16,000

备 注 Notes

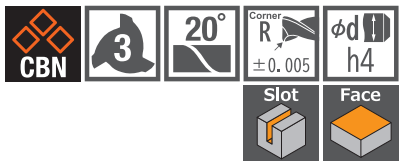
※1 切深量为中精加工、精加工时的最大值。请根据机床刚性和要求精度进行调整。
※2 切深量的ap表示轴向切深量，ae表示径向切深量。
※3 轴向进刀建议采用螺旋进刀及倾斜进刀方式。
※4 建议使用油雾冷却方式。
※5 请以相同的比率调整主轴转速和进给速度。
※6 加工参数会因切深量和机床刚性的状况而有所不同。请每次调整后再使用。
※7 请根据需要控制刀具的伸出量。
※8 建议使用刚性较大的铣刀刀柄和机床。

※1 Depth of Cut shows the maximum value for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 Recommend to apply helical or ramping for approaching into axial direction.
※4 We recommend using oil mist coolant.
※5 Adjust both spindle speed and feed at the same rate.
※6 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.
※7 Length of tool overhang must be as short as possible.
※8 Machine, tool chuck must be sufficiently accurate.

高效率的3刃造型实现高进给速度
High efficiency 3-flute design realizes high feed

CBN高效率圆鼻铣刀
CBN High Efficient Radius End Mill

SHR320



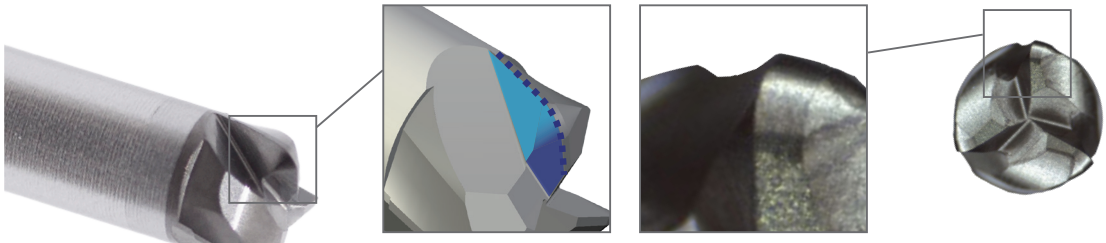
φ 0.5 × R0.1 ～ φ 2 × R0.3

共有 14 种规格
Total 14 sizes

特长 Features

高效率 High Efficiency	实现高效率的刀具设计 Specialized tool design achieves high efficiency

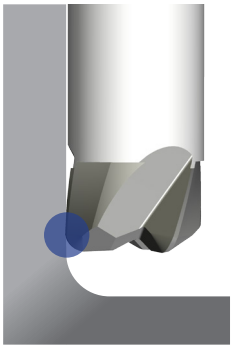
■ 螺旋R角形状的效果
Effect of spiral corner R shape



采用兼备刃口刚性和切削性能的螺旋R角造型
Adopt spiral corner R shape achieves both cutting edge rigidity and cutting ability

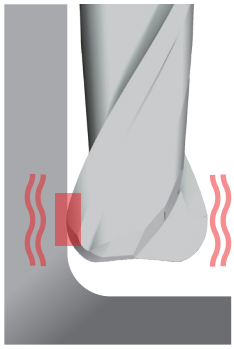
■ 外周刃倒锥造型
Peripheral cutting edge with back taper design

SHR320



点切削
减少振刀
Milling by point reduce the chattering

普通铣刀
General end mill



面切削
切削负荷大
Cutting load is large due to surface machining

为了抑制由切削负荷的不断增加产生的振刀现象，外周刃采用强倒锥造型减轻切削负荷，实现安定的加工面品质
Adopted strong back taper shape for peripheral cutting edge to suppress chattering that occurred by increasing cutting load.
Realizes a stable cutting surface through reducing cutting load.

SLD (60HRC) 冲压模造型 SLD (60HRC) Bend mold punch

即使是高进给速度也能维持高加工精度
同时兼备长寿命与高效率

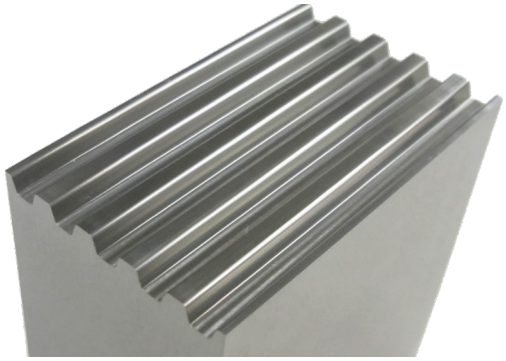
Maintain high accuracy even during high feed machining
Combine long tool life and high efficiency

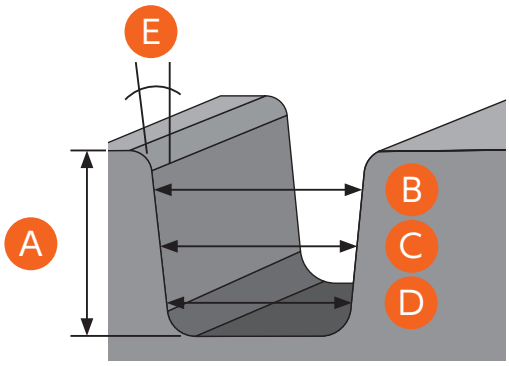
加工材料：SLD (60HRC)
Work material

工件尺寸：30 × 50 mm
Work size （加工深度 2 mm）
Machining depth

冷却方式：油雾
Coolant : Oil mist

总加工时间：3小时 20分钟
Total machining time : 3 hr 20 min





测定位置
Measuring position

加工精度
Accuracy

单位 [mm]
Unit

测定位置 Measuring position	目标值 Target	实测值 Actual	误差 Error
A	2.000	1.999	- 0.001
B	3.392	3.384 (3.391)	- 0.001
C	3.028	3.019 (3.026)	- 0.002
D	2.664	2.655 (2.662)	- 0.002
E	20°	20° 1'36''	1'36''

※ NC 程序采用公称方式，() 内的实测值是按照实际外径得出的数值，误差是目标值与实测值的误差量。
NC data is based on nominal diameter. The actual value in ( ) is the calculated value according to the actual outer diameter, and the error indicates the difference between the target value and the calculated value.

加工工序 Process	粗加工 Roughing	中粗加工 Semi-roughing	中精加工 Semi-finishing	精加工 Finishing
使用工具 Tool	MHRH430R φ2 × R0.1 × 6		SHR320 φ2 × R0.1 × 6	SHR320 φ2 × R0.1 × 6
主轴转速 [min⁻¹] Spindle speed	20,000		40,000	40,000
进给速度 [mm/min] Feed	750		1,000	2,000
切深量 ap × ae [mm] Depth of cut	ap 0.05 (沟槽) Slot	ap 0.04 (等高线) Contour line	侧面:0.02 × 0.015 Side 平面:0.015 × 0.2 Flat	侧面:0.01 × 0.005 Side 平面:0.005 × 0.1 Flat
余量 [mm] Stock	0.02		0.005	-
加工时间 Machining time	15 分钟 15 min	39 分钟 39 min	1小时 8分钟 1hr 8 min	1小时 18分钟 1hr 18 min

SHR320

规格 Size φ 0.5 × R0.1 ～ φ 2 × R0.3

CBN ≦70 HRC

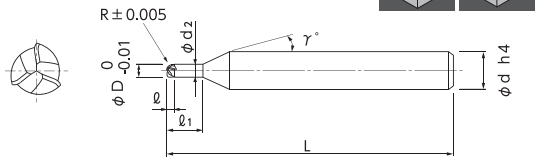
CBN高效率圆鼻铣刀
CBN High Efficient Radius End Mill

共 14 种规格
Total 14 sizes

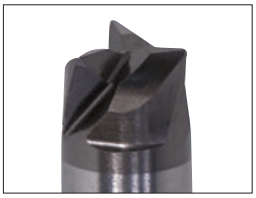
CBN材质的3刃圆鼻铣刀 可实现高效率的高精度加工

3-flute CBN corner radius end mill.
Realized high efficient and high accurate machining

3 | 20° | Corner R ±0.005 | φd h4 | Slot | Face



- 采用 3 刃和螺旋形状圆角 R，实现高精度・高效率的加工。
- Realized high accuracy and high efficiency machining by adopting 3 flutes and corner R with spiral shape.



刀刃形状
Cutting edge shape

加工材料 Work Material

高硬度钢 (～70HRC) Hardened Steel	H
◎	

★返修对应（柄长须在 15mm 以上。详情请咨询本公司。）

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00495-05011	0.5	R0.1	1.5	0.25	0.46	15°	4	50	26,000
01-00495-05012			2.5	0.25	0.46	15°	4	50	29,000
01-00495-10011	1	R0.1	3	0.5	0.95	15°	4	50	24,000
01-00495-10012			5	0.5	0.95	15°	4	52	27,000
01-00495-10021		R0.2	3	0.5	0.95	15°	4	50	24,000
01-00495-10022			5	0.5	0.95	15°	4	52	27,000
★ 01-00495-15011	1.5	R0.1	4.5	0.75	1.45	15°	4	52	28,000
★ 01-00495-15012			7.5	0.75	1.45	15°	4	52	31,000
★ 01-00495-15021		R0.2	4.5	0.75	1.45	15°	4	52	28,000
★ 01-00495-15022			7.5	0.75	1.45	15°	4	52	31,000
★ 01-00495-20011	2	R0.1	6	1	1.94	15°	4	52	29,000
★ 01-00495-20012			10	1	1.94	15°	4	52	32,000
★ 01-00495-20031		R0.3	6	1	1.94	15°	4	52	29,000
★ 01-00495-20032			10	1	1.94	15°	4	52	32,000

订购方法 How to Order

请指定SHR320 外径(D)×角半径(R)×颈长(ℓ1)。
When you order, indicate SHR320 (D)×(R)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

加工材料 Work Material			高硬度钢 Hardened Steels STAVAX・SKD61 (~52HRC)				高硬度钢 Hardened Steels SKD11・ELMAX (~62HRC)				高速钢 High Speed Steels SKH ・HAP (~68HRC)			
外径 Dia.	角半径 Corner Radius	颈长 Under Neck Length	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	0.1	1.5	0.008	0.2	1,500	50,000	0.005	0.15	800	50,000	0.003	0.1	600	50,000
		2.5	0.006	0.15	1,000	40,000	0.005	0.1	500	40,000	0.003	0.05	300	40,000
1	0.1 0.2	3	0.012	0.4	2,000	40,000	0.007	0.25	1,000	40,000	0.006	0.15	800	35,000
		5	0.008	0.3	1,500	30,000	0.005	0.15	800	30,000	0.004	0.1	400	25,000
1.5	0.1 0.2	4.5	0.015	0.6	2,500	35,000	0.008	0.4	1,200	35,000	0.007	0.2	1,000	30,000
		7.5	0.012	0.4	1,800	25,000	0.006	0.3	1,000	25,000	0.005	0.15	500	20,000
2	0.1 0.3	6	0.02	0.8	3,000	30,000	0.01	0.6	1,500	30,000	0.008	0.3	1,200	25,000
		10	0.015	0.6	2,000	20,000	0.008	0.4	1,000	20,000	0.006	0.2	600	18,000

备 注 Notes

※1 切深量是指进行等高线加工时的大概标准。请根据机床刚性和加工方法进行调整。
※2 建议以倾斜切入方式进刀。请将此时的切入角度设定在3°以内。
※3 预加工（中精加工）时请注意精加工余量相对于加工面需保持均匀。
※4 加工R角等负载大的部位或复杂的形状时，请特别注意参数设定和刀路轨迹等。
※5 请以相同的比率调整主轴转速和进给速度。
※6 建议使用油雾冷却方式。

※1 Depth of Cut is for contour line milling as the value of reference. Please adjust it depending on machine rigidity and machining method.
※2 Ramping approach with angle 3° or smaller is recommended.
※3 Recommend leaving uniform finishing allowance on the machined surface in the pre-stage cutting (semi-finishing).
※4 When cutting high load sections or complex shapes, it requires attention to condition setting and tool path.
※5 Adjust both spindle speed and feed at the same rate.
※6 Oil mist coolant is recommended.

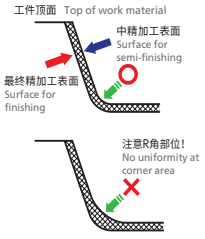
使用注意事项 Points in Use

加工环境 *Advice on Cutting Environment*

- 刀具偏摆量越小越好。
  Minimize the deflection of cutting edge.
- 掌握机床主轴的伸缩量以及机床的水平状态，需要时采取恰当的措施。
  To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

精加工量(余量) *Advice on Finishing Allowance (stock amount)*

- 使用小径CBN铣刀时，**精加工量(余量)均匀性非常重要**。
  When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- 粗加工・中精加工使用刀具磨损过大时，中精加工和精加工的余量会变大，从而影响刀具寿命和加工精度，所以**预加工时留有均匀的加工余量非常重要**。
  When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy. Therefore, it is important to get uniform stock amount in the pre-stage cutting.



最小径从φ0.1起追求加工精度的高精度造型
High accuracy specifications pursued from the smallest diameter φ 0.1

CBN超高精度圆鼻铣刀
CBN Super High Precision Radius End Mill

SHPR400

φ 0.1 × R0.01 ～ φ 3 × R0.2　　共有 142 种规格
Total 142 sizes

特长 Features

精密微細
Fine precision

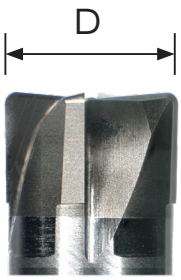
小径 4 刃造型实现高精度加工
Small diameter 4-flute design realizes high precision

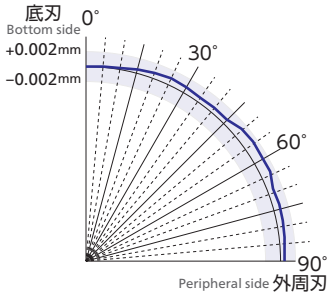
■ 实现高精度精加工的刀具设计
Tool design achieves high precision finishing

外径公差 Tolerance of outer diameter

D≦1　　0 ～ -0.005 mm
1<D≦3　　0 ～ -0.007 mm

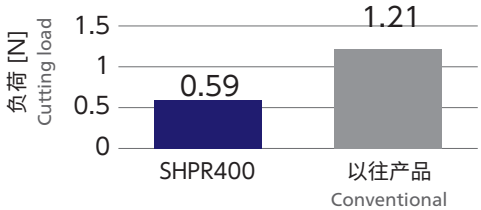
R角精度 Corner R accuracy
±0.002 mm





■ 减轻切削负荷的刃口造型
Specialized tool design reduces cutting load

所遭受的Z方向切削负荷
Force in the Z direction applied to the work piece



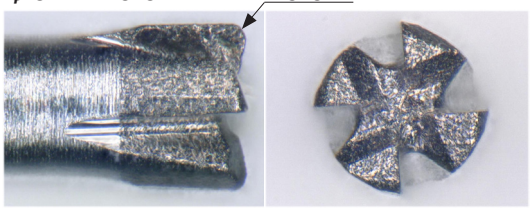
使用工具：SHPR400 φ1 × R0.1 × 3
Tool
加工材料：DC53 (60HRC)
Work material
冷却方式：油雾
Coolant : Oil mist
主轴转速：40,000 min^{-1}
Spindle speed
进给速度：1,600 mm/min
Feed
切深量：ap 0.02 × ae 0.1 mm
Depth of cut

■ 4刃造型从φ0.1起
4-Flute from φ0.1

从φ0.1起采用4刃造型
Adopt 4-flute from φ0.1 as the first in the industry

实现高效率微细加工的同时
维持安定的刀具寿命
Increased cutting efficiency and stable tool life are achieved in precise machining

φ0.1×R0.01　　R0.01



STAVAX（52HRC） 微针造型 STAVAX (52HRC) Micro needle

即使是难维持加工精度的微针造型
高切削性能的刃口造型依然可以实现高精度和长时间加工

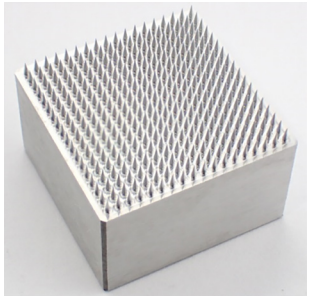
Cutting edge with high machinability realizes high precision machining and long tool life even for micro pin shapes that are difficult to maintain machining accuracy

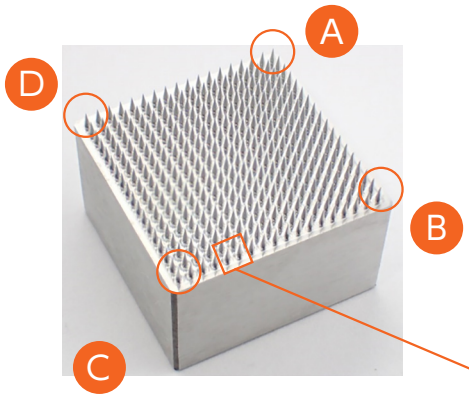
加工材料：STAVAX （52HRC）
Work material

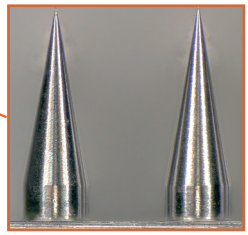
工件尺寸：15 × 15 mm
Work size （加工深度 1.2 mm）
Machining depth

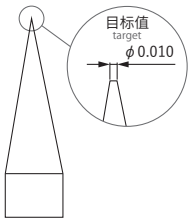
冷却方式：油雾
Coolant : Oil mist

总加工时间：24小时 53分钟
Total machining time : 24 hr 53 min









加工精度 Accuracy

单位 [mm] Unit

测定位置 Measuring position	目标值 Target	实测值 Actual	误差 Error
A	0.010	0.009	- 0.001
B		0.013	+ 0.003
C		0.013	+ 0.003
D		0.013	+ 0.003

加工工序 Process	粗加工① Roughing	粗加工② Roughing	粗加工③ Roughing	粗加工④ Roughing	精加工 Finishing
使用工具 Tool	MHRH430R ϕ2 × R0.02 × 4	SSPB220 R0.2 × 1.2	SSPB220 R0.2 × 1.2	SSR200 ϕ0.3 × R0.02 × 1.5	SHPR400 ϕ0.3 × R0.02 × 1.5
主轴转速 [min^{-1}] Spindle speed	20,000	40,000	40,000	40,000	40,000
进给速度 [mm/min] Feed	1,000	750	500	500	25 ～ 300
切深量 ap × ae [mm] Depth of cut	0.01 × 0.5	ap 0.005	ap 0.005	ap 0.003	0.003 × 0.04
余量 [mm] Stock	0.01	0.01	0.05	0.04	-
加工时间 Machining time	8 分钟 8 min	3小时 19分钟 3hr 19 min	2小时 45分钟 2hr 45 min	3小时 51分钟 3hr 51 min	14小时 50分钟 14hr 50 min

※精加工使用2支刀具
※2 end mills used for finishing

SHPR400

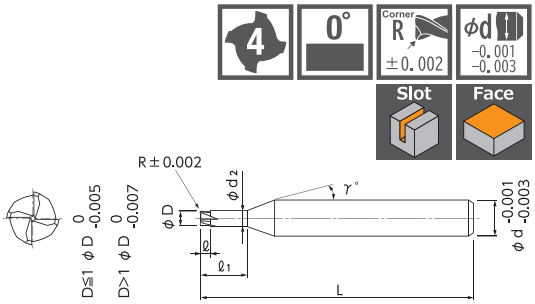
规格 Size φ 0.1 × R0.01 ～ φ 3 × R0.2

CBN ≦70 HRC

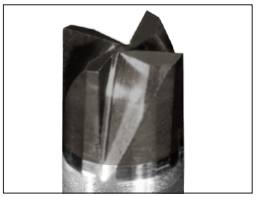
CBN超高精度圆鼻铣刀
CBN Super High Precision Radius End Mill

共 142 种规格
Total 142 sizes

最小刃径φ0.1起的4刃圆鼻铣刀 追求加工精度的高精度规格
4-flute corner radius end mill from Dia.0.1mm.
High precise type to pursue machining accuracy



- 采用新开发的刀刃形状，减轻了切削阻力！成功提高了精加工精度。
- 刃径φ0.1起的4刃！提高了微细切削的加工效率和寿命的稳定性。
- 柄径公差在 -0.001mm 至 -0.003mm 的 2μm 范围内，支持超高精度型的热缩刀柄。
- New tool design has been developed to reduce the cutting resistance and upgrade the finishing accuracy!
- Realized 4-Flute type from φ 0.1! Achieved higher efficient machining and more stable tool life in micro machining!
- The shank diameter accuracy is 2μm (-0.001~-0.003), and also supports high precision shrink fit holders.



刀刃形状
Cutting edge shape

φ0.1 及 φ0.15 的底刃的轴中心为止都没有刀刃。请注意切削余部。
Beware of stocks because there is no blade to the shaft center of endteeth of φ 0.1 and φ 0.15.

加工材料 Work Material

高硬度钢 (～70HRC) Hardened Steel	H
◎	

★返修对应（柄长须在 15mm 以上。详情请咨询本公司。）

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00485-01002	0.1	R0.01	0.2	0.04	0.09	15°	4	50	48,300
01-00485-01003			0.3	0.04	0.09	15°	4	50	48,900
01-00485-01005			0.5	0.04	0.09	15°	4	50	49,800
01-00485-01022		R0.02	0.2	0.04	0.09	15°	4	50	48,300
01-00485-01023			0.3	0.04	0.09	15°	4	50	48,900
01-00485-01025			0.5	0.04	0.09	15°	4	50	49,800
01-00485-01522	0.15	R0.02	0.2	0.06	0.14	15°	4	50	48,300
01-00485-01523			0.3	0.06	0.14	15°	4	50	48,900
01-00485-01525			0.5	0.06	0.14	15°	4	50	49,800
01-00485-01532		R0.03	0.2	0.06	0.14	15°	4	50	46,100
01-00485-01533			0.3	0.06	0.14	15°	4	50	46,800
01-00485-01535			0.5	0.06	0.14	15°	4	50	48,300
01-00485-02203	0.2	R0.02	0.3	0.08	0.19	15°	4	50	36,800
01-00485-02205			0.5	0.08	0.19	15°	4	50	36,800
01-00485-02210			1	0.08	0.19	15°	4	50	37,800
01-00485-02303		R0.03	0.3	0.08	0.19	15°	4	50	33,000
01-00485-02305			0.5	0.08	0.19	15°	4	50	33,000
01-00485-02310			1	0.08	0.19	15°	4	50	34,000
01-00485-03205	0.3	R0.02	0.5	0.13	0.285	15°	4	50	36,300
01-00485-03207			0.75	0.13	0.285	15°	4	50	36,500
01-00485-03210			1	0.13	0.285	15°	4	50	36,800
01-00485-03215			1.5	0.13	0.285	15°	4	50	37,200
01-00485-03220			2	0.13	0.285	15°	4	50	37,800

订购方法 How to Order

请指定SHPR400 外径(D)×角半径(R)×颈长(ℓ1)。
When you order, indicate SHPR400 (D)×(R)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

CBN超高精度圆鼻铣刀
CBN Super High Precision Radius End Mill

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

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01-00485-03405	0.3	R0.05	0.5	0.13	0.285	15°	4	50	32,700
01-00485-03407			0.75	0.13	0.285	15°	4	50	32,900
01-00485-03410			1	0.13	0.285	15°	4	50	33,000
01-00485-03415			1.5	0.13	0.285	15°	4	50	33,500
01-00485-03420			2	0.13	0.285	15°	4	50	34,000
★ 01-00485-04205	0.4	R0.02	0.5	0.24	0.37	15°	4	50	34,400
★ 01-00485-04210			1	0.24	0.37	15°	4	50	34,700
★ 01-00485-04215			1.5	0.24	0.37	15°	4	50	35,000
★ 01-00485-04220			2	0.24	0.37	15°	4	50	35,400
★ 01-00485-04225			2.5	0.24	0.37	15°	4	50	36,000
★ 01-00485-04405		R0.05	0.5	0.24	0.37	15°	4	50	31,000
★ 01-00485-04410			1	0.24	0.37	15°	4	50	31,200
★ 01-00485-04415			1.5	0.24	0.37	15°	4	50	31,200
★ 01-00485-04420			2	0.24	0.37	15°	4	50	31,900
★ 01-00485-04425			2.5	0.24	0.37	15°	4	50	32,400
★ 01-00485-04505		R0.1	0.5	0.24	0.37	15°	4	50	31,000
★ 01-00485-04510			1	0.24	0.37	15°	4	50	31,200
★ 01-00485-04515			1.5	0.24	0.37	15°	4	50	31,200
★ 01-00485-04520			2	0.24	0.37	15°	4	50	31,900
★ 01-00485-04525			2.5	0.24	0.37	15°	4	50	32,400
★ 01-00485-05205	0.5	R0.02	0.5	0.3	0.46	15°	4	48	28,400
★ 01-00485-05210			1	0.3	0.46	15°	4	50	28,600
★ 01-00485-05215			1.5	0.3	0.46	15°	4	50	28,800
★ 01-00485-05220			2	0.3	0.46	15°	4	50	30,200
★ 01-00485-05225			2.5	0.3	0.46	15°	4	50	31,600
★ 01-00485-05405		R0.05	0.5	0.3	0.46	15°	4	48	25,500
★ 01-00485-05410			1	0.3	0.46	15°	4	50	25,700
★ 01-00485-05415			1.5	0.3	0.46	15°	4	50	26,000
★ 01-00485-05420			2	0.3	0.46	15°	4	50	27,200
★ 01-00485-05425			2.5	0.3	0.46	15°	4	50	28,400
★ 01-00485-05505		R0.1	0.5	0.3	0.46	15°	4	48	25,500
★ 01-00485-05510			1	0.3	0.46	15°	4	50	25,700
★ 01-00485-05515			1.5	0.3	0.46	15°	4	50	26,000
★ 01-00485-05520			2	0.3	0.46	15°	4	50	27,200
★ 01-00485-05525			2.5	0.3	0.46	15°	4	50	28,400
★ 01-00485-06205	0.6	R0.02	0.5	0.3	0.56	15°	4	48	28,400
★ 01-00485-06210			1	0.3	0.56	15°	4	50	28,600
★ 01-00485-06215			1.5	0.3	0.56	15°	4	50	28,800
★ 01-00485-06220			2	0.3	0.56	15°	4	50	31,200
★ 01-00485-06225			2.5	0.3	0.56	15°	4	50	31,500
★ 01-00485-06405		R0.05	0.5	0.3	0.56	15°	4	48	25,500
★ 01-00485-06410			1	0.3	0.56	15°	4	50	25,700
★ 01-00485-06415			1.5	0.3	0.56	15°	4	50	26,000
★ 01-00485-06420			2	0.3	0.56	15°	4	50	27,000
★ 01-00485-06425			2.5	0.3	0.56	15°	4	50	28,400
★ 01-00485-06505		R0.1	0.5	0.3	0.56	15°	4	48	25,500
★ 01-00485-06510			1	0.3	0.56	15°	4	50	25,700
★ 01-00485-06515			1.5	0.3	0.56	15°	4	50	26,000
★ 01-00485-06520			2	0.3	0.56	15°	4	50	27,000
★ 01-00485-06525			2.5	0.3	0.56	15°	4	50	28,400
★ 01-00485-08215	0.8	R0.02	1.5	0.56	0.76	15°	4	50	28,800
★ 01-00485-08225			2.5	0.56	0.76	15°	4	50	31,600
★ 01-00485-08250			5	0.56	0.76	15°	4	53	32,700
★ 01-00485-08415		R0.05	1.5	0.56	0.76	15°	4	50	26,000
★ 01-00485-08425			2.5	0.56	0.76	15°	4	50	28,400
★ 01-00485-08450			5	0.56	0.76	15°	4	53	29,300
★ 01-00485-08515		R0.1	1.5	0.56	0.76	15°	4	50	26,000
★ 01-00485-08525			2.5	0.56	0.76	15°	4	50	28,400
★ 01-00485-08550			5	0.56	0.76	15°	4	53	29,300
★ 01-00485-10201	1	R0.02	1	0.7	0.95	15°	4	49	26,400
★ 01-00485-10202			2	0.7	0.95	15°	4	50	26,400
★ 01-00485-10203			3	0.7	0.95	15°	4	50	26,400
★ 01-00485-10205			5	0.7	0.95	15°	4	53	29,900

SHPR400

CBN超高精度圆鼻铣刀
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★返修对应（柄长须在 15mm 以上。详情请咨询本公司。）

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★ 01-00485-10401	1	R0.05	1	0.7	0.95	15°	4	49	23,800
★ 01-00485-10402			2	0.7	0.95	15°	4	50	23,800
★ 01-00485-10403			3	0.7	0.95	15°	4	50	23,800
★ 01-00485-10405			5	0.7	0.95	15°	4	53	26,900
★ 01-00485-10501		R0.1	1	0.7	0.95	15°	4	49	23,800
★ 01-00485-10502			2	0.7	0.95	15°	4	50	23,800
★ 01-00485-10503			3	0.7	0.95	15°	4	50	23,800
★ 01-00485-10505			5	0.7	0.95	15°	4	53	26,900
★ 01-00485-10601		R0.2	1	0.7	0.95	15°	4	49	23,800
★ 01-00485-10602			2	0.7	0.95	15°	4	50	23,800
★ 01-00485-10603			3	0.7	0.95	15°	4	50	23,800
★ 01-00485-10605			5	0.7	0.95	15°	4	53	26,900
★ 01-00485-15202	1.5	R0.02	2	1	1.45	15°	4	52	31,100
★ 01-00485-15203			3	1	1.45	15°	4	52	31,100
★ 01-00485-15204			4.5	1	1.45	15°	4	52	31,100
★ 01-00485-15207			7.5	1	1.45	15°	4	52	35,300
★ 01-00485-15402		R0.05	2	1	1.45	15°	4	52	28,000
★ 01-00485-15403			3	1	1.45	15°	4	52	28,000
★ 01-00485-15404			4.5	1	1.45	15°	4	52	28,000
★ 01-00485-15407			7.5	1	1.45	15°	4	52	31,700
★ 01-00485-15502		R0.1	2	1	1.45	15°	4	52	28,000
★ 01-00485-15503			3	1	1.45	15°	4	52	28,000
★ 01-00485-15504			4.5	1	1.45	15°	4	52	28,000
★ 01-00485-15507			7.5	1	1.45	15°	4	52	31,700
★ 01-00485-15602		R0.2	2	1	1.45	15°	4	52	28,000
★ 01-00485-15603			3	1	1.45	15°	4	52	28,000
★ 01-00485-15604			4.5	1	1.45	15°	4	52	28,000
★ 01-00485-15607			7.5	1	1.45	15°	4	52	31,700
★ 01-00485-20203	2	R0.02	3	1.2	1.94	15°	4	53	32,100
★ 01-00485-20204			4	1.2	1.94	15°	4	53	32,100
★ 01-00485-20206			6	1.2	1.94	15°	4	53	32,100
★ 01-00485-20210			10	1.2	1.94	15°	4	53	35,800
★ 01-00485-20403		R0.05	3	1.2	1.94	15°	4	53	28,800
★ 01-00485-20404			4	1.2	1.94	15°	4	53	28,800
★ 01-00485-20406			6	1.2	1.94	15°	4	53	28,800
★ 01-00485-20410			10	1.2	1.94	15°	4	53	32,200
★ 01-00485-20503		R0.1	3	1.2	1.94	15°	4	53	28,800
★ 01-00485-20504			4	1.2	1.94	15°	4	53	28,800
★ 01-00485-20506			6	1.2	1.94	15°	4	53	28,800
★ 01-00485-20510			10	1.2	1.94	15°	4	53	32,200
★ 01-00485-20603		R0.2	3	1.2	1.94	15°	4	53	28,800
★ 01-00485-20604			4	1.2	1.94	15°	4	53	28,800
★ 01-00485-20606			6	1.2	1.94	15°	4	53	28,800
★ 01-00485-20610			10	1.2	1.94	15°	4	53	32,100
★ 01-00485-30406	3	R0.05	6	1.8	2.85	15°	6	53	37,200
★ 01-00485-30409			9	1.8	2.85	15°	6	53	38,000
★ 01-00485-30412			12	1.8	2.85	15°	6	63	38,800
★ 01-00485-30415			15	1.8	2.85	15°	6	63	39,600
★ 01-00485-30506		R0.1	6	1.8	2.85	15°	6	53	37,200
★ 01-00485-30509			9	1.8	2.85	15°	6	53	38,000
★ 01-00485-30512			12	1.8	2.85	15°	6	63	38,800
★ 01-00485-30515			15	1.8	2.85	15°	6	63	39,600
★ 01-00485-30606		R0.2	6	1.8	2.85	15°	6	53	37,200
★ 01-00485-30609			9	1.8	2.85	15°	6	53	38,000
★ 01-00485-30612			12	1.8	2.85	15°	6	63	38,800
★ 01-00485-30615			15	1.8	2.85	15°	6	63	39,600

订购方法 How to Order

请指定SHPR400 外径(D)×角半径(R)×颈长(ℓ1)。
When you order, indicate SHPR400 (D)×(R)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

加工材料 Work Material				高硬度钢 Hardened Steels STAVAX・SKD61 (～52HRC)				高硬度钢 Hardened Steels SKD11・ELMAX (～62HRC)				高速钢 High Speed Steels SKH・HAP (～68HRC)			
外径 Dia.	角半径 Corner Radius	颈长 Under Neck Length	L(颈长)/D(外径)	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
				a_p mm	a_e mm	mm/min	min^{-1}	a_p mm	a_e mm	mm/min	min^{-1}	a_p mm	a_e mm	mm/min	min^{-1}
0.1	R0.01	0.2	2	0.002	0.015	320	50,000	0.002	0.01	240	50,000	0.001	0.01	120	50,000
		0.3	3	0.002	0.015	240	50,000	0.001	0.01	160	50,000	0.001	0.01	60	50,000
		0.5	5	0.002	0.01	240	50,000	0.001	0.01	160	50,000	0.001	0.01	60	50,000
	R0.02	0.2	2	0.002	0.015	400	50,000	0.002	0.01	300	50,000	0.001	0.01	200	50,000
		0.3	3	0.002	0.015	300	50,000	0.001	0.01	200	50,000	0.001	0.01	100	50,000
		0.5	5	0.002	0.01	300	50,000	0.001	0.01	200	50,000	0.001	0.01	100	50,000
0.15	R0.02	0.2	1.3	0.003	0.02	500	50,000	0.003	0.02	400	50,000	0.002	0.015	300	50,000
		0.3	2	0.003	0.02	400	50,000	0.003	0.02	300	50,000	0.002	0.015	200	50,000
		0.5	3.3	0.002	0.02	400	50,000	0.002	0.02	300	50,000	0.001	0.015	200	50,000
	R0.03	0.2	1.3	0.003	0.02	500	50,000	0.003	0.02	400	50,000	0.002	0.015	300	50,000
		0.3	2	0.003	0.02	400	50,000	0.003	0.02	300	50,000	0.002	0.015	200	50,000
		0.5	3.3	0.002	0.02	400	50,000	0.002	0.02	300	50,000	0.001	0.015	200	50,000
0.2	R0.02	0.3	1.5	0.003	0.03	800	50,000	0.003	0.03	700	50,000	0.002	0.02	500	50,000
		0.5	2.5	0.003	0.03	600	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
		1	5	0.003	0.02	400	50,000	0.003	0.02	400	50,000	0.002	0.01	200	50,000
	R0.03	0.3	1.5	0.003	0.03	800	50,000	0.003	0.03	700	50,000	0.002	0.02	500	50,000
		0.5	2.5	0.003	0.03	600	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
		1	5	0.003	0.02	400	50,000	0.003	0.02	400	50,000	0.002	0.01	200	50,000
0.3	R0.02	0.5	1.7	0.003	0.05	800	50,000	0.003	0.05	700	50,000	0.002	0.03	500	50,000
		0.75	2.5	0.003	0.05	800	50,000	0.003	0.05	640	50,000	0.002	0.03	480	50,000
		1	3.3	0.003	0.05	800	50,000	0.003	0.05	640	50,000	0.002	0.03	480	50,000
		1.5	5	0.003	0.03	640	50,000	0.003	0.03	480	50,000	0.002	0.02	320	50,000
		2	6.7	0.003	0.03	640	50,000	0.003	0.03	480	50,000	0.002	0.02	320	50,000
	R0.05	0.5	1.7	0.003	0.05	1,000	50,000	0.003	0.05	800	50,000	0.002	0.03	600	50,000
		0.75	2.5	0.003	0.05	1,000	50,000	0.003	0.05	800	50,000	0.002	0.03	600	50,000
		1	3.3	0.003	0.05	1,000	50,000	0.003	0.05	800	50,000	0.002	0.03	600	50,000
		1.5	5	0.003	0.03	800	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
		2	6.7	0.003	0.03	800	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
0.4	R0.02	0.5	1.3	0.004	0.1	900	50,000	0.004	0.1	800	50,000	0.003	0.08	600	50,000
		1	2.5	0.004	0.1	900	50,000	0.004	0.1	800	50,000	0.003	0.08	600	50,000
		1.5	3.8	0.004	0.1	900	50,000	0.004	0.1	800	50,000	0.003	0.08	600	50,000
		2	5	0.004	0.08	800	50,000	0.004	0.08	700	50,000	0.003	0.05	500	50,000
		2.5	6.3	0.004	0.08	800	50,000	0.004	0.08	700	50,000	0.003	0.05	500	50,000
	R0.05	0.5	1.3	0.005	0.1	1,100	50,000	0.005	0.1	1,000	50,000	0.004	0.08	800	50,000
		1	2.5	0.005	0.1	1,100	50,000	0.005	0.1	1,000	50,000	0.004	0.08	800	50,000
		1.5	3.8	0.005	0.1	1,100	50,000	0.005	0.1	1,000	50,000	0.004	0.08	800	50,000
		2	5	0.005	0.08	1,000	50,000	0.005	0.08	800	50,000	0.004	0.05	600	50,000
		2.5	6.3	0.005	0.08	1,000	50,000	0.005	0.08	800	50,000	0.004	0.05	600	50,000
	R0.1	0.5	1.3	0.008	0.1	1,200	50,000	0.008	0.1	1,100	50,000	0.005	0.08	900	50,000
		1	2.5	0.008	0.1	1,200	50,000	0.008	0.1	1,100	50,000	0.005	0.08	900	50,000
		1.5	3.8	0.008	0.1	1,200	50,000	0.008	0.1	1,100	50,000	0.005	0.08	900	50,000
		2	5	0.005	0.08	1,200	50,000	0.005	0.08	1,100	50,000	0.004	0.05	900	50,000
		2.5	6.3	0.005	0.08	1,200	50,000	0.005	0.08	1,100	50,000	0.004	0.05	900	50,000
0.5	R0.02	0.5	1	0.005	0.15	1,000	50,000	0.005	0.15	1,000	50,000	0.003	0.1	800	50,000
		1	2	0.005	0.15	1,000	50,000	0.005	0.15	1,000	50,000	0.003	0.1	800	50,000
		1.5	3	0.005	0.15	1,000	50,000	0.005	0.15	1,000	50,000	0.003	0.1	800	50,000
		2	4	0.005	0.1	1,000	50,000	0.005	0.1	1,000	50,000	0.003	0.08	800	50,000
		2.5	5	0.005	0.08	1,000	50,000	0.005	0.08	1,000	50,000	0.003	0.05	800	50,000
	R0.05	0.5	1	0.01	0.15	1,200	50,000	0.01	0.15	1,200	50,000	0.007	0.1	1,000	50,000
		1	2	0.01	0.15	1,200	50,000	0.01	0.15	1,200	50,000	0.007	0.1	1,000	50,000
		1.5	3	0.01	0.15	1,200	50,000	0.01	0.15	1,200	50,000	0.007	0.1	1,000	50,000
		2	4	0.007	0.12	1,200	50,000	0.007	0.12	1,200	50,000	0.005	0.08	1,000	50,000
		2.5	5	0.007	0.1	1,200	50,000	0.007	0.1	1,200	50,000	0.005	0.07	1,000	50,000

切削参数参考表 Recommended Milling Conditions

加工材料 Work Material				高硬度钢 Hardened Steels STAVAX・SKD61 (～52HRC)				高硬度钢 Hardened Steels SKD11・ELMAX (～62HRC)				高速钢 High Speed Steels SKH・HAP (～68HRC)			
外径 Dia.	角半径 Corner Radius	颈长 Under Neck Length	L(颈长)/D(外径)	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
				a_p mm	a_e mm	mm/min	min^{-1}	a_p mm	a_e mm	mm/min	min^{-1}	a_p mm	a_e mm	mm/min	min^{-1}
0.5	R0.1	0.5	1	0.02	0.15	1,600	50,000	0.02	0.15	1,500	50,000	0.01	0.1	1,400	50,000
		1	2	0.02	0.15	1,600	50,000	0.02	0.15	1,500	50,000	0.01	0.1	1,400	50,000
		1.5	3	0.02	0.15	1,600	50,000	0.02	0.15	1,500	50,000	0.01	0.1	1,400	50,000
		2	4	0.01	0.12	1,600	50,000	0.01	0.12	1,500	50,000	0.008	0.08	1,400	50,000
		2.5	5	0.008	0.1	1,600	50,000	0.008	0.1	1,500	50,000	0.005	0.07	1,400	50,000
0.6	R0.02	0.5	0.8	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		1	1.7	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		1.5	2.5	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		2	3.3	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		2.5	4.2	0.005	0.15	1,200	50,000	0.005	0.15	1,200	50,000	0.003	0.12	1,000	50,000
	R0.05	0.5	0.8	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		1	1.7	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		1.5	2.5	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		2	3.3	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		2.5	4.2	0.01	0.15	1,400	50,000	0.01	0.15	1,400	50,000	0.007	0.12	1,200	50,000
	R0.1	0.5	0.8	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		1	1.7	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		1.5	2.5	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		2	3.3	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		2.5	4.2	0.02	0.18	1,800	50,000	0.02	0.15	1,600	50,000	0.01	0.12	1,400	50,000
0.8	R0.02	1.5	1.9	0.005	0.2	1,400	45,000	0.005	0.2	1,400	45,000	0.003	0.1	1,000	40,000
		2.5	3.1	0.005	0.2	1,400	45,000	0.005	0.2	1,400	45,000	0.003	0.1	1,000	40,000
		5	6.3	0.005	0.1	1,400	45,000	0.005	0.1	1,400	45,000	0.003	0.05	1,000	40,000
	R0.05	1.5	1.9	0.01	0.25	1,800	45,000	0.01	0.2	1,600	45,000	0.007	0.1	1,200	40,000
		2.5	3.1	0.01	0.25	1,800	45,000	0.01	0.2	1,600	45,000	0.007	0.1	1,200	40,000
		5	6.3	0.01	0.2	1,800	45,000	0.01	0.15	1,600	45,000	0.005	0.1	1,200	40,000
	R0.1	1.5	1.9	0.02	0.3	2,200	45,000	0.02	0.2	1,800	45,000	0.01	0.1	1,400	40,000
		2.5	3.1	0.02	0.3	2,200	45,000	0.02	0.2	1,800	45,000	0.01	0.1	1,400	40,000
		5	6.3	0.01	0.2	2,200	45,000	0.01	0.15	1,800	45,000	0.005	0.1	1,400	40,000
1	R0.02	1	1	0.005	0.4	1,400	40,000	0.005	0.3	1,400	40,000	0.005	0.2	1,200	36,000
		2	2	0.005	0.4	1,400	40,000	0.005	0.3	1,400	40,000	0.005	0.2	1,200	36,000
		3	3	0.005	0.3	1,400	40,000	0.005	0.2	1,400	40,000	0.005	0.1	1,200	36,000
		5	5	0.005	0.3	1,400	40,000	0.005	0.2	1,400	40,000	0.005	0.1	1,200	36,000
	R0.05	1	1	0.015	0.4	2,000	40,000	0.01	0.3	1,600	40,000	0.01	0.2	1,200	36,000
		2	2	0.015	0.4	2,000	40,000	0.01	0.3	1,600	40,000	0.01	0.2	1,200	36,000
		3	3	0.015	0.3	2,000	40,000	0.01	0.2	1,600	40,000	0.01	0.1	1,200	36,000
		5	5	0.01	0.3	1,800	40,000	0.01	0.2	1,600	40,000	0.005	0.1	1,200	36,000
	R0.1	1	1	0.02	0.4	2,200	40,000	0.02	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		2	2	0.02	0.4	2,200	40,000	0.02	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		3	3	0.02	0.3	2,200	40,000	0.02	0.2	2,000	40,000	0.01	0.1	1,500	36,000
		5	5	0.015	0.3	2,200	40,000	0.015	0.2	2,000	40,000	0.007	0.1	1,500	36,000
	R0.2	1	1	0.03	0.4	2,500	40,000	0.03	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		2	2	0.03	0.4	2,500	40,000	0.03	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		3	3	0.02	0.3	2,500	40,000	0.02	0.2	2,000	40,000	0.01	0.1	1,500	36,000
		5	5	0.02	0.3	2,500	40,000	0.02	0.2	2,000	40,000	0.007	0.1	1,500	36,000
1.5	R0.02	2	1.3	0.005	0.6	2,200	36,000	0.005	0.5	1,800	30,000	0.005	0.3	1,300	24,000
		3	2	0.005	0.6	2,200	36,000	0.005	0.5	1,800	30,000	0.005	0.3	1,300	24,000
		4.5	3	0.005	0.6	2,200	36,000	0.005	0.5	1,800	30,000	0.005	0.3	1,200	24,000
		7.5	5	0.005	0.5	2,000	36,000	0.005	0.4	1,700	30,000	0.005	0.2	1,200	24,000
	R0.05	2	1.3	0.02	0.6	2,500	36,000	0.02	0.5	2,000	30,000	0.01	0.3	1,500	24,000
		3	2	0.02	0.6	2,500	36,000	0.02	0.5	2,000	30,000	0.01	0.3	1,500	24,000
		4.5	3	0.02	0.6	2,500	36,000	0.01	0.5	2,000	30,000	0.01	0.3	1,500	24,000
		7.5	5	0.02	0.5	2,400	36,000	0.01	0.4	2,000	30,000	0.01	0.2	1,400	24,000

加工材料 Work Material				高硬度钢 Hardened Steels STAVAX・SKD61 (～52HRC)				高硬度钢 Hardened Steels SKD11・ELMAX (～62HRC)				高速钢 High Speed Steels SKH・HAP (～68HRC)			
外径 Dia.	角半径 Corner Radius	颈长 Under Neck Length	L(颈长)/D(外径)	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
				ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
1.5	R0.1	2	1.3	0.04	0.6	4,000	36,000	0.03	0.5	3,200	30,000	0.015	0.3	2,000	24,000
		3	2	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.015	0.3	1,800	24,000
		4.5	3	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.01	0.3	1,800	24,000
		7.5	5	0.03	0.5	3,000	36,000	0.02	0.4	2,500	30,000	0.01	0.2	1,600	24,000
	R0.2	2	1.3	0.04	0.6	4,000	36,000	0.03	0.5	3,200	30,000	0.015	0.3	2,000	24,000
		3	2	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.015	0.3	1,800	24,000
		4.5	3	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.01	0.3	1,800	24,000
		7.5	5	0.03	0.5	3,000	36,000	0.02	0.4	2,500	30,000	0.01	0.2	1,600	24,000
2	R0.02	3	1.5	0.005	0.8	2,500	30,000	0.005	0.7	2,000	24,000	0.005	0.4	1,200	16,000
		4	2	0.005	0.8	2,300	30,000	0.005	0.7	1,800	24,000	0.005	0.4	1,100	16,000
		6	3	0.005	0.8	2,300	30,000	0.005	0.7	1,800	24,000	0.005	0.4	1,100	16,000
		10	5	0.005	0.6	2,200	30,000	0.005	0.5	1,700	24,000	0.005	0.3	1,000	16,000
	R0.05	3	1.5	0.025	0.8	2,700	30,000	0.02	0.7	2,200	24,000	0.015	0.4	1,300	16,000
		4	2	0.025	0.8	2,700	30,000	0.02	0.7	2,200	24,000	0.015	0.3	1,300	16,000
		6	3	0.025	0.8	2,700	30,000	0.02	0.7	2,200	24,000	0.015	0.3	1,300	16,000
		10	5	0.02	0.6	2,500	30,000	0.015	0.5	2,000	24,000	0.01	0.3	1,200	16,000
	R0.1	3	1.5	0.05	0.8	4,000	30,000	0.04	0.7	3,200	24,000	0.02	0.4	1,500	16,000
		4	2	0.05	0.8	3,500	30,000	0.04	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		6	3	0.04	0.8	3,500	30,000	0.03	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		10	5	0.03	0.6	3,000	30,000	0.02	0.5	2,400	24,000	0.01	0.3	1,300	16,000
	R0.2	3	1.5	0.05	0.8	4,000	30,000	0.04	0.7	3,200	24,000	0.02	0.4	1,500	16,000
		4	2	0.05	0.8	3,500	30,000	0.04	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		6	3	0.04	0.8	3,500	30,000	0.03	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		10	5	0.03	0.6	3,000	30,000	0.02	0.5	2,400	24,000	0.01	0.3	1,300	16,000
3	R0.05	6	2	0.03	1	2,700	24,000	0.02	0.85	2,200	20,000	0.015	0.6	1,300	12,000
		9	3	0.03	1	2,700	24,000	0.02	0.85	2,200	20,000	0.015	0.6	1,300	12,000
		12	4	0.03	0.85	2,700	24,000	0.02	0.7	2,200	20,000	0.015	0.5	1,300	12,000
		15	5	0.02	0.85	2,500	24,000	0.02	0.7	2,000	20,000	0.01	0.5	1,200	12,000
	R0.1	6	2	0.05	1	4,000	24,000	0.04	0.85	3,200	20,000	0.02	0.6	1,500	12,000
		9	3	0.05	1	3,500	24,000	0.04	0.85	2,800	20,000	0.02	0.6	1,500	12,000
		12	4	0.04	0.85	3,500	24,000	0.04	0.7	2,800	20,000	0.02	0.5	1,500	12,000
		15	5	0.03	0.85	3,000	24,000	0.03	0.7	2,400	20,000	0.015	0.5	1,300	12,000
	R0.2	6	2	0.05	1	4,000	24,000	0.04	0.85	3,200	20,000	0.02	0.6	1,500	12,000
		9	3	0.05	1	3,500	24,000	0.04	0.85	2,800	20,000	0.02	0.6	1,500	12,000
		12	4	0.04	0.85	3,500	24,000	0.04	0.7	2,800	20,000	0.02	0.5	1,500	12,000
		15	5	0.03	0.85	3,000	24,000	0.03	0.7	2,400	20,000	0.015	0.5	1,300	12,000

备 注 Notes

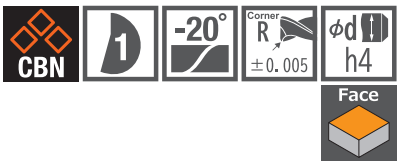
※1 切深量为中精加工、精加工时的参考值。请根据机床刚性、要求精度和加工形状进行适当调整。
※2 切深量的ap表示轴向切深量，ae表示径向切深量。
※3 为了获得优质的加工面，预加工（中精加工）时请注意精加工余量需保持均匀。
※4 R角等切削阻力大的部位，请特别注意参数设定和刀路轨迹等。
※5 轴向进刀建议采用螺旋进刀及倾斜进刀方式。
※6 发生振刀时，请以相同的比率降低主轴转速和进给速度。主轴转速过低时，也以相同的比率降低。
※7 建议使用油雾冷却方式。

※1 Depth of Cut shows maximum value for semi-finishing and finishing. Adjust milling conditions depending on rigidity of machine, desired accuracy and milling shape.
※2 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 To achieve better cutting surface, obtain uniform stock amount on cutting surface in semi-finishing.
※4 When machining at high load area, such as corners, please pay attention to set cutting condition and tool paths.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※7 We recommend using oil mist coolant.

针对高硬度钢可进行高精度平面精加工的单刃铣刀
Single flute for hardened steel machining achieves high precision finishing on plane surface

CBN超精加工用圆鼻铣刀
CBN Super Surface End Mill

SSF120



φ 0.2 × R0.05 ～ φ 2 × R0.1

共有 9 种规格
Total 9 sizes

特长 Features

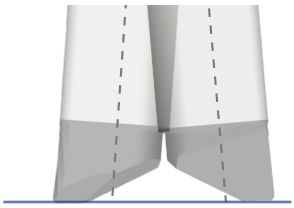
底面精加工
Bottom surface finishing

独特的刃口设计实现高精度底面精加工
Unique cutting edge design achieves high precise bottom surface finishing

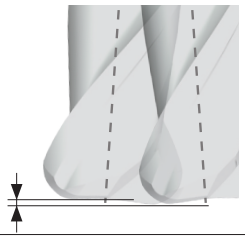
■ 抑制底刃振刀的单刃造型
Single flute design suppresses chattering at end cutting edge

无段差
No step

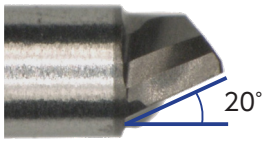
SSF120可抑制振刀
实现高精度底面加工
SSF120 suppresses chattering and realizes high accuracy on bottom surface



2刃会随着振刀
产生段差
2-flute occurs steps by run out



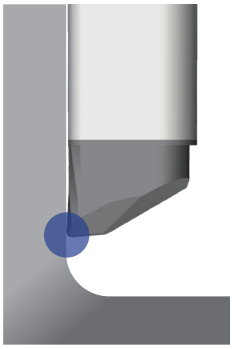
■ 高刚性设计
High rigidity tool design



提升刚性的左螺旋角20°
Left-handed 20°helix angle increases tool rigidity

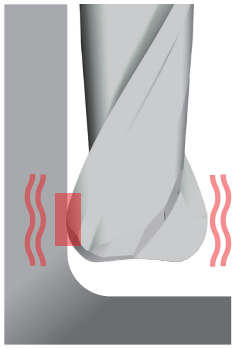
■ 外周刃倒锥造型
Peripheral cutting edge with back taper design

SSF120



点切削
减少振刀
Milling by point reduce the chattering

普通铣刀
General end mill



面切削
切削负荷大
Cutting load is large due to surface machining

为了抑制由切削负荷的不断增加产生的振刀现象，
外周刃采用强倒锥造型减轻切削负荷，
实现安定的加工面品质

Adopted strong back taper shape for peripheral cutting edge to suppress chattering that occurred by increasing cutting load.
Realizes a stable cutting surface through reducing cutting load.

加工案例1 Machining case 1

DC53 (60HRC) 微小口袋造型 DC53 (60HRC) Micro pocket

底面加工专用刀具
针对口袋加工实现面粗度Ra 0.007 μm

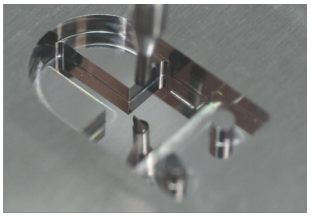
Surface roughness of Ra0.007um is achieved by
pocket processing using a specialized tool for bottom surface machining

加工材料：DC53（60HRC）
Work material

工件尺寸：10 × 6 mm（加工深度 2 mm）
Work size
Machining depth

冷却方式：油雾
Coolant : Oil mist

精加工时间：1小时 36分钟
Finishing machining time : 1 hr 36 min



面粗度：Rz 0.070 μm
Ra 0.007 μm
Surface roughness: Rz 0.070 μm
Ra 0.007 μm

使用工具 Tool	SSF120 ϕ0.8 × R0.05 × 2
主轴转速 [min^{-1}] Spindle speed	35,000
进给速度 [mm/min] Feed	150
切深量 ap × ae [mm] Depth of cut	侧面:0.01 × 0.01 Side 平面:0.003 × 0.005 Flat

加工案例2 Machining case 2

DC53 (60HRC) 镜面加工 DC53 (60HRC) Mirror finishing

实现可以清晰反射文字的程度
面粗度达到 Rz 0.0163 μm

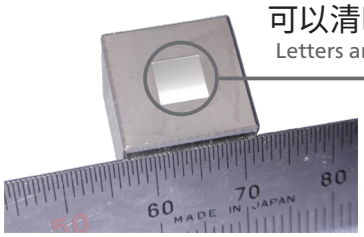
Achieves a high surface roughness of Rz0.0163um
that clearly reflects letters on the machined surface

加工材料：DC53（60HRC）
Work material

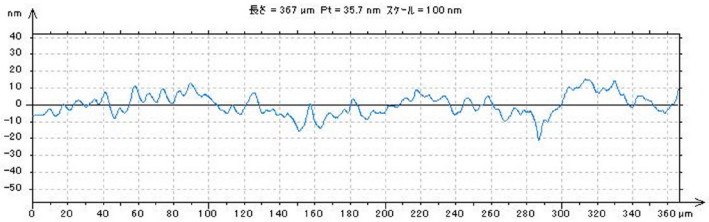
工件尺寸：15 × 15 mm
Work size

冷却方式：油雾
Coolant : Oil mist

总加工时间：30 分钟
Total machining time : 30 min



可以清晰的反射文字
Letters are clearly reflected



面粗度：Rz 0.0163 μm
Surface roughness: Rz0.0163 μm

使用工具 Tool	SSF120 ϕ0.5 × R0.05 × 0.25
主轴转速 [min^{-1}] Spindle speed	120,000
进给速度 [mm/min] Feed	300
切深量 ap × ae [mm] Depth of cut	0.002 × 0.005

SSF120

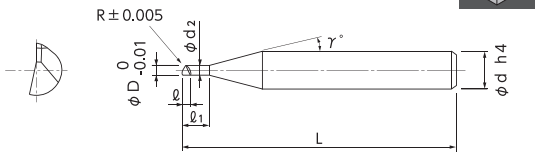
规格
Size φ 0.2 × R0.05 ～ φ 2 × R0.1

CBN ≦70 HRC

CBN超精加工用圆鼻铣刀
CBN Super Surface End Mill

共 9 种规格
Total 9 sizes

高硬度钢用单刃平面加工用铣刀
适用于高精度的平面精加工
Single flute end mill for hardened steels
Specialized for accurate finishing on flat surface



- 最适合精细加工时的基准面加工。
- 采用 NS TOOL 独创的形状和圆角 R，实现稳定的加工表面。
- Appropriate for datum plane machining on precision machining.
- NS original design and corner R to realize stable machining surface.

刀刃形状
Cutting edge shape

加工材料 Work Material

高硬度钢 (～70HRC) Hardened Steel	H
◎	

单位 [规格：mm / 价格：日元]
Unit [Size : mm / Retail Price : JPY]

产品代码 Code No.	(D)外径 Dia.	(R)角半径 Corner Radius	(ℓ)刃长 Length of Cut	(ℓ1)颈长 Under Neck Length	(d2)颈径 Neck Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00470-00020	0.2	R0.05	0.1	0.5	0.19	15°	4	50	35,000
01-00470-00030	0.3	R0.05	0.15	0.75	0.28	15°	4	50	30,000
01-00470-00040	0.4	R0.05	0.2	1	0.37	15°	4	50	25,000
01-00470-00050	0.5	R0.05	0.25	1.25	0.46	15°	4	50	22,000
01-00470-00060	0.6	R0.05	0.3	1.5	0.56	15°	4	50	24,000
01-00470-00080	0.8	R0.05	0.4	2	0.76	15°	4	50	23,000
01-00470-00100	1	R0.1	0.5	2.5	0.95	15°	4	50	22,000
01-00470-00150	1.5	R0.1	0.75	3.8	1.45	15°	4	52	23,000
01-00470-00200	2	R0.1	1	5	1.94	15°	4	52	25,000

订购方法 How to Order
请指定SSF120 外径(D)。
When you order, indicate SSF120 (D).

※(γ)为参考值。
※(γ) is reference value.

加工材料 Work Material	高硬度钢・高速钢 Hardened Steels・High Speed Steels STAVAX・SKD11・SKH (～68HRC)			
外径 Dia.	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed
	ap mm	ae mm	mm/min	min^{-1}
0.2	0.002	0.003	50	60,000
0.3	0.002	0.003	100	60,000
0.4	0.002	0.003	150	60,000
0.5	0.003	0.005	200	60,000
0.6	0.003	0.005	240	60,000
0.8	0.003	0.008	280	60,000
1	0.005	0.01	300	60,000
1.5	0.005	0.02	400	60,000
2	0.005	0.03	500	60,000
备 注 Notes	※1 切深量的ap表示轴向切深量，ae表示径向切深量。 ※2 建议使用油雾冷却方式。 ※3 建议使用刚性较大的铣刀刀柄和机床。 ※4 请根据需要控制刀具的伸出量。 ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 We recommend using oil mist coolant. ※3 Machine, tool chuck must be sufficiently accurate. ※4 Length of tool overhang must be as short as possible.			

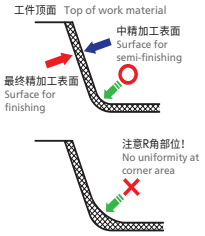
使用注意事项 Points in Use

加工环境 *Advice on Cutting Environment*

- 刀具偏摆量越小越好。
  Minimize the deflection of cutting edge.
- 掌握机床主轴的伸缩量以及机床的水平状态，需要时采取恰当的措施。
  To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

精加工量(余量) *Advice on Finishing Allowance (stock amount)*

- 使用小径CBN铣刀时，**精加工量(余量)均匀性非常重要**。
  When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- 粗加工・中精加工使用刀具磨损过大时，中精加工和精加工的余量会变大，从而影响刀具寿命和加工精度，所以**预加工时留有均匀的加工余量非常重要**。
  When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy. Therefore, it is important to get uniform stock amount in the pre-stage cutting.



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TEL. ＋ 86(512)-6866-2275

www.ns-tool.com.cn（手机官网）

使用上的安全注意事项　Attention on Safety

1）拿取刀具使用时，请特别小心避免损坏刀刃。
2）请勿空手触摸刀刃
3）为了安全，使用刀具时请带防护眼镜。
4）选用适合刀具和实际加工内容的刀柄。刀柄装夹后将刀柄的偏摆量控制最低。
5）加工工件必须固定好。
6）请预先测量刀具及加工材料的尺寸。
7）请根据工件形状和使用设备情况来调节切削参数。
8）根据实际用途请选择适合的冷却方式。使用切削油时，请采取防火措施以免发生火花引起火灾等发生。
9）加工过程中如发生异常现象（异常声音或烟雾）时，请立即停止机床。
10）请勿改造刀具。

1) When removing tools from cases, be careful of getting-out of tools and don't touch directly the cutting edges.
2) Never touch the cutting edges directly with bare hand.
3) Use safety covers and eye protection, as tools may be broken.
4) Use holders, etc. that match the tools and nature of the machining operations. The tool should be firmly attached to the holder to prevent shaking.
5) The work materials clamp firmly.
6) Make sure of dimensions of tools and work pieces before starting operation.
7) It is necessary to adjust conditions according to the dimensions of work materials and the machine.
8) Select a cutting fluid appropriate to the particular usage. Using water-insoluble fluid could lead to fires due to sparks generated during machining or heat caused by breakage. Ensure that you take proper fire-prevention measures.
9) If abnormal sound, etc. occurs during machining, stop the machine immediately.
10) Don't modify tools.

23' 11
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ISO 9001 JQA-QM6096　ISO 14001 JQA-EM3712