NS TOOL

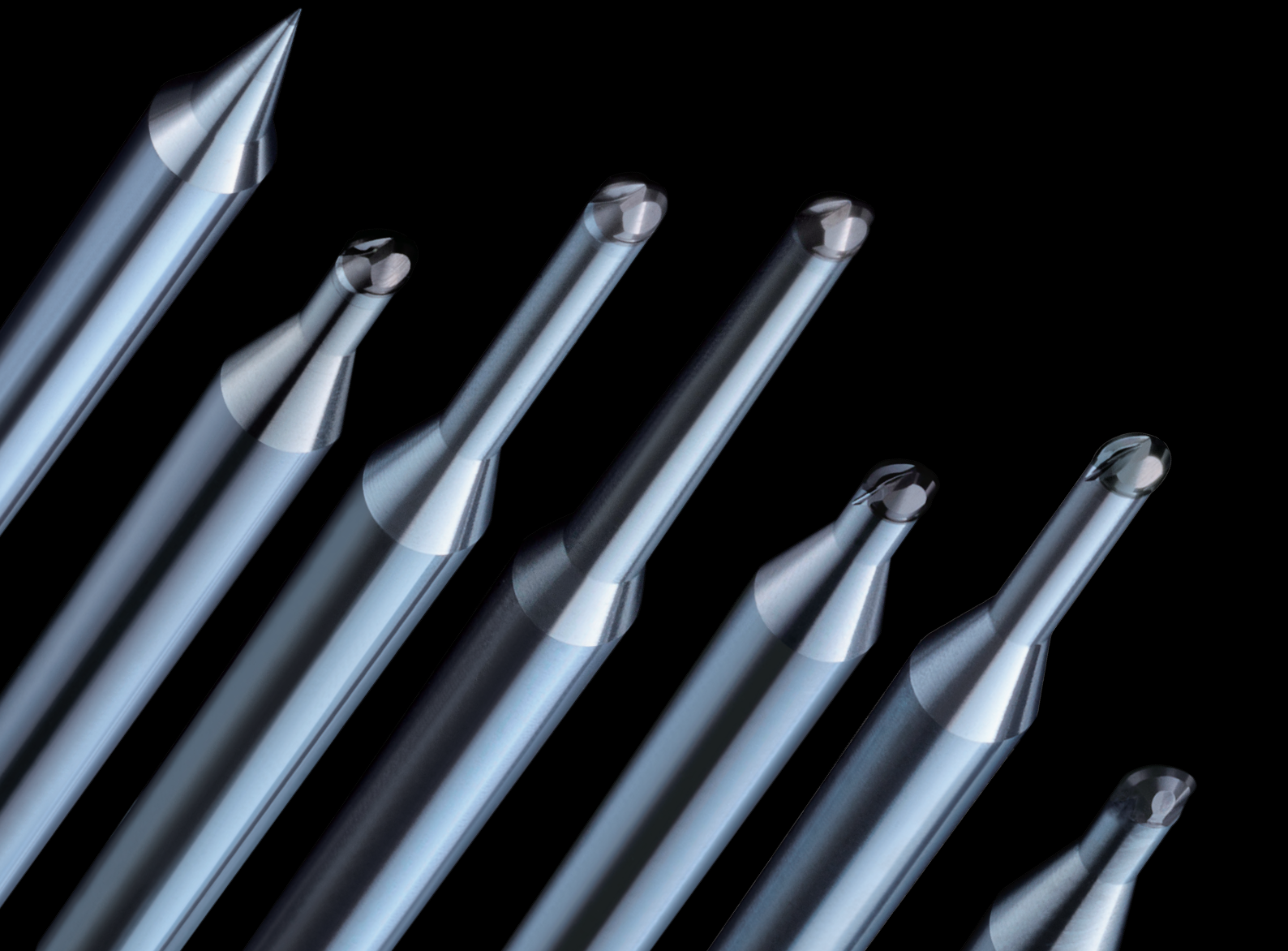
CORE LINE

「匠」心创先

CBN

CBN END MILL SERIES Vol.4
BALL END MILL

CBN 铣刀系列 Vol.4
球头系列



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

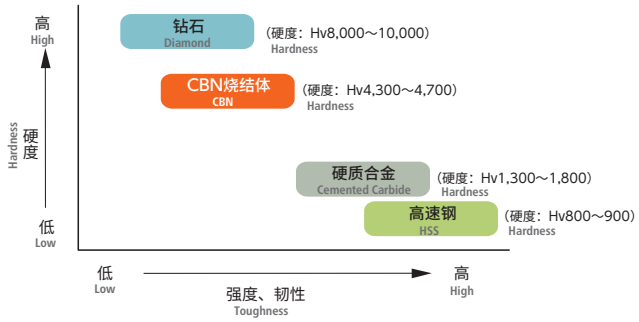
CBN球头铣刀
CBN ball end mill

类型 Type	型号 Model	最大加工深度 Maximum cutting depth (1D 2D 3D ・・・ 10D)	规格 Size 刃数・螺旋角・精度 Number of flute/Helix angle/Tolerance	加工用途 Applications
超微细 For micro milling SMB 类型 Type	**SMB120** R 角从 R0.01 起标准化 开拓新微细加工领域的超微细切削工具 Standarized sizes from R0.01 Micro cutting tools open up new areas in the microfabrication field	L/D=1	R0.01 ～ R0.05 共有 7 种规格 Total 7 sizes 1 / -20° / R ±0.002 / φd h3	3D
	SMB200 2 刃造型 R 角从 R0.01 起 高精度造型的超微细切削工具 2-flute shape specialized from R0.01 High precise specific micro end mill	L/D=0.75	R0.01 ～ R0.05 共有 7 种规格 Total 7 sizes 2 / 0° / R ±0.002 / φd -0.001 -0.003	3D
面粗度 For surface roughness SSPB 类型 Type	**SSPB220** 采用螺旋球头造型， 实现具有光泽的加工面 Adopt spiral ball shape to realize glossy finishing surface	L/D=3	R0.1 ～ R3 共有 30 种规格 Total 30 sizes 2 / 20° / R ±0.003 (R≦1) / R ±0.005 (R>1) / φd h4	3D
	SSPBL220 灵活运用螺旋球头造型， 提升沟槽加工面精度 While taking advantage of the spiral ball shape, the finishing surface of deep milling is improved	L/D=10	R0.1 ～ R1 共有 27 种规格 Total 27 sizes 2 / 20° / R ±0.003 / φd h4	3D
	SSPBTN220 螺旋球头造型和高刚性的锥颈 实现了沟槽部的高精度精加工 Features of spiral ball shape and high rigidity tapered neck shape enable high precision deep milling on finishing	L/D=10	R0.1 × 颈角 30′ (Neck taper angle) ～ R1 × 颈角 2° (Neck taper angle) 共有 64 种规格 Total 64 size 2 / 20° / R ±0.003 / φd h4	3D
加工精度稳定 For stable machining precision SSB 类型 Type	**SSB200** 高效率 CBN 球头铣刀 兼备 CBN 的超长刀具寿命和高精度及钨钢刀具的使用便利性 This CBN Ball End Mill has realized both advantages of CBN and Carbide	L/D=2.5	R0.1 ～ R1 共有 15 种规格 Total 15 sizes 2 / 0° / R ±0.003 / φd h4	3D
	SSBL200 具备 SSB200 的特长和最大 10 倍的颈长 使沟槽精加工变得更有效率 Features of SSB200 and maximum L/D=10 of the under neck length realize high efficiency deep milling on finishing	L/D=10	R0.05 ～ R1 共有 25 种规格 Total 25 sizes 2 / 0° / R ±0.003 / φd h4	3D
平缓斜面 For gradual shape SFB 类型 Type	**SFB200** 使用 R 中心刃的加工 也可实现纳米级精加工面 Outstanding machinability up to the tool center realizes a nano-level finishing surface	L/D=2.5	R0.1 ～ R1 共有 12 种规格 Total 12 sizes 2 / 0° / R ±0.003 / φd h4	3D

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。刀具在刀尖受到较大阻力的粗加工中，容易出现崩刀的情况，所以 CBN 刀具不适合用于粗加工。但在切削抵抗小的精加工中，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.

■ CBN球头铣刀　加工精度的安定性评价
CBN ball end mill　Stability evaluation of cutting accuracy

使用工具: SSBL200　R0.5 × 6
Tool　涂层钨钢铣刀　R0.5 × 6
Coated carbide end mill

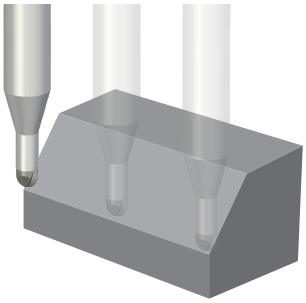
加工材料: STAVAX (52HRC)
Work material

主轴转速 n: 30,000 min^{-1}
Spindle speed

进给速度 vf: 1,500 mm/min
Feed

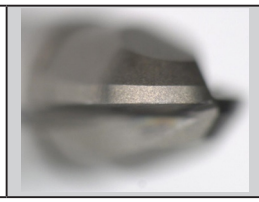
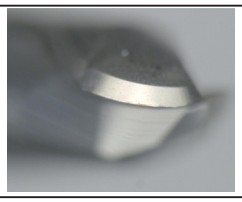
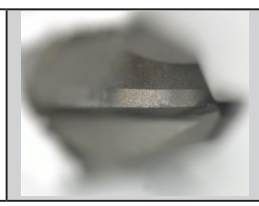
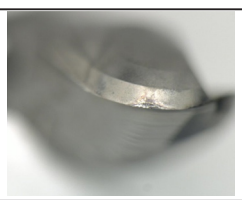
切深量: ap 0.01 mm　余量: 0.01 mm
Depth of cut　Stock

冷却方式: 油雾
Coolant　Oil mist



45°倾斜面精加工后的剩余量
Stock after finishing on 45°inclined surface

加工后的铣刀状态
Tool condition after machining

	SSBL200	涂层钨钢球头铣刀 Coated carbide ball end mill
20m 切削后 After machining 20m		
1,520m 切削后 After machining 1,520m		

精加工后的剩余量 [单位：μm]
Stock after finishing

切削距离 Cutting distance	SSBL200	涂层钨钢球头铣刀 Coated carbide ball end mill
20 m	3.7	3.4
320 m	6.8	6.8
620 m	8.0	6.6
920 m	7.9	8.8
1,220 m	7.7	12.3
1,520 m	7.0	12.4

规格尺寸从R0.01mm起标准品化，可实现超微细切削加工

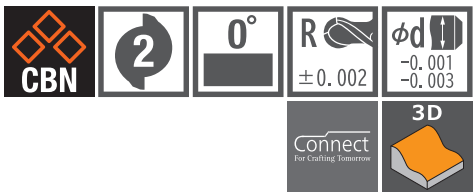
Lineup from R0.01mm enables micro precision machining

超微细加工用CBN2刃球头铣刀

CBN Micro 2-Flute Ball End Mill

SMB200 New　R0.01 ～ R0.05　共有 7 种规格

Total 7 sizes

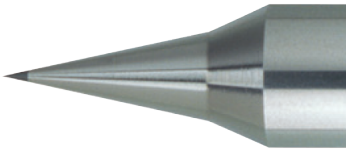


超微细加工用CBN球头铣刀 "CBN Micro Ball"

CBN Ball End mill for precision machining "CBN Micro Ball"

SMB120　R0.01 ～ R0.05　共有 7 种规格

Total 7 sizes

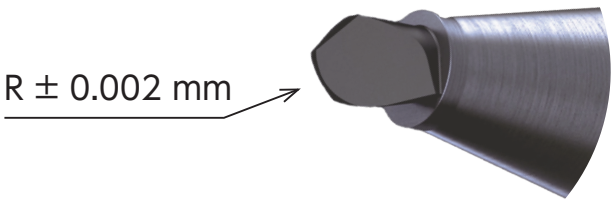


超高精度造型 Ultra High Precision	R 精度公差、柄径公差 R tolerance , shank accuracy

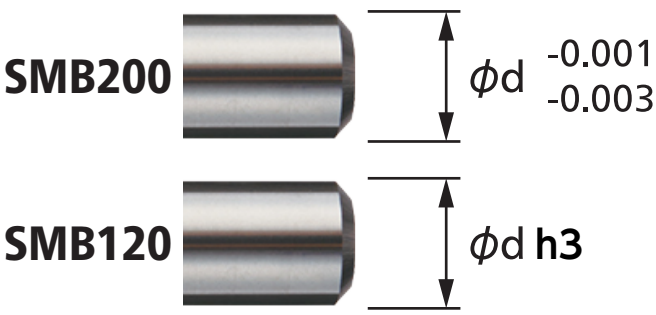
为了实现超微细切削加工，将 R 角精度公差和偏摆精度都保持在 ±0.002 mm 以内，SMB120 的刀柄精度为 0 ～ -0.0025（JIS 规格 h3），SMB200 的刀柄精度是 -0.001 ～ -0.003，控制在 0.002 mm 的范围内实现高精度规格

To enable micro precision machining, we keep R accuracy tolerance and runout accuracy are all within ± 0.002 mm,shank accuracy is 0 to -0.0025 (JIS h3) for SMB120, and -0.001 to -0.003 for SMB200, micro precision specifications are realized by making a range of 0.002 mm

R 精度公差
R tolerance



柄径公差
shank accuracy



STAVAX(52HRC) 阵列式透镜工件　STAVAX (52HRC) Micro lens array

独特的刃口造型，高精度R角精度为 ±0.002mm 实现超微细切削加工

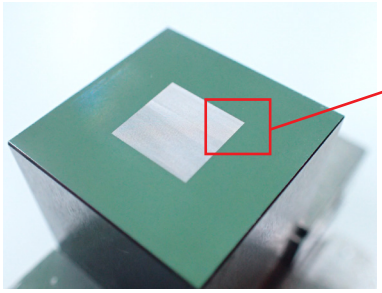
Micro precision machining is realized by specialized cutting edge and high R accuracy R±0.002mm

加工材料：STAVAX（52HRC）
Work material

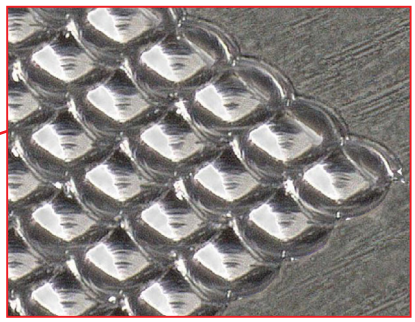
加工尺寸：9×9×加工深度 0.03 mm
Machined size　Machining depth

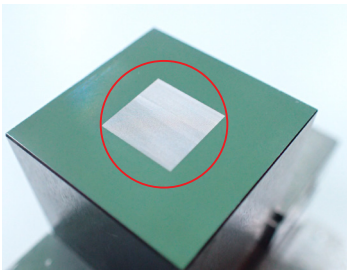
冷却方式：油雾
Coolant : Oil mist

总加工时间：93小时 57分钟
Total machining time : 93 hr 57 min

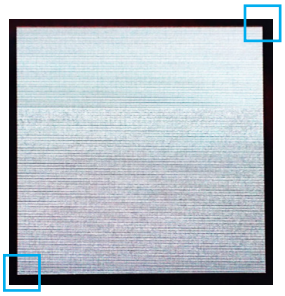


SR形状 22,500个
SR shape 22,500pcs



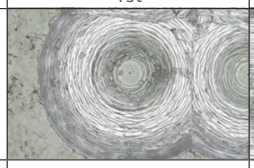
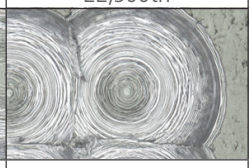


加工终期
At the end of machining



加工初期
At the beginning of machining

加工精度
Accuracy

		加工初期 At the beginning of machining 第1个 1st	加工终期 At the end of machining 第22,500个 22,500th
扩大图 (2,000倍) Enlarged photo (×2,000)			
面粗度 [μm] Surface roughness		Ra : 0.078	Ra : 0.085
加工精度 [mm] Machining accracy	深度 Depth 目标值：0.030 Target	0.031	0.030
	精度 Accuracy 目标值：R0.050 Target	R0.050	R0.049

加工工序 Process	粗加工 Roughing	精加工 Finishing
使用工具 Tool	SSBL200 R0.05 × 0.3	SMB200 R0.03
主轴转速 [min^{-1}] Spindle speed	60,000	60,000
进给速度 [mm/min] Feed	100	30
切深量 [mm] ap × ae Depth of cut	0.005 × 0.005	0.001 × 0.001
余量 [mm] Stock	0.002	-
加工时间 Machining time	36小时 16分钟 36 hr 16 min	57小时 41分钟 57 hr 41 min

SMB200 New

规格 Size R0.01 ～ R0.05

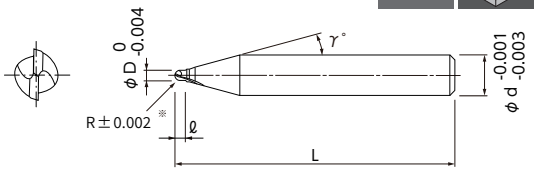
CBN ≦70 HRC

超微细加工用 CBN2刃球头铣刀
CBN Micro 2-Flute Ball End Mill

共 7 种规格
Total 7 sizes

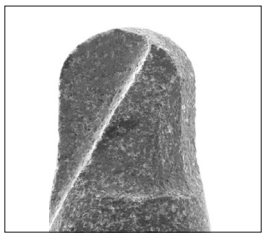
R角规格从R0.01起的2刃造型 高精度造型的超微細切削工具

2-flute shape specialized from R0.01
High precise specific micro end mill



※R 角精度以实际刃径的1/2 为基准值
R accuracy is based on a half value of actual diameter

- 从 R0.01 起采用 2 刃造型可较以往实现更高效率加工。
- 通过最大限度活用 CBN的材料特点来实现锋利的刀刃。
- 柄径公差为 -0.001mm~-0.003mm 的高精度造型。
- Adopting 2-flute shape from R0.01 enables more efficient machining than conventional products.
- Realized sharp edge by maximizing features of CBN.
- Shank diameter tolerance is high accuracy type between -0.001mm and -0.003mm.



刀刃形状
Cutting edge shape

加工材料 Work Material

调质钢 Prehardened Steel P	高硬度钢 Hardened Steel H		
	～55HRC	～65HRC	～70HRC
○	◎	◎	○

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

产品代码 Code No.	(R)球头半径 Radius	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00461-00010	R0.01	0.015	0.02	15°	4	48	78,000
01-00461-00015	R0.015	0.025	0.03	15°	4	48	68,000
01-00461-00020	R0.02	0.03	0.04	15°	4	48	57,500
01-00461-00025	R0.025	0.04	0.05	15°	4	48	53,000
01-00461-00030	R0.03	0.045	0.06	15°	4	48	51,000
01-00461-00040	R0.04	0.06	0.08	15°	4	48	46,500
01-00461-00050	R0.05	0.075	0.1	15°	4	48	38,200

订购方法 How to Order
请指定SMB200 球头半径(R)。
When you order, indicate SMB200 (R).

※(γ)为参考值。
※(γ) is reference value.

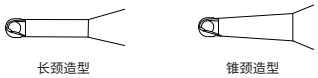
切削参数参考表 Recommended Milling Conditions

加工材料 Work Material	调质钢·高硬度钢 Prehardened Steels·Hardened Steels NAK·STAVAX (～52HRC)					调质钢·高硬度钢 Prehardened Steels·Hardened Steels SKD11·PD613·ELMAX (～60HRC)					高速钢 High Speed Steels SKH·HAP (～68HRC)				
R 球头半径 Radius	切深量 Depth of Cut		进给速度 Feed	进刀速度 Approaching Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	进刀速度 Approaching Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	进刀速度 Approaching Feed	主轴转速 Spindle Speed
	ap mm	ae mm	mm/min	mm/min	min^{-1}	ap mm	ae mm	mm/min	mm/min	min^{-1}	ap mm	ae mm	mm/min	mm/min	min^{-1}
0.01	0.0005	0.001	5	3	60,000	0.0005	0.001	5	3	60,000	0.0005	0.0005	3	1	60,000
0.015	0.001	0.001	30	5	60,000	0.001	0.001	20	5	60,000	0.0005	0.001	10	3	60,000
0.02	0.001	0.002	80	5	60,000	0.001	0.001	60	5	60,000	0.001	0.001	40	5	60,000
0.025	0.001	0.002	120	10	60,000	0.001	0.0015	100	10	60,000	0.001	0.001	60	5	60,000
0.03	0.002	0.002	180	10	60,000	0.001	0.002	140	10	60,000	0.001	0.001	80	10	60,000
0.04	0.003	0.003	280	30	60,000	0.002	0.003	200	30	60,000	0.002	0.002	120	20	60,000
0.05	0.005	0.005	400	30	60,000	0.003	0.005	300	30	60,000	0.002	0.003	180	20	60,000

备 注 Notes

※1 切深量的ap表示轴向切深量，ae表示步距量。
※2 拆装或者预调刀具时请务必小心。
※3 建议使用油雾冷却方式。
※4 尽可能抑制刀具偏摆量。
（可能的话，请确认所用主轴转速下的动态偏摆精度。）
※5 进刀角度请设在3°以下。
※6 增加切深量会导致刀具折断。特别须注意ap值的设定。
※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 Handle with care when exchanging and presetting tool.
※3 We recommend using oil mist coolant.
※4 Minimize chucking runout.
(Recommend to measure actual runout at activated spindle speed.)
※5 Tool approaching angle must be 3 degrees or below.
※6 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.

首部追加工可能
Neck modification is available



SMB200 可以进行颈部追加工
详情请咨询本公司
Neck modification is available.
Please ask for details.

SMB120

规格 Size R0.01 ～ R0.05

CBN ≦70 HRC

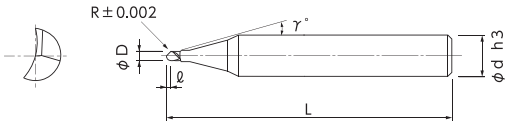
超微细加工用 CBN球头铣刀 “CBN Micro Ball”

CBN Ball End Mill for precision machining “CBN Micro Ball”

共 7 种规格
Total 7 sizes

R0.01～R0.05实现超微细加工

Realized micro milling by size line up R0.01 - R0.05



- 行业前列！ CBN材质的微米极球头铣刀。
- 球头半径从R0.01起实现标准化。
- 从调质钢到高硬度钢，皆可长时间加工。
- The world’s first CBN Micro Ball End Mill.
- Standarized sizes from R0.01.
- Realized sharp edge by maximizing features of CBN.

刀刃形状
Cutting edge shape

加工材料 Work Material

调质钢 Prehardened Steel P	高硬度钢 Hardened Steel H		
	～55HRC	～65HRC	～70HRC
○	◎	◎	○

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

产品代码 Code No.	(R)球头半径 Radius	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00460-00010	R0.01	0.02	0.02	15°	4	50	72,000
01-00460-00015	R0.015	0.03	0.03	15°	4	50	62,000
01-00460-00020	R0.02	0.04	0.04	15°	4	50	51,600
01-00460-00025	R0.025	0.05	0.05	15°	4	50	47,400
01-00460-00030	R0.03	0.06	0.06	15°	4	50	43,200
01-00460-00040	R0.04	0.08	0.08	15°	4	50	39,600
01-00460-00050	R0.05	0.1	0.1	15°	4	50	36,000

订购方法 How to Order

请指定SMB120 球头半径(R)。
When you order, indicate SMB120 (R).

※(γ)为参考值。
※(γ) is reference value.

切削参数参考表 Recommended Milling Conditions

加工材料 Work Material	调质钢・高硬度钢 Prehardened Steels・Hardened Steels NAK・STAVAX・SKD11・PD613 (～62HRC)				
R 球头半径 Radius	切深量 Depth of Cut		进给速度 Feed	进刀速度 Approaching Feed	主轴转速 Spindle Speed
	ap mm	ae mm	mm/min	mm/min	min^{-1}
0.01	0.0005	0.001	5	3	80,000
0.02	0.001	0.001	30	5	80,000
0.03	0.001	0.002	70	10	80,000
0.04	0.002	0.003	100	30	80,000
0.05	0.002	0.005	200	30	80,000

备 注 Notes

※1 切深量的ap表示轴向切深量，ae表示步距量。
※2 拆装或者调整刀具时请务必小心。
※3 建议使用油雾冷却方式。
※4 尽可能抑制刀具偏摆量。
（可能的话，请确认所用主轴转速下的动态偏摆精度。）
※5 进刀角度请设在3°以下。
※6 增加切深量会导致刀具折断。特别须注意ap值的设定。

※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 Handle with care when exchanging and presetting tool.
※3 We recommend using oil mist coolant.
※4 Minimize chucking runout.
(Recommend to measure actual runout at activated spindle speed.)
※5 Tool approaching angle must be 3 degrees or below.
※6 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.

使用R中心刃的加工也可实现纳米级镜面加工
Realized nano level surface roughness even for milling with its R-center

CBN超精加工用球头铣刀
CBN Super Finish Ball End Mill

SFB200

R0.1 ～ R1

共有 12 种规格
Total 12 sizes

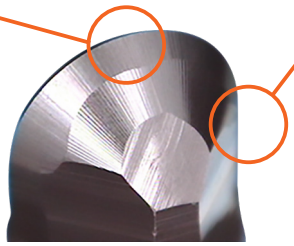
特长
Features

新颖的刃口造型
New developed cutting edge

超群的切削性
Outstanding machinability

■ R中心刃形状
Center R shape

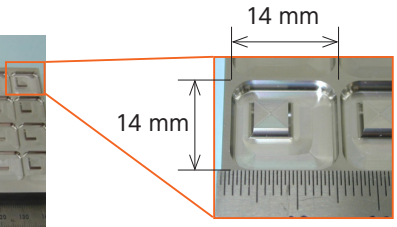
采用新颖的刃刃形状，从刃口到R中心均具有超强的锋利度
New developed cutting edge achieves outstanding machinability to center R



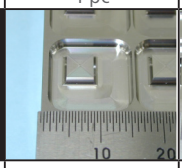
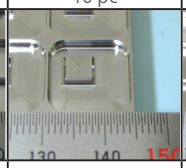
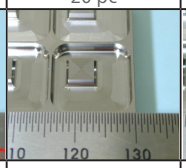
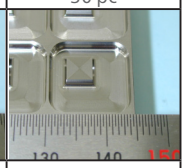
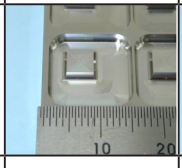
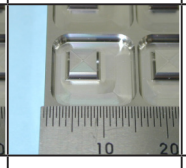
■ 无段差设计
Smoothly connected

从R角到侧刃的接续位置，刀面都采用无段差设计
No step tool design with smoothly connected between R edge shape and the peripheral cutting edge

使用工具: CBN球头铣刀 R0.5
Tool CBN ball end mill
涂层钨钢球头铣刀 R0.5
Coated carbide ball end mill
加工材料: SKD11 (60HRC)
Work material
主轴转速 n: 30,000 min^{-1}
Spindle speed
进给速度 vf: 1,200 mm/min
Feed
切深量: ap 0.01 × ae 0.02 mm
Depth of cut
冷却方式: 油雾
Coolant Oil mist



加工尺寸: 1 × 1 × 深度 1.8 mm
Machined size Depth
加工时间: 1个 30分
Machining time : 1pc 30min

	第1个 1 pc	第10个 10 pc	第20个 20 pc	第30个 30 pc
CBN铣刀 SFB200 CBN end mill				
面粗度 Rz Surface roughness	0.9 μm	1.0 μm	1.2 μm	1.0 μm
涂层钨钢铣刀 Coated carbide end mill			加工不可 Unable to machine	
面粗度 Rz Surface roughness	1.0 μm	6.2 μm	-	

ELMAX（60HRC）反射板造型 ELMAX (60HRC) Reflector model

独特的刃口造型，高精度R角精度为 R±0.003mm 实现超精密切削加工

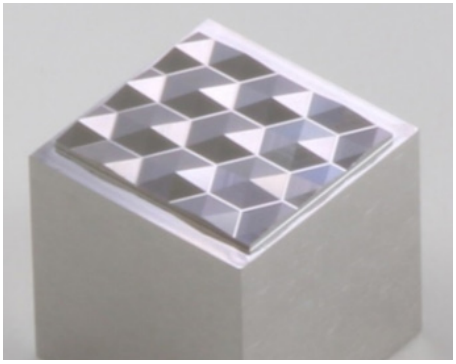
Realizes high precision machining with unique cutting edge design and high accuracy R±0.003mm

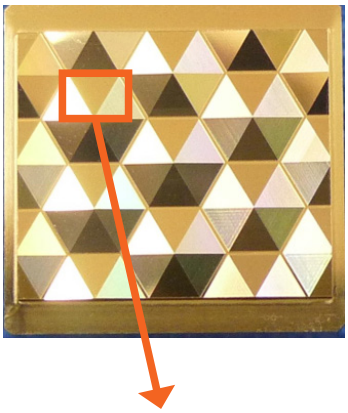
加工材料：ELMAX（60HRC）
Work material

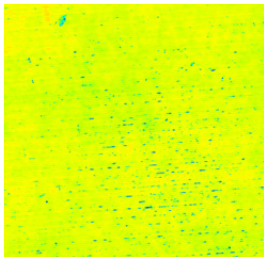
工件尺寸：20 × 20 × 加工深度 0.35 mm
Work size　　Machining depth

冷却方式：油雾
Coolant : Oil mist

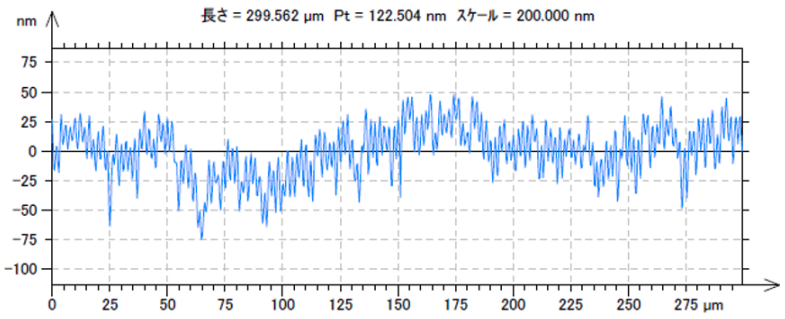
总加工时间：19 小时 10 分钟
Total machining time : 19 hr 10 min







面粗度
Surface roughness



面粗度 Surface roughness	
Ra	13.091 nm
Rz	79.649 nm

加工工序 Process	粗加工 Roughing	中精加工 Semi-Finishing	精加工 Finishing
使用工具 Tool	MSBH230 R0.2	SSBL200 R0.2 × 1.2	SFB200 R0.2 × 1
主轴转速 [min^{-1}] Spindle speed	40,000	40,000	40,000
进给速度 [mm/min] Feed	800	700	400
切深量 [mm] ap × ae Depth of cut	0.015 × 0.05	0.005 × 0.01	0.004 × 0.002
加工时间 Machining time	3小时 23分钟 3 hr 23 min	2小时 10分钟 2 hr 10 min	13小时 37分钟 13 hr 37 min

SFB200

规格
Size R0.1 ～ R1

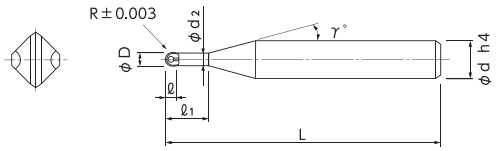
CBN ≦70 HRC

CBN超精加工用球头铣刀
CBN Super Finish Ball End Mill

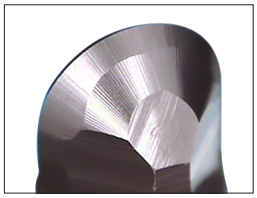
共 12 种规格
Total 12 sizes

使用R中心刃的加工也可实现纳米级精加工面
Realized nano level surface roughness even for milling with its R-center

2 | 0° | R ±0.003 | φd h4 | 3D



- 采用新颖的刀刃形状，从刃口到 R中心部均具有超强的锋利度。
- 60HRC的高硬度钢可实现连续 10 小时以上的精加工。
- 加工面精度可长时间保持 Rz1.0μm。
- 大幅减少模具的抛光加工时间。
- Sharpened edge at R-center improves shearing ability.
- Continuous 10 hours machining on hardened steel of 60HRC.
- Long-lasting high surface accuracy Rz1.0μm.
- Save significant time at polishing process.



刀刃形状
Cutting edge shape

R 中心刃具有超强的锋利度。
最适合长时间的超精密加工。
Sharp tooth edge guarantees long and consistent accuracy.

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.	(R)球头半径 Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(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
01-00500-00100	R0.1	0.5	0.15	0.2	0.19	12°	4	50	39,300
★ 01-00500-00200	R0.2	1	0.3	0.4	0.37	12°	4	50	36,000
★ 01-00500-00250	R0.25	1.25	0.38	0.5	0.46	12°	4	50	36,000
★ 01-00500-00300	R0.3	1.5	0.5	0.6	0.56	12°	4	50	32,900
★ 01-00500-00400	R0.4	2	0.6	0.8	0.76	12°	4	50	34,800
★ 01-00500-00500	R0.5	2.5	0.7	1	0.95	12°	4	50	31,700
★ 01-00500-00600	R0.6	3	0.8	1.2	1.15	12°	4	50	33,600
★ 01-00500-00700	R0.7	3.5	1	1.4	1.35	12°	4	52	35,800
★ 01-00500-00750	R0.75	3.8	1	1.5	1.45	12°	4	52	33,400
★ 01-00500-00800	R0.8	4	1	1.6	1.55	12°	4	52	35,300
★ 01-00500-00900	R0.9	4.5	1.2	1.8	1.75	12°	4	52	35,000
★ 01-00500-01000	R1	5	1.2	2	1.94	12°	4	52	30,000

订购方法 How to Order
请指定SFB200 球头半径(R)。
When you order, indicate SFB200 (R).

※(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 SKD・SKH・HAP (～68HRC)					
(R)球头半径 Radius	切深量 Depth of Cut		一般参数 Normal Speed		高速参数 High Speed	
			进给速度 Feed	主轴转速 Spindle Speed	进给速度 Feed	主轴转速 Spindle Speed
	ap mm	ae mm	mm/min	min^{-1}	mm/min	min^{-1}
0.1 ～0.2	0.005	0.01	600		1,500	
0.25～0.3	0.01	0.01	800		2,000	
0.4 ～0.6	0.01	0.02	1,200	20,000	3,000	50,000
0.7 ～0.8	0.01	0.02	1,600		4,000	
0.9 ～1	0.02	0.05	2,000		5,000	
备 注 Notes	※1 切深量的ap表示轴向切深量，ae表示步距量。 ※2 超精密加工专用的铣刀。请在完成钨钢铣刀的精加工后使用。 ※3 请将切深量固定为切削参数参考表内的数值使用。 ※4 R角加工时请特别注意参数设定（刀路轨迹等）。 ※5 建议使用油雾冷却方式。 ※6 建议使用刚性较大的铣刀刀柄和机床。 ※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 SFB200 is a Super-Finish Ball End Mill recommended to use after the finish process of carbide end mill. ※3 Cutting depth must be fixed all through the milling process according to the recommended milling conditions. ※4 Pay a special attention when choosing tool path and deciding a milling condition for corner milling. ※5 We recommend using oil mist coolant. ※6 Machine, tool chuck must be sufficiently accurate.					

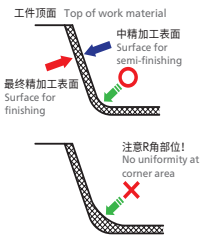
使用注意事项 Points in Use

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.



兼备CBN的超长寿命·高精度和钨钢刀具便捷使用性能的球头铣刀

Ball end mill combines both long tool life and high precision of CBN and ease of use of solid carbide end mill

CBN超高速加工用球头铣刀

CBN Super Speed Ball End Mill

SSB200 R0.1 ～ R1

共有 15 种规格
Total 15 sizes

CBN超高速加工用长颈球头铣刀

CBN Super Speed Long Neck Ball End Mill

SSBL200 R0.05 ～ R1

共有 25 种规格
Total 25 sizes

SSB200

SSBL200

可设定与钨钢铣刀精加工同等的切深量进行加工

Capable to machine with the same depth of cut as carbide tool finishing

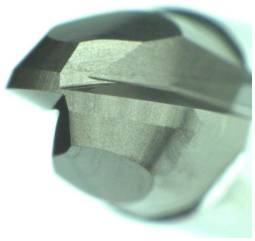
L/D 最大 10 倍
适用于深沟精加工

Capable to machine at deep area finishing by maximum L/D=10

特长

Features

高效率 High efficiency | 排屑性能 Chip evacuation



排屑性能优越，可设定与钨钢铣刀（精加工）同等的切深量，最适合用于高效率加工。

With high chip evacuation and setting the depth of cut to the same level as solid carbide tools in finishing, it enables more efficient machining than conventional CBN tools

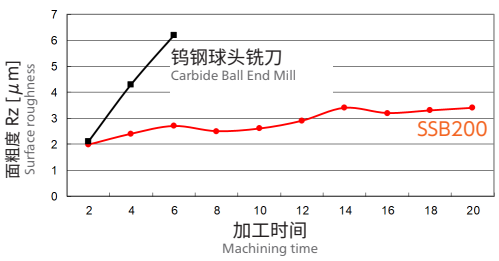
性能比较：

Performance comparison

加工材料：SKD11（62HRC）
Work material

冷却方式：油雾
Coolant : Oil mist

加工工序 Process	精加工 Finishing
使用工具 Tool	SSB200 R1 涂层钨钢铣刀 R1 Carbide Ball End Mill
主轴转速 [min⁻¹] Spindle speed	40,000
进给速度 [mm/min] Feed	3,000
切深量 [mm] Depth of cut	0.05 × 0.05



寿命是钨钢刀具的 10 倍

10 time longer tool life than carbide end mill

ELMAX（60HRC）反射板造型 ELMAX (60HRC) Reflector model

CBN的超长加工寿命•高精度性能实现了对高硬度钢的长时间精加工

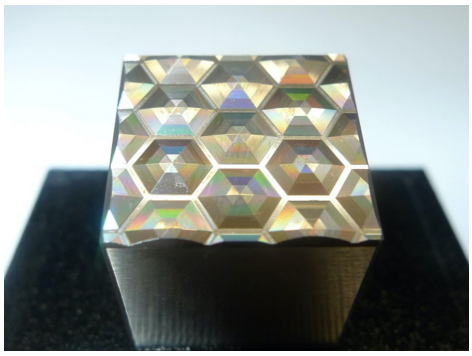
Long tool life and high accuracy of CBN enables long time finishing process on hardened steel

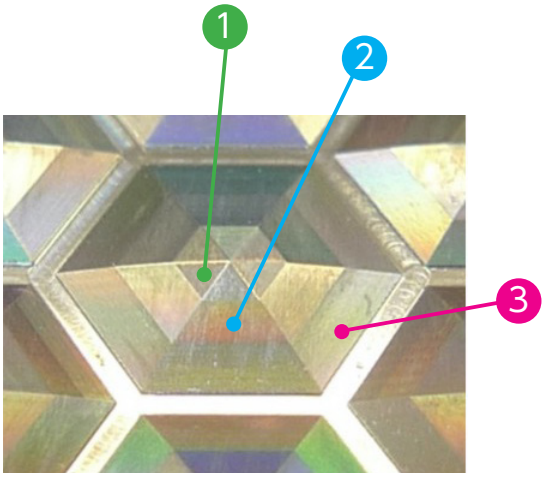
加工材料：ELMAX（60HRC）
Work material

工件尺寸：15 × 15 × 加工深度 0.35 mm
Work size　　Machining depth

冷却方式：油雾
Coolant : Oil mist

总加工时间：9小时 34分钟
Total machining time : 9 hr 34 min





面粗度
Surface roughness

面粗度 Rz [μm] Surface roughness		
1	2	3
0.87	0.89	0.57

加工工序 Process	粗加工 Roughing	沟槽加工 Slot	中精加工 Semi-finishing	精加工 Finishing
使用工具 Tool	MRBH230 R0.5 × 2	MHRH230R φ0.4 × R0.05 × 1	MRBH230 R0.5 × 2	SSB200 R0.5 × 2.5
主轴转速 [min^{-1}] Spindle speed	40,000	30,000	40,000	40,000
进给速度 [mm/min] Feed	800	125	800	400
切深量 [mm] ap × ae Depth of cut	0.02 × 0.1	ap 0.003	0.02 × 0.08	0.004 × 0.004
加工时间 Machining time	52 分钟 52 min	38 分钟 38 min	1小时 45分钟 1 hr 45 min	6小时 19分钟 6 hr 19 min

SSB200

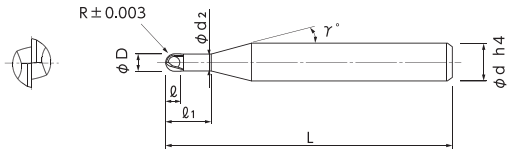
规格
Size R0.1 ～ R1

CBN ≦70 HRC

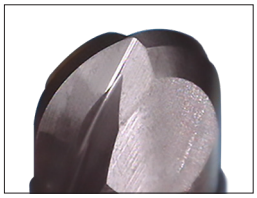
CBN超高速加工用球头铣刀
CBN Super Speed Ball End Mill

共 15 种规格
Total 15 sizes

可设定与钨钢铣刀精加工同等的切深量进行加工
Capable to machine with the same depth of cut as carbide tool finishing



- 是高效率的 CBN 球头铣刀，兼具 CBN 的延长刀具寿命高精度和钨钢铣刀的使用便利性。
- 可使用与钨钢铣刀精加工同等的切深量。
- 采用独创的刀刃形状，R 角精度达 ±0.003，并提高了耐崩刃性能！
- R 刃和外周刃的接线平滑无段差。
- ～70HRC 的高硬度材料也能加工！
- This CBN Ball End Mill has realized both advantages of CBN and Carbide.
- Depth of Cut can be increased at the equivalent level to Carbide.
- Unique flute design with R-accuracy ±0.003 prevents chipping!
- Flute is smoothly tangent from straight line to R-curve.
- Applicable for hardened materials up to 70HRC!



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.	(R)球头半径 Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(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
01-00510-00100	R0.1	0.3	0.15	0.2	0.19	15°	4	50	26,000
01-00510-00150	R0.15	0.3	0.23	0.3	0.28	15°	4	50	26,000
01-00510-00151		0.5	0.23	0.3	0.28	15°	4	50	26,000
01-00510-00152		0.75	0.23	0.3	0.28	15°	4	50	26,500
★ 01-00510-00200	R0.2	0.5	0.3	0.4	0.37	15°	4	50	25,000
★ 01-00510-00201		0.75	0.3	0.4	0.37	15°	4	50	25,500
★ 01-00510-00202		1	0.3	0.4	0.37	15°	4	50	25,500
★ 01-00510-00250	R0.25	1	0.38	0.5	0.46	15°	4	50	25,000
★ 01-00510-00300	R0.3	1.5	0.5	0.6	0.56	15°	4	50	24,000
★ 01-00510-00400	R0.4	2	0.6	0.8	0.76	15°	4	50	24,000
★ 01-00510-00500	R0.5	2.5	0.7	1	0.95	15°	4	50	24,000
★ 01-00510-00600	R0.6	3	0.8	1.2	1.15	15°	4	50	25,000
★ 01-00510-00750	R0.75	3.8	1	1.5	1.45	15°	4	52	25,000
★ 01-00510-01001	R1	4	1.2	2	1.94	15°	4	52	25,000
★ 01-00510-01000		5	1.2	2	1.94	15°	4	52	25,000

订购方法 How to Order

请指定SSB200 球头半径(R)×颈长(ℓ1)。
When you order, indicate SSB200 (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 (~62HRC)				高速钢 High Speed Steels SKH·HAP (~68HRC)			
(R)球头半径 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	0.3	0.005	0.005	720		0.005	0.005	540		0.003	0.003	360	
0.15	0.3	0.005	0.01	1,400		0.005	0.01	800		0.005	0.005	500	
	0.5	0.005	0.005	1,200		0.005	0.005	640		0.003	0.005	460	
	0.75	0.005	0.005	1,000		0.005	0.005	540		0.003	0.005	400	
0.2	0.5	0.01	0.01	1,800		0.01	0.01	1,200		0.005	0.01	640	
	0.75	0.005	0.01	1,600		0.005	0.01	1,000		0.005	0.01	540	
	1	0.005	0.01	1,400		0.005	0.01	900		0.005	0.005	460	
0.25	1	0.015	0.015	1,800	50,000	0.01	0.015	1,500	50,000	0.01	0.01	1,100	50,000
0.3	1.5	0.02	0.03	2,000		0.01	0.02	2,000		0.01	0.02	1,500	
0.4	2	0.03	0.05	2,000		0.02	0.03	2,000		0.01	0.03	1,500	
0.5	2.5	0.05	0.05	3,000		0.03	0.05	3,000		0.02	0.03	2,000	
0.6	3	0.05	0.05	3,000		0.03	0.05	3,000		0.02	0.03	2,000	
0.75	3.8	0.05	0.1	4,000		0.05	0.05	4,000		0.02	0.05	3,000	
1	4	0.1	0.1	5,000		0.05	0.05	5,000		0.03	0.05	3,000	
	5	0.1	0.1	5,000		0.05	0.05	5,000		0.03	0.05	3,000	

备 注 Notes

※1 切深量为中精加工、精加工时的最大值。
※2 切深量的ap表示轴向切深量，ae表示步距量。
※3 建议使用油雾冷却方式。
※4 请以相同的比率调整主轴转速和进给速度。
※5 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。
※6 请根据需要控制刀具的伸出量。

※1 Depth of Cut shows the maximum value for semi-finishing and finishing.
※2 Depth of Cut : ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 We recommend using oil mist coolant.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.
※6 Length of tool overhang must be as short as possible.

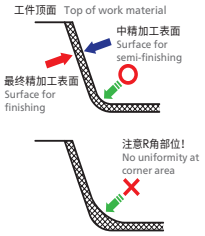
使用注意事项 Points in Use

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.



SSBL200

规格 Size R0.05 ～ R1

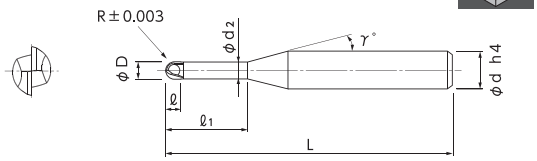
CBN ≦70 HRC

CBN超高速加工用长颈球头铣刀
CBN Super Speed Long Neck Ball End Mill

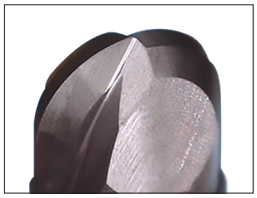
共 25 种规格
Total 25 sizes

L/D最大10倍，适用于深沟精加工
Capable to machine at deep area finishing by maximum L/D=10

2 | 0° | R ±0.003 | φd h4 | 3D



- 可适用于深沟加工。长颈型已经实现系列化！共有 25 种规格！
- 最大颈长 10mm。适用于更深的沟槽加工。
- CBN 的延长刀具寿命及长颈设计扩大了加工领域。
- 极小径规格从 R0.05 起已经实现标准化！
- 采用独创的刀刃形状，R角精度达±0.003，并提高了耐崩刃性能！
- Lineup of CBN tool with long neck applicable to deep milling, available 25 sizes in total.
- Enables milling more deeply by long under neck length up to 10mm.
- Enables wider application for milling by long neck in addition to long life and accurate finishing.
- Standardized in R0.05 at smallest.
- Unique flute design with R-accuracy ±0.003 prevents chipping!



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.	(R)球头半径 Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(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
01-00511-00051	R0.05	0.3	0.08	0.1	0.09	15°	4	50	38,200
01-00511-00052		0.5	0.08	0.1	0.09	15°	4	50	39,800
01-00511-00075	R0.075	0.45	0.12	0.15	0.14	15°	4	50	38,200
01-00511-00076		0.75	0.12	0.15	0.14	15°	4	50	39,800
01-00511-00101	R0.1	0.6	0.15	0.2	0.19	15°	4	50	28,600
01-00511-00102		1	0.15	0.2	0.19	15°	4	50	30,000
01-00511-00151	R0.15	0.9	0.23	0.3	0.28	15°	4	50	28,600
01-00511-00152		1.5	0.23	0.3	0.28	15°	4	50	30,000
★ 01-00511-00201	R0.2	1.2	0.3	0.4	0.37	15°	4	50	26,000
★ 01-00511-00202		2	0.3	0.4	0.37	15°	4	50	27,600
★ 01-00511-00251	R0.25	1.5	0.38	0.5	0.46	15°	4	50	26,000
★ 01-00511-00252		2.5	0.38	0.5	0.46	15°	4	50	27,600
★ 01-00511-00301	R0.3	3	0.5	0.6	0.56	15°	4	50	25,600
★ 01-00511-00302		4	0.5	0.6	0.56	15°	4	52	25,600
★ 01-00511-00303		5	0.5	0.6	0.56	15°	4	52	26,000
★ 01-00511-00401	R0.4	4	0.6	0.8	0.76	12°	4	53	25,600
★ 01-00511-00501	R0.5	4	0.7	1	0.95	12°	4	53	25,600
★ 01-00511-00502		5	0.7	1	0.95	12°	4	53	25,600
★ 01-00511-00504		6	0.7	1	0.95	15°	4	53	25,600
★ 01-00511-00506		8	0.7	1	0.95	15°	4	53	26,000
★ 01-00511-00508		10	0.7	1	0.95	15°	4	53	26,600
★ 01-00511-00751	R0.75	7.5	1	1.5	1.45	15°	4	52	27,600
★ 01-00511-01001	R1	6	1.2	2	1.94	15°	4	52	25,000
★ 01-00511-01003		8	1.2	2	1.94	15°	4	52	27,600
★ 01-00511-01005		10	1.2	2	1.94	15°	4	52	27,600

订购方法 How to Order

请指定SSBL200 球头半径(R)×颈长(ℓ1)。
When you order, indicate SSBL200 (R)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

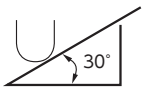
加工材料 Work Material			高硬度钢 Hardened Steels STAVAX・SKD61 (~52HRC)				高硬度钢 Hardened Steels SKD11 (~62HRC)				高速钢 High Speed Steels SKH (~68HRC)			
(R)球头半径 Radius	颈长 Under Neck Length	L(颈长)/D (外径)	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		进给速度 Feed	主轴转速 Spindle Speed	切深量 Depth of Cut		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}
0.05	0.3	3	0.005	0.005	200	50,000	0.003	0.005	150	50,000	0.002	0.003	120	50,000
	0.5	5	0.003	0.003	120	50,000	0.003	0.003	100	50,000	0.002	0.003	80	50,000
0.075	0.45	3	0.005	0.005	300	50,000	0.003	0.005	200	50,000	0.002	0.003	150	50,000
	0.75	5	0.003	0.003	200	50,000	0.003	0.003	150	50,000	0.002	0.003	100	50,000
0.1	0.6	3	0.005	0.005	500	50,000	0.005	0.005	380	50,000	0.003	0.003	280	50,000
	1	5	0.005	0.005	300	50,000	0.005	0.005	260	50,000	0.003	0.003	120	50,000
0.15	0.9	3	0.005	0.005	800	50,000	0.005	0.005	460	50,000	0.003	0.005	360	50,000
	1.5	5	0.005	0.005	480	50,000	0.005	0.005	320	50,000	0.003	0.005	280	50,000
0.2	1.2	3	0.005	0.01	1,200	50,000	0.005	0.01	820	50,000	0.005	0.005	580	50,000
	2	5	0.005	0.01	620	50,000	0.005	0.01	580	50,000	0.005	0.005	380	50,000
0.25	1.5	3	0.01	0.01	1,500	50,000	0.01	0.01	1,200	50,000	0.005	0.01	860	50,000
	2.5	5	0.01	0.01	800	50,000	0.01	0.01	680	50,000	0.005	0.01	540	50,000
0.3	3	5	0.01	0.02	1,600	40,000	0.01	0.02	1,200	40,000	0.01	0.01	920	40,000
	4	6.7	0.01	0.01	1,200	30,000	0.01	0.01	960	30,000	0.005	0.01	640	30,000
	5	8.3	0.01	0.01	800	30,000	0.005	0.01	680	30,000	0.005	0.005	480	30,000
0.4	4	5	0.01	0.03	1,500	30,000	0.01	0.02	1,200	30,000	0.01	0.01	920	30,000
0.5	4	4	0.03	0.05	2,400	40,000	0.02	0.03	2,400	40,000	0.02	0.02	1,500	40,000
	5	5	0.02	0.05	2,000	32,000	0.02	0.03	2,000	32,000	0.01	0.02	1,200	32,000
	6	6	0.02	0.03	1,500	25,000	0.01	0.02	1,500	25,000	0.01	0.01	1,000	25,000
	8	8	0.01	0.03	1,200	16,000	0.01	0.02	1,000	16,000	0.01	0.01	840	16,000
	10	10	0.01	0.02	800	12,000	0.005	0.01	720	12,000	0.005	0.005	620	12,000
0.75	7.5	5	0.02	0.03	2,000	32,000	0.01	0.03	1,800	32,000	0.01	0.01	1,200	32,000
1	6	3	0.05	0.05	4,000	40,000	0.03	0.03	4,000	40,000	0.02	0.03	2,600	40,000
	8	4	0.03	0.05	3,000	32,000	0.02	0.03	2,600	32,000	0.01	0.02	1,800	32,000
	10	5	0.02	0.03	2,000	24,000	0.01	0.03	1,600	24,000	0.01	0.02	1,200	24,000

备 注 Notes

※1 切深量为中精加工、精加工时的最大值。
※2 切深量的ap表示轴向切深量，ae表示步距量。
※3 建议使用油雾冷却方式。
※4 请以相同的比率调整主轴转速和进给速度。
※5 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。
※6 请根据需要控制刀具的伸出量。

※1 Depth of Cut shows the maximum value for semi-finishing and finishing.
※2 Depth of Cut : ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 We recommend using oil mist coolant.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.
※6 Length of tool overhang must be as short as possible.

※7 外径与颈长之比（L/D）为5以上时，以加工面的倾斜角为30°以下为参考条件。
※7 Recommended milling conditions for the sizes L/D (Effective length / Diameter) = 5 or longer are based on machining inclined angle 30 deg. or lower.



使用注意事项

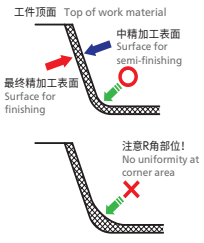
Points in Use

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.



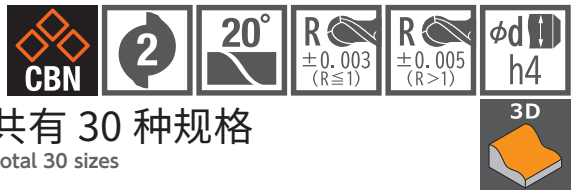
独特的刃口造型和丰富的规格种类实现高品质加工面

Unique cutting edge shape and abundant line up improve finishing surface roughness

CBN超精加工用螺旋球头铣刀

CBN Super Spiral Ball End Mill

SSPB220 R0.1 ～ R3



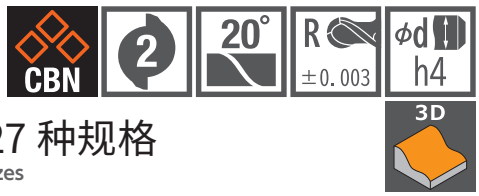
共有 30 种规格

Total 30 sizes

CBN超精加工用长颈螺旋球头铣刀

CBN Super Spiral Long Neck Ball End Mill

SSPBL220 R0.1 ～ R1



共有 27 种规格

Total 27 sizes

CBN超精加工用长颈锥形螺旋球头铣刀

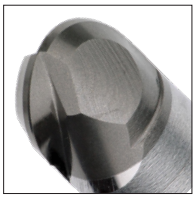
CBN Super Spiral Long Taper Neck Ball End Mill

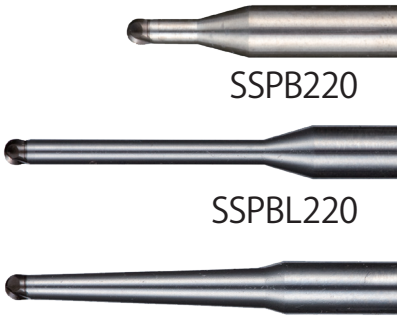
SSPBTN220 R0.1 × 颈角 30′ ～ R1 × 颈角 2°

Neck taper angle

共有 64 种规格

Total 64 sizes





SSPB220

SSPBL220

SSPBTN220

3 种型号 共 121 个规格
可对应各种加工形状

3 products, total in 121 sizes support various cutting shapes

特长

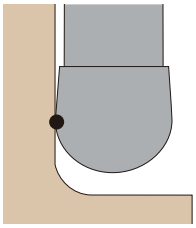
Features

切削性和耐崩损性
Cutting ability and fracture resistance

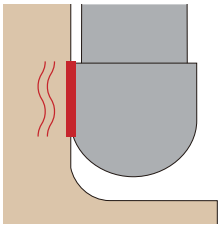
螺旋球头、倒锥形状
Spiral ball shape, Back taper shape

采用具有耐崩损性和高切削性的螺旋球头造型
实现有光泽感的精加工面品质

Spiral ball shape with improved chipping resistance and cutting ability achieves glossy finishing surface



单点切削，不易振刀
Suppress chattering by point milling



普通铣刀
General end mill

SSPB 系列采用强倒锥造型
可抑制振刀，提升加工面品质

SSPB series adopt strong back taper shape.
Suppresses chattering and improves surface quality

ELMAX(59HRC) 瓶颈口造型 ELMAX (59HRC) Bottleneck mold

采用具有高切削性能的螺旋球头造型提升了针对高硬度钢的精加工面品质

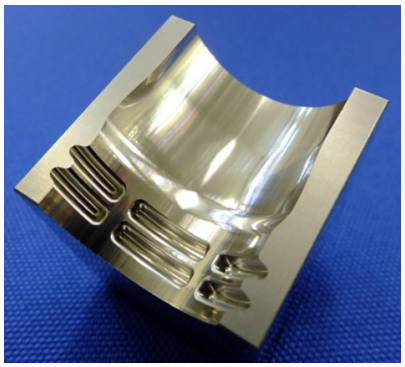
Spiral ball shape with enhanced cutting ability improves finishing surface quality of hardened steel

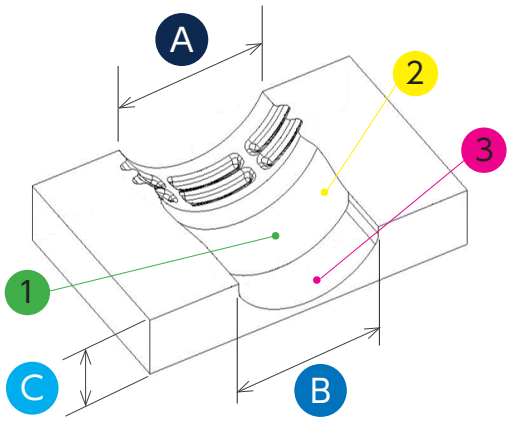
加工材料：ELMAX（59HRC）
Work material

工件尺寸：30 × 30 × 加工深度 8.134 mm
Work size　　Machining depth

冷却方式：油雾
Coolant : Oil mist

总加工时间：3小时 25分钟
Total machining time : 3 hr 25 min





加工精度 Accuracy

测定位置 Measuring position	A	B	C
目标值 Target	22.000	22.557	8.134
实测值 Actual	21.998	22.554	8.133

面粗度 Surface roughness

测定位置 Measuring position	1	2	3
Ra [μm]	0.05	0.08	0.04
Rz [μm]	0.34	0.55	0.27

加工工序 Process	粗加工 Roughing	中精加工 Semi-finishing	精加工 Finishing	精加工 Finishing
使用工具 Tool	MRBH230 R1 × 6	MRBH230 R0.5 × 5	SSPB220 R0.5 × 2.5	SSPB220 R1 × 5
主轴转速 [min^{-1}] Spindle speed	25,000	35,000	40,000	40,000
进给速度 [mm/min] Feed	2,000	1,600	1,500	1,500
切深量 [mm] ap × ae Depth of cut	0.2 × 0.3	0.04 × 0.1	0.01 × 0.007	0.01 × 0.005
加工时间 Machining time	45 分钟 45 min	45 分钟 45 min	35 分钟 35 min	1小时 20分钟 1 hr 20 min

SSPB220

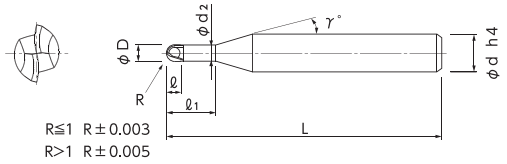
规格 Size R0.1 ～ R3

CBN ≦70 HRC

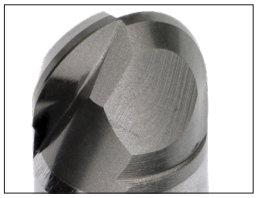
CBN超精加工用螺旋球头铣刀
CBN Super Spiral Ball End Mill

共 30 种规格
Total 30 sizes

实现具有光泽的精加工面
Realized glossy finished surface



- 采用螺旋球头形状，提高了刀刃的锋利度。
- 采用独特的刀刃形状，提高了耐崩刃性能。
- 外周刃与加工面接触，切削阻力增加会发生振刀，影响刀具的使用寿命和加工面的品质。通过采用增强型的倒锥形状，可以减轻该影响。
- 规格标准扩大到 R3，进一步扩展了加工范围。
- Adopted spiral ball shape to improve sharpness of cutting edge.
- Adopted cutting edge shape to improve the chipping resistance of cutting edge.
- When peripheral cutting edge makes contact with cutting surface, vibration occurs by an increase in cutting resistance and it affects tool life and cutting surface quality.The influence can be reduced by adoption of the strong back taper shape.
- Enlarged standard tool size up to R3 to extend application range.



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.	(R)球头半径 Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(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
01-00505-00101	R0.1	0.3	0.15	0.2	0.19	15°	4	50	30,500
01-00505-00100		0.6	0.15	0.2	0.19	15°	4	50	31,500
01-00505-00150	R0.15	0.3	0.23	0.3	0.28	15°	4	50	30,000
01-00505-00151		0.5	0.23	0.3	0.28	15°	4	50	30,500
01-00505-00152		0.75	0.23	0.3	0.28	15°	4	50	31,000
★ 01-00505-00201	R0.2	0.5	0.3	0.4	0.37	15°	4	50	27,100
★ 01-00505-00202		0.75	0.3	0.4	0.37	15°	4	50	27,600
★ 01-00505-00203		1	0.3	0.4	0.37	15°	4	50	28,100
★ 01-00505-00200		1.2	0.3	0.4	0.37	15°	4	50	28,600
★ 01-00505-00251	R0.25	1	0.38	0.5	0.46	15°	4	50	28,100
★ 01-00505-00301	R0.3	1.2	0.5	0.6	0.56	15°	4	50	25,900
★ 01-00505-00300		1.5	0.5	0.6	0.56	15°	4	50	26,400
★ 01-00505-00401	R0.4	1.6	0.6	0.8	0.76	15°	4	50	25,900
★ 01-00505-00400		2	0.6	0.8	0.76	15°	4	50	26,400
★ 01-00505-00501	R0.5	2	0.7	1	0.95	15°	4	50	25,900
★ 01-00505-00500		2.5	0.7	1	0.95	15°	4	50	26,400
★ 01-00505-00601	R0.6	2.4	0.8	1.2	1.15	15°	4	50	27,000
★ 01-00505-00600		3	0.8	1.2	1.15	15°	4	50	27,500
★ 01-00505-00751	R0.75	3	1	1.5	1.45	15°	4	52	27,000
★ 01-00505-00750		3.8	1	1.5	1.45	15°	4	52	27,500
★ 01-00505-01000	R1	4	1.2	2	1.94	15°	4	52	27,500
★ 01-00505-01001		5	1.2	2	1.94	15°	4	52	27,500
★ 01-00505-01506	R1.5	6	1.8	3	2.85	12°	6	50	29,000
★ 01-00505-01509		9	1.8	3	2.85	12°	6	70	30,000
★ 01-00505-02008	R2	8	2.4	4	3.8	12°	6	50	35,000
★ 01-00505-02012		12	2.4	4	3.8	12°	6	70	36,000
★ 01-00505-02510	R2.5	10	3	5	4.8	12°	6	60	41,000
★ 01-00505-02515		15	3	5	4.8	12°	6	80	42,000
★ 01-00505-03012	R3	12	3.6	6	5.8	–	6	60	48,000
★ 01-00505-03018		18	3.6	6	5.8	–	6	80	49,000

订购方法 How to Order

请指定SSPB220 球头半径(R)×颈长(ℓ1)。
When you order, indicate SSPB220 (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)			
(R)球头半径 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	0.3	0.005	0.005	600	40,000	0.005	0.005	450	40,000	0.003	0.003	300	40,000
	0.6	0.005	0.005	500	40,000	0.005	0.005	350	40,000	0.003	0.003	250	40,000
0.15	0.3	0.005	0.005	800	40,000	0.005	0.005	600	40,000	0.003	0.003	450	40,000
	0.5	0.005	0.005	750	40,000	0.005	0.005	550	40,000	0.003	0.003	400	40,000
	0.75	0.005	0.005	700	40,000	0.005	0.005	500	40,000	0.003	0.003	400	40,000
0.2	0.5	0.005	0.01	1,200	40,000	0.005	0.01	900	40,000	0.005	0.005	600	40,000
	0.75	0.005	0.01	1,100	40,000	0.005	0.01	850	40,000	0.005	0.005	550	40,000
	1	0.005	0.01	1,000	40,000	0.005	0.01	800	40,000	0.005	0.005	500	40,000
	1.2	0.005	0.01	1,000	40,000	0.005	0.01	800	40,000	0.005	0.005	500	40,000
0.25	1	0.01	0.01	1,200	40,000	0.01	0.01	1,000	40,000	0.005	0.005	700	40,000
0.3	1.2	0.01	0.02	1,800	40,000	0.01	0.02	1,500	40,000	0.005	0.01	1,000	40,000
	1.5	0.01	0.02	1,500	40,000	0.01	0.02	1,200	40,000	0.005	0.01	800	40,000
0.4	1.6	0.01	0.02	1,800	40,000	0.01	0.02	1,500	40,000	0.005	0.01	1,000	40,000
	2	0.01	0.02	1,500	40,000	0.01	0.02	1,200	40,000	0.005	0.01	800	40,000
0.5	2	0.02	0.04	2,500	40,000	0.02	0.03	1,800	40,000	0.01	0.02	1,200	40,000
	2.5	0.02	0.04	2,000	40,000	0.02	0.03	1,500	40,000	0.01	0.02	1,000	40,000
0.6	2.4	0.02	0.04	2,500	40,000	0.02	0.03	2,000	40,000	0.01	0.02	1,500	40,000
	3	0.02	0.04	2,500	40,000	0.02	0.03	2,000	40,000	0.01	0.02	1,500	40,000
0.75	3	0.03	0.05	3,000	40,000	0.03	0.05	3,000	40,000	0.02	0.03	2,000	30,000
	3.8	0.03	0.05	3,000	40,000	0.03	0.05	3,000	40,000	0.02	0.03	2,000	30,000
1	4	0.05	0.1	3,000	30,000	0.03	0.05	3,000	30,000	0.03	0.03	2,000	25,000
	5	0.05	0.1	3,000	30,000	0.03	0.05	3,000	30,000	0.03	0.03	2,000	25,000
1.5	6	0.08	0.15	2,300	20,000	0.05	0.075	2,100	20,000	0.04	0.06	1,300	15,000
	9	0.06	0.12	2,200	20,000	0.04	0.06	2,000	20,000	0.04	0.05	1,200	15,000
2	8	0.1	0.18	2,300	17,000	0.06	0.09	2,100	15,000	0.05	0.07	1,300	12,000
	12	0.08	0.15	2,000	17,000	0.05	0.08	1,700	15,000	0.04	0.06	1,200	12,000
2.5	10	0.11	0.21	2,200	13,000	0.08	0.12	1,800	12,000	0.07	0.1	1,300	11,000
	15	0.1	0.18	1,900	13,000	0.06	0.1	1,500	12,000	0.06	0.08	1,100	11,000
3	12	0.13	0.24	2,000	10,000	0.09	0.15	1,600	10,000	0.08	0.12	1,200	10,000
	18	0.11	0.21	1,700	10,000	0.08	0.12	1,400	10,000	0.07	0.1	1,000	10,000

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 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。
※3 R角等负载大的加工部位，请注意参数设定和刀路轨迹等。
※4 需要高品质的加工面时，加工时请将切深量调整为70%，进给速度调整为约70%。
※5 建议使用油雾冷却方式。
※6 因加工机床的原因要调整主轴转速时，必须按照相同的比率调整进给速度。

※1 Max. Depth of Cut for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※3 Required careful set up of milling conditions, tool path and etc. at cutting parts, such as corners where will become overloaded.
※4 Adjust both Depth of Cut and feed rate at 70% of the recommended milling conditions for high quality milling surface.
※5 Oil mist coolant is recommended.
※6 Adjust feed rate at same rate as spindle speed if necessary to adjust spindle speed from recommended milling conditions.

使用注意事项

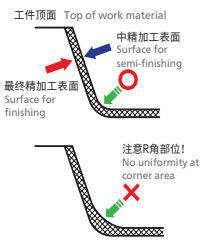
Points in Use

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.



SSPBL220

规格 Size R0.1 ～ R1

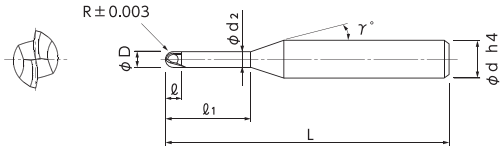
CBN ≦70 HRC

CBN超精加工用长颈螺旋球头铣刀
CBN Super Spiral Long Neck Ball End Mill

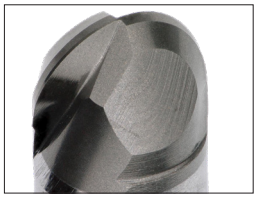
共 27 种规格
Total 27 sizes

L/D最大10倍，可实现具有光泽的精加工面
Realized glossy finished surface by maximum L/D=10

2 | 20° | R ±0.003 | φd h4 | 3D



- 进一步延长了 SSPB220 的颈长，规格实现了标准化。
- 采用兼具锋利度和耐崩刃性的螺旋球头形状以及较强的倒锥形状，在发挥 SSPB220 特长的同时能够对应深沟精加工。
- Added longer under neck length type to SSPB220 series.
- Realized deeper milling by adoption of spiral ball shape and strong back taper shape to improve both sharpness and the chipping resistance of cutting edges.



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.	(R)球头半径 Radius	(ℓ1)颈长 Under Neck Length	(ℓ)刃长 Length of Cut	(D)外径 Dia.	(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
01-00506-00101	R0.1	1	0.15	0.2	0.19	15°	4	50	33,000
01-00506-00151	R0.15	0.9	0.23	0.3	0.28	15°	4	50	31,500
01-00506-00152		1.5	0.23	0.3	0.28	15°	4	50	31,500
★ 01-00506-00201	R0.2	2	0.3	0.4	0.37	15°	4	50	30,000
★ 01-00506-00202		3	0.3	0.4	0.37	15°	4	52	30,000
★ 01-00506-00251	R0.25	1.5	0.38	0.5	0.46	15°	4	50	29,000
★ 01-00506-00252		2.5	0.38	0.5	0.46	15°	4	50	29,000
★ 01-00506-00253		3.5	0.38	0.5	0.46	15°	4	52	29,000
★ 01-00506-00301	R0.3	3	0.5	0.6	0.56	15°	4	50	28,000
★ 01-00506-00302		4	0.5	0.6	0.56	15°	4	53	28,000
★ 01-00506-00303		5	0.5	0.6	0.56	15°	4	53	28,500
★ 01-00506-00304		6	0.5	0.6	0.56	15°	4	53	28,500
★ 01-00506-00401	R0.4	4	0.6	0.8	0.76	15°	4	53	28,000
★ 01-00506-00402		6	0.6	0.8	0.76	15°	4	53	28,000
★ 01-00506-00501	R0.5	4	0.7	1	0.95	15°	4	51	28,000
★ 01-00506-00502		6	0.7	1	0.95	15°	4	53	28,000
★ 01-00506-00503		8	0.7	1	0.95	15°	4	53	28,500
★ 01-00506-00504		10	0.7	1	0.95	15°	4	53	28,500
★ 01-00506-00601	R0.6	6	0.8	1.2	1.15	15°	4	53	29,000
★ 01-00506-00751	R0.75	7.5	1	1.5	1.45	15°	4	52	29,000
★ 01-00506-00752		10	1	1.5	1.45	15°	4	52	29,000
★ 01-00506-00753		15	1	1.5	1.45	15°	4	52	29,000
★ 01-00506-01001	R1	6	1.2	2	1.94	15°	4	53	29,000
★ 01-00506-01002		8	1.2	2	1.94	15°	4	53	29,000
★ 01-00506-01003		10	1.2	2	1.94	15°	4	53	29,500
★ 01-00506-01004		14	1.2	2	1.94	15°	4	53	29,500
★ 01-00506-01005		20	1.2	2	1.94	15°	4	53	29,500

订购方法 How to Order

请指定SSPBL220 球头半径(R)×颈长(ℓ1)。
When you order, indicate SSPBL220 (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)			
(R)球头半径 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	1	0.005	0.005	200	40,000	0.005	0.005	150	40,000	0.003	0.003	100	40,000
0.15	0.9	0.005	0.005	600	40,000	0.005	0.005	400	40,000	0.003	0.005	300	40,000
	1.5	0.005	0.005	320	40,000	0.005	0.005	240	40,000	0.003	0.005	160	40,000
0.2	2	0.005	0.01	500	40,000	0.005	0.01	400	40,000	0.005	0.005	320	40,000
	3	0.005	0.005	250	40,000	0.005	0.005	200	40,000	0.003	0.005	120	40,000
0.25	1.5	0.01	0.01	1,200	40,000	0.01	0.01	1,000	40,000	0.005	0.01	600	40,000
	2.5	0.01	0.01	720	40,000	0.01	0.01	600	40,000	0.005	0.01	480	40,000
	3.5	0.01	0.01	400	36,000	0.005	0.01	320	36,000	0.005	0.005	240	36,000
0.3	3	0.01	0.02	1,200	40,000	0.01	0.02	800	40,000	0.01	0.01	600	40,000
	4	0.01	0.01	540	36,000	0.01	0.01	400	36,000	0.005	0.01	320	36,000
	5	0.01	0.01	360	30,000	0.005	0.01	320	30,000	0.005	0.005	240	30,000
	6	0.005	0.005	240	24,000	0.005	0.005	200	24,000	0.003	0.003	160	24,000
0.4	4	0.01	0.015	1,000	40,000	0.01	0.015	800	40,000	0.005	0.01	600	40,000
	6	0.005	0.01	720	30,000	0.005	0.01	540	30,000	0.005	0.005	400	30,000
0.5	4	0.02	0.03	1,600	40,000	0.02	0.02	1,200	40,000	0.01	0.015	800	40,000
	6	0.015	0.02	1,200	30,000	0.015	0.015	900	30,000	0.01	0.01	600	30,000
	8	0.01	0.015	720	20,000	0.01	0.01	540	20,000	0.005	0.01	400	20,000
	10	0.01	0.01	540	16,000	0.005	0.01	400	16,000	0.005	0.005	300	16,000
0.6	6	0.02	0.02	1,400	32,000	0.015	0.02	1,000	32,000	0.01	0.015	720	32,000
0.75	7.5	0.02	0.03	1,600	32,000	0.015	0.03	1,400	32,000	0.01	0.01	1,000	32,000
	10	0.015	0.02	900	20,000	0.01	0.02	720	20,000	0.01	0.01	540	20,000
	15	0.01	0.02	480	12,000	0.01	0.01	400	12,000	0.005	0.01	300	12,000
1	6	0.03	0.05	2,400	40,000	0.03	0.03	2,000	40,000	0.02	0.02	1,600	40,000
	8	0.03	0.03	2,000	36,000	0.02	0.03	1,400	36,000	0.01	0.02	1,000	36,000
	10	0.02	0.03	1,600	32,000	0.015	0.03	800	32,000	0.01	0.015	600	32,000
	14	0.02	0.02	900	20,000	0.01	0.02	720	20,000	0.01	0.01	540	20,000
	20	0.02	0.02	360	8,000	0.01	0.02	320	8,000	0.01	0.01	240	8,000

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 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。
※3 发生振刀时，请以相同的比率降低主轴转速和进给速度。此外，主轴转速过低时，也以相同的比率降低。
※4 R角等负载大的加工部位，请特别注意参数设定和刀路轨迹等。
※5 加工深沟时，请充分注意冷却液的供油及排屑是否顺畅。
※6 建议使用油雾冷却方式。

※1 Max. Depth of Cut for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Required careful set up of milling conditions, tool path and etc. at cutting parts, such as corners where will become overloaded.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Oil mist coolant is recommended.

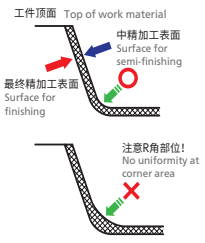
使用注意事项 Points in Use

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.



SSPBTN220

规格 Size R0.1 × 颈角 30′ ～ R1 × 颈角 2°
R0.1 × neck taper angle30′～ R1 ×neck taper angle2°

CBN ≦70 HRC

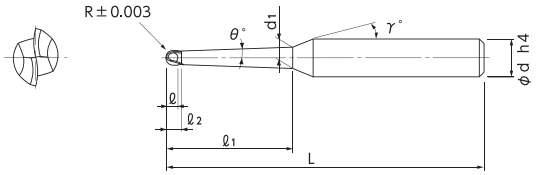
CBN超精加工用长颈锥形螺旋球头铣刀
CBN Super Spiral Long Taper Neck Ball End Mill

共 64 种规格
Total 64 sizes

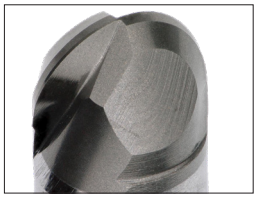
采用锥颈造型，具有高刚性
适用于高精度深沟加工

Taper neck design for high rigidity.
Suitable for deep and high accurate finishing

2 | 20° | R ±0.003 | φd h4 | 3D



- CBN 长颈球头铣刀采用锥颈形状，可增强刀具刚性。
- 搭配螺旋球头形状，提高了锋利度，并提升了深沟精加工的精度与效率。
- To realize more rigid, CBN long neck ball end mill with taper neck are adopted.
- Both efficiency and accuracy are increasing by taper neck design and spiral ball shape with improved sharpness in finish machining on deep milling.



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]

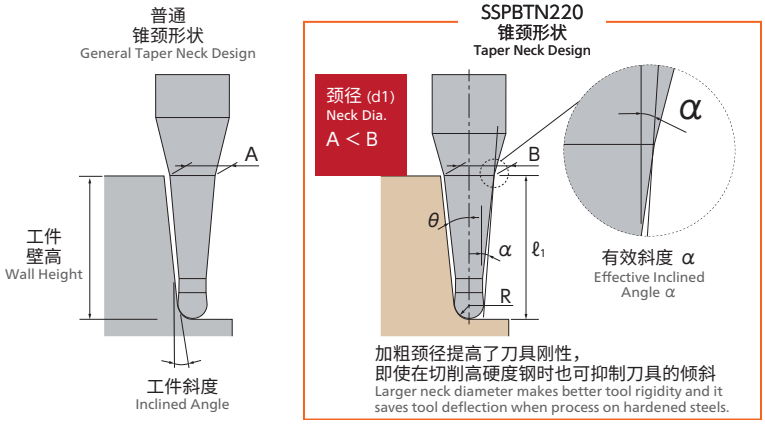
产品代码 Code No.	(R)球头半径 Radius	(θ)颈角 Neck Taper Angle	(ℓ1)颈长 Under Neck Length	(α)有效斜度 Effective Inclined Angle	(d1)颈径 Neck Dia.	(ℓ)刃长 Length of Cut	(ℓ2)颈长 Under Neck Length2	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
01-00507-01020	R0.1	30′	1.5	0°15′	0.22	0.15	0.25	15°	4	50	38,000
01-00507-01021			2	0°15′	0.22	0.15	0.25	15°	4	50	38,500
01-00507-01030		1°	1.5	0°45′	0.24	0.15	0.25	15°	4	50	38,000
01-00507-01031			2	0°45′	0.25	0.15	0.25	15°	4	50	38,500
01-00507-01040		1°30′	1.5	1°15′	0.27	0.15	0.25	15°	4	50	38,000
01-00507-01041			2	1°15′	0.29	0.15	0.25	15°	4	50	38,500
01-00507-01050		2°	1.5	1°45′	0.29	0.15	0.25	15°	4	50	38,000
01-00507-01051			2	1°45′	0.32	0.15	0.25	15°	4	50	38,500
01-00507-01520	R0.15	30′	2	0°16′	0.32	0.23	0.38	15°	4	50	36,000
01-00507-01521			3	0°16′	0.33	0.23	0.38	15°	4	52	36,500
01-00507-01530		1°	2	0°46′	0.35	0.23	0.38	15°	4	50	36,000
01-00507-01531			3	0°46′	0.38	0.23	0.38	15°	4	52	36,500
01-00507-01540		1°30′	2	1°16′	0.39	0.23	0.38	15°	4	50	36,000
01-00507-01541			3	1°16′	0.43	0.23	0.38	15°	4	52	36,500
01-00507-01550		2°	2	1°46′	0.42	0.23	0.38	15°	4	50	36,000
01-00507-01551			3	1°46′	0.48	0.23	0.38	15°	4	52	36,500
★ 01-00507-02020	R0.2	30′	3	0°18′	0.43	0.3	0.5	15°	4	50	34,500
★ 01-00507-02021			4	0°18′	0.44	0.3	0.5	15°	4	52	35,000
★ 01-00507-02030		1°	3	0°48′	0.48	0.3	0.5	15°	4	50	34,500
★ 01-00507-02031			4	0°48′	0.51	0.3	0.5	15°	4	52	35,000
★ 01-00507-02040		1°30′	3	1°18′	0.53	0.3	0.5	15°	4	50	34,500
★ 01-00507-02041			4	1°18′	0.58	0.3	0.5	15°	4	52	35,000
★ 01-00507-02050		2°	3	1°48′	0.58	0.3	0.5	15°	4	50	34,500
★ 01-00507-02051			4	1°48′	0.64	0.3	0.5	15°	4	52	35,000

订购方法 How to Order

请指定SSPBTN220 球头半径(R) ×颈角(θ) ×颈长(ℓ1)。
When you order, indicate SSPBTN220 (R)×(θ)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

CBN超精加工用长颈锥形螺旋球头铣刀
CBN Super Spiral Long Taper Neck Ball End Mill



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

产品代码 Code No.	(R)球头半径 Radius	(θ)颈角 Neck Taper Angle	(ℓ1)颈长 Under Neck Length	(α)有效斜度 Effective Inclined Angle	(d1)颈径 Neck Dia.	(ℓ)刃长 Length of Cut	(ℓ2)颈长 Under Neck Length2	(γ)颈角 Neck Taper Angle	(d)柄径 Shank Dia.	(L)全长 Overall Length	定价(日元) Retail Price
★ 01-00507-02520	R0.25	30′	4	0°18′	0.54	0.38	0.62	15°	4	52	33,500
★ 01-00507-02521			5	0°18′	0.55	0.38	0.62	15°	4	52	34,000
★ 01-00507-02530		1°	4	0°48′	0.61	0.38	0.62	15°	4	52	33,500
★ 01-00507-02531			5	0°48′	0.64	0.38	0.62	15°	4	52	34,000
★ 01-00507-02540		1°30′	4	1°18′	0.67	0.38	0.62	15°	4	52	33,500
★ 01-00507-02541			5	1°18′	0.72	0.38	0.62	15°	4	52	34,000
★ 01-00507-02550		2°	4	1°48′	0.74	0.38	0.62	15°	4	52	33,500
★ 01-00507-02551			5	1°48′	0.8	0.38	0.62	15°	4	52	34,000
★ 01-00507-03020	R0.3	30′	5	0°18′	0.65	0.5	0.75	15°	4	53	32,500
★ 01-00507-03021			6	0°18′	0.66	0.5	0.75	15°	4	53	33,000
★ 01-00507-03030		1°	5	0°48′	0.74	0.5	0.75	15°	4	53	32,500
★ 01-00507-03031			6	0°48′	0.76	0.5	0.75	15°	4	53	33,000
★ 01-00507-03040		1°30′	5	1°18′	0.82	0.5	0.75	15°	4	53	32,500
★ 01-00507-03041			6	1°18′	0.86	0.5	0.75	15°	4	53	33,000
★ 01-00507-03050		2°	5	1°48′	0.9	0.5	0.75	15°	4	53	32,500
★ 01-00507-03051			6	1°48′	0.96	0.5	0.75	15°	4	53	33,000
★ 01-00507-05020	R0.5	30′	8	0°21′	1.1	0.7	1.25	15°	4	53	32,000
★ 01-00507-05021			10	0°21′	1.12	0.7	1.25	15°	4	53	32,500
★ 01-00507-05030		1°	8	0°51′	1.23	0.7	1.25	15°	4	53	32,000
★ 01-00507-05031			10	0°51′	1.29	0.7	1.25	15°	4	53	32,500
★ 01-00507-05040		1°30′	8	1°21′	1.36	0.7	1.25	15°	4	53	32,000
★ 01-00507-05041			10	1°21′	1.45	0.7	1.25	15°	4	53	32,500
★ 01-00507-05050		2°	8	1°51′	1.49	0.7	1.25	15°	4	53	32,000
★ 01-00507-05051			10	1°51′	1.62	0.7	1.25	15°	4	53	32,500
★ 01-00507-07520	R0.75	30′	10	0°22′	1.62	1	1.9	15°	4	52	33,500
★ 01-00507-07521			15	0°22′	1.69	1	1.9	15°	4	52	34,000
★ 01-00507-07530		1°	10	0°52′	1.78	1	1.9	15°	4	52	33,500
★ 01-00507-07531			15	0°52′	1.94	1	1.9	15°	4	52	34,000
★ 01-00507-07540		1°30′	10	1°22′	1.95	1	1.9	15°	4	52	33,500
★ 01-00507-07541			15	1°22′	2.18	1	1.9	15°	4	52	34,000
★ 01-00507-07550		2°	10	1°52′	2.11	1	1.9	15°	4	52	33,500
★ 01-00507-07551			15	1°52′	2.43	1	1.9	15°	4	52	34,000
★ 01-00507-10020	R1	30′	16	0°24′	2.21	1.2	2.5	15°	4	53	33,500
★ 01-00507-10021			20	0°24′	2.27	1.2	2.5	15°	4	53	34,000
★ 01-00507-10030		1°	16	0°54′	2.48	1.2	2.5	15°	4	53	33,500
★ 01-00507-10031			20	0°54′	2.6	1.2	2.5	15°	4	53	34,000
★ 01-00507-10040		1°30′	16	1°24′	2.74	1.2	2.5	15°	4	53	33,500
★ 01-00507-10041			20	1°24′	2.93	1.2	2.5	15°	4	53	34,000
★ 01-00507-10050		2°	16	1°54′	3	1.2	2.5	15°	4	53	33,500
★ 01-00507-10051			20	1°54′	3.26	1.2	2.5	15°	4	53	34,000

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)			
(R)球头半径 Radius	颈角 Neck Taper Angle	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
			∂p mm	∂e mm	mm/min	min^{-1}	∂p mm	∂e mm	mm/min	min^{-1}	∂p mm	∂e mm	mm/min	min^{-1}
0.1	30′	1.5	0.003	0.005	140	40,000	0.003	0.003	120	40,000	0.002	0.003	100	40,000
		2	0.003	0.003	120	40,000	0.002	0.003	100	40,000	0.002	0.002	80	40,000
	1°	1.5	0.003	0.005	160	40,000	0.003	0.003	140	40,000	0.002	0.003	120	40,000
		2	0.003	0.003	140	40,000	0.002	0.003	120	40,000	0.002	0.002	90	40,000
	1°30′	1.5	0.003	0.005	200	40,000	0.003	0.003	160	40,000	0.002	0.003	140	40,000
		2	0.003	0.003	160	40,000	0.002	0.003	140	40,000	0.002	0.002	100	40,000
	2°	1.5	0.003	0.005	240	40,000	0.003	0.003	200	40,000	0.002	0.003	160	40,000
		2	0.003	0.003	200	40,000	0.002	0.003	160	40,000	0.002	0.002	120	40,000
0.15	30′	2	0.005	0.005	200	40,000	0.005	0.005	160	40,000	0.003	0.005	120	40,000
		3	0.003	0.005	160	40,000	0.003	0.003	120	40,000	0.002	0.003	100	40,000
	1°	2	0.005	0.005	240	40,000	0.005	0.005	200	40,000	0.003	0.005	160	40,000
		3	0.003	0.005	200	40,000	0.003	0.003	160	40,000	0.002	0.003	120	40,000
	1°30′	2	0.005	0.005	320	40,000	0.005	0.005	240	40,000	0.003	0.005	200	40,000
		3	0.003	0.005	240	40,000	0.003	0.003	200	40,000	0.002	0.003	160	40,000
	2°	2	0.005	0.005	400	40,000	0.005	0.005	300	40,000	0.003	0.005	240	40,000
		3	0.003	0.005	300	40,000	0.003	0.003	240	40,000	0.002	0.003	180	40,000
0.2	30′	3	0.007	0.01	320	40,000	0.005	0.01	240	40,000	0.005	0.005	160	40,000
		4	0.005	0.005	240	36,000	0.005	0.005	180	36,000	0.003	0.005	120	36,000
	1°	3	0.007	0.01	400	40,000	0.005	0.01	300	40,000	0.005	0.005	200	40,000
		4	0.005	0.005	320	36,000	0.005	0.005	240	36,000	0.003	0.005	160	36,000
	1°30′	3	0.007	0.01	480	40,000	0.005	0.01	360	40,000	0.005	0.005	240	40,000
		4	0.005	0.005	400	36,000	0.005	0.005	320	36,000	0.003	0.005	200	36,000
	2°	3	0.007	0.01	540	40,000	0.005	0.01	400	40,000	0.005	0.005	300	40,000
		4	0.005	0.005	480	36,000	0.005	0.005	360	36,000	0.003	0.005	240	36,000
0.25	30′	4	0.01	0.01	400	36,000	0.005	0.01	320	36,000	0.005	0.005	240	36,000
		5	0.005	0.01	320	32,000	0.005	0.005	240	32,000	0.003	0.005	160	32,000
	1°	4	0.01	0.01	480	36,000	0.005	0.01	400	36,000	0.005	0.005	300	36,000
		5	0.005	0.01	400	32,000	0.005	0.005	320	32,000	0.003	0.005	240	32,000
	1°30′	4	0.01	0.01	640	36,000	0.005	0.01	480	36,000	0.005	0.005	360	36,000
		5	0.005	0.01	540	32,000	0.005	0.005	400	32,000	0.003	0.005	300	32,000
	2°	4	0.01	0.01	720	36,000	0.005	0.01	540	36,000	0.005	0.005	400	36,000
		5	0.005	0.01	640	32,000	0.005	0.005	480	32,000	0.003	0.005	360	32,000
0.3	30′	5	0.01	0.01	480	36,000	0.005	0.01	400	36,000	0.005	0.005	300	36,000
		6	0.005	0.01	400	32,000	0.005	0.005	360	32,000	0.003	0.005	240	32,000
	1°	5	0.01	0.01	640	36,000	0.005	0.01	480	36,000	0.005	0.005	400	36,000
		6	0.005	0.01	540	32,000	0.005	0.005	400	32,000	0.003	0.005	300	32,000
	1°30′	5	0.01	0.01	800	36,000	0.005	0.01	640	36,000	0.005	0.005	480	36,000
		6	0.005	0.01	720	32,000	0.005	0.005	540	32,000	0.003	0.005	400	32,000
	2°	5	0.01	0.01	900	36,000	0.005	0.01	720	36,000	0.005	0.005	540	36,000
		6	0.005	0.01	800	32,000	0.005	0.005	640	32,000	0.003	0.005	480	32,000

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)			
(R)球头半径 Radius	颈角 Neck Taper Angle	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	30′	8	0.01	0.02	900	20,000	0.01	0.02	800	20,000	0.01	0.01	640	20,000
		10	0.01	0.02	720	16,000	0.005	0.01	640	16,000	0.005	0.005	480	16,000
	1°	8	0.01	0.02	1,000	20,000	0.01	0.02	900	20,000	0.01	0.01	800	20,000
		10	0.01	0.02	800	16,000	0.005	0.01	720	16,000	0.005	0.005	640	16,000
	1° 30′	8	0.01	0.02	1,200	20,000	0.01	0.02	1,000	20,000	0.01	0.01	900	20,000
		10	0.01	0.02	900	16,000	0.005	0.01	800	16,000	0.005	0.005	720	16,000
	2°	8	0.01	0.02	1,400	20,000	0.01	0.02	1,200	20,000	0.01	0.01	1,000	20,000
		10	0.01	0.02	1,000	16,000	0.005	0.01	900	16,000	0.005	0.005	800	16,000
0.75	30′	10	0.02	0.02	800	16,000	0.015	0.02	900	16,000	0.01	0.015	600	16,000
		15	0.01	0.02	540	12,000	0.01	0.01	480	12,000	0.005	0.01	400	12,000
	1°	10	0.02	0.02	900	16,000	0.015	0.02	1,000	16,000	0.01	0.015	720	16,000
		15	0.01	0.02	680	12,000	0.01	0.01	600	12,000	0.005	0.01	540	12,000
	1° 30′	10	0.02	0.02	1,200	20,000	0.015	0.02	1,000	20,000	0.01	0.015	900	20,000
		15	0.01	0.02	900	16,000	0.01	0.01	800	16,000	0.005	0.01	720	16,000
	2°	10	0.02	0.02	1,400	20,000	0.015	0.02	1,200	20,000	0.01	0.015	1,000	20,000
		15	0.01	0.02	1,000	16,000	0.01	0.01	900	16,000	0.005	0.01	800	16,000
1	30′	16	0.02	0.03	720	12,000	0.015	0.03	540	12,000	0.01	0.02	400	12,000
		20	0.02	0.02	400	8,000	0.01	0.02	360	8,000	0.01	0.01	240	8,000
	1°	16	0.02	0.03	1,000	16,000	0.015	0.03	800	16,000	0.01	0.02	600	16,000
		20	0.02	0.02	600	12,000	0.01	0.02	540	12,000	0.01	0.01	400	12,000
	1° 30′	16	0.02	0.03	1,200	20,000	0.015	0.03	1,000	20,000	0.01	0.02	800	20,000
		20	0.02	0.02	900	16,000	0.01	0.02	800	16,000	0.01	0.01	600	16,000
	2°	16	0.02	0.03	1,400	20,000	0.015	0.03	1,200	20,000	0.01	0.02	1,000	20,000
		20	0.02	0.02	1,000	16,000	0.01	0.02	900	16,000	0.01	0.01	800	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 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。
※3 发生振刀时，请以相同的比率降低主轴转速和进给速度。此外，主轴转速过低时，也以相同的比率降低。
※4 R角等负载大的加工部位，请特别注意参数设定和刀路轨迹等。
※5 加工深沟时，请充分注意冷却液的供油及排屑是否顺畅。
※6 建议使用油雾冷却方式。

※1 Max. Depth of Cut for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Required careful set up of milling conditions, tool path and etc. at cutting parts, such as corners where will become overloaded.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Oil mist coolant is recommended.

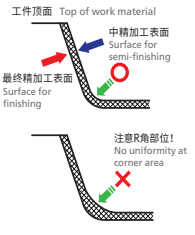
使用注意事项 Points in Use

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.



日进工具株式会社

总公司・海外营业部
140-0014 东京都品川区大井 1-28-1 住友不动产大井町站前大厦 6 F
TEL. ＋ 81(3)-6423-1191 FAX. ＋ 81(3)-6423-1192
www.ns-tool.com

日进工具香港有限公司
香港九龙尖沙咀亚士厘道 33 号 九龙中心大厦 10 楼 1001-02 室
TEL. ＋ 852-2736-8686 FAX. ＋ 852-2736-0070
www.ns-tool.com.en

日进工具香港有限公司 深圳代表处
广东省深圳市罗湖区人民南路 2008 号 深圳嘉里中心大厦 1221 室
TEL. ＋ 86(755)-2265-2275

日进工具香港有限公司 苏州办事处
江苏省苏州市工业园区星都街 80 号 凤凰国际公寓 2107 室
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.

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