

NS TOOL

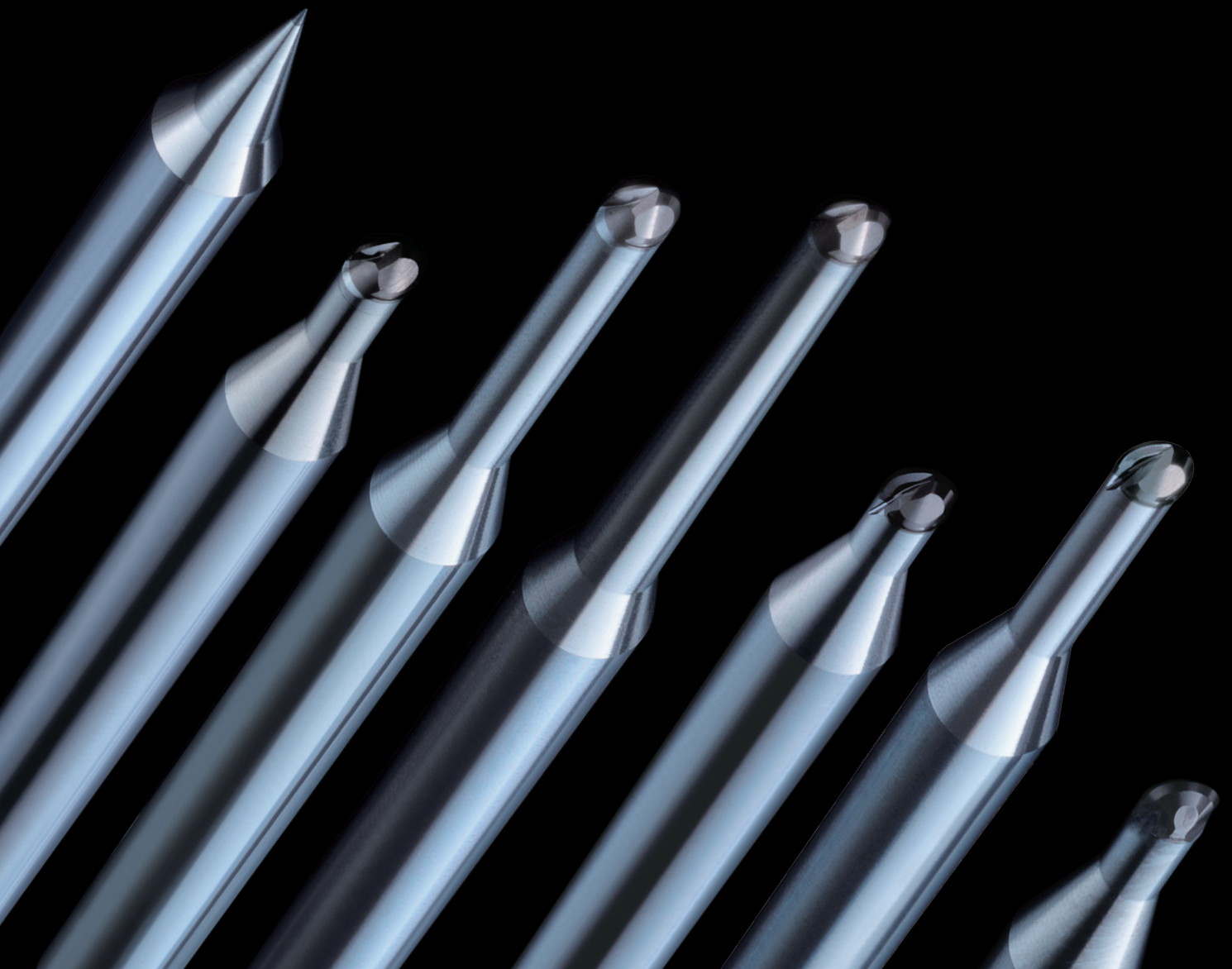
CORE LINE

For Crafting Tomorrow

CBN

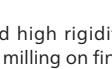
CBN END MILL SERIES Vol.4

BALL END MILL



Various lineup optimize a long time machining on hardened steel

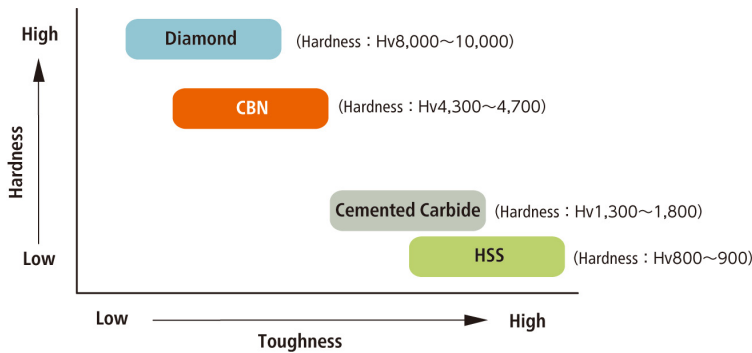
CBN ball end mill

Type	Model	Maximum cutting depth					Size Number of flute/Helix angle/Tolerance	Applications
		1D	2D	3D	...	10D		
For micro milling SMB Type	SMB120  Standardized sizes from R0.01 Micro cutting tools open up new areas in the microfabrication field						R0.01 ~ R0.05 Total 7 sizes	     
	SMB200  2-flute shape specialized from R0.01 High precise specific micro end mill						R0.01 ~ R0.05 Total 7 sizes	     
For surface roughness SSPB Type	SSPB220  Adopt spiral ball shape to realize glossy finishing surface						R0.1 ~ R3 Total 30 sizes	      
	SSPBL220  While taking advantage of the spiral ball shape, the finishing surface of deep milling is improved						R0.1 ~ R1 Total 27 sizes	     
	SSPBTN220  Features of spiral ball shape and high rigidity tapered neck shape enable high precision deep milling on finishing						R0.1xNeck taper angle 30' ~ R1xNeck taper angle 2° Total 64 sizes	     
For stable machining precision SSB Type	SSB200  This CBN Ball End Mill has realized both advantages of CBN and Carbide						R0.1 ~ R1 Total 15 sizes	     
	SSBL200  Features of SSB200 and maximum L/D=10 of the under neck length realize high efficiency deep milling on finishing						R0.05 ~ R1 Total 25 sizes	     
For gradual shape SFB Type	SFB200  Outstanding machinability up to the tool center realizes a nano-level finishing surface						R0.1 ~ R1 Total 12 sizes	     

Features

Long tool life

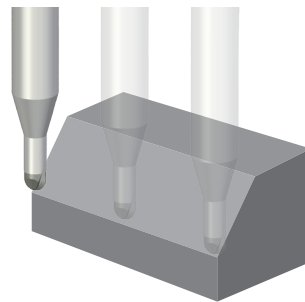
CBN (Cubic Boron Nitride) sintered alloy



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 ball end mill Stability evaluation of cutting accuracy

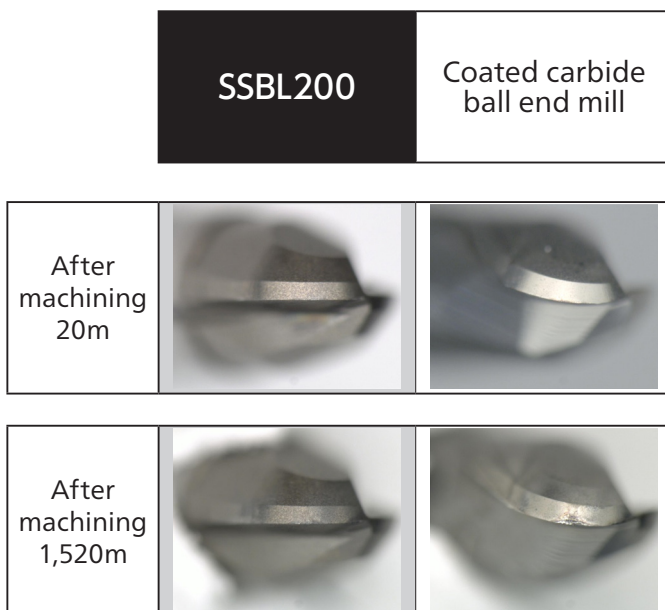
Tool : SSBL200 R0.5 × 6
Coated carbide end mill R0.5 × 6
Work material : STAVAX (52HRC)
Spindle speed n : 30,000 min⁻¹
Feed vf : 1,500 mm/min
Depth of cut : ap 0.01 mm
Stock : 0.01 mm
Coolant : Oil mist



Stock after finishing on 45°inclined surface



Tool condition after machining



Stock after finishing [Unit: μm]

Cutting distance	SSBL200	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

Lineup from R0.01mm enables micro precision machining

CBN Micro 2-Flute Ball End Mill

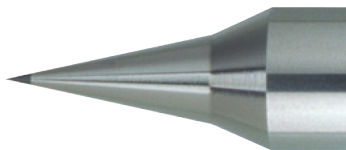
SMB200 *New* R0.01 ~ R0.05 Total 7 sizes



CBN	2	0°	R ±0.002	ϕd -0.001 -0.003
Connect For Crafting Tomorrow				3D

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

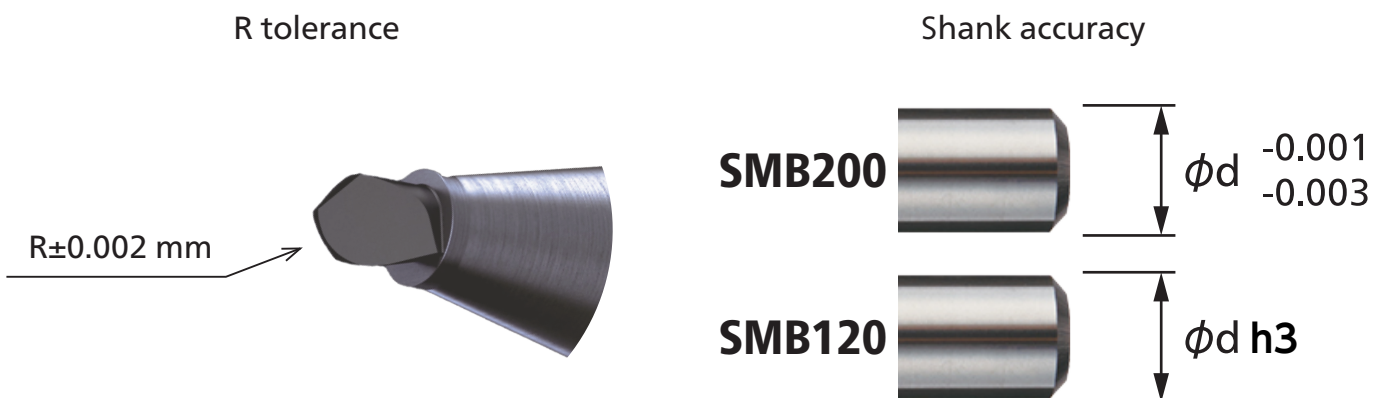
SMB120 R0.01 ~ R0.05 Total 7 sizes



CBN	1	-20°	R ±0.002	ϕd h3
				3D

Ultra High Precision	R tolerance , shank accuracy
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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



Machining case

Micro lens array STAVAX(52HRC)

Micro precision machining is realized by specialized cutting edge and high R accuracy $R \pm 0.002\text{mm}$

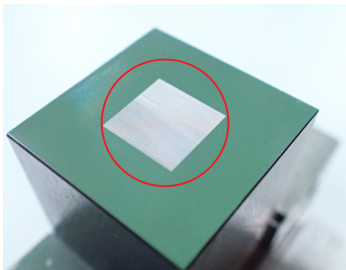
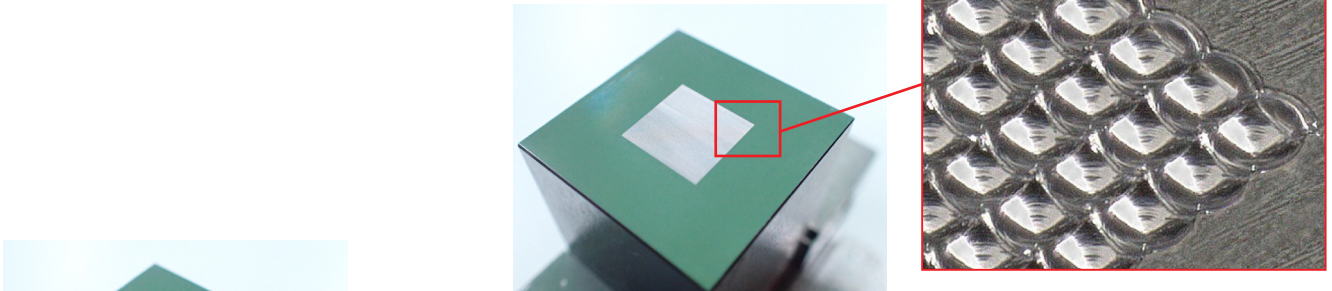
Work material : STAVAX (52HRC)

Machining size : $9 \times 9 \times$ Machining depth 0.03 mm

Coolant : Oil mist

Total machining time : 93hr 57min

SR shape 22,500pcs



Accuracy

		At the beginning of machining 1st	At the end of machining 22,500th
Enlarged photo ($\times 2,000$)			
Surface roughness [μm]		Ra : 0.078	Ra : 0.085
Machining accracy [mm]	Depth Target : 0.030	0.031	0.030
	Accuracy Target : R0.050	R0.050	R0.049

At the end of machining



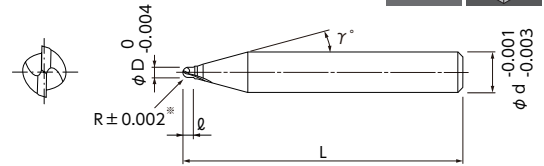
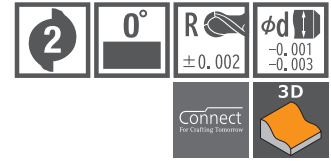
At the beginning of machining

Process	Roughing	Finishing
Tool	SSBL200 R0.05 \times 0.3	SMB200 R0.03
Spindle speed [min^{-1}]	60,000	60,000
Feed [mm/min]	100	30
Depth of cut [mm] $a_p \times a_e$	0.005 \times 0.005	0.001 \times 0.001
Stock [mm]	0.002	-
Machining time	36hr 16min	57hr 41min

CBN Micro 2-Flute Ball End Mill

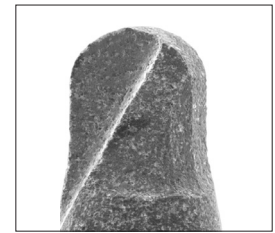
Total 7 sizes

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



※R accuracy is based on a half value of actual diameter

- 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.



Cutting edge shape

Work Material

Prehardened Steel P	Hardened Steel H		
	~55HRC	~65HRC	~70HRC
○	◎	◎	○

Unit [Size : mm]

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00461-00010	R0.01	0.015	0.02	15°	4	48
01-00461-00015	R0.015	0.025	0.03	15°	4	48
01-00461-00020	R0.02	0.03	0.04	15°	4	48
01-00461-00025	R0.025	0.04	0.05	15°	4	48
01-00461-00030	R0.03	0.045	0.06	15°	4	48
01-00461-00040	R0.04	0.06	0.08	15°	4	48
01-00461-00050	R0.05	0.075	0.1	15°	4	48

How to Order

When you order, indicate SMB200 (R).

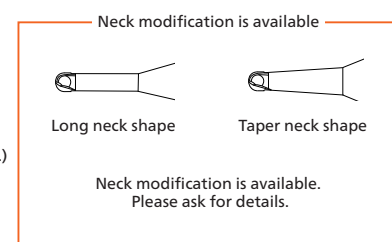
※(γ) is reference value.

Recommended Milling Conditions

Work Material	Prehardened Steels・Hardened Steels NAK・STAVAX (~52HRC)					Prehardened Steels・Hardened Steels SKD11・PD613・ELMAX (~60HRC)					High Speed Steels SKH・HAP (~68HRC)				
	Depth of Cut		Feed	Approaching Feed	Spindle Speed	Depth of Cut		Feed	Approaching Feed	Spindle Speed	Depth of Cut		Feed	Approaching Feed	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

Notes

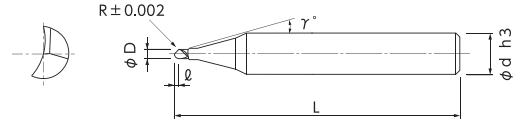
- ※1 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut.
- ※2 Handle with care when exchanging and presetting tool.
- ※3 We recommend using oil mist coolant.
- ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.)
- ※5 Tool approaching angle must be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



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

Total 7 sizes

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



- The world's first CBN Micro Ball End Mill.
- Standardized sizes from R0.01.
- Realized sharp edge by maximizing features of CBN.



Cutting edge shape

Work Material

Prehardened Steel P	Hardened Steel H		
	~55HRC	~65HRC	~70HRC
○	◎	◎	○

Unit [Size : mm]

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00460-00010	R0.01	0.02	0.02	15°	4	50
01-00460-00015	R0.015	0.03	0.03	15°	4	50
01-00460-00020	R0.02	0.04	0.04	15°	4	50
01-00460-00025	R0.025	0.05	0.05	15°	4	50
01-00460-00030	R0.03	0.06	0.06	15°	4	50
01-00460-00040	R0.04	0.08	0.08	15°	4	50
01-00460-00050	R0.05	0.1	0.1	15°	4	50

How to Order

When you order, indicate SMB120 (R).

※(γ) is reference value.

Recommended Milling Conditions

Work Material	Prehardened Steels・Hardened Steels NAK・STAVAX・SKD11・PD613 (~62HRC)				
	Depth of Cut		Feed	Approaching Feed	Spindle Speed
Radius	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

Notes

- ※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.

Realized nano level surface roughness even for milling with its R-center

CBN Super Finish Ball End Mill

SFB200

R0.1 ~ R1

Total 12 sizes



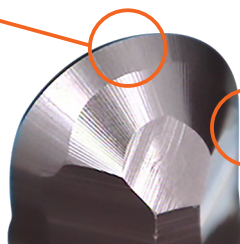
Features

New developed cutting edge

Outstanding machinability

Center R shape

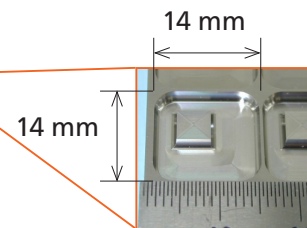
New developed cutting edge achieves outstanding machinability to center R



Smoothly connected

No step tool design with smoothly connected between R edge shape and the peripheral cutting edge

Tool : CBN ball end mill R0.5
 Coated carbide ball end mill R0.5
 Work material : SKD11 (60HRC)
 Spindle speed n : 30,000 min⁻¹
 Feed vf : 1,200 mm/min
 Depth of cut : ap 0.01 x ae 0.02 mm
 Coolant : Oil mist



Machined size : 1 x 1 x Depth 1.8 mm
 Machining time : 1pc 30min

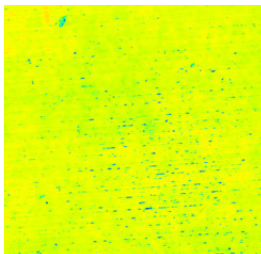
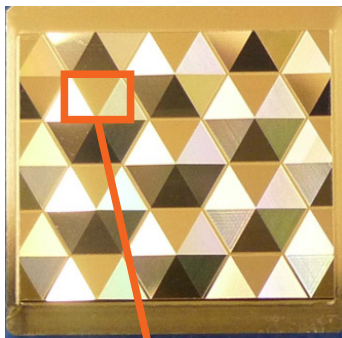
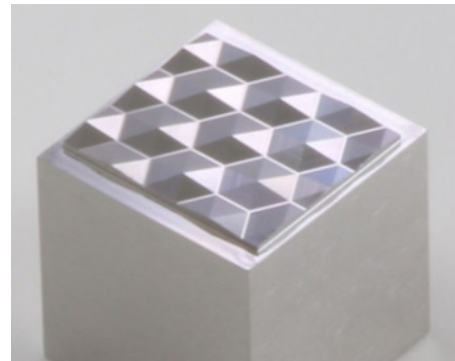
	1 pc	10 pc	20 pc	30 pc
CBN End Mill SFB200				
Surface roughness Rz	0.9 μm	1.0 μm	1.2 μm	1.0 μm
Coated carbide end mill			Unable to machine	
Surface roughness Rz	1.0 μm	6.2 μm	-	

Machining case

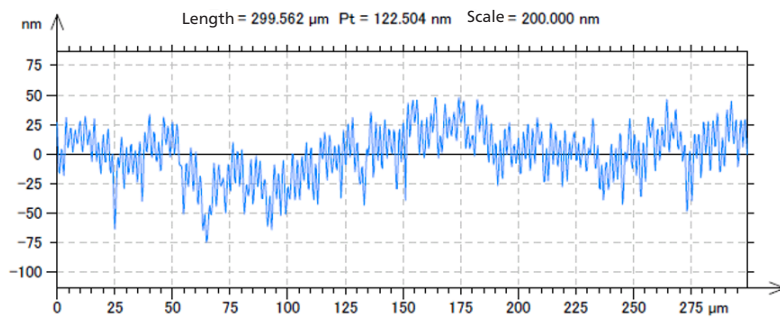
Reflector model ELMAX(60HRC)

Realizes high precision machining with unique cutting edge design and high accuracy $R\pm 0.003\text{mm}$

Work material: ELMAX (60HRC)
 Work size :20 × 20 × Machining depth 0.35 mm
 Coolant : Oil mist
 Total machining time : 19hr 10min



Surface roughness



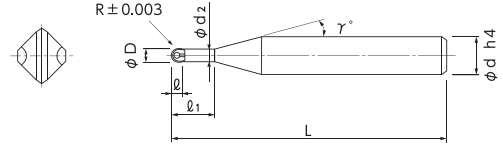
Surface roughness	
Ra	13.091 nm
Rz	79.649 nm

Process	Roughing	Semi-Finishing	Finishing
Tool	MSBH230 R0.2	SSBL200 R0.2 × 1.2	SFB200 R0.2 × 1
Spindle speed [min^{-1}]	40,000	40,000	40,000
Feed [mm/min]	800	700	400
Depth of cut [mm] $a_p \times a_e$	0.015 × 0.05	0.005 × 0.01	0.004 × 0.002
Machining time	3hr 23min	2hr 10min	13hr 37min

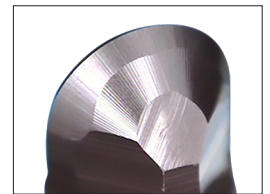
CBN Super Finish Ball End Mill

Total 12 sizes

Realized nano level surface roughness even for milling with its R-center

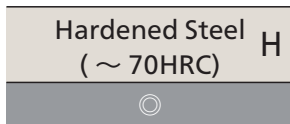


- Sharpened edge at R-center improves shearing ability.
- Continuous 10 hours machining on hardened steel of 60HRC.
- Long-lasting high surface accuracy Rz1.0μm.
- Save significant time at polishing process.



Cutting edge shape
Sharp tooth edge guarantees long and consistent accuracy.

Work Material



Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00500-00100	R0.1	0.5	0.15	0.2	0.19	12°	4	50
01-00500-00200	R0.2	1	0.3	0.4	0.37	12°	4	50
01-00500-00250	R0.25	1.25	0.38	0.5	0.46	12°	4	50
01-00500-00300	R0.3	1.5	0.5	0.6	0.56	12°	4	50
01-00500-00400	R0.4	2	0.6	0.8	0.76	12°	4	50
01-00500-00500	R0.5	2.5	0.7	1	0.95	12°	4	50
01-00500-00600	R0.6	3	0.8	1.2	1.15	12°	4	50
01-00500-00700	R0.7	3.5	1	1.4	1.35	12°	4	52
01-00500-00750	R0.75	3.8	1	1.5	1.45	12°	4	52
01-00500-00800	R0.8	4	1	1.6	1.55	12°	4	52
01-00500-00900	R0.9	4.5	1.2	1.8	1.75	12°	4	52
01-00500-01000	R1	5	1.2	2	1.94	12°	4	52

How to Order

When you order, indicate SFB200 (R).

※(γ) is reference value.

Work Material	Hardened Steels•High Speed Steels SKD•SKH•HAP (~68HRC)					
	Depth of Cut		Normal Speed		High Speed	
			Feed	Spindle Speed	Feed	Spindle Speed
Radius	a_p mm	a_e mm	mm/min	min^{-1}	mm/min	min^{-1}
0.1 ~0.2	0.005	0.01	600	20,000	1,500	50,000
0.25~0.3	0.01	0.01	800		2,000	
0.4 ~0.6	0.01	0.02	1,200		3,000	
0.7 ~0.8	0.01	0.02	1,600		4,000	
0.9 ~1	0.02	0.05	2,000		5,000	
Notes	※1 Depth of Cut : a_p =Axial Depth of Cut / a_e =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.					

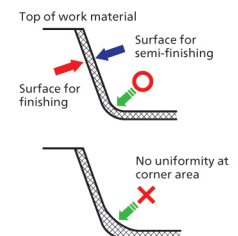
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, **uniform finishing allowance (stock amount) is important.**
- 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.**



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

CBN Super Speed Ball End Mill

SSB200 R0.1 ~ R1 Total 15 sizes

CBN Super Speed Long Neck Ball End Mill

SSBL200 R0.05 ~ R1 Total 25 sizes



SSB200

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



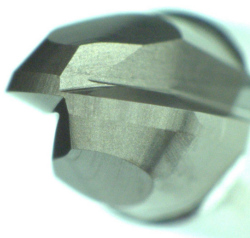
SSBL200

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

Features

High efficiency

Chip evacuation

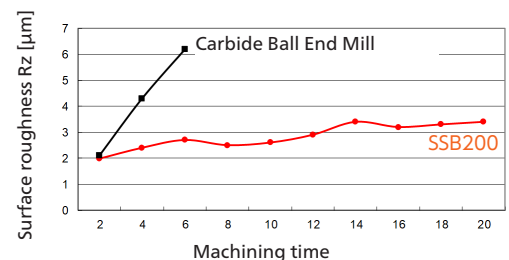


With high chip evacuation and setting the depth of cut to the same level as solid carbide tools in finishing, it enables more efficient machining than conventional CBN tools

Performance comparison:

Work material: SKD11 (62HRC)
Coolant : Oil mist

Process	Finishing
Tool	SSB200 R1 Carbide Ball End Mill
Spindle speed [min ⁻¹]	40,000
Feed [mm/min]	3,000
Depth of cut [mm]	0.05 × 0.05



10 time longer tool life than carbide end mill

Machining case

Reflector model ELMAX(60HRC)

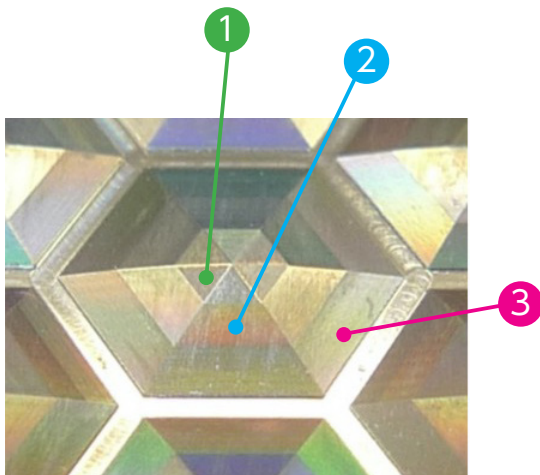
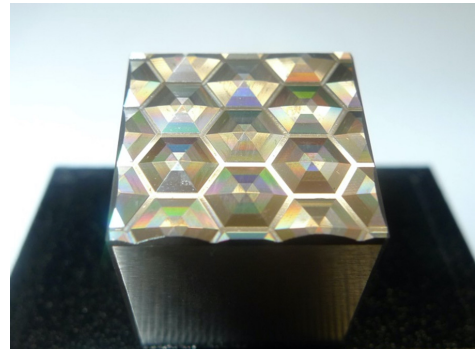
Long tool life and high accuracy of CBN enables long time finishing on hardened steel

Work material: ELMAX (60HRC)

Work size : 15 × 15 × Machining depth 0.35 mm

Coolant : Oil mist

Total machining time: 9hr 34min



Surface roughness

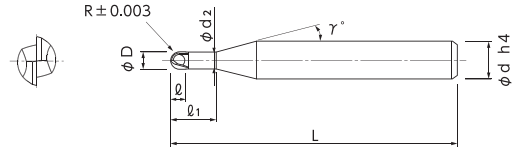
Surface roughness Rz [μm]		
1	2	3
0.87	0.89	0.57

Process	Roughing	Slot	Semi-finishing	Finishing
Tool	MRBH230 R0.5 × 2	MHRH230R ϕ 0.4 × R0.05 × 1	MRBH230 R0.5 × 2	SSB200 R0.5 × 2.5
Spindle speed [min^{-1}]	40,000	30,000	40,000	40,000
Feed [mm/min]	800	125	800	400
Depth of cut [mm] $a_p \times a_e$	0.02 × 0.1	a_p 0.003	0.02 × 0.08	0.004 × 0.004
Machining time	52 min	38 min	1hr 45min	6hr 19min

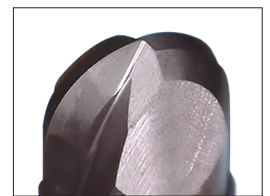
CBN Super Speed Ball End Mill

Total 15 sizes

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

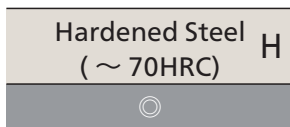


- This CBN Ball End Mill has realized both advantages of CBN and Carbide.
- Depth of Cut can be increased at the equivalent level to Carbide.
- Unique flute design with R-accuracy ± 0.003 prevents chipping!
- Flute is smoothly tangent from straight line to R-curve.
- Applicable for hardened materials up to 70HRC!



Cutting edge shape

Work Material



Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00510-00100	R0.1	0.3	0.15	0.2	0.19	15°	4	50
01-00510-00150	R0.15	0.3	0.23	0.3	0.28	15°	4	50
01-00510-00151		0.5	0.23	0.3	0.28	15°	4	50
01-00510-00152		0.75	0.23	0.3	0.28	15°	4	50
01-00510-00200	R0.2	0.5	0.3	0.4	0.37	15°	4	50
01-00510-00201		0.75	0.3	0.4	0.37	15°	4	50
01-00510-00202		1	0.3	0.4	0.37	15°	4	50
01-00510-00250	R0.25	1	0.38	0.5	0.46	15°	4	50
01-00510-00300	R0.3	1.5	0.5	0.6	0.56	15°	4	50
01-00510-00400	R0.4	2	0.6	0.8	0.76	15°	4	50
01-00510-00500	R0.5	2.5	0.7	1	0.95	15°	4	50
01-00510-00600	R0.6	3	0.8	1.2	1.15	15°	4	50
01-00510-00750	R0.75	3.8	1	1.5	1.45	15°	4	52
01-00510-01001	R1	4	1.2	2	1.94	15°	4	52
01-00510-01000		5	1.2	2	1.94	15°	4	52

How to Order When you order, indicate SSB200 (R)×(ℓ1).

※(γ) is reference value.

Work Material		Hardened Steels STAVAX・SKD61 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH・HAP (~68HRC)			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	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	50,000	0.005	0.005	540	50,000	0.003	0.003	360	50,000
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	
0.2	0.75	0.005	0.005	1,000		0.005	0.005	540		0.003	0.005	400	
	0.5	0.01	0.01	1,800		0.01	0.01	1,200		0.005	0.01	640	
0.25	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	
0.3	1	0.015	0.015	1,800		0.01	0.015	1,500		0.01	0.01	1,100	
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	
Notes		<p>※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.</p>											

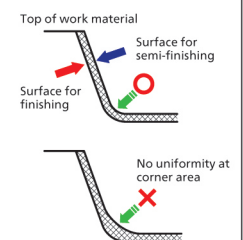
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

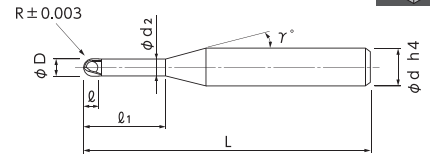
- When using small CBN End Mill, **uniform finishing allowance (stock amount) is important.**
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy. **Therefore, it is important to get uniform stock amount in the pre-stage cutting.**



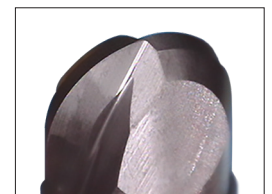
CBN Super Speed Long Neck Ball End Mill

Total 25 sizes

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

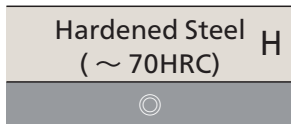


- Lineup of CBN tool with long neck applicable to deep milling, available 25 sizes in total.
- Enables milling more deeply by long under neck length up to 10mm.
- Enables wider application for milling by long neck in addition to long life and accurate finishing.
- Standardized in R0.05 at smallest.
- Unique flute design with R-accuracy ±0.003 prevents chipping!



Cutting edge shape

Work Material



Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00511-00051	R0.05	0.3	0.08	0.1	0.09	15°	4	50
01-00511-00052		0.5	0.08	0.1	0.09	15°	4	50
01-00511-00075	R0.075	0.45	0.12	0.15	0.14	15°	4	50
01-00511-00076		0.75	0.12	0.15	0.14	15°	4	50
01-00511-00101	R0.1	0.6	0.15	0.2	0.19	15°	4	50
01-00511-00102		1	0.15	0.2	0.19	15°	4	50
01-00511-00151	R0.15	0.9	0.23	0.3	0.28	15°	4	50
01-00511-00152		1.5	0.23	0.3	0.28	15°	4	50
01-00511-00201	R0.2	1.2	0.3	0.4	0.37	15°	4	50
01-00511-00202		2	0.3	0.4	0.37	15°	4	50
01-00511-00251	R0.25	1.5	0.38	0.5	0.46	15°	4	50
01-00511-00252		2.5	0.38	0.5	0.46	15°	4	50
01-00511-00301	R0.3	3	0.5	0.6	0.56	15°	4	50
01-00511-00302		4	0.5	0.6	0.56	15°	4	52
01-00511-00303		5	0.5	0.6	0.56	15°	4	52
01-00511-00401	R0.4	4	0.6	0.8	0.76	12°	4	53
01-00511-00501	R0.5	4	0.7	1	0.95	12°	4	53
01-00511-00502		5	0.7	1	0.95	12°	4	53
01-00511-00504		6	0.7	1	0.95	15°	4	53
01-00511-00506		8	0.7	1	0.95	15°	4	53
01-00511-00508		10	0.7	1	0.95	15°	4	53
01-00511-00751	R0.75	7.5	1	1.5	1.45	15°	4	52
01-00511-01001	R1	6	1.2	2	1.94	15°	4	52
01-00511-01003		8	1.2	2	1.94	15°	4	52
01-00511-01005		10	1.2	2	1.94	15°	4	52

How to Order


When you order, indicate SSBL200 (R)×(ℓ1).

※(γ) is reference value.

Work Material			Hardened Steels STAVAX·SKD61 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH·HAP (~68HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	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
0.75	10	10	0.01	0.02	800	12,000	0.005	0.01	720	12,000	0.005	0.005	620	12,000
	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

Notes

※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 Recommended milling conditions for the sizes L/D (Effective length / Diameter) = 5 or longer are based on machining inclined angle 30 deg. or lower.



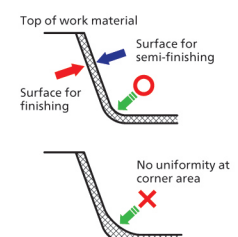
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, **uniform finishing allowance (stock amount) is important.**
- 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.**



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

CBN Super Spiral Ball End Mill

SSPB220

R0.1 ~ R3

Total 30 sizes					

CBN Super Spiral Long Neck Ball End Mill

SSPBL220

R0.1 ~ R1

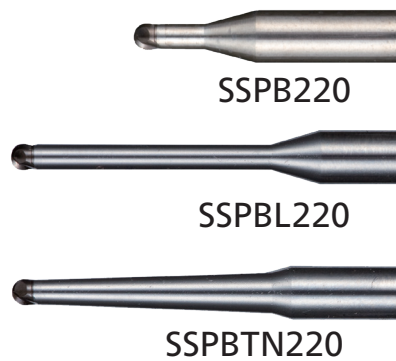
Total 27 sizes					

CBN Super Spiral Long Taper Neck Ball End Mill

SSPBTN220

R0.1 × Neck taper angle 30'
~ R1 × Neck taper angle 2°

Total 64 sizes



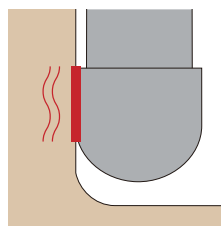
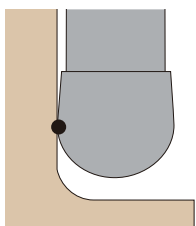
3 products, total in 121 sizes support various cutting shapes

Features

Cutting ability and fracture resistance	Spiral ball shape	Back taper shape
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Spiral ball shape with improved chipping resistance and cutting ability achieves glossy finishing surface



Suppress chattering by point milling

General end mill

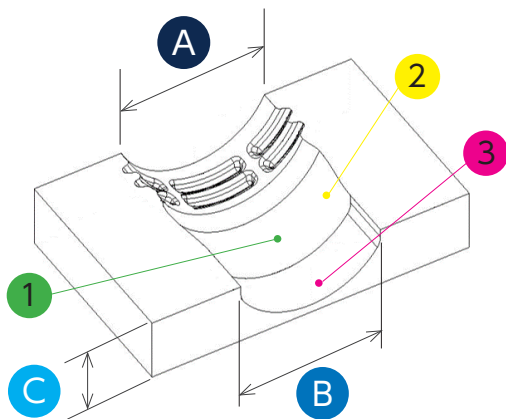
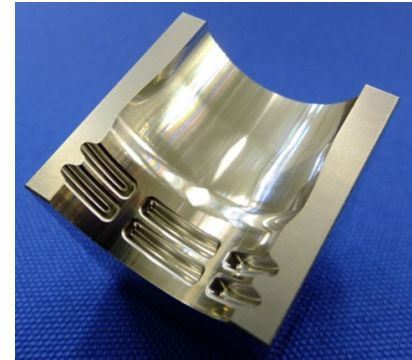
SSPB series adopt strong back taper shape. Suppresses chattering and improves surface quality

Machining case

Bottleneck mold ELMAX(59HRC)

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

Work material: ELMAX (59HRC)
 Work size: 30 x 30 x Machining depth 8.134 mm
 Coolant : Oil mist
 Total machining time : 3hr 25min



Accuracy

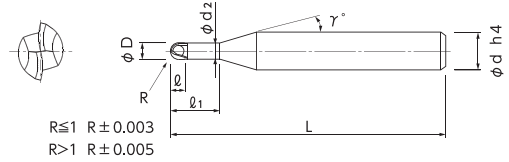
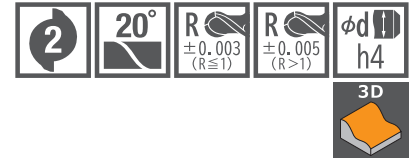
Measuring position	A	B	C
Target	22.000	22.557	8.134
Actual	21.998	22.554	8.133

Surface roughness

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

Process	Roughing	Semi-finishing	Finishing	Finishing
Tool	MRBH230 R1 x 6	MRBH230 R0.5 x 5	SSPB220 R0.5 x 2.5	SSPB220 R1 x 5
Spindle speed [min ⁻¹]	25,000	35,000	40,000	40,000
Feed [mm/min]	2,000	1,600	1,500	1,500
Depth of cut [mm] ap x ae	0.2 x 0.3	0.04 x 0.1	0.01 x 0.007	0.01 x 0.005
Machining time	45 min	45 min	35 min	1hr 20min

Realized glossy finished surface

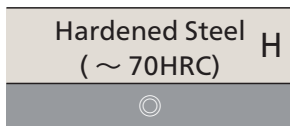


- Adopted spiral ball shape to improve sharpness of cutting edge.
- Adopted cutting edge shape to improve the chipping resistance of cutting edge.
- When peripheral cutting edge makes contact with cutting surface, vibration occurs by an increase in cutting resistance and it affects tool life and cutting 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.



Cutting edge shape

Work Material



Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ ₁)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d ₂)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00505-00101	R0.1	0.3	0.15	0.2	0.19	15°	4	50
01-00505-00100		0.6	0.15	0.2	0.19	15°	4	50
01-00505-00150	R0.15	0.3	0.23	0.3	0.28	15°	4	50
01-00505-00151		0.5	0.23	0.3	0.28	15°	4	50
01-00505-00152	R0.2	0.75	0.23	0.3	0.28	15°	4	50
01-00505-00201		0.5	0.3	0.4	0.37	15°	4	50
01-00505-00202		0.75	0.3	0.4	0.37	15°	4	50
01-00505-00203		1	0.3	0.4	0.37	15°	4	50
01-00505-00200	R0.25	1.2	0.3	0.4	0.37	15°	4	50
01-00505-00251		1	0.38	0.5	0.46	15°	4	50
01-00505-00301	R0.3	1.2	0.5	0.6	0.56	15°	4	50
01-00505-00300		1.5	0.5	0.6	0.56	15°	4	50
01-00505-00401	R0.4	1.6	0.6	0.8	0.76	15°	4	50
01-00505-00400		2	0.6	0.8	0.76	15°	4	50
01-00505-00501	R0.5	2	0.7	1	0.95	15°	4	50
01-00505-00500		2.5	0.7	1	0.95	15°	4	50
01-00505-00601	R0.6	2.4	0.8	1.2	1.15	15°	4	50
01-00505-00600		3	0.8	1.2	1.15	15°	4	50
01-00505-00751	R0.75	3	1	1.5	1.45	15°	4	52
01-00505-00750		3.8	1	1.5	1.45	15°	4	52
01-00505-01000	R1	4	1.2	2	1.94	15°	4	52
01-00505-01001		5	1.2	2	1.94	15°	4	52
01-00505-01506	R1.5	6	1.8	3	2.85	12°	6	50
01-00505-01509		9	1.8	3	2.85	12°	6	70
01-00505-02008	R2	8	2.4	4	3.8	12°	6	50
01-00505-02012		12	2.4	4	3.8	12°	6	70
01-00505-02510	R2.5	10	3	5	4.8	12°	6	60
01-00505-02515		15	3	5	4.8	12°	6	80
01-00505-03012	R3	12	3.6	6	5.8	—	6	60
01-00505-03018		18	3.6	6	5.8	—	6	80

How to Order When you order, indicate SSPB220 (R)×(ℓ1).

※(γ) is reference value.

Work Material		Hardened Steels STAVAX·SKD61 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH·HAP (~68HRC)			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	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	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
0.2	0.75	0.005	0.005	700	40,000	0.005	0.005	500	40,000	0.003	0.003	400	40,000
	0.5	0.005	0.01	1,200	40,000	0.005	0.01	900	40,000	0.005	0.005	600	40,000
0.2	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
0.25	1.2	0.005	0.01	1,000	40,000	0.005	0.01	800	40,000	0.005	0.005	500	40,000
	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

Notes

※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.

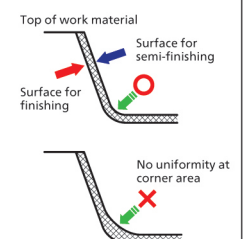
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

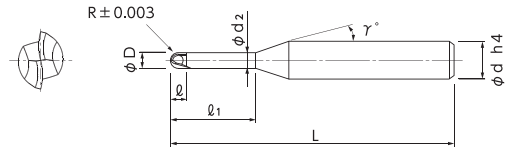
- When using small CBN End Mill, **uniform finishing allowance (stock amount) is important.**
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy. **Therefore, it is important to get uniform stock amount in the pre-stage cutting.**



CBN Super Spiral Long Neck Ball End Mill

Total 27 sizes

Realized glossy finished surface by maximum L/D=10

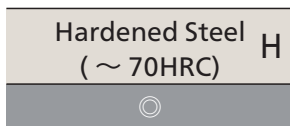


- Added longer under neck length type to SSPB220 series.
- Realized deeper milling by adoption of spiral ball shape and strong back taper shape to improve both sharpness and the chipping resistance of cutting edges.



Cutting edge shape

Work Material



Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00506-00101	R0.1	1	0.15	0.2	0.19	15°	4	50
01-00506-00151	R0.15	0.9	0.23	0.3	0.28	15°	4	50
01-00506-00152		1.5	0.23	0.3	0.28	15°	4	50
01-00506-00201	R0.2	2	0.3	0.4	0.37	15°	4	50
01-00506-00202		3	0.3	0.4	0.37	15°	4	52
01-00506-00251	R0.25	1.5	0.38	0.5	0.46	15°	4	50
01-00506-00252		2.5	0.38	0.5	0.46	15°	4	50
01-00506-00253		3.5	0.38	0.5	0.46	15°	4	52
01-00506-00301	R0.3	3	0.5	0.6	0.56	15°	4	50
01-00506-00302		4	0.5	0.6	0.56	15°	4	53
01-00506-00303		5	0.5	0.6	0.56	15°	4	53
01-00506-00304		6	0.5	0.6	0.56	15°	4	53
01-00506-00401	R0.4	4	0.6	0.8	0.76	15°	4	53
01-00506-00402		6	0.6	0.8	0.76	15°	4	53
01-00506-00501	R0.5	4	0.7	1	0.95	15°	4	51
01-00506-00502		6	0.7	1	0.95	15°	4	53
01-00506-00503		8	0.7	1	0.95	15°	4	53
01-00506-00504		10	0.7	1	0.95	15°	4	53
01-00506-00601	R0.6	6	0.8	1.2	1.15	15°	4	53
01-00506-00751	R0.75	7.5	1	1.5	1.45	15°	4	52
01-00506-00752		10	1	1.5	1.45	15°	4	52
01-00506-00753		15	1	1.5	1.45	15°	4	52
01-00506-01001	R1	6	1.2	2	1.94	15°	4	53
01-00506-01002		8	1.2	2	1.94	15°	4	53
01-00506-01003		10	1.2	2	1.94	15°	4	53
01-00506-01004		14	1.2	2	1.94	15°	4	53
01-00506-01005		20	1.2	2	1.94	15°	4	53

How to Order When you order, indicate SSPBL220 (R)×(ℓ1).

※(γ) is reference value.

Work Material		Hardened Steels STAVAX・SKD61 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH・HAP (~68HRC)			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	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	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

Notes

※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.

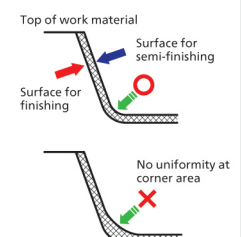
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

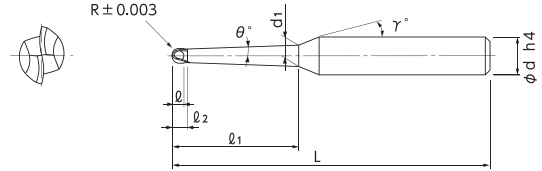
- When using small CBN End Mill, **uniform finishing allowance (stock amount) is important.**
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy. **Therefore, it is important to get uniform stock amount in the pre-stage cutting.**



CBN Super Spiral Long Taper Neck Ball End Mill

Total 64 sizes

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

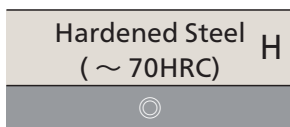


- To realize more rigid, CBN long neck ball end mill with taper neck are adopted.
- Both efficiency and accuracy are increasing by taper neck design and spiral ball shape with improved sharpness in finish machining on deep milling.



Cutting edge shape

Work Material



Unit [Size : mm]

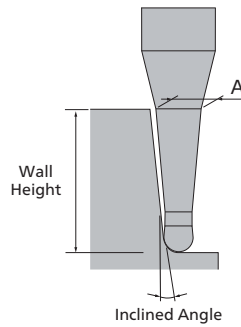
Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ_1)	Effective Inclined Angle (α)	Neck Dia. (d2)	Length of Cut (ℓ)	Under Neck Length (ℓ_2)	Neck Taper Angle (γ)	Shank Dia.(d)	Overall Length (L)
01-00507-01020	R0.1	30'	1.5	0°15'	0.22	0.15	0.25	15°	4	50
01-00507-01021			2	0°15'	0.22	0.15	0.25	15°	4	50
01-00507-01030		1°	1.5	0°45'	0.24	0.15	0.25	15°	4	50
01-00507-01031			2	0°45'	0.25	0.15	0.25	15°	4	50
01-00507-01040		1°30'	1.5	1°15'	0.27	0.15	0.25	15°	4	50
01-00507-01041			2	1°15'	0.29	0.15	0.25	15°	4	50
01-00507-01050		2°	1.5	1°45'	0.29	0.15	0.25	15°	4	50
01-00507-01051			2	1°45'	0.32	0.15	0.25	15°	4	50
01-00507-01520	R0.15	30'	2	0°16'	0.32	0.23	0.38	15°	4	50
01-00507-01521			3	0°16'	0.33	0.23	0.38	15°	4	52
01-00507-01530		1°	2	0°46'	0.35	0.23	0.38	15°	4	50
01-00507-01531			3	0°46'	0.38	0.23	0.38	15°	4	52
01-00507-01540		1°30'	2	1°16'	0.39	0.23	0.38	15°	4	50
01-00507-01541			3	1°16'	0.43	0.23	0.38	15°	4	52
01-00507-01550		2°	2	1°46'	0.42	0.23	0.38	15°	4	50
01-00507-01551			3	1°46'	0.48	0.23	0.38	15°	4	52
01-00507-02020	R0.2	30'	3	0°18'	0.43	0.3	0.5	15°	4	50
01-00507-02021			4	0°18'	0.44	0.3	0.5	15°	4	52
01-00507-02030		1°	3	0°48'	0.48	0.3	0.5	15°	4	50
01-00507-02031			4	0°48'	0.51	0.3	0.5	15°	4	52
01-00507-02040		1°30'	3	1°18'	0.53	0.3	0.5	15°	4	50
01-00507-02041			4	1°18'	0.58	0.3	0.5	15°	4	52
01-00507-02050		2°	3	1°48'	0.58	0.3	0.5	15°	4	50
01-00507-02051			4	1°48'	0.64	0.3	0.5	15°	4	52

How to Order

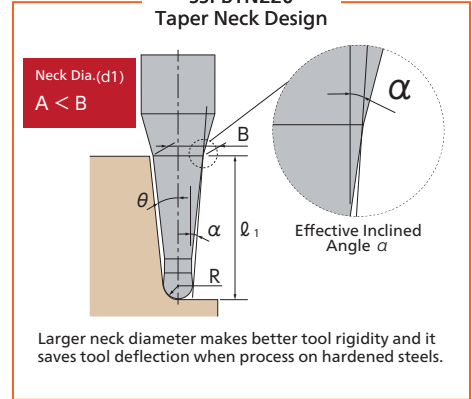
When you order, indicate SSPBTN220 (R)×(θ)×(ℓ_1).

※(γ) is reference value.

General Taper Neck Design



SSPBTN220 Taper Neck Design



Unit [Size : mm]

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ_1)	Effective Inclined Angle (α)	Neck Dia. (d2)	Length of Cut (ℓ)	Under Neck Length (ℓ_2)	Neck Taper Angle (γ)	Shank Dia.(d)	Overall Length (L)
01-00507-02520	R0.25	30'	4	0°18'	0.54	0.38	0.62	15°	4	52
01-00507-02521			5	0°18'	0.55	0.38	0.62	15°	4	52
01-00507-02530		1°	4	0°48'	0.61	0.38	0.62	15°	4	52
01-00507-02531			5	0°48'	0.64	0.38	0.62	15°	4	52
01-00507-02540		1°30'	4	1°18'	0.67	0.38	0.62	15°	4	52
01-00507-02541			5	1°18'	0.72	0.38	0.62	15°	4	52
01-00507-02550		2°	4	1°48'	0.74	0.38	0.62	15°	4	52
01-00507-02551			5	1°48'	0.8	0.38	0.62	15°	4	52
01-00507-03020	R0.3	30'	5	0°18'	0.65	0.5	0.75	15°	4	53
01-00507-03021			6	0°18'	0.66	0.5	0.75	15°	4	53
01-00507-03030		1°	5	0°48'	0.74	0.5	0.75	15°	4	53
01-00507-03031			6	0°48'	0.76	0.5	0.75	15°	4	53
01-00507-03040		1°30'	5	1°18'	0.82	0.5	0.75	15°	4	53
01-00507-03041			6	1°18'	0.86	0.5	0.75	15°	4	53
01-00507-03050		2°	5	1°48'	0.9	0.5	0.75	15°	4	53
01-00507-03051			6	1°48'	0.96	0.5	0.75	15°	4	53
01-00507-05020	R0.5	30'	8	0°21'	1.1	0.7	1.25	15°	4	53
01-00507-05021			10	0°21'	1.12	0.7	1.25	15°	4	53
01-00507-05030		1°	8	0°51'	1.23	0.7	1.25	15°	4	53
01-00507-05031			10	0°51'	1.29	0.7	1.25	15°	4	53
01-00507-05040		1°30'	8	1°21'	1.36	0.7	1.25	15°	4	53
01-00507-05041			10	1°21'	1.45	0.7	1.25	15°	4	53
01-00507-05050		2°	8	1°51'	1.49	0.7	1.25	15°	4	53
01-00507-05051			10	1°51'	1.62	0.7	1.25	15°	4	53
01-00507-07520	R0.75	30'	10	0°22'	1.62	1	1.9	15°	4	52
01-00507-07521			15	0°22'	1.69	1	1.9	15°	4	52
01-00507-07530		1°	10	0°52'	1.78	1	1.9	15°	4	52
01-00507-07531			15	0°52'	1.94	1	1.9	15°	4	52
01-00507-07540		1°30'	10	1°22'	1.95	1	1.9	15°	4	52
01-00507-07541			15	1°22'	2.18	1	1.9	15°	4	52
01-00507-07550		2°	10	1°52'	2.11	1	1.9	15°	4	52
01-00507-07551			15	1°52'	2.43	1	1.9	15°	4	52
01-00507-10020	R1	30'	16	0°24'	2.21	1.2	2.5	15°	4	53
01-00507-10021			20	0°24'	2.27	1.2	2.5	15°	4	53
01-00507-10030		1°	16	0°54'	2.48	1.2	2.5	15°	4	53
01-00507-10031			20	0°54'	2.6	1.2	2.5	15°	4	53
01-00507-10040		1°30'	16	1°24'	2.74	1.2	2.5	15°	4	53
01-00507-10041			20	1°24'	2.93	1.2	2.5	15°	4	53
01-00507-10050		2°	16	1°54'	3	1.2	2.5	15°	4	53
01-00507-10051			20	1°54'	3.26	1.2	2.5	15°	4	53

Recommended Milling Conditions

Work Material			Hardened Steels STAVAX·SKD61 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH·HAP (~68HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	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	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

Work Material			Hardened Steels STAVAX·SKD61 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH·HAP (~68HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	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

Notes

- ※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.

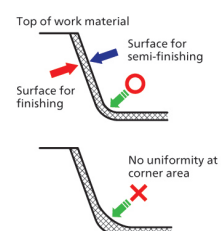
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, **uniform finishing allowance (stock amount) is important.**
- 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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Attention on Safety

- 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.