Size **R0.05～R1**

CBN-LBSF

CBN | 20° | R ±0.002 | Shank Dia 0/-0.004 | Back Taper Geometry

Patented in Japan, China, Taiwan and Korea

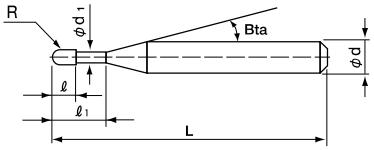
Material Applications（★ Highly Recommended ● Recommended ○ Suggested）

Work Material																
Carbon Steels	Alloy Steels	Prehardened Steels	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
S45C S55C	SK / SCM SUS	NAK HPM	～50HRC	～55HRC	～60HRC	～65HRC	～70HRC										
		○	●	●	●	●	●										

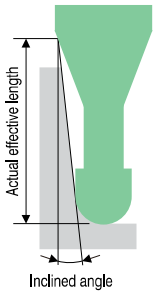
Label Sample

＃001 R1 R+0.001/0.000

Ball Radius accuracy measurments are printed on the label to support High Precision milling.



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.



Features

For higher precision and better surface finish
Ball radius accuracy ± 0.002mm based on Nominal Radius.

A cutting edge is set at the tip of the tool (zero peripheral speed). Less tool damage and improved finishing surface.

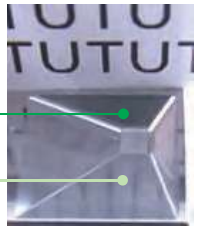
Inclined surface milling CBN-LBF & CBN-LBSF comparison
2 Flutes R0.3 × EL1.5

ELMAX（60.5HRC）

Pocket Size：9 × 9 × Depth 1.5 mm

45° Inclined Surface

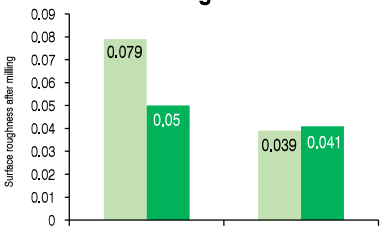
15° Inclined Surface



CBN-LBF
For long tool life

CBN-LBSF
For super surface finish

Surface Roughness after milling



Milling method	Spindle Speed	Feed Rate	Allowance	Cusp height	Coolant	Cycle Time
Contour spiral milling	30,000 min^{-1}	550 mm/min	0.005 mm	0.0001 mm	Oil mist	21.5 min

Lens application
2 Flutes CBN-LBSF R0.3 × EL1 · R1 × EL3

HAP10 (64HRC)

Work Size : 100 × 100 × 20 mm
Coolant : Oil mist, Oil coolant

Shiny surface

Surface Roughness after milling

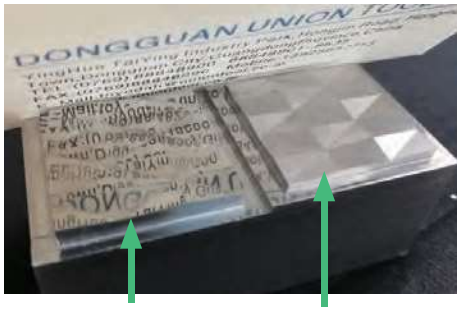
Measurment point	Ra (μm)
Front point of Y axis	0.0272
Center point of Y axis	0.0172
Back point of Y axis	0.0304

CBN-LBSF Milling video

No.	Process	Tool	Spindle Speed (min⁻¹)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Allowance (mm)	Cycle Time (h:m)
1	Roughing	HGB R2	9,480	2,400	0.18	0.75	0.08	1:01
2	Lens part/Semi-roughing		9,480	2,400	0.18	0.375	0.05	0:06
3	Periphery/Semi-roughing	HGB R1	14,700	2,160	0.1	0.35	0.05	0:07
4	Periphery/Semi-finishing1		14,700	2,160	0.1	0.1	0.02	0:03
5	Lens part/Semi-finishing1		14,700	2,160	0.03	0.1	0.02	0:36
6	Periphery/Semi-finishing2	HGB R0.5	21,000	1,750	0.04	0.04	0.005	0:15
7	Lens part/Semi-finishing2	HGB R1	14,700	2,160	0.015	0.05	0.005	1:13
8	Periphery/Finishing	CBN-LBSF R0.3 × EL1	30,000	600	0.01	0.01	0	2:56
9	Lens part/Finishing	CBN-LBSF R1 × EL3	24,000	750	0.005	0.018	0	4:52
							Total	11:09

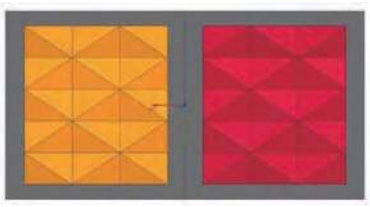
CBN-LBF/CBN-LBSF Surface roughness comparison
2 Flutes R0.5 × EL1.5

STAVAX (52HRC)



CBN-LBSF
For super surface
Ra 0.033 μm

CBN-LBF
For long tool life
Ra 0.159 μm



Size : 55 × 25 × 23 mm
Coolant : Oil mist

Spindle Speed (min⁻¹)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Cycle Time (h:m)
36,000	600	0.003	0.008	2:17

CBN-LBSF is recommended for excellent milling surface.
The surface finish is of such high quality that the letters reflect perfectly in it.

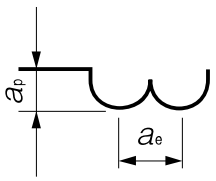
2 Flutes CBN Long Neck Ball End Mills for Super Finishing

Total 36 models　　Shank taper angle Bta is only for reference　　Unit (mm)

Model Number	Radius of Ball Nose R	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Suggested Retail Price ¥	Effective Length by Inclined Angles				
									30′	1°	1°30′	2°	3°
CBN-LBSF 2001-003	R0.05	0.3	0.07	0.09	15°	50	4	46,700	0.30	0.30	0.30	0.30	0.33
CBN-LBSF 2001-005		0.5				50	4	48,600	0.50	0.50	0.51	0.53	0.57
CBN-LBSF 20015-0045	R0.075	0.45	0.1	0.14	15°	50	4	46,700	0.45	0.45	0.46	0.48	0.51
CBN-LBSF 20015-0075		0.75				50	4	48,600	0.75	0.76	0.78	0.81	0.88
CBN-LBSF 2002-003	R0.1	0.3	0.13	0.19	15°	50	4	35,000	0.30	0.30	0.30	0.30	0.32
CBN-LBSF 2002-006		0.6				50	4	35,000	0.60	0.60	0.62	0.64	0.69
CBN-LBSF 2003-005	R0.15	0.5	0.22	0.28	15°	50	4	33,900	0.51	0.53	0.54	0.56	0.60
CBN-LBSF 2003-0075		0.75				50	4	34,400	0.77	0.79	0.82	0.85	0.91
CBN-LBSF 2003-009		0.9				50	4	35,000	0.91	0.94	0.97	1.01	1.08
CBN-LBSF 2004-0075	R0.2	0.75	0.32	0.38	15°	50	4	30,600	0.77	0.79	0.81	0.84	0.90
CBN-LBSF 2004-010		1				50	4	31,200	1.03	1.06	1.09	1.13	1.21
CBN-LBSF 2004-012		1.2				50	4	31,700	1.22	1.26	1.30	1.35	1.44
CBN-LBSF 2005-010	R0.25	1	0.4	0.48	15°	50	4	31,200	1.01	1.04	1.07	1.11	1.18
CBN-LBSF 2005-015		1.5				50	4	32,200	1.53	1.58	1.63	1.68	1.80
CBN-LBSF 2006-010	R0.3	1	0.48	0.58	15°	50	4	28,700	1.01	1.04	1.07	1.10	1.17
CBN-LBSF 2006-015		1.5				50	4	29,300	1.53	1.57	1.62	1.68	1.79
CBN-LBSF 2006-020		2				50	4	29,300	2.05	2.11	2.18	2.25	2.41
CBN-LBSF 2008-020	R0.4	2	0.6	0.78	15°	50	4	29,300	2.04	2.10	2.17	2.24	2.39
CBN-LBSF 2008-040		4				50	4	31,240	4.11	4.24	4.38	4.54	4.88
CBN-LBSF 2010-015	R0.5	1.5	0.7	0.98	15°	50	4	28,700	1.53	1.57	1.61	1.66	1.76
CBN-LBSF 2010-020		2				50	4	28,700	2.05	2.11	2.17	2.23	2.38
CBN-LBSF 2010-025		2.5				50	4	29,300	2.57	2.64	2.72	2.81	3.00
CBN-LBSF 2010-030		3				50	4	29,300	3.09	3.18	3.28	3.38	3.62
CBN-LBSF 2010-040		4				50	4	31,200	4.12	4.25	4.38	4.53	4.87
CBN-LBSF 2010-060		6				50	4	31,200	6.19	6.39	6.60	6.83	7.35
CBN-LBSF 2015-025	R0.75	2.5	0.9	1.46	15°	50	4	30,000	2.60	2.67	2.74	2.81	2.99
CBN-LBSF 2015-030		3				50	4	30,000	3.12	3.20	3.29	3.39	3.61
CBN-LBSF 2015-038		3.8				50	4	30,500	3.94	4.06	4.18	4.31	4.61
CBN-LBSF 2015-060		6				50	4	30,500	6.22	6.41	6.62	6.84	7.34
CBN-LBSF 2015-080		8				50	4	33,200	8.28	8.55	8.83	9.14	9.83
CBN-LBSF 2020-030	R1	3	1.2	1.97	15°	50	4	30,500	3.09	3.16	3.24	3.33	3.53
CBN-LBSF 2020-040		4				50	4	30,500	4.12	4.23	4.35	4.48	4.77
CBN-LBSF 2020-050		5				50	4	30,500	5.16	5.30	5.46	5.63	6.01
CBN-LBSF 2020-060		6				50	4	32,200	6.19	6.37	6.57	6.78	7.26
CBN-LBSF 2020-080		8				50	4	33,200	8.26	8.51	8.79	9.08	9.74
CBN-LBSF 2020-100		10				50	4	33,600	10.32	10.65	11.00	11.38	12.23

Milling Conditions for CBN-LBSF

WORK MATERIAL			HEAT-TREATED STEELS / HARDENED STEELS STAVAX / ELMAX / HAP10 / HAP72 (~68HRC)			
Model Number	Radius of Ball Nose (mm)	Effective Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2001-003	R0.05	0.3	30,000	70	0.003MAX	0.006MAX
2001-005		0.5	30,000	70	0.002MAX	0.006MAX
20015-0045	R0.075	0.45	30,000	150	0.004MAX	0.008MAX
20015-0075		0.75	30,000	125	0.004MAX	0.008MAX
2002-003	R0.1	0.3	30,000	240	0.005MAX	0.01 MAX
2002-006		0.6	30,000	200	0.005MAX	0.01 MAX
2003-005	R0.15	0.5	30,000	300	0.005MAX	0.01 MAX
2003-0075		0.75	30,000	250	0.005MAX	0.01 MAX
2003-009		0.9	30,000	250	0.005MAX	0.01 MAX
2004-0075	R0.2	0.75	30,000	360	0.005MAX	0.01 MAX
2004-010		1	30,000	300	0.005MAX	0.01 MAX
2004-012		1.2	30,000	300	0.005MAX	0.01 MAX
2005-010	R0.25	1	30,000	420	0.005MAX	0.01 MAX
2005-015		1.5	30,000	350	0.005MAX	0.01 MAX
2006-010	R0.3	1	30,000	500	0.01 MAX	0.015MAX
2006-015		1.5	30,000	500	0.01 MAX	0.015MAX
2006-020		2	30,000	350	0.01 MAX	0.015MAX
2008-020	R0.4	2	30,000	620	0.01 MAX	0.015MAX
2008-040		4	30,000	420	0.01 MAX	0.015MAX
2010-015	R0.5	1.5	30,000	750	0.01 MAX	0.02 MAX
2010-020		2	30,000	750	0.01 MAX	0.02 MAX
2010-025		2.5	30,000	750	0.01 MAX	0.02 MAX
2010-030		3	30,000	500	0.01 MAX	0.02 MAX
2010-040		4	30,000	500	0.01 MAX	0.02 MAX
2010-060		6	30,000	330	0.01 MAX	0.02 MAX
2015-025	R0.75	2.5	20,000	750	0.01 MAX	0.02 MAX
2015-030		3	20,000	750	0.01 MAX	0.02 MAX
2015-038		3.8	20,000	750	0.01 MAX	0.02 MAX
2015-060		6	20,000	500	0.01 MAX	0.02 MAX
2015-080		8	20,000	500	0.01 MAX	0.02 MAX
2020-030	R1	3	15,000	750	0.01 MAX	0.025MAX
2020-040		4	15,000	750	0.01 MAX	0.025MAX
2020-050		5	15,000	750	0.01 MAX	0.025MAX
2020-060		6	15,000	500	0.01 MAX	0.025MAX
2020-080		8	15,000	500	0.01 MAX	0.025MAX
2020-100		10	15,000	500	0.01 MAX	0.025MAX



Note:
- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- Recommend oil mist to avoid tool damage.