

# 3 Flutes HARDMAX



Size R0.5~R2

# HFTNB

Super MG

HARD MAX

40°

R ±0.005

R ±0.007

Shank Dia 0/-0.005

Back Taper Geometry

Variable Pitch

R0.5~R1.5

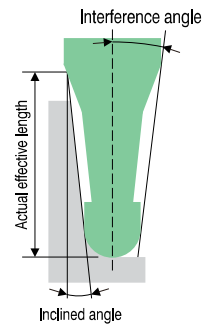
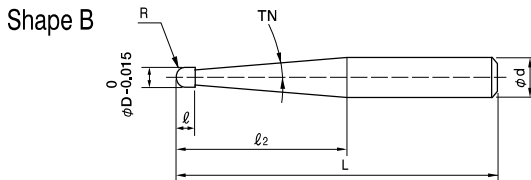
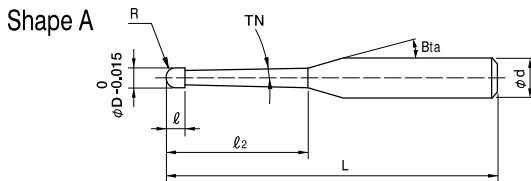
R2

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	SK / SCM	NAK HPM	~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
○	○	●	●	●	●	●		○						○	○		

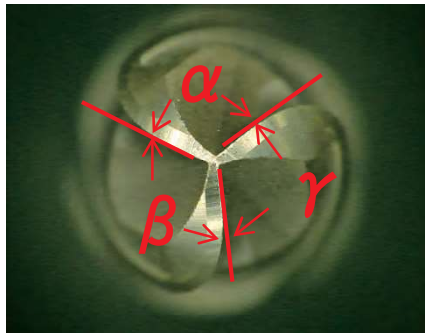
## Features

**3 Flute Taper Neck Ball End Mills for Hard Materials.**  
 The negative rake angle design improves wear resistance.  
 Back taper design reduces cutting resistance.  
 Suitable for both roughing and finishing. Diameter Tolerance : 0/-0.015.



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.

- **Variable Pitch design**  
Minimizing vibration and chattering



※ Variable Pitch  $\alpha \neq \beta \neq \gamma$

- **A wide choice of Taper Neck Angles**  
Useful sizes: 0.4° · 0.9° · 1.4° · 1.9° · 2.9°  
Using with HTNRS, Taper Neck Radius End Mill, offers higher efficient milling.  
Refer to page 412 for HTNRS.

- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Total 75 models

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length $\ell_2$	Length of Cut $\ell$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Shape	Suggested Retail Price ¥	Interference Angle	Effective Length by Inclined Angles — : Interference				
											30°	1°	1°30'	2°	3°
HFTNB 3010-080-08	R0.5	0.4°	8	0.8	16°	60	6	A	8,690	8.82°	8.05	8.30	8.57	8.85	9.48
HFTNB 3010-100-08			10			60	6		8,690	7.89°	10.07	10.38	10.71	11.07	11.87
HFTNB 3010-120-08			12			60	6		8,690	7.13°	12.08	12.46	12.86	13.29	14.26
HFTNB 3010-160-08			16			60	6		8,690	5.98°	16.10	16.61	17.16	17.74	19.03
HFTNB 3010-200-08			20			60	6		11,040	5.15°	20.13	20.77	21.45	22.18	23.81
HFTNB 3010-260-08			26			70	6		11,590	4.26°	26.17	27.00	27.89	28.85	30.97
HFTNB 3010-300-08			30			70	6		12,140	3.82°	30.19	31.16	32.19	33.29	35.75
HFTNB 3010-060-18			6			60	6		8,690	10.11°	—	6.06	6.25	6.45	6.90
HFTNB 3010-080-18			8			60	6		8,690	8.94°	—	8.07	8.33	8.60	9.21
HFTNB 3010-100-18			10			60	6		8,690	8.01°	—	10.08	10.41	10.75	11.53
HFTNB 3010-120-18		12	60			6	8,690		7.25°	—	12.10	12.49	12.91	13.84	
HFTNB 3010-160-18		16	60			6	8,690		6.10°	—	16.12	16.65	17.21	18.47	
HFTNB 3010-200-18		20	60			6	11,040		5.26°	—	20.15	20.81	21.52	23.09	
HFTNB 3010-260-18		26	70			6	11,590		4.36°	—	26.19	27.05	27.98	30.03	
HFTNB 3010-300-18		30	70			6	12,140		3.91°	—	30.21	31.21	32.28	34.66	
HFTNB 3010-100-28		10	60			6	8,690		8.13°	—	—	10.10	10.43	11.18	
HFTNB 3010-120-28		12	60			6	8,690		7.38°	—	—	12.11	12.52	13.42	
HFTNB 3010-160-28		16	60			6	8,690		6.22°	—	—	16.14	16.68	17.90	
HFTNB 3010-200-28		20	60			6	11,040		5.37°	—	—	20.17	20.85	22.38	
HFTNB 3010-260-28		26	70			6	11,590		4.46°	—	—	26.21	27.10	29.09	
HFTNB 3015-100-08	R0.75	0.4°	10	1.2	16°	60	6	A	9,110	7.55°	10.11	10.41	10.74	11.09	11.87
HFTNB 3015-160-08			16			60	6		9,940	5.64°	16.14	16.65	17.18	17.75	19.03
HFTNB 3015-200-08			20			60	6		9,940	4.82°	20.17	20.80	21.48	22.20	23.81
HFTNB 3015-300-08			30			70	6		10,760	3.54°	30.23	31.19	32.21	33.31	35.75
HFTNB 3015-100-18			10			60	6		9,110	7.66°	—	10.13	10.45	10.79	11.54
HFTNB 3015-160-18		16	60			6	9,940		5.75°	—	16.17	16.69	17.24	18.48	
HFTNB 3015-200-18		20	60			6	9,940		4.93°	—	20.19	20.85	21.55	23.11	
HFTNB 3015-300-18		30	70			6	10,760		3.63°	—	30.26	31.25	32.31	34.67	
HFTNB 3015-100-28		10	60			6	9,110		7.79°	—	—	10.15	10.48	11.21	
HFTNB 3015-160-28		16	60			6	9,940		5.87°	—	—	16.19	16.73	17.93	
HFTNB 3015-200-28		20	60			6	9,940		5.03°	—	—	20.22	20.90	22.41	
HFTNB 3015-300-28		30	80			6	10,760		3.72°	—	—	30.28	31.31	33.60	

3 Flutes

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Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ <sub>2</sub>	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Shape	Suggested Retail Price ¥	Interference Angle	Effective Length by Inclined Angles - Interference								
											30°	1°	1°30'	2°	3°				
HFTNB 3020-120-08	R1	0.4°	12	1.6	16°	60	6	A	9,100	6.40°	12.12	12.49	12.87	13.29	14.22				
HFTNB 3020-160-08			16			60	6		9,320	5.27°	16.15	16.64	17.17	17.73	18.99				
HFTNB 3020-200-08			20			60	6		9,940	4.47°	20.17	20.80	21.46	22.18	23.77				
HFTNB 3020-220-08			22			70	6		9,940	4.16°	22.18	22.87	23.61	24.40	26.16				
HFTNB 3020-260-08			26			70	6		11,040	3.65°	26.21	27.03	27.90	28.84	30.93				
HFTNB 3020-300-08			30			70	6		12,140	3.25°	30.23	31.18	32.20	33.29	35.71				
HFTNB 3020-320-08			32			80	6		12,140	3.08°	32.25	33.26	34.35	35.51	38.09				
HFTNB 3020-360-08			36			80	6		12,140	2.79°	36.26	37.40	38.63	39.94	No Interference				
HFTNB 3020-400-08			40			80	6		14,350	2.55°	40.30	41.57	42.94	44.40	No Interference				
HFTNB 3020-120-18			12			0.9°	12		60	6	9,100	6.52°	—	12.15	12.52	12.93	13.83		
HFTNB 3020-160-18		16	60				6		9,320	5.38°	—	16.17	16.68	17.23	18.46				
HFTNB 3020-200-18		20	60				6		9,940	4.57°	—	20.20	20.85	21.54	23.08				
HFTNB 3020-260-18		26	70				6		11,040	3.74°	—	26.24	27.09	28.00	30.02				
HFTNB 3020-300-18		30	70				6		12,140	3.33°	—	30.26	31.25	32.30	34.65				
HFTNB 3020-360-18		36	80				6		12,140	2.86°	—	36.30	37.49	38.76	No Interference				
HFTNB 3020-400-18		40	80				6		14,350	2.62°	—	40.33	41.65	43.06	No Interference				
HFTNB 3020-500-18		50	100				6		16,000	2.16°	—	50.39	52.05	53.83	No Interference				
HFTNB 3020-160-28		16	1.4°				16		60	6	9,320	5.49°	—	—	16.20	16.73	17.92		
HFTNB 3020-200-28	20	60		6	9,940		4.68°	—	—	20.23	20.90	22.40							
HFTNB 3020-260-28	26	70		6	11,040	3.83°	—	—	26.27	27.15	29.11								
HFTNB 3020-300-28	30	70		6	12,140	3.41°	—	—	30.30	31.32	33.59								
HFTNB 3020-400-28	40	80		6	15,070	2.69°	—	—	40.36	41.73	No Interference								
HFTNB 3020-620-38	62	1.9°		62	100	6	18,000	—	—	—	—	No Interference	No Interference						
HFTNB 3020-410-58	41		80	6	17,000	—	—	—	—	—	No Interference	No Interference							
HFTNB 3030-200-08	R1.5	0.4°	20	2.4	16°	60	6	A	11,200	3.67°	20.23	20.84	21.49	22.19	23.75				
HFTNB 3030-260-08			26			70	6		11,960	2.94°	26.27	27.07	27.93	28.86	No Interference				
HFTNB 3030-300-08			30			70	6		13,660	2.60°	30.29	31.23	32.23	33.30	No Interference				
HFTNB 3030-320-08			32			80	6		14,350	2.46°	32.31	33.31	34.38	35.52	No Interference				
HFTNB 3030-360-08			36			80	6		14,950	2.21°	36.31	37.45	38.65	39.95	No Interference				
HFTNB 3030-400-08			40			80	6		15,180	2.01°	40.36	41.62	42.97	44.41	No Interference				
HFTNB 3030-200-18		20	0.9°			20	60		6	11,200	3.76°	—	20.27	20.90	21.58	23.09			
HFTNB 3030-300-18		30				70	6		13,660	2.67°	—	30.34	31.31	32.34	No Interference				
HFTNB 3030-400-18		40				80	6		15,180	2.07°	—	40.40	41.71	43.11	No Interference				
HFTNB 3030-500-18		50				100	6		17,500	1.69°	—	50.46	52.11	No Interference	No Interference				
HFTNB 3030-600-18		60				100	6		19,000	1.43°	—	60.52	No Interference	No Interference	No Interference				
HFTNB 3030-400-28		40				80	6		15,180	2.12°	—	—	40.45	41.80	No Interference				
HFTNB 3030-500-28		50	1.4°			50	100		6	17,000	1.74°	—	—	50.51	No Interference	No Interference			
HFTNB 3030-650-28		65				—	100		6	19,000	—	—	—	No Interference	No Interference	No Interference			
HFTNB 3040-300-18		30				0.9°	30		6	16°	80	6	A	13,330	1.90°	—	30.51	31.47	No Interference
HFTNB 3040-400-18		40	80				6				17,250	1.45°		—	40.58	No Interference	No Interference	No Interference	
HFTNB 3040-500-18		50	100				6				19,000	1.18°		—	50.64	No Interference	No Interference	No Interference	
HFTNB 3040-600-18		60	100				6				20,200	0.99°		—	No Interference	No Interference	No Interference	No Interference	
HFTNB 3040-480-28	48	—	80	6	17,250		—	—			—	No Interference		No Interference	No Interference				

## Milling Conditions for HFTNB

3 Flutes

WORK MATERIAL			PREHARDENED STEELS / HARDENED STEELS NAK / SKD (30~45HRC)				HARDENED STEELS SKD / SKT (45~55HRC)				HARDENED STEELS SKD / SKH (55~65HRC)			
Model Number	Radius of Ball Nose (mm)	Neck Length (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
3010	R0.5	6	14,500	1,300	0.1	0.2	14,500	1,250	0.06	0.12	14,500	1,200	0.04	0.08
		8	14,000	1,200	0.09	0.18	13,750	1,160	0.06	0.1	13,500	1,120	0.04	0.06
		10	13,300	1,000	0.08	0.16	12,650	1,000	0.05	0.09	12,000	1,000	0.04	0.05
		12	13,000	870	0.07	0.14	12,000	850	0.04	0.08	11,000	880	0.03	0.05
		16	12,500	680	0.05	0.1	10,250	600	0.04	0.06	8,000	550	0.03	0.04
		20	12,000	600	0.04	0.08	9,500	500	0.03	0.06	7,000	400	0.02	0.04
		26	11,700	520	0.03	0.06	8,600	370	0.02	0.04	5,500	220	0.02	0.03
		30	11,500	500	0.02	0.05	8,250	350	0.02	0.04	5,000	200	0.02	0.03
3015	R0.75	10	12,000	1,230	0.13	0.3	11,500	1,100	0.09	0.2	11,000	1,100	0.06	0.14
		16	11,200	930	0.1	0.25	10,600	910	0.07	0.16	10,000	900	0.05	0.11
		20	10,800	750	0.08	0.22	9,500	700	0.06	0.14	8,200	680	0.04	0.09
		30	10,000	550	0.06	0.16	8,300	450	0.04	0.1	6,600	380	0.03	0.08
3020	R1	12	10,300	1,200	0.16	0.38	10,150	1,130	0.12	0.25	10,000	1,100	0.1	0.18
		16	10,000	1,100	0.15	0.35	9,900	1,100	0.1	0.23	9,800	1,050	0.09	0.16
		20	9,500	950	0.15	0.32	9,300	940	0.1	0.21	9,000	930	0.08	0.15
		22	9,400	900	0.14	0.3	9,100	850	0.09	0.2	8,600	840	0.08	0.14
		26	9,300	750	0.12	0.28	8,700	730	0.08	0.2	8,000	700	0.07	0.13
		30	9,200	630	0.11	0.25	8,400	590	0.08	0.17	7,500	550	0.05	0.1
		32	8,800	580	0.1	0.24	8,200	550	0.07	0.16	7,300	480	0.04	0.1
		36	8,700	570	0.09	0.22	7,900	510	0.07	0.16	7,000	450	0.04	0.1
		40	8,300	500	0.08	0.2	7,500	450	0.06	0.15	6,600	400	0.04	0.1
		41	8,300	500	0.08	0.2	7,500	450	0.06	0.15	6,600	400	0.04	0.1
		50	8,000	430	0.06	0.15	6,700	340	0.04	0.12	5,300	250	0.03	0.1
		62	7,500	350	0.04	0.1	6,000	350	0.04	0.13	5,000	300	0.02	0.05
3030	R1.5	20	9,000	1,150	0.25	0.48	8,900	1,100	0.18	0.36	8,800	1,100	0.12	0.25
		26	8,600	1,000	0.22	0.42	8,300	1,000	0.16	0.32	8,200	980	0.11	0.22
		30	8,400	950	0.21	0.4	8,100	930	0.15	0.3	7,800	920	0.1	0.21
		32	8,300	900	0.2	0.37	7,800	860	0.14	0.28	7,400	840	0.09	0.2
		36	8,100	800	0.18	0.35	7,400	720	0.13	0.26	6,800	680	0.08	0.2
		40	8,000	720	0.17	0.33	7,000	630	0.12	0.24	6,000	550	0.08	0.19
		50	7,600	570	0.14	0.28	6,400	450	0.09	0.2	5,200	400	0.06	0.17
		60	7,200	480	0.12	0.24	6,000	400	0.07	0.18	4,700	320	0.05	0.16
		65	7,200	480	0.12	0.24	6,000	400	0.07	0.18	4,700	320	0.05	0.16

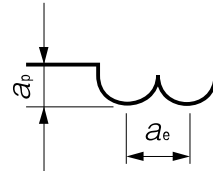
- Ø3mm Shank  
V Series
- UDC-PCD  
Series
- CBN  
Series
- Square
- Long Neck  
Square
- Radius
- Long Neck  
Radius
- Taper Neck  
Radius
- Ball / Long  
Shank Ball
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Ball
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- Spiral  
V Cutter
- Drill
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Milling Conditions for HFTNB

WORK MATERIAL			PREHARDENED STEELS / HARDENED STEELS NAK / SKD (30~45HRC)				HARDENED STEELS SKD / SKT (45~55HRC)				HARDENED STEELS SKD / SKH (55~65HRC)			
Model Number	Radius of Ball Nose (mm)	Neck Length (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
3040	R2	30	8,000	1,100	0.35	0.55	7,800	1,050	0.24	0.4	7,600	1,000	0.16	0.33
		40	7,500	930	0.3	0.48	7,300	900	0.2	0.35	7,000	900	0.15	0.3
		48	7,200	750	0.26	0.42	6,500	650	0.16	0.3	5,800	600	0.13	0.27
		50	7,200	750	0.26	0.42	6,500	650	0.16	0.3	5,800	600	0.13	0.27
		60	7,000	600	0.22	0.36	6,000	520	0.13	0.26	5,000	440	0.11	0.25

Note:

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- Decrease the feed rate more than 50% from the milling parameters when slot milling.
- Every coolant offers stable milling.



Roughness Comparison  
HFTNB R1 × Neck Length 20 × Neck Taper Angle 0.4° SKD61 (48HRC)



Work Size : 30 x 50 x 40 mm

Measurement Spot	Surface Roughness Ra (μm)	
	HFTNB	Competitor
①	<b>0.353</b>	0.451
②	<b>0.480</b>	0.865
③	<b>0.200</b>	0.270
④	<b>0.168</b>	0.248

**Better surface roughness compared to competitor's!**

No.	Milling Process	Tool	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> (mm)	a <sub>e</sub> (mm)	Allowance (mm)	Coolant	Cycle Time (h:m:s)
1	Roughing	HSLB 2060-200 (R3 x EL20)	13,000	3,500	0.6	0.6	0.05	Air Blow	0:25:33
2	Semi-finishing	HSLB 2030-200 (R1.5 x EL20)	14,500	1,360	0.18	0.1	0.02		0:49:48
3	Finishing	HFTNB 3020-200-08 / Competitor (R1 x Neck Length 20 x Neck Taper Angle 0.4°)	4,650	940	0.05	0.05	0		2:29:29
								Total	3:44:50

- φ3mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

## Taper Pocket Milling Examples

HFTNB R1 × Neck Length 30 × Neck Taper Angle 0.9° SKD61 (50HRC)

3 Flutes

Milling Shape : Taper Pocket 25 x 5 x Depth 4 mm Wall Inclined Angle 1°

Tools after milling

**HFTNB**

After 40 min



After 120 min



**Normal wear condition after 120 min milling. No chipping or any damages.**

Competitor A  
After 40 min



Chipping on the cutting edges of all 3 flutes after 40 min.

Competitor B  
After 40 min



Large chipping on the cutting edge after 40 min. Chipping also on the other 2 flutes.

**High durability throughout the long cycle time.**

Tool	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	$a_p$ (mm)	$a_e$ (mm)	Coolant	Cycle Time
HFTNB 3020-300-18	8,400	590	0.08	0.17	Air Blow	40 min / pocket

