

4 Flutes HARDMAX



Size R1~R6

HFB

Super
MG

HARD
MAX

40°

R
±0.005
R1~R1.5

R
±0.007
R2~R3

R
±0.01
R4~R6

Shank Dia
0/-0.005

Patented in Japan, China,
Taiwan, Korea, Germany,
Switzerland, and Liechtenstein

Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

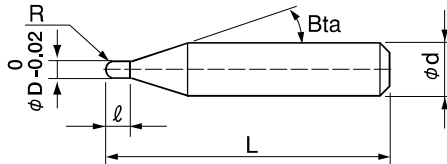
		Work Material															
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC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

Features

Dramatically improved the milling efficiency. Maximum 27 times higher chip evacuation compared to conventional tool.
New ball tip design offers polish-less bottom surface finishing.

Affordable pricing.

Diameter Tolerance: 0/-0.02



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.

Total 8 models

Unit (mm)

Model Number	Radius of Ball Nose R	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Suggested Retail Price ¥
HFB 4020-0300	R1	3	16°	50	4	6,720
HFB 4020-0300-6	R1	3	16°	50	6	7,790
HFB 4030-0450	R1.5	4.5	16°	60	6	6,890
HFB 4040-0600	R2	6	16°	70	6	6,890
HFB 4060-0900	R3	9	—	80	6	8,610
HFB 4080-1200	R4	12	—	90	8	12,300
HFB 4100-1500	R5	15	—	100	10	16,320
HFB 4120-1800	R6	18	—	110	12	20,660

Size R1~R6

HFB Short Shank

HFB-S

Super
MG

HARD
MAX

40°

R
±0.005
R1~R1.5

R
±0.007
R2~R3

R
±0.01
R4~R6

Shank Dia
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4 Flutes



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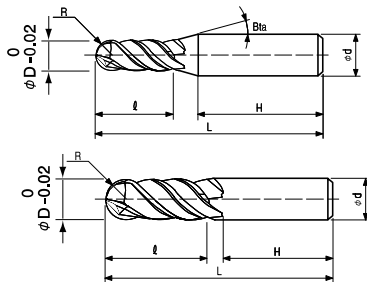
		Work Material															
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC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

Features

Compatible with shrink-fit toolholder systems for high efficiency.

A shorter overhang offers higher feed rates and precision.

Diameter Tolerance: 0/-0.02



The shank taper angle and the shank length (H) shown are 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.

Total 7 models

Unit (mm)

Model Number	Radius of Ball Nose R	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Shank Length H	Suggested Retail Price ¥
HFB 4020-0300S	R1	3	16°	40	4	31.0	6,720
HFB 4030-0450S	R1.5	4.5	16°	40	4	30.5	6,890
HFB 4040-0600S	R2	6	16°	45	6	32.5	6,890
HFB 4060-0900S	R3	9	—	50	6	34.5	8,610
HFB 4080-1200S	R4	12	—	60	8	40.5	12,300
HFB 4100-1500S	R5	15	—	60	10	35.5	16,320
HFB 4120-1800S	R6	18	—	60	12	31.5	20,660

- 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

Milling Conditions for HFB / HFB-S

◆ Roughing

- φ3mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
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WORK MATERIAL		PREHARDENED STEELS NAK80 (35~45HRC) Coolant: Water Soluble / Air Blow / Oil Mist				HARDENED STEELS STAVAX / SKD61 (45~55HRC) Coolant: Air Blow / Oil Mist			
Model Number	Radius of Ball Nose (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4020-0300	R1	20,000	1,500	0.5	0.8	16,000	1,500	0.6	0.9
4030-0450	R1.5	16,000	2,000	0.6	0.9	10,500	1,500	0.9	1.35
4040-0600	R2	15,000	3,000	0.4	0.8	9,000	3,000	0.7	1.4
4060-0900	R3	9,000	2,500	0.5	1	8,000	3,500	0.6	1.8
4080-1200	R4	CFB Series are Recommended				6,200	3,000	0.75	2.1
4100-1500	R5					4,500	2,700	0.85	2.5
4120-1800	R6					3,750	2,700	0.95	3

WORK MATERIAL		HARDENED STEELS YXR33 / SKD11 (55~60HRC) Coolant: Air Blow / Oil Mist				HARDENED STEELS HAP10 / SKD11 / YXR7 (60~65HRC) Coolant: Air Blow / Oil Mist			
Model Number	Radius of Ball Nose (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4020-0300	R1	10,000	1,500	0.4	0.8	8,500	1,200	0.3	0.7
4030-0450	R1.5	6,500	1,500	0.6	1.2	5,500	1,200	0.5	1.1
4040-0600	R2	5,500	1,750	0.6	1.2	6,200	2,000	0.45	1
4060-0900	R3	4,500	1,750	0.6	1.5	5,000	2,000	0.45	1.2
4080-1200	R4	3,750	1,500	0.7	1.75	4,500	1,800	0.5	1.4
4100-1500	R5	3,000	1,500	0.75	2	3,600	1,800	0.6	1.6
4120-1800	R6	2,500	1,500	0.9	2.4	3,000	1,800	0.7	1.8

WORK MATERIAL		HARDENED STEELS HAP72 (65~70HRC) Coolant: Air Blow / Oil Mist			
Model Number	Radius of Ball Nose (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a _p Axial Depth (mm)	a _e Radial Depth (mm)
4020-0300	R1	10,500	750	0.2	0.6
4030-0450	R1.5	7,000	750	0.25	0.8
4040-0600	R2	7,500	1,200	0.2	0.6
4060-0900	R3	5,000	1,500	0.3	0.9
4080-1200	R4	4,000	1,500	0.3	1
4100-1500	R5	3,000	1,500	0.3	1.2
4120-1800	R6	2,500	1,300	0.3	1.4

Milling Conditions for HFB / HFB-S

Please adjust milling parameter according to overhang length, referring to the following table.

4 Flutes

Radius of Ball Nose R1 ($\phi 4$ shank), R1.5

Overhang Length	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)
$\phi D \times 5$ or below	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 6$	$\times 0.9$	$\times 0.9$	$\times 0.95$	$\times 0.95$
$\sim \phi D \times 7$	$\times 0.8$	$\times 0.8$	$\times 0.9$	$\times 0.95$
$\sim \phi D \times 8$	$\times 0.7$	$\times 0.7$	$\times 0.85$	$\times 0.9$
$\sim \phi D \times 9$	$\times 0.65$	$\times 0.6$	$\times 0.8$	$\times 0.9$
$\sim \phi D \times 10$	$\times 0.55$	$\times 0.5$	$\times 0.75$	$\times 0.85$

Radius of Ball Nose R1 ($\phi 6$ shank)

Overhang Length	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)
$\phi D \times 6$	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 7$	$\times 0.85$	$\times 0.9$	$\times 0.95$	$\times 0.95$
$\sim \phi D \times 8$	$\times 0.7$	$\times 0.8$	$\times 0.9$	$\times 0.9$
$\sim \phi D \times 9$	$\times 0.55$	$\times 0.75$	$\times 0.85$	$\times 0.9$
$\sim \phi D \times 10$	$\times 0.4$	$\times 0.65$	$\times 0.8$	$\times 0.85$

Radius of Ball Nose R1.5 (Short shank)

Overhang Length	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)
$\phi D \times 5$ or below	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 6$	$\times 0.55$	$\times 0.3$	$\times 0.4$	$\times 0.55$

Radius of Ball Nose R2 or above

Overhang Length	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a_p (mm)	a_e (mm)
$\phi D \times 3$ or below	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 3.5$	$\times 1$	$\times 0.85$	$\times 0.85$	$\times 0.9$
$\sim \phi D \times 4$	$\times 1$	$\times 0.8$	$\times 0.7$	$\times 0.8$
$\sim \phi D \times 4.5$	$\times 0.85$	$\times 0.55$	$\times 0.6$	$\times 0.75$
$\sim \phi D \times 5$	$\times 0.7$	$\times 0.35$	$\times 0.6$	$\times 0.75$
$\sim \phi D \times 5.5$	$\times 0.55$	$\times 0.25$	$\times 0.55$	$\times 0.7$
$\sim \phi D \times 6$	$\times 0.4$	$\times 0.15$	$\times 0.5$	$\times 0.7$

* Refer to next page for finishing condition.

HFB Series
SKD11(60HRC)
Milling Video

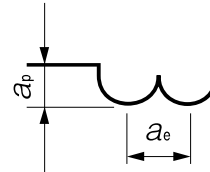


- $\phi 3$ mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
 - Long Neck Square
- Radius
 - Long Neck Radius
 - Taper Neck Radius
- Ball / Long Shank Ball
 - Long Neck Ball
 - Taper Neck Ball
- Taper
 - Barrel
- Spiral V Cutter
- Drill
- Technical Data

Milling Conditions for HFB / HFB-S

◆Finishing (overhang length ~6D)

WORK MATERIAL		PREHARDENED STEELS / HARDENED STEELS (35~60HRC) Coolant: Oil Mist			
Model Number	Radius of Ball Nose (mm)	Spindle Speed (min ⁻¹)	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
4020-0300	R1	26,000	2,000	0.02	0.06
4030-0450	R1.5	25,000	1,800	0.03	0.07
4040-0600	R2	22,500	1,500	0.04	0.08
4060-0900	R3	15,000	1,000	0.06	0.12
4080-1200	R4	11,250	750	0.08	0.16
4100-1500	R5	9,000	600	0.1	0.2
4120-1800	R6	7,500	500	0.12	0.24



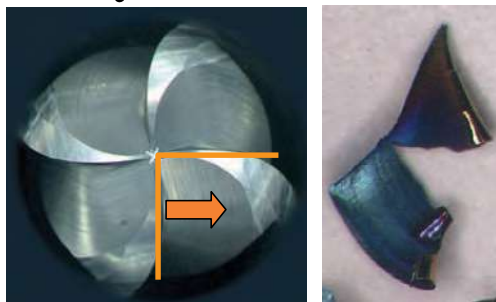
Note:

- Decrease the feed rate more than 50% from the milling parameters when slot milling.
- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machines maximum speed, or when the tool is chattering and heats up to a red color.
- Adjustments are recommended when finishing with an overhang of over 6xD.
- Recommend air blow or oil mist. For materials under 45HRC, recommend water soluble coolant.

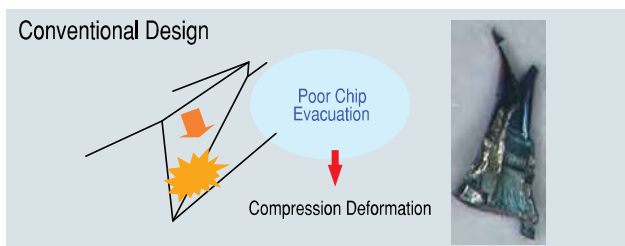
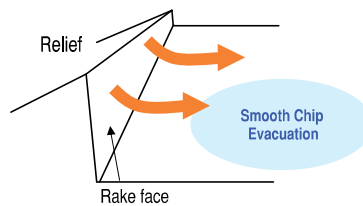
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Feature 1 Special Design Achieves Outstanding Chip Evacuation










HFB Design



Flat (Non-rolled up) chip shape shows smooth chip evacuation.



Smooth chip evacuation achieves more stable milling.

	HFB	Competitor A	Competitor B
Tip Point			
Milling Surface			
Chip Condition			



Tool	R2
Work Material	YXR33 (58HRC)
Spindle Speed	6,000 min ⁻¹
Feed Rate	2,400 mm/min (Slotting : 1,200 mm/min)
a_p	1 mm (0.25D)
a_e	1 mm (0.25D)
Overhang Length	15 mm
Coolant	Air Blow (Through Spindle)
Pocket Size	100 × 20 × 6 mm (X × Y × Z)
Cycle Time	28.2 min




D : Outside Diameter

The large pocket design of the HFB promotes better chip evacuation and longer tool life when compared to a conventional design which shows premature damage.

Feature 2 Polish-less Milling by 4 Tip Grooves

STAVAX (53HRC) Milling Example: Flat Surface Finishing HFB (R3)

HFB R3 Max Roughness Rz: 0.9 μm			
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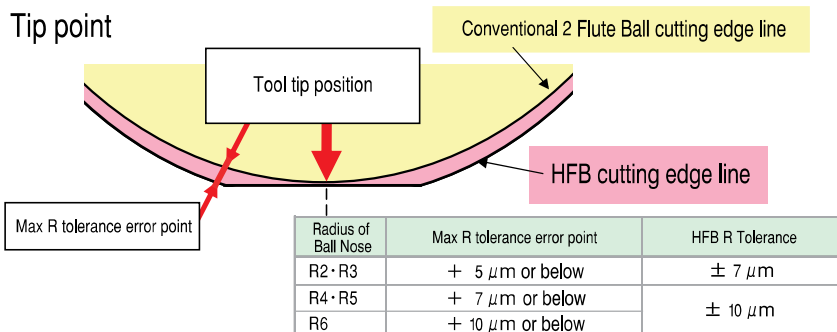
Conventional 2 Flutes Max Roughness Rz: 6.43 μm			
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Spindle Speed	12,800 min ⁻¹
Feed Rate	2,500 mm/min
a_p	0.06 mm (0.01D)
a_e	0.12 mm (0.02D)
Coolant	Oil Mist

4 grooves on the tip point help surface finishing process. Max roughness values was 0.9 μm on 1 hour testing.

The tool condition is better than conventional 2 Flutes.

Tip point



Smooth chip evacuation reduces damage at the tip.

4 Flutes

φ3mm Shank
V Series

UDC-PCD
Series

CBN
Series

Square
Long Neck
Square

Radius
Long Neck
Radius

Ball / Long
Shank Ball

Ball
Long Neck
Ball
Taper Neck
Ball

Taper
Taper

Barrel
Spiral
V Cutter

Drill
Technical Data

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