Size R0.03～R6

HSB

Super MG | HARD MAX | Shank Dia 0/-0.005

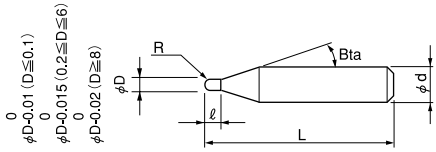
Additional 17 models

Material Applications (☆ Highly Recommended ◎ Recommended ○ Suggested)

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

Features

HARDMAX keeps the same hardness but improves resistance to oxidation at high temperatures.
Suitable for both dry and wet coolant.
Ball tip point is designed with a negative rake angle that minimizes wear and improves the target dimensions.
The negative rake design reduces as the radius transitions out to the periphery, enabling a good surface finish and reduced deflection.
Amazing efficiency with long life, combined with surface finishing on hard materials over 40HRC.



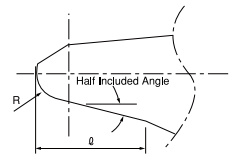
The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Radius of Ball Nose	Diameter Tolerance	Ballend Radius Tolerance	Helix Angle	Number of Flutes
R0.03～R0.05	0/-0.01	R ±0.002	0°	2 Flutes *
R0.1～R3	0/-0.015	R ±0.005	30°	
R4～R6	0/-0.02	R ±0.007		

* Only HSB1001-0020-6 has single flute.
R accuracy: +-0.005, Diameter tolerance: 0/-0.015

ATTENTION

HSB1001-0020-6 is a tapered ball end mill with single tapered flute of 10° (See the figure on right).



Total 70 models

Unit (mm)

	Model Number	Radius of Ball Nose R	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Price (¥)
	HSB20006-0006	R0.03	0.06	11°	50	4	17,460
	HSB20008-0008	R0.04	0.08	11°	50	4	14,550
	HSB1001-0020-6	R0.05	0.2	11°	50	6	13,320
	HSB2001-0010	R0.05	0.1	11°	50	4	12,120
	HSB2002-0020-6	R0.1	0.2	16°	50	6	9,840
	HSB2002-0030		0.3		50	4	8,520
	HSB2003-0030	R0.15	0.3	16°	50	4	6,960
※	HSB2003-0030-6		0.3		50	6	8,400
	HSB2003-0045		0.45		50	4	6,960
	HSB2004-0040	R0.2	0.4	16°	50	4	4,680
	HSB2004-0040-6		0.4		50	6	6,120
	HSB2004-0060		0.6		50	4	4,680
	HSB2005-0050	R0.25	0.5	16°	50	4	4,320
※	HSB2005-0050-6		0.5		50	6	5,760
	HSB2005-0075		0.75		50	4	4,320

※Additional model

Next Page ➡

Unit (mm)

	Model Number	Radius of Ball Nose R	Length of Cut ℓ	Shank Taper Angle βta	Overall Length L	Shank Diameter φd	Price (¥)
	HSB2006-0060	R0.3	0.6	16°	50	4	4,200
※	HSB2006-0060-6		0.6		50	6	5,520
	HSB2006-0090		0.9		50	4	4,200
※	HSB2007-0100	R0.35	1	16°	50	4	8,000
	HSB2008-0080	R0.4	0.8	16°	50	4	4,200
※	HSB2008-0080-6		0.8		50	6	5,520
	HSB2008-0120		1.2		50	4	4,200
※	HSB2009-0130	R0.45	1.3	16°	50	4	8,000
	HSB2010-0100	R0.5	1	16°	50	4	3,840
	HSB2010-0100-6		1		50	6	5,160
	HSB2010-0150		1.5		50	4	3,840
	HSB2010-0250		2.5		50	4	3,840
※	HSB2011-0160	R0.55	1.6	16°	50	4	9,280
※	HSB2012-0180	R0.6	1.8	16°	50	4	5,400
※	HSB2013-0190	R0.65	1.9	16°	50	4	9,280
※	HSB2014-0210	R0.7	2.1	16°	50	4	5,400
	HSB2015-0150	R0.75	1.5	16°	50	4	4,680
	HSB2015-0150-6		1.5		50	6	6,000
	HSB2015-0200		2		50	4	4,680
	HSB2015-0225		2.25		50	4	4,680
	HSB2015-0400		4		50	4	4,680
※	HSB2016-0240	R0.8	2.4	16°	50	4	5,400
※	HSB2017-0250	R0.85	2.5	16°	50	4	9,280
※	HSB2018-0270	R0.9	2.7	16°	50	4	8,000
※	HSB2019-0280	R0.95	2.8	16°	50	4	9,280
	HSB2020-0200	R1	2	16°	50	4	3,480
	HSB2020-0200-6		2		60	6	4,680
	HSB2020-0300		3		50	4	3,480
	HSB2020-0600		6		60	4	3,480
	HSB2025-0250	R1.25	2.5	16°	50	4	5,950
※	HSB2025-0250-6		2.5		60	6	6,360
	HSB2025-0375		3.75		50	4	5,950
※	HSB2025-0600		6		60	4	5,950
	HSB2030-0300	R1.5	3	16°	50	6	4,200
	HSB2030-0450		4.5		70	6	4,200
	HSB2030-0800		8		70	6	4,200
	HSB2040-0400	R2	4	16°	50	6	4,800
	HSB2040-0600		6		70	6	4,800
	HSB2040-0800		8		70	6	4,800
	HSB2050-0500	R2.5	5	16°	50	6	5,710
	HSB2050-0750		7.5		80	6	5,760
※	HSB2050-0800		8		80	6	5,760
	HSB2050-1200		12		80	6	5,760
	HSB2060-0600	R3	6	—	50	6	5,940
	HSB2060-0900		9		80	6	6,000
	HSB2060-1200		12		80	6	6,000
	HSB2080-0800	R4	8	—	60	8	9,270
	HSB2080-1200		12		90	8	9,360
	HSB2080-1400		14		90	8	9,360
	HSB2100-1000	R5	10	—	70	10	12,110
	HSB2100-1500		15		100	10	12,240
	HSB2100-1800		18		100	10	12,240
	HSB2120-1200	R6	12	—	75	12	20,580
	HSB2120-1800		18		110	12	20,790
	HSB2120-2200		22		110	12	20,790

※Additional model

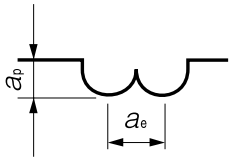
Milling Conditions for HSB

WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS NAK / STAVAX(~55HRC)				HARDENED STEELS SKD11(55~62HRC)				HARDENED STEELS HAP10(62~66HRC)				HARDENED STEELS HAP72(66~70HRC)			
Model Number	Radius of Ball Nose (mm)	Length of Cut (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)	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)
20006-0006	**R0.03**	**0.06**	30,000	100	0.002 or below	0.02	—	—	—	—	—	—	—	—	—	—	—	—
20008-0008	**R0.04**	**0.08**	30,000	130	0.003 or below	0.03	—	—	—	—	—	—	—	—	—	—	—	—
1001-0020-6	**R0.05**	**0.2**	30,000	30	0.002 or below	0.02	—	—	—	—	—	—	—	—	—	—	—	—
2001-0010		**0.1**	30,000	200	0.004 or below	0.04	—	—	—	—	—	—	—	—	—	—	—	—
2002-0020-6	**R0.1**	**0.2**	60,000	200	0.003	0.005	60,000	200	0.002	0.003	60,000	130	0.002	0.003	45,000	65	0.002	0.003
2002-0030		**0.3**	60,000	200	0.003	0.005	60,000	200	0.002	0.003	60,000	130	0.002	0.003	45,000	65	0.002	0.003
2003-0030(-6)	**R0.15**	**0.3**	60,000	350	0.006	0.008	45,000	310	0.004	0.007	43,500	180	0.003	0.005	32,500	90	0.003	0.005
2003-0045		**0.45**	60,000	350	0.006	0.008	45,000	310	0.004	0.007	43,500	180	0.003	0.005	32,500	90	0.003	0.005
2004-0040(-6)	**R0.2**	**0.4**	50,000	500	0.01	0.02	37,500	420	0.007	0.012	35,000	240	0.005	0.008	26,250	120	0.005	0.008
2004-0060		**0.6**	50,000	500	0.01	0.02	37,500	420	0.007	0.012	35,000	240	0.005	0.008	26,250	120	0.005	0.008
2005-0050(-6)	**R0.25**	**0.5**	44,000	650	0.015	0.04	33,000	530	0.01	0.02	30,000	300	0.007	0.01	22,500	150	0.007	0.01
2005-0075		**0.75**	44,000	650	0.015	0.04	33,000	530	0.01	0.02	30,000	300	0.007	0.01	22,500	150	0.007	0.01
2006-0060(-6)	**R0.3**	**0.6**	40,000	1,100	0.03	0.13	30,000	1,200	0.02	0.1	26,500	800	0.01	0.075	20,000	400	0.01	0.075
2006-0090		**0.9**	40,000	1,100	0.03	0.13	30,000	1,200	0.02	0.1	26,500	800	0.01	0.075	20,000	400	0.01	0.075
2007-0100	**R0.35**	**1**	37,000	1,350	0.045	0.17	28,500	1,400	0.03	0.135	25,000	900	0.015	0.1	18,750	450	0.015	0.1
2008-0080(-6)	**R0.4**	**0.8**	35,000	1,600	0.06	0.21	27,000	1,600	0.04	0.17	23,500	1,000	0.02	0.12	17,500	500	0.02	0.12
2008-0120		**1.2**	35,000	1,600	0.06	0.21	27,000	1,600	0.04	0.17	23,500	1,000	0.02	0.12	17,500	500	0.02	0.12
2009-0130	**R0.45**	**1.3**	32,500	1,650	0.1	0.28	25,500	1,800	0.055	0.21	22,000	1,300	0.025	0.14	16,500	650	0.025	0.14
2010-0100(-6)		**1**	30,000	1,750	0.2	0.4	24,000	2,000	0.1	0.3	21,000	1,750	0.05	0.2	16,000	875	0.05	0.2
2010-0150	**R0.5**	**1.5**	30,000	1,750	0.2	0.4	24,000	2,000	0.1	0.3	21,000	1,750	0.05	0.2	16,000	875	0.05	0.2
2010-0250		**2.5**	30,000	1,750	0.1	0.3	24,000	2,000	0.05	0.2	21,000	1,750	0.03	0.17	16,000	875	0.03	0.17
2011-0160	**R0.55**	**1.6**	30,000	1,900	0.21	0.43	22,000	2,000	0.105	0.32	19,000	1,750	0.05	0.22	14,250	875	0.05	0.22
2012-0180	**R0.6**	**1.8**	30,000	2,000	0.22	0.46	20,500	2,000	0.11	0.34	17,800	1,750	0.05	0.23	13,350	875	0.05	0.23
2013-0190	**R0.65**	**1.9**	30,000	2,150	0.23	0.49	19,000	2,000	0.115	0.36	16,600	1,750	0.05	0.24	12,450	875	0.05	0.24
2014-0210	**R0.7**	**2.1**	30,000	2,300	0.24	0.52	18,000	2,000	0.12	0.39	15,700	1,750	0.055	0.27	11,800	875	0.055	0.27
2015-0150(-6)		**1.5**	30,000	2,450	0.25	0.55	17,000	2,000	0.12	0.4	15,000	1,750	0.06	0.29	11,250	875	0.06	0.29
2015-0200	**R0.75**	**2**	30,000	2,450	0.25	0.55	17,000	2,000	0.12	0.4	15,000	1,750	0.06	0.29	11,250	875	0.06	0.29
2015-0225		**2.25**	30,000	2,450	0.25	0.55	17,000	2,000	0.12	0.4	15,000	1,750	0.06	0.29	11,250	875	0.06	0.29
2015-0400		**4**	30,000	2,450	0.15	0.45	17,000	2,000	0.07	0.31	15,000	1,750	0.04	0.24	11,250	875	0.04	0.24
2016-0240	**R0.8**	**2.4**	30,000	2,550	0.25	0.58	16,200	2,000	0.13	0.43	14,200	1,750	0.06	0.3	10,650	875	0.06	0.3
2017-0250	**R0.85**	**2.5**	30,000	2,600	0.26	0.61	15,500	2,000	0.135	0.46	13,500	1,750	0.065	0.32	10,100	875	0.065	0.32
2018-0270	**R0.9**	**2.7**	30,000	2,700	0.28	0.65	15,000	2,000	0.14	0.48	13,000	1,750	0.07	0.34	9,750	875	0.07	0.34
2019-0280	**R0.95**	**2.8**	29,000	2,800	0.3	0.69	14,500	2,000	0.145	0.49	12,600	1,750	0.075	0.36	9,450	875	0.075	0.36
2020-0200(-6)		**2**	28,000	2,900	0.3	0.7	14,000	2,100	0.15	0.5	12,250	1,800	0.08	0.35	9,200	900	0.08	0.35
2020-0300	**R1**	**3**	28,000	2,900	0.3	0.7	14,000	2,100	0.15	0.5	12,250	1,800	0.08	0.35	9,200	900	0.08	0.35
2020-0600		**6**	28,000	2,900	0.2	0.6	14,000	2,100	0.1	0.4	12,250	1,800	0.06	0.3	9,200	900	0.06	0.3
2025-0250(-6)		**2.5**	24,500	2,950	0.35	0.85	12,250	2,150	0.17	0.6	10,700	1,850	0.1	0.45	8,050	925	0.1	0.45
2025-0375	**R1.25**	**3.75**	24,500	2,950	0.35	0.85	12,250	2,150	0.17	0.6	10,700	1,850	0.1	0.45	8,050	925	0.1	0.45
2025-0600		**6**	24,500	2,950	0.26	0.75	12,250	2,150	0.125	0.5	10,700	1,850	0.08	0.4	8,050	925	0.08	0.4
2030-0300		**3**	21,000	3,000	0.4	1	10,500	2,200	0.2	0.7	9,200	1,900	0.12	0.55	6,900	950	0.12	0.55
2030-0450	**R1.5**	**4.5**	21,000	3,000	0.4	1	10,500	2,200	0.2	0.7	9,200	1,900	0.12	0.55	6,900	950	0.12	0.55
2030-0800		**8**	21,000	3,000	0.3	0.9	10,500	2,200	0.15	0.65	9,200	1,900	0.1	0.5	6,900	950	0.1	0.5
2040-0400		**4**	18,000	3,200	0.5	1.3	9,000	2,300	0.25	0.95	7,900	2,000	0.15	0.75	5,900	1,000	0.15	0.75
2040-0600	**R2**	**6**	18,000	3,200	0.5	1.3	9,000	2,300	0.25	0.95	7,900	2,000	0.15	0.75	5,900	1,000	0.15	0.75
2040-0800		**8**	18,000	3,200	0.5	1.3	9,000	2,300	0.25	0.95	7,900	2,000	0.15	0.75	5,900	1,000	0.15	0.75
2050-0500		**5**	15,600	3,500	0.5	1.5	7,800	2,500	0.25	1.05	6,800	2,100	0.15	0.85	5,100	1,050	0.15	0.85
2050-0750	**R2.5**	**7.5**	15,600	3,500	0.5	1.5	7,800	2,500	0.25	1.05	6,800	2,100	0.15	0.85	5,100	1,050	0.15	0.85
2050-0800		**8**	15,600	3,500	0.5	1.5	7,800	2,500	0.25	1.05	6,800	2,100	0.15	0.85	5,100	1,050	0.15	0.85
2050-1200		**12**	15,600	3,500	0.5	1.5	7,800	2,500	0.25	1.05	6,800	2,100	0.15	0.85	5,100	1,050	0.15	0.85

Milling Conditions for HSB

WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS NAK / STAVAX(~55HRC)				HARDENED STEELS SKD11(55~62HRC)				HARDENED STEELS HAP10(62~66HRC)				HARDENED STEELS HAP72(66~70HRC)			
Model Number	Radius of Ball Nose (mm)	Length of Cut (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)	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)
2060-0600	R3	**6**	13,000	3,500	0.6	1.8	6,500	2,500	0.3	1.3	5,700	2,200	0.2	1	4,300	1,100	0.2	1
2060-0900		**9**	13,000	3,500	0.6	1.8	6,500	2,500	0.3	1.3	5,700	2,200	0.2	1	4,300	1,100	0.2	1
2060-1200		**12**	13,000	3,500	0.6	1.8	6,500	2,500	0.3	1.3	5,700	2,200	0.2	1	4,300	1,100	0.2	1
2080-0800	R4	**8**	9,500	3,000	0.7	2.1	5,200	2,200	0.4	1.7	4,500	1,900	0.25	1.35	3,400	950	0.25	1.35
2080-1200		**12**	9,500	3,000	0.7	2.1	5,200	2,200	0.4	1.7	4,500	1,900	0.25	1.35	3,400	950	0.25	1.35
2080-1400		**14**	9,500	3,000	0.7	2.1	5,200	2,200	0.4	1.7	4,500	1,900	0.25	1.35	3,400	950	0.25	1.35
2100-1000	R5	**10**	7,500	2,500	0.8	2.5	4,300	2,000	0.5	2.1	3,750	1,750	0.3	1.7	2,800	875	0.3	1.7
2100-1500		**15**	7,500	2,500	0.8	2.5	4,300	2,000	0.5	2.1	3,750	1,750	0.3	1.7	2,800	875	0.3	1.7
2100-1800		**18**	7,500	2,500	0.8	2.5	4,300	2,000	0.5	2.1	3,750	1,750	0.3	1.7	2,800	875	0.3	1.7
2120-1200	R6	**12**	6,200	2,000	0.9	3	3,600	1,750	0.6	2.6	3,150	1,500	0.35	2	2,350	750	0.35	2
2120-1800		**18**	6,200	2,000	0.9	3	3,600	1,750	0.6	2.6	3,150	1,500	0.35	2	2,350	750	0.35	2
2120-2200		**22**	6,200	2,000	0.9	3	3,600	1,750	0.6	2.6	3,150	1,500	0.35	2	2,350	750	0.35	2

a_p : Axial Depth (mm)
a_e : Radial Depth (mm) = P_f

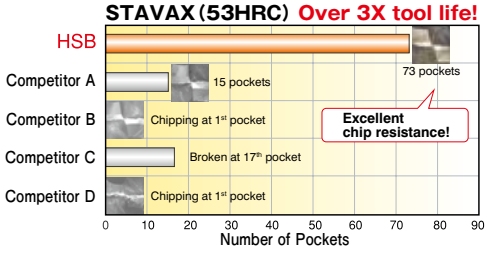


Note:
- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- Decrease the feed rate more than 50% from the milling parameters when slot milling.
- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed, or when burr and red-hot occur.
- Reduce the milling parameters when a straight shank tool exceeds 35mm of overhang length.
- Every coolant offers stable milling.

R3 Ball Tool Life Comparison: Market Leading Performance on Wear Resistance!

The number of pockets processed until the tool wear reaches 0.2mm.

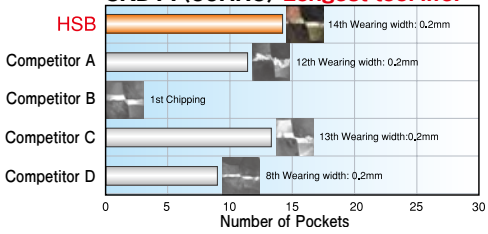
STAVAX(53HRC) Over 3X tool life!

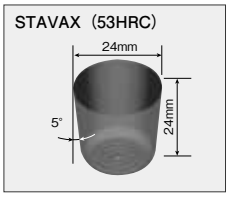


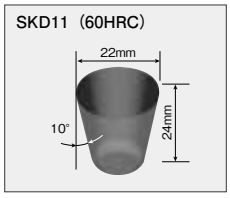
Tool Size: R3

Work Material	STAVAX (53HRC)	SKD11 (60HRC)
Spindle Speed	13,000 min^{-1}	6,500 min^{-1}
Feed Rate	3,500 mm / min	2,500 mm / min
Velocity	245 m / min	122 m / min
Feed per tooth	0.135 mm / tooth	0.19 mm / tooth
Axial Depth a_p	0.6 mm	0.3 mm
Radial Depth a_e	1.8 mm	1.3 mm
Overhang Length	30 mm	30 mm
Cycle Time	3 minutes / pocket	6.5 minutes / pocket
Coolant	Air Blow	
Milling Method	Contouring	

SKD11(60HRC) Longest tool life!







* Refer to page 378 for tool geometry.