Size R0.1～R2

HTNB

Super MG | HARD MAX | 30° | R ±0.005 | Shank Dia 0/-0.005 | Back Taper Geometry

Material Applications（★ Highly Recommended ● Recommended ○ Suggested）

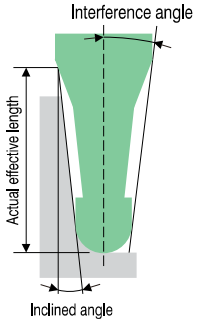
Work Material																
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels ～50HRC	Hardened Steels ～55HRC	Hardened Steels ～60HRC	Hardened Steels ～65HRC	Hardened Steels ～70HRC	Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium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

Total 245 models

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Shape	Suggested Retail Price ¥
HTNB 2002-015-1	R0.1	30′	1.5	—	0.16	—	16°	50	4	A	11,520
HTNB 2002-020-1			2					50	4		12,120
HTNB 2002-030-1			3					50	4		14,400
HTNB 2002-015-2		1°	1.5					50	4		11,520
HTNB 2002-020-2			2					50	4		12,120
HTNB 2002-030-2			3					50	4		14,400
HTNB 2002-015-3		1°30′	1.5					50	4		11,520
HTNB 2002-020-3			2					50	4		12,120
HTNB 2002-030-3			3					50	4		14,400
HTNB 2003-020-1	R0.15	30′	2	—	0.24	—	16°	50	4	A	11,520
HTNB 2003-030-1			3					50	4		12,120
HTNB 2003-020-2		1°	2					50	4		11,520
HTNB 2003-030-2			3					50	4		12,120
HTNB 2003-020-3		1°30′	2					50	4		11,520
HTNB 2003-030-3			3					50	4		12,120
HTNB 2004-030-1	R0.2	30′	3	—	0.32	—	16°	50	4	A	8,880
HTNB 2004-040-1			4					50	4		8,880
HTNB 2004-060-1			6					50	4		9,600
HTNB 2004-030-2		1°	3					50	4		8,880
HTNB 2004-040-2			4					50	4		8,880
HTNB 2004-060-2			6					50	4		9,600
HTNB 2004-030-3		1°30′	3					50	4		8,880
HTNB 2004-040-3			4					50	4		8,880
HTNB 2004-060-3			6					50	4		9,600

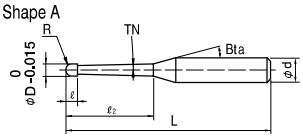
Features

Taper Neck design offers high rigidity.
Stable milling and excellent surface even on deep milling.
HARDMAX coat offers heat resistance, toughness and lubricity at a high level.
Suitable for hard materials up to 65HRC.

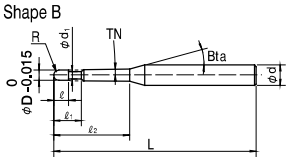


The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

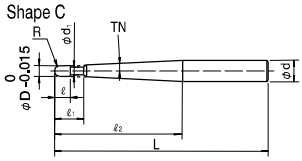
Shape A



Shape B



Shape C



Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles —: Interference				
					30′	1°	1°30′	2°	3°
HTNB 2002-015-1	R0.1	30′	1.5	13.36°	—	1.50	1.55	1.60	1.72
HTNB 2002-020-1			2	12.63°	—	2.01	2.08	2.15	2.31
HTNB 2002-030-1			3	11.37°	—	3.05	3.15	3.26	3.50
HTNB 2002-015-2		1°	1.5	13.41°	—	—	1.51	1.56	1.68
HTNB 2002-020-2			2	12.69°	—	—	2.03	2.10	2.25
HTNB 2002-030-2			3	11.46°	—	—	3.06	3.17	3.40
HTNB 2002-015-3		1°30′	1.5	13.46°	—	—	—	1.53	1.64
HTNB 2002-020-3			2	12.76°	—	—	—	2.04	2.19
HTNB 2002-030-3			3	11.56°	—	—	—	3.08	3.31
HTNB 2003-020-1	R0.15	30′	2	12.62°	—	2.01	2.08	2.15	2.30
HTNB 2003-030-1			3	11.34°	—	3.05	3.15	3.25	3.49
HTNB 2003-020-2		1°	2	12.68°	—	—	2.03	2.10	2.25
HTNB 2003-030-2			3	11.43°	—	—	3.06	3.17	3.40
HTNB 2003-020-3		1°30′	2	12.75°	—	—	—	2.05	2.19
HTNB 2003-030-3			3	11.52°	—	—	—	3.08	3.31
HTNB 2004-030-1	R0.2	30′	3	11.30°	—	3.04	3.14	3.25	3.48
HTNB 2004-040-1			4	10.23°	—	4.08	4.21	4.35	4.67
HTNB 2004-060-1			6	8.60°	—	6.14	6.34	6.56	7.04
HTNB 2004-030-2		1°	3	11.38°	—	—	3.06	3.17	3.39
HTNB 2004-040-2			4	10.33°	—	—	4.10	4.23	4.54
HTNB 2004-060-2			6	8.72°	—	—	6.16	6.37	6.84
HTNB 2004-030-3		1°30′	3	11.48°	—	—	—	3.08	3.30
HTNB 2004-040-3			4	10.44°	—	—	—	4.12	4.42
HTNB 2004-060-3			6	8.84°	—	—	—	6.19	6.64

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Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ2	Effective Length ℓ1	Length of Cut ℓ	Neck Diameter φd1	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Shape	Suggested Retail Price ¥
HTNB 2005-040-1	R0.25	30′	4	—	0.4	—	16°	50	4	A	8,400
HTNB 2005-060-1			6					50	4		8,880
HTNB 2005-080-1			8					50	4		8,880
HTNB 2005-100-1			10					50	4		9,600
HTNB 2005-040-2		1°	4					50	4		8,400
HTNB 2005-060-2			6					50	4		8,880
HTNB 2005-080-2			8					50	4		8,880
HTNB 2005-100-2			10					50	4		9,600
HTNB 2005-040-3		1°30′	4					50	4		8,640
HTNB 2005-060-3			6					50	4		8,880
HTNB 2005-080-3			8					50	4		8,880
HTNB 2005-100-3			10					50	4		9,600
HTNB 2006-040-1	R0.3	30′	4	0.9	0.48	0.56	16°	50	4	B	8,280
HTNB 2006-060-1			6					50	4		8,520
HTNB 2006-080-1			8					50	4		8,520
HTNB 2006-100-1			10					50	4		8,640
HTNB 2006-120-1			12					50	4		9,360
HTNB 2006-140-1			14					50	4		9,360
HTNB 2006-160-1			16					50	4		9,360
HTNB 2006-200-1			20					50	4		12,500
HTNB 2006-040-2		1°	4					50	4		8,280
HTNB 2006-060-2			6					50	4		8,520
HTNB 2006-080-2			8					50	4		8,520
HTNB 2006-100-2			10					50	4		8,640
HTNB 2006-120-2			12					50	4		9,360
HTNB 2006-140-2			14					50	4		9,360
HTNB 2006-160-2			16					50	4		9,360
HTNB 2006-200-2			20					50	4		12,500
HTNB 2006-040-3		1°30′	4					50	4		8,280
HTNB 2006-060-3			6					50	4		8,520
HTNB 2006-080-3			8					50	4		8,520
HTNB 2006-100-3			10					50	4		8,640
HTNB 2006-120-3			12					50	4		9,360
HTNB 2006-140-3			14					50	4		9,360
HTNB 2006-160-3			16					50	4		9,360
HTNB 2006-200-3			20					50	4		12,500
HTNB 2006-080-4		2°	8					50	4		8,520
HTNB 2006-120-4			12					50	4		9,360
HTNB 2006-200-4			20					50	4		12,500
HTNB 2006-080-6		3°	8					50	4		8,520
HTNB 2006-120-6			12					50	4		9,360
HTNB 2006-200-6			20					50	4		12,500
HTNB 2006-120-10		5°	12					50	4		9,360
HTNB 2006-200-10			20					50	4		12,500

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles — : Interference				
					30′	1°	1°30′	2°	3°
HTNB 2005-040-1	R0.25	30′	4	10.17°	—	4.08	4.21	4.35	4.66
HTNB 2005-060-1			6	8.52°	—	6.14	6.34	6.55	7.03
HTNB 2005-080-1			8	7.33°	—	8.21	8.48	8.76	9.41
HTNB 2005-100-1			10	6.43°	—	10.27	10.61	10.97	11.78
HTNB 2005-040-2		1°	4	10.27°	—	—	4.10	4.23	4.54
HTNB 2005-060-2			6	8.64°	—	—	6.16	6.37	6.84
HTNB 2005-080-2			8	7.45°	—	—	8.23	8.51	9.13
HTNB 2005-100-2			10	6.55°	—	—	10.30	10.65	11.43
HTNB 2005-040-3		1°30′	4	10.38°	—	—	—	4.12	4.41
HTNB 2005-060-3			6	8.76°	—	—	—	6.19	6.64
HTNB 2005-080-3			8	7.57°	—	—	—	8.26	8.86
HTNB 2005-100-3			10	6.67°	—	—	—	10.33	11.09
HTNB 2006-040-1	R0.3	30′	4	10.10°	—	4.08	4.21	4.34	4.65
HTNB 2006-060-1			6	8.44°	—	6.14	6.34	6.55	7.03
HTNB 2006-080-1			8	7.24°	—	8.21	8.47	8.76	9.40
HTNB 2006-100-1			10	6.33°	—	10.27	10.61	10.97	11.77
HTNB 2006-120-1			12	5.63°	—	12.34	12.74	13.18	14.14
HTNB 2006-140-1			14	5.07°	—	14.39	14.87	15.37	16.51
HTNB 2006-160-1			16	4.61°	—	16.46	17.01	17.59	18.89
HTNB 2006-200-1			20	3.90°	—	20.60	21.28	22.01	23.64
HTNB 2006-040-2		1°	4	10.21°	—	—	4.10	4.23	4.53
HTNB 2006-060-2			6	8.55°	—	—	6.17	6.37	6.83
HTNB 2006-080-2			8	7.36°	—	—	8.23	8.51	9.13
HTNB 2006-100-2			10	6.45°	—	—	10.30	10.65	11.43
HTNB 2006-120-2			12	5.74°	—	—	12.37	12.79	13.72
HTNB 2006-140-2			14	5.18°	—	—	14.43	14.93	16.03
HTNB 2006-160-2			16	4.71°	—	—	16.50	17.07	18.32
HTNB 2006-200-2			20	3.99°	—	—	20.64	21.34	22.92
HTNB 2006-040-3		1°30′	4	10.31°	—	—	—	4.12	4.41
HTNB 2006-060-3			6	8.67°	—	—	—	6.19	6.64
HTNB 2006-080-3			8	7.48°	—	—	—	8.26	8.86
HTNB 2006-100-3			10	6.57°	—	—	—	10.34	11.09
HTNB 2006-120-3			12	5.86°	—	—	—	12.40	13.31
HTNB 2006-140-3			14	5.29°	—	—	—	14.46	15.52
HTNB 2006-160-3			16	4.82°	—	—	—	16.54	17.76
HTNB 2006-200-3			20	4.09°	—	—	—	20.67	22.19
HTNB 2006-080-4		2°	8	7.60°	—	—	—	—	8.59
HTNB 2006-120-4			12	5.98°	—	—	—	—	12.89
HTNB 2006-200-4			20	4.19°	—	—	—	—	21.49
HTNB 2006-080-6		3°	8	7.86°	—	—	—	—	—
HTNB 2006-120-6			12	6.23°	—	—	—	—	—
HTNB 2006-200-6			20	4.41°	—	—	—	—	—
HTNB 2006-120-10		5°	12	6.82°	—	—	—	—	—
HTNB 2006-200-10			20	4.92°	—	—	—	—	—

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Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Shape	Suggested Retail Price ¥
HTNB 2008-060-1	R0.4	30′	6	1.2	0.64	0.76	16°	50	4	B	8,880
HTNB 2008-080-1			8					50	4		8,880
HTNB 2008-120-1			12					60	4		9,360
HTNB 2008-160-1			16					60	4		11,500
HTNB 2008-060-2		1°	6					50	4		8,880
HTNB 2008-080-2			8					50	4		8,880
HTNB 2008-120-2			12					60	4		9,360
HTNB 2008-160-2			16					60	4		11,500
HTNB 2008-060-3		1°30′	6					50	4		8,880
HTNB 2008-080-3			8					50	4		8,880
HTNB 2008-120-3			12					60	4		9,360
HTNB 2008-160-3			16					60	4		11,500
HTNB 2010-060-1	R0.5	30′	6	1.5	0.8	0.95	16°	50	4	B	7,560
HTNB 2010-080-1			8					50	4		7,560
HTNB 2010-100-1			10					50	4		7,560
HTNB 2010-120-1			12					50	4		7,560
HTNB 2010-140-1			14					50	4		7,560
HTNB 2010-160-1			16					50	4		7,560
HTNB 2010-180-1			18					50	4		7,560
HTNB 2010-200-1			20					60	4		9,600
HTNB 2010-220-1			22					60	4		9,600
HTNB 2010-260-1			26					65	4		10,080
HTNB 2010-300-1			30					70	4		10,560
HTNB 2010-320-1			32					70	4		10,560
HTNB 2010-360-1			36					80	4		11,040

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles — : Interference				
					30′	1°	1°30′	2°	3°
HTNB 2008-060-1	R0.4	30′	6	8.26°	—	6.14	6.34	6.54	7.01
HTNB 2008-080-1			8	7.04°	—	8.21	8.47	8.75	9.38
HTNB 2008-120-1			12	5.44°	—	12.33	12.74	13.17	14.13
HTNB 2008-160-1			16	4.43°	—	16.47	17.01	17.59	18.88
HTNB 2008-060-2		1°	6	8.37°	—	—	6.17	6.37	6.82
HTNB 2008-080-2			8	7.16°	—	—	8.23	8.51	9.12
HTNB 2008-120-2			12	5.55°	—	—	12.37	12.79	13.72
HTNB 2008-160-2			16	4.53°	—	—	16.50	17.06	18.31
HTNB 2008-060-3		1°30′	6	8.49°	—	—	—	6.20	6.64
HTNB 2008-080-3			8	7.28°	—	—	—	8.26	8.86
HTNB 2008-120-3			12	5.67°	—	—	—	12.40	13.30
HTNB 2008-160-3			16	4.63°	—	—	—	16.54	17.75
HTNB 2010-060-1	R0.5	30′	6	8.06°	—	6.14	6.33	6.54	7.00
HTNB 2010-080-1			8	6.84°	—	8.21	8.47	8.75	9.37
HTNB 2010-100-1			10	5.93°	—	10.27	10.60	10.96	11.74
HTNB 2010-120-1			12	5.24°	—	12.33	12.73	13.16	14.11
HTNB 2010-140-1			14	4.69°	—	14.39	14.85	15.35	16.47
HTNB 2010-160-1			16	4.25°	—	16.46	17.00	17.58	18.86
HTNB 2010-180-1			18	3.88°	—	18.51	19.12	19.77	21.21
HTNB 2010-200-1			20	3.57°	—	20.60	21.27	22.00	23.61
HTNB 2010-220-1			22	3.31°	—	22.66	23.41	24.20	25.98
HTNB 2010-260-1			26	2.88°	—	26.79	27.67	28.62	No Interference
HTNB 2010-300-1			30	2.55°	—	30.90	31.93	33.02	No Interference
HTNB 2010-320-1			32	2.41°	—	32.98	34.07	35.24	No Interference
HTNB 2010-360-1			36	2.18°	—	37.11	38.34	39.66	No Interference

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Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Shape	Suggested Retail Price ¥
HTNB 2010-060-2	R0.5	1°	6	1.5	0.8	0.95	16°	50	4	B	7,560
HTNB 2010-080-2			8					50	4		7,560
HTNB 2010-100-2			10					50	4		7,560
HTNB 2010-120-2			12					50	4		7,560
HTNB 2010-140-2			14					50	4		7,560
HTNB 2010-160-2			16					50	4		7,560
HTNB 2010-180-2			18					50	4		7,560
HTNB 2010-200-2			20					60	4		9,600
HTNB 2010-220-2			22					60	4		9,600
HTNB 2010-260-2			26					65	4		10,080
HTNB 2010-300-2			30					70	4		10,560
HTNB 2010-320-2			32					70	4		10,560
HTNB 2010-360-2			36					80	4		11,040
HTNB 2010-060-3		1°30′	6					50	4		7,560
HTNB 2010-080-3			8					50	4		7,560
HTNB 2010-100-3			10					50	4		7,560
HTNB 2010-120-3			12					50	4		7,560
HTNB 2010-140-3			14					50	4		7,560
HTNB 2010-160-3			16					50	4		7,560
HTNB 2010-180-3			18					50	4		7,560
HTNB 2010-200-3			20					60	4		9,600
HTNB 2010-220-3			22					60	4		9,600
HTNB 2010-260-3			26					65	4		10,080
HTNB 2010-300-3			30					70	4		10,560
HTNB 2010-320-3			32					70	4		10,560
HTNB 2010-360-3			36					80	4		11,040
HTNB 2010-120-4		2°	12					50	4		7,560
HTNB 2010-160-4			16					50	4		7,560
HTNB 2010-200-4			20					60	4		9,600
HTNB 2010-300-4			30					70	4		10,560
HTNB 2010-120-6		3°	12					50	4		7,560
HTNB 2010-160-6			16					50	4		7,560
HTNB 2010-200-6			20					60	4		9,600
HTNB 2010-298-6			29.8				—	70	4	C	10,560
HTNB 2010-120-10		5°	12				16°	50	4	B	7,560
HTNB 2010-200-10			20					70	6		9,600

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles — : Interference				
					30′	1°	1°30′	2°	3°
HTNB 2010-060-2	R0.5	1°	6	8.17°	—	—	6.18	6.38	6.82
HTNB 2010-080-2			8	6.95°	—	—	8.24	8.51	9.12
HTNB 2010-100-2			10	6.04°	—	—	10.31	10.66	11.42
HTNB 2010-120-2			12	5.35°	—	—	12.38	12.79	13.72
HTNB 2010-140-2			14	4.79°	—	—	14.45	14.93	16.02
HTNB 2010-160-2			16	4.34°	—	—	16.51	17.07	18.31
HTNB 2010-180-2			18	3.97°	—	—	18.58	19.21	20.61
HTNB 2010-200-2			20	3.65°	—	—	20.64	21.35	22.91
HTNB 2010-220-2			22	3.39°	—	—	22.71	23.48	25.21
HTNB 2010-260-2			26	2.95°	—	—	26.85	27.76	No Interference
HTNB 2010-300-2			30	2.62°	—	—	30.97	32.03	No Interference
HTNB 2010-320-2			32	2.48°	—	—	33.05	34.18	No Interference
HTNB 2010-360-2			36	2.24°	—	—	37.18	38.46	No Interference
HTNB 2010-060-3		1°30′	6	8.28°	—	—	—	6.21	6.65
HTNB 2010-080-3			8	7.06°	—	—	—	8.28	8.87
HTNB 2010-100-3			10	6.16°	—	—	—	10.35	11.10
HTNB 2010-120-3			12	5.45°	—	—	—	12.42	13.32
HTNB 2010-140-3			14	4.90°	—	—	—	14.47	15.52
HTNB 2010-160-3			16	4.44°	—	—	—	16.56	17.77
HTNB 2010-180-3			18	4.06°	—	—	—	18.61	19.97
HTNB 2010-200-3			20	3.74°	—	—	—	20.70	22.21
HTNB 2010-220-3			22	3.47°	—	—	—	22.77	24.44
HTNB 2010-260-3			26	3.03°	—	—	—	26.91	28.88
HTNB 2010-300-3			30	2.69°	—	—	—	31.03	No Interference
HTNB 2010-320-3			32	2.55°	—	—	—	33.11	No Interference
HTNB 2010-360-3			36	2.30°	—	—	—	37.25	No Interference
HTNB 2010-120-4		2°	12	5.57°	—	—	—	—	12.88
HTNB 2010-160-4			16	4.55°	—	—	—	—	17.18
HTNB 2010-200-4			20	3.84°	—	—	—	—	21.48
HTNB 2010-300-4			30	2.77°	—	—	—	—	No Interference
HTNB 2010-120-6		3°	12	5.82°	—	—	—	—	—
HTNB 2010-160-6			16	4.77°	—	—	—	—	—
HTNB 2010-200-6			20	4.05°	—	—	—	—	—
HTNB 2010-298-6			29.8	—	—	—	—	—	—
HTNB 2010-120-10		5°	12	6.38°	—	—	—	—	—
HTNB 2010-200-10			20	6.35°	—	—	—	—	—

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Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Shape	Suggested Retail Price ¥
HTNB 2015-100-1	R0.75	30′	10	2.25	1.2	1.42	16°	60	4	B	7,920
HTNB 2015-120-1			12					60	4		7,920
HTNB 2015-160-1			16					60	4		8,640
HTNB 2015-200-1			20					60	4		8,640
HTNB 2015-220-1			22					60	4		8,640
HTNB 2015-260-1			26					70	4		9,360
HTNB 2015-300-1			30					70	4		9,360
HTNB 2015-360-1			36					80	4		11,040
HTNB 2015-100-2		1°	10					60	4		7,920
HTNB 2015-120-2			12					60	4		7,920
HTNB 2015-160-2			16					60	4		8,640
HTNB 2015-200-2			20					60	4		8,640
HTNB 2015-260-2			26					70	4		9,360
HTNB 2015-300-2			30					70	4		9,360
HTNB 2015-360-2			36					80	4		11,040
HTNB 2015-100-3		1°30′	10					60	4		7,920
HTNB 2015-120-3			12					60	4		7,920
HTNB 2015-160-3			16					60	4		8,640
HTNB 2015-200-3			20					60	4		8,640
HTNB 2015-260-3			26					70	4		9,360
HTNB 2015-300-3			30					70	4		9,360
HTNB 2015-360-3			36					80	4		11,040
HTNB 2015-120-4		2°	12					60	4		7,920
HTNB 2015-160-4			16					60	4		8,640
HTNB 2015-200-4			20					60	4		8,640
HTNB 2015-300-4			30					70	6		11,040
HTNB 2015-120-6		3°	12					60	4		7,920
HTNB 2015-160-6			16					60	4		8,640
HTNB 2015-200-6			20					60	4		8,640
HTNB 2015-300-6			30					70	6		11,040

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles — : Interference				
					30′	1°	1°30′	2°	3°
HTNB 2015-100-1	R0.75	30′	10	5.36°	—	10.27	10.59	10.93	11.70
HTNB 2015-120-1			12	4.69°	—	12.33	12.72	13.14	14.08
HTNB 2015-160-1			16	3.75°	—	16.46	16.99	17.56	18.82
HTNB 2015-200-1			20	3.12°	—	20.59	21.26	21.98	23.57
HTNB 2015-220-1			22	2.88°	—	22.66	23.39	24.18	No Interference
HTNB 2015-260-1			26	2.50°	—	26.79	27.66	28.60	No Interference
HTNB 2015-300-1			30	2.20°	—	30.92	31.93	33.01	No Interference
HTNB 2015-360-1			36	1.87°	—	37.11	38.33	No Interference	No Interference
HTNB 2015-100-2		1°	10	5.46°	—	—	10.31	10.65	11.39
HTNB 2015-120-2			12	4.79°	—	—	12.38	12.78	13.69
HTNB 2015-160-2			16	3.83°	—	—	16.51	17.06	18.29
HTNB 2015-200-2			20	3.20°	—	—	20.65	21.34	22.89
HTNB 2015-260-2			26	2.56°	—	—	26.85	27.76	No Interference
HTNB 2015-300-2			30	2.26°	—	—	30.98	32.03	No Interference
HTNB 2015-360-2			36	1.92°	—	—	37.18	No Interference	No Interference
HTNB 2015-100-3		1°30′	10	5.57°	—	—	—	10.36	11.09
HTNB 2015-120-3			12	4.89°	—	—	—	12.43	13.31
HTNB 2015-160-3			16	3.92°	—	—	—	16.57	17.76
HTNB 2015-200-3			20	3.28°	—	—	—	20.71	22.21
HTNB 2015-260-3			26	2.63°	—	—	—	26.91	No Interference
HTNB 2015-300-3			30	2.32°	—	—	—	31.05	No Interference
HTNB 2015-360-3			36	1.98°	—	—	—	No Interference	No Interference
HTNB 2015-120-4		2°	12	4.98°	—	—	—	—	12.90
HTNB 2015-160-4			16	4.02°	—	—	—	—	17.20
HTNB 2015-200-4			20	3.36°	—	—	—	—	21.50
HTNB 2015-300-4			30	3.84°	—	—	—	—	32.25
HTNB 2015-120-6		3°	12	5.21°	—	—	—	—	—
HTNB 2015-160-6			16	4.22°	—	—	—	—	—
HTNB 2015-200-6			20	3.55°	—	—	—	—	—
HTNB 2015-300-6			30	4.04°	—	—	—	—	—

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Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Shape	Suggested Retail Price ¥
HTNB 2020-120-1	R1	30′	12	3	1.6	1.91	16°	60	4	B	8,100
HTNB 2020-160-1			16					60	4		8,100
HTNB 2020-200-1			20					60	4		8,640
HTNB 2020-220-1			22					60	4		8,640
HTNB 2020-240-1			24					60	4		9,600
HTNB 2020-260-1			26					60	4		9,600
HTNB 2020-280-1			28					70	4		10,560
HTNB 2020-300-1			30					70	4		10,560
HTNB 2020-320-1			32					70	4		10,560
HTNB 2020-340-1			34					70	4		11,040
HTNB 2020-360-1			36					80	4		11,040
HTNB 2020-400-1			40					80	4		12,480
HTNB 2020-100-2		1°	10					60	4		8,100
HTNB 2020-120-2			12					60	4		8,100
HTNB 2020-160-2			16					60	4		8,100
HTNB 2020-200-2			20					60	4		8,640
HTNB 2020-220-2			22					60	4		8,640
HTNB 2020-240-2			24					60	4		9,600
HTNB 2020-260-2			26					60	4		9,600
HTNB 2020-280-2			28					70	4		10,560
HTNB 2020-300-2			30					70	4		10,560
HTNB 2020-320-2			32					70	4		10,560
HTNB 2020-340-2			34					70	4		11,040
HTNB 2020-360-2			36					80	4		11,040
HTNB 2020-400-2			40					80	4		13,100
HTNB 2020-100-3		1°30′	10					60	4		8,100
HTNB 2020-120-3			12					60	4		8,100
HTNB 2020-160-3			16					60	4		8,100
HTNB 2020-200-3			20					60	4		8,640
HTNB 2020-220-3			22					60	4		8,640
HTNB 2020-240-3			24					60	4		9,600
HTNB 2020-260-3			26					60	4		9,600
HTNB 2020-280-3			28					70	4		10,560
HTNB 2020-300-3			30					70	4		10,560
HTNB 2020-320-3			32					70	4		10,560
HTNB 2020-340-3			34					70	4		11,040
HTNB 2020-360-3			36					80	4		11,040
HTNB 2020-400-3			40					80	4		13,100
HTNB 2020-120-4		2°	12					60	4		8,100
HTNB 2020-160-4			16					60	4		8,100
HTNB 2020-200-4			20					60	4		8,640
HTNB 2020-300-4			30					70	6		11,440
HTNB 2020-400-4			40					80	6		13,980
HTNB 2020-120-6		3°	12					60	4		8,100
HTNB 2020-160-6			16					60	4		8,100
HTNB 2020-200-6			20					60	4		8,640
HTNB 2020-300-6			30					70	6		11,440
HTNB 2020-400-6			40					80	6		13,980

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles — : Interference				
					30′	1°	1°30′	2°	3°
HTNB 2020-120-1	R1	30′	12	4.05°	—	12.34	12.72	13.14	14.05
HTNB 2020-160-1			16	3.19°	—	16.47	16.99	17.55	18.80
HTNB 2020-200-1			20	2.63°	—	20.60	21.26	21.97	No Interference
HTNB 2020-220-1			22	2.42°	—	22.66	23.39	24.17	No Interference
HTNB 2020-240-1			24	2.23°	—	24.73	25.53	26.38	No Interference
HTNB 2020-260-1			26	2.08°	—	26.79	27.66	28.59	No Interference
HTNB 2020-280-1			28	1.94°	—	28.86	29.80	No Interference	No Interference
HTNB 2020-300-1			30	1.83°	—	30.92	31.93	No Interference	No Interference
HTNB 2020-320-1			32	1.72°	—	32.99	34.07	No Interference	No Interference
HTNB 2020-340-1			34	1.63°	—	35.05	36.20	No Interference	No Interference
HTNB 2020-360-1			36	1.54°	—	37.12	38.33	No Interference	No Interference
HTNB 2020-400-1			40	1.40°	—	41.25	No Interference	No Interference	No Interference
HTNB 2020-100-2		1°	10	4.77°	—	—	10.34	10.66	11.40
HTNB 2020-120-2			12	4.13°	—	—	12.40	12.80	13.69
HTNB 2020-160-2			16	3.26°	—	—	16.53	17.08	18.29
HTNB 2020-200-2			20	2.69°	—	—	20.67	21.35	No Interference
HTNB 2020-220-2			22	2.48°	—	—	22.73	23.49	No Interference
HTNB 2020-240-2			24	2.29°	—	—	24.80	25.63	No Interference
HTNB 2020-260-2			26	2.13°	—	—	26.87	27.77	No Interference
HTNB 2020-280-2			28	2.00°	—	—	28.94	29.91	No Interference
HTNB 2020-300-2			30	1.88°	—	—	31.00	No Interference	No Interference
HTNB 2020-320-2			32	1.77°	—	—	33.07	No Interference	No Interference
HTNB 2020-340-2			34	1.67°	—	—	35.14	No Interference	No Interference
HTNB 2020-360-2			36	1.59°	—	—	37.20	No Interference	No Interference
HTNB 2020-400-2			40	1.44°	—	—	No Interference	No Interference	No Interference
HTNB 2020-100-3		1°30′	10	4.83°	—	—	—	10.38	11.09
HTNB 2020-120-3			12	4.22°	—	—	—	12.46	13.33
HTNB 2020-160-3			16	3.34°	—	—	—	16.60	17.78
HTNB 2020-200-3			20	2.76°	—	—	—	20.74	No Interference
HTNB 2020-220-3			22	2.54°	—	—	—	22.81	No Interference
HTNB 2020-240-3			24	2.35°	—	—	—	24.88	No Interference
HTNB 2020-260-3			26	2.19°	—	—	—	26.95	No Interference
HTNB 2020-280-3			28	2.05°	—	—	—	29.02	No Interference
HTNB 2020-300-3			30	1.93°	—	—	—	No Interference	No Interference
HTNB 2020-320-3			32	1.82°	—	—	—	No Interference	No Interference
HTNB 2020-340-3			34	1.72°	—	—	—	No Interference	No Interference
HTNB 2020-360-3			36	1.63°	—	—	—	No Interference	No Interference
HTNB 2020-400-3			40	1.48°	—	—	—	No Interference	No Interference
HTNB 2020-120-4		2°	12	4.29°	—	—	—	—	12.97
HTNB 2020-160-4			16	3.41°	—	—	—	—	17.26
HTNB 2020-200-4			20	2.83°	—	—	—	—	No Interference
HTNB 2020-300-4			30	3.52°	—	—	—	—	32.31
HTNB 2020-400-4			40	2.78°	—	—	—	—	No Interference
HTNB 2020-120-6		3°	12	4.48°	—	—	—	—	—
HTNB 2020-160-6			16	3.58°	—	—	—	—	—
HTNB 2020-200-6			20	2.98°	—	—	—	—	—
HTNB 2020-300-6			30	3.71°	—	—	—	—	—
HTNB 2020-400-6			40	2.94°	—	—	—	—	—

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2 Flutes HARDMAX

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Effective Length ℓ_1	Length of Cut ℓ	Neck Diameter ϕd_1	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd	Shape	Suggested Retail Price ¥
HTNB 2030-200-1	R1.5	30′	20	4.5	2.4	2.89	16°	60	6	B	9,740
HTNB 2030-220-1			22					60	6		9,740
HTNB 2030-260-1			26					70	6		10,400
HTNB 2030-300-1			30					70	6		11,880
HTNB 2030-320-1			32					70	6		12,480
HTNB 2030-360-1			36					80	6		13,000
HTNB 2030-400-1			40					80	6		13,200
HTNB 2030-420-1			42					90	6		13,680
HTNB 2030-520-1			52					100	6		15,360
HTNB 2030-200-2		1°	20					60	6		9,740
HTNB 2030-260-2			26					70	6		10,400
HTNB 2030-300-2			30					70	6		11,880
HTNB 2030-320-2			32					70	6		12,480
HTNB 2030-360-2			36					80	6		13,000
HTNB 2030-400-2			40					80	6		13,200
HTNB 2030-420-2			42					90	6		13,680
HTNB 2030-480-2			48					100	6		15,360
HTNB 2030-520-2			52					100	6		15,360
HTNB 2030-620-2			62					100	6		18,230
HTNB 2030-200-3		1°30′	20					60	6		9,740
HTNB 2030-260-3			26					70	6		10,400
HTNB 2030-300-3			30					70	6		11,880
HTNB 2030-320-3			32					70	6		12,480
HTNB 2030-360-3			36					80	6		13,000
HTNB 2030-400-3			40					80	6		13,200
HTNB 2030-420-3			42					90	6		13,680
HTNB 2030-580-3			58					100	6		15,360
HTNB 2040-300-1	R2	30′	30	6	3.2	3.87	16°	80	6	B	11,590
HTNB 2040-400-1			40					80	6		15,000
HTNB 2040-620-1			62					120	6		19,200
HTNB 2040-200-2		1°	20					80	6		11,590
HTNB 2040-300-2			30					80	6		11,590
HTNB 2040-360-2			36					80	6		13,420
HTNB 2040-400-2			40					80	6		15,000
HTNB 2040-600-2			60					120	6		19,200
HTNB 2040-410-3		1°30′	41					80	6		15,000
HTNB 2040-600-3			60					120	8		28,000
HTNB 2040-800-3			80				—	130	8	C	30,360

Unit (mm)

Model Number	Radius of Ball Nose R	Neck Taper Angle TN	Neck Length ℓ_2	Interference Angle	Effective Length by Inclined Angles — : Interference				
					30′	1°	1°30′	2°	3°
HTNB 2030-200-1	R1.5	30′	20	3.71°	—	20.59	21.23	21.92	23.46
HTNB 2030-220-1			22	3.43°	—	22.65	23.36	24.13	25.83
HTNB 2030-260-1			26	2.97°	—	26.78	27.63	28.54	No Interference
HTNB 2030-300-1			30	2.62°	—	30.91	31.90	32.96	No Interference
HTNB 2030-320-1			32	2.48°	—	32.98	34.04	35.17	No Interference
HTNB 2030-360-1			36	2.23°	—	37.11	38.30	39.58	No Interference
HTNB 2030-400-1			40	2.03°	—	41.23	42.57	44.00	No Interference
HTNB 2030-420-1			42	1.94°	—	43.30	44.70	No Interference	No Interference
HTNB 2030-520-1			52	1.60°	—	53.62	55.38	No Interference	No Interference
HTNB 2030-200-2		1°	20	3.79°	—	—	20.66	21.33	22.83
HTNB 2030-260-2			26	3.04°	—	—	26.87	27.75	29.72
HTNB 2030-300-2			30	2.69°	—	—	31.00	32.03	No Interference
HTNB 2030-320-2			32	2.54°	—	—	33.07	34.17	No Interference
HTNB 2030-360-2			36	2.29°	—	—	37.20	38.44	No Interference
HTNB 2030-400-2			40	2.08°	—	—	41.33	42.72	No Interference
HTNB 2030-420-2			42	1.99°	—	—	43.40	No Interference	No Interference
HTNB 2030-480-2			48	1.77°	—	—	49.60	No Interference	No Interference
HTNB 2030-520-2			52	1.64°	—	—	53.74	No Interference	No Interference
HTNB 2030-620-2			62	1.39°	—	—	No Interference	No Interference	No Interference
HTNB 2030-200-3		1°30′	20	3.88°	—	—	—	20.75	22.20
HTNB 2030-260-3			26	3.12°	—	—	—	26.96	28.87
HTNB 2030-300-3			30	2.76°	—	—	—	31.09	No Interference
HTNB 2030-320-3			32	2.61°	—	—	—	33.16	No Interference
HTNB 2030-360-3			36	2.35°	—	—	—	37.30	No Interference
HTNB 2030-400-3			40	2.14°	—	—	—	41.44	No Interference
HTNB 2030-420-3			42	2.05°	—	—	—	43.51	No Interference
HTNB 2030-580-3			58	1.53°	—	—	—	No Interference	No Interference
HTNB 2040-300-1	R2	30′	30	1.88°	—	30.91	31.88	No Interference	No Interference
HTNB 2040-400-1			40	1.43°	—	41.23	No Interference	No Interference	No Interference
HTNB 2040-620-1			62	0.94°	—	No Interference	No Interference	No Interference	No Interference
HTNB 2040-200-2		1°	20	2.81°	—	—	20.67	21.32	No Interference
HTNB 2040-300-2			30	1.93°	—	—	31.00	No Interference	No Interference
HTNB 2040-360-2			36	1.63°	—	—	37.21	No Interference	No Interference
HTNB 2040-400-2			40	1.47°	—	—	No Interference	No Interference	No Interference
HTNB 2040-600-2			60	1.00°	—	—	No Interference	No Interference	No Interference
HTNB 2040-410-3		1°30′	41	1.48°	—	—	—	No Interference	No Interference
HTNB 2040-600-3			60	1.92°	—	—	—	No Interference	No Interference
HTNB 2040-800-3			80	—	—	—	—	No Interference	No Interference

Milling Conditions for HTNB

WORK MATERIAL				COPPER / CARBON STEELS Cu / S45C / S50C					PREHARDENED STEELS / HARDENED STEELS NAK / SKD (30~45HRC)				
Model Number	Radius of Ball Nose (mm)	Neck Taper Angle	Neck Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth		Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth	
							Roughing (mm)	Finishing (mm)				Roughing (mm)	Finishing (mm)
2002	R0.1	1°30′ or below	1.5	42,000	640	0.008	0.02	0.015	29,000	430	0.006	0.02	0.015
			2	33,000	370	0.006	0.02	0.011	23,500	260	0.005	0.02	0.011
			3	27,000	270	0.002	0.02	0.01	19,000	165	0.001	0.02	0.009
2003	R0.15	1°30′ or below	2	36,000	650	0.009	0.03	0.018	25,200	400	0.007	0.03	0.016
			3	33,000	500	0.004	0.03	0.015	23,000	330	0.003	0.03	0.014
2004	R0.2	1°30′ or below	3	42,000	1,300	0.018	0.04	0.031	29,000	800	0.014	0.04	0.028
			4	33,000	800	0.008	0.04	0.024	23,000	520	0.006	0.04	0.023
			6	27,000	550	0.005	0.04	0.02	19,000	330	0.004	0.04	0.017
2005	R0.25	1°30′ or below	4	36,000	1,330	0.02	0.05	0.037	28,000	870	0.016	0.05	0.031
			6	29,000	900	0.012	0.05	0.031	23,000	650	0.009	0.05	0.028
			8	23,500	600	0.007	0.05	0.026	19,000	450	0.006	0.05	0.024
			10	20,000	480	0.004	0.05	0.024	18,000	380	0.003	0.05	0.021
2006	R0.3	1°30′ or below	4	44,000	2,340	0.032	0.06	0.053	32,500	1,500	0.025	0.06	0.046
			6	36,000	1,500	0.018	0.06	0.042	29,000	1,100	0.014	0.06	0.038
			8	28,500	1,150	0.018	0.06	0.04	24,000	770	0.014	0.06	0.032
			10	28,500	950	0.014	0.06	0.033	24,000	720	0.011	0.06	0.03
			12	28,500	950	0.009	0.06	0.033	24,000	720	0.007	0.06	0.03
			14	26,500	800	0.007	0.06	0.03	23,000	660	0.005	0.06	0.029
			16	25,000	700	0.005	0.06	0.028	22,000	600	0.004	0.06	0.027
			20	20,000	400	0.003	0.06	0.02	17,000	330	0.002	0.06	0.019
		2° above	8	28,500	1,380	0.022	0.09	0.048	24,000	920	0.017	0.09	0.038
			12	28,500	1,140	0.011	0.09	0.04	24,000	860	0.008	0.09	0.036
			20	20,000	480	0.004	0.09	0.024	17,000	400	0.002	0.09	0.024
2008	R0.4	1°30′ or below	6	36,000	2,000	0.023	0.08	0.056	24,000	1,300	0.019	0.08	0.054
			8	28,500	1,500	0.023	0.08	0.053	20,000	950	0.019	0.08	0.048
			12	28,500	1,200	0.018	0.08	0.042	16,500	600	0.014	0.08	0.036
			16	25,000	900	0.01	0.08	0.036	15,000	500	0.008	0.08	0.033
2010	R0.5	1°30′ or below	6	35,000	2,900	0.05	0.1	0.083	23,000	1,850	0.04	0.1	0.08
			8	28,000	2,200	0.05	0.1	0.079	19,000	1,500	0.04	0.1	0.079
			10	24,000	1,800	0.035	0.1	0.075	17,000	1,300	0.03	0.1	0.076
			12	19,000	1,360	0.027	0.1	0.072	14,000	1,000	0.022	0.1	0.071
			14	18,000	1,200	0.025	0.1	0.067	13,000	900	0.02	0.1	0.069
			16	18,000	1,150	0.025	0.1	0.064	13,000	850	0.02	0.1	0.065
			18	17,500	1,120	0.018	0.1	0.064	12,500	800	0.013	0.1	0.064
			20	17,000	1,080	0.016	0.1	0.064	12,000	780	0.013	0.1	0.064
			22	17,000	1,080	0.016	0.1	0.064	12,000	780	0.013	0.1	0.064
			26	16,000	1,000	0.015	0.1	0.063	11,000	700	0.012	0.1	0.064
			29.8	13,400	840	0.012	0.1	0.063	10,000	620	0.01	0.1	0.062
			30	13,400	840	0.012	0.1	0.063	10,000	620	0.01	0.1	0.062
			32	12,000	750	0.011	0.1	0.063	9,000	550	0.009	0.1	0.061
			36	10,000	620	0.009	0.1	0.062	7,000	420	0.007	0.1	0.06
		2° or above	12	19,000	1,632	0.032	0.15	0.086	14,000	1,200	0.026	0.15	0.086
			16	18,000	1,380	0.03	0.15	0.077	13,000	1,020	0.024	0.15	0.078
			20	17,000	1,300	0.019	0.15	0.076	12,000	920	0.016	0.15	0.077
			29.8	13,400	1,000	0.014	0.15	0.075	10,000	740	0.012	0.15	0.074
			30	13,400	1,000	0.014	0.15	0.075	10,000	740	0.012	0.15	0.074

Milling Conditions for HTNB

WORK MATERIAL				HARDENED STEELS SKD / SKT (45~55HRC)					HARDENED STEELS SKD / SKS (55~65HRC)				
Model Number	Radius of Ball Nose (mm)	Neck Taper Angle	Neck Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth		Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth	
							Roughing (mm)	Finishing (mm)				Roughing (mm)	Finishing (mm)
2002	R0.1	1°30′ or below	1.5	28,000	330	0.006	0.016	0.012	28,000	260	0.005	0.012	0.009
			2	22,000	210	0.004	0.016	0.01	22,000	190	0.004	0.012	0.009
			3	17,500	150	0.001	0.016	0.009	17,500	130	0.001	0.012	0.007
2003	R0.15	1°30′ or below	2	23,500	350	0.006	0.024	0.015	23,500	300	0.005	0.018	0.013
			3	21,500	250	0.003	0.024	0.012	21,500	200	0.002	0.018	0.009
2004	R0.2	1°30′ or below	3	27,000	670	0.012	0.032	0.025	27,000	500	0.01	0.024	0.019
			4	22,000	430	0.006	0.032	0.02	22,000	380	0.005	0.024	0.017
			6	18,000	300	0.004	0.032	0.017	18,000	260	0.003	0.024	0.014
2005	R0.25	1°30′ or below	4	27,500	650	0.014	0.04	0.024	27,500	625	0.011	0.03	0.023
			6	22,000	530	0.008	0.04	0.024	22,000	500	0.007	0.03	0.023
			8	17,000	380	0.005	0.04	0.022	17,000	350	0.004	0.03	0.021
			10	16,000	330	0.002	0.04	0.021	16,000	300	0.002	0.03	0.019
2006	R0.3	1°30′ or below	4	25,500	850	0.022	0.048	0.033	25,500	713	0.018	0.036	0.028
			6	21,000	700	0.012	0.048	0.033	21,000	550	0.01	0.036	0.026
			8	17,000	510	0.012	0.048	0.03	17,000	425	0.01	0.036	0.025
			10	17,000	470	0.009	0.048	0.028	16,000	390	0.008	0.036	0.024
			12	16,000	400	0.006	0.048	0.025	15,000	350	0.005	0.036	0.023
			14	15,500	370	0.004	0.048	0.024	14,500	320	0.004	0.036	0.022
			16	15,000	350	0.003	0.048	0.023	14,500	300	0.003	0.036	0.021
			20	12,000	200	0.001	0.048	0.017	11,000	180	0.001	0.036	0.016
		2° above	8	17,000	610	0.014	0.06	0.036	17,000	510	0.012	0.048	0.03
			12	16,000	480	0.007	0.06	0.03	15,000	420	0.006	0.048	0.028
			20	12,000	240	0.001	0.06	0.02	11,000	210	0.001	0.048	0.019
2008	R0.4	1°30′ or below	6	21,000	900	0.016	0.064	0.043	21,000	800	0.013	0.048	0.038
			8	17,000	680	0.016	0.064	0.04	17,000	600	0.013	0.048	0.035
			12	14,000	480	0.012	0.064	0.034	14,000	420	0.01	0.048	0.03
			16	13,000	420	0.006	0.064	0.032	12,500	350	0.006	0.048	0.028
2010	R0.5	1°30′ or below	6	23,000	1,500	0.034	0.08	0.065	22,000	1,200	0.028	0.06	0.055
			8	19,000	1,130	0.034	0.08	0.059	18,000	920	0.028	0.06	0.051
			10	16,000	950	0.027	0.08	0.059	15,500	770	0.022	0.06	0.05
			12	12,600	760	0.019	0.08	0.06	12,600	615	0.015	0.06	0.049
			14	12,000	700	0.017	0.08	0.058	12,000	540	0.014	0.06	0.045
			16	12,000	700	0.017	0.08	0.058	12,000	540	0.014	0.06	0.045
			18	11,000	640	0.011	0.08	0.058	11,000	490	0.01	0.06	0.045
			20	11,000	640	0.011	0.08	0.058	11,000	490	0.009	0.06	0.045
			22	11,000	640	0.011	0.08	0.058	11,000	490	0.009	0.06	0.045
			26	10,000	570	0.01	0.08	0.057	10,000	460	0.009	0.06	0.046
			29.8	9,500	530	0.009	0.08	0.055	9,500	410	0.008	0.06	0.043
			30	9,500	530	0.009	0.08	0.055	9,500	410	0.008	0.06	0.043
			32	9,000	490	0.008	0.08	0.054	9,000	380	0.007	0.06	0.042
			36	7,000	380	0.006	0.08	0.054	7,000	280	0.005	0.06	0.04
		2° or above	12	12,600	910	0.023	0.1	0.072	12,600	740	0.018	0.08	0.059
			16	12,000	840	0.02	0.1	0.07	12,000	650	0.017	0.08	0.054
			20	11,000	770	0.013	0.1	0.07	11,000	590	0.011	0.08	0.054
			29.8	9,500	640	0.011	0.1	0.067	9,500	490	0.01	0.08	0.052
			30	9,500	640	0.011	0.1	0.067	9,500	490	0.01	0.08	0.052

Milling Conditions for HTNB

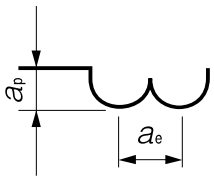
WORK MATERIAL				COPPER / CARBON STEELS Cu / S45C / S50C					PREHARDENED STEELS / HARDENED STEELS NAK / SKD (30~45HRC)				
Model Number	Radius of Ball Nose (mm)	Neck Taper Angle	Neck Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth		Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth	
							Roughing (mm)	Finishing (mm)				Roughing (mm)	Finishing (mm)
2015	R0.75	1°30′ or below	10	20,000	2,300	0.065	0.15	0.115	13,000	1,600	0.05	0.15	0.123
			12	18,000	2,000	0.055	0.15	0.111	13,000	1,500	0.045	0.15	0.115
			16	16,000	1,600	0.05	0.15	0.1	12,000	1,200	0.03	0.15	0.1
			20	14,000	1,400	0.035	0.15	0.1	10,000	950	0.025	0.15	0.095
			22	14,000	1,400	0.035	0.15	0.1	10,000	950	0.025	0.15	0.095
			26	12,000	1,200	0.025	0.15	0.1	10,000	900	0.02	0.15	0.09
			30	10,000	950	0.02	0.15	0.095	8,000	700	0.015	0.15	0.088
			36	10,000	950	0.02	0.15	0.095	7,000	600	0.015	0.15	0.086
		2° or above	12	18,000	2,400	0.066	0.225	0.133	13,000	1,800	0.054	0.225	0.138
			16	16,000	1,920	0.06	0.225	0.12	12,000	1,440	0.036	0.225	0.12
			20	14,000	1,680	0.042	0.225	0.12	10,000	1,140	0.03	0.225	0.114
			30	10,000	1,140	0.024	0.225	0.114	8,000	840	0.018	0.225	0.105
2020	R1	1°30′ or below	10	19,000	3,300	0.11	0.2	0.174	12,000	2,100	0.1	0.2	0.175
			12	17,000	2,900	0.09	0.2	0.171	12,000	2,000	0.095	0.2	0.167
			16	15,000	2,350	0.081	0.2	0.157	11,000	1,700	0.065	0.2	0.155
			20	11,000	1,600	0.068	0.2	0.145	8,400	1,100	0.055	0.2	0.131
			22	11,000	1,600	0.063	0.2	0.145	8,400	1,050	0.05	0.2	0.125
			24	11,000	1,500	0.063	0.2	0.136	8,400	1,050	0.05	0.2	0.125
			26	10,000	1,350	0.063	0.2	0.135	7,350	900	0.05	0.2	0.122
			28	10,000	1,350	0.05	0.2	0.135	7,350	870	0.038	0.2	0.118
			30	10,000	1,350	0.05	0.2	0.135	7,350	870	0.038	0.2	0.118
			32	10,000	1,350	0.041	0.2	0.135	7,350	850	0.032	0.2	0.116
			34	10,000	1,350	0.041	0.2	0.135	7,000	800	0.032	0.2	0.114
			36	10,000	1,350	0.041	0.2	0.135	7,000	800	0.032	0.2	0.114
			40	10,000	1,350	0.041	0.2	0.135	7,000	800	0.032	0.3	0.114
		2° or above	12	17,000	3,480	0.108	0.3	0.205	12,000	2,400	0.114	0.3	0.2
			16	15,000	2,820	0.097	0.3	0.188	11,000	2,040	0.078	0.3	0.185
			20	11,000	1,920	0.082	0.3	0.175	8,400	1,320	0.066	0.3	0.157
			30	10,000	1,620	0.06	0.3	0.162	7,350	1,040	0.046	0.3	0.141
			40	10,000	1,620	0.049	0.3	0.135	7,000	960	0.038	0.3	0.135
2030	R1.5	1°30′ or below	20	11,000	2,350	0.095	0.3	0.214	8,400	1,500	0.075	0.3	0.179
			22	11,000	2,350	0.09	0.3	0.214	8,400	1,500	0.071	0.3	0.179
			26	10,000	2,050	0.085	0.3	0.205	7,600	1,300	0.068	0.3	0.171
			30	10,000	2,000	0.081	0.3	0.2	7,500	1,250	0.065	0.3	0.167
			32	10,000	1,900	0.081	0.3	0.19	7,500	1,200	0.065	0.3	0.16
			36	9,000	1,700	0.073	0.3	0.189	6,000	950	0.058	0.3	0.158
			40	8,500	1,600	0.065	0.3	0.188	6,000	950	0.053	0.3	0.158
			42	8,500	1,600	0.063	0.3	0.188	6,000	950	0.05	0.3	0.158
			48	8,500	1,570	0.052	0.3	0.185	6,000	920	0.042	0.3	0.153
			52	8,500	1,550	0.045	0.3	0.182	6,000	900	0.036	0.3	0.15
			62	5,600	930	0.035	0.3	0.166	5,000	700	0.025	0.3	0.14

Milling Conditions for HTNB

WORK MATERIAL				HARDENED STEELS SKD / SKT (45~55HRC)					HARDENED STEELS SKD / SKS (55~65HRC)				
Model Number	Radius of Ball Nose (mm)	Neck Taper Angle	Neck Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth		Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth	
							Roughing (mm)	Finishing (mm)				Roughing (mm)	Finishing (mm)
2015	R0.75	1°30′ or below	10	13,000	1,200	0.04	0.12	0.092	13,000	950	0.035	0.09	0.073
			12	11,000	950	0.035	0.12	0.086	11,000	750	0.03	0.09	0.068
			16	11,000	900	0.03	0.12	0.082	11,000	750	0.025	0.09	0.068
			20	10,000	800	0.02	0.12	0.08	10,000	650	0.018	0.09	0.065
			22	10,000	800	0.02	0.12	0.08	10,000	650	0.018	0.09	0.065
			26	9,000	700	0.017	0.12	0.078	9,000	600	0.015	0.09	0.067
			30	8,000	600	0.013	0.12	0.075	8,000	500	0.013	0.09	0.063
			36	7,000	500	0.013	0.12	0.071	7,000	400	0.013	0.09	0.057
		2° or above	12	11,000	1,140	0.042	0.15	0.104	11,000	900	0.036	0.12	0.082
			16	11,000	1,080	0.036	0.15	0.098	11,000	900	0.03	0.12	0.082
			20	10,000	960	0.024	0.15	0.096	10,000	780	0.022	0.12	0.078
			30	8,000	720	0.016	0.15	0.09	8,000	600	0.016	0.12	0.075
2020	R1	1°30′ or below	10	12,000	1,800	0.074	0.16	0.15	12,000	1,350	0.064	0.12	0.113
			12	10,500	1,430	0.065	0.16	0.136	10,500	1,070	0.055	0.12	0.102
			16	10,500	1,360	0.056	0.16	0.13	10,500	1,070	0.046	0.12	0.102
			20	9,450	1,150	0.048	0.16	0.122	9,450	920	0.038	0.12	0.097
			22	9,450	1,150	0.043	0.16	0.122	9,450	920	0.036	0.12	0.097
			24	8,400	1,020	0.043	0.16	0.121	8,400	800	0.036	0.12	0.095
			26	8,400	1,020	0.043	0.16	0.121	8,400	800	0.036	0.12	0.095
			28	7,350	850	0.033	0.16	0.116	7,350	690	0.028	0.12	0.094
			30	7,350	850	0.033	0.16	0.116	7,350	690	0.028	0.12	0.094
			32	7,350	850	0.028	0.16	0.116	7,350	690	0.023	0.12	0.094
			34	6,500	745	0.028	0.16	0.115	6,500	610	0.023	0.12	0.094
			36	6,500	745	0.028	0.16	0.115	6,500	610	0.023	0.12	0.094
			40	6,500	745	0.028	0.16	0.115	6,500	610	0.023	0.12	0.094
		2° or above	12	10,500	1,720	0.078	0.2	0.164	10,500	1,280	0.066	0.16	0.122
			16	10,500	1,630	0.067	0.2	0.155	10,500	1,280	0.055	0.16	0.122
			20	9,450	1,380	0.058	0.2	0.146	9,450	1,100	0.046	0.16	0.117
			30	7,350	1,020	0.04	0.2	0.139	7,350	830	0.034	0.16	0.113
			40	6,500	890	0.034	0.2	0.135	6,500	730	0.028	0.16	0.113
2030	R1.5	1°30′ or below	20	8,000	1,400	0.065	0.24	0.175	8,000	1,200	0.053	0.18	0.15
			22	8,000	1,400	0.062	0.24	0.175	8,000	1,200	0.05	0.18	0.15
			26	7,500	1,200	0.06	0.24	0.16	7,500	1,050	0.048	0.18	0.14
			30	7,000	1,100	0.057	0.24	0.157	7,000	980	0.047	0.18	0.14
			32	7,000	1,100	0.056	0.24	0.157	7,000	950	0.046	0.18	0.136
			36	6,000	950	0.05	0.24	0.158	6,000	800	0.042	0.18	0.133
			40	5,500	850	0.045	0.24	0.155	5,500	750	0.038	0.18	0.136
			42	5,500	850	0.043	0.24	0.155	5,500	750	0.036	0.18	0.136
			48	5,500	820	0.035	0.24	0.149	5,500	720	0.03	0.18	0.131
			52	5,500	800	0.031	0.24	0.145	5,500	700	0.026	0.18	0.127
			62	4,700	600	0.023	0.24	0.128	4,700	530	0.021	0.18	0.113

Milling Conditions for HTNB

WORK MATERIAL				COPPER / CARBON STEELS Cu / S45C / S50C					PREHARDENED STEELS / HARDENED STEELS NAK / SKD (30~45HRC)				
Model Number	Radius of Ball Nose (mm)	Neck Taper Angle	Neck Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth		Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth	
							Roughing (mm)	Finishing (mm)				Roughing (mm)	Finishing (mm)
2040	R2	1°30′ or below	20	8,400	1,900	0.125	0.4	0.226	5,400	1,030	0.096	0.4	0.191
			30	7,600	1,600	0.1	0.4	0.211	4,800	850	0.083	0.4	0.177
			36	6,900	1,400	0.094	0.4	0.203	3,900	650	0.074	0.4	0.167
			40	6,500	1,300	0.086	0.4	0.2	3,900	650	0.068	0.4	0.167
			41	6,500	1,300	0.086	0.4	0.2	3,900	650	0.068	0.4	0.167
			60	4,300	780	0.063	0.4	0.181	3,300	500	0.05	0.4	0.152
			62	4,300	750	0.063	0.4	0.174	3,300	480	0.05	0.4	0.145
			80	4,300	750	0.063	0.4	0.174	3,300	480	0.05	0.4	0.145
Radial Depth (mm)			Roughing	Neck Taper Angle 1°30′ or below $a_e \leqq 0.1D$、Neck Taper Angle 2° or above $a_e \leqq 0.15D$、					Neck Taper Angle 1°30′ or below $a_e \leqq 0.1D$、Neck Taper Angle 2° or above $a_e \leqq 0.15D$、				
			Finishing	$a_e \leqq Vf / n$									



D : Outside Diameter (mm)
n : Spindle Speed
Vf : Feed Rate

Milling Conditions for HTNB

WORK MATERIAL				HARDENED STEELS SKD / SKT (45~55HRC)					HARDENED STEELS SKD / SKS (55~65HRC)				
Model Number	Radius of Ball Nose (mm)	Neck Taper Angle	Neck Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth		Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth	
							Roughing (mm)	Finishing (mm)				Roughing (mm)	Finishing (mm)
2040	R2	1°30′ or below	**20**	5,200	980	0.085	0.32	0.188	5,200	840	0.066	0.24	0.162
			30	4,500	770	0.074	0.32	0.171	4,500	690	0.059	0.24	0.153
			36	3,900	670	0.065	0.32	0.172	3,900	560	0.052	0.24	0.144
			40	3,600	600	0.059	0.32	0.167	3,600	530	0.048	0.24	0.147
			41	3,600	600	0.059	0.32	0.167	3,600	530	0.048	0.24	0.147
			60	3,100	450	0.043	0.32	0.145	3,100	400	0.036	0.24	0.129
			62	3,100	420	0.043	0.32	0.135	3,100	380	0.036	0.24	0.123
			80	2,900	340	0.035	0.32	0.117	2,500	200	0.02	0.24	0.08
Radial Depth (mm)			Roughing	Neck Taper Angle 1°30′ or below $a_e \leqq 0.08D$、Neck Taper Angle 2° or above $a_e \leqq 0.1D$、					Neck Taper Angle 1°30′ or below $a_e \leqq 0.06D$、Neck Taper Angle 2° or above $a_e \leqq 0.08D$、				
			Finishing	$a_e \leqq Vf / n$									

Note:
・Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
・The neck length and taper angle may affect the milling parameters. In operation, fine adjustments may be required.
・Recommend air blow or oil mist.
・Recommend oil coolant for Stainless Steels and Heat Resistant Alloys.
・Recommend water soluble or oil base coolant for Copper.