Size R0.05～R3

HLB

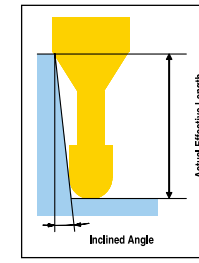
Super MG | HARD MAX | 0° R0.05 ~R0.075 | 30° R0.1 ~R3 | R ±0.002 R0.05 2flutes ~R0.075 | R ±0.005 R0.05 1flute R0.1~R3 | Shank Dia 0/-0.005

Additional 4 models

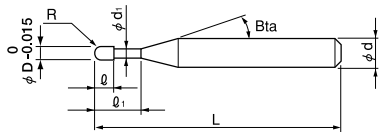
Applicable Work Material (◎Most Suitable ○Suitable)

Work Material													Suitable Coolant ◎Recommendation
CARBON STEELS S45C S55C	ALLOY STEELS SK・SCM SUS	PREHARDENED STEELS NAK HPM	HARDENED STEELS (~55HRC)	HARDENED STEELS (~60HRC)	HARDENED STEELS (~65HRC)	CAST IRON	ALUMINIUM ALLOYS	GRAPHITE	COPPER	PLASTIC	TITANIUM	HEATPROOF STEELS	
○	○	◎	◎	◎	◎	○			◎ ※3			○ ※1	◎Airblow/Oil Mist Water Soluble Oil

※1 Most suitable to use oil for the stainless steel and the heat resisting alloy steel
※3 Recommend Oil or Water Soluble coolant for Copper milling



For outstanding heat resistance and lubricating properties for hard milling of materials up to 65 HRC
Offers market leading tool life performance
Refer to page 228 for the short shank version
High R tolerance: +/-0.005 mm, Diameter tolerance: 0/-0.015 mm



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

Outside Diameter	High R tolerance	Diameter tolerance
φ0.1 (2 Flutes) ~φ0.15	0/-0.01	±0.002
φ0.1 (1 Flute) φ0.2~φ6	0/-0.015	±0.005

(Total 280 models)

Unit (mm)

Model Number	Radius of Ball Nose R	Effective Length ℓ1	Length of Cut ℓ	Neck Diameter φd1	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 1001-002	R0.05	—	0.2	—	11°	45	4	—	—	—	—	—
※ HLB 2001-003	R0.05	0.3	0.08	0.095		45	4	0.35	0.39	0.41	0.44	0.48
※ HLB 2001-005		0.5				45	4	0.57	0.61	0.65	0.68	0.76
※ HLB 20015-003	R0.075	0.3	0.12	0.135	11°	45	4	0.40	0.42	0.44	0.46	0.51
※ HLB 20015-005		0.5				45	4	0.61	0.64	0.67	0.71	0.78
HLB 2002-003	R0.1	0.3	0.16	0.17	16°	45	4	0.62	0.70	0.79	0.87	1.04
HLB 2002-005		0.5				45	4	0.85	0.95	1.05	1.15	1.34
HLB 2002-005-6						50	6	0.85	0.95	1.05	1.15	1.34
HLB 2002-0075		0.75				45	4	1.13	1.26	1.37	1.48	1.69
HLB 2002-010		1				45	4	1.41	1.56	1.68	1.80	2.03
HLB 2002-010-6						50	6	1.41	1.56	1.68	1.80	2.03
HLB 2002-0125		1.25				45	4	1.66	1.83	1.97	2.10	2.34
HLB 2002-015		1.5				45	4	1.94	2.12	2.28	2.42	2.67
HLB 2002-015-6						50	6	1.94	2.12	2.28	2.42	2.67
HLB 2002-0175		1.75				45	4	2.21	2.41	2.57	2.72	2.98
HLB 2002-020		2				45	4	2.49	2.69	2.86	3.02	3.29
HLB 2002-020-6						50	6	2.49	2.69	2.86	3.02	3.29
HLB 2002-025		2.5				45	4	3.03	3.26	3.45	3.61	3.91
HLB 2002-030		3				45	4	3.58	3.82	4.02	4.20	4.52

※mark denotes new model number

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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		Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 2003-005	R0.15	0.5	0.24	0.27	16°	45	4		0.84	0.94	1.04	1.13	1.32
HLB 2003-006		0.6				45	4		0.96	1.07	1.17	1.27	1.46
HLB 2003-0075		0.75				45	4		1.13	1.25	1.36	1.47	1.67
HLB 2003-010		1				45	4		1.41	1.55	1.67	1.79	2.01
HLB 2003-010-6						50	6		1.41	1.55	1.67	1.79	2.01
HLB 2003-0125		1.25				45	4		1.65	1.82	1.96	2.09	2.33
HLB 2003-015		1.5				45	4		1.93	2.11	2.26	2.40	2.65
HLB 2003-015-6						50	6		1.93	2.11	2.26	2.40	2.65
HLB 2003-0175		1.75				45	4		2.21	2.40	2.56	2.71	2.97
HLB 2003-020		2				45	4		2.48	2.69	2.86	3.01	3.28
HLB 2003-020-6						50	6		2.48	2.69	2.86	3.01	3.28
HLB 2003-0225		2.25				45	4		2.76	2.97	3.15	3.31	3.59
HLB 2003-025		2.5				45	4		3.03	3.25	3.44	3.60	3.90
HLB 2003-025-6						50	6		3.03	3.25	3.44	3.60	3.90
HLB 2003-0275		2.75				45	4		3.30	3.53	3.73	3.90	4.20
HLB 2003-030		3				45	4		3.57	3.81	4.01	4.19	4.51
HLB 2003-030-6						50	6		3.57	3.81	4.01	4.19	4.51
HLB 2003-035		3.5				45	4		4.11	4.37	4.58	4.77	5.12
HLB 2003-040		4				45	4		4.65	4.92	5.15	5.34	5.73
HLB 2003-045		4.5				45	4		5.18	5.47	5.71	5.91	6.34
HLB 2004-005	R0.2	0.5	0.32	0.37	16°	45	4		0.84	0.93	1.02	1.11	1.29
HLB 2004-0075		0.75				45	4		1.12	1.24	1.35	1.45	1.65
HLB 2004-010		1				45	4		1.40	1.54	1.66	1.78	1.99
HLB 2004-010-6						50	6		1.40	1.54	1.66	1.78	1.99
HLB 2004-015		1.5				45	4		1.93	2.10	2.25	2.39	2.64
HLB 2004-015-6						50	6		1.93	2.10	2.25	2.39	2.64
HLB 2004-020		2				45	4		2.48	2.68	2.85	3.00	3.27
HLB 2004-020-6						50	6		2.48	2.68	2.85	3.00	3.27
HLB 2004-025		2.5				45	4		3.03	3.25	3.43	3.60	3.89
HLB 2004-025-6						50	6		3.03	3.25	3.43	3.60	3.89
HLB 2004-030		3				45	4		3.57	3.81	4.01	4.18	4.50
HLB 2004-030-6						50	6		3.57	3.81	4.01	4.18	4.50
HLB 2004-035		3.5				45	4		4.11	4.37	4.58	4.76	5.11
HLB 2004-040		4				45	4		4.64	4.92	5.14	5.34	5.72
HLB 2004-040-6						50	6		4.64	4.92	5.14	5.34	5.72
HLB 2004-045		4.5				45	4		5.18	5.47	5.70	5.91	6.33
HLB 2004-050		5				45	4		5.71	6.02	6.26	6.48	6.95
HLB 2004-050-6						50	6		5.71	6.02	6.26	6.48	6.95
HLB 2004-055		5.5				45	4		6.24	6.56	6.81	7.05	7.56
HLB 2004-060		6				45	4		6.77	7.10	7.37	7.61	8.17
HLB 2004-060-6						50	6		6.77	7.10	7.37	7.61	8.17

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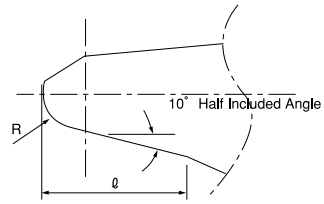
HLB1001 is a tapered ball end mill with single tapered flute of 10° (See right hand side figure)



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	Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 2005-010	R0.25	1	0.4	0.47	16°	45	4	1.40	1.53	1.65	1.76	1.98
HLB 2005-015		1.5				45	4	1.92	2.09	2.24	2.38	2.62
HLB 2005-015-6						50	6	1.92	2.09	2.24	2.38	2.62
HLB 2005-020		2				45	4	2.47	2.67	2.84	2.99	3.26
HLB 2005-020-6						50	6	2.47	2.67	2.84	2.99	3.26
HLB 2005-025		2.5				45	4	3.02	3.24	3.42	3.59	3.88
HLB 2005-025-6						50	6	3.02	3.24	3.42	3.59	3.88
HLB 2005-030		3				45	4	3.56	3.80	4.00	4.17	4.49
HLB 2005-030-6						50	6	3.56	3.80	4.00	4.17	4.49
HLB 2005-035		3.5				45	4	4.10	4.36	4.57	4.75	5.10
HLB 2005-040		4				45	4	4.64	4.91	5.14	5.33	5.71
HLB 2005-040-6						50	6	4.64	4.91	5.14	5.33	5.71
HLB 2005-045		4.5				45	4	5.18	5.46	5.70	5.90	6.32
HLB 2005-050		5				45	4	5.71	6.01	6.25	6.47	6.93
HLB 2005-050-6						50	6	5.71	6.01	6.25	6.47	6.93
HLB 2005-055		5.5				45	4	6.24	6.56	6.81	7.04	7.55
HLB 2005-060		6				45	4	6.77	7.10	7.36	7.61	8.16
HLB 2005-060-6						50	6	6.77	7.10	7.36	7.61	8.16
HLB 2005-070		7				45	4	7.83	8.18	8.46	8.75	9.38
HLB 2005-080		8				45	4	8.88	9.25	9.56	9.88	10.61
HLB 2005-080-6						50	6	8.88	9.25	9.56	9.88	10.61
HLB 2005-090		9				45	4	9.93	10.32	10.66	11.02	11.83
HLB 2005-100		10				50	4	10.98	11.39	11.76	12.16	13.05
HLB 2006-010	R0.3	1	0.48	0.57	16°	45	4	1.39	1.52	1.64	1.75	1.96
HLB 2006-015		1.5				45	4	1.92	2.08	2.23	2.36	2.61
HLB 2006-015-6						50	6	1.92	2.08	2.23	2.36	2.61
HLB 2006-020		2				45	4	2.47	2.66	2.83	2.98	3.25
HLB 2006-020-6						50	6	2.47	2.66	2.83	2.98	3.25
HLB 2006-025		2.5				45	4	3.02	3.23	3.42	3.58	3.86
HLB 2006-025-6						50	6	3.02	3.23	3.42	3.58	3.86
HLB 2006-030		3				45	4	3.56	3.80	3.99	4.17	4.48
HLB 2006-030-6						50	6	3.56	3.80	3.99	4.17	4.48
HLB 2006-035		3.5				45	4	4.10	4.35	4.56	4.75	5.09
HLB 2006-040		4				45	4	4.64	4.91	5.13	5.32	5.70
HLB 2006-040-6						50	6	4.64	4.91	5.13	5.32	5.70
HLB 2006-045		4.5				45	4	5.17	5.46	5.69	5.89	6.31
HLB 2006-050		5				45	4	5.71	6.01	6.25	6.46	6.92
HLB 2006-050-6						50	6	5.71	6.01	6.25	6.46	6.92
HLB 2006-055		5.5				45	4	6.24	6.55	6.80	7.03	7.54
HLB 2006-060		6				45	4	6.77	7.09	7.36	7.60	8.15
HLB 2006-060-6						50	6	6.77	7.09	7.36	7.60	8.15
HLB 2006-065		6.5				45	4	7.30	7.63	7.91	8.17	8.76
HLB 2006-070		7				45	4	7.82	8.17	8.46	8.74	9.37
HLB 2006-075		7.5				45	4	8.35	8.71	9.01	9.31	9.98
HLB 2006-080		8				45	4	8.88	9.25	9.56	9.88	10.59
HLB 2006-080-6						50	6	8.88	9.25	9.56	9.88	10.59
HLB 2006-085		8.5				45	4	9.40	9.78	10.11	10.45	11.21
HLB 2006-090		9				45	4	9.93	10.32	10.66	11.02	11.82
HLB 2006-095		9.5				45	4	10.45	10.85	11.21	11.59	12.43
HLB 2006-100		10				50	4	10.97	11.39	11.76	12.16	13.04
HLB 2006-100-6						50	6	10.97	11.39	11.76	12.16	13.04
HLB 2006-110		11				50	4	12.02	12.45	12.86	13.29	14.27
HLB 2006-120		12				50	4	13.06	13.51	13.96	14.43	15.49

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Unit (mm)

Model Number	Radius of Ball Nose R	Effective Length ℓ1	Length of Cut ℓ	Neck Diameter φd1	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd		Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 2008-020	R0.4	2	0.64	0.77	16°	45	4		2.46	2.65	2.81	2.96	3.22
HLB 2008-020-6						50	6		2.46	2.65	2.81	2.96	3.22
HLB 2008-030		3				45	4		3.55	3.78	3.98	4.15	4.45
HLB 2008-030-6						50	6		3.55	3.78	3.98	4.15	4.45
HLB 2008-040		4				45	4		4.63	4.90	5.12	5.31	5.68
HLB 2008-040-6						50	6		4.63	4.90	5.12	5.31	5.68
HLB 2008-050		5				45	4		5.70	6.00	6.24	6.45	6.90
HLB 2008-050-6						50	6		5.70	6.00	6.24	6.45	6.90
HLB 2008-060		6				45	4		6.76	7.09	7.34	7.59	8.13
HLB 2008-060-6						50	6		6.76	7.09	7.34	7.59	8.13
HLB 2008-070		7				45	4		7.82	8.17	8.45	8.73	9.35
HLB 2008-080		8				45	4		8.87	9.24	9.55	9.86	10.57
HLB 2008-080-6						50	6		8.87	9.24	9.55	9.86	10.57
HLB 2008-090		9				45	4		9.92	10.31	10.65	11.00	11.80
HLB 2008-100		10				50	4		10.97	11.38	11.75	12.14	13.02
HLB 2008-100-6						50	6		10.97	11.38	11.75	12.14	13.02
HLB 2010-020	R0.5	2	0.8	0.96	16°	45	4		2.47	2.65	2.81	2.95	3.20
HLB 2010-025		2.5				45	4		3.02	3.22	3.40	3.55	3.83
HLB 2010-030		3				45	4		3.56	3.79	3.97	4.14	4.44
HLB 2010-030-6						50	6		3.56	3.79	3.97	4.14	4.44
HLB 2010-040		4				45	4		4.64	4.90	5.11	5.30	5.67
HLB 2010-040-6						50	6		4.64	4.90	5.11	5.30	5.67
HLB 2010-050		5				45	4		5.71	6.00	6.23	6.44	6.89
HLB 2010-050-6						50	6		5.71	6.00	6.23	6.44	6.89
HLB 2010-060		6				45	4		6.77	7.09	7.34	7.58	8.11
HLB 2010-060-6						50	6		6.77	7.09	7.34	7.58	8.11
HLB 2010-070		7				45	4		7.83	8.17	8.44	8.72	9.34
HLB 2010-070-6						50	6		7.83	8.17	8.44	8.72	9.34
HLB 2010-080		8				45	4		8.88	9.24	9.54	9.86	10.56
HLB 2010-080-6						50	6		8.88	9.24	9.54	9.86	10.56
HLB 2010-090		9				45	4		9.93	10.31	10.64	11.00	11.78
HLB 2010-100		10				45	4		10.97	11.38	11.75	12.14	13.01
HLB 2010-100-6						50	6		10.97	11.38	11.75	12.14	13.01
HLB 2010-120		12				45	4		13.06	13.51	13.95	14.41	15.45
HLB 2010-120-6						50	6		13.06	13.51	13.95	14.41	15.45
HLB 2010-140		14				50	4		15.14	15.64	16.15	16.69	17.90
HLB 2010-140-6						60	6		15.14	15.64	16.15	16.69	17.90
HLB 2010-160		16				50	4		17.22	17.77	18.35	18.97	20.35
HLB 2010-160-6						60	6		17.22	17.77	18.35	18.97	20.35
HLB 2010-180		18				55	4		19.29	19.90	20.55	21.25	22.80
HLB 2010-200		20				55	4		21.35	22.03	22.75	23.52	25.24
HLB 2010-200-6						70	6		21.35	22.03	22.75	23.52	25.24
HLB 2010-220-6		22				70	6		23.41	24.16	24.95	25.80	27.69

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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		Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 2012-040	R0.6	4	0.96	1.16	16°	45	4		4.06	4.18	4.30	4.43	4.73
HLB 2012-060		6				45	4		6.13	6.31	6.50	6.71	7.18
HLB 2012-060-6						50	6		6.13	6.31	6.50	6.71	7.18
HLB 2012-080		8				45	4		8.19	8.44	8.70	8.99	9.62
HLB 2012-080-6						50	6		8.19	8.44	8.70	8.99	9.62
HLB 2012-100		10				45	4		10.25	10.57	10.91	11.27	12.07
HLB 2012-100-6						50	6		10.25	10.57	10.91	11.27	12.07
HLB 2012-120		12				45	4		12.32	12.70	13.11	13.54	14.52
HLB 2012-120-6						50	6		12.32	12.70	13.11	13.54	14.52
HLB 2012-140		14				50	4		14.38	14.83	15.31	15.82	16.97
HLB 2012-160		16				50	4		16.44	16.96	17.51	18.10	19.41
HLB 2012-160-6						60	6		16.44	16.96	17.51	18.10	19.41
HLB 2012-180		18				55	4		18.50	19.09	19.71	20.38	21.86
HLB 2012-200		20				60	4		20.57	21.22	21.91	22.65	24.31
HLB 2014-060	R0.7	6	1.12	1.34	16°	45	4		6.16	6.34	6.53	6.74	7.20
HLB 2014-080		8				45	4		8.22	8.47	8.73	9.02	9.64
HLB 2014-120		12				45	4		12.35	12.73	13.14	13.57	14.54
HLB 2014-160		16				50	4		16.47	16.99	17.54	18.12	19.43
HLB 2015-030	R0.75	3	1.2	1.44	16°	45	4		3.06	3.14	3.23	3.32	3.52
HLB 2015-040		4				45	4		4.10	4.21	4.33	4.45	4.74
HLB 2015-060		6				45	4		6.16	6.34	6.53	6.73	7.19
HLB 2015-060-6						50	6		6.16	6.34	6.53	6.73	7.19
HLB 2015-080		8				45	4		8.22	8.47	8.73	9.01	9.63
HLB 2015-080-6						50	6		8.22	8.47	8.73	9.01	9.63
HLB 2015-100		10				45	4		10.28	10.60	10.93	11.29	12.08
HLB 2015-100-6						50	6		10.28	10.60	10.93	11.29	12.08
HLB 2015-120		12				45	4		12.35	12.73	13.13	13.56	14.53
HLB 2015-120-6						50	6		12.35	12.73	13.13	13.56	14.53
HLB 2015-140		14				50	4		14.41	14.86	15.33	15.84	16.98
HLB 2015-160		16				50	4		16.47	16.98	17.53	18.12	19.42
HLB 2015-160-6						60	6		16.47	16.98	17.53	18.12	19.42
HLB 2015-180		18				55	4		18.54	19.11	19.73	20.40	21.87
HLB 2015-200		20				55	4		20.60	21.24	21.93	22.67	24.32
HLB 2015-200-6						60	6		20.60	21.24	21.93	22.67	24.32
HLB 2015-220		22				55	4		22.66	23.37	24.14	24.95	No Interference
HLB 2015-300		30				70	4		30.91	31.89	32.94	34.06	No Interference
HLB 2016-040	R0.8	4	1.28	1.54	16°	45	4		4.08	4.19	4.30	4.43	4.71
HLB 2016-080		8				45	4		8.20	8.44	8.70	8.98	9.60
HLB 2016-120		12				45	4		12.33	12.70	13.11	13.54	14.50
HLB 2016-160		16				50	4		16.45	16.96	17.51	18.09	19.39
HLB 2016-200		20				55	4		20.58	21.22	21.91	22.65	No Interference
HLB 2018-080	R0.9	8	1.44	1.74	16°	45	4		8.20	8.44	8.69	8.97	9.58
HLB 2018-120		12				45	4		12.32	12.70	13.10	13.52	14.48
HLB 2018-160		16				50	4		16.45	16.96	17.50	18.08	19.37
HLB 2018-200		20				55	4		20.58	21.22	21.90	22.63	No Interference

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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	Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 2020-030	R1	3	1.6	1.94	16°	45	4	3.04	3.11	3.18	3.26	3.44
HLB 2020-040		4				45	4	4.07	4.17	4.28	4.40	4.67
HLB 2020-040-6						50	6	4.07	4.17	4.28	4.40	4.67
HLB 2020-060		6				45	4	6.13	6.30	6.48	6.68	7.11
HLB 2020-060-6						50	6	6.13	6.30	6.48	6.68	7.11
HLB 2020-080		8				45	4	8.20	8.43	8.68	8.96	9.56
HLB 2020-080-6						50	6	8.20	8.43	8.68	8.96	9.56
HLB 2020-100		10				45	4	10.26	10.56	10.89	11.23	12.01
HLB 2020-100-6						50	6	10.26	10.56	10.89	11.23	12.01
HLB 2020-120		12				45	4	12.32	12.69	13.09	13.51	14.45
HLB 2020-120-6						50	6	12.32	12.69	13.09	13.51	14.45
HLB 2020-140		14				50	4	14.38	14.82	15.29	15.79	16.90
HLB 2020-160		16				50	4	16.45	16.95	17.49	18.06	19.35
HLB 2020-160-6						60	6	16.45	16.95	17.49	18.06	19.35
HLB 2020-180		18				55	4	18.51	19.08	19.69	20.34	No Interference
HLB 2020-200		20				55	4	20.57	21.21	21.89	22.62	No Interference
HLB 2020-200-6						70	6	20.57	21.21	21.89	22.62	24.24
HLB 2020-220		22				60	4	22.64	23.34	24.09	24.90	No Interference
HLB 2020-250		25				65	4	25.73	26.53	27.39	28.31	No Interference
HLB 2020-250-6						80	6	25.73	26.53	27.39	28.31	30.36
HLB 2020-300		30				70	4	30.89	31.86	32.90	No Interference	No Interference
HLB 2020-300-6						80	6	30.89	31.86	32.90	34.01	36.48
HLB 2020-350		35				80	4	36.04	37.18	38.40	No Interference	No Interference
HLB 2020-350-6						80	6	36.04	37.18	38.40	39.70	No Interference
HLB 2020-400		40				80	4	41.20	42.51	No Interference	No Interference	No Interference
HLB 2020-400-6						90	6	41.20	42.51	43.90	45.39	No Interference
HLB 2025-080	R1.25	8	2	2.41	16°	45	4	8.24	8.47	8.72	8.98	9.57
HLB 2025-100		10				45	4	10.30	10.60	10.92	11.26	12.02
HLB 2025-150		15				50	4	15.46	15.93	16.42	16.95	No Interference
HLB 2025-200		20				55	4	20.62	21.25	21.92	22.65	No Interference
HLB 2025-250		25				65	4	25.78	26.57	27.43	No Interference	No Interference
HLB 2025-300		30				70	4	30.93	31.90	No Interference	No Interference	No Interference
HLB 2030-060-3	R1.5	6	2.4	2.91	—	60	3	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2030-060-4					16°	60	4	6.17	6.32	6.49	6.66	7.06
HLB 2030-060						60	6	6.17	6.32	6.49	6.66	7.06
HLB 2030-080		8				60	6	8.23	8.45	8.69	8.94	9.51
HLB 2030-100		10				60	6	10.29	10.58	10.89	11.22	11.96
HLB 2030-120		12				60	6	12.35	12.71	13.09	13.50	14.41
HLB 2030-140		14				60	6	14.42	14.84	15.29	15.77	16.85
HLB 2030-150		15				60	6	15.45	15.90	16.39	16.91	18.08
HLB 2030-160		16				60	6	16.48	16.97	17.49	18.05	19.30
HLB 2030-200		20				70	6	20.60	21.23	21.89	22.61	24.19
HLB 2030-250		25				70	6	25.76	26.55	27.39	28.30	30.31
HLB 2030-300		30				70	6	30.92	31.88	32.90	33.99	No Interference
HLB 2030-350		35				80	6	36.08	37.20	38.40	39.69	No Interference
HLB 2030-400		40				80	6	41.23	42.52	43.90	No Interference	No Interference

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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	Effective Length by Inclined angles 30'	1°	1° 30'	2°	3°
HLB 2035-250	R1.75	25	2.8	3.41	16°	70	6	25.75	26.54	27.37	28.26	No Interference
HLB 2035-300		30				70	6	30.91	31.86	32.87	33.96	No Interference
HLB 2035-350		35				80	6	36.07	37.18	38.38	No Interference	No Interference
HLB 2040-080-4	R2	8	3.2	3.91	—	70	4	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2040-080					16°	70	6	8.21	8.42	8.64	8.87	9.40
HLB 2040-100		10				70	6	10.28	10.55	10.84	11.15	11.85
HLB 2040-120		12				70	6	12.34	12.68	13.04	13.43	14.30
HLB 2040-140		14				70	6	14.40	14.81	15.24	15.71	16.75
HLB 2040-150		15				70	6	15.43	15.87	16.34	16.84	17.97
HLB 2040-160		16				70	6	16.46	16.94	17.44	17.98	19.19
HLB 2040-200		20				70	6	20.59	21.20	21.84	22.54	No Interference
HLB 2040-250		25				70	6	25.75	26.52	27.35	28.23	No Interference
HLB 2040-300		30				70	6	30.90	31.84	32.85	No Interference	No Interference
HLB 2040-350		35				80	6	36.06	37.17	38.35	No Interference	No Interference
HLB 2040-400		40				90	6	41.22	42.49	No Interference	No Interference	No Interference
HLB 2040-450		45				90	6	46.37	47.82	No Interference	No Interference	No Interference
HLB 2040-500		50				100	6	51.53	53.14	No Interference	No Interference	No Interference
HLB 2040-600		60				120	6	61.84	No Interference	No Interference	No Interference	No Interference
HLB 2050-100	R2.5	10	4	4.91	16°	70	6	10.26	10.52	10.79	11.08	11.75
HLB 2050-150		15				70	6	15.42	15.84	16.29	16.78	No Interference
HLB 2050-200		20				70	6	20.57	21.16	21.79	No Interference	No Interference
HLB 2050-250		25				70	6	25.73	26.49	No Interference	No Interference	No Interference
HLB 2050-300		30				80	6	30.89	31.81	No Interference	No Interference	No Interference
HLB 2050-350		35				80	6	36.04	No Interference	No Interference	No Interference	No Interference
HLB 2060-100	R3	10	4.8	5.91	—	80	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-200		20				80	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-250		25				80	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-300		30				80	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-350		35				80	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-400		40				90	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-450		45				100	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-500		50				120	6	No Interference	No Interference	No Interference	No Interference	No Interference
HLB 2060-600		60				120	6	No Interference	No Interference	No Interference	No Interference	No Interference

Milling Conditions for HLB/HLB-S

WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)			
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2001	R0.05	0.3	54,000	85	0.004	0.004	48,000	75	0.004	0.004	48,000	55	0.002	0.002	48,000	45	0.002	0.002
		0.5	54,000	75	0.004	0.004	48,000	65	0.002	0.002	48,000	35	0.002	0.002	48,000	35	0.002	0.002
20015	R0.075	0.3	54,000	160	0.007	0.009	48,000	120	0.007	0.007	48,000	90	0.004	0.004	48,000	70	0.004	0.004
		0.5	54,000	140	0.007	0.009	48,000	100	0.005	0.005	48,000	60	0.004	0.004	48,000	50	0.004	0.004
2002	R0.1	0.3	54,000	430	0.010	0.010	48,000	350	0.006	0.007	48,000	280	0.006	0.007	48,000	240	0.005	0.006
		0.5	54,000	430	0.010	0.010	48,000	350	0.006	0.007	48,000	280	0.006	0.007	48,000	240	0.005	0.006
		0.75	54,000	380	0.008	0.008	48,000	330	0.005	0.005	48,000	250	0.005	0.005	48,000	220	0.005	0.005
		1	54,000	380	0.008	0.008	48,000	330	0.005	0.005	48,000	250	0.005	0.005	48,000	220	0.005	0.005
		1.25	47,000	320	0.006	0.006	47,000	250	0.004	0.004	47,000	200	0.004	0.004	47,000	170	0.004	0.004
		1.5	47,000	320	0.006	0.006	47,000	250	0.004	0.004	47,000	200	0.004	0.004	47,000	170	0.004	0.004
		1.75	42,000	290	0.004	0.004	42,000	200	0.003	0.003	42,000	170	0.003	0.003	42,000	150	0.003	0.004
		2	42,000	290	0.004	0.004	42,000	200	0.003	0.003	42,000	170	0.003	0.003	42,000	150	0.003	0.003
		2.5	31,000	180	0.002	0.003	31,000	100	0.002	0.002	31,000	100	0.002	0.002	31,000	100	0.002	0.002
		3	31,000	120	0.002	0.002	31,000	100	0.002	0.002	31,000	100	0.002	0.002	31,000	100	0.002	0.002
2003	R0.15	0.5	54,000	720	0.015	0.015	48,000	590	0.010	0.011	41,000	410	0.010	0.011	41,000	350	0.009	0.010
		0.6	54,000	720	0.015	0.015	48,000	590	0.010	0.011	41,000	410	0.010	0.011	41,000	350	0.009	0.010
		0.75	54,000	720	0.015	0.015	48,000	590	0.010	0.011	41,000	410	0.010	0.011	41,000	350	0.009	0.010
		1	54,000	640	0.014	0.015	48,000	480	0.010	0.010	41,000	370	0.009	0.010	41,000	310	0.007	0.010
		1.25	54,000	640	0.014	0.015	48,000	480	0.010	0.010	41,000	370	0.009	0.010	41,000	310	0.007	0.010
		1.5	54,000	640	0.014	0.015	48,000	480	0.010	0.010	41,000	370	0.009	0.010	41,000	310	0.007	0.010
		1.75	49,000	530	0.011	0.011	43,000	370	0.008	0.008	37,000	270	0.008	0.008	37,000	230	0.006	0.008
		2	49,000	530	0.011	0.011	43,000	370	0.008	0.008	37,000	270	0.008	0.008	37,000	230	0.006	0.008
		2.25	49,000	530	0.011	0.011	43,000	370	0.008	0.008	37,000	270	0.008	0.008	37,000	230	0.006	0.008
		2.5	43,000	460	0.009	0.010	38,000	320	0.007	0.006	32,000	240	0.006	0.006	32,000	200	0.004	0.006
		2.75	43,000	460	0.009	0.010	38,000	320	0.007	0.006	32,000	240	0.006	0.006	32,000	200	0.004	0.006
		3	43,000	460	0.009	0.010	38,000	320	0.007	0.006	32,000	240	0.006	0.006	32,000	200	0.004	0.006
		3.5	37,000	340	0.004	0.006	28,000	260	0.003	0.004	24,000	200	0.003	0.004	24,000	160	0.003	0.004
		4	37,000	300	0.004	0.006	28,000	200	0.003	0.004	24,000	160	0.003	0.004	22,000	110	0.002	0.003
		4.5	37,000	300	0.004	0.006	28,000	200	0.003	0.004	24,000	160	0.003	0.004	22,000	110	0.002	0.003

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WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)			
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2004	R0.2	0.5	54,000	870	0.023	0.036	48,000	660	0.018	0.024	37,000	450	0.015	0.024	37,000	380	0.013	0.024
		0.75	54,000	870	0.023	0.036	48,000	660	0.018	0.024	37,000	450	0.015	0.024	37,000	380	0.013	0.024
		1	54,000	870	0.023	0.036	48,000	660	0.018	0.024	37,000	450	0.015	0.024	37,000	380	0.013	0.024
		1.5	54,000	790	0.022	0.036	48,000	590	0.018	0.024	37,000	400	0.015	0.024	37,000	340	0.012	0.024
		2	54,000	790	0.022	0.036	48,000	590	0.018	0.024	37,000	400	0.015	0.024	37,000	340	0.012	0.024
		2.5	50,000	660	0.017	0.036	41,000	420	0.013	0.024	31,000	280	0.011	0.024	31,000	240	0.009	0.024
		3	50,000	660	0.017	0.018	41,000	420	0.012	0.012	31,000	280	0.011	0.012	31,000	240	0.009	0.012
		3.5	50,000	640	0.012	0.018	38,000	400	0.009	0.012	30,000	270	0.009	0.012	30,000	230	0.007	0.012
		4	50,000	640	0.012	0.018	38,000	400	0.009	0.012	30,000	270	0.009	0.012	30,000	230	0.007	0.012
		4.5	37,000	410	0.009	0.018	29,000	330	0.008	0.012	26,000	260	0.007	0.012	26,000	210	0.005	0.012
		5	37,000	410	0.009	0.018	29,000	330	0.008	0.012	26,000	260	0.007	0.012	26,000	210	0.005	0.012
		5.5	37,000	360	0.006	0.010	29,000	260	0.005	0.006	26,000	200	0.004	0.006	26,000	170	0.004	0.006
		6	37,000	360	0.006	0.010	29,000	260	0.005	0.006	26,000	200	0.004	0.006	26,000	170	0.004	0.006
2005	R0.25	1	57,000	1,380	0.029	0.054	42,000	830	0.023	0.036	32,000	550	0.018	0.036	32,000	280	0.009	0.024
		1.5	57,000	1,380	0.029	0.054	42,000	830	0.023	0.036	32,000	550	0.018	0.036	32,000	280	0.009	0.024
		2	57,000	1,250	0.028	0.054	42,000	750	0.022	0.036	32,000	500	0.018	0.036	32,000	280	0.009	0.024
		2.5	57,000	1,250	0.028	0.054	42,000	750	0.022	0.036	32,000	500	0.018	0.036	32,000	280	0.009	0.024
		3	55,000	1,010	0.021	0.036	38,000	580	0.017	0.024	31,000	400	0.014	0.024	31,000	220	0.009	0.012
		3.5	55,000	1,010	0.021	0.036	38,000	580	0.017	0.024	31,000	400	0.014	0.024	31,000	220	0.009	0.012
		4	55,000	1,010	0.021	0.036	38,000	580	0.017	0.024	31,000	400	0.014	0.024	31,000	220	0.009	0.012
		4.5	48,000	880	0.016	0.018	33,000	480	0.012	0.012	30,000	390	0.009	0.012	30,000	200	0.008	0.012
		5	48,000	880	0.016	0.018	33,000	480	0.012	0.012	30,000	390	0.009	0.012	30,000	200	0.008	0.012
		5.5	36,000	610	0.016	0.018	31,000	480	0.012	0.012	30,000	390	0.009	0.012	30,000	200	0.005	0.012
		6	36,000	610	0.009	0.018	28,000	400	0.008	0.012	27,000	330	0.005	0.012	27,000	200	0.005	0.010
		7	36,000	590	0.009	0.018	28,000	400	0.008	0.012	27,000	330	0.005	0.012	27,000	200	0.005	0.010
		8	36,000	590	0.009	0.018	28,000	400	0.008	0.012	27,000	330	0.005	0.012	27,000	200	0.005	0.010
		9	36,000	460	0.009	0.018	28,000	400	0.008	0.012	27,000	330	0.005	0.012	27,000	200	0.005	0.010
		10	36,000	460	0.009	0.018	28,000	400	0.008	0.012	27,000	330	0.005	0.012	27,000	200	0.005	0.010

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WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)			
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2006	R0.3	1	57,000	1,670	0.035	0.144	37,000	840	0.027	0.096	27,000	540	0.023	0.096	26,000	470	0.018	0.096
		1.5	57,000	1,670	0.035	0.144	37,000	840	0.027	0.096	27,000	540	0.023	0.096	26,000	470	0.018	0.096
		2	57,000	1,540	0.034	0.144	37,000	770	0.027	0.096	27,000	500	0.021	0.096	26,000	420	0.018	0.096
		2.5	57,000	1,540	0.034	0.144	37,000	770	0.027	0.096	27,000	500	0.021	0.096	26,000	420	0.018	0.096
		3	57,000	1,540	0.034	0.144	37,000	770	0.027	0.096	27,000	500	0.021	0.096	26,000	420	0.018	0.096
		3.5	54,000	1,130	0.026	0.108	35,000	600	0.020	0.072	26,000	380	0.016	0.072	26,000	320	0.013	0.072
		4	54,000	1,130	0.026	0.108	35,000	600	0.020	0.072	26,000	380	0.016	0.072	26,000	320	0.013	0.072
		4.5	54,000	1,130	0.026	0.108	35,000	600	0.020	0.072	26,000	380	0.016	0.072	26,000	320	0.013	0.072
		5	46,000	960	0.019	0.072	28,000	460	0.016	0.048	26,000	370	0.012	0.048	26,000	310	0.010	0.048
		5.5	46,000	960	0.019	0.072	28,000	460	0.016	0.048	26,000	370	0.012	0.048	26,000	310	0.010	0.048
		6	46,000	960	0.019	0.072	28,000	460	0.016	0.048	26,000	370	0.012	0.048	26,000	310	0.010	0.048
		6.5	30,000	570	0.018	0.072	24,000	440	0.014	0.048	23,000	360	0.012	0.048	23,000	300	0.009	0.048
		7	30,000	570	0.018	0.072	24,000	440	0.014	0.048	23,000	360	0.012	0.048	23,000	300	0.009	0.048
		7.5	30,000	570	0.018	0.072	24,000	400	0.014	0.048	23,000	320	0.012	0.048	23,000	270	0.009	0.048
		8	30,000	570	0.010	0.054	24,000	400	0.009	0.036	23,000	320	0.006	0.036	23,000	270	0.005	0.036
		8.5	30,000	570	0.010	0.054	24,000	400	0.009	0.036	23,000	320	0.006	0.036	23,000	270	0.005	0.036
		9	30,000	570	0.010	0.054	24,000	400	0.009	0.036	23,000	320	0.006	0.036	23,000	270	0.005	0.036
		9.5	30,000	570	0.010	0.054	24,000	400	0.009	0.036	23,000	320	0.006	0.036	23,000	270	0.005	0.036
		10	30,000	490	0.007	0.036	24,000	330	0.006	0.024	23,000	290	0.004	0.024	23,000	240	0.003	0.024
		11	30,000	490	0.007	0.036	24,000	330	0.006	0.024	23,000	290	0.004	0.024	23,000	240	0.003	0.024
		12	30,000	490	0.007	0.036	24,000	330	0.006	0.024	23,000	290	0.004	0.024	23,000	240	0.003	0.024
2008	R0.4	2	55,000	2,060	0.063	0.180	33,000	710	0.050	0.120	27,000	500	0.041	0.120	26,000	420	0.035	0.120
		3	55,000	1,860	0.063	0.180	33,000	630	0.050	0.120	27,000	440	0.041	0.120	26,000	380	0.035	0.120
		4	55,000	1,860	0.063	0.180	31,000	600	0.050	0.120	27,000	440	0.041	0.120	26,000	380	0.035	0.120
		5	47,000	1,410	0.038	0.108	28,000	570	0.030	0.072	22,000	390	0.024	0.072	22,000	330	0.020	0.072
		6	47,000	1,410	0.038	0.108	28,000	570	0.030	0.072	22,000	390	0.024	0.072	22,000	330	0.020	0.072
		7	34,000	1,040	0.027	0.090	21,000	430	0.021	0.060	22,000	390	0.018	0.060	22,000	320	0.013	0.060
		8	34,000	1,040	0.027	0.090	21,000	430	0.021	0.060	22,000	390	0.018	0.060	22,000	320	0.013	0.060
		9	23,000	600	0.027	0.090	21,000	430	0.021	0.060	20,000	370	0.017	0.060	20,000	310	0.013	0.060
		10	23,000	600	0.027	0.090	21,000	430	0.021	0.060	20,000	370	0.017	0.060	20,000	310	0.013	0.060

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WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)			
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2010	R0.5	2	46,000	2,000	0.072	0.360	32,000	770	0.057	0.240	22,000	480	0.045	0.240	18,700	480	0.009	0.180
		2.5	46,000	2,000	0.072	0.360	32,000	770	0.057	0.240	22,000	480	0.045	0.240	18,700	480	0.009	0.180
		3	46,000	2,000	0.072	0.360	32,000	770	0.057	0.240	22,000	480	0.045	0.240	18,700	480	0.009	0.180
		4	46,000	2,000	0.071	0.360	32,000	770	0.057	0.240	22,000	480	0.045	0.240	18,700	480	0.009	0.180
		5	46,000	2,000	0.071	0.360	32,000	770	0.057	0.240	22,000	480	0.045	0.240	18,700	480	0.009	0.180
		6	39,000	1,500	0.071	0.180	26,000	760	0.055	0.120	17,600	480	0.045	0.120	17,600	480	0.009	0.120
		7	39,000	1,500	0.043	0.180	26,000	760	0.034	0.120	17,600	480	0.027	0.120	17,600	360	0.009	0.120
		8	39,000	1,500	0.043	0.180	26,000	760	0.034	0.120	17,600	480	0.027	0.120	17,600	360	0.009	0.120
		9	29,000	1,110	0.028	0.180	18,900	530	0.024	0.120	17,600	420	0.018	0.120	17,600	300	0.009	0.060
		10	29,000	1,110	0.028	0.090	17,600	530	0.024	0.060	16,500	420	0.018	0.060	15,400	300	0.009	0.060
		12	18,700	660	0.027	0.090	17,600	530	0.024	0.060	16,500	420	0.018	0.060	15,400	300	0.009	0.060
		14	18,700	640	0.022	0.090	15,400	440	0.018	0.060	14,300	360	0.014	0.060	12,100	240	0.005	0.036
		16	18,700	640	0.022	0.090	15,400	440	0.018	0.060	14,300	360	0.014	0.060	12,100	240	0.005	0.036
		18	18,700	540	0.017	0.090	14,300	440	0.013	0.060	13,200	360	0.009	0.060	9,900	240	0.005	0.024
		20	18,700	540	0.017	0.054	14,300	360	0.013	0.036	13,200	300	0.009	0.036	9,900	180	0.005	0.024
		22	18,700	540	0.017	0.054	14,300	360	0.013	0.036	13,200	300	0.009	0.036	9,900	180	0.005	0.024
2012	R0.6	4	38,000	2,000	0.085	0.360	26,000	770	0.068	0.240	18,200	480	0.054	0.240	18,200	440	0.045	0.240
		6	38,000	2,000	0.085	0.360	26,000	770	0.068	0.240	18,200	480	0.054	0.240	18,200	440	0.045	0.240
		8	32,000	1,490	0.084	0.360	21,000	700	0.067	0.240	15,100	440	0.054	0.240	15,100	400	0.045	0.240
		10	24,000	1,080	0.036	0.180	16,400	530	0.027	0.120	15,100	420	0.022	0.120	15,100	390	0.018	0.120
		12	24,000	1,080	0.036	0.180	15,300	530	0.027	0.120	14,100	420	0.022	0.120	14,300	390	0.018	0.120
		14	15,400	580	0.028	0.144	15,100	460	0.022	0.096	13,800	380	0.018	0.096	13,800	380	0.015	0.096
		16	15,400	580	0.024	0.144	13,100	460	0.019	0.096	11,900	380	0.016	0.096	11,900	380	0.012	0.096
		18	15,400	580	0.024	0.144	13,100	400	0.019	0.096	11,900	340	0.016	0.096	11,900	290	0.012	0.096
		20	15,400	540	0.017	0.090	12,100	380	0.013	0.060	11,000	320	0.009	0.060	11,000	280	0.008	0.060
2014	R0.7	6	28,000	1,470	0.099	0.270	17,600	680	0.079	0.180	13,600	440	0.063	0.180	12,700	390	0.054	0.180
		8	28,000	1,470	0.099	0.270	17,600	680	0.079	0.180	13,600	440	0.063	0.180	12,700	390	0.054	0.180
		12	19,800	1,080	0.042	0.270	13,800	530	0.033	0.180	13,600	420	0.027	0.180	12,700	390	0.022	0.180
		16	13,200	620	0.033	0.180	13,100	480	0.027	0.120	11,900	390	0.021	0.120	12,400	360	0.018	0.120

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WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)			
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2015	R0.75	3	30,000	2,200	0.171	0.324	21,000	1,060	0.137	0.216	14,800	660	0.110	0.216	13,800	580	0.092	0.216
		4	30,000	2,200	0.171	0.324	21,000	1,060	0.137	0.216	14,800	660	0.110	0.216	13,800	580	0.092	0.216
		6	30,000	1,980	0.147	0.324	21,000	940	0.117	0.216	14,800	580	0.090	0.216	13,800	520	0.079	0.216
		8	26,000	1,500	0.106	0.270	16,300	700	0.084	0.180	12,100	450	0.069	0.180	12,100	400	0.057	0.180
		10	26,000	1,500	0.106	0.270	16,300	700	0.084	0.180	12,100	450	0.069	0.180	12,100	400	0.057	0.180
		12	26,000	1,500	0.106	0.270	16,300	700	0.084	0.180	12,100	450	0.069	0.180	12,100	400	0.057	0.180
		14	18,700	1,100	0.045	0.180	12,600	530	0.036	0.120	12,100	440	0.027	0.120	12,100	390	0.024	0.120
		16	12,100	620	0.036	0.180	12,400	480	0.027	0.120	11,600	390	0.022	0.120	11,600	360	0.018	0.120
		18	12,100	620	0.036	0.180	12,400	480	0.027	0.120	11,600	390	0.022	0.120	11,600	360	0.018	0.120
		20	12,100	620	0.019	0.090	12,400	480	0.016	0.060	11,600	390	0.012	0.060	11,600	360	0.010	0.060
		22	12,100	620	0.019	0.090	12,400	480	0.016	0.060	11,000	390	0.012	0.060	11,000	360	0.010	0.060
		30	10,700	450	0.019	0.090	10,900	400	0.016	0.060	11,000	390	0.012	0.060	11,000	360	0.010	0.060
2016	R0.8	4	26,000	1,970	0.157	0.324	18,900	940	0.126	0.216	13,800	580	0.102	0.216	12,600	520	0.084	0.216
		8	26,000	1,970	0.157	0.324	18,900	940	0.126	0.216	13,800	580	0.102	0.216	12,600	520	0.084	0.216
		12	25,000	1,490	0.112	0.180	15,100	700	0.090	0.120	11,500	440	0.072	0.120	11,500	400	0.061	0.120
		16	17,600	1,100	0.046	0.144	12,300	530	0.036	0.096	11,400	440	0.030	0.096	11,400	390	0.025	0.096
		20	11,000	630	0.036	0.090	11,500	480	0.030	0.060	10,900	400	0.024	0.060	10,900	360	0.019	0.060
2018	R0.9	8	26,000	1,950	0.165	0.270	16,300	930	0.132	0.240	13,800	570	0.108	0.240	12,000	520	0.089	0.240
		12	21,000	1,480	0.120	0.270	13,800	700	0.094	0.180	10,300	440	0.077	0.180	10,300	390	0.065	0.180
		16	15,400	1,080	0.048	0.180	10,800	530	0.039	0.120	9,900	420	0.031	0.120	9,900	390	0.027	0.120
		20	10,500	630	0.039	0.090	10,200	480	0.031	0.060	9,700	400	0.025	0.060	9,600	360	0.021	0.060
2020	R1	3	22,000	2,140	0.232	0.540	18,500	1,260	0.185	0.360	13,200	960	0.150	0.360	13,200	780	0.125	0.360
		4	22,000	2,140	0.232	0.540	18,500	1,260	0.185	0.360	13,200	960	0.150	0.360	13,200	780	0.125	0.360
		6	22,000	2,140	0.232	0.540	18,500	1,260	0.185	0.360	13,200	960	0.150	0.360	13,200	780	0.125	0.360
		8	22,000	1,920	0.185	0.360	18,500	1,120	0.147	0.240	13,200	870	0.120	0.240	13,200	710	0.099	0.240
		10	22,000	1,920	0.185	0.360	18,500	1,120	0.147	0.240	13,200	870	0.120	0.240	13,200	710	0.099	0.240
		12	18,700	1,470	0.166	0.360	16,000	990	0.133	0.240	11,700	780	0.107	0.240	11,700	630	0.089	0.240
		14	18,700	1,470	0.166	0.360	16,000	990	0.133	0.240	11,700	780	0.107	0.240	11,700	630	0.089	0.240
		16	18,700	1,470	0.148	0.360	16,000	990	0.118	0.240	11,700	780	0.090	0.240	11,700	630	0.079	0.240
		18	14,300	1,070	0.093	0.180	14,700	580	0.074	0.120	11,600	580	0.061	0.120	11,600	480	0.049	0.120
		20	14,300	1,070	0.093	0.180	14,700	580	0.074	0.120	11,600	580	0.061	0.120	11,600	480	0.049	0.120
		22	9,500	630	0.074	0.180	10,600	450	0.058	0.120	10,200	450	0.045	0.120	10,200	360	0.040	0.120
		25	9,500	630	0.074	0.180	10,600	450	0.058	0.120	10,200	450	0.045	0.120	10,200	360	0.040	0.120
		30	9,500	630	0.033	0.090	10,600	450	0.026	0.060	10,200	450	0.021	0.060	10,200	360	0.017	0.060
		35	9,500	530	0.026	0.090	10,600	380	0.019	0.060	10,200	380	0.017	0.060	10,200	300	0.014	0.060
		40	9,500	530	0.026	0.090	10,600	380	0.019	0.060	10,200	380	0.017	0.060	10,200	300	0.014	0.060

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WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)			
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
2025	R1.25	8	18,400	2,400	0.232	0.360	14,500	1,400	0.185	0.240	9,700	1,080	0.150	0.240	9,700	880	0.125	0.240
		10	18,400	2,400	0.232	0.360	14,500	1,400	0.185	0.240	9,700	1,080	0.150	0.240	9,700	880	0.125	0.240
		15	16,100	1,810	0.208	0.360	13,500	1,230	0.166	0.240	8,400	980	0.135	0.240	8,400	780	0.112	0.240
		20	11,500	1,330	0.116	0.180	10,200	950	0.093	0.120	8,400	980	0.074	0.120	8,400	780	0.063	0.120
		25	6,900	770	0.093	0.180	8,400	540	0.074	0.120	8,400	560	0.061	0.120	8,400	450	0.049	0.120
		30	6,900	770	0.040	0.090	8,400	540	0.033	0.060	8,400	560	0.026	0.060	8,400	450	0.021	0.060
2030	R1.5	6	15,000	2,890	0.278	0.540	12,900	1,680	0.222	0.360	9,200	1,300	0.180	0.360	6,400	710	0.180	0.360
		8	15,000	2,890	0.278	0.540	12,900	1,680	0.222	0.360	9,200	1,300	0.180	0.360	6,400	710	0.180	0.360
		10	15,000	2,600	0.278	0.540	12,900	1,680	0.222	0.360	9,200	1,300	0.180	0.360	6,400	710	0.180	0.360
		12	15,000	2,600	0.278	0.540	12,900	1,510	0.222	0.360	9,200	1,170	0.180	0.360	6,400	650	0.180	0.360
		14	15,000	2,600	0.209	0.540	12,900	1,510	0.166	0.360	9,200	1,170	0.135	0.360	6,400	650	0.090	0.360
		15	12,700	1,970	0.209	0.540	11,300	1,330	0.166	0.360	8,100	1,040	0.135	0.360	5,800	590	0.090	0.360
		16	12,700	1,970	0.209	0.540	11,300	1,330	0.166	0.360	8,100	1,040	0.135	0.360	5,800	590	0.090	0.360
		20	12,700	1,970	0.209	0.540	11,300	1,330	0.166	0.360	8,100	1,040	0.135	0.360	5,800	590	0.090	0.360
		25	10,100	1,450	0.139	0.270	8,800	1,040	0.111	0.180	8,100	1,040	0.090	0.180	5,800	590	0.090	0.360
		30	10,100	1,450	0.139	0.270	8,800	780	0.111	0.180	8,100	780	0.090	0.180	5,800	420	0.090	0.360
		35	6,600	840	0.073	0.270	7,900	620	0.055	0.180	7,500	650	0.045	0.180	5,200	360	0.045	0.180
		40	6,600	840	0.073	0.270	7,900	500	0.055	0.180	7,500	520	0.045	0.180	5,200	260	0.045	0.180
2035	R1.75	25	10,200	1,650	0.200	0.350	8,600	1,150	0.167	0.270	7,100	1,010	0.135	0.270	5,900	690	0.121	0.360
		30	10,200	1,650	0.200	0.350	8,600	1,150	0.167	0.270	7,100	1,010	0.135	0.270	5,900	690	0.121	0.360
		35	7,100	1,100	0.130	0.350	7,300	790	0.102	0.270	6,800	820	0.083	0.270	5,600	570	0.072	0.270
2040	R2	8	11,500	2,710	0.370	0.900	9,700	1,560	0.297	0.600	6,800	1,210	0.241	0.600	6,800	980	0.198	0.600
		10	11,500	2,710	0.370	0.900	9,700	1,560	0.297	0.600	6,800	1,210	0.241	0.600	6,800	980	0.198	0.600
		12	11,500	2,710	0.370	0.900	9,700	1,560	0.297	0.600	6,800	1,210	0.241	0.600	6,800	980	0.198	0.600
		14	11,500	2,440	0.370	0.900	9,700	1,430	0.297	0.600	6,800	1,110	0.241	0.600	6,800	880	0.198	0.600
		15	11,500	2,440	0.370	0.900	9,700	1,430	0.297	0.600	6,800	1,110	0.241	0.600	6,800	880	0.198	0.600
		16	11,500	2,440	0.370	0.900	9,700	1,430	0.297	0.600	6,800	1,110	0.241	0.600	6,800	880	0.198	0.600
		20	11,500	2,440	0.370	0.900	9,700	1,430	0.297	0.600	6,800	1,110	0.241	0.600	6,800	880	0.198	0.600
		25	10,300	1,850	0.279	0.540	8,400	1,250	0.223	0.360	6,000	980	0.180	0.360	6,000	780	0.151	0.360
		30	10,300	1,850	0.279	0.540	8,400	1,250	0.223	0.360	6,000	980	0.180	0.360	6,000	780	0.151	0.360
		35	7,500	1,360	0.185	0.540	6,600	950	0.148	0.360	6,000	980	0.120	0.360	6,000	780	0.099	0.360
		40	7,500	1,360	0.185	0.540	6,600	950	0.148	0.360	6,000	980	0.120	0.360	6,000	780	0.099	0.360
		45	5,000	780	0.093	0.360	5,900	470	0.074	0.240	5,600	490	0.060	0.240	5,600	390	0.050	0.240
		50	5,000	780	0.093	0.360	5,900	470	0.074	0.240	5,600	490	0.060	0.240	5,600	390	0.050	0.240
		60	4,000	500	0.078	0.300	5,000	280	0.062	0.210	5,200	250	0.040	0.180	5,100	210	0.030	0.210

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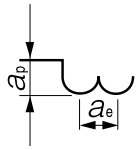
WORK MATERIAL			COPPER				PREHARDENED STEELS / HARDENED STEELS NAK/SKD (30～45HRC)				HARDENED STEELS SKD/SKT (45～55HRC)				HARDENED STEELS SKD/SKT (55～65HRC)				
Model Nunber	Radius of Ball Nose (mm)	Effective Length (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)	
2050	R2.5	10	9,600	2,590	0.406	0.900	7,800	1,350	0.324	0.800	5,600	1,050	0.252	0.800	5,600	850	0.217	0.750	
		12	9,600	2,590	0.406	0.900	7,800	1,350	0.324	0.800	5,600	1,050	0.252	0.800	5,600	850	0.217	0.750	★
		15	9,600	2,590	0.406	0.900	7,800	1,350	0.324	0.800	5,600	1,050	0.252	0.800	5,600	850	0.217	0.750	
		20	9,600	2,100	0.406	0.900	7,800	1,240	0.324	0.600	5,600	950	0.252	0.600	5,600	780	0.217	0.600	
		25	9,600	2,100	0.406	0.900	7,800	1,240	0.324	0.600	5,600	950	0.252	0.600	5,600	780	0.217	0.600	
		30	8,200	1,320	0.305	0.900	6,500	760	0.243	0.600	4,800	600	0.197	0.600	4,800	490	0.164	0.600	
		35	8,200	1,320	0.305	0.900	6,500	760	0.243	0.600	4,800	600	0.197	0.600	4,800	490	0.164	0.600	
2060	R3	10	8,000	2,530	0.555	1.800	7,400	1,670	0.443	1.200	5,200	1,300	0.360	1.200	4,100	820	0.360	1.200	
		15	8,000	2,530	0.555	1.800	7,400	1,670	0.443	1.200	5,200	1,300	0.360	1.200	4,100	820	0.360	1.200	★
		20	8,000	2,530	0.555	1.800	7,400	1,670	0.443	1.200	5,200	1,300	0.360	1.200	4,100	820	0.360	1.200	
		25	8,000	1,810	0.418	1.080	6,600	1,500	0.334	0.720	4,600	1,170	0.270	0.720	4,100	710	0.270	0.720	
		30	8,000	1,810	0.418	1.080	6,600	1,500	0.334	0.720	4,600	1,170	0.270	0.720	4,100	710	0.270	0.720	
		35	8,000	1,810	0.418	1.080	6,600	1,500	0.334	0.720	4,600	1,170	0.270	0.720	4,100	710	0.270	0.720	
		40	6,500	1,430	0.349	1.080	5,800	1,270	0.279	0.720	4,600	1,110	0.225	0.720	3,800	640	0.203	0.720	
		45	6,500	1,430	0.349	1.080	5,800	1,270	0.279	0.720	4,600	1,110	0.225	0.720	3,800	640	0.203	0.720	
		50	5,000	1,070	0.280	1.080	5,000	1,040	0.224	0.720	4,600	1,040	0.180	0.720	3,500	570	0.135	0.720	
		60	3,800	800	0.200	1.000	4,200	850	0.191	0.690	3,800	800	0.125	0.680	2,700	400	0.085	0.680	

★HLB Short Shank Series
2050-120、2060-150

a_p : Axial Depth
a_e : Radial Depth
D : Outside Diameter
n : Speed
Vf : Feed



Note
- Recommend Airblow or Oil Mist. When milling copper, recommend Water soluble or Oil coolant
- This parameter is only for reference. In operation, we recommend fine adjustments to these parameters according to the milling shape, purpose, machine capability and the operation environment
- When the parameter exceed the machine's maximum spindle speed, decrease both the spindle speed and the feed rate by the same proportion