Size R0.05～R3

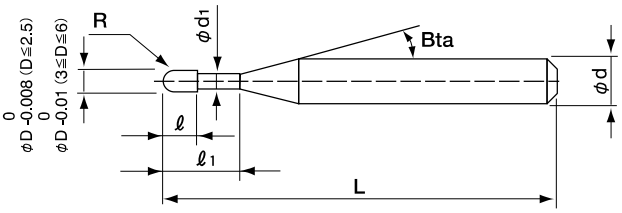
HGLB

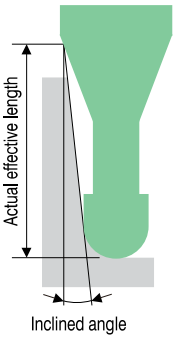
Super MG | HMG COAT | 30° | R ±0.002 (R0.05～R0.075) | R ±0.003 (R0.1～R2) | R ±0.005 (R2.5～R3) | Shank Dia 0/-0.004 | Back Taper Geometry

～ Except for R0.4 or below. $\ell_1 / D \leqq 10$

Material Applications（★ Highly Recommended ● Recommended ○ Suggested）

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





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.

New carbide materials with excellent wear resistance

Adopted new coating "HMGCOAT"

Coating series		COPPER	CARBON STEELS	PREHARDENED STEELS	HARDENED STEELS				
					～50 HRC	～55 HRC	～60 HRC	～65 HRC	～70 HRC
HMG COAT	HMGCOAT			○	○	○	●	★	★
HMW COAT	HMWCOAT	○	○	●	●	●	★	●	●
HARD MAX	HARDMAX	○	○	●	●	●	●	○	

Super negative design specialized for high hardness of 60HRC or above

Long Neck Ball series for Steels

Number of Flutes	Model Number		Features	Ball tip design		Copper	Carbon Steels	Pre hardened Steels	HARDENED STEELS ~50 HRC	~55 HRC	~60 HRC	~65 HRC	~70 HRC	Alloy Steels	Aluminum Alloys	Plastics	Titanium/ Heat Resistant Alloys	Page
2 Flutes	HGLB		Best suited for Hard Materials	Super Negative				○	●	●	●	★	★					460
	HWLB		For Hard Materials	Negative		○	○	●	★	★	★	●	●	○			○	470
	HSLB HSLB-S		For Hard Materials Multi-purpose	Negative		○	○	●	●	●	●	○		○			○	476 492
	CSELB		Multi-purpose Excellent surface quality	Standard		●	●	●	●	●				●	●		○	496
3 Flutes	CFLB		Multi-purpose Excellent surface quality	Positive		●	●	●	●	●				●	●	○	●	530

High Precision Diameter Tolerance / Radius Accuracy / Shank Diameter Tolerance

HSLB Tolerance

Radius of Ball Nose	Diameter Tolerance	Ball Radius Accuracy	Shank Diameter Tolerance
R0.03 ~ R0.075	0/-0.01	±0.002	**0/-0.005 (h5)**
R0.1 ~ R3	0/-0.015	±0.005	

HGLB Tolerance

Radius of Ball Nose	Diameter Tolerance	Ball Radius Accuracy	Shank Diameter Tolerance
R0.05 ~ R0.075	**0/-0.008**	**± 0.002**	**0/-0.004 (h4)**
R0.1 ~ R1.25		**±0.003**	
R1.5 ~ R2	**0/-0.01**		
R2.5 ~ R3		±0.005	

Shank diameter tolerance h4!

Spur Gear HAP72 (69HRC)

4 Flute / 6 Flute Radius End Mills for Hard Materials
HMERS
(P320)

Coolant : Air Blow
(Through Spindle)
Work size : φ 50.4 × Depth 11 mm

Ball End Mills for Hard Materials
HGB (P422)

Long Neck Ball End Mills for Hard Materials
HGLB

Process	Tool	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p (mm)	a_e (mm)	Allowance (mm)	Cycle Time (h:m)	Milling Method
Roughing	HGB R1.5	8,300	1,140	0.12	0.55	0.02	1:41	Roughing
Roughing	HGLB R1 × EL6	12,300	1,800	0.06	0.3	0.02	0:06	Rest machining
Semi-Finishing			1,800	0.06	0.05	0.01	0:53	Semi-Finishing
Finishing			900	0.00015 Cusp Height	—	0	0:09	45° surface / Finishing
Finishing	HMERS φ3 × CR0.1	8,600	465 1,500	0.5	1	0	0:02	Above the gear teeth / Finishing
Finishing			465 1,500	0.0002 Cusp Height	1	0	0:01	Bottom surface of cylindrical part / Finishing
Finishing	HGLB R0.5 × EL6	20,000	800	0.00015 Cusp Height	—	0	0:55	Gear wall / Finishing
Finishing			800	0.01	0.04	0	0:51	Gear bottom/ Finishing
						Total	4:38	

2 Flutes HMGCOAT for Hard Materials

Total 155 models

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	Suggested Retail Price ¥	Effective Length by Inclined Angles				
									30′	1°	1°30′	2°	3°
HGLB 2001-002	R0.05	0.2	0.08	0.095	16°	45	4	12,360	0.22	0.24	0.26	0.28	0.31
HGLB 2001-003		0.3				45	4	12,360	0.33	0.36	0.38	0.40	0.44
HGLB 2001-005		0.5				45	4	13,440	0.55	0.58	0.61	0.64	0.68
HGLB 20015-003	R0.075	0.3	0.12	0.14	16°	45	4	14,400	0.35	0.37	0.39	0.41	0.44
HGLB 20015-005		0.5				45	4	15,240	0.56	0.59	0.62	0.64	0.69
HGLB 20015-0075		0.75				45	4	16,020	0.83	0.86	0.90	0.93	1.00
HGLB 20015-010		1				45	4	16,020	1.09	1.13	1.17	1.21	1.30
HGLB 2002-003	R0.1	0.3	0.16	0.19	16°	45	4	8,640	0.42	0.44	0.46	0.48	0.52
HGLB 2002-005		0.5				45	4	8,640	0.63	0.66	0.68	0.71	0.76
HGLB 2002-0075		0.75				45	4	8,640	0.89	0.93	0.96	0.99	1.07
HGLB 2002-010		1				45	4	8,640	1.15	1.20	1.24	1.28	1.37
HGLB 2002-015		1.5				45	4	9,360	1.66	1.72	1.78	1.84	1.97
HGLB 2002-020		2				45	4	10,440	2.18	2.25	2.33	2.41	2.58
HGLB 2003-005	R0.15	0.5	0.24	0.29	16°	45	4	8,520	0.63	0.65	0.68	0.70	0.75
HGLB 2003-0075		0.75				45	4	8,520	0.89	0.92	0.96	0.99	1.05
HGLB 2003-010		1				45	4	8,520	1.15	1.19	1.23	1.27	1.36
HGLB 2003-015		1.5				45	4	9,120	1.66	1.72	1.77	1.83	1.96
HGLB 2003-020		2				45	4	9,120	2.18	2.25	2.32	2.40	2.57
HGLB 2003-025		2.5				45	4	9,360	2.70	2.78	2.87	2.97	3.18
HGLB 2003-030		3				45	4	9,360	3.21	3.32	3.42	3.54	3.80
HGLB 2004-005	R0.2	0.5	0.32	0.39	16°	45	4	5,880	0.63	0.65	0.67	0.70	0.74
HGLB 2004-0075		0.75				45	4	5,880	0.89	0.92	0.95	0.98	1.04
HGLB 2004-010		1				45	4	5,880	1.15	1.19	1.23	1.26	1.35
HGLB 2004-010-6		1				50	6	8,640	1.15	1.19	1.23	1.26	1.35
HGLB 2004-0125		1.25				45	4	6,000	1.40	1.45	1.49	1.54	1.64
HGLB 2004-015		1.5				45	4	6,000	1.66	1.71	1.77	1.82	1.95
HGLB 2004-015-6		1.5				50	6	8,740	1.66	1.71	1.77	1.82	1.95
HGLB 2004-020		2				45	4	6,120	2.18	2.25	2.32	2.39	2.56
HGLB 2004-020-6		2				50	6	9,000	2.18	2.25	2.32	2.39	2.56
HGLB 2004-025		2.5				45	4	6,360	2.70	2.78	2.87	2.96	3.17
HGLB 2004-025-6		2.5				50	6	9,240	2.70	2.78	2.87	2.96	3.17
HGLB 2004-030		3				45	4	6,720	3.21	3.31	3.42	3.53	3.79
HGLB 2004-030-6		3				50	6	9,850	3.21	3.31	3.42	3.53	3.79
HGLB 2004-035		3.5				45	4	7,320	3.73	3.84	3.97	4.10	4.40
HGLB 2004-040		4				45	4	7,320	4.24	4.38	4.52	4.67	5.01
HGLB 2005-010	R0.25	1	0.4	0.49	16°	45	4	5,880	1.15	1.19	1.22	1.26	1.34
HGLB 2005-015		1.5				45	4	5,880	1.65	1.71	1.76	1.82	1.94
HGLB 2005-020		2				45	4	5,880	2.18	2.24	2.31	2.39	2.55
HGLB 2005-025		2.5				45	4	5,880	2.69	2.78	2.86	2.96	3.16
HGLB 2005-030		3				45	4	5,880	3.21	3.31	3.41	3.53	3.77
HGLB 2005-035		3.5				45	4	5,880	3.73	3.84	3.96	4.09	4.39
HGLB 2005-040		4				45	4	5,880	4.24	4.37	4.51	4.66	5.00
HGLB 2005-045		4.5				45	4	6,000	4.76	4.91	5.06	5.23	5.61
HGLB 2005-050		5				45	4	6,000	5.27	5.44	5.61	5.80	6.22
HGLB 2005-060		6				45	4	6,120	6.30	6.50	6.71	6.94	7.45

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	Suggested Retail Price ¥	Effective Length by Inclined Angles				
									30′	1°	1°30′	2°	3°
HGLB 2006-010	R0.3	1	0.48	0.59	16°	45	4	5,040	1.14	1.18	1.22	1.25	1.33
HGLB 2006-015		1.5				45	4	4,560	1.65	1.71	1.76	1.81	1.93
HGLB 2006-015-6		1.5				50	6	6,890	1.65	1.71	1.76	1.81	1.93
HGLB 2006-020		2				45	4	4,560	2.17	2.24	2.31	2.38	2.54
HGLB 2006-020-6		2				50	6	6,960	2.17	2.24	2.31	2.38	2.54
HGLB 2006-025		2.5				45	4	4,680	2.69	2.77	2.86	2.95	3.15
HGLB 2006-025-6		2.5				50	6	6,890	2.69	2.77	2.86	2.95	3.15
HGLB 2006-030		3				45	4	4,680	3.21	3.31	3.41	3.52	3.76
HGLB 2006-030-6		3				50	6	7,080	3.21	3.31	3.41	3.52	3.76
HGLB 2006-035		3.5				45	4	4,800	3.72	3.84	3.96	4.09	4.38
HGLB 2006-040		4				45	4	4,800	4.24	4.37	4.51	4.66	4.99
HGLB 2006-045		4.5				45	4	4,800	4.76	4.90	5.06	5.23	5.60
HGLB 2006-050		5				45	4	4,800	5.27	5.44	5.61	5.80	6.21
HGLB 2006-055		5.5				45	4	4,800	5.79	5.97	6.16	6.37	6.82
HGLB 2006-060		6				45	4	4,800	6.30	6.50	6.71	6.93	7.43
HGLB 2006-080		8				45	4	6,360	8.37	8.63	8.91	9.21	9.88
HGLB 2006-100		10				45	4	6,480	10.43	10.76	11.11	11.49	12.33
HGLB 2008-020	R0.4	2	0.64	0.79	16°	45	4	4,560	2.17	2.23	2.30	2.37	2.52
HGLB 2008-025		2.5				45	4	4,800	2.69	2.77	2.85	2.94	3.13
HGLB 2008-030		3				45	4	4,800	3.21	3.30	3.40	3.50	3.74
HGLB 2008-040		4				45	4	4,800	4.24	4.36	4.50	4.64	4.97
HGLB 2008-050		5				45	4	4,800	5.27	5.43	5.60	5.78	6.19
HGLB 2008-060		6				45	4	4,800	6.30	6.49	6.70	6.92	7.41
HGLB 2008-070		7				45	4	4,800	7.33	7.56	7.80	8.06	8.64
HGLB 2008-080		8				45	4	4,800	8.36	8.62	8.90	9.20	9.86
HGLB 2010-020	R0.5	2	0.8	0.98	16°	45	4	3,840	2.18	2.24	2.30	2.36	2.51
HGLB 2010-020-6		2				50	6	6,120	2.18	2.24	2.30	2.36	2.51
HGLB 2010-025		2.5				45	4	3,840	2.70	2.77	2.85	2.93	3.12
HGLB 2010-030		3				45	4	3,840	3.21	3.30	3.40	3.50	3.73
HGLB 2010-030-6		3				50	6	6,120	3.21	3.30	3.40	3.50	3.73
HGLB 2010-040		4				45	4	4,320	4.24	4.37	4.50	4.64	4.96
HGLB 2010-040-6		4				50	6	6,720	4.24	4.37	4.50	4.64	4.96
HGLB 2010-050		5				45	4	4,320	5.28	5.43	5.60	5.78	6.18
HGLB 2010-050-6		5				50	6	6,720	5.28	5.43	5.60	5.78	6.18
HGLB 2010-060		6				45	4	4,680	6.31	6.50	6.70	6.92	7.40
HGLB 2010-060-6		6				50	6	7,080	6.31	6.50	6.70	6.92	7.40
HGLB 2010-070		7				45	4	4,680	7.34	7.56	7.80	8.06	8.63
HGLB 2010-070-6		7				50	6	7,080	7.34	7.56	7.80	8.06	8.63
HGLB 2010-080		8				45	4	4,680	8.37	8.63	8.90	9.20	9.85
HGLB 2010-080-6		8				50	6	7,080	8.37	8.63	8.90	9.20	9.85
HGLB 2010-100		10				45	4	4,680	10.43	10.76	11.10	11.47	12.30
HGLB 2010-100-6		10				50	6	7,080	10.43	10.76	11.10	11.47	12.30
HGLB 2010-120		12				45	4	4,680	12.50	12.89	13.30	13.75	14.75
HGLB 2010-140		14				45	4	5,400	14.56	15.02	15.51	16.03	17.19
HGLB 2010-160		16				50	4	6,360	16.62	17.15	17.71	18.31	19.64

Next Page ➡

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	Suggested Retail Price ¥	Effective Length by Inclined Angles				
									30′	1°	1°30′	2°	3°
HGLB 2015-030	R0.75	3	1.2	1.47	16°	45	4	4,440	3.10	3.18	3.26	3.35	3.55
HGLB 2015-030-6		3				50	6	7,130	3.10	3.18	3.26	3.35	3.55
HGLB 2015-040		4				45	4	4,440	4.13	4.24	4.36	4.49	4.77
HGLB 2015-060		6				45	4	4,440	6.19	6.37	6.56	6.76	7.22
HGLB 2015-060-6		6				50	6	7,200	6.19	6.37	6.56	6.76	7.22
HGLB 2015-080		8				45	4	4,680	8.25	8.50	8.76	9.04	9.67
HGLB 2015-080-6		8				50	6	7,200	8.25	8.50	8.76	9.04	9.67
HGLB 2015-100		10				45	4	5,040	10.32	10.63	10.96	11.32	12.11
HGLB 2015-100-6		10				50	6	7,200	10.32	10.63	10.96	11.32	12.11
HGLB 2015-120		12				45	4	5,400	12.38	12.76	13.16	13.60	14.56
HGLB 2015-120-6		12				50	6	8,130	12.38	12.76	13.16	13.60	14.56
HGLB 2015-140		14				45	4	5,400	14.44	14.89	15.36	15.87	17.01
HGLB 2015-160		16				50	4	5,400	16.50	17.02	17.57	18.15	19.46
HGLB 2015-200		20				60	4	5,400	20.63	21.28	21.97	22.71	24.35
HGLB 2020-030	R1	3	1.6	1.98	16°	45	4	3,840	3.07	3.14	3.21	3.29	3.47
HGLB 2020-030-6		3				50	6	6,120	3.07	3.14	3.21	3.29	3.47
HGLB 2020-040		4				45	4	3,840	4.10	4.20	4.31	4.43	4.70
HGLB 2020-040-6		4				50	6	6,120	4.10	4.20	4.31	4.43	4.70
HGLB 2020-060		6				45	4	4,320	6.16	6.33	6.51	6.71	7.14
HGLB 2020-060-6		6				50	6	6,600	6.16	6.33	6.51	6.71	7.14
HGLB 2020-080		8				45	4	4,680	8.23	8.46	8.72	8.99	9.59
HGLB 2020-080-6		8				50	6	7,080	8.23	8.46	8.72	8.99	9.59
HGLB 2020-100		10				45	4	4,680	10.29	10.59	10.92	11.26	12.04
HGLB 2020-100-6		10				50	6	7,080	10.29	10.59	10.92	11.26	12.04
HGLB 2020-120		12				45	4	4,680	12.35	12.72	13.12	13.54	14.48
HGLB 2020-120-6		12				50	6	7,080	12.35	12.72	13.12	13.54	14.48
HGLB 2020-140		14				45	4	4,680	14.41	14.85	15.32	15.82	16.93
HGLB 2020-160		16				45	4	4,680	16.48	16.98	17.52	18.10	19.38
HGLB 2020-200		20				60	4	4,680	20.60	21.24	21.92	22.65	No Interference
HGLB 2020-250		25				60	4	6,480	25.76	26.56	27.42	28.34	No Interference
HGLB 2020-300		30				70	4	7,320	30.92	31.89	32.93	No Interference	No Interference
HGLB 2030-060	R1.5	6	2.4	2.95	16°	60	6	4,680	6.20	6.35	6.52	6.69	7.09
HGLB 2030-080		8				60	6	4,680	8.26	8.48	8.72	8.97	9.54
HGLB 2030-100		10				60	6	5,400	10.32	10.61	10.92	11.25	11.99
HGLB 2030-120		12				60	6	5,640	12.38	12.74	13.12	13.53	14.43
HGLB 2030-140		14				60	6	6,240	14.45	14.87	15.32	15.80	16.88
HGLB 2030-160		16				60	6	6,240	16.51	17.00	17.52	18.08	19.33
HGLB 2030-180		18				60	6	6,280	18.57	19.13	19.72	20.36	21.78
HGLB 2030-200		20				70	6	6,000	20.64	21.26	21.92	22.64	24.22
HGLB 2030-220		22				70	6	6,040	22.70	23.39	24.12	24.91	26.67
HGLB 2030-250		25				70	6	6,000	25.79	26.58	27.43	28.33	30.34
HGLB 2030-270		27				70	6	6,040	27.86	28.71	29.63	30.61	No Interference
HGLB 2030-300		30				70	6	6,840	30.95	31.91	32.93	34.02	No Interference

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	Suggested Retail Price ¥	Effective Length by Inclined Angles				
									30′	1°	1°30′	2°	3°
HGLB 2040-080	R2	8	3.2	3.95	16°	70	6	4,800	8.24	8.45	8.67	8.90	9.43
HGLB 2040-100		10				70	6	4,800	10.31	10.58	10.87	11.18	11.88
HGLB 2040-120		12				70	6	6,240	12.37	12.71	13.07	13.46	14.32
HGLB 2040-140		14				70	6	6,240	14.43	14.84	15.27	15.74	16.77
HGLB 2040-160		16				70	6	6,240	16.49	16.97	17.47	18.01	19.22
HGLB 2040-180		18				70	6	6,380	18.56	19.10	19.67	20.29	No Interference
HGLB 2040-200		20				70	6	6,240	20.62	21.23	21.87	22.57	No Interference
HGLB 2040-220		22				70	6	6,380	22.68	23.36	24.08	24.85	No Interference
HGLB 2040-250		25				70	6	6,240	25.78	26.55	27.38	28.26	No Interference
HGLB 2040-270		27				70	6	6,380	27.84	28.68	29.58	30.54	No Interference
HGLB 2040-300		30				70	6	6,240	30.93	31.87	32.88	No Interference	No Interference
HGLB 2040-350		35				80	6	7,200	36.09	37.20	38.38	No Interference	No Interference
HGLB 2040-400		40				90	6	8,040	41.25	42.52	No Interference	No Interference	No Interference
HGLB 2060-100	R3	10	4.8	5.95	—	80	6	7,800	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-150		15				80	6	7,800	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-180		18				80	6	7,890	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-200		20				80	6	7,800	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-250		25				80	6	7,800	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-300		30				80	6	8,040	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-350		35				80	6	8,040	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-400		40				90	6	8,760	No Interference	No Interference	No Interference	No Interference	No Interference
HGLB 2060-500		50				120	6	9,480	No Interference	No Interference	No Interference	No Interference	No Interference

Milling Conditions for HGLB

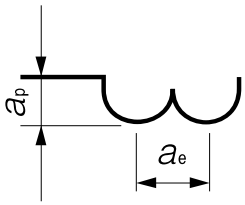
WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS NAK / STAVAX (~55HRC)				HARDENED STEELS SKD11 (55~62HRC)				HARDENED STEELS HAP10 (62~66HRC)				HARDENED STEELS HAP72 (66~70HRC)			
Model Number	Radius of Ball Nose (mm)	Effective Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (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)
2001-002	**R0.05**	0.2	48,000	200	0.005	0.01	48,000	200	0.005	0.01	48,000	150	0.003	0.006	40,000	120	0.002	0.004
2001-003		0.3	48,000	200	0.005	0.01	48,000	200	0.005	0.01	48,000	150	0.003	0.006	40,000	120	0.002	0.004
2001-005		0.5	48,000	200	0.005	0.01	48,000	200	0.005	0.01	48,000	150	0.003	0.006	40,000	120	0.002	0.004
20015-003	**R0.075**	0.3	48,000	230	0.007	0.014	48,000	230	0.007	0.014	48,000	170	0.005	0.01	40,000	135	0.003	0.006
20015-005		0.5	48,000	230	0.007	0.014	48,000	230	0.007	0.014	48,000	170	0.005	0.01	40,000	135	0.003	0.006
20015-0075		0.75	48,000	230	0.007	0.014	48,000	230	0.007	0.014	48,000	170	0.005	0.01	40,000	135	0.003	0.006
20015-010		1	38,400	160	0.005	0.01	38,400	160	0.005	0.01	38,400	120	0.003	0.007	32,000	90	0.002	0.004
2002-003	**R0.1**	0.3	44,000	250	0.01	0.03	42,000	250	0.01	0.03	40,000	200	0.008	0.024	36,000	150	0.006	0.018
2002-005		0.5	44,000	250	0.01	0.03	42,000	250	0.01	0.03	40,000	200	0.008	0.024	36,000	150	0.006	0.018
2002-0075		0.75	44,000	250	0.01	0.03	42,000	250	0.01	0.03	40,000	200	0.008	0.024	36,000	150	0.006	0.018
2002-010		1	44,000	250	0.01	0.03	42,000	250	0.01	0.03	40,000	200	0.008	0.024	36,000	150	0.006	0.018
2002-015		1.5	35,200	175	0.008	0.023	33,600	175	0.008	0.023	32,000	140	0.006	0.018	28,800	100	0.004	0.012
2002-020		2	35,200	120	0.003	0.008	33,600	100	0.003	0.008	32,000	90	0.003	0.008	28,800	70	0.002	0.006
2003-005	**R0.15**	0.5	44,000	400	0.01	0.03	42,000	350	0.01	0.03	40,000	300	0.01	0.03	36,000	250	0.008	0.024
2003-0075		0.75	44,000	400	0.01	0.03	42,000	350	0.01	0.03	40,000	300	0.01	0.03	36,000	250	0.008	0.024
2003-010		1	44,000	400	0.01	0.03	42,000	350	0.01	0.03	40,000	300	0.01	0.03	36,000	250	0.008	0.024
2003-015		1.5	44,000	400	0.01	0.03	42,000	350	0.01	0.03	40,000	300	0.01	0.03	36,000	250	0.008	0.024
2003-020		2	35,200	280	0.008	0.023	33,600	245	0.008	0.023	32,000	210	0.008	0.023	28,800	175	0.006	0.018
2003-025		2.5	35,200	185	0.006	0.017	33,600	165	0.006	0.017	32,000	150	0.006	0.017	28,800	115	0.005	0.014
2003-030		3	35,200	140	0.004	0.01	33,600	125	0.004	0.01	32,000	110	0.004	0.01	28,800	85	0.003	0.009
2004-005	**R0.2**	0.5	44,000	600	0.015	0.045	42,000	550	0.015	0.045	40,000	500	0.013	0.036	36,000	350	0.01	0.027
2004-0075		0.75	44,000	600	0.015	0.045	42,000	550	0.015	0.045	40,000	500	0.013	0.036	36,000	350	0.01	0.027
2004-010		1	44,000	600	0.015	0.045	42,000	550	0.015	0.045	40,000	500	0.013	0.036	36,000	350	0.01	0.027
2004-0125		1.25	44,000	600	0.015	0.045	42,000	550	0.015	0.045	40,000	500	0.013	0.036	36,000	350	0.01	0.027
2004-015		1.5	44,000	600	0.015	0.045	42,000	550	0.015	0.045	40,000	500	0.013	0.036	36,000	350	0.01	0.027
2004-020		2	44,000	600	0.015	0.045	42,000	550	0.015	0.045	40,000	500	0.013	0.036	36,000	350	0.01	0.027
2004-025		2.5	35,200	420	0.011	0.034	33,600	385	0.011	0.034	32,000	350	0.01	0.027	28,800	250	0.008	0.02
2004-030		3	35,200	330	0.008	0.024	33,600	310	0.008	0.024	32,000	280	0.008	0.022	28,000	200	0.006	0.016
2004-035		3.5	35,200	300	0.007	0.022	31,900	280	0.007	0.022	30,400	250	0.007	0.02	26,600	175	0.005	0.014
2004-040		4	35,200	270	0.006	0.019	30,240	250	0.006	0.019	28,800	220	0.006	0.018	25,200	150	0.004	0.012
2005-010	**R0.25**	1	44,000	900	0.02	0.065	40,000	800	0.015	0.05	36,000	600	0.015	0.05	30,000	400	0.015	0.03
2005-015		1.5	44,000	900	0.02	0.065	40,000	800	0.015	0.05	36,000	600	0.015	0.05	30,000	400	0.015	0.03
2005-020		2	44,000	900	0.02	0.065	40,000	800	0.015	0.05	36,000	600	0.015	0.05	30,000	400	0.015	0.03
2005-025		2.5	44,000	900	0.02	0.065	40,000	800	0.015	0.05	36,000	600	0.015	0.05	30,000	400	0.015	0.03
2005-030		3	32,700	450	0.01	0.04	31,500	400	0.01	0.03	30,000	300	0.008	0.03	24,000	200	0.007	0.015
2005-035		3.5	32,700	450	0.01	0.04	31,500	400	0.01	0.03	30,000	300	0.008	0.03	24,000	200	0.007	0.015
2005-040		4	32,700	450	0.01	0.04	31,500	400	0.01	0.03	30,000	300	0.008	0.03	24,000	200	0.007	0.015
2005-045		4.5	29,430	405	0.008	0.03	28,350	360	0.008	0.025	27,000	270	0.006	0.025	21,600	180	0.005	0.013
2005-050		5	26,160	360	0.005	0.02	25,200	320	0.005	0.02	24,000	240	0.004	0.02	19,200	160	0.003	0.01
2005-060		6	26,160	360	0.005	0.02	25,200	320	0.005	0.02	24,000	240	0.004	0.02	19,200	160	0.003	0.01

Milling Conditions for HGLB

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)	Effective Length (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)
2006-010		1	40,000	1,400	0.045	0.15	36,000	1,500	0.03	0.13	32,000	1,000	0.02	0.1	25,000	600	0.02	0.1
2006-015		1.5	40,000	1,400	0.03	0.13	36,000	1,300	0.03	0.13	32,000	1,000	0.02	0.1	25,000	600	0.02	0.1
2006-020		2	40,000	1,400	0.03	0.13	36,000	1,300	0.03	0.13	32,000	1,000	0.02	0.1	25,000	600	0.02	0.1
2006-025		2.5	40,000	1,200	0.025	0.1	36,000	1,100	0.025	0.1	32,000	900	0.02	0.1	25,000	500	0.02	0.1
2006-030		3	40,000	1,200	0.025	0.1	36,000	1,100	0.025	0.1	32,000	900	0.02	0.1	25,000	500	0.02	0.1
2006-035		3.5	40,000	1,100	0.023	0.09	34,000	950	0.023	0.09	32,000	800	0.018	0.09	25,000	450	0.015	0.09
2006-040	**R0.3**	4	40,000	1,000	0.02	0.08	32,000	800	0.02	0.08	32,000	700	0.015	0.07	25,000	400	0.01	0.075
2006-045		4.5	32,000	600	0.01	0.07	28,000	600	0.01	0.05	25,600	500	0.01	0.05	20,000	300	0.005	0.05
2006-050		5	32,000	600	0.01	0.07	28,000	600	0.01	0.05	25,600	500	0.01	0.05	20,000	300	0.005	0.05
2006-055		5.5	32,000	600	0.01	0.07	28,000	600	0.01	0.05	25,600	500	0.01	0.05	20,000	300	0.005	0.05
2006-060		6	32,000	600	0.01	0.07	28,000	600	0.01	0.05	25,600	500	0.01	0.05	20,000	300	0.005	0.05
2006-080		8	25,600	480	0.008	0.02	22,400	480	0.008	0.02	20,480	350	0.007	0.02	16,000	210	0.004	0.01
2006-100		10	20,480	390	0.006	0.02	17,920	390	0.006	0.02	16,400	250	0.005	0.02	12,800	150	0.003	0.01
2008-020		2	35,000	1,600	0.06	0.21	30,000	1,600	0.04	0.17	26,000	1,350	0.04	0.15	20,000	700	0.02	0.12
2008-025		2.5	35,000	1,600	0.06	0.21	30,000	1,600	0.04	0.17	26,000	1,350	0.04	0.15	20,000	700	0.02	0.12
2008-030		3	35,000	1,600	0.06	0.21	30,000	1,600	0.04	0.17	26,000	1,350	0.04	0.15	20,000	700	0.02	0.12
2008-040	**R0.4**	4	35,000	1,600	0.06	0.21	30,000	1,600	0.04	0.17	26,000	1,350	0.04	0.15	20,000	700	0.02	0.12
2008-050		5	31,500	1,300	0.04	0.17	27,500	1,300	0.03	0.15	23,400	1,000	0.03	0.11	18,000	530	0.015	0.09
2008-060		6	28,000	1,000	0.02	0.12	25,000	1,000	0.02	0.12	20,800	675	0.02	0.075	16,000	350	0.01	0.06
2008-070		7	25,200	900	0.02	0.11	22,500	900	0.02	0.11	18,700	600	0.018	0.068	14,400	330	0.009	0.05
2008-080		8	22,400	800	0.02	0.1	20,000	800	0.02	0.1	16,640	540	0.016	0.06	12,800	300	0.008	0.048
2010-020		2	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
2010-025		2.5	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
2010-030		3	30,000	1,750	0.1	0.3	24,000	2,000	0.1	0.2	21,000	1,750	0.03	0.17	16,000	875	0.03	0.17
2010-040		4	30,000	1,750	0.1	0.3	24,000	2,000	0.1	0.2	21,000	1,750	0.03	0.17	16,000	875	0.03	0.17
2010-050		5	30,000	1,750	0.1	0.3	24,000	2,000	0.1	0.2	21,000	1,750	0.03	0.17	16,000	875	0.03	0.17
2010-060		6	30,000	1,150	0.06	0.23	21,500	1,250	0.03	0.17	19,700	1,050	0.025	0.15	14,500	525	0.025	0.15
2010-070	**R0.5**	7	27,000	980	0.04	0.19	20,000	920	0.02	0.15	19,000	770	0.02	0.14	14,200	380	0.02	0.14
2010-080		8	24,000	800	0.025	0.155	18,500	580	0.015	0.12	18,400	480	0.015	0.12	13,800	240	0.015	0.12
2010-100		10	22,000	600	0.018	0.13	14,800	430	0.01	0.09	14,700	360	0.01	0.09	14,700	360	0.01	0.09
2010-120		12	14,150	320	0.015	0.12	13,400	380	0.008	0.08	13,300	290	0.008	0.08	13,300	290	0.008	0.08
2010-140		14	13,500	280	0.012	0.1	12,000	350	0.007	0.08	12,000	220	0.007	0.08	12,000	220	0.007	0.08
2010-160		16	12,150	250	0.011	0.09	10,800	320	0.006	0.07	10,800	200	0.006	0.07	10,800	200	0.006	0.07
2015-030		3	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
2015-040		4	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
2015-060		6	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
2015-080		8	23,500	1,300	0.1	0.37	15,000	1,250	0.045	0.25	14,000	1,050	0.03	0.21	10,500	525	0.03	0.21
2015-100	**R0.75**	10	23,500	1,300	0.1	0.37	15,000	1,250	0.045	0.25	14,000	1,050	0.03	0.21	10,500	525	0.03	0.21
2015-120		12	13,100	480	0.03	0.21	13,000	580	0.02	0.17	13,000	480	0.02	0.17	9,750	240	0.02	0.17
2015-140		14	11,200	400	0.025	0.19	10,900	490	0.015	0.145	10,900	390	0.015	0.145	8,200	190	0.015	0.145
2015-160		16	10,000	360	0.023	0.17	9,800	440	0.014	0.13	9,800	350	0.014	0.13	7,380	170	0.014	0.13
2015-200		20	8,900	320	0.02	0.15	8,700	390	0.012	0.12	8,700	310	0.012	0.12	6,560	150	0.012	0.12

Milling Conditions for HGLB

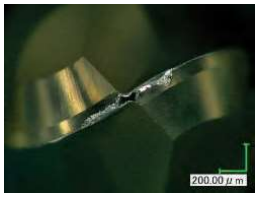
WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS NAK / STAVAX (~55HRC)				HARDENED STEELS SKD11 (55~62HRC)				HARDENED STEELS HAP10 (62~66HRC)				HARDENED STEELS HAP72 (66~70HRC)			
Model Number	Radius of Ball Nose (mm)	Effective Length (mm)	Spindle Speed (min^{-1})	Feed Rate (mm/min)	a_p Axial Depth (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)
2020-030	R1	3	28,000	2,900	0.3	0.7	14,000	2,100	0.15	0.5	14,700	2,100	0.15	0.35	12,250	1,800	0.08	0.35
2020-040		4	28,000	2,900	0.3	0.7	14,000	2,100	0.15	0.5	14,700	2,100	0.15	0.35	12,250	1,800	0.08	0.35
2020-060		6	28,000	2,900	0.2	0.6	14,000	2,100	0.1	0.4	14,700	2,100	0.15	0.3	12,250	1,800	0.06	0.3
2020-080		8	28,000	2,900	0.2	0.6	14,000	2,100	0.1	0.4	14,700	2,100	0.15	0.3	12,250	1,800	0.06	0.3
2020-100		10	28,000	2,900	0.2	0.6	14,000	2,100	0.1	0.4	14,700	2,100	0.15	0.3	12,250	1,800	0.06	0.3
2020-120		12	19,500	1,350	0.12	0.45	12,400	1,350	0.06	0.34	13,800	1,320	0.09	0.27	11,500	1,100	0.045	0.27
2020-140		14	19,500	1,350	0.12	0.45	12,400	1,350	0.06	0.34	13,800	1,320	0.09	0.27	11,500	1,100	0.045	0.27
2020-160		16	10,800	500	0.05	0.3	10,800	600	0.03	0.24	12,840	588	0.06	0.24	10,700	490	0.03	0.24
2020-200		20	10,800	500	0.035	0.25	10,800	450	0.02	0.19	10,270	440	0.04	0.19	8,560	370	0.02	0.19
2020-250		25	9,720	450	0.032	0.23	9,720	410	0.018	0.17	9,250	400	0.036	0.17	7,700	330	0.018	0.17
2020-300		30	8,650	400	0.028	0.2	8,650	360	0.016	0.15	8,200	350	0.032	0.15	6,850	300	0.016	0.15
2030-060	R1.5	6	21,000	3,000	0.4	1	13,250	2,500	0.24	0.55	11,040	2,280	0.24	0.55	9,200	1,900	0.12	0.55
2030-080		8	21,000	3,000	0.4	1	13,250	2,500	0.24	0.55	11,040	2,280	0.24	0.55	9,200	1,900	0.12	0.55
2030-100		10	21,000	3,000	0.3	0.9	12,200	2,300	0.2	0.5	11,040	2,280	0.2	0.5	9,200	1,900	0.1	0.5
2030-120		12	21,000	3,000	0.3	0.9	12,200	2,300	0.2	0.5	11,040	2,280	0.2	0.5	9,200	1,900	0.1	0.5
2030-140		14	21,000	3,000	0.3	0.9	12,200	2,300	0.2	0.5	11,040	2,280	0.2	0.5	9,200	1,900	0.1	0.5
2030-160		16	21,000	3,000	0.3	0.9	12,200	2,300	0.2	0.5	11,040	2,280	0.2	0.5	9,200	1,900	0.1	0.5
2030-180		18	17,750	2,300	0.24	0.8	11,750	1,850	0.18	0.48	10,680	1,830	0.18	0.48	8,900	1,525	0.088	0.48
2030-200		20	14,500	1,600	0.18	0.7	11,350	1,400	0.15	0.45	10,320	1,380	0.15	0.45	8,600	1,150	0.075	0.45
2030-220		22	13,000	1,440	0.16	0.63	11,000	1,020	0.13	0.42	9,960	1,000	0.13	0.42	8,300	830	0.063	0.42
2030-250		25	11,600	1,280	0.14	0.56	10,500	620	0.1	0.38	9,600	610	0.1	0.38	8,000	510	0.05	0.38
2030-270		27	10,500	1,150	0.13	0.51	9,000	540	0.08	0.34	8,200	530	0.08	0.34	6,850	440	0.04	0.34
2030-300		30	9,280	1,020	0.11	0.45	7,500	450	0.06	0.29	6,840	440	0.06	0.29	5,700	370	0.03	0.29
2040-080	R2	8	18,000	3,200	0.5	1.3	11,380	2,880	0.36	0.95	9,480	2,400	0.3	0.75	7,900	2,000	0.15	0.75
2040-100		10	18,000	3,200	0.5	1.3	11,380	2,880	0.36	0.95	9,480	2,400	0.3	0.75	7,900	2,000	0.15	0.75
2040-120		12	18,000	3,200	0.4	1.2	11,380	2,880	0.31	0.85	9,480	2,400	0.26	0.7	7,900	2,000	0.13	0.7
2040-140		14	18,000	3,200	0.4	1.2	11,380	2,880	0.31	0.85	9,480	2,400	0.26	0.7	7,900	2,000	0.13	0.7
2040-160		16	18,000	3,200	0.4	1.2	11,380	2,880	0.31	0.85	9,480	2,400	0.26	0.7	7,900	2,000	0.13	0.7
2040-180		18	18,000	3,200	0.4	1.2	11,380	2,880	0.31	0.85	9,480	2,400	0.26	0.7	7,900	2,000	0.13	0.7
2040-200		20	18,000	3,200	0.4	1.2	10,730	1,800	0.21	0.7	8,940	1,500	0.18	0.55	7,450	1,250	0.09	0.55
2040-220		22	15,250	2,250	0.33	1.1	10,730	1,800	0.21	0.7	8,940	1,500	0.18	0.55	7,450	1,250	0.09	0.55
2040-250		25	12,500	1,250	0.25	0.95	10,730	1,800	0.21	0.7	8,940	1,500	0.18	0.55	7,450	1,250	0.09	0.55
2040-270		27	11,500	1,150	0.23	0.9	10,400	1,250	0.18	0.58	8,670	1,050	0.15	0.5	7,250	890	0.075	0.5
2040-300		30	10,630	1,000	0.2	0.76	10,080	780	0.15	0.45	8,400	650	0.12	0.45	7,000	540	0.06	0.45
2040-350		35	9,030	800	0.16	0.61	8,640	730	0.13	0.43	7,200	610	0.11	0.43	6,000	510	0.055	0.43
2040-400		40	8,300	700	0.14	0.54	8,000	700	0.12	0.42	6,650	590	0.11	0.42	5,500	500	0.05	0.42
2060-100	R3	10	14,400	3,200	0.5	1.5	9,140	2,880	0.38	1.05	7,620	2,400	0.32	0.88	6,350	2,000	0.16	0.88
2060-150		15	14,400	3,200	0.5	1.5	9,140	2,880	0.38	1.05	7,620	2,400	0.32	0.88	6,350	2,000	0.16	0.88
2060-180		18	14,400	3,200	0.5	1.5	9,140	2,880	0.38	1.05	7,620	2,400	0.32	0.88	6,350	2,000	0.16	0.88
2060-200		20	14,400	3,200	0.5	1.5	9,000	2,300	0.32	0.95	7,620	2,400	0.32	0.88	6,350	2,000	0.16	0.88
2060-250		25	14,400	3,200	0.5	1.5	8,100	2,000	0.3	0.95	7,500	1,920	0.27	0.805	6,250	1,600	0.135	0.805
2060-300		30	14,400	3,200	0.5	1.5	7,700	1,800	0.26	0.88	7,440	1,500	0.22	0.73	6,200	1,250	0.11	0.73
2060-350		35	9,200	2,050	0.32	1	6,200	1,450	0.21	0.71	6,000	1,200	0.18	0.59	5,000	1,000	0.09	0.59
2060-400		40	7,000	1,050	0.2	0.8	5,600	1,000	0.19	0.64	4,800	950	0.14	0.47	4,000	810	0.07	0.47
2060-500		50	5,600	850	0.16	0.6	4,500	810	0.15	0.52	3,900	780	0.12	0.38	3,200	650	0.06	0.38



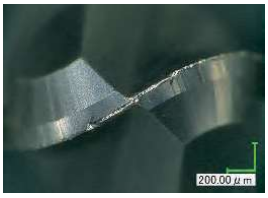
Note:
- Decrease the feed rate more than 50% from the milling parameters when slot milling.
- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machines maximum speed, or when the tool is chattering and heats up to a red color.
- Every coolant offers stable milling.

Wear Comparison HGLB R1 × EL6 HAP72 (69HRC)

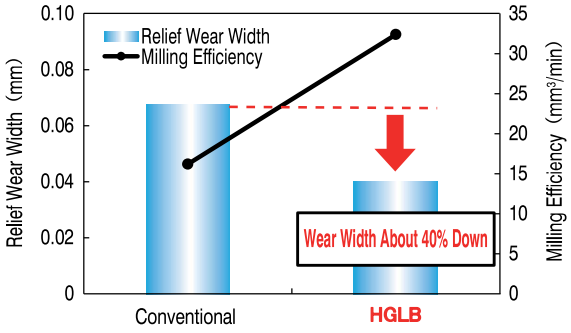
Tools after milling



Conventional



HGLB



HGLB mills twice as efficiently as the conventional tool.

Tool	Conventional	HGLB 2020-060
Spindle Speed	9,200 min^{-1}	12,250 min^{-1}
Feed Rate	900 mm/min	1,800 mm/min
a_p	0.06 mm	
a_e	0.3 mm	
Coolant	Air Blow (Through Spindle)	
Milling Shape	Square Pocket (20 x 15 x Depth 2 mm) × 2 Pockets	
Cycle Time	76 min	50 min

Milling Efficiency (mm^3/min) = Feed Rate × a_p × a_e