Size φ2～φ12

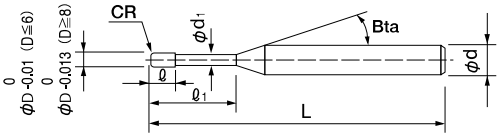
HGRRS

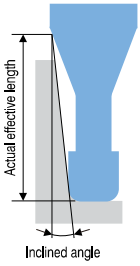
NEW

Super MG | HMG COAT | 45° | R | R ±0.003 (φ2～φ6) | R ±0.005 (φ8～φ12) | Shank Dia 0/-0.004 (φ2～φ6) | Shank Dia 0/-0.005 (φ8～φ12) | Back Taper Geometry | Variable Pitch

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										
		○	●	●	★	●	●										



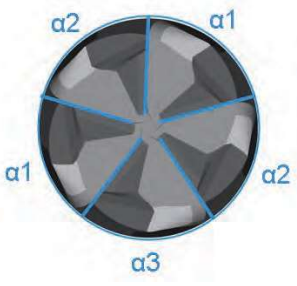


The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

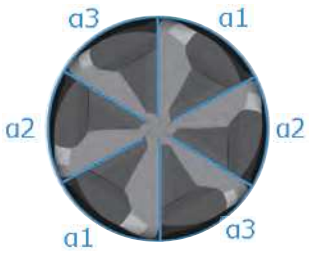
High efficiency

Multi-flutes, variable pitch and a short length of cut are some of the features that are very suitable for bottom surface milling.

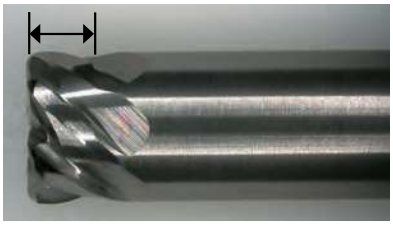
5 Flutes
φ 2～φ 4



6 Flutes
φ 6～φ 12



Short length of cut for high rigidity



High precision

Outside Diameter	Diameter Tolerance	Radius Accuracy
φ2～6	0/-0.01	±0.003
φ8～12	0/-0.013	±0.005

Total 19 models

Unit (mm)

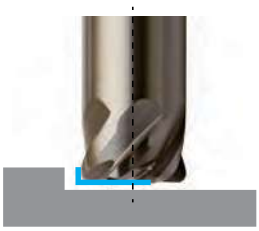
Model Number	Outside Diameter φD	Corner Radius CR	Effective Length ℓ1	Length of Cut ℓ	Neck Diameter φd1	Shank Taper Angle Bta	Overall Length L	Shank Diameter φd	Number of Flutes	Suggested Retail Price ¥
HGRRS 5020-05-06	2	R0.5	6	1	1.95	16°	50	4	5	9,920
HGRRS 5030-08-09	3	R0.8	9	1.5	2.95	16°	60	4	5	10,210
HGRRS 5040-05-12	4	R0.5	12	2	3.95	—	60	4	5	9,450
HGRRS 5040-05-12-6						16°	60	6		10,960
HGRRS 5040-10-12		R1				—	60	4		9,450
HGRRS 5040-10-12-6						16°	60	6		10,960
HGRRS 6060-03-18	6	R0.3	18	2.5	5.95	—	60	6	6	12,660
HGRRS 6060-05-18		R0.5					60	6		12,660
HGRRS 6060-10-18		R1					60	6		12,660
HGRRS 6060-15-18		R1.5					60	6		12,660
HGRRS 6080-05-24	8	R0.5	24	3.4	7.87	—	70	8	6	15,780
HGRRS 6080-10-24		R1					70	8		15,780
HGRRS 6080-20-24		R2					70	8		15,780
HGRRS 6100-05-30	10	R0.5	30	4.2	9.87	—	80	10	6	20,790
HGRRS 6100-10-30		R1					80	10		20,790
HGRRS 6100-20-30		R2					80	10		20,790
HGRRS 6120-05-36	12	R0.5	36	5	11.87	—	90	12	6	26,180
HGRRS 6120-10-36		R1					90	12		26,180
HGRRS 6120-20-36		R2					90	12		26,180

Flat surface milling example
HGRRS φ6 × CR0.5 × EL18

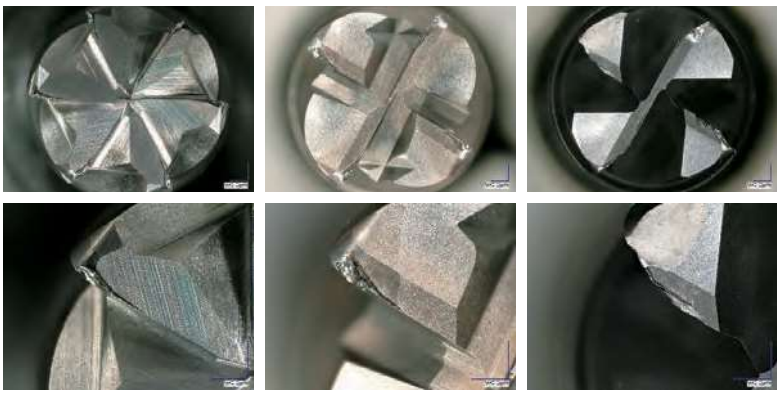
SKD11 (60HRC)

Stable milling and wear resistance are achievable even when using high efficiency milling conditions.

Spindle Speed	3,000 min^{-1}
Feed Rate	6,800 mm/min
a_p	0.08 mm
a_e	4.1 mm
Work Size	100 × 200 × 2.4 mm
Cycle Time	30 min



a_e 4.1mm for a tool diameter of φ6.



Relief wear width (mm)		
HGRRS	Conventional	Competitor
0.163	0.296	Chipping

Thin cut wide pitch milling
ϕ6 × CR0.5 Compared to catalogue conditions

SKD11 (60HRC)

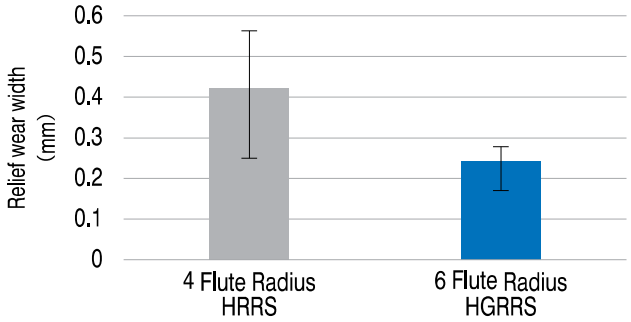
Tool Series	Number of Flutes	Spindle Speed (min^{-1})	Feed Rate (mm/min)	Feed per tooth (mm/t)	a_p (mm)	a_e (mm)	Material Removal Ammount (mm^3/min)
HGRRS 	6 flutes	3,000	6,800	0.378	0.08	**4.1**	2,230
HRRS 	4 flutes	6,000	2,070	0.086	0.11	1.08	246

High efficiency bottom surface milling is possible due to large a_e

When feed rate cannot be increased
ϕ6 × CR0.5

SKD11 (60HRC)

	Spindle Speed (min^{-1})	Feed Rate (mm/min)	Feed per tooth (mm/t)	a_p (mm)	a_e (mm)	Material Removal Ammount (mm^3/min)
HGRRS Catalogue conditions	3,000	6,800	0.378	0.08	4.1	2,230
Feed rate lowered (Catalogue condition for 4 flutes radius HRRS)	6,000	**2,070**	0.058	0.11	1.08	246



HGRRS display wear resistance even under conditions with low feed rate.

Milling Conditions for HGRRS

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	Outside Diameter (mm)	Corner Radius (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)
5020-05-06	2	R0.5	10,000	2,700	0.07	0.8	8,000	2,000	0.05	0.8	2,640	2,500	0.05	0.6	2,400	2,270	0.05	0.56
5030-08-09	3	R0.8	8,500	4,000	0.1	1.3	5,500	3,000	0.05	1.3	1,980	1,980	0.05	0.9	1,800	1,800	0.05	0.78
5040-05-12	4	R0.5	7,500	5,000	0.11	1.8	4,300	4,000	0.06	1.8	1,540	1,650	0.06	1.2	1,400	1,500	0.06	1.1
5040-05-12-6			7,500	5,000	0.11	1.8	4,300	4,000	0.06	1.8	1,540	1,650	0.06	1.2	1,400	1,500	0.06	1.1
5040-10-12		R1	7,500	5,000	0.11	1.8	4,300	4,000	0.06	1.8	1,540	1,650	0.06	1.2	1,400	1,500	0.06	1.1
5040-10-12-6			7,500	5,000	0.11	1.8	4,300	4,000	0.06	1.8	1,540	1,650	0.06	1.2	1,400	1,500	0.06	1.1
6060-03-18	6	R0.3	6,000	7,800	0.12	4.1	3,000	6,800	0.08	4.1	1,100	1,760	0.08	1.9	1,000	1,600	0.08	1.7
6060-05-18		R0.5	6,000	7,800	0.12	4.1	3,000	6,800	0.08	4.1	1,100	1,760	0.08	1.9	1,000	1,600	0.08	1.7
6060-10-18		R1	6,000	7,800	0.12	3.6	3,000	6,800	0.08	3.6	1,100	1,760	0.08	1.9	1,000	1,600	0.08	1.7
6060-15-18		R1.5	6,000	7,800	0.12	2.7	3,000	6,800	0.08	2.7	1,100	1,760	0.08	1.9	1,000	1,600	0.08	1.7
6080-05-24	8	R0.5	4,800	6,600	0.12	3.6	2,000	6,300	0.08	3.6	830	1,760	0.08	2.2	750	1,600	0.08	2
6080-10-24		R1	4,800	6,600	0.12	3.6	2,000	6,300	0.08	3.6	830	1,760	0.08	2.2	750	1,600	0.08	2
6080-20-24		R2	4,800	6,600	0.2	3.6	2,000	6,300	0.08	3.6	830	1,760	0.08	2.2	750	1,600	0.08	2
6100-05-30	10	R0.5	4,300	6,200	0.11	5.4	1,500	5,800	0.08	5.4	620	1,820	0.08	2.5	560	1,650	0.08	2.3
6100-10-30		R1	4,300	6,200	0.11	5.4	1,500	5,800	0.08	5.4	620	1,820	0.08	2.5	560	1,650	0.08	2.3
6100-20-30		R2	4,300	6,200	0.2	5.4	1,500	5,800	0.08	5.4	620	1,820	0.08	2.5	560	1,650	0.08	2.3
6120-05-36	12	R0.5	4,000	6,000	0.1	7.38	1,000	5,200	0.08	7.38	360	1,910	0.08	3.3	330	1,740	0.08	3
6120-10-36		R1	4,000	6,000	0.1	7.38	1,000	5,200	0.08	7.38	360	1,910	0.08	3.3	330	1,740	0.08	3
6120-20-36		R2	4,000	6,000	0.2	7.38	1,000	5,200	0.08	7.38	360	1,910	0.08	3.3	330	1,740	0.08	3

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 machine's maximum spindle speed, or when chattering and red-hot occur.
- Every coolant offers stable milling.