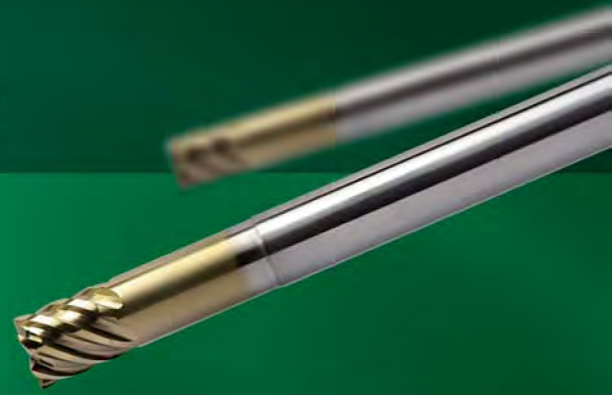


# HARDMAX 6 Flute Long Neck Radius End Mills

## HHRS Size $\phi 6 \sim \phi 12$



Material Applications (☆ Highly Recommended ◎ Recommended ○ Suggested)

Work Material															
CARBON STEELS S45C S55C	ALLOY STEELS SK/SCM SUS	PREHARDENED STEELS NAK HPM	HARDENED STEELS			CAST IRON	ALUMINUM ALLOYS	GRAPHITE	COPPER	PLASTICS	GLASS FILLED PLASTICS	TITANIUM ALLOYS	HEAT RESISTANT ALLOYS	CEMENTED CARBIDE	HARD BRITTLE (NON-METALLIC) MATERIALS
			~55HRC	~60HRC	~70HRC										
○	○	◎	◎	○		○			○			○	○		

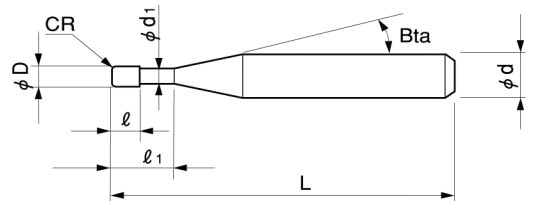
Features

Long neck radius design for milling on Harder Steels.  
High rigid 6 flute radius end mills.

**NEW**

Launching in July 2015

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.



Total 14 models

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_1$	Length of Cut $l$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$
HHRS 6060-01-210	6	RO.1	21	6	5.95	—	60	6
HHRS 6060-02-210		RO.2					60	6
HHRS 6060-03-210		RO.3					60	6
HHRS 6060-05-210		RO.5					60	6
HHRS 6060-10-210		R1					60	6
HHRS 6080-03-260	8	RO.3	26	8	7.81	—	80	8
HHRS 6080-05-260		RO.5					80	8
HHRS 6080-10-260		R1					80	8
HHRS 6100-03-310	10	RO.3	31	10	9.81	—	80	10
HHRS 6100-05-310		RO.5					80	10
HHRS 6100-10-310		R1					80	10
HHRS 6120-03-370	12	RO.3	37	12	11.81	—	100	12
HHRS 6120-05-370		RO.5					100	12
HHRS 6120-10-370		R1					100	12

# HHRS Milling Conditions

## Side Milling

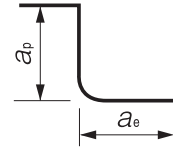
WORK MATERIAL	CARBON STEELS S45C/S50C		ALLOY STEELS SK/SCM/SUS		PREHARDENED STEELS HARDENED STEELS (30 ~ 45HRC)		HARDENED STEELS (45 ~ 55HRC)		HARDENED STEELS (55 ~ 65HRC)	
	Outside Diameter (mm)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )
6	6,300	2,650	6,300	2,650	6,300	2,650	4,800	2,000	3,200	1,600
8	4,750	2,650	4,750	2,650	4,750	2,650	3,600	2,000	2,400	1,600
10	3,800	2,650	3,800	2,650	3,800	2,650	2,850	2,000	2,000	1,600
12	3,150	2,650	3,150	2,650	3,150	2,650	2,400	2,000	1,600	1,600
Milling Amount (mm)	$a_p: 1D$ $a_e: 0.04D$		$a_p: 1D$ $a_e: 0.04D$		$a_p: 1D$ $a_e: 0.04D$		$a_p: 0.8D$ $a_e: 0.02D$		$a_p: 0.5D$ $a_e: 0.01D$	

## Flat Milling

WORK MATERIAL	CARBON STEELS S45C/S50C		ALLOY STEELS SK/SCM/SUS		PREHARDENED STEELS HARDENED STEELS (30 ~ 45HRC)		HARDENED STEELS (45 ~ 55HRC)		HARDENED STEELS (55 ~ 65HRC)	
	Outside Diameter (mm)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )	Feed Rate (mm/min)	Spindle Speed (mim <sup>-1</sup> )
6	6,300	2,650	6,300	2,650	6,300	2,650	4,800	2,000	3,200	1,600
8	4,750	2,650	4,750	2,650	4,750	2,650	3,600	2,000	2,400	1,600
10	3,800	2,650	3,800	2,650	3,800	2,650	2,850	2,000	2,000	1,600
12	3,150	2,650	3,150	2,650	3,150	2,650	2,400	2,000	1,600	1,600
Milling Amount (mm)	$a_p: 0.02D$ $a_e: 0.2D$		$a_p: 0.02D$ $a_e: 0.2D$		$a_p: 0.02D$ $a_e: 0.2D$		$a_p: 0.015D$ $a_e: 0.2D$		$a_p: 0.01D$ $a_e: 0.2D$	

### Note:

- If the milling parameters have exceeded the machine's spindle speed capacity, or when the tool is chattering and heats up to a red color, reduce both the spindle speed and feed rates proportionally.
- When milling on a side or bottom surface, set the  $a_p$  amount taking into consideration the remaining corner area.
- Recommend wet coolant for Stainless Steels.



$D$  : Outside Diameter (mm)  
 $a_p$  : Axial Depth (mm)  
 $a_e$  : Radial Depth (mm)

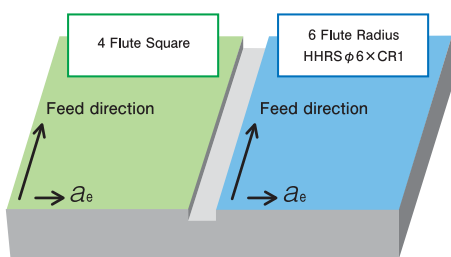
## Flat Milling Comparison between HHRS & 4 Flute Square End Mills

NAK80 (40HRC)

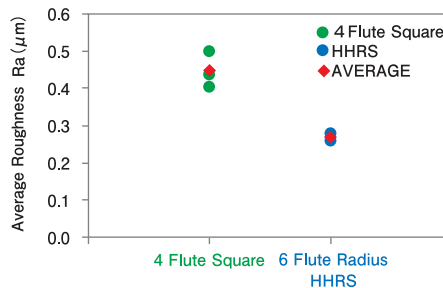
Better bottom surface roughness compared to 4 flute square type.

Spindle Speed	6,300 min <sup>-1</sup>	Radial Depth	1.2 mm
Feed Rate	2,650 mm/min	Overhang Length	22 mm
Axial Depth	0.12 mm	Coolant	Air blow (Nozzle)

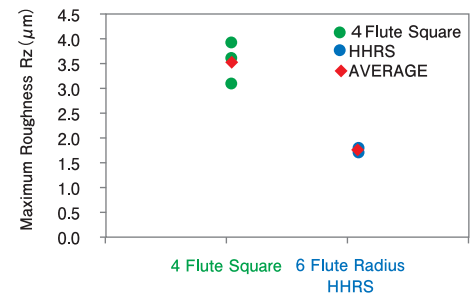
Milling Shape



Average Roughness (Ra) Comparison



Maximum Roughness (Rz) Comparison



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