



Size  $\phi 2 \sim \phi 12$

# HRRS



$\phi 2 \sim \phi 6$     $\phi 8 \sim \phi 12$

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										
		○	○	○	○										
				○	○										

Total 26 models

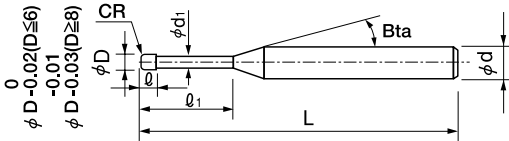
Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Price (¥)
● HRRS 4020-03-06	2	R0.3	6	2	1.91	16°	70	4	10,500
● HRRS 4020-05-06		R0.5							
○ HRRS 4030-08-09-3	3	R0.8	9	3	2.92	16°	70	3	9,800
○ HRRS 4030-08-09									
○ HRRS 4040-05-12	4	R0.5	12	4	3.82	16°	70	6	11,600
○ HRRS 4040-05-12-6									
○ HRRS 4040-10-12		R1							
○ HRRS 4040-10-12-6									
○ HRRS 4050-12-15	5	R1.2	15	5	4.82	16°	70	6	12,000
○ HRRS 4060-05-18	6	R0.5	18	6	5.82	—	90	6	13,400
○ HRRS 4060-10-18		R1							
○ HRRS 4060-15-18		R1.5							
○ HRRS 4060-20-18		R2							
○ HRRS 4080-05-24	8	R0.5	24	8	7.82	—	100	8	16,700
○ HRRS 4080-10-24		R1							
○ HRRS 4080-20-24		R2							
○ HRRS 4080-30-24		R3							
○ HRRS 4100-03-30	10	R0.3	30	10	9.82	—	110	10	22,000
○ HRRS 4100-05-30		R0.5							
○ HRRS 4100-10-30		R1							
○ HRRS 4100-20-30		R2							
○ HRRS 4100-30-30		R3					110	10	22,000
○ HRRS 4120-05-36	12	R0.5	36	12	11.82	—	120	12	27,700
○ HRRS 4120-10-36		R1							
○ HRRS 4120-20-36		R2							
○ HRRS 4120-40-36		R4							

○ Straight shank type

Features

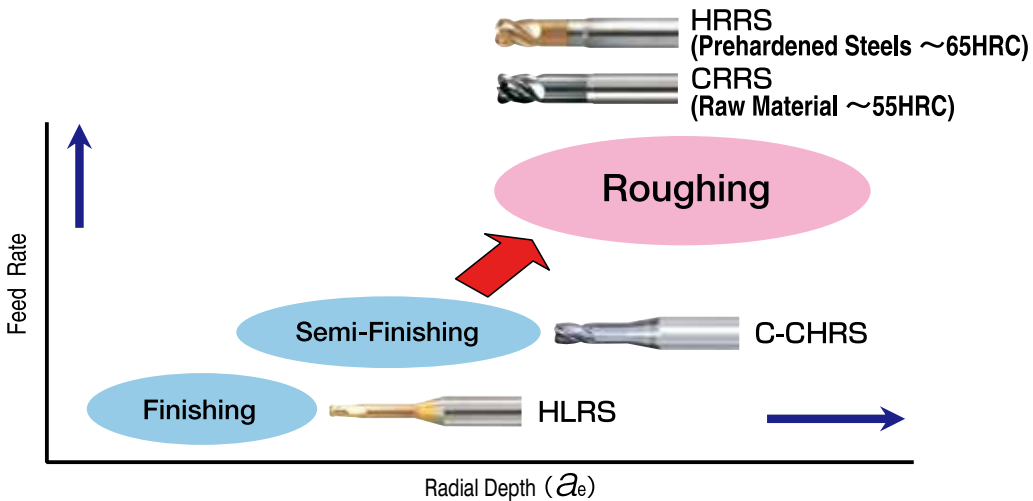
Special geometry offers greater milling amount and larger step over than a ball design. Seamless corner radius reduces cutting resistance and chattering. Rated to 65HRC milling.



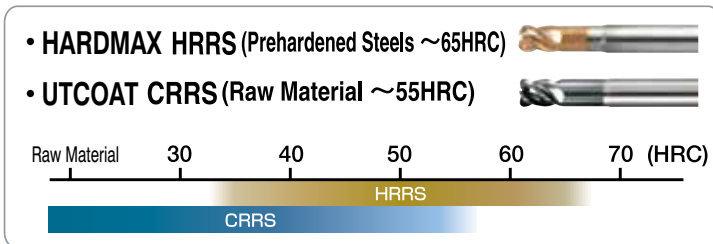
The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

UNIMAX End Mills Radius Series

Usage of Radius Series



4 Flutes Active Corner Radius End Mill's Target Hardness



- **UTCOAT CNRS**

For Hard Materials  
(Titanium and Heat Resistant Steels)

- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Spiral V Cutter
- Drill Thread Mill
- EURO Series
- Technical Data

## Milling Conditions for HRRS/HRRS-S

### ◆Roughing

WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS (30~45HRC) (Air Blow/Oil Mist)				HARDENED STEELS (45~55HRC) (Air Blow/Oil Mist)				HARDENED STEELS (55~65HRC) (Air Blow/Oil Mist)			
Model Number	Outside Diameter (mm)	Corner Radius (CR)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4020-03-06	2	R0.3	30,000	7,650	0.03	0.41	10,000	2,160	0.08	0.36	8,000	1,170	0.04	0.36
		R0.5	30,000	7,650	0.05	0.72	10,000	2,160	0.14	0.63	8,000	1,170	0.07	0.63
4030-08-09	3	R0.8	25,000	8,100	0.07	1.08	10,000	2,970	0.16	0.95	7,000	1,710	0.09	0.95
4040-05-12	4	R0.5	15,000	8,550	0.06	0.82	9,000	3,600	0.10	0.77	6,000	2,160	0.05	0.77
4040-10-12		R1	15,000	8,550	0.11	1.44	9,000	3,600	0.16	1.35	6,000	2,160	0.09	1.35
4050-12-15	5	R1.2	10,000	8,550	0.16	1.80	8,000	4,950	0.18	1.58	6,000	2,160	0.14	1.58
4060-05-18	6	R0.5	9,000	8,550	0.10	1.23	8,000	5,400	0.11	1.08	6,000	2,070	0.11	1.08
4060-10-18		R1	9,000	8,550	0.14	1.57	8,000	5,400	0.14	1.49	6,000	2,070	0.14	1.49
4060-15-18		R1.5	9,000	8,550	0.17	2.16	8,000	5,400	0.18	1.89	6,000	2,070	0.18	1.89
4060-20-18		R2	9,000	8,550	0.17	2.30	8,000	5,400	0.18	2.02	6,000	2,070	0.18	2.02
4080-05-24	8	R0.5	7,000	8,550	0.04	1.50	6,000	5,850	0.05	1.30	4,000	2,070	0.04	1.30
4080-10-24		R1	7,000	8,550	0.05	1.92	6,000	5,850	0.06	1.80	4,000	2,070	0.05	1.80
4080-20-24		R2	7,000	8,550	0.21	2.88	6,000	5,850	0.23	2.52	4,000	2,070	0.18	2.52
4080-30-24		R3	7,000	8,550	0.21	3.09	6,000	5,850	0.23	2.70	4,000	2,070	0.18	2.70
4100-03-30	10	R0.3	6,000	8,550	0.03	1.60	5,000	5,580	0.04	1.30	3,000	2,160	0.03	1.30
4100-05-30		R0.5	6,000	8,550	0.04	2.00	5,000	5,580	0.05	1.62	3,000	2,160	0.04	1.62
4100-10-30	12	R1	6,000	8,550	0.06	2.57	5,000	5,580	0.07	2.25	3,000	2,160	0.05	2.25
4100-20-30		R2	6,000	8,550	0.24	3.60	5,000	5,580	0.27	3.15	3,000	2,160	0.18	3.15
4100-30-30		R3	6,000	8,550	0.24	3.86	5,000	5,580	0.27	3.38	3,000	2,160	0.18	3.38
4120-05-36		R0.5	5,000	8,550	0.05	2.41	4,000	7,290	0.05	1.94	2,000	2,250	0.04	1.94
4120-10-36	12	R1	5,000	8,550	0.07	3.09	4,000	7,290	0.07	2.70	2,000	2,250	0.05	2.70
4120-20-36		R2	5,000	8,550	0.27	4.32	4,000	7,290	0.27	3.78	2,000	2,250	0.18	3.78
4120-30-36		R3	5,000	8,550	0.27	4.63	4,000	7,290	0.27	4.05	2,000	2,250	0.18	4.05
4120-40-36		R4	5,000	8,550	0.27	4.63	4,000	7,290	0.27	4.05	2,000	2,250	0.18	4.05

### ◆Finishing (flat/inclined surface)

WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS (30~45HRC) (Air Blow/Oil Mist)				HARDENED STEELS (45~55HRC) (Air Blow/Oil Mist)				HARDENED STEELS (55~65HRC) (Air Blow/Oil Mist)			
Model Number	Outside Diameter (mm)	Corner Radius (CR)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4020-03-06	2	R0.3	30,000	850	0.10	0.03	10,000	355	0.10	0.04	8,000	240	0.05	0.03
4020-05-06		R0.5	30,000	1,100	0.10	0.04	10,000	460	0.10	0.05	8,000	310	0.05	0.04
4030-08-09	3	R0.8	25,000	1,100	0.10	0.04	10,000	650	0.10	0.07	7,000	350	0.05	0.05
4040-05-12	4	R0.5	15,000	775	0.10	0.05	9,000	455	0.10	0.05	6,000	255	0.05	0.04
4040-10-12		R1	15,000	1,100	0.10	0.07	9,000	650	0.10	0.07	6,000	360	0.05	0.06
4050-12-15	5	R1.2	10,000	1,100	0.10	0.11	8,000	650	0.10	0.08	6,000	360	0.05	0.06
4060-05-18	6	R0.5	9,000	690	0.20	0.08	8,000	375	0.20	0.05	6,000	215	0.10	0.04
4060-10-18		R1	9,000	975	0.20	0.11	8,000	530	0.20	0.07	6,000	310	0.10	0.05
4060-15-18		R1.5	9,000	1,200	0.20	0.13	8,000	650	0.20	0.08	6,000	380	0.10	0.06
4060-20-18		R2	9,000	1,385	0.20	0.15	8,000	750	0.20	0.09	6,000	435	0.10	0.07
4080-05-24	8	R0.5	7,000	598	0.05	0.09	6,000	322	0.05	0.06	4,000	184	0.05	0.06
4080-10-24		R1	7,000	845	0.05	0.12	6,000	455	0.05	0.08	4,000	265	0.05	0.07
4080-20-24		R2	7,000	1,200	0.20	0.17	6,000	650	0.20	0.11	4,000	380	0.10	0.10
4080-30-24		R3	7,000	1,465	0.20	0.21	6,000	795	0.20	0.13	4,000	465	0.10	0.12
4100-03-30	10	R0.3	6,000	478	0.04	0.08	5,000	258	0.04	0.05	3,000	147	0.04	0.06
4100-05-30		R0.5	6,000	598	0.05	0.10	5,000	322	0.05	0.06	3,000	184	0.05	0.07
4100-10-30	12	R1	6,000	845	0.05	0.14	5,000	455	0.05	0.09	3,000	265	0.05	0.09
4100-20-30		R2	6,000	1,200	0.20	0.20	5,000	650	0.20	0.13	3,000	380	0.10	0.13
4100-30-30		R3	6,000	1,470	0.20	0.25	5,000	795	0.20	0.16	3,000	465	0.10	0.16
4120-05-36		R0.5	5,000	598	0.05	0.12	4,000	322	0.05	0.08	2,000	184	0.05	0.10
4120-10-36	12	R1	5,000	845	0.05	0.17	4,000	455	0.05	0.11	2,000	265	0.05	0.13
4120-20-36		R2	5,000	1,200	0.20	0.24	4,000	650	0.20	0.16	2,000	380	0.10	0.19
4120-30-36		R3	5,000	1,695	0.20	0.34	4,000	915	0.20	0.23	2,000	535	0.10	0.27
4120-40-36		R4	5,000	1,695	0.20	0.34	4,000	915	0.20	0.23	2,000	535	0.10	0.27

## Milling Conditions for HRRS/HRRS-S

Please adjust milling parameter referring following table.

D: Outside Diameter (mm) L: Overhang Length (mm)

D:  $\phi 2.0 \sim 3.0$

Overhang L/D	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Axial Depth (mm)	Radial Depth (mm)
$\sim \phi D \times 6$	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 7$	$\times 0.8$	$\times 0.8$	$\times 0.8$	$\times 0.9$
$\sim \phi D \times 8$	$\times 0.7$	$\times 0.7$	$\times 0.7$	$\times 0.9$
$\sim \phi D \times 9$	$\times 0.7$	$\times 0.7$	$\times 0.6$	$\times 0.8$
$\sim \phi D \times 10$	$\times 0.6$	$\times 0.6$	$\times 0.6$	$\times 0.7$

D:  $\phi 4.0 \sim 6.0$

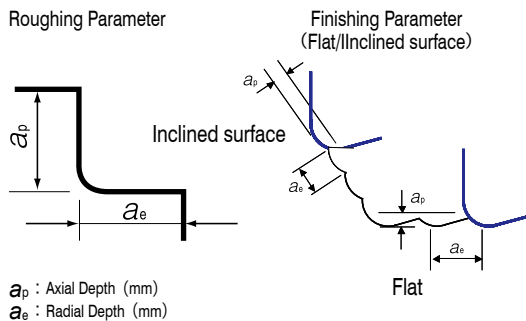
Overhang L/D	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Axial Depth (mm)	Radial Depth (mm)
$\sim \phi D \times 4$	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 5$	$\times 0.9$	$\times 0.9$	$\times 0.9$	$\times 0.9$
$\sim \phi D \times 6$	$\times 0.8$	$\times 0.8$	$\times 0.8$	$\times 0.9$
$\sim \phi D \times 7$	$\times 0.7$	$\times 0.7$	$\times 0.6$	$\times 0.8$
$\sim \phi D \times 8$	$\times 0.5$	$\times 0.5$	$\times 0.6$	$\times 0.7$

D:  $\phi 8.0 \sim 12.0$

Overhang L/D	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	Axial Depth (mm)	Radial Depth (mm)
$\sim \phi D \times 4$	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 5$	$\times 0.7$	$\times 0.7$	$\times 0.7$	$\times 0.8$
$\sim \phi D \times 6$	$\times 0.5$	$\times 0.5$	$\times 0.6$	$\times 0.7$

### Note:

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- Decrease the feed rate more than 50% from the milling parameters when slot milling.
- Only adjust the spindle speed when calculate milling conditions based on the overhang length in finishing process.
- Recommend air blow or oil mist.



Square

Square  
Long Neck  
Square

Radius

Radius  
Long Neck  
RadiusBall / Long  
Shank BallBall  
Long Neck  
BallTaper Neck  
BallTaper  
TaperSpiral  
V CutterDrill  
Thread Mill

EURO Series

Technical Data

HRRS Series  
NAK80 (40HRC)  
Milling Video



HRRS Series  
DH31S (52HRC)  
Milling Video



HRRS Series  
DH31 (52HRC)  
Milling Video

