

Size $\phi 2 \sim \phi 12$ **HRRS**Super
MGHARD
MAX

45°

R

R
 ± 0.01 R
 ± 0.015 Shank Dia
0/-0.005back taper
geometryVariable
pitch $\phi 2 \sim \phi 6$ $\phi 8 \sim \phi 12$

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			CAST IRON	ALUMINIUM ALLOYS	GRAPHITE	COPPER		PLASTIC
			(~55HRC)	(~60HRC)	(~65HRC)						◎Airblow/Oil Mist Water Soluble Oil

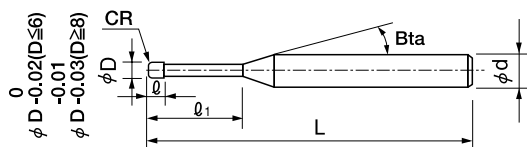
(Total 22 models)

Unit (mm)

	Model Number	Outside Diameter ϕ D	Corner Radius CR	Effective Length ℓ ₁	Length of Cut ℓ	Neck Diameter ϕ d ₁	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕ d	
◎	HRRS 4020-03-06	2	R0.3	6	2	1.91	16°	70	4	
	HRRS 4020-05-06		R0.5					70	4	
◎	HRRS 4030-08-09-3	3	R0.8	9	3	2.92	—	70	3	
	HRRS 4030-08-09						16°	70	6	
◎	HRRS 4040-05-12	4	R0.5	12	4	3.82	—	70	4	
	HRRS 4040-05-12-6						16°	70	6	
◎	HRRS 4040-10-12		R1				—	70	4	
	HRRS 4040-10-12-6						16°	70	6	
◎	HRRS 4050-12-15	5	R1.2	15	5	4.82	16°	70	6	
	HRRS 4060-05-18	6	R0.5	18	6	5.82	—	90	6	
HRRS 4060-10-18	R1		90					6		
HRRS 4060-15-18	R1.5		90					6		
HRRS 4060-20-18	R2		90					6		
◎	HRRS 4080-10-24	8	R1	24	8	7.82	—	100	8	
	HRRS 4080-20-24		R2					100	8	
◎	HRRS 4080-30-24		R3					100	8	
◎	HRRS 4100-10-30	10	R1	30	10	9.82	—	110	10	
	HRRS 4100-20-30		R2					110	10	
◎	HRRS 4100-30-30		R3					110	10	
◎	HRRS 4120-10-36	12	R1	36	12	11.82	—	120	12	
	HRRS 4120-20-36		R2					120	12	
◎	HRRS 4120-40-36		R4					120	12	

◎mark denotes Straight Shank Type

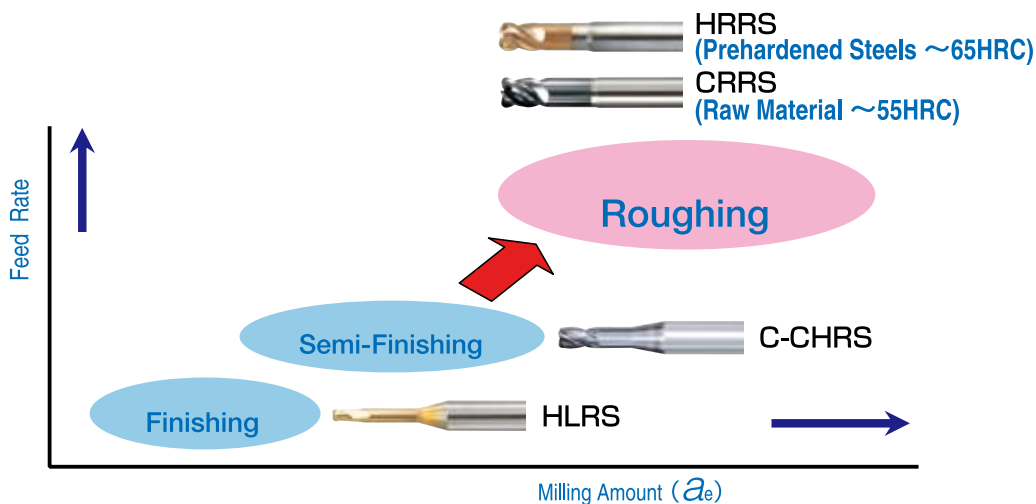
Special geometry offers bigger milling amount and wider pick feed than Ball Type
Cutting resistance and chattering are reduced by seamless corner radius



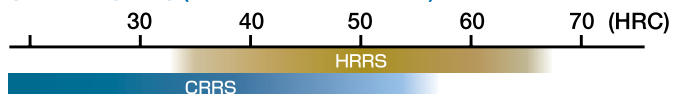
The shank taper angle shown is not an exact value and to avoid contact with the workpiece, we recommend the user controls the precise value of this angle
Shank taper angle should not make contact with the work piece

Unimax End Mills Radius Series

Usage of Radius Series



4 Flutes Active Corner Radius End Mills Target Hardness



UT coat CNRS

For Hard Materials
(Titanium and Heatproof steel)

Milling Conditions for HRRS/HRRS-S

Roughing Parameter

WORK MATERIAL			PREHARDENED STEELS / HARDENED STEELS (35~45HRC) <small>Airblow/Oil Mist</small>				HARDENED STEELS (45~55HRC) <small>Airblow/Oil Mist</small>				HARDENED STEELS (55~65HRC) <small>Airblow/Oil Mist</small>			
Model Number	Outside Diameter (mm)	Corner Radius (CR)	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)
HRRS 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
HRRS 4020-05-06		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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 4080-10-24	8	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
HRRS 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
HRRS 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
HRRS 4100-10-30	10	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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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 Parameter (Flat/Inclined surface)

WORK MATERIAL			PREHARDENED STEELS / HARDENED STEELS (35~45HRC) <small>Airblow/Oil Mist</small>				HARDENED STEELS (45~55HRC) <small>Airblow/Oil Mist</small>				HARDENED STEELS (55~65HRC) <small>Airblow/Oil Mist</small>			
Model Number	Outside Diameter (mm)	Corner Radius (CR)	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)
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 4080-10-24	8	R1	7,000	845	0.05	0.12	6,000	455	0.05	0.08	4,000	265	0.05	0.07
HRRS 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
HRRS 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
HRRS 4100-10-30	10	R1	6,000	845	0.05	0.14	5,000	455	0.05	0.09	3,000	265	0.05	0.09
HRRS 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
HRRS 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
HRRS 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
HRRS 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
HRRS 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

Please adjust milling parameter referring following table

D: $\phi 2.0 \sim 3.0$

L/D	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
$\phi D \times 6$	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\phi D \times 7$	$\times 0.8$	$\times 0.8$	$\times 0.8$	$\times 0.9$
$\phi D \times 8$	$\times 0.7$	$\times 0.7$	$\times 0.7$	$\times 0.9$
$\phi D \times 9$	$\times 0.7$	$\times 0.7$	$\times 0.6$	$\times 0.8$
$\phi D \times 10$	$\times 0.6$	$\times 0.6$	$\times 0.6$	$\times 0.7$

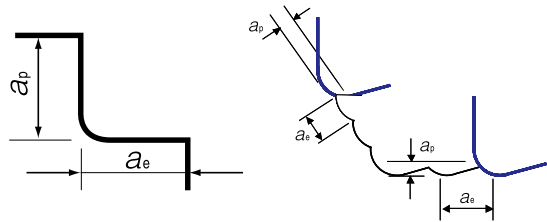
D: $\phi 4.0 \sim 6.0$

L/D	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e 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: $\phi 8.0 \sim 12.0$

L/D	Speed (min^{-1})	Feed (mm/min)	a_p Axial Depth (mm)	a_e Radial Depth (mm)
$\sim \phi D \times 4$	$\times 1$	$\times 1$	$\times 1$	$\times 1$
$\sim \phi D \times 5$	$\times 0.7$	$\times 0.7$	$\times 0.7$	$\times 0.8$
$\sim \phi D \times 6$	$\times 0.5$	$\times 0.5$	$\times 0.6$	$\times 0.7$

Roughing Parameter Finishing Parameter (Flat/Inclined surface)



a_p : (mm) Axial Depth
 a_e : (mm) Radial Depth

Note :

Recommend Using Air blow/Oil Mist

This table shows standard milling. Adjust it in accordance with milling type, purpose and used instruments in actual milling

In case of spindle rotation does not reach to target, decrease spindle and feed speed in same ratio

Use a machine that has high rigidity and generates low level of vibration

Remove chip to prevent heat generation and ignition by milling processing

Adjust only spindle speed for finishing process based on overhang length