

MUGEN COATING PREMIUM Plus
4-Flute Long Neck Corner Radius End Mill
with short shank for Hardened Steel and High accuracy cutting

MHRSH430RSF **NEW**



Wiper and seamless shape improve surface roughness
 Corner R accuracy ± 0.003 mm enhances finishing performance
 on hardened steels

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 4-Flute Long Neck Corner Radius End Mill
 with short shank for Hardened Steel and High accuracy cutting

MHRSH430RSF

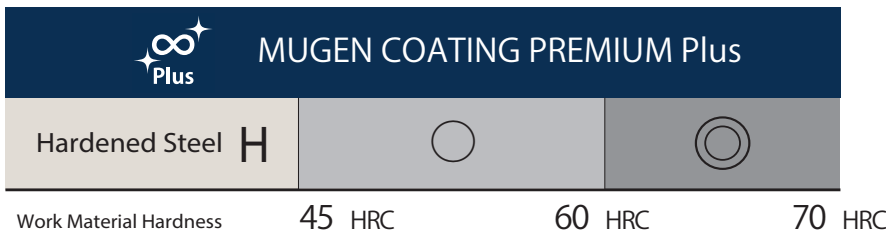
$\phi 0.1 \times R0.01 \sim \phi 2 \times R0.5$ Total 131 sizes



Features

Feature 1	Long tool life	MUGEN COATING PREMIUM Plus
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High oxidation resistance and abrasion resistance is suitable for machining above 60HRC
 Demonstrates same performance with MUGEN COATING PREMIUM even on machining 45 ~ 60HRC



- Oxidation resistant layer
 Prevents oxidation due to heat generated during cutting
- Hard coating layer
 Tool wear can be reduced when machining on high hardened steel
- High adhesion coating layer
 Structure that is difficult to crack and propagate when impact forced
- Super Micro Grain Carbide

Feature 2

Excellent accuracy and surface roughness

High accuracy corner R and wiper

Corner radius end mill to pursue accuracy and surface roughness

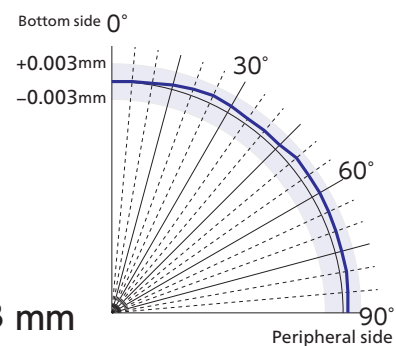
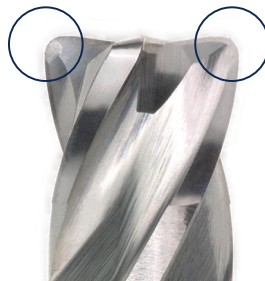
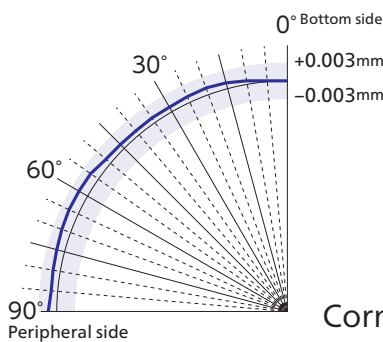
High accuracy corner R



Wiper

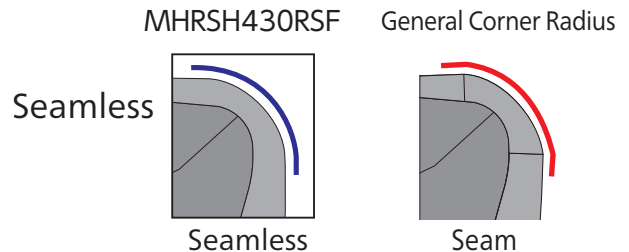
Strong back taper

Enhances surface roughness and accuracy on side machining
High accuracy corner R and Seamless

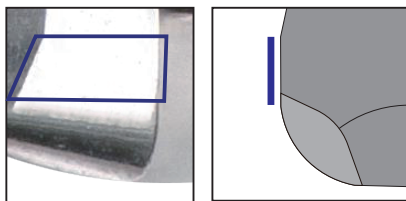


Corner Radius R ± 0.003 mm

Corner R and peripheral cutting edge are seamlessly connected, and the smooth cutting edge improves the surface roughness on side machining



Improves surface roughness on bottom by wiper
(D ≥ φ0.4)



By adopting wiper at the end tooth, improves the surface roughness on bottom surface machining

Surface roughness comparison after bottom surface finishing

Work material HAP40 (64HRC)	MHRSH430RSF	Conventional	Other tool brand A	Other tool brand B
Tool size φ2 × R0.2 × 6				
Magnification rate ×400	Ra 0.010μm	Ra 0.028μm	Ra 0.029μm	Ra 0.026μm

Wiper and seamless shape improve surface roughness
 Corner R accuracy ± 0.003 mm enhances finishing performance
 on hardened steels

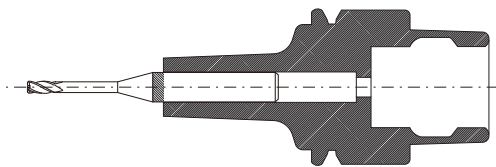
Feature
3

Improved cutting accuracy Optimal overhung length by high accuracy short shank

Realized high rigidity and high precision machining

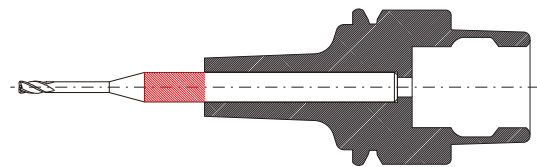
MHRSH430RSF

High precision short shank
 High rigidity with shrink fit chuck



Conventional

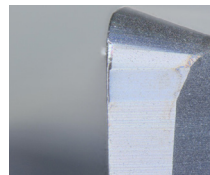
Shank tolerance with wide range
 long overhung caused lower tool rigidity



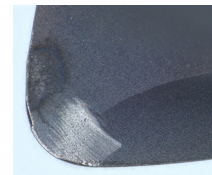
Surface roughness and wear after 60 mins machining

Tool MHRSH430RSF $\phi 2 \times R0.2 \times 6$
 Work material HAP40 (64HRC)
 Spindle speed 12,000 min⁻¹
 Feed 1,000 mm/min
 Depth of cut $a_p 0.02 \times a_e 0.05$ mm

Tool wear



End tooth
 Frank wear width
 0.023mm



Corner R
 R retreat amount
 0.003mm



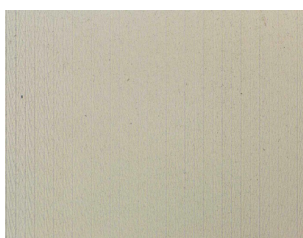
Surface roughness

1 Wall 0°



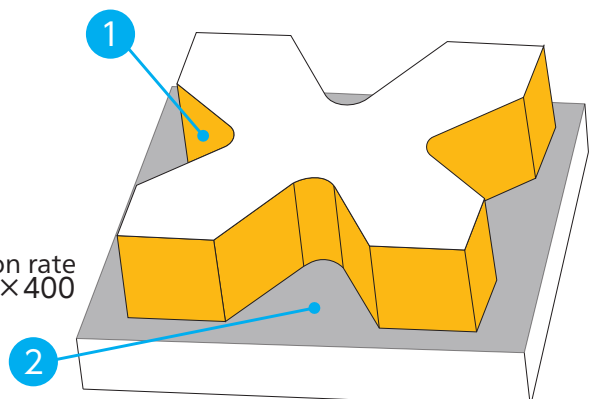
Ra 0.052 μ m

2 Bottom



Ra 0.010 μ m

Magnification rate
 ×400





Leads to various tool information



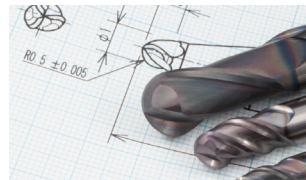
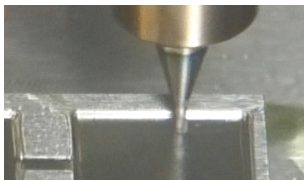
From 2D barcode on back of product case



MUGEN COATING PREMIUM Plus
4-Flute Long Neck Corner Radius End Mill
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MHRSH430RSF
Example for MHRSH430RSF

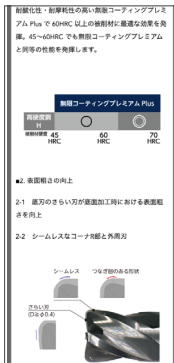
You can check disclosure information



Features

Size and Milling conditions

Video etc



Corporate Web Site

Contact us

Product Leaflet

Contact us by phone

Others



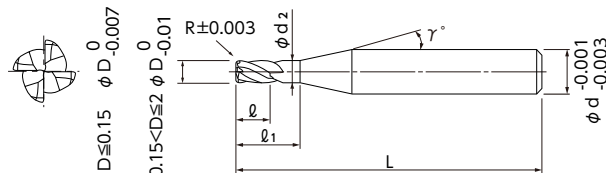
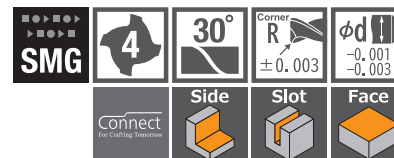
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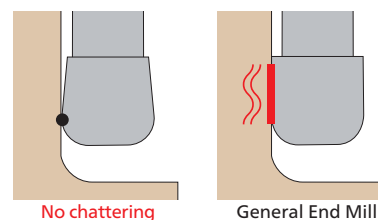
We will expand NS Tool Connect web service widely for future products

Wiper and seamless shape improve surface roughness
 Corner R accuracy ± 0.003 mm enhances finishing performance on hardened steels



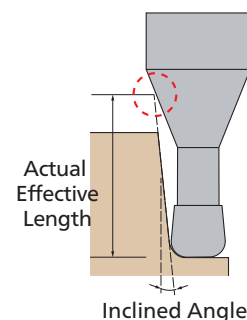
Please be aware of stock since there is no cutting edge from the center to the bottom.

- MUGEN COATING PREMIUM Plus for hardened steels with strong back taper reduce chattering to realize long tool life and excellent finishing surface.
- 4-flute end mill for high efficiency machining.
- The smallest diameter of 4-flute end mills standardizes from $\phi 0.1$, total 131 sizes.



Work Material

Hardened Steel H	
45~60HRC	60~70HRC
○	◎



Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (l_1)	Length of Cut (l)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30°	1°	1°30'	2°	3°
08-00239-01002	0.1	R0.01	0.2	0.08	0.085	15°	4	35	0.23	0.24	0.25	0.26	0.28
08-00239-01003			0.3	0.08	0.085	15°	4	35	0.33	0.35	0.36	0.37	0.4
08-00239-01503	0.15	R0.01	0.3	0.12	0.135	15°	4	35	0.33	0.35	0.36	0.37	0.4
08-00239-01505			0.5	0.12	0.135	15°	4	35	0.54	0.56	0.58	0.6	0.65
08-00239-01523		R0.02	0.3	0.12	0.135	15°	4	35	0.33	0.34	0.36	0.37	0.4
08-00239-01525			0.5	0.12	0.135	15°	4	35	0.54	0.56	0.58	0.6	0.65
08-00239-02203	0.2	R0.02	0.3	0.15	0.18	15°	4	35	0.34	0.35	0.37	0.38	0.41
08-00239-02205			0.5	0.15	0.18	15°	4	35	0.55	0.57	0.59	0.61	0.66
08-00239-02207			0.75	0.15	0.18	15°	4	35	0.81	0.84	0.87	0.9	0.97
08-00239-02210			1	0.15	0.18	15°	4	35	1.07	1.1	1.14	1.18	1.28
08-00239-02403		R0.05	0.3	0.15	0.18	15°	4	35	0.34	0.35	0.36	0.38	0.4
08-00239-02405			0.5	0.15	0.18	15°	4	35	0.55	0.57	0.59	0.61	0.65
08-00239-02407			0.75	0.15	0.18	15°	4	35	0.81	0.83	0.86	0.89	0.96
08-00239-02410			1	0.15	0.18	15°	4	35	1.07	1.1	1.14	1.18	1.27
08-00239-03205	0.3	R0.02	0.5	0.25	0.28	15°	4	35	0.55	0.57	0.59	0.61	0.66
08-00239-03207			0.75	0.25	0.28	15°	4	35	0.81	0.84	0.87	0.9	0.97
08-00239-03210			1	0.25	0.28	15°	4	35	1.07	1.1	1.14	1.18	1.28
08-00239-03215			1.5	0.25	0.28	15°	4	35	1.58	1.64	1.7	1.76	1.9
08-00239-03405		R0.05	0.5	0.25	0.28	15°	4	35	0.55	0.57	0.59	0.61	0.65
08-00239-03407			0.75	0.25	0.28	15°	4	35	0.81	0.83	0.86	0.89	0.96
08-00239-03410			1	0.25	0.28	15°	4	35	1.07	1.1	1.14	1.18	1.27
08-00239-03415			1.5	0.25	0.28	15°	4	35	1.58	1.64	1.69	1.76	1.89

How to Order

When you order, indicate MHRSH430RSF (D)×(R)×(l1). ※(γ) is reference value.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ_1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece					
									30°	1°	1°30'	2°	3°	
08-00239-04205	0.4	R0.02	0.5	0.3	0.37	15°	4	35	0.57	0.59	0.61	0.63	0.68	
08-00239-04210			1	0.3	0.37	15°	4	35	1.09	1.12	1.16	1.21	1.3	
08-00239-04215			1.5	0.3	0.37	15°	4	35	1.6	1.66	1.72	1.78	1.92	
08-00239-04220			2	0.3	0.37	15°	4	35	2.12	2.19	2.27	2.36	2.55	
08-00239-04405		R0.05	0.5	0.3	0.37	15°	4	35	0.57	0.59	0.61	0.63	0.67	
08-00239-04410			1	0.3	0.37	15°	4	35	1.08	1.12	1.16	1.2	1.3	
08-00239-04415			1.5	0.3	0.37	15°	4	35	1.6	1.66	1.71	1.78	1.92	
08-00239-04420			2	0.3	0.37	15°	4	35	2.12	2.19	2.27	2.35	2.54	
08-00239-05210	0.5	R0.02	1	0.4	0.46	15°	4	35	1.11	1.14	1.18	1.23	1.33	
08-00239-05215			1.5	0.4	0.46	15°	4	35	1.62	1.68	1.74	1.8	1.95	
08-00239-05220			2	0.4	0.46	15°	4	35	2.14	2.21	2.29	2.38	2.57	
08-00239-05225			2.5	0.4	0.46	15°	4	35	2.66	2.75	2.85	2.95	3.19	
08-00239-05410		R0.05	1	0.4	0.46	15°	4	35	1.1	1.14	1.18	1.22	1.32	
08-00239-05415			1.5	0.4	0.46	15°	4	35	1.62	1.68	1.73	1.8	1.94	
08-00239-05420			2	0.4	0.46	15°	4	35	2.14	2.21	2.29	2.37	2.56	
08-00239-05425			2.5	0.4	0.46	15°	4	35	2.65	2.75	2.84	2.95	3.18	
08-00239-05510		R0.1	1	0.4	0.46	15°	4	35	1.1	1.14	1.18	1.22	1.31	
08-00239-05515			1.5	0.4	0.46	15°	4	35	1.62	1.67	1.73	1.79	1.93	
08-00239-05520			2	0.4	0.46	15°	4	35	2.14	2.21	2.28	2.37	2.55	
08-00239-05525			2.5	0.4	0.46	15°	4	35	2.65	2.74	2.84	2.94	3.17	
08-00239-06210	0.6	R0.02	1	0.5	0.56	15°	4	35	1.11	1.14	1.18	1.23	1.33	
08-00239-06220			2	0.5	0.56	15°	4	35	2.14	2.21	2.29	2.38	2.57	
08-00239-06230			3	0.5	0.56	15°	4	35	3.17	3.28	3.4	3.53	3.81	
08-00239-06410		R0.05	1	0.5	0.56	15°	4	35	1.1	1.14	1.18	1.22	1.32	
08-00239-06420			2	0.5	0.56	15°	4	35	2.14	2.21	2.29	2.37	2.56	
08-00239-06430			3	0.5	0.56	15°	4	35	3.17	3.28	3.4	3.52	3.81	
08-00239-06510		R0.1	1	0.5	0.56	15°	4	35	1.1	1.14	1.18	1.22	1.31	
08-00239-06520			2	0.5	0.56	15°	4	35	2.14	2.21	2.28	2.37	2.55	
08-00239-06530			3	0.5	0.56	15°	4	35	3.17	3.28	3.39	3.52	3.79	
08-00239-08202		0.8	R0.02	2	0.65	0.76	15°	4	35	2.14	2.21	2.29	2.38	2.57
08-00239-08203				3	0.65	0.76	15°	4	35	3.17	3.28	3.4	3.53	3.81
08-00239-08204				4	0.65	0.76	15°	4	35	4.21	4.35	4.51	4.68	5.06
08-00239-08402	R0.05		2	0.65	0.76	15°	4	35	2.14	2.21	2.29	2.37	2.56	
08-00239-08403			3	0.65	0.76	15°	4	35	3.17	3.28	3.4	3.52	3.81	
08-00239-08404			4	0.65	0.76	15°	4	35	4.21	4.35	4.51	4.67	5.05	
08-00239-08502	R0.1		2	0.65	0.76	15°	4	35	2.14	2.21	2.28	2.37	2.55	
08-00239-08503			3	0.65	0.76	15°	4	35	3.17	3.28	3.39	3.52	3.79	
08-00239-08504			4	0.65	0.76	15°	4	35	4.2	4.35	4.5	4.67	5.04	
08-00239-08602	R0.2		2	0.65	0.76	15°	4	35	2.13	2.2	2.27	2.35	2.53	
08-00239-08603			3	0.65	0.76	15°	4	35	3.17	3.27	3.38	3.5	3.77	
08-00239-08604			4	0.65	0.76	15°	4	35	4.2	4.34	4.49	4.65	5.01	
08-00239-10202	1		R0.02	2	0.8	0.95	15°	4	35	2.16	2.23	2.31	2.4	2.59
08-00239-10203				3	0.8	0.95	15°	4	35	3.19	3.3	3.42	3.55	3.84
08-00239-10204				4	0.8	0.95	15°	4	35	4.23	4.37	4.53	4.7	5.08
08-00239-10205				5	0.8	0.95	15°	4	40	5.26	5.44	5.64	5.85	6.32
08-00239-10402			R0.05	2	0.8	0.95	15°	4	35	2.16	2.23	2.31	2.39	2.59
08-00239-10403				3	0.8	0.95	15°	4	35	3.19	3.3	3.42	3.54	3.83
08-00239-10404		4		0.8	0.95	15°	4	35	4.22	4.37	4.53	4.69	5.07	
08-00239-10405		5		0.8	0.95	15°	4	40	5.26	5.44	5.63	5.84	6.31	
08-00239-10502		R0.1	2	0.8	0.95	15°	4	35	2.16	2.23	2.3	2.39	2.57	
08-00239-10503			3	0.8	0.95	15°	4	35	3.19	3.3	3.41	3.54	3.82	
08-00239-10504			4	0.8	0.95	15°	4	35	4.22	4.37	4.52	4.69	5.06	
08-00239-10505			5	0.8	0.95	15°	4	40	5.26	5.44	5.63	5.84	6.3	
08-00239-10602		R0.2	2	0.8	0.95	15°	4	35	2.15	2.22	2.29	2.37	2.55	
08-00239-10603			3	0.8	0.95	15°	4	35	3.19	3.29	3.4	3.52	3.79	
08-00239-10604			4	0.8	0.95	15°	4	35	4.22	4.36	4.51	4.67	5.04	
08-00239-10605			5	0.8	0.95	15°	4	40	5.25	5.43	5.62	5.82	6.28	

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4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30°	1°	1°30′	2°	3°
08-00239-10702	1	R0.3	2	0.8	0.95	15°	4	35	2.15	2.21	2.28	2.36	2.53
08-00239-10703			3	0.8	0.95	15°	4	35	3.18	3.28	3.39	3.51	3.77
08-00239-10704			4	0.8	0.95	15°	4	35	4.22	4.35	4.5	4.66	5.01
08-00239-10705			5	0.8	0.95	15°	4	40	5.25	5.42	5.61	5.81	6.26
08-00239-15203	1.5	R0.02	3	1.2	1.43	15°	4	35	3.23	3.34	3.46	3.59	3.88
08-00239-15204			4	1.2	1.43	15°	4	35	4.26	4.41	4.57	4.74	5.13
08-00239-15206			6	1.2	1.43	15°	4	40	6.33	6.55	6.79	7.04	7.61
08-00239-15208			8	1.2	1.43	15°	4	40	8.4	8.69	9	9.34	10.1
08-00239-15403		R0.05	3	1.2	1.43	15°	4	35	3.23	3.34	3.46	3.59	3.87
08-00239-15404			4	1.2	1.43	15°	4	35	4.26	4.41	4.57	4.74	5.12
08-00239-15406			6	1.2	1.43	15°	4	40	6.33	6.55	6.78	7.04	7.6
08-00239-15408			8	1.2	1.43	15°	4	40	8.4	8.69	9	9.34	10.09
08-00239-15503	R0.1	3	1.2	1.43	15°	4	35	3.23	3.34	3.45	3.58	3.86	
08-00239-15504		4	1.2	1.43	15°	4	35	4.26	4.41	4.56	4.73	5.11	
08-00239-15506		6	1.2	1.43	15°	4	40	6.33	6.55	6.78	7.03	7.59	
08-00239-15508		8	1.2	1.43	15°	4	40	8.4	8.69	9	9.33	10.08	
08-00239-15603		R0.2	3	1.2	1.43	15°	4	35	3.22	3.33	3.44	3.57	3.84
08-00239-15604			4	1.2	1.43	15°	4	35	4.26	4.4	4.55	4.72	5.08
08-00239-15606			6	1.2	1.43	15°	4	40	6.33	6.54	6.77	7.01	7.57
08-00239-15608			8	1.2	1.43	15°	4	40	8.39	8.68	8.98	9.31	10.06
08-00239-15703	R0.3	3	1.2	1.43	15°	4	35	3.22	3.32	3.43	3.55	3.82	
08-00239-15704		4	1.2	1.43	15°	4	35	4.25	4.39	4.54	4.7	5.06	
08-00239-15706		6	1.2	1.43	15°	4	40	6.32	6.53	6.76	7	7.55	
08-00239-15708		8	1.2	1.43	15°	4	40	8.39	8.67	8.97	9.3	10.03	
08-00239-15803	R0.5	3	1.2	1.43	15°	4	35	3.21	3.31	3.41	3.52	3.77	
08-00239-15804		4	1.2	1.43	15°	4	35	4.25	4.38	4.52	4.67	5.01	
08-00239-15806		6	1.2	1.43	15°	4	40	6.32	6.52	6.74	6.97	7.5	
08-00239-15808		8	1.2	1.43	15°	4	40	8.38	8.66	8.95	9.27	9.98	
08-00239-20204	2	R0.02	4	1.6	1.91	15°	4	35	4.3	4.45	4.61	4.78	5.17
08-00239-20206			6	1.6	1.91	15°	4	35	6.37	6.59	6.83	7.08	7.66
08-00239-20208			8	1.6	1.91	15°	4	40	8.44	8.73	9.05	9.38	10.14
08-00239-20210			10	1.6	1.91	15°	4	40	10.5	10.87	11.26	11.68	12.63
08-00239-20404		R0.05	4	1.6	1.91	15°	4	35	4.3	4.45	4.61	4.78	5.16
08-00239-20406			6	1.6	1.91	15°	4	35	6.37	6.59	6.83	7.08	7.65
08-00239-20408			8	1.6	1.91	15°	4	40	8.44	8.73	9.04	9.38	10.14
08-00239-20410			10	1.6	1.91	15°	4	40	10.5	10.87	11.26	11.68	12.62
08-00239-20504		R0.1	4	1.6	1.91	15°	4	35	4.3	4.45	4.6	4.77	5.15
08-00239-20506			6	1.6	1.91	15°	4	35	6.37	6.59	6.82	7.07	7.64
08-00239-20508			8	1.6	1.91	15°	4	40	8.43	8.73	9.04	9.37	10.13
08-00239-20510			10	1.6	1.91	15°	4	40	10.5	10.86	11.25	11.67	12.61
08-00239-20604		R0.2	4	1.6	1.91	15°	4	35	4.3	4.44	4.59	4.76	5.13
08-00239-20606			6	1.6	1.91	15°	4	35	6.36	6.58	6.81	7.06	7.62
08-00239-20608			8	1.6	1.91	15°	4	40	8.43	8.72	9.03	9.36	10.1
08-00239-20610			10	1.6	1.91	15°	4	40	10.5	10.86	11.24	11.66	12.59
08-00239-20704		R0.3	4	1.6	1.91	15°	4	35	4.29	4.43	4.58	4.74	5.11
08-00239-20706			6	1.6	1.91	15°	4	35	6.36	6.57	6.8	7.04	7.59
08-00239-20708			8	1.6	1.91	15°	4	40	8.43	8.71	9.02	9.34	10.08
08-00239-20710			10	1.6	1.91	15°	4	40	10.5	10.85	11.23	11.64	12.56
08-00239-20804		R0.5	4	1.6	1.91	15°	4	35	4.29	4.42	4.56	4.71	5.06
08-00239-20806			6	1.6	1.91	15°	4	35	6.35	6.56	6.78	7.01	7.54
08-00239-20808			8	1.6	1.91	15°	4	40	8.42	8.7	8.99	9.31	10.03
08-00239-20810			10	1.6	1.91	15°	4	40	10.49	10.84	11.21	11.61	12.52

How to Order

When you order, indicate MHRSH430RSF (D)×(R)×(ℓ1). ※(γ) is reference value.

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)				
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		
				min ⁻¹	mm/min	a _p mm	a _e mm	min ⁻¹	mm/min	a _p mm	a _e mm	min ⁻¹	mm/min	a _p mm	a _e mm	
0.1	0.01	0.2	2	40,000	200	0.002	0.01	40,000	150	0.002	0.01	40,000	120	0.002	0.01	
		0.3	3	40,000	160	0.002	0.01	40,000	120	0.002	0.01	40,000	90	0.002	0.01	
0.15	0.01	0.3	2	40,000	240	0.002	0.015	40,000	180	0.002	0.01	40,000	140	0.002	0.01	
		0.5	3.3	40,000	160	0.002	0.015	40,000	120	0.002	0.01	40,000	90	0.002	0.01	
	0.02	0.3	2	40,000	240	0.002	0.015	40,000	180	0.002	0.01	40,000	140	0.002	0.01	
		0.5	3.3	40,000	160	0.002	0.015	40,000	120	0.002	0.01	40,000	90	0.002	0.01	
0.2	0.02	0.3	1.5	30,000	360	0.003	0.02	30,000	280	0.003	0.01	30,000	220	0.003	0.01	
		0.5	2.5	30,000	320	0.003	0.02	30,000	240	0.003	0.01	30,000	180	0.003	0.01	
		0.75	3.8	30,000	270	0.003	0.02	30,000	190	0.003	0.01	30,000	150	0.003	0.01	
		1	5	30,000	240	0.002	0.02	30,000	160	0.002	0.01	30,000	120	0.002	0.01	
	0.05	0.3	1.5	30,000	360	0.003	0.02	30,000	280	0.003	0.01	30,000	220	0.003	0.01	
		0.5	2.5	30,000	320	0.003	0.02	30,000	240	0.003	0.01	30,000	180	0.003	0.01	
		0.75	3.8	30,000	270	0.003	0.02	30,000	190	0.003	0.01	30,000	150	0.003	0.01	
		1	5	30,000	240	0.003	0.02	30,000	160	0.003	0.01	30,000	120	0.003	0.01	
		0.3	0.5	1.7	30,000	600	0.003	0.04	30,000	500	0.003	0.03	30,000	400	0.003	0.03
			0.75	2.5	30,000	560	0.003	0.04	30,000	460	0.003	0.03	30,000	360	0.003	0.03
0.3	0.05	1	3.3	30,000	500	0.003	0.04	30,000	400	0.003	0.03	30,000	300	0.003	0.03	
		1.5	5	30,000	320	0.003	0.04	30,000	240	0.003	0.03	30,000	180	0.003	0.03	
		0.5	1.7	30,000	600	0.003	0.04	30,000	500	0.003	0.03	30,000	400	0.003	0.03	
		0.75	2.5	30,000	560	0.003	0.04	30,000	460	0.003	0.03	30,000	360	0.003	0.03	
	0.02	1	3.3	30,000	500	0.003	0.04	30,000	400	0.003	0.03	30,000	300	0.003	0.03	
		1.5	5	30,000	320	0.003	0.04	30,000	240	0.003	0.03	30,000	180	0.003	0.03	
		0.5	1.3	28,000	760	0.005	0.05	25,000	650	0.004	0.04	22,000	480	0.004	0.04	
		1	2.5	28,000	700	0.005	0.05	25,000	600	0.004	0.04	22,000	450	0.004	0.04	
0.4	0.05	1.5	3.8	28,000	600	0.005	0.05	25,000	520	0.004	0.04	22,000	390	0.004	0.04	
		2	5	25,000	500	0.005	0.05	25,000	440	0.003	0.04	22,000	330	0.003	0.04	
		0.5	1.3	28,000	760	0.005	0.05	25,000	650	0.005	0.04	22,000	480	0.005	0.04	
		1	2.5	28,000	700	0.005	0.05	25,000	600	0.005	0.04	22,000	450	0.005	0.04	
	0.02	1.5	3.8	28,000	600	0.005	0.05	25,000	520	0.005	0.04	22,000	390	0.005	0.04	
		2	5	25,000	500	0.005	0.05	25,000	440	0.005	0.04	22,000	330	0.005	0.04	
0.5	0.02	1	2	23,000	900	0.006	0.1	20,000	800	0.004	0.08	18,000	600	0.004	0.08	
		1.5	3	23,000	800	0.006	0.1	20,000	640	0.004	0.08	18,000	480	0.004	0.08	
		2	4	23,000	720	0.005	0.1	20,000	600	0.003	0.08	18,000	450	0.003	0.08	
		2.5	5	23,000	680	0.005	0.1	20,000	580	0.003	0.08	18,000	420	0.003	0.08	
	0.05	1	2	23,000	900	0.007	0.1	20,000	800	0.005	0.08	18,000	600	0.005	0.08	
		1.5	3	23,000	800	0.007	0.1	20,000	640	0.005	0.08	18,000	480	0.005	0.08	
		2	4	23,000	720	0.007	0.1	20,000	600	0.005	0.08	18,000	450	0.005	0.08	
		2.5	5	23,000	680	0.006	0.1	20,000	580	0.004	0.08	18,000	420	0.004	0.08	
	0.1	1	2	23,000	900	0.007	0.1	20,000	800	0.005	0.08	18,000	600	0.005	0.08	
		1.5	3	23,000	800	0.007	0.1	20,000	640	0.005	0.08	18,000	480	0.005	0.08	
		2	4	23,000	720	0.007	0.1	20,000	600	0.005	0.08	18,000	450	0.005	0.08	
		2.5	5	23,000	680	0.006	0.1	20,000	580	0.004	0.08	18,000	420	0.004	0.08	
0.6	0.02	1	1.7	23,000	1,000	0.006	0.15	20,000	850	0.004	0.1	17,000	640	0.004	0.1	
		2	3.3	23,000	800	0.006	0.15	20,000	640	0.004	0.1	17,000	480	0.004	0.1	
		3	5	23,000	700	0.005	0.15	20,000	600	0.003	0.1	17,000	450	0.003	0.1	
	0.05	1	1.7	23,000	1,000	0.01	0.15	20,000	850	0.01	0.1	17,000	640	0.008	0.1	
		2	3.3	23,000	800	0.01	0.15	20,000	640	0.007	0.1	17,000	480	0.006	0.1	
		3	5	23,000	700	0.008	0.15	20,000	600	0.006	0.1	17,000	450	0.005	0.1	
	0.1	1	1.7	23,000	1,000	0.01	0.15	20,000	850	0.01	0.1	17,000	640	0.008	0.1	
		2	3.3	23,000	800	0.01	0.15	20,000	640	0.007	0.1	17,000	480	0.006	0.1	
		3	5	23,000	700	0.008	0.15	20,000	600	0.006	0.1	17,000	450	0.005	0.1	

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51·SKD11 (~62HRC)				High Speed Steels SKH55·HAP40 (~66HRC)				High Speed Steels SKH57·HAP72 (~70HRC)				
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		
				min ⁻¹	mm/min	a _p mm	a _e mm	min ⁻¹	mm/min	a _p mm	a _e mm	min ⁻¹	mm/min	a _p mm	a _e mm	
0.8	0.02	2	2.5	23,000	1,400	0.006	0.16	20,000	1,000	0.005	0.14	17,000	700	0.005	0.14	
		3	3.8	23,000	1,300	0.005	0.16	20,000	900	0.003	0.14	17,000	650	0.003	0.14	
		4	5	23,000	1,200	0.005	0.16	20,000	800	0.003	0.14	17,000	600	0.003	0.14	
	0.05	2	2.5	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14	17,000	700	0.012	0.14	
		3	3.8	23,000	1,300	0.015	0.16	20,000	900	0.01	0.14	17,000	650	0.008	0.14	
		4	5	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14	17,000	600	0.006	0.14	
	0.1	2	2.5	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14	17,000	700	0.012	0.14	
		3	3.8	23,000	1,300	0.015	0.16	20,000	900	0.01	0.14	17,000	650	0.008	0.14	
		4	5	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14	17,000	600	0.006	0.14	
	0.2	2	2.5	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14	17,000	700	0.012	0.14	
		3	3.8	23,000	1,300	0.015	0.16	20,000	900	0.01	0.14	17,000	650	0.008	0.14	
		4	5	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14	17,000	600	0.006	0.14	
1	0.02	2	2	21,000	2,000	0.01	0.25	17,000	1,400	0.008	0.2	15,000	1,000	0.005	0.2	
		3	3	20,000	1,800	0.01	0.25	16,000	1,300	0.008	0.2	14,000	900	0.005	0.2	
		4	4	18,000	1,500	0.008	0.25	14,000	1,100	0.005	0.2	12,000	750	0.003	0.2	
		5	5	16,000	1,400	0.005	0.25	13,000	1,000	0.003	0.2	11,000	650	0.003	0.2	
	0.05	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2	
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2	
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2	
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2	
	0.1	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2	
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2	
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2	
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2	
	0.2	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2	
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2	
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2	
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2	
	0.3	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2	
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2	
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2	
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2	
	1.5	0.02	3	2	20,000	2,000	0.01	0.4	16,000	1,400	0.008	0.3	14,000	1,000	0.006	0.3
			4	2.7	18,000	1,700	0.01	0.4	14,000	1,200	0.008	0.3	12,000	800	0.006	0.3
			6	4	16,000	1,500	0.008	0.4	13,000	1,100	0.005	0.3	11,000	750	0.004	0.3
			8	5.3	14,000	1,300	0.008	0.4	11,000	900	0.003	0.3	10,000	600	0.003	0.3
0.05		3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3	
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3	
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3	
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3	
0.1		3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3	
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3	
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3	
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3	
0.2		3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3	
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3	
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3	
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3	
0.3		3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3	
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3	
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3	
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3	

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min ⁻¹	mm/min	a _p mm	a _e mm	min ⁻¹	mm/min	a _p mm	a _e mm	min ⁻¹	mm/min	a _p mm	a _e mm
1.5	0.5	3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3
2	0.02	4	2	17,000	2,000	0.012	0.5	14,000	1,400	0.008	0.35	12,000	1,000	0.006	0.35
		6	3	15,000	1,800	0.012	0.5	12,000	1,200	0.008	0.35	11,000	900	0.006	0.35
		8	4	14,000	1,500	0.01	0.5	11,000	1,100	0.005	0.35	10,000	750	0.004	0.35
		10	5	12,000	1,300	0.01	0.5	10,000	1,000	0.003	0.35	9,000	650	0.003	0.35
	0.05	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.1	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.2	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.3	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
0.5	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35	
	6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35	
	8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35	
	10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35	

Notes

- ※1 Depth of Cut : a_p = Axial Depth of Cut / a_e = Radial Depth of Cut.
- ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
- ※3 In case of chattering etc., please adjust cutting conditions if necessary.
- ※4 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly.
- ※5 Recommend to apply helical or ramping for approaching into axial direction.
- ※6 For slotting, recommend reciprocating milling by adjusting feed & a_p in below 50% of recommended milling condition.
- ※7 Adjust both spindle speed and feed at the same rate.
- ※8 A shrink fit type is recommended for tool holder. When using collet type or others, strictly adhere to minimum gripping length.
- ※9 We recommend using oil mist coolant.

Neck taper angle (γ) of MHRSH430RSF is 15°. Our other products have a neck taper angle (γ) of 12°.



MHRSH430RSF

Our other products have a neck taper angle (γ) of 12°

Machining case 1

VANADIS23 (63HRC) Sealed mold

Realized stable dimension accuracy on machining hardened steels
 By adopting wiper at the end cutting edge achieves high precision surface roughness on plane machining

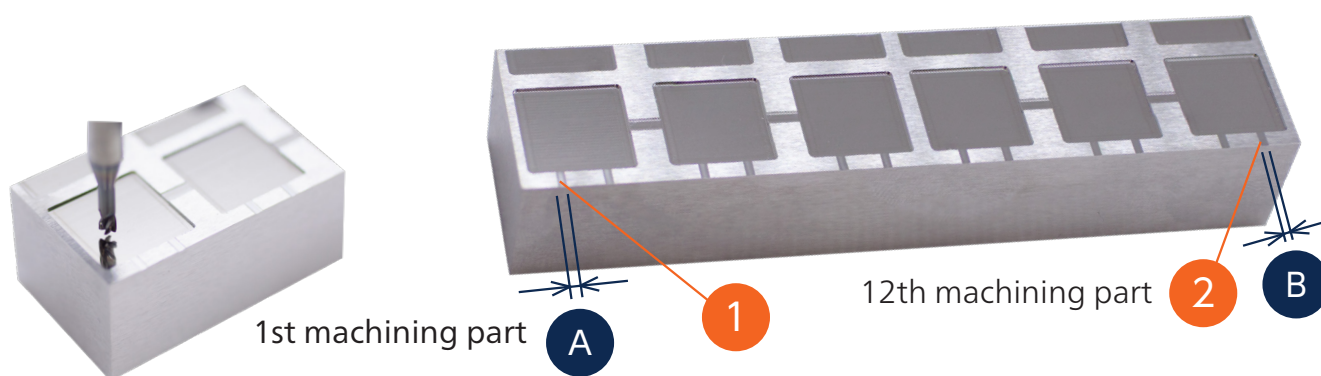
Work material : **VANADIS23 (63HRC)**

Work size : 20×90×15 mm (Machining depth 0.3 mm)

Coolant : Oil mist

Total machining time : 1hr 44min

Machining at air vent
 Comparison between 1st and 12th places



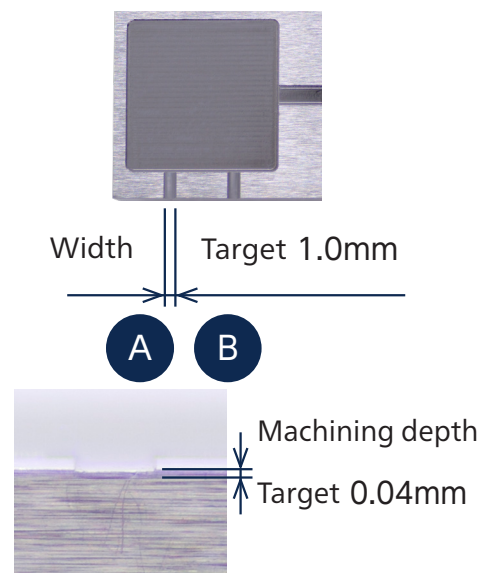
Surface Roughness

Measuring position	1	2
Ra [μm]	0.055	0.066
Rz [μm]	0.387	0.445

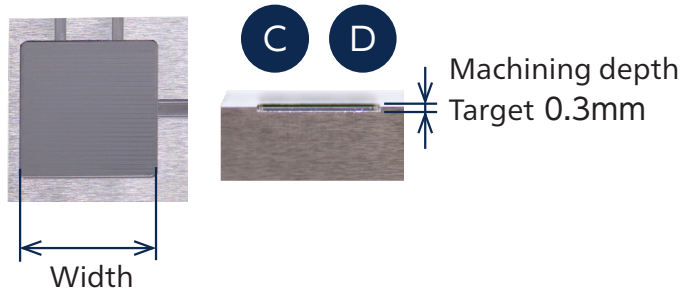
Accuracy

Measuring position	Unit [mm]			
	Groove A		Groove B	
	Width	Depth	Width	Depth
After machining	1.001	0.039	0.999	0.041

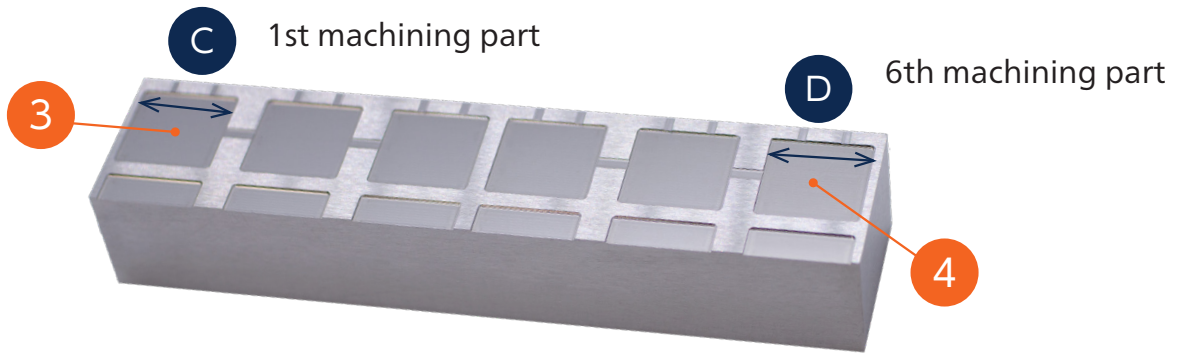
Process	Groove	
	Roughing	Finishing
Tool	MHRSH43ORSF $\phi 0.8 \times R0.02 \times 2$	MHRSH43ORSF $\phi 0.8 \times R0.02 \times 2$
Spindle speed [min ⁻¹]	11,000	11,000
Feed [mm/min]	500	300
Depth of cut $a_p \times a_e$ [mm]	0.003 × 0.18	0.005 × 0.01 Side 0.003 × 0.2 Bottom
Stock [mm]	0.01 Side 0.003 Bottom	-
Machining time	3 min	4 min



Machining at cavity
Comparison between 1st and 6th places



Target 12.0mm



Surface Roughness

Accuracy

Unit [mm]

Measuring position	3	4
Ra [μm]	0.053	0.051
Rz [μm]	0.370	0.336

Measuring position	Cavity C		Cavity D	
	Width	Depth	Width	Depth
After machining	11.999	0.298	11.998	0.296

Process	Cavity				
	Roughing	Stock removal	Bottom Semi-finishing	Finishing	Corner finishing
Tool	MHRSH43ORSF $\phi 1.5 \times R0.1 \times 4$	MHRSH43ORSF $\phi 1 \times R0.05 \times 2$		MHRSH43ORSF $\phi 1 \times R0.05 \times 2$	
Spindle speed [min^{-1}]	11,000	11,000		11,000	
Feed [mm/min]	800	800		800	800
Depth of cut $a_p \times a_e$ [mm]	0.06×0.3	0.01×0.12	ae 0.2	0.01×0.01 Side 0.004×0.2 Bottom	0.01×0.05
Stock [mm]	0.01 Side 0.004 Bottom	0.01 Side 0.004 Bottom	0.004 Bottom	-	-
Machining time	40 min	14 min	8 min	26 min	9 min

Machining case 2

HAP40 (64HRC) Gear model

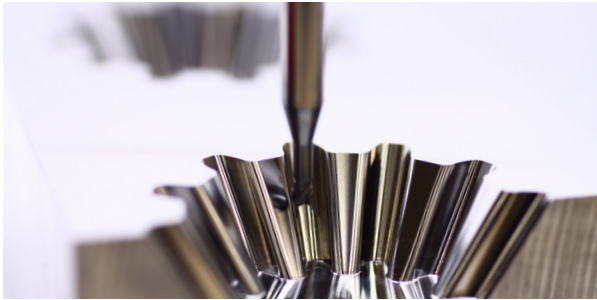
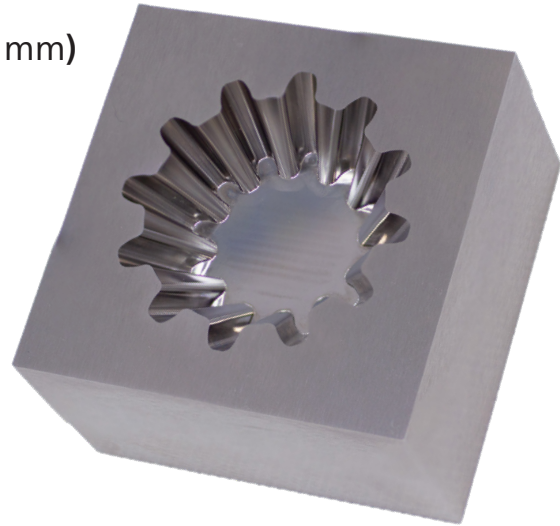
High precision tool design combines MUGEN COATING PREMIUM Plus extends tool life maintain high surface quality and accuracy even after long time machining

Work material : **HAP40 (64HRC)**

Work size : 50×50 mm (Machining depth 10 mm)

Coolant : Oil mist

Total machining time : 7hr 26min

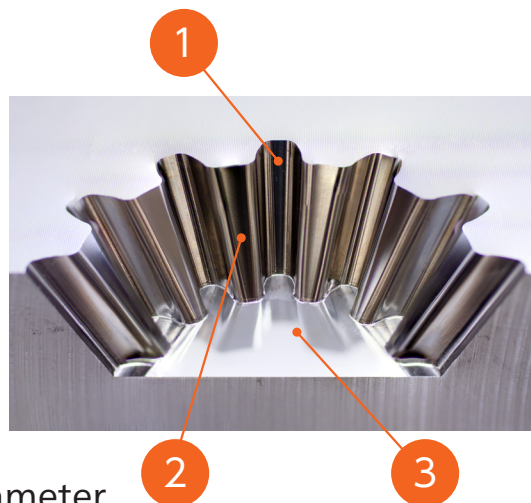


Process	Roughing※	Semi-finishing		Finishing	
		Bottom	Side	Bottom	Side
Tool	MHRSH430RSF φ2×R0.2×6	MHRSH430RSF φ2×R0.2×6		MHRSH430RSF φ2×R0.2×6	
Spindle speed [min ⁻¹]	12,000	12,000		12,000	
Feed [mm/min]	1,300	650	1,300	650	1,300
Depth of cut ap × ae [mm]	0.04×0.5	pf 0.1	pf 0.08	pf 0.05	pf 0.04
Stock [mm]	0.03	0.01		-	
Machining time	4hr 25min	1hr 5min		1hr 56min	

※ Using 2 tools for roughing

Surface Roughness

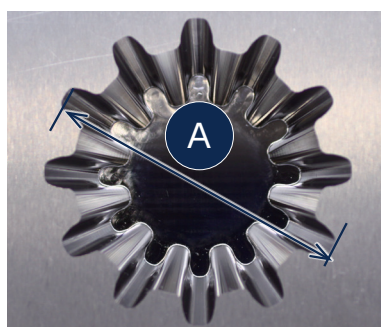
Measuring position	1	2	3
Ra [μm]	0.189	0.228	0.036
Rz [μm]	1.169	1.131	0.352



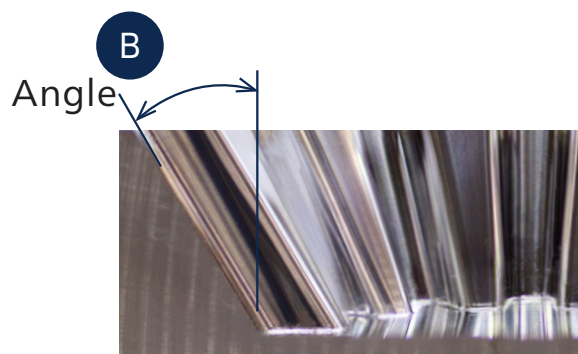
Accuracy

Measuring position	A
Target	37.100 mm
Actual	37.099 mm
Error	0.001 mm

Tip circle diameter



Measuring position	B
Target	30°45'
Actual	30°44'48"
Error	0°0'12"



Cutting edge condition after machining

	Roughing	Semi-finishing	Finishing
Bottom edge			
Peripheral cutting edge Rake face			

Realized stable machining on HAP40 (64HRC) for about 2 hours
Maintain high accuracy with less wear even after semi-finishing and finishing

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CAUTION

Attention on Safety

- 1) When removing tools from cases, be careful of getting-out of tools and don't touch directly the cutting edges.
- 2) Never touch the cutting edges directly with bare hand.
- 3) Use safety covers and eye protection, as tools may be broken.
- 4) Use holders, etc. that match the tools and nature of the processing operations. The tool should be firmly attached to the holder to prevent shaking.
- 5) The work materials clamp firmly.
- 6) Make sure of dimensions of tools and work pieces before starting operation.
- 7) It is necessary to adjust conditions according to the dimensions of work materials and the machine.
- 8) Select a cutting fluid appropriate to the particular usage. Using a non-water cutting fluid could lead to fires due to sparks generated during processing or heat caused by breakage. Ensure that you take proper fire-prevention measures.
- 9) If abnormal sound, etc. occurs during processing, stop the machine immediately.
- 10) Don't modify tools.

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■ Specifications may change without notice for improvement.