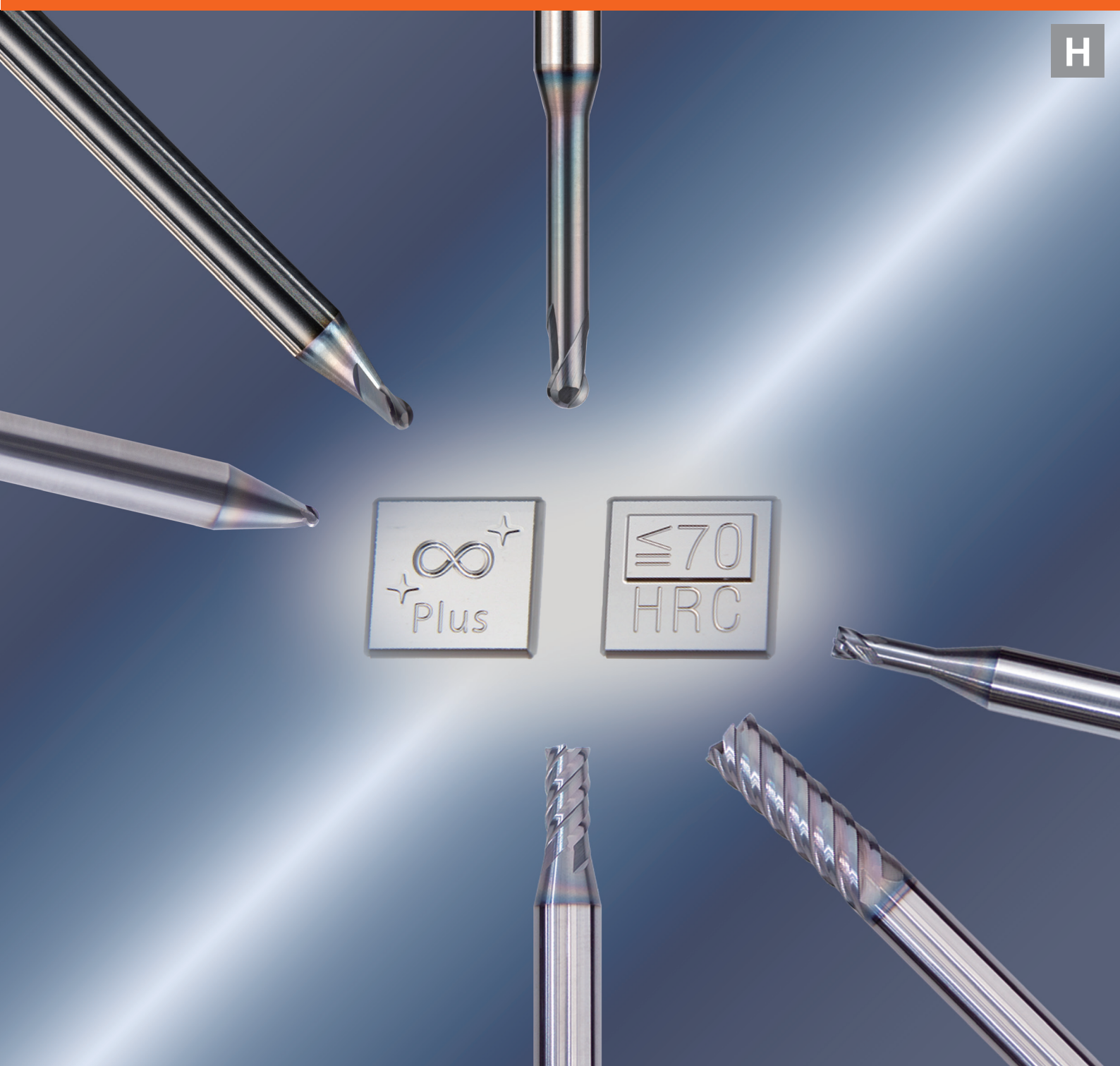


MUGEN COATING PREMIUM Plus End Mill Series

MHDSH445
MRBSH230SF

MHDSH645
MRBSH330

MSBSH330-5X
MHRSH430RSF



Features of MUGEN COATING PREMIUM Plus End Mill series

Optimized for machining hardened steels up to 60 to 70HRC

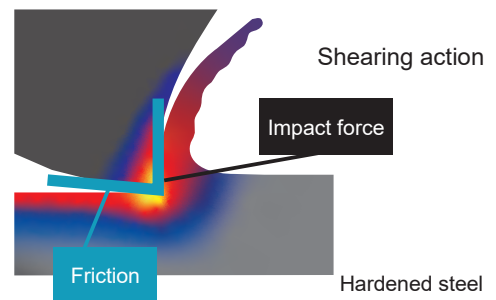
Range of NS TOOL original coating by work material hardness



MUGEN COATING PREMIUM Plus with high oxidation resistance and abrasion resistance is suitable for machining above 60HRC.

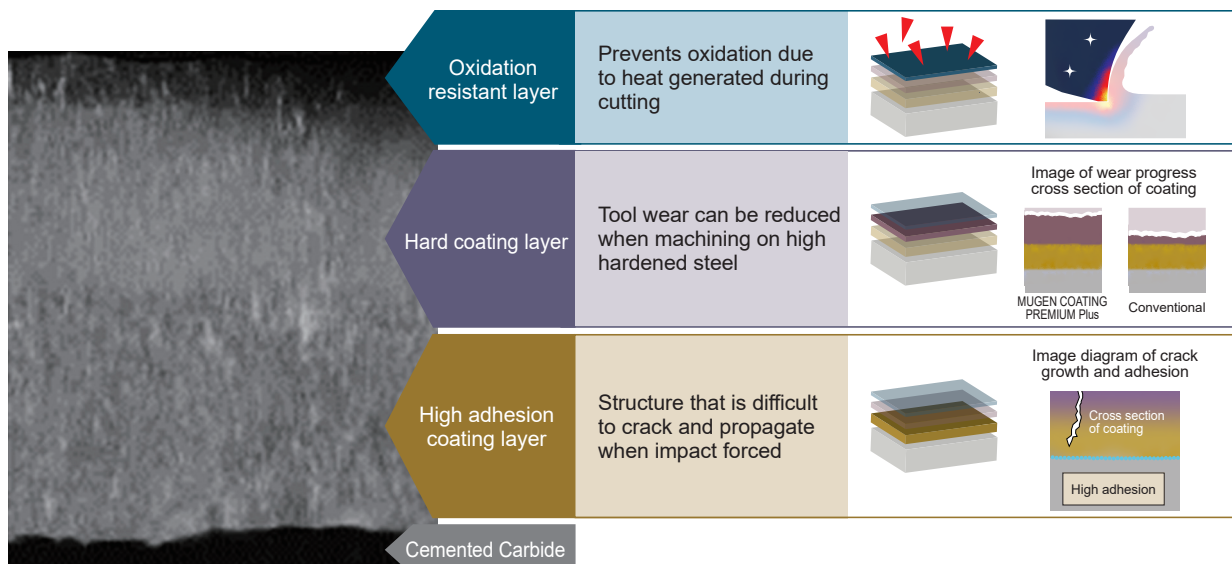
As a phenomenon when machining hardened steel of 60 to 70 HRC, the cutting load during processing is extremely high because hardness and toughness of work material are high. Therefore, the "shearing action" at tool edge cause that...

- Tools to wear easily causing frict
- Tools tends to wear to reduced hardness of material on coating oxidizes of cutting heat
- Tool is easily damaged if impact force is large



Coating Structure for MUGEN COATING PREMIUM Plus

MUGEN COATING PREMIUM PLUS is made of a three-layer coating film and provides excellent tool life for hardened steels from 60 to 70 HRC.



High precision and long tool life

High precision shank realize no fluctuate machining



Achieved high precision machining with high accuracy ball radius or corner radius

MRBSH230SF

Ball radius $R \pm 0.003$

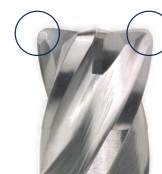
R accuracy is based on a half value of actual diameter



MHRSH430RSF

Corner radius ± 0.003

($D \leq \phi 2$)



Ball end mill R1x6 tool life comparison to HAP40 (64HRC)

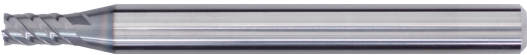
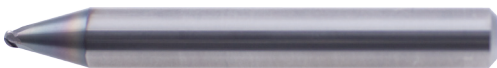
Cutting condition: $n = 20,000 \text{ min}^{-1}$, $v_f = 1,600 \text{ mm/min}$, $a_p \times a_e 0.15 \times 0.3 \text{ mm}$, Coolant: Oil mist

Tool	MRBSH230SF	Other tool brand A	Other tool brand B	Other tool brand C
After 70 min				
Tool wear	0.102 mm	0.137 mm	0.190 mm	0.157 mm

Square end mill tool life comparison to HAP40 (64HRC)

Cutting condition : $n = 4,200 \text{ min}^{-1}$, $v_f = 600 \text{ mm/min}$, $a_p \times a_e 0.12 \text{ mm}$, Coolant: Oil mist

Tool	MHDSH645 $\phi 6 \times 18$		Other tool brand A		Other tool brand B	
Wear position	Major flank notch	End edge	Major flank notch	End edge	Major flank notch	End edge
After 120 min						
Tool wear	0.060 mm	0.080 mm	0.097 mm	Wear width cannot be measured because great damage	Wear width cannot be measured because great damage	

Model・Photo	Product Name
Square End Mill	
MHDSH445 	MUGEN COATING PREMIUM Plus 4-Flute Square End Mill for Hardened Steel
MHDSH645 	MUGEN COATING PREMIUM Plus 6-Flute Square End Mill for Hardened Steel
Ball End Mill	
MSBSH330-5X 	MUGEN COATING PREMIUM Plus 3-Flute Ball End Mill for 5-axis machining
Long Neck Ball End Mill	
MRBSH230SF 	MUGEN COATING PREMIUM Plus 2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel and High accuracy cutting
MRBSH330 	MUGEN COATING PREMIUM Plus High Efficient 3-Flute Small-Diameter Long Neck Ball End Mill for Hardened Steel
Long Neck Corner Radius End Mill	
MHRSH430RSF 	MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Size Number of sizes	Number of Flute Helix Angle Shank Tolerance	Features	Page
$\phi 1 \sim \phi 4.5$ Total 10 sizes	  	High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel	6
$\phi 5 \sim \phi 6$ Total 4 sizes	  	High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel	6
R0.1 ~ R1 Total 8 sizes	  	3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining	12
R0.05 ~ R3 Total 115 sizes	  	High precision and long tool life even for hardened steel up to 70HRC	16
R0.1 ~ R3 Total 31 sizes	  	High-efficiency high-precision die machining with improved cutting edge rigidity and chip evacuation	24
$\phi 0.1 \times R0.01$ $\sim \phi 6 \times R1$ Total 205 sizes	  	Specialized cutting edge and high precision corner R enhance finishing accuracy on hardened steels	28

High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel

MUGEN COATING PREMIUM Plus
4-Flute Square End Mill for Hardened Steel

MHDSH445

φ 1 ~ φ 4.5

Total 10 sizes

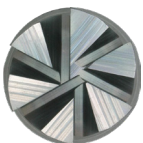


MUGEN COATING PREMIUM Plus
6-Flute Square End Mill for Hardened Steel

MHDSH645

φ 5 ~ φ 6

Total 4 sizes

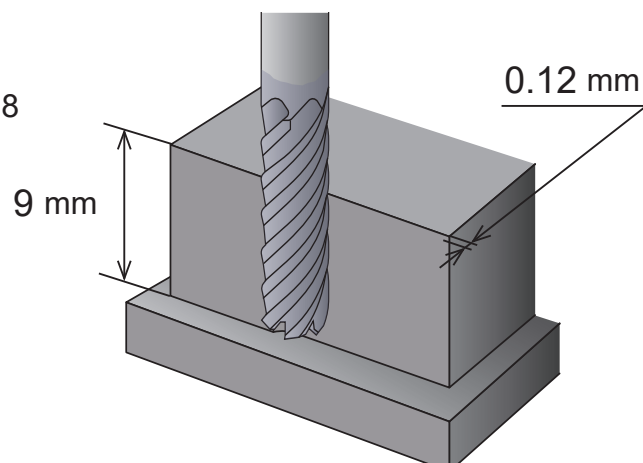


Features

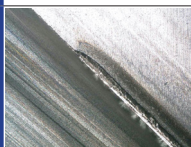
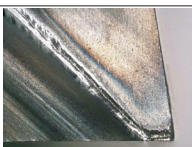
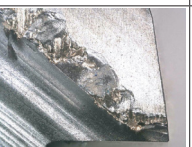
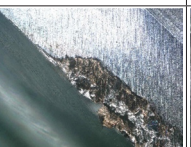
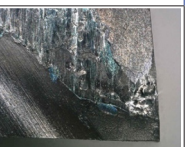
Feature 1	Long tool life	MUGEN COATING PREMIUM Plus
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Roughing

Tool MHDSH645 φ6 × Length of Cut 18
Work material HAP40 (64HRC)
Spindle speed 4,200 min⁻¹
Feed 600 mm/min
Depth of cut ap 9 × ae 0.12 mm



■ Achieves longer tool life compared to other tool brand at roughing

Tool	MHDSH645 $\phi 6 \times 18$		Other tool brand A $\phi 6 \times 15$		Other tool brand B $\phi 6 \times 15$	
Wear position	Major flank notch	End edge	Major flank notch	End edge	Major flank notch	End edge
After 120 min						
Tool wear	0.060 mm	0.080 mm	0.097 mm	Wear width cannot be measured because great damage	Wear width cannot be measured because great damage	

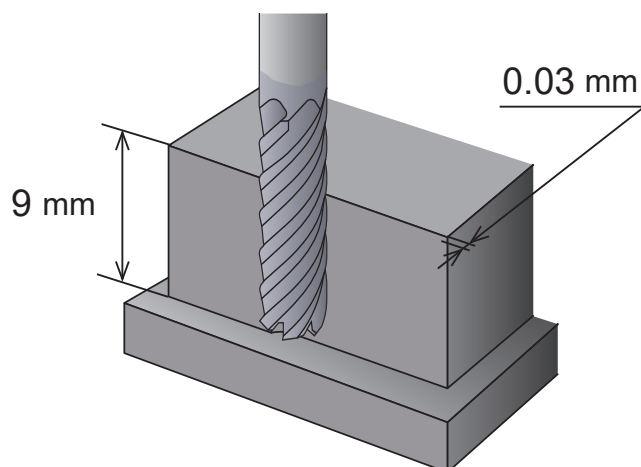
Feature
2

High rigidity tool design

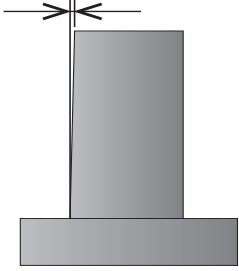
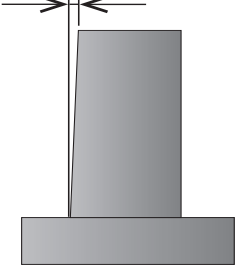
Suppress deflection at finishing

Finishing

Tool MHDSH645 $\phi 6 \times$ Length of Cut 18
 Work material HAP40 (64HRC)
 Spindle speed 4,200 min⁻¹
 Feed 600 mm/min
 Depth of cut ap 9 $\times$ ae 0.03 mm



■ Amount of deflection after 90min finishing

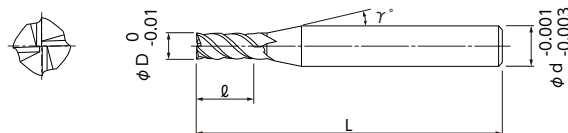
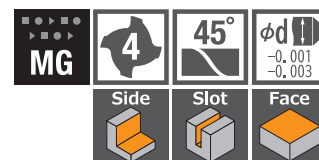
Tool	MHDSH645 $\phi 6 \times 18$	Other tool brand $\phi 6 \times 15$
Deflection amount	 0.010 mm	 0.018 mm

MHDSH645 has less deflection due to HAP40(64HRC) machining

MUGEN COATING PREMIUM Plus 4-Flute Square End Mill for Hardened Steel

Total 10 sizes

High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel



- 4-flute is lineup of length of cut expands 2D and 3D.
- MUGEN COATING PREMIUM Plus realizes long tool life even for hardened steel up to 70HRC.
- High rigidity tool design improves machining accuracy.
- Shank diameter tolerance, high accuracy type, is - 0.001mm ~ - 0.003mm.

Work Material

Hardened Steel **H**

60~70HRC



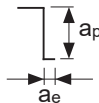
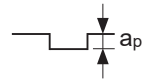
Unit [Size : mm]

Code No.	Dia. (D)	Length of Cut (l)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00429-00102	1	2	12°	6	60
08-00429-00103		3	12°	6	60
08-00429-00152	1.5	3	12°	6	60
08-00429-00153		4.5	12°	6	60
08-00429-00202	2	4	12°	6	60
08-00429-00203		6	12°	6	60
08-00429-00302	3	6	12°	6	60
08-00429-00303		9	12°	6	60
08-00429-00402	4	8	12°	6	60
08-00429-00403		12	12°	6	60

How to Order

When you order, indicate MHDSH445 (D)×(l).

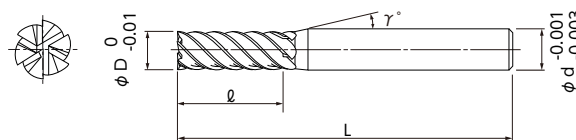
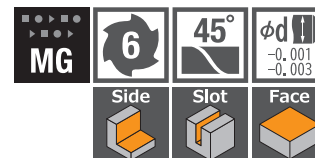
※(γ) is reference value.

Work Material			Hardened Steels/High Speed Steels SKD11・SKH51 (～62HRC)				High Speed Steels SKH55・HAP40 (～66HRC)				High Speed Steels SKH57・HAP72 (～70HRC)			
	Dia.	Length of Cut	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
Side Milling	1	2	25,000	500	1.5	0.02	20,000	240	1.5	0.02	16,000	160	1.5	0.02
		3	22,000	360	1.5	0.02	18,000	200	1.5	0.02	14,000	120	1.5	0.02
	1.5	3	16,000	560	2.25	0.03	14,000	330	2.25	0.03	10,000	240	2.25	0.03
		4.5	14,000	420	2.25	0.03	12,000	240	2.25	0.03	8,000	160	2.25	0.03
	2	4	12,000	630	3	0.04	10,000	480	3	0.04	8,000	320	3	0.04
		6	10,000	500	3	0.04	8,000	330	3	0.04	6,000	240	3	0.04
	3	6	8,000	700	4.5	0.06	7,000	560	4.5	0.06	5,600	400	4.5	0.06
		9	7,600	600	4.5	0.06	6,400	480	4.5	0.06	5,000	320	4.5	0.06
	4	8	7,000	800	6	0.08	6,000	600	6	0.08	5,000	400	6	0.08
		12	6,600	700	6	0.08	5,600	560	6	0.08	4,600	320	6	0.08
Slotting	1	2	20,000	300	0.02	-	16,000	120	0.01	-	14,000	100	0.01	-
		3	18,000	240	0.02	-	14,000	80	0.01	-	12,000	50	0.01	-
	1.5	3	12,000	380	0.03	-	10,000	160	0.015	-	8,000	120	0.015	-
		4.5	10,000	260	0.03	-	9,000	100	0.015	-	7,500	60	0.015	-
	2	4	10,000	420	0.04	-	8,000	240	0.02	-	7,000	160	0.02	-
		6	8,000	300	0.04	-	7,000	120	0.02	-	6,000	80	0.02	-
	3	6	7,500	500	0.06	-	6,000	280	0.03	-	5,000	180	0.03	-
		9	7,000	320	0.06	-	5,600	140	0.03	-	4,500	100	0.03	-
	4	8	6,000	540	0.08	-	5,000	300	0.04	-	4,500	180	0.04	-
		12	5,600	360	0.08	-	4,800	160	0.04	-	4,000	100	0.04	-
Notes			Side Milling  Slotting 											
			※1 Use a rigid and precise machine and chuck holder.											
			※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.											
			※3 Adjust both spindle speed and feed at the same rate.											
			※4 Do not use 5D cutting length for slotting.											
			※5 Use oil mist coolant.											

MUGEN COATING PREMIUM Plus 6-Flute Square End Mill for Hardened Steel

Total 4 sizes

High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel



- 6-flute is lineup of length of cut expands 2D and 3D.
- MUGEN COATING PREMIUM Plus realizes long tool life even for hardened steel up to 70HRC.
- High rigidity tool design improves machining accuracy.
- Shank diameter tolerance, high accuracy type, is - 0.001mm $\sim$ - 0.003mm.

Work Material

Hardened Steel **H**

60 $\sim$ 70HRC



Unit [Size : mm]

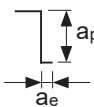
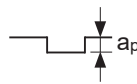
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00430-00502	5	10	12°	6	60
08-00430-00503		15	12°	6	65
08-00430-00602	6	12	-	6	60
08-00430-00603		18	-	6	65

How to Order

When you order, indicate MHDSH645 (D)×(ℓ).

※(γ) is reference value.

Recommended Conditions

Work Material			Hardened Steels/High Speed Steels SKD11・SKH51(～62HRC)				High Speed Steels SKH55・HAP40(～66HRC)				High Speed Steels SKH57・HAP72(～70HRC)			
	Dia.	Length of Cut	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
Side Milling	5	10	6,200	1,200	7.5	0.1	5,300	800	7.5	0.1	4,600	560	7.5	0.1
		15	5,600	1,000	7.5	0.1	4,800	600	7.5	0.1	4,200	480	7.5	0.1
	6	12	5,300	1,200	9	0.12	4,600	800	9	0.12	4,000	560	9	0.12
		18	4,800	1,000	9	0.12	4,200	600	9	0.12	3,600	480	9	0.12
Slotting	5	10	5,600	600	0.1	-	4,800	350	0.05	-	4,000	200	0.05	-
		15	5,000	400	0.1	-	4,200	200	0.05	-	3,600	120	0.05	-
	6	12	4,800	600	0.12	-	4,200	350	0.06	-	3,600	200	0.06	-
		18	4,200	400	0.12	-	3,600	200	0.06	-	3,200	120	0.06	-
Notes			Side Milling  Slotting 											
			※1 Use a rigid and precise machine and chuck holder.											
			※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.											
Notes			※3 Adjust both spindle speed and feed at the same rate.											
			※4 Do not use 5D cutting length for slotting.											
			※5 Use oil mist coolant.											

3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining

MUGEN COATING PREMIUM Plus
3-Flute Ball End Mill for 5-axis machining

MSBSH330-5X



R0.1 ~ R1

Total 8 sizes



Features

Feature 1	Coating	MUGEN COATING PREMIUM Plus
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Most suitable for 60HRC and above with MUGEN COATING PREMIUM Plus, high oxidation resistance and abrasion resistance.

Demonstrate same performance with MUGEN COATING PREMIUM even at 52 ~ 60HRC.

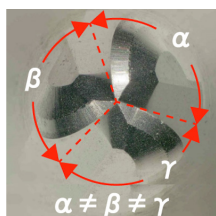
Hardened Steel H	
52~60HRC	60~70HRC
○	◎

Feature 2	High efficiency	3-Flute • Unequal flute spacing • Positive rake angle
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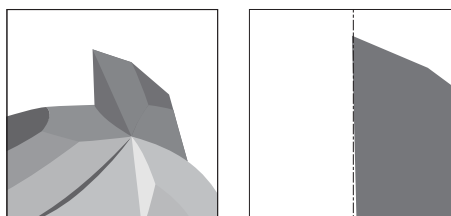
3-flute with unequal flute spacing reduces chattering and realizes high feed.

In addition, adopt positive cutting edge to carbide material with fracture resistance ability to reduce cutting load.

Unequal flute
Prevent chattering



Positive cutting edge



Feature
3

High rigidity

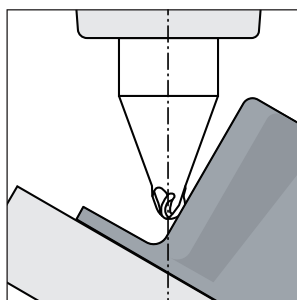
High rigidity tool design

Specialized neck design for 5-axis machining, and $\phi 6$ shank even for the smaller diameter suppress tool deflection excellently.

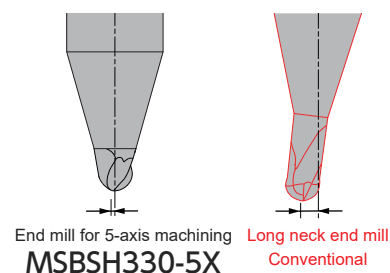
High rigidity neck design shape



Tool design for high rigidity to maximize advantages of 5-axis machining



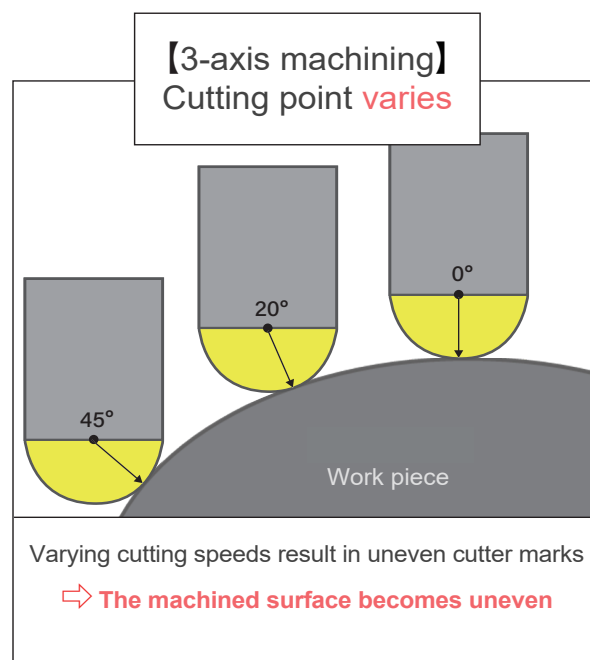
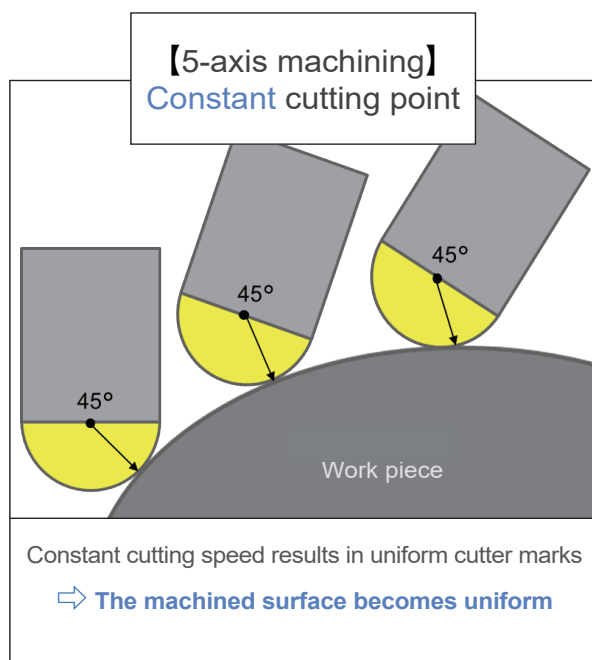
Suppressing the amount of deflection

Feature
4

Improving machined surface quality

Achieve an uniform machined surface by keeping the cutting point constant

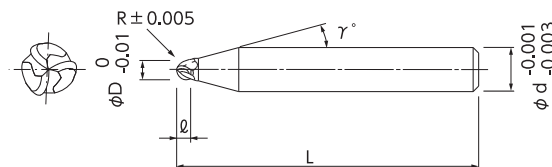
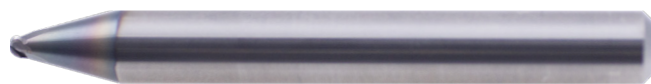
In 5-axis machining, maintaining the cutting point of the tool results in a uniform machined surface, which leads to improved surface quality



MUGEN COATING PREMIUM Plus 3-Flute Ball End Mill for 5-axis machining

Total 8 sizes

3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining



※ R accuracy is based on a half value of actual diameter

- 3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining.
- Even hardened steel of 52 to 70HRC can be machining with long tool life and high efficiency.
- By adopting positive cutting edge for carbide material emphasized breakage resistance that suppresses chattering by 3-flute and unequal flute.
- R accuracy is $\pm 0.005\text{mm}$ (R accuracy is based on a half value of actual diameter).
- Shank diameter tolerance, high accuracy type, is $-0.001\text{mm} \sim -0.003\text{mm}$.

Work Material

Hardened Steel H	
52~60HRC	60~70HRC
○	◎

Unit [Size : mm]

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00610-00100	R0.1	0.12	0.2	15°	6	50
08-00610-00150	R0.15	0.18	0.3	15°	6	50
08-00610-00200	R0.2	0.24	0.4	15°	6	50
08-00610-00250	R0.25	0.3	0.5	15°	6	50
08-00610-00300	R0.3	0.36	0.6	15°	6	50
08-00610-00500	R0.5	0.6	1	15°	6	50
08-00610-00750	R0.75	0.9	1.5	15°	6	50
08-00610-01000	R1	1.2	2	15°	6	50

How to Order

When you order, indicate MSBSH330-5X(R).

※(γ) is reference value.

Recommended Conditions

Work Material	Hardened Steels STAVAX・SKD11(～60HRC)				High Speed Steels SKH51・HAP40(～65HRC)				High Speed Steels SKH57・HAP72(～70HRC)			
Radius	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min ⁻¹	ap mm	ae mm	mm/min	min ⁻¹	ap mm	ae mm	mm/min	min ⁻¹
R0.1	0.005 ～ 0.007	0.005	400	40,000	0.003 ～ 0.005	0.003	300	40,000	0.003 ～ 0.005	0.003	220	40,000
R0.15	0.005 ～ 0.007	0.007	450	40,000	0.003 ～ 0.005	0.005	400	40,000	0.003 ～ 0.005	0.005	270	40,000
R0.2	0.02 ～ 0.03	0.03	1,100	40,000	0.008 ～ 0.012	0.02	850	40,000	0.008 ～ 0.012	0.02	650	35,000
R0.25	0.02 ～ 0.03	0.03	1,300	40,000	0.01 ～ 0.015	0.02	1,000	35,000	0.01 ～ 0.015	0.02	700	30,000
R0.3	0.03 ～ 0.045	0.06	1,500	40,000	0.02 ～ 0.03	0.05	1,100	30,000	0.02 ～ 0.03	0.05	800	25,000
R0.5	0.1 ～ 0.15	0.2	3,000	30,000	0.08 ～ 0.12	0.1	2,000	25,000	0.05 ～ 0.075	0.1	1,500	20,000
R0.75	0.1 ～ 0.15	0.3	3,800	30,000	0.1 ～ 0.15	0.2	3,000	25,000	0.06 ～ 0.09	0.2	2,200	20,000
R1	0.2 ～ 0.3	0.5	3,800	25,000	0.15 ～ 0.22	0.3	3,000	20,000	0.1 ～ 0.15	0.3	2,200	16,000
Notes	※1 Depth of cut ap indicates Axial Depth of Cut, ae indicates Radial Depth of Cut. ※2 Adjust milling condition according to machine rigidity and clamp condition of work material. ※3 Since the neck angle is 15°, please be careful to set the inclined angle to avoid interfering. ※4 Adjust milling condition with necessity when high cutting load occurred by angle of tool or work material and feed direction. ※5 The depth of cut ap is a guideline value according to the inclined angle of the tool or work material. ※6 In case of chattering etc., please adjust cutting conditions if necessary. ※7 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly. ※8 Adjust both spindle speed and feed at the same rate. ※9 Attention to a risk of chipping and breakage when insufficient chip flow. ※10 We recommend using oil mist coolant.											

High precision and long tool life even for hardened steel up to 70 HRC

MUGEN COATING PREMIUM Plus
2-Flute Long Neck Ball End Mill with Short Shank
for Hardened Steel and High accuracy cutting

MRBSH230SF

R0.05 ~ R3

Total 115 sizes



Features

Feature
1

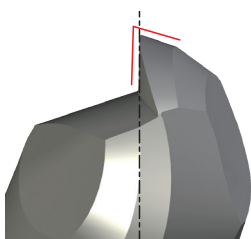
Improved machinability

Positive cutting edge

Sharp cutting edge with reduced cutting load and new material with fracture resistance realizes long tool life and high precision for hardened steel.

MRBSH230SF

Cutting edge shape

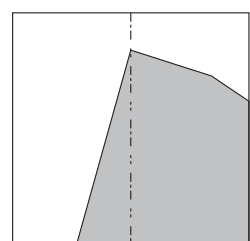
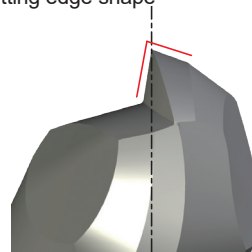


Positive cutting edge

Cutting load is reduced by positive cutting edge and by adopting a new material Super micro grain carbide prevent chipping even with hardened steel

General end mill for hardened steel

Cutting edge shape



Negative cutting edge

Negative cutting edge shape with high cutting load

Feature
2

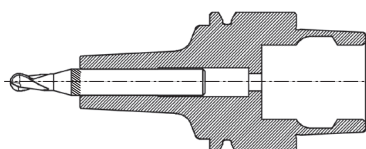
Improved cutting accuracy

Optimal overhung length

MRBSH230SF

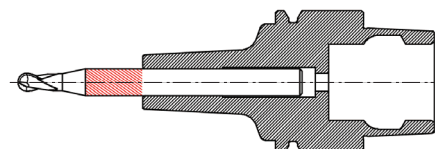
Possible to machining with high rigidity, with short tool overhung

short shank



Normal shank length

Tool overhung length is long, and tool rigidity is low

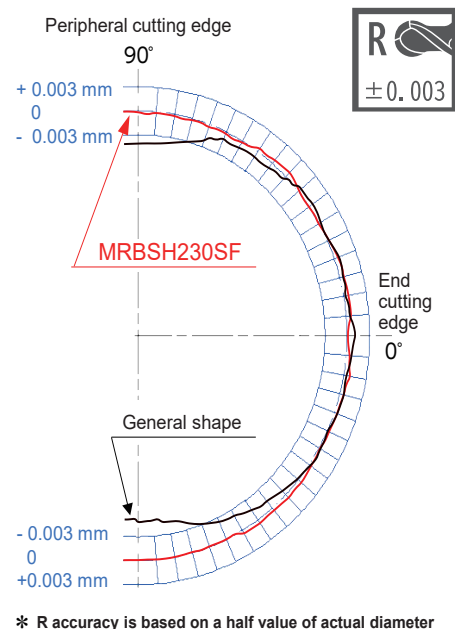
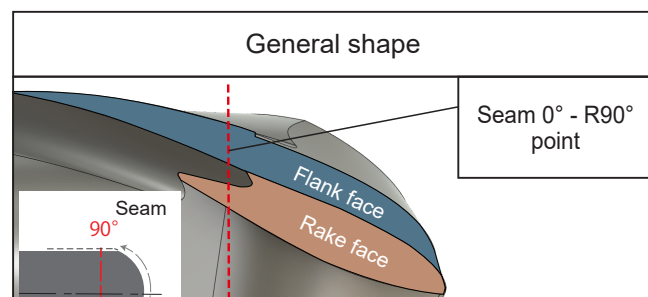
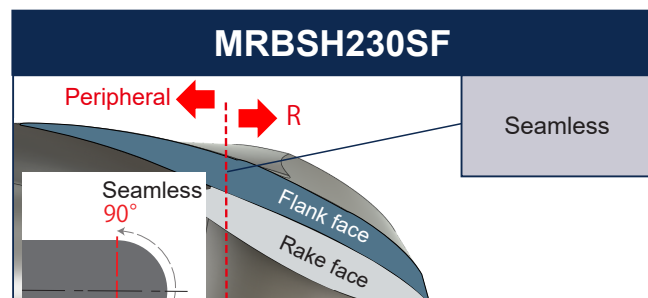


Feature
3

High accuracy R

Highly accurate R

Seamless design on rake face and flank face from R-curve to peripheral cutting edge realizes high precision R accuracy.



Comparison of dimensional accuracy

Comparison of dimensional accuracy after roughing on HAP72 (70HRC)

Machining content : Roughing contour lines for 4 pockets

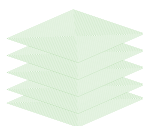
Tool : MRBSH230SF R1×6

Stock : 0.02mm

Target : 7.960mm

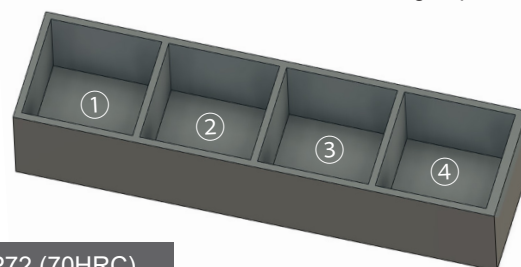
Machining time : 20 min per pocket

Tool path : Roughing contour line



Machining shape

Pocket Size : 7.960mm × 7.960mm × Machining depth 6mm



HAP72 (70HRC)

Roughing

$n = 16,000 \text{ min}^{-1}$ $vf = 1,200 \text{ mm/min}$ $ap 0.1 \times ae 0.3 \text{ mm}$ Oil Mist

Tool wear condition after 80min machining

MRBSH230SF

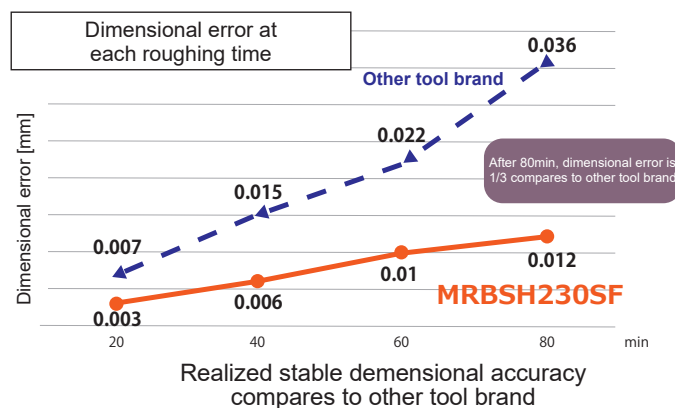


Frank wear width
0.055mm

Other tool brand



Frank wear width
0.102mm

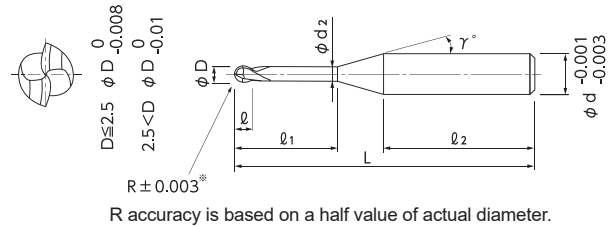


MUGEN COATING PREMIUM Plus

2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel

Total 115 Sizes

High precision and long tool life even for hardened steel up to 70HRC

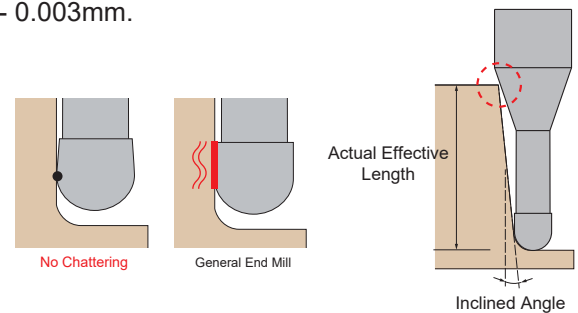


- Realize stable cutting performance even for 70 HRC hardened steels.
- Developed new MUGEN COATING PREMIUM Plus to upgrade oxidation resistance and abrasion resistance.
- Adopt optimized new tool material and tool design to reduce cutting load.
- R accuracy is $\pm 0.003\text{mm}$ (R accuracy is based on a half value of actual diameter).
- Shank diameter tolerance, high accuracy type, is $-0.001\text{mm} \sim -0.003\text{mm}$.

Work Material

Hardened Steel H

60~70HRC



Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										30°	1°	1°30'	2°	3°
08-00537-00052	R0.05	0.2	0.07	0.1	0.085	15°	4	27.4	35	0.23	0.24	0.24	0.25	0.27
08-00537-00056		0.25	0.07	0.1	0.085	15°	4	27.4	35	0.28	0.29	0.30	0.31	0.33
08-00537-00053		0.3	0.07	0.1	0.085	15°	4	27.3	35	0.33	0.34	0.35	0.36	0.39
08-00537-00054		0.4	0.07	0.1	0.085	15°	4	27.2	35	0.44	0.45	0.46	0.48	0.52
08-00537-00055		0.5	0.07	0.1	0.085	15°	4	27.1	35	0.54	0.56	0.57	0.59	0.64
08-00537-00076	R0.075	0.25	0.1	0.15	0.13	15°	4	27.5	35	0.29	0.30	0.31	0.31	0.33
08-00537-00072		0.3	0.1	0.15	0.13	15°	4	27.4	35	0.34	0.35	0.36	0.37	0.40
08-00537-00077		0.4	0.1	0.15	0.13	15°	4	27.3	35	0.44	0.46	0.47	0.49	0.52
08-00537-00073		0.5	0.1	0.15	0.13	15°	4	27.2	35	0.55	0.56	0.58	0.60	0.65
08-00537-00074		0.6	0.1	0.15	0.13	15°	4	27.1	35	0.65	0.67	0.69	0.72	0.77
08-00537-00075		0.7	0.1	0.15	0.13	15°	4	27.0	35	0.75	0.78	0.80	0.83	0.89
08-00537-00101	R0.1	0.3	0.15	0.2	0.18	15°	4	27.5	35	0.34	0.35	0.36	0.37	0.39
08-00537-00106		0.4	0.15	0.2	0.18	15°	4	27.4	35	0.44	0.46	0.47	0.48	0.51
08-00537-00102		0.5	0.15	0.2	0.18	15°	4	27.3	35	0.55	0.56	0.58	0.60	0.64
08-00537-00107		0.6	0.15	0.2	0.18	15°	4	27.2	35	0.65	0.67	0.69	0.71	0.76
08-00537-00103		0.75	0.15	0.2	0.18	15°	4	27.1	35	0.81	0.83	0.86	0.89	0.95
08-00537-00104		0.85	0.15	0.2	0.18	15°	4	27.0	35	0.91	0.94	0.97	1.00	1.07
08-00537-00105	R0.15	1	0.15	0.2	0.18	15°	4	26.8	35	1.06	1.10	1.13	1.17	1.26
08-00537-00150		0.5	0.2	0.3	0.28	15°	4	27.5	35	0.55	0.56	0.57	0.59	0.63
08-00537-00151		0.6	0.2	0.3	0.28	15°	4	27.4	35	0.65	0.67	0.69	0.71	0.75
08-00537-00152		0.75	0.2	0.3	0.28	15°	4	27.3	35	0.80	0.83	0.85	0.88	0.94
08-00537-00153		1	0.2	0.3	0.28	15°	4	27.0	35	1.06	1.09	1.13	1.17	1.25
08-00537-00154		1.25	0.2	0.3	0.28	15°	4	26.8	35	1.32	1.36	1.41	1.45	1.56
08-00537-00155	R0.2	1.5	0.2	0.3	0.28	15°	4	26.5	35	1.58	1.63	1.68	1.74	1.87
08-00537-00201		0.5	0.3	0.4	0.37	15°	4	27.7	35	0.56	0.58	0.59	0.60	0.64
08-00537-00207		0.65	0.3	0.4	0.37	15°	4	27.6	35	0.72	0.74	0.76	0.78	0.83
08-00537-00202		0.8	0.3	0.4	0.37	15°	4	27.4	35	0.87	0.90	0.92	0.95	1.01

How to Order

When you order, indicate MRBSH230SF (R) × (ℓ1) × (d).

※(γ) is reference value.

MUGEN COATING PREMIUM Plus
2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel

Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										30°	1°	1°30′	2°	3°
08-00537-00203	R0.2	1	0.3	0.4	0.37	15°	4	27.2	35	1.08	1.11	1.14	1.18	1.26
08-00537-00208		1.25	0.3	0.4	0.37	15°	4	27.0	35	1.34	1.38	1.42	1.47	1.57
08-00537-00204		1.5	0.3	0.4	0.37	15°	4	26.7	35	1.60	1.65	1.70	1.75	1.88
08-00537-00209		1.75	0.3	0.4	0.37	15°	4	26.5	35	1.86	1.91	1.98	2.04	2.19
08-00537-00205		2	0.3	0.4	0.37	15°	4	26.2	35	2.11	2.18	2.25	2.33	2.50
08-00537-00210		2.25	0.3	0.4	0.37	15°	4	26.0	35	2.37	2.45	2.53	2.62	2.81
08-00537-00206	R0.25	2.5	0.3	0.4	0.37	15°	4	25.7	35	2.63	2.72	2.81	2.90	3.13
08-00537-00251		0.5	0.35	0.5	0.46	15°	4	27.8	35	0.58	0.59	0.61	0.62	0.65
08-00537-00252		1	0.35	0.5	0.46	15°	4	27.3	35	1.10	1.13	1.16	1.19	1.27
08-00537-00253		1.5	0.35	0.5	0.46	15°	4	26.8	35	1.61	1.66	1.71	1.77	1.89
08-00537-00254		2	0.35	0.5	0.46	15°	4	26.3	35	2.13	2.20	2.27	2.34	2.51
08-00537-00255		2.5	0.35	0.5	0.46	15°	4	25.8	35	2.65	2.73	2.82	2.92	3.14
08-00537-00256		3	0.35	0.5	0.46	15°	4	25.3	35	3.16	3.27	3.38	3.49	3.76
08-00537-00307	R0.3	0.6	0.45	0.6	0.56	15°	4	27.9	35	0.68	0.70	0.71	0.73	0.76
08-00537-00300		1	0.45	0.6	0.56	15°	4	27.5	35	1.10	1.12	1.15	1.19	1.26
08-00537-00301		1.5	0.45	0.6	0.56	15°	4	27.0	35	1.61	1.66	1.71	1.76	1.88
08-00537-00302		2	0.45	0.6	0.56	15°	4	26.5	35	2.13	2.19	2.26	2.34	2.50
08-00537-00303		2.5	0.45	0.6	0.56	15°	4	26.0	35	2.65	2.73	2.82	2.91	3.12
08-00537-00304		3	0.45	0.6	0.56	15°	4	25.5	35	3.16	3.26	3.37	3.49	3.75
08-00537-00305	R0.4	3.5	0.45	0.6	0.56	15°	4	25.0	35	3.68	3.80	3.92	4.06	4.37
08-00537-00306		4	0.45	0.6	0.56	15°	4	29.5	40	4.20	4.33	4.48	4.64	4.99
08-00537-00401		1	0.6	0.8	0.76	15°	4	27.9	35	1.09	1.12	1.14	1.17	1.24
08-00537-00402		2	0.6	0.8	0.76	15°	4	26.9	35	2.13	2.19	2.25	2.32	2.48
08-00537-00403		3	0.6	0.8	0.76	15°	4	25.9	35	3.16	3.26	3.36	3.47	3.72
08-00537-00405		4	0.6	0.8	0.76	15°	4	24.9	35	4.19	4.33	4.47	4.62	4.97
08-00537-00406	R0.5	5	0.6	0.8	0.76	15°	4	28.9	40	5.23	5.40	5.58	5.77	6.21
08-00537-00507		1	0.75	1	0.95	15°	4	28.3	35	1.11	1.13	1.15	1.18	1.24
08-00537-00508		1.5	0.75	1	0.95	15°	4	27.8	35	1.63	1.66	1.71	1.75	1.86
08-00537-00501		2	0.75	1	0.95	15°	4	27.3	35	2.14	2.20	2.26	2.33	2.48
08-00537-00502		2.5	0.75	1	0.95	15°	4	26.8	35	2.66	2.73	2.82	2.90	3.10
08-00537-00503		3	0.75	1	0.95	15°	4	26.3	35	3.18	3.27	3.37	3.48	3.72
08-00537-00504	R0.6	4	0.75	1	0.95	15°	4	25.3	35	4.21	4.34	4.48	4.63	4.97
08-00537-00505		5	0.75	1	0.95	15°	4	29.3	40	5.24	5.41	5.59	5.78	6.21
08-00537-00506		6	0.75	1	0.95	15°	4	28.3	40	6.28	6.48	6.69	6.93	7.45
08-00537-00602		2.4	0.9	1.2	1.15	15°	4	27.2	35	2.55	2.62	2.69	2.77	2.95
08-00537-00603		4	0.9	1.2	1.15	15°	4	25.6	35	4.21	4.33	4.47	4.61	4.94
08-00537-00605		6	0.9	1.2	1.15	15°	4	28.6	40	6.27	6.47	6.68	6.91	7.43
08-00537-00606	R0.75	8	0.9	1.2	1.15	15°	4	26.6	40	8.34	8.61	8.90	9.21	9.91
08-00537-00751		2	1.1	1.5	1.45	15°	4	28.2	35	2.13	2.18	2.23	2.29	2.42
08-00537-00752		3	1.1	1.5	1.45	15°	4	27.2	35	3.17	3.25	3.34	3.44	3.66
08-00537-00753		4	1.1	1.5	1.45	15°	4	26.2	35	4.20	4.32	4.45	4.59	4.91
08-00537-00754		6	1.1	1.5	1.45	15°	4	29.2	40	6.27	6.46	6.67	6.89	7.39
08-00537-00755		8	1.1	1.5	1.45	15°	4	27.2	40	8.34	8.60	8.88	9.19	9.88
08-00537-00756	R0.8	10	1.1	1.5	1.45	15°	4	25.2	40	10.40	10.74	11.10	11.49	12.36
08-00537-00805		8	1.2	1.6	1.55	15°	4	27.4	40	8.33	8.60	8.88	9.18	9.87
08-00537-00901		3	1.3	1.8	1.74	15°	4	27.8	35	3.18	3.26	3.35	3.44	3.65
08-00537-00902		4	1.3	1.8	1.74	15°	4	26.8	35	4.22	4.33	4.46	4.59	4.89
08-00537-00903		6	1.3	1.8	1.74	15°	4	29.8	40	6.28	6.47	6.67	6.89	7.38
08-00537-00904		8	1.3	1.8	1.74	15°	4	27.8	40	8.35	8.61	8.89	9.19	9.87
08-00537-00905	R1	10	1.3	1.8	1.74	15°	4	25.8	40	10.42	10.75	11.11	11.49	12.35
08-00537-01006		2	1.5	2	1.94	15°	4	29.1	35	2.14	2.19	2.23	2.28	2.38
08-00537-01000		3	1.5	2	1.94	15°	4	28.1	35	3.18	3.25	3.34	3.43	3.63
08-00537-01001		4	1.5	2	1.94	15°	4	27.1	35	4.21	4.32	4.45	4.58	4.87
08-00537-01002		6	1.5	2	1.94	15°	4	25.1	35	6.28	6.46	6.66	6.88	7.36

MRBSH230SF

MUGEN COATING PREMIUM Plus

2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel

Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										3°	1°	1°30'	2°	3°
08-00537-01003	R1	8	1.5	2	1.94	15°	4	28.1	40	8.35	8.60	8.88	9.18	9.84
08-00537-01004		10	1.5	2	1.94	15°	4	26.1	40	10.41	10.74	11.10	11.48	12.33
08-00537-01005		12	1.5	2	1.94	15°	4	29.1	45	12.48	12.88	13.31	13.77	14.82
08-00537-01251	R1.25	4	2.3	2.5	2.4	15°	4	28.0	35	4.28	4.39	4.50	4.62	4.90
08-00537-01252		6	2.3	2.5	2.4	15°	4	26.0	35	6.35	6.53	6.72	6.92	7.39
08-00537-01253		8	2.3	2.5	2.4	15°	4	29.0	40	8.42	8.67	8.93	9.22	9.88
08-00537-01254		10	2.3	2.5	2.4	15°	4	27.0	40	10.48	10.81	11.15	11.52	12.36
08-00537-01256		15	2.3	2.5	2.4	15°	4	27.0	45	15.65	16.15	16.69	17.27	Free
08-00537-01500	R1.5	6	2.5	3	2.85	15°	6	33.1	45	6.44	6.61	6.79	7.00	7.45
08-00537-01501		8	2.5	3	2.85	15°	6	31.1	45	8.50	8.75	9.01	9.29	9.93
08-00537-01502		10	2.5	3	2.85	15°	6	29.1	45	10.57	10.89	11.23	11.59	12.42
08-00537-01503		12	2.5	3	2.85	15°	6	27.1	45	12.64	13.03	13.44	13.89	14.91
08-00537-01504		14	2.5	3	2.85	15°	6	30.1	50	14.71	15.17	15.66	16.19	17.39
08-00537-01505		16	2.5	3	2.85	15°	6	28.1	50	16.77	17.31	17.88	18.49	19.88
08-00537-01507		18	2.5	3	2.85	15°	6	31.1	55	18.84	19.45	20.09	20.79	22.36
08-00537-01506		20	2.5	3	2.85	15°	6	29.1	55	20.91	21.58	22.31	23.09	24.85
08-00537-02000	R2	8	3	4	3.8	15°	6	32.8	45	8.58	8.81	9.06	9.33	9.93
08-00537-02001		10	3	4	3.8	15°	6	30.8	45	10.65	10.95	11.28	11.63	12.42
08-00537-02002		12	3	4	3.8	15°	6	28.8	45	12.72	13.09	13.49	13.93	14.90
08-00537-02004		15	3	4	3.8	15°	6	30.8	50	15.82	16.30	16.82	17.38	18.63
08-00537-02005		20	3	4	3.8	15°	6	30.8	55	20.99	21.65	22.36	23.13	Free
08-00537-02006		25	3	4	3.8	15°	6	30.8	60	26.16	27.00	27.90	28.88	Free
08-00537-02502	R2.5	10	3.5	5	4.8	15°	6	32.7	45	10.63	10.92	11.22	11.55	Free
08-00537-02503		15	3.5	5	4.8	15°	6	27.7	45	15.80	16.27	16.77	Free	Free
08-00537-02504		20	3.5	5	4.8	15°	6	27.7	50	20.97	21.62	Free	Free	Free
08-00537-02505		25	3.5	5	4.8	15°	6	27.7	55	26.14	26.96	Free	Free	Free
08-00537-02506		30	3.5	5	4.8	15°	6	27.7	60	31.31	Free	Free	Free	Free
08-00537-03000	R3	10	6	6	5.7	-	6	34.4	45	Free	Free	Free	Free	Free
08-00537-03001		15	6	6	5.7	-	6	29.4	45	Free	Free	Free	Free	Free
08-00537-03002		20	6	6	5.7	-	6	29.4	50	Free	Free	Free	Free	Free
08-00537-03003		25	6	6	5.7	-	6	29.4	55	Free	Free	Free	Free	Free
08-00537-03004		30	6	6	5.7	-	6	29.4	60	Free	Free	Free	Free	Free
08-00537-03005		35	6	6	5.7	-	6	29.4	65	Free	Free	Free	Free	Free
08-00537-03006		40	6	6	5.7	-	6	29.4	70	Free	Free	Free	Free	Free

How to Order

When you order, indicate MRBSH230SF (R) × (ℓ1) × (d).

※(γ) is reference value.

Work Material			High Speed Steels/Hardened Steels SKH51・SKD11(～62HRC)				High Speed Steels SKH55・HAP40(～66HRC)				High Speed Steels SKH57・HAP72(～70HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹
R0.05	0.2	2	0.002	0.005	100	40,000	0.002	0.003	70	40,000	0.002	0.003	50	40,000
	0.25	2.5	0.002	0.005	80	40,000	0.002	0.003	50	40,000	0.002	0.003	40	40,000
	0.3	3	0.002	0.005	70	40,000	0.002	0.003	50	40,000	0.002	0.003	40	40,000
	0.4	4	0.001	0.005	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
	0.5	5	0.001	0.003	50	40,000	0.001	0.002	30	40,000	0.001	0.002	20	40,000
R0.075	0.25	1.7	0.002	0.005	160	40,000	0.002	0.003	120	40,000	0.002	0.003	100	40,000
	0.3	2	0.002	0.005	150	40,000	0.002	0.003	100	40,000	0.002	0.003	80	40,000
	0.4	2.7	0.002	0.005	120	40,000	0.002	0.003	70	40,000	0.002	0.003	50	40,000
	0.5	3.3	0.002	0.005	120	40,000	0.002	0.003	70	40,000	0.002	0.003	50	40,000
	0.6	4	0.001	0.003	100	40,000	0.001	0.002	50	40,000	0.001	0.002	40	40,000
	0.7	4.7	0.001	0.003	80	40,000	0.001	0.002	40	40,000	0.001	0.002	30	40,000
R0.1	0.3	1.5	0.005	0.005	300	40,000	0.003	0.003	200	40,000	0.003	0.003	150	40,000
	0.4	2	0.005	0.005	290	40,000	0.003	0.003	200	40,000	0.003	0.003	150	40,000
	0.5	2.5	0.005	0.005	280	40,000	0.003	0.003	180	40,000	0.003	0.003	130	40,000
	0.6	3	0.003	0.005	250	40,000	0.002	0.003	160	40,000	0.002	0.003	120	40,000
	0.75	3.75	0.003	0.005	200	40,000	0.002	0.003	150	40,000	0.002	0.003	110	40,000
	0.85	4.3	0.002	0.005	180	40,000	0.001	0.003	130	40,000	0.001	0.002	100	40,000
	1	5	0.002	0.003	160	40,000	0.001	0.002	120	40,000	0.001	0.002	90	40,000
R0.15	0.5	1.7	0.007	0.01	300	40,000	0.003	0.005	280	40,000	0.003	0.005	210	40,000
	0.6	2	0.005	0.007	300	40,000	0.003	0.005	250	40,000	0.003	0.005	180	40,000
	0.75	2.5	0.005	0.007	280	40,000	0.003	0.005	230	40,000	0.003	0.005	170	40,000
	1	3.3	0.005	0.007	250	40,000	0.003	0.005	200	40,000	0.003	0.005	150	40,000
	1.25	4.2	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.002	0.003	120	40,000
	1.5	5	0.003	0.005	180	40,000	0.002	0.003	120	40,000	0.002	0.003	90	40,000
R0.2	0.5	1.25	0.03	0.03	720	40,000	0.009	0.02	580	40,000	0.009	0.02	420	35,000
	0.65	1.6	0.025	0.03	720	40,000	0.009	0.02	580	40,000	0.009	0.02	420	35,000
	0.8	2	0.02	0.03	720	40,000	0.008	0.02	580	40,000	0.008	0.02	420	35,000
	1	2.5	0.02	0.03	720	40,000	0.008	0.02	580	40,000	0.008	0.02	400	35,000
	1.25	3.1	0.015	0.02	620	40,000	0.006	0.02	470	40,000	0.006	0.02	320	35,000
	1.5	3.75	0.01	0.02	500	40,000	0.005	0.01	400	40,000	0.005	0.01	280	35,000
	1.75	4.4	0.01	0.02	450	40,000	0.005	0.01	340	40,000	0.005	0.01	250	35,000
	2	5	0.007	0.01	380	40,000	0.005	0.007	300	40,000	0.005	0.007	220	35,000
	2.25	5.6	0.005	0.01	330	40,000	0.003	0.005	280	40,000	0.003	0.005	200	35,000
	2.5	6.25	0.005	0.007	300	40,000	0.003	0.005	260	40,000	0.003	0.005	190	35,000
	0.5	1	0.03	0.04	860	40,000	0.015	0.03	650	40,000	0.015	0.02	450	30,000
R0.25	1	2	0.02	0.03	860	40,000	0.01	0.02	650	35,000	0.01	0.02	450	30,000
	1.5	3	0.01	0.03	720	40,000	0.007	0.02	520	35,000	0.007	0.02	350	30,000
	2	4	0.01	0.02	650	40,000	0.007	0.01	400	35,000	0.007	0.01	270	30,000
	2.5	5	0.007	0.01	530	40,000	0.005	0.007	360	35,000	0.005	0.007	240	30,000
	3	6	0.007	0.01	420	35,000	0.005	0.007	320	35,000	0.005	0.007	220	30,000
	0.6	1	0.03	0.08	1,000	40,000	0.02	0.05	720	35,000	0.02	0.05	540	28,000
R0.3	1	1.7	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000	0.02	0.05	540	25,000
	1.5	2.5	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000	0.02	0.05	540	25,000
	2	3.3	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000	0.02	0.05	540	25,000
	2.5	4.1	0.02	0.04	840	40,000	0.02	0.03	640	30,000	0.02	0.03	480	25,000
	3	5	0.02	0.04	840	40,000	0.02	0.03	600	30,000	0.02	0.03	450	25,000
	3.5	5.9	0.01	0.03	600	30,000	0.01	0.02	420	30,000	0.01	0.02	310	25,000
	4	6.7	0.01	0.03	600	30,000	0.01	0.02	420	30,000	0.01	0.02	310	25,000
R0.4	1	1.3	0.08	0.12	1,600	38,000	0.06	0.1	1,200	35,000	0.035	0.1	900	28,000
	2	2.5	0.07	0.1	1,600	35,000	0.05	0.1	1,200	30,000	0.03	0.1	900	25,000
	3	3.75	0.05	0.1	1,600	35,000	0.05	0.05	1,200	30,000	0.03	0.05	900	25,000
	4	5	0.04	0.06	1,200	30,000	0.03	0.05	860	25,000	0.02	0.05	640	20,000
	5	6.25	0.03	0.05	1,000	25,000	0.02	0.03	620	25,000	0.015	0.03	460	20,000

MRBSH230SF

Recommended Conditions

Work Material			High Speed Steels/Hardened Steels SKH51・SKD11(～62HRC)				High Speed Steels SKH55・HAP40(～66HRC)				High Speed Steels SKH57・HAP72(～70HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹
R0.5	1	1	0.1	0.2	2,000	30,000	0.08	0.12	1,400	25,000	0.05	0.12	1,000	20,000
	1.5	1.5	0.1	0.2	2,000	30,000	0.08	0.12	1,400	25,000	0.05	0.12	1,000	20,000
	2	2	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000	0.05	0.1	1,000	20,000
	2.5	2.5	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000	0.05	0.1	1,000	20,000
	3	3	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000	0.05	0.1	1,000	20,000
	4	4	0.05	0.15	1,600	28,000	0.05	0.1	1,200	25,000	0.03	0.1	900	20,000
	5	5	0.04	0.1	1,400	25,000	0.03	0.05	920	20,000	0.02	0.05	700	16,000
R0.6	6	6	0.04	0.05	1,200	22,000	0.02	0.05	740	20,000	0.015	0.05	550	16,000
	2.4	2	0.1	0.2	2,000	30,000	0.08	0.1	1,600	25,000	0.05	0.1	1,200	20,000
	4	3.3	0.1	0.2	2,000	30,000	0.06	0.1	1,600	25,000	0.05	0.1	1,200	20,000
	6	5	0.05	0.1	1,400	25,000	0.03	0.07	1,000	20,000	0.02	0.07	750	16,000
R0.75	8	6.7	0.03	0.07	1,200	22,000	0.02	0.05	850	20,000	0.015	0.05	650	16,000
	2	1.3	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000	0.06	0.2	1,500	20,000
	3	2	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000	0.06	0.2	1,500	20,000
	4	2.7	0.1	0.3	2,000	25,000	0.1	0.2	1,600	22,000	0.06	0.2	1,200	18,000
	6	4	0.1	0.2	1,600	22,000	0.1	0.1	1,200	20,000	0.06	0.1	950	16,000
	8	5.3	0.05	0.2	1,400	20,000	0.05	0.1	1,000	18,000	0.03	0.1	700	13,000
R0.8	10	6.7	0.05	0.1	1,200	18,000	0.05	0.05	850	16,000	0.03	0.05	650	13,000
	8	5	0.07	0.2	1,400	20,000	0.05	0.1	1,000	16,000	0.03	0.1	750	13,000
R0.9	3	1.7	0.12	0.3	2,500	25,000	0.1	0.25	2,000	20,000	0.08	0.2	1,500	16,000
	4	2.2	0.12	0.25	2,500	25,000	0.1	0.2	1,800	20,000	0.08	0.2	1,500	16,000
	6	3.3	0.12	0.25	2,500	25,000	0.1	0.2	1,600	18,000	0.08	0.2	1,200	16,000
	8	4.4	0.08	0.2	2,300	23,000	0.08	0.15	1,400	17,000	0.06	0.1	750	13,000
	10	5.6	0.08	0.2	1,700	18,000	0.08	0.12	1,100	14,000	0.03	0.1	750	11,000
R1	2	1	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000	0.1	0.3	1,500	16,000
	3	1.5	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000	0.1	0.3	1,500	16,000
	4	2	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000	0.1	0.3	1,500	16,000
	6	3	0.2	0.3	2,000	22,000	0.15	0.3	1,600	20,000	0.1	0.3	1,200	16,000
	8	4	0.1	0.2	1,600	18,000	0.1	0.15	1,200	16,000	0.06	0.15	950	13,000
	10	5	0.1	0.2	1,400	16,000	0.1	0.1	1,000	14,000	0.06	0.1	750	11,000
	12	6	0.07	0.1	1,200	14,000	0.05	0.1	850	12,000	0.03	0.1	650	9,500
R1.25	4	1.6	0.2	0.5	2,500	20,000	0.15	0.4	2,000	18,000	0.1	0.4	1,500	14,000
	6	2.4	0.2	0.5	2,500	20,000	0.15	0.4	2,000	18,000	0.1	0.4	1,500	14,000
	8	3.2	0.2	0.3	2,100	20,000	0.15	0.3	1,800	18,000	0.1	0.3	1,300	14,000
	10	4	0.15	0.2	1,800	18,000	0.1	0.15	1,500	16,000	0.06	0.15	1,100	13,000
	15	6	0.07	0.15	1,200	14,000	0.05	0.1	900	12,000	0.03	0.1	700	9,500
R1.5	6	2	0.2	0.6	2,500	18,000	0.2	0.5	2,000	15,000	0.12	0.5	1,500	12,000
	8	2.7	0.2	0.6	2,500	18,000	0.2	0.5	2,000	15,000	0.12	0.5	1,500	12,000
	10	3.3	0.2	0.4	2,100	18,000	0.15	0.3	1,800	15,000	0.1	0.3	1,300	12,000
	12	4	0.2	0.4	2,000	18,000	0.1	0.3	1,500	15,000	0.06	0.3	1,100	12,000
	14	4.7	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000	0.06	0.2	900	10,000
	16	5.3	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000	0.06	0.2	900	10,000
	18	6	0.1	0.2	1,400	16,000	0.1	0.15	960	12,000	0.06	0.15	750	9,500
	20	6.7	0.08	0.2	1,200	14,000	0.08	0.1	850	12,000	0.06	0.1	650	9,500
R2	8	2	0.2	0.8	2,500	15,000	0.2	0.6	2,000	12,000	0.15	0.6	1,500	9,500
	10	2.5	0.2	0.8	2,500	15,000	0.2	0.6	2,000	12,000	0.15	0.6	1,500	9,500
	12	3	0.2	0.8	2,500	15,000	0.2	0.6	2,000	12,000	0.15	0.6	1,500	9,500
	15	3.75	0.2	0.8	2,000	15,000	0.15	0.6	1,600	12,000	0.12	0.6	1,200	9,500
	20	5	0.1	0.6	1,700	14,000	0.1	0.4	1,200	10,000	0.08	0.4	900	8,000
	25	6.25	0.1	0.4	1,200	14,000	0.1	0.2	850	10,000	0.08	0.2	650	8,000
R2.5	10	2	0.2	1.2	2,500	12,000	0.2	0.7	2,000	10,000	0.15	0.7	1,500	8,000
	15	3	0.2	1.2	2,500	12,000	0.2	0.7	2,000	10,000	0.15	0.7	1,500	8,000
	20	4	0.2	1	2,000	10,000	0.15	0.6	1,600	8,500	0.12	0.6	1,200	6,500

Work Material			High Speed Steels/Hardened Steels SKH51・SKD11 (∼62HRC)				High Speed Steels SKH55・HAP40 (∼66HRC)				High Speed Steels SKH57・HAP72 (∼70HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹
R2.5	25	5	0.15	0.8	1,800	8,600	0.1	0.3	1,200	7,200	0.08	0.3	1,000	6,500
	30	6	0.15	0.5	1,500	7,600	0.1	0.2	860	6,400	0.08	0.2	750	6,000
R3	10	1.7	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000	0.15	1	1,500	5,500
	15	2.5	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000	0.15	1	1,500	5,500
	20	3.3	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000	0.15	1	1,500	5,500
	25	4.1	0.2	1	2,200	8,000	0.15	0.7	1,600	7,000	0.12	0.7	1,200	5,500
	30	5	0.2	1	1,800	7,000	0.15	0.7	1,300	6,500	0.12	0.7	950	5,000
	35	5.8	0.17	0.8	1,600	6,800	0.12	0.5	1,200	5,800	0.1	0.5	800	4,500
	40	6.7	0.15	0.6	1,200	6,400	0.1	0.4	1,000	5,200	0.08	0.4	650	4,000
Notes			※1 Depth of Cut a _p indicates Axial Depth of Cut, a _e indicates Radial Depth of Cut. ※2 In case of chattering etc., please adjust cutting conditions if necessary. ※3 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly. ※4 Adjust both spindle speed and feed at the same rate. ※5 A shrink fit type is recommended for tool holder. When using collet type or others, strictly adhere to minimum gripping length. ※6 We recommend using oil mist coolant.											

Comparison of dimensional accuracy

Comparison of dimensional accuracy after finishing on HAP72 (70HRC)

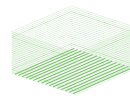
Machining content : Finishing cutting for 1 pocket

Tool : MRBSH230SF R1×6

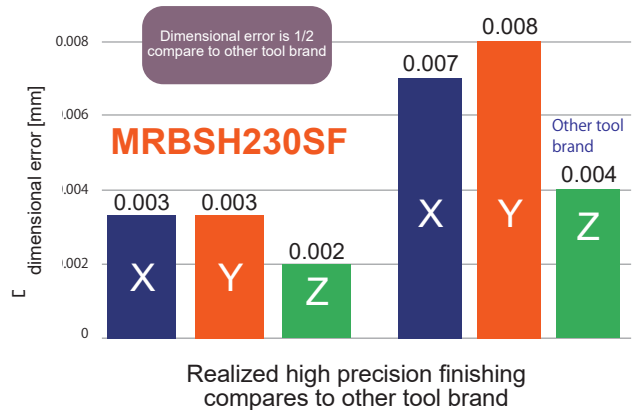
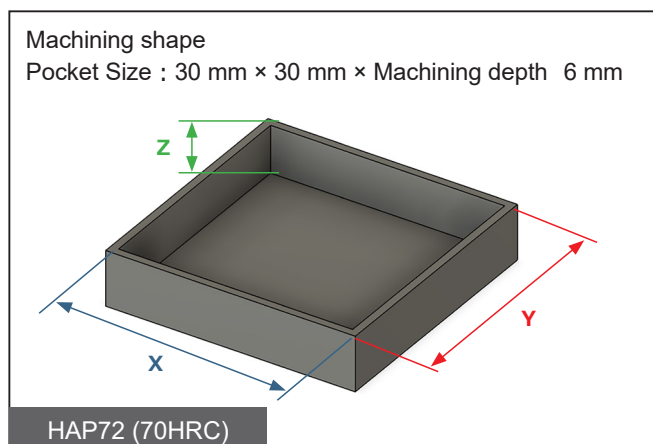
Machining time : 32 min per pocket

Tool path : Contour line finishing (side)

Scanning line finishing (bottom)



Finishing

n= 16,000min⁻¹ vf= 1,000mm/min ap 0.03 × ae 0.03mm Oil Mist

High-efficiency high-precision die machining with improved cutting edge rigidity and chip evacuation

MUGEN COATING PREMIUM Plus
High Efficient 3-Flute Small-Diameter
Long Neck Ball End Mill for Hardened Steel

MRBSH330



R0.1 ~ R3

Total 31 sizes



Features

Feature 1	Long tool life	MUGEN COATING PREMIUM Plus
---------------------	----------------	----------------------------

■ Comparison with other tool brand on roughing process

- Tool size : R1
- Work Material : HAP40 (64HRC)
- Spindle speed : 20,000 min⁻¹
- Feed : 2,400 mm/min

Under the same rate of depth of cut **ap 0.23 × ae 0.3 mm**

	Before use	After 60min	After 90min	After 120min
MRBSH330 R1×6				
Other tool brand A 4-flute ball end mill R1				
Other tool brand B 4-flute ball end mill R1				

Realize long tool life during high speed machining even comparing with the other brand tool

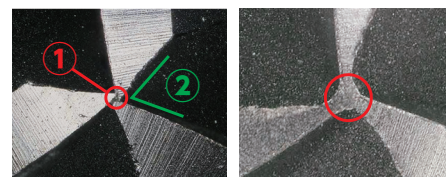
Feature
2

High efficiency

Cutting edge shape · Unequal flute spacing · 3-Flute ·
Chip evacuation

2-1

Optimized center ball shape reduces cutting load to enable high depth of cut



MRBSH330

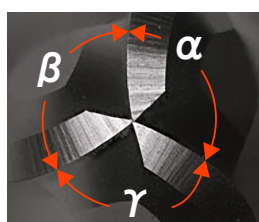
Conventional

2-2

Optimized chip pocket design realizes smooth chip removal

2-3

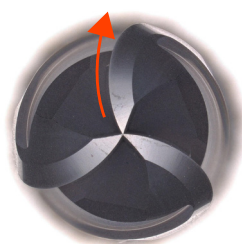
Unequal flute prevent chattering



$$\alpha \neq \beta \neq \gamma$$

2-4

Adopting strong spiral gash for the large diameters to reduce cutting load, break up the chips to improve the chip removal ability unequal flute prevent chattering ($R \geq 1.5$)



MRBSH330



Conventional

■ Machining efficiency comparison with conventional product

- Work Material : YXR7 (63HRC)
- Coolant : Oil mist
- Work size : 50 × 50 mm



Process	MRBSH330		Conventional 2-flute ball end mill	
	Diamond shape pocket	Circle shape pocket	Diamond shape pocket	Circle shape pocket
Tool size	R3 × 20	R1.5 × 10	R3 × 20	R1.5 × 10
Spindle speed (min ⁻¹)	7,000	15,000	7,000	15,000
Feed (mm/min)	3,000	2,600	2,000	1,800
Depth of cut (ap × ae mm)	0.25 × 1	0.25 × 0.5	0.2 × 1	0.15 × 0.3
Machining time	42min 9sec	16min 23sec	73min 11sec	55min 34sec

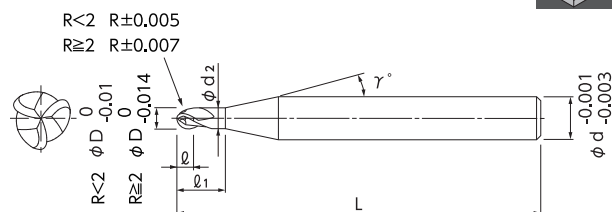
Total machining time reduced by **55% !**

MUGEN COATING PREMIUM Plus

High Efficient 3-Flute small-diameter Long Neck Ball End Mill for Hardened Steel

Total 31 sizes

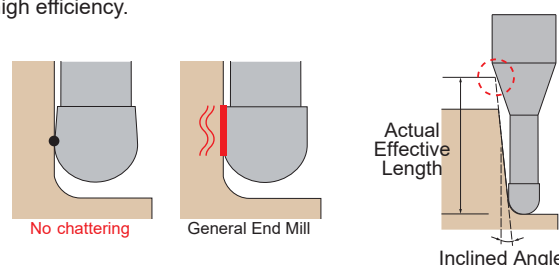
High-efficiency and high-precision die machining with improved cutting edge rigidity and chip evacuation



- High-efficiency 3-flute ball end mill optimizes a shape of central edge and enables high depth of cutting.
- Even hardened steel of 60 to 70HRC can be machining with long tool life and high efficiency.
- Shank diameter tolerance, high accuracy type, is - 0.001mm ~ - 0.003mm.

Work Material

Hardened Steel	H
60~70HRC	
	◎



Code No.	Corner Radius (R)	Under Neck Length (ℓ)	Length of Cut (ℓ)	Dia. (D)	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°
08-00634-01003	R0.1	0.3	0.15	0.2	0.18	12°	4	45	0.35	0.36	0.38	0.39	0.42
08-00634-01005		0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
08-00634-01505	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67
08-00634-01506		0.6	0.2	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81
08-00634-01507		0.75	0.2	0.3	0.28	12°	4	45	0.82	0.85	0.88	0.92	1.01
08-00634-01510		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
08-00634-02005	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69
08-00634-02008		0.8	0.3	0.4	0.37	12°	4	45	0.89	0.93	0.96	1.00	1.09
08-00634-02010		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35
08-00634-02510	R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
08-00634-02515		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
08-00634-03010	R0.3	1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
08-00634-03015		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
08-00634-03020		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
08-00634-05020	R0.5	2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
08-00634-05025		2.5	0.75	1	0.95	12°	4	45	2.70	2.80	2.91	3.03	3.31
08-00634-05030		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
08-00634-07503	R0.75	3	1.1	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
08-00634-07504		4	1.1	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
08-00634-10003	R1	3	1.5	2	1.94	12°	4	45	3.23	3.33	3.44	3.56	3.85
08-00634-10004		4	1.5	2	1.94	12°	4	45	4.27	4.42	4.58	4.76	5.17
08-00634-10006		6	1.5	2	1.94	12°	4	45	6.36	6.60	6.86	7.15	7.83
08-00634-15006	R1.5	6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
08-00634-15008		8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
08-00634-15010		10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
08-00634-20008	R2	8	3	4	3.8	12°	6	65	8.74	9.05	9.38	9.74	10.60
08-00634-20010		10	3	4	3.8	12°	6	65	10.83	11.22	11.66	12.14	13.25
08-00634-20012		12	3	4	3.8	12°	6	65	12.91	13.40	13.94	14.53	15.91
08-00634-30010	R3	10	6	6	5.7	-	6	65	Free	Free	Free	Free	Free
08-00634-30015		15	6	6	5.7	-	6	65	Free	Free	Free	Free	Free
08-00634-30020		20	6	6	5.7	-	6	65	Free	Free	Free	Free	Free

How to Order

When you order, indicate MRBSH330(R)×(ℓ1).

※(γ) is reference value.

Work Material			High Speed Steels/Hardened Steels SKH51・SKD11 (～62HRC)				High Speed Steels SKH55・HAP40 (～66HRC)				High Speed Steels SKH57・HAP72 (～70HRC)			
Corner Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹	a _p mm	a _e mm	mm/min	min ⁻¹
R0.1	0.3	1.5	0.006	0.007	450	40,000	0.004	0.005	300	40,000	0.004	0.005	220	40,000
	0.5	2.5	0.006	0.007	400	40,000	0.004	0.005	250	40,000	0.004	0.005	190	40,000
R0.15	0.5	1.7	0.01	0.01	450	40,000	0.005	0.005	400	40,000	0.005	0.005	300	40,000
	0.6	2	0.007	0.007	450	40,000	0.005	0.005	350	40,000	0.005	0.005	270	40,000
	0.75	2.5	0.007	0.007	400	40,000	0.005	0.005	350	40,000	0.005	0.005	250	40,000
	1	3.3	0.007	0.007	350	40,000	0.005	0.005	300	40,000	0.005	0.005	220	40,000
R0.2	0.5	1.25	0.035	0.04	1,100	40,000	0.013	0.02	850	40,000	0.013	0.02	650	35,000
	0.8	2	0.03	0.03	1,000	40,000	0.012	0.02	850	40,000	0.012	0.02	600	35,000
	1	2.5	0.03	0.03	1,000	40,000	0.012	0.02	850	40,000	0.012	0.02	600	35,000
R0.25	1	2	0.03	0.03	1,300	40,000	0.015	0.02	1,000	35,000	0.015	0.02	700	30,000
	1.5	3	0.015	0.03	1,000	40,000	0.01	0.02	800	35,000	0.01	0.02	500	30,000
R0.3	1	1.7	0.045	0.06	1,500	40,000	0.03	0.05	1,100	30,000	0.03	0.05	800	25,000
	1.5	2.5	0.045	0.06	1,500	40,000	0.03	0.05	1,100	30,000	0.03	0.05	800	25,000
	2	3.3	0.045	0.06	1,500	40,000	0.03	0.05	1,100	30,000	0.03	0.05	800	25,000
R0.5	2	2	0.15	0.2	3,000	30,000	0.12	0.1	2,000	25,000	0.075	0.1	1,500	20,000
	2.5	2.5	0.15	0.2	3,000	30,000	0.12	0.1	2,000	25,000	0.075	0.1	1,500	20,000
	3	3	0.15	0.2	3,000	30,000	0.12	0.1	2,000	25,000	0.075	0.1	1,500	20,000
R0.75	3	2	0.15	0.3	3,800	30,000	0.15	0.2	3,000	25,000	0.09	0.2	2,200	20,000
	4	2.7	0.15	0.3	3,000	25,000	0.15	0.2	2,400	22,000	0.09	0.2	1,800	18,000
R1	3	1.5	0.3	0.5	3,800	25,000	0.22	0.3	3,000	20,000	0.15	0.3	2,200	16,000
	4	2	0.3	0.5	3,800	25,000	0.22	0.3	3,000	20,000	0.15	0.3	2,200	16,000
	6	3	0.3	0.3	3,000	22,000	0.22	0.3	2,400	20,000	0.15	0.3	1,800	16,000
R1.5	6	2	0.3	0.6	3,800	18,000	0.25	0.5	3,000	15,000	0.15	0.5	2,250	12,000
	8	2.7	0.3	0.6	3,800	18,000	0.25	0.5	3,000	15,000	0.15	0.5	2,250	12,000
	10	3.3	0.3	0.6	3,200	18,000	0.25	0.5	2,600	15,000	0.15	0.5	2,000	12,000
R2	8	2	0.3	0.8	3,800	15,000	0.25	0.6	3,000	12,000	0.18	0.6	2,250	9,500
	10	2.5	0.3	0.8	3,800	15,000	0.25	0.6	3,000	12,000	0.18	0.6	2,250	9,500
	12	3	0.3	0.8	3,800	15,000	0.25	0.6	3,000	12,000	0.18	0.6	2,250	9,500
R3	10	1.7	0.38	1.2	3,800	8,000	0.25	1	3,000	7,000	0.18	1	2,250	5,500
	15	2.5	0.38	1.2	3,800	8,000	0.25	1	3,000	7,000	0.18	1	2,250	5,500
	20	3.3	0.38	1.2	3,800	8,000	0.25	1	3,000	7,000	0.18	1	2,250	5,500

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 If machine tool vibration is high during machining, adjust the feed rate as necessary.
 ※6 Attention to a risk of chipping and breakage when insufficient chip flow.
 ※7 Adjust both spindle speed and feed at the same rate.
 ※8 Overhang of end mill should be as short as possible from spindle nose.
 ※9 We recommend using oil mist coolant.

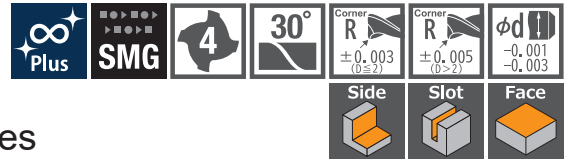
Specialized cutting edge and high precision corner R enhance finishing accuracy on hardened steels

MUGEN COATING PREMIUM Plus

4-Flute Long Neck Corner Radius End Mill

with short shank for Hardened Steel and High accuracy cutting

MHRSH430RSF



ϕ 0.1×R0.01 ~ ϕ 6×R1

Total 205 sizes



Features

Feature
1

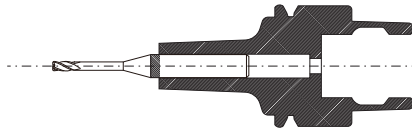
Excellent accuracy and surface roughness

Optimal overhung length by short shank High accuracy corner R and wiper

MHRSH430RSF

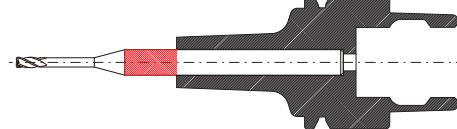
Possible to machining with high rigidity,
with short tool overhung

short shank

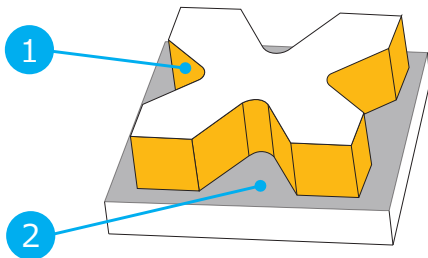


Normal shank length

Tool overhung length is long,
and tool rigidity is low



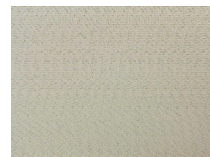
Surface roughness and wear
after 60 mins machining



Surface roughness

1

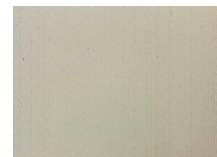
Wall 0°



Ra 0.052μm

2

Bottom



Ra 0.010μm

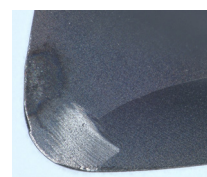
Tool wear

End tooth



Frank wear width
0.023mm

Corner R



R retreat amount
0.003mm



Tool MHRSH430RSF ϕ 2×R0.2×6
Work material HAP40 (64HRC)
Spindle speed 12,000 min⁻¹
Feed 1,000 mm/min
Depth of cut ap 0.02×ae 0.05 mm

Corner radius end mill to pursue accuracy and surface roughness



End tooth profile no center tooth
 $\phi 0.1 \times R0.01 \sim \phi 2 \times R0.5$



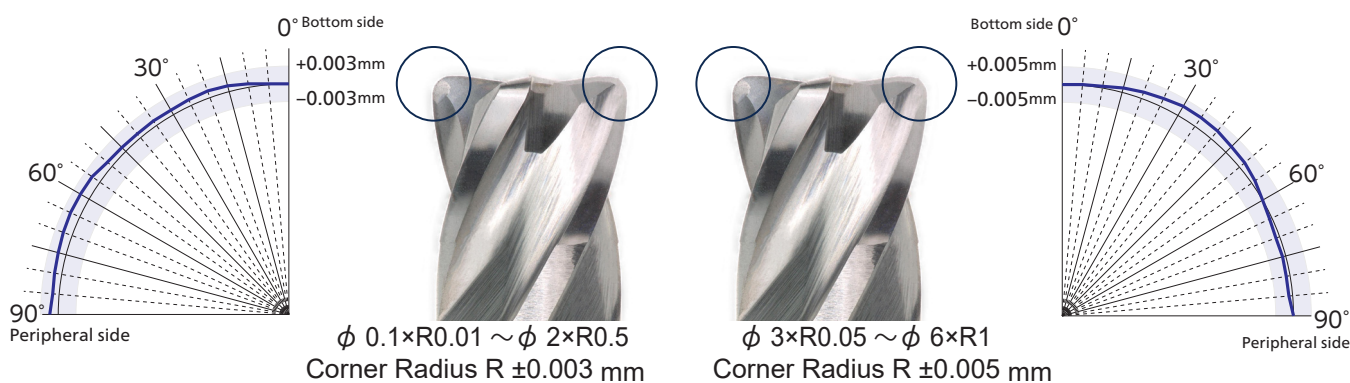
End tooth profile with center tooth
 $\phi 3 \times R0.05 \sim \phi 6 \times R1$

High accuracy corner R



Wiper Strong back taper

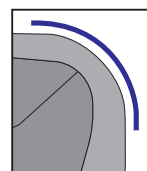
Enhances surface roughness and accuracy on side machining High accuracy corner R and Seamless



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

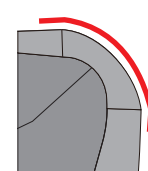
MHRSH430RSF

Seamless



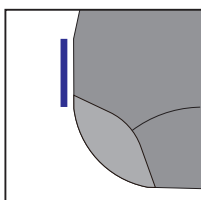
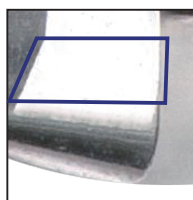
Seamless

General Corner Radius



Seam

Improves surface roughness on bottom by wiper ($D \geq \phi 0.4$)



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

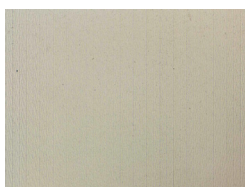
Surface roughness comparison after bottom surface finishing

Work material
 HAP40 (64HRC)

Tool size
 $\phi 2 \times R0.2 \times 6$

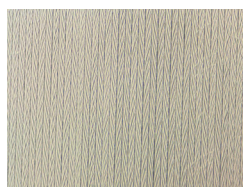
Magnification rate
 $\times 400$

MHRSH430RSF



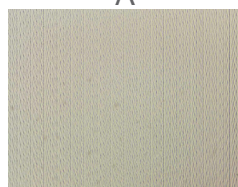
Ra 0.010 μ m

Conventional



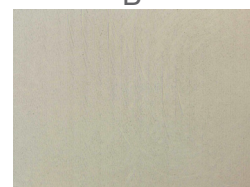
Ra 0.028 μ m

Other tool brand
 A



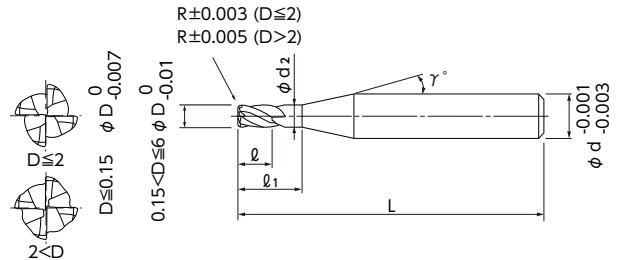
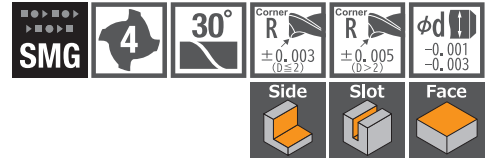
Ra 0.029 μ m

Other tool brand
 B



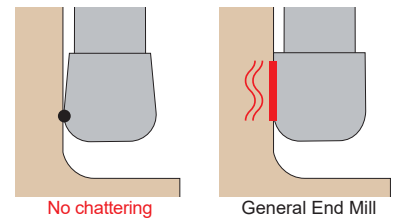
Ra 0.026 μ m

Specialized cutting edge and high precision corner R enhance finishing accuracy on hardened steels



Please be aware of stock since there is no cutting edge from the center to the bottom for $\phi 0.1 \sim \phi 2$.

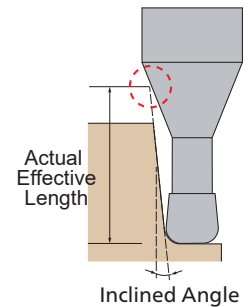
- MUGEN COATING PREMIUM Plus for hardened steels with strong back taper reduce chattering to realize long tool life and excellent finishing surface.
- 4-flute end mill for high efficiency machining.
- 4-flute end mill has 205 sizes in total that lineup from the smallest diameter $\phi 0.1$ to $\phi 6$.
- Shank diameter tolerance, high accuracy type, is $-0.001\text{mm} \sim -0.003\text{mm}$.



Work Material

Hardened Steel H

60~70HRC



Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ)	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)	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

MHRSH430RSF

MUGEN COATING PREMIUM Plus

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 (ℓ)	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.

MUGEN COATING PREMIUM Plus
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 (ℓ)	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°
08-00239-30404	3	R0.05	4	2.5	2.85	15°	6	45	4.42	4.57	4.73	4.91	5.30
08-00239-30406			6	2.5	2.85	15°	6	45	6.48	6.71	6.95	7.21	7.79
08-00239-30408			8	2.5	2.85	15°	6	45	8.55	8.85	9.17	9.51	10.28
08-00239-30410			10	2.5	2.85	15°	6	50	10.62	10.99	11.38	11.81	12.76
08-00239-30412			12	2.5	2.85	15°	6	50	12.69	13.13	13.60	14.11	15.25
08-00239-30415			15	2.5	2.85	15°	6	55	15.79	16.34	16.92	17.56	18.98
08-00239-30504		R0.1	4	2.5	2.85	15°	6	45	4.42	4.57	4.73	4.90	5.29
08-00239-30506			6	2.5	2.85	15°	6	45	6.48	6.71	6.94	7.20	7.78
08-00239-30508			8	2.5	2.85	15°	6	45	8.55	8.84	9.16	9.50	10.26
08-00239-30510			10	2.5	2.85	15°	6	50	10.62	10.98	11.38	11.80	12.75
08-00239-30512			12	2.5	2.85	15°	6	50	12.68	13.12	13.59	14.10	15.24
08-00239-30515			15	2.5	2.85	15°	6	55	15.79	16.33	16.92	17.55	18.97
08-00239-30604		R0.2	4	2.5	2.85	15°	6	45	4.41	4.56	4.72	4.89	5.27
08-00239-30606			6	2.5	2.85	15°	6	45	6.48	6.70	6.93	7.19	7.75
08-00239-30608			8	2.5	2.85	15°	6	45	8.55	8.84	9.15	9.49	10.24
08-00239-30610			10	2.5	2.85	15°	6	50	10.61	10.98	11.37	11.79	12.73
08-00239-30612			12	2.5	2.85	15°	6	50	12.68	13.12	13.58	14.09	15.21
08-00239-30615			15	2.5	2.85	15°	6	55	15.78	16.33	16.91	17.54	18.94
08-00239-30704		R0.3	4	2.5	2.85	15°	6	45	4.41	4.55	4.71	4.87	5.24
08-00239-30706			6	2.5	2.85	15°	6	45	6.48	6.69	6.92	7.17	7.73
08-00239-30708			8	2.5	2.85	15°	6	45	8.54	8.83	9.14	9.47	10.22
08-00239-30710			10	2.5	2.85	15°	6	50	10.61	10.97	11.36	11.77	12.70
08-00239-30712			12	2.5	2.85	15°	6	50	12.68	13.11	13.57	14.07	15.19
08-00239-30715			15	2.5	2.85	15°	6	55	15.78	16.32	16.90	17.52	18.92
08-00239-30804		R0.5	4	2.5	2.85	15°	6	45	4.40	4.54	4.69	4.84	5.20
08-00239-30806			6	2.5	2.85	15°	6	45	6.47	6.68	6.90	7.14	7.68
08-00239-30808			8	2.5	2.85	15°	6	45	8.54	8.82	9.12	9.44	10.17
08-00239-30810			10	2.5	2.85	15°	6	50	10.60	10.96	11.33	11.74	12.66
08-00239-30812			12	2.5	2.85	15°	6	50	12.67	13.10	13.55	14.04	15.14
08-00239-30815			15	2.5	2.85	15°	6	55	15.77	16.31	16.88	17.49	18.87
08-00239-40508	4	R0.1	8	3.2	3.8	15°	6	45	8.65	8.94	9.26	9.61	10.38
08-00239-40512			12	3.2	3.8	15°	6	50	12.78	13.22	13.70	14.21	15.35
08-00239-40516			16	3.2	3.8	15°	6	55	16.92	17.50	18.13	18.81	Free
08-00239-40520			20	3.2	3.8	15°	6	55	21.05	21.78	22.56	23.41	Free
08-00239-40608		R0.2	8	3.2	3.8	15°	6	45	8.64	8.94	9.25	9.59	10.36
08-00239-40612			12	3.2	3.8	15°	6	50	12.78	13.22	13.69	14.19	15.33
08-00239-40616			16	3.2	3.8	15°	6	55	16.91	17.50	18.12	18.79	Free
08-00239-40620			20	3.2	3.8	15°	6	55	21.05	21.77	22.55	23.39	Free
08-00239-40708		R0.3	8	3.2	3.8	15°	6	45	8.64	8.93	9.24	9.58	10.33
08-00239-40712			12	3.2	3.8	15°	6	50	12.77	13.21	13.68	14.18	15.31
08-00239-40716			16	3.2	3.8	15°	6	55	16.91	17.49	18.11	18.78	Free
08-00239-40720			20	3.2	3.8	15°	6	55	21.04	21.77	22.54	23.38	Free
08-00239-40808		R0.5	8	3.2	3.8	15°	6	45	8.63	8.92	9.22	9.55	10.29
08-00239-40812			12	3.2	3.8	15°	6	50	12.77	13.20	13.65	14.15	15.26
08-00239-40816			16	3.2	3.8	15°	6	55	16.90	17.47	18.09	18.75	Free
08-00239-40820			20	3.2	3.8	15°	6	55	21.04	21.75	22.52	23.35	Free
08-00239-50515	5	R0.1	15	4	4.75	15°	6	50	15.98	16.53	17.13	Free	Free
08-00239-50520			20	4	4.75	15°	6	55	21.15	21.88	Free	Free	Free
08-00239-50615		R0.2	15	4	4.75	15°	6	50	15.98	16.53	17.12	Free	Free
08-00239-50620			20	4	4.75	15°	6	55	21.14	21.87	Free	Free	Free
08-00239-50715		R0.3	15	4	4.75	15°	6	50	15.97	16.52	17.10	Free	Free
08-00239-50720			20	4	4.75	15°	6	55	21.14	21.87	Free	Free	Free
08-00239-50815		R0.5	15	4	4.75	15°	6	50	15.97	16.50	17.08	Free	Free
08-00239-50820			20	4	4.75	15°	6	55	21.13	21.85	Free	Free	Free

MHRSH430RSF

MUGEN COATING PREMIUM Plus

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

Unit [Size : mm]

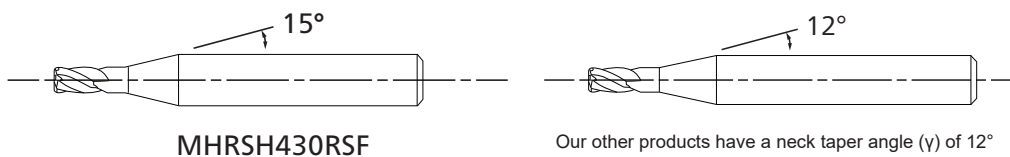
Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30°	1°	1°30'	2°	3°
08-00239-60512	6	R0.1	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60518			18	5	5.7	-	6	50	Free	Free	Free	Free	Free
08-00239-60524			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
08-00239-60530			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
08-00239-60612			12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60618		R0.2	18	5	5.7	-	6	50	Free	Free	Free	Free	Free
08-00239-60624			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
08-00239-60630			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
08-00239-60712			12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60718		R0.3	18	5	5.7	-	6	50	Free	Free	Free	Free	Free
08-00239-60724			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
08-00239-60730			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
08-00239-60812			12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60818		R0.5	18	5	5.7	-	6	50	Free	Free	Free	Free	Free
08-00239-60824			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
08-00239-60830			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
08-00239-60912			12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60918		R1	18	5	5.7	-	6	50	Free	Free	Free	Free	Free
08-00239-60924			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
08-00239-60930			30	5	5.7	-	6	65	Free	Free	Free	Free	Free

How to Order

When you order, indicate MHRSH430RSF (D)×(R)×(ℓ1).

※(γ) is reference value.

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



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	0.02	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
		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
	0.05	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
		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
0.4	0.02	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
		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
	0.05	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
		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

MHRSH430RSF

Recommended 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
	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

Recommended 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
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
3	0.05	4	1.3	13,000	2,000	0.05	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.05	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.05	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.05	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.04	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.03	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.1	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.2	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.3	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.5	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6

MHRSH430RSF

Recommended 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
4	0.1	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
	0.2	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
	0.3	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
	0.5	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
5	0.1	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
	0.2	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
	0.3	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
	0.5	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
6	0.1	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	0.2	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	0.3	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	0.5	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	1	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5

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.



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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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