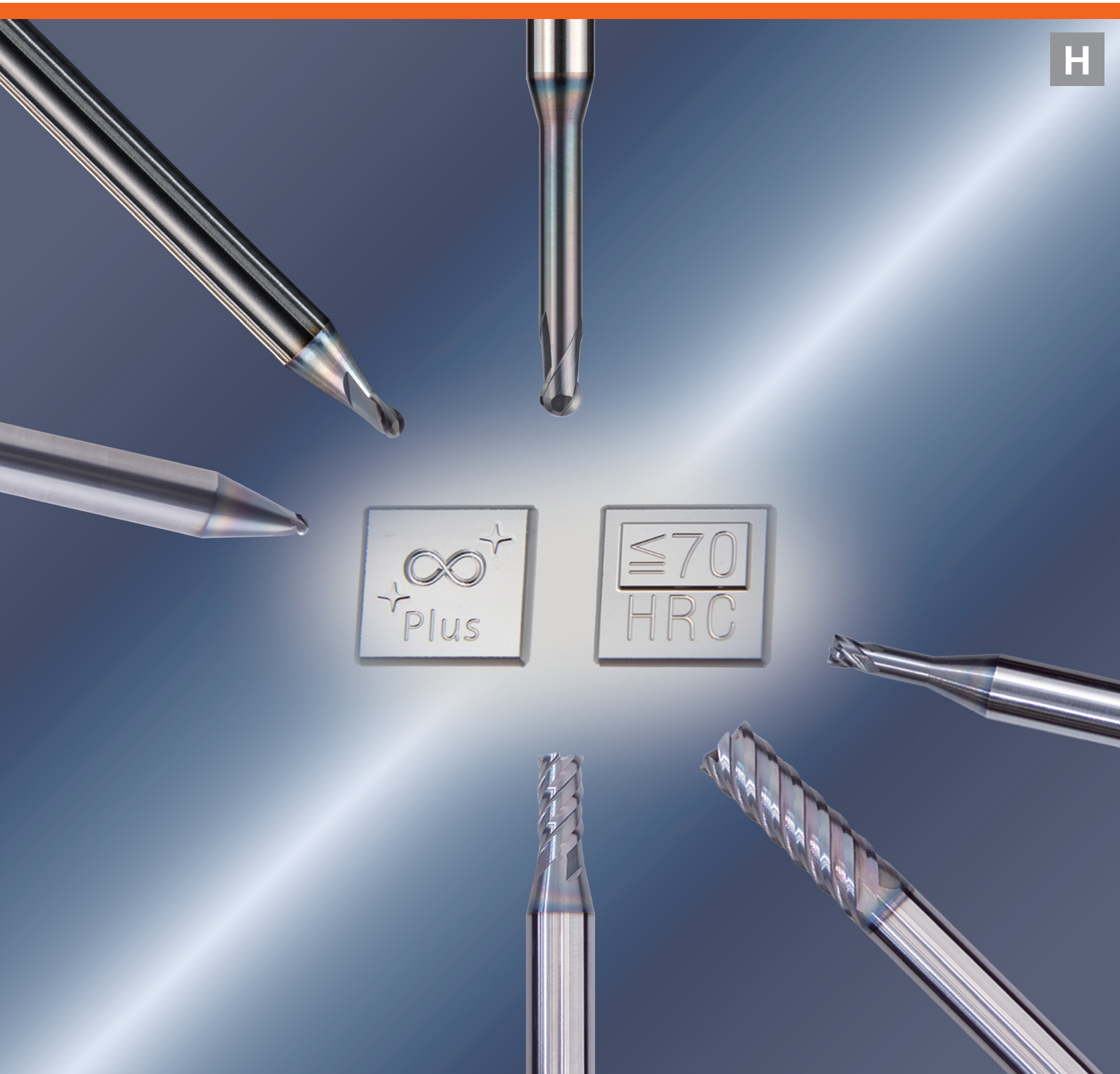
NS TOOL

For Crafting Tomorrow

MUGEN COATING PREMIUM Plus End Mill Series

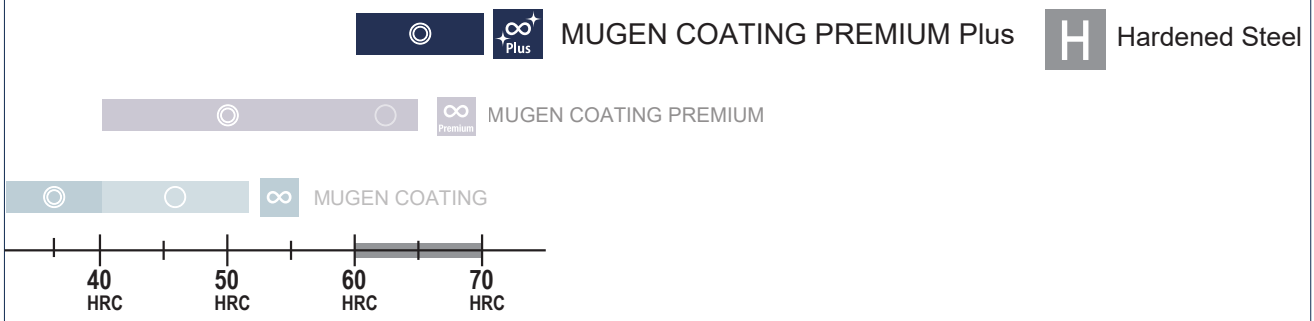
MHDSH445
MHDSH645
MSBSH230 New
MSBSH330-5X
MRBSH230SF
MRBSH330
MHDSH445R New
MHDSH645R New
MHRSH430RSF



Features of MUGEN COATING PREMIUM Plus End Mill series

Optimized for machining hardened steels up to 60 to 70HRC

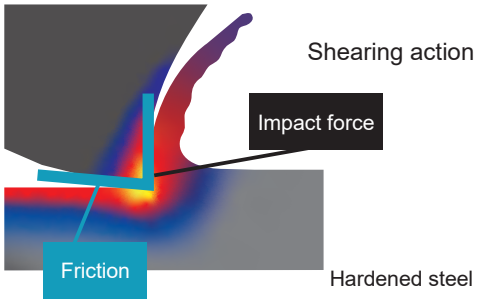
Range of NS TOOL original coating by work material hardness



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

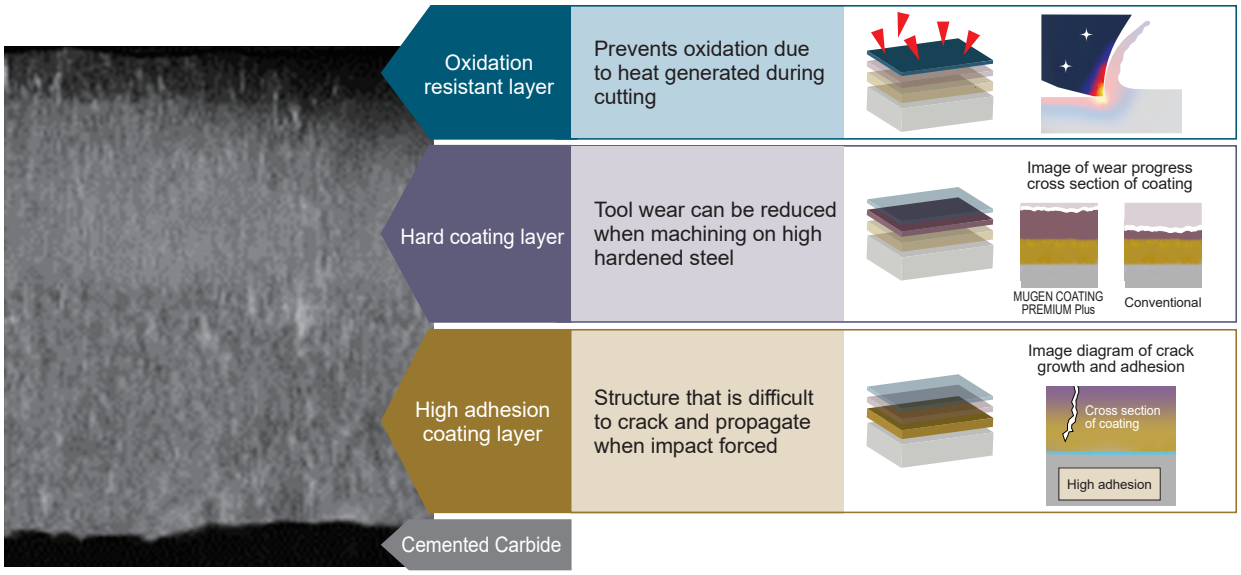
As a phenomenon when machining hardened steel of 60 to 70 HRC, the cutting load during processing is extremely high because hardness and toughness of work material are high. Therefore, the "shearing action" at tool edge cause that…

- 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



ϕ d $^{-0.001}_{-0.003}$

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

MRBSH230SF

Ball radius R±0.003

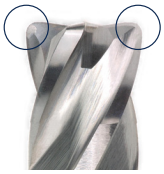
R accuracy is based on a half value of actual diameter



MHRSH430RSF

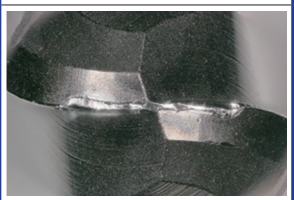
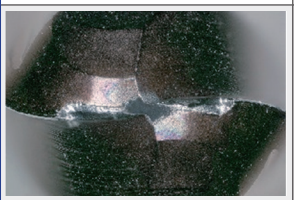
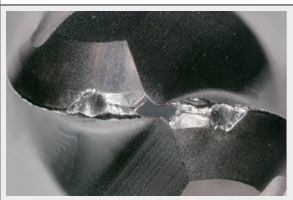
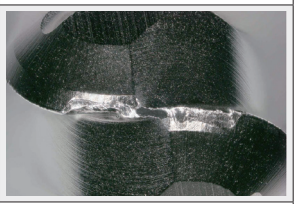
Corner radius ±0.003

(D ≦ ϕ 2)



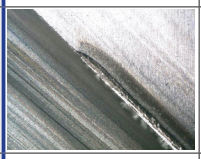
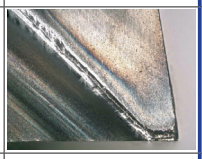
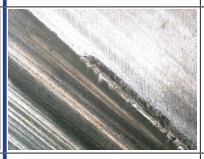
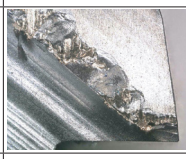
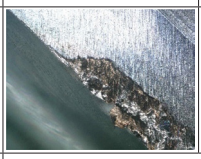
Ball end mill R1x6 tool life comparison to HAP40 (64HRC)

Cutting condition: n= 20,000min^{-1}, vf= 1,600mm/min, ap 0.15 × ae 0.3mm, 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

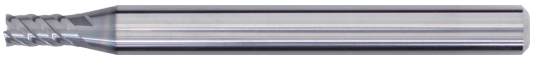
Square end mill tool life comparison to HAP40 (64HRC)

Cutting condition : n= 4,200min^{-1}, vf= 600mm/min, ap 9 × ae 0.12 mm, Coolant: Oil mist

Tool	**MHDSH645 ϕ 6×18**		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	

Lineup of MUGEN COATING PREMIUM Plus End Mill series

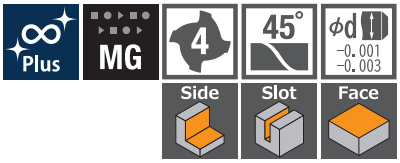
Total 481 sizes

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	
MSBSH230 New 	MUGEN COATING PREMIUM Plus 2-Flute Ball End Mill for Hardened Steel and High Accuracy Machining
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
Corner Radius End Mill	
MHDSH445R New 	MUGEN COATING PREMIUM Plus 4-Flute Corner Radius End Mill for Hardened Steel
MHDSH645R New 	MUGEN COATING PREMIUM Plus 6-Flute Corner Radius End Mill for Hardened Steel
Long Neck Corner Radius End Mill	
MHRSH430RSF Lineup Expansion 	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
ϕ1 ～ ϕ4 Total 10 sizes		High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel	6
ϕ5 ～ ϕ6 Total 4 sizes		High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel	6
R0.05 ～ R3 Total 15 sizes		Suitable for machining hardened steels up to 70HRC, such as press dies and forging dies.	12
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	16
R0.05 ～ R3 Total 115 sizes		High precision and long tool life even for hardened steel up to 70HRC	20
R0.1 ～ R3 Total 31 sizes		High-efficiency high-precision die machining with improved cutting edge rigidity and chip evacuation	28
ϕ1×R0.1 ～ ϕ4×R0.5 Total 15 sizes		Suitable for machining hardened steels up to 70HRC such as press dies and forging dies	32
ϕ5×R0.2 ～ ϕ6×R1 Total 14 sizes		Suitable for machining hardened steels up to 70HRC such as press dies and forging dies	35
ϕ0.1×R0.01 ～ ϕ6×R1 Total 269 sizes		Specialized cutting edge and high precision corner R enhance finishing accuracy on hardened steels	38

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

MHDSH445

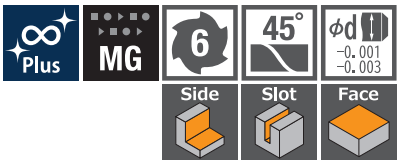


ϕ 1 ～ ϕ 4　　Total 10 sizes

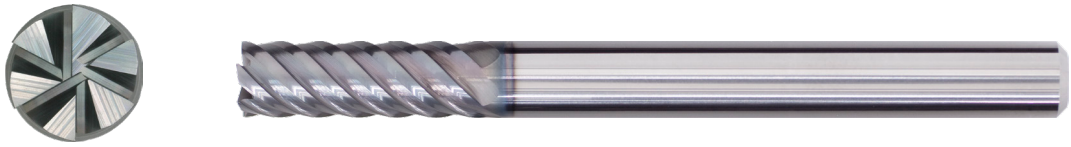


MUGEN COATING PREMIUM Plus
6-Flute Square End Mill for Hardened Steel

MHDSH645



ϕ 5 ～ ϕ 6　　Total 4 sizes

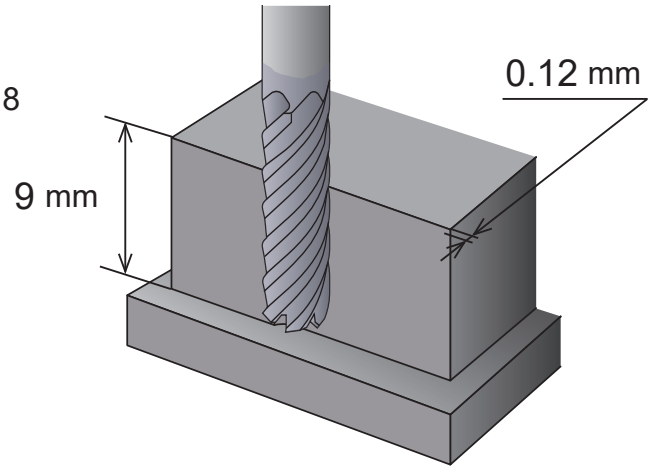


Features

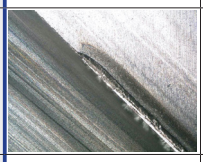
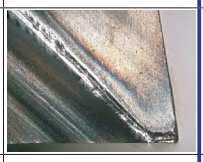
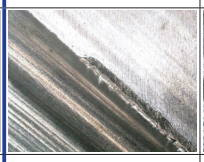
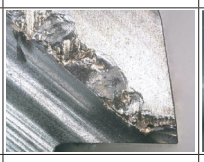
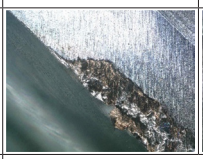
Feature 1	Long tool life	MUGEN COATING PREMIUM Plus

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



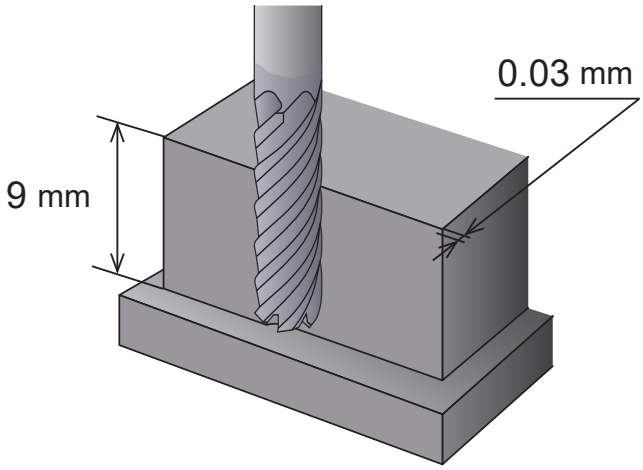
■ Achieves longer tool life compared to other tool brand at roughing

Tool	**MHDSH645 ϕ 6×18**		Other tool brand A ϕ 6×15		Other tool brand B ϕ 6×15	
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	

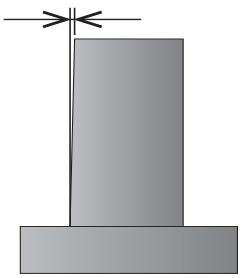
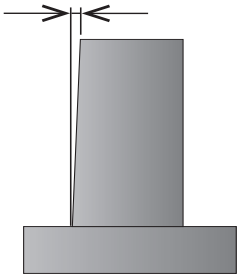
Feature 2 **High rigidity tool design** Suppress deflection at finishing

Finishing

Tool MHDSH645 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 0.03 mm



■ Amount of deflection after 90min finishing

Tool	**MHDSH645 ϕ 6×18**	Other tool brand ϕ 6×15
Deflection amount	 **0.010** mm	 0.018 mm

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

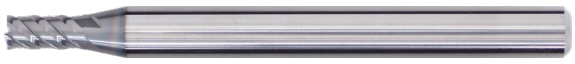
MHDSH445

Size ϕ 1 ～ ϕ 4

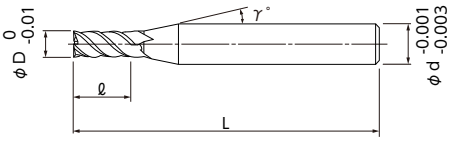
MUGEN COATING PREMIUM Plus
4-Flute Square End Mill for Hardened Steel

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]

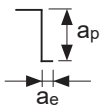
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00429-00102	1	2	12°	6	60
08-00429-00103		3	12°	6	60
08-00429-00152	1.5	3	12°	6	60
08-00429-00153		4.5	12°	6	60
08-00429-00202	2	4	12°	6	60
08-00429-00203		6	12°	6	60
08-00429-00302	3	6	12°	6	60
08-00429-00303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

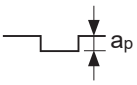
Work Material			Hardened Steels/High Speed Steels SKD11・SKH51(～62HRC)				High Speed Steels SKH55・HAP40(～66HRC)				High Speed Steels SKH57・HAP72(～70HRC)			
	Dia.	Length of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	a_p mm	a_e 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 Use oil mist coolant.

MHDSH645

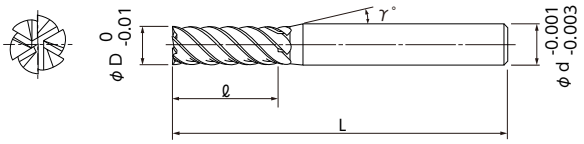
Size ϕ 5 ～ ϕ 6

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 ～ - 0.003mm.

Work Material

Hardened Steel H
60～70HRC
◎

Unit [Size : mm]

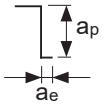
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00430-00502	**5**	**10**	12°	6	60
08-00430-00503		**15**	12°	6	65
08-00430-00602	**6**	**12**	-	6	60
08-00430-00603		**18**	-	6	65

How to Order When you order, indicate MHDSH645 (D)×(ℓ). ※(γ) is reference value.

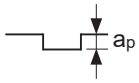
Work Material			Hardened Steels/High Speed Steels SKD11・SKH51(～62HRC)				High Speed Steels SKH55・HAP40(～66HRC)				High Speed Steels SKH57・HAP72(～70HRC)			
	Dia.	Length of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	a_p mm	a_e 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.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use oil mist coolant.

MSBSH230

New

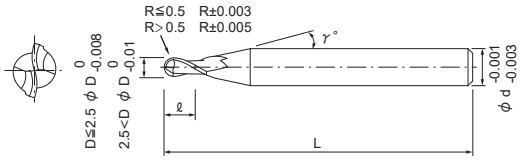
Size R0.05 ～ R3

MUGEN COATING PREMIUM Plus
2-Flute Ball End Mill for Hardened Steel and High Accuracy Machining

Total 15 sizes

Suitable for machining hardened steels up to 70HRC, such as press dies and forging dies
Recommended cutting conditions cover roughing to finishing to ensure stable machining





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

- Standard type ball end mill for machining on hardened steel.
- MUGEN COATING PREMIUM Plus provides optimal performance for high precision 3D machining of hardened steels up to 70HRC.
- Shank diameter tolerance, high accuracy type, is - 0.001mm ～ - 0.003mm.

Work Material

Hardened Steel H
60～70HRC
◎

◆ Release in Mar, 2026.

Unit [Size : mm]

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
◆ 08-00502-00005	**R0.05**	0.1	0.1	12°	4	45
◆ 08-00502-00007	**R0.075**	0.15	0.15	12°	4	45
◆ 08-00502-00010	**R0.1**	0.2	0.2	12°	4	45
◆ 08-00502-00015	**R0.15**	0.3	0.3	12°	4	45
◆ 08-00502-00020	**R0.2**	0.6	0.4	12°	4	45
◆ 08-00502-00025	**R0.25**	0.8	0.5	12°	4	45
◆ 08-00502-00030	**R0.3**	0.9	0.6	12°	4	45
◆ 08-00502-00040	**R0.4**	1.2	0.8	12°	4	45
◆ 08-00502-00050	**R0.5**	1.5	1	12°	4	45
◆ 08-00502-00075	**R0.75**	2.3	1.5	12°	4	45
◆ 08-00502-00100	**R1**	3	2	12°	4	45
◆ 08-00502-00150	**R1.5**	5	3	12°	6	60
◆ 08-00502-00200	**R2**	6	4	12°	6	60
◆ 08-00502-00250	**R2.5**	8	5	12°	6	60
◆ 08-00502-00300	**R3**	10	6	-	6	60

How to Order When you order, indicate MSBSH230 (R).

※ (γ) is reference value.

Recommended Milling Conditions

Work Material	Hardened Steels/High Speed Steels SKD11・SKH51(～62HRC)									
	Roughing						Stock removal (Inner Corner)			
Radius	Spindle Speed	Feed	Depth of Cut		Stock allowance	Material removal rate	Spindle Speed	Feed	Depth of Cut	Stock allowance
	min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm or a_e mm	mm
R0.05	40,000	100	0.003	0.005	0.005	0.002	40,000	90	0.003	0.005
R0.075	40,000	150	0.003	0.005	0.006	0.002	40,000	130	0.003	0.006
R0.1	40,000	320	0.01	0.01	0.009	0.032	40,000	280	0.009	0.009
R0.15	40,000	360	0.01	0.02	0.012	0.072	40,000	320	0.009	0.012
R0.2	40,000	820	0.02	0.05	0.015	0.82	40,000	730	0.018	0.015
R0.25	40,000	1,000	0.025	0.05	0.019	1.3	40,000	900	0.023	0.019
R0.3	40,000	1,200	0.03	0.06	0.022	2.2	40,000	1,080	0.027	0.022
R0.4	40,000	1,800	0.07	0.1	0.027	13	40,000	1,620	0.063	0.027
R0.5	30,000	2,000	0.1	0.2	0.036	40	30,000	1,800	0.09	0.036
R0.75	30,000	2,500	0.1	0.3	0.048	75	30,000	2,250	0.09	0.048
R1	25,000	2,500	0.2	0.5	0.06	250	25,000	2,250	0.18	0.06
R1.5	18,000	2,500	0.2	0.6	0.065	300	18,000	2,250	0.18	0.065
R2	16,000	2,500	0.2	0.8	0.065	400	16,000	2,250	0.18	0.065
R2.5	12,000	2,500	0.2	1.2	0.065	600	12,000	2,250	0.18	0.065
R3	8,000	2,500	0.3	1.2	0.065	900	8,000	2,250	0.27	0.065

Work Material	Hardened Steels/ High Speed Steels SKD11・SKH51(～62HRC)							
	Semi-Finishing				Finishing			
Radius	Spindle Speed	Feed	Depth of Cut	Stock allowance	Spindle Speed	Feed	Depth of Cut	Stock allowance
	min^{-1}	mm/min	a_p mm or a_e mm	mm	min^{-1}	mm/min	a_p mm or a_e mm	mm
R0.05	40,000	270	0.003	0.002	40,000	160	0.002	0
R0.075	40,000	390	0.005	0.003	40,000	270	0.003	0
R0.1	40,000	450	0.006	0.004	40,000	320	0.004	0
R0.15	40,000	610	0.008	0.005	40,000	480	0.006	0
R0.2	40,000	780	0.01	0.006	40,000	560	0.007	0
R0.25	40,000	1,010	0.013	0.008	40,000	710	0.009	0
R0.3	40,000	1,170	0.015	0.009	40,000	780	0.01	0
R0.4	40,000	1,430	0.018	0.011	40,000	1,010	0.013	0
R0.5	30,000	1,410	0.024	0.015	30,000	1,000	0.017	0
R0.75	30,000	1,910	0.032	0.02	30,000	1,310	0.022	0
R1	25,000	2,000	0.04	0.025	25,000	1,410	0.028	0
R1.5	18,000	1,760	0.049	0.03	18,000	1,240	0.035	0
R2	16,000	1,810	0.057	0.03	16,000	1,280	0.04	0
R2.5	12,000	1,510	0.063	0.03	12,000	1,070	0.045	0
R3	8,000	1,100	0.069	0.03	8,000	780	0.049	0

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=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 milling conditions if necessary.
※4 If the cutting load is high at corners, etc., set the milling conditions and tool path carefully to reduce the cutting load.
※5 In case high-efficient machining, increase spindle speed and feed rate at the same rate.
※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate in the same proportion.
※7 Minimize a possible tool overhang length.
※8 We recommend using oil mist coolant.
※9 The stock allowance and depth of cut at semi-finishing and finishing for this tool are guideline, please adjust them according to the machining condition of the previous process and required accuracy.
※10 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a ball end mill approximately 1.5 times lager than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.

MSBSH230 New

Recommended Milling Conditions

Work Material	High Speed Steels SKH55・HAP40(～66HRC)									
	Roughing						Stock removal (Inner Corner)			
Radius	Spindle Speed	Feed	Depth of Cut		Stock allowance	Material removal rate	Spindle Speed	Feed	Depth of Cut	Stock allowance
	min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm or a_e mm	mm
R0.05	40,000	60	0.002	0.005	0.004	0.001	40,000	50	0.002	0.004
R0.075	40,000	100	0.002	0.005	0.004	0.001	40,000	90	0.002	0.004
R0.1	40,000	240	0.003	0.005	0.006	0.004	40,000	210	0.003	0.006
R0.15	40,000	300	0.005	0.01	0.01	0.015	40,000	270	0.005	0.01
R0.2	40,000	480	0.01	0.02	0.012	0.096	40,000	430	0.009	0.012
R0.25	40,000	600	0.015	0.03	0.016	0.27	40,000	540	0.014	0.016
R0.3	30,000	720	0.02	0.05	0.019	0.72	30,000	640	0.018	0.019
R0.4	30,000	1,200	0.05	0.1	0.023	6	30,000	1,080	0.045	0.023
R0.5	25,000	1,400	0.08	0.1	0.031	11	25,000	1,260	0.072	0.031
R0.75	25,000	2,000	0.1	0.2	0.041	40	25,000	1,800	0.09	0.041
R1	20,000	2,000	0.15	0.3	0.052	90	20,000	1,800	0.135	0.052
R1.5	14,000	2,000	0.2	0.5	0.062	200	14,000	1,800	0.18	0.062
R2	12,000	2,000	0.2	0.6	0.065	240	12,000	1,800	0.18	0.065
R2.5	9,200	2,000	0.2	0.7	0.065	280	9,200	1,800	0.18	0.065
R3	7,000	2,000	0.2	1	0.065	400	7,000	1,800	0.18	0.065

Work Material	High Speed Steels SKH55・HAP40(～66HRC)							
	Semi-Finishing				Finishing			
Radius	Spindle Speed	Feed	Depth of Cut	Stock allowance	Spindle Speed	Feed	Depth of Cut	Stock allowance
	min^{-1}	mm/min	a_p mm or a_e mm	mm	min^{-1}	mm/min	a_p mm or a_e mm	mm
R0.05	40,000	270	0.003	0.002	40,000	160	0.002	0
R0.075	40,000	390	0.005	0.002	40,000	270	0.003	0
R0.1	40,000	450	0.005	0.003	40,000	320	0.004	0
R0.15	40,000	610	0.008	0.005	40,000	480	0.006	0
R0.2	40,000	780	0.01	0.005	40,000	560	0.007	0
R0.25	40,000	1,010	0.013	0.007	40,000	710	0.009	0
R0.3	30,000	880	0.015	0.008	30,000	580	0.01	0
R0.4	30,000	1,070	0.018	0.01	30,000	750	0.013	0
R0.5	25,000	1,180	0.024	0.013	25,000	830	0.017	0
R0.75	25,000	1,590	0.032	0.017	25,000	1,090	0.022	0
R1	20,000	1,600	0.04	0.022	20,000	1,130	0.028	0
R1.5	14,000	1,370	0.049	0.027	14,000	960	0.035	0
R2	12,000	1,350	0.057	0.03	12,000	960	0.04	0
R2.5	9,200	1,160	0.063	0.03	9,200	820	0.045	0
R3	7,000	960	0.069	0.03	7,000	680	0.049	0

Work Material	High Speed Steels SKH57・HAP72(～70HRC)									
	Roughing						Stock removal (Inner Corner)			
Radius	Spindle Speed	Feed	Depth of Cut		Stock allowance	Material removal rate	Spindle Speed	Feed	Depth of Cut	Stock allowance
	min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm or a_e mm	mm
R0.05	40,000	40	0.002	0.003	0.004	0.0002	40,000	30	0.002	0.004
R0.075	40,000	80	0.002	0.003	0.004	0.0005	40,000	70	0.002	0.004
R0.1	40,000	190	0.003	0.003	0.006	0.002	40,000	170	0.003	0.006
R0.15	40,000	240	0.005	0.005	0.009	0.006	40,000	210	0.005	0.009
R0.2	35,000	330	0.01	0.02	0.011	0.066	35,000	290	0.009	0.011
R0.25	30,000	360	0.015	0.02	0.014	0.108	30,000	320	0.014	0.014
R0.3	25,000	540	0.02	0.05	0.016	0.54	25,000	480	0.018	0.016
R0.4	25,000	900	0.03	0.1	0.02	2.7	25,000	810	0.027	0.02
R0.5	20,000	1,000	0.05	0.1	0.027	5	20,000	900	0.045	0.027
R0.75	20,000	1,500	0.06	0.2	0.036	18	20,000	1,350	0.054	0.036
R1	16,000	1,500	0.1	0.3	0.045	45	16,000	1,350	0.09	0.045
R1.5	12,000	1,500	0.12	0.5	0.056	90	12,000	1,350	0.108	0.056
R2	9,500	1,500	0.15	0.6	0.063	135	9,500	1,350	0.135	0.063
R2.5	8,000	1,500	0.15	0.7	0.065	158	8,000	1,350	0.135	0.065
R3	5,500	1,500	0.15	1	0.065	225	5,500	1,350	0.135	0.065

Work Material	High Speed Steels SKH57・HAP72(～70HRC)							
	Semi-Finishing				Finishing			
Radius	Spindle Speed	Feed	Depth of Cut	Stock allowance	Spindle Speed	Feed	Depth of Cut	Stock allowance
	min^{-1}	mm/min	a_p mm or a_e mm	mm	min^{-1}	mm/min	a_p mm or a_e mm	mm
R0.05	40,000	270	0.003	0.002	40,000	160	0.002	0
R0.075	40,000	390	0.003	0.002	40,000	270	0.003	0
R0.1	40,000	450	0.003	0.003	40,000	320	0.003	0
R0.15	40,000	610	0.005	0.004	40,000	480	0.005	0
R0.2	35,000	680	0.01	0.005	35,000	490	0.007	0
R0.25	30,000	750	0.013	0.006	30,000	530	0.009	0
R0.3	25,000	730	0.015	0.007	25,000	480	0.01	0
R0.4	25,000	890	0.018	0.009	25,000	630	0.013	0
R0.5	20,000	940	0.024	0.012	20,000	660	0.017	0
R0.75	20,000	1,270	0.032	0.016	20,000	870	0.022	0
R1	16,000	1,280	0.04	0.02	16,000	900	0.028	0
R1.5	12,000	1,170	0.049	0.025	12,000	830	0.035	0
R2	9,500	1,070	0.057	0.028	9,500	760	0.04	0
R2.5	8,000	1,010	0.063	0.03	8,000	710	0.045	0
R3	5,500	760	0.069	0.03	5,500	530	0.049	0

Notes

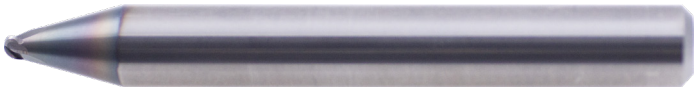
※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
※3 In case of chattering etc., please adjust milling conditions if necessary.
※4 If the cutting load is high at corners, etc., set the milling conditions and tool path carefully to reduce the cutting load.
※5 In case high-efficient machining, increase spindle speed and feed rate at the same rate.
※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate in the same proportion.
※7 Minimize a possible tool overhang length.
※8 We recommend using oil mist coolant.
※9 The stock allowance and depth of cut at semi-finishing and finishing for this tool are guideline, please adjust them according to the machining condition of the previous process and required accuracy.
※10 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a ball end mill approximately 1.5 times lager than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.

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

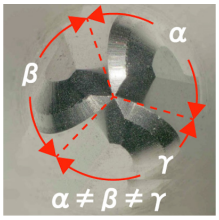
Most suitable for 60HRC and above with MUGEN COATING PREMIUM Plus, high oxidation resistance and abrasion resistance.
Demonstrate same performance with MUGEN COATING PREMIUM even at 52 ～ 60HRC.

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

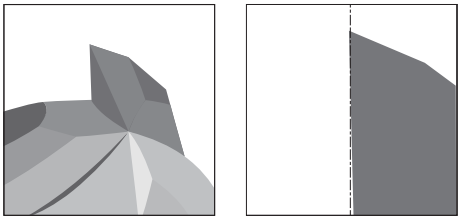
Feature 2 — High efficiency — 3-Flute・Unequal flute spacing・Positive rake angle

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



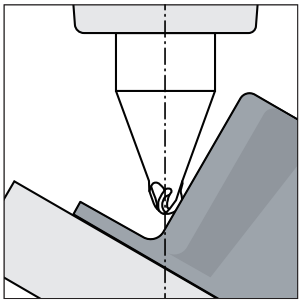
Feature 3 High rigidity — High rigidity tool design

Specialized neck design for 5-axis machining, and ϕ6 shank even for the smaller diameter suppress tool deflection excellently.

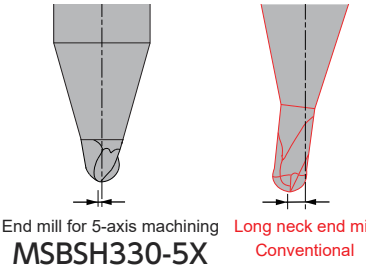
High rigidity neck design shape



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

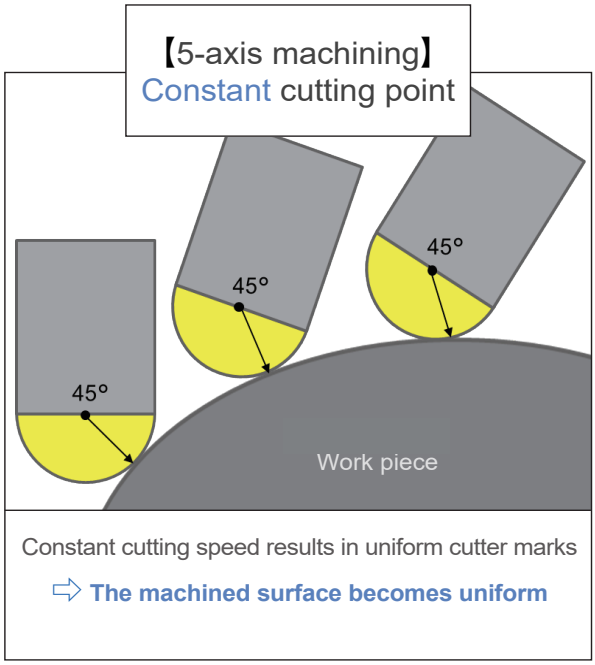


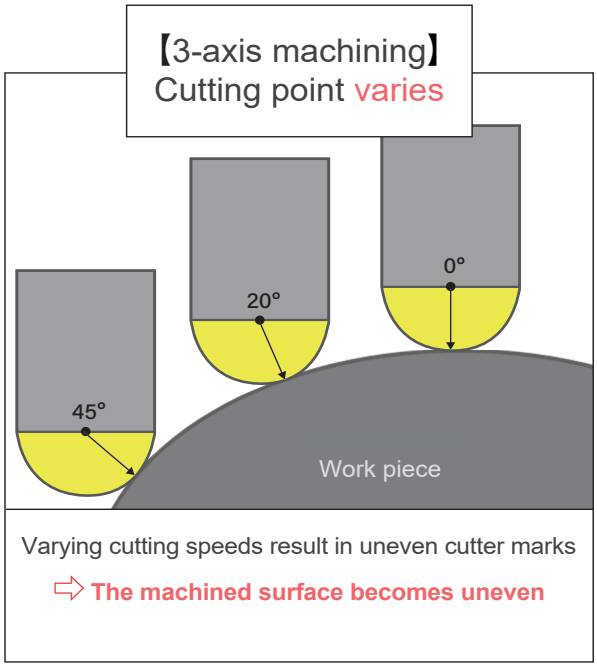
Suppressing the amount of deflection



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





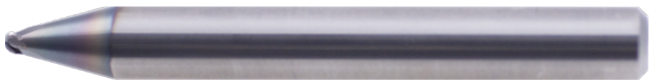
MSBSH330-5X

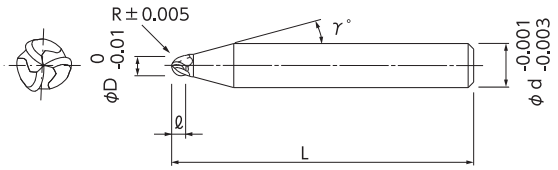
Size R0.1 ～ R1

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 ±0.005mm (R accuracy is based on a half value of actual diameter).
- Shank diameter tolerance, high accuracy type, is - 0.001mm ～ - 0.003mm.

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 Milling 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.

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

R accuracy is based on a half value of actual diameter



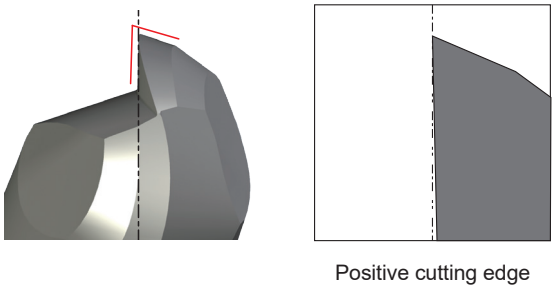
Features

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

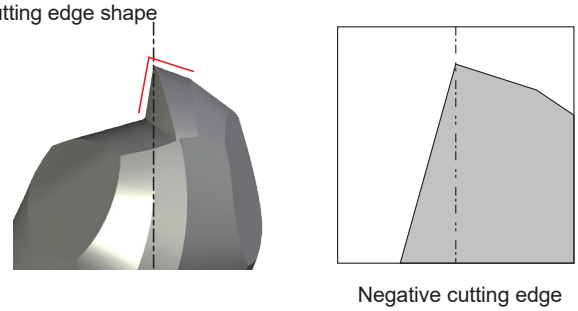
Cutting edge shape



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



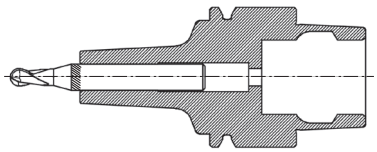
Negative cutting edge shape with high cutting load

Feature 2　Improved cutting accuracy　Optimal overhung length

MRBSH230SF

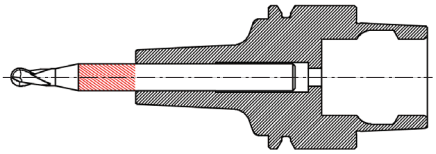
Possible to machining with high rigidity, with short tool overhung

short shank



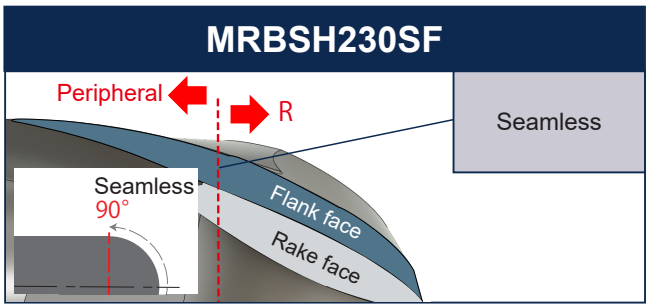
Normal shank length

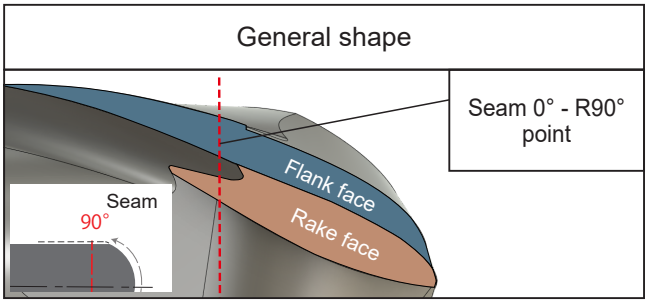
Tool overhung length is long, and tool rigidity is low

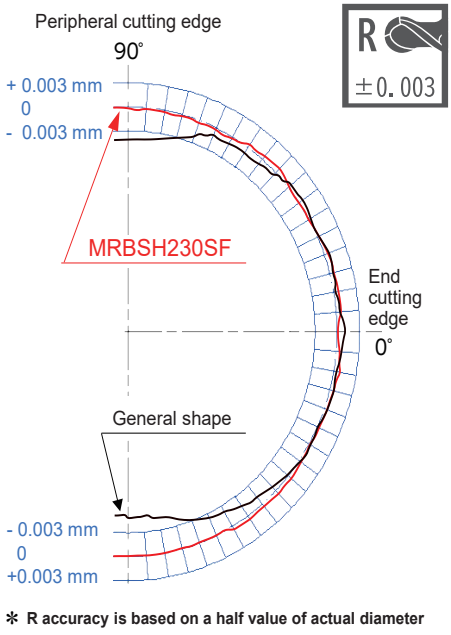


Feature 3 | High accuracy R | Highly accurate R

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





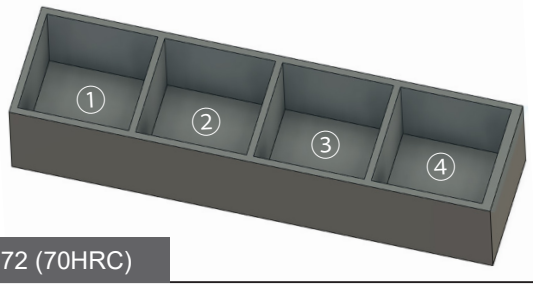


✻ R accuracy is based on a half value of actual diameter

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



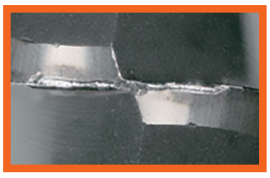
HAP72 (70HRC)

Roughing

n= 16,000min⁻¹ vf = 1,200mm/min ap 0.1 × ae 0.3mm Oil Mist

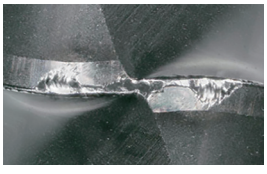
Tool wear condition after 80min machining

MRBSH230SF



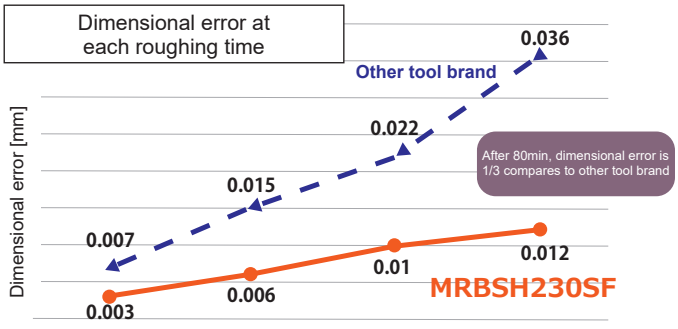
Frank wear width
0.055mm

Other tool brand



Frank wear width
0.102mm

Dimensional error at each roughing time



Realized stable demensional accuracy compares to other tool brand

MRBSH230SF

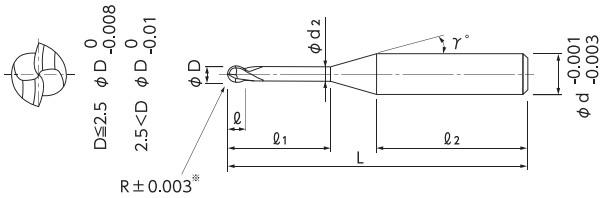
Size R0.05 ～ R3

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



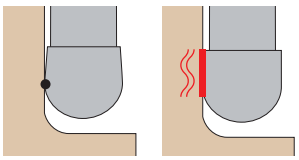


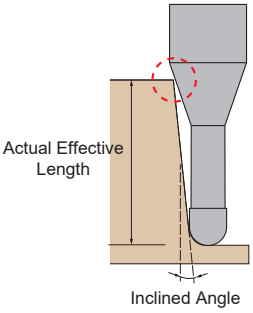
R accuracy is based on a half value of actual diameter.

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

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		**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	R0.15	**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		**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	R0.2	**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.

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°
08-00537-00203		**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	**R0.2**	**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		**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	**R0.25**	**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		**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	**R0.3**	**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		**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	**R0.4**	**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		**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	**R0.5**	**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		**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	**R0.6**	**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		**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	**R0.75**	**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		**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	**R0.8**	**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	**R0.9**	**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		**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	**R1**	**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 (ℓ3)	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°
08-00537-01003	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
R0.25	0.5	1	0.03	0.04	860	40,000	0.015	0.03	650	40,000	0.015	0.02	450	30,000
	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
R0.3	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
	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 Milling 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
	6	6	0.04	0.05	1,200	22,000	0.02	0.05	740	20,000	0.015	0.05	550	16,000
R0.6	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
	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
R0.75	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
	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
R0.8	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 ap indicates Axial Depth of Cut, ae 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

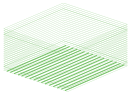
Comparison of dimensional accuracy after finishing on HAP72 (70HRC)

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)

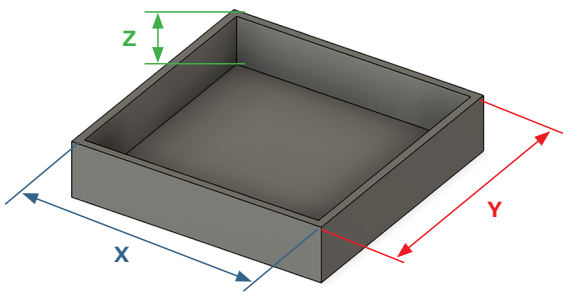


Finishing

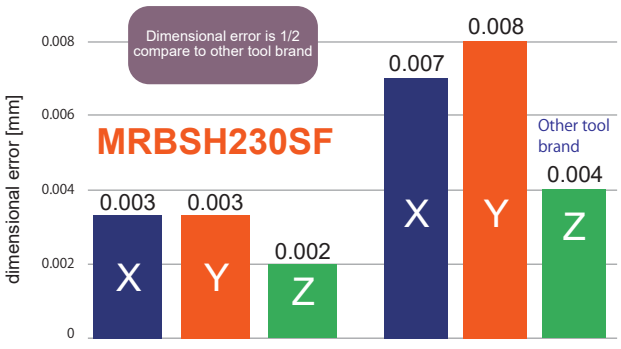
n= 16,000min^{-1} vf= 1,000mm/min ap 0.03 × ae 0.03mm Oil Mist

Machining shape

Pocket Size : 30 mm × 30 mm × Machining depth 6 mm



HAP72 (70HRC)



Realized high precision finishing compares to other tool brand

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





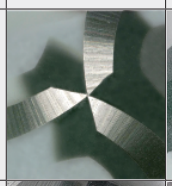
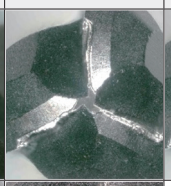
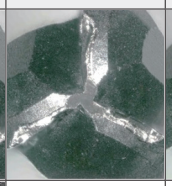
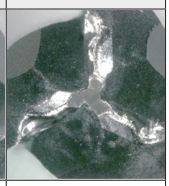
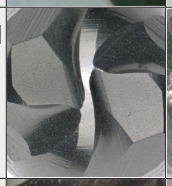
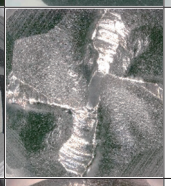
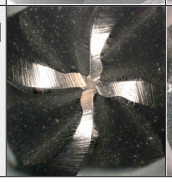
Features

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**

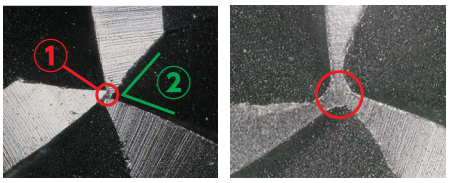
	Before use	After 60min	After 90min	After 120min
MRBSH330 R1×6				
Other tool brand A 4-flute ball end mill R1				
Other tool brand B 4-flute ball end mill R1				

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



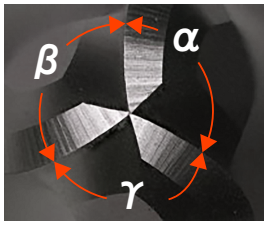
MRBSH330 Conventional

2-2

Optimized chip pocket design realizes smooth chip removal

2-3

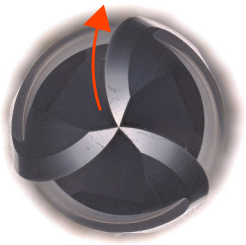
Unequal flute prevent chattering



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

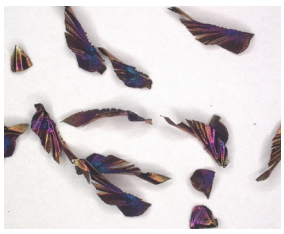
2-4

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 ≧ 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% !**

MRBSH330

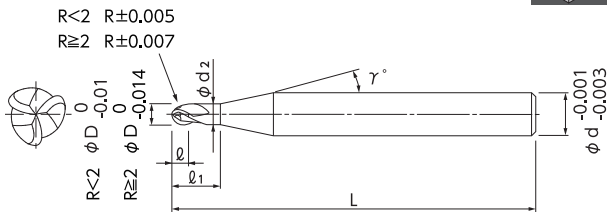
Size R0.1 ～ R3

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

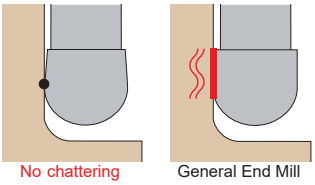
Total 31 sizes

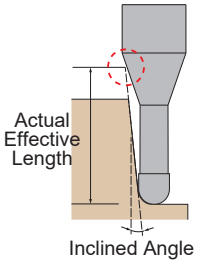
High-efficiency and high-precision die machining with improved cutting edge rigidity and chip evacuation





- 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
◎

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length (ℓ1)	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：ap = Axial Depth of Cut / ae = 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.

MHDSH445R New

Size ϕ 1 × R0.1 ～ ϕ 4 × R0.5

Plus ≦70 HRC

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

Total 15 sizes

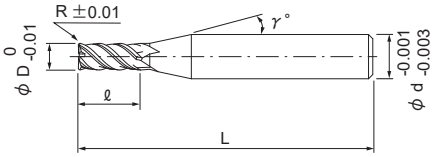
Suitable for machining hardened steels up to 70HRC, such as press dies and forging dies
Adopt multi-flute design with high rigidity and strong helix angle to realize machining on tough materials, such as high speed steel

MG | 4 | 45° | ϕd −0.001 −0.003

Side | Slot | Face







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

Work Material

Hardened Steel H
60～70HRC
◎

◆ Release in Mar, 2026.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
◆ 08-00439-10012	**1**	**R0.1**	**2**	12°	6	60
◆ 08-00439-15012	**1.5**	**R0.1**	**3**	12°	6	60
◆ 08-00439-20012	**2**	**R0.1**	**4**	12°	6	60
◆ 08-00439-30022	**3**	**R0.2**	**6**	12°	6	60
◆ 08-00439-30023			**9**	12°	6	60
◆ 08-00439-30032		**R0.3**	**6**	12°	6	60
◆ 08-00439-30033			**9**	12°	6	60
◆ 08-00439-30052		**R0.5**	**6**	12°	6	60
◆ 08-00439-30053			**9**	12°	6	60
◆ 08-00439-40022	**4**	**R0.2**	**8**	12°	6	60
◆ 08-00439-40023			**12**	12°	6	60
◆ 08-00439-40032		**R0.3**	**8**	12°	6	60
◆ 08-00439-40033			**12**	12°	6	60
◆ 08-00439-40052		**R0.5**	**8**	12°	6	60
◆ 08-00439-40053			**12**	12°	6	60

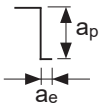
How to Order When you order, indicate MHDSH445R (D)×(R)×(ℓ).

※ (γ) is reference value.

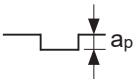
Work Material			Hardened Steels/High Speed Steels SKD11・SKH51(～62HRC)							
Dia.	Corner Radius	Length of Cut	Side milling				Slotting			
			Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
1	**R0.1**	**2**	22,000	500	1.5	0.02	18,000	300	0.01	-
1.5	**R0.1**	**3**	15,000	560	2.25	0.03	12,000	380	0.015	-
2	**R0.1**	**4**	11,000	630	3	0.04	10,000	420	0.02	-
3	**R0.2**	**6**	7,500	700	4.5	0.06	7,200	500	0.03	-
		9	7,100	600	4.5	0.06	6,800	320	0.03	-
	R0.3	**6**	7,500	700	4.5	0.06	7,200	500	0.03	-
		9	7,100	600	4.5	0.06	6,800	320	0.03	-
	R0.5	**6**	7,500	700	4.5	0.06	7,200	500	0.03	-
		9	7,100	600	4.5	0.06	6,800	320	0.03	-
4	**R0.2**	**8**	6,300	800	6	0.08	5,800	540	0.04	-
		12	6,000	700	6	0.08	5,400	360	0.04	-
	R0.3	**8**	6,300	800	6	0.08	5,800	540	0.04	-
		12	6,000	700	6	0.08	5,400	360	0.04	-
	R0.5	**8**	6,300	800	6	0.08	5,800	540	0.04	-
		12	6,000	700	6	0.08	5,400	360	0.04	-

Work Material			High Speed Steels SKH55・HAP40(～66HRC)							
Dia.	Corner Radius	Length of Cut	Side milling				Slotting			
			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
1	**R0.1**	**2**	20,000	240	1.5	0.02	15,000	120	0.01	-
1.5	**R0.1**	**3**	13,000	330	2.25	0.03	10,000	160	0.015	-
2	**R0.1**	**4**	10,000	480	3	0.04	8,000	240	0.02	-
3	**R0.2**	**6**	6,800	560	4.5	0.06	5,900	280	0.03	-
		9	6,100	480	4.5	0.06	5,500	140	0.03	-
	R0.3	**6**	6,800	560	4.5	0.06	5,900	280	0.03	-
		9	6,100	480	4.5	0.06	5,500	140	0.03	-
	R0.5	**6**	6,800	560	4.5	0.06	5,900	280	0.03	-
		9	6,100	480	4.5	0.06	5,500	140	0.03	-
4	**R0.2**	**8**	5,700	600	6	0.08	4,900	300	0.04	-
		12	5,300	560	6	0.08	4,700	160	0.04	-
	R0.3	**8**	5,700	600	6	0.08	4,900	300	0.04	-
		12	5,300	560	6	0.08	4,700	160	0.04	-
	R0.5	**8**	5,700	600	6	0.08	4,900	300	0.04	-
		12	5,300	560	6	0.08	4,700	160	0.04	-

Side Milling



Slotting

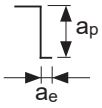
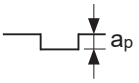


Notes

※1 Use a rigid and precise machine and chuck holder.
※2 Overhang of end mill should be as short as possible from spindle nose.
※3 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※4 Adjust both spindle speed and feed at the same rate.
※5 We recommend using oil mist coolant.

MHDSH445R New

Recommended Milling Conditions

Work Material			High Speed Steels SKH57・HAP72(～70HRC)							
			Side milling				Slotting			
Dia.	Corner Radius	Length 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
1	**R0.1**	**2**	15,000	160	1.5	0.02	14,000	100	0.01	-
1.5	**R0.1**	**3**	10,000	240	2.25	0.03	8,000	120	0.015	-
2	**R0.1**	**4**	8,000	320	3	0.04	7,000	160	0.02	-
3	**R0.2**	**6**	5,600	400	4.5	0.06	5,000	180	0.03	-
		9	5,000	320	4.5	0.06	4,500	100	0.03	-
	R0.3	**6**	5,600	400	4.5	0.06	5,000	180	0.03	-
		9	5,000	320	4.5	0.06	4,500	100	0.03	-
	R0.5	**6**	5,600	400	4.5	0.06	5,000	180	0.03	-
		9	5,000	320	4.5	0.06	4,500	100	0.03	-
4	**R0.2**	**8**	4,900	400	6	0.08	4,500	180	0.04	-
		12	4,500	320	6	0.08	4,000	100	0.04	-
	R0.3	**8**	4,900	400	6	0.08	4,500	180	0.04	-
		12	4,500	320	6	0.08	4,000	100	0.04	-
	R0.5	**8**	4,900	400	6	0.08	4,500	180	0.04	-
		12	4,500	320	6	0.08	4,000	100	0.04	-
Notes			Side Milling 				Slotting 			

※1 Use a rigid and precise machine and chuck holder.
※2 Overhang of end mill should be as short as possible from spindle nose.
※3 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※4 Adjust both spindle speed and feed at the same rate.
※5 We recommend using oil mist coolant.

MHDSH645R New

Size ϕ 5 × R0.2 ～ ϕ 6 × R1

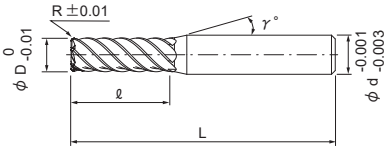
MUGEN COATING PREMIUM Plus
6-Flute Corner Radius End Mill for Hardened Steel

Total 14 sizes

Suitable for machining hardened steels up to 70HRC, such as press dies and forging dies
Adopt multi-flute design with high rigidity and strong helix angle to realize machining on tough materials, such as high speed 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.
- Improved machining accuracy with high rigidity multi-flute design.
- Shank diameter tolerance, high accuracy type, is - 0.001mm ～ - 0.003mm.

Work Material

Hardened Steel H
60～70HRC
◎

◆ Release in Mar, 2026.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
◆ 08-00440-50022	5	R0.2	10	12°	6	60
◆ 08-00440-50023			15	12°	6	65
◆ 08-00440-50032		R0.3	10	12°	6	60
◆ 08-00440-50033			15	12°	6	65
◆ 08-00440-50052		R0.5	10	12°	6	60
◆ 08-00440-50053			15	12°	6	65
◆ 08-00440-60022	6	R0.2	12	-	6	60
◆ 08-00440-60023			18	-	6	65
◆ 08-00440-60032		R0.3	12	-	6	60
◆ 08-00440-60033			18	-	6	65
◆ 08-00440-60052		R0.5	12	-	6	60
◆ 08-00440-60053			18	-	6	65
◆ 08-00440-60102		R1	12	-	6	60
◆ 08-00440-60103			18	-	6	65

How to Order When you order, indicate MHDSH645R (D)×(R)×(ℓ). ※ (γ) is reference value.

MHDSH645R New

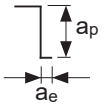
Recommended Milling Conditions

Work Material			Hardened Steels/High Speed Steels SKD11・SKH51(～62HRC)							
Dia.	Corner Radius	Length of Cut	Side milling				Slotting			
			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
5	R0.2	10	5,600	1,200	7.5	0.1	5,400	600	0.05	-
		15	5,200	1,000	7.5	0.1	4,700	400	0.05	-
	R0.3	10	5,600	1,200	7.5	0.1	5,400	600	0.05	-
		15	5,200	1,000	7.5	0.1	4,700	400	0.05	-
	R0.5	10	5,600	1,200	7.5	0.1	5,400	600	0.05	-
		15	5,200	1,000	7.5	0.1	4,700	400	0.05	-
6	R0.2	12	4,800	1,200	9	0.12	4,600	600	0.06	-
		18	4,500	1,000	9	0.12	4,000	400	0.06	-
	R0.3	12	4,800	1,200	9	0.12	4,600	600	0.06	-
		18	4,500	1,000	9	0.12	4,000	400	0.06	-
	R0.5	12	4,800	1,200	9	0.12	4,600	600	0.06	-
		18	4,500	1,000	9	0.12	4,000	400	0.06	-
	R1	12	4,800	1,200	9	0.12	4,600	600	0.06	-
		18	4,500	1,000	9	0.12	4,000	400	0.06	-

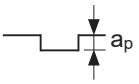
Work Material			High Speed Steels SKH55・HAP40(～66HRC)							
Dia.	Corner Radius	Length of Cut	Side milling				Slotting			
			Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
5	R0.2	10	5,100	800	7.5	0.1	4,700	350	0.05	-
		15	4,600	600	7.5	0.1	4,100	200	0.05	-
	R0.3	10	5,100	800	7.5	0.1	4,700	350	0.05	-
		15	4,600	600	7.5	0.1	4,100	200	0.05	-
	R0.5	10	5,100	800	7.5	0.1	4,700	350	0.05	-
		15	4,600	600	7.5	0.1	4,100	200	0.05	-
6	R0.2	12	4,400	800	9	0.12	4,100	350	0.06	-
		18	4,000	600	9	0.12	3,500	200	0.06	-
	R0.3	12	4,400	800	9	0.12	4,100	350	0.06	-
		18	4,000	600	9	0.12	3,500	200	0.06	-
	R0.5	12	4,400	800	9	0.12	4,100	350	0.06	-
		18	4,000	600	9	0.12	3,500	200	0.06	-
	R1	12	4,400	800	9	0.12	4,100	350	0.06	-
		18	4,000	600	9	0.12	3,500	200	0.06	-

Work Material			High Speed Steels SKH57・HAP72(～70HRC)							
			Side milling				Slotting			
Dia.	Corner Radius	Length 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
5	R0.2	10	4,500	560	7.5	0.1	4,000	200	0.05	-
		15	4,100	480	7.5	0.1	3,600	120	0.05	-
	R0.3	10	4,500	560	7.5	0.1	4,000	200	0.05	-
		15	4,100	480	7.5	0.1	3,600	120	0.05	-
	R0.5	10	4,500	560	7.5	0.1	4,000	200	0.05	-
		15	4,100	480	7.5	0.1	3,600	120	0.05	-
6	R0.2	12	3,900	560	9	0.12	3,600	200	0.06	-
		18	3,500	480	9	0.12	3,200	120	0.06	-
	R0.3	12	3,900	560	9	0.12	3,600	200	0.06	-
		18	3,500	480	9	0.12	3,200	120	0.06	-
	R0.5	12	3,900	560	9	0.12	3,600	200	0.06	-
		18	3,500	480	9	0.12	3,200	120	0.06	-
	R1	12	3,900	560	9	0.12	3,600	200	0.06	-
		18	3,500	480	9	0.12	3,200	120	0.06	-

Side Milling



Slotting



Notes

※1 Use a rigid and precise machine and chuck holder.
※2 Overhang of end mill should be as short as possible from spindle nose.
※3 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※4 Adjust both spindle speed and feed at the same rate.
※5 We recommend using oil mist coolant.

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

MHRSH430RSF

Lineup Expansion

Plus | SMG | 4 | 30° | Corner R ±0.003 (D≦2) | Corner R ±0.005 (D>2) | φd −0.001 −0.003 | Side | Slot | Face

φ 0.1×R0.01 ～ φ 6×R1　　Total 269 sizes



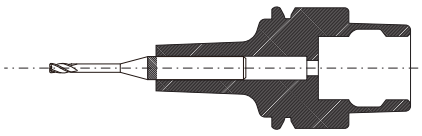
Features

Feature 1 — Excellent accuracy and surface roughness | Optimal overhung length by short shank | High accuracy corner R and wiper

MHRSH430RSF

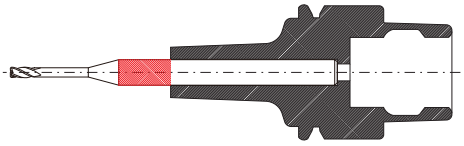
Possible to machining with high rigidity, with short tool overhung

short shank

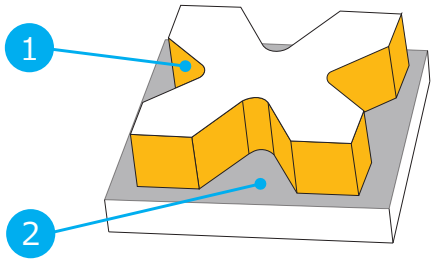


Normal shank length

Tool overhung length is long, and tool rigidity is low



Surface roughness and wear after 60 mins machining



Tool　MHRSH430RSF φ2×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

Surface roughness

1 Wall 0°



Ra 0.052μm

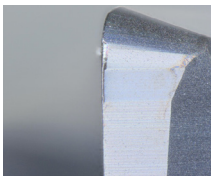
2 Bottom



Ra 0.010μm

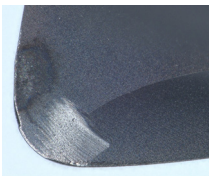
Tool wear

End tooth



Frank wear width 0.023mm

Corner R





R retreat amount 0.003mm

Corner radius end mill to pursue accuracy and surface roughness



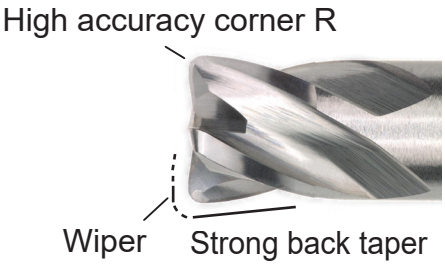
End tooth profile no center tooth

ϕ 0.1×R0.01 ～ϕ 2×R0.5

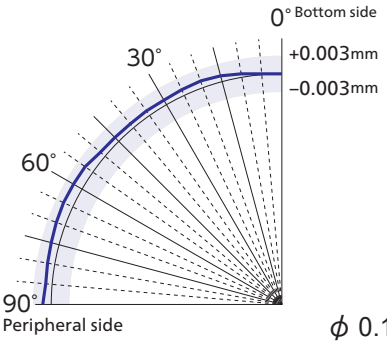


End tooth profile with center tooth

ϕ 3×R0.05 ～ϕ 6×R1



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

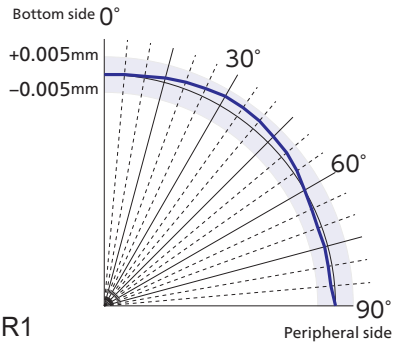




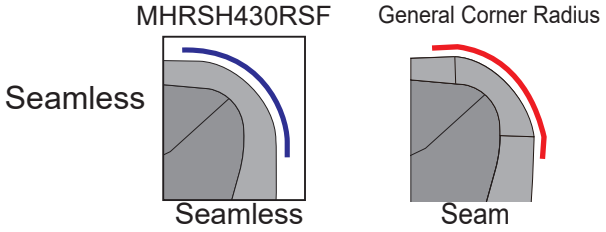
ϕ 0.1×R0.01 ～ϕ 2×R0.5
Corner Radius R ±0.003 mm



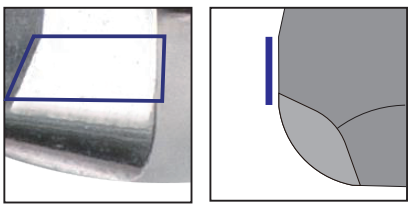
ϕ 3×R0.05 ～ϕ 6×R1
Corner Radius R ±0.005 mm



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



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



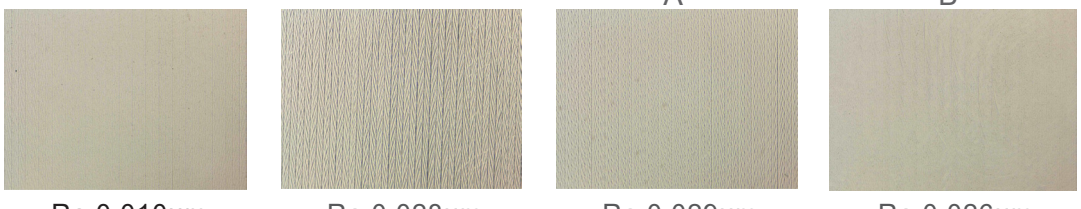
By adopting wiper at the end tooth, improves the surface roughness on bottom surface machining

Surface roughness comparison after bottom surface finishing

Work material HAP40 (64HRC)

Tool size ϕ2×R0.2×6

Magnification rate ×400



MHRSH430RSF

Lineup Expansion

Size ϕ 0.1×R0.01 ～ ϕ 6×R1

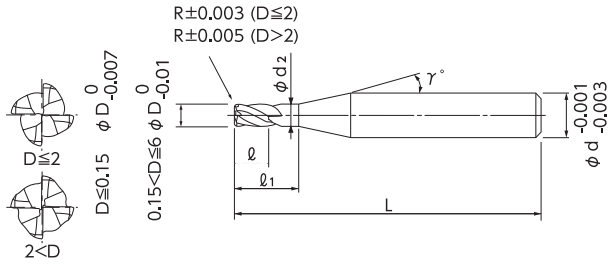
MUGEN COATING PREMIUM Plus

Total 269 sizes

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

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



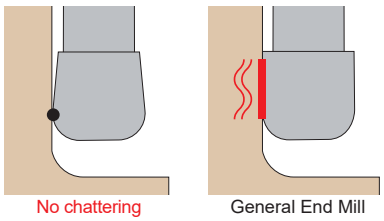


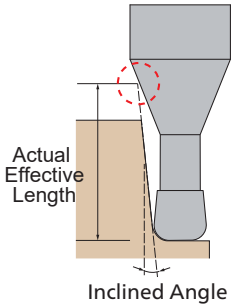
Please be aware of stock since ϕ 0.1- ϕ 2mm sizes have no center cutting edge.

- 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 269 sizes in total that lineup from the smallest diameter ϕ 0.1 to ϕ 6.
- Shank diameter tolerance, high accuracy type, is - 0.001mm ～ - 0.003mm.

Work Material

Hardened Steel H
60～70HRC
◎





◆ Release in Dec, 2025.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00239-01002	0.1	R0.01	0.2	0.08	0.085	15°	4	35	0.23	0.24	0.25	0.26	0.28
◆ 08-00239-01001			0.25	0.08	0.085	15°	4	35	0.28	0.29	0.3	0.31	0.34
08-00239-01003			0.3	0.08	0.085	15°	4	35	0.33	0.35	0.36	0.37	0.4
◆ 08-00239-01004			0.4	0.08	0.085	15°	4	35	0.44	0.45	0.47	0.49	0.52
◆ 08-00239-01005			0.5	0.08	0.085	15°	4	35	0.54	0.56	0.58	0.6	0.65
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
◆ 08-00239-01504			0.4	0.12	0.135	15°	4	35	0.44	0.45	0.47	0.49	0.52
08-00239-01505			0.5	0.12	0.135	15°	4	35	0.54	0.56	0.58	0.6	0.65
◆ 08-00239-01506			0.6	0.12	0.135	15°	4	35	0.64	0.67	0.69	0.72	0.77
◆ 08-00239-01507			0.75	0.12	0.135	15°	4	35	0.8	0.83	0.86	0.89	0.96
08-00239-01523		R0.02	0.3	0.12	0.135	15°	4	35	0.33	0.34	0.36	0.37	0.4
◆ 08-00239-01524			0.4	0.12	0.135	15°	4	35	0.44	0.45	0.47	0.48	0.52
08-00239-01525			0.5	0.12	0.135	15°	4	35	0.54	0.56	0.58	0.6	0.65
◆ 08-00239-01526			0.6	0.12	0.135	15°	4	35	0.64	0.67	0.69	0.71	0.77
◆ 08-00239-01527			0.75	0.12	0.135	15°	4	35	0.8	0.83	0.86	0.89	0.96
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
◆ 08-00239-02204			0.4	0.15	0.18	15°	4	35	0.45	0.46	0.48	0.49	0.53
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
◆ 08-00239-02404			0.4	0.15	0.18	15°	4	35	0.45	0.46	0.47	0.49	0.53
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

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 (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00239-03205	0.3	R0.02	0.5	0.25	0.28	15°	4	35	0.55	0.57	0.59	0.61	0.66
◆ 08-00239-03206			0.6	0.25	0.28	15°	4	35	0.65	0.68	0.7	0.72	0.78
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
◆ 08-00239-03212			1.25	0.25	0.28	15°	4	35	1.32	1.37	1.42	1.47	1.59
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
◆ 08-00239-03406			0.6	0.25	0.28	15°	4	35	0.65	0.67	0.7	0.72	0.78
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
◆ 08-00239-03412			1.25	0.25	0.28	15°	4	35	1.32	1.37	1.42	1.47	1.58
08-00239-03415			1.5	0.25	0.28	15°	4	35	1.58	1.64	1.69	1.76	1.89
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
◆ 08-00239-04207			0.75	0.3	0.37	15°	4	35	0.83	0.86	0.89	0.92	0.99
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
◆ 08-00239-04407			0.75	0.3	0.37	15°	4	35	0.83	0.85	0.88	0.91	0.99
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
◆ 08-00239-04505		R0.1	0.5	0.3	0.37	15°	4	35	0.57	0.58	0.6	0.62	0.66
◆ 08-00239-04507			0.75	0.3	0.37	15°	4	35	0.82	0.85	0.88	0.91	0.97
◆ 08-00239-04510			1	0.3	0.37	15°	4	35	1.08	1.12	1.15	1.19	1.28
◆ 08-00239-04515			1.5	0.3	0.37	15°	4	35	1.6	1.65	1.71	1.77	1.91
◆ 08-00239-04520			2	0.3	0.37	15°	4	35	2.12	2.19	2.26	2.34	2.53
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
◆ 08-00239-06215			1.5	0.5	0.56	15°	4	35	1.62	1.68	1.74	1.8	1.95
08-00239-06220			2	0.5	0.56	15°	4	35	2.14	2.21	2.29	2.38	2.57
◆ 08-00239-06225			2.5	0.5	0.56	15°	4	35	2.66	2.75	2.85	2.95	3.19
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
◆ 08-00239-06415			1.5	0.5	0.56	15°	4	35	1.62	1.68	1.73	1.8	1.94
08-00239-06420			2	0.5	0.56	15°	4	35	2.14	2.21	2.29	2.37	2.56
◆ 08-00239-06425			2.5	0.5	0.56	15°	4	35	2.65	2.75	2.84	2.95	3.18
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
◆ 08-00239-06515			1.5	0.5	0.56	15°	4	35	1.62	1.67	1.73	1.79	1.93
08-00239-06520			2	0.5	0.56	15°	4	35	2.14	2.21	2.28	2.37	2.55
◆ 08-00239-06525			2.5	0.5	0.56	15°	4	35	2.65	2.74	2.84	2.94	3.17
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
◆ 08-00239-08225			2.5	0.65	0.76	15°	4	35	2.66	2.75	2.85	2.95	3.19
08-00239-08203			3	0.65	0.76	15°	4	35	3.17	3.28	3.4	3.53	3.81
◆ 08-00239-08235			3.5	0.65	0.76	15°	4	35	3.69	3.82	3.95	4.1	4.43
08-00239-08204			4	0.65	0.76	15°	4	35	4.21	4.35	4.51	4.68	5.06

MHRSH430RSF Lineup Expansion

MUGEN COATING PREMIUM Plus

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

◆ Release in Dec, 2025.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ2)	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°
08-00239-08402	0.8	R0.05	2	0.65	0.76	15°	4	35	2.14	2.21	2.29	2.37	2.56
◆ 08-00239-08425			2.5	0.65	0.76	15°	4	35	2.65	2.75	2.84	2.95	3.18
08-00239-08403			3	0.65	0.76	15°	4	35	3.17	3.28	3.4	3.52	3.81
◆ 08-00239-08435			3.5	0.65	0.76	15°	4	35	3.69	3.82	3.95	4.1	4.43
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
◆ 08-00239-08525			2.5	0.65	0.76	15°	4	35	2.65	2.74	2.84	2.94	3.17
08-00239-08503			3	0.65	0.76	15°	4	35	3.17	3.28	3.39	3.52	3.79
◆ 08-00239-08535			3.5	0.65	0.76	15°	4	35	3.69	3.81	3.95	4.09	4.42
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
◆ 08-00239-08625			2.5	0.65	0.76	15°	4	35	2.65	2.74	2.83	2.93	3.15
08-00239-08603			3	0.65	0.76	15°	4	35	3.17	3.27	3.38	3.5	3.77
◆ 08-00239-08635			3.5	0.65	0.76	15°	4	35	3.68	3.8	3.94	4.08	4.39
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
08-00239-10702		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

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 (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00239-20204	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
◆ 08-00239-25406	2.5	R0.05	6	2	2.39	15°	4	35	6.41	6.63	6.87	7.12	7.7
◆ 08-00239-25408			8	2	2.39	15°	4	40	8.47	8.77	9.08	9.42	10.18
◆ 08-00239-25410			10	2	2.39	15°	4	40	10.54	10.91	11.3	11.72	12.67
◆ 08-00239-25412			12	2	2.39	15°	4	40	12.61	13.05	13.52	14.02	Free
◆ 08-00239-25506		R0.1	6	2	2.39	15°	4	35	6.41	6.63	6.86	7.12	7.69
◆ 08-00239-25508			8	2	2.39	15°	4	40	8.47	8.77	9.08	9.42	10.17
◆ 08-00239-25510			10	2	2.39	15°	4	40	10.54	10.9	11.29	11.71	12.66
◆ 08-00239-25512			12	2	2.39	15°	4	40	12.61	13.04	13.51	14.01	Free
◆ 08-00239-25606		R0.2	6	2	2.39	15°	4	35	6.4	6.62	6.85	7.1	7.66
◆ 08-00239-25608			8	2	2.39	15°	4	40	8.47	8.76	9.07	9.4	10.15
◆ 08-00239-25610			10	2	2.39	15°	4	40	10.54	10.9	11.28	11.7	12.63
◆ 08-00239-25612			12	2	2.39	15°	4	40	12.6	13.04	13.5	14	Free
◆ 08-00239-25706		R0.3	6	2	2.39	15°	4	35	6.4	6.61	6.84	7.09	7.64
◆ 08-00239-25708			8	2	2.39	15°	4	40	8.47	8.75	9.06	9.39	10.12
◆ 08-00239-25710			10	2	2.39	15°	4	40	10.53	10.89	11.27	11.69	12.61
◆ 08-00239-25712			12	2	2.39	15°	4	40	12.6	13.03	13.49	13.99	Free
◆ 08-00239-25806		R0.5	6	2	2.39	15°	4	35	6.39	6.6	6.82	7.06	7.59
◆ 08-00239-25808			8	2	2.39	15°	4	40	8.46	8.74	9.04	9.36	10.08
◆ 08-00239-25810			10	2	2.39	15°	4	40	10.53	10.88	11.25	11.66	12.56
◆ 08-00239-25812			12	2	2.39	15°	4	40	12.59	13.02	13.47	13.96	Free
08-00239-30404	3	R0.05	4	2.5	2.85	15°	6	45	4.42	4.57	4.73	4.91	5.3
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	13.6	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	4.9	5.29
08-00239-30506			6	2.5	2.85	15°	6	45	6.48	6.71	6.94	7.2	7.78
08-00239-30508			8	2.5	2.85	15°	6	45	8.55	8.84	9.16	9.5	10.26
08-00239-30510			10	2.5	2.85	15°	6	50	10.62	10.98	11.38	11.8	12.75
08-00239-30512			12	2.5	2.85	15°	6	50	12.68	13.12	13.59	14.1	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	6.7	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

MHRSH430RSF Lineup Expansion

MUGEN COATING PREMIUM Plus

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

◆ Release in Dec, 2025.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00239-30704	3	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	12.7
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	16.9	17.52	18.92
08-00239-30804		R0.5	4	2.5	2.85	15°	6	45	4.4	4.54	4.69	4.84	5.2
08-00239-30806			6	2.5	2.85	15°	6	45	6.47	6.68	6.9	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	10.6	10.96	11.33	11.74	12.66
08-00239-30812			12	2.5	2.85	15°	6	50	12.67	13.1	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
◆ 08-00239-40408	4	R0.05	8	3.2	3.8	15°	6	45	8.65	8.95	9.27	9.62	10.39
◆ 08-00239-40412			12	3.2	3.8	15°	6	50	12.78	13.23	13.7	14.22	15.36
◆ 08-00239-40416			16	3.2	3.8	15°	6	55	16.92	17.51	18.14	18.81	Free
◆ 08-00239-40420			20	3.2	3.8	15°	6	55	21.05	21.78	22.57	23.41	Free
08-00239-40508		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	13.7	14.21	15.35
08-00239-40516			16	3.2	3.8	15°	6	55	16.92	17.5	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	17.5	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	13.2	13.65	14.15	15.26
08-00239-40816			16	3.2	3.8	15°	6	55	16.9	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
◆ 08-00239-50525			25	4	4.75	15°	6	55	26.32	27.23	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
◆ 08-00239-50625			25	4	4.75	15°	6	55	26.31	27.22	Free	Free	Free
08-00239-50715		R0.3	15	4	4.75	15°	6	50	15.97	16.52	17.1	Free	Free
08-00239-50720			20	4	4.75	15°	6	55	21.14	21.87	Free	Free	Free
◆ 08-00239-50725			25	4	4.75	15°	6	55	26.31	27.22	Free	Free	Free
08-00239-50815		R0.5	15	4	4.75	15°	6	50	15.97	16.5	17.08	Free	Free
08-00239-50820			20	4	4.75	15°	6	55	21.13	21.85	Free	Free	Free
◆ 08-00239-50825			25	4	4.75	15°	6	55	26.3	27.2	Free	Free	Free
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		R0.2	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60618			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		R0.3	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60718			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		R0.5	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60818			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		R1	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
08-00239-60918			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.

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
		0.25	2.5	40,000	180	0.002	0.01	40,000	130	0.002	0.01	40,000	100	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
		0.4	4	40,000	140	0.001	0.01	40,000	100	0.001	0.01	40,000	70	0.001	0.01
		0.5	5	40,000	120	0.001	0.01	40,000	90	0.001	0.01	40,000	60	0.001	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
		0.4	2.7	40,000	200	0.002	0.015	40,000	150	0.002	0.01	40,000	110	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
		0.6	4	40,000	140	0.001	0.015	40,000	100	0.001	0.01	40,000	70	0.001	0.01
		0.75	5	40,000	120	0.001	0.015	40,000	90	0.001	0.01	40,000	60	0.001	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
		0.4	2.7	40,000	200	0.002	0.015	40,000	150	0.002	0.01	40,000	110	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
		0.6	4	40,000	140	0.001	0.015	40,000	100	0.001	0.01	40,000	70	0.001	0.01
		0.75	5	40,000	120	0.001	0.015	40,000	90	0.001	0.01	40,000	60	0.001	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
		0.4	2	30,000	340	0.003	0.02	30,000	260	0.003	0.01	30,000	200	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
		0.4	2	30,000	340	0.003	0.02	30,000	260	0.003	0.01	30,000	200	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
		0.6	2	30,000	580	0.003	0.04	30,000	480	0.003	0.03	30,000	380	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
		1.25	4.2	30,000	400	0.003	0.04	30,000	300	0.003	0.03	30,000	220	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
		0.6	2	30,000	580	0.003	0.04	30,000	480	0.003	0.03	30,000	380	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
		1.25	4.2	30,000	400	0.003	0.04	30,000	300	0.003	0.03	30,000	220	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
		0.75	1.9	28,000	730	0.005	0.05	25,000	620	0.004	0.04	22,000	460	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
		0.75	1.9	28,000	730	0.005	0.05	25,000	620	0.005	0.04	22,000	460	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
	0.1	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
		0.75	1.9	28,000	730	0.005	0.05	25,000	620	0.005	0.04	22,000	460	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

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11（～62HRC）				High Speed Steels SKH55・HAP40（～66HRC）				High Speed Steels SKH57・HAP72（～70HRC）			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
0.5	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
		1.5	2.5	23,000	900	0.006	0.15	20,000	740	0.004	0.1	17,000	540	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
		2.5	4.2	23,000	750	0.005	0.15	20,000	620	0.003	0.1	17,000	460	0.003	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
		1.5	2.5	23,000	900	0.01	0.15	20,000	740	0.008	0.1	17,000	540	0.007	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
		2.5	4.2	23,000	750	0.009	0.15	20,000	620	0.006	0.1	17,000	460	0.005	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
		1.5	2.5	23,000	900	0.01	0.15	20,000	740	0.008	0.1	17,000	540	0.007	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
		2.5	4.2	23,000	750	0.009	0.15	20,000	620	0.006	0.1	17,000	460	0.005	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
0.8	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
		2.5	3.1	23,000	1,350	0.006	0.16	20,000	950	0.004	0.14	17,000	670	0.004	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
		3.5	4.4	23,000	1,250	0.005	0.16	20,000	850	0.003	0.14	17,000	620	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
		2.5	3.1	23,000	1,350	0.017	0.16	20,000	950	0.012	0.14	17,000	670	0.010	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
		3.5	4.4	23,000	1,250	0.015	0.16	20,000	850	0.01	0.14	17,000	620	0.007	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
		2.5	3.1	23,000	1,350	0.017	0.16	20,000	950	0.012	0.14	17,000	670	0.010	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
		3.5	4.4	23,000	1,250	0.015	0.16	20,000	850	0.01	0.14	17,000	620	0.007	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
		2.5	3.1	23,000	1,350	0.017	0.16	20,000	950	0.012	0.14	17,000	670	0.010	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
		3.5	4.4	23,000	1,250	0.015	0.16	20,000	850	0.01	0.14	17,000	620	0.007	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

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11（～62HRC）				High Speed Steels SKH55・HAP40（～66HRC）				High Speed Steels SKH57・HAP72（～70HRC）			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
1	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
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

MHRSH430RSF Lineup Expansion

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11（～62HRC）				High Speed Steels SKH55・HAP40（～66HRC）				High Speed Steels SKH57・HAP72（～70HRC）			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
2.5	0.05	6	2.4	14,000	1,800	0.05	0.5	12,000	1,300	0.03	0.5	9,000	900	0.018	0.5
		8	3.2	12,000	1,700	0.05	0.5	10,000	1,200	0.03	0.5	7,500	800	0.018	0.5
		10	4	11,000	1,500	0.04	0.5	9,000	1,100	0.03	0.5	7,000	750	0.018	0.5
		12	4.8	10,000	1,300	0.03	0.5	8,000	1,000	0.02	0.5	6,700	650	0.012	0.5
	0.1	6	2.4	14,000	1,800	0.06	0.5	12,000	1,300	0.03	0.5	9,000	900	0.018	0.5
		8	3.2	12,000	1,700	0.05	0.5	10,000	1,200	0.03	0.5	7,500	800	0.018	0.5
		10	4	11,000	1,500	0.05	0.5	9,000	1,100	0.03	0.5	7,000	750	0.018	0.5
		12	4.8	10,000	1,300	0.04	0.5	8,000	1,000	0.02	0.5	6,700	650	0.012	0.5
	0.2	6	2.4	14,000	1,800	0.06	0.5	12,000	1,300	0.03	0.5	9,000	900	0.018	0.5
		8	3.2	12,000	1,700	0.05	0.5	10,000	1,200	0.03	0.5	7,500	800	0.018	0.5
		10	4	11,000	1,500	0.05	0.5	9,000	1,100	0.03	0.5	7,000	750	0.018	0.5
		12	4.8	10,000	1,300	0.04	0.5	8,000	1,000	0.02	0.5	6,700	650	0.012	0.5
	0.3	6	2.4	14,000	1,800	0.06	0.5	12,000	1,300	0.03	0.5	9,000	900	0.018	0.5
		8	3.2	12,000	1,700	0.05	0.5	10,000	1,200	0.03	0.5	7,500	800	0.018	0.5
		10	4	11,000	1,500	0.05	0.5	9,000	1,100	0.03	0.5	7,000	750	0.018	0.5
		12	4.8	10,000	1,300	0.04	0.5	8,000	1,000	0.02	0.5	6,700	650	0.012	0.5
	0.5	6	2.4	14,000	1,800	0.06	0.5	12,000	1,300	0.03	0.5	9,000	900	0.018	0.5
		8	3.2	12,000	1,700	0.05	0.5	10,000	1,200	0.03	0.5	7,500	800	0.018	0.5
		10	4	11,000	1,500	0.05	0.5	9,000	1,100	0.03	0.5	7,000	750	0.018	0.5
		12	4.8	10,000	1,300	0.04	0.5	8,000	1,000	0.02	0.5	6,700	650	0.012	0.5
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
4	0.05	8	2	8,500	1,800	0.07	1	7,000	1,300	0.06	0.8	5,500	1,000	0.03	0.8
		12	3	8,500	1,800	0.06	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.05	1	5,500	1,000	0.05	0.8	5,200	900	0.024	0.8
		20	5	6,000	1,200	0.04	1	4,500	800	0.04	0.8	4,000	650	0.018	0.8
	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

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11（～62HRC）				High Speed Steels SKH55・HAP40（～66HRC）				High Speed Steels SKH57・HAP72（～70HRC）			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
4	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
		25	5	4,800	1,100	0.06	1.6	4,000	900	0.05	1.2	3,200	550	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
		25	5	4,800	1,100	0.06	1.6	4,000	900	0.05	1.2	3,200	550	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
		25	5	4,800	1,100	0.06	1.6	4,000	900	0.05	1.2	3,200	550	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
		25	5	4,800	1,100	0.06	1.6	4,000	900	0.05	1.2	3,200	550	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.

Machining case 1

Sealed mold　VANADIS23 (63HRC)

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

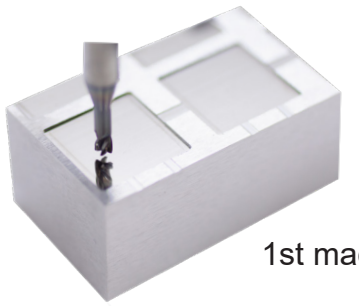
Work material : VANADIS23 (63HRC)

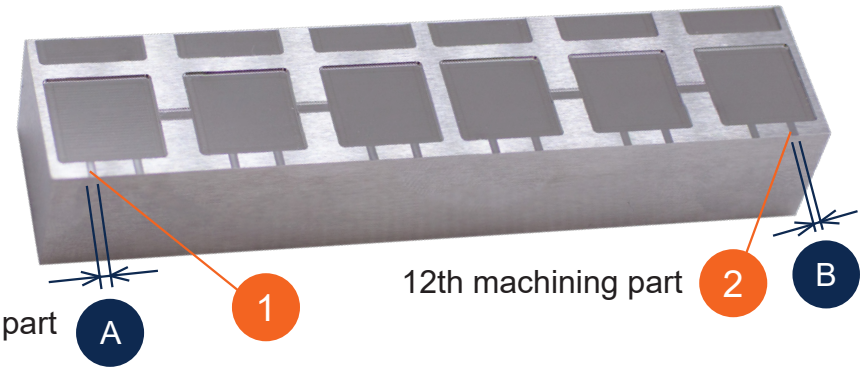
Work size : 20×90×15 mm (Machining depth 0.3 mm)

Coolant : Oil mist

Total machining time : 1hr 44min

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





Surface Roughness

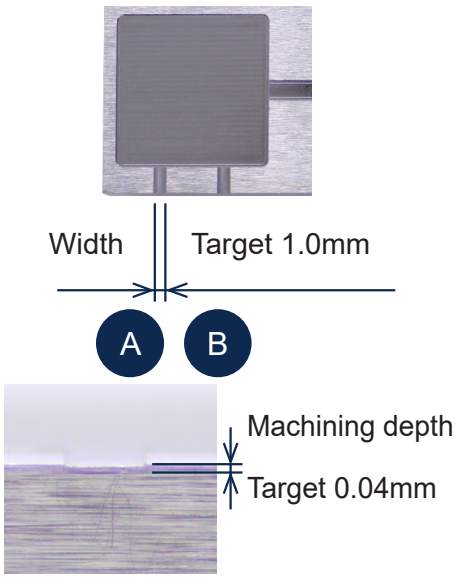
Measuring position	1	2
Ra [μm]	0.055	0.066
Rz [μm]	0.387	0.445

Accuracy

Unit [mm]

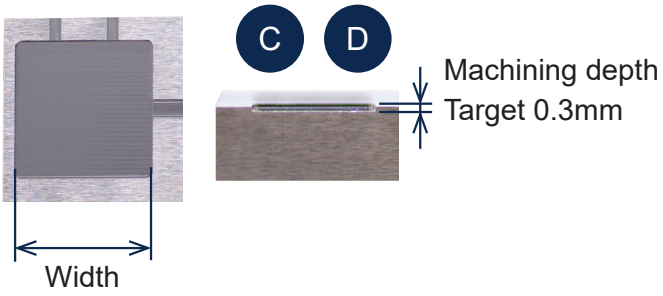
Measuring position	Slot A		Slot B	
	Width	Depth	Width	Depth
After machining	1.001	0.039	0.999	0.041

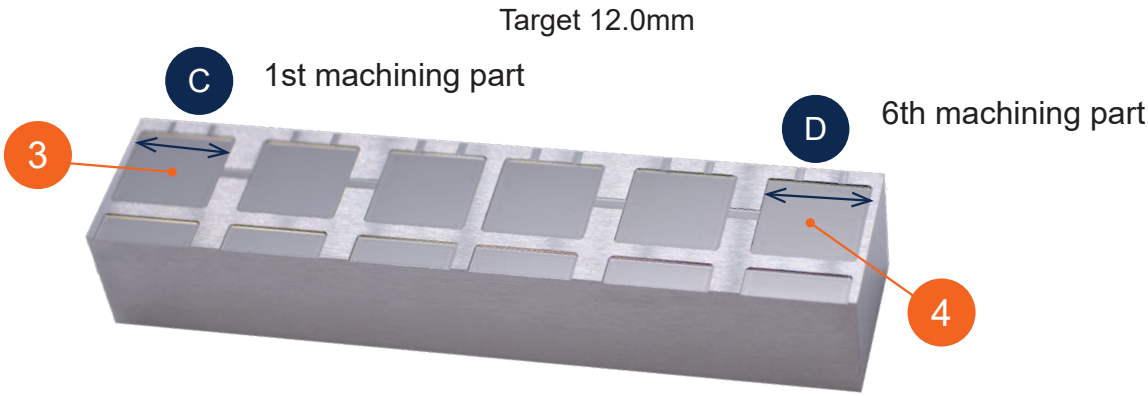
Process	Slot	
	Roughing	Finishing
Tool	MHRSH430RSF ϕ 0.8×R0.02×2	MHRSH430RSF ϕ 0.8×R0.02×2
Spindle speed [min^{-1}]	11,000	11,000
Feed [mm/min]	500	300
Depth of cut ap × ae [mm]	0.003×0.18	0.005×0.01 Side 0.003×0.2 Bottom
Stock [mm]	0.01 Side 0.003 Bottom	-
Machining time	3 min	4 min



Machining at cavity

Comparison between 1st and 6th places





Surface Roughness

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

Accuracy

Unit [mm]

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

Process	Cavity				
	Roughing	Stock removal	Bottom Semi-finishing	Finishing	Corner finishing
Tool	MHRSH430RSF ϕ 1.5×R0.1×4	MHRSH430RSF ϕ 1×R0.05×2		MHRSH430RSF ϕ 1×R0.05×2	
Spindle speed [min^{-1}]	11,000	11,000		11,000	
Feed [mm/min]	800	800		800	800
Depth of cut ap × ae [mm]	0.06×0.3	0.01×0.12	ae 0.2	0.01×0.01 Side 0.004×0.2 Bottom	0.01×0.05
Stock [mm]	0.01 Side 0.004 Bottom	0.01 Side 0.004 Bottom	0.004 Bottom	-	-
Machining time	40 min	14 min	8 min	26 min	9 min

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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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ISO 9001 JQA-QM6096 ISO 14001 JQA-EM3712

■Specifications may change without notice for improvement.
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