

# MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

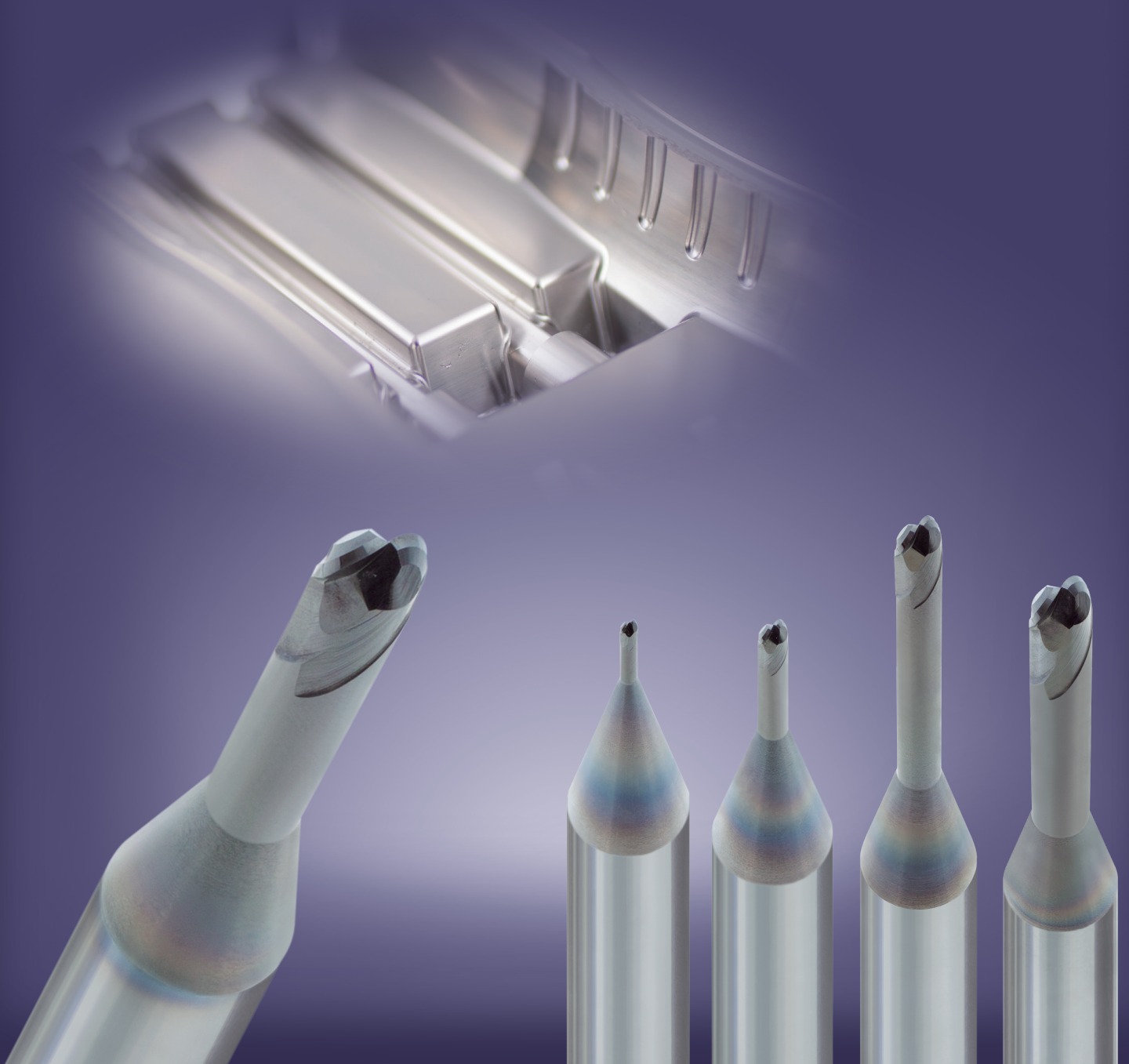
**MRBH230**

Lineup Expansion

110 sizes added  
Total 334 sizes

P

H



Long neck ball end mill supports machining from prehardened steels to hardened steels (~ 65HRC)  
 Abundant size variations with total 334 sizes

## MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

# MRBH230

Lineup Expansion

R0.05 ~ R3 Total 334 sizes



## Features

Feature 1	Coating	Performance of MUGEN COATING PREMIUM
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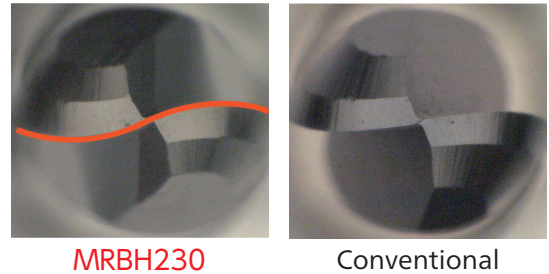
MUGEN COATING PREMIUM is a further improvement of the conventional MUGEN COATING that dramatically extends tool life during direct milling on hardened steels  
 It is effective in machining work materials with hardness from 40 to 65 HRC



**Feature 2** Cutting edge shape Spiral shape • Back taper shape

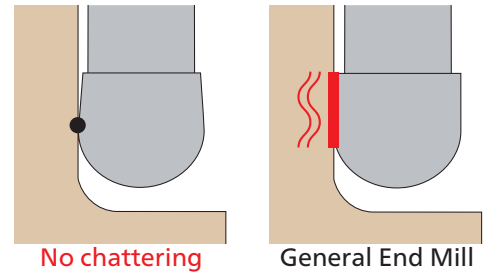
2-1

Adopt stronger spiral shape than conventional Resist chattering by improved cutting ability of center R where has high cutting load



2-2

Adopt back taper shape for the peripheral edge to suppress chattering that occurs due to increasing cutting load The cutting load is reduced by point cutting that realizes stable machining surface



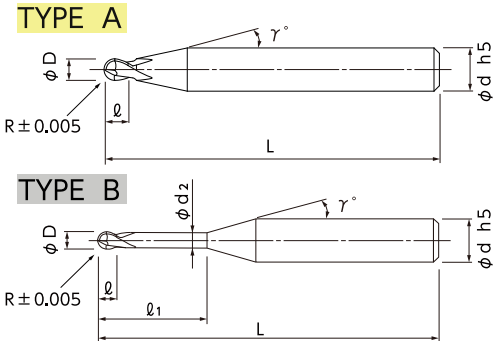
**Feature 3** Abundant line up MUGEN COATING PREMIUM Series

	Square End Mill	Ball End Mill	Corner Radius End Mill
Full Cutting Length Type	<b>MXH225, MXH230, MXH235 MXH240, MXH245</b> All round type with L/D 1~5 times	<b>MSBH230</b> Multi-purpose from roughing to finishing	<b>MHDH445R MHDH645R</b> Corner radius end mill suitable for hardened steels (~ 65HRC)
	<b>MXH225P, MXH230P, MXH235P</b> Sharp edge type with L/D 1~3 times	<b>MSBH345</b> 3-flute strong helix angle ball end mill	
	<b>MHDH445 MHDH645</b> Suitable for finishing on hardened steels (~ 65HRC)		
Long Neck Type	<b>MHRH230 MHRH430</b> Suitable for deep milling on prehardened steels and hardened steels (~ 65HRC)	<b>MRBH230</b> Ball end mill suitable for hardened steels (~ 65HRC)	<b>MHRH230R MHRH430R</b> Support to machining on prehardened steels and hardened steels (~ 65HRC)
		<b>MACH225 MACH225SF</b> Sharp cutting edge reduces cutting load	
		<b>MRBTNH230 MRBTNH345</b> Taper neck shape significantly increases tool rigidity	

## MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

Total 334 sizes

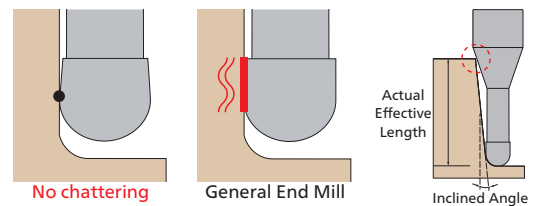
Long neck ball end mill supports machining from prehardened steels to hardened steels(~ 65HRC)  
Abundant size variations with total 334 sizes



- MUGEN COATING PREMIUM for hardened steel and unique cutting edge realize excellent chipping resistance and suppress chattering to improve finishing surface.
- Support hardened steels up to 65HRC.
- Lineup to total 334 sizes.

### Work Material

Prehardened Steel P	Hardened Steel H	
	40~60HRC	~65HRC



◆ Released in Jun, 2023.

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length (l <sub>1</sub> )	Length of Cut (l)	Type	Dia. (D)	Neck Dia. (d <sub>2</sub> )	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°
08-00527-00050	R0.05	0.2	0.07	B	0.1	0.085	12°	4	45	0.24	0.25	0.26	0.27	0.29
◆ 08-00527-00054		0.25	0.07	B	0.1	0.085	12°	4	45	0.29	0.30	0.31	0.33	0.36
08-00527-00051		0.3	0.07	B	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
◆ 08-00527-00055		0.35	0.07	B	0.1	0.085	12°	4	45	0.39	0.41	0.43	0.45	0.49
◆ 08-00527-00052		0.4	0.07	B	0.1	0.085	12°	4	45	0.45	0.46	0.48	0.51	0.56
◆ 08-00527-00056		0.45	0.07	B	0.1	0.085	12°	4	45	0.50	0.52	0.54	0.57	0.62
08-00527-00053		0.5	0.07	B	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
◆ 08-00527-00070	R0.075	0.25	0.1	B	0.15	0.13	12°	4	45	0.30	0.31	0.32	0.34	0.37
08-00527-00071		0.3	0.1	B	0.15	0.13	12°	4	45	0.35	0.37	0.38	0.40	0.43
◆ 08-00527-00076		0.35	0.1	B	0.15	0.13	12°	4	45	0.41	0.42	0.44	0.46	0.50
◆ 08-00527-00072		0.4	0.1	B	0.15	0.13	12°	4	45	0.46	0.48	0.49	0.52	0.56
◆ 08-00527-00077		0.45	0.1	B	0.15	0.13	12°	4	45	0.51	0.53	0.55	0.58	0.63
08-00527-00073		0.5	0.1	B	0.15	0.13	12°	4	45	0.56	0.58	0.61	0.64	0.70
◆ 08-00527-00074		0.6	0.1	B	0.15	0.13	12°	4	45	0.67	0.69	0.72	0.75	0.83
◆ 08-00527-00078		0.75	0.1	B	0.15	0.13	12°	4	45	0.82	0.86	0.89	0.93	1.03
08-00527-00075	1	0.1	B	0.15	0.13	12°	4	45	1.08	1.13	1.18	1.23	1.36	
08-00527-00100	R0.1	0.3	0.15	B	0.2	0.18	12°	4	45	0.35	0.36	0.38	0.39	0.42
◆ 08-00527-00110		0.4	0.15	B	0.2	0.18	12°	4	45	0.46	0.47	0.49	0.51	0.56
08-00527-00101		0.5	0.15	B	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
◆ 08-00527-00111		0.6	0.15	B	0.2	0.18	12°	4	45	0.67	0.69	0.72	0.75	0.82
08-00527-00102		0.75	0.15	B	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
◆ 08-00527-00112		0.85	0.15	B	0.2	0.18	12°	4	45	0.93	0.96	1.00	1.05	1.15
08-00527-00103		1	0.15	B	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
08-00528-00103		1	0.15	B	0.2	0.18	12°	6	50	1.08	1.13	1.18	1.23	1.35
08-00527-00104		1.25	0.15	B	0.2	0.18	12°	4	45	1.34	1.40	1.46	1.53	1.68
08-00527-00105		1.5	0.15	B	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
08-00527-00106		1.75	0.15	B	0.2	0.18	12°	4	45	1.86	1.94	2.03	2.13	2.35
08-00527-00107		2	0.15	B	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68
◆ 08-00527-00113		2.25	0.15	B	0.2	0.18	12°	4	45	2.39	2.49	2.60	2.72	3.01
08-00527-00108	2.5	0.15	B	0.2	0.18	12°	4	45	2.65	2.76	2.89	3.02	3.34	
◆ 08-00527-00114	2.75	0.15	B	0.2	0.18	12°	4	45	2.91	3.03	3.17	3.32	3.68	
08-00527-00109	3	0.15	B	0.2	0.18	12°	4	45	3.17	3.31	3.46	3.62	4.01	
◆ 08-00527-00164	R0.15	0.2*	0.2	A	0.3	-	12°	4	45	0.20	0.20	0.20	0.20	0.20
08-00527-00162		0.5	0.2	B	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67

### How to Order

When you order, indicate MRBH230 (R)×(l<sub>1</sub>)×(d).

(γ) is reference value.

\* Full cutting length type (TYPE A)

## MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length ( $\ell_1$ )	Length of Cut ( $\ell$ )	Type	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle ( $\gamma$ )	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece					
										30°	1°	1°30'	2°	3°	
08-00527-00150	R0.15	0.6	0.2	B	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81	
08-00527-00163		0.75	0.2	B	0.3	0.28	12°	4	45	0.82	0.85	0.88	0.92	1.01	
08-00527-00151		1	0.2	B	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34	
08-00527-00152		1.25	0.2	B	0.3	0.28	12°	4	45	1.34	1.39	1.45	1.52	1.67	
08-00527-00153		1.5	0.2	B	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00	
08-00528-00153		1.5	0.2	B	0.3	0.28	12°	6	50	1.60	1.67	1.74	1.82	2.00	
08-00527-00154		1.75	0.2	B	0.3	0.28	12°	4	45	1.86	1.94	2.02	2.12	2.33	
08-00527-00155		2	0.2	B	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66	
08-00527-00156		2.25	0.2	B	0.3	0.28	12°	4	45	2.38	2.48	2.59	2.71	3.00	
08-00527-00157		2.5	0.2	B	0.3	0.28	12°	4	45	2.64	2.76	2.88	3.01	3.33	
08-00527-00159		3	0.2	B	0.3	0.28	12°	4	45	3.17	3.30	3.45	3.61	3.99	
08-00527-00160		3.5	0.2	B	0.3	0.28	12°	4	45	3.69	3.85	4.02	4.21	4.65	
08-00527-00161		4	0.2	B	0.3	0.28	12°	4	45	4.21	4.39	4.59	4.81	5.32	
◆ 08-00527-00165		4.5	0.2	B	0.3	0.28	12°	4	45	4.73	4.94	5.16	5.41	5.98	
◆ 08-00527-00200	R0.2	0.3※	0.3	A	0.4	-	12°	4	45	0.30	0.30	0.30	0.30	0.30	
08-00527-00211		0.5	0.3	B	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69	
◆ 08-00527-00213		0.65	0.3	B	0.4	0.37	12°	4	45	0.74	0.76	0.79	0.82	0.89	
08-00527-00201		0.8	0.3	B	0.4	0.37	12°	4	45	0.89	0.93	0.96	1.00	1.09	
08-00527-00202		1	0.3	B	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35	
08-00528-00202		1	0.3	B	0.4	0.37	12°	6	50	1.10	1.14	1.19	1.24	1.35	
◆ 08-00527-00214		1.25	0.3	B	0.4	0.37	12°	4	45	1.36	1.42	1.47	1.54	1.68	
08-00527-00203		1.5	0.3	B	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02	
◆ 08-00527-00215		1.75	0.3	B	0.4	0.37	12°	4	45	1.88	1.96	2.04	2.13	2.35	
08-00527-00204		2	0.3	B	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68	
08-00528-00204		2	0.3	B	0.4	0.37	12°	6	50	2.15	2.23	2.33	2.43	2.68	
◆ 08-00527-00216		2.25	0.3	B	0.4	0.37	12°	4	45	2.41	2.51	2.61	2.73	3.01	
08-00527-00205		2.5	0.3	B	0.4	0.37	12°	4	45	2.67	2.78	2.90	3.03	3.34	
◆ 08-00527-00217		2.75	0.3	B	0.4	0.37	12°	4	45	2.93	3.05	3.18	3.33	3.67	
08-00527-00206		3	0.3	B	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01	
08-00527-00207		3.5	0.3	B	0.4	0.37	12°	4	45	3.71	3.87	4.04	4.23	4.67	
08-00527-00208		4	0.3	B	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33	
08-00527-00209		4.5	0.3	B	0.4	0.37	12°	4	45	4.75	4.96	5.18	5.43	6.00	
08-00527-00210		5	0.3	B	0.4	0.37	12°	4	45	5.27	5.50	5.75	6.02	6.66	
◆ 08-00527-00218		5.5	0.3	B	0.4	0.37	12°	4	45	5.80	6.05	6.32	6.62	7.32	
08-00527-00212		6	0.3	B	0.4	0.37	12°	4	45	6.32	6.59	6.89	7.22	7.99	
◆ 08-00527-00265		R0.25	0.35※	0.35	A	0.5	-	12°	4	45	0.35	0.35	0.35	0.35	0.35
◆ 08-00527-00266			0.5	0.35	B	0.5	0.46	12°	4	45	0.60	0.62	0.64	0.66	0.70
◆ 08-00527-00267			0.75	0.35	B	0.5	0.46	12°	4	45	0.86	0.89	0.92	0.96	1.04
08-00527-00250			1	0.35	B	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
◆ 08-00527-00268			1.25	0.35	B	0.5	0.46	12°	4	45	1.39	1.44	1.49	1.56	1.70
08-00527-00251			1.5	0.35	B	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
◆ 08-00527-00269			1.75	0.35	B	0.5	0.46	12°	4	45	1.91	1.98	2.06	2.15	2.36
08-00527-00252	2		0.35	B	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69	
◆ 08-00527-00270	2.25		0.35	B	0.5	0.46	12°	4	45	2.43	2.53	2.63	2.75	3.03	
08-00527-00253	2.5		0.35	B	0.5	0.46	12°	4	45	2.69	2.80	2.92	3.05	3.36	
08-00527-00254	3		0.35	B	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02	
08-00527-00255	3.5		0.35	B	0.5	0.46	12°	4	45	3.73	3.89	4.06	4.25	4.69	
08-00527-00256	4		0.35	B	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35	
08-00527-00257	4.5		0.35	B	0.5	0.46	12°	4	45	4.78	4.98	5.20	5.44	6.01	
08-00527-00258	5		0.35	B	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68	
08-00527-00259	5.5		0.35	B	0.5	0.46	12°	4	45	5.82	6.07	6.34	6.64	7.34	
08-00527-00260	6		0.35	B	0.5	0.46	12°	4	45	6.34	6.61	6.91	7.24	8.00	
◆ 08-00527-00261	7		0.35	B	0.5	0.46	12°	4	45	7.38	7.70	8.05	8.44	9.33	
08-00527-00262	8		0.35	B	0.5	0.46	12°	4	45	8.42	8.79	9.19	9.63	10.66	
◆ 08-00527-00263	9		0.35	B	0.5	0.46	12°	4	45	9.47	9.88	10.33	10.83	11.99	
08-00527-00264	10	0.35	B	0.5	0.46	12°	4	45	10.51	10.97	11.47	12.03	13.31		
◆ 08-00527-00323	R0.3	0.45※	0.45	A	0.6	-	12°	4	45	0.45	0.45	0.45	0.45	0.45	
◆ 08-00527-00324		0.6	0.45	B	0.6	0.56	12°	4	45	0.71	0.72	0.75	0.77	0.82	
◆ 08-00527-00325		0.8	0.45	B	0.6	0.56	12°	4	45	0.91	0.94	0.97	1.01	1.09	
08-00527-00300		1	0.45	B	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35	

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◆ Released in Jun, 2023.

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length ( $\ell_1$ )	Length of Cut ( $\ell$ )	Type	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle ( $\gamma$ )	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										30°	1°	1°30'	2°	3°
◆ 08-00527-00326	R0.3	1.25	0.45	B	0.6	0.56	12°	4	45	1.38	1.43	1.49	1.55	1.68
08-00527-00301		1.5	0.45	B	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
◆ 08-00527-00327		1.75	0.45	B	0.6	0.56	12°	4	45	1.91	1.98	2.06	2.14	2.35
08-00527-00302		2	0.45	B	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
08-00528-00302		2	0.45	B	0.6	0.56	12°	6	50	2.17	2.25	2.34	2.44	2.68
◆ 08-00527-00328		2.25	0.45	B	0.6	0.56	12°	4	45	2.43	2.52	2.63	2.74	3.01
08-00527-00303		2.5	0.45	B	0.6	0.56	12°	4	45	2.69	2.79	2.91	3.04	3.34
◆ 08-00527-00329		2.75	0.45	B	0.6	0.56	12°	4	45	2.95	3.07	3.20	3.34	3.67
08-00527-00304		3	0.45	B	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01
08-00528-00304		3	0.45	B	0.6	0.56	12°	6	50	3.21	3.34	3.48	3.64	4.01
08-00527-00305		3.5	0.45	B	0.6	0.56	12°	4	45	3.73	3.88	4.05	4.24	4.67
08-00527-00306		4	0.45	B	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33
08-00528-00306		4	0.45	B	0.6	0.56	12°	6	50	4.25	4.43	4.62	4.84	5.33
08-00527-00321		4.5	0.45	B	0.6	0.56	12°	4	45	4.77	4.97	5.19	5.43	6.00
08-00527-00308		5	0.45	B	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66
08-00527-00322		5.5	0.45	B	0.6	0.56	12°	4	45	5.82	6.06	6.33	6.63	7.32
08-00527-00310		6	0.45	B	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99
◆ 08-00527-00311		6.5	0.45	B	0.6	0.56	12°	4	45	6.86	7.15	7.47	7.83	8.65
08-00527-00312		7	0.45	B	0.6	0.56	12°	4	45	7.38	7.70	8.04	8.43	9.31
◆ 08-00527-00313		7.5	0.45	B	0.6	0.56	12°	4	45	7.90	8.24	8.61	9.02	9.98
08-00527-00314		8	0.45	B	0.6	0.56	12°	4	45	8.42	8.79	9.18	9.62	10.64
08-00527-00316		9	0.45	B	0.6	0.56	12°	4	45	9.47	9.88	10.33	10.82	11.97
08-00527-00318		10	0.45	B	0.6	0.56	12°	4	45	10.51	10.97	11.47	12.02	13.30
08-00527-00320		12	0.45	B	0.6	0.56	12°	4	45	12.59	13.14	13.75	14.41	15.95
◆ 08-00527-00354	R0.35	0.5*	0.5	A	0.7	-	12°	4	45	0.50	0.50	0.50	0.50	0.50
◆ 08-00527-00355		1	0.5	B	0.7	0.66	12°	4	45	1.12	1.16	1.19	1.24	1.34
08-00527-00350		2	0.5	B	0.7	0.66	12°	4	45	2.16	2.25	2.33	2.43	2.66
08-00527-00351		4	0.5	B	0.7	0.66	12°	4	45	4.25	4.42	4.62	4.83	5.32
08-00527-00352		6	0.5	B	0.7	0.66	12°	4	45	6.34	6.60	6.90	7.22	7.97
08-00527-00353		8	0.5	B	0.7	0.66	12°	4	45	8.42	8.78	9.18	9.61	10.63
◆ 08-00527-00400	R0.4	0.6*	0.6	A	0.8	-	12°	4	45	0.60	0.60	0.60	0.60	0.60
◆ 08-00527-00411		1	0.6	B	0.8	0.76	12°	4	45	1.12	1.15	1.19	1.23	1.32
◆ 08-00527-00412		1.5	0.6	B	0.8	0.76	12°	4	45	1.64	1.70	1.76	1.83	1.98
08-00527-00401		2	0.6	B	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65
08-00528-00401		2	0.6	B	0.8	0.76	12°	6	50	2.16	2.24	2.33	2.42	2.65
◆ 08-00527-00413		2.5	0.6	B	0.8	0.76	12°	4	45	2.68	2.79	2.90	3.02	3.31
08-00527-00402		3	0.6	B	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97
◆ 08-00527-00414		3.5	0.6	B	0.8	0.76	12°	4	45	3.73	3.88	4.04	4.22	4.64
08-00527-00403		4	0.6	B	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30
◆ 08-00527-00415		4.5	0.6	B	0.8	0.76	12°	4	45	4.77	4.96	5.18	5.41	5.97
08-00527-00404		5	0.6	B	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63
08-00527-00405		6	0.6	B	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96
08-00527-00406		7	0.6	B	0.8	0.76	12°	4	45	7.38	7.69	8.03	8.41	9.28
08-00527-00407		8	0.6	B	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61
◆ 08-00527-00408		9	0.6	B	0.8	0.76	12°	4	45	9.46	9.87	10.31	10.80	11.94
08-00527-00409		10	0.6	B	0.8	0.76	12°	4	45	10.50	10.96	11.45	12.00	13.26
08-00527-00410		12	0.6	B	0.8	0.76	12°	4	45	12.59	13.14	13.73	14.39	15.92
◆ 08-00527-00416		16	0.6	B	0.8	0.76	12°	4	50	16.76	17.49	18.29	19.18	21.23
◆ 08-00527-00454	R0.45	0.65*	0.65	A	0.9	-	12°	4	45	0.65	0.65	0.65	0.65	0.65
◆ 08-00527-00455		1	0.65	B	0.9	0.86	12°	4	45	1.12	1.15	1.18	1.22	1.30
08-00527-00450		2	0.65	B	0.9	0.86	12°	4	45	2.16	2.24	2.32	2.41	2.63
08-00527-00451		4	0.65	B	0.9	0.86	12°	4	45	4.25	4.42	4.60	4.81	5.29
08-00527-00452		6	0.65	B	0.9	0.86	12°	4	45	6.33	6.59	6.88	7.20	7.94
08-00527-00453		8	0.65	B	0.9	0.86	12°	4	45	8.42	8.77	9.16	9.59	10.59
◆ 08-00527-00517	R0.5	0.75*	0.75	A	1	-	12°	4	45	0.75	0.75	0.75	0.75	0.75
◆ 08-00527-00518		1	0.75	B	1	0.95	12°	4	45	1.14	1.17	1.20	1.24	1.32
◆ 08-00527-00519		1.5	0.75	B	1	0.95	12°	4	45	1.66	1.71	1.77	1.83	1.98
08-00527-00500		2	0.75	B	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
08-00527-00514		2.5	0.75	B	1	0.95	12°	4	45	2.70	2.80	2.91	3.03	3.31
08-00527-00501		3	0.75	B	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97

**How to Order**

When you order, indicate MRBH230 (R)×( $\ell_1$ )×(d). ( $\gamma$ ) is reference value.

\* Full cutting length type (TYPE A)

## MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Type	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°
08-00528-00501	R0.5	3	0.75	B	1	0.95	12°	6	50	3.22	3.35	3.48	3.63	3.97
08-00527-00520		3.5	0.75	B	1	0.95	12°	4	45	3.75	3.89	4.05	4.23	4.64
08-00527-00502		4	0.75	B	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30
08-00528-00502		4	0.75	B	1	0.95	12°	6	50	4.27	4.44	4.62	4.83	5.30
08-00527-00521		4.5	0.75	B	1	0.95	12°	4	45	4.79	4.98	5.19	5.42	5.96
08-00527-00503		5	0.75	B	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63
08-00528-00503		5	0.75	B	1	0.95	12°	6	50	5.31	5.53	5.76	6.02	6.63
08-00527-00504		6	0.75	B	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96
08-00528-00504		6	0.75	B	1	0.95	12°	6	50	6.35	6.62	6.90	7.22	7.96
08-00527-00505		7	0.75	B	1	0.95	12°	4	45	7.40	7.71	8.04	8.42	9.28
08-00528-00505		7	0.75	B	1	0.95	12°	6	50	7.40	7.71	8.04	8.42	9.28
08-00527-00506		8	0.75	B	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61
08-00528-00506		8	0.75	B	1	0.95	12°	6	50	8.44	8.79	9.18	9.61	10.61
08-00527-00507		9	0.75	B	1	0.95	12°	4	45	9.48	9.88	10.32	10.81	11.94
08-00527-00508		10	0.75	B	1	0.95	12°	4	45	10.52	10.97	11.46	12.01	13.26
08-00528-00508		10	0.75	B	1	0.95	12°	6	50	10.52	10.97	11.46	12.01	13.26
08-00527-00509		12	0.75	B	1	0.95	12°	4	45	12.61	13.15	13.75	14.40	15.92
08-00527-00515		13	0.75	B	1	0.95	12°	4	45	13.65	14.24	14.89	15.59	17.25
08-00527-00510		14	0.75	B	1	0.95	12°	4	50	14.70	15.33	16.03	16.79	18.57
08-00527-00511		16	0.75	B	1	0.95	12°	4	50	16.78	17.51	18.31	19.18	21.23
08-00527-00512		18	0.75	B	1	0.95	12°	4	55	18.87	19.69	20.59	21.58	23.88
08-00527-00513		20	0.75	B	1	0.95	12°	4	55	20.95	21.87	22.87	23.97	26.54
08-00528-00516	22	0.75	B	1	0.95	12°	6	60	23.04	24.05	25.15	26.36	29.19	
08-00527-00608	R0.6	1.2	0.9	B	1.2	1.15	12°	4	45	1.34	1.38	1.41	1.46	1.55
08-00527-00600		2.4	0.9	B	1.2	1.15	12°	4	45	2.59	2.68	2.78	2.89	3.15
08-00527-00601		4	0.9	B	1.2	1.15	12°	4	45	4.26	4.43	4.61	4.81	5.27
08-00527-00602		6	0.9	B	1.2	1.15	12°	4	45	6.35	6.61	6.89	7.20	7.92
08-00527-00603		8	0.9	B	1.2	1.15	12°	4	45	8.43	8.79	9.17	9.59	10.58
08-00527-00604		10	0.9	B	1.2	1.15	12°	4	45	10.52	10.96	11.45	11.99	13.23
08-00527-00605		12	0.9	B	1.2	1.15	12°	4	45	12.61	13.14	13.73	14.38	15.89
08-00527-00606		14	0.9	B	1.2	1.15	12°	4	50	14.69	15.32	16.01	16.77	18.54
08-00527-00607	16	0.9	B	1.2	1.15	12°	4	50	16.78	17.50	18.29	19.17	21.20	
08-00527-00703	R0.7	2	1	B	1.4	1.35	12°	4	45	2.17	2.24	2.31	2.39	2.58
08-00527-00704		4	1	B	1.4	1.35	12°	4	45	4.26	4.42	4.59	4.79	5.24
08-00527-00705		6	1	B	1.4	1.35	12°	4	45	6.34	6.60	6.88	7.18	7.89
08-00527-00700		8	1	B	1.4	1.35	12°	4	45	8.43	8.78	9.16	9.57	10.55
08-00527-00701		12	1	B	1.4	1.35	12°	4	50	12.60	13.13	13.72	14.36	15.85
08-00527-00702		16	1	B	1.4	1.35	12°	4	50	16.77	17.49	18.28	19.15	21.16
08-00527-00765	R0.75	2	1.1	B	1.5	1.45	12°	4	45	2.17	2.24	2.31	2.38	2.57
08-00527-00750		3	1.1	B	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
08-00527-00751		4	1.1	B	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
08-00527-00752		5	1.1	B	1.5	1.45	12°	4	45	5.30	5.50	5.73	5.97	6.55
08-00527-00753		6	1.1	B	1.5	1.45	12°	4	45	6.34	6.59	6.87	7.17	7.88
08-00528-00753		6	1.1	B	1.5	1.45	12°	6	50	6.34	6.59	6.87	7.17	7.88
08-00527-00755		8	1.1	B	1.5	1.45	12°	4	45	8.43	8.77	9.15	9.56	10.53
08-00528-00755		8	1.1	B	1.5	1.45	12°	6	50	8.43	8.77	9.15	9.56	10.53
08-00527-00757		10	1.1	B	1.5	1.45	12°	4	45	10.51	10.95	11.43	11.96	13.18
08-00527-00758		12	1.1	B	1.5	1.45	12°	4	45	12.60	13.13	13.71	14.35	15.84
08-00527-00759		14	1.1	B	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
08-00527-00760		16	1.1	B	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15
08-00527-00761		18	1.1	B	1.5	1.45	12°	4	55	18.86	19.67	20.55	21.53	23.80
08-00527-00762		20	1.1	B	1.5	1.45	12°	4	55	20.94	21.85	22.84	23.92	Free
08-00527-00763	22	1.1	B	1.5	1.45	12°	4	60	23.03	24.02	25.12	26.32	Free	
08-00527-00766	25	1.1	B	1.5	1.45	12°	4	65	26.16	27.29	28.54	29.91	Free	
08-00527-00764	30	1.1	B	1.5	1.45	12°	4	70	31.37	32.74	34.24	35.89	Free	
08-00527-00800	R0.8	2	1.2	B	1.6	1.55	12°	4	45	2.17	2.23	2.30	2.37	2.55
08-00527-00801		4	1.2	B	1.6	1.55	12°	4	45	4.25	4.41	4.58	4.77	5.21
08-00527-00802		6	1.2	B	1.6	1.55	12°	4	45	6.34	6.59	6.86	7.16	7.86
08-00527-00803		8	1.2	B	1.6	1.55	12°	4	45	8.43	8.77	9.14	9.55	10.51
08-00527-00805		12	1.2	B	1.6	1.55	12°	4	45	12.60	13.13	13.70	14.34	15.82

## MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

◆ Released in Jun, 2023.

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length ( $\ell_1$ )	Length of Cut ( $\ell$ )	Type	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle ( $\gamma$ )	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										30°	1°	1°30'	2°	3°
08-00527-00807	R0.8	16	1.2	B	1.6	1.55	12°	4	50	16.77	17.48	18.27	19.13	21.13
08-00527-00809		20	1.2	B	1.6	1.55	12°	4	55	20.94	21.84	22.83	23.91	Free
◆ 08-00527-00901	R0.9	3	1.3	B	1.8	1.74	12°	4	45	3.23	3.34	3.45	3.58	3.88
◆ 08-00527-00902		4	1.3	B	1.8	1.74	12°	4	45	4.28	4.43	4.59	4.78	5.20
◆ 08-00527-00903		6	1.3	B	1.8	1.74	12°	4	45	6.36	6.61	6.87	7.17	7.86
◆ 08-00527-00904		8	1.3	B	1.8	1.74	12°	4	45	8.45	8.78	9.16	9.56	10.51
◆ 08-00527-00905		10	1.3	B	1.8	1.74	12°	4	45	10.53	10.96	11.44	11.96	13.17
◆ 08-00527-00906		12	1.3	B	1.8	1.74	12°	4	45	12.62	13.14	13.72	14.35	15.82
◆ 08-00527-00907		16	1.3	B	1.8	1.74	12°	4	50	16.79	17.50	18.28	19.14	21.13
◆ 08-00527-00908		18	1.3	B	1.8	1.74	12°	4	55	18.87	19.68	20.56	21.53	Free
◆ 08-00527-00909		20	1.3	B	1.8	1.74	12°	4	55	20.96	21.86	22.84	23.92	Free
◆ 08-00527-00910		22	1.3	B	1.8	1.74	12°	4	60	23.05	24.04	25.12	26.31	Free
◆ 08-00527-00911		25	1.3	B	1.8	1.74	12°	4	65	26.17	27.31	28.54	29.90	Free
◆ 08-00527-00912		30	1.3	B	1.8	1.74	12°	4	70	31.39	32.75	34.25	Free	Free
◆ 08-00527-01000	R1	2	1.5	B	2	1.94	12°	4	45	2.19	2.24	2.30	2.36	2.52
08-00527-01001		3	1.5	B	2	1.94	12°	4	45	3.23	3.33	3.44	3.56	3.85
◆ 08-00528-01001		3	1.5	B	2	1.94	12°	6	50	3.23	3.33	3.44	3.56	3.85
08-00527-01002		4	1.5	B	2	1.94	12°	4	45	4.27	4.42	4.58	4.76	5.17
08-00528-01002		4	1.5	B	2	1.94	12°	6	50	4.27	4.42	4.58	4.76	5.17
08-00527-01004		6	1.5	B	2	1.94	12°	4	45	6.36	6.60	6.86	7.15	7.83
08-00528-01004		6	1.5	B	2	1.94	12°	6	50	6.36	6.60	6.86	7.15	7.83
08-00527-01006		8	1.5	B	2	1.94	12°	4	45	8.44	8.78	9.14	9.54	10.48
08-00528-01006		8	1.5	B	2	1.94	12°	6	50	8.44	8.78	9.14	9.54	10.48
08-00527-01008		10	1.5	B	2	1.94	12°	4	45	10.53	10.95	11.42	11.94	13.14
08-00528-01008		10	1.5	B	2	1.94	12°	6	50	10.53	10.95	11.42	11.94	13.14
08-00527-01010		12	1.5	B	2	1.94	12°	4	45	12.61	13.13	13.70	14.33	15.79
◆ 08-00528-01010		12	1.5	B	2	1.94	12°	6	50	12.61	13.13	13.70	14.33	15.79
08-00527-01020		13	1.5	B	2	1.94	12°	4	45	13.66	14.22	14.84	15.53	17.12
08-00527-01011		14	1.5	B	2	1.94	12°	4	50	14.70	15.31	15.98	16.72	18.45
◆ 08-00528-01011		14	1.5	B	2	1.94	12°	6	50	14.70	15.31	15.98	16.72	18.45
08-00527-01012		16	1.5	B	2	1.94	12°	4	50	16.78	17.49	18.27	19.12	Free
08-00528-01012		16	1.5	B	2	1.94	12°	6	60	16.78	17.49	18.27	19.12	21.10
08-00527-01013		18	1.5	B	2	1.94	12°	4	55	18.87	19.67	20.55	21.51	Free
◆ 08-00528-01013		18	1.5	B	2	1.94	12°	6	60	18.87	19.67	20.55	21.51	23.75
08-00527-01014		20	1.5	B	2	1.94	12°	4	55	20.96	21.85	22.83	23.90	Free
◆ 08-00528-01014		20	1.5	B	2	1.94	12°	6	60	20.96	21.85	22.83	23.90	26.41
08-00527-01015		22	1.5	B	2	1.94	12°	4	60	23.04	24.03	25.11	26.30	Free
08-00527-01016		25	1.5	B	2	1.94	12°	4	65	26.17	27.30	28.53	Free	Free
08-00528-01016		25	1.5	B	2	1.94	12°	6	65	26.17	27.30	28.53	29.89	33.04
◆ 08-00527-01021		27	1.5	B	2	1.94	12°	4	70	28.26	29.48	30.81	Free	Free
08-00527-01017		30	1.5	B	2	1.94	12°	4	70	31.38	32.74	34.23	Free	Free
◆ 08-00528-01017		30	1.5	B	2	1.94	12°	6	70	31.38	32.74	34.23	35.87	Free
◆ 08-00527-01022		32	1.5	B	2	1.94	12°	4	70	33.47	34.92	36.51	Free	Free
08-00527-01018		35	1.5	B	2	1.94	12°	4	70	36.60	38.19	Free	Free	Free
◆ 08-00528-01018		35	1.5	B	2	1.94	12°	6	80	36.60	38.19	39.93	41.85	Free
08-00527-01019		40	1.5	B	2	1.94	12°	4	90	41.81	43.64	Free	Free	Free
◆ 08-00528-01019	40	1.5	B	2	1.94	12°	6	90	41.81	43.64	45.64	47.83	Free	
◆ 08-00527-01258	R1.25	4	2.3	B	2.5	2.4	12°	4	45	4.36	4.50	4.65	4.82	5.22
08-00527-01250		6	2.3	B	2.5	2.4	12°	4	45	6.44	6.68	6.93	7.21	7.87
08-00527-01251		8	2.3	B	2.5	2.4	12°	4	45	8.53	8.86	9.21	9.61	10.53
08-00527-01252		10	2.3	B	2.5	2.4	12°	4	45	10.62	11.04	11.49	12.00	13.18
08-00527-01253		15	2.3	B	2.5	2.4	12°	4	50	15.83	16.48	17.20	17.98	Free
08-00527-01254		20	2.3	B	2.5	2.4	12°	4	55	21.04	21.93	22.90	Free	Free
08-00527-01255		25	2.3	B	2.5	2.4	12°	4	65	26.26	27.38	28.60	Free	Free
08-00527-01256		30	2.3	B	2.5	2.4	12°	4	70	31.47	32.82	Free	Free	Free
08-00527-01257	35	2.3	B	2.5	2.4	12°	4	70	36.69	38.27	Free	Free	Free	
08-00527-01501	R1.5	6	2.5	B	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
08-00527-01502		8	2.5	B	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
08-00527-01503		10	2.5	B	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
08-00527-01504		12	2.5	B	3	2.85	12°	6	60	12.81	13.32	13.88	14.49	15.91

**How to Order**

When you order, indicate MRBH230 (R)×( $\ell_1$ )×(d). ( $\gamma$ ) is reference value.

※ Full cutting length type (TYPE A)



## MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Type	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°	
08-00527-01505	R1.5	14	2.5	B	3	2.85	12°	6	60	14.90	15.50	16.16	16.88	18.57	
08-00527-01506		16	2.5	B	3	2.85	12°	6	60	16.98	17.68	18.44	19.27	21.22	
◆ 08-00527-01507		18	2.5	B	3	2.85	12°	6	60	19.07	19.86	20.72	21.67	23.88	
08-00527-01508		20	2.5	B	3	2.85	12°	6	65	21.16	22.04	23.00	24.06	26.53	
◆ 08-00527-01513		22	2.5	B	3	2.85	12°	6	65	23.24	24.21	25.28	26.45	29.18	
08-00527-01509		25	2.5	B	3	2.85	12°	6	65	26.37	27.48	28.70	30.04	Free	
◆ 08-00527-01514		27	2.5	B	3	2.85	12°	6	70	28.46	29.66	30.98	32.44	Free	
08-00527-01510		30	2.5	B	3	2.85	12°	6	70	31.58	32.93	34.40	36.03	Free	
08-00527-01511		35	2.5	B	3	2.85	12°	6	80	36.80	38.38	40.11	42.01	Free	
08-00527-01512		40	2.5	B	3	2.85	12°	6	90	42.01	43.83	45.81	Free	Free	
◆ 08-00527-01757	R1.75	5	2.8	B	3.5	3.35	12°	6	60	5.50	5.67	5.86	6.06	6.54	
◆ 08-00527-01758		10	2.8	B	3.5	3.35	12°	6	60	10.72	11.12	11.56	12.05	13.18	
08-00527-01750		15	2.8	B	3.5	3.35	12°	6	60	15.93	16.57	17.26	18.03	19.81	
08-00527-01754		20	2.8	B	3.5	3.35	12°	6	65	21.14	22.01	22.96	24.01	Free	
08-00527-01751		25	2.8	B	3.5	3.35	12°	6	65	26.36	27.46	28.67	29.99	Free	
08-00527-01755		30	2.8	B	3.5	3.35	12°	6	70	31.57	32.91	34.37	35.98	Free	
08-00527-01752		35	2.8	B	3.5	3.35	12°	6	80	36.79	38.36	40.07	Free	Free	
08-00527-01756		40	2.8	B	3.5	3.35	12°	6	90	42.00	43.80	45.77	Free	Free	
08-00527-01753		45	2.8	B	3.5	3.35	12°	6	90	47.22	49.25	Free	Free	Free	
◆ 08-00527-02015		R2	6	3	B	4	3.8	-	4	65	Free	Free	Free	Free	Free
◆ 08-00527-02016	6		3	B	4	3.8	12°	6	65	6.66	6.87	7.10	7.35	7.95	
08-00527-02000	8		3	B	4	3.8	-	4	65	Free	Free	Free	Free	Free	
08-00527-02001	8		3	B	4	3.8	12°	6	65	8.74	9.05	9.38	9.74	10.60	
◆ 08-00527-02017	10		3	B	4	3.8	-	4	65	Free	Free	Free	Free	Free	
08-00527-02002	10		3	B	4	3.8	12°	6	65	10.83	11.22	11.66	12.14	13.25	
08-00527-02003	12		3	B	4	3.8	12°	6	65	12.91	13.40	13.94	14.53	15.91	
08-00527-02101	14		3	B	4	3.8	12°	6	65	15.00	15.58	16.22	16.92	18.56	
08-00527-02004	15		3	B	4	3.8	12°	6	65	16.04	16.67	17.36	18.12	19.89	
◆ 08-00527-02005	16		3	B	4	3.8	12°	6	65	17.09	17.76	18.50	19.32	Free	
◆ 08-00527-02018	18		3	B	4	3.8	12°	6	65	19.17	19.94	20.78	21.71	Free	
08-00527-02006	20		3	B	4	3.8	12°	6	65	21.26	22.12	23.06	24.10	Free	
◆ 08-00527-02007	22		3	B	4	3.8	12°	6	70	23.34	24.30	25.35	26.50	Free	
08-00527-02008	25		3	B	4	3.8	12°	6	70	26.47	27.57	28.77	30.09	Free	
◆ 08-00527-02009	27		3	B	4	3.8	12°	6	70	28.56	29.75	31.05	Free	Free	
08-00527-02010	30		3	B	4	3.8	12°	6	70	31.68	33.01	34.47	Free	Free	
08-00527-02011	35		3	B	4	3.8	12°	6	80	36.90	38.46	Free	Free	Free	
08-00527-02012	40		3	B	4	3.8	12°	6	85	42.11	43.91	Free	Free	Free	
08-00527-02013	45		3	B	4	3.8	12°	6	90	47.33	49.36	Free	Free	Free	
08-00527-02014	50		3	B	4	3.8	12°	6	100	52.54	54.80	Free	Free	Free	
08-00527-02500	R2.5		10	3.5	B	5	4.8	12°	6	70	10.81	11.18	11.59	12.04	Free
08-00527-02501			15	3.5	B	5	4.8	12°	6	70	16.02	16.63	17.29	Free	Free
08-00527-02502			20	3.5	B	5	4.8	12°	6	70	21.24	22.08	Free	Free	Free
08-00527-02503			25	3.5	B	5	4.8	12°	6	70	26.45	27.52	Free	Free	Free
08-00527-02504			30	3.5	B	5	4.8	12°	6	80	31.66	Free	Free	Free	Free
◆ 08-00527-02505		35	3.5	B	5	4.8	12°	6	80	36.88	Free	Free	Free	Free	
08-00527-02506		40	3.5	B	5	4.8	12°	6	90	42.09	Free	Free	Free	Free	
◆ 08-00527-02507		45	3.5	B	5	4.8	12°	6	100	47.31	Free	Free	Free	Free	
◆ 08-00527-02508		50	3.5	B	5	4.8	12°	6	100	52.52	Free	Free	Free	Free	
◆ 08-00527-03009		R3	8	6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free
08-00527-03000	10		6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free	
◆ 08-00527-03010	12		6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free	
08-00527-03001	15		6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free	
◆ 08-00527-03011	18		6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free	
08-00527-03002	20		6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free	
08-00527-03003	25		6	B	6	5.7	-	6	70	Free	Free	Free	Free	Free	
08-00527-03004	30		6	B	6	5.7	-	6	80	Free	Free	Free	Free	Free	
08-00527-03007	35		6	B	6	5.7	-	6	85	Free	Free	Free	Free	Free	
08-00527-03005	40		6	B	6	5.7	-	6	90	Free	Free	Free	Free	Free	
08-00527-03006	50		6	B	6	5.7	-	6	120	Free	Free	Free	Free	Free	
08-00527-03008	60		6	B	6	5.7	-	6	120	Free	Free	Free	Free	Free	

## Recommended Conditions

Work Material			Hardened Steels SKD61·STAVAX·HPM-38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
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 <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>
0.05	0.2	2.0	0.003	0.005	120	40,000	0.002	0.005	100	40,000	0.002	0.003	70	40,000
	0.25	2.5	0.003	0.005	110	40,000	0.002	0.005	80	40,000	0.002	0.003	50	40,000
	0.3	3.0	0.003	0.005	100	40,000	0.002	0.005	70	40,000	0.002	0.003	50	40,000
	0.35	3.5	0.002	0.005	100	40,000	0.001	0.005	70	40,000	0.001	0.003	50	40,000
	0.4	4.0	0.002	0.005	90	40,000	0.001	0.005	70	40,000	0.001	0.003	50	40,000
	0.45	4.5	0.002	0.003	80	40,000	0.001	0.003	60	40,000	0.001	0.002	40	40,000
	0.5	5.0	0.002	0.003	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
0.075	0.25	1.7	0.003	0.005	200	40,000	0.002	0.005	160	40,000	0.002	0.003	120	40,000
	0.3	2.0	0.003	0.005	180	40,000	0.002	0.005	150	40,000	0.002	0.003	100	40,000
	0.35	2.3	0.003	0.005	180	40,000	0.002	0.005	150	40,000	0.002	0.003	100	40,000
	0.4	2.6	0.003	0.005	150	40,000	0.002	0.005	120	40,000	0.002	0.003	70	40,000
	0.45	3.0	0.003	0.005	150	40,000	0.002	0.005	120	40,000	0.002	0.003	70	40,000
	0.5	3.3	0.003	0.005	150	40,000	0.002	0.005	120	40,000	0.002	0.003	70	40,000
	0.6	4.0	0.002	0.003	120	40,000	0.001	0.003	100	40,000	0.001	0.002	50	40,000
0.1	0.75	5.0	0.002	0.003	100	40,000	0.001	0.003	80	40,000	0.001	0.002	40	40,000
	1	6.7	0.002	0.003	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
	0.3	1.5	0.01	0.01	350	40,000	0.006	0.005	300	40,000	0.003	0.003	200	40,000
	0.4	2.0	0.008	0.01	330	40,000	0.005	0.005	290	40,000	0.003	0.003	200	40,000
	0.5	2.5	0.008	0.01	320	40,000	0.005	0.005	280	40,000	0.003	0.003	180	40,000
	0.6	3.0	0.005	0.01	300	40,000	0.003	0.005	250	40,000	0.002	0.003	160	40,000
	0.75	3.8	0.005	0.01	280	40,000	0.003	0.005	200	40,000	0.002	0.003	150	40,000
	0.85	4.3	0.003	0.005	260	40,000	0.002	0.005	180	40,000	0.001	0.003	130	40,000
	1	5.0	0.003	0.005	250	40,000	0.002	0.003	160	40,000	0.001	0.002	120	40,000
	1.25	6.3	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
	1.5	7.5	0.003	0.005	150	40,000	0.002	0.003	120	40,000	0.001	0.002	80	40,000
	1.75	8.8	0.002	0.003	120	40,000	0.001	0.002	100	40,000	0.001	0.002	60	40,000
	2	10.0	0.002	0.003	100	40,000	0.001	0.002	80	40,000	0.001	0.001	50	40,000
0.15	2.25	11.3	0.001	0.002	80	40,000	0.001	0.001	70	40,000	0.001	0.001	45	40,000
	2.5	12.5	0.001	0.002	70	40,000	0.001	0.001	60	40,000	0.001	0.001	40	40,000
	2.75	13.8	0.001	0.001	60	40,000	0.001	0.001	50	40,000	0.001	0.001	35	40,000
	3	15.0	0.001	0.001	50	40,000	0.001	0.001	40	40,000	0.001	0.001	30	40,000
	-	-	0.01	0.015	450	40,000	0.007	0.01	380	40,000	0.003	0.005	320	40,000
	0.5	1.6	0.01	0.015	350	40,000	0.007	0.01	300	40,000	0.003	0.005	280	40,000
	0.6	2.0	0.007	0.01	350	40,000	0.005	0.007	300	40,000	0.003	0.005	250	40,000
	0.75	2.5	0.007	0.01	330	40,000	0.005	0.007	280	40,000	0.003	0.005	230	40,000
	1	3.3	0.007	0.01	320	40,000	0.005	0.007	250	40,000	0.003	0.005	200	40,000
	1.25	4.2	0.005	0.007	280	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000
	1.5	5.0	0.005	0.007	230	40,000	0.003	0.005	180	40,000	0.002	0.003	120	40,000
	1.75	5.8	0.003	0.005	180	40,000	0.002	0.003	150	40,000	0.002	0.002	100	40,000
	2	6.6	0.003	0.005	150	40,000	0.002	0.003	120	40,000	0.002	0.002	90	40,000
0.2	2.25	7.5	0.002	0.003	120	40,000	0.001	0.002	100	40,000	0.001	0.001	80	40,000
	2.5	8.3	0.002	0.003	100	40,000	0.001	0.002	80	40,000	0.001	0.001	70	40,000
	3	10.0	0.001	0.003	80	40,000	0.001	0.002	70	40,000	0.001	0.001	60	40,000
	3.5	11.7	0.001	0.002	70	40,000	0.001	0.001	60	40,000	0.001	0.001	50	40,000
	4	13.3	0.001	0.002	60	40,000	0.001	0.001	50	40,000	0.001	0.001	40	40,000
	4.5	15.0	0.001	0.001	50	40,000	0.001	0.001	40	40,000	0.001	0.001	30	40,000
	-	-	0.03	0.05	800	40,000	0.03	0.03	720	40,000	0.009	0.02	580	40,000
	0.5	1.3	0.03	0.05	800	40,000	0.03	0.03	720	40,000	0.009	0.02	580	40,000
	0.65	1.6	0.025	0.05	800	40,000	0.025	0.03	720	40,000	0.009	0.02	580	40,000
	0.8	2.0	0.02	0.05	800	40,000	0.02	0.03	720	40,000	0.008	0.02	580	40,000
	1	2.5	0.02	0.05	800	40,000	0.02	0.03	720	40,000	0.008	0.02	580	40,000
	1.25	3.1	0.015	0.04	700	40,000	0.015	0.02	620	40,000	0.006	0.02	470	40,000
	1.5	3.8	0.01	0.03	620	40,000	0.01	0.02	500	40,000	0.005	0.01	400	40,000
1.75	4.4	0.01	0.025	580	40,000	0.01	0.02	450	40,000	0.005	0.01	340	40,000	
2	5.0	0.01	0.02	500	40,000	0.01	0.01	380	40,000	0.005	0.007	300	40,000	
2.25	5.6	0.01	0.015	460	40,000	0.005	0.01	330	40,000	0.003	0.005	280	40,000	

## Recommended Conditions

Work Material			Hardened Steels SKD61·STAVAX·HPM-38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
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 <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>
0.2	2.5	6.3	0.007	0.01	420	40,000	0.005	0.007	300	40,000	0.003	0.005	260	40,000
	2.75	6.9	0.007	0.01	350	40,000	0.005	0.007	280	40,000	0.003	0.005	220	40,000
	3	7.5	0.007	0.01	300	40,000	0.005	0.007	240	40,000	0.003	0.005	200	40,000
	3.5	8.8	0.005	0.007	230	40,000	0.003	0.005	160	40,000	0.002	0.003	120	40,000
	4	10.0	0.005	0.005	160	30,000	0.003	0.003	120	30,000	0.002	0.003	90	30,000
	4.5	11.3	0.003	0.005	100	30,000	0.002	0.003	80	30,000	0.001	0.002	60	30,000
	5	12.5	0.002	0.003	70	30,000	0.001	0.002	50	30,000	0.001	0.002	40	30,000
	5.5	13.8	0.001	0.002	60	30,000	0.001	0.002	40	30,000	0.001	0.001	40	30,000
0.25	6	15.0	0.001	0.002	50	30,000	0.001	0.001	40	30,000	0.001	0.001	30	30,000
	-	-	0.04	0.07	1,000	40,000	0.03	0.05	860	40,000	0.015	0.03	650	40,000
	0.5	1.0	0.04	0.07	1,000	40,000	0.03	0.04	860	40,000	0.015	0.03	650	40,000
	0.75	1.5	0.03	0.06	1,000	40,000	0.025	0.03	860	40,000	0.012	0.02	650	40,000
	1	2.0	0.03	0.05	1,000	40,000	0.02	0.03	860	40,000	0.01	0.02	650	40,000
	1.25	2.5	0.025	0.05	920	40,000	0.02	0.03	780	40,000	0.01	0.02	580	40,000
	1.5	3.0	0.02	0.05	850	40,000	0.01	0.03	720	40,000	0.007	0.02	520	40,000
	1.75	3.5	0.02	0.04	800	40,000	0.01	0.03	680	40,000	0.007	0.02	480	40,000
	2	4.0	0.02	0.03	720	40,000	0.01	0.02	650	40,000	0.007	0.01	400	40,000
	2.25	4.5	0.015	0.03	650	40,000	0.007	0.02	580	40,000	0.005	0.01	380	40,000
	2.5	5.0	0.01	0.02	600	40,000	0.007	0.01	530	40,000	0.005	0.007	360	40,000
	3	6.0	0.01	0.02	500	40,000	0.007	0.01	420	40,000	0.005	0.007	320	40,000
	3.5	7.0	0.007	0.01	420	40,000	0.005	0.007	360	40,000	0.003	0.005	280	40,000
	4	8.0	0.007	0.01	350	40,000	0.005	0.007	300	40,000	0.003	0.005	260	40,000
	4.5	9.0	0.005	0.005	300	40,000	0.003	0.003	260	40,000	0.002	0.003	220	40,000
	5	10.0	0.005	0.005	240	33,000	0.003	0.003	200	33,000	0.002	0.003	180	33,000
	5.5	11.0	0.003	0.005	200	30,000	0.002	0.003	160	30,000	0.001	0.002	120	30,000
	6	12.0	0.002	0.003	120	30,000	0.001	0.002	80	30,000	0.001	0.002	70	30,000
	7	14.0	0.002	0.002	90	30,000	0.001	0.002	70	30,000	0.001	0.002	60	30,000
	8	16.0	0.002	0.002	75	30,000	0.001	0.002	60	30,000	0.001	0.002	50	30,000
9	18.0	0.001	0.002	60	25,000	0.001	0.002	50	25,000	0.001	0.001	35	22,000	
10	20.0	0.001	0.002	40	20,000	0.001	0.002	30	20,000	0.001	0.001	20	20,000	
0.3	-	-	0.05	0.1	1,400	40,000	0.03	0.08	1,000	40,000	0.02	0.05	720	35,000
	0.6	1.0	0.05	0.1	1,400	40,000	0.03	0.08	1,000	40,000	0.02	0.05	720	35,000
	0.8	1.3	0.05	0.1	1,400	40,000	0.03	0.08	1,000	40,000	0.02	0.05	720	35,000
	1	1.7	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	1.25	2.1	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	1.5	2.5	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	1.75	2.9	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	2	3.3	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	2.25	3.8	0.03	0.05	1,400	40,000	0.02	0.04	900	40,000	0.02	0.03	670	30,000
	2.5	4.2	0.03	0.05	1,200	40,000	0.02	0.04	840	40,000	0.02	0.03	640	30,000
	2.75	4.6	0.03	0.05	1,200	40,000	0.02	0.04	840	40,000	0.02	0.03	640	30,000
	3	5.0	0.03	0.05	1,200	40,000	0.02	0.04	840	40,000	0.02	0.03	640	30,000
	3.5	5.8	0.02	0.03	1,000	40,000	0.01	0.03	620	40,000	0.01	0.02	480	30,000
	4	6.7	0.02	0.03	1,000	40,000	0.01	0.03	620	40,000	0.01	0.02	480	30,000
	4.5	7.5	0.02	0.03	900	35,000	0.01	0.02	580	35,000	0.008	0.015	430	30,000
	5	8.3	0.01	0.02	720	30,000	0.007	0.015	500	30,000	0.007	0.01	400	30,000
	5.5	9.2	0.01	0.015	700	30,000	0.007	0.01	450	30,000	0.005	0.008	360	30,000
	6	10.0	0.007	0.01	500	30,000	0.005	0.007	380	30,000	0.004	0.006	320	30,000
	6.5	10.8	0.006	0.007	460	30,000	0.004	0.005	350	30,000	0.003	0.005	290	26,000
	7	11.7	0.005	0.007	400	25,000	0.003	0.005	300	25,000	0.003	0.003	260	20,000
7.5	12.5	0.004	0.006	360	25,000	0.003	0.004	280	25,000	0.002	0.003	240	20,000	
8	13.3	0.003	0.005	320	25,000	0.003	0.003	260	25,000	0.002	0.003	220	20,000	
9	15.0	0.003	0.003	280	25,000	0.003	0.002	220	25,000	0.001	0.002	160	20,000	
10	16.6	0.002	0.003	150	20,000	0.002	0.002	120	20,000	0.001	0.002	100	18,000	
12	20.0	0.002	0.002	80	20,000	0.002	0.002	60	20,000	0.001	0.002	50	18,000	

## Recommended Conditions

Work Material			Hardened Steels SKD61·STAVAX·HPM-38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
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 <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>
0.35	-	-	0.07	0.1	1,600	40,000	0.05	0.08	1,300	40,000	0.03	0.07	1,000	35,000
	1	1.4	0.07	0.1	1,600	40,000	0.05	0.08	1,300	40,000	0.03	0.07	1,000	35,000
	2	2.9	0.07	0.1	1,600	40,000	0.05	0.08	1,300	40,000	0.03	0.07	1,000	30,000
	4	5.7	0.04	0.06	1,300	40,000	0.03	0.04	820	40,000	0.015	0.02	600	30,000
	6	8.6	0.01	0.03	800	30,000	0.01	0.015	500	30,000	0.006	0.01	420	25,000
	8	11.4	0.006	0.01	520	25,000	0.005	0.006	380	20,000	0.004	0.006	250	20,000
0.4	-	-	0.1	0.15	2,000	40,000	0.08	0.12	1,600	40,000	0.06	0.1	1,200	35,000
	1	1.3	0.1	0.15	2,000	40,000	0.08	0.12	1,600	40,000	0.06	0.1	1,200	35,000
	1.5	1.9	0.1	0.15	2,000	40,000	0.08	0.12	1,600	40,000	0.06	0.1	1,200	35,000
	2	2.5	0.1	0.15	2,000	40,000	0.07	0.1	1,600	40,000	0.05	0.1	1,200	30,000
	2.5	3.1	0.1	0.15	2,000	40,000	0.07	0.1	1,600	40,000	0.05	0.08	1,200	30,000
	3	3.8	0.1	0.15	2,000	40,000	0.07	0.1	1,600	40,000	0.05	0.05	1,200	30,000
	3.5	4.4	0.08	0.12	2,000	40,000	0.06	0.08	1,600	40,000	0.04	0.05	1,200	30,000
	4	5.0	0.05	0.1	1,600	40,000	0.05	0.05	1,200	40,000	0.03	0.05	860	30,000
	4.5	5.6	0.05	0.08	1,600	40,000	0.04	0.05	1,200	40,000	0.02	0.04	860	30,000
	5	6.3	0.05	0.05	1,600	40,000	0.03	0.05	1,000	40,000	0.02	0.03	620	30,000
	6	7.5	0.03	0.05	1,200	30,000	0.02	0.03	760	30,000	0.01	0.02	560	25,000
	7	8.8	0.02	0.03	1,000	30,000	0.01	0.02	680	30,000	0.007	0.01	520	25,000
	8	10.0	0.01	0.02	820	30,000	0.007	0.01	600	30,000	0.005	0.01	480	25,000
	9	11.3	0.008	0.01	700	30,000	0.005	0.005	550	30,000	0.003	0.005	420	25,000
	10	12.5	0.005	0.005	450	25,000	0.003	0.003	380	25,000	0.002	0.003	320	20,000
	12	15.0	0.003	0.005	320	20,000	0.002	0.003	260	20,000	0.002	0.002	200	20,000
16	20.0	0.002	0.003	250	18,000	0.002	0.002	200	18,000	0.001	0.002	140	16,000	
0.45	-	-	0.1	0.2	2,200	40,000	0.08	0.15	1,800	32,000	0.06	0.1	1,300	30,000
	1	1.1	0.1	0.2	2,200	40,000	0.08	0.15	1,800	32,000	0.06	0.1	1,300	30,000
	2	2.2	0.1	0.2	2,200	40,000	0.08	0.15	1,800	30,000	0.06	0.1	1,300	30,000
	4	4.4	0.05	0.12	1,800	40,000	0.04	0.08	1,400	30,000	0.03	0.05	900	25,000
	6	6.7	0.035	0.05	1,200	30,000	0.025	0.035	800	25,000	0.015	0.025	600	20,000
	8	8.9	0.025	0.04	1,000	30,000	0.015	0.025	700	23,000	0.008	0.015	500	20,000
0.5	-	-	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.12	1,400	25,000
	1	1.0	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.12	1,400	25,000
	1.5	1.5	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.12	1,400	25,000
	2	2.0	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
	2.5	2.5	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
	3	3.0	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
	3.5	3.5	0.1	0.25	2,500	40,000	0.07	0.15	1,800	30,000	0.06	0.1	1,300	25,000
	4	4.0	0.1	0.2	2,500	40,000	0.05	0.15	1,800	30,000	0.05	0.1	1,200	25,000
	4.5	4.5	0.08	0.2	2,000	30,000	0.05	0.1	1,600	25,000	0.04	0.07	950	20,000
	5	5.0	0.05	0.15	2,000	30,000	0.04	0.1	1,600	25,000	0.03	0.05	920	20,000
	6	6.0	0.05	0.1	1,800	30,000	0.04	0.05	1,200	25,000	0.02	0.05	740	20,000
	7	7.0	0.04	0.06	1,200	30,000	0.03	0.04	950	25,000	0.02	0.03	680	20,000
	8	8.0	0.04	0.06	1,000	30,000	0.03	0.04	860	25,000	0.02	0.03	560	20,000
	9	9.0	0.03	0.05	820	25,000	0.02	0.03	750	20,000	0.01	0.02	500	18,000
	10	10.0	0.03	0.05	750	25,000	0.02	0.03	620	20,000	0.01	0.02	450	18,000
	12	12.0	0.01	0.03	600	20,000	0.007	0.02	520	18,000	0.005	0.01	400	16,000
	13	13.0	0.008	0.02	500	20,000	0.005	0.01	420	18,000	0.003	0.006	350	16,000
	14	14.0	0.005	0.01	420	20,000	0.003	0.007	360	18,000	0.002	0.005	320	16,000
16	16.0	0.005	0.005	300	18,000	0.003	0.005	250	16,000	0.002	0.003	200	14,000	
18	18.0	0.003	0.005	180	18,000	0.002	0.005	120	16,000	0.002	0.002	85	14,000	
20	20.0	0.003	0.003	100	16,000	0.002	0.003	75	14,000	0.002	0.002	60	12,000	
22	22.0	0.002	0.003	50	14,000	0.002	0.002	40	12,000	0.001	0.002	35	10,000	

## Recommended Conditions

Work Material			Hardened Steels SKD61·STAVAX·HPM-38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
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 <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>
0.6	1.2	1.0	0.1	0.3	2,500	30,000	0.1	0.2	2,000	30,000	0.05	0.1	1,600	25,000
	2.4	2.0	0.1	0.3	2,500	30,000	0.1	0.2	2,000	30,000	0.05	0.1	1,600	25,000
	4	3.3	0.1	0.2	2,500	30,000	0.07	0.2	2,000	30,000	0.05	0.1	1,600	25,000
	6	5.0	0.07	0.1	2,000	30,000	0.05	0.1	1,600	25,000	0.03	0.07	1,200	20,000
	8	6.7	0.05	0.1	1,600	30,000	0.03	0.07	1,200	25,000	0.02	0.05	920	20,000
0.6	10	8.3	0.03	0.07	1,200	20,000	0.02	0.05	860	20,000	0.01	0.03	680	18,000
	12	10.0	0.02	0.05	860	20,000	0.01	0.03	620	20,000	0.007	0.02	480	18,000
	14	11.7	0.02	0.03	600	18,000	0.01	0.02	400	18,000	0.005	0.01	300	16,000
	16	13.3	0.01	0.02	350	16,000	0.005	0.01	250	16,000	0.003	0.007	130	14,000
0.7	2	1.4	0.12	0.3	2,500	30,000	0.1	0.25	2,200	30,000	0.08	0.15	1,800	25,000
	4	2.9	0.12	0.25	2,500	30,000	0.1	0.2	2,200	30,000	0.05	0.15	1,800	25,000
	6	4.3	0.12	0.2	2,500	30,000	0.08	0.15	2,000	27,000	0.05	0.1	1,300	22,000
	8	5.7	0.12	0.2	2,500	30,000	0.08	0.15	1,800	20,000	0.03	0.08	1,000	20,000
	12	8.6	0.07	0.12	1,400	20,000	0.04	0.08	1,100	18,000	0.015	0.05	700	18,000
	16	11.4	0.02	0.05	700	17,000	0.01	0.03	600	17,000	0.008	0.02	450	16,000
0.75	2	1.3	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
	3	2.0	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
	4	2.7	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
	5	3.3	0.15	0.25	3,000	30,000	0.1	0.25	2,300	30,000	0.1	0.15	1,800	25,000
	6	4.0	0.15	0.2	3,000	30,000	0.1	0.2	2,000	30,000	0.1	0.1	1,600	25,000
	8	5.3	0.1	0.2	2,500	25,000	0.05	0.2	1,600	25,000	0.05	0.1	1,200	20,000
	10	6.7	0.1	0.1	2,500	25,000	0.05	0.1	1,200	25,000	0.05	0.05	860	20,000
	12	8.0	0.05	0.1	1,800	20,000	0.03	0.1	920	20,000	0.02	0.05	780	18,000
	14	9.3	0.05	0.07	1,200	20,000	0.03	0.05	820	20,000	0.02	0.03	650	18,000
	16	10.7	0.03	0.05	720	18,000	0.02	0.03	650	18,000	0.01	0.02	580	16,000
	18	12.0	0.02	0.04	550	16,000	0.012	0.025	400	16,000	0.008	0.015	400	14,000
	20	13.3	0.01	0.03	450	16,000	0.01	0.02	360	16,000	0.007	0.01	300	14,000
	22	14.7	0.01	0.02	330	14,000	0.01	0.01	250	14,000	0.007	0.007	200	12,000
	25	16.7	0.008	0.01	180	12,000	0.005	0.005	140	12,000	0.004	0.004	110	10,000
30	20.0	0.005	0.005	80	10,000	0.003	0.005	60	10,000	0.003	0.003	40	8,000	
0.8	2	1.3	0.15	0.3	3,000	30,000	0.1	0.25	2,500	25,000	0.1	0.2	2,000	20,000
	4	2.5	0.15	0.3	3,000	30,000	0.1	0.2	2,300	25,000	0.08	0.15	1,800	20,000
	6	3.8	0.15	0.25	3,000	30,000	0.1	0.2	2,000	23,000	0.07	0.12	1,600	20,000
	8	5.0	0.1	0.2	2,500	25,000	0.07	0.15	2,000	20,000	0.05	0.1	1,600	18,000
	12	7.5	0.07	0.1	1,800	20,000	0.05	0.07	1,500	16,000	0.03	0.05	1,200	14,000
	16	10.0	0.03	0.05	720	16,000	0.02	0.03	600	14,000	0.015	0.02	480	12,000
	20	12.5	0.01	0.03	500	14,000	0.01	0.02	380	12,000	0.01	0.01	300	10,000
0.9	3	1.7	0.15	0.35	3,000	27,000	0.12	0.3	2,500	25,000	0.1	0.25	2,000	20,000
	4	2.2	0.15	0.35	3,000	27,000	0.12	0.25	2,500	25,000	0.1	0.2	1,800	20,000
	6	3.3	0.15	0.35	3,000	27,000	0.12	0.25	2,500	25,000	0.1	0.2	1,600	18,000
	8	4.4	0.1	0.3	2,500	25,000	0.08	0.2	2,300	23,000	0.08	0.15	1,400	17,000
	10	5.6	0.1	0.3	2,000	20,000	0.08	0.2	1,700	18,000	0.08	0.12	1,100	14,000
	12	6.7	0.07	0.2	1,600	20,000	0.05	0.15	1,300	17,000	0.05	0.12	900	13,000
	16	8.9	0.07	0.15	1,200	18,000	0.05	0.1	1,000	16,000	0.03	0.1	720	12,000
	18	10.0	0.05	0.1	1,000	15,000	0.03	0.08	800	14,000	0.02	0.08	600	11,000
	20	11.1	0.05	0.08	800	15,000	0.03	0.05	640	13,000	0.02	0.05	430	9,000
	22	12.2	0.03	0.05	650	15,000	0.02	0.03	520	12,000	0.015	0.03	340	8,000
25	13.9	0.02	0.03	480	12,000	0.015	0.02	340	10,000	0.01	0.02	230	7,000	
30	16.7	0.01	0.02	300	12,000	0.007	0.01	210	10,000	0.005	0.01	120	6,000	

## Recommended Conditions

Work Material			Hardened Steels SKD61·STAVAX·HPM-38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
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 <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>
1	2	1.0	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
	3	1.5	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
	4	2.0	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
	6	3.0	0.2	0.4	2,500	25,000	0.2	0.3	2,000	25,000	0.15	0.3	1,600	20,000
	8	4.0	0.2	0.3	2,000	20,000	0.1	0.2	1,600	18,000	0.1	0.2	1,200	16,000
	10	5.0	0.1	0.3	2,000	18,000	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000
	12	6.0	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000	0.05	0.1	940	12,000
	13	6.5	0.08	0.2	1,600	16,000	0.06	0.1	1,200	14,000	0.04	0.08	940	12,000
	14	7.0	0.07	0.15	1,600	16,000	0.05	0.08	1,200	14,000	0.03	0.07	940	12,000
	16	8.0	0.07	0.15	1,600	16,000	0.05	0.08	1,200	14,000	0.03	0.07	940	12,000
	18	9.0	0.05	0.1	1,400	14,000	0.03	0.05	1,000	12,000	0.02	0.03	850	10,000
20	10.0	0.05	0.1	1,000	14,000	0.03	0.05	820	12,000	0.02	0.03	720	10,000	
1	22	11.0	0.03	0.08	850	14,000	0.02	0.06	700	12,000	0.02	0.02	600	10,000
	25	12.5	0.03	0.05	680	12,000	0.02	0.03	560	10,000	0.01	0.02	420	8,500
	27	13.5	0.02	0.05	500	12,000	0.015	0.03	410	10,000	0.01	0.02	330	8,500
	30	15.0	0.02	0.03	360	12,000	0.01	0.02	300	10,000	0.008	0.01	240	8,500
	32	16.0	0.02	0.02	230	10,000	0.01	0.015	180	8,000	0.008	0.01	150	6,800
	35	17.5	0.01	0.02	150	10,000	0.007	0.01	120	8,000	0.005	0.007	100	6,800
	40	20.0	0.005	0.01	100	10,000	0.003	0.005	80	8,000	0.002	0.003	50	6,800
1.25	4	1.6	0.3	0.5	3,000	20,000	0.2	0.5	2,500	20,000	0.15	0.4	2,000	18,000
	6	2.4	0.3	0.4	2,800	20,000	0.2	0.5	2,300	20,000	0.15	0.4	2,000	18,000
	8	3.2	0.25	0.3	2,600	20,000	0.15	0.3	2,100	20,000	0.12	0.25	1,800	18,000
	10	4.0	0.2	0.3	2,500	20,000	0.15	0.2	2,000	20,000	0.1	0.15	1,600	18,000
	15	6.0	0.1	0.2	2,000	18,000	0.07	0.15	1,600	16,000	0.05	0.1	1,200	14,000
	20	8.0	0.07	0.15	1,500	16,000	0.05	0.1	1,200	14,000	0.03	0.05	1,000	10,000
	25	10.0	0.05	0.1	1,000	14,000	0.03	0.07	850	12,000	0.02	0.03	720	8,000
	30	12.0	0.03	0.07	720	12,000	0.02	0.05	640	10,000	0.01	0.02	580	7,000
35	14.0	0.02	0.03	450	10,000	0.01	0.02	400	8,500	0.007	0.01	320	6,200	
1.5	6	2.0	0.2	0.8	3,000	20,000	0.2	0.6	2,500	18,000	0.2	0.5	2,000	14,000
	8	2.7	0.2	0.8	3,000	20,000	0.2	0.6	2,500	18,000	0.2	0.5	2,000	14,000
	10	3.3	0.2	0.6	2,500	20,000	0.2	0.4	2,000	18,000	0.1	0.3	1,500	14,000
	12	4.0	0.2	0.6	2,500	20,000	0.2	0.4	2,000	18,000	0.1	0.3	1,500	14,000
	14	4.7	0.1	0.4	2,000	18,000	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000
	16	5.3	0.1	0.4	2,000	18,000	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000
	18	6.0	0.1	0.3	1,800	18,000	0.1	0.2	1,400	16,000	0.1	0.15	1,100	12,000
	20	6.7	0.1	0.3	1,600	18,000	0.1	0.2	1,200	16,000	0.1	0.1	960	12,000
	22	7.3	0.1	0.2	1,400	17,000	0.07	0.15	1,000	15,000	0.07	0.07	880	11,000
	25	8.3	0.1	0.2	1,200	16,000	0.07	0.15	920	14,000	0.05	0.07	800	10,000
	27	9.0	0.07	0.1	1,000	14,000	0.05	0.08	800	12,000	0.03	0.05	700	9,000
	30	10.0	0.07	0.1	750	14,000	0.05	0.07	640	12,000	0.03	0.05	600	8,600
	35	11.7	0.05	0.1	620	12,000	0.03	0.07	500	10,000	0.02	0.05	420	7,200
40	13.3	0.03	0.07	450	10,000	0.02	0.05	320	8,200	0.01	0.03	260	6,400	
1.75	5	1.4	0.3	1	3,000	20,000	0.25	0.8	2,500	18,000	0.2	0.6	1,800	14,000
	10	2.9	0.25	1	3,000	20,000	0.2	0.6	2,500	18,000	0.15	0.5	1,700	14,000
	15	4.3	0.25	1	3,000	20,000	0.15	0.5	2,300	16,000	0.13	0.4	1,500	14,000
	20	5.7	0.18	0.6	2,500	18,000	0.1	0.3	1,800	15,000	0.1	0.2	1,200	12,000
	25	7.1	0.12	0.35	1,800	16,000	0.1	0.2	1,600	14,000	0.06	0.12	1,000	10,000
	30	8.6	0.1	0.25	1,500	14,000	0.07	0.15	950	11,000	0.05	0.08	800	9,000
	35	10.0	0.08	0.2	1,200	13,000	0.07	0.12	800	10,000	0.03	0.06	650	7,500
	40	11.4	0.07	0.1	800	11,000	0.04	0.07	720	9,000	0.02	0.05	450	7,000
45	12.9	0.06	0.07	700	10,000	0.035	0.05	600	7,500	0.015	0.03	320	6,000	

## Recommended Conditions

Work Material			Hardened Steels SKD61·STAVAX·HPM-38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
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 <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>	a <sub>p</sub> mm	a <sub>e</sub> mm	mm/min	min <sup>-1</sup>
2	6	1.5	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	8	2.0	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	10	2.5	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	12	3.0	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	14	3.5	0.3	1.5	3,000	20,000	0.2	0.8	2,000	16,000	0.2	0.6	1,600	12,000
	15	3.8	0.3	1.5	3,000	20,000	0.2	0.8	2,000	16,000	0.2	0.6	1,600	12,000
	16	4.0	0.3	1	2,700	18,000	0.2	0.6	2,000	16,000	0.15	0.5	1,600	12,000
	18	4.5	0.2	1	2,700	18,000	0.15	0.6	1,800	14,000	0.12	0.4	1,400	10,000
	20	5.0	0.2	1	2,400	16,000	0.1	0.6	1,800	14,000	0.1	0.4	1,400	10,000
	22	5.5	0.2	0.8	2,000	16,000	0.1	0.5	1,500	14,000	0.1	0.3	1,200	10,000
	25	6.3	0.2	0.8	1,600	16,000	0.1	0.4	1,200	14,000	0.1	0.2	1,000	10,000
	27	6.8	0.15	0.5	1,600	16,000	0.1	0.3	1,200	14,000	0.07	0.2	1,000	10,000
	30	7.5	0.1	0.3	1,600	14,000	0.07	0.2	1,200	10,000	0.05	0.15	1,000	8,200
	35	8.8	0.1	0.2	1,200	14,000	0.07	0.15	1,000	10,000	0.05	0.1	820	8,200
	40	10.0	0.07	0.15	1,200	12,000	0.05	0.1	1,000	8,600	0.03	0.07	820	6,800
45	11.3	0.07	0.1	750	12,000	0.05	0.07	620	8,600	0.03	0.05	500	6,800	
50	12.5	0.05	0.08	550	10,000	0.03	0.05	500	7,500	0.02	0.03	420	5,500	
2.5	10	2.0	0.3	1.5	3,000	18,000	0.2	1.2	2,500	12,000	0.2	0.7	2,000	9,200
	15	3.0	0.3	1.5	3,000	18,000	0.2	1.2	2,500	12,000	0.2	0.7	2,000	9,200
	20	4.0	0.3	1.2	3,000	15,000	0.2	1	2,000	10,000	0.15	0.5	1,600	8,000
	25	5.0	0.2	1	2,500	15,000	0.15	0.8	1,800	8,600	0.1	0.3	1,200	7,200
	30	6.0	0.2	0.8	2,000	12,000	0.15	0.5	1,500	7,600	0.1	0.2	860	6,400
	35	7.0	0.15	0.5	1,500	10,000	0.1	0.3	1,100	7,300	0.07	0.15	750	6,000
	40	8.0	0.1	0.2	1,200	10,000	0.07	0.15	1,000	6,800	0.05	0.1	650	5,500
	45	9.0	0.1	0.15	1,000	10,000	0.07	0.1	760	6,400	0.05	0.07	550	4,800
50	10.0	0.08	0.1	800	9,000	0.05	0.07	530	6,000	0.03	0.05	360	4,000	
3	8	1.3	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	10	1.7	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	12	2.0	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	15	2.5	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	18	3.0	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	20	3.3	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	25	4.2	0.3	1.5	3,000	16,000	0.2	1	2,000	8,000	0.15	0.7	1,500	7,000
	30	5.0	0.2	1.5	3,000	14,000	0.2	1	2,000	7,200	0.15	0.7	1,500	6,500
	35	5.8	0.2	1.2	2,400	13,000	0.17	0.8	1,600	6,800	0.12	0.5	1,200	5,800
	40	6.7	0.2	1	1,800	12,000	0.15	0.6	1,200	6,400	0.1	0.4	1,000	5,200
	50	8.3	0.1	0.6	1,200	8,200	0.1	0.3	860	4,800	0.05	0.2	620	4,000
60	10.0	0.07	0.3	600	6,000	0.05	0.15	450	3,200	0.03	0.07	300	2,500	
Notes			※1 Depth of Cut : a <sub>p</sub> = Axial Depth of Cut / a <sub>e</sub> = Radial Depth of Cut. ※2 We recommend using oil mist coolant. ※3 Adjust both spindle speed and feed at the same rate. ※4 Adjust milling conditions according to the volume of depth of cut and rigidity of machine. ※5 Length of tool overhang must be as short as possible.											

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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.