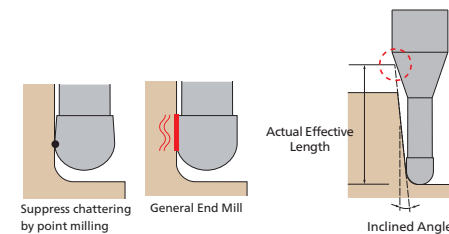
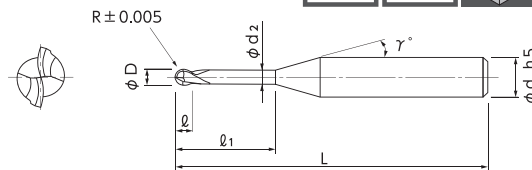


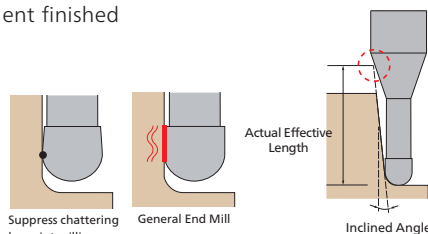
MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel Total 224 sizes

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

Long neck ball end mill for prehardened steels and hardened steels (~65HRC). Maximum L/D=22



- MUGEN COATING PREMIUM for hardened steels and unique new design excel in chipping prevention and resolves chattering to realize excellent finished surface.
- Applicable for hardened steels up to 65HRC.
- Total 224 sizes!



Code No.	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°
08-00527-00050	R0.05	0.2	0.07	0.1	0.085	12°	4	45	0.24	0.25	0.26	0.27	0.29
08-00527-00051		0.3	0.07	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
08-00527-00053		0.5	0.07	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
08-00527-00071	R0.075	0.3	0.1	0.15	0.13	12°	4	45	0.36	0.37	0.39	0.40	0.44
08-00527-00073		0.5	0.1	0.15	0.13	12°	4	45	0.57	0.59	0.61	0.64	0.70
08-00527-00075		1	0.1	0.15	0.13	12°	4	45	1.09	1.13	1.18	1.24	1.37
08-00527-00100	R0.1	0.3	0.15	0.2	0.18	12°	4	45	0.35	0.36	0.38	0.39	0.42
08-00527-00101		0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
08-00527-00102		0.75	0.15	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
08-00527-00103		1	0.15	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
08-00528-00103		1	0.15	0.2	0.18	12°	6	50	1.08	1.13	1.18	1.23	1.35
08-00527-00104		1.25	0.15	0.2	0.18	12°	4	45	1.34	1.40	1.46	1.53	1.68
08-00527-00105		1.5	0.15	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
08-00527-00106		1.75	0.15	0.2	0.18	12°	4	45	1.86	1.94	2.03	2.13	2.35
08-00527-00107		2	0.15	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68
08-00527-00108		2.5	0.15	0.2	0.18	12°	4	45	2.65	2.76	2.89	3.02	3.34
08-00527-00109	3	0.15	0.2	0.18	12°	4	45	3.17	3.31	3.46	3.62	4.01	
08-00527-00162	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.63	0.68
08-00527-00150		0.6	0.2	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81
08-00527-00163		0.75	0.2	0.3	0.28	12°	4	45	0.82	0.86	0.89	0.93	1.01
08-00527-00151		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
08-00527-00152		1.25	0.2	0.3	0.28	12°	4	45	1.34	1.39	1.45	1.52	1.67
08-00527-00153		1.5	0.2	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00
08-00528-00153		1.5	0.2	0.3	0.28	12°	6	50	1.60	1.67	1.74	1.82	2.00
08-00527-00154		1.75	0.2	0.3	0.28	12°	4	45	1.86	1.94	2.02	2.12	2.33
08-00527-00155		2	0.2	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66
08-00527-00156		2.25	0.2	0.3	0.28	12°	4	45	2.38	2.48	2.59	2.71	3.00
08-00527-00157		2.5	0.2	0.3	0.28	12°	4	45	2.64	2.76	2.88	3.01	3.33
08-00527-00159		3	0.2	0.3	0.28	12°	4	45	3.17	3.30	3.45	3.61	3.99
08-00527-00160		3.5	0.2	0.3	0.28	12°	4	45	3.69	3.85	4.02	4.21	4.65
08-00527-00161		4	0.2	0.3	0.28	12°	4	45	4.21	4.39	4.59	4.81	5.32

How to Order

When you order, indicate MRBH230 (R)×(L1)×(d). ※(γ) is reference value.

Code No.	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°	
08-00527-00211	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.59	0.60	0.62	0.64	0.69	
08-00527-00201		0.8	0.3	0.4	0.37	12°	4	45	0.89	0.93	0.96	1.00	1.09	
08-00527-00202		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35	
08-00528-00202		1	0.3	0.4	0.37	12°	6	50	1.10	1.14	1.19	1.24	1.35	
08-00527-00203		1.5	0.3	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02	
08-00527-00204		2	0.3	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68	
08-00528-00204		2	0.3	0.4	0.37	12°	6	50	2.15	2.23	2.33	2.43	2.68	
08-00527-00205		2.5	0.3	0.4	0.37	12°	4	45	2.67	2.78	2.90	3.03	3.34	
08-00527-00206		3	0.3	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01	
08-00527-00207		3.5	0.3	0.4	0.37	12°	4	45	3.71	3.87	4.04	4.23	4.67	
08-00527-00208		4	0.3	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33	
08-00527-00209		4.5	0.3	0.4	0.37	12°	4	45	4.75	4.96	5.18	5.43	6.00	
08-00527-00210		5	0.3	0.4	0.37	12°	4	45	5.27	5.50	5.75	6.02	6.66	
08-00527-00212		6	0.3	0.4	0.37	12°	4	45	6.33	6.60	6.90	7.23	8.00	
08-00527-00250		R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
08-00527-00251	1.5		0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03	
08-00527-00252	2		0.35	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69	
08-00527-00253	2.5		0.35	0.5	0.46	12°	4	45	2.69	2.80	2.92	3.05	3.36	
08-00527-00254	3		0.35	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02	
08-00527-00255	3.5		0.35	0.5	0.46	12°	4	45	3.73	3.89	4.06	4.25	4.69	
08-00527-00256	4		0.35	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35	
08-00527-00257	4.5		0.35	0.5	0.46	12°	4	45	4.78	4.98	5.20	5.44	6.01	
08-00527-00258	5		0.35	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68	
08-00527-00259	5.5		0.35	0.5	0.46	12°	4	45	5.82	6.07	6.34	6.64	7.34	
08-00527-00260	6		0.35	0.5	0.46	12°	4	45	6.34	6.61	6.91	7.24	8.00	
08-00527-00262	8		0.35	0.5	0.46	12°	4	45	8.42	8.79	9.19	9.63	10.66	
08-00527-00264	10		0.35	0.5	0.46	12°	4	45	10.52	10.98	11.49	12.04	13.35	
08-00527-00300	R0.3		1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
08-00527-00301			1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
08-00527-00302		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68	
08-00528-00302		2	0.45	0.6	0.56	12°	6	50	2.17	2.25	2.34	2.44	2.68	
08-00527-00303		2.5	0.45	0.6	0.56	12°	4	45	2.69	2.79	2.91	3.04	3.34	
08-00527-00304		3	0.45	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01	
08-00528-00304		3	0.45	0.6	0.56	12°	6	50	3.21	3.34	3.48	3.64	4.01	
08-00527-00305		3.5	0.45	0.6	0.56	12°	4	45	3.73	3.88	4.05	4.24	4.67	
08-00527-00306		4	0.45	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33	
08-00528-00306		4	0.45	0.6	0.56	12°	6	50	4.25	4.43	4.62	4.84	5.33	
08-00527-00321		4.5	0.45	0.6	0.56	12°	4	45	4.78	4.98	5.20	5.45	6.02	
08-00527-00308		5	0.45	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66	
08-00527-00322		5.5	0.45	0.6	0.56	12°	4	45	5.82	6.07	6.34	6.64	7.35	
08-00527-00310		6	0.45	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99	

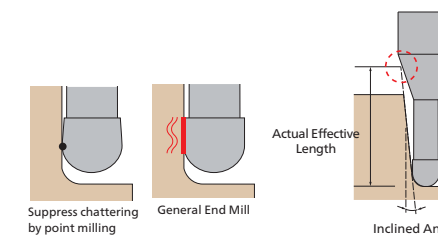
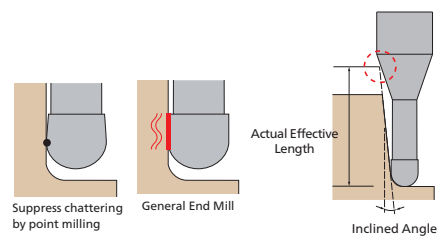
P Prehardened Steel
H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel

M Stainless Steel
S Titanium Alloy Heat Resistant Alloy

Long Neck Ball Coating

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H



Unit : mm

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ ₁)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d ₂)	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°	
									08-00527-00312	R0.3	7	0.45	0.6	0.56
08-00527-00314	8	0.45	0.6	0.56	12°	4	45	8.42	8.79		9.18	9.62	10.64	
08-00527-00316	9	0.45	0.6	0.56	12°	4	45	9.47	9.88		10.33	10.82	11.97	
08-00527-00318	10	0.45	0.6	0.56	12°	4	45	10.51	10.97		11.47	12.02	13.30	
08-00527-00320	12	0.45	0.6	0.56	12°	4	45	12.59	13.14		13.75	14.41	15.95	
08-00527-00350	R0.35	2	0.5	0.7	0.66	12°	4	45	2.17	2.25	2.34	2.44	2.67	
08-00527-00351		4	0.5	0.7	0.66	12°	4	45	4.25	4.43	4.62	4.84	5.33	
08-00527-00352		6	0.5	0.7	0.66	12°	4	45	6.34	6.61	6.91	7.23	8.00	
08-00527-00353		8	0.5	0.7	0.66	12°	4	45	8.43	8.79	9.19	9.63	10.66	
08-00527-00401	R0.4	2	0.6	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65	
08-00528-00401		2	0.6	0.8	0.76	12°	6	50	2.16	2.24	2.33	2.42	2.65	
08-00527-00402		3	0.6	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97	
08-00527-00403		4	0.6	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30	
08-00527-00404		5	0.6	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63	
08-00527-00405		6	0.6	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96	
08-00527-00406		7	0.6	0.8	0.76	12°	4	45	7.38	7.69	8.03	8.41	9.28	
08-00527-00407		8	0.6	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61	
08-00527-00409		10	0.6	0.8	0.76	12°	4	45	10.50	10.96	11.45	12.00	13.26	
08-00527-00410		12	0.6	0.8	0.76	12°	4	45	12.59	13.14	13.73	14.39	15.92	
08-00527-00450		R0.45	2	0.65	0.9	0.86	12°	4	45	2.16	2.24	2.33	2.42	2.64
08-00527-00451			4	0.65	0.9	0.86	12°	4	45	4.25	4.42	4.61	4.82	5.30
08-00527-00452	6		0.65	0.9	0.86	12°	4	45	6.34	6.60	6.89	7.21	7.96	
08-00527-00453	R0.5	8	0.65	0.9	0.86	12°	4	45	8.42	8.78	9.17	9.61	10.62	
08-00527-00500		2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65	
08-00527-00514		2.5	0.75	1	0.95	12°	4	45	2.71	2.81	2.92	3.04	3.32	
08-00527-00501		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97	
08-00528-00501		3	0.75	1	0.95	12°	6	50	3.22	3.35	3.48	3.63	3.97	
08-00527-00502		4	0.75	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30	
08-00528-00502		4	0.75	1	0.95	12°	6	50	4.27	4.44	4.62	4.83	5.30	
08-00527-00503		5	0.75	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63	
08-00528-00503		5	0.75	1	0.95	12°	6	50	5.31	5.53	5.76	6.02	6.63	
08-00527-00504		6	0.75	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96	
08-00528-00504		6	0.75	1	0.95	12°	6	50	6.35	6.62	6.90	7.22	7.96	
08-00527-00505		7	0.75	1	0.95	12°	4	45	7.40	7.71	8.04	8.42	9.28	
08-00528-00505		7	0.75	1	0.95	12°	6	50	7.40	7.71	8.04	8.42	9.28	
08-00527-00506		8	0.75	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61	
08-00528-00506		8	0.75	1	0.95	12°	6	50	8.44	8.79	9.18	9.61	10.61	
08-00527-00507	9	0.75	1	0.95	12°	4	45	9.48	9.88	10.32	10.81	11.94		

Code No.	Radius (R)	Under Neck Length (ℓ ₁)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d ₂)	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°
									08-00527-00508	R0.5	10	0.75	1
08-00528-00508	10	0.75	1	0.95	12°	6	50	10.52	10.97		11.46	12.01	13.26
08-00527-00509	12	0.75	1	0.95	12°	4	45	12.61	13.15		13.75	14.40	15.92
08-00527-00515	13	0.75	1	0.95	12°	4	45	13.66	14.25		14.90	15.62	17.29
08-00527-00510	14	0.75	1	0.95	12°	4	50	14.70	15.33		16.03	16.79	18.57
08-00527-00511	16	0.75	1	0.95	12°	4	50	16.78	17.51		18.31	19.18	21.23
08-00527-00512	18	0.75	1	0.95	12°	4	55	18.87	19.69		20.59	21.58	23.88
08-00527-00513	20	0.75	1	0.95	12°	4	55	20.95	21.87		22.87	23.97	26.54
08-00528-00516	22	0.75	1	0.95	12°	6	60	22.82	23.59		24.43	25.33	27.34
08-00527-00600	R0.6	2.4	0.9	1.2	1.15	12°	4	45	2.59		2.68	2.78	2.89
08-00527-00601		4	0.9	1.2	1.15	12°	4	45	4.26	4.43	4.61	4.81	5.27
08-00527-00602		6	0.9	1.2	1.15	12°	4	45	6.35	6.61	6.89	7.20	7.92
08-00527-00603		8	0.9	1.2	1.15	12°	4	45	8.43	8.79	9.17	9.59	10.58
08-00527-00604		10	0.9	1.2	1.15	12°	4	45	10.52	10.96	11.45	11.99	13.23
08-00527-00605		12	0.9	1.2	1.15	12°	4	45	12.61	13.14	13.73	14.38	15.89
08-00527-00606		14	0.9	1.2	1.15	12°	4	50	14.69	15.32	16.01	16.77	18.54
08-00527-00607	16	0.9	1.2	1.15	12°	4	50	16.78	17.50	18.29	19.17	21.20	
08-00527-00700	R0.7	8	1	1.4	1.35	12°	4	45	8.44	8.78	9.17	9.59	10.57
08-00527-00701		12	1	1.4	1.35	12°	4	50	12.61	13.14	13.73	14.38	15.90
08-00527-00702	R0.75	16	1	1.4	1.35	12°	4	50	16.78	17.50	18.30	19.17	21.22
08-00527-00750		3	1.1	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
08-00527-00751		4	1.1	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
08-00527-00753		6	1.1	1.5	1.45	12°	4	45	6.34	6.59	6.87	7.17	7.88
08-00528-00753		6	1.1	1.5	1.45	12°	6	50	6.34	6.59	6.87	7.17	7.88
08-00527-00755		8	1.1	1.5	1.45	12°	4	45	8.43	8.77	9.15	9.56	10.53
08-00528-00755		8	1.1	1.5	1.45	12°	6	50	8.43	8.77	9.15	9.56	10.53
08-00527-00757		10	1.1	1.5	1.45	12°	4	45	10.51	10.95	11.43	11.96	13.18
08-00527-00758		12	1.1	1.5	1.45	12°	4	45	12.60	13.13	13.71	14.35	15.84
08-00527-00759		14	1.1	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
08-00527-00760	16	1.1	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15	
08-00527-00761	R0.8	18	1.1	1.5	1.45	12°	4	55	18.86	19.68	20.57	21.56	23.87
08-00527-00762		20	1.1	1.5	1.45	12°	4	55	20.94	21.85	22.84	23.92	Free
08-00527-00763		22	1.1	1.5	1.45	12°	4	60	23.03	24.02	25.12	26.32	Free
08-00527-00764		30	1.1	1.5	1.45	12°	4	70	31.37	32.74	34.24	35.89	Free
08-00527-00803		8	1.2	1.6	1.55	12°	4	45	8.43	8.77	9.14	9.55	10.51
08-00527-00805		12	1.2	1.6	1.55	12°	4	45	12.60	13.13	13.70	14.34	15.82
08-00527-00807		16	1.2	1.6	1.55	12°	4	50	16.77	17.48	18.27	19.13	21.13
08-00527-00809		20	1.2	1.6	1.55	12°	4	55	20.94	21.84	22.83	23.91	Free

How to Order

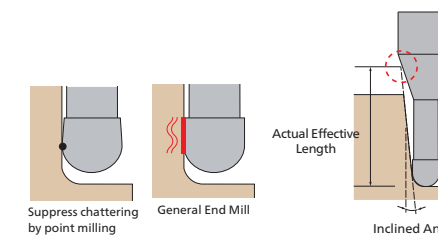
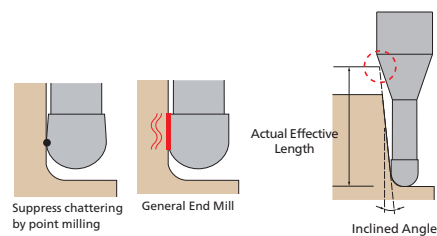
When you order, indicate MRBH230 (R)×(ℓ₁)×(d). ※(γ) is reference value.

Stainless Steel M
Titanium Alloy Heat Resistant Alloy S

Long Neck Ball Coating

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H



Unit : mm

Unit : 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)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30°	1°	1°30'	2°	3°
									08-00527-01001	R1	3	1.5	2
08-00527-01002	4	1.5	2	1.94	12°	4	45	4.27	4.42		4.58	4.76	5.17
08-00528-01002	4	1.5	2	1.94	12°	6	50	4.27	4.42		4.58	4.76	5.17
08-00527-01004	6	1.5	2	1.94	12°	4	45	6.36	6.60		6.86	7.15	7.83
08-00528-01004	6	1.5	2	1.94	12°	6	50	6.36	6.60		6.86	7.15	7.83
08-00527-01006	8	1.5	2	1.94	12°	4	45	8.44	8.78		9.14	9.54	10.48
08-00528-01006	8	1.5	2	1.94	12°	6	50	8.44	8.78		9.14	9.54	10.48
08-00527-01008	10	1.5	2	1.94	12°	4	45	10.53	10.95		11.42	11.94	13.14
08-00528-01008	10	1.5	2	1.94	12°	6	50	10.53	10.95		11.42	11.94	13.14
08-00527-01010	12	1.5	2	1.94	12°	4	45	12.61	13.13		13.70	14.33	15.79
08-00527-01020	13	1.5	2	1.94	12°	4	45	13.66	14.23		14.86	15.55	17.16
08-00527-01011	14	1.5	2	1.94	12°	4	50	14.70	15.31		15.98	16.72	18.45
08-00527-01012	16	1.5	2	1.94	12°	4	50	16.78	17.49		18.27	19.12	Free
08-00528-01012	16	1.5	2	1.94	12°	6	60	16.78	17.49		18.27	19.12	Free
08-00527-01013	18	1.5	2	1.94	12°	4	55	18.87	19.67		20.55	21.51	Free
08-00527-01014	20	1.5	2	1.94	12°	4	55	20.96	21.85		22.83	23.90	Free
08-00527-01015	22	1.5	2	1.94	12°	4	60	23.04	24.03		25.11	26.30	Free
08-00527-01016	25	1.5	2	1.94	12°	4	65	26.17	27.30		28.53	29.89	Free
08-00528-01016	25	1.5	2	1.94	12°	6	65	26.17	27.30		28.53	29.89	Free
08-00527-01017	30	1.5	2	1.94	12°	4	70	31.38	32.74		34.23	Free	Free
08-00527-01018	35	1.5	2	1.94	12°	4	70	36.60	38.19	39.93	Free	Free	
08-00527-01019	40	1.5	2	1.94	12°	4	90	41.81	43.64	Free	Free	Free	
08-00527-01250	R1.25	6	2.3	2.5	2.4	12°	4	45	6.45	6.68	6.94	7.22	7.89
08-00527-01251		8	2.3	2.5	2.4	12°	4	45	8.54	8.86	9.22	9.62	10.55
08-00527-01252		10	2.3	2.5	2.4	12°	4	45	10.62	11.04	11.49	12.00	13.18
08-00527-01253		15	2.3	2.5	2.4	12°	4	50	15.83	16.48	17.20	17.98	Free
08-00527-01254		20	2.3	2.5	2.4	12°	4	55	21.04	21.93	22.90	Free	Free
08-00527-01255		25	2.3	2.5	2.4	12°	4	65	26.26	27.38	28.60	Free	Free
08-00527-01256		30	2.3	2.5	2.4	12°	4	70	31.47	32.82	Free	Free	Free
08-00527-01257		35	2.3	2.5	2.4	12°	4	70	36.69	38.27	Free	Free	Free
08-00527-01501	R1.5	6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
08-00527-01502		8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
08-00527-01503		10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
08-00527-01504		12	2.5	3	2.85	12°	6	60	12.81	13.32	13.88	14.49	15.91
08-00527-01505		14	2.5	3	2.85	12°	6	60	14.90	15.50	16.16	16.88	18.57
08-00527-01506		16	2.5	3	2.85	12°	6	60	16.98	17.68	18.44	19.27	21.22
08-00527-01508		20	2.5	3	2.85	12°	6	65	21.16	22.04	23.00	24.06	26.53
08-00527-01509		25	2.5	3	2.85	12°	6	65	26.37	27.48	28.70	30.04	Free
08-00527-01510		30	2.5	3	2.85	12°	6	70	31.58	32.93	34.40	36.03	Free
08-00527-01511		35	2.5	3	2.85	12°	6	80	36.80	38.38	40.11	42.01	Free
08-00527-01512		40	2.5	3	2.85	12°	6	90	42.01	43.83	45.81	Free	Free

Code No.	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°
									08-00527-01750	R1.75	15	2.8	3.5
08-00527-01754	20	2.8	3.5	3.35	12°	6	65	21.14	22.01		22.96	24.01	Free
08-00527-01751	25	2.8	3.5	3.35	12°	6	65	26.37	27.47		28.69	30.03	Free
08-00527-01755	30	2.8	3.5	3.35	12°	6	70	31.57	32.91		34.37	35.98	Free
08-00527-01752	35	2.8	3.5	3.35	12°	6	80	36.79	38.37		40.10	Free	Free
08-00527-01756	40	2.8	3.5	3.35	12°	6	90	42.00	43.80		45.77	Free	Free
08-00527-01753	45	2.8	3.5	3.35	12°	6	90	47.22	49.27		Free	Free	Free
08-00527-02000	R2	8	3	4	3.8	-	4	65	8.74	9.05	9.38	9.74	10.60
08-00527-02001		8	3	4	3.8	12°	6	65	8.74	9.05	9.38	9.74	10.60
08-00527-02002		10	3	4	3.8	12°	6	65	10.83	11.22	11.66	12.14	13.25
08-00527-02003		12	3	4	3.8	12°	6	65	12.91	13.40	13.94	14.53	15.91
08-00527-02101		14	3	4	3.8	12°	6	65	15.00	15.58	16.22	16.92	18.56
08-00527-02004		15	3	4	3.8	12°	6	65	16.04	16.67	17.36	18.12	19.89
08-00527-02006		20	3	4	3.8	12°	6	65	21.26	22.12	23.06	24.10	Free
08-00527-02008		25	3	4	3.8	12°	6	70	26.47	27.57	28.77	30.09	Free
08-00527-02010		30	3	4	3.8	12°	6	70	31.68	33.01	34.47	Free	Free
08-00527-02011		35	3	4	3.8	12°	6	80	36.90	38.46	40.17	Free	Free
08-00527-02012		40	3	4	3.8	12°	6	85	42.11	43.91	Free	Free	Free
08-00527-02013		45	3	4	3.8	12°	6	90	47.33	49.36	Free	Free	Free
08-00527-02014		50	3	4	3.8	12°	6	100	52.54	54.80	Free	Free	Free
08-00527-02500	R2.5	10	3.5	5	4.8	12°	6	70	10.81	11.18	11.59	12.04	Free
08-00527-02501		15	3.5	5	4.8	12°	6	70	16.02	16.63	17.29	Free	Free
08-00527-02502		20	3.5	5	4.8	12°	6	70	21.24	22.08	Free	Free	Free
08-00527-02503		25	3.5	5	4.8	12°	6	70	26.45	27.52	Free	Free	Free
08-00527-02504		30	3.5	5	4.8	12°	6	80	31.66	Free	Free	Free	Free
08-00527-02506	40	3.5	5	4.8	12°	6	90	42.09	Free	Free	Free	Free	
08-00527-03000	R3	10	6	6	5.7	-	6	70	Free	Free	Free	Free	Free
08-00527-03001		15	6	6	5.7	-	6	70	Free	Free	Free	Free	Free
08-00527-03002		20	6	6	5.7	-	6	70	Free	Free	Free	Free	Free
08-00527-03003		25	6	6	5.7	-	6	70	Free	Free	Free	Free	Free
08-00527-03004		30	6	6	5.7	-	6	80	Free	Free	Free	Free	Free
08-00527-03007		35	6	6	5.7	-	6	85	Free	Free	Free	Free	Free
08-00527-03005		40	6	6	5.7	-	6	90	Free	Free	Free	Free	Free
08-00527-03006		50	6	6	5.7	-	6	120	Free	Free	Free	Free	Free
08-00527-03008	60	6	6	5.7	-	6	120	Free	Free	Free	Free	Free	

Stainless Steel M
Titanium Alloy Heat Resistant Alloy S

Stainless Steel M
Titanium Alloy Heat Resistant Alloy S

Long Neck Ball Coating

Long Neck Ball Coating

How to Order

When you order, indicate MRBH230 (R)×(ℓ1)×(d). ※(γ) is reference value.

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H

Stainless Steel M
Titanium Alloy Heat Resistant Alloy S

Long Neck Ball Coating

Work Material			Hardened Steels SKD61・STAVAX・HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Under Neck Length	L/D	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
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
	0.3	3.0	0.003	0.005	100	40,000	0.002	0.005	70	40,000	0.002	0.003	50	40,000
	0.5	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	0.3	2.0	0.003	0.005	180	40,000	0.002	0.005	150	40,000	0.002	0.003	100	40,000
	0.5	3.3	0.003	0.005	150	40,000	0.002	0.005	120	40,000	0.002	0.003	70	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
0.1	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
	0.5	2.5	0.008	0.01	320	40,000	0.005	0.005	280	40,000	0.003	0.003	180	40,000
	0.75	3.8	0.005	0.01	280	40,000	0.003	0.005	200	40,000	0.002	0.003	150	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
	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
	3	15.0	0.001	0.001	50	40,000	0.001	0.001	40	40,000	0.001	0.001	30	40,000
0.15	0.5	1.7	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	6.7	0.003	0.005	150	40,000	0.002	0.003	120	40,000	0.002	0.002	90	40,000
	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
0.2	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
	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
	0.8	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
	1.5	3.8	0.01	0.03	620	40,000	0.01	0.02	500	40,000	0.005	0.01	400	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
	2.5	6.3	0.007	0.01	420	40,000	0.005	0.007	300	40,000	0.003	0.005	260	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
0.25	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
	6	15.0	0.001	0.002	50	30,000	0.001	0.001	40	30,000	0.001	0.001	30	30,000
	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
	1.5	3.0	0.02	0.05	850	40,000	0.01	0.03	720	40,000	0.007	0.02	520	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
	2.5	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
0.3	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
	8	16.0	0.002	0.002	75	30,000	0.001	0.002	60	30,000	0.001	0.002	50	30,000
	10	20.0	0.001	0.002	40	20,000	0.001	0.002	30	20,000	0.001	0.001	20	20,000

Work Material			Hardened Steels SKD61・STAVAX・HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Under Neck Length	L/D	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
0.3	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
	1.5	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
	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
	2.5	4.2	0.03	0.05	1,200	40,000	0.02	0.04	840	40,000	0.02	0.03	640	30,000
	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
	7	11.7	0.005	0.007	400	25,000	0.003	0.005	300	25,000	0.003	0.003	260	20,000
0.35	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	16.7	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
	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
	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
	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
	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
	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
0.4	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
	10	12.5	0.005	0.005	450	25,000	0.003	0.003	380	25,000	0.002	0.003	320	20,0

Work Material			Hardened Steels SKD61・STAVAX・HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed mm/min	Spindle Speed min ⁻¹	Depth of Cut		Feed mm/min	Spindle Speed min ⁻¹	Depth of Cut		Feed mm/min	Spindle Speed min ⁻¹
			ap mm	ae mm			ap mm	ae mm			ap mm	ae mm		
0.6	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
	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	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	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
	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
	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	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
1	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	0.5	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
	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
	30	15.0	0.02	0.03	360	12,000	0.01	0.02	300	10,000	0.008	0.01	240	8,500
	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	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

Work Material			Hardened Steels SKD61・STAVAX・HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)				
Radius	Under Neck Length	L/D	Depth of Cut		Feed mm/min	Spindle Speed min ⁻¹	Depth of Cut		Feed mm/min	Spindle Speed min ⁻¹	Depth of Cut		Feed mm/min	Spindle Speed min ⁻¹	
			ap mm	ae mm			ap mm	ae mm			ap mm	ae mm			
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	
	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	
	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	
	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	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	
2	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	
	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	
	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	
	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											