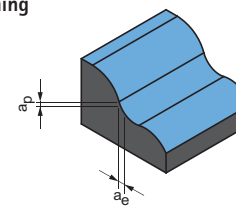


Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

Roughing



Plunge angle
1.0° - 3.0°

Next page:
Finishing

OptiMill-3D-BN-Hardened | MBN107

MMG*	Workpiece material	Strength/hardness [N/mm ²] [HRC]	Cooling			a _p [mm] in % of D	a _e [mm] in % of D	v _c [m/min]	f _z [mm]																				
			MQL/Air	Dry	Coolant				Diameter of milling cutter [mm]																				
									0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	1.80	2.00	2.50	3.00	4.00	5.00	6.00	8.00	10.00	12.00	16.00	
P	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700	✓	✓	✓	5	< 25	250-300	0.003	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.028	0.035	0.040	0.050	0.061	0.084	0.107	0.125	0.165	0.200	0.235	0.300
	P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200	✓	✓	✓	4.5	< 25	240-280	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.018	0.025	0.031	0.035	0.044	0.054	0.074	0.094	0.110	0.145	0.176	0.207	0.264
	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900	✓	✓	✓	5	< 25	250-300	0.003	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.028	0.035	0.040	0.050	0.061	0.084	0.107	0.125	0.165	0.200	0.235	0.300
	P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400	✓	✓	✓	4.5	< 25	240-280	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.018	0.025	0.031	0.035	0.044	0.054	0.074	0.094	0.110	0.145	0.176	0.207	0.264
	P3.1	Tool, bearing, spring and high-speed steels**	< 800	✓	✓	✓	5	< 25	250-300	0.003	0.004	0.006	0.008	0.010	0.011	0.015	0.019	0.027	0.033	0.038	0.048	0.058	0.080	0.102	0.119	0.157	0.190	0.223	0.285
	P3.2	Tool, bearing, spring and high-speed steels**	< 1000	✓	✓	✓	4.5	< 20	240-280	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.018	0.025	0.031	0.035	0.044	0.054	0.074	0.094	0.110	0.145	0.176	0.207	0.264
P3.3	Tool, bearing, spring and high-speed steels**	< 1500	✓	✓	✓	4	< 20	220-260	0.002	0.003	0.004	0.006	0.007	0.009	0.012	0.015	0.020	0.026	0.029	0.037	0.045	0.061	0.078	0.091	0.120	0.146	0.172	0.219	
P4	P4.1	Stainless steels, ferritic and martensitic		✓		✓	5	< 25	240-280	0.003	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.028	0.035	0.040	0.050	0.061	0.084	0.107	0.125	0.165	0.200	0.235	0.300
P5	P5.1	Cast steel		✓		✓	5	< 25	240-280	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.018	0.025	0.031	0.035	0.044	0.054	0.074	0.094	0.110	0.145	0.176	0.207	0.264
P6	P6.1	Stainless cast steel, ferritic and martensitic		✓		✓	4.5	< 25	200-250	0.002	0.003	0.004	0.006	0.007	0.009	0.012	0.015	0.020	0.026	0.029	0.037	0.045	0.061	0.078	0.091	0.120	0.146	0.172	0.219
K	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300	✓	✓	✓	6	< 30	250-300	0.004	0.005	0.007	0.010	0.012	0.014	0.019	0.024	0.034	0.042	0.048	0.060	0.073	0.101	0.128	0.150	0.198	0.240	0.282	0.360
	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓	✓	6	< 30	250-300	0.003	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.028	0.035	0.040	0.050	0.061	0.084	0.107	0.125	0.165	0.200	0.235	0.300
	K2.2	Cast iron with spheroidal graphite, GJS	≤ 800	✓	✓	✓	6	< 30	240-280	0.003	0.004	0.006	0.008	0.010	0.012	0.016	0.020	0.028	0.035	0.040	0.050	0.061	0.084	0.107	0.125	0.165	0.200	0.235	0.300
	K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓	✓	6	< 30	240-280	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.018	0.025	0.031	0.035	0.044	0.054	0.074	0.094	0.110	0.145	0.176	0.207	0.264
	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500	✓	✓	✓	6	< 30	250-300	0.002	0.003	0.004	0.006	0.007	0.009	0.012	0.015	0.020	0.026	0.029	0.037	0.045	0.061	0.078	0.091	0.120	0.146	0.172	0.219
	K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500	✓	✓	✓	6	< 30	240-280	0.002	0.002	0.004	0.005	0.006	0.007	0.010	0.012	0.017	0.022	0.025	0.031	0.038	0.052	0.066	0.078	0.102	0.124	0.146	0.186
H	H1.1	Hardened steel / cast steel	< 44	✓	✓		4	< 18	220-280	0.002	0.003	0.004	0.006	0.007	0.009	0.012	0.015	0.020	0.026	0.029	0.037	0.045	0.061	0.078	0.091	0.120	0.146	0.172	0.219
	H1.2	Hardened steel / cast steel	< 55	✓	✓		3	< 12	160-220	0.002	0.002	0.004	0.005	0.006	0.007	0.010	0.012	0.017	0.021	0.024	0.030	0.037	0.050	0.064	0.075	0.099	0.120	0.141	0.180
	H2.1	Hardened steel / cast steel	< 60	✓			1.5	< 3	100-160	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.008	0.011	0.014	0.016	0.020	0.024	0.034	0.043	0.050	0.066	0.080	0.094	0.120
	H2.2	Hardened steel / cast steel	< 65	✓			0.8	< 1.8	60-100	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.008	0.011	0.012	0.015	0.018	0.025	0.032	0.038	0.050	0.060	0.071	0.090
	H2.3	Hardened steel / cast steel	< 68	✓			0.5	< 1.5	40-80	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.006	0.008	0.009	0.011	0.013	0.019	0.024	0.028	0.036	0.044	0.052	0.066
	H3	H3.1	Wear-resistant cast/chill casting, GJN		✓	✓		1.5	< 3	100-160	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.008	0.011	0.014	0.016	0.020	0.024	0.034	0.043	0.050	0.066	0.080	0.094

Working depth correction factor - k_{AT}

AT	k _{AT}		
	a _p	n	v _f
≤ 3xD	1,00	1,00	1,00
≤ 5xD	0,80	0,90	0,90
≤ 6xD	0,70	0,85	0,85
≤ 8xD	0,60	0,75	0,75
≤ 10xD	0,50	0,70	0,70
≤ 12xD	0,45***	0,65	0,65
≤ 15xD	0,40***	0,60	0,60
≤ 20xD	0,35***	0,60	0,60
≤ 25xD	0,35***	0,50	0,50
≤ 30xD	0,30***	0,50	0,50
≤ 35xD	0,30***	0,50	0,50

Cone angle correction factor - k_{KW}

φ [°]	k _{KW}		
	a _p	n	v _f
0	1,00	1,00	1,00
0,5	1,01	1,01	1,01
1	1,02	1,02	1,02
1,5	1,03	1,03	1,03
3	1,06	1,06	1,06

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** Consultation with a MAPAL application engineer.

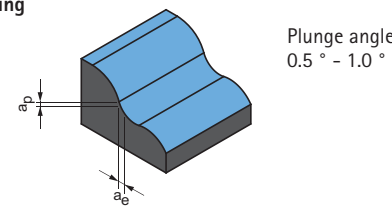
The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.

Cutting data recommendations for Ball nose milling cutter

Feed and cutting speed

Finishing



OptiMill-3D-BN-Hardened | MBN107

MMG*	Workpiece material	Strength/hardness [N/mm ²] [HRC]	Cooling			a _p [mm] in % of D	a _e [mm] in % of D	v _c [m/min]	f _z [mm]																				
			MQL/Air	Dry	Coolant				Diameter of milling cutter [mm]																				
									0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	1.80	2.00	2.50	3.00	4.00	5.00	6.00	8.00	10.00	12.00	16.00	
P	P1.1	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 700	✓	✓	✓	1.5	2.5	280-340	0.003	0.004	0.006	0.008	0.010	0.011	0.015	0.019	0.027	0.033	0.038	0.048	0.058	0.080	0.102	0.119	0.157	0.190	0.223	0.285
	P1.2	Structural, free-cutting, case hardened and heat-treated steels, non-alloy	< 1200	✓	✓	✓	1.4	2.4	280-320	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
	P2.1	Nitrided, case hardened and heat-treated steels, alloy	< 900	✓	✓	✓	1.4	2.4	270-320	0.003	0.004	0.006	0.008	0.010	0.011	0.015	0.019	0.027	0.033	0.038	0.048	0.058	0.080	0.102	0.119	0.157	0.190	0.223	0.285
	P2.2	Nitrided, case hardened and heat-treated steels, alloy	< 1400	✓	✓	✓	1.3	2.3	260-300	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
	P3.1	Tool, bearing, spring and high-speed steels**	< 800	✓	✓	✓	1.3	2.3	280-320	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.018	0.025	0.032	0.036	0.045	0.055	0.076	0.097	0.113	0.149	0.181	0.212	0.271
	P3.2	Tool, bearing, spring and high-speed steels**	< 1000	✓	✓	✓	1.2	2.2	260-300	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
P3.3	Tool, bearing, spring and high-speed steels**	< 1500	✓	✓	✓	1	2	240-280	0.002	0.003	0.004	0.006	0.007	0.008	0.011	0.014	0.019	0.024	0.028	0.035	0.042	0.058	0.074	0.087	0.114	0.139	0.163	0.208	
P4	P4.1	Stainless steels, ferritic and martensitic		✓		✓	1.3	2.3	260-300	0.003	0.004	0.006	0.008	0.010	0.011	0.015	0.019	0.027	0.033	0.038	0.048	0.058	0.080	0.102	0.119	0.157	0.190	0.223	0.285
P5	P5.1	Cast steel		✓		✓	1.3	2.3	260-300	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
P6	P6.1	Stainless cast steel, ferritic and martensitic		✓		✓	1.2	2.2	220-270	0.002	0.003	0.004	0.006	0.007	0.008	0.011	0.014	0.019	0.024	0.028	0.035	0.042	0.058	0.074	0.087	0.114	0.139	0.163	0.208
K	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300	✓	✓	✓	1.5	2.5	280-340	0.003	0.004	0.006	0.008	0.010	0.011	0.015	0.019	0.027	0.033	0.038	0.048	0.058	0.080	0.102	0.119	0.157	0.190	0.223	0.285
	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓	✓	1.4	2.4	280-320	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
	K2.2	Cast iron with spheroidal graphite, GJS	≤ 800	✓	✓	✓	1.3	2.3	270-320	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
	K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓	✓	1.2	2.2	260-300	0.003	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.042	0.051	0.070	0.089	0.105	0.138	0.167	0.196	0.251
	K3.1	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	< 500	✓	✓	✓	1.4	2.4	280-320	0.002	0.003	0.004	0.006	0.007	0.008	0.011	0.014	0.019	0.024	0.028	0.035	0.042	0.058	0.074	0.087	0.114	0.139	0.163	0.208
	K3.2	Cast iron with spheroidal graphite, GJV; malleable cast iron, GJM	> 500	✓	✓	✓	1.3	2.3	260-300	0.002	0.002	0.004	0.005	0.006	0.007	0.009	0.012	0.017	0.021	0.024	0.029	0.036	0.050	0.063	0.074	0.097	0.118	0.139	0.177
H	H1.1	Hardened steel / cast steel	< 44	✓	✓		1.2	2.2	250-300	0.003	0.004	0.005	0.007	0.009	0.011	0.015	0.018	0.026	0.032	0.037	0.046	0.056	0.077	0.098	0.114	0.151	0.183	0.215	0.274
	H1.2	Hardened steel / cast steel	< 55	✓	✓		1	2	200-250	0.002	0.003	0.005	0.007	0.008	0.010	0.013	0.017	0.023	0.029	0.033	0.041	0.051	0.070	0.089	0.104	0.137	0.166	0.195	0.249
	H2.1	Hardened steel / cast steel	< 60	✓			0.8	1.8	130-200	0.002	0.003	0.005	0.006	0.008	0.009	0.012	0.015	0.021	0.026	0.030	0.038	0.046	0.063	0.081	0.094	0.124	0.151	0.177	0.226
	H2.2	Hardened steel / cast steel	< 65	✓			0.6	1.6	100-150	0.002	0.003	0.004	0.005	0.007	0.008	0.011	0.014	0.019	0.024	0.027	0.034	0.042	0.058	0.073	0.086	0.113	0.137	0.161	0.206
	H2.3	Hardened steel / cast steel	< 68	✓			0.5	1.5	70-120	0.001	0.002	0.003	0.004	0.005	0.006	0.008	0.010	0.013	0.017	0.024	0.029	0.040	0.051	0.060	0.079	0.096	0.113	0.144	
	H3	H3.1	Wear-resistant cast/chill casting, GJN		✓	✓		0.8	1.8	130-200	0.002	0.003	0.005	0.006	0.008	0.009	0.012	0.015	0.021	0.026	0.030	0.038	0.046	0.063	0.081	0.094	0.124	0.151	0.177

Working depth correction factor - k_{AT}

AT	k _{AT}		
	a _p	n	v _f
≤ 3xD	1,00	1,00	1,00
≤ 5xD	0,80	0,90	0,90
≤ 6xD	0,70	0,85	0,85
≤ 8xD	0,60	0,75	0,75
≤ 10xD	0,50	0,70	0,70
≤ 12xD	0,45***	0,65	0,65
≤ 15xD	0,40***	0,60	0,60
≤ 20xD	0,35***	0,60	0,60
≤ 25xD	0,35***	0,50	0,50
≤ 30xD	0,30***	0,50	0,50
≤ 35xD	0,30***	0,50	0,50

Cone angle correction factor - k_{KW}

φ [°]	k _{KW}		
	a _p	n	v _f
0	1,00	1,00	1,00
0,5	1,01	1,01	1,01
1	1,02	1,02	1,02
1,5	1,03	1,03	1,03
3	1,06	1,06	1,06

* MAPAL machining groups

** If the alloy parts Cr, Mo, Ni, V, W in total > 8%, then select the next highest MAPAL machining group.

*** Consultation with a MAPAL application engineer.

The specified machining values are guide values.

The optimum data for the respective machining task should be determined during the test or machining.