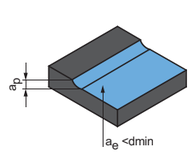
Cutting data recommendations for high-feed milling cutters

Feed and cutting speed

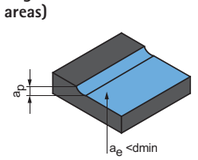
Roughing



OptiMill-3D-HF-Hardened | MHF102, 103

MMG*		Workpiece material	Strength/hardness [N/mm²] [HRC]	Cooling			a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]								
										Diameter of milling cutter [mm]								
				Dry	Air/MQL	KSS				2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.00	16.00
P	P1	P1.1	Structural, machining, case hardened and tempering steels, unalloyed	< 700	✓	✓		0.042xD	0.6xD	**280–340**	0.100	0.130	0.180	0.210	0.250	0.350	0.460	0.580	0.700
		P1.2	Structural, machining, case hardened and tempering steels, unalloyed	< 1,200	✓	✓		0.042xD	0.6xD	**240–300**	0.080	0.110	0.160	0.190	0.230	0.310	0.430	0.520	0.620
	P2	P2.1	Nitriding, hardening and tempering steels, alloyed	< 900	✓	✓		0.042xD	0.6xD	**260–320**	0.100	0.130	0.180	0.210	0.250	0.350	0.450	0.560	0.650
		P2.2	Nitriding, hardening and tempering steels, alloyed	< 1,400	✓	✓		0.042xD	0.65xD	**240–300**	0.080	0.100	0.150	0.180	0.220	0.310	0.410	0.500	0.580
	P3	P3.1	Tool, bearing, spring and high-speed steels**	< 800	✓	✓		0.042xD	0.6xD	**280–340**	0.100	0.130	0.170	0.200	0.240	0.340	0.430	0.520	0.620
		P3.2	Tool, bearing, spring and high-speed steels**	< 1,000	✓	✓		0.042xD	0.65xD	**260–300**	0.090	0.100	0.150	0.180	0.220	0.300	0.390	0.460	0.580
		P3.3	Tool, bearing, spring and high-speed steels**	< 1,500	✓	✓		0.042xD	0.65xD	**240–280**	0.080	0.100	0.140	0.170	0.210	0.290	0.380	0.440	0.560
	P4	P4.1	Stainless steels, ferritic and martensitic			✓	✓	0.042xD	0.6xD	**160–200**	0.100	0.130	0.180	0.210	0.250	0.350	0.400	0.500	0.620
	P5	P5.1	Cast steel			✓	✓	0.042xD	0.6xD	**180–220**	0.100	0.110	0.160	0.200	0.230	0.330	0.380	0.470	0.590
	P6	P6.1	Stainless cast steels, ferritic and martensitic			✓	✓	0.042xD	0.6xD	**160–200**	0.100	0.110	0.160	0.200	0.230	0.320	0.370	0.450	0.570
K	K1	K1.1	Cast iron with lamellar graphite (grey cast iron), GJL	< 300	✓	✓		0.042xD	0.7xD	**250–300**	0.100	0.130	0.180	0.210	0.250	0.350	0.460	0.580	0.700
	K2	K2.1	Cast iron with spheroidal graphite, GJS	< 500	✓	✓		0.042xD	0.7xD	**250–300**	0.080	0.110	0.160	0.190	0.230	0.310	0.430	0.520	0.620
		K2.2	Cast iron with spheroidal graphite, GJS	≤ 800	✓	✓		0.042xD	0.7xD	**200–250**	0.100	0.130	0.180	0.210	0.250	0.350	0.450	0.560	0.650
		K2.3	Cast iron with spheroidal graphite, GJS	> 800	✓	✓		0.042xD	0.7xD	**200–250**	0.080	0.100	0.150	0.180	0.220	0.310	0.410	0.500	0.580
	K3	K3.1	Cast iron with vermicular graphite, GJV; malleable cast iron, GJM	< 500	✓	✓		0.042xD	0.7xD	**220–270**	0.100	0.130	0.180	0.210	0.250	0.350	0.450	0.560	0.650
		K3.2	Cast iron with vermicular graphite, GJV; malleable cast iron, GJM	> 500	✓	✓		0.042xD	0.7xD	**200–250**	0.080	0.100	0.150	0.180	0.220	0.310	0.410	0.500	0.580
H	H1	H1.1	Hardened steel/cast steel	< 44	✓	✓		0.042xD		**180–250**	0.071	0.103	0.135	0.170	0.210	0.280	0.350	0.420	0.560
		H1.2	Hardened steel/cast steel	< 55	✓	✓		0.042xD	0.65xD	**150–200**	0.066	0.096	0.127	0.158	0.190	0.256	0.320	0.385	0.510
	H2	H2.1	Hardened steel/cast steel	< 60	✓			0.040xD	0.55xD	**110–150**	0.062	0.083	0.106	0.142	0.172	0.220	0.280	0.330	0.420
		H2.2	Hardened steel/cast steel	< 65	✓			0.030xD	0.4xD	**80–120**	0.044	0.065	0.086	0.109	0.131	0.170	0.210	0.245	0.305
		H2.3	Hardened steel/cast steel	< 68	✓			0.022xD	0.35xD	**60–85**	0.027	0.046	0.066	0.084	0.100	0.130	0.150	0.180	0.210
	H3	H3.1	Wear-resistant cast / chill casting, GJN		✓	✓		0.035xD	0.45xD	**90–120**	0.055	0.070	0.090	0.120	0.140	0.180	0.220	0.250	0.320

Finishing (flat areas)



OptiMill-3D-HF-Hardened | MHF102, 103

MMG*		Workpiece material	Strength/hardness [N/mm²] [HRC]	Cooling			a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]								
										Diameter of milling cutter [mm]								
				Dry	Air/MQL	KSS				2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.00	16.00
	H2	H2.1	Hardened steel/cast steel	< 60		✓		0.080xD	0.8xD	**160–185**	0.040	0.048	0.058	0.072	0.105	0.144	0.182	0.210	0.290
		H2.2	Hardened steel/cast steel	< 65		✓		0.040xD	0.72xD	**130–170**	0.028	0.037	0.046	0.063	0.084	0.110	0.148	0.174	0.221
		H2.3	Hardened steel/cast steel	< 68		✓		0.020xD	0.6xD	**110–130**	0.018	0.028	0.038	0.055	0.070	0.082	0.118	0.140	0.162
	H3	H3.1	Wear-resistant cast / chill casting, GJN		✓	✓		0.060xD	0.8xD	**160–180**	0.038	0.042	0.055	0.070	0.092	0.128	0.160	0.190	0.270

For finishing operations on planar surfaces, depending on the material removal rate (a_e) and the selected machining strategy, residual material may remain on the part.
For this reason, $a_e < d_{min}$ should be selected for planar surfaces.

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

The specified machining values are guide values.
The optimum data for the respective machining task should be determined during the test or machining.