









TuffCut® SS






112 / 113 Recommended Cutting Data - Profile Milling

Inch

Workpiece Material Group	ISO	Hardness	Coolant					Profile Milling (ae)					End Mill Diameter								
			● Preferred ○ Possible x Not Possible					    					1/8*	3/16*	1/4*	5/16	3/8	1/2	5/8	3/4	1
						2.3	1.8	1.2	1.1	1	*Profile milling at ≥ 50% ap is not recommended for diameters 1/4" and below.										
			Max.	Air	MMS	vc - SFM					← Multiply fz by this Factor based on ae. When finishing, use the standard fz per chart below. Only add chip thinning when roughing or semi-finishing.										
												fz - in/tooth									
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	●	●	●	1200	800	600	440	400	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	●	●	●	720	480	320	265	240	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	●	●	●	600	400	320	220	200	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Hardened Steels	H	35-45 Rc	●	○	○	480	320	250	175	160	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Hardened Steels		45-55 Rc	●	○	○	360	240	200	175	150	.0004	.0007	.0017	.0021	.0024	.0035	.0042	.0049	.0070		
Hardened Steels		55-65 Rc	●	○	○	320	220	175	150	100	.0003	.0005	.0012	.0014	.0017	.0024	.0028	.0033	.0047		
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	M	up to 28 Rc	●	x	○	1200	800	500	440	400	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	○	600	400	300	220	200	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	●	x	○	600	400	300	220	200	.0006	.0008	.0010	.0024	.0028	.0039	.0047	.0055	.0070		
High Temp Alloys Nimonic, Inconel, Monel, Hastelloy	S	up to 42 Rc	●	x	x	300	200	150	110	100	.0004	.0005	.0013	.0016	.0018	.0026	.0032	.0037	.0053		
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	●	x	x	260	175	125	100	95	.0004	.0005	.0013	.0016	.0018	.0026	.0032	.0037	.0053		
Cast-Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	●	○	○	400	350	325	300	250	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	●	○	○	230	200	190	175	150	.0007	.0011	.0026	.0032	.0037	.0053	.0063	.0074	.0100		

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Metric

Workpiece Material Group	ISO	Hardness	Coolant			Profile Milling (ae)					End Mill Diameter (mm)								
			● Preferred ○ Possible x Not Possible								3*	5*	6*	8	10	12	16	20	25
			Max.	Air	MMS	5%	10%	20%	30%	50%	*Profile milling at ≥ 50% ap is not recommended for diameters 6mm and below.								
						vc - m/min					← Multiply fz by this Factor based on ae. When finishing, use the standard fz per chart below. Only add chip thinning when roughing or semi-finishing.								
								fz - mm/tooth											
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	●	●	●	365	250	180	135	120	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	●	●	●	220	150	100	80	75	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A 128, D2, D3, D4, D5, D7	P	28 to 44 Rc	●	●	●	185	125	100	70	60	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Hardened Steels	H	35-45 Rc	●	○	○	145	100	75	55	50	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Hardened Steels		45-55 Rc	●	○	○	110	75	60	55	45	.0102	.0178	.0432	.0533	.0610	.0889	.1067	.1245	.1776
Hardened Steels		55-65 Rc	●	○	○	100	70	55	45	30	.0076	.0127	.0305	.0356	.0432	.0610	.0710	.0838	.1194
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	M	up to 28 Rc	●	x	○	365	250	150	135	120	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	○	185	125	95	70	60	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	●	x	○	185	125	95	70	60	.0152	.0203	.0254	.0610	.0711	.0991	.1194	.1397	.1778
High Temp Alloys Nimonic, Inconel, Monel, Hastelloy	S	up to 42 Rc	●	x	x	90	60	45	35	30	.0102	.0127	.0330	.0406	.0457	.0660	.0813	.0940	.1346
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	●	x	x	80	55	40	30	25	.0102	.0127	.0330	.0406	.0457	.0660	.0813	.0940	.1346
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	●	○	○	125	110	100	90	75	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	●	○	○	70	65	60	55	45	.0178	.0279	.0660	.0813	.0940	.1346	.1600	.1880	.2540