TuffCut DM®

192 Series Recommended Cutting Data - Profile Milling - **Inch**

Workpiece Material Group	ISO	Hardness	Coolant • Preferred o Possible x Not Possible			Profile Milling (ae)*					End Mill Diameter (inch)				
											1/4	3/8	1/2	5/8	3/4
						5%	10%	20%	30%	50%	*ap < .7D Stub Length ap < 1.5D Standard Length				
			Emulsion	Compressed Air	MQL	2.3	1.8	1.2	1.1	1	← 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.				
						vc - SFM					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	•	•	•	1485	1485	1155	1000	825	.0033	.0047	.0066	.0078	.0090
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	•	•	•	890	890	825	750	660	.0033	.0047	.0066	.0078	.0090
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	•	•	•	750	750	660	560	430	.0033	.0047	.0066	.0078	.0090
Hardened Steels	H	35-45 Rc	•	o	o	450	450	410	300	165	.0029	.0039	.0059	.0070	.0078
Hardened Steels	H	45-55 Rc	•	o	o	380	380	350	250	150	.0020	.0029	.0039	.0051	.0061
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	M	up to 28 Rc	•	x	o	500	500	430	400	350	.0033	.0047	.0066	.0078	.0090
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	o	430	430	400	370	330	.0025	.0033	.0049	.0059	.0066
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	•	x	o	430	430	400	360	330	.0025	.0033	.0049	.0059	.0066
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	•	x	x	165	165	130	115	100	.0008	.0011	.0017	.0019	.0023
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	400	400	370	300	250	.0008	.0011	.0017	.0019	.0023
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	•	o	o	1180	1180	1120	800	630	.0033	.0047	.0066	.0078	.0090
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	•	o	o	530	530	500	460	430	.0033	.0047	.0066	.0078	.0090

Spindle Maximum - Should the calculated spindle speed be more than your actual spindle maximum, use this formula:
(Calculated Feed x Spindle Maximum)/Calculated Speed.

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

TuffCut DM®

192 Series Recommended Cutting Data - Profile Milling - **Metric**

Workpiece Material Group	ISO	Hardness	Coolant • Preferred o Possible x Not Possible			Profile Milling (ae)*					End Mill Diameter (mm)				
						5%	10%	20%	30%	50%	8	10	12	16	20
											*ap < .7D Stub Length ap < 1.5D Standard Length				
			Emulsion	Compressed Air	MQL	2.3	1.8	1.2	1.1	1	← 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.				
						vc - m/min					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	•	•	•	450	450	350	300	250	.1000	.1200	.1700	.2000	.2300
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	•	•	•	270	270	250	230	200	.1000	.1200	.1700	.2000	.2300
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	•	•	•	230	230	200	170	130	.1000	.1200	.1700	.2000	.2300
Hardened Steels	H	35-45 Rc	•	o	o	135	135	125	90	50	.0900	.1000	.1500	.1800	.2000
Hardened Steels	H	45-55 Rc	•	o	o	115	115	105	75	45	.0660	.0760	.1000	.1320	.1550
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	M	up to 28 Rc	•	x	o	155	155	130	125	110	.1000	.1200	.1700	.2000	.2300
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	o	130	130	125	115	100	.1000	.1200	.1700	.2000	.2300
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	•	x	o	130	130	120	110	100	.0760	.0860	.1250	.1500	.1750
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	•	x	x	50	50	40	35	30	.0500	.0600	.0850	.1000	.1200
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	125	125	115	90	75	.1000	.1200	.1700	.2000	.2300
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	•	o	o	360	360	340	245	195	.1000	.1200	.1700	.2000	.2300
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	•	o	o	165	165	155	140	130	.1000	.1200	.1700	.2000	.2300

Spindle Maximum - Should the calculated spindle speed be more than your actual spindle maximum, use this formula:
(Calculated Feed x Spindle Maximum)/Calculated Speed.

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

TuffCut DM®

192 Series Recommended Cutting Data - Slotting - **Inch**

Workpiece Material Group	ISO	Hardness	Coolant • Preferred o Possible x Not Possible			Slotting*			End Mill Diameter (inch)				
									1/4*	3/8	1/2	5/8	3/4
			Emulsion	Compressed Air	MQL	25%	50%	100%	*Slotting at > 25% ap is not recommended for Diameters 1/4" and below.				
						vc - SFM			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	•	•	•	800	700	500	.0010	.0020	.0025	.0030	.0035
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	•	•	•	650	550	450	.0010	.0020	.0025	.0030	.0035
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	•	•	•	500	450	400	.0010	.0020	.0025	.0030	.0035
Hardened Steels	H	35-45 Rc	•	o	o	200	180	150	.0010	.0020	.0025	.0030	.0035
Hardened Steels	H	45-55 Rc	•	o	o	180	150	125	.0005	.0010	.0010	.0015	.0020
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	M	up to 28 Rc	•	x	o	400	350	325	.0010	.0020	.0025	.0030	.0035
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	o	320	275	250	.0010	.0020	.0025	.0030	.0035
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	•	x	o	330	275	250	.0010	.0020	.0025	.0030	.0035
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	•	x	x	110	100	95	.0005	.0010	.0010	.0015	.0020
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	230	210	195	.0008	.0009	.0011	.0017	.0019
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	•	o	o	600	550	500	.0010	.0020	.0025	.0030	.0035
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	•	o	o	320	275	250	.0010	.0020	.0025	.0030	.0035

Spindle Maximum - Should the calculated spindle speed be more than your actual spindle maximum, use this formula:
(Calculated Feed x Spindle Maximum)/Calculated Speed.

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

TuffCut DM®

192 Series Recommended Cutting Data - Slotting - **Metric**

Workpiece Material Group	ISO	Hardness	Coolant • Preferred o Possible x Not Possible			Slotting*			End Mill Diameter (mm)				
			Emulsion	Compressed Air	MQL	25%	50%	100%	8	10	12	16	20
						vc - m/min			*Slotting at > 25% ap is not recommended for Diameters 6mm and below. 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	•	•	•	245	215	150	.0400	.0500	.0600	.0800	.1000
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	•	•	•	200	170	140	.0400	.0500	.0600	.0800	.1000
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	•	•	•	150	140	120	.0400	.0500	.0600	.0800	.1000
Hardened Steels	H	35-45 Rc	•	o	o	61	55	45	.0400	.0500	.0600	.0800	.1000
Hardened Steels	H	45-55 Rc	•	o	o	55	45	40	.0200	.0250	.0300	.0400	.0500
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	M	up to 28 Rc	•	x	o	120	110	100	.0400	.0500	.0600	.0800	.1000
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	o	100	85	75	.0400	.0500	.0600	.0800	.1000
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	•	x	o	100	85	75	.0400	.0500	.0600	.0800	.1000
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	•	x	x	35	30	30	.0200	.0250	.0300	.0400	.0500
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	70	65	60	.0200	.0500	.0600	.0800	.1000
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	•	o	o	185	170	150	.0400	.0500	.0600	.0800	.1000
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	•	o	o	100	85	75	.0400	.0500	.0600	.0800	.1000

Spindle Maximum - Should the calculated spindle speed be more than your actual spindle maximum, use this formula:
(Calculated Feed x Spindle Maximum)/Calculated Speed.