

TuffCut® XT

278 / 278CB / 278N Series Recommended Cutting Data - Profile Milling - Inch

Workpiece Material Group	I S O	Hardness	Coolant ● Preferred ○ Possible x Not Possible			Profiling (ae)*				End Mill Diameter (inch)														
										1/8*	3/16*	1/4*	5/16	3/8	1/2	5/8	3/4	1						
			Emulsion	Compressed Air	MQL	5%	10%	25%	50%	*Profile Milling at ≥ 50% ap is not recommended for diameters 1/4" and below.														
						2.3	1.8	1.2	1.0	 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													
Low Carbon Steels 1018, 1020	P	up to 28 Rc	●	●	●	1475	1150	980	500	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Medium Carbon Steels 1140, 1145	P	28 to 38 Rc	●	●	●	1130	900	830	250	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Alloy Steels 4140, 4145	P	28 to 44 Rc	●	●	●	1035	840	755	250	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Die / Tool Steels A2, D2, H13, P20	P	28 to 44 Rc	●	●	●	900	725	615	200	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Hardened Steels A2, D2	H	45 to 50 Rc	●	○	○	610	495	325	250	.0006	.0010	.0012	.0016	.0020	.0024	.0030	.0040	.0050						
Hardened Steels A2, D2	H	50 to 55 Rc	●	○	○	510	410	280	200	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024						
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	●	x	○	675	545	425	360	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Stainless Steel - Austenitic 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	○	525	430	400	210	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	M	up to 28 Rc	●	x	○	410	330	295	210	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						
Stainless Steel - Difficult to Machine 17-4 PH, PH13-8Mo, Nitronics	M	over 28 Rc	●	x	○	525	430	395	110	.0006	.0010	.0012	.0016	.0020	.0024	.0030	.0040	.0050						
Cobalt Chrome Alloys	M		●	x	○	410	325	295	130	.0006	.0010	.0012	.0016	.0020	.0024	.0030	.0040	.0050						
Duplex (22%)	M		●	x	○	245	195	180	130	.0006	.0010	.0012	.0016	.0020	.0024	.0030	.0040	.0050						
Super Duplex (25%)	M		●	x	○	245	195	180	110	.0006	.0010	.0012	.0016	.0020	.0024	.0030	.0040	.0050						
High Temp Alloys	S	up to 42 Rc	●	x	x	180	150	130	85	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024						
Inconel	S		●	x	x	180	150	130	85	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024						
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr-4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	●	x	x	375	350	330	175	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024						
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	●	○	○	1625	1295	870	350	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.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	●	○	○	675	540	510	260	.0012	.0020	.0024	.0031	.0039	.0047	.0060	.0078	.0100						

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® XT

278 / 278CB / 278N Series Recommended Cutting Data - Profile Milling - Metric

Workpiece Material Group	ISO	Hardness	Coolant ● Preferred ○ Possible x Not Possible			Profiling (ae)*				End Mill Diameter (mm)								
										3*	5*	6*	8	10	12	16	20	25
			Emulsion	Compressed Air	MQL	5%	10%	25%	50%	*Profile Milling at ≥ 50% ap is not recommended for diameters 6mm and below. ← 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.								
						2.3	1.8	1.2	1.0									
						vc - m/min				fz - mm/tooth								
Low Carbon Steels 1018, 1020	P	up to 28 Rc	●	●	●	450	350	300	150	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Medium Carbon Steels 1140, 1145	P	28 to 38 Rc	●	●	●	345	275	255	75	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Alloy Steels 4140, 4145	P	28 to 44 Rc	●	●	●	315	255	230	75	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Die / Tool Steels A2, D2, H13, P20	P	28 to 44 Rc	●	●	●	275	220	185	60	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Hardened Steels A2, D2	H	45 to 50 Rc	●	○	○	185	150	100	75	.0150	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Hardened Steels A2, D2	H	50 to 55 Rc	●	○	○	155	125	85	60	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	●	x	○	205	165	130	110	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Stainless Steel - Austenitic 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	○	160	130	120	65	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	M	up to 28 Rc	●	x	○	125	100	90	65	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
Stainless Steel - Difficult to Machine 17-4 PH, PH13-8Mo, Nitronics	M	over 28 Rc	●	x	○	160	130	120	35	.0150	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Cobalt Chrome Alloys	M		●	x	○	125	100	90	40	.0150	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Duplex (22%)	M		●	x	○	75	60	55	40	.0150	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Super Duplex (25%)	M		●	x	○	75	60	55	35	.0150	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
High Temp Alloys	S	up to 42 Rc	●	x	x	55	45	40	25	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Inconel	S		●	x	x	55	45	40	25									
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	115	105	100	55	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
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	●	○	○	495	395	265	110	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500
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	●	○	○	205	165	155	80	.0300	.0500	.0600	.0800	.1000	.1200	.1600	.2000	.2500

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® XT

278 / 278CB / 278N Series Recommended Cutting Data - Slotting - Inch

Workpiece Material Group	I S O	Hardness	Coolant ● Preferred ○ Possible x Not Possible			Slotting*			End Mill Diameter (inch)								
			Emulsion	Compressed Air	MQL				1/8*	3/16*	1/4*	5/16	3/8	1/2	5/8	3/4	1
						25%	50%	100%	*Slotting at > 25% ap is not recommended for diameters 1/4" and below.								
						vc - SFM			fz - in/tooth								
Low Carbon Steels 1018, 1020	P	up to 28 Rc	●	●	●	550	500	475	.0004	.0010	.0012	.0016	.0020	.0025	.0031	.0040	.0050
Medium Carbon Steels 1140, 1145	P	28 to 38 Rc	●	●	●	275	250	225	.0004	.0010	.0012	.0016	.0020	.0025	.0031	.0040	.0050
Alloy Steels 4140, 4145	P	28 to 44 Rc	●	●	●	275	250	225	.0004	.0010	.0012	.0016	.0020	.0025	.0031	.0040	.0050
Die / Tool Steels A2, D2, H13, P20	P	28 to 44 Rc	●	●	●	225	200	175	.0004	.0010	.0012	.0016	.0020	.0025	.0031	.0040	.0050
Hardened Steels A2, D2	H	45 to 50 Rc	●	○	○	275	250	225	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
Hardened Steels A2, D2	H	50 to 55 Rc	●	○	○	225	200	175	.0001	.0002	.0003	.0004	.0005	.0006	.0008	.0010	.0015
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	●	x	○	385	360	350	.0002	.0004	.0008	.0012	.0014	.0018	.0022	.0026	.0038
Stainless Steel - Austenitic 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	○	225	210	200	.0002	.0004	.0008	.0012	.0014	.0018	.0022	.0026	.0038
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	M	up to 28 Rc	●	x	○	225	210	200	.0002	.0004	.0008	.0012	.0014	.0018	.0022	.0026	.0038
Stainless Steel - Difficult to Machine 17-4 PH, PH13-8Mo, Nitronics	M	over 28 Rc	●	x	○	125	110	100	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
Cobalt Chrome Alloys	M		●	x	○	150	130	120	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
Duplex (22%)	M		●	x	○	150	130	120	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
Super Duplex (25%)	M		●	x	○	120	110	100	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
High Temp Alloys	S	up to 42 Rc	●	x	x	100	85	75	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
Inconel	S		●	x	x	95	85	75	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
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	180	175	160	.0003	.0005	.0006	.0008	.0010	.0012	.0016	.0020	.0024
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	●	○	○	375	350	325	.0004	.0010	.0012	.0016	.0020	.0024	.0031	.0040	.0050
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	●	○	○	275	260	250	.0004	.0010	.0012	.0016	.0020	.0024	.0031	.0040	.0050

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

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TuffCut® XT

278 / 278CB / 278N Series Recommended Cutting Data - Slotting - Metric

Workpiece Material Group	ISO	Hardness	Coolant ● Preferred ○ Possible x Not Possible			Slotting*			End Mill Diameter (mm)								
									3*	5*	6*	8	10	12	16	20	25
			Emulsion	Compressed Air	MQL	25%	50%	100%	*Slotting at > 25% ap is not recommended for diameters 6mm and below.								
						vc - m/min			fz - mm/tooth								
Low Carbon Steels 1018, 1020	P	up to 28 Rc	●	●	●	170	150	145	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Medium Carbon Steels 1140, 1145	P	28 to 38 Rc	●	●	●	85	75	70	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Alloy Steels 4140, 4145	P	28 to 44 Rc	●	●	●	85	75	70	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Die / Tool Steels A2, D2, H13, P20	P	28 to 44 Rc	●	●	●	70	60	55	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Hardened Steels A2, D2	H	45 to 50 Rc	●	○	○	85	75	70	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Hardened Steels A2, D2	H	50 to 55 Rc	●	○	○	70	60	55	.0030	.0060	.0070	.0100	.0120	.0150	.0200	.0250	.0370
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	●	x	○	120	110	110	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Stainless Steel - Austenitic 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	○	70	65	60	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	M	up to 28 Rc	●	x	○	70	65	60	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
Stainless Steel - Difficult to Machine 17-4 PH, PH13-8Mo, Nitronics	M	up to 28 Rc	●	x	○	40	35	30	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Cobalt Chrome Alloys	M	over 28 Rc	●	x	○	45	40	40	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Duplex (22%)	M	over 28 Rc	●	x	○	45	40	40	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Super Duplex (25%)	M	over 28 Rc	●	x	○	40	35	30	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
High Temp Alloys	S	up to 42 Rc	●	x	x	30	25	25	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
Inconel	S	up to 42 Rc	●	x	x	30	25	25	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
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	55	55	50	.0070	.0120	.0150	.0200	.0250	.0300	.0400	.0500	.0620
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	●	○	○	115	105	100	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250
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	●	○	○	85	80	75	.0100	.0250	.0300	.0400	.0500	.0600	.0800	.1000	.1250

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.