

MILLING RECOMMENDATIONS

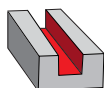


PROFILING

Workpiece Material Group		Hardness	Surface Feet Per Minute (SFM)				Radial Depth of Cut (RDOC)								
			SFM based on RDOC				Inches Per Tooth (IPT)								
			Cutting Diameter Engaged				IPT* (BASELINE)								
			5%	10%	25%	50%	1/8 [†]	3/16 [†]	1/4 [†]	5/16	3/8	1/2	5/8	1/4	1
Steels	Free Machining & Low Carbon, 10XX, 11XX, 12XX 12LXX, ASTM A27, ASTM A36	≤ 28 Rc	1475	1150	980	500	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Medium Carbon Steels, 1140, 1145	28-38 Rc	1130	900	830	250									
	Alloy, 41XX	28-44 Rc	1035	840	755	250									
Tool & Die Steels	A2, D2, H13, L6, P20, S7	28-44 Rc	900	725	615	200									
Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	675	545	425	360	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Austenitic, 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	≤ 28 Rc	525	430	400	210									
	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	≤ 28 Rc	410	330	295	210									
	Difficult to Machine, 17-4 PH, PH13-8Mo, Nitronics	> 28 Rc	525	430	395	110									
	Cobalt Chrome Alloys, ASTM F75, ASTM F562, ASTM, F90:		410	325	295	130									
	22% Duplex	> 28 Rc	245	195	180	130									
25% Super Duplex		245	195	180	110										
Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	180	150	130	85	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	525	425	330	175									
Hardened Materials		45-50 Rc	610	495	325	250	0.0006	0.0010	0.0012	0.0016	0.0020	0.0024	0.0030	0.0040	0.0050
		50-55 Rc	510	410	280	200									
Cast-Iron	Gray, SAE J431, ASTM A48	≤ 240 HB	1625	1295	870	350	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220 ASTM A602	> 240 HB	675	540	510	260									

*CHIP THINNING Adjustments	
RDOC	Increase IPT
50%	None
30%	1.1 x
25%	1.2 x
20%	1.3 x
15%	1.4 x
10%	1.8 x
7%	2.0 x
5%	2.3 x
3%	3.0 x
2%	3.5 x
1%	5.0 x

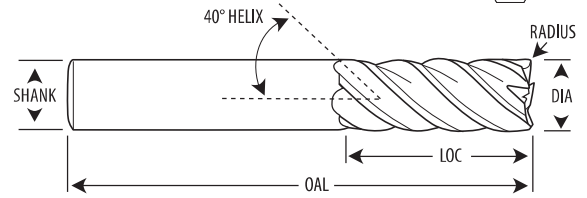
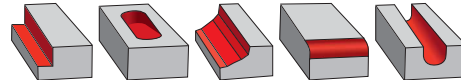
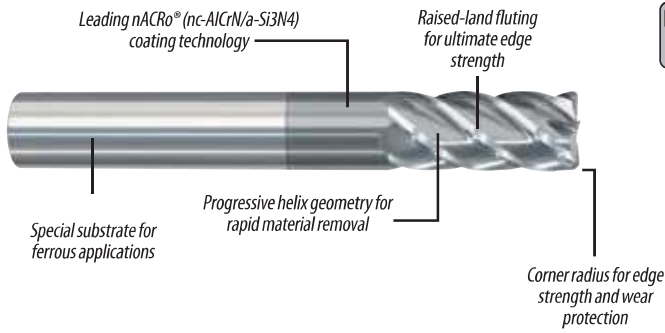
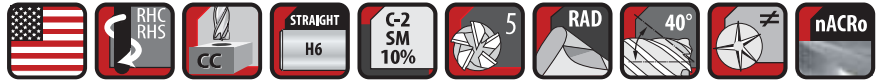
†1/4" AND SMALLER DIAMETERS: Use caution when Profiling more than 50% or Slotting more than 25%



SLOTTING

Workpiece Material Group		Hardness	Surface Feet Per Minute (SFM)			Radial Depth of Cut (RDOC)									
			SFM			IPT									
			Cutting Diameter Engaged			Cutting Diameter									
			25%	50%	100%	1/8 [†]	3/16 [†]	1/4 [†]	5/16	3/8	1/2	5/8	3/4	1	
Steels	Free Machining & Low Carbon, 10XX, 11XX, 12XX 12LXX, ASTM A27, ASTM A36	≤ 28 Rc	550	500	475	0.0004	0.0010	0.0012	0.0016	0.0020	0.0025	0.0031	0.0040	0.0050	
	Medium Carbon Steels, 1140, 1145	28-38 Rc	275	250	225										
	Alloy, 41XX	28-44 Rc	275	250	225										
Tool & Die Steels	A2, D2, H13, L6, P20, S7	28-44 Rc	225	200	175										
Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	275	250	225	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024	
	Austenitic, 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	≤ 28 Rc	225	200	175										
	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	≤ 28 Rc	385	360	350										
	Difficult to Machine, 17-4 PH, PH13-8Mo, Nitronics	> 28 Rc	225	210	200										
	Cobalt Chrome Alloys, ASTM F75, ASTM F562, ASTM, F90:		225	210	200										
	22% Duplex	> 28 Rc	125	110	100										
25% Super Duplex		150	130	120	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024		
Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	135	120	110	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024	
	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	100	85	75										
Hardened Materials		45-50 Rc	95	85	75	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024	
		50-55 Rc	180	175	160										
Cast-Iron	Gray, SAE J431, ASTM A48	≤ 240 HB	375	350	325	0.0004	0.0010	0.0012	0.0016	0.0020	0.0024	0.0031	0.0040	0.0050	
	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220 ASTM A602	> 240 HB	275	260	250										





DIA TOLERANCE: +0.000 / -0.002" SHANK TOLERANCE: +0.0000 / -0.0004"

DIA	DEC IN	LOC	SHANK	OAL	LENGTH	RADIUS	NACRo®
						0.010	295-010125B
1/8	0.1250	1/4	1/8	2-1/2	Stub	0.020	295-010126B
						0.030	295-010127B
1/8	0.1250	1/2	1/8	2-1/2	Regular	0.010	295-020125B
						0.020	295-020126B
						0.030	295-020127B
3/16	0.1875	3/8	3/16	2-1/2	Stub	0.010	295-010187B
						0.020	295-010188B
						0.030	295-010189B
3/16	0.1875	5/8	3/16	2-1/2	Regular	0.010	295-020187B
						0.020	295-020188B
						0.030	295-020189B
						0.015	295-010249B
1/4	0.2500	3/8	1/4	2-1/2	Stub	0.020	295-010250B
						0.030	295-010251B
						0.060	295-010252B
1/4	0.2500	3/4	1/4	2-1/2	Regular	0.015	295-020249B
						0.020	295-020250B
						0.030	295-020251B
						0.060	295-020252B
						0.015	295-030249B
1/4	0.2500	1-1/4	1/4	4	Long	0.020	295-030250B
						0.030	295-030251B
						0.060	295-030252B
5/16	0.3125	1/2	5/16	2-1/2	Stub	0.020	295-010312B
5/16	0.3125	13/16	5/16	2-1/2	Regular	0.020	295-020312B
5/16	0.3125	1-1/4	5/16	4	Long	0.020	295-030312B
						0.015	295-010374B
3/8	0.3750	1/2	3/8	2-1/2	Stub	0.020	295-010375B
						0.030	295-010376B
						0.060	295-010377B



DIA	DEC IN	LOC	SHANK	OAL	LENGTH	RADIUS	NACRO®
3/8	0.3750	1	3/8	2-1/2	Regular	0.015	295-020374B
						0.020	295-020375B
						0.030	295-020376B
						0.060	295-020377B
3/8	0.3750	1-1/2	3/8	4	Long	0.015	295-030374B
						0.020	295-030375B
						0.030	295-030376B
						0.060	295-030377B
1/2	0.5000	5/8	1/2	3	Stub	0.020	295-010500B
						0.030	295-010501B
						0.060	295-010502B
						0.090	295-010503B
1/2	0.5000	1-1/4	1/2	3	Regular	0.120	295-010504B
						0.020	295-020500B
						0.030	295-020501B
						0.060	295-020502B
1/2	0.5000	1-1/4	1/2	3	Regular	0.090	295-020503B
						0.120	295-020504B
						0.020	295-030490B
						0.030	295-030491B
1/2	0.5000	1-5/8	1/2	4	Long	0.060	295-030492B
						0.090	295-030493B
						0.120	295-030494B
						0.020	295-030500B
1/2	0.5000	2	1/2	4	Long	0.030	295-030501B
						0.060	295-030502B
						0.090	295-030503B
						0.120	295-030504B
5/8	0.6250	3/4	5/8	3-1/2	Stub	0.020	295-010625B
						0.030	295-010626B
						0.060	295-010627B
						0.090	295-010628B
5/8	0.6250	1-1/4	5/8	3-1/2	Regular	0.120	295-010629B
						0.020	295-020625B
						0.030	295-020626B
						0.060	295-020627B
5/8	0.6250	1-1/4	5/8	3-1/2	Regular	0.090	295-020628B
						0.120	295-020629B
						0.020	295-030620B
5/8	0.6250	2-1/8	5/8	4	Medium	0.020	295-030620B



HIGH PERFORMANCE END MILLS - 5 FLUTE



DIA	DEC IN	LOC	SHANK	OAL	LENGTH	RADIUS	NACRO®
5/8	0.6250	2-1/2	5/8	5	Long	0.020	295-030625B
						0.030	295-030626B
						0.060	295-030627B
						0.090	295-030628B
						0.120	295-030629B
3/4	0.7500	1	3/4	4	Stub	0.020	295-010750B
						0.030	295-010751B
						0.060	295-010752B
						0.090	295-010753B
						0.120	295-010754B
						0.156	295-010755B
3/4	0.7500	1-5/8	3/4	4	Regular	0.190	295-010756B
						0.020	295-020750B
						0.030	295-020751B
						0.060	295-020752B
						0.090	295-020753B
3/4	0.7500	2-1/2	3/4	5	Long	0.120	295-020754B
						0.156	295-020755B
						0.190	295-020756B
						0.020	295-030750B
						0.030	295-030751B
3/4	0.7500	2-1/2	3/4	5	Long	0.060	295-030752B
						0.090	295-030753B
						0.120	295-030754B
						0.156	295-030755B
						0.190	295-030756B
						0.020	295-021000B
1	1.0000	1-3/4	1	4	Regular	0.030	295-021001B
						0.060	295-021002B
						0.090	295-021003B
						0.120	295-021004B
						0.156	295-021005B
						0.190	295-021006B
1	1.0000	2-5/8	1	6	Long	0.250	295-021007B
						0.020	295-031000B
						0.030	295-031001B
						0.060	295-031002B
						0.090	295-031003B
						0.120	295-031004B
						0.156	295-031005B
0.190	295-031006B						
						0.250	295-031007B

