



Maximum Performance End Mills from Dura-Mill

SUGGESTED SPEED & FEED RATES

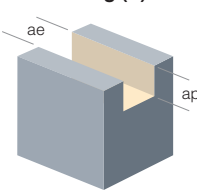
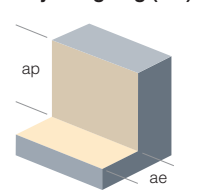
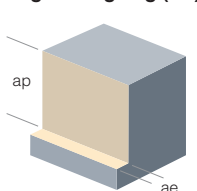
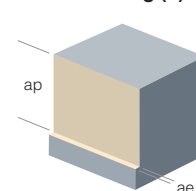
3, 4 AND 5 FLUTE FOR STEEL AND ALL GEN2 ENDMILLS

ASI Standard	Material Group	Material Hardness	Cut Type	Cutting Speed SFM	Recommended Feed Per Tooth								
					1/8" .125	3/16" .188	1/4" .250	5/16" .313	3/8" .375	1/2" .500	5/8" .625	3/4" .750	1" 1.000
Free Machining & Low Carbon Steels 1008, 1010, 1018, 1020, 1025, 1118, 12L13, 12L14, 1215, 1330	P1	≤ 175 BHN	S	450	0.0006	0.0011	0.0014	0.0018	0.0022	0.0028	0.0031	0.0034	0.0040
			HR	560	0.0009	0.0014	0.0018	0.0023	0.0027	0.0035	0.0039	0.0043	0.0050
			LR	730	0.0011	0.0017	0.0022	0.0028	0.0032	0.0042	0.0047	0.0052	0.0060
			F	925	0.0020	0.0032	0.0041	0.0052	0.0061	0.0080	0.0089	0.0098	0.0114
Medium & High Carbon Steels 1030, 1040, 1050, 1080, 1525, 1541, 1551, 1572, 1140, 1151	P2		S	425	0.0006	0.0011	0.0014	0.0018	0.0022	0.0028	0.0031	0.0034	0.0040
			HR	530	0.0009	0.0014	0.0018	0.0023	0.0027	0.0035	0.0039	0.0043	0.0050
			LR	690	0.0011	0.0017	0.0022	0.0028	0.0032	0.0042	0.0047	0.0052	0.0060
			F	875	0.0020	0.0032	0.0041	0.0052	0.0061	0.0080	0.0089	0.0098	0.0114
Easy to machine Alloy Steels & Tool Steels 4130, 4140, 4150, 4320, 4340, 5120, 5140, 6150, 8620, A Series, D Series, H Series, L2, M Series, O Series, S Series, T Series, P Series, & W Series	P3	≤ 35 HRc	S	340	0.0005	0.0009	0.0012	0.0016	0.0018	0.0023	0.0027	0.0030	0.0037
			HR	425	0.0007	0.0011	0.0015	0.0020	0.0023	0.0029	0.0034	0.0038	0.0046
			LR	550	0.0008	0.0013	0.0018	0.0024	0.0028	0.0035	0.0041	0.0046	0.0055
			F	700	0.0016	0.0025	0.0034	0.0045	0.0052	0.0066	0.0077	0.0086	0.0105
Difficult to machine Alloy Steels & Tool Steels 4130, 4140, 4150, 4320, 4340, 5120, 5140, 6150, 8620, A Series, D Series, H Series, L2, M Series, O Series, S Series, T Series, P Series, & W Series	P4	35 to 48 HRc	S	255	0.0005	0.0008	0.0011	0.0014	0.0016	0.0020	0.0024	0.0026	0.0031
			HR	320	0.0006	0.0010	0.0014	0.0018	0.0020	0.0026	0.0030	0.0033	0.0039
			LR	415	0.0007	0.0012	0.0017	0.0022	0.0024	0.0031	0.0036	0.0040	0.0047
			F	530	0.0014	0.0023	0.0032	0.0041	0.0045	0.0059	0.0068	0.0075	0.0089
Ferritic, martensitic & PH Stainless Steels 410, 416, 416F, 420F, 15-5 PH, 17-4 PH, 13-8 PH	P5	≤ 35 HRc	S	240	0.0005	0.0007	0.0010	0.0013	0.0014	0.0018	0.0022	0.0024	0.0029
			HR	300	0.0006	0.0009	0.0012	0.0016	0.0018	0.0023	0.0027	0.0030	0.0036
			LR	390	0.0007	0.0011	0.0014	0.0019	0.0022	0.0028	0.0032	0.0036	0.0043
			F	495	0.0014	0.0020	0.0027	0.0036	0.0041	0.0052	0.0061	0.0068	0.0082
Ferritic, martensitic & PH Stainless Steels 410, 416, 416F, 420F, 15-5 PH, 17-4 PH, 13-8 PH	P6	> 35 HRc	S	180	0.0004	0.0006	0.0008	0.0010	0.0012	0.0015	0.0018	0.0019	0.0022
			HR	225	0.0005	0.0008	0.0010	0.0013	0.0015	0.0019	0.0022	0.0024	0.0028
			LR	295	0.0006	0.0010	0.0012	0.0016	0.0018	0.0023	0.0026	0.0029	0.0034
			F	370	0.0011	0.0018	0.0023	0.0030	0.0034	0.0043	0.0050	0.0055	0.0064
Easy to machine Austenitic Stainless Steels 200, 201, 202, 219, 301, 302, 303, 304, 304L, 305	M1	≤ 28 HRc	S	260	0.0006	0.0009	0.0012	0.0016	0.0018	0.0023	0.0027	0.0030	0.0037
			HR	325	0.0007	0.0011	0.0015	0.0020	0.0023	0.0029	0.0034	0.0038	0.0046
			LR	420	0.0008	0.0013	0.0018	0.0024	0.0028	0.0035	0.0041	0.0046	0.0055
			F	535	0.0016	0.0025	0.0034	0.0045	0.0052	0.0066	0.0077	0.0086	0.0105
More Difficult Austenitic Stainless Steels 310, 314, 316, 316L, 317, 321, 347, 384, XM1, XM5, XM7, XM21	M2	≥ 28 HRc	S	190	0.0005	0.0007	0.0010	0.0013	0.0014	0.0018	0.0022	0.0024	0.0029
			HR	235	0.0006	0.0009	0.0012	0.0016	0.0018	0.0023	0.0027	0.0030	0.0036
			LR	305	0.0007	0.0011	0.0014	0.0019	0.0022	0.0028	0.0032	0.0036	0.0043
			F	390	0.0014	0.0020	0.0027	0.0036	0.0041	0.0052	0.0061	0.0068	0.0082
Austenitic Stainless Steel - Duplex 2205, 2507	M3	≤ 28 HRc	S	180	0.0004	0.0006	0.0008	0.0010	0.0012	0.0015	0.0018	0.0019	0.0022
			HR	225	0.0005	0.0008	0.0010	0.0013	0.0015	0.0019	0.0022	0.0024	0.0028
			LR	295	0.0006	0.0010	0.0012	0.0016	0.0018	0.0023	0.0026	0.0029	0.0034
			F	370	0.0011	0.0018	0.0023	0.0030	0.0034	0.0043	0.0050	0.0055	0.0064
Grey Cast Iron Class 20,25,30,35,40,45,50,55,60. G3000, G3500	K1	≤ 250 BHN	S	330	0.0007	0.0011	0.0014	0.0018	0.0022	0.0028	0.0031	0.0034	0.0040
			HR	415	0.0009	0.0014	0.0018	0.0023	0.0027	0.0035	0.0039	0.0043	0.0050
			LR	540	0.0011	0.0017	0.0022	0.0028	0.0032	0.0042	0.0047	0.0052	0.0060
			F	685	0.0020	0.0032	0.0041	0.0052	0.0061	0.0080	0.0089	0.0098	0.0114
Ductile & Malleable Cast Iron 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K2	≤ 250 BHN	S	295	0.0005	0.0009	0.0012	0.0016	0.0018	0.0023	0.0027	0.0030	0.0037
			HR	370	0.0006	0.0010	0.0014	0.0018	0.0020	0.0026	0.0030	0.0035	0.0042
			LR	480	0.0007	0.0012	0.0017	0.0022	0.0024	0.0031	0.0036	0.0042	0.0050
			F	610	0.0014	0.0023	0.0032	0.0041	0.0045	0.0059	0.0068	0.0080	0.0095

S = Slotting / HR = Heavy Roughing / LR = Light Roughing / F = Finishing

ASI Standard	Material Group	Material Hardness	Cut Type	Cutting Speed SFM	Recommended Feed Per Tooth								
					1/8" .125	3/16" .188	1/4" .250	5/16" .313	3/8" .375	1/2" .500	5/8" .625	3/4" .750	1" 1.000
Iron-Based Heat Resistant Alloys A-286, Discaloy, Incoloy 801, N-155, 16-25-6, A-297, A-351, A-608	S1		S	120	0.0003	0.0004	0.0006	0.0007	0.0010	0.0012	0.0016	0.0020	0.0024
			HR	150	0.0004	0.0005	0.0007	0.0009	0.0012	0.0015	0.0020	0.0025	0.0030
			LR	195	0.0005	0.0006	0.0008	0.0011	0.0014	0.0018	0.0024	0.0030	0.0036
			F	245	0.0009	0.0011	0.0016	0.0020	0.0027	0.0034	0.0045	0.0057	0.0068
Cobalt-Based Heat Resistant Alloys Stellite, AiResist 213, Haynes 25 (L605), Haynes 188	S2		S	100	0.0003	0.0004	0.0006	0.0007	0.0010	0.0012	0.0016	0.0020	0.0024
			HR	125	0.0004	0.0005	0.0007	0.0009	0.0012	0.0015	0.0020	0.0025	0.0030
			LR	165	0.0005	0.0006	0.0008	0.0011	0.0014	0.0018	0.0024	0.0030	0.0036
			F	200	0.0009	0.0011	0.0016	0.0020	0.0027	0.0034	0.0045	0.0057	0.0068
Nickel-Based Heat Resistant Alloys Astroloy, Hastelloy, Inconel, Incoloy 901, Nimonic, Rene 41, Udimet, Waspaloy, Monel	S3		S	80	0.0003	0.0004	0.0006	0.0007	0.0010	0.0012	0.0016	0.0020	0.0024
			HR	100	0.0004	0.0005	0.0007	0.0009	0.0012	0.0015	0.0020	0.0025	0.0030
			LR	130	0.0005	0.0006	0.0008	0.0011	0.0014	0.0018	0.0024	0.0030	0.0036
			F	165	0.0009	0.0011	0.0016	0.0020	0.0027	0.0034	0.0045	0.0057	0.0068
Titanium Alloys 6Al-4V	S4		S	170	0.0004	0.0006	0.0009	0.0011	0.0014	0.0018	0.0020	0.0024	0.0028
			HR	215	0.0005	0.0008	0.0011	0.0014	0.0017	0.0022	0.0025	0.0030	0.0035
			LR	280	0.0006	0.0010	0.0013	0.0017	0.0020	0.0026	0.0030	0.0036	0.0042
			F	355	0.0011	0.0018	0.0025	0.0032	0.0039	0.0050	0.0057	0.0068	0.0080
Hardened Steels D2, D3, H10, 11, 13, Alloy Steels: 4140, 4150, 4320, 4340, P20, 21	H2	48HRc to 55HRc	S	160	0.0001	0.0002	0.0003	0.0005	0.0008	0.0010	0.0014	0.0016	0.0020
			HR	200	0.0002	0.0003	0.0004	0.0006	0.0010	0.0012	0.0017	0.0020	0.0025
			LR	260	0.0002	0.0004	0.0005	0.0007	0.0012	0.0014	0.0020	0.0024	0.0030
			F	330	0.0005	0.0007	0.0009	0.0014	0.0023	0.0027	0.0039	0.0045	0.0057

RECOMMENDED APPLICATION TYPES

Slotting (S)	Heavy Roughing (HR)	Light Roughing (LR)	Finishing (F)
 <p>Axial DOC (ap) = up to 0.5 x D Radial DOC (ae) = 1 x D</p>	 <p>Axial DOC (ap) = 1.25 x D Radial DOC (ae) = 0.5 x D</p>	 <p>Axial DOC (ap) = 1.25 x D Radial DOC (ae) = 0.2 x D</p>	 <p>Axial DOC (ap) = up to 2 x D Radial DOC (ae) = 0.05 x D</p>

- When exceeding recommended axial DOC for both Heavy Roughing (HR) and Light Roughing (LR) applications, the following adjustments to feed rates should be considered. Axial DOC 2xD = Reduce IPT by 50%. Axial DOC 3xD = Reduce IPT by 75%. Cutting Speed (SFM) remains unchanged.
- When exceeding recommended Axial DOC on Finishing (F) applications, reduce the recommended IPT by 20%. Cutting Speed (SFM) remains unchanged.
- For Ramping Operations, a ramp angle of 3-5° is recommended. Feed rate (IPT) remains unchanged.
- Seven (7) flute end mills should be used for Finishing (F) applications only.
- When using extended reach tools, reduce the recommended feed rates by 20%.