

Recommended Speeds & Feeds for Variable Endmills 1 of 2

			Radial WOC up to 10% of dia.								Radial WOC 10%-30% of tool dia.								
			Feed rate, IPT (Inch per Tooth)								Feed rate, IPT (Inch per Tooth)								
Material	Hardness R/C	Starting SFM	Endmill Diameter								Starting SFM	Endmill Diameter							
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	1400	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1300-750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0013	.003	.004	.005	.006	.007	.009	.011		.001	.0025	.0032	.004	.0047	.0055	.007	.0085
Medium Carbon and High Carbon, Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620,	30-40 RC	750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	700-400	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0013	.003	.004	.005	.006	.007	.009	.011		.001	.0025	.0032	.004	.0047	.0055	.007	.0085
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	500-300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0011	.0027	.0035	.004	.005	.006	.0078	.0087		.0009	.002	.0028	.0033	.004	.0047	.006	.007
Hardened Steels Hardened Carbon Steels and Tool steels	42-54 RC	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
	.0007	.0016	.0023	.0027	.0034	.0046	.0055	.007	.0005	.0012		.0018	.002	.0027	.0036	.0043	.0054		
	54-62 RC	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
	.0005	.0009	.0016	.0025	.0028	.004	.0046	.006	.0004	.0007		.0012	.0018	.0022	.003	.0036	.0045		
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	750-450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0014	.0033	.004	.004	.0047	.007	.0092	.011		.0011	.0025	.0033	.004	.0047	.055	.007	.0085
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	500-300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0011	.0028	.0035	.0043	.005	.006	.007	.085		.0009	.0022	.0028	.0033	.004	.0047	.0055	.0067
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	450-250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.011	.0023	.0028	.0037	.0042	.0055	.0065	.0085		.0009	.0018	.0022	.0029	.0033	.0044	.005	.0067
High Temp alloys Inconel, Monel, Hastelloy	Up to 42 RC	125	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	110	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0016	.0023	.0027	.0035	.0046	.0055	.007		.0005	.0012	.0018	.0022	.0027	.0036	.0043	.0055
Titanium	Up to 42 RC	375	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	375-275	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0011	.0028	.0035	.0043	.005	.006	.007	.085		.0009	.0022	.0028	.0033	.004	.0047	.0055	.0067
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	—	1200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1200-800	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0015	.0035	.0042	.0052	.0062	.0072	.0095	.011		.0011	.0026	.0035	.0042	.005	.0055	.0075	.0085
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450	—	700	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	700-450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0015	.0035	.0042	.0052	.0062	.0072	.0095	.011		.0011	.0026	.0035	.0042	.005	.0055	.0075	.0085
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	1500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0025	.0055	.007	.0085	.011	.014	.016	.022		.002	.0045	.0055	.0065	.0085	.0105	.0125	.0165
Cast Aluminum High Silicon A380, Castings	Over 3% Si	1500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1500-1200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.002	.0045	.0055	.0065	.0085	.011	.0125	.017		.0015	.0035	.0045	.0055	.007	.0085	.010	.013
Magnesium	—	1700	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1700-900	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0015	.0035	.0045	.005	.007	.009	.010	.014		.001	.003	.0035	.004	.005	.007	.008	.010
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	1200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1200-650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0015	.0025	.003	.004	.005	.0065	.008	.011		.001	.002	.003	.004	.005	.006	.007	.009

Recommended Speeds & Feeds for Variable Endmills 2 of 2

			Radial WOC 30%-50% of tool dia.								Slotting								
			Endmill Diameter								Endmill Diameter								
Material	Hardness R/C	Starting SFM	Feed rate, IPT (Inch per Tooth)								Starting SFM	Feed rate, IPT (Inch per Tooth)							
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	750-450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0015	.002	.0025	.003	.0035	.005	.006		.0006	.0015	.0018	.0023	.0026	.003	.004	.005
Medium Carbon and High Carbon, Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620	30-40 RC	350-275	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0015	.002	.0025	.003	.0035	.005	.006		.0006	.0015	.0018	.0023	.0026	.003	.004	.005
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	350-250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0006	.0013	.0017	.002	.0025	.003	.004	.005		.005	.0012	.0015	.0018	.0023	.0027	.0035	.004
Hardened Steels Hardened Carbon Steels and Tool steels	42-54 RC	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
	.0004	.0008	.0011	.0014	.0017	.0025	.003	.004	.0003	.0007	.001	.0012	.0015	.002	.0025	.003			
	54-62 RC	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
	.0003	.0005	.0008	.0011	.0015	.002	.0025	.003	.0002	.0004	.0007	.001	.0012	.0017	.002	.0025			
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	425-350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0015	.002	.0025	.003	.0035	.005	.006		.0006	.0015	.0018	.0023	.0026	.003	.004	.005
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	200-300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	225	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0006	.0013	.0017	.002	.0025	.003	.004	.005		.0005	.0012	.0015	.0018	.0023	.0027	.0035	.004
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	175-275	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0006	.0012	.0015	.0018	.002	.0027	.0032	.004		.0005	.001	.0012	.0016	.0018	.0025	.0028	.0038
High Temp alloys Inconel, Monel, Hastelloy	Up to 42 RC	125-100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0004	.0008	.0012	.0014	.0017	.0023	.0027	.0033		.0003	.0007	.001	.0012	.0015	.002	.0025	.003
Titanium	Up to 42 RC	375	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	150	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0006	.0013	.0017	.002	.0025	.003	.004	.005		.005	.0012	.0015	.0018	.0023	.0027	.0035	.004
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	---	800-400	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	400	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0015	.002	.0025	.003	.0035	.005	.006		.0006	.0015	.0018	.0023	.0026	.003	.004	.005
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450	---	450-300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0015	.002	.0025	.003	.0035	.005	.006		.0006	.0015	.0018	.0023	.0026	.003	.004	.005
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	1500-1000	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1000	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0012	.0025	.0035	.004	.005	.0065	.0075	.010		.001	.0023	.003	.0035	.0045	.006	.007	.009
Cast Aluminum High Silicon A380, Castings	Over 3% Si	1300-750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.001	.002	.0025	.003	.004	.005	.006	.008		.0008	.0018	.0023	.0028	.0036	.0046	.0055	.0075
Magnesium	---	850-650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	700	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0007	.0017	.002	.0025	.0035	.004	.005	.0065		.0006	.0015	.002	.0023	.003	.004	.0045	.006
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	600-450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0006	.0012	.0016	.002	.0025	.0032	.0038	.005		.0005	.001	.0015	.002	.0025	.003	.0035	.005

Recommended Speeds & Feeds for Spot Drills

		Starting SFM	<i>Feed rate, IPR (Inch per Revolution)</i>							
Material	Hardness R/C	Starting SFM								
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0025	.004	.005	.006	.007	.008	.010	.012
Medium Carbon and High Carbon, Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620	30-40 RC	200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.002	.003	.004	.005	.006	.007	.009	.011
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	150	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0015	.0025	.003	.004	.0045	.005	.006	.008
Hardened Steels Hardened Carbon Steels and Tool steels	42-54 RC	75	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.001	.002	.0025	.003	.004	.005	.006	.007
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	125	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0025	.004	.005	.006	.007	.008	.010	.012
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.002	.003	.004	.005	.006	.007	.009	.010
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	85	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.002	.003	.004	.005	.006	.007	.009	.010
High Temp alloys Inconel, Monel, Hastelloy	Up to 42 RC	50	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.001	.002	.003	.004	.0045	.005	.0065	.008
Titanium	Up to 42 RC	65	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.002	.003	.0035	.0045	.005	.006	.0075	.009
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	—	325	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0025	.004	.005	.0055	.0065	.008	.010	.0125
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450	—	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.002	.0035	.004	.005	.006	.007	.009	.011
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.005	.008	.009	.011	.012	.016	.020	.025
Cast Aluminum High Silicon A380, Castings	Over 3% Si	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.004	.006	.008	.010	.011	.013	.016	.020
Magnesium	—	600	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.003	.005	.006	.007	.008	.009	.011	.014
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.003	.005	.006	.007	.008	.010	.012	.016

Recommended Speeds & Feeds for Drill Mills

			Milling								Chamfering									
			Feed rate, IPT (Inch per Tooth)								Feed rate, IPT (Inch per Tooth)									
Material	Hardness R/C	Starting SFM	Drill Mill Diameter								Starting SFM	Drill Mill Diameter								
			1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	450									500									
			.0006	.0015	.0018	.0023	.0026	.003	.004	.005		.0006	.0013	.0015	.0018	.0025	.0031	.004	.0052	
Medium Carbon and High Carbon, Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620	30-40 RC	300									350									
			.0006	.0015	.0018	.0023	.0026	.003	.004	.005		.0005	.0011	.0014	.0017	.0023	.0028	.0034	.0045	
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	250									250									
			.0005	.0012	.0015	.0018	.0023	.0027	.0035	.004		.0006	.0013	.0015	.002	.0025	.003	.004	.005	
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	350									350									
			.0006	.0015	.0018	.0023	.0026	.003	.004	.005		.0006	.0011	.0016	.0021	.0028	.0033	.0041	.0055	
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	225									200									
			.0005	.0012	.0015	.0018	.0023	.0027	.0035	.004		.0002	.0007	.001	.0012	.0016	.002	.0024	.003	
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	200									200									
			.0005	.001	.0012	.0016	.0018	.0025	.0028	.0038		.0006	.0012	.0016	.0019	.0025	.003	.0037	.0048	
Gray Cast Iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	---	400									900									
			.0006	.0015	.0018	.0023	.0026	.003	.004	.005		.0012	.0025	.003	.0035	.005	.006	.007	.009	
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450	---	300									600									
			.0006	.0015	.0018	.0023	.0026	.003	.004	.005		.001	.002	.0025	.003	.004	.005	.0065	.0075	
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	1000									1000									
			.001	.0023	.003	.0035	.0045	.006	.007	.009		.0012	.0025	.003	.0035	.005	.006	.007	.009	
Cast Aluminum High Silicon A380, Castings	Over 3% Si	750									700									
			.0008	.0018	.0023	.0028	.0036	.0046	.0055	.0075		.0014	.0028	.0035	.0042	.0055	.007	.0085	.011	
Magnesium	---	700									1500									
			.0006	.0015	.002	.0023	.003	.004	.0045	.006		.0012	.0025	.003	.0035	.0045	.006	.007	.0095	
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	500									500									
			.0005	.001	.0015	.002	.0025	.003	.0035	.005		.001	.002	.0025	.003	.004	.005	.006	.007	

** Use OD of tool for all speed and feed calculations.

** If milling axial DOC exceeds .5 x dia, reduce IPT or radial DOC by 50%.

** Drilling - use milling IPT. Please note feed is listed as inches per tooth, not inches per rev.

** Calculate all drilling with 2 flutes. Even the 4 flute style since only 2 flutes are effective when drilling.

** Please note speeds and feeds are approximate values and can vary greatly depending on cutting situations.

Recommended Speeds & Feeds for Carbide Chamfer Mills

Material		Hardness R/C		Parameters for Edge break up to 20% of tool dia.							Parameters for chamfer larger than 20% of tool dia.										
				Starting SFM	Chamfer Mill Diameter							Starting SFM	Chamfer Mill Diameter								
					Feed rate, IPT (Inch per Tooth)								Feed rate, IPT (Inch per Tooth)								
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330		Up to 30		650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	600-500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.001	.0017	.002	.0025	.0035	.0042	.005	.007		.0006	.0013	.0015	.0018	.0025	.0031	.004	.0052
Medium Carbon and High Carbon, Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620		30-40 RC		450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	400-300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0007	.0015	.0018	.0023	.0031	.0037	.0045	.006		.0005	.0011	.0014	.0017	.0023	.0028	.0034	.0045
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2		30-44 RC		350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	300-200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0008	.0015	.002	.0025	.0032	.004	.005	.0065		.0006	.0013	.0015	.002	.0025	.003	.004	.005
Hardened Steels Hardened Carbon Steels and Tool steels		42-54 RC		200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	150-100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0005	.0011	.0016	.0021	.0027	.0034	.0042	.005		.0003	.0008	.0012	.0017	.0022	.003	.0038	.0045
		54-65 RC		150	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	150-100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0004	.0008	.0011	.0016	.002	.0025	.003	.0035									
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F		Up to 30 RC		500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	450-350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0008	.0015	.002	.0025	.0032	.004	.005	.0065		.0006	.0011	.0016	.0021	.0028	.0033	.0041	.0055
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH		Up to 30 RC		250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	200-150	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0005	.001	.0012	.0015	.002	.0025	.003	.0035		.0002	.0007	.001	.0012	.0016	.002	.0024	.003
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic		Over 30 RC		350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	300-200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0008	.0015	.002	.0025	.003	.0036	.0043	.006		.0006	.0012	.0016	.0019	.0025	.003	.0037	.0048
High Temp alloys Inconel, Monel, Hastelloy		Up to 42 RC		75	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	50	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0004	.0009	.001	.0014	.0018	.0023	.0027	.0036		.0002	.0005	.0007	.0009	.0011	.0014	.0017	.0023
Titanium		Up to 42 RC		150	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	125-100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0005	.0009	.0012	.0015	.002	.0025	.003	.0038		.0003	.0006	.0008	.0009	.0012	.0015	.0018	.0025
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40		---		1200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1100-900	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.002	.004	.005	.006	.0075	.0095	.012	.015		.0012	.0025	.003	.0035	.005	.006	.007	.009
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450		---		750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	700-500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0015	.0035	.0042	.0052	.0062	.0072	.0095	.011		.001	.002	.0025	.003	.004	.005	.0065	.0075
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075		Up to 3% Si		1100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1000	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.002	.004	.005	.006	.0075	.0095	.012	.015		.0012	.0025	.003	.0035	.005	.006	.007	.009
Cast Aluminum High Silicon A380, Castings		Over 3% Si		750	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	700	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0018	.0035	.0043	.0052	.007	.0085	.010	.0135		.0014	.0028	.0035	.0042	.0055	.007	.0085	.011
Magnesium		---		1500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	1500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.002	.004	.005	.0055	.0075	.0095	.011	.015		.0012	.0025	.003	.0035	.0045	.006	.007	.0095
Non Ferrous Copper, Brass, Bronze		Up to 30 RC		600	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
					.0015	.003	.004	.0045	.006	.0075	.009	.012		.001	.002	.0025	.003	.004	.005	.006	.007

Recommended Speeds & Feeds for Roughing Endmills

Material	Hardness R/C	Starting SFM	Feed rate, IPT (Inch per Tooth)							Starting SFM	Feed rate, IPT (Inch per Tooth)								
		Radial WOC 30%-50% of tool dia.	Endmill Diameter							Slotting	Endmill Diameter								
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	600-350	#	#	5/16	#	#	#	#	1	350	#	#	5/16	#	#	#	#	1
			.0005	.0013	.0016	.002	.0023	.0027	.0036	.0042		.0005	.0013	.0016	.002	.0023	.0027	.0036	.0042
Medium Carbon and High Carbon Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620,	30-40 RC	450-300	#	#	5/16	#	#	#	#	1	300	#	#	5/16	#	#	#	#	1
			.0005	.0013	.0016	.002	.0023	.0027	.0036	.0042		.0005	.0013	.0016	.002	.0023	.0027	.0036	.0042
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	350-250	#	#	5/16	#	#	#	#	1	250	#	#	5/16	#	#	#	#	1
			.0003	.001	.0012	.0015	.002	.0023	.0028	.0034		.0003	.001	.0012	.0015	.002	.0023	.0028	.0034
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40		350	#	#	5/16	#	#	#	#	1	300	#	#	5/16	#	#	#	#	1
			.0005	.0013	.0016	.002	.0023	.0027	.0036	.0042		.0005	.0013	.0016	.002	.0023	.0027	.0036	.0042
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450		250	#	#	5/16	#	#	#	#	1	200	#	#	5/16	#	#	#	#	1
			.0003	.001	.0012	.0015	.002	.0023	.0028	.0034		.0003	.001	.0012	.0015	.002	.0023	.0028	.0034

Recommended Speeds & Feeds for Standard Endmills 1 of 2

Material	Hardness R/C	Endmill Diameter Feed rate, IPT (Inch per Tooth)										Endmill Diameter Feed rate, IPT (Inch per Tooth)									
		Starting SFM Radial WOC up to 10% of tool dia.										Starting SFM Radial WOC up to 10%-30% of tool dia.									
		1/8 1/4 5/16 3/8 1/2 5/8 3/4 1										1/8 1/4 5/16 3/8 1/2 5/8 3/4 1									
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0008	.0015	.002	.0023	.0033	.0039	.0048	.0063		.0005	.001	.0013	.0015	.0022	.0026	.0032	.0042		
Medium Carbon and High Carbon Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620,	30-40 RC	550	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	425	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0008	.0015	.002	.0023	.0033	.0039	.0048	.0063		.0005	.001	.0013	.0015	.0022	.0026	.0032	.0042		
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	359	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0008	.0015	.0020	.0023	.0033	.0039	.0048	.0063		.0005	.001	.0013	.0015	.0022	.0026	.0032	.0042		
Hardened Steels Hardened Carbon Steels and Tool steels	42-54 RC	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
	54-62 RC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0003	.0008	.0011	.0015	#####	.0027	.0032	.0005		.0002	.0005	.0007	.001	.0014	.0018	.0021	.0003		
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	250	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0002	.0005	.0008	.0012	.0015	.0021	.0027	.0038		.0001	.0003	.0005	.0008	.001	.0014	.0018	.0025		
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0002	.0005	.0008	.0012	.0015	.0021	.0027	.0030		.00015	.0003	.0005	.0008	.001	.0014	.0018	.002		
High Temp alloys Inconel, Monel, Hastelloy	Up to 42 RC	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA		
Titanium	Up to 42 RC	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA		
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	---	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	400	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0006	.0011	.0015	.0018	.0027	.0033	.0045	.0054		.0004	.0007	.001	.0012	.0018	.0022	.003	.0036		
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450	---	450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0006	.0009	.0015	.0018	.0023	.0030	.0036	.0045		.0004	.0006	.001	.0012	.0015	.002	.0024	.003		
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	1100	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	900	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0012	.0020	.0030	.0035	.0045	.0060	.0068	.0090		.0008	.0013	.002	.0023	.003	.004	.0045	.006		
Cast Aluminum High Silicon A380, Castings	Over 3% Si	800	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0008	.0017	.0023	.0032	.0039	.0053	.0060	.0075		.0005	.0011	.0015	.0021	.0026	.0035	.004	.005		
Magnesium	---	650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	650	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0008	.0017	.0023	.0032	.0039	.0053	.0060	.0075		.0005	.0011	.0015	.0021	.0026	.0035	.004	.005		
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	900	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	900	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1		
			.0008	.0014	.0017	.0026	.0030	.0038	.0048	.0068		.0005	.0009	.0011	.0017	.002	.0025	.0032	.0045		

Recommended Speeds & Feeds for Standard Endmills 2 of 2

Material	Hardness R/C	Endmill Diameter Feed rate, IPT (Inch per Tooth)									Endmill Diameter Feed rate, IPT (Inch per Tooth)								
		↓ Starting SFM Radial WOC up to 30%-50% of tool dia.									↓ Starting SFM Slotting								
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	450	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0005	.001	.0013	.0015	.0022	.0026	.0032	.0042	NA	NA	NA	NA	NA	NA	NA	NA	NA
Medium Carbon and High Carbon Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620,	30-40 RC	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0005	.001	.0013	.0015	.0022	.0026	.0032	.0042	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0005	.001	.0013	.0015	.0022	.0026	.0032	.0042	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hardened Steels Hardened Carbon Steels and Tool steels	42-54 RC	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
	54-62 RC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	275	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0002	.0005	.0007	.001	.0014	.0018	.0021	.0003	NA	NA	NA	NA	NA	NA	NA	NA	NA
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	200	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0001	.0003	.0005	.0008	.001	.0014	.0018	.0025	NA	NA	NA	NA	NA	NA	NA	NA	NA
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	150	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.00015	.0003	.0005	.0008	.001	.0014	.0018	.002	NA	NA	NA	NA	NA	NA	NA	NA	NA
High Temp Alloys Inconel, Monel, Hastelloy	Up to 42 RC	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Titanium	Up to 42 RC	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gray Cast Iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	-----	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0004	.0007	.001	.0012	.0018	.0022	.003	.0036	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503, 2502, 300, 350, 400, 450	-----	300	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0004	.0006	.001	.0012	.0015	.002	.0024	.003	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	850	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0008	.0013	.002	.0023	.003	.004	.0045	.006	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cast Aluminum High Silicon A380, Castings	Over 3% Si	500	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0005	.0011	.0015	.0021	.0026	.0035	.004	.005	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	-----	350	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0005	.0011	.0015	.0021	.0026	.0035	.004	.005	NA	NA	NA	NA	NA	NA	NA	NA	NA
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	600	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1	NA	1/8	1/4	5/16	3/8	1/2	5/8	3/4	1
			.0005	.0009	.0011	.0017	.002	.0025	.0032	.0045	NA	NA	NA	NA	NA	NA	NA	NA	NA

Recommended Speeds & Feeds for Carbide Corner Rounding Tools

		Starting SFM	Feed rate, IPR (Inch per Revolution)								
Material	Hardness R/C		Corner Rounder Programmable Dia								
Low Carbon Steel 1006, 1008, 1018, 1020, 1022, 1025, 1117, 1140, 1215, 1330	Up to 30	500	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.001	.0013	.0015	.0017	.0018	.0019	.0021	.0022	.0024
Medium Carbon and High Carbon, Steels 1030, 1040, 1050, 1060, 1085, 1095, 1541, 1551, 9255, 3135, 3415, 4130, 4140, 4150, 4320, 4520, 5015, 5120, 5140, 8620,	30-40 RC	400	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0008	.001	.0012	.0013	.0015	.0016	.0017	.0018	.0021
Tool Steels T1, T2, T15, A2, A7, H13, P20, S7, D2	30-44 RC	300	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0004	.0005	.0006	.0009	.0011	.0013	.0015	.0016	.0019
Hardened Steels Hardened Carbon Steels and Tool steels	45-65 RC	100	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.0011
Stainless Steel 430F, 301, 303, 410, 416, 420F, 430, 430F	Up to 30 RC	300	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.001	.0011	.0012	.0013	.0015	.0016	.0018	.002	.0022
Stainless Steel 301, 302, 303, 304, 305, 420, 15-5PH, 17-4PH, 17-7PH	Up to 30 RC	250	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0008	.001	.0011	.0012	.0014	.0015	.0017	.0018	.002
Stainless Steel 302B, 304B, 309, 310, 316, 316B, 316L, 317, 317L, 321, Nitronic	Over 30 RC	200	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0005	.0006	.0007	.0008	.0009	.001	.0011	.0013	.0015
High Temp alloys Inconel, Monel, Hastelloy	Up to 42 RC	75	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.00035	.0004	.00045	.0005	.00055	.0006	.0007	.0009	.001
Titanium	Up to 42 RC	200	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0006	.00065	.0007	.00076	.00085	.0009	.001	.0011	.0012
Gray Cast iron ASTM A48, Class 20,25,30,35, SAE J431C, Grades G1800,G3000,G3500, GG10,15,20,25,30,35,40	_____	500	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0012	.0015	.0017	.0019	.0021	.0023	.0026	.0028	.003
Ductile Cast Iron 60-40-18, 65-45-12, D40148, D4512, 32510, 35108, M3210, M4504, M5503 2502, 300, 350, 400, 450	_____	400	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0008	.001	.0012	.0013	.0015	.0016	.0017	.0018	.0021
Aluminum 2024, 6061, 7075, 1050, 6351, 5005, 2017, 7075	Up to 3% Si	750	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0022	.0025	.0028	.0032	.0036	.0038	.0042	.0045	.005
Cast Aluminum High Silicon A380, Castings	Over 3% Si	600	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0021	.0023	.0026	.0028	.0031	.0034	.0038	.004	.0045
Magnesium	_____	1000	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0022	.0025	.0028	.0032	.0036	.0038	.0042	.0045	.005
Non Ferrous Copper, Brass, Bronze	Up to 30 RC	500	0.210	0.225	0.275	0.305	0.335	0.365	0.400	0.430	0.460
			.0018	.002	.0022	.0025	.0027	.003	.0033	.0037	.004

- Programmable diameter is determined by the tools tip diameter added to the tool radius.
- Speeds and Feeds are based on tool at full axial depth and taking 2 radial passes, with first radial pass at 70% and second radial pass at 30%.
 - For rounding both sides of a slot simultaneously, reduce IPT by 60%-70%.
 - Adding more passes will allow for increased feed rates.
 - For better surface finish, increase SFM in 10% increments.