

General Purpose End Mills

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Materials	SFM	End Mill Diameter Chip Load Per Tooth							
Hard Grades (>32 HRC)	Speed	1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"
Non Ferrous									
Aluminum+Aluminum Alloys --440, 356, 380, C61300	500-1000	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
Copper --Navel Brass, High Silicon Bronze, A-17, C-17200	800-1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Copper Alloys --Nickel Silver, Beryllium Copper, Oxygen-Free Copper	700-1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Plastics,Acrylics, Phenolics --Polycarbonate	200-500	0.001	0.002	0.003	0.004	0.006	0.008	0.001	0.015
Stainless Steel									
Precipitation --17/4, 17/7, AF-71, Custom 450/636, 15/7 Mo, 21-6-9	90-150	0.0005	.0005	0.001	0.001	0.002	0.002	0.004	0.006
Austenitic --304, 310, 314, 316, 321, 330, 347, 348, 21-6-9	100-150	0.0001	0.0002	0.0005	0.001	0.0015	0.002	0.003	0.004
Martensitic --420, 430F, 440C, 446	100-175	0.0001	0.0002	0.0005	0.0005	0.001	0.001	0.003	0.004
High Temp Alloys									
Cobalt Base --Air-Resist 13/213/215, Haynes 21/36, NASA CO-W-RE	40-80	0.0004	.0005	0.001	0.001	0.001	0.001	0.0015	0.002
Nickel Base --Hastalloy, Inconel 718/X/W, Waspalloy, Rene 41-95	50-90	0.0005	0.0005	0.001	0.001	0.002	0.0025	0.003	0.004
Iron Base --A-286, Haynes 556, Discoly, V57	60-120	0.0005	0.0005	0.001	0.0015	0.002	0.0025	0.003	0.004
Titanium Alloys --5AL-2.5Sn-Eli, 8Al-1 Mo-1V	90-160	0.0005	0.0005	0.0005	0.001	0.001	0.0015	0.002	0.004
Steel									
High Steel Strength --4340M, EDT-150, HP9-430, 300M, D6-Ac, 11-10	80-180	0.0005	.0005	0.001	0.001	0.001	0.0015	0.002	0.004
High Alloy Steels --Stressproof, AmorPlate	80-180	0.0005	0.0005	0.001	0.001	0.001	0.0015	0.002	0.004
Low Alloy Steels Maraging --23XX, 31XX	100-200	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006
Cast Iron									
Ductile Iron	80-140	0.0005	0.001	0.0015	0.002	0.002	0.003	0.004	0.005
Cast Iron --Malleable, Chilled	90-160	0.0005	0.001	0.002	0.003	0.004	0.005	0.006	0.008
Formulas									
RPM= (SFM x 3.82)/tool diameter									
IPM= number of flutes x RPM x chip load per tooth									
The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.									
<p>Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tool's ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.</p>									

General Purpose End Mills

Materials	SFM	End Mill Diameter Chip Load Per Tooth							
Soft Grades (<32 HRC)	Speed	1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"
Non Ferrous									
Aluminum Alloys --2024-T4/T6, 2014, 6061-T6/T651, 7075-T6	800-2000	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
Copper --Yellow Brass, High Lead Brass, Red Brass	800-1500	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Copper Alloys --Alum/Bronze, Low Silicon Bronze	800-1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Magnesium --De-CAt, Extruded	900-1300	0.001	0.002	0.002	0.003	0.004	0.006	0.008	0.009
Plastics, Acrylics, Phenolics --Polysulfone	200-600	0.001	0.002	0.003	0.004	0.006	0.008	0.001	0.015
Carbon, Graphites	200-400	0.040	0.040	0.060	0.080	0.010	0.001	0.015	0.020
Stainless Steel									
Precipitation --13/8, 15/5, AM-350/355	80-250	0.0005	.0005	0.001	0.001	0.002	0.002	0.004	0.006
Austenitic --200 Series, 302, 303, 304L, 316L	100-350	0.0001	0.0002	0.0005	0.001	0.0015	0.002	0.003	0.004
Martensitic --403, 410, 416	100-250	0.0001	0.0002	0.0005	0.0005	0.001	0.001	0.003	0.004
High Temp Alloys									
Cobalt Base --Stellite, HS-21, HAYNES25/188, x-40, L-605	60-100	0.0004	.0005	0.001	0.001	0.001	0.001	0.0015	0.002
Iron Base --Incoly 600-802, Multimet N-155, Timkin 16-25-6	80-130	0.0005	0.0005	0.001	0.0015	0.002	0.0025	0.003	0.004
Titanium Alloys --6AL-4V, Astm 1/2/3, 6 AL-25N-4Zr-2Mo-Si	50-250	0.0005	0.0005	0.0005	0.001	0.001	0.0015	0.002	0.004
Steel									
High Strength Steels --4340, 6150, 52100, H-11, H-13	50-250	0.0005	.0005	0.001	0.001	0.001	0.0015	0.002	0.004
High Alloy Steels --A-2/6/10, P-3/10, 01, 02, 06	100-300	0.0005	0.0005	0.001	0.001	0.001	0.0015	0.002	0.004
Medium Alloy Steels --200, 250, 300	150-350	0.0005	0.0005	0.001	0.002	0.0025	0.0035	0.004	0.005
Low Alloy Steels Maraging --10XX, 11XX, 13XX	100-400	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006
Cast Iron									
Ductile Iron --Ductile Cast Iron	100-400	0.0005	0.001	0.0015	0.002	0.002	0.003	0.004	0.005
Cast Iron --Gray Cast Iron	100-400	0.0005	0.001	0.002	0.003	0.004	0.005	0.006	0.008

Formulas

$$\text{RPM} = (\text{SFM} \times 3.82) / \text{tool diameter}$$

$$\text{IPM} = \text{number of flutes} \times \text{RPM} \times \text{chip load per tooth}$$

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

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