

Material Designation		SFM [ft/min]	ae max. [inch]	ap max [inch]	Chip Load Per Tooth [inch]					
					1/8"	3/16" 1/4" 5/16"	3/8" 7/16"	1/2" 5/8"	3/4"	1"
Machining Steel	< 500 N/mm ²	164	1xø	0.7xø	0.0006	0.0011	0.0014	0.0017	0.0019	0.0022
	> 500 N/mm ²	115	1xø	0.7xø	0.0006	0.0011	0.0014	0.0017	0.0019	0.0022
Construction Steel	Non-Alloy < 500 N/mm ²	164	1xø	0.7xø	0.0008	0.0012	0.0014	0.0019	0.0022	0.0025
	Non-Alloy > 500 N/mm ²	115	1xø	0.7xø	0.0008	0.0012	0.0014	0.0019	0.0022	0.0025
	Alloy	98	1xø	0.7xø	0.0006	0.0011	0.0014	0.0017	0.0019	0.0022
Spring Steel	Annealed < 250 HB	98	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
Cementation Steel	< 150 HB	156	1xø	0.7xø	0.0006	0.0011	0.0014	0.0017	0.0019	0.0022
	150-200 HB	123	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	> 200 HB	98	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
Nitriding Steel	< 1000 N/mm ²	115	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	> 1000 N/mm ²	90	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
Quenched & Tempered Steel	Non-Alloy < 800 N/mm ²	131	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	Non-Alloy 800-1000 N/mm ²	115	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	Alloy < 800 N/mm ²	115	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	Alloy 800-1000 N/mm ²	98	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	Alloy 1000-1300 N/mm ²	90	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
Cast Iron	Non-Alloy	328	0.8xø	0.7xø	0.0006	0.0011	0.0017	0.0022	0.0028	0.0033
	Low-Alloy	262	0.8xø	0.7xø	0.0006	0.0011	0.0017	0.0022	0.0028	0.0033
	High-Alloy	197	0.8xø	0.7xø	0.0006	0.0011	0.0017	0.0022	0.0028	0.0033
Cast Iron with Lamellar Graphite	Non-Alloy < 180 HB	197	1xø	0.7xø	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
	Non-Alloy > 180 HB	164	1xø	0.7xø	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
	Alloy	131	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
	High Alloy	115	1xø	0.7xø	0.0004	0.0008	0.0011	0.0014	0.0017	0.0019
Spheroidal Cast Iron	Non-Alloy < 180 HB	197	1xø	0.7xø	0.0008	0.0012	0.0014	0.0019	0.0022	0.0025
	Non-Alloy > 180 HB	164	1xø	0.7xø	0.0008	0.0012	0.0014	0.0019	0.0022	0.0025
	Alloy	131	1xø	0.7xø	0.0003	0.0006	0.0008	0.0011	0.0014	0.0017
White Malleable Cast Iron	< 180 HB	197	1xø	0.7xø	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
	> 180 HB	164	1xø	0.7xø	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
Black Malleable Cast Iron	< 180 HB	197	1xø	0.7xø	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
	> 180 HB	164	1xø	0.7xø	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039

Material Designation		SFM [ft/min]	ae max [inch]	ap max [inch]	Chip Load Per Tooth [inch]					
					1/8"	3/16" 1/4" 5/16"	3/8" 7/16"	1/2" 5/8"	3/4"	1"
Machining Steel	< 500 N/mm ²	853	1xø	1xø	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	> 500 N/mm ²	787	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Construction Steel	Non-Alloy < 500 N/mm ²	820	1xø	1xø	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Non-Alloy > 500 N/mm ²	755	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Alloy	722	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Cementation Steel	< 150 HB	689	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	150-200 HB	656	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	> 200 HB	623	1xø	1xø	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
Nitriding Steel	< 1000 N/mm ²	623	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	> 1000 N/mm ²	558	1xø	1xø	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
Quenched & Tempered Steel	Non-Alloy < 800 N/mm ²	656	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Non-Alloy 800-1000 N/mm ²	623	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Alloy < 800 N/mm ²	623	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Alloy 800-1000 N/mm ²	591	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Alloy 1000-1300 N/mm ²	558	1xø	1xø	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
Non-Alloy Tool Steel	General	607	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Tool Steel for Cold Processing	Low Alloy < 1000 N/mm ²	591	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Low Alloy < 1200 N/mm ²	558	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Low Alloy < 1500 N/mm ²	492	1xø	1xø	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
	High Alloy Annealed < 1000 N/mm ²	525	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	High Alloy Hardened < 1300 N/mm ²	459	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Tool Steel for Warm Processing	Low Alloy < 1200 N/mm ²	656	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Low Alloy < 1500 N/mm ²	591	1xø	1xø	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
	High Alloy Annealed < 1000 N/mm ²	492	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	High Alloy Hardened < 1300 N/mm ²	459	1xø	1xø	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	High Alloy Hardened < 1600 N/mm ²	427	1xø	1xø	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
Stainless Steel	Ferric	328	1xø	1xø	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035
	Martensitic	262	1xø	1xø	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035
	Austenitic A5 < 40%	328	1xø	1xø	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035
	Austenitic A5 > 40%	328	1xø	1xø	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035
	Sulphured	361	1xø	1xø	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035

* Feeds and speeds are starting points for overall lengths of 4" and shorter.
For end mills with overall lengths over 4" decrease the feeds and speeds.

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High Temperature Alloy	Fe-Alloy	98	1xØ	0.5xØ	0.0004	0.0008	0.0012	0.0016	0.0020	0.0024
	Ni-Alloy not hardened	98	1xØ	0.5xØ	0.0004	0.0008	0.0012	0.0016	0.0020	0.0024
	Ni-Alloy hardened	98	1xØ	0.5xØ	0.0004	0.0008	0.0012	0.0016	0.0020	0.0024
	Co-Alloy	98	1xØ	0.5xØ	0.0004	0.0008	0.0012	0.0016	0.0020	0.0024
Cast Iron	Non-Alloy	656	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Low-Alloy	525	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	High-Alloy	394	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Stainless Cast Steel	Ferric/Martensitic	328	1xØ	1xØ	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035
	Austenitic	328	1xØ	1xØ	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035
Cast Iron with Lamellar Graphite	Non-Alloy < 180 HB	656	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Non-Alloy > 180 HB	591	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Alloy	525	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	High Alloy	394	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Spheroidal Cast Iron	Non-Alloy < 180 HB	623	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Non-Alloy > 180 HB	558	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Alloy	492	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
White Malleable Cast Iron	< 180 HB	591	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	> 180 HB	525	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Black Malleable Cast Iron	< 180 HB	591	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	> 180 HB	525	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
Copper	Non-Alloy	919	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Wrought Alloy Non-Hardened	787	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Wrought Alloy Hardened	656	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	CuNi-Alloy	787	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	CuNiZn-Alloy Long-Chipping	656	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	CuNiZn-Alloy Short-Chipping	787	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
CuZn (Brass)	Long-Chipping	984	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Short-Chipping	1148	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
CuSn (Bronze)	Long-Chipping	787	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Short-Chipping	919	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
CuAlFe (Ampco)	Long-Chipping	459	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
	Short-Chipping	525	1xØ	1xØ	0.0010	0.0018	0.0028	0.0039	0.0047	0.0055
Titanium	Non-Alloy	295	1xØ	1xØ	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047
	Alloyed-Annealed	262	1xØ	1xØ	0.0006	0.0012	0.0020	0.0024	0.0031	0.0039
	Alloyed-Hardened	164	1xØ	1xØ	0.0005	0.0010	0.0016	0.0020	0.0028	0.0035

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					1/8"	3/16" 1/4" 5/16"	3/8" 7/16"	1/2" 5/8"	3/4"	1"
Machining Steel	< 500 N/mm ²	968	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	> 500 N/mm ²	755	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
Construction Steel	Non-Alloy < 500 N/mm ²	968	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Non-Alloy > 500 N/mm ²	755	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Alloy	640	0.05xØ	0.08xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
Spring Steel	Annealed < 250 HB	853	0.04xØ	0.05xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Natural Hardened 250-350 HB	755	0.04xØ	0.05xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
	Spring Hardened 1200-1600 N/mm ²	509	0.04xØ	0.05xØ	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
Cementation Steel	< 150 HB	919	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	150-200 HB	853	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	> 200 HB	656	0.05xØ	0.08xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
Nitriding Steel	< 1000 N/mm ²	771	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	> 1000 N/mm ²	574	0.05xØ	0.08xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
Quenched & Tempered Steel	Non-Alloy < 800 N/mm ²	853	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Non-Alloy 800-1000 N/mm ²	689	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Alloy < 800 N/mm ²	574	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Alloy 800-1000 N/mm ²	640	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Alloy 1000-1300 N/mm ²	574	0.05xØ	0.08xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
	Alloy 1300-1600 N/mm ²	476	0.04xØ	0.05xØ	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
Non-Alloy Tool Steel	General	755	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
Tool Steel for Cold Processing	Low Alloy < 1000 N/mm ²	640	0.05xØ	0.08xØ	0.0011	0.0022	0.0033	0.0055	0.0069	0.0083
	Low Alloy < 1200 N/mm ²	541	0.04xØ	0.05xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
	Low Alloy < 1500 N/mm ²	427	0.04xØ	0.05xØ	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039
	High Alloy Annealed < 1000 N/mm ²	541	0.05xØ	0.08xØ	0.0011	0.0017	0.0022	0.0041	0.0055	0.0062
	High Alloy Hardened < 1300 N/mm ²	377	0.04xØ	0.05xØ	0.0010	0.0017	0.0019	0.0025	0.0033	0.0039

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