

Milling Speeds

Material	Brinell Hardness	Material Condition*	SFPM		
			HSS	Carbide	
Resulphurized Carbon Steels					
1212, 1213, 1214	100-150	HR, A	140	600	
	150-200	CD	130	550	
1108,1109, 1115, 1117, 1118, 1120, 1126, 1211	100-150	HR, A	130	550	
	150-200	CD	115	500	
1132, 1137, 1139, 1140, 1144, 1146, 1151	175-225	HR, A, N, CD	115	450	
	275-325	Q & T	70	290	
	325-375	Q & T	45	200	
	375-425	Q & T	35	170	
Leaded Carbon Steels					
11L17, 11L18, 12L13, 12L14	100-150	HR, A, N, CD	140	600	
	150-200	HR, A, N, CD	130	625	
	200-250	N, CD	110	400	
Carbon Steels					
1006, 1008, 1009, 1010,1012,1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1513, 1514	100-125	HR, A, N, CD	110	425	
	125-175	HR, A, N, CD	110	400	
	175-225	HR, N, CD	90	350	
	225-275	CD	65	250	
1027, 1030, 1033, 1035, 1036, 1037, 1028, 1039, 1040, 1041, 1042, 1043, 1045, 1046, 1048, 1049, 1050, 1052, 1524, 1526, 1527, 1541	125-175	HR, A, N, CD	100	375	
	175-225	HR, A, N, CD	85	325	
	225-275	N, CD, Q & T	70	225	
	275-325	Q & T	55	200	
	325-375	Q & T	35	160	
1055, 1060, 1064, 1065, 1070, 1074, 1078, 1080, 1084, 1086, 1090, 1095, 1548, 1551, 1552, 1561, 1566	375-425	Q & T	25	140	
	125-175	HR, A, N, CD	90	350	
	175-225	HR, A, N, CD	75	300	
	225-275	N, CD, Q & T	60	200	
	275-325	Q & T	45	160	
1055, 1060, 1064, 1065, 1070, 1074, 1078, 1080, 1084, 1086, 1090, 1095, 1548, 1551, 1552, 1561, 1566	325-375	Q & T	30	145	
	375-425	Q & T	15	125	
	Resulphurized Alloy Steels				
	4140, 4150	175-200	HR, A, N, CD	100	400
		200-250	HR, N, CD	90	350
250-300		Q & T	60	280	
300-375		Q & T	45	220	
375-425		Q & T	35	160	
Leaded Alloy Steels					
41L30, 41L40, 41L47, 41L50, 43L47, 51L32, 52L100, 86L20, 86L40	150-200	HR, A, N, CD	115	425	
	200-250	HR, N, CD	95	375	
	250-300	Q & T	70	260	
	300-375	Q & T	50	210	
	375-425	Q & T	40	180	

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			HSS	Carbide
Alloy Steels				
4012, 4023, 4024 4028, 4118, 4120, 4419, 4422, 4427, 4615, 4620, 4621, 4626, 4718, 4720, 4815, 4817, 4820, 5015, 5017, 5020, 6118, 8115, 8615, 8617, 8620, 8622, 8625, 8627, 8820, 8822, 94B17	125-175	HR, A, N, CD	100	400
	175-225	HR, N, CD	90	350
	225-275	CD, N, Q & T	60	250
	275-325	Q & T	50	200
	325-375	Q & T	40	175
	375-425	Q & T	25	150
1330, 1335, 1340, 1345, 4032, 4037, 4042, 4047, 4130, 4135, 4137, 4140, 4142, 4145, 4147, 4150, 4160, 4337, 4340, 50B44, 50B46, 50B50, 50B60, 5130, 5132, 5140, 5145, 5147, 5150, 5160, 51B60, 6150, 81B45, 8630, 8635, 8637, 8640, 8642, 8645, 8650, 8655, 8660, 8740, 9254, 9255, 9260, 9262, 94B30, E51100, E52100	175-225	HR, A, N, CD	75	310
	225-275	N, CD, Q & T	60	260
	275-325	N, Q & T	50	210
	325-375	N, Q & T	35	180
	375-425	Q & T	20	140
Tool Steels				
A2, A3, A8, A9, A10	200-250	A	50	200
A4, A6	200-250	A	45	160
A7	225-275	A	40	140
D2, D3, D4, D5, D7	200-250	A	40	150
S1, S2, S5, S6, S7	175-225	A	55	215
O1, O2, O6, O7	175-225	A	50	200
W1, W2, W5	15-200	A	85	250
Free Machining Stainless Steels				
430F, 430F SE	135-185	A	95	375
203EZ, 303, 303 Se, 303 MA, 303Pb, 303 Cu	135-185	A	90	325
	225-275	CD	75	300
416, 416Se, 420F, 420F Se, 440F, 440F Se	135-185	A	95	375
	185-240	CD	80	325
	275-325	Q & T	50	225
	375-425	Q & T	20	100
Stainless Steels				
405, 409, 429, 430, 434, 436, 442, 446, 502	135-185	A	75	275
201, 202, 301, 302, 304, 304L, 305, 308, 321, 347, 348	135-185	A	60	200
	225-275	CD	50	180
302B, 309, 309S, 310, 310S, 314, 316, 316L, 317, 330	135-185	A	50	200
403, 410, 420, 501	135-175	A	75	325
	175-225	A	65	275
	275-325	Q & T	40	175
	375-425	Q & T	25	100
414, 431, 440A, 440B, 440C	225-275	A	50	180
	275-325	Q & T	40	140
	375-425	Q & T	20	100
15-5PH, 17-4PH, 17-7PH, AF-71, 17-14CuMo, AFC-77, AM-350, AM-355, AM-362, Custom 455, HNM, PH13-8, PH14-8Mo, PH15-7Mo, Stainless W	150-200	A	60	200
	275-325	H	50	180
	325-375	H	40	110
	375-450	H	25	75

Milling Speeds

Material	Brinell Hardness	Material Condition*	SFPM	
			HSS	Carbide
Gray Cast Iron				
ASTM Class 20	120-150	A	100	425
ASTM Class 25	160-200	AC	80	325
ASTM Class 30, 35, & 40	190-220	AC	70	250
ASTM Class 45, & 50	220-260	AC	50	190
ASTM Class 55, & 60	250-320	AC, HT	30	110
ASTM Type 1, 1b, 5	100-215	AC	50	200
ASTM Type 2, 3, 6	120-175	AC	40	190
ASTM Type 2b, 4	150-250	AC	30	180
Malleable Iron				
32510, 35018	110-160	MHT	110	475
40010, 43010, 45006, 45008, 48005, 50005	160-200	MHT	80	375
	200-240	MHT	65	250
53004, 60003, 60004	200-255	MHT	55	225
70002, 70003	220-260	MHT	50	200
80002	240-280	MHT	45	130
90001	250-320	MHT	25	110
Ductile Iron				
60-40-18, 65-45-12	140-190	A	75	425
80-55-06	190-225	AC	60	325
	225-260	AC	50	200
100-70-03	240-300	HT	40	160
120-90-02	270-330	HT	25	90
	330-400	HT	N/A	30
Copper Alloys				
C38500, C35600, C37700, C54400, C36000, C37000, C33200, C34200, C35300, C31400, C48500, C34000	N/A	A	240	550
	N/A	CD	260	600
C68700, C26000, C65500, C44300, C44500, C22600, C36500, C36800, C79600, C24000, C33500, C65100, C67500, C28000, C77000, C23000, C26800	N/A	A	180	415
	N/A	CD	210	480
C61400, C17000, C17200, C17500, C22000, C70600, C71500, C11000, C21000, C74500, C75700, C75400, C75200, C10200, C50200, C52400, C51000, C52100, C12200	N/A	A	90	210
	N/A	CD	100	230
Aluminum				
Wrought	N/A	CD	600	1200
	N/A	ST & A	500	1000
Sand & permanent mold casting alloys	N/A	AC	750	1500
	N/A	ST & A	600	1200

*Abbreviations: A, annealed; AC, as cast; CD, cold drawn; H, precipitation hardened; HR, hot rolled; HT, heat treated; MHT, malleablizing heat treatment; N, normalized; Q & T, quenched & tempered; ST & A, solution treated & aged