Drilling Speeds/Feeds

			Carbide 118° PT		Carbide Tin 140° PT		Carbide Str. Flute 120° PT		HSCO Tin 130° PT		HSS 118° PT	
Materials	**Examples**	**Hardness**	**SFM**	**FC**	**SFM**	**FC**	**SFM**	**FC**	**SFM**	**FC**	**SFM**	**FC**
Low & Non-Alloy Steels	1010, 12L14	≤ 16 Rc	–	–	330	12	–	–	200	12	105	8
Steel & Cast Steel	1045, 8620	17 - 32 Rc	–	–	280	10	–	–	185	12	90	8
Steels 4140, 4340	33 - 40 Rc	–	–	235	8	–	–	120	8	40	40	5
Steels 4620, 5140	41 - 65 Rc	–	–	160	4	–	–	55	5	15	16	4
Hardened & Maraging Steels	300M	45 - 63 Rc	–	–	100	3	–	–	–	–	–	–
Hardened Steels	–	55 - 65 Rc	–	–	–	–	–	–	–	–	–	–
Tool Steel, Unalloyed	1086, W1	≤ 32 Rc	–	–	245	9	–	–	130	12	45	6
Tool Steel, Low Alloyed	52100, L2	≤ 32 Rc	–	–	235	10	–	–	130	10	45	6
Tool Steel, High Alloyed	A2, D2, H13	≤ 32 Rc	–	–	200	10	–	–	90	10	30	6
Stainless, Martensitic	400 Series	≤ 34 Rc	–	–	210	10	–	–	110	8	25	7
Stainless, Sulphered	300 Series	≤ 24 Rc	–	–	200	6	–	–	80	7	15	4
Stainless, Austenitic	300 Series, PH's	≤ 28 Rc	–	–	–	–	–	–	55	5	10	3
Manganese Armor Plate	A 128(A)	–	–	–	–	–	–	–	–	–	–	–
Super Alloys – Ni & Co Based	Inc., Hast. Nim	< 27 Rc	–	–	–	–	–	–	55	4	15	1
Super Alloys – Ni & Co Based	Inc., Hast. Nim	27 - 38 Rc	25	3	–	–	–	–	–	–	5	3
Super Alloys – Ni & Co Based	Inc., Hast. Nim	> 38 Rc	–	–	–	–	–	–	–	–	–	–
Cast Iron	A48-20B, 40B	< 225 HB	185	8	315	16	410	12	200	16	90	10
Cast Iron	A48-45B to 60	225 -270 HB	150	8	260	16	330	12	160	16	70	10
Nodule & Ductile Iron	GGG-40 to 60	< 150 HB	150	8	260	16	330	12	160	16	70	10
Nodule & Ductile Iron	CG Iron	≤ 260 HB	115	6	210	16	–	–	125	12	50	9
Malleable Iron	ASTM A502	≤ 350 HB	150	8	260	16	330	12	160	16	70	10
Chilled Cast Iron	–	400 - 600 HB	–	–	–	–	–	–	–	–	–	–
Pure Copper	101	≤ 75 HB	425	7	560	7	–	–	315	12	160	10
Cu – Ni – Zn Alloys	CuNi10Zn42Pb	≤ 180 HB	295	9	395	10	–	–	245	12	100	9
Brass – Short Chipping	Ms58	≤ 150 HB	360	12	525	16	690	16	360	12	200	10
Brass – Long Chipping	51000	≤ 150 HB	360	9	525	12	–	–	260	12	125	9
Bronze, Soft	CDA 65500	< 100 HB	330	9	490	12	–	–	260	12	115	9
Bronze, Special	Ampco 8 – 16	≤ 200 HB	200	8	260	12	–	–	160	12	85	7
Bronze, Special	Ampco 20	200 - 300 HB	80	3	165	5	–	–	125	7	54	5
Bronze, Special	Ampco 20 – 26	> 300 HB	80	3	–	–	–	–	–	–	–	–
Al & Al Alloys Wrought	6061, 7075	< 140 HB	725	10	820	16	1315	16	360	16	220	12
Al Alloys ≤ 10% Si	355, 360	≤ 180 HB	560	10	655	16	855	16	210	12	140	12
Al Alloys 10 – 14% Si	385, 413	≤ 180 HB	490	10	590	16	790	16	160	12	100	10
Al Alloys > 14% Si	A390, 393	≤ 180 HB	330	9	460	12	655	16	–	–	–	–
Ti & Ti Alloys	4900, 4902, 492	≤ 24 Rc	80	3	130	5	–	–	–	–	–	–
Ti Alloys	6AL 4V	< 24 Rc	55	2	105	4	–	–	–	–	–	–
Zinc Alloys	Zamak	< 80 HB	490	9	655	16	–	–	360	16	220	12
Thermoplastics	Plexiglas	–	130	12	–	–	–	–	150	12	125	12

Feed Curve Conversion

Feed Curve	.060" 1.5MM	.160" 4.0MM	.250" 6.3MM	.315" 8.0MM	.400" 10.0MM	.625" 16.0MM
16	.002"	.006"	.010"	.012"	.014"	.019"
12	.0018"	.005"	.008"	.010"	.011"	.015"
10	.0015"	.004"	.006"	.0075"	.009"	.012"
9	.0013"	.0035"	.0055"	.007"	.008"	.011"
8	.0012"	.003"	.005"	.006"	.007"	.010"
7	.0011"	.0027"	.0045"	.0055"	.006"	.009"
6	.001"	.0025"	.004"	.005"	.0055"	.0075"
5	.0007"	.002"	.003"	.004"	.004"	.006"
4	.0006"	.0015"	.0025"	.003"	.0035"	.005"
3	.0004"	.001"	.002"	.0025"	.003"	.0035"
2	.0002"	.0008"	.001"	.0013"	.0015"	.0025"

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Specific Cutting Force k_c for f_z = .016 for Different Materials

Material		HB	Specific Cutting Force, $k_{c\ .016}$ * lbs/in.^{2}
Unalloyed Steel	C = 0.15%	125	**290,000**
	C = 0.35%	150	**304,500**
	C = 0.60%	200	**316,100**
Low Alloy Steel	Non-Hardened	180	**304,500**
	Hardened and Tempered	275	**402,400**
	Hardened and Tempered	300	**402,300**
	Hardened and Tempered	350	**402,300**
High Alloy Steel	Annealed	200	**362,500**
	Hardened	325	**543,100**
Stainless Steel	Martensitic/Ferritic	200	**330,500**
	Austenitic	175	**355,200**
Steel Castings	Unalloyed	180	**261,000**
	Low Alloyed	200	**304,500**
	High Alloyed	225	**362,500**
Hard Steel	Hardened Steel	55 HRC	**681,500**
	Manganese Steel 12%	250	**522,000**
Malleable Cast Iron	Ferritic	130	**137,700**
	Pearlitic	230	**159,500**
Grey Cast Iron	Low Tensile Strength	180	**159,500**
	High Tensile Strength	260	**203,000**
Nodular Cast Iron	Ferritic	160	**152,200**
	Pearlitic	250	**253,700**
Chilled Cast Iron		400	**398,700**
Heat Resistant Alloys	Fe-base, Annealed	200	**435,000**
	Fe-base, Aged	280	**442,200**
	Ni- or Co-Base, Annealed	250	**520,000**
	Ni- or Co-Base, Aged	350	**540,000**
	Ni- or Co-Base, Cast	320	**536,500**
Aluminum Alloys	Non Heat Treatable	60	**72,500**
	Heat Treatable	100	**116,000**
Aluminum Alloys, Cast	Non Heat Treatable	75	**108,100**
	Heat Treatable	90	**130,500**
Copper and Copper Alloys	Lead Alloys, Pb > 1%	110	**101,500**
	Brass, Red Brass	90	**101,500**
	Bronze and Leadfree Copper Including Electrolytic Copper	100	**253,150**

***The $k_{c\ 0.4}$-values are valid for: f_2 = .016 inch/z, K_r = 90°, λ_{sh} = +6°**

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