

Cobalt & HSS Drills Speeds & Feeds

Material	Grades	SFM			Tool Diameter (IPR)						
					<=1/8	1/4	3/8	1/2	3/4	1	1-1/2+
		HSS	HSS-HD	Cobalt	(.1250)	(.2500)	(.3750)	(.5000)	(.7500)	(1.000)	(1.500)+
P - Steels											
High Strength Tool Steel	A2, D2, P20, H11, H13, S2, 01	30-65	33-75	33-75	.0007-.0020	.0030-.0040	.0040-.0065	.0060-.0070	.0065-.0075	.0070-.0080	.0075-.0085
Low Carbon	A36, 12L14, 12L15, 1005, 1018, 1020, 1108-1119, 1213-1215, 1513-1518, 4012, 5015, 9310	95	95	95	.0009-.0050	.0060-.0070	.0090-.0100	.0100-.0110	.0110-.0120	.0120-.0130	.0130-.0140
Medium Carbon	1040-1095, 1140-1151, 1330-1345, 1520-1572, 4023-4063, 4120-4161, 4330-4340, 4620-4640, 8620-8660, 8740-8750, 6150, 51000, 52100	115	115	115	.0009-.0050	.0060-.0070	.0090-.0120	.0110-.0120	.0110-.0130	.0120-.0140	.0130-.0150
M - Stainless Steels											
Austenitic	301-304L, 310, 316L, 321, 347	26	36	36	.0010-.0030	.0035-.0050	.0050-.0075	.0080-.0090	.0009-.0100	.0100-.0110	.0110-.0120
Martensitic	403, 410, 416, 420, 430, 431, 440	50	70	72	.0010-.0024	.0025-.0037	.0040-.0055	.0050-.0060	.0060-.0070	.0070-.0080	.0080-.0090
Precipitation Hardening	12/8, 15/5, 17/4, AM-350/355/363, PH13-8MO, PH14-8/MO	20	30	30	.0020-.0030	.0030-.0040	.0040-.0050	.0050-.0060	.0060-.0070	.0070-.0080	.0080-.0090
K - Cast Irons											
Ductile	A536, J434, 60-40-18	45	55	55	.0007-.0025	.0025-.0035	.0040-.0060	.0060-.0070	.0065-.0075	.0070-.0080	.0075-.0085
Gray	A48, A436, A319, Class 20, G4000	80-100	90-115	90-115	.0006-.0030	.0030-.0060	.0040-.0090	.0070-.0100	.0080-.0120	.0009-.0130	.0100-.0140
Malleable	A220, A602, J158	80-100	90-115	90-115	.0006-.0030	.0030-.0060	.0040-.0090	.0070-.0100	.0080-.0120	.0009-.0130	.0100-.0140
N - Non-Ferrous											
Aluminum Alloys	2014, 2024, 6061, 7075	300	300	300	.0007-.0050	.0004-.0080	.0060-.0110	.0080-.0120	.0090-.0130	.0120-.0140	.0130-.0150
High Silicon	A380, A390	60-80	80-95	80-95	.0007-.0050	.0004-.0080	.0060-.0110	.0080-.0120	.0090-.0130	.0120-.0140	.0130-.0150
Brass/Bronze	Aluminum Bronze, Low Silicon Bronze	90-115	90-130	90-130	.0008-.0040	.0035-.0070	.0050-.0075	.0075-.0090	.0080-.0100	.0090-.0110	.0100-.0120
Composites	G-10, Fiberglass, Graphite, Graphite Epoxy, Plastics	100-125	125-175	125-175	.0040-.0060	.0030-.0050	.0040-.0060	.0050-.0070	.0060-.0080	.0070-.0090	.0080-.0100
Copper		108	125	125	.0010-.0035	.0038-.0065	.0070-.0090	.0080-.0110	.0100-.0120	.0110-.0130	.0110-.0130
Magnesium		90-115	90-130	90-130	.0008-.0040	.0035-.0070	.0050-.0075	.0075-.0090	.0100-.0120	.0110-.0130	.0110-.0130
S - High Temp Alloys											
Cobalt Base	Stellite, HS-21, Haynes 25/188, X40, L605	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron Base	Incoloy 800-802, Multmet N-155, Timkin 16-25-6, Carpenter 22-b3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel Base	Inconel 625/718, Inco 700, 713C, 718, Monel 400-401, 404, K401, Rene, Rene 41 & 95 Hastelloy, Waspoly, Udimet 500 & 700	10-20	20-23	20-23	.0004-.0013	.0013-.0020	.0020-.0030	.0030-.0035	.0003-.0040	.0035-.0045	.0040-.0050
Titanium	Commercially Pure, 6Al-4V, ASTM 1/2/3, 6Al-25N-4Zr-2Mo-Si, Ti-8Al-1Mo, Ti-8Al-4Mo	20-75	35-90	35-90	.0006-.0025	.0020-.0040	.0030-.0055	.0040-.0060	.0045-.0065	.0005-.0070	.0006-.0065

NOTE: Speeds and Feeds listed are estimated and will vary by application. These tools can be found on pages 293-317.

High Speed Steel Drills Feed Rate Per Revolution Based on Cut				Cobalt Drills Feed Rate Per Revolution Based on Cut						
Drill Size	Light	Medium	Heavy	Drill Size	Cobalt			AlTiN Coated Cobalt		
					Light	Medium	Heavy	Light	Medium	Heavy
1/16"-1/8"	.0005-.0010	.0010-.0020	.0020-.0030	1/16"-1/8"	.0006-.0011	.0011-.0022	.0022-.0033	.0007-.0013	.0013-.0026	.0026-.0040
1/8"-1/4"	.0010-.0030	.0030-.0050	.0050-.0070	1/8"-1/4"	.0011-.0033	.0033-.0055	.0055-.0077	.0013-.0040	.0040-.0066	.0066-.0092
1/4"-1/2"	.0030-.0050	.0050-.0070	.0070-.0090	1/4"-1/2"	.0033-.0055	.0055-.0077	.0077-.0099	.0040-.0066	.0066-.0092	.0092-.0119
1/2"-3/4"	.0050-.0080	.0080-.0110	.0110-.0140	1/2"-3/4"	.0055-.0088	.0088-.0121	.0121-.0154	.0066-.0106	.0106-.0145	.0145-.0185
3/4"-1"	.0080-.0110	.0110-.0140	.0140-.0170	3/4"-1"	.0088-.0121	.0121-.0154	.0154-.0187	.0106-.0145	.0145-.0185	.0185-.0224
>1"	.0120-.0150	.0150-.0200	.0200-.0250	>1"	.0132-.0165	.0165-.0220	.0220-.0275	.0158-.0198	.0198-.0264	.0264-.0330