

# High Speed Steel & Cobalt Drills

## Speed and Feed Recommendations

WORKPIECE MATERIAL	BRINELL HARDNESS BHN	SURFACE SPEED SFM	FEED PER REVOLUTION BY DRILL DIAMETER				
			1/8"	1/4"	1/2"	3/4"	1"
<b>Low Carbon Steel</b> 1018, 12L12, 1108, 1213	≤120	110	0.0030	0.0040	0.0080	0.0100	0.0110
<b>Low &amp; Medium Carbon Steel</b> 1018, 1551, 11L44	120 - 250	65	0.0040	0.0060	0.0110	0.0130	0.0140
<b>Medium Carbon and Alloyed Steel</b> 1040, 1140, 4340, 8640	≤250	60	0.0030	0.0040	0.0080	0.0100	0.0110
<b>Tool and Die Steels</b> P20, A2, D2, H12	≤250	50	0.0030	0.0040	0.0080	0.0100	0.0110
<b>Tool and Die Steels</b> P20, A2, D2, H12	250 - 350	35	0.0020	0.0030	0.0060	0.0070	0.0080
<b>Free Machining Stainless Steels</b> 303, 410, 416, 440F	≤250	60	0.0040	0.0060	0.0110	0.0130	0.0140
<b>Moderate Machining Stainless Steels</b> 304, 316	≤300	45	0.0020	0.0030	0.0060	0.0070	0.0080
<b>Difficult Machining Stainless Steels</b> 17-4PH, 316L, AM350	≤300	20	0.0020	0.0030	0.0060	0.0070	0.0080
<b>Cast Iron</b> Soft Gray	≤160	105	0.0040	0.0060	0.0110	0.0130	0.0140
<b>Cast Iron</b> Gray	160 - 260	90	0.0040	0.0060	0.0110	0.0130	0.0140
<b>Cast Iron</b> Ductile	250	80	0.0030	0.0040	0.0080	0.0100	0.0110
<b>Cast Iron</b> Malleable	250 - 330	55	0.0020	0.0030	0.0060	0.0070	0.0080
<b>Titanium Alloys</b> Commercially Pure 99.0	110 - 170	90	0.0030	0.0040	0.0080	0.0100	0.0110
<b>Titanium Alloys</b> Ti-6Al-4V, ASTM B367 Grades C-3, C-4	≤250	50	0.0030	0.0040	0.0080	0.0100	0.0110
<b>High Temperature Alloys</b> Inconel, Hastelloy, Waspaloy	≤150	50	0.0030	0.0040	0.0080	0.0100	0.0110
<b>High Temperature Alloys</b> Inconel, Hastelloy, Waspaloy	150 - 250	20	0.0010	0.0020	0.0045	0.0060	0.0070
<b>Aluminum Alloys</b> 2025, 6061, A140, 514.0	≤150	325	0.0040	0.0060	0.0110	0.0130	0.0140
<b>Copper Alloys</b> Brass and Bronze	≤200	80	0.0040	0.0060	0.0110	0.0130	0.0140
<b>Composites &amp; Plastics</b>	≤128	175	0.0020	0.0030	0.0060	0.0070	0.0080
<b>Magnesium Alloys</b> AZ80A, HM12A, AM60A, ZE41A	50 - 90	325	0.0040	0.0060	0.0110	0.0130	0.0140

**NOTE:** The speeds and feeds shown are suggested starting points only and may be increased or decreased depending on actual material and machining conditions. Start conservatively and increase speed and feed until drilling cycle is optimized.