

## Drilling Recommendations for Various Materials

### Recommended Surface Feet per Minute (SFM) and Coolant by Material Application

#### Ferrous Materials

Materials	Brinell Hardness	Geometry	SFM	Coolant
Low Carbon Steel	85 - 125	general purpose	80 - 95	Soluble oil
Medium Carbon Steel	125 - 175	general purpose	70 - 85	Soluble oil
High Carbon Steel	175 - 225	heavy duty	45 - 65	Soluble oil
Steel Alloys	Under 200	general purpose	60 - 90	Soluble oil
	200 - 300	heavy duty	40 - 70	Soluble oil
	Over 300	cobalt	20 - 30	Soluble oil
Steel Drop Forgings (heat treated)	330 - 370		30 - 40	Cutting oil
	370 - 420		20 - 30	Cutting oil
	Over 420		10 - 20	Cutting oil
Grey Cast Iron (soft)	125	general purpose	140 - 150	Dry
Grey Cast Iron (medium)	120 - 200	heavy duty	50 - 80	Soluble oil
Grey Cast Iron (hard)	Up to 350	heavy duty	25 - 40	Soluble oil
Titanium Alloys (Ti)-75A	300 - 440	cobalt	50 - 60	Cutting oil
Ti-150A, RS-120	300 - 440	cobalt	40 - 50	Cutting oil
Ti140A, RC 130B	300 - 440	cobalt	30 - 40	Cutting oil
Ti-6AL-4V	300 - 440	cobalt	20 - 30	Cutting oil
300 Series Stainless	120 - 200	cobalt	20 - 40	Cutting oil
400 Series Stainless	200 - 300	cobalt	40 - 70	Cutting oil
Martensitic 416, 420, F416, Plus K, 400F, 416SSE, 440F	135 - 185	cobalt	40 - 50	Cutting oil
Precipitation Hardening	325 - 375	cobalt	30	Cutting oil
Stainless Steel (cast)	400 - 450	cobalt	20	Cutting oil
Heat Resisting Steels	175 - 225	cobalt	10 - 25	Cutting oil
Nimonic Alloys	200 - 300	cobalt	10 - 20	Cutting oil
Manganese, 12-14% min	125 - 220	heavy duty	10 - 12	Cutting oil
Spring Steels	402	cobalt	15 - 30	Soluble oil
Armor Plate	200 - 250	cobalt	40	Soluble oil
	250 - 300	cobalt	35	Soluble oil
	300 - 350	cobalt	30	Cutting oil

#### Non-Ferrous Materials

Materials	Brinell Hardness	Geometry	SFM	Coolant
Aluminum (pure)	140 - 350	fast spiral*	130 - 200	Soluble oil
Aluminum Alloys	140 - 330	fast spiral*	150 - 300	Soluble oil
Aluminum (lead)	40 - 100	fast spiral*	200 - 325	Soluble oil
Aluminum Silicon Alloy (die cast)	40 - 100	fast spiral*	25 - 50	Soluble oil
Brass	190 - 210	slow spiral*	200 - 250	Cutting or soluble oil
Bronze	150 - 200	slow spiral*	200 - 250	Soluble oil
Copper (nickel & copper tin alloy)	65 - 100	general purpose*	140 - 200	Cutting or soluble oil
Copper (aluminum alloys)	30 - 100	general purpose*	120 - 200	Cutting or soluble oil
Magnesium Alloys (wrought)	50 - 90	general purpose*	140 - 330	Cutting or soluble oil
Magnesium Alloys (cast)	50 - 90	general purpose*	140 - 365	Cutting or soluble oil
Nickel Alloys (wrought & cast)	80 - 170	general purpose	70	Cutting or soluble oil
Nickel Alloys (Monel)	115 - 240	general purpose	55	Cutting or soluble oil
Nickel Alloys (Beryllium nickel)	200 - 250	general purpose	12	Cutting or soluble oil
Zinc Alloy	112 - 126	general purpose	200 - 250	Soluble oil

\*bright only