

Speeds and Feeds



- 1) Select your material in the ISO colored chart with respect to material description and hardness (HB).
- 2) Start with the recommended cutting speed, v_c (ft/min) and feed per revolution, f_r (in/rev). Adjust the cutting speed and/or feed rate based on your cutting conditions.

Material			Recommended Cutting Speed			Recommended Feed Per Revolution							
Group	Description	Hardness (HB)	Min	Starting Value	Max	Tool Diameter (in)							
						0.315 Ø	0.394 Ø	0.472 Ø	0.551 Ø	0.630 Ø	0.787 Ø	1.000 Ø	
P	1	Low-Carbon Steels, Short Chipping	<125	262	410	558	0.004–0.008	0.005–0.01	0.006–0.012	0.007–0.015	0.007–0.018	0.01–0.019	0.012–0.02
	2	Medium- and High-Carbon Steels	<220	345	459	591	0.004–0.011	0.005–0.014	0.006–0.015	0.008–0.018	0.009–0.018	0.011–0.02	0.012–0.02
	3	Alloy Steels and Tool Steels	<330	164	246	328	0.004–0.011	0.005–0.014	0.006–0.015	0.008–0.018	0.009–0.018	0.011–0.02	0.012–0.02
	4	Alloy Steels and Tool Steels	340–450	164	246	328	0.004–0.011	0.005–0.014	0.006–0.015	0.007–0.018	0.007–0.018	0.009–0.019	0.01–0.02
	5	Ferritic, Martensitic, and PH Stainless Steels	<330	160	210	260	0.004–0.008	0.004–0.009	0.004–0.01	0.006–0.011	0.006–0.013	0.007–0.014	0.009–0.017
	6	High-Strength Ferritic, Martensitic, and PH Stainless Steels	350–450	160	210	260	0.004–0.008	0.004–0.009	0.004–0.01	0.006–0.011	0.006–0.013	0.007–0.014	0.009–0.017
M	1	Austenitic Stainless Steel	130–200	130	260	360	0.002–0.009	0.003–0.009	0.004–0.01	0.004–0.01	0.004–0.01	0.005–0.012	0.006–0.013
	2	High-Strength Austenitic Stainless and Cast Stainless Steel	150–230	110	180	250	0.002–0.009	0.003–0.009	0.004–0.01	0.004–0.01	0.004–0.01	0.005–0.012	0.006–0.013
	3	Duplex Stainless Steel	135–275	70	110	160	0.002–0.009	0.003–0.009	0.004–0.01	0.004–0.01	0.004–0.01	0.005–0.012	0.006–0.013
K	1	Gray Cast Iron	120–290	197	312	558	0.006–0.011	0.006–0.013	0.007–0.014	0.008–0.017	0.01–0.019	0.011–0.02	0.013–0.022
	2	Low- and Medium-Strength Ductile Irons (Nodular) and Compacted Graphite Irons	130–260	197	246	295	0.006–0.011	0.006–0.012	0.007–0.013	0.008–0.016	0.01–0.019	0.011–0.02	0.013–0.022
	3	High-Strength Ductile Irons and Austempered Ductile Iron	180–350	131	213	295	0.006–0.012	0.007–0.013	0.007–0.014	0.008–0.016	0.008–0.017	0.009–0.019	0.01–0.02

NOTE: Through coolant is recommended for greater than 3XD applications.



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**Feed Rate, Per Revolution
(in/min)**

$$v_f = f_n \cdot n$$

**Feed Per Revolution
(in/rev)**

$$f_n = \frac{v_f}{n}$$

**Cutting Speed
(ft/min)**

$$v_c = \frac{\pi \cdot D_{tool} \cdot n}{12}$$

**Spindle Speed
(rev/min)**

$$n = \frac{v_c \cdot 12}{\pi \cdot D_{tool}}$$

**Material Removal Rate
(in³/min)**

$$MMR = D_{tool} \cdot f_n \cdot v_c \cdot 3$$

Imperial

Symbol	Definition	Unit
v_f	Feed rate	<i>in/min</i>
f_n	Feed per revolution	<i>in/rev</i>
v_c	Cutting speed	<i>ft/min (SFM)</i>
n	Spindle speed	<i>rev/min (RPM)</i>
D_{tool}	Tool cutting diameter	<i>in</i>
MMR	Material removal rate	<i>(in³/min)</i>
Z	Number of teeth/flutes	