

# 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,  $v_c$  (m/min) and feed per revolution,  $f_n$  (mm/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 (mm)							
						8 Ø	10 Ø	12 Ø	14 Ø	16 Ø	20 Ø	25 Ø	
P	1	Low-Carbon Steels, Short Chipping	<125	90	125	170	0.11–0.20	0.13–0.25	0.14–0.31	0.17–0.39	0.19–0.45	0.25–0.48	0.30–0.52
	2	Medium- and High-Carbon Steels	<220	105	140	180	0.11–0.28	0.12–0.35	0.16–0.37	0.21–0.46	0.23–0.46	0.28–0.50	0.30–0.52
	3	Alloy Steels and Tool Steels	<330	50	75	100	0.11–0.28	0.12–0.35	0.16–0.37	0.21–0.46	0.23–0.46	0.28–0.50	0.30–0.52
	4	Alloy Steels and Tool Steels	340–450	50	75	100	0.11–0.28	0.12–0.35	0.16–0.37	0.17–0.36	0.19–0.45	0.22–0.48	0.25–0.50
	5	Ferritic, Martensitic, and PH Stainless Steels	<330	50	65	80	0.10–0.20	0.10–0.23	0.10–0.25	0.14–0.29	0.16–0.32	0.18–0.36	0.22–0.42
	6	High-Strength Ferritic, Martensitic, and PH Stainless Steels	350–450	50	65	80	0.10–0.20	0.10–0.23	0.10–0.25	0.14–0.29	0.16–0.32	0.18–0.36	0.22–0.42
M	1	Austenitic Stainless Steel	130–200	40	80	110	0.06–0.22	0.08–0.23	0.09–0.24	0.10–0.25	0.11–0.26	0.13–0.28	0.13–0.32
	2	High-Strength Austenitic Stainless and Cast Stainless Steel	150–230	35	55	75	0.06–0.22	0.08–0.23	0.09–0.24	0.10–0.25	0.11–0.26	0.13–0.28	0.13–0.32
	3	Duplex Stainless Steel	135–275	20	35	50	0.06–0.22	0.08–0.23	0.09–0.24	0.10–0.25	0.11–0.26	0.13–0.28	0.13–0.32
K	1	Gray Cast Iron	120–290	60	95	170	0.15–0.29	0.16–0.32	0.17–0.35	0.21–0.42	0.25–0.48	0.28–0.52	0.32–0.56
	2	Low- and Medium-Strength Ductile Irons (Nodular) and Compacted Graphite Irons	130–260	60	75	90	0.15–0.29	0.16–0.30	0.17–0.33	0.21–0.41	0.25–0.48	0.28–0.52	0.32–0.56
	3	High-Strength Ductile Irons and Austempered Ductile Iron	180–350	40	65	90	0.16–0.30	0.17–0.33	0.18–0.36	0.20–0.41	0.21–0.44	0.23–0.48	0.25–0.50

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



# Speeds and Feeds



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

$$v_f = f_n \cdot n$$

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

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

**Cutting Speed  
(m/min)**

$$v_c = \frac{\pi \cdot D_{tool} \cdot n}{1000}$$

**Spindle Speed  
(rev/min)**

$$n = \frac{v_c \cdot 1000}{\pi \cdot D_{tool}}$$

**Material Removal Rate  
(mm<sup>3</sup>/min)**

$$MMR = \frac{D_{tool} \cdot f_n \cdot v_c}{4}$$

## Metric

Symbol	Definition	Unit
$v_f$	Feed rate	mm/min
$f_n$	Feed per revolution	mm/rev
$v_c$	Cutting speed	m/min (SMM)
$n$	Spindle speed	rev/min (RPM)
$D_{tool}$	Tool cutting diameter	mm
$MMR$	Material removal rate	(mm <sup>3</sup> /min)
$Z$	Number of teeth/flutes	