Speed and Feeds

1) Select your material in the ISO colored chart.
2) Start with the appropriate feed per tooth, f_z (in) for your application. Start with a middle/average value for cutting speed, V_c (ft/min). Adjust the cutting speeds and/or feed based on your cutting conditions.

ISO Material		Parameter	Series Name	Engraving Ball End Mill
			Coating	TiAlN
			Tool Diameter	3/16" Ø
P	Steels (1.0)	Cutting Speed, V_c	SFM MIN	200
			SFM MAX	500
		Feed per Tooth, f_z	Slotting	0.0008
			Plunge/Ramp	0.0012
			Rough Profile	0.0008
			HEM	0.0008
			Finish	0.0012
M	Stainless Steels (.60)	Cutting Speed, V_c	SFM MIN	130
			SFM MAX	260
		Feed per Tooth, f_z	Slotting	0.0004
			Plunge/Ramp	0.0006
			Rough Profile	0.0004
			HEM	0.0004
			Finish	0.0006
K	Cast Iron (1.25)	Cutting Speed, V_c	SFM MIN	250
			SFM MAX	400
		Feed per Tooth, f_z	Slotting	0.0006
			Plunge/Ramp	0.0014
			Rough Profile	0.0006
			HEM	0.0006
			Finish	0.0014

ISO Material		Parameter	Series Name	Engraving Ball End Mill
			Coating	TiAlN
			Tool Diameter	3/16" Ø
S	Super Alloys (Nickel based, Inconel) (.20)	Cutting Speed, V_c	SFM MIN	25
			SFM MAX	115
		Feed per Tooth, f_z	Slotting	0.0003
			Plunge/Ramp	0.0006
			Rough Profile	0.0003
			HEM	0.0003
			Finish	0.0006
	Titanium (.35)	Cutting Speed, V_c	SFM MIN	35
			SFM MAX	330
		Feed per Tooth, f_z	Slotting	0.0004
			Plunge/Ramp	0.0007
			Rough Profile	0.0004
			HEM	0.0004
			Finish	0.0007
H	Hardened Steels > 48 RC (.75)	Cutting Speed, V_c	SFM MIN	80
			SFM MAX	130
		Feed per Tooth, f_z	Slotting	0.001
			Plunge/Ramp	0.0013
			Rough Profile	0.0012
			HEM	0.0012
			Finish	0.0013

Speeds and Feeds

Feed Rate, Per Revolution (in/min)

$$v_f = f_n \cdot n$$

Feed Rate, Per Tooth (in/min)

$$v_f = f_z \cdot n \cdot Z$$

Feed Per Revolution (in/rev)

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

Feed Per Tooth (in)

$$f_z = \frac{v_f}{n \cdot Z}$$

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)

$$MMR = a_p \cdot a_e \cdot v_f$$

Inch

Symbol	Definition	Unit
v_f	Feed rate	in/min
f_n	Feed per revolution	in/rev
f_z	Feed per tooth	in
v_c	Cutting speed	ft/min (SFM)
n	Spindle speed	rev/min (RPM)
D_{tool}	Tool cutting diameter	in
MRR	Material removal rate	(in³/min)
a_e	Radial depth of cut	in
a_p	Axial depth of cut	in
Z	Number of teeth/flutes	