Speeds and Feeds

ISO Material		Parameter	Series Name	Engraving Cutter
			Coating	Uncoated
			Tool Diameter	1/8" Ø
	Wood	Cutting Speed, V_c	SFM MIN	500
			SFM MAX	800
		Feed per Tooth, f_z	Slotting	0.003
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
	Composites	Cutting Speed, V_c	SFM MIN	300
			SFM MAX	600
		Feed per Tooth, f_z	Slotting	0.003
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
	Plastics (3.0)	Cutting Speed, V_c	SFM MIN	500
			SFM MAX	800
		Feed per Tooth, f_z	Slotting	0.0025
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
N	High Si Aluminum (>10%) (2.0)	Cutting Speed, V_c	SFM MIN	500
			SFM MAX	800
		Feed per Tooth, f_z	Slotting	0.0018
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
	Low Si Aluminum (<10%) (3.0)	Cutting Speed, V_c	SFM MIN	1100
			SFM MAX	1500
		Feed per Tooth, f_z	Slotting	0.0018
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
	Brass & Copper (3.0)	Cutting Speed, V_c	SFM MIN	400
			SFM MAX	600
		Feed per Tooth, f_z	Slotting	0.0009
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
	Graphite (3.0)	Cutting Speed, V_c	SFM MIN	500
			SFM MAX	800
		Feed per Tooth, f_z	Slotting	0.0015
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	

ISO Material		Parameter	Series Name	Engraving Cutter
			Coating	TiAlN
			Tool Diameter	1/8" Ø
P	Steels (1.0)	Cutting Speed, V_c	SFM MIN	230
			SFM MAX	350
		Feed per Tooth, f_z	Slotting	0.0006
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
M	Stainless Steels (.60)	Cutting Speed, V_c	SFM MIN	130
			SFM MAX	280
		Feed per Tooth, f_z	Slotting	0.0006
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
K	Cast Iron (1.25)	Cutting Speed, V_c	SFM MIN	250
			SFM MAX	400
		Feed per Tooth, f_z	Slotting	0.001
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
S	Super Alloys (Nickel based, Inconel) (.20)	Cutting Speed, V_c	SFM MIN	80
			SFM MAX	120
		Feed per Tooth, f_z	Slotting	0.0003
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
	Titanium (.35)	Cutting Speed, V_c	SFM MIN	120
			SFM MAX	200
		Feed per Tooth, f_z	Slotting	0.0003
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	
H	Hardened Steels > 48 RC (.75)	Cutting Speed, V_c	SFM MIN	80
			SFM MAX	130
		Feed per Tooth, f_z	Slotting	0.0008
			Plunge/Ramp	
			Rough Profile	
			HEM	
			Finish	

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.

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 (in^3/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*
MMR	Material removal rate	*(in^3/min)*
a_e	Radial depth of cut	*in*
a_p	Axial depth of cut	*in*
Z	Number of teeth/flutes	