

Speeds 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	Uncoated
		Tool Diameter	1/8" Ø
Wood	Cutting Speed, V_c	SFM MIN	500
		SFM MAX	800
	Feed per Tooth, f_z	Slotting	0.0015
		Plunge/Ramp	0.00175
		Rough Profile	0.0015
		HEM	0.0015
Composites	Cutting Speed, V_c	SFM MIN	300
		SFM MAX	600
	Feed per Tooth, f_z	Slotting	0.0015
		Plunge/Ramp	0.002
		Rough Profile	0.0015
		HEM	0.0015
Plastics (3.0)	Cutting Speed, V_c	SFM MIN	500
		SFM MAX	800
	Feed per Tooth, f_z	Slotting	0.0015
		Plunge/Ramp	0.00175
		Rough Profile	0.0015
		HEM	0.0015

ISO Material	Parameter	Series Name	Engraving Ball End Mill
		Coating	Uncoated
		Tool Diameter	1/8" Ø
N High Si Aluminum (>10%) (2.0)	Cutting Speed, V_c	SFM MIN	500
		SFM MAX	800
	Feed per Tooth, f_z	Slotting	0.0006
		Plunge/Ramp	0.0005
		Rough Profile	0.0005
		HEM	0.0007
Low Si Aluminum (<10%) (3.0)	Cutting Speed, V_c	SFM MIN	1100
		SFM MAX	1500
	Feed per Tooth, f_z	Slotting	0.0039
		Plunge/Ramp	0.0051
		Rough Profile	0.0039
		HEM	0.0039
Brass & Copper (3.0)	Cutting Speed, V_c	SFM MIN	400
		SFM MAX	600
	Feed per Tooth, f_z	Slotting	0.0004
		Plunge/Ramp	0.0006
		Rough Profile	0.0004
		HEM	0.0004
Graphite (3.0)	Cutting Speed, V_c	SFM MIN	500
		SFM MAX	800
	Feed per Tooth, f_z	Slotting	0.0015
		Plunge/Ramp	0.0015
		Rough Profile	0.002
		HEM	0.002

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	