



**INDUSTRIAL**

## Solid Carbide Spiral CNC Router Bits / End Mills for Steel, Stainless Steel & Non Ferrous Metal with AlTiN Coating Speed and Feed Chart

Material Group	Speed SFM*	Chip Load	
		up to 1/4" Dia.	1/4" to 1/2" Dia.
Aluminum/Related Alloys	600 - 1200	.001 - .002	.002 - .004
Brass Bronze	300 - 550	.001 - .002	.002 - .003
Copper/Related Alloys	500 - 900	.001 - .002	.002 - .003
Cast Iron (soft 195bhn)	200 - 500	.001 - .002	.002 - .003
Cast Iron (medium 225bhn)	125 - 300	.001 - .002	.002 - .003
Cast Iron (hard 275bhn)	80 - 300	.0005 - .001	.001 - .002
Magnesium	800 - 1400	.001 - .003	.003 - .005
Monel/Nickel Alloys	65 - 175	.0005 - .001	.001 - .002
Plastics	600 - 1200	.001 - .003	.003 - .006
Steel-Heat Treated (35-40Rc)	150 - 350	.0003 - .0005	.0005 - .001
Steel-Heat Treated (40-45Rc)	125 - 275	.0002 - .0005	.0005 - .001
Steel-Heat Treated (45Rc)	50 - 200	.0002 - .0005	.0005 - .001
Steel-Medium Carbon	175 - 350	.0005 - .001	.001 - .002
Steel, Mold & Die	50 - 250	.0005 - .001	.001 - .002
Steel, Tool	150 - 250	.0005 - .001	.001 - .002
Stainless-Soft	250 - 400	.0005 - .001	.001 - .002
Stainless-Hard	75 - 250	.0005 - .001	.001 - .002
Titanium Alloys	90 - 225	.0003 - .0009	.0009 - .002

\* Surface Feet/Minute  
 $SFM = 0.262 \times \text{Dia.} \times \text{RPM}$

*Replace or Resharpen drills  
 at first sign of dulling or rounding.*



# Solid Carbide Spiral CNC Router Bits / End Mills for Steel, Stainless Steel & Non Ferrous Metal with AlTiN Coating Speed and Feed Chart

## General Endmill Calculations

### In order to find the

#### RPM (Revolution Per Minute)

The speed by which the tool or spindle is rotating.

#### SFM (Surface Per Minute)

The manufacturer's suggested working velocity of the tool based on geometry, substrate, coatings and workpiece material.

#### IPM (Inches Per Minute)

The feed rate by which the workpiece material passes by the endmill during production.

#### IPT (Inches Per Tooth)

The manufacturer's suggested feedrate, measured in .001" increments, as applied to each tooth of the endmill, aka "chip load".

#### Feed Rate

The distance traveled by the workpiece as the tool revolves one time only.

### If you know these...

### Then the math becomes easy...

Suggested **Surface Feed Per Minute (SFM)**  
(see page 1 for material suggestions)  
**Diameter of Tool**

$$\text{RPM} = \text{SFM} \times 3.82, \div \text{Diameter of tool}$$

**Revolutions Per Minute (RPM)**  
**Diameter of Tool**

$$\text{SFM} = .262 \times \text{RPM} \times \text{Diameter of tool}$$

**RPM**  
Chip Load  
(feed per tooth per revolution)  
Number of teeth

$$\text{IPM} = \text{RPM} \times \text{Chip Load} \times \text{Number of flutes}$$

**IPM (inches per minute)**  
**RPM (revolutions per minute)**  
Number of Flutes on tool

$$\text{IPT} = \text{IPM} \div \text{RPM} \div \text{Number of flutes}$$

**IPM (inches per minute)**  
**RPM (revolutions per minute)**

$$\text{IPR} = \text{IPM} \div \text{RPM}$$

### A working example to calculate RPMs...

Whereby you want to run a 3/8" diameter, 4 fluted endmill at the suggested 200 SFM. What are your suggested RPMs?

$$\text{RPMs} = \text{SFM} \times 3.82, \div \text{Diameter of tool}$$

Example... 200 SFM x 3.82, ÷ .375"... equals 2,037 RPM

A working example to calculate the SFM... for the same 3/8" diameter tool when you know that your spindle runs at 18,000 RPMs...

$$\text{SFM} = .262 \times \text{RPM} \times \text{Diameter of tool}$$

Example... .262 SFM x 18,000 x .375"... equals 1,768.5 SFM

A working example to find the work material's suggested feed-rate, for the same 3/8" diameter, 4 fluted tool, when I know the spindle is running at 2,500 RPM and a chip load of .0025" per tooth...

$$\text{IPM} = \text{RPM} \times \text{Chip Load} \times \text{Number of flutes}$$

Example... 2,500 x .0025" x 4... equals 25 IPM (inches per minute)

A working example to see if your chip load is correct, for a 3/8" diameter, 2 fluted tool routing aluminum at 5,000 RPMs at 45 IPM feed...

$$\text{IPT} = \text{IPM} \div \text{RPM} \div \text{Number of flutes}$$

Example... 45 ÷ 5,000 ÷ 2 flutes... equals .0045" per tooth