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

		Chip Load Per Tooth	
Material Group	**Speed SFM***	**up to 1/4" Dia.**	**1/4" to 1/2" Dia.**
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 Per Minute**

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

Simple Machining Calculations:
To find **RPM:** (SFM x 3.82) / diameter of tool
To find **SFM:** 0.262 x diameter of tool x RPM
To find **Feed Rate IPM:** RPM x # of flutes x chip load
To find **Chip Load:** Feed Rate IPM / (RPM x # of Flutes)

Depth of Cut: 1 x D Use recommended chip load
2 x D Reduce chip load by 25%
3 x D Reduce chip load by 50%

Disclaimer: These values are based on test results. Your results may vary.
It is important to understand that these values are only recommendations.

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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**	RPM = SFM x 3.82, ÷ Diameter of tool
Revolutions Per Minute (RPM) **Diameter of Tool**	SFM = .262 x RPM x Diameter of tool
RPM Chip Load (feed per tooth per revolution) Number of teeth	IPM = RPM x Chip Load x Number of flutes
IPM (inches per minute) **RPM** (revolutions per minute) Number of Flutes on tool	IPT = IPM ÷ RPM ÷ Number of flutes
IPM (inches per minute) **RPM** (revolutions per minute)	IPR = IPM ÷ 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?

RPMs = SFM x 3.82, ÷ 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...

SFM = .262 x RPM x 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...

IPM = RPM x Chip Load x 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 at 5,000 RPMs at 45 IPM feed...

IPT = IPM ÷ RPM ÷ Number of flutes
Example... 45 ÷ 5,000 ÷ 2 flutes... equals .0045" per tooth

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