

# Chart for hand grinding turning tool bits

**Rake**

**End view** **Side view**  
side clearance

	<b>Hard steel like 4140</b>	<p>Roughing cut 50 f.p.m. .010 and up feed  <math>\frac{1}{2}</math>" <math>\phi</math> 382 rpm, 1" <math>\phi</math> 191 rpm, 2" <math>\phi</math> 95 rpm, 4" <math>\phi</math> 64 rpm, 6" <math>\phi</math> 32 rpm</p> <p>Finishing 75 f.p.m. .002 to .010 feed  <math>\frac{1}{2}</math>" <math>\phi</math> 574 rpm, 1" <math>\phi</math> 287 rpm, 2" <math>\phi</math> 143 rpm, 4" <math>\phi</math> 72 rpm, 6" <math>\phi</math> 48 rpm</p>
	<b>Steel 12L14 or Stressproof 1114</b>	<p>Roughing cut 90 f.p.m. .010 and up feed  <math>\frac{1}{2}</math>" <math>\phi</math> 668 rpm, 1" <math>\phi</math> 344 rpm, 2" <math>\phi</math> 172 rpm, 4" <math>\phi</math> 85 rpm, 6" <math>\phi</math> 88 rpm</p> <p>Finishing 100 f.p.m. .002 to .010 feed 1"<math>\phi</math> 382 rpm, 2" <math>\phi</math> 191 rpm, 4" <math>\phi</math> 95 rpm, 6" <math>\phi</math> 64 rpm</p>
	<b>Steel cold rolled and Stainless Steel</b>	
	<b>Soft steel hot rolled</b> Must be sharp all the time or the steel will tear	
	<b>Aluminum Wood and Plastics</b>	<p>Roughing cut 300 f.p.m. .010 and up feed  1" <math>\phi</math> 1146 rpm, 2" <math>\phi</math> 573 rpm, 4" <math>\phi</math> 285 rpm, 6" <math>\phi</math> 192 rpm</p> <p>Finishing 400 f.p.m. .002 to .010 feed 1"<math>\phi</math> 1527 rpm, 2" <math>\phi</math> 764 rpm, 4" <math>\phi</math> 380 rpm, 6" <math>\phi</math> 255 rpm</p>

**Free cutting bronze and leaded brass**

Roughing cut 300 f.p.m. .010 and up feed  
1"  $\phi$  1146 rpm, 2"  $\phi$  573 rpm, 4"  $\phi$  285 rpm, 6"  $\phi$  192 rpm

Finishing 400 f.p.m. .002 to .010 feed 1" $\phi$  1527 rpm, 2"  $\phi$  764 rpm, 4"  $\phi$  380 rpm, 6"  $\phi$  255 rpm

**Tool for threading**  
**Cross slide feed**  
**Soft steel hot rolled**  
**Must be sharp all the time or the steel will tear**

**Tool for threading**  
**Compound rest feed set at 29°**  
**Soft steel hot rolled**  
**Must be sharp all the time or the steel will tear**

**Threading 4140 steel, cast iron and bronze**  
25 fpm  
 $\frac{1}{2}$ "  $\phi$  181 rpm, 1"  $\phi$  96 rpm, 2"  $\phi$  48 rpm, 4"  $\phi$  24 rpm

**Threading steel, aluminum 50 fpm**  
1"  $\phi$  191 rpm, 2"  $\phi$  95 rpm, 4"  $\phi$  48 rpm

**Feed R/H & L/H**  
male & female threads

**Feed R/H**  
male thread

**This side lower on opposite side of direction of feed**

**Then Cutoff**  
10° to 15° on tool as shown for best job  
For rake angle use above angle

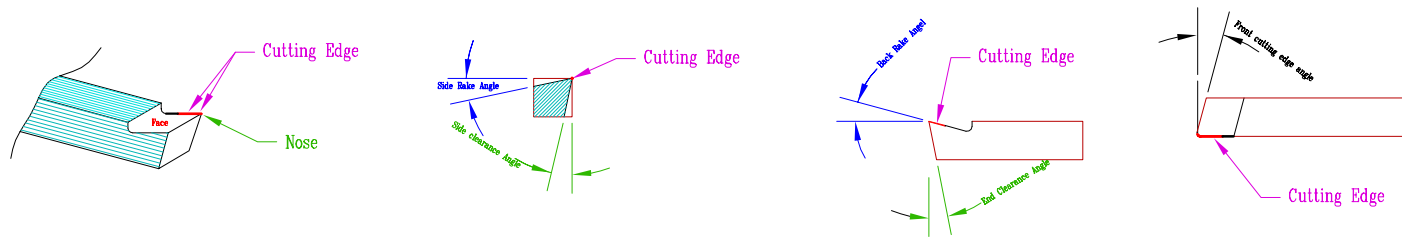
**For Cutoff chamfer first**  
Can also just start cut and use a file to chamfer then finish the cutting off

**Maximum in feed is .0005"**

Angles and speeds shown are for HSS steel  
(note: For turning speed for carbide use 3X the speed and angle not shown) Threading speed is maximum speed of 300 RPM.

For inserts use Mfg charts and tables

# SPEED, ANGLE AND COOLANT CHART



MATERIAL	CUTTING SPEED	TOOL ANGLES IN DEGREES				Cutting Fluid
		Front Clearance	Side Clearance	Back Rake	Side Rake	
	Feet per Minute					
	<b>HSS Tool Bits</b>					
Steel free cutting 12L14 1112	100	8	10	16	14	Thread cutting oil
steel low carbon hot rolled	100	8	10	10	15-20	Thread cutting oil
steel med carbon and cold roller	70	8	10	12	14	Thread cutting oil
Steel 4140 4340 & 5140	50	8	10	12	14	Thread cutting oil
Tool steels	30	8	10	8	12	Thread cutting oil
Cast Iron	50	8	10	5	12	Water soluble oil or dry
Stainless Steel	70-120	8	6	8	4	Thread cutting oil
Aluminum-Free Cutting	600-1000	9	9	30	15	Mineral oil
Aluminum High Tensile	300-600	8	8	25	10	Mineral oil
Brass	400-800	5	5	0	0	Mineral oil
Bronze	120-200	8	10	6	8	Mineral oil
Die-Castings-Zinc	180-300	8	8	8	10	Mineral oil
Magnesium Alloy	500-800	10	10	8	8	Mineral oil
Monel	60-100	7	6	7	4	Thread cutting oil
Copper	80-150	5	5	20	25	Mineral oil
Plastics-Cast Resin	200-400	8	10	20	20	Dry
Plastics-Bonded Fiber	250-600	7	7	20	20	Dry
Rubber	160-200	10	12	25	25	Dry
Nylon	400-700	5	5	10	30	Dry
Wood	400-800	20	20	30	30	Dry
	<b>Carbide Tools</b>					
Steel 12L14 & 1112	300	8	8	0	15	Thread cutting oil
Steel Med Carbon	210	8	8	0	8	Thread cutting oil
Steel 4140, 4340 & 5140	150	8	8	0	5	Thread cutting oil
Aluminum soft - hard	1800 - 900	8	8	30 - 10	30 - 15	Mineral oil
Brass and bronze soft - hard	1500 - 300	8	8	10 - 0	0	Mineral oil
Mineral oil is Straight mineral oil or up to 30% lard added		Thread cutting oil is Mineral oil, lard and sulfur oil				