

# Speeds & Feeds

## Standard (Blue Line)

in	Cutting Speed (SFM)		Feed per tooth (IPT). For slotting reduce by 20%									
	Min	Max	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	1
			0.125	0.1875	0.250	0.3125	0.375	0.4375	0.500	0.625	0.750	1.000
Aluminum Alloys	600	800	0.0011	0.0017	0.0022	0.0027	0.0032	0.0038	0.0042	0.0060	0.0085	0.0092
Soft Steels (>35Rc)	500	600	0.0006	0.0008	0.0010	0.0012	0.0016	0.0024	0.0030	0.0034	0.0036	0.004
Alloy Steels < 35Rc (4140-4340)	350	400	0.0006	0.0010	0.0016	0.0020	0.0025	0.0031	0.0036	0.0037	0.0039	0.0045
Alloy Steels > 35Rc (4140-4340)	250	350	0.0004	0.0009	0.0014	0.0019	0.0020	0.0028	0.0031	0.0032	0.0036	0.0042
Tool Steels < 36Rc (A2, D2, S7)	100	200	0.0004	0.0007	0.0014	0.0020	0.0020	0.0025	0.0033	0.0031	0.0035	0.0042
Tool Steels > 36Rc (A2, D2, S7)	250	350	0.0003	0.0009	0.0017	0.0020	0.0025	0.0029	0.0031	0.0037	0.004	0.005
Die Steels (P20, H13)	200	300	0.0005	0.0010	0.0017	0.0020	0.0023	0.0032	0.0033	0.0037	0.0037	0.004
Easy to cut Stainless Steels (303)	250	350	0.0006	0.0006	0.0008	0.0008	0.0014	0.0021	0.0026	0.0031	0.0038	0.0042
Mod. Difficult to cut Stainless Steels	225	275	0.0005	0.0005	0.0005	0.0007	0.0012	0.0020	0.0024	0.0028	0.0034	0.0041
Difficult to cut Stainless Steels (316L)	200	250	0.0003	0.0004	0.0006	0.0007	0.0013	0.0019	0.0023	0.0028	0.0031	0.0038
Gray Cast Iron	450	550	0.0006	0.0008	0.0010	0.0012	0.0016	0.0025	0.0030	0.0035	0.0045	0.0055
High Temperature Alloys	50	100	0.0003	0.0004	0.0005	0.0007	0.0008	0.0014	0.0016	0.0020	0.0023	0.0028

## X-Mill

in	Cutting Speed (SFM)		Feed per tooth (IPT)									
	Min	Max	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
			0.125	0.1875	0.250	0.3125	0.375	0.500	0.625	0.750	1.000	
Soft Steels (>35Rc)	550	550	0.0006	0.0008	0.0010	0.0012	0.0016	0.0024	0.0024	0.0034	0.0029	
Alloy Steels < 35Rc (4140-4340)	375	375	0.0006	0.0010	0.0016	0.0020	0.0025	0.0031	0.0036	0.0037	0.0039	
Alloy Steels > 35Rc (4140-4340)	300	300	0.0004	0.0009	0.0014	0.0019	0.0020	0.0028	0.0031	0.0032	0.0036	
Tool Steels < 36Rc (A2, D2, S7)	300	300	0.0004	0.0007	0.0014	0.0020	0.0020	0.0025	0.0033	0.0031	0.0035	
Tool Steels > 36Rc (A2, D2, S7)	150	150	0.0003	0.0009	0.0017	0.0020	0.0025	0.0029	0.0031	0.0037	0.0040	
Die Steels (P20, H13)	250	250	0.0005	0.0010	0.0017	0.0020	0.0023	0.0032	0.0033	0.0037	0.0037	
Easy to cut stainless steels (303)	300	300	0.0006	0.0006	0.0008	0.0008	0.0014	0.0021	0.0026	0.0031	0.0038	
Mod. Difficult to cut stainless Steels	255	255	0.0005	0.0005	0.0005	0.0007	0.0012	0.0020	0.0024	0.0028	0.0034	
Difficult to cut Stainless Steels (316L)	220	220	0.0003	0.0004	0.0006	0.0007	0.0013	0.0019	0.0023	0.0028	0.0031	
Gray Cast Iron	500	500	0.0006	0.0008	0.0010	0.0012	0.0016	0.0025	0.0029	0.0034	0.0045	
High Temperature alloys	80	80	0.0003	0.0004	0.0005	0.0007	0.0008	0.0014	0.0016	0.0020	0.0023	
Titanium	140	140	0.0004	0.0005	0.0007	0.0008	0.0013	0.0019	0.0024	0.0026	0.0037	

### NOTE:

Side milling applications - for longest reach (L3 LON) tools, reduce max step over by 30%  
 Slot milling applications - for longest reach (L3 LON) tools, reduce max slotting depth by 30%  
 Lower value of cutting speed (SFM) is used for high-stock removal applications or for higher hardness (machinability) within group  
 Higher value of cutting speed (SFM) is used for finishing applications or for lower hardness (machinability) within group  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly

RPM	$(3.82 \times \text{SFM}) / \text{Dia.}$
IPR	$\text{IPM} / \text{RPM}$
SFM	$(\text{RPM} \times \text{Dia.}) / 3.82$
IPM	$\text{IPT (Chip Load)} \times \text{No. of Teeth} \times \text{RPM}$
IPT (Chip Load)	$(\text{Chip Load}) = \text{IPM} / (\text{No. of Teeth} \times \text{RPM})$

# Speeds & Feeds

## T-Mill

	Cutting Speed (SFM)		Feed per tooth (IPT)						
	Min	Max	1/8 0.125	3/16 0.1875	1/4 0.250	3/8 0.375	1/2 0.500	5/8 0.625	3/4 0.750
Ferric, martensitic, and 15-5 PH stainless steels <35 Rc	235	270	0.0007	0.0010	0.0014	0.0021	0.0026	0.0030	0.0035
Ferric, martensitic, and 15-5 PH stainless steels >35 Rc	195	230	0.0007	0.0010	0.0014	0.0021	0.0026	0.0030	0.0035
Austenitic stainless steel (302, 303, 304)	300	375	0.0008	0.0011	0.0018	0.0023	0.0029	0.0031	0.0034
Austenitic stainless steel (316)	195	270	0.0006	0.0009	0.0013	0.0018	0.0024	0.0025	0.0029
Nickel based heat-resistant alloys	90	140	0.0003	0.0004	0.0007	0.0011	0.0016	0.0020	0.0023
Titanium Alloys (Ti6Al4V)	170	220	0.0005	0.0008	0.0008	0.0015	0.0021	0.0028	0.0036

### NOTE:

Side milling applications - for longest reach (L3 LON) tools, reduce max step over by 30%  
 Slot milling applications - for longest reach (L3 LON) tools, reduce max slotting depth by 30%  
 Lower value of cutting speed (SFM) is used for high-stock removal applications or for higher hardness (machinability) within group  
 Higher value of cutting speed (SFM) is used for finishing applications or for lower hardness (machinability) within group  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly

## Thread Mill

	Cutting Speed (SFM)		Feed per tooth (IPT) for nominal thread size							
	Min	Max	< 1/8 0.125	1/8 - 3/16 0.1875	3/16 - 1/4 0.250	1/4 - 5/16 0.3125	5/16 - 3/8 0.375	3/8 - 1/2 0.500	1/2 - 5/8 0.625	5/8 - 3/4 0.750
Copper / Brass / Bronze	490	660	0.0004	0.0007	0.0010	0.0015	0.0018	0.0022	0.0030	0.0037
Aluminum Alloys	460	620	0.0004	0.0008	0.0012	0.0017	0.0021	0.0025	0.0035	0.0040
Soft Steels (<35Rc)	390	520	0.0003	0.0006	0.0010	0.0013	0.0017	0.0020	0.0027	0.0035
Alloy Steels < 35Rc (4140-4340)	460	620	0.0003	0.0006	0.0010	0.0012	0.0015	0.0018	0.0025	0.0032
Alloy Steels > 35Rc (4140-4340)	390	520	0.0002	0.0004	0.0007	0.0009	0.0012	0.0015	0.0020	0.0028
Tool Steels < 36Rc (A2, D2, S7)	300	490	0.0001	0.0003	0.0005	0.0007	0.0010	0.0012	0.0015	0.0018
Tool Steels > 36Rc (A2, D2, S7)	200	330	0.0001	0.0002	0.0004	0.0005	0.0007	0.0009	0.0012	0.0015
Die Steels (P20, H13)	160	250	0.0001	0.0003	0.0005	0.0007	0.0010	0.0012	0.0015	0.0018
Difficult to cut Stainless Steels (316L)	200	260	0.0003	0.0004	0.0006	0.0008	0.0011	0.0015	0.0020	0.0025
Gray Cast Iron	390	520	0.0005	0.0007	0.0010	0.0013	0.0017	0.0025	0.0032	0.0040
High Temperature Alloys	160	300	0.0003	0.0005	0.0007	0.0009	0.0012	0.0015	0.0021	0.0028
Titanium	260	460	0.0003	0.0005	0.0007	0.0009	0.0012	0.0015	0.0021	0.0028

\*\*Due to the nature of thread milling, the thread mill will range from 140° tooth engagement for internal threads, to 60° engagement for external threads. Because of this, once you have calculated feed rate you must adjust it by the factors below

### NOTE:

For internal thread - programmed Feed Rate = Feed Rate X (hole diameter - cutter diameter) / hole diameter  
 For external thread - programmed Feed Rate = Feed Rate X (hole diameter + cutter diameter) / hole diameter  
 Lower value of cutting speed (SFM) is used for high-stock removal applications or for higher hardness (machinability) within group  
 Higher value of cutting speed (SFM) is used for finishing applications or for lower hardness (machinability) within group  
 Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly

RPM	$(3.82 \times \text{SFM}) / \text{Dia.}$
IPR	$\text{IPM} / \text{RPM}$
SFM	$(\text{RPM} \times \text{Dia.}) / 3.82$
IPM	$\text{IPT (Chip Load)} \times \text{No. of Teeth} \times \text{RPM}$
IPT (Chip Load)	$(\text{Chip Load}) = \text{IPM} / (\text{No. of Teeth} \times \text{RPM})$

# Speeds & Feeds

## High Velocity

in	Cutting Speed (SFM)		Feed per tooth (IPT). For slotting reduce by 20%									
	Min	Max	1/32	1/16	3/32	1/8	3/16	1/4	5/16	3/8	7/16	1/2
			0.03125	0.0625	0.9375	0.125	0.1875	0.250	0.3125	0.375	0.4375	0.500
Soft Steels (<35Rc)	490	660	0.0004	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0024	0.0027	0.0033
Alloy Steels < 35Rc (4140-4340)	460	620	0.00035	0.0005	0.0006	0.0010	0.0016	0.0020	0.0025	0.0031	0.0032	0.0035
Alloy Steels > 35Rc (4140-4340)	390	520	0.0003	0.0004	0.0005	0.0009	0.0014	0.0019	0.0020	0.0028	0.0030	0.0033
Tool Steels < 36Rc (A2, D2, S7)	300	490	0.00025	0.0003	0.0004	0.0006	0.0009	0.0013	0.0016	0.0025	0.0027	0.0030
Tool Steels > 36Rc (A2, D2, S7)	200	330	0.0002	0.00025	0.0003	0.0009	0.0017	0.0020	0.0025	0.0029	0.0030	0.0033
Die Steels (P20, H13)	160	250	0.00025	0.0003	0.0005	0.0010	0.0017	0.0020	0.0023	0.0032	0.0035	0.0037
Easy to cut Stainless Steels (303)	260	330	0.0003	0.0004	0.0006	0.0006	0.0008	0.0008	0.0014	0.0021	0.0028	0.0033
Mod. Difficult to cut Stainless Steels	200	260	0.00025	0.00035	0.0005	0.0005	0.0005	0.0007	0.0012	0.0020	0.0025	0.0030
Difficult to cut Stainless Steels (316L)	200	260	0.00015	0.0002	0.0003	0.0004	0.0006	0.0007	0.0013	0.0019	0.0023	0.0025
Gray Cast Iron	390	520	0.0003	0.0004	0.0006	0.0008	0.0010	0.0012	0.0016	0.0025	0.0027	0.0035
High Temperature Alloys	160	300	0.00015	0.0025	0.0003	0.0004	0.0005	0.0007	0.0008	0.0014	0.0023	0.0029
Titanium	260	460	0.0002	0.0003	0.0004	0.0005	0.0007	0.0008	0.0013	0.0019	0.0020	0.0026

## HV Feed Mill

in	Cutting Speed (SFM)		Feed per tooth (IPT)						
	Min	Max	1/8	3/16	1/4	5/16	3/8	1/2	5/8
			0.125	0.1875	0.250	0.3125	0.375	0.500	0.625
Alloy Steels < 35Rc (4140-4340)	800	1000	0.0082	0.0113	0.0125	0.0156	0.0187	0.0197	0.0235
Alloy Steels > 35Rc (4140-4340)	800	990	0.0082	0.0113	0.0124	0.0153	0.0184	0.0193	0.0231
Tool Steels < 36Rc (A2, D2, S7)	720	790	0.0060	0.0076	0.0082	0.0097	0.0119	0.0126	0.0156
Tool Steels > 36Rc (A2, D2, S7)	590	720	0.0052	0.0062	0.0066	0.0078	0.0096	0.0102	0.0129
Die Steels (P20, H13)	490	590	0.0039	0.0039	0.0039	0.0038	0.0054	0.0059	0.0078
Easy to cut Stainless Steels (303)	700	800	0.0061	0.0077	0.0082	0.0097	0.0122	0.0130	0.0156
Gray Cast Iron	750	820	0.0064	0.0080	0.0087	0.0105	0.0130	0.0138	0.0164

## A-Mill

in	Cutting Speed (SFM)		Feed per tooth (IPT)					
	Min	Max	1/4	3/8	1/2	5/8	3/4	1
			0.250	0.375	0.500	0.625	0.750	1.000
Rougher Series (510)								
Aluminum Alloys	1200	1600	0.0036	0.0057	0.008	0.0098	0.0119	0.016
Aluminum Alloys 440, 356, 380, C61300	600	1000	0.0027	0.0043	0.006	0.0074	0.0089	0.012
Semi-Finisher Series (520)								
Aluminum Alloys	1200	1600	0.0054	0.00855	0.012	0.0147	0.01785	0.024
Aluminum Alloys 440, 356, 380, C61300	600	1000	0.00405	0.00645	0.009	0.0111	0.01335	0.018
Finisher Series (550)								
Aluminum Alloys	1200	1600	0.00342	0.005415	0.0076	0.00931	0.011305	0.0152
Aluminum Alloys 440, 356, 380, C61300	600	1000	0.002565	0.004085	0.0057	0.00703	0.008455	0.0114

**NOTE:**

Side milling applications - for longest reach (L3 LON) tools, reduce max step over by 30%

Slot milling applications - for longest reach (L3 LON) tools, reduce max slotting depth by 30%

Lower value of cutting speed (SFM) is used for high-stock removal applications or for higher hardness (machinability) within group

Higher value of cutting speed (SFM) is used for finishing applications or for lower hardness (machinability) within group

Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly