

# Single Form Thread Milling Guide

Single Form Threadmills are the most versatile threading tool due to their ability to mill multiple pitch sizes. Since they are used in a helical interpolation environment, specific machining parameters are needed to avoid deflection and breakage. These tools can be used successfully in materials ranging from Aluminum to Steels.

# Speeds & Feeds calculations:

- 1. Determine the correct SFM and Chip Load (IPT) for the cutter and material
- 2. Calculate the Speed (RPM) and Linear Feed (IPM)
- 3. Adjust Linear Feed to account for helical interpolation of internal or external threads
- 4. Determine correct number of radial passes at full axial depth

Example: Tool #822720 to machine a 6-40 internal thread in 17-4 stainless steel

- 1. From Speeds & Feeds chart (next page), SFM is 150 and Chip Load (IPT) is .00023
- 2. Calculate Speed (RPM) and Linear Feed (IPM)

```
RPM = (SFM x 3.82) / Cutter Diameter

= (150 \times 3.82) / .098

= 5847

Linear Feed (IPM) = RPM x IPT x Number of Flutes

= 5847 \times .00023 \times 2

= 2.69
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3. Adjust Linear Feed (use Table 1 to determine Major Thread Diameter)

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Adj Internal Feed = [(Major Thread Dia - Cutter Dia) / Major Thread Dia] x Linear Feed = [(.138- .098) / .138] x 2.69 = 0.78

Adj External Feed = [(Major Thread Dia + Cutter Dia) / Major Thread Dia] x Linear Feed = [(.138 + .098) / .138] x 2.69 = 4.60
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4. Determine Number of Radial Passes using Table 1

(Note: The number of passes should be based on the thread size of the tool, and not the machined part)

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For Easy Machinability = 2 Radial Pass at full Axial Depth
For Moderate Machinability = 3 Radial Passes at full Axial Depth
For Difficult Machinability = 4 Radial Passes at full Axial Depth
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Definitions:

Easy Machinability materials include Non-Ferrous alloys and Leaded Steels Moderate Machinability materials include 200/300/400 Stainless Steels and Steels up to 35 Rc Difficult Machinability materials include Inconel, Titanium and Steels 36-45 Rc

5. Conclusion

In this example, the tool would run at 5847 RPM, 0.78 IPM and make 3 Radial Passes

## Setup & Use:

- 1. Check software and input proper feed values (Linear or Adjusted)
- 2. Choke up on tool
- 3. Minimize runout (consider entire system of spindle, collet, holders etc)
- 4. Minimize all vibration (consider tool holding, work holding, rpm "sweet spot" etc)
- 5. Break in tool by reducing feed rates by 25% on first 1-2 holes
- 6. Cutter should engage part using an arcing toolpath to avoid shock loading (see Table 2)
- 7. Climb mill for best finish and tool life (see Table 2)
- 8. Flush chips with coolant to avoid recutting

Table 1 Tool	Major Number of Radial Passes*										
Thread	Thread	Easy	Moderate	Difficult							
Size	Diameter	Machinabilty	Machinabilty	Machinabilty							
00	0.047	2	3	4							
0	0.060	2	3	4							
1	0.073	2	3	4							
2	0.086	2	3	3							
3	0.099	2	3	3							
4	0.112	2	3	4							
5	0.125	2	3	3							
6	0.138	2	3	4							
8	0.164	2	2	3							
10	0.190	2	3	4							
12	0.216	2	2	3							
1/4	0.250	2	2	3							
5/16	0.312	2	2	3							
3/8	0.375	2	2	3							
7/16	0.437	2	2	3							
1/2	0.500	2	2	3							
9/16	0.562	2	2	3							
5/8	0.625	2	2	3							
3/4	0.750	2	2	3							
7/8	0.875	2	2	3							
1	1.000	2	3	4							

Table 1

\* Number of Radial Passes are based on the coarsest pitch by thread size. For finer pitches, the number of passes may be reduced by 1 pass.

### Table 2



Step 1-2: Cutter moves into position Step 2-3: Cutter engages part with arcing tool path while "Z" feeds up from bottom

Step 3-4: Cutter moves helically

Step 4-5: Cutter exits part along arcing tool path while maintaining "Z" feed

Step 5-6: Cutter returns to center

# INTERNAL, LEFT HAND THREAD (CLIMB MILLING)

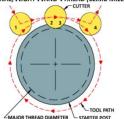
Step 1-2: Cutter moves into position Step 2-3: Cutter engages part with arcing tool path while "Z" feeds down

from top

Step 3-4: Cutter moves helically
Step 4-5: Cutter exits part along arcing tool path
while maintaining "7" feed

Step 5-6: Cutter returns to center

## EXTERNAL, RIGHT HAND THREAD (CLIMB MILLING)



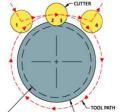
Step 1-2: Cutter engages part with arcing tool path while "Z" feeds down

from top

Step 2-3: Cutter moves helically Step 3-4: Cutter exits part along arcing tool path while maintaining "Z" feed

while maintaining "Z" feed

# EXTERNAL, LEFT HAND THREAD (CLIMB MILLING)



Step 1-2: Cutter engages part with arcing tool path while "Z" feeds up from bottom

Step 2-3: Cutter moves helically Step 3-4: Cutter exits part along arcing tool path

3-4: Cutter exits part along arcing t while maintaining "Z" feed

					H			: (≤ 271 l					
MATERIAL	SFM	0.047	0.062	0.078	0.093	Chip I 0.125	Load (IPT) B 0.187	y Cutter Dia 0.250	0.312	0.375	0.500	0.625	0.750
ALUMINUM ALLOYS		0.047	0.062	0.076	0.093	0.125	0.107	0.250	0.312	0.375	0.500	0.625	0.750
Casting (2xx, 5xx, 7xx, 8xx)	750	.00016	.00021	.00026	.00031	.00042	.00088	.00118	.00180	.00217	.00289	.00361	.00433
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000			.00020	.55551					.00217			
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	750		.00019	.00024	.00028	.00038	.00080						
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	700							.00106	.00162	.00195	.00260	.00325	
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	650	.00014											.00390
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	475												
Wrought - 5%-8% Si (4xxx)	1000												
Wrought - 8%-12% Si (4xxx)	800												
MAGNESIUM ALLOYS	1500	00046	.00021	.00026	.00031	.00042	.00088	.00118	.00180	.00217	.00289	.00361	.00433
ZINC ALLOYS	800	.00016	.00021	.00020	.00031	.00042	.00086	.00116	.00180	.00217	.00269	.00301	.00433
COPPER ALLOYS High Coppers - 90%+ (C1xxxx)	225												
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	500												
Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225												
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500	.00015	.00020	.00025	.00030	.00040	.00072	.00096	.00151	.00182	.00242	.00303	.00363
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500												
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225												
Cast Copper Alloys (C83300-C86200, C86400-C87900, C9200-C95800, C97300-C97800, C99400-C99700)	550												
	Hardness: 29.37 Pc (279.344 HRn)												



**Speeds & Feeds** 

Product Table: Thread Milling Cutters - Single Form - UN Threads

Characteristics: Medium/Long Reach

**Series:** 8227xx, 8227xx-C3

## Please note:

All posted speed and feed parameters are suggested starting values that may be increased given optimal setup conditions. Chip loads reflect uncoated cutters and may be increased 5%-10% if coated. For ferrous materials with hardness  $\leq 28$  Rc, chip loads can be increased 3%-5%.

If you require additional information, Harvey Tool has a team of technical experts available to assist you through even the most challenging applications. Please contact us at **800-645-5609** or **Harveytech@harveyperformance.com**.

WARNING: Cutting tools may shatter under improper use. Government regulations require use of safety glasses and other appropriate safety equipment in the vicinity of use.

	Hardness: 29-37 Rc (279-344 HBn)										Hardness: 38-45 Rc (353-421 HBn)															
MATERIAL														Chiral and (IRT) Dr. Cotton Dismotor												
	SFM	0.047	0.062	0.078	0.093	0.125	0.187	0.250	0.312	0.375	0.500	0.625	0.750	SFM	0.047	0.062	0.078	0.093	0.125	0.187	0.250	0.312	0.375	0.500	0.625	0.750
CARBON STEELS																										
Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	600	.00012	.00016	.00020	.00023	.00032	.00071	.00095	.00147	.00177	.00236	.00295	.00354	-	-	-	-	-	-	-	-	-	-	-	-	-
1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 51xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	200	.00012	.00016	.00020	.00023	.00032	.00071	.00095	.00131	.00158	.00210	.00263	.00315	-	-	-	-	-	-	-	-	-	-	-	-	-
STAINLESS STEELS																										
203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	450	.00012	.00016	.00020	.00023	.00032	.00071	.00095	.00147	.00177	.00236	.00295	.00354	-	-	-	-	-	-	-	-	-	-	-	-	-
201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 420, 429, 430, 434, 436, 442, 446, 501, 502	200	.00012	.00016	.00020	.00023	.00032	.00047	.00063	.00098	.00118	.00158	.00197	.00236	100	.00010	.00013	.00017	.00020	.00027	.00040	.00054	.00084	.00100	.00134	.00167	.00201
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	150	.00012	.00016	.00020	.00023	.00032	.00047	.00063	.00088	.00106	.00142	.00177	.00213	90	.00010	.00013	.00017	.00020	.00027	.00040	.00054	.00075	.00090	.00120	.00151	.00181
TOOL STEELS																										
A, L, O, P, W series	200	.00013	.00017	.00022	.00026	.00035	.00052	.00069	.00115	.00139	.00185	.00231	.00277	100	.00011	.00015	.00018	.00022	.00029	.00044	.00059	.00098	.00118	.00157	.00196	.00236
D, H, M, T, S series	200	.00012	.00016	.00020	.00023	.00032	.00047	.00063	.00105	.00126	.00168	.00210	.00252	90	.00010	.00013	.00017	.00020	.00027	.00040	.00054	.00089	.00107	.00143	.00179	.00214
TITANIUM ALLOYS	150	.00013	.00017	.00022	.00026	.00035	.00052	.00069	.00101	.00121	.00162	.00202	.00243	75	.00011	.00015	.00018	.00022	.00029	.00044	.00059	.00086	.00103	.00137	.00172	.00206
HIGH TEMP ALLOYS																										
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	70	.00011	.00014	.00018	.00021	.00029	.00043	.00058	.00085	.00102	.00137	.00171	.00205	50	.00009	.00012	.00015	.00018	.00025	.00037	.00049	.00072	.00087	.00116	.00145	.00174