

THREAD MILL FEED & SPEED CHART

In order to use the following chart appropriately, it is necessary to understand that Machining Centers will apply the feed rate at the centerline of the spindle. It is correct to use a normal calculation and the following Feed & Speed Chart when cutting in a straight line, however, it is incorrect when cutting an internal thread. Therefore, the feed rate must be recalculated.

The following is an example of how to apply the feed rate correctly:

- The tool is a TM290-24 cutting a 3/8-24 thread in stainless steel.
- The outside diameter of the tool is 0.290.
- The surface foot per minute (SFM) is 150.
- The chip per tooth is 0.001. The tool has four flutes.
- The revolutions per minute (RPM) equal the SFPM x 3.82 divided by the outside diameter of the tool.
In this example: $(150 \times 3.82) / 0.290$, which equals 1925 RPM.
- The RPM x feed (chip per tooth) x the number of flutes equals the non-adjusted feed rate or NAFR.
In this example: $1925 \times 0.001 \times 4 = 7.7$ (NAFR)
- The major diameter of the thread is 0.375. We will call this D. The outside diameter of the tool is 0.290. We will call this d.

- We will call the adjusted feed rate the AFR. The formula for the AFR for internal interpolation is $AFR = NAFR \times \frac{D-d}{D}$

D

- In this example:

$$AFR = 7.7 \times \frac{(0.375 - 0.290)}{0.375}$$

Therefore, the adjusted feed rate equals 1.75. This is the feed rate that will equal 0.001 chip per tooth in the above example. This is the feed rate that must be used in the CNC program.

It is necessary to use more than one radial depth pass when cutting an unfavorable length-to-diameter ratio, coarse pitches, and hard materials. When cutting a thread with two passes, cut approximately 65 percent of the thread on the first pass and 35 percent on the finish pass. For three passes use a 50/30/20 ratio. For four passes, use a 40/27/20/13 ratio. The idea is to equalize the side cutting pressure.

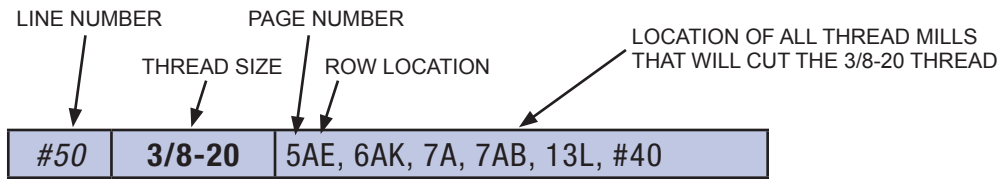
MATERIAL	SPEED SFPM	FEED (inches per tooth)							
		0.110-0.125	0.140	0.170-0.187	0.250	0.350	0.500	0.750	1.0+
Aluminum & Magnesium Brass Bronze Hard Bronze	800-UP	0.0006-0.0010	0.0006-0.0015	0.0010-0.0020	0.0015-0.0030	0.002-0.004	0.003-0.006	0.004-0.008	0.006-0.009
	500-800	0.0006-0.0010	0.0006-0.0015	0.0010-0.0020	0.0015-0.0025	0.002-0.003	0.003-0.005	0.004-0.008	0.005-0.009
	400-600	0.0005-0.0010	0.0005-0.0015	0.0010-0.0020	0.0015-0.0025	0.002-0.003	0.003-0.005	0.005-0.007	0.005-0.008
	230-290	0.0004-0.0008	0.0004-0.0009	0.0005-0.0013	0.0007-0.0015	0.001-0.002	0.002-0.003	0.004-0.006	0.004-0.007
Cast Iron-Soft Cast Iron-Hard Steel-Soft Steel-Medium	200-280	0.0004-0.0008	0.0006-0.0010	0.0010-0.0020	0.0010-0.0025	0.002-0.003	0.002-0.004	0.003-0.006	0.004-0.007
	190-260	0.0003-0.0007	0.0005-0.0010	0.0006-0.0015	0.0007-0.0015	0.001-0.002	0.002-0.003	0.003-0.004	0.004-0.005
	230-400	0.0006-0.0010	0.0007-0.0015	0.0010-0.0020	0.0010-0.0025	0.002-0.003	0.002-0.004	0.003-0.005	0.003-0.006
	200-350	0.0004-0.0008	0.0006-0.0015	0.0007-0.0013	0.0008-0.0020	0.001-0.003	0.001-0.003	0.002-0.004	0.003-0.005
Steel-Hard Stainless Steel Titanium Inconel	120-220	0.0003-0.0006	0.0004-0.0010	0.0005-0.0010	0.0007-0.0015	0.001-0.002	0.001-0.003	0.002-0.004	0.002-0.004
	120-220	0.0003-0.0010	0.0004-0.0010	0.0005-0.0010	0.0007-0.0015	0.001-0.002	0.001-0.003	0.002-0.004	0.002-0.004
	70-100	0.0003-0.0006	0.0003-0.0008	0.0004-0.0008	0.0005-0.0010	0.001-0.002	0.001-0.002	0.002-0.003	0.002-0.003
	70-100	0.0003-0.0006	0.0003-0.0007	0.0004-0.0007	0.0005-0.0010	0.001-0.002	0.001-0.002	0.002-0.003	0.002-0.003



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EXAMPLE: HOW TO USE THE THREAD MILL LOCATOR



#50	3/8-20	5AE, 6AK, 7A, 7AB, 13L, #40
#51	3/8-24	5AF, 6AH, 6AL, 7B, 7AC, 13L, #41
#52	3/8-27	5AG, 6AM, 7AD, 13I-13L
#53	3/8-28	7C, 13L, #43
#54	3/8-32	5AH, 6AN, 7D, 13L, #44
#55	3/8-36	7E, 13L, #45
#56	3/8-40	7F, 13L, #46
#57	.390-27	#52
#58	7/16-14	5AI, 6AI, 6AO, 7Y, 13L
#59	7/16-16	7G, #48
#60	7/16-18	5AJ, 6AP, 7H, #49
#61	7/16-20	5AK, 6AQ, 6BG, 7I, #50



To find a thread mill to cut a 7/16-20 internal thread, simply look for the **7/16-20** in the chart. It's located on line #61. Line #61 lists several location numbers. These numbers will show all the tools available to produce this thread. The location numbers on line #61 are 5AK, 6AQ, 6BG, 7I, #50. The first number indicates the page in the catalog where the tool is found. For 5AK, look on catalog page 5 and then search for 5AK. The letters follow alphabetically down the columns. The 6AQ, 6BG and 7I are more options for cutting the 7/16-20 thread. Notice the #50 located at the end of line #61. This indicates that Line #50 lists more thread mills that will cut the 7/16-20 thread. The tools in line #50 will cut both the 3/8-20 and the 7/16-20 internal threads.

Why use the 3/8-20 thread mill for cutting a 7/16-20 thread? Although the 7/16-20 is larger and stronger, the smaller thread mill will allow for better chip evacuation and better coolant penetration. Also, the smaller thread mill will run at a higher RPM for the designated Surface Feet Per Minute (SFPM). Both would be an excellent choice.

If the thread mill is small and the length of thread deep, always use the largest tool available. For larger thread sizes with more favorable length-to-diameter ratios, a smaller size thread mill of the same pitch can be used quite effectively.

THREAD MILL LOCATOR

INTERNAL UN THREADS

LINE	THREAD	LOCATION	LINE	THREAD	LOCATION	LINE	THREAD	LOCATION
#1	0-80	13A	#59	7/16-16	7G, #48	#117	7/8-10	13P, #101
#2	1-64	13B	#60	7/16-18	5AJ, 6AP, 7H, #49	#118	7/8-12	5BF, 13P, #102
#3	1-72	13B	#61	7/16-20	5AK, 6AQ, 6BG, 7I, #50	#119	7/8-14	5BG, 13P, #103
#4	2-56	12A, 13C, 13D	#62	7/16-24	5AL, 6AR, 7J, #51	#120	7/8-16	5BH, 13P, #104
#5	2-64	13C, 13D	#63	7/16-27	#52	#121	7/8-18	130, 13P, #89
#6	3-48	13E	#64	7/16-28	5AM, 6AS, #53	#122	7/8-20	13P, #106
#7	3-56	13C-13E	#65	7/16-32	#54	#123	7/8-24	13N-13P, #72
#8	4-40	5A, 6W, 12B, 13F	#66	1/2-12	5AN, 6AT, 12R, 13M	#124	7/8-27	13M-130, #52
#9	4-48	13E, 13F	#67	1/2-13	5AO, 6AU, 6BH, 7AN, 13M	#125	7/8-28	13N, 130, #74
#10	5-40	#8	#68	1/2-14	13M, #58	#126	7/8-32	13N, 130, #75
#11	5-44	13F	#69	1/2-16	5AP, 6AV, 13M, #59	#127	15/16-12	#118
#12	6-32	5B, 6X, 12C, 13G	#70	1/2-18	12S, 13M, #60	#128	15/16-16	#120
#13	6-40	5C, 12D, 13F, 13G	#71	1/2-20	5AQ, 6AW, 7AO, 12T, 13M, #61	#129	15/16-20	13P, #106
#14	8-32	5D, 5G, 6Y, 7K, 12E, 13G, 13H	#72	1/2-24	5AR, 6AX, 7AP, 13M, #62	#130	15/16-28	13N, 130, #74
#15	8-36	5E, 7L, 13G, 13H	#73	1/2-27	13M, #52	#131	15/16-32	13N, 130, #75
#16	10-24	5F, 5H, 6A, 6B, 6Z, 7M, 12F, 13I	#74	1/2-28	5AS, 6AY, 7AQ, 13M, #64	#132	1-8	5BD, 5BJ, 6BQ, 7BD, 13P
#17	10-28	5I, 6C, 6AA, 7N, 13I	#75	1/2-32	5AT, 6AZ, 7AR, 13M, #54	#133	1-10	5BK, 7BE, #117
#18	10-32	5J, 6D, 6AB, 7O, 12G, 13G-13I	#76	9/16-12	5AW, 6BC, 6BI, #66	#134	1-12	5BL, 7AH, 7BF, #118
#19	10-36	13I, #15	#77	9/16-14	13M, #58	#135	1-14	5BM, 7AI, 7BG, #119
#20	10-40	13F-13I, #13	#78	9/16-16	5AX, 6BD, #69	#136	1-16	5BN, 7BH, #120
#21	10-48	5K, 6E, 12H, 13E-13I	#79	9/16-18	5AY, 6BE, 6BJ, #70	#137	1-18	7AJ, 130, 13P, #89
#22	10-56	13C-13I	#80	9/16-20	5AZ, 6BF, #71	#138	1-20	5BO, 7AK, 7BI, 13P, #106
#23	12-24	#16	#81	9/16-24	#72	#139	1-24	13N-13P, #72
#24	12-28	#17	#82	9/16-27	13M, #52	#140	1-27	13M-130, #52
#25	12-32	#18	#83	9/16-28	#74	#141	1-28	13N, 130, #74
#26	12-36	5P, 6J, 13G-13I	#84	9/16-32	#75	#142	1-32	13N, 130, #75
#27	12-40	#20	#85	5/8-11	5AV, 6BB, 6BK, 7AT, 13N	#143	1-1/4-7	5BI, 13Q
#28	12-48	#21	#86	5/8-12	5BA, 7AE, 7AU, 13N, #76	#144	1-1/4-8	13Q, #132
#29	12-56	13C-13I	#87	5/8-14	5BB, 7AF, 13M, 13N, #58	#145	1-1/4-10	#133
#30	1/4-20	5L, 5Q, 6F, 6K, 6AC 7P, 12I, 13J	#88	5/8-16	5BC, 7AG, 7AV, 13N, #78	#146	1-1/4-12	#134
#31	1/4-24	5M, 5R, 6G, 6L, 7Q, 13I, 13J	#89	5/8-18	7AW, 13N, #79	#147	1-1/4-14	#135
#32	1/4-27	13I, 13J	#90	5/8-20	7AX, 13N, #80	#148	1-1/4-16	#136
#33	1/4-28	5N, 5S, 6H, 6M, 6AD, 7R, 12J, 13J	#91	5/8-24	13N, #72	#149	1-1/4-18	#137
#34	1/4-32	5O, 5T, 6I, 6N, 7S, 12K, 13G-13J	#92	5/8-27	13M, 13N, #52	#150	1-1/4-20	#138
#35	1/4-36	5P, 5U, 6J, 6O, 13G-13J	#93	5/8-28	13N, #74	#151	1-1/4-24	13N-13P, #72
#36	1/4-40	5V, 6P, 13F-13J	#94	5/8-32	13N, #75	#152	1-1/4-28	13N, 130, #74
#37	1/4-48	5W, 13E-13J	#95	11/16-12	#86	#153	1-3/8-6	13Q
#38	1/4-56	13C-13J	#96	11/16-16	#88	#154	1-3/8-8	13Q, #132
#39	5/16-18	5X, 6Q, 6AE, 7T, 12L, 13K	#97	11/16-20	#90	#155	1-3/8-10	#133
#40	5/16-20	5Y, 6R, 7U, 13K, #30	#98	11/16-24	13N, #72	#156	1-3/8-12	#134
#41	5/16-24	5Z, 6S, 6AF, 7V, 12M, 13K, #31	#99	11/16-28	13N, #74	#157	1-3/8-14	#135
#42	5/16-27	13I-13K	#100	11/16-32	13N, #75	#158	1-3/8-16	#136
#43	5/16-28	5AA, 6T, 7W, 12N, 13K, #33	#101	3/4-10	5AU, 6BA, 6BL, 7AS, 130	#159	1-3/8-18	#137
#44	5/16-32	5AB, 6U, 7X, 12O, 13K, #34	#102	3/4-12	6BM, 7AZ, 130, #86	#160	1-3/8-20	#138
#45	5/16-36	13K, #35	#103	3/4-14	6BN, 7BA, 130, #87	#161	1-3/8-24	13N-13P, #72
#46	5/16-40	5AC, 6V, 12P, 13K, #36	#104	3/4-16	6BO, 7BB, 130, #88	#162	1-3/8-28	13N, 130, #74
#47	5/16-48	13K, #37	#105	3/4-18	130, #89	#163	1-1/2-6	5BP, 13Q
#48	3/8-16	5AD, 6AG, 6AJ, 7Z, 12Q, 13K, 13L	#106	3/4-20	7BC, 130, #90	#164	1-1/2-8	5BQ, 13Q, #132
#49	3/8-18	7AA, 13L, #39	#107	3/4-24	13N, 130, #72	#165	1-1/2-10	5BR, #133
#50	3/8-20	5AE, 6AK, 7A, 7AB, 13L, #40	#108	3/4-27	13M-130, #52	#166	1-1/2-12	5BS, 7AL, #134
#51	3/8-24	5AF, 6AH, 6AL, 7B, 7AC, 13L, #41	#109	3/4-28	13N, 130, #74	#167	1-1/2-14	#135
#52	3/8-27	5AG, 6AM, 7AD, 13I-13L	#110	3/4-32	13N, 130, #75	#168	1-1/2-16	5BT, 7AM, #136
#53	3/8-28	7C, 13L, #43	#111	13/16-12	#102	#169	1-1/2-18	#137
#54	3/8-32	5AH, 6AN, 7D, 13L, #44	#112	13/16-16	#104	#170	1-1/2-20	#138
#55	3/8-36	7E, 13L, #45	#113	13/16-20	#106	#171	1-1/2-24	13N-13P, #72
#56	3/8-40	7F, 13L, #46	#114	13/16-28	13N, 130, #74	#172	1-1/2-28	13N, 130, #74
#57	.390-27	#52	#115	13/16-32	13N, 130, #75			
#58	7/16-14	5AI, 6AI, 6AO, 7Y, 13L	#116	7/8-9	5BE, 6BP, 7AY, 13P			

THREAD MILLS



THREAD MILL LOCATOR

INTERNAL METRIC THREADS

LINE	THREAD	LOCATION	LINE	THREAD	LOCATION	LINE	THREAD	LOCATION
#1	M1.4-.3	13A	#22	M8-1.0	8M, 9F, 13K, #19	#43	M18-1.0	13N, 13O, #30
#2	M1.6-.35	13A	#23	M8-1.25	8N, 9G, 9P, 12AB, 13J, 13K, #20	#44	M18-1.5	9AG, 13N, 13O, #37
#3	M1.8-.35	13A, 13B	#24	M9-1.25	#23	#45	M18-2.5	8AD, 9Z
#4	M2-.4	12U, 13B, 13C	#25	M10-.75	13L, #21	#46	M20-1.0	13N, 13O, #30
#5	M2.5-.45	13C, 13D	#26	M10-1.0	8O, 9H, 12AC, 13L, #22	#47	M20-1.5	13N, 13O, #37
#6	M3-.35	13A-13E	#27	M10-1.25	13L, #23	#48	M20-2.0	13N, 13O, #42
#7	M3-.5	8A, 8Q, 12V, 13E, 13F	#28	M10-1.5	8P, 9I, 9Q, 12AD, 13K, 13L	#49	M20-2.5	9AH, 13O, #45
#8	M3.5-.35	13A-13E	#29	M11-1.5	#28	#50	M24-1.0	8AE, #43
#9	M3.5-.6	8B, 8R, 13F, 13G	#30	M12-1.0	8Y, 9U, 9AC, 13M, #26	#51	M24-1.5	8AF, 13P, #44
#10	M4-.5	8C, 8S, 12W, 13G, 13H, #7	#31	M12-1.25	8V, 9R, 13L, 13M, #23	#52	M24-2.0	8AG, 13O, 13P, #42
#11	M4-.7	8D, 8T, 12X, 13G, 13H	#32	M12-1.5	8W, 9S, 13M, #28	#53	M24-2.5	8AH, 13O, 13P, #45
#12	M4.5-.5	9L, 13I, #10	#33	M12-1.75	8X, 9T, 9AD, 13L, 13M	#54	M24-3.0	8AI, 13P
#13	M4.5-.75	8E, 8U, 13G-13H	#34	M12-2.0	12AE, 13M	#55	M27-3.0	#54
#14	M5-.5	13I, #10	#35	M14-1.0	13N, #30	#56	M30-1.0	#50
#15	M5-.7	8F, 8AL, 13I, #11	#36	M14-1.25	8Z, 9V, #31	#57	M30-1.5	#51
#16	M5-.8	8G, 8AM, 9M, 12Y, 13G-13I	#37	M14-1.5	8AA, 9W, 9AE, #32	#58	M30-2.0	#52
#17	M6-.5	8H, 8AN, 9A, 9J, 13I, 13J, #10	#38	M14-1.75	8AB, 9X, #33	#59	M30-3.0	#54
#18	M6-.75	8I, 8AO, 9B, 9K, 13I, 13J, #13	#39	M14-2.0	8AC, 9Y, #34	#60	M30-3.5	13Q
#19	M6-1.0	8J, 8AP, 9C, 9N, 9AA, 12Z, 13I, 13J	#40	M16-1.0	13N, #30	#61	M33-3.5	13Q
#20	M6-1.25	8K, 8AQ, 9D, 9AB	#41	M16-1.5	13N, #37	#62	M36-4.0	8AJ, 13Q
#21	M8-.75	8L, 9E, 9O, 12AA, 13K, #18	#42	M16-2.0	9AF, 13N, #39	#63	M40-6.0	8AK, 13Q

EXTERNAL THREADS

UN EXTERNAL		METRIC EXT.	
TPI		PITCH	
-4	13Q	6.00	13Q
-6	13Q	5.50	13Q
-7	13Q	5.00	13Q
-8	7BD, 13P, 13Q	4.50	13Q
-9	7AY, 13P	4.00	13Q
-10	6BA, 7AS, 7BE, 13O, 13P	3.50	13Q
-11	6BB, 7AT, 13N-13P	3.00	13P
-12	6AT, 6BC, 7AE, 7AH, 7AL, 7AU, 7AZ, 7BF, 13M-13P	2.50	9Z, 13O, 13P
-13	6AU, 7AN, 13M-13P	2.00	9Y, 13M-13P
-14	6AO, 7Y, 7AF, 7AI, 7BA, 7BG, 13L-13P	1.75	9T, 9X, 13L-13P
-16	6AJ, 6AV, 6BD, 7G, 7Z, 7AG, 7AM, 7AV, 7BB, 7BH, 13K-13P	1.50	9I, 9S, 9W, 13K-13P
-18	6Q, 6AP, 6BE, 7H, 7T, 7AA, 7AJ, 7AW, 13J-13P	1.25	9G, 9R, 9V, 13J-13P
-20	6R, 6AK, 6AQ, 6AW, 6BF, 7A, 7I, 7U, 7AB, 7AK, 7AO, 7AX, 7BC, 7BI, 13J-13P	1.00	9F, 9H, 9U, 13I-13O
-24	6S, 6AL, 6AR, 6AX, 7B, 7J, 7V, 7AC, 7AP, 13I-13P	0.80	13G-13O
-27	6AM, 7AD, 13I-13O	0.75	9E, 13G-13O
-28	6T, 6AS, 6AY, 7C, 7W, 7AQ, 13I-13O	0.70	13G-13L
-32	6U, 6AN, 6AZ, 7D, 7X, 7AR, 13G-13O	0.60	13F-13L
-36	7E, 13G-13L	0.50	13E-13K
-40	6V, 7F, 13F-13L	0.45	13C-13J
-48	13E-13K	0.40	13B-13G
-56	13C-13J	0.35	13A-13E
-64	13B-13G	0.30	13A-13E
-72	13A-13D		
-80	13A-13D		