

**METAL DRILLING
REFERENCE GUIDE**



Dia./ Type	Dec. Equiv.	Fractional Tap	Machine Screw Tap	Metric Tap	Screw Ext.
1/64"	.0156				
1/32"	.0312				
1.0 mm	.0394				
60	.0400				
59	.0410				
58	.0420				
57	.0430				
56	.0465				
3/64"	.0469		0 - 80 NF		
55	.0520				
54	.0550				
1.5 mm	.0591				
53	.0595		1 - 64 NC, 1 - 72 NF		
1/16"	.0625				
52	.0635				
51	.0670				
50	.0700		2 - 56 NC, 2 - 64 NF		
49	.0730				
48	.0760				
5/64"	.0781		3 - 48 NC		EX-1
47	.0785				
2.0 mm	.0787				
46	.0810				
45	.0820		3 - 56 NF		
44	.0860		4 - 36 NS		
43	.0890		4 - 40 NC		
42	.0935				
3/32"	.0938		4 - 48 NF		
41	.0960			3 mm - .60	
40	.0980				
2.5 mm	.0984			3 mm - .50	
39	.0995			3 mm - .50	
38	.1015	1/8" - 40 NS	5 - 40 NC		
37	.1040		5 - 44 NF		
36	.1065		6 - 32 NC		
7/64"	.1094				EX-2
35	.1100				
34	.1110		6 - 36 NS		
33	.1130		6 - 40 NF		
32	.1160		6 - 48 NS		
3.0 mm	.1181				
31	.1200				
1/8"	.1250				
30	.1285			4mm-.70,4mm-.75	
29	.1360		8 - 32 NC, 8 - 36 NF		
3.5 mm	.1378				
28	.1405				

Dia./ Type	Dec. Equiv.	Fractional Tap	Machine Screw Tap	Metric Tap	Screw Ext.
9/64"	.1406	8 - 40 NS			ST-1
27	.1440				
26	.1470	3/16" - 24 NS			
25	.1495		10 - 24 NC		
24	.1520				
23	.1540				
5/32"	.1562	3/16" - 32 NS			EX-3
22	.1570				
4.0 mm	.1575				
21	.1590		10 - 32 NF		
20	.1600			5 mm - .90	
19	.1660			5 mm - .80	
18	.1695				
11/64"	.1719				
17	.1730				
16	.1770		12 - 24 NC		
4.5 mm	.1772				
15	.1800				
14	.1820		12 - 28 NF		
13	.1850		12 - 32 NEF		
3/16"	.1875				ST-2
12	.1890				
11	.1910				
10	.1935		14 - 20 NS		
9	.1960				
5.0 mm	.1969			6 mm - 1.00	EX-4
8	.1990			6 mm - 1.00	
7	.2010	1/4" - 20 NC			
13/64"	.2031		14 - 24 NS		
6	.2040				
5	.2055				
4	.2090	1/4" - 24 NS			
3	.2130	1/4" - 28 NF			
5.5 mm	.2165				
7/32"	.2188	1/4" - 32 NEF			
2	.2210				
1	.2280	1/4" - 40 NS			
A	.2340				
15/64"	.2344			7 mm - 1.00	ST-3
6.0 mm	.2362			7 mm - 1.00	
B	.2380				
C	.2420				
D	.2460				
E	.2500				
1/4"	.2500				EX-4
6.5 mm	.2559				
F	.2570	5/16" - 18 NC			

Tap & Drill Selection Chart

Dia./ Type	Dec. Equiv.	Fractional Tap	Pipe Tap	Metric Tap	Screw Ext.
G	.2610				
17/64"	.2656			8 mm - 1.25	
H	.2660				
I	.2720	5/16" - 24 NF			
7.0 mm	.2756			8 mm - 1.00	
J	.2770			8 mm - 1.00	
K	.2810				
9/32"	.2812	5/16" - 32 NEF			
L	.2900				
M	.2950				
7.5 mm	.2953				
19/64"	.2969				EX-5
N	.3020			9 mm - 1.25	
5/16"	.3125	3/8" - 16 NC			ST-4
8.0 mm	.3150			9 mm - 1.00	
O	.3160			9 mm - 1.00	
P	.3230			9 mm - .75	
21/64"	.3281		1/8" - 28 BSP		
Q	.3320	3/8" - 24 NF	1/8" - 27 NPT		
8.5 mm	.3346			10 mm - 1.50	
R	.3390			10 mm - 1.50	
11/32"	.3438			10 mm - 1.25	
S	.3480				
9.0 mm	.3543			10 mm - 1.00	
T	.3580			10 mm - 1.00	
23/64"	.3594				
U	.3680	7/16" - 14 NC			
9.5 mm	.3740			11 mm - 1.50	
3/8"	.3750			11 mm - 1.50	ST-5
V	.3770				
W	.3860				
25/64"	.3906	7/16" - 20 NF			
10.0 mm	.3937				
X	.3970				
Y	.4040				
13/32"	.4062			12 mm - 1.75	EX-6
Z	.4130			12 mm - 1.50	
10.5 mm	.4134			12 mm - 1.50	
27/64"	.4219	1/2" - 13 NC		12 mm - 1.25	
11.0 mm	.4331				
7/16"	.4375		1/4" - 18 NPT		
11.5 mm	.4528				
29/64"	.4531	1/2" - 20NF, 1/2" - 24NS	1/4" - 19 BSP		
15/32"	.4688			14 mm - 2.0	ST-6
12.0 mm	.4724			14 mm - 2.0	
31/64"	.4844	9/16" - 12 NC			
12.5 mm	.4921			14 mm - 1.5	

Dia./ Type	Dec. Equiv.	Fractional Tap	Pipe Tap	Metric Tap	Screw Ext.
1/2"	.5000			14mm-1.25, 14mm-1.5	
13.0 mm	.5118			14 mm - 1.25	
33/64"	.5156	9/16" - 18 NF			
17/32"	.5313	5/8" - 11 NC			EX-7
35/64"	.5469			16 mm - 2.0	
9/16"	.5625		3/8" - 18 NPT		ST-7
37/64"	.5781	5/8" - 18 NF		16 mm - 1.5	
19/32"	.5938	11/16" - 11 NS			
39/64"	.6094			18 mm - 2.5	
5/8"	.6250	11/16" - 16 NS			
41/64"	.6406				
21/32"	.6562	3/4" - 10 NC		18 mm - 1.5	
43/64"	.6719				
11/16"	.6875	3/4" - 16 NF		20 mm - 2.5	
45/64"	.7031		1/2" - 14 NPT		
23/32"	.7188				
47/64"	.7344				
3/4"	.7500				
49/64"	.7656	7/8" - 9 NC			
25/32"	.7812				
51/64"	.7969				
13/16"	.8125	7/8" - 14 NF		22 mm - 1.5	EX-8
53/64"	.8281			24 mm - 3.0	
27/32"	.8438				
55/64"	.8594				
7/8"	.8750	1" - 8 NC		24 mm - 2.0	
57/64"	.8906				
29/32"	.9062				
59/64"	.9219	1" - 12 NF	3/4" - 14 NPT		
15/16"	.9375	1" - 14 NS			
61/64"	.9531				
31/32"	.9688				
63/64"	.9844	1-1/8" - 7 NC			
1"	1.0000				
1-1/64"	1.0156				
1-1/32"	1.0312				
1-1/16"	1.0625				EX-9
1-3/32"	1.0938				
1-1/8"	1.1250				
1-5/32"	1.1562		1" - 11-1/2 NPT		
1-3/16"	1.1875				
1-1/4"	1.2500				
1-5/16"	1.3125				
1-3/8"	1.3750				
1-7/16"	1.4375				
1-1/2"	1.5000		1-1/4" - 11-1/2 NPT		

NC = National Coarse (USS)
 NS = National Special
 NF = National Fine (SAE)

NEF = National Extra Fine
 NPT = National Pipe Taper
 BSP = British Standard Pipe

Cutting Speeds - by Working Material Deep Hole Drilling Parameters

Speeds for High Speed Steel Drills	SFM*
Aluminum and its Alloys	200-300
Brass and Bronze (Ordinary)	150-300
Bronze (High Tensile)	70-150
Die Castings (Zinc Base)	300-400
Iron-Cast (Soft)	100-150
Cast (Medium hard)	70-100
Hard Chilled	30-40
Malleable	80-90
Magnesium and its Alloys	250-400
Monel Metal or High-Nickel Steel	30-50
Plastics or Similar Materials (Bakelite)	100-300
Steel - Mild (.2 carbon to .3 carbon)	80-110
Steel (.4 carbon to .5 carbon)	70-80
Tool (1.2 carbon)	50-60
Forgings	40-50
Alloy - 300 to 400 Brinell	20-30
High Tensile (Heat Treated)	
35 to 40 Rockwell C	30-40
40 to 45 Rockwell C	25-35
45 to 50 Rockwell C	15-25
50 to 55 Rockwell C	7-15
Stainless Steel	
Free Machining Grades	30-80
Work Hardening Grades	15-50
Wood	300-400

*Surface Feet per Minute (SFM)

$$\text{RPM} = \frac{\text{SFM} \times 3.82}{\text{Drill Diameter}}$$

Feed Per Drill Revolution

Drill Diameter Range	Light	Medium	Heavy
1/16 to 1/8	.0005 - .0010	.0010 - .0020	.0020 - .0040
1/8 to 1/4	.0010 - .0030	.0030 - .0050	.0040 - .0050
1/4 to 3/8	.0030 - .0050	.0050 - .0070	.0060 - .0100
3/8 to 1/2	.0040 - .0060	.0050 - .0080	.0080 - .0120
1/2 to 3/4	.0050 - .0070	.0070 - .0100	.0090 - .0140
3/4 to 1	.0070 - .0100	.0090 - .0140	.0140 - .0200

Speeds and Feeds for Deep Hole Drilling

Holes that fall into the "deep-hole drilling" category are three or more drill bit diameters in depth. When you are drilling this deep, you must adjust your speeds and feeds accordingly. The deeper the hole is, the more probable that chips might lodge in the flutes and clog the drill. When the flute clogs, the amount of friction and heat will increase. Heat build-up in the drill bit could cause failure and breakage. Lubricants always help the dissipation of heat from the tip of the drill bit, which prolongs the drill's life. Removing the drill and evacuating the chips after drilling short distances, often called "step-drilling," will also lessen the chance of heat build-up. Some good rules of thumb when deep-hole drilling are to reduce your rate of speed and feed, remove the bit more often from the material, and use lubricant whenever you can.

Speed and Feed Reduction (Based upon hole depth)

Hole Depth to Diameter (times drill diameter)	Ratio Speed Reduction	Feed Reduction
3	10%	10%
4	20%	10%
5	30%	20%
6	35-40%	20%

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