



QUALITY SYSTEM REGISTERED TO ISO 9001:2008

HIGH SPEED • COBALT • CARBIDE - HIGH PERFORMANCE TOOLS - HIGH PRODUCTION TOOLS - PRODUCTION TOOLS - SPECIAL APPLICATIONS



MORSE

CUTTING TOOLS

MACHINING APPLICATION SOLUTIONS

DRILL SIZE	DECIMAL	DRILL SIZE	DECIMAL	DRILL SIZE	DECIMAL	DRILL SIZE	DECIMAL
80	0.0135	41	0.0960	15/64	0.2344	15/32	0.4688
79	0.0145	40	0.0980	6mm	0.2362	12mm	0.4724
1/64	0.0156	2.5mm	0.0984	B	0.2380	12.2mm	0.4803
0.4mm	0.0157	39	0.0995	C	0.2420	31/64	0.4844
78	0.0160	38	0.1015	6.2mm	0.2441	12.5mm	0.4921
77	0.0180	37	0.1040	D	0.2460	1/2	0.5000
0.5mm	0.0197	2.7mm	0.1063	1/4 & E	0.2500	13mm	0.5118
76	0.0200	36	0.1065	6.5mm	0.2559	33/64	0.5156
75	0.0210	7/64	0.1094	F	0.2570	17/32	0.5312
74	0.0225	35	0.1100	G	0.2610	13.5mm	0.5315
0.6mm	0.0236	34	0.1110	6.7mm	0.2638	35/64	0.5469
73	0.0240	33	0.1130	17/64	0.2656	14mm	0.5512
72	0.0250	32	0.1160	H	0.2660	9/16	0.5625
71	0.0260	3mm	0.1181	I	0.2720	14.5mm	0.5709
0.7mm	0.0276	31	0.1200	7mm	0.2756	37/64	0.5781
70	0.0280	1/8	0.1250	J	0.2770	15mm	0.5906
69	0.0292	3.2mm	0.1260	K	0.2810	19/32	0.5938
68	0.0310	30	0.1285	9/32	0.2812	39/64	0.6094
1/32	0.0312	29	0.1360	7.2mm	0.2835	15.5mm	0.6102
0.8mm	0.0315	3.5mm	0.1378	L	0.2900	5/8	0.6250
67	0.0320	28	0.1405	M	0.2950	16mm	0.6299
66	0.0330	9/64	0.1406	7.5mm	0.2953	41/64	0.6406
65	0.0350	27	0.1440	19/64	0.2969	16.5mm	0.6496
0.9mm	0.0354	3.7mm	0.1457	N	0.3020	21/32	0.6562
64	0.0360	26	0.1470	7.7mm	0.3031	17mm	0.6693
63	0.0370	25	0.1495	5/16	0.3125	43/64	0.6719
62	0.0380	24	0.1520	8mm	0.3150	11/16	0.6875
61	0.0390	23	0.1540	O	0.3160	17.5mm	0.6890
1mm	0.0394	5/32	0.1562	8.2mm	0.3228	45/64	0.7031
60	0.0400	22	0.1570	P	0.3230	18mm	0.7087
59	0.0410	4mm	0.1575	21/64	0.3281	23/32	0.7188
58	0.0420	21	0.1590	Q	0.3320	18.5mm	0.7283
57	0.0430	20	0.1610	8.5mm	0.3346	47/64	0.7344
1.1mm	0.0433	4.2mm	0.1654	R	0.3390	19mm	0.7480
56	0.0465	19	0.1660	8.7mm	0.3425	3/4	0.7500
3/64	0.0469	18	0.1695	11/32	0.3438	49/64	0.7656
1.2mm	0.0472	11/64	0.1719	S	0.3480	19.5mm	0.7677
1.3mm	0.0512	17	0.1730	9mm	0.3543	25/32	0.7812
55	0.0520	16	0.1770	T	0.3580	20mm	0.7874
54	0.0550	4.5mm	0.1772	23/64	0.3594	51/64	0.7969
1.4mm	0.0551	15	0.1800	9.2mm	0.3622	20.5mm	0.8071
1.5mm	0.0591	14	0.1820	U	0.3680	13/16	0.8125
53	0.0595	13 & 4.7mm	0.1850	9.5mm	0.3740	21mm	0.8268
1/16	0.0625	3/16	0.1875	3/8	0.3750	53/64	0.8281
1.6mm	0.0630	12	0.1890	V	0.3770	27/32	0.8438
52	0.0635	11	0.1910	9.7mm	0.3819	21.5mm	0.8465
1.7mm	0.0669	10	0.1935	W	0.3860	55/64	0.8594
51	0.0670	9	0.1960	25/64	0.3906	22mm	0.8661
50	0.0700	5mm	0.1969	10mm	0.3937	7/8	0.8750
1.8mm	0.0709	8	0.1990	X	0.3970	22.5mm	0.8858
49	0.0730	7	0.2010	10.2mm	0.4016	57/64	0.8906
1.9mm	0.0748	13/64	0.2031	Y	0.4040	23mm	0.9055
48	0.0760	6	0.2040	13/32	0.4062	29/32	0.9062
5/64	0.0781	5.2mm	0.2047	Z	0.4130	59/64	0.9219
47	0.0785	5	0.2055	10.5mm	0.4134	23.5mm	0.9252
2mm	0.0787	4	0.2090	10.7mm	0.4213	15/16	0.9375
46	0.0810	3	0.2130	27/64	0.4219	24mm	0.9449
45	0.0820	5.5mm	0.2165	11mm	0.4331	61/64	0.9531
44	0.0860	7/32	0.2188	7/16	0.4375	24.5mm	0.9646
2.2mm	0.0866	2	0.2210	11.2mm	0.4409	31/32	0.9688
43	0.0890	5.7mm	0.2244	11.5mm	0.4528	25mm	0.9843
42	0.0935	1	0.2280	29/64	0.4531	63/64	0.9844
3/32	0.0938	A	0.2340	11.7mm	0.4606	1	1.0000

RECOMMENDED HOLE DIAMETERS FOR TAPPING					
UNIFIED THREADS			METRIC THREADS		
TAP SIZE	CUTTING TAPS Based on 75% Thread (in.)	FORMING TAPS Based on 65% Thread (in.)	TAP SIZE	CUTTING TAPS Based on 75% Thread (in.)	FORMING TAPS Based on 65% Thread (in.)
0-80	0.0478"	0.0545"	M1.6 X 0.35	0.0496"	0.0569"
1-64	0.0578"	0.0661"	M1.8 X 0.35	0.0574"	0.0648"
1-72	0.0595"	0.0669"	M2 X 0.4	0.0634"	0.0718"
2-56	0.0686"	0.0781"	M2.2 X 0.45	0.0694"	0.0788"
2-64	0.0708"	0.0791"	M2.5 X 0.45	0.0812"	0.0906"
3-48	0.0787"	0.0898"	M3 X 0.5	0.0989"	0.1094"
3-56	0.0816"	0.0911"	M3.5 X 0.6	0.1148"	0.1274"
4-40	0.0876"	0.1010"	M4 X 0.7	0.1306"	0.1453"
4-48	0.0917"	0.1028"	M4.5 X 0.75	0.1484"	0.1641"
5-40	0.1006"	0.1140"	M5 X 0.8	0.1662"	0.1829"
5-44	0.1029"	0.1150"	M6 X 1.0	0.1979"	0.2188"
6-32	0.1076"	0.1242"	M7 X 1.0	0.2372"	0.2582"
6-40	0.1136"	0.1270"	M8 X 1.25	0.2670"	0.2932"
8-32	0.1336"	0.1502"	M8 X 1.0	0.2766"	0.2976"
8-36	0.1369"	0.1517"	M10 X 1.5	0.3362"	0.3676"
10-24	0.1494"	0.1716"	M10 X 1.25	0.3458"	0.3719"
10-32	0.1596"	0.1762"	M12 X 1.75	0.4053"	0.4420"
12-24	0.1754"	0.1976"	M12 X 1.25	0.4245"	0.4507"
12-28	0.1812"	0.2002"	M14 X 2.0	0.4745"	0.5164"
1/4-20	0.2013"	0.2279"	M14 X 1.5	0.4936"	0.5251"
1/4-28	0.2152"	0.2342"	M16 X 2.0	0.5532"	0.5951"
5/16-18	0.2584"	0.2879"	M16 X 1.5	0.5724"	0.6038"
5/16-24	0.2719"	0.2941"	M18 X 2.5	0.6128"	0.6652"
3/8-16	0.3141"	0.3474"	M18 X 1.5	0.6511"	0.6826"
3/8-24	0.3344"	0.3566"	M20 X 2.5	0.6915"	0.7439"
7/16-14	0.3679"	0.4059"	M20 X 1.5	0.7299"	0.7613"
7/16-20	0.3888"	0.4154"	M22 X 2.5	0.7702"	0.8226"
1/2-13	0.4251"	0.4660"	M22 X 1.5	0.8086"	0.8400"
1/2-20	0.4513"	0.4779"	M24 X 3.0	0.8298"	0.8927"
9/16-12	0.4813"	0.5257"	M24 X 2.0	0.8682"	
9/16-18	0.5084"	0.5379"	M27 X 3.0	0.9479"	
5/8-11	0.5364"	0.5848"	M27 X 2.0	0.9863"	
5/8-18	0.5709"	0.6004"	M30 X 3.5	1.0469"	
3/4-10	0.6526"	0.7058"	M30 X 2.0	1.1044"	
3/4-16	0.6891"	0.7224"	M33 X 3.5	1.1650"	
7/8-9	0.7668"		M33 X 2.0	1.2225"	
7/8-14	0.8054"		M36 X 4.0	1.2639"	
1-8	0.8782"		M36 X 3.0	1.3023"	
1-12	0.9188"		M39 X 4.0	1.3820"	
1-14	0.9304"		M39 X 3.0	1.4204"	

RECOMMENDED HOLE DIAMETERS FOR PIPE TAPS				
TAP SIZE	NPT** HOLE SIZE	NPTF** HOLE SIZE	NPS HOLE SIZE	NPSF HOLE SIZE
1/16	0.2460"	0.2420"	0.2500"	0.2460"
1/8	0.3390"	0.3320"	0.3438"	0.3390"
1/4	0.4375"	0.4375"	0.4375"	0.4375"
3/8	0.5781"	0.5625"	0.5781"	0.5781"
1/2	0.7031"	0.7031"	0.7188"	0.7188"
3/4	0.9063"	0.9063"	0.9375"	0.9219"
1	1.1406"	1.1406"	1.1719"	1.1563"
1-1/4	1.4844"	1.4844"	1.5156"	
1-1/2	1.7344"	1.7344"	1.7500"	
2	2.2031"	2.1875"	2.2187"	
2-1/2	2.6250"	2.6250"	2.6563"	
3	3.2500"	3.2500"		

**For tapping without reaming

USEFUL FORMULAS		
SFM = .262 X DIA X RPM	RPM = 3.82 X SFM / DIA	
Mill:	Drill:	Tap:
IPM = FPT X #Teeth X RPM	IPM = FPR X RPM	Pitch = 1 / TPI
FPT = IPM / (#Teeth X RPM)	FPR = IPM / RPM	IPM = RPM X Pitch
<small>IPM = FEEDRATE IN INCHES PER MINUTE</small>	<small>FPT = FEED PER TOOTH IN INCHES</small>	<small>TPI = THREADS PER INCH</small>
<small>FPR = FEED PER REVOLUTION IN INCHES</small>	<small>RPM = REVOLUTIONS PER MINUTE</small>	

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