

Starrett®

Precision, Quality and Innovation...
Since 1880

INCHMETRIC TAP DRILL SIZES & DECIMAL EQUIVALENTS

TAP SIZE	TAP	TAP	TAP	TAP	TAP	DECIMAL EQUIVALENT	
						DRILL	TAP DRILL
1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	.0625	.0625
5/32"	5/32"	5/32"	5/32"	5/32"	5/32"	.1562	.1562
3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	.1875	.1875
1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	.2500	.2500
5/16"	5/16"	5/16"	5/16"	5/16"	5/16"	.3125	.3125
3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	.3750	.3750
7/16"	7/16"	7/16"	7/16"	7/16"	7/16"	.4375	.4375
1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	.5000	.5000
5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	.6250	.6250
3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	.7500	.7500
7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	.8750	.8750
1"	1"	1"	1"	1"	1"	1.0000	1.0000

METRIC TAP DRILL SIZES		
METRIC TAP	TAP DRILL (mm)	DECIMAL (inch)
M1.6 x 0.35	1.25	.0492
M1.8 x 0.35	1.45	.0571
M2 x 0.4	1.60	.0630
M2.2 x 0.45	1.75	.0689
M2.5 x 0.45	2.05	.0807
M3 x 0.5	2.50	.0984
M3.5 x 0.6	2.90	.1142
M4 x 0.7	3.30	.1299
M4.5 x 0.75	3.70	.1457
M5 x 0.8	4.20	.1654
M6 x 1	5.00	.1968
M7 x 1	6.00	.2362
M8 x 1.25	6.70	.2638
M9 x 1	7.00	.2756
M10 x 1.25	8.50	.3346
M12 x 1.75	8.70	.3425
M12 x 1.25	10.20	.4016
M14 x 2	10.80	.4252
M14 x 1.5	12.00	.4724
M16 x 2	12.50	.4921
M16 x 1.5	14.00	.5512
M18 x 2.5	14.50	.5709
M18 x 1.5	15.50	.6102
M20 x 2.5	16.50	.6496
M20 x 1.5	17.50	.6890
M22 x 2.5	18.50	.7283
M22 x 1.5	19.50	.7677
M24 x 3	20.50	.8071
M24 x 2	21.00	.8268
M27 x 3	22.00	.8661
M27 x 2	24.00	.9449
M30 x 3.5	25.00	.9843
M30 x 2	26.50	1.0433
M33 x 3.5	28.00	1.1024
M36 x 4	31.00	1.2164
M36 x 3	32.00	1.2558
M39 x 4	33.00	1.2952

REFERENCE TABLES



METRIC AND ENGLISH EQUIVALENTS

Linear Measure	
Metric to Inch	Inch to Metric
1 millimeter = 0.03937 inch	1 inch = 25.4 millimeters = 2.54 centimeters
1 centimeter = 0.3937 inch	1 foot = 304.8 millimeters = 0.3048 meter
1 meter = 39.37 inches = 3.2808 feet = 1.0936 yards	1 yard = 0.9144 meter
1 kilometer = 0.6214 mile	1 mile = 1.609 kilometers

Square Measure	
Metric to Inch	Inch to Metric
1 square millimeter = 0.00155 square inch	1 square inch = 6.452 square centimeters = 645.2 square millimeters
1 square centimeter = 0.155 square inch	1 square foot = 0.0929 square meter = 929 square centimeters
1 square meter = 10.764 square feet = 1.196 square yards	1 square yard = 0.836 square meter
1 are = 0.0247 acre = 1076.4 square feet	1 acre = 0.4047 hectare = 40.47 ares
1 hectare = 2.471 acres = 107,639 square feet	1 square mile = 2.5900 square kilometers
1 square kilometer = 0.3861 square mile = 247.1 acres	

Cubic Measure	
Metric to English	English to Metric
1 liter = 0.2642 U.S. gallon = 1.0567 U.S. quarts	1 U.S. quart = 0.946 liter
1 liter (cubic decimeter) = 0.0353 cubic foot = 61.024 cubic inches	1 U.S. gallon = 3.785 liters = 231 cubic inches
1 cubic centimeter = 0.061 cubic inch	1 cubic inch = 16.38706 cubic centimeters
1 cubic meter = 264.2 U.S. gallons	1 cubic foot = 0.02832 cubic meter = 28.317 liters
1 cubic meter = 35.315 cubic feet = 1.308 cubic yards	1 cubic yard = 0.7646 cubic meter

Weight	
Metric to English	English to Metric
1 gram = 15.432 grains	1 grain = 0.0648 gram
1 gram = 0.03527 ounce avoirdupois (Commercial)	1 ounce avoirdupois (Commercial) = 28.35 grams
1 kilogram = 2.2046 pounds = 35.274 ounces avoirdupois (Commercial)	1 pound = 0.4536 kilogram = 453.6 grams
1 metric ton = 0.9842 ton (of 2240 pounds) = 2204.6 pounds	1 short ton (2,000 pounds) = .907 metric ton = 907 kilograms



INCH TO MILLIMETER CONVERSIONS

Decimal	mm
0.001	0.0254
0.002	0.0508
0.003	0.0762
0.004	0.1016
0.005	0.1270
0.006	0.1524
0.007	0.1778
0.008	0.2032
0.009	0.2286
0.010	0.2540
0.020	0.5080
0.030	0.7620
0.040	1.0160
0.050	1.2700
0.060	1.5240
0.070	1.7780
0.080	2.0320
0.090	2.2860
0.100	2.5400
0.110	2.7940
0.120	3.0480
0.130	3.3020
0.140	3.5560
0.150	3.8100
0.160	4.0640
0.170	4.3180
0.180	4.5720
0.190	4.8260
0.200	5.0800
0.210	5.3340
0.220	5.5880
0.230	5.8420
0.240	6.0960
0.250	6.3500
0.260	6.6040
0.270	6.8580
0.280	7.1120
0.290	7.3660
0.300	7.6200
0.310	7.8740
0.320	8.1280
0.330	8.3820
0.340	8.6360
0.350	8.8900
0.360	9.1440
0.370	9.3980
0.380	9.6520
0.390	9.9060
0.400	10.1600
0.410	10.4140
0.420	10.6680
0.430	10.9220
0.440	11.1760
0.450	11.4300
0.460	11.6840
0.470	11.9380
0.480	12.1920
0.490	12.4460

Decimal	mm
0.500	12.7000
0.510	12.9540
0.520	13.2080
0.530	13.4620
0.540	13.7160
0.550	13.9700
0.560	14.2240
0.570	14.4780
0.580	14.7320
0.590	14.9860
0.600	15.2400
0.610	15.4940
0.620	15.7480
0.630	16.0020
0.640	16.2560
0.650	16.5100
0.660	16.7640
0.670	17.0180
0.680	17.2720
0.690	17.5260
0.700	17.7800
0.710	18.0340
0.720	18.2880
0.730	18.5420
0.740	18.7960
0.750	19.0500
0.760	19.3040
0.770	19.5580
0.780	19.8120
0.790	20.0660
0.800	20.3200
0.810	20.5740
0.820	20.8280
0.830	21.0820
0.840	21.3360
0.850	21.5900
0.860	21.8440
0.870	22.0980
0.880	22.3520
0.890	22.6060
0.900	22.8600
0.910	23.1140
0.920	23.3680
0.930	23.6220
0.940	23.8760
0.950	24.1300
0.960	24.3840
0.970	24.6380
0.980	24.8920
0.990	25.1460
1.000	25.4000

Fraction	Decimal	mm
1/64	0.0156	0.3969
1/32	0.0313	0.7938
3/64	0.0469	1.1906
1/16	0.0625	1.5875
5/64	0.0781	1.9844
3/32	0.0938	2.3812
7/64	0.1094	2.7781
1/8	0.1250	3.1750
9/64	0.1406	3.5719
5/32	0.1563	3.9688
11/64	0.1719	4.3656
3/16	0.1875	4.7625
13/64	0.2031	5.1594
7/32	0.2188	5.5562
15/64	0.2344	5.9531
1/4	0.2500	6.3500
17/64	0.2656	6.7469
9/32	0.2813	7.1438
19/64	0.2969	7.5406
5/16	0.3125	7.9375
21/64	0.3281	8.3344
11/32	0.3438	8.7312
23/64	0.3594	9.1281
3/8	0.3750	9.5250
25/64	0.3906	9.9219
13/32	0.4063	10.3188
27/64	0.4219	10.7156
7/16	0.4375	11.1125
29/64	0.4531	11.5094
15/32	0.4688	11.9062
31/64	0.4844	12.3031
1/2	0.5000	12.7000

Fraction	Decimal	mm
33/64	0.5156	13.0969
17/32	0.5313	13.4938
35/64	0.5469	13.8906
9/16	0.5625	14.2875
37/64	0.5781	14.6844
19/32	0.5938	15.0812
39/64	0.6094	15.4781
5/8	0.6250	15.8750
41/64	0.6406	16.2719
21/32	0.6563	16.6688
43/64	0.6719	17.0656
11/16	0.6875	17.4625
45/64	0.7031	17.8594
23/32	0.7188	18.2562
47/64	0.7344	18.6531
3/4	0.7500	19.0500
49/64	0.7656	19.4469
25/32	0.7813	19.8438
51/64	0.7969	20.2406
13/16	0.8125	20.6375
53/64	0.8281	21.0344
27/32	0.8438	21.4312
55/64	0.8594	21.8281
7/8	0.8750	22.2250
57/64	0.8906	22.6219
29/32	0.9063	23.0188
59/64	0.9219	23.4156
15/16	0.9375	23.8125
61/64	0.9531	24.2094
31/32	0.9688	24.6062
63/64	0.9844	25.0031
1	1.0000	25.4000



MILLIMETER TO INCH CONVERSIONS

mm	Decimal	mm	Decimal	mm	Decimal	mm	Decimal
0.01	.00039	0.51	.02008	1	.03937	51	2.00787
0.02	.00079	0.52	.02047	2	.07874	52	2.04724
0.03	.00118	0.53	.02087	3	.11811	53	2.08661
0.04	.00157	0.54	.02126	4	.15748	54	2.12598
0.05	.00197	0.55	.02165	5	.19685	55	2.16535
0.06	.00236	0.56	.02205	6	.23622	56	2.20472
0.07	.00276	0.57	.02244	7	.27559	57	2.24409
0.08	.00315	0.58	.02283	8	.31496	58	2.28346
0.09	.00354	0.59	.02323	9	.35433	59	2.32283
0.10	.00394	0.60	.02362	10	.39370	60	2.36220
0.11	.00433	0.61	.02402	11	.43307	61	2.40157
0.12	.00472	0.62	.02441	12	.47244	62	2.44094
0.13	.00512	0.63	.02480	13	.51181	63	2.48031
0.14	.00551	0.64	.02520	14	.55118	64	2.51969
0.15	.00591	0.65	.02559	15	.59055	65	2.55906
0.16	.00630	0.66	.02598	16	.62992	66	2.59843
0.17	.00669	0.67	.02638	17	.66929	67	2.63780
0.18	.00709	0.68	.02677	18	.70866	68	2.67717
0.19	.00748	0.69	.02717	19	.74803	69	2.71654
0.20	.00787	0.70	.02756	20	.78740	70	2.75591
0.21	.00827	0.71	.02795	21	.82677	71	2.79528
0.22	.00866	0.72	.02835	22	.86614	72	2.83465
0.23	.00906	0.73	.02874	23	.90551	73	2.87402
0.24	.00945	0.74	.02913	24	.94488	74	2.91339
0.25	.00984	0.75	.02953	25	.98425	75	2.95276
0.26	.01024	0.76	.02992	26	1.02362	76	2.99213
0.27	.01063	0.77	.03031	27	1.06299	77	3.03150
0.28	.01102	0.78	.03071	28	1.10236	78	3.07087
0.29	.01142	0.79	.03110	29	1.14173	79	3.11024
0.30	.01181	0.80	.03150	30	1.18110	80	3.14961
0.31	.01220	0.81	.03189	31	1.22047	81	3.18898
0.32	.01260	0.82	.03228	32	1.25984	82	3.22835
0.33	.01299	0.83	.03268	33	1.29921	83	3.26772
0.34	.01339	0.84	.03307	34	1.33858	84	3.30709
0.35	.01378	0.85	.03346	35	1.37795	85	3.34646
0.36	.01417	0.86	.03386	36	1.41732	86	3.38583
0.37	.01457	0.87	.03425	37	1.45669	87	3.42520
0.38	.01496	0.88	.03465	38	1.49606	88	3.46457
0.39	.01535	0.89	.03504	39	1.53543	89	3.50394
0.40	.01575	0.90	.03543	40	1.57480	90	3.54331
0.41	.01614	0.91	.03583	41	1.61417	91	3.58268
0.42	.01654	0.92	.03622	42	1.65354	92	3.62205
0.43	.01693	0.93	.03661	43	1.69291	93	3.66142
0.44	.01732	0.94	.03701	44	1.73228	94	3.70079
0.45	.01772	0.95	.03740	45	1.77165	95	3.74016
0.46	.01811	0.96	.03780	46	1.81102	96	3.77953
0.47	.01850	0.97	.03819	47	1.85039	97	3.81890
0.48	.01890	0.98	.03858	48	1.88976	98	3.85827
0.49	.01929	0.99	.03898	49	1.92913	99	3.89764
0.50	.01969	1.00	.03937	50	1.96850	100	3.93701



DECIMAL EQUIVALENTS OF 8THS, 16THS, 32NDS AND 64THS

8ths
1/8 = .125
1/4 = .250
3/8 = .375
1/2 = .500
5/8 = .625
3/4 = .750
7/8 = .875

16ths
1/16 = .0625
3/16 = .1875
5/16 = .3125
7/16 = .4375
9/16 = .5625
11/16 = .6875
13/16 = .8125
15/16 = .9375

32nds
1/32 = .03125
3/32 = .09375
5/32 = .15625
7/32 = .21875
9/32 = .28125
11/32 = .34375
13/32 = .40625
15/32 = .46875
17/32 = .53125
19/32 = .59375
21/32 = .65625
23/32 = .71875
25/32 = .78125
27/32 = .84375
29/32 = .90625
31/32 = .96875

64ths	
1/64 = .015625	33/64 = .515625
3/64 = .046875	35/64 = .546875
5/64 = .078125	37/64 = .578125
7/64 = .109375	39/64 = .609375
9/64 = .140625	41/64 = .640625
11/64 = .171875	43/64 = .671875
13/64 = .203125	45/64 = .703125
15/64 = .234375	47/64 = .734375
17/64 = .265625	49/64 = .765625
19/64 = .296875	51/64 = .796875
21/64 = .328125	53/64 = .828125
23/64 = .359375	55/64 = .859375
25/64 = .390625	57/64 = .890625
27/64 = .421875	59/64 = .921875
29/64 = .453125	61/64 = .953125
31/64 = .484375	63/64 = .984375

DECIMAL EQUIVALENTS OF LETTER SIZE DRILLS

Letter	Size of Drill in Inches
A	.234
B	.238
C	.242
D	.246
E	.250
F	.257
G	.261
H	.266
I	.272
J	.277
K	.281
L	.290
M	.295

Letter	Size of Drill in Inches
N	.302
O	.316
P	.323
Q	.332
R	.339
S	.348
T	.358
U	.368
V	.377
W	.386
X	.397
Y	.404
Z	.413

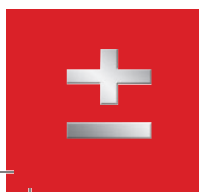


DECIMAL EQUIVALENTS OF NUMBER SIZE DRILLS

No.	Size of Drill in Inches	No.	Size of Drill in Inches	No.	Size of Drill in Inches	No.	Size of Drill in Inches
1	.2280	21	.1590	41	.0960	61	.0390
2	.2210	22	.1570	42	.0935	62	.0380
3	.2130	23	.1540	43	.0890	63	.0370
4	.2090	24	.1520	44	.0860	64	.0360
5	.2055	25	.1495	45	.0820	65	.0350
6	.2040	26	.1470	46	.0810	66	.0330
7	.2010	27	.1440	47	.0785	67	.0320
8	.1990	28	.1405	48	.0760	68	.0310
9	.1960	29	.1360	49	.0730	69	.0292
10	.1935	30	.1285	50	.0700	70	.0280
11	.1910	31	.1200	51	.0670	71	.0260
12	.1890	32	.1160	52	.0635	72	.0250
13	.1850	33	.1130	53	.0595	73	.0240
14	.1820	34	.1110	54	.0550	74	.0225
15	.1800	35	.1100	55	.0520	75	.0210
16	.1770	36	.1065	56	.0465	76	.0200
17	.1730	37	.1040	57	.0430	77	.0180
18	.1695	38	.1015	58	.0420	78	.0160
19	.1660	39	.0995	59	.0410	79	.0145
20	.1610	40	.0980	60	.0400	80	.0135

AMERICAN STANDARD PIPE THREAD AND TAP DRILL SIZES

Pipe Size Inches	Threads Per Inch	Root Diameter Small End of Pipe and Gage	Tap Drill	
			Taper NPT	Straight NPS
1/8	27	.3339"	Q	11/32"
1/4	18	.4329"	7/16"	7/16"
3/8		.5676"	9/16"	37/64"
1/2		.7013"	45/64"	23/32"
3/4	11-1/2	.9105"	29/32"	59/64"
1		1.1441"	1-9/64"	1-5/32"
1-1/4		1.4876"	1-31/64"	1-1/2"
1-1/2		1.7265"	1-47/64"	1-3/4"
2		2.1995"	2-13/64"	2-7/32"



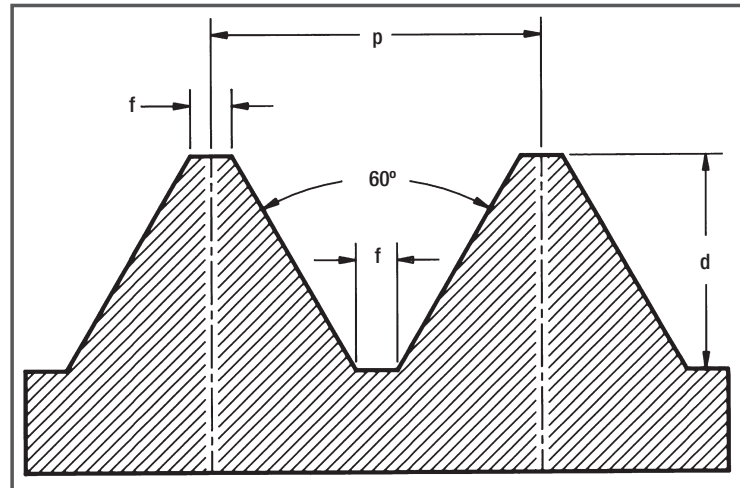
AMERICAN NATIONAL AND UNIFIED COARSE AND FINE THREAD DIMENSIONS AND TAP DRILL SIZES

$$p = \text{pitch} = \frac{1}{\text{thread per inch}}$$

$$d = \text{depth} = p \times .649519$$

$$f = \text{flat} = \frac{p}{8}$$

$$\text{pitch diameter} = D - \frac{.6495}{N}$$



Size	Threads per inch		Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Tap Drill Approx. 75% Full Thread	Decimal Equiv. of Tap Drill
	NC UNC	NF UNF					
0	—	80	.0600	.0519	.0438	3/64"	.0469
1	64	—	.0730	.0629	.0527	53	.0595
1	—	72	.0730	.0640	.0550	53	.0595
2	56	—	.0860	.0744	.0628	50	.0700
2	—	64	.0860	.0759	.0657	50	.0700
3	48	—	.0990	.0855	.0719	47	.0785
3	—	56	.0990	.0874	.0758	46	.0810
4	40	—	.1120	.0958	.0795	43	.0890
4	—	48	.1120	.0985	.0849	42	.0935
5	40	—	.1250	.1088	.0925	38	.1015
5	—	44	.1250	.1102	.0955	37	.1040
6	32	—	.1380	.1177	.0974	36	.1065
6	—	40	.1380	.1218	.1055	33	.1130
8	32	—	.1640	.1437	.1234	29	.1360
8	—	36	.1640	.1460	.1279	29	.1360
10	24	—	.1900	.1629	.1359	26	.1470
10	—	32	.1900	.1697	.1494	21	.1590
12	24	—	.2160	.1889	.1619	16	.1770
12	—	28	.2160	.1928	.1696	15	.1800
1/4"	20	—	.2500	.2175	.1850	7	.2010
1/4"	—	28	.2500	.2268	.2036	3	.2130
5/16"	18	—	.3125	.2764	.2403	F	.2570
5/16"	—	24	.3125	.2854	.2584	I	.2720
3/8"	16	—	.3750	.3344	.2938	5/16"	.3125
3/8"	—	24	.3750	.3479	.3209	Q	.3320
7/16"	14	—	.4375	.3911	.3447	U	.3680
7/16"	—	20	.4375	.4050	.3726	25/64"	.3906
1/2"	13	—	.5000	.4500	.4001	27/64"	.4219
1/2"	—	20	.5000	.4675	.4351	29/64"	.4531
9/16"	12	—	.5625	.5084	.4542	31/64"	.4844
9/16"	—	18	.5625	.5264	.4903	33/64"	.5156
5/8"	11	—	.6250	.5660	.5069	17/32"	.5312
5/8"	—	18	.6250	.5889	.5528	37/64"	.5781
3/4"	10	—	.7500	.6850	.6201	21/32"	.6562
3/4"	—	16	.7500	.7094	.6688	11/16"	.6875
7/8"	9	—	.8750	.8028	.7307	49/64"	.7656
7/8"	—	14	.8750	.8286	.7822	13/16"	.8125



AMERICAN NATIONAL AND UNIFIED COARSE AND FINE THREAD DIMENSIONS AND TAP DRILL SIZES

Size	Threads per inch		Outside Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Tap Drill Approx. 75% Full Thread	Decimal Equiv. of Tap Drill
	NC UNC	NF UNF					
1"	8	–	1.0000	.9188	.8376	7/8"	.8750
1"	–	12	1.0000	.9459	.8917	59/64"	.9219
1-1/8"	7	–	1.1250	1.0322	.9394	63/64"	.9844
1-1/8"	–	12	1.1250	1.0709	1.0168	1-3/64"	1.0469
1-1/4"	7	–	1.2500	1.1572	1.0644	1-7/64"	1.1094
1-1/4"	–	12	1.2500	1.1959	1.1418	1-11/64"	1.1719
1-3/8"	6	–	1.3750	1.2667	1.1585	1-7/32"	1.2187
1-3/8"	–	12	1.3750	1.3209	1.2668	1-19/64"	1.2969
1-1/2"	6	–	1.5000	1.3917	1.2835	1-11/32"	1.3437
1-1/2"	–	12	1.5000	1.4459	1.3918	1-27/64"	1.4219
1-3/4"	5	–	1.7500	1.6201	1.4902	1-9/16"	1.5625
2"	4-1/2	–	2.0000	1.8557	1.7113	1-25/32"	1.7812
2-1/4"	4-1/2	–	2.2500	2.1057	1.9613	2-1/32"	2.0313
2-1/2"	4-1/2	–	2.5000	2.3376	2.1752	2-1/4"	2.2500
2-3/4"	4	–	2.7500	2.5876	2.4252	2-1/2"	2.5000
3"	4	–	3.0000	2.8376	2.6752	2-3/4"	2.7500
3-1/4"	4	–	3.2500	3.0876	2.9252	3"	3.0000
3-1/2"	4	–	3.5000	3.3376	3.1752	3-1/4"	3.2500
3-3/4"	4	–	3.7500	3.5876	3.4252	3-1/2"	3.5000
4"	4	–	4.0000	3.3786	3.6752	3-3/4"	3.7500

MILLIMETER TAP DRILL SIZES

Metric Tap	Tap Drill mm	Decimal Equiv. Inches	Metric Tap	Tap Drill mm	Decimal Equiv. Inches
M1.6 x 0.35	1.25	.0492	M16 x 2	14.00	.5512
M1.8 x 0.35	1.45	.0571	M16 x 1.5	14.50	.5709
M2 x 0.4	1.60	.0630	M18 x 2.5	15.50	.6102
M2.2 x 0.45	1.75	.0689	M18 x 1.5	16.50	.6496
M2.5 x 0.45	2.05	.0807	M20 x 2.5	17.50	.6890
M3 x 0.5	2.50	.0984	M20 x 1.5	18.50	.7283
M3.5 x 0.6	2.90	.1142	M22 x 2.5	19.50	.7677
M4 x 0.7	3.30	.1299	M22 x 1.5	20.50	.8071
M4.5 x 0.75	3.70	.1457	M24 x 3	21.00	.8268
M5 x 0.8	4.20	.1654	M24 x 2	22.00	.8661
M6 x 1	5.00	.1968	M27 x 3	24.00	.9449
M7 x 1	6.00	.2362	M27 x 2	25.00	.9843
M8 x 1.25	6.70	.2638	M30 x 3.5	26.50	1.0433
M8 x 1	7.00	.2756	M30 x 2	28.00	1.1024
M10 x 1.5	8.50	.3346	M33 x 3.5	29.50	1.1614
M10 x 1.25	8.70	.3425	M33 x 2	31.00	1.2205
M12 x 1.75	10.20	.4016	M36 x 4	32.00	1.2598
M12 x 1.25	10.80	.4252	M36 x 3	33.00	1.2992
M14 x 2	12.00	.4724	M39 x 4	35.00	1.3780
M14 x 1.5	12.50	.4921	M39 x 3	36.00	1.4173

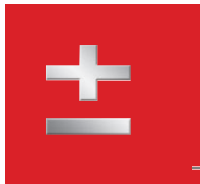


TAP DRILL SIZES FOR FRACTIONAL SIZE THREADS

APPROXIMATELY 65% DEPTH THREAD/AMERICAN NATIONAL THREAD FORM

Tap Size	Threads per Inch	Hole Diameter	Drill	Tap Size	Threads per Inch	Hole Diameter	Drill	Tap Size	Threads per Inch	Hole Diameter	Drill
1/16	72	.049	3/64	1/4	28	.215	3	7/8	12	.794	51/64
1/16	64	.047	3/64	1/4	27	.214	3	7/8	9	.767	49/64
1/16	60	.046	56	1/4	24	.209	4	15/16	12	.856	55/64
5/64	72	.065	52	1/4	20	.201	7	15/16	9	.829	53/64
5/64	64	.063	1/16	5/16	32	.282	9/32	1	27	.964	31/32
5/64	60	.062	1/16	5/16	27	.276	J	1	14	.930	15/16
5/64	56	.061	53	5/16	24	.272	I	1	12	.919	59/64
3/32	60	.077	5/64	5/16	20	.264	17/64	1	8	.878	7/8
3/32	56	.076	48	5/16	18	.258	F	1-1/16	8	.941	15/16
3/32	50	.074	49	3/8	27	.339	R	1-1/8	12	1.044	1-3/64
3/32	48	.073	49	3/8	24	.334	Q	1-1/8	7	.986	63/64
7/64	56	.092	42	3/8	20	.326	21/64	1-3/16	7	1.048	1-3/64
7/64	50	.090	43	3/8	16	.314	5/16	1-1/4	12	1.169	1-11/64
7/64	48	.089	43	7/16	27	.401	Y	1-1/4	7	1.111	1-7/64
1/8	48	.105	36	7/16	24	.397	X	1-5/16	7	1.173	1-11/64
1/8	40	.101	38	7/16	20	.389	25/64	1-3/8	12	1.294	1-19/64
1/8	36	.098	40	7/16	14	.368	U	1-3/8	6	1.213	1-7/32
1/8	32	.095	3/32	1/2	27	.464	15/32	1-1/2	12	1.419	1-27/64
9/64	40	.116	32	1/2	24	.460	29/64	1-1/2	6	1.338	1-11/32
9/64	36	.114	33	1/2	20	.451	29/64	1-5/8	5-1/2	1.448	1-29/64
9/64	32	.110	35	1/2	13	.425	27/64	1-3/4	5	1.555	1-9/16
5/32	40	.132	30	1/2	12	.419	27/64	1-7/8	5	1.680	1-11/16
5/32	36	.129	30	9/16	27	.526	17/32	2	4-1/2	1.783	1-25/32
5/32	32	.126	1/8	9/16	18	.508	33/64	2-1/8	4-1/2	1.909	1-29/32
11/64	36	.145	27	9/16	12	.481	31/64	2-1/4	4-1/2	2.034	2-1/32
11/64	32	.141	9/64	5/8	27	.589	19/32	2-3/8	4	2.131	2-1/8
3/16	36	.161	20	5/8	18	.571	37/64	2-1/2	4	2.256	2-1/4
3/16	32	.157	22	5/8	12	.544	35/64	2-5/8	4	2.381	2-3/8
3/16	30	.155	23	5/8	11	.536	17/32	2-3/4	4	2.506	2-1/2
3/16	24	.147	26	11/16	16	.627	5/8	2-7/8	3-1/2	2.597	2-19/32
13/64	32	.173	17	11/16	11	.599	19/32	3	3-1/2	2.722	2-23/32
13/64	30	.171	11/64	3/4	27	.714	23/32	3-1/8	3-1/2	2.847	2-27/32
13/64	24	.163	20	3/4	16	.689	11/16	3-1/4	3-1/2	2.972	2-31/32
7/32	32	.188	12	3/4	12	.669	43/64	3-3/8	3-1/4	3.075	3-1/16
7/32	28	.184	13	3/4	10	.653	21/32	3-1/2	3-1/4	3.200	3-3/16
7/32	24	.178	16	13/16	12	.731	47/64	3-5/8	3-1/4	3.325	3-5/16
15/64	32	.204	6	13/16	10	.715	23/32	3-3/4	3	3.425	3-7/16
15/64	28	.200	8	7/8	27	.839	27/32	4	3	3.675	3-11/16
15/64	24	.194	10	7/8	18	.821	53/64				
1/4	32	.220	7/32	7/8	14	.805	13/16				

REFERENCE TABLES



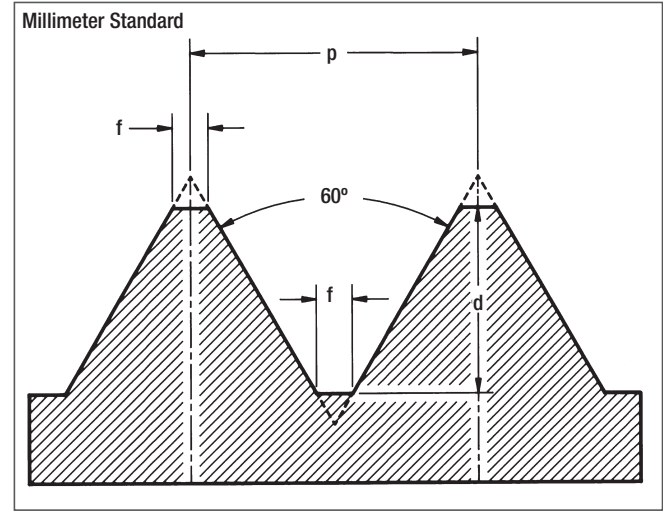
DOUBLE DEPTH OF SCREW THREADS

$$D.D. = \frac{1.732}{N} \text{ For V Thread}$$

$$D.D. = \frac{1.299}{N} \text{ For American Nat. Form, U.S. Std}$$

$$D.D. = \frac{1.28}{N} \text{ For Whitworth Standard}$$

ISO EXTERNAL THREADS MEDIUM FIT



p = distance between any point on a thread to the corresponding point on the adjacent thread
 d = depth - 0.64952P
 f = flat - 0.125P

Threads per Inch	V Threads	Am. Nat. Form U.S. Standard	Whitworth Standard
N	D.D.	D.D.	D.D.
2	.86600	.64950	.64000
3	.57733	.43300	.42666
4	.43300	.32475	.32000
10	.17320	.12990	.12800
13	.13323	.09992	.09846
18	.09622	.07216	.07111
20	.08660	.06495	.06400
22	.07872	.05904	.05818
24	.07216	.05412	.05333
26	.06661	.04996	.04923
27	.06415	.04811	.04740
28	.06185	.04639	.04571
30	.05773	.04330	.04266
32	.05412	.04059	.04000
34	.05094	.03820	.03764
36	.04811	.03608	.03555
38	.04558	.03418	.03368
40	.04330	.03247	.03200
56	.03093	.02319	.02285
60	.02887	.02165	.02133
80	.02165	.01623	.01600

Designation	mm Diameter	mm Pitch
M2 x 0.4	2	0.4
M3 x 0.5	3	0.5
M4 x 0.7	4	0.7
M5 x 0.8	5	0.8
M6 x 1	6	1.0
M8 x 1.25	8	1.25
M10 x 1.5	10	1.5
M12 x 1.75	12	1.75
M16 x 2	16	2.0
M20 x 2.5	20	2.5
M24 x 3	24	3.0
M30 x 3.5	30	3.5



AMERICAN STANDARD ACME SCREW THREAD DIMENSIONS

h = Basic depth of thread
 h' = Depth of thread with clearance
 K = Tap drill
 Basic minor diameter of nut
 Fc = Width of flat at crest of thread
 Fr = Width of flat at bottom of space
 n = Number of threads per inch
 p = Pitch of thread
 Kr = Minor diameter of screw
 D = Major diameter of screw
 T = Major diameter of tap

FOR 10 OR FEWER THREADS PER INCH

$$h' = \frac{P}{2} \text{ plus } .010$$

$$Fr = \frac{.3707}{n} \text{ minus } .0052$$

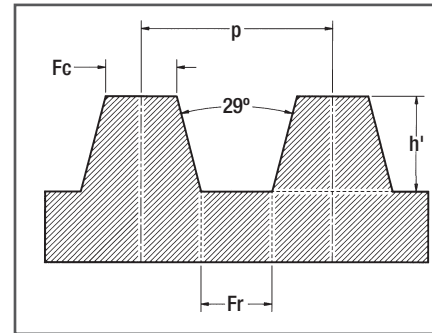
$$T = D \text{ plus } .020$$

FOR MORE THAN 10 THREADS PER INCH

$$h' = \frac{P}{2} \text{ plus } .005$$

$$Fr = \frac{.3707}{n} \text{ minus } .0026$$

$$T = D \text{ plus } .010$$



$$p = \frac{1}{n} \quad Fc = \frac{.3707}{n}$$

$$K = D \text{ minus } p \quad Kr = D \text{ minus } 2h'$$

Threads per inch (n)	Depth of Thread with Clearance (h')	Flat at Top of Thread (Fc)	Flat at Bottom of Space (Fr)	Space at Top of Thread	Thickness at Root of Thread
1	.5100	.3707	.3655	.6293	.6345
1-1/3	.3850	.2780	.2728	.4720	.4772
2	.2600	.1854	.1802	.3146	.3198
3	.1767	.1236	.1184	.2097	.2149
4	.1350	.0927	.0875	.1573	.1625
5	.1100	.0741	.0689	.1259	.1311
6	.0933	.0618	.0566	.1049	.1101
7	.0814	.0530	.0478	.0899	.0951
8	.0725	.0463	.0411	.0787	.0839
9	.0655	.0412	.0360	.0699	.0751
10	.0600	.0371	.0319	.0629	.0681
12	.0467	.0309	.0283	.0524	.0550
14	.0407	.0265	.0239	.0449	.0475
16	.0363	.0232	.0206	.0393	.0419

TAPERS AND ANGLES

Taper per Foot	Degree	Included Angle Minute	Second	Degree	Angle With Center Line Minute	Second	Taper per inch	Taper per inch from Center Line
1/8"	0	35	49	0	17	54	.010417	.005208
1/4"	1	11	37	0	35	49	.020833	.010417
3/8"	1	47	25	0	53	43	.031250	.015625
1/2"	2	23	13	1	11	37	.041667	.020833
5/8"	2	59	1	1	29	30	.052083	.026042
3/4"	3	34	47	1	47	24	.062500	.031250
7/8"	4	10	33	2	5	17	.072917	.036458
1"	4	46	19	2	23	9	.083333	.041667
1-1/4"	5	57	47	2	58	53	.104167	.052084
1-1/2"	7	9	10	3	34	35	.125000	.062500
1-3/4"	8	20	27	4	10	14	.145833	.072917
2"	9	31	38	4	45	49	.166667	.083333
2-1/2"	11	53	37	5	56	49	.208333	.104167
3"	14	2	0	7	1	30	.250000	.125000
3-1/2"	16	35	39	8	17	50	.291667	.145833
4"	18	55	29	9	27	44	.333333	.166667
4-1/2"	21	14	22	10	37	11	.375000	.187500
5"	23	32	12	11	46	6	.416667	.208333
6"	28	4	21	14	2	10	.500000	.250000

REFERENCE TABLES



PITCH DIAMETER TABLES - AMERICAN NATIONAL THREAD FORM FOR NOS. 575 AND 585 SCREW THREAD MICROMETERS

Number Sizes

$$\text{Caliper Reading or Pitch Diameter} = D - \frac{.6495}{N}$$

Fractional Sizes

$$\text{Caliper Reading or Pitch Diameter} = D - \frac{.6495}{N}$$

No.	Basic and Max. Outside Diameter	Threads Per Inch	Caliper Reading or Max. Pitch Diameter	Single Depth of Thread
	D	N	$D - \frac{.6495}{N}$	$\frac{.6495}{N}$
0	.060	80	.0519	.0081
1	.073	72	.0640	.0090
2	.086	64	.0759	.0101
3	.099	56	.0874	.0116
4	.112	48	.0985	.0135
5	.125	44	.1102	.0148
6	.138	40	.1218	.0162
7	.151	36	.1330	.0180
8	.164	36	.1460	.0180
9	.177	32	.1567	.0203
10	.190	30	.1684	.0217
12	.216	28	.1928	.0232
14	.242	24	.2149	.0271
16	.268	22	.2385	.0295
18	.294	20	.2615	.0325
20	.320	20	.2875	.0325
22	.346	18	.3099	.0361
24	.372	16	.3314	.0406
26	.398	16	.3574	.0406
28	.424	14	.3776	.0464
30	.450	14	.4036	.0464

Diameter Inches	Threads Per Inch	Caliper Reading of Pitch Diameter	Single Depth of Thread
D	N	$D - \frac{.6495}{N}$	$\frac{.6495}{N}$
NOTE: As there is no standard of diameter for the finer pitches, this column is left blank.	64	—	.0101
	62	—	.0105
	60	—	.0108
	58	—	.0112
	56	—	.0116
	54	—	.0120
	52	—	.0125
	50	—	.0130
	48	—	.0135
	46	—	.0141
	44	—	.0148
	42	—	.0155
	40	—	.0162
	38	—	.0171
36	—	.0180	
34	—	.0191	
32	—	.0203	
30	—	.0217	
28	—	.0232	
26	—	.0250	
24	—	.0271	
22	—	.0295	
1/4	20	.2175	.0325
5/16	18	.2764	.0361
3/8	16	.3344	.0406
7/16	14	.3911	.0464
1/2	13	.4501	.0499
9/16	12	.5084	.0541
5/8	11	.5660	.0590
3/4	10	.6851	.0649
7/8	9	.8029	.0721
1	8	.9188	.0812
1-1/8	7	1.0322	.0928
1-1/4	7	1.1572	.0928
1-3/8	6	1.2668	.1082
1-1/2	6	1.3918	.1082
1-5/8	5-1/2	1.5070	.1180
1-3/4	5	1.6201	.1299
1-7/8	5	1.7451	.1299
2	4-1/2	1.8557	.1443
2-1/2	4	2.3376	.1624
3	3-1/2	2.8145	.1855
3-1/2	3-1/4	3.3002	.1998
4	3	3.7835	.2165



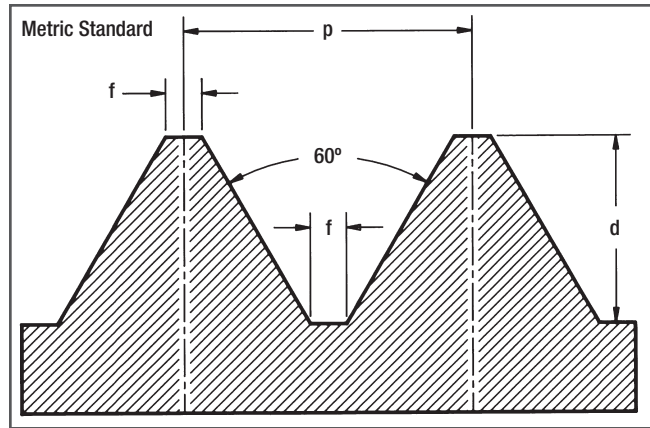
PITCH DIAMETER TABLES

FOR NOS. 575 AND 585 SCREW THREAD MICROMETERS

Whitworth Standard

Caliper Reading or Pitch Diameter for Whitworth Threads = $D - \frac{.640}{N}$

Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread
D	N	$D - \frac{.640}{N}$	$\frac{.640}{N}$
—	48	—	.0133
—	46	—	.0139
—	44	—	.0146
—	42	—	.0152
—	40	—	.0160
—	38	—	.0168
—	36	—	.0178
—	34	—	.0188
—	32	—	.0200
—	30	—	.0213
—	28	—	.0229
—	26	—	.0246
—	24	—	.0267
—	22	—	.0291
1/4	20	.2180	.0320
5/16	18	.2769	.0355
3/8	16	.3350	.0400
7/16	14	.3918	.0457
1/2	12	.4467	.0533
9/16	12	.5092	.0533
5/8	11	.5668	.0582
11/16	11	.6293	.0582
3/4	10	.6860	.0640
13/16	10	.7485	.0640
7/8	9	.8039	.0711
15/16	9	.8664	.0711
1	8	.9200	.0800
1-1/8	7	1.0336	.0914
1-1/4	7	1.1586	.0914
1-3/8	6	1.2684	.1066
1-1/2	6	1.3934	.1066
1-5/8	5	1.4970	.1280
1-3/4	5	1.6220	.1280
1-7/8	4-1/2	1.7328	.1422
2	4-1/2	1.8578	.1422
2-1/8	4-1/2	1.9828	.1422



$p = \text{pitch} = \frac{1}{\text{No. thread per inch}}$
 $d = \text{depth} = p \times .6495$
 $f = \text{flat} = \frac{\text{pitch}}{8}$

Size Mm	Pitch	
	Intl. Std.	French Std.
2	.45	.50
3	.55	.50
4	.70	.75
5	.85	.75
6	1.00	1.00
7	1.00	1.00
8	1.25	1.00
9	1.25	1.00
10	1.50	1.50
11	1.50	—
12	1.75	1.50
14	2.00	2.00
16	2.00	2.00
18	2.50	2.50
20	2.50	2.50
22	2.50	2.50
24	3.00	3.00
26	—	3.00
27	3.00	—
28	—	3.00
30	3.50	3.50
32	—	3.50
33	3.50	3.50
34	—	3.50
36	4.00	4.00
38	—	4.00
39	4.00	—
40	—	4.00



PITCH DIAMETER TABLE

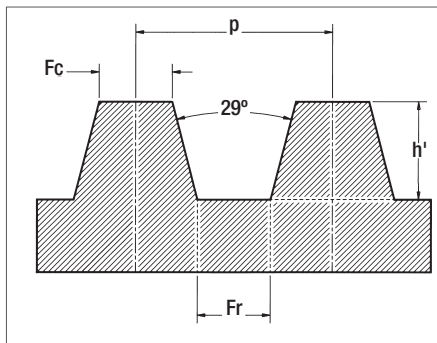
FOR NOS. 575 AND 585 SCREW THREAD MICROMETERS "V" STANDARD THREAD FORM

Caliper Reading or Pitch Diameter for "V" Threads = $D - \frac{.866}{N}$

Diameter Inches	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread	Diameter Inches*	Threads per Inch	Caliper Reading or Pitch Diameter	Single Depth of Thread
D	N	$D - \frac{.866}{N}$	$\frac{.866}{N}$	D	N	$D - \frac{.866}{N}$	$\frac{.866}{N}$
Note: As there is no standard of diameter for the finer pitches, this column is left blank.	64	—	.0135	1/4	24	.2139	.0361
	62	—	.0140	1/4	20	.2067	.0433
	60	—	.0144	5/16	20	.2692	.0433
	58	—	.0149	5/16	18	.2644	.0481
	56	—	.0155	3/8	18	.3269	.0481
	54	—	.0161	3/8	16	.3209	.0541
	52	—	.0167	7/16	16	.3834	.0541
	50	—	.0173	7/16	14	.3756	.0619
	48	—	.0180	1/2	14	.4381	.0619
	46	—	.0188	1/2	13	.4334	.0666
	44	—	.0197	1/2	12	.4278	.0722
	42	—	.0206	9/16	14	.5006	.0619
	40	—	.0217	9/16	12	.4903	.0722
	38	—	.0228	5/8	11	.5463	.0787
	36	—	.0241	5/8	10	.5384	.0866
	34	—	.0255	11/16	10	.6009	.0866
	32	—	.0271	3/4	10	.6634	.0866
	30	—	.0289	7/8	9	.7788	.0962
	28	—	.0309	1	8	.8918	.1082
	26	—	.0333	1-1/8	8	1.0168	.1082
—	—	—	1-1/4	7	1.1263	.1237	
—	—	—	1-1/2	6	1.3557	.1443	

* These figures give the outside diameter for screws with threads cut theoretically sharp. As it is not practical to make these threads sharp, the outside diameter will measure less than the figures given, the pitch diameter remaining the same.

AMERICAN STANDARD ACME SCREW THREAD DIMENSIONS



- h = Basic depth of thread
- h' = Depth of thread with clearance
- K = Tap drill
- K = Basic minor diameter of nut
- Fc = Width of flat at crest of thread
- Fr = Width of flat at bottom of space
- n = Number of threads per inch
- p = Pitch of thread
- Kr = Minor diameter of screw
- D = Major diameter of screw
- T = Major diameter of tap

$p = \frac{1}{n}$ $F_c = \frac{.3707}{n}$
 K = minus p Kr = D minus 2h'

FOR 10 OR FEWER THREADS PER INCH

$h' = \frac{P}{2}$ plus .010
 $Fr = \frac{.3707}{n}$ minus .0052
 T = D plus .020

FOR MORE THAN 10 THREADS PER INCH

$h' = \frac{P}{2}$ plus .005
 $Fr = \frac{.3707}{n}$ minus .0026
 T = D plus .010

Threads per inch (n)	Depth of Thread with Clearance (h')	Flat at Top of Thread (Fc)	Flat at Bottom of Space (Fr)	Space at Top of Thread	Thickness at Root of Thread
1	.5100	.3707	.3655	.6293	.6345
1-1/3	.3850	.2780	.2728	.4720	.4772
2	.2600	.1854	.1802	.3146	.3198
3	.1767	.1236	.1184	.2097	.2149
4	.1350	.0927	.0875	.1573	.1625
5	.1100	.0741	.0689	.1259	.1311
6	.0933	.0618	.0566	.1049	.1101
7	.0814	.0530	.0478	.0899	.0951
8	.0725	.0463	.0411	.0787	.0839
9	.0655	.0412	.0360	.0699	.0751
10	.0600	.0371	.0319	.0629	.0681
12	.0467	.0309	.0283	.0524	.0550
14	.0407	.0265	.0239	.0449	.0475
16	.0363	.0232	.0206	.0393	.0419



GENERAL GUIDE FOR CUTTING SPEEDS AND FEEDS FOR DRILLS

The following information is a general guide. Specific jobs may need to be modified because of varying job conditions, such as coolant, equipment and job requirements.

GUIDE FOR DRILL FEEDS

Drill feeds are governed by the size of the drill and also the material to be drilled.

The lower feeds should be used when drilling relatively hard materials such as alloy steels. The higher feeds should be used when drilling relatively soft materials such as aluminum and brass.

These feeds are based on the peripheral speed of a drill.

Drill Dia.	Feed per Rev.	Drill Dia.	Feed per Rev.
Under 1/80	.0010 - .0020	Under 3mm	.025 - .05mm
1/80 - 1/40	.0020 - .0040	3 - 6mm	.05 - .100mm
1/40 - 1/20	.0040 - .0070	6 - 13mm	.100 - .180mm
1/20 - 10	.0070 - .0150	13 - 25mm	.180 - .370mm
Over 10	.0150 - .0250	Over 25mm	.370 - .630mm

GUIDE FOR PERIPHERAL SPEEDS

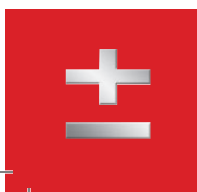
Material	Feet/Minute		Meters/Minute	
	Carbon Drill	HSS Drill	Carbon Drill	HSS Drill
Machinery Steel	30	80	9	24
Cast Iron	35	100	10.5	30
Brass	60	200	18	60
Alloy Steel	–	50	–	15

Drill Diameter		Peripheral Speeds – Feet per Minute (Meters per Minute)					
		Revolutions per Minute					
Inches	mm	30 (9)	50 (15)	60 (18)	80 (24)	100 (30)	200 (60)
1/8	3	917	1528	1833	2445	3056	6112
1/4	6	458	764	917	1222	1528	3056
1/2	13	229	382	458	611	764	1528
1	25	115	191	229	306	382	764
1-1/2	38	76	127	153	204	255	509
2	50	57	96	115	153	191	382
3	75	38	64	76	102	127	255



STANDARDS FOR SHEET AND WIRE GAGES WITH CORRESPONDING STARRETT GAGES

Dimensions of Sizes in Decimal Parts of an Inch						
Number of Wire Gage	281 American or Brown & Sharpe	188 245 Birmingham or Stubs' Iron Wire	287 Washburn & Moen, Worcester, MA	280 American S. & W. Co's. Music Wire Gage	Stubs' Steel Wire	283 U.S. Standard Gage for Sheet and Plate Iron and Steel
00000000	.731429					
0000000	.651356					
000000	.580049			.004		.46875
00000	.516549			.005		.4375
0000	.460000	.454	.3938	.006		.40625
000	.409642	.425	.3625	.007		.375
00	.364797	.380	.3310	.008		.34375
0	.324861	.340	.3065	.009		.3125
1	.289279	.300	.2830	.010	.227	.28125
2	.257626	.284	.2625	.011	.219	.265625
3	.229423	.259	.2437	.012	.212	.250
4	.204307	.238	.2253	.013	.207	.234375
5	.181941	.220	.2070	.014	.204	.21875
6	.162023	.203	.1920	.016	.201	.203125
7	.144285	.180	.1770	.018	.199	.1875
8	.128490	.165	.1620	.020	.197	.171875
9	.114424	.148	.1483	.022	.194	.15625
10	.101897	.134	.1350	.024	.191	.140625
11	.090742	.120	.1205	.026	.188	.125
12	.080808	.109	.1055	.029	.185	.109375
13	.071962	.095	.0915	.031	.182	.09375
14	.064084	.083	.0800	.033	.180	.078125
15	.057068	.072	.0720	.035	.178	.0703125
16	.050821	.065	.0625	.037	.175	.0625
17	.045257	.058	.0540	.039	.172	.05625
18	.040303	.049	.0475	.041	.168	.050
19	.035891	.042	.0410	.043	.164	.04375
20	.031961	.035	.0348	.045	.161	.0375
21	.028462	.032	.03175	.047	.157	.034375
22	.025347	.028	.0286	.049	.155	.03125
23	.022572	.025	.0258	.051	.153	.028125
24	.020101	.022	.0230	.055	.151	.025
25	.017900	.020	.0204	.059	.148	.021875
26	.015941	.018	.0181	.063	.146	.01875
27	.014196	.016	.0173	.067	.143	.0171875
28	.012641	.014	.0162	.071	.139	.015625
29	.011258	.013	.0150	.075	.134	.0140625
30	.010025	.012	.0140	.080	.127	.0125
31	.008928	.010	.0132	.085	.120	.0109375
32	.007950	.009	.0128	.090	.115	.01015625
33	.007080	.008	.0118	.095	.112	.009375
34	.006305	.007	.0104		.110	.00859375
35	.005615	.005	.0095		.108	.0078125
36	.005000	.004	.0090		.106	.00703125
37	.004453				.103	.006640625
38	.003965				.101	.00625
39	.003531				.099	
40	.003145				.097	



TEMPERATURE CONVERSIONS

This table shows conversions from degrees Fahrenheit (°F) directly to degrees Celsius (°C) and vice versa. It covers the range of temperatures used in most hardening, tempering and annealing operations.

Lower, higher and intermediate conversions can be made by substituting a known Fahrenheit (°F) or Celsius (°C) temperature figure in either of the following formulas:

$$^{\circ}\text{F} = \frac{^{\circ}\text{C} \times 9}{5} + 32$$

$$^{\circ}\text{C} = \frac{^{\circ}\text{F} - 32}{9} \times 5$$

°F	°C
-160	-107
-140	-96
-120	-84
-100	-73
-80	-62
-60	-51
-40	-40
-20	-29
0	-18
20	-7
32	0
40	4
60	16
80	27
100	38
120	49
140	60
160	71
180	82
200	93
212	100
220	104
300	149
400	204
500	260
600	316
700	371
800	427
1000	538
1200	649
1400	760
1600	871
1800	982
2000	1093
2200	1204

RULES RELATIVE TO THE CIRCLE

TO FIND CIRCUMFERENCE

- Multiply diameter by 3.1416
- Or divide diameter by 0.3183

TO FIND DIAMETER

- Multiply circumference by 0.3183
- Or divide circumference by 3.1416

TO FIND RADIUS

- Multiply circumference by 0.15915
- Or divide circumference by 6.28318

TO FIND SIDE OF AN INSCRIBED SQUARE

- Multiply diameter by 0.7071
- Or multiply circumference by 0.2251
- Or divide circumference by 4.4428

TO FIND SIDE OF AN EQUAL SQUARE

- Multiply diameter by 0.8862
- Or divide diameter by 1.1284
- Or multiply circumference by 0.2821
- Or divide circumference by 3.545

SQUARE

- A side multiplied by 1.4142 equals diameter of its circumscribing circle
- A side multiplied by 4.443 equals circumference of its circumscribing circle
- A side multiplied by 1.128 equals diameter of an equal side
- A side multiplied by 3.547 equals circumference of an equal circle

TO FIND THE AREA OF A CIRCLE

- Multiply circumference by one-quarter of the diameter
- Or multiply the square of diameter by 0.7854
- Or multiply the square of circumference by .07958
- Or multiply the square of 1/2 diameter by 3.1416

TO FIND THE SURFACE OF A SPHERE OR GLOBE

- Multiply the diameter by the circumference
- Or multiply the square of a diameter by 3.1416
- Or multiply four times the square of radius by 3.1416

HIGH TEMPERATURES JUDGED BY COLOR

Degrees Centigrade	Degrees Fahrenheit	High Temperatures Judged by Color
400	752	Red heat, visible in the dark
525	975	Red heat, visible in daylight
700	1292	Dark red
900	1652	Cherry-red
1100	2012	Orange-red
1300	2372	Yellow-white
1500	2732	Brilliant white

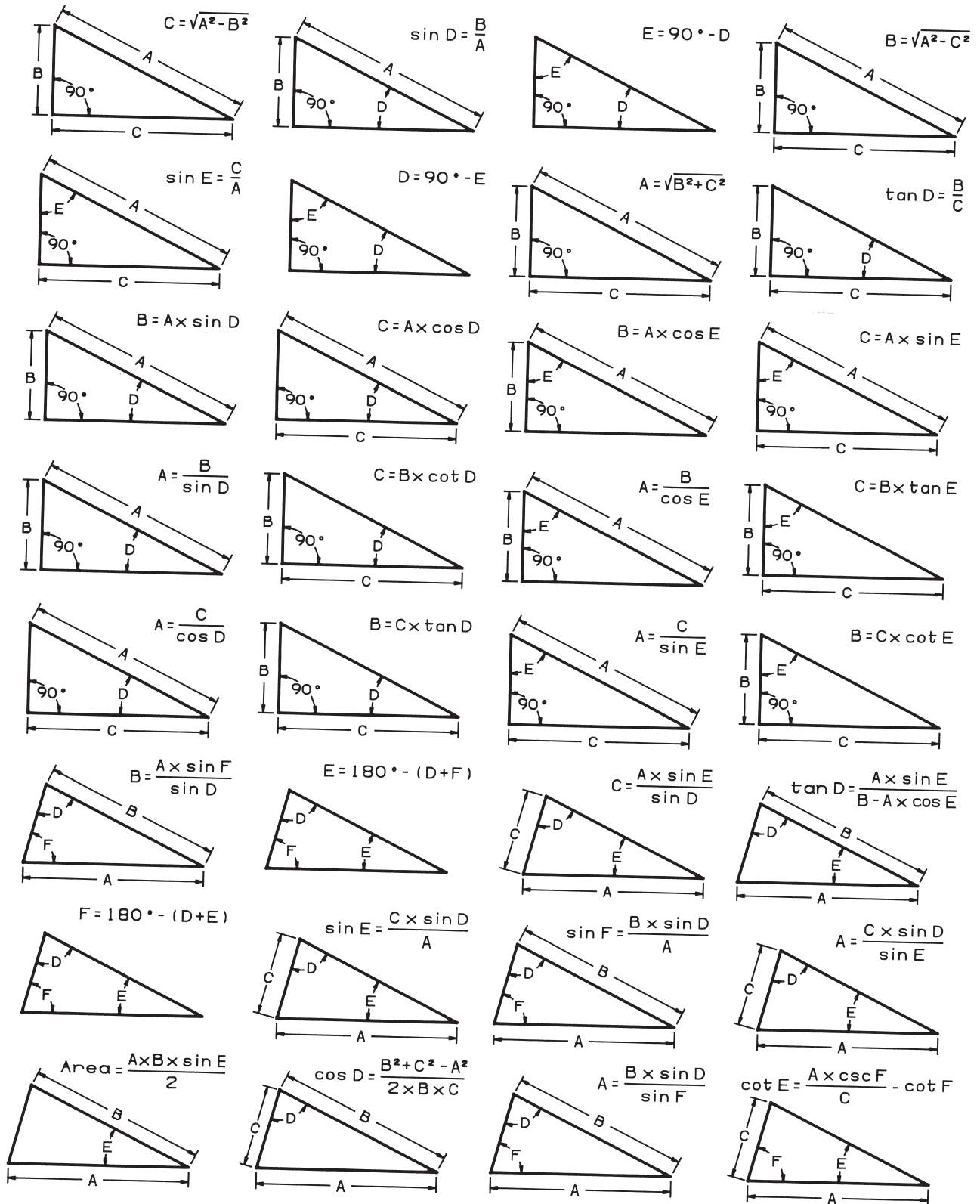
COLORS FOR TEMPERING

Degrees Centigrade	Degrees Fahrenheit	Colors for Tempering
221.1	430	Very pale yellow
237.8	460	Straw-yellow
254.4	490	Yellow-brown
260.0	500	Brown-yellow
271.1	520	Brown-purple
282.2	540	Full purple
293.3	560	Full blue



TRIANGLE CHART

FOR THE RAPID SOLUTION OF RIGHT-ANGLE AND OBLIQUE-ANGLE TRIANGLES





REFERENCE TABLES