TABLE 302

Standard Hand Tap Dimensions, Screw, Fractional and Metric Sizes

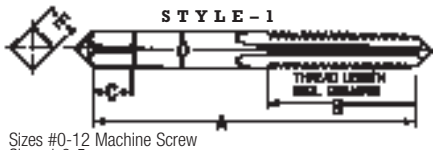
GENERAL DIMENSIONS

NOMINAL DIA. RANGE–IN. OVER	NOMINAL DIA. RANGE–IN. TO (INCL.)	MACHINE SCREW SIZE NO.	NOMINAL FRACTIONAL DIAMETER (IN.)	METRIC DIAMETER (MM)	STYLE	OVERALL LENGTH A	THREAD LENGTH B	SQUARE LENGTH C	SHANK DIA. D	SIZE OF SQUARE E
.052	.065	0	1/16	M1.6	1	1-5/8	5/16	3/16	.141	.110
.065	.078	1		M1.8	1	1-11/16	3/8	3/16	.141	.110
.078	.091	2		M2, M2.2	1	1-3/4	7/16	3/16	.141	.110
.091	.104	3	3/32	M2.5	1	1-13/16	1/2	3/16	.141	.110
.104	.117	4			1	1-7/8	9/16	3/16	.141	.110
.117	.130	5	1/8	M3, M3.15	1	1-15/16	5/8	3/16	.141	.110
.130	.145	6		M3.5	1	2	11/16	3/16	.141	.110
.145	.171	8	5/32	M4	1	2-1/8	3/4	1/4	.168	.131
.171	.197	10	3/16	M4.5, M5	1	2-3/8	7/8	1/4	.194	.152
.197	.223	12	7/32		1	2-3/8	15/16	9/32	.220	.165
.223	.260	14	1/4	M6, M6.3	2	2-1/2	1	5/16	.255	.191
.260	.323		5/16	M7, M8	2	2-23/32	1-1/8	3/8	.318	.238
.323	.395		3/8	M10	2	2-15/16	1-1/4	7/16	.381	.286
.395	.448		7/16		3	3-5/32	1-7/16	13/32	.323	.242
.448	.510		1/2	M12, M12.5	3	3-3/8	1-21/32	7/16	.367	.275
.510	.573		9/16	M14	3	3-19/32	1-21/32	1/2	.429	.322
.573	.635		5/8	M16	3	3-13/16	1-13/16	9/16	.480	.360
.635	.709		11/16	M18	3	4-1/32	1-13/16	5/8	.542	.406
.709	.760		3/4		3	4-1/4	2	11/16	.590	.442
.760	.823		13/16	M20	3	4-15/32	2	11/16	.652	.489
.823	.885		7/8	M22	3	4-11/16	2-7/32	3/4	.697	.523
.885	.948		15/16	M24	3	4-29/32	2-7/32	3/4	.760	.570
.948	1.010		1	M25	3	5-1/8	2-1/2	13/16	.800	.600
1.010	1.073		1-1/16	M27	3	5-1/8	2-1/2	7/8	.896	.672
1.073	1.135		1-1/8		3	5-7/16	2-9/16	7/8	.896	.672
1.135	1.198		1-3/16	M30	3	5-7/16	2-9/16	1	1.021	.766
1.198	1.260		1-1/4		3	5-3/4	2-9/16	1	1.021	.766
1.260	1.323		1-5/16	M33	3	5-3/4	2-9/16	1-1/16	1.108	.831
1.323	1.385		1-3/8		3	6-1/16	3	1-1/16	1.108	.831
1.385	1.448		1-7/16	M36	3	6-1/16	3	1-1/8	1.233	.925
1.448	1.510		1-1/2		3	6-3/8	3	1-1/8	1.233	.925

TOLERANCES

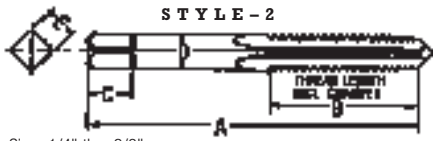
ELEMENT	NOMINAL DIAMETER RANGE–INCHES OVER	NOMINAL DIAMETER RANGE–INCHES TO (INCL.)	DIRECTION	TOLERANCE–INCHES GROUND THREAD
Length Overall–A	.052	1.010	Plus or Minus	1/32
	1.010	1.510	Plus or Minus	1/16
Length of Thread–B	.052	.223	Plus or Minus	3/64
	.223	.510	Plus or Minus	1/16
	.510	1.510	Plus or Minus	3/32
Length of Square–C	.052	1.010	Plus or Minus	1/32
	1.010	1.510	Plus or Minus	1/16
Diameter of Shank–D	.052	.223	Minus	.0015
	.223	.635	Minus	.0015
	.635	1.010	Minus	.002
	1.010	1.510	Minus	.002
Size of Square–E	.052	.510	Minus	.004
	.510	1.010	Minus	.006
	1.010	1.510	Minus	.008

STYLE – 1



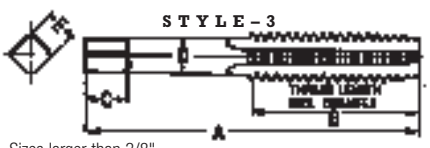
Sizes #0-12 Machine Screw
Sizes 1.6-5mm

STYLE – 2



Sizes 1/4" thru 3/8"
Sizes 6-10mm

STYLE – 3



Sizes larger than 3/8"
Sizes 12mm and larger

TABLE 311

Standard Pipe Tap Dimensions, Straight and Taper, Ground Thread

GENERAL DIMENSIONS

NOMINAL SIZES INCHES	OVERALL LENGTH A	LENGTH OF THREAD B	LENGTH OF SQUARE C	DIAMETER OF SHANK D	SIZE OF SQUARE E
1/16	2-1/8	11/16	3/8	.3125	.234
1/8*	2-1/8	3/4	3/8	.3125	.234
1/8	2-1/8	3/4	3/8	.4375	.328
1/4	2-7/16	1-1/16	7/16	.5625	.421
3/8	2-9/16	1-1/16	1/2	.7000	.531
1/2	3-1/8	1-3/8	5/8	.6875	.515
3/4	3-1/4	1-3/8	11/16	.9063	.679
1	3-3/4	1-3/4	13/16	1.1250	.843
1-1/4	4	1-3/4	15/16	1.3125	.984
1-1/2	4-1/4	1-3/4	1	1.5000	1.125
2	4-1/2	1-3/4	1-1/8	1.8750	1.406
2-1/2	5-1/2	2-9/16	1-1/4	2.2500	1.687
3	6	2-5/8	1-3/8	2.6250	1.968
3-1/2	6-1/2	2-11/16	1-1/2	2.8125	2.108
4	6-3/4	2-3/4	1-5/8	3.0000	2.250

*Small Shank

TOLERANCES

ELEMENT	RANGE	DIRECTION	TOLERANCE
Length Overall–A	1/16" to 3/4" incl. 1" to 4" incl.	Plus or Minus Plus or Minus	1/32" 1/16"
Length of Thread–B	1/16" to 3/4" incl. 1" to 1-1/4" incl. 1-1/2" to 4" incl.	Plus or Minus Plus or Minus Plus or Minus	1/16" 3/32" 1/8"
Length of Square–C	1/16" to 3/4" incl. 1" to 4" incl.	Plus or Minus Plus or Minus	1/32" 1/16"
Dia. of Shank–D	1/16" to 1/8" incl. 1/4" to 1/2" incl. 3/4" to 1" incl. 1-1/4" to 4" incl.	Minus Minus Minus Minus	.0015" .0020" .0020" .0030"
Size of Square–E	1/16" to 1/8" incl. 1/4" to 3/4" incl. 1" to 4" incl.	Minus Minus Minus	.0040" .0060" .0080"

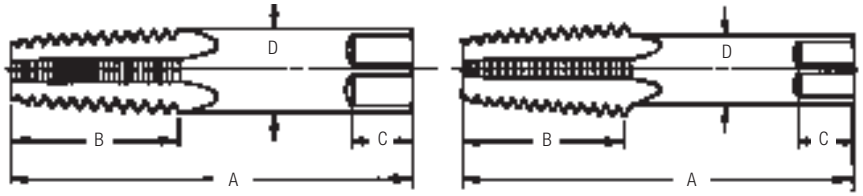


TABLE 357

American National Standard and Dryseal American National Standard Taper Pipe Threads

BASIC DIMENSIONS–TAPER THREAD

Nominal Pipe Size Inches	Outside Dia. of Pipe Inches	Threads per Inch	Pitch of Thread	Pitch Dia. at Gaging Notch Basic Inches	Thickness of Standard Thin Ring Gage and Distance from Small End to Gaging Notch–Inches	Effective Thread External Inches	Wrench Make Up Inches	Total Length of Thread Inches	Pitch Dia. at Small End of Internal Effective Thread Inches	Pitch Dia. at End of Pipe Inches	Minor Diameter at End of Pipe Inches	*Tap Drill Size	Minimum Hole Depth for Std. Pipe Tap Table 338
	D	n	p	E_1	L_1	L_2	L_3	L_4	E_3	E_0	K_0	NPT & NPTF	
1/16	.3125	27	.03704	.28118	.160	.2611	.1111	.3896	.26424	.27118	.2416	C	9/16
1/8	.405	27	.03704	.37360	.1615	.2639	.1111	.3924	.35656	.36351	.3339	Q	19/32
1/4	.540	18	.05556	.49163	.2278	.4018	.1667	.5946	.46697	.47739	.4329	7/16	13/16
3/8	.675	18	.05556	.62701	.240	.4078	.1667	.6006	.60160	.61201	.5676	9/16	13/16
1/2	.840	14	.07143	.77843	.320	.5337	.2143	.7815	.74504	.75843	.7013	45/64	1-1/32
3/4	1.050	14	.07143	.98887	.339	.5457	.2143	.7935	.95429	.96768	.9105	29/32	1-1/32
1	1.315	11-1/2	.08696	1.23863	.400	.6828	.2609	.9845	1.19733	1.21363	1.1441	1-9/64	1-1/4
1-1/4	1.660	11-1/2	.08696	1.58338	.420	.7068	.2609	1.0085	1.54083	1.55713	1.4876	1-31/64	1-9/32
1-1/2	1.900	11-1/2	.08696	1.82234	.420	.7235	.2609	1.0252	1.77978	1.79609	1.7265	1-23/32	1-5/16
2	2.375	11-1/2	.08696	2.29627	.436	.7565	.2609	1.0582	2.25272	2.26902	2.1995	2-3/16	1-9/32
2-1/2	2.875	8	.12500	2.76216	.682	1.1375	.250[1]	1.5712	2.70391[1]	2.71953	2.6195	2-39/64	1-27/32
3	3.500	8	.12500	3.38850	.766	1.2000	.250[2]	1.6337	3.32500[2]	3.34062	3.2406	3-15/64	1-29/32
3-1/2	4.000	8	.12500	3.88881	.821	1.2500	.250	1.6837	3.82188	3.83750	3.7375		2
4	4.500	8	.12500	4.38712	.844	1.3000	.250	1.7337	4.31875	4.33438	4.2344		2-1/16
5	5.563	8	.12500	5.44929	.937	1.4063	.250	1.8400	5.37511	5.39073	5.2907		
6	6.625	8	.12500	6.50597	.958	1.5125	.250	1.9462	6.43047	6.44609	6.3461		
8	8.625	8	.12500	8.50003	1.063	1.7125	.250	2.1462	8.41797	8.43359	8.3336		
10	10.750	8	.12500	10.62094	1.210	1.9250	.250	2.3587	10.52969	10.54531	10.4453		
12	12.750	8	.12500	12.61781	1.360	2.1250	.250	2.5587	12.51719	12.53281	12.3428		

[1]2-1/2" NPTF and ANPT L_3=.375, E_3=2.69609 [2]3" NPTF and ANPT L_3=.375, E3-3.31719

*Methods of inspection vary. Care should be taken to use a tap drill or taper reamer which can meet thread specifications. Sizes given permit direct tapping without reaming the hole, but only give a full thread for approx. L_1 distance. See columns K_0 and L_3.

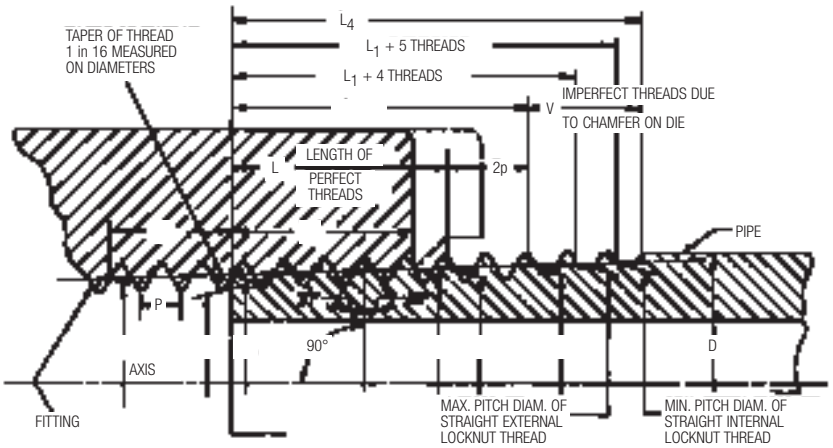
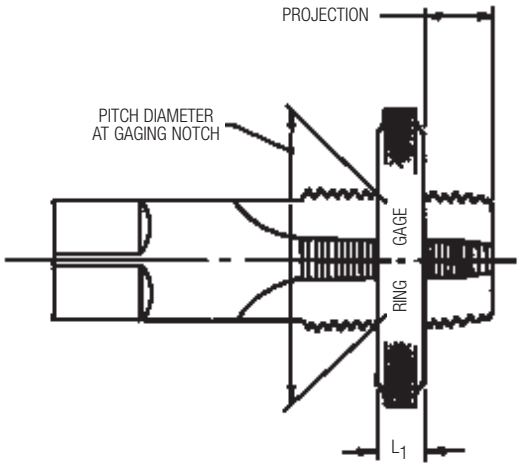


TABLE 357

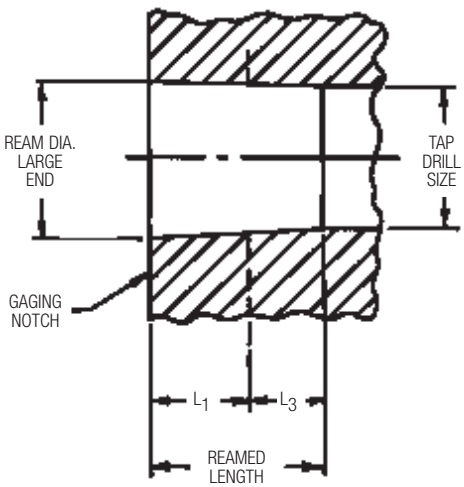
Measurement of Taper Pipe Taps, Reaming Data and Tap Drill Sizes

SIZE	PROTECTION: NPT & NPTF MIN.	PROTECTION: NPT & NPTF MAX.	PROTECTION: SAE-SHORT MIN.	PROTECTION: SAE-SHORT MAX.	REAM DIA. LARGE END	GAGE WIDTH L_1	REAMED LENGTH $L_1 + L_3$	TAP DRILL FOR USE WITH REAMING	TAP DRILL FOR USE WITHOUT REAMING	FORMING TAP DRILL FOR USE WITHOUT REAMING
1/16-27	.250	.375	.222	.259	.2515	.1600	.2711	15/64	C	I
1/8-27	.250	.375	.222	.259	.3340	.1615	.2726	21/64	Q	9.25mm
1/4-18	.397	.521	.333	.389	.4472	.2278	.3945	27/64	7/16	12.1mm
3/8-18	.392	.516	.333	.389	.5826	.240	.4067	9/16	9/16	5/8
1/2-14	.517	.641	.429	.500	.7213	.320	.5343	11/16	45/64	19.3mm
3/4-14	.503	.627	.429	.500	.9317	.339	.5533	57/64	29/32	31/32
1-11-1/2	.584	.772			1.1691	.400	.6609	1-1/8	1-9/64	
1-1/4-11-1/2	.592	.780			1.5138	.420	.6809	1-15/32	1-31/64	
1-1/2-11-1/2	.606	.792			1.7528	.420	.6809	1-45/64	1-23/32	
2-11-1/2	.574	.760			2.2267	.436	.6969	2-3/16	2-3/16	

PROJECTION THRU RING GAGE



REAMED HOLE DATA



Tap Recommendations for Classes 2, 3, 2B & 3B
Unified and American Screw Threads

SCREW SIZES

SIZE	THREADS PER INCH		RECOMMENDED TAP FOR CLASS OF THREAD				MIN. ALL CLASSES (BASIC)	PITCH DIAMETER LIMITS FOR CLASS OF THREAD			
	NC AND UNC	NF AND UNF	CLASS 2	CLASS 3	CLASS 2B	CLASS 3B		MAX. CLASS 2	MAX. CLASS 3	MAX. CLASS 2B	MAX. CLASS 3B
0	**	80	G H1	G H1	G H2	G H1	.0519	.0536	.0532	.0542	.0536
1	64	**	G H1	G H1	G H2	G H1	.0629	.0648	.0643	.0655	.0648
1	**	72	G H1	G H1	G H2	G H1	.0640	.0658	.0653	.0665	.0659
2	56	**	G H1	G H1	G H2	G H1	.0744	.0764	.0759	.0772	.0765
2	**	64	G H1	G H1	G H2	G H1	.0759	.0778	.0773	.0786	.0779
3	48	**	G H1	G H1	G H2	G H1	.0855	.0877	.0871	.0885	.0877
3	**	56	G H1	G H1	G H2	G H1	.0874	.0894	.0889	.0902	.0895
4	40	**	G H2	G H1	G H2	G H2	.0958	.0982	.0975	.0991	.0982
4	**	48	G H1	G H1	G H2	G H1	.0985	.1007	.1001	.1016	.1008
5	40	**	G H2	G H1	G H2	G H2	.1088	.1112	.1105	.1121	.1113
5	**	44	G H1	G H1	G H2	G H1	.1102	.1125	.1118	.1134	.1126
6	32	**	G H2	G H1	G H3	G H2	.1177	.1204	.1196	.1214	.1204
6	**	40	G H2	G H1	G H2	G H2	.1218	.1242	.1235	.1252	.1243
8	32	**	G H2	G H1	G H3	G H2	.1437	.1464	.1456	.1475	.1465
8	**	36	G H2	G H1	G H2	G H2	.1460	.1485	.1478	.1496	.1487
10	24	**	G H3	G H1	G H3	G H3	.1629	.1662	.1653	.1672	.1661
10	**	32	G H2	G H1	G H3	G H2	.1697	.1724	.1716	.1736	.1726
12	24	**	G H3	G H1	G H3	G H3	.1889	.1922	.1913	.1933	.1922
12	**	28	G H3	G H1	G H3	G H3	.1928	.1959	.1950	.1970	.1959

The above recommended taps normally produce the Class of Thread indicated in average materials when used with reasonable care. However, if the tap specified dies not give a satisfactory gage fit in the work, a choice of some other limit tap will be necessary.

Tap Recommendations for Classes 2, 3, 2B & 3B Unified and American Screw Threads

FRACTIONAL SIZES

	THREADS PER INCH		RECOMMENDED TAP FOR CLASS OF THREAD					PITCH DIAMETER LIMITS FOR CLASS OF THREAD			
SIZE	NC AND UNC	NF AND UNF	CLASS 2	CLASS 3	CLASS †2B	CLASS 3B	MIN. ALL CLASSES (BASIC)	MAX. CLASS 2	MAX. CLASS 3	MAX. CLASS 2B	MAX. CLASS 3B
1/4	20	**	G H3	G H2	G H5	G H3	.2175	.2211	.2201	.2223	.2211
1/4	**	28	G H3	G H1	G H4	G H3	.2268	.2299	.2290	.2311	.2300
5/16	18	**	G H3	G H2	G H5	G H3	.2764	.2805	.2794	.2817	.2803
5/16	**	24	G H3	G H1	G H4	G H3	.2854	.2887	.2878	.2902	.2890
3/8	16	**	G H3	G H2	G H5	G H3	.3344	.3389	.3376	.3401	.3387
3/8	**	24	G H3	G H1	G H4	G H3	.3479	.3512	.3503	.3528	.3516
7/16	14	**	G H5	G H3	G H5	G H3	.3911	.3960	.3947	.3972	.3957
7/16	**	20	G H3	G H1	G H5	G H3	.4050	.4086	.4076	.4104	.4091
1/2	13	**	G H5	G H3	G H5	G H3	.4500	.4552	.4537	.4565	.4548
1/2	**	20	G H3	G H1	G H5	G H3	.4675	.4711	.4701	.4731	.4717
9/16	12	**	G H5	G H3	G H5	G H3	.5084	.5140	.5124	.5152	.5135
9/16	**	18	G H3	G H2	G H5	G H3	.5264	.5305	.5294	.5323	.5308
5/8	11	**	G H5	G H3	G H5	G H3	.5660	.5719	.5702	.5732	.5714
5/8	**	18	G H3	G H2	G H5	G H3	.5889	.5930	.5919	.5949	.5934
3/4	10	**	G H5	G H3	G H5	G H5	.6850	.6914	.6895	.6927	.6907
3/4	**	16	G H3	G H2	G H5	G H3	.7094	.7139	.7126	.7159	.7143
7/8	9	**	G H6	G H4	G H6	G H4	.8028	.8098	.8077	.8110	.8089
7/8	**	14	G H4	G H2	G H6	G H4	.8286	.8335	.8322	.8356	.8339
1	8	**	G H6	G H4	G H6	G H4	.9188	.9264	.9242	.9276	.9254
1	**	12	G H4	G H2	G H6	G H4	.9459	.9515	.9499	.9535	.9516
1		14 NS	G H4	G H2	G H6	G H4	.9536	.9585	.9572	.9609	.9590
1-1/8	7	**	G H8	G H4	G H8	G H4	1.0322	1.0407	1.0381	1.0416	1.0393
1-1/8	**	12	G H4	G H4	G H6	G H4	1.0709	1.0765	1.0749	1.0787	1.0768
1-1/4	7	**	G H8	G H4	G H8	G H4	1.1572	1.1657	1.1631	1.1668	1.1644
1-1/4	**	12	G H4	G H4	G H6	G H4	1.1959	1.2015	1.1999	1.2039	1.2019
1-3/8	6	**	G H8	G H4	G H8	G H4	1.2667	1.2768	1.2738	1.2771	1.2745
1-3/8	**	12	G H4	G H4	G H6	G H4	1.3209	1.3265	1.3249	1.3291	1.3270
1-1/2	6	**	G H8	G H4	G H8	G H4	1.3917	1.4018	1.3988	1.4022	1.3996
1-1/2	**	12	G H4	G H4	G H6	G H4	1.4459	1.4515	1.4499	1.4542	1.4522

The above recommended taps normally produce the Class of Thread indicated in average materials when used with reasonable care. However, if the tap specified does not give a satisfactory gage fit in the work, a choice of some other limit tap will be necessary.

Forming Tap Recommendations for Classes 2, 2B & 3B
Unified and American Screw Threads

SCREW SIZES	THREADS PER INCH: NC AND UNC	THREADS PER INCH: NF AND UNF	RECOMMENDED LIMIT: CLASS 2	RECOMMENDED LIMIT: CLASS 2B	RECOMMENDED LIMIT: CLASS 3B
0		80	G H2	G H3	G H2
1	64		G H2	G H3	G H2
		72	G H2	G H3	G H2
2	56		G H2	G H3	G H2
		64	G H2	G H3	G H2
3	48		G H2	G H3	G H2
		56	G H2	G H3	G H2
4	40		G H3	G H5	G H3
		48	G H3	G H5	G H3
5	40		G H3	G H5	G H3
		44	G H3	G H5	G H3
6	32		G H3	G H5	G H3
		40	G H3	G H5	G H3
8	32		G H3	G H5	G H3
		36	G H3	G H5	G H3
10	24		G H4	G H6	G H4
		32	G H4	G H6	G H4
12	24		G H4	G H6	G H4
		28	G H4	G H6	G H4
FRACTIONAL SIZES					
1/4	20		G H4	G H6	G H4
		28	G H4	G H6	G H4
5/16	18		G H5	G H7	G H5
		24	G H5	G H7	G H5
3/8	16		G H5	G H7	G H5
		24	G H5	G H7	G H5
7/16	14		G H5	G H8	G H5
		20	G H5	G H8	G H5
1/2	13		G H5	G H8	G H5
		20	G H5	G H8	G H5
9/16	12		G H7	G H10	G H7
		18	G H7	G H10	G H7
5/8	11		G H7	G H10	G H7
		18	G H7	G H10	G H7
3/4	10		G H7	G H10	G H7
		16	G H7	G H10	G H7
7/8	9		G H9	G H12	G H9
		14	G H9	G H12	G H9
1	8		G H9	G H12	G H9
		12	G H9	G H12	G H9

The above recommended taps normally produce the Class of Thread indicated in average materials when used with reasonable care. However, if the tap specified does not give a satisfactory gage fit in the work, a choice of some other limit tap will be necessary. All the H-Limits shown will produce a Class 2B fit.

Tap Recommendations for Classes 4H & 6H
Metric Screw Threads

THREAD PER INCH		RECOMMENDED TAP FOR CLASS OF THREAD		PITCH DIAMETER LIMITS FOR CLASS OF THREAD					
				MILLIMETERS			INCH CONVERSION		
NOMINAL DIAMETER	PITCH	4H	6H	MIN. ALL CLASSES (BASIC)	MAX. 4H	MAX. 6H	MIN. ALL CLASSES (BASIC)	MAX. 4H	MAX. 6H
M1.6	0.35	D1	D3	1.373	1.426	1.458	.0541	.0561	.0574
M2	0.4	D1	D3	1.740	1.796	1.830	.0685	.0707	.0720
M2.5	0.45	D1	D3	2.208	2.268	2.303	.0869	.0893	.0907
M3	0.5	D1	D3	2.675	2.738	2.775	.1053	.1078	.1092
M3.5	0.6	D1	D4	3.110	3.181	3.222	.1224	.1252	.1268
M4	0.7	D2	D4	3.545	3.620	3.663	.1396	.1425	.1442
M4.5	0.75	D2	D4	4.013	4.088	4.131	.1580	.1609	.1626
M5	0.8	D2	D4	4.480	4.560	4.605	.1764	.1795	.1813
M6	1	D3	D5	5.350	5.445	5.500	.2106	.2144	.2165
M6	0.75	D2	D3	5.513	5.598	5.645	.2170	.2204	.2222
M7	1	D3	D5	6.350	6.445	6.500	.2500	.2537	.2559
M7	0.75	D2	D4	6.513	6.598	6.645	.2564	.2598	.2616
M8	1.25	D3	D5	7.188	7.288	7.348	.2830	.2869	.2893
M8	1	D3	D5	7.350	7.445	7.500	.2894	.2931	.2953
M10	1.5	D3	D6	9.026	9.138	9.206	.3554	.3598	.3624
M10	1.25	D3	D5	9.188	9.288	9.348	.3617	.3657	.3680
M12	1.75	D3	D6	10.863	10.988	11.063	.4277	.4326	.4356
M12	1.25	D3	D5	11.188	11.300	11.368	.4405	.4449	.4476
M14	2	D3	D7	12.701	12.833	12.913	.5000	.5052	.5084
M14	1.5	D3	D6	13.026	13.144	13.216	.5128	.5175	.5203
M16	2	D4	D7	14.701	14.833	14.913	.5788	.5840	.5871
M16	1.5	D3	D6	15.026	15.144	15.216	.5916	.5962	.5990
M18	2.5	D4	D7	16.376	16.516	16.600	.6447	.6502	.6535
M18	1.5	D3	D6	17.026	17.144	17.216	.6703	.6750	.6778
M20	2.5	D4	D7	18.376	18.516	18.600	.7235	.7290	.7323
M20	1.5	D3	D5	19.026	19.144	19.216	.7490	.7537	.7565
M24	3	D4	D8	22.051	22.221	22.316	.8681	.8748	.8786
M24	1.5	D3	D5	23.026	23.151	23.226	.9065	.9114	.9144
M27	3	D5	D8	25.051	25.221	25.316	.9863	.9930	.9967
M27	2	D5	D7	25.701	25.841	25.925	1.0118	1.0174	1.0207
M30	3.5	D5	D9	27.727	27.907	28.007	1.0916	1.0987	1.1026
M30	2	D5	D7	28.701	28.841	28.925	1.1300	1.1355	1.1388
M33	3.5	D5	D9	30.727	30.907	31.007	1.2097	1.2168	1.2207
M33	2	D5	D7	31.701	31.841	31.925	1.2481	1.2536	1.2569
M36	4	D5	D9	33.402	33.592	33.702	1.3150	1.3225	1.3268
M36	2	D5	D7	34.701	34.841	34.925	1.3662	1.3717	1.3750

The above recommended taps normally produce the Class of Thread indicated in average materials when used with reasonable care. However, if the tap specified does not give a satisfactory gage fit in the work, a choice of some other limit tap will be necessary.
D1 Limit to have minus .0005 tolerance.

TABLE 329

Standard Machine Screw Taps for Tapping Unified and American National Coarse and Fine Threads

SIZE	THREADS PER INCH: NC AND UNC	THREADS PER INCH: NC AND UNF	THREADS PER INCH: NS	MAJOR DIAMETER: GROUND THREAD: BASIC	MAJOR DIAMETER: GROUND THREAD: MIN.	MAJOR DIAMETER: GROUND THREAD: MAX.	MAJOR DIAMETER: CUT THREAD: MIN.	MAJOR DIAMETER: CUT THREAD: MAX.	BASIC PITCH DIA.	PITCH DIAMETER LIMITS: GROUND THREAD: H1 LIMIT MIN.	PITCH DIAMETER LIMITS: GROUND THREAD: H1 LIMIT MAX.	PITCH DIAMETER LIMITS: GROUND THREAD: H2 LIMIT MIN.	PITCH DIAMETER LIMITS: GROUND THREAD: H2 LIMIT MAX.	PITCH DIAMETER LIMITS: GROUND THREAD: H3 LIMIT MIN.	PITCH DIAMETER LIMITS: GROUND THREAD: H3 LIMIT MAX.	PITCH DIAMETER LIMITS: CUT THD. MIN.	PITCH DIAMETER LIMITS: CUT THD. MAX.
0	**	80	**	.0600	.0605	.0616	.0609	.0624	.0519	.0519	.0524	.0524	.0529	****	****	.0521	.0531
1	64	**	**	.0730	.0736	.0750	.0740	.0755	.0629	.0629	.0634	.0634	.0639	****	****	.0631	.0641
1	**	72	**	.0730	.0736	.0748	.0740	.0755	.0640	.0640	.0645	.0645	.0650	****	****	.0642	.0652
2	56	**	**	.0860	.0867	.0883	.0872	.0887	.0744	.0744	.0749	.0749	.0754	****	****	.0746	.0756
2	**	64	**	.0860	.0866	.0880	.0870	.0885	.0759	.0759	.0764	.0764	.0769	****	****	.0761	.0771
3	48	**	**	.0990	.0999	.1017	.1003	.1018	.0855	.0855	.0860	.0860	.0865	****	****	.0857	.0867
3	**	56	**	.0990	.0997	.1013	.1002	.1017	.0874	.0874	.0879	.0879	.0884	****	****	.0876	.0876
4	**	**	36	.1120	.1135	.1156	.1137	.1157	.0940	****	****	.0945	.0950	****	****	.0942	.0957
4	40	**	**	.1120	.1133	.1152	.1136	.1156	.0958	.0958	.0963	.0963	.0968	****	****	.0960	.0975
4	**	48	**	.1120	.1129	.1147	.1133	.1153	.0985	.0985	.0990	.0990	.0995	****	****	.0987	.1002
5	40	**	**	.1250	.1263	.1282	.1266	.1286	.1088	.1088	.1093	.1093	.1098	****	****	.1090	.1105
5	**	44	**	.1250	.1263	.1280	.1264	.1284	.1102	.1102	.1107	.1107	.1112	****	****	.1104	.1119
6	32	**	**	.1380	.1401	.1421	.1402	.1422	.1177	.1177	.1182	.1182	.1187	.1187	.1192	.1182	.1197
6	**	40	**	.1380	.1393	.1412	.1396	.1416	.1218	.1218	.1223	.1223	.1228	****	****	.1220	.1235
8	32	**	**	.1640	.1661	.1681	.1662	.1682	.1437	.1437	.1442	.1442	.1447	.1447	.1452	.1442	.1457
8	**	36	**	.1640	.1655	.1676	.1657	.1677	.1460	.1460	.1465	.1465	.1470	****	****	.1462	.1477
10	24	**	**	.1900	.1927	.1954	.1928	.1948	.1629	.1629	.1634	.1634	.1639	.1639	.1644	.1634	.1649
10	**	32	**	.1900	.1921	.1941	.1922	.1942	.1697	.1697	.1702	.1702	.1707	.1707	.1712	.1702	.1717
12	24	**	**	.2160	.2187	.2214	.2188	.2208	.1889	.1889	.1894	****	****	.1899	.1904	.1894	.1909
12	**	28	**	.2160	.2183	.2206	.2184	.2204	.1928	.1928	.1933	****	****	.1938	.1943	.1933	.1948

TABLE 327

Standard Hand Taps for Tapping Unified and American National Coarse and Fine Threads

	THREADS PER INCH			MAJOR DIAMETER					PITCH DIAMETER LIMITS																	
				GROUND THREAD			CUT THREAD		GROUND THREAD																CUT THD.	
									L1 LIMIT			H1 LIMIT		H2 LIMIT		H3 LIMIT		H4 LIMIT		H5 LIMIT		H6 LIMIT		H8 LIMIT		
SIZE	NC AND UNC	NF AND UNF	NS	BASIC	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	BASIC PITCH DIA.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MAX.	
1/4	20	**	**	.2500	.2533	.2565	.2532	.2557	.2170	.2175	.2175	.2175	.2180	.2180	.2185	.2185	.2190	****	****	.2195	.2200	****	****	****	****	.2180	.2200
1/4	**	28	**	.2500	.2523	.2546	.2524	.2549	****	****	.2268	.2268	.2273	.2273	.2278	.2278	.2283	.2283	.2288	****	****	****	****	****	****	.2273	.2288
5/16	18	**	**	.3125	.3161	.3197	.3160	.3185	.2759	.2764	.2764	.2764	.2769	.2769	.2774	.2774	.2779	****	****	.2784	.2789	****	****	****	****	.2769	.2288
5/16	**	24	**	.3125	.3152	.3179	.3153	.3178	****	****	.2854	.2854	.2859	.2859	.2864	.2864	.2869	.2869	.2874	****	****	****	****	****	****	.2859	.2874
3/8	16	**	**	.3750	.3790	.3831	.3789	.3814	.3339	.3344	.3344	.3344	.3349	.3349	.3354	.3354	.3359	****	****	.3364	.3369	****	****	****	****	.3349	.3369
3/8	**	24	**	.3750	.3777	.3804	.3778	.3803	****	****	.3479	.3479	.3484	.3484	.3489	.3489	.3494	.3494	.3499	****	****	****	****	****	****	.3484	.3499
7/16	14	**	**	.4375	.4422	.4468	.4419	.4449	.3906	.3911	.3911	.3911	.3916	.3916	.3921	.3921	.3926	****	****	.3931	.3936	****	****	****	****	.3916	.3941
7/16	**	20	**	.4375	.4408	.4440	.4407	.4437	****	****	.4050	.4050	.4055	.4055	.4060	.4060	.4065	****	****	.4070	.4075	****	****	****	****	.4055	.4075
1/2	13	**	**	.5000	.5050	.5100	.5047	.5077	.4495	.4500	.4500	.4500	.4505	.4505	.4510	.4510	.4515	****	****	.4520	.4525	****	****	****	****	.4505	.5430
1/2	**	20	**	.5000	.5033	.5065	.5032	.5062	****	****	.4675	.4675	.4680	.4680	.4685	.4685	.4690	****	****	.4695	.4700	****	****	****	****	.4680	.4700
9/16	12	**	**	.5625	.5679	.5733	.5675	.5705	****	****	.5084	.5084	.5089	.5089	.5094	.5094	.5099	****	****	.5104	.5109	****	****	****	****	.5089	.5114
9/16	**	18	**	.5625	.5661	.5697	.5660	.5690	****	****	.5264	.5264	.5269	.5269	.5274	.5274	.5279	****	****	.5284	.5289	****	****	****	****	.5269	.5289
5/8	11	**	**	.6250	.6309	.6368	.6304	.6334	****	****	.5660	.5660	.5665	.5665	.5670	.5670	.5675	****	****	.5680	.5685	****	****	****	****	.5665	.5690
5/8	**	18	**	.6250	.6286	.6322	.6285	.6315	****	****	.5889	.5889	.5894	.5894	.5899	.5899	.5904	****	****	.5909	.5914	****	****	****	****	.5894	.5914
11/16	**	**	11	.6875	.6934	.6993	.6929	.6996	****	****	.6285	****	****	****	****	.6295	.6300	****	****	****	****	****	****	****	****	.6290	.6320
11/16	**	**	16	.6875	.6915	.6956	.6914	.6954	****	****	.6469	****	****	****	****	.6479	.6484	****	****	****	****	****	****	****	****	.6474	.6499
3/4	10	**	**	.7500	.7565	.7630	.7559	.7599	****	****	.6850	.6850	.6855	.6855	.6860	.6860	.6865	****	****	.6870	.6875	****	****	****	****	.6855	.6885
3/4	**	16	**	.7500	.7540	.7581	.7539	.7579	****	****	.7094	.7094	.7099	.7099	.7104	.7104	.7109	****	****	.7114	.7119	****	****	****	****	.7099	.7124
7/8	9	**	**	.8750	.8822	.8894	.8820	.8860	****	****	.8028	.8028	.8033	.8033	.8038	****	****	.8043	.8048	****	****	.8053	.8058	****	****	.8038	.8068
7/8	**	14	**	.8750	.8797	.8843	.8799	.8839	****	****	.8286	.8286	.8291	.8291	.8296	****	****	.8301	.8306	****	****	.8311	.8316	****	****	.8296	.8321
1	8	**	**	1.0000	1.0081	.10162	1.0078	1.0118	****	****	.9188	.9188	.9193	.9193	.9198	****	****	.9203	.9208	****	****	.9213	.9218	****	****	.9198	.9228
1	**	12	**	1.0000	1.0054	1.0108	1.0055	1.0095	****	****	.9459	****	****	****	****	****	****	.9474	.9479	****	****	****	****	****	****	.9469	.9499
1	**	**	14	1.000	1.0047	1.0093	1.0049	1.0089	****	****	.9536	****	****	.9541	.9546	****	****	.9551	.9556	****	****	.9561	.9566	****	****	.9546	.9571
1-1/8	7	**	**	1.1250	1.1343	1.1436	1.1337	1.1382	****	****	1.0322	****	****	****	****	****	****	1.0332	1.0342	****	****	****	****	****	****	1.0332	1.0367
1-1/8	**	12	**	1.1250	1.1304	1.1358	1.1305	1.1350	****	****	1.0709	****	****	****	****	****	****	1.0719	1.0729	****	****	****	****	****	****	1.0719	1.0749
1-1/4	7	**	**	1.2500	1.2593	1.2686	1.2587	1.2632	****	****	1.1572	****	****	****	****	****	****	1.1582	1.1592	****	****	****	****	****	****	1.15482	1.1617
1-1/4	**	12	**	1.2500	1.2554	1.2608	1.2555	1.2600	****	****	1.1959	****	****	****	****	****	****	1.1969	1.1979	****	****	****	****	****	****	1.1969	1.9999
1-3/8	6	**	**	1.3750	1.3859	1.3967	1.3850	1.3895	****	****	1.2667	****	****	****	****	****	****	1.2677	1.2687	****	****	****	****	****	****	1.2677	1.2712
1-3/8	**	12	**	1.3750	1.3804	1.3858	1.3805	1.3850	****	****	1.3209	****	****	****	****	****	****	1.3219	1.3229	****	****	****	****	****	****	1.3219	1.3249
1-1/2	6	**	**	1.5000	1.5109	1.5217	1.5100	1.5145	****	****	1.3917	****	****	****	****	****	****	1.3927	1.3937	****	****	****	****	****	****	1.3927	1.3962
1-1/2	**	12	**	1.500	1.5054	1.5108	1.5055	1.5100	****	****	1.4459	****	****	****	****	****	****	1.4469	1.4479	****	****	****	****	****	****	1.4499	1.4469

To Order

WHEN ORDERING OR REQUESTING QUOTATIONS FOR STANDARD OR SPECIAL TAPS, PLEASE SPECIFY:

1. Quantity _____
2. List number _____ and Catalog number _____
3. Inch size _____ or Metric size _____
4. Threads per inch _____ or Metric pitch _____ RH or LH* _____
5. Thread designation (NC, NPT, etc.) _____
6. Thread limit _____ or Class of fit required _____
7. Number of flutes _____ Straight or spiral* _____ RH or LH* _____
8. Style of chamfer _____
9. Material being tapped _____ and Hardness _____
10. Required thread depth _____
11. Depth of hole _____
12. Type of hole: Thru _____ Blind _____ Interrupted _____
13. Number of starts, if multiple thread* _____
14. Overall length* _____ Thread length* _____
15. Shank length* _____ Shank diameter* _____ and Style* _____
16. Depth of flutes* _____ Degree of hook or rake* _____
17. Other* _____
18. Describe machine being used _____ and Coolant _____

In addition to the above information, it is helpful when a print or sample of the part being tapped is furnished.
*Important information for special taps.

Tap Drill Sizes for Unified Inch Screw Thread

TAP SIZE	TAP DRILL SIZE	DECIMAL EQUIV. OF TAP DRILL (INCHES)	PROBABLE PERCENT OF THREAD ENGMT.
0-80	56	.0465	74
	3/64	.0469	72
	1.25mm	.0492	57
1-64	54	.0550	81
	1.45mm	.0571	71
	53	.0595	59
1-72	1.5mm	.0591	69
	53	.0595	66
	1.55mm	.0610	58
2-56	51	.0670	75
	1.75mm	.0689	67
	50	.0700	62
2-64	50	.0700	71
	1.8mm	.0709	67
	49	.0730	56
3-48	48	.0760	79
	5/64	.0781	71
	46	.0810	60
3-56	46	.0810	71
	45	.0820	66
	2.1mm	.0827	63
4-40	44	.0860	75
	43	.0890	66
	2.3mm	.0906	61
4-48	2.3mm	.0906	73
	42	.0935	62
	2.4mm	.0945	58
5-40	39	.0995	73
	38	.1015	67
	2.6mm	.1024	64
5-44	38	.1015	74
	2.6mm	.1024	71
	37	.1040	65
6-32	36	.1065	73
	7/64	.1095	66
	34	.1110	62
6-40	33	.1130	72
	2.9mm	.1142	68
	32	.1160	62
8-32	3.4mm	.1339	70
	29	.1360	64
	3.5mm	.1378	60
8-36	29	.1360	72
	3.5mm	.1378	67
	9/64	.1406	60
10-24	3.7mm	.1457	78
	25	.1495	71
	24	.1520	67
10-32	5/32	.1563	78
	22	.1570	77
	21	.1590	72
12-24	11/64	.1719	78
	17	.1730	76
	16	.1770	68
12-28	16	.1770	80
	15	.1800	73
	14	.1820	69
1/4-20	9	.1960	80
	7	.2010	72
	13/64	.2031	69
1/4-28	5.4mm	.2126	76
	3	.2130	75
	5.5mm	.2165	67
5/16-18	F	.2570	74
	6.6mm	.2598	70
	G	.2610	68
5/16-24	H	.2660	82
	6.8mm	.2677	78
	I	.2720	70
3/8-16	7.8mm	.3071	81
	5/16	.3125	74
	O	.3160	69
3/8-24	8.4mm	.3307	77
	Q	.3320	75
	8.5mm	.3346	70
7/16-14	23/64	.3594	81
	9.3mm	.3661	74
	9.4mm	.3701	70
7/16-20	W	.3860	75
	25/64	.3906	68
	10.0mm	.3937	63
1/2-13	10.5mm	.4134	84
	27/64	.4219	75
	11.0mm	.4331	64
1/2-20	11.4mm	.4488	74
	29/64	.4531	67
	11.6mm	.4567	62
9/16-12	15/32	.4688	84
	31/64	.4844	69
	12.5mm	.4921	62
9/16-18	1/2	.5000	82
	13.0mm	.5118	66
	33/64	.5156	60
5/8-11	17/32	.5313	76
	13.7mm	.5394	70
	35/64	.5469	63
5/8-18	9/16	.2525	82
	14.5mm	.5709	70
	37/64	.5781	60
3/4-10	41/64	.6406	81
	21/32	.6563	69
	17.0mm	.6693	59
3/4-16	11/16	.6875	72
	17.5mm	.6890	70
	17.7mm	.6969	60
7/8-9	49/64	.7656	73
	19.7mm	.7756	66
	25/32	.7813	62
7/8-14	51/64	.7969	79
	20.5mm	.8071	68
	13/16	.8125	62
1-8	55/64	.8594	84
	7/8	.875	74
	57/64	.8906	64
1-12	29/32	.9063	82
	59/64	.9219	68
	23.5mm	.9252	65
1-14	59/64	.9219	79
	23.5mm	.9252	75
	15/16	.9375	62
1-1/8-7	31/32	.9688	81
	63/64	.9844	73
	1	1.0000	65
1-1/8-12	1-1/32	1.0313	82
	26.4mm	1.0394	74
	1-3/64	1.0469	67
1-1/4-7	1-3/32	1.0938	81
	1-7/64	1.1094	73
	1-1/8	1.1250	64
1-1/4-12	1-5/32	1.1563	81
	29.5mm	1.1614	76
	1-11/64	1.1719	67
1-3/8-6	1-13/64	1.2031	77
	1-7/32	1.2188	69
	1-15/64	1.2344	62
1-3/8-12	1-9/32	1.2813	81
	1-19/64	1.2969	66
	33.0mm	1.2992	64
1-1/2-6	1-21/64	1.3281	76
	1-11/32	1.3438	69
	1-23/64	1.3594	62
1-1/2-12	1-13/32	1.4063	80
	1-27/64	1.4219	66

The percent of thread engagement in this table is based upon the probable hole size the drill will cut.The actual hole size may vary as a result of the condition of the drill, machine and material being drilled. The actual percent of thread engagement may be determined by pin gaging the hole.

Tap Drill Sizes for Screw Thread Inserts

	ALUMINUM				STEEL, PLASTIC, MAGNESIUM			
TAP SIZE	TAP DRILL SIZE	DECIMAL EQUIV. OF TAP DRILL (INCHES)	MINOR DIA. LIMITS (AFTER TAPPING) MIN.	MAX.	TAP DRILL SIZE	DECIMAL EQUIV. OF TAP DRILL (INCHES)	MINOR DIA. LIMITS (AFTER TAPPING) MIN.	MAX.
4-40	#31	.1200	.116	.121	#31	.1200	.119	.124
5-40	#30	.1285	.128	.133	#29	.1360	.131	.136
6-32	#25	.1495	.144	.150	#25	.1495	.148	.154
6-40	#26	.1470	.144	.149	#25	.1495	.148	.153
8-32	#17	.1730	.170	.176	#16	.1770	.174	.180
10-24	13/64	.2031	.199	.205	#5	.2055	.203	.209
10-32	#7	.2010	.196	.202	13/64	.2031	.200	.206
12-24	#2	.2210	.221	.227	#1	.2280	.225	.231
1/4-20	17/64	.2656	.261	.267	17/64	.2656	.265	.271
1/4-28	G	.2610	.257	.264	17/64	.2656	.261	.268
5/16-18	Q	.3320	.328	.334	Q	.3320	.331	.337
5/16-24	21/64	.3281	.323	.330	Q	.3320	.327	.334
3/8-16	X	.3970	.390	.398	X	.3970	.396	.402
3/8-24	25/64	.3906	.385	.392	25/64	.3906	.389	.396
7/16-14	29/64	.4531	.453	.463	15/32	.4687	.461	.471
7/16-20	29/64	.4531	.450	.458	29/64	.4531	.453	.461
1/2-13	33/64	.5156	.515	.525	17/32	.5312	.523	.533
1/2-20	33/64	.5156	.513	.522	33/64	.5156	.515	.524

NOTE: Tap Drills listed above should produce holes within the required limits. However, variations in material and equipment may require the use of drills which are larger or smaller than those recommended.
NOTE: Minor Diameter Limits for steel, plastic, and magnesium are such as to allow for material contraction and provide maximum tap life.

Tap Drill Sizes for Metric Screw Threads

TAP SIZE	TAP DRILL SIZE	DECIMAL EQUIV. OF TAP DRILL (INCHES)	PROBABLE PERCENT OF THREAD ENGMT.
M1.6x.35	1.22mm	.0480	75
	1.25mm	.0492	69
	1.28mm	.0504	62
M2x.4	1.57mm	.0618	75
	1/16	.0625	72
	52	.0635	67
M2.5x.45	2.02mm	.0795	75
	45	.0820	64
	2.11mm	.0831	60
M3x.5	40	.0980	72
	39	.0995	66
	38	.1015	58
M3.5x.6	33	.1130	75
	32	.1160	65
	3.0mm	.1181	58
M4x.7	30	.1285	76
	3.3mm	.1299	72
	3.4mm	.1339	61
M4.5x.75	26	.1470	74
	25	.1495	67
	24	.1520	61
M5x.8	19	.1660	71
	18	.1695	62
	11/64	.1719	56
M6x1	9	.1960	75
	8	.1990	69
	7	.2010	65
M7x1	15/64	.2344	76
	B	.2380	69
	C	.2420	61
M8x1.25	17/64	.2656	74
	I	.2720	64
	7.0mm	.2756	58
M10x1.25	11/32	.3438	74
	S	.3480	67
	9.0mm	.3543	57
M10x1.5	Q	.3320	77
	R	.3390	68
	11/32	.3438	62
M12x1.25	27/64	.4219	74
	10.9mm	.4291	63
	11.0mm	.4331	57
M12x1.75	Y	.4040	73
	13/32	.4062	71
	Z	.4130	63
M14x1.5	12.5mm	.4921	73
	1/2	.5000	62
	12.8mm	.5039	57
M14x2	15/32	.4688	78
	12.1mm	.4764	70
	31/64	.4844	62
M16x1.5	14.5mm	.5709	72
	37/64	.5781	63
	14.8mm	.5827	57
M16x2	35/64	.5469	78
	14.1mm	.5551	70
	9/16	.5625	62
M18x1.5	16.5mm	.6496	72
	16.6mm	.6535	67
	21/32	.6563	63
M18x2.5	39/64	.6094	75
	15.7mm	.6181	68
	5/8	.6250	63
M20x1.5	18.5mm	.7283	72
	47/64	.7344	64
	18.7mm	.7362	61
M20x2.5	11/16	.6875	75
	45/64	.7031	63
	18.0mm	.7087	58
M24x2	22.0mm	.8661	72
	7/8	.875	64
	22.4mm	.8819	57
M24x3	53/64	.8281	73
	27/32	.8438	63
	21.5mm	.8465	61
M27x3	24.0mm	.9449	74
	61/64	.9531	68
	31/32	.9688	58
M30x3.5	1-3/64	1.0469	72
	1-1/16	1.0625	63
	1-5/64	1.0781	54
M33x3.5	29.5mm	1.1614	74
	1-11/64	1.1719	68
	1-3/16	1.1875	59
M36x4	1-17/64	1.2656	71
	1-9/32	1.2813	63
	33.0mm	1.2992	55

The percent of thread engagement in this table is based upon the probable hole size the drill will cut.The actual hole size may vary as a result of the condition of the drill, machine and material being drilled. The actual percent of thread engagement may be determined by pin gaging the hole.

Forming Tap Drill Sizes for Unified Inch Screw Threads

TAP SIZE	TAP DRILL SIZE	DECIMAL EQUIV. OF TAP DRILL (INCHES)	PROBABLE PERCENT OF THREAD ENGMT.
0-80	1.33mm	.0524	73
	1.35mm	.0531	63
	1.37mm	.0539	54
1-64	52	.0635	75
	1.64mm	.0646	65
	1.67mm	.0657	54
1-72	1.64mm	.0646	73
	1.66mm	.0654	65
	1.68mm	.0661	57
2-56	1.92mm	.0756	73
	1.94mm	.0764	66
	1.97mm	.0776	57
2-64	1.95mm	.0768	72
	1.97mm	.0776	65
	47	.0785	55
3-48	2.2mm	.0866	76
	2.24mm	.0882	65
	43	.0890	59
3-56	2.24mm	.0882	76
	43	.0890	69
	2.3mm	.0906	56
4-40	40	.0980	72
	39	.0995	64
	2.57mm	.1012	54
4-48	39	.0995	76
	2.57mm	.1012	65
	2.6mm	.1024	56
5-40	2.8mm	.1102	77
	2.85mm	.1122	65
	33	.1130	60
5-44	2.85mm	.1122	72
	33	.1130	66
	2.91mm	.1146	57
6-32	3.05mm	.1201	76
	3.1mm	.1220	67
	3.16mm	.1244	56
6-40	3.15mm	.1240	72
	3.18mm	.1252	65
	3.23mm	.1272	54
8-32	3.7mm	.1457	78
	3.75mm	.1476	69
	25	.1495	59
8-36	3.75mm	.1476	77
	25	.1495	67
	3.85mm	.1516	56
10-24	19	.1660	78
	18	.1695	65
	11/64	.1719	57
10-32	11/64	.1719	76
	4.42mm	.1740	66
	4.45mm	.1752	61
12-24	4.9mm	.1929	75
	4.95mm	.1949	68
	5.0mm	.1969	61
12-28	9	.1960	74
	5.05mm	.1988	63
	5.1mm	.2008	55
1/4-20	5.65mm	.2224	75
	5.7mm	.2244	69
	1	.2280	58
1/4-28	5.85mm	.2303	73
	5.88mm	.2315	68
	15/64	.2344	55
5/16-18	9/32	.2813	77
	7.25mm	.2854	66
	7.3mm	.2874	60
5/16-24	7.35mm	.2894	74
	7.4mm	.2913	67
	7.45mm	.2933	60
3/8-16	8.65mm	.3406	75
	8.75mm	.3445	66
	S	.3480	57
3/8-24	8.9mm	.3504	78
	9.0mm	.3543	64
	9.05mm	.3563	57
7/16-14	X	.3970	78
	10.2mm	.4016	69
	13/32	.4063	59
7/16-20	10.4mm	.4094	75
	Z	.4130	63
	10.54mm	.4150	58
1/2-13	11.6mm	.4567	77
	11.75mm	.4626	66
	11.8mm	.4646	62
1/2-20	12.0mm	.4724	73
	12.1mm	.4764	61
	12.15mm	.4783	55
9/16-12	33/64	.5156	77
	13.25mm	.5217	67
	13.4mm	.5276	56
9/16-18	17/32	.5313	74
	13.6mm	.5354	64
5/8-11	14.6mm	.5748	76
	14.75mm	.5807	66
	14.85mm	.5846	60
5/8-18	19/32	.5938	73
	15.2mm	.5984	62
	15.25mm	.6004	56
3/4-10	17.7mm	.6969	73
	17.8mm	.7008	67
	17.9mm	.7047	61
3/4-16	18.2mm	.7165	70
	18.3mm	.7205	61
7/8-9	13/16	.8125	77
	20.8mm	.8189	69
	21.0mm	.8268	59
7/8-14	21.25mm	.8366	71
	21.4mm	.8425	58
1-8	15/16	.9375	68
	24.0mm	.9449	60
1-12	61/64	.9531	74
	24.5mm	.9646	55

The percent of thread engagement in this table is based upon the probable hole size the drill will cut.The actual hole size may vary as a result of the condition of the drill, machine and material being drilled. The actual percent of thread engagement may be determined by pin gaging the hole.

Forming Tap Drill Sizes for Metric Screw Threads

TAP SIZE	TAP DRILL SIZE	DECIMAL EQUIV. OF TAP DRILL (INCHES)	PROBABLE PERCENT OF THREAD ENGMT.
M2x.35	1.39mm	.0547	72
	1.41mm	.0555	64
	1.43mm	.0563	55
M2x.4	1.76mm	.0693	74
	50	.0700	67
	1.81mm	.0713	55
M3x.45	2.24mm	.0882	71
	43	.0890	65
	2.29mm	.0902	55
M3x.5	2.7mm	.1063	75
	2.75mm	.1083	61
M4x.6	3.15mm	.1240	75
	3.18mm	.1252	67
	3.22mm	.1268	57
M4x.7	3.6mm	.1417	74
	3.65mm	.1437	64
	3.68mm	.1449	57
M5x.75	4.06mm	.1598	77
	4.1mm	.1614	69
	4.15mm	.1634	59
M5x.8	4.55mm	.1791	73
	4.6mm	.1811	64
	4.65mm	.1831	55
M6x1	5.45mm	.2146	73
	5.5mm	.2165	66
	7/32	.2188	57
M7x1	6.45mm	.2539	72
	6.5mm	.2559	65
	6.55mm	.2579	58
M8x1.25	7.3mm	.2874	75
	L	.2900	67
	7.45mm	.2933	57
M10x1.25	9.3mm	.3661	74
	U	.3680	69
	9.45mm	.3720	56
M10x1.5	9.15mm	.3602	77
	9.25mm	.3642	67
	9.35mm	.3681	57
M12x1.25	11.3mm	.4449	73
	11.35mm	.4469	67
	11.4mm	.4488	61
M12x1.75	11.0mm	.4331	78
	7/16	.4375	68
	11.25mm	.4429	57
M14x1.5	13.2mm	.5197	70
	13.25mm	.5217	65
	13.3mm	.5236	60
M14x2	12.9mm	.5079	75
	13.0mm	.5118	67
	33/64	.5156	60
M16x1.5	15.1mm	.5945	79
	15.2mm	.5984	69
	15.3mm	.6024	60
M16x2	14.85mm	.5846	78
	15.0mm	.5906	67
	19/32	.5938	61
M18x1.5	17.2mm	.6772	69
	17.3mm	.6811	59
M18x2.5	21/32	.6563	73
	16.8mm	.6614	65
	16.9mm	.6654	59
M20x1.5	19.1mm	.7520	78
	19.2mm	.7559	68
	19.3mm	.7598	58
M20x2.5	18.6mm	.7323	76
	18.75mm	.7382	67
	18.9mm	.7441	58
M24x1.5	23.2mm	.9134	66
	23.25mm	.9154	61
M24x3	22.4mm	.8819	73
	22.5mm	.8858	68
	57/64	.8906	62

The percent of thread engagement in this table is based upon the probable hole size the drill will cut.The actual hole size may vary as a result of the condition of the drill, machine and material being drilled. The actual percent of thread engagement may be determined by pin gaging the hole.

Tapping Information

MATERIAL		TAPPING SPEED FPM THREADS PER INCH 7 OR LESS	8-15	16-24	OVER 24	SUFACE TREATMENT OR COATING
Zinc & Magnesium Alloys -	Wrought & Cast	65	77	88	100	04, 88, 89
Aluminum Alloys -	Wrought	50	67	83	100	04, 88, 89
	Cast	50	67	83	100	04, 88, 89, 90
Brass		50	60	70	80	02, 04, 82, 88
Cast Iron -	Gray, As Cast	25	28	32	35	23, 84, 89
Copper		25	28	32	35	02, 04, 82, 88
Iron -	Ductile & Malleable	20	27	33	40	03, 23, 84, 88, 89, 90
Bronze		20	25	30	35	02, 04, 82, 88
Carbon Steel -	Low Carbon, 1029, Also Leaded	20	30	40	50	03, 23, 84, 88, 89, 90
	Medium Carbon, 1030-1055	20	23	27	30	03, 23, 84, 88, 89, 90
Alloy Steel -	4xxx Series	15	18	22	25	03, 23, 84, 88, 89, 90
Stainless Steel -	Free Machining, Cold Drawn	20	27	33	40	03, 23, 84, 88, 89, 90
	300 Series, Cold Drawn	15	18	22	25	03, 23, 84, 88, 89, 90
	Precipitation Hardening	8	12	16	20	03, 23, 84, 88, 89, 90
Titanium Alloys -	Under Rc30	15	18	22	25	04, 23, 82, 84, 90
	Rc 30 - 40	5	8	12	15	04, 23, 82, 84, 90
Tool & Die Steels -	S, L, A, O & D Series	10	13	17	20	03, 23, 84, 88, 89, 90
High Temperature Alloys -	Monel, Nickel	8	12	16	20	23, 82, 84, 88, 89, 90
	Inconel	5	7	8	10	23, 82, 84, 88, 89, 90

Tapping speeds shown are approximate and may vary for each application.

Surface Treatments and Coatings

CODE NO.	DESCRIPTION	CHARACTERISTICS	APPLICATION
02	Nitride Approx. Hardness, 1200 HV, Rc 72	Consists of a thin, hardened case .0005 to .002 deep on the surface of the tool to resist abrasion and reduce galling.	Can be used in most Abrasive Materials, both Ferrous and Non-Ferrous. Not recommended where chipping may be a problem.
22	Double Nitride Approx. Hardness, 1400 HV, Rc 74	Consists of a higher hardened case on the surface of the tool to resist abrasion and reduce galling. Prone to brittleness and chipping.	Can be used on Non-Metallic, Highly Abrasive Materials such as Bakelite, Plastics, Hard Rubber and Fibers.
03	Steam Oxide Approx. Hardness, No change from Base Material	Consists of a layer of ferrous oxide on the surface of the tool which has good lubricant retaining properties. Improves toughness by relieving grinding stresses.	Can be used in Low Carbon, Stainless and Free Machining Steels. Not recommended for use in soft, Non-Ferrous Materials where it may cause galling.
23	Nitride and Oxide Approx. Hardness, 1200 HV, Rc 72	A combination of two treatments which produces the favorable characteristics of both, resistance to abrasion and galling.	Can be used in Iron and Cast Iron, Stainless and High Tensile Steels. Not recommended for use in Non-Ferrous Materials where it may cause galling.
04	Chrome Plate Cr, Hard Chromium Approx. Hardness, 1200 HV, Rc 72	Consists of a very thin layer of hard chromium on the surface of the tool which reduces friction and prevents galling.	Can be used on most Ferrous, Non-Ferrous and Non-Metallic Materials. While unlikely, it may cause galling in High Chromium Stainless Steels.
88	Titanium Nitride TiN, PVD Process Approx. Hardness, 2400 HV, *Rc 86	Consists of a very hard coating on the surface of the tool which has outstanding wear resistance, reduces friction and prevents galling.	Can be used on most Ferrous, Non-Ferrous and Non-Metallic Materials. While unlikely, it may cause galling in Titanium and Titanium Alloys.
89	Titanium Carbonitride TiCN, PVD Process Approx. Hardness, 3000 HV, *Rc 94	Consists of an extremely hard coating on the surface of the tool which has outstanding wear resistance, reduces friction and prevents galling.	Can be used on most Ferrous, Non-Ferrous and Abrasive Materials. Very effective at higher Speeds. While unlikely, it may cause galling in Titanium and Titanium Alloys.
90	Chromium Carbide CrC, PVD Process Approx. Hardness, 1850 HV, Rc 80	Consists of a very hard coating on the surface of the tool which has excellent wear resistance, reduces friction and prevents galling.	Can be used on Titanium, Titanium Alloys, Exotic Materials and Die Cast Aluminum. Very effective at higher speeds and in many tapping applications. Under certain conditions it may cause galling in Wrought Aluminum.
82	Chromium Nitride CrN, PVD Process, Approx. Hardness, 1750 HV, Rc 79	Consists of a very hard coating on the surface of the tool which has excellent wear resistance, reduces friction and prevents galling.	Can be used on Titanium, Titanium Alloys, Nickel-Base Alloys and Copper Alloys. Very effective at higher speeds and in many tapping applications. Under certain conditions it may cause galling in Wrought Aluminum.
84	Titanium Aluminum Nitride - TiAlN, PVD Process Approx. Hardness, 2600 HV, *RC 89	Consists of an extremely hard coating on the surface of the tool which has outstanding wear resistance, reduces friction and prevents galling. Forms an Aluminum Oxide layer at high speeds and elevated temperatures.	Can be used on Titanium, Titanium Alloys, Nickel-Base Alloys, Stainless Steel and Cast Iron. Very effective at higher speeds and in some tapping applications. Not recommended for Wrought Aluminum, Copper and Brass.

* Theoretical values for approximate comparison to the Vickers Hardness values.
NOTE: While most surface treatments and coatings have anti-galling properties, they may cause galling in materials composed of or containing identical base elements. Also, Steam Oxide and some coatings may cause galling in soft materials such as Aluminum.

CALCULATIONS FOR SPEED

RPM = (3.82 x FPM) / DIA.
FPM = (RPM x DIA.) / 3.82

TECHNICAL INFORMATION

Standard Marking Symbols for Taps

CODE	DESCRIPTION
NC	American National Coarse Thread Series
UNC	Unified Coarse Thread Series
NF	American National Fine Thread Series
UNF	Unified Fine Thread Series
NEF	American National Extra-Fine Thread Series
UNEF	Unified Extra-Fine Thread Series
N	American National 8, 12 and 16 Thread Series (8N, 12N, 16N)
UN	Unified Constant-Pitch Thread Series
NS	American National Thread – Special
UNS	Unified Thread – Special
UNM	Unified Miniature Thread Series
NR	American National Thread with a .018P to .144P Controlled Root Radius
UNR	Unified Constant-Pitch Thread Series with a .108P to .144P Controlled Root Radius
UNRC	Unified Coarse Thread Series with a .108P to .144P Controlled Root Radius
UNRF	Unified Fine Thread Series with a .108P to .144P Controlled Root Radius
*UNJ	Unified Thread Series with a .15011P to .18042P Controlled Root Radius
*UNJC	Unified Coarse Thread Series with a .15011P to .18042P Controlled Root Radius
*UNJF	Unified Fine Thread Series with a .15011P to .18042P Controlled Root Radius
NH	American National Hose Coupling and Firehose Coupling Threads
NPS	American Standard Straight Pipe Thread
NPSC	American Standard Straight Pipe Thread in Pipe Couplings (Mark NPS)
NPSF	Dryseal American Standard Pipe Thread (Fuel)
NPSH	American Standard Straight Pipe Thread for Hose Couplings and Nipples
NPSI	American Standard Dryseal Intermediate Straight Pipe Thread
NPSL	American Standard Straight Pipe Thread for Loose-Fitting Mechanical Joints with Locknuts
NPSM	American Standard Straight Pipe Threads for Free-Fitting Mechanical Joints for Fixtures (Mark NPS)
ANPT	Aeronautical National Form Taper Pipe Thread
NPT	American Standard Taper Pipe Thread
NPTF	Dryseal American Standard Taper Pipe Thread (Fuel)
NPTR	American Standard Taper Pipe Thread for Railing Joints (Mark NPT)
NGO	National Gas Outlet Thread R. H. or L. H.
NGS	National Gas Straight Thread
NGT	National Gas Taper Thread
PTF	Dryseal SAE Short Taper Pipe Thread
ACME-C	Acme Thread Centralizing
ACME-G	Acme Thread General Purpose
STUB ACME	Stub Acme Thread
N BUTT	American Buttress Thread
STI	Special Thread for Helical Wire Screw Thread Inserts
SGT	Special Gas Taper Thread

*Root Radius required on Male thread only.