Torque Cut High Performance HSSE Color Ring Taps

- RedLine Torque Cut High Performance Taps give you greater performance when tapping Steel Alloys, Stainless Steels, Titanium and a variety of other Steels with a maximum Rc of 32.
- Made from High Vanadium Powdered Metal, Torque Cut Taps provide the right combination of strength and abrasion resistance. The benefit to this is increased speeds, while achieving longer tool life and a lower cost per thread.
- High Performance Taps found on pages 357-379.

High Performance HSSE Color Ring Tap Speeds

Material	Grades	SFM Torque Cut HP	SFM Pipe Taps	Ring Color
P - Steels				
High Strength Tool Steel	A2, D2, P20, H11, H13, S2, 01	30-60	10-30	Green
Low Carbon	A36, 12L14, 12L15, 1005, 1018, 1020, 1108-1119, 1213-1215, 1513-1518, 4012, 5015, 9310	40-90	15-35	Yellow
Medium Carbon	1040-1095, 1140-1151, 1330-1345, 1520-1572, 4023-4063, 4120-4161, 4330-4340, 4620-4640, 8620-8660, 8740-8750, 6150, 51000, 52100	40-90	15-35	Yellow
M - Stainless Steels				
Austenitic	301-304L, 310, 316L, 321, 347	10-30	15-35	Blue
Martensitic	403, 410, 416, 420, 430, 431, 440	20-40	10-30	Red
Precipitation Hardening	12/8, 15/5, 17/4, AM-350/355/363, PH13-8MO, PH14-8/MO	8-20	6-15	Red
K - Cast Irons				
Ductile	A536, J434, 60-40-18	30-50	N/A	White
Gray	A48, A436, A319, Class 20, G4000	20-80	N/A	White
Malleable	A220, A602, J158	30-50	20-35	White
N - Non-Ferrous				
Aluminum Alloys	2014, 2024, 6061, 7075	90-150	65-110	Black
Aluminum High Silicon	A380, A390	65-75	50-55	Black
Brass/Bronze	Aluminum Bronze, Low Silicon Bronze	N/A	N/A	N/A
Composites	G-10, Fiberglass, Graphite, Graphite Epoxy, Plastics	N/A	N/A	N/A
Copper		N/A	N/A	N/A
Magnesium		N/A	N/A	N/A
S - High Temp Alloys				
Cobalt Base	Stellite, HS-21, Haynes 25/188, X40, L605	N/A	N/A	N/A
Iron Base	Incoloy 800-802, Multmet N-155, Timkin 16-25-6, Carpenter 22-b3	8-20	6-15	Blue
Nickel Base	Inconel 625/718, Inco 700, 713C, 718, Monel 400-401, 404, K401, Rene, Rene 41 & 95 Hastelloy, Waspoloy, Udimet 500 & 700	8-20	6-15	Blue
Titanium	Commercially Pure, 6Al-4V, ASTM 1/2/3, 6Al-25N-4Zr-2Mo-Si, Ti-8Al-1Mo, Ti-8Al-4Mo	20-50	15-35	Blue

NOTE: Speeds and Feeds listed are estimated and will vary by application.

General Purpose & Other Tap Speeds

Material	Grades	SFM
P - Steels		
High Strength Tool Steel	A2, D2, P20, H11, H13, S2, 01	15-25
Low Carbon	A36, 12L14, 12L15, 1005, 1018, 1020, 1108-1119, 1213-1215, 1513-1518, 4012, 5015, 9310	20-40
Medium Carbon	1040-1095, 1140-1151, 1330-1345, 1520-1572, 4023-4063, 4120-4161, 4330-4340, 4620-4640, 8620-8660, 8740-8750, 6150, 51000, 52100	20-30
M - Stainless Steels		
Austenitic	301-304L, 310, 316L, 321, 347	10-20
Martensitic	403, 410, 416, 420, 430, 431, 440	10-20
Precipitation Hardening	12/8, 15/5, 17/4, AM-350/355/363, PH13-8MO, PH14-8/MO	10-20
K - Cast Irons		
Ductile	A536, J434, 60-40-18	15-30
Gray	A48, A436, A319, Class 20, G4000	15-30
Malleable	A220, A602, J158	30-60
N - Non-Ferrous		
Aluminum Alloys	2014, 2024, 6061, 7075	70-90
Aluminum High Silicon	A380, A390	60-80
Brass/Bronze	Aluminum Bronze, Low Silicon Bronze	60-100
Composites	G-10, Fiberglass, Graphite, Graphite Epoxy, Plastics	50-70
Copper		60-80
Magnesium		60-80
S - High Temp Alloys		
Cobalt Base	Stellite, HS-21, Haynes 25/188, X40, L605	10-25
Iron Base	Incoloy 800-802, Multmet N-155, Timkin 16-25-6, Carpenter 22-b3	10-25
Nickel Base	Inconel 625/718, Inco 700, 713C, 718, Monel 400-401, 404, K401, Rene, Rene 41 & 95 Hastelloy, Waspoloy, Udimet 500 & 700	10-25
Titanium	Commercially Pure, 6Al-4V, ASTM 1/2/3, 6Al-25N-4Zr-2Mo-Si, Ti-8Al-1Mo, Ti-8Al-4Mo	5-15

NOTE: Speeds listed are estimated and will vary by application.

These tools can be found on pages 380-403.

Tap Drill Chart

Metric Tap Drill Size
(Recommended Drill Sizes Suitable for 6H Tolerance)

Tap Size	Cutting Tap Drill Size	Roll Form Tap Drill Size	Tap Size	Cutting Tap Drill Size	Roll Form Tap Drill Size	Tap Size	Cutting Tap Drill Size
M1.6 x 0.35	1.25MM	—	M10 x 1.5	8.5MM	9.20MM	M24 x 3	53/64
M1.8 X 0.35	1.45 MM	—	M10 x 1.25	8.75MM	U	M24 x 2	22MM
M2 x 0.4	1.60MM	—	M12 x 1.75	13/32	7/16	M27 x 3	24MM
M2.2 x 0.45	1.75MM	—	M12 x 1.25	10.75MM	.447*	M27 x 2	63/64
M2.5 x 0.45	2.05MM	—	M14 x 2	12MM	13MM	M30 x 3.5	1-3/64*
M3 x 0.5	2.5MM	7/64	M14 x 1.5	12.5MM	13.20MM	M30 x 2	1-7/64*
M3.5 x .06	2.9MM	3.2MM	M16 x 2	14MM	15MM	M33 x 3.5	1-11/64*
M4 x 0.7	3.3MM	#27	M16 x 1.5	14.5MM	15.25MM	M33 x 2	31MM*
M4.5 x 0.75	3.75MM	4.10MM	M18 x 1.5	15.5MM	16.25MM	M36 x 4	32MM*
M5 x 0.8	#19	4.60MM	M18 x 1.5	16.5MM	17.25MM	M36 x 3	33MM*
M6 x 1	5MM	5.50MM	M20 x 2.5	17.5MM	47/64	M39 x 4	35MM*
M7 x 1	6MM	6.50MM	M20 x 1.5	18.5MM	.757*	M39 x 3	36MM*
M8 x 1.25	H	L	M22 x 2.5	19.5MM	—	—	—
M8 x 1	J	7.50MM	M22 x 1.5	20.5MM	—	* Reaming Recommended	

Machine Screw Sizes NC & NF

Nom. Size Tap	Recommended Tap Drill		Probable Hole Size	Actual % Thread
	Drill	Decimal		
0 - 80	3/64	.0469	.0484	71
1 - 64	53	.0595	.0610	59
1 - 72	53	.0595	.0610	67
2 - 56	50	.0700	.0717	62
2 - 64	50	.0700	.0717	70
3 - 48	47	.0785	.0804	69
3 - 56	46	.0810	.0829	69
4 - 40	43	.0890	.0910	65
4 - 48	42	.0935	.0955	61
5 - 40	39	.0995	.1018	71
5 - 44	38	.1015	.1038	72
6 - 32	36	.1065	.1091	71
6 - 40	33	.1130	.1156	69
8 - 32	29	.1360	.1389	62
8 - 36	29	.1360	.1389	70
10 - 24	25	.1495	.1527	69
10 - 32	21	.1590	.1622	68
12 - 24	17	.1730	.1765	73
12 - 28	15	.1800	.1835	70
1/4 - 20	7	.2010	.2048	70

Fractional Sizes NC & NF

Nom. Size Tap	Recommended Tap Drill		Probable Hole Size	Actual % Thread
	Drill	Decimal		
1/4 - 28	3	.2130	.2168	72
5/16 - 18	F	.2570	.2608	72
5/16 - 24	I	.2720	.2761	67
3/8 - 16	5/16	.3125	.3169	72
3/8 - 24	Q	.3320	.3364	71
7/16 - 14	U	.3680	.3726	70
7/16 - 20	W	.3860	.3906	72
1/2 - 13	27/64	.4219	.4266	73
1/2 - 20	29/64	.4531	.4578	65
9/16 - 12	31/64	.4844	.4892	68
9/16 - 18	33/64	.5156	.5204	58
5/8 - 11	17/32	.5313	.53620	75
5/8 - 18	37/64	.5781	.5831	58
3/4 - 10	21/32	.6562	.6613	68
3/4 - 16	11/16	.6875	.69250	71
7/8 - 9	49/64	.7656	.7708	72
7/8 - 14	13/16	.8125	.8177	62
1 - 8	7/8	.8750	.8809	73
1 - 12	59/64	.9219	.9279	67
1 - 14	15/16	.9375	.9435	61

Taper Pipe Taps

Nom. Size	Tap Drill	
	NPT	NPTF
1/16 - 27	D	C
1/8 - 27	Q	Q
1/4 - 18	7/16	7/16
3/8 - 18	9/16	9/16
1/2 - 14	45/64	45/64
3/4 - 14	29/32	29/32
1 - 11-1/2	1-9/64	1-9/64
1-1/4 - 11-1/2	1-31/64	1-31/64
1-1/2 - 11-1/2	1-47/64	1-23/32
2 - 1-1/2	2-13/64	2-3/16
2-1/2 - 8	2-5/8	2-39/64
3 - 8	3-1/4	3-15/64
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Roll Form Taps - App. 65% Thread

Tap	Drill	Tap	Drill
0 - 80	54	12-28	8
1 - 64	1.65MM	1/4-20	1
1 - 72	1.7MM	1/4-28	A
2 - 56	5/64	5/16-18	7.3MM
2 - 64	2MM	5/16-24	M
3 - 48	43	3/8-16	8.8MM
3 - 56	2.3MM	3/8-24	T
4 - 40	39	7/16-14	Y
4 - 48	2.6MM	7/16-20	10.5MM
5 - 40	33	1/2-13	11.8MM
5 - 44	2.9MM	1/2-20	12.0MM
6 - 32	1/8	9/16-12	17/32
6 - 40	3.2MM	9/16-18	13.5MM
8 - 32	25	5/8-11	14.75MM
8 - 36	24	5/8-18	15.25MM
10 - 24	11/64	3/4-10	45/64
10 - 32	16	3/4-16	23/32
12 - 24	5MM	—	—

Machine Screw Tap (NC & NF) Dimensions

Size	OAL	Thread Length	Square Length	Shk ø	Square
#0 (.060)	1-5/8	5/16	3/16	.141	.110
#1 (.073)	1-11/16	3/8	3/16	.141	.110
#2 (.066)	1-3/4	7/16	3/16	.141	.110
#3 (.099)	1-13/16	1/2	3/16	.141	.110
#4 (.112)	1-7/8	9/16	3/16	.141	.110
#5 (.125)	1-15/16	5/8	3/16	.141	.110
#6 (.138)	2	11/16	3/16	.141	.110
#8 (.164)	2-1/8	3/4	1/4	.168	.131
#10 (.190)	2-3/8	7/8	1/4	.194	.152
#12 (.216)	2-3/8	15/16	9/32	.220	.165

Fractional Size Tap (NC & NF) Dimensions

Size	OAL	Thread Length	Square Length	Shk ø	Square
1/4	2-1/2	1	5/16	.255	.191
5/16	2-23/32	1-1/8	3/8	.318	.238
3/8	2-15/16	1-1/4	7/16	.381	.286
7/16	3-5/32	1-7/16	13/32	.323	.242
1/2	3-3/8	1-21/32	7/16	.367	.275
9/16	3-19/32	1-21/32	1/2	.429	.322
5/8	3-13/16	1-13/16	9/16	.480	.360
11/16	4-1/32	1-13/16	5/8	.542	.406
3/4	4-1/4	2	11/16	.590	.442
7/8	4-11/16	2-7/32	3/4	.697	.523
1	5-1/8	2-1/2	13/16	.800	.600
1-1/8	5-7/16	2-9/16	7/8	.896	.672
1-1/4	5-3/4	2-9/16	1	1.021	.766
1-3/8	6-1/16	3	1-1/16	1.108	.831
1-1/2	6-3/8	3	1-1/8	1.233	.925

Small Shank Extension Tap Dimensions

Size	NC/NF	Thread Length	Square Length	Shk ø	Square
6 – 32	NC	11/16	3/16	.097	.073
8 – 32	NC	3/4	1/4	.123	.092
10 – 24	NC	7/8	1/4	.136	.102
10 – 32	NF	7/8	1/4	.136	.102
1/4 – 20	NC	1	5/16	.185	.139
1/4 – 28	NF	1	5/16	.185	.139
5/16 – 18	NC	1-1/8	3/8	.240	.180
5/16 – 24	NF	1-1/8	3/8	.240	.180
3/8 – 16	NC	1-1/4	7/16	.275	.206
3/8 – 24	NF	1-1/4	7/16	.275	.206
7/16 – 14	NC	1-7/16	13/32	.323	.242
7/16 – 20	NF	1-7/16	13/32	.323	.242
1/2 – 13	NC	1-21/32	7/16	.367	.275
1/2 – 20	NF	1-21/32	7/16	.367	.275
5/8 – 11	NC	1-13/16	9/16	.480	.360
5/8 – 18	NF	1-13/16	9/16	.480	.360
3/4 – 10	NC	2	11/16	.590	.442
3/4 – 16	NF	2	11/16	.590	.442

Pulley Tap Dimensions

Size	Thread Length	Square Length	Shk ø	Square	Neck Length	Ground Length
1/4	1	5/16	.255	.191	3/8	1-1/2
5/16	1-1/8	3/8	.318	.238	3/8	1-9/16
3/8	1-1/4	7/16	.381	.286	3/8	1-5/8
7/16	1-7/16	1/2	.444	.333	7/16	1-11/16
1/2	1-21/32	9/16	.507	.380	1/2	1-11/16
5/8	1-13/16	11/16	.633	.475	5/8	2
3/4	2	3/4	.759	.569	3/4	2-1/4

See page 346 for overall lengths available.

Pipe Tap, Straight & Taper (NC & NF) Dimensions

Size	OAL	Thread Length	Square Length	Shk ø	Square
1/16 – 27	2-1/8	11/16	3/8	.3125	.234
1/8 – 27	2-1/8	3/4	3/8	.3125(SS)	.234
1/8 – 27	2-1/8	3/4	3/8	.4375(LS)	.328
1/4 – 18	2-7/16	1-1/16	7/16	.5625	.421
3/8 – 18	2-9/16	1-1/16	1/2	.7000	.531
1/2 – 14	3-1/8	1-3/8	5/8	.6875	.515
3/4 – 14	3-1/4	1-3/8	11/16	.9063	.679
1 – 11-1/2	3-3/4	1-3/4	13/16	1.1250	.843
1-1/4 – 11-1/2	4	1-3/4	15/16	1.3125	.984
1-1/2 – 11-1/2	4-1/4	1-3/4	1	1.5000	1.125
2 – 11-1/2	4-1/2	1-3/4	1-1/8	1.8750	1.406

Metric Tap Dimensions

Size	OAL	Thread Length	Square Length	Shk ø	Square	Inch Blank
M1.6 x .35	1-5/8	5/16	3/16	.141	.110	#0
M2 x .40	1-3/4	7/16	3/16	.141	.110	#2
M2.5 x .45	1-13/16	1/2	3/16	.141	.110	#3
M3 x .50	1-15/16	5/8	3/16	.141	.110	#5
M3.5 x .60	2	11/16	3/16	.141	.110	#6
M4 x .70	2-1/8	3/4	1/4	.168	.131	#8
M4.5 x .75	2-3/8	7/8	1/4	.194	.152	#10
M5 x .80	2-3/8	7/8	1/4	.194	.152	#10
M6 x 1	2-1/2	1	5/16	.255	.191	1/4
M6.3 x 1	2-1/2	1	5/16	.255	.191	1/4
M7 x 1	2-23/32	1-1/8	3/8	.318	.238	5/16
M8 x 1.25	2-23/32	1-1/8	3/8	.318	.238	5/16
M10 x 1.50	2-15/16	1-1/4	7/16	.381	.286	3/8
M12 x 1.75	3-3/8	1-21/32	7/16	.367	.275	1/2
M14 x 2	3-19/32	1-21/32	1/2	.429	.322	9/16
M16 x 2	3-13/16	1-13/16	9/16	.480	.360	5/8
M18 x 2.50	4-1/32	1-13/16	5/8	.542	.406	11/16
M20 x 2.50	4-15/32	2	11/16	.652	.489	13/16
M24 x 3	4-29/32	2-7/32	3/4	.760	.570	15/16
M30 x 3.50	5-7/16	2-9/16	1	1.021	.766	1-3/16
M36 x 4	6-1/16	3	1-1/8	1.233	.925	1-7/16

Styles of Taps

The type of hole to be tapped has much to do with the chamfer style of that tap that's best suited. Some holes go all the way through. Some, while not through-holes, are relatively deep; some are quite shallow (a little deeper than diameter). Each of these three kinds of holes - through, deep-bottoming blind, and shallow bottoming has a tap best suited to threading requirements.

Taper Taps

This style with a 7-10 thread chamfer, has the longest chamfer of the three to distribute action over the maximum number of teeth. The taper also acts as a guide in starting the cutting action in the hole.

Plug Taps

This style, with a 4-6 thread chamfer, is most widely used in through holes and where there is sufficient room at the bottom in blind holes.

Bottoming Taps

This style, with a 1-2 thread chamfer, is made with just enough chamfer for starting in the hole. As the name implies, it is designed to thread blind holes to the bottom.

Tap Sizes

Tap sizes have been standardized to conform with those of standard screws, bolts and studs. Machine Screw tap size range from No. 0 through No. 14; No. 0 being .0600" outside diameter; No. 1 being .0730"; No. 2 being .0860, etc all in .0130" increments.

Threads per Inch

A measurement shown for various tooth forms. The Unified Series adopted by Great Britain during the war and the corresponding American National Standard. NC and UNC mean coarse thread. NF and UNF mean fine thread. NS means special thread.

Pitch Diameter

This is the basic dimension of a screw, threaded hole or a tap — the diameter of an imaginary cylinder, the surface of which passes through the thread where width of thread and space between threads are identical. This cylinder would be a cone for tapered taps. It is upon Pitch Diameter that tolerance limits are based to establish Class of Thread.

Class of Thread

There are three established Classes of Thread, designated in the Unified series by adding "A" for screws and "B" for nuts (or other internal threads) to show definite limits and tolerances.

Class 1B Thread

The hole is classified as 1B when a 1A screw can be run in readily for quick and easy assembly. The fit is 1B Thread and is rarely used in today's metalworking.

Class 2B Thread

This is a 2A screw in a 2B hole. This 2B Thread has wide application, accommodates plating, finishes and coating to a limited extent and therefore has fair tolerance allowances.

Class 3B Thread

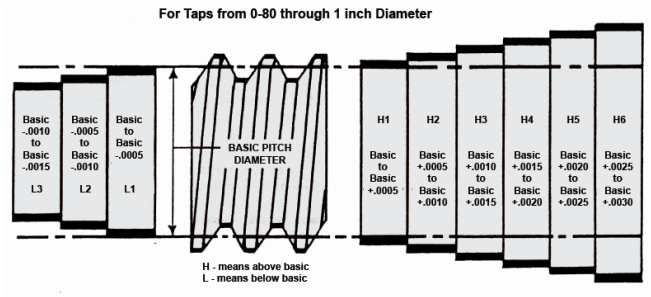
This is a 3A screw in a 3B nut or threaded hole for applications where tolerance limits are close.

GH Numbers

In the tables that follow, tap selections are shown for the Class of Thread desired and under the Class of Thread heading, applicable GH Numbers are listed. "G" means Ground Thread and "H" means that pitch diameter is on the high side of basic. These two letters are followed by a numeral showing the tolerance of pitch diameter oversize as follows:

H1 = Basic to Basic plus .0005"
H2 = Basic plus .0005" to Basic plus .0010"
H3 = Basic plus .0010" to Basic plus .0015"
H4 = Basic plus .0015" to Basic plus .0020"
H5 = Basic plus .0020" to Basic plus .0025"
H6 = Basic plus .0025" to Basic plus .0030"
H7 = Basic plus .0030" to Basic plus .0035"

The diagram below, exaggerated for clarity, illustrates these several selectives in Pitch Diameter tolerance—including "L" (undersize tolerance), although no "L" taps are shown in this book. Pitch Diameter varies with the number of threads per inch because the number of threads of Pitch of screw determines the height of thread. Since Basic Pitch Diameter is measured from points half the height of the fully formed thread, a hole drilled to provide theoretical 50% thread engagement would be of the same diameter as the pitch diameter of the tap.



The Basic Point in Thread Measurement

All measurements must have a controlling point or base from which to start. In the case of a screw thread, this control point is called the BASIC or theoretically correct size, which is calculated on the basis of a full form thread. Thus, on a given screw thread, we have the Basic Major Diameter, the Basic Pitch Diameter and Basic Minor Diameter.

While it is impossible in practice to form screw threads to their precise theoretical or BASIC Sizes, it is possible and practical to establish limits which the deviation must not exceed. These are called the "Maximum" and "Minimum" Limits. If the product is no smaller than the "Minimum Limit" and no larger than the "Maximum Limit," then it is within the size limits required. This difference between the Maximum and Minimum Limits is the TOLERANCE.

In actual practice the Basic Size is not necessarily between the Maximum and Minimum Limits. In most cases, the Basic Size is one of the Limits. In general, tolerances for internal threads will be above Basic and for external threads, below Basic. See drawing below.

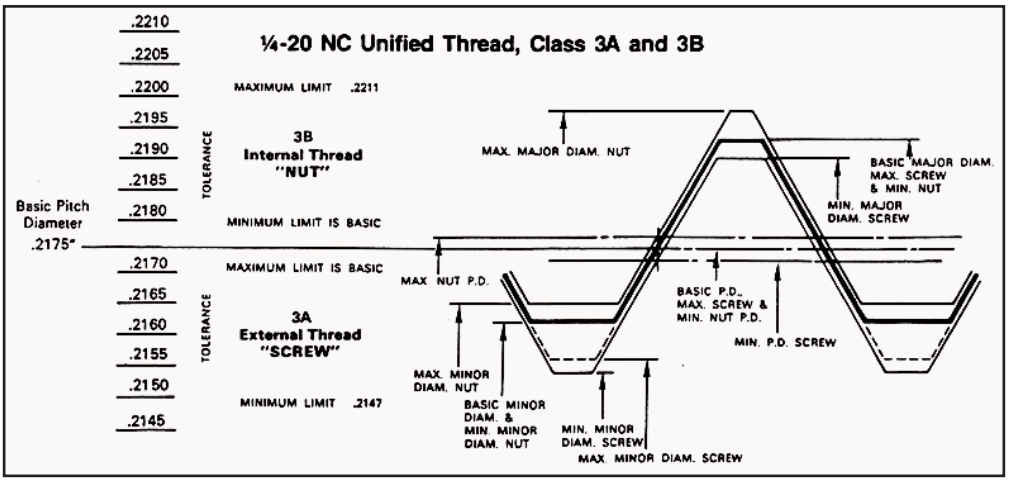
For graphic representation, the Basic Pitch Diameter is commonly designated by a line with variations from it indicated by shorter lines spaced to represent a numerical scale, as shown on the left half of the drawing below.

On an actual screw thread, the Basic Dimensions would follow the contour of the theoretically perfect thread, as on the right half of the drawing below.

To find the basic pitch diameter or basic minor diameter of any screw thread, subtract the constant for the number of threads per inch from the basic major diameter.

Constants For Finding Pitch Diameter And Minor Diameter Of Screw Threads

Threads Per Inch	Pitch In Inches	Constants for Finding Basic Pitch Diameter			Constants for Finding Basic Minor Diameter		
		National Thread	Whitworth Thread	Theoretical V	National Thread	Whitworth Thread	Theoretical V
80	0.012500	0.00812	0.00800	0.01083	0.01624	0.01601	0.02165
72	0.013888	0.00902	0.00889	0.01203	0.01804	0.01786	0.02406
64	0.015625	0.01015	0.01000	0.01353	0.02030	0.02001	0.02706
60	0.016666	0.01083	0.01067	0.01443	0.02165	0.02134	0.02887
56	0.017857	0.01160	0.01144	0.01546	0.02320	0.02286	0.03093
50	0.020000	0.01299	0.01281	0.01732	0.02598	0.02562	0.03464
48	0.020833	0.01353	0.01334	0.01804	0.02706	0.02668	0.03608
44	0.022727	0.01476	0.01455	0.01968	0.02952	0.02910	0.03936
40	0.025000	0.01624	0.01601	0.02165	0.03248	0.03202	0.04330
36	0.027777	0.01804	0.01779	0.02406	0.03608	0.03558	0.04811
32	0.031250	0.02030	0.02001	0.02706	0.04059	0.04002	0.05413
30	0.033333	0.02165	0.02134	0.02887	0.04330	0.04268	0.05773
28	0.035714	0.02320	0.02287	0.03093	0.04639	0.04574	0.06186
27	0.035461	0.02406	0.02372	0.03208	0.04812	0.04742	0.06416
26	0.037037	0.02498	0.02463	0.03331	0.04996	0.04926	0.06662
24	0.041666	0.02706	0.02668	0.03608	0.05413	0.05336	0.07217
22	0.045454	0.02952	0.02911	0.03936	0.05905	0.05821	0.07873
20	0.050000	0.03248	0.03202	0.04330	0.06495	0.06403	0.08660
18	0.055555	0.03608	0.03557	0.04811	0.07217	0.07114	0.09623
16	0.062500	0.04059	0.04002	0.05413	0.08119	0.08004	0.10825
14	0.071428	0.04639	0.04574	0.06186	0.09279	0.09147	0.12372
13	0.076923	0.04996	0.04926	0.06662	0.09993	0.09851	0.13323
12	0.083333	0.05413	0.05336	0.07217	0.10825	0.10672	0.14434
11-1/2	0.086956	0.05648	0.05568	0.07531	0.11296	0.11132	0.15062
11	0.090909	0.05905	0.05821	0.07873	0.11809	0.11642	0.15746
10	0.010000	0.06495	0.06403	0.08660	0.12990	0.12806	0.17321
9	0.111111	0.07217	0.07115	0.09623	0.14434	0.14230	0.19245
8	0.125000	0.08119	0.08004	0.10825	0.16238	0.16008	0.21651
7	0.142857	0.09279	0.09148	0.12372	0.18558	0.18295	0.24744
6	0.166666	0.10825	0.10672	0.14434	0.21651	0.21344	0.28868
5-1/2	0.181818	0.11809	0.11642	0.15746	0.23619	0.23284	0.31492
5	0.200000	0.12990	0.12807	0.17321	0.25981	0.25613	0.34641
4-1/2	0.222222	0.14434	0.14230	0.19245	0.28868	0.28458	0.38490
4	0.250000	0.16238	0.16008	0.21651	0.32479	0.32017	0.43301
3-1/2	0.285711	0.18558	0.18295	0.24744	0.37115	0.36590	0.49487
3-1/4	0.307692	0.19985	0.19702	0.26647	0.39970	0.39404	0.53294
3	0.333333	0.21651	0.21344	0.28868	0.43301	0.42689	0.57733



Thread Constants For Various Percentages

Formula for Obtaining Tap Drill Sizes (Select nearest commercial stock drill)

$$\text{(Outside Diameter of Thread)} - \left(\frac{0.01299 \times \text{Amount of Percentage of Full Thread}}{\text{Number of Threads per Inch}}\right) = \text{Drilled Hole Size}$$

$$\text{(Number of Threads per Inch)} \times \left(\frac{\text{Outisde Diameter of Thread - Selected Drill Diameter}}{0.01299}\right) = \text{Percentage of Full Thread}$$

Figures in table show amount to subtract from O.D. of screw to obtain specific percentages of thread.

Example:

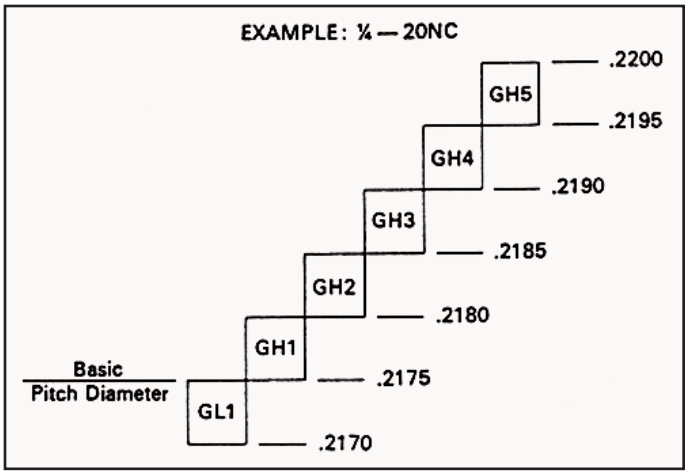
Find the hole size for obtaining 75% of thread in a 1/4-20 tapped hole, follow first column to 20 threads, then across to 75% of thread. This figure (.0485) when subtracted from the .250 diameter leaves .2015, which is the required diameter of the hole for a 1/4-20 thread.

Thread Constants For Various Percentages

Threads per Inch	Double Depth	60% Thread	65% Thread	70% Thread	75% Thread	80% Thread	85% Thread
6	0.21651	0.1300	0.1408	0.1517	0.1625	0.1733	0.1842
7	0.18558	0.1114	0.1207	0.1300	0.1393	0.1486	0.1579
8	0.16238	0.0975	0.1056	0.1138	0.1219	0.1300	0.1381
9	0.14434	0.0866	0.0939	0.1011	0.1083	0.1156	0.1228
10	0.12990	0.0779	0.0844	0.0909	0.0974	0.1039	0.1105
11	0.11809	0.0708	0.0767	0.0826	0.0885	0.0944	0.1005
12	0.10825	0.0649	0.0702	0.0755	0.0808	0.0861	0.0921
13	0.09992	0.0599	0.0649	0.0699	0.0749	0.0799	0.0850
14	0.09278	0.0556	0.0602	0.0648	0.0694	0.0740	0.0789
16	0.08119	0.0486	0.0526	0.0566	0.0606	0.0646	0.0691
18	0.07217	0.0431	0.0466	0.0501	0.0536	0.0571	0.0614
20	0.06495	0.0389	0.0421	0.0453	0.0485	0.0517	0.0553
24	0.05412	0.0326	0.0354	0.0382	0.0410	0.0438	0.0460
27	0.04811	0.0288	0.0312	0.0336	0.0360	0.0384	0.0409
28	0.04639	0.0276	0.0298	0.0324	0.0347	0.0370	0.0395
30	0.04330	0.0260	0.0282	0.0304	0.0326	0.0348	0.0368
32	0.04059	0.0243	0.0263	0.0283	0.0303	0.0323	0.0345
36	0.03608	0.0216	0.0234	0.0252	0.0270	0.0288	0.0307
40	0.03247	0.0194	0.0210	0.0226	0.0242	0.0258	0.0276
44	0.02952	0.0177	0.0192	0.0207	0.0222	0.0237	0.0251
48	0.02706	0.0161	0.0174	0.0187	0.0200	0.0213	0.0230
56	0.02319	0.0138	0.0149	0.0160	0.0171	0.0182	0.0197
64	0.02029	0.0121	0.0131	0.0141	0.0151	0.0161	0.0173
72	0.01804	0.0107	0.0115	0.0123	0.0131	0.0139	0.0153
80	0.01623	0.0097	0.0105	0.0113	0.0121	0.0129	0.0138

Relation of Tap Pitch Diameter to Basic Pitch Diameter

American tap manufacturers use a series of tap pitch diameter limits. These limits feature a .0005" tolerance in tap sizes #0 through 1 inch, and a .001 inch or greater tolerance in tap sizes above 1 inch through 1-1/2 inch diameter, inclusive. The chart shows the relationship between tap pitch diameter limits and basic (nominal) pitch diameter.



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

Machine Screw Sizes

Machine Screw Size	Basic Pitch Diameter	Tap Recommendations For Class 2 Thread		Tap Recommendations For Class 2B Thread		Tap Recommendations For Class 3B Thread		Oversize X-Press® Taps
		Styles Available	Max. P.D. Limits Thread	Styles Available	Max. P.D. Limits Thread	Styles Available	Max. P.D. Limits Thread	Styles Available
0-80 NF, UNF	.0519	B-2	.0536	B-3	.0542	B-2	.0536	
1-64 NC, UNC	.0629	B-2	.0648	B-3	.0655	B-2	.0648	
1-72 NF, UNF	.0640	B-2	.0658	B-3	.0665	B-2	.0659	
2-56 NC, UNC	.0744	B-2	.0764	B-3	.0772	B-2	.0765	
2-64 NF, UNF	.0759	B-2	.0778	B-3	.0786	B-2	.0779	
3-48 NC, UNC	.0855	B-2	.0877	B-3	.0885	B-2	.0877	
3-56 NF, UNF	.0874	B-2	.0894	B-3	.0902	B-2	.0895	
4-40 NC, UNC	.0958	P-3, B-3	.0982	P-5, B-5	.0991	P-3, B-3	.0982	
4-48 NF, UNF	.0985	P-3, B-3	.1007	P-5, B-5	.1016	P-3, B-3	.1008	
5-40 NC, UNC	.1088	P-3, B-3	.1112	P-5, B-5	.1121	P-3, B-3	.1113	
5-44 NF, UNF	.1102	P-3, B-3	.1125	P-5, B-5	.1134	P-3, B-3	.1126	
6-32 NC, UNC	.1177	P-3, B-3	.1204	P-5, B-5	.1214	P-3, B-3	.1204	P-10, B-10
6-40 NF, UNF	.1218	P-3, B-3	.1242	P-5, B-5	.1252	P-3, B-3	.1243	
8-32 NC, UNC	.1437	P-3, B-3	.1464	P-5, B-5	.1475	P-3, B-3	.1465	P-10, B-10
8-36 NF, UNF	.1460	P-3, B-3	.1485	P-5, B-5	.1496	P-3, B-3	.1487	
10-24 NC, UNC	.1629	P-4, B-4	.1662	P-6, B-6	.1672	P-4, B-4	.1661	P-10, B-10
10-32 NF, UNF	.1697	P-4, B-4	.1724	P-6, B-6	.1736	P-4, B-4	.1726	P-10, B-10
12-24 NC, UNC	.1889	P-4, B-4	.1922	P-6, B-6	.1933	P-4, B-4	.1922	
12-28 NF, UNF	.1928	P-4, B-4	.1959	P-6, B-6	.1970	P-4, B-4	.1959	

Fractional Sizes

¼-20 NC, UNC	.2175	P-4, B-4	.2211	P-6, B-6	.2223	P-4, B-4	.2211	P-10, B-10
¼-28 NF, UNF	.2268	P-4, B-4	.2299	P-6, B-6	.2311	P-4, B-4	.2300	P-10, B-10
5/16-18 NC, UNC	.2764	P-5, B-5	.2805	P-7, B-7	.2817	P-5, B-5	.2803	P-10, B-10
5/16-24 NF, UNF	.2854	P-5, B-5	.2887	P-7, B-7	.2902	P-5, B-5	.2890	P-10, B-10
⅜-16 NC, UNC	.3344	P-5, B-5	.3389	P-7, B-7	.3401	P-5, B-5	.3387	P-10, B-10
⅜-24 NF, UNF	.3479	P-5, B-5	.3512	P-7, B-7	.3528	P-5, B-5	.3516	P-10, B-10
7/16-14 NC, UNC	.3911	P-5, B-5	.3960	P-8, B-8	.3972	P-5, B-5	.3957	P-10, B-10
7/16-20 NF, UNF	.4050	P-5, B-5	.4086	P-8, B-8	.4104	P-5, B-5	.4091	P-10, B-10
½-13 NC, UNC	.4500	P-5, B-5	.4552	P-8, B-8	.4565	P-5, B-5	.4548	P-10, B-10
½-20 NF, UNF	.4675	P-5, B-5	.4711	P-8, B-8	.4731	P-5, B-5	.4717	P-10, B-10
9/16-12 NC, UNC	.5084	P-7, B-7	.5140	P-10, B-10	.5152	P-7, B-7	.5135	
9/16-18 NF, UNF	.5264	P-7, B-7	.5305	P-10, B-10	.5323	P-7, B-7	.5308	
⅝-11 NC, UNC	.5660	P-7, B-7	.5719	P-10, B-10	.5732	P-7, B-7	.5714	
⅝-18 NF, UNF	.5889	P-7, B-7	.5930	P-10, B-10	.5949	P-7, B-7	.5934	
¾-10 NC, UNC	.6850	P-7, B-7	.6914	P-10, B-10	.6927	P-7, B-7	.6907	
¾-16 NF, UNF	.7094	P-7, B-7	.7139	P-10, B-10	.7159	P-7, B-7	.7143	

The above recommended taps will normally produce the class of thread indicated in most materials. 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.

Standard Taps - Recommendations & Gaging Limits for Classes 2, 3, 2B & 3B Unified & American Screw Threads

Machine Screw Sizes

	Threads per Inch		Recommended Tap For Class of Thread				Pitch Diameter Gaging Limits For Class of Thread				
Tap Size	NC UNC	NF UNF	Class 2	Class 3	Class 2B	Class 3B	GO All Classes (Basic)	Hi Class 2	Hi Class 3	Hi Class 2B	Hi 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

Fractional Sizes

¼	20		G H3	G H2	G H5	G H3	.2175	.2211	.2201	.2223	.2211
¼		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
⅜	16		G H3	G H2	G H5	G H3	.3344	.3389	.3376	.3401	.3387
⅜		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
½	13		G H5	G H3	G H5	G H3	.4500	.4552	.4537	.4565	.4548
½		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
⅝	11		G H5	G H3	G H5	G H3	.5660	.5719	.5702	.5732	.5714
⅝		18	G H3	G H2	G H5	G H3	.5889	.5930	.5919	.5949	.5934
¾	10		G H5	G H3	G H5	G H5	.6850	.6914	.6895	.6927	.6907
¾		16	G H3	G H2	G H5	G H3	.7094	.7139	.7126	.7159	.7143
⅞	9		G H6	G H4	G H6	G H4	.8028	.8098	.8077	.8110	.8089
⅞		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
1⅛	7		G H8	G H4	G H8	G H4	1.0322	1.0407	1.0381	1.0416	1.0393
1⅛		12	G H4	G H4	G H6	G H4	1.0709	1.0765	1.0749	1.0787	1.0768
1¼	7		G H8	G H4	G H8	G H4	1.1572	1.1657	1.1631	1.1668	1.1644
1¼		12	G H4	G H4	G H6	G H4	1.1959	1.2015	1.1999	1.2039	1.2019
1⅜	6		G H8	G H4	G H8	G H4	1.2667	1.2768	1.2738	1.2771	1.2745
1⅜		12	G H4	G H4	G H6	G H4	1.3209	1.3265	1.3249	1.3291	1.3270
1½	6		G H8	G H4	G H8	G H4	1.3917	1.4018	1.3988	1.4022	1.3996
1½		12	G H4	G H4	G H6	G H4	1.4459	1.4515	1.4499	1.4542	1.4522

Standard Taps - Recommendations for Classes 2, 2B, 3B & Oversize Unified & American Screw Threads

Machine Screw Sizes

Tap Size	Threads per Inch NC UNC	NF UNF	NS	Major Diameter* in Inches Basic	Min.	Max.	Basic Pitch Diam.	Pitch Diameter Limits in inches H1 Limit Min.	H1 Limit Max.	H2 Limit Min.	H2 Limit Max.	H3 Limit Min.	H3 Limit Max.	H7 Limit* Min.	H7 Limit* Max.
0		80		.0600	.0605	.0615	.0519	.0519	.0524	.0524	.0529				
1	64			.0730	.0735	.0745	.0629	.0629	.0634	.0634	.0639				
1		72		.0730	.0735	.0745	.0640	.0640	.0645	.0645	.0650				
2	56			.0860	.0865	.0875	.0744	.0744	.0749	.0749	.0754				
2		64		.0860	.0865	.0875	.0759	.0759	.0764	.0764	.0769				
3	48			.0990	.1000	.1010	.0855	.0855	.0860	.0860	.0865				
3		56		.0990	.0995	.1005	.0874	.0874	.0879	.0879	.0884				
4			36	.1120	.1135	.1145	.0940			.0945	.0950				
4	40			.1120	.1135	.1145	.0958	.0958	.0963	.0963	.0968				
4		48		.1120	.1130	.1140	.0985	.0985	.0990	.0990	.0995				
5	40			.1250	.1265	.1275	.1088	.1088	.1093	.1093	.1098				
5		44		.1250	.1260	.1270	.1102	.1102	.1107	.1107	.1112				
6	32			.1380	.1400	.1410	.1177			.1182	.1187	.1187	.1192	.1207	.1212
6		40		.1380	.1395	.1405	.1218	.1218	.1223	.1223	.1228				
8	32			.1640	.1660	.1670	.1437	.1437	.1442	.1442	.1447	.1447	.1452	.1467	.1472
8		36		.1640	.1655	.1665	.1460	.1460	.1465	.1465	.1470				
10	24			.1900	.1930	.1940	.1629	.1629	.1634	.1634	.1639	.1639	.1644	.1659	.1664
10		32		.1900	.1920	.1930	.1697	.1697	.1702	.1702	.1707	.1707	.1712	.1727	.1732
12	24			.2160	.2190	.2200	.1889	.1889	.1894			.1899	.1904		
12		28		.2160	.2185	.2195	.1928	.1928	.1933			.1938	.1943		

Fractional Sizes

Tap Size	Threads per Inch NC UNC	NF UNF	NS	Major Diameter in Inches Basic	Min.	Max.	Basic Pitch Diam.	Pitch Diameter Limits in Inches H1 Limit Min.	H1 Limit Max.	H2 Limit Min.	H2 Limit Max.	H3 Limit Min.	H3 Limit Max.	H4 Limit Min.	H4 Limit Max.	H5 Limit Min.	H5 Limit Max.	H6 Limit Min.	H6 Limit Max.
¼	20			.2500	.2540	.2550	.2175	.2175	.2180	.2180	.2185	.2185	.2190			.2195	.2200		
¼		28		.2500	.2525	.2535	.2268	.2268	.2273	.2273	.2278	.2278	.2283	.2283	.2288				
5/16	18			.3125	.3170	.3180	.2764	.2764	.2769	.2769	.2774	.2774	.2779			.2784	.2789		
5/16		24		.3125	.3155	.3165	.2854	.2854	.2859	.2859	.2864	.2864	.2869	.2869	.2874				
⅜	16			.3750	.3800	.3810	.3344	.3344	.3349	.3349	.3354	.3354	.3359			.3364	.3369		
⅜		24		.3750	.3780	.3790	.3479	.3479	.3484	.3484	.3489	.3489	.3494	.3494	.3499				
7/16	14			.4375	.4435	.4445	.3911	.3911	.3916	.3916	.3921	.3921	.3926			.3931	.3936		
7/16		20		.4375	.4415	.4425	.4050	.4050	.4055	.4055	.4060	.4060	.4065			.4070	.4075		
½	13			.5000	.5065	.5075	.4500	.4500	.4505	.4505	.4510	.4510	.4515			.4520	.4525		
½		20		.5000	.5040	.5050	.4675	.4675	.4680	.4680	.4685	.4685	.4690			.4695	.4700		
9/16	12			.5625	.5690	.5700	.5084			.5089	.5094	.5094	.5099			.5104	.5109		
9/16		18		.5625	.5670	.5680	.5264			.5269	.5274	.5274	.5279			.5284	.5289		
⅝	11			.6250	.6320	.6330	.5660	.5660	.5665	.5665	.5670	.5670	.5675			.5680	.5685		
⅝		18		.6250	.6295	.6305	.5889	.5889	.5894	.5894	.5899	.5899	.5904			.5909	.5914		
11/16			11	.6875	.6945	.6955	.6285					.6295	.6300						
11/16			16	.6875	.6925	.6935	.6469					.6479	.6484						
¾	10			.7500	.7575	.7590	.6850	.6850	.6855	.6855	.6860	.6860	.6865			.6870	.6875		
¾		16		.7500	.7550	.7560	.7094	.7094	.7099	.7099	.7104	.7104	.7109			.7114	.7119		
⅞	9			.8750	.8835	.8850	.8028			.8033	.8038			.8043	.8048			.8053	.8058
⅞		14		.8750	.8810	.8820	.8286			.8291	.8296			.8301	.8306			.8311	.8316
1	8			1.0000	1.0095	1.0110	.9188			.9193	.9198			.9203	.9208			.9213	.9218
1		12		1.0000	1.0065	1.0075	.9459							.9474	.9479				
1			14	1.0000	1.0060	1.0070	.9536			.9541	.9546			.9551	.9556				
1⅛	7			1.1250	1.1350	1.1370	1.0322							1.0332	1.0342				
1⅛		12		1.1250	1.1315	1.1325	1.0709							1.0719	1.0729				
1¼	7			1.2500	1.2600	1.2620	1.1572							1.1582	1.1592				
1¼		12		1.2500	1.2565	1.2575	1.1959							1.1969	1.1979				
1⅜	6			1.3750	1.3870	1.3890	1.2667							1.2677	1.2687				
1⅜		12		1.3750	1.3815	1.3825	1.3209							1.3219	1.3229				
1½	6			1.5000	1.5120	1.5140	1.3917							1.3927	1.3937				
1½		12		1.5000	1.5065	1.5075	1.4459							1.4469	1.4479				

* Major Diameter for H7 Limit Tap is .002" larger than values shown in column 6 and 7.

Straight Pipe Taps
Ground Thread Limits

American National Standard Straight Pipe Thread Form (NPS) (NPSC) (NPSM)

Nominal Size in Inches	Threads per Inch	Major Diameter in Inches: Plug at Gaging Notch	Major Diameter in Inches: Minimum G	Major Diameter in Inches: Maximum H	Pitch Diameter in Inches: Plug at Gaging Notch E	Pitch Diameter in Inches: Minimum K	Pitch Diameter in Inches: Maximum L
⅛	27	.3983	.4022	.4032	.3736	.3746	.3751
¼	18	.5286	.5347	.5357	.4916	.4933	.4938
⅜	18	.6640	.6701	.6711	.6270	.6287	.6292
½	14	.8260	.8374	.8357	.7784	.7806	.7811
¾	14	1.0364	1.0447	1.0457	.9889	.9906	.9916
1	11½	1.2966	1.3062	1.3077	1.2386	1.2402	1.2412
1¼	11½	1.6413	1.6507	1.6522	1.5834	1.5847	1.5862
1½	11½	1.8803	1.8897	1.8912	1.8223	1.8237	1.8252
2	11½	2.3542	2.3639	2.3654	2.2963	2.2979	2.2994
2½	8	2.8454	2.8604	2.8619	2.7622	2.7640	2.7660
3	8	3.4718	3.4868	3.4883	3.3885	3.3904	3.3924
3½	8	3.9721	3.9872	3.9887	3.8888	3.8908	3.8928
4	8	4.4704	4.4855	4.4870	4.3871	4.3891	4.3911

Lead Tolerance
A maximum lead deviation of plus or minus .0005" within any two threads not farther apart than 1" is permitted.

Angle Tolerance

Threads per Inch	Deviation in Half Angle
8	25' Plus or Minus
11½ to 27 Inclusive	30' Plus or Minus

Dryseal American National Standard Straight Pipe Thread Form (NPSF)

Nominal Size M Inches	Threads per Inch	Major Diameter: Minimum G	Major Diameter: Maximum H	Pitch Diameter: Plug at Gaging Notch E	Pitch Diameter: Minimum K	Pitch Diameter: Maximum L	Minor* Diam. Flat Max.
1/16	27	.3008	.3018	.2812	.2772	.2777	.004
⅛	27	.3932	.3942	.3736	.3696	.3701	.004
¼	18	.5239	.5249	.4916	.4859	.4864	.005
⅜	18	.6593	.6603	.6270	.6213	.6218	.005
½	14	.8230	.8240	.7784	.7712	.7717	.005
¾	14	1.0335	1.0345	.9889	.9817	.9822	.005
1	11½	1.2933	1.2943	1.2386	1.2295	1.2305	.006

* As specified or sharper.

Lead Tolerance
A maximum lead deviation of plus or minus .0005" within any two threads not farther apart than 1" is permitted.

Angle Tolerance

Threads per Inch	Deviation in Half Angle
11½ to 27 inclusive	30' Plus or Minus

Taper Pipe Taps
Ground & Cut Thread Limits

American National Standard Taper Pipe Thread Form (NPT)

Nominal Size in Inches	Threads per Inch	**Gage Measurement in Inches: Projection	Tolerance Plus or Minus: Cut Thread*	Tolerance Plus or Minus: Ground Thread	Taper per Foot in Inches: Cut Thread* Minimum	Taper per Foot in Inches: Cut Thread* Maximum	Taper per Foot in Inches: Ground Thread Minimum	Taper per Foot in Inches: Ground Thread Maximum
1/16	27	.312	1/16	1/16	23/32	27/32	23/32	25/32
1/8	27	.312	1/16	1/16	23/32	27/32	23/32	25/32
1/4	18	.459	1/16	1/16	23/32	27/32	23/32	25/32
3/8	18	.454	1/16	1/16	23/32	27/32	23/32	25/32
1/2	14	.579	1/16	1/16	23/32	13/16	23/32	25/32
3/4	14	.565	1/16	1/16	23/32	13/16	23/32	25/32
1	11 1/2	.678	3/32	3/32	23/32	13/16	23/32	25/32
1 1/4	11 1/2	.686	3/32	3/32	23/32	13/16	23/32	25/32
1 1/2	11 1/2	.699	3/32	3/32	23/32	13/16	23/32	25/32
2	11 1/2	.667	3/32	3/32	23/32	13/16	23/32	25/32
2 1/2	8	.925	3/32	3/32	47/64	51/64	47/64	25/32
3	8	.925	3/32	3/32	47/64	51/64	47/64	25/32
3 1/2	8	.938	1/8	1/8	47/64	51/64	47/64	25/32
4	8	.950	1/8	1/8	47/64	51/64	47/64	25/32

** Distance small end of tap projects through Taper Thread Ring Gage L1.

Lead Tolerance

Cut Thread* = A maximum lead deviation of plus or minus .003" within any two threads not farther apart than 1" is permitted.

Ground Thread = A maximum lead deviation of plus or minus .0005" within any two threads not farther apart than 1" is permitted.

Angle Tolerance

Threads per Inch	Tolerance: Half Angle: Cut Thread*	Tolerance: Half Angle: Ground Thread	Tolerance: Full Angle: Cut Thread*
8	40′ Plus or Minus	25′ Plus or Minus	60′
11 1/2 to 27 Inclusive	45′ Plus or Minus	30′ Plus or Minus	68′

* Cut thread tolerances apply only to NPT taps.

Widths of Flats at Tap Crests and Roots

Threads Per Inch	Tap Flat Width at	Column I NPT – Cut & Ground Thread ANPT – Ground Thread: Minimum	Column I: Maximum	Column II NPTF – Ground Thread: Minimum	Column II: Maximum
27	Major Dia.	.0014	.0041	.0040	.0055
	Minor Dia.		.0041		.0040
18	Major Dia.	.0021	.0057	.0050	.0065
	Minor Dia.		.0057		.0050
14	Major Dia.	.0027	.0064	.0050	.0065
	Minor Dia.		.0064		.0050
11 1/2	Major Dia.	.0033	.0073	.0060	.0083
	Minor Dia.		.0073		.0060
8	Major Dia.	.0048	.0090	.0080	.0103
	Minor Dia.		.0090		.0080

Minimum minor diameter flats are not specified. May be as sharp as practicable.

Note: Cut thread taps made to Column I are marked NPT but are not recommended for ANPT application. Ground thread taps made to Column I may be used for NPT and ANPT applications and are so marked. Ground thread taps made to Column II are marked NPTF and used for Dry-seal application.

Pipe Taps
Drill Selector (NPS) (NPT) (NPSF) (NPTF)

Straight and Taper Piper Taps

The drill diameters listed for NPT (not reamed) are the diameters of standard drills which are the closest to minor diameters at small end of the pipe.

They represent the diameters of the holes which would be cut with a twist drill correctly ground when drilling a material without tearing or flow of metal. This is approximately the condition that exists when a correctly sharpened twist drill is cutting a hole in a homogeneous block of cast iron.

When nonferrous metals and other similar materials are to be drilled and tapped, it may be found necessary to use a drill of slightly larger or smaller diameter to produce a hole of a size that will make it possible for the tap to cut an acceptable pipe thread with the required thread height.

It should be understood that this table of twist drill diameters is intended to help only the occasional user of drills in the application of this standard.

When internal pipe threads are produced in larger quantities in a particular type of material and with specially designed machinery it may be found to be more advantageous to use a drill size not given in the table, even one having non-standard diameter.

	Straight Pipe (NPS)		Taper Pipe (NPT)			
Nominal Pipe Size	Tap Drill Size	Decimal Equivalent	Tap Drill Size With Reamer	Decimal Equivalent	Tap Drill Size Without Reamer	Decimal Equivalent
1/16–27	1/4	0.250	6.1 mm	0.240	"D"	0.246
1/8 –27	11/32	0.344	21/64	0.328	"Q"	0.332
1/4 –18	7/16	0.438	27/64	0.422	7/16	0.438
3/8 –18	37/64	0.578	9/16	0.562	9/16	0.562
1/2 –14	23/32	0.719	11/16	0.688	45/64	0.703
3/4 –14	59/64	0.922	57/64	0.891	29/32	0.906
1 –11 1/2	1 5/32	1.156	1 1/8	1.125	1 9/64	1.141
1 1/4 –11 1/2	1 1/2	1.500	1 15/32	1.469	1 31/64	1.484
1 1/2 –11 1/2	1 3/4	1.750	1 23/32	1.719	1 47/64	1.734
2 –11 1/2	2 7/32	2.219	2 3/16	2.188	2 13/64	2.203
2 1/2 – 8	2 21/32	2.656	2 19/32	2.594	2 5/8	2.625

Straight and Taper Pipe Taps - Dryseal

The drill diameters given are for taper and straight internal pipe threads and will usually permit the tapping of acceptable threads in free-machining brass or steel provided the drill is correctly sharpened. When hard metals or other similar materials are to be drilled and tapped, it may be necessary to use a drill of slightly larger diameter whereas some soft materials may require a smaller size.

Taper pipe threads of improved quality are obtained when the holes are taper reamed after drilling and before tapping. Standard taper pipe reamers are used and, as in drilling, the actual size of the hole depends upon the material and is best determined by a trial.

	Straight Pipe (NPSF)		Taper Pipe (NPTF)			
Nominal Pipe Size	Tap Drill Size	Decimal Equivalent	Tap Drill Size With Reamer	Decimal Equivalent	Tap Drill Size Without Reamer	Decimal Equivalent
1/16–27	D	.246	A	.234	C	.242
1/8 –27	R	.339	21/64	.328	Q	.332
1/4 –18	7/16	.438	27/64	.422	7/16	.438
3/8 –18	37/64	.578	9/16	.563	9/16	.562
1/2 –14	23/32	.719	11/16	.688	45/64	.703
3/4 –14	59/64	.922	57/64	.891	29/32	.906
1 –11 1/2	1 5/32	1.156	1 1/8	1.125	1 9/64	1.141
1 1/4–11 1/2			1 15/32	1.469	1 31/64	1.484
1 1/2 –11 1/2			1 45/64	1.703	1 23/32	1.719
2 –11 1/2			2 11/64	2.172	2 3/16	2.188
2 1/2 – 8			2 37/64	2.578	2 39/64	2.609
3 – 8			3 13/64	3.203	3 15/64	3.234