

Drill Chart - Standard Drill Sizes / Millimeter Sizes

(See typical tolerances of drilled holes at bottom of page)

Drill (in.)	Decimal	Drill (in.)	Decimal	Drill (in.)	Decimal	Drill (mm)	Decimal (in.)	Drill (mm)	Decimal (in.)	Drill (mm)	Decimal (in.)
80	.0135	1/8	.1250	O	.3160	.35	.0138	3.4	.1339	8.0	.3150
79	.0145	30	.1285	P	.3230	.4	.0157	3.5	.1378	8.1	.3189
1/64	.0156	29	.1360	21/64	.3281	.45	.0177	3.6	.1417	8.2	.3228
78	.0160	28	.1405	Q	.3320	.5	.0197	3.7	.1457	8.25	.3248
77	.0180	9/64	.1406	R	.3390	.55	.0217	3.75	.1477	8.3	.3267
76	.0200	27	.1440	11/32	.3437	.6	.0236	3.8	.1496	8.4	.3307
75	.0210	26	.1470	S	.3480	.65	.0256	3.9	.1535	8.5	.3346
74	.0225	25	.1495	T	.3580	.7	.0276	4.0	.1575	8.6	.3386
73	.0240	24	.1520	23/64	.3594	.75	.0295	4.1	.1614	8.7	.3425
72	.0250	23	.1540	U	.3680	.8	.0315	4.2	.1654	8.75	.3445
71	.0260	5/32	.1562	3/8	.3750	.85	.0335	4.25	.1674	8.8	.3465
70	.0280	22	.1570	V	.3770	.9	.0355	4.3	.1693	8.9	.3504
69	.0292	21	.1590	W	.3860	.95	.0374	4.4	.1732	9.0	.3543
68	.0310	20	.1610	25/64	.3906	1.0	.0394	4.5	.1771	9.1	.3583
1/32	.0313	19	.1660	X	.3970	1.05	.0413	4.6	.1811	9.2	.3622
67	.0320	18	.1695	Y	.4040	1.1	.0433	4.7	.1850	9.25	.3642
66	.0330	11/64	.1719	13/32	.4062	1.15	.0453	4.75	.1870	9.35	.3661
65	.0350	17	.1730	Z	.4130	1.2	.0472	4.8	.1890	9.4	.3701
64	.0360	16	.1770	27/64	.4219	1.25	.0492	4.9	.1929	9.5	.3740
63	.0370	15	.1800	7/16	.4375	1.3	.0512	5.0	.1968	9.6	.3780
62	.0380	14	.1820	29/64	.4531	1.35	.0531	5.1	.2008	9.7	.3819
61	.0390	13	.1850	15/32	.4687	1.4	.0551	5.2	.2047	9.75	.3839
60	.0400	3/16	.1875	31/64	.4844	1.45	.0571	5.25	.2067	9.8	.3858
59	.0410	12	.1890	1/2	.5000	1.5	.0591	5.3	.2087	9.9	.3898
58	.0420	11	.1910	33/64	.5156	1.55	.0610	5.4	.2126	10.0	.3937
57	.0430	10	.1935	17/32	.5312	1.6	.0629	5.5	.2165	10.5	.4133
56	.0465	9	.1960	35/64	.5469	1.65	.0650	5.6	.2205	11.0	.4331
3/64	.0469	8	.1990	9/16	.5625	1.7	.0669	5.7	.2244	11.5	.4528
55	.0520	7	.2010	37/64	.5781	1.75	.0689	5.75	.2264	12.0	.4724
54	.0550	13/64	.2031	19/32	.5937	1.8	.0709	5.8	.2283	12.5	.4921
53	.0595	6	.2040	39/64	.6094	1.85	.0728	5.9	.2323	13.0	.5118
1/16	.0625	5	.2055	5/8	.6250	1.9	.0748	6.0	.2362	13.5	.5315
52	.0635	4	.2090	41/64	.6406	1.95	.0768	6.1	.2401	14.0	.5512
51	.0670	3	.2130	21/32	.6562	2.0	.0787	6.2	.2441	14.5	.5708
50	.0700	7/32	.2187	43/64	.6719	2.05	.0807	6.25	.2461	15.0	.5906
49	.0730	2	.2210	11/16	.6875	2.1	.0827	6.3	.2480	15.5	.6102
48	.0760	1	.2280	45/64	.7031	2.15	.0846	6.4	.2520	16.0	.6300
5/64	.0781	A	.2340	23/32	.7187	2.2	.0866	6.5	.2559	16.5	.6496
47	.0785	15/64	.2344	47/64	.7344	2.25	.0886	6.6	.2598	17.0	.6693
46	.0810	B	.2380	3/4	.7500	2.3	.0905	6.7	.2638	17.5	.6889
45	.0820	C	.2420	49/64	.7656	2.35	.0925	6.75	.2658	18.0	.7087
44	.0860	D	.2460	25/32	.7812	2.4	.0945	6.8	.2677	18.5	.7283
43	.0890	E	.2500	51/64	.7969	2.45	.0965	6.9	.2716	19.0	.7480
42	.0935	1/4	.2500	13/16	.8125	2.5	.0984	7.0	.2756	19.5	.7677
3/32	.0937	F	.2570	53/64	.8281	2.55	.1004	7.1	.2795	20.0	.7874
41	.0960	G	.2610	27/32	.8437	2.6	.1024	7.2	.2835	20.5	.8071
40	.0980	17/64	.2656	55/64	.8594	2.65	.1043	7.25	.2855	21.0	.8268
39	.0995	H	.2660	7/8	.8750	2.7	.1063	7.3	.2874	21.5	.8465

38	.1015	I	.2720	57/64	.8906	2.75	.1083	7.4	.2913	22.0	.8661
37	.1040	J	.2770	29/32	.9062	2.8	.1102	7.5	.2953	22.5	.8858
36	.1065	K	.2811	59/64	.9219	2.9	.1142	7.6	.2990	23.0	.9055
7/64	.1093	9/32	.2812	15/16	.9375	3.0	.1181	7.7	.3031	23.5	.9252
35	.1100	L	.2900	61/64	.9531	3.1	.1220	7.75	.3051	24.0	.9449
34	.1110	M	.2950	31/32	.9687	3.2	.1260	7.8	.3071	24.5	.9646
33	.1130	19/64	.2968	63/64	.9844	3.25	.1280	7.9	.3110	25.0	.9843
32	.1160	N	.3020	1	1.000	3.3	.1299				
31	.1200	5/16	.3125								

HOLE DIA TOLERANCE-STANDARD DRILLED HOLE TOLERANCES FOR HOLES DRILLED WITH A DRILLING MACHINE USING SUITABLE JIGS AND FIXTURES, THE HOLE TOLERANCES DEPEND UPON THE DIAMETER OF THE HOLE AND INCREASE AS THE HOLE DIAMETER INCREASES. THE FOLLOWING ARE STANDARD TOLERANCES FOR GENERAL MACHINE WORK AND APPLY IN ALL CASES EXCEPT WHERE GREATER OR LESSER ACCURACY IS REQUIRED BY THE DESIGN.














**.0135 THRU .125 +.004/-.001
.1260 THRU .25 +.005/-.001
.2510 THRU .500 +.006/-.001
.5010 THRU .750 +.008/-.001
.7510 THRU 1.000 +.010/-.001
1.001 THRU 2.000 +.012/-.001**

Tap Drill Reference

Imperial Tap Drill Chart											
Machine Screw Size		Number of Threads Per Inch	Minor Dia.	Tap Drills				Clearance Hole Drills			
				Aluminum, Brass & Plastics		Stainless Steel, Steels & Iron		All Materials			
				75% Thread		50% Thread		Close Fit		Free Fit	
No. or Dia.	Major Dia.			Drill Size	Decimal Equiv.	Drill Size	Decimal Equiv.	Drill Size	Decimal Equiv.	Drill Size	Decimal Equiv.
0	.0600	80	.0447	3/64	.0469	55	.0520	52	.0635	50	.0700
1	.0730	64	.0538	53	.0595	1/16	.0625	48	.0760	46	.0810
		72	.0560	53	.0595	52	.0635				
2	.0860	56	.0641	50	.0700	49	.0730	43	.0890	41	.0960
		64	.0668	50	.0700	48	.0760				
3	.0990	48	.0734	47	.0785	44	.0860	37	.1040	35	.1100
		56	.0771	45	.0820	43	.0890				
4	.1120	40	.0813	43	.0890	41	.0960	32	.1160	30	.1285
		48	.0864	42	.0935	40	.0980				
5	.1250	40	.0943	38	.1015	7/64	.1094	30	.1285	29	.1360
		44	.0971	37	.1040	35	.1100				
6	.1380	32	.0997	36	.1065	32	.1160	27	.1440	25	.1495
		40	.1073	33	.1130	31	.1200				
8	.1640	32	.1257	29	.1360	27	.1440	18	.1695	16	.1770
		36	.1299	29	.1360	26	.1470				
10	.1900	24	.1389	25	.1495	20	.1610	9	.1960	7	.2010
		32	.1517	21	.1590	18	.1695				
12	.2160	24	.1649	16	.1770	12	.1890	2	.2210	1	.2280
		28	.1722	14	.1820	10	.1935				
		32	.1777	13	.1850	9	.1960				
1/4	.2500	20	.1887	7	.2010	7/32	.2188	F	.2570	H	.2660
		28	.2062	3	.2130	1	.2280				
		32	.2117	7/32	.2188	1	.2280				
5/16	.3125	18	.2443	F	.2570	J	.2770	P	.3230	Q	.3320
		24	.2614	I	.2720	9/32	.2812				
		32	.2742	9/32	.2812	L	.2900				
3/8	.3750	16	.2983	5/16	.3125	Q	.3320	W	.3860	X	.3970
		24	.3239	Q	.3320	S	.3480				
		32	.3367	11/32	.3438	T	.3580				
7/16	.4375	14	.3499	U	.3680	25/64	.3906	29/64	.4531	15/32	.4687
		20	.3762	25/64	.3906	13/32	.4062				
		28	.3937	Y	.4040	Z	.4130				
1/2	.5000	13	.4056	27/64	.4219	29/64	.4531	33/64	.5156	17/32	.5312
		20	.4387	29/64	.4531	15/32	.4688				
		28	.4562	15/32	.4688	15/32	.4688				
9/16	.5625	12	.4603	31/64	.4844	33/64	.5156	37/64	.5781	19/32	.5938
		18	.4943	33/64	.5156	17/32	.5312				
		24	.5114	33/64	.5156	17/32	.5312				
5/8	.6250	11	.5135	17/32	.5312	9/16	.5625	41/64	.6406	21/32	.6562
		18	.5568	37/64	.5781	19/32	.5938				
		24	.5739	37/64	.5781	19/32	.5938				
11/16	.6875	24	.6364	41/64	.6406	21/32	.6562	45/64	.7031	23/32	.7188
3/4	.7500	10	.6273	21/32	.6562	11/16	.6875	49/64	.7656	25/32	.7812
		16	.6733	11/16	.6875	45/64	.7031				
		20	.6887	45/64	.7031	23/32	.7188				
1-3/16	.8125	20	.7512	49/64	.7656	25/32	.7812	53/64	.8281	27/32	.8438
7/8	.8750	9	.7387	49/64	.7656	51/64	.7969	57/64	.8906	29/32	.9062
		14	.7874	13/16	.8125	53/64	.8281				
		20	.8137	53/64	.8281	27/32	.8438				

		20	.8137	53/64	.8281	27/32	.8438				
15/16	.9375	20	.8762	57/64	.8906	29/32	.9062	61/64	.9531	31/32	.9688
1	1.000	8	.8466	7/8	.8750	59/64	.9219	1-1/64	1.0156	1-1/32	1.0313
		12	.8978	15/16	.9375	61/64	.9531				
		20	.9387	61/64	.9531	31/32	.9688				
1-1/16	1.0625	18	.9943	1.000	1.000	1-1/64	1.0156	1-5/64	1.0781	1-3/32	1.0938
1-1/8	1.1250	7	.9497	63/64	.9844	1-1/32	1.0313	1-9/64	1.1406	1-5/32	1.1562
		12	1.0228	1-3/64	1.0469	1-5/64	1.0781				
		18	1.0568	1-1/16	1.0625	1-5/64	1.0781				
1-3/16	1.1875	18	1.1193	1-1/8	1.1250	1-9/64	1.1406	1-13/64	1.2031	1-7/32	1.2188
1-1/4	1.2500	7	1.0747	1-7/64	1.1094	1-5/32	1.1562	1-17/64	1.2656	1-9/32	1.2812
		12	1.1478	1-11/64	1.1719	1-13/64	1.2031				
		18	1.1818	1-3/16	1.1875	1-13/64	1.2031				
1-5/16	1.3125	18	1.2443	1-1/4	1.2500	1-17/64	1.2656	1-21/64	1.3281	1-11/32	1.3438
1-3/8	1.3750	6	1.1705	1-7/32	1.2187	1-17/64	1.2656	1-25/64	1.3906	1-13/32	1.4062
		12	1.2728	1-19/64	1.2969	1-21/64	1.3281				
		18	1.3068	1-5/16	1.3125	1-21/64	1.3281				
1-7/16	1.4375	18	1.3693	1-3/8	1.3750	1-25/64	1.3906	1-29/64	1.4531	1-15/32	1.4688
1-1/2	1.500	6	1.2955	1-11/32	1.3437	1-25/64	1.3906	1-33/64	1.5156	1-17/32	1.5312
		12	1.3978	1-27/64	1.4219	1-7/16	1.4375				
		18	1.4318	1-7/16	1.4375	1-29/64	1.4531				
1-9/16	1.5625	18	1.4943	1-12	1.500	1-33/64	1.5156	1-37/64	1.5781	1-19/32	1.5938
1-5/8	1.625	18	1.5568	1-9/16	1.5625	1-37/64	1.5781	1-41/64	1.6406	1-21/32	1.6562
1-11/16	1.6875	18	1.6193	1-5/8	1.6250	1-41/64	1.6406	1-45/64	1.7031	1-23/32	1.7188
1-3/4	1.750	5	1.5046	1-9/16	1.5625	1-5/8	1.6250	1-49/64	1.7659	1-25/32	1.7812

Grade Identification Markings for Carbon Steel Externally Threaded Fasteners

Grade Identification Marking	Specification	Material	Nominal Size in.	Proof Load Stress ksi	Tensile Strength Min ksi	Hardness Rockwell Min Max	See Note			
 No Mark	SAE J429 - Grade 1	Low or Medium Carbon Steel	1/4 thru 1 1/2	33	60	B70 B100				
	SAE J429 - Grade 2		1/4 thru 3/4 over over 3/4 thru 1 1/2	55 33	74 60	B80 B100 B70 B100				
	ASTM A307 - Grade A		1/4 thru 4	–	60	B69 B100				
	ASTM A307 - Grade B		1/4 thru 4	–	60 Min 100 Max	B69 B95				
	SAE J429 - Grade 5 ASTM A449 - Type 1	Medium Carbon Steel, Quenched and Tempered	1/4 thru 1 over 1 thru 1 1/2	85 74	120 105	C25 C34 C19 C30				
	ASTM A449 - Type 1		over 1 1/2 thru 3	55	90	183 235	3			
	SAE J429 - Grade 5.1	Low or Medium Carbon Steel, Quenched and Tempered	N0.6 Thru 1/2	85	120	C25 C40	4			
	SAE J429 - Grade 5.2 ASTM A449 - Type2	Low Carbon Martensite Steel, Quenched and Tempered	1/4 thru 1	85	120	C26 C36 C25 C34				
	ASTM A325 - Type 1	Medium Carbon Steel Quenched and Tempered					5			
	ASTM A325 - Type 2	Low Carbon Martensite Steel, Quenched and Tempered	1/2 Thru 1 over 1 to 1 1/2	85 74	120 105	C24 C35 C19 C31				
	ASTM A325 - Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered								6
	ASTM A354 - Grade BC	Medium Carbon Alloy Steel, Quenched and Tempered					1/4 thru 2 1/2 over 2 1/2 thru 4	105 95	125 115	C26 C36 C22 C33
	SAE J429 - Grade 8 ASTM A354 - Grade BD	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 1 1/2	120	150	C33 C39				
			1/4 thru 2 1/2 over 2 1/2 thru 4	120 105	150 140	C33 C39 C31 C39	7			
	SAE J429 - Grade 8.2	Low Carbon Martensite Alloy Steel, Quenched and Tempered	1/4 thru 1	120	150	C33 C39				
	ASTM A490 - Type 1	Medium Carbon Alloy Steel, Quenched and Tempered	1/2 Thru 1 1/2	120	150 Min 170 Max	C33 C38				
	ASTM A490 - Type 2	Low Carbon Martensite Steel, Quenched and Tempered	1/2 Thru 1	120	150 Min 170 Max	C33 C38				
	ASTM A490 - Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/2 Thru 1	120	150 Min 170 Max	C33 C38	6			

- In addition to the indicated grade marking, all grades included in this Table must be marked for manufacturer identification.
- While hex heads are shown, grade markings apply equally to products with other head configurations.
- Hardnesses are Brinell Hardness Numbers.
- Grade 5.1 is a popular grade for sems
- A325 Type 1 bolts may also be marked with 3 radial lines 1200 apart in addition to the A325 marking.
- The bolt manufacturer, at his option, may add other markings to indicate the use of atmospheric corrosion resistant steel.
- A354 Grade BD products, in sizes 1 1/2 in. and smaller, are identified as shown and, at the manufacturers option, may have the letters BD added. Larger sizes are marked only BD.

NOTES:



CARBON STEEL BOLTS PROOF AND TENSILE STRENGTHS



PROOF LOAD AND TENSILE STRENGTH REQUIREMENTS (a)

Nominal Dia of Product and Threads per in.	Stress Area, in. ²	Grade 1		Grade 2		Grade 4		Grades 5 and 5.2 ^B		Grade 5.1		Grade 7		Grades 8, 8.1, 8.2 ^B	
		Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb
Coarse Thread Series - UNC															
No.6-32	0.00909	-	-	-	-	-	-	-	-	750	1,100	-	-	-	-
8-32	0.0140	-	-	-	-	-	-	-	-	1,200	1,700	-	-	-	-
10-24	0.0175	-	-	-	-	-	-	-	-	1,500	2,100	-	-	-	-
12-24	0.0242	-	-	-	-	-	-	-	-	2,050	2,900	-	-	-	-
1/4-20	0.0318	1,050	1,900	1,750	2,350	2,050	3,650	2,700	3,800	2,700	3,800	3,350	4,250	3,800	4,750
5/16-18	0.0524	1,750	3,150	2,900	3,900	3,400	6,000	4,450	6,300	4,450	6,300	5,500	6,950	6,300	7,850
3/8-16	0.0775	2,550	4,650	4,250	5,750	5,050	8,400	6,600	9,300	6,600	9,300	8,150	10,300	9,300	11,600
7/16-14	0.1063	3,500	6,400	5,850	7,850	6,900	12,200	9,050	12,800	9,050	12,800	11,200	14,100	12,800	15,900
1/2-13	0.1419	4,700	8,500	7,800	10,500	9,200	16,300	12,100	17,000	12,100	17,000	14,900	18,900	17,000	21,300
9/16-12	0.182	6,000	10,900	10,000	13,500	11,800	20,900	15,500	21,800	15,500	21,800	19,100	24,200	21,800	27,300
5/8-11	0.226	7,450	13,600	12,400	16,700	14,700	25,400	19,200	27,100	19,200	27,100	23,700	30,100	27,100	33,900
3/4-10	0.334	11,000	20,000	18,400	24,700	21,700	38,400	28,400	40,100	-	-	35,100	44,400	40,100	50,100
7/8-9	0.462	15,200	27,700	15,200	27,700	30,000	53,100	39,300	55,400	-	-	48,500	61,400	55,400	69,300
1-8	0.606	20,000	36,400	20,000	36,400	39,400	69,700	51,500	72,700	-	-	63,800	80,600	72,700	90,900
1-1/8-7	0.763	25,200	45,800	25,200	45,800	49,600	87,700	56,500	80,100	-	-	80,100	101,500	91,600	114,400
1-1/4-7	0.969	32,000	58,100	32,000	58,100	63,000	111,400	71,700	101,700	-	-	101,700	127,700	116,300	145,400
1-3/8-6	1.155	38,100	69,300	38,100	69,300	75,100	132,800	85,500	121,300	-	-	121,300	153,600	138,600	173,200
1-1/2-6	1.405	46,400	84,300	46,400	84,300	91,300	161,600	104,000	147,500	-	-	147,500	186,900	168,600	210,800
Fine Thread Series - UNF															
No.6-40	0.01015	-	-	-	-	-	-	-	-	850	1,200	-	-	-	-
8-38	0.01474	-	-	-	-	-	-	-	-	1,250	1,750	-	-	-	-
10-32	0.0200	-	-	-	-	-	-	-	-	1,700	2,400	-	-	-	-
12-28	0.0258	-	-	-	-	-	-	-	-	2,200	3,100	-	-	-	-
1/4-28	0.0364	1,200	2,200	2,000	2,700	2,350	4,200	3,100	4,350	3,100	4,350	3,800	4,850	4,350	5,450
5/16-24	0.0580	1,900	3,500	3,200	4,300	3,750	6,700	4,900	6,950	4,900	6,950	6,100	7,700	6,950	8,700
3/8-24	0.0878	2,900	5,250	4,800	6,500	5,700	10,100	7,450	10,500	7,450	10,500	9,200	11,700	10,500	13,200
7/16-20	0.1187	3,900	7,100	6,550	8,800	7,700	13,650	10,100	14,200	10,100	14,200	12,500	15,800	14,200	17,800
1/2-20	0.1599	5,300	9,600	8,800	11,800	10,400	18,400	13,600	19,200	13,600	19,200	16,800	21,300	19,200	24,000
9/16-18	0.203	6,700	12,200	11,200	15,000	13,200	23,300	17,300	24,400	17,300	24,400	21,300	27,000	24,400	30,400
5/8-18	0.256	8,450	15,400	14,100	18,900	16,600	29,400	21,800	30,700	21,800	30,700	26,900	34,000	30,700	38,400
3/4-16	0.373	12,300	22,400	20,500	27,600	24,200	42,900	31,700	44,800	-	-	39,200	49,600	44,800	56,000
7/8-14	0.509	16,800	30,500	16,800	30,500	33,100	58,500	43,300	61,100	-	-	53,400	67,700	61,100	76,400
1 -12	0.663	21,900	39,800	21,900	39,800	43,100	76,200	56,400	79,600	-	-	69,600	88,200	79,600	99,400
1-1/4 uns	0.679	22,400	40,700	22,400	40,700	44,100	78,100	57,700	81,500	-	-	71,300	90,300	81,500	101,900
1-1/8-12	0.856	28,200	51,400	28,200	51,400	55,600	98,400	83,300	89,900	-	-	89,900	113,800	102,700	128,400
1-1/4-12	1.073	35,400	64,400	35,400	64,400	69,700	123,400	79,400	112,700	-	-	112,700	142,700	128,800	161,000
1-3/8-12	1.315	43,400	78,900	43,400	78,900	85,500	151,200	97,300	138,100	-	-	138,100	174,900	157,800	197,200
1-1/2-12	1.581	52,200	94,900	52,200	94,900	102,800	181,800	117,000	116,000	-	-	166,000	210,300	189,700	237,200

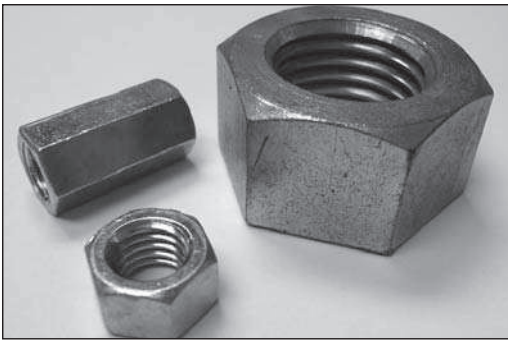
A) Proof loads and tensile strengths are computed by multiplying the proof load stresses and tensile strength stresses given in Table 1 by the stress area of the thread.

The stress area of sizes and thread series not included in this table may be computed from the formula: $A_s = 0.7854 [D - \frac{0.9743}{n}]^2$ where D equals nominal diameter in inch, and n equals threads per inch.














B) Grades 5.2 and 8.2 applicable to sizes 1/4 through 1 in.



CARBON STEEL NUTS PROOF LOADS AND HARDNESS



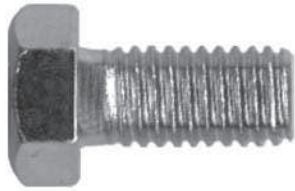
GRADE IDENTIFICATION MARKINGS FOR POPULAR GRADES OF CARBON STEEL NUTS

Grade Identification Marking	Specification	Material	Nominal Size in.	Proof Load Stress ksi	Hardness Rockwell		See Note
					Min	Max	
	ASTM A 563 - Grade 0	Carbon Steel	1/4 thru 1 1/2	69	B55	C32	3, 4
	ASTM A 563 - Grade A	Carbon Steel	1/4 thru 1 1/2	90	B68	C32	3, 4
	ASTM A 563 - Grade B	Carbon Steel	1/4 thru 1	120	B55	C32	3, 4
over 1 thru 1 1/2			105				
	ASTM A563 - Grade C	Carbon Steel, May Be Quenched and Tempered	1/4 thru 4	144	B78	C38	5
	ASTM A563 - Grade C3	Atmospheric Corrosion Resistant Steel, May Be Quenched and Tempered	1/4 thru 4	144	B78	C38	5, 9
	ASTM A563 - Grade D	Carbon Steel, May Be Quenched and Tempered	1/4 thru 4	150	B84	C38	6
	ASTM A563 - Grade DH	Carbon Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	6
	ASTM A563 - Grade DH3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	5, 9
	ASTM A194 - Grade 1	Carbon Steel	1/4 thru 4	130	B70	-	7
	ASTM A194 - Grade 2	Medium Carbon Steel	1/4 thru 4	150	159	352	7, 8
	ASTM A194 - Grade 2H	Medium Carbon Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 2HM	Medium Carbon Steel, Quenched and Tempered	1/4 thru 4	150	159	237	7, 8
	ASTM A194 - Grade 4	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 7	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 4	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	150	159	237	7
See note 1,2,10							

NOTES:

1. In addition to the indicated grade marking, all grades, except AS63 grades 0, A and B, must be marked for manufacturer identification.
2. The markings shown for all grades of A194 nuts are for cold formed and hot forged nuts. When nuts are machined from bar stock the nut must be additionally marked with the letter 'B'.
3. Nuts are not required to be marked unless specified by the purchaser. When marked, the identification marking shall be the grade letter 0, A or B.
4. Properties shown are those of non-plated or non-coated coarse thread hex nuts.
5. Properties shown are those of coarse thread heavy hex nuts.
6. Properties shown are those of coarse thread heavy hex nuts.
7. Properties shown are those of coarse and 8-pitch thread heavy hex nuts.
8. Hardnesses are Brinell Hardness Numbers.
9. The nut manufacturer; at his option, may add other markings to indicate the use of atmospheric corrosion resistant steel.
10. Specifications - ASTM A563 - Carbon and Alloy Steel Nuts / ASTM A194 - Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service





**MECHANICAL REQUIREMENTS FOR STAINLESS
STEEL BOLTS, SCREWS, STUDS AND NUTS**

Grade ¹	General Description	Mechanical Requirements							
		Bolts ¹ Screws And Studs					Nuts		
		Full Size Bolts, Screws, Studs		Machined Test Specimens Of Bolts, Screws, Studs					
		Yield ² Strength min ksi	Tensile Strength min ksi	Yield ² Strength min ksi	Tensile Strength min ksi	Elongation ³ % Min	Hardness Rockwell Min	Proof Load Stress ksi	Hardness Rockwell Min
303-A	Austenitic Stainless Steel Sol. Annealed	30	75	30	75	20	B75	75	B75
304-A	Austenitic Stainless Steel Sol. Annealed	30	75	30	75	20	B75	75	B75
304	Austenitic Stainless Steel Cold Worked	50	90	45	85	20	B85	90	B85
305-A	Stainless Steel Sol. Annealed	30	75	20	75	20	B70	75	B70
305	Austenitic Stainless Steel Cold Worked	50	90	45	85	20	B85	90	B85
316-A	Austenitic Stainless Steel Sol. Annealed	30	75	30	75	20	B70	75	B70
316	Austenitic Stainless steel Sol. Annealed	50	90	45	85	20	B85	90	B85
316-SH	Austenitic Stainless Steel Strain Hardened	See Note 6	See Note 6	See Note 6	See Note 6	15	C25	See Note 6	C20
410-H	Stainless Steel Hardened and Tempered	95	125	95	125	20	C22	125	C22
410-HT	Martensitic Stainless Steel Hardened and Tempered	135	180	135	180	12	C36	180	C36
416-H	Martensitic Stainless Steel Hardened and Tempered	95	125	95	125	20	C22	125	C22
416-HT	Martensitic Stainless Steel Hardened and Tempered	135	180	135	180	12	C36	150	C36
430	Ferritic Stainless Steel	40	70	40	70	20	B75	70	B75