

STUD TENSILE-TORQUE STRENGTHS

The information shown here provides a simple method for obtaining wrench torque and tensile strength data for various thread pitch and weld bases. From this information you are able to find the yield strength of common weld base diameters, the yield strength of the various threaded sections, and the torque-tension relation at loads varying from minimum to maximum. This information was obtained from test results conducted by a leading torque wrench manufacturer, recommendations of several nut and bolt manufacturers and generally accepted formulas.

However, because of the variables affecting the torque-tension relation, steel strength, thread finish, lubrication, washer type, hardness and many other factors can cause variations.



Standard Arc Welding Studs – Tensile/Torque Strengths

Low-Carbon Steel – 61,000 psi Min. Tensile, 49,000 psi Min. Yield

Stud Thread Diameter	META sq. in.	Yield Load (lb) @ 50 000 psi	Ultimate Tensile Load (lb) @ 55 000psi	Yield Torque* @ 50 000 psi	Ultimate Torque* @ 55 000 psi
10-24 UNC	.017	852	1,060	32 in. lb	39 in. lb
10-32 UNF	.020	980	1,225	36 in. lb	45 in. lb
1/4-20 UNC	.032	1,558	1,933	6 ft lb	7.7 ft lb
1/4-28 UNF	.036	1,773	2,200	7 ft lb	8.8 ft lb
5/16-18 UNC	.052	2,567	3,185	12.7 ft lb	16.6 ft lb
5/16-24 UNF	.058	2,837	3,530	14.7 ft lb	18.8 ft lb
3/8-16 UNC	.078	3,797	4,710	23.5 ft lb	30 ft lb
3/8-24 UNF	.088	4,297	5,340	26 ft lb	33 ft lb
7/16-14 UNC	.106	5,208	6,465	37 ft lb	45 ft lb
7/16-20 UNF	.118	5,782	7,299	42 ft lb	52 ft lb
1/2-13 UNC	.142	6,953	8,660	57.8 ft lb	72 ft lb
1/2-20 UNF	.160	7,840	9,760	64.7 ft lb	81 ft lb
5/8-11 UNC	.226	11,075	13,785	115 ft lb	144 ft lb
5/8-18 UNF	.255	12,500	15,550	130 ft lb	161 ft lb
3/4-10 UNC	.334	16,366	20,375	210 ft lb	255 ft lb
3/4-16 UNF	.372	18,230	22,690	227 ft lb	283 ft lb
7/8-9 UNC	.462	22,640	28,120	330 ft lb	410 ft lb
7/8-14 UNF	.509	22,980	31,050	363 ft lb	452 ft lb
1-8 UNC	.606	29,694	36,900	494 ft lb	615 ft lb
1-14 UNF	.678	33,222	41,350	553 ft lb	688 ft lb

Stainless Steel – 75,000 psi Min. Ultimate, 30,000 PSI Min. Yield

Stud Thread Diameter	META sq. in.	Yield Load (lb) @ 30,000 psi	Ultimate Tensile Load (lb) @ 75,000psi	Yield Torque* @ 30,000 psi	Ultimate Torque* @ 75,000 psi
10-24 UNC	.0174	609	1,218	23.3 in. lb	45.7 in. lb
10-32 UNF	.0200	700	1,400	26.8 in. lb	53 in. lb
1/4-20 UNC	.0318	996	2,226	4.7 ft lb	9.2 ft lb
1/4-28 UNF	.0362	1,267	2,534	5.3 ft lb	10.5 ft lb
5/16-18 UNC	.0524	1,834	3,668	9.3 ft lb	19.1 ft lb
5/16-24 UNF	.0579	2,026	4,052	10.5 ft lb	21.1 ft lb
3/8-16 UNC	.0775	2,712	5,424	16.9 ft lb	33.9 ft lb
3/8-24 UNF	.0876	3,066	6,132	19 ft lb	38.3 ft lb
7/16-14 UNC	.1063	3,720	7,440	26.8 ft lb	54 ft lb
7/16-20 UNF	.1180	4,130	8,260	30 ft lb	60 ft lb
1/2-13 UNC	.1419	4,966	9,930	41 ft lb	82.8 ft lb
1/2-20 UNF	.1600	5,600	11,200	47 ft lb	93 ft lb
5/8-11 UNC	.226	6,743	15,820	83 ft lb	164.7 ft lb
5/8-18 UNF	.255	8,925	17,850	93 ft lb	185.7 ft lb
3/4-10 UNC	.334	11,690	23,380	146 ft lb	292 ft lb
3/4-16 UNF	.372	13,020	26,040	163 ft lb	326 ft lb
7/8-9 UNC	.462	16,170	32,340	236 ft lb	471 ft lb
7/8-14 UNF	.509	17,815	35,630	260 ft lb	520 ft lb
1-8 UNC	.606	21,210	42,420	353 ft lb	707 ft lb
1-14 UNF	.678	23,730	47,460	395 ft lb	791 ft lb

* Torque figures based on assumption that excessive deformation of thread has not taken relationship between torque/tension out of its proportional range.

In actual practice a stud should not be used at its yield load. A factor of safety must be applied. It is generally recommended that studs be used at no more than 60% of yield. However, factor of safety may vary up or down, depending on the particular application. The user will make this determination.