



Torque-Tension Relationship for A307A, Grade 5, 8 & 9 Bolts

Nominal Dia. (in.)	threads per inch	Tensile Stress Area (sq. in.)	307A ASTM A307 Grade A			SAE J429 Grade 5			SAE J429 Grade 8			FNL Grade 9						
			Tightening Torque			Tightening Torque			Tightening Torque			Tightening Torque						
			Clamp Load (Lbs.)	K = 0.15	K = 0.17	K = 0.20	Clamp Load (Lbs.)	K = 0.15	K = 0.17	K = 0.20	Clamp Load (Lbs.)	K = 0.15	K = 0.17	K = 0.20	Clamp Load (Lbs.)	K = 0.15	K = 0.17	K = 0.20
Unified Coarse Thread Series																		
1/4	20	0.0318	859	32 in-lbs	37 in-lbs	43 in-lbs	2029	76 in-lbs	86 in-lbs	101 in-lbs	2864	107 in-lbs	122 in-lbs	143 in-lbs	3357	126 in-lbs	143 in-lbs	168 in-lbs
5/16	18	0.0524	1416	66	75	88	3342	157	178	209	4719	221	251	295	5531	259	294	346
3/8	16	0.0775	2092	10 ft-lbs	11 ft-lbs	13 ft-lbs	4940	23 ft-lbs	26 ft-lbs	31 ft-lbs	6974	33 ft-lbs	37 ft-lbs	44 ft-lbs	8174	38 ft-lbs	43 ft-lbs	51 ft-lbs
7/16	14	0.1063	2870	16	18	21	6777	37	42	49	9568	52	59	70	11214	61	70	82
1/2	13	0.1419	3831	24	27	32	9046	57	64	75	12771	80	90	106	14969	94	106	125
9/16	12	0.1819	4912	35	39	46	11599	82	92	109	16375	115	130	154	19193	135	153	180
5/8	11	0.2260	6102	48	54	64	14408	113	128	150	20340	159	180	212	23840	186	211	248
3/4	10	0.3345	9030	85	96	113	21322	200	227	267	30101	282	320	376	35281	331	375	441
7/8	9	0.4617	12467	136	155	182	29436	322	365	429	41556	455	515	606	48707	533	604	710
1	8	0.6057	16355	204	232	273	38616	483	547	644	54517	681	772	909	63899	799	905	1065
1 1/4	7	0.9691	26166	409	463	545	53786	840	952	1121	87220	1363	1545	1817	102229	1597	1810	2130
1 1/2	6	1.4053	37942	711	806	949	77991	1462	1657	1950	126473	2371	2688	3162	148237	2779	3150	3706
Fine Thread Series																		
1/4	28	0.0364	982	37 in-lbs	42 in-lbs	49 in-lbs	2319	87 in-lbs	99 in-lbs	116 in-lbs	3274	123 in-lbs	139 in-lbs	164 in-lbs	3837	144 in-lbs	163 in-lbs	192 in-lbs
5/16	24	0.0581	1568	73	83	98	3702	174	197	231	5226	245	278	327	6125	287	325	383
3/8	24	0.0878	2371	11 ft-lbs	13 ft-lbs	15 ft-lbs	5599	26 ft-lbs	30 ft-lbs	35 ft-lbs	7905	37 ft-lbs	42 ft-lbs	49 ft-lbs	9265	43 ft-lbs	49 ft-lbs	58 ft-lbs
7/16	20	0.1187	3205	18	20	23	7568	41	47	55	10684	58	66	78	12523	68	78	91
1/2	20	0.1600	4319	27	31	36	10197	64	72	85	14396	90	102	120	16873	105	120	141
9/16	18	0.2030	5480	39	44	51	12940	91	103	121	18268	128	146	171	21412	151	171	201
5/8	18	0.2560	6911	54	61	72	16317	127	144	170	23036	180	204	240	27000	211	239	281
3/4	16	0.3730	10070	94	107	126	23776	223	253	297	33566	315	357	420	39343	369	418	492
7/8	14	0.5095	13756	150	171	201	32479	355	403	474	45853	502	568	669	53743	588	666	784
1	14	0.6799	18357	229	260	306	43343	542	614	722	61190	765	867	1020	71720	896	1016	1195
1 1/4	12	1.0729	28970	453	513	604	59548	930	1055	1241	96565	1509	1710	2012	113182	1768	2004	2358
1 1/2	12	1.5810	42688	800	907	1067	87747	1645	1865	2194	142292	2668	3024	3557	166778	3127	3544	4169

The torque values can only be achieved if nut (or tapped hole) has a proof load greater than or equal to the bolt's minimum ultimate tensile strength.

Clamp load calculated as 75% of the proof load when specified by the standard. ASTM A307 utilized 75% of 36,000 PSI.

Torque values for 1/4 and 5/16-in series are in inch-pounds. All other torque values are in foot-pounds.

Torque values calculated from formula $T=KDF$, where

K = 0.15 for "lubricated" conditions

K = 0.17 for zinc plated and dry conditions; we have also found various forms of customer applied thread lockers to have a similar K value.

K = 0.20 for plain and dry conditions

D = Nominal Diameter

F = Clamp Load

Note: When using Zinc Plated (lubricated with wax) Top Lock Nuts, the K value can vary between 0.12-0.16

Caution: All material included in this chart is advisory only, and its use by anyone is voluntary. In developing this information, Fastenal has made a determined effort to present its contents accurately.

Extreme caution should be used when using a formula for torque/tension relationships. Torque is only an indirect indication of tension. Under/over tightening of fasteners can result in costly equipment failure or personal injury.