

SAE Bolt Torque Estimates

Grade 2, 5, 8 coarse (UNC) thread bolts, 1/4" to 1-1/4" - foot-pounds (ft-lb)

CALCULATED ESTIMATES - NOT INSTALLATION SPECIFICATIONS

Size	UNC TPI	UNF TPI*	Wrench	Grade 2 (ft-lb)	Grade 5 (ft-lb)	Grade 8 (ft-lb)
1/4"	20	28	7/16"	5.5	8.5	11.9
5/16"	18	24	1/2"	11.3	17.4	24.6
3/8"	16	24	9/16"	20	30.9	43.6
7/16"	14	20	5/8"	32	49.4	69.8
1/2"	13	20	3/4"	48.8	75.4	106.4
9/16"	12	18	13/16"	70.4	108.7	153.5
5/8"	11	18	15/16"	97.1	150.1	211.9
3/4"	10	16	1-1/8"	172.5	266.5	376.3
7/8"	9	14	1-5/16"	166.7	429.3	606
1"	8	12	1-1/2"	249.9	643.6	908.6
1-1/8"	7	12	1-11/16"	354.2	794.3	1288
1-1/4"	7	12	1-7/8"	499.7	1120.5	1817.1

* UNF TPI is shown for reference only (ASME B1.1) - the Grade 2/5/8 values are calculated for UNC (coarse) thread; there is no separate UNF torque figure.

Method

Calculated reference estimates, not installation specifications. $T = K \times F \times d$; $K = 0.20$ (assumed plain, unplated steel); $F = 75\%$ of proof stress x tensile stress area; d is nominal diameter in inches (T in inch-pounds before conversion to ft-lb). Tensile stress area $A_t = 0.7854 \times (D - 0.9743 / n)^2$ in², where D is nominal diameter and n is threads per inch (UNC, coarse thread). SAE J429 specifies fastener mechanical properties, not a universal tightening torque.

Limitations

Use the equipment or fastener manufacturer's specified torque and assembly condition. These examples cover coarse (UNC) thread only, assume Grade 2 bolts are 6 inches or shorter (SAE J429 specifies lower Grade 1 values for longer Grade 2 bolts and studs), and do not cover fine threads, stainless steel, flange bolts, torque-to-yield fasteners, or safety-critical joints. Do not apply a universal oil, anti-seize, coating or thread-locker reduction.

SAE J429 Grade 2 proof strength drops from 55 to 33 ksi above 3/4 in, so Grade 2 values step down at 7/8 in.

Sources

- Portland Bolt: $T = KDP$, $K = 0.20$ for plain unplated bolts and 75% proof-load assumption
<https://www.portlandbolt.com/technical/bolt-torque-chart/>
- Portland Bolt: SAE J429 grade 2/5/8 minimum proof strength by diameter range
<https://www.portlandbolt.com/technical/sae-j429/>
- AmesWeb: UNC tensile stress area formula, $A_t = 0.7854(D - 0.9743/n)^2$
<https://amesweb.info/Screws/bolt-torque-calculation-formula.aspx>

SAE Bolt Torque Estimates

Grade 2, 5, 8 coarse (UNC) thread bolts, 1/4" to 1-1/4" - inch-pounds (in-lb)

CALCULATED ESTIMATES - NOT INSTALLATION SPECIFICATIONS

Size	UNC TPI	UNF TPI*	Wrench	Grade 2 (in-lb)	Grade 5 (in-lb)	Grade 8 (in-lb)
1/4"	20	28	7/16"	65.6	101.4	143.2
5/16"	18	24	1/2"	135.2	208.9	294.9
3/8"	16	24	9/16"	239.7	370.5	523.1
7/16"	14	20	5/8"	383.7	593	837.2
1/2"	13	20	3/4"	585.3	904.6	1277.1
9/16"	12	18	13/16"	844.3	1304.9	1842.2
5/8"	11	18	15/16"	1165.3	1801	2542.5
3/4"	10	16	1-1/8"	2069.5	3198.3	4515.2
7/8"	9	14	1-5/16"	1999.9	5151.2	7272.3
1"	8	12	1-1/2"	2998.4	7723.3	10903.4
1-1/8"	7	12	1-11/16"	4250.5	9531.4	15456.3
1-1/4"	7	12	1-7/8"	5996.4	13446.4	21805

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Method

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