Bolt Torque Chart

SAE bolt torque, coarse threads, grades 2, 5 and 8

Grade 2 stops at 3/4 inch.

Torque = K × diameter × clamp load, with clamp load at 75% of proof load (a reusable joint). K is 0.20 for dry threads and 0.15 for lubricated threads. Proof load is tensile stress area times proof strength: grade 2 at 55 ksi, grade 5 at 85 ksi, grade 8 at 120 ksi, and ISO classes 8.8, 10.9 and 12.9 at 580, 830 and 970 MPa. Stress area is π/4 × (D − 0.9743/TPI)² for inch threads and π/4 × (D − 0.9382 × pitch)² for metric.

Bolt (diameter-TPI)	Stress area (in²)	Grade 2 clamp load (lb)	Grade 2 dry (ft-lb)	Grade 2 lubricated (ft-lb)	Grade 2 dry (N·m)	Grade 2 lubricated (N·m)	Grade 5 clamp load (lb)	Grade 5 dry (ft-lb)	Grade 5 lubricated (ft-lb)	Grade 5 dry (N·m)	Grade 5 lubricated (N·m)	Grade 8 clamp load (lb)	Grade 8 dry (ft-lb)	Grade 8 lubricated (ft-lb)	Grade 8 dry (N·m)	Grade 8 lubricated (N·m)
1/4-20	0.0318	1,313	5	4	7	6	2,029	8	6	11	9	2,864	12	9	16	12
5/16-18	0.0524	2,163	11	8	15	11	3,342	17	13	24	18	4,719	25	18	33	25
3/8-16	0.0775	3,196	20	15	27	20	4,940	31	23	42	31	6,974	44	33	59	44
7/16-14	0.1063	4,385	32	24	43	33	6,777	49	37	67	50	9,568	70	52	95	71
1/2-13	0.1419	5,853	49	37	66	50	9,046	75	57	102	77	12,771	106	80	144	108
9/16-12	0.1819	7,505	70	53	95	72	11,599	109	82	147	111	16,375	154	115	208	156
5/8-11	0.2260	9,323	97	73	132	99	14,408	150	113	203	153	20,340	212	159	287	215
3/4-10	0.3345	13,796	172	129	234	175	21,322	267	200	361	271	30,101	376	282	510	383
7/8-9	0.4617	—	—	—	—	—	29,435	429	322	582	437	41,556	606	455	822	616
1-8	0.6057	—	—	—	—	—	38,616	644	483	873	654	54,517	909	681	1232	924

Metric bolt torque, classes 8.8, 10.9 and 12.9

Bolt (size×pitch)	Stress area (mm²)	Class 8.8 clamp load (kN)	Class 8.8 dry (N·m)	Class 8.8 lubricated (N·m)	Class 8.8 dry (ft-lb)	Class 8.8 lubricated (ft-lb)	Class 10.9 clamp load (kN)	Class 10.9 dry (N·m)	Class 10.9 lubricated (N·m)	Class 10.9 dry (ft-lb)	Class 10.9 lubricated (ft-lb)	Class 12.9 clamp load (kN)	Class 12.9 dry (N·m)	Class 12.9 lubricated (N·m)	Class 12.9 dry (ft-lb)	Class 12.9 lubricated (ft-lb)
M6×1	20.1	8.8	11	8	8	6	12.5	15	11	11	8	14.6	18	13	13	10
M8×1.25	36.6	15.9	25	19	19	14	22.8	36	27	27	20	26.6	43	32	31	24

Bolt (size×pitch)	Stress area (mm²)	Class 8.8 clamp load (kN)	Class 8.8 dry (N·m)	Class 8.8 lubricated (N·m)	Class 8.8 dry (ft-lb)	Class 8.8 lubricated (ft-lb)	Class 10.9 clamp load (kN)	Class 10.9 dry (N·m)	Class 10.9 lubricated (N·m)	Class 10.9 dry (ft-lb)	Class 10.9 lubricated (ft-lb)	Class 12.9 clamp load (kN)	Class 12.9 dry (N·m)	Class 12.9 lubricated (N·m)	Class 12.9 dry (ft-lb)	Class 12.9 lubricated (ft-lb)
M10×1.5	58.0	25.2	50	38	37	28	36.1	72	54	53	40	42.2	84	63	62	47
M12×1.75	84.3	36.7	88	66	65	49	52.5	126	94	93	70	61.3	147	110	109	81
M14×2	115.4	50.2	141	105	104	78	71.9	201	151	148	111	84.0	235	176	173	130
M16×2	156.7	68.2	218	164	161	121	97.5	312	234	230	173	114.0	365	274	269	202
M20×2.5	244.8	106.5	426	319	314	236	152.4	610	457	450	337	178.1	712	534	525	394
M24×3	352.5	153.3	736	552	543	407	219.4	1053	790	777	583	256.4	1231	923	908	681

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