ACE Hardware Zimbabwe

Bolt Torque Chart

Tightening torques for metric, stainless and SAE bolts, calculated to VDI 2230, with grade markings and lubrication factors.

Workshop Reference Charts
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Metric bolts

Metric coarse - tightening torque in Nm (friction μ = 0.14)

Thread	Pitch	4.6	5.8	8.8	10.9	12.9	Preload 8.8 kN	Preload 10.9 kN
M3	0.5	0.5	0.9	1.4	2.1	2.5	2.5	3.6
M4	0.7	1.2	2.2	3.3	4.8	5.6	4.3	6.3
M5	0.8	2.4	4.3	6.5	9.5	11.1	7	10.3
M6	1	4	7	11	17	19	9.9	14.6
M8	1.25	10	18	27	40	47	18.1	26.6
M10	1.5	20	35	54	79	93	28.8	42.3
M12	1.75	35	61	93	137	160	42	61.7
M14	2	56	98	149	218	256	57.6	84.6
M16	2	86	151	230	338	395	78.9	115.9
M18	2.5	120	209	329	469	549	99.3	141.4
M20	2.5	169	295	464	661	773	127.2	181.1
M22	2.5	231	404	635	904	1058	158.5	225.8
M24	3	290	508	798	1136	1330	183.1	260.8
M27	3	428	749	1176	1675	1960	240.3	342.3
M30	3.5	581	1017	1598	2275	2663	292.5	416.5
M33	3.5	786	1376	2162	3079	3604	363.7	518
M36	4	1011	1769	2780	3959	4633	427.3	608.5

Torques are calculated to VDI 2230 for 90% use of the bolt's minimum yield strength, with thread and head friction μ = 0.14 (zinc-plated or lightly oiled), standard hex heads and medium clearance holes. 1 Nm = 0.738 ft-lb.

Metric fine - Nm (μ = 0.14)

Thread	8.8	10.9	12.9
M8 × 1	29	43	50
M10 × 1.25	57	83	98
M10 × 1	60	88	103
M12 × 1.5	97	143	167
M12 × 1.25	101	149	174
M14 × 1.5	160	235	275
M16 × 1.5	245	359	421
M18 × 1.5	368	524	613
M20 × 1.5	512	729	853
M22 × 1.5	693	986	1154
M24 × 2	866	1233	1443
M27 × 2	1263	1799	2105
M30 × 2	1758	2504	2931

Stainless steel - Nm (lubricated, μ = 0.14)

Thread	A2-70 / A4-70	A4-80
M3	1	1.3
M4	2.3	3.1
M5	4.6	6.1
M6	8	11
M8	19	26
M10	38	51
M12	65	87
M14	105	139
M16	162	216
M18	224	299
M20	316	422
M22	433	577
M24	544	725

Inch bolts and adjustments

SAE Grade 5 and 8 - UNC (μ = 0.14)

UNC	Gr 5 ft-lb	Gr 8 ft-lb	Gr 5 Nm	Gr 8 Nm
1/4"-20	10	13	13	18
5/16"-18	19	27	26	36
3/8"-16	33	46	44	63
7/16"-14	52	73	70	99
1/2"-13	79	112	108	152
9/16"-12	113	160	153	216
5/8"-11	157	222	213	301
3/4"-10	278	392	376	532
7/8"-9	446	630	604	854
1"-8	667	942	904	1278

SAE Grade 5 and 8 - UNF (μ = 0.14)

UNF	Gr 5 ft-lb	Gr 8 ft-lb	Gr 5 Nm	Gr 8 Nm
1/4"-28	11	15	15	21
5/16"-24	21	30	28	40
3/8"-24	37	52	50	71
7/16"-20	57	81	78	110
1/2"-20	89	125	120	170
9/16"-18	125	177	169	239
5/8"-18	176	249	239	337
3/4"-16	307	433	416	587
7/8"-14	487	688	660	933
1"-12	724	1023	981	1386

Adjusting for lubrication (to reach the same preload)

Condition of threads	Typical μ	Multiply table torque by
Molybdenum disulphide (MoS_2) paste	0.08 - 0.10	0.69
Oiled / anti-seize	0.10 - 0.12	0.81
Zinc plated, lightly oiled (table basis)	0.12 - 0.16	1.00
Plain black / phosphated, dry	0.16 - 0.20	1.25
Hot-dip galvanised, dry	0.20 - 0.25	1.5

Bolt grade markings

Marking	Meaning
8.8	1st number × 100 = tensile strength in MPa (800). 2nd number × 10 = yield as % of tensile (80%)
Nut 8 / 10 / 12	Use a nut class at least equal to the bolt's first number
A2-70, A4-80	Stainless: A2 = 304, A4 = 316; 70 / 80 = tensile ÷ 10 in MPa
SAE Grade 5	3 radial lines on the head (120 ksi tensile)
SAE Grade 8	6 radial lines on the head (150 ksi tensile)

> These are maximum assembly torques for steel-to-steel joints. Use the equipment maker's figure where one is given, and reduce torque for soft materials (aluminium, plastics), gaskets and tapped holes in cast iron. Re-torque after the first run-in only when the maker says so.

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