Tightening Torque Guide

It is vital that bolts and other threaded fasteners are tightened with the right force, so that they sufficiently clamp components without damaging the bolt or nut. If a bolt is under-torqued, the bolt will not clamp and hold the parts properly. If it is over-torqued, the bolt or nut could break or crack.

Below are the approximate values of torque that need to be applied to different bolt sizes. As stated above, there are a number of factors that affect tightening torque. The values in these tables should only be used as a guide. The exact tightening torque will need to be determined using a torque wrench.

Determining Bolt Tightening Torques

Torque is the force at a joint when you apply a force at the end (of a spanner, for example). Mathematically it is the force multiplied by the distance to the joint. The torque will depend on several factors, such as:

+ Diameter and size of bolt - The torque will increase with the bolt size.
+ Type of metal and its properties: Properties like tensile shear, and yield strength are important here.
+ Number of threads (coarse vs fine threads): Finer threads have a higher tightening torque.
+ Surface finish on the material and treatments like lubrication, galvanising or waxing: Galvanised fasteners need a higher tightening torque than plain fasteners. Lubrication will reduce tightening torque.

Table 1

Different Classes of Bolts (Metric)
Recommended Tightening Torque, Nm

Thread	Bolt Grade						
	3.6	4.6	4.8	5.8	8.8	10.9	12.9
M1.6	0.05	0.065	0.086	0.11	0.17	0.24	0.29
M2	0.10	0.13	0.17	0.22	0.35	0.49	0.58
M2.2	0.13	0.17	0.23	0.29	0.46	0.64	0.77
M2.5	0.20	0.26	0.35	0.44	0.70	0.8	1.20
M3	0.35	0.46	0.61	0.77	1.20	1.70	2.10
M3.5	0.55	0.73	0.97	1.20	1.90	2.70	3.30
M4	0.81	1.10	1.40	1.80	2.90	4.00	4.90
M5	0.60	2.20	2.95	3.60	5.70	8.10	9.70
M6	2.80	3.70	4.90	6.10	9.80	14.00	17.00
M8		8.9	10.5	15.0	24.0	33.0	40.0
M10		17.0	21.0	29.0	47.0	65.0	79.0
M12		30.0	36.0	51.0	81.0	114.0	136.0
M14		48	58	80	128	181	217
M16		74	88	123	197	277	333
M18		103	121	172	275	386	463
M20		144	170	240	385	541	649
M22		194	230	324	518	728	874
M24		249	295	416	665	935	1120
M27		360	435	600	961	1350	1620
M30		492	590	819	1310	1840	2210
M36		855	1030	1420	2280	3210	3850
M42		1360		2270	3610	5110	6140
M45		1690		2820	4510	6340	7610
M48		2040		3400	5450	7660	9190

Table 2
Stainless Steel Fasteners (Metric)
Recommended Tightening Torque, Nm

Nominal Size	Pitch, mm	Stress Area, mm^2	Class 50, Nm	Class 70, Nm	Class 80, Nm
M3	0.50	5.03	0.4	0.9	1.2
M4	0.70	8.78	1.0	2.1	2.7
M5	0.80	14.20	1.9	4.2	5.5
M6	1.00	20.10	3.3	7.1	9.4
M8	1.25	36.60	8.0	17.1	22.8
M10	1.50	58.00	15.8	33.9	45.2
M12	1.75	84.30	27.6	59.2	78.9
M14	2.00	115.00	44.0	94.2	125.6
M16	2.00	157.00	68.6	147.0	195.9
M18	2.50	192.00	94.3	202.2	269.6
M20	2.50	245.00	133.8	286.7	382.2
M22	2.50	303.00	182.0	390.0	519.9
M24	3.00	353.00	231.3	495.6	660.8
M27	3.00	459.00	338.3	725.0	966.7
M30	3.50	561.00	549.5	984.6	1312.7
M33	3.50	694.00	625.2	1339.8	1786.4
M36	4.00	817.00	802.9	1720.6	2294.1
M39	4.00	976.00	1039.1	2226.7	2969.0

Table 3
UNC Recommended Tightening Torque

		SAE Grade 5		SAE Grade 8	
Nominal Size, in	Threads per inch	Nm	lbft	Nm	lbft
1/4”	20	9.5	7	14	10
5/16”	18	20	15	28.5	21
3/8”	16	36	27	51.5	38
7/16”	14	59	43	81	60
1/2”	13	90	66	125	92
9/16”	12	129	95	180	133
5/8”	11	176	130	248	183
3/4”	10	312	230	441	325
7/8”	9	502	370	709	523
1”	8	760	560	1064	785
1 1/8”	7	935	690	1513	1116
1 1/4”	7	1316.5	971	2135	1575
1 3/8”	6	1727	1274	2800	2065
1 1/2”	6	2291	1690	3715	2740

Table 4
UNF Recommended Tightening Torque

		SAE Grade 5		SAE Grade 8	
Nominal Size, in	Threads per inch	Nm	lbft	Nm	lbft
1/4”	28	11	8	16	12
5/16”	24	23	17	31	23
3/8”	24	41	30	58	43
7/16”	20	65	48	91	67
1/2”	20	100	74	141	104
9/16”	18	142	105	202	149
5/8”	18	203	150	281	207
3/4”	16	352.5	260	492	363
7/8”	14	556	410	782	577
1”	12	827	610	1165	859
1 1/8”	12	1047	772	1697.5	1252
1 1/4”	12	1458	1075	2365	1744
1 3/8”	12	1965	1449	3187.5	2351
1 1/2”	12	2578	1901	4180	3083