A GUIDE TO TORQUE VALUES

It should be understood that the subject of torque tension loading is beyond the scope of this document. The information here supplied is an acceptable guide for normal conditions; for critical applications, however, further information and research will be necessary.

In preparing this guide to torque values, the following basic assumptions have been made:

(a) bolts and nuts are new, standard finish, uncoated and not lubricated*

(b) the load will be 90% of the bolt yield strength

(c) the coefficient of friction (μ) is 0.14

(d) the final tightening sequence is achieved smoothly and slowly, until the torque tool indicates full torque has been obtained.

* If lubrication has been applied to the bolt and/or the nut (other than the normal protective oil film), multiply the recommended torque by the appropriate factor shown in the table.

Example: bolt and nut are both phosphated; required torque = torque recommended x 0.75.

		Surface condition of bolt			
		Self	Zinc	Cadmium	Phosphate
Surface condition of nut	Self	1.00	1.00	0.80	0.90
	Zinc	1.15	1.20	1.35	1.15
	Cadmium	0.85	0.90	1.20	1.00
	Phosphate and oil	0.70	0.65	0.70	0.75
	Zinc with wax	0.60	0.55	0.65	0.55

Formulae

Accepted formulae relating torque and tension, based on many tests are:

$$M = \frac{P \times D}{60}$$

M = torque lbf.ft
P = bolt tension lbf
D = bolt dia.ins

Or for metric sizes:

$$M = \frac{P \times D}{5000}$$

M = torque N.m
P = bolt tension Newtons
D = bolt dia. mm

These formulae may be used for bolts outside the range of the tables overleaf.

Recommended Maximum Bolt Loads and Torque Values (UNC Threads)

UNC	Quality P				S				T				A/F
in	Newtons	N.m	lbf	lbf.ft	Newtons	N.m	lbf	lbf.ft	Newtons	N.m	lbf	lbf.ft	in
1/4	4379	5.43	984	4.00	8320	10.3	1870	7.60	8980	11.1	2018	8.19	7/16
5/16	7344	11.2	1650	8.26	13954	21.3	3136	15.71	15061	23.0	3385	16.96	1/2
3/8	10951	19.9	2461	14.68	20807	37.9	5161	27.95	22458	40.9	5048	30.17	9/16
7/16	15065	31.9	3386	23.53	28623	60.7	6434	44.77	30894	65.5	6945	48.31	5/8
1/2	20244	48.8	4551	36.00	38463	92.7	8646	68.37	41516	100	9333	73.76	3/4
9/16	26075	70.4	5861	51.92	49542	134	11137	98.83	53474	144	12021	106	7/8
5/8	32452	97.4	7295	71.84	61658	185	13861	136.45	66552	200	14961	147.5	15/16
3/4	49781	178	11191	131.3	94584	338	21263	249.3	102091	364	22950	268.5	1 1/8
7/8	67157	279	15097	205.8	127599	530	28685	391	137725	572	30961	422	1 5/16
1	88221	418	19832	308.3	167620	795	37682	586	180923	858	40673	633	1 1/2
1 1/8	111007	593	24955	437.4	210913	1126	47415	830	227652	1216	51178	897	1 11/16
1 1/4	142135	837	31953	617.3	270091	1591	60718	1173	291527	1717	65537	1266	1 7/8
1 3/8	168641	1096	37911	808.4	320417	2083	72032	1536	345847	2248	77749	1658	2 1/16
1 1/2	206578	1456	46440	1074	392498	2767	88237	2041	423648	2987	95239	2203	2 1/4

Recommended Maximum Bolt Loads and Torque Values (UNF Threads)

UNF	Quality P				S				T				A/F
in	Newtons	N.m	lbf	lbf.ft	Newtons	N.m	lbf	lbf.ft	Newtons	N.m	lbf	lbf.ft	in
1/4	5232	6.28	1176	4.63	9941	11.9	2234	8.78	10730	12.9	2412	9.51	7/16
5/16	8410	12.5	1891	9.22	15979	23.8	3592	17.55	17247	25.7	3877	18.96	1/2
3/8	12911	22.7	2903	16.74	24531	43.2	5514	31.9	26478	46.6	5952	34.4	9/16
7/16	17416	35.9	3915	26.5	33091	68.2	7439	50.3	35717	73.6	8029	54.3	5/8
1/2	23685	55.4	5325	40.9	45002	105	10116	77.4	48574	114	10919	84.0	3/4
9/16	30075	79.0	6761	58.3	57143	150	12846	111	61678	162	13865	119	7/8
5/8	38156	111	8578	81.9	72496	210	16297	155	78250	227	17591	167	15/16
3/4	56078	195	12607	144	106549	370	23953	273	115005	399	25854	294	1 1/8
7/8	76297	309	17152	228	144965	587	32589	433	156470	634	35175	468	1 5/16
1	99200	459	22301	339	188480	873	42371	644	203439	942	45734	695	1 1/2
1 1/8	128738	667	28941	492	244602	1267	54988	934	264015	1368	59352	1009	1 11/16
1 1/4	161358	925	36275	682	306580	1757	68921	1296	330911	1896	74391	1398	1 7/8
1 3/8	199331	1252	44811	923	378728	2378	85141	1754	408786	2567	91898	1893	2 1/16
1 1/2	240377	1642	54039	1211	456717	3119	102673	2300	492965	3367	110822	2482	2 1/4

Recommended Maximum Bolt Loads and Torque Values (Metric CoarseThreads)

	3.6		5.6		6.9		8.8		10.9		12.9		A/F
mm	Newtons	N.m	Newtons	N.m	Newtons	N.m	Newtons	N.m	Newtons	N.m	Newtons	N.m	mm
2	284	0.12	378	0.16	731	0.31	863	0.37	1216	0.52	1461	0.63	4
3	726	0.44	966	0.59	1863	1.13	2206	1.34	3109	1.88	3727	2.26	5.5
4	1255	1.00	1677	1.34	3226	2.60	3825	3.04	5374	4.31	6453	5.15	7
5	2059	1.96	2736	2.65	5286	5.10	6257	6.03	8806	8.48	10591	10.20	8
6	2903	3.43	3864	4.51	7453	8.73	8836	10.30	12405	14.71	14906	17.65	10
8	5315	8.24	7090	10.79	13680	21.57	16230	25.50	22751	35.30	27360	42.17	13
10	8473	16.7	11278	21.57	21771	42.17	25791	50.01	36284	70.61	43541	85.32	17
12	12356	28.4	16475	38.25	31773	73.55	37657	87.28	52956	122.60	63547	147.10	19
16	23340	69.6	31087	93.16	60016	178.50	71196	210.80	100027	299.10	120131	357.90	24
20	36481	135	48641	180	93849	384.1	111305	411.9	156415	578.6	187796	696.3	30
24	52563	230	70019	308.9	135331	598.2	160338	711.0	225552	1000	270662	1196	36
30	84043	466	112286	622.7	215745	1206	255952	1422	359902	2010	432471	2403	46
36	123073	814	164261	1089	316753	2099	374612	2481	527595	3491	432526	4197	55
42	169164	1304	225552	1746	435413	3364	515827	3991	725688	5609	870826	6727	65

P,S & T are the Material grade for unified inch and Whitworth fasteners (BS1768 & BS1083)
P = grade UTS of 35 tonf/in^2 and min. yield of 21 tonf/in^2, S = grade UTS of 50 tonf/in^2 and min. yield of 40 tonf/in^2,
T = grade UTS of 55 tonf/in^2 and min. yield of 41 tonf/in^2

These torque values are for guidance only! Always check with the equipment/bolt manufacturer.