



Fasteners 101 – Torque Setting

Torque settings: How much torque is the right amount is highly dependent on the size of the bolt, the thread pitch, and the surface condition of the threads. Over- and under-torquing a bolt can result in premature failure, though most failures are due to under-torque. In under-torque a bolt may be subjected to more variable loading and can fail in far fewer fatigue cycles. See Tables 1 and 2 for **nominal*** (**see note below table**) torque settings and adjusts to be made based on thread conditions (dry, oil, etc.).

Table 1. Torque settings in Ft.lbs for Bolts in Tension, reduce torque by 33% for bolts in shear. Titanium bolts should be used with MoS2 paste (Ti64's Ti-Treat Moly Paste is ideal).

Bolt		Grade 5 Steel Metric 8.8 Steel Ti64 140ksi (w/ MoS2)		Grade 8 Steel Metric 10.9 Steel Ti64 160ksi (w/ MoS2)		Socket Head Cap Screw (12.9 equivalent)	
Diameter	Thread per inch	Dry	Oiled & Ti64 w/ MoS2	Dry	Oiled & Ti64 w/ MoS2	Dry	Oiled
1/4"	20	8	6	12	9	14	11
1/4"	28	10	7	14	10	16	13
5/16"	18	17	13	25	18	29	23
5/16"	24	19	14	29	20	33	26
3/8"	16	30	23	45	35	49	39
3/8"	24	35	25	50	40	54	44
7/16"	14	50	35	70	55	76	61
7/16"	20	55	40	80	60	85	68
1/2"	13	75	55	110	80	113	90
1/2"	20	90	65	120	90	126	100
9/16"	12	110	80	150	110	163	130
9/16"	18	120	90	170	130	181	144
5/8"	11	150	110	220	170	230	184
5/8"	18	180	130	240	180	255	204
3/4"	10	260	200	380	280	400	320
3/4"	16	300	220	420	320	440	350
7/8"	9	430	320	600	460	640	510
7/8"	14	470	360	660	500	700	560
1"	8	640	480	900	680	980	780
1"	12	710	530	990	740	1060	845



- *Table 1 above lists nominal torques settings based solely upon bolt strength. Appropriate torque setting may vary significantly depending on the number of thread engagement, the alloy you are threading into (i.e. aluminum may take significantly less torque), etc. Consult application specific settings from the assembly manufacturer for exact torque settings.

Table 2. Adjustments to torque setting based on thread treatment

LUBRICANT OR PLATING	TORQUE CHANGES
Clean dry bolt	use std torque setting
Oil	Reduce torque 15% to 25%
Dry Film (Teflon or moly based)	Reduce torque 50%
Dry Wax (Cetyl alcohol)	Reduce torque 50%
Chrome plating	No change
Cadmium plating	Reduce torque 25%
Zinc plating	Reduce torque 15%

- Note, the torque reductions noted in table 2 are not additive, i.e. for a cadmium plated bolt with dry wax film, torque should only be reduced by the greater of the 2 suggested reductions, in this case 50% reduction for the dry wax, **NOT 50%+25% or 75% reduction** because the bolt is both Cd plated and dry wax coated.