Torque Values - Data Prepared by W. Christie

The correct tightening of threaded fasteners can have a significant effect on their performance. Many application problems such as self-loosening and fatigue can be elimented by correct torque. It should be understood that the subject of torque tension loading is beyond the scope of this manual. The information supplied here is an acceptable guide for normal conditions. However, for critical applications further information and research will be necessary.

In preparing this guide to torque values, the following basic assumptions were 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 (u) 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 firm), 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.

Lubrication Factor

		Surface condition of bolt			
			Electroplated		
		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

N.B. Antiseize lubricants can reduce torque required by approximately 20%

CONVERSION FACTORS

Torque
lbf.ft x 1.36 = N.m
N m x 0.737 = lbf.ft

Force
lbf x 4.45 = N
N x 0.225 = lbf

Pressure
lbf /in^2 x 0.069 = bar
bar x 14.504 = lbf/in^2

Flow
l/s x 2.119 = cu.ft/min
cu.ft/min x 0.472 = l/S

Power
hp x 0.746 = KW

$$kW = \frac{N\ m \times rev/min}{95555}$$

FORMULAE

Accepted formulae relating torque and tension, based on any 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

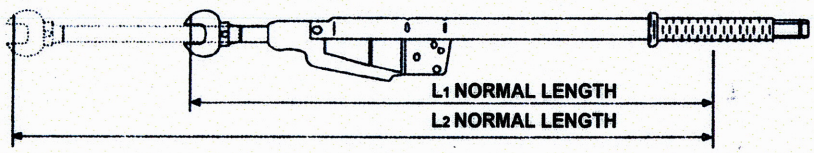
These formulae may be used for bolts outside the range of the tables.

FORMULA FOR CALCULATING THE EFFECT OF TORQUE WRENCH EXTENSIONS

$$M2 = M1 \times \frac{L2}{L1}$$

where L1 is the normal length and L2 is the extended lendth, M1 is the set torque and M2 the actual torque applied to the nut.
Example: Torque setting 100 N m.
L1 = 500 L2 = 650 (units of length not important, this is a ratio)

$$M2 = 100 \times \frac{650}{500} = 130\ N.m$$



Torque Conversion Scale