

Torque Values Selection

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

*Bolts and nuts are new, standard finish, uncoated and not lubricated**

The load will be 90% of the bolt yield strength

The coefficient of friction () is 0,14

The final tightening sequence is achieved smoothly and slowly until the torque indicates full torque has been obtained.

The information supplied here is an acceptable guide for normal conditions and includes information on:

- Lubrication Factors
- Conversion Factors
- Formula relating Torque and Tension
- the Formula for calculating the effect of Torque Wrench extensions
- Torque Conversion Scale

* 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 Lubrication Factor table. N.B. Antiseize lubricants can reduce torque required by approximately 20%.

Lubrication factor

		Surface condition of bolt			
		Self	Electroplated		
			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 and Wax	0,60	0,55	0,65	0,55

Conversion Factors

Torque	Flow
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lbf.ft x 1.36 = Nm Nm x 0.737 = lbf.ft Force lbf x 4.45 = N N x 0.225 = lbf Pressure lbf/in x 0.069 = bar bar x 14.504 = lbf/in	l/s x 2.119 = cu.ft/min cu.ft/min x 0.472 = l/s Power hp x 0.746 = kW $\text{kW} = \frac{\text{Nm} \times \text{rev/min}}{95555}$
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Formulae Relating to Torque and Tension

Imperial	Metric
M = torque lbf.ft	M = torque Nm
P = bolt tension lbf	P = bolt tension Newtons
D = bolt dia.ins	D = bolt dia. mm
$M = \frac{P \times D}{60}$	$M = \frac{P \times D}{5000}$

Formula for Calculating the Effect of Torque Wrench Extensions

$$M_2 = M_1 \times \frac{L_2}{L_1}$$

where L1 is the normal length and L2 is the extended length, M1 is the set torque and M2 the actual torque applied to the nut.

eg. L1=500 L2=650 so

$$M_2 = 100 \times \frac{650}{500} = 130 \text{ Nm}$$