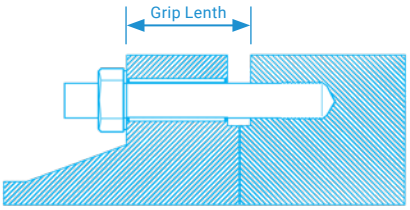
BOLTIGHT®
PART OF THE NORD-LOCK GROUP

OIL PRESSURE CALCULATION SHEET

The formula widely used to calculate the oil pressure to be used with a bolt tensioning tool is given below along with definitions of the terms used;

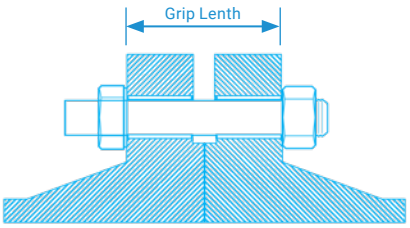


BOLT LOAD

Residual Bolt Load required when the tensioning operation is complete.

TENSIONING FORCE

The load that will be applied by the bolt tensioner during the tensioning operation.



LOAD TRANSFER FACTOR

The ratio of **tensioning force** to **bolt load**.

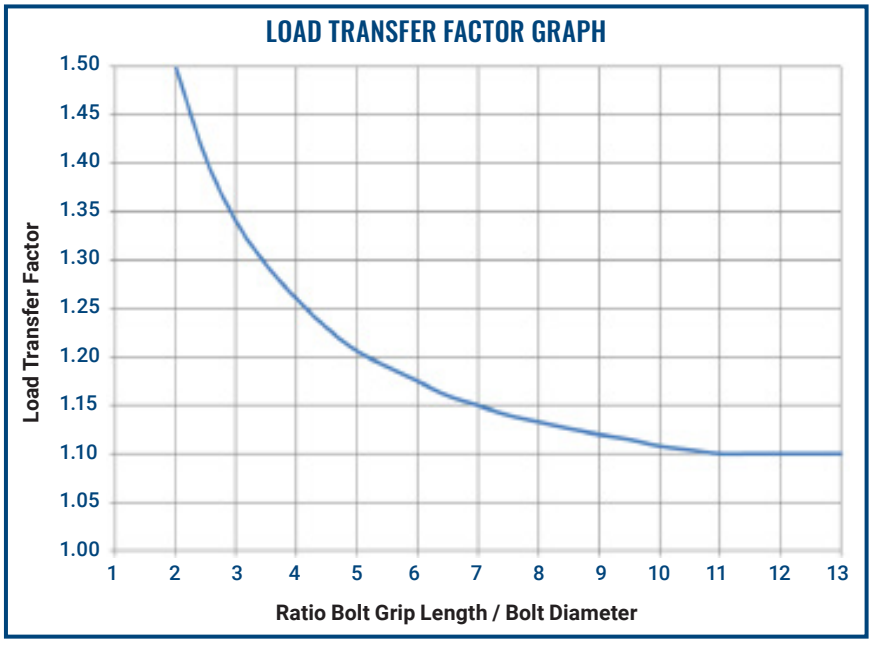
$$\text{Load Transfer Factor} = \frac{\text{Tensioning Force}}{\text{Bolt Load}} = \frac{1.01 + \text{Bolt Diameter (mm)}}{\text{Grip Length (mm)}}$$

If the **Load Transfer Factor** calculates to less than 1.10 then use 1.10.
Tensioning Force = Bolt Load x Load Transfer Factor

$$\text{Oil Pressure (bar)} = \frac{10 \times \text{Tensioning Force (Newtons)}}{\text{Tool Pressure Area (mm}^2\text{)}}$$

Check that the oil pressure calculated does not exceed the maximum working pressure of the bolt tensioning tool. Users who require highly accurate residual bolt stresses should perform a bolt extension measurement before and after tensioning. In this way residual bolt stresses can be calculated from the actual bolt extensions measured.

Always check that the tensioning force will not exceed 95% of the yield strength of the bolt material. If it does, the grip length of the bolt must be increased. Please contact your representative for advice on this.



IMPORTANT . The chart and formula should only be used as a guide. The actual residual load can be affected by many factors including but are not limited to, damage to bolt and nut threads, squareness of the nut washer face to the nut threads, squareness of the joint faces, condition of the joint face under the nut, and the use of washers. Users who require very accurate and known residual bolt loads should use measurements to determine the actual residual load achieved. For example perform a bolt length measurement before and after tensioning, then calculate the residual load from the measured bolt extension. Boltight accepts no responsibility for the actual residual loads achieved with it's bolt tensioning tools.

Production Site Boltight Limited
Tel: +44 (0) 1922 669222
Email: sales.boltight.uk@nord-lock.com
www.nord-lock.com

Sales Office Nord-Lock Ltd
Tel: +44 (0) 1264 355557
Email: enquiries@nord-lock.co.uk
www.nord-lock.com

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WORKED EXAMPLE

Flange	18 inch 900 lb
Bolt diameter (D)	1-7/8 inch UN8
No. of bolts	20
Bolt grip length (G)	204 mm
Residual bolt stress required	275 N/mm² (40,000 psi)
Bolt tensioning tool no.	No. 23A
Hydraulic pressure area	5489.8 mm²

Calculate residual load

Bolt stress area	1567 sq mm (2.43 inch²)
Residual load per bolt	= 275 x 1567 / 1000
	= 430.9 kN

Calculate load transfer factor = 1.01 + D/G where :-

Load transfer factor (LTF)

D = 1.875 x 25.4 = 47.652 mm

G = 204 mm

= 1.01 + (47.625 / 204)

= 1.01 + 0.233

= 1.243

Calculate initial bolt load required

Initial bolt load = Residual bolt load x load transfer factor

= 430.9 kN x 1.243

= 535.6 kN

Calculate Oil pressure B

Oil pressure B = Initial bolt load / Hydraulic pressure area

Convert kN to N (535.6 kN x 1000 = 535,600 N)

=[535,600 N x 10] / 5489.8 mm^2

= 975.6 bar

Calculate Oil pressure A

Oil pressure A = 1.25 x Oil pressure B

= 975.6 x 1.25

= 1219.5 bar

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