Important Bolt Loads in Gasket Joints Formulas PDF

Formulas
Examples
with Units

List of 16
Important Bolt Loads in Gasket Joints Formulas

1) Actual Cross-sectional Area of Bolts given Root Diameter of Thread Formula

Evaluate Formula

Formula

$$A_b = \frac{2 \cdot \pi \cdot y_{sl} \cdot G \cdot N}{\sigma_{gs}}$$

Example with Units

$$126.6466\,\text{mm}^2 = \frac{2 \cdot 3.1416 \cdot 3.85\,\text{N/mm}^2 \cdot 32\,\text{mm} \cdot 4.1\,\text{mm}}{25.06\,\text{N/mm}^2}$$

2) Bolt Load in Design of Flange for Gasket Seating Formula

Evaluate Formula

Formula

$$W_{m1} = \left(\frac{A_m + A_b}{2}\right) \cdot \sigma_{gs}$$

Example with Units

$$15612.38\,\text{N} = \left(\frac{1120\,\text{mm}^2 + 126\,\text{mm}^2}{2}\right) \cdot 25.06\,\text{N/mm}^2$$

3) Bolt load under operating condition Formula

Evaluate Formula

Formula

$$W_{m1} = H + H_p$$

Example with Units

$$15486\,\text{N} = 3136\,\text{N} + 12350\,\text{N}$$

4) Bolt Load under operating condition given Hydrostatic End Force Formula

Evaluate Formula

Formula

$$W_{m1} = \left(\left(\frac{\pi}{4}\right) \cdot (G)^2 \cdot P\right) + \left(2 \cdot b_g \cdot \pi \cdot G \cdot P \cdot m\right)$$

Example with Units

$$15516.2005\,\text{N} = \left(\left(\frac{3.1416}{4}\right) \cdot (32\,\text{mm})^2 \cdot 3.9\,\text{MPa}\right) + \left(2 \cdot 4.21\,\text{mm} \cdot 3.1416 \cdot 32\,\text{mm} \cdot 3.9\,\text{MPa} \cdot 3.75\right)$$

5) Deflection of Spring Initial Bolt Load to Seal Gasket Joint Formula

Evaluate Formula

Formula

$$y_{sl} = \frac{W_{m2}}{\pi \cdot b_g \cdot G}$$

Example with Units

$$3.7922\,\text{N/mm}^2 = \frac{1605\,\text{N}}{3.1416 \cdot 4.21\,\text{mm} \cdot 32\,\text{mm}}$$

6) Gasket Width given actual Cross-sectional Area of Bolts Formula

Evaluate Formula

Formula

$$N = \frac{\sigma_{gs} \cdot A_b}{2 \cdot \pi \cdot y_{sl} \cdot G}$$

Example with Units

$$4.0791\,\text{mm} = \frac{25.06\,\text{N/mm}^2 \cdot 126\,\text{mm}^2}{2 \cdot 3.1416 \cdot 3.85\,\text{N/mm}^2 \cdot 32\,\text{mm}}$$

7) Hydrostatic Contact Force given Bolt Load under Operating condition Formula

Evaluate Formula

Formula

$$H_p = W_{m1} - \left(\left(\frac{\pi}{4}\right) \cdot (G)^2 \cdot P\right)$$

Example with Units

$$12349.4339\,\text{N} = 15486\,\text{N} - \left(\left(\frac{3.1416}{4}\right) \cdot (32\,\text{mm})^2 \cdot 3.9\,\text{MPa}\right)$$

8) Hydrostatic end force Formula

Evaluate Formula

Formula

$$H = W_{m1} - H_p$$

Example with Units

$$3136\,\text{N} = 15486\,\text{N} - 12350\,\text{N}$$

9) Hydrostatic End Force given Bolt Load under Operating condition Formula

Evaluate Formula

Formula

$$H = W_{m1} - \left(2 \cdot b_g \cdot \pi \cdot G \cdot m \cdot P\right)$$

Example with Units

$$3106.3657\,\text{N} = 15486\,\text{N} - \left(2 \cdot 4.21\,\text{mm} \cdot 3.1416 \cdot 32\,\text{mm} \cdot 3.75 \cdot 3.9\,\text{MPa}\right)$$

10) Initial Bolt Load to seat Gasket Joint Formula

Evaluate Formula

Formula

$$W_{m2} = \pi \cdot b_g \cdot G \cdot y_{sl}$$

Example with Units

$$1629.4561\,\text{N} = 3.1416 \cdot 4.21\,\text{mm} \cdot 32\,\text{mm} \cdot 3.85\,\text{N/mm}^2$$

11) Load on bolts based on hydrostatic end force Formula

Evaluate Formula

Formula

$$F_b = f_s \cdot P_t \cdot A_m$$

Example with Units

$$18816\,\text{N} = 3 \cdot 5.6\,\text{MPa} \cdot 1120\,\text{mm}^2$$

12) Stress Required for Gasket Seating Formula

Evaluate Formula

Formula

$$\sigma_{gs} = \frac{2 \cdot \pi \cdot y_{sl} \cdot G \cdot N}{A_b}$$

Example with Units

$$25.1886\,\text{N/mm}^2 = \frac{2 \cdot 3.1416 \cdot 3.85\,\text{N/mm}^2 \cdot 32\,\text{mm} \cdot 4.1\,\text{mm}}{126\,\text{mm}^2}$$

13) Stress Required for Gasket Seating given Bolt Load Formula

Evaluate Formula

Formula

$$\sigma_{gs} = \frac{W_{m1}}{\frac{A_m + A_b}{2}}$$

Example with Units

$$24.8571\,\text{N/mm}^2 = \frac{15486\,\text{N}}{\frac{1120\,\text{mm}^2 + 126\,\text{mm}^2}{2}}$$

14) Test pressure given Bolt Load Formula

Evaluate Formula

Formula

$$P_t = \frac{F_b}{f_s \cdot A_m}$$

Example with Units

$$5.4018\,\text{MPa} = \frac{18150\,\text{N}}{3 \cdot 1120\,\text{mm}^2}$$

15) Total cross-sectional area of bolt at root of thread Formula

Evaluate Formula

Formula

$$A_{m1} = \frac{W_{m1}}{\sigma_{oc}}$$

Example with Units

$$297.8077\,\text{mm}^2 = \frac{15486\,\text{N}}{52\,\text{N/mm}^2}$$

16) Width of U Collar given Initial Bolt Load to Seat Gasket Joint Formula

Evaluate Formula

Formula

$$b_g = \frac{W_{m2}}{\pi \cdot G \cdot y_{sl}}$$

Example with Units

$$4.1468\,\text{mm} = \frac{1605\,\text{N}}{3.1416 \cdot 32\,\text{mm} \cdot 3.85\,\text{N/mm}^2}$$

Variables used in list of Bolt Loads in Gasket Joints Formulas above

- A_b Actual Bolt Area *(Square Millimeter)*
- A_m Greater Cross-section Area of Bolts *(Square Millimeter)*
- A_{m1} Bolt Cross-Sectional Area at Root of Thread *(Square Millimeter)*
- b_g Width of u-collar in Gasket *(Millimeter)*
- F_b Bolt Load in Gasket Joint *(Newton)*
- f_s Factor of Safety for Bolt Packing
- G Gasket Diameter *(Millimeter)*
- H Hydrostatic End Force in Gasket Seal *(Newton)*
- H_p Total Joint Surface Compression Load *(Newton)*
- m Gasket Factor
- N Gasket Width *(Millimeter)*
- P Pressure at Outer Diameter of Gasket *(Megapascal)*
- P_t Test Pressure in Bolted Gasket Joint *(Megapascal)*
- W_{m1} Bolt Load Under Operating Condition for Gasket *(Newton)*
- W_{m2} Initial Bolt Load to Seat the Gasket Joint *(Newton)*
- y_{sl} Gasket Unit Seating Load *(Newton per Square Millimeter)*
- σ_{gs} Stress Required for Gasket Seating *(Newton per Square Millimeter)*
- σ_{oc} Stress Required for Operating Condition for Gasket *(Newton per Square Millimeter)*

Constants, Functions, Measurements used in list of Bolt Loads in Gasket Joints Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Measurement: **Length** in Millimeter (mm) *Length Unit Conversion*
- Measurement: **Area** in Square Millimeter (mm²) *Area Unit Conversion*
- Measurement: **Pressure** in Megapascal (MPa) *Pressure Unit Conversion*
- Measurement: **Force** in Newton (N) *Force Unit Conversion*
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²) *Stress Unit Conversion*

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