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Bolt Loads in Gasket Joints Formulas

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List of 16 Bolt Loads in Gasket Joints Formulas

Bolt Loads in Gasket Joints

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

Open Calculator

fx $$A_b = \frac{2 \cdot \pi \cdot y \cdot G \cdot N}{\sigma_{sbat}}$$

ex $$125.0018\text{mm}^2 = \frac{2 \cdot \pi \cdot 3.8\text{N/mm}^2 \cdot 32\text{mm} \cdot 4.1\text{mm}}{25.06\text{N/mm}^2}$$

2) Bolt Load in Design of Flange for Gasket Seating

Open Calculator

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

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

3) Bolt load under operating condition

Open Calculator

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

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

4) Bolt Load under operating condition given Hydrostatic End Force

Open Calculator

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

ex $$15486.8\text{N} = \left(\left(\frac{\pi}{4}\right) \cdot (32\text{mm})^2 \cdot 3.9\text{MPa}\right) + (2 \cdot 4.2\text{mm} \cdot \pi \cdot 32\text{mm} \cdot 3.9\text{MPa} \cdot 3.75)$$

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

Open Calculator

$$y = \frac{W_{m2}}{\pi \cdot b \cdot G}$$

$$3.801245\text{N/mm}^2 = \frac{1605\text{N}}{\pi \cdot 4.2\text{mm} \cdot 32\text{mm}}$$

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

Open Calculator

$$N = \frac{\sigma_{sbat} \cdot A_b}{2 \cdot \pi \cdot y \cdot G}$$

$$4.132741\text{mm} = \frac{25.06\text{N/mm}^2 \cdot 126\text{mm}^2}{2 \cdot \pi \cdot 3.8\text{N/mm}^2 \cdot 32\text{mm}}$$

7) Hydrostatic Contact Force given Bolt Load under Operating condition

Open Calculator

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

$$12349.43\text{N} = 15486\text{N} - \left(\left(\frac{\pi}{4}\right) \cdot (32\text{mm})^2 \cdot 3.9\text{MPa}\right)$$

8) Hydrostatic end force

Open Calculator

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

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

9) Hydrostatic End Force given Bolt Load under Operating condition

Open Calculator

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

$$3135.771\text{N} = 15486\text{N} - (2 \cdot 4.2\text{mm} \cdot \pi \cdot 32\text{mm} \cdot 3.75 \cdot 3.9\text{MPa})$$

10) Initial Bolt Load to seat Gasket Joint

Open Calculator

$$W_{m2} = \pi \cdot b \cdot G \cdot y$$

$$1604.474\text{N} = \pi \cdot 4.2\text{mm} \cdot 32\text{mm} \cdot 3.8\text{N/mm}^2$$

11) Load on bolts based on hydrostatic end force

Open Calculator

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

$$18480\text{N} = 3 \cdot 5.5\text{MPa} \cdot 1120\text{mm}^2$$

12) Stress Required for Gasket Seating

Open Calculator

$$\sigma_{sbat} = \frac{2 \cdot \pi \cdot y \cdot G \cdot N}{A_b}$$

$$24.86147\text{N/mm}^2 = \frac{2 \cdot \pi \cdot 3.8\text{N/mm}^2 \cdot 32\text{mm} \cdot 4.1\text{mm}}{126\text{mm}^2}$$

13) Stress Required for Gasket Seating given Bolt Load

Open Calculator

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

$$24.85714\text{N/mm}^2 = \frac{15486\text{N}}{\frac{1120\text{mm}^2 + 126\text{mm}^2}{2}}$$

14) Test pressure given Bolt Load

Open Calculator

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

$$5.401786\text{MPa} = \frac{18150\text{N}}{3 \cdot 1120\text{mm}^2}$$

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

Open Calculator

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

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

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

Open Calculator

$$b = \frac{W_{m2}}{\pi \cdot G \cdot y}$$

$$4.201376\text{mm} = \frac{1605\text{N}}{\pi \cdot 32\text{mm} \cdot 3.8\text{N/mm}^2}$$

Variables Used

- 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** Width of u-collar *(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** Gasket Unit Seating Load *(Newton per Square Millimeter)*
- σ_{sbat} Stress Required for Gasket Seating *(Newton per Square Millimeter)*
- σ_{sbd} Stress Required for Operating Condition for Gasket *(Newton per Square Millimeter)*

Constants, Functions, Measurements used

- Constant: **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

Check other formula lists

- **Bolt Loads in Gasket Joints Formulas**
- **Elastic Packing Formulas**
- **V Ring Packing Formulas**

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