



# Bolt Loads in Gasket Joints Formulas

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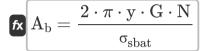




#### **List of 16 Bolt Loads in Gasket Joints Formulas**

## Bolt Loads in Gasket Joints &

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



Open Calculator 🗗

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

2) Bolt Load in Design of Flange for Gasket Seating

 $W_{m1} = \left(rac{A_m + A_b}{2}
ight) \cdot \sigma_{sbat}$ 

Open Calculator 🗗

 $extbf{ex} 15612.38 ext{N} = \left(rac{1120 ext{mm}^2 + 126 ext{mm}^2}{2}
ight) \cdot 25.06 ext{N/mm}^2$ 

3) Bolt load under operating condition

fx  $W_{m1} = H + H_p$ 

Open Calculator 🗗

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

4) Bolt Load under operating condition given Hydrostatic End Force

 $\mathbf{W}_{\mathrm{m}1} = \left( \left( \frac{\pi}{4} \right) \cdot (\mathbf{G})^2 \cdot \mathbf{P} \right) + (2 \cdot \mathbf{b} \cdot \pi \cdot \mathbf{G} \cdot \mathbf{P} \cdot \mathbf{m})$ 

Open Calculator 🗗

ex

 $15486.8\mathrm{N} = \left(\left(\frac{\pi}{4}\right)\cdot\left(32\mathrm{mm}\right)^2\cdot3.9\mathrm{MPa}\right) + \left(2\cdot4.2\mathrm{mm}\cdot\pi\cdot32\mathrm{mm}\cdot3.9\mathrm{MPa}\cdot3.75\right)$ 





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

 $\mathbf{x} = rac{\mathrm{W}_{\mathrm{m2}}}{\pi \cdot \mathrm{b} \cdot \mathrm{G}}$ 

Open Calculator 🗗

- $\boxed{\textbf{9x} 3.801245 \text{N}/\text{mm}^2 = \frac{1605 \text{N}}{\pi \cdot 4.2 \text{mm} \cdot 32 \text{mm}}}$
- 6) Gasket Width given actual Cross-sectional Area of Bolts
- $N = rac{\sigma_{sbat} \cdot A_b}{2 \cdot \pi \cdot y \cdot G}$

Open Calculator

- $ext{ex} \ 4.132741 ext{mm} = rac{25.06 ext{N/mm}^2 \cdot 126 ext{mm}^2}{2 \cdot \pi \cdot 3.8 ext{N/mm}^2 \cdot 32 ext{mm}}$
- 7) Hydrostatic Contact Force given Bolt Load under Operating condition
- $\mathbf{H}_{\mathrm{p}} = \mathrm{W}_{\mathrm{m}1} \left( \left( rac{\pi}{4} 
  ight) \cdot (\mathrm{G})^2 \cdot \mathrm{P} 
  ight)$

Open Calculator 🛂

- $\mathbf{ex}$  12349.43N = 15486N  $\left(\left(\frac{\pi}{4}\right) \cdot (32\text{mm})^2 \cdot 3.9\text{MPa}\right)$
- 8) Hydrostatic end force
- $\mathbf{K} = \mathbf{W}_{\mathrm{m}1} \mathbf{H}_{\mathrm{p}}$

Open Calculator

- $\texttt{ex} \ 3136 \mathrm{N} = 15486 \mathrm{N} 12350 \mathrm{N}$
- 9) Hydrostatic End Force given Bolt Load under Operating condition
- fx  $H = W_{m1} (2 \cdot b \cdot \pi \cdot G \cdot m \cdot P)$

Open Calculator 🗗

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



# 10) Initial Bolt Load to seat Gasket Joint 🗗

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

Open Calculator 🚰

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

# 11) Load on bolts based on hydrostatic end force 🗹

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

Open Calculator

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

# 12) Stress Required for Gasket Seating

 $\sigma_{
m sbat} = rac{2 \cdot \pi \cdot {
m y} \cdot {
m G} \cdot {
m N}}{{
m A}_{
m b}}$ 

Open Calculator 🚰

 $extbf{ex} \ 24.86147 ext{N/mm}^2 = rac{2 \cdot \pi \cdot 3.8 ext{N/mm}^2 \cdot 32 ext{mm} \cdot 4.1 ext{mm}}{126 ext{mm}^2}$ 

#### 13) Stress Required for Gasket Seating given Bolt Load

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

Open Calculator 🗗

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

# 14) Test pressure given Bolt Load 🖸

 $\mathbf{F}_{\mathrm{t}} = rac{\mathrm{F}_{\mathrm{b}}}{\mathrm{f}_{\mathrm{s}} \cdot \mathrm{A}_{\mathrm{m}}}$ 

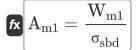
Open Calculator

 $oxed{ex} 5.401786 ext{MPa} = rac{18150 ext{N}}{3 \cdot 1120 ext{mm}^2}$ 





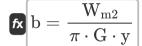
#### 15) Total cross-sectional area of bolt at root of thread



Open Calculator

$$m ex = 297.8077mm^2 = rac{15486N}{52N/mm^2}$$

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



Open Calculator

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



#### Variables Used

- Ab Actual Bolt Area (Square Millimeter)
- Am Greater Cross-section Area of Bolts (Square Millimeter)
- A<sub>m1</sub> Bolt Cross-sectional Area at Root of Thread (Square Millimeter)
- **b** Width of u-collar (Millimeter)
- **F**<sub>b</sub> Bolt Load in Gasket Joint (Newton)
- fs Factor of Safety for Bolt Packing
- **G** Gasket Diameter (Millimeter)
- **H** Hydrostatic End Force in Gasket Seal (Newton)
- H<sub>p</sub> Total Joint Surface Compression Load (Newton)
- m Gasket Factor
- N Gasket Width (Millimeter)
- P Pressure at Outer Diameter of Gasket (Megapascal)
- Pt Test Pressure in Bolted Gasket Joint (Megapascal)
- W<sub>m1</sub> Bolt Load Under Operating Condition for Gasket (Newton)
- W<sub>m2</sub> Initial bolt load to seat the gasket joint (Newton)
- y Gasket Unit Seating Load (Newton per Square Millimeter)
- σ<sub>sbat</sub> Stress Required for Gasket Seating (Newton per Square Millimeter)
- σ<sub>sbd</sub> 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
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