

Important V Ring Packing Formulas PDF



**Formulas
Examples
with Units**

**List of 25
Important V Ring Packing Formulas**

1) Multiple spring installations Formulas ↻

1.1) Bolt Load given Flange pressure Formula ↻

Formula

$$F_v = p_f \cdot a \cdot \frac{C_u}{n}$$

Example with Units

$$15.4 \text{ N} = 5.5 \text{ MPa} \cdot 100 \text{ mm}^2 \cdot \frac{0.14}{5}$$

Evaluate Formula ↻

1.2) Bolt Load given Modulus of Elasticity and Increment Length Formula ↻

Formula

$$F_v = E \cdot \frac{dl}{\left(\frac{l_1}{A_1}\right) + \left(\frac{l_2}{A_2}\right)}$$

Example with Units

$$15.4123 \text{ N} = 1.55 \text{ MPa} \cdot \frac{1.5 \text{ mm}}{\left(\frac{3.2 \text{ mm}}{53 \text{ mm}^2}\right) + \left(\frac{3.8 \text{ mm}}{42 \text{ mm}^2}\right)}$$

Evaluate Formula ↻

1.3) Bolt load in gasket joint Formula ↻

Formula

$$F_v = 11 \cdot \frac{m_{ti}}{d_n}$$

Example with Units

$$15.4786 \text{ N} = 11 \cdot \frac{0.00394 \text{ N}}{2.8 \text{ mm}}$$

Evaluate Formula ↻

1.4) Flange pressure developed due to tightening of bolt Formula ↻

Formula

$$p_f = n \cdot \frac{F_v}{a \cdot C_u}$$

Example with Units

$$5.5 \text{ MPa} = 5 \cdot \frac{15.4 \text{ N}}{100 \text{ mm}^2 \cdot 0.14}$$

Evaluate Formula ↻

1.5) Flange pressure given Twisting moment Formula ↻

Formula

$$p_f = 2 \cdot n \cdot \frac{T}{a \cdot C_u \cdot d_b}$$

Example with Units

$$5.5556 \text{ MPa} = 2 \cdot 5 \cdot \frac{0.07 \text{ N} \cdot \text{m}}{100 \text{ mm}^2 \cdot 0.14 \cdot 9 \text{ mm}}$$

Evaluate Formula ↻



1.6) Gasket Area given Flange pressure Formula

Formula

$$a = n \cdot \frac{F_v}{p_f \cdot C_u}$$

Example with Units

$$100\text{mm}^2 = 5 \cdot \frac{15.4\text{N}}{5.5\text{MPa} \cdot 0.14}$$

Evaluate Formula 

1.7) Initial Bolt Torque given Bolt Load Formula

Formula

$$m_{ti} = d_n \cdot \frac{F_v}{11}$$

Example with Units

$$0.0039\text{N} = 2.8\text{mm} \cdot \frac{15.4\text{N}}{11}$$

Evaluate Formula 

1.8) Minimum percentage compression Formula

Formula

$$P_s = 100 \cdot \left(1 - \left(\frac{b}{h_i} \right) \right)$$

Example with Units

$$30 = 100 \cdot \left(1 - \left(\frac{4.2\text{mm}}{6.0\text{mm}} \right) \right)$$

Evaluate Formula 

1.9) Nominal Bolt Diameter given Bolt Load Formula

Formula

$$d_n = 11 \cdot \frac{m_{ti}}{F_v}$$

Example with Units

$$2.8143\text{mm} = 11 \cdot \frac{0.00394\text{N}}{15.4\text{N}}$$

Evaluate Formula 

1.10) Number of Bolts given Flange pressure Formula

Formula

$$n = p_f \cdot a \cdot \frac{C_u}{F_v}$$

Example with Units

$$5 = 5.5\text{MPa} \cdot 100\text{mm}^2 \cdot \frac{0.14}{15.4\text{N}}$$

Evaluate Formula 

1.11) Twisting Moment given Flange Pressure Formula

Formula

$$T = \frac{p_f \cdot a \cdot C_u \cdot d_b}{2 \cdot n}$$

Example with Units

$$0.0693\text{N}^*\text{m} = \frac{5.5\text{MPa} \cdot 100\text{mm}^2 \cdot 0.14 \cdot 9\text{mm}}{2 \cdot 5}$$

Evaluate Formula 

1.12) Uncompressed gasket thickness Formula

Formula

$$h_i = \frac{100 \cdot b}{100 - P_s}$$

Example with Units

$$6\text{mm} = \frac{100 \cdot 4.2\text{mm}}{100 - 30}$$

Evaluate Formula 



1.13) Width of u collar given uncompressed Gasket Thickness Formula

Formula

$$b = \frac{(h_i) \cdot (100 - P_s)}{100}$$

Example with Units

$$4.2 \text{ mm} = \frac{(6.0 \text{ mm}) \cdot (100 - 30)}{100}$$

Evaluate Formula 

2) Single spring installations Formulas

2.1) Actual Diameter of Spring Wire given Actual mean diameter of Conical spring Formula

Formula

$$d_{sw} = 2 \cdot \left(D_a + D_o - \left(\frac{w}{2} \right) \right)$$

Example with Units

$$39.2 \text{ mm} = 2 \cdot \left(0.1 \text{ mm} + 23.75 \text{ mm} - \left(\frac{8.5 \text{ mm}}{2} \right) \right)$$

Evaluate Formula 

2.2) Actual Diameter of Spring Wire given Deflection of Spring Formula

Formula

$$d_{sw} = .0123 \cdot \frac{(D_a)^2}{y}$$

Example with Units

$$0.0008 \text{ mm} = .0123 \cdot \frac{(0.1 \text{ mm})^2}{0.154 \text{ mm}}$$

Evaluate Formula 

2.3) Actual mean diameter of conical spring Formula

Formula

$$D_a = D_o - \left(\frac{1}{2} \right) \cdot (w + d_{sw})$$

Example with Units

$$-38 \text{ mm} = 23.75 \text{ mm} - \left(\frac{1}{2} \right) \cdot (8.5 \text{ mm} + 115 \text{ mm})$$

Evaluate Formula 

2.4) Actual Mean Diameter of Conical Spring given Deflection of Spring Formula

Formula

$$D_a = \frac{\left(\frac{y \cdot d_{sw}}{0.0123} \right)^1}{2}$$

Example with Units

$$0.7199 \text{ mm} = \frac{\left(\frac{0.154 \text{ mm} \cdot 115 \text{ mm}}{0.0123} \right)^1}{2}$$

Evaluate Formula 

2.5) Deflection of conical spring Formula

Formula

$$y = .0123 \cdot \frac{(D_a)^2}{d_{sw}}$$

Example with Units

$$1.1\text{E-}6 \text{ mm} = .0123 \cdot \frac{(0.1 \text{ mm})^2}{115 \text{ mm}}$$

Evaluate Formula 

2.6) Diameter of wire for spring given Mean diameter of Conical spring Formula

Formula

$$d_{sw} = \frac{\left(\frac{\pi \cdot (D_m)^2}{139300} \right)^1}{3}$$

Example with Units

$$3.3\text{E-}6 \text{ mm} = \frac{\left(\frac{3.1416 \cdot (21 \text{ mm})^2}{139300} \right)^1}{3}$$

Evaluate Formula 



2.7) Inside diameter of member given Mean diameter of Conical spring Formula

Formula

$$D_i = D_m - \left(\left(\frac{3}{2} \right) \cdot w \right)$$

Example with Units

$$8.25 \text{ mm} = 21 \text{ mm} - \left(\left(\frac{3}{2} \right) \cdot 8.5 \text{ mm} \right)$$

Evaluate Formula 

2.8) Mean diameter of conical spring Formula

Formula

$$D_m = D_i + \left(\left(\frac{3}{2} \right) \cdot w \right)$$

Example with Units

$$21 \text{ mm} = 8.25 \text{ mm} + \left(\left(\frac{3}{2} \right) \cdot 8.5 \text{ mm} \right)$$

Evaluate Formula 

2.9) Mean diameter of conical spring given Diameter of spring wire Formula

Formula

$$D_m = \frac{\left(\frac{(d_{sw})^3 \cdot 139300}{\pi} \right)^{\frac{1}{4}}}{2}$$

Example with Units

$$33718.23 \text{ mm} = \frac{\left(\frac{(115 \text{ mm})^3 \cdot 139300}{3.1416} \right)^{\frac{1}{4}}}{2}$$

Evaluate Formula 

2.10) Nominal packing cross section given Actual mean diameter of Conical spring Formula

Formula

$$w = 2 \cdot \left(D_a + D_o - \left(\frac{d_{sw}}{2} \right) \right)$$

Example with Units

$$-67.3 \text{ mm} = 2 \cdot \left(0.1 \text{ mm} + 23.75 \text{ mm} - \left(\frac{115 \text{ mm}}{2} \right) \right)$$

Evaluate Formula 

2.11) Nominal packing cross section given Mean diameter of Conical spring Formula

Formula

$$w = (D_m - D_i) \cdot \frac{2}{3}$$

Example with Units

$$8.5 \text{ mm} = (21 \text{ mm} - 8.25 \text{ mm}) \cdot \frac{2}{3}$$

Evaluate Formula 

2.12) Outer Diameter of spring wire given Actual mean diameter of Conical spring Formula

Formula

$$D_o = D_a - \left(\frac{1}{2} \right) \cdot (w + d_{sw})$$

Example with Units

$$-61.65 \text{ mm} = 0.1 \text{ mm} - \left(\frac{1}{2} \right) \cdot (8.5 \text{ mm} + 115 \text{ mm})$$

Evaluate Formula 



Variables used in list of V Ring Packing Formulas above

- **a** Gasket Area (Square Millimeter)
- **A_i** Area of Cross Section at the Inlet (Square Millimeter)
- **A_t** Area of Cross Section at the Throat (Square Millimeter)
- **b** Width of u-collar (Millimeter)
- **C_u** Torque Friction Coefficient
- **D_a** Actual Mean Diameter of Spring (Millimeter)
- **d_b** Diameter of Bolt (Millimeter)
- **D_i** Inside Diameter (Millimeter)
- **D_m** Mean Diameter of Conical Spring (Millimeter)
- **d_n** Nominal Bolt Diameter (Millimeter)
- **D_o** Outer Diameter of Spring Wire (Millimeter)
- **d_{sw}** Diameter of Spring Wire (Millimeter)
- **dl** Incremental Length in Direction of Velocity (Millimeter)
- **E** Modulus of Elasticity (Megapascal)
- **F_v** Bolt Load in Gasket Joint of V Ring (Newton)
- **h_i** Uncompressed gasket thickness (Millimeter)
- **l₁** Length of joint 1 (Millimeter)
- **l₂** Length of joint 2 (Millimeter)
- **m_{ti}** Initial Bolt Torque (Newton)
- **n** Number of Bolts
- **p_f** Flange Pressure (Megapascal)
- **P_s** Minimum Percentage Compression
- **T** Twisting Moment (Newton Meter)
- **w** Nominal Packing Cross-section of Bush Seal (Millimeter)
- **y** Deflection of Conical Spring (Millimeter)

Constants, Functions, Measurements used in list of V Ring Packing 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: Moment of Force** in Newton Meter (N*m)
Moment of Force Unit Conversion 



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