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V Ring Packing Formulas

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List of 25 V Ring Packing Formulas

V Ring Packing

Multiple spring installations

1) Bolt Load given Flange pressure

$$fx \quad F_b = p_f \cdot A \cdot \frac{C_u}{n}$$

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

$$ex \quad 25.66667N = 5.5MPa \cdot 100mm^2 \cdot \frac{0.14}{3}$$

2) Bolt Load given Modulus of Elasticity and Increment Length

$$fx \quad F_b = E \cdot \frac{dl}{\left(\frac{l_1}{A_i}\right) + \left(\frac{l_2}{A_t}\right)}$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$ex \quad 99.53362N = 10.01MPa \cdot \frac{1.5mm}{\left(\frac{3.2mm}{53mm^2}\right) + \left(\frac{3.8mm}{42mm^2}\right)}$$


3) Bolt load in gasket joint

$$fx \quad F_b = 11 \cdot \frac{m_{ti}}{dn}$$

[Open Calculator !\[\]\(f1c5da15572e3e09d343161be98f508d_img.jpg\)](#)

$$ex \quad 7857.143N = 11 \cdot \frac{2N}{2.8mm}$$



4) Flange pressure developed due to tightening of bolt 

$$fx \quad p_f = n \cdot \frac{F_b}{A \cdot C_u}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 3889.286MPa = 3 \cdot \frac{18150N}{100mm^2 \cdot 0.14}$$

5) Flange pressure given Twisting moment 

$$fx \quad p_f = 2 \cdot n \cdot \frac{M_t}{A \cdot C_u \cdot d_{bolt}}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)


$$ex \quad 619.0476MPa = 2 \cdot 3 \cdot \frac{13N \cdot m}{100mm^2 \cdot 0.14 \cdot 9mm}$$

6) Gasket Area given Flange pressure 

$$fx \quad A = n \cdot \frac{F_b}{p_f \cdot C_u}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 70714.29mm^2 = 3 \cdot \frac{18150N}{5.5MPa \cdot 0.14}$$

7) Initial Bolt Torque given Bolt Load 

$$fx \quad m_{ti} = dn \cdot \frac{F_b}{11}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 4.62N = 2.8mm \cdot \frac{18150N}{11}$$



8) Minimum percentage compression 

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)


$$ex \quad 30 = 100 \cdot \left(1 - \left(\frac{4.2\text{mm}}{6\text{mm}} \right) \right)$$

9) Nominal Bolt Diameter given Bolt Load 

$$fx \quad dn = 11 \cdot \frac{m_{ti}}{F_b}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 1.212121\text{mm} = 11 \cdot \frac{2\text{N}}{18150\text{N}}$$

10) Number of Bolts given Flange pressure 

$$fx \quad n = p_f \cdot A \cdot \frac{C_u}{F_b}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 0.004242 = 5.5\text{MPa} \cdot 100\text{mm}^2 \cdot \frac{0.14}{18150\text{N}}$$

11) Twisting Moment given Flange Pressure 

$$fx \quad M_t = \frac{p_f \cdot A \cdot C_u \cdot d_{\text{bolt}}}{2 \cdot n}$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 0.1155\text{N}^*\text{m} = \frac{5.5\text{MPa} \cdot 100\text{mm}^2 \cdot 0.14 \cdot 9\text{mm}}{2 \cdot 3}$$



12) Uncompressed gasket thickness

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

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$\text{ex } 5\text{mm} = \frac{100 \cdot 4.2\text{mm}}{100 - 16}$$

13) Width of u collar given uncompressed Gasket Thickness

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

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$\text{ex } 5.04\text{mm} = \frac{(6\text{mm}) \cdot (100 - 16)}{100}$$

Single spring installations

14) Actual Diameter of Spring Wire given Actual mean diameter of Conical spring

$$\text{fx } d = 2 \cdot \left(D_{\text{driver a}} + D_o - \left(\frac{W}{2} \right) \right)$$

[Open Calculator !\[\]\(0fb13ad0bfa3d86868cdd3883e5665b3_img.jpg\)](#)

$$\text{ex } 21.5\text{mm} = 2 \cdot \left(8\text{mm} + 7\text{mm} - \left(\frac{8.5\text{mm}}{2} \right) \right)$$



15) Actual Diameter of Spring Wire given Deflection of Spring

$$\text{fx } d = .0123 \cdot \frac{(D_{\text{driver a}})^2}{y}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

$$\text{ex } 0.302769\text{mm} = .0123 \cdot \frac{(8\text{mm})^2}{2.6\text{mm}}$$

16) Actual mean diameter of conical spring

$$\text{fx } D_{\text{driver a}} = D_o - \left(\frac{1}{2}\right) \cdot (w + d)$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$\text{ex } 0.75\text{mm} = 7\text{mm} - \left(\frac{1}{2}\right) \cdot (8.5\text{mm} + 4\text{mm})$$

17) Actual Mean Diameter of Conical Spring given Deflection of Spring

$$\text{fx } D_{\text{driver a}} = \frac{\left(\frac{y \cdot d}{0.0123}\right)^1}{2}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

$$\text{ex } 0.422764\text{mm} = \frac{\left(\frac{2.6\text{mm} \cdot 4\text{mm}}{0.0123}\right)^1}{2}$$



18) Deflection of conical spring 

$$fx \quad y = .0123 \cdot \frac{(D_{\text{driver a}})^2}{d}$$

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5_img.jpg\)](#)

$$ex \quad 0.1968\text{mm} = .0123 \cdot \frac{(8\text{mm})^2}{4\text{mm}}$$

19) Diameter of wire for spring given Mean diameter of Conical spring 

$$fx \quad d = \frac{\left(\frac{\pi \cdot (D_m)^2}{139300}\right)^{\frac{1}{3}}}{3}$$

[Open Calculator !\[\]\(2b376d1a92330ab09dad2665d2f89bf5_img.jpg\)](#)

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

20) Inside diameter of member given Mean diameter of Conical spring 

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

[Open Calculator !\[\]\(c444627dab9fee9a1550c053ffaaaae2_img.jpg\)](#)

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



21) Mean diameter of conical spring

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

[Open Calculator !\[\]\(6605b201d6f14d9b3bcb8ab5f274d107_img.jpg\)](#)

$$ex \quad 17.75\text{mm} = 5\text{mm} + \left(\left(\frac{3}{2} \right) \cdot 8.5\text{mm} \right)$$

22) Mean diameter of conical spring given Diameter of spring wire

$$fx \quad D_m = \frac{\left(\frac{(d)^3 \cdot 139300}{\pi} \right)^{\frac{1}{3}}}{2}$$

[Open Calculator !\[\]\(e8fb589d58dad1692debababa5e928b6_img.jpg\)](#)

$$ex \quad 1.418898\text{mm} = \frac{\left(\frac{(4\text{mm})^3 \cdot 139300}{\pi} \right)^{\frac{1}{3}}}{2}$$

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

$$fx \quad w = 2 \cdot \left(D_{\text{driver a}} + D_o - \left(\frac{d}{2} \right) \right)$$

[Open Calculator !\[\]\(4688aadfd656ded00cd6bdfae55089a9_img.jpg\)](#)

$$ex \quad 26\text{mm} = 2 \cdot \left(8\text{mm} + 7\text{mm} - \left(\frac{4\text{mm}}{2} \right) \right)$$



24) Nominal packing cross section given Mean diameter of Conical spring



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

Open Calculator

$$ex \quad 10.66667\text{mm} = (21\text{mm} - 5\text{mm}) \cdot \frac{2}{3}$$

25) Outer Diameter of spring wire given Actual mean diameter of Conical spring



$$fx \quad D_o = D_{\text{driver a}} - \left(\frac{1}{2}\right) \cdot (w + d)$$

Open Calculator

$$ex \quad 1.75\text{mm} = 8\text{mm} - \left(\frac{1}{2}\right) \cdot (8.5\text{mm} + 4\text{mm})$$



Variables Used






- **A** 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** Diameter of spring wire (Millimeter)
- **d_{bolt}** Diameter of Bolt (Millimeter)
- **D_{driver a}** Actual mean diameter of spring (Millimeter)
- **D_i** Inside Diameter (Millimeter)
- **D_m** Mean Diameter of Conical Spring (Millimeter)
- **D_o** Outer diameter of spring wire (Millimeter)
- **dl** Incremental Length in Direction of Velocity (Millimeter)
- **dn** Nominal Bolt Diameter (Millimeter)
- **E** Modulus of Elasticity (Megapascal)
- **F_b** Bolt Load in Gasket Joint (Newton)
- **h_i** Uncompressed gasket thickness (Millimeter)
- **l₁** Length of joint 1 (Millimeter)
- **l₂** Length of joint 2 (Millimeter)
- **M_t** Twisting Moment (Newton Meter)
- **m_{ti}** Initial bolt torque (Newton)
- **n** Number of Bolts



- p_f Flange pressure (Megapascal)
- P_s Minimum Percentage Compression
- w Nominal Packing Cross-section of Bush Seal (Millimeter)
- y Deflection of Conical Spring (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:** **Moment of Force** in Newton Meter (N*m)
Moment of Force Unit Conversion 



Check other formula lists

- [Bolt Loads in Gasket Joints Formulas](#) 
- [Elastic Packing Formulas](#) 
- [V Ring Packing Formulas](#) 

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