Important Retaining Rings and Circlips Formulas PDF

Formulas
Examples
with Units

List of 18
Important Retaining Rings and Circlips Formulas

1) Depth of Groove Formulas

1.1) Depth of Groove given Allowable Impact Loading on Groove Formula

Evaluate Formula

Formula

$$D_g = F_{ig} \cdot \frac{2}{F_{tg}}$$

Example with Units

$$3.8889\,\text{m} = 35\,\text{N} \cdot \frac{2}{18\,\text{N}}$$

1.2) Depth of Groove given Allowable Static Thrust Load and Allowable Impact Loading on Groove Formula

Evaluate Formula

Formula

$$D_g = \frac{F_{ig} \cdot 2}{F_{tg}}$$

Example with Units

$$3.8889\,\text{m} = \frac{35\,\text{N} \cdot 2}{18\,\text{N}}$$

1.3) Depth of Groove given allowable Static Thrust Load on Groove Formula

Evaluate Formula

Formula

$$D_g = \frac{f_s \cdot \Phi \cdot F_{tg}}{C \cdot D \cdot \pi \cdot \sigma_{sy}}$$

Example with Units

$$3.8261\,\text{m} = \frac{2.8 \cdot 0.85 \cdot 18\,\text{N}}{0.11 \cdot 3.6\,\text{m} \cdot 3.1416 \cdot 9\,\text{Pa}}$$

1.4) Depth of Groove given Allowable Static Thrust Load on Ring which is Subject to Shear Formula

Evaluate Formula

Formula

$$D_g = \frac{F_{ig} \cdot \frac{2}{F_{tg}}}{1000}$$

Example with Units

$$0.0039\,\text{m} = \frac{35\,\text{N} \cdot \frac{2}{18\,\text{N}}}{1000}$$

2) Factor of Safety Formulas

2.1) Factor of Safety given allowable Static Thrust Load on Groove Formula

Evaluate Formula

Formula

$$f_s = \frac{C \cdot D \cdot D_g \cdot \pi \cdot \sigma_{sy}}{F_{tg} \cdot \Phi}$$

Example with Units

$$2.7809 = \frac{0.11 \cdot 3.6\,\text{m} \cdot 3.8\,\text{m} \cdot 3.1416 \cdot 9\,\text{Pa}}{18\,\text{N} \cdot 0.85}$$

2.2) Factor of Safety given Allowable Static Thrust Load on Ring Formula

Evaluate Formula

Formula

$$F_s = \frac{C \cdot D \cdot t \cdot \pi \cdot \tau_s}{F_{rT}}$$

Example with Units

$$5.8316 = \frac{0.11 \cdot 3.6\,\text{m} \cdot 5\,\text{m} \cdot 3.1416 \cdot 6\,\text{N}}{6.4\,\text{N}}$$

3) Load Capacities of Groove Formulas

3.1) Allowable impact loading on groove Formula

Evaluate Formula

Formula

$$F_{ig} = \frac{F_{tg} \cdot D_g}{2}$$

Example with Units

$$34.2\,\text{N} = \frac{18\,\text{N} \cdot 3.8\,\text{m}}{2}$$

3.2) Allowable Static Thrust Load given Allowable Impact Loading on Groove Formula

Evaluate Formula

Formula

$$F_{tg} = F_{ig} \cdot \frac{2}{D_g}$$

Example with Units

$$18.4211\,\text{N} = 35\,\text{N} \cdot \frac{2}{3.8\,\text{m}}$$

3.3) Allowable Static Thrust Load on Groove Formula

Evaluate Formula

Formula

$$F_{tg} = \frac{C \cdot D \cdot D_g \cdot \pi \cdot \sigma_{sy}}{f_s \cdot \Phi}$$

Example with Units

$$17.877\,\text{N} = \frac{0.11 \cdot 3.6\,\text{m} \cdot 3.8\,\text{m} \cdot 3.1416 \cdot 9\,\text{Pa}}{2.8 \cdot 0.85}$$

3.4) Shaft Diameter given allowable Static Thrust Load on Groove Formula

Evaluate Formula

Formula

$$D = \frac{F_{tg} \cdot f_s \cdot \Phi}{C \cdot D_g \cdot \pi \cdot \sigma_{sy}}$$

Example with Units

$$3.6248\,\text{m} = \frac{18\,\text{N} \cdot 2.8 \cdot 0.85}{0.11 \cdot 3.8\,\text{m} \cdot 3.1416 \cdot 9\,\text{Pa}}$$

3.5) Tensile Yield Strength of Groove Material given allowable Static Thrust Load on Groove Formula

Evaluate Formula

Formula

$$\sigma_{sy} = \frac{f_s \cdot \Phi \cdot F_{tg}}{C \cdot D \cdot \pi \cdot D_g}$$

Example with Units

$$9.0619\,\text{Pa} = \frac{2.8 \cdot 0.85 \cdot 18\,\text{N}}{0.11 \cdot 3.6\,\text{m} \cdot 3.1416 \cdot 3.8\,\text{m}}$$

4) Load Capacities of Retaining Rings Formulas

4.1) Allowable impact loading on ring Formula

Evaluate Formula

Formula

$$F_{ir} = \frac{F_{rT} \cdot t}{2}$$

Example with Units

$$16\,\text{N} = \frac{6.4\,\text{N} \cdot 5\,\text{m}}{2}$$

4.2) Allowable Static Thrust Load on Ring given Allowable Impact Loading Formula

Evaluate Formula

Formula

$$F_{rT} = F_{ir} \cdot \frac{2}{t}$$

Example with Units

$$6.4\,\text{N} = 16\,\text{N} \cdot \frac{2}{5\,\text{m}}$$

4.3) Allowable static thrust load on ring which is subject to shear Formula

Evaluate Formula

Formula

$$F_{rT} = \frac{C \cdot D \cdot t \cdot \pi \cdot \tau_s}{F_s}$$

Example with Units

$$6.4348\,\text{N} = \frac{0.11 \cdot 3.6\,\text{m} \cdot 5\,\text{m} \cdot 3.1416 \cdot 6\,\text{N}}{5.8}$$

4.4) Ring Thickness given Allowable Impact Loading on Ring Formula

Evaluate Formula

Formula

$$t = F_{ir} \cdot \frac{2}{F_{rT}}$$

Example with Units

$$5\,\text{m} = 16\,\text{N} \cdot \frac{2}{6.4\,\text{N}}$$

4.5) Ring Thickness given Allowable Static Thrust Load on Ring which is subject to Shear Formula

Evaluate Formula

Formula

$$t = F_{rT} \cdot \frac{F_s}{C \cdot D \cdot \pi \cdot \tau_s}$$

Example with Units

$$4.9729\,\text{m} = 6.4\,\text{N} \cdot \frac{5.8}{0.11 \cdot 3.6\,\text{m} \cdot 3.1416 \cdot 6\,\text{N}}$$

4.6) Shaft Diameter given Allowable Static Thrust Load on Ring which is subject to Shear Formula

Evaluate Formula

Formula

$$D = F_{rT} \cdot \frac{F_s}{C \cdot t \cdot \pi \cdot \tau_s}$$

Example with Units

$$3.5805\,\text{m} = 6.4\,\text{N} \cdot \frac{5.8}{0.11 \cdot 5\,\text{m} \cdot 3.1416 \cdot 6\,\text{N}}$$

4.7) Shear Strength of Ring Material given Allowable Static Thrust Load on Ring Formula

Evaluate Formula

Formula

$$\tau_s = F_{rT} \cdot \frac{F_s}{C \cdot t \cdot \pi \cdot D}$$

Example with Units

$$5.9675\,\text{N} = 6.4\,\text{N} \cdot \frac{5.8}{0.11 \cdot 5\,\text{m} \cdot 3.1416 \cdot 3.6\,\text{m}}$$

Variables used in list of Retaining Rings and Circlips Formulas above

- **C** Conversion Factor
- **D** Shaft Diameter *(Meter)*
- D_g Depth of Groove *(Meter)*
- F_{ig} Allowable Impact Loading on Groove *(Newton)*
- F_{ir} Allowable Impact Loading on Ring *(Newton)*
- F_{rT} Allowable Static Thrust Load on Ring *(Newton)*
- f_s Factor of Safety
- F_s Safety Factor
- F_{tg} Allowable Static Thrust Load on Groove Wall *(Newton)*
- **t** Ring Thickness *(Meter)*
- σ_{sy} Tensile Yield Strength of Groove Material *(Pascal)*
- τ_s Shear Strength of Metal Ring *(Newton)*
- **Φ** Reduction Factor

Constants, Functions, Measurements used in list of Retaining Rings and Circlips Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Measurement: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Pressure** in Pascal (Pa) *Pressure Unit Conversion*
- Measurement: **Force** in Newton (N) *Force Unit Conversion*

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