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Retaining Rings and Circlips Formulas

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List of 18 Retaining Rings and Circlips Formulas

Retaining Rings and Circlips

Depth of Groove

1) Depth of Groove given Allowable Impact Loading on Groove

$$fx \quad d = F_{ig} \cdot \frac{2}{F_{tg}}$$

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

$$ex \quad 3.888889m = 35N \cdot \frac{2}{18N}$$

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

$$fx \quad d = \frac{F_{ig} \cdot 2}{F_{tg}}$$

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

$$ex \quad 3.888889m = \frac{35N \cdot 2}{18N}$$



3) Depth of Groove given allowable Static Thrust Load on Groove

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

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

$$ex \quad 0.283228m = \frac{2.8 \cdot 0.85 \cdot 18N}{1.486 \cdot 3.6m \cdot \pi \cdot 9Pa}$$

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

$$fx \quad d = \frac{F_{ig} \cdot \frac{2}{F_{tg}}}{1000}$$

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

$$ex \quad 0.003889m = \frac{35N \cdot \frac{2}{18N}}{1000}$$

Factor of Safety

5) Factor of Safety given allowable Static Thrust Load on Groove

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

[Open Calculator !\[\]\(b792654f2cef9719eabeb6c5be00811e_img.jpg\)](#)

$$ex \quad 34.60113 = \frac{1.486 \cdot 3.6m \cdot 3.5m \cdot \pi \cdot 9Pa}{18N \cdot 0.85}$$



6) Factor of Safety given Allowable Static Thrust Load on Ring

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

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

$$ex \quad 78.77936 = \frac{1.486 \cdot 3.6m \cdot 5m \cdot \pi \cdot 6N}{6.4N}$$

Load Capacities of Groove

7) Allowable impact loading on groove

$$fx \quad F_{ig} = \frac{F_{tg} \cdot d}{2}$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a_img.jpg\)](#)

$$ex \quad 31.5N = \frac{18N \cdot 3.5m}{2}$$


8) Allowable Static Thrust Load given Allowable Impact Loading on Groove

$$fx \quad F_{tg} = F_{ig} \cdot \frac{2}{d}$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a_img.jpg\)](#)

$$ex \quad 20N = 35N \cdot \frac{2}{3.5m}$$




9) Allowable Static Thrust Load on Groove 

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

Open Calculator 


$$ex \quad 222.4358N = \frac{1.486 \cdot 3.6m \cdot 3.5m \cdot \pi \cdot 9Pa}{2.8 \cdot 0.85}$$

10) Shaft Diameter given allowable Static Thrust Load on Groove 

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

Open Calculator 

$$ex \quad 0.29132m = \frac{18N \cdot 2.8 \cdot 0.85}{1.486 \cdot 3.5m \cdot \pi \cdot 9Pa}$$

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

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

Open Calculator 

$$ex \quad 0.7283Pa = \frac{2.8 \cdot 0.85 \cdot 18N}{1.486 \cdot 3.6m \cdot \pi \cdot 3.5m}$$



Load Capacities of Retaining Rings

12) Allowable impact loading on ring

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

[Open Calculator !\[\]\(950a62bbddad88d64435fd35607dfc42_img.jpg\)](#)

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

13) Allowable Static Thrust Load on Ring given Allowable Impact Loading

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

[Open Calculator !\[\]\(73002692dd5e7a64e60946be3158e719_img.jpg\)](#)

$$\text{ex } 2.8\text{N} = 7\text{N} \cdot \frac{2}{5\text{m}}$$

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

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

[Open Calculator !\[\]\(104fbf564e2e5a8fbd84f31656d114c7_img.jpg\)](#)

$$\text{ex } 289.7632\text{N} = \frac{1.486 \cdot 3.6\text{m} \cdot 5\text{m} \cdot \pi \cdot 6\text{N}}{1.74}$$




15) Ring Thickness given Allowable Impact Loading on Ring 

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

Open Calculator 


$$ex \quad 2.1875m = 7N \cdot \frac{2}{6.4N}$$

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

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

Open Calculator 

$$ex \quad 0.110435m = 6.4N \cdot \frac{1.74}{1.486 \cdot 3.6m \cdot \pi \cdot 6N}$$

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

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

Open Calculator 

$$ex \quad 0.079513m = 6.4N \cdot \frac{1.74}{1.486 \cdot 5m \cdot \pi \cdot 6N}$$



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

[Open Calculator !\[\]\(3d8c13c92b853674f749aac6fa869926_img.jpg\)](#)

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

$$\text{ex } 0.132522\text{N} = 6.4\text{N} \cdot \frac{1.74}{1.486 \cdot 5\text{m} \cdot \pi \cdot 3.6\text{m}}$$






Variables Used

- **C** Conversion factor
- **d** Depth of groove (*Meter*)
- **D** Shaft Diameter (*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*)
- **T_s** Shear Strength of Metal Ring (*Newton*)
- **Φ** Reduction Factor



Constants, Functions, Measurements used

- **Constant:** **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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