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Torsion Equation of Circular Shafts Formulas

Calculators! Examples! Conversions!

List of 17 Torsion Equation of Circular Shafts Formulas

Torsion Equation of Circular Shafts

1) Angle of Twist with known Shear Strain at Outer Surface of Shaft

Open Calculator

fx $$\theta_{\text{Circularshafts}} = \frac{\eta \cdot L_{\text{shaft}}}{R}$$

ex $$72.86364\text{rad} = \frac{1.75 \cdot 4.58\text{m}}{110\text{mm}}$$

2) Angle of Twist with known Shear Stress in Shaft

Open Calculator

fx $$\theta_{\text{Torsion}} = \frac{\tau \cdot L_{\text{shaft}}}{R \cdot G_{\text{Torsion}}}$$

ex $$0.187364\text{rad} = \frac{180\text{MPa} \cdot 4.58\text{m}}{110\text{mm} \cdot 40\text{GPa}}$$

3) Angle of Twist with known Shear Stress induced at Radius r from Center of Shaft

Open Calculator

fx $$\theta_{\text{Torsion}} = \frac{L_{\text{shaft}} \cdot \tau}{R \cdot G_{\text{Torsion}}}$$

ex $$0.187364\text{rad} = \frac{4.58\text{m} \cdot 180\text{MPa}}{110\text{mm} \cdot 40\text{GPa}}$$

4) Length of Shaft with known Shear Strain at Outer Surface of Shaft

Open Calculator

fx $$L_{shaft} = \frac{R \cdot \theta_{Circularshafts}}{\eta}$$

ex $$4.525714m = \frac{110mm \cdot 72rad}{1.75}$$

5) Length of Shaft with known Shear Stress induced at Radius r from Center of Shaft

Open Calculator

fx $$L_{shaft} = \frac{R \cdot G_{Torsion} \cdot \theta_{Torsion}}{\tau}$$

ex $$4.571111m = \frac{110mm \cdot 40GPa \cdot 0.187rad}{180MPa}$$

6) Length of Shaft with known Shear Stress induced at Surface of Shaft

Open Calculator

fx $$L_{shaft} = \frac{R \cdot G_{Torsion} \cdot \theta_{Torsion}}{\tau}$$

ex $$4.571111m = \frac{110mm \cdot 40GPa \cdot 0.187rad}{180MPa}$$

7) Modulus of Rigidity of material of Shaft using Shear Stress-induced at Surface of Shaft

Open Calculator

$$G_{\text{Torsion}} = \frac{\tau \cdot L_{\text{shaft}}}{R \cdot \theta_{\text{Torsion}}}$$

$$40.07778\text{GPa} = \frac{180\text{MPa} \cdot 4.58\text{m}}{110\text{mm} \cdot 0.187\text{rad}}$$

8) Modulus of Rigidity of Shaft if Shear Stress-induced at Radius 'r' from Center of Shaft

Open Calculator

$$G_{\text{Torsion}} = \frac{L_{\text{shaft}} \cdot \tau}{R \cdot \theta_{\text{Torsion}}}$$

$$40.07778\text{GPa} = \frac{4.58\text{m} \cdot 180\text{MPa}}{110\text{mm} \cdot 0.187\text{rad}}$$

9) Radius of Shaft if Shear Stress induced at Radius r from Center of Shaft

Open Calculator

$$R = \frac{r \cdot \tau}{T_r}$$

$$109.8\text{mm} = \frac{0.122\text{m} \cdot 180\text{MPa}}{200\text{MPa}}$$

10) Radius of Shaft using Shear Strain at Outer Surface of Shaft

Open Calculator

fx $$R = \frac{\eta \cdot L_{shaft}}{\theta_{Circularshafts}}$$

ex $$111.3194\text{mm} = \frac{1.75 \cdot 4.58\text{m}}{72\text{rad}}$$

11) Radius of Shaft using Shear Stress induced at Surface of Shaft

Open Calculator

fx $$R = \frac{\tau \cdot L_{shaft}}{G_{Torsion} \cdot \theta_{Torsion}}$$

ex $$110.2139\text{mm} = \frac{180\text{MPa} \cdot 4.58\text{m}}{40\text{GPa} \cdot 0.187\text{rad}}$$

12) Shear Strain at Outer Surface of Circular Shaft

Open Calculator

fx $$\eta = \frac{R \cdot \theta_{Circularshafts}}{L_{shaft}}$$

ex $$1.729258 = \frac{110\text{mm} \cdot 72\text{rad}}{4.58\text{m}}$$

13) Shear Stress at Surface of Shaft using Shear Stress-induced at Radius 'r' from Center of Shaft

Open Calculator

fx $$T_r = \frac{\tau \cdot r}{R}$$

ex $$199.6364\text{MPa} = \frac{180\text{MPa} \cdot 0.122\text{m}}{110\text{mm}}$$

14) Shear Stress induced at Radius 'r' from Center of Shaft

Open Calculator

fx $$\tau = \frac{T_r \cdot r}{R}$$

ex $$221.8182\text{MPa} = \frac{200\text{MPa} \cdot 0.122\text{m}}{110\text{mm}}$$

15) Shear Stress induced at Radius 'r' from Center of Shaft using Modulus of Rigidity

Open Calculator

fx $$T_r = \frac{r \cdot G_{\text{Torsion}} \cdot \theta_{\text{Circularshafts}}}{\tau}$$

ex $$0.001952\text{MPa} = \frac{0.122\text{m} \cdot 40\text{GPa} \cdot 72\text{rad}}{180\text{MPa}}$$

16) Shear Stress induced at Surface of Shaft

Open Calculator

fx $$\tau = \frac{R \cdot G_{\text{Torsion}} \cdot \theta_{\text{Torsion}}}{L_{\text{shaft}}}$$

ex $$179.6507\text{MPa} = \frac{110\text{mm} \cdot 40\text{GPa} \cdot 0.187\text{rad}}{4.58\text{m}}$$

17) Value of Radius r using Shear Stress induced at Radius r from Center of Shaft

Open Calculator

fx $$r = \frac{T_r \cdot R}{\tau}$$

ex $$0.122222\text{m} = \frac{200\text{MPa} \cdot 110\text{mm}}{180\text{MPa}}$$

Variables Used

- $G_{Torsion}$ Modulus of Rigidity *(Gigapascal)*
- L_{shaft} Length of Shaft *(Meter)*
- r Radius from Center to Distance r *(Meter)*
- R Radius of Shaft *(Millimeter)*
- T_r Shear Stress at Radius r *(Megapascal)*
- $\theta_{Circularshafts}$ Angle of Twist for Circular Shafts *(Radian)*
- $\theta_{Torsion}$ Angle of Twist SOM *(Radian)*
- τ Shear Stress in Shaft *(Megapascal)*
- η Shear Strain

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m), Millimeter (mm)
  Length Unit Conversion
- Measurement: **Pressure** in Gigapascal (GPa)
  Pressure Unit Conversion
- Measurement: **Angle** in Radian (rad)
  Angle Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

Check other formula lists

- **Torsion Equation of Circular Shafts Formulas**
- **Torsional Rigidity and Polar Modulus Formulas**

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