



Torque Transmitted by a Hollow Circular Shaft Formulas

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Examples!

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List of 16 Torque Transmitted by a Hollow Circular Shaft Formulas

Torque Transmitted by a Hollow Circular Shaft

1) Maximum Shear Stress at Outer Surface given Diameter of Shaft on Hollow Circular Shaft

$$au_{
m m} = rac{16 \cdot {
m d_o} \cdot {
m T}}{\pi \cdot \left({
m d_o^4 - d_i^4}
ight)}$$

Open Calculator

2) Maximum Shear Stress at Outer Surface given Total Turning Moment on Hollow Circular Shaft

$$au_{
m m} = rac{ {
m T} \cdot 2 \cdot {
m r_h}}{\pi \cdot \left({
m r_h^4 - r_i^4}
ight)}$$

Open Calculator 🗗

ex
$$4.8\text{E}^-8\text{MPa} = \frac{4\text{N*m} \cdot 2 \cdot 5500\text{mm}}{\pi \cdot \left((5500\text{mm})^4 - (5000\text{mm})^4 \right)}$$



3) Maximum Shear Stress at Outer Surface given Turning Force on Elementary Ring

 $au_{
m s} = rac{{
m T_f \cdot d_o}}{4 \cdot \pi \cdot ({
m r^2}) \cdot {
m b_r}}$

Open Calculator 🚰

- $\boxed{ 111.4085 \mathrm{MPa} = \frac{2000.001 \mathrm{N} \cdot 14 \mathrm{mm}}{4 \cdot \pi \cdot \left(\left(2 \mathrm{mm} \right)^2 \right) \cdot 5 \mathrm{mm}} }$
- 4) Maximum shear stress induced at outer surface given shear stress of elementary ring
- fx $\left| au_{
 m s} = rac{{
 m d}_{
 m o} \cdot {
 m q}}{2 \cdot {
 m r}}
 ight|$

Open Calculator

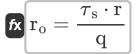
- 5) Maximum Shear Stress Induced at Outer Surface given Turning Moment on Elementary Ring
- $au_{
 m s} = rac{{
 m T}\cdot{
 m d_o}}{4\cdot\pi\cdot({
 m r}^3)\cdot{
 m b_r}}$

Open Calculator

ex $111.4085 \mathrm{MPa} = \frac{4 \mathrm{N^*m \cdot 14 mm}}{4 \cdot \pi \cdot \left(\left(2 \mathrm{mm} \right)^3 \right) \cdot 5 \mathrm{mm}}$



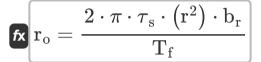
6) Outer Radius of Shaft given Shear Stress of Elementary Ring 🗗



Open Calculator 🚰

 $\mathbf{ex} \ 2000.009 \mathrm{mm} = rac{111.4085 \mathrm{MPa} \cdot 2 \mathrm{mm}}{0.111408 \mathrm{MPa}}$

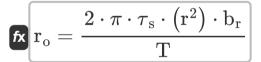
7) Outer Radius of Shaft using Turning Force on Elementary Ring



Open Calculator

 $= \frac{2 \cdot \pi \cdot 111.4085 \text{MPa} \cdot \left((2 \text{mm})^2 \right) \cdot 5 \text{mm}}{2000.001 \text{N}}$

8) Outer Radius of Shaft using Turning Force on Elementary Ring given Turning Moment



Open Calculator 🖸

 $= \frac{2 \cdot \pi \cdot 111.4085 \text{MPa} \cdot \left((2 \text{mm})^2 \right) \cdot 5 \text{mm}}{4 \text{N*m}}$



9) Radius of Elementary Ring given Shear Stress of Elementary Ring 🗗



Open Calculator

$$\mathbf{f}\mathbf{x} = rac{\mathrm{d_o} \cdot \mathrm{q}}{2 \cdot au_\mathrm{s}}$$

$$\mathbf{ex} = 0.007 \text{mm} = \frac{14 \text{mm} \cdot 0.111408 \text{MPa}}{2 \cdot 111.4085 \text{MPa}}$$

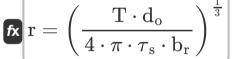
10) Radius of Elementary Ring given Turning Force of Elementary Ring

Open Calculator

$$\mathbf{f}$$
 $\mathbf{r}=\sqrt{rac{T_f\cdot d_o}{4\cdot\pi\cdot au_s\cdot b_r}}$

$$ext{ex} \ 2 ext{mm} = \sqrt{rac{2000.001 ext{N} \cdot 14 ext{mm}}{4 \cdot \pi \cdot 111.4085 ext{MPa} \cdot 5 ext{mm}}}$$

11) Radius of Elementary Ring given Turning Moment of Elementary Ring



$$\mathbf{ex}$$
 $2\mathrm{mm} = \left(rac{4\mathrm{N^*m} \cdot 14\mathrm{mm}}{4 \cdot \pi \cdot 111.4085\mathrm{MPa} \cdot 5\mathrm{mm}}
ight)^{rac{1}{3}}$

Open Calculator



12) Shear Stress at Elementary Ring of Hollow Circular Shaft 🗗

fx $\mathbf{q} = rac{2 \cdot \mathbf{ au_s} \cdot \mathbf{r}}{\mathbf{d_o}}$

Open Calculator 🚰

 $\mathbf{ex} = \frac{2 \cdot 111.4085 \text{MPa} \cdot 2 \text{mm}}{14 \text{mm}}$

13) Total Turning Moment on Hollow Circular Shaft given Diameter of Shaft

 $ag{T} = rac{\pi \cdot au_{
m m} \cdot \left(\left({
m d}_{
m o}^4
ight) - \left({
m d}_{
m i}^4
ight)
ight)}{16 \cdot {
m d}_{
m o}}$

Open Calculator

14) Total Turning Moment on Hollow Circular Shaft given Radius of Shaft

$$ag{T} = rac{\pi \cdot au_{
m m} \cdot \left(\left({
m r}_{
m h}^4
ight) - \left({
m r}_{
m i}^4
ight)
ight)}{2 \cdot {
m r}_{
m h}}$$

Open Calculator

ex

$$26.50933\text{N*m} = \frac{\pi \cdot 3.2\text{E}^{-7}\text{MPa} \cdot \left(\left((5500\text{mm})^{4}\right) - \left((5000\text{mm})^{4}\right)\right)}{2 \cdot 5500\text{mm}}$$



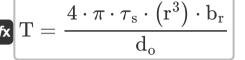
15) Turning Force on Elementary Ring 🗗

 $ag{T_{
m f}} = rac{4 \cdot \pi \cdot au_{
m s} \cdot {
m r}^2 \cdot {
m b_r}}{{
m d_o}}$

Open Calculator 🗗

$$=$$
 $2000.001 \mathrm{N} = rac{4 \cdot \pi \cdot 111.4085 \mathrm{MPa} \cdot (2 \mathrm{mm})^2 \cdot 5 \mathrm{mm}}{14 \mathrm{mm}}$

16) Turning Moment on Elementary Ring



Open Calculator

$$= \frac{4 \cdot \pi \cdot 111.4085 \text{MPa} \cdot \left((2 \text{mm})^3 \right) \cdot 5 \text{mm}}{14 \text{mm}}$$



Variables Used

- **b**_r Thickness of Ring (Millimeter)
- di Inner Diameter of Shaft (Millimeter)
- do Outer Diameter of Shaft (Millimeter)
- q Shear Stress at Elementary Ring (Megapascal)
- r Radius of Elementary Circular Ring (Millimeter)
- r_h Outer Radius Of Hollow circular Cylinder (Millimeter)
- ri Inner Radius Of Hollow Circular Cylinder (Millimeter)
- r_o Outer Radius of Shaft (Millimeter)
- **T** Turning Moment (Newton Meter)
- **T**_f Turning Force (Newton)
- τ_m Maximum Shear Stress on Shaft (Megapascal)
- τ_S Maximum Shear Stress (Megapascal)





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Function: sqrt, sqrt(Number)

 A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Pressure in Megapascal (MPa)
 Pressure Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Torque in Newton Meter (N*m)
 Torque Unit Conversion
- Measurement: Stress in Megapascal (MPa)
 Stress Unit Conversion





Check other formula lists

- Deviation of Shear Stress produced in a Circular Shaft subjected to Torsion Formulas
- Expression for Strain Energy stored in a Body Due to Torsion Formulas
- Expression for Torque in terms of Polar Moment of Inertia
 Formulas
- Flanged Coupling Formulas
- Torque Transmitted by a Hollow Circular Shaft Formulas

Polar Modulus Formulas

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