



Deflection in Spring Formulas

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List of 23 Deflection in Spring Formulas

Deflection in Spring 🗗

Close-Coiled Helical Spring

1) Deflection for Close-Coiled Helical Spring

$$\delta = rac{64 \cdot \mathrm{W_{load} \cdot R^3 \cdot N}}{\mathrm{G_{Torsion} \cdot d}^4}$$

Open Calculator

$$= \frac{64 \cdot 85 \text{N} \cdot (225 \text{mm})^3 \cdot 9}{40 \text{GPa} \cdot (45 \text{mm})^4}$$

2) Diameter of Spring Wire or Coil given Deflection for Close-Coiled Helical Spring

$$\mathbf{f}$$
 $\mathbf{d} = \left(rac{64 \cdot W_{load} \cdot R^3 \cdot N}{G_{Torsion} \cdot \delta}
ight)^{rac{1}{4}}$

Open Calculator

$$\texttt{ex} \ 45 \text{mm} = \left(\frac{64 \cdot 85 \text{N} \cdot 225 \text{mm}^3 \cdot 9}{40 \text{GPa} \cdot 3.4 \text{mm}}\right)^{\frac{1}{4}}$$



3) Load Applied on Spring Axially given Deflection for Close-Coiled Helical Spring

 $\left| \mathbf{W}_{\mathrm{load}} = rac{\delta \cdot \mathrm{G}_{\mathrm{Torsion}} \cdot \mathrm{d}^4}{64 \cdot \mathrm{N} \cdot \mathrm{R}^3}
ight|$

Open Calculator

 $85 \mathrm{N} = \frac{3.4 \mathrm{mm} \cdot 40 \mathrm{GPa} \cdot 45 \mathrm{mm}^4}{64 \cdot 9 \cdot \left(225 \mathrm{mm}\right)^3}$

4) Mean Radius of Spring given Deflection for Close-Coiled Helical Spring

 $m R = \left(rac{\delta \cdot G_{Torsion} \cdot d^4}{64 \cdot W_{load} \cdot N}
ight)^{rac{1}{3}}$

Open Calculator

 $oxed{ex} 225 \mathrm{mm} = \left(rac{3.4 \mathrm{mm} \cdot 40 \mathrm{GPa} \cdot 45 \mathrm{mm}^4}{64 \cdot 85 \mathrm{N} \cdot 9}
ight)^{rac{1}{3}}$

5) Modulus of Rigidity given Deflection for Close-Coiled Helical Spring

 $extbf{K}G_{ ext{Torsion}} = rac{64 \cdot W_{ ext{load}} \cdot R^3 \cdot N}{\delta \cdot d^4}$

Open Calculator

 $oxed{40 ext{GPa} = rac{64 \cdot 85 ext{N} \cdot 225 ext{mm}^3 \cdot 9}{3.4 ext{mm} \cdot 45 ext{mm}^4}}$



6) Number of Spring Coils given Deflection for Close-Coiled Helical Spring

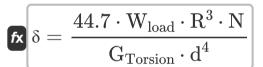
 $N = rac{\delta \cdot G_{Torsion} \cdot d^4}{64 \cdot W_{load} \cdot R^3}$

Open Calculator

 $= \frac{3.4 \text{mm} \cdot 40 \text{GPa} \cdot (45 \text{mm})^4}{64 \cdot 85 \text{N} \cdot (225 \text{mm})^3}$

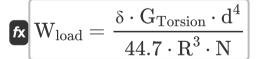
Spring of Square Section Wire

7) Deflection of Square Section Wire Spring



Open Calculator 🗗

8) Load given Deflection of Square Section Wire Spring



Open Calculator

ex $121.7002N = \frac{3.4 \text{mm} \cdot 40 \text{GPa} \cdot (45 \text{mm})^4}{44.7 \cdot (225 \text{mm})^3 \cdot 9}$

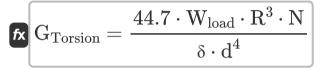


9) Mean radius given Deflection of Square Section Wire Spring

 $m R = \left(rac{\delta \cdot G_{Torsion} \cdot d^4}{44.7 \cdot W_{load} \cdot N}
ight)^{rac{1}{3}}$

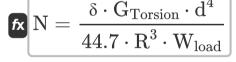
Open Calculator

10) Modulus of Rigidity using Deflection of Square Section Wire Spring



Open Calculator

11) Number of Coils given Deflection of Square Section Wire Spring



Open Calculator

ex $12.88591 = \frac{3.4 \text{mm} \cdot 40 \text{GPa} \cdot (45 \text{mm})^4}{44.7 \cdot (225 \text{mm})^3 \cdot 85 \text{N}}$



12) Width given Deflection of Square Section Wire Spring

 \mathbf{f} $\mathbf{d} = \left(rac{44.7 \cdot W_{\mathrm{load}} \cdot R^3 \cdot N}{\delta \cdot G_{\mathrm{Torsion}}}
ight)^{rac{1}{4}}$

Open Calculator 🗗

ex 41.13812mm = $\left(\frac{44.7 \cdot 85 \text{N} \cdot (225 \text{mm})^3 \cdot 9}{3.4 \text{mm} \cdot 40 \text{GPa}}\right)^{\frac{1}{4}}$

Leaf Springs

13) Deflection in Leaf Spring given Moment

 $\delta = \left(rac{\mathbf{M}\cdot\mathbf{L}^2}{8\cdot\mathbf{E}\cdot\mathbf{I}}
ight)$

Open Calculator 🗗

ex 4.584964mm = $\left(\frac{67.5$ kN*m·(4170mm)²}{8·20000MPa·0.0016m⁴}\right)

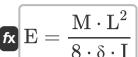
14) Length given Deflection in Leaf Spring

 $\mathbf{L} = \sqrt{rac{8 \cdot \delta \cdot \mathbf{E} \cdot \mathbf{I}}{\mathbf{M}}}$

Open Calculator 🚰



15) Modulus of Elasticity given Deflection in Leaf Spring and Moment

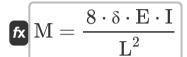


Open Calculator 🗗

$$8 \cdot \delta \cdot I$$

ex
$$26970.38 \text{MPa} = \frac{67.5 \text{kN*m} \cdot (4170 \text{mm})^2}{8 \cdot 3.4 \text{mm} \cdot 0.0016 \text{m}^4}$$

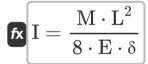
16) Moment given Deflection in Leaf Spring



Open Calculator

$$= \frac{50.05492 \text{kN*m} = \frac{8 \cdot 3.4 \text{mm} \cdot 20000 \text{MPa} \cdot 0.0016 \text{m}^{4}}{(4170 \text{mm})^{2}} }$$

17) Moment of Inertia given Deflection in Leaf Spring



Open Calculator 🚰

$$= \frac{0.002158 \text{m}^4}{8 \cdot 20000 \text{MPa} \cdot 3.4 \text{mm}}$$



For Centrally Loaded Beam

18) Deflection in Leaf Spring given Load 🗗

 $\delta_{
m Leaf} = rac{3 \cdot {
m W}_{
m load} \cdot {
m L}^3}{8 \cdot {
m E} \cdot {
m n} \cdot {
m b} \cdot {
m t}^3}$

Open Calculator

19) Load given Deflection in Leaf Spring

 $\mathbf{w}_{ ext{load}} = rac{8 \cdot \delta_{ ext{Leaf}} \cdot \mathbf{E} \cdot \mathbf{n} \cdot \mathbf{b} \cdot \mathbf{t}^3}{3 \cdot \mathbf{L}^3}$

Open Calculator 🗗

20) Modulus of Elasticity in Leaf Spring given Deflection

 $\mathbf{E} = rac{3 \cdot \mathrm{W_{load} \cdot L^3}}{8 \cdot \delta_{\mathrm{Loof}} \cdot \mathrm{n} \cdot \mathrm{b} \cdot \mathrm{t^3}}$

Open Calculator 🚰



21) Number of plates given Deflection in Leaf Spring

 $n = rac{3 \cdot W_{load} \cdot L^3}{8 \cdot \delta_{Leaf} \cdot E \cdot b \cdot t^3}$

Open Calculator

22) Thickness given Deflection in Leaf Spring

 $\mathbf{t} = \left(rac{3 \cdot W_{load} \cdot L^3}{8 \cdot \delta_{Leaf} \cdot E \cdot n \cdot b}
ight)^{rac{1}{3}}$

Open Calculator

23) Width given Deflection in Leaf Spring

 $b = rac{3 \cdot W_{load} \cdot L^3}{8 \cdot \delta_{Leaf} \cdot E \cdot n \cdot t^3}$

Open Calculator 🗗



Variables Used

- b Width of Cross Section (Millimeter)
- **d** Diameter of Spring (Millimeter)
- E Young's Modulus (Megapascal)
- G_{Torsion} Modulus of Rigidity (Gigapascal)
- I Area Moment of Inertia (Meter⁴)
- L Length in Spring (Millimeter)
- M Bending Moment (Kilonewton Meter)
- n Number of Plates
- N Number of Coils
- R Mean Radius (Millimeter)
- **t** Thickness of Section (Millimeter)
- W_{load} Spring Load (Newton)
- δ Deflection of Spring (Millimeter)
- δ_{l eaf} Deflection of Leaf Spring (Millimeter)





Constants, Functions, Measurements used

- Function: sqrt, sqrt(Number)
 Square root function
- Measurement: Length in Millimeter (mm)

 Length Unit Conversion
- Measurement: Pressure in Gigapascal (GPa)

 Pressure Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Moment of Force in Kilonewton Meter (kN*m)
 Moment of Force Unit Conversion
- Measurement: Second Moment of Area in Meter⁴ (m⁴)
 Second Moment of Area Unit Conversion
- Measurement: Stress in Megapascal (MPa)
 Stress Unit Conversion





Check other formula lists

Deflection in Spring Formulas

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