calculatoratoz.com

unitsconverters.com

Load and Strength Characteristics Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 13 Load and Strength Characteristics Formulas

Load and Strength Characteristics

1) Imaginary Force at Center of Gravity of Bolted Joint given Primary Shear Force

Open Calculator

fx $P = (P_1') \cdot n$

ex $12000\text{N} = 3000\text{N} \cdot 4$

2) Number of Bolts given Primary Shear Force

Open Calculator

fx $n = \frac{P}{P_1'}$

ex $4 = \frac{12000\text{N}}{3000\text{N}}$

3) Pre Load in Bolt given Amount of Compression in Parts Joined by Bolt

Open Calculator

fx $P_i = \delta_c \cdot k$

ex $16500\text{N} = 11\text{mm} \cdot 1500\text{N/mm}$

4) Pre Load in Bolt given Elongation of Bolt

Open Calculator

fx $$P_i = \delta_b \cdot (k_b')$$

ex $$15850\text{N} = 0.05\text{mm} \cdot 3.17\text{E}\hat{}5\text{N/mm}$$

5) Pre Load in Bolt given Wrench Torque

Open Calculator

fx $$P_i = \frac{M_t}{0.2 \cdot d}$$

ex $$16500\text{N} = \frac{49500\text{N*mm}}{0.2 \cdot 15\text{mm}}$$

6) Resultant Load on Bolt given Pre Load and External Load

Open Calculator

fx $$P_b = P_i + \Delta P$$

ex $$19000\text{N} = 16500\text{N} + 2500\text{N}$$

7) Stiffness of Bolt given Thickness of Parts Joined by Bolt

Open Calculator

fx $$(k_b') = \frac{\pi \cdot d^2 \cdot E}{4 \cdot l}$$

ex $$318086.3\text{N/mm} = \frac{\pi \cdot (15\text{mm})^2 \cdot 207000\text{N/mm}^2}{4 \cdot 115\text{mm}}$$

8) Tensile Force on Bolt given Maximum Tensile Stress in Bolt

Open Calculator

fx $$P_{tb} = \sigma t_{max} \cdot \frac{\pi}{4} \cdot d_c^2$$

ex $$9952.566\text{N} = 88\text{N/mm}^2 \cdot \frac{\pi}{4} \cdot (12\text{mm})^2$$

9) Tensile Force on Bolt in Shear

Open Calculator

fx $$P_{tb} = \pi \cdot d_c \cdot h \cdot \frac{S_{sy}}{f_s}$$

ex $$9997.804\text{N} = \pi \cdot 12\text{mm} \cdot 6\text{mm} \cdot \frac{132.6\text{N/mm}^2}{3}$$

10) Tensile Force on Bolt in Tension

Open Calculator

fx $$P_{tb} = \frac{\pi}{4} \cdot d_c^2 \cdot \frac{S_{yt}}{f_s}$$

ex $$10009.11\text{N} = \frac{\pi}{4} \cdot (12\text{mm})^2 \cdot \frac{265.5\text{N/mm}^2}{3}$$

11) Thickness of Parts Held Together by Bolt given Stiffness of Bolt

Open Calculator

fx $$l = \frac{\pi \cdot d^2 \cdot E}{4 \cdot (k_b')}$$

ex $$115.3941\text{mm} = \frac{\pi \cdot (15\text{mm})^2 \cdot 207000\text{N/mm}^2}{4 \cdot 3.17\text{E}\hat{}5\text{N/mm}}$$

12) Wrench Torque Required to Create Required Pre Load

Open Calculator

fx $$M_t = 0.2 \cdot P_i \cdot d$$

ex $$49500\text{N*mm} = 0.2 \cdot 16500\text{N} \cdot 15\text{mm}$$

13) Young's Modulus of Bolt given Stiffness of Bolt

Open Calculator

fx $$E = \frac{(k_b') \cdot l \cdot 4}{d^2 \cdot \pi}$$

ex $$206293.1\text{N/mm}^2 = \frac{3.17\text{E}\hat{}5\text{N/mm} \cdot 115\text{mm} \cdot 4}{(15\text{mm})^2 \cdot \pi}$$

Variables Used

- ΔP Load due to External Force on Bolt *(Newton)*
- d Nominal Bolt Diameter *(Millimeter)*
- d_c Core Diameter of Bolt *(Millimeter)*
- δ_b Elongation of Bolt *(Millimeter)*
- E Modulus of Elasticity of Bolt *(Newton per Square Millimeter)*
- f_s Factor of Safety of Bolted Joint
- h Height of Nut *(Millimeter)*
- k Combined Stiffness of Bolt *(Newton per Millimeter)*
- k_b' Stiffness of Bolt *(Newton per Millimeter)*
- l Total Thickness of Parts held together by Bolt *(Millimeter)*
- M_t Wrench Torque for Bolt Tightening *(Newton Millimeter)*
- n Number of Bolts in Bolted Joint
- P Imaginary Force on Bolt *(Newton)*
- P_1' Primary Shear Force on Bolt *(Newton)*
- P_b Resultant Load on Bolt *(Newton)*
- P_i Pre Load in Bolt *(Newton)*
- P_{tb} Tensile Force in Bolt *(Newton)*
- S_{sy} Shear Yield Strength of Bolt *(Newton per Square Millimeter)*
- S_{yt} Tensile Yield Strength of Bolt *(Newton per Square Millimeter)*
- δ_c Amount of Compression of Bolted Joint *(Millimeter)*
- σt_{max} Maximum Tensile Stress in Bolt *(Newton per Square Millimeter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Torque** in Newton Millimeter (N*mm)
  Torque Unit Conversion
- Measurement: **Stiffness Constant** in Newton per Millimeter (N/mm)
  Stiffness Constant Unit Conversion
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²)
  Stress Unit Conversion

Check other formula lists

- **Joint Analysis Formulas**
- **Load and Strength Characteristics Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

1/8/2024 | 10:37:46 AM UTC *Please leave your feedback here...*