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Important Formula of Connection Rod Formulas

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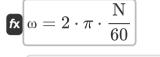
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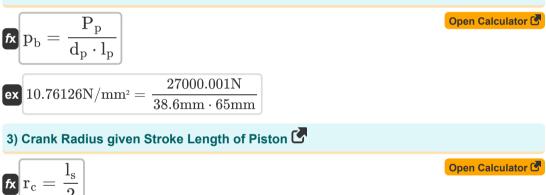
List of 14 Important Formula of Connection Rod Formulas

Important Formula of Connection Rod ⤴

1) Angular Velocity of Crank given Engine Speed in RPM ⤴

$$fx \quad \omega = 2 \cdot \pi \cdot \frac{N}{60}$$

$$ex \quad 52.35988 \text{rad/s} = 2 \cdot \pi \cdot \frac{500}{60}$$

2) Bearing Pressure on Piston Pin Bush ⤴

$$fx \quad p_b = \frac{P_p}{d_p \cdot l_p}$$

$$ex \quad 10.76126 \text{N/mm}^2 = \frac{27000.001 \text{N}}{38.6 \text{mm} \cdot 65 \text{mm}}$$

3) Crank Radius given Stroke Length of Piston ⤴

$$fx \quad r_c = \frac{l_s}{2}$$

$$ex \quad 137.5 \text{mm} = \frac{275 \text{mm}}{2}$$

4) Critical Buckling Load on Connecting Rod by Rankine Formula ⤴

Open Calculator ⤴

fx $$P_c = \sigma_c \cdot \frac{A_C}{1 + a \cdot \left(\frac{L_C}{k_{xx}}\right)^2}$$

ex $$106797N = 110.003N/mm^2 \cdot \frac{995mm^2}{1 + 0.00012 \cdot \left(\frac{205mm}{14.24mm}\right)^2}$$

5) Critical Buckling Load on Connecting Rod Considering Factor of Safety ⤴

Open Calculator ⤴

fx $$P_{fos} = P_{cr} \cdot f_s$$

ex $$145632.3N = 27000N \cdot 5.39379$$

6) Force Acting on Connecting Rod ⤴

Open Calculator ⤴

fx $$P_{c\prime} = \frac{P}{\cos(\varphi)}$$

ex $$19800N = \frac{19079.88N}{\cos(15.5°)}$$

7) Inertia Force on Bolts of Connecting Rod ⤴

Open Calculator ⤴

fx $$P_{ic} = m_r \cdot \omega^2 \cdot r_c \cdot \left(\cos(\theta) + \frac{\cos(2 \cdot \theta)}{n}\right)$$

ex

$$1078.342N = 2.533333kg \cdot (52.35988rad/s)^2 \cdot 137.5mm \cdot \left(\cos(30°) + \frac{\cos(2 \cdot 30°)}{1.9}\right)$$

8) Mass of Connecting Rod ⤴

Open Calculator ⤴

fx $$m_{ci} = A_C \cdot D_C \cdot L_C$$

ex $$1.4E\hat{\ }\text{-}5kg = 995mm^2 \cdot 0.0682kg/m^3 \cdot 205mm$$

9) Mass of Reciprocating Parts in Engine Cylinder ☝

Open Calculator ☝

fx $$m_r = m_p + \frac{m_c}{3}$$

ex $$2.533333kg = 2kg + \frac{1.6kg}{3}$$

10) Maximum Bending Moment on Connecting Rod ☝

Open Calculator ☝

fx $$M_{con} = m_c \cdot \omega^2 \cdot r_c \cdot \frac{L_C}{9 \cdot \sqrt{3}}$$

ex $$7931.781N*mm = 1.6kg \cdot (52.35988rad/s)^2 \cdot 137.5mm \cdot \frac{205mm}{9 \cdot \sqrt{3}}$$

11) Maximum Force Acting on Connecting Rod given Maximum Gas Pressure ☝

Open Calculator ☝

fx $$P_{cr} = \pi \cdot D_i^2 \cdot \frac{p_{max}}{4}$$

ex $$27000N = \pi \cdot (92.7058mm)^2 \cdot \frac{4N/mm^2}{4}$$

12) Maximum Force Acting on Piston Pin Bearing ☝

Open Calculator ☝

fx $$P_p = \pi \cdot D_i^2 \cdot \frac{p_{max}}{4}$$

ex $$27000N = \pi \cdot (92.7058mm)^2 \cdot \frac{4N/mm^2}{4}$$

13) Maximum Inertia Force on Bolts of Connecting Rod ☝

Open Calculator ☝

fx $$P_{imax} = m_r \cdot \omega^2 \cdot r_c \cdot \left(1 + \frac{1}{n}\right)$$

ex $$1457.594N = 2.533333kg \cdot (52.35988rad/s)^2 \cdot 137.5mm \cdot \left(1 + \frac{1}{1.9}\right)$$

14) Minimum Height of Connecting Rod at Small End 🔗

fx $H_{small} = 0.75 \cdot H_{sm}$

Open Calculator 🔗

ex $41.4mm = 0.75 \cdot 55.2mm$

Variables Used

- **a** Constant Used in Buckling Load Formula
- **A_C** Cross Sectional Area of Connecting Rod *(Square Millimeter)*
- **D_C** Density of Connecting Rod Material *(Kilogram per Cubic Meter)*
- **D_i** Inner Diameter of Engine Cylinder *(Millimeter)*
- **d_p** Inner Diameter of Bush on Piston Pin *(Millimeter)*
- **f_s** Factor of Safety for Connecting Rod
- **H_{sm}** Height of Connecting Rod at Mid Section Small End *(Millimeter)*
- **H_{small}** Height of Connecting Rod Section at End *(Millimeter)*
- **k_{xx}** Radius of Gyration of I Section About XX Axis *(Millimeter)*
- **L_C** Length of the Connecting Rod *(Millimeter)*
- **l_p** Length of Bush on Piston Pin *(Millimeter)*
- **l_s** Stroke Length *(Millimeter)*
- **m_c** Mass of Connecting Rod *(Kilogram)*
- **m_{ci}** Mass of Connected Rod *(Kilogram)*
- **M_{con}** Bending Moment on Connecting Rod *(Newton Millimeter)*
- **m_p** Mass of Piston Assembly *(Kilogram)*
- **m_r** Mass of Reciprocating Parts in Engine Cylinder *(Kilogram)*
- **n** Ratio of Length of Connecting Rod to Crank Length
- **N** Engine Speed in Rpm
- **P** Force on Piston Head *(Newton)*
- **p_b** Bearing Pressure of Piston Pin Bush *(Newton per Square Millimeter)*
- **P_c** Critical Buckling Load on Connecting Rod *(Newton)*
- **$P_{c'}$** Force Acting on Connecting Rod *(Newton)*
- **P_{cr}** Force on Connecting Rod *(Newton)*
- **P_{fos}** Critical Buckling Load on FOS Connecting Rod *(Newton)*

- **P_{ic}** Inertia Force on Bolts of Connected Rod *(Newton)*

- **P_{imax}** Maximum Inertia Force on Bolts of Connecting Rod *(Newton)*

- **p_{max}** Maximum Pressure in Engine Cylinder *(Newton per Square Millimeter)*

- **P_p** Force on Piston Pin Bearing *(Newton)*

- **r_c** Crank Radius of Engine *(Millimeter)*

- **θ** Crank Angle *(Degree)*

- **σ_c** Compressive Yield Stress *(Newton per Square Millimeter)*

- **φ** Inclination of Connecting Rod With Line of Stroke *(Degree)*

- **ω** Angular Velocity of Crank *(Radian per Second)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- 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: **Weight** in Kilogram (kg)
  Weight Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Pressure** in Newton per Square Millimeter (N/mm²)
  Pressure Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Angular Velocity** in Radian per Second (rad/s)
  Angular Velocity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Torque** in Newton Millimeter (N*mm)
  Torque Unit Conversion
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²)
  Stress Unit Conversion

Check other formula lists

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