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Design of Push Rod Formulas

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List of 16 Design of Push Rod Formulas

Design of Push Rod

Diameter of Push Rod

1) Inner Diameter of Engine Push Rod given Radius of Gyration

Open Calculator

fx $$d_i = \sqrt{16 \cdot k_G^2 - d_o^2}$$

ex $$6.63325\text{mm} = \sqrt{16 \cdot (3\text{mm})^2 - (10\text{mm})^2}$$

2) Maximum Inner Diameter of Engine Push Rod given Outer Diameter

Open Calculator

fx $$d_i = 0.8 \cdot d_o$$

ex $$8\text{mm} = 0.8 \cdot 10\text{mm}$$

3) Maximum Outer Diameter of Engine Push Rod given Inner Diameter

Open Calculator

fx $$d_o = \frac{d_i}{0.6}$$

ex $$11.66667\text{mm} = \frac{7\text{mm}}{0.6}$$

4) Minimum Inner Diameter of Engine Push Rod given Outer Diameter

Open Calculator

fx $d_i = 0.6 \cdot d_o$

ex $6\text{mm} = 0.6 \cdot 10\text{mm}$

5) Minimum Outer Diameter of Engine Push Rod given Inner Diameter

Open Calculator

fx $d_o = \frac{d_i}{0.8}$

ex $8.75\text{mm} = \frac{7\text{mm}}{0.8}$

6) Outer Diameter of Engine Push Rod given Radius of Gyration

Open Calculator

fx $d_o = \sqrt{16 \cdot k_G^2 - d_i^2}$

ex $9.746794\text{mm} = \sqrt{16 \cdot (3\text{mm})^2 - (7\text{mm})^2}$

Stress and Force in Push Rod

7) Actual Length of Engine Push Rod

Open Calculator

fx $l = \sqrt{\frac{k_G^2}{a} \cdot \left(\frac{\sigma_c \cdot A_{rod}}{P} - 1\right)}$

ex $90.11271\text{mm} = \sqrt{\frac{(3\text{mm})^2}{0.000133} \cdot \left(\frac{12\text{N/mm}^2 \cdot 42\text{mm}^2}{450\text{N}} - 1\right)}$

8) Area of Cross Section of Engine Push Rod

Open Calculator

fx $$A_{rod} = \frac{\pi}{4} \cdot \left(d_o^2 - d_i^2\right)$$

ex $$40.05531\text{mm}^2 = \frac{\pi}{4} \cdot \left((10\text{mm})^2 - (7\text{mm})^2\right)$$

9) Compressive Stress in Engine Push Rod

Open Calculator

fx $$\sigma_c = \frac{P \cdot \left(1 + a \cdot \left(\frac{l}{k_G}\right)^2\right)}{A_{rod}}$$

ex $$11.49012\text{N/mm}^2 = \frac{450\text{N} \cdot \left(1 + 0.000133 \cdot \left(\frac{70\text{mm}}{3\text{mm}}\right)^2\right)}{42\text{mm}^2}$$

10) Cross Section Area of Engine Push Rod given Force, Stress, and Radius of Gyration

Open Calculator

fx $$A_{rod} = \frac{P \cdot \left(1 + a \cdot \left(\frac{l}{k_G}\right)^2\right)}{\sigma_c}$$

ex $$40.21542\text{mm}^2 = \frac{450\text{N} \cdot \left(1 + 0.000133 \cdot \left(\frac{70\text{mm}}{3\text{mm}}\right)^2\right)}{12\text{N/mm}^2}$$

11) Force Acting on Engine Push Rod

Open Calculator

$$P = \frac{\sigma_c \cdot A_{rod}}{1 + a \cdot \left(\frac{l}{k_G}\right)^2}$$

$$469.969\text{N} = \frac{12\text{N/mm}^2 \cdot 42\text{mm}^2}{1 + 0.000133 \cdot \left(\frac{70\text{mm}}{3\text{mm}}\right)^2}$$

12) Force Acting on Engine Push Rod given its Dimensions and Stress Generated

Open Calculator

$$P = \frac{\sigma_c \cdot \frac{\pi}{4} \cdot \left(d_o^2 - d_i^2\right)}{1 + a \cdot \left(\frac{l^2}{\frac{d_o^2 + d_i^2}{16}}\right)}$$

$$449.2263\text{N} = \frac{12\text{N/mm}^2 \cdot \frac{\pi}{4} \cdot \left((10\text{mm})^2 - (7\text{mm})^2\right)}{1 + 0.000133 \cdot \left(\frac{(70\text{mm})^2}{\frac{(10\text{mm})^2 + (7\text{mm})^2}{16}}\right)}$$

13) Force Acting on Engine Push Rod Made of Steel

Open Calculator

$$P = \frac{\sigma_c \cdot A_{rod}}{1 + \frac{1}{7500} \cdot \left(\frac{l}{k_G}\right)^2}$$

$$469.8895\text{N} = \frac{12\text{N/mm}^2 \cdot 42\text{mm}^2}{1 + \frac{1}{7500} \cdot \left(\frac{70\text{mm}}{3\text{mm}}\right)^2}$$

14) Moment of Inertia of Cross Section of Engine Push Rod

Open Calculator

fx $$I_a = \frac{\pi}{64} \cdot \left(d_o^4 - d_i^4\right)$$

ex $$373.015\text{mm}^4 = \frac{\pi}{64} \cdot \left((10\text{mm})^4 - (7\text{mm})^4\right)$$

15) Radius of Gyration of Cross Section of Engine Push Rod

Open Calculator

fx $$k_G = \sqrt{\frac{d_o^2 + d_i^2}{16}}$$

ex $$3.051639\text{mm} = \sqrt{\frac{(10\text{mm})^2 + (7\text{mm})^2}{16}}$$

16) Radius of Gyration of Engine Push Rod given Stress, Force and Cross Section Area

Open Calculator

fx $$k_G = \sqrt{\frac{\left(l^2\right) \cdot a}{\left(\frac{\sigma_c \cdot A_{rod}}{P}\right) - 1}}$$

ex $$2.330415\text{mm} = \sqrt{\frac{\left((70\text{mm})^2\right) \cdot 0.000133}{\left(\frac{12\text{N/mm}^2 \cdot 42\text{mm}^2}{450\text{N}}\right) - 1}}$$

Variables Used

- **a** Constant used in Buckling Load Formula
- A_{rod} Cross Sectional Area of Push Rod *(Square Millimeter)*
- d_i Inner Diameter of Push Rod *(Millimeter)*
- d_o Outer Diameter of Push Rod *(Millimeter)*
- I_a Area Moment of Inertia of Push Rod *(Millimeter⁴)*
- k_G Radius of Gyration of Push Rod *(Millimeter)*
- **l** Length of Push Rod *(Millimeter)*
- **P** Force on Push Rod *(Newton)*
- σ_c Stress in Push Rod *(Newton per Square Millimeter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Second Moment of Area** in Millimeter⁴ (mm⁴)
  Second Moment of Area Unit Conversion
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²)
  Stress Unit Conversion

Check other formula lists

- **Design of Engine Valves Formulas**
- **Design of Push Rod Formulas**
- **Design of Rocker Arm Formulas**
- **Design of Valve Spring Formulas**
- **Engine Cylinder Formulas**

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