



Important Formulas of Piston

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Examples!

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List of 18 Important Formulas of Piston

Important Formulas of Piston 🗗

1) Inner Diameter of Piston Pin

Open Calculator 🚰

$$= 33.3 \mathrm{mm} = 0.6 \cdot 55.5 \mathrm{mm}$$

2) Length of Piston Pin used in Connecting Rod

fx
$$l_1 = 0.45 \cdot D_i$$

fx $d_{
m i} = 0.6 \cdot d_{
m o}$

Open Calculator 🗹

$$\texttt{ex} 81 \text{mm} = 0.45 \cdot 180 \text{mm}$$

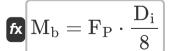
3) Length of Piston Skirt given Allowable Bearing Pressure

$$\mathbf{f}_{\mathbf{k}} egin{aligned} \mathbf{l}_{\mathrm{s}} &= \mathbf{\mu} \cdot \mathbf{\pi} \cdot \mathrm{D_{i}} \cdot rac{\mathrm{p}_{\mathrm{max}}}{4 \cdot \mathrm{P_{b}}} \end{aligned}$$

Open Calculator 🖒

$$ext{ex} 50.60791 ext{mm} = 0.1 \cdot \pi \cdot 180 ext{mm} \cdot rac{1.43191084 ext{N/mm}^2}{4 \cdot 0.4 ext{N/mm}^2}$$

4) Maximum Bending Moment on Piston Pin



Open Calculator

$$= 144 \text{kN} \cdot \frac{180 \text{mm}}{8}$$



5) Maximum Bending Stress in Piston Pin

 $\sigma_{
m max} = 4 \cdot {
m F_P} \cdot {
m D_i} \cdot rac{{
m d_o}}{\pi \cdot \left({
m d_o^4 - d_i^4}
ight)}$

Open Calculator 🗗

ex

 $221.3985 \mathrm{N/mm^2} = 4 \cdot 144 \mathrm{kN} \cdot 180 \mathrm{mm} \cdot rac{55.5 \mathrm{mm}}{\pi \cdot \left(\left(55.5 \mathrm{mm}
ight)^4 - \left(33.2 \mathrm{mm}
ight)^4
ight)}$

6) Maximum Gap between Free Ends of Ring after Assembly

fx $G = 0.004 \cdot D_i$

Open Calculator 🚰

 $\mathbf{ex} \ 0.72 \mathrm{mm} = 0.004 \cdot 180 \mathrm{mm}$

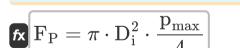
7) Maximum Gap between Free Ends of Ring before Assembly

 $21.36 \text{mm} = 4 \cdot 5.34 \text{mm}$

fx $G = 4 \cdot b$

Open Calculator 🚰

8) Maximum Gas Force on Piston Head



Open Calculator

= $36.43769 \mathrm{kN} = \pi \cdot (180 \mathrm{mm})^2 \cdot rac{1.43191084 \mathrm{N/mm^2}}{4}$

9) Maximum Length of Piston Skirt 🛂

fx $m l_s = 0.8 \cdot D_i$

Open Calculator 🗗

ex $144 \text{mm} = 0.8 \cdot 180 \text{mm}$

10) Minimum Length of Piston Skirt 🔽

fx $m l_s = 0.65 \cdot D_i$

Open Calculator

 $= 117 \text{mm} = 0.65 \cdot 180 \text{mm}$

11) Number of Piston Rings

 $\mathbf{z} = rac{\mathrm{D_i}}{10 \cdot \mathrm{h_{min}}}$

Open Calculator 🗗

 $= 3.991131 = \frac{180 \text{mm}}{10 \cdot 4.51 \text{mm}}$

12) Outer Diameter of Piston Pin 🛂

 \mathbf{f} $\mathbf{d}_{\mathrm{o}} = \pi \cdot \mathrm{D_{i}^{2}} \cdot rac{\mathrm{p_{max}}}{4 \cdot (\mathrm{p_{h}c}) \cdot \mathrm{l_{1}}}$

Open Calculator

 $\mathbf{ex} \left[59.26852 \mathrm{mm} = \pi \cdot (180 \mathrm{mm})^2 \cdot rac{1.43191084 \mathrm{N/mm^2}}{4 \cdot 7.59 \mathrm{N/mm^2} \cdot 81 \mathrm{mm}}
ight]$



13) Permissible Bending Stress for Piston

 $\sigma_{
m ph} = rac{{
m P}_0}{{
m f}_{
m s}}$

Open Calculator

= $30.66667 \mathrm{N/mm^2} = \frac{92 \mathrm{N/mm^2}}{3}$

14) Radial Width of Piston Ring

 $b = D_i \cdot \sqrt{3 \cdot rac{p_w}{\sigma_{tp}}}$

ex $5.346797 \mathrm{mm} = 180 \mathrm{mm} \cdot \sqrt{3 \cdot \frac{0.025 \mathrm{N/mm^2}}{85 \mathrm{N/mm^2}}}$

15) Radius of Piston Cup

 $m R = 0.7 \cdot D_i$

Open Calculator 🚰

Open Calculator G

 $\boxed{126\text{mm} = 0.7 \cdot 180\text{mm}}$

16) Side Thrust on Piston

 $\mathbf{F}_{\mathrm{a}} = \mathbf{\mu} \cdot \mathbf{\pi} \cdot \mathrm{D}_{\mathrm{i}}^2 \cdot rac{\mathrm{p}_{\mathrm{max}}}{\mathbf{\Lambda}}$

Open Calculator

= $3.643769 \mathrm{kN} = 0.1 \cdot \pi \cdot \left(180 \mathrm{mm}\right)^2 \cdot rac{1.43191084 \mathrm{N/mm^2}}{4}$





17) Thickness of Piston Head According to Grashoff's Formula 🖸



Open Calculator

$$ag{t_h} = D_i \cdot \sqrt{3 \cdot rac{p_{max}}{16 \cdot \sigma_{ph}}}$$

$$ext{ex} \ 16.84399 ext{mm} = 180 ext{mm} \cdot \sqrt{3 \cdot rac{1.43191084 ext{N/mm}^2}{16 \cdot 30.66 ext{N/mm}^2}}$$

18) Thickness of Piston Head given Cylinder Inner Diameter 🚰



Open Calculator 2

$$= 7.26 \text{mm} = 0.032 \cdot 180 \text{mm} + 1.5$$

fx $t_{
m h}=0.032\cdot {
m D_i}+1.5$



Variables Used

- **b** Radial Width of Piston Ring (Millimeter)
- **d**_i Inner Diameter of Piston Pin (Millimeter)
- **D**_i Diameter of Cylinder Bore (Millimeter)
- do Outer Diameter of Piston Pin (Millimeter)
- Fa Side Thrust on Piston (Kilonewton)
- **F**_P Force Exerted on Piston (Kilonewton)
- **f**_S Factor of Safety of Engine Piston
- G Gap between Free Ends of Piston Ring (Millimeter)
- h_{min} Minimum Axial Thickness of Piston Ring (Millimeter)
- I₁ Length of Piston Pin in Connecting Rod (Millimeter)
- Is Length of Piston Skirt (Millimeter)
- Mb Bending Moment (Newton Meter)
- P₀ Ultimate Tensile Strength of Piston (Newton per Square Millimeter)
- P_b Bearing Pressure for Piston Skirt (Newton per Square Millimeter)
- **p**_b**c** Bearing Pressure of CrankPin Bush (Newton per Square Millimeter)
- p_{max} Maximum Gas Pressure Inside Cylinder (Newton per Square Millimeter)
- p_w Allowable Radial Pressure on Piston Ring (Newton per Square Millimeter)
- R Radius of Piston Cup (Millimeter)
- t_h Thickness of Piston Head (Millimeter)
- Z Number of Piston Rings





- µ Coefficient of Friction for Piston Skirt
- σ_{max} Maximum Bending Stress in Piston Pin (Newton per Square Millimeter)
- σ_{ph} Bending Stress in Piston Head (Newton per Square Millimeter)
- σ_{tp} Permissible Tensile Stress for Ring (Newton per Square Millimeter)





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 Newton per Square Millimeter (N/mm²)
 Pressure Unit Conversion
- Measurement: Force in Kilonewton (kN)
 Force Unit Conversion
- Measurement: Torque in Newton Meter (N*m)
 Torque Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm²)
 Stress Unit Conversion





Check other formula lists

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