Answer on Question #49045-Engineering-Other

A pressure gauge is connected to the working chamber of Cylinder 1 and measures its pressure P1. A force F1 is acting on the piston push rod in the direction shown in the figure, with a magnitude of 100 Newtons. The diameter of Cylinder 1 is given as 45mm. Calculate the magnitude of pressure P1 resulting from the force on the piston F1. Give your answer in Pa.

Solution

The magnitude of pressure P_1 resulting from the force on the piston F_1 is

$$P_1 = \frac{F_1}{A_1},$$

where $A_1 = \frac{\pi d_1^2}{4}$ is the area of Cylinder 1, $d_1 = 45\text{mm} = 45 \cdot 10^{-3} m$ is diameter of Cylinder 1.

Thus

$$P_1 = \frac{F_1}{\frac{\pi d_1^2}{4}} = \frac{4 \cdot 100\ \text{N}}{\pi (45 \cdot 10^{-3} m)^2} = 63 \cdot 10^3 Pa = 63000\ Pa.$$

Answer: $\boldsymbol{63 \cdot 10^3 Pa = 63000\ Pa}$.