Answer on Question #73852-Physics-Other

A one metre long steel wire of diameter 8mm has an elastic limit of 5.0*10^9Pa. Calculate the maximum axial tensile load that can be applied to such a wire. Also calculate the elongation

Solution

$$Y = 21 \cdot 10^{10} \frac{N}{m^2}$$

The maximum axial tensile load is

$$F = pA = \frac{p\pi d^2}{4} = \frac{\pi(5 \cdot 10^9)(0.008)^2}{4} = 2.5 \cdot 10^5 N.$$

The elongation is

$$e = \frac{p}{Y} l = \frac{5 \cdot 10^9}{21 \cdot 10^{10}} 1 = 0.024\, m.$$