Answer on question #57028, Physics / Other

Question The diameter of steel rods 8 mm. Calculate the force required to stretch the rod by 0.3% its length (Y=$2 \cdot 10^{11}$ N/m^2) Ans: 3.014 x 10 power 4 N

Solution Hook's law:

$$\sigma = Y\epsilon$$

where $\epsilon = 0.003$ is relative deformation, and σ is stress. So we find

$$\sigma = 2 \cdot 10^{11} \cdot 0.003 = 6 \cdot 10^8\, Pa$$

Having stress in the rod we can easily find force:

$$F = \sigma \cdot S$$

where $S\pi r^2 = 3.14 \cdot 0.008^2$ is area of cross-section of the rod. Hence

$$F = 6 \cdot 10^8 \cdot 3.14 \cdot 0.008^2 \approx 3.014 \cdot 10^4\, N$$