

Solution 1,

$$\sigma_{\max} = 100 \cdot 10^6 \text{ Pa}$$

$$A = 700 \cdot 10^{-9} \text{ m}^2$$

$$F = \sigma_{\max} \cdot A = 70 \text{ N}$$

Solution 2:

$$\Delta l = 0,01 \text{ m}$$

$$F = 10000 \text{ N}$$

$$A = 500 \cdot 10^{-9}$$

$$l = 1 \text{ m}$$

1 Calculate the stress

$$\sigma = \frac{F}{A} = 2 \cdot 10^{10} \text{ Pa}$$

2 The deformation

$$\epsilon = \frac{\Delta l}{l} = 0,01$$

The Young Modulus:

$$E = \frac{\sigma}{\epsilon} = 2 \cdot 10^{12} \text{ Pa}$$

Solution 3,

$$E = 100 \cdot 10^9 \text{ Pa}$$

$$\sigma = 100 \cdot 10^6 \text{ Pa}$$

$$A = 500 \cdot 10^{-9} \text{ m}^2$$

$$\varepsilon = \frac{\sigma}{E} = ~~1000~~ 0,001 [-]$$