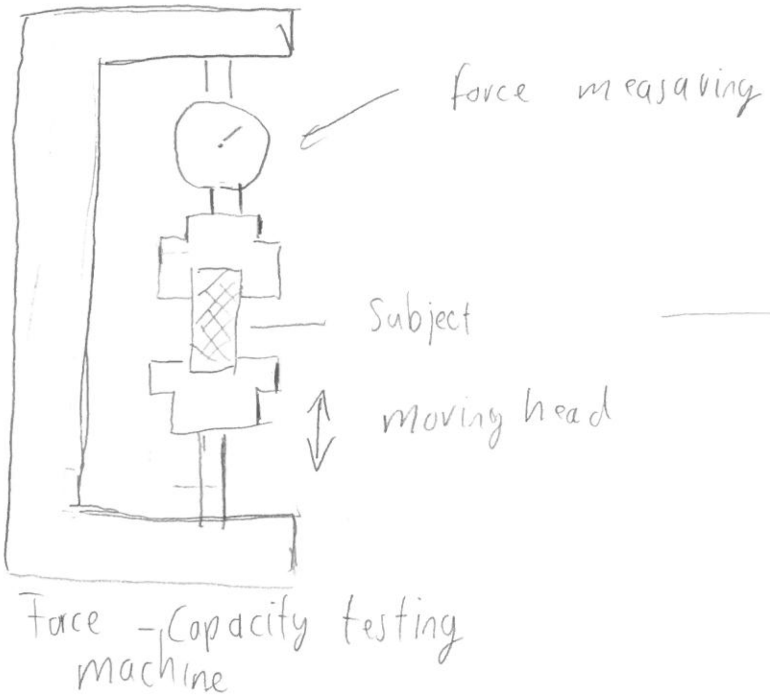
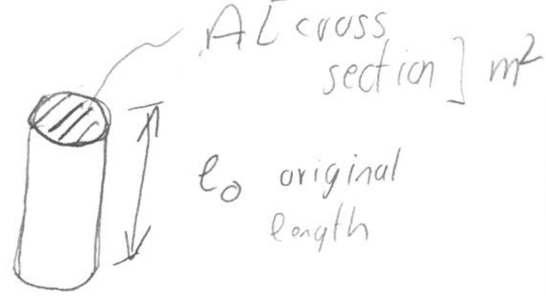
Force Capacity testing





1, The investigated object is pressed / pulled.

2 The force [F] and the deformation is measured [Δl]

3 Force deformation diagram can be plotted

$\Longrightarrow$

Stress - Strain calculation

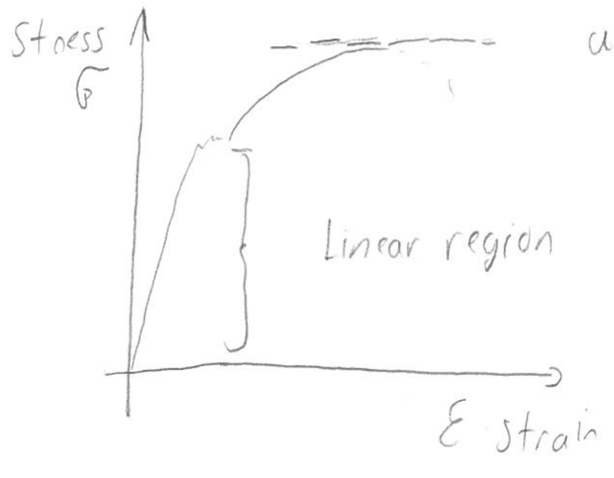
Stress (Force per unit)

$$\sigma = \frac{F \text{ (force)}}{A \text{ (Area of cross section)}}$$ dimension: Pa (Pascal)

Strain

$$\varepsilon = \frac{\Delta l \text{ (deformation)}}{l_0 \text{ (original length)}} \quad (-)$$

Stress - Strain diagram



In linear region the connection betwen σ and ε is linear.
This phenomenon is described by the Hooke law:

$$\sigma = E \cdot \varepsilon$$

stress Young's modulus Strain

Young's modulus measures the stiffness of the material.
Dimension: Pascal (Pa)

Examples

1, The ultimate tensile stress of a bone is $\sigma_{max} = 100 \cdot 10^6$ Pa, the cross section is $700 \cdot 10^{-9}$ m^2

Calculate the maximum loading force

2, The measured deformation of a ligament is $\Delta l = 0{,}01$ m. the applied force was $F = 10000$ N. The cross section was $A = 500 \cdot 10^{-9}$ m^2. Calculate the Young's modulus

3. The Young's modulus is $E = 100 \cdot 10^9$ Pa. The Stress is $\sigma = 100 \cdot 10^6$ Pa. The cross section is $A = 600 \cdot 10^{-9}$ m^2. Calculate the strain (ε)