

Student _____
Faculty _____ Year ____ Group ____
Date _____

TENSILE TESTING

Following standard SR EN 10002-1:2002

Aim of test:

To present the methodology for tensile testing and to obtain elastic constants and mechanical characteristics of steel:

- Young's modulus E
- Yield limit σ_y
- Ultimate tensile strength σ_u
- Percent elongation A
- Percent reduction of the area Z

The specimen

Material : *Steel*

Diameter in the measurement zone: $d_0=10$ mm

Cross section area = _____ mm²

Length of measurement zone: $L_0 = 100$ mm

Measurement of the elongation ΔL_i : using an extensometer with a 0.001mm/div. dial gauge

Formulae

Based on the values ($F_i, \Delta L_i$) obtained experimentally, one calculates:

The normal stress $\sigma_i = \frac{F_i}{S_0}$

The normal strain $\epsilon_i = \frac{\Delta L_i}{L_0} \cdot 100$ [%]

The percent elongation $A = \frac{L_u - L_0}{L_0} \cdot 100$ [%]

The percent reduction of the area

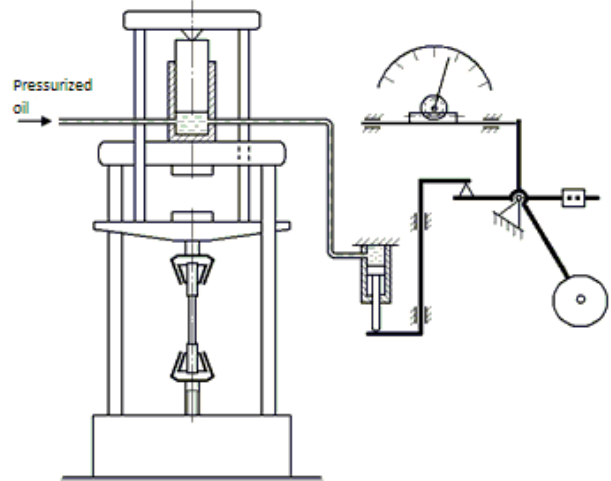
$$Z = \frac{S_u - S_0}{S_0} \cdot 100$$
 [%]

F_i is the force for which the extensometer registers the elongation $\Delta L_i = L_i - L_0$

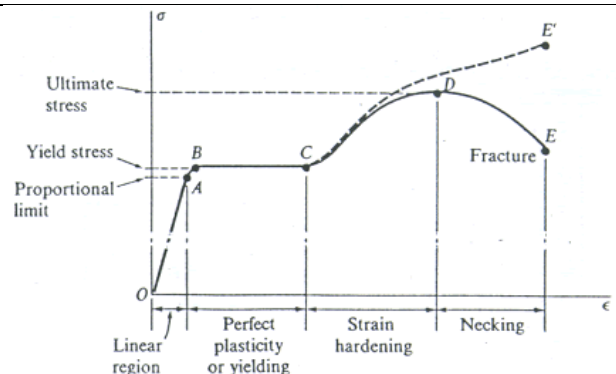
L_u is the ultimate length (measured between the marks of the extensometer after final breaking)

$S_u = \frac{\pi \cdot d_u^2}{4}$ with d_u being the diameter in the failure section

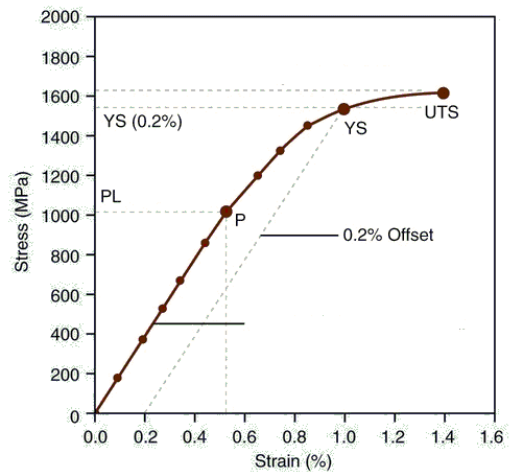
The testing machine



Universal hydraulic testing machine with a maximum load of 300 kN



Stress strain curve for carbon steel (ductile)



Stress strain curve for alloy steel (less ductile)

