LAB 5: Tensile strength

1. Preparation:

- tensile strength: $\mathbf{R_t} = \frac{\mathbf{F}_{max}}{\mathbf{S}}$

- ductility – **percentage elongation after fracture (δ)** - permanent elongation of the original length after fracture, expressed as the percentage of the original length L_0:

$$\delta = \frac{L_u - L_0}{L_0} \quad [\%]$$

- **percentage reduction of area (Z)** - maximum change of cross sectional area, which was occurred during the test, expressed as a percentage of the original cross-sectional area S_0 .

$$\mathbf{Z} = \frac{S_0 - S_u}{S_0} \quad [\%]$$

where S_0 is original cross-sectional area before testing [m^2]
S_u minimum cross-sectional area after fracture [m^2]

2. Procedure

- weigh and measure prepared test samples – $\boldsymbol{m}$ [g], $\boldsymbol{L}$ [mm]. For the samples with smooth surface measure their diameter $\boldsymbol{D}$ [mm] (in two perpendicular directions).
- carry out the test according the teachers instructions on the machine FP 100
- write down the values of the maximal force $\boldsymbol{F_{max}}$ [kN] and elongation $\boldsymbol{L_u}$ [mm] of each sample – from test machine
- measure the diameter of the steel bar in the place of fracture in two perpendicular directions $\boldsymbol{d_1}$, $\boldsymbol{d_2}$ [mm]

3. Protocol

There is one joint protocol for LAB 5 and LAB 6

- count the original cross-section area $\boldsymbol{S_0}$ [mm^2] of steel bar from the mass $\boldsymbol{m}$ of a known length $\boldsymbol{L}$ and its density (7850 kg/m^3) according the formula :

$$\rho = \frac{m}{V} = \frac{m}{S_0 \times L}$$

- count bulk density of each material ρ_v [kg.m^{-3}], if not given
- for each material count tensile strength R_t [MPa] and percentage elongation δ
- count the minimum cross-sectional area S_u [mm^2] of steel bar after fracture from the arithmetic mean of diameters d_1 and d_2 and count the percentage reduction of area Z

LAB 6: Thermal conductivity

1. Preparation:

- thermal conductivity (chapter16 – p. 87)
- factors, affected the thermal conductivity
- thermal conductivity of building materials (chap..16 – p. 87)
- thermal conductivity measuring methods (p.87)

2. Procedure

- weigh and measure prepared test samples
- the measuring will be carried out on the apparatus ISOMET according the instructions
- write down the values of the coefficient of thermal conductivity λ [W.m.K^{-1}] - from the display

3. Protocol

- count the bulk density ρ_v [kg.m^{-3}] of measured materials
- fill in the values of the coefficient of thermal conductivity

For protocol you can use the form attached. If you use the hand made form, it has to be similar to this form.

LAB 5+6: Tensile strenght, thermal conductivity

Name:	
Signature:	Study group:
Date:	Number of annexes : (all calculations, given data)

Results:				
Tensile strength				
Material		Steel		
Bulk density ρ_V	[kg.m^{-3}]	7850		
Tensile strenght R_t	[MPa]			
Ductility δ	[%]			
Reduction of area Z	[%]			
Thermal conductivity				
Material				
Bulk density ρ_V	[kg.m^{-3}]			
Coefficient of thermal conductivity λ	[W/m.K]			