Scope		**Determination of critical force (buckling)**			
Group		Team No.		Date	
Team members					
Comments					

1. Principle

A pinned rod is loaded with an axial force. The aim of the exercise is to determine the axial force (the so-called critical force) that will cause the rod to buckling. The critical force is determined using the Southwell method. The determined force should be compared with the theoretical value.

2. Test stand

The view of the test stand is shown in Figure 1, and the diagram of the measurement of the horizontal angle φ and the rod deflection d in Figure 2.

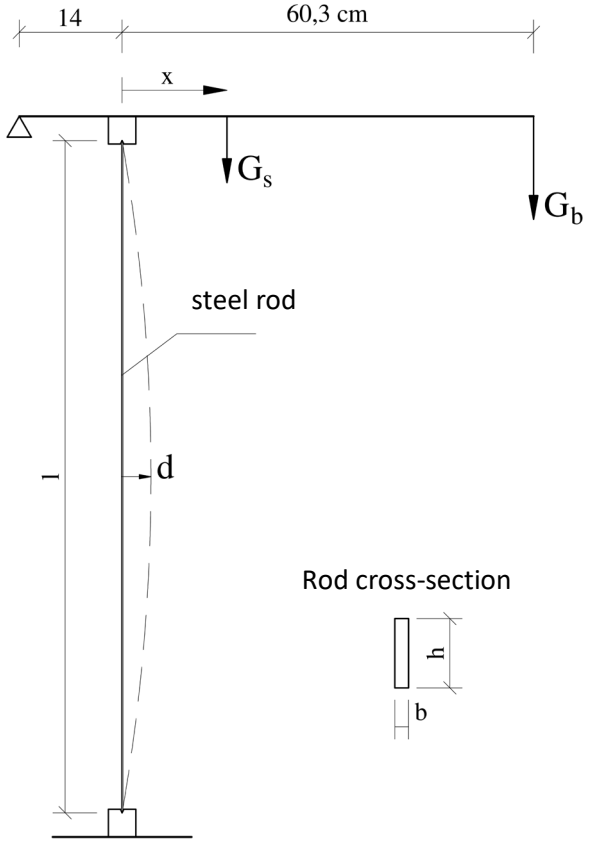

Fig. 1 Test stand

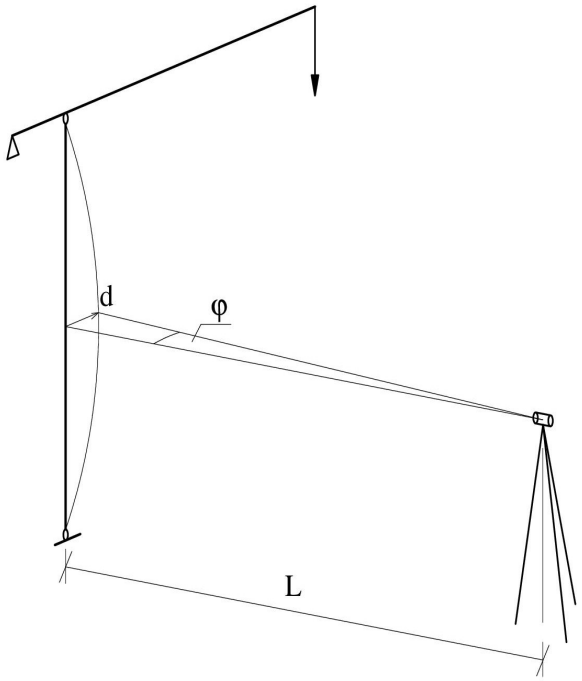

Fig. 2 Rod deflection d measurement

The value of the axial force acting on the rod is:

$F = G_0 + G_b \cdot \frac{14+60.3}{14} + G_s \cdot \frac{x}{14}$,

where: $G_0 = 273.7$ N (lever weight), $G_s = 40.7$ N (slider weight), x [cm] – slider position, G_b – weight placed on the scale [kG]; 1 kG = 9.81 N.

3. Course of the exercise
- measure the dimensions of the cross-section of the rod and its length,

  b = ……..… h = ……..……. l = …….
- place the rod on the test stand,
- measure the distance from the theodolite to the rod L = …….,
- using a theodolite, read the initial value of the horizontal angle φ [grad] for $F = G_0$,
- gradually increase the force F, each time reading the horizontal angle φ [grad] and calculating the horizontal deflection of the rod d,
- based on the measurements, determine the critical force using the graph of the function $d\left(\frac{d}{F}\right)$,
- determine the value of the critical force and compare it with the theoretical value.

4. Measurement and calculation results

G_b [kG]	G_b [N]	x [cm]	F [N]	φ [grad]
0.0	0.0			

Note: the report should show how the calculations were performed (equation, data substitution, result, units).