

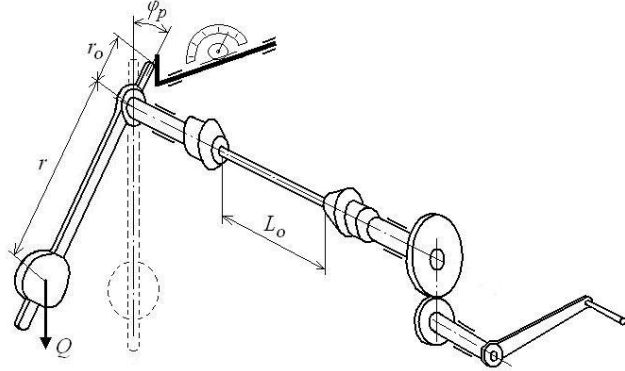
Student \_\_\_\_\_  
Faculty \_\_\_\_\_ Year \_\_\_\_ Group \_\_\_\_  
Date \_\_\_\_\_

### TORSION TESTING OF WIRES

Aim of tests:

To present the methodology for torsion testing and determination of elastic constants and mechanical characteristics of a spring wire:  
- Shear modulus  
- Yield limit in torsion  
- Ultimate strength in torsion

The testing machine



The specimen

Material : \_\_\_\_\_  
Diameter of wire:  $d = 4.5$  mm  
Length of measurement zone:  $L_0 = 100$  mm

Measurement of rotation angle of the wire  
is made using a mechanical torsionmeter

Formulae

Yield limit in torsion:  $\tau_y = \frac{12M_{ty}}{\pi d^3}$

Ultimate strength in torsion:  $\tau_u = \frac{12M_{tu}}{\pi d^3}$

Shear modulus:  $G = 584 \cdot \frac{L_0 \cdot \Delta M_t}{d^4 \cdot \Delta \varphi}$

where  $M_{ty}$  is the moment of torsion in yielding,  $M_{tu}$  is the ultimate moment of torsion and  $\Delta \varphi$  is the variation of the angle of rotation (in degrees) that corresponds to an increase  $\Delta M_t$  of the moment of torsion

Results

a) Determination of the shear modulus

Reading nr.	1	2	3	4	5	6	7	8
Moment of torsion $M_t$ [N·mm]								
Angle of rotation $\varphi$ [deg]								

Interval	Variation of $M_t$ [N·mm]	Variation of $\Delta \varphi$ [deg]	Shear modulus G [MPa]
1 - 2			
2 - 3			
3 - 4			
4 - 5			
5 - 6			
6 - 7			
7 - 8			

Average value :  $G =$  \_\_\_\_\_ MPa

b) Mechanical characteristics in torsion for the studied material

Moment of torsion at yielding $M_{ty}$ [N·mm]	Ultimate moment of torsion $M_{tu}$ [N·mm]	Yield limit in torsion $\tau_y$ [MPa]	Ultimate strength in torsion $\tau_u$ [MPa]

Observations

1. The behavior of the material was (ductile/fragile) \_\_\_\_\_
2. The failure surface was normal to the axis of the specimen.
3. The temperature of the specimen increased during test due to internal friction.
4. The specimen was magnetized due to the orientation of the grains deformed by hardening.