

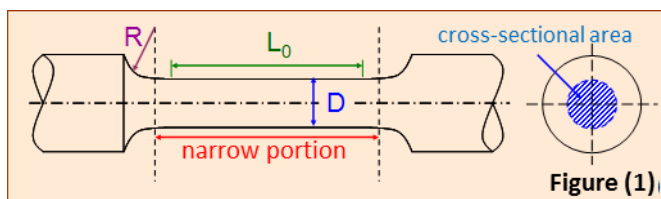
Mechanical Testing Laboratory (MTL)



Determination of mechanical strengths of materials plays an important role in material selection and engineering design. In Central Laboratory, there are 2 universal testing machines, 2 hardness testers and 1 impact testing system for determination of the materials' mechanical properties.

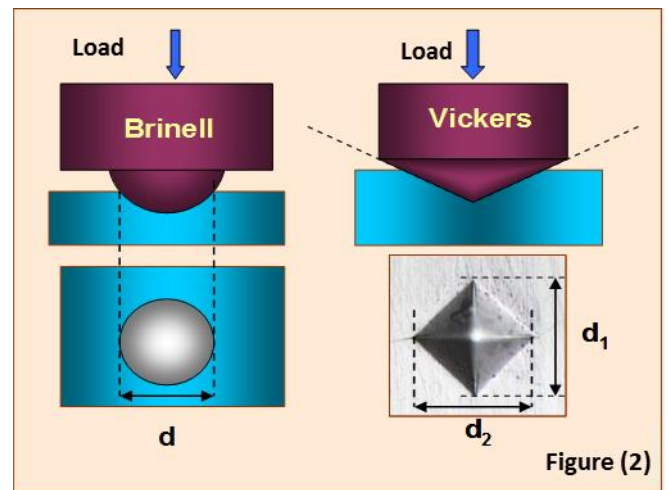
BASIC PRINCIPLES

Tensile Testing: Tensile testing is the most common testing method for the determination of mechanical properties of materials. In a tensile test a material's strength is measured under an applied load. A test specimen (*Figure (1)*) is mounted to a universal test machine and a force (load) is applied. In the tensile test, the elongation of materials is measured by an extensometer, the applied force (load) is measured using a load cell and, as a result, stress-strain curves (*Figure (5)*) are obtained. It is possible to determine ductility, strength, and rigidity of materials by the tensile test.

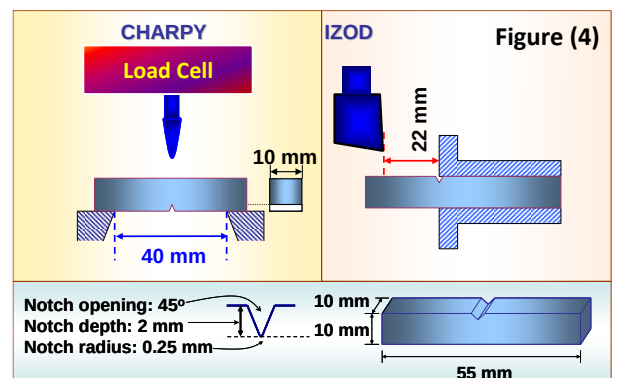
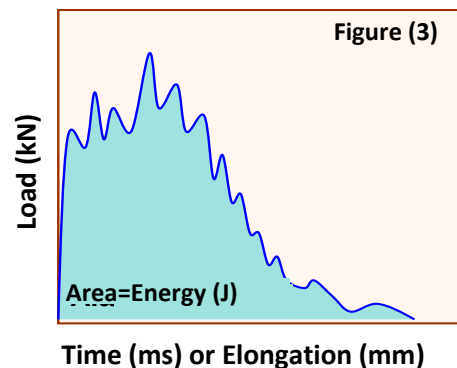


Apart from tensile test, it is possible to carry out compression and flexural tests using the universal test machine.

Hardness Measurement: Hardness is a property which determines a material's resistance to plastic deformation. In order to determine a hardness value, conical, pyramidal or spherical (*Figure (2)*) shapes of indenters are applied to the surface of samples and followed by measurement of the hardness value depending on the size or depth of the indentation left in the surface. Four standard test methods are used to make the relationship between the indenter size and hardness (Brinell, Vickers, Knoop and Rockwell).



Impact Test: The energy required for breaking a test specimen by the impact of high velocity weight is measured by using an impact test machine (*Figure (4)*). The absorbed energy can be used as a measure of material's strength and toughness during an impact test. The information obtained after the impact test, can give information to engineers about how materials behave in real applications. In the impact test machine, it is possible to do Charpy, Izod, and Penetration tests. When the Charpy and Izod tests are done at different temperatures, the brittle – ductile transition temperature of the materials can be determined.



THE PROPERTIES OF THE INSTRUMENTS IN MECHANICAL TESTING LABORATORY

Universal Testing Machines:

	Zwick	Instron
Load Capacity	250 kN	30 kN
Additional Load Cells	100 N, 10 kN	1 kN
Extensometer	Controllable Gauge	25 mm Gauge Length
Tests	Tensile, Compression, 3-4 point bending	Tensile, Compression, Creep (1000 °C)

Hardness Measurement Machines:

	Micro	Macro
Load Capacity	10 g – 1 kg	1- 100 kg
Tests	Vickers Knoop	Brinell, Vickers Rockwell

Impact Test Machine:

Maximum Impact Velocity	20 m/s
Energy Range (With low weight head)	2.6- 826 J
Energy Range (With low weight head)	4.6 - 945 J
(With high weight head)	25 - 1603 J
Maximum Falling Height	Simulates to 20.4 m

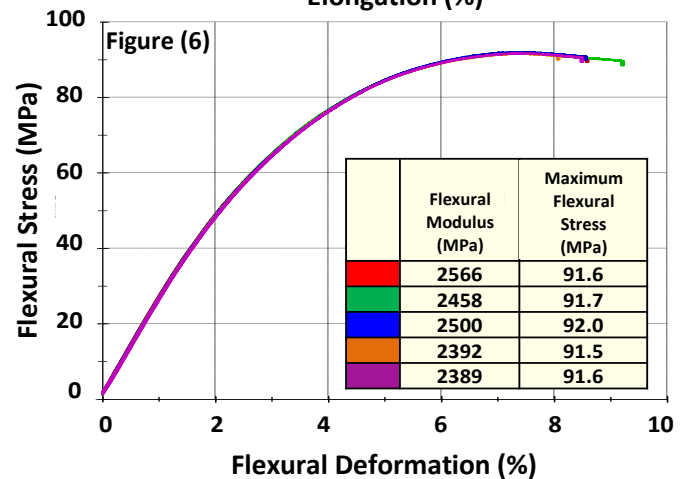
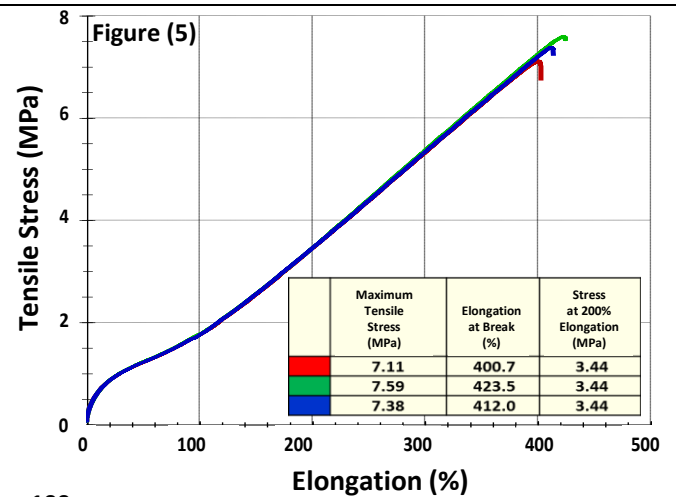
MATERIALS

The basic mechanical properties of a wide range of materials' (Metal, plastic, ceramic, and composite) can be determined. These properties are,

- Young's Modulus
- Tensile strength
- Compression strength
- Yield strength
- Ductility
- Toughness
- Deformation at fracture
- Impact strength
- Hardness

SAMPLE RESULTS

The tensile test results of a rubber material are given in Figure (5). Three point bending test results of a plastic material are given in Figure (6).



ACCREDITED METHODS

Mechanical Testing Laboratory has become entitled to take the Accreditation Certificate by the analysis methods given below by TÜRKAK.

- EN ISO 527-1, TS EN ISO 527-1 Plastics – Determination of tensile properties – Part 1: General principles
- EN ISO 527-2, TS EN ISO 527-2 Plastics – Determination of tensile properties – Part 2: Test conditions for moulding and extrusion plastics
- EN ISO 527-3, TS 1398-3 EN ISO 527-3 Plastics – Determination of tensile properties – Part 3: Test conditions for films and sheets
- EN ISO 527-4, TS EN ISO 527-4 Plastics – Determination of tensile properties – Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites
- EN ISO 6892-1, TS EN ISO 6892-1 Metallic materials – Tensile testing – Part 1: Method of test at room temperature
- ISO 6507-1, TS EN ISO 6507-1 Metallic materials – Vickers hardness test – Part 1: Test method

INTERNATIONAL PROFICIENCY TESTS

Since 2011, Mechanical Testing Laboratory has attended the proficiency tests organized by the international accredited institutions. The z-scores of the proficiency tests the laboratory attended were less than 2 ($|z| \leq 2$) which is accepted as successful according to ISO/IEC 17043 standard.

CONTACT INFORMATION

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