



## STRENGTH OF MATERIALS LABORATORY

### AIM:

To familiarize the students with the use of stress, strain measuring instruments.

### OBJECTIVES:

- To understand the various mechanical properties by conducting tensile test.
- To understand the hardness value of different materials.

### LIST OF EXPERIMENTS:

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical properties Comparison
  - (i) Unhardened specimen
  - (ii) Quenched Specimen and
  - (iii) Quenched and tempered specimen.
11. Microscopic Examination of Hardened samples and
  - (i) Hardened and tempered samples.

### LIST OF EQUIPMENTS :

- Universal Tensile Testing machine
- Torsion Testing Machine
- Impact Testing Machine
- Brinell Hardness Testing Machine
- Rockwell Hardness Testing Machine
- Spring Testing Machine for tensile and compressive loads
- Metallurgical Microscope
- Muffle Furnace (800°C )

## AATSM01 UNIVERSAL TESTING MACHINE

AATSM01 Universal Testing Machine is designed to perform tensile, compression, bending and shear tests on metal & other materials, both in the form of test pieces and as finished products.

### DESCRIPTION :

Operation of the machine is by hydraulic transmission of load from the test specimen to a separately housed load indicator. The system is ideal since it replaces transmission of load : through levers and knife edges, which are prone to wear and damage due to shock on rupture of test pieces. Load is applied by a hydrostatically lubricated ram. Main cylinder pressure is transmitted to the cylinder of the pendulum dynamometer system housed in the control panel. The cylinder of the dynamometer is also of self - lubricating design.

### UTILITIES REQUIRED:

- AC Three Phase Power Supply- 440v.
- Floor Space – 0.75m \* 0.75m

### TECHNICAL DETAILS:

- Load capacity options (40, 50, 60 KN)
- Loading accuracy as high as  $\pm 1\%$ .
- Training roll autographic recorder supplied as standard to enable study of the behavior of materials.
- High reading accuracy due to large size and design of dial.
- Wide range of standard and special accessories, including load stabilizer. Easy change from plain to threaded and screwed specimens.
- Motorized loading and unloading cycle.
- Large effective clearance between columns enables testing of standard specimens as well as structures.
- Fully enclosed and protected pendulum.

### Range Of Experiments:

- Tension Test
- Compression Test
- Transverse Test
- Double Shear Test



## AATSM 02 TORSION TESTING MACHINE



Torsion Testing Machine is designed for conducting Torison and Twist Tests on various metal wire, tubes sheet materials. Torque measurement by pendulum Dynamometer System. Torque ranges can be adjusted. Torque can be applied to specimen by geared motor through gear box

Autographic recorder can be provided to know the relation between torque and angle of twist on specific request.

### UTILITIES REQUIRED:

- Electricity 440 V, AC Three Phase power supply.
- Floor Space – 1.5m \* 1m

### TECHNICAL DETAILS:

#### SPECIFICATIONS:

- Torsional Speed of 0.1/0.2 RPM
- Torque Compensated Motors
- Maintenance Free Gear Box

MODEL NAME	TTM-C1	TTM-C2
Capacity (kg-m)	20	50
Ranges in (kg-m)	20, 10 & 5	50, 25 & 10
No. of divn. on dial	500	500
Torsion Speed & Direction	Fixed Reverse	Fixed Reverse
Clearance Between Grips (mm)	0-450	0-500
Gear motor (In HP)	0.5	0.5

#### OPTIONAL ACCESSORIES:

- Auto Range Selection with Range Selector Wheel.
- 3 or 4 Torque Ranges for Higher Accuracy.
- Variable Speed Drive

#### RANGE OF EXPERIMENTS:

- Torsion & Twist Tests can be carried out on various metal rods and flats.



## AATSM03 IMPACT TESTING MACHINE

**Impact testing machine** is used to test the resistance of metal & alloys to external impacts and is widely used to assess the strength of metals.

The pendulum is mounted on antifriction bearings. It has two starting positions, the upper one for Charpy and the lower one for Izod testing. One release, the pendulum swings down to break the specimen and the energy absorbed in doing so is measured as the difference between the height of drop before rupture and the height of rise after rupture of the test specimen and is read from the position of maximum pointer on the dial scale.

### UTILITIES REQUIRED:

- AC Three Phase Power Supply- 440v.
- Floor Space – 1m \* 0.5m

### TECHNICAL DETAILS:

SPECIFICATIONS	AAT-M1	AAT – M2
Maximum Capacity	300 J/168 J	300 J / 170 J
Minimum Scale Graduation	2J	0.5 J
Overall Size (Approx.)	1.1 m * 0.45 m * 1.65m	1.1 m x 0.45 m * 1.65m
Net Weight (Approx.)	375 Kg.	375 Kg.

### Optional Accessories:

- Calliper gauge for checking V notch for Izod & Charpy
- Depth notch gauge including V & U notch, angle & radius.
- Self centring tong.
- **V - Notch** milling cutter.
- **U - notch** milling cutter

### RANGE OF EXPERIMENTS:

- **Charpy Test**
- **Izod Test**
- **Impact Tension Test**



## AATSM04 BRINNELL HARDNESS TESTER

AAT Hardness Testers (AATSM04) Models are manually operated. All these models are suitable for testing hardness of metals & alloys of all kinds hard or soft, whether flat, round or irregular in shape.

The machine is designed with a hydraulic power pack and control circuit for effortless loading unloading operation. A dial gauge in from measures depth of ball penetration. This facilitates production testing within tolerance limits by comparison method. The Actual Load Application System Is Of Dead Weight Type Combined With Mechanical Lever System. The Supporting Hydraulic System IS For Initial Of Load Before Each Test And Damping The Load Application System For Smooth Application Of Load.

### UTILITIES REQUIRED:

- AC Three Phase Power Supply- 440v.
- Floor Space – 0.75m \* 0.75m

### TECHNICAL DETAILS:

SPECIFICATIONS	
Max load (kgf)	3000
Load range (kgf)	In stage of 250 kgf
Initial Load range (kgf)	250
Max. test height (mm)	410
Depth of throat (mm)	200
Size of base (mm)	670 x 370
Machine height (mm)	1127 mm
Nett. weight (Approx. Kg.)	450 kg
Test Performed	Brinell

### RANGE OF EXPERIMENTS:

- Hardness Tests on Metals.



## AATSM05 ROCKWELL HARDNESS TESTING MACHINE

AATSM05 Rockwell & Rockwell Superficial tests consists of forcing an indenter (Diamond or Ball) into the surface of a test piece in two steps i.e. first with preliminary test force and thereafter with additional test force and then measuring depth of indentation after removal of additional test force (Remaining preliminary test force active) for measurement of hardness value.

### UTILITIES REQUIRED:

- AC Three Phase Power Supply- 440v.
- Floor Space – 0.75m \* 0.75m

### TECHNICAL DETAILS:

- initial Load : 10 kg
- Loads : 60, 100, 150
- Maximum Test Height : 230mm
- Maximum Depth of elevating Screw below base :240mm
- Size of base : approx.171x 423mm
- Depth of throat : 133mm
- Machine Height: 635mm
- Net Weight : 75 kg

### Features:

- Direct analog dial reading.
- Advanced design, easy to operate.
- Engineered to obtain highly sensitive and accurate readings.

### RANGE OF EXPERIMENTS :

- Hardness Tests on Metals.



## AATSM06 SPRING TESTING MACHINE

The Spring Testing Machine (AATSM06) is used for evaluating load and elongation of springs in tension and compression.

Machines enable load deflection tests of tension and compression springs to be carried out accurately and quickly. The Cabinet contains the hydraulic unit the hand wheel of the pump and the release valve handle are outside the cabinet for easy operation. This compact base carrier two fixed upright and four horizontal plates. The first and the third plates with two small uprights from an adjustable frame. The second and the fourth plates are fixed. A square threaded wheel arrangements provided for adjusting the height of the springs.

### **UTILITIES REQUIRED:**

- AC Three Phase Power Supply- 440v.
- Floor Space – 0.75m \* 0.75m

### **TECHNICAL DETAILS:**

#### **SPECIFICATIONS :**

- Maximum Capacity – 100 kN
- Free length of tension spring – 100 mm
- Diameter of compression spring – 80 mm
- Maximum Cross Head Travel - 100mm
- Force Measuring Resolution – 0.2 N
- Connected Load – 2 hp
- Max. distance between compression plates – 400 mm

#### **Grip:**

- Compression Plate
- Optional Accessories – Tension Grip/ Hook
- The Load application is by means of a Rack & Pinion Hand Wheel.

#### **Range Of Experiments :**

- To Conduct Tension & Compression test on Spring Specimen.
- To Calculate 'K' factor.



## AATSM07 METALLURGICAL MICROSCOPES

### TECHNICAL DETAILS:

- **Equipped with** bright field vertical illuminator.
  - High intensity low voltage lamp **6V-15W** with adjustable field and aperture.
  - Iris-diaphragm with slots for dropping coloured filters.
- ❖ It provides excellent bright field in incident illumination of opaque and semi-opaque specimen.
- ❖ Product available with magnification ranging from 25x to 625x.



## AATSM08 MUFFLE FURNACE

### TECHNICAL DETAILS:

**Muffle Furnaces** with double walled construction of thick PCRC sheet. Outside finished in shoving enamel and gap insulated with ceramic wool. Heating elements of kantha A-1 wire fitted with high quality energy regulator, pyrometer, thermocouple, silver thermal fuse.

### **Optional Accessories:-**

- Solid state temp. Controller in lieu of energy regulator.
  - Digital temp. indicator-cum-controller.
  - Digital temp. indicator-cum-controller with computer data logger.
  - Models with maximum temperatures **900°C, 1000°C, 1100°C, 1200°C & 1600°C** available.
- ❖ Muffle Furnaces are available in different dimensions with Rate of Power ranging from 1.5kW to 5kW.

