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## Universal Testing Machines



Standards:

Specification:

Universal Testing Machine is designed for testing metals and other materials under tension, compression, bending, transverse and shear loads. Hardness test on metals can also be conducted.

### **Principle of Operation:**

Operation of the machine is by hydraulic transmission of load from the test specimen to a separately housed load indicator. The hydraulic system is ideal since it replaces transmission of load through levers and knife-edges, which are prone to wear out 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 selflubricating design. The load transmitted to the cylinder of the dynamometer is transferred through a lever system to a pendulum. Displacement of the pendulum actuates the rack and pinion mechanism which operates the load indicator pointer and the autographic recorder. The deflection of the pendulum represents the absolute load applied on the test specimen.

Return movement of the pendulum is effectively damped to absorb energy in the event of sudden breakage of specimen.

The Machine consists of:

### **Straining Unit:**

This consists of a hydraulic cylinder, motor with chain and sprocket drive and a table coupled with the ram of the hydraulic cylinder, mounted on to a robust base. The cylinder and the ram are individually lapped to eliminate friction. The upper cross-head is rigidly fixed to the table by two straight columns. The lower cross-head is connected to two screwed columns which are driven by a motor. Axial loading of the ram is ensured by relieving the cylinder and ram of any possible side loading by the provision of ball seatings.

An elongation scale, with a minimum graduation of 1 mm, is provided to measure the deformation of the specimen. Tension test is conducted by gripping the test specimen between the upper and lower cross-heads. Compression, transverse, bending, shear and hardness tests are conducted between the lower cross-head and the table. The lower cross-head can be raised or lowered rapidly by operating the screwed columns, thus facilitating ease of fixing of the test specimen.

#### **Control Panel:**

The control panel consists of a power pack complete with drive motor and an oil tank, control valves, a pendulum dynamometer, a load indicator system and an autographic recorder.

#### **Power Pack:**

The power pack generates the maximum pressure of 200 Kgf/cm<sup>2</sup>. The hydraulic pump provides continuously nonpulsating oil flow. Hence the load application is very smooth.

#### **Hydraulic Controls:**

Hand operated wheels are used to control the flow to and from the hydraulic cylinder. The regulation of oil flow is infinitely variable. Incorporated in the hydraulic system is a regulating valve, which maintains a practically constant rate of piston movement.

#### **Load Indicator System:**

This system consists of a large dial and a pointer. A dummy pointer is provided to register the maximum load reached during the test. Different measuring ranges can be selected by changing relevant weights on the pendulum and operating the range selection knob. An overload trip switch is incorporated which automatically cuts out the pump motor when the load range in use is exceeded.

**Pendulum Dynamometer:**

This unit permits selection of favourable hydraulic ratios producing relatively small frictional forces. Pressurised oil in the loading cylinder pushes up the measuring piston proportionately and actuates the special dynamometer system. The piston is constantly rotated to eliminate friction. The dynamometer system is also provided with an integral damper and ensures high reliability of operation. The load transmitted to the dynamometer is transferred through a pendulum to the load indicator.

**Accuracy And Calibration:**

All Universal Testing Machines are closely controlled for sensitivity, accuracy and calibration during every stage of manufacture. Every machine is then calibrated over each of its measuring ranges in accordance with the procedure laid down in British Standards 1610:1964 and IS: 1828-1975.

**Universal Testing Machines comply with:**

Grade "A" of BS : 1610 and Grade 1.0 of IS :1828  
An accuracy of  $\pm 1\%$  is maintained from 20% of the load range selected to full load.