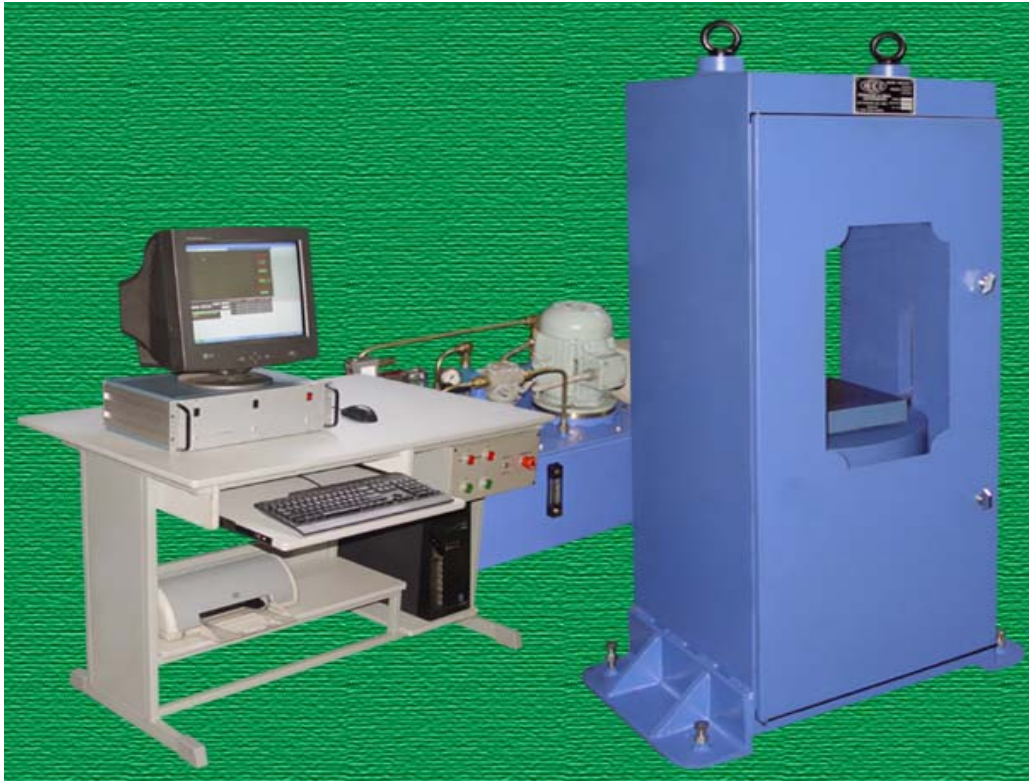


**HCA-592.402 AUTOMATIC COMPRESSION TESTING MACHINE  
(CAPACITY-3000kN)**

**(BOTH STRESS & STRAIN CONTROLLED)**



**Salient Features:-**

- ✚ Conforming to Testing Procedures laid down in **IS** for concrete specimen
- ✚ Based on **CLOSED LOOP FEEDBACK** mechanism
- ✚ Fully Computer Controlled operation with User friendly Software
- ✚ Controlling on both **Stress & Strain** basis
- ✚ Facility to study **Post failure behaviors** of specimens
- ✚ High speed Data Acquisition card with 100 kHz sampling rate and 16-bit resolution
- ✚ Programmable Rate of Loading (Pace Rate)
- ✚ Start, Stop, Hold operation through computer
- ✚ Inching/Release operation to set Sample
- ✚ Auto release facility after specimen failure
- ✚ Online Plotting of Graphs ( Load v/s Displacement, Load v/s Time, Displacement v/s Time) with display of data
- ✚ Programmable Data Saving Interval
- ✚ Storing of Data in Numeric form
- ✚ Safety Limits for Over Load & Over displacement range

## The detailed Specification of the system is given below:

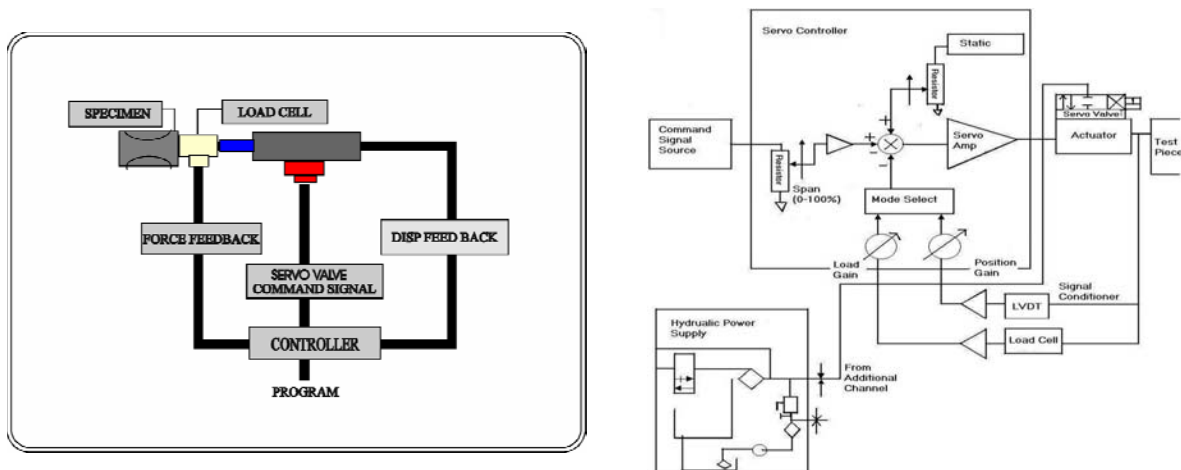
These compression testing machines are state of the art machines based on the principal of **CLOSE LOOP**. The system can be loaded on **Stress or Strain basis**. The system accuracy is better than  $\pm 1\%$  where as the controlling accuracy is with in  $\pm 2\%$  as per IS 1828. A special type of 4 piece seating is provided conforming to IS 14858.

### CLOSED LOOP PRINCIPLE IS AS EXPLAINED BELOW:-

The function of the servo control system is to provide accurate load control. The operation of the system is under control of a command source signal. This signal is generated in the function generator and is processed at a speed of 10 kHz in the P.I.D. controller.

An electro hydraulic servo-valve under the control of an electronic controller controls the application of hydraulic power to a linear actuator to provide the programmed force to the test specimen. Hydraulic power is provided by hydraulic power supply which controls the pressure, flow, temperature and provides required filtration for the hydraulic fluid. The out put of the power supply is often interfaced to the servo-valve and actuator by hydraulic accessory module which provides further filtration and minimizes pressure surges in the system.

The electronic servo controller constantly senses error between the command signal and feed back signal. It then acts to minimize this error via its out put to the servo-valve. Strain gauge based Pressure transducer supply force feed back as well as readout data to the servo controller to close the servo loop.



There are all the necessary safety features as over load, over travel, over temperature, safety protection and over load protection for the electrical controls. In addition to all these protections there are programmable protections through the software.

Supporting software is totally windows based and user friendly. It has the features for on line graphical presentation in addition to the numerical test results.

The system has essentially three parts.

1. Loading Frame
2. Hydraulic Power Pack
3. PC based Control system and Control Software

## 1. LOADING FRAME

Load frame is steel welded fabricated structure having a upper cross head, base and solid side plates. It is designed to withstand a few million times of full cycles of loading without any sign of distortion or fatigue.

The base carries a fine finished hydraulic ram and the Solid platen with self centering arrangement of dimension 350mmx350mm with hardness greater than 50HRC as per EN standard.

The top plate has the spherical seating to take care of any irregularity of the specimen surface or slight misplacement of the specimen from the central position. **Front cover** is provided, made of acrylic sheet, as a protection to the operator while at the same time giving an unobstructive view of the specimen under test. **Proximity switch** is provided as a safe guard against over travel. A displacement transducer is fitted with the ram to measure the deformation of the specimen. Various height spacers are provided to accommodate concrete specimens.

Broad Specifications of the loading frame are given as follows.

Capacity of the frame	: 3000kN
Load Resolution	: 0.1kN up to 999kN and 1kN from 1000kN to 3000kN
Vertical Clearance (Clearance between platens)	: 400mm
Horizontal Clearance (Distance between side plates):	500mm
Travel of the Ram	: 50mm
Platen Size	: 350mmx350mm

## 2. HYDRAULIC POWER PACK

Hydraulic power supplies are compact in design and are suitable for the supply of required flow and pressure for the movement of the actuator. It has an oil tank of adequate capacity, vane type pump powered by a three phase motor. All the electrical controls including the temperature controller are fixed on one side of the tank. It includes all the accessories like pressure line filter, return line filter, oil level, relief valve, pressure

gauge and shell & tube type heat exchanger. Anti vibration mountings are provided as standard along with the HPS.

Heat exchanger for keeping oil within working temperature range is provided as standard. The system is kept at a distance from the loading unit and connected through flexible pipes.

Broad specifications of the system are:-

Motor capacity	5 H.P.
Flow of the pump	5LPM
Capacity of the tank	100litres
Operating pressure	275 bars
Heat exchanger	4500 kcal/hr

Power pack is provided with standard accessories like return line filter 25 microns, pressure line filter 10 microns, pressure gauge 400 bars, oil level. Suction breather, digital temperature indicator.

System will be supplied with necessary cable and fittings for the operation of the machine. Total machine operates on 3 Phase 440VAC, 50Hz.

(Note: Running water for oil cooling is to be provided by the consignee)

### 3. PC BASED CONTROL SYSTEM AND CONTROL SOFTWARE

Control system provides the digital servo control, Ramp generation for the machine actuator, data acquisition, etc. for the continuous operation of the system.

#### (a) Signal Conditioning & Controlling Unit

HEICO servo controller basically consists of signal conditioning unit and controlling unit. Signal conditioning unit receives the output signal from the various transducers (Pressure Transducers and LVDT) and amplifies and process that signal as per the requirement and transfer it to computer through connecting cables where it is accepted by the data acquisition system. The out put from the signal conditioning unit for each transducers ranges from 0-5V.

Control is on **Stress or Strain basis**. It consists of dedicated servo-controller card that gives the desired processed signal through the P.I.D controller to the servo valve to operate in **stress or strain mode**. It also sends the signal to computer and accepts the command from the software to operate in desired manner. The parameters like rate of loading, safety limits for load can initially be programmed through the software. The facility is given to program the rate of loading from **1kN/sec-10kN/sec** in Load control and **0.01mm/sec-1mm/sec** in displacement control.

#### Salient Features

- Fully Computer Controlled operation (Start, Stop, Hold etc. operations)
- Controlling on both **Stress & Strain** basis

- High speed Data Acquisition card with 100 kHz sampling rate and 16-bit resolution
- Programmable Rate of Loading
- Automatic Pace rate control as programmed in the software
- Inching/Release operation to set Sample
- Auto release/Auto Shut down facility after specimen failure
- Load Hold facility with peak load record
- Manual emergency stop button

### **(b) Dedicated Computer for Controlling and Data acquisition**

System is provided with dedicated computer with built in data acquisition card. Broad specifications of the computer & data acquisition card are given below.

#### **Computer**

Intel P-IV Dual Core Processor,  
1.8 Ghz or Higher, 160 GB HDD,  
2 GB RAM, DVD R/W drive,  
Key Board, Optical Mouse,  
17" TFT Screen,  
Deskjet Colored Printer  
UPS 1KVA (APC Make)

#### **Data acquisition card**

The PCI Bus advanced data acquisition card provides the following advanced features

- 32 bit PCI- bus
- 16-bit Analog Input resolution
- Auto Scanning Channel selection up to 16 channels
- Up to 100 KHz A/D Sampling Rates
- 16 Single ended Analog Input channels
- Bipolar Input signals
- Programmable gain of x1, x2, x4, x8, x16
- Input range: +/-10V, +/-5V, +/-2.5 V, +/-1.25V, +/-0.625V
- One 12-bit Monolithic multiplying Analog Output channel
- 16 Digital Output and 16 Digital Input channels
- 4 extended Digital Input and Digital Output channels on the 37 - pin connector
- 3 Independent programmable 16-bit down counters.
- Three A/D Trigger modes: Software Trigger, Programmable Pacer Trigger and External Pulse Trigger
- Pre-trigger control
- Internal DC-to-DC converter for stable Analog power source.

### **CONTROL SOFTWARE**

Control software is the integral part of the system for precise controlling, operation & Data Acquisition, storage, processing, analysis and reporting.

## **Salient Features**

- Windows based user friendly software with easy user interface
- Programmable rate of loading (Pace Rate)
- Inching/Release operation to set Sample
- Computer/Software programmable Safety Limits for each channel
- Independent Taring of each channel
- Auto release/Auto shut down of system facility after sample failure
- To see the post failure behavior of the specimen
- Programmable Data Saving Interval
- Safety Limits for Over Load & Over displacement range
- Facility to hold machine and restart the loading during the test.
- Online display of numerical values of Load and Displacement simultaneously
- Online plotting of data of Load v/s Time, Displacement v/s time and Load v/s Displacement graphs
- Automatic display of breaking load at the end of the test
- Real time clock for tracking date, time and runs
- Facility to save test data along with order information about the specimen such as age, specimen no., size, dimensions etc. in user defined file/directory
- Facility to avoid unauthorized use by creating users password

## **Analysis Software**

Analysis software provides flexibility to user to do statistical analysis of test results and report generation.

### **Salient features**

- Plotting of following graphs-
  - a) Load v/s Time
  - b) Displacement v/s Time
  - c) Load v/s Displacement
  - d) Stress v/s Strain
- Calculation of various results (Young's modulus, Maximum strain, Compressive Strength etc.)
- Facility to list all the tests in compiled form
- Facility to plot the data for a selected run
- Statistical analysis of the test results
- Batch Summary Report
- Detailed Summary Report
- Result Sheet Generation