



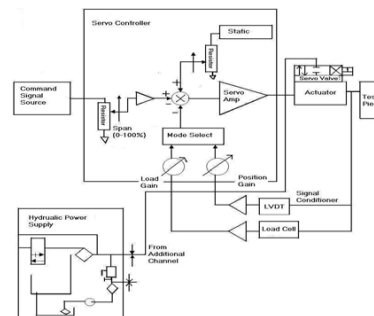
**MODEL : EKE-SST/FORMS MODULE 15KN/250KN
SHOCK ABSORBER/DAMPER TESTING MACHINE / FORMS
(FATIGUE ON RESILIENT MOUNTING)/CRACK DEVELOPER**

Dampening force of a directly proportional to velocity and this parameter needs to be precisely controlled. A small variation of 1mm in a stroke of 100 mm for 100rpm can result in a variation of 10% in **dampening** force.

Dampening force can be evaluated in the field orientation i.e. Vertical or Horizontal or at any angle between horizontal to vertical and can be locked at any position as per requirement.

For the precise control of frequency (rpm) and displacement **ENKAY** has introduced electronically controlled hydraulic based Servo controlled close loop system with maximum Dampening force up to of 5000kg depending upon customer requirement. The Machine is capable of conducting Compression/Tension/Flexure Tests on Shockers, Dampers, Polymer Mounting, Resilient, Rubber etc.

A signal equivalent to frequency and amplitude is created in a function generator which is fed to the P.I.D. controller. Machine response signal is also fed to the P.I.D. controller. The error signal between the two signal creates differential pressure resulting in the movement of the actuator corresponding to programmed frequency and amplitude thereby completing the close loop.



ENKAY is manufacturing different capacity Shock Absorber Testing Machine with option for Tilting of the frame for Vertical to Horizontal to enable testing of Shock Absorber as fitted in actual condition in the field.

Standard Models available are-

1. **EKE100.10**- Vertical Shock Absorber/Damper Testing Machine, Capacity-1000kg
2. **EKE100.10 KN** - Vertical & Horizontal Shock Absorber/Damper Testing Machine, Capacity-1000kg
3. **EKE100.30**- Vertical Shock Absorber/Damper Testing Machine, Capacity-3000kg
4. **EKE100.30 KN** - Vertical & Horizontal Shock Absorber/Damper Testing Machine, Capacity-3000kg
5. **EKE100.50**- Vertical Shock Absorber/Damper Testing Machine, Capacity-5000kg
6. **EKE100.50 KN** - Vertical & Horizontal Shock Absorber/Damper Testing Machine, Capacity-5000kg

ENKAY ENTERPRISES

(An ISO 9001:2015 company)

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A typical test set up comprises of

1. Load Frame with side jacks (**Optional**-Arrangement for tilting up to 90°), includes
 - a) Dynamic Hydraulic Actuator
 - b) Load Cell
 - c) Displacement Transducer
2. Module with servo valve, high pressure filter, gas filled accumulators
3. Recording System includes
 - a) Signal Conditioning and Controlling Unit
 - b) Computer for Controlling and Data acquisition
 - c) Control and Analysis Software
 - d) Test Base Plates

1. LOAD FRAME WITH SIDE JACKS

It is a free standing load frame with two long vertical columns. Cross head with two hydraulic locking jacks slide over these columns and can be clamped anywhere over the entire length. Crosshead is lowered or raised by the side jacks with long travel. Controls are provided for lifting and lowering of the middle crosshead. Arrangement is also provided for locking of the crosshead at any desired position. Lower side of the middle plate carries the actuator with a built in LVDT where as load cell is fixed to the top crosshead. Manifold is provided at the base for proper distribution of oil to the actuator and hydraulic-lock.



Frame with Tilting Arrangement

Technical Specifications

| | | |
|---------------------------------------|---|------------------------------------|
| Capacity | : | 1000kg/3000kg/5000kg/ Upto 25000KG |
| Horizontal clearance | : | 500mm |
| Vertical clearance | : | 1200mm |
| Capacity of the Actuator | : | 1000kg/3000kg/5000kg |
| Displacement (Testing stroke length): | : | 0-200mm |

(OPTIONAL- Arrangement for tilting of the Loading Unit from vertical to 90° horizontal to suit it for the Horizontal Testing of Shockers can also be incorporated in the machine)

a) Actuator with Servo valve

Actuator is a linear motion device, which gives a controlled motion either on stress basis or strain basis. It is a precision piece of equipment which follows the command from the wave generator through the servo valve. It is an equal area ram and piston with surface finish of 0.2 microns. End plates have metallic seals for side thrust. Servo valve is fixed to the actuator. These valves are high performance two stage valves with a pressure drop of @ 70 bars.

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Technical Specifications

| | | |
|------------------------------|---|-------------------------------------|
| Type | : | Double Acting & Double ended |
| Load carrying capacity | : | +/-1000kg or +/-3000kg or +/-5000kg |
| Stroke length | : | 0-250mm |
| Max. Operating pressure | : | 210Bars |
| Servo valve 2 stage | : | 60 LPM / 95 LPM |
| In built Displacement sensor | : | 300mm (+/- 150mm*0.01mm) |
| Test frequency | : | 0.01 – 25Hz. |

b) Load Cell

It is a strain gauge based type load cell with full wheat-stone bridge configuration. It has Alloy steel, electro less nickel plated structure for outstanding corrosion resistance. Structure of the load cell is such that it can be loaded in compression over few million numbers of times to test various type of shock absorbers. It has a over load capacity of 150% with a resolution of 1kg.

Technical Specification

| | | |
|-----------------------|---|--|
| Capacity | : | +/-5Tonnes or +/-10Tonnes |
| Make | : | Adi-Artech |
| Full Scale Output | : | 2.0 mV/V |
| Non-Linearity | : | < \pm 0.10% FSO |
| Hysteresis | : | < \pm 0.10% FSO |
| Non-Repeatability | : | < \pm 0.15% FSO |
| Creep (30 minutes) | : | < \pm 0.04% FSO |
| Excitation Voltage | : | 10 Volts DC |
| Safe overload | : | 150% |
| Operating Temperature | : | 0 ^o C to +60 ^o C |
| Protection Class | : | IP68 |

c) Displacement Transducer

The variation in strain, deflection etc is measured with help of Micropulse Linear Transducer. Salient feature of Micropulse Transducer:

- Very high resolution, repeatability and linearity.
- Immunity to shock, vibration, contamination and electrical noise.
- An absolute output signal.
- Automatic signal regulation.
- Resolution 0.1mm

Technical Specification

| | | |
|-----------------------|---|-------------------|
| Range | : | 300mm |
| Make | : | Gefran/Balluff |
| Full Scale Output | : | 10.0 Volts |
| Independent Linearity | : | \pm 0.02% of FS |
| Repeatability | : | <0.01mm |
| Hysteresis | : | <0.01mm |
| Pressure Withstand | : | Up to 600 Bars |
| Excitation Voltage | : | 24 Volts DC |

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| | | |
|-----------------------|---|--|
| Sampling Time | : | 1ms |
| Operating Temperature | : | -30 ⁰ to +75 ⁰ C |
| Protection Class | : | IP67 |

2. HYDRAULIC POWER PACK

Hydraulic power supplies are compact in design and are suitable for the supply of required flow and pressure for the actuation of the actuator. It has an oil tank of adequate capacity, vane type pump powered by a three phase motor. It includes all the accessories like pressure line filter, return line filter, oil level, relief valve, glycerin filled pressure gauge, Bye pass valve in case of clogging of the filter etc. Anti vibration mountings are provided as standard along with the HPS to protect against shock loading during the operation of the machine.

A suitable Air cooled heat exchanger would be provided for cooling of the hydraulic oil. Temperature controller is provided to prevent overheating of the hydraulic beyond 60°C.

Technical Specifications

| | | |
|--------------------------|---|----------------|
| Flow of the pump | : | 64/ 95LPM |
| Motor Capacity | : | 30/50HP |
| Max. Operating Pressure | : | 210 Bars |
| Type of pump | : | Vane |
| Capacity of the oil tank | : | 200/400 litres |
| Pressure line filter | : | 3 microns |
| Return line filter | : | 10 microns |
| Hoses | : | 5 meter long |
| Electrical Cable | : | 5meter long |



All accessories like, pump pressure gauge, level gauge, pressure-line filter (3 microns) , return line filter (10 Microns) , digital temperature controller are provided as standard along with the system.

System will be supplied with necessary cable and fittings for the operation of the machine. Total machine operates on 440VAC 3 phase supply.

ELECTRICAL CONTROL CABINET

This Electrical control Cabinet consisting of Electrical Components like:-

- (1) Contactors.
- (2) Time delay relays.
- (3) Power inlet.
- (4) Indicating lamps(RYB)
- (5) Temperature Controller

and other electrical accessories are fixed inside the Electrical Control cabinet

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3. MODULE WITH SERVO VALVE, HIGH PRESSURE FILTER, GAS FILLED ACCUMULATORS

This module carries state of the art **Servo Valve (761 Series)** fitted on a manifold. It has a high Pressure Line mesh filter at its inlet port. Two gas charged accumulators are fitted on A-B Port.

This module interfaces power pack and the actuator through pressure pipe lines and is fitted on to the actuator.

4. RECORDING SYSTEM

Control system provides the digital servo control, Ramp generation, different waveforms (Sine, Square & Triangular) for the machine, data acquisition, hydraulic control etc. for the continuous operation of the system.

(a) Signal Conditioning & Controlling Unit

ENKAY **Servo controller** basically consists of signal conditioning unit and controlling unit. Signal conditioning unit receives the output signal from the various transducers and amplifies and process that signal as per the requirement and transfer it to computer through dedicated cables where it is accepted by the data acquisition system. The out put from the signal conditioning unit for each transducers range from 0-5V. The controlling unit controls the movement of the RAM with respect to the signal input on feed back basis either from LOAD CELL or DISPLACEMENT sensor.

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 either in strain mode or stress 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 for machine, safety limits for load & displacement can initially be programmed through the software.



(**Note**: - With the increase in frequency the amplitude (stroke) tend to decrease. However, **Performance curve** is attached for ready reference)

Specifications of Controller

- Auto PID operation with auto loop shaping servo operation
- Closed loop update rate is 10 kHz
- No. of control channels- 2
- Control Mode- Load/Displacement
- Demand generation - Sine, Triangular, Square and Ramp signal
- Standalone operation to Start, Stop & Hold the test system
- High speed Data Acquisition card with 100 kHz sampling rate

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- System accuracy- Load accuracy : $\pm 1\%$ of indicated value of Load
Displacement accuracy: $\pm 1\%$ of indicated value of Displacement
- Two types of Loading- Dynamic (for fatigue test) and Static (Ramp)
- Dynamic Frequency Range- 0.01Hz to 25Hz (**Note: The stroke of actuator depends upon the frequency of operation. Performance curve enclosed for reference**)
- Static Ramp rate: Load control mode - 0.1kN/sec to 1kN/sec.
Displacement control mode- 0.01mm/sec to 500mm/sec.
- Environmental Temperature- 0^oC to +60^oC
- Relative Humidity- 10% to 85% non-condensing
- Supply Input- 220-240 VAC, 50 Hz

(b) Computer for Controlling and Data acquisition

System is provided with dedicated computer of following configuration or better with built in data acquisition card and wave generator.

Computer

Intel Core i5 480M (2.53GHz or higher),
500GB HDD, 4GB DDR RAM,
512MB Graphics, 4USB ports,
Keyboard, Mouse,
19" LCD monitor,
UPS 500VA
Deskjet Color printer

c) CONTROL AND ANALYSIS SOFTWARE

Control software is the integral part of the system for precise controlling & Data Acquisition and analysis.

Salient Features

- Windows based user friendly software
- Four different types of loading can be given to the sample- Sine, Triangular, Square, Random waveform and Ramp signal
- In Cyclic mode machine can go as high as 25Hz (25 cycle/second) and as low as a) Hz (0.01 cycle/second) covering Test Velocity 0-30cm/sec or 0-50cm/sec.
- Programmable Loading parameters – Frequency, Base, Amplitude etc.
- Programmable rate of loading in static mode
- Two types of Tests- Dynamic (for fatigue test) and Static (Ramp).
- Defining test sequences
- Facility to create Testing profiles for various type of Shock absorbers
- Computer/Software programmable Safety Limits for each load & displacement
- Independent Taring of each channel
- Facility to hold the actuator and restart the loading during the test.
- Facility to increase the Base load, frequency/velocity and amplitude during the test
- Facility to indicate dynamic load against varying piston speeds

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- Facility to compare predefined values (design parameters) with specified tolerance to ascertain the suitability of the shock absorber
- Facility to vary the stroke keeping the frequency constant at particular value and then by keeping the stroke constant and varying the frequency
- Facility to save the data after the test with the identification details of shock absorber tested
- Shows number of cycle on screen
- Store the number of cycles in Dynamic test
- Online display and recording the various parameters such as Load, Displacement, stroke length and test velocity
- On-line graphical display of Load and Displacement
- Auto adjustment of graph scales
- Storing of data of each channel in user defined file/directory that can be directly opened in Excel and Analysis Software
- To analyze the test result Analysis software is given which shows different type of graph and data i.e. **Load Vs Displacement graph, Load Vs Time graph, Displacement Vs Time graph and Load Vs Speed graph** for statistical analysis.

Analysis Software

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

Salient features

- Plotting of following graphs-
 - b) Time v/s Load
 - c) Time v/s Displacement
 - d) Load v/s Displacement
 - e) Load v/s Speed
- Generation of various test results (Number of cycle adjustable (idle/acting), Maximum and minimum load etc.)
- Facility to plot the data for a single cycle
- Statistical analysis of the test results
- Detailed Summary Report
- Facility to take print out of the data and all the graphs
- Result Sheet generation

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TABLE - TECHNICAL DETAILS

| MODEL | EKE100.10 | EKE100.30 | EKE100.50 | EKE100.10 | EKE100.30 | EKE100.50 |
|---|------------------------|------------------|------------------|------------------|------------------|------------------|
| Capacity of Frame (kg) | 1000 | 3000 | 5000 | 1000 | 3000 | 5000 |
| Max. permissible damping force (in tension and compression) | 600 | 1500 | 3000 | 600 | 1500 | 3000 |
| Total Stroke (mm)* | 250 (+125) | 250 (+125) | 250 (+125) | 250 (+125) | 250 (+/-125) | 250 (+/-125) |
| No. of Strokes /min | 1-200 | 1-200 | 1-200 | 1-300 | 1-300 | 1-300 |
| Test Velocity (cm/sec.) | 30 | 30 | 30 | 50 | 50 | 50 |
| Frequency Range (Hz) | 0.01-25 | 0.01-25 | 0.01-25 | 0.01-25 | 0.01-25 | 0.01-25 |
| Servo Valve (LPM) | 60 | 60 | 60 | 60 | 60 | 60 |
| No. of Servo Valves | 1 | 1 | 1 | 2 | 2 | 2 |
| Flow of Pump (LPM) | 64 | 64 | 64 | 95 | 95 | 95 |
| Motor Power (HP) | 30 | 30 | 30 | 50 | 50 | 50 |
| Max. Working Pressure (kg/ cm ²) | 210 | 210 | 210 | 210 | 210 | 210 |
| Capacity of Oil Tank (Litre) | 200 | 200 | 200 | 400 | 400 | 400 |
| Load cell Capacity (kg) | 2000 | 5000 | 10000 | 2000 | 5000 | 10000 |
| Displacement Transducer Range (mm) | 300 (±150) | 300 (±150) | 300 (±150) | 300 (±150) | 300 (±150) | 300 (±150) |
| Maximum Length of Shock absorber tested (mm) | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| Power Supply | 440V AC, 3 Phase, 50Hz | | | | | |

(OPTIONAL- Arrangement for tilting of the Loading Unit from vertical to 90° horizontal to suit it for the Horizontal Testing of Shockers can also be provided in above mentioned Models.)

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