



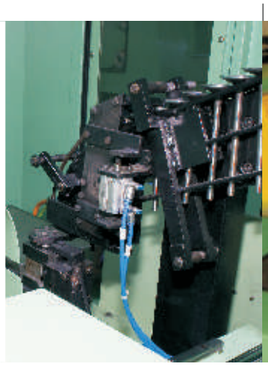




ETA Product Range Includes:

Friction Welding Machines
- Continuous drive Rotary Friction Welding
- Linear Friction Welding
- Friction Stir Welding
- Friction Surfacing

Electrical Upsetting Machines
(Metal Gathering Machines)
- Hydraulic & Electrical Servo Upsetters

Servo Controlled Screw Presses

Machines for making Engine Valves
- Tappet End Grinding
- Valve End Cut off
- Grooving
- Head diameter Turning and Facing
- Profile Turning
- Straightening
- Chemical Etching
- Friction Welding Machine (Pin to Pin and Head to Pin)
- Servo Electric Upsetters

Special Purpose Machines
- Ball Turning and Burnishing
- Commutator Slotting
- Shaft Straightening
- Double Ended CNC Turning
- Duplex Milling for Gear Pump Body
- Bore Grinding - Carbon Bushes

Testing Machines
- OBJ Boot Testing
- Parking Brake Testing
- Fatigue Test Rig for Steering Column
- Axial Elasticity Testing for SBJ, OBJ and IBJ
- Test Rigs for Steering Gears
  - -Rack Push Pull Testing
  - -Endurance Testing
  - -Impact Testing
  - -Torque to Failure Testing
  - -3-Axis Durability Test
  - -Functional Test
  - -Alternated Fatigue Test
- Accelerator Pedal Module Active Endurance Test Rig
- Control Arm and Silent Block Test Facility
- Control Arm Test Facility
- Stewart Platform
- Hub and Knuckle Test Facility
- Rear Beam Test Facility
- Hydraulic Hose Flex - Impulse Testing

Assembly Machines
- Steering Gear
- Forward Carrier (Differential Case)

Packaging Machines
- Tablet Filling
- Bottle Filling and Capping

Global customer base
24 hours on-line service support

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CAT-TEST RIG-E-0114-SWE-1

Simulation & Testing

Ensure High Reliability, Performance, Safety and Life

ETA TECHNOLOGY

Global Functional Test Rig

(For Steering Systems)

This Test Rig is designed for performance evaluation of different types of steering systems for the passenger car segment. It is mainly intended for product development and quality assurance. Different types of Steering Systems tested are the following:

- Mechanical steering gear
- Hydraulic steering gear
- Electro-hydraulic steering gear
- Electronically powered steering gear
  - belt driven or column driven

Vertical rotary actuator simulates the steering wheel condition

Linear actuators simulate the stub axle condition

CAN communication enables read and write parameters and characteristics to and from the ECU

Features

- End of line testing
- Performance evaluation test
- NVH test
- CAN Commutation test
- All types of passenger car steering gear
- NI + LabView RT hardware and software
- Yoke lift measurements
- FFT, Power spectrum, Efficiency, Analysis on NI Diadem
- Low inertia torque motor for pinion torqueing

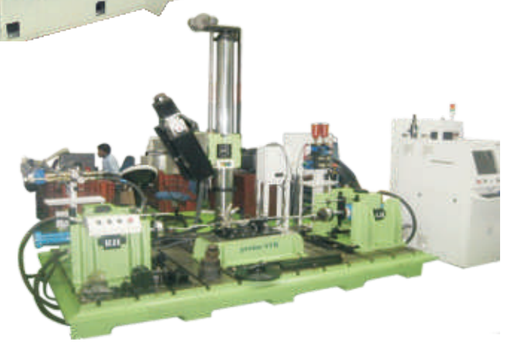
3-Axis Durability Test Rig

This facilitates easy configuration of the test set ups to conduct the following tests on Steering Gear of Passenger Cars and Utility Vehicles.

- Durability tests
- Alternated fatigue test
- Reverse durability test
- Wear tests
- Wear test without power assistance
- Parking test
- Load cycle test
- Rotation and reverse rotation endurance test
- Mounting foot fatigue test
- Input torque test
- Rack pull test
- Valve curve & leakage tests
- Endurance test
- Impact wear test
- Efficiency test
- Noise test (NVH)

Hydraulic linear actuators will simulate the stub axle condition.

Vertical pinion drive actuator will simulate the steering wheel condition.



Features

- NI real time (FPGA) hardware
- Lab-View software
- Fatigue rated dynamically calibrated load cells
- In-built LVDT sensors for actuator displacement
- In-built encoder for measuring speed/ angle
- AC servomotor for rotary actuator
- Programmable test parameters
- FFT, power spectrum, efficiency & analysis on NI Diadem
- Low inertia torque motor for pinion torqueing

Steering Gear Yoke Setting Rig

This is a computerized stand alone system, designed to perform Yoke Setting operations with programmable controlled parameters. Automatic tightening of Yoke Cover to achieve required input pinion torque and yoke lift within set tolerance range is achieved by this machine.

All controls are driven by a standalone dedicated real time hardware (cRIO / PXI) and HMI are on MS OS based PC.

Features

- Auto yoke cover torqueing
- Auto yoke lift measurement
- Auto input torque test
- Lift >5 µm and <80 µm
- Real time controls with MS OS based host for HMI

Online / Offline plots and displays with reports & results offer flexibility in data analysis.

Ball Joint Endurance Test Rig

This endurance and wear test bench serves to simulate the wear on ball joints as per the loads experienced in a vehicle. Required Tilt & Rotation axes are driven by Rotary Actuators.

High frequency, high amplitude loading system is established by linear loading of stem using linear servo cylinder.

Online calibration, user friendly test software, standalone operation with independent power-pack etc. make the test rig, easy to operate.

Axial loading and longitudinal radial loading can be offered as 4th and 5th axes.

Environment chamber to generate humidity and temperature are optional.

Features

- Environment simulation of temperature and humidity
- Saline water and mud water spraying with Heive can also be offered

- Elasticity measurement on the test rig is possible without disengaging the ball joint

All Test Rigs required to test ball joints namely - Endurance Test Rig (ETR), Elasticity Test Rig (ELTR) & Torque Test Rig (TTR) can be offered

6 Stations Boot Testing Machine

AC spindle motor and drive for articulation and rotation

Number of ball joint	: 6
Articulation angle	: ± 30° with frequency variable from 0.1Hz to 3Hz
Rotation angle	: ± 70° variable from 0.12Hz to 3Hz
Operation temperature	: -40°C to +140°C
Humidity range	: +15% to 90 % RH

Ball Joint Elasticity Test Rig

This test rig facilitates radial elasticity, axial elasticity and the pull out / push out tests for the OBJ, IBJ, control arms and stabilizer links of automotive steering systems.

Online calibration, user friendly test software, stand alone operation with independent power pack etc. make the test rig useful.

A digital extensometer with 1µm accuracy is supplied to measure the end lift.

Actuator integrated sensor is used for push out / pull out test displacement measurements.

Features

- True elasticity between pin and shank.
- Endurance testing with settable amplitude, frequency and waveform.

Ball Joint Torque Test Rig

This test rig facilitates rotational and articulation torque tests on IBJ, OBJ, stabilizer links and connecting rods.

Tests Conducted

- Breakaway and rotation torque
- Breakaway and articulation torque
- Preparation by tipping & tumbling

Features

- Low friction bearing
- Geared AC servomotor
- Analog outputs for torque and angle
- Friction compensation (during calibration)

Hub Rotation Durability Test Rig

This is a computerized standalone system to perform hub rotational durability test operations with block programming and controlled parameters.

All controls hardware and software are based on National Instruments products.

Online plots and displays with results offer flexibility in data analysis.

Features

- Programmable speeds and forces
- Temperature monitoring

Accelerator Pedal Module Active Endurance Test Rig

This test rig facilitates endurance test requirements on all accelerator pedal modules.

APM pedals can be tested for voltage output or contact resistance measurements.

Facility to set the 0% pedal position (LI) & 100% pedal position (MS) is available.

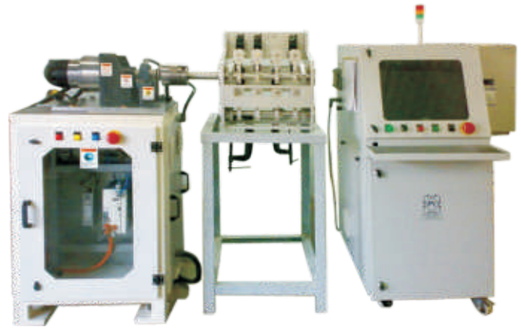
A geared servo motor generates the required torque needed to press 8 pedals simultaneously.

An absolute encoder (16 bit) provides absolute (referenced) position for controlling the pedal position.

Online / offline analysis and reports available.

Features

- Synchronisity test, stability test, contact resistance test, SRC test, kick down error test & snap tests are conducted
- Up to 8 Pedals can be tested simultaneously



Gear / Vane Pump Test Rig

This rig facilitates performance characterization of pumps for the end of line testing.

It is designed to facilitate

- Discharge Vs. Speed characteristics at Set Load
- Discharge Vs. Load characteristics at Set Speed
- Volumetric Efficiency
- Overall Efficiency
- Efficiency at Rated Speed & Pressure

Features

- Automatic selection of the flow, pressure and speed on selection of the model
- Security (multiple level) to allow access, based on user levels
- Configuration of sensors and online calibration of sensors

Web Vehicle Sensing Test Rig

This test rig facilitates web and vehicle sensing lock test on a 100% check basis in the production line for partial fulfillment of ECE / JSS etc. specifications.

Features

- Upto 3 G capability
- Less than 45 secs cycle time and easy front loading scheme
- Accurate control of G-level with plots, reports etc.
- User friendly tester with indigenous design and components

Configurable Test Rig for Chassis Component

This test rig helps to :

- Establish in-house facility to test products such as Frame, Suspensions, Cross members, Arms etc.
- Carry out load fatigue, static strength test, vibration durability test and cyclic fatigue tests on the above jobs.
- Configure a test with programmable load amplitude, frequency and number of cycles.

Feature

- Block programming tests to realize various road conditions – serially

Cylinder Assembly Cell

Component Station

Rod Sub Assembly Station

Gland Torquing Station

Cylinder assembly cell has been designed to facilitate :

- Single piece flow concept
- Mechanized semi-automatic torquing system for piston and gland
- Reduce operator error
- Reduce cycle time
- Facilitate assembly of different models
- PLC Controls
- Cycle time of less than 300 seconds (floor to floor) (Including loading / unloading)
- Diagnostics

Flex-impulse Test Rig for Hydraulic Hoses

This test-rig simulates rigorous field test conditions. The test complies with SAE standard. For static impulse test , upto 6 hoses are held on two manifolds (90 degree and 180 degree) and for flex impulse test, upto four hoses can be tested.

Crash / Impact Simulators

Crash (Impact) test rig , offers free fall and thrust fall with varying velocities.

Drop mass of 5 kgs to 50 kgs can be used to impact.

Accelerometer and load cells (dynamically calibrated) are used to offer co-relation of 'F = m A.'

High speed data acquisition system with National Instruments hardware and software offers reliable data plots and reports.

Features

- Testing by First Principle
- Low Cost
- High Response Impact Loadcells

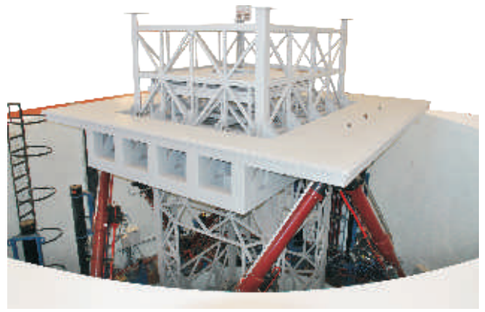
Stewart Platform

This huge platform creates a usable and safe motion base environment for simulation of air, sea or any other arbitrary motion within its specified limits. Safety is the most important factor of the system. Real-time control of the motion base will guarantee a satisfactory level of safety.

Mathematical modeling transfer functions, dynamics and prediction of proposed trajectories can be run on the platform.

Simulation of the overall system model shall yield allowable gains of operation, frequency response, resonance frequency, required filtration etc. leading to a stable operation of the platform by the system design.

The simulation also calculates and predicts the accelerations, forces and the velocities for time wise trajectory.



Features

- 50,000 Kgs Payload capacity
- Upto 1.5 G capability
- Upto 1.5 m/sec velocity
- Surge, Sway & Heave - Linear
- Pitch, Roll & Yaw - Rotary
- Programmable combinational motions possible

'End of the Line' Tester for Parking Brake

This machine is designed for End-of-line testing of Parking brake assembly of automobile.

Function: All Parking brakes after assembly, have to be tested for the following parameters:

- Proper functioning of Release button including measurement of load required
- Proper functioning of the brake lamp switch
- Mechanical efficiency of the Brake assembly
- If all the above parameters are acceptable, print label 'ACCEPT' with part number and serial number. If rejected, print 'REJECTED' label

The entire records are archived in the industrial PC and can be retrieved at any time.