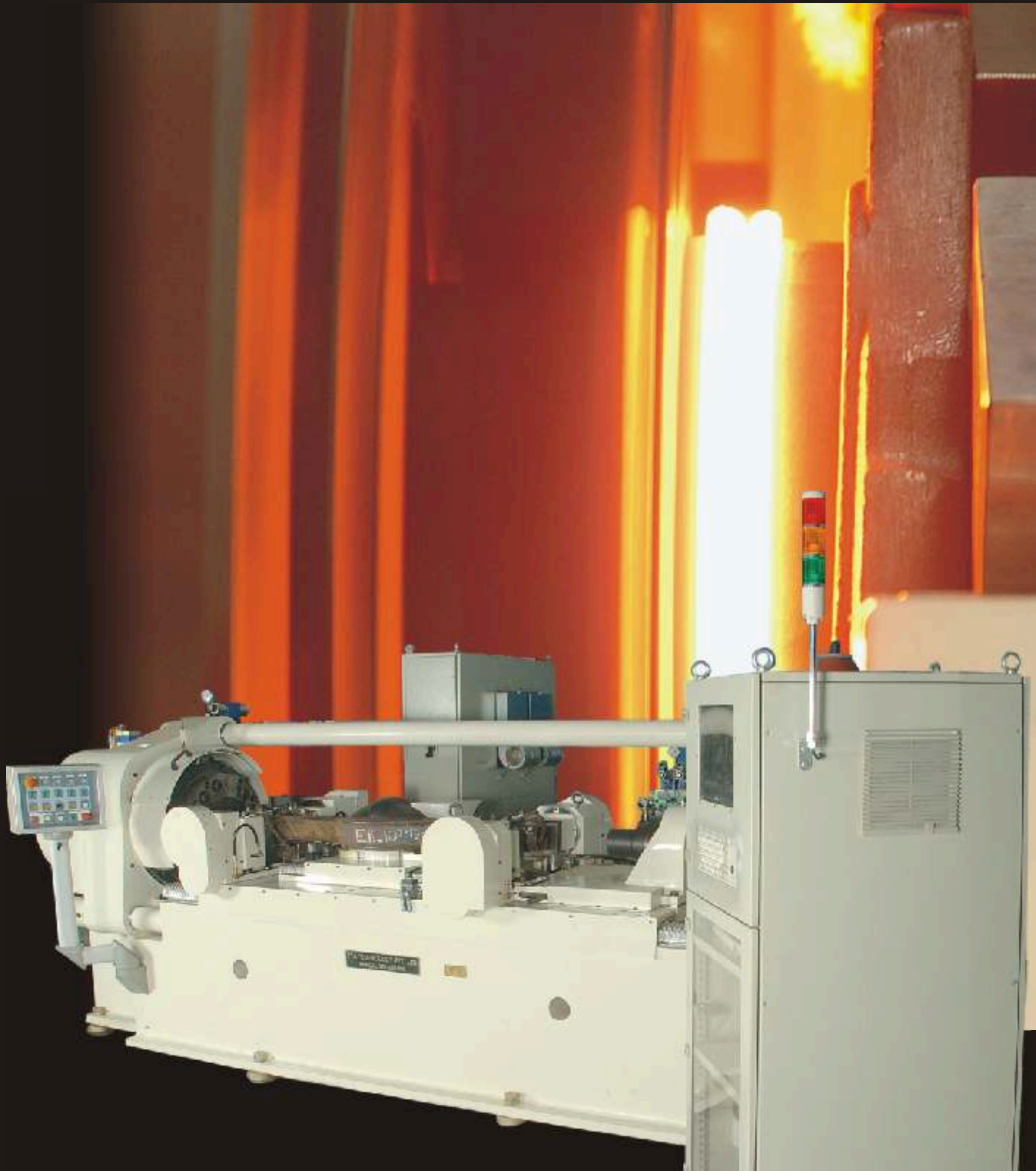


# ETA

TECHNOLOGY (Pvt.) Ltd.



*Driven By Constant Innovation*



## About Us

ETA Technology Pvt Ltd was established in the year 1991. ETA today manufactures a wide variety of machines- Friction Welding Machines, Test rigs for auto components, Special Purpose Machines and Assembly Machines. The hallmark of ETA machines is the high level of technology with simplicity of design.

In the field of friction welding, ETA Technology is reckoned as one of the best in the world and this has helped the company to bag prestigious orders from corporates like Wipro, TRW and Arvin Meritor. ETA has customers from across the globe and the company's export is worth US \$ 2.5 million.

The company manufactures most of the special purpose machines needed for the Engine Valve Industry; Electrical Upsetting Machines, Screw Press, Straightening Machines, Tappet Grinding Machines, Grooving Machine etc.

ETA also makes a range of Test Rigs for auto components- both On-line Testing and Life cycle Testing.

ETA Technology is a member of BMTMN, a consortium of SMEs manufacturing machines tools.





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# About Friction Welding

Friction Welding is a solid phase welding of two similar or dissimilar materials using the heat generated by rubbing of two materials and when the impurities at the interface are removed as flash, stopping the relative motion of jobs and applying a forge welding force to form a strong metallic bond.

## Friction Welding Process



**ETA Technology** manufactures Friction Welding Machines of capacities varying from 10KN to 2000 KN. Small machines of capacity upto 100KN are available in Vertical Design.

In small machines upto 60KN Capacity, the axial forces are applied by an AC servomotor through a ball screw. Machines above 60KN use a hydraulic cylinder to apply the axial forces. In machines upto 200KN capacity a load cell is used to measure the axial force on the job and it is controlled in a closed loop by means of a Servo valve.

The spindle is driven by an AC servo or an AC spindle motor and can be rapidly braked by line-regenerative braking. Here the kinetic energy of rotation of the spindle is converted as electrical energy and fed back to the mains. In machines where hydraulic cylinders are used for applying axial forces, the control is carried out by a hydraulic servo valve. All important parameters like axial thrust, spindle speed, loss of length and spindle torque are read and plotted on-line during welding. The Weld data of each and every weld can be archived and retrieved.

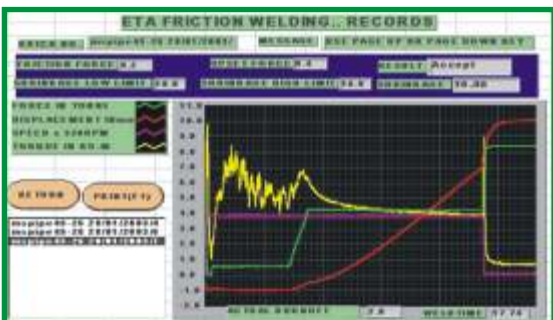
Spindle orientation can be done to facilitate welding of jobs like propeller shafts where two parts joined should have a definite angular position.

### Advantages:

- Very short cycle time (only a few seconds) and hence ideal for mass production.
- Saving of costly materials if bi-metallic component is used. Eg. Drills - HSS/ MCS .
- Very low heat-affected zone and hence semi finished components can be welded.
- Low energy consumption.
- No edge preparation, filler material, shielding gas, spattering, fumes and radiation.
- Excellent welding: Joint is as strong or stronger than parent material.
- Materials as diverse as Cu to Al, Cu or Al to steel, Titanium to stainless steel etc can be welded.
- 100% In-process quality check.

### Typical Applications

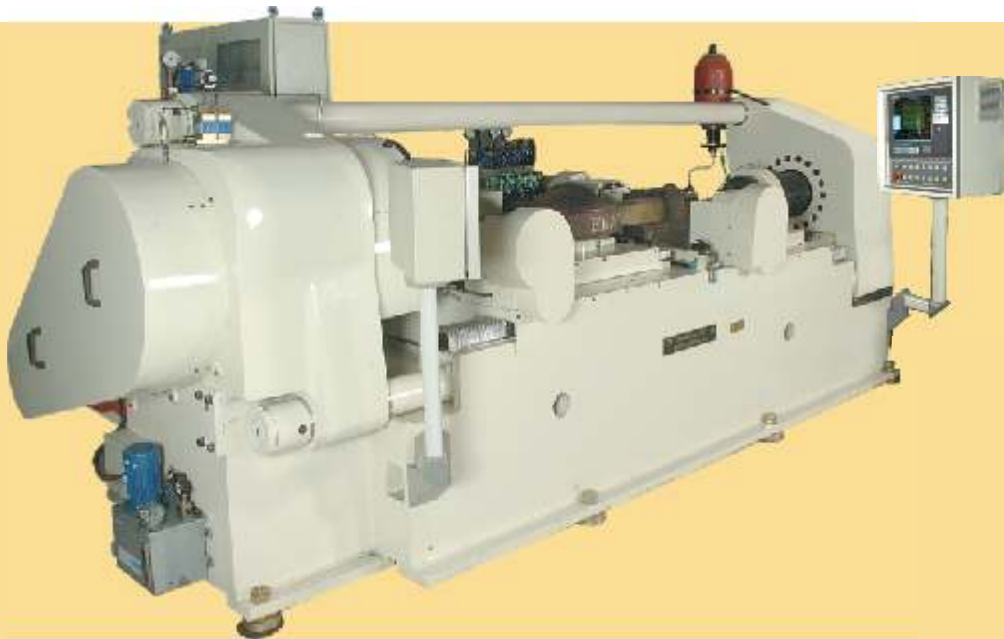
IC Engine Valves, Twist drills, Taps, Reamers, Propeller Shafts, Axle housings, Hydraulic hose end fittings, Tie rod ends, Steering columns, C V Joints, Fasteners, Spin tub of washing machines, Cable lugs, Cluster gears, Combustion burner tips, Mono block pump shafts, piston rods to rodeye etc.



The graph displays all the four important parameters ( Axial force, Loss of length, Spindle speed and Spindle torque) during welding against a time scale. Every weld data is stored and can be retrieved easily.



# Friction Welding Machines



Capacity 1250KN



Capacity 600 KN

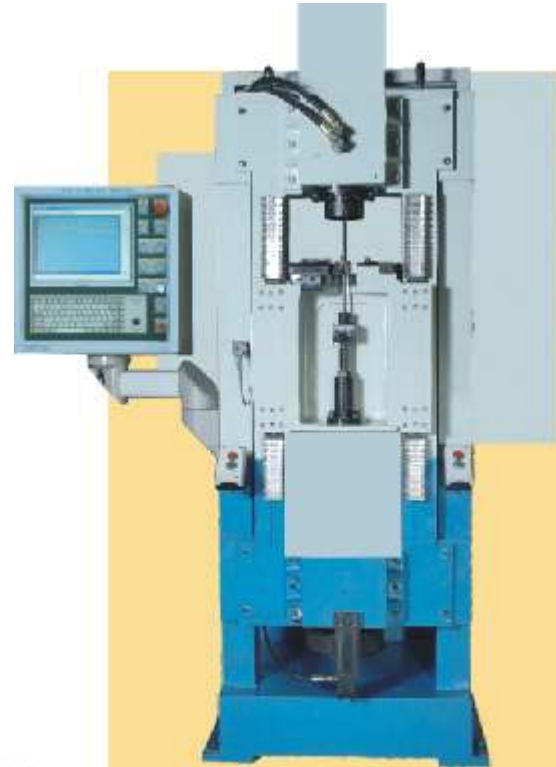


Capacity 200 KN



## Friction Welding Machines

30KN machine with built-in shear for weld flash removal



60KN Vertical friction Welding machine to weld IC Engine valves.



30KN Machine incorporated with auto-load/ auto-transfer to deflect/ deflash/ unload. Total cycle time within 9 secs.

Machines available in various capacities .

	Unit	Model 3T	Model 10T	Model 20T	Model 50T	Model 100T	Model 125T
Max. Forge welding force	KN	30	100	200	500	1000	1250
Diameter Range(Mild steel)	mm	3 - 13	6 - 25	8 - 36	20 - 70	40 - 100	50 - 125

## Machines for Manufacturing IC Engine Valves



### Deflashing/ Deflect

The weld flash on the friction welded job is turned off in this machine by either single point turning or by a plunge cut. Subsequently the job, while in rotation, is bent by a set of rollers in all the planes by a definite angle and then straightened automatically. This ensures the quality of the weld joint. The cycle time of this machine matches with that of the friction welding m/c, so a single operator can handle both machines.



### Electrical Upsetting Machine - Model: 50/450v

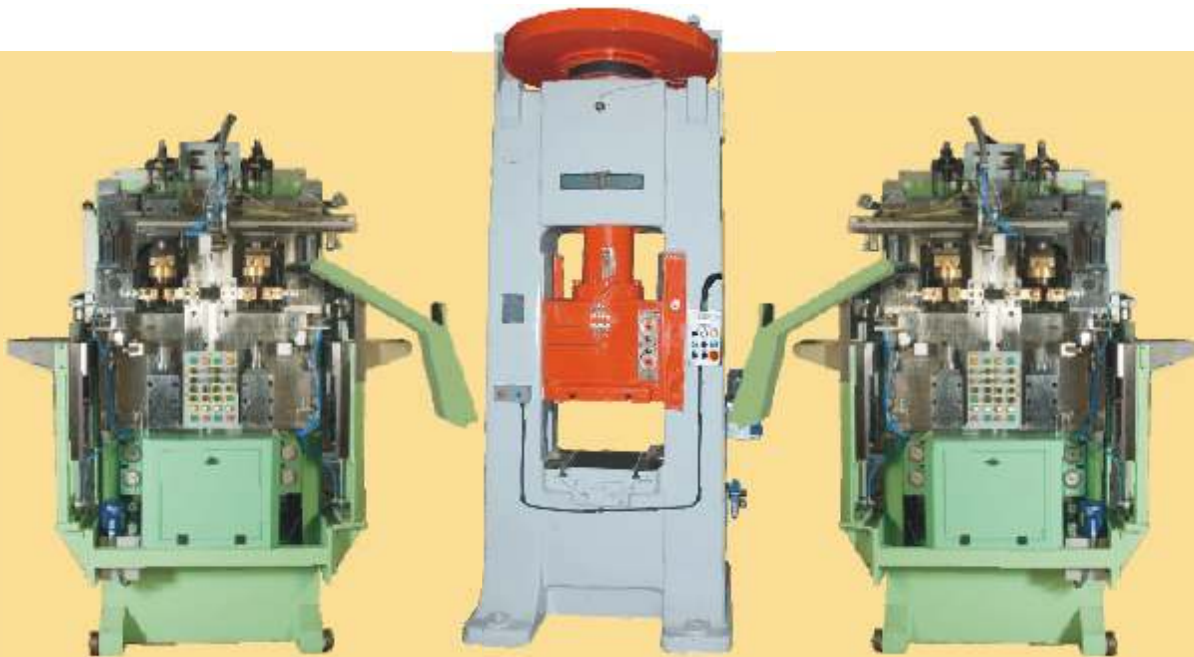
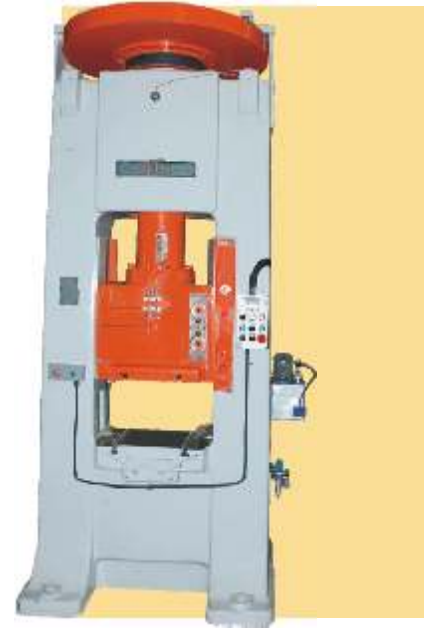
For manufacturing of flanged components from bar stock (eg. Engine valves, half - shafts) electrical upsetting method is used. Here the bar is held near one end between two Cu jaws with the end firmly butting against an anvil. The secondary of a resistance welding transformer is connected to the anvil and jaws. Since the portion of the bar between the Cu jaws and anvil short circuits the transformer a heavy short circuit current passes through this section and consequently heats up this section. Simultaneously an upsetting force is applied axially on the job from the other end and the plastic material in the heated section deforms into a bulb shape. When the required volume of material is thus gathered in the bulb the operation is stopped, the job is transferred to a forging press and the bulb is forged to the desired shape.

## Machines for Manufacturing IC Engine Valves

### Servo Controlled Positive Drive Screw Press

In a conventional Friction Screw Press, energy is transmitted from the transmission wheels to the flywheel by friction through a leather band. On return stroke, energy stored in the moving parts is dissipated as heat by applying brake.

In an innovation by ETA, the two transmission wheels are dispensed with. The fly wheel is driven by an AC servo/spindle motor through a timer pulley/belt. The motor can be made to run the flywheel at a preset speed very precisely till the dies come very close. The motor is now disabled and the entire energy in the moving masses gets transferred to the job. When the moving die comes to rest, the motor is reversed and the ram returns to its home position very precisely. Since there is no mechanical braking no energy is wasted. The motor brakes on line - regeneration principle where the kinetic energy in the moving mass is converted to electrical energy and sent back to the mains. Since the drive motor does not run when the ram is stationary no energy is consumed during idling of press.



### Two Twin Upsetters On Either Side Of Servo Press With Autoload/ Transfer

Upsetters are provided with simple pick & place type autoload/ unload systems. There are two separate loading systems and one unloader for each Twin-upsetter. The loading on the two upsetters is staggered by half the cycle time. It may be noted that the workarea is not cluttered by the loader/ unloader and it is very operator-friendly.



## Machines for Manufacturing IC Engine Valves

### Tappet End Grinding

This is a pendulum type machine wherein the valve moves over a pasted disc type grinding wheel capable of stock removal of upto 2 mm in one stroke . It is fully automatic with chute loading and input length checking.



### Valve Straightening

Valves after forging and heat treatment would be bent both on stem and on head. These are straightened on this automatic machine at a very fast rate. Cycle time is as low as 5 sec. The stem is straightened to 0.05mm and Head within 0.08mm. Four models are available.

	Vs70	Vs100	Vs130	Vs170
<b>Stem dia</b>	4 to 6.5	6 to 8	7 to 13	12 to 22
<b>Head dia</b>	15 to 27	20 to 40	35 to 60	55 to 90
<b>Length</b>	55 to 120	85 to 150	100 to 200	190 to 350

Valves with hardness over 40 HRC are liable to break during straightening and to overcome this problem, valves are heated in-situ to make them ductile and then straightened.

## Machines for Manufacturing IC Engine Valves



### SPM For Grooving, Chamfering And Tappet End Facing

The valve is held on the stem by a collet in a special spindle and two tools on a two - axis CNC slide form or generate the groove and chamfer. Tappet face is also machined in the same setting. The jobs are automatically loaded and unloaded. Cycle time is less than 10 seconds.



### SPM FOR TURNING HEAD DIA, FACE AND RADIUS

Attaining a face runout of under 50 microns on the face of I.C.Engine valves is a difficult proposition because the reference for facing is the seat. Since the valve is not a rigid component, while clamping it against the seat, the valve bends to the extent of seat runout and after facing when it is removed from the collet, the head will spring back and will show the same runout as the seat had.

This problem is overcome by providing a nose-stopper for the valve which sits on a hemisphere whose center is on the axis of the spindle. This provides a rocking action for the stopper and thus avoids bending of the valve head.

Photograph shows a twin spindle CNC turning machine wherein on the first spindle the valve forging is machined on its head dia and faced. The valve automatically moves to the chute on the second spindle and from here a pick and place unit feeds it to the second spindle. It is clamped on the head and the tappet end by two collets and the radius and seat are machined.

### Etching Machine

ETA also offers electro-chemical etching machine for marking monogram/ part number on the valve. Two types of machines are available-Static and Rolling head. In the latter the job rolls under the etching head and the characters get etched on the job. Etching on complete periphery of the job is possible. But here etching on chrome plated surface will not be effective. In Static head machine this problem is overcome; but etching is possible only on an arc of 120 degrees on the periphery of the job.



## Special Purpose Machines

### Ball Turning And Burnishing Machine

This machine is used for turning and burnishing of ball head used in automobile ball joints. There is an optional CNC slide (Z-axis) to machine the undercut relief behind the ball head. Sphericity achieved on the ball head is within  $4\mu\text{Ra}$  and surface finish better than  $0.1\text{ microns Ra}$ . Machine can be tooled up for IBJ, OBJ, and SBJ Ball pins.



### Commutator Slotting Machine

Slotting machine is used for slot cutting of commutator risers. The job is rotated for one turn and the angular position of every copper segment is recorded by means of a laser sensor. Now the job is precisely positioned such that the slotting cutter can cut the first slot in the middle of the segment. After every slot the job is indexed by the precise angular displacement and all slots are cut. Jobs are loaded and unloaded automatically. Average cycle time (floor to floor) for a 23 segment commutator is 16 seconds.



## ASSEMBLY MACHINES

### Steering Gear Assembly Machine

To assemble rack and pinion type steering gears of passenger cars, with 'poka-yoke' arrangement to ensure that the operator assembles all parts correctly.



### Forward Carrier Assembly Machine

For assembly of forward carrier (diff case) of trucks. Here the pinion shaft is supported on two taper roller bearings (back to back) with two spacers and a helical gear on it. The machine determines the right height of the top spacer and displays it on a computer monitor. This way, without trial and error, the predetermined torque for the pinion shaft can be achieved.





## Special Purpose Machines & Test rigs

### Shaft Straightening Machine

This is an intelligent machine that automatically calculates the extent of bend on a shaft, where its location is and then straightens it using a built-in hydraulic press. The machine consists of a servomotor-driven slide on which a set of V-blocks support the job. A stepper motor rotates the job through one revolution and three linear scales measure the 'runouts' at three points on the job. A computer determines at what point and to what extent the straightening load is to be applied.

Machines are available for straightening of jobs of various diameters and lengths.



### Fatigue Test Rig For Steering Columns

The column is secured in 'as-in-vehicle-mounted' condition and two servomotors are connected to either end of the column. The one on the wheel end runs on velocity mode and other on torque mode. The column is tested for life at various torques, frequency and angle of rotation as the test procedure stipulates. There is provision for locking of pinion end of the column. Plotting of graph (Torque Vs angle of rotation) is provided.



### Other machines for testing steering columns are

UJ back lash testing and plotting of hysteresis, Free torque Testing, Torque to Failure, Key-lock Testing, Offset bend testing.

## STEERING GEARS

### Rack Push-Pull Testing

The rack is pushed and pulled at a uniform speed and a graph is plotted with axial load Vs displacement. In case of power steering ATF at the desired temperature is circulated at preset flow rate. The auto-cycle includes filling, testing and purging.



### Endurance Test Rig

The steering gear is mounted in the '*as-in-vehicle-mounted*' condition and a hydromotor drives the pinion shaft through a torque sensor. Two hydraulic cylinders offer bidirectional axial load to the rack through universal load cells.

**Other machines for steering gear are Impact test rig, Torque to failure Testing.**



### Axial Elasticity Test Rig

ETA manufacture test rigs for SBJ, OBJ and IBJ. Machines for ball joints are built for fatigue testing, axial and radial elasticity measurements (including plotting of hysteresis loop). Other test rigs for ball joints include rotary and articulation torque measurement, pull out and push test and Boot testing.



### 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 up to 6 hoses are held on two manifolds (90deg and 180deg) and for flex impulse test up to four pipes can be tested.

Specifications:

Max Pressure : 600 bar

Capacity : 1/8" - 2" ID

Square Wave pattern as per SAE , J343

Max oil Temperature : 120 deg Flex range of moving manifold : 340mm Max

Impulse rate : 15 to 75CPM



### Shock Absorber Test Rig

On-line testing machine of motor cycle shock absorber. Two forks are tested at a time. The forks are placed on a crosshead with the top ends on adaptors fixed to two load cells. The crosshead can be reciprocated up and down on a vertical slide by a variable crank. A linear scale / LVDT measures the displacement and a graph load v/s displacement can be plotted .





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AUTOLEC INDUSTRIES.

AXLES INDIA

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