



## 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



**ETA TECHNOLOGY PVT. LTD.,**  
484-D, Rotary Udyog Road (13th Cross),  
IV Phase, Peenya Industrial Area,  
Bangalore - 560 058,  
Karnataka, India.

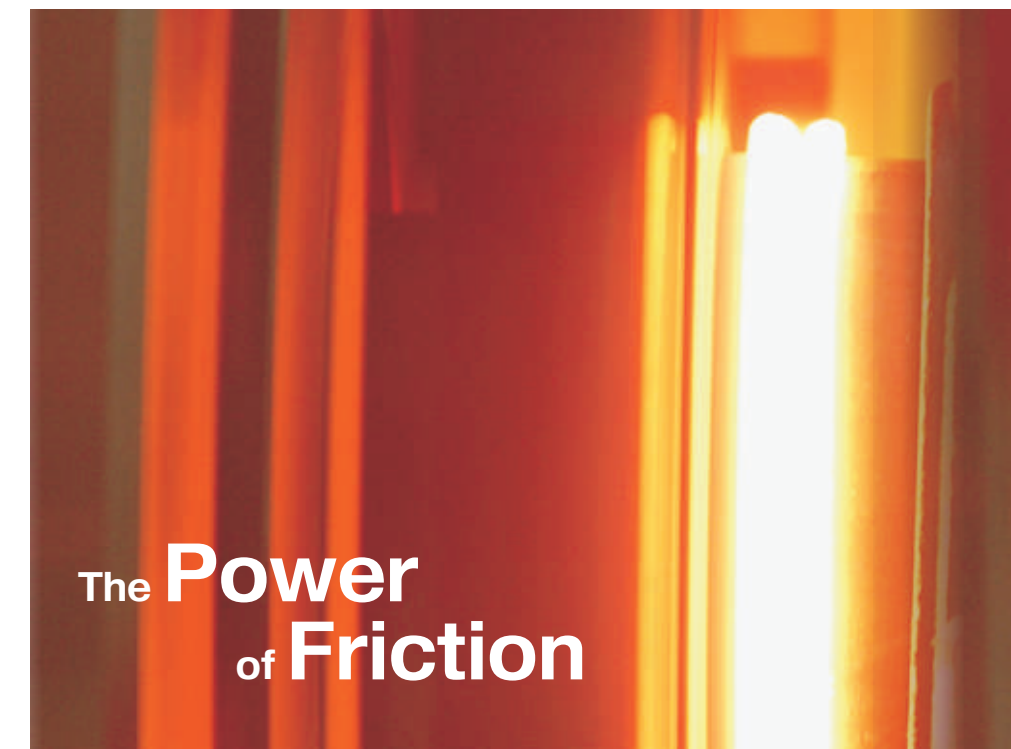
Tel: +91-80-28361487, 41171481/ 1491  
Fax: +91-80-28360581

E-mail : [info@etatechnology.in](mailto:info@etatechnology.in)  
URL: [www.etatechnology.in](http://www.etatechnology.in)

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# Friction Welding Machines

Friendly and Untiring Workhorses for  
Precision and Performance



The **Power**  
of **Friction**

Machines for Friction Stir Welding & Friction Surfacing  
are also offered

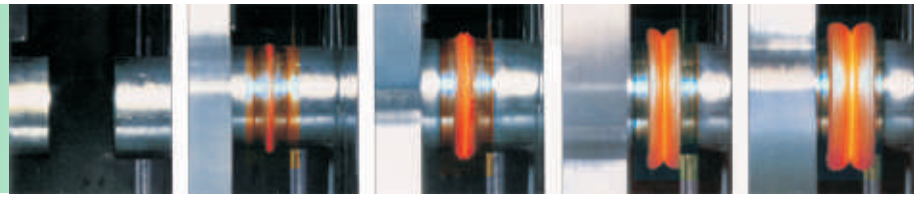


**ETA TECHNOLOGY**

*Leaders in Friction Welding*

## FRICION WELDING - A SOLID PHASE WELDING

### PROCESS



Friction welding is a solid phase welding process, in which two similar or dissimilar materials are made to rub against each other under axial force to produce sufficient heat at the interface 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 between the materials.

### Friction Welding - Advantages

- Short cycle time (a few seconds) and hence ideal for mass production
- Saving costly material if bi-metallic component is used (drills – HSS/ MCS)
- Low energy consumption
- No edge preparation, filler material or shielding gas
- No spattering, fumes and radiation
- Excellent welding; joint as strong as or stronger than parent materials
- 100% in-process quality check
- Material as diverse as Cu to Al, Cu or Al to Steel, Titanium to SS, PVC to Nylon etc. can be welded

### Typical Components Welded on ETA Machines



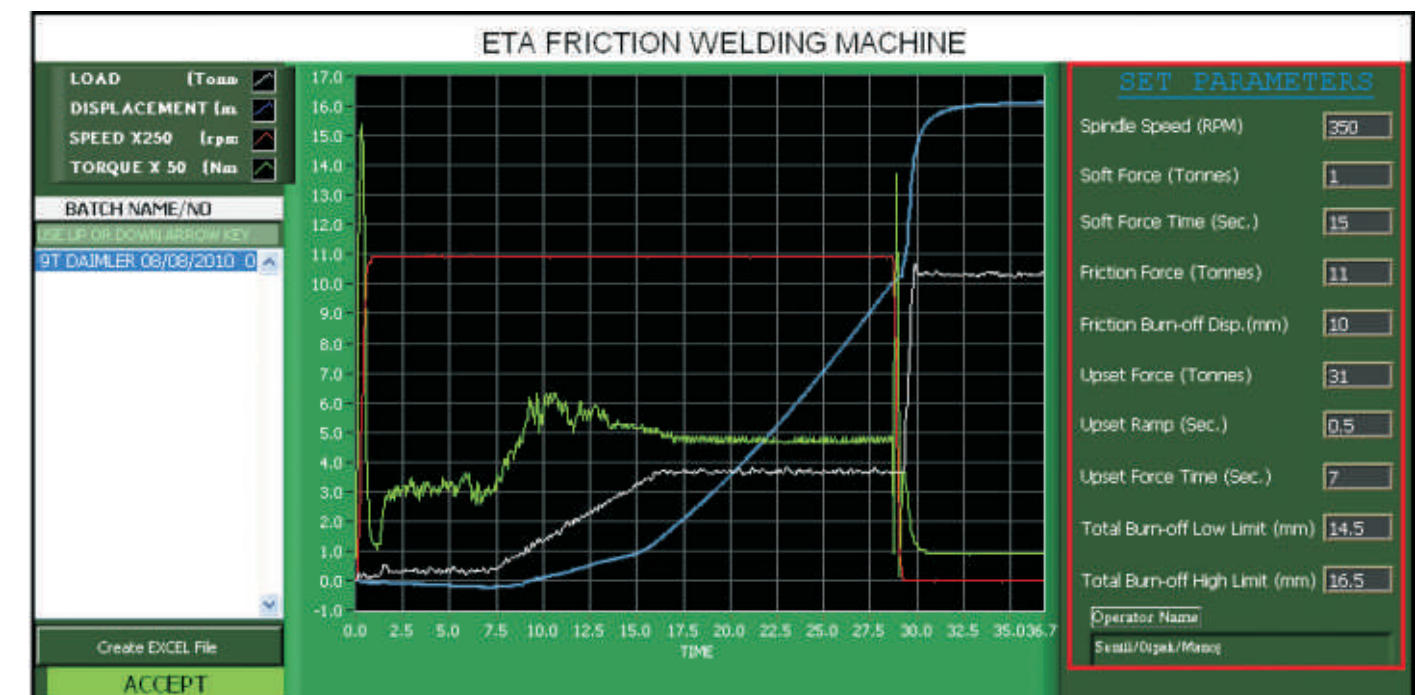
## WIDE RANGE OF MACHINES WITH CHOICE OF CONFIGURATIONS AND FEATURES...

ETA designs and supplies machines of capacity ranging from 30kN to 2000kN for varied customized applications. Machines are available in vertical (up to 60kN), horizontal or inclined configurations with or without tie rods. Machines are also offered with twin heads, built-in or stand alone deflash units, automatic component loading/ unloading systems, special vices for welding unlimited rod/ pipe length etc.. Advanced features with simplicity in design, make ETA Friction Welding Machines the preferred choice.

### Features include

- Spindle driven by AC servo motor
- Rapid stopping of spindle by regenerative braking which saves energy
- Welding force provided by servo hydraulic cylinders in closed loop control system
- Pressure transducer/ load cell and linear scale feedback for load and displacement control
- PLC based control system integrated with Industrial PC and advanced software
- On-line plotting of important parameters like axial thrust, spindle speed, loss of length and spindle torque during weld cycle
- Archival and retrieval of weld data
- Axial welding forces applied through AC servo motor and ball screws for smaller capacity machines (less than 60kN) as option
- Spindle orientation facility for aligned welding
- Remote customer support through internet

### On-line plotting of important parameters



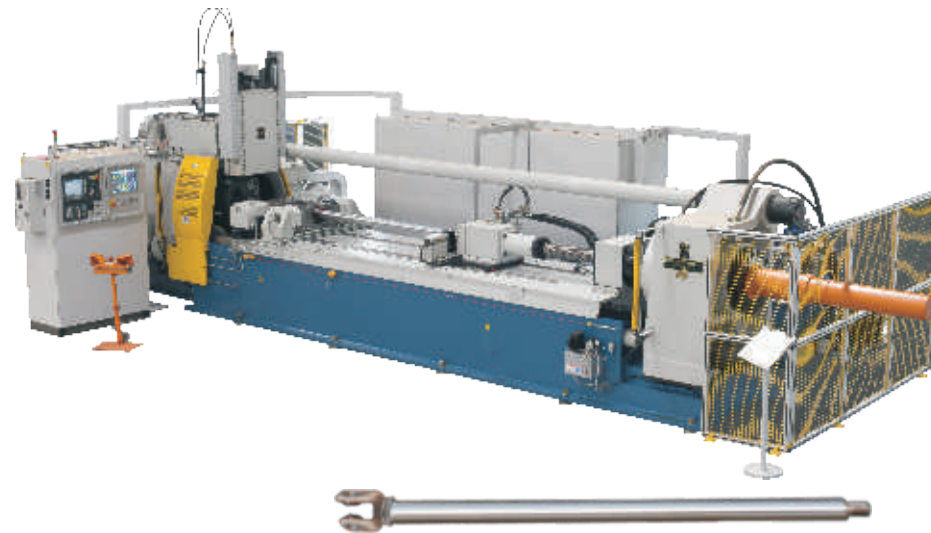
### Friction Welding Machines Available in Capacities...

Models	3T	6T	10T	15T	20T	30T	40T	60T	100T	125T	150T	200T
Max. Forge welding force in kN	30	60	100	150	200	300	400	600	1000	1250	1500	2000
* Weld cross sectional area in mm <sup>2</sup>	250	500	830	1250	1665	2500	3330	5000	8330	10415	12500	16660

\* Only indicative – Assumed Forge pressure = 12kg/ mm<sup>2</sup> - MS Material

## FRICION WELDING MACHINES FOR SPECIFIC APPLICATIONS

### 200T - Horizontal Machine with built-in CNC Deflash Unit

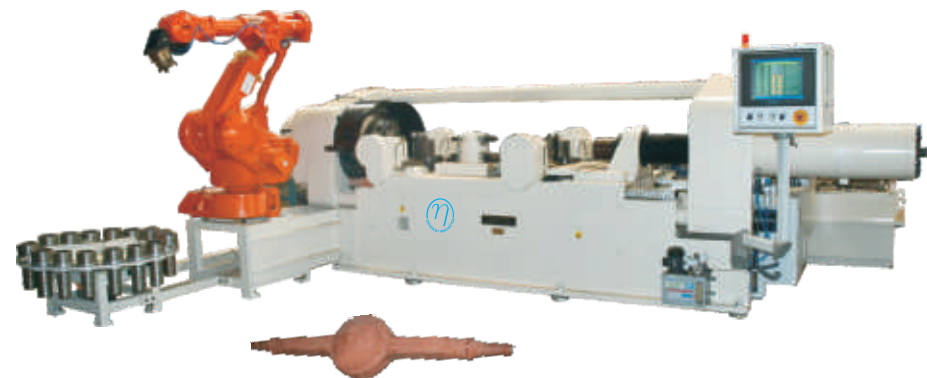


Designed for welding rod-eye to rod of piston rod of hydraulic cylinder

Spindle speed : 0-450 rpm- Infinitely variable  
 Spindle motor : 250kW, 800 rpm, 2986 Nm.  
 Chuck : 2 jaw chuck- dia. 600mm  
 -hydraulically operated

**Rod -eye**  
 Max. height of Rod-eye : 280mm  
 Bore dia. : 140mm  
 Max. dia. of Rod-eye : 280mm  
**Rod**  
 Rod dia. : Min. 50mm / Max.130mm at weld  
 Rod length : 750mm to 3500mm

### 100T - Horizontal Machine integrated with Robot for component loading/ unloading



Designed for welding live and dummy Axle housings (Spindle to Axle Housing)

Max. forge force : 1000kN  
 Max. OD of spindle : 150mm  
 Max. length of spindle : 380mm  
 Max. length of axle : 2300mm

### 150T - Horizontal Machine without back stop

Designed for welding unlimited length of Pipe / Rod with heavy duty hydraulic clamping system

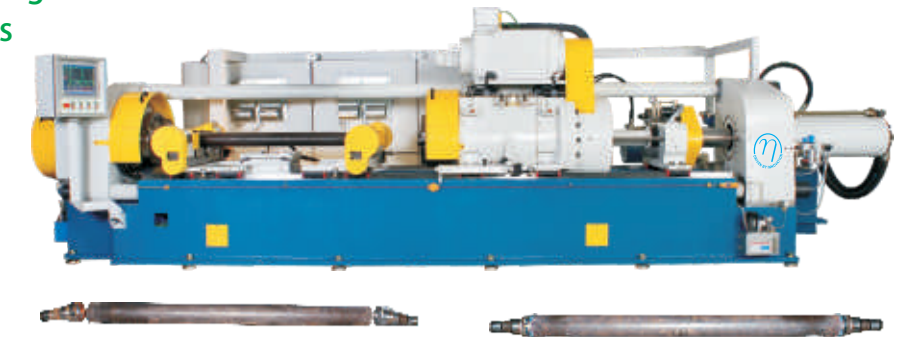
Max. forge force : 1500kN  
 Max. OD of rotating piece : 150mm  
 Max. length of rotating piece : 450mm



### 125T - Twin Head Machine One head fixed and the other moving for simultaneous welding at both ends

Designed for welding live and dummy Axles (Spindle to Axle Housing)

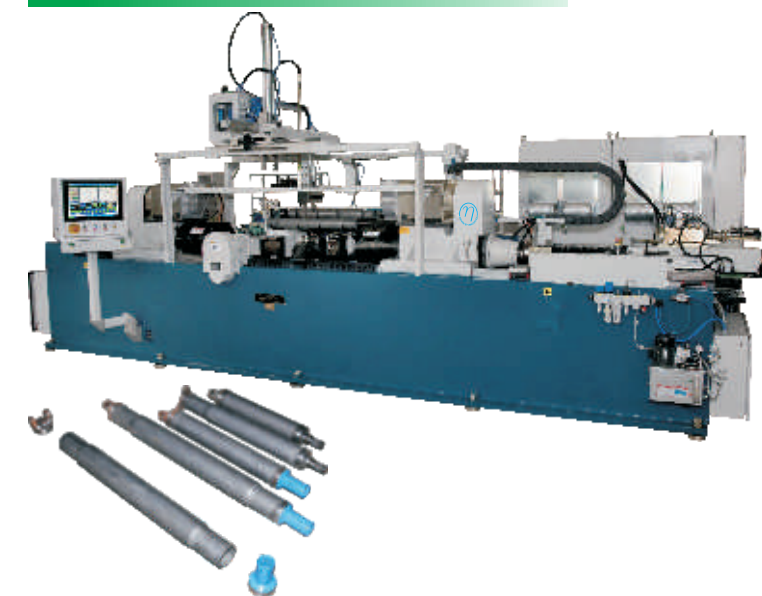
Max. forge force : 1250kN  
 Max. OD of spindle : 160mm  
 Max. length of spindle : 380mm  
 Max. length of axle : 2500mm



### 15T - Twin Sliding Head Machine with automatic loading (non-rotating part) and unloading the welded job

Enables welding at both ends of propeller shafts simultaneously to join end pieces to tube with precise orientation.

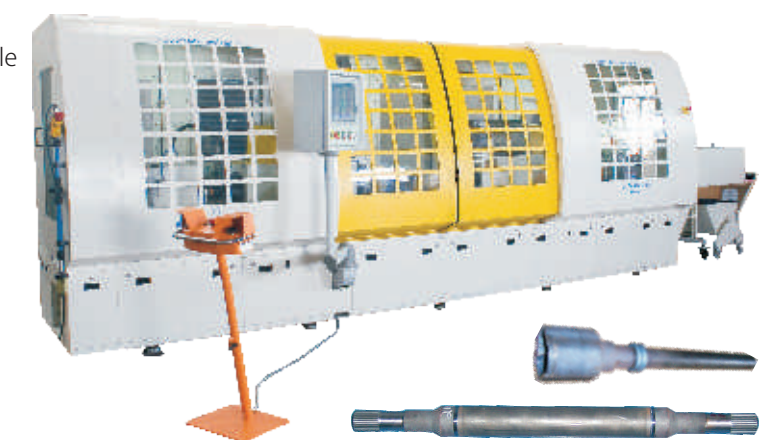
Max. forge force : 150 kN  
**Rotating parts**  
 - Midship shaft  
 - Tube yoke  
 - Tube sleeve  
 - Tube flange  
**Non-rotating parts**  
 Max. dia. of tube : 102mm  
 Max. wall thickness : 3mm  
 Max. length of tube : 1500mm



### 20T - Dual Sliding Head Machine with Built-in CNC Deflash Unit

Designed for welding Stub Shaft / Tripod to Tubular Shaft

Max. forge force : 200 kN  
 Spindle speed : 0-1500 rpm-Infinitely variable  
 Spindle torque : 210 Nm  
**Tubular shaft (non-rotating part)**  
 Dia. at weld - OD : 60mm max.  
 Wall thickness : 5mm max.  
 Length : 450mm max.  
**Stub Shaft (rotating part)**  
 Dia. at weld : 60mm max.  
 Max. Wall thickness : 5mm  
 Max. Length : 250mm  
**Tripod**  
 Dia. at Weld : 50mm max.



### 3T - Machine With built-in deflash, deflect and auto loading/ unloading



Designed for welding Engine Valves - Pin to Pin

- Max. forge force : 30kN
- Max. dia. at weld : 10mm
- Max. stem pin length : 150mm
- Max. length of head pin : 220mm

### 6T - Vertical Machine for smaller foot print



Designed for welding Engine Valves Forged Head to Pin

- Max. forge force : 60kN
- Max. dia. at weld : 14mm
- Max. length of rod held in spindle : 150mm

### 6T - Slant Bed Machine



Designed for welding Engine Valves

- Max. forge force : 60kN
- Max. dia. at weld : 14mm
- Max. length of rod held in spindle : 150mm
- Max. length of rod clamped in vice : 200mm

### 6T - Machine With built-in deflash, deflect and auto loading/ unloading



Designed for welding Engine Valves - Head to Pin

- Max. forge force : 60kN
- Max. dia. at weld : 14mm
- Max. head dia. : 50mm

### 20T - Machine with Built-in Pre-machining (Milling) Unit



Designed for welding Bimetallic Cable lug (Copper to Aluminium)

- Max. forge force : 200kN
- Max. dia. at weld : 40mm

## FRICION STIR WELDING AND FRICION SURFACING MACHINES

### Friction Stir Welding

Friction stir welding is an Eco-friendly process to weld and produce near nano grain sized materials. It is a relatively new solid-state joining process. It is useful for joining high strength aerospace aluminum alloys and other metallic alloys that are hard to weld using conventional fusion welding. This environment friendly technology is considered to be the most significant development in the metal joining process.



This three-axis vertically configured Friction Stir Welding machine accommodates a maximum plate size of 1000mm x 400mm and has a maximum thrust of 100 kN on Z-axis.

#### Features :

- The machine can be built to cater to various axial loads and job sizes
- Machine can be supplied in single or double column configuration
- To maintain tool angle in linear welding the head can be tilted manually

### Linear Friction Welding Machine

Linear friction welding works on the basic principle of rubbing two pieces of material together by linear oscillation of one of the parts, till the surfaces get hot enough to become plastic and join together under the application of forge force.

- Max. forge force : 100kN
- Max. linear rubbing frequency : 50Hz
- Linear motion to slide : Through crank, driven by AC spindle motor
- Amplitude : 3mm
- Load control : By Servo hydraulics

### Friction Surfacing

Friction surfacing is a process derived from friction welding, whereby a cladding material, in rod form is rotated under pressure, generating a plasticised layer in the rod at the interface with the substrate. By moving a substrate across the face of the rotating rod a plasticised layer between 0.2-2.5mm thick is deposited.



The following data is acquired and recorded

- X-axis Load/ Displacement
- Y-axis Load/ Displacement
- Z-axis Load/ Displacement
- Spindle speed/ Spindle torque
- For contour welding the tool can be tilted automatically to follow the required path
- Machine is available for both longitudinal and circumferential seam welding
- The machine is controlled through a Siemens 840D CNC System

