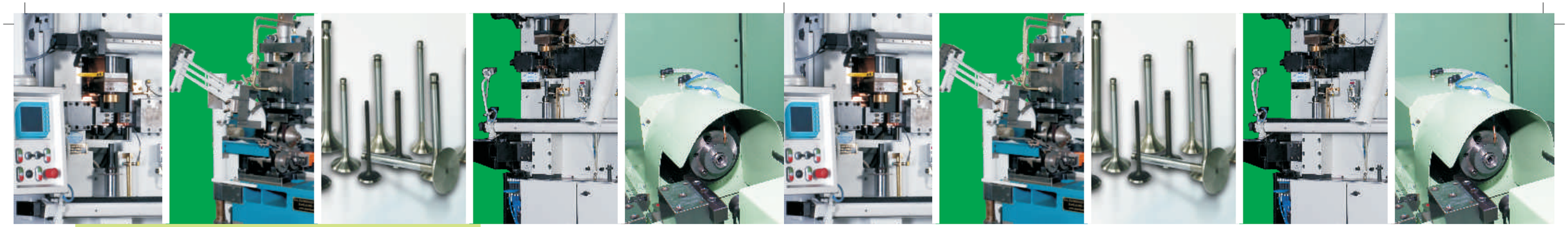

ETA Product Range Includes:

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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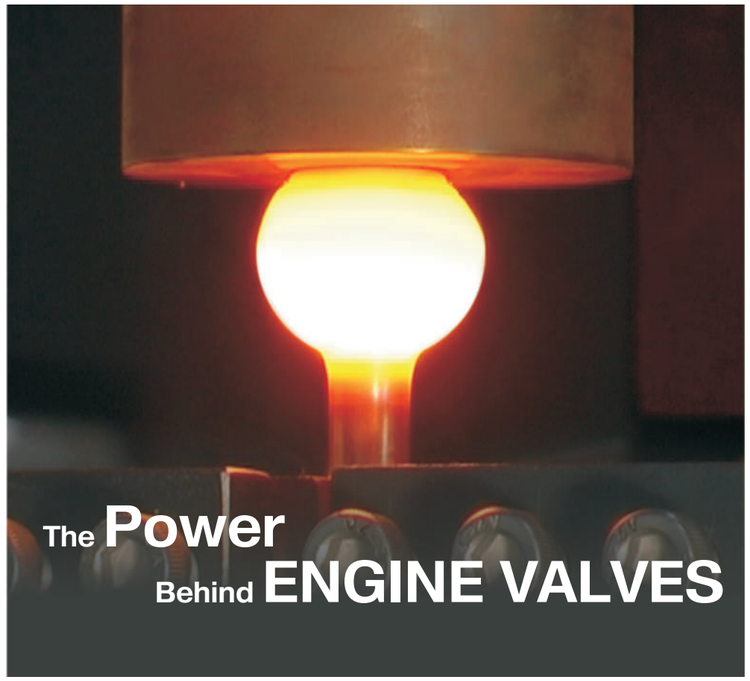
CAT-VMM-E-0114-SWE-1

Machines For Manufacturing Engine Valves

Power, Precision and Performance to Shape Valves for High Engine Efficiency



ETA TECHNOLOGY

FRICTION WELDING MACHINES

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

Designed for welding Engine Valves - Pin to Pin

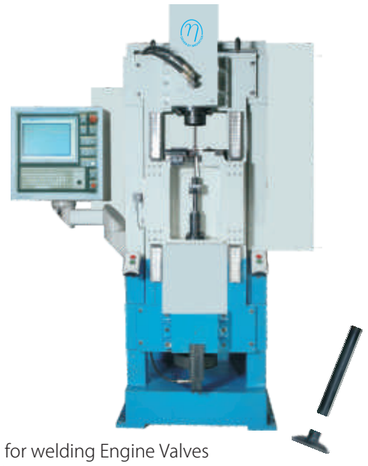
Max. forge force	: 30kN
Max. dia. at weld	: 10mm
Max. stem pin length	: 150mm
Max. length of head pin	: 220mm

6T - 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 - Vertical Machine
for smaller foot print



Designed for welding Engine Valves Head to Pin

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

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

VALVE STRAIGHTENING MACHINES

Valves after forging and heat treating normally would be bent both on stem and head. These are straightened on this automatic machine at a very fast rate. Cycle time is as low as 5 seconds. The stem is straightened to 0.05 mm and the head within 0.08 mm.

Auto loading and unloading provision is an optional feature.

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

Heating system is optional.

Machine with heating system for straightening Titanium Valves or Valves having hardness more than 40HRC

Model		VS70	VS100	VS130	VS170
Stem dia.	mm	4 to 6.5	6 to 8	7 to 13	12 to 22
Head dia.	mm	15 to 27	20 to 40	35 to 60	55 to 90
Length	mm	55 to 120	85 to 150	100 to 200	190 to 350

UPSETTING AND FORGING SOLUTIONS

ELECTRICAL UPSETTING MACHINES

In this machine, a high density electric current at very low voltage is made to pass through a portion of bar stock, which is held against an anvil and clamped between two jaws to generate sufficient heat to make the portion red hot and plastic. An upsetting force is applied axially on the rod against the anvil, making the portion which is in plastic stage, to deform into a bulb shape and to gather the required volume.

Machines are available in
12, 20, 30, 37, 50, 75 and 125 kVA ratings.

20kVA Twin Head Upsetter with
Auto Loading / Un-loding and Anvil Indexing

In Upsetters with more than 50 kVA capacity three phase power supply is rectified to DC and inverted to single phase AC. A single phase transformer can thus be used with three phase balanced power input.

50kVA/ 400V Single Head
Upsetting Machine

Supplied with various versions & features

- Horizontal and Vertical
- Single head or double head
- Auto loading & Unloading option
- Servo controlled Upsetting and Anvil cylinders
- Bulb temperature control through Optical pyrometer
- Anvil Auto Indexing
- Upsetting force and anvil movement controlled by servomotors through ball screws
- Upsetting force measured by load cell and controlled in closed loop

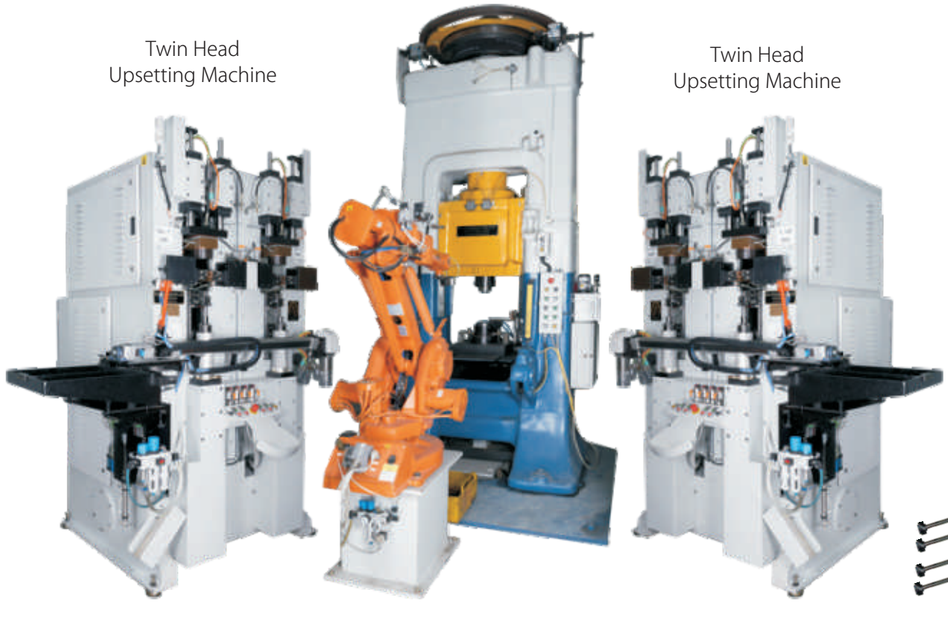
SERVO CONTROLLED POSITIVE-DRIVE SCREW PRESS

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

In an innovation by ETA, the two transmission wheels on the conventional Friction Screw Press are dispensed with. The flywheel is driven by an AC servo/ spindle motor through a timer belt/ gear. 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 during return stroke. 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.

High Speed Production Cell for Engine Valve Forgings

ETA offers high speed production cell with auto loading of Upsetters - unloading - transfer to Press and unloading from Press.



TAPPET END GRINDING MACHINES

This is a pendulum type machine wherein the valve moves over a grinding wheel capable of stock removal of up to 2mm in one stroke. It is fully automatic with chute loading and input length checking. Floor to floor time - 5 seconds

At pre-set frequency the ground job is measured for its length. To compensate for the wheel wear the spindle head is moved automatically by means of an AC servo motor.

Similar machine is available for finish grinding of tappet end of the valve. In this machine the pendulum is moved by a crank, driven by a servo motor.

VALVE END CUT OFF MACHINE

ETA also supplies machines for valve end cut-off operation with automatic chute loading facility. Valve is made to fall from the chute into a clamping fixture mounted on an oscillating beam. The beam oscillation is achieved through an AC servo motor, which enables precise control of cutting feed and rapid approach. The job is fed against a cut-off diamond grinding wheel mounted on the machine spindle.

HEAD DIA. TURNING, FACING AND PROFILE TURNING

Attaining a face run out of under 50 micron on the face of Engine valve is a difficult proposition because, the reference for facing is the seat or top of radius. 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 is hemispherical. This provides a rocking action for the stopper and thus avoids bending of valve head.

Cycle time <12 sec for a 40mm dia. Valve
Run out on face < 0.05mm
Run out on head < 0.08mm

GROOVING, CHAMFERING AND TAPPET END FACING MACHINE

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 achieved is less than 10 seconds.

ETCHING MACHINE

Electro chemical etching machines are offered for marking monogram/ part number on the valves. Two types of machines are available- Static and Moving 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.