

**Department of Mechanical Engineering,
Indian Institute Of Science
Bangalore**

DST – Fund for Improvement in S&T Infrastructure

Brief Outline of the Department

Mechanical Engineering activities at the Indian Institute of science commenced in 1945 with the establishment of the Department of Internal Combustion Engineering that later merged with the subsequently created Mechanical department. The initial work within the department was focused on more traditional Mechanical Engineering mainly concerned with design and manufacture. The department is engaged in both basic and applied research, and also has strong interaction with industry. It has a strong history of contributing to quality manpower for industry and research; more than thirty of its doctorates are faculty members in leading academic institutes like IISc and the IITs.

Teaching & Research Activities

The Department offers the following programs 1) Master of Engineering (ME), 2) MSc (Engg.), 3) PhD and 4) Direct PhD (after B.E). Typically the ME program has students from among the top 30 GATE ranks in the country. Apart from the regular students, the department has sponsored students from National Laboratories and Industry, and under the QIP program. Research activities are in both the classical areas (Mechanical System, Solid Mechanics, Fluid Mechanics, IC Engines, Materials Science, Manufacturing) and in the more modern areas like MEMS, Nano-technology and Bio-mechanics.

Facilities Created

Under the FIST grant the following facilities have been created :-

A. Machining Centre Type W-408S – 5 Axes with Numerical Control GE-FANUC 161 MA :

This is a high precision five axes-machining center having a resolution of 0.001 mm. It is capable of allowing cutting at high speeds for better surface integrity and accuracy. At the highest spindle speeds (14K rpm) it can deliver torque of up to 3 Nm. Since the scales used for feed back in the control have a resolution of 1 micron, precision machining is possible. This centre is used for micro-machining, including for MEMS devices.



B. High precision XYZ translation stage :

Consists of 15 mm manual stage and two piezo-electric drive control stages.

X-Axis :Manual control with Micrometer (Range : 15 mm)

Y-Axis :Coarse control with Micrometer and Fine control with Piezo positioning
Coarse Range : 15mm ; Fine range : 30 micron in increments of 5 nm

Z-Axis :Coarse control with Micrometer and Fine control with Piezo positioning
Maximum load in vertical direction : 100 gms ; Coarse Range : 15 nm

Feed Back :Capacitor feed back for Y and Z axis ; Measurement range : 50 micron
Resolution : 1 nm

The equipment is a Y - Z stage with manual micro-control and precision piezo-electric positioning having ranges of motion in 10s of microns and resolution of about 10 nm. The equipment is being extensively used for a range of small length scale calibration problems in the department. Now there are many research groups in the department who are involved in setting up various small length scale experimental systems such as Atomic Force Microscope, Micro Electromechanical Systems, Force Sensors with pN resolution, flow and viscosity measurements at 100 nm length scales etc.

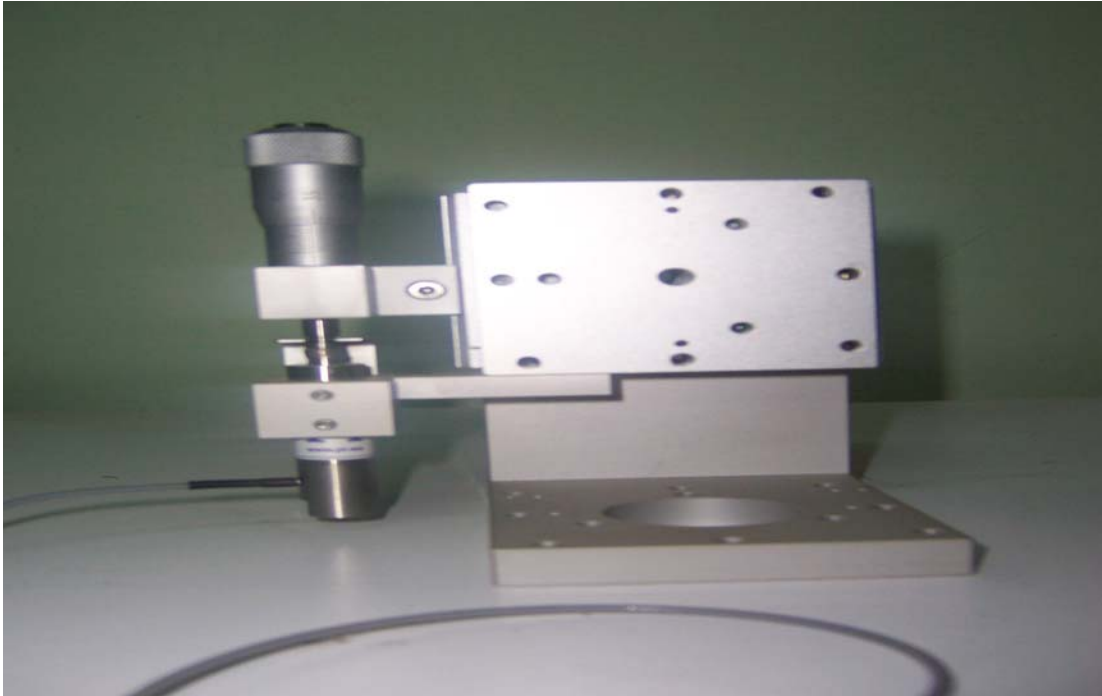


Fig. 2 . XYZ translation stage :

C. 3-axis computer controlled positioning system (Gantry Type):

XYZ Gantry: The precision XYZ positioning system has traverse lengths of 1000 mm (X), 500 mm (Y) and 250 (Z) and is driven by three computer controlled Panasonic AC servo-motors. Precision ball screws are used on all three axis. The XYZ gantry is a general--purpose precision positioning system. It is used for experiments that require such movement. These include experimenting with new manufacturing techniques like layered manufacturing.

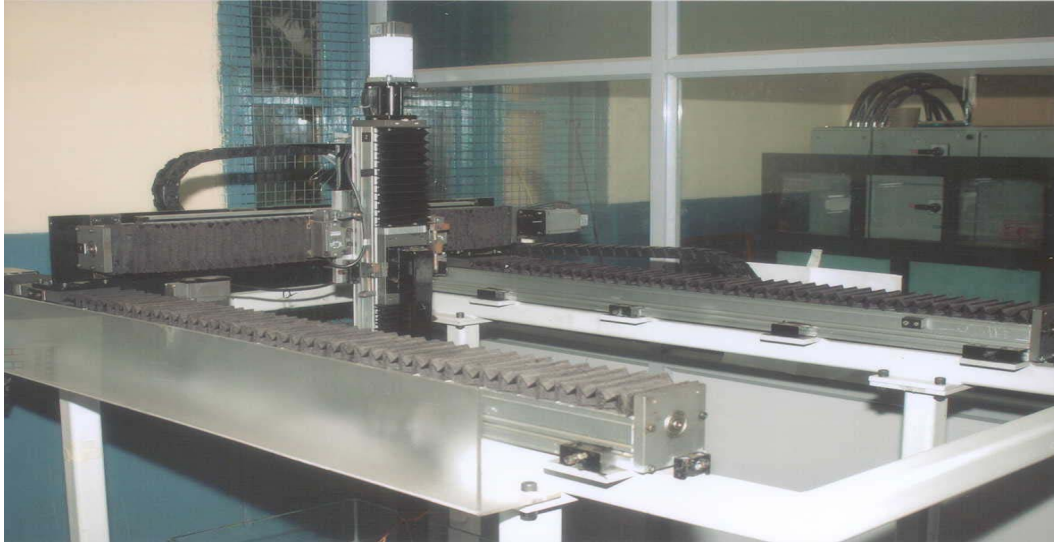


Fig 3. Photographs of the Gantry

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