

The background of the slide is a low-angle, upward-looking photograph of a bridge's structural elements, including cables and a concrete pylon, against a clear blue sky. The perspective creates a sense of height and engineering.

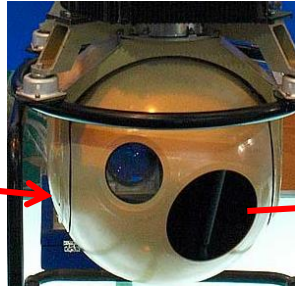
CMTI Technologies & Modalities for Technology Transfer

By

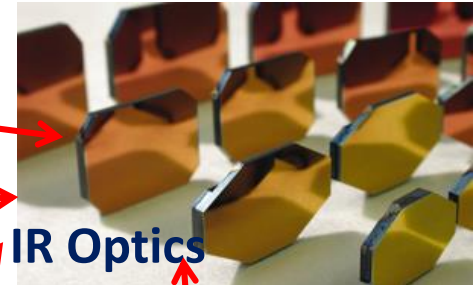
Dr. N.Balashanmugam

Joint Director, CMTI, Bangalore

Lenses for Night Vision & Thermography for Defense & Civil Industry



IR & Thermography system



IR Optics

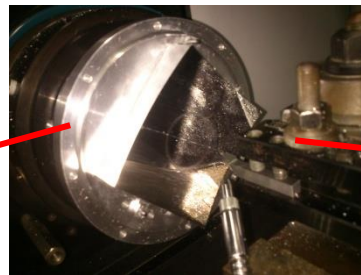
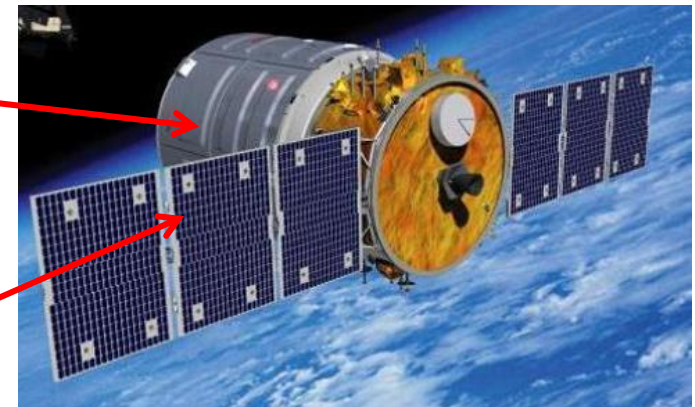
Germanium and silicon for IR optics,
Night Vision, Thermography System



Night Vision



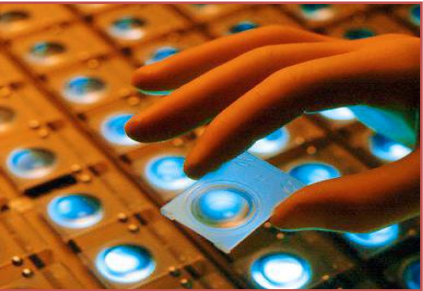
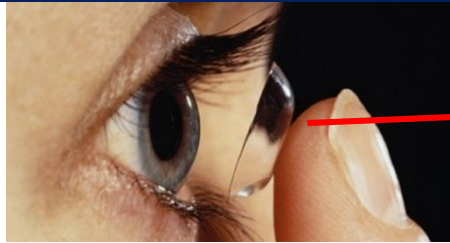
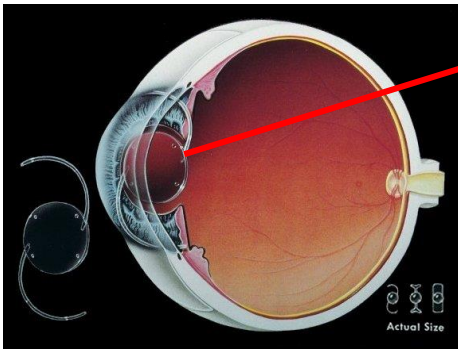
Metal Mirrors for Space & Astronomical Systems



Space Satellite

Ophthalmic, Intro-ocular & Contact lenses for Medical Sectors

Contact Lenses



IOL Lens

**Polymer optics for
Ophthalmic**

Ultra Precision Mechanical Components



Air Bearing elements.
Hydrostatic & Hydrodynamic Bearing
Elements.
High Precision Mechanical Elements.

Ultra Stiff Ultra Precision Diamond Turning Machine

Salient Features:

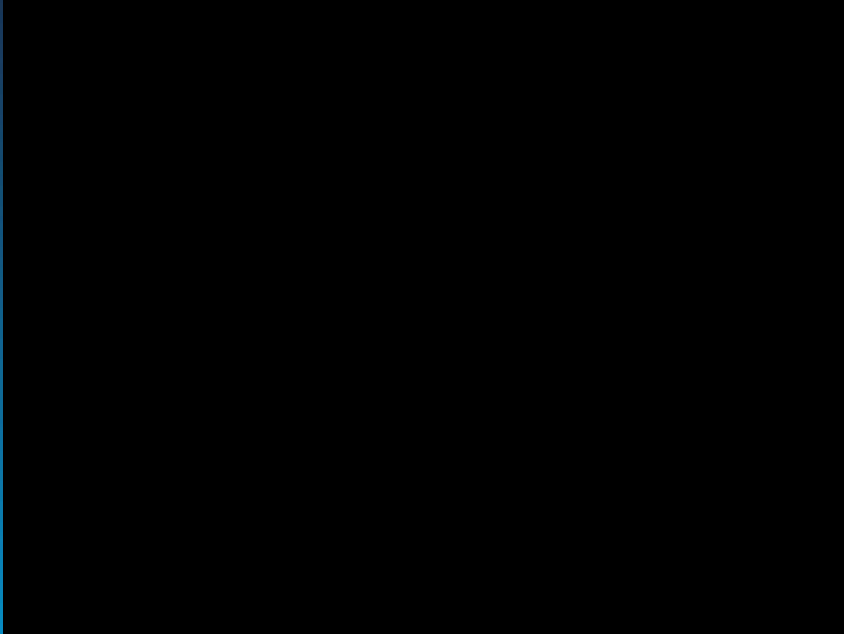
- High Stiff Hydrostatic Oil Bearing Slides
- Ultra Precise Aerostatic Spindle
- Natural Granite Bed with Vibration Isolation System and active leveling
- Max Workpiece: Dia 250 mm, Lg: 150mm



Ra: 2nm

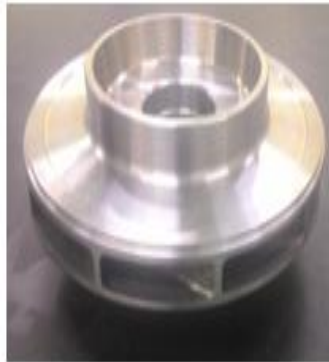
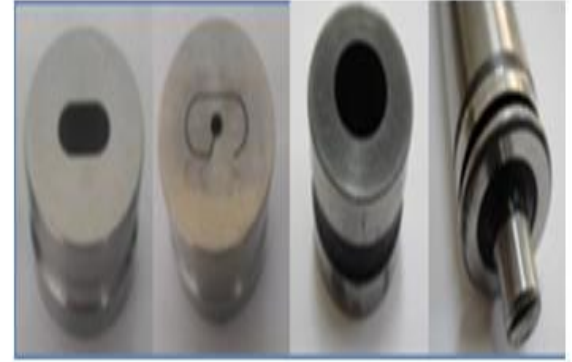
Form Accuracy: <0.2 μ m

Ultra Stiff Ultra Precision Diamond Turning Machine



Ra: 2nm

Form Accuracy: $<0.2 \mu\text{m}$



How to Finish Intricate Components?

Abrasive Flow Finishing Machine

Salient Features:

- Super finish / deburr ID and OD of components
- Radiusing of sharp edges
- Finishes inaccessible areas & complex internal passages
- Temperature control of abrasive laden polymer media
- Simultaneous processing of multiple passages

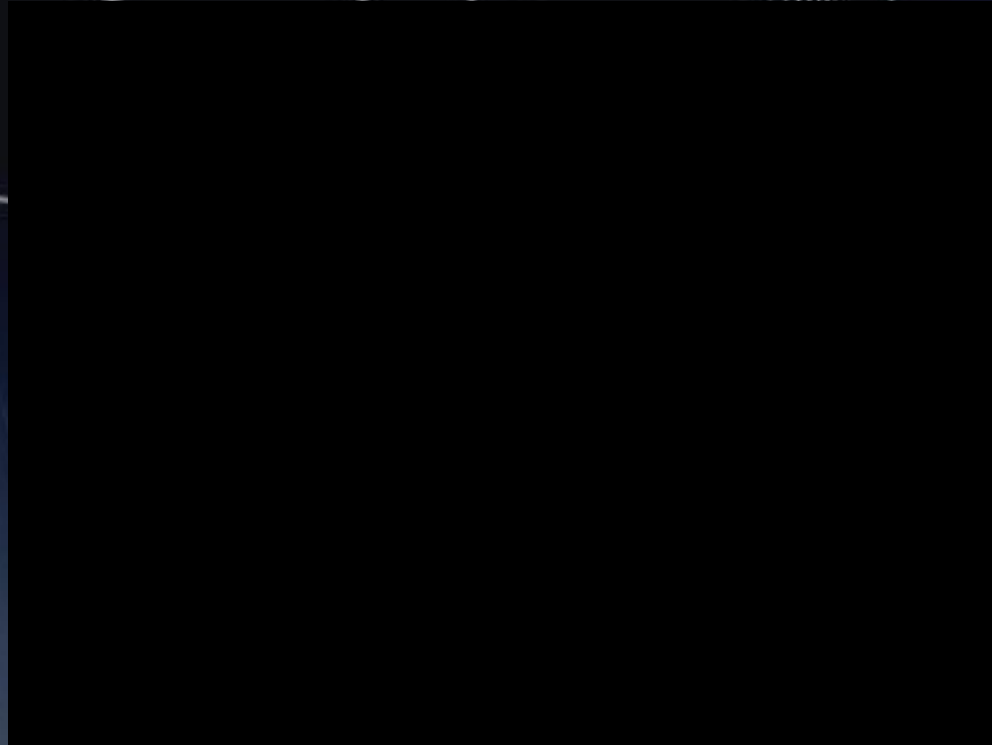
Applications:

- Micro/Nano finishing,
- Radiusing
- Deburring

Max. Height of the Component : 250mm

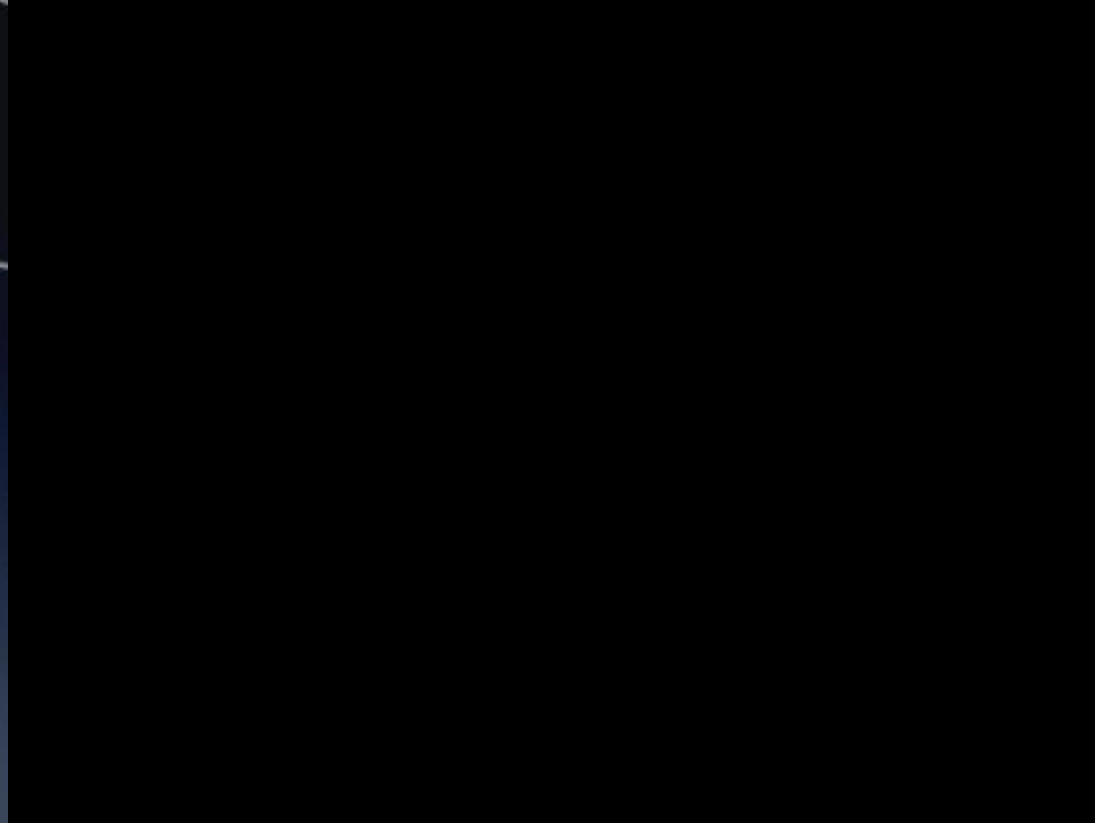


Abrasive Flow Finishing Machine



Centre tube for filter element

Abrasive Flow Finishing Machine



Shuttle valve for Aircraft landing gear actuator

Mass - IH: Projection Microstereolithography (PμSL)System

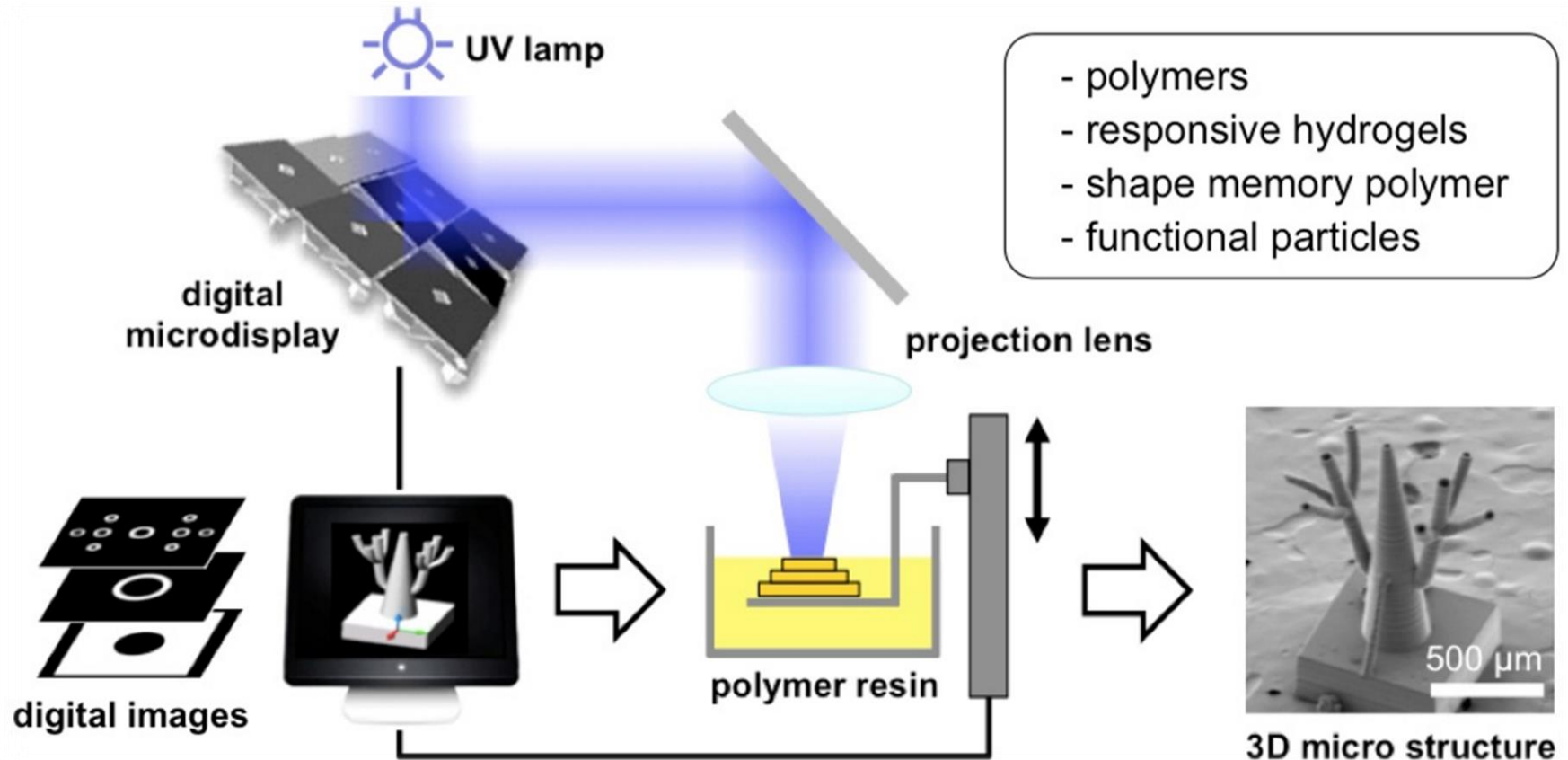


Sukshm3D.
सूक्ष्म Micro rapid prototyping

A product of **CMTI** | Central Manufacturing
Technology Institute

PMSL SYSTEM DEVELOPED BY CMTI

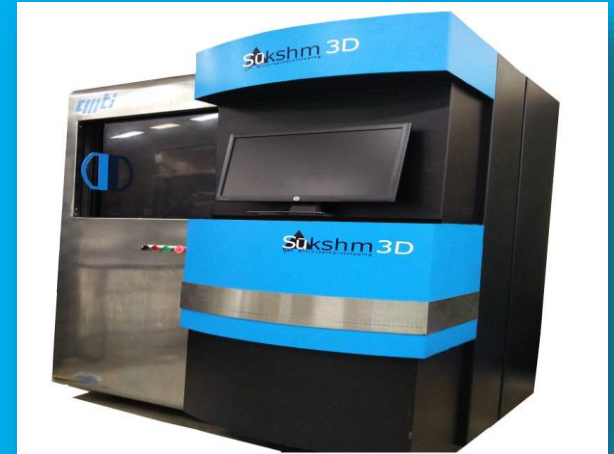
Mass IH Process- Projection Micro Stereo Lithography



Sukshm 3D Micro fabrication system

Salient Features:

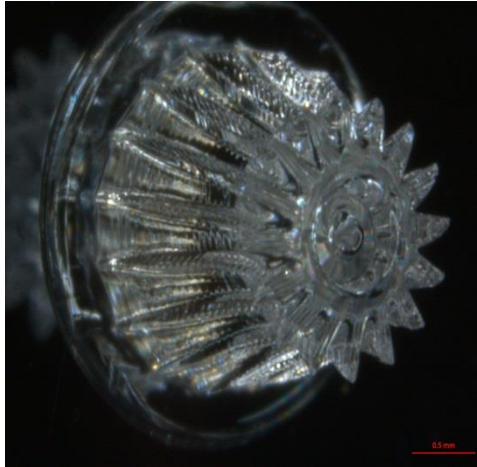
- *It enables complex 3D ultra fine solids to be made in a short time by means of spatial light modulation technique.*
- *A UV-curable resin on is cured at a super-precision resolution by a high-precision digital light exposure mechanism.*
- *3-D structures are created by the layer-by-layer forming method, under which 3-D ultra-fine solids are formed automatically by repeated light exposure and resin coating.*
- *Ultra-fine Features down to 10um level cab be fabricated*
- *Layer thickness can be optimized to 5um level so that staircase effect can be eliminated with continuous exposers of UV projection*



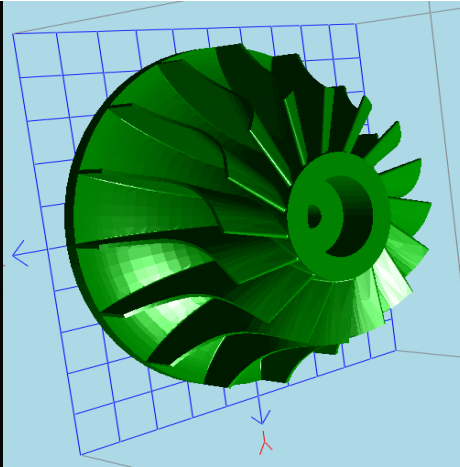
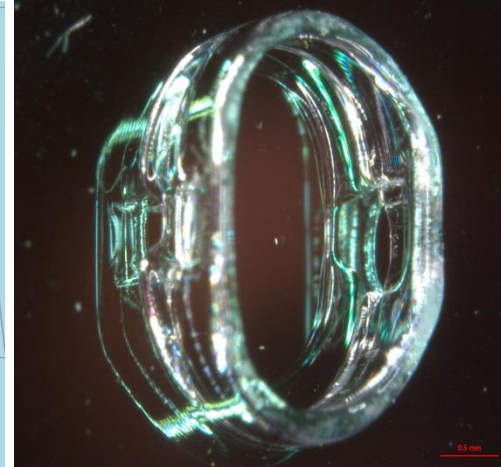
Applications:

- Polymer based 3D Microfabrication for various applications in MEMS, Jewellery, Biomedical industries.
- Fabrication of complex 3D Micro components
- MEMS sensors, actuators, and micro bellows
- Micro fluidic channels and micro fluidic devices
- Bio medical Implants like coronary stents & scaffolds
- Micro moulds and lenses for optics industry
- Micro mixers and micro pumps

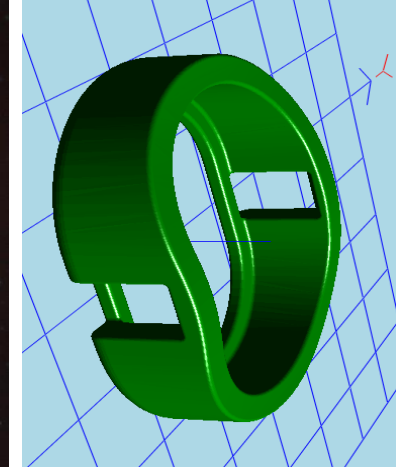
Fabrication of Complex 3D Micro Components



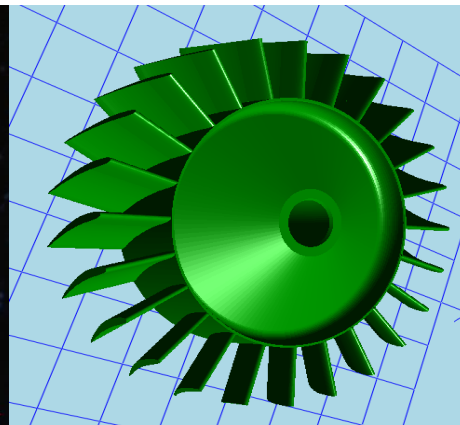
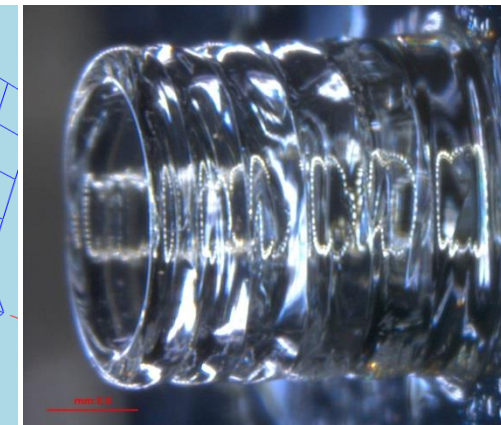
Micro Rotor- Compressor



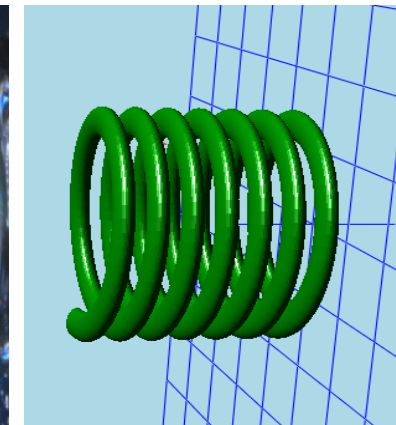
Micro Sensor Component

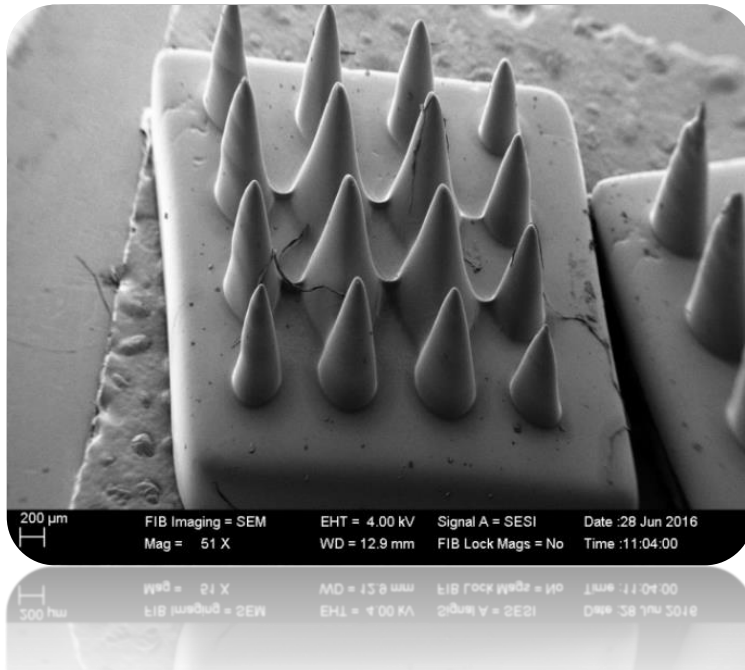
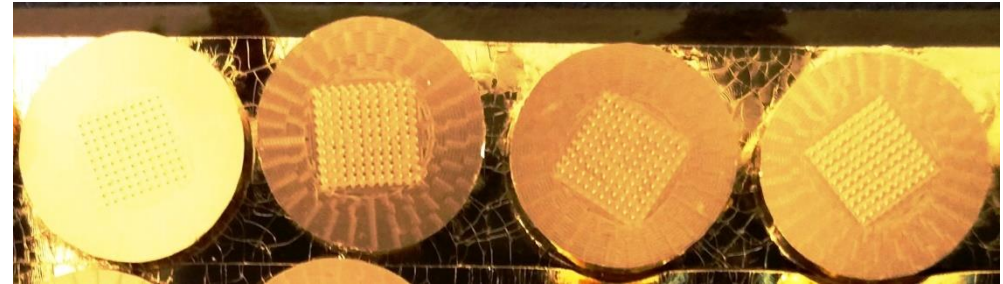


Micro Turbine



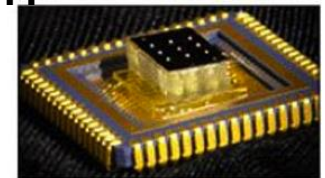
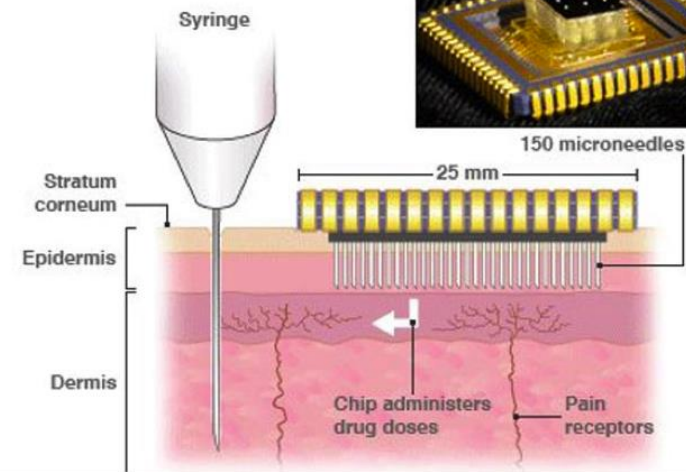
Micro Spring



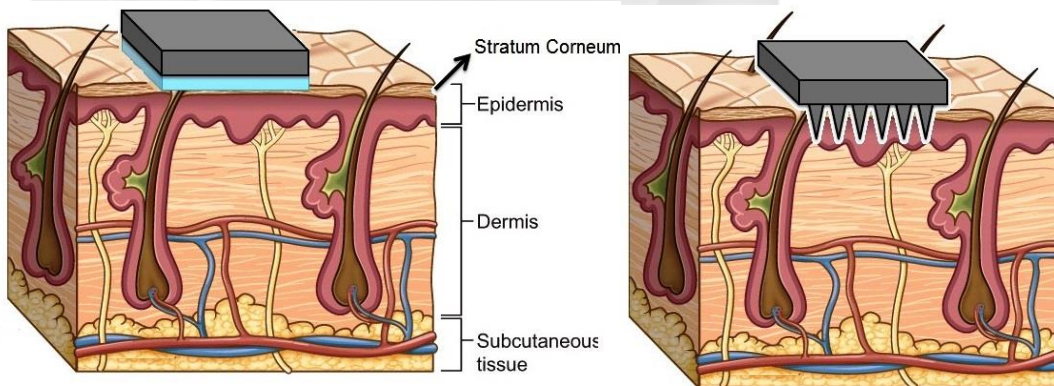


Microneedle Array Based Biopotential Electrodes developed at CMTI

MICRONEEDLES DRUG PATCH

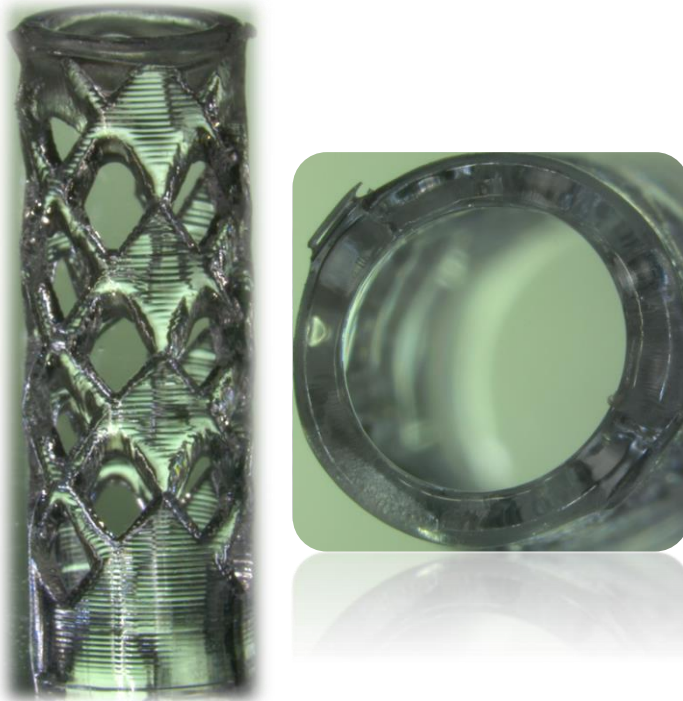


Micro Needle Electrodes for Painless Drug Delivery



Micro Needle Electrodes for Biopotential Acquisition

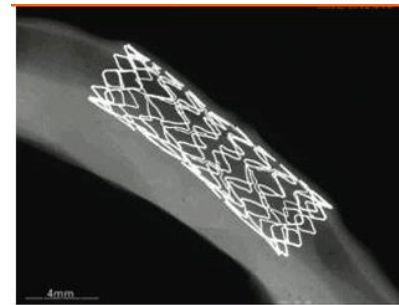
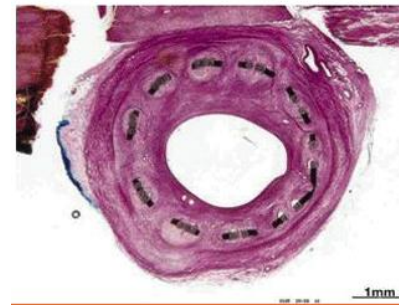
Fabrication of Polymeric Coronary Stents



“The dream has always been to find a temporary solution for a temporary problem, giving blood vessels a chance to bounce back to their natural state”.

They do their job and disappear...

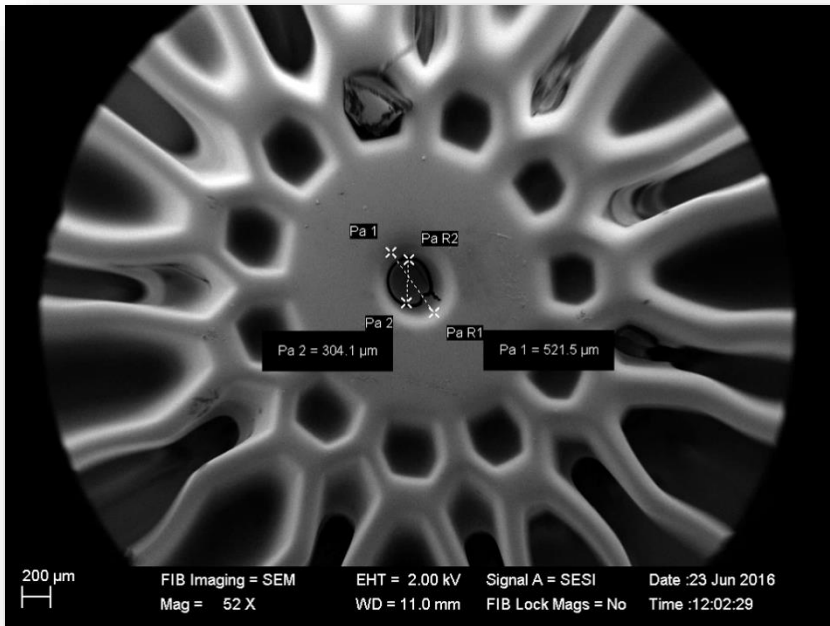
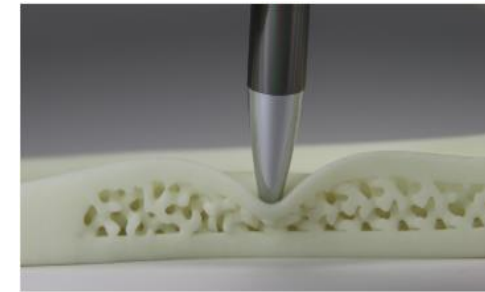
Despite the development and progression of metallic stents, many concerns still remain because of their permanent nature. Thus, the concept of bio absorbable stents has emerged as an alternative to permanent metal stents.



Metallic Stent



Polymeric Stent

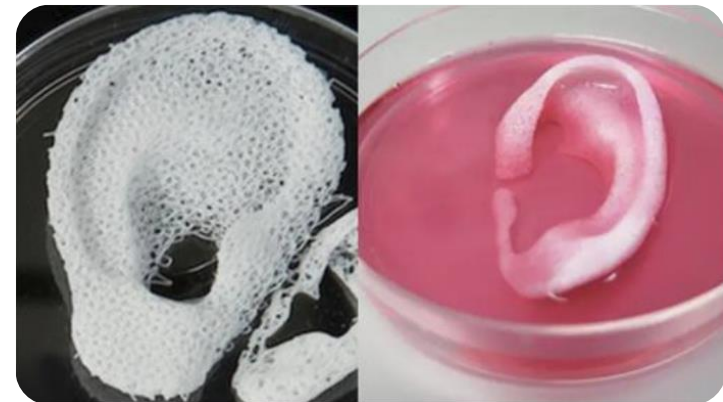


Hearing aid caps Soft biocompatible implants



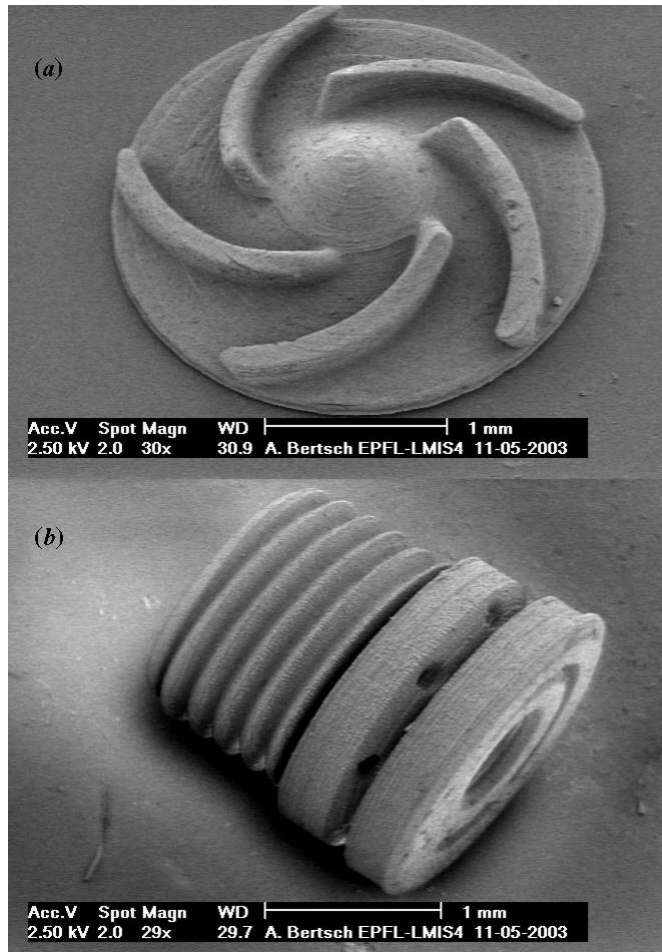
Dental implants

Projection Microstereolithography (PμSL) technology can fabricate three-dimensional (3D) tissue engineered scaffolds with controlled biochemical and mechanical micro-architectures.



Tissue Engineering

Ceramic MSL



Ceramic Micro Parts

- Alumina 75% by weight mixed with Polymer (HDDA)
- 3D parts made by MSL
- Polymer melted away by heating
- Green ceramic part is sintered at 1600 deg C
- Shrinkage is about 20%
- Scattering of radiation by ceramics is also an issue
- Curing depth and width gets reduced due to scattering

Issues: Scattering, Shrinkage, high viscosity

Thread Measurement System

Salient Features:

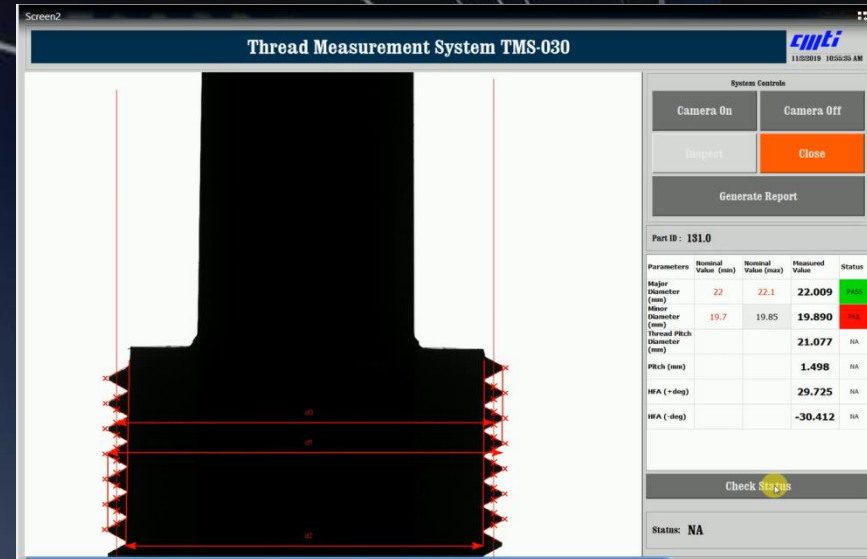
- Non-contact method of external thread measurement to check for dimensional tolerances.
- High speed thread
- Can be used for automating in manufacturing lines.
- User friendly thread measurement system requiring minimum human intervention.
- Records measurement results for statistical analysis.

- Measurement Range: Upto 30mm
- Measurement Accuracy: $\pm 10 \mu\text{m}$



Thread Measurement System

GUI of the System
displaying the
measurement of a thread
gauge



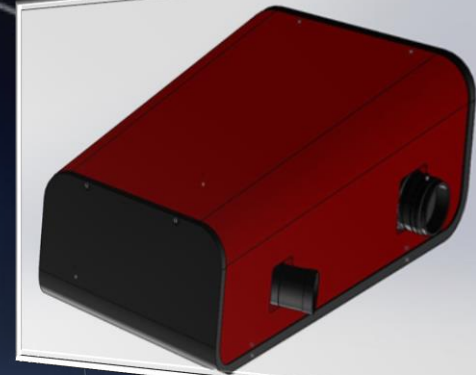
3D SCANNER

Salient Features:

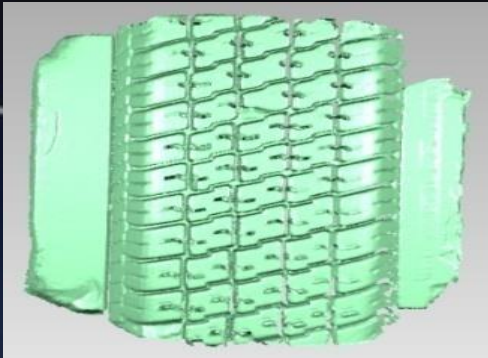
- *Short measuring times.*
- *Actual and nominal comparison with CAD data.*
- *Portable as it can be mounted on a tripod/robot.*
- *Automated registration using rotary table and markers.*

Applications

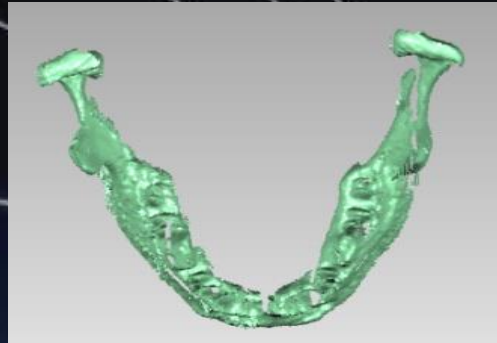
- *Dimensional measurements*
 - *Reverse Engineering*
 - *Automated Inspection Tasks*
-
- *Measurement Area: 267*205*150 mm³*
 - *Accuracy: 150 μ m*
 - *Fastest Measurement Time: 4 secs*



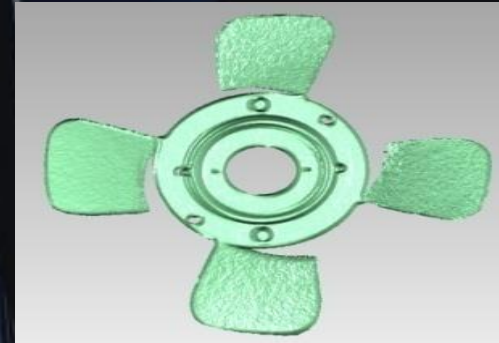
3D Scanner- Point cloud captured



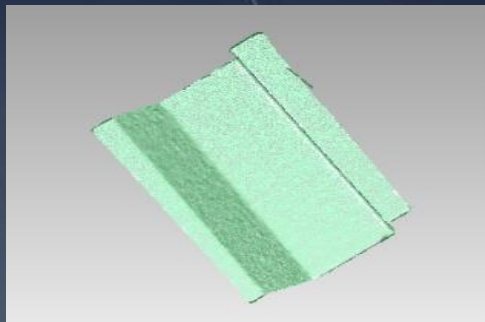
(a) Tyre Mold



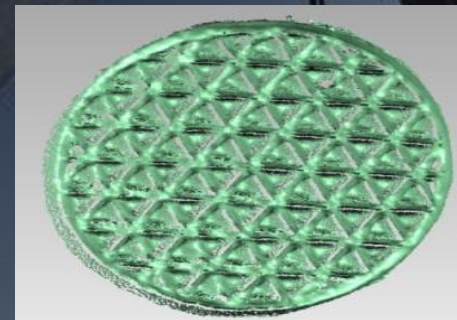
(b) Lower human jaw bone model



(c) Turbine



(d) A small locating component



(e) Lattice Mirror Housing

ULTRA STIFF ULTRA PRECISION HYDROSTATIC SLIDE

Salient Features:

- Hydrostatic oil Bearing gives infinite life
- True motion, zero stick-slip, zero backlash & Maximum positioning accuracy
- High stiffness for Heavy loads & excellent geometric performance
- High Dampening effect from oil film for vibration from machining process
- Direct drive with Integrated Linear motor with low cogging force
- Ultra precision Linear Glass Scale for position feedback

Applications:

- Ideally suited for development of Ultra Precision Machines



Nano Slide way HS 200

Model & Type	HS 200; Fully constrained hydrostatic, box way slide
Travel	200 mm (8 Inch)
Load Capacity & Stiffness	1000Kg (10,000 N) 1000N/ μ m
Drive System	Brushless DC Linear Motor
Feedback Resolution	32 picometer
Straightness	Horizontal :0.2 μ m over full travel Vertical : 0.4 μ m over full travel

HYDROSTATIC SLIDE APPLICATIONS

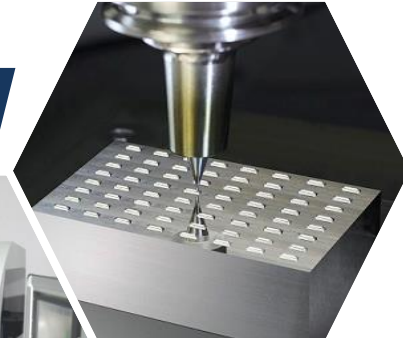
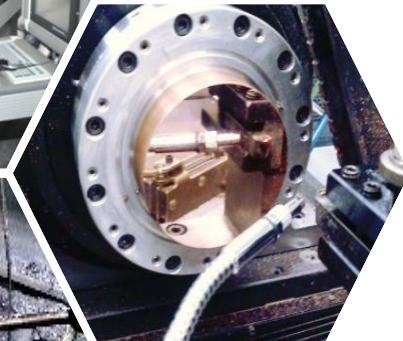
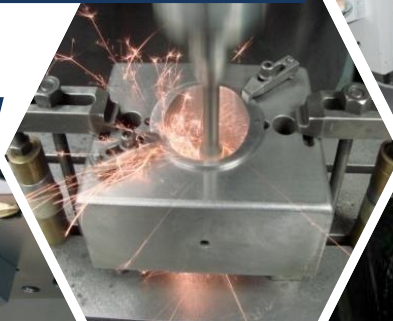


**HIGH PRECISION MILLING/
BORING MACHINES**

**DIAMOND TURNING
MACHINES**

HIGH PRECISION GRINDING MACHINES

HARD TURNING MACHINES

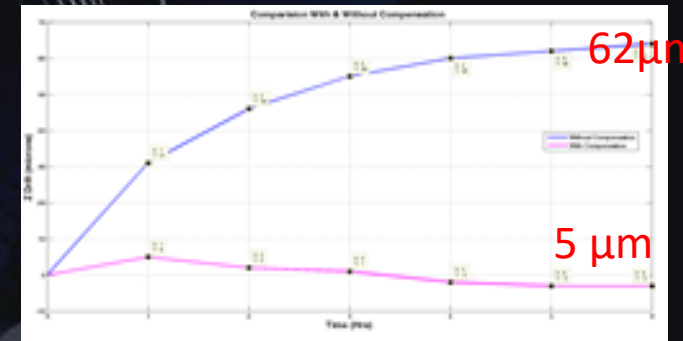
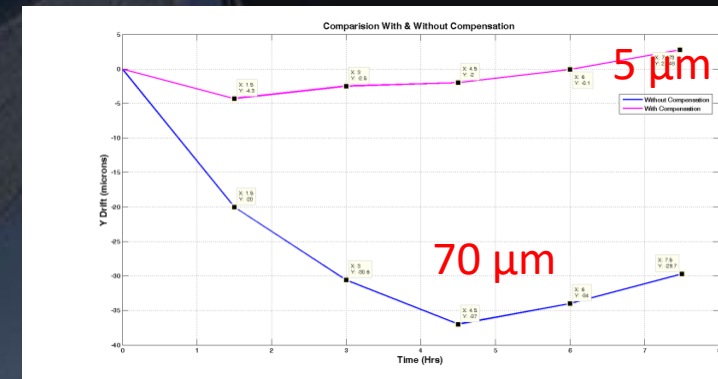


Thermal Error Compensation for Machine Tool Applications

Machine tool thermal distortion can account for 75 % of the total machining error.

Salient Features:

- *RTD based Temperature Sensors*
- *Recursive Neural Network based Algorithm*
- *CNC Interface module*
- *Real Time Compensation*
- *Upto 80% error compensation contributed by thermal distortion*
- *Low Cost solution*
- *Can work with all general purpose CNC controllers*



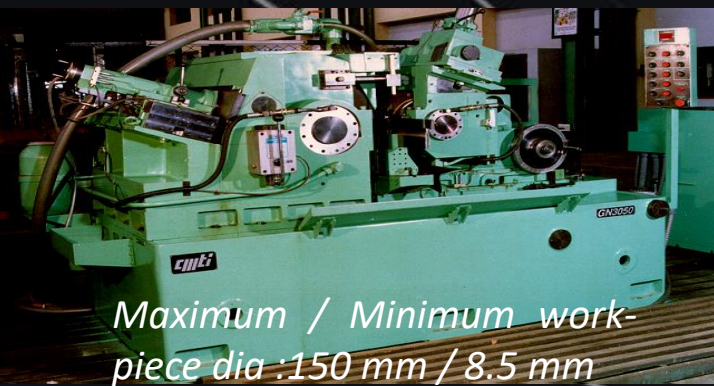
Blue: Without Compensation
Pink: With Compensation

Machine Health Management System (MHMS)- Machine Fault Diagnostic Module



Salient Features:

- Machine tool vibration measurement
- Data acquisition through MEMS Accelerometer
- Signal Conditioning and Analysis
- *Fault diagnosis for Unbalance, Misalignment, Mechanical looseness and Bearing faults*
- Fault display on LCD Display Screen



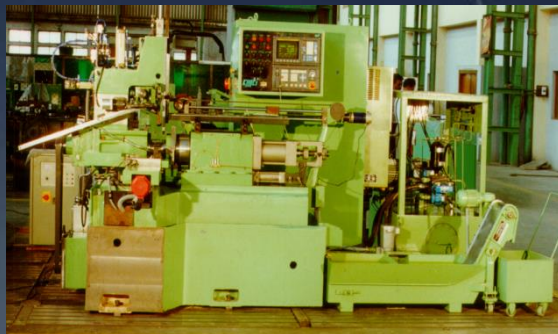
**Centreless Grinding Machine
GN 3050**



**Facing and Taper Boring
Machine (FTB -320)**



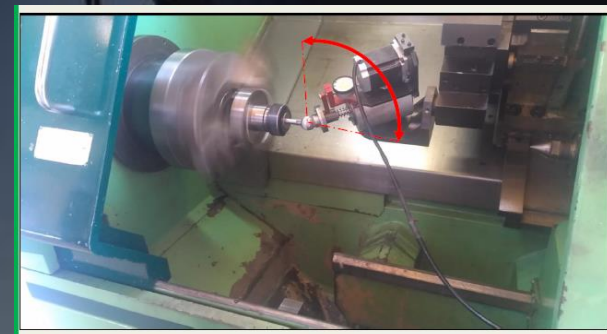
Line Boring Machine (LBM)



Finish Turning Machine



**Key Stone Piston Ring
Grinding Machine (GKPR)**



**Sphere Lapping Attachment for
CNC Lathe**

Modalities for Technology Transfer

- Calling for Expression of interest
- Conducting Pre application conference
- Inviting Request for Qualification {Direct or through e-tendering (forward auction)}
- Evaluating Requests and selection of firms

Modalities for Technology Transfer

- Technology transfer is done on non-exclusive basis
- In certain cases, Technology Transfer is done on exclusive basis with lock in period
- License fee is different for both

Modalities for Technology Transfer

Technology transfer involves

- Licence fee
- Royalty

Modalities for Technology Transfer

What do we offer?

- Blue print of drawings
- Bill of Materials
- Technological process for critical parts
- Bought out items ;
- Vendor's list
- Testing Protocols
- Machineries and Infrastructure required
- Data base of process receipe
- Hand holding

A large, dark-colored statue of Lord Venkateswara, a Hindu deity, is the central focus. The statue is seated and has a serene expression. In the background, a large crowd of people is gathered in an open area, and distant hills are visible under a clear sky.

Looking forward to have our
Technologies in your factories

Thank You