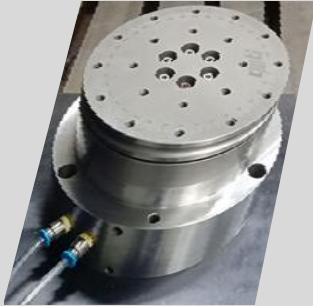




# Technology Profile

RELEASE 2.0





# CMTI

## Technology Profile

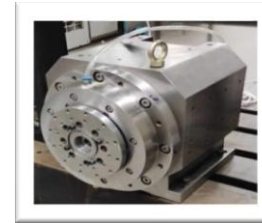
RELEASE 2.0

Central Manufacturing Technology Institute,  
(An autonomous R&D Institute under Ministry of Heavy Industries &  
Public Enterprises, Govt. of India),  
Tumkur Road, Bengaluru 560 022,  
Karnataka, India

Tel: 91-80-22188373, Fax: 91-80-23370428, Email: [cmti@nic.in](mailto:cmti@nic.in),  
Website: [www.cmti-india.net](http://www.cmti-india.net)

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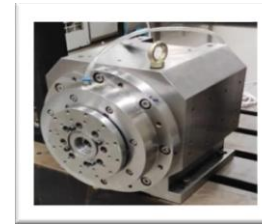


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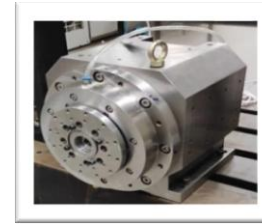


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## SALIENT FEATURES

- Motion Error in Nanometres
- High Bearing Stiffness
- High damping
- High Dimensional stability
- Near Zero Static Friction
- Near Zero Thermal Distortion
- No Harmonics
- No Air Hammer Effect
- Laminar Flow
- Higher Working Speed Range
- Integrated Motor
- Water Cooled

# Ultra-Precision Air Bearing Spindle-Nanospin AIM 80

**Specification:**

Bearing type: Aerostatic radial and thrust

RPM: up to 3500 rpm

Motion Error  $\leq$  100 nm

Stiffness Radial: 80 N/ $\mu$ m Axial: 150 N/ $\mu$ m

**Level of Development :**

TRL 6

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard materials commonly used for engineering product development, such as various categories of steel alloys, copper alloy, etc

**Major Plant Equipment and Machines required:**

Ultra-precision micro machining Centre, Wire EDM, Turning and Milling Machine, Precision Grinding Machine, Ultra precision dimension, form and roundness testing equipments.

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of ultra precision air bearing spindle

**Applications:**

Single Point Diamond Turning (SPDT)

Ultra Precision Turning

Ultra Precision Milling & Micro Milling

Ultra Precision Grinding

Form Testers

**Technology Package:**

One set of all assembly/integration drawings for the prototype in the form of reproducible on tracing sheets.

One set of Mechanical component drawings for manufacturing.

One set of operation & user's guide manual

To provide consultancy in activities related to development..



## SALIENT FEATURES

Motion Error in nanometer

High load carrying capacity &  
stiffness

High damping

High Dimensional stability

Near Zero Static Friction



# Air Bearing Rotary Stage

**Specification:**

Bearing type: Aerostatic radial and thrust  
RPM: 0-500 rpm  
Motion Error  $\leq 100$  nm  
Load carrying capacity: up to 500N

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard materials commonly used for engineering product development, such as various categories of steel alloys, copper alloy, etc.,

**Major Plant Equipment and Machines required:**

Ultra-precision micro machining Centre, Turning and Milling Machine, Precision Grinding Machine, Ultra precision dimension, form and roundness testing equipments.

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of ultra precision rotary table.

**Applications:**

Ultra precision roundness testing equipments

**Technology Package:**

One set of all component, assembly/integration drawings. One set of operation & user's guide manual. To provide support for development.



## SALIENT FEATURES

Non mechanical clamping of components

Negligible deformation of clamped components

Suction holes on the chuck work arranged to set an effective holding area

Provision for precision dynamic balancing

# Vacuum Chucks for Ultra- Precision Air Bearing Spindle

**Specification:**

Component clamping size: 50mm to 120mm Dia

Component holding capacity: 5Kg

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard materials commonly used for engineering product development, such as aluminium alloy

**Major Plant Equipment and Machines required:**

Ultra-precision micro machining Centre, Turning and Milling Machine

**Techno economics :**

Having high potential in commercialization of ultra precision work holding chucks

**Applications:**

Chucks for ultra precision air bearing spindle

**Technology Package:**

One set of all assembly/integration drawings for the prototype in the form of reproducible on tracing sheets.

One set of Mechanical component drawings for manufacturing.

One set of operation & user's guide manual

To provide consultancy in activities related to development.



---

## SALIENT FEATURES

Non contact coupling in nature  
Does not effect the rotary  
performance of spindle

# Non-contact Rotary Coupling for Vacuum Transmission

**Specification:**

Vacuum suction up to 0.8bar  
Component weight: up to 5Kg

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard materials commonly used for engineering product development, such as steel alloy

**Major Plant Equipment and Machines required:**

Turning and Milling Machine

OD and ID Grinding machine

**Techno economics :**

Having high potential in commercialization

**Applications:**

Chucks for ultra precision air bearing spindles

**Technology Package:**

One set of all assembly/integration drawings for the prototype in the form of reproducible on tracing sheets.

One set of Mechanical component drawings for manufacturing.

One set of operation & user's guide manual

To provide consultancy in activities related to development.



## SALIENT FEATURES

Running accuracies resolution below 10nm.

3 Probe and 5 probe configurations  
As per ISO230-7 and ASME B5.54 standards.

Substitute for import items.

Supplied with calibration certificate  
under NABL accreditation for  
sensors.

# Spindle Error Scope

**Specification:**

Spindle RPMs: 100 to 20,000

Resolution: 10 nm

Measurement range 125um to 250um

Bandwidth up to 15k Hz

**Level of Development :**

TRL 9

**Status of Commercialization:**

Ready for Technology Transfer

**Techno economics:**

Indigenous development of technology and having high potential use in precision spindle developments as per ISO and ASME standards.

The cost of the developed systems is 1/3 of the imported systems Technology Package:

Indigenously developed software with more functions and features than imported software.

Hardware systems comprising 3 to 5 ultra high precision capacitive sensors with suitable data acquisition system.

Precision Probe Nest and handheld analytics PC with effective GUI controls

Display features: Polar plot view of

✓Total Error

✓Synchronous error



## SALIENT FEATURES

Plug & Play Module

Real Time Thermal Error

Compensation

RTD Interface

CNC Interface

Artificial Intelligence based Algorithm



# Thermal Error Compensation Module (TECM) for Machine Tool Applications

High End CPU to compute Thermal Error Compensation Value

Built-in 8 Channel RTD Interface Module

Built-in CNC Interface module which can talk to ANY make and Model of Computerised Numerical Controller (CNC)

Artificial Intelligence based Algorithm

Mathematical Equations solver for effective computation of Thermal Error

Computation interval as low as 100ms

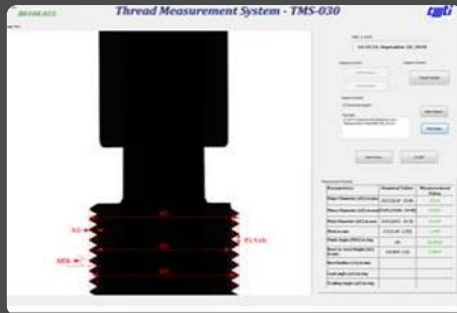
Removal of Thermal Error due to Machining : 70 to 85%

Low cost solution

TECM module for Lathe, Milling Machine, Machining Centres, Grinding Machines and also for special purpose machines

Just a month to make Machine ready with compensation module integrated

Uses 3 wire RTD as Temperature sensors



## SALIENT FEATURES

Non-contact external thread High speed threads parameter measurement system which can be used for automating the thread measurement process in the thread manufacturing lines.

User friendly thread measurement system requiring minimum human intervention. Records measurement results for statistical analysis.

# Thread Measurement System – TMS-030

**Specification:**

Measurement Principle: Non-contact vision based measurement on back lit external thread image.

Measuring Range:  $\phi$  30 mm

Measurement Accuracy:  $\pm 10 \mu\text{m}$

Measurement Features: Major diameter, minor diameter, pitch diameter, pitch, flank angle, root-to-crest height.

**Level of Development:**

TRL 4-5

**Status of Commercialization:**

Ready for Technology Transfer (for metric threads). Can be extended to other thread types.

**Major Raw materials Utilized:**

Standard components such as camera, optics, light, PC, development software, calibration target, DIO module etc., that are commercially available at component level.

Standard materials like stainless steel

**Major Plant Equipment and Machines required:**

Facility for manufacturing of frame and the outer package.

Precision metrological measurement capability.

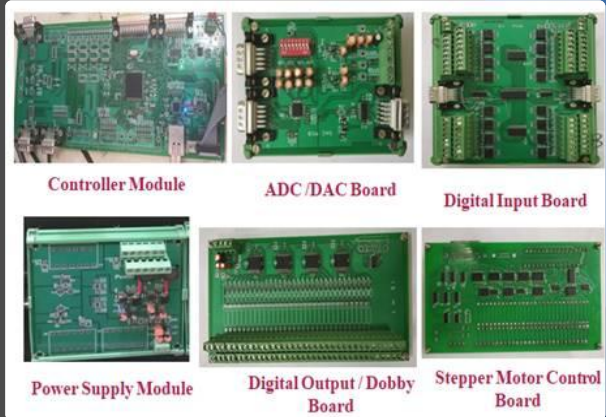
Capability in software development, system integration and testing

**Techno economics:**

Non-contact measurement method scores better in terms of ease of use and faster inspection rate.

**Technology Package:**

Bill of Materials, Application Software and source code with GPL 3.0 license in a CD, Design details, and Technical report.



## SALIENT FEATURES

Controller is an Import Substitution  
Cost Effective Solution

Modular Design for easy repair or  
replace

32 Digital Input/ Digital Output  
Module (Expandable)

16 Stepper Motor's Control board  
(Expandable)

Available Interface : SPI, I2C, CAN  
2.0, Ethernet, UART, USB

# Controller for 450/550 RPM High-Speed Shuttle Less Ravier Loom

High End CPU as Controller

Expandable 32 Digital Input/ Output Modules

4- Channel Analogue Output Module

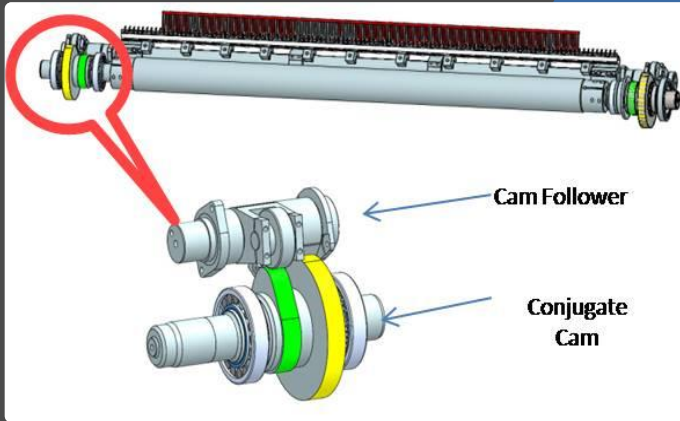
Weft Selection through Innovative Logic circuit in Stepper Motor Control Board

Fault / Alarm Detection

10.1" HMI Screen

**Innovative algorithm** for Tension Control

Controller designed is Generic in nature therefore it is suitable for Loom Machines, Smart Manufacturing, Factory Automation, CNC Control etc



## SALIENT FEATURES

Positive conjugate cam units  
Balanced & synchronized beat-up  
cams setup  
Heavy-duty Roller follower for higher  
beating forces

# Conjugate Cam Mechanism For High Speed Textile Weaving Machine

**Specification:**

Max. Operating speed : 450 rpm

Precision machined Harmonic cam profile

Follower angular Oscillation :  $\pm 30^\circ$

**Level of Development :**

TRL 7-8

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

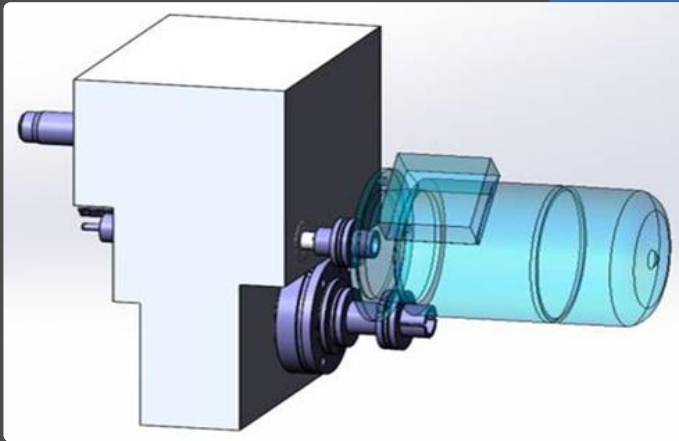
Standard common materials

**Major Plant Equipment and Machines required:**

General purpose manufacturing facilities like CNC lathe, Milling and grinding etc.,

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of High Speed Weaving Machines.



## SALIENT FEATURES

Versatile System with Output shaft  
for Primary Weaving Mechanisms  
In-built mechanism for pick finding



# Drive Mechanism with Pick-finding for Textile Weaving Machine

**Specification:**

Output Speed: 450 rpm

High energy efficient Motor with VFD

**Level of Development :**

TRL 7-8

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard common materials

**Major Plant Equipment and Machines required:**

General purpose manufacturing facilities like

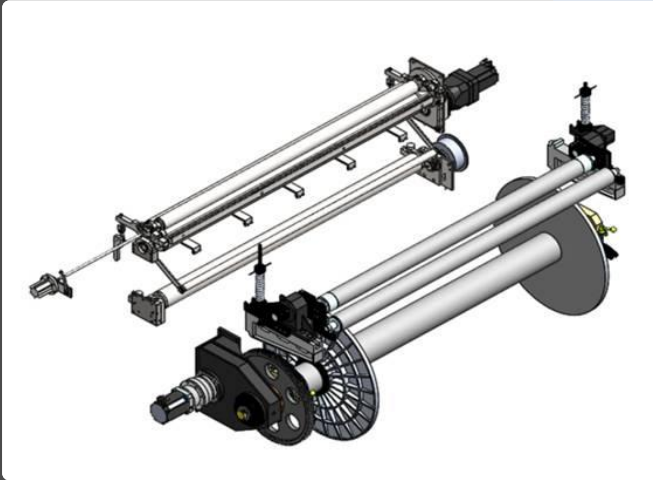
CNC lathe,

Milling and

grinding etc.

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of High Speed Weaving Machines.



## SALIENT FEATURES

Servo Geared Motor for simplified and compact design

Spline Shaft for engagement and disengagement of Warp Beam

2-Pressure Roller Configuration

Load Cell for accurate tension monitoring

# Let-off and Take up Mechanism with Tension Control for Weaving Machine

**Specification:**

Pick Density Range: 6 to 255 ppi

Max Warp Tension: 12 Kn

**Level of Development :**

TRL 7-8

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard Common materials

**Major Plant Equipment and Machines required:**

General purpose manufacturing facilities like CNC lathe, Milling and grinding etc.,

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of High Speed Weaving Machines.



## SALIENT FEATURES

Twin screw gear boxes are meant for driving Twin Screw Mixers / Extruders

Output shafts are Co-rotating

Output shafts are placed vertically one above the other

Gearbox with Output shafts placed side by side is also possible

Smaller centre distance between output shafts

High torque transmitting and thrust load carrying capacity

Import Substitution

# Twin Screw Gearbox

**Specification:**

Centre Distance: 32.6 mm  
Max. Input Speed: 1500 rpm  
Gear Ratio: 1:5

- Max. Output Speed: 300 rpm
- Design Torque/Shaft:150 Nm
- Thrust load on each shaft: 1000kgf

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard common engineering materials

**Major Plant Equipment and Machines required:**

General purpose manufacturing facilities like Lathe, Milling ,Grinding, EDM, Gear Cutting and Grinding machines, etc.

**Techno economics :**

Its an indigenous product, highly competitive with imported machine

Extruder Gearboxes are used to drive Twin screw extruders which are used in industries such as Food, Pharmaceutical, Polymer, Space, Defence, etc.



## SALIENT FEATURES

Two Lobed Profile. Co-rotating, self wiping and intermeshing type.

Elements comprising of forward conveying, reverse conveying, degassing element, flat kneading paddles, helical kneading paddles.

Each element comprises of Internal Spline for torque transmission and for easy assembly.

# Screw Elements of Twin Screw Mixer / Extruders

**Specification:**

Element major dia.: 73.2 mm  
Element minor dia.: 38 mm  
Centre Distance: 57.1 mm  
Clearance b/w elements: 1.5 mm

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Standard common engineering materials

**Major Plant Equipment and Machines required:**

General purpose manufacturing facilities like Lathe, Milling, Grinding, EDM, etc

**Techno economics :**

Its an indigenous product, highly competitive with imported machine

Potential exists for homogenous mixing of ingredients for varied industries such as Food, Pharmaceutical, Polymer, Space, etc. Its an indigenous product highly competitive with imported machine

**Applications:**

Continuous mixing of chemical ingredients (powders & liquids) for achieving high level of homogeneity up to a viscosity of 100000 poise.

**Technology Package:**

Know how for Manufacture of screw elements



## SALIENT FEATURES

The capacity : 50 aircrafts /charge

Max. Charging Pr. : up to 210 bar

Compact, light weight

One - switch operation

Up to 5 minutes continuous duty  
cycle

Reliable (>200cycles tested)



# Battery Operated Hydraulic Power Pack to Charge Fighter Aircraft Brake Accumulator

**Specification:**

LxWxH: 1mx0.8mx0.5m

Weight: 80 Kgs

Battery operated

**Level of Development :**

TRL 9

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Aluminium extrusions, LiFePO<sub>4</sub> battery (green), PLC (automation), Pressure switches, compact gear pump

**Major Plant Equipment and Machines required :**

Hydraulic oil  
Battery (Li-ion)

PLC

Switches

**Techno economics :**

It is a hydraulic rig designed for charging the parking brake accumulator of the LCA – tej as, within 1min, lightweight for transportation in cargo aircrafts, charge the accumulator of more than 20 aircrafts at a go.

Hence doesn't require techno economic study.

**Technology Package:**

Mechanical structure (cart)

Hydraulic system

Battery with BMS

PLC

**Applications:**

Hydraulic charging of aircraft parking brake accumulator



## SALIENT FEATURES

Surface mount

Submerged measurements

Sensor size: <math><3\text{mm} \times 3\text{mm}</math>

Water proof (IP 65)

Corrosion resistant

# Temperature Sensors

**Specification:**

Temperature Range: -25 to 200°C

Accuracy:  $\pm 0.5^{\circ}\text{C}$

Packaging: High temperature epoxy packaging and SS probe packaging

**Level of Development :**

TRL 6

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Silicon wafer, Pt thin films

**Major Plant Equipment and Machines required:**

Lithography, Deposition

**Techno economics :**

Indigenous development of technology and having high potential in commercialization and usage in machine tools, space and aerospace applications.

The cost of the temperature sensors will be 3/4<sup>th</sup> the imported cost and the sensors will be supplied after testing and validation at CMTI.

**Technology Package:**

Process Technology for lithography and physical vapour deposition.



## SALIENT FEATURES

Hydraulic Low pressure station  
(20 to 200 bar)

Hydraulic High pressure Station  
(200 to 600bar)

Pneumatic pressure station  
(2 to 20 bar)

Operational frequency 1 - 5 Hz NI  
cRIO-9068 embedded controller,  
5 Pressure waveforms (Sine,  
Square, Saw tooth, Triangle and  
user defined) .

# Pressure Endurance Test Rig

## Major Plant Equipment and Machines required :

Hydraulic oil, Gas media source

Hydraulic power pack

NI controller

Lab view software

## Techno economics:

It is a special product for testing Unit Under Test (UUTs) Endurance life using Oil or air media, hence doesn't require techno economic study.

## Technology Package:

Mechanical Equipments

Hydraulic power pack

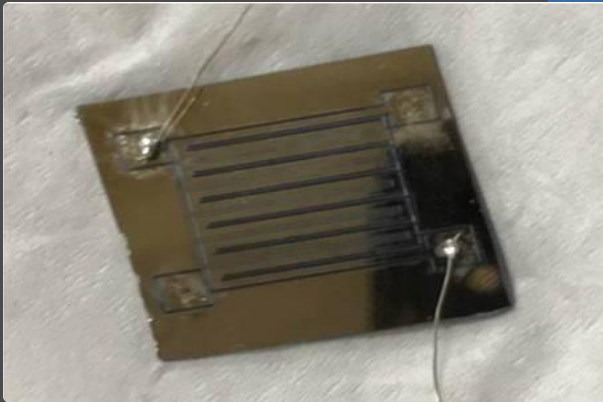
NI controller / cabinet

PC console / user interface (Lab View Programme)

Assembly / Component mounting drawings and specification, Maintenance document

## Industries / Application include:

Qualifying elements for the endurance life, like MEMS pressure sensors, tubes, valves any hydraulic, pneumatic elements etc.



## SALIENT FEATURES

Very small within 20 x 20 mm

# Process for Manufacturing Micro-heater

**Specification:**

Customisable, varies as per temperature and size requirement

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Single side silicon wafer, nickel, silver paste and leads

**Major Plant Equipment and Machines required:**

High Precision Excimer Laser Micro Machining System

Physical Vapour Deposition

**Techno economics :**

Indigenous development of technology and having high potential in using in various custom heater like flow sensors, calorimeters etc.

High grade heaters which cannot be manufactured in mass.

**Technology Package:**

Process Technology



## SALIENT FEATURES

Can be coated on any aerospace  
material.



# Process for Super Black Coating

**Specification:**

Up to 6”

**Level of Development :**

TRL 5

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Aerospace substrate and hydrocarbon gases

**Major Plant Equipment and Machines required:**

Plasma Enhanced Chemical Vapour Deposition  
and Physical Vapour Deposition

Scanning Electron Microscopy

UV-Vis Spectroscopy

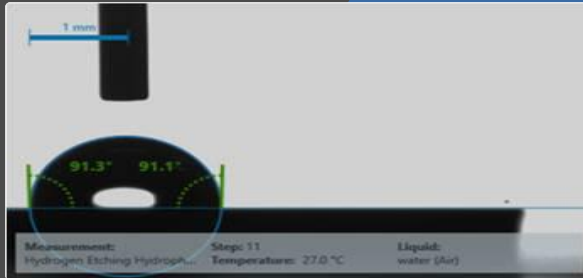
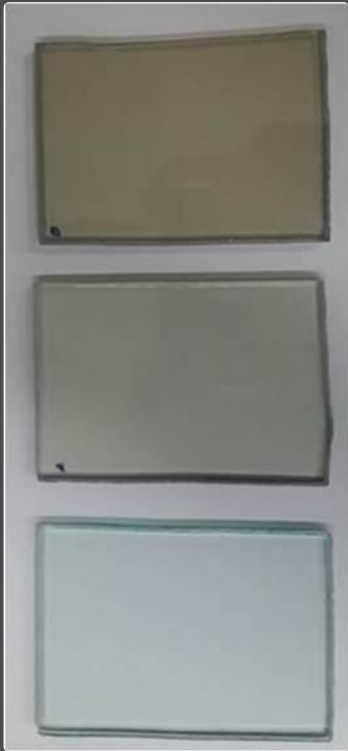
Raman Spectroscopy

**Techno economics :**

Indigenous development of technology and having high potential in space and defence application

**Technology Package:**

Process Technology for development of such coatings



## SALIENT FEATURES

High hardness diamond like carbon films which can be deposited without heating

# Process for Scratch Resistant and Hydrophobic Surfaces

**Specification:**

Hardness of 2500 HV approximately  
COF of 0.05-0.1

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Depends on the substrate given

**Major Plant Equipment and Machines required:**

Plasma Enhanced Chemical Vapour Deposition

Raman Spectroscopy

Nano Indenter

Contact Angle Measurement

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of Diamond like Carbon film development.

**Technology Package:**

Process Technology for implementation of Diamond like Carbon films



## SALIENT FEATURES

High hardness diamond like carbon films which can be deposited without heating

# Process for Scratch Resistant and Aesthetic Surfaces

**Specification:**

Hardness of 2500 HV approximately

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Depends on the substrate given

**Major Plant Equipment and Machines required:**

Plasma Enhanced Chemical Vapour Deposition

Raman Spectroscopy

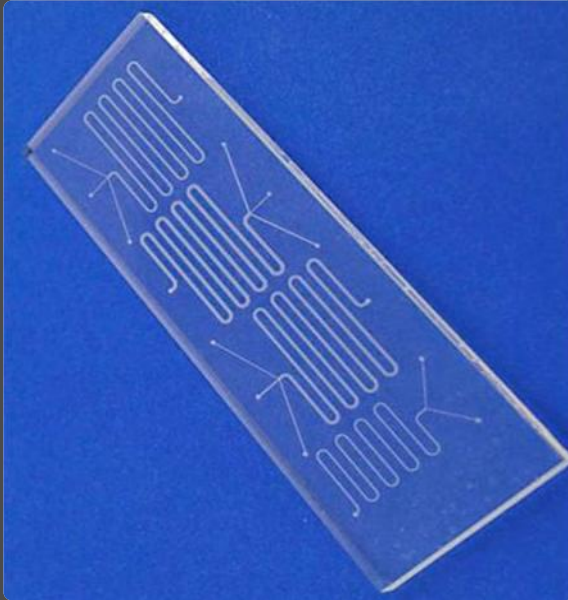
Nano Indenter

**Techno economics :**

Indigenous. development of technology and having high potential in commercialization of Diamond like Carbon film development

**Technology Package:**

Process Technology for implementation of Diamond like Carbon films



## SALIENT FEATURES

State of the art process technology  
to fabricate micro-fluidic channels of  
varying dimensions using Ultra Fast  
Pulsed Laser

# Process Technology for Micro-fluidic Channels

**Specification:**

Minimum feature size can be as small as 1  $\mu\text{m}$

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Plant Equipment and Machines required:**

High Precision Ultra Fast Pulsed Laser Micro Machining System

**Materials for fluidic channels:**

Borosilicate glass

Quartz

Fused silica glass

PDMS

PMMA

Polycarbonate (PC) etc

**Technology Package:**

Process Technology for Laser machining.

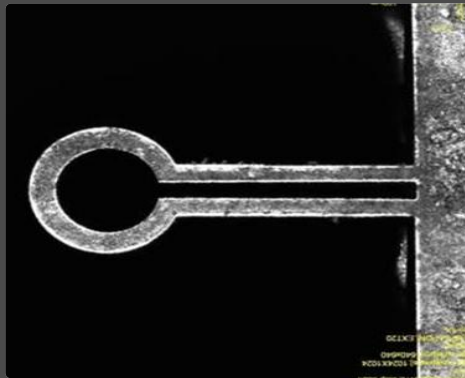
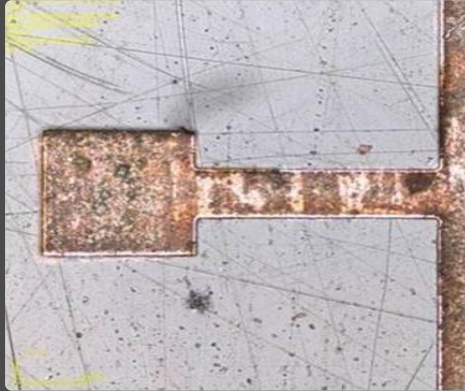
**Industries / Application include:**

Point-Of-Care (POC) devices

Stem cell research & cell culture

Chemical biology

Biological studies



## SALIENT FEATURES

State of the art process technology  
to fabricate micro-cantilevers of  
varying dimensions using Ultra Fast  
Pulsed Laser



# Process Technology for Micro-Cantilever

**Specification:**

Micro-cantilever of minimum feature size as small as 1  $\mu\text{m}$  and a minimum thickness of up to 3-5  $\mu\text{m}$  can be fabricated

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Silicon, Nickel, Copper, NiTi & TiN

Polymers like SU-8, PDMS etc

**Major Plant Equipment and Machines required:**

High Precision Ultra Fast Pulsed Laser Micro Machining System

**Micro-cantilever Applications:**

To detect physical, chemical, and biological particles (target materials) with extremely high sensitivity and selectivity

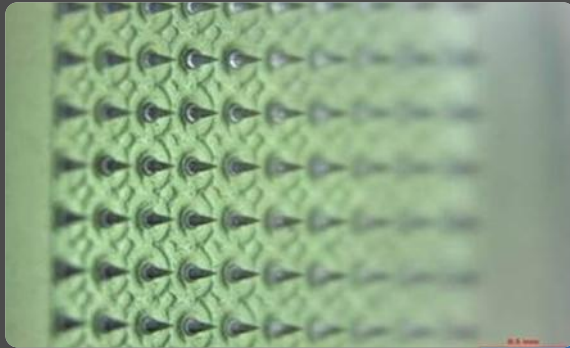
To penetrate tissue in therapeutic and diagnostic applications

As tweezers or grippers for pick and place applications of Nano-sized particles or microscopic surgeries

As transport mechanisms for sensors to detect Nano-size particles on a surface

**Technology Package:**

Process Technology for Laser machining



## SALIENT FEATURES

Process technology for micromachining of micro needle of varying sizes on different metals and polymers.

Substitute for import items

# Process Technology for Micro Needles

**Specification:**

Tip diameter down to 10  $\mu\text{m}$   
Base diameter: 100 to 1000  $\mu\text{m}$   
Height: 100 to 1000  $\mu\text{m}$

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

SS 316, Bio compatible materials like PMMA

**Major Plant Equipment and Machines required:**

High Precision Micro Machining Centre  
High resolution optical microscope

Confocal Microscopy

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of Micro needles development.

**Technology Package:**

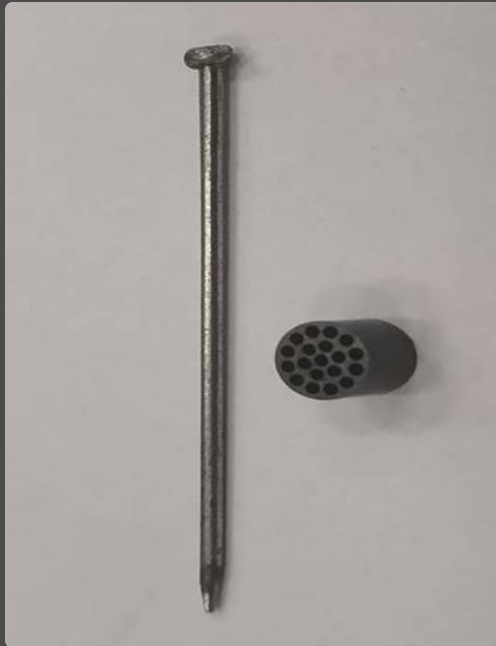
Process Technology for Micromachining

**Technology Package:**

Process Technology for implementation of Diamond like Carbon films

**Industries/ Application include:**

Bio potential measurement  
Drug delivery



## SALIENT FEATURES

Process technology for Micro holes  
drilling using Micro Milling/ Micro  
EDM of feature size in few microns

# Process Technology for Micro Holes Drilling

**Specification:**

Minimum hole dia : 50 µm

Hole dia : 50 µm to 1000 µm

**Level of Development :**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Copper, SS

**Major Plant Equipment and Machines required:**

High Precision Micro Machining Centre

Micro EDM Machine

High resolution optical microscope

**Techno economics :**

Technology for Micron holes drilling.

**Technology Package:**

Process Technology for Micromachining

**Industries/Application include:**

Fuel injection nozzles

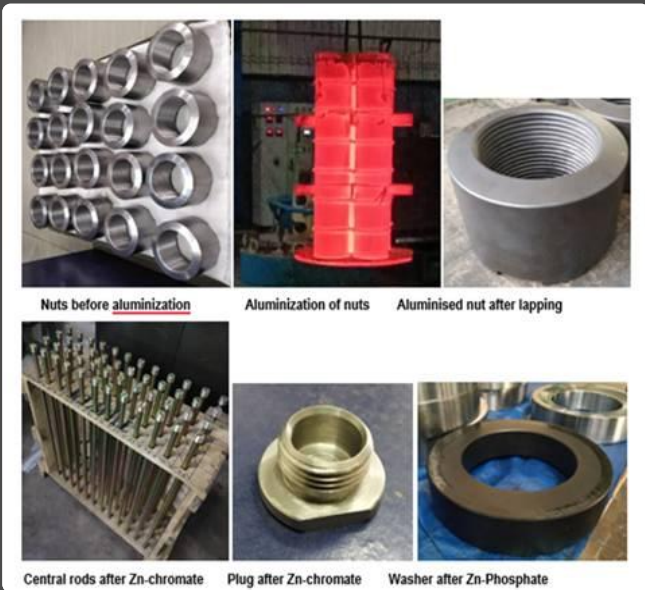
Micro filters, micro reactors

Orifices

Drug delivery systems

# SALIENT FEATURES

Characterization of Consistent Aluminium diffusion layer over thread profile (flank, crest, and root) on the threaded specimen is maintained at 60 – 150  $\mu\text{m}$ , Surface finish less than 1.6  $\mu\text{m}$  and hardness at 300 – 320 BHN. Purity, Particle size, Homogeneity of the aluminizing mixture and Hermetic sealing solutions Establishment of Aluminization cycles.



# Process Technology for Aluminium Diffusion

**Level of Development :**

TRL 9

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Low alloy steel

**Major Plant Equipment and Machines required:**

Heat treatment furnace with temperature control of  $\pm 10^{\circ}\text{C}$

**Techno economics:**

Indigenous development of technology and having high potential in general coating industries for commercialization.

Its highly effective coating for corrosion protection of fasteners which remain in tightened condition in open atmosphere for long duration like wind mill, Automobile applications. Fasteners can be loosened easily without much effort.

**Technology Package:**

Composition of Aluminisation mixture  
Aluminisation cycles to be followed  
Packing and sealing of retorts  
Post cleaning of article after aluminisation

**Industries/Application include:**

Nuclear reactor  
Gas turbine  
Medical  
General industry articles subjected to heavy corrosion



## SALIENT FEATURES

Laser drilling of micro-holes into glass and polymer vials/ ampoules for the purpose of leak test hole system validation. A range of hole sizes can be created in order to replicate defects in vials for use when calibrating leak detection devices.



# Process Technology for Leak Test Hole Drilling for Container Closure Integrity Testing (CCIT)

**Specification:**

Depending upon the wall thickness of the vial/ ampoule, hole sizes can be as small as 1  $\mu\text{m}$

**Level of Development:**

TRL 7

**Status of Commercialization:**

Ready for Technology Transfer

**Major Plant Equipment and Machines required:**

High Precision Ultra Fast Pulsed Laser Micro Machining System

**Packaging Elements for CCIT:**

Vials, Ampoules, Pouches (filled or unfilled), Bags, Filled and Sealed Bottles, Metal containers, Foil and blister packs

**Techno economics :**

Indigenous development of technology and having high potential in commercialization of the process

**Technology Package:**

Process Technology for Laser machining

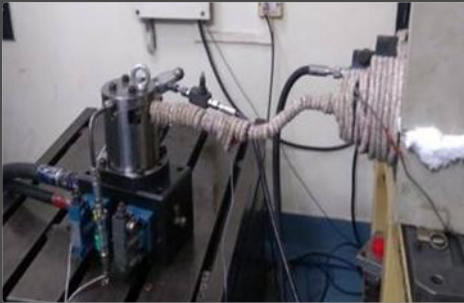
**Industries / Application include:**

Pharmaceutical

Medical Device

Biotechnology

Food / Packaging



## SALIENT FEATURES

To conduct pressure impulse test on hydraulic elements with pressure pulse of 420 bar up to 5Hz with hydraulic fluid at +135°C and -40°C. Design of intensifier and heating system for maintaining the required pressure and temperature.

# Process Technology for Pressure impulse testing of hydraulic elements with Hyd fluid at elevated Temperature

**Level of Development :**

TRL9

**Status of Commercialization:**

Ready for Technology Transfer

**Major Raw materials Utilized:**

Depends on the substrate given

**Major Plant Equipment and Machines required:**

Plasma Enhanced Chemical Vapour Deposition

**Techno economics:**

Indigenous development of technology for testing of fatigue strength of the material at its extreme temperature.

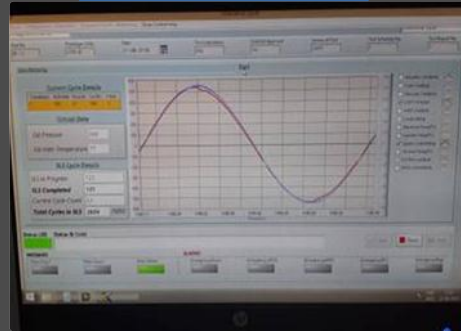
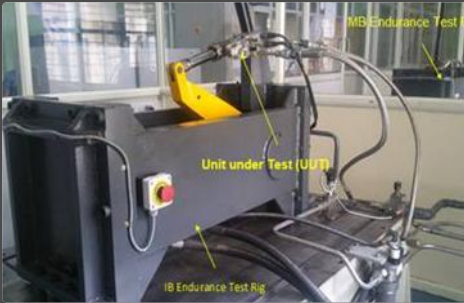
**Technology Package:**

Pressure impulse cycling of hydraulic LRUs with fluid at temperature 135°C and -40°C.

Real time pressure waveform monitoring and servo control for maintaining the pressure wave from and oil fluid temperature.

**Industries/Application include:**

Qualification testing of hydraulic LRUs.



## SALIENT FEATURES

To conduct endurance testing of actuator or cylinders by simulating the loading at various frequency at different temperature layering.

Real time controller for load tuning with respect to the load, stroke and frequency of operation.

Real time data logging and retrieval.

Controlled continuous supply of hydraulic oil at various temperature at 135°C max and pressure at 280 bar.

# Technology for Development of Endurance tester for simulation of real time loading Hydraulic elements with temperature layering

**Level of Development :**

TRL 9

**Status of Commercialization:**

Ready for Technology Transfer

**Techno economics :**

Indigenous development of technology for Heating of hydraulic oil to 135°C and continuous supply of fluid at pressure 280 bar

Design of hydraulic system and heat exchanger rated for continuous supply of hydraulic oil at 135°C and pressure at 280 bar

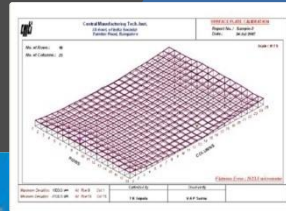
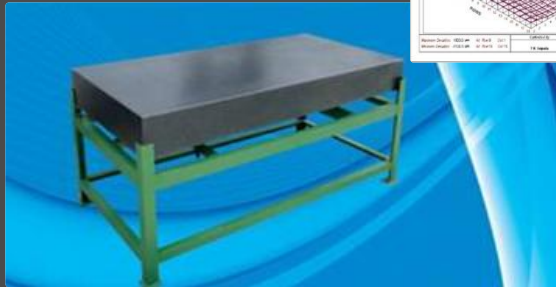
**Technology Package:**

Endurance cycling of Actuators at various fluid temperature from ambient to 135°C .

Real time data logging and retrieval, servo control for maintaining the load at various stroke and frequency by maintaining the required fluid temperature.

**Industries/Application include:**

Qualification testing of air worthy hydraulic actuator.



## SALIENT FEATURES

CSurFlat evaluates flatness of the working surface overall and also flatness of any local areas recommended in IS 2285 : 2003 / IS 7327 : 2003

CSurFlat supports grid pattern calibration method as per IS 12937 : 1990

CSurFlat evaluates flatness error by generating a regression plane determined by Least Square fit

# Software for Surface Flatness Evaluation

## Specification:

Windows based and user friendly, runs on Win-2000 / XP

Interactive screens display context sensitive operational instructions

Elaborate and detailed error, information and confirmation messages

Easy and fast learning. Training guide included

SurFlat is stand-alone as it uses built-in Data Base Management System

Facilitates database backup and recovery

Supports two types of grid measurements, double and single grid (IS 12937 : 1990)

Pre-filled and easy navigation grid formation for entering level readings

Automatically fills blank cells

Supports entries either in Arc Sec or in mm / met  
Flatness evaluation on the fly

The deviation of each measurement point is shown in tabular form and also in deviation plot with deviation zoom

Reports include evaluation details, table(s) of readings, deviation and deviation plot

All reports print custom company / laboratory name and logo(s)

Help is supplied in both WINHELP and HTML. Soft copies of help documents are also supplied in PDF form.

For further details contact:

Dr. N. Balashanmugam

Joint Director

balashanmugam.cmti@nic.in

+91-80-22188302/380

+91 (0) 9449842676

Mrs. Sharmila. M.R

SAO & Nodal Officer

sharmila.cmti@nic.in

+91-80-22188341/351

+91 (0) 9449842681