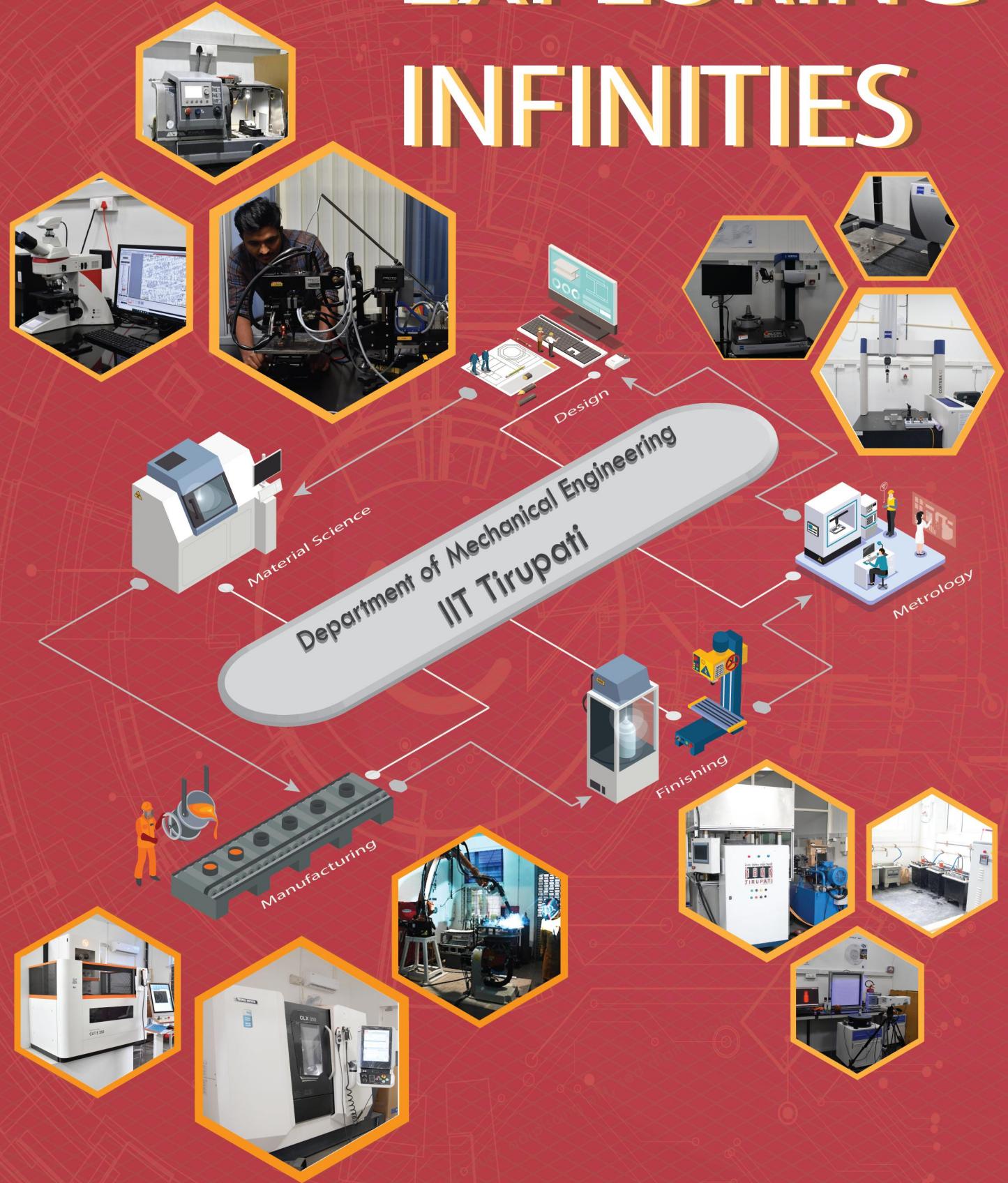


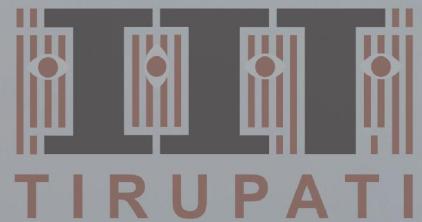
EXPLORING INFINITIES



Department of
Mechanical Engineering

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About the Institute

The Indian Institute of Technology Tirupati (IIT Tirupati), established in 2015, is an autonomous Institute under Ministry of Education, Government of India. IIT Tirupati started functioning with the support of its mentoring institute, IIT Madras, from the academic year of 2015-16. The academic programs consist of B.Tech, M.Tech, M.S. and PhD in the field of Civil & Environmental Engineering, Mechanical Engineering, Computer Science & Engineering, Electrical Engineering and Chemical Engineering. Also, have M.Sc and research programs in the field of Chemistry, Mathematics & Statistics and Humanities & Social Sciences. The curriculum for various programs have an emphasis on theoretical knowledge and practice-oriented laboratories. Courses are well planned to nurture innovation, creativity, quality, teamwork, communication skills, ethics, and societal interaction.

About the Department

The Department of Mechanical Engineering, established in 2015, offers B. Tech, M. Tech (in Design and Manufacturing), and PhD programmes. The Department offers common undergraduate courses titled 'Engineering Drawing' and 'Engineering Mechanics' to B. Tech students of all the engineering disciplines of IIT Tirupati. The faculty members of the Department are engaged in research in the areas of Solid Mechanics and Design, Thermal and Fluid Engineering, Manufacturing Engineering and Materials Research, and Robotics. Also, a wide range of advanced industry relevant courses are offered in line with the current research topics relevant to the Department and interdisciplinary research. The Department is highly active in organizing symposiums, seminars, and workshops to train the faculties and students from the Institute and other institutions, simultaneously promoting research collaboration. The Department is actively engaged in collaboration with industries, research organizations, and other universities on the research problems of contemporary relevance. The world class laboratory facilities available in the department in Design, Thermal and Manufacturing Engineering fields along with the highly talented department faculties enables the possibility of Industry- Academia collaboration.

MESSAGE

From the Inspiring Minds



Dr. K.N. Satyanarayana
Director
IIT Tirupati



Dr. Madan Mohan Avulapati
Head of the Department
Mechanical Engineering

Research Facilities at IIT Tirupati



RESEARCH Facilities at IITT

Design
Facilities

Specimen Preparation
and
Material Charactrization
Facilities

Manufacturing
Facilities

Joining
Facilities

Measurement
Facilities





Manufacturing Facilities



CNC Milling Machine

CMX 600V
DMG MORI

Description:

The machine has an improved C-frame concept with movable table as X-axis and a rigid Y-axis. It possesses a sophisticated design and optimized construction. The thermal compensation ensures a stable, precise and highest quality production process. It has 6 µm accuracy of positioning in all axes without linear scales.

Features:

Siemens controller

Perfect 3D Control Technology.

19 inch multi-touch control panel

Fast and convenient "zoom" features

45 degrees swivel range offers decisive user benefits.

Quick and convenient access to parameters and user data

FEM-optimized design & construction with small footprint.

Rigid C-frame concept for higher stability and perfect ergonomics

Accuracy of positioning in all axes of 8 µm (according to ISO 230-2)

Specifications:

Longitudinal travel: 600 mm

Cross travel: 540 mm

Vertical travel: 500 mm

Clamping area: 900x500 mm

Maximum workpiece weight : 500 kg

Spindle speed: 20-12000 rpm

Accuracy :10 microns

Applications:

Automobile

Aerospace

Manufacturing industries

Hydraulic and pneumatic components

CNC Turning Machine

CMX CLX 350
DMG MORI

Description:

The CLX 350 has high machining performance and is perfect for mass production. It has linear guides for the X and Z axes to ensure high machine dynamics. The machine ensures high quality, compactness and resistance to torsions.

Features:

Siemens controller

3D Control Technology.

19 inch multi-touch control panel

Fast and convenient "zoom" features.

More efficiency for machining with a bar feeder.

45 degrees swivel range offers decisive user benefits.

Quick and convenient access to parameters and user data.

Complete machining of complex parts thanks to sub spindle and Y-axis.

Y axis with travel range ± 40 mm for superior milling operations, i.e. for complete lateral surface machining.

Specifications:

Max. turning diameter: 320 mm

Max. cutting length with tailstock: 530 mm

Max. chuck size: 250 mm

Max spindle motor speed: 5000 rpm

Drive power rating (100% DC): 11 kW (AC)

Max. bar capacity diameter: 65 mm

Maximum swing diameter: 610 mm

Torque(100 % DC) : 112 N·m

Accuracy: 10 microns

Max. workpiece weight: 400 kg

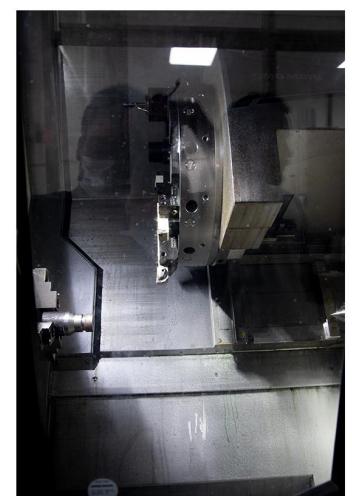
Applications:

Automobile

Aerospace

Manufacturing industries,

Hydraulic and pneumatic components



CNC Wire Cut-EDM

AgieCharmilles CUT E 350
GF Machining Solutions

Description:

The AgieCharmilles CUT E 350 range puts efficiency at the touch of your finger with a smart, easy-to-use human-machine interface (HMI) and onboard technologies that streamline your job setup, improve your cutting speed, improve your surface finish, protect your valuable workpieces and ensure your process robustness.

Features:

Large touch screen human-machine

Intelligent Power Generator (IPG) further improves cutting speed, precision and surface quality

Accurate cutting of large and heavy parts

The POWER-EXPERT module automatically determines the optimal power to send through the wire, which is especially beneficial in stepped parts.

Wire: 0.25mm brass or zinc coated

Dielectric fluid: Deionized water

Contour accuracy: 5 µm

Best Ra Tungsten Carbide/Steel: 0.12/0.18 µm

Work area: 820 mm×680mm×245 mm

X-, Y-, Z- axis travel: 350 mm×250mm×250 mm

U-, V- axis travel: ± 45 mm

Taper angle/ Height: ± 30°/56mm

X, Y, U, V, Z measurement resolution: 0.1 µm

Speed of axis movement: 0-3000 mm/min

Software module: AC cam software

Max. workpiece weight: 400 kg



Applications:

Possible to machine difficult to cut materials; Machining of complex shapes

Computerized Multi-task Casting Machine

Description:

It is a Declaration of Conformity of European Standards certified stir casting machine with a capacity of 700 gms to 2 kg of Aluminium or Magnesium. It is integrated with KANTHAL APM Coils as the heating element, permanent magnet DC motor controlled gate valve with 4 reduction gears, permanent magnet DC motor operated stirrer with a twin-fin blade, preheating furnace for the reinforcement with Nichrome wire as the heating element and inert gas mixing system.

Attachments:

1. Vacuum Die Casting Setup: Containing a Stainless steel tank with a silicon gasket to store the vacuum of 700 mm Hg, portable metallic mould with preheater of 450 °C capacity.
2. Squeeze Die Casting Setup: Containing a 10hp 3-phase motor controlled hydraulic press with 150-ton capacity, mild steel die with preheater of 400 °C capacity, L-shaped runway with a heater of 800°C capacity
3. Ultrasonic Vibrator: a 20 kHz, 60 - 100 % adjustable 2500 watt power capacity and ultrasonic liquid processor type vibrator with 30 mm horn diameter.

Features:

1. Computerized Equipment
2. Auto cut-off at the extreme positions of the stirrer
3. Auto UP & Down while stirring
4. Auto-stop at Open & Close positions of Gate valve
5. Inert gas mixing system for melting Magnesium



Abrasive Flow Finishing

Custom made by
Dr. M. Ravi Shankar

Description:

This process is also known as electrolytic polishing, electropolishing, and anodic polishing. The process works on the principle of the anodic dissolution by the law of electrolysis. In other terms, it is a controlled corrosion process to remove material from the anodic surface. The ECP process setup comprises of the electrolytic solution, anode and cathode electrodes, and a power supply. When the electric supply is provided to the electrochemical cell, the electrolytic solution dissociated into the ions, and the positive and negative charges move towards their respective electrodes. This process extensively used for finishing of the internal and external surfaces of any complex features.

Features:

Hydraulic pressure: 0-21 MPa

No of cycles: max 10,000

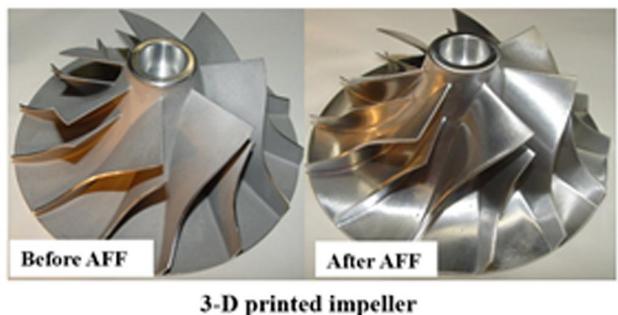
Stroke length: 0-85 mm

Maximum abrasive medium volume: 1.5 L

Maximum height of component to be polished: 200 mm

Applications:

Finishing of nozzles micro holes, aerospace components, additive manufactured components, conformal cooling channels etc.



Electrochemical Polishing

G.V. Enterprisers

Description:

This process is also known as electrolytic polishing, electropolishing, and anodic polishing. The process works on the principle of the anodic dissolution by the law of electrolysis. In other terms, it is a controlled corrosion process to remove material from the anodic surface. The ECP process setup comprises of the electrolytic solution, anode and cathode electrodes, and a power supply. When the electric supply is provided to the electrochemical cell, the electrolytic solution dissociated into the ions, and the positive and negative charges move towards their respective electrodes. This process extensively used for finishing of the internal and external surfaces of any complex features.

Features:

Heater: 0-80 °C

Rectifier: 0-80 V and 0-150 A

Tank capacity: 1feet x 1 feet x 1 feet

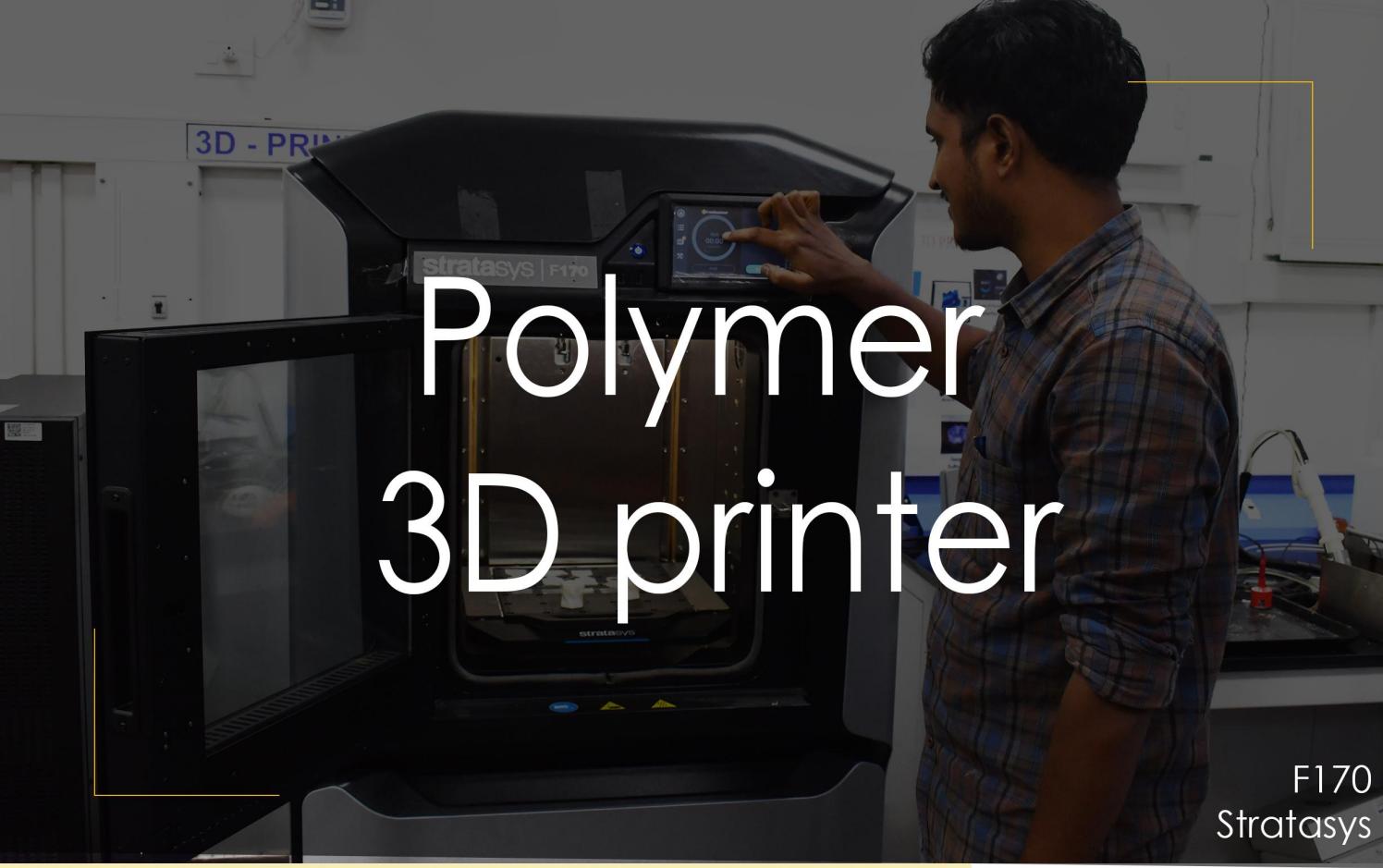
Cathode materials available: stainless steel, lead and titanium

Applications:

wind tunnels,
turbine blades,
micro nozzles,

Finishing of the aerospace components,
additive manufactured lattice structures, etc.





Polymer 3D printer

F170
Stratasys

Description:

Stratasys F170 gives the option of up to four different materials, along with our easy-to-remove soluble support material. Create complex parts and assemblies with no compromise on accuracy, detail and repeatability. However intricate the part, the soluble support dissolves to leave a pristine finish, requiring no hands-on removal. Stratasys' Fused Deposition Modeling (FDM) technology provides prototype parts, including internal features, which can be used to field-test form, fit, and function and material bay containing two model and two support spools which allow for auto changeover.

Features:

maximum build area : 10 x 10 x 10 inch (254 x 254 x 254 mm)

Printable materials: ABS,PLA

Accuracy: Parts are produced within an accuracy of +/- .200 mm

Layer thickness: 0.254 mm

Software: Grab CAD print

Applications: Automobile industry, Aerospace industry ,Additive manufacturing.



Tandem Wire Arc Additive Manufacturing (TWAAM) Setup

KUKA Robot KR 16 R2010

Description:

The Kuka KR16 R2010 robotic model is characterized by its high accuracy of ± 0.04 mm maximizing its power at high speed. With a load capacity of 16 kg up to 19.2 kg in order to improve the dynamic performance of the robot and an arm reach of up to 2013 mm, ideal for large parts handling, assembly and palletizing applications. Equipped with the powerful KRC4 controller.

Features:

Maximum reach 2013 mm
Maximum payload 19.2 kg
Rated payload 16 kg
Rated supplementary load, rotating column / link
arm / arm
0 kg / 0 kg / 10 kg
Pose repeatability (ISO 9283) ± 0.04 mm
Number of axes 6
Mounting position Floor;
Ceiling;
Wall;
Desired angle
Footprint 430.5 mm x 370 mm
Weight approx. 255 kg

Applications:

Arc welding
Assembly
Handling
Measuring/Inspection
Cutting/Separation
Palletizing/ Packaging
Machining
Cleanroom for other areas
Applying/Painting/Glueing
Laser welding

Spray Dryer

Spraymate

Description:

For fast & efficient spray drying of aqueous and organic solutions. Supports various Atomiser Nozzle types viz. Co-current, Counter current, Ultrasonic. Ideal for R&D, product development work and can spray dry even a small patch of 50 ml. PC based software SprayWin for online control and monitoring of spray dryer.

Features:

Aseptic GMP design

Power Rating: 3000W

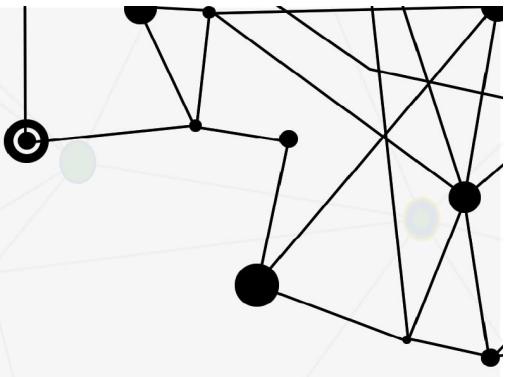
Evaporation Capacity: 1.0 L/H₂O/hr max

Aspirator Blower Capacity: 118Nm³ /hr max

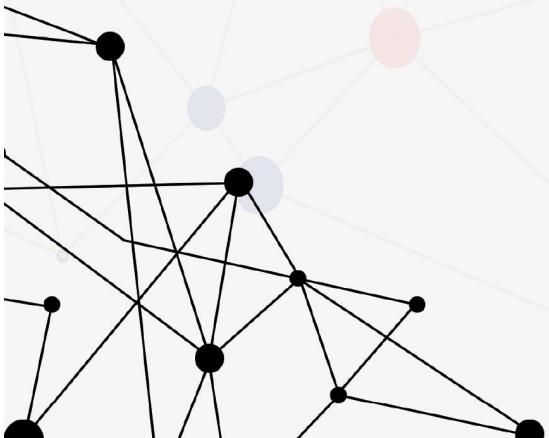
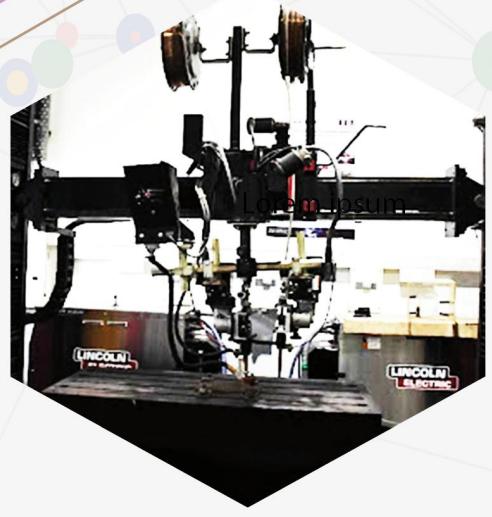
Applications:

Pharmaceutical, Ayurvedics,
Herbals, Food Products,
Biochemical, Fragrances,
Flavor, Aromatics, Pesticides &





Joining Facility



Hot/Cold wire Gas Tungsten Inert Gas (H-GTAW) Welding setup

Frontius Magic Wave 4000

Description:

The Fronius MagicWave 4000 is a completely digitised TIG AC/DC power source with ActiveWave technology that is used especially for aluminium applications, and is characterised by the softest possible yet highly stable arc. Apart from the different power categories from 170 to 500 A, the devices also vary in their mobility – from the portable device to the high-power stationary complete system. The MagicWave features an extremely robust design and an exceptionally self-explanatory operating concept.

Features:

AC/DC GTAW power source.

Torch oscillations at 0-140Hz.

Welding current range: 3-400 A.

Travel speed of modular plate: 1-50mm/s.

Magic wave technology for precise heat control.

Torch vertical and cross adjustment: 0-300mm and 0-600mm.

Applications:

Aerospace industries

Automobile industries

Marine industries

Cladding

Narrow Groove/Gap Tandem Submerged Arc Welding (SAW-T) setup

Power wave AC/DC 1000 SD

Lincoln electric (welding power source)

Primo automation systems (gantry system and welding table)

Description:

The Power Wave AC/DC 1000 SD delivers Waveform Control Technology to submerged arc welding. Choose constant current or constant voltage operation and set variable frequency and amplitude. Software-driven AC, DC positive or DC negative output allows the user to control the deposition rate and penetration. The result over conventional power sources is increased weld speeds, consistently higher quality welds and improved efficiencies in a single or multi-arc environment.

Features:

Industry 4.0 readiness.

AC/DC tandem SAW power source.

Can perform narrow groove joining.

Welding current range: 100 – 1000 A.

Waveform controlled technology for precise heat control.

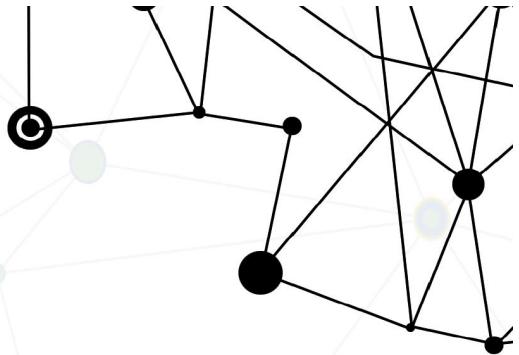
Gantry system (horizontal slide: 2000 mm and vertical slide: 750 mm).

Maximum workpiece length: 1000 mm and Maximum travel speed 42 mm/s.

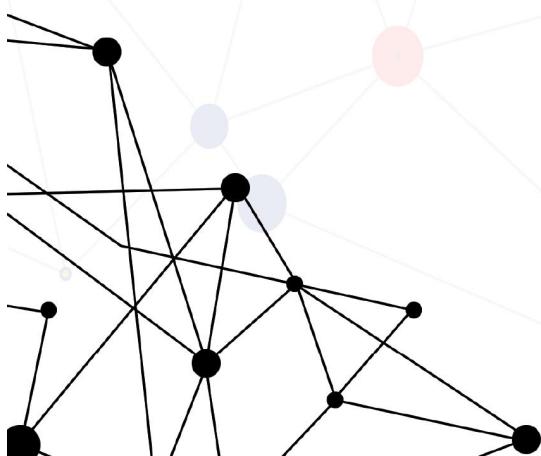
Applications:

All heavy fabrication industries

Ship building, spiral pipe welding, pressure vessel welding, cladding...etc.



Measurement Facility



Co-ordinate Measuring Machine

Zeiss Measuring Machine
Contura G2

Description:

The robust machine design of CONTURA G2 ensures reproducibly precise measuring results and allows for the option of passive or active technology. CONTURA G2 RDS VAST XXT is optimally used for measuring complex features and parts with multiple angles that require very small stylus, as ZEISS RDS articulating probe holder can reach 20,376 positions in 2.5° increments.

Features:

Measuring Range: 700 mm × 700 mm × 600 mm

Resolution: 1.8 µm

Accuracy: 1.8 µm

Max. load: 2000-3000 kg.

Applications:

Measurement of coordinate points
Industries.



CNC Surface Roughness and contour Measurement

ZEISS SURFCOM NEX 031SD-12-1

Description:

The surfcom nex 031sd-12-n contour and roughness measuring station allows you to measure the minuscule radii, bevels, angles cut-ins and length tolerances. It gives high productivity through completely automated measurements.

Features:

Measurement of minuscule radius, bevels, angles cut-ins and length tolerances.

Distance and angle measurements with freely selectable profile points.

2D & 3D display and analysis of topographical measuring data.

The linear drive enables quick and precise measurements.

Wide range of evaluation possibilities.

Fast generation of measuring reports.

Powerful SURFCOM MAP software.

Vibration-free measurements.

Important Specifications:

X-Measuring range : 100.

X-axis indication accuracy (μm) :

Lateral $\pm (1.0 + 1.0 L/100)$ MPE.

X-axis accuracy : 2 μm / 100 mm.

Measuring speed mm/s : 0.03 to 20.

Z-axis Measuring range (mm) : 60 mm.

Software module : surfcom Map software.

Straightness accuracy (P_t) : 0.15 $\mu\text{m}/100$ mm.

Gauge Resolution : 0.1 nm for roughness & 40 nm for contour.

Applications:

Automobile, Aerospace, Hydraulic and pneumatic components, Bearing industry, Medical industry.



Form Tester

RONDCOM NEX Rs Alpha-300-SD-21

Description:

The machine is a highly-accurate form tester and is a comprehensive version. It provides enhanced measurement functions for different types of workpieces, excellent maintainability, and an ergonomic design that combines beauty and usability. It is the perfect combination of function and design.

Features:

Mechanism capable of measuring various kinds of work without interfering with the R axis as standard equipment.

By using two measurement data of 0° and 180° , an evaluation algorithm that cancels error due to temperature change or bus line deviation is standard installed.

Special rotary table for precisely measuring form errors on the R, T and Z axes.

Measures inner and outer diameters with high repetition accuracy.

Offset type CNC detector holder.

Specifications:

Straightness over Column Length: $0.15 \mu\text{m}/300\text{mm}$.

Straightness over Total measuring: $0.7 \mu\text{m}/180\text{mm}$.

Horizontal Arm Axis Movement range : 180 mm.

Rotational accuracy: $(0.02+3.2H)/10000 \mu\text{m}$.

Software module: surfcom Map software.

Resolution Horizontal Arm Axis: $0.1 \mu\text{m}$.

Speed of traverse (H A A) : 30mm/sec.

Resolution: $0.1 \mu\text{m}$ (Column Axis).

Speed of Traverse: 60 mm/s.

Column Length: 300 mm.



Applications:

Automobile, Aerospace, Hydraulic and pneumatic components, Bearing industry.

Non-Contact Measurement of Angles

Taylor Hobson Ultra High Precision Digital Autocollimator

Description:

The autocollimator is flexible, affordable, easy-to-use and read. They are extremely accurate instruments with a wide variety of applications. It is ideal for ultra-precision measurements and indexing of small angles.

Features:

Measuring range: 300 secs.

Simple touch-screen operation.

Laser sighting aid for easy set up.

Simultaneous two axis display 0.001 sec.

Simultaneous dual axis operation and display.

High accuracy: 0.1 seconds over central 100s (0.2 seconds over full range).

Applications:

Cranes.

Satellite testing.

Air compressors.

Printing presses.

Aircraft assembly jigs.

Steam and gas turbines.

Marine propulsion machinery.



Height Gauge

Digimar 817 clm
Mahr

Description:

The new Height Measuring Instrument Digimar 817 CLM with the innovative Quick Mode. Highly accurate rapid measurements, a wide range of measuring and evaluation options and excellent operator comfort.

Features:

Measuring force N 1.0 ± 0.2 .

Repeatability μm 0.5 (plane) 1 (bore).

Measuring error* μm $(1.8+L/600)$. L in mm.

Perpendicularity error (elect. adjusted) μm : $10\mu\text{m}$.

Operating time of rechargeable battery h up to 16.

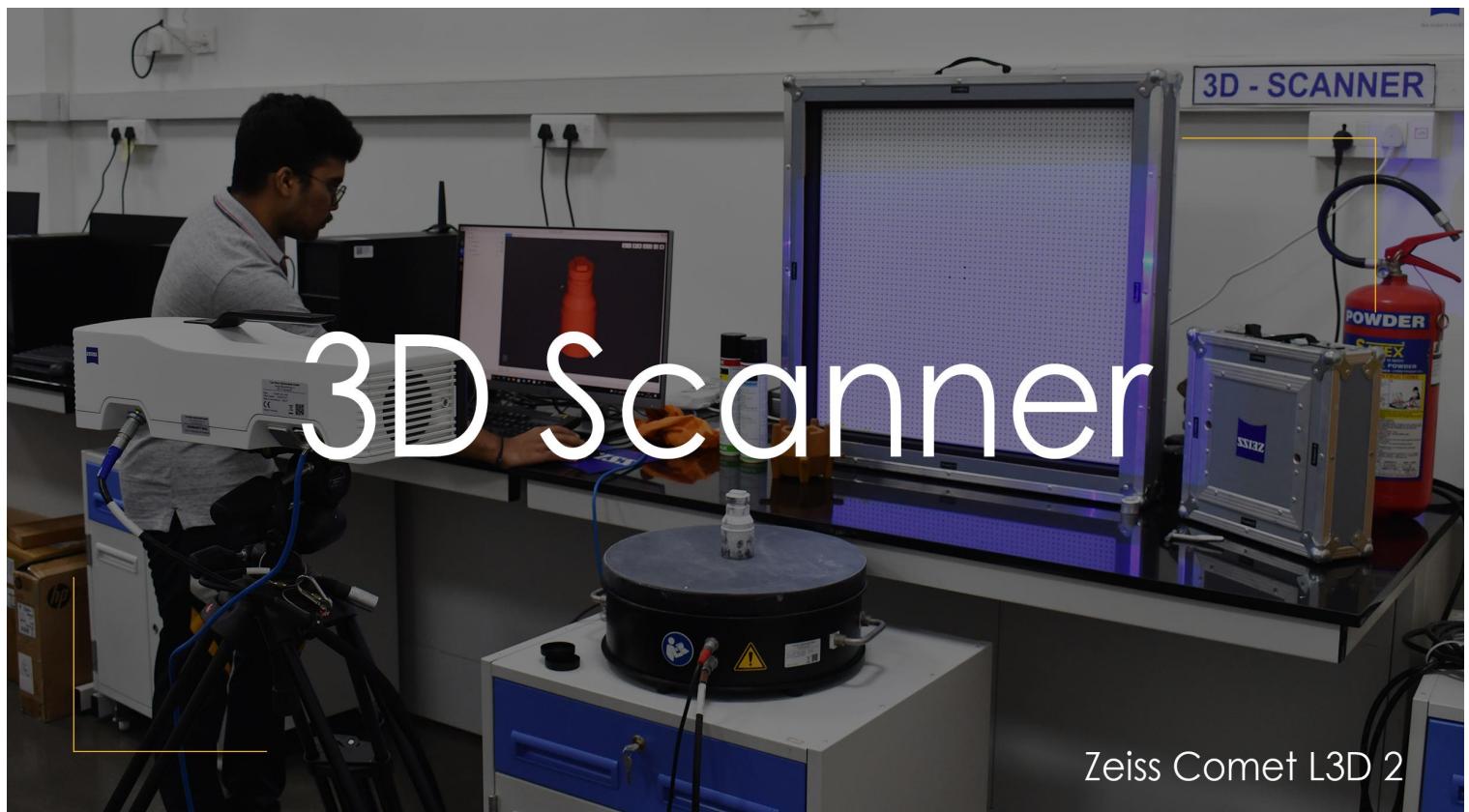
inch 0.001" / 0.0005" / 0.0001" / 0.00005" / 0.00001".

Resolution mm 0.01 / 0.005 / 0.001 / 0.0005 / 0.0001.

Measuring range : 0 - 350 mm, 0 - 600 mm, 0 - 1000 mm.

Applications :

Automobile, Metrology or Metal working, Manufacturing.



Zeiss Comet L3D 2

Description:

Zeiss Comet L3D 2 is the latest evolution of the COMET L3D lineup. The ultra-compact 3D sensor offers great flexibility, a high measuring speed and impressive performance. It is also equipped with a camera of 5 MP which allows it to reach a 2448 x 2050 resolution. It is portable and with different fields of views (FOV), the system is converted to scan several formats of work pieces in an ideal manner.

Features:

Generates virtual CAD model from physical model.

Measuring volume:

For 100 mm model: 118 X 98X 60 mm³

For 250 mm model: 255 X 211 X 140mm³.

Surface comparison with report function.

Camera Resolution :2448 X 2050 pixels.

Fast triangular network generation.

Non contact type instrument.

Intuitive network processing.

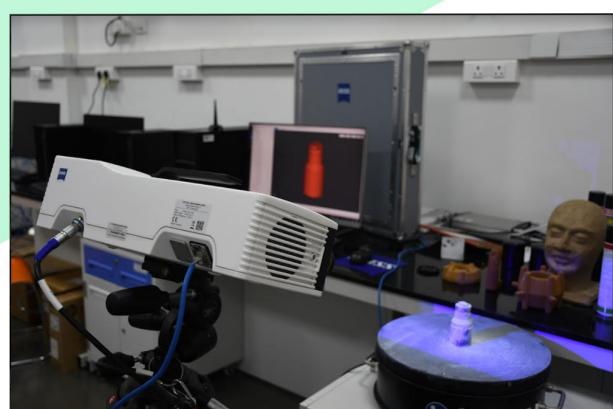
Working distance: 760 mm.

Applications:

Reverse Engineering.

Additive manufacturing.

Rapid prototyping.



Vibration DAQ System

OROS OR36

Description:

The OROS OR36 has a compact-size and autonomy; the instrument perfectly serves the on-site measurement (predictive maintenance, commissioning, building vibration) for consultants. With a comfortable computing power and its built-in removable SSD, OR36 fulfill the in-flight test applications. It offers the capability of an advanced laboratory instrument in a modular, rugged and portable package.

Features:

Rugged 4 to 16 channels chassis

Portable: 5.2 kg (11.4 lbs)

4, 8, 12 or 16 universal inputs

1 to 4 real-time computation

ForceDSPs



Rheometer

RST Cone Plate Rheometer

Description:

The RST-CPS Rheometer is great for cones and plates as well as plate to plate system for small volumes and wide shear rate ranges. Rheological evaluation through controlled stress and controlled rate measurements provide comprehensive viscosity flow curves, thixotropic response, yield stress determination, creep analysis and viscosity vs. temperature profiling.

Temperature controller:

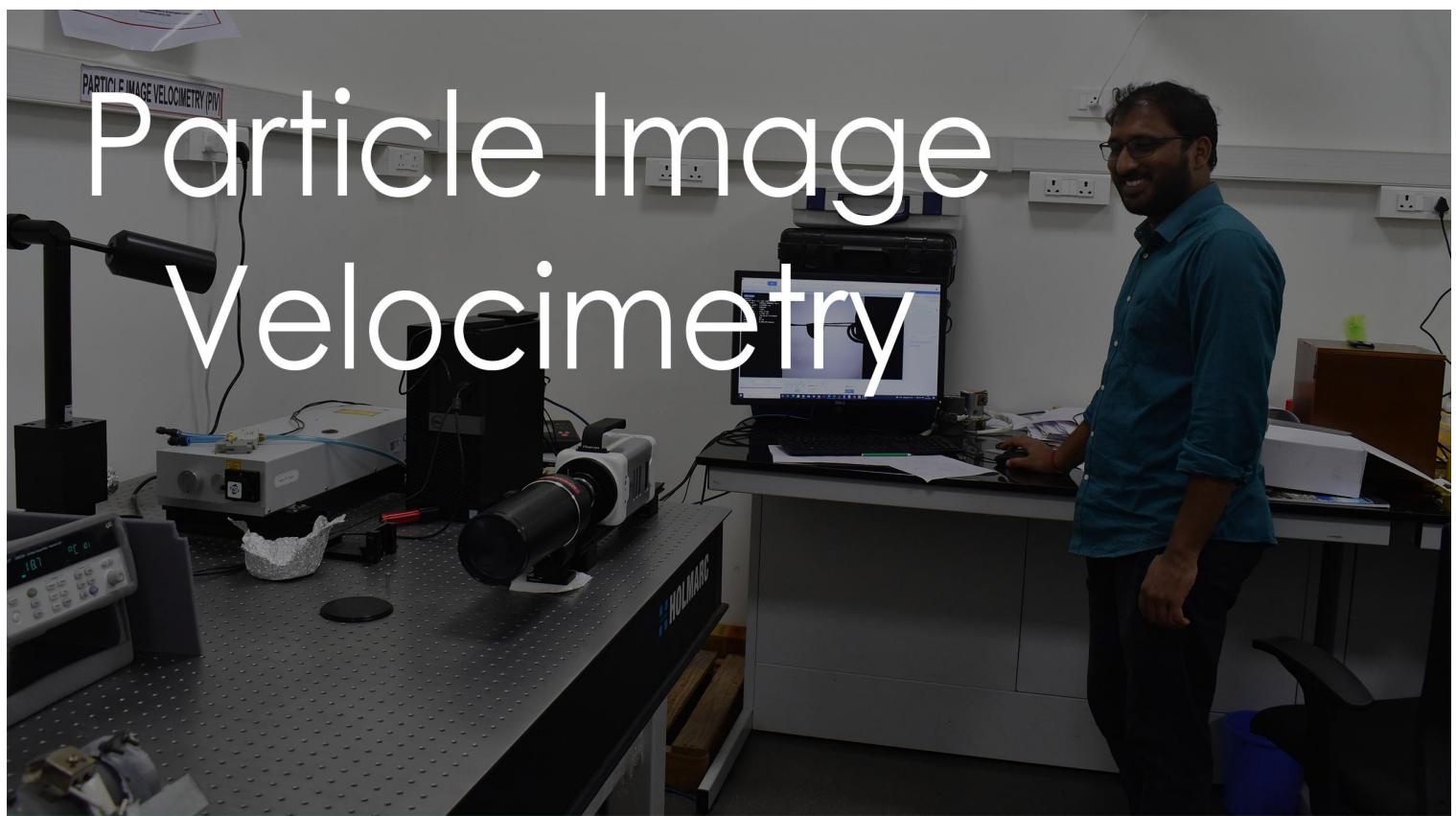
Model	TC-550AP
T Low	-20°C
T High	+200°C
Temperature Stability	0.01°C
Reservoir Capacity	7.0 Liters
Max flow rate	16 LPM

Features & Applications:

- Auto spindle identity recognition.
- Spindle barcode for auto spindle recognition.
- Quick and easy automatic or manual gap setting.
- Quick connect coupling for easy spindle attachment.
- User-friendly LCD touch screen with graphical display.
- 11 memory slots for structured multi-step test programs.
- 21 CFR compliance for controlled user access and data security.
- Optional Rheo 3000 Software for PC control and data management.
- Controlled stress/rate operation to analyze comprehensive flow behavior.
- Rapid temperature control of plate with Peltier option for quick profiling of viscosity vs. temperature.



Particle Image Velocimetry



PIV Results

Instantaneous planar velocity vector fields
Higher-order quantities such as vorticity,
shear stress, Q-criterion, and turbulent energy
A sequence of images can provide temporal
flow characteristics (flow evolution)

Specifications:

Max Output 1200mj
Pulse Duration 4ns
Wavelength 1064nm, 532nm, 355nm
Leaser Medium Nd:YAG

PCT PRO E&E

Setaram PCT PRO E&E

Description:

It is a fully automated Sievert's instrument for measurement of gas sorption properties of materials.

The device is designed for the measurements of chosen gas sorption (H_2 , CO_2 , CH_4 , N_2 , Ar, He) in a solid sample (bulk, foils, powders) in following modes:

- automated measurement of pressure-Composition Isotherms (PCT, PCI).
- automated temperature programmed desorption (TPD) - dynamic measurements.
- automated measurement of kinetics and rate constants of sorption as a function of pressure and temperature.
- automated measurement of cycling sorption and PCT isotherms.

Specifications:

Pressure measurements: 4 pressure transducers.

Calibrated reservoirs: 5 high pressure calibrated volumes.

PID software controlled Aliquot sizing – Fixed P , ΔP or $f(\Delta P)$.

Sorption Gas: Carbon Dioxide, Methane, Nitrogen, Argon, Hydrogen.

Temperature range: - 260°C to 500°C with different sample holder's options.

Operating pressure range: From vacuum to 200 bar *Pressure regulation:* automated.

Maximum sensitivity Sorption Gas: 3 μ mole of gas (with the Micro Doser attachment).

Pressure regulation: 2 transducers for vacuum to 200 bar *Experiment pressure:* 1 transducer for vacuum to 200 bar 1 transducer for vacuum to 5bar *Accuracy:* 1% of the reading.

Applications:

X-Ray, neutron diffraction, Molecular sieves (zeolites, MOF's, etc. for gas separation and vapor removal), Methane adsorption on substrates.

Phased array NDT Ultrasound scan

Omniscan MX2
Olympus

Description:

The OmniScan MX2 is a modular instrument that is fully compatible with most phased array modules already in the field. Its technology platform allows for fast and easy software and phased array module upgrades ranging from 16:64 to 32.128 configurations. It comes with all software options including Multigroup, Time-of-Flight Diffraction (TOFD) and the new Weld Overlay Wizard software that facilitates the creation of industry standard weld overlays for analysis assistance and volumetric flaw placement. Wizards during setup and calibration, a high S-scan and A-scan display refresh rate, and a fast pulse repetition frequency (PRF) make the OmniScan MX2 an efficient inspection too.

Features:

Effective digitizing frequency : up to 100 MHz
Maximum pulsing rate : Up to 10 kHz (C-scan)
Portable: 3.2 kg

Applications:

Composite inspection, Pressure vessel weld inspection etc..

Digital Image Correlation (DIC-2D)

VIC-2D
Correlated Solutions

Description:

The VIC-2D system utilizes optimized correlation algorithms to provide non-contact, full-field, two-dimensional displacement and strain data for mechanical testing on planar specimens. In-plane displacements are measured at every pixel subset within the area of interest, and full-field strain is computed with many tensor options. It measures in-plane displacements and strains over 2000% with measurement resolution as low as 10 microstrain possible. Specimen sizes ranging from microns to meters are measured easily, and with a built-in microscope distortion correction and SEM drift correction module, the software is the most flexible and powerful 2D DIC software on the market.

Features:

Frame Rate : 75 Hz

In-Plane Displacement Resolution : 0.00005

Strain Resolution : ~10 micro strain

Strain Range : from 0.005% to >2,000%

Applications:

Testing of Flat specimen in tension,
shear, crack growth, fatigue/cyclic and more



Sample Preparation and Material Characterization Facility



Precision cutting machine

Brilliant 220
ATM

Description:

The BRILLIANT 220 can be fitted with up to three automatic axes (X, Y, Z) and several cutting modes for maximum flexibility and ideal use of space. With its modular construction and different options and clamping tools the cutting machine Brilliant 220 can be easily equipped for specific applications. It is especially suited for precise cutting of small parts of different geometries. Use of a vacuum sample holder allows cutting of thin sections and unmounted samples with a precision of 0.001 mm

Features:

Speed variable: 300 – 5000 rpm.

Max. cutting capacity: Ø 75 mm.

Cutting wheel: up to Ø 203 mm.

Cutting chamber (WxD) : 405 X 500 mm.

Y axis (vertical) : 80 mm and *Z-axis (cross feed) :* 80 mm.

Vacuum sample holder and laser indicator to select cutting location of sample.

Applications:

Especially suited for precise cutting of small parts of different geometries. SEM, TEM analysis samples can be cut.



Hot Mounting Press

Bain mount-H Auto
Chennai Metco, India

Description:

The Bainmount-H auto gives a uniform flatness for further grinding and polishing. It is also used in areas where advanced mono layer preparations of moulds are required. Advantageous for particles, Powder and Grain analysis. Hydraulic fully automatic system with advanced touch screen. The process sequence is executed automatically. Mould assemblies can be exchanged quickly and without tools.

Features:

Diameter of ram is 30 mm.

Stainless steel body pressure gauge system.

Wide range of samples can be accommodated.

The process sequence is executed automatically.

Provision to accommodate 38 mm and 51 mm mould size(s).

Digital Temperature Indicator and digital timer with LCD Display system.

Fully hydraulic, water-cooled hot mounting press for mounting samples before polishing.

Applications:

To prepare Bakelite mounted samples for SEM analysis, TEM analysis, Hardness studies...etc.

Automatic Polishing Machine

Bainpol-auto
Chennai Metco, India

Description:

The Bainpol-auto is a fully automatic variable speed single disc polisher with an innovative polisher head which can polish six samples simultaneously for metallography studies.

Features:

Variable force: 1 to 4 bar.

Variable speed: 50-600 RPM.

300 mm single aluminium disc.

Polisher head variable speed: 50 to 200 rpm.

Electronic control with LC-Display with Digital timer.

Holds 6 sample moulds (interchangeable mould sizes).

Single pressure specimen loading, Pneumatically applied.

Automatic dozers system to feed diamond suspension during the polishing.

Applications:

To polish Bakelite mounted samples for SEM analysis, TEM analysis, Hardness studies...etc.

Heat treatment furnace

Nabertherm LHTC 08/16
Nabertherm Germany

Description:

This is a muffle furnace of LHTC 08/16 type consisting of SiC Rods as heating elements inside the walls. The durability of the SiC rods in periodic use, in combination with their high heating speed, make these high-temperature furnaces to all-rounders in the laboratory. Heating times of 20 - 25 minutes to 1400°C can be achieved. High heating rate capacities are available for heating.

Features:

Volume: 8 Litre.

Heating elements: SiC rods.

Max temperature: 1600 °C.

Heating time to T max: 60 minutes.

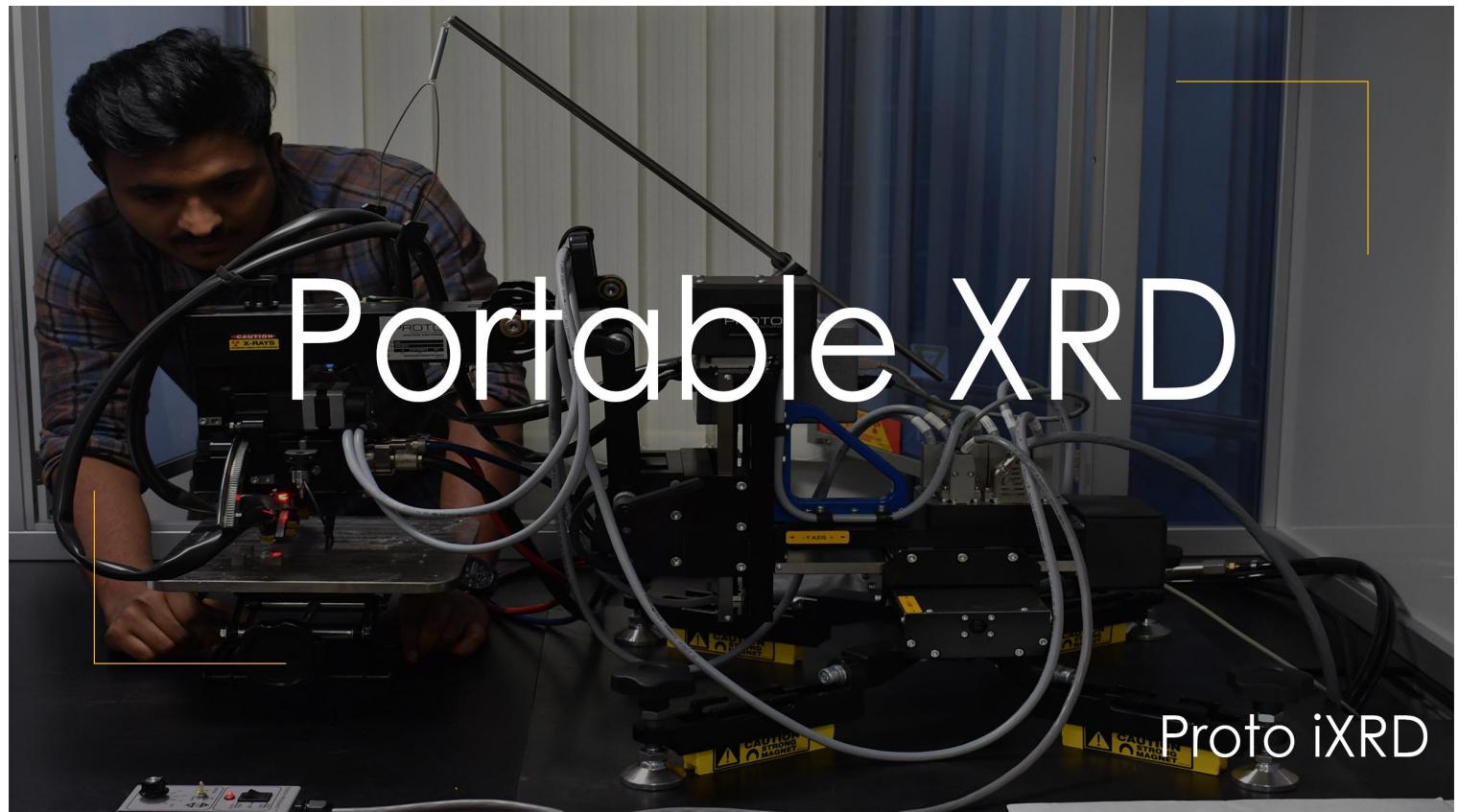
Furnace casing: double walled casing.

Temperature controller: PID based microprocessor temperature controller.

Furnace inner dimensions: width: 170mm, depth: 290 mm and height: 170 mm.

Applications:

Heat treatment (heating and holding for specified time) of different metal samples with increased/decreased heating rates up to a temperature of 1600 degree Celsius.



Portable XRD

Proto iXRD

Description:

It is 300W self-contained control unit. With integrated high-voltage supply, x-ray tube cooling, motor control, system electronics, and a display panel for KV, mA, and interlocks, this system provides everything you need to run measurements safely and reliably.

Features:

Manual and automatic focusing option for smaller and critical cross sections. 200 watt fine focus X-ray tubes (cr, cu, mn) for mild steel, aluminium, stainless steel respectively.

Goniometer with integrated phi axis and tri-axial measurement option.

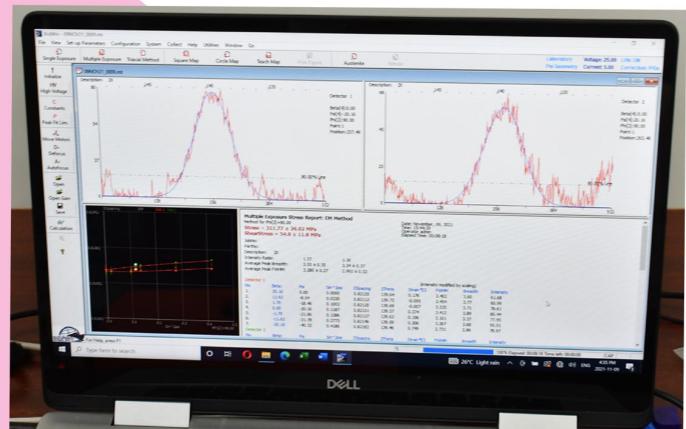
Electro polishing for sub layer residual stress measurement.

Allowable stress range: As per ASTM E2860.

Retained austinite measurement.

Applications:

Automobile industry,
Aerospace , marine
and Additive manufacturing.



Metallurgical Microscope

Leica DM4M

Description :

The microscope automatically recognizes the selected contrast technique and objective in use, accurately opens and closes the aperture and field diaphragms, and adapts the light intensity. This microscope also be used in particle analysis, phase, or grain analysis, reproducibility matters.

Features:

Manual 3-plate stage ergonomically placed, programmable buttons.

Coded 6-fold or 7-fold objective nosepiece.

LED illumination for all contrast modes.

Manual 2-gear focus drive.

Illumination Manager.

Contrast Manager.

Contrast modes:

Differential Interference contrast,

Brightfield, Darkfield,

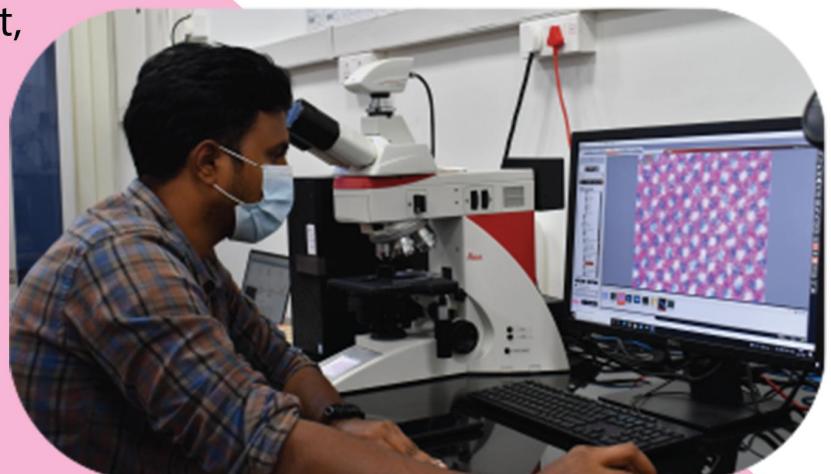
Polarization, Fluorescence

Applications:

Automobile industry,

Aerospace,

Additive manufacturing.



Stereo Microscope

S9i
Leica

Description:

The microscope automatically recognizes the selected contrast technique and objective in use, accurately opens and closes the aperture and field diaphragms, and adapts the light intensity. It offers a zoom range of .61x - 5.5x for a total magnification of 6.1x - 55x with 10x eyepieces. The integrated 10 M.P. The camera offers 1080P HD video display and capture via HDMI cable.

Features:

Integrated, network-camera for easy image sharing.

The S9i delivers real-time images with up to 35 frames.

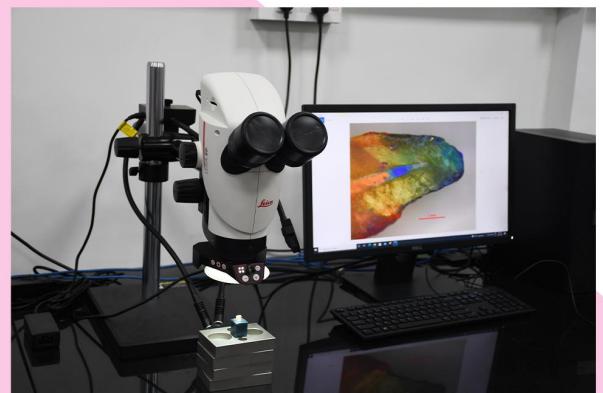
122 mm working distance for easy sample manipulations under the microscope.

Fusion optics technology with 12 mm depth of field to find details faster

High magnification up to 55x and 9:1 zoom for quick changes from overview to details.

Applications:

Automobile industry, Aerospace , marine and Additive manufacturing.





Design Facilities



Designing Software Licenses

Computer Center (CC) supports the institute with different licensed software to avoid the usage of pirated or unlicensed version of the software.

Available Mechanical Design, Numerical and Computational tools:

MATLAB:

IIT Tirupati has subscribed to the Mathworks Total Academic Headcount (TAH) license for MATLAB, Simulink and other add-on products. The TAH license allows the installation of all these products on the Institute PCs or Personal PCs for teaching, research and learning.

AutoCAD:

AutoCAD is a commercial computer-aided design (CAD) and drafting software application.

Creo Software:

Creo Software is another computer-aided design (CAD) software. IIT Tirupati purchased 50 perpetual floating licenses of Creo Software for research and training purposes.

COSMOL:

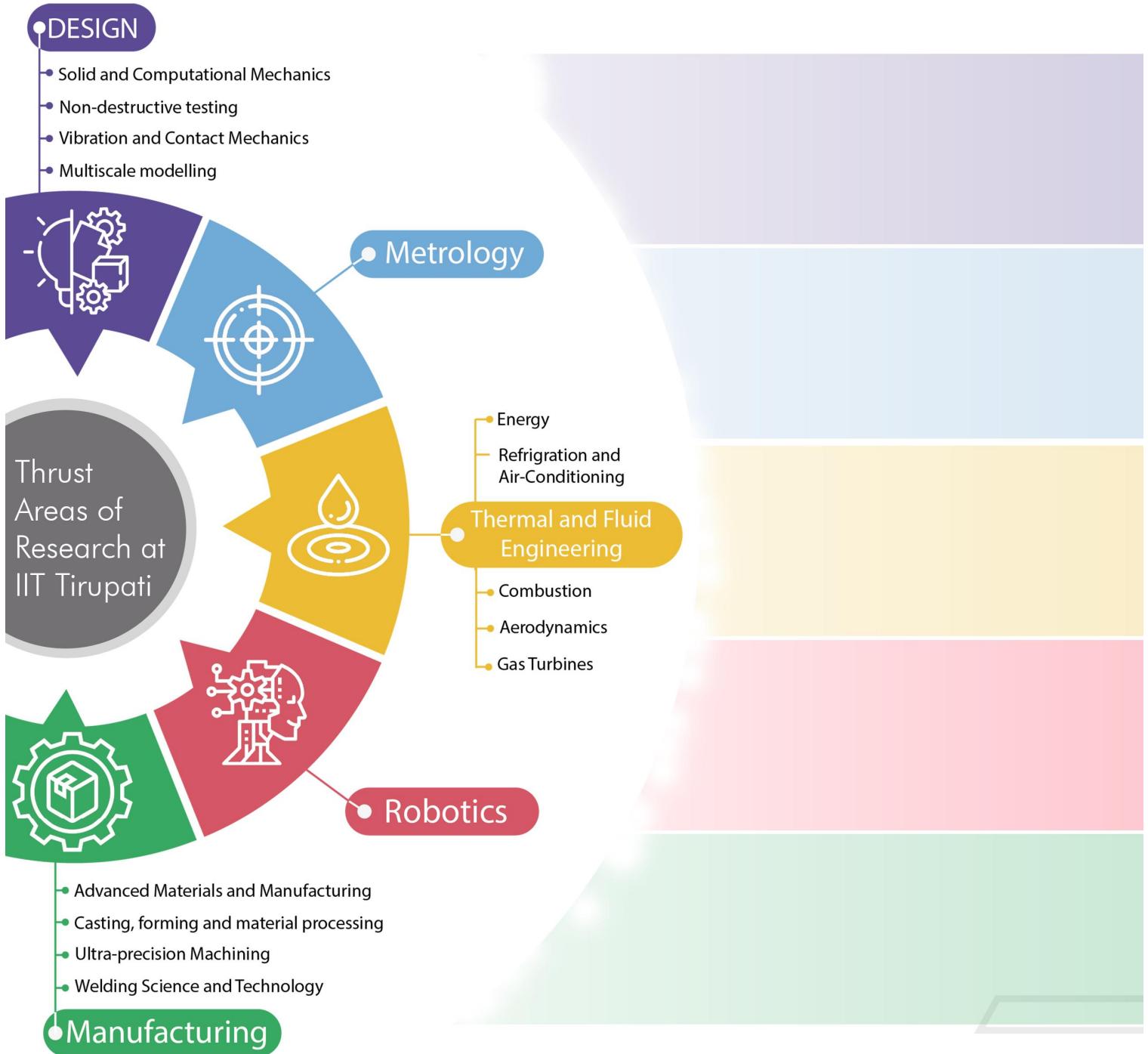
It is a cross-platform finite element analysis, solver and multiphysics simulation software. IIT Tirupati has 50 perpetual floating licenses of COMSOL Multiphysics 5.4 software

Simulia Abaqus:

Simulia Abaqus FEA is software for finite element analysis and computer-aided engineering.

Thrust Areas

IIT Tirupati has huge emphasis on research. Students and Faculties are actively involved in research



Faculty Details



Dr. Madan Mohan Avulapati

Assistant Professor and Head of the Department

Ph.D - Indian Institute of Science(IISc), Bangalore ,India.

Areas of Interest : Liquid atomization, Combustion, Alternative fuels for IC engines and gas turbines.

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Faculty Details



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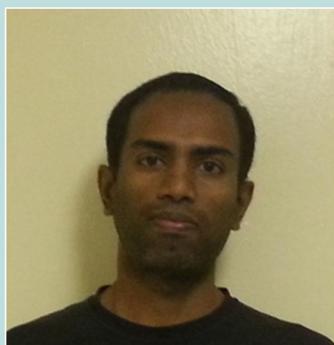
Dr. P. Venkataraman

Assistant Professor

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Areas of Interest : Hydraulic fracturing, Multiscale modeling.

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Dr. Yujendra Mitikiri

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