



Surface and Materials Testers

Product Overview



Hardness, Friction, Roughness,
Coating Adhesion, Wear, Film Thickness
Elastic Modulus, 3D Topography, Defects



Rtec-Instruments

Total solution in material surface testing

Rtec Instruments develops and manufactures advanced mechanical and optical surface characterization testing instruments. We supply high-precision, reliable, and innovative product lines to solve your research and quality control needs. With unwavering customer support and new application development assistance, we lead several new technological fronts such as space, EV, coatings, and sustainability drive.



Applications

The complete solution for surface and material characterization for various industries including:



Automobile



Semiconductor



Aerospace



Optical



Hard Coating



Renewable Energy



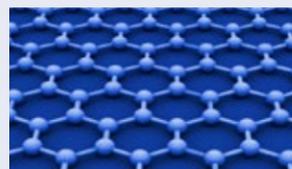
Materials



Bio-Materials



Thin Films



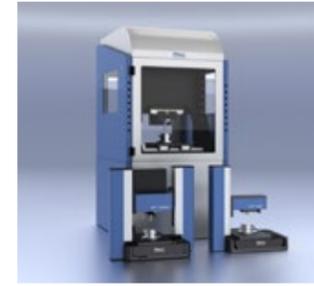
2D Materials



Battery Research



Bearings



Multi Function Tribometers

MFT Series

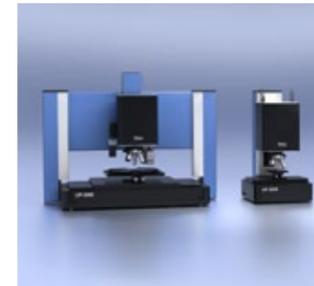
The most versatile and advanced existing tribometers with interchangeable test modules and environmental chambers to perform several tests on one platform.



Indentation and Scratch Testers

SMT Series

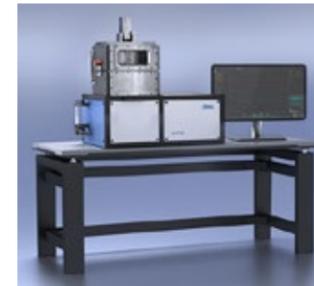
These powerful benchtop surface materials testers are for nano to macro indentation and scratch characterization. Accurately and reliably measure surface properties, such as hardness, adhesion, roughness, and elastic modulus.



3D Optical Profilometers

UP Series

The high-speed optical profilometers are a 5-mode in-1 surface inspection system. In fact, they work across a multitude of surfaces—transparent, opaque, rough, or smooth.



Vacuum Tribometer

MVT-2

Study surface mechanical properties in a vacuum across a wide load and speed range. Cryogenic cooling and high-temperature capabilities mimic real-life conditions.



Fretting Testers

FFT Series

Run fretting wear tests from a micron stroke to several mm. Test across a wide load, speed, and temperature range.



Additional Surface and Material Testers

HFRR, SRV, Air Jet Erosion, 2 Roller, 3 Roller, & CMP Tester

Rtec-Instruments provides the right tools necessary to characterize and analyze any coating, lubricant, and material.

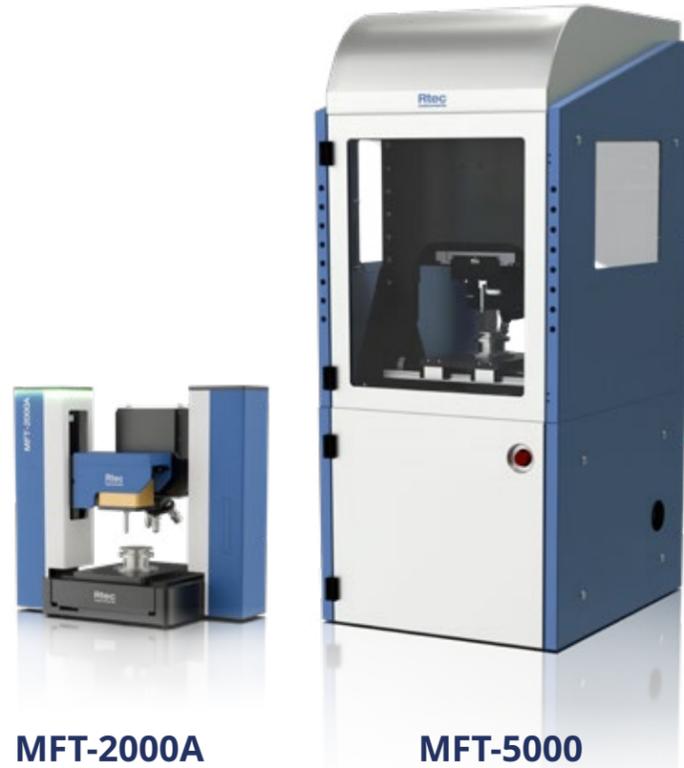
Multi Function Tribometers

MFT Series

The Multi Function Tribometer series performs various tribological and mechanical tests, including friction, wear, hardness, modulus, roughness, and lubrication testing on one platform. In addition, the tribometer features advanced capabilities such as patented in-situ imaging, capacitive force sensors, and multiple testing modes. It is also highly customizable and adaptable to suit specific testing requirements, making it ideal for various applications in materials research and quality control.

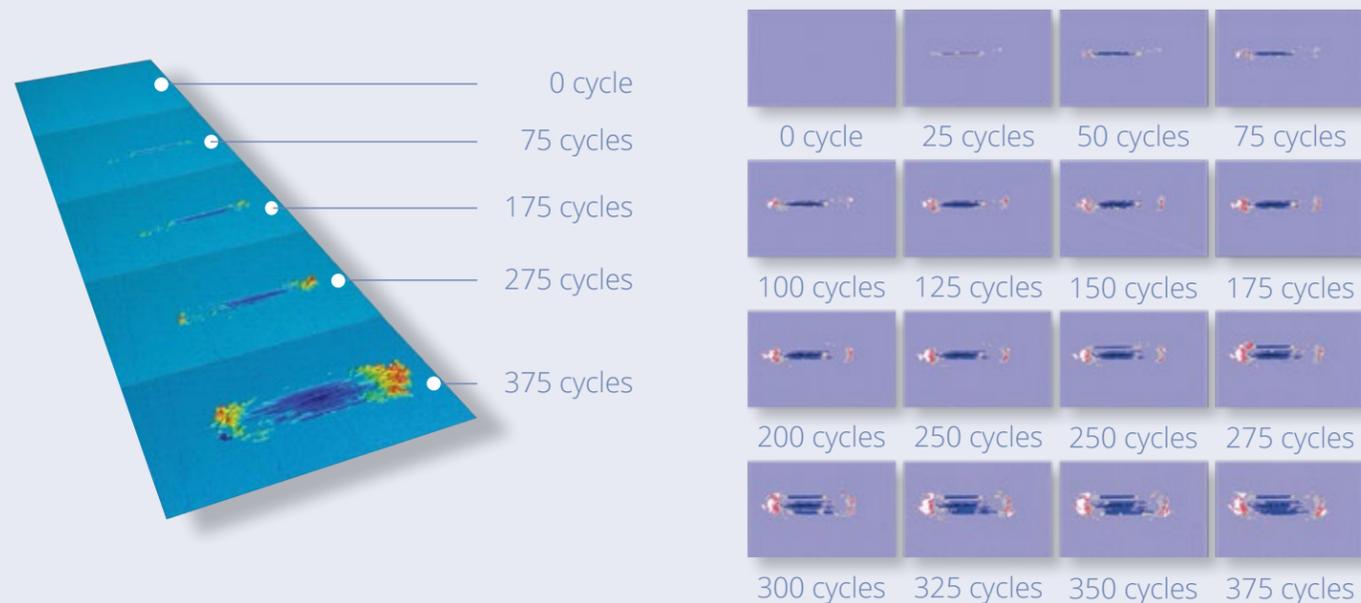
Main Features:

- Integrated 3D profilometer
- Closed-loop down force control
- -120 °C to 1200 °C temperature
- Modular – interchangeable modules
- Fully motorized stage X, Y, Z



MFT-2000A Load Range up to 100/200 N* **MFT-5000** Load Range up to 10,000 N
*Depends on configuration

Sub-nanometer 3D Image of Wear Mark Progression During Test



Commonly Used Modular Drives and Chambers



Electrified Modules



Available Sensors

Capacitive Sensor (Patent # 1017938GB2) / Piezo Sensors / Torque Sensors / 1D, 2D, 6D Sensors / In-line Dynamic Torque Sensors / Acoustic Emission / Temperature / Electrical Contact Resistance

Indentation and Scratch Testers

SMT Series

The precise PiQ Nanoindentation Tester SMT-2000 measures surface properties such as hardness and elastic modulus at the nanoscale. Compact materials surface tester SMT-5000 is an all-in-one modular platform that measures hardness (instrumented indentation), scratch adhesion & cohesion, scratch hardness, film thickness, and multi-pass wear at the nano and micro scales.



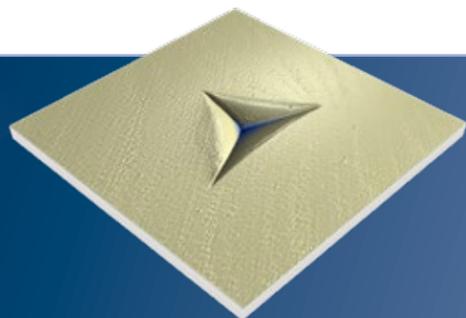
SMT-2000

The smart nanoindenter combines piezo actuation and capacitive sensing technologies. Highest precision measurements of mechanical properties, such as hardness, elastic modulus, and creep.



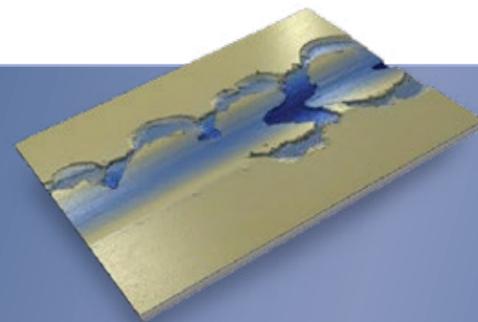
SMT-5000

Indentation, scratch, and wear on one platform with nano-to-micro range. Patented in-line 3D imaging and non-destructive film thickness measurement. AFM option is available.



Instrumented Indentation (IIT)

Hardness, elastic modulus, creep, and fatigue can be determined on almost any material, from soft to hard and from fragile to brittle. Using the latest actuation (piezo) and sensing technologies (capacitive sensors), quantify the properties of surfaces from nano to micro ranges.



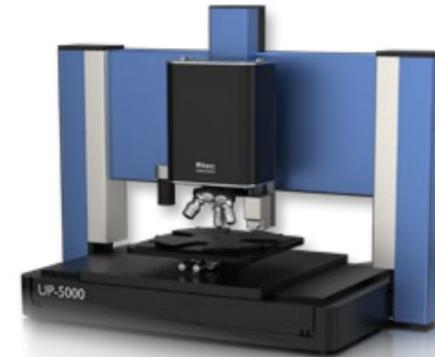
Scratch Testing

The 3D Scratch Tester combines the latest scratch testing technology with an in-line 3D Profilometer. Typical applications for the scratch tester are quantifying coating adhesion, cohesion, scratch resistance, and self-healing properties. Interchangeable modules allow nano, micro, macro, or heavy-duty range measurements.

3D Universal Optical Profilometers

UP Series

The 3D Universal Surface Profilometers perform highly accurate surface analysis to calculate surface roughness, step height, surface texture, 3D topography, and more with nm precision. One platform features several measurement modes (3D confocal microscopy, interferometry, dark field and bright field imaging, variable focus). In addition, it can also analyze chemical properties (Raman), film thickness (reflectance), and AFM with a click of a button.



UP-5000

3D Confocal Microscope, Interferometry, AFM, Raman, Spectral Film Thickness, and More



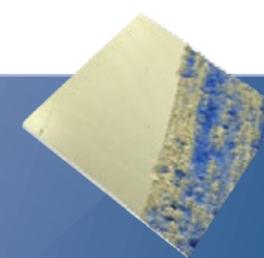
UP-3000

3D Confocal Microscope, Interferometry, Bright and Dark Field Imaging, and More

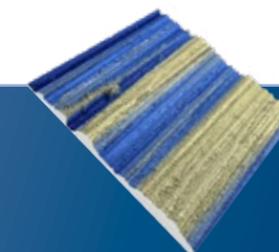


UP-2000

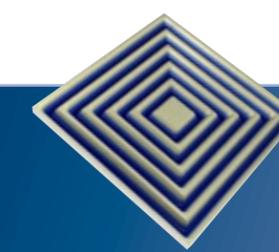
White Light Interferometer



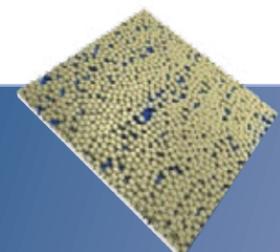
Transparent Materials



Smooth and Rough Materials



Shiny and Dark Materials



2D Materials

Spinning Disk Confocal

It is optimized to look at steep slopes, transparent, and translucent surfaces. Provides the fastest and highest XY-resolution 3D imaging and topography.

White Light Interferometry

Optimized to look at smooth, flat surfaces. Provides the highest Z resolution 3D imaging and topography of the surface.

Bright and Dark Fields

Imaging provides two different ways to look at the surface with additional illumination. Dark field identifies small cracks by showing them brightly on a dark background.

Variable Focus Imaging

In Variable Focus Imaging, a series of images are taken on different focal planes and analyzed to create an entirely in-focus final image.

Vacuum Tribometer

MVT-2

The Multi Function Vacuum Tribometer performs various tribological and mechanical tests, including friction, wear, hardness, and modulus testing on one platform.

Main Features:

- Load mN to 200 N
- Up to 400/1000 °C heating
- -150 °C cryogenic cooling
- Rotary and linear friction, wear, indentation, scratch, and modules



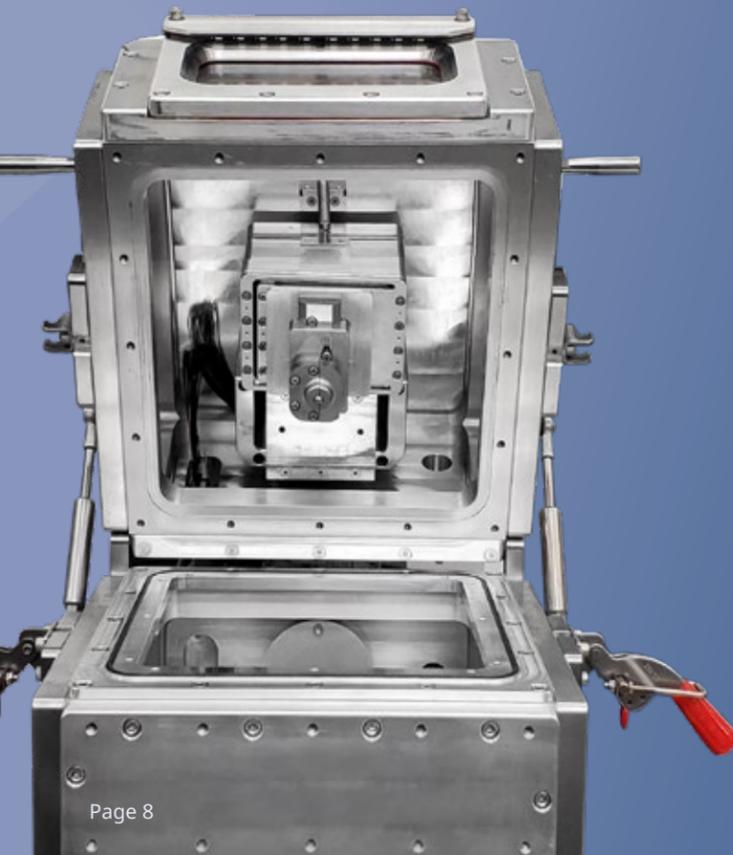
Fretting Testers

FFT Series

The state-of-the-art fretting wear testers provide outstanding stroke and frequency specifications in the industry. The ultra-rigid platform and unique system design also include advanced high-speed controllers, making it ideal for both industry and university research.

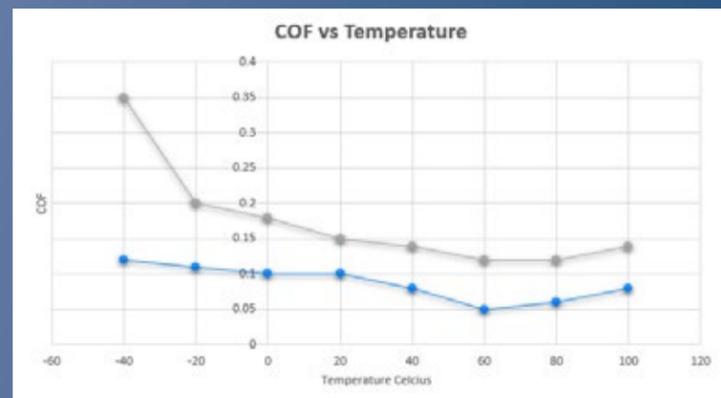
Main Features:

- High frequency Piezo sensors
- Voice coil actuator
- Flexure-based design
- Down to 10 µm stroke



Accurate Determination of Failure Events

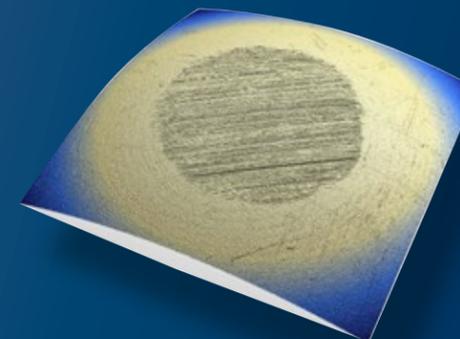
The tester can accommodate various in-line monitoring sensors to quantify real-time surface dynamics.



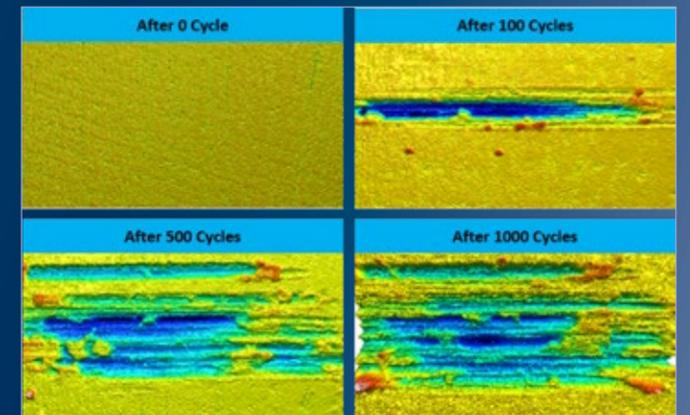
Two Sample COF vs. Temperature Comparison

Rtec-Instruments Fretting Solution

The test module comprehensively characterizes fretting wear from micron to macro scale. Ultrasensitive piezo-based force sensors, combined with a robust design, high stiffness holders, and low floor noise, provide quantitative fretting wear characterization of materials, interfaces, thin films, and components.



3D Wear Scar Mark



Wear Track Progression

Get the Data You Need

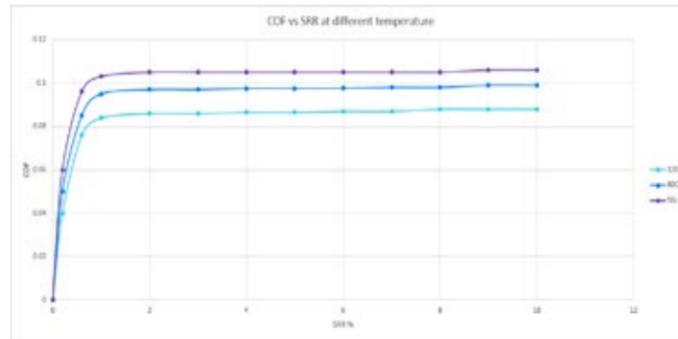
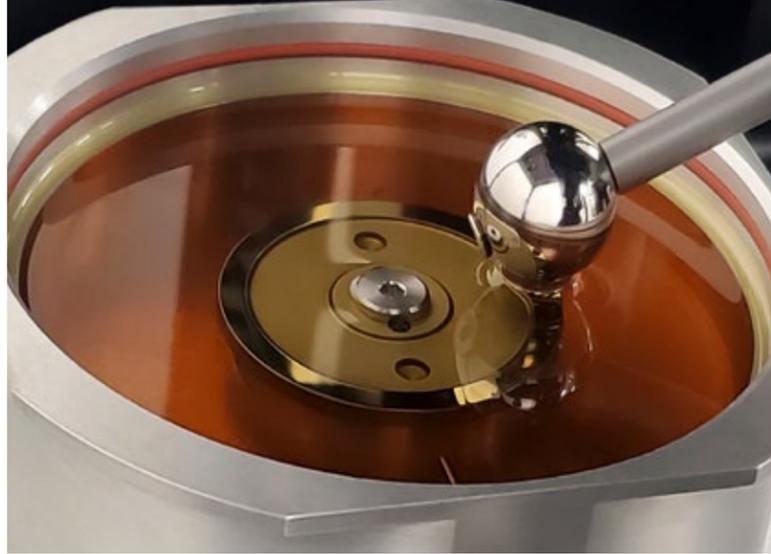
The tests can be done in controlled environmental conditions to simulate real-life scenarios. The benchtop fretting tester, single coil, or double coil fretting testers are all easy to use and provide intuitive data interpretation.

Mini Traction Machine

Our multi-function traction module measures the frictional properties of lubricated contacts under a wide range of sliding rolling ratios. Its one-click operation, wide load, speed, and temperature range make it ideal for quality control or an R&D environment. The module can operate at a high sliding-to-rolling ratio using two independently controlled closed-loop servo drives.

Main Features:

- Capacitive force sensors for sensitivity
- Up to 200 N sensor
- 6 to -6 m/s
- Temperature -40 °C to 250 °C
- Measure current and voltage



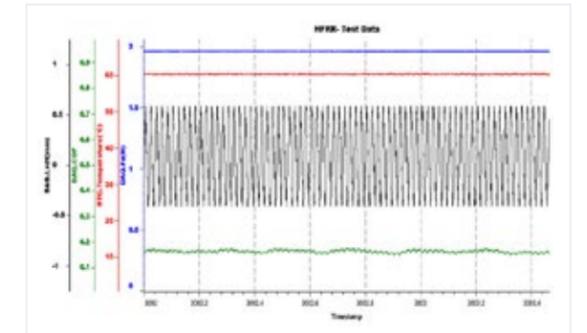
HFRR Tester

FFT-M

This latest-generation HFRR tester conforms to ASTM D6079 and related international standards. The FFT-M evaluates fuel lubricity, predicts additives' performance, and studies friction wear. Its rigid platform design, easy-to-use high-frequency sensors, and real-time downforce control make it optimal for quality control and R&D.

Main Features:

- Real-time friction force with piezo force sensors
- Room to 180 °C (up to 400°C and cooling options available)
- Load Range up to 20 N (More ranges available)



Reliable High Frequency Data

4 Ball Tester

The Automatic 4-Ball Tester is used to study extreme pressure EP, coefficient of friction, load wear index, ball weld point, and wear preventive additives for lubricating grease, oil, and additives.

Main Features:

- Programmable closed-loop force up to 10,000 N (No Dead Weights)
- -40°C to 200°C (400°C) Temperature
- Automatic EP and Wear
- In-line Torque, Acoustic signal, Downforce
- ASTM, DIN, ISO Compliant

SRV Tester

The latest generation SRV Testing Machine is designed to test lubricants, grease, additives, and materials in high-frequency linear oscillation motion.

Main Features:

- High-resolution piezo sensors
- Room to 350°C (optional -40°C, 800°C) temperature
- Up to 3000 N for EP testing
- Confirms several ASTM and DIN standards, including ASTM D5706, D5707, D6425, and DIN 51834.



Air Jet Erosion Tester

Perform repeated impact tests with Rtec Instruments' Air Jet Erosion Tester, the AJ-1000. The AJ-1000 ranks the erosion of various materials and coatings by subjecting samples to different abrasive particles of various shapes, sizes, temperatures, and impact speeds.

Main Features:

- Conforms to ASTM G76, ASTM G211-14
- Automatic in-line sample and particle velocity measurement
- Open platform allows mounting real samples and test coupons
- Fully automatic – run and test data with a click of a button



Twin Roller Tester

Rtec-Instruments' TwinRoller-3000 is an ideal two roller machine for studying traction, wear, and rolling contact fatigue under various combinations of rolling and sliding. With an open platform architecture that allows easy access and use, the tester comprises of two high torque independently controlled servo motors, electro-servo drives, and advanced controllers that allow high repeatability and precision measurements.

Main Features:

- Load up to 8000 N (more ranges available)
- Real-time force and speed control
- High power motors
- -35 to 150 °C temperature



Two Roller During A Test

High Pressure Tribometer

Rtec Instruments' high-pressure tribometer runs ball-on-disk and pin-on-disk tribology tests under high pressure. It studies friction and wear of various materials for valves, seals, liners, bearings, compressors, and more.

Main Features:

- Up to 200 PSI pressure
- In-line friction and wear
- Patented capacitive high-pressure force sensor
- -35 to 100 °C Temperature Range
- Load Range 5 N to 2000 N



Micropitting Tester

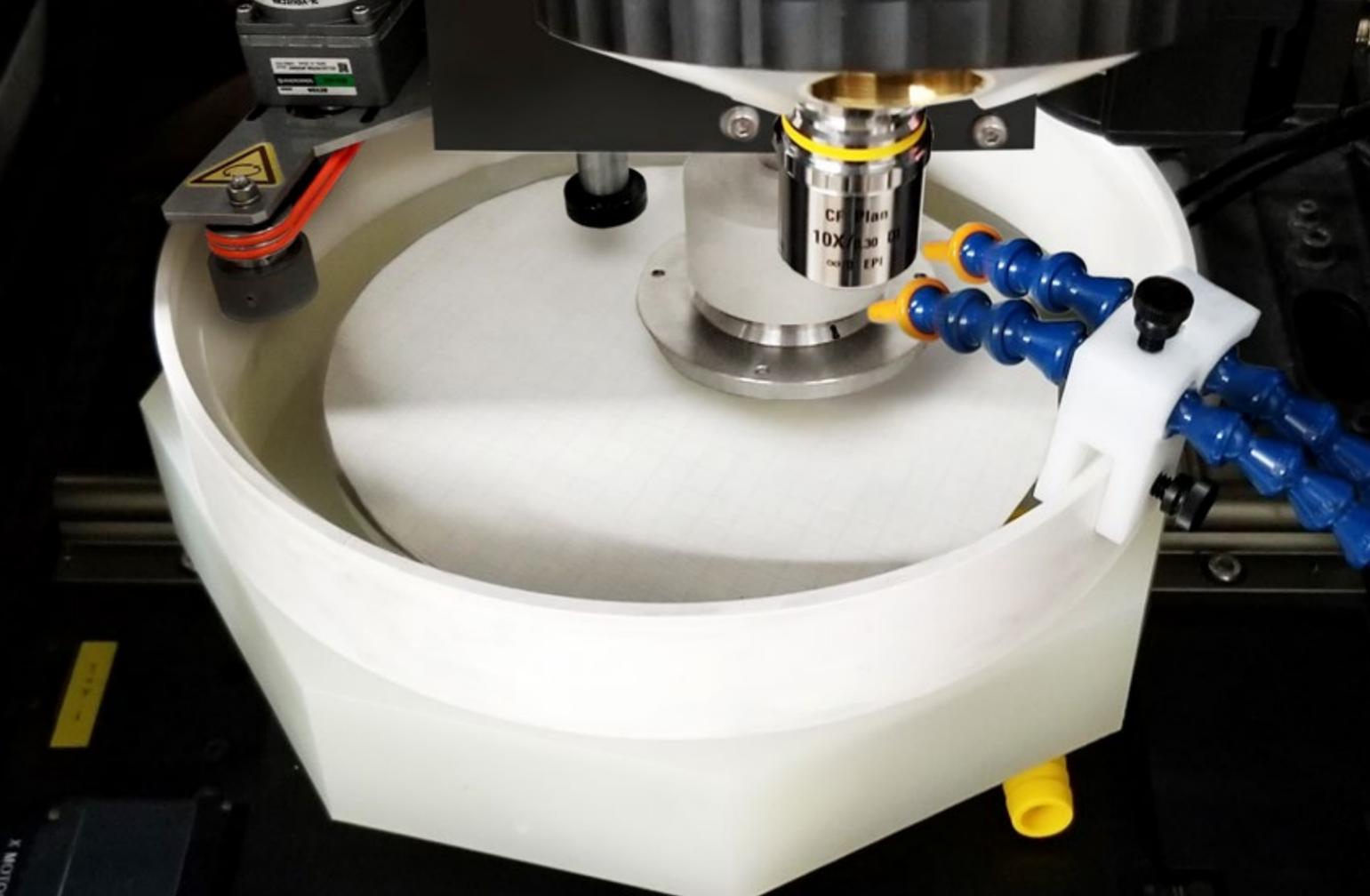
The Three Roller or Micropitting Tester is an ideal rolling contact machine to study pitting, traction, wear, and more under various combinations of rolling and sliding. The open platform architecture allows for easy access to the samples and setup. In addition, the fully automated and advanced controllers allow for high repeatability and precision measurements with the broadest test range in load, temperature, and speed.

Main Features:

- Load up to 5000 N (more ranges available)
- Up to 5.5 m/s speeds for rapid testing
- Run several million cycles in a short duration
- -35 to 150 °C temperature
- Standard torque range up to 60 Nm* (larger range available)



Three Roller During A Test



Film Thickness

The film thickness measurement module uses spectral reflectance to obtain the thickness of coated surfaces.

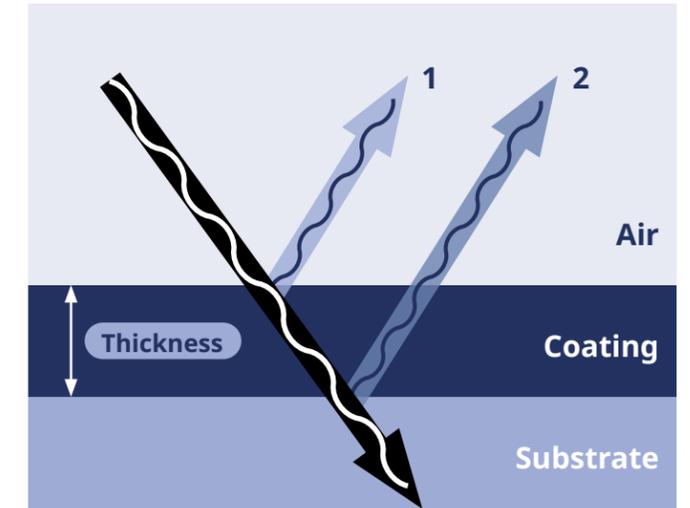
Spectral reflectance relies on the interaction of the coating surface with light to calculate the thickness. The comparison of incident light to reflected light from the different interfaces below the sample's surface allows the measurement of optical constants, thickness, and surface roughness.

The reflection data are fairly intuitive and easy to interpret, especially for relatively thick films.

Thickness information is primarily contained in the frequency of reflectance spectrum oscillations, while optical constants (more precisely – optical contrast, i.e., the difference between optical

constants at the interface) information is contained in the amplitude of the oscillations.

Our full package includes easy-to-use software to record all measurements and produce statistics.

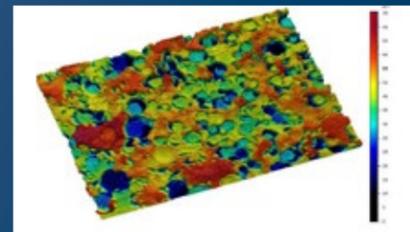


CMP Tester

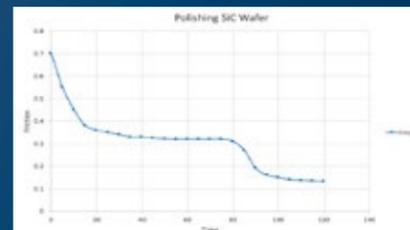
The CMP tester is used for CMP process development and consumable R&D. It accelerates and optimizes consumables and polishing process development, improving slurry, pad, pad conditioner, removal rates, polishing process, and particles. Additionally, the CMP tester contains an in-line integrated 3D profiler to study pad surface change with time.

Main Features:

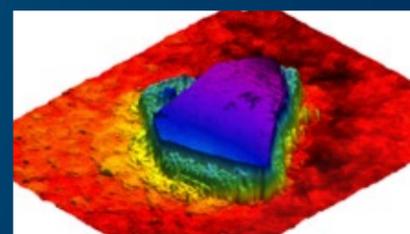
- Real-time coefficient of friction
- Controlled downforce and speed
- Integrated 3D profilometer
- Several wafer sizes can be mounted
- In-line temperature and acoustic emission



CMP Pads



CMP Friction vs. Time Data



Single Diamond on Pad Conditioner

Main Features:

- Extensive materials library (500+)
- Real-time, one-click measurement and analysis of thickness, n&k and roughness measurement
- Ease of use, no expert knowledge required
- Powerful analysis package scaling correction, multi-sample measurement, dynamic measurement.
- History of analysis: recall/display measurement results and statistics





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