HYSITRON®

TI 980 TriboIndenter®

NANOMECHANICAL TEST INSTRUMENT

Unrivaled Performance Accelerating Innovation

The World's Most Powerful Nanomechanical & Nanotribological
Test System For All Your Material Analysis Needs

Accelerate Your Research to the Next Level

The TI 980 TriboIndenter is Hysitron's latest, most advanced nanomechanical test instrument that operates at the intersection of maximum performance, flexibility, reliability, usability, and speed. The TI 980 is the next-generation of Hysitron's renowned TriboIndenter product family, building upon decades of technological innovation to deliver a new level of extraordinary performance, enhanced capabilities, and ultimate versatility in nanomechanical characterization.

Keeping You at the Forefront of Materials Discovery and Development

The Hysitron Experience

We understand that when you partner with Hysitron, you expect the very best—the best instruments, the most innovative technologies, the greatest flexibility to surpass tomorrow's testing needs, the most productive collaborations, and the best support. Since our founding in 1992, Hysitron has established itself as the worldwide market leader in the fields of nanomechanical and nanotribological characterization. Our continued success is in large part due to the researchers and engineers we serve every day. By understanding your unique characterization requirements, we have been challenged to continually introduce new innovative products to help solve current and emerging material challenges. The TI 980 TriboIndenter is our best instrument yet.

Every Hysitron nanomechanical test instrument is fully supported by the entire Hysitron team. Nanomechanical and nanotribological characterization is not a portion of our business, it is our business. With over 600 years of cumulative experience in material testing at the nanoscale, the Hysitron team is here to support you every step of the way and help you achieve your next major discovery.

Expect the Best!

Powerful Enhancements to the TriboIndenter Family

One Giant Leap for Nanomechanical Testing

The TI 980 TriboIndenter is everything a superior nanomechanical test instrument needs to be, achieving remarkable advances in control and throughput capabilities, testing flexibility, applicability, measurement reliability, and system modularity.

Electronics

Performech® II Advanced Control Module

- Maximum performance high speed, closed loop operation
- Industry-leading noise floor performance
- Integrated multi-technique controls with auxiliary signal I/Os
- Enables 500x faster nanomechanical testing

Measurement Modes

Synchronized Multi-Scale Measurement

- Seamlessly measure with multiple Hysitron transducers, each fully optimized for the measurement at hand
- Powerful base configuration includes nano-to-micro indentation, nanoscratch, nanowear, high resolution in-situ SPM imaging, dynamic nanoindentation, and high speed property mapping as standard

Software

Versatile System Control and Data Analysis Software

TriboScan™ 10

- Full-featured control software featuring revolutionary new capabilities: XPM™ ultra-fast nanoindentation, SPM⁺ in-situ SPM imaging, dynamic surface finding, enhanced sample navigation, automated system calibrations, and innovative automated testing routines

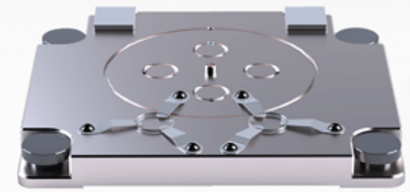
Tribo iQ™

- Powerful data processing, analysis, and graphing software
- Programmable data analysis modules, sharable amongst the Hysitron community
- Automatic, customizable report generation

Maximum Flexibility

Futureproof Characterization Potential

- Multi-layered enclosure delivers superior environmental isolation with integrated access ports for future technique expansion
- Universal sample chuck provides mechanical, magnetic, and vacuum mounting capabilities to accommodate the widest range of samples



Powerful Base Configuration
Maximizing Your Characterization Potential

In-Situ SPM Imaging
Dual piezo scanners deliver high-resolution sample surface topography imaging and nanometer precision test placement accuracy

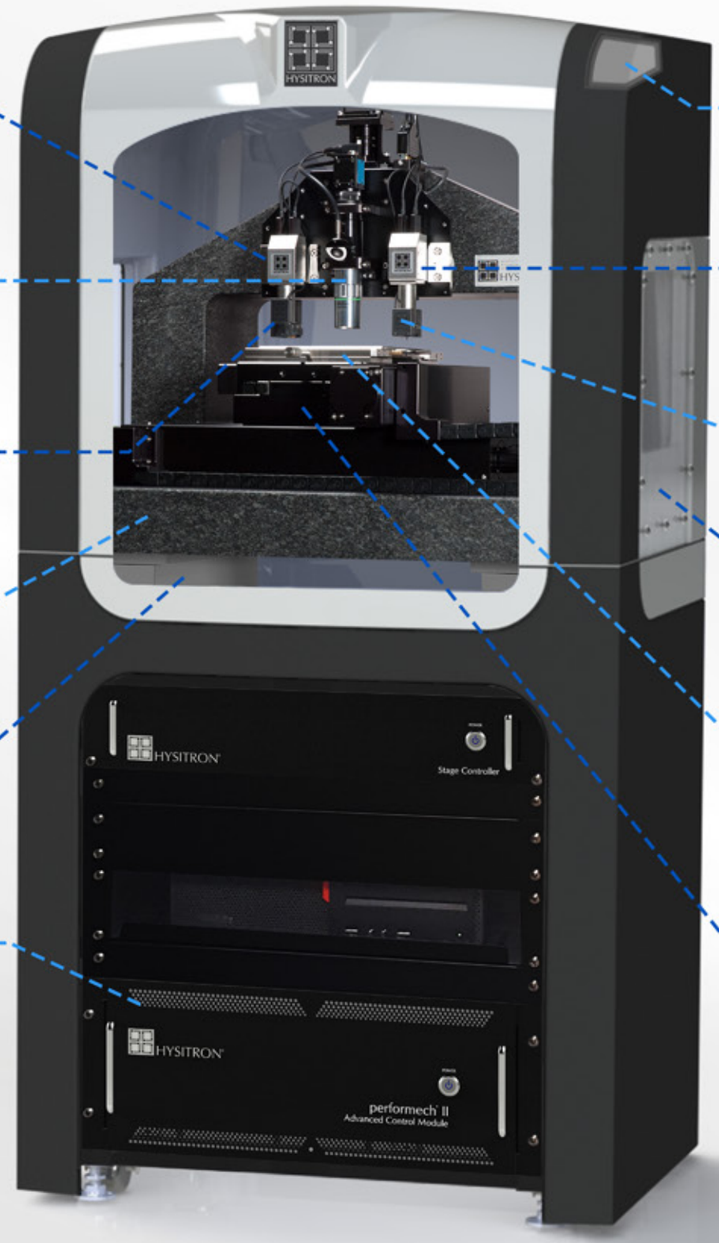
Optical Imaging
High resolution, color optics enable easy sample navigation and course test positioning

2D Capacitive Transducer
Renowned low noise 2D capacitive transducer technology enables quasistatic nanoindentation, nanoscratch, and nanowear characterization

Test Stability
Metrology grade granite framing assures superior instrument rigidity and test stability

Vibration Isolation
Integrated active anti-vibration isolation system isolates the instrument from the environment

Performech® II
High speed, low noise, fast feedback and acquisition rates provide industry-leading control over the testing process



Environmental Isolation
Multi-layered enclosure protects against thermal, acoustic, and temperature disturbances

Property Mapping
XPM™ ultra high speed nanoindentation delivers high-resolution, quantitative mechanical property maps

Dynamic Nanoindentation
nanoDMA® III enables viscoelastic characterization, continuous measurement of properties as a function of depth, frequency, and time

Modularity
Customizable enclosure panels streamline system upgradability and technique integration

Versatile Sample Chuck
Rapid and reliable sample mounting options: magnetic, mechanical, and vacuum

Encoded Staging
High precision motorized staging system provides a large accessible test region and automated multi-sample testing

Developed From the Bottom Up to Deliver the World's Best Nanomechanical Test Instrument

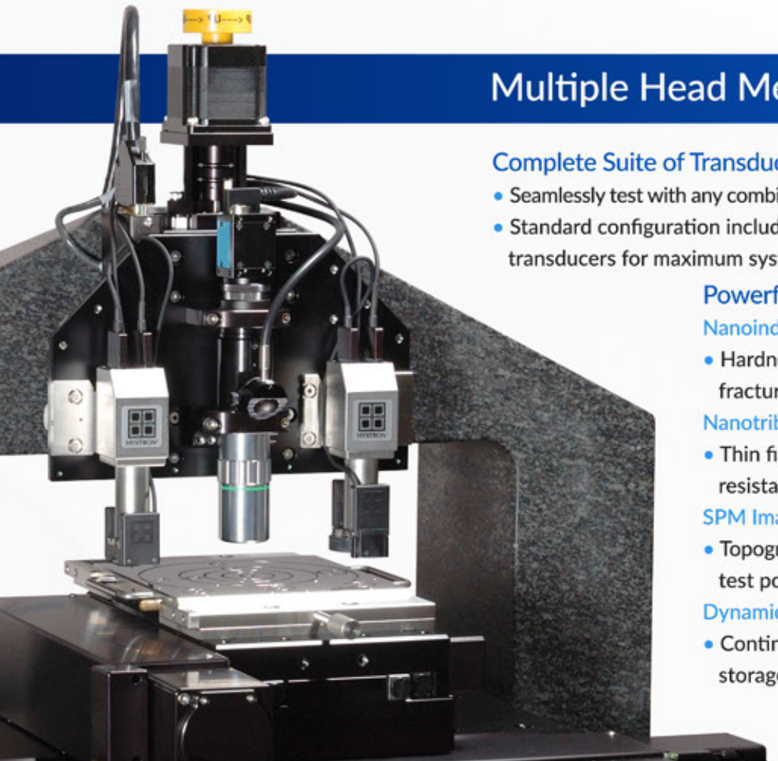
Unlimited Nanomechanics

Maximum Performance • Optimized Multi-Scale Testing
Speed & Automation • Simplicity & Advanced Visualization

Performech® II Advanced Control Module

The Definition of Precision Control in Nanomechanics

- Industry leading force and displacement noise floors deliver maximum measurement accuracy and repeatability
- Ultra-fast feedback control algorithms provide superior control over the testing process
- Peak performance control of Hysitron's full suite of transducers developed specifically for the test being performed
- Up to 24 channels of data acquisition with a simultaneous data sampling rate of 1.2MHz on all channels



Multiple Head Measurement Synchronicity

Complete Suite of Transducers Fully Optimized for the Task at Hand

- Seamlessly test with any combination of two Hysitron transducers
- Standard configuration includes Hysitron's 2D capacitive and nanoDMA® III transducers for maximum system versatility and performance

Powerful Base System Configuration:

Nanoindentation
- Hardness, elastic modulus, creep, stress relaxation, fracture toughness, high speed property mapping

Nanotribology
- Thin film adhesion, friction coefficients, scratch/mar resistance, reciprocating wear

SPM Imaging
- Topography and gradient imaging, nanometer precision test positioning, friction force imaging

Dynamic Nanoindentation
- Continuous hardness and modulus depth profiling, storage modulus, loss modulus, tan-delta

Simplicity and Speed of Automation

Automated System Calibrations—Perfection, Every Time

- Tip Area Function Calibration
- Transducer Calibration
- Tip-to-Optics Offset Calibration

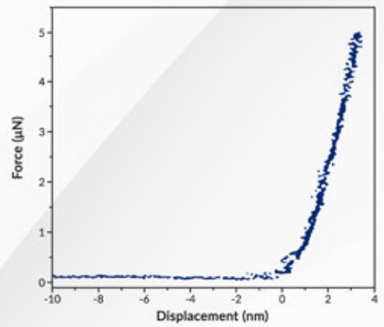
Automated Testing Routines

- Rapid, multi-sample automated testing capabilities for high throughput characterization, compatible with all Hysitron testing techniques
- Smart automation routines validate probe shape at user-defined intervals
- High resolution multi-scale imaging with whole-sample optical surveying simplifies the testing process

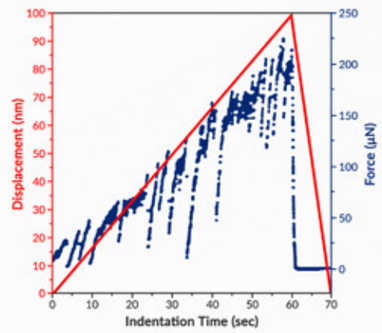
Lowest Noise Floors

Quantitative Characterization to the Low End of Nano

- Quantitative scale connectivity from the microscale to the very bottom of the nanoscale
- Nano-Newton force noise combined with displacement measurement capabilities smaller than the diameter of 90% of atoms provide quantitative characterization of nearly any material in any form
- System configurable to test over 6 orders of magnitude in force and 10 orders of magnitude in displacement
- Force and displacement noise floors are guaranteed at *your* facility at the time of installation



Fastest Feedback Control



Superior Control Over the Testing Process

- Provides maximum accuracy, reliability, and repeatability for truly quantitative nanomechanical and nanotribological characterization
- Force and displacement feedback control algorithms developed specifically for the physics of the Hysitron transducers
- Performs a full sense-analyze-control loop every 0.000013 seconds, enabling the system to measure and respond to fast transient events and dependably replicate the user-defined test function

Hysitron | TI 980 TriboIndenter

nanoDMA® III - Dynamic Nanoindentation

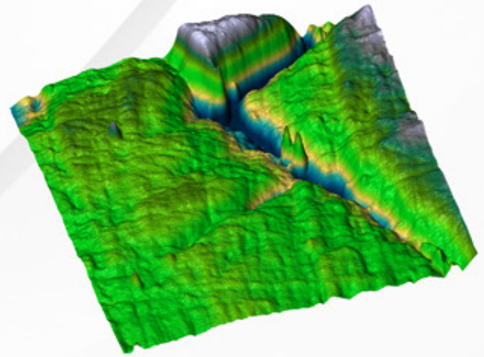
Hysitron's nanoDMA III is a powerful dynamic nanoindentation technique to provide a continuous measurement of elastic-plastic and viscoelastic properties as a function of indentation depth, frequency, and time.

- Universally applicable technique for the comprehensive characterization of materials—from soft polymers to hard coatings
- Coupled AC and DC force modulation for reliable and quantitative nanoscale dynamic characterization from the initial surface contact
- Reference frequency in-situ drift correction capabilities delivers maximum accuracy during long test cycles

SPM⁺ Imaging for Superior Nanomechanical Testing Results

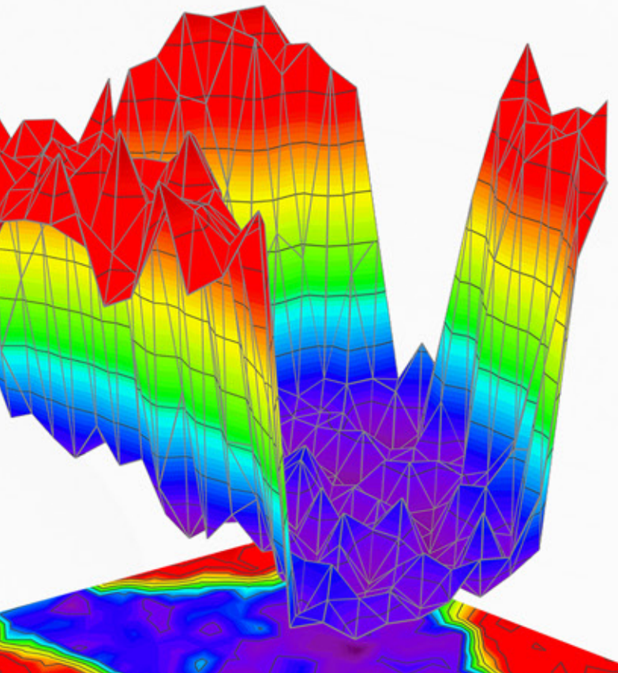
Hysitron is the pioneer in 'scanning nanoindenters', which utilize the same probe to raster the sample surface for topography imaging as to conduct the nanomechanical test. Utilizing the same probe for imaging and measurement maximizes test placement accuracy, provides immediate post-test observation of material deformation behavior, and accelerates testing throughput.

- High precision probe placement accuracy (±10nm)
- Fully customizable SPM resolution options from 64x64 to 4096x4096
- Quickly image high aspect ratio features with rectangular imaging of any X-Y resolution combination
- Industry-leading nanomechanical SPM image resolution with enhanced color pallets
- Compatible with additional Hysitron techniques, including lateral force imaging, nanoDMA® III, nanoECR®, and xSol® environmental control stages



XPM - Accelerated Property Mapping

Hysitron's XPM sets a new industry standard in terms of nanomechanical testing throughput paired with measurement resolution and accuracy. With XPM, more data can be taken in a single afternoon than could be collected in an entire year using traditional nanoindentation methodologies. These exclusive performance capabilities are made possible by the coupling of three industry-leading Hysitron technologies: a high bandwidth electrostatically actuated transducer, fast control and data acquisition electronics, and top-down in-situ SPM imaging. These synchronized technologies can perform 6 nanoindentation measurements/second to achieve comprehensive quantitative nanomechanical property maps and property distribution statistics in a record amount of time.



Measure More in Less Time!

- Ultra-high speed quantitative mechanical property measurements (6 per second)
- Rapid, high-resolution spatial mapping of hardness and modulus with distribution statistics
- Obtain a robust tip area function calibration within a minute
- 500x faster than traditional nanoindentation testing
- Compatible with Hysitron's xSol® environmental control stage for rapid testing throughput under extreme environmental conditions

TriboScan™ 10 & Tribo iQ™

TriboScan 10

Powerful Testing Flexibility for Unlimited Characterization Potential

- Full integration of Hysitron's suite of testing techniques into a single, intuitive software package
- Tab-based software architecture makes software navigation simple and helps users easily follow the instrument operational sequence
- Flexible, segment-by-segment definition of the testing sequence provides greater control over the test parameters in all modes of operation

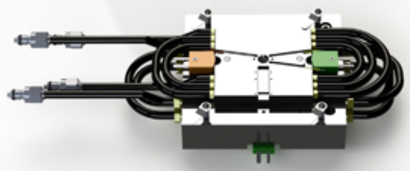
Tribo iQ

Adaptable Data Analysis

- Easy-to-use interface, fully customizable to perform basic to advanced data analysis
- Intuitive data organization with simplified workflow and three-click-to-report functionality
- User-writable data processing and analysis modules streamlines data analysis
- Open architecture analysis modules are sharable amongst the Hysitron community

Upgrade Options

Hysitron offers the broadest range of innovative characterization techniques to keep you at the forefront of materials development



xSol® Environmental Stage

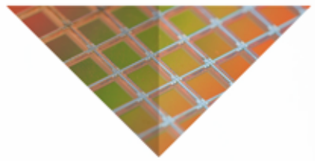
One Stage, Multiple Environments - Quantitative nanomechanical and nanotribological characterization as a function of temperature, atmospheric composition, and humidity level.

nanoECR®

Conductive Nanoindentation: In-situ correlation of nanomechanical properties, material deformation behavior, and electrical contact resistance.

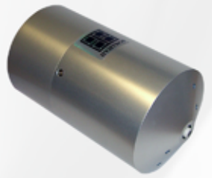
xProbe

Rigid probe MEMS transducer with ultra-low force and displacement noise floors typically associated with AFMs.



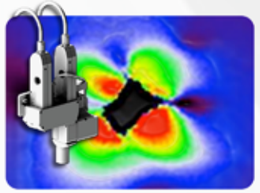
iTF

Patented intrinsic thin film mechanical property solution that provides quantitative, substrate-free elastic properties of thin films and layered structures.



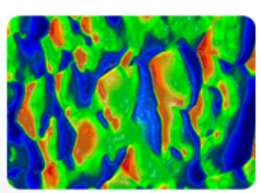
3D OmniProbe™ & MultiRange NanoProbe™

Expanded force and displacement testing range transducers for microscale mechanical and tribological testing.



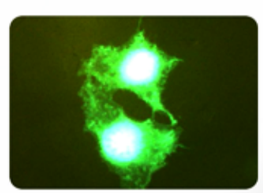
Synchronized Raman Spectroscopy

Spatially correlate mechanical and tribological properties with material structure and chemistry.



Modulus Mapping™

Scanning dynamic nanoindentation mode provides quantitative, high-resolution maps of modulus distribution across a surface.

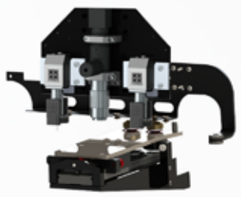


Fluorescence Microscopy

Integrated fluorescence microscope enables fluorochrome-guided test placement.

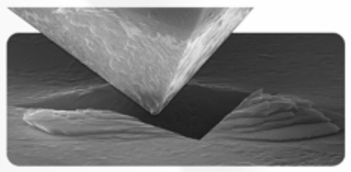
Electrochemical Cell

Quantitative measurement of nanoscale mechanical and tribological behavior to be studied under oxidizing and reducing conditions.



Automated Probe Changer

Push button exchange of testing probes provides maximum uptime, ease-of-use, and probe-customizable automation routines.



Test Probes

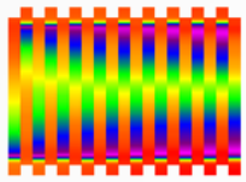
Hysitron offers the widest range of standard and customized probe geometries to meet your unique characterization requirements.

Sample Chucks

Secure almost any sample with a diverse range of magnetic, mechanical and vacuum chucks capable of testing up to a 300mm wafer.

TriboAE™

In-situ, through tip monitoring of acoustic signals generated from fracture and deformation events during the nanoindentation process.



TriboImage™

Time resolved cyclic nanoscale scratch/wear characterization.

Hysitron Global Laboratories

Please visit www.hysitron.com/contact-us to locate your closest Hysitron Representative

Unrivaled Performance Accelerating Innovation

About Hysitron

Hysitron is the world leader in the development and commercialization of nanomechanical test instruments and has designed, manufactured, and serviced cutting edge technology for the scientific community since 1992. As the pioneers of in-situ imaging with nanomechanical property measurement capabilities, Hysitron has grown with the nanotechnology market for over two decades.

In addition to nanoindentation and microindentation, Hysitron's nanoindenter instrument capabilities include tribology, modulus mapping, dynamic mechanical analysis, acoustic emission monitoring, electrical contact resistance, and in-situ SEM and TEM nanomechanical testing. Our nanoindenter instruments are specifically designed to solve your nanomechanical property needs and our team of expert scientists and engineers is always available to answer your questions and help solve your problems.

HYSITRON®

Hysitron, Inc.
9625 West 76th Street | Minneapolis, MN 55344 USA
Phone: +1-952-835-6366 | Fax: +1-952-835-6166
info@hysitron.com | www.hysitron.com