

SEM PICOINDENTER SERIES

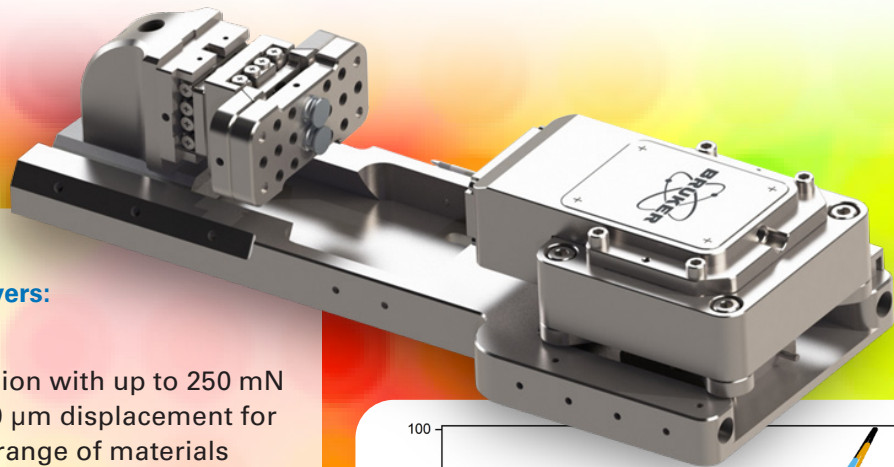
Hysitron PI Envision SEM PicoIndenter

Extended Value and Capabilities for
In-Situ Nanomechanical Testing

Hysitron PI Envision

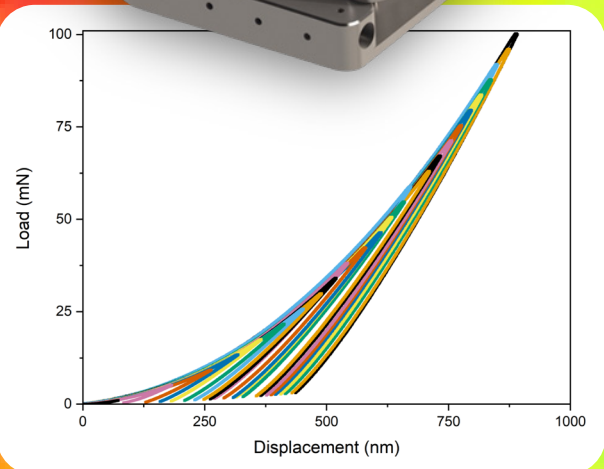
Superior Functionality for In-Situ Nanomechanical Testing

The Hysitron PI Envision SEM PicoIndenter delivers high-performance nanomechanical testing capabilities in a compact, easily upgradable platform designed for seamless integration into a variety of microscopy environments. PI Envision facilitates precise measurements of mechanical properties with its best-in-class control and over fifty easily exchangeable tips for characterizing everything from soft polymers to hard ceramics. The system offers sub-nanometer force and displacement resolution, as well as support for advanced testing modes, including high-throughput nanoindentation, mechanical property mapping, nanotribology, and high-temperature testing. PI Envision's modular architecture makes it suitable for both specialized investigations and routine workflows, ensuring adaptability for evolving research programs and multi-user facilities that prioritize high data quality, experimental versatility, and long-term scalability.



Hysitron PI Envision delivers:

- Sub-nanometer precision with up to 250 mN force capacity and 100 μm displacement for characterizing a wide range of materials
- Advanced upgrades for performing nanotribology, property mapping, and high-temperature testing to 800°C
- Encoded stage control and 78 kHz feedback rate for obtaining fast, repeatable results from indentation, compression, tension, or fatigue testing



Load-displacement curve with high-load transducer option.

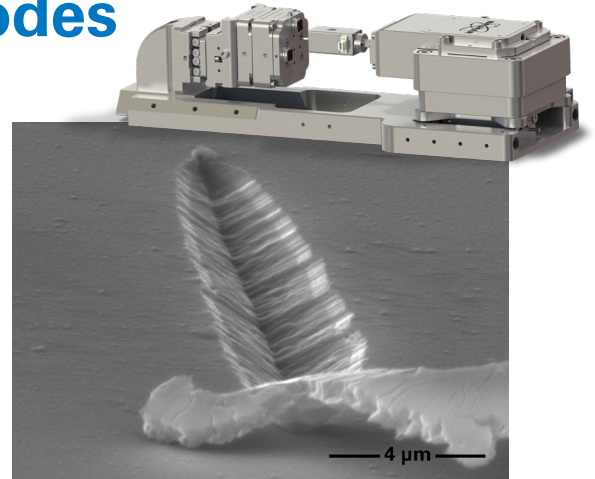
Intuitive Operation for a Wide Range of Testing Modes

PI Envision is powered by Hysitron's core transducer technology, delivering consistent and reliable nanoindentation results. This PicoIndenter is engineered with numerous features to enhance usability, reliability, throughput, and performance:

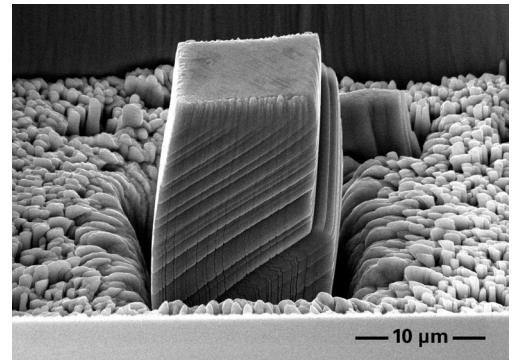
- An encoded stage ensures precise and repeatable sample positioning within the extended travel range of 12x12 mm.
- Dual sample mounts provide experiment flexibility and reduce manual sample exchanges.
- A large tip-to-mount standoff distance enables room-temperature testing of samples up to 25 mm thick.

Exceptional Value with an Easy Path to Future Upgradability

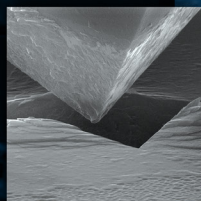
PI Envision comes standard with force capabilities up to 10 mN and a displacement range of 1 nm to 5 μm . The instrument's base configuration supports a comprehensive suite of standard and optional testing modes, including nanoindentation, compression, bending, direct-pull tension, push-to-pull tension, nanoDynamic, property mapping, and electrical characterization. Performance can be extended with system configurations supporting loads up to 250 mN and a broader displacement range of 1 nm to 100 μm . Additional testing modules are compatible with these configurations, including high temperature testing up to 800°C and nanotribological characterization.



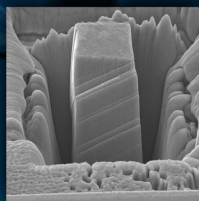
In-situ scratch testing using the nanoScratch module.



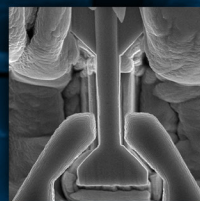
Micropillar compression with PI Envision.



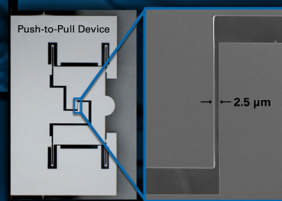
Nanoindentation



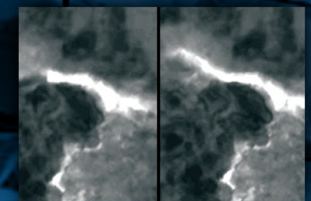
Pillar Compression



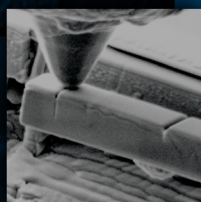
Direct Pull Tensile



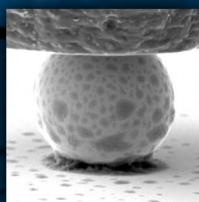
Push-to-Pull Tensile



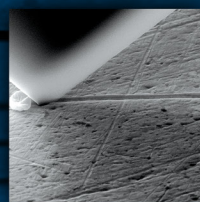
nanoDynamic



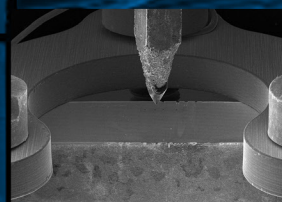
Beam Bending



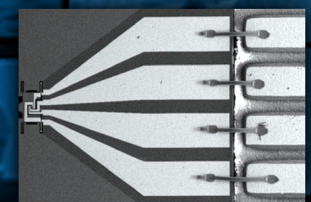
Particle Compression



nanoTribology



High Temperature (800°C)



Electrical Testing

Hysitron PI Envision Specifications

Max Force (transducer dependent)	10 mN; 250 mN
Force Noise Floor (inside an SEM, 60 Hz)	<0.4 μ N
Force Noise Floor (in ideal environment, 60 Hz, 10 mN transducer)	<50 nN
Maximum Displacement	5 μ m; 30 μ m; 100 μ m
Displacement Noise Floor (inside an SEM, 60 Hz)	<1 nm
Displacement Noise Floor (ideal environment, 60 Hz, 10 mN transducer)	<0.1 nm
Machine Stiffness	0.7 x 10 ⁶ N/m
Sample Positioning Range and Sensitivity	12 mm x 12 mm x 16 mm (indentation axis); 1 nm encoder
System Size (base system, excluding SEM stage connecting adapter)	55 mm x 32 mm x 191 mm (WxHxL); 460 g
Multi-Sample Mount	Yes
Automated Indentation with Stage	Large area: (>1 mm x >1 mm), no stitching
Tip Options	Over 50 available, including diamond, sapphire, vanadium carbide, boron nitride, tungsten, and steel

Hysitron PI Envision Modes and Capabilities

Nanoindentation Testing	Supports load-controlled, displacement-controlled, and open-loop for fundamental mechanical characterization
Compression Testing	Enables intrinsic displacement-controlled testing of micropillars, nanoparticles, and other small-scale structures
Direct-Pull Tensile Testing	Employs a gripper probe to apply stable, uniaxial tensile loads for accurate material response
Push-to-Pull (PTP) Tensile Testing	Uniquely simplifies tensile testing of nanostructures such as nanotubes, nanofibers, nanowires, and thin films (patented by Bruker)
Electrical PTP Tensile Testing	Enhances PTP testing with integrated four-point electrical measurements to study electromechanical coupling
nanoScratch Testing	Simultaneously captures normal and lateral forces to evaluate friction, interfacial strength, and adhesion—ideal for semiconductor materials and coatings
Electrical Characterization	Monitors changes in electrical properties during mechanical deformation; applicable to piezoelectric and other functional materials
High-Temperature Heating	Enables mechanical testing—quasi-static, dynamic, and mapping—at elevated temperatures up to 800°C
Property Mapping	Rapidly generates high-spatial-resolution quantitative mechanical property maps
nanoDynamic Testing	Applies oscillatory forces to continuously evaluate viscoelastic and fatigue properties at room and elevated temperatures

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Bruker Nano Surfaces and Metrology

Minneapolis, MN • USA
Phone +1.952.835.6366

productinfo@bruker.com



www.bruker.com/PI-Envision