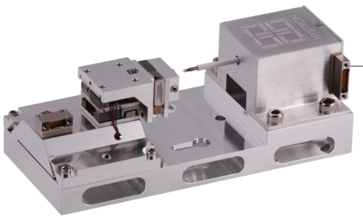
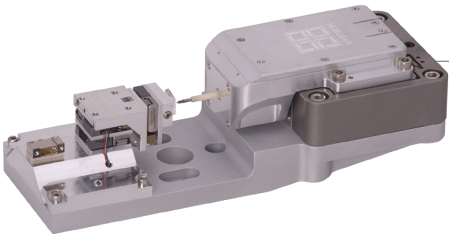
>> Hysitron, Inc. is the world leader in the innovation, design, and production of nanomechancial test instruments.

PI SERIES SEM PICOINDENTER® INSTRUMENT OVERVIEW



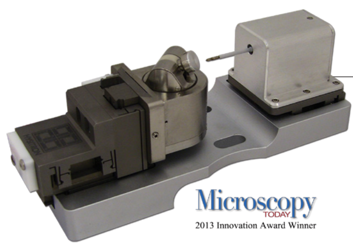
PI 85 SEM PicoIndenter®

Providing superior *in situ* nanomechanical testing in a compact platform, the PI 85 is a robust, versatile tool for truly nanoscale mechanical testing spanning the entire materials spectrum (metals & alloys, ceramics, composites, semiconductor materials, etc.).



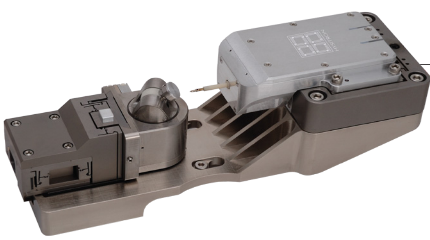
PI 85xR SEM PicoIndenter®

With a variable load frame, the PI 85xR is designed to give researchers the extra force and displacement necessary to generate failure in hard materials and protective coatings or induce yield in larger, more complex structures such as micro-scale pillars, particles, and coatings.



PI 87 SEM PicoIndenter®

The enhanced sample positioning capabilities of the PI 87 gives researchers the ability to align the sample with various detectors (EBSD, EDS, WDS, etc.) for mechanical characterization as a function of crystal orientation, grain structure, or chemical composition. Seamless FIB milling also facilitates sample modification and 3D characterization.

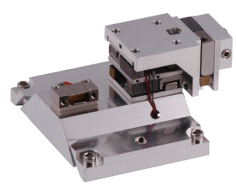


PI 87xR SEM PicoIndenter®

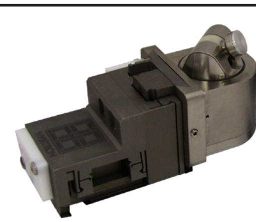
Combining Hysitron's advanced 5-axis sample positioning stage with the extended range transducer, the PI87xR is the most advanced *in situ* mechanical testing instrument available, giving the user and unprecedented flexibility and control from micro- to nano-scale.

STAGE OPTIONS

- **3 Degrees of Freedom: X, Y, Z**
- Maximum Stage Travel (XYZ): >3 mm
- Stage Travel Sensitivity: ≤20 nm

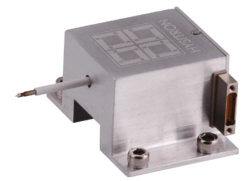


- **5 Degrees of Freedom: X, Y, Z, Rotation, Tilt**
- Maximum Stage Travel (X, X', Y, Z): >8 mm
- Stage Travel Sensitivity: ≤5 nm
- Tilt/Rotation Range: 180°
- Tilt/Rotation Accuracy: <0.33°, <0.12°



TRANSDUCER OPTIONS

- **Maximum Force: 30 mN**
- **Maximum Displacement: 5 µm**
- Force Noise Floor: < 400 nN
- Displacement Noise Floor: <1 nm



- **Maximum Force: >100 mN**
- **Maximum Displacement: 150 µm**
- Variable Load Frame Configuration

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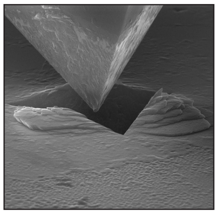
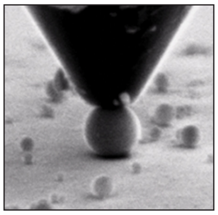
TESTING MODES



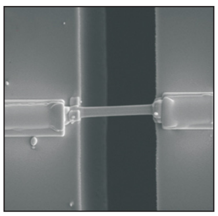
NANOINDENTATION

Precise control and measurement of force and displacement allow for the quantitative determination of fundamental mechanical properties such as hardness, elastic modulus, and creep performance for a wide variety of materials with direct observation of deformation and data-video correlation.



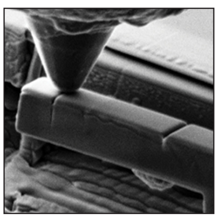
COMPRESSION

Precise tip placement using electron microscope imaging for verification of tip-sample alignment while compressing pillars and particles. High-speed video capture verifies the extent of the compression, onset of yield, and helps reveal unique deformation mechanisms in small-scale samples.



TENSILE

Direct-pull and Push-to-Pull (PTP) testing of dog-bone specimens, thin films, or nanowires allows for the *in situ* measurement of tensile properties and observation of stress-strain behavior in advanced materials not easily tested by traditional means.



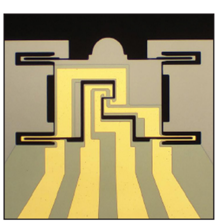
BEND

Accurate loading alignment and specimen measurement using electron microscope imaging enables straightforward stiffness and fracture toughness measurements for single-phase, composite, or multi-layered materials.

HYBRID TECHNIQUES

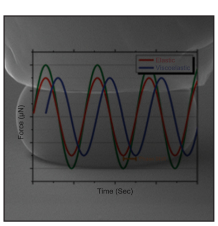
HEATING

Available in 400 °C and 800 °C models, resistive heating facilitates the *in situ* study of nanomechanical properties across a broad range of potential use conditions. Tight PID control and highly localized sample heating results in maximum system stability while testing in vacuum prevents surface oxide formation, allowing the direct measurement and observation of thermally initiated material transformations.



ELECTRICAL

Using the Electrical Characterization Module (ECM), simultaneous measurement of electrical and mechanical properties is possible through nanoindentation, compression, or tensile loading using an Electrical Push-to-Pull (E-PTP) device.



DYNAMIC

nanoDMA® PI provides sinusoidal loading from 1-300 Hz to evaluate the time dependent and viscoelastic response of a broad range of materials. Applications include *in situ* fatigue testing, drift-free creep measurements, and accurate depth profiling for storage/loss modulus, hardness, and tan-δ using powerful *CMX* algorithms.

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