

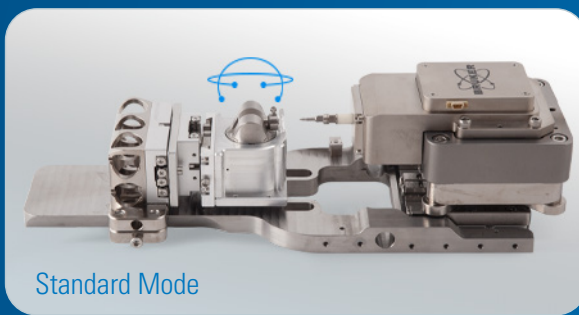
## • Hysitron PI 89 SEM PicoIndenter

The Hysitron PI 89 SEM PicoIndenter leverages the advanced imaging capabilities of scanning electron microscopes (SEM, FIB/SEM), making it possible to perform quantitative nanomechanical testing while simultaneously imaging. Based upon Bruker's leading-edge capacitive transducer technology, this new system is the next-generation descendant of the first commercial, market-leading in-situ SEM nanomechanics platforms. Throughout the years, the Hysitron brand has steadily expanded the range of PicoIndenter capabilities, and extended force and displacement ranges with patented xR transducer technology and other exclusive advances. Innovative features of the PI 89 include the electrical characterization module (ECM), Push-to-Pull (PTP) tension for thin films and nanowires, direct-pull tension, fatigue, rotation/tilt stage (patent), elevated temperature testing, and nanoscratch, making it the most comprehensive in-situ nanomechanical test instrument for SEM and FIB/SEM available today.

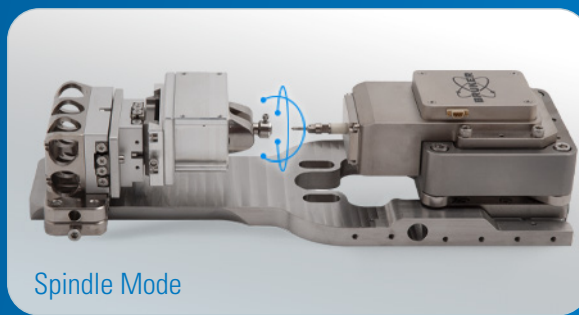
### Hysitron PI 89 Features

- Proprietary interchangeable transducer technology provides extended range (10 mN, 500 mN, 3.5 N, and 150  $\mu$ m) in-situ nano- to micro-scale mechanical testing
- Exclusive load and displacement-controlled testing modes enable nanoindentation, compression, tension, fatigue, or bending tests
- New encoded stage technology (1 nm resolution) enables indentation within nanocrystalline grains
- Two rotation/tilt stage configurations enable better sample positioning for nanomechanical testing, secondary electron imaging, in-situ FIB milling, and analytical imaging
- Futureproof modular design allows for upgradability of in-situ testing techniques, including 800°C heating, scratch testing, electrical characterization, scanning probe microscopy (SPM) imaging, property mapping (XPM), and dynamic fatigue testing
- Performech® II Advanced Control Module delivers 78 kHz feedback rate and data acquisition up to 39 kHz to capture transient events, such as fracture initiation

Two rotation/tilt stage configurations available with next-generation system design.



Standard Mode



Spindle Mode

### Advanced Performance and Functionality

The Hysitron PI 89 mounts easily to the SEM stage without being a permanent fixture in the microscope. The compact design of the instrument allows for maximum stage tilt and minimum working distance to enable optimal imaging during testing. The new, redesigned platform features increased versatility and ease of use over the industry-standard PI 88 system by adding a simple sliding stage mount to the sample side of the system. This allows for quick and simple adjustment of the sample position relative to the transducer, and accommodates swapping probes, samples and add-on options while also increasing the available space for larger samples, additional stages, and new options.

In addition, the new encoded linear stages allow for greater repeatability during automated motions and while increasing travel range. Improved frame stiffness was accomplished by redesigning the mechanical load frame axis.

The upgraded platform design utilizes Bruker's state-of-the-art xR transducers, and is compatible with existing PI 88 nanoscratch, XPM, SPM, high temperature, and rotation/tilt stage options. Other options that are still fully compatible include ECM, direct tensile mode, PTP, nanoDynamic, automated indentation, EBSD, TKD and STEM.

### Hysitron PI 89 SEM PicoIndenter Specifications

Max Force	Load Load: 10 mN; High Load: 0.5 N New High Load Option: >3.5 N
Force Noise Floor* (inside an SEM, 60Hz)	<0.4 $\mu$ N; <5 $\mu$ N; 30 $\mu$ N
Force Noise Floor (in ideal environment, 60Hz, 10 mN transducer)	<50 nN
Maximum Displacement	5 $\mu$ m; 150 $\mu$ m
Displacement Noise Floor* (inside an SEM, 60Hz)	<1 nm
Displacement Noise Floor (in ideal environment, 60Hz, 10 mN transducer)	<0.1 nm
Machine Stiffness (N/m)	$0.9 \times 10^6$
Sample Positioning Range	12 mm x 26 mm x 29 mm (indentation axis)
Sample Positioning Sensitivity	1 nm (encoded)
System Width, Height, Length (base system)	68 mm, 42 mm, 191 mm
Base System Mass	480g
Multi-Sample Mount	Yes
Automated Indentation/XPM with Stage	Larger area: (>1 mm x >1 mm)
Rotation and Tilt Stage	Two configurations
Degree of Positioning Freedom	Each configuration has 5 degrees
Spindle-Mode Rotation of Sample	Yes

\*Guaranteed on install

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