Unprecedented performance

The TS 75 nanomechanical test instrument is driven by the NEW performech™ DSP embedded controller, providing unsurpassed performance and industry-leading sensitivity. The performech controller boasts a sub 30 nN force noise floor and ~80X faster feedback control than the standard controller. The compact design of the Hysitron capacitive transducer* allows it to be interfaced to most commercially available AFM’s via a simple, temporary modification. The Hysitron transducer replaces the AFM detector assembly and provides topographic feedback for imaging. Utilizing the same indenter probe to obtain in-situ SPM images as to perform the nanoindentation experiment guarantees quantitative and repeatable data. Additionally, the transducer utilizes a rigid indenter probe that makes the quantification of the force and displacement measurements more reliable than those made with a cantilever-based probe system, which intrinsically introduces many uncertainties into the measurement.

The TS 75 also supports the NEW RAPIDprobe™ transducer, which provides further increased sensitivity, a higher mechanical bandwidth, and 10x faster SPM imaging than the standard capacitive transducer. The TS 75 is the highest performing nanomechanical test instrument on the market today.

In-situ SPM imaging

The in-situ SPM imaging capability of the TS 75 is critical for precise test placement and microstructure identification. The in-situ images are obtained by raster scanning the indenter probe over the sample surface and can be used to reliably place a test within 10 nm of the desired testing location. This technique allows for effortless pre- and post-test topographical imaging without the need to reposition an auxiliary imaging instrument over the nanoscale testing site. The force and displacement results acquired during the test, in conjunction with the in-situ imaging* capability, offer an unparalleled wealth of information concerning the material deformation behavior and mechanical properties of the material.

Quantitative 30 x 30 μm modulus map of fiber-epoxy composite using RAPIDprobe transducer.
Available testing modes

Standard

- **Quasistatic nanoindentation** – Measure Young’s modulus, hardness, fracture toughness and other mechanical properties via indentation
- **performech** – DSP embedded controller featuring a sub 30 nN force noise floor and an enhanced digital feedback routine
- **Scanning Wear™** – Observe and quantify wear volumes and wear rates using in-situ imaging capability
- **SPM imaging** – In-situ imaging using the indenter tip provides nanometer precision positioning and SPM topography

Upgrade options

- **nanoDMA™** – Investigate time-dependent properties of materials using a dynamic testing technique designed for polymers and biomaterials
- **Modulus mapping** – Quantitatively map the storage and loss stiffness and moduli over an area from a single SPM scan
- **Feedback control** – Operate in closed loop load or displacement control to allow testing techniques such as creep and stress relaxation
- **Scratch testing** – Quantify scratch resistance, critical delamination forces, friction coefficients and more with simultaneous normal and lateral force and displacement monitoring
- **Automated TriboScope** – Automated indentation using predetermined patterns or ClickMode™ allows faster data collection with less operator time
- **Thermal control** – Heating or heating/cooling stages can be added for investigation of mechanical properties at non-ambient temperatures
- **RAPIDprobe transducer** – MEMS actuation technology specifically designed for ultra-low load nanoindentation and provides 10x faster SPM imaging than standard capacitive transducer

Highlights

- **performech** DSP embedded controller offering a <30 nN force noise floor and ~80x faster digital feedback control than previous generation
- Stability of the Hysitron capacitive transducer design minimizes set-up time and the necessity of specialized lab environments
- **In-situ imaging** provides nanometer precision positioning and the convenience of SPM topography
- User-friendly, Windows®-based software for test design and analysis
- Real-time data display and automated analysis routines yield results in minutes
- Numerous tip geometries available to meet the demands of the various test types available on the TS 75
- **RAPIDprobe** MEMS actuation technology compatible

Transducer specifications

- **Load**
  - Resolution: <1 nN
  - Noise Floor (standard transducer): <30 nN
- **Displacement**
  - Resolution: 0.0004 nm
  - Noise Floor: 0.2 nm
  - Drift: <0.05 nm/sec

Deformation transients (caused by dislocation burst activity) are easily detected in this displacement controlled force vs. displacement curve for Al(100) acquired with a Hysitron three-plate capacitive transducer and performech controller.

*Covered under US patents: 5,553,486; 5,576,483; 5,661,235; 5,869,751; 6,026,677; 7,107,694.