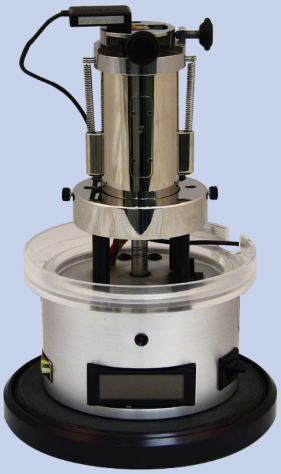
TS-SERIES

HYSITRON®

TS 75 TriboScope®



TS 75 TriboScope

The next generation nanomechanical test instrument interfaced to your AFM

The **TS 75** is a fully integrated AFM attachment surpassing the lower limit of traditional nanomechanical testing. The increased performance and testing speed of the **TS 75** comfortably establishes itself as the next generation of nanomechanical testing devices, allowing researchers to:

- Obtain quantitative mechanical properties
- Reliably test softer materials
- Accurately test smaller volumes of material
- Achieve a faster sample throughput

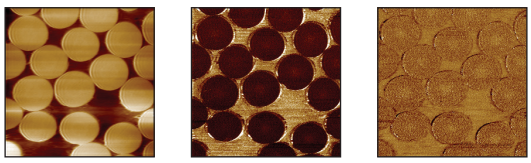
***In-situ* SPM imaging**

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.

Unprecedented performance

The **TS 75** nanomechanical test instrument is driven by the **Digital TriboScope® Controller**, providing unsurpassed performance and industry-leading sensitivity. The **Digital TriboScope 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.



Quantitative 30 x 30 µm modulus map of fiber-epoxy composite using **RAPIDprobe** transducer.

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Available testing modes

Standard

- **Quasistatic nanoindentation** – Measure Young's modulus, hardness, fracture toughness and other mechanical properties via indentation
- **Digital TriboScope Controller** – DSP embedded controller featuring a sub 30 nN force noise floor and an enhanced digital feedback routine
- **ScanningWear™** – 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

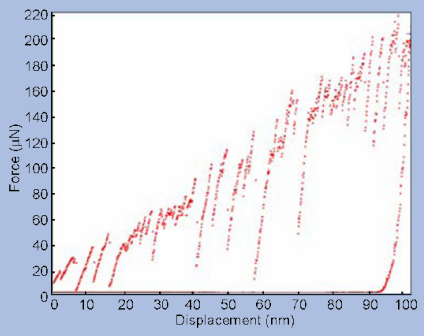
- **nanoDMA®** – Investigate time-dependent properties of materials using a dynamic testing technique designed for polymers and biomaterials
- **Modulus Mapping™** – Quantitatively map the storage and loss stiffness and moduli over an area from a single SPM scan
- **Feedback control** – Operate in closed 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

- **Digital TriboScope 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).

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

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