NanoIndenter XP Mechanical Properties Microprobe System

NanoIndenter XP microprobe hardware: consisting of indenter, positioning microscope, controlling hardware. A variety of tip geometries are available, including Berkovitch, cube corner, cone.

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>Resolution</th>
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</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>1.5 mm</td>
<td>&lt;0.01 nm</td>
</tr>
<tr>
<td>DCM Mode: Loads</td>
<td>10 mN</td>
<td>1 nN</td>
</tr>
<tr>
<td>XP Mode: Loads</td>
<td>500 mN</td>
<td>50 nN</td>
</tr>
<tr>
<td>High Load: Loads</td>
<td>10 N</td>
<td>50 nN</td>
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</table>

**Lateral Force option**
Allows measurement of force in X and Y lateral directions, simultaneous with vertical mode operation.

**High Load option**
Extends operation of the XP up to 1 kg in vertical load.

**Continuous stiffness option**
Applies a harmonic oscillation on top of the quasi-static motion, allowing continuous monitoring of stiffness. Force amplitudes of 60 nN to 300 mN. Frequency range of 0.05 Hz to 200 Hz.

**Dynamic Contact Module**

**TestWorks 4 Explorer Level software**
Controls all components, records and analyzes data. Operates within Microsoft NT operating system. Explorer level allows extensive programming of test protocol. Data output exported to Excel files.

**Hard materials**
Well-developed methods for characterizing material properties of small material volumes:
- Elastic modulus and hardness of metals, ceramics, other hard materials.
- Viscoelastic properties of materials using harmonic loading (storage modulus, loss modulus), constant load (creep response), or constant displacement (relaxation response).
- Scratch testing to determine film adhesion, coefficient of friction, variation of properties with depth.
Tissue Mechanics Lab

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Soft tissues
- Non-penetrating indentation to determine elastic and viscoelastic properties of soft tissues.
- Micropenetration to determine fracture toughness of soft tissues.
- Scratch testing to determine fracture toughness of soft tissues.

Specifications:
- Indentation head assembly
- Displacement resolution <0.01 nm
- Total usable indenter travel 1.5 mm
- Maximum indentation depth > 500 um
- Load application Coil/magnet assembly
- Displacement measurement Capacitance gauge
- Max load 10 N
- Load resolution 50 nN
- Load frame stiffness 1 X 107 N/m
- Motorized x-y sample manipulation table with computer mouse control. Positioning accuracy 1.5 um.
- High performance vibration isolation system: air isolation table, passive environmental enclosure.
- Optical imaging system with 4X and 40X lenses.
- Fully automated, computerized data acquisition and control system including monitor and keyboard.

Computer
- Pentium III a450 MHz, 128 Mb RAM, 8.4 Gv Hard drive, 4X write/24X read CDRW, 3.5" 1.44 Mb floppy drive, ZIP drive
- Complete operating and data analysis software package
  - TestWorks 4 Professional level operation package
  - TestWorks 4 Analyst data analysis package
  - Microsoft Office 2000
- Hewlett-Packard laser printer