Offering More than 25 Years of Material Science Experience

- **RESEARCH AND CONSULTATION**: Extensive range of research content such as brochures, application notes, publications, and videos.

- **EXPERT ASSISTANCE**: Dedicated Mechanical Tester experts happy to guide you through any question or project request.

- **CUTTING EDGE INNOVATION**: At Nanovea we are always developing cutting edge technologies and standards. We innovate our instruments so that you can innovate your own products.

- **PRE AND POST INSTALLATION SUPPORT**: Full walk-through and guide to make sure the instrument is installed perfectly. Dedicated support team to help you after your instrument has been installed.
INSTRUMENTS
NANOVEA PB1000

- Dual Modules Mounting Nano and Micro
- Largest observable testing area
- Widest Range of Loads for Indentation/Scratch & Wear
- Excellent lateral accuracy <0.2μm with precision encoder
- Motorized Z motion capable of moving 50mm with video zoom
- Height adjustment capability of 140mm
- AFM and 3D optical profilometer options

TESTING MODULES

NANOVEA PB1000

ENVIRONMENTAL MODULES

Nano Module Micro Module

<table>
<thead>
<tr>
<th>Hot Temperature</th>
<th>Cold Temperature</th>
<th>Humidity</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Hot Temperature" /></td>
<td><img src="image2.png" alt="Cold Temperature" /></td>
<td><img src="image3.png" alt="Humidity" /></td>
<td><img src="image4.png" alt="Liquid" /></td>
</tr>
</tbody>
</table>
Widest Range of Loads with Best Accuracy

- Microscope Video Zoom Imaging
- AFM / 3D Optical Profiler Integration
- Environmental Modules & Custom Sample Holders
- Automated Z Control 50mm
- Nano & Micro on a Single System
- Automated XY Control 200 x 150mm

64 x 68 x 82cm
NANOVEA CB500

- Load Modules available: Nano or Micro
- Compact and modern design with full capability
- Full Capability Indentation Scratch and Wear Testing
- Excellent lateral accuracy <0.2µm with precision encoder
- Motorized Z motion capable of moving 50mm with video zoom
- Low maintenance cost

TESTING MODULES

<table>
<thead>
<tr>
<th>Nano Module</th>
<th>Micro Module</th>
</tr>
</thead>
</table>

ENVIRONMENTAL MODULES

- Hot Temperature
- Cold Temperature
- Humidity
- Liquid
Compact and Modern Design

- AUTOMATED Z CONTROL 50MM
- MICROSCOPE VIDEO ZOOM IMAGING
- NANO OR MICRO ON A SINGLE SYSTEM
- ENVIRONMENTAL MODULES & CUSTOM SAMPLE HOLDERS
- AUTOMATED XY CONTROL 50 X 100mm
- 38 x 33 x 70cm
**Precision and fast Piezo Actuator**

- Ultra sensitive load cell (independent from actuator)
- True closed loop control depth and load feedback
- Capacitor ring sensor for precision depth
- Optional nano load with depth up to 1500\(\mu\)m
- Optional capacitor driven highest accuracy load cell
- Fast speed mapping
- Fast and reactive scratch testing

**TESTING MEASUREMENTS**

- Instrumented Indentation
- Scratch and Adhesion
- Wear and Friction
MICRO-MODULE

- World’s leading micro mechanical testing with highest sensitivity
- Wide usable range of loads (5 orders of magnitude)
- Capacitor sensor for nano precision depth
- Designed to eliminate inaccurate and slow surface reference
- Direct vertical loading with no cantilever or pivot point
- Most sensitive AE sensor

TESTING MEASUREMENTS

Instrumented Indentation  Scratch and Adhesion  Wear and Friction
NANOVEA SUPERIOR TECHNIQUE
CASE FOR BETTER INDENTATION ACCURACY

PIEZO ACTUATOR

INDEPENDENT LOAD & DEPTH SENSOR

CLOSED LOOP FEEDBACK OR OPEN LOOK MODE FROM DEPTH OR LOAD SENSOR

SOFT HARD

CAPACITIVE DEPTH SENSOR

LOAD CELL SENSOR

CAPACITOR DEPTH SENSOR

NO INDEPENDENT LOAD & DEPTH SENSOR

NO LOAD SENSOR

REQUIRES SUBTRACTION OF SUPPORTING SPRINGS SIGNAL

COIL ACTUATOR

SOFT HARD

PIEZO VOLTAGE

LOAD MEASURED LOAD APPLIED

COIL VOLTAGE

LOAD MEASURED LOAD APPLIED

LOAD CALCULATED LOAD APPLIED

N NANOVEA

OTHERS
CASE FOR BETTER SCRATCH & WEAR

LOAD CELL SENSOR
CAPACITIVE DEPTH SENSOR

PIEZO ACTUATOR
INDEPENDENT LOAD & DEPTH SENSOR

CAPACITOR DEPTH SENSOR

NO INDEPENDENT LOAD & DEPTH SENSOR
NO LOAD SENSOR

LOAD APPLIED = LOAD MEASURED
PIEZO VOLTAGE

LOAD CALCULATED
LOAD APPLIED

COIL VOLTAGE

N NANOVEA

OTHERS
SUPERIORITY OF COMPRESSIVE LOAD CELL

ACTUATOR

COMPRESSIVE LOAD CELL
CAPACITIVE DEPTH SENSOR

SCRATCH TOP VIEW
CANTILEVER SENSOR

INDENTATION

LOAD IS APPLIED EVENLY

FORWARD MOVEMENT OF TIP DURING LOADING

NANOVEA

OTHERS
CASE AGAINST SURFACE REFERENCING TECHNOLOGY

PIEZO ACTUATOR

LOAD CELL SENSOR
CAPACITIVE DEPTH SENSOR

ALL VERTICALLY ALIGNED DEPTH MEASUREMENTS

SURFACE REFERENCING DEPTH SENSOR

ROUGH

SOFT

NO EFFECT FROM SURFACE REFERENCING

REFERENCE DISPLACEMENT

t

EVEN NANOMETER MOVEMENT EFFECTS DATA ACCURACY

N NANOVEA

OTHERS
ENVIRONMENTAL MODULES
**HOT TEMPERATURE**

- Temperatures up to 400°C (600°C custom)
- Tip and sample inside oven for increased accuracy
- Designed with MACOR with low thermal expansion coefficient of material of <10^{-6} / °C

**HUMIDITY**

- Chamber encloses indenter and sample
- Humidity control down to below 5% and up to dew point

**COLD TEMPERATURE**

- Enclosed peltier cooling system for increased accuracy
- Down to -10°C lower custom temperature
- Tip and sample in the enclosed environment

**LIQUID**

- Custom height
- Heating option
CONSUMABLES
INDENTER TYPES

- VICKERS
- BERKOVICH
- KNOOP
- CUBE CORNER
- BALL
- CONICO-SPHERICAL (60°, 90° & 120°)
- FLAT
- KNIFE
QUALITY & ACCURACY

DIAMOND AREA FUNCTION

TRUE AREA

IDEAL AREA

0 100 200 300 1

DEPTH

QUALITABLE QUALITY CHECK FOR DIAMONDS

GOOD FOR ANY TYPE OF INDENTERS INCLUDING SPHENO-CONICAL
LONG-TERM TRACKING & RECORDING OF DIAMOND QUALITY
QUICK SINGLE INDENT CHECK

Patent EP3076153
IMAGING TOOLS
MICROSCOPE VIDEO IMAGING | PB1000 & CB500

• Ultra zoom Lens with coax lighting & detent
• Large area stitching capability
• Color Video Camera (1200x1600)
• Maximum magnification of 8000X
• Three positions turret (optional)
• Video Microscope to/from Indenter position with accuracy of <0.2μm
3D OPTICAL PROFILER | PB1000

- Chromatic Confocal technique
- Max Z range up to 3mm
- Best angular capability
- Large surface scan
- Full 3D Profilometry capability
- Optical Profiler to/from indenter position video imaging with accuracy of <0.2μm
ATOMIC FORCE MICROSCOPE | PB1000

- Scan of XY 110µm | high resolution XY 25µm
- Lateral resolution 1.7nm
- Static, dynamic and extended modes
- Max Z range 22µm | 5µm
- Height resolution 0.4nm | 0.13nm
- Integrated video camera
- AFM to/from indenter position or video imaging with accuracy of < 0.2µm
INSTRUMENTED INDENTATION | HARDNESS AND ELASTIC MODULUS

THIN FILM

LOW LOAD

LOAD

20 μN

DEPTH

HIGH LOAD

LOAD

400 N

DEPTH

LOW LOAD

ELASTIC MATERIALS

LOAD

DEPTH

HIGH LOAD

PLASTIC MATERIALS

LOAD

DEPTH

HARDNESS / ELASTIC MODULUS vs DEPTH

LOAD

HARDNESS

ELASTIC MODULUS

TIME

DEPTH

INSTRUMENTED INDENTATION   HARDNESS AND ELASTIC MODULUS


BERKOVICH

VICKERS

KNOOP

CONICAL
INSTRUMENTED INDENTATION | STRESS vs STRAIN

STRESS vs STRAIN

LOAD vs TIME

STRESS vs STRAIN

TIME vs STRAIN
INSTRUMENTED INDENTATION | CREEP RELAXATION

**INDENT**

**COMPRESSION**

**CREEP**

- **LOAD** vs **TIME**
  - Creep Zone

**RELAXATION**

- **DEPTH** vs **TIME**
  - Relaxation Zone
DYNAMIC MECHANICAL ANALYSIS (DMA)

LOAD vs. TIME

MODULUS vs. TIME

STORAGE MODULUS

LOSS MODULUS

GLASS TRANSITION TEMPERATURE

LOAD vs. TEMPERATURE

STORAGE MODULUS

LOSS MODULUS

Tg

Tan δ

TEMPERATURE vs. TIME
INSTRUMENTED INDENTATION | ULTIMATE YIELD STRENGTH & FATIGUE

**YIELD STRENGTH**

**FATIGUE**
INSTRUMENTED INDENTATION | FRACTURE TOUGHNESS

LOAD CRACKING

LOAD

DEPTH

CRACKING

LOAD

ACOUSTIC EMISSION
INSTRUMENTED SCRATCH | ADHESIVE FAILURE

- Critical Load
- Delamination
- Load
- Friction
- Depth
- Acoustic Emission

ASTM C1624, ASTM F2496, ASTM D2197, ASTM D7027
ISO 20502, ISO 1518
**POLYMER**  \( H_{Sp} = 0.16 \text{ GPa} \)

**METAL**  \( H_{Sp} = 3.20 \text{ GPa} \)
INSTRUMENTED SCRATCH | MULTI-PASS WEAR

**DEPTH**

DISTANCE

**FRICTION**

DISTANCE

- 20th Pass
- 10th Pass
- 1st Pass

- 20th Pass
- 10th Pass
- 1st Pass
VARIETY OF MATERIALS

- METALS
- CERAMICS
- GLASS
- POLYMERS
- BIOMATERIALS
- COMPOSITES

INSTRUMENTED FRICTION | COEFFICIENT OF FRICTION (COF)

VARIETY OF GEOMETRIES

CONSTANT LOAD

PROGRESSIVE LOAD
ADVANCED AUTOMATION
ADVANCED AUTOMATION

BROADVIEW MAP SECTION TOOL

FAST MAPPING

WIZARD ASSISTANT

- Generate automatically best test parameters
- Any materials / any thickness
- Recommend best diamond type and sizes
- Automatically test any samples
ADVANCED AUTOMATION

TRACKING ZOOMED VIEW

W/ AE, FRICTION, AND DEPTH DATA

W/ FULL SCRATCH IMAGE
### BASE

<table>
<thead>
<tr>
<th>Feature</th>
<th>CB500</th>
<th>PB1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum # of Modules</td>
<td>1 (Nano or Micro)</td>
<td>2 (Nano &amp; Micro)</td>
</tr>
<tr>
<td>X&amp;Y Motorized Stages</td>
<td>100 x 50mm</td>
<td>200 x 150mm</td>
</tr>
<tr>
<td>XY Lateral Resolution</td>
<td>0.1μm</td>
<td>0.1μm</td>
</tr>
<tr>
<td>Z Motorized Approach (range)</td>
<td>50mm</td>
<td>50mm (+ 140mm manual extra slide)</td>
</tr>
<tr>
<td>Base Type</td>
<td>Desktop</td>
<td>Desktop or Stand Alone</td>
</tr>
<tr>
<td>Desktop Dimensions</td>
<td>38 x 33 x 70cm</td>
<td>64 x 68 x 82cm</td>
</tr>
<tr>
<td>Stand-Alone Dimensions</td>
<td>N/A</td>
<td>92 x 92 x 183cm</td>
</tr>
<tr>
<td>Zoom Video Microscope</td>
<td>1600 x 1200 Camera</td>
<td>1600 x 1200 Camera</td>
</tr>
<tr>
<td>3D Optical Profiler</td>
<td>N/A</td>
<td>Optional</td>
</tr>
<tr>
<td>AFM</td>
<td>N/A</td>
<td>Optional</td>
</tr>
<tr>
<td>High Speed Fretting Wear</td>
<td>N/A</td>
<td>Custom up to 40 Hz</td>
</tr>
</tbody>
</table>

### MODULES

<table>
<thead>
<tr>
<th>Feature</th>
<th>NANO</th>
<th>MICRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition Rate</td>
<td>24bit</td>
<td>24bit</td>
</tr>
<tr>
<td>Modes of Testing</td>
<td>Indentation, Scratch &amp; Wear</td>
<td>Indentation, Scratch &amp; Wear</td>
</tr>
<tr>
<td>Loading System</td>
<td>Piezo Electric</td>
<td>Ball Screw Servo Motor</td>
</tr>
<tr>
<td>Load Sensor (independent from depth sensor)</td>
<td>Ultra Sensitive Compressive Load Cell</td>
<td>Compressive Load Cell</td>
</tr>
<tr>
<td>Force Range</td>
<td>80</td>
<td>400</td>
</tr>
<tr>
<td>Force Resolution</td>
<td>0.1μm</td>
<td>0.3</td>
</tr>
<tr>
<td>Force Noise Floor rms</td>
<td>0.004</td>
<td>0.14</td>
</tr>
<tr>
<td>FastMap</td>
<td>5.0μm</td>
<td>50μm</td>
</tr>
<tr>
<td>Depth Sensor Range</td>
<td>0.1μm</td>
<td>0.3</td>
</tr>
<tr>
<td>Friction Noise Floor RMS</td>
<td>150 - 400kHz</td>
<td>150 - 400kHz</td>
</tr>
<tr>
<td>Acoustic Emission Frequencies**</td>
<td>0.3</td>
<td>6</td>
</tr>
<tr>
<td>Sensitivity of AE Absolute Energy</td>
<td>0.005aJ</td>
<td>N/A</td>
</tr>
<tr>
<td>DMA / CSM Frequencies</td>
<td>0.1 to 100Hz</td>
<td>Yes</td>
</tr>
<tr>
<td>Frequency &amp; Temperature Sweep at Constant Load</td>
<td>Yes</td>
<td>275°</td>
</tr>
<tr>
<td>Temperature Oven***</td>
<td>Yes</td>
<td>275°</td>
</tr>
<tr>
<td>Humidity</td>
<td>Yes</td>
<td>275°</td>
</tr>
<tr>
<td>Cold Temperature</td>
<td>Yes</td>
<td>275°</td>
</tr>
</tbody>
</table>

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* Larger balls or geometries with lighter materials are available.
** Other frequency range available, Nano only available under sample.
*** Specifications subject to change, please contact Nanovea for latest.
Today’s Standard For Tomorrow’s Materials.

Firmly aligned with our vision, Nanovea aims to simplify advanced measurement technologies to stimulate materials engineering for the common good. Ease of use, advanced automation and the dedication to superior accuracy are the driving forces behind its full range of precision instruments.

As a Trusted Quality Manufacturer, our Profilometers, Mechanical Testers & Tribometers can be found internationally in distinguished educational and industrial organizations ranging from automotive to cosmetic, biotechnology to medical devices and from microelectronics to space applications. Thousands of clients rely on our accurate & honest solutions, superior instruments and experienced laboratory and consulting services.