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

ENVIRONMENTAL MODULES

Nano Module  Micro Module

Hot Temperature  Cold Temperature  Humidity  Liquid
Widest Range of Loads with Best Accuracy
NANOVA 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

- Nano Module
- Micro Module

ENVIRONMENTAL MODULES

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

- Automated Z Control 50mm
- Microscope Video Zoom Imaging
- Environmental Modules & Custom Sample Holders
- Nano or Micro on a Single System
- Automated XY Control 50 x 100mm
- 38 x 33 x 70cm
NANO-MODULE

- 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 1500μm
- 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
NANOVA SUPERIOR TECHNIQUE
CASE FOR BETTER INDENTATION ACCURACY

PIEZOELECTRIC ACTUATOR

- Independent load & depth sensor
- Capacitive depth sensor
- Closed loop feedback or open loop mode from depth or load sensor

COIL ACTUATOR

- No independent load & depth sensor
- No load sensor
- Requires substraction of supporting springs signal

NANOVEA

others
CASE FOR BETTER SCRATCH & WEAR

PIEZO ACTUATOR

LOAD CELL SENSOR
CAPACITIVE DEPTH SENSOR

INDEPENDENT LOAD & DEPTH SENSOR

NO INDEPENDENT LOAD & DEPTH SENSOR
NO LOAD SENSOR

LOAD APPLIED = LOAD MEASUREMENT
PIEZO VOLTAGE

LOAD CALCULATED
LOAD APPLIED
COIL VOLTAGE

N NANOVEA

OTHERS
SUPERIORITY OF COMPRESSION LOAD CELL

INDENTATION

LOAD IS APPLIED EVENLY

NANOVEA

FORWARD MOVEMENT OF TIP DURING LOADING

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

REFERENCE DISPLACEMENT

NO EFFECT FROM SURFACE REFERENCING

NANOVEA

EVEN NANOGRAM MOVEMENT EFFECTS DATA ACCURACY

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 | -50°C lower custom temperature
- Tip and sample in the enclosed environment

LIQUID

- Custom height
- Heating option
QUALITY & ACCURACY

DIAMOND AREA FUNCTION

NANOVEA
Patent EP3076153

SINGLE-indent | ONE-MINUTE | HIGH-Accuracy

TRUE AREA
IDEAL AREA

DEPTH

OTHERS

> 100-indent | > 120-MINUTES | QUANTITY OF INDENTS ON SILICA LIMITS ACCURACY

TRUE AREA
IDEAL AREA

DEPTH

QUANTIFIABLE QUALITY CHECK FOR DIAMONDS

QUALITY TRACKING VALUE

1ST | 100TH | 2000TH

1.1 | 1.6 | 3.5

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

Patent EP3076153
• Objective magnification up to 100x
• Large area stitching capability
• Color Video Camera (1200x1600)
• Three position turret (optional)
• Video Microscope to/from Indenter position with encoder accuracy of <0.2μN
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
MECHANICAL TESTING PROPERTIES
INSTRUMENTED INDENTATION | HARDNESS AND ELASTIC MODULUS

LOW LOAD

HIGH LOAD

ELASTIC MATERIALS

LOW LOAD

HIGH LOAD

PLASTIC MATERIALS

HARDNESS / ELASTIC MODULUS vs DEPTH


INSTRUMENTED INDENTATION

BERKOVICH

VICKERS

KNOOP

CONICAL

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

LOAD

HARDNESS

ELASTIC MODULUS

DEPTHTIME

DEPTHTIME

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DEPTHTIME
INSTRUMENTED INDENTATION | **CREEP RELAXATION**

**INDENT**

**COMPRESSION**

**CREEP**

![Graph showing load-time relationship during creep zone](image1)

**RELAXATION**

![Graph showing depth-time relationship during relaxation zone](image2)
DYNAMIC MECHANICAL ANALYSIS (DMA)

LOAD vs. TIME

MODULUS vs. TIME

GLASS TRANSITION TEMPERATURE

LOAD vs. TEMPERATURE

STORAGE MODULUS vs. TEMPERATURE

LOSS MODULUS vs. TEMPERATURE

\( T_g \)

\( \tan \delta \)
INSTRUMENTED INDENTATION | ULTIMATE YIELD STRENGTH & FATIGUE

**YIELD STRENGTH**

**FATIGUE**
INSTRUMENTED INDENTATION | FRACTURE TOUGHNESS

LOAD CRACKING DEPTH

LOAD

CRACKING

DEPTH

ACOUSTIC EMISSION

LOAD
INSTRUMENTED SCRATCH | ADHESIVE FAILURE

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

(Images of scratch patterns and graphs showing load, friction, depth, and acoustic emission.)

ASTM C1624, ASTM F2496, ASTM D2197, ASTM D7027
ISO 20502, ISO 1518
INSTRUMENTED SCRATCH | COHESIVE FAILURE

Friction

Acoustic Emission

Load

In-situ Depth

Elastic Deformation

Residual Depth

Plastic Deformation

Load

8% 40° 8%
**POLYMER**  \( H_{Sp} = 0.16 \text{ GPa} \)

**METAL**  \( H_{Sp} = 3.20 \text{ GPa} \)
**VARIETY OF MATERIALS**

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

**VARIETY OF GEOMETRIES**

---

**CONSTANT LOAD**

- **FRICTION**
- **LOAD**
- **DISTANCE**

**PROGRESSIVE LOAD**

- **FRICTION**
- **LOAD**
- **DISTANCE**
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>Maximum # of Modules</th>
<th>1 (Nano or Micro)</th>
<th>2 (Nano &amp; Micro)</th>
</tr>
</thead>
<tbody>
<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>

### NANO

| Acquisition Rate | 24bit           | 24bit |
| Modes of Testing | Indentation, Scratch & Wear | Ball Screw Servo Motor |
| Loading System | Piezo Electric | Compressive Load Cell |
| Load Sensor (independent from depth sensor) | Ultra Sensitive Compressive Load Cell | |
| Force Range | 80 | 400 | 1800 | 4800mN | 20 | 40 | 200 | 400N |
| Force Resolution | 0.004 | .03 | 0.14 | 0.28µN | 1.2 | 2.4 | 12 | 24µN |
| Force Noise Floor rms | 0.12 | 1 | 4 | 12µN | 50 | 100 | 500 | 1000µN |
| FastMap | 5min (100 indents) | 12min (100 indents) |
| Depth Sensor | Capacitor Ring | Large Area Capacitor |
| Range | 250 | 1500µm | 1mm w/ 50mm motor encoder |
| Displacement Resolution | 0.003nm | 0.01nm |
| Displacement Noise Floor rms | 0.04nm | 0.15nm |
| Indenter Geometries Including Flat or Balls Up To* | 6mm | 25mm |
| Friction Range | 40 | 400 | 1800mN | 20 | 200N |
| Force Resolution | 0.004 | .014 | 0.28µN | 1.2 | 12µN |
| Friction Noise Floor RMS | 0.3 | 6 | 12µN | 1.2 | 2mN |
| Acoustic Emission Frequencies** | 150 - 400kHz | 150 - 400kHz |
| Sensitivity of AE Absolute Energy | 0.005µJ | 0.005µJ |
| DMA / CSM Frequencies | 0.1 to 100Hz | N/A |
| Frequency & Temperature Sweep at Constant Load | Yes | N/A |
| Temperature Oven*** | 275° | 450°C | 275° | 450° | 600°C |
| Humidity | 5% to Dew Point | 5% to Dew Point |
| Cold Temperature | Down to -10°C | -50°C | Down to -10°C | -50°C |

*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.
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.