

NANO INDENTATION TESTER ENT-5

ELIONIX
Action for Innovation

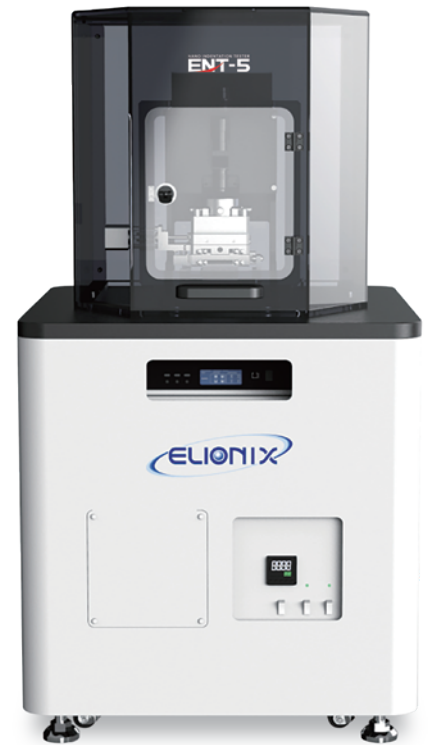
Nanoindentation tester

ENT-5
5th generation of Elionix
Nanoindentation Tester

High data reproducibility by suppressing disturbance in the measurement environment

"Made in Japan."

Supports a wide range of test loads from 0.5 μ N to 2,000mN



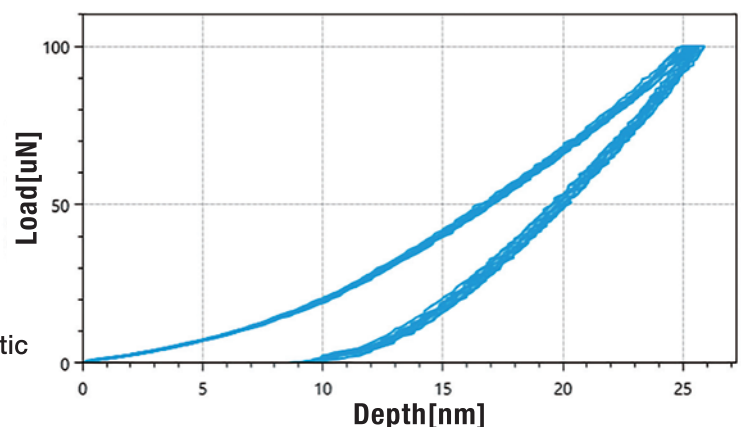
Features

● Applicable to variable kind of materials

- Plating, hard-coat thin layer
- Resin, polymer thin film
- Ultra-thin DLC coating
- Functional resin, surface modification layer
- Fine particles and powder materials

● Nano indentation test

- Mechanical characteristics such as hardness and elastic modulus on thin film or surface layer can be obtained.
- Analyze the load/unload curves to determine the characteristics. No need to observe indentations
- Compliant with ISO14577-1 / JIS Z 2255



● Measurable materials



Polymer films



Electronic components
(IC, LSI, etc.)



Rubber,
Elastomer



Glass,
Ceramic



Metal



Plastic



Various fibers,
Carbon fiber



Thin film / Coating

Features

NANO INDENTATION TESTER ENT-5

1.Temperature control

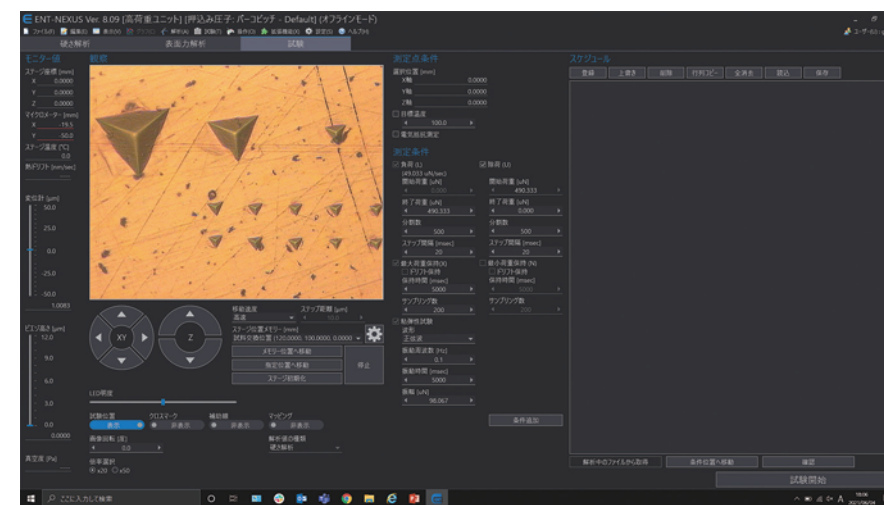
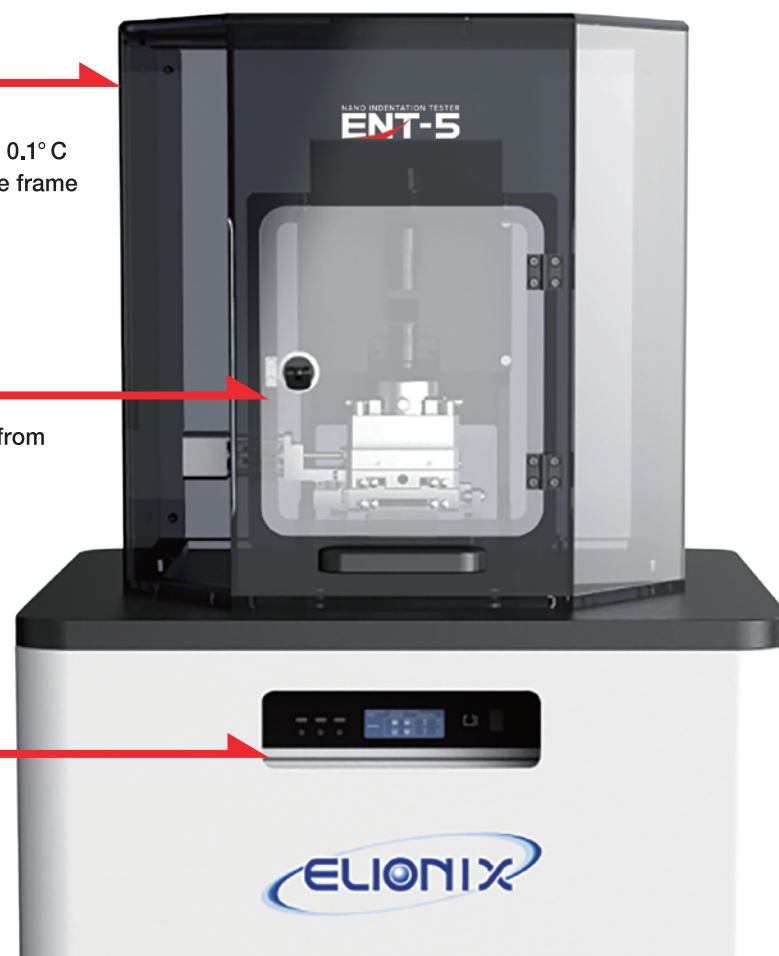
- Prevent thermal expansion of samples and testing machines
- Temperature control in the environmental isolation shield at $\pm 0.1^{\circ}\text{C}$
- Low thermal expansion material (Nobinite) is used for machine frame and Sample holder /stage
- Reduce impact from environmental airflow

2.High precision positioning stage

- Adopts in-house developed high-precision stage technology from Elionix Electron Beam Lithography system
- $0.1\mu\text{m}$ step in positioning
- Observe the material with magnification of 2,000x and set the measurement point.
(standard objective lens 20x and digital zoom)

3.Active vibration isolation

- Vibration-resistant wedge-shaped high-precision stage
- Active vibration isolation table



※It may differ from the actual product software

4.Software

- Pop-up alerting for daily check : indenter tip correction, temperature drift correction.
- Easy-to-use operability

5.Data reproducibility

- Improved data reproducibility by suppressing the disturbances from vibration and temperature changes
- Stable data even with continuous measurement

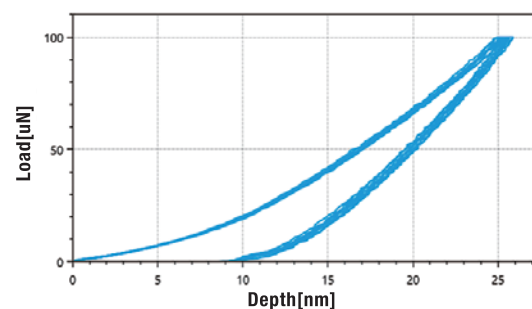
6.Maintainability

- Easy replacement of loading unit
- Minimum downtime with easy-change loading units

Measurement Example

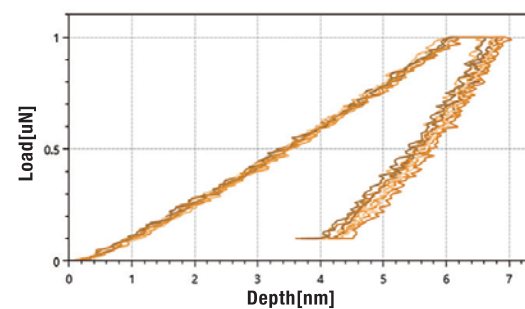
● Loading units

High load unit



High load unit Measurement example [Fused silica]
(Load : $100\mu\text{N}$ Overlay 9times)

Low load unit

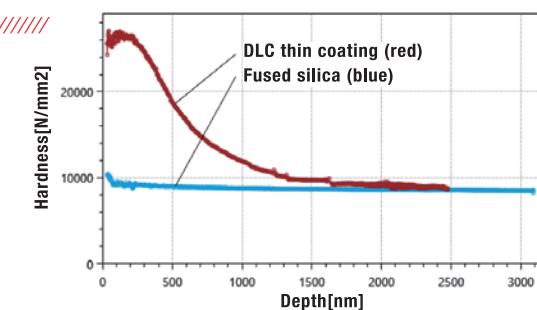


Low load unit Measurement example [resist]
(Load : $1\mu\text{N}$ Overlay 9times)

● Measurement example

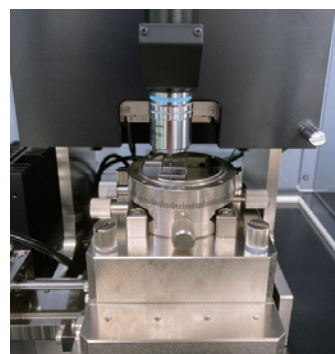
Dynamic Instrumented Indentation Test (standard function)

- This is the method measuring continuous stiffness distribution along the depth. Applying small oscillation during loading course and calculate hardness and elastic modulus.
- Sample
Fused silica (blue), DLC coating (red)
- Test results
Fused silica shows almost constant hardness regardless of the indentation depth. On the other hand, the DLC sample shows gradual changing in the hardness from the surface to the base material.



● Sample holder

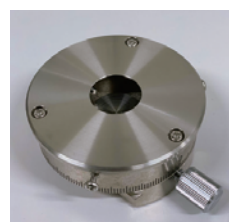
Optional holders



Standard sample holder (φ50mm)



Heating holder
* Sample size
 $10 \times 15 \times 3\text{mm}$
* Temperature range
R.T~ 250°C (High load)
R.T~ 180°C (Low load)



Sample holder for Resin embedding sample
* Sample size
Diameter $25 \sim 40\text{mm}$
Height $9 \sim 14\text{mm}$

*Customized holders to fix samples with special shapes are available.

Underwater test (optional)

- Hardness test in the water/solution with immersion objective lens and indenter.

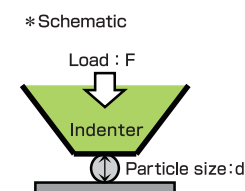


Underwater sample holder
* Sample size
 $\phi 20\text{mm} \times 3\text{mm}$
* Schematic
Sample
Indenter
solution

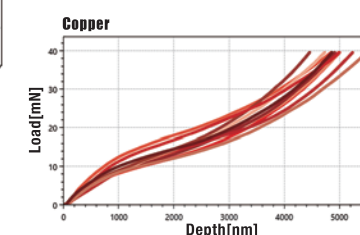
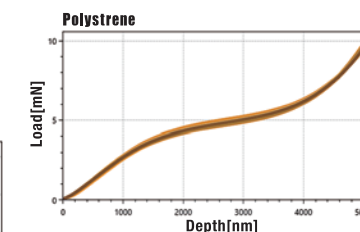
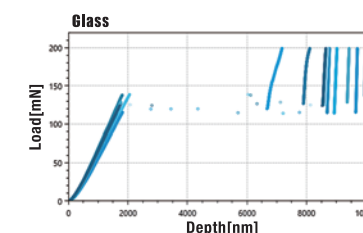
Compressive strength of micro particles test (optional)

- This is the method to measure the fracture strength /deformation strength of particles in which a load is continuously applied by a flat punch.

JIS Z 8844:2019 Test method of fracture and deformation strength of a fine particle



- Sample
Glass(Particle size $10\mu\text{m} \pm 0.5\mu\text{m}$)
Polystyrene(Particle size $10\mu\text{m} \pm 0.5\mu\text{m}$)
Copper(Particle size $10\mu\text{m} \pm 2\mu\text{m}$)
- Test results
In ductile polystyrene and copper, the displacement changes continuously with the load.
In brittle glass, discontinuous curve is seen when the glass is broken.



Load system

Load	High load unit: $5\ \mu\text{N} \sim 2,000\text{mN}$	Low load unit: $0.5\ \mu\text{N} \sim 10\text{mN}$
Load resolution	High load unit: 5nN	Low load unit: 0.03nN
Loading method	Electro magnetic	

Indenter displacement measurement system

Measurement range	$\pm 50\ \mu\text{m}$
Measurement resolution	0.3pm
Measurement method	Optical

Stage

Sample size (typical)	$\phi 50 \times t3.5\text{mm}$
Measurable area	X50mm, Y40mm
Min.increment	$0.1\ \mu\text{m}$

Optical observation system

Objective lens	x20 *standard specification (x10, x50, x100 as option)
Monitor magnification	x500 *standard specification (x2,000 with digital zoom)

System

Number of load units that can be mounted	1 unit
Vibration isolation method	Active vibration isolation table
Temperature control	Control temperature with 0.1°C step in the shield.

External dimensions / Environmental conditions

External dimensions	650mm(W) $\times$ 650mm(D) $\times$ 1,200mm(H) (main unit only)
Power supply	100 $\sim$ 120V (Plug connection), 220/230/240V (Switchboard connection or Plug connection). * Installation prepared by end-user or distributor), 50/60HZ
Temperature	20 $\sim$ 25 $^\circ\text{C}$ (No sudden temperature changes)
Humidity	Less than 60%
Floor vibration	Below 0.5gal p-p (Less low frequency vibration)

Option (holder)

Heating holder	High load unit: Max. heating temperature 250 $^\circ\text{C}$	Low load unit: Max. heating temperature 180 $^\circ\text{C}$
Sample holder for Resin embedding sample	Sample holder for resin-embedded sample	
Custom sample holder	Custom sample holder can be designed upon request	

Option (measurement)

Viscoelasticity test	This is the method to obtain elastic modulus (E'), the loss elastic modulus (E''), and the loss coefficient ($\tan\delta$). Applying small oscillation at the maximum loading. In addition, the glass transition point (T_g) can be evaluated with heating stage.
Underwater test	Hardness test can be performed in water.
Compressive strength of micro particles test (Only high load unit)	This is the method to measure the fracture strength / deformation strength of particles by a flat indenter with continuous load.

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