

MECHANICAL CHARACTERIZATION

Hardness and scratch tester

ANTON PAAR

STEP 4

Surface Testing Platform

This instrument can be used for all kinds of industrial coatings, from the plasma-processed layers used in semiconductor and optical technology to the decorative and protective coatings used for consumer goods and automobile parts.

The Step 4 Surface Testing Platform is equipped with a nano/micro indenter and a scratch tester.

During the measurement, the instrument records the load and penetration depth, returning a complete loading and unloading curve where the force is plotted as a function of the indenter penetration depth. From the processing of these curves, it is possible to obtain the instrumented

hardness, elastic modulus and a wide range of micro-mechanical characteristics.

The micro and nano indentation testers cover a wide loading range (0.002 ÷ 30 N). This allows to characterize the mechanical properties of different materials.

The scratch test allows the characterization of the scratch resistance of a wide range of materials (polymeric, metallic, ceramic) and provides a quantitative, comparative measure of the adhesion of thin films onto hard or soft substrates. The test consists of sliding a tip of known geometry onto the sample surface, under a constant or variable normal load.

Indentation

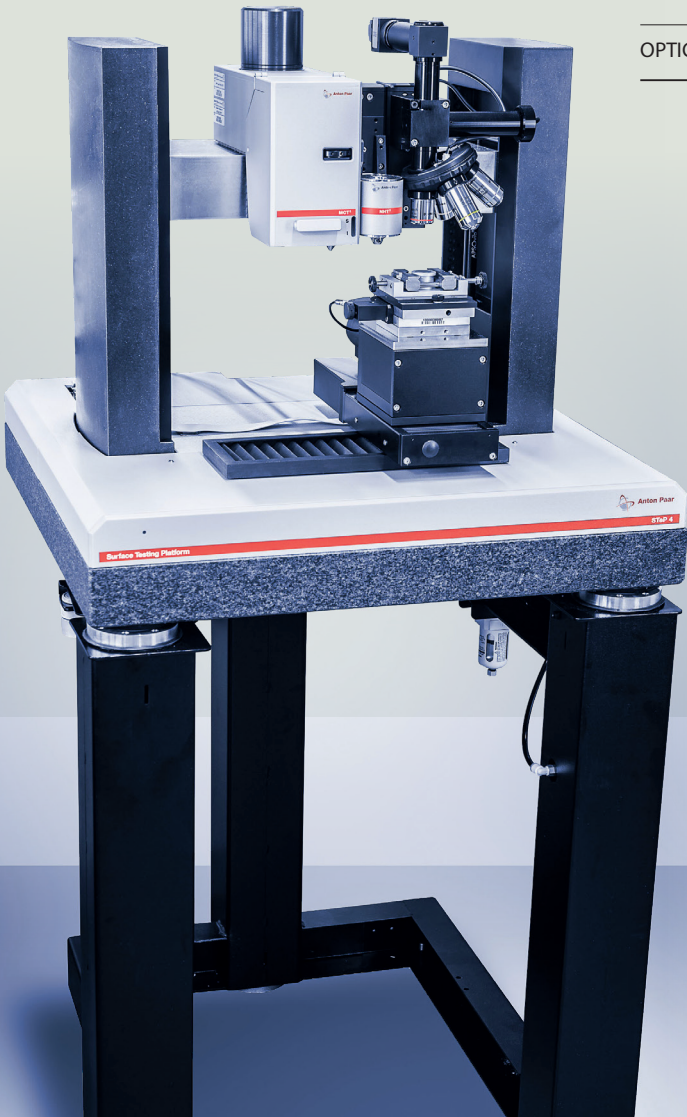
- Automatic hardness/elastic modulus calculation
- Different indentation modes: applied load control, penetration depth control, strain rate control.
- Depth profiling with continuous multi cycles modes
- Creep and relaxation analysis
- Elastic and plastic energies
- Sinusoidal mode analysis (1-20Hz - Nano)
- Statistical analysis functions (average & std deviation)

Scratching

- Full control of scratch tests: scratch length, scratch speed, loading gradient
- Loading modes: progressive, constant, incremental
- Pre-scan and post-scan modes

Materials

- PVD/CVD coatings (TiN, TiCN, DLC)
- Thermal barrier coatings
- Metals and alloys
- Ceramics and composites
- Glasses
- Semiconductors
- Polymers
(coatings, paints and bulk materials)
- Biomaterials
(bones, cartilage, cornea, prostheses, stents, contact lenses, tissues and hydrogels)
- Pharmaceutical pills
- Cementitious materials
(concrete, cement)



Specifications

ELABORATION	Control and elaboration software for micro/nano indentation and scratching
STABILIZATION SYSTEM	Antivibration air table
SAMPLE HOLDER	Motorized
INDENTATOR	MICRO (MST3) Vickers Rockwell (scratch)
	NANO (NHT3) Berkovich
REVOLVER	4 SLOTS
LOAD/PENETRATION	MICRO (MST3) 0.01 N - 30 N (50mN-10N Instrumented hardness, 10N-30N Vickers hardness) 0 µm - 1000 µm Scratch up to 30 N
	NANO (NHT3) 0 mN – 500mN 0 µm - 200 µm
OPTICS	Digital 5x, 20x, 50x, 100x

