

INDENTATION PLATFORM (ANTON PAAR)

1. Micro-Combi Tester (MCT)

The Micro Combi Tester is a universal measurement head for full mechanical characterization of coatings and bulk samples. The unique wide load range of this instrument allows the determination of adhesion, scratch resistance, hardness, elastic modulus, friction, and wear for a wide range of samples.

Technical Details

- Maximum load of 30 N
- Load resolution of 6 μn
- Loading rate up to 300 N/min
- Scratch speed from 0.1 to 600 mm/min

Types of measurements

- Indentation hardness (H_{IT}), Martens hardness (H_M)
- Indentation modulus (E_{IT}), reduced modulus (E_r)
- Maximum indentation depth (h_{max})

2. Nanoindentation Tester (NHT)

The Nanoindentation Tester is designed to provide low loads with depth measurements on the nanometer scale for the measurement of hardness, elastic modulus, creep, etc. With the unique top surface referencing technique, an indentation measurement can be made immediately without waiting for thermal stabilization.

Technical Characteristics

- Testing force up to 500 mN
- Force resolution of 0.02 μn
- Depth up to 200 μm
- Depth resolution of 0.01 nm
- Load frame stiffness $> 10^7$ N/m
- Measurements based on ISO 14577, ASTM E2546

Typical Applications

- Hard coatings (PVD, CVD coatings): thickness range of 1 ÷ 20 μm
- Metallurgy: characterization and microstructure of metals, alloys
- Nanoindentation of oxide coatings on thin-film polymer substrates
- Mechanical properties of cementitious materials
- Characterization of thermal spray coatings

3. Atomic Force Microscopy (AFM)

This AFM technique allows seeing and measuring surface structure with unprecedented resolution and accuracy. An atomic force microscope enables us, for example, to obtain images showing the arrangement of individual atoms in a sample. Compared to other microscopes, such as optical or electron microscopes, AFM provides higher resolution not only in the lateral direction but also in the vertical direction, so that very precise information about the surface topography is obtained. Another advantage of AFM is that the sample does not have to be conductive, so insulating samples can be used.

Types of measurements

- Friction
- Phase electrical conductivity/resistance
- Thermal conductivity/resistance
- Glass transition temperature
- Melting temperature
- Stiffness