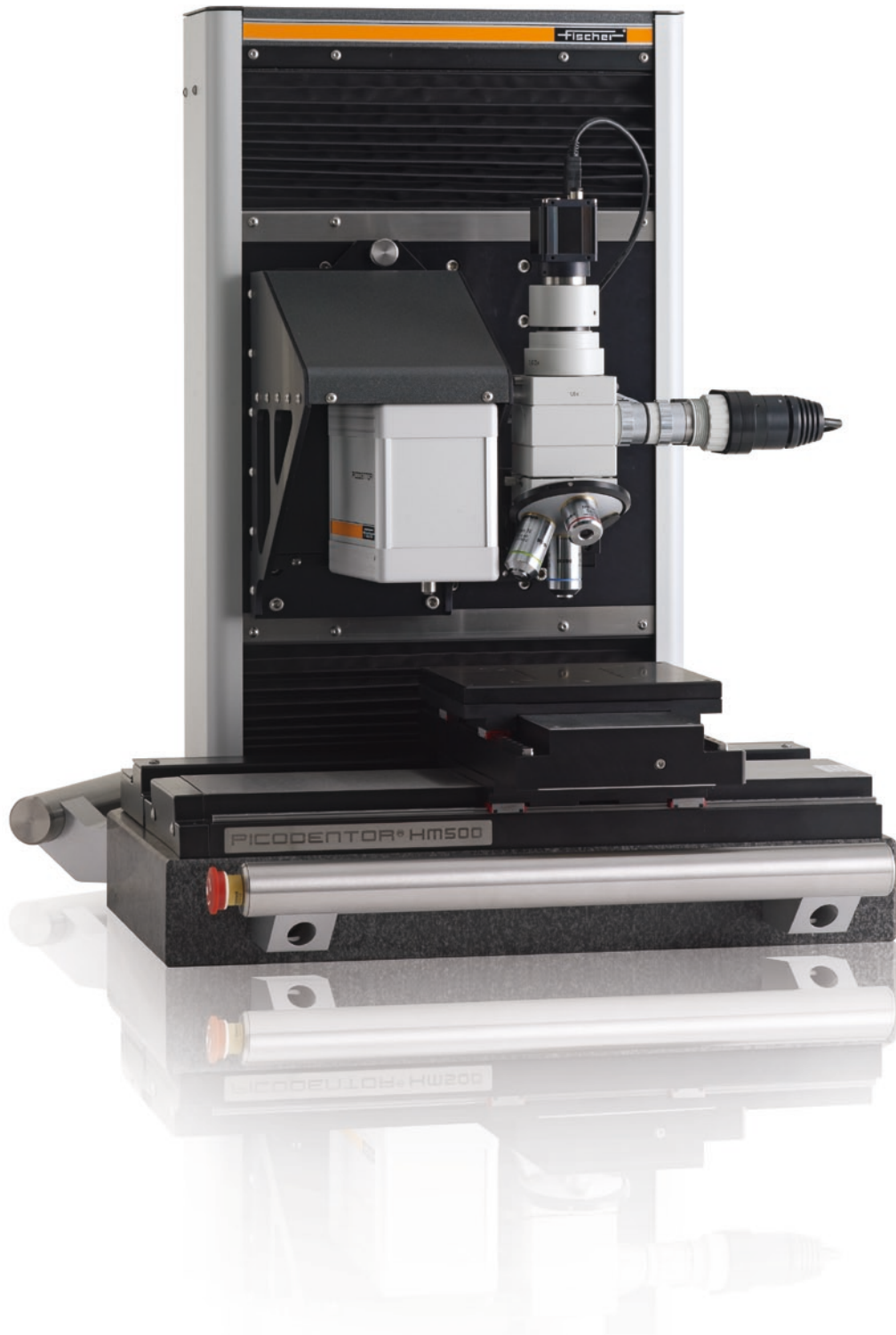


PICODENTOR® HM500

Microhardness Measurement of Coatings in the Nanometer Range



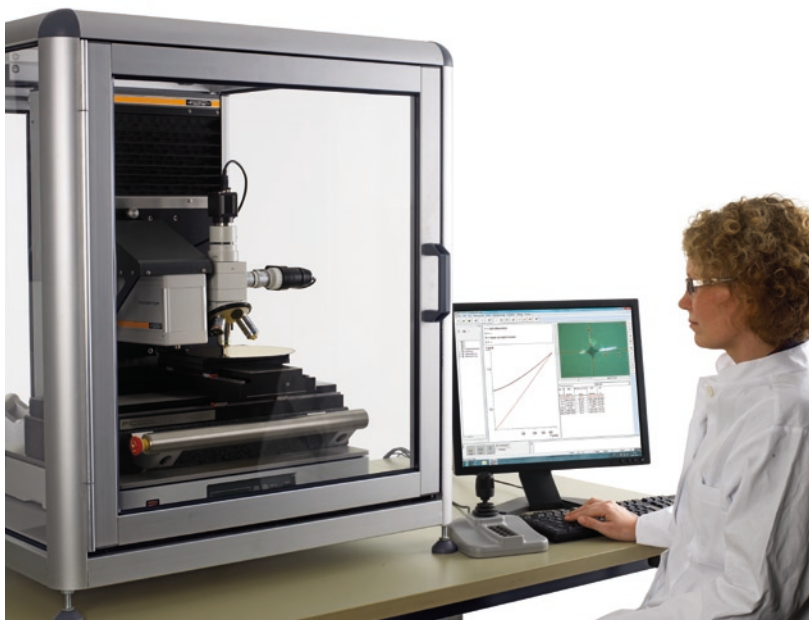
fischer®

Ultra-thin hard coatings – a challenge

Highly complex coating systems in the nanometer range have been developed over the past years to achieve scratch-resistant, soil-resistant, antistatic, reflecting or storage-capable surfaces. Hard material coatings of TiN, TiC or DLC (diamond-like carbon) with thicknesses of 1 to 4 micrometers are already in use for tools and engine components. Coatings with thicknesses of only a few micrometers or even only a few tens or hundreds of nanometers are gaining importance due to their excellent properties. The determination of the properties of such coatings is essential for their optimization.

The PICODENTOR® HM500 Measurement System

The PICODENTOR HM500 is the ideal instrument for the determination of properties of ultra-thin hard coatings. With high-precision distance measurements in the picometer range and load generation down to a few micronewtons, the PICODENTOR HM500 can be used – according to the load/indentation depth method – to characterize ultra-thin coatings or surface areas with regard to their mechanical properties.



PICODENTOR® HM500, complete system

Components of the PICODENTOR® HM500

Measurement System

The system consists of the following components:

- PC with installed WIN-HCU® Software
- Positioning device, granite construction, with measuring head, programmable X/Y-stage, motorized Z-axis, optical system with three or optional four lenses, autofocus and automatic objective detection
- Joystick for controlling X/Y-stage and Z-axis
- Active anti-vibration table
- Optional: atomic force microscope (AFM)

Characteristics

- Determination of the Martens hardness HM, characteristic elastic quantities and additional material parameters, even in the nano range, using the instrumented indentation test according to ISO 14577-1 and ASTM E 2546.
- Simple handling through automatic objective detection and motorized Z-axis with autofocus
- Excellent price/performance ratio: The achieved resolution and accuracy for the load and distance measurement is in the same range as that of instruments with a much higher purchasing price.
- Most samples can be measured quickly and without sample preparation. Thus, the device is not only suitable for lab applications, but also for production monitoring.
- Measurements even on the smallest structures through high accuracy X/Y table with a repeatability of $\leq 0.5 \mu\text{m}$.
- Due to its granite design, the device is extremely dimensionally stable, has a very low thermal expansion and is excellently isolated against vibrations.
- Additional vibration damping through closed measuring chamber and active anti-vibration table.
- Easy operation through the customizable WIN-HCU® Software.

Applications

- Hard material coatings, general
- Ultra thin DLC coatings
- Protective coatings on glass
- Soil-resistant coatings (sol-gel coatings)
- Coatings of PC hard disks and CDs
- Very thin paint coatings
- Ion implanted surfaces
- Nanocoatings for sensors
- Medical technology (e. g. Implants)
- Matrix effects in alloys
- Biological materials
- Ceramic materials
- Hardness determination on cross-sectioned specimens

Application example:

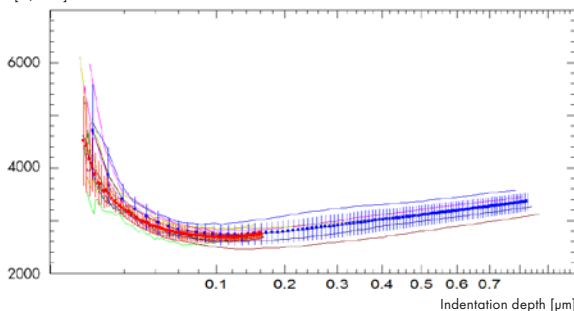
Ultra-thin protective coatings



Wafer

In the electronics industry, the printed conductors and their coating thickness are becoming ever finer and thinner. Since the indentation depth of the indenter for hardness tests should only be at most 10 percent of the coating thickness, the test load must be reduced accordingly to a minimum.

Martens hardness
HM [N/mm²]



Results of the hardness determination on an approx. 600 nm thick silicon oxide coating on a wafer

Very thin, transparent nanometer coatings are applied to hard discs, CDs, DVDs and Blue-ray discs to increase the wear protection and abrasion resistance.

Application example:

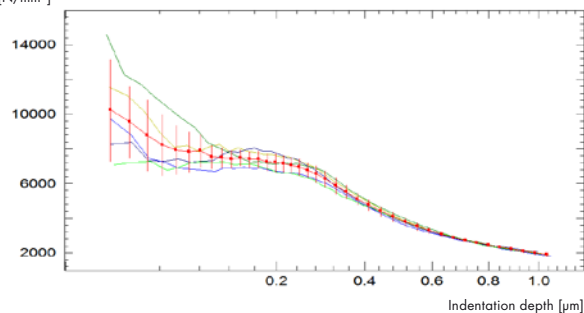
Coated spectacle lenses



For spectacle lenses made of synthetic material, scratch-free protective coatings are indispensable

Synthetic glasses receive several coatings of different thicknesses in the nanometer range to obtain a scratch-resistant, soil-resistant and anti-reflective surface. Testing the mechanical properties of such thin coatings requires a measurement system with a high-precision distance measurement in the picometer range and a load generation down to a few micro-newtons.

Indentation hardness HIT
[N/mm²]



Results of the hardness determination on a coated synthetic eyeglass

Product

PICODENTOR® HM500

Order no.

604-602

Optional accessories

- Objective/field of vision
100x/70 x 50 μm
- Atomic force microscope (AFM)
- Sample holder
- Cross-section sample support
- Indenters, special shapes on request

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