PICODENTOR® HM500

Microhardness Measurement System

Description

The micro hardness measurement system PICODENTOR® HM500 utilizes the load/indentation depth method according to DIN EN ISO 14577-1. With this method, the indenter – typically a Vickers or Berkovich pyramid – is continuously pressed into the material tested with an increasing test load, and then unloaded. The respective indentation depth is measured at the same time. Taking into account the geometric relationship between the indentation depth and the shape of the indenter, this measurement results in the Martens hardness HM. Additional important characteristic material quantities can be obtained from the resultant load/unload cycle.

Measurable characteristic material quantities:

Material characteristics computed according to ISO 14577-1:

- Martens hardness HM
- Indentation hardness H_{IT} (convertible to HV)
- Modulus of indentation E_{IT}
- Indentation creep C_{IT}
- Percent elastic portion η_{IT} of the indentation work W_{elast}/W_{total}
- Additional quantities such as Martens hardness at a certain test load, portion of plastic deformation, etc.

Characteristic quantities computed from the measurement plot according to the previous DIN 50359.

ESP – mode, partial load and unload measurements, to obtain quantities like E_{IT}, H_{IT} in dependence on depth or load.

Design

The measuring head contains the indenter, the test load generating unit, and the position measurement unit for determining the indentation depth, as well as the entire electronic system. The indenter is generally a diamond pyramid as per Vickers with 136° plane angle, to DIN EN ISO 14577-2. Indenters with a diamond pyramid according to Berkovich or with hard metal spheres are available as well. The controlled touchdown of the measuring head leads to a very small machine compliance.

The specified test load is built up with high precision. The measurement of the indentation depth is carried out with a resolution in the picometer range. The extremely sensitive touch-down of the indenter allows for the exact determination of the zero point. The tip roundness of the indenter is determined using a reference measurement and is taken into account in the results, The micro hardness determination is computer controlled, free of any subjective influence, and thus independent of the operator.

General Specifications

Intended use	Micro hardness measurement system for measurements according to DIN EN ISO 14577 of lacquer coatings, electroplated coatings, hard coatings, polymers, metals, glass and much else.
Design	Measurement system with PC, measuring head, positioning device (granite), programmable X/Y-stage, motorized z-axis, autofocus, joystick for controlling X/Y-stage and Z-axis, measurement chamber.
Vibration damper system	Active anti-vibration table

Measuring head

Hardness measurement range	0,001 bis 120.000 N/mm^2: near diamond hardness
Test load range	0,005 – 500 mN
Load resolution	≤ 100 nN
Distance resolution	≤ 40 pm

Microscope / camera magnifications

Objective	5x, 20x and 50x
Video picture (field of vision)	1400 µm x 1000 µm, 350 µm x 250 µm, 140 µm x 100 µm Automatic objective detection

Indenters

Design	Standard: Vickers Optional: Berkovich, Knoop, hard metal spheres Ø 0.4 mm or Ø 2.0 mm, Special shapes on request
Approach speed of the indenter	≤ 0,1 µm / sec
Maximum indentation depth	150 µm

XY measuring stage

Design	Programmable X/Y-stage
Table dimensions	180 mm x 150 mm
Maximum Travel X/Y	170 mm x 140 mm
Repeatability precision X/Y	≤ 0,5 µm (unidirectional)
Max. specimen height	130 mm
Max. specimen weight	2 kg

Options

Objective / Video picture	100x / 70 µm x 50 µm
Atomic force microscope (AFM)	
Base Frame	
Sample holders	

Electrical data

Line voltage, line frequency	100 – 240 V +/- 10 % 47 – 63 Hz, 360 VA
Power consumption	max. 120 W (without evaluation PC)
Protection class	IP40

Dimensions

Exterior dimensions of positioning unit (H x D x W)	630 mm x 650 mm x 610 mm
Weight of positioning unit	120 kg
Weight including measurement chamber and anti-vibration table	220 kg

Environmental Conditions

Temperature: Operation	Climatic chamber class 2 10 °C – 40 °C / 50 °F – 104 °F
Temperature: Storage/Transport	0 °C – 50 °C / 32 °F – 122 °F
Humidity of ambient air	≤ 95 %, non-condensing

Evaluation unit

Software	WIN-HCU®
Operating system	Windows®

Standards

CE conformity	EN 61010
Standards	DIN EN ISO 14577 ASTM E 2546

Order

PICODENTOR® HM500	604-749

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