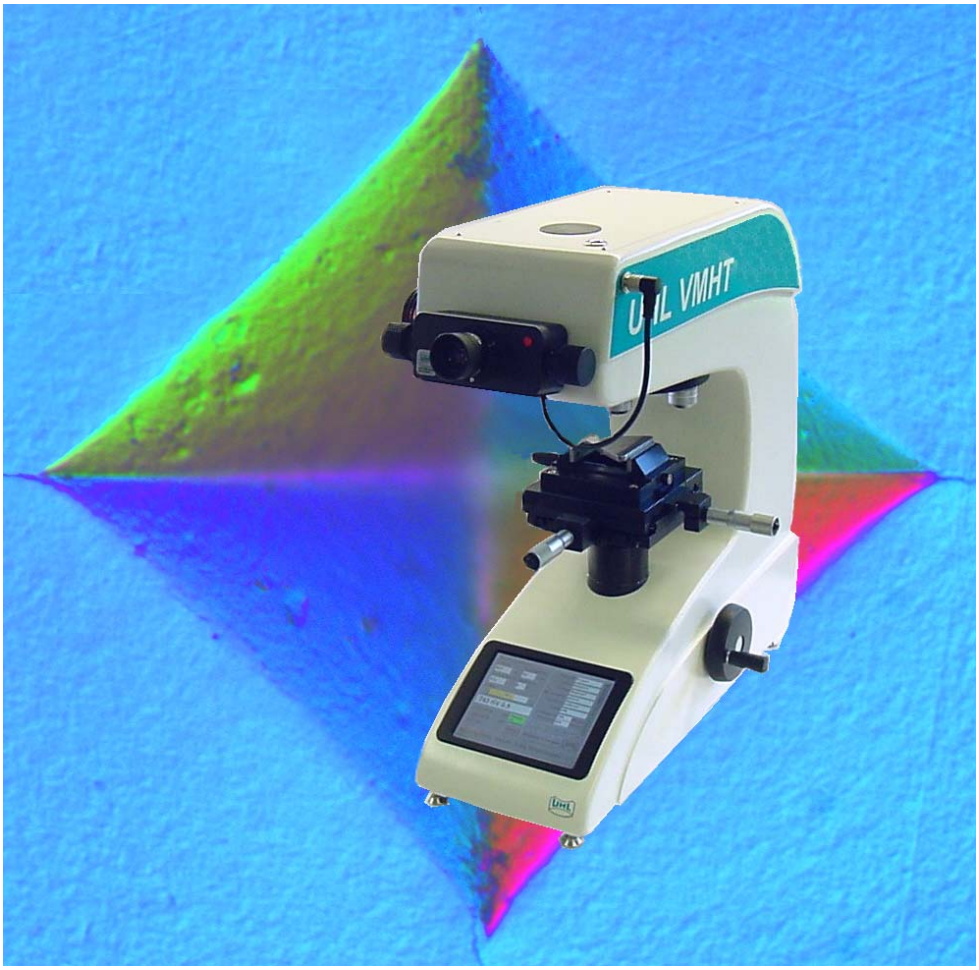
UHL VMHT

Microhardness Tester



Measuring instruments for manual, semiautomatic or fully automatic microhardness testing.

Revision: 15

UHL VMHT - straight to the point!

Test Forces

All the instruments offer 12 steps of test force: 1, 5, 10, 15, 25, 50, 100, 200, 300, 500, 1000, 2000 p (gf) covering the range of test forces required by the standards ASTM E-384, EN ISO 6507 and EN ISO 4545. At the touch of a button, the test force is automatically selected. The test force can also be changed by the computer when running automated measurement cycles and as a consequence allowing different test forces in the inspection.

Focus Finder

The newly introduced focus finder is available with all objectives (Leica Plan) and enables the operator to detect the focus position very quickly. This is particularly helpful in cases of highly polished samples with few details such as steel etc.

Approach Velocity

For specific applications depending on elastic and plastic properties of the material, the approach velocity of the indenter can be selected between 25 and 60 µm/s.

Optics

The infinity corrected Leica Plan objectives 10x and 50x are used according to International Standards, objectives 2.5x and 100x are optional. The measuring eyepiece with field of view 16 mm offers an optimized, ergonomic working position. Easily exchangeable aperture diaphragms enable the operator to optimize the contrast according to his applications.
The high quality of the optics ensures that indentations of small loads can be measured.

Printer/PC Interfaces

According to the desired peripheral instrument (PC or printer), USB and ethernet interfaces can be used.

Results and Data Storage

For each test, the measured diagonal lengths and the hardness value with test force are given as well as tolerance judgement, statistics (mean value, maximum/minimum, standard deviation). The test results can be stored as well as the specimen description and operator name.

Motorized Turret

All of the models are equipped with a motorized turret. After choosing the indentation spot, the indenter is brought into its working position at the touch of the button “Start indentation”. After finishing the indentation process, the previously chosen objective is automatically swiveled in and measurement (either by the operator with measuring eyepiece or by PC with image analysis) can immediately start.

The standard turret has 4 positions and can hold 3 objectives and one indenter.
The optional turret with 6 positions can hold 4 objectives and 2 indentors.

UHL VMHT - Very Impressive!

The new standard in microhardness testing

The new UHL VHMT not only has an exceptional new design, it makes microhardness testing more convenient for the user than any other instrument:

- 12 steps of test force
  yield more than the range required by ASTM E-384/EN ISO 6507/EN ISO 4545.
- Motorized selection of test force
  offers full control via touch panel display there is no mechanical dialing knob necessary.
- Selectable approach velocity
  prevents bouncing effects on specific materials.
- Focus finder
  helps to quickly determine the focal plane especially in case of highly polished samples.
- Especially in the fields of testing laboratories and materials research, the outstanding performance of the VMHT and VMHT MOT can be appreciated.
- The VMHT is a cost-effective instrument with motorized **(new)** turret movement and is push button controlled.
- The VMHT MOT offers a motorized turret and a touch panel display for more comprehensive information and interaction.
- Due to the outstanding optics it can be used as a simple brightfield metal microscope.

VMHT Order no.: **VMH-001**

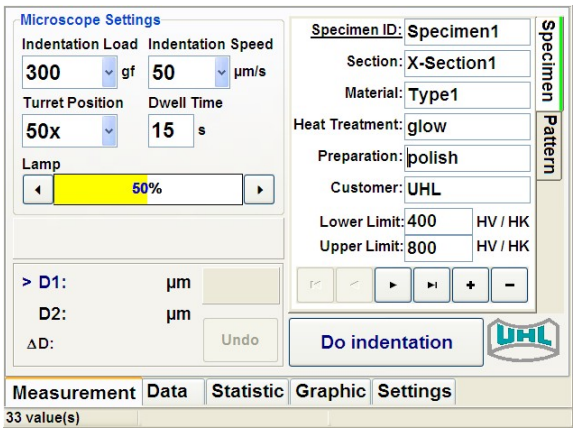
Revision: 15

UHL VMHT MOT

Intuitive User Interface

The color touch-display of the **VMH-002** hardness tester has a clear and easy user interface. All settings can be done by touching the desired value or function.

The user interface is straight forward without a deep submenu structure.



VMHT MOT Order no.: **VMH-002**

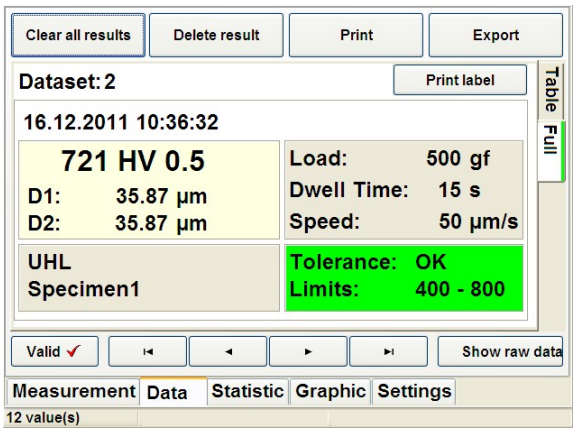
The user interface supports the following languages: german, englisch, french, polish

View Results

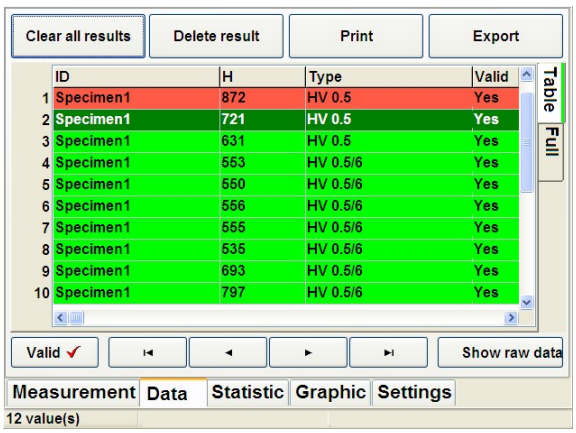
Results are shown in a structured detail view with all necessary testing parameters.

Values within the tolerance are shown green, values out of tolerance are shown red.

Integrated statistic functions are used for data evaluation.

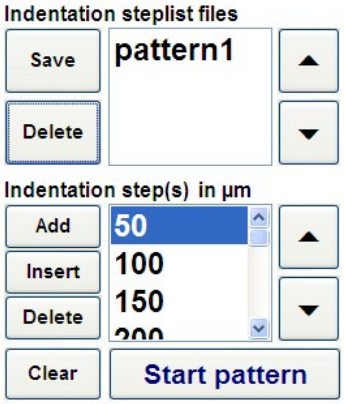


The table view gives a good overview of all results for one or multiple specimen.



Results protocols can be exported on a USB memory stick using the integrated PDF generator (e.g. to send it by e-mail).

To export the data to a spreadsheet application by texfile, the Ethernet interface can be used additionally.



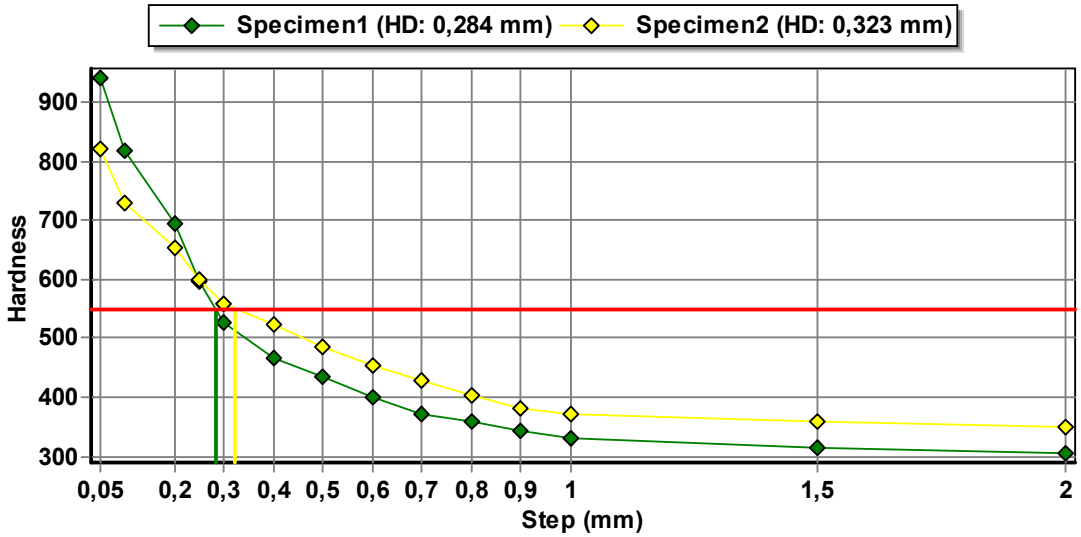
Graphical Display

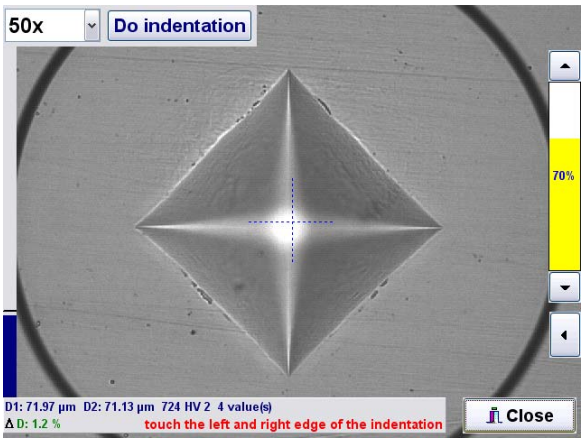
The values can be shown in a graph.

By defining a list of steps and the hardness limit, the CHD hardness depth (in mm) can be determined.

The graphs can be directly printed or saved on a USB memory stick.

Hardness limit: 550





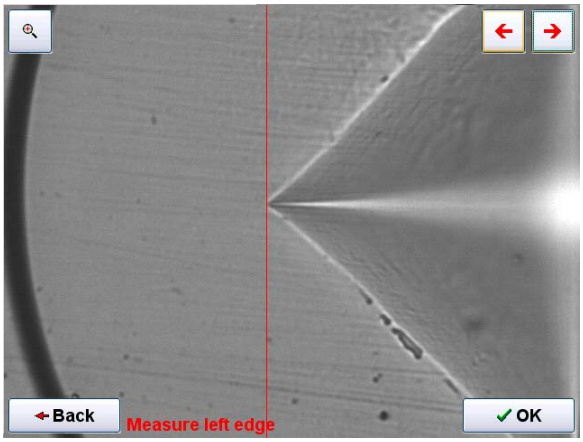
Integrated Video Feature

The **VMH-002V** hardness tester is equipped with the optional high resolution digital video camera.

The video image is shown directly on the touch-display. It can be saved on a USB memory stick or it can be printed.

An optical and electronic focus finder with peak display makes focussing easy and repeatable.

VMHT MOT Order no.: **VMH-002V** with video option



Touch and Measure

Measuring the indentation is done directly on the touch-screen.

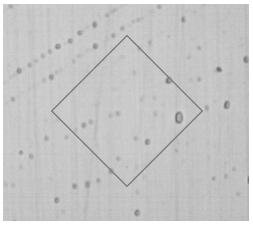
To show the entire indentation, the video image is downscaled to fit into the screen. During the measurement, the image is zoomed to its native resoltution or 2x digital.

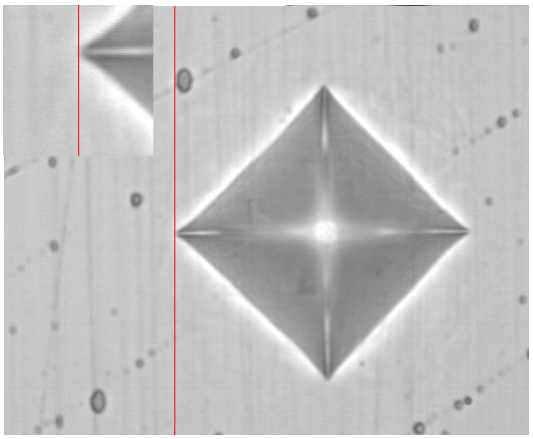
The line position is preset by an automatic edge finder.

To adjust the lines, touch the desired position, move the line on the screen or use the arrow soft-buttons for fine adjustment.

This gives the operator a comfortable workflow even at high workload.

A crosshair or the estimated indentation can be shown in the video image for exact positioning (e.g. for thin coatings).





To simplify the edge detection and to increase the accuracy, an on-screen magnificator is available.

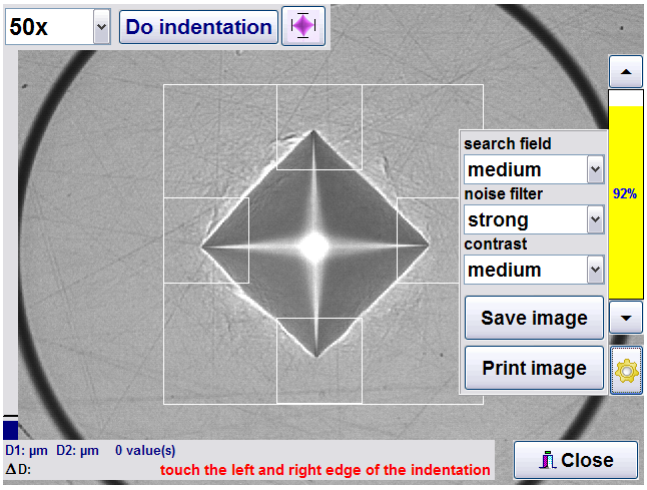
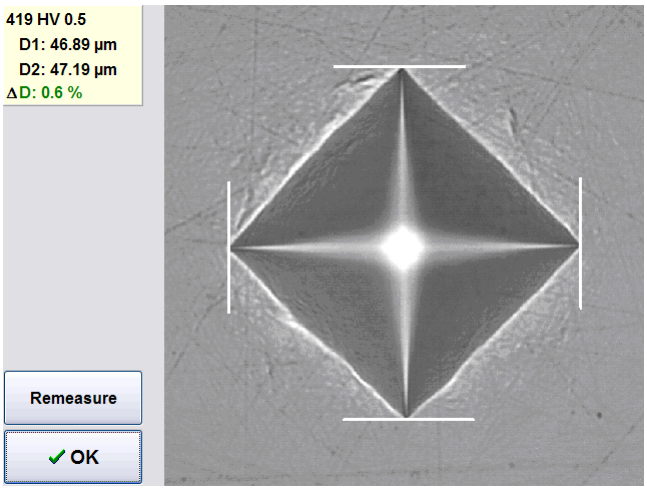


Image Analysis

The model **VMH-002VA** is based on VMH-002V and provides additionally the possibility to measure the indentation user independent by image analysis.

After defining just a few parameters, the system determines size and position of the indentation.



The measurement is done by touching the icon.

After automatic detection of the indentation edges, the result is shown for evaluation and confirmation.

Coordinate Stage

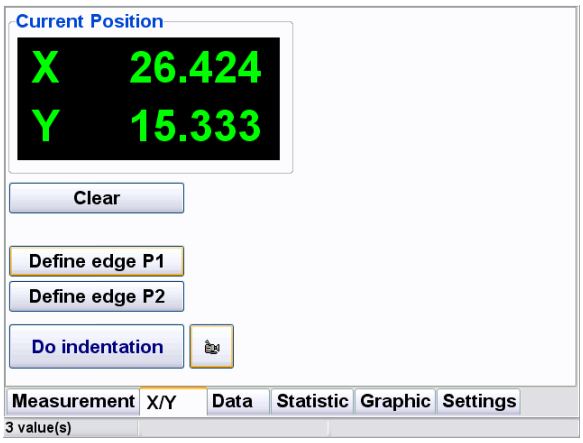
The specimen stage of the hardness tester VMHT MOT can be equipped with digital micrometer spindels or stepper motors (incl. motor controller) optionally.

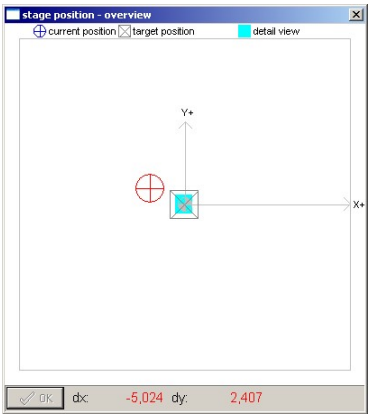
This enables the comfortable creation of hardness patterns.

Order options:

digital micrometer spindels: (25 x 25 mm)	VMH-002(V/A)**D**
stepper motors with controller: (50 x 50 mm)	VMH-002(V/A)**M**

For hand driven stages, a dialog appears to move the stage to a position. This position must be driven by the micrometer spindels, and is reached when two figures are overlapping completely.

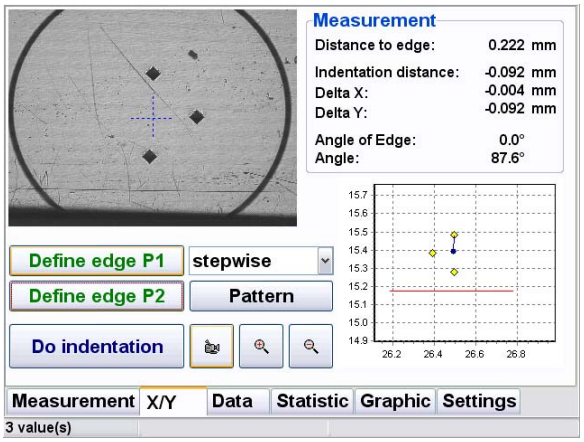




VMHT MOT Order no.: **VMH-002VD** with video option and digital micrometer spindels

VMHT MOT Order no.: **VMH-002VM** with video option, motorized stage and motion controller

Point of View



With the video option and coordinate stage, more complex manual patterns can be created easily and comfortable in a graphic view.

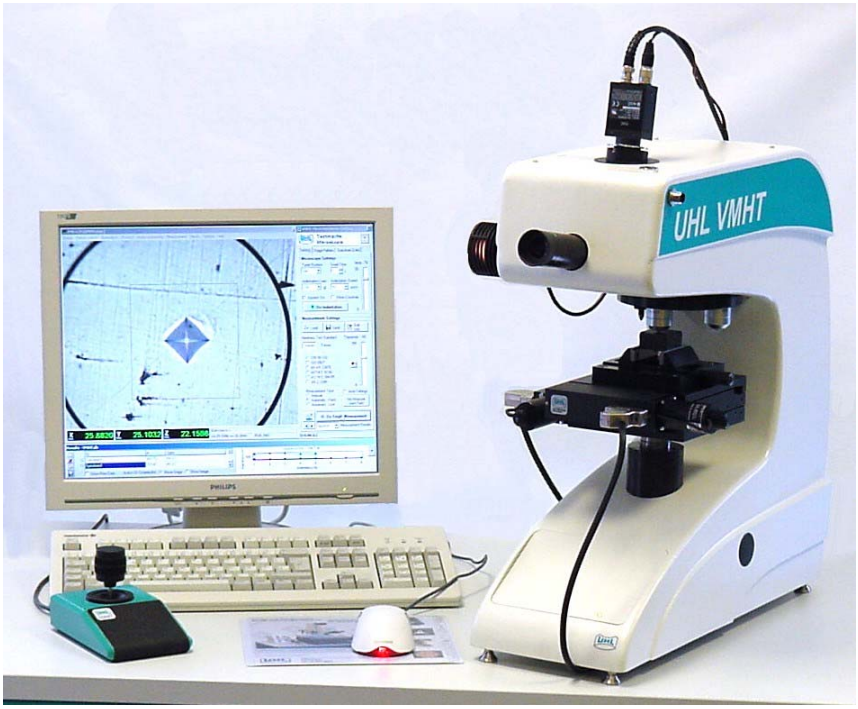
The positions are shown in relation to an alignment line along an edge.

The distance to the edge and the x/y distance to the last indentation is calculated and shown. With this ferature e.g. a zig-zag pattern can be created.

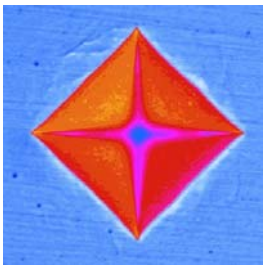
If the specimen database contains nominal hardness values, the current position and the button to do an indentation are coloured red when the distance between the indentations is smaller than it is allowed in the standard.

The lenses used to create the pattern and used to measure are reselected automatically.

The workflow provides the option to measure directly after the indentation (recommended for digital micrometer spindels) or to do all indentations before measuring (recommended for stepper motors). With stepper motors, the operator can do other work during the indentations.



VMHT AUTO mot Order no.: **VMH-I04**



UHL
VMHT AUTO

Fully Automated Measurements

In case of many similar samples like in production sites with high capacities or where the test parameters have to be applied always in the same reproduceable condition, the VMHT AUTO brings its full capacity.
The operator just orientates the specimen on the motorized stage and defines the test parameters using the Interactive Measuring Software IMS-VMHT. Consecutively, the system performs the measurements fully automated without any further attendance.

If the sample thickness is not parallel, the operator can define three z-positions using the autofocus to do an area alignment.

Enhanced Labour Productivity

Since the VMHT AUTO is destined to perform its measurements unattended, it leaves the personnel capacity free for other tasks, e.g. sample preparation.

Ease of Use

No extensive elaborate training or programming knowledge is required to operate the system. The Interactive Measuring Software IMS-VMHT (working under WINDOWS™) offers a simple working environment. All neccessary information is shown on one screen. The operator is able to recall previously defined measuring routines. The software supports the following languages: german, englisch

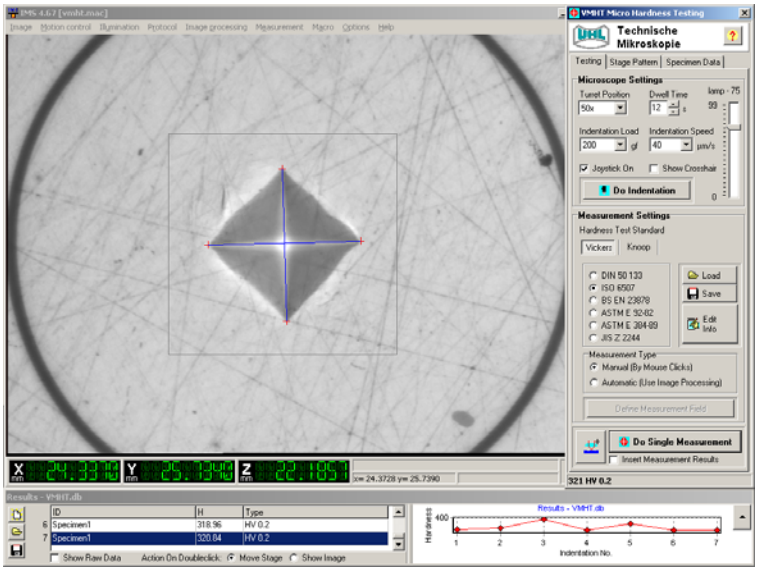
Configuration

The VMHT AUTO comes completely configured and calibrated including the Performance Station PC with TFT color display.

The system is available in 2 configurations:

- VMHT AUTO man – is a semiautomated system with manual stage and focus control. The image is acquired via TV camera and evaluated by means of the Interactive Measuring Software IMS-VMHT.

- VMHT AUTO mot – is fully automated and has both motorized stage and focus control including Autofocus function.
A joystick servers for motion control of x/y and focus movement.



Just Click!

Accuracy

Since a personal judgment caused by the operator is totally eliminated, the imprints are measured permanently under reproducible conditions.
The high resolution TV camera and the stage increment of 0.1 µm guarantee highest measurement accuracy.
Another advantage linked with automated measurements is the avoidance of fatiguing
the operator thus introducing measurements errors.

Change of Test Load

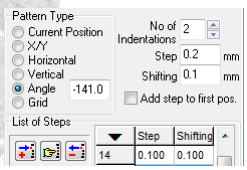
All of the VMHT models have motorized selection of the test forces. As a consequence, the test force can also be changed by the IMS-VMHT software. This offers the unique possibility of creating e.g. hardness profiles based on different test forces.

Measurement Process

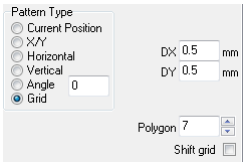
The pattern can be predefined by different methods: i.e. either by simply moving the stage to the desired indentation spots visible in the high resolution image using the joystick or within a complete image of the entire specimen after a scan (stitching).
The indentation positions can be defined in many different flexible ways: single position, angular line (with shifting), X/Y pattern or grid (e.g. for welding analysis). Minimum distances between the indentations, according to the standard, are calculated and shown (also graphically).

When all testing parameters are set, the system automatically moves from spot to spot, focuses the specimen by calculating the optimum focus position (integrated Autofocus function). The high resolution digital camera acquires the image, sophisticated measuring software routines are calculating the diagonal lengths and the resulting hardness value based on the chosen test force.

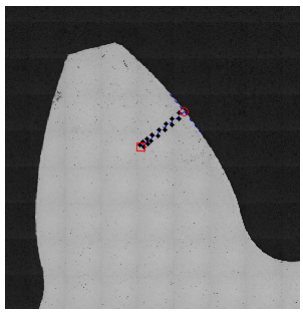
All results are immediately listed in a table and stored in a result database. From there the data can be exported to application programmes like Microsoft™ EXCEL. Reporting is done by using Microsoft™ WORD.

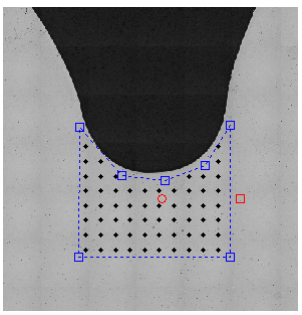


graphical definition of an angular line (e.g. CHD or NHD)

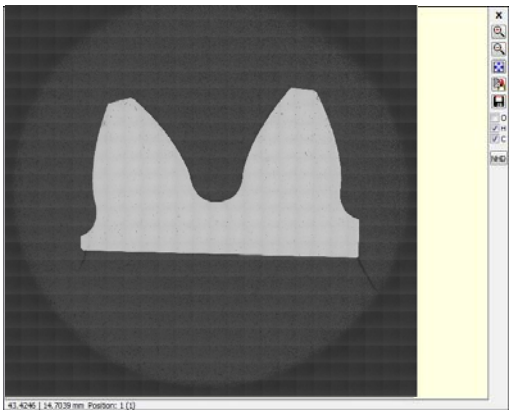


graphical definition of a grid with flexible borders and distances

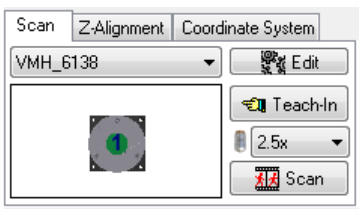




graphical view of the scan



different sample holders for the scan available

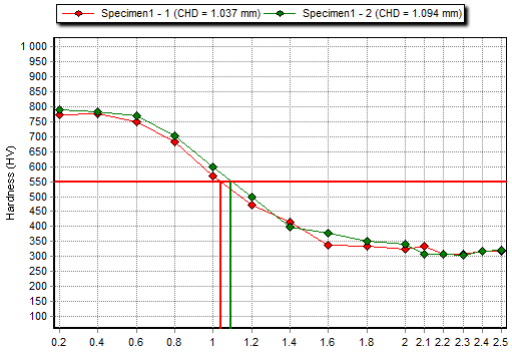


Applications

Vickers Indenter

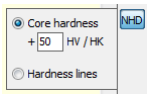
Knoop Indenter

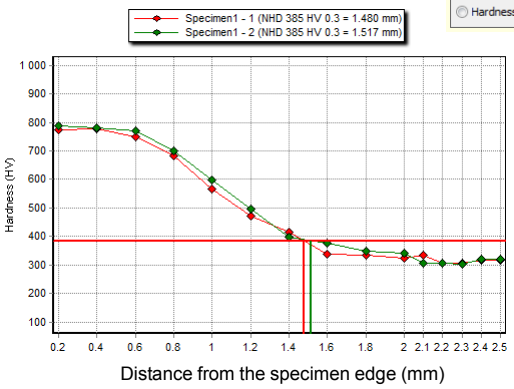
Case Hardness Depth - CHD



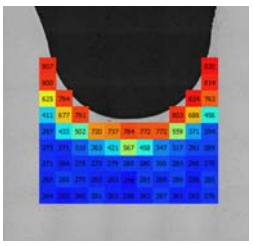
	Statistics
Specimen1 - 1	CHD = 1.037 mm
Specimen1 - 2	CHD = 1.094 mm
No. of indentations	30

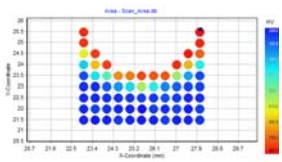
Nitriding Hardness Depth - NHD



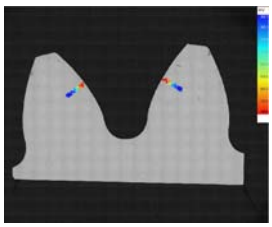


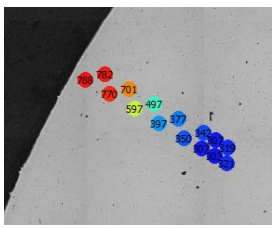
	Statistics
Specimen1 - 1	NHD 385 HV 0.3 = 1.480 mm
Specimen1 - 2	NHD 385 HV 0.3 = 1.517 mm
Core hardness	335 HV 0.3
Average	NHD 385 HV 0.3 = 1.498 mm
No. of indentations	33





coloured display of an area or a line
with or without hardness values





Metallography

Surface Phenomena – Surface Treatment

- Case-hardening of steels
- Surface hardening of titanium
- Electrodeposited coating: hardness, brittleness, adhesion
- Effects of various mechanical and thermal treatments on the surface layers

Study of Alloys and Alloy Constitution

- Quantification of transition areas

Determination of the Effect of Thermal Treatment

- Heat treatment of steels, non ferrous alloys, precipitation treatments and age-hardening
- Segregation and coring, rates of diffusion
- Recrystallisation

Materials Science

- Brittleness: ratio hardness/toughness
- Plastic properties
- Paint films – hardness of painted surfaces

Tribology Research

- Work hardening
- Estimate mild wear losses
- Correlation hardness number – wear resistance

Metal Powder Particles

- Mechanical properties
- Durability and performance of alloy components

Ceramics

- Determination of the hardening degree of glaze

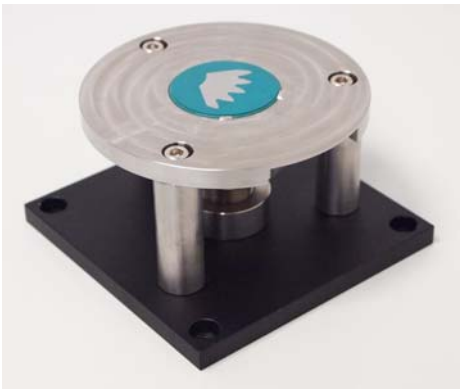
Accessories

Description	Order no.
• measuring objective 2.5:1, working distance 11 mm, num. aperture 0.07	**VMH.082**
• measuring objective 5:1, working distance 14 mm, num. aperture 0.12	**VMH.065**
• measuring objective 20:1, working distance 1.1 mm, num. aperture 0.4	**VMH.066**
• measuring objective 50:1, working distance 8.2 mm, num. aperture 0.5	**VMH.007L**
• measuring objective 100:1, working distance 0.27 mm, num. aperture 0.9	**VMH.055**
• measuring objective 100:1, working distance 3.5 mm, num. aperture 0.75	**VMH.055L**
• aperture diaphragm for objective 100:1 (for VMH-I0x and VMH-002V already in scope of delivery)	**VMH-502**
• hardness test block Vickers 100 HV 0,1	**VMH.062**
• hardness test block Vickers 300 HV 0,3	**VMH.059**
• hardness test block Vickers 720 HV 0,5	**VMH.057**
• hardness test block Knoop 720 HK 0,5	**VMH.056**
• anti vibration plate with rubber elements	**VMH-101**
• Knoop indentor	**VMH.058**
• Brinell indentor, ball diameter 1 mm	**VMH.071**
• turret with 6 positions for 4 objectives and 2 indentors	**VMH-302/6**

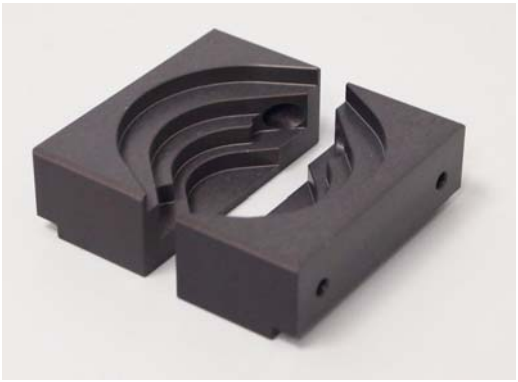
• digital measuring eyepiece (for VMH-002V)	**VMH-400**

- TV-adaptor with c-mount connector **VMH-401**

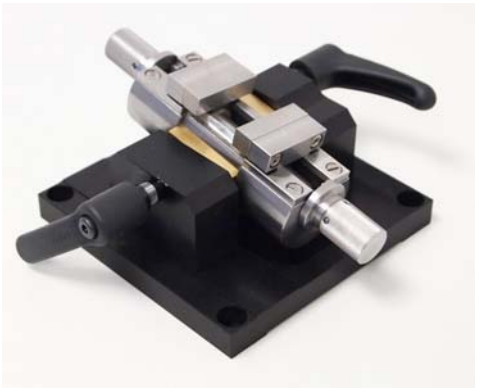
- holder for specimen with diameter 38 **VMH-6138**



- clamping jaws for round specimens, suitable for standard vice VMH-610, sample diameter 25, 30, 38, 40 and 50 mm **VMH-610B**



- swiveling vice, max. width 47 mm, swiveling range ±23° and ±16° **VMH-611**

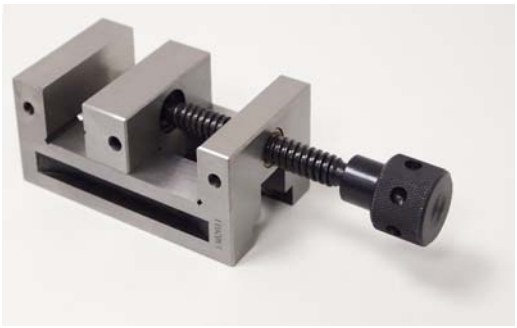


- holder for wires of 0.4 to 3 mm diameter **VMH-613**

- holder for thin sheet metal **VMH-615**

- Clamping prism for pins and shafts with a diameter of 1 to 15 mm **VMH-616**

- precision vise (LxWxH: 110x60x50 mm,
  maximum opening 55 mm) **VMH-617**



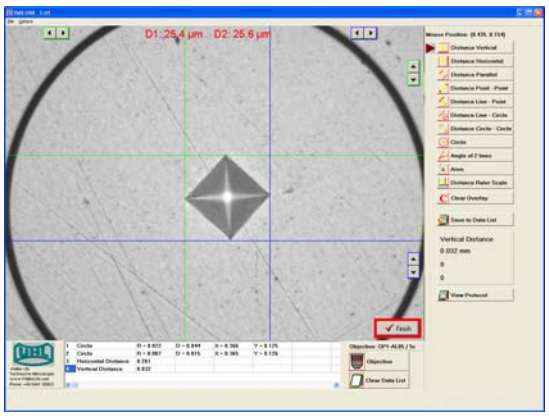
- laser color printer
  (preinstalled driver on VMH-002) **VMH-756**
- label printer for VMH-002, 90 x 29 mm label size **VMH-757**
- CMOS colour camera with USB2.0 interface, resolution 1280x1024
  for VMS-VMH with connection cable 2 m **VM4-USB**
- software for import and storing of VM4-USB video camera image
  and microhardness tester VMHT data,
  measurement of Vickers or Knoop indentation **VMS-VMH**

Specifications

Order no.	VMHT VMH-001	VMHT MOT VMH-002(V),(M/D)	VMHT AUTO man VMH-I03	VMHT AUTO mot VMH-I04(M)
International standards	ASTM E-384; ASTM E-92; EN ISO 6507/1-3; EN ISO 4545; JIS Z 2244; JIS Z 2251; CE-approval			
Indenter	Vickers or Knoop (standard) – Brinell (optional)			
Test Force	12 steps: 1 - 5 - 10 - 15 - 25 - 50 - 100 - 200 - 300 - 500 - 1000 - 2000 (p)/(gf)			
Loading procedure	automatic			
Selection of indenter	manual turret	motorized turret		
Dwell time	6 - 99 s	5 - 99 s		
Approach velocity	50 µm/s	25 to 60 µm/s (selectable in steps of 5 µm/s)		
Motorized selection of test force	via buttons	via touch screen	via PC	
Optics	Filar measuring eyepiece*, magn. 10x Field of view 16 mm		Eyepiece, 10x	
Standard objectives	HI PLAN 10x/0.25 – 11.1 mm free working distance N PLAN 50x/0.75 – 0.37 mm free working distance (spring loaded)			
Optional objective	N PLAN 2,5x/0,07 – 11 mm free working distance (spring loaded) N PLAN 100x/0.90 – 0.27 mm free working distance (spring loaded)			
Number of objectives (max.) Number of indentors (max.)	4-fold turret: 3 1	with optional 6-fold turret: 4 2		
Light source	20 W, adjustable			
Focus finder	Special diaphragm in conjugated image of field aperture			
Aperture diaphragm	Easily exchangeable for reproducible conditions of measurement			
Color filters	Green (other filters on request)			
Camera options	MS2-403 or VM4-USB (VMH-002**V**) with VMH-401 TV adapter (C-mount)		Image analysis via TV and PC (WINDOWS-based) resolution: 1280 x 1024 pixel	
optional measuring software VMS-VMH	only with VM4-USB camera, measuring in the video image, saving images			
Measurement System	Electronic encoder		Semi-automatic: manual stage manual focus control	Fully automatic: motorized stage motorized focus control autofocus (TV-based)
Effective measurable length	10x: 800 µm (eye-piece), 500 µm (video), 50x: 160 µm (eye-piece), 96 µm (video), 100x: 80 µm (eye-piece), 40 µm (video),			
Display resolution	0.1 µm	0.01 µm		
Specimen Stage		optional: motorized (M) or with digital micrometer spindels (D)		motorized
Stage size	135 x 135 mm			135 x 135 (opt. 323 x 301) mm
X/Y travel	25 x 25 mm	25 x 25 (opt. 50 x 50 - **M**) mm		50 x 50 (opt. 150 x 100 - **M**) mm
Positioning increment	10 µm	optional 1 µm (M or D)		0.1 µm
Maximum specimen height on stage	90 mm (M: 75 mm)			75 mm
Maximum specimen depth from center of indenter	116 mm			
Maximum opening of vise	59 mm			
Leveling	built-in spirit level			
Data Display/Handling				
Data entering	via buttons	via touch screen	via PC	
Data display	Diagonals d1/d2 (µm), hardness value HV/HK, test load (N/gf), dwell time (s), tolerance judgement			
Statistics	Mean value, maximum/minimum value, standard deviation			
Graphic		line graph, CHD and NHD hardness depth		
Data memory	max. 99 test data	max. 9999 test data	PC	
Interfaces	USB (data export)	USB (mouse, printer) ethernet, monitor	PC: ethernet, USB	
Accessories	Various fixtures for clamping different types of specimens			
Power supply	Wide range power supply: 100 V to 240 V AC/50 to 60 Hz			
Measures	392 x 536 x 533 mm (w x h x d) with TV adapter: 392 x 550 x 533 mm		with TV adapter: 392 x 550 x 533 mm (w x h x d)	
Weight	35 kg (without PC)			

* VMH-002V comes with Eyepiece 10x

Upgrade of existing hardness testers



All manual hardness testers with a c-mount camera attachment can be equipped with a USB camera (**VM4-USB**). In combination with this camera a measuring software for measuring the hardness by horizontal and vertical lines and saving the video images is available: **VMS-VMH**.

This is an effordable solution to upgrade old hardness testers of any brand to convenient video technology.

UHL
technische Mikroskopie

- competence in microscopy and measuring applications.

Wir entwickeln, konstruieren, fertigen, montieren und vertreiben feinmechanische und optische Bauteile und Geräte zum Positionieren, Messen und Prüfen.

We develop, design, produce, assemble and distribute precision mechanical and optical components and instruments for positioning, measuring and testing.

Walter Uhl
technische Mikroskopie GmbH & Co.KG
Loherstraße 7
D-35614 Aßlar

Tel. +49 (0) 6441 88603
Fax +49 (0) 6441 85718

www.walteruhl.com

Specifications are about to change without notice!