CLEMEX intelligent microscopy

CMT.HD

*The real **High Definition** Solution in **micro & macro** hardness*

Get the whole picture
. Visualize the entire sample
. Position indents precisely
. Get accurate results

CLEMEX intelligent microscopy

A Commitment to
Excellence in Imaging

For more then 20 years, Clemex has been providing integrated solutions for Image Analysis in microscopy to meet the specific needs of customers worldwide. This is our expertise and our commitment.

Clemex is known for its reliability, its high-quality products, and its after-sales service. Customer satisfaction is important to us.

Clemex CMT.HD meets a need in the hardness testing industry, one that is in constant evolution, and in keeping with international standards. Clemex CMT.HD is the best in its class, combining speed and accuracy of measurement.

This makes it the tool of choice for hardness testing.

Micro and Macro Hardness Solution

When a hardness testing solution that produces reliable, accurate and repeatable test results is needed, choose from the Clemex CMT.HD line of macro and micro (single or dual) hardness testing solutions. Field proven systems, they offer unparalleled capabilities and are fully ASTM E-384 and DIN/ISO 6507 compliant.

> Precise Positioning
With its **Background Image** of the entire sample (macroviews) and its Annotation Tools, Clemex CMT.HD enables you to position indents precisely where they are required. No other software offers such accuracy.

> Precise & Reproducible Measurements
The Clemex CMT.HD has the highest image resolution on the market. This allows measurement of indents to be precise and reproducible. Clemex CMT.HD: combining performance with precision.

> Enhance Productivity
The Clemex CMT.HD combines ease-of-use, reliability, auto-calibration, thus minimizing subjectivity associated with human intervention. The system can run for hours without interruption, saving time and money.

> Turn Your Tester into a Powerful Image Analysis Tool
Clemex CMT.HD adds power to your tester, allowing you to analyze grain size, phase area %, coating/decarburization thickness, and many more.

Clemex CMT.HD
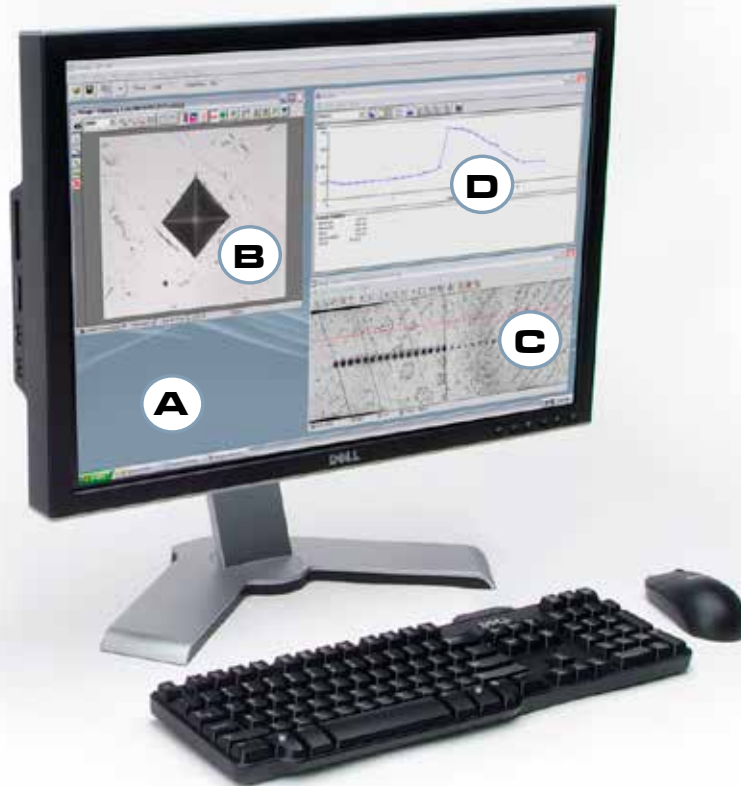Single or Dual Indenter

Loads Detection

Motorized Load Control

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Intelligent Workspace Layout

The workspace layout is user-friendly and provides a detailed overview of the sample as well as all the necessary annotation, and measuring tools.

Full HD 1080

(A) **HD Resolution**
Maximize your workspace by running in a high-resolution environment of 1920 x 1000 pixels, or more.

(B) **Image Window**
The intuitive Image Window interface allows easy viewing of sample surface and indents.

(C) **Stage Pattern Window**
Create or modify traverses and/or patterns and their positions, then see the stage move in real time in the Stage Pattern Window.

(D) **Results Window**
Results are clearly displayed in graphical or tabular form. Track and review specific indents.

Intelligent Workflow

Clemex CMT.HD is the top-of-the-line automated macrohardness tester. With 4 easy steps, it provides added precision when positioning indents thanks to its integrated macroview technique and its layout tools. By visualizing the complete sample, no matter its size, traverses and/or patterns can now be mapped-out with unequaled precision.
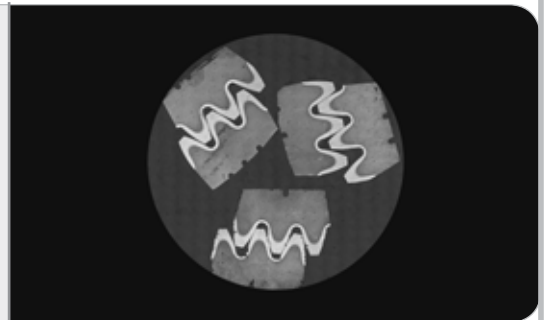
Auto focusing, and automatic measuring and reporting, allow this system to function unattended, thus increasing throughput and productivity.

STEP 1

See the Entire Sample

Place the sample in the sample-holder and, with one click, acquire a macroview image of the sample and set reference points for one or more traverses using the annotation tools.
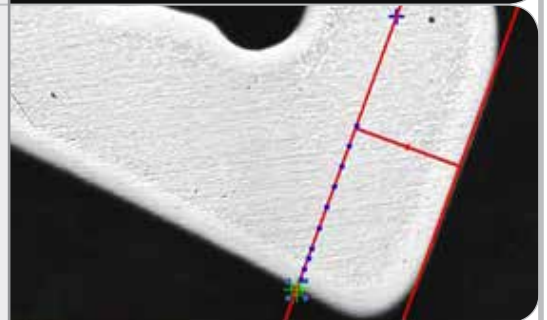

STEP 2

Set-Up Traverses/Patterns

Open, modify, or create new traverses/patterns using reference points or lines. Traverses and patterns can be individually adjusted.
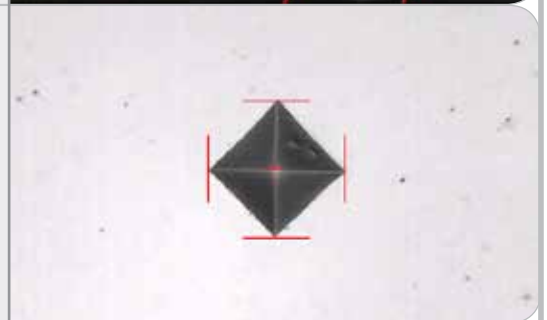

STEP 3

Click & Walk Away

Clemex CMT.HD intelligently follows the predefined patterns, indents the sample, focuses when needed, measures, and generates data dynamically. Everything is automated, freeing users for other tasks.
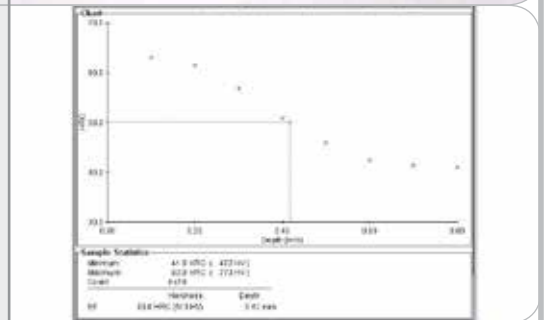

STEP 4

Get Results

Review results in graphical and/or tabular format. Export results to the spreadsheet application of your choice, or simply print standard or customized reports.
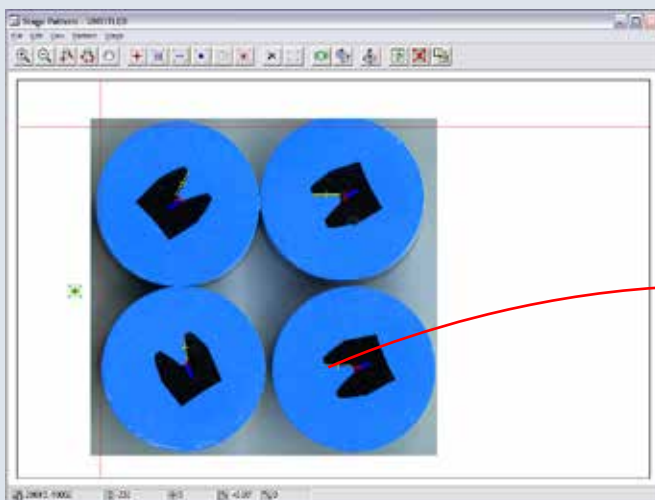
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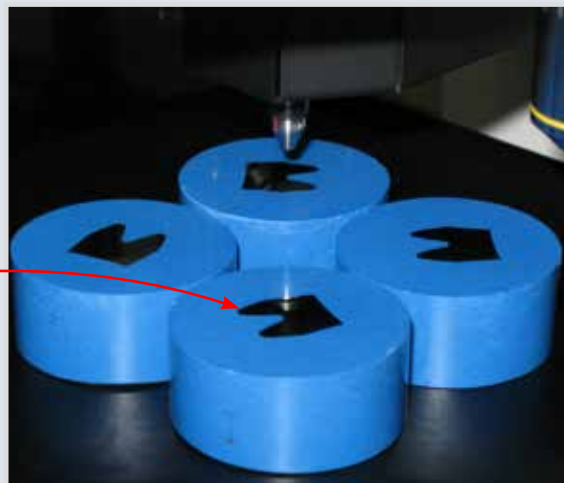## Intelligent Macroview Images

Get a detailed image of the **whole** sample in seconds by scanning the complete sample holder using a flat bed scanner. No matter the size of the sample, get a crisp and precise image. Thanks to these unique features developed by Clemex, obtain a perfect, high resolution, and evenly illuminated view of the full sample.

With Intelligent macroview images an operator can see microstructural changes, Heat-Affected or Heat-Treated zones, and much more. Reference points for traverses can be set exactly where they are needed so that indents yield significant data.

High-res macroview images can be saved for later use, in analysis reports, or for archiving purposes.


Scanned Macroview Image

Samples on stage

Precise positioning at any magnification

Intelligent Annotation Tools

Positioning reference points and measuring where traverses are to be placed is made easy using the annotation tools in Clemex CMT.HD. Conveniently located on the side of the Image Window, these tools perform multiple functions:

- Finding the center of the sample
- Drawing straight and/or parallel lines
- Adding ticker marks
- Adding measurements for report purposes
- And more…

No matter the complexity of the pattern layout, combining intelligent macroviews with annotation tools allows traverses and/or patterns to be positioned precisely where they are needed.

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Intelligent & Precise Positioning

Clemex Macroview Feature

Clemex CMT.HD hardness tester offers a complete, high definition image of a sample, **no matter its size**. This innovative feature provides an "aerial view" of the sample, offering sharp close-ups as well as global views. The macroview image makes it possible to position as many as 99 traverses – to within a few micron.
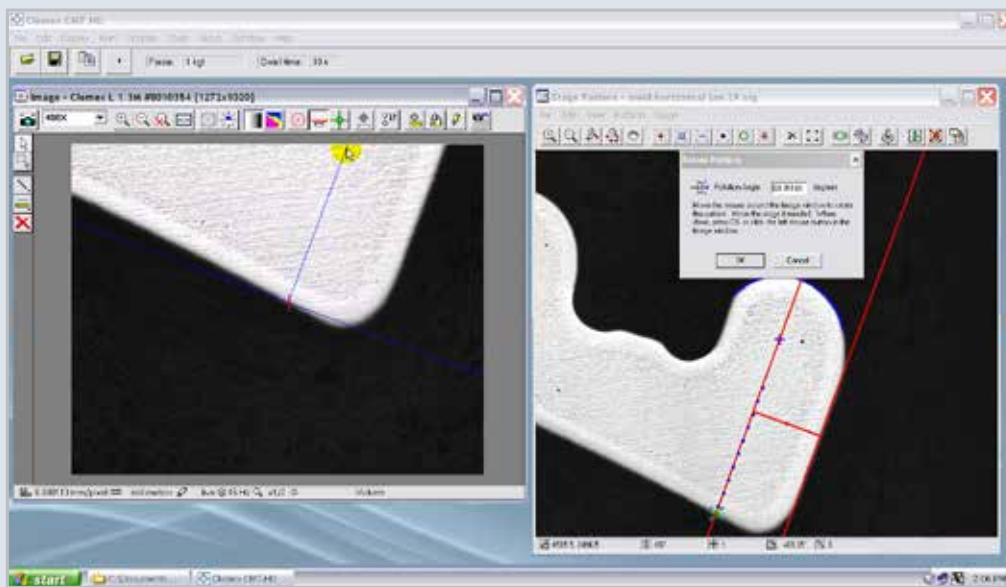
*Traverse centered across the contact surface of weld sample*
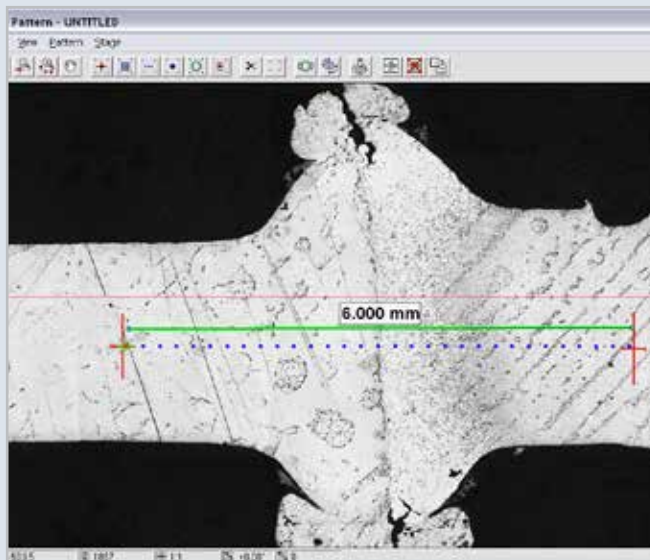
Traverse centered in weld sample
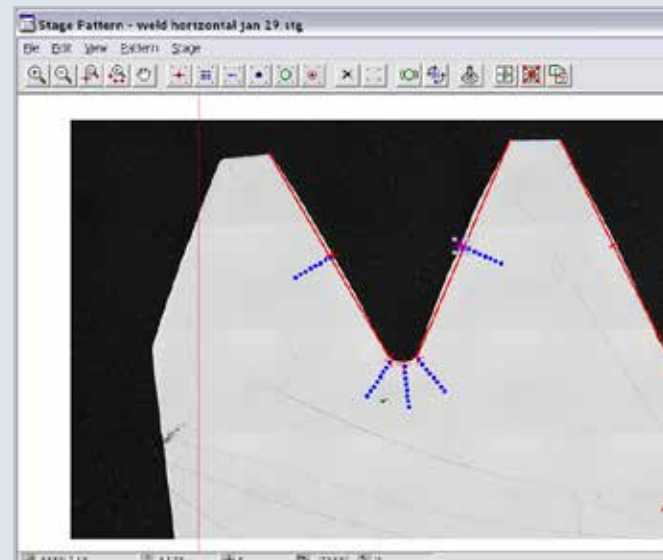
Five traverses perpendicular to the edge of gear

Unique Reference Circle Tool

This exceptional tool allows indents to be positioned at precise distances from the sample's edge. The Reference Circle is the ideal tool for irregular or curved samples, where indents need to be at a given distance from the edge. Used as a visual guide in conjunction with the Stage Pattern Window, once a radius is specified, the distance between indents is determined by a Y value that resets every time a field is added to the pattern.
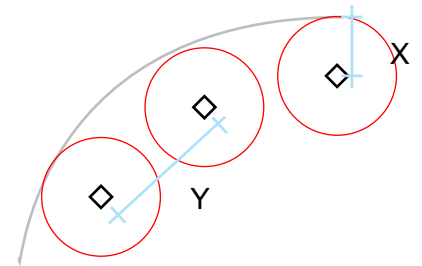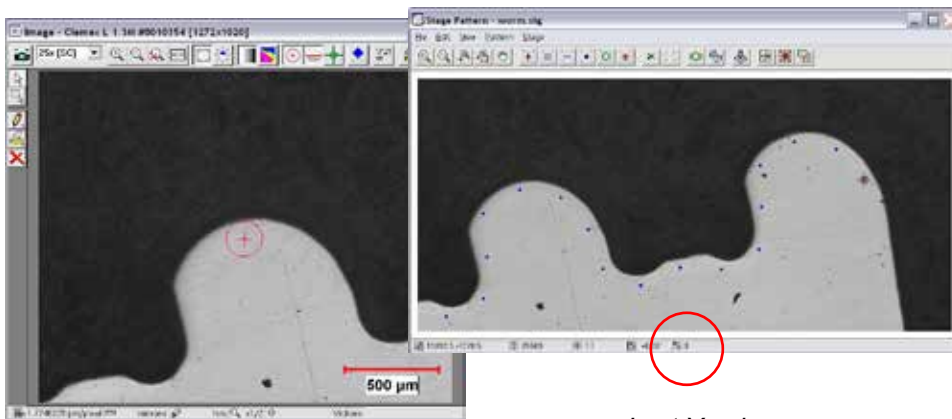
Last Y value

Position indent precisely along the edge

Multidirectional Traverses

Thanks to the powerful CMT.HD stage control interface, single or multiple traverses/patterns can be rapidly created. Save, copy, or paste traverses/patterns to predefined locations with a simple click of the mouse. The T-Bar tool rotates traverses to any angle to ensure its perpendicularity with the sample edge or to accommodate sample tilt. Up to 99 patterns or traverses can be created, with each traverse comprising up to 32,000 indents.
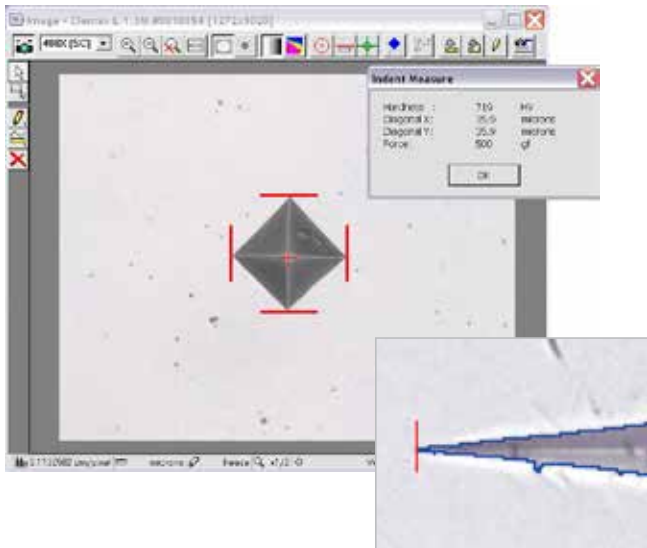

T-Bar Rotation tool
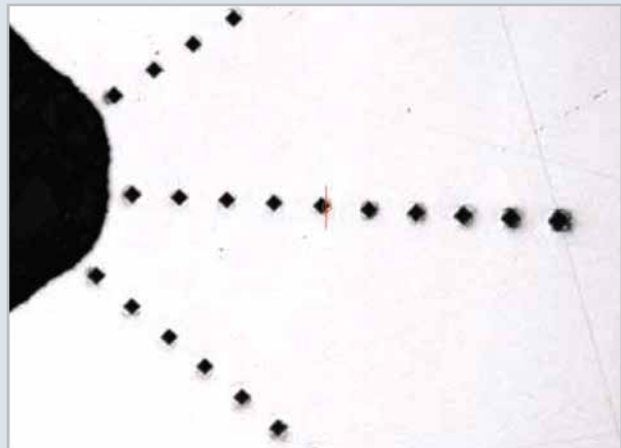
3 Traverses perpendicular to edge

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## Intelligent Precision

Precise Imaging

Using a high-resolution digital camera, Clemex CMT.HD acquires images with a resolution of 1.3 megapixels; that's **300% more** than the competition. Additionally, indent diagonals are measured from tip to tip using dimensional calibration based on a high precision stage micrometer - unlike subjective calibration methods used by some systems.

Clemex CMT.HD produces the sharpest images and finest details ever seen in macrohardness testing. This means precise and repeatable results.

Repeatable Measurements

With software controlled focus (0.1 micron per step), shading correction, and DC regulated light source, objective and reproducible results are obtained regardless of the number of indents measured. The graph to the right demonstrates a run on a 703 HV Test Block which shows a 5 HV variation for 25 consecutive measurements on the same indent, each preceded by an autofocus.

This variation of less than 1% is well within the ASTM and ISO requirements, and is by far narrower than the range obtained by operators using a filar micrometer.
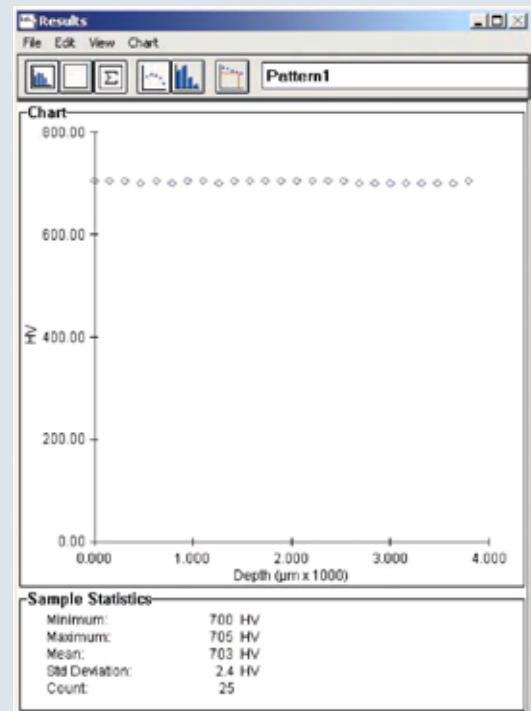
Software Controlled Illumination & Lens Positioning

Equipped with a unique software controlled illumination, Clemex CMT.HD keeps image brightness levels constant on all objectives, any magnification. Samples are always properly illuminated.
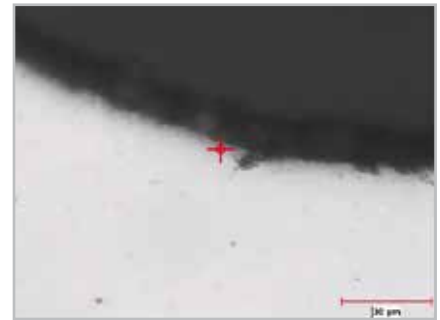
The Clemex software controlled lens adjustment offset guarantees perfect alignment of lenses and indenters.


Illumination at 25x
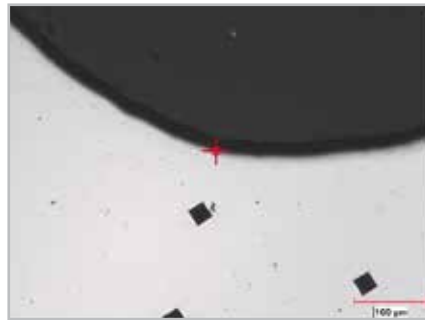
Illumination at 100x

*Illumination at 400x*

Background-Independent Detection

From perfectly polished to rough and etched samples, Clemex CMT.HD has the edge over traditional macrohardness testers. Using its unique auto-detection capabilities, Clemex CMT.HD measures indents on any sample surface. For extreme cases, indents can be measured manually with cursors.
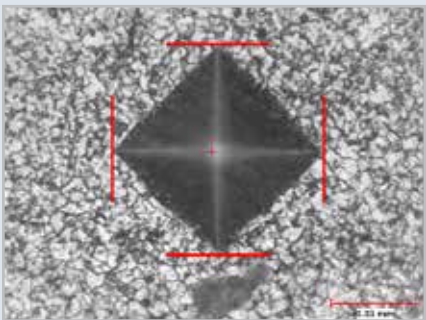

Etched Sample
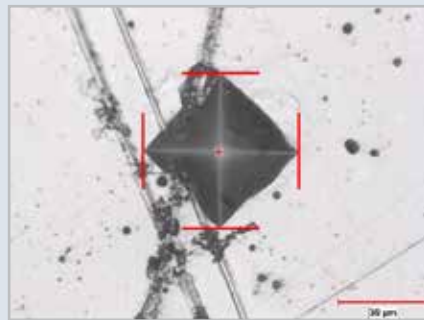
Roughly polished sample
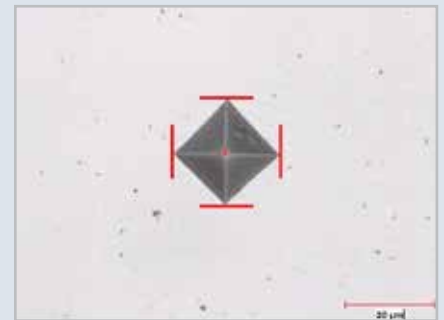
*Clean sample*

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Intelligent Results

Multiple Conversion Tables

Clemex CMT.HD's native hardness measurements are in HV or HK. Conversion tables for HRA, HRB, and HRC scales are in compliance with ASTM E-140 standards. Up to six additional custom conversion tables can be defined. Case depths are calculated automatically by selecting a case hardness value. A total of 4 case depths can be displayed simultaneously on the same graph.
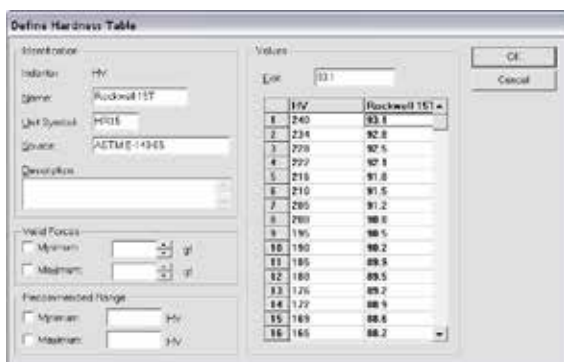

Custom Conversion Table
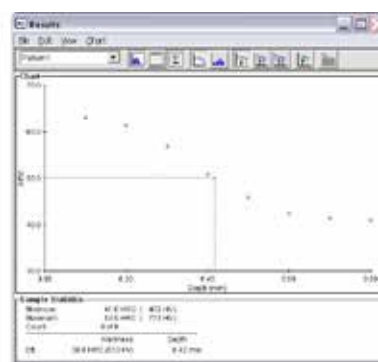
Case Depth in HRC

Error-Free Validation

Compliance with ISO 6507, ASTM E 384, and other standards, is simplified with built-in validation functions. Indenting and measuring certified test blocks prior to the actual analysis routine, or at any predetermined time, guarantees that the instrument is in perfect operating condition. Clemex CMT.HD uses invariant dimensional calibration, as opposed to empirically trying to match a test block by trial and error. It also applies load using dead weights, whose mass stays constant, while load cells, on the contrary, may drift over time.
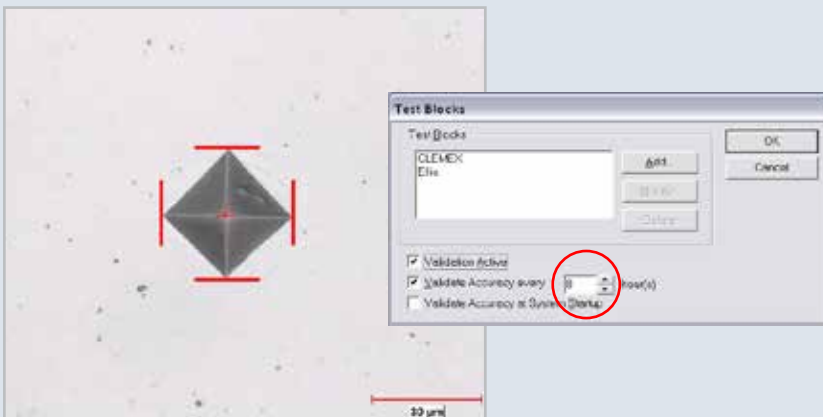

Validation set each 8 hours

Unique Clemex self-level vise with built-in Test Block holder.

Free Run

This unique feature allows you to indent a sample anywhere, at will, and obtain statistically relevant results. No need to map out a pattern, simply position the sample, indent, click to measure, then go to the next spot you want to indent on the sample. Measurements are automatically cumulated in the Results window, no matter how many indents are done.
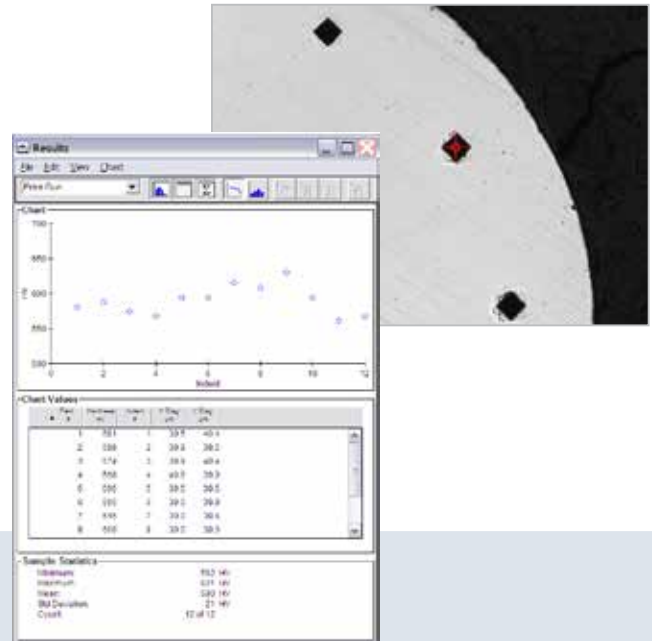
Report Generation

Print results directly from Clemex CMT.HD or export data to the spreadsheet program of your choice for further statistical analysis. Images and histograms can be copied easily and laid out in a standard, or customized, MS Office templates.
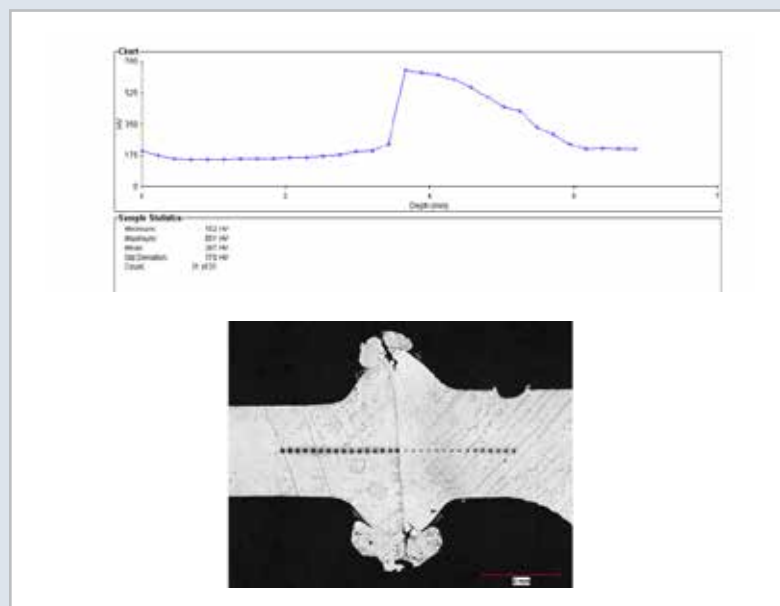
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Intelligent Analysis packages

### Turn Your Tester into a Powerful Quantitative Microscopy Instrument

Included with Clemex CMT.HD is our versatile Clemex Vision Lite software with four Application Packages, allowing the Tester to act as a materials image analysis system. Analyze phases, layer thickness, and grain or particle size, and gain a complete understanding of mechanical properties of your samples with a single tool.
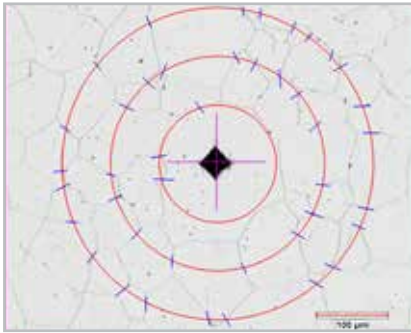
Grain size
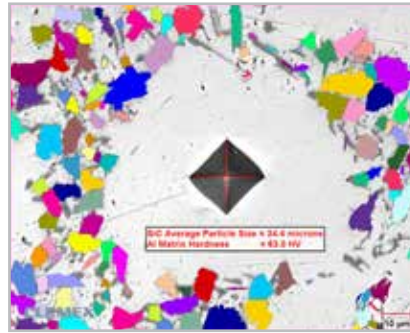
Particle Size
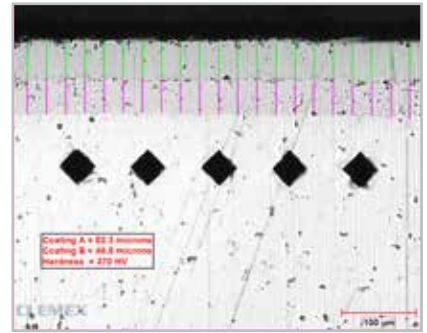
Coating thickness

Multiple Samples

Clemex sample holders have unique designs, allowing users to analyze mounted or unmounted samples. Holding multiple samples, some holders accommodate a test block, allowing users to validate the calibration of the macrohardness tester at any time without having to remove the sample. Samples are easily removed or inserted with a simple slide-in drawer system.

Holders with slide-drawer system are purchased separately

Clemex CMT.HD Specifications (Single or Dual)

	MMT Single	MMT Dual	ZMT Single	ZMT Dual	VMT
Hardware					
Int. Standards	ASTM E-384, , EN ISO 6507/1-3				
Indenter	Vickers	Vickers & Knoop	Vickers	Vickers & Knoop	Vickers
Test Force	5 - 1000 g	1 - 2000 g	10 - 2000 g	10 - 2000 g	300 g - 30 kg
Loading Procedure	Automatic				
Load Detection	Controlled	Controlled	Motorized	Motorized	Controlled
Selection of Indenter	Motorized turret				
Dwell Time	5 - 99 seconds				
Standard Objectives	N PLAN 2.5X/0.07 -- N PLAN 10X/0.22 -- N PLAN 40X/0.65				N PLAN 2.5X/0.07 N PLAN 10X/0.22 N PLAN 20X/0.45
Optional Objectives	N PLAN 5X/0.12 -- N PLAN 20X/0.45				N PLAN 40X/0.65
Turret	Motorized Turret, up to 4 objectives and 2 indenters				
Light Source	LED				
Camera	Camera, B/W, USB2 (1.3 Mega pixel) with cable				
Power Supply	Wide range power supply: 100V to 240V AC/50 to 60Hz, CE				
Weight	35 kg		45 kg		52 kg
Specimen Stage & Focus					
X/Y Travel	Motorized 100 x 60mm (optional 200 x 100mm)				
X/Y Positioning Increment	0.5µ				
Focusing	automatic 0.1µ				
Clemex CMT.HD Software					
Detection	Auto detection or semi-auto with cursors				
Illumination	Computer controlled				
Hardness Scale	HV, HK, HRC, HRB, HRA and 6 user-defined				
Number of Patterns	99 patterns or up to 32,000 indents				
Diagonals Measurements	Image Analysis, ASTM E-384, EN ISO 6507 compliant				
Data Display	Diagonals d1/d2 (µm), Hardness Value HV/HK, Test Load (gf), Dwell Time (S), XY position				
Statistics	Mean, Maximum/Minimum, STD, Case Depth (5 values), Graphical Display				
Interface	RS 232				
Operating System	Windows 7/8, 32/64 bits				

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