SHIMADZU

Excellence in Science
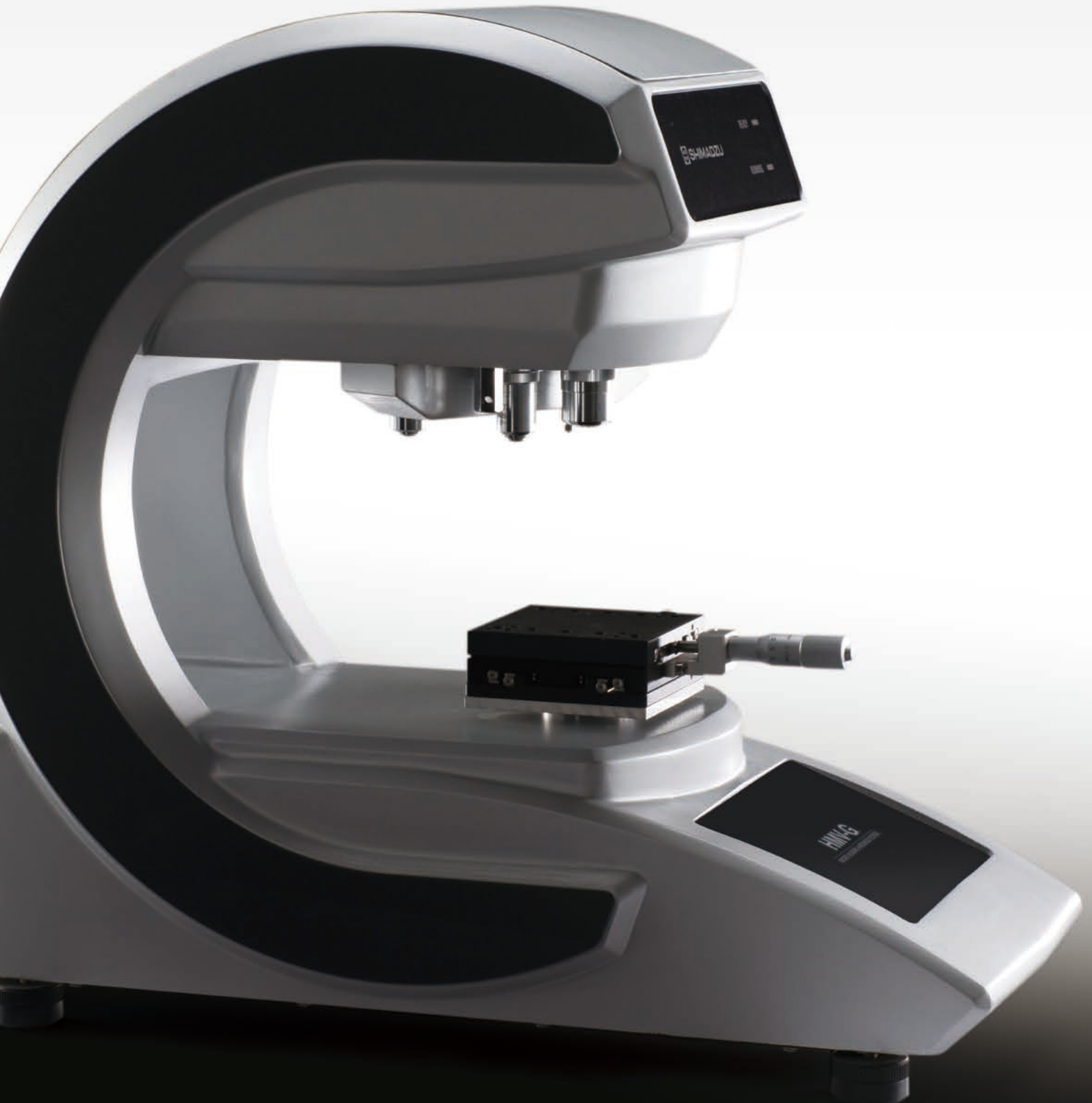
Micro Vickers Hardness Tester

HMV-G Series

Hardness Testers Featuring Automatic Length Measurement are the New Standard

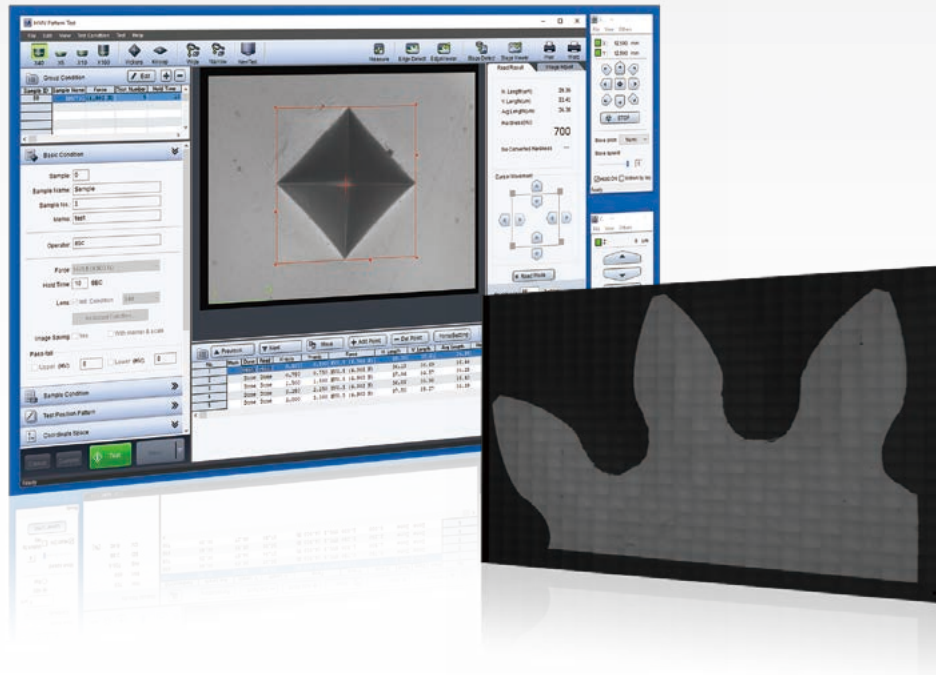**The Entire Series is Compatible with ISO6507-1, -2.**
(Test Force: 9.807 mN (HV0.001) to 19.61 N (HV2))

Whenever, Whoever, Everyone is an Expert from Day One

Micro Vickers Hardness Tester

HMV-G Series

This is the era in which the automatic reading of Vickers hardness measurements becomes the norm.
Shimadzu micro Vickers hardness testers are equipped with excellent automatic reading functions and visually straightforward, convenient software. In addition, an extensive lineup of options is available to accommodate a variety of needs.

Standardized automatic length measurement function using a digital camera built into a novel G frame (G31 series)

Compatible with an XY stage equipped with an electric micrometer (G31 series)

Easy-to-use software (G31 series)

Capable of automatically recognizing the full sample image and the sample edges (G31-FA series)

Select the System to Suit the Situation

HMV-G31 Series

Standardized automatic length measurement function using a digital camera built into a novel G frame

G Frame `G31` `G30` `FA`

The corner-less, elegant frame disperses the load uniformly for stability, and extends in the depth direction to expand the work space and improve operability. Additionally, because the central part of the frame is open, long narrow samples can now be measured as is.
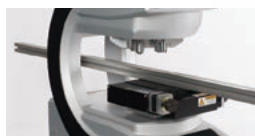
Multi Turret (D Type) `G31` `G30` `FA`

Two indenters and four lenses can be attached.

User-Designated Test Force Settings `G31` `G30` `FA`

Using electromagnetic control, tests can be performed with a user-designated test force from 9.807 mN (HV0.001) to 19.61 N (HV2). (Minimum increment of 9.807 mN)

Test Conditions Assist Function `G31` `G30` `FA`

This function can select the optimal lens from the anticipated hardness, or determine the optimal test force from the anticipated indentation depth and hardness.

Fracture Toughness Measurements `G31` `G30` `FA`

The system can measure the crack length when the indenter makes an indentation, so the fracture toughness of brittle materials can be measured.

Measurement Mode Settings `G31` `G30` `FA`

The user can select standard testing, in which the indentation is read after each test, or consecutive testing, in which the reading is taken after a number of test cycles.

Intelligent Software `G31` `FA`

The software automatically sets the optimal indentation test force from the anticipated hardness and anticipated indentation depth.
Further, the software automatically sets the optimal lens magnification from the anticipated hardness.

Automatic High Speed Readings `G31` `FA` → See page 6

One sample can be read in 0.3 seconds. (for monochrome cameras only)

Compact Design with a Built-in Digital Camera `G31` `FA`

The digital camera is built in, so the design is compact.

Automatic Lens Switching (T Type) `G31` `FA`

After the automatic reading is taken, the lens is automatically switched to suit the size of the indentation.

Reading of Scored Surfaces `G31` `FA`

The software can read not only samples with a mirror finish, but also samples scored by etching.

Routine Inspection Graphs `G31` `FA`

The average hardness per lot is displayed in a graph, so the user can check changes in hardness.

Color Camera Model `G31` `FA` → See page 7

Models with color cameras are available.

USB Communication with a General Purpose PC `G31`

Connect to a PC with just two USB cables. (Excluding the models with an electric stage)

Electric Micrometer (Optionally Available) `G31` → See page 9

After purchasing the HMV-G31/HMV-G21, if the electric micrometer option is subsequently added, the simplified electric XY stage function can be used.

The Following Situations Are Envisioned:

Surface Processing and Etching Fields

- There is a shortage of trained users, and the data varies significantly depending on the analyst.
- There are scratches on the surfaces of lead frames and mechanical parts, so measuring indentation lengths is difficult.
- Statistical controls should be implemented to evaluate quality stability, but there are not enough personnel.
- The goal is to measure a range of samples, even those with unknown hardness levels.

Solar Cell Field

- The goal is to evaluate the hardness of metal foils such as those used in solar cell wiring, but the foils cannot be measured because the test forces are too great.
- The goal is to evaluate not only Micro Vickers hardness, but also Knoop hardness and other hardness types, but switching indenters is difficult.
- The goal is to evaluate a variety of materials ranging in quality from hard to soft. However, this is difficult because test forces are inappropriate, and the lens magnification may not suit the indentation.

HMV-G31-FA Series

High Efficiency, Completely Automatic Measurements Using the Electric XYZ Stage and Special Software

Stage Viewer

Search the stage, and overlap the image data to create a total image. Also, the stage can be moved to the measurement position from the total image obtained.

Automatic Sample Shape Recognition

The system recognizes the shape of the sample, and sets the test position using this information.

General Purpose Test Pattern Settings

The coordinates of test positions are set using Excel data. As a result, programs can be created on a PC without installing special software. Angular adjustments to suit the sample orientation are made easily while observing the actual sample.

The Following Situations Are Envisioned:

Machine Industry Field

The goal is to evaluate the hardness distribution of parts with complicated shapes such as gears used in automobiles, aircraft, and hydraulic equipment, but determining measurement positions is difficult.

The goal is to measure the depth of hardening due to heat treatment, but measurement point positioning and calculations are difficult.
There are many test points, and measurement is difficult.

HMV-G30 Series

Turn it ON and Start Measuring Immediately. Active in Educational Fields.

Simple Test Mode

Simple test mode can be selected to start testing immediately just by setting the test force and the retention time.

LCD Data Graphs

The data are displayed in graphs, and it is easy to re-select or re-measure data.

LCD Touch Panel → See page 7

The simple window configuration is easy to use. In addition to test condition settings, statistical graphs are displayed to summarize the results.

Direct USB Transfers

Just connect a USB flash drive to the instrument to automatically save data in CSV format.

Sleep Mode

Sleep mode starts up when the instrument is not in use, conserving power.

The Following Situations Are Envisioned:
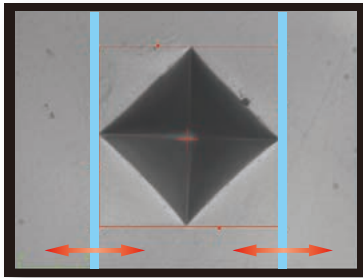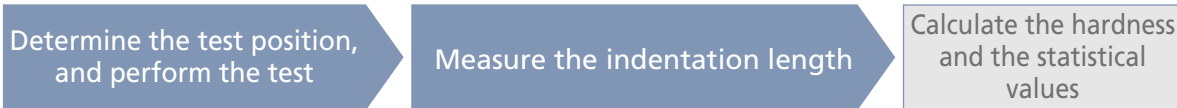
Transport Equipment Field

The goal is to measure the hardness of camshafts and other long samples, but the tests cannot be performed because the instrument cannot accommodate the samples.

Users wish to avoid using PCs on-site.
Measuring samples for the first time is problematic because the degree of indentation force and magnification for measurement are unknown.

Excellent Automatic Reading Function

In Vickers hardness measurements, the diagonal length of the indentation must be measured. With the PC software for the HMV-G series, images are acquired by the digital camera, and the diagonal length of the indentation is measured automatically. This eliminates human error and leads to stable results.

Determine the test position, and perform the test	Measure the indentation length	Calculate the hardness and the statistical values

Align the measurement lines with the corners of the indentation while peering through a lens with one eye

- Measurement values are inconsistent
- The measurement takes time
- Experience is required

With the HMV-G31 Automatic Reading Function:
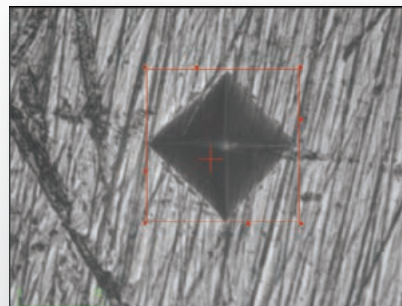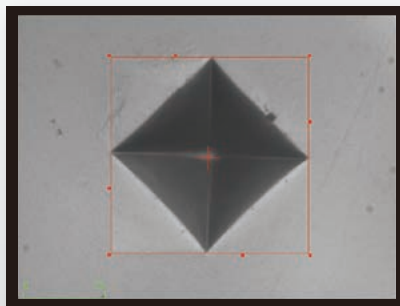
Reduced variability

Anyone can obtain the same test results.

Capable of measuring even scored surfaces

There is no need to polish the samples.

Less time needed for measurements

High-speed measurements (approximately 0.3 seconds)

Less burden on the analyst

Select the Type to Suit the Objective

## High Resolution Color Camera Type `NEW`

If visual inspection of the surface color is required in order to check the condition of the sample surface before testing, the sample can be positioned in the hardness tester, the sample surface can be checked, and then the sample can be tested as is.

The number of lenses is reduced

Used like a microscope

Photograph a wide range with the approx. 5 megapixel camera.
Built-in digital zoom function enables photographing fine details.
Make observations in color to assess the characteristics of samples.

Examples of a Colored Image
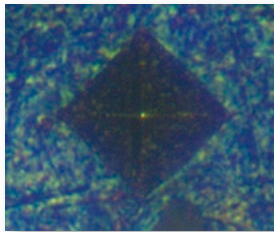**(Surface-treated metal sample)**
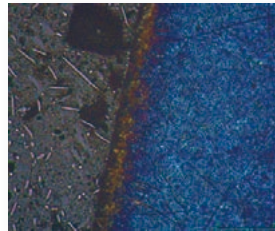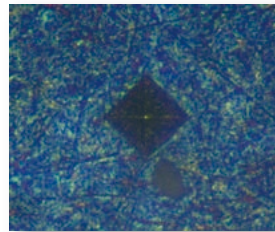

Photograph Taken with the Color Camera
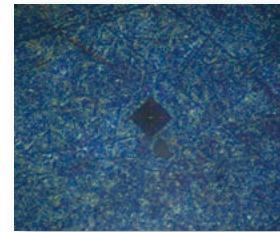

Photograph Taken with the Monochrome Camera

Digital Zoom Function: With the zoom, even fine details can be observed, with 1/2× wide range observations.


2×

1×

1/2×

Stand-Alone Model (HMV-G30)

A color touch panel has been adopted, so the user can easily set the conditions, measure the indentation length, and display the results. There is no need to connect to a PC.

In standard testing mode, sample information, shape correction, pass/fail determinations and other detailed conditions can be set before testing.
Additionally, fracture toughness tests are supported.
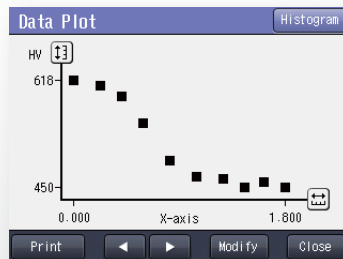
Using the digital micrometer head, the G30 series can make depth of hardening graph measurements.
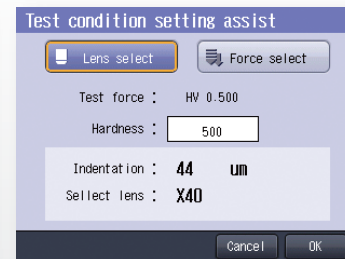
The system is equipped with a test conditions assist function that determines the optimal lens or the optimal test force from the anticipated hardness.

Automated Testing with the Electric Stage

Edge Detection and Automatic Edge Pattern Creating Function

The software automatically detects the sample edges, and then automatically creates a parallel pattern, region pattern, or perpendicular/zigzag pattern.
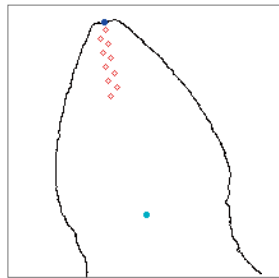For circular samples, a circular pattern can be created in which the central coordinates are automatically calculated, and the user configures the angle/radius for the test position.
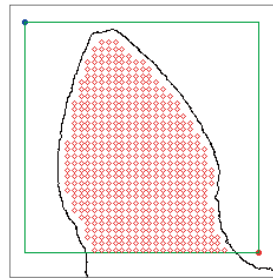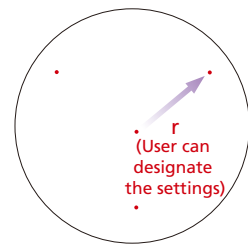

● Edge following pattern
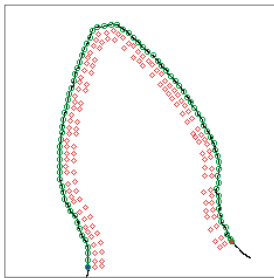
● Perpendicular pattern/ zigzag pattern

● Region pattern

● Circular pattern

r
(User can designate the settings)

Automatic Test Pattern Creating Function

Pattern Tests

The test position pattern is set automatically. There are 10 configurable patterns (a user-designated position can also be set).

Application Examples

Testing Automobile Gears
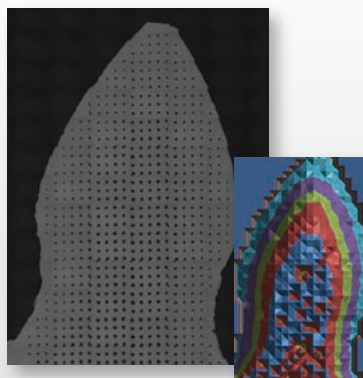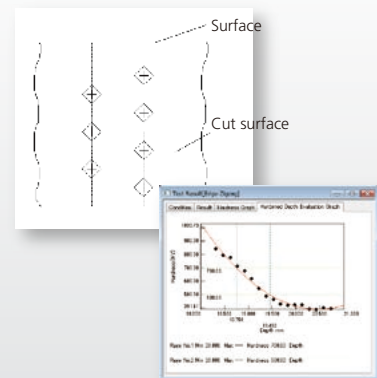The system can detect the gear edges, and measure the hardness within the gear. Additionally, the test force can be changed for each test position.

Measuring the Depth of Hardening (JIS G 0559 and ISO 3754)
The depth of hardening can be determined to check the amount of quenching.

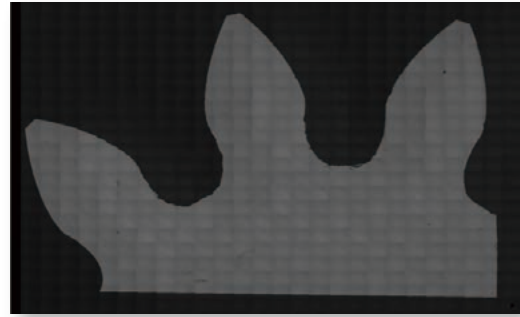Surface

Cut surface

Testing Automobile Gears   Measuring the Depth of Hardening
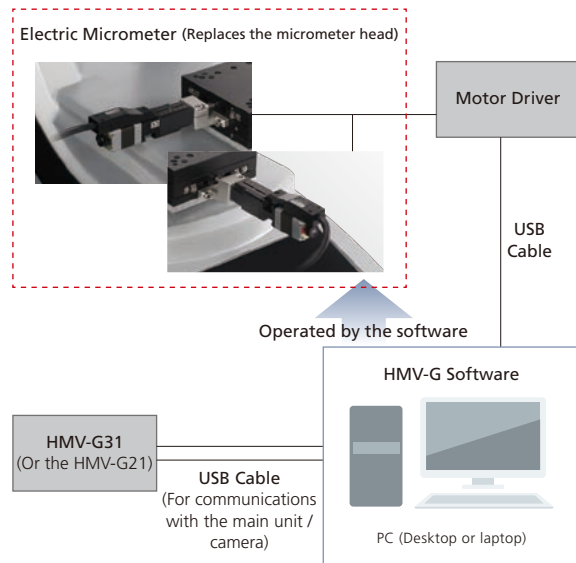
Stage Viewer Function

The overall image of a large sample can be seen by photographing specified ranges and then combining the images.
Double-click in the window to move the XY stage to that position.

Electric Micrometer (Optionally Available) NEW

The electric XY stage function can be used by replacing the micrometer head on the HMV-G31 manual stage.
It can be installed in existing HMV-G21/HMV-G31 systems.
Note: XY directions only. There is no electric micrometer for the Z axis direction.

Electric Micrometer (Replaces the micrometer head)

Motor Driver

USB Cable

Operated by the software

HMV-G Software

HMV-G31 (Or the HMV-G21)

USB Cable (For communications with the main unit / camera)

PC (Desktop or laptop)

Specifications

Suitable Hardness Tester and XY Stage	Manual XY stage provided as standard with the HMV-G31 and HMV-G21 (Surface area: 100 × 100 mm)
Drive Method	Stepping motor drive; open loop control
Stroke	±12.5 mm (0 to 25 mm) for both the X axis and Y axis
Movement Speed	2 mm/s max.
Positioning Accuracy	0.02 mm / 10 mm
Backlash during Round Trip Turnback	0.003 mm max.
Movement Resolution	0.001 mm
Power Supply	Single-phase 100 VAC 100 VA (50 Hz/60 Hz) Note: Prepare a grounded outlet. (D type ground, with a ground resistance of 100 Ω max.) Note: In addition, a power supply for the hardness tester unit and the PC will be required.
Personal Computer	As per the recommended PC specifications for the HMV-G. OS Windows® 10 (64 bit edition) CPU (recommended) Intel® Core™ i5-6500 or faster (Windows® 10) One USB 2.0 port (full speed) is used. (In addition, the tester unit uses two ports.)

The main sequence of operations is laid out in a way that is easy to visualize, so the system can be used easily by anyone.
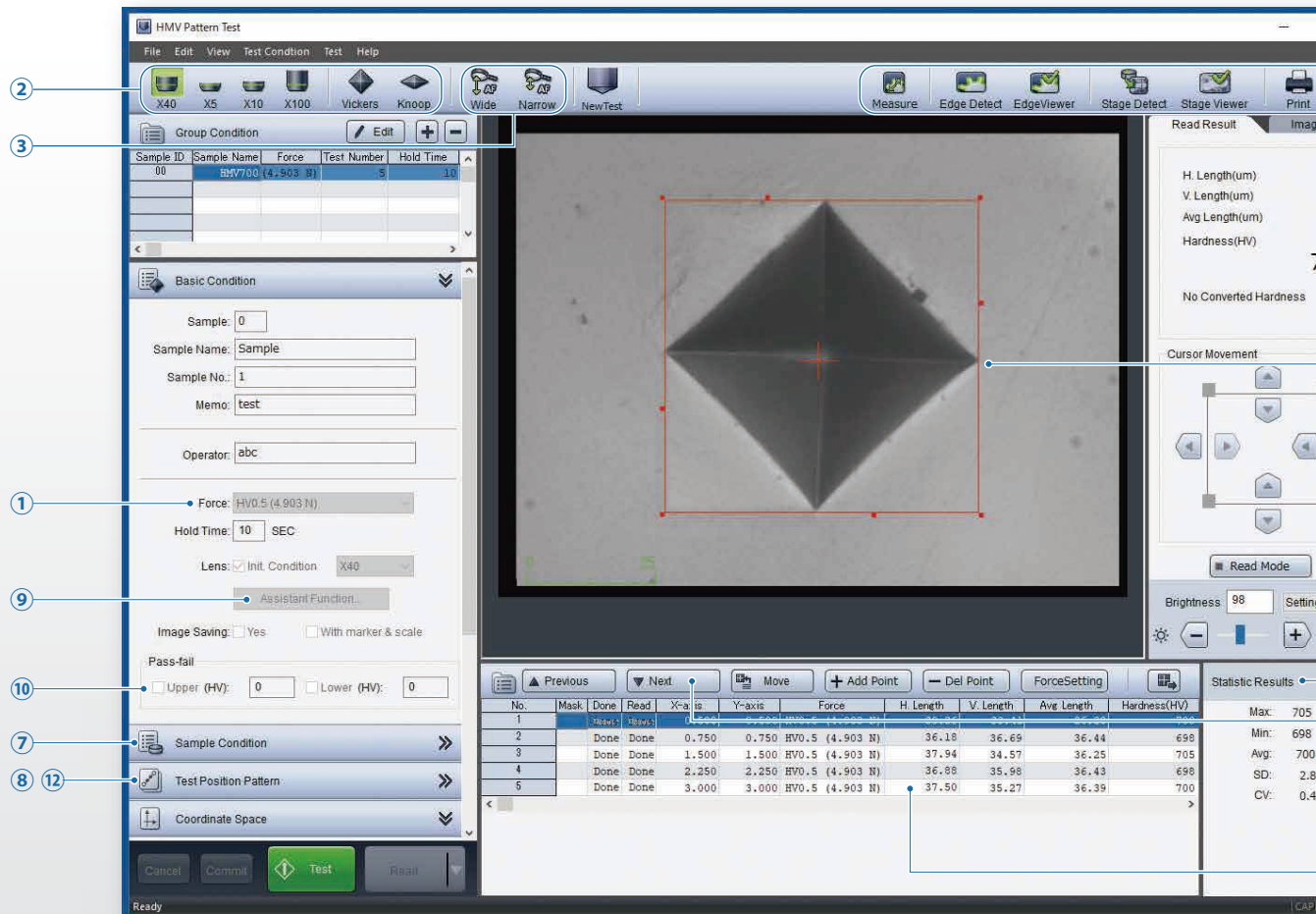
Word Report Function NEW

A test results report is created automatically in Word format. Creating a template (.dotx format) in advance enables reports to be created automatically in an original layout.

Note: Microsoft® Word 2016 or later is required to change the layout.
Note: Direct conversion to PDF files is possible even if Word has not been installed on the PC.

Improving the Reliability of Test Results Data NEW

Managing the Data from a Server PC is Preferred
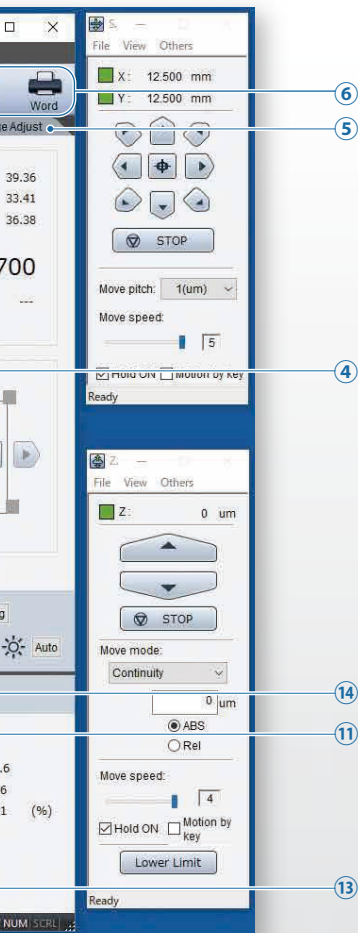- • **The results are saved automatically**
- • **They can also be saved to a PC on the network.**

Managing who Did the Testing is Preferred
Were the results from manual measurements altered arbitrarily?
- • **Saving the name of the experimenter**
- • **Password restrictions on manual measurements**

LAN

• Test Results Data
  (HMV-G Proprietary
  Format / CSV Format)
• Image
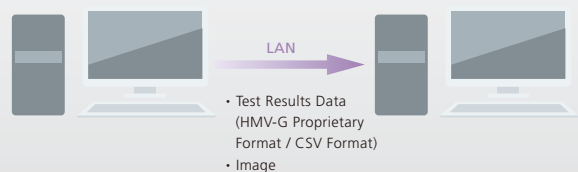
① In simple mode, tests can be performed by setting the test force and retention time.

② The objective lenses and indenters can be switched with a single click. *1

③ Autofocus can be performed with a single click. *2

④ The instrument switches to a high-magnification lens automatically when the indentation is small. *1

⑤ Image quality adjustments are easy in the test window.

⑥ Each function is easily accessed with large icons.

⑦ Sample surface conditions (cylindrical or spherical) are easily configured.

⑧ The pattern can be easily checked with the preview function.

⑨ The assist function simplifies the setting of conditions.

⑩ For convenience, conditions and results are simultaneously displayed.

⑪ The test position can be checked easily before testing.

⑫ Patterns can be created without using special software.

⑬ If there are scratches at the test position, and the indentation cannot be read, then a new position is specified and the test performed again.

⑭ Statistical results are displayed simultaneously.

*1: Electric turret required
*2: Compatible only with FA models
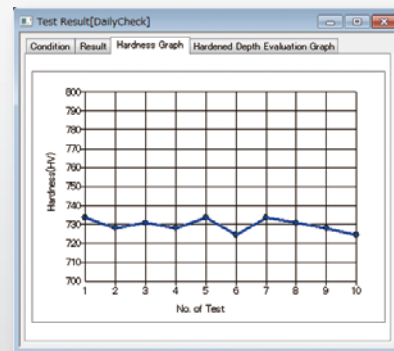
Image Quality Adjustment Function for Each Lens

NEW

If the camera image brightness and other visual qualities are changed for each lens, the image quality adjustments (such as brightness and contrast) can be saved separately.
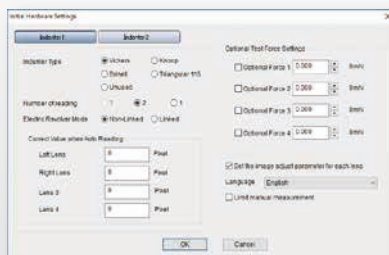
Routine Inspection Graphs

Data graphs can be created just by selecting the daily results.

HMV-G
Micro Vickers Hardness Tester

Options

Molded Sample Vise

This accommodates molded samples with a variety of sizes.
Use this if the sample is embedded in resin.

Note: It can also be customized to suit the desired sample size.
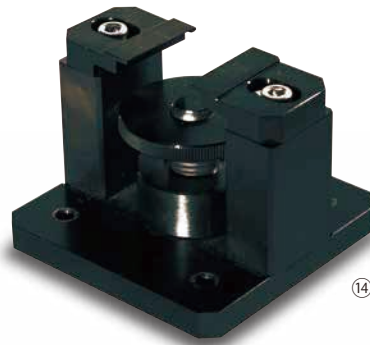
⑭ Molded Sample Vise

Standard Vise

Use this as the most standard vise.
Note that a universal vise is also available for samples of indeterminate shape with top surfaces that cannot be horizontal when gripped.
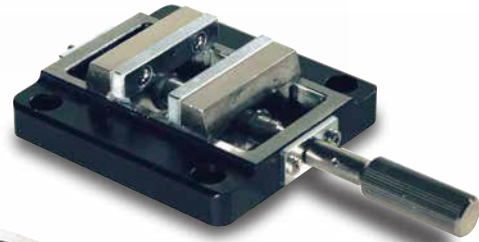
⑤ Standard Vise

Thin Sample Attachment, Type 3

Use this to fasten thin plates.
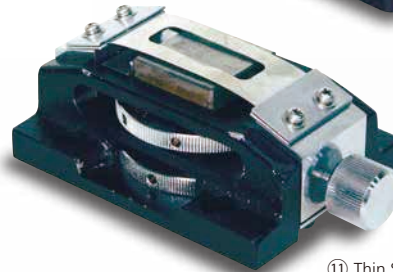
⑪ Thin Sample Attachment, Type 3

Additional Lineup

⑤ Standard Vise

⑦ Universal Vise

⑧ Simple Leveler
(for Universal Vise)

⑨ Thin Sample Attachment,
Type 1

⑩ Thin Sample Attachment,
Type 2

⑪ Thin Sample Attachment,
Type 3

⑫ Slender Sample Attachment,
Type 1

⑬ Slender Sample Attachment,
Type 2

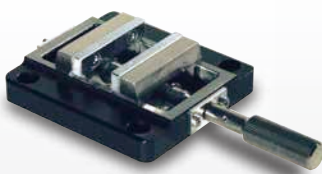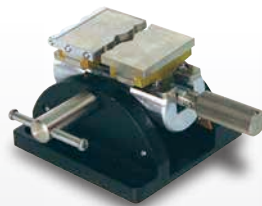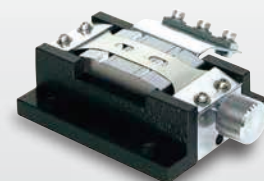| No.	Description	P/N	Description
1	Knoop Indenter	347-20418	Longitudinal edge angle 172°30′ , 130°
2	Brinell Indenter	347-20419-11	Brinell ultra hard steel ball indenter (1 mm diameter)
3	Triangle Pyramid Indenter 115°	347-20420	Tip angle 115° triangle pyramid indenter
4	Vickers Indenter	347-20344	
5	Standard Vise	341-64251-40	36 mm opening (* Standard accessory for FA type)
6	Standard Vise	347-64251-41	60 mm opening
7	Universal Vise	344-17140-40	22 mm opening
8	Simple Leveler (for Universal Vise)	344-13218	For leveling the sample on the universal vise
9	Thin Sample Attachment, Type 1	344-16039-40	For sample with 0.4 to 3 mm thickness
10	Thin Sample Attachment, Type 2	344-17040-40	For sample with 0.02 to 0.5 mm thickness
11	Thin Sample Attachment, Type 3	344-17737-40	For sample with 30 mm max. width and 8 mm max. thickness
12	Slender Sample Attachment, Type 1	344-16038-40	For sample with 0.4 to 3 mm diameter
13	Slender Sample Attachment, Type 2	344-82943-40	For sample with 0.15 to 1.6 mm diameter
14	Molded Sample Vise	347-21990-40	Diameter 1" to 1.5" Height 5 to 30 mm
15	Molded Sample Vise (for Electric XY Stage)	347-21990-41	Diameter 1" to 1.5" Height 5 to 20 mm (when the electric XY stage is attached)
16	Objective Lens, 5×	347-25575	
17	Objective Lens, 10×	344-89941-40	
18	Objective Lens, 20×	344-89924-40	
19	Objective Lens, 40×	347-25400	
20	Objective Lens 40x, Super-Long Working Distance Type	344-89300-41	
21	Objective Lens, 50×	344-89964-40	
22	Objective Lens, 100×	344-89977-40	
23	Line Printer	347-20928-01	Equipped with graphics printer cable for printing graphs
24	Thermal Paper Roll	078-15027-11	For line printer
25	Standard Hardness Block HMV40	340-06619-14	Nominal hardness 40
26	Standard Hardness Block HMV100	340-06619-31	Nominal hardness 100
27	Standard Hardness Block HMV200	340-06619-22	Nominal hardness 200
28	Standard Hardness Block HMV300	340-06619-23	Nominal hardness 300
29	Standard Hardness Block HMV400	340-06619-24	Nominal hardness 400
30	Standard Hardness Block HMV500	340-06619-05	Nominal hardness 500
31	Standard Hardness Block HMV600	340-06619-06	Nominal hardness 600
32	Standard Hardness Block HMV700	340-06619-07	Nominal hardness 700
33	Standard Hardness Block HMV800	340-06619-08	Nominal hardness 800
34	Standard Hardness Block HMV900	340-06619-09	Nominal hardness 900
35	Digital Micrometer Communications Set	347-25447-11	Stroke ±12.5 mm; display unit 1 µm 2PLS / set (Equipped with cable)
36	Rotary Stage	344-82857-01	Stage surface diameter 125 mm; movement range ±5°
37	Disk Vacuum Absorption Device	344-17127-40	4,5,6 inches (Absorption air source is required.)
38	Vibration Isolation Table (Bench top type)	339-82039-01	
39	Vibration Isolation Table (Desk type)	344-04193-03	
40	Windproof Case H750	347-24400-21	
41	Windproof Case H900	347-24400-22	Use this in combination with an active vibration damping stand.
42	Electric Micrometer Kit	347-26307-41	This motorizes the micrometer for the standard manual XY stage. Stroke: ±12.5 mm
43	Manual Length Stroke XY Stage	347-25551	Stroke: ±20 mm Stage area: 120 × 120 mm
44	Objective Micrometer	046-60201-02	

Specifications

		HMV-G31 Series		HMV-G30 Series	
Model P/N	Monochrome Camera without Electric Turret	HMV-G31S	HMV-G31D	HMV-G30S	HMV-G30D
		344-04273-□□	344-04274-□□	344-04271-□□	344-04272-□□
	Monochrome Camera with Electric Turret	HMV-G31ST	HMV-G31DT	HMV-G30ST	HMV-G30DT
		344-04277-□□	344-04278-□□	344-04275-□□	344-04276-□□
	Color Camera without Electric Turret	HMV-G31S-HC	HMV-G31D-HC		
		344-04287-□□	344-04288-□□		
	Color Camera with Electric Turret	HMV-G31ST-HC	HMV-G31DT-HC		
		344-04289-□□	344-04290-□□		
Test Force		16 stages in total 9.807 mN, 19.61 49.03, 98.07, 245.2, 490.3, 980.7 mN, 1.96 N, 2.942, 4.903, 9.807, 19.61 N 12 stages (HV0.001, HV0.002, HV0.005, HV0.01, 0.025, 0.05, 0.1, 0.2, 0.3, 0.5, 1, and 2) plus four user-designated stages *1			
Loading Unit		Automatic loading and automatic force changing			
Test Force Duration Time		User-designated settings from 0 to 999 sec*2, in 1 sec increments			
Maximum Number of Indenter Attachments		1	2× (1 empty)	1	2× (1 empty)
Standard Indenter Provided		Vickers Indenter			
Maximum Number of Objective Lens Attachments		2	4	2	4
Standard Objective Lenses Provided		40× (1 empty)	40× 10× (2 empty)	40× (1 empty)	40× 10× (2 empty)
Indentation Reading System		Automatic readings via digital image analysis, and manual settings for line length measurement in the PC window		Manual readings via an optical microscope	
Eyepiece				×10	
Digital Camera	Monochrome	USB Connection (USB 2.0) 1/3-inch image size Measurement image 640 × 480 pixels 256 tint gradations (digital image data)			
	Color	USB Connection (USB 3.0 Super Speed) 2/3-inch image size Measurement image 2448 × 2048 pixels			
Effective Measurement Range (For 40× objective lens)		Monochrome Camera: 120 × 90 μm Color Camera: 195 × 160 μm		250×250μm	
XY Stage		Area: 100 × 100 mm; Stroke: ±12.5 mm; Sample: Maximum height 100 mm Instrument's lateral direction (width direction): Unlimited*3; Instrument's depth direction: Unlimited for samples with a width of 120 mm max.*3 When sample width is greater than 120 mm: 200 mm max.*3 Z Axis Stroke: 60 mm; Spacer provided: Thickness 40 mm; Maximum Loading: 10 kg The center of gravity of objects loaded must be located on the stage.			
Autofocus Function					
Pattern Settings Items					
Image Acquisition Functions					
Data Processing Functions		① Vickers Hardness HV ② Knoop hardness HK*4 ③ Brinell hardness: HB*4 ④ Triangular Pyramid Hardness HT*3 ⑤ Length, direct reading L (μm)*5 ⑥ Fracture Toughness Kc ⑦ Shape correction function (cylindrical surfaces and spherical surfaces) Note: The cracks for measuring fracture toughness are determined manually by the operator.			
Results Displayed	Displayed Items	Data No., diagonal line length, hardness, conversion value, average, standard deviation, coefficient of variation, maximum value, minimum value, pass/fail determination			
	Graphical Display	Variance graph, depth of hardening graph*6		Variance graph, histogram, depth of hardening graph*6	
External Output	USB			Transfer of test results to a USB flash drive (CSV format)	
	Printer	Printer output from a PC via software		Thermal printer Compatible with laser printers	
External Dimensions		Approx. W350 × D570 × H540 mm			
Weight		Approx. 45 kg			
Power Supply		Main unit: Single-phase 100 to 115 VAC, 230 VAC, 100 VA (50/60 Hz) Note: Prepare a grounded outlet. (D type ground, with a ground resistance of 100 Ω max.) Note: With the HMV-G31 series, a power supply for the PC will be required in addition to the above mentioned.			
PC Provided*8		OS: Windows® 10 (64 bit edition) CPU: Intel® Core™ i5-6500 or faster USB Ports*8: For monochrome camera 　　　Uses two USB 2.0 or 3.0 ports 　　　For color camera 　　　Uses one USB 3.0 port (required) and 　　　one USB 2.0 or 3.0 port			

*1) An arbitrary test force can be configured in the range of 9.807 mN to 19.61 N, in increments of the minimum 9.807 mN (HV 0.001).
*2) When performing tests with the retention time set to 60 seconds or longer, turn ON the instrument at least 30 minutes before starting the test.
*3) The width of open space in the instrument's depth direction is approximately 140 mm.
　　When testing samples with a width of 120 mm or less and a depth of 175 mm or more, give consideration to the required movement range of the XY stage, and ensure that the width of the open space is not exceeded.
　　Ensure that the shape of the sample is such that it is stable when placed on the XY stage.
*4) The Knoop indenter, Brinell indenter and triangular pyramidal indenter are optional. The Brinell hardness and triangular pyramidal hardness are only read in manually.

Model P/N		HMV-G31-FA and HMV-G31-XY (HMV-G31 + Electric XY Stage)			
	Monochrome Camera without Electric Turret				
	Monochrome Camera with Electric Turret	HMV-G31-FA-S 344-04279-□□	HMV-G31-FA-D 344-04280-□□	HMV-G31-XY-S 344-04281-□□	HMV-G31-XY-D 344-04282-□□
	Color Camera without Electric Turret				
	Color Camera with Electric Turret	HMV-G31-FA-S-HC 344-04291-□□	HMV-G31-FA-D-HC 344-04292-□□	HMV-G31-XY-S-HC 344-04293-□□	HMV-G31-XY-D-HC 344-04294-□□
Test Force		16 stages in total 9.807 mN, 19.61 49.03, 98.07, 245.2, 490.3, 980.7 mN, 1.96 N, 2.942, 4.903, 9.807, 19.61 N 12 stages (HV0.001, HV0.002, HV0.005, HV0.01, 0.025, 0.05, 0.1, 0.2, 0.3, 0.5, 1, and 2) plus four user-designated stages [*1]			
Loading Unit		Automatic loading and automatic force changing			
Test Force Duration Time		User-designated settings from 0 to 999 sec[*2], in 1 sec increments			
Maximum Number of Indenter Attachments		1	2	1	2
Standard Indenter Provided		Vickers Indenter			
Maximum Number of Objective Lens Attachments		2	4	2	4
Standard Objective Lenses Provided		40× (Super-long Working Distance) 5× (0 empty)	40× (Super-long Working Distance) 5× (2 empty)	40× (1 empty)	40× 10× (2 empty)
Indentation Reading System		Automatic readings via digital image analysis, and manual settings for line length measurement in the PC window			
Eyepiece					
Digital Camera	Monochrome	USB Connection (USB 2.0) 1/3-inch image size Measurement image 640 × 480 pixels 256 tint gradations (digital image data)			
	Color	USB Connection (USB 3.0 Super Speed) 2/3-inch image size Measurement image 2448 × 2048 pixels			
Effective Measurement Range (For 40× objective lens)		Monochrome Camera: 120 × 90 μm Color Camera: 195 × 160 μm			
XY Stage		Area: 125 × 125 mm; XY Axis Stroke: ±25 mm; Sample: Maximum height 65 mm Instrument's lateral direction (width direction): Unlimited Instruments depth direction: Unlimited for samples with a width of 120 mm max.[*3] When sample width is greater than 120 mm: 175 mm max. Z Axis Stroke: 45 mm; Spacer provided: Thickness 30 mm Note: There is also a large sample stage edition with an area of 200 × 200 mm and an XY axis stroke of ±60 mm.			
Autofocus Function		Y		N	
Pattern Settings Items		Linear division, linear pitch, matrix, rectangular division, rectangular pitch, square, circular division, circular pitch, arbitrary, zigzag			
Image Acquisition Functions		Total image acquisition function and edge detection function			
Data Processing Functions		① Vickers Hardness HV ② Knoop hardness HK[*4] ③ Brinell hardness: HB[*4] ④ Triangular Pyramid Hardness HT[*3] ⑤ Fracture Toughness Kc ⑥ Shape correction function (cylindrical surfaces and spherical surfaces) Note: The cracks for measuring fracture toughness are determined manually by the operator.			
Results Displayed	Displayed Items	Data No., diagonal line length, hardness, conversion value, average, standard deviation, coefficient of variation, maximum value, minimum value, pass/fail determination			
	Graphical Display	Variance graph, depth of hardening graph[*6]			
External Output	USB				
	Printer	Printer output from a PC via software			
External Dimensions		Approx. W350 × D570 × H540 mm			
Weight		Approx. 50 kg			
Power Supply		Main unit: Single-phase 100 to 115 VAC, 230 VAC, 100 VA (50/60 Hz) Motor Control Box: Single-phase 100 VAC, 100 VA (50/60 Hz) Note: Prepare a grounded outlet. (D type ground, with a ground resistance of 100 Ω max.) Note: A power supply for the PC will be required in addition to the above mentioned.			
PC Provided[*8]		OS: Windows® 10 (64 bit edition) CPU: Intel® Core™ i5-6500 or faster USB Ports: For monochrome camera Uses two USB 2.0 or 3.0 ports For color camera Uses one USB 3.0 port (required) and one USB 2.0 or 3.0 port			

*5) The direct length reading is only available with HMV-G30 series.
*6) Depth of hardening graphs can only be displayed when the digital micrometer (optionally available) is used.
*7) The set items with the PC provided by Shimadzu is recommended.
*8) Another USB 2.0 or 3.0 port must be added if using the electric micrometer kit.
   Connect the electric micrometer kit to a USB 2.0 port when using it with a color camera type unit.

Dynamic Ultra Micro Hardness Tester

DUH™ Series

Precision Universal Testing Machines

Autograph AGX™-V Series

Hydraulic Universal Testing Machines

UH-X Series

DUH-211

AGX-100kNV

UH-500kNX

DUH and AGX are trademark of Shimadzu Corporation.
Intel and Intel Core are trademarks of Intel Corporation or its subsidiaries.
Microsoft and Windows are trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries.

SHIMADZU

Shimadzu Corporation
www.shimadzu.com/an/