

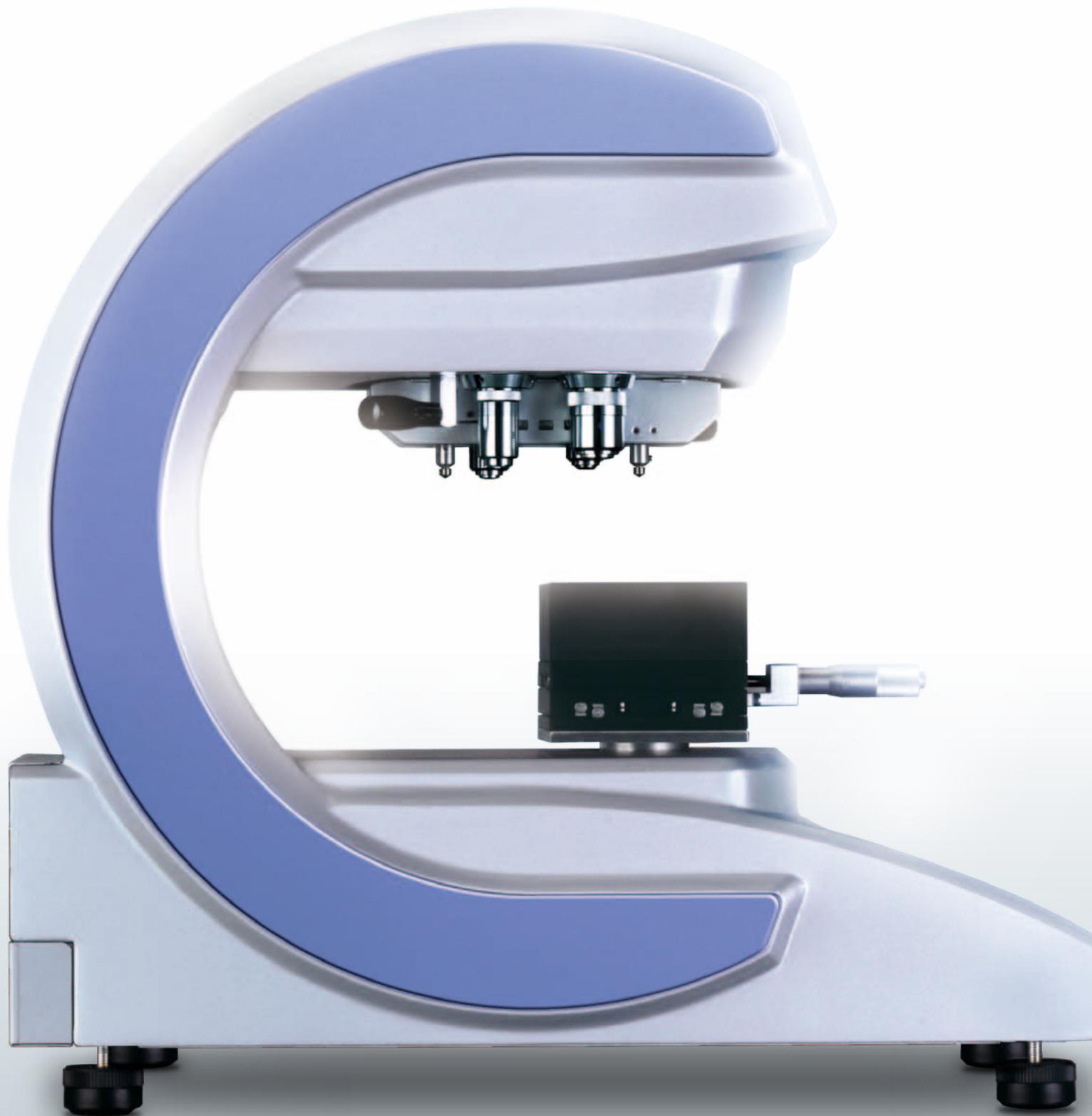


Micro Vickers Hardness Tester

# HMV-G Series



Hardness Testers Featuring Automatic Length Measurement are the New Standard



# Everyone is an expert

In recent years, instruments have been increasingly used by inexperienced operators. At the same time, reliable measurements are essential in order to ensure quality, so instruments are needed that can be used easily by anyone, with no risk of human measurement error. Our Micro Vickers Hardness Testers, featuring automatic length measurement, have been standardized as a response to such demands.

## ■ Standardized automatic length measurement function using a CCD camera built in a novel G frame (G21 series)

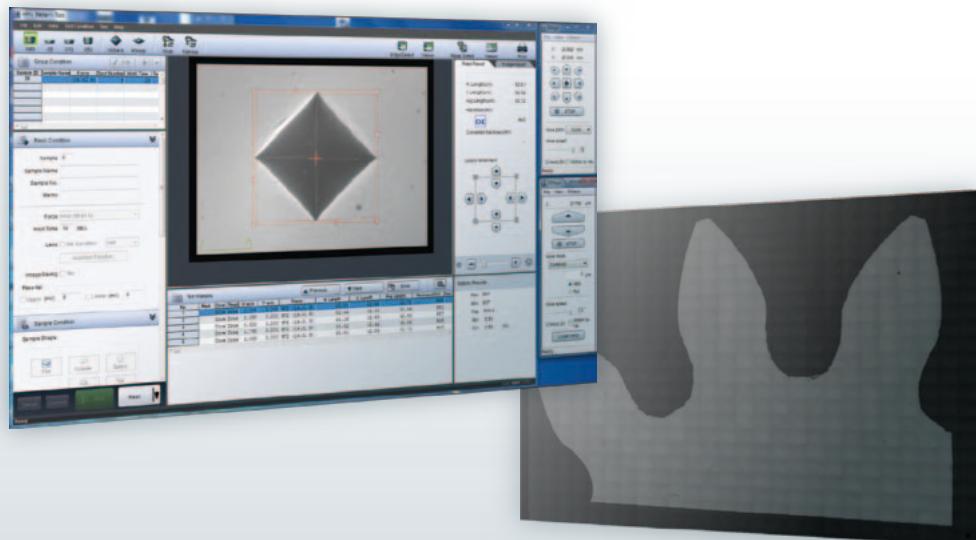
The automatic length measurement function provides simple, secure measurements, with no risk of human error. The adoption of the novel G frame expands the work space, dramatically improves operability, and makes it easy to test samples that are long or have a large surface area. Also, with the automatic lens switching function, magnification can be set to automatically match the size of the indentation with the correct lens, enabling any user to accurately measure samples. (T models only)

## ■ Easy-to-use software (G21 series)

Everything from setting of conditions to the display of results can be checked in a single window, so anyone can perform tests smoothly. In addition, with the routine inspection graphs function, it is easy to check data in chronological order just by selecting the measurement results, so it can be used effectively for ISO17025 and ISO16949 certification.

## ■ Capable of automatically recognizing the total image of the sample and the sample edges (FA type)

It is easy to determine the test position for gears and other samples with complicated shapes, which shortens the work time. Furthermore, samples can be positioned by clicking at an arbitrary position on the total image, which dramatically improves operability.



Micro Vickers Hardness Tester

# HMV-G Series

# Leave Everything to the HMV-G Series

— Do you have any of the following problems? —

## G21 Series

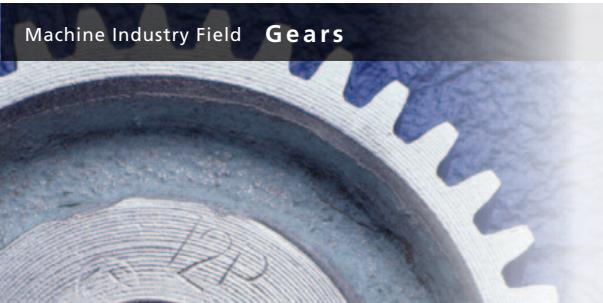


For example...

- 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 processing should be performed 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.

For example...

- 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.



For example...

- The goal is to evaluate **the hardness distribution of gears and other parts with complicated shapes**, such as those 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.



**G21 FA** Type



For example...

- 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.  
**I don't want to use a personal computer on-site.**
- Measuring samples for the first time is problematic,
- because **neither the optimal indentation force nor the optimal magnification for measurement** are known.



**G20** Series

# Leave Everything to the HMV-G Series

## — Solve your problems! —

### G21 Series



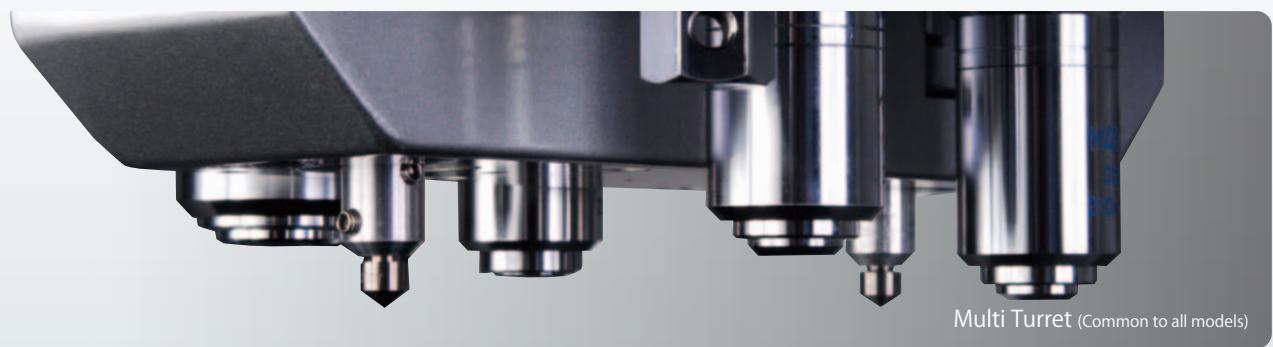
- Equipped with an **automatic reading function** that adopts highly specialized algorithms.  
Even scratched samples can be measured with good repeatability.
- User-friendly software allows **all the information to be seen at a glance**. This improves operational efficiency and eliminates errors.
- Equipped with a smart, compact **built-in CCD camera mechanism**. The instrument can be installed neatly and simply, with no need for wiring arrangements.
- With **the routine inspection graph<sup>1)</sup> generating function**, the data can be assessed in chronological order. The stability of the testing system can be evaluated using statistical methods, which means the instrument can be used effectively for obtaining ISO 17025<sup>2)</sup> and ISO 16949<sup>2)</sup> certification.
- **A low test force function** can be added to enable tests from 9.8 mN. Soft samples and thin samples can be evaluated.
- Select a system with **a multi turret function** where two indenters and four objective lenses can be attached.<sup>3)</sup> (D models only.) Select the optimal model to suit the usage application.
- Equipped with an **automatic lens switching function** that switches the lens to suit the size of the indentation.

Samples of unknown hardness can be measured easily and reliably even by inexperienced users. (T models only.)

\*1) ISO 6507-1 (Vickers hardness test - Test method) Annex C (Informative) : Procedure for checking of the testing machine by user (Extract) A check of the machine should be carried out on each day that the machine is used, at approximately each hardness level and for each range or scale that is used. A record of these results should be maintained over a period of time, and used to measure reproducibility and monitor drift of the machine.

\*2) ISO 17025 General requirements for the competence of testing and calibration laboratories  
(JIS Q 17025 General requirements for the competence of testing and calibration laboratories)  
ISO 16949 Quality management system - Particular requirements for the application of ISO 9001 for automotive production and relevant service part organizations

\*3) One indenter and two objective lenses are optional.





Stage Viewer Function

- A **stage viewer function** allows the user to observe the total image of the sample for specifying arbitrary positions. It is easy to test a desired position. Furthermore, an **automatic sample shape recognition function** detects the edges of the sample so test positions can be configured easily along the sample edges.
- An **Excel compatible programming function** has been adopted. Test patterns can be programmed with an office PC.
- The **test force can be set for individual points** in a test pattern. The test force can be configured individually, so the size of the indentation can be arranged even if the hardness changes.

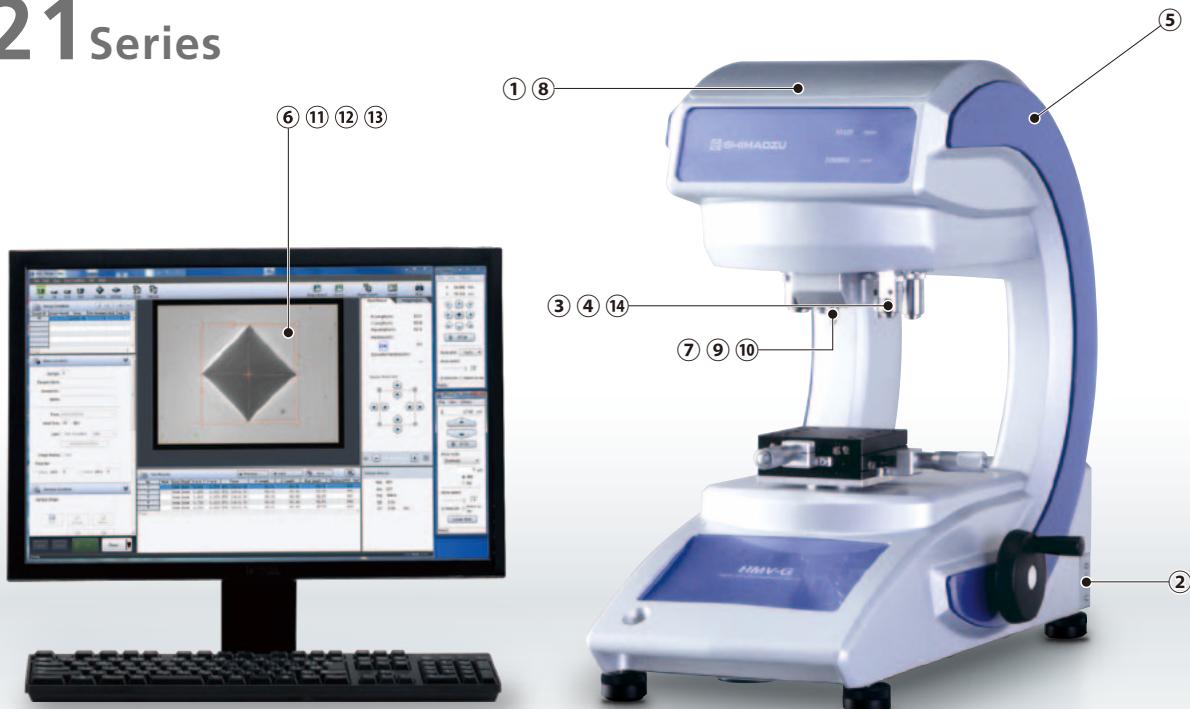


LCD Touch Panel

- The design now incorporates an open space at the center of the frame. This makes it possible to place long samples at test positions that could not be tested conventionally.
- A **direct USB transfer function** allows data to be stored automatically on a USB memory stick. Test data can be extracted and transferred without using a PC. Furthermore, a **color LCD touch panel** has been adopted with a **big**, user-friendly display. This improves the visual ease of use, enabling fast, efficient measurements.
- Utilizing **the assist function**, the indentation force can be set automatically based on the estimated indentation depth and the estimated hardness of the sample. In addition, the lens magnification is automatically determined based on the estimated hardness. This means that users who are unfamiliar with the instrument can use it securely, even when testing new samples.

# A Variety of Functions

## G21 Series



### ① Compact Design G21 FA

The CCD camera is built in, making the design compact.



### ② USB Communication with General Purpose PCs G21

The instrument can be connected with a PC using only two USB cables. (Except when an electric stage is attached.)

### ③ Automatic High-Speed Readings G21 FA

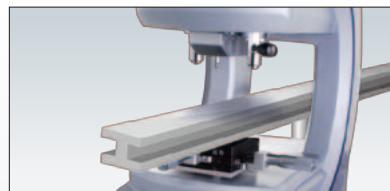
A single sample can be read in 0.3 seconds.

### ④ Reading Scratched Surfaces G21 FA

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

### ⑤ G Frame G21 FA G20

A stable frame that is devoid of angles, has a graceful style, and disperses test loads uniformly has been adopted. The inner direction has been expanded to increase the workspace, which improves both efficiency and operability. Even large samples can be accommodated. The center of the G frame is open, so long and narrow samples can now be tested as is (design registration pending).



### ⑥ Test Conditions Assist Function G21 G20

This function selects the optimal lens from the estimated hardness, or determines the optimal test force from the estimated indentation depth and hardness. (patent pending)

### ⑦ Multi Turret (Optional) G21 FA G20

Two indenters and four lenses can be attached.

### ⑧ Ultra Long Life Illumination G21 FA G20

An LED is provided as standard. It is energy efficient, which is great for the environment, and has a long life, which reduces replacement maintenance. (patent pending)

### ⑨ Low Test Force (Optional) G21 FA G20

Tests can be performed at arbitrary test forces in the range from 1 gf to 2 kgf.

### ⑩ Electromagnetic Force Control G21 FA G20

The indentation test force can be configured seamlessly.

### ⑪ Fracture Toughness Measurements G21 G20

The system measures the lengths of cracks created when the indenter makes an impression, so it is possible to measure the fracture toughness value for brittle materials.

### ⑫ Measurement Mode Settings G21 FA G20

Select either standard tests, in which indentations are read in each test, or sequential tests, in which readings are performed in sequence after applying loads for a set number of test cycles.

### ⑬ Routine Inspection Graphs G21 FA

Average hardness is displayed for each lot to confirm changes in hardness. (patent pending)

### ⑭ Automatic Lens Switching (T models) G21 FA

After automatic readings, lenses are switched automatically to suit the size of the indentation. (patent pending)

## G21 FA Type



### ⑯ Stage Viewer FA

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.

### ⑯ Automatic Sample Shape Recognition FA

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

### ⑯ General Purpose Test Pattern Settings FA

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.

## G20 Series



### ⑯ Direct USB Transfers G20

Connect a USB memory stick to the instrument to automatically save data in CSV format.



### ⑯ Simple Test Mode G20

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

### ⑯ Sleep Mode G20

Sleep mode starts up when the instrument is not in use to conserve the amount of power used.

### ⑯ LCD Touch Panel G20

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

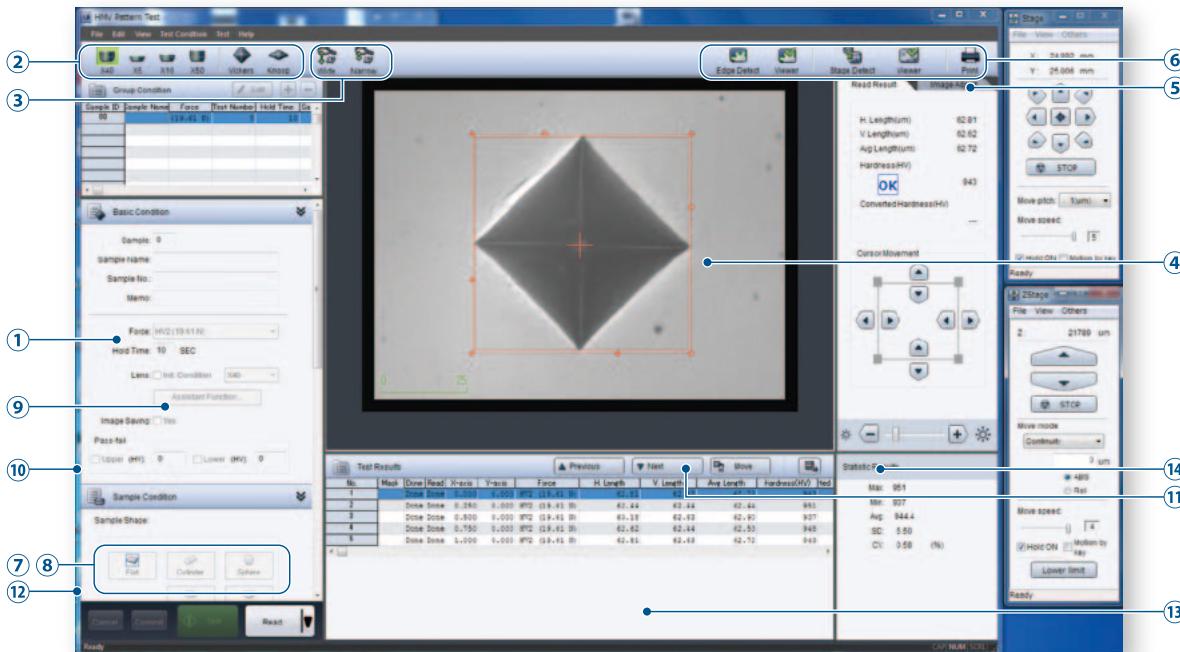
### ⑯ LCD Data Graphs G20

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

# HMV-G Series Test Software

## Simple Test Operations

The sequence of primary operations from setting conditions to displaying results is arranged for ease of visual tracking, so that anyone can use the instrument easily.



① In simple mode, tests can be performed by setting the test force and duration 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 The test window makes image quality adjustments easy.

⑥ Each function is easily accessed with large icons.

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

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

⑨ The assist function makes setting conditions easy.

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.

## Stage Viewer

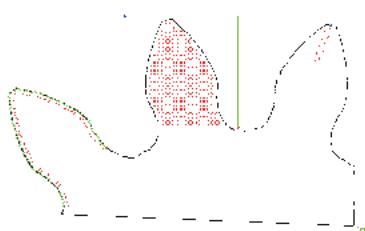
The full sample on the stage can be seen even when the image is bigger than the microscope's field of view.



Double-click on the image to move the XY stage to that position.

## Automatic Sample Shape Recognition

The system detects sample edges to create patterns along the edges, filling the area surrounded by the edges, and orthogonal to the edges.



## Improved Indentation Reading Accuracy

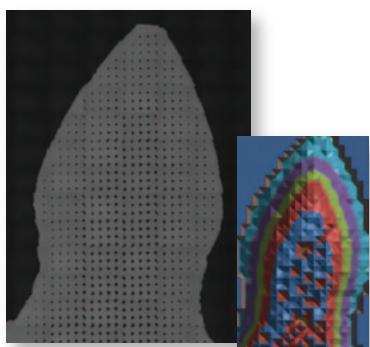
The system is equipped with new algorithms that can read indistinct indentations on scratched surfaces.



# Sample Applications

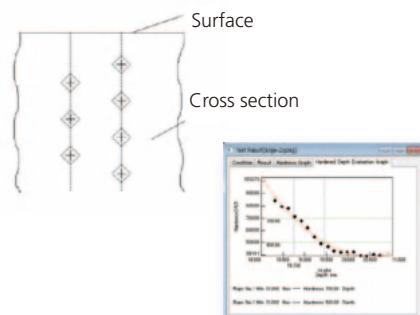
## Testing Automotive Gears

The system detects the gear edges and measures the hardness inside the gear.  
Also, the test force can be changed for each test position. (patent pending)



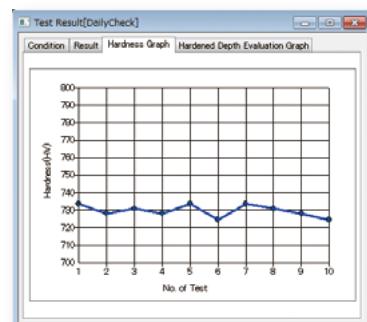
## Measurement of Depth of Hardening (JIS G 0559, ISO 3754)

The depth of hardening can be determined to check the state of quenching.



## Routine Inspection Graphs

Data graphs can be created by selecting daily results.

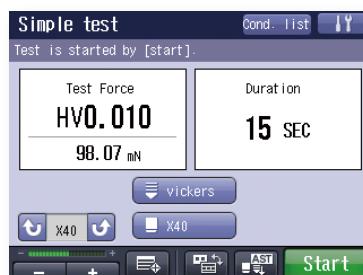


## Touch Panel Operator (HMV-G20 Series)

A color touch panel has been adopted, making it easy to set conditions, measure indentation lengths, and display results.



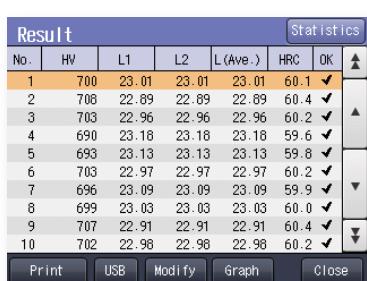
In standard test mode, tests can be performed by setting detailed conditions such as sample information, shape corrections, and pass/fail determinations. Fracture toughness tests are also possible.



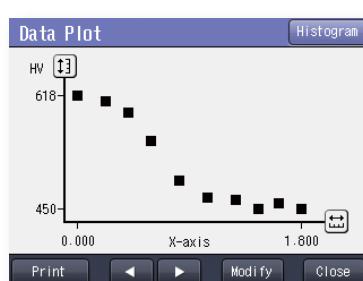
Simple test mode can be selected to start testing immediately just by setting the test force and the duration time.



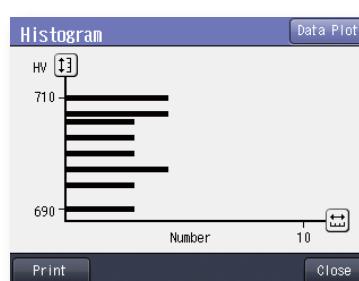
The system is equipped with a test conditions assist function to determine the optimal lens or test force from the estimated hardness.



Test results can be listed and statistics can be displayed. Results can be written in text format to a USB memory stick.



Depth of Hardening Measurement  
Depth of hardening graph measurements are also possible with the G20 series by using a digital micrometer head.



The hardness values can be displayed in a histogram.

# System Configuration



5 Standard Vise



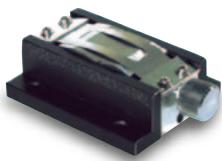
6 Universal Vise



7 Horizontal Adjustment Stand (for Universal Vise)



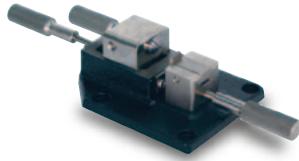
8 Thin Sample Attachment, Type 1



9 Thin Sample Attachment, Type 2



10 Thin Sample Attachment, Type 3



11 Slender Sample Attachment, Type 1



12 Slender Sample Attachment, Type 2



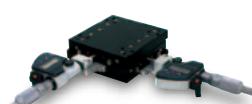
13 Mold Sample Vise



24 Dot Printer



22 Line Printer



38 Digital Micrometer Head



39 Rotary Stage

For details, refer to the Accessories List.

# Accessories List

No.	Description	P/N	Remarks
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
6	Universal Vise	344-17140-40	22 mm opening
7	Leveling Stage (for universal vise)	344-13218	For leveling the sample on the universal vise
8	Thin Sample Attachment, Type 1	344-16039-40	For sample with 0.4 mm to 3 mm thickness
9	Thin Sample Attachment, Type 2	344-17040-40	For sample with 0.02 mm to 0.5 mm thickness
10	Thin Sample Attachment, Type 3	344-17737-40	For sample with 30 mm max. width and 8 mm max. thickness
11	Slender Sample Attachment, Type 1	344-16038-40	For sample with 0.4 mm to 3 mm diameter
12	Slender Sample Attachment, Type 2	344-82943-40	For sample with 0.15 mm to 1.6 mm diameter
13	Mold Sample Vise	347-21990-40	Diameter 1" to 1.5"; height 5 mm to 30 mm
14	Mold Sample Vise (for electric XY stage)	347-21990-41	Diameter 1" to 1.5"; height 5 mm to 20 mm (when equipped with an electric XY stage)
15	Objective Lens 5x	347-25575	
16	Objective Lens 10x	344-89941-40	
17	Objective Lens 20x	344-89924	
18	Objective Lens 40x	347-25400	
19	Objective Lens 40x, Extra-Long Working Distance Type	344-89300-41	
20	Objective Lens 50x	344-89964	
21	Objective Lens 100x	344-89977	
22	Line Printer	347-20928-XX	Equipped with graphics printer cable for printing graphs -02:120 V -03:230 V
23	Roll of Thermal Paper	078-15027-11	For line printer
24	Dot Printer	347-21007-XX	Equipped with cable for numerical printing only (cannot print graphs) -02:120 V -03:230 V
25	Roll of Paper	078-15014-11	For dot printer
26	Ink Ribbon	078-15014-12	For dot printer
27	Laser Printer	088-52093-04	
28	Standard Hardness Block HMV 40	340-06619-14	Nominal hardness 40
29	Standard Hardness Block HMV 100	340-06619-31	Nominal hardness 100
30	Standard Hardness Block HMV 200	340-06619-22	Nominal hardness 200
31	Standard Hardness Block HMV 300	340-06619-23	Nominal hardness 300
32	Standard Hardness Block HMV 400	340-06619-24	Nominal hardness 400
33	Standard Hardness Block HMV 500	340-06619-05	Nominal hardness 500
34	Standard Hardness Block HMV 600	340-06619-06	Nominal hardness 600
35	Standard Hardness Block HMV 700	340-06619-07	Nominal hardness 700
36	Standard Hardness Block HMV 800	340-06619-08	Nominal hardness 800
37	Standard Hardness Block HMV 900	340-06619-09	Nominal hardness 900
38	Digital Micrometer Head	081-02772-01	Stroke ±12.5 mm; display units 1 µm
39	Rotary Stage	344-82857	Stage surface diameter 125 mm; movement range ±5°
40	Disk Vacuum Adsorption Device	344-17127-02	4, 5, 6 inches (Adsorption air source is required.)
41	Bench-Top Shock Absorber	344-81401	
42	Desk-Type Shock Absorber	344-04193-01	
43	Objective Micrometer	046-60201-02	
44	Low Test Force Compatibility	347-25215	Test forces 1 g, 2 g, and 5 g added; available only when main unit ordered
45	AD Kit	344-04225-44	Post-installation AD kit for G20 series

# Specifications

Model	HMV-G21S	HMV-G21ST	HMV-G21D	HMV-G21DT	HMV-G-XY-S				
Operation Method	Via PC								
Maximum Number of Indenters Attached	1		2		1				
Standard Indenters Provided	Vickers indenter		Vickers indenter		Vickers indenter				
Maximum Number of Objective Lenses Attached	2		4		2				
Standard Objective Lenses Provided	40x		40x 10x		40x				
Electric Turret Function <sup>*1</sup>	No	Yes	No	Yes	Yes				
Test Force	Nine force types: 98.07 mN, 245.2 mN, 490.3 mN, 980.7 mN, 1,961 N, 2,942 N, (When low test force option is applied)								
Test Force Accuracy	Test force 9.807 mN to 1.951 N								
Loading Unit									
Test Force Duration Time									
Indentation Reading Method	Automatic reading from analysis of a digital image from the built-in CCD camera, or by manually setting								
Eyepiece	Image capture by the built-in CCD camera								
Effective Measurement Range	120 mm × 90 mm (with 40x objective lens)								
Indentation Measurement Resolution	0.09 µm (automatic), 0.18 µm (manual) (with 40x objective lens)								
XY Stage	Manual type Area: 100 mm × 100 mm; stroke: ±12.5 mm; sample: max. height of 100 mm Instrument lateral direction (width direction): unlimited <sup>*5</sup> ; instrument depth direction: for sample width of 120 mm or less, unlimited <sup>*5</sup> ; for sample width of 120 mm or more: 200 mm max. <sup>*5</sup> Z axis stroke: 60 mm; spacers provided: 40 mm thick								
Data Processing Functions	Measurement modes: 1) Vickers hardness HV, 2) Knoop hardness								
Statistical Calculation	Maximum number of data points	5000							
	Statistical items	Average, standard deviation, coefficient of variation, maximum value,							
	Graphical display	Variance, depth of hardening <sup>*8</sup> , transition graph							
Results Display	Displayed items	Data No., diagonal line length,							
	Graphical display	Variance graph, depth of hardening graph <sup>*8</sup>							
External Output	USB	Communication with PC							
	Printers	Dot printer,							
External Dimensions									
Weight	Approx. 44 kg								
Power Requirements	Single phase AC100-115 V, 1 A AC230 V, 0.5 A								
Compatible PC	OS: Windows 7 (32-bit version) <sup>*9</sup> , CPU (Intel®Core™2Duo or faster recommended),								

\*1 The electric turret function is only available when the system is newly purchased. It cannot be added after purchase.

\*2 In the 98.07 mN to 19.61 N range, arbitrary test force values can be set with minimum units of 9.807 mN (HV0.001).

\*3 The low test force option is only available when the system is newly purchased. It cannot be added after purchase.

There are 3 initial low test force settings: 9.807 mN, 19.61 mN, and 49.04 mN.

When the arbitrary test force settings function is used, the test force can be set with minimum units of 9.807 mN (HV0.001) in the range from 9.807 mN to 88.26 mN (HV0.001 to HV0.009).

\*4 When the test force duration time is set to 60 seconds or more, wait 30 minutes or longer with the power ON before testing.

\*5. Ensure that the shape of the sample fits stably on the XY stage.

\*6 The Knoop indenter, Brinell indenter, and triangle pyramid indenter are optional.

\*7 Crack determination is performed by the operator.

\*8 Depth of hardening graphs can only be displayed when the digital micrometer (optional) is used.

\*9 Not compatible with 64-bit OS versions. The PC specifications are subject to change with time.

HMV-G-XY-D	HMV-G-FA-S	HMV-G-FA-D	HMV-G20S	HMV-G20ST	HMV-G20D	HMV-G20DT			
			Standalone						
2	1	2	1		2				
Vickers indenter	Vickers indenter	Vickers indenter	Vickers indenter		Vickers indenter				
4	2	4	2		4				
40x 10x	40x extra-long working distance type 5x		40x		40x 10x				
Yes			No	Yes	No	Yes			
4.903 N, 9.807 N, and 19.61 N (HV0.01, 0.025, 0.05, 0.1, 0.2, 0.3, 0.5, 1, and 2), and 4 arbitrary settings <sup>*2</sup>									
Three types <sup>*3</sup> in addition to the above: 9.807 mN, 19.61 mN, and 49.04 mN (HV0.001, HV0.002, and HV0.005)									
range: ±1.5 % max., Test force 1.961 N to 19.61 N range: ±1 % max.									
Automatic loading and automatic force changing									
0 to 999 secs. <sup>*4</sup> Selectable in second units.									
the length lines in the PC window display.			Manual reading with an optical microscope						
		Image capture by the built-in CCD camera With autofocus function		10x					
			250 µm × 250 µm (with 40x objective lens)						
			0.01 µm (with 40x objective lens)						
Electric type Area: 125 mm × 125 mm; stroke: ±25 mm; sample: max. height of 65 mm Instrument lateral direction (width direction): unlimited <sup>*5</sup> Instrument depth direction: for sample width of 120 mm or less, unlimited <sup>*5</sup> ; for sample width of 120 mm or more, 200 mm max. <sup>*5</sup> Z axis stroke: 45 mm; spacers provided: 30 mm thick			Manual type Area: 100 mm × 100 mm; stroke: ±12.5 mm; sample: max. height of 100 mm Instrument lateral direction (width direction): unlimited <sup>*5</sup> ; instrument depth direction: for sample width of 120 mm or less, unlimited <sup>*5</sup> ; for sample width of 120 mm or more: 200 mm max. <sup>*5</sup> Z axis stroke: 60 mm; spacers provided: 40 mm thick						
HK, 3) Brinell hardness HB <sup>*6</sup> , 4) triangle pyramid hardness HT <sup>*6</sup> , 5) direct length reading L (µm), 6) fracture toughness Kc <sup>*7</sup>			999						
minimum value, conversion value (HK, HBW, HS, MPa, HRA, HRB.HRC, HRD, HR15N, HR30N, HR45N)									
Variance, depth of hardening, transition graph			Variance, depth of hardening <sup>*8</sup> , histogram						
hardness, conversion value, average, standard deviation, coefficient of variation, maximum value, minimum value, pass/fail determination									
Variance graph, depth of hardening graph			Variance graph, depth of hardening graph <sup>*8</sup> , histogram						
(CCD camera: 1 port; instrument control: 1 port)			Transfer of test results to USB memory stick (CSV format)						
thermal printer, laser printer compatible									
Approx. W350 mm × D570 mm × H540 mm									
Approx. 48 kg			Approx. 44 kg						
Provide a grounding wire. (Grounding resistance 100 Ω max.)									
two USB2.0 ports used									

Software Function	HMV-G21	HMV-G21-T	HMV-G-XY	HMV-G-FA		HMV-G21	HMV-G21-T	HMV-G-XY	HMV-G-FA
Simple operations	○	○	○	○	Brightness changes for each lens	○	○	○	○
Assistant function	○	○	○	○	Turret control	—	○	○	○
Indentation reading	○	○	○	○	Lens switches automatically depending on the size of the indentation	—	○	○	○
Sample shape correction	○	○	○	○	Pattern setting	—	○	○	○
Statistics and conversion hardness	○	○	○	○	Stage viewer	—	○	○	○
Analysis and printing	○	○	○	○	Automatic sample shape recognition	—	○	○	○
Measurement of depth of hardening	○*1	○*1	○	○	Test force setting for each test position	—	○	○	○
Fracture toughness tests	○	○	○	○	Hardness distribution map	—	○	○*2	○*2
Routine inspection graph	○	○	○	○	Autofocus	—	—	—	○

\*1 The optional digital micrometer head is required. \*2 Microsoft Excel is separately required.



### Related Products



DUH Series



AG-X plus Series



UH-X Series



PDA-7000



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