Micro Vickers Hardness Tester

HMV-G Series
Hardness Testers Featuring Automatic Length Measurement are the New Standard

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.
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.
Leave Everything to the HMV-G Series
— Do you have any of the following problems? —

Automatic Detection Type

**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.

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.
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** 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\(^*2\) and ISO 16949\(^*2\) 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. (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**

(3) **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.
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.

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

2. USB Communication with General Purpose PCs
   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
   A single sample can be read in 0.3 seconds.

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

5. G Frame
   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.

6. Test Conditions Assist Function
   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)
   Two indenters and four lenses can be attached.

8. Ultra Long Life Illumination
   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.

9. Low Test Force (Optional)
   Tests can be performed at arbitrary test forces in the range from 1 gf to 2 kgf.

10. Electromagnetic Force Control
    The indentation test force can be configured seamlessly.

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

14. Automatic Lens Switching (T models)
    After automatic readings, lenses are switched automatically to suit the size of the indentation. (patent pending)
Compact Design
The CCD camera is built in, making the design compact.

G Frame
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).

Multi Turret (Optional)
Two indenters and four lenses can be attached.

Electromagnetic Force Control
The indentation test force can be configured seamlessly.

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.

Fracture Toughness Measurements
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.

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

Automatic High-Speed Readings
A single sample can be read in 0.3 seconds.

Test Conditions Assist Function
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)

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

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

Ultra Long Life Illumination
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.

Low Test Force (Optional)
Tests can be performed at arbitrary test forces in the range from 1 gf to 2 kgf.

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

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

*) The USB memory is restricted to without encryption and security software etc.

G21 FA Type

G20 Series
# 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.

### 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.

**Sample Applications**

- **Touch Panel Operator (HMV-G20 Series)**
  - Automatic sample shape recognition
  - Improved indentation reading accuracy
  - The system detects sample edges to create patterns along the edges, filling the area surrounded by the edges, and orthogonal to the edges.
  - The system is equipped with new algorithms that can read indistinct indentations on scratched surfaces.
  - The system is equipped with a test conditions assist function to determine the optimal lens or test force from the estimated hardness.

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

## Measurement of Depth of Hardening

- **Routine Inspection Graphs**
  - The system detects the gear edges and measures the hardness inside the gear.
  - The test force can be changed for each test position. (patent pending)
  - 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.
  - The depth of hardening can be determined to check the state of quenching.
  - Data graphs can be created by selecting daily results.

- **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

- 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.

---

*1 Electric turret required
*2 Compatible only with FA models.
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

For details, refer to the Accessories List.
## Accessories List

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>P/N</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knoop Indenter</td>
<td>347-20418</td>
<td>Longitudinal edge angle 172°30', 130°</td>
</tr>
<tr>
<td>2</td>
<td>Brinell Indenter</td>
<td>347-20419-11</td>
<td>Brinell ultra hard steel ball indenter (1 mm diameter)</td>
</tr>
<tr>
<td>3</td>
<td>Triangle Pyramid Indenter 115°</td>
<td>347-20420</td>
<td>Tip angle 115° triangle pyramid indenter</td>
</tr>
<tr>
<td>4</td>
<td>Vickers Indenter</td>
<td>347-20344</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Standard Vise</td>
<td>341-64251-40</td>
<td>36 mm opening (*Standard accessory for FA type)</td>
</tr>
<tr>
<td>6</td>
<td>Universal Vise</td>
<td>344-17140-40</td>
<td>22 mm opening</td>
</tr>
<tr>
<td>7</td>
<td>Leveling Stage (for universal vise)</td>
<td>344-13218</td>
<td>For leveling the sample on the universal vise</td>
</tr>
<tr>
<td>8</td>
<td>Thin Sample Attachment, Type 1</td>
<td>344-16039-40</td>
<td>For sample with 0.4 mm to 3 mm thickness</td>
</tr>
<tr>
<td>9</td>
<td>Thin Sample Attachment, Type 2</td>
<td>344-17040-40</td>
<td>For sample with 0.02 mm to 0.5 mm thickness</td>
</tr>
<tr>
<td>10</td>
<td>Thin Sample Attachment, Type 3</td>
<td>344-17737-40</td>
<td>For sample with 30 mm max. width and 8 mm max. thickness</td>
</tr>
<tr>
<td>11</td>
<td>Slender Sample Attachment, Type 1</td>
<td>344-16038-40</td>
<td>For sample with 0.4 mm to 3 mm diameter</td>
</tr>
<tr>
<td>12</td>
<td>Slender Sample Attachment, Type 2</td>
<td>344-82943-40</td>
<td>For sample with 0.15 mm to 1.6 mm diameter</td>
</tr>
<tr>
<td>13</td>
<td>Mold Sample Vise</td>
<td>347-21990-40</td>
<td>Diameter 1&quot; to 1.5&quot;; height 5 mm to 30 mm</td>
</tr>
<tr>
<td>14</td>
<td>Mold Sample Vise (for electric XY stage)</td>
<td>347-21990-41</td>
<td>Diameter 1&quot; to 1.5&quot;; height 5 mm to 20 mm (when equipped with an electric XY stage)</td>
</tr>
<tr>
<td>15</td>
<td>Objective Lens 5x</td>
<td>347-25575</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Objective Lens 10x</td>
<td>344-89941-40</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Objective Lens 20x</td>
<td>344-89924</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Objective Lens 40x</td>
<td>347-25400</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Objective Lens 40x, Extra-Long Working Distance Type</td>
<td>344-89300-41</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Objective Lens 50x</td>
<td>344-89964</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Objective Lens 100x</td>
<td>344-89977</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Line Printer</td>
<td>347-20928-XX</td>
<td>Equipped with graphics printer cable for printing graphs</td>
</tr>
<tr>
<td>23</td>
<td>Roll of Thermal Paper</td>
<td>078-15027-11</td>
<td>For line printer</td>
</tr>
<tr>
<td>24</td>
<td>Dot Printer</td>
<td>347-21007-XX</td>
<td>Equipped with cable for numerical printing only (cannot print graphs)</td>
</tr>
<tr>
<td>25</td>
<td>Roll of Paper</td>
<td>078-15014-11</td>
<td>For dot printer</td>
</tr>
<tr>
<td>26</td>
<td>Ink Ribbon</td>
<td>078-15014-12</td>
<td>For dot printer</td>
</tr>
<tr>
<td>27</td>
<td>Laser Printer</td>
<td>088-52093-04</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Standard Hardness Block HMV 40</td>
<td>340-06619-14</td>
<td>Nominal hardness 40</td>
</tr>
<tr>
<td>29</td>
<td>Standard Hardness Block HMV 100</td>
<td>340-06619-31</td>
<td>Nominal hardness 100</td>
</tr>
<tr>
<td>30</td>
<td>Standard Hardness Block HMV 200</td>
<td>340-06619-22</td>
<td>Nominal hardness 200</td>
</tr>
<tr>
<td>31</td>
<td>Standard Hardness Block HMV 300</td>
<td>340-06619-23</td>
<td>Nominal hardness 300</td>
</tr>
<tr>
<td>32</td>
<td>Standard Hardness Block HMV 400</td>
<td>340-06619-24</td>
<td>Nominal hardness 400</td>
</tr>
<tr>
<td>33</td>
<td>Standard Hardness Block HMV 500</td>
<td>340-06619-05</td>
<td>Nominal hardness 500</td>
</tr>
<tr>
<td>34</td>
<td>Standard Hardness Block HMV 600</td>
<td>340-06619-06</td>
<td>Nominal hardness 600</td>
</tr>
<tr>
<td>35</td>
<td>Standard Hardness Block HMV 700</td>
<td>340-06619-07</td>
<td>Nominal hardness 700</td>
</tr>
<tr>
<td>36</td>
<td>Standard Hardness Block HMV 800</td>
<td>340-06619-08</td>
<td>Nominal hardness 800</td>
</tr>
<tr>
<td>37</td>
<td>Standard Hardness Block HMV 900</td>
<td>340-06619-09</td>
<td>Nominal hardness 900</td>
</tr>
<tr>
<td>38</td>
<td>Digital Micrometer Communication Set</td>
<td>347-25447-11</td>
<td>Stroke ±12.5 mm; display units 1 µm, 2 PLS/set (Equipped with cable)</td>
</tr>
<tr>
<td>39</td>
<td>Rotary Stage</td>
<td>344-82857</td>
<td>Stage surface diameter 125 mm; movement range ±5°</td>
</tr>
<tr>
<td>40</td>
<td>Disk Vacuum Adsorption Device</td>
<td>344-17127-02</td>
<td>4, 5, 6 inches (Adsorption air source is required.)</td>
</tr>
<tr>
<td>41</td>
<td>Bench-Top Shock Absorber</td>
<td>344-81401</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Desk-Type Shock Absorber</td>
<td>344-04193-01</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Objective Micrometer</td>
<td>046-60201-02</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Low Test Force Compatibility</td>
<td>347-25215</td>
<td>Test forces 1 g, 2 g, and 5 g added; available only when main unit ordered</td>
</tr>
<tr>
<td>45</td>
<td>AD Kit</td>
<td>344-04225-44</td>
<td>Post-installation AD kit for G20 series</td>
</tr>
</tbody>
</table>
### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>HMV-G21S</th>
<th>HMV-G21ST</th>
<th>HMV-G21D</th>
<th>HMV-G21DT</th>
<th>HMV-G-XY-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Number of Indenters Attached</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Number of Objective Lenses Attached</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Standard Objective Lenses Provided</td>
<td>40x</td>
<td>40x</td>
<td>40x</td>
<td>40x</td>
<td>40x</td>
</tr>
<tr>
<td>Electric Turret Function*1</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Test Force</td>
<td>Nine force types: 9.807 mN, 245.2 mN, 490.3 mN, 980.7 mN, 1.961 N, 2.942 N, (When low test force option is applied)</td>
<td>Test force 9.807 mN to 1.951 N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Force Accuracy</td>
<td></td>
<td>Test force 9.807 mN to 1.951 N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Force Duration Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indentation Reading Method</td>
<td>Automatic reading from analysis of a digital image from the built-in CCD camera, or by manually setting</td>
<td>Manual reading with an optical microscope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyepiece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective Measurement Range</td>
<td>0.09 µm (automatic), 0.18 µm (manual) (with 40x objective lens)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indentation Measurement Resolution</td>
<td>120 µm × 90 µm (with 40x objective lens)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XY Stage</td>
<td>Manual type. Area: 100 mm × 100 mm; stroke: ±12.5 mm; sample: max. height of 100 mm; instrument lateral direction (width direction): unlimited<em>5; instrument depth direction: for sample width of 120 mm or less, unlimited</em>5; for sample width of 120 mm or more: 200 mm max.*5; Z axis stroke: 60 mm; spacers provided: 40 mm thick</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical Calculation</td>
<td>Maximum number of data points 5000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical items</td>
<td>Average, standard deviation, coefficient of variation, maximum value,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphical display</td>
<td>Variance, depth of hardening*8, transition graph</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results Display</td>
<td>Displayed items</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphical display</td>
<td>Variance graph, depth of hardening graph*8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Output</td>
<td>USB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printers</td>
<td>Communication with PC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ink jet printer,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Dimensions</td>
<td>Approx. 44 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 44 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Requirements</td>
<td>Main body: Single phase AC 100-115 V, 1 A AC230 V, 0.5 A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide a grounding wire. (Grounding resistance 100 Ω max.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating conditions</td>
<td>Temperature: 10 to 35°C (The temperature change under test is less than 1°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatible PC</td>
<td>OS: Windows 7 (32-bit version)*9, CPU (Intel®Core™i2Duo or faster recommended),</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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.

*4 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).

*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 communication set (optional) is used.

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

*10 Installation of shock absorber is recommended to install to a place with the equipment as a vibratory source or with shock or noticeable vibration.
### Operating conditions

<table>
<thead>
<tr>
<th>External Dimensions</th>
<th>External Output</th>
<th>Statistical Calculation</th>
<th>Data Processing Functions</th>
<th>XY Stage</th>
<th>Effective Measurement Range</th>
<th>Eyepiece</th>
<th>Indentation Reading Method</th>
<th>Test Force Duration Time</th>
<th>Loading Unit</th>
<th>Test Force Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Standard Objective Lenses Provided

<table>
<thead>
<tr>
<th>Maximum Number of Objective Lenses Attached</th>
<th>HMV-G21</th>
<th>HMV-G21-T</th>
<th>HMV-G-XY</th>
<th>HMV-G-FA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### Main body

- Single phase: AC 100-115 V, 1 A  
- AC230 V, 0.5 A (only HMV-G-FA/-XY)  
- (Grounding resistance 100 Ω max.)  
- Provide a grounding wire. (Grounding resistance 100 Ω max.)

### Humidity

- 60% max. (with no condensation)

### Two USB2.0 ports used

### Main functions

- Automatic and manual measurement types
- Automatic loading and automatic force changing
- XY stage with effective measurement range

### Optional functions

- Automatic sample shape recognition
- Hardness distribution map
- Autofocus

### Operating conditions

- **Temperature**: 10 to 35°C (The temperature change under test is less than 1°C)
- **Humidity**: 60% max. (with no condensation)
- **Two USB2.0 ports used**

### Other functions

- Measurement of hardness, hardness distribution, and sample shape
- Routine inspection of hardness

### Software functions

- Brightness changes for each lens
- Turret control
- Pattern setting
- Stage viewer
- Automatic sample shape recognition
- Hardness distribution map
- Autofocus

### Optional functions

- The optional digital micrometer head is required.
- Microsoft Excel is separately required.

---

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

- Dynamic Ultra Micro Hardness Tester DUH Series
- Precision Universal Tester Autograph AG-X plus Series
- Universal Testing Machine UH-X Series
- Optical Emission Spectrometer PDA-7000

For Research Use Only. Not for use in diagnostic procedures.

This publication may contain references to products that are not available in your country. Please contact us to check the availability of these products in your country.

Company names, product/service names and logos used in this publication are trademarks and trade names of Shimadzu Corporation, its subsidiaries or its affiliates, whether or not they are used with trademark symbol “TM” or “®”.

Third-party trademarks and trade names may be used in this publication to refer to either the entities or their products/services, whether or not they are used with trademark symbol “TM” or “®”.

Shimadzu disclaims any proprietary interest in trademarks and trade names other than its own.

The contents of this publication are provided to you “as is” without warranty of any kind, and are subject to change without notice. Shimadzu does not assume any responsibility or liability for any damage, whether direct or indirect, relating to the use of this publication.