HM-100
Micro-Vickers Hardness Testing Machines
The HM-100 Micro-Vickers hardness testing machine is a new series in Mitutoyo hardness testers. To expand the measurement application range, a new designed indenter/object turret and control unit are employed. The new turret has three objective mounts. By adopting the calibration function, all of three objectives can be used for the indentation measurement. For easy setup of Knoop hardness measurement, the turret also has an additional mount for a Knoop indenter. The new separate control unit has two choice of display type. The LED type employs a durable sheet switch for hard workshop environment. The other LCD type employs a touch screen function. All of operations including statistical data processing, data conversion to other hardness scale and condition setting for OK/±NG tolerance judgment can be performed by a simple touch of screen.

![HM-100 Micro-Vickers Hardness Testing Machines](image)

**Simplified model**
HM-101 - with measuring microscope

**Standard models**
HM-102 - with durable sheet switch control unit
HM-112 - with touch screen control unit
HM-122 - with touch screen control unit and power turret
HM-114 - with touch screen control unit
HM-124 - with touch screen control unit and power turret

**Available test force (N) and hardness scale**

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<thead>
<tr>
<th>Test Force</th>
<th>HV0.0005</th>
<th>HV0.001</th>
<th>HV0.002</th>
<th>HV0.003</th>
<th>HV0.004</th>
<th>HV0.005</th>
<th>HV0.01</th>
<th>HV0.025</th>
<th>HV0.05</th>
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**Order No.**

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<td>810-124E</td>
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<td>810-125D</td>
<td>810-126D</td>
<td>810-127D</td>
<td>810-128D</td>
<td>810-129D</td>
</tr>
</tbody>
</table>
**Advanced models**

**HM-103** - with video monitor system and durable sheet switch control unit

**HM-113** - with video monitor system

**HM-123** - with video monitor system and touch screen control unit

**HM-115** - with video monitor system and touch screen control unit

**HM-125** - with video monitor system, touch screen control unit and power turret

<table>
<thead>
<tr>
<th>Order No.</th>
<th>HM-103</th>
<th>HM-113</th>
<th>HM-123</th>
<th>HM-115</th>
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<td>810-969E</td>
<td>810-990E</td>
<td>810-998E</td>
<td>810-975E</td>
</tr>
</tbody>
</table>

**Multi-functional models**

Hardness Testing System with AT-400

**System 5** (AT-400 system + HM-112)

**System 6** (AT-400 system + HM-122)

**System 7** (AT-400 system + HM-114)

**System 8** (AT-400 system + HM-124)

AT-400 System..... Integrates an automatic XY stage system and automatic indentation reading program into the HM series.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>System 5</th>
<th>System 6</th>
<th>System 7</th>
<th>System 8</th>
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<tr>
<td>100V</td>
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<td>810-314-5D</td>
<td>810-314-6D</td>
<td>810-314-7D</td>
<td>810-314-8D</td>
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</tbody>
</table>
FEATURES

Machine proper

- A wide range of test force from 4.903x10^-3N to 19.61N* is available for measuring a various type of specimens. The load duration can be set in 1sec increments between 5 and 99sec** The minimum reading of indentation is 0.01µm***. It allows small indentations to be measured with high precision.

*HM-124/125/System 8
**60sec: HM-102/103
***0.1µm: HM-102/103, 0.2µm: HM-101

- The indenter/objective turret provides a high positioning accuracy and repeatability. This allows the HM-100 to indent a target place set through the objective exactly. A hardness in minute area like crystal grain boundary and deposit of metal material can be measured simply and accurately.

- Up to three* objectives can be installed on the turret mount (except for HM-101). The calibration function allows all of objectives installed to be used for the measurement. This expands the measurement application. The magnification can be switched according to the indentation result.

*two: HM-102/103

- In addition to the standard Vickers indenter, an optional Knoop indenter can be installed at the next mount on the turret*. A simple turn of the turret makes the HM-100 of a Knoop hardness testing machine.

*except for HM-101, HM-102/103

- The power turret* can switch indenter/objective position by a single touch of LCD screen.

*HM-122/123/System 6, HM-124/125/System 8

TECHNICAL DATA

Loading accuracy

<table>
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</table>

**Test force selection**

By dial/touch screen or dial*

*HM-101, HM-102/103, HM-112/113/System 5, HM-122/123/System 6

Hardness standards conformed

- ISO 6507-2, ISO 4546, ASTM E-384, JIS B 7725, JIS B 7734

XY stage

- 810-011: XY stage with 0.01mm micrometer head
  - 100x100mm (4"x4") table top size
  - 25x25mm (1"x1") travel range
  - Standard for HM-101, HM-102/103

- 810-074: XY stage with 0.001mm Digimatic micrometer head
  - 100x100mm (4"x4") table top size
  - 25x25mm (1"x1") travel range
  - Standard for HM-112/113, HM-114/115, HM-122/123, HM-124/125

- 810-314-1: AT-301 automatic XY stage system (0.005mm/step)
  - 130x130mm (5.1"x5.1") table top size
  - 50x50mm (2"x2") travel range
  - Standard for System 5, 6, 7, 8

Maximum specimen size (HxD*)

- 95x150mm (3.74"x5.90") for 810-011/810-074 XY stage
- 85x150mm (3.34"x5.90") for 810-012 XY stage (optional)
- 65x150mm (2.56"x5.90") for 810-093 XY stage

*From the center of indenter shaft
### Control unit

**Touch screen type**

<table>
<thead>
<tr>
<th>HM-112/113/System 5</th>
<th>HM-122/123/System 6</th>
<th>HM-114/115/System 7</th>
<th>HM-124/125/System 8</th>
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<tbody>
<tr>
<td>✔</td>
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</table>

- Back-lit LCD graphic display for Indentation size (D1 and D2)
- Hardness value and scale
- Number of measurement point
- XY table position
- Test conditions (HV/HK indenter type, test force, load duration)
- OK/NG tolerance judgment
- Cylindrical and spherical surface compensation and offset
- Remote selection of the test force
- Remote control of power turret
- Complete conversion to other hardness scales (Soft metal: HV, HK, HBS, TENS, HRA/B/F/G/15T/30T/45T) (Hard metal: HV, HK, HS, HBS, TENS, HRA/C/D/15N/30N/45N)
- Powerful statistical processing (No. of data, max./min./mean values, range, upper/lower limit values, standard deviation (n, n-1), No. of passing/defective) with flexible data point editing and 256 data memory

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### Automatic XY stage and automatic indentation reading program

**AT-400 System 5/6/7/8**

- The high-speed auto-reader captures the indentation and displays hardness result in just 0.3 second, so the otherwise lengthy measuring work can be performed quickly.
- Complex multi-point measurement can be performed with ease.
- The movement pattern of the XY stage can be set line, zigzag, matrix, circle, random, or combination.
- The learn function allows part programs to be easily created.
- Measurement conditions and positional data can be displayed on the monitor.
- The evaluation curves of case depth and hardness curves can be displayed on the monitor.

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### Durable sheet switch type

**HM-102/103/131**

- LED display for Indentation size (D1 and D2)
- Hardness value
- OK/NG tolerance judgment

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### Optical path

2-way (video monitor/photograph) switchable

### Indenter/objective turret

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### Number of indenter mount

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</table>

*Second (Knoop) indenter is a factory-set option.

### Number of objective mount

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</table>

*One for measurement and the other for observation.
** All for measurement with calibration function.
***Additional third objective is a factory-set option.

### Resolution of indentation measurement

0.01µm/0.1µm (HM-102/103)/0.2µm (HM-101 with 50x objective)

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### Control unit

**Touch screen type**: HM-112/113/System 5, HM-122/123/System 6, HM-114/115/System 7, HM-124/125/System 8

- LCD
- Indentation size (D1 and D2)
- Hardness value/converted hardness value and scale
- Number of measurement point
- XY table position
- Test conditions (HV/HK indenter type, test force, load duration)
- OK/NG tolerance judgment
- Cylindrical and spherical surface compensation and offset

### Durable sheet switch type: HM-102/103

- LED display
- Indentation size (D1 and D2)
- Hardness value
- OK/NG tolerance judgment

### Data output

*RS-232C, Digimatic Code and Centronics
*Except for HM-101

### Power supply

100/120/220/240V AC (not switchable), 50/60Hz

### Power consumption

Approximately 60VA

### Dimensions (Wx Dx H)

Machine: 410x600x590mm (16.14”x23.62”x23.23”)
Control unit: 165x260x105mm (6.50”x10.23”x4.13”)

### Mass

Approx. 42kg (92.4 lbs.)
OPTIONAL ACCESSORIES

Printers

**iDP-3110-40PF**
Standard printer that can be connected to a hardness testing machine with a Centronics output interface.

- **Order No.**
  - 810-078K: 100V AC, with connecting cable
  - 810-078A: 120V AC, with connecting cable
  - 810-078D: 220V AC, with connecting cable
  - 810-078E: 240V AC, with connecting cable
- 19BAA173: Printer paper (20-roll set)
- 19BAA174: Ink ribbon cartridge (5 pcs. set)

**NP-104**

- **Order No.**
  - 810-097K: 100V AC, with connecting cable
  - 810-097A: 120V AC, with connecting cable
  - 810-097D: 220V AC, with connecting cable
  - 810-097E: 240V AC, with connecting cable
  - 965014: Connecting cable (2m/80”)
  - 93719T: Foot switch
  - 09EAA082: Printer paper (10-roll set)

**DP-1VR — SPC printer**
A cost-effective portable printer capable of statistically calculating up to 100000 pieces of data. The DP-1VR can be connected to a hardness testing machine with an SPC output.

- **Order No.**
  - 264-504: 100V AC
  - 264-504A: 120V AC
  - 264-504D: 220V AC
  - 264-504E: 240V AC
  - 936937: Connecting cable (1m/40”)
  - 965018: Connecting cable (2m/80”)
  - 937179: Foot switch
  - 09EAA082: Printer paper (10-roll set)

**19BAA221**
Printer paper (1 roll)

**50x50mm (2"x2") XY travel stage**
Table top dimension: 125x125mm (4.9"x4.9")
Minimum reading: 0.01mm

- **Order No.**
  - 810-012: 50x50mm (2"x2") XY travel stage

**30x30mm (1"x1") XY travel stage**
Table top dimension: 75x75mm (2.9"x2.9")
Minimum reading: 0.01mm

- **Order No.**
  - 810-011: 30x30mm (1"x1") XY travel stage

**Video printer**
VP-1200 (Seikosha)
By connecting with the video monitor unit, the image displayed on the screen can be recorded with 256 gray levels.

- **Order No.**
  - 810-092: 100V AC, with connecting cable
  - 810-092A: 120V AC, with connecting cable
  - 810-092D: 220V AC, with connecting cable
  - 810-092E: 240V AC, with connecting cable
  - 965018: Connecting cable (2m/80”)

**Clamping devices (Vises)**
Used to clamp a specimen.

- **Order No.**
  - 810-016: 45mm (1.77") max. opening
  - 810-017: 100mm (3.94") max. opening

**Hardness test blocks**

- **Order No.**
  - 19BA001: 100HV0.3
  - 19BA002: 200HV0.3
  - 19BA003: 300HV0.3
  - 19BA004: 400HV0.3
  - 19BA005: 500HV0.3
  - 19BA006: 600HV0.3
  - 19BA007: 700HV0.3
  - 19BA008: 800HV0.3
  - 19BA009: 900HV0.3
  - 19BA010: 40HV0.01

**Objectives — factory set option —**

- **Order No.**
  - 810-616: 5x
  - 810-617: 10x
  - 810-618: 20x
  - 810-619: 50x
  - 810-620: 100x

**Standard accessory**

- 810-617: 10x objective
- 810-619: 50x objective
- 810-620: 100x objective (HM-114/115/134, HM-124/125)
- 19BAA058: Diamond indenter
- 810-011: XY stage (HM-101, HM-102/103)
- 810-012: XY stage (HM-112/113, HM-114/115, HM-122/123, HM-124/125)
- 810-314-1: AT-400 automatic XY stage system (System 5/6/7/8)
- 810-016: Vice
- 19BAA134: Camera mount adapter
- 19BAA007: Hardness test block (700HV0.3)
- 19BAA269: Vickers hardness calculation table (HM-101)
- 19BAA219: Halogen bulb (6V/20W, except for HM-101)
- 810-011: XY stage (HM-112/113, HM-114/115, HM-122/123, HM-124/125)
- 19BAA134: Camera mount adapter
- 19BAA007: Hardness test block (700HV0.3)
- 19BAA269: Vickers hardness calculation table (HM-101)
- 19BAA219: Halogen bulb (6V/20W, except for HM-101)
- 810-314-1: AT-400 automatic XY stage system (System 5/6/7/8)
- 810-016: Vice
- 19BAA134: Camera mount adapter
- 19BAA007: Hardness test block (700HV0.3)
- 19BAA269: Vickers hardness calculation table (HM-101)
- 19BAA219: Halogen bulb (6V/20W, except for HM-101)
- 810-011: XY stage (HM-112/113, HM-114/115, HM-122/123, HM-124/125)
Specimen clamping devices

Specimen (thin plate) holder
Secures a plate or foil-like specimens.
Order No. 810-013

Specimen thickness: 5mm (.197") or less

Specimen (wire) holder
Used to horizontally secure a wire or needle specimen.
Order No. 810-014

Specimen diameter: 0.4 to 3mm (.015" to .118")

Specimen (wire or ball) holder
Used to vertically secure a wire or specimen.
Order No. 810-015

Specimen diameter: 0.4 to 3mm (.015" to .118")

Rotatable universal specimen holder
Used to secure a specimen, that has a measuring surface that is hard to stabilize, perpendicularly to the indenter axis.
Order No. 810-084

Specimen thickness: 32mm (1.25") or less
Specimen diameter: 38mm (1.49") or less

Window size: 25x10mm (.98"x.39")
Specimen thickness: 3mm (.118") or less

Specimen tilting holder
Used to secure a specimen that has a measuring surface not perpendicular to the indenter axis.
Order No. 810-019

Max. opening: 37mm (1.45")
Rotation: ±25°

Universal specimen holder
Used to secure a specimen, that has a measuring surface that is hard to stabilize, perpendicularly to the indenter axis.
Order No. 810-020

Specimen thickness: 30mm (1.18") or less
Specimen diameter: 38mm (1.49") or less

Photographing units

PM-10M-Pola
Polaroid film (#667) type.
Camera magnification: 3.6x
Order No. 810-022 (excluding eyepiece)

SC-35
35mm film type.
Camera magnification: 1.2x
Order No. 810-021 (excluding eyepiece)

Eyepieces
Order No.
810-050: 2.5x
810-051: 3.3x
810-052: 5.0x
810-053: 6.7x

Dimensions

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>381 (15.0&quot;)</td>
<td>185 (7.2&quot;)</td>
<td>165 (6.5&quot;)</td>
</tr>
<tr>
<td>588 (23.1&quot;)</td>
<td>307 (12.0&quot;)</td>
<td>150 (5.9&quot;)</td>
</tr>
<tr>
<td>155 (6.1&quot;)</td>
<td>200 (7.8&quot;)</td>
<td>85 (3.3&quot;)</td>
</tr>
<tr>
<td>300 (11.8&quot;)</td>
<td>307 (12.0&quot;)</td>
<td>402 (15.8&quot;)</td>
</tr>
</tbody>
</table>

Unit: mm (inch)