

## INDEX

<b>Micro Hardness Testing Machines</b>	
Lineup of Hardness Testing Machines	450
HM-101 / 102 / 103 / 112 / 113	451
HM-211	452
VLPK2000	453
AT-400	453
AAV-500	454
HV-112 / 113 / 114 / 115	455
<b>Rockwell Hardness Testing Machines</b>	
HR-511 / 521 / 522 / 523	456
AR-10, AR-20, ARK-600, ATK-600	457
<b>Micro Zone Test System</b>	
MZT-500	458
ABK-1	458
ASH	459
<b>Portable Hardness Testing Instruments</b>	
Hardmatic HH-411	460
Hardmatic HH-300	461



**Micro Hardness  
Testing Machines**



**Rockwell Hardness  
Testing Machines**



**Micro Zone Test  
System**



**Portable Hardness  
Testing Instruments**

## New Products



HARDMATIC HH-411

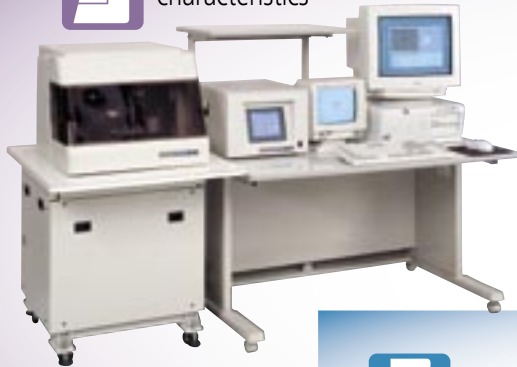
WIZard HR-500

# Lineup of Hardness Testing Machines

Hardness testing machines provide the simplest and most economical testing methods among many material testing machines, playing an important role in research activities, production activities, and commercial transactions. Mitutoyo offers a choice of standard hardness testing machines that are optimal for hard materials such as metals to soft materials such as plastic and rubber, as well as custom-designed testers such as in line-type automatic machines and labor-saving machines required on the shop floor.



Micro surface material characteristics



Rockwell



Vickers



Rockwell Superficial



Brinell



Shore



Rebound type portable



For sponge, rubber, and plastic



# HM-101 / 102 / 103 / 112 / 113

## SERIES 810 — Micro-Vickers Hardness Testing Machines

### Technical Data

Test force range:	98.07, 245.2, 490.3, 980.7, 1961, 2942, 4903, 9807mN
Test force setting:	By dial
Loading accuracy:	1% (forces less than 1gf are ignored)
Load control:	Automatic (loading, duration, unloading)
Load duration:	5 - 30 sec: HM-101 5 - 60 sec: HM-102, HM-103 5 - 99 sec: HM-112, HM-113
XY stage	
Stage size:	100 x 100mm
Travel range:	25 x 25mm, with micrometer heads
Mim. reading:	0.01mm: HM-101, HM-102, HM-103 0.001mm: HM-112, HM-113
Max. specimen height:	95mm
Max. specimen depth:	150mm (from the center of indenter)
Indenter/objective turret:	Manual type
No. of indenter mount:	1-mount
No. of objective mount:	2-mount (10X, 50X)
Optical path:	2-way (measurement / exposure)
Minimum reading:	0.1μm (0.2μm: HM-101)
Data output:	RS-232C, Digimatic code (SPC) and Centronics
Power supply:	100/120/220/240V AC, 50/60Hz
Dimensions (W x D x H)	
Main unit:	410 x 600 x 590mm
Control unit:	165 x 260 x 105mm
Mass (main unit):	42kg

### Optional Accessory

810-017:	Vise (max. opening: 100mm)
810-013:	Specimen (thin plate) holder
810-085:	Adjustable specimen (thin plate) holder
810-014:	Specimen (wire) holder
810-015:	Specimen (wire or ball) holder
810-019:	Specimen tilting holder
810-020:	Universal specimen holder
810-084:	Rotatable universal specimen holder
810-018:	Rotary table
810-092:	Video printer (VP-1200, 100V AC)
19BAA221:	Video printer paper
810-622:	Printer (DPU-414)
19BAA157:	Printer paper (10-roll set)
19BAA266:	Connecting cable for printer
19BAA102:	Connecting cable for printer (HV-102)
264-504:	DP-1VR
09EAA082:	Printer paper of DP-1VR (10-roll set)
936937:	SPC cable (1m)
965014:	SPC cable (2m)
19BAA001:	Hardness test block (100HV0.3)
19BAA002:	Hardness test block (200HV0.3)
19BAA003:	Hardness test block (300HV0.3)
19BAA004:	Hardness test block (400HV0.3)
19BAA005:	Hardness test block (500HV0.3)
19BAA006:	Hardness test block (600HV0.3)
19BAA007:	Hardness test block (700HV0.3)
19BAA008:	Hardness test block (800HV0.3)
19BAA009:	Hardness test block (900HV0.3)
19BAA010:	Hardness test block (40HV0.01)
—:	VLPK auto-reading measuring program (See page 447.)

### Consumable Parts

19BAA219:	Illumination lamp (1 pc.)
-----------	---------------------------



Refer to the Hardness Testing Machines leaflet (E4104) for more details.

### FEATURES

- A wide range of test force from 4.903x10<sup>-3</sup>N 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-112, HM-113

HM-101  
Economical manual type



HM-102  
Economical digital type



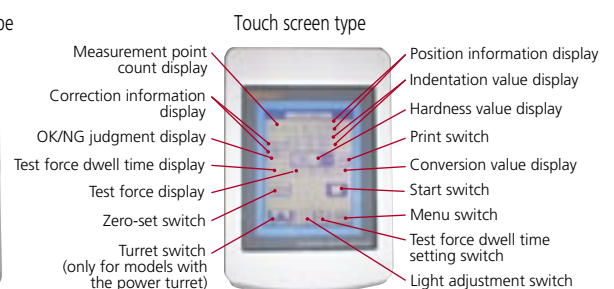
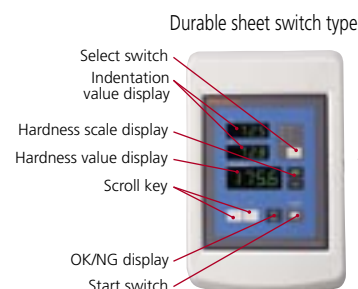
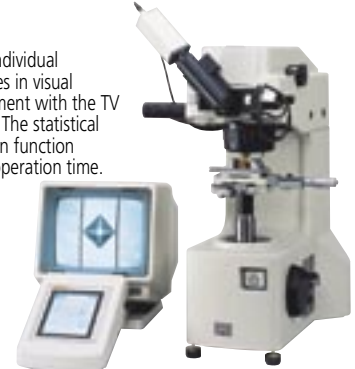
HM-112  
Digital display of measurement results and a statistical calculation function.



HM-103  
The TV monitor removes fatigue in visual measurement, reducing detecting errors.



HM-113  
Reduce individual differences in visual measurement with the TV monitor. The statistical calculation function reduces operation time.



### SPECIFICATIONS

Model No.	HM-101	HM-102	HM-103	HM-112	HM-113
Order No.	810-124*	810-125*	810-959*	810-127*	810-969*
Test force range	98.07, 245.2, 490.3, 980.7, 1961, 2942, 4903, 9807mN				
Test force setting	By dial	By dial	By dial	By dial	By dial
Control unit	—	Durable sheet switch type		Touch screen type	
Video monitor	—	—	9" B/W	—	9" B/W
Indenter/objective turret	Manual type	Manual type	Manual type	Manual type	Manual type
No. of indenter mount	1	1	1	1	1
No. of objective mount	1 (observation), 1 (measurement)	2 (measurement)	2 (measurement)	2 (measurement)	2 (measurement)

\*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **810-959A**):

**A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V



# HM-211

## SERIES 810 — Micro-Vickers Hardness Testing Machines

### FEATURES

- The latest electromagnetic force motor used in the loading mechanism has enabled the test force to be freely selected (see test force specifications over the wide range of 0.4903mN (0.05gf) to 19810mN (2kgf). It is also possible to freely set the time for loading and load dwell time. Now your desire for absolute control over the indentation size in Vickers hardness testing can be satisfied. The HM-200 series always offers the test force most appropriate for the specimen material and shape.
- It is possible to perform not only the Vickers hardness test but also a fracture toughness test (IF test: JIS R 1607-1995) on ceramics.
- The objectives used enable a very comfortable working distance between the objective and the specimen surface. This greatly reduces the possibility of collision between the specimen and the objective during focusing operations. (e.g. 1.1mm for 50X objective)
- The contrast that is most appropriate for the magnification of the objective can be obtained by manipulating the variable aperture stop in the illumination unit. This makes the indentations clearly visible, leading less variation and reducing the chance of error when measuring the diagonal lengths.



Power turret with 2 indenter mounts and 4 objective mounts  
(manual operation possible)

Touch switch type control panel



### Technical Data

Test force range:	
HM-211:	98.07mN to 980.7mN (9.807mN increments) 980.7mN to 9807mN (98.07mN increments)
HM-221:	0.4903mN 0.9807mN to 9.807mN (0.9807mN increments) 9.807mN to 980.7mN (9.807mN increments) 980.7mN to 19610mN (98.07mN increments)
Test force generation: Electromagnetic	
Load control:	Automatic (loading, duration, unloading)
Load duration:	1 - 999 sec (1 sec increment)
XY stage	
Stage size:	100 x 100mm
Travel range:	25 x 25mm, with micrometer heads
Min. reading:	0.001mm
Max. specimen height:	133mm
Max. specimen depth:	160mm (from the center of indenter)
Indenter/objective turret: Motor driven and manual operation	
No. of indenter mount:	2-mount
No. of objective mount:	4-mount
Optical path: 2-way (measurement / exposure)	
Minimum reading:	0.01μm
Data output: RS-232C, Digimatic code (SPC) and Centronics	
Power supply:	100/120/220/240V AC, 50/60Hz
Dimensions (W x D x H):	400 x 625 x 600mm
Mass:	43kg

### Optional Accessory

<b>19BAA061:</b>	Diamond indenter for Knoop (HM-211)
<b>810-017:</b>	Vise (max. opening: 100mm)
<b>810-013:</b>	Specimen (thin plate) holder
<b>810-085:</b>	Adjustable specimen (thin plate) holder
<b>810-014:</b>	Specimen (wire) holder
<b>810-015:</b>	Specimen (wire or ball) holder
<b>810-019:</b>	Specimen tilting holder
<b>810-020:</b>	Universal specimen holder
<b>810-084:</b>	Rotatable universal specimen holder
<b>810-018:</b>	Rotary table
<b>810-092:</b>	Video printer (VP-1200, 100V AC)
<b>19BAA221:</b>	Video printer paper
<b>19BAA242:</b>	Connecting cable for video printer
<b>810-622:</b>	Printer (DPU-414)
<b>19BAA157:</b>	Printer paper (10-roll set)
<b>19BAA266:</b>	Connecting cable for printer
<b>264-504:</b>	DP-1VR
<b>09EAA082:</b>	Printer paper of DP-1VR (10-roll set)
<b>936937:</b>	SPC cable (1m)
<b>965014:</b>	SPC cable (2m)
<b>19BAA001:</b>	Hardness test block (100HV0.3)
<b>19BAA002:</b>	Hardness test block (200HV0.3)
<b>19BAA003:</b>	Hardness test block (300HV0.3)
<b>19BAA004:</b>	Hardness test block (400HV0.3)
<b>19BAA005:</b>	Hardness test block (500HV0.3)
<b>19BAA006:</b>	Hardness test block (600HV0.3)
<b>19BAA007:</b>	Hardness test block (700HV0.3)
<b>19BAA008:</b>	Hardness test block (800HV0.3)
<b>19BAA009:</b>	Hardness test block (900HV0.3)
<b>19BAA010:</b>	Hardness test block (40HV0.01)
—:	VLPK auto-reading measuring program (See page 447.)

### SPECIFICATIONS

Model No.	HM-211	HM-221
<b>Order No.</b>	<b>810-352*</b>	<b>810-533*</b>
Test force range	98.07mN to 980.7mN (9.807mN increments), 980.7mN to 9807mN (98.07mN increments)	0.4903mN, 0.9807mN to 9.807mN (0.9807mN increments), 9.807mN to 980.7mN (9.807mN increments), 980.7mN to 19610mN (98.07mN increments)
Test force control	Force generation by electromagnetic and automatic control (load, dwell, unload)	
Control unit	Touch screen type	Touch screen type
Video monitor	—	—
Indenter/objective turret	Motor driven and manual operation	Motor driven and manual operation
No. of indenter mount	2	2
No. of objective mount	4 (10X and 50X are standard accessory)	4 (10X, 50X and 100X are standard accessory)

\* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **810-959A**):  
**A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

### Consumable Parts

<b>19BAA207:</b>	Illumination lamp (1 pc.)
------------------	---------------------------



Refer to the HM-200 leaflet (E4308) for more details.

# VLPK2000

## SERIES 810 — Auto-Reading Measuring Program

### Technical Data

Automatic indentation detection:  
HV (Vickers) and HK (Knoop)  
Detecting method: Quadratic curve regression method  
Detecting time: 0.3 seconds  
Detecting reproducibility:  $\pm 0.5\%$  (0.1 $\mu$ m) (objective lens 50X, diagonal line 11 - 45mm, 500HV)  
Manual measurement method: Video line measurement of HV (Vickers) and HK (Knoop)  
Conversion  
Hard steel: HV, HK, HS, TENS, HRA, HRC, HRD, HR15N, HR30N, HR45N  
Soft metal: HV, HK, TENS, HRA, HRF, HRB, HRG, HR15T, HR30T, HR45T  
OK/NG judgment: Calculated at measurement  
Image save: Available on each operation screen  
Center marker: Display function ON/OFF  
Measurement data save: Saved in the text format (CSV format) Can be processed with the data processing macro  
Function: Power turret control, Test force duration time control (5 to 99s), Illumination level switch (15 levels), Loading speed level switch (4 levels), Indentation control

### FEATURES

In hardness measurement the diagonal lines of the indentation must be measured on the TV monitor, which often results in varying measurements taken by different individuals. It also makes it difficult to save labor and increase efficiency.

### FEATURES

- 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.



VLPK2000  
Auto-reading measuring program

# AT-400

## SERIES 810 — Auto-Reading Hardness Testing System with automatic XY stage

### Technical Data

Automatic XY stage  
Movement range: 50.8 x 50.8mm  
Minimum pitch: 0.001mm (1 $\mu$ m)  
External dimensions (W x D x H): 240 x 240 X 65mm  
Measurement pattern: Line, Staggered, 3-point staggered, Matrix, Circle / arc, Random pattern, Teaching pattern, Combination pattern  
Setting point count: Max. 1000 points  
Auto-reading function: Refer to the above Technical Data of VLPK2000.

The VLPK2000 auto-reading measuring program automatically reads the lengths of the indentation's diagonal lines and converts the result to a hardness value, thereby reducing operator-dependent measurement error. Moreover, the program's automatic high-speed reading function requires only 0.3 second to read hardness, which significantly improves work efficiency in hardness measurement.

- 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.



AT-400 for microhardness model



Refer to the Hardness Testing Machines leaflet (E4104) for more details.

810-314-2\*: For microhardness models  
810-314-12\*: For Vickers hardness models

\*Suffix A for 110V, C for 100V, D for 220/230V, E for 240V, DC for China, K for Korea or non for 100V

# AAV-500

## SERIES 810 — Automatic Vickers Hardness Testing System

### FEATURES

It can perform all operations required in the Vickers hardness test and Knoop hardness test such as loading, turret indexing,

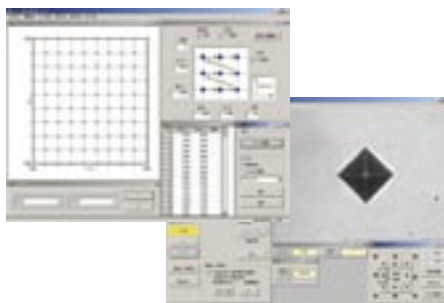
focusing, indentation dimension detecting, and measurement position movement in full automatic, so it is optimal for labor saving requirements of your test environment.



AAV-501

- An indentation dimension automatic detecting time of 0.3 seconds is achieved (when a PC with recommended specifications is used), which dramatically improves operation efficiency.
- Detecting reproducibility of  $\pm 0.5\%$  is achieved (For objective lens 50X, diagonal line 11 to 45mm, and 500HV), which provides reliable and stable test results.
- All operations from test condition setting to test result analysis can be performed on a Windows PC. In addition, data processing for the test results can be performed by using spreadsheet software.

The AAV-500 Series reduces individual differences in impression dimension measurement in the Vickers hardness test by adopting special image analysis technologies. In addition, improved precision and high speed have been realized with a detecting time of 0.3 seconds.



### Technical Data

Automatic indication detection  
 Detecting reproducibility:  $\pm 0.5\%$  (0.1 $\mu$ m)  
 Detecting method: Quadratic curve regression method  
 Detecting time: 0.3 seconds  
 Detecting minimum unit: 0.1 $\mu$ m  
 Manual measurement function: Measurement method with video line  
 X-Y automatic stage  
 Stage area: 130 x 130mm  
 Movement range: 50 x 50mm  
 Minimum pitch: 1 $\mu$ m  
 Software function  
 Patterned measurement: Line, staggered, 3-point staggered, matrix, circle, arc, random  
 Teaching measurement pattern setting  
 Hardness calculation function  
 Hardness conversion function  
 OK/NG judgment  
 Analysis software function:  
 Device condition display  
 Measurement data display  
 Statistical calculation  
 Graph display  
 Dimensions (W x D x H) / Mass  
 AAV-501 / AAV-502: 450 x 545 x 950mm / 77kg  
 AAV-503 / AAV-504: 665 x 516 x 1000mm / 91kg

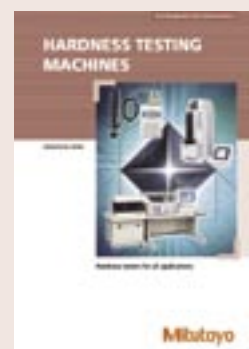
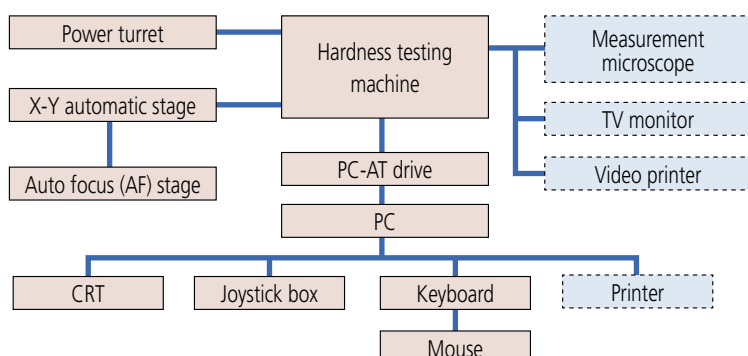
### SPECIFICATIONS

Model No.	AAV-501	AAV-502	AAV-503	AAV-504
Order No.	810-725*	810-726*	810-727*	810-728*
Test force range	98.07 - 9807mN	4.904 - 19610mN	1.961 - 196.1N	9.807 - 490.3N
Test force switching	By external PC	By external PC	Manual	Manual
Objective	10X / 50X	10X / 50X / 100X	10X / 20X	10X / 20X
Measurable indentation size	20 - 200 / 4 - 40 $\mu$ m	20 - 200 / 4 - 40 / 2 - 20 $\mu$ m	40 - 400 / 20 - 100 $\mu$ m	40 - 400 / 20 - 100 $\mu$ m
Minimum reading	0.1 $\mu$ m	0.1 $\mu$ m	0.1 $\mu$ m	0.1 $\mu$ m

\*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **810-959A**):  
**A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

### System Configuration

     : Optional accessories



Refer to the Hardness Testing Machines leaflet (E4104) for more details.



# HV-112/113/114/115

## SERIES 810 — Vickers Hardness Testing Machines

### Technical Data

Test force range	9.807, 49.03, 98.07, 196.1, 294.2, 490.3N
AVK-C0:	
HV-112, HV-113:	1.961, 2.942, 4.903, 9.807, 24.51, 49.03, 98.07, 196.1N
HV-114, HV-115:	9.807, 19.61, 29.42, 49.03, 98.07, 196.1, 294.2, 490.3N
Test force setting:	By dial
Loading accuracy:	±1%
Load control:	Automatic (loading, duration, unloading)
Load duration:	5s - 99s (1s increments) (5, 10, 15)
Max. specimen height:	210mm (205mm: AVK-C0)
Max. specimen depth:	170mm (165mm: AVK-C0) (from the center of indenter shaft)
Indenter/objective turret:	Manual
No. of indenter mount:	1-mount
No. of objective mount:	2-mount (1-mount: AVK-C0)
Optical path*:	Split in two ways for video monitor and photograph (Single way: AVK-C0)
Minimum reading:	0.1µm (1µm: AVK-C0)
Control unit*:	Touch screen type
Data output*:	RS-232C, Digimatic code (SPC) and Centronics
Power supply:	100/120/220/240V AC, 50/60Hz
Dimensions (W x D x H)	
Main unit:	245 x 515 x 770mm
Control unit*:	165 x 260 x 105mm
Mass (main unit):	50kg (45kg: AVK-C0)
*Except for AVK-C0	

### Optional Accessory

<b>19BAA063:</b>	Diamond indenter for Knoop
<b>810-037:</b>	Round table (ø180mm)
<b>810-038:</b>	Round table (ø250mm)
<b>810-012:</b>	50x50mm-travel XY stage
<b>810-016:</b>	Vise (max. opening: 45mm)
<b>810-017:</b>	Vise (max. opening: 100mm)
<b>810-092:</b>	Video printer (VP-1200, 100V AC)
<b>19BAA221:</b>	Video printer paper
<b>810-622:</b>	Printer (DPU-414)
<b>19BAA157:</b>	Printer paper (10-roll set)
<b>19BAA266:</b>	Connecting cable for printer
<b>264-504:</b>	DP-1VR
<b>09EAA082:</b>	Printer paper of DP-1VR (10-roll set)
<b>936937:</b>	SPC cable (1m)
<b>965014:</b>	SPC cable (2m)
<b>19BAA011:</b>	Hardness test block (200HV)
<b>19BAA012:</b>	Hardness test block (300HV)
<b>19BAA013:</b>	Hardness test block (400HV)
<b>19BAA014:</b>	Hardness test block (500HV)
<b>19BAA015:</b>	Hardness test block (600HV)
<b>19BAA016:</b>	Hardness test block (700HV)
<b>19BAA017:</b>	Hardness test block (800HV)
<b>19BAA018:</b>	Hardness test block (900HV)
—:	VLPK auto-reading measuring program (See page 447.)

### Consumable Parts

<b>810-087:</b>	Illumination lamp (1 pc.)
-----------------	---------------------------



Refer to the Hardness Testing Machines leaflet (E4104) for more details.

### FEATURES

- A wide range of test force from 1.961N to 490.3N\* 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 0.1µm. It allows small indentations to be measured with high precision.

\* Refer to the page 3 for details.

### Function: Control unit

- Back-lit LCD graphic display for Indentation size (D1 and D2), Hardness value and scale, Number of measurement point
- Test conditions (HV / HK indenter type, test force, load duration), GO / ±NG tolerance judgment, Cylindrical and spherical surface compensation and offset
- Remote control of power turret
- Conversion to other hardness scales
- Statistical processing



### SPECIFICATIONS

Model No.	AVK-C0	HV-112	HV-113	HV-114	HV-115
Order No.	810-160*	810-163*	810-981*	810-165*	810-985*
Test force range	9.807, 49.03, 98.07, 196.1, 294.2, 490.3N	1.961, 2.942, 4.903, 9.807, 24.51, 49.03, 98.07, 196.1N		9.807, 19.61, 29.42, 49.03, 98.07, 196.1, 294.2, 490.3N	
Test force setting	By dial	By dial	By dial	By dial	By dial
Control unit	—	Touch screen type			
Video monitor	—	—	9" B/W	—	9" B/W
Indenter/objective turret	Manual operation	Motor driven	Motor driven	Motor driven	Motor driven
No. of indenter mount	1	1	1	1	1
No. of objective mount	1 (measurement)	2 (measurement)	2 (measurement)	2 (measurement)	2 (measurement)

\*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **810-959A**):

**A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

### 810-155: AVK-HF

Vickers hardness testing at high temperatures.



# HR-511/521/522/523

## SERIES 810 — Rockwell Type Hardness Testing Machines

### FEATURES

- Multiple test force generation for Rockwell, Rockwell Superficial and Brinell hardness.
- Dolphin-nose indenter arm for easy reach of interior (min.  $\varnothing 40\text{mm}/\varnothing 22\text{mm}^*$ ) and exterior surfaces.
- \*When using an optional diamond indenter (19BAA292).
- Real time electronic test force control for accurate loading. This perfectly eliminates load force overshooting.

- Indenter escape function for continuous testing at fixed table position. This eliminates instability caused by the table retraction.
- Auto-stop elevation table and automatic preliminary test force loading to provide stable test force generation.



#### Function: Control unit

##### Durable sheet switch type

- Durable sheet switch operation with LED display.
- Remote selection of the test force linked to the hardness scale selection.
- Powerful statistical processing and 1024 data memory.
- Data offset
- OK / NG tolerance judgment.
- Statistical processing



#### Function: Touch screen type

- Touch screen operation with a back-lit LCD graphic display.
- Remote selection of the test force linked to the hardness scale selection.
- Choice of message language in English, German, French, Spanish, Italian and Japanese for user friendly operation.
- Cylindrical and spherical surface compensation.
- Data offset
- Conversion to other hardness scales.
- Powerful statistical processing with flexible data point editing and 1024 data memory.
- Measured data editing
- OK/NG tolerance judgment.
- Statistical processing, histogram and X-R chart



### SPECIFICATIONS

Model No.	HR-511	HR-521	HR-522	HR-523
Order No.	810-208*	810-202*	810-203*	810-204*
Preliminary test force	29.42N, 98.07N	29.42N, 98.07N	29.42N, 98.07N	29.42N, 98.07N
Test force	Rockwell superficial: 147.1, 294.2, 441.3N Rockwell: 588.4, 980.7, 1471N Brinell: 1839N		Rockwell superficial: 147.1, 294.2, 441.3N Rockwell: 588.4, 980.7, 1471N Brinell: 61.29, 98.07, 153.2, 245.2, 294.2, 306.4, 612.9, 980.7, 1226, 1839N	
Test force setting	By control unit	By control unit	By control unit	By control unit
Stage elevation	Manual	Manual	Manual	Power drive
Control unit	Sheet switch type	Touch screen type	Touch screen type	Touch screen type

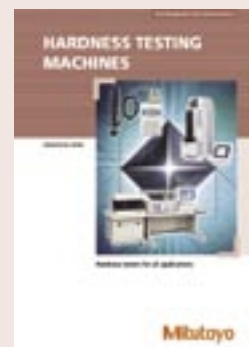
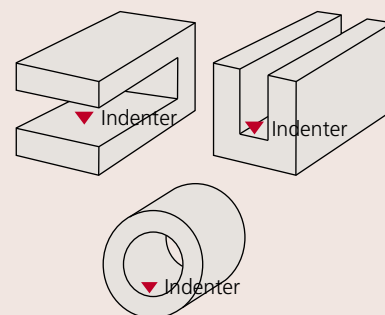
\*To denote your AC line voltage add the following suffixes to the order No. (e.g.: 810-959A):  
A for UL/CSA, D for CEE, E for BS, F for SAA, DC for China, K for EK, No suffix is required for JIS/100V

### Technical Data

Preliminary test force: 29.42N, 98.07N  
Test force:  
Rockwell superficial: 147.1, 294.2, 441.3N  
Rockwell: 588.4, 980.7, 1471N  
Brinell\*: 61.29, 98.07, 153.2, 245.2, 294.2, 306.4, 612.9, 980.7, 1226, 1839N  
Test force setting: By control unit  
Load control: Automatic (loading, duration, unloading)  
Load duration: 0s - 120s (1s increments)  
Max. specimen height: 205mm (for standard flat anvil)  
Max. specimen depth: 150mm (from the center of indenter shaft)  
Stage elevation: Manual or power drive  
Control unit: Sheet switch type or touch screen type  
Data output: RS-232C, Digimatic code (SPC) and Centronics  
Power supply: 100/120/220/240V AC, 50/60Hz  
Dimensions (W x D x H)  
Main unit: 250 x 670 x 605mm  
Control unit: 165 x 260 x 105mm  
Mass (main unit): 65kg  
\*HR-511, HR-521: 1839N only

Optional Accessory: See page 477.

Various shapes of specimen can be measured.  
(Nose-type indenter axis mechanism has been adopted)  
The nose-type indenter mechanism allows measurement of pipe samples as well as the top surface of a flat sample.



Refer to the Hardness Testing Machines leaflet (E4104) for more details.



# AR-10, AR-20, ARK-600, ATK-600

## SERIES 810 — Rockwell/Rockwell Superficial Hardness Testing Machine

### Technical Data

Preliminary test force:	29.42N*, 98.07N
Test force	
Rockwell superficial*:	147.1, 294.2, 441.3N
Rockwell:	588.4, 980.7, 1471N
Test force setting:	By dial (by weight exchange: AR-10)
Load control:	Automatic (loading, duration, unloading)
Minimum reading:	0.1HR (ARK-600, ATK-600), 0.5HR (AR10, AR-20)
Anvil:	Flat (ø64mm)
Max. specimen height:	140mm (165mm: AR-10)
Max. specimen depth:	122mm (115mm: AR-10) (from the center of indenter shaft)
Stage elevation:	Manual
Data output**:	RS-232C, Digimatic code (SPC)
Power supply:	100/120/220/240V AC, 50/60Hz
Dimensions (W x D x H)	
AR-10:	215 x 455 x 682mm
AR-20:	210 x 486 x 680mm
ARK-600:	210 x 486 x 680mm
ATK-600:	210 x 486 x 720mm
Mass	
AR-10:	38kg
AR-20:	40kg
ARK-600:	40kg
ATK-600:	42kg
*ATK-600 only	
**ARK-600 and ATK-600 only	

### Optional Accessory

19BAA292:	Diamond indenter (Min. to ø22mm, HR-500)
19BAA072:	Diamond indenter (AR-10, AR-20, ARK-600)
19BAA073:	Diamond indenter (ATK-600)
19BAA074:	1/16" DIA steel ball indenter
19BAA082:	Spare 1/16" steel ball (10 pcs. set)
19BAA076:	1/4" DIA steel ball indenter
19BAA084:	Spare 1/4" steel ball (10 pcs. set)
19BAA075:	1/8" DIA steel ball indenter
19BAA083:	Spare 1/8" steel ball (10 pcs. set)
19BAA077:	1/2" DIA steel ball indenter
19BAA085:	Spare 1/2" steel ball (10 pcs. set)
810-037:	Round tables (ø180mm)
810-038:	Round tables (ø250mm)
810-043:	Spot anvils (ø12mm)
810-030:	Spot anvils (diamond tipped type for Rockwell Superficial)
810-044:	Spot anvils (ø5.5mm)
810-040:	V-anvils (ø40mm, 30mm groove width)
810-041:	V-anvils (ø40mm, 6mm groove width)
810-042:	V-anvils (ø10mm, 8mm groove width)
810-029:	V-anvils (400mm length, 30mm groove width)
19BAA123:	Hardness test blocks (30HRC - 35HRC)
19BAA124:	Hardness test blocks (45HRC - 50HRC)
19BAA125:	Hardness test blocks (60HRC - 65HRC)
19BAA126:	Hardness test blocks (90HRB - 95HRB)
19BAA127:	Hardness test blocks (30HRB - 35HRB)
19BAA128:	Hardness test blocks (64HR30N - 69HR30N)
19BAA129:	Hardness test blocks (74HR30T - 79HR30T)
810-622:	Printer (DPU-414, 100V)
19BAA262:	Connecting cable
19BAA157:	Printer paper
19BAA161:	Measuring microscope (20x model)
19BAA318:	Measuring microscope (40x model)
19BAA319:	Measuring microscope (100x model)
19BAA277:	ø1mm carbide ball indenter
19BAA279:	ø2.5mm carbide ball indenter
19BAA280:	ø5mm carbide ball indenter
19BAA284:	ø10mm carbide ball indenter
19BAA281:	Spare ø1mm carbide ball (5pcs. set)
19BAA283:	Spare ø2.5mm carbide ball (5pcs. set)
19BAA162:	Spare ø5mm carbide ball (1pc.)
19BAA163:	Spare ø10mm carbide ball (1pc.)
19BAA027:	Hardness test block (200HBW)

### FEATURES: AR-10, AR-20

- Economy type Rockwell hardness testing machines.
- Diamond indenter (HRA, HRD, HRC) and 1/16" diameter steel ball indenter (HRF, HRB, HRG) are provided.
- The dial indicator can be zero-set automatically, allowing the preliminary test load to be applied with the table elevation wheel only.
- Test load selection can be made with wheel. (AR-20)



AR-10



AR-20

### FEATURES: ARK-600, ATK-600

- Diamond indenter and 1/16" diameter steel ball indenter are provided as standard.
- The ARK-600 is designed for testing Rockwell hardness. The ATK-600 can measure Rockwell and Rockwell Superficial hardness scales by one unit.
- The measured hardness is displayed on the large LED.
- Test load selection can be easily made with the selection wheel.



ARK-600



ATK-600

### SPECIFICATIONS

Model No.	AR-10	AR-20	ARK-600	ATK-600
Order No.	810-200*	810-201*	810-218*	810-257*
Preliminary test force	98.07N	98.07N	98.07N	98.07, 29.42N
Test force	588.4, 980.7, 1471N	588.4, 980.7, 1471N	588.4, 980.7, 1471N	147.1, 294.2, 441.3, 588.4, 980.7, 1471N
Minimum reading	0.5HR	0.5HR	0.1HR	0.1HR
Test force setting	By weight exchange	By dial	By dial	By dial

\*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **810-959A**):  
**A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

# MZT-500

## SERIES 810 — Micro Zone Test System

When it comes to evaluating mechanical properties of ultra-small regions of ultra-fine specimens, the MZT-500 Series are most powerful in the fields of research and development and quality control. The MZT-500 can evaluate mechanical properties, which the conventional hardness testing machines for fine specimens cannot measure, such as: various CVD and PVD-deposited or generated films, including ion-plated

films; hardness of ultra-fine cross-sections; bonding mechanical properties; and wear mechanical properties of carbon fiber, glass fiber, whisker, etc.



### SPECIFICATIONS

Model No.	MZT-511	MZT-512	MZT-521	MZT-522
Order No.	810-809*	810-810*	810-811*	810-812*
Basic system	✓	✓	✓	✓
Data analysis / control device	✓	✓	✓	✓
Video line measurement software	—	✓	—	✓
Automatic multi-point measurement device	—	—	✓	✓

\* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **810-959A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Test force loading device	Test force range	0.098 to 980.7mN
	Control resolution	0.916μN
	Loading speed	0.1 to 100mN/s
Indenter indentation depth measurement device	Measurement range	0 to 20μm
	Measurement minimum unit	0.1nm
Indenter	Type	Bercovici triangular pyramid indenter
	Camera	1/3 inch black and white (410,000 pixels)
	Monitor	9 inch black and white
Sample surface observation device	Objective (monitor magnification)	100X (2600X), 10X (260X)
	Maximum dimension	90mm
Specimen dimensions	Maximum depth	90mm (From the center of the indenter axis)
Test type	Indenter indentation test (with an preliminary test force)	
	Indenter indentation test (without an preliminary test force)	
	Indentation depth setting test, continuous indenter indentation test, repeated indenter indentation test	

- Test data  
You can obtain the indentation factor, which is related to the hardness value (partially) shown in Martens hardness test (ISO14577) and Young's modulus. Deformation characteristics in the load, dwell, and unload phases are also obtainable for use in determining properties of the specimen material.
- Hardness tests such as Vickers and Knoop hardness tests are supported. (MZT-512 and 522 only)
- The balance lever vibration isolation mechanism reduces the effect of external vibrations on measurements.
- The impression position precision is ±0.5mm or less.
- Material characteristics evaluation of micro powder is available.
- Indenter indentation depth can be measured up to a maximum of 20mm with a measurement resolution of 0.1nm.
- Test force between 0.098mN and 980.7mN can be applied electromagnetically for evaluation of material properties in submicroscopic areas.
- Field-compatible form with cover for protection against dust and wind.

# ABK-1

## SERIES 810 — Hydraulic Brinell Hardness Testing Machine

ABK-1 is a hydraulic Brinell hardness testing machine that is simple to operate and has high precision. This machine is suitable for hardness testing of raw materials, cast/forged components, and special steels.



### FEATURES

- The mount table up/down handle uses a thrust bearing, providing smooth up/down operation.
- A large impression can create a smooth surface even when measuring on rough surfaces.
- Weight are divided so that a test force from 4923N (500kgf) to 29420N (3000kgf) can be applied. Two sizes of steel indenters, 10mm and 5mm, can be used according to the specimen.

### SPECIFICATIONS

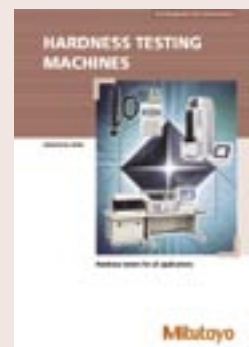
Model No.	ABK-1
Order No.	810-265
Test force range	4903 - 29420N

### Technical Data

Test force: 4903, 7355, 9807, 14710, 19614, 24517, 29420N  
 Test force conversion: Manual method  
 Test force control: Manual (load, duration, unload)  
 Test force duration time: Manual (arbitrary)  
 Specimen dimension  
 Maximum height: 200mm  
 Maximum depth: 155mm  
 Dimensions (W x D x H): 430 x 510 x 1100mm  
 Mass: 180kg

### Optional Accessory

- 19BAA162:** Carbide ball (ø5mm)
- 19BAA163:** Carbide ball (ø10mm)
- 19BAA071:** ø5mm steel ball (spare, 10pcs/set)
- 19BAA165:** ø10mm steel ball (spare, 5pcs/set)
- 19BAA166:** Hardness test block (200HB)
- 19BAA098:** Split level



Refer to the Hardness Testing Machines leaflet (E4104) for more details.

# ASH

## SERIES 810 — Shore Hardness Testing Machine

### Optional Accessory

- 19BAA205:** Roll testing stand  
**19BAA206:** Diamond hammer for general use  
**19BAA215:** Diamond hammer for rolls  
**810-090:** Measurement tube for general use  
**810-091:** Measurement tube for rolls

- 19BAA204:** Swing arm  
 Used for the measurement of large components over  $\phi 100\text{mm}$  that cannot be measured by the main unit frame. It can be used easily by removing the measurement tube from the frame and installing it on the tip of the arm instead.



- 19BAA205:** Roll testing stand  
 Useful for measuring surface hardness of rolls over  $\phi 100\text{mm}$  and other large workpieces that cannot be measured by the main unit frame. Can be used easily by removing the measurement tube from the main unit frame and installing it instead.



- 19BAA202:** Diamond hammer  
 Spares are provided as options in the event of accidental breakage.



- 19BAA203:** Hammer drawing tool  
 Used to remove the diamond hammer from the measurement tube.



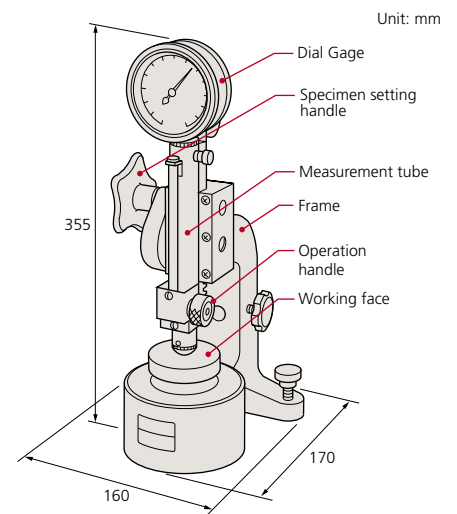
Refer to the Hardness Testing Machines leaflet (E4104) for more details.

The Shore hardness testing machine is designed for easy hardness measurement where test machine and test method must be in compliance with the JIS standard. It is suitable for hardness testing of large, heavy, and difficult to move items such as rolls and for hardness measurement of final finish surfaces. It has a compact body that is easy to move. By removing the measurement tube, it can be used to directly measure the hardness of the specimen.



### FEATURES

- Easy to operate, allowing quick measurement.
- The depth of indentation is small so that it can be used for product inspection.
- A wide range of measurement is available from small specimens to large specimens, with more applications possible by using special accessories such as the swing arm or roll testing stand.



### SPECIFICATIONS

Model No.	ASH-D0	ASH-D1
<b>Order No.</b>	<b>810-266</b>	<b>810-267</b>
Measurement target	General	Rolls
Standard	JIS D 7727	
Dial range / graduation	0 - 140HS / 1HS	
Tolerance (mean value)	$\pm 1.5$ (35 to 95HS)	$\pm 1.0$ (30 to 100HS)
Tolerance (dispersion)	1.5 (less than 75HS) 2.0 (75HS or more)	1.5 (30 to 100HS)
Specimen maximum height	70mm	
Specimen maximum depth	45mm (from the center of the indenter axis)	
Dimensions (W x D x H)	160 x 170 x 355mm	
Mass	16kg	



# Hardmatic HH-411

## SERIES 810 — Impact Type Hardness Testing Unit

HH-411 is a rebound type portable hardness tester for metal with a compact body and high operability. It allows anyone to perform hardness testing easily at the touch of a key, so it can be used widely on various components in the field.



**810-298:** ASTM standard  
**810-299-02:** JIS standard  
 Including the display unit, D type impactor (810-287) and carbide ball (198AA457).

### Rich variety of detectors available

In addition to the general-purpose detector (D type) supplied as standard equipment, the detector lineup includes rich variations (sold separately) to support special applications. The DC type is provided for hardness testing of internal walls of pipes with diameters that cannot be tested with the D type, the D+15 type for bearings and gears, and the DL type for small areas such as the bottom of small gears and weld corners.

### Equipped with automatic orientation correction

For the rebound type hardness tester, gravity affects the measurement result depending on the orientation of the detector relative to the vertical when pressed against the specimen surface. The HH-411 is equipped with the latest measurement technology that automatically detects the orientation of the detector to automatically correct for this effect, so maximum accuracy is always achieved.

### Hardness testing of small surfaces is possible

Only a small surface (standard D type:  $\phi 22\text{mm}$ , separately sold DL type:  $\phi 4\text{mm}$ ) area on is required for hardness testing. Therefore the HH-411 can be used for testing of various specimen shapes such as around grooves and gear teeth.

### Equipped with a data save function

Up to 1800 hardness test results can be saved, which is useful for patrol tests in the field.

### Hardness scale can be selected for your own individual purpose

Based on the hardness HL value (L value: according to ASTM A 956), conversion can be performed to Vickers, Brinell, Rockwell C, Rockwell B, and Shore hardness as well as tensile strength. Conversion can be performed after the test, or hardness value display in the conversion mode is also available.

### Great operability

The basic operation is to press the detector against the sample surface and push the detector button by your finger just like clicking a ballpoint pen, so it is easy for anyone to do.

### Impactors (Optional accessories)

Various impactors can be connected to the display unit.



**810-288**  
 Use for inner walls of cylinders. The grip is short to allow easy positioning within a cylinder.



**810-290**  
 Use for gear teeth, welded corners, etc.



**810-289**  
 Use for concave workpieces such as gear teeth, ball bearing races, etc.

### Technical Data

Impactor:	Impact hammer with integrated detector and carbide-ball tip (D type: conforming to ASTM A 956)
Display unit:	7-segment LCD
Display range* / Resolution	
Leeb:	1-999HL / 1HL
Vickers:	43-950HV / 1HV
Brinell:	20-894HB / 1HB
Rockwell C:	19.3-68.2HRC / 0.1HRC
Rockwell B:	13.5-101.7HRB / 0.1HRB
Shore:	13.2-99.3HS / 0.1HS
Tensile strength:	499-1996MPa / 1MPa
*Display range depends on conversion table.	
Functions:	Auto angle compensation, Offset, OK/NG judgment, Hardness scale conversion Data storage (1800 data entries) Statistical analysis (Average, Maximum, Minimum, Dispersion) Auto sleep function Impact counter display function
Testable workpiece	
Thickness:	Minimum 5mm or more
Mass:	5kg or more in mass
Test points:	5mm or more from the edge of the sample, 3mm or more to each of the tested points.
Surface roughness:	Ra 10 $\mu\text{m}$ or less
Output:	RS-232C, SPC
Power supply:	Alkaline AA battery 2pcs or optional AC adapter (battery life: 70 hours)
Size / Mass	
Display unit:	70 x 110 x 35 mm, 200g
Impactor:	$\phi 28$ x 175 mm, 120g

### Optional Accessory

<b>264-504:</b>	Digimatic Mini-Processor DP-1VR
<b>937387:</b>	Connecting cable for
<b>09EAA082:</b>	Printer paper (10 rolls/set)
<b>810-622:</b>	Thermal printer DUP-414
<b>198AA262:</b>	Thermal printer connecting cable
<b>198AA157:</b>	Thermal printer paper
<b>198AA238:</b>	RS-232C connecting cable for PC
<b>526688:</b>	AC adapter of display unit
<b>198AA243:</b>	Hardness test block (880HLD)
<b>198AA244:</b>	Hardness test block (830HLD)
<b>198AA245:</b>	Hardness test block (730HLD)
<b>198AA246:</b>	Hardness test block (620HLD)
<b>198AA247:</b>	Hardness test block (520HLD)
<b>198AA248:</b>	Support ring for convex surface of cylinder (R10 - R20)
<b>198AA249:</b>	Support ring for convex surface of cylinder (R14 - R20)
<b>198AA250:</b>	Support ring for convex surface of sphere (R10 - R27.5)
<b>198AA251:</b>	Support ring for concave surface of sphere (R13.5 - R20)
<b>198AA457:</b>	Carbide ball for D, DC, D+15 type impactors
<b>198AA458:</b>	Ball shaft for DL type impactor
<b>810-287:</b>	D type impactor UD-411
<b>810-288:</b>	DC type impactor UD-412
<b>810-289:</b>	D+15 type impactor UD-413
<b>810-290:</b>	DL type impactor UD-414



Refer to the HH-411 Impact Type Hardness Testing Unit leaflet (E4299) for more details.

# Hardmatic HH-300

## SERIES 811 — Durometers for Rubber and Plastics Hardness Testing

### Technical Data

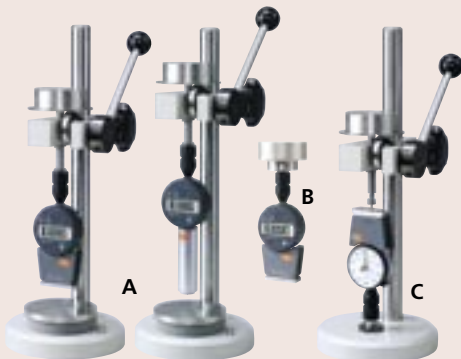
- Designed in accordance with the ASTM D 2240, ISO 868, ISO 7619, DIN 53 505, JIS K 6253, and JIS K 7215 specifications.
- Units are available in both Shore A and Shore D scales, and will test a wide variety of applications.
- The Digital Durometer is provided with data hold function, permitting the operator to make an error-free reading on the LCD screen.
- The Dial Durometer is provided with a peak retaining hand for error-free reading.

### Optional Accessory

- 19BAA180:** Holding bar\*  
**811-019:** Testing stand (Shore A)  
**811-012:** Testing stand (Shore D)  
**811-013:** Testing stand (Shore A)\*\*  
**811-014:** Testing stand (Shore D)\*\*  
**811-017:** Auxiliary weights (Shore A)  
**811-018:** Auxiliary weights (Shore D)  
 \*Only available on Compact Type Durometer.  
 \*\*Long-leg Type Durometer attachment is included.

### Testing stand applications

- These stands are used to mount Durometers. They allow constant-pressure hardness measurement by pressing the Durometer vertically on a workpiece.
- Anyone can perform repeatable hardness measurement due to fewer possibilities of human error and measurement variations.
  - The supplied weights can be attached directly to a Durometer and allow constant-pressure hardness measurement of large samples for which a stand cannot be used.
  - The supplied weights are used for calibrating the spring tension of Durometers.



- Workstage dimension: ø90mm
- Maximum sample height: 90mm



Refer to the Hardmatic HH-300 leaflet (E4137) for more details.

### FEATURES

Digital / Dial Durometers are suitable for testing the nature of the following materials — natural rubber, neoprene, polyesters, P.V.C., leather, Thiokol, nitrite rubber, wax, vinyl, cellulose acetates, glass polystyrene, etc.



### SPECIFICATIONS

Order No.	Digital	811-336	811-336-01	811-332	881-338	811-338-01	811-334
	Dial	811-335	811-335-01	811-331	881-337	811-337-01	811-333
Model No.	Digital	HH-336	HH-336-01	HH-332	HH-338	HH-338-01	HH-334
	Dial	HH-335	HH-335-01	HH-331	HH-337	HH-337-01	HH-333
Scale		Shore A			Shore D		
Applications		Natural rubber, soft elastomers, etc.			Hard elastomers, plastics, hard rubber, ebonite, etc.		
Resolution		0.5 (digital) or 1 (dial)			0.5 (digital) or 1 (dial)		
Range		HA: 10 - 90			HD: 20 - 90		
Standards	ASTM D 2240	✓	✓	✓	✓	✓	
	ISO 868	✓	✓	✓	✓	✓	
	ISO 7619	✓	✓	✓	✓	✓	
	DIN 53 505	—	✓	✓	—	✓	
	JIS K 6253	✓	✓	✓	✓	✓	
	JIS K 7215	✓	✓	✓	✓	✓	
Pressure foot		44 x 18mm	ø18mm		44 x 18mm	ø18mm	
Spring force (mN)		550+75H (H:Reading 10-90)			444.5H (H:Reading 20-90)		
Indenter		Blunt taper (Tip diameter: 0.79mm)			Sharp point (Tip curvature: 0.1±0.01mm)		
Tip angle		35°±0.25°			30°±0.5°		
Indenter diameter		1.25mm					
Indenter protrusion		2.5mm					
Functions		Digital: Data hold, Zero -setting, SPC output, Power ON/OFF (Power supply: SR44 x 1pc.) Analog Durometer: Peak retaining hand					
Type		Compact		Long-leg	Compact		Long-leg
Dimensions (WxDxH)	Digital	60 x 28.5 x 151mm		60 x 28.5 x 193mm	60 x 28.5 x 151mm		60 x 28.5 x 193mm
	Dial	56 x 33.5 x 144mm		56 x 33.5 x 186mm	56 x 33.5 x 144mm		56 x 33.5 x 186mm
Mass	Digital	290g		310g	290g		310g
	Dial	300g		320g	300g		320g

