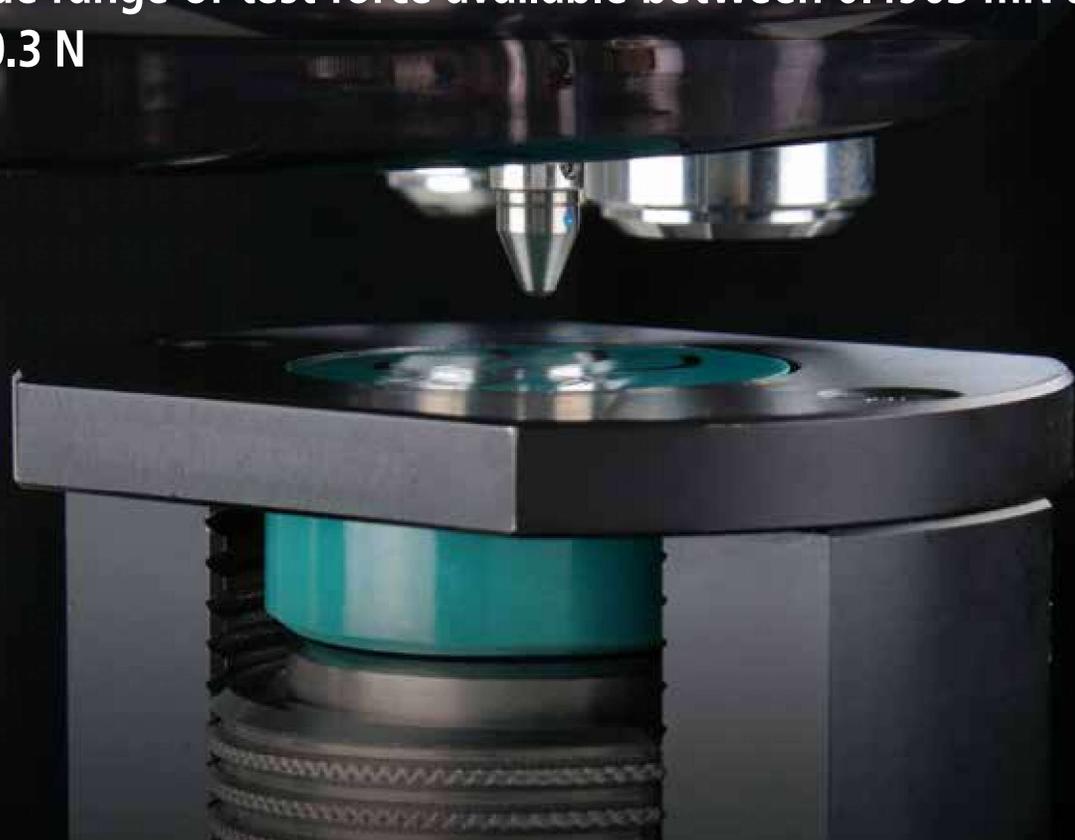


Hardness Testing Machines Overview HM/HV/HR/HH Series



Vickers Hardness Testing Machine Series

Wide range of test force available between 0.4903 mN and 490.3 N



Micro Vickers hardness testing machines

Advanced model HM-200 Series

HM



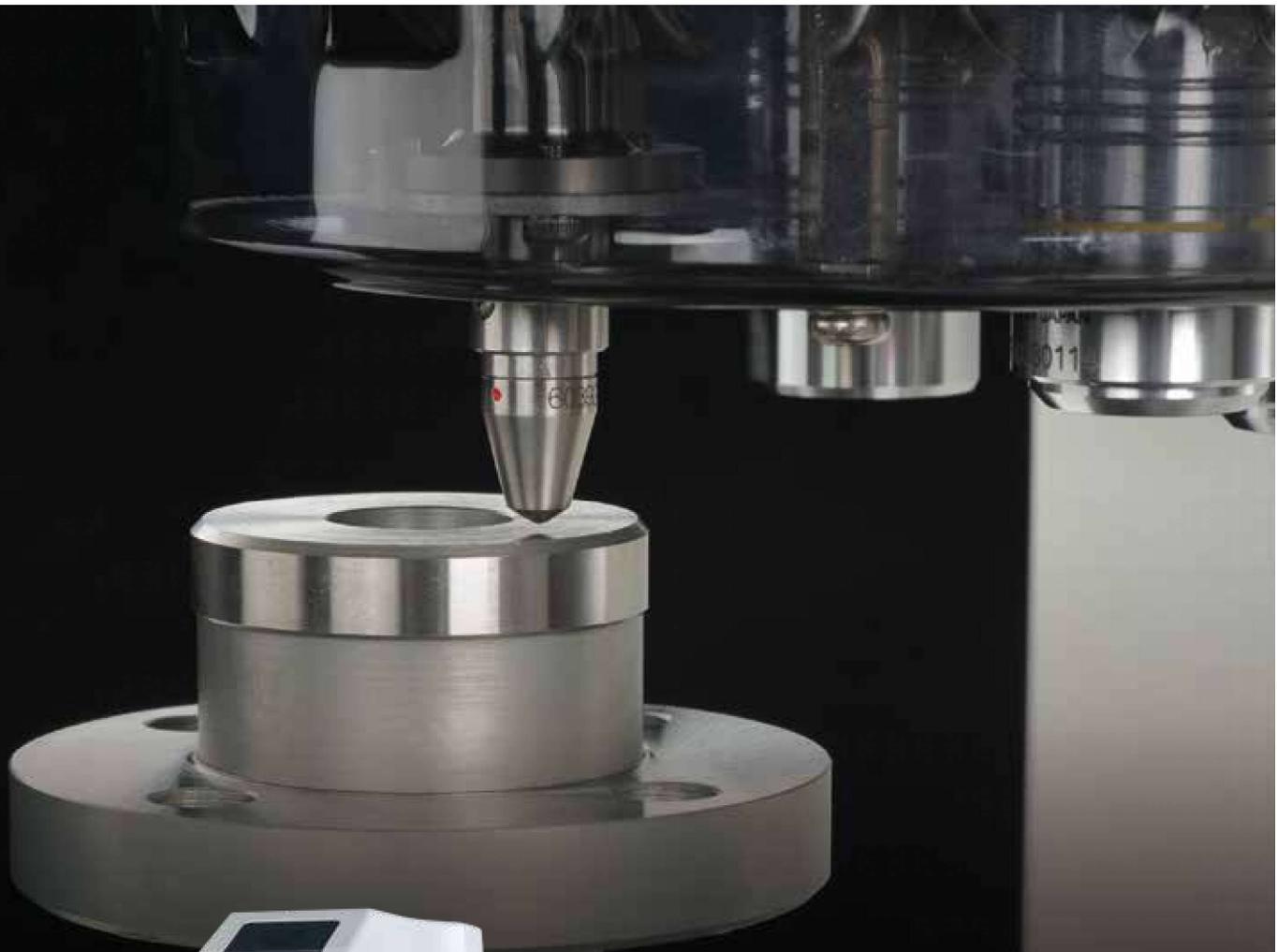
Smart model
HM-100 Series



HM-200 Series: [Page 8](#)

Test force: **0.4903 to 19610** mN

HM-100 Series: [Page 11](#)



Vickers hardness testing machines

Advanced model HV-100 Series

HV 

HV-100 Series: [Page 12](#)

Test force: **2.942 to 490.3 N**



Advanced model

Micro Vickers hardness testing machines HM-200 Series

Adopts an electromagnetic force (force motor) load mechanism.
Freely select different test forces.
Four types of system (A to D) available for different purposes.



An online system to monitor the operational and mechanical statuses of measuring machines. This allows you to grasp the state of a process flow from the operational status of measuring machines within a production process.



System A

Micro Vickers hardness testing machines HM-210A/HM-220A

All-in-one model with simple touch-panel operation

Features

- Touch-panel operation (Including test force conversion)
- Measurement of indentation dimensions using a measuring microscope
- Positioning using a manual XY stage



USB Interface enables use of removable data storage devices.

Note: Camera and monitor are optional accessories.

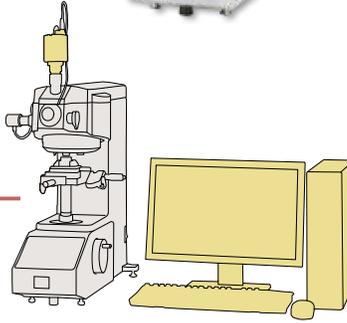
System B

Micro Vickers hardness testing machines HM-210B/HM-220B

Automatic dimensions by AVPAK-10/20 eliminates indentation measurement errors.

Features

- Operated using AVPAK-10/20 (Including test force conversion)
- Automatic indentation reading
- Positioning using a manual XY stage



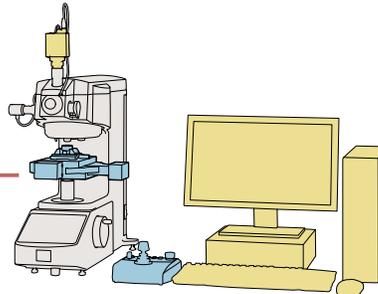
System C

Micro Vickers hardness testing machines HM-210C/HM-220C

Improves work efficiency for multi-point testing

Features

- Operated using AVPAK-10/20 (Including test force conversion)
- Automatic indentation reading
- Automatic positioning with motorized XY stage



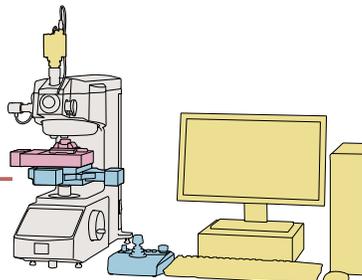
System D

Micro Vickers hardness testing machines HM-210D/HM-220D

Top-end model with autofocus

Features

- Operated using AVPAK-10/20 (Including test force conversion)
- Automatic indentation reading
- Automatic positioning with motorized XY stage
- Autofocusing



Refer to page 10 for details of each system.

System configuration	System A	System B	System C	System D
Testing action	Single point	Single point	Programmed multi-point	Programmed multi-point
Measuring indentations	Measuring microscope	Automatic (AVPAK-10/20)	Automatic (AVPAK-10/20)	Automatic (AVPAK-10/20)
Camera (for observing and measuring indentations)	CMOS, 1,230,000 pixels*1	Color, 3 million pixels	Color, 3 million pixels	Color, 3 million pixels
Test-point positioning	Manual XY stage*2	Manual XY stage*2	Motorized XY stage	Motorized XY stage
Focusing	Manual	Manual	Manual	Auto
Remote box	—	—	Motorized XY stage/Turret	Motorized XY stage/Turret
Operating the main unit	Touch panel	PC (AVPAK-10/20)	PC (AVPAK-10/20)	PC (AVPAK-10/20)

*1 When a TV camera unit is used (pixel count of the camera itself: 1,280,000)

*2 Manual XY stage (optional) can be supplied.

Note: The AVPAK-20 software package is not for use within, or export to, the United States of America. The AVPAK-10 software package is for the United States of America.

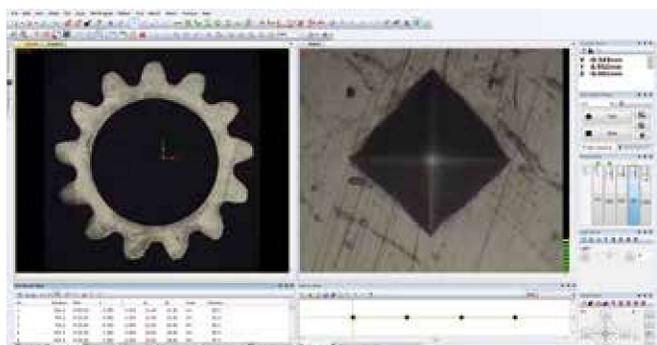
Objective lens specifications for HM-210/220

Item	Specification					
Model No.	MH Plan 2X	MH Plan 5X	MH Plan 10X	MH Plan 20X	MH Plan 50X	MH Plan 100X
Magnification	2X	5X	10X	20X	50X	100X
Working distance	6.0 mm	27.0 mm	11.8 mm	5.2 mm	2.5 mm	1.5 mm
Operation guarantee	Observation	Observation	Measurement/Observation	Measurement/Observation	Measurement/Observation	Measurement/Observation

AVPAK-10/20 software for controlling for Systems B/C/D

AVPAK-10/20 software for controlling Systems B, C and D allow seamless handling such as screen layout for control, testing status and result display.

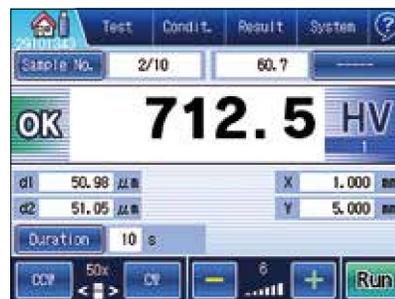
Note: The **AVPAK-20** software package is not for use within, or export to, the United States of America.
The **AVPAK-10** software package is for the United States of America.



Refer to page 38 for details of the AVPAK.

Touch-panel display for System A

Easy-to-understand graphic display enables intuitive operation. Functions for converting values and compensating for curved surfaces, as well as a test condition guiding function are all provided as standard features. (Installed in the System A main unit)



Refer to page 42 for details of the Touch-panel.

Specifications: TV camera unit

System A

Item	Specification
Order No.	810-456-20 ^{*1} 810-454-20 ^{*2}
Camera	Imaging device: 1/3.2-inch CMOS (1,230,000 pixels)
Color LED screen magnification	When using a 10X objective lens: Approx. 200X
	When using a 50X objective lens: Approx. 1000X
	When using a 100X objective lens: Approx. 2000X
Color LED monitor	Power supply: 100-230 V AC, 50/60 Hz
	Power consumption: DC 12 V / 1.0 A: 9 W
	Screen size: 8 inch
	External dimensions: 202 (W) × 29.2 (D) × 175.8 (H) mm Mass: 1.7 kg

*1 Factory-installed options

*2 Units separately available. They need to be assembled and adjusted by field service engineers.

Specifications: Manual stage unit

Systems A and B

Item	Specification	
Order No.	810-420	810-423
Type	Manual XY 25×25	Manual XY 50×50
XY range	25×25 mm	50×50 mm
Table size	100×100 mm	130×130 mm
Minimum display unit	0.001 mm	
Dimensions	221 (W) × 221 (D) × 37 (H) mm	305 (W) × 305 (D) × 49 (H) mm
Mass	2.5 kg	6.6 kg

Specifications: Motorized stage unit

Systems C and D

Item	Specification	
Order No.	810-461-10	810-462-10
Type	Motorized XY 50×50	Motorized XY 100×100
Motorized XY stage		
XY range	50×50 mm	100×100 mm
Table size	130×130 mm	130×165 mm
Repeatability	2 μm	
Max. drive speed	25 mm/s	
Dimensions	242.5 (W) × 242.5 (D) × 55 (H) mm	299.5 (W) × 299.5 (D) × 55 (H) mm
Mass	5 kg	6.2 kg
Control unit		
Power consumption	67 W	
Dimensions	300 (W) × 290 (D) × 92 (H) mm	
Mass	4.5 kg	

Specifications: Motorized auto focus stage unit

System D

Item	Specification
Order No.	810-465
Table size	140×130 mm
Repeatability	0.2 μm
Dimensions	250 (W) × 132 (D) × 48 (H) mm
Mass	3 kg

System configuration for HM-210/220

Parameter	Item	System A	System B	System C	System D	Details	Notes
Main unit	HM-210 manual model main unit	●	—	—	—	Camera, 10X lens, 50X lens, etc.	
	HM-220 manual model main unit	●	—	—	—	Camera, 10X lens, 50X lens, etc.	
	HM-210 system model main unit	—	●	●	●	10X lens, 50X lens	No measuring microscope, no touch panel
	HM-220 system model main unit	—	●	●	●	10X lens, 50X lens	No measuring microscope, no touch panel
Stage	Motorized XY stage unit 50×50 mm	—	—	●	●		
	Motorized XY stage unit 100×100 mm	—	—	●	●		
	Manual XY stage unit 25×25 mm	●	●	—	—		
	Manual XY stage unit 50×50 mm	●	●	—	—		
	AF stage unit	—	—	—	●		
Others	AVPAK-10	—	●	●	●		
	AVPAK-20	—	●	●	●		Available overseas except the United States

●: One of each type must be selected from the choice offered —: Cannot be selected △: Contact Mitutoyo Sales Dept.

Specifications

Model		HM-210				HM-220							
Display unit		metric	inch/mm	metric	metric	inch/mm	metric						
Operation		Manual	Manual	System	Manual	Manual	System						
Applicable standards		JIS B7725/ISO 6507-2											
Testable hardness		Vickers hardness (HV)/Knoop hardness (HK)/Fracture toughness (Kc)											
Test force		mN	(gf)	mN	(gf)	mN	(gf)	mN	(gf)	mN	(gf)	mN	(gf)
		98.07	(10)	1961	(200)	0.4903	(0.05)	9.807	(1)	196.1	(20)	2942	(300)
		196.1	(20)	2942	(300)	0.9807	(0.1)	19.61	(2)	294.2	(30)	4903	(500)
		294.2	(30)	4903	(500)	1.961	(0.2)	29.24	(3)	490.3	(50)	9807	(1000)
		490.3	(50)	9807	(1000)	2.942	(0.3)	49.03	(5)	980.7	(100)	19610	(2000)
		980.7	(100)			4.903	(0.5)	98.07	(10)	1961	(200)		
Indenter approach speed		Fixed at 60 μm/s				HV0.03 or less: Variable between 2 and 60 μm/s. Can be set in 1 μm/s increments. HV0.031 or greater: Fixed at 60 μm/s							
Specimen	Maximum dimensions	Depth: 160 mm Height: 133 mm (Manual XY stage unit 25 mm)/72 mm (Motorized XY stage unit 100 mm+AF stage)											
	Max. loading capacity	System A, B: 3 kg System C: 7 kg System D: 4 kg											
Optical section	Optical system	Infinitely corrected optical system, 4-port objective lens switching method											
	Illumination	Light source	White LED										
		Aperture diaphragm	Variable										
	Standard objective lens	Lens	MH Plan 10X MH Plan 50X										
		Working distance	11.8 mm 2.5 mm										
		Real field of view and imaging range	System A: Real field of view: ø0.28 mm (maximum range: 0.14 mm) System B, C, D: Imaging range: 0.118 (H) mm×0.089 (V) mm										
Measuring microscope (Ocular)	System A: Length-measuring microscope with integrated encoder and eyepiece (10X) System B, C, D: Factory-installed options												
Mechanism	Test time	Test force loading time	1 to 99 s Can be set in 1 s increments.										
		Test force duration time	0 to 999 s Can be set in 1 s increments.										
		Test force unloading time	1 to 99 s Can be set in 1 s increments.										
	Loading device	Test force control	Electromagnetic (voice coil)										
		Test force switching	System A: Can be selected from touch panel System B, C, D: Can be selected by AVPAK-10/20										
	Turret	Operation method	Motor drive (Can be operated by manual)										
Number of turret ports		System A: Touch panel System B: AVPAK-10/20 System C/D: AVPAK-10/20 and Remote Control Box											
Data output		Indenter shaft unit: Up to two can be installed (including the standard Vickers indenter shaft unit already installed); Objective lens unit: Up to four can be installed (including the standard 10X, 50X objective lens already installed)											
Power supply/Power consumption		RS-232C, Digimatic (can be used in only System A), USB2.0/Type A (only mounted in System A for USB memory), USB2.0/Type B (for PC communication)											
Maximum specimen dimensions/Maximum load capacity	System A	AC100 V 50/60 Hz 31 W (for HM-210 manual model main unit) 44 W (for HM-220 manual model main unit) 30 W (for HM-210 system model main unit) 43 W (for HM-220 system model main unit)											
	System B, C, D	Approx. 315 (W) ×671 (D) ×595 (H) mm											
Mass	System A	Approx. 315 (W) ×586 (D) ×741 (H) mm											
	Common for all system	38.5 kg (Manual model main unit) 37.4 kg (System model main unit)											

Note: The AVPAK-20 software package is not for use within, or export to, the United States of America. The AVPAK-10 software package is for the United States of America.

Standard accessories for HM-200 Series

Order No.	Item	Specification/Remarks
19BAA058	Diamond indenter	Vickers indenter for HM-210
19BAA059	Diamond indenter	Vickers indenter for HM-220
—	Hardness test block	700 HV 0.3 25 mm (diameter) ×6 mm (thickness)
—	Indenter shaft unit	With Vickers indenter
—	Objective lens unit 10X	With objective lens 10X
—	Objective lens unit 50X	With objective lens 50X
19BAA133	Spacer	Material: Bakelite 11 (W) ×42 (D) ×13 (H) mm
11AAB405	Extension shaft	For elevation shaft: 38 mm With two set screws
11AAB406	Extension shaft	For elevation shaft: 76 mm With two set screws

Order No.	Item	Specification/Remarks
12BAM841	Vinyl cover	For the hardness testing machine main unit
—	Tool kit	
—	User's manual	
—	Configuration disc	For System B, C, D
—	Accessory case	
—	Inspection certificate	In both Japanese and English for the tester
—	Inspection certificate for test piece	In both Japanese and English for test piece
—	Warranty card	In both Japanese and English

Smart model

Micro Vickers hardness testing machines HM-100 Series

The ideal series for Vickers hardness testing at the microscopic scale. Basic smart machines with the minimum requirement of functions for hardness testing. Three types are available: an analog model (**HM-101**) and digital models (**HM-102/103**).



HM-101



HM-102



HM-103

Specifications

Model	HM-101	HM-102	HM-103						
Applicable standards	JIS B7725/ISO 6507-2								
Testable hardness	Vickers hardness (HV)/Knoop hardness (HK)								
Test force	mN (gf)	98.07 (10)	245.2 (25)	490.3 (50)	980.7 (100)	1961 (200)	2942 (300)	4903 (500)	9807 (1000)
Test force control	Auto (load, duration, unload)								
Test force duration time	5 to 30 s (Arbitrary setting)			5 to 60 s					
Indenter approach speed	Approx. 60 $\mu\text{m/s}$ (Approx. 50 $\mu\text{m/s}$)								
Specimen dimensions	Height: 95 mm, Depth: 150 mm								
Optical path	Measurement path/exposure path (Optical path split method)								
Objective lens	10X (For observation), 50X (For measurement)			10X, 50X (Measurement available with both lenses)					
Minimum display	0.2 μm			0.1 μm					
Maximum measurement length	Objective lens 50X: 140 μm			Objective lens 10X: 700 μm		Objective lens 10X: 500 (V) \times 650 (H) μm Objective lens 50X: 100 (V) \times 130 (H) μm			
Manual XY stage	With analog micrometer head, Minimum graduation 10 μm								
Table size	100 \times 100 mm								
Stage XY range	25 \times 25 mm								
Measurement magnification calibrator	—			Installed					
Data processing function	—			Indentation diagonal length Hardness value Pass/failure decision function					
TV device Camera (1/3 inch) Monitor (8 inch monochrome)	—			—			Standard accessory		
Turret switch	Manual								
External connection interface	—			Digimatic, RS-232C, Centronics					
External dimensions	Main unit: Approx. 380 (W) \times 600 (D) \times 590 (H) mm								
Mass	Main unit: 42 kg								
Power supply/ Power consumption	AC 100 V \pm 10% (AC 120 V, AC 220 V, AC 240 V according to the factory shipped setting) HM-101, 102: 60 VA or less HM-103: Approx. 90 VA or less								

Note 1: An optional Knoop indenter is required for Knoop hardness measurement.

Note 2: **HM-102/103** operation panel external dimensions: 165 (W) \times 260 (D) \times 105 (H) mm, 1.5 kg

Note 3: **HM-103** TV unit monitor external dimension: 232 (W) \times 227 (D) \times 426 (H) mm, mass: 4.4 kg

Standard accessories

Vickers indenter	19BAA058	1
Objective lenses	10X: 810-617 50X: 810-619	1
Fine adjustment table	810-011	1
Standard vise	810-016 Jaw opening: 51 mm	1
Hardness test block	700 HV 0.3 ϕ 25 mm	1
Power code	One of any of the following: 02ZAA000 Order No. suffix: C and No suffix For PSE 02ZAA010 Order No. suffix: A For UL/CSA 02ZAA020 Order No. suffix: D For CEE 02ZAA030 Order No. suffix: E For BS 02ZAA040 Order No. suffix: DC For CCC 02ZAA050 Order No. suffix: K For KC	1
Tool kit	—	1
Accessory box	—	1
User's manual	—	1

Note: Weights and loading shaft are included in the accessory box as standard accessories and need to be attached to the main unit during assembly.

Advanced model

Vickers hardness testing machines HV-100 Series

Advanced model for carrying out not only Vickers hardness tests, but also Knoop, Brinell and Kc fracture toughness measurement. Choose from four types of system.



An online system to monitor the operational and mechanical statuses of measuring machines. This allows you to grasp the state of a process flow from the operational status of measuring machines within a production process.



System A

Vickers hardness testing machines HV-110A/HV-120A

All-in-one model with simple touch-panel operation

Features

- Touch-panel operation (Including test force conversion)
- Measurement of indentation dimensions using a measuring microscope
- Positioning using a manual XY stage (optional)



USB Interface enables use of removable data storage devices.

Note: Camera and monitor are optional accessories.

Refer to page 14 for details of each system.

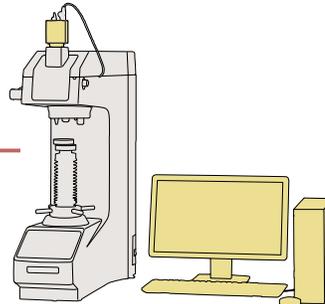
System B

Vickers hardness testing machines HV-110B/HV-120B

Automatic dimensions by AVPAK-10/20 eliminates indentation measurement errors.

Features

- Operated using AVPAK-10/20 (Including test force conversion)
- Automatic measurement of indentations
- Positioning using a manual XY stage (optional)



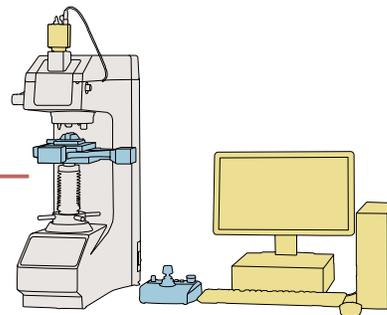
System C

Vickers hardness testing machines HV-110C/HV-120C

Improves work efficiency for multi-point testing

Features

- Operated using AVPAK-10/20 (Including test force conversion)
- Automatic indentation reading
- Automatic positioning with motorized XY stage



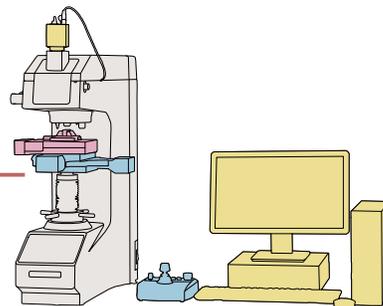
System D

Vickers hardness testing machines HV-110D/HV-120D

Top-end model with autofocus

Features

- Operated using AVPAK-10/20 (Including test force conversion)
- Automatic indentation reading
- Automatic positioning with motorized XY stage
- Autofocusing



System configuration	System A	System B	System C	System D
Testing action	Single point	Single point	Programmed multi-point	Programmed multi-point
Measuring indentations	Measuring microscope	Automatic (AVPAK-10/20)	Automatic (AVPAK-10/20)	Automatic (AVPAK-10/20)
Camera (for observing and measuring indentations)	CMOS, 1,230,000 pixels*1	Color, 3 million pixels	Color, 3 million pixels	Color, 3 million pixels
Test-point positioning	Manual XY stage*2	Manual XY stage*2	Motorized XY stage	Motorized XY stage
Focusing	Manual	Manual	Manual	Auto
Remote box	—	—	Motorized XY stage/Turret	Motorized XY stage/Turret
Operating the main unit	Touch panel	PC (AVPAK-10/20)	PC (AVPAK-10/20)	PC (AVPAK-10/20)

*1 When a TV camera unit is used (pixel count of the camera itself: 1,280,000)

*2 Manual XY stage (optional) can be supplied.

Note: The AVPAK-20 software package is not for use within, or export to, the United States of America. The AVPAK-10 software package is for the United States of America.

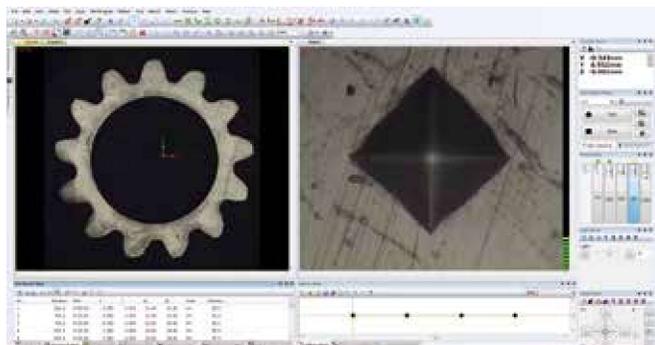
Objective lens specifications for HV-110/120

Item	Specification					
Model No.	MH Plan 2X	MH Plan 5X	MH Plan 10X	MH Plan 20X	MH Plan 50X	MH Plan 100X
Magnification	2X	5X	10X	20X	50X	100X
Working distance	6.0 mm	27.0 mm	11.8 mm	5.2 mm	2.5 mm	1.5 mm
Operation guarantee	Observation	Observation	Observation/Measurement	Observation/Measurement	Observation/Measurement	Observation/Measurement

AVPAK-10/20 software for controlling for Systems B/C/D

AVPAK-10/20 software for controlling Systems B, C and D allow seamless handling such as screen layout for control, testing status and result display.

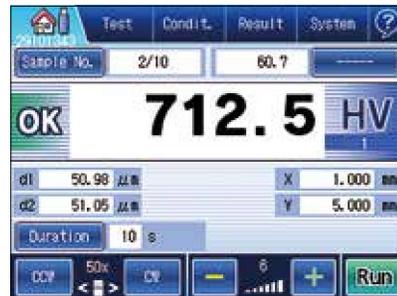
Note: The **AVPAK-20** software package is not for use within, or export to, the United States of America.
The **AVPAK-10** software package is for the United States of America.



Refer to page 38 for details of the AVPAK.

Touch-panel display for System A

Easy-to-understand graphic display enables intuitive operation. Functions for converting values and compensating for curved surfaces, as well as a test condition guiding function are all provided as standard features. (Installed in the System A main unit)



Refer to page 42 for details of the Touch-panel.

Specifications: TV camera unit

System A

Item	Specification
Order No.	810-456-20 ^{*1} 810-454-20 ^{*2}
Camera	Imaging device: 1/3.2-inch CMOS (1,230,000 pixels)
Color LED screen magnification	When using a 10X objective lens: Approx. 200X
	When using a 50X objective lens: Approx. 1000X
	When using a 100X objective lens: Approx. 2000X
Color LED monitor	Power supply: 100-230 V AC, 50/60 Hz
	Power consumption: DC 12 V / 1.0 A: 9 W
	Screen size: 8 inch
	External dimensions: 202 (W) × 29.2 (D) × 175.8 (H) mm Mass: 1.7 kg

*1 Factory-installed options

*2 Units separately available. They need to be assembled and adjusted by field service engineers.

Specifications: Manual stage unit

Systems A and B

Item	Specification	
Order No.	810-420	810-423
Type	Manual XY 25×25	Manual XY 50×50
XY range	25×25 mm	50×50 mm
Table size	100×100 mm	130×130 mm
Minimum display unit	0.001 mm	
Dimensions	221 (W) × 221 (D) × 37 (H) mm	305 (W) × 305 (D) × 49 (H) mm
Mass	2.5 kg	6.6 kg

Specifications: Motorized stage unit

Systems C and D

Item	Specification	
Order No.	810-461-10	810-462-10
Type	Motorized XY 50×50	Motorized XY 100×100
Motorized XY stage		
XY range	50×50 mm	100×100 mm
Table size	130×130 mm	130×165 mm
Repeatability	2 μm	
Max. drive speed	25 mm/s	
Dimensions	242.5 (W) × 242.5 (D) × 55 (H) mm	299.5 (W) × 299.5 (D) × 55 (H) mm
Mass	5 kg	6.2 kg
Control unit		
Power consumption	67 W	
Dimensions	300 (W) × 290 (D) × 92 (H) mm	
Mass	4.5 kg	

Specifications: Motorized auto focus stage unit

System D

Item	Specification
Order No.	810-465
Table size	140×130 mm
Repeatability	0.2 μm
Dimensions	250 (W) × 132 (D) × 48 (H) mm
Mass	3 kg

System configuration for HV-110/120

Parameter	Item	System A	System B	System C	System D	Details	Notes
Main unit	HV-110 manual model main unit	●	—	—	—	Camera, 10X lens, etc.	
	HV-120 manual model main unit	●	—	—	—	Camera, 10X lens, etc.	
	HV-110 system model main unit	—	●	●	●	10X lens	No measuring microscope, no touch panel
	HV-120 system model main unit	—	●	●	●	10X lens	No measuring microscope, no touch panel
Stage	Motorized XY stage unit 50×50 mm	—	—	●	●		
	Motorized XY stage unit 100×100 mm	—	—	●	●		
	Manual XY stage unit 50×50 mm	○	○	—	—		
	Round table	○	○	—	—	Outside diameter ø180 mm	
	Round table	○	○	—	—	Outside diameter ø250 mm	
Others	AF stage unit	—	—	—	●		
	AVPAK-10	—	●	●	●		
	AVPAK-20	—	●	●	●		Available overseas except the United States

○: Selectable ●: One of each type must be selected from the choice offered —: Cannot be selected △: Contact Mitutoyo Sales Dept.

Specifications

Model		HV-110		HV-120		
Display unit		metric	inch/mm	metric	metric	
Operation		Manual	Manual	System	Manual	
Applicable standards		JIS B7725/ISO 6507-2				
Testable hardness		Vickers hardness (HV)/Knoop hardness (HK)/Fracture toughness (Kc)/Brinell hardness (HB)				
Test force		N	(kgf)	N	(kgf)	
		9.807	(1)	196.1	(20)	
		19.61	(2)	294.2	(30)	
		29.42	(3)	490.3	(50)	
		49.03	(5)			
Indenter approach speed		60 μm/s, 150 μm/s				
	Specimen	Maximum dimensions: Depth: 170 mm Height: 210 mm (Manual main unit and flat anvil)/132 mm (System main unit+motorized XY stage unit 50 mm+AF stage)				
Optical section	Max. loading capacity	System A, B: 20 kg System C: 7 kg System D: 4 kg				
	Optical system	Infinitely corrected optical system, 3-port objective lens switching method				
	Illumination	Light source	White LED			
		Aperture diaphragm	Variable			
	Standard objective lens	Lens	MH Plan 10X			
		Working distance	11.8 mm			
Measuring microscope (Ocular)	System A: Real field of view: 1.4 mm (When the length-measuring microscope is used) System B, C, D: Imaging range: 0.590 (H) mm×0.443 (V) mm					
Mechanism	Test time	Test force loading time: 5 to 999 s Can be set in 1 s increments.				
	Loading device	Test force control	Electromagnetic (voice coil)			
		Test force switching	System A: Can be selected from touch panel System B, C, D: Can be selected by AVPAK-10/20			
	Turret	Drive method	Motor drive (Can be operated by manual)			
		Operation method	System A: Touch panel System B: AVPAK-10/20 System C/D: AVPAK-10/20 and Remote Control Box			
Data output	Number of turret ports: Indenter shaft unit: Up to one can be installed (including the standard Vickers indenter shaft unit already installed); Objective lens unit: Up to three can be installed (including the standard 10X objective lens already installed)					
Power supply/Power consumption	RS-232C, Digimatic, USB2.0/Type A (only mounted in system A for USB memory), USB2.0/Type B (for PC communication)					
Maximum specimen dimensions/Maximum load capacity	System A	AC100 V 50/60 Hz (Manual main unit: 24 W System main unit: 22 W)				
	System B, C, D	Approx. 307 (W) ×696 (D) ×781 (H) mm				
Mass	Common for all system	HV-110: 60 kg (Manual model main unit), 59 kg (System model main unit) HV-120: 58 kg (Manual model main unit), 57 kg (System model main unit)				

Note: The AVPAK-20 software package is not for use within, or export to, the United States of America. The AVPAK-10 software package is for the United States of America.

Standard accessories for HV-100 Series

Order No.	Item	Specification / Remarks
19BAA060	Diamond indenter	
—	Objective lens 10X	
—	Hardness test block	700 HV 10 64 mm (diameter) ×15 mm (thickness)
810-039	Flat anvil	Outside diameter ø64 mm
383876	Vinyl cover	
12BAL402	Protective sheet	For main unit
—	Level	

Order No.	Item	Specification / Remarks
—	Tool kit	
—	User's manual	
—	Configuration disc	For System B, C, D
—	Accessory case	
—	Inspection certificate for test piece	In both Japanese and English for test piece
—	Warranty card	In both Japanese and English

Combination for Brinell test correspondence table and optional accessories

	Test force / diameter	30	10	5	2.5	1
HV-110	Indenter	HBW 1/30	HBW 1/10	HBW 1/5	HBW 1/2.5	HBW 1/1
	ø1 mm (11AAD469)	○	○	○	Brinell weight (0.5) 11AAC697	○
	Indenter	HBW 2.5/187.5	HBW 2.5/62.5	HBW 2.5/31.25	HBW 2.5/15.625	HBW 2.5/6.25
HV-120	ø2.5 mm (11AAD470)	—	Brinell weight (12.5) 11AAC700	Brinell weight (1.25) 11AAC698	Brinell weight (5.625) 11AAC699	Brinell weight (1.25) 11AAC698
	Indenter	HBW 1/30	HBW 1/10	HBW 1/5	HBW 1/2.5	HBW 1/1
	ø1 mm (11AAD469)	○	○	○	○	○
HV-120	Indenter	HBW 2.5/187.5	HBW 2.5/62.5	HBW 2.5/31.25	HBW 2.5/15.625	HBW 2.5/6.25
	ø2.5 mm (11AAD470)	—	—	Brinell weight (1.25) 11AAC698	Brinell weight (5.625) 11AAC699	Brinell weight (1.25) 11AAC698

○: Compatible with only when adding an indenter. —: Not compatible

Optional accessories for Micro Vickers/Vickers hardness testing machines

Item	Order No.	Description	HM-210A	HM-220A	HM-210B	HM-220B	HM-210C	HM-220C	HM-210D	HM-220D	HM-101/102/103	HV-110A/HV-120A	HV-110B/HV-120B	HV-110C/HV-120C	HV-110D/HV-120D	
Measuring microscope (connection)	11AAE777				●	●	●	●	●	●						Factory-installed options
	11AAE677				●	●	●	●	●	●						They need to be assembled and adjusted by field service engineers.
	11AAE778											●	●	●		Factory-installed options
	11AAE678											●	●	●		They need to be assembled and adjusted by field service engineers.
TV camera unit	With monitor	810-456-20	●	●	●	●	●	●	●	●	●	●	●	●	●	Factory-installed options
		810-454-20	●	●	●	●	●	●	●	●	●	●	●	●	●	They need to be assembled and adjusted by field service engineers.
	Without monitor	810-457-20	●	●	●	●	●	●	●	●	●	●	●	●	●	Factory-installed options
		810-455-20	●	●	●	●	●	●	●	●	●	●	●	●	●	They need to be assembled and adjusted by field service engineers.
Objective lens unit	11AAE765	2X	●	●	●	●	●	●	●	●						Factory-installed options
	11AAE766	5X	●	●	●	●	●	●	●	●						Select up to two types of objective lens unit
	11AAE768	20X	●	●	●	●	●	●	●	●						They need to be assembled and adjusted by field service engineers.
	11AAE769	100X	●	●	●	●	●	●	●	●						Select up to two types of objective lens unit
	11AAE665	2X	●	●	●	●	●	●	●	●						They need to be assembled and adjusted by field service engineers.
	11AAE666	5X	●	●	●	●	●	●	●	●						Select up to two types of objective lens unit
	11AAE668	20X	●	●	●	●	●	●	●	●						They need to be assembled and adjusted by field service engineers.
	11AAE669	100X	●	●	●	●	●	●	●	●						Select up to two types of objective lens unit
Objective lens	810-616	5X								●						An objective lens cannot be additionally to mounted.
	810-618	20X								●						They need to change for Factory-installed options or they need to be assembled and adjusted by field service engineers.
	810-620	100X								●						They need to change for Factory-installed options or they need to be assembled and adjusted by field service engineers.
	11AAE772	2X									●	●	●	●		Factory-installed options
	11AAE773	5X									●	●	●	●		Select up to two types of objective lens unit
	11AAE774	20X									●	●	●	●		They need to be assembled and adjusted by field service engineers.
	11AAE775	50X									●	●	●	●		Select up to two types of objective lens unit
	11AAE776	100X									●	●	●	●		They need to be assembled and adjusted by field service engineers.
	11AAE672	2X									●	●	●	●		Select up to two types of objective lens unit
	11AAE673	5X									●	●	●	●		They need to be assembled and adjusted by field service engineers.
	11AAE674	20X									●	●	●	●		Select up to two types of objective lens unit
	11AAE675	50X									●	●	●	●		They need to be assembled and adjusted by field service engineers.
	11AAE676	100X									●	●	●	●		Select up to two types of objective lens unit
Indenter for Knoop hardness test	19BAA061	For standard strength test	●		●		●		●							Color-coded: Red line
	19BAA062	For low strength test		●		●		●		●						Color-coded: Blue line
	19BAA063	For standard strength test									●	●	●	●		
Indenter shaft unit for Knoop hardness test	11AAE770		●		●		●		●							With a Knoop indenter
	11AAE771			●		●		●		●						Factory-installed options
	11AAE670		●		●		●		●							With a Knoop indenter
	11AAE671			●		●		●		●						They need to be assembled and adjusted by field service engineers.
For Brinell hardness test	Indenter	11AAD469	ø1 mm								●	●	●	●		Carbide ball indenter
		11AAD470	ø2.5 mm								●	●	●	●		Carbide ball indenter
	Spare carbide ball	19BAA281	ø1 mm									●	●	●	●	Carbide ball indenter
		19BAA283	ø2.5 mm									●	●	●	●	Carbide ball indenter
Weight for Brinell hardness test	11AAC697	0.5 kgf									●	●	●	●		
	11AAC698	1.25 kgf									●	●	●	●		
	11AAC699	5.625 kgf									●	●	●	●		
	11AAC700	12.5 kgf									●	●	●	●		

Note: The factory-installed options are factory-assembled, before shipment, to a hardness testing machine ordered together with them.

Item	Order No.	Description	HM-210A	HM-220A	HM-210B	HM-220B	HM-210C	HM-220C	HM-210D	HM-220D	HM-101/102/103	HV-110A/HV-120A	HV-110B/HV-120B	HV-110C/HV-120C	HV-110D/HV-120D
Hardness standard block	19BAA010	40 HMV	●	●	●	●	●	●	●	●					
	19BAA001	100 HMV	●	●	●	●	●	●	●	●					
	19BAA002	200 HMV	●	●	●	●	●	●	●	●					
	19BAA003	300 HMV	●	●	●	●	●	●	●	●					
	19BAA004	400 HMV	●	●	●	●	●	●	●	●					
	19BAA005	500 HMV	●	●	●	●	●	●	●	●					
	19BAA006	600 HMV	●	●	●	●	●	●	●	●					
	19BAA007	700 HMV	●	●	●	●	●	●	●	●					
	19BAA008	800 HMV	●	●	●	●	●	●	●	●					
	19BAA009	900 HMV	●	●	●	●	●	●	●	●					
	19BAA011	200 HV									●	●	●	●	
	19BAA012	300 HV									●	●	●	●	
	19BAA013	400 HV									●	●	●	●	
	19BAA014	500 HV									●	●	●	●	
	19BAA015	600 HV									●	●	●	●	
	19BAA016	700 HV									●	●	●	●	
	19BAA017	800 HV									●	●	●	●	
	19BAA018	900 HV									●	●	●	●	

Hardness standard block for Micro Vickers hardness testing machines
An inspection certificate is supplied for HV0.01/HV0.1/HV1.

Hardness standard block for Vickers hardness testing machines
An inspection certificate is supplied for HV1/HV10.

Common applications

Item	Order No.	Description	HM-210A	HM-220A	HM-210B	HM-220B	HM-210C	HM-220C	HM-210D	HM-220D	HM-101/102/103	HV-110A/HV-120A	HV-110B/HV-120B	HV-110C/HV-120C	HV-110D/HV-120D	
External output	264-505	Digimatic Mini-Processor DP-1VA LOGGER 	●	●						○	●					Note that a connection cable is not supplied with the DP-1VA LOGGER and must be ordered separately.
	936937	Connection cable (1 m) Type D	●	●							●					10-pin plain connector
	937387	Connection cable (1 m) Type E								○						6-pin round connector
	09EAA082	Printing paper														For DP-1VA (10 rolls)
	02AZD810D	U-WAVE-R	●	●						○	●					
	02AZD730G	U-WAVE-T (IP67 type)	●	●						○	●					
	02AZD880G	U-WAVE-T buzzer type	●	●						○	●					
	02AZD790E	U-WAVE-T dedicated connection cable Type E								○						6-pin round connector
	02AZD790D	U-WAVE-T dedicated connection cable Type D	●	●							●					10-pin plain connector
	264-020	Input tool IT-020U	●	●						○	●					Applicable OS: Windows 10 (64 bit)
	06AFM380E	Input tool direct USB-ITN-E								○						
	06AFM380D	Input tool direct USB-ITN-D	●	●							●					
	11AAC236	EXPAK-06	●	●							●					Refer to page 50 for details.
	11AAC237	EXPAK-07 (for HM-102/103)								○						
02NDB101D	MeasurLink® Real-Time Professional			●	●	●	●	●	●			●	●	●		

○: Except HM-101

Specimen fixtures

Note: Use the specimen fixtures below under a test force of 1 kgf/9.81 N only (except for resin mold specimen tables).

Item	Order No.	Description	HM-210A	HM-220A	HM-210B	HM-220B	HM-210C	HM-220C	HM-210D	HM-220D	HM-101/102/103	HV-110A/HV-120A	HV-110B/HV-120B	HV-110C/HV-120C	HV-110D/HV-120D	
Specimen mounting jig	Sheet specimen table	810-013 	●	●	●	●			▲	▲	●					Prevents variations of hardness results due to flexure and wrinkling during measurement of sheets of thickness within 5 mm. (e.g. Scalpel blades, etc.)
	Thin specimen table (vertical type)	810-015-1 	●	●	●	●			●	●	●					Clamps pin-shaped specimens of 0.4 to 3.2 mm diameter or less in a chuck. (e.g. Wire of steel or copper, etc.)
	Thin specimen table (horizontal type)	810-014-1 	●	●	●	●			▲	▲	●					Holds a thin specimen of 0.4 to 3.2 mm diameter or less for measuring on a side face. (e.g. Wire, piano wire, etc.)
Tilting specimen table	810-019 		●	●	●	●	▲	▲	▲	▲	●					Levels the specimen measurement face to prevent variations of indentation shape, with an opening width of 37 mm, tilt angle of ±15°, and rotation angle of ±25°.
Sheet specimen table	810-085 		●	●	●	●	●	●	●	●						Enables securing of very thin or narrow specimens like foil or fine wire. (thickness within 3 mm and width within 56 mm)
Resin mold specimen tables	810-650-1	ø25.4±0.5 mm														Resin molds can easily be installed. Specimen height: 9 to 39 mm Test force conversion: supports up to 50 kgf
	810-650-2	ø30±0.5 mm														
	810-650-3	ø31.75±0.5 mm	●	●	●	●	●	●	●	●	●	●	●	●	●	
	810-650-4	ø38.1±0.5 mm														
	810-650-5	ø40±0.5 mm														
Tabletop for resin mold specimen stand	11BAF894	ø25.4±0.5 mm														Tabletop attached to resin mold specimen stand
	11BAF895	ø30±0.5 mm														
	11BAF896	ø31.75±0.5 mm	●	●	●	●	●	●	●	●	●	●	●	●	●	
	11BAF897	ø38.1±0.5 mm														
	11BAF898	ø40±0.5 mm														
Adjustable specimen table (Specimen thickness of 30 mm or less)	810-020 		▲	▲	▲	▲	▲	▲	▲	●						Allows proper alignment of the sample surface and the indenter axis when parallelism of the sample is poor. It cannot be used with automatic hardness testing systems.

▲: There are protrusions from the specimen surface, so be careful when handling the indenter and lens.

Specimen fixtures

Note: Use the specimen fixtures below under a test force of 1 kgf/9.81 N only (except for round table, V-anvil, and vise).

Item	Order No.	Description	HM-210A	HM-220A	HM-210B	HM-220B	HM-210C	HM-220C	HM-210D	HM-220D	HM-101/102/103	HV-110A/HV-120A	HV-110B/HV-120B	HV-110C/HV-120C	HV-110D/HV-120D	
Rotary tilting specimen table	810-095		●	●	●	●	●	●	●	●						In cases where top and bottom surfaces of the specimen are not parallel, the tilting rotary specimen table's adjuster and standard accessory hand press can be used to make adjustments (adjustment range: $\pm 3^\circ$) so the top surface of the specimen is perpendicular to the indenter shaft of the hardness testing machine. When attached to the testing machine, the specimen surface can be rotated 360° (in 2° increments). Height: 20 mm or more Diameter: 15 to 55 mm
Rotary table (Minimum graduation 1')	810-018		●	●	●	●	●	●	●	●						The specimen fixed on the table can be rotated for convenient measurement.
Round table	810-037	(Diameter: 180 mm) 									●	●				
	810-038	(Diameter: 250 mm)														
V-anvil	810-040	V-anvil (large) 										●	●			Angle: 120° , Outside diameter: $\phi 40$ mm, Groove width: 30 mm For shaft (max. $\phi 60$ mm)
	810-041	V-anvil (small)														Angle: 90° , Outside diameter: $\phi 40$ mm, Groove width: 6 mm For shaft (max. $\phi 8.4$ mm)
Vise	810-016		●	●	●	●	●	●	●	●	●	●	●	●	●	Open width: 51 mm
	810-017		●	●	●	●	●	●	●	●	●	●	●	●	●	Open width: 100 mm

Other optional accessories

Item	Order No.	Description	HM-210A	HM-220A	HM-210B	HM-220B	HM-210C	HM-220C	HM-210D	HM-220D	HM-101/102/103	HV-110A/HV-120A	HV-110B/HV-120B	HV-110C/HV-120C	HV-110D/HV-120D	
Hardness calculation table (for Knoop)	19BAA270									●						Only HM-101
Calibration certificate			●	●	●	●	●	●	●	●	●	●	●	●	●	
System rack	998923				●	●	●	●	●	●		●	●	●	●	For PC
Stand for testing machine	11AAC702											●	●	●	●	Only for the testing machines 680 (W) ×680 (D) ×520 (H) mm
Vibration isolator	810-641		●	●	●	●	●	●	●	●						Only for the testing machines Spring vibration isolator with damper 690 (W) ×740 (D) ×700 (H) mm Maximum load: 60 kg
	11AAC719											●	●	●	●	Only for the testing machines Spring vibration isolator with damper 690 (W) ×740 (D) ×700 (H) mm Withstand load: 100 kg
S wing for vibration isolator. Provides a storage area.	810-644		●	●	●	●	●	●	●	●	●	●	●	●	●	For vibration isolator (810-640, 810-641, 810-642, 810-643) To be attached to a vibration isolator 740 (W) ×300 (D) ×228 (H) mm
Foot switch	937179T (Resin type) 12AAJ088 (Metal type)										●					Switch for starting hardness testing. With a series of test operations such as Ocular/footswitch/turret switch/vertical handle operation, the test machine can be operated without using touch-panel.
Table	02ATE760		●	●	●	●	●	●	●							1800 (W) ×900 (D) ×740 (H) mm

Software for Hardness testing machines

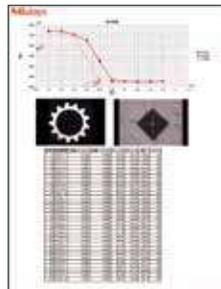
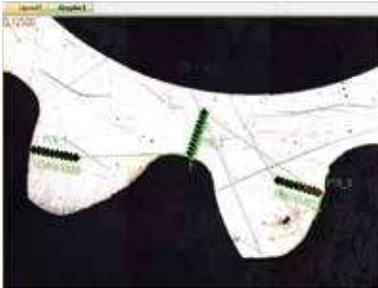
AVPAK

Note 1: The AVPAK-20 software package is not for use within, or export to, the United States of America.
 The AVPAK-10 software package is for the United States of America.
 Note 2: For Stitching, Auto trace, and Contour detection are functions only for AVPAK-20.

Introduction of software AVPAK-10/20 function (HM-200 Series, HV-100 Series)

Graphic view (of stored images)

For displaying the entire specimen and checking the pattern positioning. The digital zoom function can be used to easily magnify and check the indentation site.

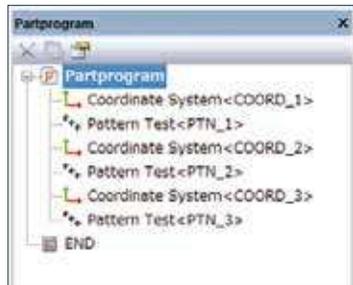


Layout view

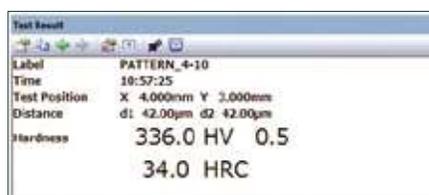
Photos from individual views, graphs, tables, etc., can be laid out freely to help with report creation.

Part program

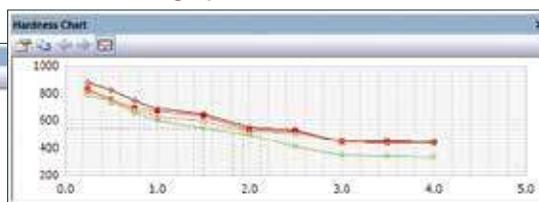
Automatically records the sequence of operations in a test. To repeat the same test, the part program can be called up for repeated execution.



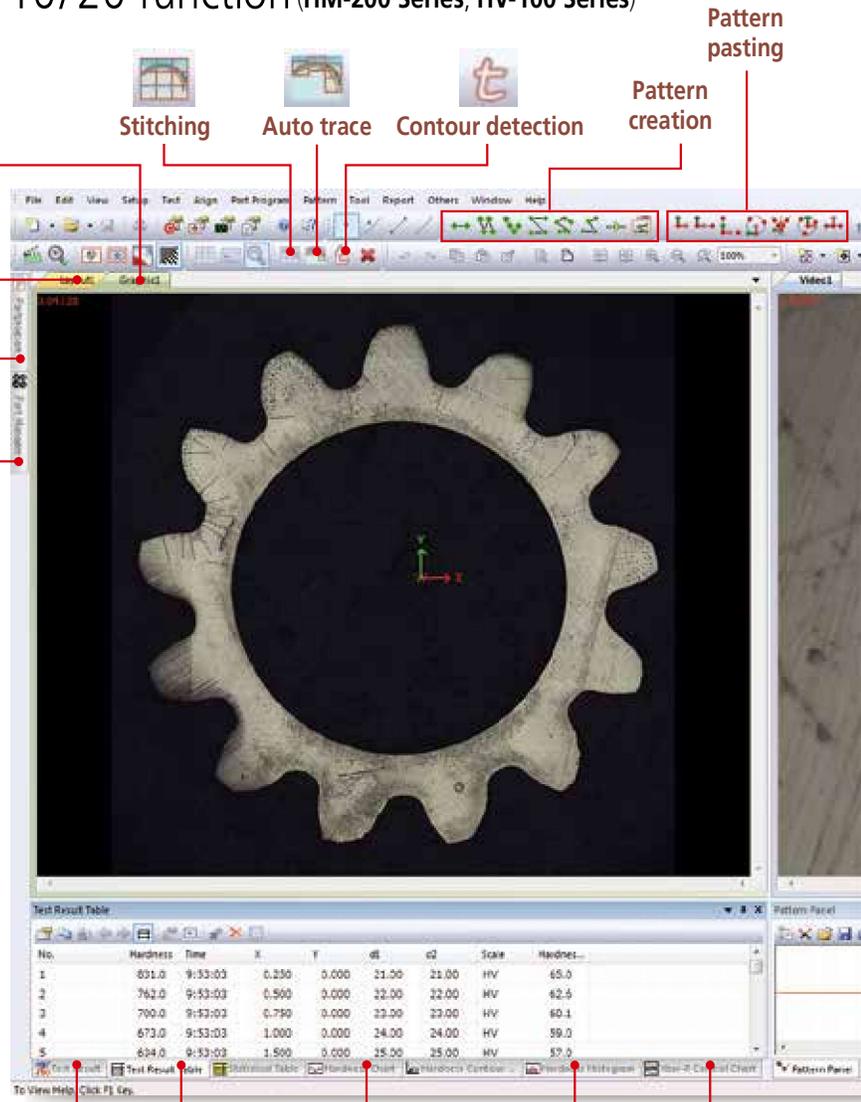
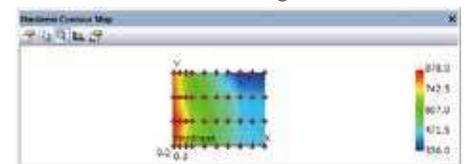
Test result view



Hardness curve graph



Hardness distribution diagram



Parts manager

Test result list view

Video view (live image)
Indentation image display
 Small indentations can be observed using the digital zoom function.

Contrast level meter
 Stable focusing can be easily achieved by anyone.

Counter
 Displays the stage's current coordinates.
 (Z-axis information is only for System D)

Property panel

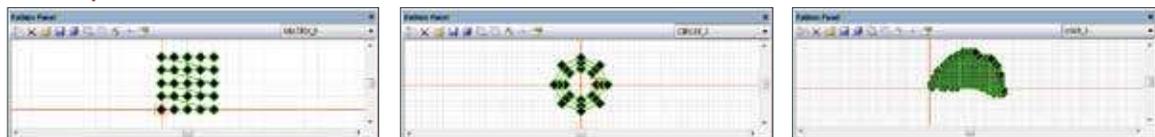
Test control
 Controls test actions such as wide- or narrow-range auto-focusing and measurement of indentations.

Turret control
 Switches the objective lens and indenter in and out of the test position

Illumination control
 Controls the illumination in 100 steps

Stage control
 Used to move the motorized XY stage and AF stage.
 (Systems C and D only)

Pattern panel



Frequency distribution graph



Note: All the screens shown in this page are for AVPAK-20.

Feature of software AVPAK-10/20 function

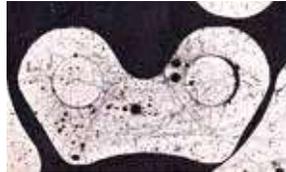
Function related to capture of specimen image and pattern setting of test position



Stitching (Only for AVPAK-20)

Takes images of an entire rectangular field from the moving stage then combines the images.

Note: Only for System C/D of HM/HV



Auto trace (Only for AVPAK-20)

Automatically traces the shape of the sample. Takes images as the stage moves along the outer contours of the specimen then combines the images.



Note: Only for System C/D of HM/HV



Contour detection (Only for AVPAK-20)

Detects the outline of the workpiece from combined images.

Various kinds of pattern setting

Performs time-consuming pattern setting with ease.



Pattern creation

This tool supports the creation of test patterns such as straight lines, zigzag lines, and teaching patterns.



Pattern pasting

This tool supports the pasting of created test patterns. It adjusts the origin, direction, etc., to paste a pattern.

Remote Control Box

Assists operation using AVPAK-10/20. Besides control of the motorized XY stage, the Remote Control Box can be used for turret switching, XY stage speed control and single-point testing.



There are four speeds to choose from for stage control using the joystick—Step, Low, Middle, and High.

Dimensions: 177×174×107 mm (W×D×H)

Mass: 1 kg

Note: Supplied with System C/D of HM/HV and HR-620B only

Note: With regarding to the AVPAK-20, not for use and/or export to the United States of America.

Handling of multiple specimens

Part program and Parts Manager functions support testing of multiple and irregular specimens.

Multi-specimen testing

Executes different part programs for each irregular specimen



Parts Manager

Executes a common part program for specimens having the same shape



Reading of indentations

Improvement in image-processing performance has improved the indentation measurement function.

Note 1: measurement accuracy varies according to conditions.

Note 2: Only for HM/HV



Simple test panel

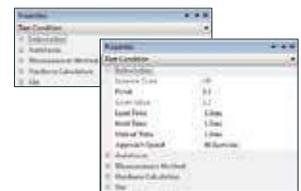


Operations from test condition setting to test start are navigated with the guidance function.



Property panel

Used for setting the test conditions such as the test force and duration time, as well as the indentation measurement condition.



Navigation function

When the test position is being moved during multi-point testing, this function guides the travel of the XY manual stage to the next position. (System B)

Note: Only for System B with manual XY stage.



Introduction of software AVPAK-10/20 function (HR-600 Series)

(Refer to pages 38 to 40 for details of other functions)

The screenshot shows the AVPAK software interface with several key components highlighted by red callouts:

- Test result table:** A table displaying test results for various points, including time, frequency, and hardness values.
- Test result view:** A large central window showing a 3D visualization of the test path on the X-axis stage.
- Display test position on X-axis stage:** A callout pointing to the 3D visualization of the test path.
- Hardness curve graph:** A graph showing the hardness curve, penetration depth, frequency distribution, and hardness distribution diagram.
- Pattern panel:** A panel displaying a pattern of test points.
- Control panel:** A panel containing controls for stage position, program execution, and stage operation.

Test Result Table:

No.	Label	Time	F	HRC	Coil	OK/NC	Deviation	View
1	PTN_L1-1	19:43:58	3.500	0.900	60.4	HRC	OK	
2	PTN_L1-2	19:46:13	3.000	0.900	60.4	HRC	OK	
3	PTN_L1-3	19:48:48	3.000	0.900	60.7	HRC	OK	
4	PTN_L1-4	19:49:54	7.000	0.900	60.2	HRC	OK	
5	PTN_L1-5	19:49:58	3.000	0.900	60.8	HRC	OK	
6	PTN_L1-6	19:50:28	3.000	0.900	60.4	HRC	OK	
7	PTN_L1-7	19:50:50	11.000	0.900	60.9	HRC	OK	
8	PTN_L1-8	19:50:58	15.000	0.900	60.9	HRC	OK	
9	PTN_L1-9	19:51:21	15.000	0.900	60.7	HRC	OK	
10	PTN_L1-10	19:52:46	25.000	0.900	60.4	HRC	OK	
11	PTN_L1-11	19:54:32	30.000	0.900	60.9	HRC	OK	
12	PTN_L1-12	19:55:23	25.000	0.900	60.2	HRC	OK	
13	PTN_L1-13	19:56:06	3.000	1.000	60.5	HRC	OK	

Counter Panel:

X - 86.771mm
Y - 43.772mm
Z - 60.289mm

System Panel:

Run Target: Perforasi
 [Run] [Stop] [Record] [Time Left: 0:00]
 [Stop] [Perforasi P.]

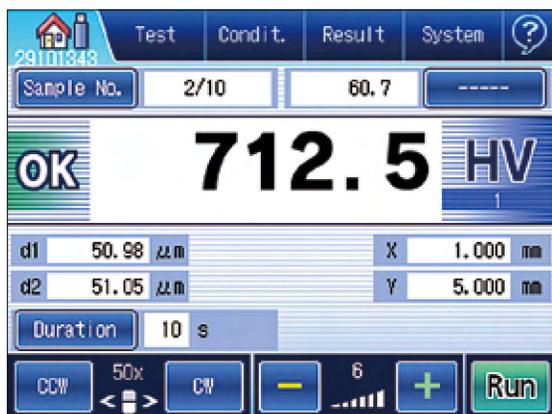
Stage Panel:

1 2 3 4 5
 [Home] [Left] [Right] [Up] [Down] [Enter]

Software for Touch-panel

Easy-to-understand graphic display enables intuitive operation. Functions for converting values and compensating for curved surfaces, as well as a test condition guiding function are all provided as standard features.

The user interface is of the same design across all testing machines, ensuring user-friendly operation.



The standard screen displays test results and test conditions. Various types of information can be confirmed on this one screen.



The simple screen displays only test results. The extra-large characters help prevent reading errors.



The list screen displays the last five test results, average, and variation. This screen is optimal for displaying the average of multiple test points.



This screen supports setting of test conditions such as verification of the minimum thickness of a workpiece at the specified test force.



This screen allows setting of a conversion scale, GO/NG judgment and external output. It allows instantaneous verification of settings in the form of a list.



This screen provides a list of statistics of test results. It allows easy storing and printing results simply by clicking the icon.

FORMEio for external communication program

AUTOMATION Enables smooth and efficient measurements

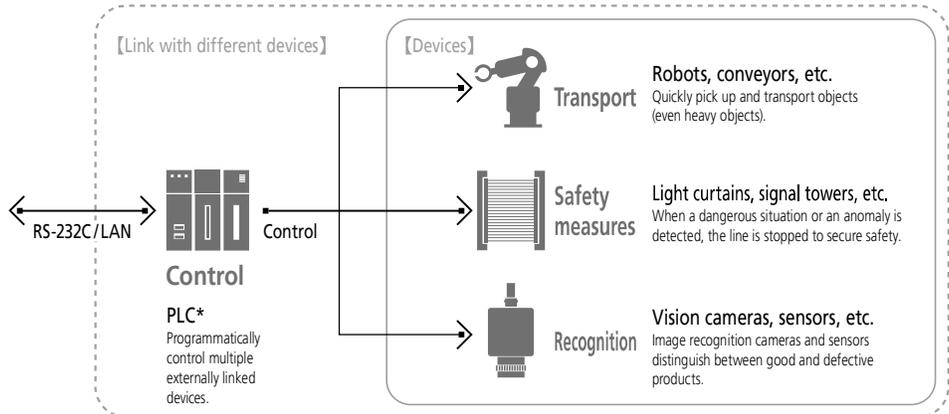
By installing an X-axis stage on an **HR-620B** machine and creating a system that coordinates with robots, you can automate the testing procedure, from mounting workpieces to sorting them according to test results.



Example of hardness testing machine automation on a production line



HR-620B+X-axis stage



* Programmable Logic Controller

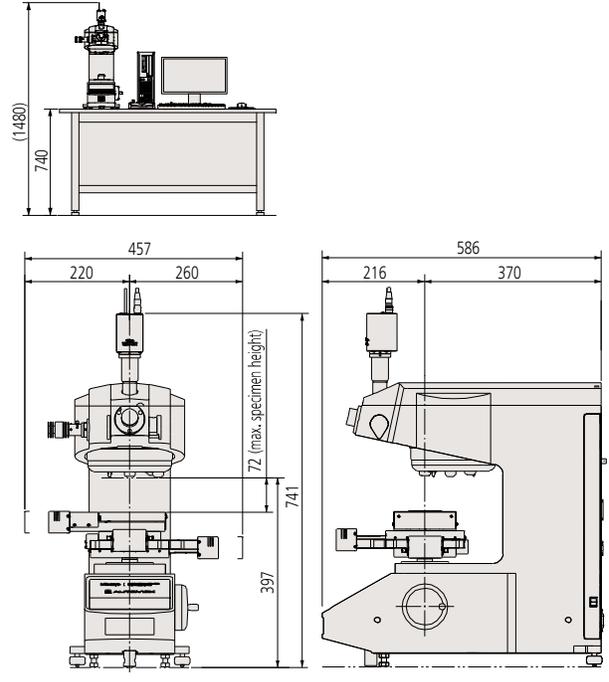
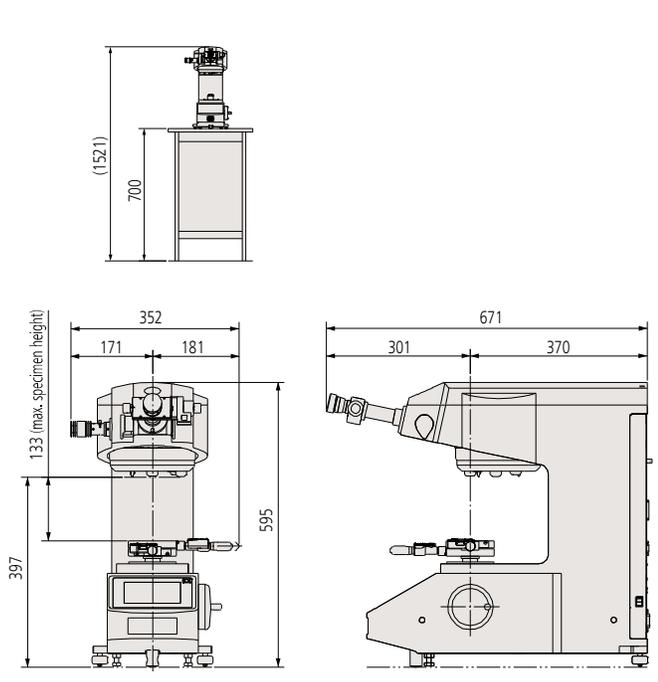
Dimensions

Micro Vickers Hardness Testing Machines HM-200 Series

System A

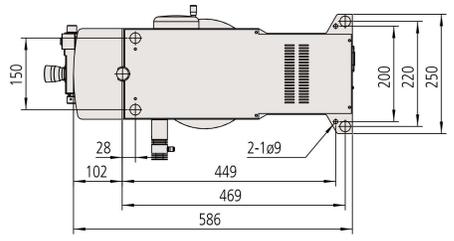
System D

Unit: mm

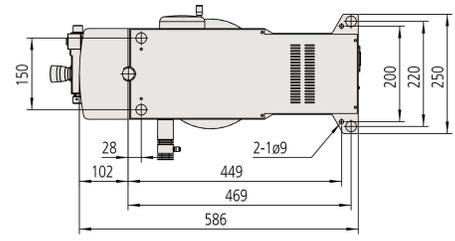


Note 1: When the 25×25 mm manual XY stage is used

Note 2: When the 100×100 mm motorized XY stage is used



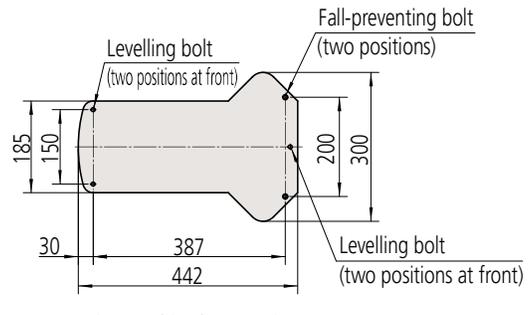
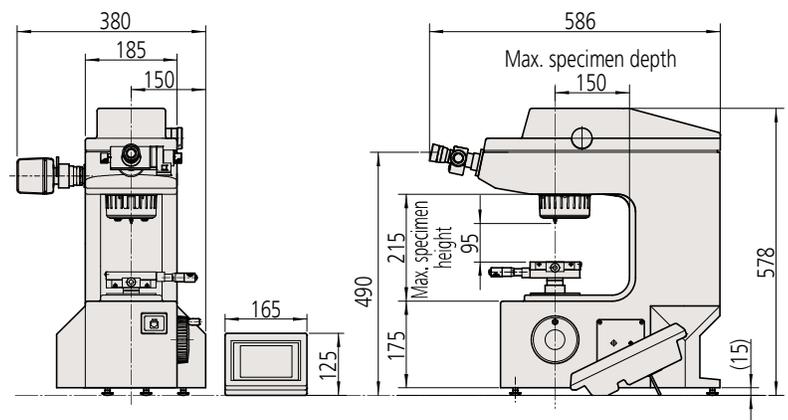
Testing machine bottom view



Testing machine bottom view

Micro Vickers Hardness Testing Machines HM-100 Series

Unit: mm



Testing machine bottom view

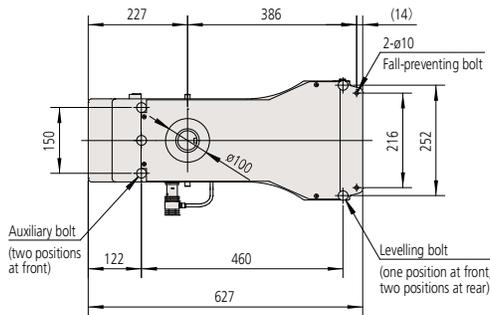
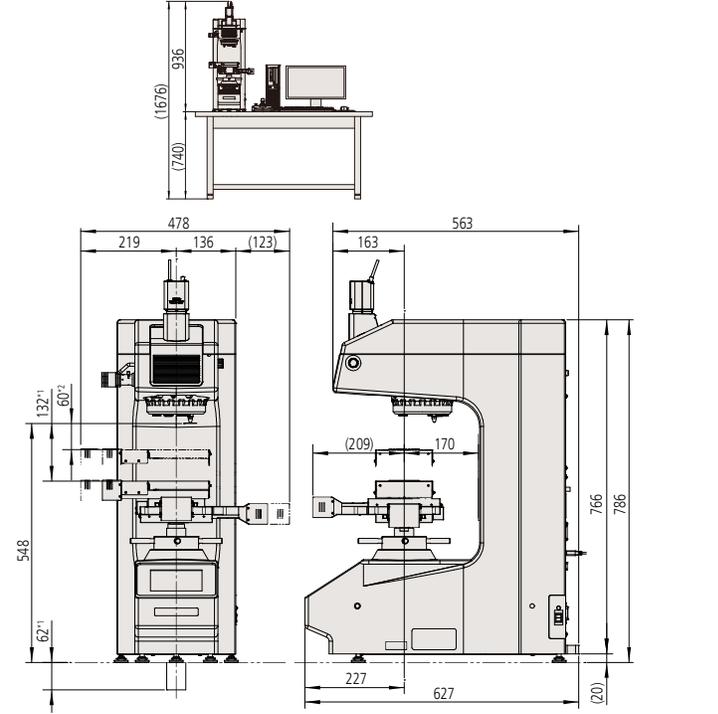
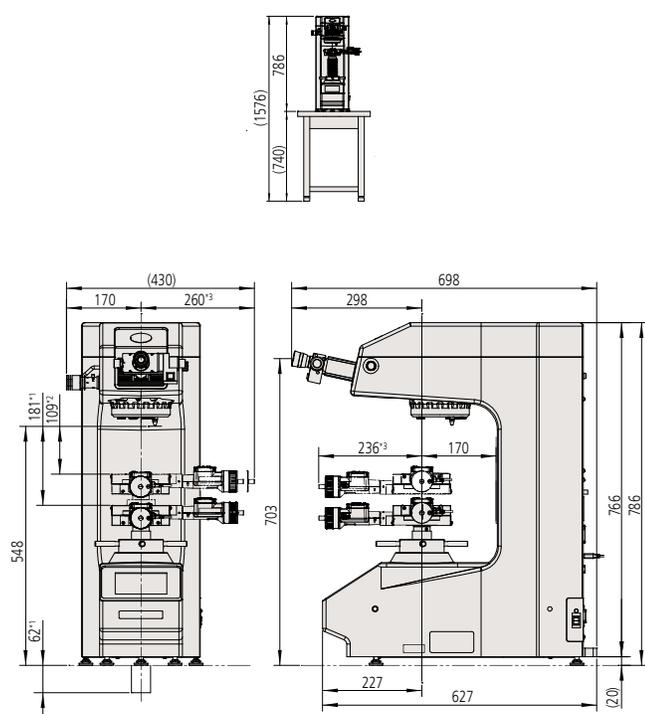
Dimensions

Vickers Hardness Testing Machines HV-100 Series

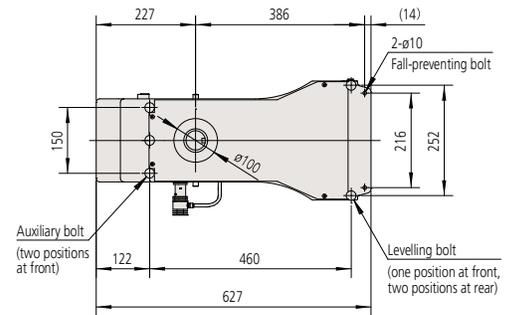
System A

System D

Unit: mm



Testing machine bottom view



Testing machine bottom view

*1 Maximum height of specimen when an escape hole exists below the main shaft in the machine mounting table that allows the shaft to be lowered to the maximum extent.
 *2 Maximum height of specimen when an escape hole does not exist in the machine mounting table.
 *3 Dimension when the manual XY stage unit with 50 mm stroke (optional) is equipped.

*1 Maximum height of specimen when an escape hole exists below the main shaft in the machine mounting table that allows the shaft to be lowered to the maximum extent.
 *2 Maximum height of specimen when an escape hole does not exist in the machine mounting table.



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