



The first name in materials testing

Hardness Testing Machines



Range of closed loop, load cell based Hardness Testing Machines





FH series of Hardness testers

ROCKWELL Hardness Testing Machines



FH30-4
1-250kgf



FH30-5
1-187.5kgf



FH31-2
1-250kgf



FH31-3
1-187.5kgf



FH1-7
3-150kgf



FH11-52
3-150kgf



FH12-38
3-150kgf

VICKERS Hardness Testing Machines



FH6-1 5gf-2kgf
FH6-9 200gf-62.5kgf
FH6-11 1gf-62.5kgf



FH7-4 50gf-250kgf
FH7-5 200gf-250kgf
FH7-6 50gf-62.5kgf



FH14-1
5gf-2kgf

BRINELL Hardness Testing Machines



FH9-26
62.5-3000kgf



FH9-32
31.25-3000kgf

UNIVERSAL Hardness Testing Machines



FH11-50 200gf-250kgf
FH11-51 200gf-3000kgf



FH12-37
5-3000kgf

Most Common Hardness Tests

- **Rockwell (HR scales)** Indenting the test material with a diamond cone (HRC) or hardened (tungsten) steel ball indenter (HRB etc.). Applying a preload of 10kgf first and a main test force of 60, 100 or 150kgf.
- **Rockwell Superficial (HR scales)** Indenting the test material with a diamond cone or hardened (tungsten) steel ball indenter, depending on the scale preliminary set. The Superficial Rockwell scales use lower force and shallower impressions on brittle and very thin materials. Applying a preload of 3kgf first and a main test force of 15, 30 or 45kgf.
- **Vickers (HV)** Indenting the test material with a diamond indenter, in the form of an upside down perfect pyramid with a square base and an angle of 136° between opposite faces, subjected to test forces of 1 to 120kgf. A microscope or USB camera visualizes and measures the indentation.
- **Micro-Vickers (HV)** Indenting the test material with a diamond indenter, in the form of an upside down perfect pyramid with a square base and an angle of 136° between opposite faces, subjected to test forces usually not exceeding 1kgf. A precision microscope or high resolution USB camera is used to visualize and measure the indentations. Magnifications up to 600x are most common, but magnifications up to 1000x are becoming popular as well.
- **Knoop (HK)** Indenting the test material with an 'elongated' diamond pyramid, subjected to test forces usually not exceeding 1kgf. A precision microscope or high resolution USB camera visualizes and measures the indentations. Magnifications up to 600x are most



Hardness

Hardness is the property of a material enabling it to resist plastic deformation, usually by penetration of another object. The term may also refer to stiffness, temper or resistance to bending, scratching, abrasion or cutting. Scientists and journalists often confuse stiffness with Hardness. For example, the element Osmium is stiffer than, but not as hard as, diamond.

In materials science there are three principal operational definitions of hardness:

- **Scratch Hardness** Resistance to fracture or plastic (permanent) deformation due to friction from a sharp object.
- **Indentation Hardness** Resistance to plastic (permanent) deformation due to a constant load from a sharp object.
- **Rebound Hardness** Height or speed of the bounce of an object dropped on the material, related to elasticity.

Hardness is not an intrinsic material property. There are no precise definitions in terms of fundamental units of mass, length and time. A Hardness property value is the result of a defined measurement procedure.

Hardness of materials has long been assessed by resistance to scratching or cutting. An example would be that material B scratches material C, but not material A. Alternatively, material A scratches material B slightly and scratches material C heavily.

The usual method of obtaining a Hardness value is to measure the depth or area of an indentation left by an



indenter of a specific shape, with a specific force applied for a specific time.

There are several principal standard test methods to express the relationship between hardness and the size of the impression or the rebound velocity on specific materials. Vickers, Rockwell, Brinell and Leeb are the most common scales. For practical and calibration reasons, each of these methods is divided into a range of scales, defined by a combination of applied load and indenter geometry or, in the case of the rebound method, by the weight of the impact body.

common.

- **Brinell (HB)** Indenting the tested material with a 1, 2.5, 5 or 10mm diameter hardened steel or carbide ball subjected to a load/force ranging from 1 to 3000kg. A microscope or USB camera is used to visualize and measure the rather large indentations.
- **Leeb (HL) (rebound method)** Portable hardness testing. An impact body with a spherical tungsten carbide tip is impelled onto the test surface by spring force. The impact creates a plastic deformation of the surface – an indentation – that causes the impact body to lose part of its original speed (or energy). The softer the material is, the more speed will be lost at rebound of the impact body. Applicable to a wide variety of components, minimum test requirements should be obeyed.
- **Ultrasonic (UCI)** Portable hardness testing. A Vickers shaped diamond indenter fixed on a vibrating rod that presses on the test surface with a specific force and then measures its hardness by applying ultrasonic vibrations and analyzing its damping effect. Commonly used for small, thin components that cannot be tested by rebound hardness testers.
- **Shore (HS scales)** Portable (rubber/plastics) hardness testing. Hardness is determined by pressing the indenter foot firmly onto the sample. The indenter is connected to a linear measuring device and measures the indent depth, which is then converted through a mechanical or an electronic system to the Shore value. The deeper the indent, the softer the material.
- **IRHD** Measures the indentation resistance of

elastomeric or rubber materials based on the depth of penetration of a ball indenter. An initial contact force is applied to a 1, 2.5 or 5mm ball indenter and penetration is set to zero. The force is increased to a specified total load and the depth of penetration is measured. The IRHD value is related to the depth of indenter penetration. Commonly used for testing small parts and O-rings.

- **Webster** Portable hardness testing. The object to be tested is placed between the anvil and the penetrator. Pressure is then applied to the handles until 'bottom' is felt, at which time the dial indicator is read. There are different types of indenters and different force settings for different materials.

Less Common Scales

- **HM**
Martens (formerly HU - universal hardness).
- **H**
Ball indentation hardness
- **HVT**
Modified vickers method, depth measurement
- **HBT**
Modified brinell method, depth measurement



Rockwell Hardness testers

FH30

The model FH 30 is an automatic, load cell, closed loop, force feedback, test force application system with Rockwell, Superficial Rockwell & Brinell scales as part of Hardness testing capabilities.

Features and benefits

- Load cell, closed loop, force feedback system
- 150mm protruding nose, 200mm throat depth(30-5)
- Load range 1-250kgf (9.8-2452N)
- Meets or exceeds ISO, ASTM and JIS standards
- Force(load) measurement at the indenter position
- 250mm workpiece height(30-5)
- Power LED light near indenter for bright sample illumination
- Removable workpiece clamp, with interchangeable inserts, clamps/holds sample firmly in position (optional)
- Industrial 6.5" touch screen
- USB connectivity
- ABS cover included, protecting machine base against falling objects
- Optional Brinell microscope package, for brinell measurement



FH30-4

MODEL DETAILS

FH-030-0004	3-150kgf 1-250kgf	Rockwell, Superficial Rockwell Brinell (optional)
FH-030-0005	3-150kgf 1-187.5kgf	Rockwell, Superficial Rockwell Brinell (optional)

STANDARD ACCESSORIES

- Power cable
- Four adjustable feet
- Certificate
- Installation and user manual



FH30-5



FH30-4



FH31

The model FH 31 is an automatic, load cell, closed loop, force feedback, test force application system with Rockwell, Superficial Rockwell & Brinell scales as part of Hardness testing capabilities.

Features and benefits

- Load cell, closed loop, force feedback system
- 150mm protruding nose, 200mm throat depth (FH31-3)
- Load range 1-250kgf (9.8-2452N)
- Meets or exceeds ISO, ASTM and JIS standards
- Force(load) measurement at the indenter position
- Absolute linear applied test force, no lever construction
- 400mm workpiece height (FH31-3)
- Removable workpiece clamp, with interchangeable inserts, clamps/holds sample firmly in position (optional)
- Integrated high performance system controller, mSSD hard drive storage
- Industrial touch screen 8.5" (FH31-3), 6.5" (FH31-2)
- LAN, W-LAN, USB connectivity
- ABS cover included, protecting machine base against falling objects
- Optional palm scanner for automatic brinell measurement



FH31-2

MODEL DETAILS

FH-031-0002	3-150kgf 1-250kgf	Rockwell, Superficial Rockwell Brinell (optional)
FH-031-0003	3-150kgf 1-187.5kgf	Rockwell, Superficial Rockwell Brinell (optional)

STANDARD ACCESSORIES

- Keyboard & mouse
- Power cable
- Four adjustable feet
- Certificate
- Installation and user manual



FH31-2



FH31-3



FH1

The model FH 1 is a fully automatic, load cell, closed loop, force feedback, test force application system with Rockwell, Superficial Rockwell & Brinell (optional) scales as part of Hardness testing capabilities.

Features and benefits

- Fully automatic, load cell, closed loop, force feedback system
- Load range 1-250kgf (9.8-2452N)
- Meets or exceeds ISO, ASTM and JIS standards
- Optional palm scanner for Brinell Hardness testing
- Clamp for indenter protection & workpiece fixation
- Full color industrial 6.5" HD touch screen interface
- Real feel rubber buttons for workflow control
- Adjustable workpiece illumination
- Solid C-frame and spindle with spindle bellows
- Large workpiece accommodation: 315x200mm (HxD)

STANDARD ACCESSORIES

- Power cable
- Four adjustable feet
- Certificate
- Installation and user manual



FH1-7

MODEL DETAILS

FH-001-0007	3-150kgf	Rockwell, Superficial Rockwell
	1-250kgf	Brinell (optional)



FH1-7

FH11 - Rockwell

The model FH 11-52 is a digital twin scale, load cell, closed loop, force feedback, test force application system with Rockwell, Superficial Rockwell & Brinell (optional) scales as part of Hardness testing capabilities.

Features and benefits

- Digital, twin scale, load cell, closed loop, force feedback system
- Load range 3-150kgf (29.4-1471N)
- Meets or exceeds ISO, ASTM and JIS standards
- Built-in laser positioning system (optional)
- Full color industrial 15" touch screen interface
- Adjustable workpiece illumination
- Manual, motorized stages
- Large workpiece accommodation: 345x220mm (HxD)



FH11-52

STANDARD ACCESSORIES

- Power cable
- Four adjustable feet
- Certificate
- Installation and user manual

MODEL DETAILS

FH-011-0052	3-150kgf	Rockwell, Superficial Rockwell Brinell (optional)
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FH11-52



FH12 - Rockwell

The model FH 12-38 is a load cell, closed loop, force feedback, test force application system with Rockwell, Superficial Rockwell & Brinell scales as part of Hardness testing capabilities.

Features and benefits

- Load cell, closed loop, force feedback system
- Load range 3-150kgf (29.4-1471 N)
- Meets or exceeds ISO, ASTM and JIS standards
- Motorized Z axis (standard)
- Descending test head with automatic workpiece detection
- PC based Horizon hardness testing firmware and database file system, standard
- Large, adjustable 15" industrial touch screen
- Brinell option: optical - high resolution palm scanner with on screen auto read and fine tune adjustments of indentation
- Testing procedure and results storage on internal harddrive
- LAN, WLAN, USB-2, RS232, printer and DVI connectivity, standard
- On board built-in driver for (optional) motorized XY stage, standard
- Free definable test patterns case depth, traverse, free style, etc, optional
- Raise and lower upto 600kg specimen (standard)
- Floor standing model

STANDARD ACCESSORIES

- T-slot testing table 650x500mm
- Single indenter position
- 5MP palm scanner (Brinell)
- Built-in 3 axis support driver
- Toolset and power cable
- Four adjustable feet
- Certificate
- Installation and user manual



FH12-38

MODEL DETAILS

FH-012-0038

3-150kgf

Rockwell, Superficial Rockwell, Brinell(optional)



FH12-38

Vickers Hardness testers

FH6

The model FH 6 series, Micro Vickers, Vickers, Knoop, Brinell Hardness testing machines is a new generation that uses a unique, electronically controlled, closed loop system and advanced force sensor technology to achieve absolute accuracy, reliability and repeatability.

Features and benefits

- Load cell, closed loop, force control
- Load range 1gf-62.5kgf (0.0098-613N)
- Meets or exceeds ISO, ASTM and JIS standards
- Advanced measurement options; single, serial measurements, 2 high definition camera systems
- Intelligent workpiece positioning
- Auto brightness, contrast, sharpness and focus
- Anti-collision system for objectives and indenters
- High power LED vertical illuminator with filter position
- 15" portrait mode, HD industrial touchscreen
- Connectivity: four USB, RJ45 ethernet, LAN, W-LAN, RS232, Bluetooth



FH6

MODEL DETAILS

FH-006-0001	5gf-2kgf	Vickers, Knoop
FH-006-0009	200-62.5kgf	Vickers, Knoop, Brinell
FH-006-0011	1gf-62.5kgf	Vickers, Knoop, Brinell

STANDARD ACCESSORIES

- One indenter position/actuator installed
- One objective 10x, one objective 50x
- Four vibration dampers
- Power cable, spare fuse
- Certificate of calibration
- Installation and user manual



FH6



FH7

The model FH7 series, Micro Vickers, Vickers, Knoop, Micro Brinell Hardness testing machines is a new generation that uses a unique, electronically controlled, closed loop system and advanced force sensor technology to achieve absolute accuracy, reliability and repeatability.

Features and benefits

- Load cell, closed loop, force control
- Load range 50gf-250kgf (0.5-2452N)
- Meets or exceeds ISO, ASTM and JIS standards
- Fully automatic advanced co-ordinate pattern, weld pattern and free style testing of metallic and plastic parts in any common hardness scale
- 8 position, advanced high speed turret(optional)
- Quick change stage and anvil post
- Anti-collision system for objectives and indenters
- High power LED vertical illuminator with filter position
- 15" portrait mode, HD industrial touchscreen
- Connectivity: four USB, RJ45 ethernet, LAN, W-LAN, RS232, Bluetooth

STANDARD ACCESSORIES

- 5MP HD indent viewing camera
- Motorized Z-axis
- Powerful embedded micro-controller, MS windows 10, 80GB SSD data storage
- Four vibration dampers
- Power cable, spare fuse
- Certificate of calibration
- Installation and user manual



FH7

MODEL DETAILS

FH-007-0004	50gf-250kgf	Vickers, Micro-Vickers, Knoop, Micro Brinell
FH-007-0005	200gf-250kgf	Vickers, Micro-Vickers, Knoop, Micro Brinell
FH-007-0006	50gf-62.5kgf	Vickers, Micro-Vickers, Knoop, Micro Brinell



FH7



FH14

The model FH 14 series, Micro Vickers, Vickers, Knoop Hardness testing machines is a new generation of instruments, improving conventional Hardness testing methods and focused on eliminating user influence on the test results.

Features and benefits

- Load cell, closed loop, force control
- Load range 5gf-2kgf (0.05-20N)
- Meets or exceeds ISO, ASTM and JIS standards
- Smart touch work flow control
- Auto brightness and contrast
- Anti-collision system for objectives and indenters
- High power LED vertical illuminator with filter position
- USB, RS232 port, one camera USB port
- Upto 170mm specimen height accomodation

STANDARD ACCESSORIES

- One indenter position/actuator installed
- One objective 10x, one objective 50x
- Four vibration dampers
- Power cable
- Spare fuse
- Four adjustable feet
- Certificate of calibration
- Installation and user manual



FH14-1

MODEL DETAILS

FH-014-0001

5gf-2kgf

Vickers, Knoop





Brinell Hardness testers

FH9

The model FH 9 is a Brinell Hardness testing machines is a new generation that uses a unique, load cell based, closed loop system and integrates a precision optical system with high quality objectives and a digital display.

Features and benefits

- Load cell, closed loop, force control
- Load range 31.25-3000kgf (306N-29kN)
- Meets or exceeds ISO, ASTM and JIS standards
- Full-color industrial touch screen 7.5" (FH9-26) & 15" (FH9-32)
- Simultaneous conversion to Rockwell, Vickers and Leeb rebound testing
- 6 position motorized turret; 3 indenters, 2 brinell objectives with ring lights and 1 laser positioning system (FH9-32)
- Brinell digital scanner (CCD camera) for automatic indent measurement (FH9-26)
- Horizon high performance PC-based camera indent measuring system. Automatic measurement of the indent on the industrial touch screen. Archive file, handle images and data on the tester or your network

FH9-32



MODEL DETAILS

FH-009-0026	62.5-3000kgf	Brinell with scanner
FH-009-0032	31.25-3000kgf	Brinell

STANDARD ACCESSORIES

- Fuse 2A (3pcs)
- RS232, USB, and/or RJ45 connections for data output
- Four adjustable feet
- Power cable
- Certificate of calibration
- Installation and user manual

FH9-26



FH9-32





Universal Hardness testers

FH11 - Universal

The model FH 11-50/51 is a Universal system with load cell, closed loop, force feedback, test force application having Rockwell, Superficial Rockwell, Vickers, Knoop & Brinell scales as part of Hardness testing capabilities.

Features and benefits

- Load cell, closed loop, force feedback system
- Load range 200gf-3000kgf (1.96-29kN)
- Meets or exceeds ISO, ASTM and JIS standards
- Descending test head with automatic workpiece detection
- Free definable, manual or motorized 8 position turret for objectives and indenters
- High definition optical system for images of 0.7x to 1000x magnification
- 18MP full HD camera system
- PC based Horizon Hardness testing firmware and database file system, standard
- Large, adjustable 15" industrial touch screen
- Automatic or manual focus, manual or fully automatic indent measurement, standard
- Testing procedure and results storage on embedded harddrive
- LAN, WLAN, USB-2, RS232, printer and DVI connectivity, standard
- On board built-in driver for (optional) motorized XY stage, standard



FH11-51

MODEL DETAILS

FH-011-0050	200gf-250kgf	Rockwell, Superficial Rockwell, Vickers, Knoop, Brinell, Ball indentation, HVT, HBT
FH-011-0051	200gf-3000kgf	Rockwell, Superficial Rockwell, Vickers, Knoop, Brinell, Ball indentation, HVT, HBT

STANDARD ACCESSORIES

- Motorized turret with 8 positions
- Objectives for 0.7x-1000x magnification
- Built-in 3 axis support driver
- Toolset and power cable
- Certificate
- Installation and user manual



FH11-51



FH12 - Universal

The model FH 12-37 is a Universal system with load cell, closed loop, force feedback, test force application having Rockwell, Vickers, Knoop & Brinell scales as part of Hardness testing capabilities.

Features and benefits

- Load cell, closed loop, force feedback system
- Load range 5-3000kgf (49N-29kN)
- Meets or exceeds ISO, ASTM and JIS standards
- Motorized Z axis (standard)
- Descending test head with automatic workpiece detection
- Free definable, manual or motorized 6 position turret for objectives and indenters
- High definition optical system for images of 0.7x to 1000x magnification
- PC based Horizon Hardness testing firmware and database file system, standard
- Large, adjustable 15" industrial touch screen
- Automatic or manual focus, manual or fully automatic indent measurement, standard
- Testing procedure and results storage on embedded harddrive
- LAN, WLAN, USB-2, RS232, printer and DVI connectivity, standard
- On board built-in driver for (optional) motorized XY stage, standard
- Free definable test patterns case depth, traverse, free style, etc, optional
- Raise and lower upto 600kg specimen (standard)
- Floor standing model

STANDARD ACCESSORIES

- T-slot testing table 650x500mm
- Motorized turret with 6 positions
- Objectives for 0.7x-1000x magnification
- Built-in 3 axis support driver
- Toolset and power cable
- Certificate
- Installation and user manual



FH12-37

MODEL DETAILS

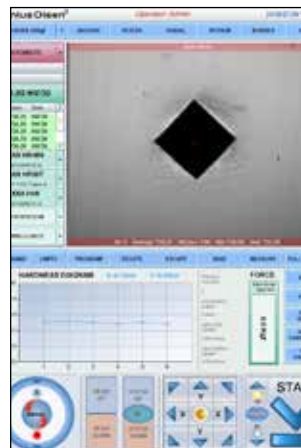
FH-012-0037	5-3000kgf	Rockwell, Vickers, Knoop, Brinell, Ball indentation, HVT, HBT
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FH12-37

Horizon control software

Sample screenshots from our on-board Horizon Hardness software show the simple menu-driven simplicity of the software.



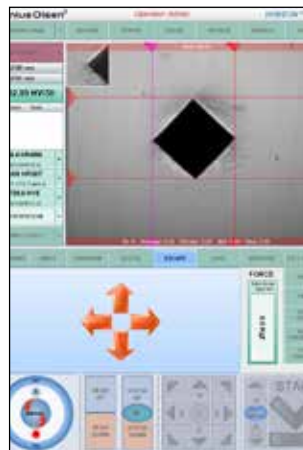
Screen 1: Results from a five-location Hardness test showing the mean and standard deviation of the results.



Screen 2: User-defined pattern/sequence of Hardness measurement locations.



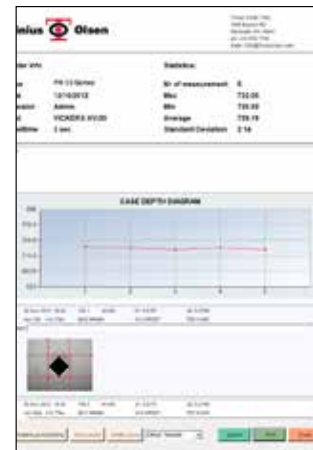
Screen 3: Test selection menu.



Screen 4: Filar lines option to manually define the precise edges of the indent, along with the zoom measurement option.



Screen 5: The conversion options between the different scales.



Screen 6: Report generation process. Reports are printed directly from the tester.

HORIZON ANALYSIS AND CONTROL SOFTWARE

Sample screenshots from our PC-based Horizon analysis and control software. This software can take data from multiple machines types and produce a single test report that displays all results in your chosen formats; these screens shows the different machine set-up and control capabilities of different hardness scales.



Tinius
Olsen



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