

Hardness

Wallace Bench Hardness Testers

Wallace offer both macro and micro bench-mounted models for evaluating the hardness of rubber in two different measurement scales – IRHD and Shore.

All these robustly designed models conform to international testing standards.

H14 Macro IRHD Hardness Tester
H12 Micro IRHD Hardness Tester
H17A/C/D/O Macro Shore Hardness Tester
H17M Micro Shore Hardness Tester



Versions

To suit customers' varying needs and budgets, Wallace offer 4 versions for each bench-mounted model – from a basic, standalone version to a computer-linked version:

1. Basic, Stand alone

Features include:

- Touch button, automatic operation
- Visual LED indication of foot and indenter contact
- Digital display with programmable resolution to 0.1, 0.5 or 1 units
- Built-in diagnostics to check instrument's internal settings

2. With Printer

The compact, high-speed, 24 character-width printer, provides a permanent record of results and instrument settings.

Various parameters can be set including:

- Sample identification with auto-increasing suffix
- Date and time of test
- Traceability of aborted tests

3. With Printer and Data Input Terminal

The data input terminal contains a 16 character, two-line LCD display and QWERTY keypad. It supplies additional information on the operation of the hardness tester and offers the user several new options.

Test parameters are more easily set. Data for operator and sample identification can be entered. The timing of the primary and secondary indenter loads (H12 and H14) can also be pre set.

Other features include:

- Data and time recording and traceability
- Calibration check reminder

4. PC Interface

This version provides a RS232C interface. Data is transmitted at the end of a test, allowing a PC to collect the results.

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H14 Macro IRHD Hardness Tester

- One touch, fully automatic operation
- Accurate and consistent results
- Easy access to sample area
- Operator dependency reduced
- Range of sample tables
- Four models offered

The Wallace H14 is a digital, bench-mounted hardness tester designed for measuring in IRHD the hardness of standard rubber samples.

The robust, 'C' frame design allows the operator easy access from front and sides to safely load and remove samples. The indenter mounting is essentially frictionless and its position sensed by a linear variable differential transformer, providing the instrument with outstanding sensitivity. The adjustable anti-vibration feet reduce the effect of external vibration.

By simply pressing the start button, the instrument functions automatically, allowing accurate, repeatable results to be recorded in much less time than traditional models.

As minimal training is required, new operators soon become confident with the H14, achieving consistent readings from the outset.

A range of optional sample tables is available, designed to locate samples of varying shapes and special holding fixtures.

Keys on the front panel easily adjust the measuring head up and down to suit the sample height.

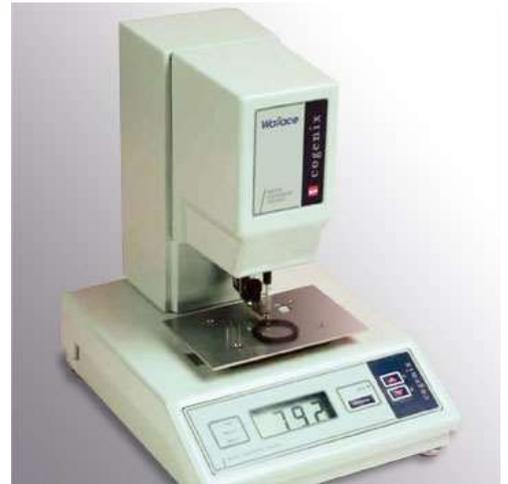
Once the start key is pressed, the foot descends to secure the sample, followed by the indenter, which lowers through the centre of the foot with a primary load of 0.3N to find its datum position. After 5 seconds, in line with the testing standards, the force is increased to 5.7N and applied for a further 30 seconds. At this point the instrument identifies the indenter position and the hardness value is automatically frozen and displayed clearly on the LCD screen. Two LEDs on the instrument's front panel monitor all stages of the test cycle.

Four instrument models are offered:

Hardness: Wallace Bench Hardness Testers

H14/1 Basic, stand alone - H14/2 with Printer - H14/3 with Printer and Data Input Terminal - H14/PC

Specification



H14 Macro IRHD Hardness Tester	
Dimensions	214mm (w) x 255mm (d) x 300mm (h)
Weight	7.5kg
Resolution	0.1 units
Indenter shape	Sphere
Indenter diameter	2.50mm
Full range display	1.8mm
Force method	Weight
Foot force	8.3N
Primary indenter force	0.3N
Secondary force	5.4N
Force duration	5 + 30 seconds
Minimum sample thickness	8mm
Standards	BS ISO 48 (was BS 903: Pt. A26), DIN ISO 48 □ ASTM D 1415

H12 Micro IRHD Hardness Tester

- Tests small/thin samples and O-rings
- One-touch, fully automatic operation
- Accurate and consistent results
- Easy access to sample area
- Operator dependency reduced
- Range of sample tables

The Wallace H12 is a digital bench-mounted hardness tester that measures in IRHD the hardness of most rubber samples. In particular it has been designed to accurately test thin sections and small test pieces such as O-rings.

The robust, 'C' frame design allows the operator easy access from front and sides to safely load and remove samples. The indenter mounting □ is essentially frictionless and its position sensed by a linear variable differential transformer, providing the instrument with outstanding sensitivity. Adjustable anti-vibration feet reduce the effect of external vibration.

By simply pressing the start button, the instrument functions automatically, allowing accurate, repeatable results to be recorded in much less time than traditional models.

As minimal training is required, new operators soon become confident with the H12, achieving consistent readings from the outset.

Hardness: Wallace Bench Hardness Testers

A range of optional sample tables are available, designed to locate samples of varying shapes and special sample holding fixtures. It includes the O-ring adaptor (H19/ORR) that ensures the centre of the ring is directly beneath the centre line of the indenter.

Keys on the front panel easily adjust the measuring head up and down to suit the sample height. Once the start key is pressed, the foot descends to secure the sample, followed by the indenter, which lowers through the centre of the foot with a primary force of 8.3mN to find its datum position. After 5 seconds, in line with the testing standards, the force is increased to 153.3mN and applied for a further 30 seconds. At this point the instrument identifies the indenter position and the hardness value is automatically frozen and displayed clearly on the LCD screen.



Four instrument models are offered:

H12/1 Basic, standalone - H12/2 with Printer - H12/3 with Printer and Data Input Terminal - H12/PC

Specification

H12 Micro IRHD Hardness Tester	
Dimensions	214mm (w) x 255mm (d) x 300mm (h)
Weight	7.5kg
Resolution	0.1 units
Indenter shape	Sphere
Indenter diameter	0.395mm
Full range display	0.3mm
Force method	Weight
Foot force	235mN
Primary indenter force	8.3mN
Secondary force	145mN
Force duration	5 + 30 seconds
Minimum sample thickness	1.5mm
Standards	BS ISO 48 (was BS 903: Pt. A26), DIN ISO 48□ASTM D1415

H17 Shore Scale Hardness Tester

- Tests soft and hard materials using different Shore scales
- One-touch, fully automatic operation
- Accurate and consistent results
- Easy access to sample area
- Operator dependency reduced
- Range of sample tables
- Four versions offered for each model

The Wallace range of H17 digital, bench-mounted hardness testers is designed for measuring in Shore scale the hardness of various materials. Four models are offered – the H17A for testing standard rubber, H17O for soft rubber and medium density textiles, H17D for hard rubbers and plastics and H17M for thin/small rubber samples.

The robust, 'C' frame design allows the operator easy access from front and sides to safely load and remove samples. The adjustable anti-vibration feet reduce the effect of external vibration.

Hardness: Wallace Bench Hardness Testers

By simply pressing the start button, the instrument functions automatically, allowing accurate, repeatable results to be recorded in much less time than traditional models.

As minimal training is required, new operators soon become confident with the H17, achieving consistent readings from the outset.

A range of optional sample tables is available, designed to locate samples of varying shapes, sizes and special holding fixtures. Keys on the front panel easily adjust the measuring head up and down to suit the sample height.



Once the start key is pressed, the foot descends to secure the sample. In line with the testing standards, once the foot contacts the sample the indentation depth is recorded after a pre set dwell time, typically 3 seconds. At this point the instrument identifies the indenter position and the hardness value is automatically frozen and displayed clearly on the LCD screen.

Four instrument models are offered:

H17/1 Basic, stand alone - H17/2 with Printer - H17/3 With Printer and Data Input terminal - H17/PC

Specification

Model	H17A	H17D	H17O	H17M
Dimensions	214(w) x 255(d) x 300(h) mm	214(w) x 255(d) x 360(h) mm	214(w) x 255(d) x 300(h) mm	214(w) x 255(d) x 300(h) mm
Weight	8.7kg	13.7kg	8.7kg	8.7kg
Resolution	0.1	0.1	0.1	0.1
Indenter shape	35° Cone (Frustum)	30° Cone	½ Spherical	30° Cone
Indenter radius	Flat	0.1mm	1.19mm	0.79mm
Full scale	2.5mm	2.5mm	2.5mm	1.25mm
Force method	Spring	Spring	Spring	Spring
Max. indenter force	8.05N	44.45N	8.05N	0.765N
Force duration	1 or 3 seconds	1 or 3 seconds	1 or 3 seconds	1 or 3 seconds
Minimum sample thickness	6mm	6mm	6mm	1.25mm
Standards	Shore A Scale : BS/DIN ISO 7619-1, ISO 7619-1, ASTM D2240, JIS K6301 Shore O Scale : ASTM D2240, Shore D Scale : ASTM D2240, Shore M Scale : ASTM D2240			

Test Blocks and Sample Tables

Rubber Hardness Test Blocks are available in 5 scales – IRHD (Macro), IRHD (Micro), Shore A, D and M. They are manufactured from high-quality rubber formulated to resist the ageing effects on hardness of temperature and time.

The test blocks are for use as a check to ensure instruments are functioning properly and read correctly. They are not intended as standards with specific hardness values. Test blocks should be returned to Wallace every 12 months for re-calibration. The table below lists the test blocks available.

Test blocks	Scale	Hardness range (type)	Quantity of	Instrument model
H10	IRHD	40 - 90	6	H1, H2, H3, H14, H15,
H11	IRHD Micro	40 - 70	4	H5, H5A, H5B, H12

Hardness: Wallace Bench Hardness Testers

H10A	Shore A	20 - 90	6	H16A, H17A,
H10D	Shore D	30 - 80	5	H16D, H17D,
H11M	Shore M	40 - 70	4	H17M

Sample Tables for Wallace Hardness Testers

These sample tables will suit any of the bench-mounted Wallace Hardness Testers, including the H12, H14 and H17 models. The tables accurately locate onto precision dowels, so no extra fixings are required.

'V' Groove Tables

For location of solid section extrusions and mouldings. Dimensions, 180mm (w) x 76mm (d)

H19/2 1mm wide 'V' groove

H19/3 4mm wide 'V' groove

H19/4 8mm wide 'V' Groove

H19/5 Matrix Table

For precise location of sample holding fixture. Dimensions: 180mm (w) x 76mm (d) □ The matrix consists of 126 holes located on 10mm centres. Alternate holes are tapped to accept M3 threaded screws or drilled to 3mm to accept a dowel.

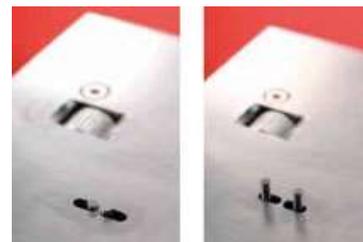
H19/ORA O-ring Holder

To locate the centre of an O-ring directly beneath the indenter of Wallace Micro Hardness Testers.

Upon turning the knurled wheel, 2 gear driven pins rise from the surface to locate the O-ring. The holder accommodates cross section diameters of between 1 and 5.5mm.

H19/7 Oversized Table

A flat surface for easy positioning of large samples. Dimensions: 300mm (w) x 76mm (d)



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Hardness

Hardness (resistance to indentation) is one of the most widely measured properties used to characterize rubber, as it is a practical way of determining the degree of vulcanization.

Two measurement scales are in general use – International Rubber Hardness Degrees (IRHD) and the Shore scale. The two test methods use totally different indenter geometries, indenter forces, test time and procedures.

IRHD is used specifically to evaluate rubber whereas Shore has developed into several different scales for testing a wide range of materials – from foam to hard plastics. Two Shore scales are relevant to rubber: 'A', which is used for evaluating rubbers, and 'D', for hard rubbers and plastics.

The IRHD hardness tester specifies an indenter with a 2.5mm spherical tip, whereas the Shore A instrument uses a 35° cone with a 0.79mm diameter flat tip. The indenter force is applied by a constant load in an IRHD instrument but by a spring in the Shore model. The Shore A scale is linear whereas, the IRHD is nonlinear (see graph 1).

Much work has been done to evaluate the relationship between IRHD and Shore A, for example in 1993 Briscoe and Sebastian concluded $IRHD = Shore A + 4^\circ$, but they found this varied significantly for different types of rubber.

Micro hardness scales

Both IRHD and Shore micro (M) scales have been developed for testing thin/small rubber samples. The original micro scale was IRHD, which was developed in the 1950s and resulted in Wallace's renowned H5 Micro Hardness tester, which was very successful and in production for over 40 years.

For the IRHD micro scale, indenter displacements are deliberately set at $1/6^{th}$ of the original 'macro' scale and forces at $1/36^{th}$. This makes results between IRHD micro and macro tests comparable. However, Shore M is not designed as a scaled-down version of the Shore A but as a test capable of evaluating hardness of smaller samples. Shore M uses an indenter and spring unrelated to those specified in the A scale, so there is no clear relationship between the two.

Hardness testing of thin/small samples

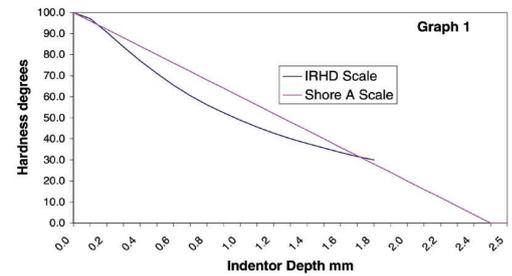
Operators should consider procedures carefully to achieve accuracy, for example:

1. By using a macro tester on thin rubber, they may record an unrealistically high value as the instrument measures the effect of the hard table beneath the sample (see graph 2).
2. When measuring an O-ring, they should consider using a device that ensures the centre of the ring is directly beneath the indenter. Otherwise a falsely low value may be recorded (see graph 3).
3. When measuring thin rubber, they should ensure it is lying perfectly flat on the sample table. Otherwise part of the indenter force will be absorbed flattening the sample, not measuring its hardness, leading to a falsely low result.
4. Micro-hardness scales involve very small indenter displacements e.g. for an average rubber, 1 IRHD = .005mm (5 microns). So for best performance and accuracy it is important that micro testers are handled carefully and regularly serviced and calibrated.

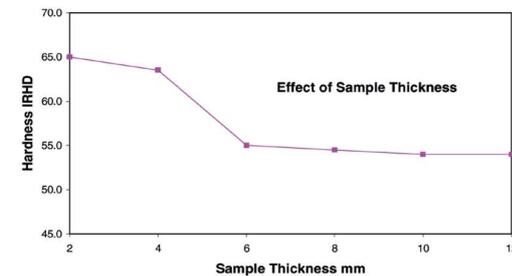
Bench mounted v hand held?

Bench-mounted hardness testers produce the most repeatable and reliable results. Pocket meters, although convenient for outside the laboratory, do rely entirely on the operator's hand pressure and a consistent 90° (vertical) angle of application.

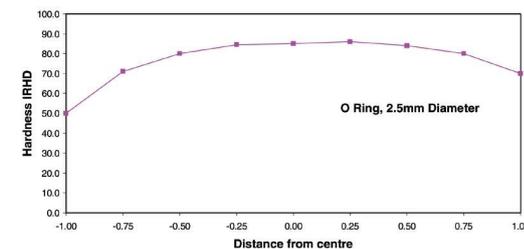
We supply bench mounted IRHD or Shore Scale Instruments, in Macro or Micro versions, we are confident you will find the correct instrument for your needs from the extensive range of Wallace Hardness Testers.



Graph 1



Graph 2



Graph 3

Hardness: **Wallace Bench Hardness Testers**

**Our sales team can be contacted on:
info@wallaceinstruments.com
T: +44 (0)1306 867417**

Owing to continuous development, we reserve the right to introduce improvements and modify specifications without prior notice.