



## BENCH & FLOOR TYPE HARDNESS TESTERS

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**WWW.INNOVATEST-EUROPE.COM**

# About us

## INNOVATEST® Group of companies

With its foundation laying in the 19th century (1890) INNOVATEST® has a rock solid position in the market of materials testing instruments, optical measuring equipment and general testing instruments such as surface roughness, wall thickness, vibration, and other portable testing equipment.

For the last 28 years, the owners have largely invested in the product tier Hardness Testing, while still keeping their focus on other product lines.

### Commitment

With a wide range -, fit to any budget -, offering both traditional and state-of-the-art testing instruments, INNOVATEST® is one of the market leaders in hardness testing solutions.

Committed to solve your testing problem and not just selling products:

- Solution driven
- High quality standard
- Traditional and state-of-the art technology
- Solutions and technology that fit your budget
- Global sales network
- Global service capabilities
- Superior guarantee system

### Development

A significant part of our revenues combined with European and local government funding are continuously invested in new product development. With our eyes firmly focused on the future, we are committed to advance and innovate our product line, in order to be a competent market player, offering our customers reliable, "fit for purpose" technology and affordable service and support.

The VERZUS™ series of Load Cell Closed Loop hardness testers are just a first step towards implementing new technologies. The NEMESIS 9000™ will change the way we look at hardness testing for ever.

New machine vision systems will complete hardness testing technology, while new materials offer the possibility to develop more advanced multifunction equipment.

### Service and calibration

We have confidence in our products. Therefore we offer a (limited) guarantee of 2 years or longer on all our products. All products are supplied with a quality and guarantee certificate and a service passport.

Our modern workshops and professional technical staff offer service on demand, at any time and at any location in the world. First line, local after sales service and support.

### Product portfolio

INNOVATEST® develops and manufactures hardness testing instruments, accessories and machine vision systems as well as tester automation. The company further supplies a range of optical instruments such as microscopes, profile projectors, vision measuring systems, roughness testers, wall thickness testers, coating thickness gauges, vibration meters and other quality assurance instruments.

Our goal is to bring you confidence and to reach absolute customer satisfaction by offering high quality affordable instruments and an ever lasting service.

We welcome you to challenge us.

R.H.J.M. Engbersen  
Managing Director  
Chief Executive Officer

# Hardness testing

## Hardness

Hardness is the property of a material enabling it to resist plastic deformation, usually by penetration of another object. The term “hardness” may also refer to stiffness, temper or resistance to bending, scratching, abrasion or cutting. Scientists and journalists often confuse stiffness with hardness. This however is incorrect. Osmium (platinum family) is stiffer than diamond 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.

## Measuring hardness

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

The usual method to obtain 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 case of the rebound method, by the weight of the impact body.



# Hardness testing

## 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 60Kgf, 100Kgf, 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 15Kgf, 30Kgf, or 45Kgf.

### **Vickers (HV)**

Indenting the test material with a diamond indenter, in the form of an inverted perfect pyramid with a square base and an angle of 136 degrees between opposite faces, subjected to test forces of 1Kgf to 120Kgf.

A microscope or USB camera is used to visualize and measure the indentation.

### **Micro Vickers (HV)**

Indenting the test material with a diamond indenter, in the form of an inverted perfect pyramid with a square base and an angle of 136 degrees 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. However, magnifications up to 1000x are becoming popular as well.

### **Knoop (HK)**

Indenting the test material with a "elongated" diamond pyramid, 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.

### **Brinell (HB)**

Indenting the to be tested material with a 1, 2.5, 5, or 10mm diameter hardened steel or carbide ball subjected to a load/force ranging from 1kg 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 which has 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, due to which the impact body loses part of its original speed (or energy). Consequently, the softer the material is, the more speed will be lost at rebound of the impact body.

Applicable for 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.

# Hardness testing

## Most common hardness tests

### Shore (HS scales)

Portable (rubber/plastics) hardness testing.

The hardness value 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 electronical 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 the penetration is set to zero.

The force is increased to a specified total load and the depth of the penetration is measured. The IRHD value is related to the depth of indenter penetration.

The method is 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 hardness scales

The following hardness methods are less frequently used or superseded by other methods:

- **HM** Martens (instrumented indentation testing, formerly HU – universal hardness)
- **H** Ball indentation hardness
- **HVT** Modified Vickers method, depth measurement
- **HBT** Modified Brinell method, depth measurement
- **BARCOL** Impression hardness



## Installation of your tester



### **Rest assure with a proper installation.**

INNOVATEST® engineers have installed thousands of hardness testers worldwide.

Against reasonable costs, you can count on our expertise to make the installation of your valuable tester a success.

Our service team is equipped with load cells and test materials traceable to international standards.

The final check list and final testing will be done in your presence, ensuring you of a good working machine, properly installed and meeting its all over specifications when our engineers leave.

## Relocation of your equipment

Hardness testing instruments are sensitive equipment. They need to be installed on a solid table, in a vibration free environment. After installation, hardness testers cannot just be relocated to another area without taking proper precautions. Our experienced engineering team can advise you on how to move your tester or better, take care of the detailed planning, transport preparation, reinstalling, calibration and certification of your tester.

## Product training



### **Product training, user interface & test sample familiarization**

We offer training packages for each of our instruments in our well equipped training center. A one or two days course can be done directly after the installation of your equipment (on location).

Alternatively, it is also possible to do a full training at our facilities in The Netherlands.

# Service

## Support Desk



If you are in need of any immediate advice or assistance with regards to any of our products, contact the INNOVATEST® support desk at +31-43-3520060. In many cases, the support desk can offer immediately assistance to answer any questions you might have or solve any problem fast and effectively.

## Software customizing

In the early stage of your interest in our testers, our sales team will gather the required information to offer a product adapted to your individual requirements. Do not hesitate and ask for customized solutions on both software and hardware. In close cooperation with our customers we will develop and supply the right configuration for your job.

## Mechanical & software customizing



INNOVATEST® has developed many customized testers for particular testing tasks such as testing of irregular components at high and low temperatures. But also specific testing cases such as the testing of bullet shells (casings). We also design special fixtures to hold your sample perfectly in position.

Our testers can be equipped with motorized spindles, rotary tables, inclination systems, while workpiece positioning by robots are nowadays common requests.

## Service & maintenance



Reduce your possible down time risk. INNOVATEST® Service is available to do a regular check and standard maintenance on any of our testers regardless of the location. Regular service avoids unpleasant surprises.

At the same time our staff can update the standard software, if such updates are available. If in spite of regular service and good maintenance a tester is faulty, you can count on our service staff to be available at your request. (See also our general sales conditions).

# Service

## Calibration



Count on the broad experience of the INNOVATEST® service personnel for yearly calibration of your hardness testing machines.

Reference measuring equipment traceable to international standards such as ISO & ASTM make part of our calibration set. Our calibration, which includes possibly required adjusting, assures reliable testing results.

## Rental equipment

On many occasions INNOVATEST® will be able to offer you rental equipment if a short or long term lease will be more attractive than buying.

In particular we offer rental options for a wide range of portable instruments or leasing options for a wide range of bench hardness testers.

**Ask our sales department for rates and arrangements.**





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# IMPRESSIONS™

## IMPRESSIONS™ software

Hardness testing workflow control & user interface.

Hardness testing and work flow control software with full tester control functionality, easy to operate intuitive controls and a number of graphical presentations. IMPRESSIONS™ has been developed on a concept following the normal sequential procedures related to the particular hardness test (standard), such as:

preparing and setting up the test, executing the test, reviewing and editing results, and managing and reporting data.

No need to change pages or tab to another screen. All common tester functionality can be selected directly from the main screen without the need to view any other screen. Less frequently used settings are in sub menus that can be reached simply by a touch of on the high resolution screen.

The progress indicator follows and guides you through the natural workflow of the hardness test, prompting you to input information when needed. No unnecessary and confusing software options are displayed when not needed, as only necessary software functions will be available on the different steps.

As well as full tester control, IMPRESSIONS™ allows you to create an endless variety of standard test programs for retained parts or retained procedures. Setting up your tester from scratch is no longer required as all saved product settings are available in a blink of an eye.

Setting up a test program from scratch requires no more than 10 seconds while it can be stored with name and/or number as per your requirement. IMPRESSIONS™ not only controls the standard operation of your tester. Behind the start button, that will immediately launch the testing procedure, there are many additional functions.

With IMPRESSIONS™, INNOVATEST® has developed a software system, that eliminate results, while guaranteeing the application of ASTM, ISO or JIS standards in the test process. High resolution camera technology, overview camera's, automatic turret control, descender, optical ZOOM system and many additional advanced functions such as;