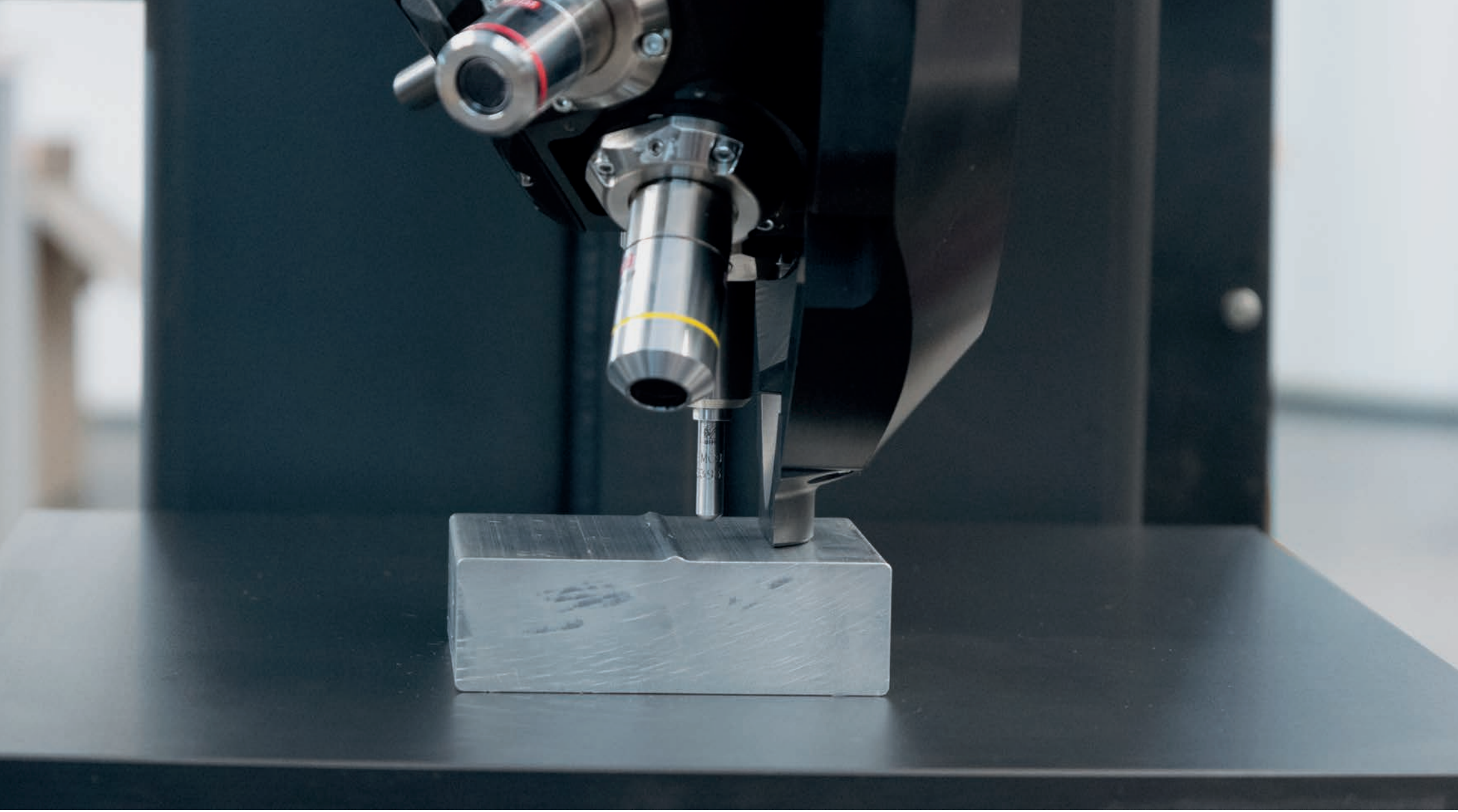


Machines for:

hardness testing on metals, ceramics and plastics

Zwick / Roell

Machines for:
hardness testing on metals, ceramics and plastics

Contents **Page**

1. ZwickRoell – Your reliable partner for hardness testing

160 years

of experience in quality assurance

Accredited ISO/IEC 17025 Calibration Laboratory

Accredited in accordance with ISO/IEC 17025

Connectivity and digitalisation – we accompany your future.

ZwickRoell offers innovative and flexible testing solutions developed in close cooperation with research and industry.

Reliable test results – from standard-compliant to customer-specific.

Test results are clearly displayed to enable long-term logging and later conclusions.
Individual export options facilitate transfer to customer-specific data storage.

> 300

M€ turnover in 2023

ISO

5 members

of ISO standardisation committees

Our success story is based on the vision of Karl Maier, who wanted to develop hardness testing machines that **"don't simply do everything, but do everything in hardness testing simply"** – simple tools that can also perform complex functions.

True to this motto, we have been developing and building hardness testing machines for generations.

Intelligent testing solutions

You will find the right solution for all testing tasks with us. From standardised testing against norms and standards for customer-specific test sequences, through changing test tasks within a test system, to fully automated, complex test sequences.

Hardness testing worldwide

We are represented in over 50 countries and offer our customers fast and reliable hardness testing solutions. With more than 100 experts in this field, we support our customers in testing their products for durability and reliability.

> 25.000

hardness testing machines installed worldwide

1800

employees, of which over 100 are in hardness testing

2. Overview of hardness testing methods

Hardness test methods are methods for determining the hardness of a material. The hardness is an important material parameter that allows conclusions to be drawn about wear resistance, strength, material quality and machining processes. There are numerous hardness testing methods that can be used, depending on the type of material and field of application.

Hardness testing starts by pressing a carbide metal ball, diamond cone or diamond pyramid into a specimen. The test force is always applied vertically, without impact and for a precisely defined dwell time.
The choice of the right hardness testing method depends on various factors, such as the type of material, the expected hardness, the surface condition and the precision required for the measurement.

Optical methods

With the Vickers, Knoop and Brinell optical test methods, the indentation created is measured (indentation diagonals, diameter) and the hardness value is calculated from this.

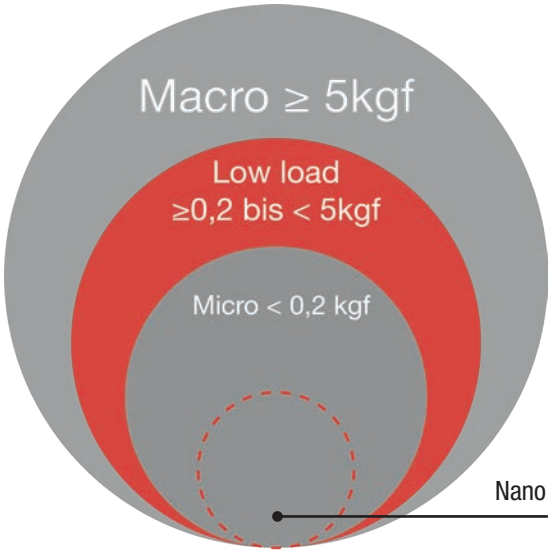
Depth difference method

Here a distinction is first made between methods with a constant force application (instrumental indentation testing, Martens) and methods with preload and main load (Rockwell, HBT, HVT).

In the Rockwell test, the indentation depth caused by the indenter is measured.
The deeper a defined indenter penetrates into the surface of a workpiece under a defined test force, the softer the tested material.

Distinction between the load ranges

Depending on the field of application, different main loads (test loads) are used during hardness testing. Depending on the level of the main load applied to a test specimen during the hardness test, a distinction is made in the ISO standard between micro, low-load and macro hardness testing.



Hardness testing methods

Static load application

An indenter with a carbide metal ball or diamond cone/diamond pyramid is pressed into a specimen lying on a solid surface. The test force is applied vertically, without impact and for a precisely defined dwell time.

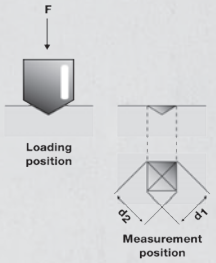
Dynamic force application

Large workpieces often require portable testers which normally employ dynamic force application.

Optical test methods

The indentation is measured after the test load has been removed. The measured length values (indentation diagonal, diameter) are used to calculate the hardness value.

- Vickers HV
- Brinell HBW
- Knoop HK



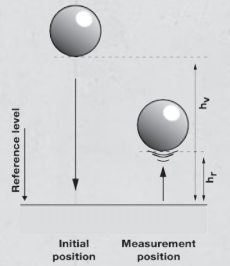
Depth difference method

The indentation depth is measured under test load or after the additional test load has been removed.

Energy measurement

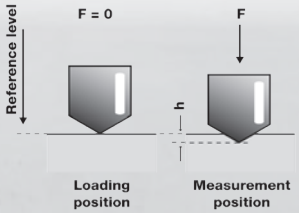
Impact velocity and rebound velocity (or height) of the impact body are measured.

- Leeb HL
- Rebound hardness (e.g. sclerograph)



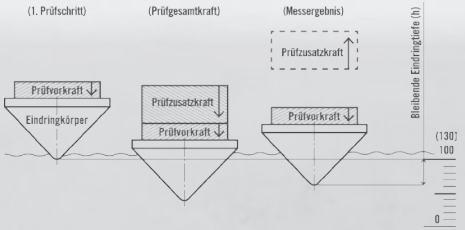
Measurement under constant test load

- Instrumented indentation test
- Martens HM
- Ball-indentation hardness
- Modified Vickers HVT method



Measurement under preload after removal of the additional load

- Rockwell (A, B, C, D, E, F, G, H, K, N, T, W, X, Y)
- Rockwell (R, L, M, E, K, alpha)
- Modified Brinell HBT method



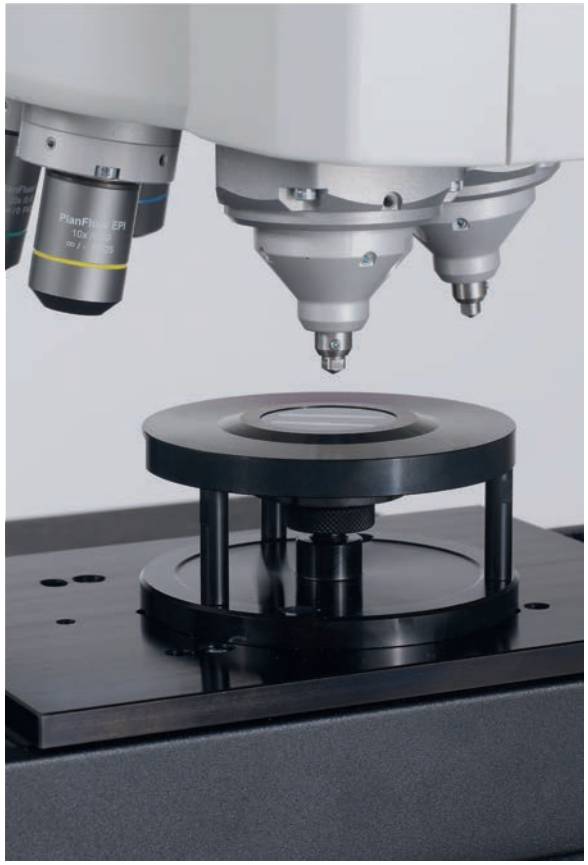
3. Low-load and micro hardness testing machines – the DuraScan Series

The pioneering standard load range is from 10 gf to 62.5 kgf and is applied with closed-loop control (optionally expandable to 0.25 gf to 62.5 kgf). Our DuraScan series features an automatic 6-position turret for rapid change of indenters and lenses. The ecos™ III test software is user-friendly and requires minimum training.

The DuraScan micro hardness tester is suitable for solving a wide variety of test tasks and will become your efficient companion when it comes to hardness testing in the laboratory. Various applications can use template functions and support according to the latest specifications of the standard. The hardness can be determined for a wide range of materials and shapes. Test steel, aluminium, sintered parts, copper and many other materials in the form of flat surfaces, tubes and even balls. Depending on the model, the tester is operated via a touch display mounted on the device or via an external PC with monitor.

DuraScan 10

DuraScan 80



Specimen holder for testing an embedded specimen

6-position turret

Innovative image analysis for precise test results

The DuraScan series uses a 12-megapixel camera that sets new standards in image quality and allows 4x zoom without loss of quality. This innovative solution allows a wide range of applications to be covered with a small number of lenses. The DuraScan uses only lenses with maximum optical resolution; the fully automatic evaluation reliably controls the brightness of the image and automatically evaluates the indentation.

Fields of application

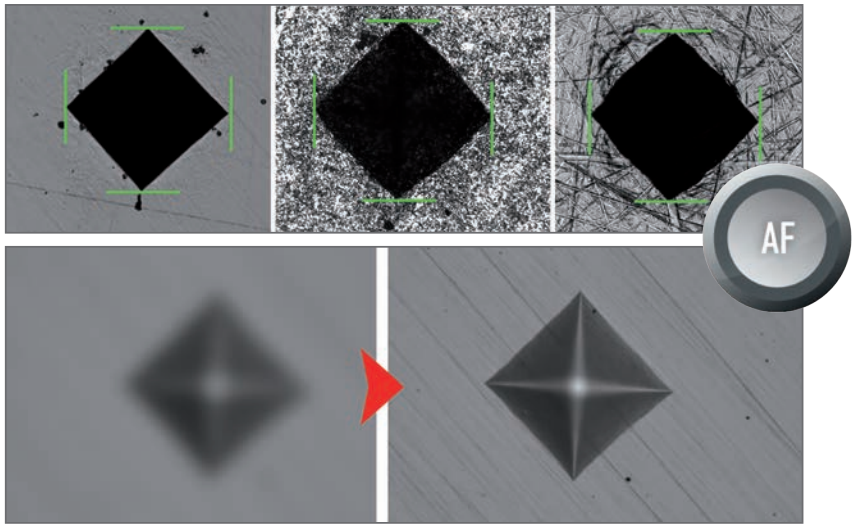
The DuraScan models are particularly suitable for in-process testing of embedded specimens such as weld seams or hardened workpieces. With the low load levels, even very thin materials or coatings can be tested. Additional modules allow the testing of special work-pieces such as pipe segments or tooth flanks.

Standard-compliant hardness testing

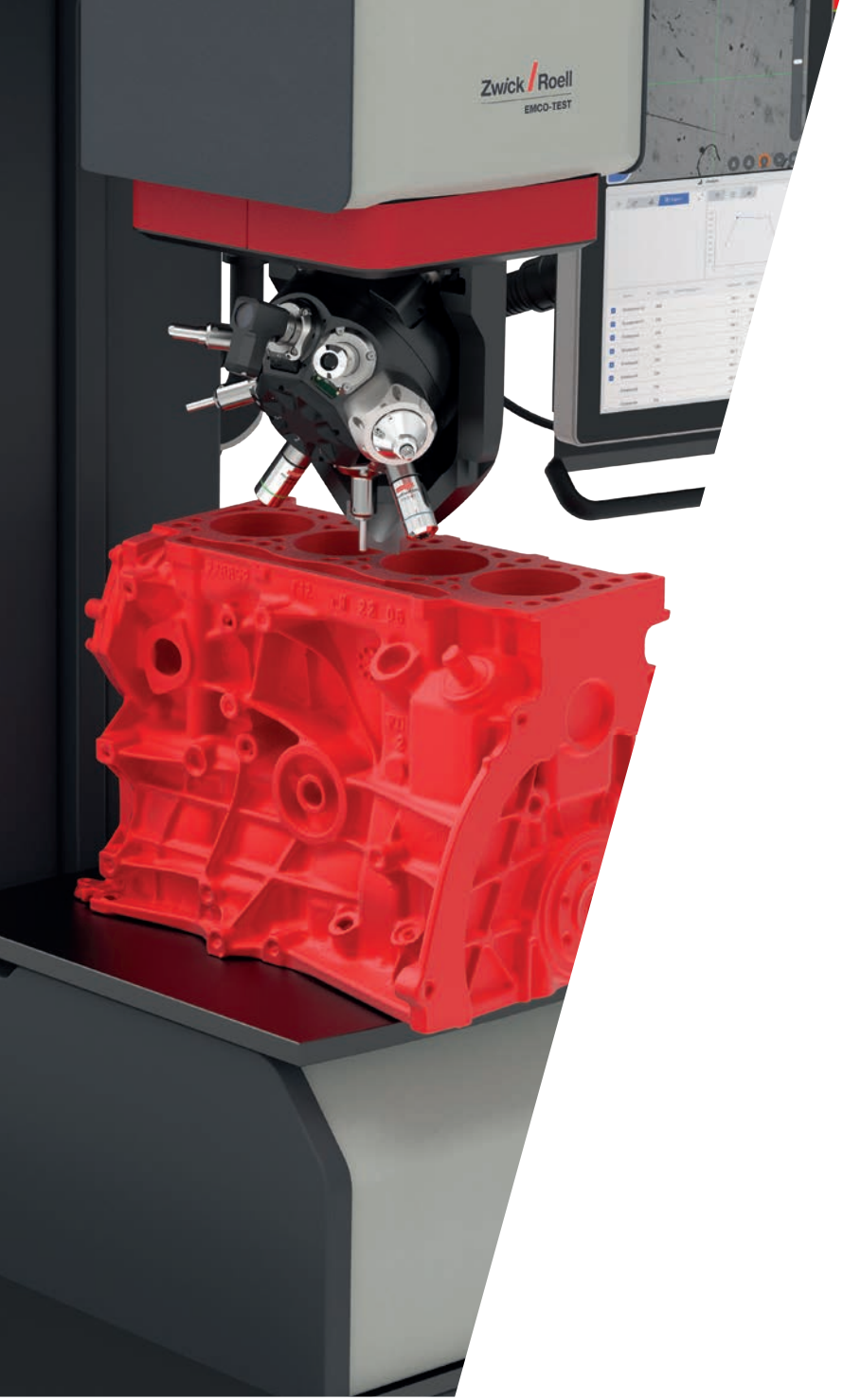
- ISO 6506, ISO 6507, ISO 4545
- ASTM E384, ASTM E92, ASTM E10

Accessories

With an extensive range of accessories, every DuraScan can be adapted to the individual testing requirements. In our accessories you will find a wide variety of specimen holders, lenses, software modules and much more.



Fully automatic test point evaluation



4. Universal hardness tester - the new VisionLine

The VisionLine universal hardness testers have been specially developed for a wide range of testing requirements and cover Brinell, Vickers, Rockwell, Knoop, plastic and carbon testing.
With their wide standard load range of 0.3 - 250 kgf or 3 - 3000 kgf and an optional extension down to 10 gf, they offer maximum flexibility for a wide range of test methods. Thanks to their robust design, the semi-automatic hardness testers are ideal for use in production environments and in laboratories for quality assurance. The Vision 250-Z Pro and Vision 3000-Z Pro models offer full automation for laboratory use. Depending on the model, operation is via touch display or external PC with monitor. The new design allows flexible adaptation to individual requirements, while the ecos™ III software provides optimum support for the user‘s testing tasks.

Human Focus – people at the heart of the technology

The Vision hardness tester is specially designed to put the operator at the center of attention. With freely adjustable working heights, and industrial touch display and a status light, it offers optimum comfort in everyday working life. The compact, fully automatic version, which does not require additional intervention protection, and the flexible

8-fold tool changer

Control unit

control unit offer convenience and ergonomic benefits. A unique clamping system ensures that the component is secured against slipping with constant force. This prevents damage to the machine, guarantees reliable test results and provides the user with a high level of safety. The stepless and fast feed rate makes operation easier, more ergonomic and saves time.

Standard-compliant hardness testing

- ISO 6506, ISO 6507, ISO 6508, ISO 4545, ISO 2039
- ASTM E384, ASTM E92, ASTM E10, ASTM E18
- DIN 51917

Maximum flexibility and efficiency - tests for every requirement with the 8-fold tool changer

The fully automatic tool changer with 8 positions offers maximum flexibility thanks to freely configurable indenters, lenses and load extensions. Integrated lighting and tool changes in seconds increase efficiency and enable simple, fast testing. This saves time and extends the range of applications for the device.

Status light

Variant with handwheel

Vision 250 (0.3-250 kg)
Vision 3000 (3-3000 kg)

Motorized test head

Vision 250-Z (0.3-250 kg)
Vision 3000-Z (3-3000 kg)

Fully automatic version *with motorized test head feed and automatic slide*

Vision 250-Z Pro (0.3-250 kg)
Vision 3000-Z Pro (3-3000 kg)

From individual testing to series testing

Depending on the model, you can choose between fast individual testing or fully automated series testing for components of varying heights. Based on your needs, you can quickly obtain results or test multiple parts simultaneously, saving valuable time.

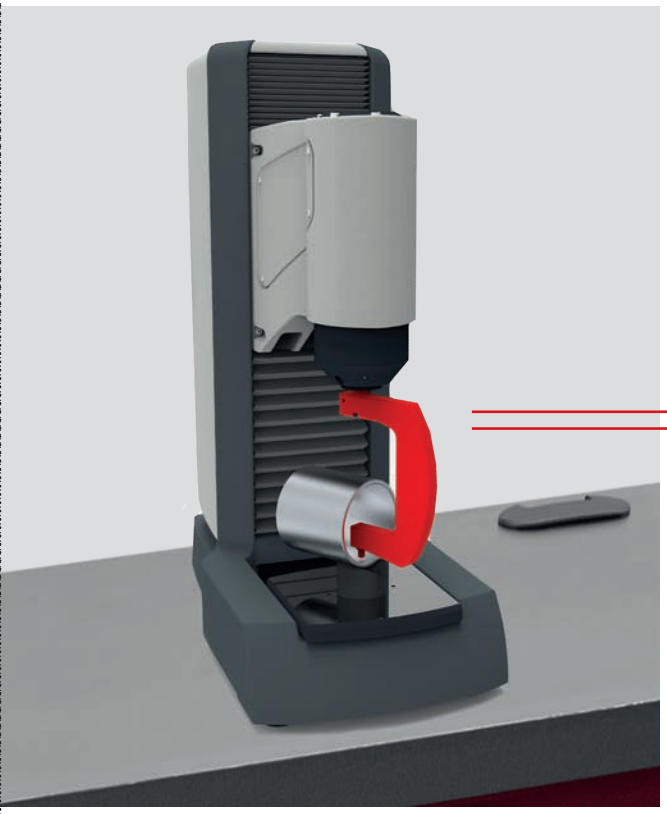
Accessories

With an extensive range of accessories, every Vision model can be adapted to your individual testing requirements. Our accessory options include a variety of sample holders, lenses and anvils.

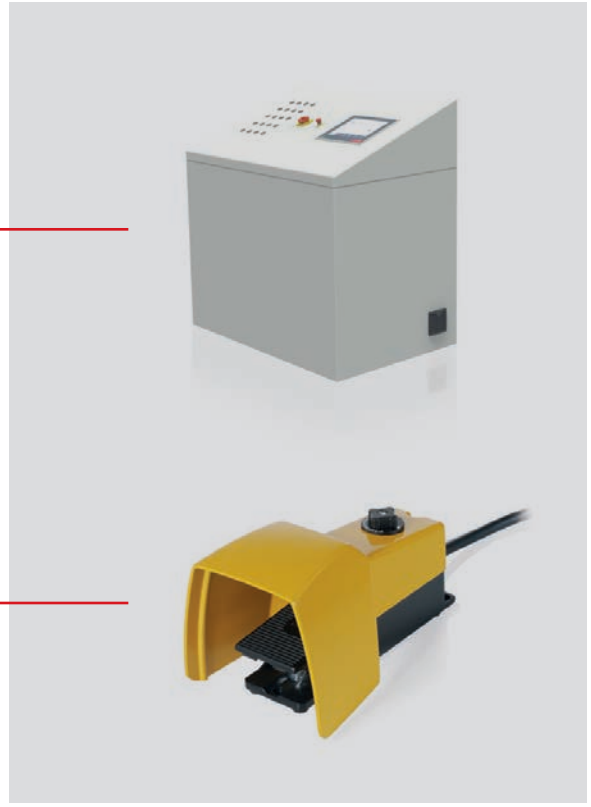
5. DuraJet Rockwell hardness testing machine – flexible and versatile

Sturdy and versatile – those are the main features of the DuraJet G5. With electronic load application and a load range from 1 kg to 250 kg, this hardness tester covers the complete Rockwell hardness range. But the hardness tester can do even more: Tests on plastics and carbon as well as Vickers and Brinell tests can be performed in depth.

This flexibility coupled with very simple operation predestines the DuraJet G5 tester for use where several testers have previously been used in different configurations.



Optional C-Adapter in hard-to-reach places



External machine control

Wide range of applications

The hardness tester is suitable for everything from quick incoming goods inspections to ongoing quality control in rough production environments. The sturdy control panel in combination with our "ecos Workflow DuraJet" hardness testing software ensures simple and intuitive operation even with little training.
Numerous functions such as template function, measurement data management or an export of the test data enable modern hardness testing. With the extensive range of accessories, the DuraJet can be individually adapted to customer needs. For example, we offer nose cone extensions or a C-Adapter that can be used to test in hard-to-reach places.

Long-life PLC control

The exclusive use of standard PLC modules to control the hardness tester ensures a high degree of operational reliability and service-friendliness. It also ensures that the long-term availability of high-quality spare parts is guaranteed.

PLC control

6. N3 Rockwell hardness tester - simple and cost-effective

The N3 hardness tester is easy to use and requires minimal training. The proven spring principle guarantees maximum precision, repeatability and robustness. Its compact design allows flexible use in different working environments, while the durable and low-maintenance construction ensures a sustainable and cost-effective solution.

Flexible spring clip system, easy adjustment and clamped testing with protected indenter

Thanks to the innovative, interchangeable spring bushing system, different test loads can be flexibly adapted by simply replacing the spring bushing. The system also enables clamped testing, in which the test piece remains securely and firmly fixed during the entire process to ensure precise results. At the same time, the indenter is mechanically protected from damage, resulting in a longer service life and consistent test accuracy.

Extensive standards coverage and sustainable investment

The N3 covers numerous standards, including Rockwell hardness testing according to ISO 6508 and ASTM E18 as well as the HVT, HBT and plastics testing methods according to ISO 2039. The robust design prevents overshooting and enables a stable test position, ideal for demanding workpieces. With a guaranteed spare parts availability of at least 10 years after product discontinuation, the N3 remains a safe, long-term investment and the simple lever operation means that the machine can also be easily operated with work gloves.

Analog dial gauge

Spring principle system

Dial gauge

The N3A hardness tester uses an analog dial gauge to display the measured value. Three color scales are printed on the dial. Depending on the selected test method and test load, the hardness value is read off the scale.

ecos™ III

Next-level efficiency

We have passionately dedicated ourselves to perfecting our hardness testing software and now achieved a unique result. A result that not only combines maximum **efficiency, simple operation** and **perfect clarity**, but also really carries these values deep in its DNA.

Welcome to the world of ecos™ III – the world's most unique hardness testing software on the market! Our software is based on **the latest AI technology** and enables reliable and time-saving evaluation of indents. But what makes ecos III truly unique in the field of hardness testing machines is its impressive ability **to seamlessly continue your work** even while the machine is still carrying out test jobs.

Imagine placing test points on panorama images that have already been captured while the machine is carrying out test jobs at the same time.

I a world in which data acquisition and processing are becoming increasingly complex, ecos III keeps you **on top of things**. Test data can be skilfully combined into jobs, while our software integrates seamlessly into your workflows. A multitude of helpful tools enables precise positioning of test points and test series. Thanks to the possibility of saving recurring
test settings as templates and using them again flexibly, you increase your efficiency and precision to an unprecedented level.

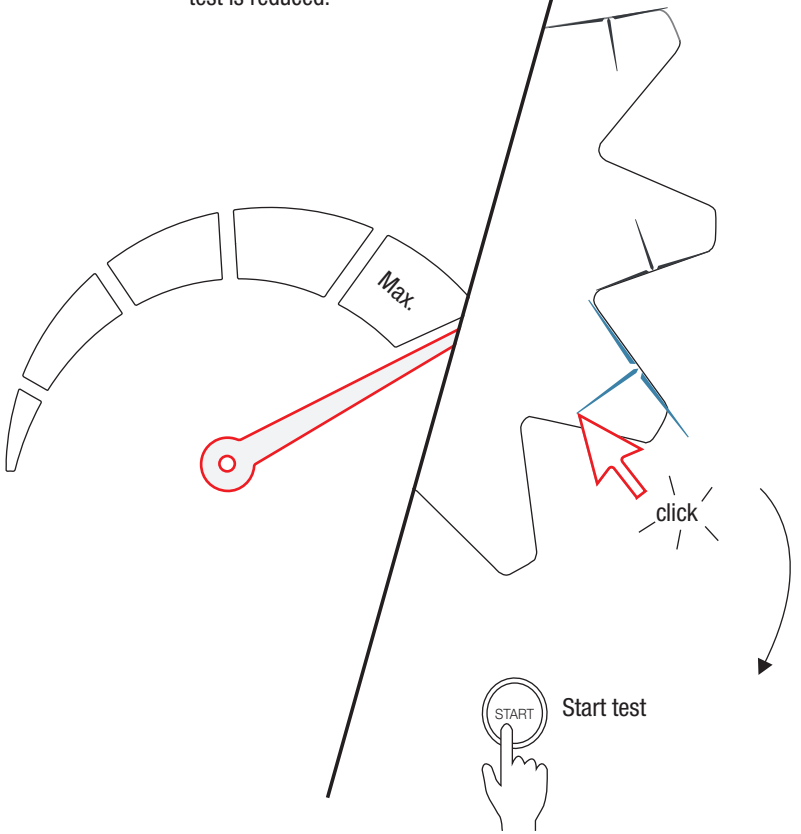
ecos™ III – with us, the future of hardness testing software is already a reality today. Increase your productivity, save valuable time and experience the revolution in hardness testing.

Welcome to the future, welcome to ecos™ III

7. ecos™ III – The most efficient hardness test software

Quick

With ecos™ III you benefit from a well thought-out operating concept in which all the routines have been optimised. This cuts the operating time by up to 65%, and the number of staff required for the test is reduced.

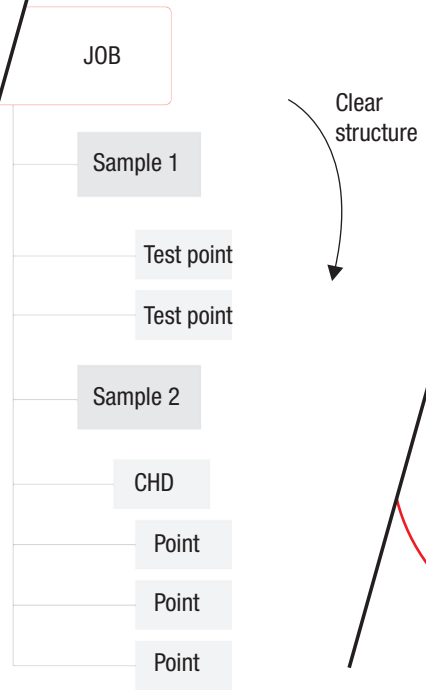


Simple

Thanks to a clear operating structure with simple rules, quick familiarisation is no problem. Even complex and extensive test patterns can be defined and placed on the workpiece with just a few clicks.

Clear

In ecos™ III, clarity comes first. All test elements are distinctly divided into jobs and specimens. This keeps everything clear, even with large amounts of data, and allows test reports to be created for multiple specimens and trend analyses.

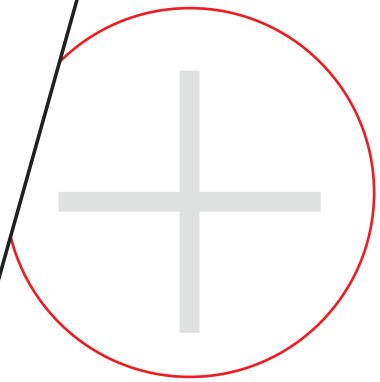


Clear structure

And more

ecos™ III was developed to set new standards for the operation of hardness testers. In addition to comprehensive standard test specifications, such as for curve measurements or hardness mappings, ecos™ III offers extensive functions that help with your day-to-day work:

- AI-based image evaluation for reliable results
- Extensive template mode for recurring tasks
- User-defined operating restrictions
- Simple report designer
- Extensive statistics and analysis functions
- Export results to txt, xls, Word, PDF or many more.



Find out more at zwickroell.com

8. Automation, customizing, special machines

Our hardness testing machines are as individual as our customers. That is why we offer customised accessories for our series machines in order to meet the most diverse requirements. Whether customised test tables, specimen holders or nose cones – we put your ideas into practice and meet your testing requirements.

We work closely with our customers here to develop the right solution for their requirements. It is important to us that our solutions are not only functional, but also safe. It goes without saying that we comply with the applicable legal regulations and also use signalling systems so that you can keep an eye on the status of your hardness testing machine at all times. We also offer external operating options for controlling your machine remotely. You can therefore operate your machine easily, conveniently and, above all, safely.

Automation

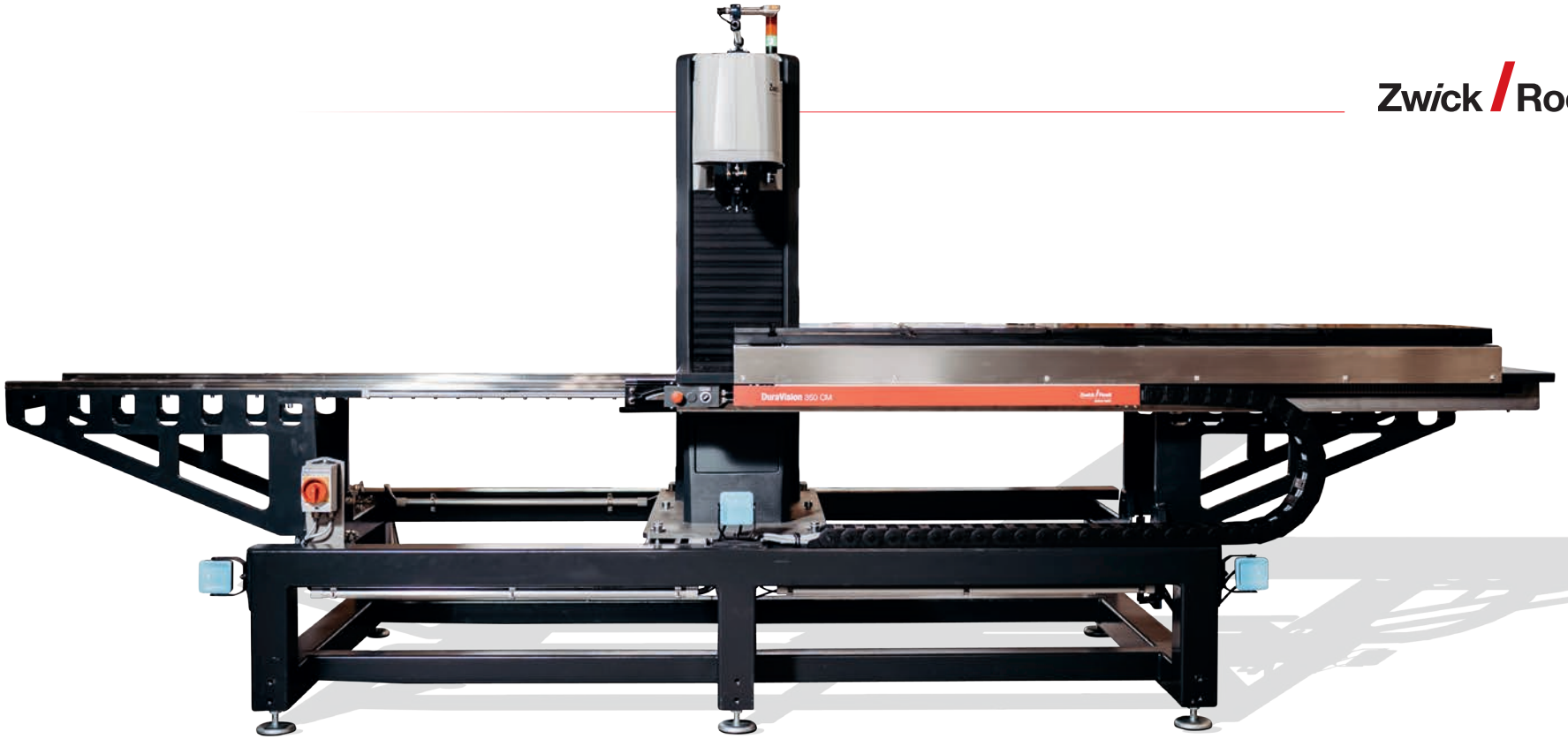
Working closely with our customers, we automate the entire hardness testing process, including specimen handling. Automated testing systems have become indispensable in modern test laboratories today (testing requirements – testing cycles) in order to meet the high demands for carrying out material tests. They take over the handling of the specimens and perform the tests in a repeatable and comparable manner according to the specifications of the standards.
Our automation concept for hardness testing is used particularly where large numbers of tests are to be carried out. The highly qualified laboratory personnel are relieved of routine activities and are available for more demanding tasks.

Automated hardness testing

Customizing

Our hardness testing machines are customisable and can be tailored to your specific needs. We offer customised accessories for series machines, including test tables, specimen holders, nose cones and fixtures that enable efficient workpiece testing in accordance with the standards. Furthermore, external operating options can be added for remote control of the machines. Safety is a top priority and our solutions comply with local regulations. Contact us and let us carry out your individual project together.

Individual test table



The **DuraVision 350 CM** is also a solution that can be individually adapted to the needs of our customers. Specimens with large dimensions or large numbers of specimens can be placed on the fully automatic, 2000 mm long XY carriage. The special laser allows the specimen to be easily positioned.

A radar system is used instead of an elaborate CE enclosure. Any person entering the safety area is immediately detected and the machine is stopped. The integrated traffic light indicates the current operating status of the machine. The machine performs test jobs fully automatically.

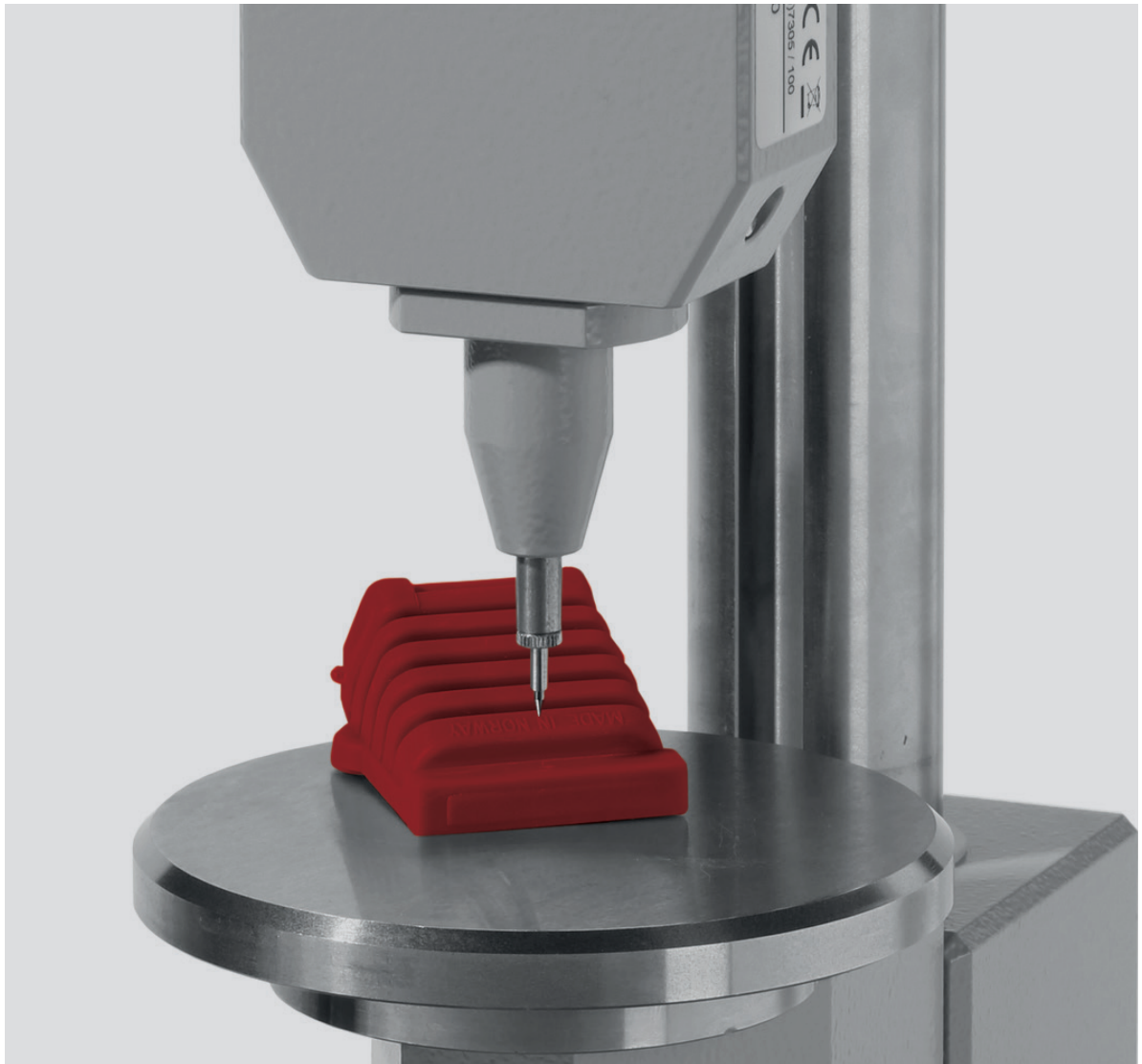
VR5C

Special machines

The fully automatic VR5C hardness testing system is made for special requirements in hardness testing compliant with Brinell.
The system is operated by a Siemens S7 controller in conjunction with the proven ecos Workflow test software.
The test cycle and test point evaluation take place fully automatically. The specimen surface is prepared for the test points with the integrated milling fixture. Machine adaptation, e.g. hydraulic punch, etc., is possible.
Simply contact us and tell us about your requirements. For flexible integration of hardness testing into existing production lines, we also offer our DuraPro hardness test modules.

9. Portable hardness testing

With our portable hardness testers, hardness testing comes to the workpiece. No matter whether you want to test heavy steel plates, large gear wheels or in drill holes of large workpieces. All that is possible with our portable hardness testers. The load range extends from 15 kg to 187.5 kg



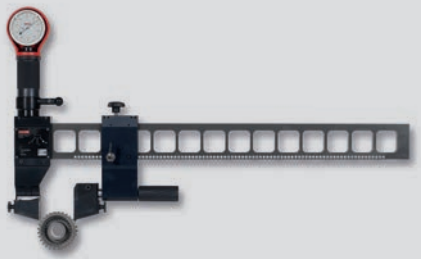
Testing of metals

Our portable Rockwell hardness testers in the load range from 15 to 187.5 kgf are the result of more than 65 years of experience. They have proven themselves in many branches of industry (e.g. energy, shipbuilding, mining, large-scale plant construction, oil and petrochemicals) for decades. The heart of every tester is the reliable spring sleeve unit for load application. The hardness value is indicated on an analogue dial gauge. Use of these portable hardness testers ranges from the simple measurement of sheet metal through to hardness testing on tooth flanks as well as in drill holes.

Portable hardness testers for metals

N4 - Hardness testing micrometers for testing sheet metal & plates, etc.

N6 - Hardness testing in drill holes



N7 - Tooth flank tester for testing of gear wheels

Testing of plastic and rubber

ZwickRoell offers various testing machines in different versions (analogue/digital or with/without holder/stand) for the mobile hardness testing of plastics and elastomers. Shore and IRHD (International Rubber Hardness Degree) hardness testers determine the penetration depth in a wide range of materials, from foams and rubber through to rigid plastics.

Portable hardness testers for plastic and rubber

Shore Digital

Shore A & D

IRHD3105 combitest

IRHD3103

10. Test blocks and machine accessories

Test blocks are used for indirect calibration procedures and for periodic daily checks of hardness testers.

The use of high quality test blocks with minimum hardness deviation is crucial to ensuring the operational reliability of hardness testing machines. To ensure traceability to the hardness standard, the test blocks must have minimum hardness deviation and be calibrated with minimum measurement uncertainty.

ZwickRoell's test blocks are calibrated to UKAS standards in Indentec's UKAS accredited laboratory to ensure that each block is reliable and meets the required standard. Our test blocks cover the full range of hardness testing methods, scales and values and are used worldwide in a wide range of industries including aerospace, automotive, science, machine engineering, manufacturing, medicine and primary metal production.

Different test blocks

Accessories

A hardness tester us an important tool in material testing and analysis. With the right accessories, the machine can be used even more effectively and meet individual requirements. You can find more accessories such as specimen holders and test tables at: **www.zwickroell.com**


DURAVISION

11. Services and After Sales

Your strong partner for the complete machine cycle

All-round support for you: In addition to meeting the most diverse testing requirements, we accompany you throughout the entire life cycle of the testing systems with customized services – worldwide.

- **Accredited calibration laboratory ISO/IEC 17025**
  ZwickRoell is the first port of contact for the servicing of your testing systems. With a worldwide service network, hundreds of service staff and numerous international accreditations to EN ISO/IEC 17025 for our calibration laboratories, you are in the best hands with ZwickRoell. Our calibration of testing machines is demonstrably independent, efficient and precise.

- **Consulting and application technology**
  Our experts advise you in detail and individually before you buy a machine. Together we find the optimum testing solution for you.

- **Maintenance and inspection**
  Our regular maintenance and inspection reliably protects your machines against standstills and avoidable repair costs.

- **Calibration**
  We have calibration laboratories around the world. Apart from our DAkkS accreditation, we are also accredited in accordance with A2LA, COFRAC, UKAS, NABL, PCA, PJLA, INMETRO and TÜRKAK.

- **Software services**
  Our experienced software engineers develop individual solutions for every application and all your needs.

- **Online services**
  We are continuously working on the expansion of our digital services, from system monitoring to web demonstrations. We provide you with perfect digital support.

- **Hotline and customer support**
  Have you got questions or need support? Our service engineers are there for you at any time: We help you quickly and competently – no matter whether it concerns your testing machines or your test software.

- **Modernisation**
  We would be happy to support you in modernising your existing hardness testing machine, and so safeguard your investment in the long term.

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Zwick / Roell