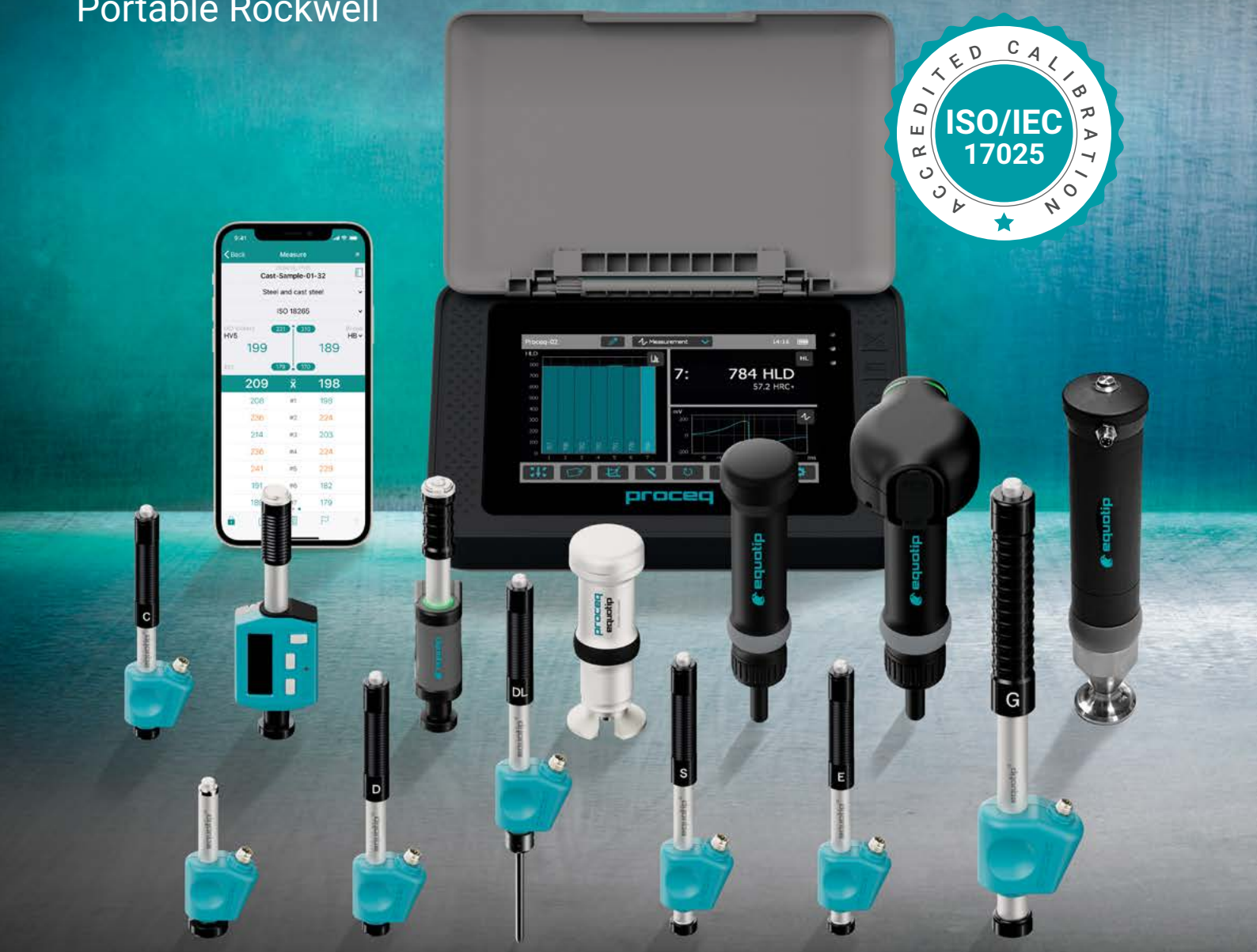
equotip

Portable Hardness Testers

Conduct accurate hardness testing wherever needed

Leeb – UCI – Equotip
Portable Rockwell

ACCREDITED CALIBRATION
ISO/IEC 17025



proceq
A Screening Eagle Company

V 001

Content

Proceq – A story of success over more than 70 years

A legacy of quality, a future of growth.

Market Leader

Proceq SA, founded 1954 in Switzerland, is the global leader in portable measurement solutions for the non-destructive testing of material properties of metal, concrete, rock, paper and composites. The first Equotip portable hardness tester was introduced by Proceq in 1975.

Worldwide Local Support

Our team of dedicated experts are available to advise you on our instruments and their applications. In addition, you may take further benefits from our instructional videos, evaluation tools, online webinars and of course our live seminars globally.

Swiss Made

Proceq instruments are developed, designed and manufactured in Switzerland, guaranteeing the highest product and service quality. Since 1994, the management system of Proceq SA is also certified according to ISO 9001.

Experience

Proceq has been a proud innovator in the field of portable non-destructive testing, developing solutions that have conquered the inspection industry for decades. Most famous brands are Equotip®, Schmidt®, Pundit®, Profometer® and Carboteq®.

Swiss Accreditation Service & ISO/ IEC 17025

Proceq is certified as a Swiss Confederation Accredited Calibration Lab, providing all new Equotip devices with ISO/IEC 17025 factory calibration as standard. ISO/IEC 17025 is a formal recognition of the technical and organizational competence to execute calibrations.

Merger between Proceq SA and Tectus Dreamlab

In 2019, Proceq SA merged with Tectus Dreamlab to form Screening Eagle Technologies - a company with a mission to protect the built world with sensors, software, and data.

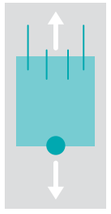
Creators of Leeb Principle in 1975

Since Proceq invented the Leeb hardness test principle in 1975, Equotip has become established as a globally recognized brand for portable hardness testing and a de facto global industry standard.

PORTABLE HARDNESS TESTING METHODS

Discover the method that suits you best

The Equotip can utilize 3 different portable hardness testing methods. Read about the benefits of each method to know which best suits your project needs.

	LEEB	UCI	ROCKWELL
Our products			
Equotip 550	x	x	x
Equotip Live	x	x	
Piccolo 2 | Bambino 2	x		
	Leeb Hardness Testing Principle The Leeb hardness testing principle is based on the dynamic (rebound) method. In the Leeb method, a spring propels an impact body through a guide tube toward the test piece and measures the loss of impact energy of the impact body due to the impact. The loss of energy correlates with the hardness of the test piece.	**The Ultrasonic Contact Impedance Principle** In the UCI method, a resonator excites a rod with an 136° Vickers diamond into longitudinal ultrasonic oscillation. As the diamond is forced into the material, the frequency of the rod oscillation changes in response to the contact surface between the diamond and the testing material. This frequency change is directly related to the size of the indentation and therefore the hardness of the material.	**The Portable Rockwell Principle** The Portable Rockwell is a portable adaptation of the bench-top Rockwell method based on the direct indentation. With the Rockwell method, a diamond indenter is forced into the test surface using a precisely controlled force. The indentation depth of the diamond is measured while a load is applied and released.

APPLICATION RANGE

The perfect solution for every application

Choosing the right hardness testing method is crucial. Different tasks require different approaches. Equotip offers a diverse range of portable hardness testers to suit these varying needs.

		LEEB	PORTABLE ROCKWELL	UCI
	Av. Roughness R, (um / winch)	7 / 275	2/80	12.5 / 500
	Min. Mass (kg / lbs)	0.02 / 0.045	No requirement	0.3 / 0.66
	Min. Thickness (mm / inch)	1/0.04	10 x ind. depth	5/0.2
Oil & Gas	Weld, base material & Heat Affected Zone (HAZ)		●	
	Pressure vessels	●	●	●
	Pipes	●	●	●
	Flanges	●	●	●
	Wellhead equipment		●	●
	Rock Core	●		
Automotive	Engine blocks	●		
	Shafts	●	●	●
	Gears	●	●	●
	Panels		●	●
	Brake Systems			●
Aerospace	Turbine blades	●	●	●
	Casing / Housing			●
	Panels		●	●
	Cast objects	●		
	Landing gears	●		
Manufacturing & Machinery	Rolls	●		
	Coils	●	●	●
	Bars/pipes	●	●	●
	Heat treatment/Casting	●	●	
	Wires		●	●
Power Generation	Boilers	●		●
	Pipes	●	●	●
	High alloy steel (incl. Superalloys) components	●		●
	Generator stator wedges	●		
	Turbine bolts		●	●
	Turbine stator		●	●
	Wind turbine nose	●		●

equotip

PORTFOLIO

APPLICATION RANGE

Versatile, accurate and user-friendly solutions for portable hardness testing

Equotip 550

The Versatile Portable Hardness Testing System

Shock-absorbing, touchscreen, dust and splashproof, and functional in wide temperature range. You have 3 different test methods to choose from.

Equotip 550
Leeb

For on-site testing of heavy, large or installed parts.

Equotip 550
UCI

For fine-grained material, heat-treated surfaces, weld inspection, surface treated parts, turbine blades and coatings.

Equotip 550
Portable Rockwell

Primarily for small, light, thin, walled or tubular test objects, scratch-sensitive and polished parts, machined parts.

Equotip Live

Hardness Testing on Your Mobile Device

Using UCI and Leeb methods for fast and practical hardness testing. Check the results on your mobile device or on the Workspace website.

Equotip Piccolo 2 | Bambino 2

Entry model for Rapid Onsite Tests

Easy to use, entry level Leeb hardness testers, ideal for projects that only tolerate a small indentation.

All Proce'q probes are delivered with ISO 17025-Accredited calibrations.

Equotip 550

EQUOTIP 550

The All-In-One Portable Hardness Testing Solution

The rugged Swiss-made metal hardness testers are designed for portable hardness testing at production facilities, on site, in the lab and in the workshop.

The Equotip 550 is the most versatile all-in-one solution for portable hardness testing using Leeb, Portable Rockwell and UCI.

The hardness measurements are made by using the dynamic rebound testing method according to Leeb, the static Portable Rockwell hardness test and the Ultrasonic Contact Impedance (UCI) method.

UCI **Leeb** **Rockwell**

Powerful Hardware

- Rugged housing
- High-capacity battery
- Versatile connectivity
- Suitable for automation

Measuring Performance

- Selection of various probes with the highest accuracy & repeatability*
- Custom conversions
- Combined methods

Ease of Use

- Large touchscreen
- Personalized views
- Custom reports

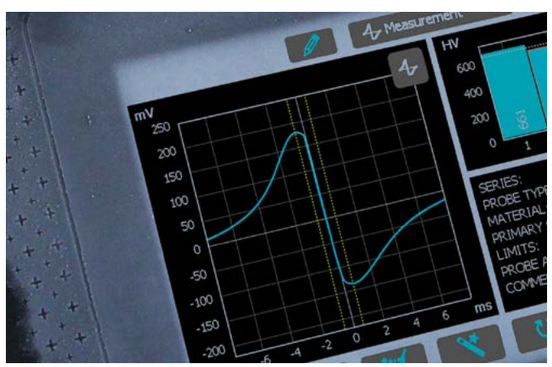
Read more about accuracy & repeatability

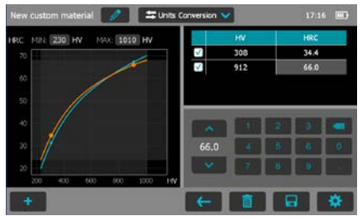
https://www.screeningeagle.com/en/inspection/what-you-should-know-about-the-accuracy-and-repeatability-of-uci-probes

EQUOTIP 550 - DISPLAY

Equotip 550 Touchscreen Unit - Built for Demanding Environments

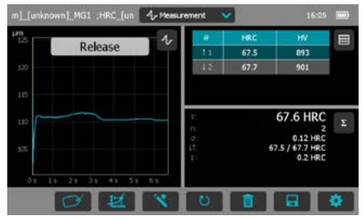
Equotip 550 takes advantage of a new generation full color, dual processor Touchscreen Unit with enhanced software capabilities. It offers a unique range of functions and probes which help speed up on-site and laboratory inspections and analysis.





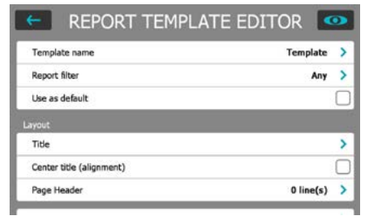
Increased accuracy through conversion curve options

Create, edit and verify material conversion curves directly on the instrument (one-point, two-point shift or polynomial). PC software enables direct sharing of conversions with customers, suppliers and associated companies.



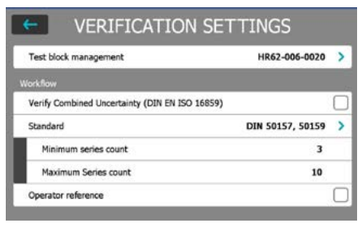
Reduced incorrect measurements with interactive guides

Obtain the most relevant settings for any application and recognize and prevent faulty usage with intelligent on-screen notifications, supporting and training the users.



Time saving through customized reports

Generate PDF reports on-site directly on the instrument and export to a USB stick. The reports can be fully configured and enhanced with customer specific information and company logo.

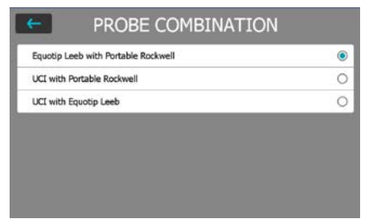


Traceable precision by verification management

Feed the measurement results directly into data management systems. Comprehensive software tools and libraries help to easily include the Equotip 550 into existing production chains.

Reduced costs due to a future proof all-in-one solution

Apply three measuring principles and to connect nine different probes with only one device. There is no need to buy several instruments to meet your future testing needs.



Enlarged application range by combining methods

Reduce the influence of material and geometries with the step-by-step combined method wizard for automatic on-site correlation of two different measuring principles.

EQUOTIP 550 - DISPLAY

Equotip 550 Touchscreen Unit Specifications

Full color, dual processor touchscreen unit with enhanced software capabilities.

Touchscreen Features

For simplified and improved usability on high resolution display

Shock-absorbing

Rugged housing

Resistance

Connectors and circuits are protected against dust and voltage spikes

Scratch-resistant

Solid touchscreen with Gorilla® Glass technology

Personalized Screens

Arrange the view according to your needs

Elaborated User Interface

Designed by industry experts for smooth operation

Display	7” color display 800x480 pixels	Battery	3.6 V, 14.0 Ah
Memory	Internal 8 GB flash memory	Battery Lifetime	> 10h (in standard operating mode)
Regional Settings	Metric and Imperial units, multi-language and time zone support	Humidity	< 95 % RH, non condensing
Power Input	12 V +/-25% / 1.5 A	Operating Temperature	-10 °C to +50 °C
Connectors	Probe, USB and Ethernet	IP	54
Dimensions	250 x 162 x 62 mm	Certification	CE
Weight	1525 g (incl. Battery)		

EQUOTIP 550 - LEEB - TECH INFORMATION

Probes for any function

Equotip 550 Leeb has multiple probes with automatic angle detection, which are suited for various kinds of test pieces and and from any angle. Here are all the probes you can choose from.

Standards

ASTM A956 / A370 / A1058

DIN EN ISO16859

GB/T 17394

JB/T 9378

Conversion standards

ASTM E140

ISO 18265

DL/T 1845 (Leeb D only)

Proceq's own conversion curves

Guidelines

ASME CRTD-91

DGZfP Gudeline MC 1

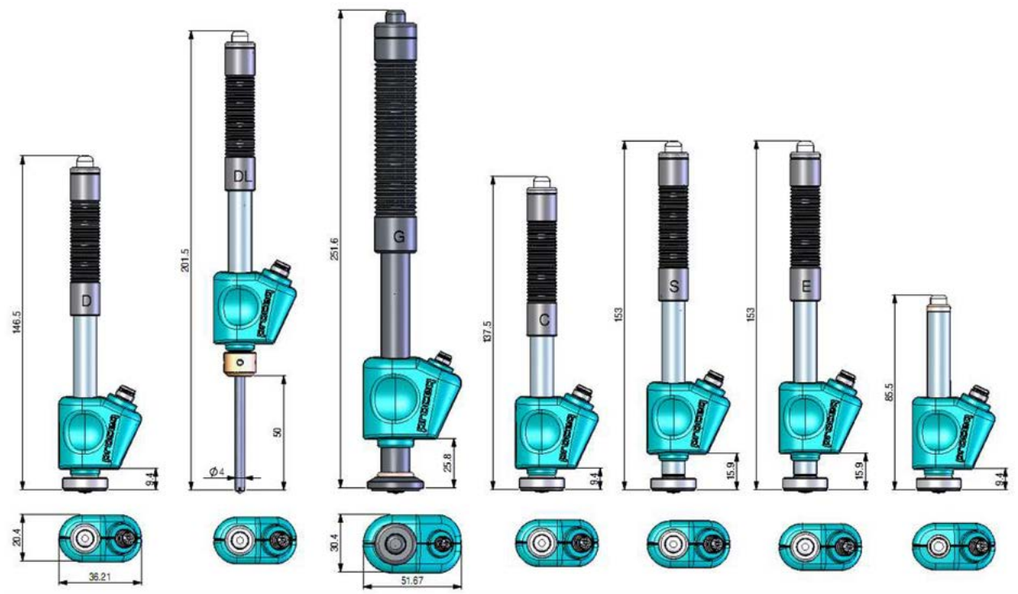
VDI / VDE Gudeline 2616 Paper 1

Nordtest Technical Reports 99.12, 99.13, 99.36

	 D/DC	 DL	 S	 E	 G	 C
Impact energy	11 Nmm	11 Nmm	11 Nmm	11 Nmm	90 Nmm	3 Nmm
Indenter	Tungsten carbide 3 mm	Tungsten carbide 2.8 mm	Silicon carbide 3 mm	Polycrystalline diamond 3 mm	Tungsten carbide 5 mm	Tungsten carbide 3 mm
Scope	Most commonly used probe. For the majority of applications.	Narrow indenter (probe) tip for measurement on hard to reach areas or spaces with limited access.	For measurements in extreme hardness ranges. Tool steels with a high carbide content.	For measurements in extreme hardness ranges. Tool steels with high carbide content.	Large and heavy components, e.g. casts and forged parts.	For surface hardened components, coatings, thin or impact-sensitive parts.
Test blocks	<500 HLD ~600 HLD ~775 HLD	<710 HLDL ~780 HLDL ~890 HLDL	<815 HLS ~875 HLS	~740 HLE ~810 HLE	~450 HLG ~570 HLG	~565 HLC ~665 HLC ~835 HLC

Dimensions of the probes

Our probes come in various lengths and widths for testing even in deep or tight areas, as well as various impact energies and indenter materials. This versatility ensures that no matter the size or accessibility of the area you're working with, or end application, you have the perfect probe to get the job done accurately and efficiently.



EQUOTIP 550 - LEEB - ACCESSORIES

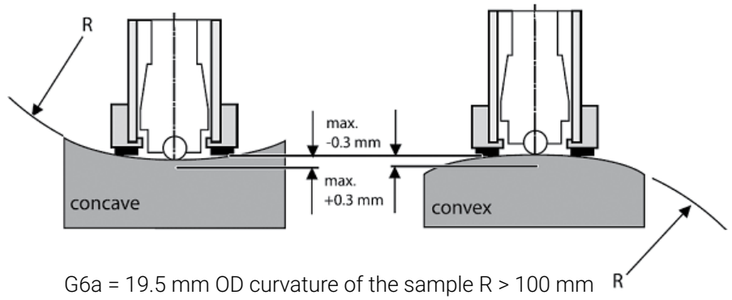
A wide variety of impact devices and support rings

To ensure accurate measurements in all cases, Proceq offers a range of special support rings designed for measurements on curved sample surfaces.

Impact Devices D/DC, C, E, S and G

D6 = The 19.5 mm OD minimum test surface curvature of R = 60 mm.

D6a = 13.5 mm outer diameter (OD), test surface curvature is larger than R = 30 mm.



G6a = 19.5 mm OD curvature of the sample R > 100 mm

G6= 29.5 mm OD curvature of the sample R > 50 mm

Cylindrical Test Surfaces

Z10–15 (R = 10 to 15 mm cylinder radius)

Z14.5–30 (R = 14.5 to 30 mm),

HZ11–13 (R = 11 to 13 mm)

HZ12.5–17 (R = 12.5 to 17 mm)

HZ16.5–30 (R = 16.5 to 30 mm cylinder radius)

Spherical Test Surfaces

K10–15 (R = 10 to 15 mm spherical radius)

K14.5–30 (R = 14.5 to 30 mm spherical radius).

HK11–13 (R = 11 to 13 mm)

HK12.5–17 (R = 12.5 to 17 mm)

HK16.5–30 (R = 16.5 to 30 mm cylinder radius)

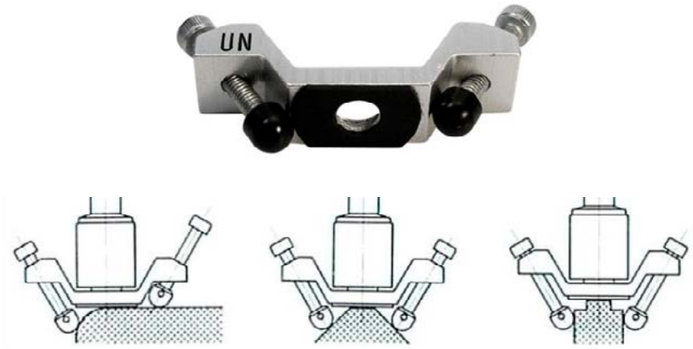
HK12.5–17 (R = 12.5 to 17 mm spherical radius)

Testing in Recesses Impact device *

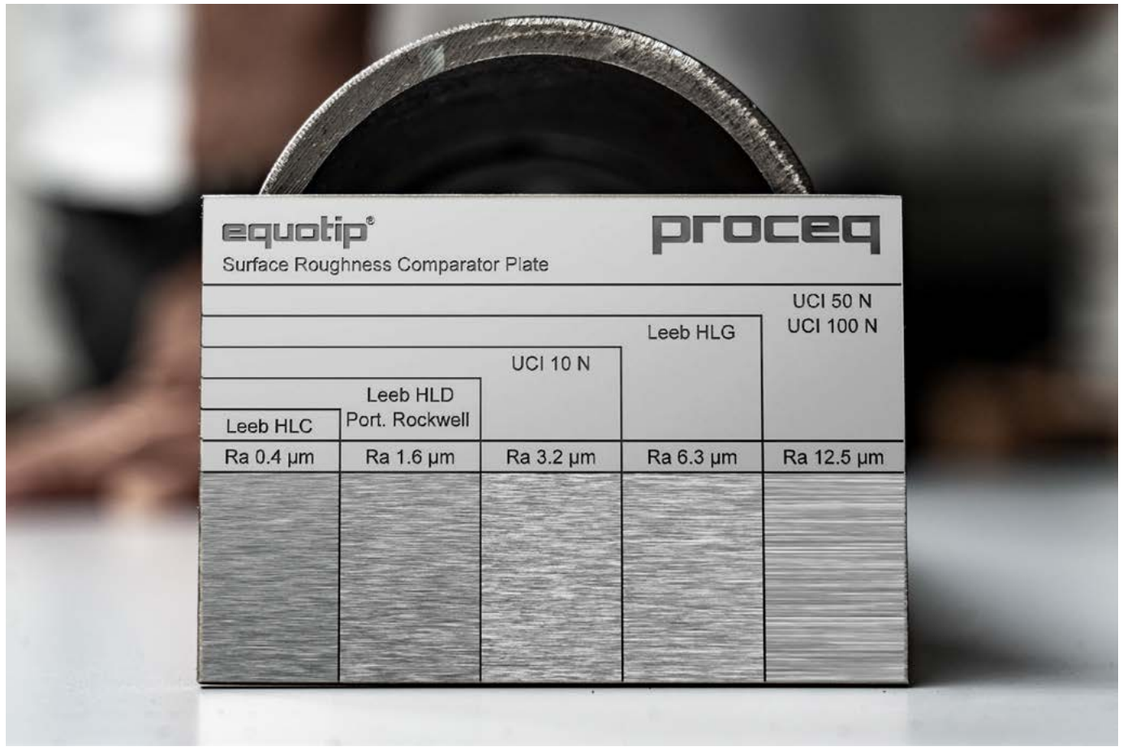
Quick on-site roughness comparison

- For each hardness measurement there are criteria regarding the surface roughness
- The harder the material, the more critical is the surface quality

Universal Support Ring



Impact device	Ra	Rt	ISO 1302
D, DC, DL, S, E	2.0 µm	10.0 µm	N7
G	7.0 µm	30.0 µm	N9
C	0.4 µm	2.5 µm	N5



EQUOTIP 550 - LEEB - CONVERSION SCALES

Maximize flexibility with the widest range of Leeb conversion curves for comprehensive material testing.

With the broadest conversion curve and material portfolio, you'll be ready for any testing scenario, ensuring accurate hardness measurements across a wide range of materials. This means flexibility now and the confidence to meet future testing needs as they arise

			Probe					
Material Class	**Method**	**Unit**	**D/DC**	**DL**	**S**	**E**	**G**	**C**
Steel and Cast Steel	Vickers	HV	81-955	80-950	101-964	84-1211	*	81-1012
	Brinell	HB	81-654	81-646	101-640	83-686	90-646	81-694
	Rockwell	HRB	38-100	37-100	*	*	48-100	*
		HRC	20-68	21-68	22-70	20-72	*	20-70
		HRA	*	*	61-88	61-88	*	*
	Shore	HS	30-99	31-97	28-104	29-103	*	30-102
	R_m σ1[a]	MPa	275-2194	275-2297	340-2194	283-2195	305-2194	275-2194
	R_m σ2[b]	MPa	616-1148	614-1485	615-1480	616-1479	618-1478	615-1479
	R_m σ3[c]	MPa	449-847	449-847	450-846	448-849	450-847	450-846
Work Tool Steel	Vickers	HV	80-900	80-905	104-924	82-1009	*	98-942
	Rockwell	HRC	21-67	21-67	22-68	23-70		20-67
Stainless Steel	Vickers	HV	85-802	*	119-934	88-668	*	*
	Brinell	HB	85-655	*	105-656	87-661	*	*
	Rockwell	HRB	46-102	*	70-104	49-102	*	*
		HRC	20-62	*	21-64	20-64	*	*
High Alloy Steels								
P/T91(10Cr9Mo1VNbN)			130-300	*	*		*	*
P/T92 (10Cr9moW2VNbBN)			130-281	*	*		*	*
P/T92 welded			140-330	*	*		*	*
GH4145			280-390	*	*		*	*
C422 (22Cr12NiWMoV)	Brinell	HBW	240-380	*	*		*	*
20Cr13			280-310	*	*		*	*
05Cr17Ni4Cu4Nb			265-333	*	*		*	*
14Cr12NiBmo2VN			280-403	*	*		*	*
22CR12NiWMoV			256-320	*	*		*	*
Grey Cast Iron (GG) Lamellar Graphite	Brinell	HB	90-664	*	*		*	*
	Vickers	HV	90-698	*	*		92-326	*
	Rockwell	HRC	21-59	*	*		*	*
Nodular Cast Iron (GGG)	G Brinell	HB	95-686	*	*		127-364	*
	Vickers	HV	96-724	*	*		*	*
	Rockwell	HRC	21-60	*	*		19-37	*
Cast Aluminum Alloys	Brinell	HB	19-164	20-187	20-184	23-176	19-168	21-167
	Vickers	HV	22-193	21-191	22-196	22-198	*	*
	Rockwell	HRB	24-85	*	*	*	24-86	23-85
Brass Copper/Zinc Alloys	Brinell	HB	40-173	*	*		*	*
	Rockwell	HRB	14-95	*	*		*	*
CuAl CuSn Alloys (Bronze)	Brinell	HB	60-290	*	*		*	*
Wrought Copper Alloys	Brinell	HB	45-315	*	*		*	*

EQUOTIP 550 - LEEB - TEST PIECE REQUIREMENTS

Test piece thickness and weight criteria

When dealing with pieces that are thin, light, polished, or small, selecting the right probe is crucial based on the weight criteria of the testing piece. The probe you choose must accommodate the specific characteristics of the material to ensure accurate results.

	LEEB						
Impact devices/probes	D	DC	DL	S	E	C	G
Thin objects						○	
Light objects						○	
Objects with limited/difficult accessibility		●	●				
Polished objects [1)]						●	
Small round objects [2)]	●	●		●	●	●	
Mid-size objects	●	●	●	●	●	●	
Very hard objects				●	●		
Large objects	●	●	●	●	●	●	●
Large cast objects							●

1) If only small indentation are allowed. 2) Leeb probes in combination with correct support ring. ○) Depending on test object.

				D/DC	DL	S	E	G	C
Test Piece Requirements	Surface preparation	Roughness grade class ISO 1302		N7				N9	N5
		Max. roughness depth Rt (µm / µinch)		10 / 400				30 / 1200	2.5 / 100
		Average roughness Ra (µm / µinch)		2 / 80				7 / 275	0.4 / 16
	Minimum sample mass	Of compact shape (kg / lbs)		5 / 11				15 / 33	1.5 / 3.3
		On solid support (kg / lbs)		2 / 4.5				5 / 11	0.5 / 1.1
		Coupled on plate (kg / lbs)		0.05 / 0.2				0.5 / 1.1	0.02 / 0.045
	Minimum sample thickness	Uncoupled (mm / inch)		25 / 0.98				70 / 2.73	15 / 0.59
		Coupled (mm / inch)		3 / 0.12				10 / 0.4	1 / 0.04
		Surface layer thickness (mm / inch)		0.8 / 0.03					0.2 / 0.008
	Indentation size on test surface	With 300 HV, 30 HRC	Diameter (mm / inch)	0.54 / 0.021				1.03 / 0.04	0.38 / 0.015
			Depth (µm / µinch)	24 / 960				53 / 2120	12 / 480
		With 600 HV, 55 HRC	Diameter (mm / inch)	0.45 / 0.017				0.9 / 0.035	0.32 / 0.012
			Depth (µm / µinch)	17 / 680				41 / 1640	8 / 2560
		With 800 HV, 63 HRC	Diameter (mm / inch)	0.35 / 0.013					0.30 / 0.011
			Depth (µm / µinch)	10 / 400					7 / 280

Our range of probes is designed to handle various weights and surfaces, providing the precision needed for delicate and lightweight items.

EQUOTIP 550 - LEEB - CASE STUDY/APPLICATION NOTE

Non-invasive Testing in Lava Tubes on the First Space Analog Mission in Portugal

Ana Pires, a pioneering scientist-astronaut, led Portugal's first space analog mission to a lava tube similar to those found on the Moon. But this wasn't your typical scientific expedition. Read more to discover the extreme conditions they faced and the innovative tools they used.

Overview

Scientist-astronaut Ana Pires led Portugal's first space analog mission to assess geotechnical rock mass and underground geomechanical stability and characterize lava tubes similar to those found on the moon.

The Schmidt Hammer and Equotip portable hardness tester were used to assess the rock hardness of the lava tube rock wall during the engineering geology mapping and geotechnical assessment.

The team successfully collected valuable data despite the extreme conditions, significantly highlighting Portugal's potential in space exploration.

Scientist-astronaut Ana Pires is a researcher at INESC TEC's Centre for Robotics and Autonomous Systems and has been using Screening Eagle's Proceq equipment for over twenty years. From the ground-breaking missions here on earth at "Mars" Terrestrial Analog sites and in marine environments to the all-women microgravity mission to perform research in "space", Ana proves there are no limits…

For this mission, which stimulated a Lunar environment, Ana Pires (Geosciences and Geotechnics), Rui Moura (Geophysics), and Helder I. Chaminé (Geo-Mapping and Geomechanics) were the Geo-team of Crew Zero.

Challenge

Lava tubes have been identified on Mars and the Moon. Aside from being good places for humans to protect themselves from radiation, micrometeorites, and extreme temperature variations, lava tubes may be the starting point for building labs and habitats on the Moon and Mars. That's why performing underground engineering geology mapping and testing the geotechnical rock mass behavior and geomechanical stability of the lava tubes here on Earth is crucial.

There are several lava tubes worldwide, and this project proves that Portugal holds excellent potential for this type of research. The extreme conditions for the research were highly challenging. There is an isolated shelter from the exterior on the site's surface where the team can store equipment and food and use the bathroom.

Underground, inside the lava tubes, the team has tents to sleep in and headlamps and lighting to conduct their research. Most of the time, the team spends inside the lava tube researching, mapping, and collecting rock and soil samples. Seven researchers were inside the cave conducting various experiments, including Ana's geotechnical characterization and geomechanical evaluation testing on rock mass.

Solution

Equotip portable hardness testers and Schmidt Classic Hammers (types L, LR) were the chosen tech solutions for this project. They have been the trusted geo-partners for Ana's working life in all extreme environments. Ana uses both technologies to correlate the values and understand the rock behavior better. During the mission, the team had three remote outreach and educational activities sessions, explaining what they were doing live in real time.

The Equotip portable hardness tester was used to understand if these structures are safe to build, do construction, and do architecture inside. Geotechnologies like Proceq offer a rugged solution to measure rock hardness. The Equotip and Schmidt Hammer complement the rock hardness assessment and help assess the geomechanical behavior of rock mass and the underground geotechnical mapping. This helps humanity better understand the future if these caves are safe for humans to live inside. Important work!

Results

The team spent almost 24 hours daily for 6 nights and 7 days underground in the lava tubes, showing great potential for using these natural stretches for space training activities.

Everything went well, and they received support from the local speleological association ('Associação Os Montanheiros'), which offered all the safety and backing they needed.

The results of this mission were more than geotechnical assessment and more than science. It was also an extraordinary project because two women led this first mission. Ana was the commander of this mission, and Yvette Gonzalez, an indigenous-origin Executive Officer (XO), brought diversity where it had not been before while leading a mission that had also never been done in Portugal.

This unique and vital mission shows the potential benefits of construction or habitation inside lava tubes. It also shows the incredible potential of the non-destructive testing equipment, Schmidt hammer and Equotip, when used in extreme conditions.

The team collected vast amounts of data over the seven days they spent inside the lava tubes. Now, they are mapping, processing, analyzing, and assessing the data to draw conclusions and learn lessons about the lava tube's geomechanical behavior and stability.

"It was an extreme mission, but at the same time and as a woman, leading the first lunar space analog mission in Portugal was amazing!" – Ana Pires, INESCTEC.

EQUOTIP 550 - UCI - TECH INFORMATION

Next generation of UCI with various test loads (HV1, HV5, HV10)

Its electronic force sensor allows you to adjust the load to your testing needs and controls the precise force application.

Standards

ASTM A1038 / A370 / A1058

DIN 50159

GB/T 34205

Conversion standards

ASTM E140

ISO 18265

Proceq's own conversion curves

Guidelines

ASME CRTD-91

DGZfP Gudeline MC 1

VDI / VDE Gudeline 2616 Paper 1

Measuring range	20 – 2000 HV
Resolution	1 HV (UCI), 0.1 HRC
Measuring accuracy	± 2% (150 – 950 HV)
Test loads	Selectable: HV1, HV5, HV10
Diamond indenter	Vickers diamond according to ISO 6507-2
Dimensions	150 x ⌀ 40 mm (6.1 x ⌀ 1.57 inches) without foot

Adjustable test load for the HV1, HV5, HV10 probe

The required test load can be selected by the user in the settings menu. For each measurement series, the force can be chosen from three levels, HV1, HV5, and HV10 (~10 N, ~50N, and ~100 N), to fit a wide range of applications. The minimum required mass for reliable UCI measurements is 0.3 kg (0.66 lbs), and a thickness of at least 5 mm (0.2 inch).

HV1	Precision parts, thin coatings, hardened layers, ion-nitride surfaces, coatings , turbine blades
HV5	HAZ, carburized parts, press stamping dies, thin-walled parts, turbine blades, baring, tooth flanks, coatings, ion-nitride surfaces, thinner precision-parts
HV10	Casts, Forgings, weld inspection, HAZ

For Heat Affected Zones

HAZ feature is specially designed for one of the most common applications with UCI, the evaluation of heat affected zones of welds. This feature makes it even easier to evaluate and document the results.

EQUOTIP 550 - UCI - ACCESSORIES

Special Foot

The optionally available special foot increases the measurement repeatability by maintaining the required angle deviation of ±5 degrees. It can be used for flat or curved surfaces. For curved surfaces, there are two different apertures, one for diameters from 5 to 25 mm and one for larger diameters from 20 to 70 mm.

EQUOTIP 550 - UCI - CONVERSION SCALES

UCI

Material Class	Method	Unit	Conversation Range	E modulus GPa
Steel and cast Steel	Leeb	HLD	290-890	210
	Brinell	HB	66-737	
	Rockwell	HRC	20-70	
		HRA	59-99	
		HRB	37-85	
		HR15N	69-94	
		HR15T	78-96	
	Rm	MPa	220-2264	
Aluminium	Vickers	HV	24-225	75
	Brinell**	HB	24-199	
	Rockwell**	HRB	24-255	
1 point quick shift conversion curves				
Titanium / Ti5Al-4V	Vickers	HV	263-406*	115
Cast Iron / GJS			141-193*	160
Incoloy 825 / 2.4858			32-197*	195
304L / 1.4301			170-244*	200
P91 / T91			140-228*	218
Alloy 75 / 2.4630			140-225*	221

* Recommended conversion range base on 1-point quick shift conversions.
Measurements outside of this range may be prone to higher measurement errors.

**Conversion based on ISO 18265

Read more about the Young's (Elastic) modulus impact on UCI measurements

https://www.screeningeagle.com/en/inspection/youngs-modulus-ultrasonic-contact-impedance-hardness-testing

EQUOTIP 550 - UCI - TEST PIECE REQUIREMENTS

UCI test loads, specimen requirements and indentation size specs

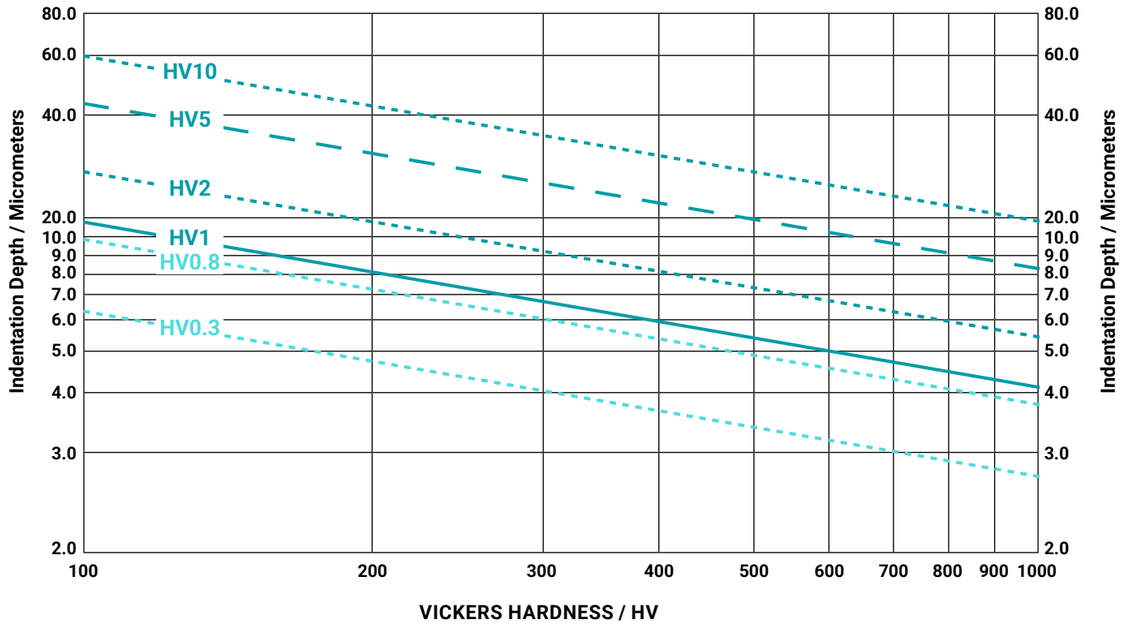
The UCI test method has lower requirements for test specimen thickness and weight, which can give it an advantage when testing thin and lightweight parts.

Impact devices/probes	UCI < 1kgf	UCI 1-10 kgf
Thin objects	●	○
Light objects	●	○
Objects with limited/difficult accessibility	○	●
Polished objects[1]	●	●
Small round objects	●	●
Mid-size objects	●	●
Very hard objects	●	●
Large objects	●	●
Large cast objects	○	○
Coatings	●	○

1) if only smal indentation are allowed. ○) Depending on test object.

Probe setup		HV0.3 (2.9N)	HV0.8 (7.8N)	HV1 (9.8 N)	HV5 (49 N)	HV10 (98N)
Minimal required wall thickness (DIN50159)		5 mm / 0.2 inch				
Minimal required wall thickness (ASTM A1038)		2 mm / 0.08 inch				
Minimal required weight (ASTM A1038)		0.3 kg / 0.66 lbs				
Minimal required weight (DIN 50159)		0.2 kg / 0.44 lbs				
Minimum layer thickness		10 x indentation depth				
Required surface roughness	Grade class	N6	N7	N8	N10	
	Average roughness	<0.8 µm / 31 µinch	1.6 µm / 63 µinch	3.2 µm / 125 µinch	12.5 µm / 500 µinch	
Acceptable surface curvature		Radius > 3 mm				
Minimum indentation spacing	Indentation to edge	5 mm / 0.2 inch				
	Between indentations	3 mm / 0.12 inch				
Indentation size on test surface						
300 HV, ~ 30 HRC	Depth	6.1 µm /236 µinch	10.0 µm /394 µinch	11.3 µm / 445 µinch	25.3 µm / 996 µinch	35.5 µm / 1398 µinch
	Diagonal	43 µm /1693 µinch	70 µm /2756 µinch	79.1 µm / 3114 µinch	177.1 µm / 6972 µinch	248 µm / 9764 µinch
600 HV, ~ 55 HRC	Depth	4.3 µm /169 µinch	7.1 µm/276 µinch	8 µm / 315 µinch	17.9 µm / 705 µinch	25.1 µm / 988.2 µinch
	Diagonal	30.4 µm /1196 µinch	49.7 µm /1956 µinch	56 µm / 2205 µinch	125.3 µm / 4933 µinch	175 µm / 6890 µinch
800 HV, ~ 63 HRC	Depth	3.8 µm /138 µinch	6.1 µm /236 µinch	6.9 µm / 272 µinch	15.5 µm / 610 µinch	21.7 µm / 854 µinch
	Diagonal	26.3 µm /1035 µinch	43 µm /1693 µinch	272 µm / 1900 µinch	108.5 µm / 4272 µinch	152 µm / 5984 µinch

Vickers indentation depth vs. hardness & test load map



EQUOTIP 550 - UCI - TECH INFORMATION

UCI Motorized Probes: MOTO-03 & MOTO-08

Its very low indentation force enables users effortless testing of coatings, thin layers and delicate surfaces with nearly no impact from operator on the final result.

Standards	Conversion standards	Guidelines
ASTM A956 / A370 / A1058	**ASTM E140**	**ASME CRTD-91**
DIN 50159	**ISO 18265**	**DGZfP Gudeline MC 1**
GB/T 17394	**Proceq's own conversion curves**	**VDI / VDE Gudeline 2616 Paper 1**

Hardness measurements with test loads below 10 N (HV1) fall into the category of microhardness testing and produce very small indentations on the test surface, making them highly sensitive to probe handling. This is why motorized probes are the preferred solution when working with loads below 10 N.

Resonator protector for non-flat surfaces

Magnetic foot stand for flat and magnetic materials

V-shaped foot adapter for curves surfaces 8-30 mm

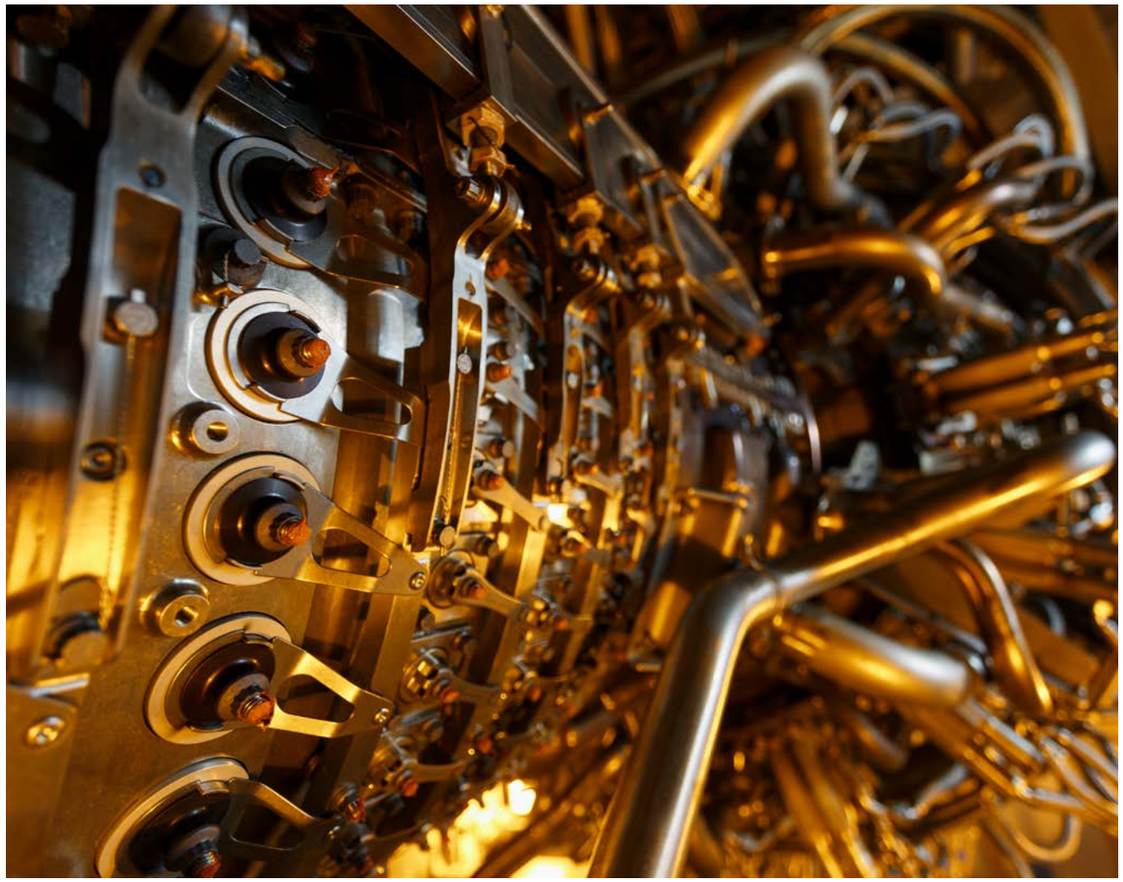
Specs	
Measuring range	100-1500 HV
Resolution	1 HV (UCI), 0.1 HRC
Measuring accuracy	± 2% (150 – 950 HV)
Test loads	HV 0.3, HV 0.8
Diamond indenter	136° Vickers diamond indenter according to ISO 6507-2
Dimensions	235 mm x ⌀ 40 mm (9.25 inch x 1.57) inch

Thin coating testing guide based on the test force / kgf (HV)	**0.3**	**0.8**
Thin coatings with highly polished surface	●	
Coatings with thickness over 40 micron (Chromium and Copper)	●	
Hardening layer with thickness over 20 micron	●	○
Rotogravure cylinders	●	○
Precision parts	●	
Bearing race		●
Bearings guide rail		●
Bearings		●
Crankshafts and camshafts		●
Ion nitridated layers	●	●
Precision mold	●	●
Small parts	●	●
Case hardeninng	●	●
Polished metals (Steel, Al, Ti, etc) without wisible surface damage	●	○

EQUOTIP 550 - UCI - CASE STUDY/AN

Turbomachinery: Quality assure different components with one probe

For turbomachinery such as gas or steam turbines that work under high temperature and pressure environment, it is essential to check the hardness of different components. This application note describes how you can quality assure and measure the hardness of several different components with just one probe.



This application note describes how to quality assure and measure the hardness of several different components with just one probe.

Turbomachinery components for high temperature and pressure

Gas turbines and steam turbines work under high temperature and pressure environment. Some components even sustain dynamic loadings. It is essential to check the hardness of different components of turbines to ensure enough strength as well as other parameters e.g. anti-fatigue performance.

Components with hardness exceeding the required boundaries might lead to severe consequences. For example, turbine blades with less hardness than required might crack and then break during operation, fly out at a high speed, damage infrastructure and hurt people.

Different test loads for different applications

Screening Eagle customers around the world use the Equotip 550 UCI and Equotip Live UCI to assure the quality of turbines. Previously, the customer was using UCI probes which only allow one test load per probe. Due to the test load requirements from different components, they need to purchase and maintain multiple probes.

The unique “adjustable test load” feature of Equotip UCI probes allows customers to measure hardness on different components with only one probe. For instance, HV1 test load is selected to measure on thin coating layers of the turbine blades, HV5 test load is selected to measure on big bolts and HV10 test load is selected to measure on the rotor. It is very convenient for customers to carry only one probe to cover all the applications they need for the entire turbine.also shows the incredible potential of the non-destructive testing equipment, Schmidt hammer and Equotip, when used in extreme conditions.

Quick on-site test thanks to the portability and unique feature: 3-in-1

Before the turbine is assembled together, customers take the device to quickly test different parts one by one on the manufacturing sites. Once the turbine is assembled and installed, customers easily take the device to power plant sites and quality assure the entire turbine during e.g. scheduled outages.

EQUOTIP 550 - ROCKWELL - TECH INFORMATION

Material independent method

Equotip portable Rockwell is a portable version of the conventional Rockwell method and can be used to test larger test pieces but also thin elements, wires and rods, heat exchangers in aerospace, automotive, machine industry and even in space rockets.

Standards

ASTM A3246

DIN 50157

Conversion standards

ASTM E140

ISO 18265

Guidelines

ASME CRTD-91

DGZfP Gudeline MC 1

VDI/ VDE Gudeline 2616 Paper 1

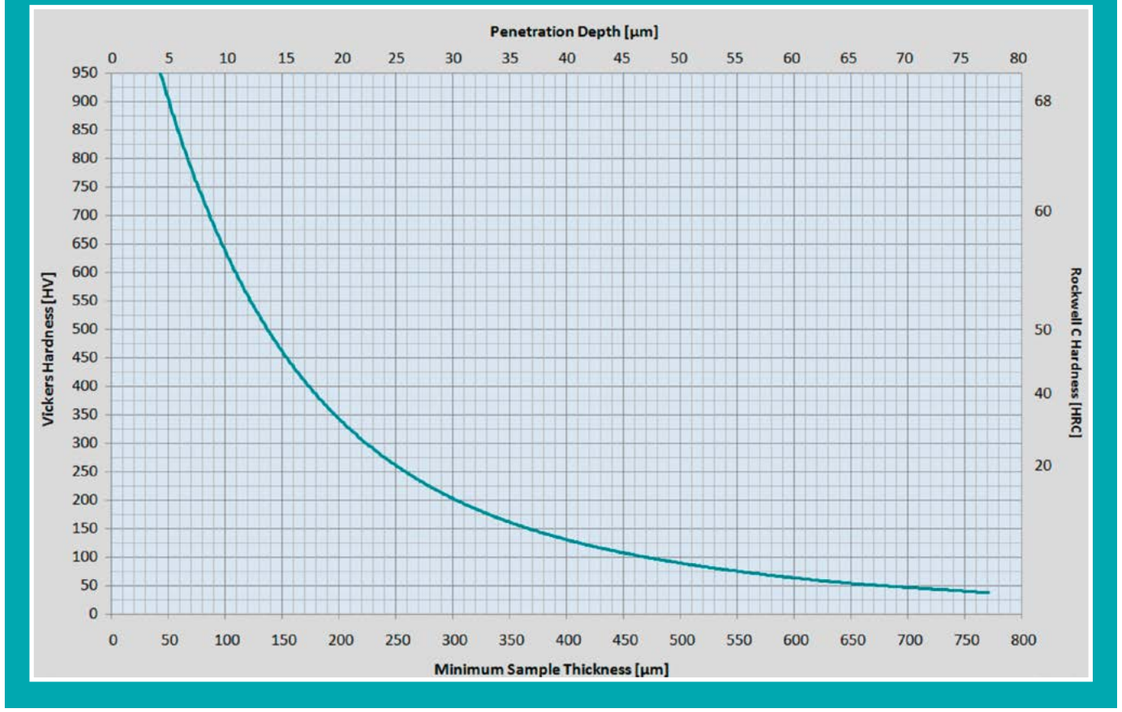
The Equotip Portable Rockwell has no mass limitations, and its thickness limitations follow the same principles as the stationary Rockwell method, allowing users to test pieces even below 1 mm.

Measuring range	0-100 µm; 19-70 HRC; 35-1‘000 HV
Resolution	0.1 µm; 0.1 HRC; 1 HV
Measuring accuracy	± 0.8 µm; ~ ± 1.0 HRC over entire range
Test loads	Preload 10 N / Total Load 50 N
Diamond indenter	Angle 100.0° ± 0.5°, diameter of flat area of 60 µm ± 0.5 µm
Dimensions	112 x Ø 40 mm // 4.4 x Ø 1.57 inches (without foot)

This product must be used with the foot

No thickness limitation

The required minimum thickness for a reliable hardness reading is ten times the indentation depth. For the mass there is no minimum requirement.



EQUOTIP 550 - ROCKWELL - ACCESSORIES

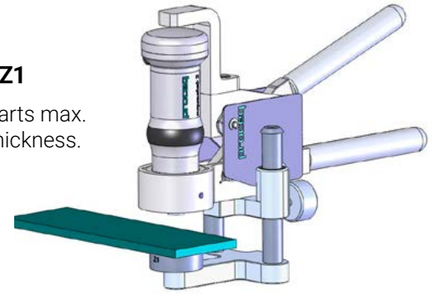
The Equotip Portable Rockwell Measuring Clamp

A measuring clamp is an excellent tool for testing pipes and cylindrical objects because it ensures stable and accurate positioning of the probe, preventing vibrations and slippage and improving the consistency of results, especially on curved surfaces and thin test objects.

Clamp Adapters

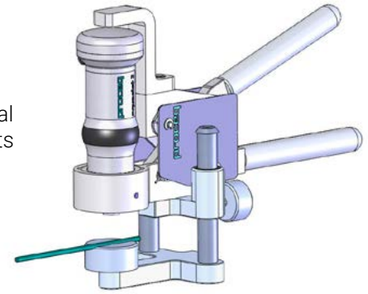
Support Z1

For flat parts max. 40 mm thickness.



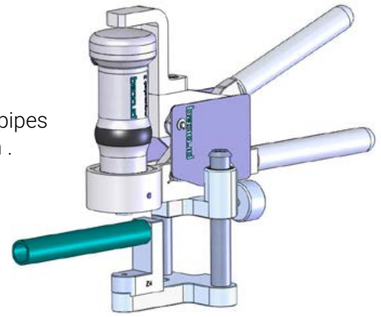
Support Z2

For thin cylindical parts, wires, bolts min. Ø 3 mm.



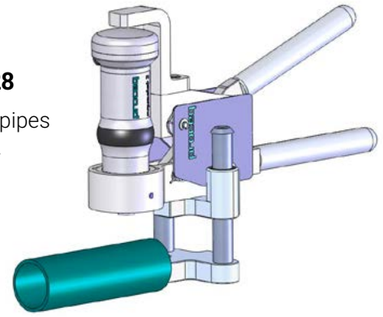
Support Z4

For tubes and pipes up to Ø 28 mm .



Support Z4+28

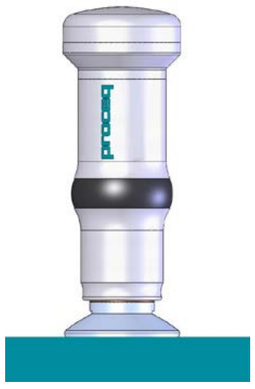
For tubes and pipes over Ø 28 mm.



Rockwell feet for any shape

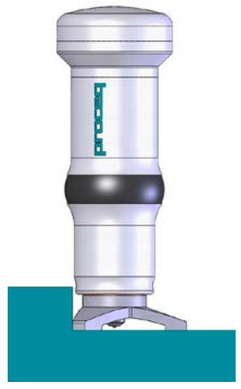
Round standard foot (magnetic)

Ideal for flat parts, and test locations more than 10 mm from an edge.



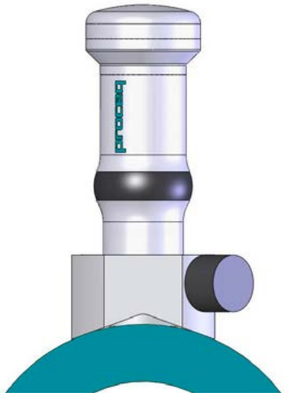
Tripod foot

Designed for tests that require accurate positioning (welds, heat-affected zones).



Special feet RZ 18-70 and 70-∞

Designed for curved test pieces such as cylindrical parts, tubes, pipes.



EQUOTIP 550 - ROCKWELL - CONVERSION SCALES

Available unit conversions to various most common hardness scales and mechanical strength.

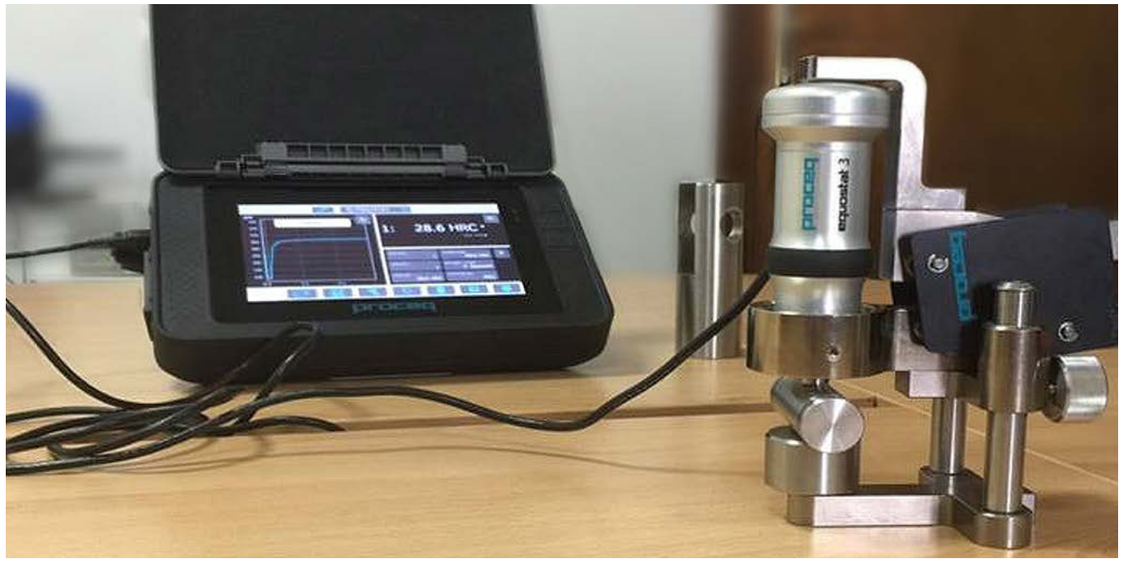
Material Class	Method	Unit	Conversion Range
	Leeb	HLD	290-890
	Vickers	HV	30-1080
	Brinell	HB	76-618
	Rockwell	HRA	37-87
Steel and cast Steel		HRB	55-100
		HRC	19-70
		HR15N	69-93
		HMMRC	19-70
	R_m	MPa	255-2180

EQUOTIP 550 - ROCKWELL - TEST PIECE REQUIREMENTS

The Equotip Portable Rockwell probe delivers reliable testing with accurate results, and proper surface preparation is essential for achieving this precision. It also offers flexibility across various curvatures, making it ideal for diverse testing needs.

Probe setup	50 N probe with clamp	50 N probe with round standard foot (ø = 42 mm)	50 N probe with tripod	50 N probe with special feet
Minimum test piece thickness	250 µm at ~ 20 HRC <100 µm at ~70 HRC			
Maximum test piece thickness	40 mm *	no maximum thickness limits		
Test piece surface condition	recommended mean surface roughness Ra < 2 µm to minimize data scatter			
Surface curvature		foot to be used for plane surfaces	very small curvatures acceptable	18 – 70 mm radius of curvature or 70 mm – ∞
Maximum test piece hardness	70 HRC			
Minimum spacing	three times the diameter of a test indentation			

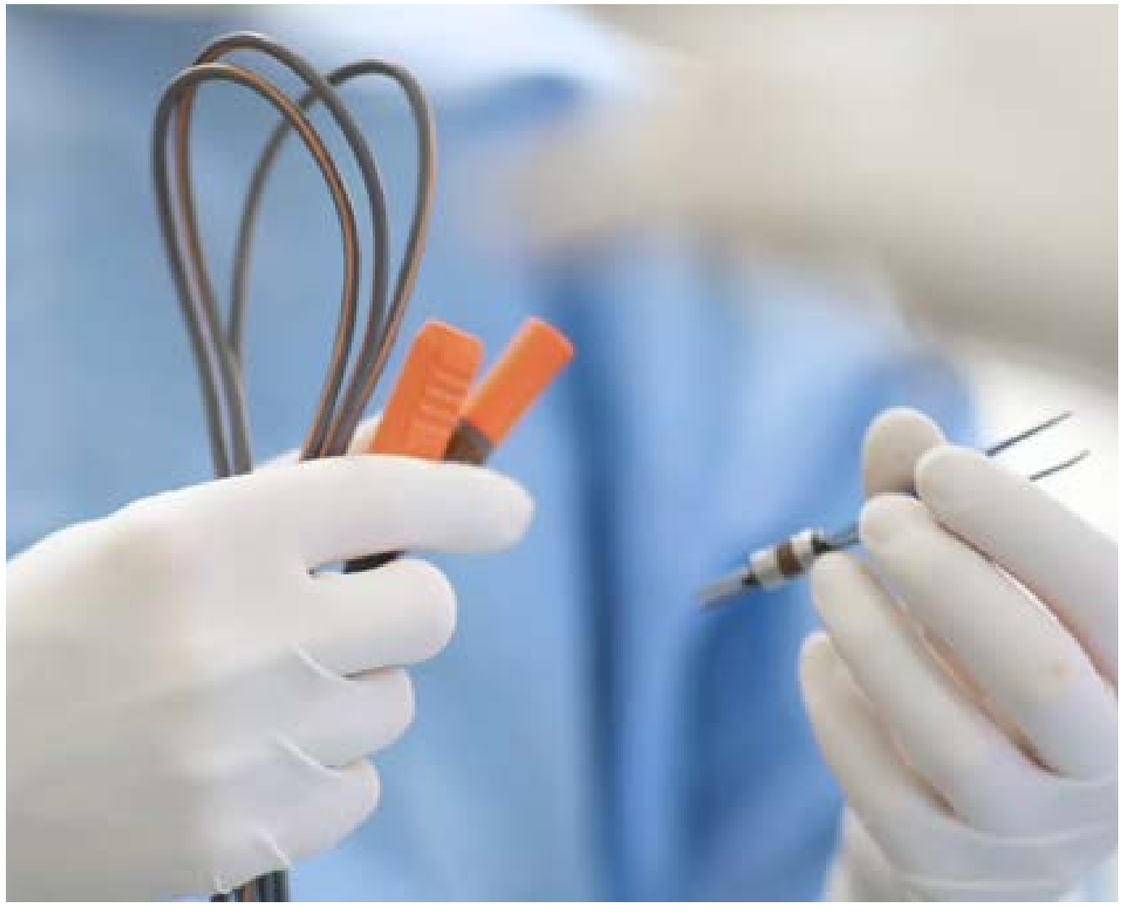
*Test piece thickness is required because of the clamp



EQUOTIP 550 - ROCKWELL - CASE STUDY/AN

Assessing the Hardness of Thin Medical Wires

Accurately assessing the hardness of small components such as very thin medical wires can be a challenging task. See how to achieve quick and reliable hardness measurements for thin wires using the direct-indentation method.



This application note describes how to inspect the hardness of thin medical wires with portable hardness testers.

Hardness evaluation of thinner wires

The industry is well equipped with such tools as Leeb rebound testers or Ultrasonic Contact Impedance (UCI) to evaluate the hardness of larger objects that fulfill the mass and dimension criteria; crucial conditions to correctly evaluate the hardness of tested objects.

Objects below the mass dimension limits must be coupled with a special grease to a solid surface, in order to prevent the test piece from vibrations. However, as the objects become smaller, the correct assessment of the hardness is a challenging task.

Quick and reliable measurement with the direct-indentation method

For many years, our customers have been verifying HRA and HRC hardness values of very thin 3 - 5 mm medical wires made out of stainless steel, copper, aluminium and brass.

The Equotip 550 Portable Rockwell probe installed in the measuring clamp fits the application perfectly and delivers the required results quickly and easily. The simplicity and portability of the Equotip 550 are greatly appreciated by the customers.

What materials can be tested?

In short, any. The Portable Rockwell method measures the penetration depth of the test piece and is measured in micrometers, hence any material which is at least 10 x thicker than the indentation depth can be successfully tested.

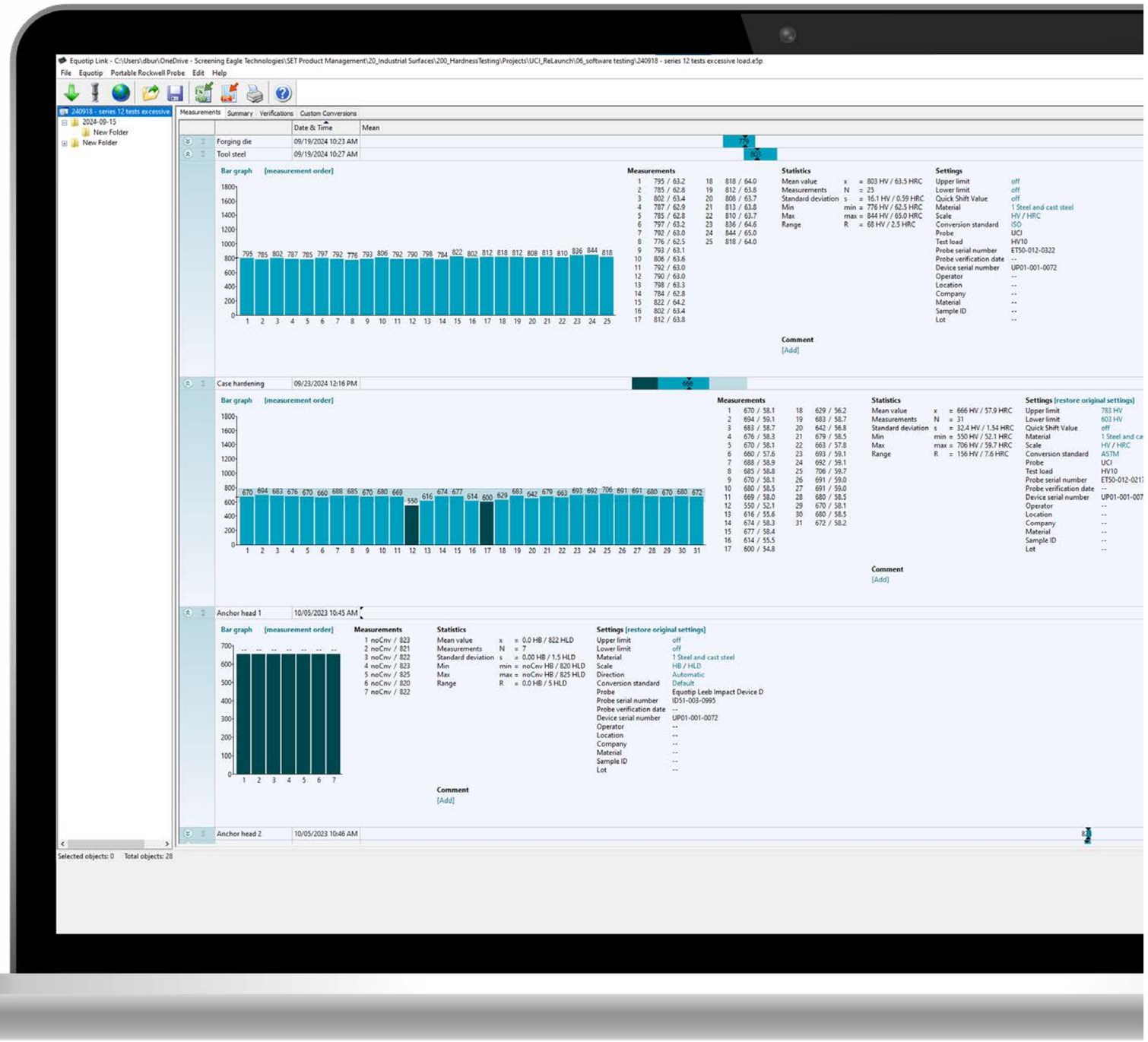
EQUOTIP 550 - LINK

Store and process your data efficiently

Your gateway to data management and consistent updates. Receive notifications and prompts whenever new software update is available.

Your data solution: storage, processing, and updates. A PC software that enables you to:

- View and modify your measurement data thanks to the intuitive user interface (min, max values, measurement range, average, measurement and test piece traceable data)
- Secure your data on a local drive
- Download, view, process, and export your measurement, verification and custom conversion data to excel and PNG files
- Change your conversion units and standards directly in the software
- Manage a fleet of your devices, upload your custom conversion files to multiple devices within your organization, download or upload your device settings



Compatible with a wide variety of Windows Environments (from XP up to Windows 11)

Equotip Live

EQUOTIP LIVE - GENERAL INTRO

Adhering to global industry standards

New generation wireless impact device

- Ergonomic design
- Multi-color status LEDs
- Standard Batteries (for flights)
- Bluetooth LE
- Compliance to standards

Take it to any workspace and share data in real-time! There is no need to go back to the office to sync your data.

Powerful features for data review and sharing

- Enhanced logbook features including text and voice notes, photos and tested objects keep your observations and details with the data.
- Multiple data exporting possibilities (URL, PDF, CSV)
- Available for web browsers and iOS based devices

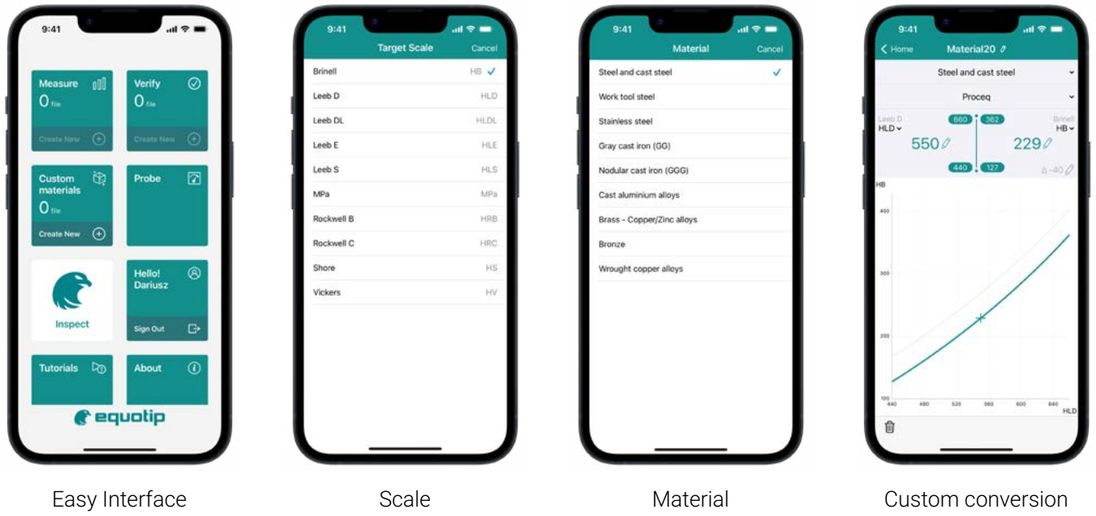
Custom materials

- Flexible for all applications, such as new or rare materials and non-standard alloys
- Custom curve conversion function
- Application of custom conversion to new and already-acquired data sets

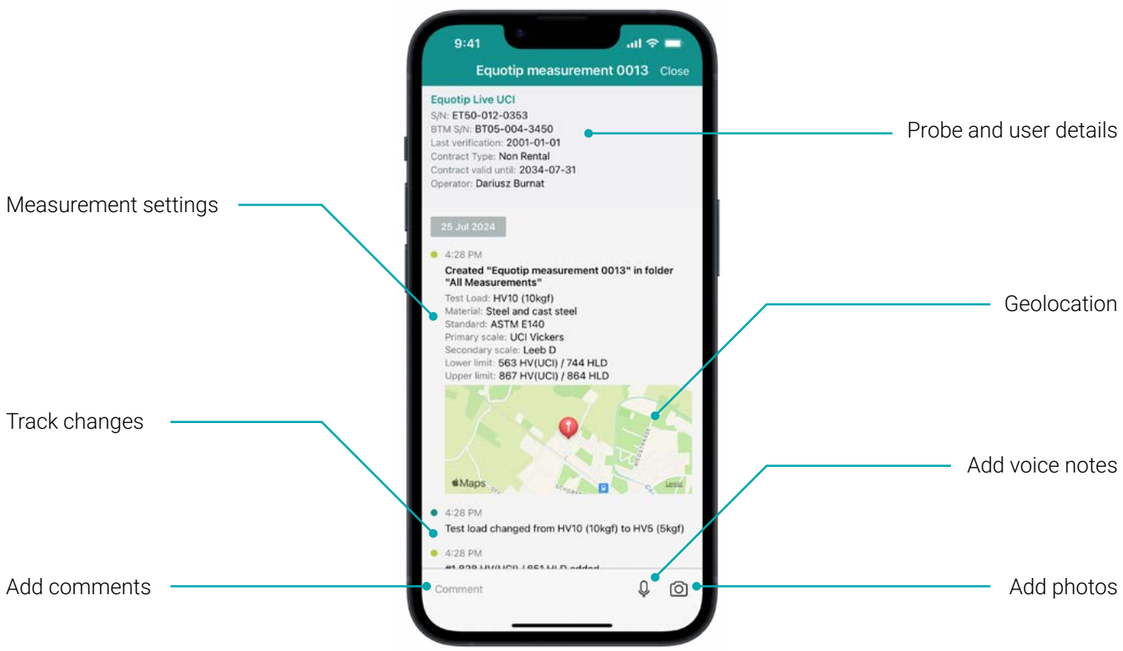
EQUOTIP LIVE - SOFTWARE

Sync and share: on the go reporting

Full Analysis Engine in your hand



Easy Interface | Scale | Material | Custom conversion



All the IoT ecosystem of Proceq solutions:

- Access data wherever
- Generate reports (photo bar charts, statistics..)
- Traceable logbook (screenshot geo location, text)
- Verification and calibration information

EQUOTIP LIVE - LEEB D

Software connected Dynamic Rebound Impact Device

Standards

ASTM A956 / A370 / A1058

ISO 16859

GB/T 17394

JB/T 9378

Conversion standards

ASTM E140

ISO 18265

Proceq's own conversion curves

Guidelines

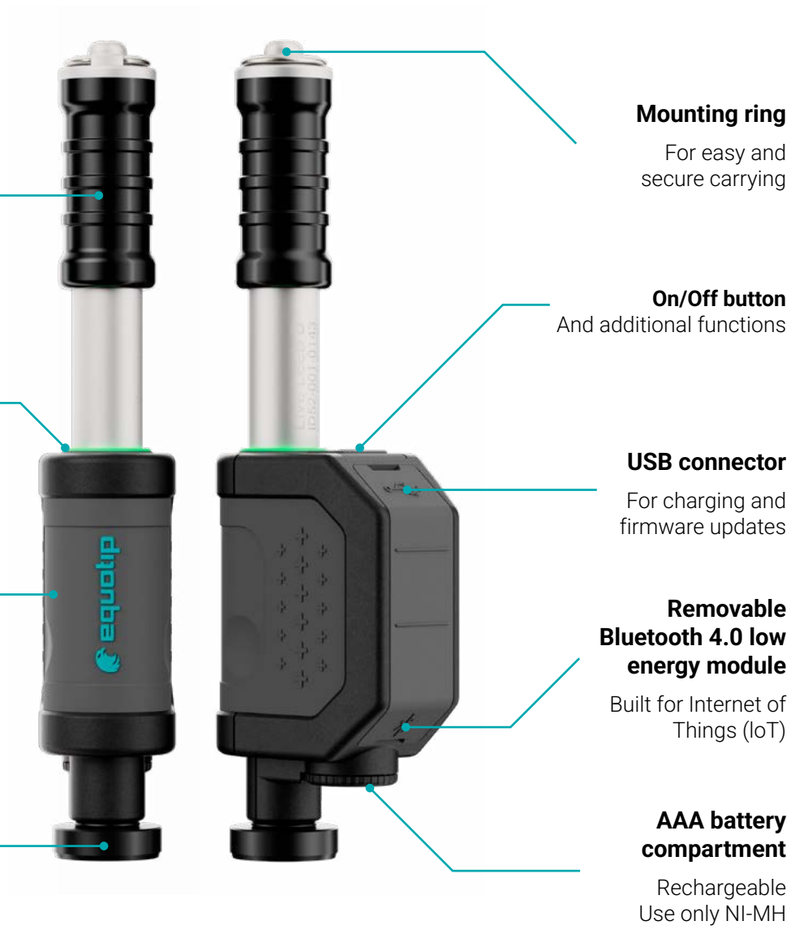
ASME CRTD-91

DGZfP Gudeline MC 1

VDI / VDE Gudeline 2616 Paper 1

Nordtest Technical Reports 99.12, 99.13, 99.36

Operation hours	Up to 20h
Measuring range	100-1000 HLD
Measuring accuracy	± 4HLD, (0.5% @800 HLD)
Indenter	Tungsten carbide (D)
Impact energy / Test force	11 Nmm (D, DL)
Measuring resolution	1 HLD/HV/HB 0.1 HRC/HRB/HS 1 N/mm 2 (Rm)
Weight	86 g
Dimensions	46 x 24.5 x 146 mm
Operating temperature	-10 to 50 °C, Humidity 90% max



Loading grip

Innovative loading grip for safe operation

Multi-color LED ring

With status indication

Functional materials

Slip proofed rubber and IP 54 sealed housing

Exchangeable support ring

Compatible with existing Proceq accessories

Mounting ring

For easy and secure carrying

On/Off button

And additional functions

USB connector

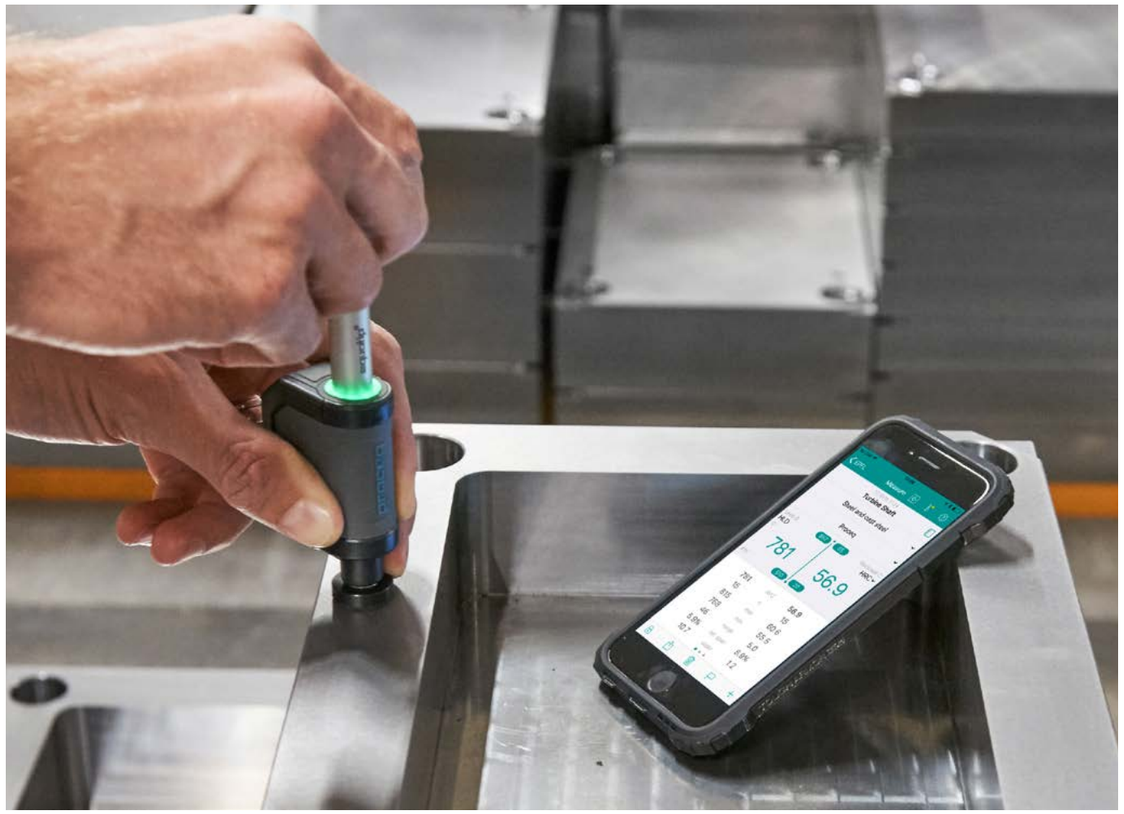
For charging and firmware updates

Removable Bluetooth 4.0 low energy module

Built for Internet of Things (IoT)

AAA battery compartment

Rechargeable
Use only NI-MH



EQUOTIP LIVE - UCI

Software connected Ultrasonic Contact Impedance hardness testing

Standards

ASTM A1038 / A370

DIN 50159

GB/T 34205

Conversion standards

ASTM E140

ISO 18265

Proceq's own conversion curves

Guidelines

ASME CRTD-91

DGZfP Gudeline MC 1

VDI / VDE Gudeline 2616 Paper 1

Operation hours	4-8h (depending on the used battery capacity)
Measuring range	20-2000 HV
Measuring accuracy	± 2%
Indenter	ISO 6507-2 compliant, 136° Vickers diamond
Impact energy / Test force	HV1 (9.8 N), HV5 (49 N), HV10 (98N) in one probe
Measuring resolution	1 HV(UCI), 0.1 HRC
Weight	234 g
Dimensions	77 x 62 x 185.5 mm
Operating temperature	-20°C to +60°C / 14°F to 122°F

Color diodes indicating the device status

Ergonomic head design for various type of grips, comfortable load application and easier angle maintenance

Force-measurement sensor facilitating precise and accurate measurements

Easily swappable standard AA rechargeable battery, 6h> operation

Bluetooth LE dongle for wireless operation

Micro USB port for firmware updates and charging (also powerbank)

234g/8.26 oz, lightweight anodized aluminum housing limiting the operator fatigue

Traceable, certified, ISO 6507-2 compliant, 136° Vickers diamond

Equotip
Piccolo 2
Bambino 2

EQUOTIP PICCOLO 2 / BAMBINO 2

Ideal for Rapid On-Site Hardness Tests

Standards

ASTM A370

ASTM A956

DIN EN ISO 16859

GB/T 17394

JB/T 9378

Conversion standards

ASTM E140

ISO 18265

Proceq's own conversion curves

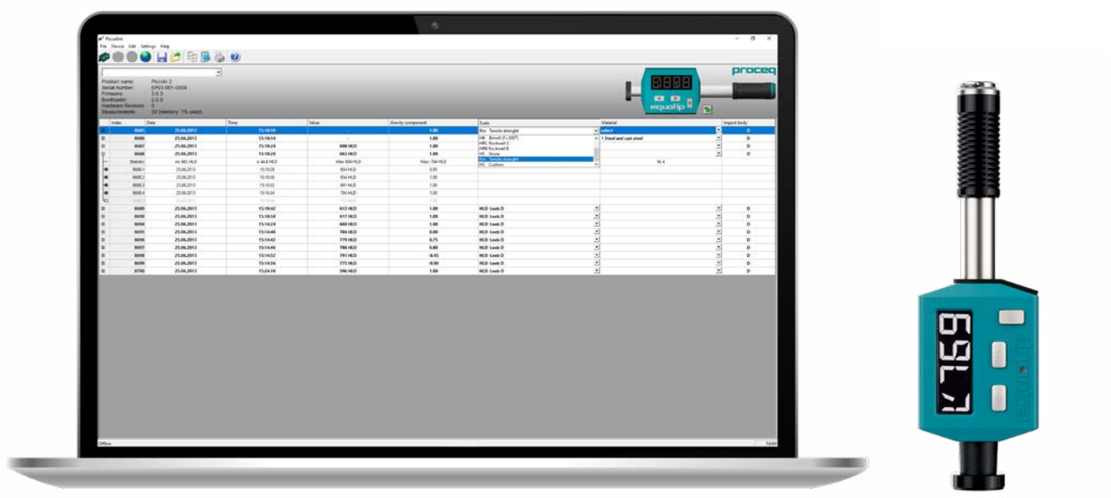
Guidelines

ASME CRTD-91

DGZfP Gudeline MC 1

VDI / VDE Gudeline 2616 Paper 1

Nordtest Technical Reports 99.12, 99.13, 99.36



Features

- Compact: pocket size
- Large and bright display
- Robust metal Zn/Al casing
- Leeb D/DL method
- Li-Ion Battery
- PC Software (Piccolo 2 only)

Software

- Automatic compensation for impact direction
- Remote control of Piccolo 2 settings
- User-defined hardness conversions (Piccolo 2 only)
- Piccolo Link (Piccolo 2 only) for data download, management and export (CSV, PNG), Conversion curve management, and for upgrades of constantly expanding Equotip and Equotip Link Software.

	With Impact device D	With Impact device DL
Measuring range	150-950 HLD	250-970 HLDL
Instrument dimensions	147.5 x 44 x 20 mm (5.71 x 1.75 x 0.79 inches)	203 x 44 x 20 mm (7.99 x 1.75 x 0.79 inches)
Instrument weight	142 g (5 ounces)	152 g (5.4 ounces)

	Piccolo 2	Bambino 2
Conversion	80-955 HV, 81-678 HB, 20-70 HRC, 38-102 HRB, 30-100 HS Piccolo 2 only: 274-2193 N/mm2	
Instrument dimensions	147.5 x 44 x 20 mm (5.71 x 1.75 x 0.79 inches) 203 x 44 x 20 mm (7.99 x 1.75 x 0.79 inches)	
Measuring resolution	1 HLD/HLDL/HV/HB; 0.1 HRC/HRB/HS 1 N/mm 2 (Rm)	
Measuring accuracy	± 4 HLx (0.5% @800 HLD / HLDL)	
Maximum test hardness	890 HLD (955 HV, 68HRC)	
Impact energy / Test force	11 Nmm (D, DL)	
Indenter	Tungsten carbide (~1,600 HV), 3 mm (0.12 inches) diameter	
Battery	Rechargeable Li ion, operation period over 20,000 impacts, charging current 100mA	
Operation hours	> 20'000 impacts	
Operating conditions	Temperature: -10 to +60 °C, Humidity: 90% max.	
Memory	Non-votailevolatile, RAM 32KBytes, 2'000 impacts	
Connectivity	PC connection for data exporting	No

ACCESSORIES

- Easily interchange D and DL impact devices
- Support rings available

Calibration

CALIBRATION - CALIBRATION TEST BLOCKS

Self verify your devices with full traceability test blocks

All applicable standards recommend or require performing a simple equipment test before and after material testing. In this indirect check, measurements are performed on certified hardness reference blocks in the corresponding hardness range, to verify the correct operation of the test equipment.

Leeb Features:

- Patented process ensuring the highest hardness homogeneity
- Double side-calibration enables the users 2x longer lifetime
- ISO & ASTM compliant
- ISO 17025-accredied calibration

	Hardness level			
Probe type	Soft	Medium	Hard	Very hard
D/DC	~< 500 HLD / 220 HB	~600 HLD/ 325 HB	~ 775 HLD/ ~56 HRC	
DL	~<710 HLDL/<220 HB	~780 HLDL/325 HB	~890 HLDL /~56 HRC	
C	~565 HLC/<220 HB	~665 HLC / ~325 HB	~835 HLC/~56 HRC	
G	~<450 HLG/ >200 HB	~570 HLG/ 340 HB		
S			~815 HLS/ ~56 HRC	~850 HLS/ ~62 HRC
E			~740 HLE/ ~56 HRC	~800 HLE/~63 HRC

UCI Features:

- Patented process ensuring the highest hardness homogeneity
- Available with HV1, HV5 and HV10 calibrations., as well as HV0.3&HV0.8
- ISO & ASTM compliant
- ISO 17025-accredied calibration

	Hardness level		
Probe type	Soft	Medium	Hard
UCI	~ 300 HV	~550 HV	~850 HV

Rockwell Features:

- Enlarged surface providing longer lifetime
- Unmatched hardness homogeneity
- ISO & ASTM compliant

	Hardness level		
Probe type	Soft	Medium	Hard
Rockwell	~ 20 HRC	~45 HRC	~62 HRC

Wide range of additional calibrations is available for all test blocks to meet every customer requirement.

CALIBRATION - CALIBRATION SERVICE AND WARRANTY

Worldwide service network

Proceq embodies reliability and quality assurance in the industry, with an ISO/IEC 17025 accredited calibration laboratory. This accreditation helps ensure that every product leaving our calibration facility meets the highest standards and has full traceability.

All Equotip hardness testing probes, Leeb and UCI test blocks are deliverd with ISO 17025-accredited calibrations, as our factory default calibrations.

Proceq's commitment to excellence extends globally, facilitated by its expansive service network of partners and sales presence spanning over 100 countries. This extensive reach underscores the company's dedication to serving customers worldwide, providing you with unparalleled support and accessibility to its cutting-edge products and services.

Service and Support

Proceq is committed to providing the best support and service available in the industry through the Proceq certified service centers worldwide. This results in complete support for Equotip by means of our global service and support facilities. Proceq offers various extended warranty options.

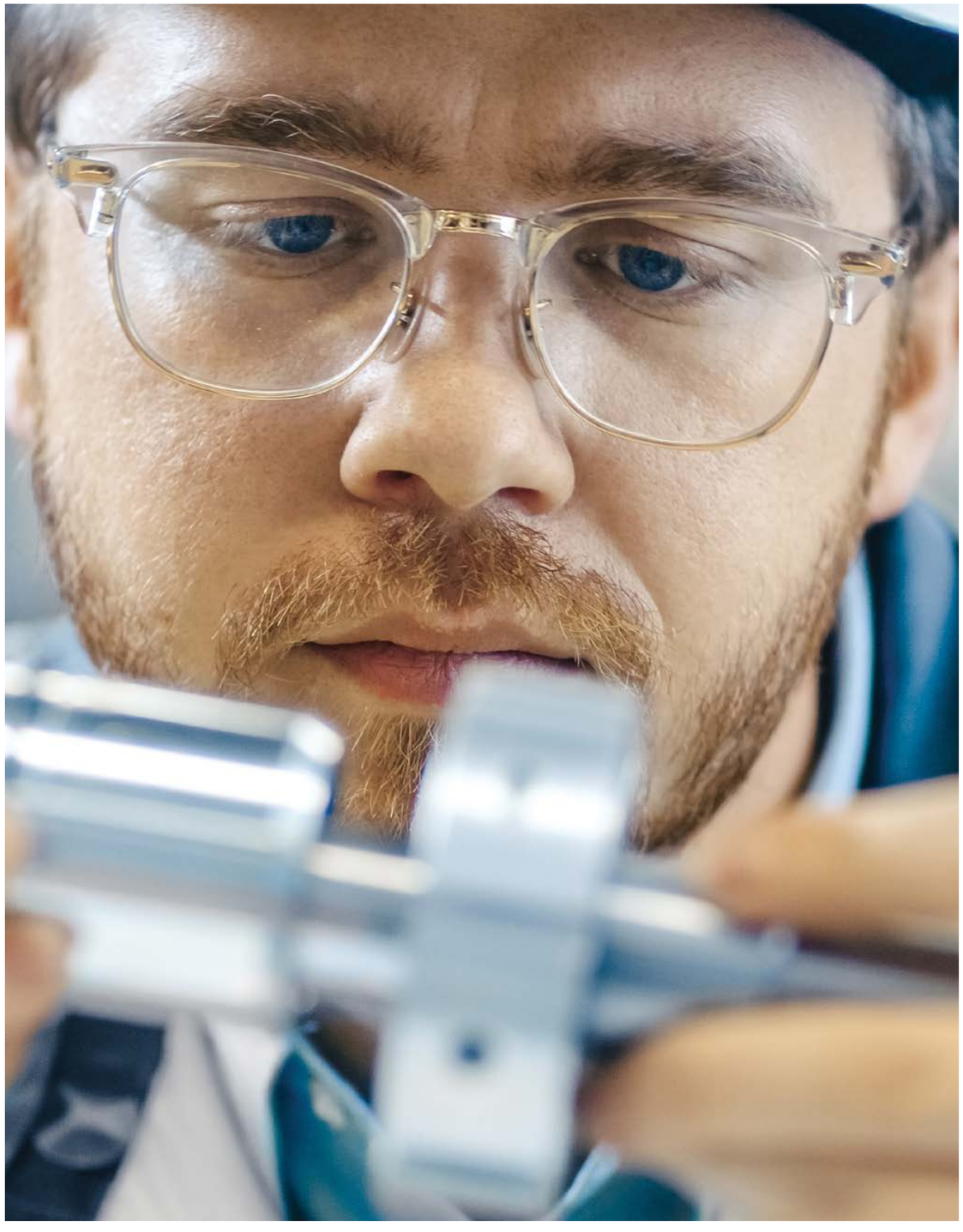
What is ISO/IEC 17025?

ISO/IEC 17025 (The International Organization for Standardization) accreditation serves as a formal recognition of the technical competence and reliability of testing laboratories in calibration.

Why is traceability crucial for quality control?

Traceability ensures accurate measurement results. To maintain accuracy in every step of the calibration process, it is essential to have full traceability to National Standards (SI units). ISO/IEC 17025 confirms that traceability in the laboratory is assured. This means that all the measurements are made using the same standard and they can later be related to known references, expressed in standard units, through a series of calibration comparisons. This ensures reliability and universal acceptance of measurement standards among laboratories.

Read more in this QR: https://www.screeningeagle.com/en/product/services/calibration-lab
This ensures reliability and universal acceptance of measurement standards among laboratories.



PORTABLE HARDNESS TESTING BOOK

Written by the inventors of Equotip

The Equotip team brings portable hardness expertise to your fingertips with the world's first portable hardness testing book! Used to train thousands of hardness quality experts all over the world, the book is now an industry must-have.

Download for free from our website.

Decades of knowledge in one comprehensive book.

Chapter

01 02 03 04 05 06 07 08

Driving quality for the automotive sector

Automotive manufacturing involves many different components and routine hardness testing is carried out in several areas. Components where quality of materials and manufacture is regularly subjected to hardness testing include engine blocks and cylinders, shafts, gears, brake systems, coils and panels.

The production and assembly of a whole range of high quality, precision-engineered components is required in automobile manufacture. Hardness testing plays a crucial role in ensuring that these parts have been manufactured correctly and that they will perform according to specification during the operational lifetime of that vehicle.
The following paragraphs describe the three foremost examples of where hardness testing is used in the automotive sector.

Combustion engines

Engine cylinder blocks and cylinder heads are heat treated to optimize their resistance to excessive wear and tear – and to ensure a long lifetime for the whole engine.
Hardness tests are most commonly carried out on aluminum components and determine whether or not they meet the required parameters. Wrong hardness values not only compromise the lifetime, but can also damage tools during the next steps in the manufacturing process.
It is also common practice to conduct hardness testing on used engine parts, after repairs for example, to check whether long-term exposure to heat has caused any change in the hardness or materials integrity.

Shafts

Hardness is an important parameter for ensuring the quality of cam- and crankshafts of automotive engines.
A hardness value which is too low indicates problems during the quenching process. This results in low strength and low abrasion performance of the crankshaft. On the other hand, if hardness values are too high, then this can lead to brittleness and failure.
Therefore, the hardness must be carefully checked and monitored constantly to find and solve problems quickly. Otherwise, entire crankshaft batches may need to be scrapped.

Gears

Transmission gears are not only present within this sector but also belong to the machinery sector too. For example, gears are used in cranes too – where they require hardness testing before being installed onto the main unit. If the hardness is not within the specified standard, damage to the whole crane system may be caused.

1 Cylinder head block – hardness testing is used to determine whether components meet the required parameters.
2 Inspection of automotive shaft with Equotip UCI.
3 Whether for automotive or industrial use, transmission gears must be hardness tested, else risk damage to the whole installation.

Chapter

01 02 03 04 05 06 07 08

Applications for hardness testing

Hardness measurements are used in a wide variety of industries at many production levels, from process control to quality control of manufactured products to the regulated monitoring of material performance during use, for example condition monitoring or lifetime assessment and extension. Many industries regularly carry out hardness testing and, typically, these are businesses within the automotive, oil and gas, machinery and manufacturing and aerospace sectors. However, there are also many less conventional users of and uses for hardness testing. The following pages offer an insight into both the traditional and not-so-traditional applications for hardness testing.

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Why is ha

The requirements relat
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increasing continuous
major focus, along with

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For inquiries, please contact us!

We have over 200 local partners in many different countries around the world. We'll keep you in contact with your local partner to serve and support you with any requests.

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