

# **equotip**<sup>®</sup> Portable Hardness Testing Leeb – Rockwell – UCI



### **Measuring Performance**

- High accuracy
- Custom conversions
- Combined methods

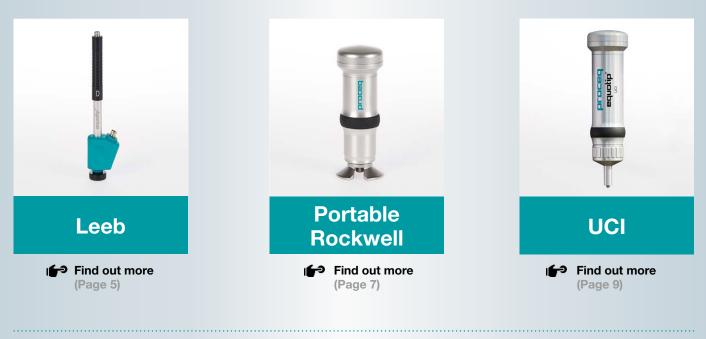


### Ease of Use

- Large touchscreen
- Personalized views
- Custom reports



# **The All-In-One Portable Hardness Testing Solution**





**Powerful Hardware** 

• High capacity battery

• Versatile connectivity

Rugged housing

# **Covering Broad Application Range**



		Leeb	Portable Rockwell	UCI
		Dynamic Rebound	Static Rockwell	Ultrasonic Contact Impedance Method
	Av. Roughness ${\rm R_a}(\!\mu m/\mu inch)$	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 & HAZ		0	•
	Pressure Vessels		• • •	
	Flanges	•	• •	
	Pipes		• •	•
	Wellhead Equipment		•	<b>)</b>
Automotive				
	Engine Blocks	•		
	Shafts	•	•	•
	Panels		•	2
	Gears	٠		•
	Brake Systems		•	2
Aerospace			1	
	Turbine Blades		•	•
	Casings / Housings		•	
	Panels		•	
	Cast Objects	•		
	Landing Gears	•		
Manufacturing and M				
	Rolls	•	•	
	Coils	•	•	•
	Bars / Pipes	•		•
	Heat Treatment / Casting	•		
Constant Constant	Wires		•	
Combining methods			0	5
Extends the application range to samples and for correlating one n	confined spaces, non-ideal nethod with another.			CI & Rockwell



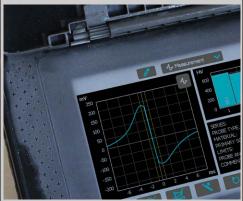
# Equotip<sup>®</sup> 550 Touchscreen Unit Built for Demanding Environments



Shock-absorbing, dust and water proof (IP 54) rugged housing



Functional at a wide temperature range from -10  $^\circ$ C to +50  $^\circ$ C



Connectors and circuits are protected against dust and voltage spikes





#### Standards

ASTN	A956 / A370
ISO	<b>EN</b> 16859
DIN	50156
GB/T	17394
JB/T	9378

#### **Conversion Standards**

ASTM E140

#### Guidelines

ASME CRTD-91 DGZfP Guideline MC 1 VDI / VDE Guideline 2616 Paper 1 Nordtest Technical Reports 99.12, 99.13, 99.36



# The global industry standard

Highly accurate ±4 HL



Wide Measurement Range Leeb impact devices are best suited for on-site testing of heavy, large or already installed parts.



#### Impact Devices & Accessories

Proceq offers a wide variety of impact devices along with support rings to serve most hardness testing requirements.



#### **Broad Hardness Scales** Coverage

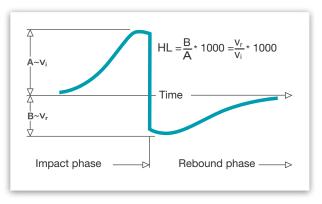
The measurements are automatically converted to all common hardness scales (HV, HB, HRC, HRB, HRA, HS) as required.



#### **Test Blocks Portfolio**

Extensive range of precise hardness test blocks available for each impact device with different hardness levels for regular verification.

Equotip Test Blocks Flyer



### The Leeb Measuring Principle – Invented by Proceq

Leeb hardness principle is based on the dynamic (rebound) method. An impact body with a hard metal test tip is propelled by spring force against the surface of the test piece. Surface deformation takes place when the impact body hits the test surface, which results in loss of kinetic energy. This energy loss is detected by a comparison of velocities v, and v, when the impact body is at a precise distance from the surface for both the impact and rebound phase of the test, respectively.

Velocities are measured using a permanent magnet in the impact body that generates an induction voltage in the coil which is precisely positioned in the impact device. The detected voltage is proportional to the velocity of the impact body. Signal processing is then providing the hardness reading.



# Equotip<sup>®</sup> Leeb Impact Devices

	Impact energy			D/DC	DL	<b>S</b>	E 11 Nmm	G 90 Nmm	C 3 Nmm
	Indenter			Tungsten	Tungsten	Ceramics	Polycrystalline	Tungsten	Tungsten
				carbide 3 mm	carbide 2.8 mm	3 mm	diamond 3 mm	carbide 5 mm	carbide 3 mm
	Scope			Most com- monly used probe. For the majority of applications.	Narrow indent- er (probe) tip for measure- ment on hard reach areas or spaces with limited access.	For mea- surements in extreme hard- ness ranges. Tool steels with a high carbide content.	For mea- surements in extreme hard- ness ranges. Tool steels with high carbide content.	Large and heavy com- ponents, e.g. casts and forged parts.	For surface hardened components, coatings, thin or impact-sen- sitive 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
	Steel and cast steel	Vickers Brinell Rockwell	HV HB HRB HRC	81-955 81-654 38-100 20-68	80-950 81-646 37-100 21-68	101-964 101-640 22-70	84-1211 83-686 20-72	90-646 48-100	81-1012 81-694 20-70
		Shore Rm N/mm <sup>2</sup>	HRA HS σ1 σ2 σ3	30-99 275-2194 616-1480 449-847	31-97 275-2297 614-1485 449-849	61-88 28-104 340-2194 615-1480 450-846	61-88 29-103 283-2195 616-1479 448-849	305-2194 618-1478 450-847	30-102 275-2194 615-1479 450-846
_	Cold work tool steel	Vickers Rockwell	HV HRC	80-900 21-67	80-905 21-67	104-924 22-68	82-1009 23-70	*	98-942 20-67
Range	Stainless steel	Vickers Brinell Rockwell	HV HB HRB HRC	85-802 85-655 46-102 20-62	*	119-934 105-656 70-104 21-64	88-668 87-661 49-102 20-64	*	*
Measuring	Cast iron lamellar graphite GG	Brinell Vickers Rockwell	HB HV HRC	90-664 90-698 21-59	*	*	*	92-326	*
leasi	Cast iron, nodular graphite GGG	Brinell Vickers Rockwell	HB HV HRC	95-686 96-724 21-60	*	*	*	127-364 19-37	*
2	Cast aluminium alloys	Brinell Vickers Rockwell	HB HV HRB	19-164 22-193 24-85	20-187 21-191	20-184 22-196	23-176 22-198	19-168 24-86	21-167 23-85
	Copper/zinc alloys (brass)	Brinell Rockwell	HB HRB	40-173 14-95	*	*	*	*	*
	CuAI/CuSn-alloys (bronze)	Brinell	HB	60-290	*	*	*	*	*
	Wrought copper alloys, low alloyed	Brinell	НВ	45-315	n	Î		<u>^</u>	
	Surface		rade class ISO 1302	N7				N9	N5
ts	preparation		ess depth R, (µm / µinch)	10 / 400				30 / 1200	2.5 / 100
en	Minimum sample		hness R <sub>a</sub> (µm / µinch) hape (kg / lbs)	2 / 80 5 / 11				7 / 275 15 / 33	0.4 / 16
Requirements	mass	On solid supp		2/4.5				5 / 11	0.5 / 1.1
ire		Coupled on p		0.05 / 0.2				0.5 / 1.1	0.02 / 0.045
ī	Minimum sample	Uncoupled (m		25 / 0.98				70 / 2.73	15 / 0.59
ec	thickness	Coupled (mm		3 / 0.12				10 / 0.4	1 / 0.04
			thickness (mm / inch)	0.8 / 0.03					0.2 / 0.008
Test Piece	Indentation size on		Diameter (mm / inch)	0.54 / 0.021				1.03 / 0.04	0.38 / 0.015
ie	test surface	30 HRC	Depth (µm / µinch)	24 / 960				53 / 2120	12 / 480
<b>D</b>		With 600 HV,	Diameter (mm / inch)	0.45 / 0.017		-		0.9 / 0.035	0.32 / 0.012
S		55 HRC	Depth (µm / µinch)	17 / 680				41 / 1640	8 / 2560
Te		With 800 HV,	Diameter (mm / inch)	0.35 / 0.013				11, 1040	0.30 / 0.011
		63 HRC	Diameter (mm / inch)	10 / 400					7 / 280
		l				1			curve / correlation

\*Custom conversion curve / correlation



#### Standards

**DIN** 50157

#### **Conversion Standards**

ASTM E140

**ISO EN** 18265

#### Guidelines

DGZfP Guideline MC 1 VDI / VDE Guideline 2616 Paper 1

Advanced algorithm option for faster measurement

Probe can be connected directly to PC

TTTTT



#### **Specially For Thin Parts**

Particularly suited for scratchsensitive and polished parts or on thin parts, profiles and pipes. The required minimum thickness for a reliable hardness reading is ten times the indentation depth. For the mass there is no minimum requirement.



# Suits Various Sample Geometries

Unique measuring clamp and support feet are available for the probe allowing tests to be carried out on various geometries.

World-Class

Portable Static

Hardness Testing



The Rockwell Measuring Principle

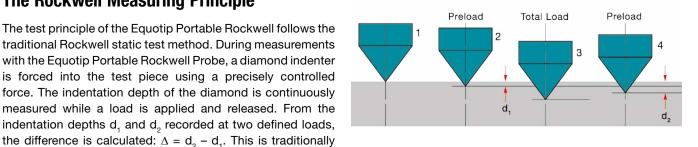
#### Broad Hardness Scales Coverage

Measurements in HRC and HV with automatic integrated conversions to HB, HRA, HRB and many more common scales in compliance to ASTM E140 and ISO 18265.



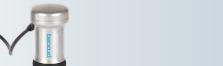
#### For Any Environment

The Equotip 550 Portable Rockwell can be utilized for on-site, factory and lab environment with almost no limitation.





referred to as plastic deformation.

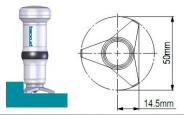


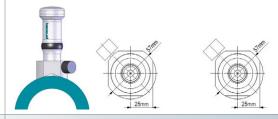
Equotip<sup>®</sup> 550 Portable Rockwell

# Equotip<sup>®</sup> Portable Rockwell Probe and Accessories

Measuring range	0-100 μm; 19-70 HRC; 35-1'000 HV
Resolution	0.1 μm; 0.1 HRC; 1 HV
Measuring accuracy	$\pm$ 0.8 µm; ~ $\pm$ 1.0 HRC over entire range
Test loads	Preload 10 N / Total Load 50 N
Diamond indenter	Angle 100.0° $\pm$ 0.5°, diameter of flat area of 60 $\mu m$ $\pm$ 0.5 $\mu m$
Dimensions	Ø 40 mm, Length 115 mm







**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  $70-\infty$ Designed for curved test pieces such as cylindrical parts, tubes, pipes.

### The Portable Rockwell Measuring Clamp







Support Z4 for tubes and pipes up to Ø 28 mm



Support Z2 for thin cylindical parts, wires, bolts min. Ø 3 mm



Support Z4+28 for tubes and pipes over Ø 28 mm



### Equotip<sup>®</sup> 550 UCI

#### Standards

ASTM A1038

**DIN** 50159

#### **Conversion Standards**

ASTM E140

**ISO** 18265

#### Guidelines

DGZfP Guideline MC 1 VDI / VDE Guideline 2616 Paper 1 ASME CRTD-91



# Most Flexible and Convenient Ultrasonic Hardness Tester

One-Step Calibration



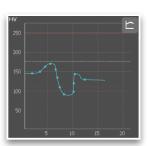
#### Adjustable test load

With this unique and patented feature a wide range of applications can be covered offering test loads ranging from HV1 to HV5, eliminating the need to purchase more than one UCI probe.



#### Quick & Reliable Measurements

User guidance enables reliable and accurate hardness readings to be obtained quickly and easily.



#### Unique Software Features Additional features such as the profile view and industry specific settings allow for a very smooth workflow.



#### Broad Hardness Scales Coverage

Measurements in HV with automatic integrated conversions to HB, HRA, HRB, HRC and many more common scales in compliance to ASTM E140 and ISO 18265.

### **The UCI Measuring Principle**

The UCI (Ultrasonic Contact Impedance) method uses the same pyramid-shaped diamond as a conventional Vickers hardness tester. Unlike Vickers testing, no optical evaluation of the indentation is required, enabling fast and portable measurements. The UCI method excites a rod into an ultrasonic oscillation. The test load is applied by a spring and typically ranges from 1 to 5 kg of force (HV1 – HV5). As the diamond is forced into the material, the frequency of the rod oscillation changes in response to the contact area between the diamond and the material under test. The instrument detects the shift in frequency, converts it to a hardness value which is immediately displayed on the screen.



# Equotip® UCI Probe and Accessory

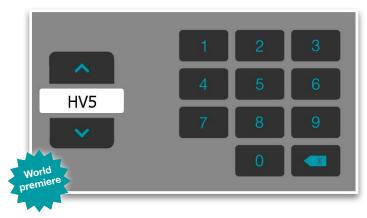
	Measuring range	20 – 2000 HV
<b>a</b> .	Resolution	1 HV (UCI), 0.1 HRC
equotiç	Measuring accuracy	± 2 % (150 – 950 HV)
	Test loads (in 10 N steps)	Selectable: HV1, HV2, HV3, HV4, HV5
	Diamond indenter	Vickers diamond according to ISO 6507-2
ų	Dimensions	155 x ø 40 mm (6.1 x ø 1.57 inches) without foot

### **Adjustable test load**

The required test load can be selected by the user in the settings menu. For each measurement series, the force can be chosen from five levels between HV1 and HV5 (~10 N and ~50 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).

#### Examples:

HV1	Precision parts, thin coatings, hardened layers
HV5	Large components, HAZ, forging parts



### **Special Foot**





# Equotip<sup>®</sup> 550 Touchscreen Unit Unique Features

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





Best-in-class reliability arising from 40 years of experience

Equotip solutions are recognised worldwide for providing best-in-class durability, high long-term accuracy and premium service.



Increased accuracy through conversion curve options

**Reduce incorrect measurements** 

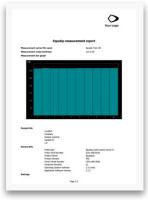
Select from preloaded established conversions. Create, edit and verify material conversion curves directly on the instrument (one-point, two-point shift or polynomial). PC software allows to share conversions with customers, suppliers and associated companies.

Intelligent on-screen notifications to obtain the most relevant settings for any application and to recognize and prevent faulty usage.



Time saving through customized reports

with interactive guides



The Equotip 550 allows to easily create 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.



# Equotip<sup>®</sup> 550 Touchscreen Unit Unique Features





Traceable precision by verification management

Step by step verification wizard in line with applicable standards helps to regularly check the proper functioning of the instrument over time.



Optimized production process with automation package



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



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

The high versatile Equotip 550 gives the possibility to apply three measuring principles and to connect nine different probes to only one device. There is no need to buy several instruments from now on.

Enlar by co

Enlarged application range by combining methods

The step by step combined method wizard allows automatic on-site correlation of two different measuring principles to reduce dependencies on material and geometries.



# Equotip<sup>®</sup> 550 Touchscreen Unit Unmatched User Experience

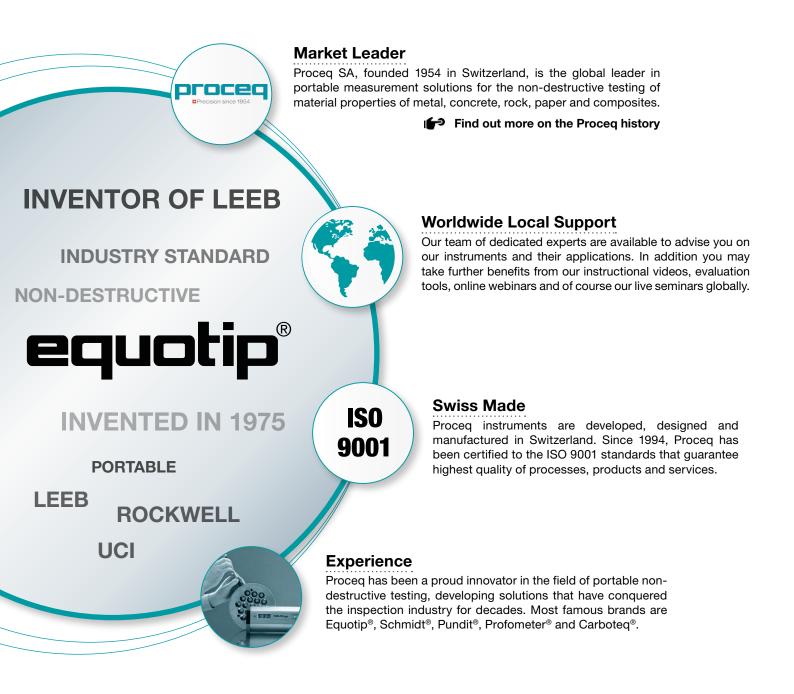
**Touchscreen Features** For simplified and improved usability on high resolution display



7" color display 800x480 pixels	Battery	3.6 V, 14.0 Ah
Internal 8 GB flash memory	Battery Lifetime	> 8 h (in standard operating mode)
Metric and Imperial units, multi-lan-	Humidity	< 95 % RH, non condensing
guage and timezone supported	Operating	-10 °C to +50 °C
12 V +/-25 % / 1.5 A	Temperature	
Probe, USB host / device and Ethernet	IP	54
250 x 162 x 62 mm	Certification	CE
1525 g (incl. Battery)		
	Internal 8 GB flash memory Metric and Imperial units, multi-lan- guage and timezone supported 12 V +/-25 % / 1.5 A Probe, USB host / device and Ethernet 250 x 162 x 62 mm	Internal 8 GB flash memoryBattery LifetimeMetric and Imperial units, multi-lan- guage and timezone supportedHumidity12 V +/-25 % / 1.5 ATemperatureProbe, USB host / device and EthernetIP250 x 162 x 62 mmCertification



# Proceq – A Story of Success over more than 60 Years







### **New Equotip 550 Interactive Animation**

Simulate a real measurement situation right now! Get an insight into the software features, unique user interface and innovative wizards!

Click here to start the interactive Equotip Demo!

6

# Overcome the limitations of stationary hardness testing

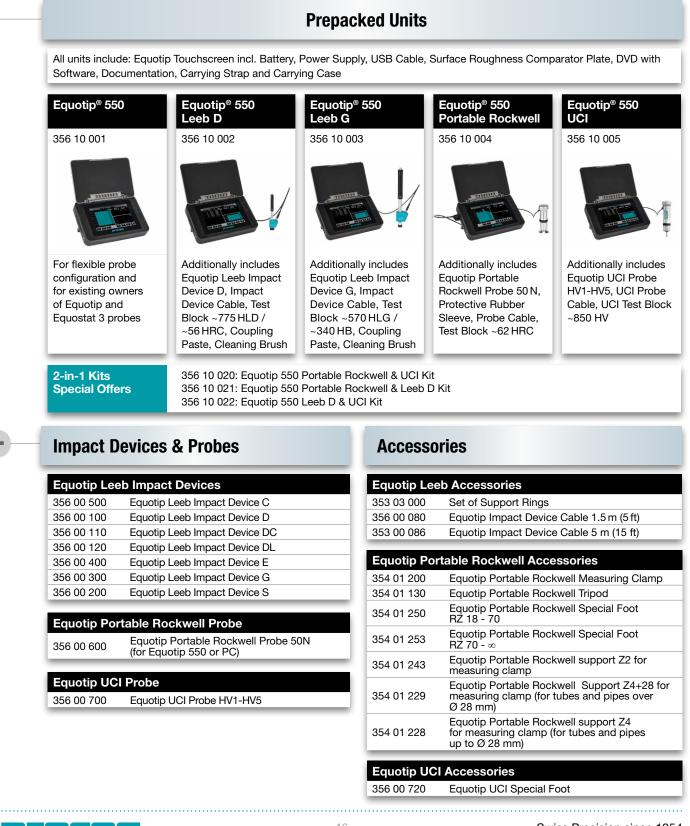
- 100% portable and extremely flexible
- No interruptions in production due to 24h availability

A A DESCRIPTION OF A DE

• Equally reliable, accurate and standardized

## **Ordering Information**

Contact us for an on-site demo





<b>Test Blocks</b>	Test	Bloc	ks
--------------------	------	------	----

Equotip Le	eb Test Blocks Calibrated by Proceq
357 11 500	Equotip Test Block C, ~565 HLC / <220 HB
357 12 500	Equotip Test Block C, ~665 HLC / ~325 HB
357 13 500	Equotip Test Block C, ~835 HLC / ~56 HRC
357 11 100	Equotip Test Block D/DC, <500 HLD / <220 HB
357 12 100	Equotip Test Block D/DC, ~600 HLD / ~325 HB
357 13 100	Equotip Test Block D/DC, ~775 HLD / ~56 HRC
357 13 105	Equotip Test Block D/DC, ~775 HLD, one side
357 11 120	Equotip Test Block DL, <710 HLDL / <220 HB
357 12 120	Equotip Test Block DL, ~780 HLDL /~325 HB
357 13 120	Equotip Test Block DL, ~890 HLDL / ~56 HRC
357 13 400	Equotip Test Block E, ~740 HLE / ~56 HRC
357 14 400	Equotip Test Block E, ~810 HLE / ~63 HRC
357 31 300	Equotip Test Block G, <450 HLG / <200 HB
357 32 300	Equotip Test Block G, ~570 HLG / ~340 HB
357 13 200	Equotip Test Block S, ~815 HLS / ~56 HRC
357 14 200	Equotip Test Block S, ~875 HLS / ~63 HRC

### **Additional Test Block Calibrations**

Factory Cal	ibrations by Proceq
357 10 109	Equotip Leeb Test Block Additional Calibration HLD / HLDC
357 10 129	Equotip Leeb Test Block Additional Calibration HLDL
357 10 209	Equotip Leeb Test Block Additional Calibration HLS
357 10 409	Equotip Leeb Test Block Additional Calibration HLE
357 10 509	Equotip Leeb Test Block Additional Calibration HLC
357 30 309	Equotip Leeb Test Block Additional Calibration HLG

By Accredite	ed Institutes
357 90 909	Equotip Leeb Test Block Additional Calibration HL (DIN 50156-3)
357 90 919	Equotip Leeb Test Block Additional Calibration HB (ISO 6506-3)
357 90 929	Equotip Leeb Test Block Additional Calibration HV (ISO 6507-3)
357 90 939	Equotip Leeb Test Block Additional Calibration HR (ISO 6508-3)

Equotip Por	table Rockwell Test Blocks
357 41 100	Equotip Portable Rockwell Test Block ~20 HRC, ISO 6508-3 HRC Calibration
357 42 100	Equotip Portable Rockwell Test Block ~45 HRC, ISO 6508-3 HRC Calibration
357 44 100	Equotip Portable Rockwell Test Block ~62 HRC, ISO 6508-3 HRC Calibration
Equotip UC	l Test Blocks
Equotip UC	Test Blocks Equotip UCI Test Block ~300HV, ISO 6507-3 HV5 Calibration
	Equotip UCI Test Block ~300HV, ISO 6507-3

By Accredited Institutes	
357 90 918	Equotip Portable Rockwell Test Block Additional Calibration HB (ISO 6506-3)
357 90 928	Equotip Portable Rockwell Test Block Additional Calibration HV (ISO 6507-3)

By Accredited Institutes	
357 90 940	Equotip UCI Test Block Additional Calibration HB, ISO 6506-3
357 90 941	Equotip UCI Test Block Additional Calibration HR, ISO 6508-3
357 90 942	Equotip UCI Test Block Additional Calibration HV1, ISO 6507-3

### 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 a complete support for Equotip by means of our global service and support facilities.

### Warranty Information

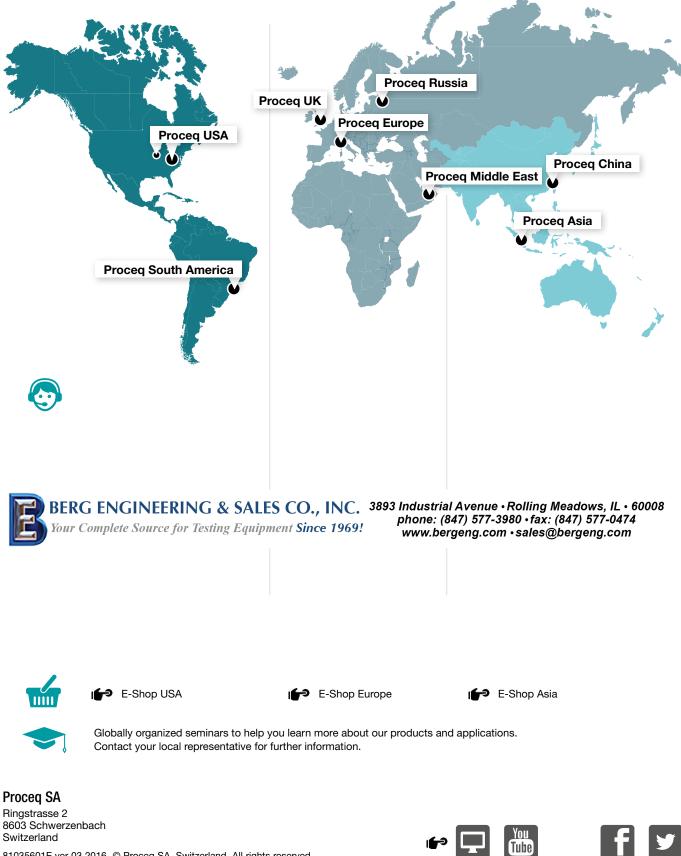
Each instrument is backed by the standard Proceq warranty and extended warranty options.

- » Electronic portion of the instrument: 24 months
- » Mechanical portion of the instrument: 6 months

Subject to change without notice. All information contained in this documentation is presented in good faith and believed to be correct. Proceq SA makes no warranties and excludes all liability as to the completeness and/or accuracy of the information. For the use and application of any product manufactured and/or sold by Proceq SA explicit reference is made to the particular applicable operating instructions.







Click on the Proceq subsidiaries for more information

Switzerland 81035601E ver 03 2016 © Proceq SA, Switzerland. All rights reserved.