



## Unmatched Metal Hardness Testing

The Equostat 3 hardness tester can be connected both to the portable Equotip 3 platform and directly to the PC, with graphic user guidance

### Hardness Measurements made easy

Stationary hardness testers can only accommodate test pieces of limited size. Moreover, transportation of the test pieces is often impractical. On the other end of the spectrum, Leeb rebound tests have limitations in terms of minimum sample mass and thickness. The Equostat 3 works well in outdoor, factory and lab environments, and has only very few requirements on test piece geometries. The Equostat 3 probe can be connected directly to a laptop or PC, on which live user guidance dialogs as well as the hardness readings are displayed. Alternatively, the probe plugs into the Equotip 3 indicating device to combine the Rockwell principle of Equostat 3 with the Leeb rebound principle of Equotip to become the most versatile hardness tester.

### Stable Measurements according to DIN 50157 and ASTM B724

The Equostat 3 displays the signal curve as well as operating instructions in real time. This enables users to achieve the most repeatable measurements of any commercially available hardness tester. Compared to stationary testers, Equostat 3 uses a sharper indenter and smaller loads. The test method is standardized both according to DIN 50157 (metals) and ASTM B724 (aluminum). The conversions from Rockwell hardness to many other scales follow the ISO 18265 and the ASTM E140 tables, respectively.

### Benefits to the Customer

**Uniqueness:** The first hardness tester that connects directly to a PC and to the portable Equotip 3 testing platform.

**User guidance:** The user is instructed precisely when to apply and release the test loads; the displayed signal curve enables the user to judge the quality of the measurement.

**Repeatability:** Unmatched by the competition.

**Robustness:** The new Equostat 3 indenter is extremely durable; the probe features a protective rubber sleeve.

**Versatility:** Measuring clamp, magnetic feet, and special feet adapt to most sample shapes.

**Standards conformance:** Method conforms to DIN 50157 and ASTM B724 with ISO 18265 and ASTM E140 conversions, respectively.

**Software:** The included PC software package Equolink 3 addresses professional data management needs.

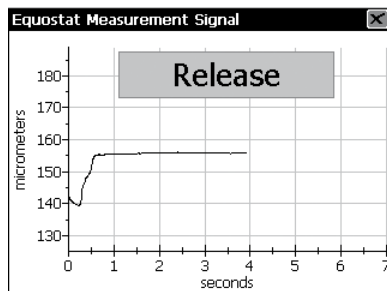
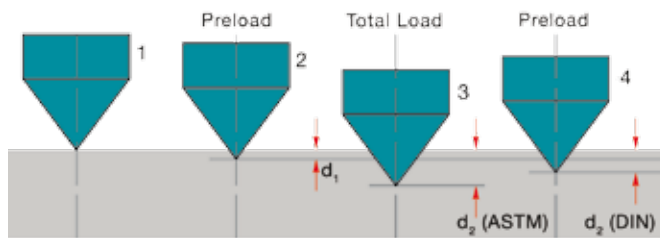
## The Portable Rockwell Principle

The hardness testing principle in Equostat 3 follows the Rockwell stationary test. During measurements with the Equostat 3 probe, a diamond indenter is forced into the test piece to be measured and then released back out of the material. The indentation depth of the diamond is continuously measured while the load is applied and released. From the indentation depths  $d_1$  and  $d_2$  recorded at two defined loads, the difference is calculated:  $\Delta = d_2 - d_1$ . The difference  $\Delta$  is a measure of the hardness of the material, and is independent of the test direction.

There are three main differences to traditional stationary Rockwell tests:

1. The test loads are lower.
2. The Equostat 3 indenter is sharper.
3. The holding times during a test are shorter.

## Functionality that fits your Needs



### Measurement on Basis of DIN 50157

Both depth measurements  $d_1$  and  $d_2$  are taken at preload, first during application ( $d_1$ ) and then after release of the total load ( $d_2$ ). The difference between the depths  $d_1$  and  $d_2$  originates from the deformation response of the material to penetration.

### Measurement on Basis of ASTM B724

The depth measurements are taken at preload ( $d_1$ ) and at the total load ( $d_2$ ), respectively.

### User guidance dialogs

The measurement signal is displayed in real-time on a PC screen or the Equotip 3 indicating device. This allows the user to judge the quality of the ongoing measurement through evaluation of the signal curve.

## Measurements are Non-Destructive

Due to the low test loads, Equostat 3 only penetrates a few micrometers of the test piece, making the test particularly suitable for:

- Scratch-sensitive and polished surfaces
- Thin parts, profiles and pipes with a wall thickness  $\leq 2$  mm
- Hardness profiles in heat-affected zone of welds



Equostat 3 probe connected to PC

## Test Piece Requirements

Probe setup	Minimum test piece thickness	Maximum test piece thickness	Test piece surface condition	Surface curvature	Maximum test piece hardness	Minimum spacing
50 N probe with clamp	1 mm at ~20 HB 130 $\mu$ m at ~70 HRC	41 mm	recommended mean surface roughness $R_a < 2 \mu$ m to minimize data scatter		70 HRC	three times the diameter of a test indentation
50 N probe with round standard foot ( $\phi = 42$ mm)				foot to be used for plane surfaces		
50 N probe with tripod				very small curvatures acceptable		
50 N probe with long foot				very small curvatures acceptable	recommended < 60 HRC	
50 N probe with special feet				18 - 70 mm radius of curvature or 70 mm - $\infty$	70 HRC	

## Key Advantages to other Hardness Testing Methods

The Equostat 3 has a great number of advantages compared to other hardness testing techniques:

Compared to:	Equostat 3's key advantages are as follows:
stationary Rockwell	Equostat 3 has lower loads permitting to test surface layers
stationary Brinell	Equostat 3 indentations are much smaller
Poldi hammer	Equostat 3 is a direct measurement, as opposed to a comparative test
stationary Vickers	No optical readout necessary in Equostat 3
micro Vickers	Equostat 3 can be used also in dirty environments
Leeb rebound	Equostat 3 has no requirements on the sample weight
Shore scleroscope	Equostat 3 measurements are independent of the test direction
UCI	Equostat 3 achieves more repeatable testing with lower user dependence
TIV	Equostat 3 has very rugged diamond indenters
electrical penetration depth	Also non-conductive samples can be tested with Equostat 3

## The Right Measuring Setup for the Application

To access various test locations and to accommodate user preferences, the Equostat 3 offers a range of adaptors.

- The measuring clamp can easily be adjusted to the sample thickness. Additional adaptors for bolts, wires and thin tubes further allow measurements on different sample geometries.
- The round foot, the tripod and the long foot are designed for flat surfaces. The magnetic insets in the feet aid in the testing of steel samples.
- The two special feet can be adjusted to the sample radius to be used for cylindrical samples from 18 mm - 70 mm and 70 mm - ∞, respectively.
- Equostat 3 can be automated with third-party remote one-axis test setups and the Equotip 3 Automation Package.



Adaptors for different applications



Measuring clamp



Magnetic foot

### Setup

Clamp  
Round standard foot  
Tripod  
Long foot  
Special foot 18 - 70 mm  
Special foot 70 mm - ∞

### Application

Small parts, tubes and pipes, difficult geometries, highest precision measurements, laboratory tests  
Sheet materials, flat parts, test locations more than 10 mm from an edge.  
Tests that require accurate positioning, welds, heat-affected zones, test locations more than 10 mm from edge  
Restricted and narrow geometries, where high aiming accuracy is needed, welds, heat-affected zones  
Curved test pieces such as cylindrical parts, tubes, pipes  
Curved test pieces such as cylindrical parts, pipes

## Technical Information Equostat 3

<b>Equostat 3 Probe</b>	
Measuring range	19-70 HRC; 19-70 HMMRC; 67-638 HB; 35-950 HV; 60-86 HRA; 29-107 HRB; 225-2250 MPa; 69-94 HR15N; 88-96 HR15T
Resolution	0.1 µm; 0.1 HRA; 0.1 HRB; 0.1 HRC; 0.1 HRE; 0.1 HRH; 0.1 HR15N; 0.1 HR15T; 1 HB; 1 HV; 0.1 HS; 1 MPa
Measuring accuracy	~ ± 1.5 HRC over entire range
Maximum test hardness	70 HRC
Test direction	any direction (no correction required)
Test loads	10 N / 50 N (probe 50 N)
Diamond indenter	angle 100.0° ± 0.5°
<b>Equotip 3 Indicating Device</b>	
Dimensions	170 x 200 x 45 mm (6.7 x 7.9 x 1.8 inches)
Weight	780 g (27.5 oz) plus battery pack 120 g (4.2 oz)
Display	4.7" QVGA LCD with adjustable contrast and backlight
Internal data storage	100'000 - 1'000'000 values (depending on data type)
Interface	Ethernet, USB 1.1, RS 232
Battery type	rechargeable Li ion or 3 standard size "C" cells
Battery max. charge voltage	4.2 V
Battery operation period	typically 10 hours
Operating temperature	0 to + 50 °C (32 to 122 °F)
Humidity	non-condensing, 90% max

## Ordering Information

Part No.	Description	Picture
354 01 000	<b>Equostat 3 Hardness Tester - Clamp Unit</b> Consisting of: Indicating device with stand, AC adapter, Equostat 3 probe 50 N (with 2.0m 4-pole/USB cable, indenter, round standard foot, protective rubber sleeve), measuring clamp, Equostat 3 test block (~62 HRC), USB cable, Equotip CD with Equolink 3 software and product documentation, operating instructions, product certificates, carrying case	
354 01 001	<b>Equostat 3 Hardness Tester - Freehand Measuring Unit</b> Consisting of: Indicating device with stand, AC adapter, Equostat 3 probe 50 N (with 2.0m 4-pole/USB cable, indenter, round standard foot, protective rubber sleeve), Equostat 3 test block (~62 HRC), USB cable, Equotip CD with Equolink 3 software and product documentation, operating instructions, product certificates, carrying case	
354 01 002	<b>Equostat 3 Hardness Tester - PC Unit</b> Consisting of: Equostat 3 probe 50 N (with 2.0m 4-pole/USB cable, indenter, round standard foot, protective rubber sleeve), Equostat 3 test block (~62 HRC), Equotip CD with Equolink 3 software and product documentation, operating instructions, product certificates, carrying case	
353 10 050	<b>Equotip 3 Hardness Tester - Basic Unit</b> Consisting of: Indicating device with stand, AC adapter, USB cable, Equotip CD with Equolink 3 software and product documentation, operating instructions, product certificates, carrying case	
353 00 091	<b>Equotip 3 Automation Package</b> Consisting of: Activation code, 2.0m 4-pole cable with automation branch connector, Equotip CD with automation libraries, Equolink 3 software and product documentation, operating instructions	

## Accessories

Part No.	Description	Part No.	Description
354 01 200	Equostat 3 measuring clamp	357 41 100	Equostat 3 test blocks
354 01 127	Equostat 3 round standard foot	357 42 100	Equostat 3 test block calibrated by Proceq (~20 HRC)
354 01 130	Equostat 3 tripod	357 43 100	Equostat 3 test block calibrated by Proceq (~45 HRC)
354 01 142	Equostat 3 long probe foot	357 44 100	Equostat 3 test block calibrated by Proceq (~62 HRC)
354 01 250	Equostat 3 special foot RZ 18 - 70		
354 01 253	Equostat 3 special foot RZ 70 - ∞		
354 01 137	Equostat 3 protective rubber sleeve	357 90 918	Test block calibrations by accredited institute
		357 90 928	Additional calibration in HB (ISO 6506-3)
		357 90 938	Additional calibration in HV (ISO 6507-3)
			Additional calibration in HR (ISO 6508-3)

## Applicable Standards

- DIN 50157 (2007)
- ISO 18265 (2003)
- ASTM B724
- ASTM E140 (2007)
- DGZfP Guideline MC 1 (2008)
- VDI / VDE Guideline 2616 Paper 1 (2010)

## Service and Warranty Information

Proceq is committed to providing complete support for the Equostat 3 by means of our global service and support facilities. Furthermore, each instrument is backed by the standard Proceq warranty and extended warranty options.

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.

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