equostat 3

Operating Instructions

Portable Metal Hardness Tester

proceq

Table of Contents

1. Safety and liability

1.1. Safety and usage precautions

This manual contains important information on the safety, use and maintenance of the Equostat 3. Read through the manual carefully before the first use of the instrument. Keep the manual in a safe place for future reference.

1.2. Liability and warranty

Proceq's "General Terms and Conditions of Sale and Delivery" apply in all cases. Warranty and liability claims arising from personal injury and damage to property cannot be upheld if they are due to one or more of the following causes:
- Failure to use the instrument in accordance with its designated use as described in this manual.
- Incorrect performance check for operation and maintenance of the instrument and its components.
- Failure to adhere to the sections of the manual dealing with the performance check, operation and maintenance of the instrument and its components.
- Unauthorized structural modifications to the instrument and its components.
- Serious damage resulting from the effects of foreign bodies, accidents, vandalism and force majeure.

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.

1.3. Safety instructions

The instrument is not allowed to be operated by children or anyone under the influence of alcohol, drugs or pharmaceutical preparations. Anyone who is not familiar with this manual must be supervised when using the instrument.

1.4. Labelling

The following icons are used in conjunction with all important safety notes used in this manual.

Danger:
This symbol indicates a risk of serious or fatal injury in the event that certain rules of behaviour are disregarded.

Note:
This symbol indicates important information.

2. Tutorial on Portable Rockwell Hardness Testing

2.1. Test Principle

During measurement 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 indentor is measured continuously during application and release of the test load. From the indentation depths d_1 and d_2 recorded at two defined loads, the difference is calculated: $\Delta = d_2 - d_1$. This difference Δ is a measure of the hardness of the material.
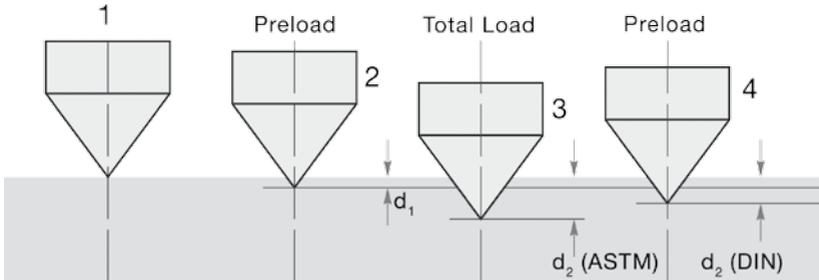
2.1.1. Measurement on Basis of DIN 50157 ("DIN method")

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

2.1.2. Measurement on Basis of ASTM B724 ("ASTM method")

According to ASTM B274 the depth measurement d_1 is taken at preload, d_2 at the total load. As this standard refers to aluminium testing, this mode is applicable only to testing aluminium alloys (i.e. if Material Group 6 is selected; for details please refer to 7.2 Material Groups)

2.2. Test piece preparations

Keep the test piece supported, flat, during the test, i.e. avoid movement. Ensure that the surface of the work piece is clean, smooth, even and dry. If required, use appropriate cleaning agents for cleaning, such as acetone or isopropanol (no water!).

2.3. Test conditions

Probe setup	Min. test piece thickness	Max. test piece thickness	Test piece surface condition	Surface curvature	Maximum test piece hardness	Minimum spacing
50 N probe with clamp		40 mm				
50 N probe with round standard foot (dia. = ø = 42 mm)	1 mm at ~20 HB 130 µm at ~70 HRC	N/A	recommended mean surface roughness R_a < 2 µm to minimize data scatter	foot to be used for plane surfaces	70 HRC	three times the diameter of a test indentation
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 or 70 mm - ∞	70 HRC	

2.4. Selecting the Best Equostat 3 Probe Setup

Preload / total load	Setup	Application
10 N / 50 N	clamp	small parts, tubes and pipes, difficult geometries, highest precision measurements, laboratory tests
10 N / 50 N	round standard foot	sheet materials, flat parts, test locations that are more than 10 mm from the edge
10 N / 50 N	tripod	tests where high aiming accuracy is needed, welds, heat-affected zones, test locations that are more than 10 mm from the edge
10 N / 50 N	long foot	restricted and narrow geometries, tests were high aiming accuracy is needed, welds, heat-affected zones
10 N / 50 N	special foot 18 - 70 mm	curved test pieces such as cylindrical parts, tubes, pipes
10 N / 50 N	special foot 70 mm - ∞	curved test pieces such as cylindrical parts, tubes

Note:
The Equotip 3 indicating device can also be connected to Equotip impact devices which follow the Leeb principle. By combining Equotip and Equostat on the same indicating device, almost every hardness test application can be addressed.
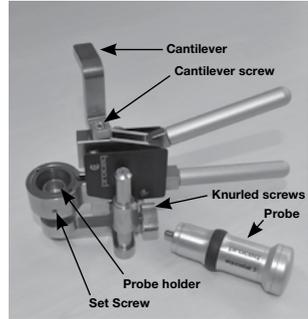
Note:
The hardness testing principle in Equostat 3 follows the Rockwell stationary test. As for the Rockwell test, no adjustment for the test direction is required. However, there are three main differences to traditional stationary Rockwell tests: 1. The test loads are lower. 2. The Equostat 3 indenter is sharper. 3. The dwell times during the test are shorter.

2.4.1. Installing the Measuring Clamp

The Equostat 3 measuring clamp is designed to facilitate the hardness testing of very thin or small samples. Optimum measuring performance of this clamp is guaranteed when applied to steel samples. Equostat 3 clamp measurements stand out due to extremely repeatable results.

1. Use the Equostat setup tool to release the cantilever. Turn it by 90°.
2. Take the probe and remove the foot. The diamond indenter remains mounted.
3. Screw the probe into the probe holder of the clamp clockwise (hand-tight).
4. Turn the cantilever so its tip is centered over the probe; tighten the cantilever screw securely using the 3mm Allen key setup tool.
5. The recommended clearance between the bottom of the probe holder and the sample surface should be between 2 and 5mm. Adjust the height with the two knurled screws.

i **Note:** In case the probe connector is in an inconvenient position, release the set screw. Ensure that the springs in the mechanism do not get lost. Turn the mechanism into a convenient position, aligning the set screw with the guide channel. Lock the set screw so that the probe holder will still slide up and down without rubbing on the set screw.

General Considerations

- Due to the mechanics / physics of the ASTM B724 measuring mode, which specifies testing on aluminum samples, when using the hand clamp, slight but unavoidable elastic deformation of the clamp can noticeably affect the reading. It is therefore not advisable to use the Equostat 3 clamp, when using ASTM B724 measuring mode. Hardness conversions according to ASTM E140, when using the measuring clamp in the standard DIN 50157 measuring mode are unaffected.
- When measuring cylindrical samples with adapters Z4 or Z4+28, make sure, the sample is not twisted on the clamp support (neither in plane with the clamp support, nor rotational round it). This is best ensured when the back part of the clamp rests on a table and only the sample support of the clamp sticks out over the table's edge.
- When applying the load, slowly squeeze the leavers and allow the sample to adjust to the support. During the measurement, do not touch the sample, if possible. When releasing, grab the sample again.
- Whenever the sample geometry (i.e. the wall thickness) allowes it, freehand measurements usually offer better measuring performance. This applies particularly to measurements on cylinders.
- For small diameter rods (or stiff enough pipes), the V-notch clamp adapter Z2 has been designed. When installing the Z2 support ensure that the center of the V-notch is centered underneath the probe holder.

2.4.2. Installation of Standard Foot or Tripod

The round standard foot permits measurements on test objects that are only accessible from one side, such as large metal sheets. The tripod is used when the flat foot cannot be placed on the test piece without wiggling.
- The diamond indenter remains mounted (1).
- Install the foot on the probe (2).

2.4.3. Installing the Long Foot

The long foot increases accessibility of the Equostat 3 probe to constricted test piece geometries.
- Unscrew the reference mandrel (1).
- Demount the diamond indenter using a paper clip or similarly thin tool (2).
- Screw the extension rod onto the probe, and the indenter onto the extension rod (3).
- Install the long reference mandrel.
- Install the long foot on the probe (4).

2.4.4. Installing the Special Foot

Two special feet extend the Equostat 3 application range to cylindrical test pieces.
- The diamond indenter remains mounted (1).
- Install the foot on the probe (2).
- Place the foot on the test piece and release the set screw on the foot. Then press down the probe onto the test piece and lock the set screw (3).

2.5. Testing procedure

2.5.1. Connecting Equostat 3 to the Equotip 3 Indicating Device
- Connect the Equostat 3 probe to the indicating device using the provided probe cable.
- On the Equotip 3 indicating device press the on / off button ⬤ for approx. 2 seconds to power up the device.
- Open the main menu by pressing 🖵. Select "Bar graph" or "Basic mode" from the "View" menu (see section 6.1. "Views").
- Select the suitable value for the surface curvature by pressing the F1 key. For zero surface curvature, select "Off".
- Select the material group applicable to the test piece by pressing the F2 key (see section 7.2. "Material groups").
- Select the hardness scale to be displayed by pressing F3 (see 7.3. "Hardness scales").
- Select the number of readings n per measurement series by pressing the F4 key (see section 7.4. "Number of indentation tests per measurement series").

> **i**
>
> **Note:** The material dependence for conversions of the Equostat 3 hardness is small. If the elasto-plastic properties of your test piece material are very different from the selectable materials, i.e. large deviations from stationary test results are found, please refer to section 8.1. "Custom conversion curves" to increase accuracy.

2.5.2. Connection to Equolink 3 software
- Connect the Equostat 3 probe to a PC using the provided probe cable

- Start the Equolink 3 software [icon] , and click [icon] for the software to detect the Equostat 3 probe. Click the "New" button at the bottom of the screen.
- Select the suitable value for the surface curvature. For zero surface curvature, select "off".
- Select the material group applicable to the test piece (see section 7.2. "Material groups").
- Select the hardness scale to be displayed (see 7.3. "Hardness scales").
- Select the number of readings n per measurement series (see section 7.4. "Number of indentation tests per measurement series").

The user can now start testing the test piece.

2.5.3. Using the Equostat 3 Probe
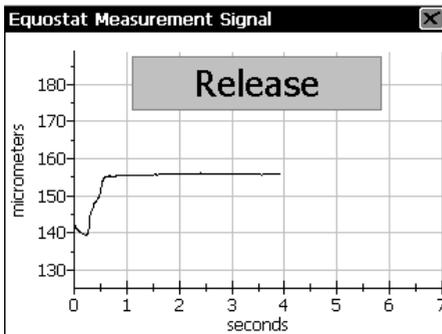
o Conduct measurements by cycling through the "1. position – 2. press down – 3. release" mechanism:
1. Position the probe on the test piece. Take particular care that the foot is placed on the test piece without wiggling or directly on top of a previous test indentation. It is recommended to hold the probe foot firmly with one hand. When using the clamp, adjust the height of the clamp to accommodate the test piece.
2. Depress the probe body with the other hand through the loading stage, until contact is felt. Hold for approx. 2-3 seconds, following the instructions shown on the display.
3. Slowly release the load. To perform another reading, repeat this cycle.
o After the last of the n readings, the hardness average and further statistics of the measurement series are displayed.

> ℹ **Note:** The guidance dialogue on the Equotip 3 screen or in the Equolink 3 window, respectively, will indicate the appropriate timing for the load-release cycle.

> ℹ **Note:** If possible, follow the standard practice of "Hardness testing with portable measuring instruments operating with mechanical penetration depth", as described in the standard DIN 50157-1 (metallic materials). Alternatively, use ASTM B724 (aluminium materials), or other applicable standards.

Note: If no standards are available at hand, the user is recommended to average a minimum of n = 3...5 readings of the test piece taken at an indentation distance of 1 to 3 mm (0.04 to 0.12") from each other. Do not carry out an indentation in an area that has already been deformed by another indentation.

2.6. Testing Curved Surfaces

The instrument in the standard foot setup works properly only when the foot sits securely on the surface (i.e. without wiggling), and if the diamond indenter is precisely aligned 90° to the test surface. If convex surfaces are tested, replace the standard foot by a specially suited foot for testing cylindrical surfaces, or by using the measuring clamp, respectively (see "Accessories" or contact your local Proceq representative).

2.7. Testing Welds and Heat-Affected Zones (HAZ)

For weld testing, or the testing of HAZ, the combination of the Equostat 3 with the Equotip impact device DL has proven particularly useful to cover a wide range of geometries. The Equostat 3 helps to cover the range of particularly thin-walled test pieces, whereas the Equotip impact device DL is used for rigid / tightly-fixed test pieces.

The user yields best aiming accuracy using the long foot or the tripod. On curved test pieces, the special feet can be used to adjust to the cylindrical geometry. Even and smooth sample surfaces are of the essence.

3. Overview of the Equostat 3

The Equostat 3 is typically used for testing the hardness of metallic surfaces. As a result of its compact design, measurements can be carried out quickly, on the spot and in any position and direction. The device measures the difference of indentation depths at defined loads. Based on calibration curves, this difference is used to calculate

- the Vickers hardness HV (when using Material Group 1),
- the Rockwell hardness HRB (when using Material Group 6).

Conversions of the determined hardness to different hardness scales are provided, for example to Rockwell (HMMRC, HRA, HRB, HRC, HR15N, HR15T), Brinell (HB), Vickers (HV), and Shore (HS), as well as to tensile strength (R_m), according to the conversion standards ISO 18265 or ASTM E140, and according to customer selections (please refer to 7.1 Measuring Method, Conversion Standard)

Note: 'MM' stands for 'mobile mechanical' measurement, an ancillary that is required by the German standard DIN 50157 to explicitly denote the lower applied loads, sharper indenter shape and shorter loading times during a measurement. The different denomination is formal, i.e. the HMMRC results should be very close if not equal to stationary HRC readings.

3.1. Application Examples

- portable testing applications on both small and large test pieces
- fully documented hardness tests on assembled machines or steel and cast constructions, as well as on small parts and awkward part geometries
- testing of metallic work pieces when the test indentation should be as small as possible
- quality control measurements for quick determination of a particular heat treatment condition

- fast testing of numerous measuring points to examine the change of hardness over large areas
- automated testing
- laboratory tests which require very high repeatability

⚠️ **Danger:**
Other applications could be dangerous. The manufacturer is not liable for damage caused by improper use or incorrect operation.

3.2. Product Versions, Components and Accessories

Equotip 3 indicating device
- instrument with all the necessary hardness testing functions incl. extended statistics
- large memory for storage of ~ 1'000'000 measurement values
- configuration of user profiles with customized permission settings
- communication with PC or printing of data directly via the USB, Ethernet or RS 232 interfaces
- Equolink 3 PC software for documented testing

Equotip 3 with the Equostat 3 probe
- hardness measurements widely independent of material and of body dimensions with excellent sensitivity down to small penetrations of only a few µm (i.e. high hardness)
- various options to test in freehand mode, or use the measuring clamp for further improved stability during testing
- testing range from very soft (aluminium) up to very hard materials (case-hardened)
- conversion of hardness to various scales (HRA, HRB, HRC, HR15N, HR15T, HB, HV) and tensile strength for steel (R_m)

Equotip 3 with Equotip 3 impact devices
- optimized testing of diverse metallic materials and test piece geometries using a variety of impact device types
- testing in the original Leeb rebound hardness scales with highest accuracy and repeatability
- conversion of hardness to various scales (HRA, HRB, HRC, HB, HV, HS) and tensile strength for steel (R_m)
- testing of special materials using customer-specific hardness conversions

Equotip 3 Automation Package
- remote control of the Equotip 3 indicating device
- integration of hardness tests into quality management systems and in (semi-) automated testing environments

Equotip and Equostat test blocks
verify the correct functioning of
- Leeb impact devices on Equotip test blocks calibrated in the genuine Leeb scales
- Equostat 3 probes on Equostat 3 test blocks calibrated in the HRC and HRB scales

3.3. Device overview

1	Equotip 3 indicating device
2	Equostat 3 probe
3	Equostat 3 probe cable
4	Connection ports
5	Status LED
6	On / off button
7	LCD display
8	Keypad
9	Battery compartment
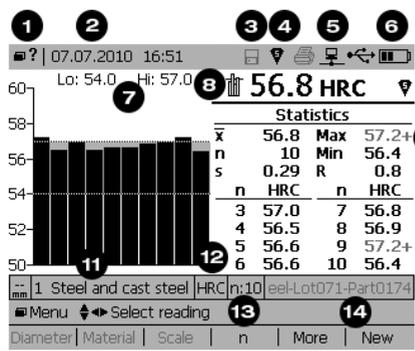
1	Open menu and help (when mouse is connected)
2	Date and time
3	Automatic storage (on/off)
4	Probe connected
5	Printing / ethernet / USB connection status
6	Battery level indicator
7	Low and high limit settings
8	Display mean value / last reading
9	Reading not within limits
10	Diameter surface curvature
11	Material group
12	Hardness scale
13	Number of hardness readings per series
14	File name of measurement series
15	Active navigation keys
16	Function of navigation keys in the present context
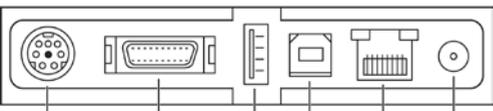
1	RS 232 for printer
2	20-pole input for Equotip impact devices
3	USB 1.1 type A (master) for Equostat 3 probe, keyboard, mouse, barcode scanner, printer
4	USB 1.1 type B (slave) for PC
5	Ethernet
6	Power supply 12 V DC, 1.25 A

3.4. Keypad

Key	Description
⏻	Indicating device on / off
F1 F2 F3 F4 F5 F6	Context sensitive functions
🖫	Switch on / off automatic storage. On: number in end of file name is incremented automatically with each new test series, disc symbol is displayed
x̄	Large number displays mean value / last single reading on: mean value symbol is displayed next to the measurement value
#	Define the alphanumeric file name of the measurement series
▢	Open menu
◈	Navigate through menu
☑	Confirm selection
☒	Close dialog boxes
+ −	Increase / decrease a number
?	Access help function
☀	Switch backlight on / off. ON: adjust the backlight (5 levels)

3.5. Menu structure

Main Menu

Measurement	View	Memory	Config	Help
Diameter F1	Bar graph	Save series 🖫	Language...	About EQUOTIP3...
Material F2	Basic mode	Set series file name... #	User interface...	Show help index... ?
Scale F3	Signal graph	Set save folder...	Display...	Show help content... ?
n... F4	Conversion function	Explorer...	System settings ▶	Show system info...
Limits...	Display mean x̄	Properties...	User profiles ▶	
Close F5	Set bar graph range...		Equostat settings...	
Remove F6	Multiple series bar graph		Equotip settings...	
Comment...	Scale bar width		Signal compression...	
Print series ▶			Customer conversions ▶	

3.6. Equolink 3 overview

1	Open / save file
2	Download data / detect Equostat 3 probe / update firmware
3	Export / print
4	Help
5	Readings
6	Statistics
7	Settings
8	Comment
9	Folder structure of project
10	Measurement series in folder
11	Number of readings per series
12	Equostat 3 direct measurement window
13	Status bar

4. Getting Started using Equostat 3 with the Equotip 3 Indicating Device

4.1. Setting up the Instrument

A functional Equostat 3 instrument consists of the following components:
- Equotip 3 indicating device to process, display and store the measurements
- Equotip 3 stand to attach to the back of the indicating device (or alternatively, use the optional protective carry pocket with neck strap for enhanced portability)
- Equostat 3 probe connected to the indicating device via probe cable
- Equostat 3 hardness test block to conduct the performance check

4.2. Power on / off

To power-up the Equotip 3 indicating device, press the on / off button ⊙ for approx. 2 seconds. The instrument will go through a booting sequence, subsequently displaying "Starting up ...", "Loading configuration ..." and the measurement screen. The measurement screen displays the last readings shown before the previous shutdown.

4.3. Auto idle / Standby / Shutdown

In accordance with the power manager settings, the instrument automatically switches to idle or standby mode.

> **i** **Note:** In case the device is powered on but the screen does not respond to pressing any keys, a reset can be carried out by pressing the on / off key for approx. 20 sec.

4.4. Charging the battery

A fully charged battery is sufficient for at least 8 hours of operation. The operation time can be extended by reducing the brightness of the backlight or switching it off. If the battery becomes weak, the battery indicator on the screen starts flashing until the indicating device eventually

switches off. To recharge the battery, use the Equotip 3 AC power adapter. The charging status of the battery is indicated by the green status LED beside the on / off key:

LED continuously on	Battery is charging.
Flashing - LED mostly on - LED mostly off	Indicating device is in standby state. - Battery is charging - Battery is not charging
LED continuously off	Battery is fully charged or not inserted.

⚠️ **Danger:**
To fully recharge the battery, the device needs approx. 8 hours of charging.
Danger: Only use the Equotip 3 AC power adapter (12 V, 1.25 A) to charge the Equotip 3 indicating device.

ℹ️ **Note:** Only the Equotip 3 Li-Ion battery can be charged internally in the Equotip 3 indicating device.

ℹ️ **Note:** The integrated Li-Ion battery allows over 500 complete charge / discharge cycles. If the operation time of the battery is shortening notably, a new battery should be ordered. The battery lifetime has expired when the LED does not go off even though the battery has been charged for several days.

4.5. Optimizing performance of the battery system

As with many other electronic instruments using a rechargeable battery, the battery system will perform best when it is first completely discharged and then completely charged.
Thus, in order to calibrate the battery indicator 🔋 of the Equotip 3, Proceq recommends conducting a complete discharge-charge cycle, as follows:

1. Upload the latest OS (version $\geq$ 1.2.2) and firmware (version $\geq$ 1.6.0). Verify on the first screen when booting up, or in the help menu, that these have been successfully loaded.
2. Disconnect the mains power supply.
3. Set backlight to the highest level.
4. Select the menu item Config >> System settings >> Power manager... and set both entries under "Battery powered" to "never".
5. Wait until the battery is discharged completely. Make sure that the Equotip 3 is running. It will shut down at the end of the discharge process.
6. Connect the mains power supply.
7. Switch off the backlight.
8. Completely recharge the battery. The instrument must be switched on during the charging process.
9. Wait until the battery is charged completely. Make sure that the Equotip 3 is running. It is best to open the "Show system info" box.
10. Check if the timestamps under "Bat. charged" and "Bat. discharged" entries in the "System info [Battery]" dialog have been set.
11. Restore the Power manager settings, as desired.

ℹ️ **Note:** The recalibration of the battery indicator can take 24 hours, depending on the initial charging state of the battery before the cycle is started.

4.6. Performance check / daily verification

1. Verify that the Equostat 3 test block is supported by a solid worktop to ensure it is fix and free of vibrations. Use a test block the hardness of which is similar to that of the test object. Proceq offers test blocks at three hardness levels.
2. Peel off the protective sticker off the surface, and store for subsequent reuse. Ensure that the testing surface is clean, smooth and dry. If required, use acetone, isopropanol or the like to remove any residues of adhesives or dirt (no water!).
3. Power on: Press the on / off button ⏻ for approx. 2 seconds to switch on the Equotip 3 indicating device.
4. Display: Select "Bar graph" or "Basic mode" from the "View" menu (see "Views").
5. Settings: Turn off the diameter correction by pressing the F1 key. Select the hardness scale, in which the Equostat test block is calibtrated in, by pressing the F3 key. Select the number of indentation tests n per measurement series by pressing the F4 key.
6. Perform 10 indentation tests, which ideally should be evenly distributed across the entire test block (see section 2.5. "Testing Procedure").
7. The average set point hardness of the block is engraved on the surface. The measured average should coincide with the target range. (If not, please refer to sections 4. "Getting Started" and 13. "Troubleshooting".)

Your new Equostat 3 is fully operational and you can now continue with your measurements.

> **i** **Note:** First time user: Complete the "Tutorial on portable Rockwell hardness Testing", or watch a demonstration by a qualified Proceq representative.

> **i** **Note:** Ensure that the testing surface is clean, smooth and dry before you apply the protective surface sticker back on the test block.

> **i** **Note:** The performance check should be done regularly before each use of the instrument to verify the mechanical and electronic functions of the probe and the indicating device. This requirement is also included in the relevant hardness standards, see section 10.3. "Standards and Guidelines Applied".

5. Getting started using the Equostat 3 with a PC / laptop

5.1. Setting up Equolink 3

A functional Equostat 3 instrument consists of the following components:
• Equolink 3 running on a PC to process, display and store the measurements
• Equostat 3 probe connected to the PC via the probe cable
• Equostat 3 hardness test block to conduct the performance check

5.2. Preparing a measurement

To start the Equolink 3 software, double-click ▣ Equolink 3 . Press the ▯ to detect the Equostat 3 probe connected to the PC. Follow the on-screen instructions and select to the desired probe via USB. The instrument is now ready start testing.

5.3. Performance check / daily verification

1. Verify that the Equostat 3 test block is supported by a solid worktop to ensure it is fix and free of vibrations. Use a test block the hardness of which is similar to that of the test object. Proceq offers test blocks at three hardness levels.

2. Peel the protective sticker off the surface; and store it for subsequent reuse. Ensure that the testing surface is clean, smooth and dry. If required, use acetone, isopropanol or the like to remove any residues of adhesives or dirt (no water!).
3. Settings: Turn off the diameter correction. Select the hardness scale in which the Equostat test block is calibtrated in. Select the number of indentation tests n per measurement series.
4. Perform 10 indentation tests, which ideally shall be evenly distributed across the entire test block (see section 2.5. "Testing procedure").
5. The average set point hardness of the block is engraved on the surface. The measured average shall coincide with the target range. (If not, please refer to sections 4. "Getting started" and 13. "Troubleshooting".)

Your new Equostat 3 is fully operational and you can now continue with your measurements.

> **i** **Note:** First time user: Complete the "Tutorial on portable Rockwell hardness Testing", or watch a demonstration by a qualified Proceq representative.

> **i** **Note:** Ensure that the testing surface is clean, smooth and dry before you stick the protective surface sticker back on the test block.

> **i** **Note:** The performance check should be done regularly before each use of the instrument to verify the mechanical and electronic functions of the probe and the indicating device. This requirement is also included in the relevant hardness standards, see section 10.3. "Standards and guidelines applied".

6. Views and Display Settings

The Equotip 3 indicating device offers multiple options for displaying the menus and measurements.

6.1. Views

Enter the "View" menu to adjust the content displayed on the screen:
*   Bar graph: Shows the measurements as a bar graph. This view is practical when the hardness profile of a test piece is measured.
    *   Multiple series bar graph: Multiple measurement series are displayed.
    *   Set bar graph range: To overview the relevant hardness range only, the viewing range can be fixed.
    *   Scale bar width: Controls the width of the bars that represent the readings.
*   Basic mode: The last reading / mean value is displayed as a large number. This view is handy when the screen is viewed from a distance, or when the device is used in a dark surrounding like a factory floor.
*   Signal graph: The actual measurement signal from the probe is displayed. This view is convenient to demonstrate the measurement principle in training sessions, to study the signal shape for consistency, or for signal studies in laboratory studies.
*   Conversion function: Measurements are displayed as data points on a graph of the active conversion function. This view permits the user to relate the scattering range of the readings in the converted hardness unit to the data scatter in the original penetration depth measurement (in µm).

	Note: The large number on the display can either give the mean value or the last reading of the measurement series, respectively. Use the ⬛ key to switch between the two modes.

6.2. Backlight

The backlight can be adjusted to pre-defined lighting levels simply by pressing the ⬛ key repeatedly.

	Note: Navigate to "Config" – "Display" to adjust the LCD contrast and the back-light.

6.3. Sound

The Equotip 3 indicating device can be configured ("Config" – "System settings" – "Sound...") to emit audible alarms in case of pre-defined events. For example, when a signal cannot be evaluated or limits are exceeded, alarm signals prompt the user to repeat the measurement or to reject the part, respectively. Also, completion of a measurement series is acknowledged through a validation signal. This feature is useful especially when rapid series testing is conducted.

6.4. On-Screen Help

During operation, the user may refer to the Equotip 3 on-screen help library. It is accessible via the "Help" submenu or through pressing the ⬛ key to receive context sensitive help.

6.5. Operating language

The desired language can be selected in "Config" – "Language".

7. Settings

When starting up, the Equotip 3 is in the same state as it was before the last shutdown. To adjust the settings, either press the "context sensitive function" keys or the "open menu" keys, respectively.

	Note: If ✕ symbol is shown instead of the ⬛ symbol, unplug the probe cable for approx. 2 seconds and plug back in to re-establish the connection.

	Note: If the automatic storage option is turned on, all data are automatically stored as original penetration depth measurements (in µm) with additional information such as diameter correction, time and serial number of the used devices. When transferring the data to the PC using the Equolink 3 software, they can then be converted to any other scale without accumulation of conversion errors, since the stored original penetration depth value is used as the original value for all conversions.

7.1. Measuring Method, Conversion Standard

There are two measuring methods implemented in Equostat 3, following DIN 50157 or ASTM B724 as described in section 2.1. "Test principle". The default measuring method is DIN 50157, as it is applicable to testing all metals. It generally yields the more consistent results. Users have the option to measure in the ASTM B724 mode whenever ASTM E 140 is chosen as conversion standard and material group 6 (Cast aluminium alloys) is selected.

- Press the ⬛ key to open the "Config" submenu and select "Equostat settings...".
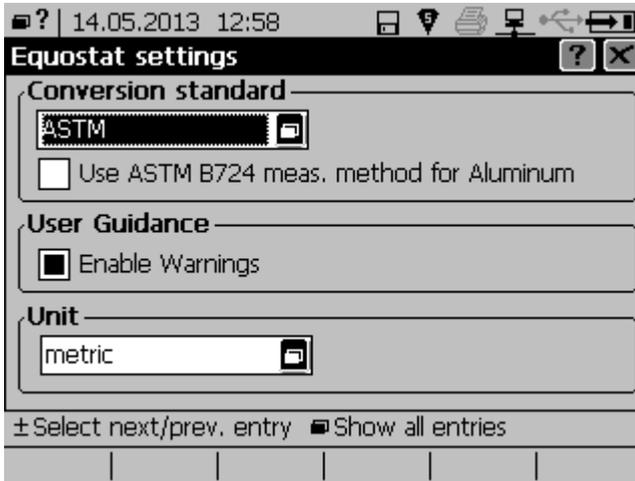
- Use the ⬛ to select the conversion standard. If ASTM E140 is selected, the alternative measurement method according to ASTM B724 can be selected. This mode will then be employed for material group 6 (Cast aluminium allows).
- To exit the selection window hit the ⌧ key.

> **Note:** In accordance with the selected measuring method, either ISO 18265 or ASTM E140 hardness conversions are applied in the DIN or ASTM method, respectively.

7.2. Material groups

To switch between material groups,

- Press the F2 key to select the material group.

- Use the navigation keys to choose a material group.

- Confirm selection with the ⊡ key. If readings were shown on the display, they will be converted using the conversion function for the newly selected material group.

> **i** **Note:** Material group selections have no effect on measurements of the Equostat 3 penetration depth difference in μm, as no conversion is applied. In contrast, hardness conversions to other scales show some dependence on the elasto-plastic material properties. Free online material databases and the Equotip 3 on-screen help can be useful to assign your materials to one of the nine material groups. Suitability of conversions for specific materials should be verified on calibrated test pieces before use. For further advice, please contact Proceq.

> **i** **Note:** For a given hardness scale, the dropdown menu only lists the material groups for which conversions are available. If no conversion is available, use a different material group and apply a custom conversion, see section 8.1. "Custom Conversion Curves".

7.3. Hardness Scales
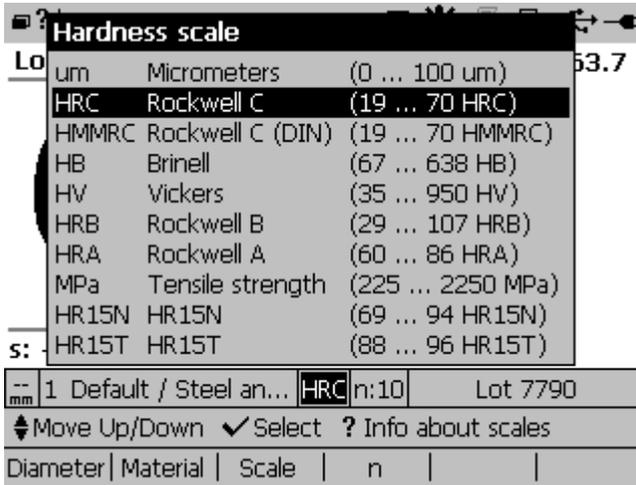
To change the hardness scale using conversion functions from the depth measurement in µm to other scales:

- Press the F3 key to select the hardness scale.
- Use the navigation keys to choose a hardness scale.
- Confirm selection with the ▣ key. If readings were shown on the display, they will now have been converted to the newly selected hardness scale.

i	**Note:** For a given material group, the dropdown menu only lists the hardness scales for which conversions are available.

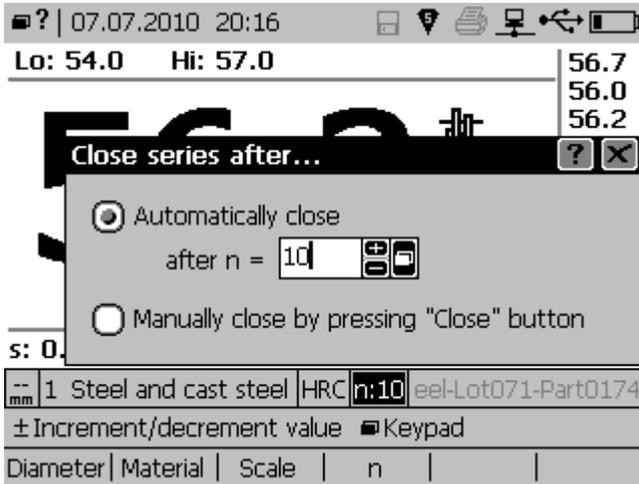|	
i	**Note:** Measurements for certain steels can be converted to tensile strength according to DIN EN ISO 18265.

i	**Note:** Converted hardness values may vary depending on the conversion standard selected (ISO 18265 or ASTM E140).

7.4. Number of Indentation Tests per Measurement Series

In order to end a measurement series, the user can close the series using the function key "Close". Alternatively, if a fixed number of indentation tests, e.g. n = 5, is desired for each series, automatic termination of the series after 5 recorded values can be set. To set a fixed number of indentation tests,

• Press the F4 key.

• Use the +/- buttons to select the desired number of indentations.

• To exit press the ⊠ key.

> **Note:** "Bad" measurement readings may be erased from a test series using the navigation keys and then pressing the function key "Remove". Make sure readings are only removed in accordance with the relevant quality guidelines, or restrict this function using user profile settings, respectively.

> **Note:** Following closure of a test series, the user may decide to add further readings or replace "bad" readings simply by pressing the function key "More". The function key "New" clears the display to start a new series.

7.5. File Name of Measurement Series

In order to define the alphanumeric file name of the measurement series,

- Press the ⬛ key.
- Use the navigation keys to input the filename.
- To exit press the ⬛ key. The file name can be used as the reference to the tested production lot / part. The file name identifies the test series after downloading the data to a PC using Equolink 3 or the Equotip 3 Automation Package, respectively.

> ⓘ **Note:** Ensure that the floppy-disc symbol for automatic storage is displayed if the data needs to be saved. If this function is switched off, the measured data is lost once the series has been closed.

> ⓘ **Note:** Keyboard-style or SMS-style input modes can be used. The configuration can be changed through "Config" – "User interface". A USB keyboard, a USB mouse or a USB scanner may be connected to the connection ports (use the USB type A socket). A USB keyboard, mouse, etc. can be connected to the Equotip 3 indicating device at the same time as Equostat 3 using standard USB hubs to multiply the USB port.

> ⓘ **Note:** When a measurement series has been closed and the series is stored, the last alphanumeric character of the file name is automatically incremented. A different file name can be defined manually by pressing the ⬛ key.

7.6. Limits
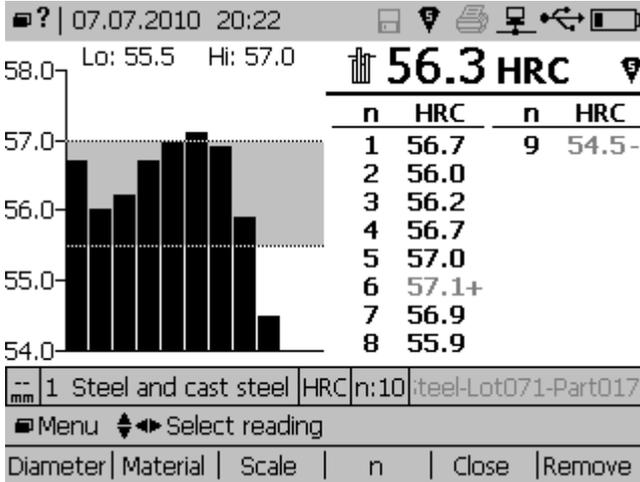
In order to define lower and upper hardness limits for a tested part,

- Press the ⬛ key to open the "Measurement" submenu and select "Limits...".

- Use the navigation keys and the ⬛ key to activate the upper and / or lower limit.
  The limits can be changed by pressing the ⊕ ⊖ keys.

- Confirm selection with the ⬛ key. The range of "good" readings is now highlighted in grey, and values outside the limits are flagged with a "+" or "-" next to the values.

8. Advanced Settings

The most frequently used advanced functionalities of the Equotip 3 indicating device are described below.

8.1. Custom Conversion Curves

8.1.1. Minimizing Conversion Errors

Provided the material group is selected correctly, conversion errors will not normally exceed ±2 HR for Rockwell scales and ±10 % for HB and HV. In most cases, the conversion error is significantly lower. If higher accuracy is required, or if the alloy under test is not covered by one of the built-in conversions, the Equotip 3 indicating device provides a variety of methods to define material-specific conversions. These custom conversion curves can be set up through "Config" – "Customer Conversions", and used through the "hardness scales" dialog, see section 7.3. "Hardness scales".

8.1.2. Methods for Setting Custom Conversions

The Equotip 3 provides three methods to accomplish custom conversions (example µm → HB):

- One-point method: The penetration depth difference in µm (using Equostat 3) and the hardness in the desired scale HB (using a stationary Brinell hardness tester) are deter-

mined for a reference work piece. A standard conversion function µm --> HB is then adapted through vertical offset until the measured reference data pair lies on the shifted curve.

- Two-point method: Two reference test pieces are tested, one as soft and one as hard as possible to find two data pairs µm / HB. A standard conversion function µm --> HB is then adapted through adding a straight line until both of the measured reference data pairs lie on the tilted curve.

- Conversion polynomial: If a custom conversion needs to be applied throughout a wide hardness range, several reference test pieces shall be measured to find a stable basis for interpolation. Up to 5th order polynomials can be programmed into the Equotip 3 indicating device by defining the polynomial coefficients A_i in HB (µm) = $A_0 + A_1 \cdot \mu m + A_2 \cdot \mu m^2 + A_3 \cdot \mu m^3 + A_4 \cdot \mu m^4 + A_5 \cdot \mu m^5$.

8.1.3. Example of a Custom Curve

- The data pairs (34.9 µm / 75.4 HB) and (56.2µm / 136 HB) were measured on two reference test pieces made from "Al-Cu alloy".
- To measure "Al-Cu alloy" in future using an adapted µm --> HB conversion, the original µm --> HB conversion curve for "Aluminium Alloy" is tilted using the two data points. In this example, the special conversion is defined as valid for the range 34.9µm to 56.2µm.
- Once this curve has been created, it can be selected via material group "Customer defined" – "Al-Cu alloy", using the hardness scale "HB Brinell".
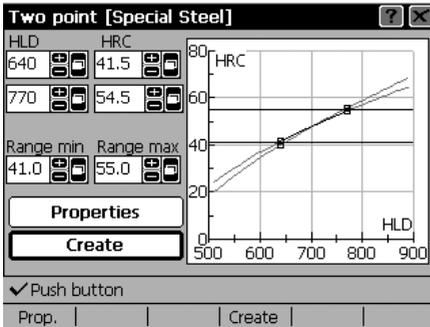
8.1.4. Measuring Reference Test Pieces

- The test piece surfaces must be prepared very carefully.
- Prior to each measurement series, the proper working order of Equostat 3 shall be verified against the Euqostat 3 calibrated test block.
- The functioning of the static hardness testing machine (HV, HB, etc.) shall be verified against respective test blocks of the corresponding measuring scale and range.
- To obtain a pair of comparative values, the mean values from at least 10 to 15 µm-measurement values and from 3 values from the static test shall be calculated. These values shall be obtained from proximate positions in a small measuring area.

8.2. Data Printout and Digital Output

The Equotip 3 is equipped with USB, Ethernet and RS 232 ports by default:
- USB type A: Connector socket for Equostat 3, keyboard, mouse, barcode scanner, printer, etc.
- USB type B: Refer to the separate operating instructions "Equolink 3 Software" included on the Equotip CD.

- Ethernet: Configuration is accessed through "Config" – "System settings" – "IP settings...". Enter the IP address of the device or use the DHCP option.
- RS 232 (serial): The RS 232 interface can be used for printing, but due to its speed limitations it is not suitable for device updates.
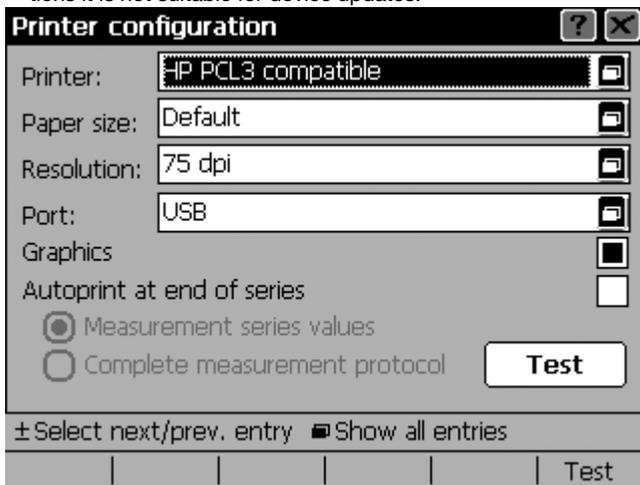
- Printer setup: Printers can be connected via USB type A, RS 232, or network (ethernet), respectively. Configuration is accessed through "Config" – "System settings" – "Printer...". Various printers can be selected from a list. If "Autoprint at end of series" has been enabled, the indicating device will automatically print a protocol each time a measurement series is closed. Alternatively, a protocol of the current series can be printed at any time using "Measurement" – "Print series" – "Long protocol" or "Short protocol".

> **Note:** Communication via Ethernet connection is faster than USB.

8.3. User Profiles with Password Protection

8.3.1. Minimizing Operating Errors and Enhancing Efficiency
Super-users can define user profiles via "Config" – "User profiles". User profiles can be configured to serve purposes such as:
- Test piece specific device settings: For different work pieces, the needs for hardness testing may vary. For example, the hardness of small and large test pieces can require the use of Equostat 3 with conversion to HB and impact device G with conversion to HB, respectively. In this case, two user profiles "Small test pieces" and "Large test pieces" can be defined to start up with the settings and restrictions that apply to the respective work pieces. This permits a rapid change of settings at minimal risk for making mistakes.
- User-specific device settings: Two users who test in different surroundings can configure their own preferences for how the data should be displayed on the screen (views bar graph, basic mode etc.) and for display settings (backlight, contrast).
- Access restrictions: Password protection is an effective tool where it is important to trace back test execution to particular users. Also access to confidential data can be restricted.

8.3.2. Example of a User Profile
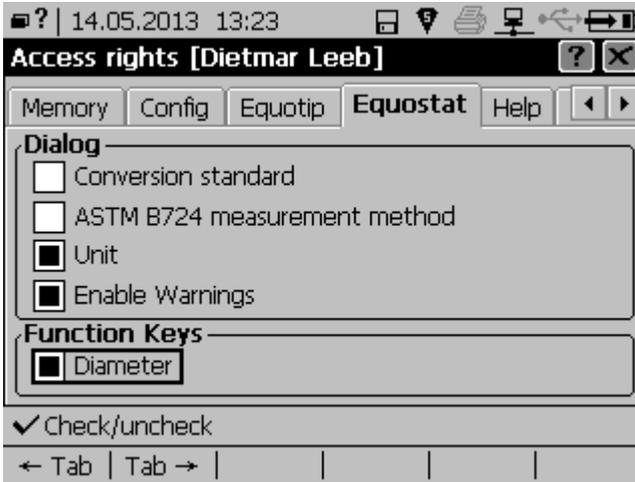
- User "Dietmar Leeb" has been given restricted access rights for measurements.
- On the one hand, Dietmar Leeb is permitted to adjust the setting of the surface diameter correction during the test. Also, Dietmar Leeb is free to take as many indentations per measurement series as he believes is required to make a sound statement.
- On the other hand, Dietmar Leeb is required to test according to the DIN standard and thus cannot change the measuring method, and neither can he change the settings for material and scale, as he is assigned to only report the hardness of aluminium parts in Brinell. For these parts, also the pass/fail limits are fixed.

9. Data Evaluation

9.1. Statistics
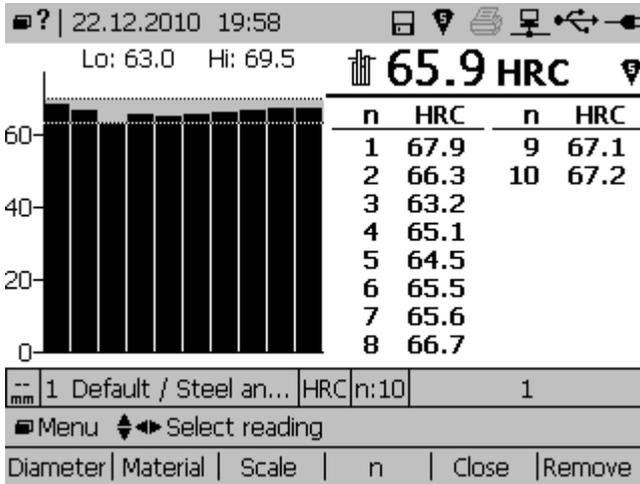
Statistics for measurement series of up to 9999 indentations are calculated automatically:
- Number of indentation tests n = 10, lower limit 63.0 HRC, upper limit 69.5 HRC.
- The bar graph provides a convenient overview confirming that all the 10 readings fall within the limits.
- The series statistics (average $\bar{x}$, standard deviation s, Max/Min, value range R) are shown in the upper screen section.
- The single readings are shown in the lower screen section.

9.2. PC Application Software Equolink 3

More Equotip functionality is made available through the Equolink 3 PC software. A separate manual "Equolink 3 Software" is included on the Equotip CD.

10. Technical specifications

10.1. Equotip 3 Indicating Device

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)
Housing	shock resistant ABS plastic
Display	4.7" QVGA LCD with adjustable contrast and backlight
Integrated memory	flash 32 MB (non-volatile), RAM 64 MB (volatile)
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
Input voltage	9 to 16 V DC
Max. input current @ 9.4 V	1.3 A
Battery operation period	typically 10 hours
Operating temperature	0 to + 50 °C (32 to 122 °F)
Humidity	non-condensing, 90% max.

10.2. Equostat 3 probes

Dimensions	112.5 x ø 42 mm (4.4 x ø 1.6 inches)
Weight	260 g (9.17 oz)
Power supply	via USB (5 V, max. 100 mA)
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, 100-107HRH (AL only), 75-106 HRE (AL only)
Measuring accuracy	~ ± 1.5 HRC according to DIN 50157
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
Test direction	any direction (no correction required)
Test loads	10 N / 50 N (probe 50 N)
Diamond indenter	angle 100.0° ± 0.5°
Operating temperature	0 to +50 °C (32 to 122 °F)
Humidity	non-condensing, 90% max.

10.3. Standards and guidelines applied

- DIN 50157 (2007)
- ISO 18625 (2003)
- ASTM B724 (2006)
- ASTM E140 (2007)
- DGZfP Guideline MC 1 (2008)
- VDI / VDE Guideline 2616 Paper 1 (2010)

11. Part numbers and accessories

Part No.	Description
354 01 000	**Equostat 3 Hardness Tester Clamp Unit** 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	**Equostat 3 Hardness Tester freehand measuring unit** 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	**Equostat 3 Hardness Tester PC Unit** 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	**Equotip 3 Hardness Tester Basic Unit** 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	**Equotip 3 Automation Package** consisting of: activation code, 1.5m 4-pole cable with automation branch connector, Equotip CD with automation libraries, Equolink 3 software and product documentation, operating instructions

Part No.	Warranties
354 88 001	1-year extended warranty on Equostat 3
354 88 002	2-year extended warranty on Equostat 3
354 88 003	3-year extended warranty on Equostat 3

Part No.	Probes for Use with Equotip 3 Indicating Device
353 00 100	Equotip 3 impact device D
353 00 110	Equotip 3 impact device DC
353 00 120	Equotip 3 impact device DL
353 00 200	Equotip 3 impact device S
353 00 300	Equotip 3 impact device G
353 00 400	Equotip 3 impact device E
353 00 500	Equotip 3 impact device C

Part No.	Equostat 3 Feet
354 01 127	Equostat 3 round standard foot
354 01 130	Equostat 3 tripod
354 01 141	Equostat 3 long foot
354 01 250	Equostat 3 special foot RZ 18 mm - 70 mm
354 01 253	Equostat 3 special foot RZ 70 mm - ∞

Part No.	Equotip Test Blocks
357 41 100	Equostat 3 test block calibrated by Proceq (20 HRC)
357 42 100	Equostat 3 test block calibrated by Proceq (45 HRC)
357 44 100	Equostat 3 test block calibrated by Proceq (62 HRC)

Part No.	Test Block Calibrations
357 90 918	Equostat test block extra calibration, certified by accredited institute according to ISO 6506-3 (Brinell)
357 90 928	Equostat test block extra calibration, certified by accredited institute according to ISO 6507-3 (Vickers)
357 90 938	Equostat test block extra calibration, certified by accredited institute according to ISO 6508-3 (Rockwell)

Part No.	Accessories
353 00 001	Equotip 3 indicating device
354 01 117	Equostat 3 indenter
354 01 200	Equostat 3 measuring clamp
354 01 221	Support Z1 for measuring clamp (for flat parts)
354 01 243	Support Z2 for measuring clamp (for thin cylindical parts; wires, bolts, etc.)
354 01 228	Support Z4 for measuring clamp (for tubes and pipes up to Ø 28 mm)
354 01 229	Support Z4+28 for measuring clamp (for tubes and pipes over Ø 28 mm)
353 00 010	Equotip 3 stand assembly
353 00 085	Equotip 3 AC adapter
353 00 029	Rechargeable Equotip 3 battery
354 01 145	Equostat 3 carry case with cut-out for test block (except G) and accessories
353 00 070	Protective carry pocket for the Equotip 3 indicating device
353 00 037	Equotip 3 neck / wrist strap
354 01 139	Equostat 3 probe cable 2 m (4-pole/USB)
353 00 082	Equotip 3 RS 232 adapter cable 1.5 m for connection to printer
354 01 137	Equostat 3 protective rubber sleeve

12. Maintenance and Support

Proceq is committed to providing a complete support service for this instrument. It is recommended that the user obtain available updates and other user information regularly through www.proceq.com.

12.1. Regular Device Check

Performance checks (see section 4.6. "Performance Check / Daily Verification") of the instrument should be carried out at least once a day or at the latest after 1000 tests. In the case of infrequent use, carry out the check before the beginning and at the end of a test series. In addition, have the device calibrated by an authorized Proceq Service Center once a year.

> **i** **Note:** The unit is working properly when the average is within the target range. If the average deviates from the setpoint value by more than ±2 HRC, see section 13. "Troubleshooting".

12.2. Cleaning

- Equostat 3 probe:
    1. Unplug the cable and unscrew the probe foot.
    2. Take the rubber protector off the probe.
    3. Clean the probe with a soft cloth. If needed, use isopropanol to remove severe stains. Use a cotton pad to clean inaccessible areas.
    4. Reassemble.
- Indenter: Clean the indenter with an isopropanol-soaked soft cloth.
- Feet, measuring clamp: Clean carefully with a soft cloth, use isopropanol if needed.
- Housing of indicating device: Clean the display and housing with a clean, dry cloth after use. Also clean the connector sockets with a clean, dry brush.

> **i** **Note:** Never immerse the device in water or clean it under running water. Do not use abrasives, solvents or lubricants to clean the device.

> **i** **Note:** If the factory floor presents a dirty, dusty and rough environment, the user is advised to slip the rubber protector over the probe, and to use an Equotip 3 protective carrying pouch.

12.3. Storage

Only store the Equostat 3 in the original packaging and in a dry room free of dust.

12.4. Updating the Equotip 3 Firmware and Operating System

Connect the device to the computer. Updates can be done using Equolink 3 as follows:
- From the respective folder on the Equotip CD, install Equolink 3 to your PC.
- Select the "Device" menu from the menu bar and select "PqUpgrade" in the submenu, or click the symbol in the toolbar.
- Select "Express" and confirm with "Next".
- Select the device type and confirm with "Next".
- In the "Choose Communication Type" dialog box, select the type of communication used

between the Equotip 3 and PC, and then click "Next".
- In the "Device search result and selection" dialog box, make sure the serial number of the device in the drop-down field is the device to be updated, and then click "Next".
- PqUpgrade will now search the Proceq servers for any available updates.
- Follow the on-screen instructions to finish the update.

> **i** **Note:** Before updating the firmware, the measured data should be saved to the PC.

> **i** **Note:** The "Custom" update is recommended for advanced users only.

13. Troubleshooting

13.1. Incorrect Measurements or Failed Performance Check

o During the performance check, if the average deviates from the setpoint value by more than ±2 HRC:
  1. Make sure that the foot sits securely on the probe or the probe securely in the clamp, respectively.
  2. Clean the indenter, paying close attention especially to the front part (diamond) and to the screw thread. Replace the indenter if necessary, or replace the test block if there is insufficient space for additional tests.
  3. Clean the probe, as described in section 12.2. "Cleaning".
  4. Check the mounting and wear of the stand and clamp. Check for deposits. Clean or replace if necessary.
  5. If the instrument still shows excessive deviations: return the device to an authorized Proceq Service Center for recalibration / inspection.
o An incorrect conversion or a wrong setting for the diameter correction may have been selected. Refer to section 7. "Settings".
o The selected conversion scale is not in the permissible range ("noCnv"). Select another hardness scale.
o Individual values are scattered very widely or are continuously too low.
  1. The testing location is insufficiently prepared. Carefully prepare the testing location for the indentation, see section 2.2. "Test piece preparations".
  2. The test is conducted while the device is not held vertically on the surface, which will generally give a warning on the guidance dialog. This may occur especially when using the long foot or the tripod. Try using another foot, or take more care to align the probe vertically to the surface.
  3. Test piece is insufficiently supported. Prepare the test piece for the test e.g. through supporting it with a larger metal piece.
  4. Make sure the probe does not tilt / move on the surface. See section 2.6. "Testing curved surfaces".

> **i** **Note:** Do not re-grind test blocks or try to use non-Proceq indenters. This will impair accuracy and may also deteriorate functionality of the Equostat 3.

13.2. No Reading displayed or No Probe Connection

- Check the connection of the probe cable. Unplug for 2 seconds and plug back in.
- Check if genuine Equostat 3 parts and accessories are used.
- Check for tight seating of the support foot on the thread of the probe.
- Press down the indenter with the ball of your hand to make sure that the mechanism is moveable. If not, the mechanics of the probe may be jammed or defective. If so, contact an authorized Proceq Service Center.

13.3. Empty Display

- If nothing is indicated on the display, activate the device through pressing any key.
- If nothing happens, the instrument may be too cold and/or the battery may be discharged. Take the device to a warmer place and/or charge the battery.

13.4. Battery

- If the indicating device does not switch on, recharge the battery using the Equotip 3 AC power adapter, see section 4.4. "Charging the Battery".
- The battery can be replaced with another Equotip 3 Lithium-Ion battery, or with 3 standard C cell batteries (Alkaline, NiCd or NiMH). Lithium-Ion batteries can be recycled.
- Recalibration of lifetime indicator: Refer to 4.5. "Optimizing Performance of the Battery System".

i	**Note:** Do not remove or insert the Lithium-Ion battery while the device is running with an external power supply. This leads to an unwanted reset of the lifetime indicator, which subsequently results in wrong battery status indication.

i	**Note:** If the operation time of the battery is shortening noticeably, order a new battery. The battery lifetime has expired when the LED does not go off even though the battery has been charged for several days.

⚠	**Danger:** Only use the Equotip 3 AC power adapter (12 V, 1.25 A) to charge the Equotip 3 indicating device.

13.5. Error messages

- o "The application contains no version information...":
  Possible causes:
  1. Something fatal went wrong during device update, e.g. a power loss occurred.
  2. The flash memory of the device is defective.

  Countermeasures:
  1. Delete the update by pressing the "yes" button when the error message "The application contains no version information..." is displayed. Then retry updating the device.
  2. If this error persists, contact an authorized Proceq Service Center.
- o "Boot menu":
  - o If critical files in the Equotip 3 indicating device have been corrupted, the boot menu can help to reset the device to a functioning state.
  - o For this, select "Start Default Application".

Note: The boot menu can be accessed by simultaneously pressing and during the booting sequence in case the indicating device does not boot up properly anymore.

13.6. Slowing Down of Device

The device reacts very slowly, e.g. keys must be pressed for several seconds until the key press is registered, or measurements are displayed with a delay of several seconds.
- The more you write to the flash memory (e.g. measurement series, device power up & shutdown cycles, device updates), the more frequently this condition can occur.
- The flash disc is automatically cleaned up when there are too many invalid sectors. This is a common and necessary task.
- Wait some minutes, or continue working under this special condition.

13.7. Device Reset

If the indicating device does not react, a reset must be carried out to correct faults. Press and hold the on / off key for approx. 20 seconds. Wait for approx. 5 seconds, and then press the on / off key again to switch on the indicating device.

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9001

proceq

... more than 50 years of know-how you can measure!