English

User Manual

PCE-2550 Hardness Tester

User manuals in various languages (français, italiano, español, português, nederlands, türk, polski, русский, 中文) can be found by using our product search on: www.pce-instruments.com

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v1.0

Contents

1 Safety notes

Please read this manual carefully and completely before you use the device for the first time. The device may only be used by qualified personnel and repaired by PCE Instruments personnel. Damage or injuries caused by non-observance of the manual are excluded from our liability and not covered by our warranty.

- The device must only be used as described in this instruction manual. If used otherwise, this can cause dangerous situations for the user and damage to the meter.
- The instrument may only be used if the environmental conditions (temperature, relative humidity, …) are within the ranges stated in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture.
- Do not expose the device to shocks or strong vibrations.
- The case should only be opened by qualified PCE Instruments personnel.
- Never use the instrument when your hands are wet.
- You must not make any technical changes to the device.
- The appliance should only be cleaned with a damp cloth. Use only pH-neutral cleaner, no abrasives or solvents.
- The device must only be used with accessories from PCE Instruments or equivalent.
- Before each use, inspect the case for visible damage. If any damage is visible, do not use the device.
- Do not use the instrument in explosive atmospheres.
- The measurement range as stated in the specifications must not be exceeded under any circumstances.
- Non-observance of the safety notes can cause damage to the device and injuries to the user.

We do not assume liability for printing errors or any other mistakes in this manual.

We expressly point to our general guarantee terms which can be found in our general terms of business.

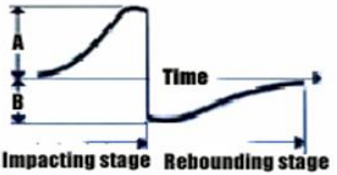
If you have any questions please contact PCE Instruments. The contact details can be found at the end of this manual.

2 Measuring principle

An impact body of known weight is propelled against the measuring surface. The hardness value is calculated from the rebound velocity and the impact velocity at 1 mm distance from the measuring surface using the following formula:

HL = 1000×VB/VA

HL-- Hardness according to Leeb
VB-- Rebound velocity
VA-- Impact velocity



3 Specifications

3.1 Technical specifications

Measurement ranges	170 ... 960 HLD
Accuracy	on 760±30HLD test block = ±6 HLD on 530±40HLD test block = ±10 HLD
Repeatability	on 760±30HLD test block = 6 HLD on 530±40HLD test block = 10 HLD
Measuring direction	360°
Impact device	D-type
Measuring units	HL, HB, HRB, HRC, HRA, HV, HS
Selectable materials	10
Calibration	Possible on included hardness test block
Display	OLED display 128 x 64 pixels
Internal memory	1 ...373 measurement series (with averaging from 31 measurements) 1 ... 2688 measurement series (with averaging from 1 measurement) approx. 2000 measurement series with AVG after 3 measurements Measurement series consists of mean value / direction of measurement / material / number of measurements for averaging / measured values of each individual measurement
Automatic power-off function	yes
Power supply	2 x CR2016 button cells (not rechargeable)
Operating time	approx. 8 h continuous operation
Interface	Micro USB **Note**: For software use only
Environmental conditions	0 ... +40 °C / 32 ...104 °F, ≤90 % RH
Dimensions	145.5 x 32 x 26 mm / 5.73 x 1.26 x 1.02“
Weight	160 g / <1 lb

Measurement ranges according to material and hardness scale

Material	**Steel and cast steel**	**Cast Steel** HL / HV / HB / HRC / HS / HRB / HRA
Scale	Rockwell, Brinell, Vickers, Shore	
Measurement range	HRC: 17.9 ... 68,5	
	HRB: 59.6 ... 99,6	
	HRA: 59.1 ... 85,8	
	HB: 127 ... 651	
	HV: 83 ... 976	
	HS: 32.2 ... 99,5	
Material	**Cold rolled steel**	**CWT Steel** HL / HV / HRC
Scale	Rockwell, Vickers	
Measurement range	HRC: 20.4 ... 67,1	
	HV: 80 ... 898	
Material	**Stainless steel**	**STAIN. Steel / Stainless Steel** HL / HV / HB / HRB
Scale	Rockwell, Brinell, Vickers	
Measurement range	HRB: 46.5 ... 101,7	
	HB: 85 ... 655	
	HV: 85 ... 802	
Material	**Grey cast iron**	**GC Iron** **Gray Cast Iron** HL / HB
Scale	Rockwell, Brinell, Vickers	
Measurement range	HRC: ---	
	HB: 93 ... 334	
	HV: ---	
Material	**Ductile iron**	**NC Iron** HL / HB
Scale	Rockwell, Brinell, Vickers	
Measurement range	HRC: ---	
	HB: 131 ... 387	
	HV: ---	
Material	**Cast aluminium alloy**	**Cast Alumin** HL / HB / HRB
Scale	Rockwell, Brinell	
Measurement range	HRB: 23.8 ... 84,6	
	HB: 19 ... 164	
Material	**Brass**	**Cooper-Zinc** HL / HB / HRB
Scale	Rockwell, Brinell	
Measurement range	HRB: 13.5 ... 95,3	
	HB: 40 ... 173	
Material	**Bronze**	**Cooper-Alumin** HL / HB
Scale	Brinell	
Measurement range	HB: 60 ... 290	
Material	**Wrought copper alloy**	**Wrought Cooper** HL / HB
Scale	Brinell	
Measurement range	HB: 45 ... 315	
Material	**Wrought steel alloy**	**Wrought Steel** HL / HB
Scale	Brinell	
Measurement range	HB: 143 ... 650	

Chart 2

Specifications D-type impact device

Impact energy	11 Nmm / mJ
Impact body mass	5.5 g
Impact body	Tungsten carbide 3 mm
Application	Suitable for most applications
Test blocks	<500 HLD ~600 HLD ~775 HLD
Measurement range steel	81...654 HB
Max. roughness of the measuring surface	
Peak-to-valley height R_t	10.0 µm
Mean roughness R_a / AA	2.0 µm = N7
Minimum sample mass	
Compact design	5 kg
Coupled	2 kg
Minimum thickness of the sample	
Compact design	25 mm
Coupled	3 mm
Surface layer thickness	≥0.8 mm
Test indentation diameter / depth	
300 HV / 30 HRC	0.54 mm / 24 µm
600 HV / 55 HRC	0.45 mm / 17 µm
800 HV / 63 HRC	0.35 mm / 10 µm
Min. Radius of curvature	30 mm
Min. distance of impact points	3 mm
Min. distance to edge	5 mm

Chart 3

Conversion table HLD - Mpa

No.	Material	Hardness (HLD)	Tensile strength σ_b (MPa)
1	Mild Steel	350 ... 522	374 ... 780
2	High-Carbon Steel	500 ... 710	737 ... 1670
3	Cr Steel	500 ... 730	707 ... 1829
4	Cr-V Steel	500 ... 750	704 ... 1980
5	Cr-Ni Steel	500 ... 750	763 ... 2007
6	Cr-Mo Steel	500 ... 738	721 ... 1875
7	Cr-Ni-Mo Steel	540 ... 738	844 ... 1933
8	Cr-Mn-Si Steel	500 ... 750	755 ... 1993
9	Super Strength Steel	630 ... 800	1180 ... 2652
10	Stainless Steel	500 ... 710	703 ... 1676

Chart 4

Note: The chart is for orientation purposes only!

3.2 Delivery scope

1 x hardness tester PCE-2550
1 x USB connection cable
1 x hardness test block
1 x cleaning brush
1 x support ring Ø14 mm
1 x carrying case
1 x user manual

3.3 Optional accessories

PCE-HAK, adaptor set, consisting of:

HZ12.5-17	Concave adaptor, 12.5...17 mm (inside)
HZ11-13	Concave adaptor, 11...13 mm (inside)
HZ16.5-30	Concave adaptor, 16.5...30 mm (inside)
Z10-15	Convex adaptor, 10...15 mm (outside)
Z14.5-30	Convex adaptor, 14.5...30 mm (outside)
Z25-50	Convex adaptor, 25...50 mm (outside)
HK11-13	Ball adaptor, 11...13 mm (inside)
HK12.5-17Sphere	Ball adaptor, 12.5...17 mm (inside)
HK16.5-30Sphere	Ball adaptor, 16.5...30 mm (inside)
K14.5-30	Ball adaptor, 14.5...30 mm (external)
K10-15	Ball adaptor, 10...15 mm (external)
UN	Universal holder

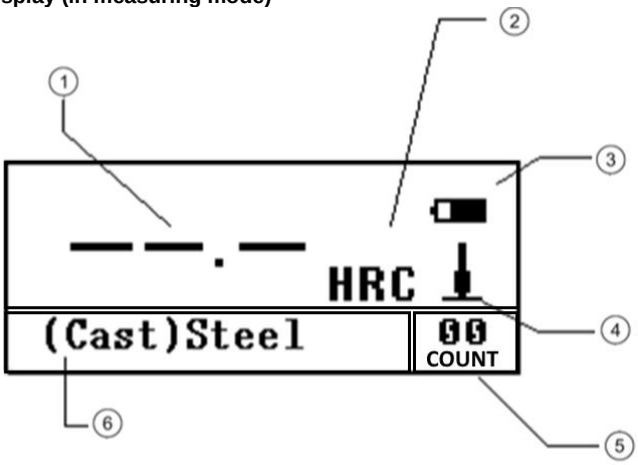
4 Device description

1. OLED display
2. Function keys
3. Micro USB interface
4. Impact device
5. Impact body
6. Support ring
7. Clamping slide
8. Trigger button

Function keys

Key	Function
	-On/off -In the menu: back -In measurement mode: save AVG measurement
	-Open menu -In the menu: Select, confirm, scroll through options
	-Cursor right/forward/down -Decrease numbers
	-Cursor left/back/up -increase numbers -In measurement mode: delete measurement

Display (in measuring mode)



1. Measured value / average value (AVG)
2. Hardness scale
3. Battery level indicator (**no battery / charging via USB not possible**)
4. Direction of impact / direction of measurement
5. Number of measurements carried out for averaging
6. Material

Hint: In measuring mode, the  key can be used to switch directly between the hardness scale / measuring direction / material and number of measurements to be used for averaging.

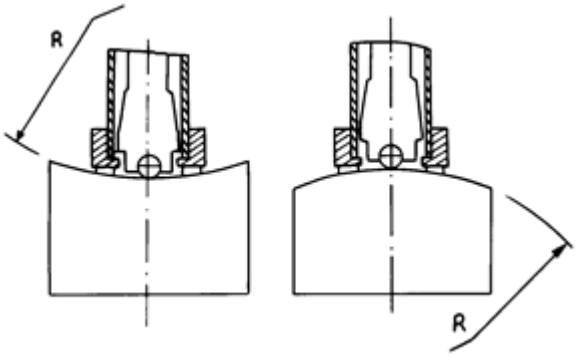
The changes are made with the  key and confirmed with the  key.

5 Operation

5.1 Getting started

General requirements for the material sample

- The surface temperature of the sample must be below 120 °C.
- The sample must meet the minimum thickness specified in the specifications.
- The surface to be tested should not be too uneven or rough. This could cause errors. The sample being measured should be metallic, smooth and free of grease.
- The surface should not be magnetic.
- If the radius of curvature R of the test surface is smaller than 30 mm, a small support ring should be used.
- The intrinsic magnetism of the sample should be below 30 Gauss.



Requirements for the weight of the material sample
For samples which are heavier than five kilogrammes and have a compact design, no support is necessary. Material samples with a weight of two to five kilogrammes but also heavier thin-walled samples should be stabilised by means of a fixing device. This is to prevent the sample from being deformed or displaced when touched. Material samples weighing less than two kilogrammes should be firmly connected with a fixing device of more than five kilogrammes.

Coupling of the material sample to a fixing device/base plate
The contact surface between the material sample and the base plate should be even and smooth. A thin, even layer of coupling gel should be applied between the base plate and the material sample. The sample should then be pressed onto the base plate with circular movements to achieve the best possible contact and distribution of the coupling gel. The direction of impact of the measurement should be perpendicular to the contact surface. The material sample must not have less than a minimum thickness of five millimetres for this method.

Requirements for material samples with hardened surface
Surface and case-hardened steel often gives deviating hardness readings due to its non-homogeneous nature if the material thickness of the hardened layer is less than 0.8 mm.

Note
Good coupling needs experience. Insufficiently coupled samples cause large fluctuations in measured values. Usually, the values are then lower than expected and an unusual noise development occurs (acoustically clearly distinguishable from the measurement on the test block). During the impact, the sample is subjected to a quite large (max. 900 N) but very short-lasting force. Therefore, clamping the material sample in a vice, for example, is unsuitable as a support. The sample can shift minimally. Such faulty measurements can usually be recognised by the large scatter of the measurement results.

5.2 Switching on the meter

To switch on the meter, press the  key.

To switch off the meter, press and hold the  key until "Power OFF" is displayed.

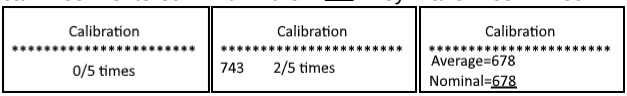
5.3 Check before measurement

Before measuring, check the meter with a hardness test block of known hardness, e. g. the hardness test block that is included. For this purpose, make 5 measurements with vertical impact direction. Keep a minimum distance of 3 mm to the next impact point and 5 mm to the edge. The arithmetic mean of the 5 measurement results is the hardness value. In case of a larger deviation, a calibration can be carried out.

5.4 Calibration

Before using the meter for the first time or if it has not been used for a long time, a calibration should be carried out using the Leeb hardness test block that comes with the meter.

- When switching on, press and hold ⏻ and 📖 until calibration mode opens.
- Now make 5 measurements on the hardness test block with vertical impact direction.
- After the 5 measurements, an ACTUAL [Average] and TARGET [Nominal] value appears.
- In case of deviations, the [Nominal] value, which is written on the hardness test block, can be entered with the ▶ key and confirmed with the 📖 key.



Hint:
The "Nominal" value can only be changed by ±15 HL. If the deviation is greater, we recommend sending the device to PCE Instruments for calibration.

5.5 Measurement

5.5.1 Hardness measurement

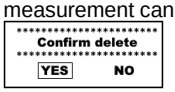
Hint:
Before each measurement, make sure that the measurement settings shown in the display correspond to the application.

- Press down the clamping slide (7) to clamp the impact body.
- Then press the support ring (6) vertically (90 °) onto the sample surface.
- Then release the impact body with the trigger button (8).
- We recommend making 5 measurements per test spot.

Hint:
The minimum centre to centre distance between two impact points should not be less than 3 mm and the distance from an impact point to the edge of the sample must not be less than 5 mm.

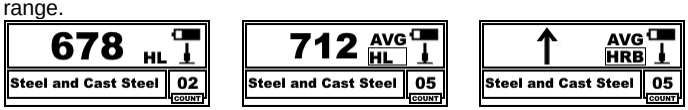
If a measurement is faulty, it can be deleted by pressing the ◀ key.

The selection is made by pressing one of the two keys ▶ or ◀. Confirm with the 📖 key. A measurement can be cancelled by pressing the ⏻ key.



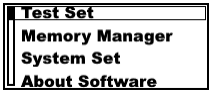
When the set number of measurements has been made, the mean value **AVG** appears.

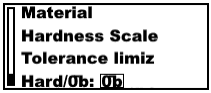
In AVG mode, the 📖 key can be used to subsequently change the hardness scale. The conversion of the measured values then takes place automatically. An arrow in place of the measured value means that the measured value / hardness scale does not match the conversion range.



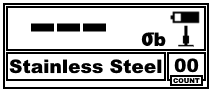
5.5.2 Tensile strength measurement (Mpa σb)

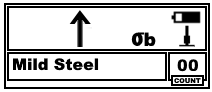
To measure the tensile strength, select the mode for tensile strength in the "**Test Set**" menu under "**Hard/σb**": σb**.**





Then set the desired material as well as the impact direction and proceed with the measurement as with the hardness measurement.

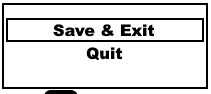




An arrow in place of the measured value means that the measured value is outside the measurement range.

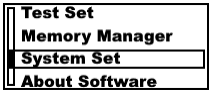
5.6 Save and delete

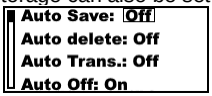
- To **manually save** the measurement series, press and release the key in AVG mode. The following query then appears in the display:

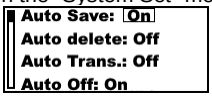


- The key can now be used to scroll through the options.
- Confirmation is made by pressing the key.

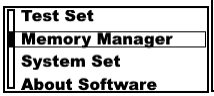
Note: Automatic data storage can also be set in the "System Set" menu.

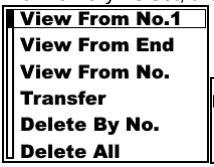


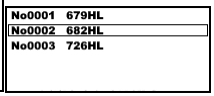




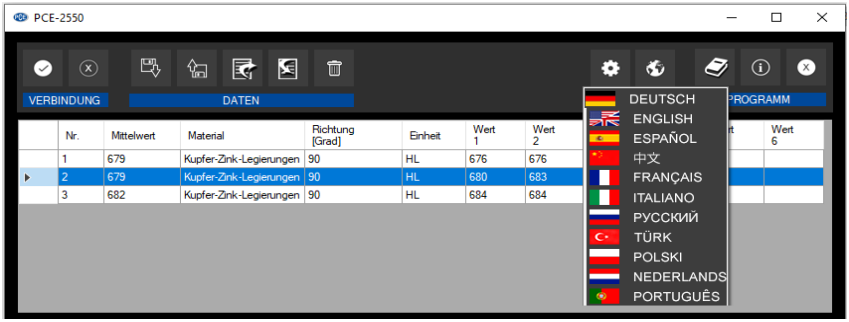
To access the saved values, go to the "Memory Manager" menu with the key. Here you can retrieve the values. If "No Memory" is set, the memory is cleared.







The saved measurement data can be transferred to the PCE-2550 software via the USB interface. The software is available in several languages and can be downloaded free of charge from the PCE Instruments website:
https://www.pce-instruments.com/english/download-win_4.htm



5.7 Menu structure

Test Set			
	Impact Direc.	**Impact Direction** **********	Measuring direction / direction of impact
	Average	**Mean Times** ********** **03**	Number of measurements from which the mean value is to be formed. 1 ...31
	Material	see chart 2 and 4	Depending on whether hardness or tensile strength is tested
	Hardness Scale	HL, HV, HB, HRC, HS, HRB, HRA	Depending on the selected material
	Tolerance Limit	Min / Max	0000 ... 9999 ****not activated****
	Hard / σb:	Hard or σb	Hard=hardness measurement σb=tensile strength
	Sample Type:	D	Selection of impact body D / DC / D+15 / C / G / DL / E We only offer **D**
	Standard:	EN	AS / EN

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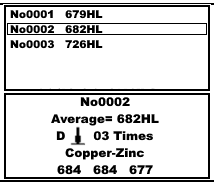
Display from the first measurement</td><td> 
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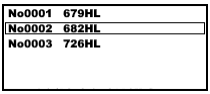
Display from the last measurement</td><td> 
</td><td>Selection is made with the key. Scroll with the key.</td></tr>
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Display range selection</td><td> 
</td><td>Change number
Change position
Confirm</td></tr>
<tr><td>Transfer</td><td></td><td>Measurement data transfer to the PCE-2550 software</td></tr>
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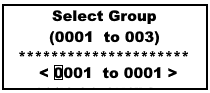
Deletion of certain measurements</td><td> 
</td><td>Change number
Change position
Confirm</td></tr>
<tr><td>Delete All

Delete all measurements</td><td> 
</td><td></td></tr>
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<tr><td rowspan="4"></td><td>Auto Save:</td><td>Off / On</td><td>Automatic data storage</td></tr>
<tr><td>Auto Delete:</td><td>Off / On</td><td>Automatic deletion</td></tr>
<tr><td>Car Trans..:</td><td>Off / On</td><td>No function</td></tr>
<tr><td>Auto Off:</td><td>Off / On</td><td>Automatic power off</td></tr>
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<tr><td></td><td colspan="3">SoftWare Version Ver1.02
Code: PCE-190812SN
A11011909019</td></tr>
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6 Maintenance and cleaning

6.1 Batteries (no rechargeable batteries)

When the  icon flashes, the batteries must be replaced. To do this, unscrew the cover at the back and remove the old batteries. Replace them with 2 new CR2016 button cells.

6.2 Troubleshooting

Problem	Cause	Solution
Meter does not switch on	Batteries flat	Replace the batteries.
No measured value is displayed	No measurement	Check the release and course of the impact body. If it hits the test spot without any problems, contact our service department.
The measured value is inaccurate	Calibration expired	Calibrate the meter.

6.3 Maintenance of the impact body

No special maintenance is required, apart from occasional (after approx. 1000 ... 2000 measurements) cleaning of the impact body and the guide tube. To do this, unscrew the support ring and remove the impact body. The impact body must be cleaned of dirt and metal dust. Clean the guide tube with the brush provided. Do not put oil or grease on the impact body. The impact body must be loosened after each use.
The impact body is excluded from the warranty!

7 Warranty

You can read our warranty terms in our General Business Terms which you can find here: https://www.pce-instruments.com/english/terms.

8 Disposal

For the disposal of batteries in the EU, the 2006/66/EC directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose.

In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law.

For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations.

If you have any questions, please contact PCE Instruments.

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