



User Manual

PCE-950 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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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 General description

- Customised curve for a specific testing material
- OLED display of 128x32 matrix
- Converts to all common hardness scales (HV ,HB,HRC,HRB,HRA,HS)
- Easy to use menu system
- With miniUSB interface, multiple communication modes are adopted to meet customized requirements of various users
- Max. 600 groups of data can be stored in memory
- Upper and lower limit of hardness can be preset; with alarm
- Test values software calibration function
- Working voltage:3.7 V rechargeable Li-Ion battery
- Continuous working period: approx. 50 h
- Can be used with impact device Type C, DC, G, D+15, DL, E
- Smart and skid-proof design
- Charging indicator

3 Main applications

- Direct measurement of heavy workpieces and permanently installed parts
- Measurements during production process, especially in mass production
- Material identification of metal materials
- Failure analysis of pressure vessels
- Bearings and other parts
- Testing of parts in confined or hard-to-access areas

4 Technical specifications

Hardness measuring range by material	
Cast steel	HRC: 19.8 ... 68.5 HRB: 59.6 ... 99.6 HRA: 59.1 ... 85.8 HB: 80 ... 651 HV: 83 ... 976 HS: 32.2 ... 115
Hammered steel	HB: 143 ... 650
Cold-rolled steel	HRC: 20.4 ... 67.1 HV: 80 ... 898
Stainless steel	HRB: 45.5 ... 101.7 HB: 85 ... 655 HV: 85 ... 802
Cast iron	HB: 93 ... 334
Ductile iron	HB: 131 ... 387
Aluminum alloy	HRB: 23.8 ... 84.6 HB: 19 ... 164
Brass	HRB: 13.5 ... 95.3 HB: 40 ... 173
Bronze	HB: 60 ... 290
Forged copper alloy	HB: 45 ... 315
General specifications	
Accuracy	± 6 HL at 730 ... 790 HL ± 10 HL at 490 ... 570 HL
Repeatability	6 HL at 730 ... 790 HL 10 HL at 490 ... 570 HL
Total measuring range	170 ... 960 HL
Hardness scales	HL (HLD): Leeb (Type D impact device) HB: Brinell HRC: Rockwell C HRB: Rockwell B HRA: Rockwell A HV: Vickers HS: Shore
Impact device	Type D
Measuring direction	360°
Display	128 x 32 OLED
Data storage	Internal memory saves up to 600 readings
Power supply	Built-in rechargeable Li-ion battery
Battery life	Approx. 50 hours
Data interface	Mini USB
Dimensions	Approx. 153 x 54 x 24 mm / 6.02 x 2.13 x 0.95 in
Weight	Approx. 250 g / < 1 lb

5 Delivery contents

1 x durometer PCE-950, 1 x brush, 1 x miniature adapter, 1 x USB cable, 1 x power supply, 1 x test block, 1 x user manual, 1 x carrying case

6 Optional adaptors

No.	Order code	Image	Description
1	HK16.5-30		Adaptor to measure spherical surfaces as for example in mould making. Enables centering and prevents slipping and resulting measurement errors. Radius: 16,5 ... 30 mm
2	HK11-13		Adaptor to measure spherical surfaces as for example in mould making. Enables centering and prevents slipping and resulting measurement errors. Radius: 11 ... 13 mm
3	Z25-50		Adaptor to measure outer radii, e. g. on round steel and pipes. Enables centering and prevents slipping and resulting measurement errors. Radius: 25 ... 50 mm
4	Z10-15		Adaptor to measure outer radii, e. g. on round steel and pipes. Enables centering and prevents slipping and resulting measurement errors. Radius: 10 ... 15 mm

5	HZ12.5-17		Adaptor to measure inner radii, e. g. in pipes and tanks. Enables centering and prevents slipping and resulting measurement errors. Radius: 12.5 ... 17 mm
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7 Optional external impact devices

The external impact devices just have to be connected to the device. The device will recognize them automatically (for connection, see device description).

No.	Order code	Type
1	SG-D	D, 1800 HV
2	SG-G	G, 1800 HV
3	SG-DL	DL, 1800 HV
4	SG-C	C, 1800 HV
5	SG-D+15	D + 15, 1800 HV
6	SG-DC	DC, 1800 HV

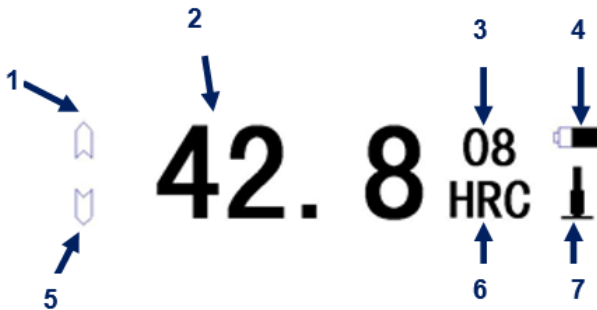
8 Device description

8.1 Device



- | | | | |
|---|----------------|---|--|
| 1 | On/Off key | 2 | MiniUSB connection |
| 3 | Release button | 4 | Loading sheath |
| 5 | Charging LED | 6 | Connection external impact device |
| 7 | OLED display | 8 | Operating keys:
Arrow keys – move cursor
MENU/OK – Main menu/confirm |

8.2 Main screen



- | | | | |
|---|---------------------|---|--------------------------|
| 1 | Alarm upper limit | 2 | Reading |
| 3 | No. of measurements | 4 | Battery level indication |
| 5 | Alarm lower limit | 6 | Hardness scale |
| 7 | Impact direction | | |

Upper / lower limit alarm

When measured value is over/below the limit, the icon will be full.

Measured value

Current measured value (without "AVE") or current average value (with "AVE") will be displayed. The average value can only be displayed if the desired no. of impacts has been set in advance. If ↑ is displayed, this means that the measured value exceeds the measurement range / the convertible range. If ↓ is displayed, this means that the measured value is below the measurement range / the convertible range.

No. of measurements

The number of measurements is displayed here. The no. of measurements after which the average value is shown can be set previously in the menu.

Battery level indication

The battery icon shows the current battery level.

Hardness scale

The hardness scale currently used is shown here.

Impact direction

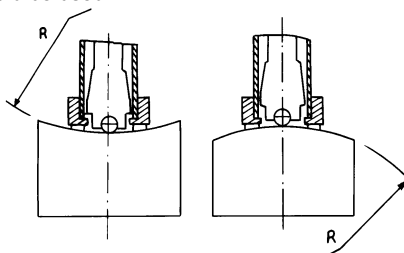
The current impact direction is displayed here.

No.	Type of impact device	hardness value of standard Leeb hardness block	Error of displayed value	Repeatability of displayed value
1	D	760±30HLD 530±40HLD	±6 HLD ±10 HLD	6 HLD 10 HLD

9 Operation

9.1 Preparation prior to testing

- If the surface to be tested is too rough, measuring errors can occur. The surface of the sample must be smooth, flat, and free from oil or grease.
- Curved surfaces: Make sure that the testing surface of workpiece is plane. When the radius of curvature R of the curved surface to be tested is less than 30 mm, a small support ring or should be used.





- When the sample is magnetic, this can falsify the result.
- When the sample weighs over 5 kg, a support is needed.
- Samples made of profile material or with thin wall thicknesses and parts weighing between 2 and 5 kg need a support of more than 5 kg which must be tightly and evenly coupled with the sample to avoid deformations caused by the impact of the impact device or by vibrations.
- Samples with a weight below 2 kg also have to be coupled tightly and evenly to a support of more than 5 kg. The surface between the sample and the support should be even and smooth. Apply an adequate but not an excessive amount of coupling agent to these surfaces.
- The minimum weight of a sample should always be 100 g.
- The minimum thickness of the sample is 3 mm.
- The hardness penetration depth of hardened parts must be at least 0.8 mm.
- To avoid errors caused by rough surfaces, the surface should be polished and have a roughness Ra <2 µm or Rz <10 µm

9.2 Testing the accuracy

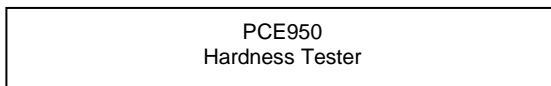
A standard Leeb hardness block should be used to verify the accuracy of the portable hardness tester and the measurement error and repeatability should not exceed the values in the following chart.

No.	Type of impact device	Hardness value of standard Leeb hardness test block	Accuracy	Repeatability
1	D	760±30HLD 530±40HLD	±6 HLD ±10 HLD	6 HLD 10 HLD

Note: It is recommended that you take a minimum of 5 tests and obtain your average. That value should be within the tolerance shown in the chart above. If the value exceeds this tolerance, you must send the device to PCE Instruments for calibration.

9.3 Measurement

Press the On/Off key to turn on the device. The following will be shown on the screen:



The device will automatically enter measurement mode.

Push down the loading sheath to lock the impact body. Now place the device with the support ring on the surface of test sample. The direction of impact should be vertical with the testing surface. Make sure that the meter is placed firmly on the test surface and push down the release button on the top of the device to make a measurement. Five measurements should be carried out per measuring point of the test sample. The deviation of the mean value should not exceed the values in the chart.

The distance between any two indentations, or the distance between any indentation center and the edge of the test sample should be in accordance with the specifications in the following chart:

Type of impact device	The distance of two indentation centers	The distance between indentation center and edge of test piece
	No less than	No less than
D	3	5

9.4 How the results are displayed

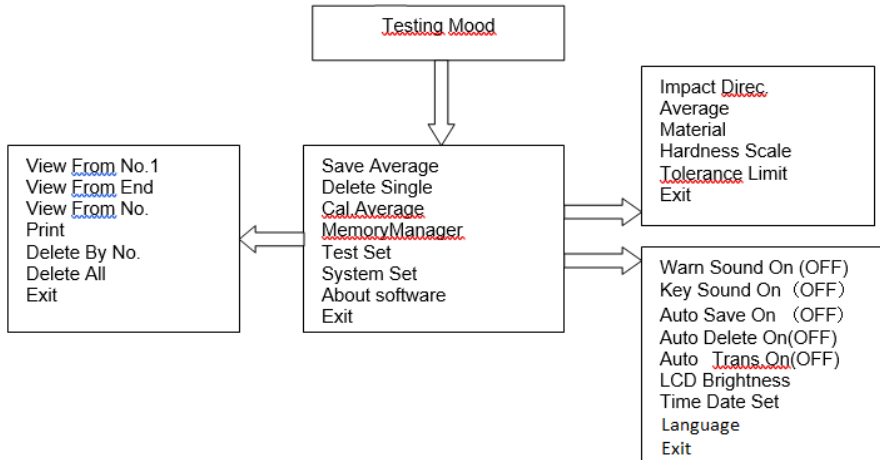
- The hardness value will be displayed ahead of the unit HL (Leeb hardness), followed by the type of impact device. For example, 700 HLD expresses that the Leeb hardness is 700 and was measured by means a D-type impact device.
- For values converted into other hardness units, the corresponding hardness scale should be added ahead of Leeb hardness abbreviation. For example, 400HVHLD expresses that the Vickers hardness value is 400, which was converted from the Leeb hardness value, measured by a D-type impact device.

9.5 Information on hardness scales

- Not all materials can be converted into every hardness scale. The hardness scale will return to Leeb hardness (HL) automatically after the material has been changed. Therefore, the material must be selected first when setting the measurement parameters, and the hardness scale should be set next.

10 Menu structure

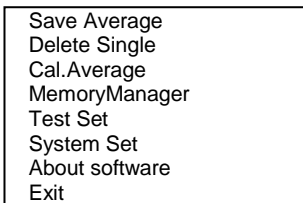
When you are in measurement mode, press the MENU/OK key to enter the main menu. Here you can set all parameters.



11 Settings

Function overview

Press the MENU/OK key to enter the main menu.



You can move the cursor by using the arrow keys. With the MENU/OK key, you can select a function.

Function	Description
Save Average	Saves the measured average.
Delete Single	Deletes individual data measured to calculate the average.
Cal. Average	Calculates the average of individual measurement results.
MemoryManager	
View From No.1	All measured values (averages)
View From End	All measured values from new to old
View From No.	Here you can set what measurements you want to view.
Print	Function not yet available
Delete By No.	Here you can delete certain measurements
Delete All	All measured data are deleted from the memory
Exit	

11.1 Save Average

This function is used to save the current average value. This function is only available if you have made as many measurements as previously set under Test Set – Average or via the “Cal.Average” function that stops the measurement immediately.

11.2 Delete Single

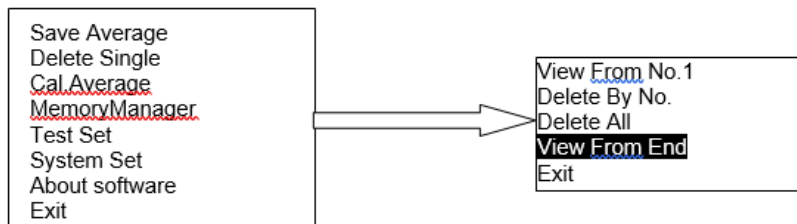
If you wish to delete the displayed measured value or average value, go to “Delete Single”, use the arrow keys to select “Yes” or “No”. The latter applies if you decide not to delete the value.

11.3 Cal. Average

This function is to calculate the average value and to terminate the test.

11.4 Memory Manager

Use the MENU/OK key to go to the main menu.



Navigation

View From No.1: 0001

No.001	01/17	789HL
No.002	01/17	517HL
No.003	01/17	788HL
No.004	01/17	522HL

Navigate through the data by using the arrow keys. To return to the last page, press the MENU/OK key.

Deletion

File No. 1: 0001

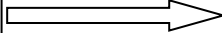
Confirm delete
Yes No

Use the arrow keys to select the file to be deleted and confirm with the MENU/OK key.

Select „Yes“ by using the arrow keys and confirm with MENU/OK.

11.5 Test Set

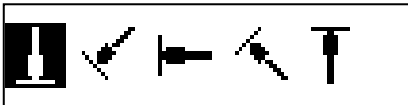
Save Average
Delete Single
Cal.Average
MemoryManager
Test Set
System Set
About software
Exit



Impact Direc.
Average
Material
Hardness Scale
Tolerance Limit
Exit

Press the MENU/OK key to enter the main menu. Press the arrow keys to move the cursor and press MENU/OK to select "Test Set". Move the cursor to the parameter you wish to set and press MENU/OK.

Impact Direction



Press the arrow keys to select the impact direction and confirm with MENU/OK.

Average

MeanTimes:	10
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Here you can set the no. of impacts / measurements to calculate the average. You can select a no. between 1 and 10. The number can be changed using the arrow keys, At the end, confirm with the MENU/OK key.

Material

Cast steel
CWT.Steel
STAIN. Steel
GC.Iron
NC.Iron
Cast Alumin
Copper-Zinc
Copper-alumin
Wrought Copper

Press the arrow keys to select a material and confirm with MENU/OK.

Note: When a new material is measured, the value will automatically be displayed in HL: Therefore, it is important to first select the material and then the hardness scale.

Hardness Scale

HL	HV HB HRC
HS HRB HRA	

Press the arrow keys to select a hardness scale. Press MENU/OK to confirm.

Note: Only provide hardness scales that are available for the selected material. When a new material is measured, the value will automatically be displayed in HL: Therefore, it is important to first select the material and then the hardness scale.

Tolerance Limit

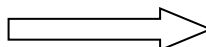
Min	Max
0170	0960

Change the lower and upper limit with the arrow keys and use the MENU/OK key to get to the next digit. When the last digit has been set, you will enter measurement mode.

Note: When the value set exceeds the measurement range, you will be asked to set it again. When the Min value exceeds the Max value, Min and Max will be swapped.

11.6 System Setting

Save Average
Delete Single
Cal.Average
MemoryManager
Test Set
System Set
About software
Exit



Key Sound On (OFF)
Auto Save On (OFF)
Auto Delete On(OFF)
Auto Trans.On(OFF)
LCD Brightness
Time Date Set
Exit



Warn Sound

Here you can enable or disable the alarm tones. Use the MENU/OK key to enable or disable the function.

Key Sound

Here you can enable or disable key sounds. Use the MENU/OK key to enable or disable the function.

Auto Save

This function allows automatic saving of the averages. Use the MENU/OK key to enable or disable the function.

Auto Delete

If you enable this function, the system will automatically delete those test results that are out of range. The deleted values need to be replaced by making the same number of measurements as values deleted. Use the MENU/OK key to enable or disable the function.

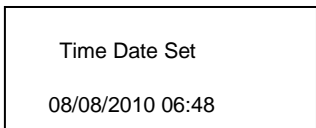
Auto Transfer

After the average is calculated, the data can be transferred in text format to a computer automatically via the USB cable. Use the MENU/OK key to enable or disable the function.

LCD Brightness

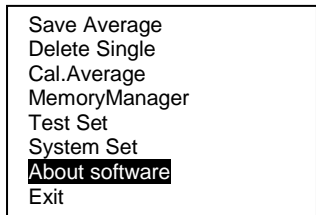
Use the arrow keys to set the brightness of the display. Confirm with MENU/OK:

Time Date Set



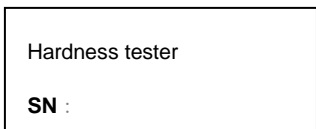
Press the arrow keys to select the menu item Time Date Set. Press MENU/OK to confirm. Press MENU/OK to move the cursor to the next digit and change it by using the arrow keys. At the end, press MENU/OK to confirm.

11.7 About software



Press MENU/OK to enter the main menu. Use the arrow keys to select the menu item "About Software" and confirm with MENU/OK.

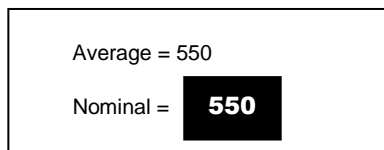
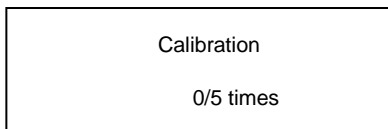
In this menu item, you will find some information about the device, including the serial number and the software version. To navigate, use the arrow keys. By pressing the MENU/OK key, you return to the measurement mode.



11.8 Exit

Via this menu item, you can leave the menu.

12 Calibration




The device needs to be calibrated before first use or after a long period of non-use.

Press and hold the On/Off key and the arrow keys at the same time to enter the calibration screen. Set the impact direction 【↓】 and make 5 measurements of the test block that comes with the meter.

The meter will then display the average value. Use the arrow keys to enter the standard value which you can find on the test block. Press MENU/OK to finish the calibration. The accuracy is $\pm 6\text{HL}$.

13 Battery recharging

 This icon (flashing) indicates low battery. Recharge the battery to avoid the device switching off automatically.

14 Automatic Shut Off

The auto shut off function is designed to save battery power.

- The battery will automatically shut off after 5 minutes of inactivity.
- The screen will flash for 20 seconds before automatic shut off. Press any button other than the On/Off key to terminate the shutting off.
- When the battery is too low, the system will be shut off automatically and the battery icon will flash.

15 Connection to the computer

- Switch on the device.
- Install the driver and the software on your computer. Both can be found on the USB pen drive.
- Connect the device to the computer, using the USB cable.
- Open the software and click "CONN" in the lower part of the software screen so that the software recognises the device.
- Now you can load your measurements and view them as graphics by clicking "READ" or "LOAD."

16 Conversion chart

Material	HL	HRC	HRB	HB		HS	HV
				30D ²	10D ²		
Cast steel	300 ~ 900	20.0 ~ 68.0	38.4 ~ 99.5	80 ~ 647		32.5 ~ 99.5	80 ~ 940
CWT steel	300 ~	20.4 ~					80 ~ 898
Stainless steel	300 ~	19.6 ~	46.5 ~	85 ~ 655			80 ~ 802
Grey cast iron	360 ~			93 ~ 334			
Nodular cast	400 ~			131 ~			
Cast aluminium	174 ~				20 ~		
Copper zinc	200 ~		13.5 ~ 95.3		40 ~		
Copper alum.	300 ~				60 ~		
Wrought	200 ~				45 ~		

17 Maintenance

17.1 Troubleshooting

Failure	Cause	Solution
Failure in starting	Battery empty	Recharge battery
No measuring value	Probe wire open circuit	Replace probe wire
Value is inaccurate	Calibration data loss	Repeat calibration

17.2 Other maintenance

- For every 1000-2000 impact, use nylon brush to clean the pipe/tube and the impact body of the impact device. Take the supporting ring and the impact body off, insert and twist nylon brush counterclockwise to the bottom and pull back. Repeat for 5 times and re-install the supporting ring and the impact body.
- Keep the impact body released after use.
- Using of any kind of lubricant is strictly prohibited in the impact device.
- When calibrating error is more than 2 HRC, it might be necessary to replace the test tip or the impact body. Contact PCE Instruments.
- The impact body, the supporting ring and the loading sheath are excluded from the warranty.

18 Warranty

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

19 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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