**+INSIZE+**

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**ISH-PHB
PORTABLE HARDNESS TESTER
OPERATION MANUAL**

+INSIZE+

Attention

◆ Don't impact without measurement and calibration, otherwise the impact device may be damaged.

◆ Please reading the operation manual careful before using, make sure the weight, thickness, surface roughness of the workpiece are meeting the requirement.

◆ Please do calibration when use the device first time or interval for a long time.

◆ Clean up the rusty, oil on the surface before measure.

◆ The distance between any two impact position should be ≥3mm. the distance between impact position and the edge of the sample should be ≥3mm.

◆ Make the support ring stick to the surface of the workpiece and keep the impact direction perpendicular to the surface.

◆ Keep operator, workpiece and impact device steady during measurement.
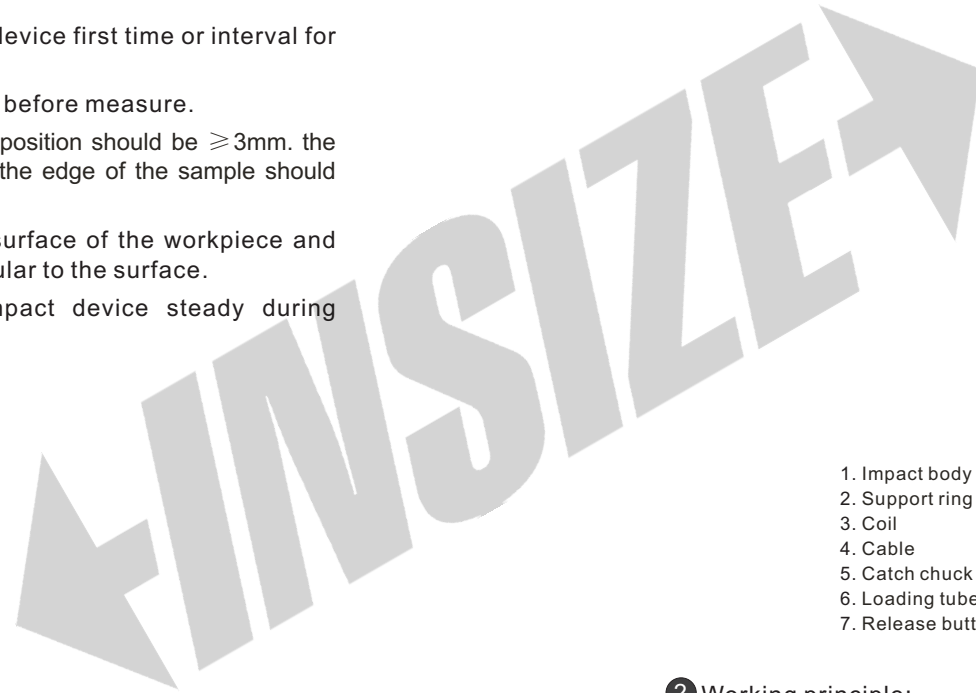
Description

1 Structure:

LCD Display

Button

Main unit

1. Impact body
2. Support ring
3. Coil
4. Cable
5. Catch chuck
6. Loading tube
7. Release button

Impact device

2 Working principle:

Push down the loading tube before measurement, the catch chuck catch up the impact body. Make the support ring stick to the surface of the workpiece and keep the impact direction perpendicular to the surface. Then press the release button, the impact body will impact the surface. The coil collect the velocity signal and the cable transmit the dada to the main unit.

3 Specification:

- ◆ Display range: 0~999HLD
- ◆ Accuracy: ±6HLD(when HLD=800)
- ◆ repeatability: ±6HLD
- ◆ Impact direction: 0°, ±90°, 180°, ±45°, ±135°
- ◆ Conversion scales: HV, HB, HRB, HRC, HV, HSD, MPa

4 Button function:

- ◆ 1. On/Off button ⏻ : Turn it on/off by pressing and holding the button.
- ◆ 2. Up arrow button ▲ :
  ① In measurement mode, press this button to select conversion scale.
  ② In measurement mode, press ↵ button to delete current result and press this button to confirm.
- ◆ 3. Setup button �:
  ① In measurement mode, press this button to select the items need to be set like statistic times, material code, date, time, etc.
  ② Turn off the machine, press this button and On/Off button
- ◆ together to enter conversion value calibration.
  4. Return button ↵ :
  ① Back to measurement mode.
  ② Turn off the machine, press this button and On/Off button
- ◆ together to enter Leeb value calibration.
  5. Down arrow button ▼: In measurement mode, press this button to enter data browsing mode.

5 LCD display:

Date and time

HLD value

HLD averaged value

Impact and statistic times

Material code

Conversion value

Impact direction
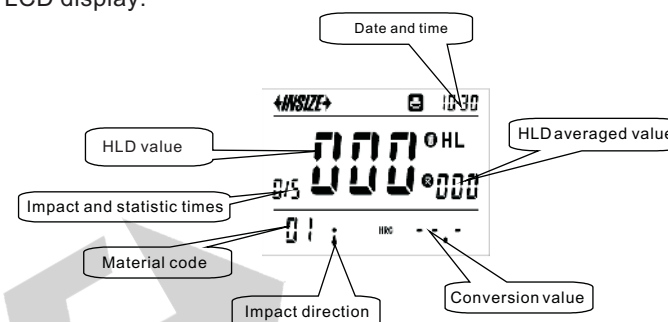
Leeb Value Calibration

Please do calibration when use the device first time or interval for a long time.

Note: Please do calibration with standard test block in packing box.

1 Press setup button then set measuring conditions by using up and down buttons, select material code to number 01, the impact direction is down. Turn off the machine after do setup.

2 press ruturn button and On/Off button together (about 2 seconds) to enter Leeb value calibration, the INSIZE logo will blink on top left corner. Measure 5 times on the surface of standard test block(you should do enter calibration mode again if get any value which deviation is large).

3 Input the actual HLD value of the test block by use up and down buttons, then press return button back to measurement mode.

Note: The distance between any two impact position should be ≥3mm. the distance between impact position and the edge of the sample should be ≥3mm.

Conversion Value Calibration

This calibration is applied to some workpiece you don't know the Leeb hardness but only conversion hardness value like HB, HV, etc.

Note: Please do calibration with known hardness workpiece.

1 Press up arrow button to select the conversion scale, then Press setup button then set measuring conditions by using up and down

buttons, select right material code, the impact direction is down. Turn off the machine after do setup.

❷ press setup button and On/Off button together (about 2 seconds) to enter conversion value calibration, the INSIZE logo will blink on top left corner. Measure 5 times on the surface of workpiece (you should do enter calibration mode again if get any value which deviation is large).

❸ Input the actual value of workpiece by use up and down buttons then press return button back to measurement mode.

Note: The distance between any two impact position should be ≥3mm. the distance between impact position and the edge of the sample should be ≥3mm.

Measurement

❶ Preparation before measuring:

◆ Turn on the machine.

◆ Press setup button and set statistic times, select the material code according to the back label, then press return button back to measurement mode.

Hardness	Tensile strength (MPa)
01.Steel and Cast Steel	11. Low Carbon Steel
02. Alloy Tool Steel	12. Hi Carbon Steel
03. Stainless Steel	13. Chrome Steel
04. Grey Cast Iron	14. Cr-V Steel
05. Ductile Iron	15. Cr-Ni Steel
06. Cast Al Alloys	16. Cr-Mo Steel
07. Cu-Zn Alloys	17. Cr-Ni-Mo Steel
08. Cu-Sn Alloys	18. Cr-Mn-Si Steel
09. Copper	19. Hi Strength Steel
10. Forging Steel	20. Stainless Steel

Note: The value can only convert to "Mpa" When select the material code 11~20.

◆ Press up arrow button to select right conversion scale.

Note:
1. The conversion value is "---" indicated the conversion is out of range.
2. Conversion value only supplies the general reference, which may result in some offset. Precisely conversion generally needs related comparative tests.

◆ Sample Preparation:

Inappropriate sample will cause a great measurement error. Therefore, users should make the necessary handling and preparation under the original conditions of sample.

Preparation of the sample and the surface of test should be coincident with the following basic requirements:

1) During the process of sample surface preparation, users should avoid the impacts of cold processing and thermal processing.

2) The sample surface is plane for better, the test surface should be with a metallic sheen, and not involve oxide layer orother stains.

3) Roughness of the test surface Ra ≤ 1.6

4) Sample must be of sufficient quality and rigidity. If it's lack of quality and rigidity, it may cause displacement or shaking in the process of testing impact, which can lead to large errors. Generally speaking, if the sample quality is more than 5kg can be directly tested; if the sample quality is 2~5kgs, the sample should be taken in fixation test by means of appropriate clamping; if the sample quality is 0.1~2kgs, the sample should be conducted coupling before the test; if the sample quality is less than 0.1kg, this hardness tester is inappropriate to use.

Coupling method: Testing sample's back should be prepared to make a plane as a supporting surface with a smooth formation. Filling with a little coupling substance (Industry Vaseline can be used), users can now press to the surface of the supporting object (The weight of supporting object should be more than 5 kg, and it can be replaced by test block) to stick into integration.

5) Samples should be thick enough and with sufficient surface absorption layered. If users use D-type impact device, the thickness of sample should not be less than 5mm, and surface absorption layer (or surface-hardening layer) should not be less than 0.8mm. To accurately measure the hardness of the material, the best way is to remove the surface-hardening material, the best way is to remove the surface-hardening layer by processing.

6) When testing sample surface is not horizontal, the curvature radius of testing and nearby surface should be

larger than 30mm. And appropriate supporting ring should be elected and installed.

7) A sample should not be with magnetic. The signal of the impact device would be seriously interfered in the work by the magnetic, which may cause inaccurate test results.

2 Measuring Steps:

◆ Loading: Simply load the impact device by sliding the loading tube forward.
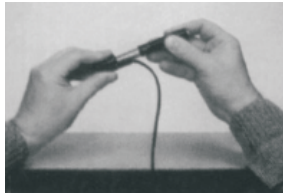
◆ Place: Then place and hold the impact device on the surface of the test piece at the desired test point. Impact indirection should be vertical with the test of surface.
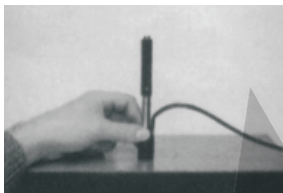
◆ Burst impact (Measure): Trigger the impact by pressing the release button. The hardness value will be instantaneously displayed.
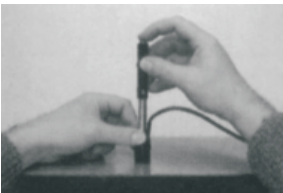
◆ Read off the test result from screen.

Note: Generally, each measurement location of sample is conducted for the five tests. The "S" (difference of maximum value and minimum value) values must be less than 15HL. The distance between any two impact position should be ≥3 mm ; the distance between impact position and the edge of the sample should be ≥3 mm.

3 Memory:

The data group (such as test result, conversion result, sample material and impact direction) automatically save in memory after one individual measurement. ISH-PHB hardness tester can store 99 sets of data, when measuring times more than 99, the last group of data will store the 99th position and the first group of data will be erased. The second group of data will be moved into the 2th position, simultaneously the position of other group of data, will be moved into lower position.

Press down arrow button to enter memory store mode, use up and down buttons to browsing the memory.

4 Print (the printer is optional):

After one set measurement press setup button and let the print symbol blink, now press return button to print current result.

Maintenance

1 Impact Device Maintenance:

After using 1000-2000 times, users should clean the catheter of impact device and impact body with nylon brush, and screw off the supporting ring before clean the catheter, and then take out the impact body, rotate the nylon brush into the tube in an anti-clockwise direction, and pull out when touching the bottom. So repeatedly, and then load up the impact body and supporting ring; Users should release the impact body after use. And the lubricant is banned.

2 Normal Maintenance Procedures:

In calibration of the hardness tester, if finding that error is larger than 6HLD, users must be renew the steel ball or impact body, because the reason may be that the steel ball or impact body is wore out to lead to failure in operation.

Factors Affection Accuracy

Incorrect operation or improper testing conditions would have serious impact on testing accuracy. Following is several common factors effect the accuracy of testing for the use of reference:

1) Roughness of sample surface

When the impact body impact on the sample, a small pit would arise on the sample surface, so at the same time, should finish the surface of the sample. The more roughness, the less consumption of impact energy whereas the less roughness, the more consumption of impact energy. Accordingly, the roughness of sample testing points on the surface Ra≤ 1.6.

2) The shape of sample surface

Leeb testing principle demands the velocity of rebound and impact are on the same line, because the impact body is moving in a metal tube. Even if the velocity of rebound and impact are not on the same line, it also can show hardness for sure, but the impact body would collide with tube wall when it rebounds, which will affect the velocity of rebound. Therefore, a greater error is on test accuracy. When the radius of curvature of the testing sample surface is smaller, the solution is the use of suitable variant supporting circle. If users require special supporting circle, we can contribute to design and process.

3) The weight of the sample

If the sample weight must be larger than or equal to 5kg, and not easily sway. If the sample weight were less, the sample would need proper treatment (It is necessary to increase the supporting or mounting through coupling compress on larger weight testing stand), and the testing results can be achieved in accuracy. There should be a certain area at the testing points (the area required to meet a set of testing points) and no vibration or shaking. If the weight is not enough, users must be as much as possible reduce the jitter and sloshing by the methods of increasing supporting, coupling and compressing. And supporting device should avoid shock.

4) The sample stability

Any effective tests need to minimize possible interference from outside; it's more important to dynamic measure such as Leeb hardness test. Therefore, measuring only allowed in stable hardness testing system. If it's likely to lead to sample movement in the tests, users should fix it before testing.

Measuring And Conversion Range

Materials	HLD	HV	HB	HRC	HRB	HS	Tensile strength(Mpa)
Steel & cast steel	300-900	81-955	81-654	20-68	38 -100	32 -100	375 -2639
Tool steel	300-840	80-898		20-67			
Stainless steel	300-800	85-802	85-655		47-101		
Cast iron	360-650		93-334				
Cast aluminum alloy	170-570		19-164		23-84		
Brass	200-550		40-173		13-95		
Bronze	300-700		60-290				
Copper	200-960		45-315				

Standard Delivery

Main unit	1pc
Impact device D	1pc
Hardness test block	1pc
Small support ring	1pc
Cleaning brush	1pc

Optional Accessory

Support rings	refer to our catalogue
Wireless printer	ISH-DS-PRINTER