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ISH-SPHD
PORTABLE HARDNESS TESTER
OPERATION MANUAL

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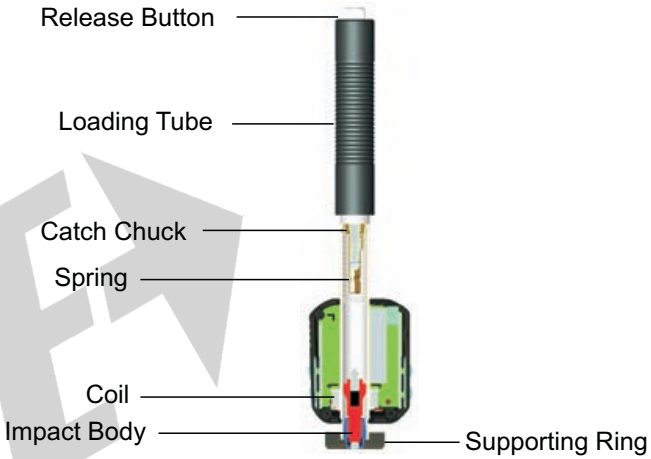
Technical Specifications

- Accuracy: ±6HLD(when HLD=800)
- Measuring direction: any direction (detect automatically)
- LCD display: 128 x 64 dot LCD with backlight
- Data memory: 500 groups
- Hardness scale: based on HLD, can be converted into: HB, HRB, HRC, HV, HS
- Impact energy: 11N;
- Mass of the impact body: 5.5g
- Impact tip: Material: tungsten carbide
  Diameter: 3mm
  Hardness: ⩾1600HV
- Application workpiece:
  minimum weight: 5kg
  2kg(on solid support)
  0.1kg(couple on plate)
  minimum thickness: 5mm
  minimum radius of curved surface: 11mm
  maximum roughness(Ra): 1.6μm
- Power supply: Li-ion rechargeable battery
- Charger port: AC/DC adapter or USB port
- Maximum continuous working time: approx. 16 hours
- Operating environment: temperature: -10~+60°C
  humidity: 20%~85%
- Storage environment: -30~+80°C
  humidity: 5%~95%
- Dimensions: 147 x 35 x 22 mm
- Weight: 65 g

Part Description



Operating Instructions

1 Keys and Function:

1) " ▷ " : Select material, scale etc ;

2) " □ " : Menu;

3) " " : Print;

4) " " : ON/OFF & Back;

5) " □ "+" ": Hardness Calibration; press" □ " and " " together to enter the calibration mode when turning on the power;

6) " "+" □": Delete; press and hold" ", then press " □ " to delete the current data;

7) " ▷ "+" ": Set the date and time; press " ▷ "and " " together together to set the date and time when turning on the power;

8) " "+" ▷": Data Browse; press and hold " ", then press " ▷ " to browse data.

2 LCD Screen:

3 Setting:

◆ Material:

In measurement mode, press " □ " three times, the material will highlight, then press " ▷ " to select the material; the material can be changed according to following sequence:
Steel & Cast steel → Alloy Tool Steel → Stainless Steel → Grey Cast Iron →Ductile Iron →Cast Al Alloys →brass→bronze → Copper → Forging Steel → Steel & Cast steel →….

Note:

1) It is necessary to select the material classification.
When you did not know the material type, you must refer the related handbook.

2) When you change the material group, the impact times will be set to "0".

◆ Hardness Scale:

In measurement mode, press "□" twice, the hardness scale will highlight, then press "▷" to select the hardness scale; the hardness scale can be changed according to following sequence:
HLD→HB→HRB→HRC→HV→HSD→HLD….

HLD Leeb
HB Brinell
HRB Rockwell B
HRC Rockwell C
HV Vickers
HS Shore

Note:

1) The value "---" means out of range.

2) The default hardness scale is HLD.

◆ Total Measuring Times:

In measurement mode, press "□" four times, total measuring times will highlight, then press " ▷ " to set the number, the maximum number is 9.

◆ Browse Data:

1) Browse the data in current group: in measurement mode, press "□" once, the impact time character will highlight, then press "▷", you can browse the data in current group.

2) Browse the data in memory: in measurement mode, press and hold " ", then press "▷" to display the historical data browse mode, press "▷" to select the next group, press "□" to select the previous group; press " " you can choose browse, delete the data that you selected or delete all data. Press " " will return to previous menu.

◆ Setting the Date and Time:

ISH-SPHD has built-in real-time clock, it can set the clock and the calendar when it is necessary. Please as follows:

1) press"▷" and "⏻" together to enter the date and time setting mode when turn on the power.

2) Press " ▷" and " □ " to set the "day" then press "🖨" to set the month...use the same way to set the year, hour, minute and second. In the "second" set-up process, press " ⏻ " to finish the setting and back to measurement mode.

◆ Calibration:

Calibration is used to calibrate the measured value (HLD) of the hardness tester, please as follows:

1) Press "□" and "⏻" together to enter the calibration mode when turning on the power then test five times on the test block and get the average of measurements value.

2) Press "▷" to browse result, you can press "🖨" to delete the error result.

3) Press "□" to display the mode, the "hundred" bit will be highlighted, input the HLD value that marked on test block.

4) Press "□" to increase from 0 to 9, to set the "hundred" bit.

5) Press the "▷", the "ten" bit will be highlighted, Press " □ " to increase from 0 to 9, to set the "ten" bit.

6) Press the "▷", the "last" bit will be highlighted, Press " □ " to increase from 0 to 9, to set the "last" bit.

7) Press "⏻" to return to the measurement mode, the calibration is finished.

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.

4 The Format of Memory Data:

The data (such as hardness value, scale, sample material and impact direction, time, date etc.) will be saved in memory automatically after each test. ISH-SPHD can store 500 data, when test times are more than 500, the last data will be stored in the first position and the first data will be removed.

5 Backlight:

Backlight is used for dark conditions. If there is none test or operation in 3 seconds, the backlight will be turn off automatically, when testing or pressing any key, the backlight will be turn on.

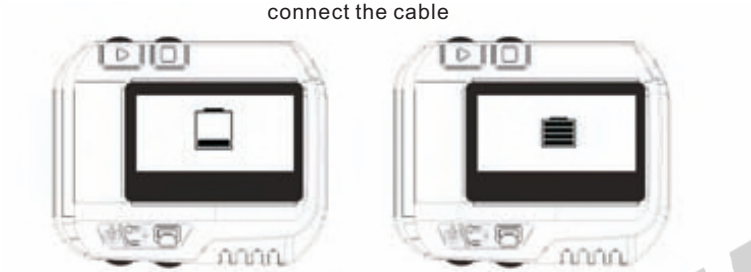
6 Automatic Shutdown:

If there is not measurement, and none operation in 3 minutes, the gauge will switch off automatically in order to saving battery power. The gauge will store all the parameters automatically before turning off.

7 Charging:

User needs to charge when battery capacity is lower. Firstly, user should connect the ISH-SPHD and the charger with the USB cable, and then connect the charger with AC/DC adapter to start charging. Meanwhile, the screen will display charging indicator. User can also charge it with USB port of computer.

connect the cable



charging fully charged

Hardness Test

1. Setting:

   Press "⏻" to turn on, and check if it needs to charge. Check if every setting is correct, especially the material and scale.

2. Preparation:

   Inappropriate sample will cause a great measurement error. Therefore, user should make the necessary handling for preparation under the original conditions of sample. Preparation of the sample and the surface of test should be coincident with the following requirements:

   - During the process of sample surface preparation, user should avoid the impacts of cold and thermal processing.
   - It is better the sample surface is flat, the test surface should be with a metallic sheen, do not include oxide layer or other stains.

- Roughness of the test surface Ra≤ 1.6μm.
- 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) 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.
  4) Samples should be thick enough and with sufficient surface absorption layered. 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.

5) 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.

6) 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.

3 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 LCD.

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.

4 Memory and print:

The data group (such as test result, conversion result, sample material and impact direction) automatically save in memory after one individual measurement. ISH-SPHD hardness tester can store 500 sets of data.

Press " " button toprint out the memory data (when connected to printer) in test.

5 Backlight and auto-power off:

Highlight LED backlight is used for poor light conditions. Users can turn on or turn off the backlight by pressing the button (it will automatically save this model while shutdown). If there is no measure, and no key operation in 10 seconds, the backlight will be turning off automatically, and the display unit will be shut off in 3 minutes.

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$\leqslant$ 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
Printer	1pc
Hardness test block	1pc
Small support ring	1pc
Cleaning brush	1pc
AC/DC adapter	1pc
USB cable and sofware	1pc

Optional Accessory

Support rings	refer to our catalogue