

LHT-200

Portable Hardness Tester

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# User's Manual



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STAR☆RR☆ INSTRUMENTS

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## **CAUTION**

### **Please Carefully Read This First**

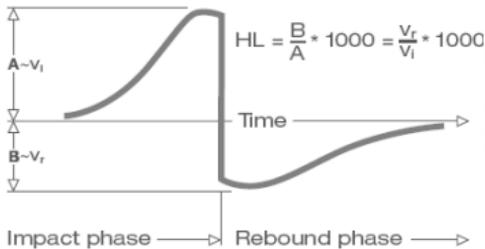
- 1. Users can only use the special battery and power adapter offered by our company in display unit, or may cause damage to products, battery leakage, even fire or explosion.**
- 2. Any components of the product cannot be submerged in water and exposed in the rain, which could cause a battery explosion, and display unit damage.**
- 3. Avoid electrical shock, do not open the cabinet.**
- 4. Even if the instrument is not used for a long time, store it in a dry and cool place after fully charging it once every three months. This is to maintain the battery functions.**

## **1. SUMMARIZE**

### **1.1 Measuring Principle Scope**

**LHT-200 Portable Hardness Tester** measuring principle is physically a rather simple, dynamic hardness test. An impact body with a hard metal test

tip is propelled by spring force against the surface of the test piece. Surface deformation takes place when the impact body hits the test surface, which will result in loss of kinetic energy. This energy loss is calculated by velocity measurements when the impact body is at a precise



distance from the surface for both the impact and rebound phase of the test. The permanent magnet in the impact body generates an induction voltage in the single coil of the impact device. The voltage of the signal is proportional to the velocity of the impact body, and signal processing by the electronics provides the hardness reading for display and storage.

Simply put, harder materials produce higher rebound velocity than those which are less hard (higher L

value). **LHT-200 Portable Hardness Tester** is a direct hardness measurement within any particular material group (i.e. steel, aluminum, etc.) and can be used as a final test result without conversion.

However, **LHT-200 Portable Hardness Tester** has established conversions to other hardness scales for the convenience of our customers. These conversions to other scales (HRC, HRB, HB, HV, HSD etc.) are programmed into the electronics, and can be shown directly on the display as the test result. All data is stored in the native L scale to prevent any possible errors with multiple conversions.

## **1.2 The Hardness Value "L"**

This term, 1978 introduced by Doctor Dietmar Leeb into measuring technology, is the quotient for the impact body's rebound and impact velocity, multiplied by 1000. Harder materials produce higher rebound velocity than those which are less hard. With reference to a particular material group (e.g. steel, aluminum etc.) the L-value represents a direct hardness measurement and is used as such. Comparison curves with standard static hardness values have been established (Brinell, Vickers,

Rockwell C, B) for the most prevalent materials, enabling the L values to be converted into the relevant values for these procedures. With **LHT-200 Portable Hardness Tester**, such hardness values can be directly displayed in the hardness scales HRC, HRB, HB, HV, HSD and tensile strength (MPa).

### **1.3 Main Features**

- Highly accurate  $\pm 6$  HL
- Automatic correction for impact direction
- Large, easy to read display with backlight
- Menu language: English, Deutsch, French, Italian, Spanish, Russian, Polish, Farsi, Korean, Chinese Simplified, Chinese Traditional
- To operate with touch screen
- Large memory with on-screen review of data
- Converts to all common hardness scales (HV, HB, HRC, HRB, HSD) and tensile strength MPa.
- Rechargeable Ni-MH batteries
- Automatically detect the Impact Device type
- Conforms to the Standard DIN 51056 & ASTM A956-02

## **1.4 Application Range**

- Good for all metals
- Ideal for production level testing
- Best suited for on-site testing of heavy, big or already installed parts
- Handy for difficult to access or confined test locations
- Automatic compensation for impact direction
- Excellent for material selection and acceptance tests
- Easy to use and accurate on curved test surfaces (R > 10 mm)
- Metal production & processing
- Automotive & transportation
- Machinery & power plants
- Petro-chemical, refineries
- Aerospace & shipyard
- Metal constructions
- Testing services & laboratories

## **1.5 Technical Information**

### **1.5.1 Display Unit**

- HL Display Range: 0~999HLD
- Accuracy:  $\pm 6$  HL
- Unit Display: large LCD, backlight, touch screen

- Unit Material: shock resistant ABS plastic
- Internal Data Storage: 500 measured value
- Resolution: 1 HL; 1 HV; 1 HB; 0.1 HRC; 0.1 HRB; 1 HSD; 1 MPa
- Battery Type: rechargeable Ni-MH battery
- Operating Temperature: 0°C~+50°C (32°F~122°F)
- Storage Temperature: -10°C~+60°C (14°F~140°F)
- Humidity: 90 % max.
- Dimension: 130 x 87 x 28 mm (5.1 x 3.3 x 1.1 inches)
- Weight: 240g

### 1.5.2 Impact Devices

The **LHT-200 Portable Hardness Tester** is fitted with universal impact device D. Special impact devices are available for use in extremely confined spaces, with special component geometry or surface finish. These significantly extend the possibilities of application for the **LHT-200 Portable Hardness Tester** procedure. Each special impact device is compatible with unit D indicating device and is supplied as accessory.

## 1 Impact Device D

Application: For the majority of your hardness testing assignments.

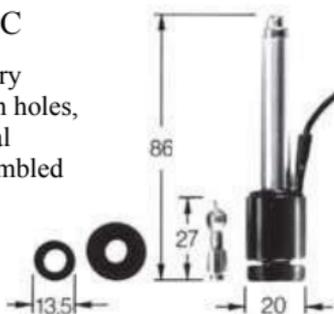
Weight: 75 g



## 2 Impact Device DC

Application: Use in very confined spaces, e.g. in holes, cylinders or for internal measurements on assembled machines.

Weight: 50 g



### 3 Impact Device DL

Application: For measurements in extremely confined spaces or at the base of grooves.

Weight: 100 g



### 4 Impact Device C

Application: Surface hardened components, coatings, thin walled or impact sensitive components (small measuring indentation).

Weight: 75 g



### 5 Impact Device D+15

Application: Particularly slim front section and with measuring coil moved back. Suit for hardness measurements in grooves and on recessed surfaces.

Weight: 80 g



### 6 Impact Device G

Application: Heavy castings and forgings solid parts.

Weight: 250 g



## Impact Devices

Preparation of the surface	D, DC, DL, D+15	C	G
Roughness class ISO	N7	N5	N9
Max. roughness depth Rt	10 µm	2.5 µm	30 µm
Centre line average CLA, AA, Ra	2 µm	0.4 µm	7 µm
<b>Min. weight of samples</b>			
of compact shape	5 kg	1.5 kg	15 kg
on solid support	2 kg	0.5 kg	5 kg
coupled on plate	0.1 kg	0.02 kg	0.5 kg
<b>Min. thickness of sample</b>			
uncoupled	25 mm	15 mm	70 mm
coupled	3 mm	1 mm	10 mm
surface layer thickness	0.8 mm	0.2 mm	

**Max. Hardness of samples**

Indentation size on test surface			
with 300 HV, 30 HRC *			
diameter	0.54 mm	0.38 mm	1.03 mm
depth	24 µm	12 µm	53 µm
with 600 HV, 55 HRC *			
diameter	0.45 mm	0.32 mm	0.90 mm
depth	17µm	8 µm	41 µm
with 800 HV, 63 HRC *			
diameter	0.35mm	0.30 mm	
depth	10µm	7 µm	

\* Approximate hardness conversion for steel

## 7 Support Rings

On curved surfaces having a radius less than 30 mm, effective positioning on the test piece is facilitated by the use of support rings (set of 12). The appropriate support ring is

screwed on to the front of the impact device. The set includes support rings for cylindrical, hollow-cylindrical, spherical or



hollow-spherical surfaces with a radius of 11 mm. Special support rings can be manufactured for geometrically complex surfaces.

## 8 Application Criteria

Valid for impact devices D, DC, DL, C, D+15, G as is standard practice for hardness measurements, the measuring location surface should be bright and smoothly ground. It does not have to be polished.

Damage to the test piece surface after testing with **LHT-200 Portable Hardness Tester** will be minimal. At least 2 to 3 test impacts should be made at each measuring location, and then in all cases the

average should determine for the individual readings. A surface of 10 x 10 mm is sufficient for measurement purposes. The device can also be used without special preparation using unit D. Slim work pieces and those weighing between 2 and 5 kg must be placed on a solid base plate for testing in such manner that the force of the impact neither shifts them nor causes them to flex, since otherwise the readings could be falsified. Compact miniature parts with plane measuring surfaces can also be tested, but must be "coupled" for the purpose with rigid base. "Coupling" is affected by lightly coating the work piece with coupling paste and "sticking" it firmly to a base-plate of adequate weight.

## 1.6 Overview the Display Unit

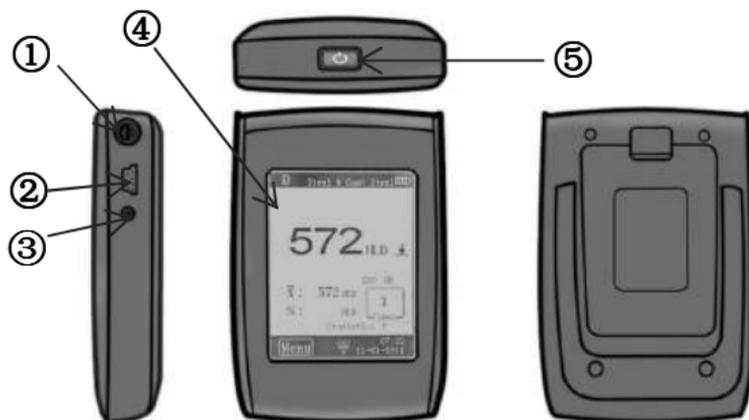
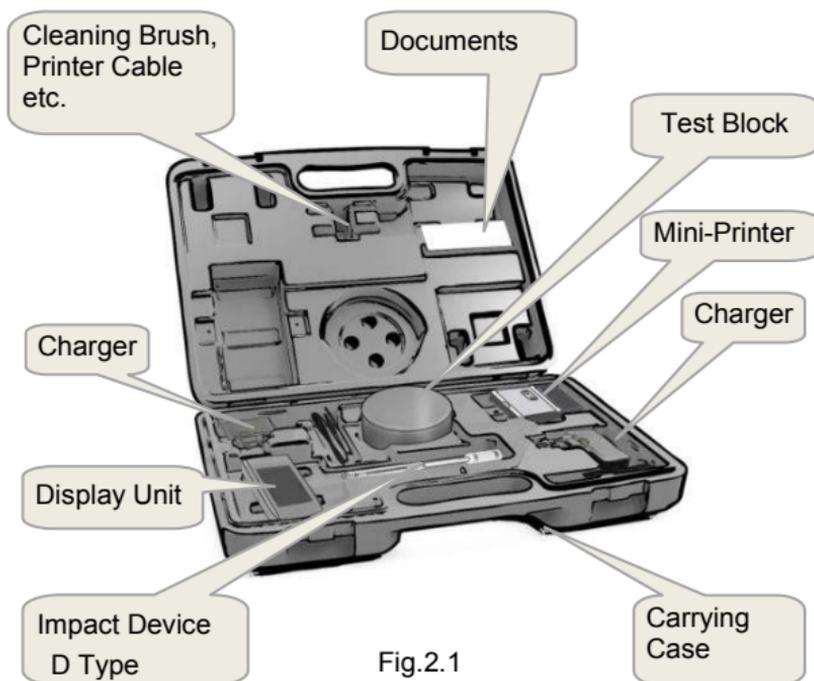


Fig 1.1

- |                 |               |
|-----------------|---------------|
| 1. Sensor Jack  | 2. Data Jack  |
| 3. Charger Jack | 4. LCD screen |
| 5 Power Switch  |               |

## 2. CHECKING SUPPLIED ACCESSORIES

Make sure that the following accessories are supplied with your instrument. (Fig 2.1)



## 3. QUICK START GUIDE

### 3.1 Connecting

To use the signal cable to connect between display unit and sensor. (Fig 3.1)

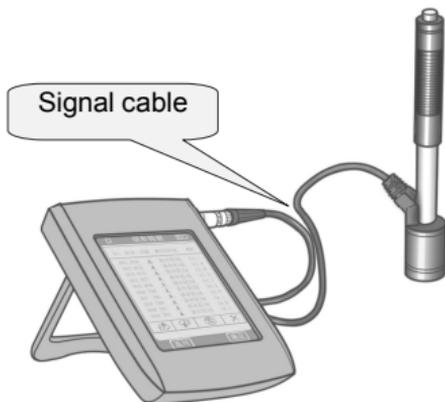


Fig 3.1

### 3.2 Charge the Battery

You must Charge the battery (in display unit) before using the instrument for the first time.

### 3.3 Calibrate the Instrument

Test block are calibrated in accordance with the dynamic hardness value L. You must be calibrated **LHT-200 Portable Hardness Tester** by the test block before using the hardness tester for the first time. **(See 4.2.5.1 Items)**

## 4. OPERATING INSTRUCTIONS

### 4.1 Display Unit

#### 4.1.1 Button

**POWER ON/OFF** button : Press it to turn on the hardness tester; In any case, users can press this button again for one second to turn off the instrument.

#### Note:

1. When the instrument is charging, to monitor the charge state you can't turn off the instrument by press this button

#### 4.1.2 Measure Mode

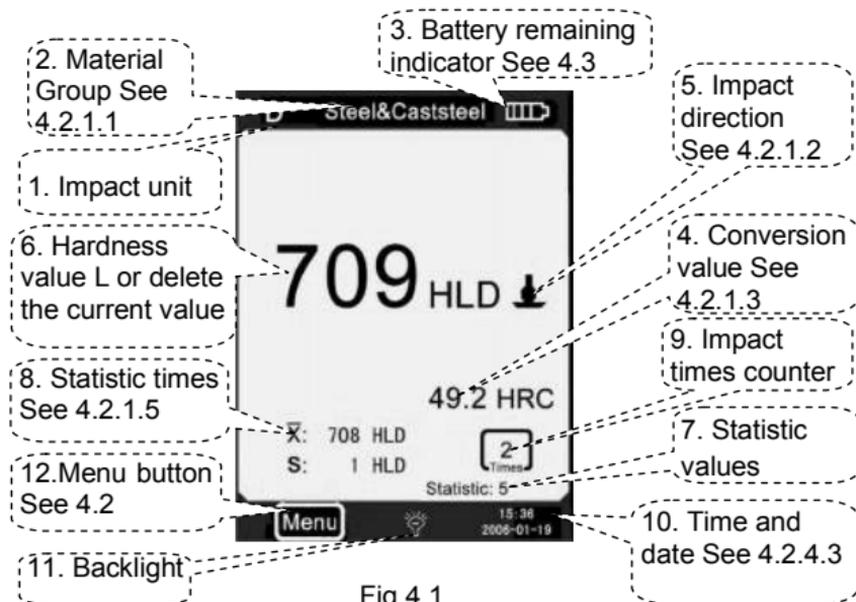


Fig 4.1

**1. Impact unit type:** The impact unit type that connected to the display unit.

**2. Material group:** The material of the sample.

**3. Battery remaining indicator:** indicate the remaining time of battery.

**4. Conversion value:** The conversion value of measured value “L”.

**Note:**

When “---” appear at this position, indicated the conversion is out of range.

**5. Impact direction:** Display the impact direction.

**6. Hardness value L:** Measured hardness value L (Leeb).

**7. Statistic values:**

$\bar{X}$ : Mean value.

S: The difference of maximum value and the minimum value.

**8. Statistic times:** The impact times in a statistic data group

**9. Impact times counter:** Finished times of impact

**10. Time and date:** time and date of the system

**11. Backlight on/off:** click it will turn on the backlight when backlight is off; when backlight is on, click it will turn off the backlight.

### 4.1.3 Automatically detect the Impact Device type

When the Impact Device connects to the Display Unit, the Display Unit can automatically detect the impact device type. In the upper left corner of LCD will display the detected impact device type.

**Note:**

1. The impact device must be provided by us, otherwise it is impossible to achieve automatic detection.
2. This detection is only in the main interface to be valid

## 4.2 Using the Menu

**LHT-200** selects the multistage menu mode. (Fig 4.2) In measure mode, click **Menu** on the screen to display the menu. (Fig 4.3) It contains six options: **Testing Setup; Printing Setup; Memory Management; System Setting; Calibration; Information;**

Menu	Testing Setup	Material Group
		Impact Direction
		Scale
		Limit Values
		Statistic
	Printing Setup	Workpiece
		Items
		Print Memory
	Memory Management	Print All
		Browse A To Z
		Browse Z To A
		Browse Selected
		Upload Data
		Delete Selected
	System Setting	Delete All
		Auto Print ON/OFF
		Gross Error ON/OFF
		Key Sound ON/OFF
		Alarm ON/OFF
		Language: EN
Date/Time		
Backlight Time		
Calibration	Test Calibration	
	Touch Calibration	
Information		

Fig 4.2

## System Setting; Calibration and Information.

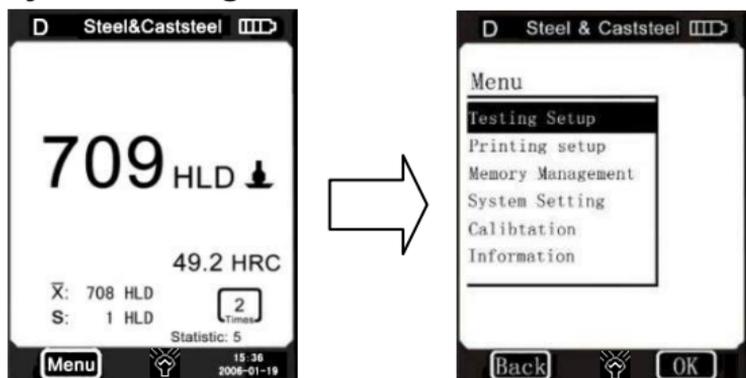


Fig 4.3

### 4.2.1 Testing Setup

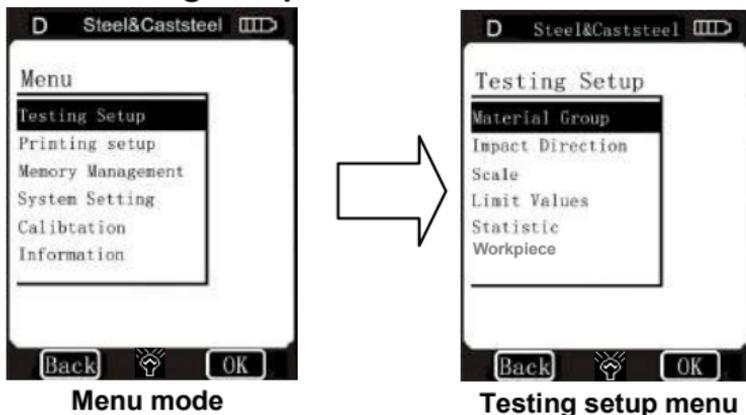


Fig 4.4

Click **Testing Setup** item on the menu mode to display the **Testing Setup** menu.

This menu item contain five selectable items:

**Material Group, Impact Direction, Scale, Limit Values and Statistic.**

### 4.2.1.1 Material Group



Fig 4.5



Fig 4.6

**4.2.1.1.1** In measure mode, use touch pen to click the “**Material Group**” character to select the desired material.

When the type of impact unit is set to D and “**Scale**” is set to **hardness scale** (Fig 4.5), clicks on “**Material Group**” character continuously, the material changes 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**→...

When the type of impact unit is set to D and “**Scale**” is set to **MPa (tensile strength)** (Fig 4.6), clicks on “**Material Group**” character continuously, the material changes according to following sequence:

**Low Carbon Steel**→**Hi Carbon Steel**→**Chrome Steel**→**Cr-V Steel**→**Cr-Ni Steel**→**Cr-Mo Steel**→**Cr-Ni-Mo Steel**→**Cr-Mn-Mo Steel**→**Cr-Mn-Si Steel**→**Hi Strength Steel**→**Stainless Steel**→**Low Carbon Steel**→...

When the type of impact unit is set to G, clicks on “**Material Group**” character continuously, the material changes according to following sequence:

**Steel**→**Grey Cast Iron**→**Ductile Iron**→**Steel**→...  
**Note: When the type of impact unit is set to G, the Scale could only set to HB or HRB**

**4.2.1.1.2 In Material Group menu**, use touch pen to click the desired material item to select the material. Click “**△**” or “**▽**” to page up or page down. Click **Back** to the upper menu.

**Note:**

**1. It is necessary to select the material classification. When you did not know the material type, you must be reference**

the related material handbook.

2. When you change the material group, the Impact times counter will be set to “0”.

#### 4.2.1.2 Impact Direction

4.2.1.2.1 In measure mode, use touch pen to click the “Impact Direction” logo to select the desired impact direction. (Fig 4.7)

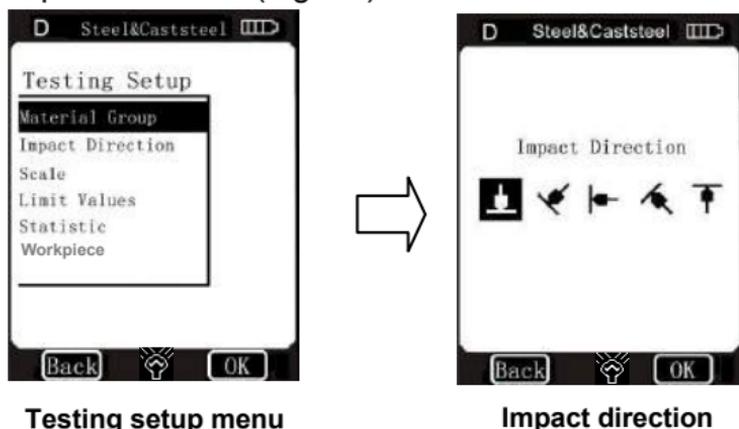


Fig 4.7

Click on “Impact Direction” logo continuously, the impact direction changes according to following sequence: ...

4.2.1.2.2 In Impact Direction menu, click the desired impact direction logo to select the desired impact direction.

### 4.2.1.3 Scale

**4.2.1.3.1** In measure mode, use touch pen to click the “**Scale**” character to select the desired hardness scale or tensile strength. Under selected the D-type impact unit, click on “**Scale**” character continuously, and the scale changes according to following sequence:

**HB→HRB→HRC→HV→HSD→MPa→HB...**

HB      Brinell

HRB     Rockwell

HRC     Rockwell

HV      Vickers

MPa     Tensile strength

Under selected the G-type impact unit, click on “**Scale**” character continuously, and the scale changes according to following sequence:

**HB→HRB→HB...**

**4.2.1.3.2** In **Scale** menu, click desired hardness scale or tensile strength on the menu to select the hardness scale or tensile strength.

Fig 4.8: the type of impact unit is set to D;

Fig 4.9: the type of impact unit is set to G.

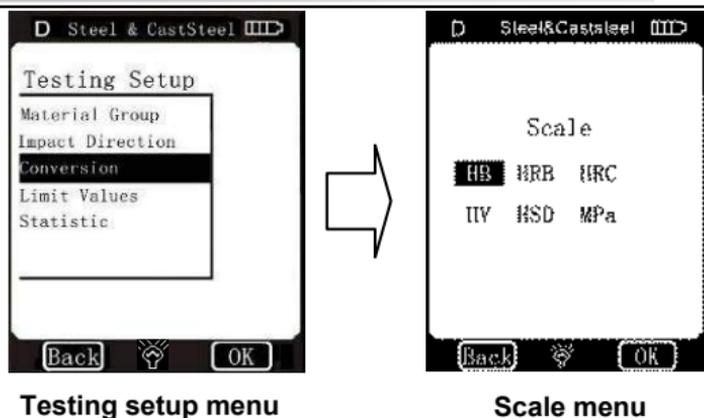


Fig 4.8

**Note:**

1. Since there are differences between the different hardness scale's valid range. Some test HL value cannot be converted, at this time, the “---” will be show on the location where conversion value display.
2. When you set the scale from hardness scale to tensile strength or from tensile strength to hardness scale, you must be reset the material group.
3. Conversion value only supplies the general reference, which may result in some offset. Precisely conversion generally needs related comparative tests.



Fig 4.9

#### 4.2.1.4 Limit Values

When the measured value “L” is out of the limit value range, the display unit will be alarm and send out a prompt.

In **Testing Setup** menu, click **Limit Values** item to display the **Limit Values** setup menu. Fig 4.10

Set the limit values through click the screen keyboard.

Click **OK** confirm the limit values setup.

Click **BACK** to cancel the limit values setup.

Click   to select a desired bit.

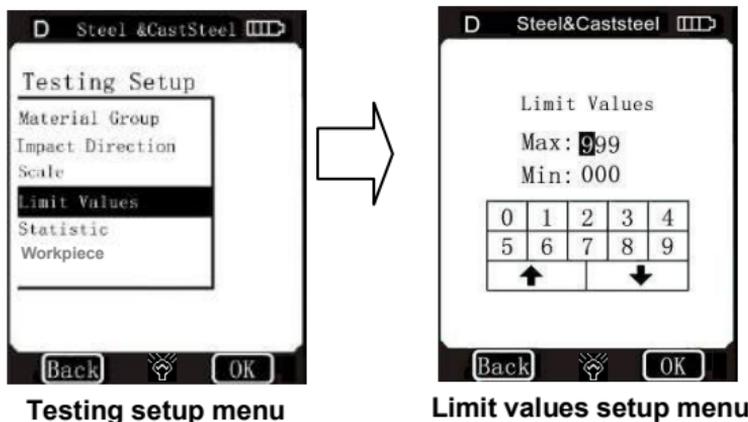


Fig 4.10

#### 4.2.1.5 Statistic

**LHT-200 Portable Hardness Tester** has automatic statistic function.

When the impact times are up to the **Statistic Times**

**Value**, “X” value (the Mean value of measured hardness value L) and “S” value (the difference of Maximum value and the minimum value) are automatically formed and display on the screen. In measure mode, use touch pen to click the “**Statistic**” character to display the **Statistic Times Value** setup menu; or in **Testing Setup** menu, click **Statistic** item to display the **Statistic Times Value** setup menu. Fig 4.11

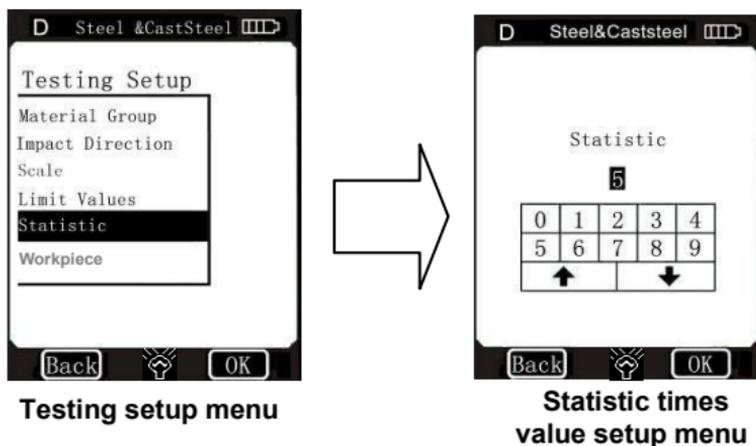


Fig 4.11

Click **OK** to confirm the **Statistic Times Value** entry. Click **BACK** to cancel the **Statistic Times Value** entry.

Click **↑↓** to select a desired bit.

**Note:**

1. The statistic times value range is 1 ~ 99, when you set

this value to “1”, the system has no **Statistic process**.

2. When the value has be reset, the impact times’ counter will count from “0”.

#### 4.2.1.6 Sample code setting

When several samples is need to be measured, the samples can be coded (Fig 4.12). The coded range is 1-50. When the date saved, the sample code saved too. The samples number corresponding to the data can be printed. It also can be looked up during data browsing.

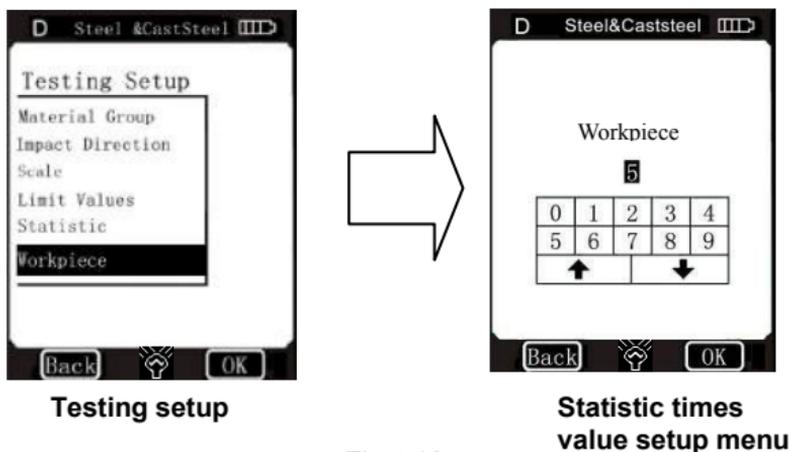


Fig 4.12

#### 4.2.2 Printing Setup

When you have a micro-printer (optional), you can print out the measured values in many formats.

In menu mode, directly click **Printing Setup** on the

menu mode to display the **Printing Setup** menu. Fig 4.12

There are three options in this menu: **Items**, **Print Memory** and **Print All**.

#### 4.2.2.1 Items

A complete test result report form should include: measured values, conversion values, date, time, impact direction, statistic value, material, etc. you can choose the printing items in this menu. There are five options in this menu: **Date**, **Time**, **Direction**, **Mean Value** and **Material**. Fig 4.13

In **Items** menu, click the desired item to display its **Function Switch**. Then click “**ON**” or “**OFF**” to confirm you choose.

Click **BACK** or “**X**” to back to upper menu.



Menu mode

Print setup menu

Print setup menu

Function switch

Fig 4.13

### 4.2.2.2 Print Memory

You can print out the measured values and related items through this menu.

In **Printing Setup** menu, use touch pen to click **Print Memory** item to display the **Serial No. Range** menu.

Fig 4.14 Set the printing range through click the screen keyboard (Click   to select a desired bit), and then click **OK** to display the confirm menu.

Fig 4.14, click “YES” to confirm printing, or click “NO” to cancel printing. Click **BACK** or “X” to cancel printing and back to upper menu.

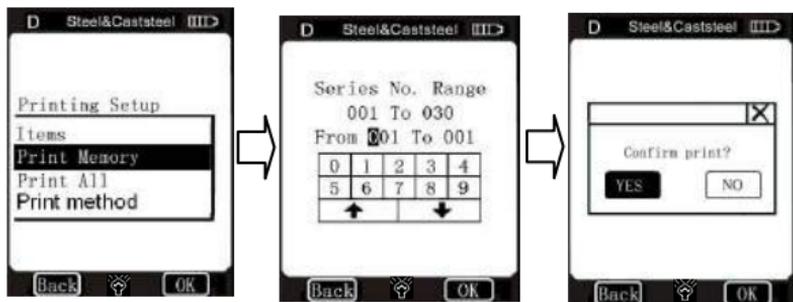


Fig 4.14

### 4.2.2.3 Print All

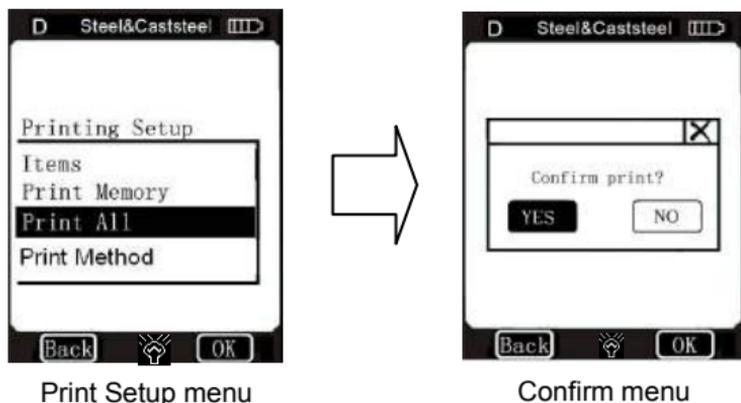


Fig 4.15

Use this menu you can print out all the measured data in memory. In **Printing Setup** menu, use touch pen to click **Print All** item to display the confirm menu. Fig 4.15

Use touch pen to click “YES” to confirm printing, or click “NO” to cancel printing.

Click **BACK** (or “X”) cancel printing and back to upper menu.

**Note:** LHT-200 Portable Hardness Tester Metal Hardness Tester can save about 500 data in memory, if you will print out all the memory data, you will spend a very long time.

### 4.2.3 Memory Management

Through this menu, you can browse and delete the memory data, simultaneously also can print out the memory data.

In menu mode, directly click **Memory Management** item to display the **Memory Management** menu. Fig 4.16

There are five options in this menu: **Browse A To Z**, **Browse Z To A**, **Browse Selected**, **Delete Selected** and **Delete All**.

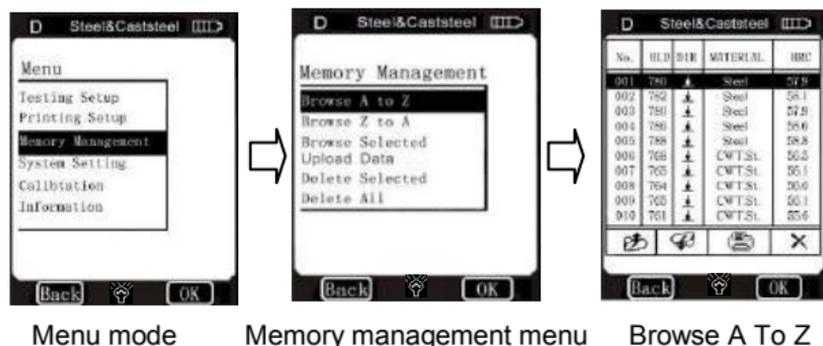


Fig 4.16

#### 4.2.3.1 The Format of Memory Data

The data group (such as test result, conversion result, sample material and impact direction), automatically saved in memory after one individual measurement. The format of memory data is shown in Fig 4.17

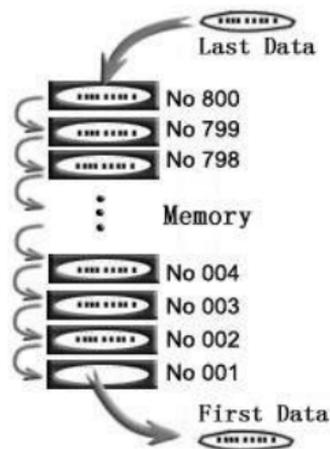


Fig 4.17

After the data quantity that saved in the memory has been bigger than 800 groups, the Last group of data will store the 800th position and the first group of data will be erased. The second group of data will be moved into the 001st position, simultaneously the position of other group of data, will be moved into lower position.

#### 4.2.3.2 Data Browser Mode

This tester has provided three browser modes:

**Browse A To Z**, **Browse Z To A** and **Browse Selected**.

In **Memory Management** menu, use touch pen to click the desired item, then click **OK** on the screen to display the relevant data browse menu, or directly click desired item in **Memory Management** menu to display the relevant data browse menu.

When you select **Browse A To Z** item, the menu is shown in Fig 4.16. In this menu, click  to page up, click  to page down, click  delete selected group of data, click  to print selected group of data, click OK to show the test time of selected group of data.

When you select **Browse Z To A** item, the menu is shown in Fig 4.18

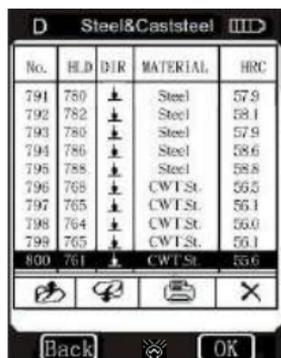
Click  to page up.

Click  to page down.

Click  to delete selected group of data.

Click  to print selected group of data.

Click OK to show the test time of selected group of data.



No.	HLD	DIR	MATERIAL	HRC
791	780	上	Steel	57.9
792	782	上	Steel	58.1
793	780	上	Steel	57.9
794	786	上	Steel	58.6
795	788	上	Steel	58.8
796	768	上	CWT.St.	56.5
797	765	上	CWT.St.	56.1
798	764	上	CWT.St.	56.0
799	765	上	CWT.St.	56.1
800	761	上	CWT.St.	55.6

Fig 4.18

When you select **Browse**

**Selected** item, you can select serial No. range of that group of data stored in memory. This menu is shown in Fig 4.19.

In this menu, the input method is same as **Print Memory**, please refer to 4.2.2.2. When the serial No. range input has finished, click OK to browse the selected group of data. Fig 4.20

Click  to page up.

Click  to page down.

Click  to delete selected group of data.

Click  to print selected group of data.

Click OK to show the test time of selected group of data.

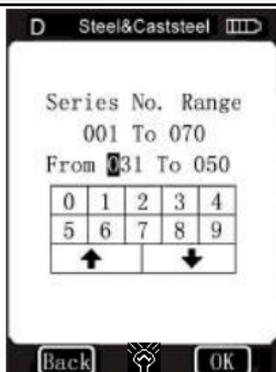


Fig 4.19

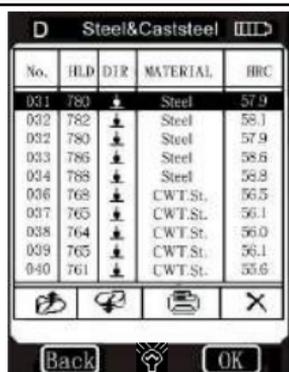


Fig 4.20

### 4.2.3.3 Upload Data

The data stored in the display unit through USB submit to the computer. It need to install the software accompanied with CDS before the data uploading. Then use USB cable to connect with computer, the display unit driver need to be installed in computer if the display unit is the first time connect with computer, the driver also included in cd-room. Implement data upload specific operation method please refer to the PC software help document.

### 4.2.3.4 Delete Memory Data

There are three ways to delete the memory data.

#### 4.2.3.4.1 Delete Memory Data in Data Browser Menu Please refer to 4.2.3.2.

#### 4.2.3.4.2 Delete Selected

In **Memory Management** menu, directly click **Delete Selected** item in **Memory Management** menu to display the serial No. range menu. Fig 4.21, In serial No. range menu, input you desired range that you want to delete, and then click **OK** on the screen to display a confirm menu. Use touch pen to click “YES” or click **OK** to confirm delete, or select “NO” to cancel delete. Click **Back** or “X” to cancel delete and back to upper menu.

**Note:** If the input range is out of the Serial No. range, then it will delete the actual data group in your input range and in memory data sequence number will arrange.

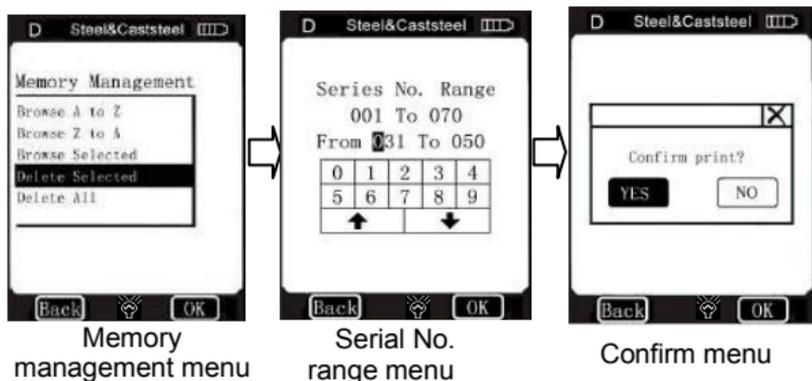


Fig 4.21

#### 4.2.3.4.3 Delete All

This operation will delete all data in memory.

In **Memory Management** menu, directly click **Delete All** item in **Memory Management** menu to display a confirm menu. Fig 4.22

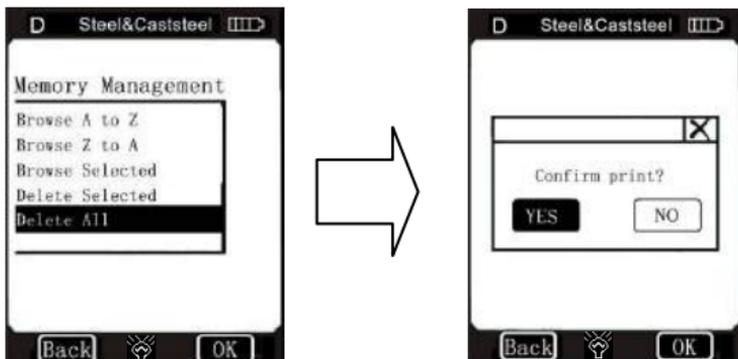


Fig 4.22

Click “YES” (or click **OK**) to confirm delete.

Click “NO” to cancel delete.

Click **BACK** (or “**X**”) to cancel delete and back to upper menu.

#### 4.2.4 System Setting

**System Setting** contains some system function switches; users can setup various switching functions according to their requirements, such as the adjustment of system calendar and clock.

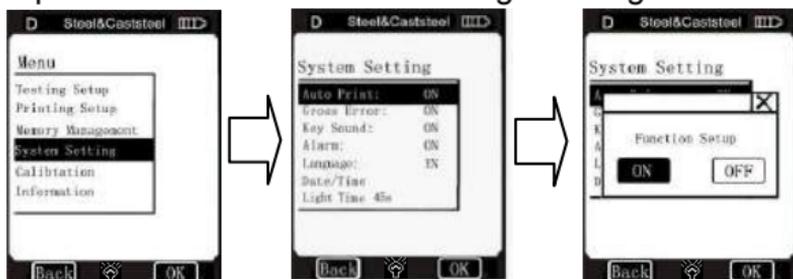
In menu mode, directly click the **System Setting** option on the screen to display system setting menu, users can set for the corresponding switches or turn

into the windows of setting system calendar and clock. Clicking **BACK**, users can turn back to the upper menu.

#### 4.2.4.1 System Function Switch

Users can set four functions on the **system setting** menu: **Auto Print**; **Gross Error**; **Key Sound**; **Alarm**; **Language**; **Date/Time**; **Light Time**.

Users can open the function-setting window being selected by pressing button to choose relative operation options, and then click relative operation options to conduct function setting. See Fig 4.23.



Menu mode

System setting menu

Function switch

Fig 4.23

Users can choose if turning on this function or not by using touch pen to click, they can confirm amendment by directly clicking **ON** and **OFF**.

Users can cancel operation by clicking **BACK** and **X** on screen.

When **Auto Print** is set as **ON**, printer will automatically print the data after the data measure finished.

When **Gross Error** is set as **ON**, gross errors will be shown out according to Grubbs criteria as the **Statistic Times Value** have

been completed. See Fig

The screenshot shows a handheld device screen with a data table and control elements. At the top, it displays 'D Steel&Caststeel' and a battery icon. The table has five columns: 'No.', 'HLD', 'DIR', 'MATERIAL', and 'HRC'. The data rows are: 001 (836, ↓, Steel), 002 (834, ↓, Steel), 003 (835, ↓, Steel), 004 (837, ↓, Steel), and 005 (836, ↓, Steel). Below the table are four icons: a left arrow, a right arrow, a printer, and an 'X' (delete). At the bottom, it shows statistics:  $\bar{X} = 835$  and  $S = 2$ . There are 'Back' and 'OK' buttons at the very bottom.

No.	HLD	DIR	MATERIAL	HRC
001	836	↓	Steel	
002	834	↓	Steel	
003	835	↓	Steel	
004	837	↓	Steel	
005	836	↓	Steel	

$\bar{X} = 835$      $S = 2$

Back    OK

Fig 4.24

4.24. Users can click **X** to conduct deletion (Please refer to 4.2.3.3). When data has been deleted without supplementary point's measure, users can click **OK** to confirm the end of the measure, and be ready for the next measure. If supplementary point's measure is needed, users can click **BACK** to back to the **Measure Mode** window, and conduct supplement.

When **Key Sound** is set as **ON**, as users operate click effective icons on the touch screen, the buzzer will shortly beep once.

When **Alarm** is set as **ON**, as measured value is out of the limit values or gross errors appear, the buzzer will continuously beep twice.

#### 4.2.4.2 Language

In **System Setting** menu, click **Language** item to display the **Language** setup menu. Fig 4.25



Fig 4.25

#### 4.2.4.3 Date / Time

In **System Setting** menu, directly click **Date/Time** item to display the **Date/Time** setup menu.

Fig 4.26

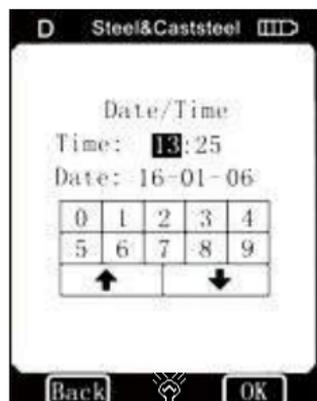


Fig 4.26

1. Users can choose to set contents

(hour/minute/day/month/year) by clicking button on the screen.

2. Input data by clicking the numbers on the touch screen.

3. Users can successfully complete to setup by clicking **OK** on the screen.

4. To cancel new setup by clicking **BACK** on the screen. Sample: Steps of setting time of 10:50 am, Jan. 16, 2009 listed as follow:

1. Choose “hour” in **Date/Time** setup menu by clicking the number “1” then “0” on the screen.
2. Choose “minute” in **Date/Time** setup menu by clicking the number “5” and “0” on the screen.
3. Choose “day” in **Date/Time** setup menu by clicking the number “1” and “6” on the screen.
4. Choose “month” in **Date/Time** setup menu by clicking the number “0” and “1” on the screen.
5. Choose “year” in **Date/Time** setup menu by clicking the number “0” and “9” on the screen.
6. Click **OK** on the screen to confirm setting amendment; click **BACK** on the screen to cancel setting amendment.

#### 4.2.4.4 Backlight Time

In **System Setting** menu, click **Backlight Time** item to display the **Backlight Time** setup menu. Fig 4.27 You can choose 15 seconds, 30 seconds, 45 seconds or 3 minutes.



Fig 4.27

#### 4.2.5 Calibration

The **Calibration** contains the **Test Calibration** and

## Touch Calibration.

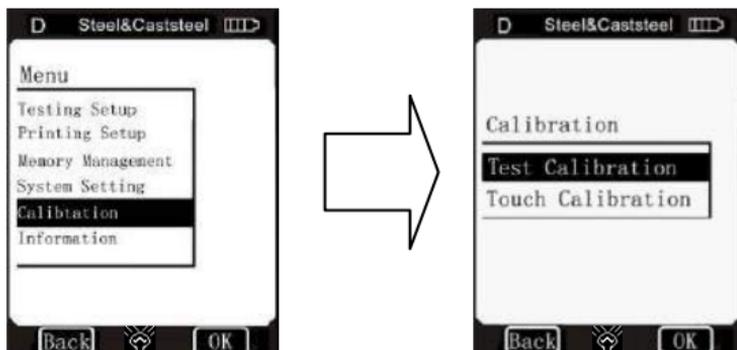


Fig 4.28

**Test Calibration** is used to calibrate the measured value of the hardness tester, so as to farthest decrease measuring error.

The **Touch Calibration** is used to calibrate the accuracy of the touch screen position, so as to provide correct fast operation of touch screen.

In **System setting** menu, select **Calibration** by clicking on the **Calibration** option to enter the **Calibration** screen. See Fig 4.28.

### 4.2.5.1 Test Calibration

In **Calibration** menu, click **OK** on the screen to display the **Test Calibration** menu, or directly click **Test Calibration** item in **Calibration** menu to display the **Impact Device** Selection menu. Fig 4.29

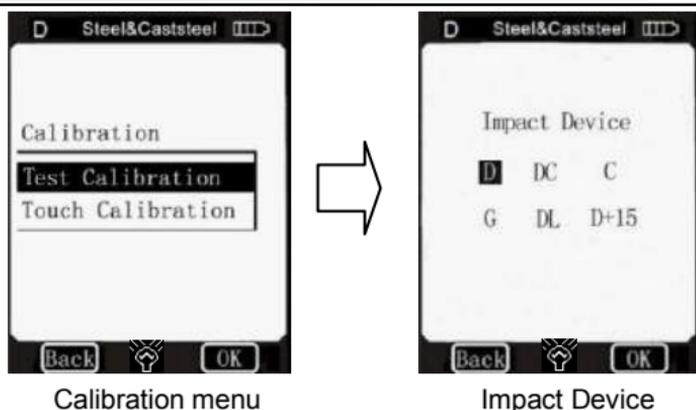


Fig 4.29

In “**Impact Device**” selection menu, choice impact device type, then choice “**Scale**” (Fig 4.30), if you chosen HL, then directly show the calibration menu (Fig 4.32), if you chosen other scale, you need to select material from “**Material**” menu (Fig 4.31), then show the calibration menu (Fig 4.32).

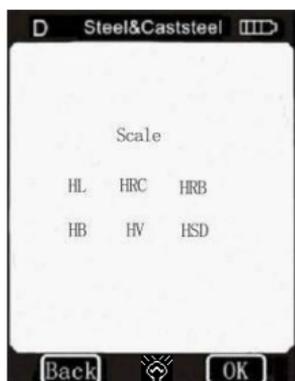


Fig 4.30



Fig 4.31

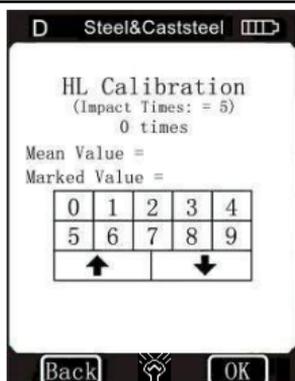


Fig 4.32



Fig 4.33

Carries on 5 effective impact tests on the test block, (when **Alarm** is set to ON, Ref. 4.2.4.1, and the number of impact times is less than 5, clicking OK will display an alarm prompt indicating there are operating errors), the measured values will display on the screen, (Users can delete the wrong data and measure again), Fig 4.33, then click **BACK** on the screen to back to **Test Calibration** menu, the Mean value automatically formed. Input the **HLD** value that marked on test block through click the screen keyboard and then click **OK** on the screen, The **Test calibration** finished.

**Note:**

1. If it's the first time to use the hardness tester or has been so long since the last time, users should calibrate the machine on the Test Block.

The default impact direction is downwards. (See Appendix

1 in details)

2. Appendix 3~7 show the scale and measurement ranger, if the date that you set is out of the ranger, it will show a failure message. Fig 4.34.

#### 4.2.5.2 Touch Calibration

The **Touch Calibration** is actually used to calibrate the consistency between touch

screen sensor and LCD coordinates. If there is a deviation existing between the actual position of touch screen presses and the position of presses figures displayed by LCD, users should conduct Touch Calibration. **LHT-200 Portable Hardness**

**Tester** Hardness display coordinates has been carefully calibrated when it's launched. Due to the difference of environmental conditions (especially notable changes in temperature and humidity), coordinates errors may arise during the process of use. It



Fig 4.34



Fig 4.35

is normal for small errors that can be corrected well on this function.

In **Calibration** menu, directly click **Touch Calibration** item in **Calibration** menu to display the **Touch Calibration** menu. See the Fig 4.35.

According to the prompt shown on the screen, users can click the cross center by using touch pen under the steps of Fig 4.36.



After completing the above three steps, a rectangular frame will be automatically displayed in the middle of the window, see Fig 4.37. Then users can click the core of rectangular frame by using touch pen, and system may automatically return to the window of the **Calibration**, and now, **Touch Calibration** has been completed.



If it can't be return to the window of **Calibration**, it means the operation was inefficient, users should re-click the core of rectangular frame again (3 times at most); if it's still inefficient after 3 times, it will automatically return to the window shown as Fig 4.36(**Step 1**). Users should re-start all the steps of **Touch Calibration** till it's successfully done.

#### 4.2.6 Information

**Information** includes developers and version information of the software and the serial number of the unit. Products manufactured in different periods, the software will be different because of version upgrade. Therefore in use,

if users ask service engineer or agent for advice of technical problems related to software, they may be required to provide such information. In menu mode, users can directly click **Information** on the screen to get in the window of **Information**. See Fig 4.38.

**Note: Version number may be changed with software upgrade, which will not be re-notified.**



Fig 4.38

### 4.3 Charging

Users need to recharge batteries when batteries are used for the first time and exhaustion of electricity arises.

The capacity of battery will show as empty after exhausting use (3 columns as full), and show a word "Power Shortage!" Besides, the buzzer will beep once in two seconds to tell the user it's time to charge. Firstly, users should insert the plug of charger into the right charger jack of display unit, see Fig 4.39,

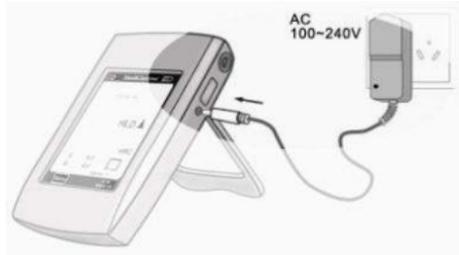


Fig 4.39

and then connect the charger with AC socket (100~220V/50~60Hz) to start charging. Meanwhile, the screen of display unit will display "charging...". See Fig 4. 40.

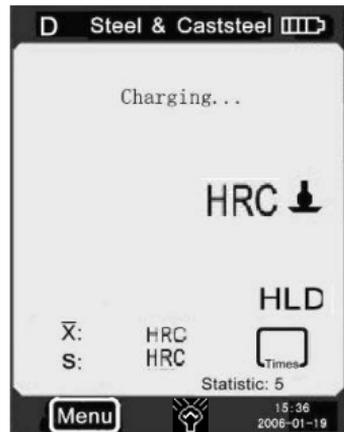


Fig 4.40

At the end of charging, users can see "charging complete" on the screen. If users press **ON/OFF**

button at this time, the machine won't be turned off, because it is on a supervision mode.

**Note: Please use the exclusive charger.**

#### **4.4 Backlight**

The LED backlight is used for poor light conditions. If the LED backlight is turn on, it can automatically open backlight when turn on the machine. If there is no measure, and no touch screen operation, it will close backlight for saving power. To set the lighting time, please reference 4.2.4.4.

#### **4.5 Automatic Shutdown**

Display unit will automatically shutdown in the following case in order to save battery power.

Display unit will store all the parameters automatically before turning-off.

1. If there is no measure, and no touch operation in 3 minutes, display unit will automatically switch off. And it will beep continuously in 10 seconds before shutdown.
2. When battery power is not enough, the display unit will display "power shortage", and buzzer will beep once in one second, and the display unit will automatically switch off after 10 seconds.

## 5. DATA PRINTING

**LHT-200 Portable Hardness Tester** can be linked with exclusive micro printer, so printer can print out the measured values. Micro printer is an optional device. If necessary, please contact the dealer.



Fig 5.1

### 5.1 Connect Printer

Put the printer next to the display unit, keep the distance between them does not exceed 3m.

Boot the printer by pressing **POWER** button on the printer. Now you can use the wireless print.

Other printer operations involving printer power connecting or power recharging is attached in printer

Test Report			
-----			
Impact Unit Type: D			
Material : Steel&Caststeel			
1	808 HLD	↓	61.2 HRC
Date: 31-07-06		Time: 18:21:27	
2	808 HLD	↓	61.2 HRC
Date: 31-07-06		Time: 18:21:27	
3	805 HLD	↓	60.8 HRC
Date: 31-07-06		Time: 18:21:27	
4	808 HLD	↓	61.2 HRC
Date: 31-07-06		Time: 18:21:27	
5	805 HLD	↓	60.8 HRC
Date: 31-07-06		Time: 18:21:27	
-----			
s	= 3 HLD	00.4 HRC	
$\bar{x}$	= 806 HLD	61.0 HRC	
Printed: 31-07-06		18:21:27	
-----			

Fig 5.2

user manual.

## 5.2 Test Report Format

A complete test report is shown at Fig 5.2.

**Note:**

1. The specific contents of the report may be setup in Items menu. (See 4.2.2.1 Items)
2. The date and time printed are the print date and time.

## 5.3 Test Report Printing

**LHT-200 Portable Hardness Tester** offers various typing ways. Users can flexibly choose the way of typing in the actual use. Before printing, users must set the print method. (See 4.2.2.4 Items)

### 5.3.1 Automatic Printing

If **Auto Print** has been set to **ON**, printer can print automatically during the measure process. Display unit will sent out the data to printer after the completion of a group of test data. The printer will print the title of report before the beginning of each group of data. When the **Statistic Times Values** is set as 1, the printer can't print automatically. When the **Statistic Times Values** is set as 2 to 99, the printer will print automatically by the statistic group.

### 5.3.2 Manual Printing

When **Auto Print** has been set to **OFF**, users can operate printer manually.

When the impact times is up to users **Statistic Times Values**, click the , the printer will print out all the measured values and statistics results in the group, and form a complete test report.

### 5.3.3 Assemble Printing

Users may not print the report during the test; instead, they can print the measured values in **Printing Setup** menu. See 4.2.2.2 **Print Memory** and 4.2.2.3 **Print All**.

### 5.3.4 The other Printing Ways

Users can print when browsing some data management pages (See 4.2.3.2 **Data Browser Mode**); Users can also execute printing in the window of statistic list (See 4.2.4.1).

When these printing ways is available,  will show on screen. Users can conduct operation according to relevant functions.

**Note:**

1 **Statistic results in testing report would arise at the ending part of testing report only when automatic and manual printing ways of that the Statistic Times Values is**

set as 2 to 99.

2. The dates and time in testing reports is the ones when the testing reports are being printed, not belong to the test dates and time.

3. Thermal printing papers should be stored in an environment without high temperature and strong light. If it's necessary to storage, users should store their copies.

## 6. HARDNESS TEST

### 6.1 Test Preparation

- 1) Make sure if the system connection is safe and reliable.
- 2) Press **ON/OFF** button to switch on the power, and check if it's need to charging. Inspect if every setting of display unit is correctly, particularly the materials and impact direction. The setting inconsistent with the actual condition may set up a great error.

### 6.2 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 (just for D type impact device, for other impact device, please reference page 15 & 16):

- 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 or other stains.
- 3) Roughness of the test surface  $Ra \leq 1.6$ .
- 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.

Sample quality  $\geq 5\text{kg}$  can be directly tested; if the sample quality is  $2\sim 5\text{kgs}$ , the sample should be taken in fixation test by means of appropriate clamping; if the sample quality is  $0.05\sim 2\text{kgs}$ , the sample should be conducted coupling before the test; if the sample quality  $< 0.05\text{kg}$ , 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, the thickness of sample should not be less than 5mm, and surface absorption layer (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 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.

## 7. TEST STEPS

### Performing of Hardness Test

**Easy to use** – simple operating elements allow for accurate measurements even by occasional users.

#### 1) Loading

Simply load the impact device by sliding the loading tube forward.



Step 1

#### 2) Place

Then place and hold the impact device on the surface of the test piece at the desired test point.



Step 2

#### 3) Measure

Trigger the impact by pressing the trigger button. The hardness value will be instantaneously displayed.



Step 3

#### 4) Read the test result

Modern electronics with power saving features provide for long operating life. The large LCD display always shows how **HARDNESS TESTER** is configured to test. Variable function touch screen allow for quick change of common test parameters, and the on screen hint line shows the other active control keys. No subjective measuring errors are possible, giving highly repeatable results. Internal self diagnostics with error messages assure reliable test results. Readings can be stored automatically in the internal memory or sent directly to a printer. Repeating the above steps, users can carry out tests in more points.

**Note: Generally, each measurement location of sample is conducted for the five tests. The “S” value (difference of maximum value and the minimum value) values must be less than 12HL. The distance between any two impact positions should be  $\geq 3$  mm; the distance between impact position and the edge of the sample should be  $\geq 3$  mm.**

## 8. TROUBLES AND SOLUTIONS

No.	Trouble	Reasons	Solutions
1	No response switched	Lack power	Replace battery
2	Touch Screen no response	System halt	Reinstall the battery
3	Touch Screen inaccurate	Parameters change	Touch Calibration (See 4.2.5.2)
4	Abnormally high results	Steel ball wearing	Replace the Steel ball
5	No test results	Sensor cables loose	Re-linking
6	Printer no response	Printer is too far away from the host	Reduce the distance between the printer and the host
* Other Trouble ,please contact with agents or distributor.			

## 9. MAINTENANCE AND SERVICE

### 9.1 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 cleaning 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.

## **9.2 Store the Report**

Because printing paper is thermal paper, it should be preserved to avoid the heat and direct light. If the print records are necessary to be kept in long-term preservation, please copy and preserve in time.

## **9.3 Normal Maintenance Procedures**

In calibration of the hardness tester, if finding that error is larger than 12HLD, 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.

When the hardness tester arises other abnormal phenomena, users should not demolish or adjust any fixed assembly parts, instead, they should complete warranty cards, send them to maintenance department of professional maintenance by authorized organizations for maintenance. Machine

staying in maintenance organizations generally do not last more than a week.

#### **9.4 Service**

In the following cases, the authorized agent is not responsible for free maintenance of products, but maintenance service is available.

- 1) Not according to brochures, fail to connect and protect the product, and lead it into failure or damage;
- 2) Beyond the warranty period;
- 3) Serial No. of product warranty card is inconsistent with the product itself;
- 4) Machinery parts are in disassembly or repaired by non-authorized agency or non-professional maintenance staff;
- 5) The parts are not in warranty (steel ball, sensors wires, frames, supporting ring components);
- 6) Unexpected factors or human actions have been resulted in damage of products, such as the use of non-exclusive charger, high temperature, influent water, mechanical destruction and crash etc.;
- 7) As customers make their way back to repair, products are damaged as a result of

transportation and handling;

- 8) Irresistible force like earthquake and fire that cause product failures.

## Appendix1. DAILY CHECKING

Normal test block is mainly used for calibrate the hardness tester. The error and the repeatability of the hardness tester should be in the scope defined by the following table.

Impact Device	Impact direction	Hardness of Test block (HL)	Error Allowed	Repeatability Allowed
D		750~830	$\pm 12\text{HLD}$	12HLD
		490~570	$\pm 12\text{HLD}$	12HLD

**Note:**

### 1. Error=HLD-HLD

HLD is the average value of 5 values measured on the test block.

HLD is the value that marked on test block.

### 2. Repeatability= $\text{HLD}_{\max} - \text{HLD}_{\min}$

$\text{HLD}_{\max}$  is the maximum value in 5 values that measured on the test block.

$\text{HLD}_{\min}$  is the minimum value in 5 value measured on the test block.

---

## **Appendix2. FACTORS AFFECTING THE ACCURACY**

Incorrect operation or improper testing conditions would have serious impact on testing accuracy. Following is several common factors affecting the accuracy of testing for the use of reference (just for D type impact device, for other impact device, please reference page 15 & 16):

### **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 less roughness, while the less consumption of impact energy. Accordingly, the roughness of sample testing points on the surface  $Ra \leq 1.6$ .

### **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 reducing the jitter and sloshing by the methods of increasing supporting, coupling and compress. 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.

### Appendix3. SCALE RANGE - D & DC Type

Materials	HV	HB	HRC	HRB	HSD	Tensile strength (MPa)
Steel & Cast Steel	81-955	81-654	20.0-68.4	38.4-99.5	32.5-99.5	375-2639
Alloy Tool Steel	80-898		20.4-67.1			375-2639
Stainless Steel	85-802	85-655	19.6-62.4	46.5-101.7		740-1725
Grey Cast Iron		63-336				
Ductile Iron		140-387				
Cast Aluminum Alloys		19-164		23.8-84.6		
Brass		40-173		13.5-95.3		
Bronze		60-290				
Copper		45-315				
Forging Steel	83-976	142-651	19.8-68.5	59.6-99.6	26.4-99.5	

### Appendix4. SCALE RANGE - DL Type

Material	HLDL	HRC	HRB	HB	HV	HSD
Steel	560-950	20-68.4	38.4-99.5	81-654	81-955	32.5-97.9

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### Appendix5. SCALE RANGE - C Type

Material	HLC	HRC	HB	HV	HSD
Steel	350~960	20.0~69.5	80~683	80~996	31.9~102

### Appendix6. SCALE RANGE - D+15 Type

Material	HLD+15	HRC	HB	HV	HSD
Steel	481~850	20~	188~	192~	32.5~
		64	654	825	88.4

### Appendix7. SCALE RANGE - G Type

Materials	HLG	HRB	HB
Steel	300~750	47.7 ~ 99.9	90 ~ 646
Grey Cast Iron	340~600		92 ~ 326
Ductile Iron	340~600		127 ~ 364

## Warranty Card

Description: Portable Hardness Tester

Model: \_\_\_\_\_

User: \_\_\_\_\_ Tel: \_\_\_\_\_

Add: \_\_\_\_\_

Agent: \_\_\_\_\_ Tel: \_\_\_\_\_

Date: \_\_\_\_\_

### Warranty Description

Please use our product exactly according to our user's manual.

All products sold by our company or authorized dealer are covered by 12 month warranty.

Anthropogenic causes, irresistible natural factors cause the product damage, our company will not warranty.