



Portable Leeb Hardness Tester SH-500 Operation Manual

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Preface

◆Safety and Liability

This manual contains important information on the safety, usage and maintenance of instrument. Read the manual carefully before use the instrument. Keep the manual in a safe place for future reference.

◆Safety Instructions

⚠Danger: This symbol indicates a risk of serious or fatal injury in the event that certain rules of behavior are disregarded.

⚠Precision instrument, handle with care and avoid any serious shaking to damage internal components.

⚠Indenter of instrument is diamond, absolute hardness in nature, do not use it to scratch and damage precious objects.

⚠After a measurement, take off indenter about half second, then make a new measurement. Otherwise it can not make resonance between indenter and specimen in a short time.

⚠After finished use, please keep instrument in carrying case, avoid any damage by accident.

⚠Do not disassemble main unit and probe, otherwise no service to the instrument .

⚠Do not use the instrument under inflammable air environment, otherwise will lead to fire or explode.

⚠**About battery:**

- Please only use the battery supplied by original manufacturer;
- Do not disassemble battery;
- when install battery, aim correctly socket to avoid wrong connection of battery negative and positive;
- Do not throw battery in fire or heating;
- do not put battery in water or touch water;
- do not use battery in case of deformation;
- turn off instrument before replace battery, do not take off battery during power on status;
- battery is installed well before leaving factory, do not make modification if no special situation.

⚠**About recharger:**

- keep it in dry status;
- Avoid short circuit, otherwise will damage it;
- do not touch it by wet hand, otherwise will get an electric shock.

◆Statement

- Without the prior written permission of the Company and its subsidiaries for all products related to the contents of this manual may be reproduced in any form spread, or in a retrieval system, or translated into other languages are stored.
- The Company reserves the right to change the specification contained hardware and software specifications without prior notice.
- Every effort was made to ensure the accuracy and integrity of information contained in the instructions, if any, flaws and errors, reflected to us, we will revise the next edition, we would appreciate it!

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1、 Introduction

1.1 Advantages :

- SH-500 apply 320x240 color LCD, support multiple languages, menu operation, easy and convenient.
- Metal Shell, nice design.
- Large memory could store 500 groups (Relative to average times 32 ~ 1) information including single measured value, mean value, impact direction, impact times, material and hardness scale etc.
- With blue tooth communication, can connect with computer to use statistic software.
- Seven impact devices are available for special application. Automatically identify the type of impact devices.
- Pre-set hardness limited, auto delete exceeds value.
- With adjustable background light, use in dark environmental.
- With kinds of hint on LCD to see clearly on all status.
- Support software calibration function.
- Read test result directly, no need check table.
- Support blue tooth printer.
- Rechargeable battery as the power source. Charge circuit integrated inside the instrument.
- Available to connect statistic software to do data analysis and reviewing.
- Permitted Error conform ASTM A965.

1.2 Main Application &Testing Range:

1.2.1Main Application:

- Die cavity of molds.
- Bearings and other parts.
- Failure analysis of pressure vessel, steam generator and other equipment.
- Heavy work piece.
- The installed machinery and permanently assembled parts.
- Testing surface of a small hollow space.
- Material identification in the warehouse of metallic materials.
- Rapid testing in large range and multi-measuring areas for large-scale work piece.

1.2.2 Testing Range:

Test ranges, see table1-1、table1-2.

Table 1-1

| Materials | Scale | Impact Devices | | | | | |
|----------------------|-------|----------------|-----------|------------|-----------|------------|-----------|
| | | D/DC | D+15 | C | G | E | DL |
| Steel and cast steel | HRC | 17.9~68.5 | 19.3~67.9 | 20.0~69.5 | | 22.4~70.7 | 20.6~68.2 |
| | HRB | 59.6~99.6 | | | 47.7~99.9 | | 37.0~99.9 |
| | HRA | 59.1~85.8 | | | | 61.7~88.0 | |
| | HB | 127~651 | 80~638 | 80~683 | 90~646 | 83~663 | 81~646 |
| | HV | 83~976 | 80~937 | 80~996 | | 84~1042 | 80~950 |
| | HS | 32.2~99.5 | 33.3~99.3 | 31.8~102.1 | | 35.8~102.6 | 30.6~96.8 |
| Steel | HB | 143~650 | | | | | |
| CWT、ST | HRC | 20.4~67.1 | 19.8~68.2 | 20.7~68.2 | | 22.6~70.2 | |
| | HV | 80~898 | 80~935 | 100~941 | | 82~1009 | |
| Stainless steel | HRB | 46.5~101.7 | | | | | |
| | HB | 85~655 | | | | | |
| | HV | 85~802 | | | | | |
| GC.IRON | HRC | | | | | | |
| | HB | 93~334 | | | 92~326 | | |
| | HV | | | | | | |
| BRONZE | HB | 60~290 | | | | | |
| NC、IEON | HRC | | | | | | |
| | HB | 131~387 | | | 127~364 | | |
| | HV | | | | | | |
| C.ALUM | HB | 19~164 | | 23~210 | 32~168 | | |
| | HRB | 23.8~84.6 | | 22.7~85.0 | 23.8~85.5 | | |
| BRASS | HB | 40~173 | | | | | |
| | HRB | 13.5~95.3 | | | | | |
| COPPER | HB | 45~315 | | | | | |

Table 1-2

| Item | Materials | HLD | σ_b (Mpa) |
|------|---------------------------|---------|------------------|
| 1 | C low-carbon steel | 350~522 | 375~780 |
| 2 | C high-carbon steel | 500~710 | 737~1670 |
| 3 | Cr chrome steel | 500~730 | 707~1829 |
| 4 | CrV chrome-vanadium steel | 500~750 | 704~1980 |
| 5 | CrNi chrome-nickel steel | 500~750 | 763~2007 |
| 6 | CrMo | 500~738 | 721~1875 |
| 7 | CrNiMo | 540~738 | 844~1933 |
| 8 | CrMnSi | 500~750 | 755~1993 |
| 9 | SSST | 630~800 | 1180~2652 |
| 10 | SST | 500~710 | 703~1676 |

1.3 Description:

1.3.1 Basic configuration:

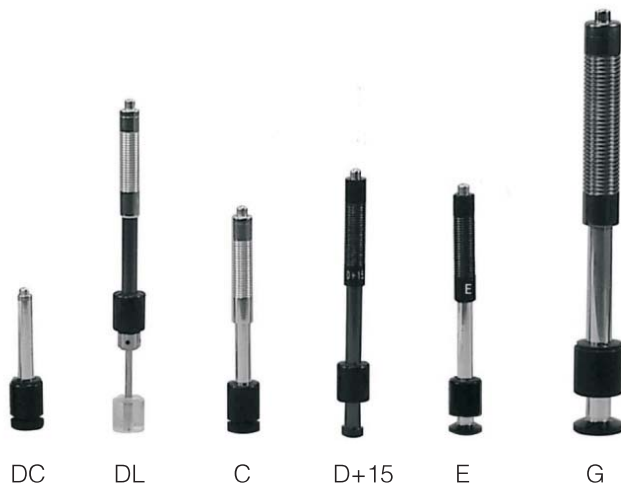
| Item | Commodity Name | Model | Code | quantity | remark |
|------|-----------------------------|--------------|---------|----------|------------------|
| 1 | SH-500 Main Unit | SH-500 | 852-150 | 1 | 2 years warranty |
| 2 | Impact device with cable | D | 852-410 | 1 | Consumables |
| 3 | Hardness block (750-830)HLD | (750-830)HLD | 852-630 | 1 | Consumables |
| 4 | Recharger | 882-851 | 882-851 | 1 | Consumables |
| 5 | Screw Driver | 882-951 | 882-951 | 1 | Consumables |
| 6 | ABS carrying case | 882-991 | 882-991 | 1 | Consumables |
| 7 | Brush | 852-860 | 852-860 | 1 | Consumables |
| 8 | Warranty card | SH-500 | / | 1 | ----- |
| 9 | Quality certificate | SH-500 | / | 1 | ----- |
| 10 | Operation manual | SH-500 | / | 1 | ----- |

1.3.2 Optional:

Optional Accessories as below:

| Item | Name | Model | Code | Qty | Remark |
|------|--------------------|---------|---------|-----|-------------|
| 1 | Impact Device | DC | 852-420 | / | Consumables |
| 2 | Impact Device | DL | 852-430 | / | Consumables |
| 3 | Impact Device | C | 852-440 | / | Consumables |
| 4 | Impact Device | D+15 | 852-450 | / | Consumables |
| 5 | Impact Device | E | 852-460 | / | Consumables |
| 6 | Impact Device | G | 852-470 | / | Consumables |
| 7 | Blue Tooth Printer | 890-831 | 890-831 | / | Consumables |
| 8 | Blue tooth | 852-710 | 852-710 | / | Consumables |

1.3.3 Impact Devices:



1.3.4 Specifications of Impact Devices:

Impact devices technical data, table1-3

Table 1-3

| Impact Device | Main Technical Data | | | | Hardness Range HL |
|---------------|---------------------|------------|-------------|----------|-------------------|
| | Weight/g | Energy/N·m | Diameter/mm | Material | |
| D | 5.5 | 11.0 | 3 | Tungsten | 200~900 |
| DC | 5.5 | 11.0 | 3 | Tungsten | 200~900 |
| G | 20.0 | 90.0 | 5 | Tungsten | 300~750 |
| C | 3.0 | 2.7 | 3 | Tungsten | 350~960 |

1.3.5 Features of Impact Devices:

Application of Impact devices, Table1-4

Table 1-4

| Impact Device | Application | Features | Weight/g |
|---------------|--|--|----------|
| D | for the majority of testing applications | Most widely used probe | 75 |
| DC | for applications in restricted spaces, e.g. in bores, cylinders or for measurement in assembled machines | Short impact device, the others features same like D | 50 |
| G | solid components, e.g. Heavy-duty casts and forged parts. | Increased impact energy, 9 times than D | 250 |
| C | For surface-hardened components, coatings, thin or impact-sensitive parts (small indentation) | Reduced impact energy, energy is 1/4 of D | 75 |
| E | for measurement in extreme hardness ranges (about 50HRC/60HV). Tool steels with high carbide content. | Diamond indenter (about 5000HV) | 80 |
| D+15 | for measurement under extreme space limitations or on the floor of grooves. | Slim measuring nose | 50 |

1.3.6 Technical of Impact Devices:

Specimen request, table 1-5

Table 1-5

| Specimen | Weight/kg | | | Min Thickness/mm | | Surface Roughness/um | | |
|---------------|-----------|---------|---------------|------------------|---------------|----------------------|-----|-----|
| Impact device | Coupling | Support | Test directly | Specimen | Harden layers | ISO | Ra | Rz |
| D、DC、D+15 | 0.10~2 | 2~5 | >5 | 5 | ≥0.8 | N 7 | 2 | 10 |
| G | 0.5~5 | 5~15 | >15 | 10 | | N 9 | 7 | 30 |
| C | 0.02~0.05 | 0.5~1.5 | >1.5 | 1 | ≥0.2 | N 5 | 0.4 | 2.5 |

Test pieces with curved surfaces may be tested on either the convex or concave surfaces providing that this radius of curvature of the specimens is matched to the size of the support ring and is not less than 2 in.

(50 mm) for the G impact device or 13/16 in. (30 mm) for other impact devices, see table 1-6

Table 1-6

| Impact device | radius of curvature/mm |
|---------------|------------------------|
| D、DC | ≥30 |
| G | ≥50 |

2、Structure Feature & Testing Principle

2.1 Structure of main unit and Impact D:

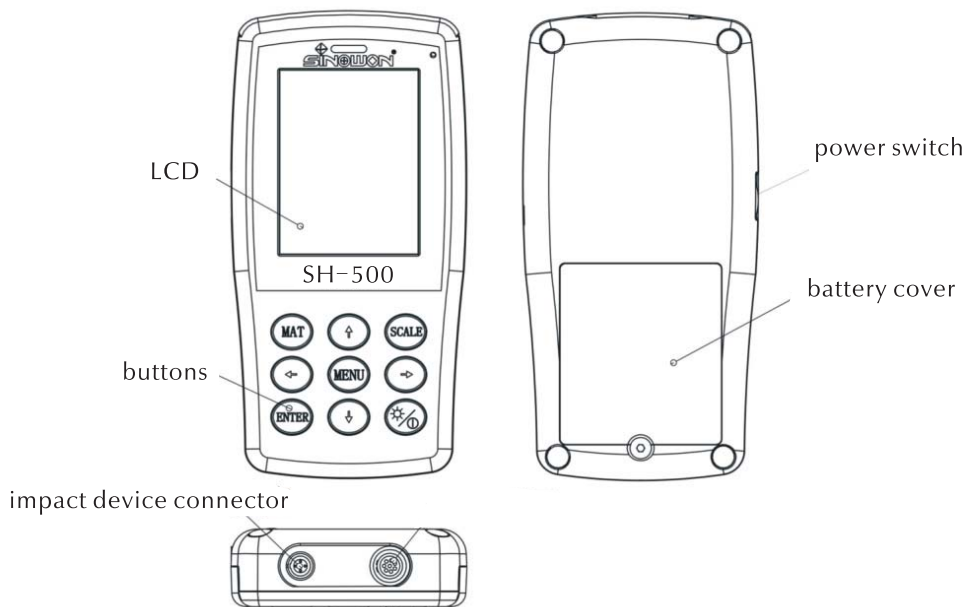


Fig 2-1-1 Structure of main unit

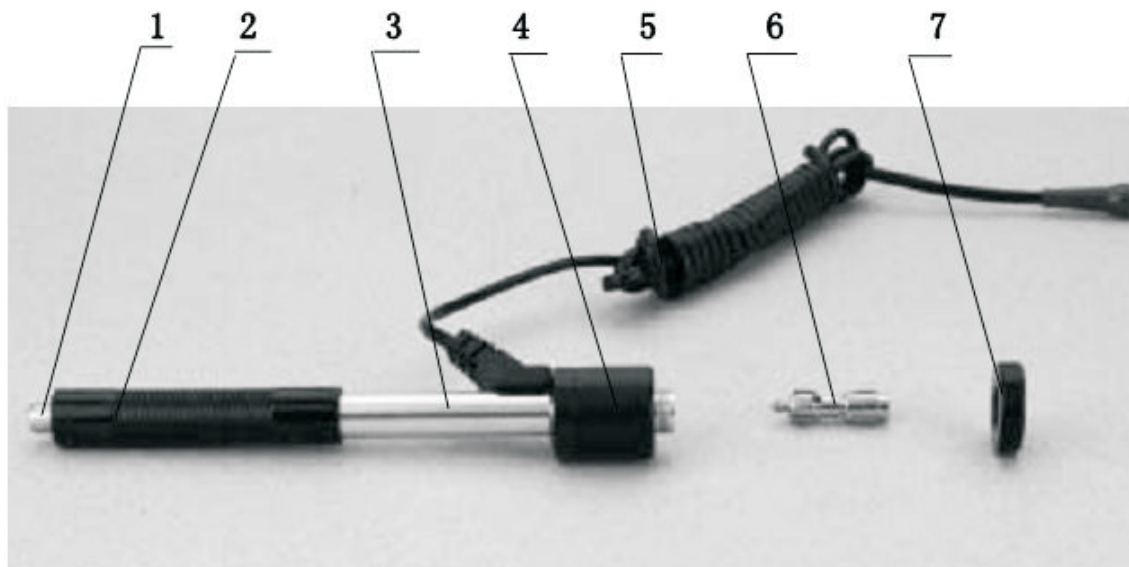


Fig 2-1-2 Structure of impact D

- | | | | |
|--------------------|----------------|----------------|-------------|
| 1 Release button | 2 Loading tube | 3 Guide tube | 4 Coil unit |
| 5 Connection cable | 6 Impact body | 7 Support ring | |

2.2 Testing Principle:

Leeb hardness value is calculated from comparing the energy of a test body before and after impacting on a sample. This Energy is quoted in the hardness unit HL and is calculated from comparing the impact and rebound velocities (v_a , v_r) of the impact body. It rebounds faster from harder samples than from softer ones, resulting in a greater energy quotient which is defined as $1000 \cdot v_r/v_a$.

$$HL = 1000 V_R/V_A$$

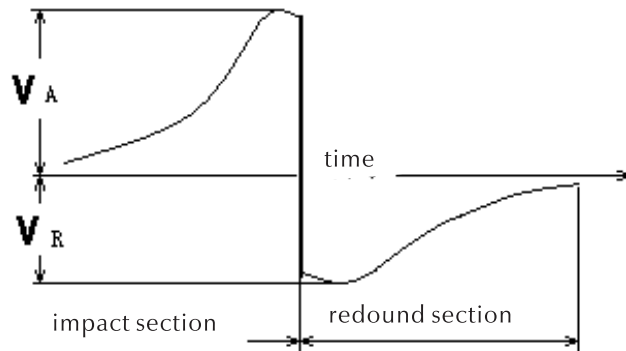


Fig 2-1

3、Technical Features

3.1 Technical Specification:

- Impact devices technical data conform table1-3
- Verification according to JJG747, permitted error and repeatability conform table2-2

Table 2-2 permitted error and repeatability

| Impact device type | Hardness range | Permitted error | repeatability |
|--------------------|----------------|-----------------|---------------|
| D | 490~830HLD | ± 12 HLD | 12HLD |
| DC | 490~830HLDC | ± 12 HLDC | 12HLDC |
| G | 460~630HLC | ± 12 HLC | 12HLC |
| C | 550~890HLC | ± 12 HLC | 12HLC |

- Test range: (170~960)HLD; (17~68.5) HRC;(19~651)HB;(80~976)HV;(30~100)HS;
(59~85)HRA; (13~100) HRB.
- Test direction: 360°.
- Hardness scales: leeb、Brinell、Rockwell HRB、Rockwell BRC、Rockwell HRA、Vickers、Shore.
- Metal Shell.
- 320×240 color LCD.
- 4800mA Li-ion Rechargeable battery.
- Working voltage: 4.2V.
- working time: 12 hours.
- Standby: one month.
- communication: Bluetooth.
- Storage: 500 groups test results, include 1-32 times test data for one group.
- Languages: Chinese, English, German, Turkish, etc.
- Standard delivery : Impact device D.
- Optional impact devices: DC/D+15/DL/G/C/E.
- Printing: Bluetooth wireless printer.

3.2 Weight and Packing:

Main unit dimension: 160*80*31(mm)

Weight: About 0.5(kg)

4、Operation

4.1 Preparation:

4.1.1 Preparation of the Sample Surface:

- In the preparation processing for sample surface, the hardness effect of being heated or cold processing on the surface of sample should be avoided.
- Too big roughness of the being measured surface could cause error. So, the surface of the sample to be measured must appear metallic luster, smoothing and polish, without oil stain.
- Light-weight sample must be firmly coupled with a heavy base plate. Both coupled surface must be flat and smooth, and there is no redundant coupling agent existing. The impact direction must be vertical to the coupled surface. When the sample is a big plate, long rod or bending piece, it can be deformed and become unstable, even though its weight and thickness is big enough, and accordingly, the test value may not be accurate. So the sample should be reinforced or supported at its back.
- For the sample with hardened layer on surface, the depth of hardened layer should conform to Table 1-5.
- Performance of the Leeb hardness test on parts with a residual magnetic field may affect the results. It is recommended that any residual magnetic field be less than 4 G.

4.1.2 Permitted Error:

- Before specimen measurement, please test the hardness block and see if permitted error and repeatability conform table 2-2.

▲ Remark: If exceeds table 2-2, please see part 6.6 to calibrate.

4.1.3 Indentation Distance:

- The distance between any two impact points shall not be less than two diameters edge-to-edge. The distance between the impact point and a specimen edge shall not be less than three diameters edge-to-edge. No point shall be impacted more than once, see table 2-3

Table 2-3

| Impact devices | istance between any two impact points/mm | distance between the impact point and a specimen edge/mm |
|----------------|--|--|
| | Not less than | Not less than |
| D、DC | 3 | 5 |
| DL | 3 | 5 |
| D+15 | 3 | 5 |
| G | 4 | 8 |
| E | 3 | 5 |
| C | 2 | 4 |

4.1.4 Parameters Settings:

4.1.4.1 Buttons illustration, see part 6.4

4.1.4.2 System setting, see part 6.5.1

4.1.4.3 Test setting, see part 6.5.2

4.1.4.4 Calibration, see part 6.6

4.2 Operation Details:

4.2.1 Operation:

- Insert the plug of the impact device into the socket of impact device on the instrument, slide power switch, instrument goes to testing status.
- LCD shows impact device after connect well, fig 4-2-1 shows the impact device is D.
- ▲ If no impact device connected, show DL, default impact device is DL.
- Press **【 SCALE 】** to switch display hardness scales, press **【 ← 】** choose test direction, press **【 → 】** adjust test number. The third row shows current measurement, material is stainless steel, direction is downward.
- ▲ Please do not change test direction during testing.
- Press the release button on the upside of the impact device to test.
- ▲ Remark: The sample and the impact device as well as the operator are all required to be stable now. The action direction should pass the axis of the impact device.
- After unloading, it shows result and test number increase 1; if exceeds set permitted error, made 2 sounds and LCD show ↑ or ↓. And will not include test group. If test number reached setting, make 2 sounds, see fig 4-2-1.
- ▲ Remark: Press **【 ↑ 】** or **【 ↓ 】** to check the test results.
- Each measure area of the sample usually need 3 to 5 times of testing operation. The result data dispersion should not more than mean value $\pm 15HL$.
- If want accurate conversion from the Leeb hardness value to other hardness value, contrastive test is needed to get conversion relations for the special material. Use inspection qualified Leeb hardness tester and corresponding hardness tester to test at the same sample respectively. For each hardness value, each measure homogeneously 5 points of Leeb hardness value in the surrounding of more than three indentations which need conversion hardness, using Leeb hardness arithmetic average value and corresponding hardness average value as correlative value respectively, make individual hardness contrastive curve. Contrastive curve at least should include three group of correlative data.
- Read hardness value, print test results, power off.

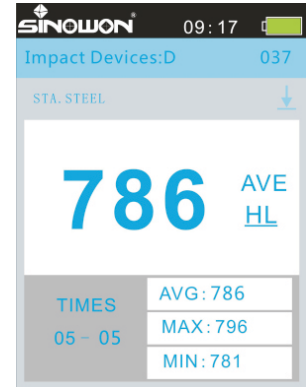


Fig 4-2-1

4.3 Result Reading:

The average Leeb hardness number for each test area with the impact device indicated (for example, 700HLD or 700HLD+15).

When hardness values converted from the Leeb number are reported, the instrument used shall be reported in parentheses, for example, HB (HLC).

5、Special Attention

- Please make sure power off when replace impact device .
- When did not reach set test number, it can not save and print tested results.
- Only impact device D and DC can test strength.
- Hardness conversion according to ASTM E140.
- Do not use lubricant for impact devices.

6、 Operation Illustration

6.1 Power on :

Upward slide power switch, it will show fig 6-1-1, then auto check impact device, then check whether correct, and enter main interface fig 6-1-2.



Fig 6-1-1



Fig 6-1-2

6.2 Power off:

At any time downwards power switch, power off.

6.3 Interface Illustration:

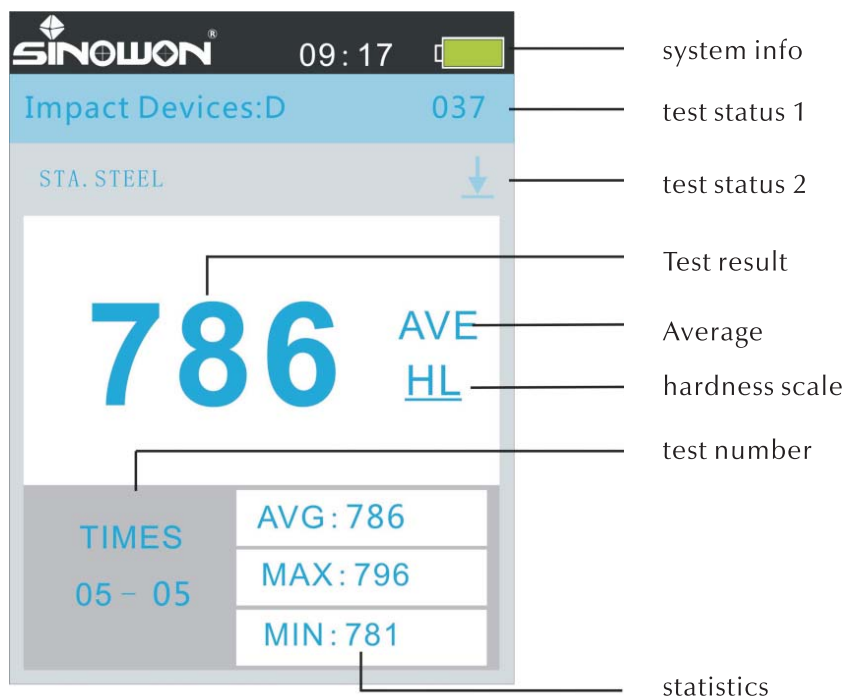



Fig 6-3

- **System Info:** From left to right: Brand Sinowon; Time; Battery, show battery status.
- **Test Status 1:** From left to right: Impact device D, test number, now it is 37.
- **Test Status 2:** Show Test materials and direction.
- **AVE:** Shows when tested down current group
- **Test result:** show test result, ↑ higher than hardness range, ↓ lower than hardness range; then show average value.
- **Hardness scale:** show test hardness scale.
- **Test number:** show test number in one group.
- **Statistics:** show average, min and max value in one group test results.

6.4 Buttons Operation:

- **【 MAT 】** ——select printing data.
- **【 SCALE 】** ——1. Select test hardness scales, 2.when printing, used to print selected data.
- **【 MENU 】** ——enter system setting, and as back to previous menu.
- **【 ETR 】** ——used as confirm button, and edit.
- **【 ↑ 】** ——direction button, see previous test result .
- **【 ↓ 】** ——direction button, see next test result.
- **【 → 】** ——1.right button; 2. Increase test number; 3.backlight adjust, 4.page down when check test results; 5.increase when edit mode.
- **【 ← 】** ——1.left button; 2change impact direction 3.backlight adjust, 4.page up when check test results; 5. Decrease when edit mode.
-  ——power on/off backlight .

6.5 Menu :

Press **【 MENU 】** to see 6 items, Fig 6-5-1:

[1]System Setting、[2]Test Setting、[3]Storage Setting、[4]Printing Setting、[5]Software info、[6]HepI .

Press **【 ↑ 】** or **【 ↓ 】** switch menu item, press **【 ETR 】** enter sub menu.

6.5.1 System Setting :

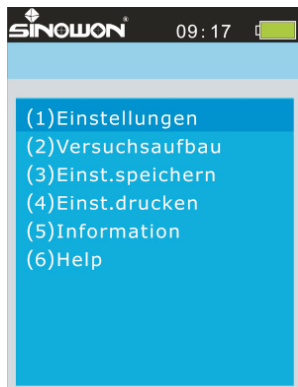


Fig 6-5-1

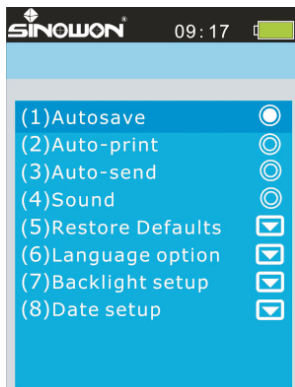


Fig 6-5-2

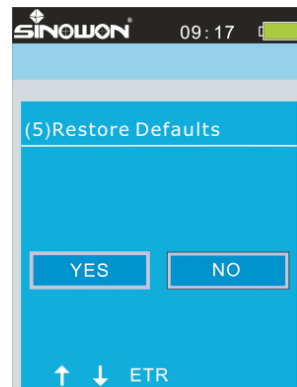


Fig 6-5-3

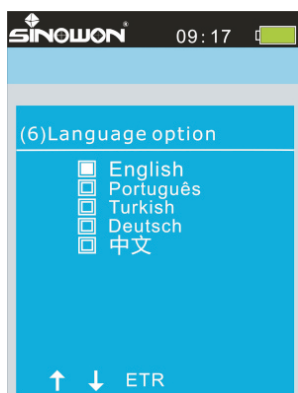


Fig 6-5-4

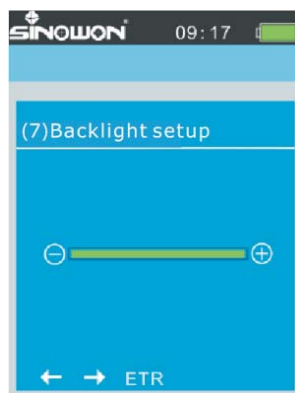


Fig 6-5-5



Fig 6-5-6

Press [MENU] in main unit, enter system setting, Fig 6-5-1, press [↑] or [↓] switch to [1] system setting, then press [ETR] enter sub menu, fig 6-5-2.

● Auto Save

Press [↑] or [↓] switch to auto save, press [ETR] to switch on/off; ☒ means switch on, ☐ means off, press [MENU] back to previous step.

● Auto Print

Press [↑] or [↓] switch to auto print, Press [ETR] to switch on/off, press [MENU] back to previous step.

▲ **Remark:** when auto print switch on, then each measurement will be printed by blue tooth printer (printer is connected well).

● Auto Send

Switch to auto send, press **[ETR]** switch to on/off, press **[MENU]** back to previous step.

▲Remark: when auto send switch on, then each measurement will be sent to blue tooth printer (printer is connected well).

● Sound

Switch to sound, press **[ETR]** to switch on/off, press **[MENU]** back to previous step.

● Restore defaults

Switch to restore defaults, press **[ETR]** to sub menu, fig 6-5-3, press **[←]** or **[→]** move to "YES", press **[ETR]**, LCD shows "Please wait..." system execute defaults setup, and back to previous step. Press "NO" to cancel, press **[MENU]** back to previous step.

▲Remark: This function will clean all the setup.

● Language Option

Select the language like Chinese, English, German, etc.

 means selected,  not selected.

● Backlight setup

This function is to adjust backlight.

● Date setup

Press **[ETR]** to sub menu, Fig.6-5-6, then press **[ETR]** to edit mode, after set well, then press **[MENU]** to previous step.

6.5.2 Test Setting :

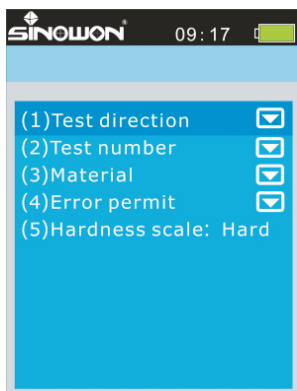


Fig 6-5-7

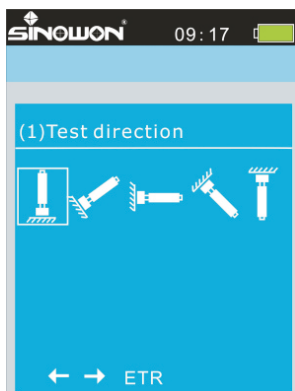


Fig 6-5-8

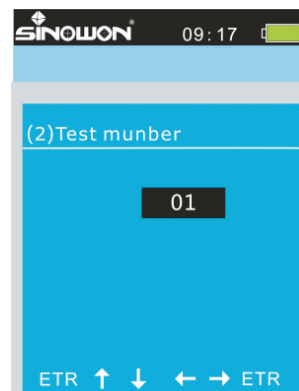


Fig 6-5-9

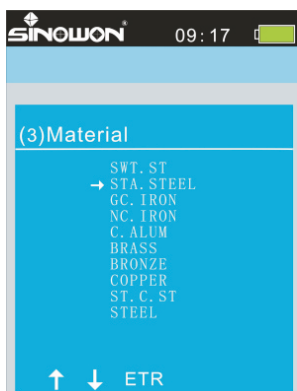


Fig 6-5-10



Fig 6-5-11

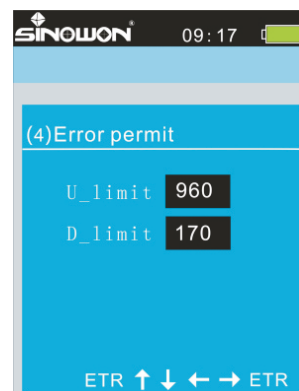


Fig 6-5-12

In main interface, press **【MENU】** enter system menu, fig 6-5-1, press **【↑】** or **【↓】** switch to test setting, press **【ETR】** enter sub menu, following 5 items are included, fig 6-5-7.

● Test direction

Switch to test direction and press **【ETR】** enter direction selection page, fig 6-5-8. In main page, press **【←】** can quickly switch test direction.

● Test Number

In Fig6-5-9, press ETR to edit, and press direction buttons to adjust number, pres [ETR] finish. In main page press **【→】** increase test number.

● Material

This function is to select test materials.

● Error Permit

In test setting page, switch to error permit, fig 6-5-11. Pres ETR to edit. This function is to judge test result whether in set range, if exceeds range, it shows LIMIT. Fig6-5-12, If test result not in the range 170-960, the result will not included.

● Hardness Scale

When select hardness, it will show fig6-5-10 for all materials. When select strength, it show Fig6-5-11, press [ETR] switch hardness/strength.

6.5.3Storage Setting:

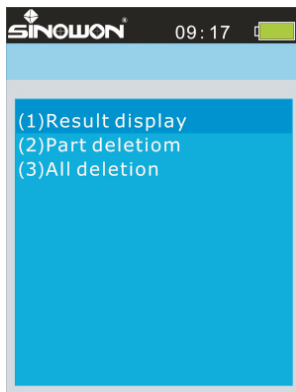


Fig6-5-13



Fig6-5-14

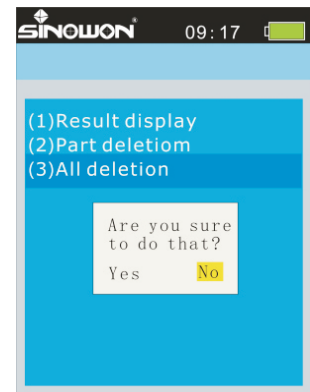


Fig6-5-15

In main interface, press [MENU] enter system menu, fig 6-5-1, press [↑] or [↓] switch to storage setting, press [ETR] enter sub menu, following 3 items are included, fig 6-5-13.

● Result display

- ◆ In Fig6-5-13, Press button [ETR] to see all test results, like fig6-5-14. If no result, it will show no data.
- ◆ Press [↑] or [↓] to choose result, press [←] or [→] change page UP or page DOWN.
Press [ETR] to see more details.

● Part Deletion

Press [ETR] select will be deleted data, press [SCALE] delete and [MENU] to cancel.

● All deletion

Delete all test results.

6.5.4 Printing Setting:

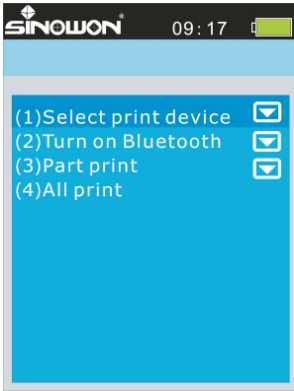


Fig 6-5-16

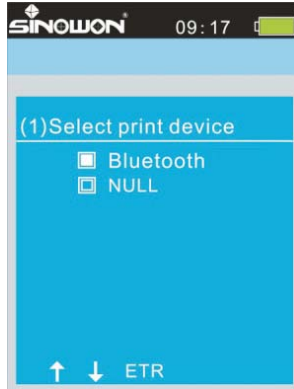


Fig 6-5-17

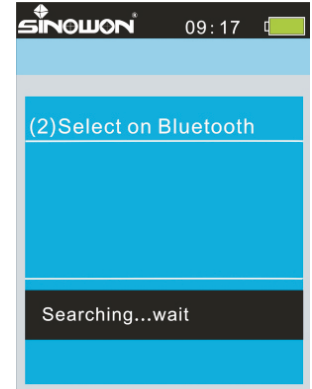


Fig 6-5-18

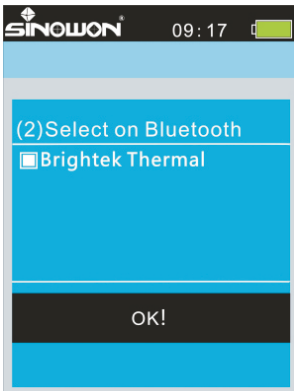


Fig 6-5-19

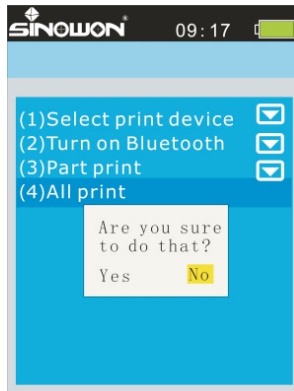


Fig 6-5-20

- **Select print device**——Press [ETR] select print device: Bluetooth /NULL; select “Bluetooth” to connect Bluetooth printer; select “NULL” means do not connect any printer. Fig 6-5-17, the current device is “Bluetooth printer”.
- **Select on Bluetooth**——Press [ETR] to select device, see fig6-5-18; after a few seconds show connected, then display shows OK, means connected well, see Fig6-5-19.
 1. Make sure print device is “Bluetooth”;
 2. It takes a few seconds to connect;
 3. If connected failed, press 【MENU】 back to previous step, and do it again.
- **Part Print**——This function is to print selected test results.
- **All print**——See Fig6-5-20, Press yes and [ETR] to print all test results.

6.5.5 Version info:

In main page press **[MENU]** enter system setting, see Fig 6-5-1, switch to Version Info to see instrument info, show as Fig6-5-20.

6.5.6 Operation Help:

Press **[MENU]** enter system setting page, see Fig 6-5-1, switch to Help to enter sub menu, see Fig6-5-21 to get details of operation information.



Fig 6-5-21

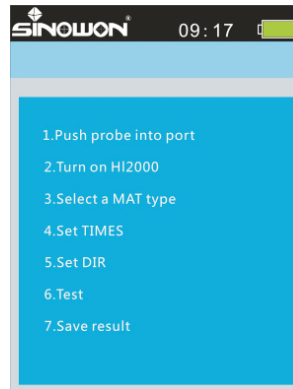


Fig 6-5-22

6.6 Software Calibration:

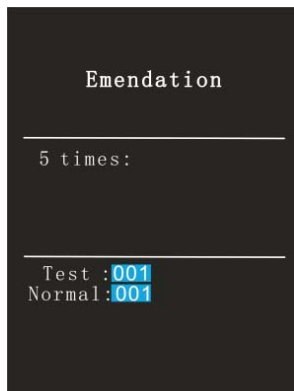


Fig 6-6-1

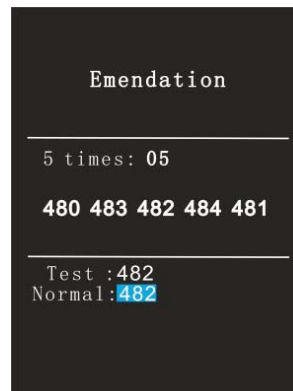


Fig 6-6-2

he first time use this instrument or long time no use, please make calibration before measurement. Each probe needs to be calibrated.

Press **[ETR]** and power button at the same time, then enter calibration page, see Fig6-6-1.


Make 5 measurement in same hardness block, then average value will be displayed in Test, then will auto fill into Normal value, see Fig6-6-2.


Then press **[↑]** or **[↓]** to adjust normal value according to standard block, press **[ETR]** to finish calibration.

If want to cancel the operation, just press **[MENU]**.

6.7 TAbout Battery:

● Recharge Battery

Instrument already included lithium ion battery 4.2V/4800mAh, when show battery like  means battery is low, please recharging soon.

Use USB power cable, available power is AC220V/50Hz or AC110V/60Hz, generally needs 8hours to recharging full, but do not less than 4 hours, when show  means recharging done.

● Replace Battery

When can not recharging, or only can work short time, then please consider replace a battery.

Please note must be power off when replace battery.

7、Trouble Shooting

| Trouble | Analysis | Solution |
|-----------------------------------|--|--|
| Power on no display | 1.No battery、 2.Battery damaged 3.Fuse broken | 1.Recharging then power on 2.Replace battery 3.Replace fuse |
| Can not recharging | Battery damaged | Replace battery |
| No test result | Bad connection with impact device | Check if impact device did not connect well with main unit, otherwise, impact device is broken, please replace one. |
| No test result, but show ↑ ↓ . | Exceeds test hardness range | Place use others hardness scales and try again, if still no results, please test by bench hardness tester to see the hardness value. |
| Dark display, can not see clearly | 1.adjust backlight 2.LCD damaged | 1.adjust backlight by press left and right direction button 2.contact with our service to repair |
| Restart when recharging | 1.recharger did not connect well with main unit 2.recharger is damaged | 1.reconnect 2.Buy a new recharger |
| Exceeds permitted error | 1.impact device is broken 2.impact tube is dirty 3.calibration value is disorder | 1.replace impact device 2.clean impact tube 3 recalibration |

8、Maintenance

- When verification by rockwell hardness block and error higher than 2HRC, then please replace new impact device.
- Please do not disassemble instrument but send to us for repair if any malfunction.

9、Calibration Interval

- Generally hardness tester needs to be verified each year.

10、 Notice

- Two years warranty for main unit only for quality problem, the others accessories are not under warranty. Refer packing list of hardness tester.
- please show invoice and warranty card in case need repair.
- we ask for charges for accessories not under warranty.

11、 Notice of Transport and Storage Conditions

- Storage should be far away from the vibration, corrosion, moisture, dust, also should be stored at a normal temperature and humidity. Please put in the original packing box before transportation to avoid any damage.



ISO 9001:2015 Certified Company



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