# iLeeb-300 Portable Hardness Tester

## Instruction Manual


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# Contents

# 1.Brief Introduction

## 1.1 Features

●Probe automatic identification, plug and play (other manufacturers require users to plug the probe before boot)

●Using Cortex-M0 core high-performance ARM processor as the main control chip, processing speed;

●Unique full-format display, at the main interface, all the standard can be displayed, no need to look up the table, no need to switch;

●Leeb hardness shock wave display, can determine the effectiveness of testing and impact device working conditions, such as whether the probe is worn, whether there is dirt in the casing.

●With USB communication interface, standard with host computer data processing software.

●With Bluetooth Printing Function, Optional Bluetooth Printer. According to the principle of Leeb hardness measurement, a variety of metal materials can be tested.

●The power supply adopts 2 AA (No. 5) size ordinary alkaline batteries, which can work continuously for not less than 50h. It has the functions of automatic dormancy, automatic shutdown and other power-saving functions.

●The instrument is compact, portable, high reliability and suitable for harsh operating environment, anti-vibration, impact and electromagnetic interference.

## 1.2 Main Purpose and Scope of Application

### 1.2.1 Main Purpose

●Mold cavity;

●Bearings and other parts;

●Failure analysis of pressure vessel, steam turbine generator unit and its equipment;

# 1.Brief Introduction

●Heavy workpieces;

●Installed mechanical or permanently assembled parts;

●Workpieces with narrow test space;

●Formal original records of test results are required;

●Material differentiation of metal material warehouse;

●Rapid inspection of multiple measuring parts in a large range of large workpieces.

### 1.2.2 Scope of Application

See attached table 1 and 2 for the scope of application.

## 1.3 Working Conditions

Ambient temperature: operating temperature - 10 ℃ ~ + 50 ℃;

Storage temperature: - 30 ℃ ~ + 60 ℃;

Relative humidity ≤ 90%;

There is no strong vibration, strong magnetic field, corrosive medium and serious dust in the surrounding environment.

# 2.Technical Parameters

See the table below for indication error and indication repeatability.

Table 2-1

| No. | Impact device Type | Standard Hardness Test Block | Indication error | Indication repeatability |
|---|---|---|---|---|
| 1 | D | 760±30HLD<br>530±40HLD | ±6 HLD<br>±10 HLD | 6 HLD<br>10 HLD |
| 2 | DC | 760±30HLDC<br>530±40HLDC | ±6 HLDC<br>±10 HLDC | 6 HLD<br>10 HLD |
| 3 | DL | 878±30HLDL<br>736±40HLDL | ±12 HLDL | 12 HLDL |
| 4 | D+15 | 766±30HLD+15<br>544±40HLD+15 | ±12 HLD+15 | 12 HLD+15 |
| 5 | G | 590±40HLG<br>500±40HLG | ±12 HLG | 12 HLG |
| 6 | E | 725±30HLE<br>508±40HLE | ±12 HLE | 12 HLE |
| 7 | C | 822±30HLC<br>590±40HLC | ±12 HLC | 12 HLC |

●Measurement range: HLD (170 ~ 960);

●Measurement direction: support vertical downward, oblique downward, horizontal, oblique upward and vertical upward;

●Measuring materials: steel and cast steel, alloy tool steel, cast aluminum alloy, gray cast iron, nodular cast iron, stainless steel, copper zinc alloy (brass), copper tin alloy (bronze), pure copper;

●Hardness system: Richter (HL), Brinell (HB), Rockwell B (HRB), Rockwell C (HRC), Vickers (HV), shore (HS);

●Display: color screen;

●Data storage: up to 100 groups (impact times 32 ~ 1);

●Working voltage: 3V (two AA size alkaline batteries in series);

●Continuous working time: Low brightness for about 15 hours;High brightness for about 7 hours;

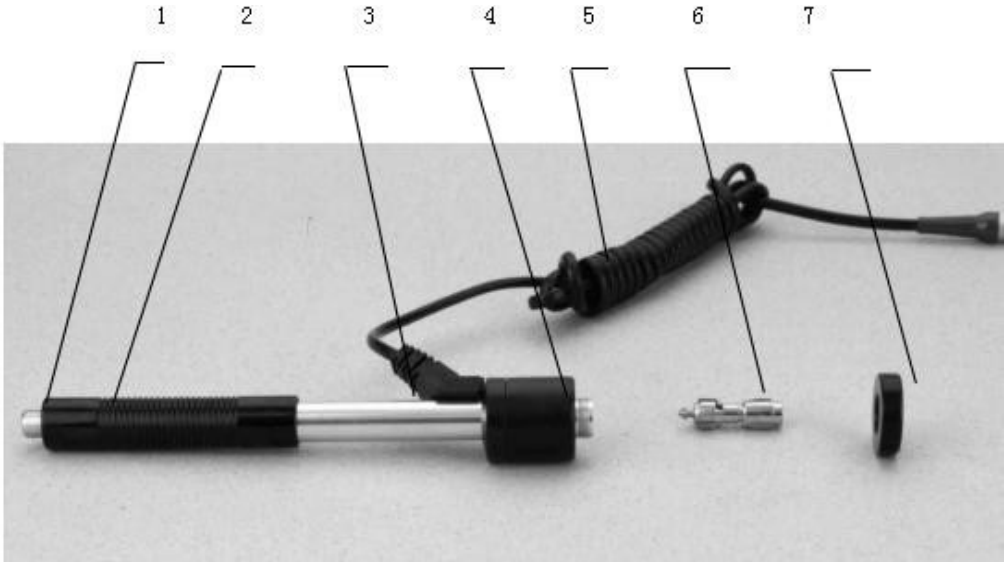
●Communication interface standard: USB;

# 3.Structural Features and Working Principle

## 3.1Structural features


1.Impact device socket 2. Impact device 3.Main unit 4. Keyboard 5.Screen

### 3.1.1 D Impact Device




1.release button

2. loading sleeve

3. conduit

4. coil part

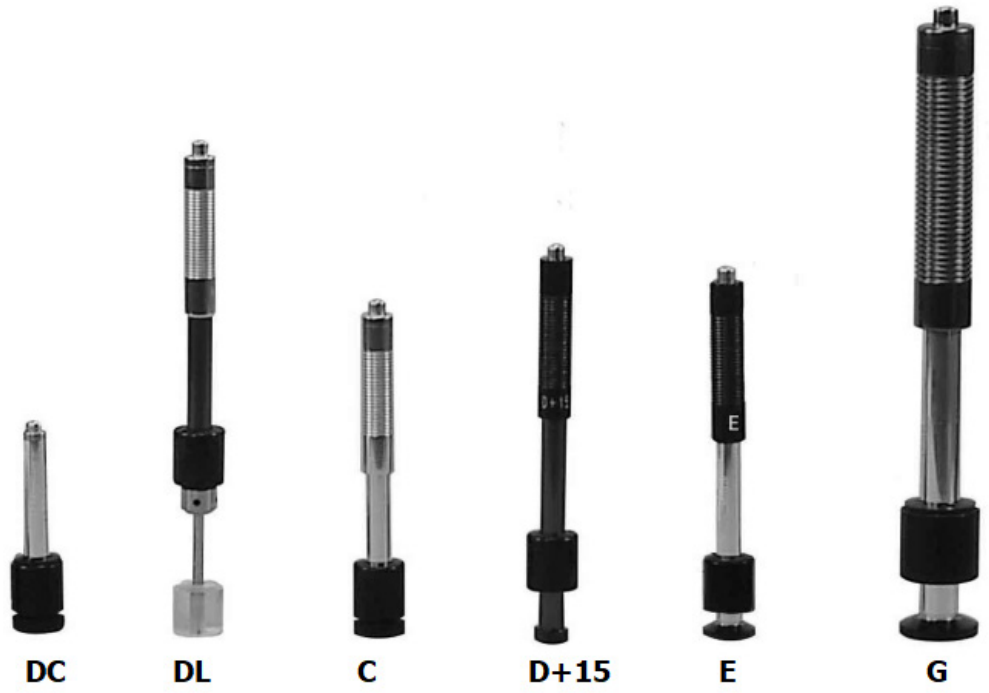
5. wire

6.impact body

7. support ring

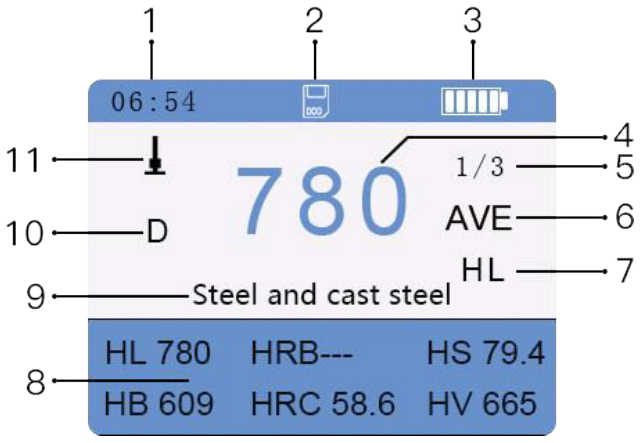
# 3.Structural Features and Working Principle

### 3.1.2 Special Shaped Impact Device




### 3.2Main Display Interface

After startup, the instrument will automatically enter the main display interface, as shown in the following figure:




1. Time display
2. Automatic storage Flag
3. Battery level display
4. Measured value
5. Number of measurements
6. Average flag
7.Hardness value
8. 6 display of hardness system
9. Material of tested material
10.Impact device type
11. Impact direction

# 3.Structural Features and Working Principle

**Description of main display interface**

**Material:** the currently set material.

**Impact direction:** current impact direction.

**Hardness system:** the hardness system of the current measured value.

**Battery power:** displays the remaining power.

**Measured value:** current single measured value (no average value prompt), current average value (with average value prompt).

The display "- Hi -" indicates that the conversion or measurement range is exceeded, and "- Lo -" indicates that it is lower than the conversion or measurement range.

**Impact times:** the completed impact times are displayed during measurement, and the set impact times are displayed when the impact times are set with the key, Average **value Icon:** after reaching the set impact times, the average value icon "Ave" appears.

## 3.3Keyboard Definition

| | | | | | |
|---|---|---|---|---|---|
| MAT | Material selection | HD | UP / Hardness system selection | MENU | Enter menu |
| DIR ← | Direction / Left | | Data statistics / Down | SAVE → | Save / Right |
| | Waveform view | CNT | Average times setting | | On/Off |

●Press MAT the key to change the material setting, and each press will cycle among the materials.

●The hardness system setting can be changed by pressing the HD key. Each press will change the current material and impact device circulation between various hardness systems.

●Press MENU the key to enter the menu mode for various settings.

# 3.Structural Features and Working Principle

●Press CNT the key to modify the setting of impact times, enter the setting state of [impact times] on time for the first time, and select the box to display the currently set impact times, press HD or DIR set the times, and then exit the setting on time.

●Press DIR the key to modify the impact direction of the impact device, and each press will cycle between each direction.

●Press SAVE the key to save the measurement data without opening the automatic data saving. The saved data can only be saved when it is the display average value.

●Press the key to view the statistical table of data measured each time.

●Press the key to view the impact waveform generated during impact measurement and judge the accuracy of data from the surface. Refer to Section 3.4 working principle

●Press the key to start / shut down. Generally, it needs to be pressed for 3 seconds to start / shut down.

## 3.4Working Principle

Impact the surface of the sample at a certain speed with an impact body of specified quality under the action of elastic force, and use a punch to

Calculate the hardness value according to the ratio of rebound speed and impact speed at 1mm on the surface. The calculation formula is as follows:

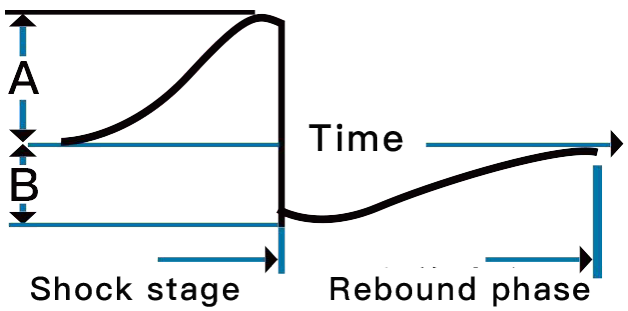
HL=1000 × VB/VA

Where:

HL - Leeb hardness value

VB - rebound speed of impact body

VA - impact speed of impactor




The output signal diagram of the impact device is shown in the right figure.

# 4.Preparation before Measurement

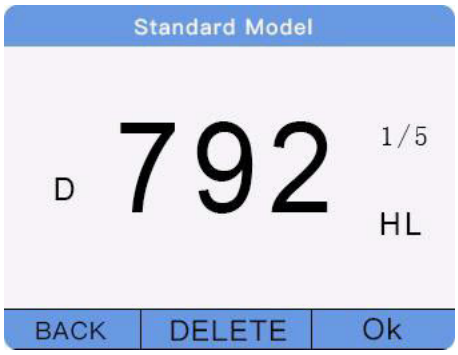
## 4.1Instrument Preparation

For newly purchased instruments, please check carefully with reference to the packing list. If the instruments and accessories are incomplete, please contact the manufacturer in time.

Before using the instrument for the first time or after a long time of non use, the instrument and impact device must be calibrated with random Leeb hardness block (i.e. user calibration)

When a host machine is equipped with multiple types of impact devices, each impact device only needs to be calibrated once, and there is no need to re-calibrate after replacing the impact device.

Press [wave] and [power] hold the key while pressing the key to start the machine to enter the user calibration interface, as shown in the figure below:




Measure 5 points vertically downward on the calibrated Leeb hardness block. After measuring 5 points, the display will show the average value and "Ave" sign.

Press [HD] [↕] the key to enter the standard value.

Press the OK key to complete the calibration or press the return key to cancel the calibration operation.

## 4.2Selection of Impact Device

Please refer to attached table 1 of this manual for the basis of selection.

# 4.Preparation before Measurement

## 4.3Preparation of measured working piece

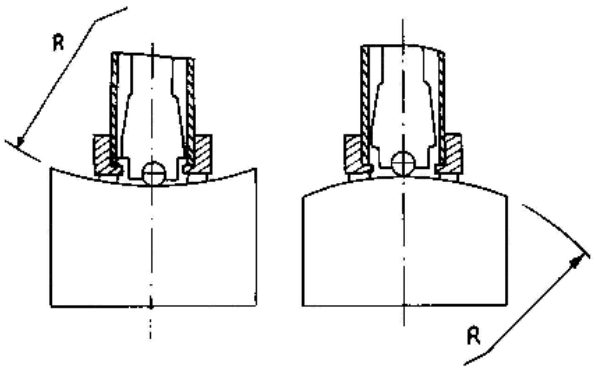
The surface condition of the working piece shall meet the relevant requirements in Table 3. In addition:

●The surface temperature of the working piece shall not be overheated and shall be less than 120 °C.

●The surface roughness of the working piece shall not be too large, otherwise it will cause measurement error. The measured surface of the working piece must show metallic luster, and be flat, smooth and free of oil stain.

●Requirements for working piece weight: no support is required for heavy samples weighing more than 5kg; The test piece with a weight of 2-5kg, the test piece with a overhanging part and the thin-walled test piece shall be supported by an object during the test, so as to avoid the deformation, bending and movement of the test piece caused by the impact force. For medium-sized working pieces, they must be placed on a flat and solid plane, and the samples must be placed absolutely stably without any shaking.

●Curved surface working piece: the test surface of the working piece is preferably flat. When the curvature radius r of the measured surface is less than 30mm (D, DC, D + 15, C, e, DL impact device) and less than 50mm (g impact device), small support ring or special-shaped support ring shall be used during the test.




●The workpiece shall have sufficient thickness, and the minimum thickness of the workpiece shall comply with the provisions of Table 3.

# 4.Preparation before Measurement

●For workpieces with surface hardening layer, the depth of hardening layer shall comply with the provisions of Table 3.

●Coupling: light workpieces must be closely coupled with solid supports, the two coupling surfaces must be flat and smooth, the amount of coupling agent should not be too much, and the test direction must be perpendicular to the coupling plane; When the workpiece is a large-area plate, long rod and curved part, even if the weight and thickness are large, it may still cause deformation and instability of the test piece, resulting in inaccurate test values. Therefore, it shall be reinforced or supported on the back of the test point.

●The magnetism of the workpiece itself shall be less than 30 Gauss.

# 5.Measurement Method

**Note:** the value of random hardness block is measured vertically downward on it for 5 times with a calibrated Leeb hardness tester, and the arithmetic mean value is taken as the hardness value of random hardness block. If the value exceeds the standard, the user calibration function can be used for calibration.

Before measurement, the instrument can be tested with random hardness block, and the indication error and repeatability shall not be greater than those specified in Table 2-1.

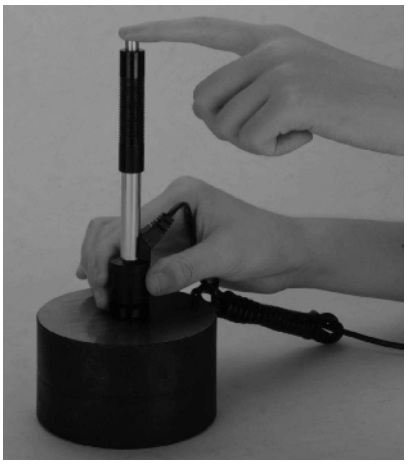
## 5.1Startup

insert the impact device plug into the impact device socket of the instrument.

press ⏻ the key for a long time. At this time, the power is turned on, and the instrument starts and enters the measurement state.

# 5.Measurement Method

## 5.2Loading



●Push down the loading sleeve to lock the impact device ; For DC type impact device, the loading rod can be sucked on the surface of the sample, and the DC type impact device can be inserted into the loading rod until the stop position. At this time, the loading is completed.

## 5.3Positioning

Press the supporting ring of the impact device tightly on the sample surface according to the selected measurement direction, and the impact direction shall be perpendicular to the test surface;

## 5.4Measurement

●press the release button on the upper part of the impact device for measurement. At this time, the sample, impact device and operator shall be stable, and the force direction shall pass through the axis of the impact device. Each time a measurement is completed, the display screen will display the measured value; The count of impact times increases by 1; If the measurement range is exceeded, the buzzer will sound for a long time; After reaching the set number of shocks, the buzzer will give two short beeps. After waiting for 2 seconds, the buzzer will give one short beep to display the average value.

# 5.Measurement Method

●Each measuring part of the sample is generally tested for many times. The data dispersion shall not exceed ± 15hl of the average value.

●The distance between any two indentations or the distance between the center of any indentation and the edge of the sample shall comply with the provisions in the following table.

●For specific materials, in order to accurately convert the Leeb hardness value into other hardness values, comparative tests must be conducted to obtain the corresponding conversion relationship. The method is: use the qualified Leeb hardness tester and the corresponding hardness tester to test on the same sample respectively. For each hardness value, measure the Leeb hardness of five points evenly distributed around more than three hardness indentations to be converted, and use the average value of Leeb hardness and the average value of corresponding hardness as the corresponding values to make the hardness comparison curve. The comparison curve shall include at least three groups of corresponding data.

Table 5-1

| Impact Device Type | Distance between two indentation centers | Distance between indentation center and specimen edge |
|---|---|---|
| | Not less than | Not less than |
| D; DC | 3mm | 5mm |
| DL | 3mm | 5mm |
| D+15 | 3mm | 5mm |
| G | 4mm | 8mm |
| E | 3mm | 5mm |
| C | 2mm | 4mm |

## 5.5Reading Measured Values

●Use the average value of multiple effective test points as one Leeb hardness test data.

●The hardness value is shown in front of the Richter hardness symbol HL, and the type of

# 5.Measurement Method

impact device is shown in front of the value.

### 5.6Special Tips

●Under normal conditions, the current measured value cannot be stored when the set impact times are not reached.

●Only D-type and DC type impact devices have strength measurement function, so when using other types of impact devices, it will not be possible to switch to strength measurement function. If D / DC type impact device is used and set as strength measurement mode.

●Not all materials can be converted to all hardness systems.

# 6.Instrument Operation

### 6.1Instrument Startup and Shutdown

1)Insert the impact device plug into the instrument impact device socket;

2)Press ⏻ the key for a long time. With the startup beep, the instrument will automatically detect the type of impact device and display it. At this time, please pay attention to whether it is correct, and then enter the main measurement display interface. At this time, the parameters of the instrument are the parameters used before the last shutdown;

3)In the power on state, the ⏻ long key can realize the shutdown operation.

### 6.2Material Setting

Press MAT the key to change the material setting. Each press will cycle among the materials and change the hardness system to Richter scale, so set the material first and then the

hardness system.

### 6.3Hardness Test Setup

The HD key can be switched and selected in various hardness systems. The hardness systems supported by the instrument include HL, HV, Hb, HRA、HRC, HS and HRB.

### 6.4Setting of Impact Direction

Press DIR the key to change the impact direction setting.

### 6.5Average Frequency Setting

The average number of times can be modified in the range of 1 ~ 32 times.

Press CNT the key to enter the "impact times" setting state, and frame select to display the current impact times. Press HD the key and the key to adjust the impact times to a predetermined value.

In the setting state of "impact times", press CNT to exit the setting.

### 6.6Storage Function

#### 6.6.1Storing Test Results

Up to 100 data groups can be stored in the instrument.

After hardness measurement, you can directly press SAVE the key to save the current data group into the instrument; The storage operation is valid only after the average value is displayed, and can only be saved once. If the measurement is not finished (the average value is not displayed), the data cannot be saved.

During data storage, the storage icon on the display flashes, indicating that storage is in progress.

When storing values, if the total number of records in the current file has reached 100, the

instrument will automatically overwrite the 100th group.

### 6.7Statistical Function

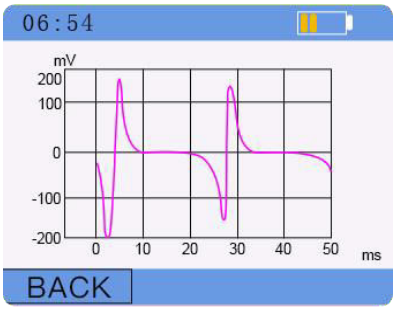
This instrument has a statistical table for viewing each measurement, which can more intuitively view each measurement value.

Press the key to enter the statistics interface and view the statistics table of each measured value within the set number of times.

### 6.8Shock Waveform Display Function

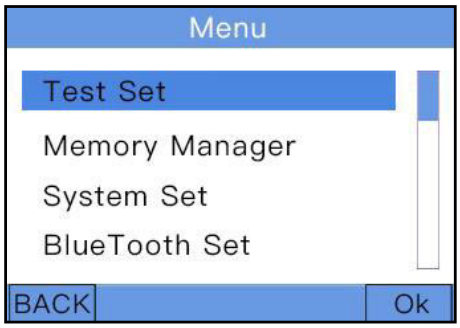
The instrument has the function of viewing the impact waveform display of each measurement.

Press the key to view the display of the impact waveform. From the impact waveform, you can judge the effectiveness of the test and the working state of the impact device, such as whether the probe is worn and whether there is dirt in the casing.




### 6.9Menu Functions

Press MENU the key to set the test conditions, storage management, system setting and view the product information of the instrument.



# 6.Instrument Operation

### 6.9.1Test Condition Setting

6.9.1.1 Setting of Impact Device

Press MENU the key, select "test condition setting" through the key, press the OK key to set the impact device, press the OK key to select the impact device model, and select auto as the automatic impact device. If you like or the machine cannot be recognized, you can manually select the impact device of D / DC / DL / D + 15 / C / G / E model respectively.

6.9.1.2 Material Setting

Press MENU the key, select "test condition setting" through the key, and press the confirm key to enter the material setting interface. In the hardness mode, you can select the options of "steel and cast steel", "alloy tool steel", "cast aluminum alloy", "gray cast iron", "nodular cast iron", "stainless steel", "copper zinc alloy", "copper tin alloy" and "pure copper". In the strength mode, the options of "carbon steel", "chromium steel", "chromium vanadium steel", "chromium nickel steel", "chromium molybdenum steel", "chromium nickel molybdenum steel", "chromium manganese silicon steel", "ultra-high strength steel" and "stainless steel" are available.

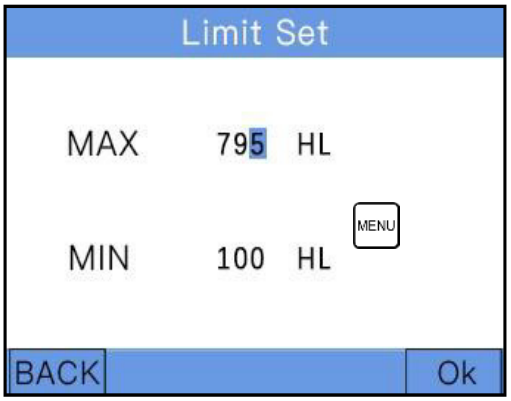
6.9.1.3 Times Setting

Press MENU the key and select "test condition setting" through the key. After pressing the confirm key, you can select the "times setting" interface, which can select the times of measuring and calculating the average value. The selection range of times is 1-32 times.

6.9.1.4 Setting Limits

Pressthe MENU key, select "test condition setting" through the key, and press the OK key to select the "set limit" interface. After entering the set limit, you can set the required upper and lower limits of the measured values. (refer to 5.9.2.3 if an alarm is required when exceeding the limit)

# 6.Instrument Operation




6.9.1.5 Hardness / Strength Setting

Press MENU the key, select "test condition setting" through HD the key, press the confirm key, you can select the "hardness / strength" interface, enter the interface, and you can select whether to measure hardness or strength.

**6.9.2Storage Management**

The instrument can store up to 100 groups of hardness / strength measurement data (impact times 32 ~ 1). Each group of data includes single measurement value, average value, impact direction, times, material, hardness system and impact device model.

Press MENU the key, select "storage management" through HD the key, press the OK key to enter the data interface, select the measurement data, and press the OK key to view the relevant measurement data.

When the instrument stores 100 groups of data, the measured data will not be saved,and the storage flag on the interface will turn red and flash three times to remind that the data has not been saved. To save data, delete the data before saving.

Delete stored data: in the storage management interface, press SAVE the key to delete all data.

**6.9.3System Setting**

The instrument can personalize the system, such as automatic storage, key sound, warning switch, LCD brightness, automatic shutdown, time setting, language and other

options.

6.9.3.1 Automatic Storage

Press MENU the key, select "system setting" through HD the key, and press the confirm key to enter the system setting interface. Select "automatic storage" and press the confirm key. There is a check mark behind it, indicating that the automatic storage function has been started. If you want to cancel, press the OK key again, and the check box disappears.

6.9.3.2 Key Sound

Press MENU the key, select "system setting" through HD the key, and press the confirm key to enter the system setting interface. Select "key sound" and press the OK key. There is a check mark behind it, indicating that the key sound function has been started. If you want to cancel, press the OK key again, and the check box disappears.

6.9.3.3 Warning Switch

Press MENU the key, select "system setting" through HD the key, and press the confirm key to enter the system setting interface. Select the "warning switch" and press the OK key, followed by a check, indicating that the warning alarm function has been started. If you want to cancel, press the OK key again, and the check box disappears.

If the warning switch is selected to turn on, in the main interface, when the measured value exceeds the upper and lower limits (refer to 6.9.1.4 for the upper and lower limits), the color of the test value turns pink.

6.9.3.4 LCD Brightness

Press MENU the key, select "system setting" through HD the key, press the OK key to enter the system setting interface, select "LCD brightness" and press the OK key

to enter the LCD brightness interface, press HD to display the brightness, and the number "5" is the brightest.

6.9.3.5 Automatic shutdown

Press MENU the key, select "system setting" through HD the key, press the OK key to enter the system setting interface, select "automatic shutdown" and press the OK key to select the time of automatic shutdown. When the instrument is not operated, the instrument will shut down at the selected time point (2 minutes / 5 minutes / 10 minutes).

6.9.3.6 Time setting

Press MENU the key, select "system setting" through HD the key, press the confirm key to enter the system setting interface, select "time setting" and press DIR SAVE the OK key. After entering the time setting interface, select the position to be set, press the resize key, and then press HD the OK key to exit.

6.9.3.7 Language

Press MENU the key, select "system setting" through HD the key, press the OK key to enter the system setting interface, select "language" and press the OK key to enter the language setting interface, press to select Chinese / English, and press HD the OK key to exit.

6.9.4Product Information

Press MENU he key, select "product information" through HD the key, and press the confirm key to view the relevant information of the instrument.

# 7.Maintenance and Repair

## 7.1Maintenance of Impact Device

●After 1000-2000 times of use, clean the conduit and impact body of the impact device with a nylon brush. When cleaning the conduit, first unscrew the support ring, then take out the impact body, screw the nylon brush counterclockwise into the tube, pull it out to the end, repeat this for 5 times, and then install the impact body and support ring;

●Release the impact device after use;

●It Is forbidden to use various lubricants in the impact device.

## 7.2Precautions for Instrument Use

●Avoid strong vibration of the instrument;

●Avoid placing the instrument in too humid environment;

●When plugging in and out the probe, hold the movable jacket and force along the axis. Do not rotate the probe to avoid damaging the cable core of the probe.

●The attachment of oil and dust will gradually aging and fracture the probe wire. After use, remove the dirt on the cable.

## 7.3Instrument Maintenance

●When the standard Rockwell hardness block is used for verification, if the error is greater than 2hrc, the ball joint may be worn and invalid, and the ball joint or impact device shall be replaced.

●In case of other abnormal phenomena of the hardness tester, please do not disassemble or adjust any fixed assembly parts. After filling in the warranty card, submit it to the maintenance department of our company to implement the warranty regulations.

# 8.Appendix: Vibration Standards

Table 1

| Hardness Scale | Impact Device | | | | | |
|---|---|---|---|---|---|---|
| | D/DC | D+15 | C | G | E | DL |
| 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 |
| HB | 143~650 | | | | | |
| 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 | |
| HRB | 46.5~101.7 | | | | | |
| HB | 85~655 | | | | | |
| HV | 85~802 | | | | | |
| HRC | | | | | | |
| HB | 93~334 | | | 92~326 | | |
| HV | | | | | | |
| HRC | | | | | | |
| HB | 131~387 | | | 127~364 | | |
| HV | | | | | | |
| HB | 19~164 | | 23~210 | 32~168 | | |
| HRB | 23.8~84.6 | | 22.7~85.0 | 23.8~85.5 | | |
| HB | 40~173 | | | | | |
| HRB | 13.5~95.3 | | | | | |
| HB | 60~290 | | | | | |
| HB | 45~315 | | | | | |

# 8.Appendix: Vibration Standards

Table 2

| No. | Material | HLD | σb(MPa) |
|---|---|---|---|
| 1 | C mild steel | 350~522 | 374~780 |
| 2 | C High carbon steel | 500~710 | 737~1670 |
| 3 | Cr | 500~730 | 707~1829 |
| 4 | CrV | 500~750 | 704~1980 |
| 5 | CrNi | 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 |

Table 3

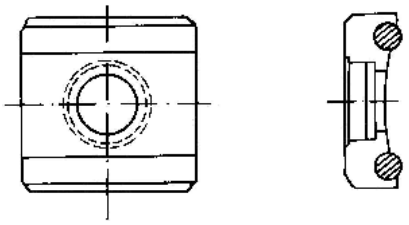
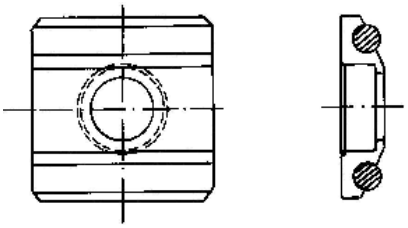
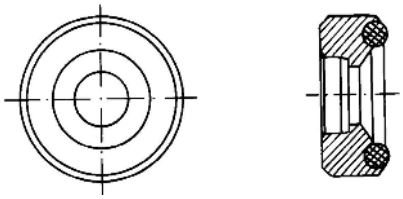
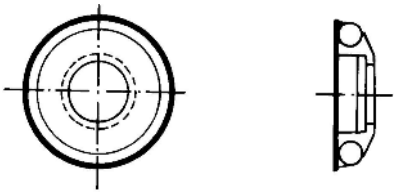
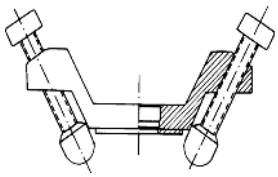
| Special shaped impact device | DC(D)/DL | D+15 | C | G | E |
|---|---|---|---|---|---|
| Impact energy | 11mJ | 11mJ | 2.7mJ | 90mJ | 11mJ |
| Impactor mass | 5.5g/7.2g | 7.8g | 3.0g | 20.0g | 5.5g |
| Ball joint hardness: | 1600HV | 1600HV | 1600HV | 1600HV | 5000HV |
| Ball joint diameter: | 3mm | 3mm | 3mm | 5mm | 3mm |
| Ball joint material: | Tungsten carbide | Tungsten carbide | Tungsten carbide | Tungsten carbide | diamond |
| Impact device diameter: | 20mm | 20mm | 20mm | 30mm | 20mm |
| Length of impact device: | 86(147)/ 75mm | 162mm | 141mm | 254mm | 155mm |
| Weight of impact device: | 50g | 80g | 75g | 250g | 80g |
| Maximum hardness of test piece | 940HV | 940HV | 1000HV | 650HB | 1200HV |
| Average surface roughness of test piece Ra | 1.6μm | 1.6μm | 0.4μm | 6.3μm | 1.6μm |

# 8.Appendix: Vibration Standards

| | | | | | | |
|---|---|---|---|---|---|---|
| Minimum weight of test piece: | Direct measur -ement | >5kg | >5kg | >1.5kg | >15kg | >5kg |
| | Need stable support | 2~5kg | 2~5kg | 0.5~1.5kg | 5~15kg | 2~5kg |
| | Dense coupling required | 0.05~2kg | 0.05~2kg | 0.02~0.5kg | 0.5~5kg | 0.05~2kg |
| Minimum thickness of test piece Dense coupling | | 5mm | 5mm | 1mm | 10mm | 5mm |
| Minimum depth of hardened layer | | ≥0.8mm | ≥0.8mm | ≥0.2mm | ≥1.2mm | ≥0.8mm |
| Ball joint indentation size | | | | | | |
| Hardness 300HV | Indentation diameter | 0.54mm | 0.54mm | 0.38mm | 1.03mm | 0.54mm |
| | Indentation depth | 24μm | 24μm | 12μm | 53μm | 24μm |
| Hardness 600HV | Indentation diameter | 0.54mm | 0.54mm | 0.32mm | 0.90mm | 0.54mm |
| | Indentation depth | 17μm | 17μm | 8μm | 41μm | 17μm |
| Hardness 800HV | Indentation diameter | 0.35mm | 0.35mm | 0.35mm | - | 0.35mm |
| | Indentation depth | 10μm | 10μm | 7μm | - | 10μm |
| Application field of impact device | | DC type measuring hole or cylindrical cylinder; DL type measuring slender narrow groove or hole; Type D is used for routine measurement | D + 15 contact surface is fine and lengthened, which is suitable for measuring groove or concave surface | C-type impact force is small, with little damage to the measured surface and no damage to the hardened layer. It is suitable for measuring small light parts and hardened layer. | G-type measur -ement for heavy castings and forgings with rough surface | E-type measuring material with extremely high hardness |

# 8.Appendix: Vibration Standards

Table 4

| No. | Model | Diagram of special-shaped support ring | Remarks |
|---|---|---|---|
| 1 | Z10-15 |  | Outer cylindrical surface R10~R15 |
| 2 | Z14.5-30 | | Outer cylindrical surface R14.5~R30 |
| 3 | Z25-50 | | Outer cylindrical surface R25~R50 |
| 4 | HZ11-13 |  | Inner cylindrical surface R11~R13 |
| 5 | HZ12.5-17 | | Inner cylindrical surface R12.5~R17 |
| 6 | HZ16.5-30 | | Inner cylindrical surface R16.5~R30 |
| 7 | K10-15 |  | Measuring outer sphere SR10~SR15 |
| 8 | K14.5-30 | | Measuring outer sphere SR14.5~SR30 |
| 9 | HK11-13 |  | Measuring inner sphere SR11~SR13 |
| 10 | HK12.5-17 | | Measuring inner sphere SR12.5~SR17 |
| 11 | HK16.5-30 | | Measuring inner sphere SR16.5~SR30 |
| 12 | UN |  | Outer cylindrical surface with adjustable radius R10~∞ |

# 9.Packing List

| | Name | Qty | Note |
|---|---|---|---|
| Standard Accessories | Main unit | 1 | |
| | D impact device | 1 | |
| | Standard Test block | 1 | |
| | Brush | 1 | |
| | Supporting ring | 1 | |
| | AA battery | 2 | |
| | Documents | 1 | |
| | ABS suitcase | 1 | |
| Optional Accessories | Brush B | | |
| | Special shaped impact device and support ring | | G impact device |
| | software | | See Schedule 3 and Schedule 4 |
| | Cable | 1 | PC terminal |
| | Bluetooth printer | 1 | |
| | Printing cable | 1 | |

**Note**: Due to transportation costs, dry batteries are not delivered by default.

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