TCM-R1
Leeb Hardness Tester
User Manual
Hello:

Thank you for your purchase of our Leeb Hardness Tester TCM-R1Series (it is called Hardness Tester below), the Hardness Tester is portable device. It is small in size, light in weight and very easy and fast to take a test. Before using the Hardness Tester you must read this User’s Manual carefully.

The Hardness Tester confirms to the following specifications:

Technical standards for Leeb Hardness Tester, JB/T 9378-2001

Transformation relation of different hardness scales, ISO 18265: 2003
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### 1 Structure Feature

1.1 The body
1.2 Impact device of type D

1.3 Some other types of impact device available as options

![Diagram of impact devices]

1.4 Technical Specifications

Error and repeatability of displayed value see Table 1.

Table 1

<table>
<thead>
<tr>
<th>Type of impact device</th>
<th>DC(D)/DL</th>
<th>D+15</th>
<th>C</th>
<th>G</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11mJ</td>
<td>11mJ</td>
<td>2.7mJ</td>
<td>90mJ</td>
<td>11mJ</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Mass of impact body</td>
<td>5.5g/7.2g</td>
<td>7.8g</td>
<td>3.0g</td>
<td>20.0g</td>
<td>5.5g</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11mJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test tip hardness:</td>
<td>1600HV</td>
<td>1600HV</td>
<td>1600HV</td>
<td>1600HV</td>
<td>5000HV</td>
</tr>
<tr>
<td>Dia. Test tip:</td>
<td>3mm</td>
<td>3mm</td>
<td>3mm</td>
<td>5mm</td>
<td>3mm</td>
</tr>
<tr>
<td>Material of test tip:</td>
<td>Tungsten carbide</td>
<td>Tungsten carbide</td>
<td>Tungsten carbide</td>
<td>Tungsten carbide</td>
<td>synthetic diamond</td>
</tr>
<tr>
<td>Impact device diameter:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact device length:</td>
<td>20mm</td>
<td>20mm</td>
<td>20mm</td>
<td>30mm</td>
<td>20mm</td>
</tr>
<tr>
<td>Impact device weight:</td>
<td>75mm</td>
<td>162mm</td>
<td>141mm</td>
<td>254mm</td>
<td>155mm</td>
</tr>
<tr>
<td></td>
<td>50g</td>
<td>80g</td>
<td>75g</td>
<td>250g</td>
<td>80g</td>
</tr>
<tr>
<td>Max. hardness of sample</td>
<td>940HV</td>
<td>940HV</td>
<td>1000HV</td>
<td>650HB</td>
<td>1200HV</td>
</tr>
<tr>
<td>Mean roughness value of sample surface Ra:</td>
<td>1.6μm</td>
<td>1.6μm</td>
<td>0.4μm</td>
<td>6.3μm</td>
<td>1.6μm</td>
</tr>
<tr>
<td>Min. weight of sample:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure directly</td>
<td>&gt;5kg</td>
<td>&gt;5kg</td>
<td>&gt;1.5kg</td>
<td>&gt;15kg</td>
<td>&gt;5kg</td>
</tr>
<tr>
<td>Need support firmly</td>
<td>2~5kg</td>
<td>2~5kg</td>
<td>0.5~1.5kg</td>
<td>5~15kg</td>
<td>2~5kg</td>
</tr>
<tr>
<td>Need coupling tightly</td>
<td>0.05~2kg</td>
<td>0.05~2kg</td>
<td>0.02~0.5kg</td>
<td>0.5~5kg</td>
<td>0.05~2kg</td>
</tr>
<tr>
<td>Min. thickness of sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coupling tightly</td>
<td>Min. layer thickness for surface hardening</td>
<td>5mm</td>
<td>5mm</td>
<td>1mm</td>
<td>10mm</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥0.8mm</td>
<td>≥0.8mm</td>
<td>≥0.2mm</td>
<td>≥1.2mm</td>
</tr>
</tbody>
</table>

Size of tip indentation

<table>
<thead>
<tr>
<th>Hardness</th>
<th>Indentation diameter</th>
<th>Depth of indentation</th>
<th>0.54mm</th>
<th>0.54mm</th>
<th>0.38mm</th>
<th>1.03mm</th>
<th>0.54mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>300HV</td>
<td></td>
<td></td>
<td>24μm</td>
<td>24μm</td>
<td>12μm</td>
<td>53μm</td>
<td>24μm</td>
</tr>
<tr>
<td>600HV</td>
<td></td>
<td></td>
<td>17μm</td>
<td>17μm</td>
<td>8μm</td>
<td>41μm</td>
<td>17μm</td>
</tr>
<tr>
<td>800HV</td>
<td></td>
<td></td>
<td>10μm</td>
<td>10μm</td>
<td>7μm</td>
<td>--</td>
<td>10μm</td>
</tr>
</tbody>
</table>

DC: Test hole

G: Test

E: Test
2 Overview

2.1 Features
- Ultra-thin case, making it extremely portable and easy to hold
- Suitable for multiple impact devices and 6 types of hardness scales are available for various applications
- Large and clear digital display
- Ultra-low power dissipation with three AAA batteries powered

2.2 Technical Specification:
- **Hardness Scales**: HL, HRC, HRB, HV, HB, HS
- **Test Precision**: HLD: ±6, HRC: ±1, HB: ±4
- **Standard Impact Device**: impact device of Type D
- **Upper / Lower Limits Setting**: (170-960)HLD, (17.9-69.5)HRC, (19-683)HB, (80-1042)HV, (30.6-102.6)HS, (13.5-101.7)HRB
- **Optional Impact Device**: D / C / DC / D+15 / DL / G
- **Number of Impact Devices Equipped With One Time**: one
- **Language:** Chinese/English
- **Screen Display:** 128X64 dot matrix LCD, backlight and adjustable contrast
- **Measuring Direction:** 360° (down, inclined down, level, inclined up and up)
- **Data Memory:** 200 readings
- **Maximum Hardness of The Measured Work Piece:** 940HV (for D, DC, DL, D+15, C impact device)
- **Radius of Rurvature of The Measured Work:** Rmin=50mm (If using Alien supporting ring, Rmin=10mm)
- **Recognition Function:** Recognize the type of the impact device by itself
- **Measurable Material:** Steel and cast steel, alloy tool steel, stainless steel, gray cast iron, nodular cast iron, aluminum casting alloy, copper zinc alloy (brass), copper tin alloy (bronze), fine copper
- **Power Supply:** 1.5V AAA battery (3 PCS)
- **Working time:** about 150 hours
- **Shape Size:** 155mm*68mm*27mm
- **Weight:** 230g

### 2.3 Main function parameter
- Choose Testing Materials, Hardness Scales, Measuring Direction and times of Tests By Button;
- Direct Display of Hardness Scales including HRB, HRC, HV, HB, HS, HL;
- Show the Result of Each Test Repeated, Automatically or Manually Remove the Wrong Test Results;
- Directly Output the Average Single Test Result or All the Results In One Time;
- Automatic detection of the Battery Voltage, Low Voltage Warning for Battery protection, with Battery Indicating Icon in Test Status;
- Descriptive Status Bar Display, Buzzer, Error Information, Time, Battery Quantity and so on;
- Ambient temperature: Operating temperature – 10~+50°C;
- Storage temperature: -30°C ~ +60°C.

### 2.4 Testing and measurement range

**Table 2 Measurement range**

<table>
<thead>
<tr>
<th>Material</th>
<th>Method</th>
<th>D/DC</th>
<th>D+15</th>
<th>C</th>
<th>G</th>
<th>E</th>
<th>DL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HRC</td>
<td>17.9~68.5</td>
<td>19.3~67.9</td>
<td>20.0~69.5</td>
<td>22.4~70.7</td>
<td>20.6~68.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HRB</td>
<td>59.6~99.6</td>
<td></td>
<td>47.7~99.9</td>
<td></td>
<td>37.0~99.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HRA</td>
<td>59.1~85.8</td>
<td></td>
<td></td>
<td>61.7~88.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel and cast steel</td>
<td>HB</td>
<td>127~651</td>
<td>80~638</td>
<td>80~683</td>
<td>90~646</td>
<td>83~663</td>
<td>81~646</td>
</tr>
<tr>
<td></td>
<td>HV</td>
<td>83~976</td>
<td>80~937</td>
<td>80~996</td>
<td></td>
<td>84~1042</td>
<td>80~950</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>32.2~99.5</td>
<td>33.3~99.3</td>
<td>31.8~102.1</td>
<td></td>
<td>35.8~102.6</td>
<td>30.6~96.8</td>
</tr>
<tr>
<td></td>
<td>Steel</td>
<td>HB</td>
<td>143~650</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CWT, ST</td>
<td>HRC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Hardness</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless steel</td>
<td>HRB: 46.5~101.7</td>
<td>HB: 85~655</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GC. IRON</td>
<td>HRC</td>
<td>HB: 93<del>334, 92</del>326</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC. IRON</td>
<td>HRC</td>
<td>HB: 131<del>387, 127</del>364</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. ALUM</td>
<td>HB: 19<del>164, 23</del>210, 32~168</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRASS</td>
<td>HB: 40~173</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>HV</th>
<th>20.4~67.1</th>
<th>19.8~68.2</th>
<th>20.7~68.2</th>
<th>22.6~70.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel</td>
<td></td>
<td>80~898</td>
<td>80~935</td>
<td>100~941</td>
<td>82~1009</td>
</tr>
<tr>
<td>GC. IRON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC. IRON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. ALUM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.5 Leeb Hardness Testing Principle

The basic principle is: use an impact body of certain weight impacts against the testing surface under certain test force, then measure the impacting velocity and the rebounding velocity of the impact body respectively when the spherically test tip is located 1mm above the testing surface.

The calculation formula is as follows:

\[ HL = 1000 \times \frac{VB}{VA} \]

Where, HL—— Leeb hardness value

VB—— Rebounding velocity of the impact body

VA—— Impacting velocity of the impact body

3 Preparation & Testing

3.1 Preparation & Inspection before Testing

3.1.1 Preparation of Sample Surface
Preparation for sample surface should conform to the relative requirement in the Table 3.

(1) In the preparation processing for sample surface, the hardness effect of being heated or cold processing on the surface of sample should be avoided.

(2) Surface roughness of the measured surface outside the recommended range will cause measurement error. So the surface of the sample to be measured must have the appearance of a metallic luster, smooth, free of scale, paint, rust, etc.

(3) Support of test sample. Support is not necessary for heavy sample of greater than 10lbs. Medium weight parts must be set on flat and stable solid surface e.g. steel table NOT wood. The sample must set absolutely stable on the surface without any wobble or spring.

(4) The sample should have enough thickness, and minimum thickness of sample should conform to Table 3.

(5) For the sample with hardened layer on surface, the depth of hardened layer should conform to Table 3.

(6) Curved surface: The best testing surface of sample is flat. When the curvature radius R of the surface to be tested is smaller than 30mm (D, DC, D+15,C, E and DL type of impact device) and smaller than 50mm (G type of impact device), the small support ring or the shaped support rings should be chosen.

(7) Coupling. 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.

(8) Magnetism of the sample itself should be avoided.
<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Sketch of non-conventional Supporting ring</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Z10-15</td>
<td><img src="image" alt="Sketch of Z10-15" /></td>
<td>For testing cylindrical outside surface R10 ~ R15</td>
</tr>
<tr>
<td>2</td>
<td>Z14.5-30</td>
<td><img src="image" alt="Sketch of Z14.5-30" /></td>
<td>For testing cylindrical outside surface R14.5 ~ R30</td>
</tr>
<tr>
<td>3</td>
<td>Z25-50</td>
<td><img src="image" alt="Sketch of Z25-50" /></td>
<td>For testing cylindrical outside surface R25 ~ R50</td>
</tr>
<tr>
<td>4</td>
<td>HZ11-13</td>
<td><img src="image" alt="Sketch of HZ11-13" /></td>
<td>For testing cylindrical inside surface R11 ~ R13</td>
</tr>
<tr>
<td>5</td>
<td>HZ12.5-17</td>
<td><img src="image" alt="Sketch of HZ12.5-17" /></td>
<td>For testing cylindrical inside surface R12.5 ~ R17</td>
</tr>
<tr>
<td>6</td>
<td>HZ16.5-30</td>
<td><img src="image" alt="Sketch of HZ16.5-30" /></td>
<td>For testing cylindrical inside surface R16.5 ~ R30</td>
</tr>
</tbody>
</table>
### 3.1.2 System Setting

See 4.5 for details.

### 3.1.3 Presetting Testing condition

See 4.2 for details.

### 3.2 Testing Program

Verification of the tester is by using standard test block. The error and repeatability of displayed value should be within the regulation of table 4.

**Note:** Use a calibrated hardness tester, test the standard test block downward vertically for 5 times, the arithmetical average value compare with the value of standard test block. If this value exceeds the standard value, could use the function of software calibration to adjusting.

#### 3.2.1 Start-Up

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>K10-15</td>
<td>For testing spherical outside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface SR10 ~ SR15</td>
</tr>
<tr>
<td>8</td>
<td>K14.5-30</td>
<td>For testing spherical outside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface SR14.5 ~ SR30</td>
</tr>
<tr>
<td>9</td>
<td>HK11-13</td>
<td>For testing spherical inside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface SR11 ~ SR13</td>
</tr>
<tr>
<td>10</td>
<td>HK12.5-17</td>
<td>For testing spherical inside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface SR12.5 ~ SR17</td>
</tr>
<tr>
<td>11</td>
<td>HK16.5-30</td>
<td>For testing spherical inside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface SR16.5 ~ SR30</td>
</tr>
<tr>
<td>12</td>
<td>UN</td>
<td>For testing cylindrical outside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>surface, radius adjustable R10 ~</td>
</tr>
<tr>
<td></td>
<td></td>
<td>∞</td>
</tr>
</tbody>
</table>
(1) Insert the plug of the impact device into the socket of impact device on the tester.

(2) Press the key, now power is connected. The instrument is in testing condition.

Table 4:

<table>
<thead>
<tr>
<th>No.</th>
<th>Material</th>
<th>HLD</th>
<th>Strength $\sigma_0$(MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mild steel</td>
<td>350 ~ 522</td>
<td>374 ~ 780</td>
</tr>
<tr>
<td>2</td>
<td>High-Carbon steel</td>
<td>500 ~ 710</td>
<td>737 ~ 1670</td>
</tr>
<tr>
<td>3</td>
<td>Cr steel</td>
<td>500 ~ 730</td>
<td>707 ~ 1829</td>
</tr>
<tr>
<td>4</td>
<td>Cr-V steel</td>
<td>500 ~ 750</td>
<td>704 ~ 1980</td>
</tr>
<tr>
<td>5</td>
<td>Cr-Ni steel</td>
<td>500 ~ 750</td>
<td>763 ~ 2007</td>
</tr>
<tr>
<td>6</td>
<td>Cr-Mo steel</td>
<td>500 ~ 738</td>
<td>721 ~ 1875</td>
</tr>
<tr>
<td>7</td>
<td>Cr-Ni-Mo steel</td>
<td>540 ~ 738</td>
<td>844 ~ 1933</td>
</tr>
<tr>
<td>8</td>
<td>Cr-Mn-Si steel</td>
<td>500 ~ 750</td>
<td>755 ~ 1993</td>
</tr>
<tr>
<td>9</td>
<td>Super strength steel</td>
<td>630 ~ 800</td>
<td>1180 ~ 2652</td>
</tr>
<tr>
<td>10</td>
<td>Stainless steel</td>
<td>500 ~ 710</td>
<td>703 ~ 1676</td>
</tr>
</tbody>
</table>

3.2.2 Loading
Pushing the loading-tube downwards until contact is felt. Then allow it to slowly return to the starting position or using other method locking the impact body.
3.2.3 Localization
Press the impact device supporting ring on the surface of the sample firmly, and the impact direction should be vertical to the testing surface.

3.2.4 Testing
(1)Press the release button on the upside of the impact device to test. 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.

(2)Each measure area of the sample usually need 5 times of testing operation. The result data dispersion should not more than mean value±15HL.

(3)The distance between any two impact points or from the center of any impact point to the edge of testing sample should conform to the regulation of Table 5.

Table 5
(4) If you 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.

4 Operation in Details

Diagrams of the keyboard
Function of the keys:

- Power on/off and LCD brightness on/off.
- Menu/Enter
- Cancel or Escape.
- Direction.
- Material.
- Scale.
- Upward/Save
- Downward/Delete
- Left/Right.

4.1 Power on

Plug in the impact device, and press to power on the system. The screen shows as below:

![Image: Leeb Hardness Tester Fimaware 3.50 detecting]

The system would automatically detect the type of the impact device during power up and would display this information on the screen as below.
Following is the main display interface as below.

4.2 Test Set

Press at the main interface to enter the main menu—Leeb H Tester, as below. Press key or could continuously glance downward or upward.

Press to enter menu “Set parameter”. Press key or to move the cursor to the line you want to set, and press key to enter submenu.

4.2.1 Hard/σ setting

Press key or to move the cursor to the line of “Measure H”, and then press key to switch H/TS continuously.
Note:

1. H is short for Hardness and TS is short for strength.

2. When H/TS is switched to TS, the hardness scale could not be selected.

3. Only D type of impact device has the function of TS measure. So the impact device could not be selected.

4.2.2 Impact Direction Setting

Press key \[ \text{←} \] or \[ \text{→} \] to move the cursor to the line of “Set DIR”, and press key \[ \text{↓} \] to enter submenu “Set DIR”, and then press key \[ \text{↑} \] or \[ \text{↓} \] to choose one of the five kinds of impact direction such as downward, upward, downward 45°, upward 45° and level 180° as below. After setting up correctly, press key \[ \text{↓} \] to confirm it and return submenu “Set parameter”.

Set impact direction using shortcut key:

Press key \[ \text{DIR} \] in main interface to change times quickly.

4.2.3 Material Setting

When H/TS is preset to hardness, it will display the following material: Steel and Cast Steel, Cold Work Tool Steel, Stainless Steel, Gray Cast Iron, Nodular Cast Iron, Cast Aluminum Alloys, Copper-Zinc Alloys, Copper-Aluminum Alloys, Wrought Copper and Wrought Steel. And when H/TS is preset to 6b, it will display the following material: Mild Steel, High-Carbon Steel, Cr Steel, Cr-V Steel, Cr-Ni Steel, Cr-Mo Steel, Cr-Ni-Mo Steel, Cr-Mn-Si Steel, Super Strength Steel and Stainless Steel.

Enter submenu “Set Material”, and then press key \[ \text{←} \] or \[ \text{↓} \] to move the cursor to the material you want to preset. Press key \[ \text{↓} \] to confirm it and return submenu “Set parameter” as below.
Set material using shortcut key:

Press key [MAT] in main interface to change times quickly.

4.2.4 Average Times Setting

Enter submenu “Set Times”, and then press key [↑] or [↓] to set the times you want to preset as below.

Press key [OK] to confirm it and return submenu “Set parameter”.

4.2.5 Tolerance Limit Setting

Enter sub-menu “Set UL”, and then press key [←] to move the cursor and press key [↑] or [↓] to change the number as below.
Press key to confirm it and return sub-menu “Set parameter”.

**NOTE:**
1. UL is short for up limit and LL is short for lower limit.
2. Set LL is the same with UL.

4.2.6 Hardness Scale Setting

Enter submenu “Set Unit”, and then press key or to move the cursor to the hardness scale you want to preset, as below.

Press key to confirm it and return sub-menu “Set parameter”.

**Set hardness scale using shortcut key:**

Press key in main interface to change hardness scale quickly.

4.2.7 Impact device setting

Enter submenu “Set Hammer”, and then press key or to move the cursor to the impact device you want to preset, as below.
Press key to confirm it and return submenu “Set parameter”.

NOTICE: When the “AVE” mark is displayed on the screen, it is invalid to use shortcut key to change parameters. At this time, saving the old result in order to start a new setup is necessary.

4.3 Testing
See chapter 3 for details

4.4 Save and Print the data
4.4.1 Save the data
After finishing the test, press key to save the data, then press key to confirm it or press key to cancel it.

4.4.2 Check the data
Press key to return to the main menu “Leeb H Tester”. Now press key or to move the cursor to the line of “Check data”, and then press key to enter submenu “Check data” where you can check the data we have saved as below.

Press or to move the cursor to the line which you want to see details, the press key to check the detail information of the data as below.
Press the key \[→\] to turn the page to check all of the information.

**4.4.3 Delete the data**

Enter submenu “Check data”, and press key \[↓\] to delete the data, then press key \[→\] to confirm it or press key \[↓\] to cancel it as below.

```
Check data
1. 01:00  440

Check data
1. Delete ?
```

**4.5 System set**

Press the key \[→\] to return to the main menu “Leeb H Tester”. Now press key \[↓\] or \[↑\] to move the cursor to the line of “Set system”, and then press key \[→\] to enter submenu “Set system” as below.

```
Set system
  Set time
  Auto power-off
  Set Contrast
```

**4.5.1 Time data set**

Press key \[↓\] or \[↑\] to move the cursor to the line of “Set time”, and press key \[→\] to enter submenu “Set time” as below.
Press key ← to move the cursor and press key ▼ or ▶ to change the NO. Press key → to confirm it and return submenu “Set system”.

4.5.2 Auto power-off

Press key ▼ or ▶ to move the cursor to the line of “Auto power-off”, and press key → to enter submenu “Auto power-off” as below.

Press key ▼ or ▶ to change the standby time. For example, the digital 1 indicates the standby time is 1 second and the maximum standby time is 10 seconds, while NO.0 indicates standby time is infinite. The Sign shows in the screen when the number is not 0. Press key ← to confirm it and return submenu “Set system”.

4.5.3 LCD brightness set

Press key ▼ or ▶ to move the cursor to the line of “Set Contrast”, and press key → to enter submenu “Set Contrast” as below.
Press key  or  to change the LCD brightness. Press key  to confirm it and return submenu “Set system”.

4.5.4 Silent mode set

Press key  or  to move the cursor to the line of “Mute? No” and then press key  to switch on/off the silent mode continuously as below.

If the silent mode is off, the sign in the screen is  or it is  .

5 Servicing & Maintenance

5.1 Impact Device Servicing

1) After the impact device has been used for 1000--2000 times, please use the nylon brush provided to clean the guide tube and impact body. When cleaning the guide tube, unscrew the support ring first, then take out the impact body, spiral the nylon brush in counter-clock direction into the bottom of guide tube and take it out for 5-6 times, and then install the impact body and support ring again.

2) Release the impact body after use.

3) Any lubricant is absolutely prohibited inside the impact device.

5.2 Normal Maintenance Program

When using standard Rockwell hardness block to testing, if all the error is bigger than 2 HRC, it may be the invalidation of impacted ball top caused by abrasion. Changing the spherical test tip or impact object should be considered.

When the hardness tester appears some other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts. Fill in and present the warranty card to us. The warranty service can be carried on.

5.3 The battery
1) Press [ ] to power off the system, and open up the back cover to take out the battery.

2) Remove the battery when not using the instrument for long time, in order to avoid battery leakage and corrosion the instrument.

6 Malfunction analysis and maintenance

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No display or the display moving up and down</td>
<td>Too low battery voltage</td>
<td>Charge</td>
</tr>
<tr>
<td></td>
<td>Damaged battery</td>
<td>Change the battery</td>
</tr>
<tr>
<td></td>
<td>The fuse is blew</td>
<td>Replace it</td>
</tr>
<tr>
<td></td>
<td>Datum drift of the voltage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instrument failure</td>
<td>Please call our customer service center for help.</td>
</tr>
</tbody>
</table>
Unable to be charged

- The battery is damaged
  - Replace it.
  
- The charger is damaged.
  
- The instrument is damaged.

The impact body is unhook or unable to release

- The hook of the impact device is damaged.
  
- The ink spike the impact body wears out.

Please call our customer service center for help.
The error of the value is relatively large.

- The preparation of the sample doesn't meet demand. See chapter 3 for details.
- Non-operation. See chapter 4 for details.
- Error caused by metallic character. See chapter 4 for details.
- Discreteness of the hardness of the sample is large. See chapter 4 for details.
- The probe is not suitable. See chapter 1.4 for details.

Inside of the probe is too dirty? YES: Please clean.
NO: The probe is damaged.

- The ball of the impact body wears out. Please call our customer service center for help.
- The impact body loses. Please tighten.
- Datums or drift of the interior.
- Instrument failure.
**No value or show sign E**

- The socket of the impact device is bad. Connect it and reinstall it.
- Going dead. Reinstall the FUEE.
- The cable of the probe is broken. Relink it.
- The value is out of measurement range. See chapter 2.6 for details.
- Misoperation. See chapter 4 for details.
- Datum drift.
  - The impact body is damaged. Please call our customer service center for help.
  - The instrument is damaged.

**The printer is unable to work normally.**

- The printer is off. Turn on it.
- The connection between the printer and the instrument is bad. Clean the socket and reconnect.
- The printer is damaged. Please call our customer service center for help.
<1> When using standard Rockwell hardness block to testing, if all the error is bigger than 2HRC, it may be the invalidation of impacted ball top caused by abrasion. Changing the spherical test tip or impact object should be considered.

<2> When the hardness tester appears some other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts. Fill in and present the warranty card to us. The warranty service can be carried on.

### 7 List of components not warranty

1. the shell
2. the screen display
3. the panel
4. the impact body
5. the support ring
6. the probe cable
7. the battery (the damage caused by faulty operation problem)
8 Instructions for Standard Leeb Hardness Test Specimen

The Standard Leeb Hardness Test Specimen is a new standard instrument of measurement for hardness measurement used for periodic calibration or daily calibration for the Leeb Tester and the standard have delivered the Leeb Hardness magnitude Since April 1, 2004. We’ll give a brief description of the standard to make you know and use it correctly. The rule for the error of indication and the repeatability of indication of the Leeb Hardness value is listed in table 7, the rule made by the national metrological verification regulations (JJG747-1999) in table 7 is suitable for Leeb Hardness Tester of new, in use and having been repaired.

Error of displayed value: $\delta = \text{HLD} - \text{HLD}$

In the formula, HLD represents for the average of five measurement values, HLD represents for the hardness value of Standard Leeb Hardness Test Specimen.

Repeatability of displayed value: $b = \text{HLD}_{\text{max}} - \text{HLD}_{\text{min}}$

In the formula, HLDmax represents for the maximum value of the five measurement values, HLDmin represents for the minimum value of the five measurement values. The HLD in the two formulas above can also be HLDC, HL(D+15), HLC, HLG and HLE.

Table 7: Error and repeatability of displayed value

<table>
<thead>
<tr>
<th>NO.</th>
<th>Type of impact device</th>
<th>Hardness value of Leeb standard hardness block</th>
<th>Error of displayed value</th>
<th>Repeatability of displayed value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
<td>760±30HLD</td>
<td>±6 HLD</td>
<td>6 HLD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>530±40HLD</td>
<td>±10 HLD</td>
<td>10 HLD</td>
</tr>
<tr>
<td>2</td>
<td>DC</td>
<td>760±30HLD</td>
<td>±6 HLDC</td>
<td>6 HLDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>530±40HLDC</td>
<td>±10 HLDC</td>
<td>10 HLDC</td>
</tr>
<tr>
<td>3</td>
<td>DL</td>
<td>878±30HLD</td>
<td>±12 HLDL</td>
<td>12 HLDL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>D+15</td>
<td>766±30HLD+15 544±40HLD+15</td>
<td>±12 HLD+15 12 HLD+15</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>G</td>
<td>590±40HLG 500±40HLG</td>
<td>±12 HLG 12 HLG</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>E</td>
<td>725±30HLE 508±40HLE</td>
<td>±12 HLE 12 HLE</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>C</td>
<td>822±30HLC 590±40HLC</td>
<td>±12 HLC 12 HLC</td>
<td></td>
</tr>
</tbody>
</table>

**Users Notice**

1. Please fill out the warranty registration card completely. Then mail the copies of the warranty registration card and the invoice within 15 days of receipt of the product to our user service center.

2. If there is a fault or problem within a year after you the instrument please contact us. When you receive an RMA # return the instrument to us with a copy of your warranty registration card and invoice. If you can't show the warranty registration card and the invoice we would calculate the warranty period from the date the instruments was manufactured, and the warranty period is one year.

3. If it is out of the warranty period, we will assess and repair costs up return of the product to us.

4. Damages caused by transportation, installation, faulty operation, non-professional maintenance are out of warranty service. If you alter the warranty registration car or there is no invoice, the warranty is voided.