MANUAL
TH-174
Universal hardness tester
Changes in products and/or product specifications can emerge due to new technologies and continuous development.

We reserve the right to change or modify specifications of products without prior notice.

We recommend you to contact our sales office for up-to-date information.

© All rights reserved
## CONTENTS

1 Introduction

1.1 Features 2
1.2 Main application and testing range 2
1.3 Specification 3
1.4 Working condition 3

2 Structure feature & testing principle

2.1 Structure feature 4
2.2 Working principle 5

3 Specifications 6

4 Operation

4.1 Preparation before Operation 7
4.2 Measurement 8

5 Special prompt 10

6 Operation explain in details

6.1 Switch on 11
6.2 Measuring operation 12
6.3 Key-press operation 12
6.4 Switch off 12
6.5 Menu structure 13
6.6 Common functions 14
6.7 Memory manager 15
6.8 Test setting 17
6.9 System setting 19
6.10 Calibration 20
6.12 Battery replacement 21
6.13 Backlight 21
6.14 Auto Power Off 21

7 Maintenance and repair 22

8 Non-warranty parts 23
1 INTRODUCTION

1.1 Features
- LCD display 128x32 dot matrix
- USB communication interface
- Impact direction automatically identifying
- Memory 270 average data in 9 files
- Upper and lower limit pre-setting
- Battery capacity display and power off automatically lack of voltage
- Backlight for convenient use in darkness
- Software calibration
- AAA 1.5V (7#) battery 2 pc

1.2 Main application and testing range

1.2.1 Main application
- The installed machinery and permanently assembled parts
- Die cavity of moulds
- Heavy and large workpiece
- Failure analysis of pressure vessel, steam turbo set and other equipment
- Narrow space workpiece
- Axletree and other spare parts
- Material identification of the metal material warehouse
- Quick inspection for large workpiece
- Others.
1.2.2 Testing range

See table 1.

Table 1

<table>
<thead>
<tr>
<th>Material</th>
<th>Hardness scale</th>
<th>Application range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel and Cast Steel</td>
<td>HRC</td>
<td>20.6～68.2</td>
</tr>
<tr>
<td></td>
<td>HB</td>
<td>81～646</td>
</tr>
<tr>
<td></td>
<td>HV</td>
<td>80～950</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>30.6～96.8</td>
</tr>
<tr>
<td></td>
<td>HRB</td>
<td>37～99.9</td>
</tr>
</tbody>
</table>

1.3 Specification

- TH-174 Main Unit 1
- AAA 1.5V (7#) battery 2
- Small supporting ring 1
- Cleaning brush 1
- Hardness test block 1

1.4 Working condition

- Working temperature: 0°C～40°C
- Humidity: \( \leq 90\% \)
- The surrounding environment should be no vibration, no strong magnetic field, corrosive medium and heavy dust.
2 STRUCTURE FEATURE & TESTING PRINCIPLE

2.1 Structure feature

Structure feature see figure 1.

Figure 1

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supporting ring</td>
<td>9</td>
<td>Impact device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Concave hole</td>
<td>10</td>
<td>USB interface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Switch key</td>
<td>11</td>
<td>Release key</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Display window</td>
<td>12</td>
<td>Loading key</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Operation key</td>
<td>13</td>
<td>Bolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Confirm key</td>
<td>14</td>
<td>Battery cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Operation key</td>
<td>15</td>
<td>Nameplate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Shell</td>
<td>16</td>
<td>Battery location</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.2 Working principle

The basic principle is: The impact object of certain weight pounds at the testing surface under certain test force. Measure the impacting velocity and the rebounding velocity of the impact object respectively when it is 1mm above the testing surface.

The calculation formula is:

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

Where:
- *HL*  Leeb hardness value
- *VB*  Rebounding velocity of the impact object
- *VA*  Impacting velocity of the impact object
### 3 SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness Scales</td>
<td>HLDL/HB/HRC/HV/HS/HRB</td>
</tr>
<tr>
<td>Impact device</td>
<td>DL</td>
</tr>
<tr>
<td>Measuring range</td>
<td>560~950HLDL</td>
</tr>
<tr>
<td>Measuring direction</td>
<td>360°, auto identification;</td>
</tr>
<tr>
<td>Display</td>
<td>128x32 dot matrix LCD with backlight</td>
</tr>
<tr>
<td>Data memory</td>
<td>270 average data in 9 files</td>
</tr>
<tr>
<td>Power</td>
<td>AAA 7# 1.5V 2pc</td>
</tr>
<tr>
<td>Dimensions</td>
<td>215mm×60mm×25mm</td>
</tr>
<tr>
<td>Weight</td>
<td>about 180g.</td>
</tr>
</tbody>
</table>
4 OPERATION

4.1 Preparation before Operation

4.1.1 Preparation for sample surface

In order to reduce the effect of surface roughness of the testing object on the measuring result, it is necessary to make the surface to be tested smooth enough, with the Ra value not exceeding 1.6 µm, and clean the surface and ensure that it is free of oil.

- No support is needed for testing objects weighing over 5kg.
- When a testing object is 2-5kg and the testing part is suspended, it should be supported by an object weighing more than 5kg in order to prevent the testing piece from being bend, deformed or moved.
- When a testing object is less than 2kg, it should be coupled with a support object weightier than 5kg. The coupling surface of the testing object and the support surface must be even and smooth, with no surplus coupling agent seen. The testing direction must be perpendicular to the coupling surface.
- The testing object should be no less than 0.1kg and the minimum thickness should not be less than 5mm. The hardened surface should not be less than 0.8mm in thickness.
- The clipped surface should be perpendicular to the testing direction.
- When the testing object is a large plate, rod or curve surfaced work piece, it is easy to cause it to deform or out of balance even if it is fairly big in weight and thickness, thus leading to inaccurate measurement. So it should be reinforced or supported on the back of the testing point.
- The testing object should be free from magnetism.

4.1.2 Preset test parameters

Refer to Item 6.8.
4.2 Measurement

The instrument can be checked with standard test block, the accuracy and repeatability displayed should be within ±12HLDL.

4.2.1 Loading

Press the gauge vertically onto the surface of workpiece, hold the unit by left hand, hold the loading rubber key and pull down it to finish the loading.

4.2.2 Measuring

- Press the release button on top of the unit to do the measurement. The sample and the main unit as well as the operator are all required being stable.
- Usually, test 5 times on the workpiece. The data dispersion should not be more than ±15HL from the average value.
- The distance between any two indentations or from the center of any indentation to the edge of tested sample should conform to the regulation of table 6.

<table>
<thead>
<tr>
<th>Table 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distance between any two indentations mm</strong></td>
</tr>
<tr>
<td>&gt; 3mm</td>
</tr>
</tbody>
</table>

- For special material, if accurate conversion from the Leeb hardness into other hardness method is wanted, contrastive test must be done to get conversion relations. Use inspected qualified Leeb hardness tester and corresponding other hardness tester to test at same sample respectively. For each hardness value, measure 5 Leeb hardness values, using Leeb hardness arithmetic average value and corresponding hardness method average value as correlative value to make individual hardness contrastive curve see figure 3.
4.2.3 Testing result

- In front of Leeb hardness symbol HL, expresses the hardness value; behind HL expresses type of impact device.

For example:
700HLDL expresses using DL type of impact device measured Leeb hardness value is 700

- For other hardness scale converted from Leeb hardness scale, put the symbol of corresponding hardness scale in front of Leeb hardness scale.

For example:
400HVHLDL expresses using DL type of impact device measured Leeb hardness value converted Vickers hardness value is 400.

Figure 3

A1-A5: Hardness samples
•”.: Impress of hardness scales to be converted
“•.”: Impress of HL hardness scales
5. SPECIAL PROMPT

- In normal condition, it could not memory present testing value while not reaching impact times which has been set. If want to memory, press **Cal. Average** at the main display interface to end the testing in advance and then memory
- When using the function of **Cal. Average** to end the testing in advance, the function of **Auto Save, Auto Trans.** etc. will not work
- Not all hardness methods can be converted to each other for all materials See table 1. The setting of hardness scale will recover to HL automatically after material setting is changed. So select **Material** first then select **Hardness Scale** when setting measure condition.
6. OPERATION EXPLAIN IN DETAILS

6.1 Switch on

Press \( \text{ } \) to switch on the screen will show as follows in 2 seconds:

Then it enters the main display interface see figure 4.

**Figure 4**

**Instruction of the main display interface:**

- **Measured value:**
  Display present single time measured value (without average value indicator), or display
  the present average value (with average value indicator).
  Display \( \uparrow \) means over conversion or measured range, \( \downarrow \) means lower than conversion
  or measured range.

- **Impact times:**
  Display the times that have been impacted, the according times will be displayed in reverse
  video when browsing single measured value.
- **Average value indicator:**
  After reaching the preset impact times, it appears to show the mean value.

- **Hardness scale:**
  Show the present hardness scale that has been selected.

- **Impact direction:**
  Show the present impact direction that has been selected.

- **Battery info:**
  Show the rest capacity of battery.

- **Over tolerance alarm:**
  It will display as ▲ when the present measured value or average value is within the tolerance range otherwise it will display as △.

- **Lower tolerance alarm:**
  It will display as ◀ when the present measured single value or average value is within the tolerance range otherwise it will display as ◁.

### 6.2 Measuring operation

The screen will display each measured value during each measurement under the measuring display interface, and the impact times add 1 accordingly if the measured value is beyond tolerance range the according mark will change to solid mark the average value will be displayed in 2 seconds when reaching the impact times.

### 6.3 Key-press operation

- Press orque or  to browse single measured value the impact times will be displayed in reverse video
- Press to enter the menu.

### 6.4 Switch off

Press ircle to switch off.
6.5 Menu structure

Preset tester parameters and the additional functions can be performed by the menu operation. At the main display interface, press ➤ to enter the main menu.

- For convenient operation, the common function such as “Save Average” “Delete Single” “Cal. Average” “Backlight On (Off)” have been put into main display interface.
- The main display interface have the key Exit it is convenient to return to measuring interface.
- By pressing Exit key the gauge will return to the measuring interface directly but not the previous menu.
- By pressing the key ← or → users can choose all functions and sub-menu circularly.
### 6.6 Common functions

Press ➡️ to enter the main menu under measuring interface.

<table>
<thead>
<tr>
<th>Save Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete Single</td>
</tr>
<tr>
<td>Cal. Average</td>
</tr>
<tr>
<td>Memory Manager</td>
</tr>
<tr>
<td>Backlight On</td>
</tr>
<tr>
<td>Test Set</td>
</tr>
<tr>
<td>System Set</td>
</tr>
<tr>
<td>About Software</td>
</tr>
<tr>
<td>Exit</td>
</tr>
</tbody>
</table>

Press ▼ or ▲ to move the cursor to demanded function and press ➡️ confirm.

**Note:**
Press ▼ or ▲ to see pale letter.

---

- **Save Average:**
  Memory the present average value.

  **Note:**
  The memory can not be processed under the both position of not reaching preset impact times and not choosing “Cal. Average”.

- **Delete Single:**
  Delete the last measured value
  Delete the certain measured value when browsing the single measured value
  Delete the last single measured value when displaying average value.

  **Note:**
  Please move the cursor to “YES” or “NO” and press ➡️ to confirm when delete.

- **Cal. Average:**
  Display the average measured value when impact times have not reached preset times.

- **Backlight On (Off):**
  “Backlight On” will be displayed when choosing the backlight
  “Backlight Off” will be displayed when not choosing the backlight.

  **Note:**
  Press any one of the keys ▼, ▲, ➡️ when switch on the backlight will be chose.
6.7 Memory manager

The instrument includes 9 files and each one can memory 30 measured average value. You can choose another file to memory when 30 measured average value is stored. Press \( \rightarrow \) to enter the main menu when on measuring display interface.

Press \( \leftarrow, \rightarrow \) to move the cursor to Memory Manager press \( \rightarrow \) enter Memory Manager.

Note:
The pale letter can be seen by pressing \( \leftarrow \) or \( \rightarrow \).

6.7.1 Browsing file

Firstly please choose the file number to be browsed.

File No.: 1

Press \( \leftarrow, \rightarrow \) to choose the file number. Press \( \rightarrow \) to confirm.

<table>
<thead>
<tr>
<th>No.</th>
<th>File name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>789HL</td>
</tr>
<tr>
<td>02</td>
<td>517HL</td>
</tr>
<tr>
<td>03</td>
<td>788HL</td>
</tr>
<tr>
<td>04</td>
<td>522HL</td>
</tr>
</tbody>
</table>

Press \( \leftarrow, \rightarrow \) to turn the page. Press \( \rightarrow \) return to Memory Manager.
6.7.2 Delete file

Firstly please choose the file number to be deleted.

File No. : 1

Press ←, → to choose the file number. Press ↓ to enter confirm delete interface.

Confirm Delete

YES NO

Press ←, → to choose. Press → to confirm and return to Memory Manager.

6.7.3 Memory file choosing

Choose the file number for memory.

File No. : 1

Press ←, → to choose the file number. Press → to confirm and return to measuring display interface.
6.8 Test setting

Press → to enter the main menu under measuring display interface.

<table>
<thead>
<tr>
<th>Save Average</th>
<th>Delete Single</th>
<th>Cal. Average</th>
<th>Memory Manager</th>
<th>Backlight On</th>
</tr>
</thead>
</table>

| Test Set | System Set | About Software | Exit |

Press ←, → to move the cursor to Test Set and press →.

Note: The pale letter can be seen by pressing ←, →.

Press ←, → to move the cursor to certain function and press →.

Note: The pale letter can be seen by pressing ←, →.

6.8.1 Selection of impact direction

Press ←, → to move the cursor to select the impact direction. Press ← to finish the setting and return to measuring display interface. If preset impact direction to AUTO the instrument can identify the impact direction and correct the wrong direction automatically.

Both directions of ↑ and ← are different and need to be confirmed by hand. Press ←, → to move the cursor to correct impact direction. Press ← to confirm. The indication of different direction displays is caused of shaking of impact device.
6.8.2 Mean times setting

The mean times can be modified from 1 to 10.

Mean Times: 10

Press ➡️, ➡️ to modify. Press ➡️ to finish set and return to measuring display interface.

6.8.3 Material setting

(Cast) Steel
CWT. Steel
Cast Alumin

Press ➡️, ➡️ to move the cursor to certain material to be set. Press ➡️ to finish set and return to measuring display interface.

Note:
1. The hardness scale will come back to HL after material setting.
2. Choose material firstly before choosing hardness scale.

6.8.4 Hardness scale setting

HL HV HB HRC
HS HRB

Press ➡️, ➡️ to move the cursor to certain scale to be set. Press ➡️ to finish and return to measuring display interface.
Note:
1. The hardness scales that displayed here only are corresponding to the choose material.
2. Choose material firstly before choosing hardness scale.
3. The hardness scale will come back to HL automatically after material setting.

6.8.5 Upper and lower limit setting

<table>
<thead>
<tr>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>0230</td>
<td>0960</td>
</tr>
</tbody>
</table>

Press \( \leftarrow \), \( \rightarrow \) to move the cursor to the position of figure.
Press \( \rightarrow \) to move the cursor to next figure the cursor will come back to measuring display interface when moving to the last figure.

Note:
1. The instrument will remind you to reset the upper and lower limit when presetting is out of range.
2. The lower and upper limit will reverse automatically when the lower setting is over the upper setting.

6.9 System setting

Press \( \leftarrow \) to enter the main menu under measuring display interface.
Press \( \downarrow \), \( \uparrow \) to move the cursor to System Set and press \( \rightarrow \).

Note:
The pale letter can be seen by pressing \( \downarrow \), \( \uparrow \).

Press \( \downarrow \), \( \rightarrow \) to move the cursor to certain function to be set
Press \( \leftarrow \) to finish or enter into corresponding interface.
- **Auto Save:**
  It stores the average value automatically after measuring and displaying average value. The “Auto Save On” displays when the function is turned off, and the “Auto Save Off” displays when the function is turned on.

- **Auto Delete:**
The “Auto Delete On” displays when the delete function is turned off and the “Auto Delete Off” displays when the function is turned on.

6.9.1 LCD brightness setting

**Bright:** Press[▶]  
**Dark:** Press[◀]

Press [▶] to add the brightness.  
Press [◀] to reduce the brightness.  
Press [Finish] to finish and return to measuring display interface

**Note:**
1. Bright means more brightness.  
2. Dark means less brightness.

6.10 Calibration

**Calibration**

0/5 Times

The tester should be calibrated using standard test block before use this gauge for the first time, or reuse after a long time. Press [1] and press [2] simultaneously the gauge will be switched on and enter the calibration state.  
Preset the impact direction as [1].  
Measure 5 points on the standard hardness block.
Average= 550
Nominal=550

It will display average value after measurement.
Press to input the standard value of test block.
Press to finish calibration.
Range of adjustment: ±15HL.

6.12 Battery replacement
- When battery capability run out, the battery display symbol will glint as please replace battery as soon as possible.
- When replacing the battery the tester should be switch off firstly.
- Push out the battery cover, install 2 AAA 7# 1.5V battery into the battery compartment according to correct direction.
- Push in the cover after installation of battery.
- The replacement of battery should be finished within 15 minutes, if beyond it the memory data may lost.
- Please collect the used battery avoiding pollution.

6.13 Backlight
The LCD screen has EL backlight. It is convenient to use in dark condition. Press any one of three keys , , and press simultaneously, the backlight will be function on. Also the backlight can be set under the main menu see 6.6.

6.14 Auto Power Off
- The tester has the function of auto power off to save the power of battery.
- If there is neither measurement nor any operation within 5 minutes, the tester will shut off automatically. The screen will glint for 20 seconds before power off. Except key, press any key to stop the twinkle of LCD screen and stop the operation of power off at the moment.
- While voltage of battery is too low, the tester will show < Battery Empty!>, then power off automatically.
7 MAINTENANCE AND REPAIR

- After the impact device is used for 1000–2000 times, use the cleaning brush provided to clean the guide tube and the impact body. To clean the guide tube, unscrew the support ring firstly, then take out the impact body, spin the cleaning brush in counter-clock direction into the bottom of guide tube and take it out for 5 times, and then install the impact body and support ring again.

- Release the impact body after use.

- Any lubricant is absolutely prohibited inside the impact device.
<table>
<thead>
<tr>
<th></th>
<th>NON-WARRANTY PARTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outside frame</td>
</tr>
<tr>
<td>2</td>
<td>Battery cover</td>
</tr>
<tr>
<td>3</td>
<td>Display window</td>
</tr>
<tr>
<td>4</td>
<td>Impact body</td>
</tr>
<tr>
<td>5</td>
<td>Support</td>
</tr>
</tbody>
</table>
EC-DECLARATION OF CONFORMITY

This certifies that the following designated product
TH-174 (Portable hardness tester)
complies with the essential protection requirements of
Member States relating to electromagnetic compatibility.

This declaration applies to all specimens manufactured
in accordance with the manufacturing drawings
which form part of this declaration.

Assessment of compliance of the product with the requirements relating
to the compatibility was based on the following standards:
EN55022, EN60555-2, EN60555-3, EN50082-1

This declaration is the responsibility of the manufacturer/importer:

Company name: INNOVATEST Europe BV
Address: Borgharenweg 140
Telephone / Telefax: +31-43-3520060 / +31-43-3631168
Name of the subscriber: Nicole Paulissen-Schiffer
Position: General Manager
City: Maastricht

Authorized representative signature
CORPORATE HEAD OFFICE
MANUFACTURING, DISTRIBUTION & SERVICE

INNOVATEST Europe BV
Borgharenweg 140
6222 AA Maastricht (The Netherlands)
Phone: +31 43 3520060
Fax: +31 43 3631168
Email: info@innovatest-europe.com