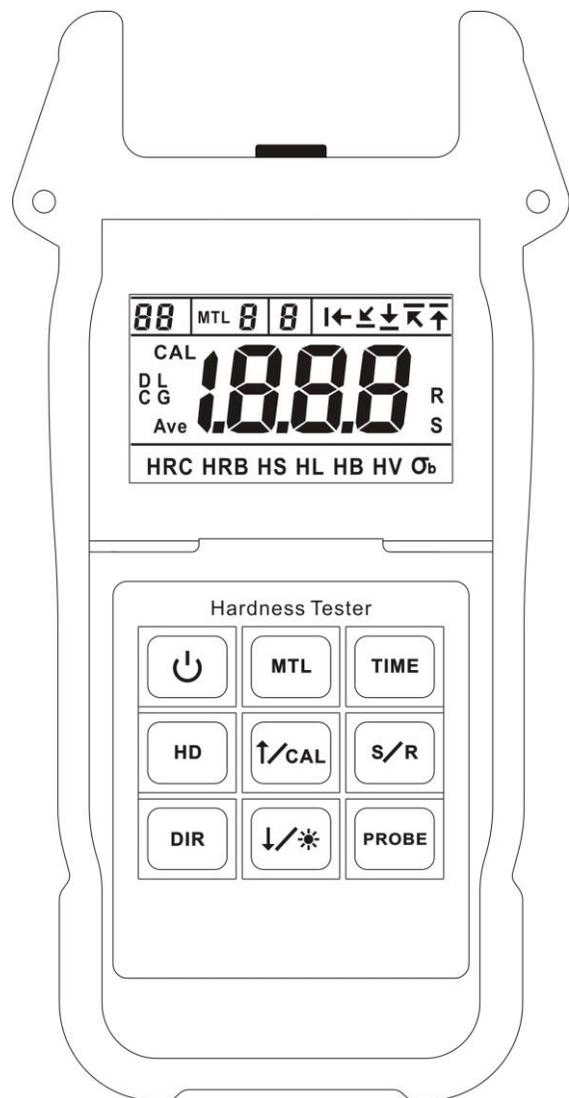# Hardness Tester BHT-1800

User Manual

1. Testing Principle and Application

1.1 Testing Principle

It's a dynamic method based on the principle of energy measurement. The ratio of the rebound velocity VB to the impact velocity VA multiplied by 1,000 yields the hardness value HL (Leeb hardness). HL is a direct measure of the hardness.

An impact body with a hard tip is impacted by spring energy against the sample to be measured and then rebounds. During the impact, a permanent magnet integrated in the impact body passes through a coil in which voltage is induced by the forwards and backwards movement. This voltage is proportional to the velocities. The impact and rebound velocity is measured when the impact body tip is approx. 1 mm (0.04 inches) away from the sample to be measured. The measuring signal is converted to the hardness value by the unit electronics, shown in the display.
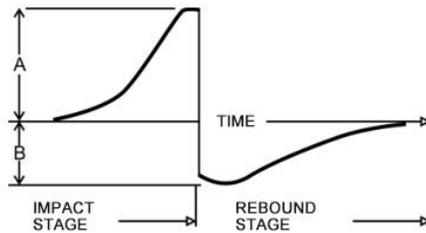

$$HL = 1000 \times V_B / V_A$$

1.2 Application

- Die cavity of molds
- Large, hard parts
- Narrow testing area
- Material identification in the metallic materials warehouse
- Bearings and other parts production lines
- The installed machinery and permanently assembled parts
- Failure analysis of pressure vessel, turbine generator set and other devices

2. Schematic Diagram of Product and Impact Device

D-type Impact Device
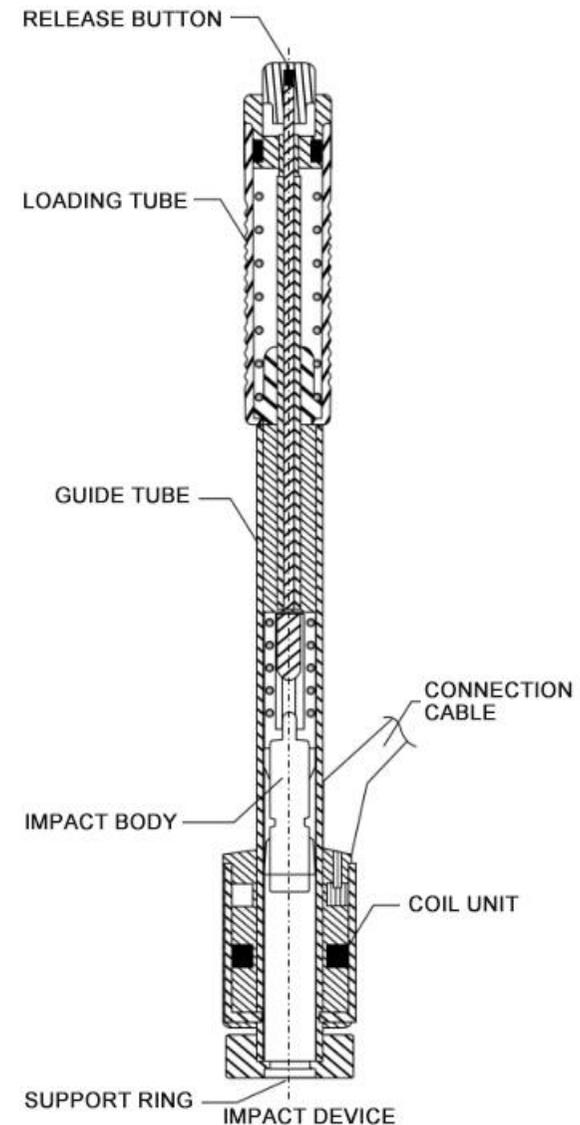
2.1 Types of Impact Devices

D   C   DL   G

2.2 Applications of Impact Devices

Types	Features
D	For normal testing
C	Small impact force, little damage to the tested surface (no damage to hardened layer), applicable to small/light/thin parts and surface hardened layers
DL	Small and thin head, applicable to narrow and long slots or holes
G	Applicable to large and rough surface casting pieces

3. Technical Parameters and Accessories

3.1 Technical Parameters

Perform standard：GB/T 17394-1998，ASTM A956

	Leeb（HL）	Brinell（HB）	Rockwell（HRB）	Rockwell（HRC）	Rockwell（HV）	Shore（HS）	Tensile strength（σb）
Range	200-960	30-651	13.5-100	19.8-68.5	80-976	26.4-99.5	375-2639

Impact device: D type, optional: G, C, DL, probe can be automatically identified;

Indication error: <±6HLD(HLD=800), Repeatability error: < 6HLD(HLD=800)

Impact direction: vertical down, Diagonal down, horizontal, diagonal up, vertical up

Applicable materials: steel and cast steel, stainless steel, gray cast iron, nodular graphite, cast aluminum alloys, copper-zinc alloys, copper-tin alloys and pure copper

Resolution: 1HL, 1HV, 1HB, 0.1HRB, 0.1HRC, 0.1HS, 1σb

Display: high contrast segment LCD (with backlight)

Storage: 99 groups (1-7 impact testing value and a mean value Ave)

Power supply: 4*1.5V AAA batteries

Working temperature: -10 ~ +50℃

Dimensions: 177mm×73mm×35mm（H×W×D)

Weight: 270g (with batteries)

3.2 Standard Accessorie

Leeb Hardness Tester	1
D-type impact device	1
Leeb hardness test block	1
Small support ring	1
Nylon brush	1
AAA batteries	4
User Manual	1
Tool Case	1

3.3 Optional Accessories

Impact devices: G, C, DL

4. Preparations

4.1 Requirements for specimen

4.1.1 Requirements for Surface Roughness

Surface roughness is an important requirement for the surface quality, the tested surface should be flat and smooth without oil pollution. If it's too rough, it shall result in test error.

The roughness of the finished surface should not exceed the following values:

Types	Surface Roughness (Ra)
D, DL	2 µm
G	7 µm
C	0.4 µm

4.1.2 Requirements for Test Weight

Requirements for test weight are described as follow:

| Types	Test Weight (kg)		
	Coupling is required	Stability is required	May be directly used
D, DL	0.05~2.0	2.0~5.0	>5.0
G	0.5~5.0	5.0~15.0	>15.0
C	0.02~0.5	0.5~1.5	>1.5

4.1.3 Thickness of Hardened Layer

Thickness of hardened layer should comply with the requirements as shown below:

Types	Min. Thickness of Hardened Layer (mm)
D, DL	0.8
G	1.2
C	0.2

4.1.4 Requirements for Curved Surface Test Piece

Small support ring shall be used when the test piece's radius of curvature (R) is smaller than 30mm (D/C/DL type) or 50mm (G type).
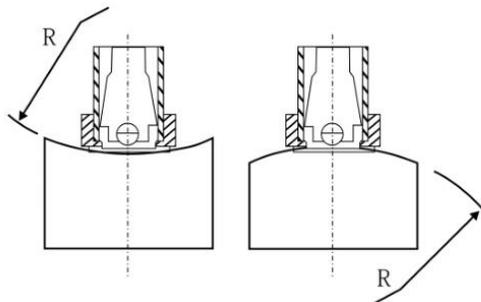
4.2 Test Piece Support

 ◆ Support is not needed for heavy test pieces;

 ◆ Medium size test piece must be firmly placed on a flat and solid surface without any vibration

 ◆ Light weight test piece must be firmly coupled with the support and the coupled surface must be flat and smooth, no excessive couplant, impact direction must be vertical on the coupled surface.

 ◆ For large, long and bending test pieces, it might result in inaccurate value due to deformation, So the sample should be reinforced or supported at its back.

5. Use and Operation
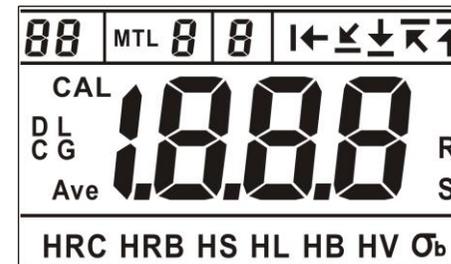
LCD Display   **Key**
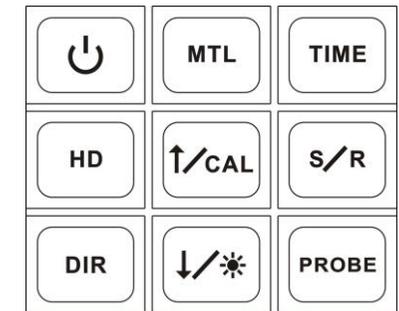
5.1 Power On

Firstly insert the impact device in the tester and then press 🔘 key to power on the tester, LCD screen displays the defaulted parameters for initial use, and after that, it shall display the status when power off previously. If the test parameters comply with current status, you may start the test; if no, please set up again.

5.2 Test Parameters Setting

（1）Test Materials Setting

Press MTL key to switch the materials, 0-9 represent:

Number	Hardness	Tensile strength (σb)
0	steel and cast steel	carbon steel
1	stainless steel	chrome nickel steel
2	forged steel	chrome molybdenum steel
3	alloy tool steel	chrome vanadium steel
4	gray cast iron	chromansil
5	nodular graphite	ultra-high intensity steel
6	cast aluminum alloy	stainless steel
7	brass	chrome-nickel-molybdenum steel
8	bronze	chrome steel
9	pure copper	low intensity carbon steel

（2）Hardness Scale Setting

Press [HD] key to switch hardness scale in turn:

HL → HB → HV → σ_b → HRC → HRB → HS
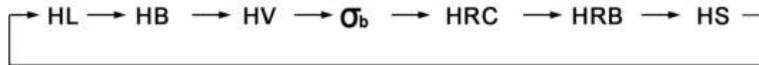
（3）Probe Setting

Install the probe in power-off status, and it shall automatically identify the probe when turning on; or in power-on status, press [PROBE] key to change the probe.

Standard probe: D; optional probes: C, DL, G

（4）Impact Directions Setting

Press [DIR] key to switch the impact directions in turn:
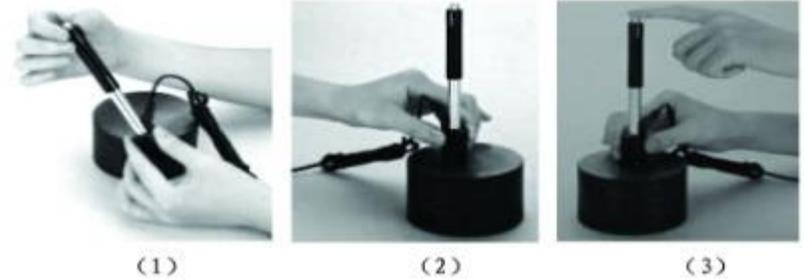
↓ → ↗ → ↑ → ← → ↘

Vertical down, Diagonal up 45°, vertical up, horizontal, Diagonal down 45°

（5） Impact Times Setting

Press [TIME] key to set up impact times.

1~7 times can be set, normally 3 times; when it reaches the testing times, the tester shall automatically calculate the mean value (Ave) and display on the screen.

5.3 Testing

(1) Loading: push the Loading tube downwards to lock the impact body;

(2) Localization: firmly press the impact device support ring on the tested surface, distance between two impact points should be ≥3mm;

(3) Testing: press release button on the impact device to start the 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.

After test is finished, indication area shall display the hardness value or Tensile strength value, and meanwhile testing times add a value.

* Please avoid to impact in the center of the hardness block as possible as it can!

5.4 Turn on Backlight

When the testing is operated in dark environment, press [↓/✳] key to turn on the backlight; long press [↓/✳] key to turn it off.

5.5 Calibration

The tester and impact device must be calibrated using the supplied hardness block before use as the first time, or having not been used for a long time

Methods: long press [↑/CAL] key to enter calibration interface and the screen displays CAL icon; when the screen displays the mean value (Ave), take the indicated value on the block as a standard, press [↑/CAL] / [↓/✳] key to adjust the value; finally press [S/R] key to save and finish the calibration.

* When the tester has been used for a period of time, the probe might be slightly worn out, which shall result in some test error, at this point, it may also use calibration.

5.6 Save

In testing process, press $\boxed{\text{S/R}}$ key to display the storage quantity at the top left corner of the screen and S icon is turned on, save the current data group after finishing the measurement serial. S icon shall disappear after saving the testing value, if you want to continue to save, further press $\boxed{\text{S/R}}$ key to save.

* This instrument saves 99 groups data (7 values and 1 Ave value for a group at most), if the storage is full, the new testing value group shall cover the previous group.

5.7 Browsing Memory Data

Long press $\boxed{\text{S/R}}$ key to enter browsing mode and the screen displays R icon; press $\boxed{\text{↑/CAL}}$ or $\boxed{\text{↓/*}}$ key to view the memorized data. Long press $\boxed{\text{S/R}}$ key to exit.

6. Maintenance

After a long period of use, please use the attached brush to clean the stand pipe and impact body.

◆ Screw down the support ring and take out the impact body.

◆ put and rotate the brush into the stand pipe in anti-clockwise and pull it out from the bottom, repeat this operation to clean the pipe.

◆ Install back the impact part and support ring.

◆ Release the impact spring after each test.

◆ Please remove the batteries if you are not using the device.