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**HDT-L411 PORTABLE LEEB  
HARDNESS TESTER(BASIC MODEL)  
OPERATING INSTRUCTION**



**Specifications**

- ◆ Accuracy:  $\pm 2\text{HLD} \pm 0.3\%$  (or HL = 800)
- ◆ Resolution: 1HLD, 1HV, 1HB, 0.1HRC, 0.1HRB, 0.1HRA, 0.1HS, 1SGM
- ◆ Display: 128x64LCD
- ◆ Impact direction: full Angle measurement
- ◆ Hardness scale: HL/HRC/HRB/HB/HV/HS/HRA/  $\sigma_b$
- ◆ Measuring range: HL170-960, HRC1-74, HRB1.2-140, HB18-1027, HV42-1220, HS3.9-112, HRA7-88.5, SGM (rm) 89-3300N/mm<sup>2</sup>
- ◆ Memory: 999 data can be saved and re-readable
- ◆ Working conditions:
  - Minimum weight: 5kg(direct measurement)
  - 2kg(fixed to the weight)
  - 0.05kg(coupled to the weight)
  - Minimum thickness: 5mm
  - Minimum radius: 30mm
  - Minimum roughness(Ra): 2 $\mu\text{m}$
- ◆ Statistics: Average/Max/Min value can be calculated automatically
- ◆ Power supply: 1.5V AAA battery \*1, With power display
- ◆ Interface: USB for charging or connect to PC
- ◆ Operating environment: -20~+45°C
- ◆ Dimension (L x W x D): 148 x 45 x 21 mm
- ◆ Weight: 105 g
- ◆ Standard: ASTM A956, DIN 50156, GB/T 17394-1998

**Applications**

- ◆ Hardness tests on installed machines or steel structures: e.g. on heavy and large work-piece or on permanently installed system parts.
- ◆ Rapid testing of multiple measuring areas for examination of hardness variations over larger regions.
- ◆ Measuring hardness for produced parts at production line.
- ◆ Identifying metallic material stored in a warehouse.
- ◆ Ineffectiveness analysis of permanent parts, pressure -vessel, turbo generator.

**Layout of instrument**



**Symbols and illustrations**

1 Symbols and Illustrations

Symbol	illustrations
HL	Leeb hardness value used with impact device D
HB	Brinell hardness value
HRB	Rockwell B hardness value
HRC	Rockwell C hardness value
HS	Shore hardness value
HV	Vickers hardness value
HRA	Rockwell A hardness value
$\sigma_b(\text{N/mm}^2)$	Strength value

2 Measurement and Conversion Table

IMPACT DEVICE D								HLD: 170-960
MATERIALS	HRC	HRB	HB	HV	HS	HRA	Σb	
							N/mm <sup>2</sup>	
STEEL/CAST STEEL	0.1-74.7	1.2-140	28-1027	45-1230	4.0-112	7-88.5	118-3315	
ALLOY TOOL STEEL	0.9-78.7		15-1878	32-1698	5.5-128		79-6599	
STAINLESS STEEL	3.7-62.4	8.3-101.7	85-655	36-802	6-131		108-1725	
LAMELLAR IRON	21-59	24-100	35-570	90-698	6-83			
NODULAR IRON	21-60	24-100	62-857	96-724	8-90			
CAST ALUMINUM	1-48	24-85	19-445	22-193	3-64		129-2618	
BRASS	1-53	1.5-99.6	32-477	29-495	5-65	32-76	258-4146	
BRONZE	1-56	14-100	15-505	11-535	2-68	29-76	190-1860	
WROUGHT COPPER	1-54	14-100	39-569	38-590	6-73			
FORGING STEEL	1-72		50-1060	48-1110	7-103		200-3750	

Preparation before Measuring

1 Requirements for the sample

1. The surface temperature of sample should be less than 120C.
2. The samples must feature a metallic smooth, ground surface, in order to eliminate erroneous measurements brought about by coarse grinding or lathe scoring. The roughness of the finished surface should not exceed 2µm.
3. Requirements for the weight of the sample  
For samples weighing over 5 kg and of compact shape, no support is needed.  
Samples weighing between 2-5 kg, and also for heavier samples with protruding parts or thin walls, should be placed on a solid support in such a manner that they do not bend or move by the impact force.
4. Samples weighing less than 2 kg should be firmly coupled with a stable support weighing over 5 kg.

For coupling purposes,

- (1) Application of the coupling paste (As thin as possible).
- (2) Mutual rubbing of both parts while firmly press the sample against the base plate.
- (3) A particular advanced of coupling is the possibility of obtaining a very uniform, rigid connection between the sample and the support, totally eliminating stresses at the sample surface. The resulting variation in measured values is very low.
5. Surface-hardened steels and especially case-hardened steels produce L-values which are too low when case-hardening depth

is small because of their soft core. When measuring with impact device D the depth of the hardened layer should be no less than 0.8 mm.

2 Surface test piece requirements

For test sample of curving surface with radius of curvature R less than 30mm, a small supporting ring should be used.

3 Large area event specimen

When the specimen is a large area of plate, long bar and bending part, even if the quality and thickness meet the requirements, it may still cause deformation and instability of the specimen, resulting in inaccurate test values.

4 Properties of the sample

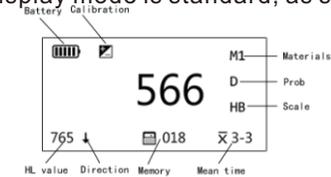
The requirements of d-type impact device on specimen quality and roughness are as follows:

light-weight: 0.05-2Kg      medium: 2.5Kg      heavy: > 5Kg

Minimum surface roughness: ISO N7/Ra 2µm/Rz 10µm

Operation

After starting up, the meter enters the measurement mode by default, and the screen display mode is standard, as shown in the figure.



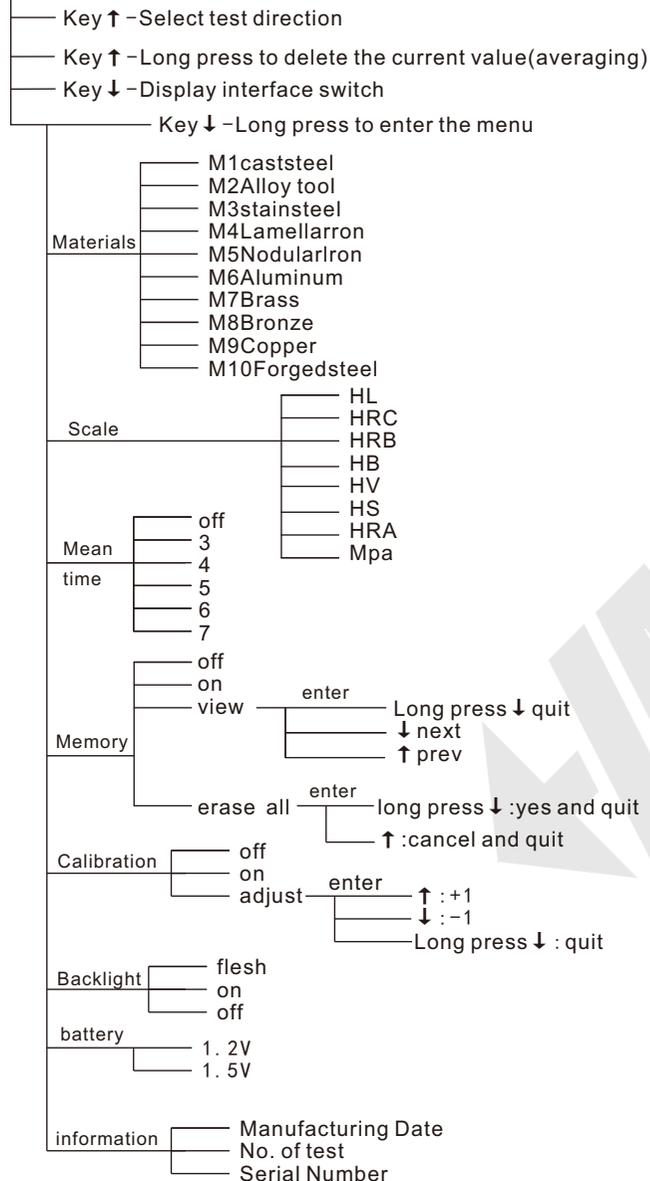
The meter has a variety of screen display modes: standard mode, large character mode, statistical parameter mode, by pressing "↑" key to choose.

1 Button description

↑	↓
In measuring mode, press it to enable/disable impact direction indicator In menu mode, press it to change parameters	In measuring mode, press it to switch among normal mode, big font mode and statistics mode In measuring mode, press and hold it to enter main menu In menu mode, press it to change to next menu item In menu mode, press and hold it to save the settings and exit to measuring mode

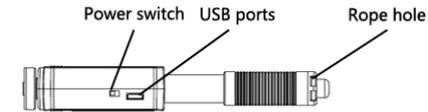
2 Diagram of Operation

HDT- L411 menu



3 Power on /off the instrument

Power on/off  
Push POWER SWITCH to switch on/off the tester



If the " " icon is displayed in the process of starting up the meter, it means that the meter has turned on the calibration function of measurement data. Please pay attention to whether the instrument is properly calibrated when measuring. Incorrect calibration will affect the accuracy of instrument display data

4 Parameters setup

1. Materials selection

Press button to enter menu "Materials", then press ↑ to change materials from M1 to M10. Press ↓ to go to next menu item. Press and hold ↓ to save settings and exit menu mode.



- |                        |                     |
|------------------------|---------------------|
| M1: Steel & Cast Steel | M6: Cast Aluminum   |
| M2: Alloy Tool Steel   | M7: Copper-Zinc     |
| M3: Stainless Steel    | M8: Copper-Aluminum |
| M4: Grey Cast Iron     | M9: Wrought Copper  |
| M5: Nodular Cast Iron  | M10: Forging Steel  |

2. Hardness scale conversion

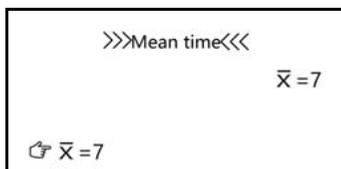
Hardness scale is based on the material selected. Not every material has same conversion. For example, for steel, it has conversions from HL to HRC / HRB / HB / HV / HS / HRA / σ; but for Grey Cast Iron (GG), only has conversions to HRC / HRB / HB / HV. The default hardness scale is Leeb hardness value (HL).

Press button ↓ consecutively to enter menu until "Scale" displays on LCD, then press ↑ to change scales orderly. Press ↓ to go to next menu item. Press and hold ↓ to save settings and exit menu mode



### 3. Mean times

Press button consecutively to enter menu "Mean time", then press to change value orderly. Press to go to next menu item. Press and hold to save settings and exit menu mode. The default mean time is 0 time.



If the mean time is set to 3 times, an indicator  $\bar{x}$  3-3 will be displayed on the lower-right corner.

Note: In the measurement interface, when the average number is on, long press to delete the current value.

### 4. Memory setup

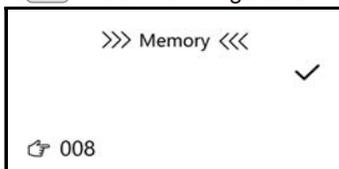
Press button consecutively to enter menu "Memory", then press to select "✓", "View", "Erase all" or "x" orderly. The default setting is memory off.

Memory off

x : Press and hold to save settings and exit menu mode.

Memory on

✓: Press and hold to save settings and exit menu mode.



View

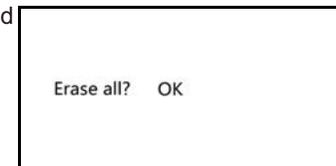
Press button to enter "View" mode. In this mode, press or to turn the page forth or back.

Press and hold button to exit "View" mode and go back to

"Memory" menu. Press and hold to save settings and exit menu mode.

Erase all

Press then "Erase all?" displays, press and hold to delete all stored

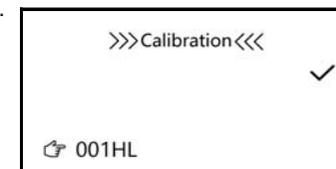


It will return to Memory mode after deleting data, press to go to next menu item. Press and hold to save settings and exit menu mode.

### 5. Calibration

The measurement compensation is used for calibration of the instrument. After the instrument is used for some time, the ball tip on impact body may be worn out or the instrument recognize wrong angle of probe which would lead inaccuracy. In order to compensate such error, the tester is designed to re-calibrate by user.

Press button consecutively to enter menu "Calibration", then press to select "x", "✓" or "Adjust" orderly. Press to go to next menu item. Press and hold to save settings and exit menu mode. The calibration procedure is only valid for current hardness scale.

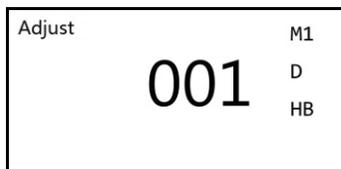


(1) Calibration off

x : Press button to go to next menu item. Press and hold to save settings and exit menu mode.

(2) Adjust

Adjust: Press button to enter Adjust mode. In this mode, press or to adjust compensation value, then press and hold to save settings and exit menu mode.



(3) Calibration on

✓: Press button to activate calibration indicator and go to next menu item. Press and hold to save settings and exit menu mode. After calibration is activated, an indicator will be displayed on LCD.



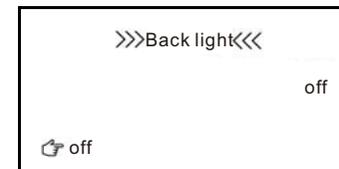
(4) Calibration procedure

- a) Turn off the calibration function.
- b) Take measurements on the standard hardness block D and make sure the measuring direction is downward vertically.
- c) If the hardness value of standard block is HL780, but the reading of tester is HL760, it means this tester need to be calibrated.
- d) Enter the Adjust mode, Calibration Adjust (Refer to 6.8.2), set the adjust value to 20 (Standard value – real testing value), then activate the calibration (Calibration On). An will be displayed in the LCD.
- e) In this mode, take measurements on the standard block again to check if the readings are acceptable.

**Note: The user calibration procedure should be done every half year, if you don't use the tester for long time, before start to use it, you should also do a calibration.**

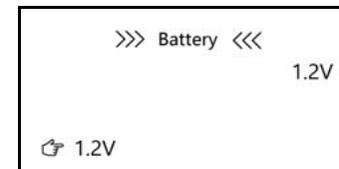
**6. Backlight**

Press button consecutively to enter menu “Backlight”, then press to select “on”, “off”, “flesh” Press to go to next menu item. Press and hold to save settings and exit menu mode.



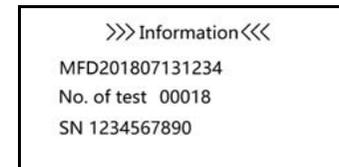
**7. Battery**

Press button consecutively to enter menu “Battery”, then press to select “1.2V” or “1.5V” Press to go to next menu item. Press and hold to save settings and exit menu mode. Information



**8. Information**

Press button consecutively to display System Information. Press to exit menu mode.



**5 Measurement display mode**

This meter has a variety of screen display modes, including standard mode, large character mode and statistical parameter mode. Press to switch display modes in the measurement state, as shown below:

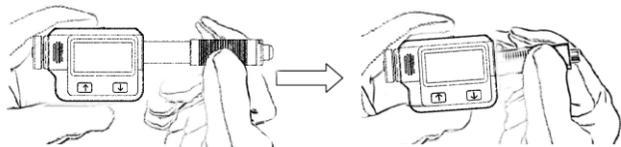


## Take Measuring

### 1 Loading Spring

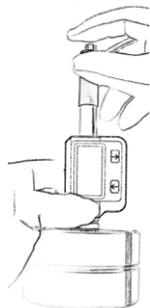
Hold the main body (the tester) with left hand while right hand is holding loading tube, then push the loading tube with a little force against spring force toward tester until to lock the impact body.

Loose the force and let the loading tube returns to the original position



### 2 Take measurement

Place the tester against onto the surface of object to be measured by the support ring.



**Please note: the proper way of holding is important for obtaining better readings.**

**Attention: the tester must be placed against object surface firmly and perpendicularly. A slight gap between support ring of tester and surface of object will lead inaccurate reading.**

### 3 Release the testing force

After firmly placing the tester onto the surface of object with left hand, hold the loading tube with thumb and middle finger of right hand and press the release button with forefinger.

The impact body inside probe will impact the surface of object with spring force. Then the hardness reading will be displayed on the screen.

## Maintenance and Repair

Do your best to avoid shock, heavy dust, damp, strong magnetic field, and oil stain.

### 1 Maintenance of the Impact Device

The devices do not require any particular care other than periodic cleaning of the impact body and the guide tube after performing approximately 1000-2000 tests. During cleaning, the following procedures need to be observed:

Unscrew support ring and remove impact body from guide tube.

Clean off any dirt and metallic dust from the impact body and the spherical test tip.

Clean guide tube with the special brush provided.

Do not apply oil to any parts for the impact device.

### 2 Replacing Battery

When a battery indicator displays that reminds you to replace the battery. However it is still possible to measure for some time. Please make sure to obtain suitable batteries.

## Introduction of PC software

Data communication software is designed for reading and processing the data of hardness tester. It can read the data from the memory of hardness tester, export the data to the computer and print the data from the computer printer.

System requirement: A PC with USB port  
Windows 7 / Windows 8 / Windows 10

### 1 Connect PC and hardness tester by USB cable

Before using PC software, please make sure the tester is switched off and connect PC and hardness tester using USB cable supplied with the instrument.

### 2 Driver installation

Computer will prompt "Found new hardware" while the hardness tester is connected to the computer first time, please install the driver located in X:\Drivers folder. (X: means CDROM drive letter).

### 3 Software Installation

Double click "setup.exe" to install the PC software. Please follow the installation wizard to finish it.

#### 4 Start PC software

After the data communication software is installed, a shortcut will be created on the desktop automatically. Double click the shortcut to run the program.

