INNOVATEST®
Advanced Materials Testing Solutions

MANUAL
TH-1100

Portable 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.

CONTENTS

1 INTRODUCTION

1.1 FEATURES

- Compact device ,portable and easy operation;
- Dot matrix LCD display;
- Battery capacity display and power off automatically lack of voltage;
- Suitable for testing multiple materials and various hardness scale can be preset;
- Impact times can be preset to satisfy various requirement of customer;
- Rechargeable Li battery;

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 work piece;
- Failure analysis of pressure vessel, steam turboset 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

NO.	Material	Hardness scale	Application range
M01	Steel and Cast Steel	HRC	20.0~68.4
M01	Steel and Cast Steel	HRB	38.4 ~99.8
M01	Steel and Cast Steel	HB	81~654
M01	Steel and Cast Steel	HV	81~955
M01	Steel and Cast Steel	HS	32.5~99.5
M02	Cold Work Tool Steel	HRC	20.4~67.1
M02	Cold Work Tool Steel	HV	80~898
M03	Stainless Steel	HRB	46.5~101.7
M03	Stainless Steel	HB	85~655
M03	Stainless Steel	HV	85~802
M04	Grey Cast Iron	HB	93~334
M05	Nodular Cast Iron	HB	131~ 387
M06	Cast Aluminum Alloys	HB	19~164
M06	Cast Aluminum Alloys	HRB	23.8~84.6
M07	Copper-Zinc Alloys	HB	40~173
M07	Copper-Zinc Alloys	HRB	13.5~95.3
M08	Copper-Aluminum Alloys	HB	60~290
M09	Wrought Copper	HB	45~315
M10	Wrought Steel	HB	143~650

1.3 SPECIFICATION

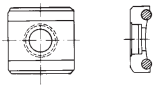
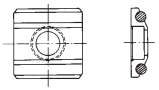
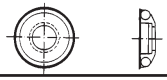
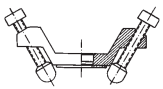
1.3.1 Standard delivery

- TH-1100 main unit 1
- Small supporting ring 1
- Cleaning brush 1
- Hardness test block 1
- Charger 1

1.3.2 Optional parts

Supporting rings; see table 2.

Table 2

No.	Code	Model	Sketch	Remarks
1	03-03.7	Z10-15		For testing cylindrical outside surface R10-R15
2	03-03.8	Z14.5-30		For testing cylindrical outside surface R14.5-R30
3	03-03.9	Z25-50		For testing cylindrical outside surface R25-R50
4	03-03.10	HZ11-13		For testing cylindrical inside surface R11-R13
5	03-03.11	HZ12.5-17		For testing cylindrical inside surface R12.5-R17
6	03-03.12	HZ16.5-30		For testing cylindrical inside surface R16.5-R30
7	03-03.13	K10-15		For testing spherical outside surface SR10-SR15
8	03-03.14	K14.5-30		For testing spherical outside surface SR14.5-SR30
9	03-03.15	HK11-13		For testing spherical inside surface SR11-SR13
10	03-03.16	HK12.5-17		For testing spherical inside surface SR12.5-SR17
11	03-03.17	HK16.5-30		For testing spherical inside surface SR16.5-SR30
12	03-03.18	UN		For testing cylindrical outside Surface , radius adjustable R10～∞

1.4 WORKING CONDITION

Environmental temperature: 0°C~40°C
Relative humidity: <90%

The surrounding environment should be no vibration, strong magnetic field, corrosive medium and heavy dust.

2 STRUCTURE FEATURE & TESTING PRINCIPLE

2.1 STRUCTURE FEATURE

Structure feature see figure 1.

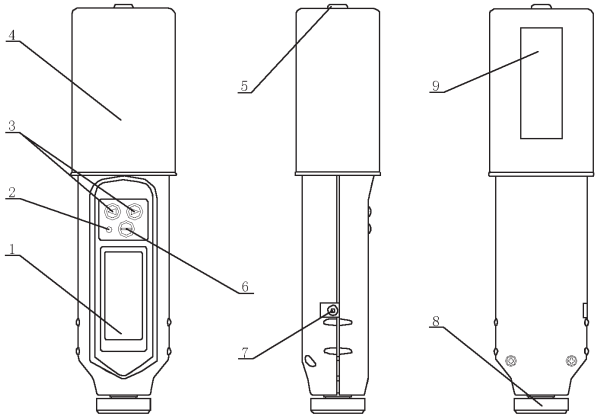


Figure 1

1	display window	6	power key
2	indicator light	7	charger socket
3	operation key	8	support ring
4	sheath	9	nameplate
5	release button		

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 as followed:

$$HL=1000\times VB/\ VA$$

Where,

HL	Leeb hardness value
VB	Rebounding velocity of the impact object
VA	Impacting velocity of the impact object

3 SPECIALTIES

3.1 SPECIFICATIONS

3.1.1 Impact Device D

3.1.2 Features of Impact Device and testing demand see table 3 indentation dimension of test tip see table 4

Table 3

Parameter	**Value**
Impact energy	11mJ
Impact object weight	5.5g
Hardness of test tip	≥1600HV
Diameter of test tip	3mm
Material of test tip	Tungsten Carbide
Max. hardness of workpiece	940HV
Roughness of workpiece Ra	≤1.6μm
Min. weight of workpiece	
Test directly	>5kg
Need stable support	2~5kg
Need couplant	0.05~2kg

Min thickness of workpiece	
Test directly	>5mm
Need couplant	≤5mm
Min. depth of harden surface	0.8mm

Table 4

Hardness HV	**Parameter**	**Value mm**
300	Indentation diameter	0.54
300	Indentation depth	0.024
600	Indentation diameter	0.54
600	Indentation depth	0.017
800	Indentation diameter	0.35
800	Indentation depth	0.010

3.1.3 Accuracy and repeatability of displayed value see table 5.

Table 5

Hardness value of Leeb standard test block	**Error of displayed value**	**Repeatability of displayed value**
760±30HLD	±6 HLD	10 HLD
530±40HLD	±10 HLD	10 HLD

- Measuring range: 170~960HLD
- Measuring direction: 360°
- Scales: HL, HB, HRA, HRB, HRC, HV, HS
- Display: 112×48 dot matrix LCD
- Range of impact times: 1~9 optional;
- Charger power: 6V/400mA
- Continual working time: >8 hours
- Continual charging time: 2~3 hours
- Power: 3.7V
- Dimension: 145mm×35mm×30mm
- Weight: about 130g.

4 USING

4.1 PREPARATION BEFORE USING

4.1.1 Preparation for sample surface

Preparation for sample surface should conform to the relative requirement in figure 3.

- In the preparation process for sample surface, the hardness effect of being heated or cold processing on the surface of sample should be avoided
- Too big roughness of the measured surface could cause measure error. So, the measured surface must be metallic luster, smoothing and polish, without oil stain
- 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; the small support ring or the shaped support ringsshould be chosen, see figure

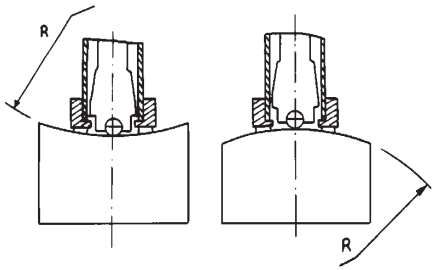


Figure 2

- Support of test sample Support is not necessary for heavy sample. Medium-weight parts must be set on the smoothing and stable plane. The sample must set absolutely equability and without any wobble.
- The sample should have enough thickness, minimum thickness of sample should conform to table 3.
- For the sample with hardened layer on surface, the depth of hardened layer should conform to table 3.
- Coupling
  Light-weight sample must be firmly coupled with a heavy base plate. Both coupled sufaces must be flat and smooth. And there should be no redundant coupling agent exists. 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 should be reinforced or supported at its back.
- Magnetism of the sample itself should be avoided.

4.1.2 Preset test parameters

See 6.8.

4.2 TESTING

- The instrument can be calibrated with standard test block, the accuracy and repeatability displayed should be within the regulation of table 5.

4.2.1 Loading

- Put the supporting ring onto the surface of workpiece hold the upper part by left hand and press down the body by right hand while holding the loading key
- Impact direction should be vertical to tested surface.

4.2.2 Testing

- Press release button at top of the main unit to test. The sample and the main unit as well as the operator are all required being stable
- Usually, test 5 times on each measure area of sample. The data dispersion should not be more than mean value ±15HL
- 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 6

Distance between any two indentations mm	**Indentation to the edge of tested sample mm**
>3	>5

4.2.3 Testing result

- The test result display on the screen in large print
- The hardness tester will clear zero and begin measurement again after any change in preset of any test parameters(hardness scale, material, impact direction, test time etc.).

5 OPERATION EXPLAIN IN DETAILS

5.1 SWITCH ON

Press ⏻ to switch on the screen will show as follows:

Figure 4

Then enter main display interface, see as figure 5

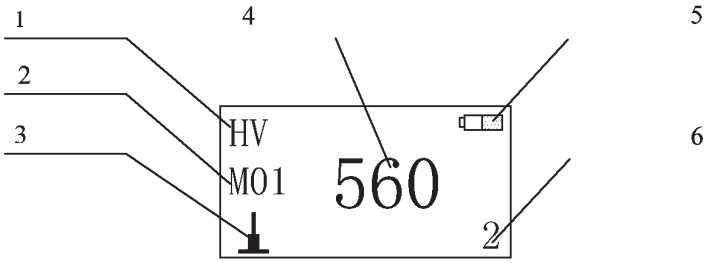


Figure 5

1 Hardness scale
2 Material
3 Impact direction
4 Measured value
5 Battery capacity
6 Impact times

Instruction of the main display interface

-	Measured value	Display present single measured value (without average value indicator ⧖), or display the present average value (with average value indicator). ⧖
-	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.

5.2 SWITCH OFF

Press ⏻ to switch off.

5.3 MEASURING OPERATION

The screen will display each measured value during each measurement under the measuring display interface, and the impact times add 1 accordingly; The average value and average value indicator will display when reaching the preset impact times.

NOTE:
After hardness scale, material, impact direction and impact times have been set, measurement can be carried out when all the parameters are not in reverse video.

5.4 VIEW DATA

Press ▼ to browse each single measured value after finished a group of measurement, each single measured value will display from the first one to last one. When the last one display, press to ▼ return measuring interface.

5.5 HARDNESS SCALE SETTING

Press ⓐ,the hardness scale will be displayed in reverse in video under measuring display interface,then ⓥ press to select the corresponding hardness scale as you wanted. See as figure 6

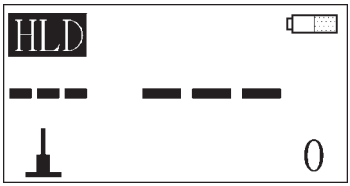


Figure 6

Press ⓐ to end the setting of hardness cale and enter material setting

5.6 SET MATERIAL

After finished the setting of hardness scale, press ⓥ to select the corresponding material, see as figure 7.

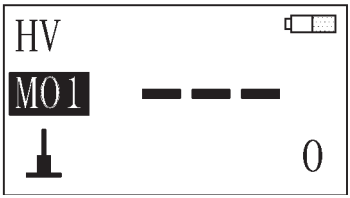


Figure 7

Press ⓐ to end the setting of material and enter impact direction setting.

NOTE:
1. *Any other hardness scale can not be selected when the hardness scale is HLD*
2. *Different hardness scale corresponds to different material.*

5.7 IMPACT DIRECTION SETTING

Press ▽ to select the impact direction after finished the setting of material, see as figure 8

Figure 8

Press △ to end the setting of impact direction and enter the setting of impact times.

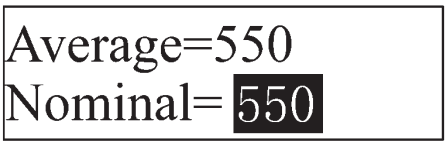
5.8 IMPACT TIMES SETTING

After finished the setting of impact direction ,press ▽ to set impact times, see as figure 9.
Press △ to end the setting of impact times and enter measuring interface.

5.9 SOFTWARE CALIBRATION

The tester should be calibrated using standard test block before use this tester for the first time, or reuse after a long time.
Press ▽ and ◁ simultaneously the tester is switched on and it enters the software calibration state. See as figure 10.

It will display average value after measurement, see as figure 11.
Press △ to input nominal value. Press ▽ to finish calibration.
Range of adjustment: ±15HL.



5.10 SOFTWARE

Press Ⓐ and Ⓓ simultaneously to enter into software information display screen. Software version and instrument serial NO. will display, see as figure 12. It will return measuring interface automatically in five seconds.No notification if there is any change with software version and mark.

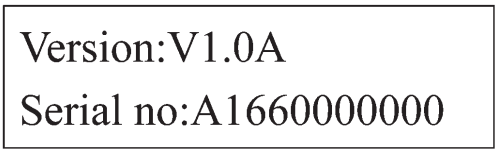


Figure 12

5.11 CHARGE

1) Li-ion rechargeable battery is taken in case of lower voltage the red LED will blink and give alarm the tester will shutoff automatically in case of delayed charge;
2) In case of lower voltage insert the battery charger plug into the processing unit socket red LEDwill be on. When charge finishes green LED will be on;

5.12 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 key operation within 5 minutes, the tester will shut off automatically.

6 TROUBLE SHOOTING

If the instrument can not be switched on ,please plug the charger in to charger socket, and then press power key to charge it.If it still does not work, please connect with INNOVATEST Europe service department.

7 MAINTENANCE AND REPAIR

7.1 IMPACT DEVICE

- 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.

7.2 REPAIR

- When using standard Rockwell hardness block to test, if all the error is bigger than 2 HRC, maybe the test tip is invalid because of abrasion. Changing the test tip or impact object should be considered.
- When the hardness tester appears any other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts by yourself. You can contact with INNOVATEST Europe service department.

8 INSPECTION PERIODS

The inspection period of such hardness tester should not beyond one year. Uses should arrange the inspection according to its own condition.
Version:V1.0A
Serial no:A1660000000

9 NOTICE FOR USES

Non-guaranty parts:
- outside frame
- impact body
- support rings
- display window
- keyboard film

10 NOTICE OF TRANSPORTATION AND STORAGE

Please keep it away from vibration, strong magnetic field, corrosive medium, dumpiness and dust.

EC-DECLARATION OF CONFORMITY

This certifies that the following designated product
TH-1100 (Portable hardness tester)
complies with the essential protection requirements of
Council Directive 89/336/EWG approximation of the laws of the
Member States relating to electromagnetic companies.

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:

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