



Product Name	GAOTek Portable Digital Hardness Tester Meter
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1 General Description

Features

- OLED display of 128×64 matrix is used., highlight display; no viewing angle
- Converts to all common hardness scales(HV, HB, HRC, HRB, HRA, HS).
- English displaying and menu operating, the operation is easy and convenient.
- With the USB 2.0 interface, multiple communication modes are adopted to meet the customized requirements of various users.
- Equipped with 7 types of impact devices which need not be recalibrated when changing them, the system can identify the type of impact device automatically.
- Max600 groups (impact times:32~1) of data can be stored at internal non-volatile data storage.
- Upper and lower limits of hardness can be preset; When the tested value exceeds the limits, the alarm will be sent out automatically to make it convenient for the requirements of batch measurements.
- A Backlight display has been used to make it convenient for use in poor light.
- Test values software calibration function.
- Auto power off to save energy.
- Material of “cast steel” is added; HB values can be read out directly when the D/DC impact device is used to measure the “cast steel” workpiece.
- Thermal printer integrated, convenient for in-field printing.
- lithium cell rechargeable battery as the power source. Charge circuit integrated inside the instrument. Continuous working period of no less than 100 hours
- Software PC can be installed according to the requirements of a user, the function will be more powerful to satisfy the more strict demands of quality control and management.

Main Application and Testing Range

Main Application

- The assembled machinery and permanently installed parts
- Die cavity of moulds
- Heavy workpiece
- Failure analysis of pressure vessel, steam turbo-generator set and other equipment
- Narrow testing space where the workpiece installed
- Bearings and other parts
- Cases which require the test result with normalized original recording
- Material identification of the metal material warehouse



- Quick tests of large range and multipoint measuring positions for heavy workpiece

Testing Range

Testing range see table1 and table2.

Table 1

Material	Hardness method	Impact device						
		D/DC	D+15	C	G	E	DL	
Steel and cast steel	HRC	17.9~	19.3~	20.0~		22.4~	20.6~	
		68.5	67.9	69.5		70.7	68.2	
	HRB	59.6~			47.7~		37.0~	
		99.6			99.9		99.9	
	HRA	59.1~85.					61.7~	
		8					88.0	
HB	127~	80~638	80~683	90~646	83~663	81~646		
	651							
HV	83~976	80~937	80~996		84~	80~950		
					1042			
HS	32.2~	33.3~	31.8~		35.8~	30.6~		
	99.5	99.3	102.1		102.6	96.8		
Hammered steel	HB	143~650						
Cold work tool steel	HRC	20.4~	19.8~	20.7~		22.6~		
		67.1	68.2	68.2		70.2		
HV	80~898	80~935	100~		82~			
			941		1009			
Stainless steel	HRB	46.5~						
		101.7						
	HB	85~655						
	HV	85~802						



Table 1

Material	Hardness method	Impact device					
		D/DC	D+15	C	G	E	DL
Gray cast iron	HRC						
	HB	93~334			92~326		
	HV						
Nodular cast iron	HRC						
	HB	131~387			127~364		
	HV						
Cast aluminum alloys	HB	19~164		23~210	32~168		
	HRB	23.8~84.6		22.7~85.0	23.8~85.5		
Brass(copper-zinc alloys)	HB	40~173					
	HRB	13.5~95.3					
Bronze (copper-aluminum/copper-tin alloys)	HB	60~290					
Wrought copper alloys	HB	45~315					

Table 2

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

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Types and specification

	No.			Remarks
Standard Delivery	1	Main unit	1	
	2	D type impact device	1	
	3	Small supporting ring	1	
	4	Nylon brush (A)	1	
	5	High value Leeb test block	1	
	6	Battery Charger	1	9V 1000mA
	7	Paper for printing	1	
	8	Communication cable	1	
	9	DataView Software	1	
Additional Optional Delivery	1	Nylon brush (II)		In case of choosing G type impact device
	2	Various non-conventional type of impact devices		See table 3
	3	Various non-conventional type of impact supporting ring		See table 4
	4			

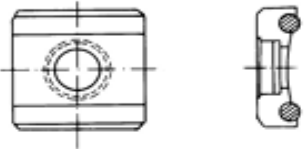
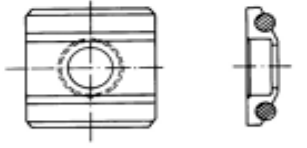

Table 3


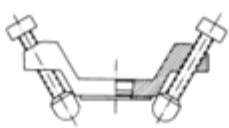
Non conventional impact devices	DC(D)/D L	D+15	C	G	E
Impacting energy	11Mj	11mJ	2.7mJ	90mJ	11mJ
Mass of impact body	5.5g/7.2g	7.8g	3.0g	20.0g	5.5g
Test tip Hardness	1600HV	1600HV	1600HV	1600HV	5000HV
Diameter of test tip	3mm	3mm	3mm	5mm	3mm
Material of test tip	Tungsten carbide	Tungsten carbide	Tungsten carbide	Tungsten carbide	synthetic diamond
Impact device Diameter	20mm	20mm	20mm	30mm	20mm
Impact device Length	86(147)/ 75mm	162mm	141mm	254mm	155mm
Impact device Weight	50g	80g	75g	250g	80g
Max. hardness of workpiece	940HV	940HV	1000HV	650HB	1200HV



Mean roughness of workpiece surface of the Ra		1.6 μ m	1.6 μ m	0.4 μ m	6.3 μ m	1.6 μ m
Min. weight of sample						
Measure directly		>5kg	>5kg	>1.5kg	>15kg	>5kg
Need support firmly		2~5kg	2~5kg	0.5~1.5kg	5~15kg	2~5kg
Need coupling tightly		0.05~2kg	0.05~2kg	0.02~0.5kg	0.5~5kg	0.05~2kg
Min. thickness of sample coupling tightly		5mm	5mm	1mm	10mm	5mm
Min. layer thickness for surface harden		≥0.8mm	≥0.8mm	≥0.2mm	≥1.2mm	≥0.8mm
Size of tip indentation						
Hardness 300HV	Indentation diameter	0.54mm	0.54mm	0.38mm	1.03mm	0.54mm
	Indentation depth	24 μ m	24 μ m	12 μ m	53 μ m	24 μ m
Hardness 600HV	Indentation diameter	0.54mm	0.54mm	0.32mm	0.90mm	0.54mm
	Indentation depth	17 μ m	17 μ m	8 μ m	41 μ m	17 μ m
Hardness 800HV	Indentation diameter	0.35mm	0.35mm	0.35mm	--	0.35mm
	Indentation depth	10 μ m	10 μ m	7 μ m	--	10 μ m
Available type of impact device		D: General test DC: Hole or hollow-cylindrical test DL: Slender narrow groove or hole test	D+15: groove or reentrant surface	C: small, light, thin parts or surface of hardened layer	G: large, thick, heavy or rough surface steel	E: super high hardness material

Table 4

No.	Code	Type	Sketch of non conventional supporting ring	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	03-03.1 0	HZ11-13		For testing cylindrical inside surface R11~R13
5	03-03.1 1	HZ12.5-17		For testing cylindrical inside surface R12.5~R17
6	03-03.1 2	HZ16.5-30		For testing cylindrical inside surface R16.5~R30
7	03-03.1 3	K10-15		For testing spherical outside surface SR10~SR15
8	03-03.1 4	K14.5-30		For testing spherical outside surface SR14.5~SR30

9	03-03.1 5	HK11-13		For testing spherical inside surface SR11~SR13
10	03-03.1 6	HK12.5-17		For testing spherical inside surface SR12.5~SR17
11	03-03.1 7	HK16.5-30		For testing spherical inside surface SR16.5~SR30
12	03-03.1 8	UN		For testing cylindrical outside surface, radius adjustable R10~∞

Operating conditions:

Ambient temperature:-10°C~40°C

Relative humidity: ≤90%

No vibration, no strong magnetic field and no corrosive medium and heavy dust in ambient environment

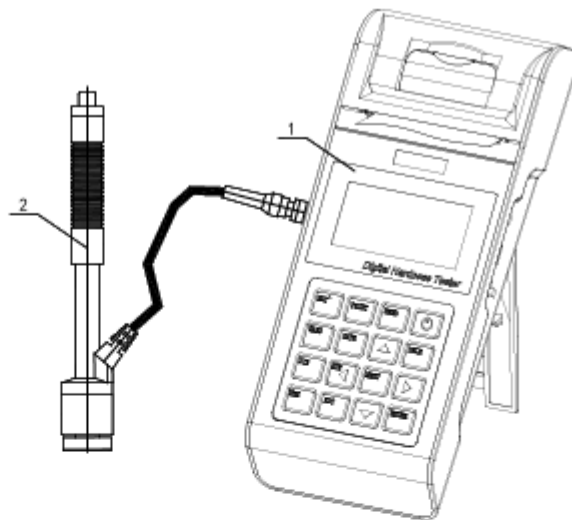
2 Structure features and Testing principle

2.1 Structure features

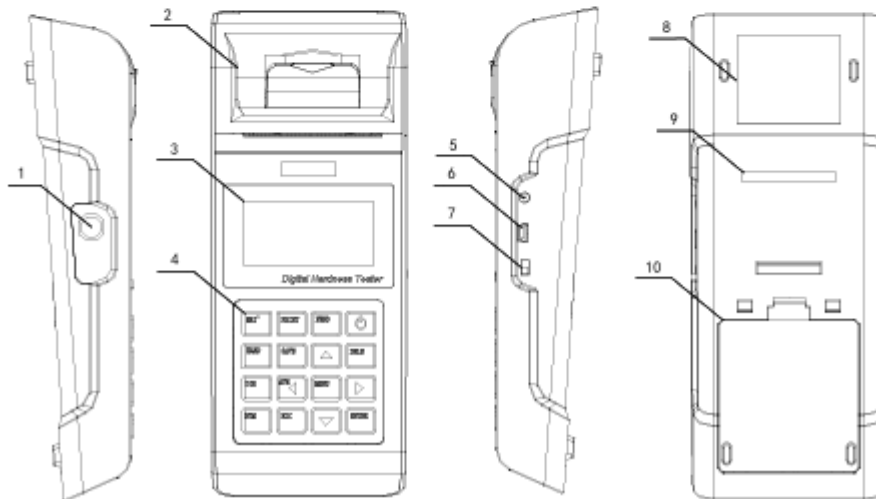
2.1.1 Hardness Tester

1: Main unit

2: Impact device

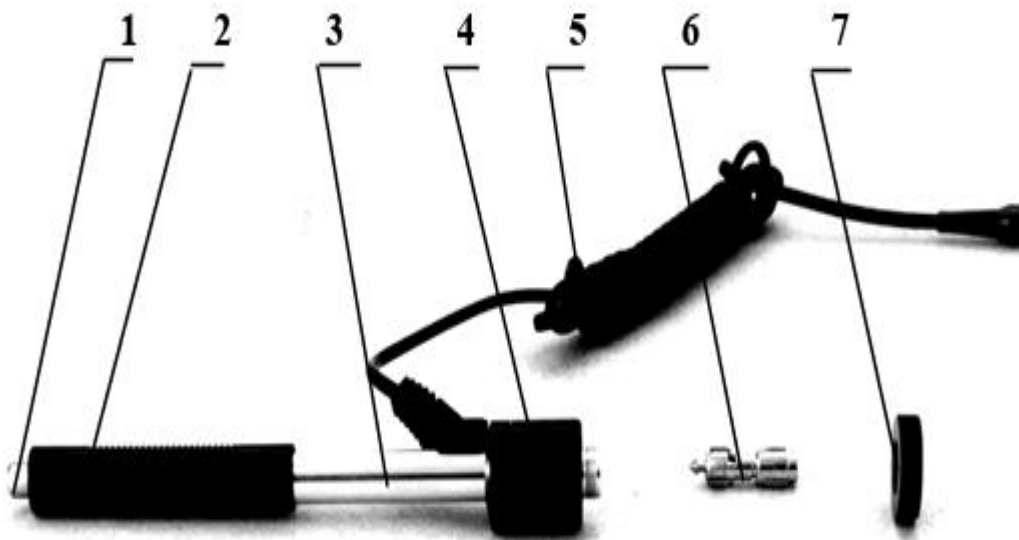


2.1.1.2 Main unit



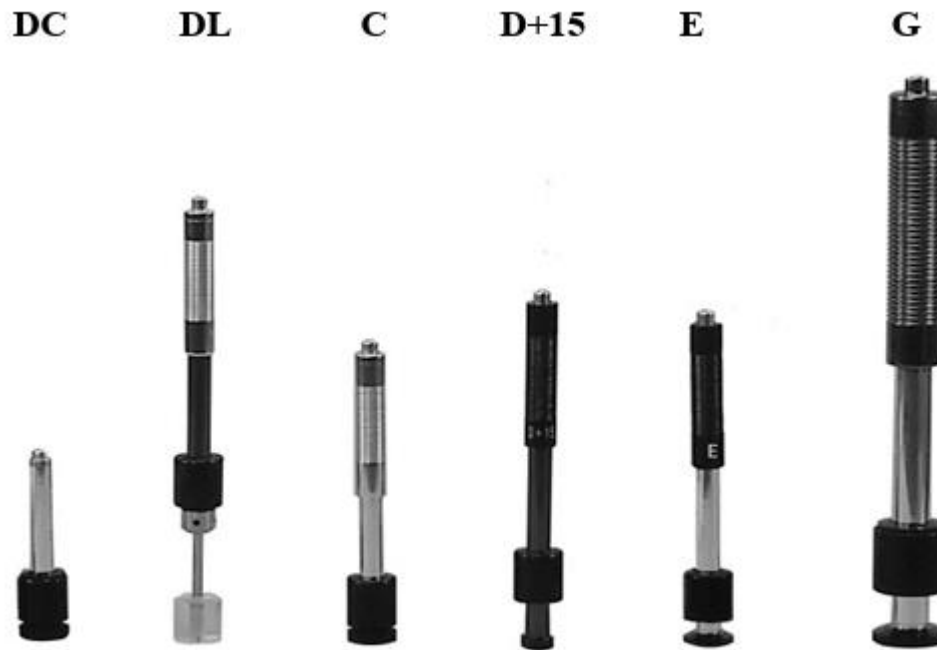
1. Socket of impact device
2. Paper compartment cover
3. LCD display
4. Keypad
5. Power jack
6. Socket of USB
7. Battery switch
8. Product label
9. Serial Number
10. Battery compartment cover

2.1.3 D-type impact device



1. Release button
2. Loading sheath
3. Guide tube
4. Coil part
5. Connection cable
6. Impact body
7. Support ring

2.1.4 Non conventional types of impact devices



2.2 Testing principle

Let an impact body whose weight is definite rush into the surface of the sample, the hardness value comes from the rate of rebound velocity and rush velocity at a 1mm distance from the testing surface.

The calculation formula is following:

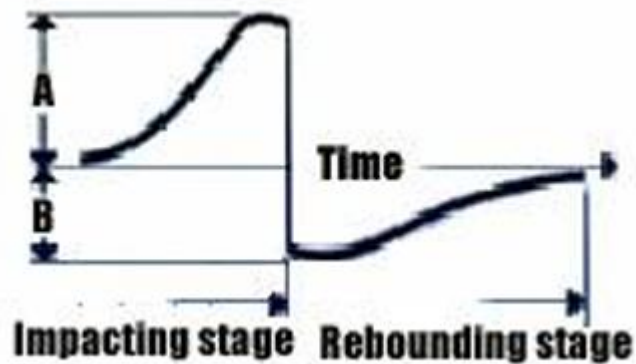
$$HL=1000 \times VB / VA$$

In which: HL——Leebhardness value

VB——Rebounding velocity of the impact body

VA——Impacting velocity of the impact body

Output signal diagram of the impact device is as following:



Technical capabilities

Specifications

1. Measuring range: HLD (170~960) HLD
2. Measuring direction: 360°
3. Hardscape: HL, HB, HRB, HRC, HRA, HV, HS
4. Display: OLED, 128×64matrix
5. Printing paper: width is (57.5±0.5) mm, diameter is 30mm
6. Datamemory:48~600 groups (impact times: 32~1)
7. Rangeofupperandlower limit: the same as measuring range
8. WorkingBattery pack: 7.4V lithium
9. Battery charger: 9V/1000mA
10. Continuous working period: approx. 100 h
11. Communication interface: USB
12. Accuracy and repeatability of displayed value, see table 5.

3.2 Dimension sizeand weight

3.2.1 Dimension 209×85×45mm (mainunit)

3.2.2 Weight approx.0.6kg (mainunit)



Table 5

No.	Type of impact device	hardness value of standard Leeb hardness block	Error of displayed value	Repeatability of displayed value
1	D	760 ± 30HLD 530 ± 40HLD	± 6 HLD ± 10 HLD	6 HLD 10 HLD
2	DC	760 ± 30HLDC 530 ± 40HLDC	± 6 HLDC ± 10 HLDC	6 HLD 10 HLD
3	DL	878 ± 30HLDL 736 ± 40HLDL	± 12 HLDL	12 HLDL
4	D+15	766 ± 30HLD+15 544 ± 40HLD+15	± 12 HLD+15	12 HLD+15
5	G	590 ± 40HLG 500 ± 40HLG	± 12 HLG	12 HLG
6	E	725 ± 30HLE 508 ± 40HLE	± 12 HLE	12 HLE
7	C	822 ± 30HLC 590 ± 40HLC	± 12 HLC	12 HLC



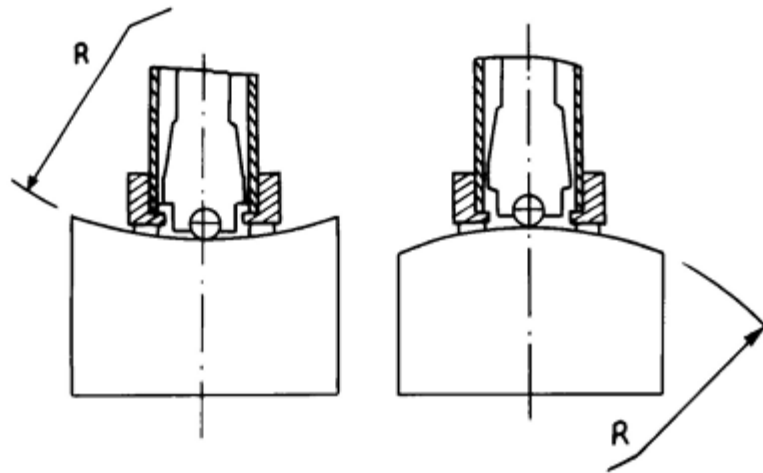
4 Testing

4.1 Preparation and Inspection before testing

4.1.1 The preparation of the workpiece surface

The preparation for the workpiece surface should comply with the relevant requirements specified in Table 3

- During the sample preparation, the effect on the surface hardness of the sample caused by overheating, cold processing, etc. should be avoided as far as possible.
- If the surface to be tested is too rough, a measuring error will appear. So the surface of the sample must have a metallic lustre and the surface must be flat, smooth and have no oil dirt.
- Curved surface: it is better than the testing surface of the workpiece plane. When the curvature radius of the curved surface to be tested is less than 30mm (for D, DC, D+15, C, E and DL type impact devices) and less than 50mm (for G type impact devices), as small support ring or non-conventional support ring should be used.
- Workpiece supporting
 - Support is not necessary for heavy test workpieces
 - The workpiece with medium weight must be placed on a flat and solid plane, and it must be placed stably without any shaking.
- The thickness of the workpiece is necessary, and the min. thickness should comply with the specifications in Table 3.
- As most of the pieces with a hardened surface layer, the depth of the hardened layer should comply with Table 3.
- Coupling
 - The workpiece's lightweight must be firmly coupled with the support; both coupled surfaces must be flat, and smooth and the coupling agent should not be too much. The measuring direction must be vertical to the coupled surface.
 - The workpiece is a large area plate, long rod or bending piece, it can be deformed and become unstable even if the weight and the thickness are heavy and the test value may not be accurate. So it should be reinforced or supported at the back of the workpiece.
- Selfmagnetism of workpiece should be less than 30 Gauss.



4.1.2 System setting of tester

Specific procedures for setting refer to 6.9.

4.1.3 Measuring condition setting of tester

Specific procedures for setting refer to 6.5

4.2 Testing

- A standard hardness block should be used to check the tester before the testing, and the reading value error and repeatability should not be more than the specification in Table 5.

Note: the hardness value of the standard hardness test block can be measured via a Leeb hardness tester which has been calibrated; five times measuring should be carried out in the direction of vertically down and the arithmetic mean of five values should be used as the hardness value of standard hardness test block. If the value exceeds the standard range, it can be calibrated via the user calibration function.

4.2.1 Start-up

- Insert the impact device plug into the socket of impact device located on the right of the tester.
- Press **【】** key to turn on the power, then the tester enters into the measuring status.

4.2.2 Loading

- Push down the loading sheath to lock the impact body; for the DC-type impact device, the loading bar can be attracted on the testing surface and the DC-type impact device into the loading bar until the stop position, of the loading has been finished.
- Press tightly the support ring of impact device on the surface of test sample, the direction of impact should be vertical with testing surface.



4.2.3 Testing

- Press down the release button on the top of the impact device to make a test. At this point, the test sample, impact device and operator are all required to be stable; and the force direction should comply with the axis of the impact device.
- Five measurements should be carried out per measuring position of a test sample. The divergence of data should not exceed $\pm 15HL$ of the mean value.
- Distance between any two indentations, or the distance between any indentation centre and the edge of the test sample should be by the specification of Table 6.
- For special materials, a comparative test must be performed to obtain relevant conversion relation if Leeb hardness value accurately conversing to other types of hardness value is required. Procedures are as follows: tests are made on the same test sample via Leeb hardness tester which recalibrated well and the relevant hardness meter respectively; for each hardness value, five points uniformly distributed around hardness indentation should be chosen to make tests, and tests for three (at least) indentations should be made; the mean value of Leeb hardness and the mean value of relevant hardness will be act as



relevant values respectively to make a comparative hardness curve. Three groups corresponding data should be included at least in comparative curve.

Table 6

Type of impact device	The distance of two indentations center	The distance between indentation center and edge of test piece
	No less than	No less than
D、 DC	3	5
DL	3	5
D+15	3	5
G	4	8
E	3	5
C	2	4

4.2.4 Read measured value

4.2.5 Print out the result For specific setting methods, see 6.3.3 and 6.6.

4.2.6 Press **【】** key to turn off

4.2.7 The processing of testing results

The mean value of five valid testing points can serve as testing data for Leeb hardness.

4.2.8 The expression of testing results

- Hardness value will be displayed ahead of HL (the symbol of Leeb Hardness), and the type of impact device will be displayed back of HL. For example, 700HLD expresses that the Leeb hardness is 700 using the measurement made by the D type of impact device.
- For other types of hardness which changed from the Leeb Hardness value, the corresponding hardness symbol should be added ahead of the Leeb hardness symbol. For example, 400HVHLD expresses that the Vickers hardness value is 400, which changed from Leeb hardness value measured by D type impact device.



Note: HL values measured by various impact devices are various. For example 700HLD≠700HLC.

5 Special prompts

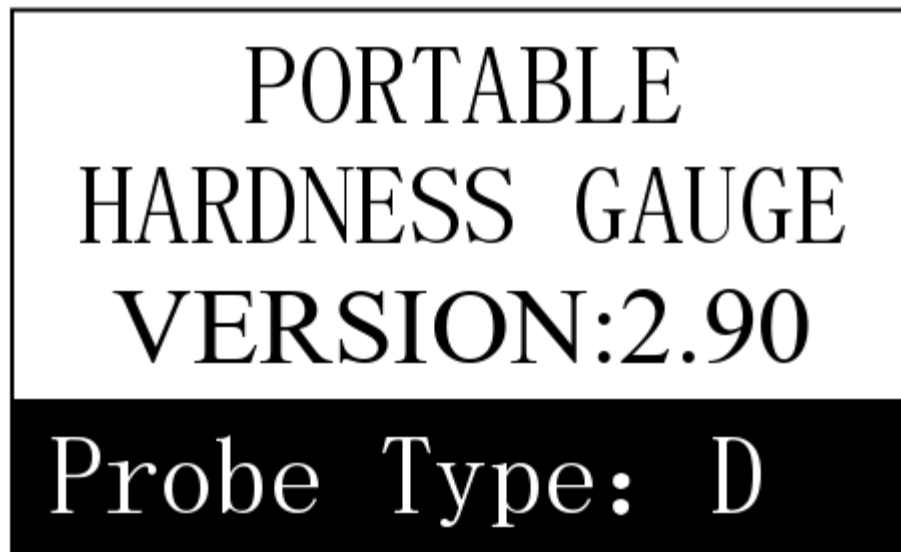
- Replacing the impact device must be performed under the condition of turn off, otherwise, the impact device type can not be identified automatically, and even it is possible to cause damage to the circuit board of the tester.
- In normal conditions, the current measured value can be printed or stored if the **【Impact times】** value which had been set is not satisfied. If printing and storing are required at this point, **【Average】** key can be pressed down to finish measurement, then printing can be carried out.
- The functions of**【Auto Save】**,**【Auto Print】**,and**【Auto Trans.】**will be inactive in case of pressing down **【Average】** key to finish measurement in advance.
- Only DC type impact devices have strength measuring function so that **【Hard/σb】**setting can not be changed if other type impact devices are used; if the setting has been changed into **【σb】** via D/DC type impact device, the **【Hard/σb】** setting will be changed into **【Hard】** when other impact devices had been installed instead of D/DC type impact device.
- When **【σb】** has been set, the hardness scale will not be set (the cursor will skip off **【Hardness Scale】**).
- Not all materials can be changed into every hardness scale, hardness scale will return to Leed hardness (HL) automatically after material has been changed. So **【Material】** will be set firstly when setting measurement parameters, and **【Hardness Scale】** should be set subsequently.



6 Detail Testing procedures

6.1 Start-up

Press **[]** key to turn on the equipment, following interface will be displayed.



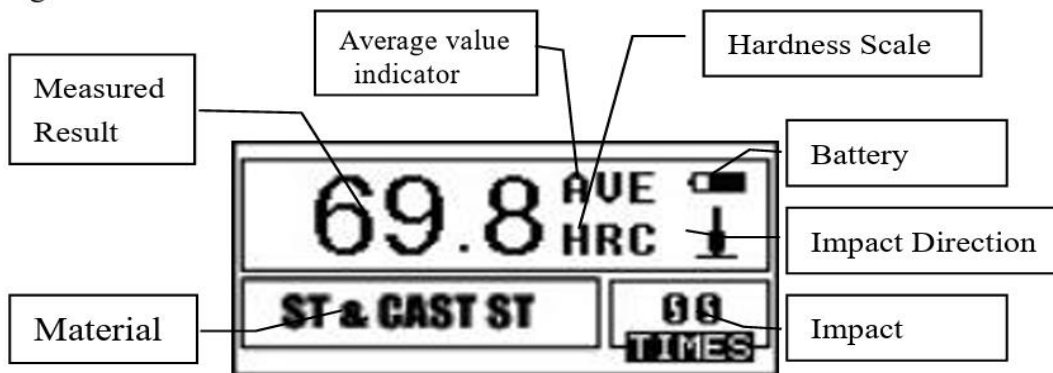
The tester will check and display the type of impact device. At this point carefully observe whether the type is right or not, then enter the main measuring display interface.

6.2 Turn On or turn off

Tester can be turn on or trun off by press **[]** key in any display status.

6.3 Testing

The tester will enter the main display interface after turn on, as the following figure.



The measured values are displayed in a big font in this interface, and multiple shortcut key operation functions are supplied.

6.3.1 Explanation of the Main Display Interface

Battery information: displaying rest capacity when no charging, and displaying charging degree when charging.

Impact direction: current impact direction. **Average value indicator:** The average value will be displayed when the impact times setting has been achieved.

Hardness scale: the hardness scale of the current measuring value.

Measured value: current single measured value (without average value indicator), current average value (with average value indicator). It expresses the value is more than the conversion or measuring range when is displayed, and it expresses the value is lower than the conversion or measuring range when is displayed.

Material: material that has been set currently. **Impact times:** impact times that have been finished will be displayed when measuring; Impact times that have been set will be displayed when impact times have been set by shortcut key, and the times corresponding to a single measured value will be displayed when viewing a single measured value.



6.3.2 Testing procedures

Testing can be carried out under this interface status, and the current measured value will be displayed whenever one measurement is finished. The counting of impact times will add 1 per measurement performed. The buzzer will send out a long sound provided that the value exceeds the tolerance limit, and the buzzer will send out two short sounds if the impact times which has been set are achieved. After 2 seconds of waiting, the average value will be displayed with a short sound given out by the buzzer.

6.3.3 Key operation

- Press the **【SAVE】** key to save current group data. The key can only be active after the average value has been displayed; furthermore, the same can be done only once.
- Press **【DELETE】** key, the latest single measured value can be deleted, but the deletion should be confirmed in the following interface. Press **【】【】** key to move the cursor to **【YES】**; then press **【ENTER】** key to confirm the deletion ===== Confirm delete? ===== NO YES of latest single measuring value. Press **【】【】** key to move the cursor to **【NO】**; then press **【ENTER】** key to cancel the deletion. Deletion can be cancelled by pressing **【ESC】** key wherever the cursor.
- Single measured values can be viewed by pressing **【】** or **【】** key, and the average value or latest measured value can be shown again by pressing **【ESC】** key. The viewing sequence is different by press **【】** or **【】** key.
- Measurement can be finished by press **【Average】** key in case of impact times setting has not been achieved, and the average value will be displayed.
- LCD backlight can be turned on or off by pressing **【P】** key.
- Press **【MENU】** or **【ENTER】** key to return to main interface.



- Press **【MENU】** key to enter the main menu interface.

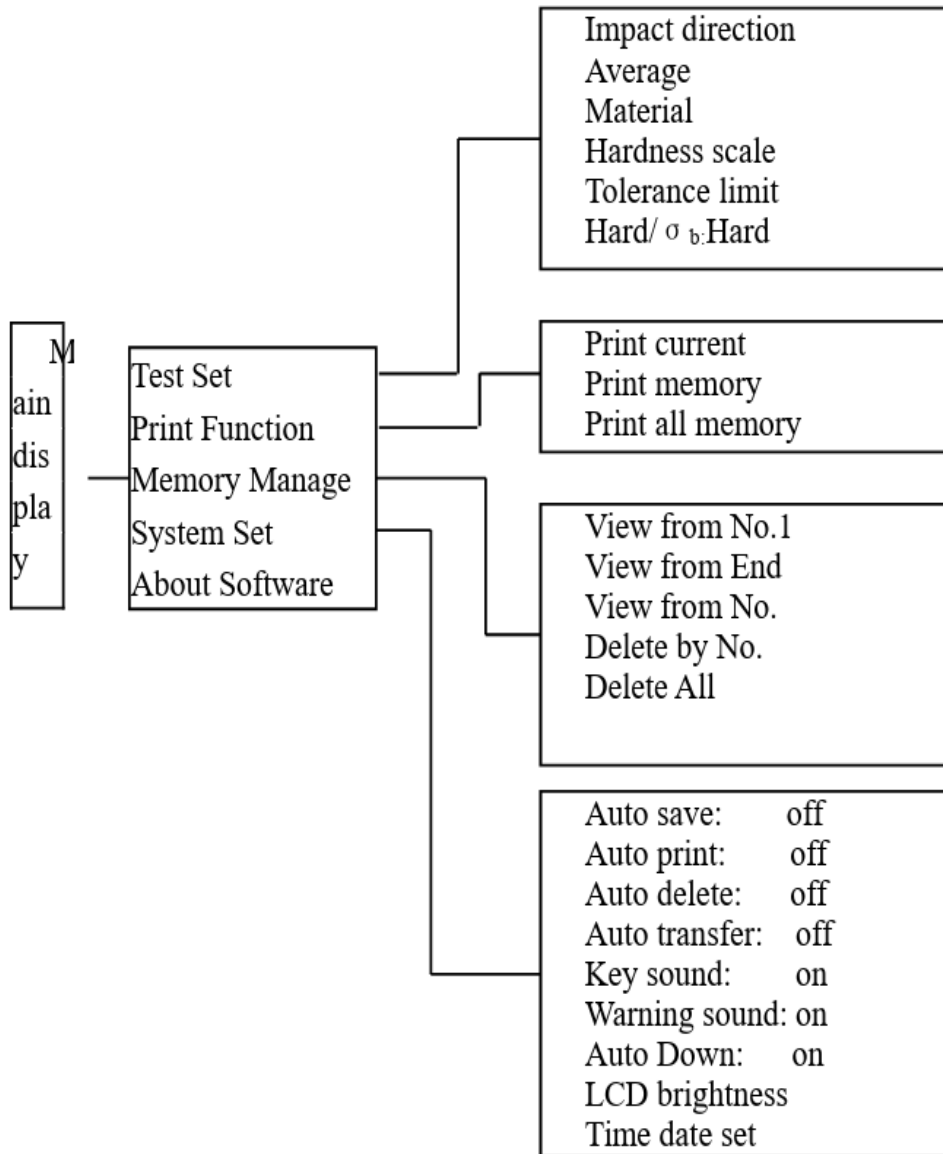
Shortcut key setting:

- The impact direction setting can be changed by pressing **【DIREC.】** key.
- Impact times setting can be changed by press **【TIMES】**key, the current impact times can be shown by pressing **【TIMES】**the first time; the counting will add 1 when press **【TIMES】**once, and it will return to 1 if times of 32 is achieved.
- The hardness scale setting can be changed by pressing the **【HARD】** key. Whenever the key once, a circulating conversion among all hardness scales that are available to the current material and impact device will be performed. The hardness scale will be changed into Leeb hardness if the current setting is a strength measurement.
- Material setting can be changed by pressing **【MAT'L】** key. Whenever pressing the key once, the circulating conversion among all material settings will be performed, and the hardness scale will be changed into Leeb hardness, therefore, the material should be set first when measuring, and then the hardness scale should be set.

Note: what is called “conversion” refers to the corresponding relationship of Leeb Hardness and other hardness for a certain material, which is established based on abundant tests. According to the conversion relationship, the Leeb hardness value measured will be changed into other hardness scale values automatically via calculation by hardness tester.

6.4 Menu structure diagram

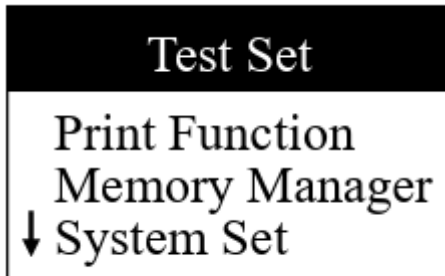
The parameter setting and additional function of equipment can both realized by menu operating. At the main display interface, pressing **【MENU】**key to enter the main menu.





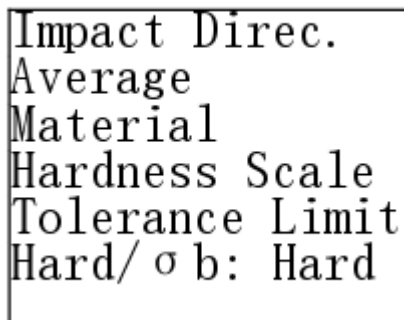
6.5 Measuring condition setting

When in main display interface, pressing **【MENU】** key to enter the main menu.



Press **【ENTER】** key to enter **【TEST Set】** menu.

Press **【↓】** key to move cursor to the item which will be set, then press **【ENTER】** key.



*Note: 1. If the **【Hard/σb】** is set to **【Hard】**, the hardness scale could not be selected obviously.*

*Therefore, the cursor will skip over the item **【Hardness】** while moving.*

*2. Only a D/DC type impact device is provided with the function of strength measuring, therefore, the cursor can not be moved to item **【Hard/σb】** when another type of impact device is used.*



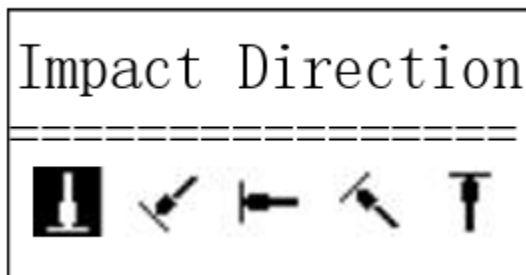
3. The symbol ↓ on the left bottom of the menu shows the menu does not end, which can be paged down by pressing []key; The symbol ↑ on the top of the menu shows the menu does not end, which can be paged up by pressing []

Press []key to move the cursor to the material which will be set. Press [ENTER] key to finish the change. Press the [ESC] key to cancel the change. Note 1: The symbol ↓ on the left bottom of the menu shows the menu does not end, which can be paged down by pressing []key; The symbol ↑ on the top of the menu shows the menu does not end, which can be paged up by pressing [] 6.5.4 Hardness scale setting]

6.5.1 Impact direction setting

Press [] [] key to move the cursor to the direction which will be set.

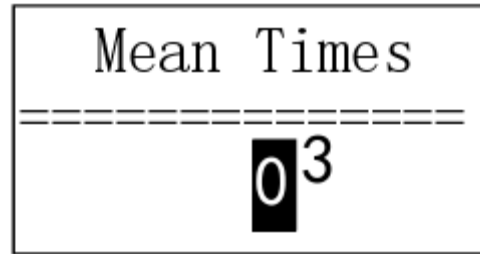
Press [ENTER] key to finish the change. Press the [ESC] key to cancel the change.



6.5.2 Mean Times Setting

The mean times can be modified in the range of 1~32.

Press the number key to input the value, and the cursor can move in circles to the right automatically.



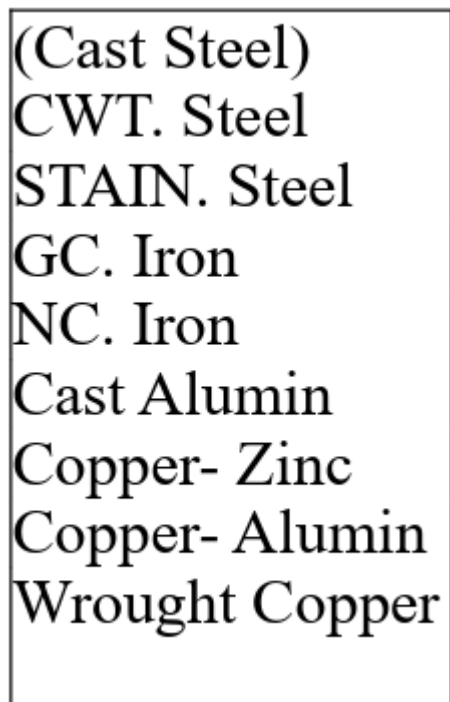
Press **[ENTER]** key to finish the change. Press **[ESC]** key to cancel the change.

6.5.3 Material setting

6.5.3.1 Following available materials will be displayed in case of **[Hard/ σb]** is set to **[Hard]**:

Press **[↑]** key to move cursor to the material which will be set.

Press **[ENTER]** key to finish the change. Press **[ESC]** key to cancel the change.



Note:

1. After the material setting has been changed, the hardness scale setting will return to HL automatically.

2. Material should be chosen before the hardness scale.



3. The symbol ↓ on the left bottom of the menu shows the menu does not end, which can be paged down by pressing []key; The symbol ↑ on the top of the menu shows the menu does not end, which can be paged up by pressing [].

6.5.3.2 Following available materials will be displayed in case of [Hard/ob] is set to [ob]:

Press [] key to move cursor to the material which will be set.

Press [ENTER] key to finish the change. Press the [ESC] key to cancel the change.

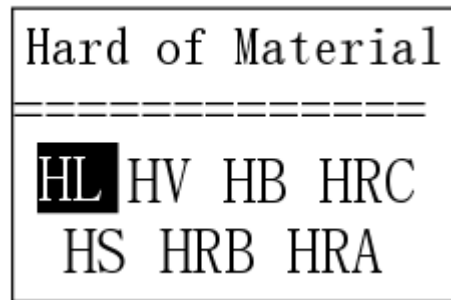
Mild Steel
High- C Steel
Cr Steel
Cr-V Steel
Cr-Ni Steel
Cr-Mo Steel
Cr-Ni- MoSteel
Cr-Mn- Si Steel
Super ST. Steel
STAIN. Steel

Note 1: The symbol ↓ on the left bottom of the menu shows the menu is not end, which can be paged down by pressing []key; The symbol ↑ on the top of the menu shows the menu is not end, which can be paged up by press.

6.5.4 Hardness scale setting

Press [] or [] key to move cursor to the hardness scale which will be set. Press [ENTER] key to finish the change.

Press [ESC] key to cancel the change.



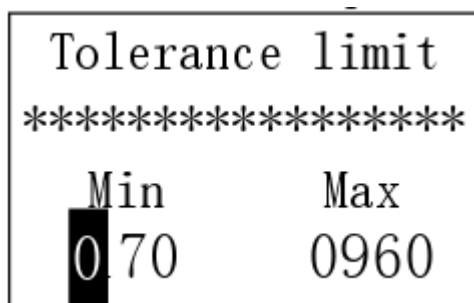
Note:

- 1. For the current selected impact device and material, only the hardness scale which can be conversed will be displayed; hardness which can be conversed will not be displayed.**
- 2. Material should be chosen before the hardness scale.**
- 3. After the material setting has been changed, the hardness scale setting will return to HL.**

6.5.5 Tolerance limit setting

Press the number key to input the value, and the cursor can move in circles to the right automatically.

Press **[ENTER]** key to finish the change. Press the **[ESC]** key to cancel the change.



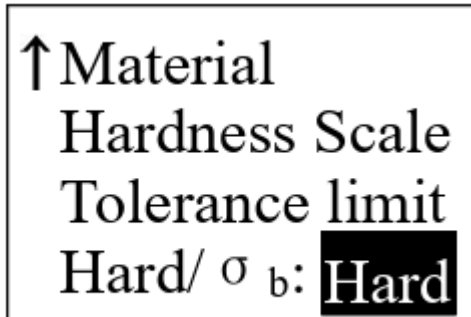
Note:

1. If the setting exceeds the measuring range, the tester will ask the operator to reset it.
2. Exchanging will be done automatically if the Min. tolerance limit is more than Max. tolerance limit.



6.5.6 Hardness/ σ_b setting

Press **【ENTER】** key to perform the selection between **【Hard/ σ_b 】**, and the cursor will exchange between hardness and strength.



Note:

*Only a D/DC type impact device is provided with the function of strength measuring. Therefore, the item can only be set to **【Hard】** if the impact device is not D or DC type.*

6.6 Print function

If it is in main display interface, press **【MENU】** key to enter main menu.

Press **【↓】** key to move cursor to **【Print Function】**.

Press **【ENTER】** key to enter **【Print Function】** menu.



Test Set
Print Function
Memory Manager
System Set

Print Current

Print Memory

Print All Mem

Press **【▲】【▼】** key to move the cursor to the print function required, then press **【ENTER】** to print.

6.6.1 Printing current value

Note: Information about serial number and operator should be filled by manual.

```

Portable
Hardness Tester
-----
No.:
Operator:
Time:13:40:46
Date:08/08/2012
-----
Probe Type: D
Impact direc.:+90 Deg
Mean Times:05
Material:Matl      of
Roller
-----
  51.4 50.9 51.5 51.6
  51.7
Average= 51.4HSD
  
```

6.6.2 Print Memory value

Select Group
(001 to 010)

From **0** 01 to 001

As for **【Print Memory】**, the group range is necessary to be selected firstly, and the group range which saved in memory will be displayed at the same time.

Press number key to input the value, and the cursor can move in circles to right automatically.

Press **【ENTER】** key to confirm print.

Press **【ESC】** key to cancel print.



Information to be printed includes: tester name, date, type of impact device, impact direction, average times, material, group No., single measured value and average value.

If the information in the group is as the same as that in the previous group, such as date, type of impact device, impact direction, average times, material and hardness scale, only group No., single measured value and average value can be printed, otherwise date and measuring conditions can also be printed out.

```

      Portable
      Hardness Tester
-----
No. :

Operator:

*****
Date:01/09/2012
Probe Type: D
Impact direc.:+90 Deg
Average:03
Material:
Steel and Cast Steel
-----
No.:0002 550 549 548
Average= 549HL
No.:0003 529 527 533
Average= 530HL
*****

```

Note:

- 1. Actual number of groups will be printed in case of the number which had been set exceeds the actual range.**
- 2. No difference for the sequence to print the starting and ending group, that is to say if 1~5 groups will be printed, the sequence can be set from 1 to 5 or from 5 to 1.**
- 3. Wider the range of groups, shows the nearer the group from current; on the contrary, it will be further.**



6.6.3 Print all memory

Press **【Print All Mem】** key to print the values of all groups in the memory in the same format.

6.6.4 Paper Feeding

When the printer is powered on and ready for printing, press the **【FEED】** key then the instrument will start manual paper feeding. Manual paper feeding is unavailable while charging.

Note:

The printing function is unavailable while charging.

Do not open the cover of the paper compartment during printing. Otherwise, the instrument may not print normally.

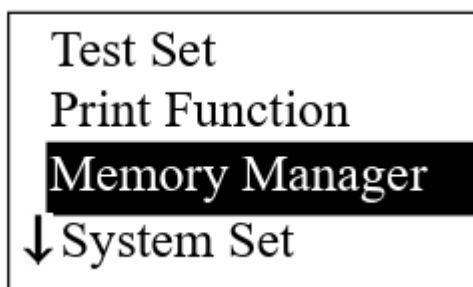
Printing with paper that has been stored for over long period or of poor quality may reduce the print quality or even damage the printer.

6.7 Memory manager

When in the main display interface, press the **【MENU】** key to enter the main menu.

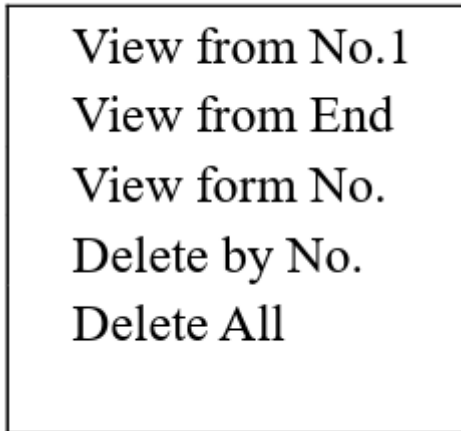
Press **【↓】** key to move the cursor to **【Memory Manager】**.

Press **【ENTER】** key to enter menu **【MemoryManager】**. If no data in the memory, “No Memory!” will be showed, and return subsequently.





Press **⏏** key to move the cursor to the function required, then press **⏏** key.



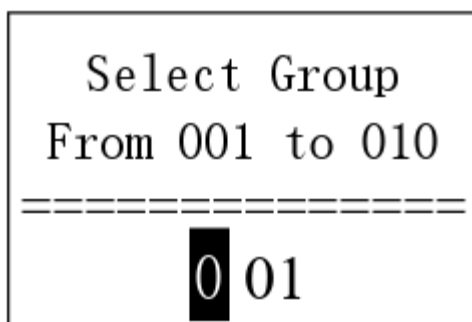
6.7.1 Viewing from the No.1 group/ Viewing from the end group

Press **⏏** key to display data in memory from the No.1 group.

Press **⏏** key to display data in memory from the end group.

6.7.2 Viewing from selected group

Press **⏏** key, selecting interface will be displayed Press number key to input the value. Press **⏏** key to display data in memory from the starting group selected. Press **⏏** key to cancel operation.





6.7.3 Deleting selected group

Press **【Delete by No.】** key, a interface including group range to be deleted will be showed.

Press number key to input digital value.

Press **【Enter】** key to cancel the selected group. Press **【Esc】** key to cancel the operation.

Select Group
(001 to 010)

From **0**01 to 001

Note:

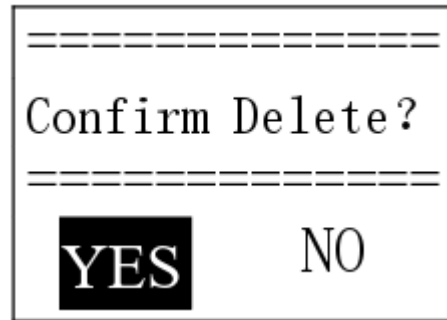
- 1. If the input group number exceeds the actual range, then delete the actual group among them.**
- 2. No difference in the sequence to the starting and ending group, that is to say, if 1~5 groups will be deleted, the sequence can be set from 1 to 5 or from 5 to 1.**
- 3. Data group No. saved in memory will be reordered after deletion.**
- 4. When deleting data, especially small group data, because the following data needs to be moved, max 30 seconds(approx.) may be required. Never to turn off power at this time, or data confusion can be caused.**

6.7.4 Delete all

Press **【DeleteAll】** to cancel all data in memory.

6.7.5 Confirm deletion

30



A confirming interface will be displayed when deleting data in memory.

Press **[] []** key to move cursor to **[YES]**, then press **[ENTER]** key to delete the data.

Press **[] []** key to move cursor to **[NO]**, then press **[ENTER]** key to cancel the operation.



6.8 Viewing interface

The No., dates and average values of 8 groups data can be displayed at most in the same interface.

Press **[] []** key to turn over pages. Press **[ESC]** key to exit view.

By pressing **[ENTER]** key, cursor will be showed and furthermore detail can be viewed.



No. 001	02/07	62. 4HSD
No. 002	03/07	77. 6HSD
No. 003	03/07	546HL
No. 004	03/07	483HL
No. 005	04/07	666HL
No. 006	06/07	787HL
No. 007	06/07	690HL
No. 008	08/07	820HL

Press **↓** key to select the group in this interface.

Press **[ESC]** key to return to the previous viewing interface.

Press **[ENTER]** key to view detail information in this group.

Press **↓** key to turn over pages to view average value, measuring condition or single measured value.

No. 007	06/07/07
Average =	690HL
D ↓	05 Times
(Cast) Steel	↓

Press **[ESC]** key to return to the previous viewing interface.

569	568	562	↑
564	565		

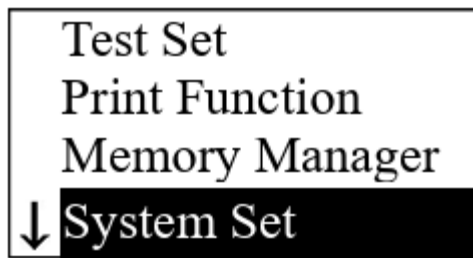


6.9 System Set

When in the main display interface, press the **【ESC】** key to enter the main menu.

Press **【↑】** key to move cursor to **【System Set】**.

Press **【ENTER】** key to enter **【System Set】** menu.



Press **【↓】** key to move the cursor to the item to be set. Press **【ENTER】** key to directly change, or enter the corresponding changing interface.

Press **【ESC】** key to return. For items of **【Auto Save】**, **【Auto Print】**, **【Auto Delete】**, **【Auto Trans.】**, **【Key Sound】** and **【Warn. Sound】**, **【ENTER】** key can be pressed to selected **【On】** or **【Off】**. If **【Auto Save】** is set to **【On】**, the current group data can be saved automatically after measuring finished and average value displayed.



Auto Save:	Off
Auto Print:	Off
Auto Delete:	Off
Auto Trans.:	Off
Key Sound:	On
Warn. Sound:	On
Auto Down:	On
LCD Brightness	
Time Date Set	

If **【Auto Delete】** is set to **【On】**, a gross error can be deleted automatically when average times have been achieved or measurements have been finished in advance by pressing **【AVE.】** key according to 36rule. If some data had been cancelled, additional measurements should be carried out to satisfy the times set.

If **【Auto Trans.】** is set to **【On】**, the current group data can be output in text format via USB after measuring the finished and average value displayed.

If **【Key Sound】** is set to **【On】**, the buzzer will send out a short sound with each pressing.

If **【Warn. Sound】** is set to **【On】**, the buzzer will send out a long sound in 33 cases of measured value exceeding the tolerance limit, data deletion or other cases.

If **【Auto Down】** is set to **【On】**, Power will turn off if neither measurement nor any key operation is performed within 5 minutes.

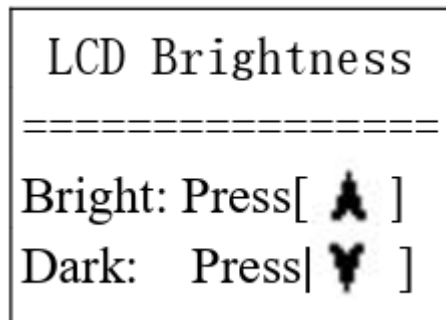
6.9.1 LCD Brightness Set

Press **【 brightness. Press **【** key to increase **】** key to reduce brightness.**

Press **【ENTER】** key to finish change. Press **【ESC】** key to cancel change.

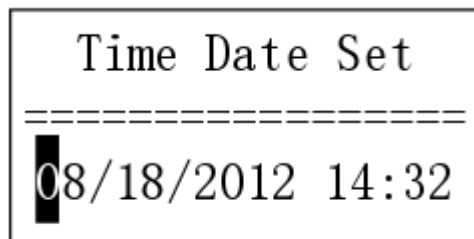


The brighter of brightness, the deeper of color; The darker of brightness, the lighter of color;



6.9.2 Time and Date Set

When in this interface, current time and date will be displayed on the screen, the format is “mm/dd/yy”.



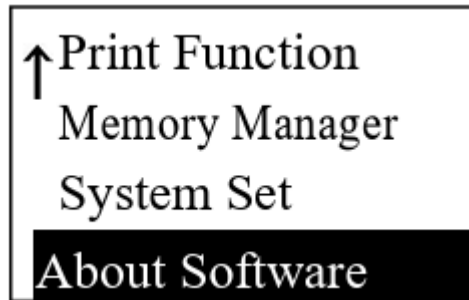
Press **[0-9]** key to input the value, Press **[←]** key to move cursor.

Press **[ENTER]** key to finish the change, which current time and date will be replaced by time and date set.

Press the **[ESC]** key to cancel the change.

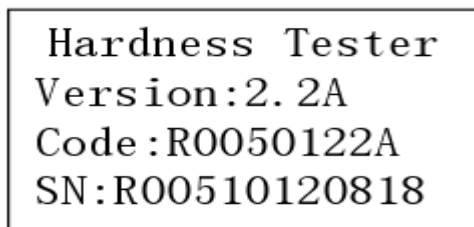
6.10 About software

When in the main display interface, press **[MENU]** key to enter the main menu.



Press **↑** key to move cursor to **【About Software】**.

Press **【ENTER】** key to enter **【About Software】**.



Information about the tester and embedded software will be displayed on this interface.

The software version and embedded software identification are subject to change due to the upgrading of software without notifying in advance.

6.11 Software calibration

The tester and impact device must be calibrated with a standard Leeb hardness test block before the first use, or reusing after a long-term idle.

One-time calibration is enough for each type of impact device equipped with a main unit; recalibration is not necessary after the replacement of the impact device later.

Press **【ENTER】** key as well as **【】** key at the same time to enter the interface of software calibration.



Calibration

0/5 times

Calibration

Average=550
Nominal=**550**

Impact direction should be set to **【↓】**. Five points should be measured vertically down on the Leeb hardness test block.

The average value will be shown after measuring. Press **【0】** key input nominal value.

Press **【ENTER】** Key to finish calibration.

Press **【ESC】** key to cancel calibration.

The calibration range is $\pm 15HL$.

6.12 Turn off the power automatically

Auto turn-off function is supplied to save the energy of the battery.

If neither measurement nor any key operation is performed within 5 minutes, the tester will turn off automatically, a flash showing for 20 seconds on the LCD screen before switching off. At this time, any key except **【↓】** can be pressed to stop the flash of LCD screen, and cancel the turn off operation.

In case of too low battery voltage, “Battery Empty!” will be displayed and turn off automatically.



6.14 Battery Charge

The instrument uses a lithium battery pack as its power source. When the battery pack almost runs out, the battery symbol on the display will glint. It needs charging as soon as possible. Try to drain your battery pack as fully as possible before it is charged for the longest battery service.

Plug the power adapter into the mains supply power socket and then plug the charger connector into the power jack of the instrument. If the instrument is in power-off condition, it will turn on automatically after the charger plug is inserted into the power jack. The battery symbol will alternately show between and when charging. The more the dark part indicates the closer it is to full capacity. When the battery is fully charged, the battery symbol on the display will glint.

Please use the configured AC-DC adapter to charge the battery pack.

Warning: When the battery pack is being charged, printing or paper feeding is unavailable.

6.15 Battery Replacement

When the battery pack fails to be charged, the user should replace the batteries following the program below:

Power down the instrument.

Take off the battery compartment cover and take out the battery pack.

Insert the connection plug of the new battery pack into the socket on the circuit board.

Reset the battery cover.

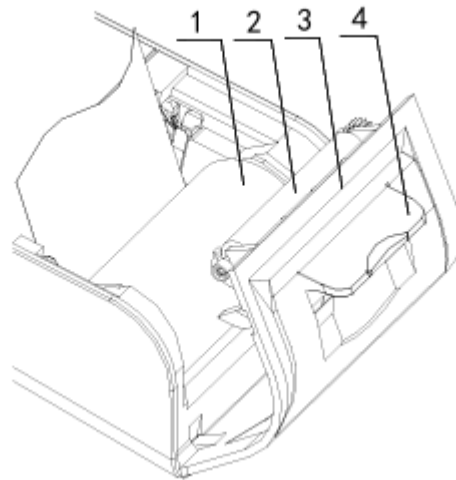
Turn on the instrument to check.

Warning: Please pay much attention to the polarity of the battery during battery replacement.

6.16 Paper Loading

An instrument designed with a dedicated mechanism for opening the paper compartment cover. Pull this mechanism with your fingers, you can easily open the paper compartment cover.

- According to the illustration, put the paper into the paper compartment with attention to the paper direction. If the paper is misplaced, the instrument will fail to print.
- Pull a trip of paper out of the compartment.
- Make sure that the paper is well in place and close the paper compartment cover.



- 1. Paper 2. Paper Roller 3. Paper Compartment Cover 4. Mechanism of Open the Cover

6.17 The connection of the data communication cable

Insert one connection plug of the transmission cable into the USB socket on the right side of main unit, and insert the another plug into the USB port on the back of computer box. Refer to the manual of the DataPro software for detailed information.

7 Troubleshooting

Failure	Cause	Solution
Failure in starting	Battery empty	Replace battery
No measuring value	Probe cable open circuit	Replace Probe cable
Value is inaccurate	Calibration data lose	over again Calibration
Charge failure	Battery failure	Replace the battery with a new pack



The operation to restore the factory parameters

Actual use, if the measured value of the error or deviation is too large, may be operator error or other causes within the parameters of the machine error, the best approach is to restore the factory parameters, as follows:

1. Press **MENU** KEY into main menu.
2. Use **↓** to select **About Software**
3. Press **➡** key the machine will all the parameters back to factory settings, while the machine automatically shut down.

8 Maintenance

8.1 Impact device

- After using the impact device for 1000-2000 times, use the nylon brush provided to clean the guide tube and the impact body of the impact device. To clean the guide tube, unscrew the support ring and then take out the impact body, and spiral the nylon brush in the counter-clock direction into the guide tube. When the brush reaches the bottom, draw it out. Repeat this action for 5 times and mount the impact body and the support ring.
- Remember to release the impact body after use.
- Any lubricating agent is absolutely banned to use inside the impact device.

8.2 Standard maintenance procedures

If the error is $> 2\text{HRC}$ when using a standard Rockwell hardness block to test, maybe the test tip is disabled. Changing the test tip or impact body should be considered.

If other abnormal phenomena occur, the user should not disassemble or adjust any part used for fixing. You can return the hardness tester to the service department of our company.



Notice of Transportation and Storage

The tester should be stored at room temperature, away from vibration, strong magnetic field, corrosive medium, dampness and dust.

Non-warranty part

1. Sheath of Main Unit
2. Panel
3. Support ring
4. Probe cable
5. Impact body
6. Battery