

CONTENT

1.Principle of Leeb hardness testing method	1
2. Summary	2
2.1 View of Instrument	2
2.2 D Type Impact Device	3
2.3 Types of Impact Device	4
2.4 Technical Specifications of Impact Devices	4
2.5 Standard Delivery	5
2.6 Optional Accessories	6
3.Functions and Applications	7
3.1 Technical Specifications	7
3.2 Applications	7
4.Pre-Treatment of Workpiece	8
4.1 Workpiece Requirements	8
4.1.1 Surface Roughness requirements	8
4.1.2 Weight and Thickness Requirements	8
4.1.3 Surface Hardened Layer	8
4.1.4 Curved surface Requirement	9
4.2 Support of Test Piece	9
5.Operation	9
5.1 Display	9
5.2 Keyboard	11
5.3 Turn on the Instrument	11
5.4 Parameters Setting	11
5.4.1 File Number	12
5.4.2 Material	12
5.4.3 Hardness Scale	13
5.4.4 Impact Direction	13
5.4.5 Impact Number of Times	13
5.4.6 Set the upper limit and lower limit alarm	13
5.4.7 Set the types of the Impact Device	14
5.4.8 Language Settings	14
5.4.9 Auto Power-Off Settings	14
5.4.10 Clean All Files	14
5.5 Measuring	14
5.6 Average Times	15
5.7 Remove Gross Error Manually	15
5.8 Data Save and Read settings	15
5.8.1 Storage Testing Result	15
5.8.2 Reading	16
5.8.3 Delete	16
5.8.4 Transfer of the Save Data	16
5.9 Calibration (Error-correction settings)	17
6. Maintenance & servicing	17
6.1 Cleaning of Impact Body	17

1. Principle of Leeb hardness testing method

The impact body, which is equipped with tungsten carbide, impacts into the work piece and rebounds back. The rebound and impact velocities are measured at the 1mm point from the work piece in the following way: the integrated permanent magnet will produce directly proportional voltage with the impact velocity. The Leeb hardness values are calculated by the following formula:

$$HL=1000 \times (V_b / V_a)$$

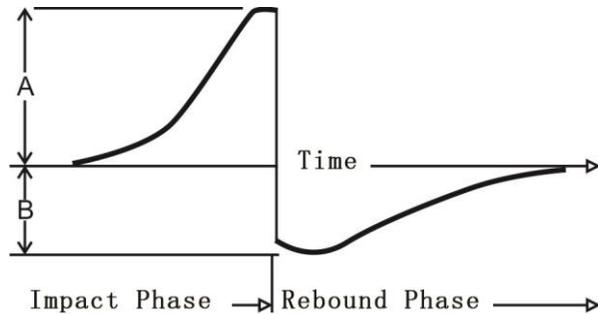
In Which: HL: Leeb hardness values

V_b : the voltage produced during the rebound of impact body

V_a : the voltage produced during the impact of impact body

Figure 1 shows the voltage produced during the impact and rebound of impact body:

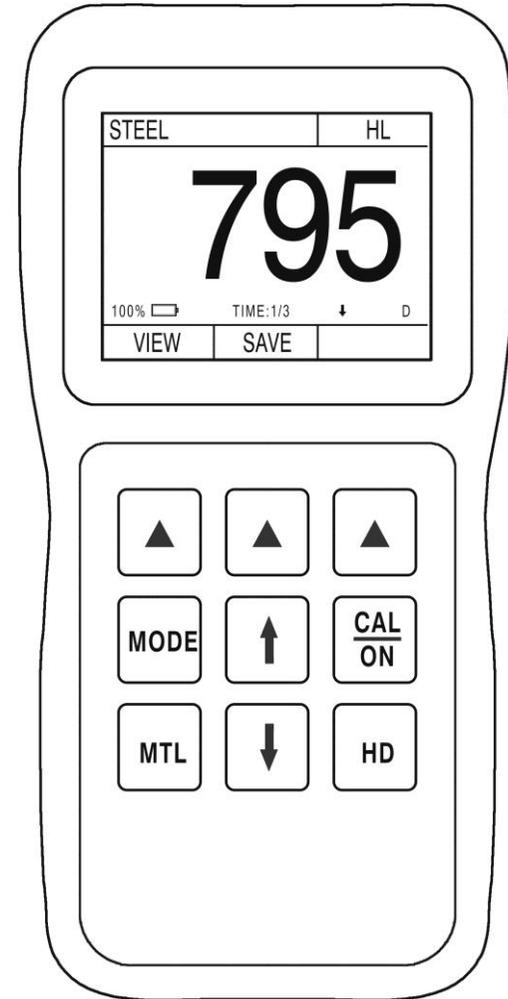
Figure 1 voltage features of output signal



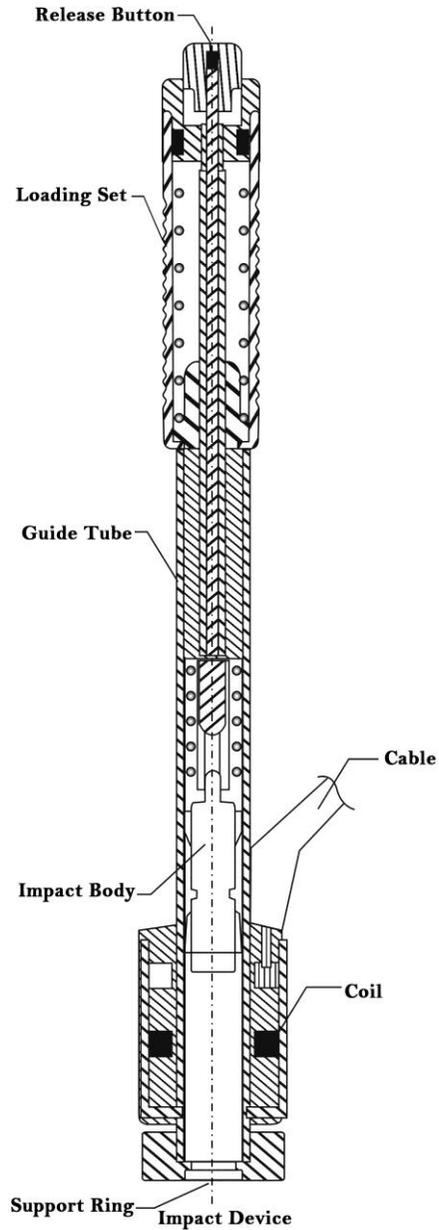
The Leeb hardness values can be converted to other hardness scales directly, such as HV, HRC, HRB, HB and HS.

2. Summary

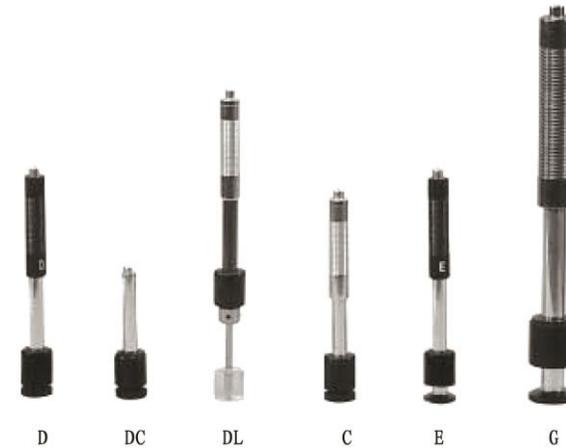
2.1 View of Instrument



2.2 D type impact device



2.3 Types of Impact Device



2.4 Impact devices introduction

Special Impact Device	D/DC/DL	C	G	E
Impact Energy	11mJ	11mJ	11mJ	11mJ
Mass of Impact Body	5.5g/7.2g	TYPE OF IMPACT VICES	20.0g	5.5g
Test Tip Hardness	1600HV	1600HV	1600HV	5000HV
Test Tip Diameter	3mm	3mm	5mm	3mm
Test Tip Material	Tungsten carbide	Tungsten carbide	Tungsten carbide	Tungsten carbide
Impact Device Diameter	20mm	20mm	30mm	20mm
Impact Device Length	86/147/75mm	141mm	254mm	155mm
Impact Device Weight	50g	75g	250g	80g
Max. Hardness of Sample	940HV	1000HV	650HV	1200HV
Average surface roughness Ra:	1.6μm	0.4μm	6.3μm	1.6μm
Min. Weight of Sample:				
Of compact shape	>5kg	>1.5kg	>15kg	>5kg
On solid support	2~5kg	0.5~1.5kg	5~15kg	2~5kg
Coupled on plate	0.05~2kg	0.02~0.5kg	0.5~5kg	0.05~2kg
Min. thickness of sample:				
Coupled	5mm	1mm	10mm	5mm
Min. thickness of layers	≥0.8mm	≥0.2mm	≥1.2mm	≥0.8mm

Indentation of test tip						
With 300HV	Diameter	0.54mm	0.38mm	1.03mm	0.54mm	
	Depth	24μm	12μm	53μm	24μm	
With 600HV	Diameter	0.54mm	0.32mm	0.90mm	0.54mm	
	Depth	17μm	8μm	41μm	17μm	
With 800HV	Diameter	0.35mm	0.35mm	--	0.35mm	
	Depth	10μm	7μm	--	10μm	
Impact Device applicable scope		DC used for very confined spaces such as holes, cylinders, internal measurement. DL used for extremely confined spaces.	C used for testing case hardened or thin walled components	G used for solid heavy component, such as rough castings and forgings.	E used for high hardness material.	

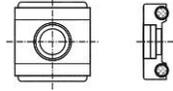
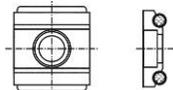
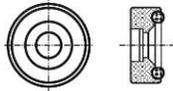
Figure 2.1

2.5 Standard delivery:

- ◆ Main unit
- ◆ D type impact device
- ◆ HLD value Standard Calibration Block
- ◆ DataView software
- ◆ USB Communication cable
- ◆ Small supporting ring
- ◆ Cleaning brush
- ◆ 2 AA batteries
- ◆ User`s manual
- ◆ Suitcase

2.6 Optional accessories:

- ◆ Impact device DC/C/DL/G
- ◆ Standard Calibration Test Block
- ◆ Protective Rubber case
- ◆ Straps
- ◆ Standard supporting ring
- ◆ Small Supporting ring
- ◆ Special supporting rings (see following table)

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

3.Functions and Applications

3.1 Technical Specifications

Measuring Method: Leeb Hardness Testing method

Hardness Scale: HL, HB, HRB,HRC,HV,HS

Measuring Range : HLD (200-960) HRC (19.8-68.5) HB (30-651)

HV (80-976) HS (26.4-99.5) HRB (13.5-100)

Impact device: D type impact device (Standard); Optional C/G/DC/DL

Accuracy: ±6HLD (HLD=800), **Repeatability** 6HLD (HLD=800)

Measuring direction: Vertically Downwards, Downward Sloping, Level, Upwardly Inclined, Vertically Upwards

Material :Steel& Cast Steel, Stainless Steel, GC IRON, NC IRON, Cast Aluminum alloy, Macht metal, Copper-tin alloy, Brass, Forged Steel

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

Display: Color HD IPS Screen

Memory:11000 Groups (with 1-8 impact times)

Power: 2 AA batteries

Working temperature: -10℃~ +50℃

Size: 153 × 76×37 (mm) (H×W×D)

Weight: 242g include batteries

Standard: GB/T 17394-2014, ASTM A956

3.2 Applications

Installed machinery and Permanent assembly parts

Mould cavity

Heavy workpieces

Failure analysis of pressure vessel, turbine and other equipments

Small test area

The production line of Bearings and other parts

Distinguish the material of the metal material warehouse

4. Pre-Treatment of Workpiece

4.1 Workpiece Requirements

4.1.1 Surface Roughness requirements

Surface roughness is an important requirement for the surface of the test piece, it should be smooth and no oil, or will cause measurement errors.

The surface roughness requirements are listed in table 4.1

Impact Device Type	Work piece surface roughness Ra
D、 DC、 DL	2 μm
G	7 μm
C	0.4 μm

Figure 4.1

4.1.2 Weight and Thickness Requirements

Different impact devices require the following different weight / thickness of test piece:

Impact device type	Min weight	Min thickness (no coupling)	Min thickness (coupling)
D、 DC、 D+15	5kg	25mm	3mm
G	15kg	70mm	10mm
C	1.5kg	10mm	1mm

Figure 4.2

4.1.3 Surface Hardened Layer

The surface Hardened layer thickness of test piece should meet the following requirements:

Impact device	Min. depth of surface hardened layer (mm)
D、 DC、 DL	0.8
C	0.2

Figure 4.3

4.1.4 Curved surface Requirement

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 (D, DC, C, E and DL type of impact device) and smaller than 50mm (G type of impact device), the small support ring or the special support rings should be chosen.

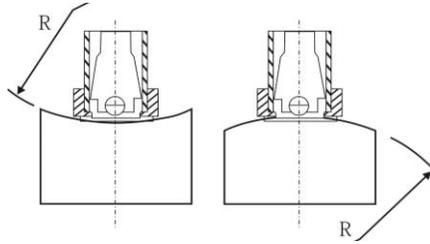


Figure 4.4

4.2 Support of Test piece

- ◆ The heavy work piece do not need support
- ◆ The Mid-heavy work piece must be placed on a flat, sturdy surface, and absolutely smooth placement, without any shaking.
- ◆ Light work piece must be tightly coupled with the solid support body, the coupling surface must be smooth, and Coupled dosages don't too much, Test direction must be perpendicular to the coupling surface.
- ◆ When the work piece is a large area of Sheet, Pole and Bending Parts, Even if a large weight and thickness may still cause deformation, so reinforcement and support in the rear surface of the test point is necessary.

5. Operation

5.1 View Switching

There are three testing interface selections. With the first function bottom corresponding to the view can switch display interfaces after starting up. The default interface is the big font like the following (Fig.5.1). Press the first function bottom corresponding to the view can switch to multiple display interfaces (Fig.5.2) and curve interface (Fig. 5.3) in turns.

The multiple display interfaces can show not only the testing value that you have set, but also the two testing values of common use at the same time without interchange.

In the curve interface, except to show the three testing value in the multiple interface, it also shows the curve drawn by the latest testing value, which can show the uniformity of the testing piece vividly. It can be deleted by pressing the third function bottom corresponding to the delete displayed on the view.

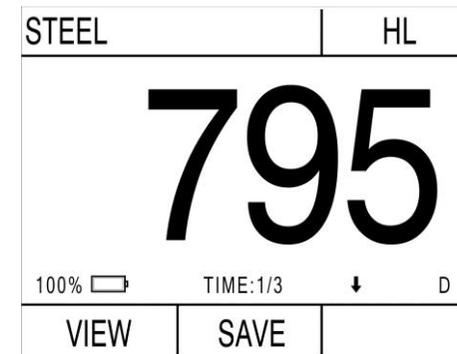


Figure 5.1



Figure 5.2

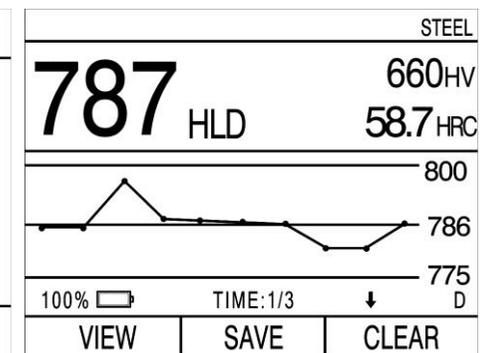


Figure 5.3

5.2 Keyboard

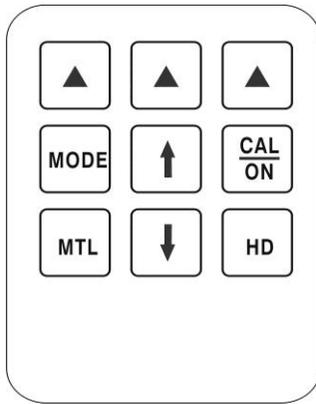


Figure 5.4

5.3 Turn on the instrument

Press “on” to enter into the big font testing interface. It displays the default parameter for the very first start, and for the next time it displays the parameters automatically before power off.

5.4 Parameter Setting

Press MODE to enter into the parameter configuration interface. Under which through pressing up and down arrow to move the cursor to the parameter item which needs to be changed. Following first function bottom of the hint on the display, move the cursor to the parameter and press up and down bottom to adjust, and press Return to get back.

5.4.1 File Number Setting

Under the specification configuration interface, adjust the file number as needed is possible. The instrument can save up to 200 files, in which each file can save 55 testing value groups, and each group includes 1-8 testing value and one average value. At cursor display file number item, press open corresponding to the second function bottom to scan the saved value in the files.

CONFIGUARTION	
FILE No.	001
MATERIAL	STEEL
HARDNESS	HL
IMPACT DIRECTION	↓
IMPACT TIMES	3
SELECT	OPEN

Figure 5.5

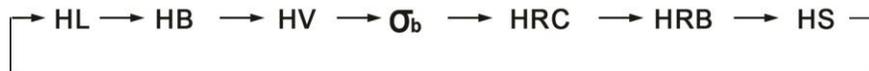
5.4.2 Testing Material setting

Can be set both in the specification configuration interface and in the testing interface by pressing MTL. The suitable materials are as follows:

Hardness	Tensile strength
Steel and Cast Steel	C
GC. IRON	CrNi
NC. IRON	CrMo
C. ALUM	CrV
BRASS	CrMnSi
BRONZE	SSST
COPPER	SST
SST	CrNiMo
Forging Steel	Cr
Alloy tool steel	

5.4.3 Hardness Scales

Under the parameter configuration interface can adjust the Hardness Scale, and under the testing interface press HD can also adjust the Hardness Scale. The Hardness Standard is as follows:



5.4.4 Impact Direction

Under the parameter configuration interface can adjust the impact direction.

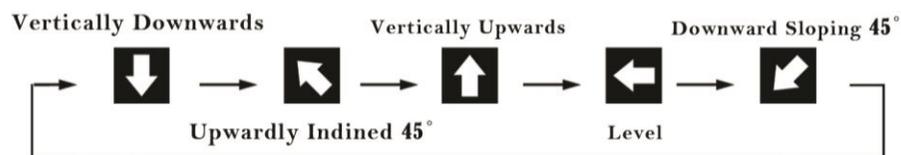


Figure 5.6

5.4.5 Impact Times

Under the parameter configuration interface can set the impact times, which is available from 1-8 times.

5.4.6 Set the upper limit and lower limit alarm

Under the parameter configuration interface can choose whether to use this function. The default function of setting the upper limit and lower limit alarm is close; at this time the both upper limit and lower limit value is grey. Put the cursor on the upper and lower limit alarm, can start the function by press the third function bottom.

When the function starts, the color of the limit values is green, also at the right side displays the specific values of upper limit and lower limit. At this time press the “select” corresponding to the first function bottom, the cursor displays on the values, through pressing the corresponding arrow to the third function bottom to adjust the digit(the unit, decade or hundreds), press up and down arrows to adjust the figure. Then press “RETURN” to finish the adjustment.

After setting up, when doing the testing under the testing interface, if the

impact value is greater or smaller than the set one before, the impact value turns red. Under the curve interface, it will display two straight lines of the upper and lower limit, when the impact value is greater than upper or lower limit, the testing value is displayed in red, and the place is also out of the limit line.

5.4.7 Set the types of the Impact Device

Under the parameter configuration interface can set the type of the probes among D, C, G and DL.

5.4.8 Language Settings

Under the parameter configuration interface can interchange the languages, among Chinese, English, Japanese, French and Italian.

5.4.9 Auto Power-Off Settings

Under the parameter configuration interface can set the standby time among 5 Min, 10 Min, 20 Min and automatic power off.

5.4.10 Clean All Files

Under the parameter configuration interface can choose delete all to delete the whole file that have saved.

5.5 Measuring

After finish the parameters setting, then start measuring:

- ◆Load the impact body: Pushing the loading-tube until contact is felt. Then allow it to slowly return to the starting position locking the impact body.
- ◆Press the impact device support ring firmly on the surface of the sample, the impact direction should be vertical to the testing surface.
- ◆Press the release button on the upside of the impact device to test. The sample and the impact device as well as the operator are all required to be stable now.



Figer(1)

Figer(2)

Figer(3)

5.6 Average value

Setting 3-5 times to get the average value is used very often. After measuring the times that has set before, comes the testing value in White Font to show the average value.

5.7 Data saving and read settings

5.7.1 Storage testing result

Under the testing interface, press the save bottom namely the second function bottom correspond the save model on the display. It shows the file and the group number that have been saved currently after starting the save function bottom. If start the save function, it saves the impact value automatic, press again to cancel the save function.

5.7.2 Reading

Long press the save bottom to turn on the reading mode, see the following figure, by this time it shows the latest saving group value, the Max. Value, Min. Value and the Max. Difference, by pressing the up and down bottom to look over the all the values that have been saved. Then press return bottom to exit the reading mode.

F001-01		STEEL	
781 HLD		654 _{HV} 58.0 _{HRC}	
Statistics	n	HLD	n HLD
MAX:784	1:	782	5: 782
MIN:780	2:	781	6: 780
R:4	3:	780	7: 784
N:8	4:	781	8: 784
DEL-FILE	DELETE		RETURN

Figure 5.8

5.7.3 Delete

Under the reading interface, press the second function bottom correspond to delete model of written to delete one group value. And press the first function bottom correspond to delete model of written to delete all the current saved values.

5.7.4 Data Transmission

The data in stored can be transferred from the instrument to a PC via communication software, to save, statistic and analyze the measurement. (See the help documentation in communication software for details)

5.8 Calibration

Measuring error can be usually caused by impact device abrasion or changing another impact device. So it is necessary to correct the error to make the measurement accurate.

After starting up, press CAL to enter the calibration mode, and use the impact device to test the block. Choosing 1-8 times of testing are available, then get the average value automatic, after which press up and down arrow to adjust the testing value to the standard value. By this time press the first function bottom correspond to the calibration model of written to finish the calibration procedure. The instrument will keep the calibrated data. For the delete of the calibrated data, is to press the second function bottom correspond to the delete. Press the third function bottom correspond to the return to exit the calibration mode.

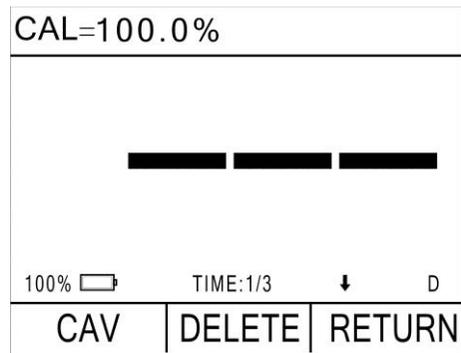


Figure 5.9

6. Maintenance & servicing

6.1 Clean the Impact Device

After long time using, the impact device has been used for 1000-2000 times, please use the cleaning brush to clean the tube and impact body.

- ◆ unscrew the support ring first, then take out the impact body;
- ◆ Spiral the nylon brush in counter-clock direction into the bottom of the tube and take it out for 5 times
- ◆ Install the impact body and support ring.
- ◆ Release the impact body after use.