



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:

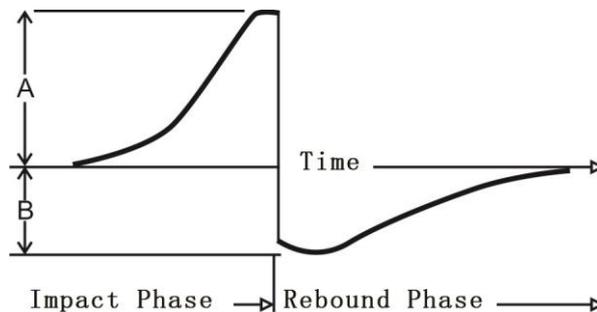


Figure 1 voltage features of output signal

2. Summary

Figure 2.1

2.1 Instrument Diagram

2.2 Standard Configuration

- ◆ Main unit(With D type impact device)
- ◆ HLD value Standard Calibration Block



- ◆ LmView software
- ◆ USB Communication cable
- ◆ Small supporting ring
- ◆ Cleaning brush
- ◆ Recharger
- ◆ User`s manual
- ◆ Suitcase
- ◆ AAA Polymer lithium battery, Voltage: 3.7V, Capacity of 600 MA/H, “Prohibition of air transport”

2.3 Optional Configuration

- ◆ DL Impact device
- ◆ Standard calibration test block
- ◆ Standard supporting ring
- ◆ Special supporting rings
- ◆ Small supporting ring

3. Functions and Applications

3.1 Technical Specifications

Measuring Method: Leeb hardness testing method

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

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) , σ_b (375-2639).

Impact Device: D type impact device (Standard); Interchangeable DL type impact device (optional)

Accuracy: Less than $\pm 6\text{HLD}$ (HLD=800), Repeatability $< 10\text{HLD}$ (HLD=800)

Measuring Direction: 360 degree by manual setting

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



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

Display: OLED full color dot matrix screen

Memory: 1000groups (each group includes 1-6 testing results)

Communication: USB 2.0

Power: AAA Polymer lithium battery, Capacity of 600 MA/H, voltage: 3.7 V

Working Temperature: -10°C~ +50°C

Size: 149MM*45MM

Weight: 105g

Battery: 10g

Standard: GB/T 17394-1998, 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

1. Surface roughness is an important requirement for the test piece, it should be smooth and no oil otherwise will cause measurement errors. The surface roughness of the sample at all testing points must be less than 2 μ m.

2. Sample weight >5 kg ,It does not easily move, can be tested directly without support.

Sample weight is 2~5kg, with overhanging part or thin wall workpiece, the sample should be fixed in place with object more than 5kg weight to avoid deformation or moving.



Sample weight <2kg, the sample should be coupled with another supporting object, the weight of supporting object should be more than 5 kg, and the surface of supporting body should be flat, smooth, and no excess coupling agent, the rule is that the testing direction must be perpendicular to the coupling surface throughout the test procedure.

3. Other requirements of the sample: Sample weight $\geq 0.1\text{kg}$, Sample thickness $\geq 5\text{mm}$, hardened-layer depth of the sample $>0.8\text{mm}$.

4. While the supporting body being clamped, the impact direction should be perpendicular to the testing surface.

5. When sample is large area of plate, long rod, or curve piece, even fairly heavy and thick, it may also cause incorrect test value. So the back of the test point should be reinforced and supported.

6. The magnetism of the sample should be less than 30 gauss.

4.2 Selection of Supporting Ring

When the curvature radius(R) of testing sample surface is smaller than 30mm and greater than 11mm, the small supporting ring should be used, or choose our special supporting ring(Optional) to obtain the best test condition.

No.	Code	Model	Diagram of Special Supporting Ring	Remark
1	03-03.7	Z10-15		Measure outside surface of cylinder R10~R15
2	03-03.8	Z14.5-30		Measure outside surface of cylinder R14.5~R30
3	03-03.9	Z25-50		Measure outside surface of cylinder R25~R50
4	03-03.1 0	HZ11-13		Measure inner surface of cylinder R11~R13
5	03-03.1	HZ12.5-		Measure inner surface of



NauMetrics

Precision Measuring Instruments

Postbus 540
7550 AM Hengelo (Ov.)
0031 (0) 74 3490022
www.naumetrics.nl
info@naumetrics.nl

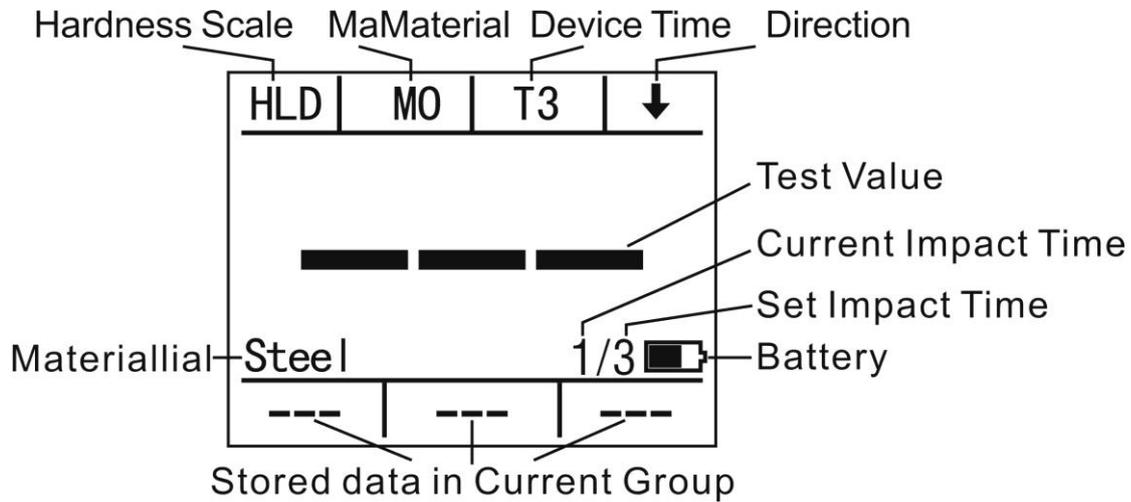


	1	17		cylinder R12.5~R17
6	03-03.1 2	HZ16.5- 30		Measure inner surface of cylinder R16.5~R30
7	03-03.1 3	K10-15		Measure outside spherical surface SR10~SR15
8	03-03.1 4	K14.5-30		Measure outside spherical surface SR14.5~SR30
9	03-03.1 5	HK11-13		Measure inside spherical surface SR11~SR13
10	03-03.1 6	HK12.5- 17		Measure outside spherical surface SR12.5~SR17
11	03-03.1 7	HK16.5- 30		Measure outside spherical surface SR16.5~SR30
12	03-03.1 8	UN		Measure outside surface of cylinder, adjustable radius R10~∞

5. Operation

5.1 Turn on the Instrument

Press button to turn on the instrument, the screen will display the default interface , then power on again will display the last parameters automatically.



5.2 Parameters Setting

5.2.1 Material

Press “**MO**” button to choose the material, code no. from M0~M9:

Material code no.	M0	M1	M2	M3	M4	M5	M6	M7	M8	M9
Hardness	Steel and Cast Steel	G C. IRON	NC. IRON	C. ALUM	BRA SS	BR ON ZE	CO PPE R	SST	FOR GIN G STE EL	ALL OY TOO L STE EL
Tensile strength	C	CrNi	CrM o	CrV	CrM nSi	SS ST	SST	CrNi Mo	Cr	

Figure5.1



5.2.2 Hardness Scale

Press 'HTL' button to choose the Hardness scale and strength;

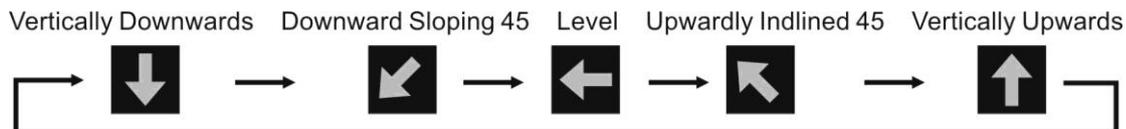


5.2.3 Impact Times

Press 'T (1-6)' button to set the impact times from T1~T6, which will calculate the mean value after certain impacts.

5.2.4 Impact Direction

Press '↓' (direction) button to select impact direction



5.3 Measuring

5.3.1 Operating

Start measuring after setting the parameters

- ◆ 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 perpendicular 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.
- ◆ After testing, the screen displays as following, the tester will save testing results automatically, or it won't save testing results if the testing value is invalid. After several testing, the recent testing values will display in sequence at the bottom of the screen.

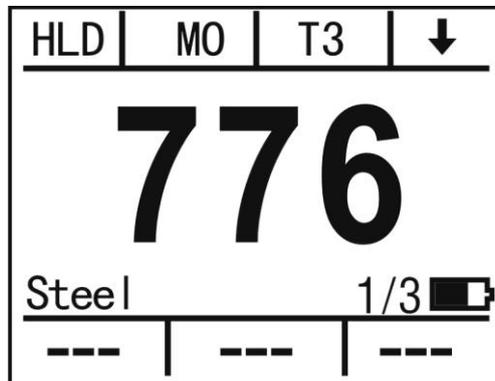


Figure 5.6

5.3.2 Reject the Gross Error Value

During the measuring process, if the deviation between the measured value and standard value is too big before the mean value displaying, the current measured value can be deleted by press “T(1-6)” button, and the current value would be neither stored nor in averaging. After deleting, the impact times minus one.

5.3.3 Average value

When the impact times reach the setting parameter , then the tester will display the following average value and will show the symbol “Ave”, 2-6 times is usually used in normal measurement, the value will be displayed in white figures.

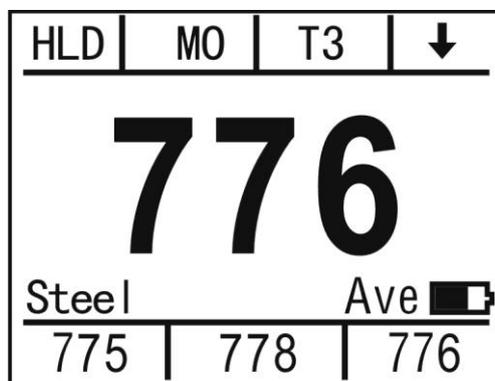


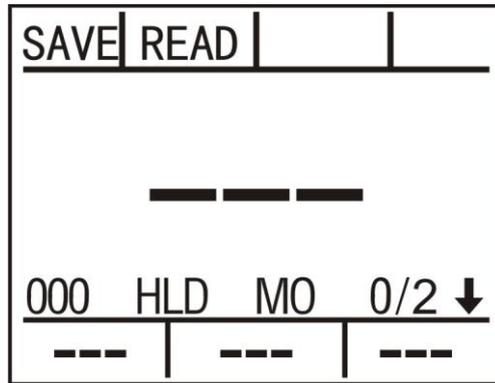
图 5.7

5.4 Data Storage and Readings



5.4.1 Storage testing result

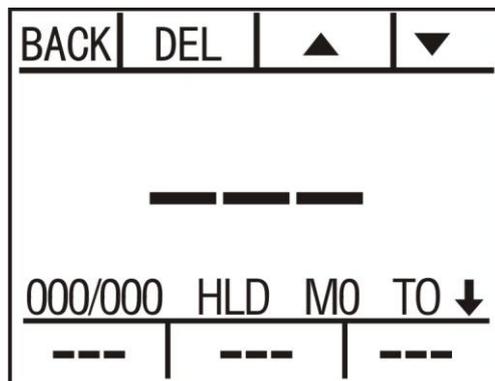
Long press 'HLD' button to set the saving function. and 'SAVE' symbol will display instead of 'HLD'. Again press the 'HLD' button to 'SAVE', see the following figure:



The tester will save testing results automatically, including 6 testing results and 1 average value each group, Press 'SAVE' to save the current group data, Press READ button to enter the reading mode.

5.4.2 Reading

In saving status, press ▲ ▼ to read the impact value in recently saved groups. Average value will be displayed at the center of the screen, and the saved value displayed at the bottom of the screen. Current group number, all saved groups, hardness scale, material, impacting times and impacting directions will be displayed under the average value. All data will be displayed in grey figures. If the stored values in one group are more than three, press ▲ or ▼ twice to see the rest values.





In reading status, 'DEL' will be displayed instead of 'MO'. Press 'MO' again to 'DEL'. Press 'DEL' to delete the data group while reading, the data groups minus one after deleting.

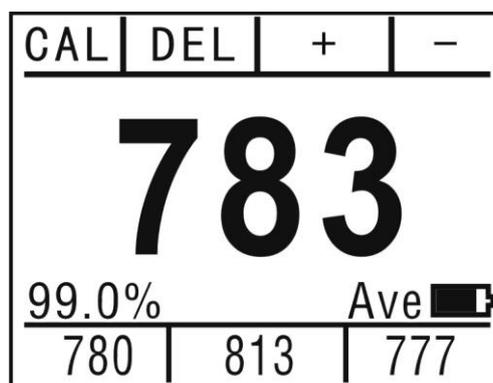
5.4.3 Storage Data Transmission

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)

5.5 Calibration (Error-correction settings)

Measuring error can be usually caused by impact device abrasion after long time using. So it is necessary to correct the error by calibration procedure to make the measurement accurate.

Long press 'Mo' button, the tester will enter calibration mode. Press 'HLD' again to 'CAL', Press 'MO' again to 'DEL'. Impact the standard block continuously until get the average values, then press up and down button to adjust the value to the standard value, press 'CAL' button to complete calibration, Calibration result will be displayed at the left bottom of the screen in form of percentage. Finally long press 'DEL' button to exit calibration.



6. Maintenance & servicing

After long time using, 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 several times
- ◆ Install the impact body and support ring.



- ◆ Release the impact body after use.

7. Switching Function Interface

- ◆ Long press **C** button to delete the current value, Long press **D** button to shut down and turn on the instrument.

