Digital Hardness Tester

DHT-300 ^{plus}

Instruction Manual

V.5.01

Contents

1. Introduction

DHT-300plus is an advanced mini hardness tester, characterized by its high accuracy, wide measuring range and simplicity for operation. It is suitable for testing hardness of the ordinary metal and widely applied in many industrial fields, such as petroleum, chemistry machinery and electric power industries etc.

2. Principle of Leeb hardness testing method

2.1 History of Leeb hardness testing method

The Leeb hardness testing method was firstly used in 1978. It is defined as: the rebound velocity of impact body divided by the impact velocity and then multiplied by 1000. For specified metals, Leeb hardness values indicate the hardness relations, and it can also be converted to other hardness scales (eg. HB, HV, HRC).

2.2 Definition of Leeb hardness

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:

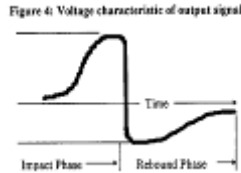$HL = 1000 \times (V_b / V_a)$

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

Figure 4: Voltage characteristic of output signal

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

2.3 Symbol of Leeb hardness values

Just like the other hardness scales, users will get different hardness values with different impact devices, for example: 720HLD≠720HLC.

Because Leeb hardness values are produced by the responding impact devices, it should be expressed with its impact device when it is converted to other hardness scales. for example：the Leeb hardness value 510HLD should be expressed as below when it is converted to Rockwell hardness scales HRC:

      510.20 HRCLD

In which：**510**   Leeb hardness values
        20   converted hardness values
     HRC means the converted object
       L   means the measuring method
       D   means impact device D

3. Pre-treatment of work piece

To get the accurate measuring results, pre-treatment of work piece is required.

3.1 work piece surface

a) Temperature of work piece should be less than 80℃；
b) The surface roughness requirements are listed in table 3.1.1

<div align="center">Table：3.1.1</div>

Impact device	Work piece surface roughness
D, DC, D＋15	2μm
G	7μm
C	0.4μm

c)   The small support ring or non-conventional support rings are required for work piece with curved surface radius less than 30mm, for details please refer to appendix 2.

3.2 weight of work piece

a) No support is required for work piece weight more than 5kg.
b) Work piece with medium-weight of 2-5kg and also heavier work piece with protruding parts or thin walls should be placed on a solid support in such a manner that they do not move or flex during the test impact.
c) Light- weight work piece should be rigidly coupled with a non-yielding support such as a heavy base plate.
Work piece weight and height 3.2.1

Table 3.2.1

Impact device type	weight（kg）			Minimum thickness of work piece（mm）
	Needing coupled	Needing support	No need	
D、DC、D+15	0.05-2	2-5	>5	3
G	0.5-5	5-15	>15	10
C	0.02-0. 5	0.5-1.5	>1.5	1

3.3 work piece surface hardened layer

If the work piece surface hardened layer is too thin, the impact force of short duration will go through the layer and make the L-value incorrect. The proper depth surface hardened layer are listed below:

Tale：3.3.1

Impact device	Minimum depth of surface hardened layer（mm）
D, DC, D+15	0.8
C	0.2

3.4 No strong magnetism on the work piece surface

Strong magnetism will affect the circuit winding greatly, and affect the accuracy of testing results, so it is required to avoid strong magnetism during the testing.

4. Typical Applications

・Installed machines and permanent parts of assembled system
・Molding surface of die
・Heavy work-pieces
・Ineffectiveness analysis of pressure-vessel, turbo-generator set etc.
・Bearing and other messy produced parts at production line
・Obtaining test data requested as original formal records
・Identifying metallic material stored in a warehouse

5. Functions of DHT-300plus hardness tester

5.1 Technical specifications

Display:　　128×64 OLED
Display error: ±0.5％ (HLD=800)
Relative repetitive display error: ±0.8％ （HLD=800）
Memory:　　1250
Battery:　　3.7V rechargeable lithium-battery with working more than 16 hours continuously
Auto-off:　　2 minutes without working
Size:　　158×41×26 mm
Weight:　　120g

5.2 DHT-300plus Hardness Tester

5.2.1 Main Body

❶   LCD display
❷   USB port/charging port/reset
❸   Impact device
❹   Name plate (back)/Indicator of charge
❺   Keypad

5.2.2 Function of Display

❶   Hardness scale
❷   Measuring value
❸   Average value
❹   Maximum value
❺   Minimum value
❻   Memory location
❼   Battery power
❽   Times of measurement/average
❾   Material
❿   Direction
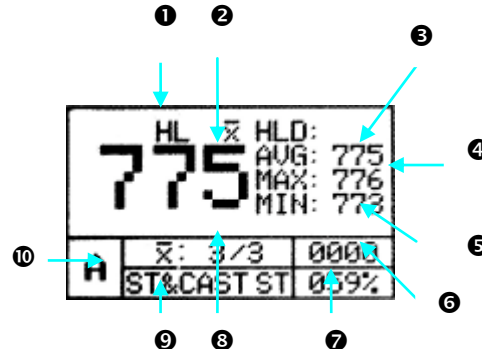
5.2.3 Keypad

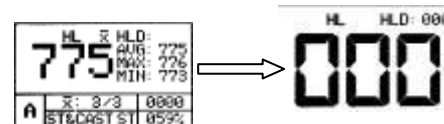❶ ON/OFF/Menu /Esc

❷ Select/Move/Delete

❸ Select/Set/Change the Display

6. Operation of the Instrument

6.1 starting and turning off

Press key turning on the power,
then detailed items of available function
last-use will display on the LCD.

Hold key for more than 3 seconds, turn the instrument off.

Prompt: You can press key to change the display style.

6.2 Function of Menu

Users can change or modify the function of gauge by selecting different items of menu.

Press key into menu state, then press key or key to select item you want to change or modify.

1. MEASUREMENT	**5.** LOCATION	**9.** CONTRAST
2. AVG. TIMES	**6.** MEMORY	**10.** DEFAULT
3. MAT. & SCALE	**7.** DATA OUTPUT	
4. TOLERANCE	**8.** CALIBRATION	

- Press ⏻ key, the gauge will go back to measurement state.

6.2.2   Average Times

The average times can be selected from 2 to 8.

AVERAGE TIMES
    3.

- Press ⏻ key to into the item
- Press ⬆ key or ⬇ key to increase or to decrease the average times
- Press ⏻ key to confirm

Prompt: 3 or 5 average times are to be recommended

6.2.3   Material and scale

The gauge provides 9 types of material and the corresponding scales.

1. ST CAST ST	**5.** NC IRON	**9.** COPPER
2. CWT STEEL	**6.** CAST ALUM	
3. STAINLESS	**7.** BRASS	
4. GC IRON	**8.** BRONZES	

8

- Press ⏻ key to into the item
- Press ▲ key or ▼ key to select the required material
- Press ⏻ key to confirm

The most of 6 types of scale can be selected according to the selected material

SCALE
1.HL   2.HRC
3.HRB 4.HB
5.HS   6.HU

- Press ▲ key or ▼ key to select the required scale
- Press ⏻ key to confirm

6.2.4   Tolerance

If the measurement value is lower than the lower limit value or upper than the upper limit value, the sign "L" or "H" will appear on the LCD.

TOLERANCE
LOWER.   100 HL
UPPER.   900 HL

- Press ⏻ key to into the item
- Press ▲ key to increase limit value

9

- Press ⊙ key to change setting value
- Press ⏻ key to confirm

6.2.5 Location

The gauge provides 1250 memory locations, from 0000 to 1249.

```
SET LOCATION
LOCATION 0000
```

- Press ⏻ key to into the item
- Press ⊙ key to increase location value
- Press ⊙ key to change setting value
- Press ⏻ key to confirm

6.2.6 Memory

The gauge provides sequence storage space with 1250 groups and batch storage space with 12 which can save 100 groups.

```
1. SEQ. STORE
2. BATCH STORE
3. CLEAR MEMORY
```

In sequence store, you can select "AUTO STORE " or "CLOSE STORE "states to determining store or not store

measuring value.

1. AUTO STORE
2. CLOSE STORE

- Press ⬆ key or ⬇ key to select the required item
- Press ⏻ key to confirm

In batch store, you can select which batch is used to save the measuring value.

BATCH STORE

BATCH 1. TO 12.

SELECT BAT. 1.

- Press ⬆ key or ⬇ key to select the required item
- Press ⏻ key to confirm

If you want to clear the memory built-in DHT-300plus, you can go to the item "CLEAR MEMORY" and setup the locations you want to clear.

CLEAR ADDRESS

0000 0000

- Press ⬆ key or ⬇ key to select the location value
- Press ⏻ key to confirm

6.2.7   Data Output

Through determining the desired initial and end location number, you can output the value stored in the gauge to PC.

OUTPUT

1.SEQUENCE
2. BATCH

- Press ⏻ key to into the item
- Press ⬆ key or ⬇ key to select the required item
- Press ⏻ key to confirm

In sequence store, you can output the save data from the start location to the finish location.

SEQUENCE

START   0001
FINISH   0300

- Press ⬆ key to increase location value
- Press ⬇ key to change setting value
- Press ⏻ key to confirm

In batch store, you can output the batch you selected

```
BATCH OUT
BATCH 1. TO 12.
SELECT BAT. 1.
```

- Press ▲ key to increase batch number
- Press ▲ key or ▼ key to change the batch number
- Press ⏻ key to confirm

6.2.8   Calibration

You can modify measurement value when an error happening by changing desired value.

```
CALIBRATION
CAL. RANGE ±99
AVG. DATA 000
CAL. DATA -27
```

- Press ⏻ key to into the item
- Press ▲ key to increase calibration value
- Press ▼ key to change setting value

- Press ⏻ key to confirm

6.2.9   Contrast

If you want to change the LCD contrast, you can go to the item and adjust the LCD contrast.

CONTRAST

1 2 3 4 5

- Press ⏻ key to into the item
- Press ▲ key to increase contrast value
- Press ▼ key to decrease contrast value
- Press ⏻ key to confirm

6.2.10   Default

The gauge will recover the default parameters when confirm "DEFAULT" state.

9. CONTRAST
10. DEFAULT
11. BACKLIGHT

- Press ⏻ key to confirm

6.3 Data output via USB

DHT-300plus hardness tester supplies user very powerful USB data port for transferring saved data to computer.

6.3.1 Installation of USB driver program

When the instrument is connected to computer, it will be recognized immediately and installation of USB driver program is required. Install the program from CD supplied by us as the instruction files in the CD (DHT-300SetupFiles).

6.3.2 Installation of DataReceiver software

After the installation of USB driver, it is required to set up the DataReceiver software which is also in the CD (DHT-300USB-DataReceiver-Setup) to C: Program Files/USB-DataReciever.

6.3.3 Transferring of data

For the transferring of data, please refer to chapter **6.2.7 DATA OUTPUT.**

Prompts : It is necessary to preset the proper communication port number of the computer before transferring of data.

7. Repairing and Maintenance

In order to keep the accuracy and reliability of the instrument, it is necessary of timely evaluation and maintenance.

7.1 Maintenance of battery

The battery of DHT-300plus should be charged timely to avoid damaging the battery. The proper charging time is about 4 hours.

7.2 Maintenance of impact body tip

Because of the abrasion of impact body tip, the measured values may get larger than the standard value or get bad repeatedly. When it gets a larger measured value but not a bad repeatedly, it can be corrected by error correction function, for details please refer to "**6.2.10 Calibration**". If it gets a larger measured value and also a bad repeatedly, just change the impact body tip.

7.3 Maintenance of instrument
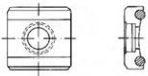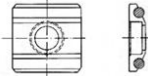
DHT-300plus is supplied with two year's certification of maintenance. Users should read the maintenance items below.

8. Appendix

Appendix 1：Measuring/ converted range of impact device D:

Materials	HL	HRC	HRB	HB		HS	HV
				30D^2	10D^2		
ST & CAST ST	300~900	20.0~68.0	38.4~99.5	80~647		32.5~99.5	80~940
CWT STEEL	300~640	20.4~67.1	46.5~100.7				80~898
STAINLESS	300~800	19.6~62.4		85~656			85~802
GC IRON	360~650			90~334			
NC IRON	400~660			131~367			
CAST ALUM	174~560				20~190		
BRASS	200~550		13.5~95.3		40~173		
BRONZES	300~700				60~290		
COPPER	200~690				45~315		

Appendix 2：Non-conventional support rings

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

Note：We will not play any notification on modification of this manual.

PACKING CARD

Code	Content	Quantity	Remarks
1	Main unit with impact device D	1	
2	small support ring and brush	1	
3	Standard hardness test block	1	
4	AC Adapter/Charger	1	
5	Instruction files	1	
6	Software (CD)	1	
7	USB connecting cable	1	
8	Carrying case	1	

WARRANTY CARD

The Hardness Tester DHT-300plus has endured strict checking, it completely comply with the national standards and our company standards. The following after sales services are guaranteed:

1、 In the first 3 months after purchasing, we supply complete free repairing and exchanging.
2、 We supply a warranty of 24 months (excluding the impact devices), and we will be in charge of the repairing and maintenance of our instrument for its whole life.
3、 During the warranty term, we will supply cost-free repairing and maintenance services if the malfunction is caused by the manufacturing quality. And when it is out of the warranty term, we will supply the services with collection of charges.
4、 Please do not dismantle the instrument sheath, any problems aroused from that will not be within our service.
5、 Users should send back the warranty card while receiving the instrument. Otherwise we will not supply any guaranteed services.