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HDT-RT151

**MOTORIZED DIGITAL ROCKWELL HARDNESS
TESTER OPERATION MANUAL**



Precautions

1. Before use, read the "Instruction Manual" carefully to understand the operation steps and precautions of the hardness tester in detail, so as to avoid damage to the hardness tester or safety accidents due to improper use.
2. Please carefully remove the cable tie and anti-vibration tape when installing and debugging the hardness tester.
3. The power socket of the hardness tester must use a single-phase three-core socket, and the ground terminal must meet the specified protective grounding requirements.
4. It is strictly forbidden to disassemble and assemble the electrical components of the hardness tester and the installation position of the switch socket by yourself. If you disassemble and assemble without authorization, it may cause an accident.
5. During the process of applying or removing the test force and test force holding process, the hardness tester cannot turn the screw rotary wheel

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I. Brief introduction of hardness tester

1.1 Hardness is one of the important indicators of material mechanical properties, and hardness test is an important means to judge the quality of metal materials or parts.

Since the hardness of metals has a corresponding relationship with other mechanical properties, most metal materials can approximately calculate other mechanical properties such as strength, fatigue, creep and abrasion by measuring the hardness.

1.2 The Touch Screen Rockwell hardness tester is displayed on a novel large screen, which has good reliability, operability and intuitiveness. It is a high-tech product integrating electromechanical. Its main functions are as follows:

- 1.2.1 Selection of Rockwell hardness scale;
- 1.2.2 Conversion values between hardness scales;
- 1.2.3 Hardness test result printout

II. Technical parameters

2.1 Initial test force: 98.07N (10kg) tolerance $\pm 2.0\%$

2.2 Total test force: 588.4N (60kg), 980.7N (100kg), 1471N (150kg) tolerance $\pm 1.0\%$

2.3 Indenter specifications:

2.3.1 Diamond Rockwell indenter

2.3.2 $\phi 1.5875\text{mm}$ ball indenter

2.4 Power supply voltage: AC220V $\pm 5\%$, 50~60Hz

2.5 Delay control: adjustable from 2 to 60 seconds

2.6 The maximum height of the tested piece: 230mm

2.7 Throat: 170 mm

2.8 Hardness tester dimensions (length x width x height) 475 x 200 x 700 (mm)

2.9 The weight of the hardness tester is about: 70kg

2.10 Rockwell hardness test scale, indenter, test force and application range (the commonly used scales for Rockwell hardness test are A, B, and C) (Table 1)

III. Installation of three hardness testers

3.1 Working conditions:

3.1.1 At room temperature within the range of 10 to 30 degrees Celsius;

3.1.2 The indoor relative humidity is not more than 65%;

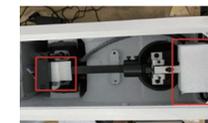
3.1.3 In a vibration-free environment, there is no corrosive medium around.

3.2. Unpacking and installation

3.2.1 Cut off the packing tape on the packing box, unscrew the screw on the bottom of the wooden box to remove the box cover, and take out the accessory box.

3.2.2 Use a wrench to unscrew the two M10 outer hexagon bolts under the bottom plate, and the hardness tester is separated from the bottom plate (pay attention to safety)

3.2.3 Open the top cover of the machine and take out the sponge filling inside (as shown in the figure).



3.2.4 After unpacking, place the hardness tester horizontally on a stable workbench, and its levelness shall not exceed 1mm/m. At the same time, open a hole in the appropriate position of the workbench (Figure 1), so that the lifting screw can work normally. It is recommended that the height of the workbench is about 500mm.

Table 1

| ruler | Head type | Initial test force | Total test force (N) | Application range |
|-------|--|--------------------|----------------------|---|
| HRA | Diamond indenter | 98.07 N (10kg) | 588.4 (60kg) | Carbide, carbide steel, case hardened steel, hardened steel sheet |
| HRD | | | 980.7(100kg) | Sheet steel, surface hardened steel |
| HRC | | | 1471(150kg) | Hardened steel, quenched and tempered steel, chilled cast iron |
| HRF | ball indenter $\phi 1.5875\text{mm}$ (1/16 inch) | | 588.4 (60kg) | Cast iron, aluminum, magnesium alloy, bearing alloy, annealed copper alloy, thin mild steel plate, etc. |
| HRB | | | 980.7(100kg) | Mild steel, aluminum alloy, copper alloy, malleable iron, annealed steel |
| HRG | | | 1471(150kg) | Phosphor bronze, beryllium bronze and malleable iron |
| HRH | ball indenter $\phi 3.175\text{mm}$ (1/8 inch) | | 588.4 (60kg) | Aluminum, zinc, lead, etc. |
| HRK | | | 1471(150kg) | Soft materials such as bearing alloys, tin, hard plastics |
| HRE | | | 980.7(100kg) | |
| HRL | 588.4 (60kg) | | | |
| HRM | 980.7(100kg) | | | |
| HRR | Ball indenter $\phi 12.7\text{mm}$ (1/2 inch) | 588.4 (60kg) | | |

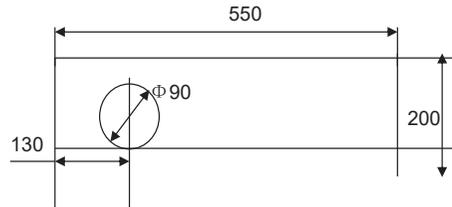


fig. 1

Note:

1. Open the top cover of the machine and take out the sponge filling inside.
2. This machine is an electronic control machine, without weights, it can be used when it is powered on!

3.3 Corresponding relationship between selected test force and weight application (Table 2)

table 2

| | | |
|-----|----------------|----------|
| HRA | (20~75) HRA | ± 2HRA |
| | (>75~88) HRA | ± 1.5HRA |
| HRB | (20~45) HRB | ± 4HRB |
| | (>45~80) HRB | ± 3HRB |
| | (>80~100) HRB | ± 2HRB |
| HRC | (20~70) HRC | ± 1.5HRC |
| HRD | (40~70) HRD | ± 2HRD |
| | (>70~77) HRD | ± 1.5HRD |
| | (>90~100) HRE | ± 2HRE |
| HRF | (60~90) HRF | ± 3HRF |
| | (>90~100) HRF | ± 2HRF |
| HRG | (30~50) HRG | ± 6HRG |
| | (>50~75) HRG | ± 4.5HRG |
| | (>75~94) HRG | ± 3HRG |
| HRH | (80~100) HRH | ± 2HRH |
| HRK | (40~60) HRK | ± 4HRK |
| | (>60~80) HRK | ± 3HRK |
| | (>80~100) HRK | ± 2HRK |
| HRE | (70~90) HRE | ± 2.5HRE |
| HRL | (100~120) HRL | ± 1.2HRL |
| HRM | (85~110) HRM | ± 1.5HRM |
| HRR | (114~125) HRR | ± 1.2HRR |

IV. Function introduction

Turn on the switch power at the back of the machine body, and the operation interface will appear on the screen.

Machine main interface:



Settinginterface



Testinginterface



Display interface



Chart interface



Program setting interface

4.1.1 Setting interface

4.1.1.1 Select the scale to be tested (as shown in the figure)



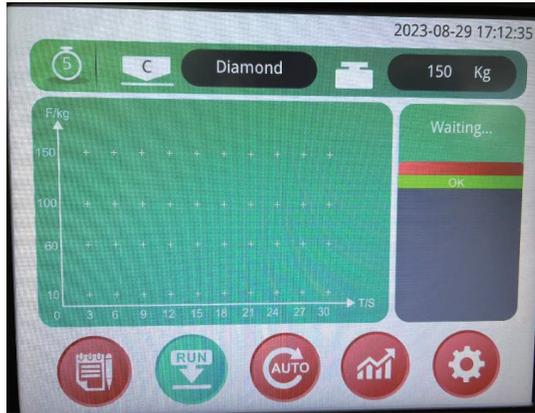
4.1.1.2 Select the scale to be converted (as shown in the figure)



4.1.1.3 According to the needs of users, test groups and testers can be set up by themselves. At the same time, the qualified hardness range can be selected according to the user's product, and the test product can be quickly screened to pass or fail.



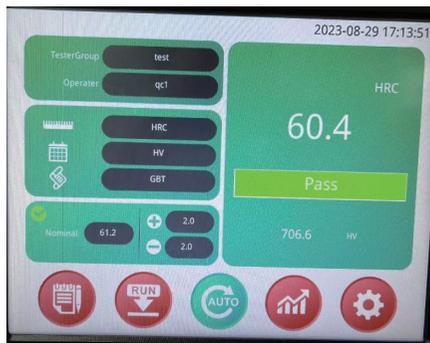
4.1.2 Test interface



4.1.2.1 After selecting the corresponding test scale in the setting interface, the test interface will automatically match the corresponding test force and the selected indenter. Please refer to:

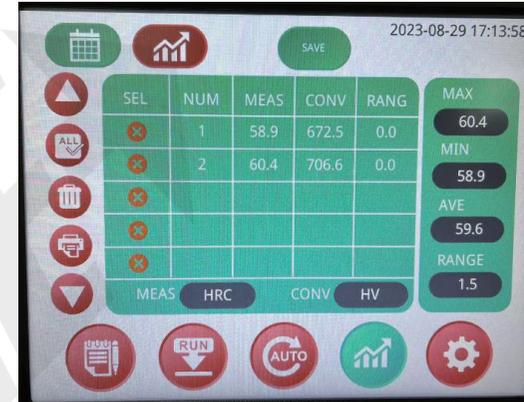
| ruler | Test force (N) | Corresponding indenter |
|-------|----------------|------------------------------|
| HRA | 588.4 (60kg) | Diamond indenter/Diamond |
| HRB | 980.7(100kg) | Steel ball indenter/1.5875mm |
| HRC | 1471(150kg) | Diamond indenter/Diamond |

4.1.3 Display interface (display test results)



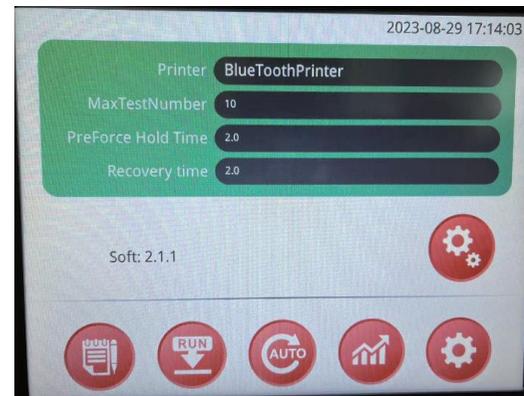
4.1.4 Chart interface

This interface can display the maximum value, minimum value, average value, deviation range of each group, can delete, print data, etc.



4.1.5 Program interface

This page can be used to set the language, the number of times for each group, the type of test, and display the date and time (long press on the date to modify).

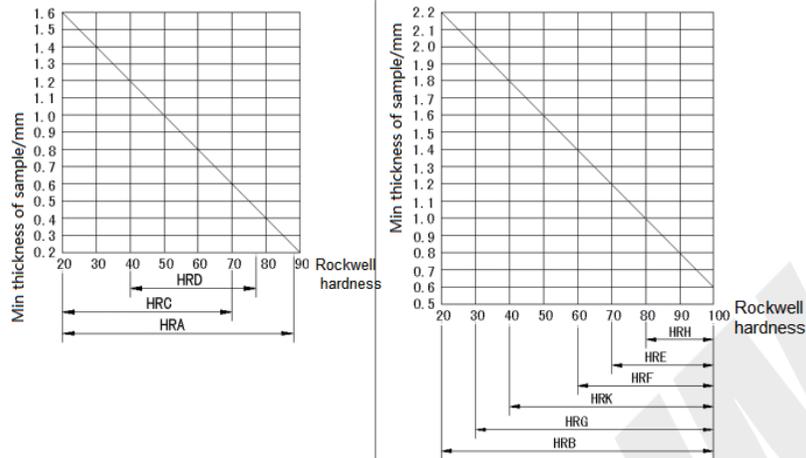


V. Correct use of five hardness testers

5.1 Preparation before use

5.1.1 The surface of the tested piece should be smooth, free from dirt, scale, pits and obvious processing traces. The supporting surface of the sample and the test platform should be clean to ensure a good seal.

5.1.2 The minimum thickness of the test piece should be greater than 10 times of the indentation depth. After the test, there must be no visible traces of deformation on the back of the test piece .



5.1.3 The tested piece should be placed on the test platform stably, and the test piece should not be moved during the process of applying the test force, and the test force can be applied vertically to the test piece.

5.1.4 Choose the appropriate test bench according to the shape and size of the test piece. If the test piece is irregular, you can make a special fixture according to the specific geometric shape to make the hardness test display value correct.

5.1.5 When the tested piece is cylindrical, a "V" type test bench must be used, and the test results must be corrected, and the corrected values are all positive values. Rockwell hardness correction table for testing on convex cylindrical surface (Table 3).

Table 3

| Hardness value (HR) | Cylindrical specimen diameter (mm) | | | | | | | | |
|---------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|
| | 6 | 10 | 13 | 16 | 19 | 22 | 25 | 32 | 38 |
| | Correction amount of Rockwell A, C, D scale (HR) | | | | | | | | |
| 20 | | | | 2.5 | 2.0 | 1.5 | 1.5 | 1.0 | 1.0 |
| 25 | | | 3.0 | 2.5 | 2.0 | 1.5 | 1.0 | 1.0 | 1.0 |
| 30 | | | 2.5 | 2.0 | 1.5 | 1.5 | 1.0 | 1.0 | 0.5 |
| 35 | | 3.0 | 2.0 | 1.5 | 1.5 | 1.0 | 1.0 | 0.5 | 0.5 |
| 40 | | 2.5 | 2.0 | 1.5 | 1.0 | 1.0 | 1.0 | 0.5 | 0.5 |
| 45 | 3.0 | 2.0 | 1.5 | 1.0 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 |
| 50 | 2.5 | 2.0 | 1.5 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.5 |
| 55 | 2.0 | 1.5 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0 |
| 60 | 1.5 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 |
| 65 | 1.5 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 |
| 70 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 |
| 75 | 1.0 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0 |
| 80 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0 | 0 |
| 85 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hardness value (HR) | Cylindrical specimen diameter (mm) | | | | | | | | |
| | 6 | 10 | 13 | 16 | 19 | 22 | 25 | | |
| | Correction of Rockwell B, F, G scales (HR) | | | | | | | | |
| 20 | | | | 4.5 | 4.0 | 3.5 | 3.0 | | |
| 30 | | | 5.0 | 4.5 | 3.5 | 3.0 | 2.5 | | |
| 40 | | | 4.5 | 4.0 | 3.0 | 2.5 | 2.5 | | |
| 50 | | | 4.0 | 3.5 | 3.0 | 2.5 | 2.0 | | |
| 60 | | 5.0 | 3.5 | 3.0 | 2.5 | 2.0 | 2.0 | | |
| 70 | | 4.0 | 3.0 | 2.5 | 2.0 | 2.0 | 1.5 | | |
| 80 | 5.0 | 3.5 | 2.5 | 2.0 | 1.5 | 1.5 | 1.5 | | |
| 90 | 4.0 | 3.0 | 2.0 | 1.5 | 1.5 | 1.5 | 1.0 | | |
| 100 | 3.5 | 2.5 | 1.5 | 1.5 | 1.0 | 1.0 | 0.5 | | |

5.2 Operation sequence of the hardness tester (taking the HRC high-value standard hardness block as an example)

5.2.1 Take out the large platform and the standard hardness block with high HRC value from the accessory box (wipe the oil on the surface of the platform and hardness block).

5.2.2 In the setting interface , select HRC as the measurement scale, click the test interface, and the program will automatically identify the corresponding test force 1471N (150kg) and diamond indenter (please check whether the indenter on the machine is a diamond indenter).



5.2.3 Turn the hand wheel on the rotary wheel screw clockwise, and the screw rod rises. The standard hardness block should be in contact with the indenter slowly and without impact until the hardness tester on the test interface enters the OK position and the buzzer sounds. At this time The initial test force has been applied and the test bench stops rising. (When the rising speed of the test bench is too fast and the displayed value exceeds OK, the buzzer will sound for a long time, indicating that there is an operation error. The test bench should be lowered and the test point should be replaced).

5.2.4 When the motor is started, the main test force is automatically loaded, the dwell time is 5 seconds, the seconds count down to 0, the motor rotates, the main test force is automatically unloaded, and the initial test force is retained. The buzzer sounds, and the hardness value in the hardness display area is read.

5.2.5 Rotate the rotary wheel in the opposite direction, the test bench descends replace the test point, and repeat the above operation.

5.2.6 There are no less than five test points on each specimen (the first point is not counted). For the inspection of large batches of parts, the test points can be appropriately reduced.

5.2.7 Press the " Print " button to print out. Done.

Note: After the initial test force is applied, the interface settings cannot be selected, and should be setted after rotated the screw counterclockwise and made it lowered

VI. Hardness tester maintenance and precautions

6.1 Test personnel should abide by the operating procedures, and can often use standard

blocks to calibrate the instrument before and after the test. For hardness testers that are not frequently used, several hardness measurements should be performed on the standard block after starting up, and the test piece should be tested after stabilization. 6.2 During the hardness test, it is strictly forbidden to turn the screw handwheel when adding the test force, maintaining the test force, or removing the test force.

6.3 The use of hardness blocks can only be carried out on the working surface, and the distance between two adjacent indentations and the center to edge of the indentation is not less than 3mm.

6.4 When transporting the hardness tester, ensure that the whole machine is vertically upward. The power plug should be unplugged first.

6.5 The hardness tester should be kept clean and covered with a dust cover after testing.

The hardness block and the ball indenter are coated with anti-rust oil after use to prevent rust.

6.6 The hardness tester should do a good job of periodic verification, at least once a year to ensure the accuracy of the hardness tester.

6.7 Common troubleshooting of hardness tester:

6.7.1 When the hardness tester had problem, it should be repaired by contacting us, and common faults can be solved by itself (Table 4).

table 4

| Problem | Possible Causes | Method of exclusion |
|--|---|--|
| Lifting screw stuck | The fit gap between the lifting screw is very small, and tiny threads or dirt may cause jamming | Take off the protective cover of the lifting screw, wipe the thread with a clean cloth, and then hold the knob handle with both hands to pull the lifting screw up and down (sandpaper is not allowed to rub the screw). |
| The deviation of hardness indication value is large. | 1. Indenter damaged 2. Wrong choice of test force 3. The total test force or indenter is wrongly selected | 1. Replace the diamond indenter or ball indenter. 2. Check the test scale selected in the setup interface. 3. Select the test force and indenter according to the requirements in Table 1. |