

HDT-ST300/ST310/ST320
AUTOMATIC DIGITAL ROCKWELL/SUPERFICIAL
ROCKWELL HARDNESS TESTER



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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)
- 2.11 Allowable error of indication value of hardness tester (Table 2)

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	588.4 (60kg)		Cast iron, aluminum, magnesium alloy, bearing alloy, annealed copper alloy, thin mild steel plate, etc.	
HRB	Ball indenter φ1.5875mm (1/16 inch)		980.7(100kg)	Mild steel, aluminum alloy, copper alloy, malleable iron, annealed steel
HRG	Ball indenter φ3.175mm (1/8 inch)		1471(150kg)	Phosphor bronze, beryllium bronze and malleable iron
HRH			588.4 (60kg)	Aluminum, zinc, lead, etc.
HRK			1471(150kg)	Soft materials such as bearing alloys, tin, hard plastics
HRE			980.7(100kg)	
HR L			588.4 (60kg)	
HRM		Ball indenter φ6.35mm (1/4 inch)	980.7(100kg)	
HRR		Ball indenter φ12.7mm (1/2 inch)	588.4 (60kg)	

Table 2 Allowable error of indication value of hardness tester

Hardness scale	Hardness range of standard blocks	Indication maximum allowable error
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

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.
- 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.

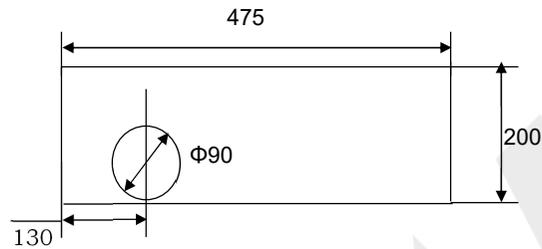


Figure 1

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!

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:

4.1 Selection interface



Setting interface



Testing interface



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:Table 3

Table 3

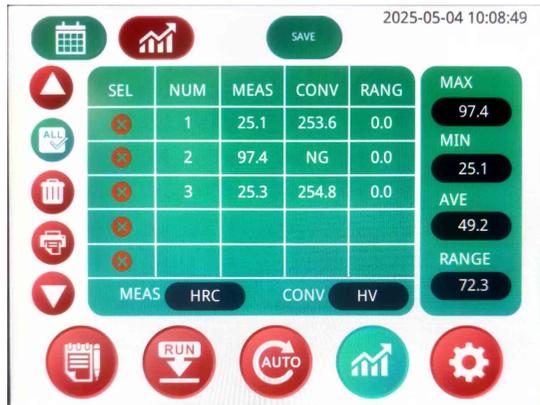
Ruler	Test force (N)	Corresponding indenter
HRA	588.4 (60kg)	Diamond indenter/Diamond
HRB	980.7(100kg)	Steel ball indenter/1.5875mm
HRC	1471(150kg)	Diamond indenter/Diamond

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).

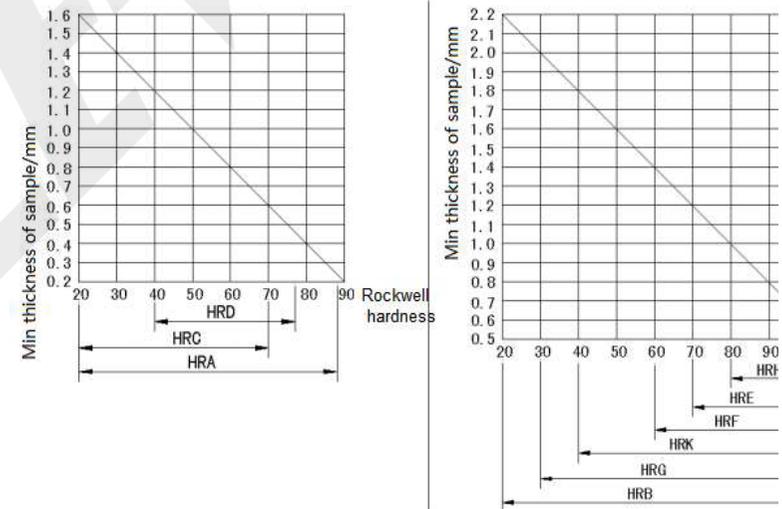


V. Correct use of five hardness testers

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 (Figure 6).

Figure 6



- 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 4)

Table 4

Hardness value (HR)	Cylindrical specimen diameter (mm)								
	6	10	13	16	19	twenty two	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 Press the run button of touch screen, 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.

5.2.4 Press down button of machine, the test bench descends, replace the test point, and repeat the above operation.

5.2.5 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.

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

Note: After the test force is applied, the interface settings cannot be selected, and should be setted after working bench down.

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 5).

Table 5

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.	<ul style="list-style-type: none"> 1 Indenter damaged 2 Wrong choice of test force 3 The total test force or indenter is wrongly selected 	<ul style="list-style-type: none"> 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.