

Operation Manual

Digital Rockwell Hardness Tester

Precautions:

1 before using the instrument should be carefully read the "User's Manual", a detailed understanding of the instrument steps

And the use of precautions to avoid improper use caused by damage to equipment or security incidents.

2 Please carefully remove the cable ties and vibration-proof tape when installing and testing the instrument.

3 The power socket of the instrument must be a single-phase three-pin socket, and the grounding terminal must meet the specified protection grounding requirements.

4 equipment, electrical components, switch socket is strictly prohibited to install their own disassembly, if unauthorized disassembly, will likely lead to accidents.

5 The instrument can not turn the handwheel or turn the wheel during application or removal of the test force and the test force holding.

6 This unit is committed to improving the quality of the hardness, and constantly update the structure, if the use of manual

The contents are slightly different from the structure of the instrument, without any notice, please forgive me.

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Brief introduction

1 hardness tester concept

1.1 Definitions and Uses of Hardness Tester

The so-called hardness, is the material under certain conditions to resist the other does not occur by the residual deformation of the object into the ability. The greater the resistance, the higher the hardness, otherwise the lower the hardness. Hardness tester is used to determine the hardness of the material testing equipment, and hardness test is to determine the quality of metal materials or products as a means of parts.

The instrument is mainly applied to the material Rockwell hardness test.

In the mechanical properties of the test, the hardness is the easiest, most economical, the most rapid method, but also the machinery manufacturing process to check product quality one of the measures. As the hardness of metal and other mechanical properties of the relationship between each other, therefore, most of the metal material can be determined by measuring the hardness of other mechanical properties, such as strength, fatigue, creep, wear and internal damage.

1.2 Rockwell hardness test basic principles:

At the beginning of the test, the test head was placed on the test piece, the initial test force was applied and a reference point measured by the displacement measuring device was established. As the initial test force to indentation into the specimen, so the surface smooth or irregular will not affect the test. The test machine then applies the main test force, the larger force, into the specimen deeper, then the main test force is removed and the initial test force is maintained, at which time the tester measures the depth of the indentation relative to the established reference point. The straight depth of the dent is the basis for the Rockwell hardness value. Dent shallow depth only indicates that the material hardness is higher, the dent depth is relatively deep, then the material hardness is soft. As shown in Figure 1-1:

Figure 1-1 Schematic diagram of the hardness tester

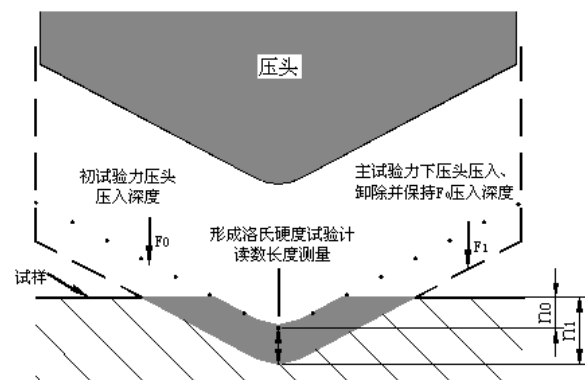
1.3 Rockwell hardness test formula:

$$\text{HRC.A} = 100 - n_1 - n_0 \cdot 0.002 \quad (1.1)$$

$$\text{HRB} = 130 - n_1 - n_0 \cdot 0.002 \quad (1.2)$$

Where: n_0 - the initial test force F_0 , the pressure head into the depth of the sample

n_1 - The depth at which the indenter is pressed into the test piece to apply the total test force F and to remove the main test force F_1 while still maintaining the initial test force F_0 .



1.4 The hardness of the numerical representation

According to the relevant standard hardness expressed as hardness value + hardness scale + other: such as hardness: 60HRC, etc., please refer to the relevant standards.

2 digital display Rockwell hardness to the new large-screen display, with good reliability, maneuverability and intuitive

Is set in the mechanical and electrical integration of high-tech products. Its main functions are as follows:

2.1 Rockwell hardness scale selection

2.2 The choice of plastic Rockwell scale (special requirements, according to contract supply)

2.3 hardness conversion between the hardness;

2.4 Hardness test results printout;

2.5 RS-232 HyperTerminal settings, for users to extend functionality.

Technical parameters:

1 Initial test force: 10kgf (98.07N) Tolerance \pm 2.0%

2 Total test force: 60kgf (588.4N), 100kgf (980.7N), 150kgf (1471N) Tolerance \pm 1.0%

3 Head Specifications:

3.1 Diamond Rockwell indenter

3.2 ϕ 1.5875mm ball indenter

4 Power supply voltage: AC220V \pm 5%, 50-60Hz

5 delay control: 1-60 seconds adjustable

6 The maximum allowable height of the test piece: 190mm

7 indenter center to the fuselage distance: 165mm

8 Hardness Tester Dimension (length \times width \times height) 520 \times 240 \times 720 (mm)

9 The weight of the instrument is about 80kg

10 Rockwell hardness test ruler, indenter, test force and application range (Table 1)

Table 1

Ruler	Type of head	Initial test force	Total test force (N)	Applications
HRA	Diamond indenter	98.07 N (10kg)	588.4 (60kg)	Carbide, carbide surface 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 pressure head ϕ 1.5875mm (1/16 inch)		588.4 (60kg)	Cast iron, aluminum, magnesium alloy, bearing alloy, annealed copper alloy, thin soft steel plate
HRB			980.7 (100kg)	Mild steel, aluminum alloy, copper alloy, malleable iron, annealed steel
HRG			1471 (150kg)	Phosphor bronze, beryllium bronze and malleable cast iron

HRH	Ball indenter φ 3.175mm (1/8 inch)	588.4 (60kg)	Aluminum, zinc, lead and so on
HRE		980.7 (100kg)	Bearing alloys, tin, hard plastic and other soft materials
HRK		1471 (150kg)	

11 hardness of the value of the allowable error (Rockwell hardness test commonly used ruler A, B, C three) (Table 2)

Table2

Hardness scale	Standard block hardness range	The maximum allowable error of indication
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
HRE	(70~90)HRE	±2.5HRE
	(>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

Installation of Hardness Tester:

1 hardness of the working conditions

1.1 in the room temperature 10-30 degrees Celsius;

1.2 indoor relative humidity less than 65%;

1.3 in the absence of vibration environment, the surrounding non-corrosive media.

2 Hardness Tester

2.1 Remove the screws of the four fixed boxes, lift the box, remove the pad around the hardness tester pad and accessories box.

2.2 raise the floor, with a wrench to the bottom of the M10 bolt out of the two, the hardness and the bottom plate, mention

Out of the hardness (note that security).

2.3 Unscrambled hardness level after the level of stability in the table, the level of not more than 1mm

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/ m. with(Figure 1), the lifting screw to work properly.

3 hardness tester placed (Figure 2)

After the durometer is placed properly, open the top cover (1) and the rear cover (2). (22) in the body, (Fig. 6), and the fixed moving parts of the white yarn are solved, and then covered to prevent dust into the inside.

4 Installation of the weight set (Fig. 3)

4.1 When installing the weight, the instrument should be in the unloading test state.

4.2 Remove the weight set from the accessory box and wipe. Turn the variable load handwheel (9) to 588 and remove it from the rear cover

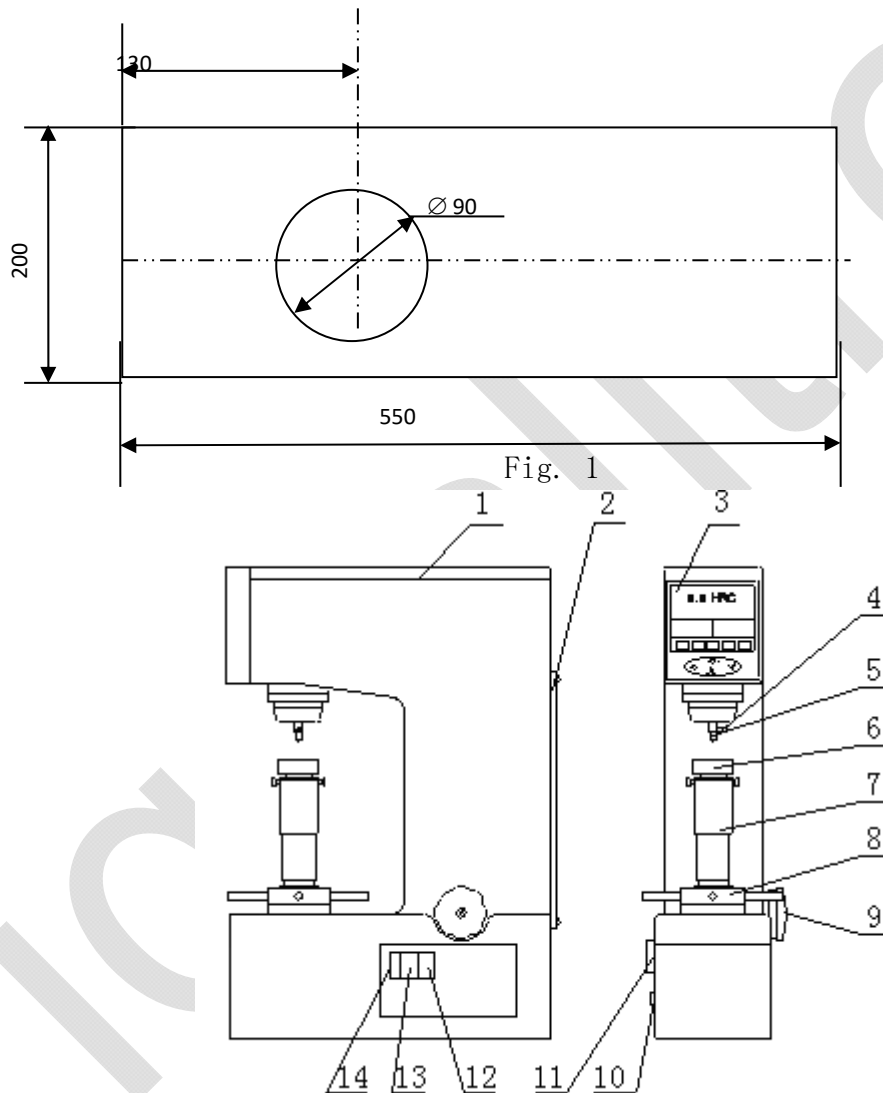


Fig. 2

1 Top cover 2 Rear cover 3 Display 4 Head pressure screw 5 Head 6 Test stand 7 Hoist screw 8 Knob 9 Variable load handwheel 10 RS-232 socket 11 Printer 12 Power socket 13 Fuse 14 Switch

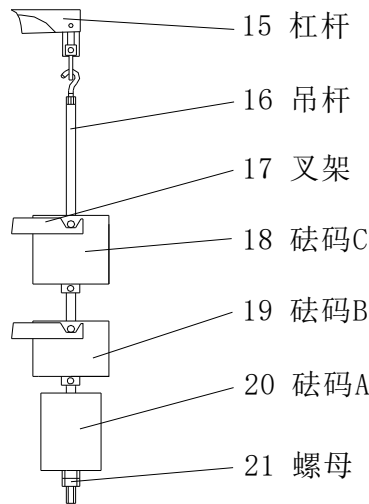


image 3

(16), insert the boom into the weight A (20) hole, screw into the M10 nut (21) at the end of the boom, and hook the boom in the lifting lug at the end of the lever (15). Place the weights B (19) and C (18) on the two forks (17), and turn the variable hand wheel clockwise for one week to see if the two pins on the weights are placed on the fork Slot. Turn the variable load handwheel (9) to 1471, at which point all weights are suspended and do not touch any part.

5 test force and weight applied to choose the corresponding relationship (Table 3)

Table 3

Ruler	Test Force (N)	Variable hand wheel engraved value	Weight force (weight code)
HRA	588.4 (60kg)	588	Boom + weight A
HRB	980.7 (100kg)	980	Boom + weight A + weight B
HRC	1471 (150kg)	1471	Boom + weight A + weight B + weight C

Four-panel key function

1) Turn on the power (12), open the boat switch (14), the main screen shows "Welcome" interface, wait a moment, the main screen interface (Figure 4)

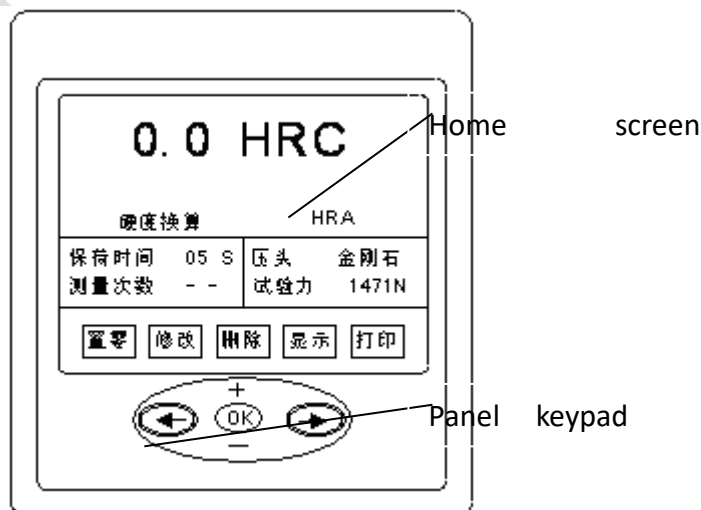
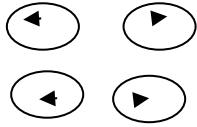


图 4

1.Zero - When the cursor is on this key, the decimal point may be left on the main screen after the test is finished. Press OK to display the hardness zone number as zero (0.0HR30N).



2 Modify - Press to move the cursor to the modification key, press the OK key, the screen displays "Repair

(Figure 5), press the key to move the cursor up or down to select: scale, scale, load time, date and time, then press OK to display the selected item, move the cursor to select, load time and date Time Press + - to change the number, select OK and then press the OK button, the main screen back to their desired user interface.

3	Modify project	Delete - the cursor moves to this key, press the OK key to delete last test of hardness data.
4	Measuring scale	Display - the cursor moves to this key (the first point is not displayed), press OK key, the screen displays the hardness of the
test,	Conversion scale	and calculate the minimum, maximum, average and error values.
last	Duration Time	Display 12 times at most each time. If you want to display the 12 times, press the "Modify" key to return the test number to zero.
6	Date time	PRINT - The cursor moves to this key (the first point does not print) and press OK to print the output. Include: year, month, day, error, average, minimum, maximum, hardness and the number of times.

Rockwell hardness scale selection, a total of 12 rulers

Test the choice of total lead time (default 5 seconds)

Revise year, month, day,

hour

图 5

Five the correct use of hardness tester

1 preparation before use

1.1 the surface of the tested parts shall be smooth and clean, and shall not have dirt, oxide skin, pits and significant processing marks,

The supporting surface of the specimen and the test bench shall be clean to ensure good sealing.

1.2 the minimum thickness of the specimen shall be 10 times greater than the depth of the indentation. After the test, the specimen shall not be visible on the back of the deformation.

1.3 test pieces shall be stable on the test rig, afterburner process may move the specimen, and ensure the force imposed on the vertical test specimen.

1.4 according to the shape of the specimen, the size of the test bench to choose the appropriate test pieces, such as special shape, can be manufactured according to the

specific geometry of the special fixture, so that the hardness test value is correct.

1.5 when the test piece is cylindrical, it is necessary to use the "V" type test bench when the diameter of the tested piece is less than 38 (25) mm

At the same time, the test results should be corrected and the correction values are positive. Modification of Rockwell hardness scale for cylindrical specimens

Value (Table 4)

2 Hardness of the order of operation

2.1 test HRC standard hardness block, according to table 1 test force 1471N (150kg) and diamond indenter.

Clockwise rotation of the handwheel to determine the total test force.

The 2.2 pressing head (5) is pushed into the main shaft hole, and the supporting surface is tightly attached,

The pressure head stop screw (4) is slightly tightened, and then the HRC hardness block is arranged on the test table (6).

2.3 button, the cursor moves to "modify", press the OK key. Display modify item form,

Select the "measurement scale" and then press the OK key, the main screen shows 12 hardness test scale, select HRC, press

OK, the main screen is restored to the test state.

2.4 in accordance with the 2.3 method of operation, and then select the hardness test of the conversion scale and holding time.

The 2.5 rotating wheel (8) rotates clockwise, and the lifting screw (7) rises, so that the test piece can be slowly and without impact

When the hardness meter is displayed between 570~610, the test table (6) stops rising, and the hardness tester automatically increases the test force. When the speed of the test table is too fast, the display value is more than 610, the buzzer is long, and the operation is wrong.

2.6 automatic test force, keep time for 5 seconds, then the number of seconds countdown from 5 to 0, the time to the rotation of the motor, automatic unloading test force, buzzer sound, read the display value of hardness test. Note: when the test force is added, it is strictly prohibited to turn the variable load hand wheel (9), such as the force rotation will make the internal gear dislocation, test force confusion.

Preparation and selection of specimens

The sample should have a certain size and thickness, it should be able to ensure that the distance between the center of the adjacent indentation and the indentation center to the edge of the specimen is greater than 3 mm, the minimum thickness of the specimen should not be less than the indentation depth of eight times. After the test, there is no obvious deformation trace on the supporting surface of the specimen, and the minimum thickness depends on the material and the load.

Minimum thickness gauge

Ruler	Hardness value HR	Minimum thickness (mm)	Ruler	Hardness value HR	Minimum thickness (mm)
A	70	0.7	B	80	1.0
	80	0.5		90	0.8
	90	0.4		100	0.7
B	25	2.0	C	20	1.5
	30	1.9		30	1.3
	40	1.7		40	1.2
	50	1.5		50	1.0
	60	1.3		60	0.8
	70	1.2		67	0.7

2.7 the reverse rotating wheel (8), the test table (6) is decreased, and the test point of the test piece is replaced.

Table 4

2.8 test points on each specimen shall be not less than five (excluding the first point). Inspection and measurement of large quantities of parts Points can be properly reduced.

Hardness value	Diameter of cylindrical specimen (mm)								
	6	10	13	16	19	22	25	32	38
HR	Modification 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	Diameter of cylindrical specimen (mm)							
	6	10	13	16	19	22	25	
HR	Modification of Rockwell B, F, G scale (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	1.5
90	4.0	3.0	2.0	1.5	1.5	1.5	1.5	1.0
100	3.5	2.5	1.5	1.5	1.0	1.0	1.0	0.5

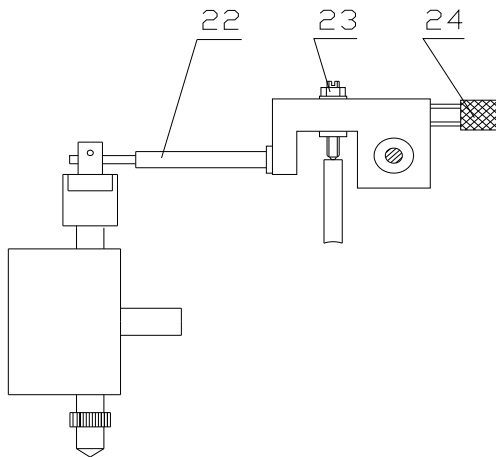
2.9 the cursor moves to the "print" button, press the OK key, print out. Complete operation.

3 hardness indication adjustment (Figure 6)

The precision of the indicating value of the hardness tester has been calibrated before the factory

Make proper adjustment on the basis of understanding the principle of instrument structure. Method: the upper cover (1) is taken off, and the output value is lower than the standard hardness block, then the screw cap is first used in the groove of the screw rod (23), and the nut is loosened, but the screw (23) can not be rotated. The adjusting screw (24) clockwise precession trace "screw (23) move forward", a half turn, raised about 1 degrees,

then the same way to screw the nut (23) slightly tight. Re test the indicated value until it is adjusted to the specified error range (Table 2), if the measured value is higher than the standard block hardness value, then the opposite direction is rotated to adjust the screw (24) and the screw (23) is moved backwards. R)



24 connecting rod 23 screw adjusting screw 22

Figure 6

Six RS-232 super terminal settings

Hardness meter and computer connection method is as follows:

1 hardness tester before starting, take out the inside of the box RS-232 communication lines, hardness tester and computer connected to the computer

You must turn off the electric), 9 core pin inserted hardness 9 core output socket (10), the other 9 core is inserted in the COM port on the computer.

2 turn on the computer, click on the computer interface to start the program attachment newsletter super

Terminal.

3 out of the connection description dialog box, enter the name bar "AA", press the OK key. Jump to "connect to"

Dialog box. In the dialog box, use N to connect directly to the serial port COM1 (or COM2)

Fixed key.

4 "COM1 (or COM2) the properties dialog box, baud rate (B), the input" 9600 "

Press the OK key to enter the AA super terminal interface and save the session AA.

5 when the computer operating platform is Windos98, the program may not be installed in the super terminal, in the computer

Click start to set the control panel to add or remove programs installed by the super terminal.

6 after the hardness test is complete, the print output is consistent with the computer display.

Seven hardness meter maintenance and precautions

1 the test personnel shall comply with the operating rules, and can use the standard block to proofread the instrument before and after the test. Infrequently used The hardness tester, after the boot on the standard block to carry out a number of hardness measurement, stability, and then test the specimen

2 in hardness test, test force, maintain test force, unloading test force, non rotational variable load handwheel.

3 hardness can only be used in the work surface, two adjacent indentation and

indentation center to the edge of not less than 3mm, the use of a period of two years.

4 when handling the hardness, the long rod should be fixed, and the weight and the suspender. Where the weight is taken off, the suspender should be Unplug the power plug.

5 hardness tester should be kept clean, dust cover after testing. The hardness block and ball head are coated with antirust oil.

6 hardness tester do periodic verification, at least once a year to ensure the accuracy of the hardness tester.

7 hardness tester troubleshooting

Hardness meter failure, should be associated with the relevant units for repair, the general failure can be resolved on their own (Table 5)

表 5

phenomenon	Possible cause	Elimination method
Boot, the display does not light	1 power failure 2 fuse	1 check whether the power cord is connected 2 remove the fuse in the accessory box
Boot, button failure	The instrument is not working	After starting, wait a moment, the instrument automatically returns to work
Lifting screw	With the gap between the lifting screw is small, fine thread or dirt may cause stuck	Take the screw lifting protection under the hood, with a cloth to wipe clean the thread, then hold the wheel pull down lifting screw (disabled sandpaper friction screw).
Hardness shows a large deviation.	1 head damage. 2 weight installation sequence reversed. 3 instrument placement is not level, weight and the body wall friction. 4 total test force or pressure head selection error.	1 replace the diamond indenter or ball indenter. 2 install weights group in figure 3. 3 according to the third paragraph of article second of the requirements of the 2.4, the use of level calibration hardness tester. 4 according to table 1 requirements of the test force and pressure head.

Eight accessories (packing list)

Serial number	Name (specification)	Number
1	Diamond Rockwell indenter	1 只
2	Φ1.5875mm ball indenter	1 只
3	Flat bench, the bench, "V" type test	共 3 只
	Rockwell hardness standard block	
4	HRB	1 块
5	HRC High and low	共 2 块
6	Fuse 2A	2 根
7	Power cord	1 根
8	RS-232 communication line	1 根
9	Weight A, B, C	共 3 只
10	Dust proof plastic cover	1 只
11	Product qualification certificate	1 份
12	Printer paper	1 份
13	Product specification	1 本