

BMS 150-CDM

Digital Rockwell Clock Rockwell Hardness Tester

OPERATION MANUAL



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1 Brief

Hardness is an important indicator of the mechanical properties of materials. It refers to the ability of a material to resist the other material's deformation without itself undergoing residual deformation. In the mechanical performance test, Rockwell hardness test is one of the simplest, fastest and most economical methods. Because it can directly indicate the hardness value, the test efficiency is the highest. In many cases, work can be done that cannot be done by other mechanical properties. At present, with the rapid development of scientific research and industry in China, Rockwell hardness test method has been widely used in national defense, scientific research, laboratories and factory workshops.

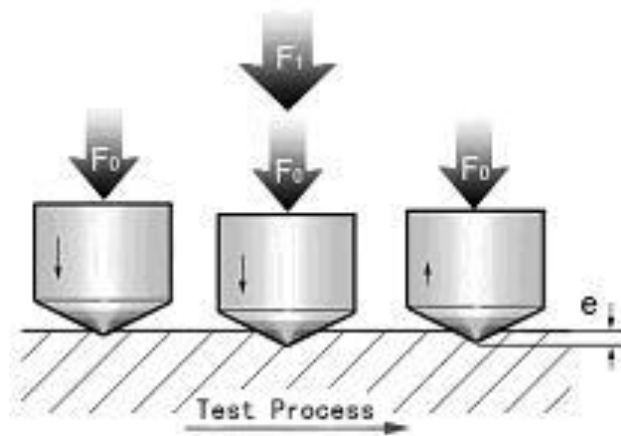


Fig. 1 Test Principle of Rockwell Hardness Tester

1.1 Scope of Use

The pressure head and total test force shall be selected according to the following table during the test.

Symbol	Indenter	Total test force N (kgf)	Mark hardness symbol	Allowable measurement range
B	Φ 1.588mm Ball	980.7 (100)	HRB	20—100
C	120° Diamond	1471 (150)	HRC	20—70
A	120° Diamond	588.4 (60)	HRA	20—88

A scale: used to determine the hardness of more than 70HRC metal (such as tungsten carbide, hard alloy, etc.), can also be measured hard sheet material and surface layer hardened material.

C scale: used to determine the hardness of heat-treated steel products

B scale: for the determination of soft or medium hardness of metal and unhardened steel products.

2 Main Technical Parameter

1. Initial test force 98.07N (10kgf)
2. Total test force 588.4N(60kgf) 980.7N(100kgf)1471N(150kgf)
3. Indicator scale C:0—100; B:30—130
4. Max. height of specimen 210mm、
5. Distance from indentation center to machine wall 155mm
6. Dimension 220*510*694mm
7. Voltage 220V/50HZ
8. Net weight 90kg

3 Test Principles and Methods

The determination of Rockwell hardness is based on a diamond cone with an apex angle of 120 ° or a quenched steel ball with a diameter of Φ1.588mm as an indenter, which is pressed into the surface of the sample with a specified test force. During the test, first add the initial test force, and then add the main test force. After pressing into the surface of the specimen, the main test force is removed. Under the condition of retaining the initial test force, the Rockwell value of the tested metal material is determined according to the difference between the pressing depth under the action of the total test force on the surface of the specimen and the pressing depth under the action of the initial test force. To indicate the level of Rockwell hardness, the greater the depth, the lower the hardness value. The measured depth of 0.002mm is 1 Rockwell unit. The Rockwell hardness symbol is indicated by HR and noted with the scales A, B, C, etc. Such as HRA, HRB, HRC, etc.

$$HRK = \frac{h_1 - h_2}{C}$$

The calculation formula :

In the formula: c---constant, Equal to 0.002mm;

h_1 —Depth of indenter under total test force;

h_2 —Depth of indenter under initial test force;

K—constant, A, C scale is 100,B scale is 130。

In actual use, the hardness of the material can be read directly from the scale on the Rockwell special table.

3.1 Brief description of mechanism performance

The hardness tester is composed of a body, a loading mechanism, a measurement indicating mechanism, a specimen supporting mechanism and other parts. The body is a closed shell. Except for the exposed workbench, lead screw and variable load handle, other mechanisms are installed in the body shell to keep clean. The loading mechanism consists of a spindle, a lever, a weight, an electric lifting mechanism, a weight conversion mechanism, and a control circuit. The initial test force is mainly generated by the weight of the spindle, indenter, circular knife, long prismatic knife, large lever, small lever, ejector rod and other parts and the measurement pressure of the indicator. When the test piece contacts with the indenter and continues to rise, when the large and small levers are in horizontal position (the small pointer of the indicator points at the red point and the large pointer points vertically upward), due to the weight of the lever and other parts and the measurement pressure of the indicator, the indenter can be subjected to an initial test force of 98.07N(10kgf). The total test force consists of the main test force (generated by the weight of the weight) plus the initial test force. There are 3 weights and lifting rings in the electric lifting mechanism. When the start button on the panel is pressed, the lifting ring weight will also be lowered along with it. When the lifting ring is installed at the tail end of the large lever during the lowering process, the main test force will be stably applied to the pressure head through the large lever. The weight of the weight and the lifting ring then act on the large lever, so that the pressure head is subjected to the total test force. The fuselage is equipped with a weight changer. When the load changing handle is rotated to different positions, the required total test forces of 1471N(150), 980.7N(100) or 588.4N(60) can be obtained. **The holding time of the test force can be adjusted by adjusting the TIME on the panel, and the holding time can be appropriately extended when the hardness of the sample is low. The sample retention time is generally 3-8S. It is strictly forbidden to set the hold time to 0 seconds, and the hardness tester program will lose control.** When the holding time is over, the electric lifting mechanism automatically rotates to remove the main test force. The measuring and indicating mechanism is composed of ejector rod, small lever, adjusting plate, adjusting screw and indicator. When the pressure head of the rising sample is jacked up, the ejector rod will jack up the small lever and drive the pointer of the indicator to rotate through the adjusting screw. Specimen support mechanism including workbench, screw, hand wheel and other parts.

3.2 Installation of hardness tester

3.2.1 Unpacking

After opening the top cover of the packing box and the surrounding baffle, remove the 4 fixing screws at the bottom of the fuselage, and then place the hardness tester in a dry and clean room without corrosive gas and vibration. The table on which the hardness tester is installed should be firm and have holes with a diameter greater than $\Phi 50\text{mm}$ for the lead screw to pass through.

Check the integrity of spare accessories according to the packing list.

Open engine cover and rear cover

Hold the lifting ring by hand and slowly lift up the weight set and take out the weight fixing support block at the same time. Then, gently lower the weight set to make the weight cylindrical pin fall into the groove of the supporting plate and hold the weight.

Unfasten the small lever fastening cord .

Turn the hand wheel to lower the screw and take out the pressure head cushion block.

2.Remove the lead screw protective sleeve, wash the anti-rust oil applied to the lead screw and hand wheel with kerosene, then pour a small amount of lubricating oil into the contact between the lead screw and the hand wheel, and reinstall the lead screw protective sleeve.

3. Check the position of the adjustment block on the large lever, whether it is between the two red marks, otherwise it should be reloaded in the correct position.

4. Install the large flat table on the upper end of the lead screw, then place the level on the table and adjust it so that the level of the hardness tester is within 0.2/1000.

3.3 Operation of Digital Display Meter

Display

Measurement Interface

Hardness Value: 61.0 mm HRC

Locking Icon

Indentation Chart

Statistics: 1 / 5, 61.0, 0.0, 770 HV

Current Setup

Battery level: In charging, Full

Scale: HRC

Tolerance: 65.0

Print (On), Wireless (Off), Correction (On), Cylindrical Correction (Off)

Menus Interface

Measurement, System, Memory, Correction

Scale Menu

Scale (highlighted)

Auto Function, Statistic, Conversion, Tolerance

* The yellow word indicates the currently selected item

Keypad



Pressing and holding for about 2 seconds (long pressing) to power on or off.

This key will be invalid when the power is plugged in from the back socket. Now, the indicator will automatically power on or off as the power is turned on and off.

Under the Measurement



Set the display to initial value of hardness, 100 or 130.



To Locking the value of hardness.



Return to measuring interface.



To browse data saved in memory. Press to return.



To view current setups. Press to return.

Under the Menus



Enter or confirm the setting.



Changing the setting.
Move digit.



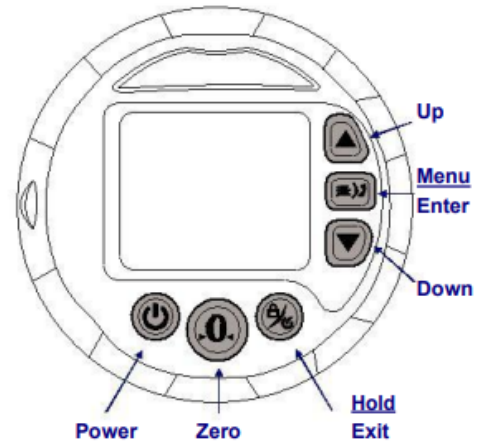
Exit or return to the previous item.



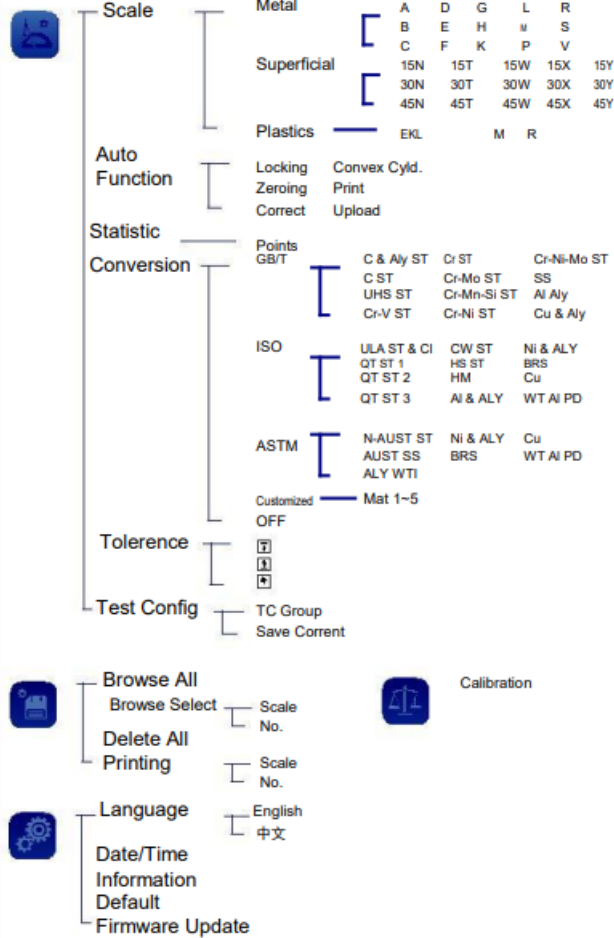
Move the setup item up. Or increase the value.



Move the settings item down. Or reduce the value.



Menus



Index of Material



Abbreviation	Materials
C & ALY ST	Carbon Steel & Alloy Steel
C ST	Carbon Steel
Cr ST	Chrome Steel
Cr-V ST	Chromium Vanadium Steel
Cr-Ni ST	Chrome Nickel Steel
Cr-Mo ST	Chrome-Molybdenum Steel
Cr-Ni-Mo ST	Chromium Nickel Molybdenum Steel
Cr-Mn-Si ST	Chromium Manganese Silicon Steel
UHS ST	Ultra-high Strength Steel
SS	Stainless Steel
Al ALY	Aluminum Alloy
Cu & ALY	Copper Alloy
ULA & CI	UN-LOW Alloy Steels & Cast Iron
QT ST 1	Q-T Steels in Quench-Tempered
QT ST 2	Q-T Steels in Untreated, Normalized
QT ST 3	Q-T Steels in Quenched
CW ST	Cold Working Steels
HS ST	High Speed Steels
NonAUST ST	Non-Austenitic Steels
AUST SS	Austenitic Stainless Steel
ALY WTI	Alloyed White Irons
Al & ALY	Aluminium & Alloys
WT Al PD	Wrought Aluminium Products
BRS	Cartridge Brass
Cu	Copper
Ni & ALY	Nickel & High-Nickel Alloys
HM	Hardmetals

*The embedded conversion data is processed according to the standards, it may include a very small calculation error. Please check it from the standards text if necessary.

Index of Icon


  Manual Lock


  Auto Lock


  Timing Lock

 Conversion

 Tolerance


 Wireless Data Transfer


 Print


 Upload


 Correction


 Cylinder Correction

 Statistic


 Standard Value


 Test Force


 Diamond Indenter

 Ball Indenter


 Statistic Points


 Mean Value

 Range


 PageUp

 PageDown


 Page Up/Down

 Delete

 Print

 Update

 Save

 Upload

*  on  off

4 Operation and use method

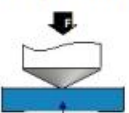
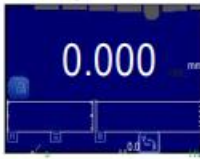


4.1 Preparation before test:

Installation of the pressure head: when installing the pressure head, attention should be paid to eliminating the gap between the pressure head and the end face of the spindle. The elimination method is: install the indenter and gently fix it with screws, then place the standard block or test piece on the workbench, rotate the handwheel and add the initial test force, press the start key to add the main test force to the indenter, and then loosen and tighten the screws to eliminate the gap between the indenter and the spindle end face. **(Note: During adjustment, the test force holding time shall be appropriately adjusted longer)**



4.2 Test Procedure :

Test Procedure

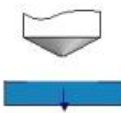

- Lift the test piece, until the indicator reading is between 2.80mm and 3.20mm (Zeroing zone).









Zeroing automatically.
For scales of A,C,D,N,T,W,X,Y, to be initialized to "100".
For the other scales, to be initialized to "130".
- Loading the main test force.

Lower and remove the test piece. The indicator turns to "0.000mm".



- Unloading the main test force.

Locking the hardness number automatically or pressing  .

① Clean the top surface of the screw and the upper and lower end surfaces of the selected workbench, and place the workbench on the screw.

② Lift the sample until the indicator reading is between 2.80mm and 3.20mm (zero position area). (as shown in the above figure), press the [START] key to start, the machine will automatically load, maintain and unload, and then the interface will automatically display the hardness value.



The lead screw protective sleeve is provided to protect the lead screw from dust. When the hardness tester is not in use or when the height of the test piece is less than 100mm, it shall be sleeved outside the lead screw. When the height of the test piece is greater than 100mm, it is set outside the screw. When the height of the test piece is greater than 100mm, it must be removed to avoid lifting the workbench and invalidating the test.

5 Maintenance and repair of hardness tester

1. When the hardness tester is not used for a long time, cover the machine with a dust cover.
2. Regularly inject a small amount of oil into the contact between the screw) and the handwheel.
3. Before using the hardness tester, the top surface of the screw and the upper end surface of the worktable should be wiped clean.
4. If it is found that the hardness indication error is large. ① Take down the workbench and check whether the contact surface with the screw is clean. ② Check whether the screw protective sleeve is jacked up the workbench. ③ Check whether the pressure head is damaged.
5. If the power is connected and there is no display on the panel, check whether the fuse is melted and the power supply is normal.
6. Check the accuracy of the hardness tester regularly with the standard hardness block carried by the machine.
 - ① Wipe the workbench and standard hardness block, test on the working surface of the hardness block, and never test on the supporting surface.
 - ② If the indication error is large, in addition to the inspection according to item 4 of this section, check whether there are burrs on the supporting surface of the standard hardness block. If there are burrs, they should be polished with oilstone. When testing at different positions of the standard hardness block, the hardness block should be dragged on the workbench and should not be taken away from the workbench.

6 Standard Accessories

Name	Specification	Unit	Qty
Digital Display Electric Rockwell Hardness Tester	HRS-150D	set	1
Big flat work bench		pc	1
Small flat work bench		pc	1
V type work bench		pc	1
Diamond indenter	120°	pc	1
HRB Indenter	Ball indenter	pc	1
HRB Steel Ball	φ 1.588mm	pc	1
Standard Rockwell hardness block	60-70 HRC	pc	1
Standard Rockwell hardness block	85-100HRB	pc	1
Screwdriver		pc	2
Dust cover		pc	1
Accessory case		pc	1
Manual		pc	1
Certificate		pc	1
Packing List		pc	1