

Hardness Tester iUniv-187.5

Operation Manual

Precautions

1. Carefully read the Instruction Manual before you use the present instrument and get to know thoroughly the operation procedure and the usage precautions so as to avoid the damages to the instrument and the safety accidents caused by the improper operation.
2. All the bands and the anti-shock tapes should be carefully removed before the instrument is installed and calibrated.
3. The single-phase 3-pin socket should be used for the power source and the ground connecting cable should meet the safety requirements.
4. It is strictly prohibited to tamper with the installed position of all the electric component parts, switches, and sockets of this instrument. Otherwise the instrument will be caused accident.
5. It is to be avoided to turn the Load-change Hand Wheel or the Rotating Wheel during the loading and unloading operations and the dwell time of the test force.
6. Our company tries to improve the quality of the hardness testers and renew their structure. In case the contents in the INSTRUCTION MANUAL are a bit different with the actual structure of the instrument, it is hoped and apologized for the fact that the further notice will not be given.

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I . Brief Introduction to Electronic Hardness Tester

1. Hardness is one of the important mechanic characteristics of the material while the hardness testing is an important method to judge the quality of the metal material or its component parts. The hardness of the metal is correspondent to its mechanic characteristics, and so its mechanic characteristics such as the strength, tiredness, wriggling and wearing out can be tested out approximately through its hardness testing.
2. The Motorized Brinell Rockwell & Vickers Hardness Tester, a multi-functional hardness tester with Brinell, Rockwell & Vickers 3 kinds of testing methods and 7 steps testing force will meet the needs of many kinds of hardness measurement. The instrument is adopted automatic shifter to load, dwell and unload testing force, rotate the Load-Change Hand Wheel to change values of testing force, therefore the operation for this instrument is simple, easy and quickly. Beside set zero to the dial, there is no man made error for operation. The present instrument is with high sensitivity and stability, so as fit for usage in workshop and testing laboratory.

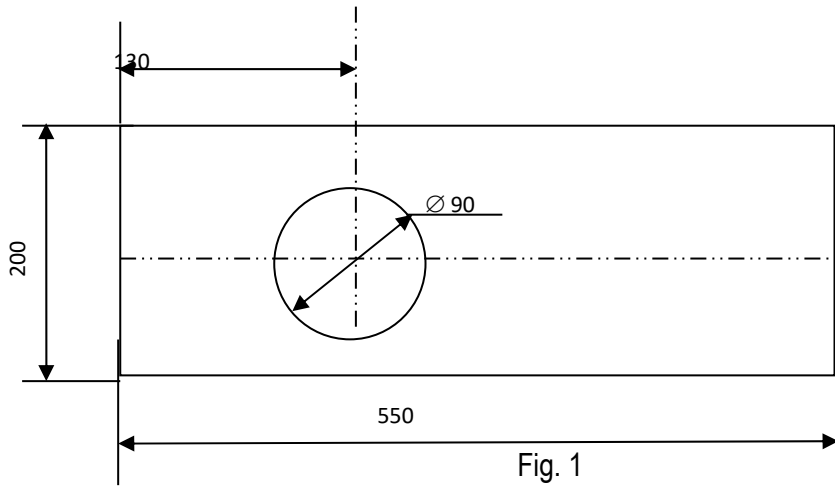
II . The Technical Specifications of the Hardness Tester

1. The Initial Test Force: 98.07N (10Kg); Tolerance: $\pm 2.0\%$
2. The Tolerance of Total Test Force: $\pm 1.0\%$
 - 2.1 The Test Force of Brinell hardness: 306.5N (31.25Kg), 612.9N (62.5Kg), 1893N (187.5Kg)
 - 2.2 The Test Force of Rockwell Hardness: 588.4N (60Kg), 980.7N (100Kg), 1471N (150Kg)
 - 2.3 The Test Force of Vickers Hardness: 294.2N (30Kg), 980.7N (100Kg)
3. The Indenter Specifications:
 - 3.1 The diamond Rockwell indenter
 - 3.2 The diamond Vickers indenter
 - 3.3 The $\phi 1.5875$ mm, $\phi 2.5$ mm, $\phi 5$ mm ball indenter
4. The Power Source and the Voltage: AC220V $\pm 5\%$, 50-60 HZ

5. Time-delayed control: 2-60 seconds, can be adjusted
6. The Distance from the Indenter Central Point to the Instrument Body: 165mm.
7. The Max. Height of the Specimen:
 - 7.1 The Max. Height of the Specimen for Rockwell Hardness: 170mm
 - 7.2 The Max. Height of the Specimen for Brinell & Vickers Hardness: 140mm
8. The Amplification of Microscope: 37.5^x , 75^x
9. The Overall Dimension of tester: 520X240X700mm (Length X Width X Height).
10. The Total Weight of the Tester: 85Kg (Approx).

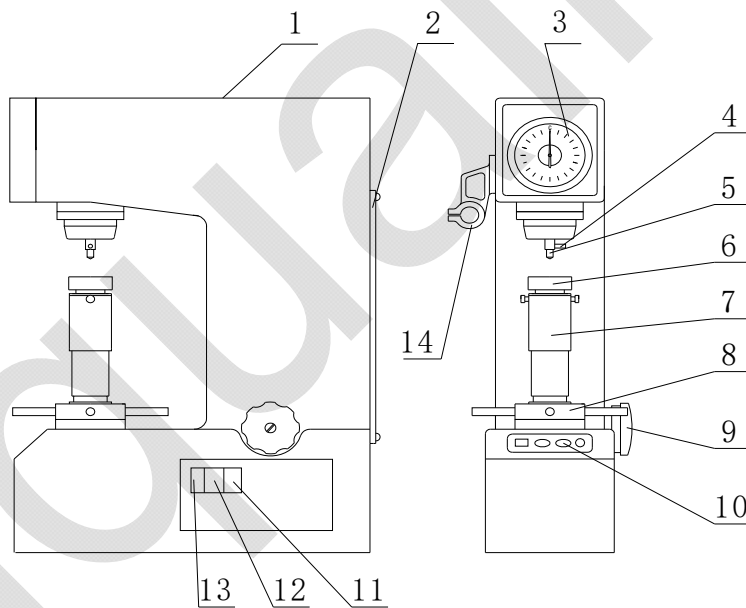
III Installation of the Hardness Tester

1. The working condition of the tester
 - 1.1 Under the room temperature, between 10~30°C;
 - 1.2 The relative humidity in the test room shall not be over 65%;
 - 1.3 In an environment free from vibration;
 - 1.4 Without corrosive agent in surroundings.
2. The unpacking of the Tester
 - 2.1 Loosen off 4 nuts from the bottom of the packing box; hold up and move off packing box, then take out accessories kit.
 - 2.2 Lift the bottom plate and unscrew the two (2) M10 bolts under bottom plate with a spanner to separate the hardness tester from the bottom plate (take care of the safety).
 - 2.3 After unpacking, the tester shall be placed on a stable bench with horizontal deviation less than 1mm/m. A hole shall be drilled at an appropriate location on the bench (see Fig.1) to enable the Up and Down Moving Shaft (7) to operate properly.



3. The installation of the tester (see Fig. 2)

After the hardness tester is properly placed, open The Upper Cover (1) and The Back Cover (2). Untie the fastening rubber tape (Fig.4) on the Connecting Rod (23) and all the white gauzes on moving parts and then recover the tester to keep away dust.



- | | | |
|---|-----------------------|----------------------------|
| 1. The Upper Cover | 2. The Back Cover | 3. The Dial |
| 4. The Fastening Screw for the Indenter | 5. The Indenter | 6. The Working Table |
| 7. Upper and Down Moving Shaft | 8. The Rotating Wheel | 9. Load- Change Hand Wheel |
| 10. The Touch Panel | 11. The Power Socket | |
| 12. The Fuse | 13. The Switch | 14. The Frame |

Fig.2

4. The Installation of the Weight Group (Fig.3)

4.1 During installation of weights, the instrument should be in the state without any test force.

4.2 Take the weight group out of the accessories kit and clean them thoroughly, then read the code number of the weights carefully. Rotate the Load-Change Hand Wheel (9) to the place 306, and then put each weight on the plate of the Hanging Rod (16) from the up to the down according to priority of weight code number 1, 2, 3, 4. The round pegs on both sides of the weight should be properly placed in the groove of the Fork-Shaped Frame (18). Weight 0 (15) should be putted on the upper place of the hanging rod (when test force is 294.2N (30Kg), the Weight 0 should be removed off). After that, rotate the load-change hand wheel clockwise for a whole cycle and observe. The weights should not touch any components when they are impending on. (Note: firstly, put the level instrument on the working table to adjust the levelness for the hardness tester).

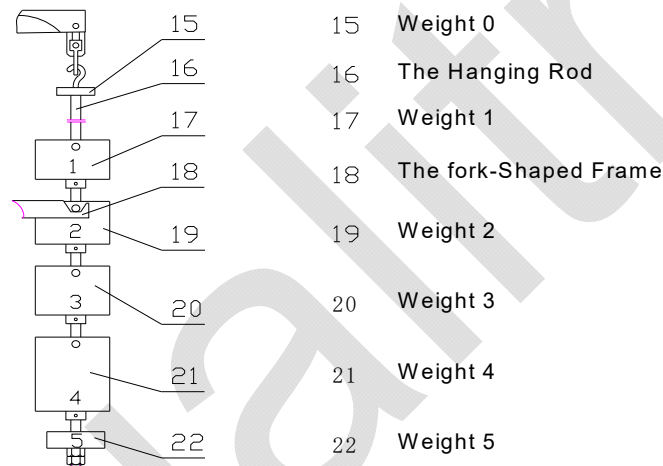


Fig. 3

5. The Correspondence Relation among Hardness Scale--Test Force--Weights in Working Status (Table 1).

Table1

Hardness Scale	Test Force	Graduated Value of Load-Changing Hand Wheel	Force on the Weight (Weight Code)	Note
HV	294.2N(30kg)	306	Weight 5	Remove Weight 0
HB	306.5N(31.25kg)	306	Weight5+Weight0	Put back Weight 0 to original place
HRA	588.4N(60kg)	588	Weight5+Weight0+Weight1	
HB	612.9N(62.5kg)	613	Weight5+Weight0+Weight2	
HV,HRB	980.7N(100kg)	980	Weight5+Weight0+Weight2+Weight3	
HRC	1471N(150kg)	1471	Weight5+Weight0+Weight1+Weight2+ Weight4	
HB	1839N(187.5kg)	1839	Weight 5+Weight 0+Weight 1+Weight 2+Weight 3+Weight 4	

IV Rockwell Hardness

1. The Technical Specifications of Rockwell Hardness

1.1 The Initial Test Force: 98.07N (10Kg)

1.2 The Total Test Force : 588.4N (60Kg), 980.7N (100Kg), 1471N(150Kg)

1.3 The Indenter: The Diamond Rockwell Indenter, The ϕ 1.5875 mm Ball Indenter

1.4 The Tolerance of Rockwell Hardness Display Value (Table 2)

Table 2

Hardness Scale	Hardness Range of The Standard Testing Blocks	The Max. Tolerance of Display Value
HRA	20 ~ ≤75HRA	±2HRA
	>75 ~ ≤88HRA	±1.5HRA
HRB	20 ~ ≤45HRB	±4HRB
	>45 ~ ≤80HRB	±3HRB
	>80 ~ ≤100HRB	±2HRB
HRC	20 ~ ≤70HRC	±1.5HRC

1.5 The Scale, Indenter, Testing Force and Application Fields of the Rockwell Hardness Test (Table3)

Table 3

Scale	Indenter	Initial Test Force (N)	Total Test Force (N)	Applications
HRA	Diamond Indenter	98.07 (10kg)	588.4	Hard alloy, carbide, surface-quenched steel, carburized steel plate (sheet)
HRD			980.7	Steel sheet, surface-quenched steel
HRC			1471	Quenched steel, tempered steel, Hard cast iron
HRF	Ball Indenter φ1.5875mm (1/16 inch)		588.4	Cast iron, aluminum, magnesium alloy, bearing alloy, annealed copper alloy, mild steel sheet
HRB			980.7	Mild steel, aluminum alloy, copper alloy, malleable cast iron, annealed steel
HRG			1471	Phosphor bronze, beryllium bronze, malleable cast iron
HRH			588.4	Aluminum, zinc, lead, etc
HRE			Ball Indenter φ3.175mm (1/8 inch)	980.7
HRK	1471			

There are 3 kinds of testing scale for Rockwell Hardness such as A, B & C.

- 2 Do all preparation work before the Use
 - 2.1 The surface of the specimen should be smooth and clean without any feculence, oxidized peels and concaves, on the outstanding without processing signs.
 - 2.2 The Min. thickness of the specimen should be 10 times superior to the depth of the indentation. After the test, the back of the specimen should not have any visible signs of deformation.
 - 2.3 The specimen should be stably fixed on the working table. There should be no any movement of the specimen during the testing process and the test force should be loaded perpendicularly on the specimen.
 - 2.4 When the specimen is columned in shape, the V-shaped testing table must be used. When testing HRC or HRA hardness value, the diameter of the specimen is smaller than 38 mm and when testing HRB hardness value, the diameter of specimen is smaller than 25 mm, the results of the test should be revised. The revised values are all positive numbers. (Table 4).
- 3 The Operation Procedure of The Rockwell Hardness Tester
 - 3.1 Connect the Power Socket (11) with power source, then turn on The Switch (13), nixie tube of the Touch Panel (10) will light.
 - 3.2 According to hardness grade of the specimen, select Scale form Table 3. Turn the Load-Change Hand Wheel clockwise to confirm the total testing force.
 - 3.3 Push the indenter (5) into the hole of main spindle closely against the supporting plane and make the caved plane of the indenter handle face to the screw. Fasten slightly the Fastening Screw for the Indenter (4), and then place the specimen on the Working Table (6).
 - 3.4 Turn the Rotating Wheel (8) clockwise, lift the Up and Down Moving Shaft, enable the specimen slowly touch the indenter without any shock until the short pointer in dial indicator of the instrument move from black point to red point, at this time, the long pointer turn 3 cycles then indicate towards to position "C" vertically (When testing HRB hardness value, the long pointer indicate towards to position "B". When testing Brinell & Vickers hardness value, it is no necessary to set Zero). At this point, it has loaded initial Test Force 98.07N (10Kg), the

offset of long pointer could not exceed 5 Rockwell hardness units, otherwise the Rotating Wheel shall turn anticlockwise and the position of specimen be changed for another repeat test.

3.5 Rotate the Dial (3) of the instrument to let long pointer indicate position "C".

3.6 Press "START" key on the touch panel, the motor begin to work, the instrument load the test force automatically.

When dwell time of total test force is up, the motor rotates to unload the test force automatically.

3.7 At this time, the data indicated by the long pointer in dial indicator of the instrument is the hardness value of the specimen tested (when testing HRB hardness for the specimen, the hardness value should be readout from the data in the inner ring of the dial).

3.8 The dwell time of total test force for Rockwell hardness measurement is 5 seconds. The dwell time can be adjusted by pressing up and down key on the touch plane.

3.9 Turn the Rotating Wheel in anticlockwise to let the Working Table go down, change testing position for other test and repeat above mentioned operation process.

3.10 The number of the point to be tested is not less than 5 (the first point in not include.) The number of the points to be tested may be reduced a bit for the specimen tested in a serial.

Table4

Hardness value HR	Diameter (mm) of the Columned Specimens								
	6	10	13	16	19	22	25	32	38
	Modified Value (HR) of Rockwell Scales A, C & D								
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)	Diameter (mm) of the Columned Specimens								
	6	10	13	16	19	22	25		
	Modified Value (HR) of Rockwell Scales B, F & G								
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		

4. The Rockwell Hardness Value Regulated (Fig.4)

The precision of the displayed hardness value of the Tester is just calibrated before the instrument is turned out of the factory. If a tolerance is caused due to the transportation, the operator may regulate it based on the understanding of the instrument structure and principle. The method is as follows: Remove the Upper Cover. If

the value displayed is inferior to the value of standard block, fix the M4 Screw Rod (24) with a screw piece and unscrew the nut a little and rotate Screw (25) clockwise a bit (half a circle is about 1 degree hardness value higher); regulate the Zero position for the dial indicator and then fix the Screw Rod (24) and fasten the nut. Do the test and display value until the value stands in the tolerance range (Table 2). If the displayed value is higher than the hardness value of the standard block, rotate the Screw in the opposite direction.

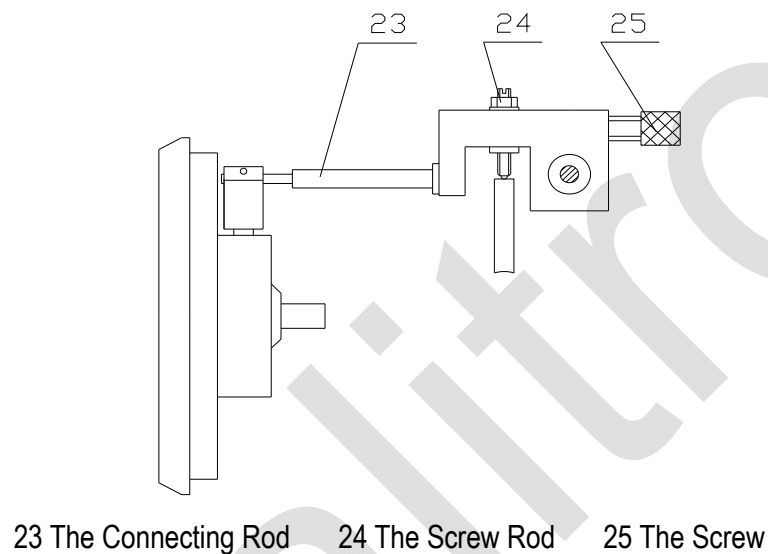


Fig. 4

V . Vickers Hardness

1. Technical Specifications of Vickers Hardness

1.1 Test forces: 294.2N(30 Kg), 980.7N(100Kg)

1.2 Indenter: Vickers Diamond Indenter

1.3 Testing Range of Vickers Hardness: 40HV ~ 1000HV

1.4 The Tolerance and Repetition of Displayed Value for Vickers Hardness Tester Table 5

(Table 5)

Hardness Sign	Value of Hardness Block	Tolerance of Displayed Value	Value of Hardness Block	Repetition of Displayed Value
HV30, HV100	100~250HV	±2%	≤225HV	6%
	300~1000HV	±3%	>225HV	4%

1.5 By means of 5X Objective for Vickers hardness testing, the amplification of measuring microscope is 75X.

1.6 When using 5X Objective, the Min. Graduation Value of the eyepiece drum wheel is 0.002mm (I=0.002mm).

2. Do all preparation work before do testing.

2.1 The surface of the specimen should be smooth and clean without any feculence, therefore to guarantee the length of diagonal of indentation could be measured accurately. The degree of surface finish should not less than 0.8

2.2 Put the specimen stably on the testing table, its touching surface should be clean. It is prohibited to move the specimen during measurement, and the test force should be loaded on the specimen keep vertically.

2.3 The Min. thickness of specimen or testing layer should not less than 1.5 times diagonal length of the indentation. After testing, the back of specimen should not have any visible signs of deformation.

3 The Operation Procedure of The Vickers Hardness Tester

3.1 Take out the special device from accessories kit and clean rust preventing oil from it. Assembly the Slipped Testing Table (33) with the UP and Down Moving Shaft according to installing drawing (Fig. 5), Fasten the Knurled Nut (34).

3.2 Insert the Seat of Microscope (30) into hole of the Frame (14) left at the instrument, then arming at a pit, fasten the Screw (28). The bottom plane of the Microscope Seat should keep in parallel with testing table.

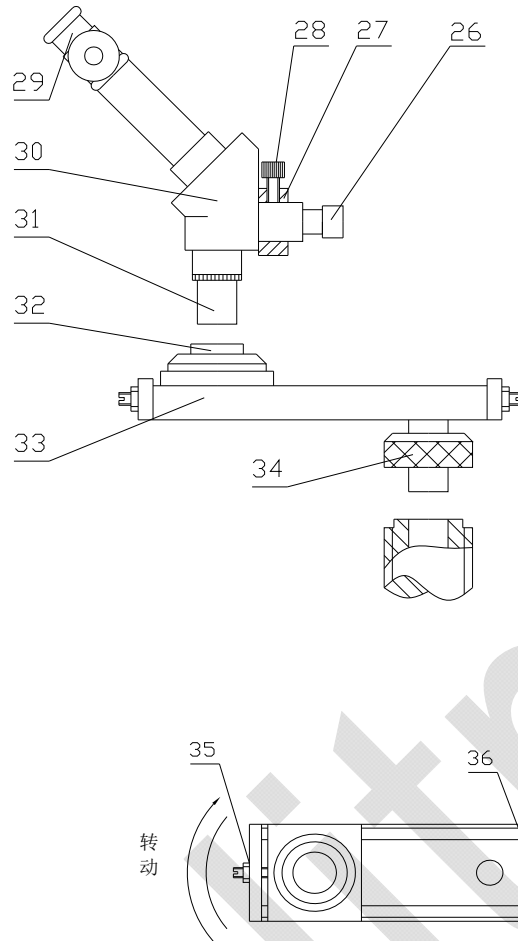


Fig. 5

- | | | |
|-------------------------|-------------------------------|---------------------|
| 26. The Inside Light | 27. The Support Frame | 28. The Screw |
| 29. The Micro Eyepiece | 30. The Seat of Microscope | 31. The Objective |
| 32. The Specimen | 33. The Slipped Testing Table | 34. The Knurled Nut |
| 35. The Blocking Nail 1 | 36. The Blocking Nail 2 | |

3.3 Insert the Micro Eyepiece (29) to the hole and push it to the end. Insert the plug of the Inside Light (26) to the socket in left of main body of the instrument, the Inside Light (26) should be insert to the hole of the Seat of Microscope (30), Screw the Objective (31) into the hole under the Seat of Microscope (30).

3.4 Place the specimen (32) on the testing table. Move the Slipped Testing Table (33) to the place of the Blocking Nail 2 (36).

- 3.5 Connect the instrument with power source and turn the Switch on. The nixie tube lights up, and the Inside Light also will be bright.
- 3.6 According to measuring requirement of specimen tested, rotate the Load-Change Hand Wheel to select the test force 294.2N (30Kg) or 980N (100Kg).
- 3.7 Operate according to operation process described as Item 3.3 ~3.6 in 3 section of Chapter IV Rockwell Hardness (For ferrous metal, the dwell time of test force should keep 10~15 seconds and for non-ferrous metal, the dwell time should be 30 ± 2 seconds).
- 3.8 After getting the indentation, lower down slightly the testing table to enable the specimen leave off the Indenter, then move the Slipped Testing Table together with specimen to below under the Objective (31), a bit to touch with the Blocking Nail 1 (35).
- 3.9 Rotate the Slipped Testing Table (33) slightly around the hole center of the UP and Down Moving Shaft (7) to find indentation, at this point, turn the Rotating Wheel to enable testing table move up and down until the image of indentation observed from eyepiece becomes clear, then the focusing process is completed, fasten the Knurled Nut.
- 3.10 If the digital or graduated lines seem vague in the eyepiece, adjust the eye guard on eyepiece. This is according to personal vision. If the image observed from eyepiece is vague or a half clear and other half vague, that means the center of light source is departure. Rotate the Inside Light (26) to adjust the center position of light source.
- 3.11 Measure 2 diagonal lengths of each indentation, calculate out the average length value for the indentation, then multiply a rate and check from the Check List Table to get the hardness value.
- 3.12 The difference value between average value of hardness tests and hardness value of standard hardness block divide hardness value of standard hardness block, the result data that shows as percent is the Tolerance of Displayed Value of the hardness tester. The difference value between Max. Hardness value and Min. hardness value divide the average hardness values equals Repetition of Displayed Value of the hardness

tester. (Table 5)

3.13 Example: by means of 5X Objective, test force 294.2N(30Kg), measure out the Vickers hardness value

(Fig. 5)

$L=l \times n$

L-----The diagonal length of indentation (mm)

n----- Number of grids of testing indentation

l----- Min. graduation value of the micro eyepiece drum wheel when 5X Objective is usage. $l=0.002\text{mm}$

Therefore, $L=0.002 \times (400 - 221) = 0.358$, Look it up from the Check List of Vickers Hardness Value, get value 434HV30.

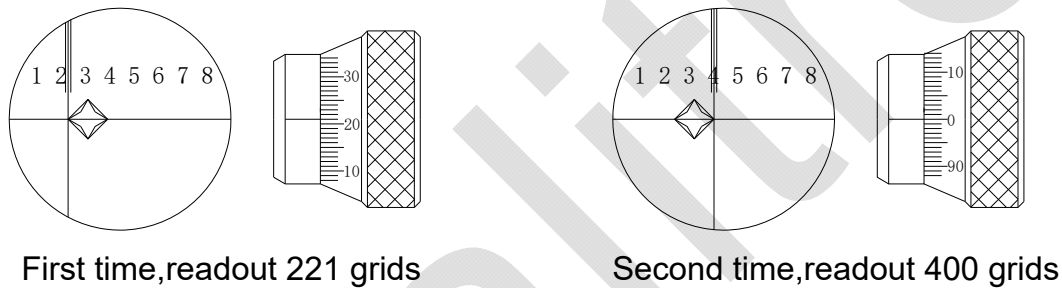


Fig.6

VI. Brinell hardness

1. The Technical Specification of Brinell Hardness Tester

1.1 Test Force: 306.5N(31.25Kg), 612.9N(62.5Kg), 1839N(187.5KG)

1.2 Ball Indenter: $\phi 2.5\text{ mm}$, $\phi 5\text{ mm}$

1.3 The Tolerance and Repetition of Displayed Value for Brinell Hardness Tester Table 6

(Table 6)

Hardness Range (HBW)	Tolerance of Displayed Value (%)	Repetition of Displayed Value (%)
≤ 125	± 3	≤ 3.5
$125 < \text{HBW} \leq 225$	± 2.5	≤ 3.0
> 225	± 2	≤ 2.5

1.4 The Brinell Hardness Testing Range: 8HBW~650HBW

1.5 By means of 2.5[×] Objective for Brinell hardness testing, the amplification of measuring microscope is 37. 5[×].

1.6 When using 2.5[×] Objective, the Min. Graduation Value of the eyepiece drum wheel is 0.004 mm (l=0.004mm).

2. Do All Preparation Work Before The Use

2.1 The surface of the specimen should be smooth and clean without any feculence, therefore to guarantee the diameters of indentation could be measured accurately.

2.2 Put the specimen stably on the testing table, its touching surface should be clean. It is prohibited to move the specimen during measurement, and the test force should be ensured to load on the specimen vertically.

2.3 The Min. thickness of specimen should be 10 times superior to the depth of the indentation. After testing, the back of specimen should not have any visible signs of deformation.

3. The Operation Procedure of the Brinell hardness Tester

3.1 The hardness testing operation process between Brinell and Vickers is very similarly. The differences are as follows:

a. The Dwell Time: 10~15 seconds for ferrous metal, 30~35 seconds for non-ferrous metal, if the Brinell hardness value is less than 35, the dwell time should be 60 seconds.

b. The measuring for indention should use with outside light.

3.2 After Brinell hardness testing, the testing table should lower down 20mm, than find the indentation.

3.3 The distance between centers of two neighborhood indentations and the distance from center of indentation to edge of standard hardness block should be 3 times superior to the diameter of the indentation. Measuring the diameters of each indention should be in 2 mutually perpendicular directions, calculate the average value of diameter. The rate of the difference value between 2 mutually perpendicular diameters divided the shorter diameter value should not large than 1%.

3.4 The difference value between average value of hardness tests and hardness value of standard hardness block divide hardness value of standard hardness block, the result data that shows as percent is the Tolerance of

Displayed Value of the hardness tester. The difference value between Max. Hardness value and Min. hardness value divide the average hardness values equals Repetition of Displayed Value. (Table 6)

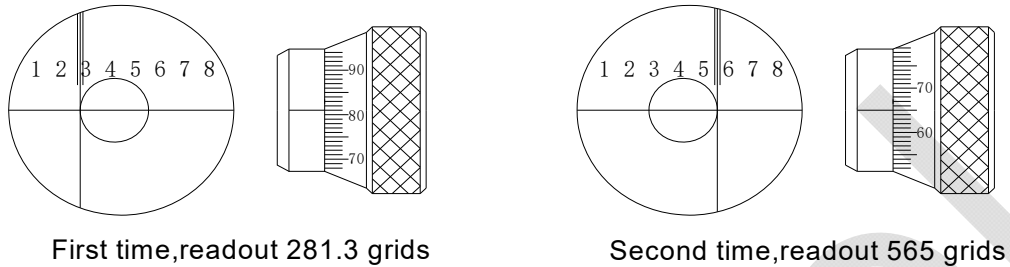


Fig7

3.5 Example: by means of 2.5^x Objective, ball indenter ϕ 2.5 mm, test force 1839N(187.5 Kg), measure out the Brinell hardness value (Fig. 7)

$$L=l \times n$$

L-----The diameter of indentation (mm)

n----- Number of grids of testing indentation

l----- Min. graduation value of the micro eyepiece drum wheel when 2.5^x Objective is usage. l=0.004mm

Therefore, $L=0.004 \times (565 - 281.3) = 1.1348$, Look it up from the Check List of Brinell hardness Value, get value 175HBW2.5/187.5.

VII. The Maintenance of the Hardness Tester and the Precautions

1. The operator should observe the operation regulations and calibrate the instrument with the standard block before and after the test. If the tester is rarely used, the several tests should be carried out to make the tester stable and then carry out the necessary tests.
2. The hardness block should be used only on the working plane, and the life time of the hardness blocks is 2 years.
3. During the transportation of the tester, the tester should be fixed with the Connecting Rod, with the Weights and

the Hanging Rod discharged. Disconnect the power source before the Weights and the Hanging Rod are taken out.

4. Keep the tester clean and cover the tester after the use, lubricate the hardness blocks and ball indenters with the rust preventing oil.
5. Carry out periodic inspection of the tester, at least once a year in order to assure the correct operation of the tester.
6. The Treatment of the Common Malfunctions of the Tester

When the test is in the un-working state, it is advisable to get in touch with the relative units for the repair. The normal and common problems should be dealt by one's self (Table7) .

Table7

Phenomenon	Possible Causes	Method Used
When the tester is on ,the nixie tube is not light up	1 The current is blocked. 2 The fuse is broken.	1 Control the power cable. 2 Change the fuse.
The long pointer is offset, not point to "C" position	After regulate the display value of hardness, it causes the long pointer offsets.	According to Fig.4, loosen the Nut on Screw Rod (24) slightly, rotate the M4 Screw Rod a bit, enable the Dial aim to "C" position, then fix the screw, and fasten the Nut.
The Up and Down Moving Shaft road is blocked	The space between the screws is too small or they are blocked by the thread ends at dirt	Remove the protecting cover of the Up and Down Moving Shaft and clean the teeth of the gear and than held Rotating Wheel with two hands to pull the Shaft up and down.
The deviation of the display hardness value is too great.	1 The indenter is damaged 2 The protecting cover outside the Up and Down Moving Shaft (7) touch with the Working Table (8). 3 The weights are not arranged in order. 4. The tester is not placed in the horizontal level, with the weights touch the inside wall of the instrument body. 5. The total test force or the indenter is wrongly chosen.	1 Change the diamond indenter or the ball indenter. 2 Lower down the protecting cover to let it lower than the upper plane of the Up and Down Moving Shaft, then fasten the screw. 3 Install the weights according to Fig.3 4 Calibrate the tester with a lever according to Item 4.2 in 4 section of the Chapter III. 5 Select the tester force and the indenter according to the requirements

VIII. The Accessories (The Packing List)

1. Accessories Kit of Main Body

No.	Description of Goods	Quantity
1	Diamond Rockwell Indenter	1 PC
2	Diamond Vickers Indenter	1 PC
3	φ1.5875mm, φ2.5mm, φ5mm Ball Indenter	Total 3 PCS
4	Large Testing Table	1 PC
5	Medium Testing Table	1 PC
6	"V" Shaped Testing Table	1 PC
7	HRC (High, Lower)	Each 1 PC, Total 2 PCS
8	HRB	1 PC
9	Standard Vickers Hardness Block	1 PC
10	Standard Brinell Hardness Block	1 PC
11	Weight 0, 1, 2, 3, 4	Total 5 PCS
12	Power Cable	1 PC
13	Fuse 0.5A (5 X 20)	2 PCS
14	Plastic Anti-dust Bag	1 PC
15	Check List of Brinell Hardness	1 PC
16	Instruction Manual	1 PC
17	Quality Certificate	1 PC

2. Accessories Kit of Microscope

No.	Description of Goods	Quantity
1	Seat of Microscope	1 PC
2	Micro Eyepiece	1 PC
3	2.5 [×] Objective	1 PC
4	5 [×] Objective	1 PC
5	Slipped Testing Table	1 PC
6	Outside Light	1 PC
7	Inside Light	1 PC