MVicky-1000T
Digital Micro Vickers Hardness Tester

Instruction Manual

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1.Precautions

1.1 It is advisable to use the single-phase 3-pin socket for the power source connection on the present instrument. The grounding end must be according to the stipulated requirement for earth protecting.

1.2 It is necessary to read carefully the usage instruction manual before the operation of the present instrument in order to know the operational procedures and the precautions so as to avoid the damages to the instrument and the personal unsafe accident caused by the incorrect operation.

1.3 During the installment and the preoperational test, the sticking paper that protects the indenter against the shock during the transportation should be taken off carefully because the over-strength in doing it would affect the positional precision of the indenter.

1.4 It is prohibited to dismount and alternate without permission all the electric component parts, the switches and sockets as well as their fixed positions, otherwise, it will cause accident.

1.5 The turret should not be moved unless the testing force has been unload completely, otherwise it would damage the instrument and the indenter.

1.6 During the loading, dwelling and unloading process, press the emergency stop button immediately in case of emergency, and the instrument will stop testing automatically and return to initial position.

1.7 In case the appearance and design of the instrument and the contents in this usage instruction manual are changed, it is hoped and apologized for the fact that the further notice will not be given.

2.Brief Introduction

2.1Digital Micro Vickers Hardness Tester is a new type high-tech product combining the optical, mechanic and electronic techniques; with a touch screen, a novel and pleasing appearance, direct-viewing, operational functions and reliability, and hence it is an ideal instrument for the testing of micro-hardness. The indenter and the objective shifting are automatically completed.

2.2The instrument is made with a precise design in the field of mechanics, CPU control of the testing in the electric field, and adopts the highly clear optic measuring system in the field of optics as well, which improves the test accuracy.

2.3The main function is as follows:

▲Selection of HV or HK test method;

▲Selection of all the scales of Micro hardness;

▲Conversion between the hardness scales;

▲Automatic shifting between the indenter and the objective;

▲Presetting of the dwell time;

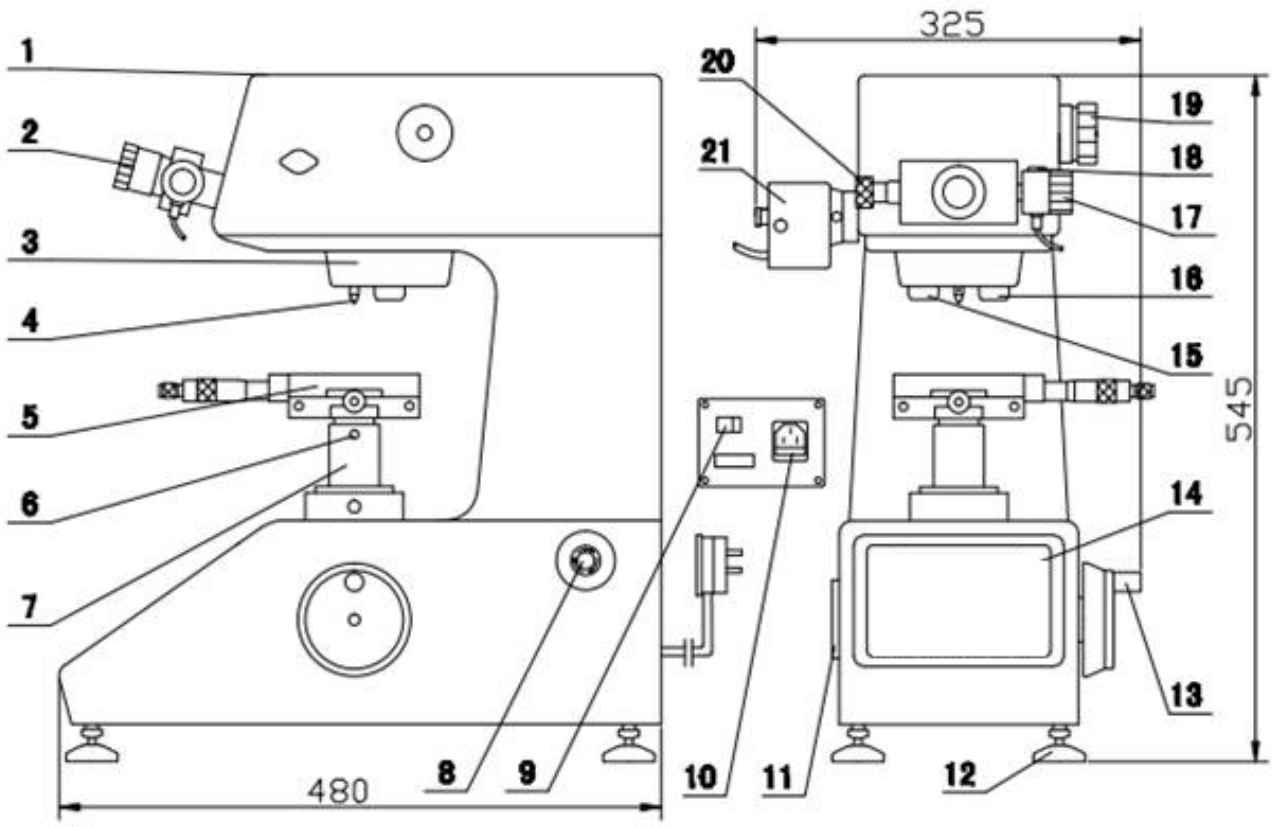
▲Regulation of the light source intensity;

▲The screen shows the hardness value (HV) and indicates the test numbers after measure the diagonal and press the input button;

▲Built-in printer, the test result can be print out.

2.4According to the particular requirements of the client, the instrument can be equipped with CCD / LCD device. The instrument is suitable for testing the micro and thin pieces, the parts with the permeated and coated surface, it is also fit for testing Vickers and Knoop hardness value for the crisp materials such as the agate, glass, ceramics and it is, therefore, an ideal hardness measuring instrument for the scientific research institutes, the universities and colleges, the industrial production units and the metrological institutes using with for studying and measuring.

3.External Structure



1. Upper Cover
2. Eyepiece
3. Automatic Turret
4. Indenter
5. X-Y TestTable
6. Screw
7. Lifting Screw
8. Emergency Stop Button
9. Power Switch
10. Power Cord and Fuse
11. Printer
12. Regulating Screw
13. Hand Wheel
14. Touch Screen
15. 10×Objective
16. 40×Objective
17. Right Drum Wheel
18. Eyepiece Button
19. Load-Change Hand Wheel
20. Left Drum Wheel
21. The Light Source of the Eyepiece

4.Technical Specifications

4.1 Test force: 0.098N (10gf) ,0.245N (25gf) ,0.49N (50gf) ,0.9807N (100gf) , 1.961N (200gf) ,2.942N (300gf) ,4.903N (500gf) ,9.807N (1000gf)

4.2 Repetition of displayed hardness value: Table 1; Hardness tester error of the largest allowed: Table 2

4.3 Test force application method: automatic loading and unloading

4.4 Shifting between indenter and objective:automatic shifting

4.5 Dwell time of the test force: 0~60s (5 seconds as a unit)

4.6 Optical system:

Measuring Eyepiece	10X	
Objective	10^X (Observation)	40^X (Measurement)
Total Amplification	100^X (Observation)	400^X (Measurement)
Resolution Rate		0.06 μm

4.7 Power supply:AC220V / 50~60Hz

4.8 X-Y Test table:

Size:100×100 mm

Stroke:25×25 mm

Resolution:0.01 mm

4.9 Max height of the specimen:90 mm

4.10Distance between the center of the indenter and the exterior panel: 100mm

4.11 Weight of the main body:about 31kg

4.12 Dimension (L×W×H):480×325×545 mm

5.Installation of the Instrument

5.1 Operational conditions:

▲Room temperature within (23±5)℃;

▲Installed in a horizontal position on a solid basement;

▲In an environment without any shock or vibration;

▲In a surrounding without any corroding agent;

▲Relative room humidity inferior to 65%.

5.2 Unpacking

▲Cut the packing belt, screw out the screw at the bottom of box and then take out the instrument and the accessories kit;

▲Place the instrument on the prepared solid working table (for the construction of the working table, ≥550×300mm, height about 600mm);

5.3 Installation

▲Take out the 4 horizontal regulating screws out of the accessories kit and screw them in the holes on the base panel of the instrument. Unpack the gauze band wrapped on the lifting screw and the hand wheel (Fig.1);

▲Tear lightly the anti-shock sticking paper on the indenter with both the hands. Clean the indenter lightly with the lens-cleaning paper dipped with some ether; (just move the lens-cleaning paper on the indenter several times by holding the paper on both ends with hands);

▲Open the upper cover and screw off the two anti-shock screws (Fig.2);

5.Installation of the Instrument

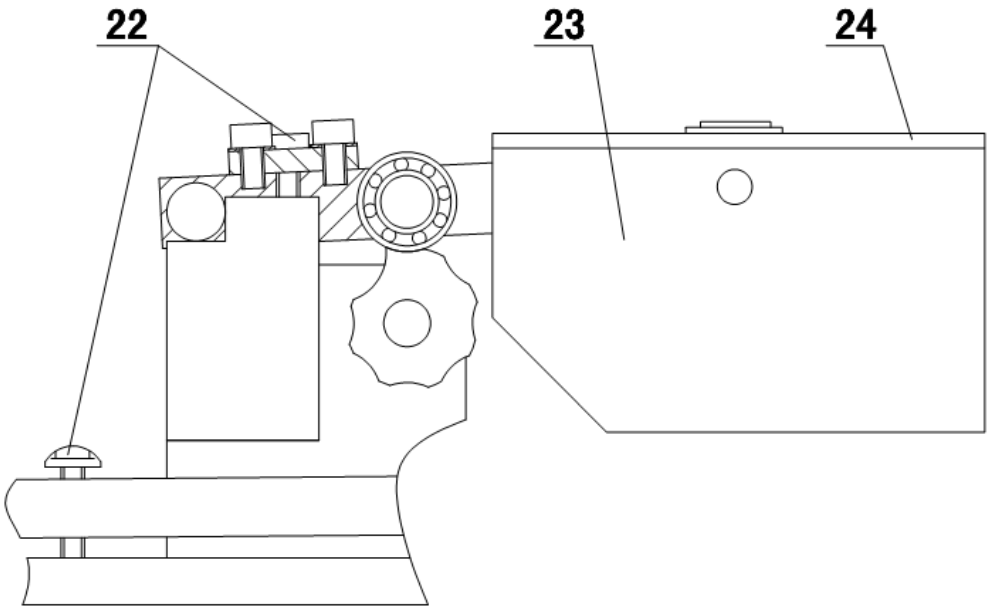
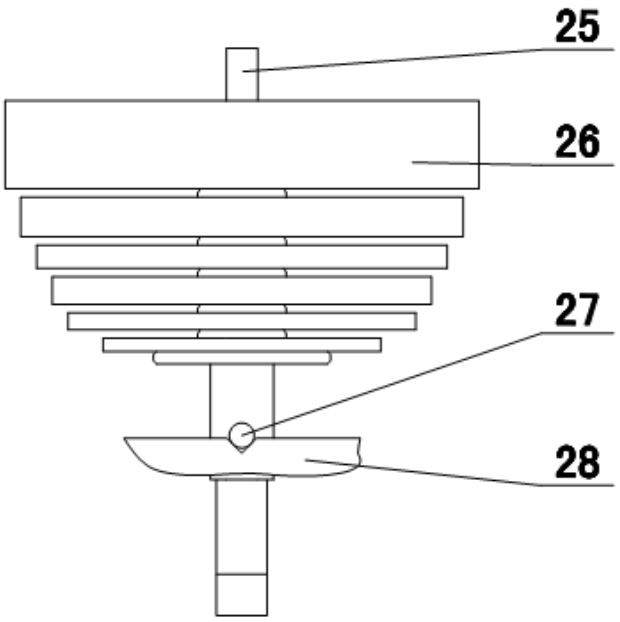


Fig.2

22. Anti-shock screws　　23. Weight base　　24. Weight base cover



25.Weight axis

26.Weights

27.Weight axis peg

28. V-Shaped groove

Fig.3

▲Tear down the belt of the weight base and unload the weight base cover.

▲Take the weight axis and weights out of the accessories kit and clean them

thoroughly, (clean the supporting surface of the weight axis with cleaning gauge dipped with some oil so as to protect it against rust;) put the 6 weights on the weight axis in the order from small to big (Fig.3);

▲Hold the top of the weight axis, put the axis into the weight cover and the rotate the weight axis so that the peg on the lower part of the axis may fall into the V-shaped groove on the lever, and cover the weight base cover;

▲Rotate the load-change hand wheel so as to make the weight base move smoothly on the position-fixing groove;

5.4 Take off the dust-protecting cover of the eyepiece tube and put the eyepiece into the hole, which must be inserted in the end;

5.5 Take out the X-Y test table and put the axis into the hole of the lifting screw and fix it with screws;

5.6 Take the level (the leveling gauge) out of the accessories kit and put it on the cross test table, and regulate the horizontal screws so as to make the water bubble stay in the center.

5.7 Function of Each Key (Fig.4)

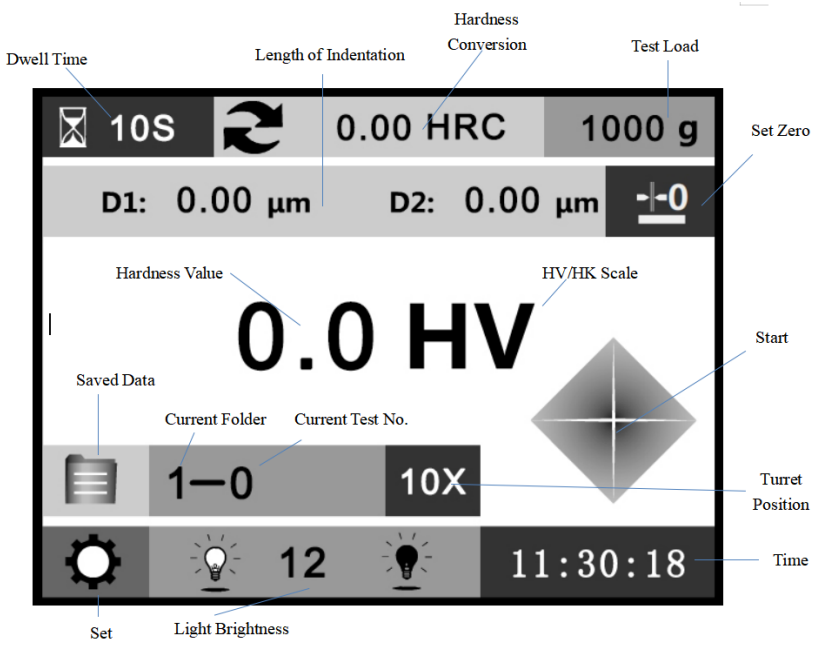


Fig.4

6.How to Carry Out the Test

6.1 Selection of Test Force

▲Rotate the load-change hand wheel to make the test force to meet the requirements of the selection. When rotate the load-change hand wheel, do it slowly so as to avoid the impulsive force caused by any fast movement.

6.2 Turn on the Power Switch. The screen lights and shows the main page (Fig.4). You can directly press each key to select "Test Scale, Dwell Time, Light, Conversion Scale, Time".

6.3 When the selection is completed, the instrument is in the working state.

6.4 The turret rotates automatically after starting up and make the 40^{X} objective face in the frontal direction. The general amplification is 400^{X}. (The eyepiece, the objective and the specimen are in the focusing state.)

6.5 Place the standard block or the specimen on the testing table and then rotate the hand wheel to raise the table. Put one of the eyes close to the eyepiece to observe. When the block or the specimen comes into the distance of 1~2 mm under the objective, at this point, in the center of the vision field of the objective appears a bright spot , which shows it is very close to the focusing plane. At this time raise the testing table up slowly until the block or specimen surface forms a clear image in the eyepiece.

6.6 The luminosity of the light source in the vision field can be regulated through the keys"  "or"  "on the screen.

The distance between the indenter and the specimen is about 0.4mm after focusing. When the irregular-shaped specimen is to be tested, take care not to damage the indenter owning to the touching of the indenter with the specimen.

6.How to Carry Out the Test

6.7 Press " ◆ " key to start working.

▲It automatically applies the test force, the screen shows the turret to the indenter and blinks for loading.

▲When the test force exerted to complete, the dwell begins and the dwell time is counted down to zero.

▲When the dwell time end, the test force automatically unloads and the dwell time shows back to the set value.

6.8 After the test force application is completed, the 40×objective will turn to working position automatically.

IF YOU MISTAKENLY PRESS "START", IT IS PROHIBITED TO ROTATE THE TURRET UNTIL THE LOADING, DWELLING AND UNLOADING PROCESS ARE COMPLETELY FINISHED. OTHERWISE, THE INSTRUMENT WOULD BE DAMAGED.

6.9 Measurement of Diagonal

▲First rotate the eye guard to make the two lines clearly seen in the eyepiece before the measurement of the indentation diagonal (Fig.6).

▲Observe the indentation in the eyepiece; rotate the hand wheel to focus until the image quality of indentation become clear.

▲Rotate the left and right drum wheel to enable the inner side edges of two graduated lines move closely without limit between them, the light slot between graduated lines become smaller and smaller till reaching critical state with no light slot. Press to set zero (Fig.7).

▲Rotate the left drum wheel to enable the inner side of left graduated line tangent to the left tip of the diagonal line of the indentation. (Fig.8)

▲Rotate the right drum wheel to enable the inner side of right graduated line

tangent to the right tip of the diagonal line of the indentation. (Fig.9)

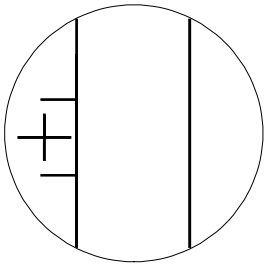


Fig.6

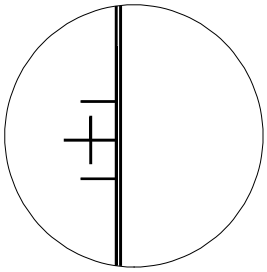


Fig.7

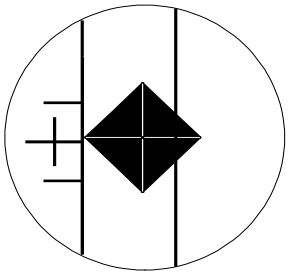


Fig.8

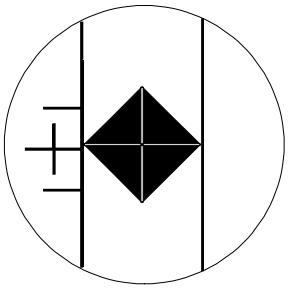


Fig.9

The instrument has memory for setting the zero. It is necessary to reset the zero only when the instrument is re-started after it is closed. When new operator comes, please set the zero so as to keep the accuracy for the measurement.

▲Press the input measuring button on the eyepiece and the screen shows D1 value.

▲Turn the eyepiece clockwise 90º, during the turning operation, the eyepiece should move along the inner side of the eyepiece tube without any space between them, otherwise it would affect the correctness of the measurement. Measure other diagonal line length of indentation as same way. Press the input measuring button on the eyepiece, the screen shows D2 value. The system calculates hardness value automatically and shows testing results (HV value) automatically as well.

6.10 Owing to the difference of the roughness and levelness of the surface of the specimen, the indentation may become deformed. And so the measurement of the diagonal lines should be carried out in two mutual vertical directions.

6.11 If you think the present measurement is not correct, just repeat to measure again.

6.12 When the indentation observed in the eyepiece is too large or too small to measure precisely, it is necessary to re-select the testing force according to the thickness and size of the material to suit the requirements of the measurement.

7.Cautions

7.1 The Indenter

▲The indenter is the important part of the instrument, and hence it is necessary to take care not to touch the indenter during the operation.

▲In order to assure the precision of the measurement, it is important to keep the indenter clean. If it is covered with grease or dust, it should be cleaned carefully with absorbent cotton dipped with alcohol or industrial ether, especially the tip of the indenter.

▲The round column of the indenter is marked with a red dot. If the indenter is once unloaded, take care to make the red dot face the frontal direction when it is reloaded, and the focus of the diagonal line of the indentation should be aligned with the red dot. It is possible to make the alignment of the cross-shaped in the microscope line with the diagonal line of the indentation. If the indentation observed is not aligned with the cross-shaped line, please unscrew the screw on the indenter, turn the indenter a bit and the fasten the screw, and then make the alignment again through tests until the alignment is all right to your satisfaction (Fig.10)

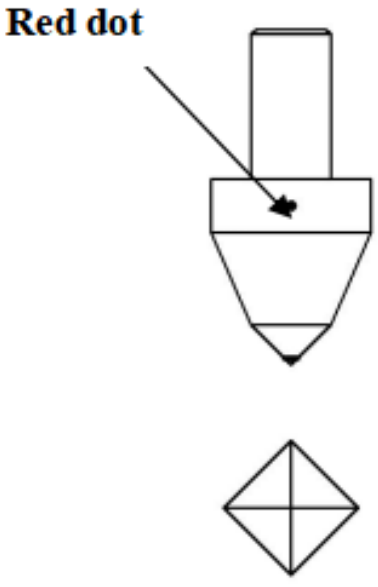


Fig.10

7.Cautions

7.2 The Specimen

▲The surface of the specimen must be clean, as the grease or the dirt on the surface would make the edge of the image of the indentation vague, thus affecting the precision of the measurement. The specimen can be cleaned by alcohol and ether.

▲When thin filaments, thin pieces and small bits are used as the specimens, the fine wire test table, the thin specimen test table and the fork-shaped test table should be used to hold the specimens respectively on the cross testing table for the measurement. If the specimen is too small to be held by the fixture, the specimen should be inlayed and polished for the measurement.

7.3 The Eyepiece

▲Owing to the difference of the personal visions, the graduated lines observed in the vision field of the objective may seem vague. And accordingly, the observer should adjust the lens in front of the objective according to his personal visional line so as to make the graduated line observed in the vision field clear.

▲As the eyepiece is put in the eyepiece tube, it is necessary to turn the eyepiece by 90º during the measurement of the two diagonal lines of the indentation. During the turning operation the eyepiece should move along the inner side of the tube without any space between them; otherwise it would affect the correctness of the measurement.

7.4 Regulation of the Light Source (Fig.11)

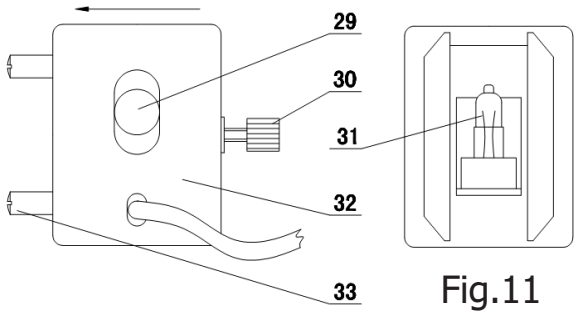


Fig.11

29.Screw one
30.Screw two
31.Halogen lamp
32.Back cover
33.Screw three

7.Cautions

▲Turn on the power switch of the hardness tester and observe the light source of the eyepiece.

▲Fasten the Screw Two in clockwise direction to make the light beam in the vision field equality. (You can loosen the Screw Three and then fasten the Screw Two if it is necessary.)

▲Loosen the Screw One and move it up and down.

7.5 Change of the Lamp Bulbs

▲Following goods is required:

A New lamp (a halogen lamp, 12V, 15 ~ 20W

B Dry and soft cloth

▲Unscrewing the Screw two in anti-clockwise direction, push the Back Cover in left direction as arrowhead marked and move the Back Cover down.

▲Take out the bad lamp and replace on a new lamp and clean the lamp surface with a soft cloth.

▲Equip the Back Cover returned as above mentioned procedure.

NOTE:

1. The power switch of the hardness tester must be shut off before the lamp replacement, because there is dangerous voltage in the inside of hardness tester.

2. The replacement lamp and original lamp must be the same size and model. It will damage the circuit of hardness meter if the improper lamp is equipped.

8.Attached Tables

▲Repetition of displayed value of Micro Vickers hardness tester

Table.1

Standard Hardness Range	Repetition of Displayed Hardness Value (%)		
	HV5~HV100	HV0.2~ < HV5	< HV0.2
≤225HV	≤3	≤6	≤9
> 225HV	≤2	≤4	≤5

▲Tolerance of displayed value of Micro Vickers hardness tester

Table.1

Hardnes Symbol	Hardness tester error of the largest allowed ±%														
	Hardness HV														
	50	100	150	200	250	300	350	400	450	500	600	700	800	900	1 000	1 500
HV 0.01																
HV 0.015	10															
HV 0.02	8															
HV 0.025	8	10														
HV 0.05	6	8	9	10												
HV 0.1	5	6	7	8	8	9	10	10	11							
HV 0.2		4		6		8		9		10	11	11	12	12		
HV 0.3		4		5		6		7		8	9	10	10	11	11	
HV 0.5		3		5		5		6		6	7	7	8	8	9	11
HV 1		3		4		4		4		5	5	5	6	6	6	8
HV 2		3		3		3		4		4	4	4	4	5	5	6

1 When the indentation diagonal length is less than 0.020 mm, the table does not display the value.
2 For intermediate values, the maximum allowable error can be obtained by interpolation.
3 About the Micro Hardness Tester value in the table is 0.001mm or indentation diagonal length of the average of 2% of the maximum permissible error given, please select the bigger.

9.Usage Method of Knoop (HK) Hardness

9.1 Sample Introduction of Knoop Hardness

The distinguishing characteristic of Knoop test is the improvement on indenter's design. Only need to measure the long diagonal line length of indentation, therefore the relative error of measurement becomes smaller. Comparing with the micro Vickers test, when press the test force with same value, the indentation of Knoop hardness test is shallower, hence, it is suitable to test the thin sheet parts. It is used to test brittle and hard materials such as enamel, glass, agate, man-made precious stone, ceramic metals, etc.

9.2 Usage of Hardness Tester

9.2.1 When replace on the Knoop indenter, the red point on outer cylinder of indenter should face to front direction (see Fig.12).

9.2.2 Press the HV key to enable the testing method change to "HK", the Knoop hardness test method. (Fig.4)

9.2.3 The operation method is just as same as that of micro Vickers hardness test, see Section 6.

9.2.4 Only require to measure the long diagonal line length of the indentation; then press the input button on the eyepiece. The Knoop hardness value (HK) will be displayed on the screen.

9.3 The Max. Allowed Tolerance of Displaying Value

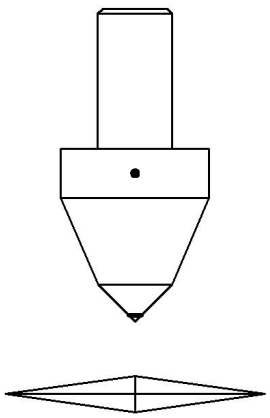


Fig.12

9.Usage Method of Knoop (HK) Hardness

Hardness Scale	Test Force (N)	Max Allowed Tolerance of Display Value %								
		Hardness Value(HK)								
		50	100	150	200	250	300	350	400	450
HK0.01	0.098	5	6	7	9	9	10	11	-	-
HK0.025	0.245	5	5	5	6	6	7	7	8	8
HK0.05	0.49	5	5	5	5	5	5	5	6	6
HK0.1	0.98	5	5	5	5	5	5	5	5	5
HK0.2	1.961	5	5	5	5	5	5	5	5	5
HK0.3	2.942	5	5	5	5	5	5	5	5	5
HK0.5	4.903	5	5	5	5	5	5	5	5	5
HK1	9.807	5	5	5	5	5	5	5	5	5

10.Accessories (The Packing List)

Item	Description		Specification	Quantity
	No.	Name		
Main Instrument	1	Hardness Tester		1 set
	2	Vickers Indenter		1 piece
	3	Objective	10×, 40×	2 pieces
Accessories	4	Accessories Box		1 piece
	5	Weights		6 pieces
	6	Weight Axis		1 piece
	7	X-Y Test Table		1 piece
	8	Thin Specimen Test Table		1 piece
	9	Fork-shaped Test Table		1 piece
	10	Fine Wire Test Table		1 piece
	11	Eyepiece	10×	1 piece
	12	Level Regulation Screw		4 pieces
	13	Level		1 piece
	14	Halogen Lamp	12V, 15~20W	1 piece
	15	Fuses	1A/250V, 5×20 mm	2 pieces
	16	Power Cable		1 piece
	17	Screwdriver		2 pieces
	18	Dust-Preventing Cover		1 piece
	19	Vickers Hardness Block	HV0.2 Middle Block, HV1 High Block	2 pieces
Documents	20	Usage Instruction Manual		1 copy

10.1 Optional Accessories

▲Knoop Indenter

▲Hardness Test Blocks

▲Metallographic Sample Cutting Machine

▲Metallographic Sample Mounting Press

▲Metallographic Sample Polishing Machine

▲CCD Image Measuring System

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