

# NANOVEA *Series*

**Digital Micro Hardness Tester**

**HWMMT-X3  
HWMMT-X7**

**Operating Instruction Manual (Basic Section)**

Thank you for purchasing this Nanovea Series Digital Micro Hardness Tester. Please read this manual thoroughly before using this machine to ensure correct handling enabling safe and full utilization of the machine's features.



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## Digital Vickers Hardness Tester

HWMMT-X3

HWMMT-X7

### Operating Instruction Manual (Basic Section)

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## 1. Safety precautions

Be sure to read this operating instruction manual thoroughly to ensure safe use of this machine.

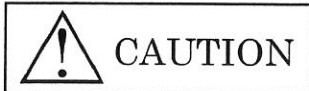
Familiarize yourself with all aspects of the machine and safety precaution points before use.

After reading this manual, it should always be kept in a place where it can be referred to by the operators at any time.

Safety precaution points in this section are differentiated by ranking as "DANGER" and "CAUTION".



Incorrect handling will result in a dangerous condition with the possibility of suffering death or serious injury.



Incorrect handling will result in a dangerous condition with the possibility of suffering moderate or minor injury, and mechanical damage arising.

Even with items designated as "CAUTION", there is the possibility of serious outcomes resulting depending on the situation. All the details described are important, and must be followed.

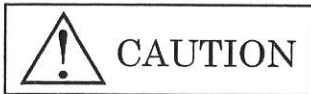
The appearance, and specifications described in this operating manual and in brochures may be changed without notice due to improvements.

This company bears no responsibility for damage or injury due to accidents arising from use other than the correct methods described in this operating manual.

TTS UNLIMITED, INC.

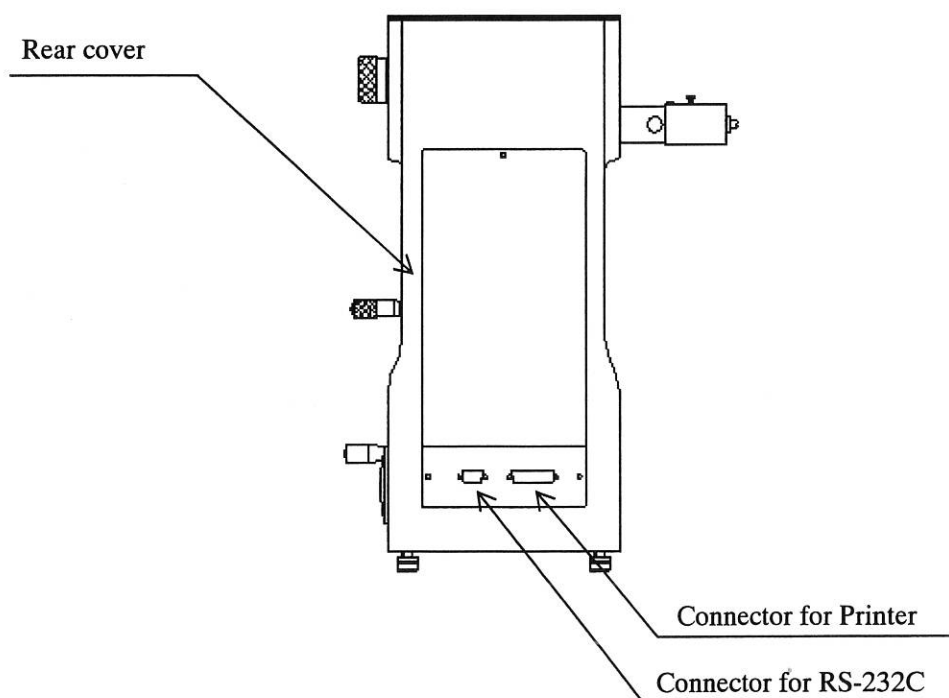
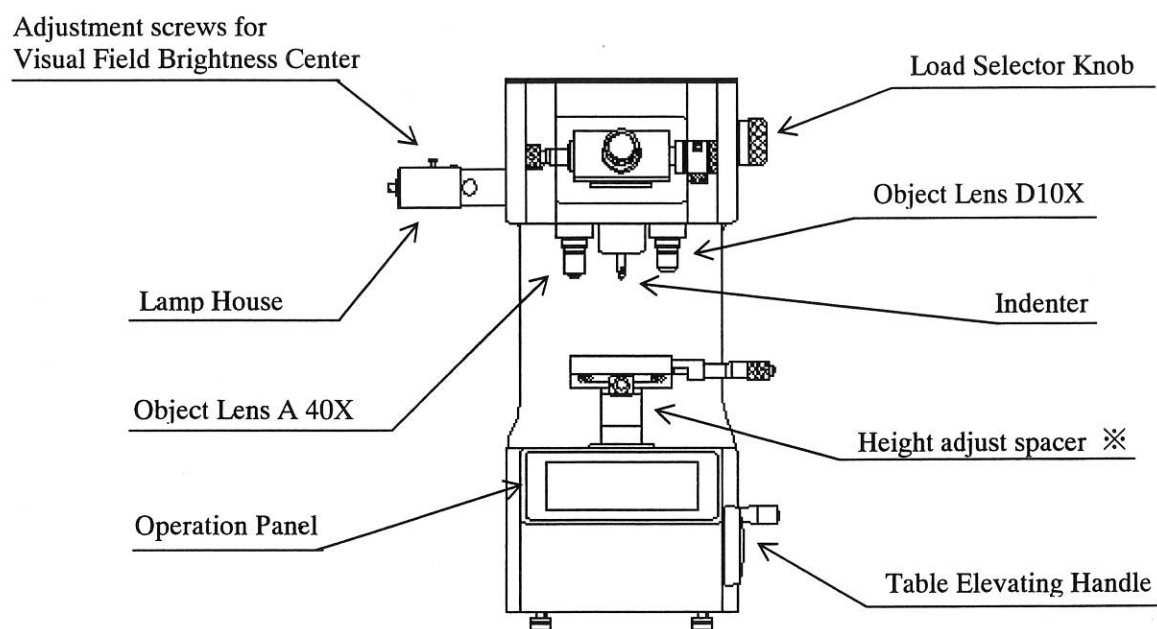


- ★ Do not move or perform wiring, maintenance or inspection work while connected to the power supply.  
Turn off the power supply, disconnect the power supply cable from the socket, and wait several minutes before carrying out this work.  
Risk of burns or electric shock.
- ★ This machine must not be modified.  
Risk of fire or electric shock.
- ★ Transportation, installation, wiring, maintenance and inspection works should be performed by specialists.  
Risk of electric shock, injury, or fire.
- ★ Do not install in explosive environments, or in highly smoky or dusty areas.  
May result in injury or fire.
- ★ Do not remove the top or rear covers, or side panels unnecessarily.  
Risk of electric shock or injury.
- ★ Position the machine correctly on a stable platform, and secure it firmly with the attached anti-toppling fittings.  
Risk of injury.  
The anti-toppling fittings fitted to the machine are intended to prevent the machine toppling during normal use. However, caution should be taken as their capability may be exceeded by major earthquakes etc.
- ★ Do not damage or bend the power supply cable.  
Do not position heavy objects on the power supply cable.  
Risk of fire or electric shock.
- ★ Do not use power supply voltages other than that indicated on the machine side panel.  
Risk of fire or electric shock.
- ★ Do not keep containers containing water or chemicals near the machine.  
Risk of fire or electric shock if they topple and liquid gets inside the machine.
- ★ Always disconnect the power supply cable from the socket before replacing fuses. Risk of electric shock if conducting items such as metal are accidentally inserted inside the fuse holders.
- ★ The triad earthed power supply cable attached to the machine should be used.  
When an adaptor is necessary for the socket, make sure the attached earth terminal is properly connected to the adaptor.
- ★ Do not cover the machine with easily flammable materials when it is connected to the power supply.  
May result in fire.



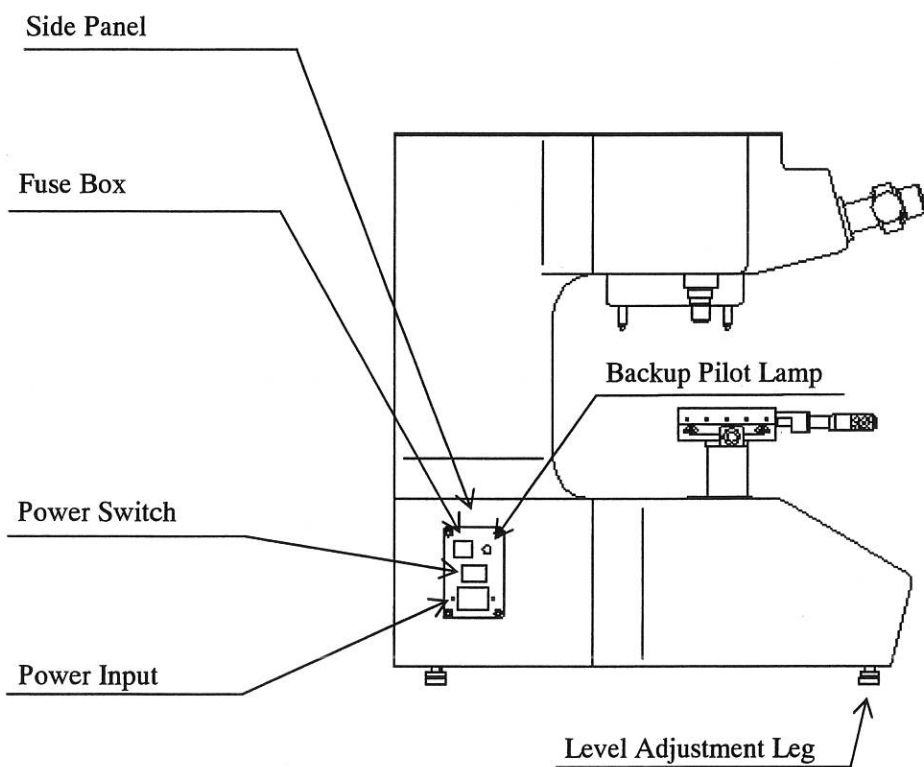
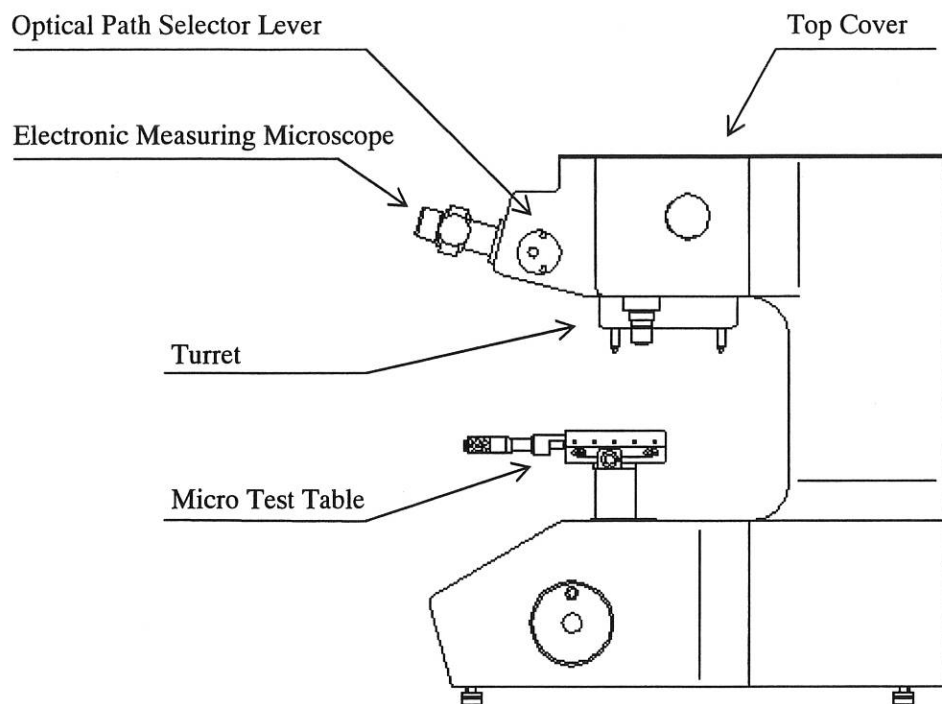
- ★ Do not insert fingers or articles into openings in the machine.  
Risk of injury or electric shock.
- ★ Do not touch the tip of the diamond indenter unnecessarily.  
Risk of injury.
- ★ Do not insert fingers between the indenter and the specimen platform.  
Risk of injury.
- ★ Fully insert the power supply cable right into the machine socket and power socket.  
Risk of fire or electric shock.
- ★ When pulling out the power supply cable, always pull out by holding the plug and not the cable.  
Risk of fire or electric shock.  
Do not insert or pull out the plug with wet hands.  
Risk of electric shock.
- ★ Use fuses specified by this company.  
Use of other fuses may result in fire.
- ★ Do not use batteries other than the genuine items wired by this company.  
Insert the connectors in the correct direction when installing.  
Mistakes may simply damage the machine, or result in fire and injury due to rupture and leakage of the batteries.
- ★ If a malfunction occurs, immediately turn off the power supply switch, remove the power supply cable from the socket, and contact the agent where the machine was purchased.

## 2. Part names



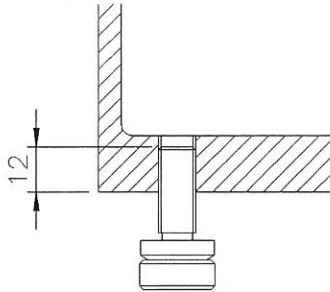
※If you measure a high sample, Please remove it.



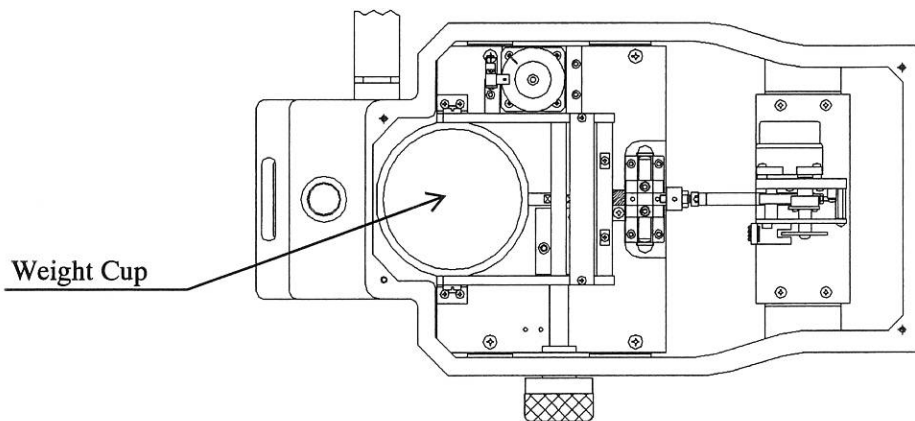


### 3. Preparation for the Test

- (1) Install in a place free from vibration and dust.
- (2) Please place the tester quietly on the stand and attach the four level adjusting legs in the accessory box. Screw in half way through the legs (12mm).

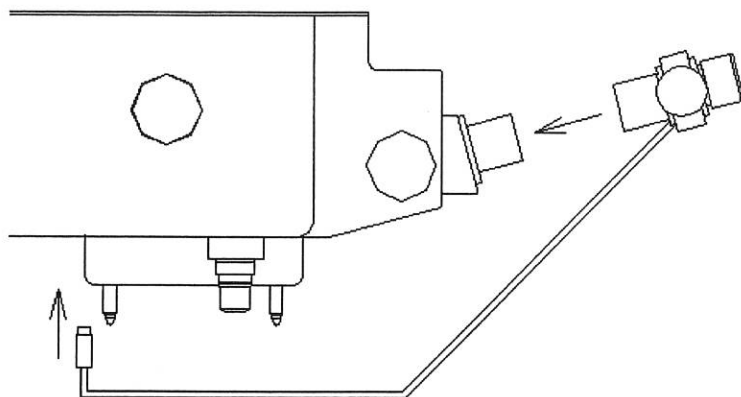


- (3) Detach the protector which fixes the Micro Test Table.
- (4) Place a level on the Micro Test Table and adjust the level adjustment legs to get the accurate level. A level and spanners are in the accessory box.
- (5) Remove the Top Cover and then the transportation protectors.
- (6) Please put weight in a weight cup sequentially from small one.



- (7) Move the Load Selector Knob from Min. to Max. from Max. to Min. several times. See if the weight cup goes up and down smoothly.

(8) Attach the Electronic Measuring Microscope and connect the connector.



(9) Place the Top Cover back as it was.

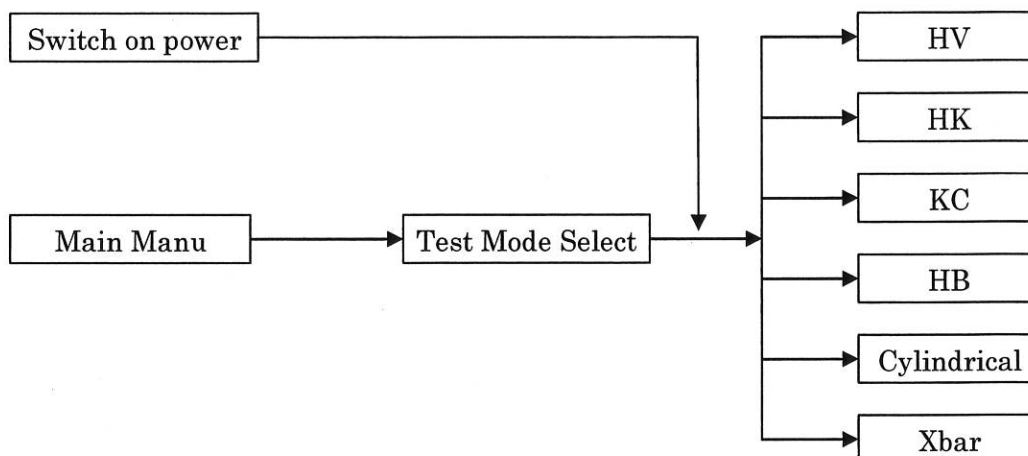
(10) Check the specifications of the power source. Connect the power cord to the power input connector and the other end to the outlet.

(11) Turn on the switch.

## 4. Basic operations for hardness testing measurements

### 4-1 TEST Mode Function

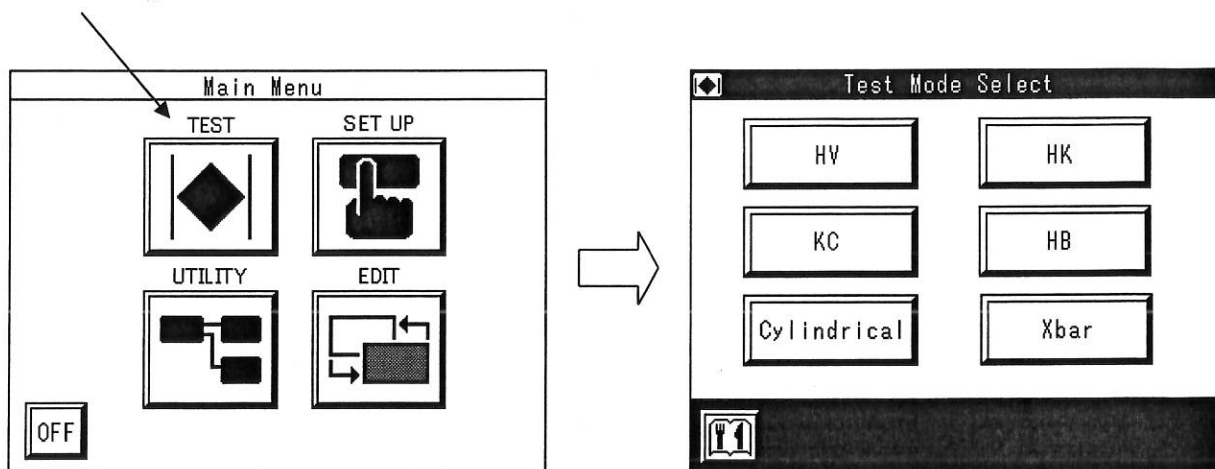
#### (1) Flow Chart of LCD



There are the six kinds of test modes of this device.

HV	Vickers Test mode
HK	Knoop Test mode
KC	Fracture Toughness Test mode
HB	Brinell Test mode (light-load)
Cylindrical	Cylindrical Correction Test mode
Xbar	Xbar Test mode (1Lot average and range are measured)

[TEST] is select from [Main Menu] when the test mode is changed.

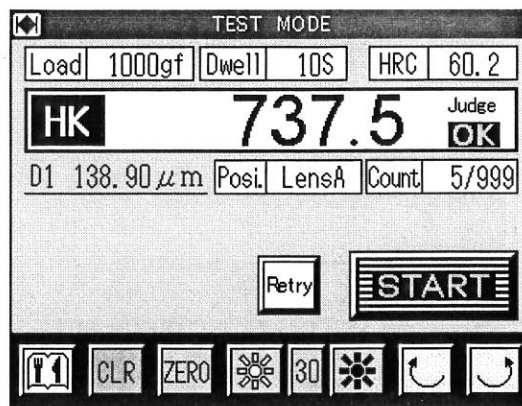
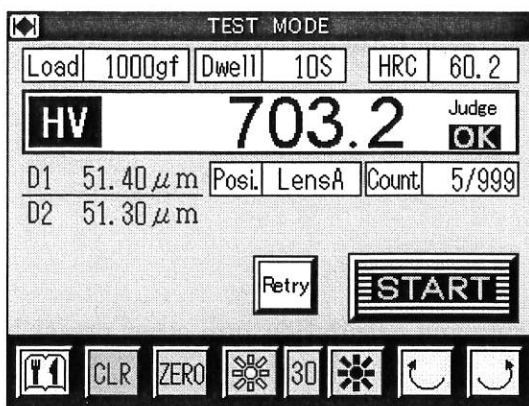


Test mode is memorized.

It is displayed on the screen when the power switch is turned on.

## 4-2 Basic operation of "HV Test mode" and "HK Test mode"

The hardness measurement of Vickers and Knoop is done.



### A. Keys and their functions



[Menu key]

Changes to the main Menu display.



[Clear Key]

Clears the memory data stored in the tester.



[Zero Set key]

For zero setting of the measuring lines.



[Up key]

Turns up the light.



[Down key]

Turns down the light.



[Left key]

Turns left the turret.



[Right key]

Turns right turret.



[Start key]

Starts the loading. The letters START flash during the loading.



[Retry key]

Present data, one deletion.

## B. Displays

Load 1000gf

Shows the test load selected by Load Selector Knob. Either gf or SI can be chosen.

Dwell 10S

Shows the dwell time.

HRC 60.2

Converts the hardness obtained by measuring and calculation into other preset hardness scale and show it.

**HV** 703.2 Judge **OK**

HV : Shows the measuring method.

703.2 : Shows the hardness got by measuring and calculation.

Judge : Judges if the hardness is within the preset range and shows OK, high, low.

D1 51.40  $\mu\text{m}$   
D2 51.30  $\mu\text{m}$

Shows the diagonal length of the indentation.

Posi. LensA

Shows the turret position.

Count 5/999

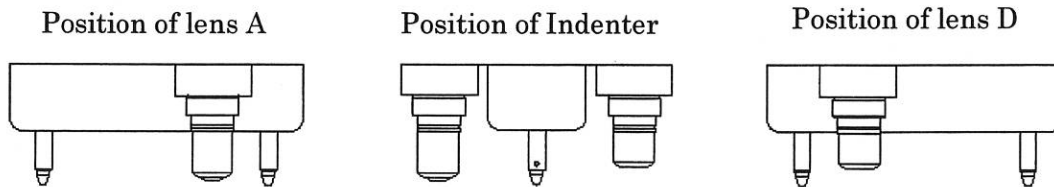
This tester has the temporary function. The quantity of data to be memorized can be set on the denominator. The numerator shows the quantity of data actually measured.

### C. Measurement

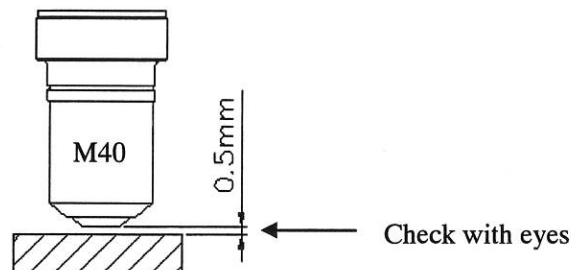
Use the Hardness Standard Test Block in accessory box and measure the Hardness Tester. The preparation for the following operation has already been done in our factory. Just turn on the switch.



1. Turn the Turret so that the Lens A( $\times 40$  Object lens) faces the front. Turn the Turret till the stopper spring clicks.

For HWMMT-X7, press the turret key (Left key & Right key).

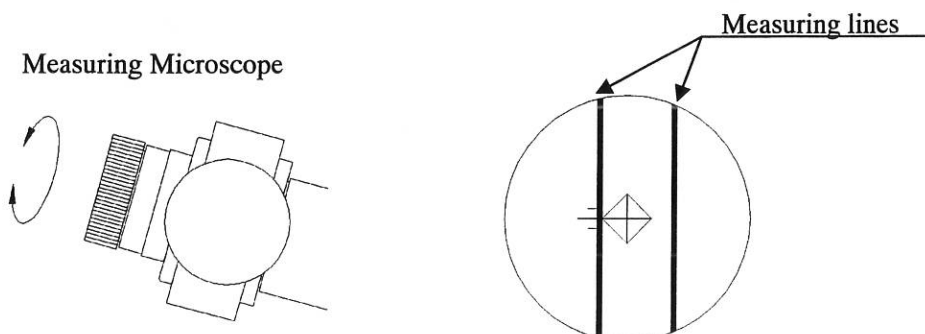


2. Place the Hardness Standard Test Block on the Micro Test Table and turn the Table Elevating Handle so that the Block comes close to the Object lens. Do not crush the distance should be less than 0.5mm.




3. Look into the Electronic Measuring Microscope and adjust the brightness of the visual field with  "Up key" and  "Down key". Too much brightness tires the eye.

4. Turn the eyepiece of the Electronic Measuring Microscope so that the Measurement Lines appear clearly. The best varies from person to person depending his eyesight.




5. Lower the Micro Test Table turning the Table Elevating Handle and find the position where the Block is focused. Never elevate it looking into the Microscope. The Block may run into the lens and break it. After getting the right focus, you may turn the handle up and down for small adjustment. If the focus is not correct, repeat 2. When it is difficult to focus correctly, move one end of the Block toward the center of the lens and adjust the position of the Block by hand. If you move the Block under the lens, the bright and dark parts move in the visual field. The borderline is the end of the Block. Focus in that position.
6. After correct focusing, move the part to be measured to the center of the visual field.
7. Set the Load Selector Knob to 1Kgf (Other positions give smaller indentations.)

8. Press the "Start key"  . The letters Start flash and the loading begins.

For HWMMT-7X, if the "Start key" is pressed at the lens position, the Turret turns automatically to the Indenter position and the loading starts.

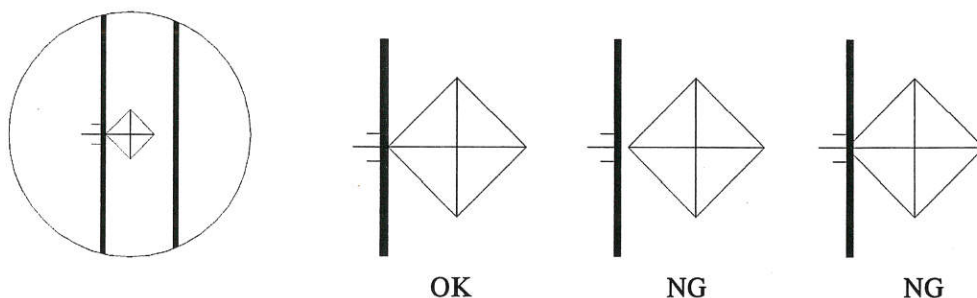
While "START" flashes, do not vibrate the Tester and the installation stand.

Never turn the Turret when the "START" is flashing. It may damage the Tester.

9. When "START" stops flashing, the Turret returns to the lens position automatically after loading.
10. Through the Electronic Measuring Microscope, you can see the indentation. Check the focus again. Focus on the four edges, not on the center of the indentation. Readjust the brightness as well, as the distance between the block and the lens is not the same as the first distance.
11. Narrow the two measurement lines turning the right and left buttons. Stop where the two lines touch each other. Never go beyond that. If each line passes the other line, the Measurement lines may break. If there is a gap between the lines, accurate measurement can't be expected.
12. Press "Zero Set key"  on the display. The figures of D1 and become "0,0".
13. Separate the two lines a little so that a part of the indentation can be seen.



14. Turn the left button of the Electronic Measuring Microscope and move the left measurement line till it meets the edge of the indentation.



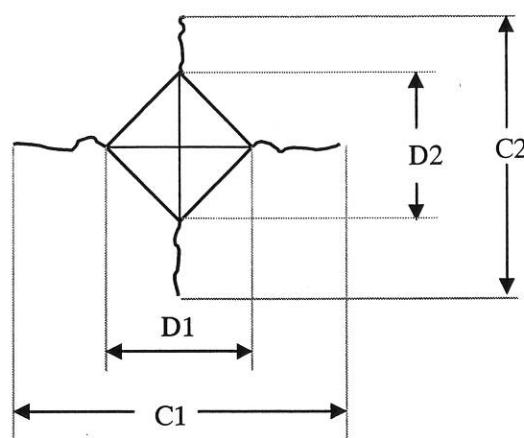
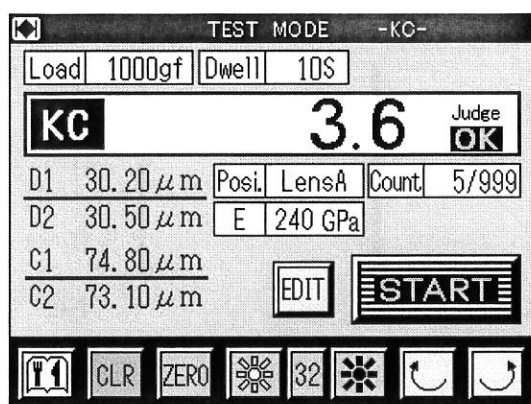
15. Do the same with the right line.
16. Press "READ" switch on the Electronic Measuring Microscope once. The display shows the D1 length.
17. Turn the Electronic Measuring Microscope 90 and measure the vertical length. Do the same as with the horizontal length.
18. Press "READ" switch and it shows the D2 length as well as the hardness.

#### Caution

- ※ A dirty indenter causes vagueness of the outline of the indentation and makes accurate measuring impossible. Remove dust lightly with clean cloth or an applicator. Benzene and alcohol can also be used. Thinner must not be used.
- ※ Blocks should be cleared of dust. Even the grease on the fingers can affect the measurement. The softer Blocks should be cleaned carefully. Even cloth may cause scratches.
- ※ Foreign matters between Micro Test Table and the thing to be measured could cause error in the measurement.

### 4-3 Operation of "KC Test mode"

The measurement of fracture toughness is done.



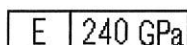
#### A. Keys and their functions



[EDIT key]

Change to the Operation display.

#### B. Displays



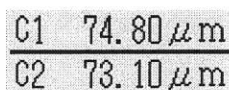
Shows the elastic modulus.



KC: Shows the measuring method.

3.6: Shows the hardness got by measuring and calculation.

Judge: Judges if the hardness is within the preset range and shows OK, high, low.



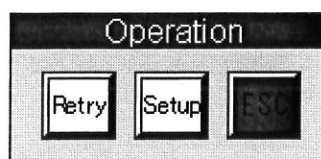
Shows the crack length of the indentation.

#### C. Elastic modulus setting

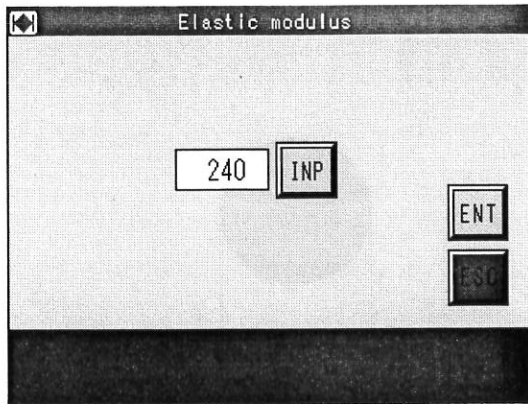
1. Press the "EDIT key".



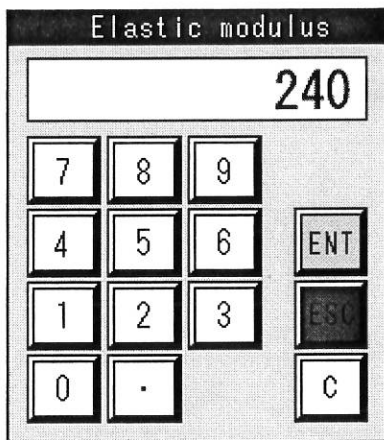
Operation display is indicated.



2. Press the "Setup key".  Elastic modulus display is indicated.



3. Press the "INP key".  Input display is indicated.



Input elastic modulus, and press an ENT key.

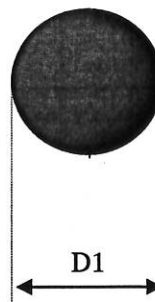
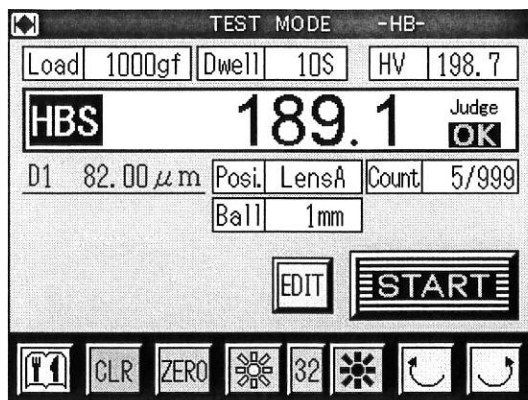
#### D. Measurement

Basic operation is the same as the HV, HK test mode.

Measure crack length C1, C2 after the diagonal length D1, D2.

#### 4-4 Operation of "HB Test mode"

The measurement of light load Brinell is done. (Ball indenter is option)



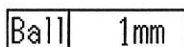
##### A. Keys and their functions



[EDIT key]

Change to the Operation display.

##### B. Displays



Shows the ball indenter diameter.



HBS, HBW: Shows the measuring method.

189.1: Shows the hardness got by measuring and calculation.

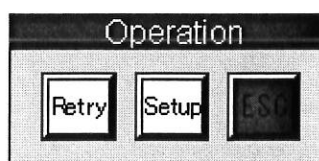
Judge: Judges if the hardness is within the preset range and shows OK, high, low.


##### C. Ball diameter / kind select

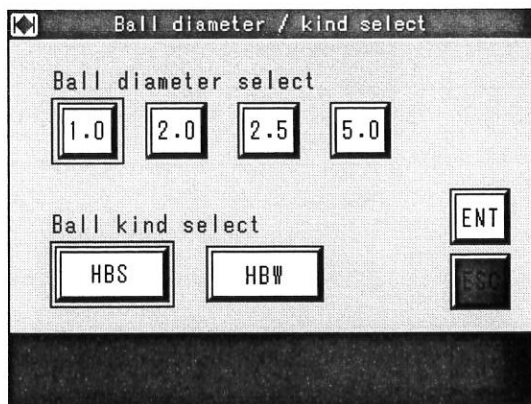
1. Press the "EDIT key".



Operation display is indicated.



2. Press the "Setup key".  Ball diameter / kind select display is indicated.



Select ball diameter and kind, and press an ENT key.

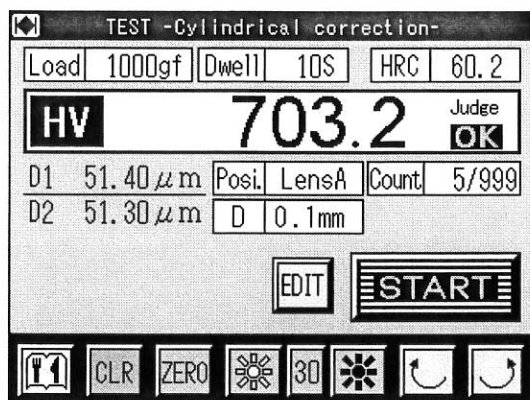
#### D. Measurement

Basic operation is the same as the HV, HK test mode.

Measure diameter length D1.

#### 4-5 Operation of "Cylindrical correction Test mode"

The measurement of cylinder surface and spherical surface is done.



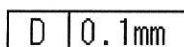
##### A. Keys and their functions



[EDIT key]

Change to the Operation display.

##### B. Displays



Shows the specimen diameter.



HV: Shows the measuring method.

703.2: Shows the hardness got by measuring and calculation.

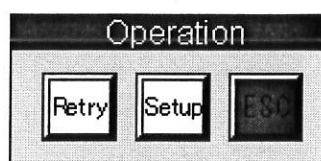
Judge: Judges if the hardness is within the preset range and shows OK, high, low.


##### C. Cylindrical correction setting

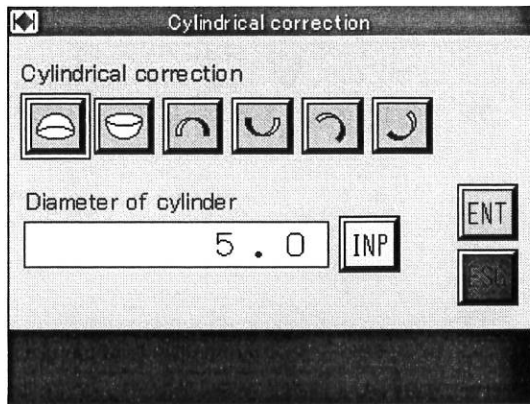
1. Press the "EDIT key".



Operation display is indicated.

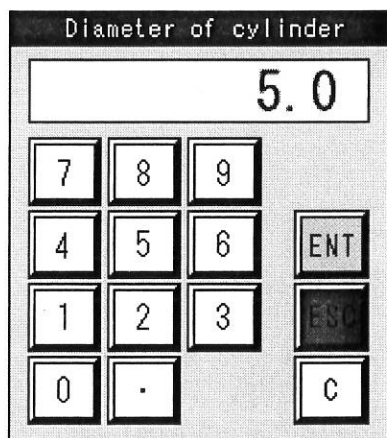


2. Press the "Setup key".  Cylindrical correction display is indicated.



Select kind of correction.

3. Press the "INP key".  Input display is indicated.



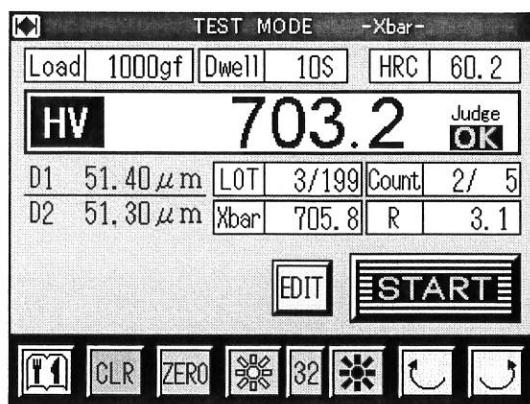
Input diameter, and press an "ENT key".

#### D. Measurement

Basic operation is the same as the HV, HK test mode.

#### 4-6 Operation of "Xbar Test mode"

The measurement of 1Lot average and range is done.



##### A. Keys and their functions



[EDIT key]

Change to the Operation display.

##### B. Displays

LOT 3/199

Shows the number of measurement of lot.

Count 2/ 5

Shows the number of measurement.

Xbar 705.8

Shows the average of 1lot.

R 3.1

Shows the range of 1lot.

HV 703.2 Judge OK

HV: Shows the measuring method.

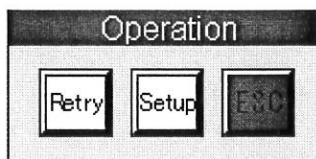
703.2: Shows the hardness got by measuring and calculation.

Judge: Judges if the hardness is within the preset range and shows OK, high, low.

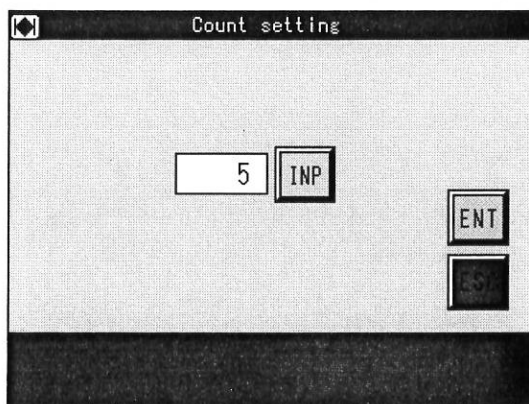


### C. Count setting

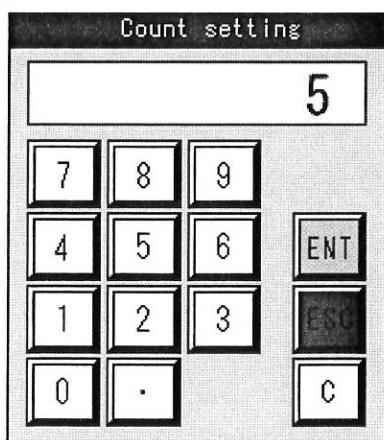
1. Press the "EDIT key".  Operation display is indicated.



2. Press the "Setup key".  Count setting display is indicated.



3. Press the "INP key".  Input display is indicated.



Input number of count (1~5), and press an "ENT key".

### D. Measurement

Basic operation is the same as the HV, HK test mode.

