

# A63.7015

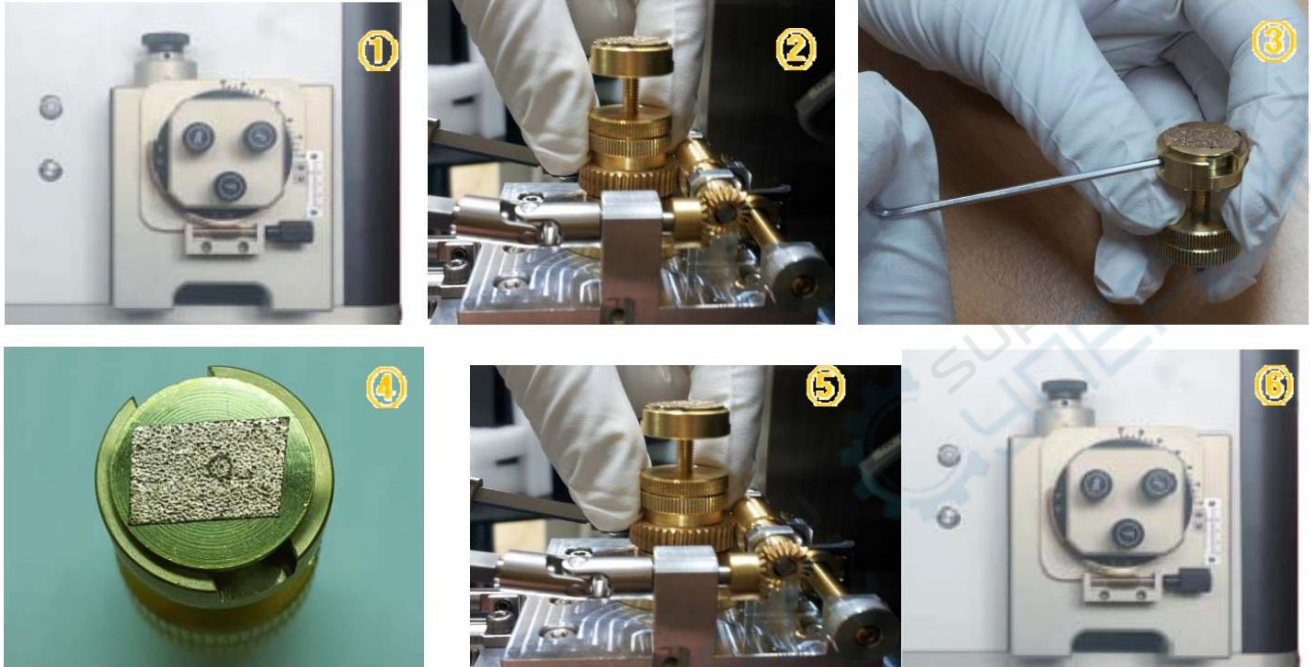
Tungsten Filament Scanning Electron  
Microscope, SE, 20x~150000x

## Instruction Manual



To ensure the safety and obtain satisfactory performance, please study this instruction manual thoroughly before start to use the instrument.

## (1) Sample preparation & installation (sample height adjustment)



1. Open the door with the vacuum completely released.
2. Turn the bracket fixed on the control shaft counterclockwise.
- 3.4. Unscrew the sample stage fixed on the bracket and install the prepared sample.
5. Fix the height of the sample and adjust the height by W/D JIG. (W/D refers to working distance)
  - Rotate the upper and lower parts of the two nuts mounted on the bracket, the height of the upper edge of the sample and the lower part of the limit arm of the clamp. After completion, tighten the fixing nuts in opposite directions without changing the height of the sample.
- ※ If the sample is relatively high, a nut can be removed to adjust the height. Fix the stage on the bracket and turn it clockwise to fix it in place.
6. Slowly close the cabin door, press the vacuum button at the same time to vacuum, wait until the cabin door is sucked and let go.

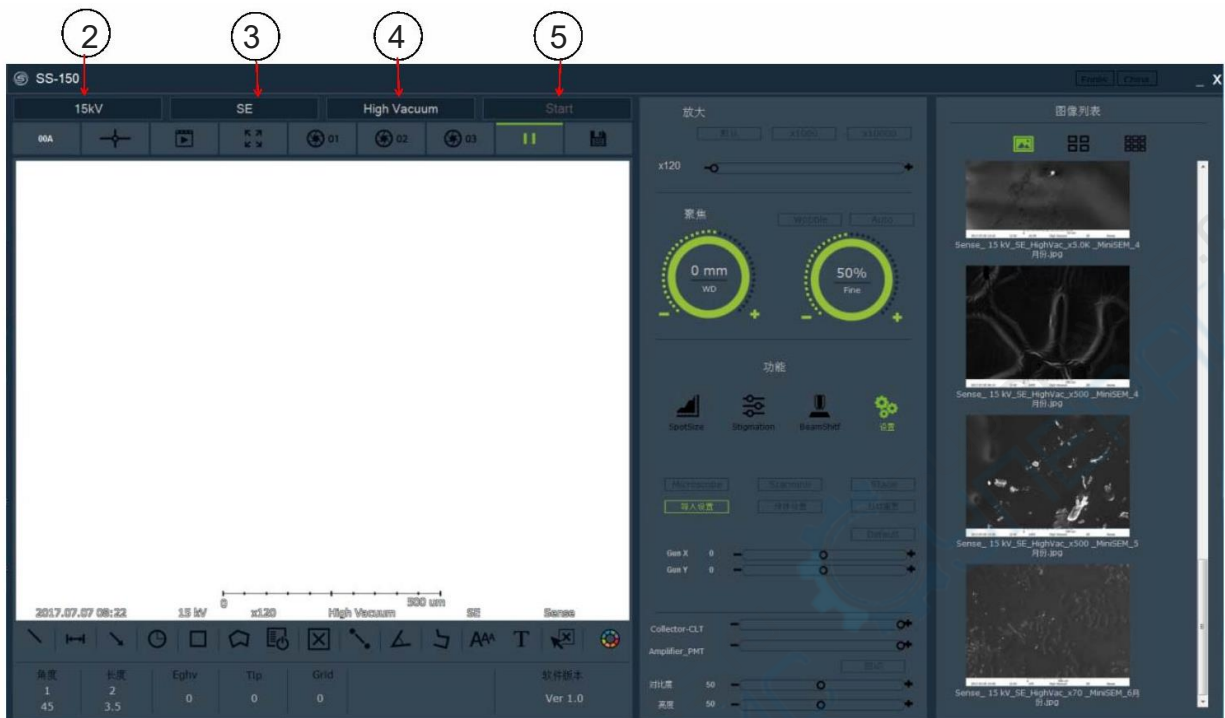
## (2) Equipment preparation, start, end



**Note:** A63.7006 chassis No diaphragm rod on outer surface, soft. There is no difference in the software interface, no [Manual (6)] Steps

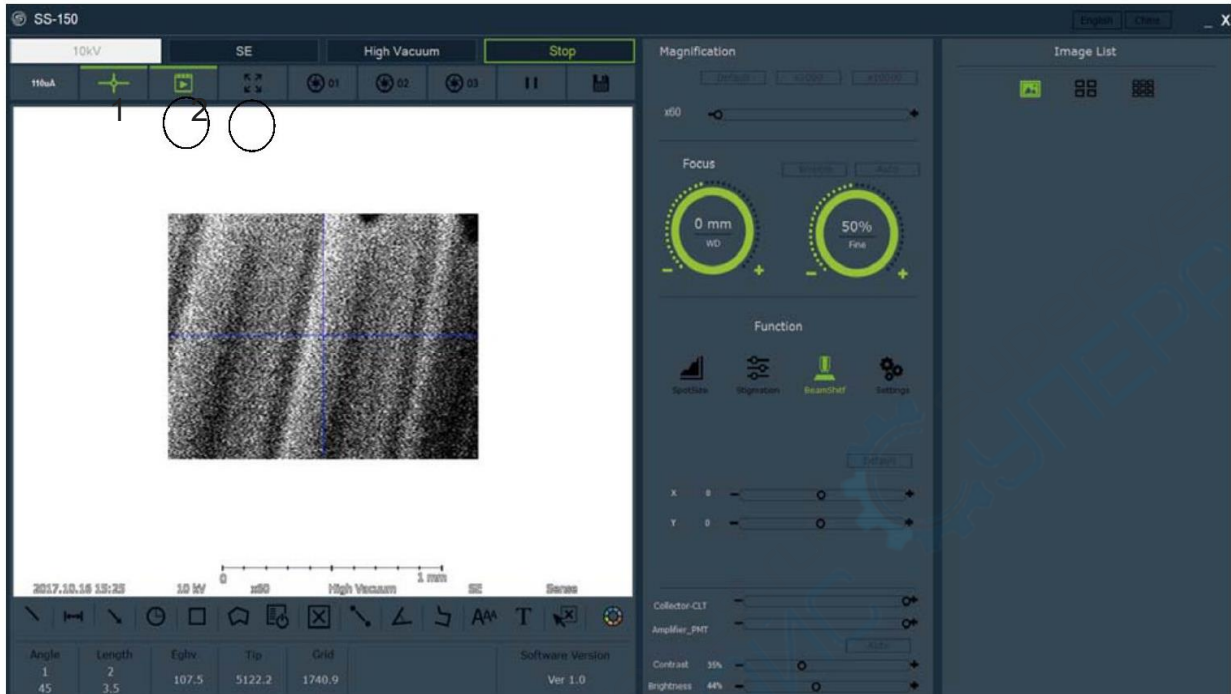
1. Press the power switch (POWER).
2. Open the hatch and replace the sample stage. **【Reference Manual (1)】**
3. Close the hatch.
4. Press and hold the vacuum button EXCHANGE (three seconds). (vacuum time 2.5 minutes)
  - Make sure you are vacuuming and try to open the hatch.
  - After the vacuum is completed, the signal tone (2 beeps) and the LED signal light are solid and do not flash.
  - ※If the signal tone continues to call, you need to push the door again and press it again Exchange key.
5. Select the SENSE-SEM icon on the computer desktop, double-click to start the software, and acquire images according to the sequence of operations.
6. Click the "stop" button on the software after the image is taken to close the software.
7. Press and hold EXCHANGE to release the vacuum. (Complete in 40 seconds)
8. Turn off the power switch.


### (3) SEM S/W startup, parameter setting



1. Double-click the SENSE-SEM icon on the desktop and wait for the software to run.
2. Select the appropriate acceleration voltage in the upper left of the software. (5/10/15/20/30KV)
  - Accelerating voltage should be selected according to the properties of the sample, image requirements and observation magnification, etc.
  - Usually the higher the acceleration voltage, the higher the resolution of the SEM, and different objects to be observed may need to change the acceleration voltage for best results.
3. Select the detector type SE/BSE used for this observation and analysis. (Secondary Electrons/Backscattered Electrons)
4. Select High Vacuum mode. (High Vacuum/Low Vacuum means high vacuum/low vacuum)
5. Click the "Start" button, and the electron gun emits an electron beam to form an image.
  - Note: 1) The software cannot be run when the SEM power is turned off or the SEM-PC Cable is not connected properly.
  - 2). The first time it starts, it starts in high vacuum mode, and it can be switched to low vacuum during use. (Only BSE Mode)
  - 3). Confirm whether the electron beam current value in the upper left corner of the image display window has risen to (above 100uA).
  - The tungsten filament needs to be replaced when the current value is 40~60uA (no picture)

#### (4) Turn on the real-time image and move the observation area




1. Click on the software  (320x240) function, high-speed real-time image scanning starts.

Use this mode when adjusting focus

- When the image is dark, you need to adjust the value of "Spot Size (Electron Amount)" (The lower the parameter the brighter / 5~30% - SE image)
- If the graphics are unstable or relatively bright and white, adjust the parameters to the right as above (20~70% - BSE image)

※The image cannot be seen at all

- 1). Confirm the filament value (beam current value in the upper left corner of the image display window)
2. Use when looking for sample observation points  (640x480) full screen mode, wider field of view.

## (5) Adjust magnification and focus



1. Using the mechanical handle of the SEM, X axis (transverse), Y Axis (vertical) adjustment, move the sample to be observed position to Center of field of view.



2. Use the mouse cursor to adjust the magnification, zoom to the left zooms out, and to the right the magnification increases. (mouse cursor on High-speed real-time image position, scroll wheel can also zoom in or out magnification.)  
 3. Adjust the focus with the mouse cursor in the "Focus" area, Coarse adjustment on the left, fine adjustment on the right

### ※Focus adjustment method

- 1). Decrease the magnification, such as 300 times or other magnifications.
  - 2). Use the mouse to adjust the focus coarse adjustment slider left and right to make the image the clearest.
  - 3). Use the mouse to adjust the focus fine-tuning slider left and right to make the image the clearest.
  - 4). Change the magnification to your desired magnification, and repeat steps 2) and 3) above.
- ※If you choose a magnification of 3,000 times or more, you need to adjust it in conjunction with "Stigmation".

\*When adjusting the sample position, use low magnification appropriately rate, it is easier to observe the shape of the sample, easy to Determine the location.

### -Z axis (vertical) adjustment

1). When the SE detector is selected, due to the excitation

The characteristics of SE, adjust the Z-axis height properly, which is convenient for collection Board attracts more SE.

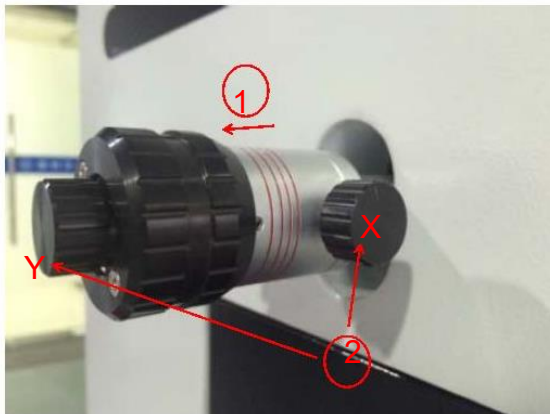
2). Z-axis adjustment directly affects WD (working distance),

And the appropriate WD and sample surface flatness, magnetic physical properties such as sex. uneven surface For magnetic samples, WD is generally 5~10mm; for magnetic samples, WD is one Generally 25~35mm.

### -T axis (tilt angle)

The size of the inclination angle depends on the magnification and the sample table The nature of the face varies. The lower the multiple, the smaller the inclination angle; the higher the multiple, The angle of inclination is large. The sample has obvious convex and concave, and the inclination angle is small; The product is relatively flat and the inclination angle is large.

## (6) Aperture rod adjustment (For A63.7015 Only)



### 1. Aperture adjustment

The diaphragm is divided into four gears (30, 50, 50, 100um),

The size is in order from the inside to the outside according to the red circle in the picture.

- should be selected according to the nature of the sample, observation magnification, etc.

Choose the aperture size, generally choose 50um. (100um for EDS)


- Adjustment method: turn left, inward or outward Pull, rotate right to lock.

### 2. Image swing lever



1) Left-click the Focus wobble function in the software, the field of view is a high-speed real-time image, and it can be adjusted repeatedly. The XY position is controlled by electronic control until the image does not move.

- Adjust the swing function after making the image clear, it is beneficial to watch the image swing direction, you can call the "cross"

shelf"  function, easy to see the shaking direction; if the image is not clear, press [Manual (5)] to operate.

- Shake and adjust the X-axis knob in the left and right directions of the image.

- Shake and adjust the Y-axis knob in the up and down direction of the image, from the bottom left to the top right.

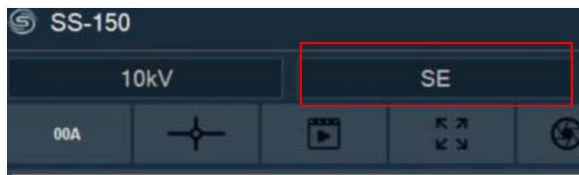
2) . Right click on the wobble, when the field of view is a high-speed real-time image, the image sways so much that it is impossible to distinguish the shaking direction.

Reduce the shaking frequency A, and repeat the above 1) steps.

Note: 1). The swing function needs to be adjusted when changing the voltage or changing the aperture size.

2). After adjusting the swing, it is necessary to fine-tune the focus to achieve the clearest state.

## (7) Spot size adjustment



4. Adjust the "beam" with the spot size progress bar  
Amount-Size"

※ During SE image operation

1) 5~30% : The brightest image can be obtained image, high magnification image (more than 5 thousand times),

Because the great energy is concentrated in the focal point, the conditioning aspect Limited. (Expanded edge)

2) 30~60% : form a more suitable figure Image (5K~20K times image)

※ When adjusting the spot size, according to the sample The characteristics and equipment conditions are the same as the above.

Difference, according to the actual observation condition setter Combined spot pattern.

※ During BSE image operation

1) 50% before/after : you can get the best combined image effect.

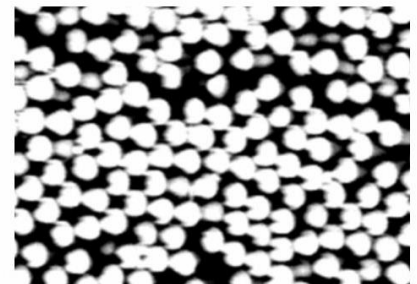
※ When changing the detector, click the detector selection area on the software (red box in the picture above), switch detector (SE ↔ BSE mode)

When SE → BSE is changed, because of the spot size,

An unstable image like the one on the right may appear, While adjusting the spot size

5. Stigmation

Adjust the resolution. (Click the 50% button)







## 5. Stigmatism

Function: Using the electron beam correction function, by moving X, Y axis to make the image sharper and clearer.

Principle: Use an external magnetic field to convert the inherent elliptical magnetic field. The field is corrected to a nearly rotationally symmetric magnetic field.

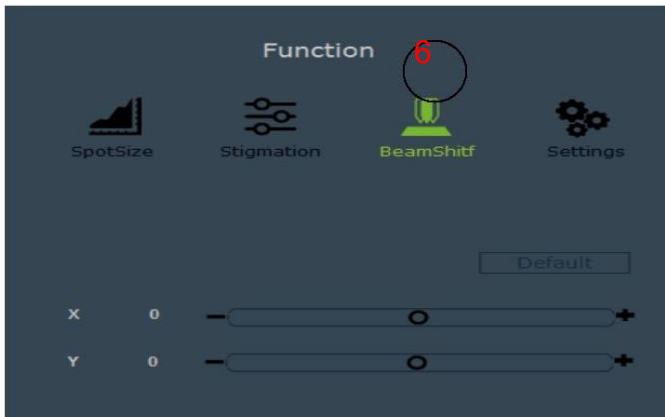
Operation essentials:

- 1). Can not be used when shooting images below 3,000 times (no big difference)
- 2) The image is not clearly clear after high magnification adjustment and focus.

When the clearest position

Note: The adjustment range of X and Y is plus or minus 20%, and the astigmatism is positive

In the range of minus 20%, a clear image cannot be obtained and the edge value is A clear image is obtained indicating that the diaphragm is contaminated.



6. The beam shift function is to slightly move the x,y axis position of the electron beam. When observing at high magnification, it is difficult to move the image through the mechanical knob. This function can be used to partially move the image position for easy observation.

\*Max  $\pm 150\mu\text{m}$

※Reset button makes the image quickly return to the middle position



7. Collector-CLT (collector), generally adjusted to the maximum, benefit

The excited SE/BSE is most attracted by high pressure; Amplifier-PMT (amplifier), generally adjusted to the maximum, good for signal conversion.

8. Contrast (contrast), Brightness (brightness) is Adjust the color effect function of the image, move the image to the right getting brighter, moving the image to the left gets darker

9. There are 5 types of image observation modes (scanning).

1).Fast Scan-Used when real-time scanning (320x240:0 sec) to focus and adjust image position

2). Slow Scan (640x480 : 3 seconds) Confirm and correct the picture before saving


3).Photo Mode1 (1280x960 : 30 seconds) high resolution image storage

4).Photo Mode2 (2560x1920 : 60 seconds) higher resolution image storage

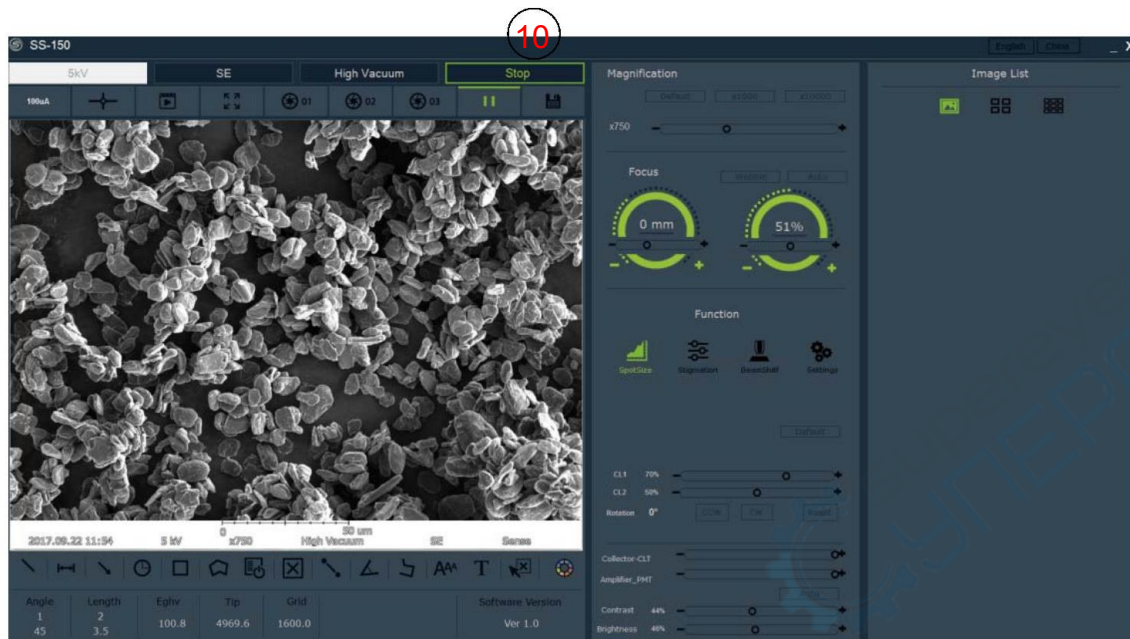
5).Photo Mode3 (5120x3840 : 90 seconds) highest resolution image storage

\*5 Mode software main interface can be switched at will.

10. Image Storage

- Click the save icon , after the image acquisition is completed, you will be prompted to set the storage path. After selecting the path, the software automatically names and saves the file.

## (8) The image scanning is completed (the device is turned off)



10. Click the “stop” button of the software after the image analysis is completed. When start is displayed, the software stops the image acquisition operation and turns off the high voltage.

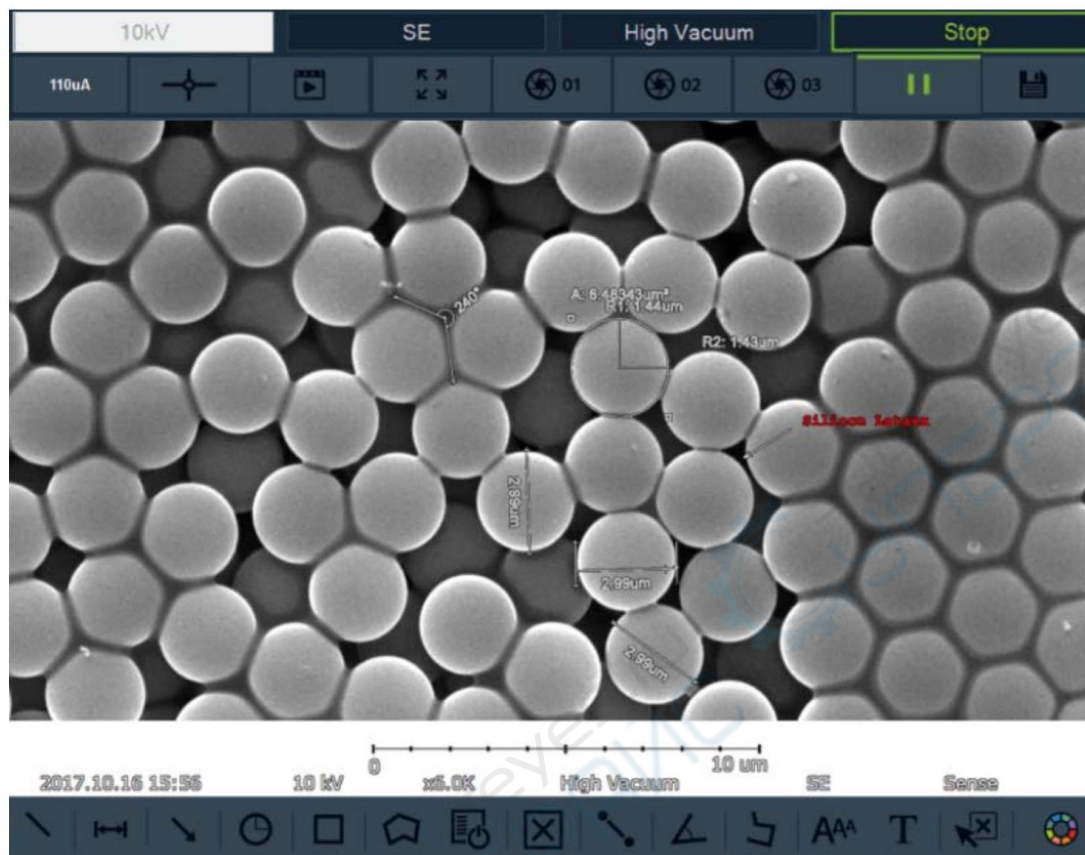
- Click the "stop" button when you want to change the acceleration voltage during the image analysis process. When start is displayed, stop collecting images, then change the voltage, and then click "start" to restart the operation.




11. When changing samples, click the “stop” button on the software. When start is displayed, press the “EXCHANGE” button 11 on the device to release the vacuum, and then you can replace the sample and observe again.



12. If testing is not required, press button 12 on the device to power off the SEM.

## (9) The method of using the measuring tool



1. The Measuring Tools function can measure and store parameters such as length, angle, area, etc.

- Click the "Pause" button  after finishing (Photo mode 1, 2 or 3)  
Measure the bar and store the picture, select the measurement tool

※ Click   Can delete, and edit mark data.

## **(10) Attachment: Equipment Inspection and Troubleshooting**

### **(1) Inspection of Vacuum system**

#### **1). O-ring inspection and replacement**

Due to frequent sample change or filament replacement, the O-ring vacuum seal at the door of the vacuum chamber or the O-ring of the electron gun

The frequency of wear of the type vacuum seal is higher. Due to dust adhesion, pollution and other reasons, the phenomenon of vacuum leakage will be caused.

Regular cleaning management is required.

Remove the O-ring vacuum seal from the groove. Do not operate with metal tools. If in the groove or seal ring

Defects or deformations in the surface can prevent complete vacuum extraction.

Use a non-woven cloth dipped in a small amount of ethanol to wipe the removed sealing ring to remove dust and contamination on it. Wiped

Please ensure that the sealing ring does not directly contact other pollution sources such as skin or clothes to avoid secondary pollution.

Carefully inspect the seals for dirt or blemishes. If defects or deformation are found, the sealing ring needs to be replaced.

Dip a small amount of vacuum grease and spread it evenly on the surface of the sealing ring.

Use ethanol to clean the grooves that hold the sealing ring.

Put the sealing ring evenly coated with vacuum sealing oil into the slot in its original position.

#### **2). Rotary pump oil inspection and replacement**

If the vacuum pump oil is insufficient or discolored or deteriorated, it will affect the performance of the vacuum pump. Therefore, it is necessary to periodically check the Check and replace the empty pump oil.

#### **Replenish**

The replenishment of vacuum pump oil means that when the vacuum pump oil is not deteriorated or polluted, the oil volume is lower than the standard position and the

Replenish pump oil.

When replenishing the pump oil, please refer to the vacuum pump oil gauge and pour the vacuum pump oil from the oil filling port.

### **Replace**

When the vacuum pump oil is discolored, it can be seen by the vacuum pump oil dipstick, or it needs to be replaced regularly vacuum pump oil every 6 months to 1 year

Remove the air hose and oil mist connected to the main unit of the equipment.  
Remove the screw at the drain port and drain the pump oil.

Reinstall the screw after the waste oil is completely drained, and inject new oil from the oil filling port. Appropriate injection volume for vacuum pump oil dipstick 2/3 of the lower and upper limits.

Reconnect the main unit of the equipment with the vacuum pump pipe (Air hose) and oil mist.

## **(2) Troubleshooting**

### **1) Troubleshooting**

If the equipment is abnormal during use, please operate according to the tips in this chapter. If a malfunction not mentioned in this chapter occurs

When you are born, please stop running the equipment and contact our company.

- The Troubleshooting Inspection System should only be operated by trained personnel who understand the equipment.
- Failure to use the correct protective measures during troubleshooting may result in casualties or serious injuries.
- Therefore, protection devices must be used during troubleshooting.
- Please turn off the power before troubleshooting.
- Please reconfirm the precautions before troubleshooting. If you are unable to determine how to implement the fault maintenance, please immediately
- Stop working and contact our company.

## 2) In case of equipment failure

### 2.1. System power failure

Phenomenon:

After pressing the power button on the front of the " A63.7015 (A63.7006)", the display light does not light up, the power supply of the device does not supply power, and the device does not work.

can start.

reason:

- 1) The 220V plug for power supply cannot supply power
- 2) " A63.7015 (A63.7006)" internal overload caused E.L.B (leakage protector) to turn off the power

Solution:

Check if the 220V plug that supplies the power to the device is disconnected from the power supply box

Check if the switch of E.L.B (leakage protector) on the back of " A63.7015 (A63.7006)" is on

If it is confirmed that the switch on the back of the device was turned on before, and the switch was not turned off manually, then

Do not open the switch, please contact the after-sales engineer

Note: If it is confirmed that the power plug is correctly inserted into the power supply box, and the switch of the E.L.B (leakage protector) is on

When it is on, please pay special attention that even if you do not turn on the switch button on the front of the device, the SMPS and other parts of the device will not work.

may be charged

### 2.2. PC Startup Failure

#### Problem

The computer does not turn on normally or nothing appears on the screen

Black screen in the middle of computer startup, stop starting

The software does not execute properly

#### Reason

Computer power supply is not supplying power

Computer not shutting down properly causing software problems

The cable between the computer and A63.7015/A63.7006 is not properly connected

#### Solution:

- Check whether the computer's power supply plug is properly inserted
- Check if your computer's battery is dead
- Check the connection status of the cable between the computer and A63.7015/A63.7006

- Check if the " A63.7015 (A63.7006)" device is turned on
- Check if necessary, programs are executing
- Check if your computer has virus.

### 2.3. Communication failure

#### **Problem**

The error message "Cannot find Active Scan facility" pops up

#### **Reason**

Poor USB cable connection between device and computer

#### **Solution**

Reconnect the USB cable

### 2.4, Vacuum Failure

#### **Problem**

A continuous beep of "BB" is emitted from the internal motherboard of the device during the vacuuming process

#### **Reason**

- The vacuum pump tube between the mechanical vacuum pump and A63.7015/A63.7006 is not properly connected
- Mechanical vacuum pump failure
- Molecular pump failure
- The sample compartment door is not fully closed

#### **Solution**

- Check the connection status of the vacuum pump between the mechanical vacuum pump and A63.7015/A63.7006
- Close the sample compartment door tightly when vacuuming
- Replacing the vacuum pump oil in the mechanical vacuum pump