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## Preface

Thank you for purchasing our MS-115 Operating Microscope. Please read this instruction carefully for the sake of your better use.

## General Requirement for Safety

Please read carefully about following precautions to avoid unexpected personal injury as well as the product being damaged and other possible dangers.

## Precautions

1. Do not use this instrument in the environment where is prone to fire and blast or where there is much dust and high temperature. Use it in the room and simultaneously be careful to keep it clean and dry.
2. Check that all the wires are correctly and firmly connected before use. Ensure that the instrument is well grounded.
3. Please pay attention to all the rating of the electrical connecting terminal.
4. Please only use fuse according to the specifications and rating stipulated by our product.
5. Use the power cable supplied with this instrument.
6. Don't touch the surface of the lens and prism with hand or hard objects.
7. Turn off the main power first before replacing the bulb and fuse.
8. To prevent the instrument from falling down to floor, it should be placed on the floor where the inclination angle is less than  $10^{\circ}$  .
9. Turn off the power and cover the instrument with dustproof cover when it is not in use.
10. In case there is any trouble, please first refer to the trouble-shooting guide. If it still can't work, please make contact with the authorized distributor or our repair department.

### ★ THE SAFETY MARKS USED IN THIS INSTRUMENT



**TYPE B**



**ATTENTION**



**TERMINAL OF THE  
PROTECTIVE  
GROUNDING**



**SEPARATE  
COLLECTION**



**UPWARD**



**CAUTION  
PLACE**



**AVIOD DAMP**



**SCALD WARNING**

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# 1 Features and Specifications

## 1.1 Features

MS-115 operating microscope is a double binocular microscope. The main microscope has zoom magnification and the visual angle of eyepiece can be adjusted from  $0^{\circ}$  to  $60^{\circ}$ . The assistant microscope has three-step magnifications and the visual angle of eyepiece is  $45^{\circ}$ , and it can be locked at  $90^{\circ}$  to the left or the right of the main scope.

The illumination system adopts a xenon bulb as main light source and a halogen bulb as backup light source and you can choose the one you need. Xenon light source has the advantage of high brightness, high color index and excellent color restitution. According to the characters of ophthalmic operation, the illumination system is equipped with a group of filters in the form of a rotating disk. The system apply  $-2^{\circ}$   $+6^{\circ}$  coaxial illumination and  $26^{\circ}$  oblique illumination and it can be switched by a knob.

Its adjusting functions include magnifying, focusing, horizontally removing, pitching and inclining in which magnifying, focusing and horizontally removing can be controlled by footswitch.

This instrument must be used in the environment where surrounding temperature varies from  $+5^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ , relative humidity varies from 30% to 75% and atmospheric pressure varies from 700hPa to 1060hPa.

This instrument is available and flexible for hardly difficulty operations, such as ophthalmic operation, neurosurgery and etc..

## 1.2 Specification

### 1. Main microscope

Zoom	$y=1: 6$
Total magnification(main)	$4.6\times\sim 27\times$
Diameter of visual field(mm)	$\Phi 8.5\sim \Phi 46\text{mm}$

### 2. Assistant microscope

Total magnification	$6\times, 10\times, 16\times$
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### 3. Object lens

Focus	$F=200\text{mm}$
Practical working distance	170mm

### 4. Eyepiece

Magnification of eyepiece	$12.5\times/18\text{B}$
The adjustable range of diopter	$\pm 5\text{D}$
The height of eyepiece cover	18mm

### 5. Binocular tube

Visual angle of main scope	$30^{\circ} \sim 90^{\circ}$
Visual angle of assistant scope	$45^{\circ}$

The adjustable range of pupil distance	55mm~75mm
<b>6. Illumination</b>	
Light source	Medical xenon bulb + halogen bulb
Brightness adjustment	1~99, motorized raster
Illumination mode	-2° +6° coaxial illumination
26° Oblique illumination field	26° Oblique illumination ≥Φ45mm
Coaxial illumination maximum intensity	120,000Lx~150,000Lx for xenon not less than 35,000Lx for halogen
Oblique illumination maximum intensity	120,000Lx~150,000Lx for xenon not less than 30,000Lx for halogen
<b>7. Filters</b>	
Integrated filters	UV、 IR
Optional filters	macula lutea protection(black spot) filter, red-free filter, GG435, GG475filter
<b>8. The parameter of position adjustment</b>	
Maximum stretch radius of microscope arm	1230mm
Vertical movement range (from floor to front surface of objective)	880mm~1420mm
Fine focusing distance	≥45mm
Fine focusing speed	≤2mm/s
Moving range of coordinate device	50mm×50mm
Moving speed of coordinate device	≤2mm/s
<b>7. Electric parameter</b>	
Input voltage	AC220V ± 10%/50Hz ± 1Hz AC110V ± 10%/60Hz ± 1Hz
Input power	280VA
Fuse tube	AC250V T4.0A(51S-040H) AC125V T8.0A(51S-080L)
Electrical safety standard	executive standard IEC601-1 Type B, Kind I

## 2 Names and Uses of Parts

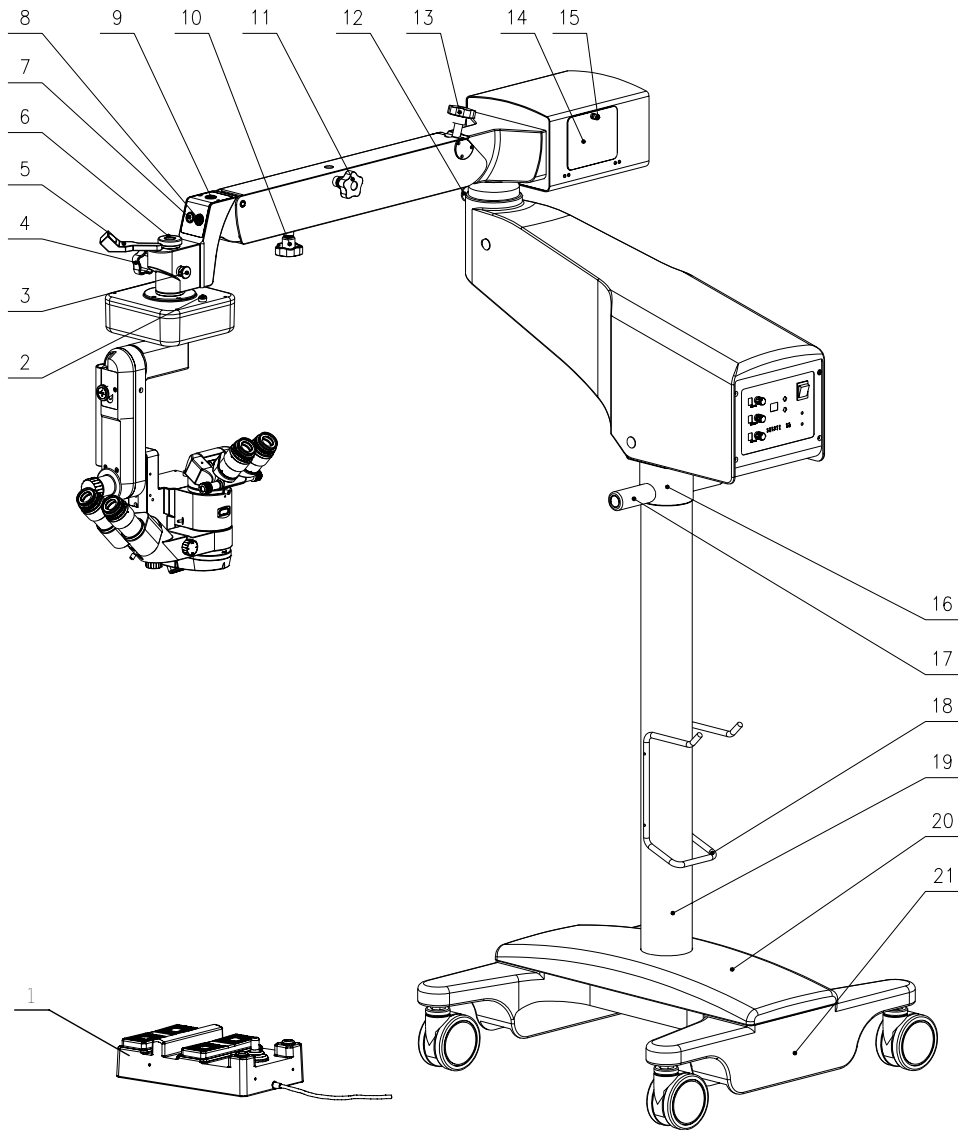


Fig. 1

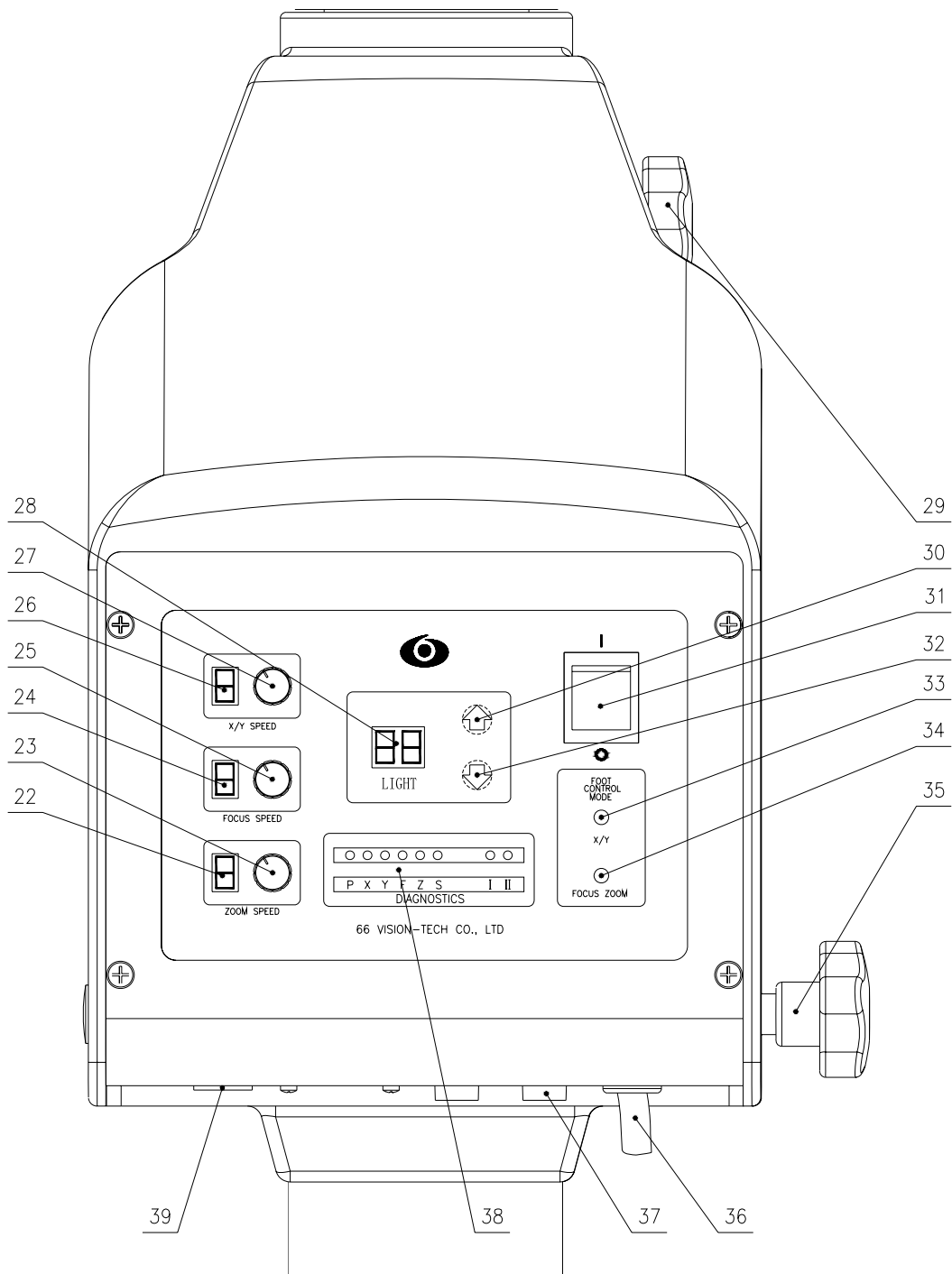


Fig.2

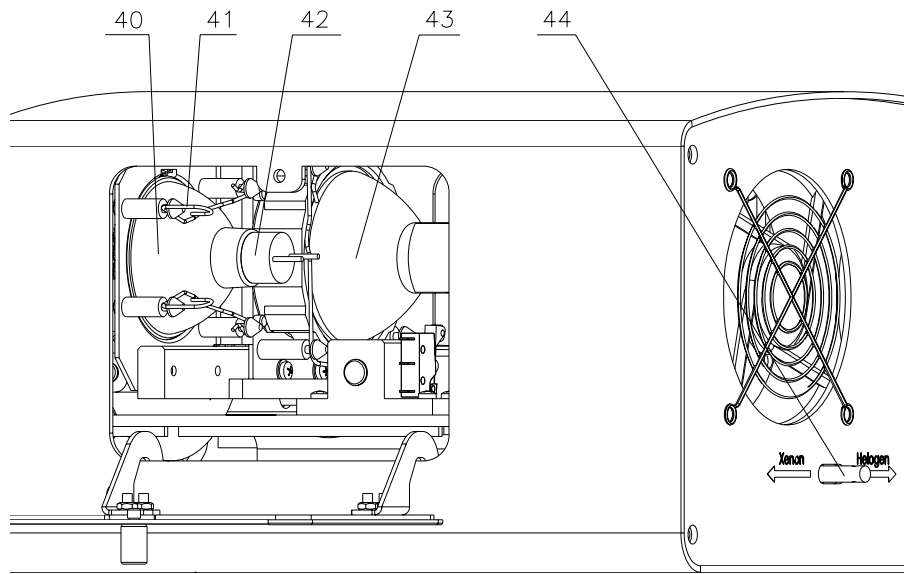


Fig.3

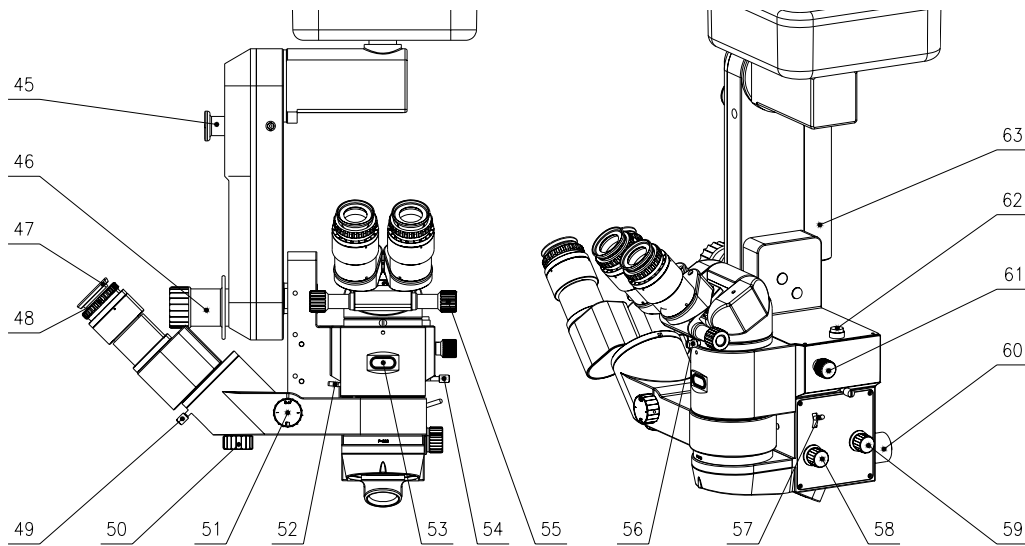


Fig.4

- [1] footswitch

To control magnification, focusing, horizontal movement and illumination switch


- [2] reposition button

Press the button to make the coordinate moving device return back to the center position.

- [3] locking pin

Avoid the microscope falling when assembling and disassembling instrument or when the according screw becomes flexible.



- [4] star locking handwheel (sterile cover)  
To lock the angle between microscope with coordinate device and the suspension axle.
- [5] rotating connector  
Lock the position of fiber optics. The fiber optics is through out of the second arm and pass the rotating connector.
- [6] fixation nut  
Hang the microscope on the second arm using the nut. The nut must be periodically checked even if there is locking pin[3].
- [7] fiber optics
- [8] 7 core plug/socket  
The control line connector for the coordinate device
- [9] 8 core plug/socket  
The control line connector for focusing and magnification
- [10] lower limit knob on the second arm  
Loosen the knob to adjust the microscope position vertically to the lowest position when the second arm is falling.
- [11] star handwheel fixation screw (sterile cover)  
Fasten the knob clockwise to fix the second arm so that the microscope will not move vertically.
- [12] limiting spring pin  
The spring pin limits the revolving angle of the second arm relative to the first arm. The maximum revolving angle is  $270^\circ$ . The spring pin also lock the angle of  $180^\circ$  between the two arms.
- [13] balance adjusting button  
Turn the knob when adding or taking off accessories to re-adjust the vertical moving balance on the second arm.
-  **Attention: Push the second arm to the peak before adjusting the balance knob[13]. At that time the revolving resistance of the balance knob is minimum.**
- [14] door of the lamp house
- [15] knob  
Rotate it to open the side door when replacing of bulb.
- [16] decorative hoop
- [17] removing handle  
Hold the handle with two hands when moving the instrument.
- [18] cable hook  
For coiling and hanging the cable when moving or storing the instrument.
- [19] column
- [20] balance board
- [21] base  
To support and fix the column.

[22] display of magnification speed

The system has zoom magnifications with 5 steps (1-5), Each figure indicate a step.

The greater the figure is, the faster the speed is.

[23] magnification speed adjustment knob

The system has zoom magnifications with 5 steps. Clockwise turn the knob, the speed is up, otherwise the speed is down.

[24] focusing speed displayer

The principle is the same with [22].

[25] focusing speed adjusting knob

The knob can control focusing speed. The principle is the same with [23].

[26] X-Y moving speed displayer

X-Y moving speed has 5 steps (1-5). Greater the figure is, faster the speed is.

[27] X-Y moving speed adjusting knob

To control the speed of the coordinate device moving up X or Y orient. Turn the knob clockwise, the speed is up, otherwise the speed is down.

[28] illumination brightness displayer

The brightness is showed by figure1~99. Greater the figure is, brighter the illumination is.

[29] star handwheel fixation screw (sterile cover)

Turn the screw clockwise to limit to fix the second arm immobile to the first arm.

[30] illuminate brightness increasing button

Press the button to increase brightness.

[31] power switch

[32] illumination brightness decreasing button

Press the button to decrease brightness.

[33] X-Y switch button

The moving direction of X-Y coordinate is reverse if the button light is twinkling by pressing this button down. It means that X+ orient movement become X- orient movement, Y orient movement is the same. The movement will return to be normal by press this button again.

[34] FOCUS/ZOOM switch button

The button has two functions, is switching focusing (exchange of F+ and Z-) and switching magnification (exchange of F- and Z+). The principal is the same with [33].

[35] star handwheel fixation screw (sterile cover)

Turn the screw clockwise to limit to fix the first arm.

[36] power supply wires

[37] fuse tube

[38] working status testing displayer

The testing displayer indicates whether chip system electrical is ok. If there is no problems, the bulb is shining in green, otherwise the bulb is shining in red. There are eight bulbs: "P" 5V power supply, "X" X coordinate of X-Y, "Y" coordinate of X-Y, "F" focus

function, “Z” magnification function, “S” fans, “I” status of halogen, “II” status of xenon.

[39] 7 core footswitch socket

[40] Halogen bulb

[41] spring steel wire

For compact and fix bulbs.

[42] ceramic socket

[43] xenon bulb

[44] switch handle

Stir it to switch bulb. When the normal bulb has troubles, stir the handle to spare bulb to continue the operation.

[45] trig wrench

Lock the arm at angle of  $0^{\circ}$ ,  $30^{\circ}$ ,  $60^{\circ}$ , counter orient  $28^{\circ}$  during assembly or disassembly of arm.

[46] incline switch handle (knob could be pulled out to sterilized)

Turn around the handle to make the light axle incline forward and backward.

[47] eye cover

Used to adjust pupil distance.

[48] diopter adjustment hoop

Turn the hoop around to adjust the eyepiece diopter ranging from  $-5D$  to  $+5D$ .

[49] fixation screw of assistant eyepiece tube

For the fixation of the assistant eyepiece tube. At ordinary times, never loosen the screw to avoid the eyepiece tube falling.

[50] focus inching-adjustment knob (sterile cover)

[51] magnifying knob (sterile cover)

By turning the knob, three magnifications of assistant scope are available:  $6\times$ ,  $10\times$ ,  $16\times$ .

[52] locking pin lever

It is used to make the assistant microscope locked at  $90^{\circ}$  to the left or the right of the main scope. Push the lever, the assistant scope revolving in vertical at angle of  $+90^{\circ}$ . When the assistant scope has return back to the angle of  $90^{\circ}$  to the main scope, locking pin spring to orient socket and lock the assistant scope.

[53] displaying window

[54] roller fixation screw

Used for fixing illumination.

[55] pupil distance adjustment knob (sterile cover)

To adjust pupil distance which can be adjusted continually from 50mm to 70mm.

[56] fixation screw of main body

Used to fix the main eyepiece tube. The screw can't be loosened at ordinary time avoiding the main eyepiece tube falling and being danged.

[57]  $-2^{\circ}$   $+6^{\circ}$  illumination lever (sterile cover)

Push the lever to increase  $-2^\circ$  coaxial illumination.

[58] coaxial illumination/oblique illumination switch button (sterile cover)

[59] filters chosen knob

Use it to choose the hole, GG435, GG475, red-free filter and black spot filter in order.

[60] fiber optics connector

[61] magnification adjustment knob (sterile cover)

Change the magnification by hand.

[62] focusing reposition button

Press the button to make the microscope return back to the original focusing position.

[63] protect pipe

Fiber optics drill in the pipe, which is used for orient and protecting fiber optics.

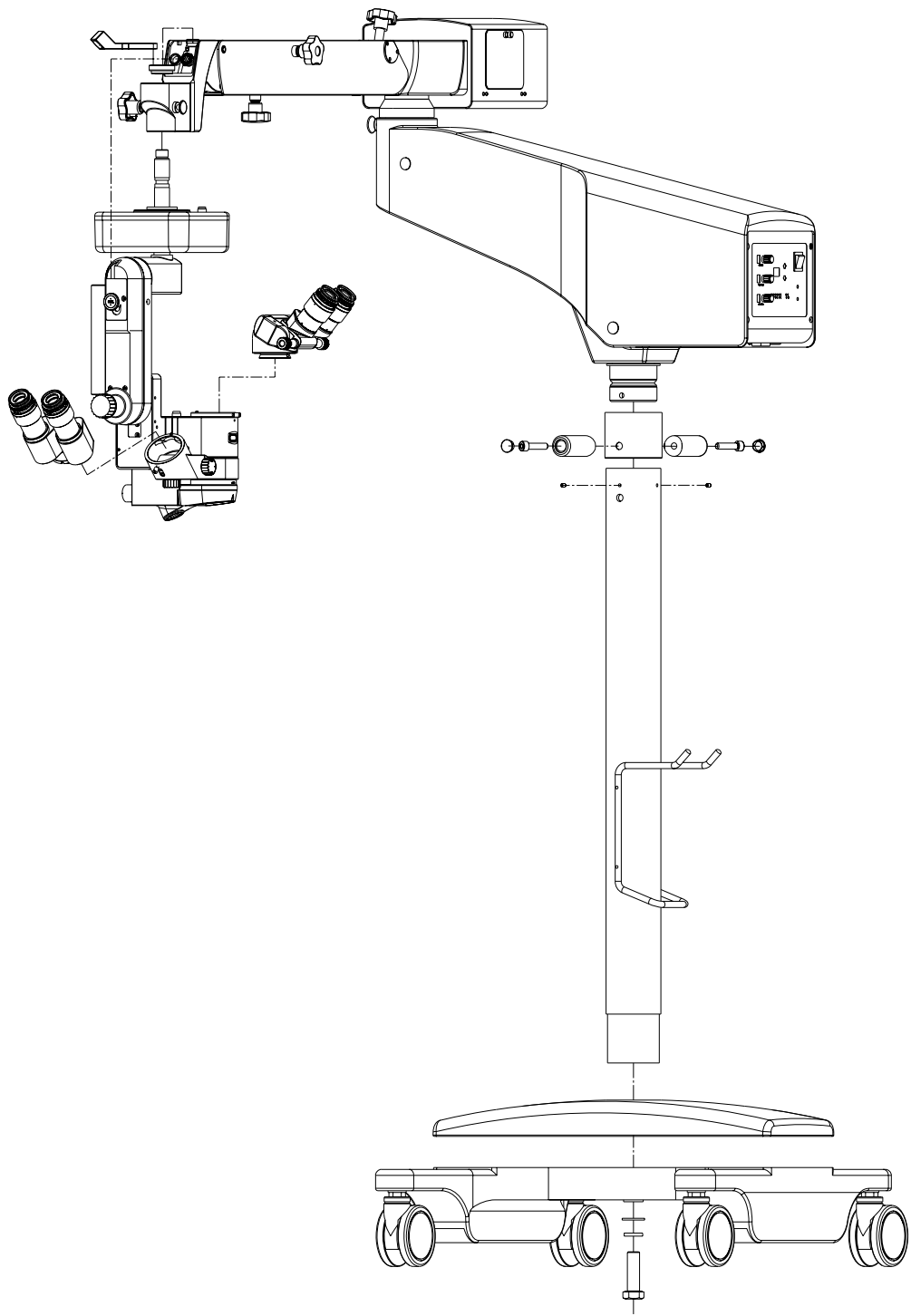


Fig.5

### 3 Assembly

This equipment may be installed either by user self with reference to the manual or by the serviceman sent by the manufacturer or authorized representatives when facing real difficulties.

This equipment is packed in five packages. Please open the package in the direction indicated by the mark on the packages. Take out all the parts and assemble them according to the following procedures:

#### 3.1 Assembly of the base

Take out the base[21] from the package and lay it on the earth. Take out the Balance block[20] and place it gently targeting the two Position Holes. Hands hold at less than 35mm to the edge of the Balance Block. Indicated in Fig. 6.

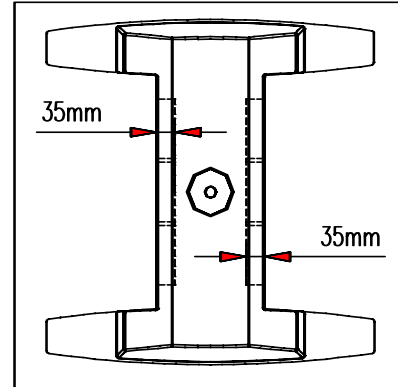


Fig.6



**Attention: At least two persons are required for this job due to the heavy weight of the base. Gentle handling is a must.**

#### 3.2 Assembly of the column to the base

1. Take out the Column[19] from the packing case, and the contact side with the earth should be a foam pad underneath it, in order to prevent its surface painting from damaged. Remove the decorative hoop[16]. Then remove Hexagon screws from the bottom of the column with a plus spanner supplied in the package. Take off the spring washer and flat washer.

2. Insert the column into the Balance Block vertically (Notice that there are two Position Hole of 90° at the bottom of the column), and then rotate the column to the needed direction. Then insert the Hexagon screw together with the spring washer and the flat washer from the beneath into the column (indicated in Fig. 5). Note insert the spring washer first, then the flat washer.

#### 3.3 Assembly of the arm to the column

Take out the plastic cover, the removing handle[17] and the hexagon screws. Set the decorative hoop[16] on the column. Screw off the 4 hexagon cone screws with the 4mm hexagon spanner from the column to make the decorative hoop lower than hole wall. Take out the arm from the packing case and assembly it to the column, and then screw down the 4 hexagon cone screws with the 4mm hexagon spanner. Assembly the decorative hoop, the removing handle, the hexagon screws, and screw down them with the 8mm hexagon spanner, then screw the plastic cover on the top of the column with the removing handle[17](indicated in Fig. 5).



**Attention: During this course the starlike fixation wheel[15] must be inspected to see Whether it is loosen or not. Please rotate the wheel clockwise to fasten it in order to avoid the injury risk.**

### 3.4 Assembly of the microscope main body

1. Loosen the starlike fixation wheel[29] counter clockwise, and then rotate the Second Arm according to the First Arm to the needed angle, then fasten the wheel[29] clockwise.

2. Check out whether the Block in the Axial hole on the top of the Second Arm towers is above the hole. If it towers above, just back the star-like fixation wheel[4] for a few steps, then press down the block with the finger, so that it may not tower above any more.

3. Rotate down the fixation screw[6] from the hanging axis of the X-Y coordinator.

4. Pull the plug at one end of the cord through the axis hole from bottom to top. And then pull out the security pin[3] with one hand, and insert the hanging axis of the coordinator into the axial hole with the other hand at the same time. Then release the security pin, so that the pin may spring into the groove. After that, put the fixation nut on the plug, and rotate it firmly.



**Attention: For the sake of the safety, two persons are required to do this job.**

5. Connect the 7-pin plug[11] with the 7-pin socket[8] of the Second Arm through the control cord of the X-Y coordinator.

6. Connect the 8-pin plug[12] of the holding arm with the 8-pin socket[12] of the Second Arm. Notice that the inner groove of the plug should comply with the direction of the notch of the socket edge during the connection(indicated in Fig. 5).

### 3.5 Assembly of the eyepiece tube

1. Loosen the fixation screw[56] of the microscope main body, and take down the dust-proof cover from the main body.

2. Insert the main eyepiece tube into the microscope main body. During the insertion, the location groove on the bottom of the eyepiece tube must match the location pin of the body, and the assembly surface should be smooth.

3. Fasten the fixation screw[56] of the microscope main body, then fix the eyepiece.

4. It's the same as the above 3 items when assembling the assistant microscope. The fixation screw should be fastened till the hands cannot move it(indicated in Fig. 5).

### 3.6 Adjust the dynamic balance of the second arm

After the above assembly, the dynamic balance of the second arm should be adjusted. First hold the bottom of the X-Y coordinator, then loosen the star-like fixation wheel[11]. When the arm is loosened and could move up and down, push the Second Arm to the utmost peak. Now the resistance against the rotation adjustment of the balance adjustment knob[13] is the smallest.

First, rotate the balance adjustment knob[13] counter clockwise (to increase the resistance). Deploy the Second Arm horizontally, and drag the microscope up and down, and then compare the resistance between upwards moving and downwards moving. If the resistance of upwards moving is bigger, continue rotating the balance adjustment knob[13] counter clockwise. If the resistance of downwards moving is bigger, then rotate the balance adjustment knob[13] clockwise. Do this repeatedly till the resistances of upwards moving and downwards moving are

almost equivalent. Then the second arm may stay steadily in any position of  $\pm 20^\circ$  relative to horizontal line.



**Attention: every time before adjusting the balance adjustment knob[16], the Second Arm should be pushed to the utmost peak in order to decrease the resistance against the rotation adjustment of the balance adjustment knob[16].**

After finishing the assembly, put through the power and check each operation function of the machine according to the user manual. If the machine cannot work normally, please first overhaul it according to 6.3 Trouble Shooting. If it still cannot work, please contact our after-sales service department.

### **3.7 Assembly of the fiber optics**

1. Insert the rotation connector[5] into the hole above the top of the arm.
2. Insert the fiber optics into the hole of the rotation connector[5], then pull it through the protection tube[63] behind the inclination arm, then plug the fiber optics[7] into the hole[60] of the illuminator(indicated in Fig. 5).

### **3.8 Assembly of the CCD camera**

The CCD camera of this instrument is an optional accessory. If you have ordered this CCD camera device when buying the microscope, you can fix it according to the following procedures.

1. First check the packing case for the CCD device, and it includes the spare parts and tools(indicated in chapter. 9).
2. Loosen the fixation screw[56] of the main eyepiece tube, and take down the main eyepiece tube.
3. Assemble the beam splitter to the microscope main body.
4. Select the right side or the left side of the main scope as the assembly position for the CCD camera just according to the actual requirements. Rotate down the dust-proof slipcover and place it appropriately.
5. Take out the CCD adapter from the package, and insert it into the beam outlet hole according to the direction displayed in the figure, then rotate the screw flange firmly.
6. Rotate down the original camera lens and screw flange of the CCD camera, and place them appropriately. Insert the connector for the camera head into the assembly position and fasten it.
7. Insert the camera head with the connector into the CCD adapter. Please make sure that the groove of the assembly surface of the connector must target the location pin of the camera head. List the nut and fasten it, then rotate the flange of the camera head.
8. Connect the red wire of the nude end of DC-12V with the positive terminal of the power supply of the CCD camera with a Philips screwdriver, and the black wire with the negative terminal. Connect the cord plug with the defined power supply. (Whether this procedure is needed or not depends on the CCD camera selected.)
9. Rotate the video wire connector around the signal output port of the CCD camera. Plug



one end of the 75  $\Omega$  video wire into the video wire connector, and the other end into the monitor or the Video Import of a video recorder. Turn the power on after the entire configuration has been correctly set. Watch the image on the monitor screen and note the direction of the image. If the image is reversed, just dismantle the CCD camera and mount it again after rotating for 180° .

10. Finally fit the eyepiece to the beam splitter (indicated in Fig. 7).

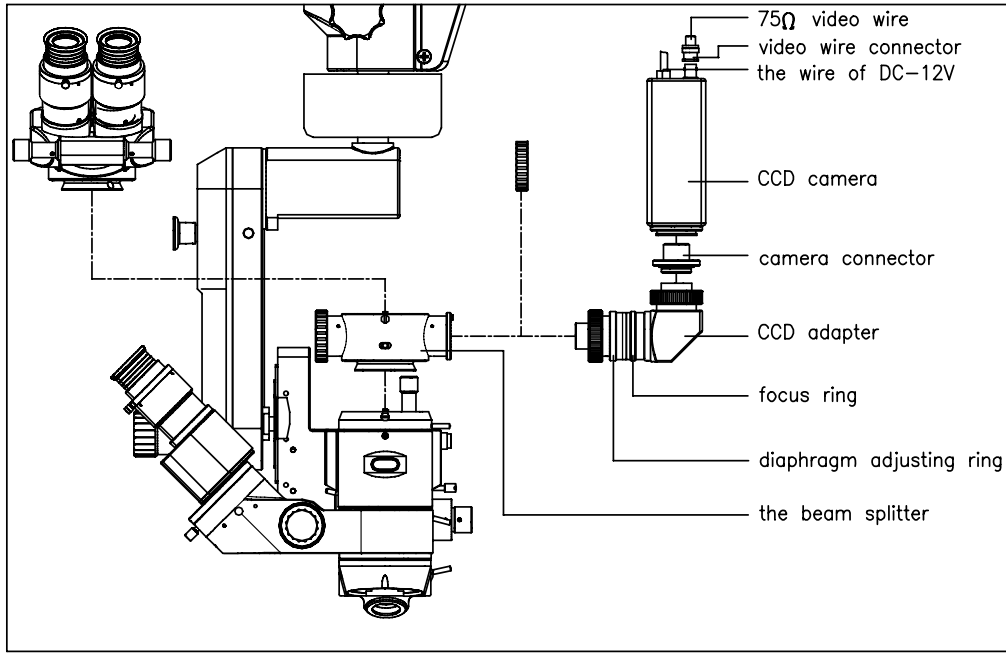


Fig.7



**Attention: The dynamic balance of the Second Arm must be adjusted after the above assemblies.**

## 4 Preparation before Using the Instrument

1. Check whether the local power voltage and frequency match the one the instrument. If not, don't start this instrument.



**Attention: Please make sure that the input voltage/frequency of this instrument is complied with the local power voltage/frequency.**

2. Check the grounding and make sure that the instrument is earthed well.

3. This instrument is equipped with a 3-pin power cable, and please select a suitable socket to match it.



**Attention: Please use the special cable, or that complies with IEC227 standard to ensure the instrument's well grounding.**

4. The power switch [31] on the blue plate has two statuses. If the power is put through, it gives out green light; if the power is cut down, the switch may not give out light. Make sure the power switch is cut down before the power line connects to the electrical outlet.

5. Close the doors on the both sides of the lamp house in position, and insure that halogen bulb/xenon bulb is in working place.

6. Insert the plug of the instrument into the local socket.

7. Turn on the power switch, and the switch may give out green light. Watch the illumination light of the instrument to confirm that the instrument illuminates normally.

8. The switch on the blue plate should be turned off after the above check. Extract the plug and cover the instrument with the dust-proof slipcover.

## 5 Use of the Instrument

### 5.1 Use of the foot control switch

Foot control switch indicated in Fig. 8

1. Open the bottom door by the bottom door handle [39], and connect the plug of the foot switch with the 7 core footswitch socket. Notice that the notch of the plug should comply with the protuberant direction inside the socket. Then put through the power and turn on the switch [31], then the instrument could be normally used.

2. When fine focusing, step down the focusing switches on the up side of the foot switch's crossbeam. Step down the left focusing switch, and the microscope may move upwards; step down the right one, and the microscope may move downwards.

3. When changing magnification of the microscope, step down the magnification switches on the down side of the foot switch's crossbeam. Step down the left magnification switch, and the magnification may increase; step down the right magnification switch, and the magnification may decrease.

4. During the operation, if it needs to change the operation position so that it could be seen through the microscope, just adjust the X-Y coordinator's horizontal position. Manipulate the Direction stick on the foot switch with the foot, and the microscope's vision field may move relatively according to the Stick's forward, backward, right, left forward, right forward, left backward, right backward movements. The directions of vision field movement and Stick's movement are the same.

5. The antennas on the two sides of the front of the foot switch are used to control the brightness of illumination. The brightness of illumination will plus 5 grades when step the left antennas once, while it will subtract 5 grades when step the right one.

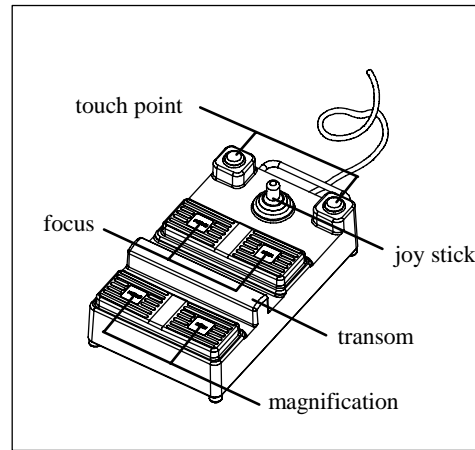


Fig.8

### 5.2 Setting and adjustment before using

1. Adjusting the balance of the 2nd arm. Unscrew the star handwheel fixation screw [11] on the arm. If the Arm may rebound upwards, then rotate the balance adjustment knob[13] clockwise to increase the upward resistance. If the Arm descends, then rotate the balance adjustment knob[13] counter clockwise to increase the downwards to resistance until the upwards

resistance and downwards on are almost equivalent. After finishing the balance adjustment of the Second Arm, the microscope could stay steadily at any rough focusing position within  $\pm 20^\circ$  relating to the horizontal line.

2. According to the height of the operation surface and the operation needs, the lowest position of the microscope's vertical movement could be adjusted to prevent the microscope from unexpected falling and causing medical accident. When adjusting, just loosen the lower-limit fixation wheel[11] of the Second Arm, and rotate the wheel counter clockwise, then adjust the microscope to the needed position, and finally fasten the wheel clockwise.

3. Put through the power, and check whether the bulb has been burned out.



**Attention: The invalid bulb must be replaced before operation to ensure the later operation may go on smoothly.**

4. All the sterile cover must be sterilized before use.

5. Confirm the angle of the holding arm for the microscope. The holding arm could be adjusted at  $30^\circ$ ,  $60^\circ$ ,  $28^\circ$ . When it's set to  $30^\circ$  or  $60^\circ$ , there may be great space above the microscope, and it's suitable to assemble other attachments. When it's set to  $28^\circ$ , and if the X-Y coordinator resets to the center, then the main microscope may be coaxial with the X-Y hanging shaft. When adjusting, pull out the spanner[45] and push downwards to depart the fixation block, and then rotate the holding arm till the needed angle, then the fixation block will rebound to the groove automatically(indicated in Fig. 9).

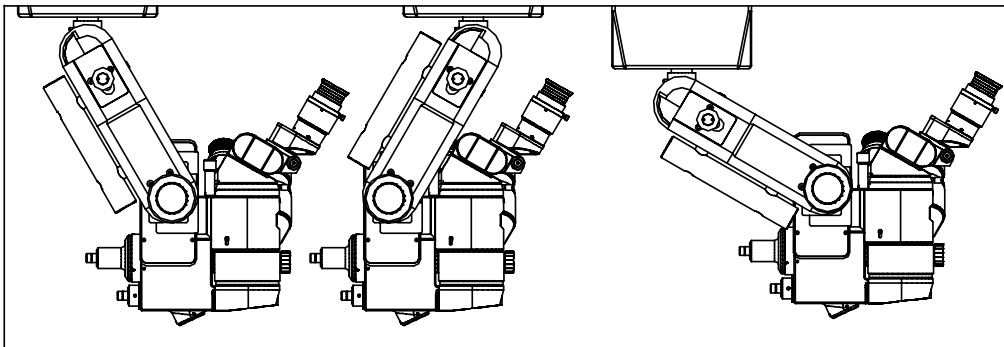


Fig.9

6. Set the position of the assistant scope. The assistant scope can be placed either at the left side or right side of the main microscope. If you want to change the position of the assistant scope, first press the locking pin lever [52] downwards, then rotate the assistant scope. Release the locking pin lever after the assistant scope moves a small angle and continues to rotate the assistant scope until the locking pin clicks into the locating.

### 5.3 Adjustment during using

1. Move the instrument to a proper place. Stamp the two brakes to avoid possible slipping.

2. Place the footswitch [1] to a proper place.

3. Insert the power plug on the panel of column into the power socket, then turn on the power switch[31].

4. Press the reposition button [2] on the coordinate device and the reposition button [62] on the focusing device making the adjustment be original position.

5. Loosen the star fixation screws [4], [29], [35] and star locking handwheel [11], then hold the second arm to control microscope to make the operation position be in the center of the light spot. Adjust the illuminate brightness increasing button[30] and the illumination brightness decreasing button[32] to get the suited brightness. The image will be clear with 10× magnification.

6. Adjust the eye-cover [47] height. Before adjusting the diopter, first adjust the eye-cover height which should be decided by doctor's requirement. If the doctor does operation with glasses, the eye-cover should be rolled down, otherwise, rolled up. The eye-cover height is right when doctor could observe the fringe of visual field while his eyepits don't touch the eye-cover. There are four hoops marks showing the eye-cover height. If doctor remembers the adjusted position, he could turn the knob to the mark directly.

7. Adjust the diopter. The eyepiece diopter must be adjusted so that the image is clear both through the main and assistant microscope. If the doctor's diopter is 1D, adjust the diopter to the mark "1D". The adjustable arrange is  $\pm 5D$ . Turn the diopter adjustment hoop [48] to the white mark agreeing with the doctor's diopter. If the doctor does the operation with glasses, he could adjust the diopter to the mark "0" because the glasses have calibrated his diopter. If the assistance still feels the image not clear, please adjust the fine focus knob of assistant scope[50] to get the clear image.

8. Adjust the pupil distance. While adjusting the pupil distance of main microscope, turn the pupil distance adjustment knob[55] until you can observe correctly and posses the stereoscopic vision. While adjusting the pupil distance of assistant microscope, hold the assistant eyepiece tube and pull it. If the figure of doctor's pupil distance has been known, adjust the pupil distance to the figure directly.



**Attention: All above should be done before sterilization.**

9. Drag the microscope away from the operate surface, and then equip the sterile covers at the following parts: star handwheel fixation screw[4] [10] [11] [29] [35] incline switch handle[46] focus inching-adjustment knob[50] magnification knob of assistance microscope[51] pupil distance adjustment knob[55] 0° illumination lever[57] coaxial illumination/oblique illumination switch button[58] black dot lever[59] magnification adjustment knob[61]



**Attention: Cover the microscope lens with one-off covers according to the doctor's request. Then tow the microscope to make the operation position be at the center of light spot.**

10. Adjust rough focusing before fine focusing which is controlled by footswitch.

11. Choose the appropriate filter according to the requirement of the operation

There are four filters in the illumination body including GG435, GG475, red-free filter and black spot filter. You can choose anyone of them thought the knob[59] or don't choose anyone of them.

GG435: weaken the energy of the short wave light to prevent cornea trauma

GG475: impair the energy of blue light and the reflex light from cornea to enhance the ability of distinguishing the detail organization and avoid cornea trauma

red-free filter: get rid of the red light above 580nm to reduce the affect of imaging brought by large red area when bleeding.

black spot filter: a black dot appears in the center of light spot to keep from parts of light coming into pupil to protect retina from being burned by strong light.

12. During operation, in order to get the best infrared reflex and clearly observe the cortex remains on the crystal rear part, push the 6° illumination lever down to make-2° +6° coaxial illumination. At that time, the illumination could lead to the best infrared reflex illumination.

13. During operation, select illumination types by using switch button[58]. Coaxial or incline illumination can be adopted.

14. During operation, inclining the main microscope forward or backward at a certain angle is needed; turn the incline switch handle [46]. Counter clockwise turning the handle means inclining forward, otherwise, backward.



**Attention: In case of one of the bulbs are burned off in operation, stir the stir handle[44] to change the spare bulbs to working place, so that assure the continua of operation.**

## 5.4 Removing and storing after using

1. Make the microscope be in the nearest place from column. Fasten every star fixation screw to make stretch arm and microscope not possibly move.

2. Pull out the power plug and wind the power line round the cable hook [18].

3. Place the footswitch [1] flatly on the balance board[20]. (Fig.10)

4. Before moving, release the brake to make the four wheels is rotated.

5. While moving the instrument, hold the movement handles[17] and make the instrument move slowly and carefully to avoid falling and bumping.

6. Take off all sterile covers and handles to be sterilized for next use.

7. Replace the burned bulb for next use (See 6.1.1).

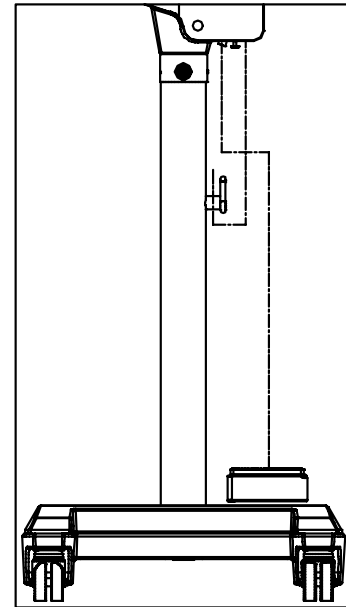


Fig.10

## 6 Maintenance

### 6.1 Replacement of brittle



**Attention: The waste products are dealt as general dust.**

### 6.1.1 Replacement of spare bulb

1. Replacement of bulb during operation. Stir the stir handle[44], and switch to spare bulb and make sure the continua of operation.

2. Replacement of bulb after operation. Open the side door of the lamp house by the knob [15]. Take out of the halogen bulb after releasing the spring through the method showed in fig. 11, and pull out clay socket[44]. Then replace the new bulb by the contrary steps. (Fig 11). The replacement of xenon bulb is similar.



**Attention: Use the special bulbs for this instrument. Every bulb has its rated life, the capability of the bulb will be reduced when the using time excess the rated life. Please replace the overused bulb with an appointed one in time or there will be risk of safety.**

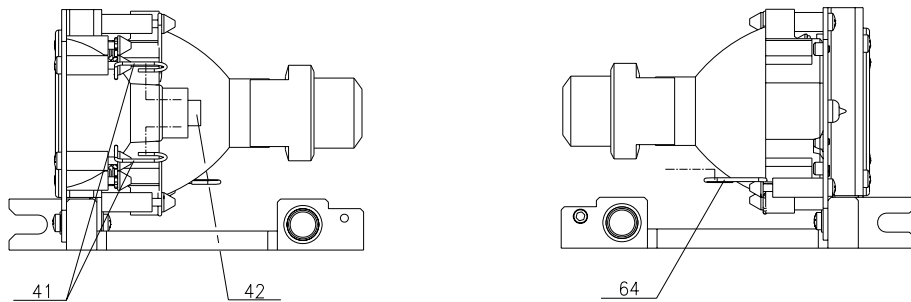


Fig. 11

### 6.1.2 Replacement of fuse tube

Please use the fuses witch have the same type, specification and rating.



**Attention: For the sake of safety, turn off the power switch and pull out the power input line before replacing fuses.**

## 6.2 Cleaning

We suggest the cleaning-period be once three months or according to requirement.

1. After the instrument had been examined and up to standard, the instrument must be maintained carefully. Unskilled or unqualified users who are not familiar with the structure and function of the instrument should not disassemble it. Otherwise the instrument may be damaged and the quality will not be assured.

2. The instrument should not be placed in a dusty, moist or corrosive environment.

3. Every lens should not be disassembled. If there are dusts stained on the lens, blow them with a globe or wipe off them with a dust pen. Creasy or water stains can be cleaned with lens cleaning-paper or liquid solvent (1:1 mixture of alcohol and ether). Be careful to prevent the solvent from infiltrating the edges of lens.

4. The temporarily needless accessories should be disassembled and put in a closet box packed with moisture-absorber.

### 6.3 General guide of removing trouble

If there are some troubles, check it up according to the table followed. If it can not help you, you may contact with our service department.

Phenomena of faults	Probable reason	Guide of removing
The bulb doesn't take effect	The connection between power lines is not good	Re-connect the power lines
	Don't adjust the illumination adjustment knob after turning on the power switch	Adjust the illumination adjustment knob
	The plug and the socket of bulb are not well connected	Take off the bulb. Shave the oxide layer and reassemble the bulb. Fasten the fixation screw on plug pin.
	The bulb has been turned off (input voltage exceeds rating)	Replacement of the bulb (input voltage level off to 230V)
	The fuse tube has been melted	Replacement of the fuse tube
Light spot is too dim or not even	Fiber optics was not inserted to the root	Insert the fiber optics to its root
The main microscope and the assistant's have not the same focus	The diopter was not adjusted	Adjust the diopter of the main microscope and the assistant's or the focus inching-adjustment knob[65].
The footswitch doesn't take effect	The plug on footswitch and the socket on column are not good connected or the two groups of connecting parts on the second arm are not good connected	Re-connect them
The second arm is obstructed when making movement downwards	Limited by limiting slide board	Re-adjust the low limit handle
Bulb in window is lighted in red while diagnosing	Power supply of corresponding chip has trouble	Contact with us
The signal light "I" and "II" is on or off at the same time	When both of them are off	Check whether the side door of light housing is close in position and whether the lamp switch bar move to limited place

	When both of them are on	Try to restart the instrument, if the problem is still exist, please make contact with our service department
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## 6.4 Ordering the brittle

Name	Specification	Recommended type&producer
Cold-reflex Halogen lamp	AC12V/100W	HLX64627(OSRAM)
Xenon lamp	DC7.2A/100W	XBO R 100W/45C(OSRAM)
Fuse tubes	AC250V 4.0A	AC250V T4.0A(51S-040H)
	AC125V 8.0A	AC125V T8.0A(51S-080L)

## 7 Responsibility

According to users' requires for service, we can provide the circuit diagram and the list of the electric element, etc.

If you need some correlative datum, respective service or you have questions, please contact with us or the dealer authorized.

## 8 Transport and storing

During transportation, the relative humidity varies from 10% to80%, surrounding temperature varies from -40°C to +50°C and atmospheric pressure varies from 500hPa to 1060hPa, dampproof, no conversion, no great shakings.

This instrument should be reserved in the room where relative humidity varies from 10% to80%, surrounding temperature varies from -40°C to +50°C and atmospheric pressure various from 500hPa to 1060hPa, no caustic gas and drafty.

Fasten all moveable parts during shot-distance moving and the instrument cannot be inclined exceeding 10°(see 5.4). If long-distance movement is needed, please move it after re-packing.

If the reservation duration has been over 5 years, please contact with us or the dealer authorized.

Rejection of the instrument should be dealt with according to environments protecting law. Please don't pollute environments.

## 9 Spare accessories and tools

1	cold reflexation halogen bulbs(12V100W)	1pcs
2	sterile covers for fixation handwheel	5pcs
3	sterile covers for pupil distance adjustment knob	2pcs
4	sterile covers for magnification knob of assistant microscope	2pcs
5	sterile covers for focus inching-adjustment knob	1pc
6	sterile cover for magnifying knob	1pc

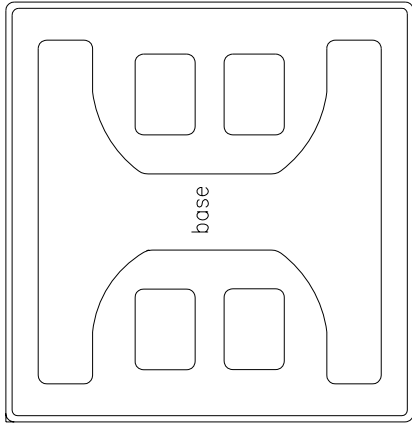




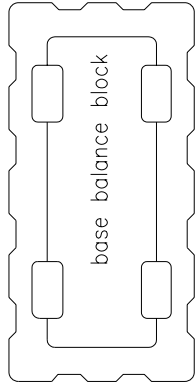




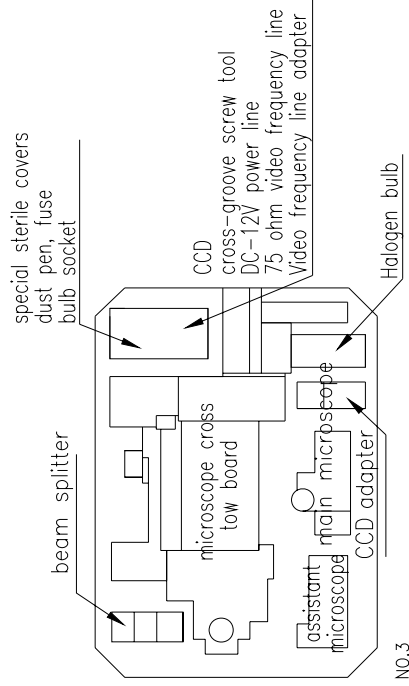
# SOM2000Dx OPERATION MICROSCOPE ENGAGEMENT LIST PLANE SKETCH MAP



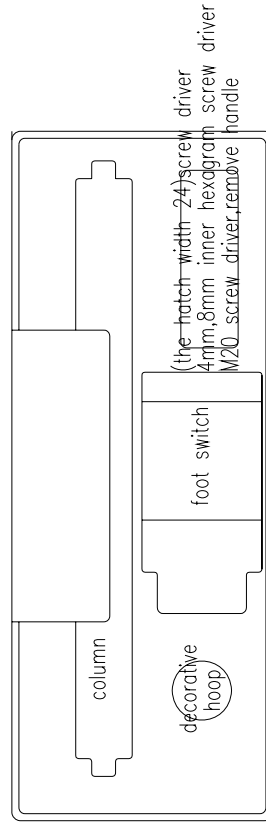
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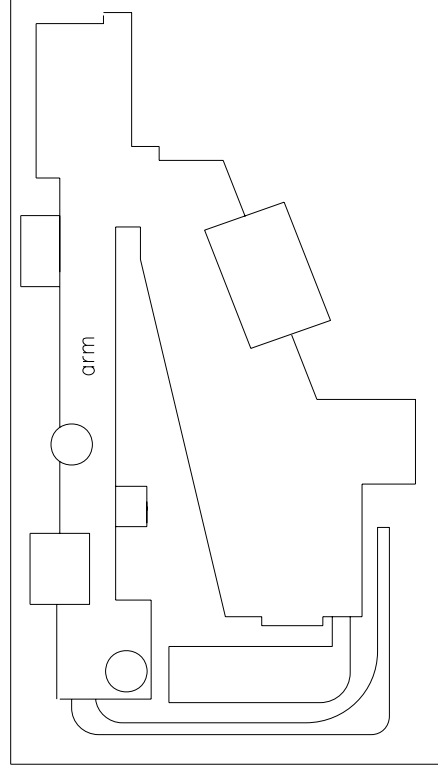
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NO.5