Biological Microscope Instructions

This manual is written for biological microscope. For safety, exerting best performance of the instrument, and making you familiar with the instrument entirely, we strongly recommended that you carefully read this manual before using the microscope.

Symbols used in this instruction

Although this product is designed to provide you with utmost safety during use, incorrect usage or disregard of the instructions may cause personal injury or property damage. For your own safety, read the instruction manual carefully and thoroughly before using the product. Do not discard this manual. Always keep it near the product for easy reference.

Inside the instruction manual, safety instructions are indicated with symbols below. Be sure to follow the instruction marked with these symbols for your safety.

	Symbol	Meaning
\triangle	Warning	Disregarding instruction marked with this symbol may lead to serious injury or even death.
\triangle	Caution	Disregarding instructions marked with this symbol may lead to injury or property damage.

Symbols labeled on the product

Symbol	Meaning	
(Protective conductor Terminal.	
<u> </u>	Caution! Hot surface The lamp and its surroundings become hot during use. Do not touch them while the lamp is on and for thirty minutes after the lamp is turn off. The lamp and its surroundings remain hot even after the lamp is turned off. Make sure that they are sufficiently cool before replacing the lamp.	
\triangle	The symbol is indicated on the nameplate. Confirm that the input voltage indications correspond to the voltage provided in your region.	
_	Turn on the power switch. Revolve the brightness knob to adjust the brightness of the field of view.	
0	Turn off the power switch	

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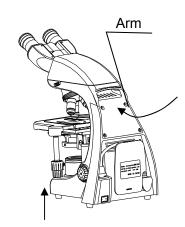
Safety precautions

1. Carrying the microscope

This microscope is a precision instrument. Handle it gently. Avoid subjecting it to sudden impacts and shocks. Strong shocks and forcible sliding for the microscope could degrade image precision.

- 1). When carrying the microscope, hold it at its arm with both hands.
- Do not hold the focus knobs, the eyepiece tube, or the stage. These parts could easily come off and could result in malfunctions.

Note: do not let things like specimen and filters fall.



1. Working environment

the microscope is a precision instrument. Improper operation or storage could damage the instrument or degrade image precision. The product must be operated in the following conditions:

- 1) Keep the microscope from direct sunshine.
- 2)Temperature:0 to +40 °C;Maximum humidity:85% (no condensation)

Altitude: less than 2000m

Pollution degree: 2

Over-voltage: II

- 3) Place the instrument on a stable and firm horizontal plane, or any vibration and shock will degrade precision.
- 4) Keep it in a drafty room and use a dustcover when the microscope is not in use.
- 5) Keep the microscope free of moisture and foreign matter
- 6) Keep the microscope fee of moisture to prevent short circuiting that could result in overheating or other malfunctions. If water splashes on the microscope, immediately turn off the power switch and unplug the power cord. Then, wipe off the water with a dry cloth. Short circuiting can also result when foreign matter is trapped inside the microscope. if foreign matter or water has entered the microscope, do not use the microscope and contact with our company.

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2. Focus knobs

Do not turn the right and left focus knobs simultaneously in opposite directions. Do not turn the coarse focus knob any further after the stage has been moved up or down to its limit. This operation will damage the focusing mechanism.



Do not turn the knobs in opposite directions

3. Never dissemble the microscope

Except those mentioned in the instruction manual, do not dissemble the microscope. Disassembly could degrade the performance, cause electrical shock or personal injury or damage the instrument. If you have any problem, contact with us.

4. Check the input voltage

The input voltage is indicated on nameplate at the back of microscope. Confirm that these input voltage indication corresponds to the voltage provided in your region. The use of microscope with the different input voltage will cause over current and over heating, which may result in fire or severe damage to microscope.



5. Use the specified LED lamp, fuse and power cord

The led lamp and fuse has been installed properly before leaving factory. Use the specified LED lamp, fuse and power cord for replacement if needed. Using an incorrect led lamp, fuse or power cord may damage the instrument or cause a fire. Do use the earthed power cord (PE) for extended cord.

Specified LED lamp:1 W

- Specified fuse: T1AL250V, 5×20 miniature fuses
 - * For safety, the machine is equipped with three-legged ground plugs to give protective grounding, if you have no such socket, please install it. Do not use any other adapter plugs and reducing security performance.

6. Turn off power switch before assembling the microscope, replacing the lamp or fuse and plugging in or unplugging the power cord.

Turn off the power switch before you plug or unplug the power cord to prevent electrical shock or fire. Also turn off the power switch and then unplug the power cord before assembling the microscope and before changing the lamp or fuse.

7. Oil-immersion observation

Use only a minimum quantity of oil. If too much oil is applied, surplus oil could flow out to the stage and the condenser which could lead to degraded performance.

WARNING!

When using petroleum benzene or absolute alcohol to wipe off immersion oil or to clean the lenses, follow the instructions provided by their manufactures. Absolute alcohol and petroleum benzene are inflammable. Take great care when handling them.

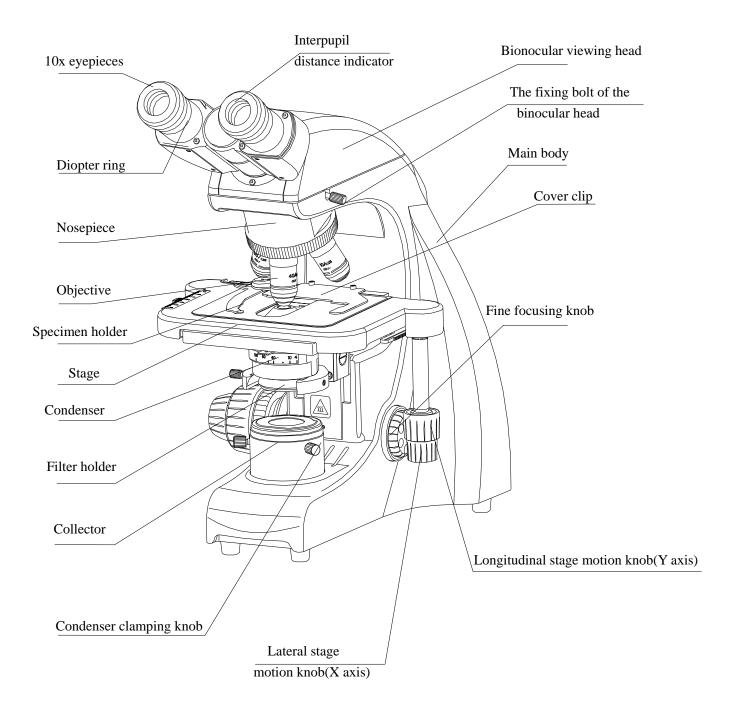
8. Storage

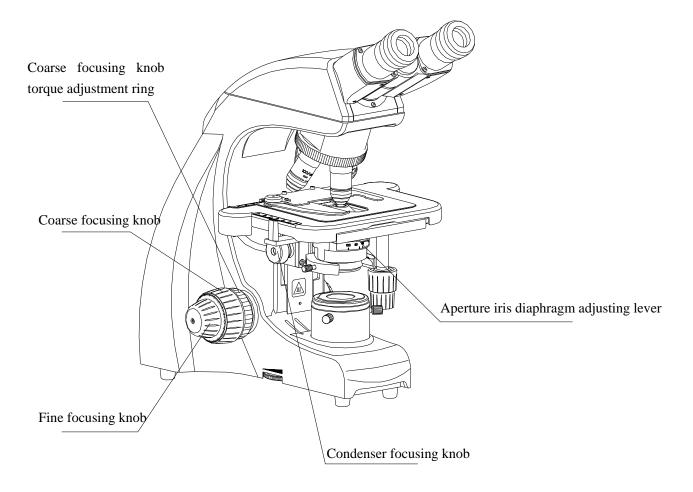
Storage the microscope in a dry, well-ventilated and clean room. The storage time is less than 6 months.

Note:

The equipment you purchase does not necessarily contain some of the products mentioned in the brochure.

I . Nomenclature of Each Part





$\boldsymbol{\mathrm{II}}$. Application

Biological microscope BM series are the dedicated microscope

for biological and medical areas, applied in the field of microscopic measurement, health agencies, laboratories, research institutes and universities and other units for biology, pathology, bacterial observation, education and professional studies, clinical trials and routine medical examination. The advanced and unique product design, using a variety of structure and technology, make the instrument easy to use, safe and reliable.

Ⅲ. Specifications

Optical system: 160mm/∞
 Illumination: S LED (1W)

Input voltage: 110~240V 50/60H

Voltage fluctuation: ± 10%

Fuse rating:T1AL250V , 5×20 miniature fusex2

3. Focusing Mechanism:

Fine focus knob graduation: 2 um/graduation

Fine focus knob travel: 0.2mm up or down/revolution

4. Stage:

Stroke: X axis: 75mm, Y axis: 54mm

X axis: 78mm, Y axis: 56mm

5. Revolving Nosepiece:4-hole fixed type

6. Condenser: abbe condenser NA1.25 with iris diaphragm

Inserting /lever/push-in/revolving type

7. binocular head: interpupil distance:55~75mm

8. Temperature: $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$

Relative humidity:85% max. no condensation should form.

Altitude:2000m max Pollution: degree 2

Overvoltage category: category 2

2. Optical parameter

1) Objective

a. achromatic objective

Objective	Aperture(N.A)	Cover slip	Working	type
magnification		thickness(mm)	distance	
4x	0.1	0.17	26.9	dry
10x	0.25	0.17	6.4	dry
40x	0.65	0.17	0.6	dry
100x	1.25	0.17	0.098	oil

b. infinite achromatic objective

Objective	Aperture(N.A)	Cover slip	Working	type
magnification		thickness(mm)	distance	
4x	0.1	0.17	25	dry
10x	0.25	0.17	5.6	dry
40x	0.65	0.17	0.6	dry
100x	1.25	0.17	0.14	oil

Microscope terminology

(1) Total magnification

The total magnification of a microscope is the individual magnifying power of the objective multiplied by that of the eyepiece.

(2) numerical aperture(N.A.)

the numerical aperture is an important factor in determining the efficiency of the condenser and objective. It is represented by the formula:

N.A.=
$$n \times \sin \alpha$$

Where n is the refractive index of the medium (air,immersion oil,etc.)between the objectives and the specimen or condenser. and α is half of the maximum angle at which light enters or leaves the lens from or to a focused object point on the optical axis.

The larger the numerical aperture the brighter the image and the higher the resolution.

(3) resolving power

the ability of an optical system to discriminate between two discrete objects separated by a minute distance. The more minute the distance, the higher the resolving power of the optical system. In relation to the numerical aperture, the resolving power is represented by the following formula:

resolving power= $\lambda / (2 \times N.A.)$

where λ is the used wavelength of light.(the resolving power in the above table is indicated for λ =0.55 um)

(4) working distance(W.D.)

the clearance between the front of the objective and the upper surface of the cover glass, when a specimen image is sharply focused generally, the higher the magnifying power of the objective, the shorter the working distance.

(5) field number of the eyepiece

the diameter of the opening of the field stop inside the eyepiece measured in mm.when an eyepiece has an indicating of "10x/18",it means that the magnification is 10x and the field number is 18 for that eyepiece.

(6) real viewfield

the diameter in mm of the field of view observable through the eyepiece. Real viewfield=field number of eyepiece/magnification of objective

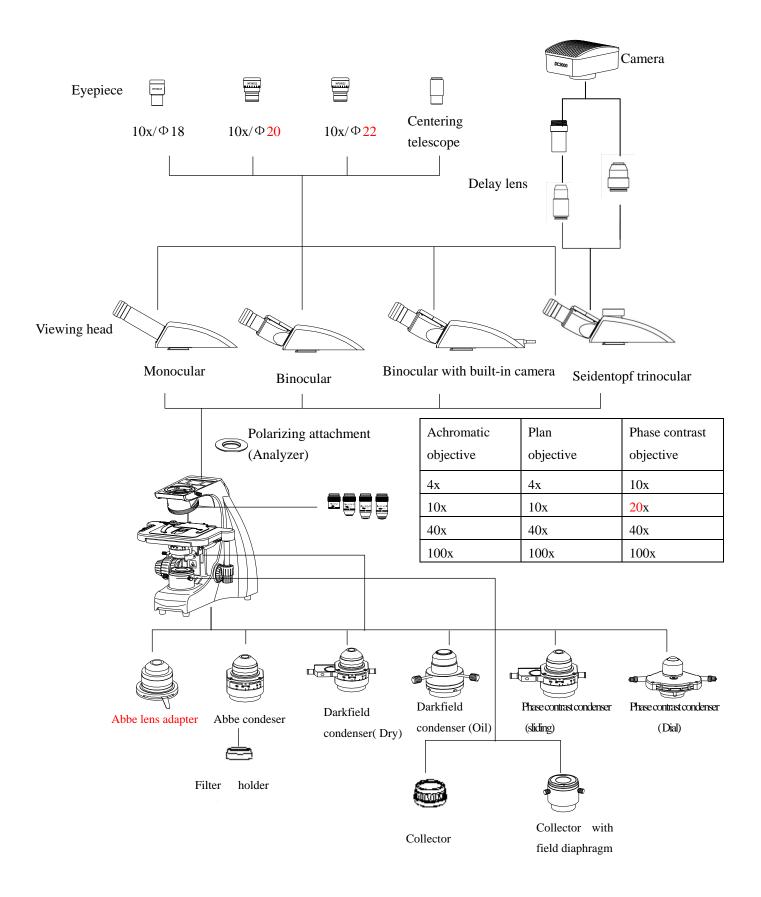
(7) depth of focus

the depth(thickness)of the specimen image in focus, extending above and below the focused image plane. the larger the N.A. of the objective, the shallower the depth of focus.

Depth of focus(um)=

Chromatic objective

${\rm IV}.$ Configurations



V. Assembly

Before assembly, please read safety precautions thoroughly, and do the assembling in the following sequence.

1. Check the input voltage

The input voltage is indicated on nameplate at the back of microscope. Confirm that these input voltage indication corresponds to the voltage provided in your region. The use of microscope with the different input voltage will cause over current and over heating, which may

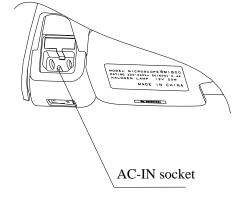
result in fire or severe damage to microscope.

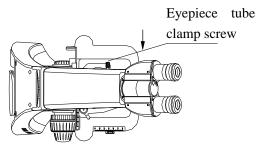
Turn off the power switch (set the switch to "o" state). Connect one end (socket) of the provided power cord into the AC-IN socket at the back of microscope and the AC-IN socket at the back of microscope and plug the other end (plug) into the AC line receptacle with the ground conductor, make sure the power cord is connected securely.

- Please use the provided power cord.
- If an extension cord is used, use only a cord that includes a protective earth (PE) wire.
- Place the microscope in a place where AC line receptacle can be reached nearby.



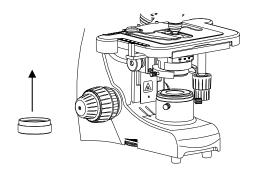
Loosen the eyepiece tube clamp screw by hand and install the eyepiece tube on the dovetail mount. Tighten up the screw.





3. Attaching the blue filter

Remove the filter holder from the bottom of the condenser, put the blue filter in the holder and return the holder to the condenser as needed.



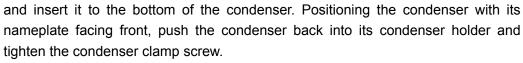
4. Adjustment and Replacement of Additional Components

1) Condenser

The condenser is attached to the microscope before shipment. When removing or replacing the condenser, follow the procedure below:

c. Lower the condenser holder a little by the condenser focusing knob.

Loosen the condenser clamp screw to remove the condenser. Put the blue filter into the filter holder



- a. Raise the condenser holder to its full limit by revolving the condenser focusing knob.
- b. Slightly lower the condenser so that light passing through the condenser focus the image on the correct position of the specimen (center of the optical path).if the diffuser image is seen on the view field, slightly raise or lower the condenser till the diffuser image is gone.

2) Objective

Install the objectives into the revolving nosepiece before operating the microscope. Screw a new objective into the revolving nosepiece. Set the objectives in such an order that the objective magnification increases as the revolving nosepiece is turned clockwise (as viewed from the top of the microscope).

3) Specimen holder

The specimen holder is attached to the stage.

When removing the holder, loosen the two knurled screws.

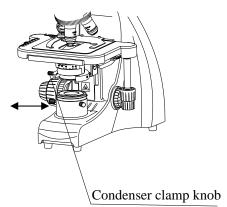
Eyepiece

The 10x eyepieces are placed in the packing box.

When installing the eyepieces, push them down to its full limit and tighten up the set screw.

When changing to a 16x eyepiece (optional), be sure to change both the right and left eyepieces together. The right and left eyepieces should be of the same magnification.

Note: insert the eyepieces till the end.



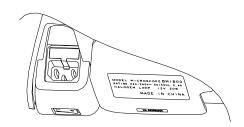
5) Other accessories

For installation of other accessories such as the photo micrographic equipment, see the manual provided for each product.

5. Replacement of Consumable Materials WARING!

Replacing the fuse

- Turn off the power switch (turn to O) and unplug the power cord before replacing the fuse.
- Remove the fuse holder using the screwdriver.
- Replace with a new fuse.
- Check that the voltage in your region is the same as that appears in the window of the fuse holder.
- Put the fuses and the fuse holder back in place.



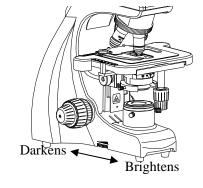
VI. Operations

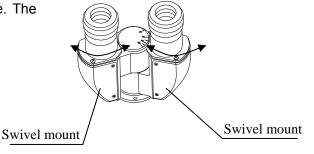
1. Lamp illumination

Turn on the power switch (turn to"—" state) and the lamp will come on. Turn the brightness control knob to adjust the brightness of the view field.

2. Interpupillary Distance Adjustment

Adjust the distance between the eyepieces to merge the right and left view fields into one. The dot". " indicates the interpullary distance.



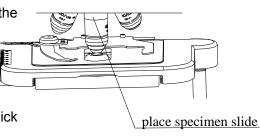


3. Specimen Mounting

Place specimen slide on the stage with the cover glass facing upward. Open the claw of the specimen holder with your finger at the root tilt and fix the specimen slide with the claw.

4. Focus with the 10x objective

Rotate the revolving nosepiece to bring the 10x objective into the optical path.(the objective will click into place when rotated into position.) bring the



specimen image into focus by turning the coarse focus and then fine focus knob.

- Direction of stage movement relative to focus knob rotation is shown in the figure.
- There is no coarse focus knob on the side with the stage motion knobs. There
 are both coarse and fine focus knobs on the opposite side of the stage motion
 knobs.
- Do not turn the right and left focus knobs simultaneously in the opposite directions. Do not turn the coarse focus knob further after the stage has reached its lower or upper limit. These operations could result in a malfunction.

Focusing

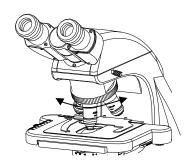
Turning the focus knobs recklessly is a long and hard way to focus on the image. If you are using a high power objective, you may even damage the specimen by pressing it against the objective. Before breaking the cover glasses or damaging the objective, read the following and find the correct way to focus on the specimen.

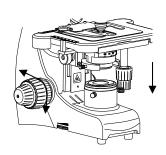
- 1) put the 10x (or 4x) objective in the optical path.
- 2) Turn the coarse focus knob to raise the stage to its upper limit.
- Looking into the eyepiece, slowly rotate the coarse focus knob to lower the stage. When the specimen image appears, stop rotating the knob.
- 4) Rotate the fine focus knob and precisely focus on the image. when you want to observe the image with a high power objective, first focus on the image using a 10x (or 4x) objective. Then change to a high power objective and rotate the fine focus knob for precise focusing.

5. Eyepiece Diopter Adjustment

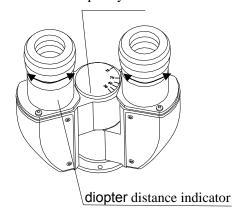
Adjust the diopter ring on the eyepiece tube according to the difference between your left and right eyesight. This adjustment enables the user to take full advantage of the high-quality objective, including their parfocality.

- 1) Swing the 40x objective in the optical path. Rotate the coarse and then fine focus knobs to bring the specimen in focus.
- 2) Switch back to the 10x (or 4x) objective.









- 3) While looking into the left eyepiece with your left eye, focus on the specimen by rotating the left diopter ring and not using the focus knob.
- 4) Repeat the steps (1) to (3).

6. Condenser Vertical Position Adjustment

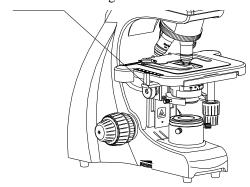
Use the condenser focusing knob to move up the condenser till it touches the limit, then slightly lower the condenser. If you should see the diffuser image on the view field background, slightly move up or down the condenser till the diffuser image disappears.

7. Objective selection

Rotate the revolving nosepiece to the desired objective magnification. (The objective will click into place when rotated into position.)

Adjust the aperture diaphragm lever according to the selected objective. See item 8.

Condenser focusing knob



8. Aperture diaphragm adjustment

Set the condenser aperture diaphragm lever to the same figure as the magnification of the objective in the optical path.



Plan 40 0.65

Corresponding objective magnification

100× (60×) 40× 10× 4×

Adjusting the aperture diaphragm

- the aperture size is increased or decreased by rotating the condenser aperture diaphragm lever. if the aperture diaphragm is closed, the brightness and resolution are decreased but the contrast and range of focus are increased. If the aperture diaphragm is opened, the brightness and resolution are increased but the contrast and range of focus are decreased.
- Generally, a good image of sufficient contrast can be achieved with the aperture diaphragm closed to approximately 70%-80% of the objective's numerical aperture.
- 3) The aperture diaphragm controls the numerical aperture of the illumination. Do not Use it to control brightness. Use the brightness control knob to control the

brightness.

The objective's numerical aperture is indicated on the side of the objective.
 For example: 40x/0.65= magnifying power 40x, numerical aperture 0.65.
 To observe the diaphragm image, remove the eyepiece and look down the open

tube.

The figures on the condenser show the approximate position of the aperture diaphragm lever corresponding to each objective magnification. (When the aperture diaphragm lever is moved to that position, the size of the aperture diaphragm will be 70%-80% of the objective's numerical aperture.) Each time you switch the objective, align the aperture diaphragm lever to the same figure as the magnifying power of the objective to get a good image with sufficient contrast.

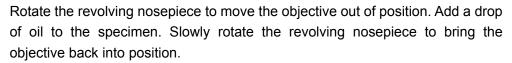
9. Oil-immersion observation

The "oil" mark on the side of an objective indicates that it is an oil-immersion type objective. An oil-immersion objective is used with the immersion oil applied between the front of the objective and the cover glass.

 oil-immersion observation operation Condenser:

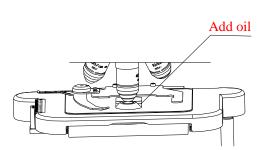
Move the specimen backward and lower the condenser slightly. Add a drop of oil on the front of the condenser from the long hole on the stage. Bing the specimen back over the condenser and slowly raise the condenser.





- 2) eliminate air bubbles
- a. Avoid contact of immersion oil with eyes or skin. In the event of contact with eyes or skin, take one of the following measures although the oil immersion oil does not contain any toxic ingredients.
 - Contact with skin: rinse your skin thoroughly with soap and water.
- b. Contact with eye: rinse your eye thoroughly with water (more than 15 minutes) and see a doctor.
- c. Do not leave immersion oil in the sun (or ultraviolet rays).
- d. Air bubbles degrade the image. To see if any air bubbles are trapped in the oil, remove one eyepiece and fully open the aperture diaphragm. Look into the eyepiece tube and check the objective pupil (a bright round part).
- e. Do any of the following to eliminate air bubbles:
 - Rotate the revolving nosepiece to move the objective back and forth; Gently turn the condenser focusing knob to move the condenser up and down; Add another drop of oil;

Wipe off the oil and apply again.



3) handling of the immersion oil

Use a minimum quantity of oil. if too much oil is applied, surplus oil could flow out onto the stage and the condenser and degrade performance.

After completing oil-immersion observation, be sure to clean the objective, condenser, and any other parts that may be stained by oil.any oil residue left on the lenses of oil-immersion type objectives or adhesion of oils on the front lens of dry type objectives will degrade image quality.use ether to wipe off oil and finish with absolute alcohol (ethyl or methyl alcohol).wipe off the oil several times (generally 3 or 4 times).

A WARNING!

When handling ethyl or ether, be sure to follow the instructions provided by the manufactures. Since they are highly inflammable, take great care when handling them.

4) Cautions on handling the immersion oil

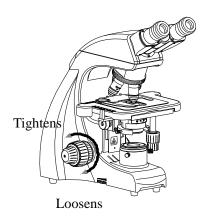
Close the container cap tightly after use. Check the cap periodically to make sure it has not come loose, allowing oil to leak out.

Do not press the container hard. oil could splash out.

If you find an oil drips around the container, wipe them off.

10. Adjusting the torque of the coarse focus knob

The tension (torque) of the coarse focus knob rotation can be adjusted. To increase the tension, turn the coarse focus knob torque adjustment ring counterclockwise. The torque adjustment ring is located at the back of the coarse focus knob. To decrease the tension, turn the ring clockwise. Do not decrease the tension too much. If it is too loose, the stage will fall under its own weight.



Troubles	Troubles Cause		
Optical part			
Not bright enough in the	The nosepiece is not located	Revolve to click-stop	
view field, or even no view	in click-stop position	position.	
field seen	Field diaphragm in not	Center the field	
	centered properly	diaphragm.	
	Field diaphragm is closed too	Largen the field diaphragm	
	much	to proper size.	
Dirt or dust in the view field	Dirt or dust on the	Clean the dirt or dust	
	lens(objective, eyepiece,		
	condenser)		
	Dirt or dust on field lens or on		
	front glass of the condenser		
	Dirt or dust on the specimen		
The image is diffused	Condenser position too low.	Position the condenser	
		slightly lower than the	
		upper limit	
	Aperture diagram closed too	Open up the aperture	
	much.	diaphragm	
Poor image quality (low	Revolving nosepiece not in	Revolve to click-stop	
resolution, contras too low	click-stop osition(objective not	position	
or too high)	centered in the optical path)		
	Dust or dirt on front lens of	Clean them	
	objective		
	No immersion oil used for	Apple immersion oil to the	
	oil-immersion objective	objective	
	Air bubbles in immersion oil	Remove bubbles	
	Use other immersion oil	Use the provided	
		immersion oil	
	Dirt or dust on the specimen	Clean it	
	Dirt or dust on eyepiece or	Clean them	
	condenser		
Image dark on one side	Objective not centered in the	Revolve to click-stop	
	optical path	postion	
	Specimen rises form stage	Stabilize it using the holder	
	surface		

Ⅷ.Troubleshooting Table

Mechanical part				
Coarse focus knob is hard	The torque adjustment ring	Loosen the torque		
to revolve	is set too tight	adjustment ring		
The stage slide down or	The torque adjustment ring	Tighten the torque		
specimen defocused during	is set too loose	adjustment ring		
observation	13 301 100 10030	adjustificht filig		
Image cannot be focused	Slide upside down	Turn over the slide so that		
with high-power objectives	Chac apside down	the cover glass faces up		
with high-power objectives	Cover glass too thick	Use a cover glass of the		
	Cover glass too trick	specified		
		thickness(0.17mm)		
High-power objective	Slide upside down.	Turn over the slide so that		
contacts slide when	Slide upside down.			
changed over from low	Cover glass too thick	the cover glass faces up Use a cover glass of the		
power	Cover glass too trick	_		
power		specified		
Caralina a imaga i imaga	Specimen holder not	thickness(0.17mm)		
Specimen image jumps	'	Fasten securely		
when specimen is moved by	securely fastened to the			
the stage	stage	A dissat it		
Binocular images not	Interpupillary distance not	Adjust it		
integrated	adjusted correctly.	A dissat it		
Excessive eye fatigue	Diopter not adjusted	Adjust it		
	correctly	Adia di la dalata a ana aria di da		
	Inadequate brightness or	Adjust brightness using the		
	illumination	control knob.		
Electrical part				
Lamp does not light when	No power supply	Check power cord		
switched on		connection		
	Lamp bulb burnt out	Replace the bulb.		
Low brightness	The input voltage is too low	Increase the input voltage		
Flickering or unstable lamp	Lamp bulb about to fail Replace the bulb			
brightness				

VIII. Care and Maintenance

1. The contaminations on glass surface, as finger mark and oil, could be gently wiped with a piece of soft cloth or tissue paper, gauze which has been immersed in alcohol at xylene mixture.

⚠ WARNING!

Since solvents such as ether and alcohol are highly flammable, they must be handle carefully.

Be sure to keep these chemicals away from open flames or potential sources of electric sparks

- ---for example, electrical equipment that is being switched on or off. Also remember always use these chemicals only in a well-ventilated room.
- 2. Do not attempt to use organic solvents to clean the microscope components other than the glass components. To clean them, use a lint-free, soft cloth slightly moistened with a diluted neutral detergent.
- 3. Do not disassemble any part of the microscope as this could result in malfunction or reduced performance.
- 4. when the microscope is not in use, cover with the dust cover, and store it in a dry place wheremold is not likely to form.
 - It is especially recommended that the objectives and eyepieces be kept in a container (such as a desiccator) with desiccant in it.
- 5. The microscope should be placed in a stable and horizontal place.

IX. Product Standard

- 1. standard of product: 《Biological Microscope》
- Medical apparatus registration standard: Jiang Su province Food and Drug Administration, t production license Number: 2001-0111
- 3. Medical apparatus production license:
- 4. Medical apparatus product registration NO.;

X. About the Manufacture

- 1. Company registration address: NO.9 Hengda road, Economic and Technological Development Zone, Nanjing
- 2. Company registration address: NO.9 Hengda road, Economic and Technological Development Zone, Nanjing