BS-2093B Series

Inverted Biological Microscope

Instruction Manual

BS-2093B

BS-2093BF

To ensure the safety and obtain satisfactory performance, please study this operation instruction thoroughly before your operation.

⚠ ATTENTIONS

1. Please clean sample-touching part after using.
   - Following the **Fig.1** step to move the instrument, make sure the sample is taken away. Use one hand holding ①position,the other hand holding② position.
   - Once the sample is damaged, must take steps to avoid pollution.
   - If rising microscope's height with other parts, must keep it in horizontal position, avoid incline and sample slip.

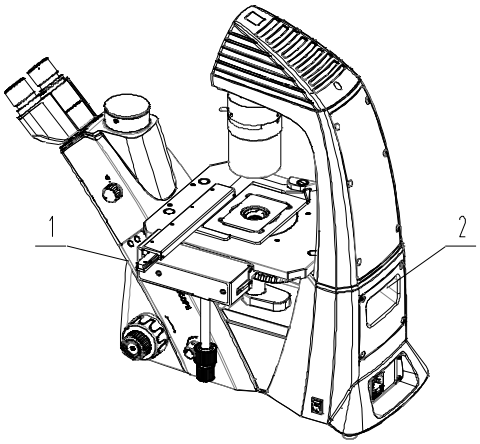
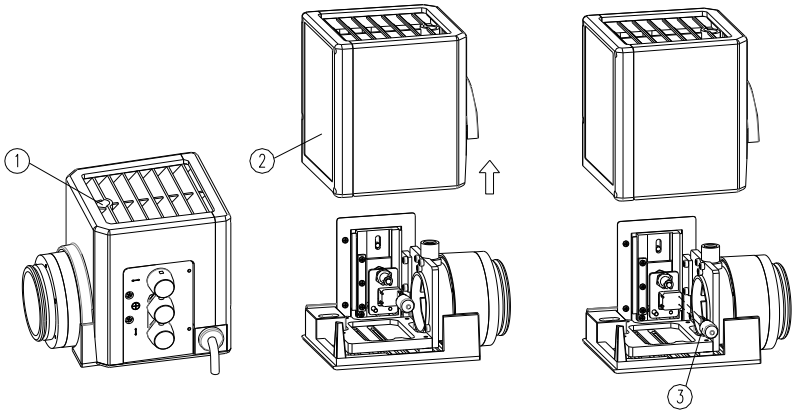


Fig.1 Carrying Diagram

Fig.2 Replace Bulb

2. Before replacing the lamp, first turn off power switch at off position **O**, and unplug it in case of electric shock and burn.If microscope is in use or after use, the bulb and lamp house must be cooled off completely before proceeding, please see **Fig.2** ,Loosening screw and replace bad bulb with required bulb. The power supply must be cut off before bulb replacement.



3. Microscope must be placed on stable and horizontal table.
4. Only use our power line, wrong power line can't guarantee instrument safety and performance.
5. The microscope ground terminal must be tightly connected with plug ground terminal.
6. If unexpected situation happens, please pull the plug out.
7. Disassembly only by the professionals. The microscope has been adjusted before shipping, Unprofessional-person should not disassemble and remove any other parts.
   If you have any questions, please contact with manufacturer or local distributor.
8. Wide voltage input 100～240V, 47～63Hz, if not in this range, it may cause damage for equipment.
9. Don't open microscope lower plate when in use or else exposed electrical element will lead to electric shock. Before replacing the lamp or fuse, please turn off power switch and pull out the plug from the socket.
10. Do not use alcohol, gasoline, paper and other combustibles near the instrument, to prevent fire ! !

Safety Mark

MARK	MEANING
	Surface will be hot, don't touch it.
	Please read manual instruction carefully at first. Misuse will lead to body damage or instrument damage.
	It is near the fuse socket , means be care of electric leakage.
	Main switch " ON "
	Main switch " OFF "

1） PREPARATION

a. Microscope is precise instrument, carefully operation, avoid collisions and shaky.
   Using environment should not be in direct sunlight , high temperature or high humidity and dusty, avoid violent shaky.
b. Tension for coarse focusing knob can adjustable.
c. Please leave enough space (10cm) for ventilation.
d. Please follow Fig.1 to carry microscope.
   ★ Firstly, take away sample, filters and round stage parts avoid damage .
   ★ If the microscope is leaning slightly, not in good position, rubber gasket may be fall off.

2） MAINTENANCE AND STORE

a. Please use gauze with 70% ether and 30% alcohol mixed liquor to gently wipe the lens, Alcohol and ether are inflammable material, please take them away from fire. Be careful for turn on and off power . Please keep indoor air ventilation.
b. Please use soft fabric to clean other parts with neutral detergent besides glass parts.
c. If not in use ,please put dust cover on microscope.
d. Please collect packing material for storage and carry after unpack carton.

CONTENTS

1. Parts Name

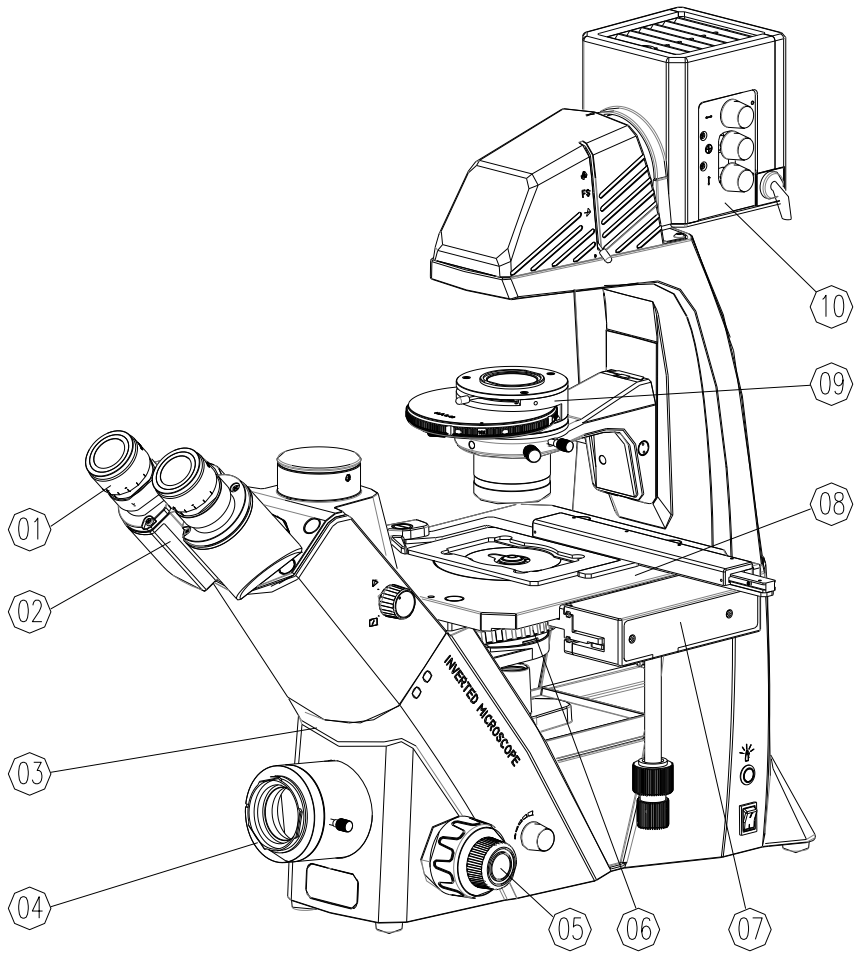


Fig.3 Main Parts Name

1） Eyepiece
2） Seidentopf Trinocular Head
3） Main Body
4） Adaptor for DSLR Camera
5） Coaxial Coarse and Fine Focusing Knob
6） Nosepiece
7） Attached Mechanical Stage
8） Fixed Stage
9） Turnable Phase Contrast Condenser
10） Lamphouse

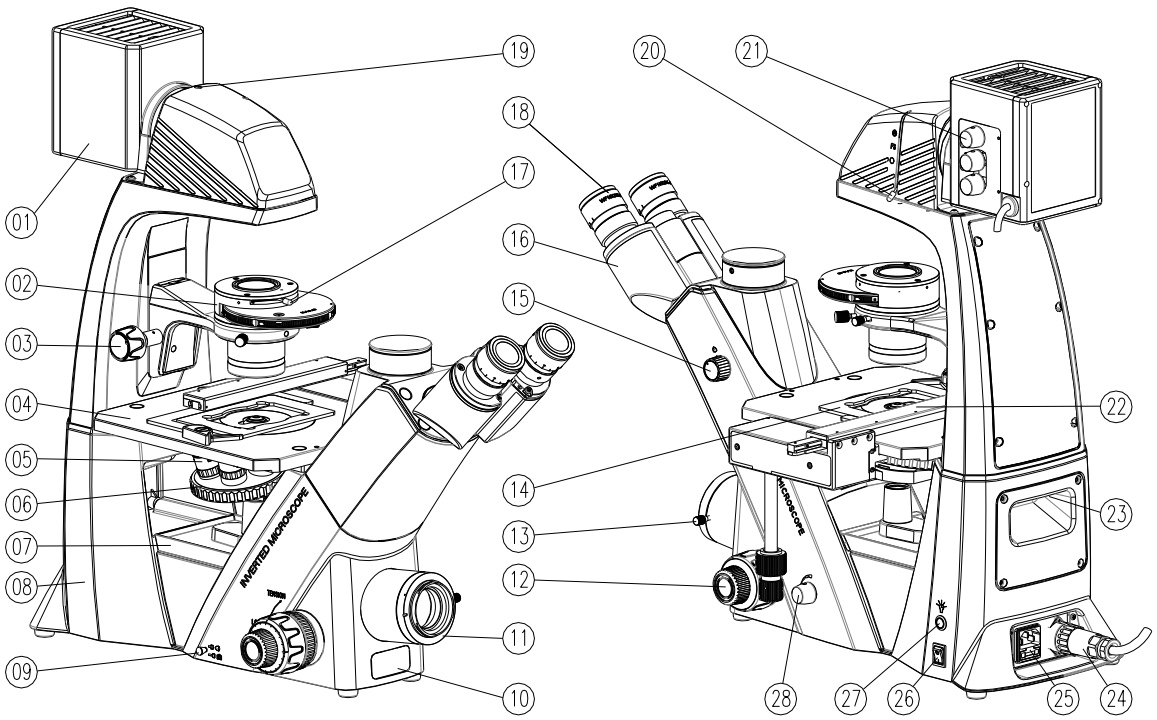
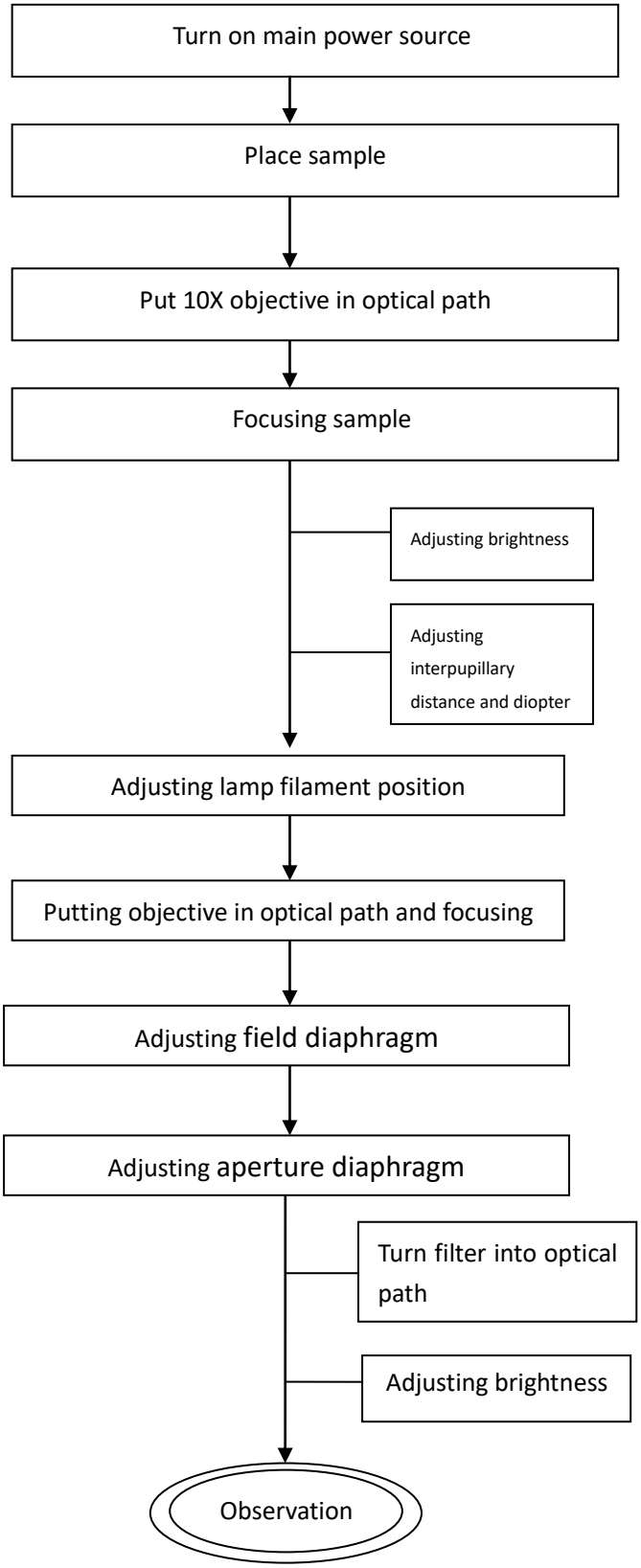


Fig.4 Control Parts

1） Lamp House
2） Turnable Phase Contrast Condenser
3） Liftable Knob for Turnable Phase Contrast Condenser
4） Fixed Stage
5） Objective
6） Nosepiece
7） Surplus Water Plate
8） Main Body
9） Convertible handle for DSLR Camera
10） Infrared Sensors Indicator
11） Adaptor for DSLR Camera
12） Coarse & Fine Focusing Knobs
13） Fastening Screw for DSLR Camera Adaptor
14） Culture Dish Holder
15） Trinocular Switch Lever
16) Seidentopf Trinocular Head
17) Aperture Diaphragm Lever
18) Eyepiece
19) Fastening Screw for Lamphouse
20) Field Diaphragm Lever
21) Adjustable Knob for lamp bulb
22) Attachable Mechanical Stage
23) Handle
24) Lamphouse Plug
25) Power Socket (with fuse holder)
26) Power Switch
27) Infrared Sensors Switch
28) Potentiometer Knob

2. Observation Steps



3. Operation

3.1 Main Body

3.1.1 Turn On Light Source (**Fig.5**)

a. Turn potentiometer knob② to the minimum, turn on power switch to①position **I (ON).**

b. Rotating potentiometer knob② to increase and decrease brightness for good illumination .

c. Push button④to open infrared sensors switch,if you leaving the Infrared sensors window for 10 minutes , it will be off automatically. If someone closing to it ,the bulb will turn to bright again.

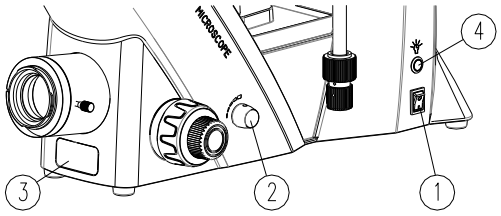
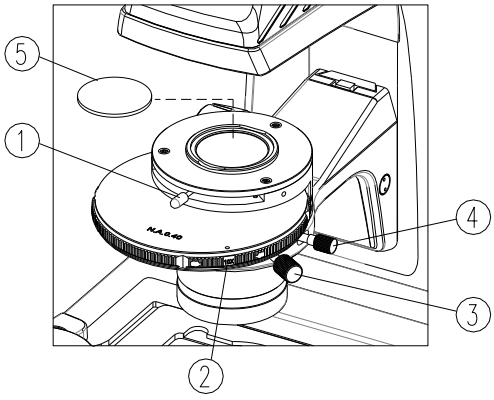


Fig.5 Power Switch

3.1.2 Aperture Diaphragm (**Fig.6**)

Gently moving diaphragm lever ① to adjust aperture diaphragm for best image contrast .



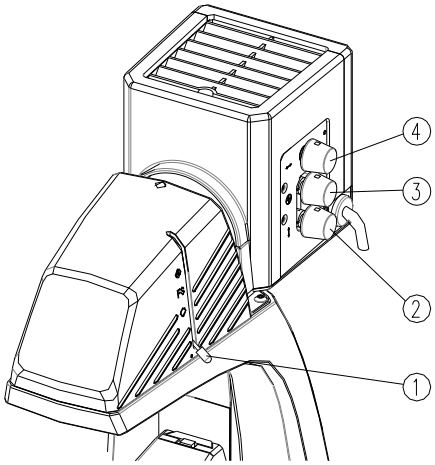


Fig.6 Adjustment of Aperture Diaphragm and Placement Of filter

Fig.7 Adjustment of Field Diaphragm and filament

3.1.3 Adjustment of Field Diaphragm and Lamp Filament

a. Adjust field diaphragm lever③to make diaphragm smaller until see the field. (**Fig.7**)

b. Adjust phase contrast condenser liftable knob③(**Fig.4**) for for clear field image.

c. Adjust centring screw③(**Fig.6**) to make field diaphragm coincide with field , fasten the thumb screw④ (**Fig.6**),adjust field diaphragm to make image edge

d. Adjust lamphouse knobs②③④(**Fig.7**) to make lamp filament image in the centre of aperture diaphragm, keep left right image in symmetry.

3.1.4 Usage of Filter (**Fig.6**)

a. Take out the filter⑤.

b. Place the filer⑤into the hole which above turnable phase contrast condenser.

3.2 Focusing Unit

Adjustment of Coaxial Coarse Focusing Knob Tension (**Fig.8**)

a. Coarse focusing knob tension can be adjustable ,hold adjustable ring ① and rotate it. Anti-clockwise direction is decrease, clockwise direction is increase.

b. If stage is decreasing automatically, the sample is deviating from the focusing point, means tension too low ,clockwise rotating adjustable ring ① to increase tension.

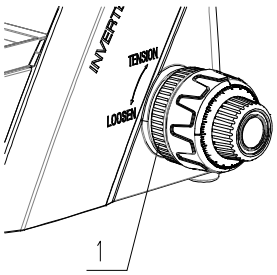


Fig.8 Tension Adjustment For Coarse Focusing Knob

⚠ **Don't rotate coarse and fine focusing knobs with reverse direction at the same time.**

3.3 Observation Tube

3.3.1 Adjustment of Interpupillary Distance

Please adjusting binocular tube to make left and right field coincide completely. Indication point ● is interpupilary distance.

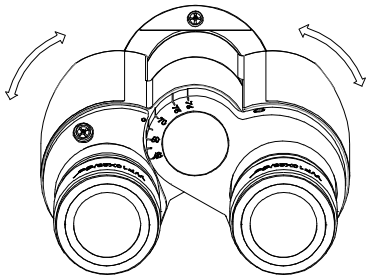


Fig.9 Adjustment of Interpupilary Distance

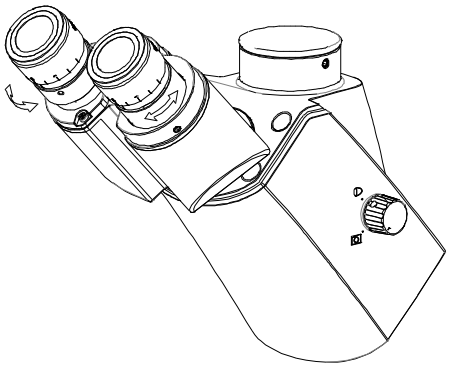


Fig.10 Adjustment Of Diopter

3.3.2 Adjustment of Diopter (Fig.10)

Please turn adjusting ring scale **0** to scale line at the first use.

a. With right eye to observation by right eyepiece, focusing the sample by coarse and fine focusing knob .

b. With left eye to observation by left eyepiece, focusing the sample by coarse and fine focusing knob .

3.3.3 Locking Eyepiece

Eyepiece can be tighten by using thumb screw ① (**Fig. 11**). If want to change eyepiece, must unscrew it at first.

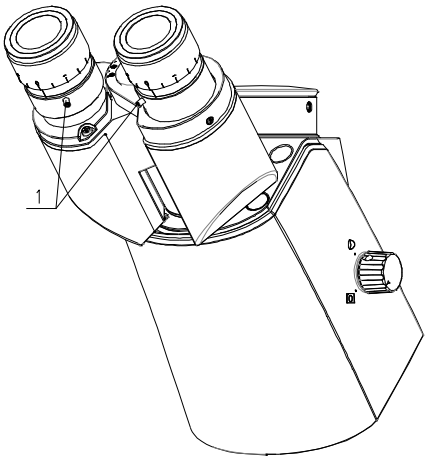


Fig.11 Locking Eyepiece

3.4 Stage

3.4.1 Fixed Stage

a. Insert standard round plate ① in stage.

b. Install the clamps②on the stage by screw joint.

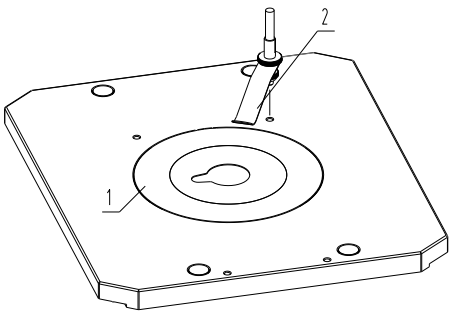


Fig.12 Fixed Stage

3.4.2 Mechanical Stage

a. Mechanical stage can be moved freely at X and Y direction.

b. Insert standard stage round plate❶in stage. (also don't insert round plate as needed).

c. Install attached mechanical stage❷in stage with knurled screw❸or hexagon socket cap screws.

d. Put stage plate ❹in stage as needed and fixed with clamps.

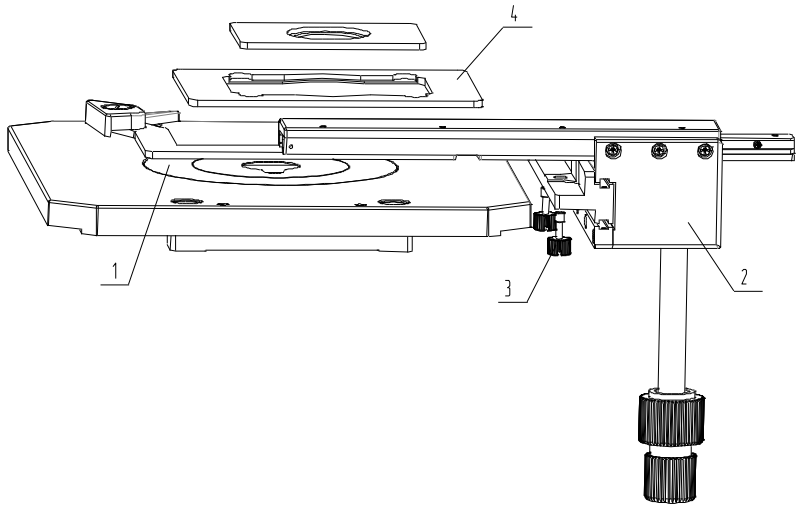


Fig. 13 Mechanical Stage

3.5 Condenser

◎ According to culture dish height to decide whether to disassemble the condenser.

a. Rotate liftable knob❷to lower phase contrast condenser.

b. Unscrew thumb screw① to disassemble phase contrast condenser❺.

c. Whe removing the condenser， please hold the condenser with hand in case of falling and damage.

d. Knurled screw❸is condenser centring screw， condenser positioning screw❹should be installed in relevant hole.

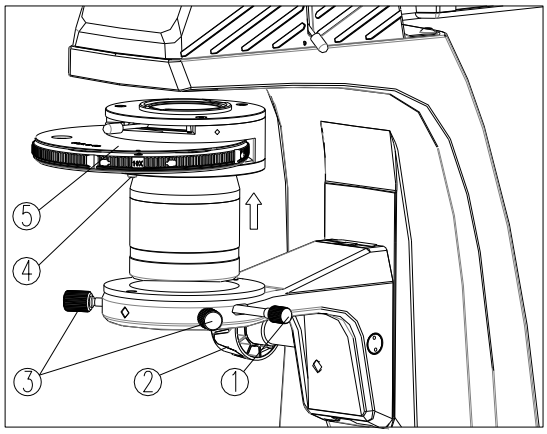


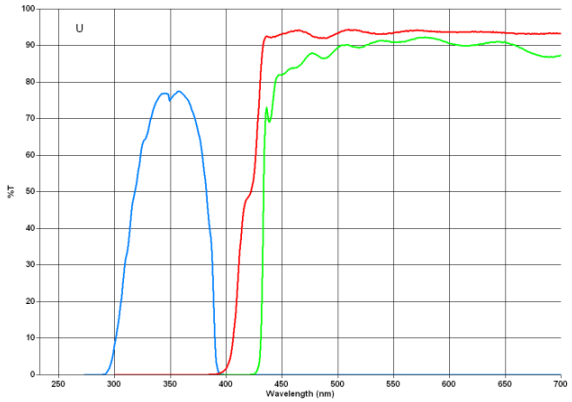
Fig. 14 Condenser Installation

3.6 Fluorescence Attachment

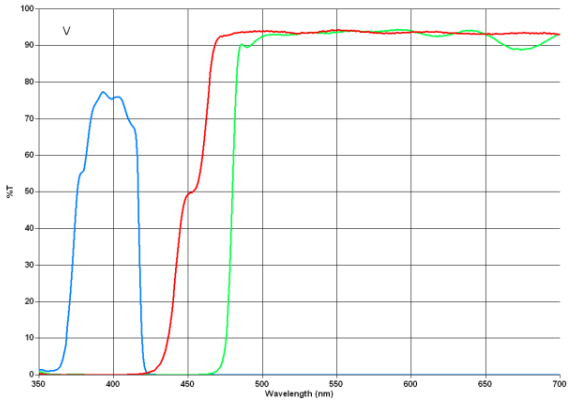
◎ **BS-2093B inverted biological microscope can configured with fluorescence attachment (lamp house, power supply etc.**)

3.6.1 Mechanism of Fluorescence Production

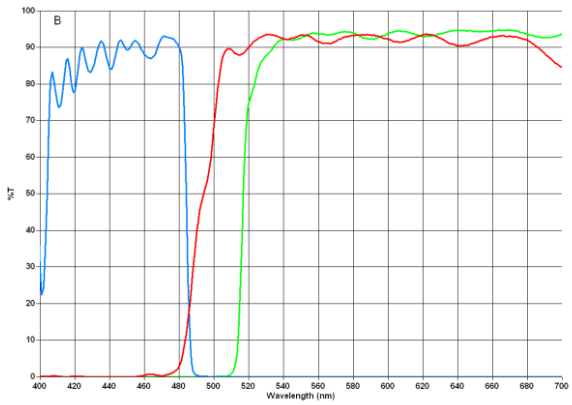
Ultraviolet(U), Violet(V), Blue(B), Green(G) transmittance characteristic curve.



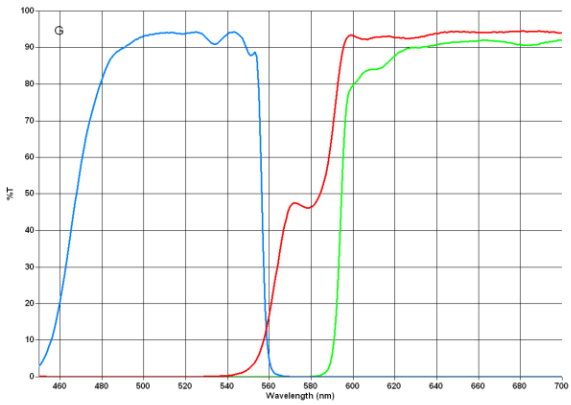
UV (Ultraviolet)Excitation



V (Violet) Excitation



B(Blue Light)Excitation



G (Green Light)Excitation

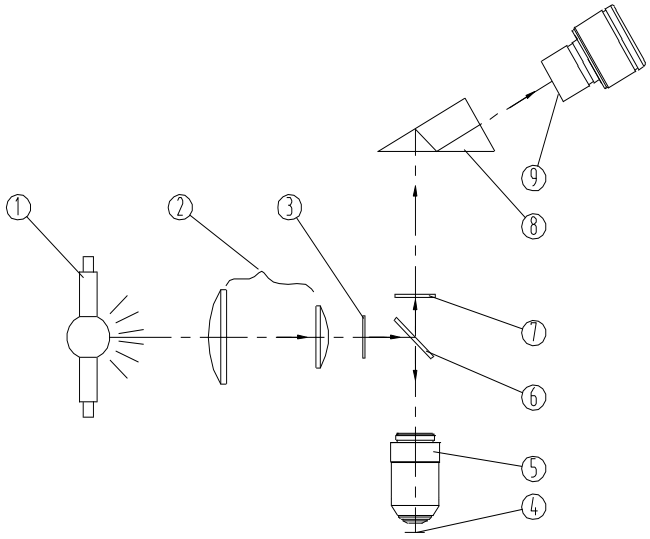
Fluorescence is a kind of photoluminescence in natural world. This kind of material will emit more longer wavelength light than irradiation light wavelength ,if stop light, emitted light will disappeared. The longer wavelength is fluorescent light. The substance which can launch the fluorescent is called fluorescence material.

Stimulate the principle:

Now use blue-ray as example (B light, the wavelength of 490nm), when the light is emitted from the DC mercury lamp, after condenser and stimulated color filter, get the exciting light wavelength of 490 nm or so, then through color spectroscope reflection into the objective, color spectroscope has the nature of selective reflection in a certain spectrum area. It will completely reflect all light which is shorter than a certain wavelengths and all light which is longer than a certain wavelengths of light will totally through it. According to this feature , color spectroscope can be designed corresponds to the excitation light beam splitter, it reflects the light of wavelength under 490 nm, and the wavelength is more than 490 nm light can through. So such a wavelength of 490 nm or so exciting light after color spectroscope, greater than 490 nm light through color spectroscope to be removed, and

the excitation under 490 nm light irradiation by fluorescence objective can converge on the fluorescent specimens, specimen inspire greater than 490 nm wavelength of fluorescence(effective fluorescence wavelength of 525nm) and fluorescence imaging by objective gathering, and through the color spectroscope (with a small amount of under 490 nm exciting light is reflected back to the light source and not through) and cut-off filter (cutoff wavelength less than 525 nm light), pure fluorescent light beam for observation and photography.

Fluorescent Attachment Diagram



1) Mercury Lamp
2) Condenser
3) Excitation Filter
4) Specimen
5) Objective
6) Color Spectroscope
7) Filter for Resistance
8) Prisms Group For Inverting Light Path Direction
9) Eyepiece

3.6.2 Parts Name

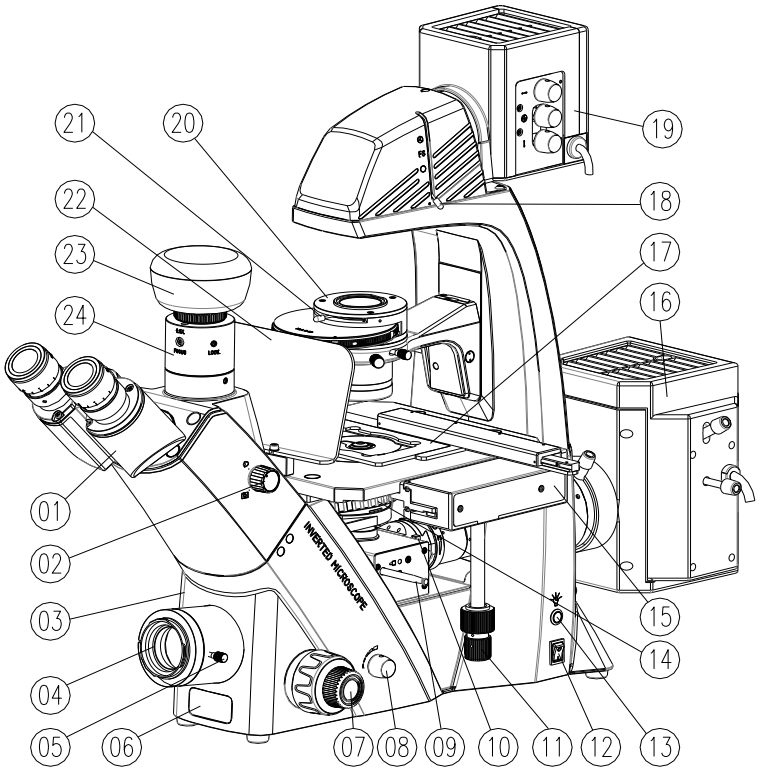


Fig. 15 Fluorescence Parts Name

1) Eyepiece 2) Trinocular Switch knob 3) Main Body 4) Adaptor for DSLR Camera
5) Fastening Screw for DSLR Camera Adaptor 6) Infrared Sensors Indicator
7) Coarse & Fine Focusing Knobs 8) Potentiometer Knob 9) Fluorescent Transforming Handle
10) Diaphragm Slider 11) Mechanical Stage Hand Knob 12) Power Switch
13) Infrared Sensors Switch 14) Nosepiece 15) Attached Mechanical Stage For 96-hole Plate
16) 100W Mercury Lamphouse 17) Stage Plate 18) Field Diaphragm Lever
19) 12V50W Halogen Lamphouse 20) Turnable Phase Contrast Condenser
21) Aperture Diaphragm Lever 22) UV Protecting Plate 23) Digital Camera 24) C-mount

3.6.3 Fluorescence Observation Processes

According to bright field observation methods to adjust microscope, take following steps to make observation:

- Put mercury lamp power supply power plug into the power socket, please firstly check the power supply voltage whether conform to the requirements of the instrument and supply voltage.
- Open the mercury lamp power switch, mercury lamp power voltage fluctuation may not be out of 100～240V, otherwise affect the start of mercury lamp. It takes about 10 minutes to reach stable state, the maximum luminous efficiency.
- Put 10X objective in optical path. Put fluorescent specimen on the slide, with fixed clamp, regulating

stage vertical moving handle to make the objective in the optical path.

●Through push and pull the fluorescent transform handle, fluorescence excitation cube will be moved into light path .

●Adjusting coarse and fine focusing knob to get clear image.

●Adjusting the center of the low and high pressure mercury lamp.

After getting clear image by focusing , using condenser axial adjustment knob, mercury lamp arc light can be seen in the eyepiece . If arc light regiment not in the center of the field, by adjusting the vertical and horizontal adjustment knob of mercury lamp light box to make the center of the arc light group in the field of view, adjusting the mirror, make the brightness to the brightest. When arc light group in the center, adjusting condenser axial adjustment knob to make arc light group into the whole field, fluorescence observation can be made.

Try to avoid frequent open mercury lamp power supply, it will reduce mercury lamp working life. Once closed, mercury should be restart after five minutes later.

3.6.4 **Mercury Lamp Power House**

a) Main Parameter

Input Voltage: AC100～240V 47～63Hz

Output Voltage: DC18V~40V Maximum

Stable Output Current: 3.6A～4.9A

Start Stable time: 2 minutes

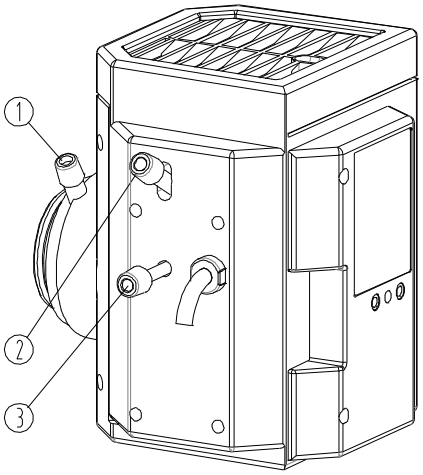


Fig.17 Adjustment For Mercury Lamp House

1) Condenser Adjusting Knob
2) Vertical Adjusting Knob for Mercury lamp
3) Horizontal Adjusting Knob for Mercury lamp

b) Use Of Power Supply

● Determine the input voltage is conform to the requirements of the instrument, can open the main power switch, open the indicator lights on the rear panel is light, indicating the power switch on.

● Gently press the trigger switch, power box above positive press switch in place can let go, don't have to hold for a long time. If you don't can trigger mercury lamp, please check the mercury lamp light boxes closed is complete.

● Mercury lamp light will be stable after 2 minutes commonly, lamp power consumption between 90 W and 135 W.

● Mercury lamp service life is 100 hours or so, so use for a period of time after the brightness will decrease.

● After replacing mercury lamp, power box timers need to reset, pressing the reset which on the front side of power box.

● Don't often press the power box timer reset button, also can't often time, according to otherwise

it will affect the service life.

● Don't no-load test output voltage, also don't open source box to adjust or modified, in order to avoid damage to mercury lamp or power box.

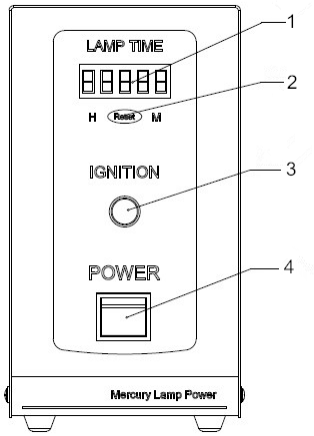


Fig.18 Front Side

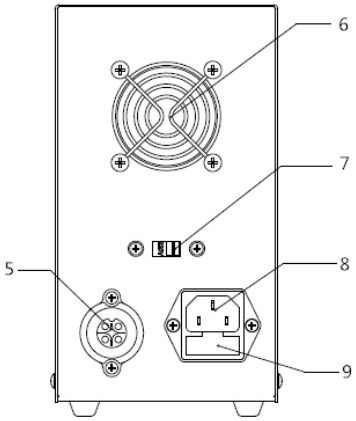


Fig.19 Back Side

1) Timer 2) Reset 3) Trigger Switch 4) Power Switch 5) Output Socket 6) Cooling Fan 7) Voltage Transfer Switch 8) Input Power Plug 9) Fuse Holder

3.6.5 **Replacement of Mercury Bulb**

Cut off the power supply, with inner hexagon screwdriver to adjust the socket head screw which in the rear of the mercury lamp light box , then slowly remove the mercury lamp light box upper portion, upside down on top of the desktop. Unscrew two mercury lamp set screw, remove the old mercury lamp, change new mercury lamp, then tighten the two fixed screw will recover lamp holder, open screw tightening the mercury lamp holder. Then according to the mentioned methods for mercury lamp in front of the center.

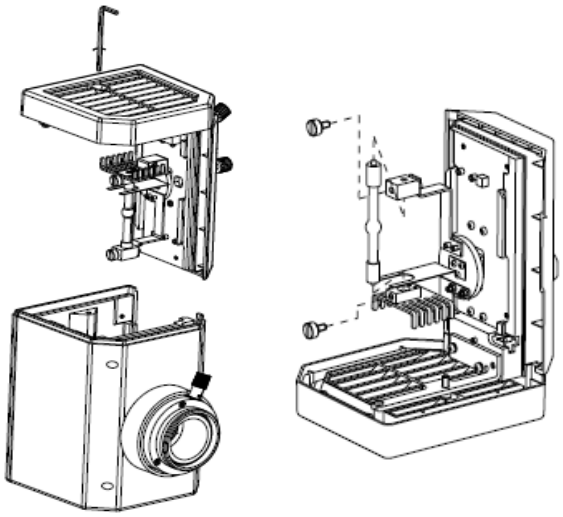


Fig.20 Replacement Of Mercury Lamp

●Don’t remove mercury lamp under the condition of electricity from inside the box! Danger!

●Mercury lamp must be replaced after cooling.

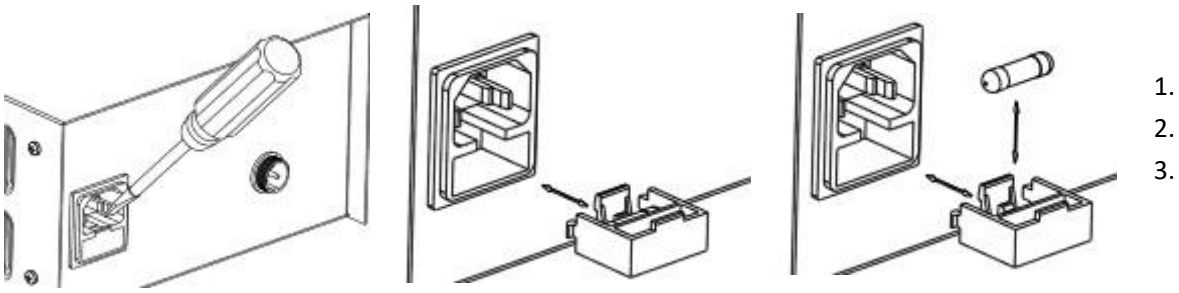
●Note mercury lamp installation in negative direction, and the lamp glass shell on uneven parts from the direction of the condenser.

●With gauze dipped in a little alcohol ether 4:6 mixture to wipe the lamp glass shell surface, there is no dust, fingerprints, etc contamination tubes.

3.6.6 Replacement of Mercury Lamp Fuse

Turn off the power, pull out the plug and open fuse box. Mercury power supply fuse:

Φ5×20mm, 5.0A, 250V (The detail steps are as follows).



1.
2.
3.

Fig.21 Replacement Of Fuse Tube

4. Trouble Shooting

Trouble	Causation	Remedy
1. Optical System		
a. Field incomplete or illumination irregular.	Nosepiece not in right location.	Readjust nosepiece in right position.
	Filter slider not in right place.	Readjust filter slider
	Phase Contrast Slider aren't moved out of optical path.	Moving out the slider.
b. Dirt or dust in objective field.	Lens of collector is dirty.	Thoroughly clean.
	Sample is dirty.	
	Eyepiece is dirty.	
c. Dazzling image	Aperture diaphragm isn't wide enough.	Readjust it.
d. Bad Image quality, for example, not sharp, low picture contrast, image detail not clear.	Objective isn't in right position.	Rotate nosepiece to locating position.
	Objective front lens is dirty.	Thoroughly clean .
	Culture dish bottom is thick.	Use normal size culture dish.
	Culture dish optical performance isn't good.	Use standard culture dish.
	Sample is dirty.	Thoroughly clean
e. Partial image isn't clear or unsteady .	Objective isn't in right position.	Rotate nosepiece to locating position.
	Sample isn't placed at right stage place.	Correctly placing sample and fixer it with holder.
f. The effect of phase contrast observation image is poor.	Annular spot don't focus with dish holder.	Readjust it.
	Culture dish bottom isn't flat.	Use standard culture dish.
2. Mechanical Focusing Unit		
a) Coarse focusing knob is too tight.	Tension too big.	Loosing tension adjusting ring，reset again.
b) Nosepiece glide down automatically.	Tension too small.	Tightening tension adjusting ring, reset again.
3. Binocular Observation Tube		
Field of Binocular observation tube isn't inconsistent.	Wrong interpupillary distance.	Correctly set again.
	Binocular diopter is incorrect.	
	Left eye and right eye with different eyepiece.	Change one eyepiece, to make it same as another eyepiece.
4. **Nosepiece**		
When using high power objective, it will touch the sample.	Improper sample.	Use right sample.
	Culture dish bottom is too thick.	Use standard dish.
5. **Power System**		
a) Bulb don't work.	No bulb.	Install bulb.
	Bulb or fuse is broken.	Change new bulb or fuse.
	Don't plug in power.	Plug in power safely.
b) Bulb is easy broken.	Don't use specified specification bulb.	Use specified specification bulb.
	No bulb.	Install bulb.

5. Installation

5.1 Installation Diagram

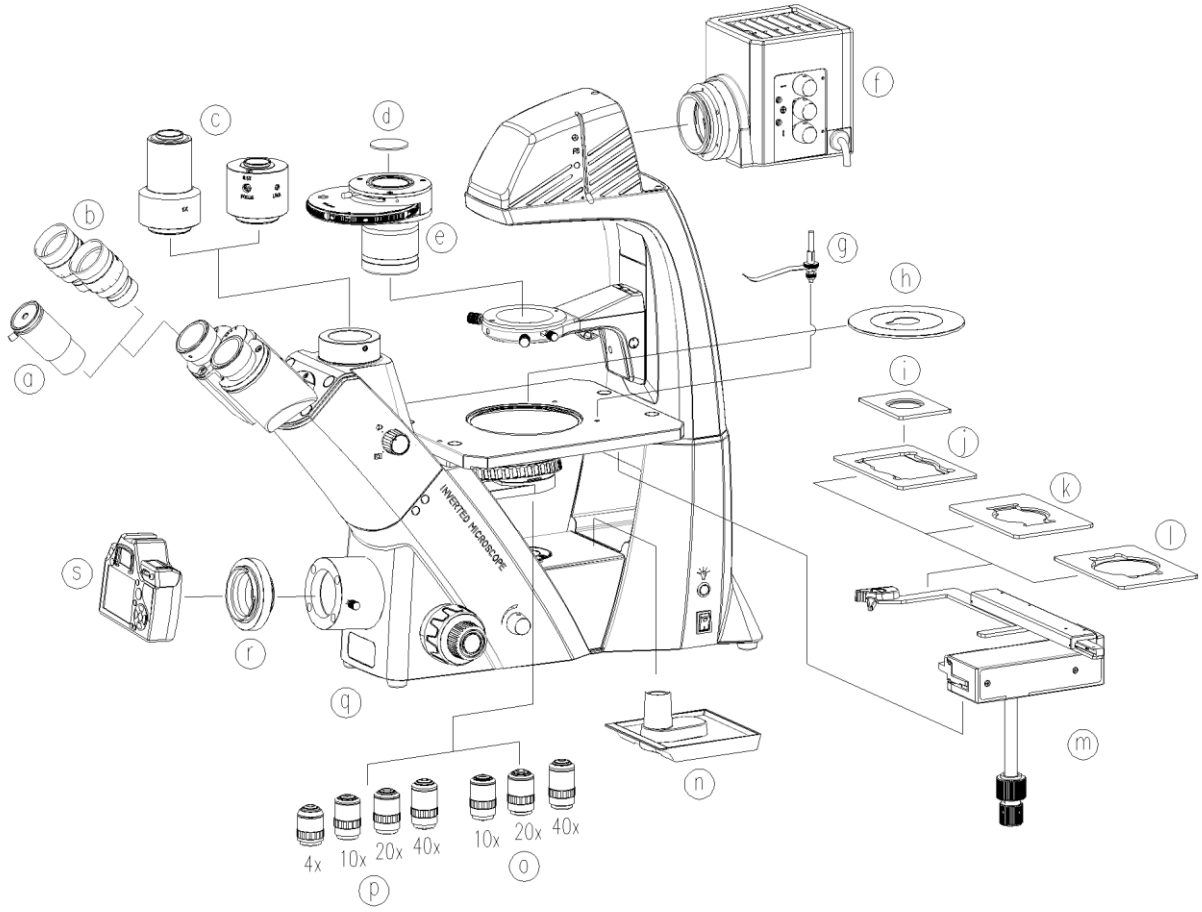


Fig. 21

ⓐCentring Telescope ⓑEyepiece ⓒC-mount ⓓFilters

ⓔTurnable Phase Contrast Condenser ⓕHalogen Lamphouse ⓖClamps

ⓗStage Round plate ⓘⓙⓚCulture Dish Holder ⓛ Blood Cell Counter Holder ⓜAttached Mechanical Stage For 96-hole Plate ⓝSurplus Water Plate

ⓄLWD Infinity Plan Phase Contrast Objectives ⓟLWD Infinity Plan Objectives

ⓠMainbody ⓡAdaptor for DSLR Camera ⓢDSLR Camera

5.2 Installation Steps

5.2.1 Installation And Replacement of Bulb (Fig.2 ,Fig.4)

WARNING: Cut off the power line plug before replace bulb.

a. Completely loosening screw on the top of the lamp house, pulling out lamp shade.
b. Loosening bulb pins locking screw, using glove or gauze to hold the bulb and insert fully into the socket.
c. Install the lamp again.

◎ Bulb: **6V 30W** Halogen

5.2.2 Replacement of Fuse

WARNING：Turn off the power plug before replacement.

Fuse box is installed below the power socket, fuse rating: Φ5×20mm, 5A/250V.

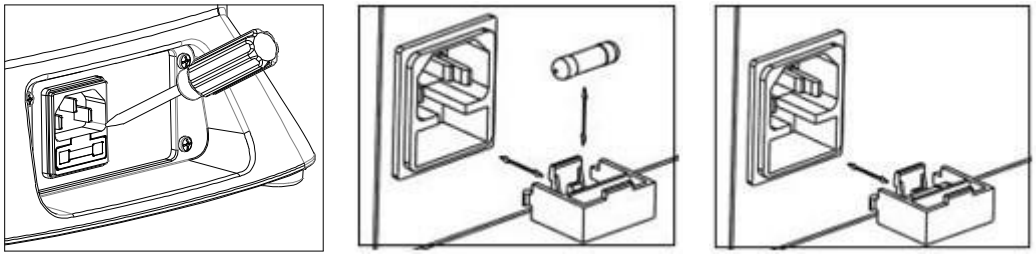


Fig. 22 Replacement Of Fuse

5.2.3 Connecting Power Line

a. Don't curve or twine power line .

b. Make sure the main switch at off mark **O** when connecting power lines.

c. Must use three-phase plug which can connect ground electrode, Otherwise can't use the microscope.

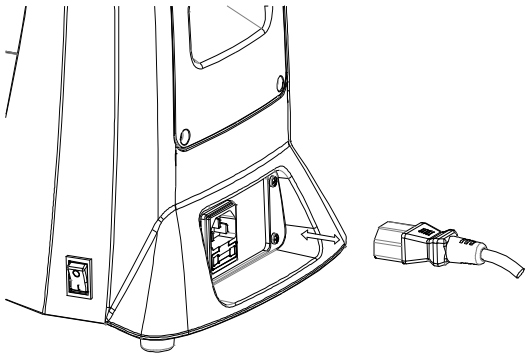


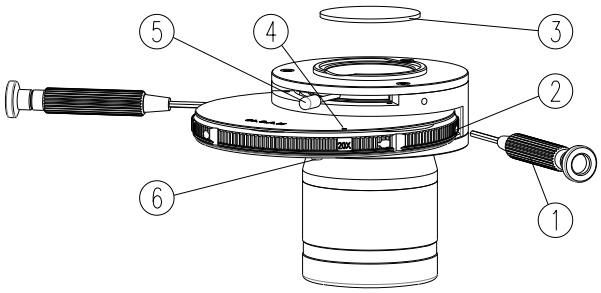
Fig. 23 Power Line Connection

If power line is close to lamp house or relevant device, it will melt and cause electric leakage. So don't close to lamp house.

5.2.4 Installation Of Turnable Phase Contrast Condenser

a. Put phase contrast condenser into the holder(Fig.24), positioning screw⑥must aim at relevant hole in connecting plate.

Fig.24 Phase Contrast Installation



①Hexagonal Screwdriver

② Adjusting Screw Hole

③Filters

④ Annular Plate Datum Point

⑤ Aperture Diaphragm Lever

⑥ Positioning Screw

b. Put PH objective into optical path (the objective must be coincided with the annular plate power).

c. Pull eyepiece out and insert centring telescope, observing bright ring(annular plate) coincide with dark ring(phase contrast plate),adjusting annular plate screw to make dark ring completely cover the bright ring.

d. Pull the centring telescope out, use eyepiece to make phase contrast observation.

Before Coincide After Coincide

Fig.25 Phase Contrast Plate Adjustment

5.2.5 Installation of Photography Device

5.2.5.1 Video System (Optional)

a) Remove the dust cover, use allen wrench to unscrew the locking screw at trinocualr observation tube connector.

b) Connecting C-mount with observation tube connector, digital camera with C-mount.

c) Tightening the locking screw.

d) Please take down the digital camera if not in use, keep in dry environment. Cover observation tube connector with cap for anti-dust.

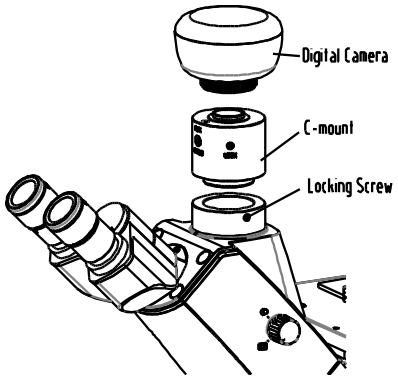


Fig.26 Installation Of Video System

e) Please read operation manual about usage of digital camera and circuit connection.

5.2.5.2 DSLR Camera System (Optional)

a) Firstly, remove the camera lens and connect the DSLR camera①with interface②,ensure install in good place.

b) Then gently connect DSLR camera①with adaptor, rotating to suitable angle, then tightening the locking screw④.

c) Please take down the digital camera if not in use, keep in dry environment. Cover observation tube connector with cap for anti-dust.

d) Please read operation manual about usage of SLR digital camera and circuit connection.

◎ When installing DSLR camera, should remove the camera lens and change to manual position M.

◎ Different adaptor with different DSLR camera.

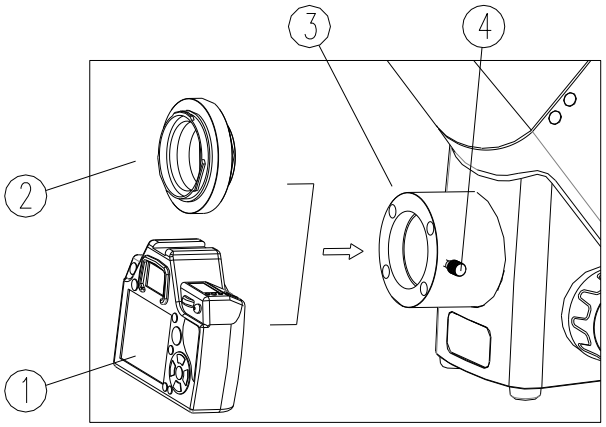


Fig. 27 Installation Of DSLR Camera