# AE-BK102 Series Biological Microscope

## Operation Instruction

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

# Contents



✧ Technical specifications are subject to change without notice.

## 1. Parts Name

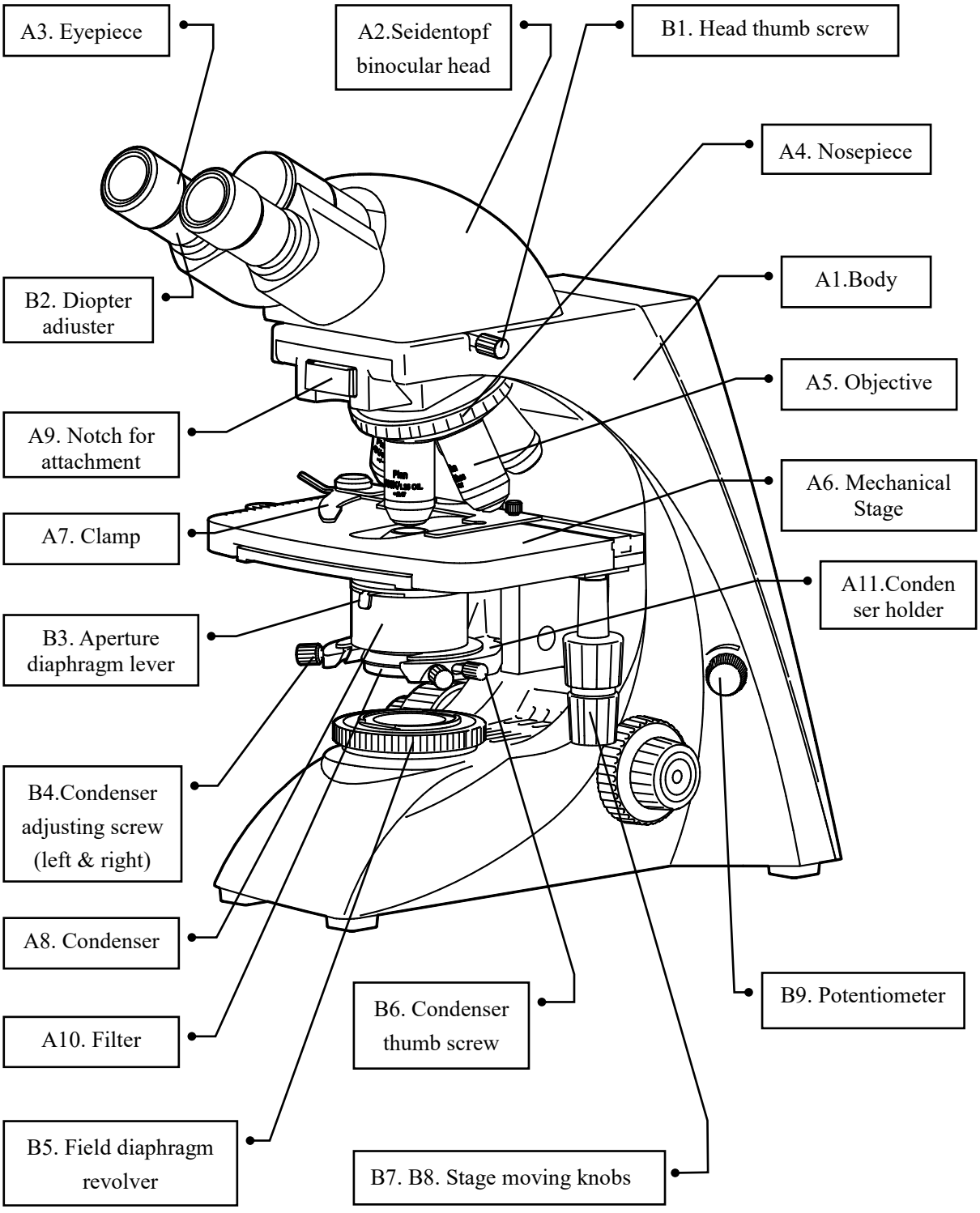



**Fig.1-1**

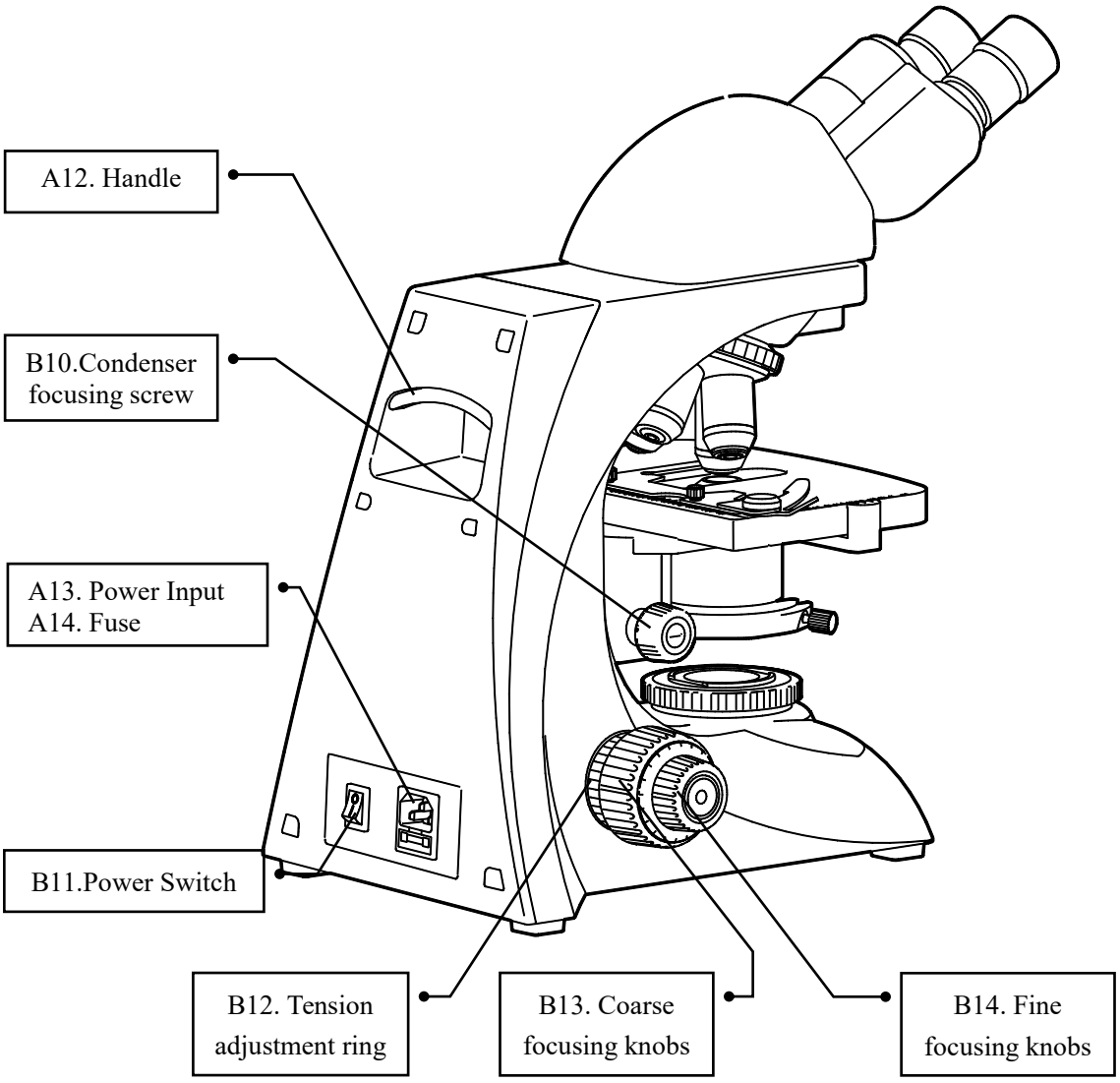
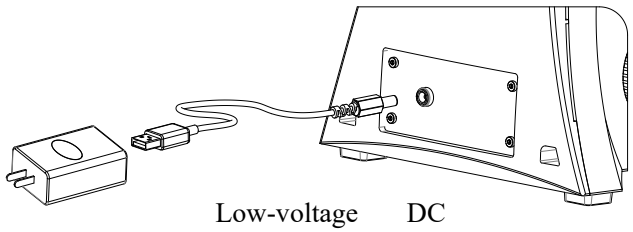



**Fig.1-2**



Low-voltage DC Input for LED Light Source

A1.Body A2.Seidentopf binocular head
A3. Eyepiece A4. Nosepiece A5. Objective
A6. Mechanical Stage A7. Clamp A8. Condenser A9. Notch for attachment A10. Filter
A11.Condenser holder A12. Handle A13. Power Input A14. Fuse A15. Lamp Plate

B1. Head thumb screw B2. Diopter adjuster B3. Aperture diaphragm lever B4.Condenser adjusting screw (left & right) B5. Field diaphragm revolver B6. Condenser thumb screw
B7. B8. Stage moving knobs B9. Potentiometer B10. Condenser focusing screw B11.Power Switch B12. Tension adjustment ring B13. Coarse focusing knobs B14. Fine focusing knobs
B15. Lamp plate thumb screw

## 2. Specification

2.1 Total magnifications

| Objectives / Eyepiece | 4× | 10× | 20× | 40× | 100× |
|---|---|---|---|---|---|
| 10× | 40× | 100× | 200× | 400× | 1000× |
| 16× | 64× | 160× | 320× | 640× | 1600× |

2.2 Objectives (with eyepiece 10X)

| Objectives | | N.A. | Objective Field (mm) | Resolving Power (μm) | Working Distance（mm） | |
|---|---|---|---|---|---|---|
| | | | Field Numberφ20 | | Achromatic objective | Plan objective |
| Infinite | 4× | 0.10 | 5 | 2.8 | 9.5 | 6.73 |
| | 10× | 0.25 | 2 | 1.1 | 1.7 | 4.19 |
| | 20×(spring) | 0.40 | 1 | 0.69 | / | 2.14 |
| | 40×(spring) | 0.66 | 0.5 | 0.42 | 0.39 | 0.45 |
| | 100×(oil, spring) | 1.25 | 0.2 | 0.22 | 0.12 | 0.12 |

2.3 The other specification

2.3.1 Mechanical tube length: 160mm

2.3.2 Conjugate distance:Infinite

2.3.3 Head: Seidentopf binocular (trinocular) 30°,
Interpupillary adjustable distance is 48-75mm,
Diopter adjustable range ±5,
Anti-fungal systems.

2.3.4 Nosepiece: Quintuple

2.3.5 Mechanical Stage:Size 175mm X 145mm , Travel range:78mm X 55mm

Integrated stage (optional) size: 182 mm×140mm, Travel range: 77mm×52mm

Two-slide holder.

2.3.6 Focusing systems: Coaxial coarse and fine focusing knobs,
Coarse stroke 25mm, fine division 2 μm,
Condenser up-down range 25mm

2.3.7 Condenser: Abbe condenser, N.A.1.25 with iris diaphragm.

Aperture center is adjustable.

2.3.8 Illumination: Koehler illumination system

2.3.9 Filter: Blue filter is standard outfits, green and amber is optional.

2.3.10. Electric components: Input voltage AC 100-240V, 50/60Hz
Output voltage DC1.2-6V , 12V/20W halogen lamp
Rotation potentiometer
Fuse 5A φ5×20

Low-voltage Input for LED Light Source:
Power Adapter Input: AC100～240V，50-60Hz , Output DC 5V～12V
Main Iutput voltage DC 5V～12V, Bulb: 3W LED
Rotation potentiometer with power switch.

## 3. Installation

Please install the microscope as the following:

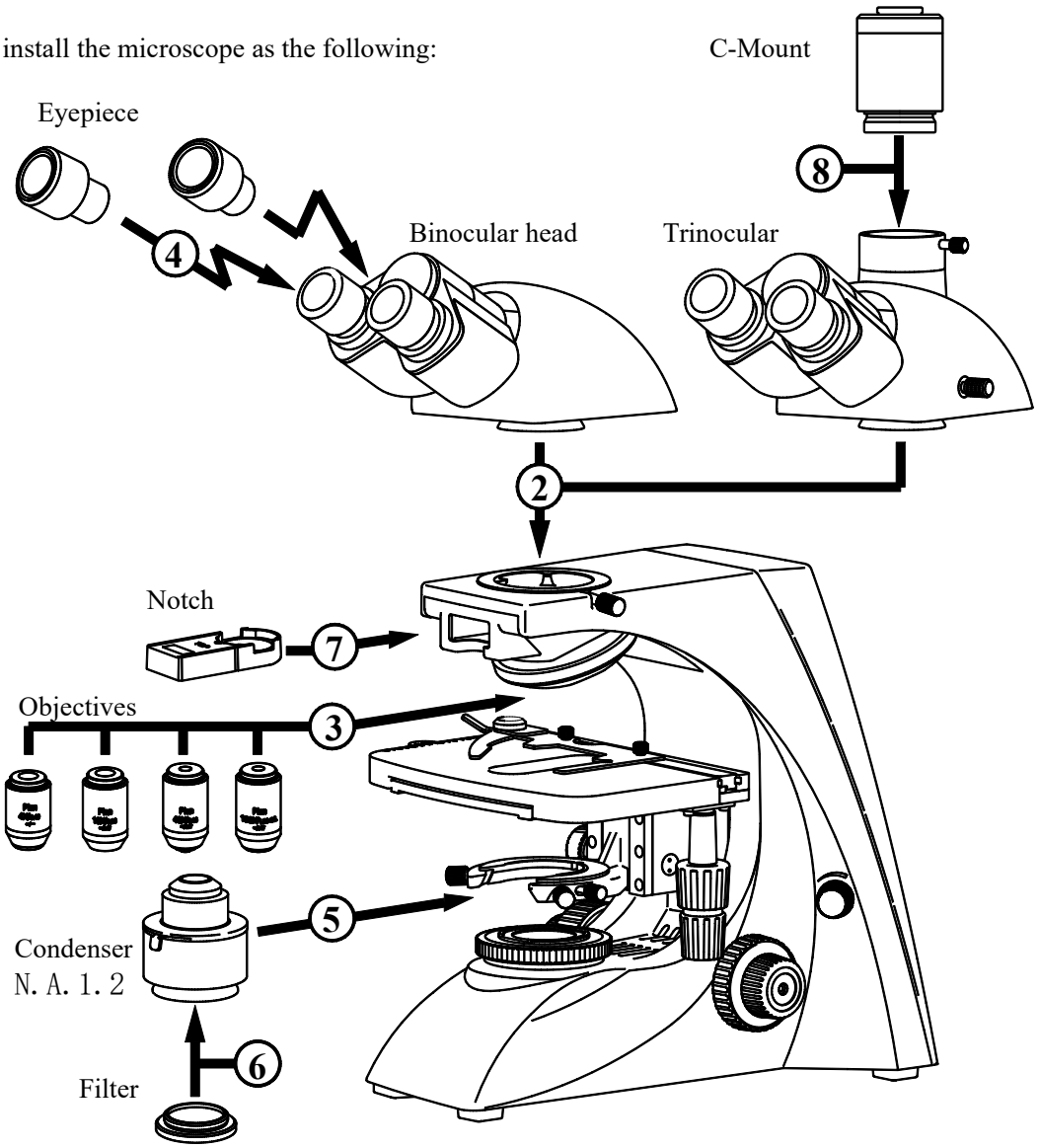



**Fig.2**

Installation Process:

3.1 Installing Halogen Lamp (if the lamp is installed before purchase, please pass it)

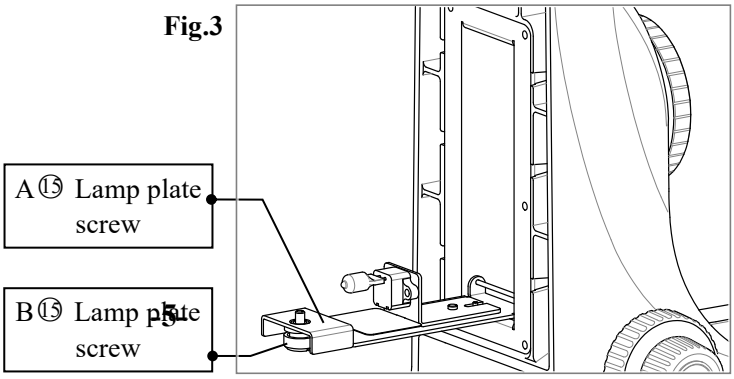
a. Take down the base of microscope, Loose the screw B15, put out the lamp plate (Fig.3);

b. Take a new lamp from the lamp package, and hold the lamp with the foam;

c. Insert the lamp into lamp holder as the picture, then put back A15 lamp plate and the screw.

d. Take the microscope up and take the power.

**Fig.3**




3.2 Installing binocular head

Loose B1 binocular head thumb screw, put out A2 head, put it on the top of

body as Fig.1, tighten the screw.

3.3 Installing objectives

Take out the objective from the packing box, and drive them into the holes of nosepiece orderly and tightly according to the times.

3.4 Installing eyepiece

Take out the eyepiece tube cover, then get the eyepiece from the packing bag, and insert it into the tubes.

3.5 Installing condenser

3.6 Turn B13 coarse focusing knob, rise A6 mechanical stage to top;

3.7 Turn B10 condenser focusing screw, and take A11 condenser holder to the lowest position;

3.8 Loose B6 condenser thumb screw, put the condenser to the holder, tighten B6 condenser thumb screw;

3.9 Turn B10 condenser focusing screw, and rise the condenser to working position.

3.6 Installing blue filter or the other attachment

If blue filter would be used, the installing should be done before process 5, or do the installing during process 5-C, then put A10 blue filter or the other attachment to the bottom hole of A8 condenser.

3.7 Installing the module attachment

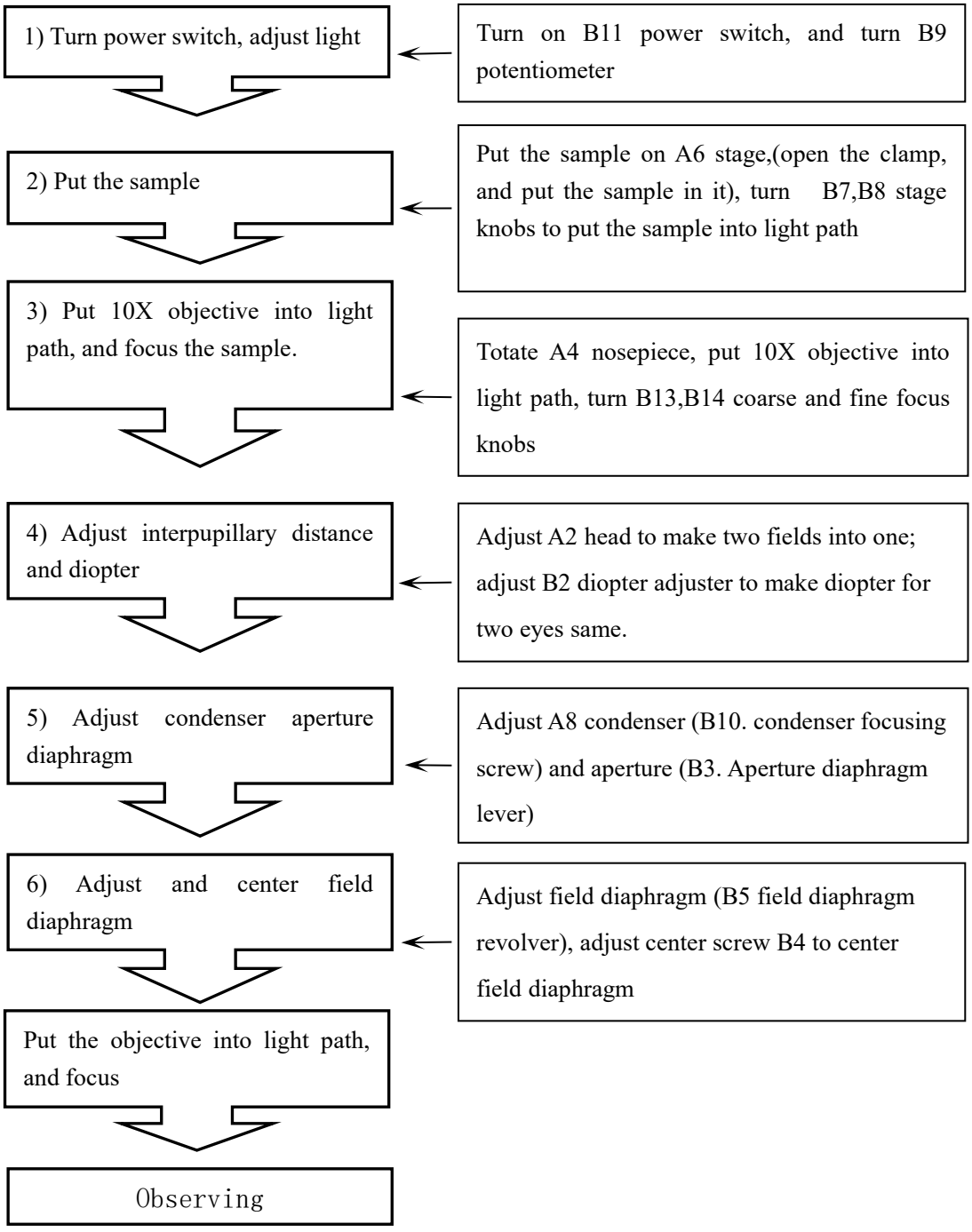
The microscope can be with A9 module attachment, and it is multifunctional. Analyzer and wavelength plate can be installed in A9 notch. Polarizer is installed over field diaphragm or below the condenser. Filter can be installed in the notch if the other attachment is in the bottom hole of condenser.

3.8 Installing C-mount

Loose the thumb screw in trinocular tube, put the C-mount into trinocular tube, then tighten the screw.

# 4. Operation

4.1 Operation process instruction




4.2 Operation

4.2.1 Illumination

4.2.1.1 Confirm the voltage is available, then take power

4.2.1.2 Turn on power switch B11

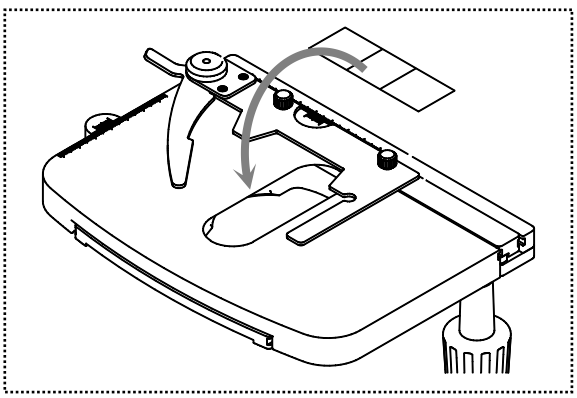
4.2.1.3 Turn B9 potentiometer to adjust light

4.2.2 Sample placing

Put the sample (cover is up) on stage A6, and fix it with clamp A7. Turn B7,B8 stage knobs to put the sample into the light path. (Fig.4)

▲ Two samples can be placed on the stage together

**Fig.4**



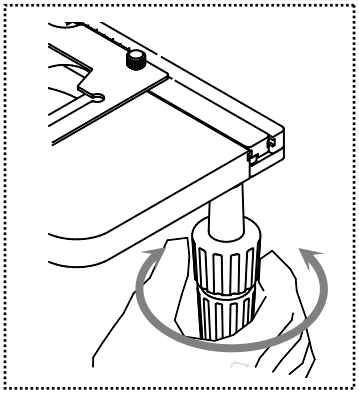
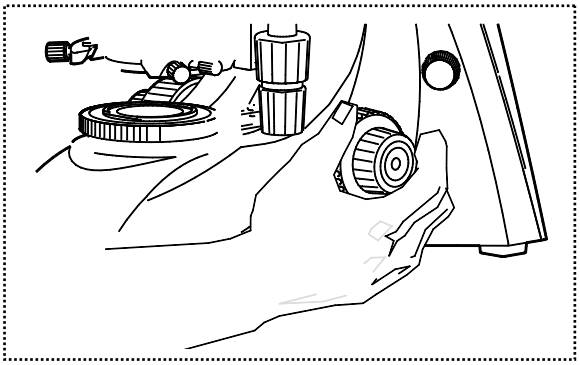


**Fig.5**

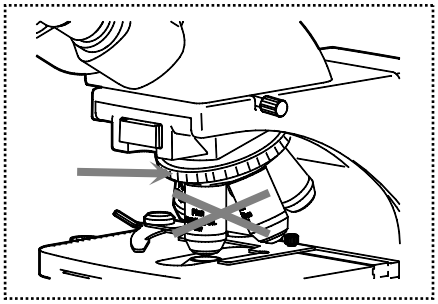
4.2.3 Focusing (Fig.5)

Put 10X objective into light path, turn coarse focusing knob B13, observe from right eyepiece with right eye, then turn slowly fine focusing knob B14 to make the image clear after finding image.



▲ The tension adjustment ring B12 can adjust the tension of the coarse and fine focusing unit to prevent the stage from sliding down automatically and to improve the comfort of operation. Rotation clockwise makes tension decrease, and by contraries, rotation counterclockwise makes tension increase.

**Fig.6**



▲ Don't turn left and right coarse and fine focusing knobs with different direction with power at the same time, if so, the focusing system will be damaged.(Fig.6)

4.2.4 Interpupillary distance and diopter adjustment

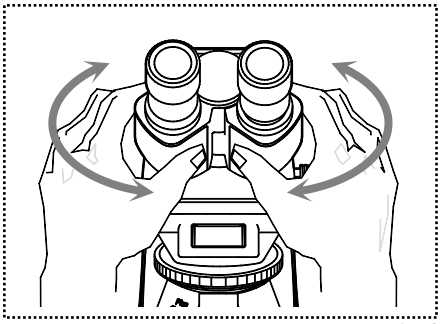
4.2.4.1 Interpupillary distance adjustment

Interpupillary distance is different for everyone, so interpupillary distance should be adjusted before using binocular microscope. Please take the two eyepiece tubes to turn until the bright rings observed by two eyes are in superposition entirely. (Fig.7)

4.2.4.2 Diopter adjustment (Fig.8)

As focusing for binocular, user should observe right eyepiece with right eye, and make the right eyepiece clear by focusing adjustment, then observe the left eyepiece, at the same time, adjust the diopter ring of the left eyepiece tube to make the image of left eyepiece clear as same as the right eyepiece.

**Fig.7**

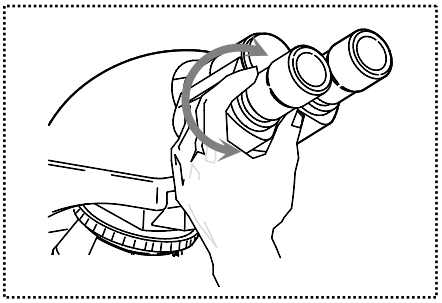


4.2.5 Condenser and aperture diaphragm adjustment

4.2.5.1 Condenser up-down

Turn the condenser focusing screw B10 to adjust the distance between condenser front and the specimen, and change the equal illumination to obtain the best brightness.

**Fig.8**



4.2.5.2 Aperture diaphragm adjustment

Stir the handle of iris aperture of condenser to adjust size of iris aperture for adjusting the contrast of the specimen.

4.2.6 Centering field diaphragm (The process is for microscope with field diaphragm)

4.2.6.1 Put 10X objective into light path, turn B5 field diaphragm revolver anti-clockwisely, then close field diaphragm smaller.

4.2.6.2 Observe through eyepiece, turn B10 condenser focusing screw, adjust condenser up or down to get the image of field diaphragm

4.2.6.3 Turn B4 condenser adjusting screw to move the image to the center of field.

4.2.6.4 Put 40X objective into light path, turn B5 field diaphragm revolver to make the field diaphragm image bigger than field diaphragm. Please center it again if the image isn't in center.

4.3 Usage of immersion oil objective

The 100X objective of B series microscope can be used for observation even if without immersion oil. However, adding moderate immersion oil between the front lens of 100X objective and the cover glass of specimen can make the image clearer. Please pay attention that air bubble and impurity can't be in the immersion oil, otherwise, the image would be affected.

First of all, take 40X objective which has been focused well out from bright path, then take 100X objective into bright path. At this time, nosepiece or stage moving knob should be turned slightly, and also slightly turn fine focusing knob to clear away the air bubble of immersion oil, otherwise, the air bubble would affect the image badly.

▲ After immersion oil used, the oil of specimen and the microscope surface should be soon cleaned by absorbent cotton, lens paper, gauze or soft cotton cloth with moderate mixture of pure industrial alcohol and ether (proportion 1:4)

▲ Standard thickness 0.17mm cover glass should be chosen when high times objective used, and thickness error should be within 0.01mm, otherwise, image definition would be affected.

4.4 Points of attention after using

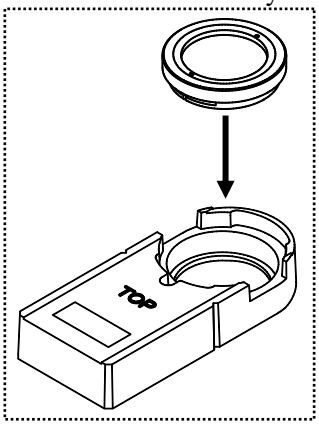
4.4.1 Power of microscope should be turned off after using, and the plug should be pulled down. If immersion oil used, please clean objective and specimen soon. Finally, cover microscope with dust cover.

4.4.2 Please take eyepiece and objectives out from microscope if user will stop using it for a long time, and place eyepiece and objectives into drier with drying agent. Cover microscope with dust cover.

# 5. Installation & Operation For Attachments

The microscope can be with kinds of accessories, for example, phase contrast unit, camera, darkfield unit, polarizing unit.

Installation of Analyzer




5.1 Polarizing Unit

Polarizing unit includes polarizer and analyzer.

5.1.1Installation

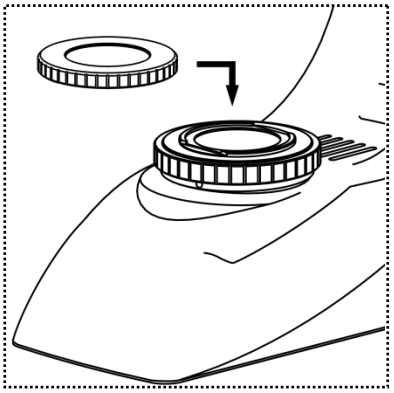
Put out A9 unit of the stand front, and place the analyzer into the round groove of A9 unit steadily. Insert A9 unit into the groove as per step7.

Place the Polarizer on the collector.

5.1.2 Use

Enlarge diaphragm of condenser to PH position, and revolve the polarizer to make the field of eyepiece darkest when there is no sample in stage. Put the sample to observe.

Installation of Polarizer



5.2 Installation of Phase Contrast Unit

The phase contrast unit includes simple phase contrast unit and aperture phase contrast unit.

5.2.1 Installation

Put out Objectives, condenser as per step 3, 5, and install phase contrast objective, simple phase contrast condenser or aperture phase contrast condenser.

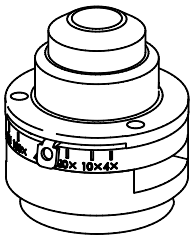
5.2.2 Use

10X,20X, 40X, 100X phase slides are supplied for simple phase contrast unit, and there is mark in the slides.

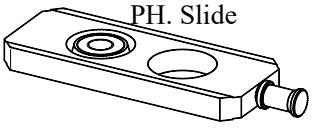
Enlarge the diaphragm of condenser to PH position, put the phase contrast objective into optical path. Insert the slide into the groove of the condenser by right side.

Phase Contrast Objectives

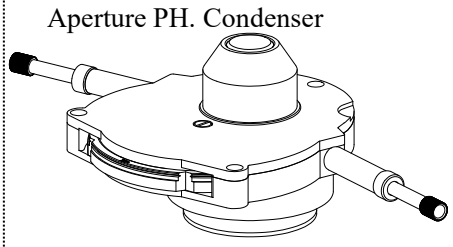
Simple PH. Condenser



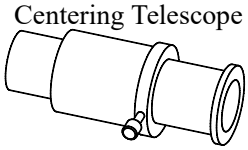
PH. Slide



Aperture PH. Condenser



Centering Telescope



▲ The spot of slide has been adjusted, and don't need to center it.

▲ The face marked TOP is up when installing.

5.2.3 Use of Aperture phase contrast unit

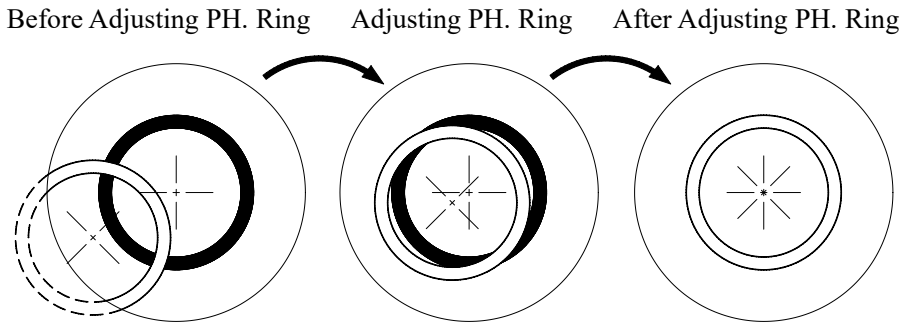
Move the turning disk of aperture phase contrast condenser to the location marked "0", adjust the instrument as per universal way. Move the turning disk of aperture phase contrast condenser to location marked "10×", then enlarge the aperture diaphragm to the maximum,

and put the 10X PH objective into optical path.

Replace eyepiece by the centering telescope, then loosen its stop screw and twitch telescope axially to make the phase ring (dark) and the annular diaphragm (bright ring) image clear ( user can adjust slightly the condenser holder knob), tighten the stop screw again.

Put the two handles of back condenser to adjusting location, turn and adjust the center of spot to overlap the bright ring and dark ring, no leak light.

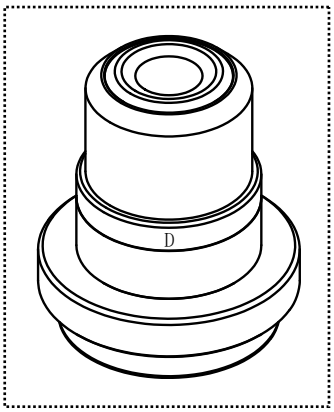
Replace the centering telescope by eyepiece to observe.




5.3 Dark Field Condenser

Reference to bright field observation method to adjust equipment replace the bright field condenser with dark field condenser, slightly adjust the height of condenser bracket, and adjust condenser center with condenser adjusting screw B4 for best observation effect ,and then begin the dark field observations.

Dark Field Condenser




5.4 Installing and using of camera and CCD attachment

5.4.1 Installing

Connect the C-mount with CCD camera or connect camera with camera adaptor, then connect it with c-mount, finally put it into microscope.

5.4.2 Using

First get a clear image from eyepiece, then put out lever on the side of trinocular head, and collect image with camera. Clear image should be in screen. Adjust B14 fine focusing knobs to get it clear if image isn't clear.

# 6. Epi-fluorescence Attachment Operation Instruction

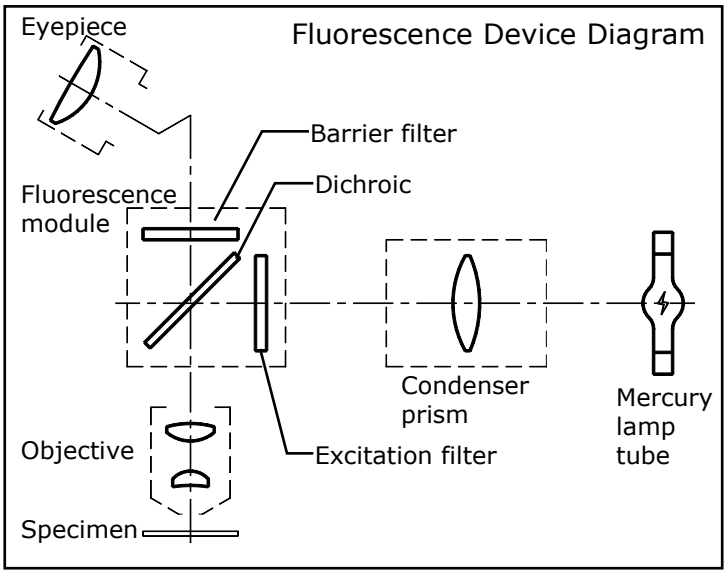
6.1 Applications

Some objects can emit a ray which wavelength is longer than that of the excitation light when irradiated. This ray is called fluorescence, and observers can study the objectives through fluorescence microscope using the phenomenon.

Fluorescence microscope has wide applications in basic theory research and clinical diagnosis about medicine, biology, as well as analysis and test in industry, agriculture, stockbreeding, criminal investigation, legal medical appraise, environmental protection etc.

6.2 Principle

The device consisting of Epi-fluorescence illuminator, 100W direct current mercury lamp power box, fluorescence objectives is combined with microscope to make up fluorescence microscope. The device is designed and manufactured with Epi-excitation principle and provided with 2 group excitation filters system of FL2: blue (B), green (G),or with 4 group excitation filters system of FL4: blue (B), green (G), violet (V) and ultraviolet (UV).




The light emitted from the lamp is converted to the excitation light (e.g.blue light) with specified wavelength by going through the excitation filter, then passes through dichroic prism and objectives (the objective plays role of condenser) to irradiate vertically the object. The object is excited and emits fluorescence with specified wavelength (e.g. green and yellow) and make image passing through objectives, dichroic prism and eyepieces. The light (including excitation light) without fluorescence wavelength is reflected or absorbed by dichroic prism and barrier filter, and can not reach the view system. Therefore, what can be seen in the view field is the bright fluorescence image against the dark background.

6.3 Installation & Operation

A Installation

6.3.1 Take all parts from the package， remove the protective package and place it on the vacant bench.

6.3.2 Turn fluorescence device and put the protective plate in with the screw, then tighten it by wrench.

6.3.3 Then put the device in upright direction, then link the main body connector with main body bayonet, fasten the microscope with screw.

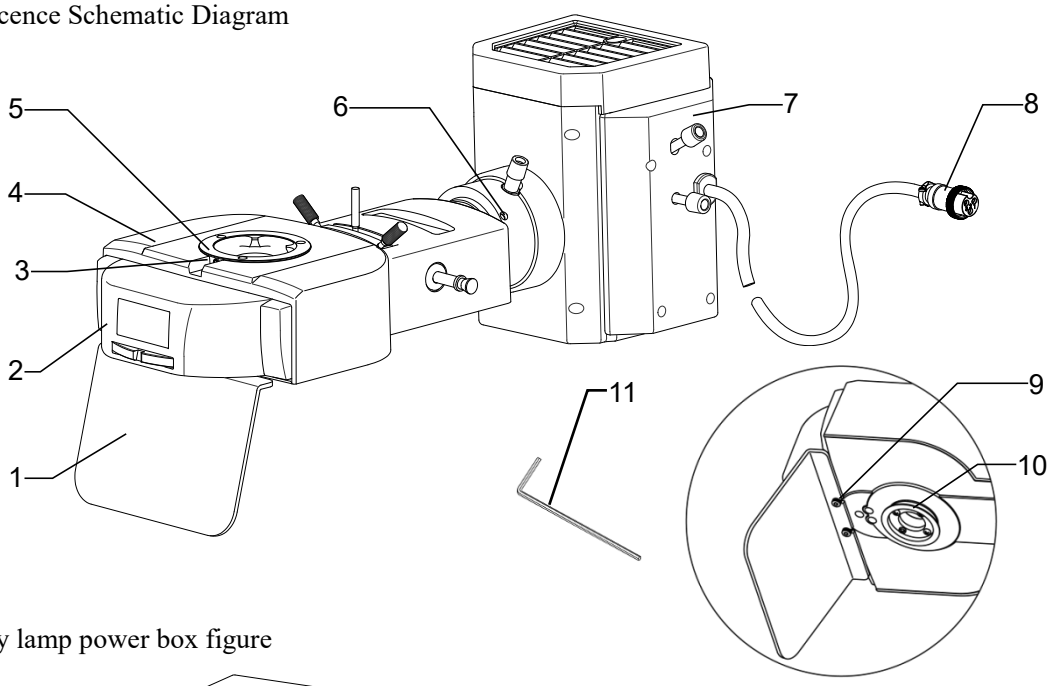
6.3.4 Slightly loosen the locking screw ,then connect the tube connector on the front and the back-tube of the fluorescence mercury power box, fixed with locking screw.

6.3.5 Joint the observing tube with bayonet, and then lock it with wrench.

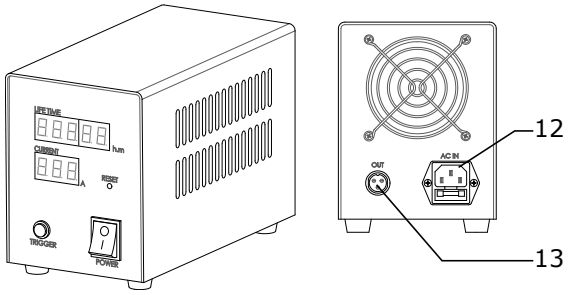
6.3.6 Use lamp power line to connect lamp power socket and relevant socket.

6.3.7 According to the installation instruction to install microscope main body.

Fluorescence Schematic Diagram




Mercury lamp power box figure




1．Protective plate　2. Front cover　3. Locking screw for observing tube　4.Main body
5. Observing tube connector　6.Lamp box locking screw　7.Fluorescence mercury lamp box
8. Power socket　9.Mounting screw for protective plate　10.Main body connector
11.Wrench　12.Power interface　13.Lamp box connecting interface

6.3.8 Take all parts from the package，remove the protective package and place it on the vacant bench.

6.3.9 Turn fluorescence device and put the protective plate in with the screw, then tighten it by wrench.

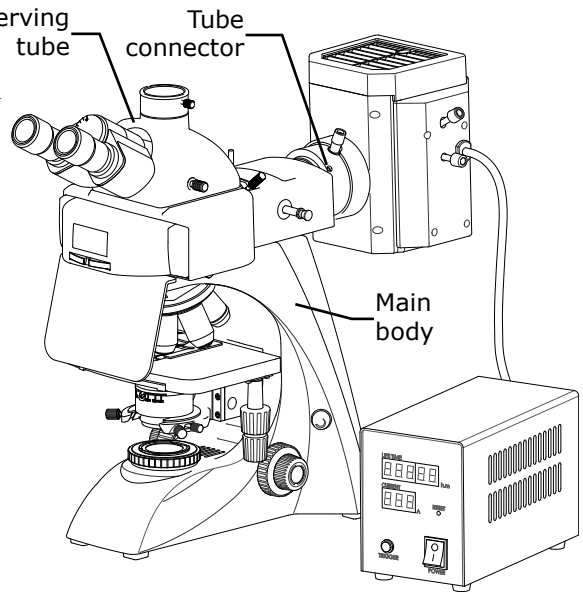
6.3.10 Then put the device in upright direction, then link the main body connector with main body bayonet, fasten the microscope with screw.

6.3.11 Slightly loosen the locking screw ,then connect the tube connector on the front and the back-tube of the fluorescence mercury power box, fixed with locking screw.

6.3.12 Joint the observing tube with bayonet, and then lock it with wrench.

6.3.13 Use lamp power line to connect lamp power socket and relevant socket.

6.3.14 According to the installation instruction to install microscope main body.



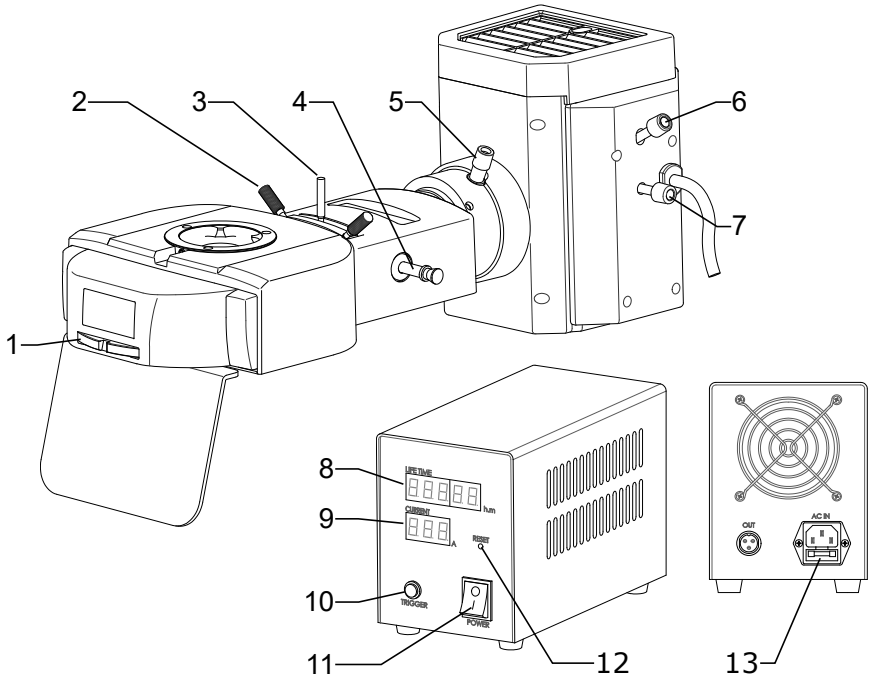
B Operation

Please adjust microscope in bright field method and operate fluorescence attachment as follows:

6.3.15 Insert the plug of the mercury power source into external power supply socket (please make sure the rated current and voltage are coincided with the input supply voltage at first).

6.3.16 Turn off the Epi-fluorescence switch and turn on the mercury power source (the input voltage should be within 220V±10V, otherwise the starting will be affected). It takes 10 minutes to make the mercury lamp reach the stable state and max. luminescence efficiency.

6.3.17 Swing the fluorescence Objective 10X into the optical path.




1 Fluorescence module switch driver
2 Field diaphragm centering handle
3 Field diaphragm adjusting lever
4 Light switch lever
5 Lamp condenser adjusting lever
6 Light source vertical adjusting knob
7 Light source horizontal adjusting knob
8 Time display window
9 Electricity display window
10 Mercury start button
11 Power switch of mercury lamp power source
12 Reset button
13 Fuse cap

6.3.18 Place the fluorescence specimen on the stage and fix it with the clamp, adjust the stage knobs to move the specimen in the optical path.

6.3.19 Pull the filter converting lever to the needed position.

6.3.20 Maximize the field diaphragm by manipulating the field diaphragm adjust lever on the Epi-fluorescence device.

6.3.21 Focusing by rotating the coarse and fine focusing knobs to make the image clear.

6.3.22 Centering the filament image of the high pressure mercury lamp.

Indistinct bright block of mercury lamp filament image can be seen in the view field after getting the clear fluorescence image, pulling the light condenser to move the light condenser axially to move the bright block in the brightest position. If the bright block diverges the view field center, it can be centered by adjusting the horizontal or vertical lever on the mercury lamp house (the instrument has been adjusted before dispatching, in normal case, it would be better not to center again).

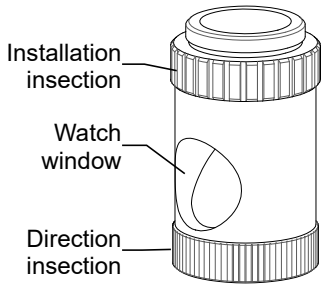
▲ Before perform fluorescence observation, locate the specimen with the transmission light first.

▲ To prevent the fluorescence from attenuation quickly, block the excitation light with barrier when preparing for fluorescence observation or photography. Only when observing or photographing, irradiate the specimen with the excitation light.

▲ Don't switch off the mercury lamp within the initial 15 minutes it lights on for avoiding shorten its lifetime. The user can block the light with the barrier when leaving for a short time, and the lamp once turned off should be lighted on again after 3 minutes.

▲ Fluorescence microphotograph requires a long exposure time, so it is better to use the high sensitivity film (e.g.27 DIN).

6.4 Use of fluorescent centering device




The Fluorescent centering device can center directly the light source for convenient using.

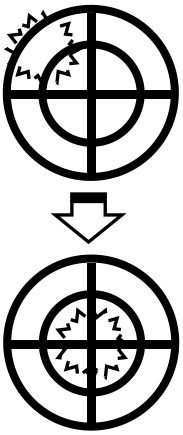
The size of the device is similar to the normal objective, and there is an observation window in the side of cover.

6.4.1 Hold the silvery colour gear in the centering device, and install it on the nosepiece ,turn the cover of centering device to align the observation window .

6.4.2 Turn the fluorescence device to G, and watch the light source's position through the widow.

6.4.3 Adjust the handle of light source condenser properly, and make the outline of the light source clear, adjusting the knob on fluorescence lamp house to center.

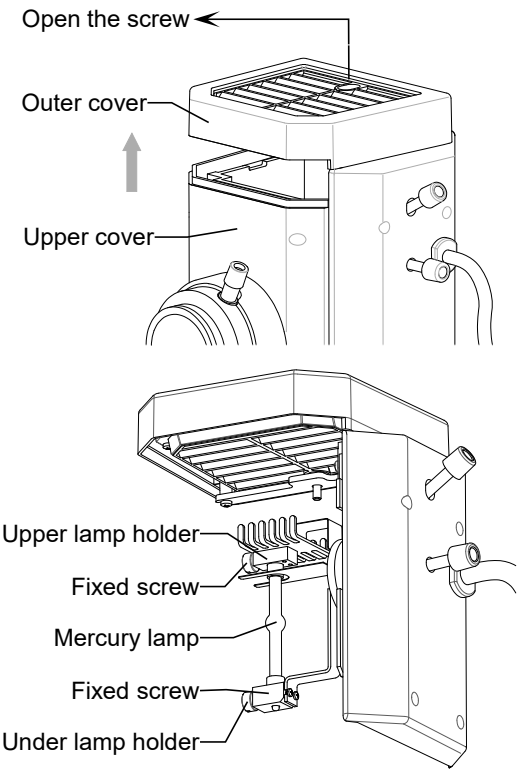
6.4.4 The cross line center in observation window must be aligned with the lamp house .



▲ Please turn the fluorescence device to G, because the brightness of G is suitable for observation better to avoid to feel unconformable for high brightness.

6.5 Fluorescent mercury lamp replacement

Turn off the power supply, loosen the thumb screw then take out the lamp holder. Loosen the two fixing screws of mercury lamp, replace the used lamp with a new one, then screw down the two fixing screws, take back the lamp holder and tighten the thumb screw. At last, center the mercury lamp.




▲ Danger! It is absolutely forbidden to take the lamp holder out of the lamp house while the mercury lamp lights on.

▲ The mercury lamp should not be replaced until it cools down completely.

▲ Clean the bulb with the gauze soaked with a few mixture of alcohol and ether (4∶6). Stains such as dust and fingerprint are not allowed on the bulb surface.

6.6 Replacement of the fuse

Remove the safety box, replace the safety tube inside, and install it back.

# 7. Maintenance

7.1 Clean microscope

7.1.1 Don’t touch the lens with hand, Dust on lens should be cleaned by soft brush or absorbent cotton or cleaned by absorbent cotton, lens paper with the mixture of alcohol and ether (proportion 1:4).

7.1.2 Alcohol and ether all are burnt early, please take them away from fire. Be careful for turn on and off power.

7.1.3 Don’t clean painted metal and galvanizing metal with organic solvent such as alcohol, ether or the mixture of the both. Silicon cloth or soft cleaning preparation is suggested to clean it.

7.1.4 Plastic should be cleaned by soft cloth with clear water.

7.2 Environment of using and placing

7.2.1 Microscope should be used and placed in a cool, dry, non-dust, non-shake and non-corrosive gases environment.

7.2.2 Microscope should be used in environment of indoor temperature 0°-40°C and maximum relative humidity 85%.

7.2.3 Removing equipment is suggested to be installed when microscope used in heavy humidity area to avoid fungus and mist damage instrument.

7.2.4 Please pay attention to prevent microscope from violent shake and vibration in application and in carrying. Don’t drag it on the surface of worktable to avoid damage to microscope and worktable.

7.3 Replacement of bulb

7.3.1 Turn off power, and pull out plug.

7.3.2 Wait the bulb become cool.

▲ Please be sure that the bulb is cool, then follow by the nest operations.

7.3.3 Lay aside the microscope reliably, unscrew the knurled thumb screw of the lamp housing cover on the underside of base.

7.3.4 Pull over the lamp housing cover.

7.3.5 Pull out the bulb should be replaced, hold a new bulb with silk cloth to avoid fingerprint and dust affect bulb brightness and service life, and insert fully the contact pins into the bulb socket.

7.3.6 Close the lamp housing cover, and screw the knurled thumb screw.

▲After working for above 10 hours continuously, better cut off the microscope about 30 minutes.

7.4 Replacement of fuse (Shown in Fig.8)

7.4.1 Cut off power of microscope, and pull out the plug.

7.4.2 Unscrew fuse cap in the back of base, take out old fuse.

7.4.3 Replace a new fuse, then screw the fuse cap.

## 8.Troubleshooting

In the period of using BK series microscope, if there is any trouble occurs, please referring to the following sheet listed some common troubleshooting resolve them.

| Trouble | Causation | Remedy |
|---|---|---|
| Switch on but bulb dark | Plug is unreliable | Plug in again |
| | Bulb is broken | Change bulb |
| | Fuse is broken | Change fuse |
| Bulb is flickering or brightness is unsteady | Bulb is unstable | Insert it again |
| | Bulb is broken | Replacing bulb |
| Brightness of view field isn't enough or is Uneven | Bulb specification doesn't meet the requirement | Replacing bulb |
| | Brightness isn't adjusted correctly | Adjust rotation potentiometer |
| | Objective isn't in correct position | Make the objective in correct position |
| | The size of iris aperture is too small | Adjust the size of iris aperture |
| Brightness of view field isn't enough or is Uneven | Lens (objective,eyepiece, condenser, light collector) has dust | Clean it |
| | Position of condenser is too low | Higher condenser |
| Image isn't clear (contrast or definition isn't enough) | Cover glass of specimen doesn't meet the requirement | Use required thickness cover glass (0.17mm) |
| | Cover glass of specimen isn't in up direction | Place specimen correctly |
| | Surface of objective lens isdirty (especially it is easy for the front lens of 40X objective to dip in immersion oil) | Clean it |
| | Immersion oil isn't used for 100X objective (oil) | Use immersion oil |
| | Immersion oil doesn't meet the requirement | Use immersion oil supplied by us |
| | There is bubble in immersion oil | Clear the bubble way |
| | Size of iris aperture isn't proper | Adjust the size of iris aperture |
| | Position of condenser is too low | Readjust the position of condenser |
| One side of image is dark or image is moving as focusing | Objective isn't in correct position | Make the objective in correct position |
| | Specimen isn't placed correctly | Place specimen levelly on stage and clip it with clamp |
| Objective touches specimen as changing low times objective to high times objective | Cover glass of specimen isn't in up direction | Place specimen correctly |
| | Cover glass doesn't meet the requirement | Use required thickness cover glass (0.17mm) |
| Image observed by two eyes aren't in superposition entirely. | Interpupilary distance isn't adjusted correctly | Adjust interpupilary distance according to two eyes |
| It is easy for eyes to be tired during observing | Diopter isn't adjusted correctly | Readjust diopter |