



BS-5070B/T BS-5070BTR/TTR Polarizing Microscope

User Manual

To obtain optimum performance and to familiarize yourself fully with the use of your microscope, we recommend that you read this manual thoroughly before use. Retain this instruction manual in an easily accessible place near the work desk for future reference. BS-5070B/T do not have reflected illumination system, for other parts, they are the same as BS-5070BRT/TTR, the operation is also similar.

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Safety notice

1. Transportation

As microscope is a precision instrument, handle with care, avoiding impact or abrupt movement during transportation. Do not push or pull the microscope during using, otherwise the precision for image will be reduced.

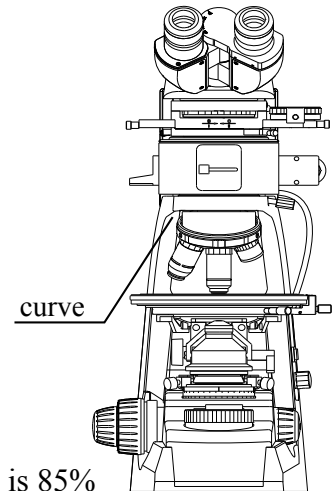
- 1.1 Hold the curve and keep the microscope in balance
- 1.2 Do not hold the focusing knob, eyepiece tubes and stage as these parts are movable. Troubles maybe caused by such handles.

Do not make specimen or filters fall off.



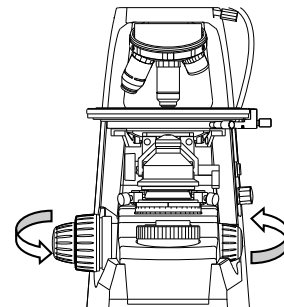
2. Working Environment

- 2.1 Temperature range is 0°C ~40°C and the max. humidity is 85%
- 2.2 Altitude :<2000m
- 2.3 Barometric: 86KPa~106KPa
- 2.4 Avoid high temperature and humidification otherwise there will be fog or mold on the lens
- 2.5 Keep the environment breezy and cover the microscope with the dust-cover
- 2.6 Avoid violent vibration as the vibration will reduce the image's quality



3. Focusing knob

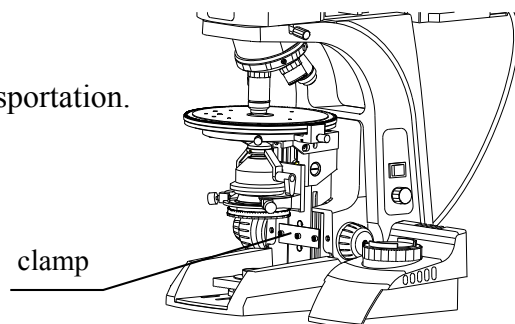
Never turn the left and right focusing knob in the adverse direction at the same time. Do not turn the coarse focusing knob when the stage reaches max. position. These improper operations will make focusing structure unworkable.



Never turn the left and right focusing knob in the adverse direction at the same time

4. Clamp

The clamps fix the microscope firmly during transportation. Please remove them before using.



5. Do not take the microscope apart

as it will be damaged. Such operations might have bad effect on the performance and make user get an electric shock or injured. Please contact with manufacturers if there is any problem.

6. Use the spare parts supplied by the manufactures

The bulb, fuse and electronic cord have been assembled already in the factory and please make sure to use the spare parts of them supplied by the manufacturers. Improper bulb, fuse and electronic cord will destroy microscope and cause fire. Please make sure to use PE electronic cord when using extra-long electronic cord.

Spare bulbs: halogen bulb 12V 20W, 12V50W (reflect)

LED lamp 5W(transmission), 10W (reflect)

Spare fuse: 250V 1A delayed model, 5 × 20 minitype fuse

7. Mounting the bulb

Never touch the surface of bulb with your hand directly. Please use gloves or cloth material when you mount the bulb to avoid leaving fingerprints. Fingerprints or stains should be wiped off with a tissue moistened with a small amount of alcohol. The fingerprints will etch on the bulb's surface and make brightness lower and life cycle shorter.

Please make sure the bulb's touching points are Ok as it will not light or short circuit if the bulb's touching points are damaged. Insert the bulb's legs into the bulb holder firmly. The bulb will go out if its legs have not been inserted into the holder firmly. Such Operation may cause short circuit or smoking. At last, please make sure if the collector has been mounted properly



8. Temperature for illumination

There will be high temperature when the bulb is lightened, never move the collector when the bulb is lightened. Do not touch the bulb within 30 minutes after it has been gout out. Make sure the bulb has been be cooling enough time (at least 30 minutes) to avoid scald.

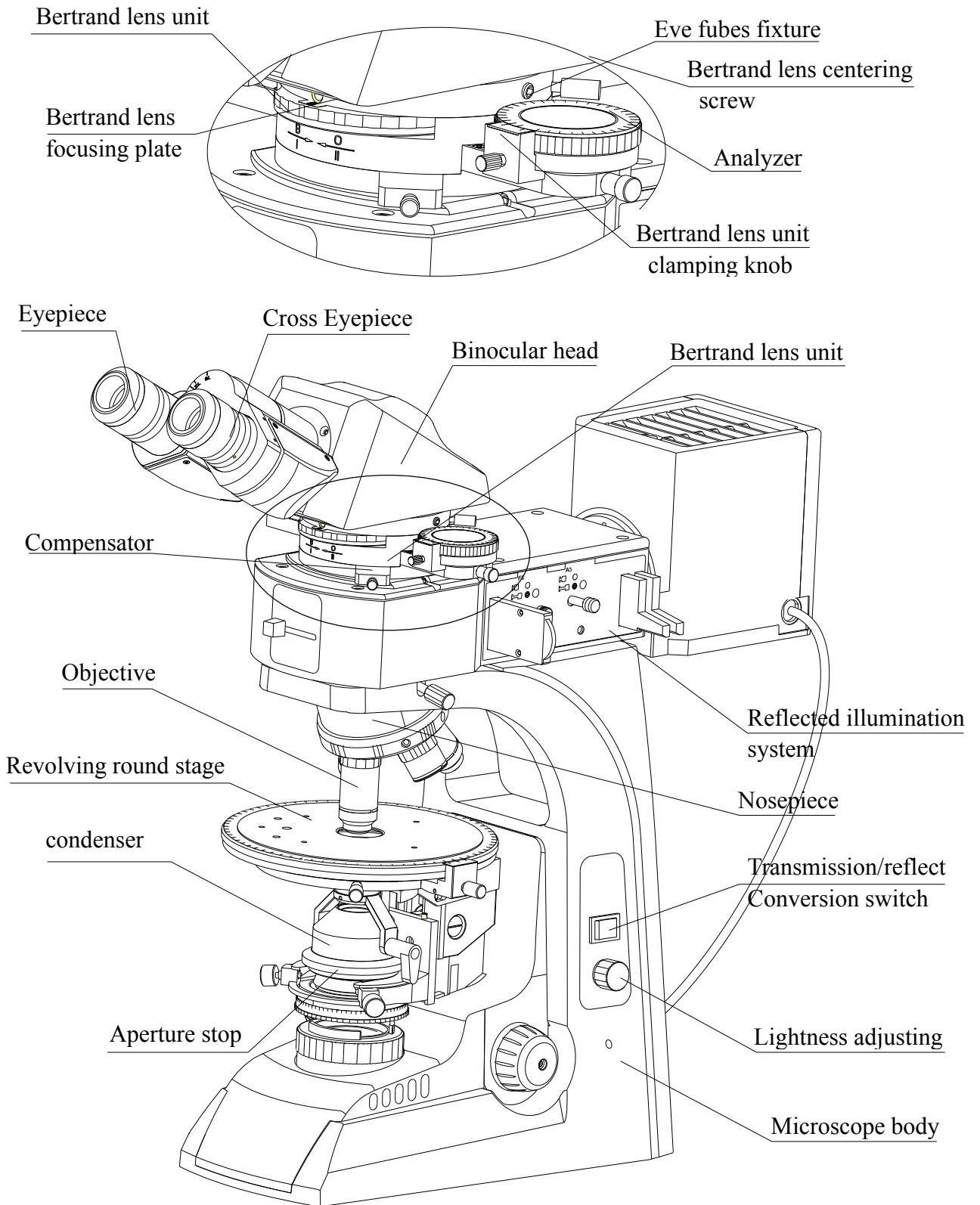
Do not put fibre, papers and incendive things (eg. Gasoline, aether, methanol and ethanol) close to the bulb.

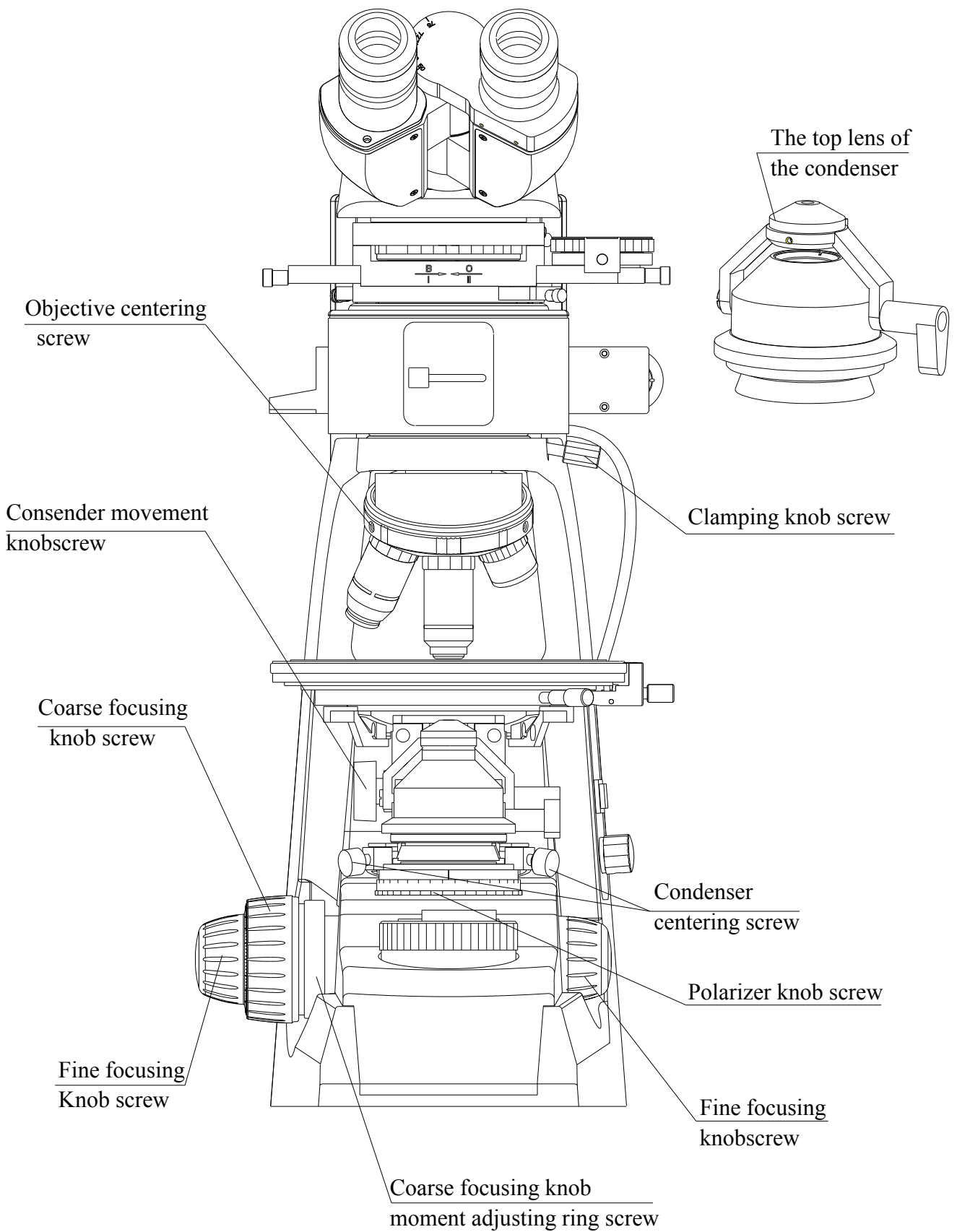
9. Make sure to turn off the power supply before assembling microscope, replacing bulb or fuse.**Notice:**

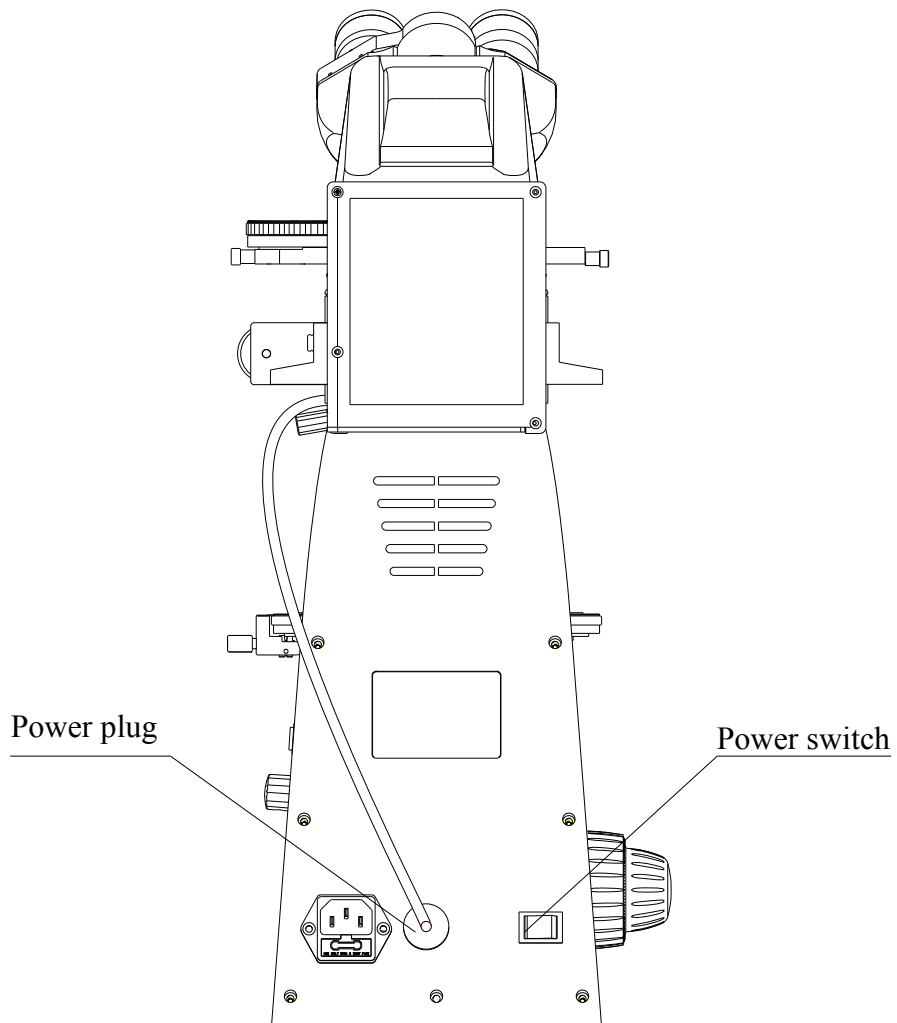
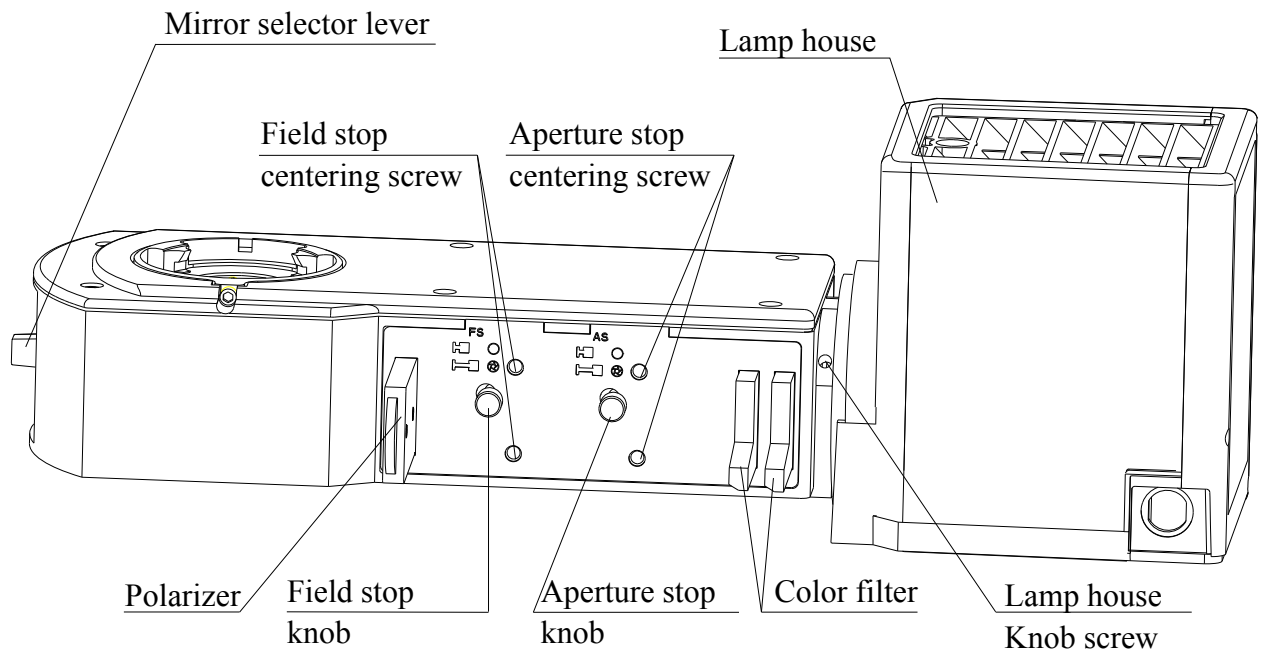
The instruction you buy may not including some products mentioned in this instruction. Safety has been considered during design while users still have the possibility to be injured and the instruction to be damaged when improper operation made. Please pay much more attention to read this instruction carefully before using and keep it properly to make sure it will be got when it is necessary.

Mark	Meaning
	1.Hot surface, don't touch with your hands
	2.Read the instruction manual carefully before operating the microscope unproper
—	operation will cause hurt or damage to the operator and instrument 3.Switch on
O	4.Switch off

1. Structure and nomenclature







2. Technical parameter and specification

2.1 Optical system: infinity optical system

2.2 Objectives: stress-relieving infinity plan objectives

Magnification	NA	Cover glass thickness(mm)
4X	0.10	0.17
10X	0.25	0.17
20X	0.40	0.17
40X	0.65	0.17
60X	0.80	0.17
100X (OIL)	1.25	0.17
20X	0.4	0
40X	0.65	0
60X	0.8	0
100X	0.9	0

2.3 Eyepiece:

Category	Magnification	Field of view (mm)
Eyepiece:	10X	20
Crisscross eyepiece	10X	20
Eyepiece with scale of crosshair	10X	20
eyepiece with gridding	10X	20

2.4 Total magnification

objective	4X	10X	20X	40X	60X	100X
eyepiece	10X					
Total magnification	40X	100X	200X	400X	600X	1000X

2.5 Nosepiece

Centerable quintuple

2.6 Rotatable stage:

Diameter ϕ 160mm, 360° scale. Minimum reading 6' by means of vernier scale

2.7 Coaxial Coarse and Fine Focusing System,

Sensitivity and Graduation of Fine Focus: 0.002mm

Focusing movement range: 24mm

2.8 Illumination system:

Transmission light: Halogen lamp 12V20W

Reflected light: Halogen lamp 12V50W

2.9 Eye tubes:

Trinocular tube

2.10 Filter:

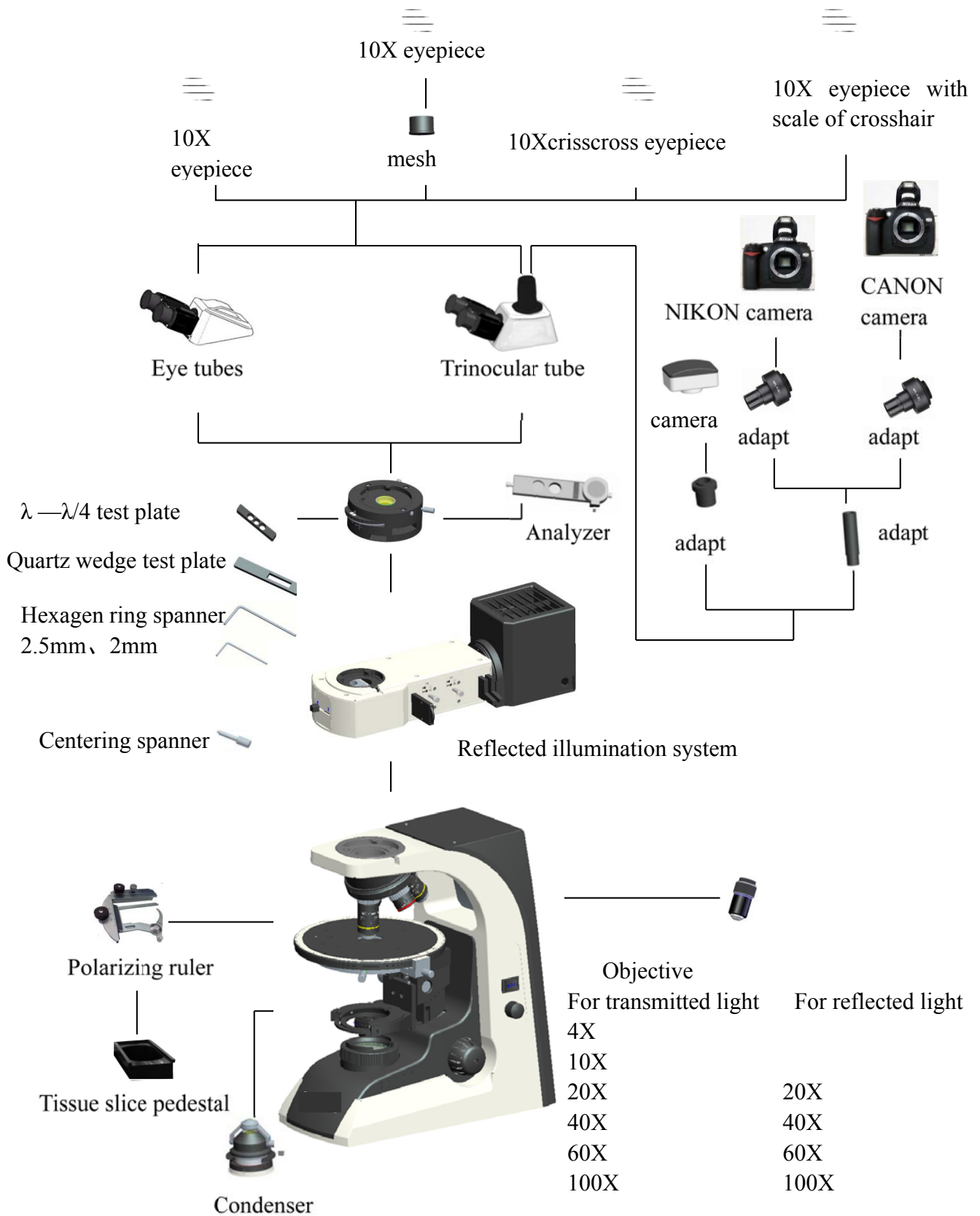
Blue, green, frosted, gray

2.11 Test plate compensator

λ test plate (first-order red) , $1/4\lambda$ test plate, Quartz wedge test plate

2.12 condenser: NA=0.9

3. BS-5070BTR/TTR Configuration

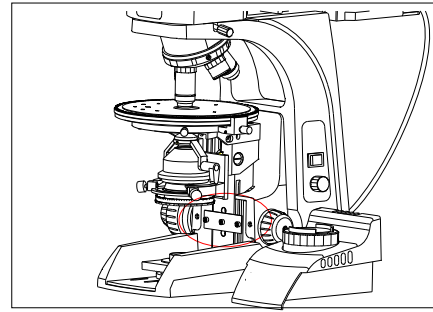


4. Assembly Diagram

4.1 Removing the clamps for transportation

The clamps fix the stage and focusing adjustment firmly during transportation.

Handle the grooves beside collector and pull it out. Remove the clamps by wrenches.



4.2 Reflected illumination system

Mount the Illumination System ① into the round dovetail on the head of the microscope body properly and use the Allen screw driver to tighten the set screw ② to fix it.

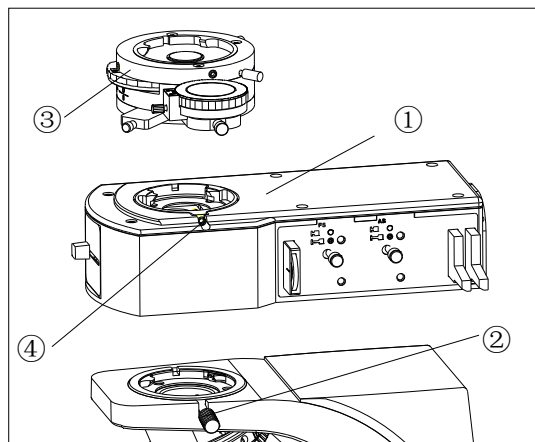


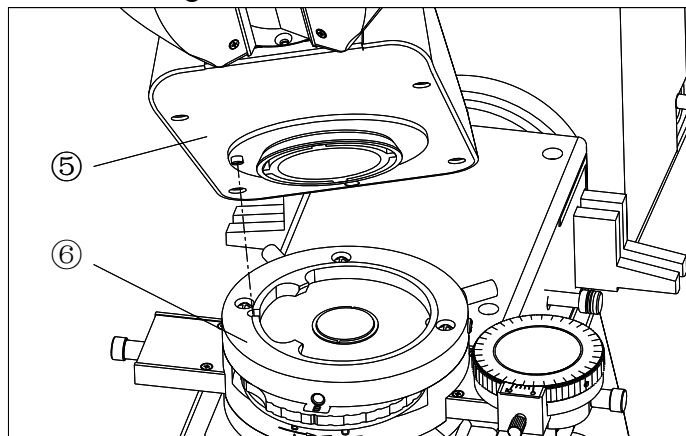
Fig 1

4.3 Mounting Bertrand lens unit (Fig.1)

Mount the Bertrand lens unit ③ into the round dovetail on the reflection Illumination system ① properly and use the Allen screw driver to tighten the set screw ④ to fix it.

4.4 Mounting trinocular viewing head (Fig.2)

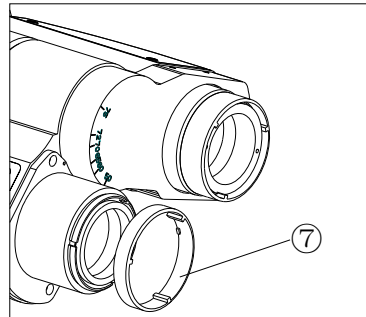
Mount the trinocular viewing head ⑤ onto the illumination system properly and use the Allen screw driver to tighten the bolt ⑥ to fix it.



4.5 Eyepiece

The eyepiece is inserted into the left eye lens barrel, another cross eyepiece (positioning) alignment right eyepiece tube within the gap insertion, the installation should be pushed down to ensure that the adjustable eyepiece, eye baseline cross divisional position unchanged.

During operation, such as the need to rotate 360 degrees when the eyepiece, take off the binocular plastic ring ⑦, then insert into the eyepiece.



4.6 Objective

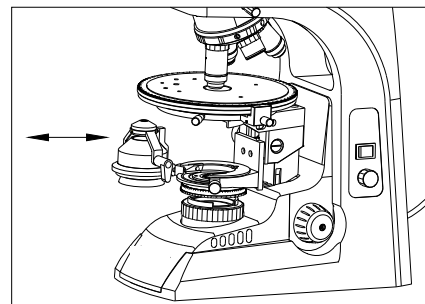
Adjusting the coarse focus knob until the support device of the mechanical stage reach its low limit position.

Insert the 10X objective into the primary hole (which without centering holes on its sides) on the nosepiece, then push the nosepiece clockwise and install other objectives by the sequence of low to high magnification.

4.7 Condenser

Before delivery, the condensing lens is mounted on the microscope. According to the following steps to remove or alter the condenser:

- 1) The stage of adjustment to the highest position, rotating mirror elevating handwheel will mirror bracket falling to the appropriate position.
- 2) the first side of the condensing lens center adjusting screws, can be taken out condenser when installing the condenser, in stent, tighten the screws.



4.8 Mounting Test Plate Compensator

Insert the optical compensator into the test plate adapter.

4.9 Filter


Transmission light: The filter has been mounted in the microscope before shipment. By in case of need, it can be taken out the filter from the bottom of condenser.

Reflected light: Engage the optimum filter sliders for the purpose of observation in the filter insertion slots.

4.10 Mounting Polarizer

Reflected light: Insert the polarizer into its slot and make it in the light path center.

NOTE: the polarizer and analyzer are engaged when pushed in to the second click-stop position. To disengaged the polarizer and analyzer, and to place the empty hole in the light path, pull the analyzer out to the first click-stop.

The silkscreen 

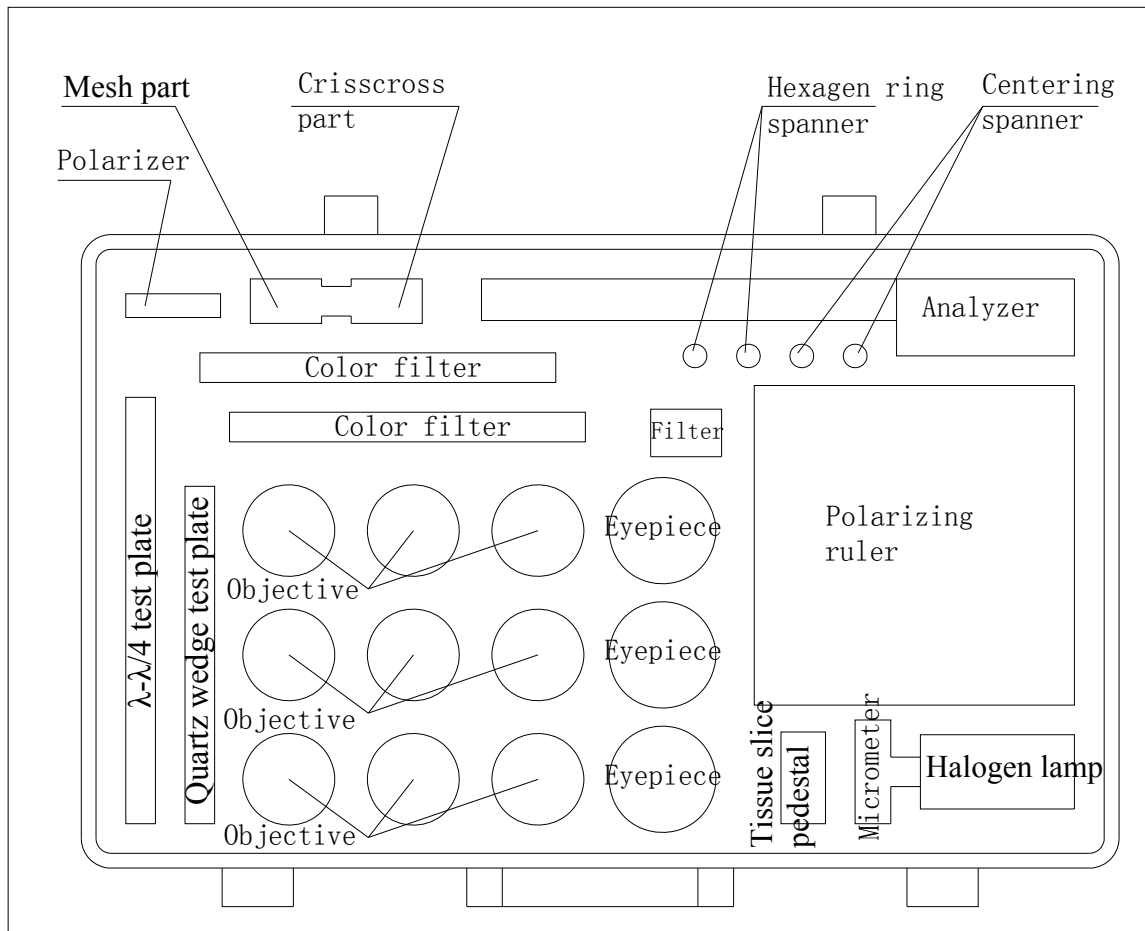
“- -” means polarization direction is north and south.

“• •” means polarization direction is west and east.

4.11 Polarizing ruler

By in case of need, install the polarizing ruler on the revolving round stage.

Note: parts when not in use can be shown in the aluminum alloy box save



5. Operation

5.1 Illumination

Connect the power; press the main switch that on the backside of microscope body to the “I” (on) position.

When using transmitted light illumination, press the Transmission/reflect conversion switch to the “I” (on) position.

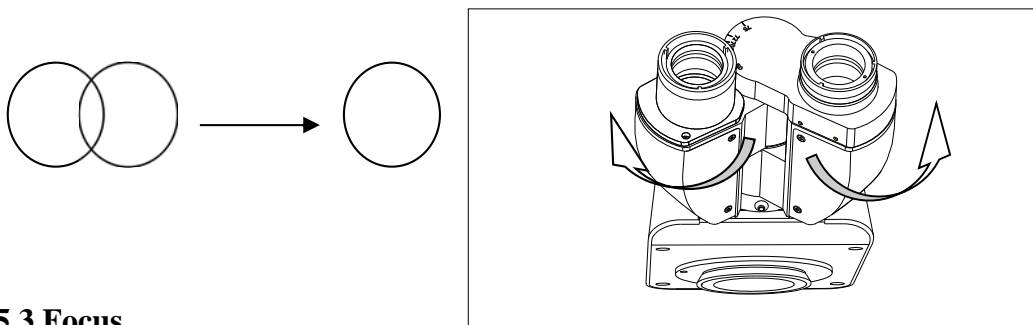
When using reflected light illumination, press the Transmission/reflect conversion

switch to the “II” (on) position.

Turning the brightness adjustment knob clockwise, the voltage raise, and the brightness strengthen; turning with the anti-direction, the voltage decline, and the brightness weaken.

5.2 Interpupillary range

Adjust the siendentipf binocular to make sure that view field in the right and left eyepiece is consistent. The point “.” stands for the interpupillary distance

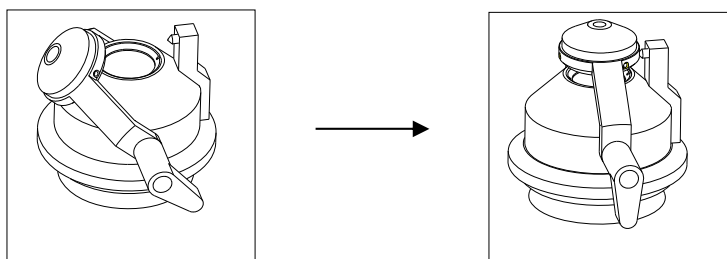


5.3 Focus

Use the 10×objective to focus. To avoid the objective touch with the specimen, you should raise the mechanical stage and let the specimen close to the objective, then slowly separating them to focus. The operator can converse turn the coarse focus knob to get the specimen down ,and search images in the 10×ocular simultaneously, then use the fine knob to focus. At this moment, you can replace other magnification objectives safely, and focus without the risk of destroying the specimen.

The tension of the coarse focusing knob has been adjusted before leaving factory. If it is too loose, for example, the stage decline slightly due to self-weight, the tension adjustment collar can be adjusted.

(When focus on the specimen by 40X or 60X objective, make sure the top lens of the condenser is in the light path center.)



NOTE:

Slide the mirror selector lever toward the indication of the mirror for the desired

observation method.

T: Transmission light observation

R: Reflected light observation

5.4 Adjusting the optical axis

The revolving nosepiece is centerable. Before leaving the factory, the optical axis of the objective and the center of stage has been adjusted coaxial, please do not adjust them unless necessary.

★ Make sure the 10X objective is inserted into the primary hole on the centerable revolving nosepiece.

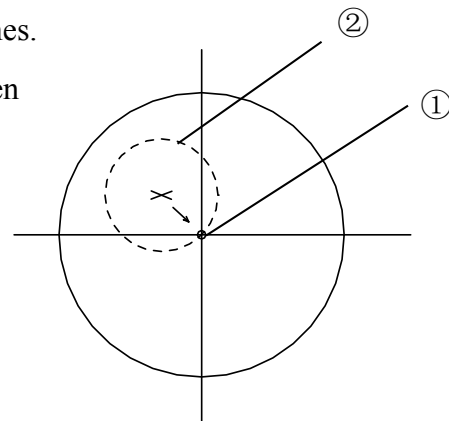
Perform the following adjustments if the optical axial and the center of stage is not coaxial.

1) Focus on the specimen by 10x objective and look for an easily recognizable detail ① in the field. Move this detail in the center of the eyepiece cross lines.

2) When the stage is rotated, the detail moves in circle ②. Manipulate the two stage centering knobs to coincide the imaginary center of the circle circumscribed by the detail with the intersection of the eyepiece cross lines.

3) Moving the specimen only, move a new specimen detail into the cross line center.

3) Repeat steps 2 and 3 several times until the center of the stage rotation is in the center of the cross lines, i.e., when rotating the stage, the specimen stays in the center of the cross lines.



This concludes centering of the optical axis for the 10X objective, which will act as the reference objective. Now, center the other objectives with the centerable nosepiece by engaging the objectives into the light path one after another. (Each objective has 2 centering screw on the nosepiece.)

5.5 Orthoscopic Observation

Revolve the Bertrand lens dial to “O” position to remove the Bertrand lens from optical path. Push the analyzer into its slot. The polarizer and the analyzer can be

360° rotatable, turn anyone until complete extinction is obtained.

Place the specimen for orthoscopic observation.

Insert test plates for further observation test and study.

5.6 Adjusting the aperture stop axis

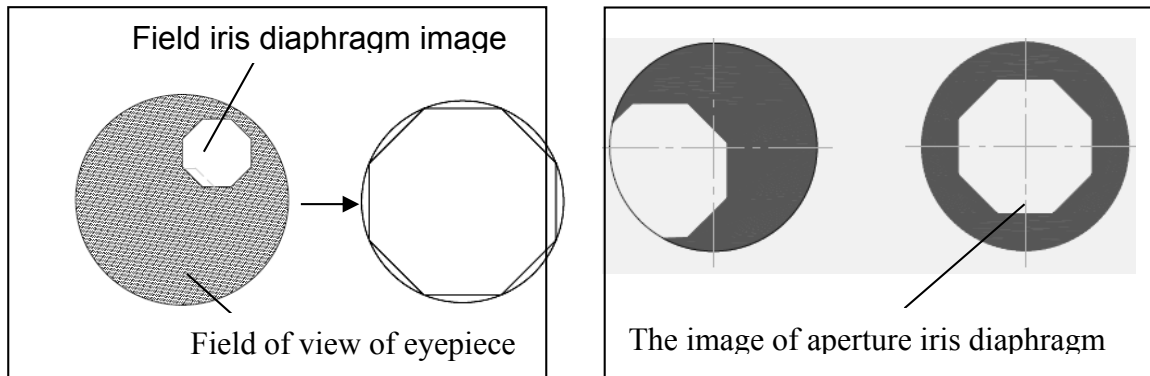
When using transmitted light illumination, revolve the Bertrand lens dial to “B” position or remove the eyepiece, observe for the back focal plane round bright of objective lens, slowly open contraction the aperture diaphragm, diaphragm and observation of bright circle concentricity, such as offset adjustable condenser center adjusting screw and achieve both coincidence.

5.7 Adjusting the diaphragm

The center of the aperture and field diaphragm in the reflective lighting part, have been adjusted, before products leave factory, in general do not open. When using transmitted light illumination, if the aperture is not in the center of view field, adjustable aperture adjusting screws.

5.7.1 Centering the Field Iris Diaphragm (FS)

- 1) Slide the mirror selector lever to “R”.
- 2) Engage the 10X objective by rotating the revolving nosepiece, place the specimen on the stage and adjust approximate focusing.
- 3) Pull out the FS knob on the reflected light illuminator to reduce the aperture iris diaphragm a little.
- 4) Rotate the two FS centering screws using the Allen screwdriver to adjust so that the field iris image becomes concentric with the field of view.
- 5) While pushing in the FS knob, open the field iris diaphragm until the field iris image inscribes the field of view. If the image is found to be eccentric, adjust the centering again.
- 6) Open the field iris so that its image is almost the same size as (Fig. 28 subscribes) the field of view.



5.7.2 Centering the Aperture Iris Diaphragm (AS)

- 1) Slide the mirror selector lever to “R”.
- 2) Engage the 10X objective by rotating the revolving nosepiece, place the specimen on the stage and adjust approximate focusing.
- 3) Remove the eyepiece, look into the eyepiece sleeve and pull the AS knob, so that the aperture is about 70%.
- 4) If the center of the iris diaphragm is deviated, center it by rotating the two AS centering screws using the Allen screw driver.

With some specimens, an image with high contrast and little flare may sometimes be obtained when the aperture is slightly closed. It is therefore recommended to also try a slightly closed aperture.

5.8 Compensator

- 1) gypsum plate (λ)

In the orthogonal polarizing filter has a purple interference color. The gypsum plate is inserted into the optical path, can make mineral film interference color is raised or lowered a grade. For example, a mineral thin-section interference color is a gray, is inserted into the gypsum plate, if the same radius in parallel, the interference color by a gray into level two blue green; if the synonym radius parallel, the interference color on a gray to level orange. In general, gypsum plate compared to the interference color is low (level two yellow below) mineral tablets.

- 2) mica plate ($\lambda/4$)

In the orthogonal polarizing filter has a gray interference color. Insert the mica plate, can make mineral tablets by GC interference colors are listed in order of ascending,

descending a color sequence. For example, a mineral flakes interference color is a purple, join the mica plate, if the radius is parallel, the interference color is elevated a color sequence and change to a two LAN; if the synonym radius parallel, the interference color to reduce a color change to level orange. In general, mica plate compared to the interference color high mineral tablets.

3) quartz wedge

In the orthogonal polarizing filter was inserted between the quartz wedge, on the thin to thick sequentially presenting a level to the four level of interference colors. In the mine from thin to thick plate is inserted into the quartz wedge, when the same radius are parallel, the minerals in the order of interference colour gradually increased; synonym radius are parallel, the order of interference colour gradually reduce.

5.9 Conoscopic Observation

Use 20X to 100X objectives.

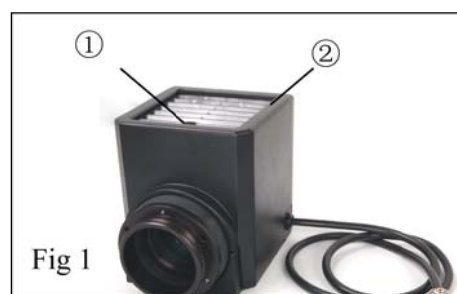
- 1) Engage the polarizer and analyzer for extinction position
- 2) Swing the condenser top lens into the light path.
- 3) Revolve the Bertrand lens dial to "B" position to engage the lens into the light path.
- 4) Open the aperture iris diaphragm to largest size.
- 5) Revolve the focusing dial of the Bertrand lens to focus on the conoscopic image.

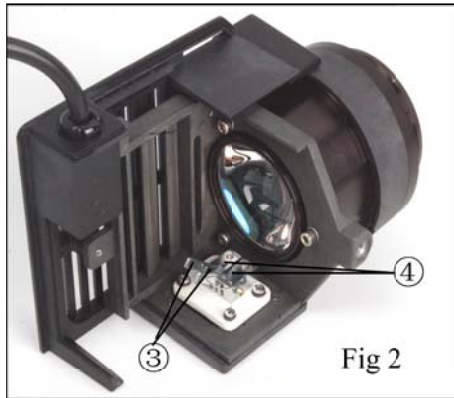
Note: If the periphery of the conoscopic image is dark, move the condenser vertically to find the position where the periphery is brightest.

5.10 Replacement for bulb

5.10.1 The lamp bulb for reflected lighting

- 1) The applicable lamp bulb is the 12V50W.(PHILIPS)
- 2) Fully loosen the clamping screw ① at the top of the lamp housing using the provided hexagon wrench S3.(Fig. 1)
- 3) Remove the lamp housing ② by lifting it up.
- 4) Tilt the bulb socket by 90° (Fig. 2)





5) While pushing down the bulb clamping levers, hold the halogen bulb with gloves or a piece of gauze, insert the bulb pins into the sections as far as they will go. Then return the lamp clamping lever gently back to the original position to clamp the bulb. (Fig. 3)

Caution for Bulb Replacement During or Right After Use

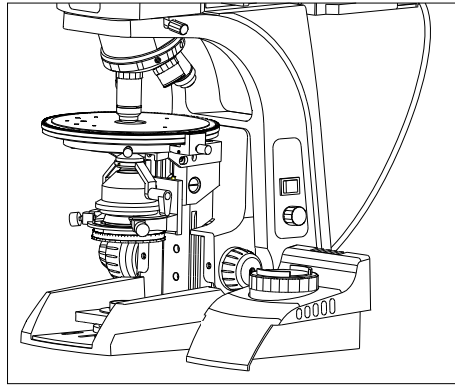
When using, or soon after it is turned off the lamp, the lamp house and nearby parts will be very hot and will cause serious burns. Please turn the main switch on “O” (off), pull out power plug, and make sure the bulb, the lamp room and periphery are all cool. Then, you can do your replacing.

- ★ Please insert the lamp gently, or it will be damaged by excessive extrusion.
- ★ Do not touch the Halogen bulb with your bare hands. It will shorten the service life or cause it to burst. If you leave finger marks on the surface carelessly, clean it with a dry soft cloth.

⚠ When using, the temperature of the lamp housing surface will be very hot, please pay attention to the warning written on the Warning board.

5.10.2 Replacement for bulb

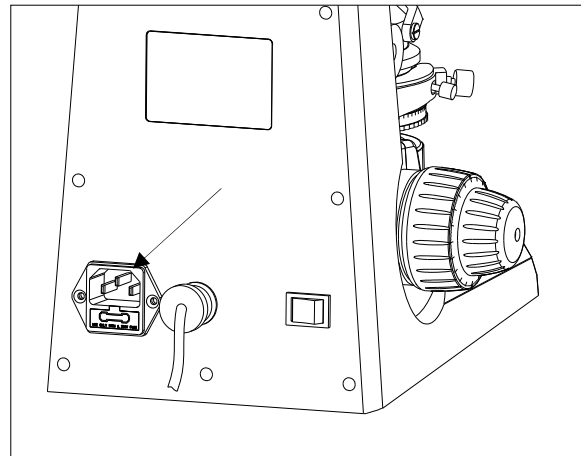
- 1) The applicable lamp bulb is the 12V20W.
- 2) Turn off the power supply (turn the switch to “O”) and pull out the connector Wait for 30 minutes till the bulb is cooling.



- 3) Handle the grooves in condenser and pull it out. Pull out the original bulb
- 4) Replace the bulb by gloves or cloth material then insert the bulb into the socket entirely.
- 5) Pull the condenser back to its original position. Connect the electronic cord to the power supply

5.10.3 Replacement for fuse

- 1) Turn off the power supply (turn the switch to “O”) and pull out the connector.
- 2) Open the cover for fuse by screwdriver.
- 3) Mount the new fuse
- 4) Make sure that the voltage shown in the cover for fuse is same to the working voltage.
- 5) Mount the cover.



6. Maintenance

All the lenses have been well checked and adjusted. It is forbidden to disassemble them yourself.

The nosepiece and coarse/fine focus unit have a compact and precise frame, so please don't disassemble them as possible as you can.

Keep the instrument clean, wipe dust regularly, and be attention to avoid contaminating the optical elements especially.

The contaminations on the prism, as finger mark and oil, could be gently wiped with a piece of soft cloth or tissue paper, gauze which has been immersed in pure alcohol or xylene. (Note that the alcohol and the xylene are all burned easily, do not let them near the fire, and use them in a drafty room as possible as you can.)

Don't use organic solvent to wipe the non-optical elements, when you need to clean, use the soft detergent, please.

When using, if the microscope is splash by liquid, cut off the power at once, and wipe up the moisture.

Do not disassemble any parts of the microscope. That will affect the function or decline the performance of the microscope.

Place the instrument in a cool, dry position. After using the microscope, remember to cover it with dust helmet. Do wait for the lamp house cooling completely before cover.

7. Trouble shooting

PROBLEM	REASON FOR PROBLEM	SOLUTION
Bulb lights but the field of view is dark.	The aperture or field iris diaphragm is closed.	Open the aperture and field iris diaphragms.
	Analyzer and polarizer are engaged in light path.	Disengage them from light path.
	Mirror selector lever is in an intermediate position	Set the knob correctly.
Field of view is obscured or not evenly illuminated	Mirror selector lever is in an intermediate position.	Set the knob correctly.
	Revolving nosepiece is not in a click position.	Set it in a click position.
	Field iris diaphragm is not centered.	Center the field iris diaphragm correctly and open it sufficiently.
	ND filter is not in a click position.	Set it in a click position.
	Lamp bulb is not installed correctly.	Push halogen bulb terminals all the way into stop position.

	Analyzer and/or polarizer not installed correctly	Engage analyzer and polarizer in light path.
Dirt or dust is visible in the field of view.	Dirt/dust on eyepiece	Clean thoroughly.
	Dirt/dust on specimen	
The image is defocus\low-resolution	Revolving nosepiece is not in a click position.	Set it in a click position.
	The surface of the objective lens is moldy or has contaminant	Clean thoroughly.
	Dirt/dust on specimen	
One side of image is blurred.	Objective is not correctly engaged in light path.	Make sure that revolving nosepiece clicks into place correctly.

PROBLEM	REASON FOR PROBLEM	SOLUTION
The coarse focus knob is hard to run	The tension adjustment collar is too tight	Loose properly
	Pre-focusing lever is locked.	Release pre-focusing lever.
Stage drifts down by itself or focus is lost during observation.	Tension adjustment ring is too loose.	Tighten ring to an optimum tightness
Field of view of one eye does not match that of the other.	Interpupillary distance is incorrect.	Adjust it again.
The eyes overtire	Incorrect diopter adjustment.	Adjust diopter correctly
	Brightness uncomfortable.	Adjust the bulb voltage
The lamp can't light	No power supply	Check the power cord, and connect them exactly
	the installation of the bulb is wrong	Install the bulb correctly
	The bulb burn out	Change a new bulb
	The connection of lamp housing power plug is incorrect.	Connect again follow the instructions
	The power opened incorrectly.	Press it to the appointed position follow the instructions
The bulb burn out in a high frequency	Not use the specified lamp	Use the required lamp
The height of the brightness is not enough	Not use a appointed lamp	use a appointed lamp
The light glimpse	The bulb is going to spoil	Change the bulb
	The power cord have a poor contact	Check the power cord, and connect them exactly