



iMetal-40UP Metallographic Microscope

Instruction Manual



Anhui Mikrosize Precision Instrument Co.,Ltd

Add: A-4035 RuiFeng Business Expo, Wuhu City, China, 241000.

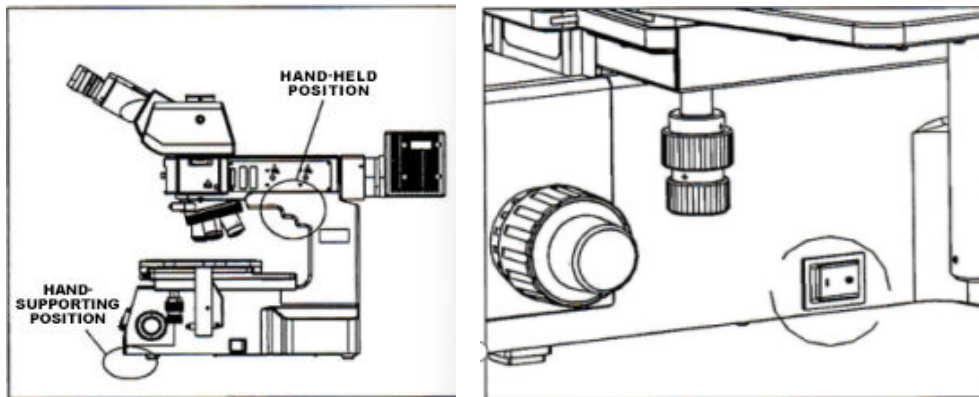
Web: www.mikrosize.com **Email:** mikrosize@mikrosize.com

Contents

1.Before Use Instructions	1
1.1Names of Each Part	3
2.Installation	6
2-1. Installation Steps	6
3.Operating Instructions	10
3-1. Illumination	10
3-2. Optical Path Selection	10
3-3. Focusing	11
3-4. Tightness Adjustment of Focusing Mechanism.....	11
3-5. Pupillary Distance Adjustment	11
3-6. Using the Eyecups	12
3-7. Stage Adjustment	12
3-8. Condenser Centering	12
3-9. Field Diaphragm Adjustment	13
3-10. Aperture Diaphragm Adjustment.....	13
3-11. Using the Color Filters	14
3-12. Bright-Field/Dark-Field Switching	15
3-13 Switching Between Bright Field and Dark Field	15
3-14. Using the Simple Polarization Device	16
3-15. Using the CTV Adapter	16
3-16. Using the DIC Components	17
4.Troubleshooting	18

1. Before Use Instructions

I. Operation



1. The microscope is a precision instrument. Operate it carefully and avoid physical shocks as much as possible.
2. Do not place the microscope in direct sunlight, high - temperature, high - humidity, dusty environments, or places prone to strong shocks. Ensure the working surface is flat and level. Working environment requirements: Ambient temperature 5°C - 40°C, maximum relative humidity 80%.
3. Moving the microscope requires two people. One person grabs the arm with both hands, and the other supports the bottom of the (mirror body). Handle it gently. (See the left figure)
 - ▲ If moving the microscope, grabbing the microscope's stage, focusing knob, objective lens, and light source will damage the microscope.
4. During operation, the surface of the light source will become very hot. Ensure there is sufficient ventilation around the light source.
5. To ensure safety, avoid lightning strikes.
6. Before replacing the bulb or fuse, make sure the main switch is in the "0" (OFF) position (see the left figure), and disconnect the power supply. At the same time, wait until the bulb and lamp housing are completely cool before proceeding.
7. This machine uses a wide - voltage design and can adapt to any voltage within the 100 - 240V range. No additional transformer is needed. Ensure the power supply voltage is within this range.
8. Use the dedicated power cord provided by our company.
9. This machine does not place all disconnection devices in hard - to - operate positions.

1. Before Use Instructions

II. Maintenance

1. Gently wipe and clean the lenses with a gauze cloth. If you need to remove fingerprints and oil stains, use a very small amount of a mixed solution of ethanol and ether in a 3:7 ratio or a xylene - soaked gauze to gently wipe.

▲ Ethanol and ether are extremely flammable. Be careful not to bring these chemicals close to open flames and possible spark sources, such as during the on/off operations of electronic equipment. Whenever possible, use these chemicals in a well - ventilated room.





2. Do not use organic solvents to clean the non - optical components of the microscope. For cleaning, use a neutral detergent.

3. If the microscope is contaminated by liquids during use, immediately disconnect the power supply and wipe it dry.

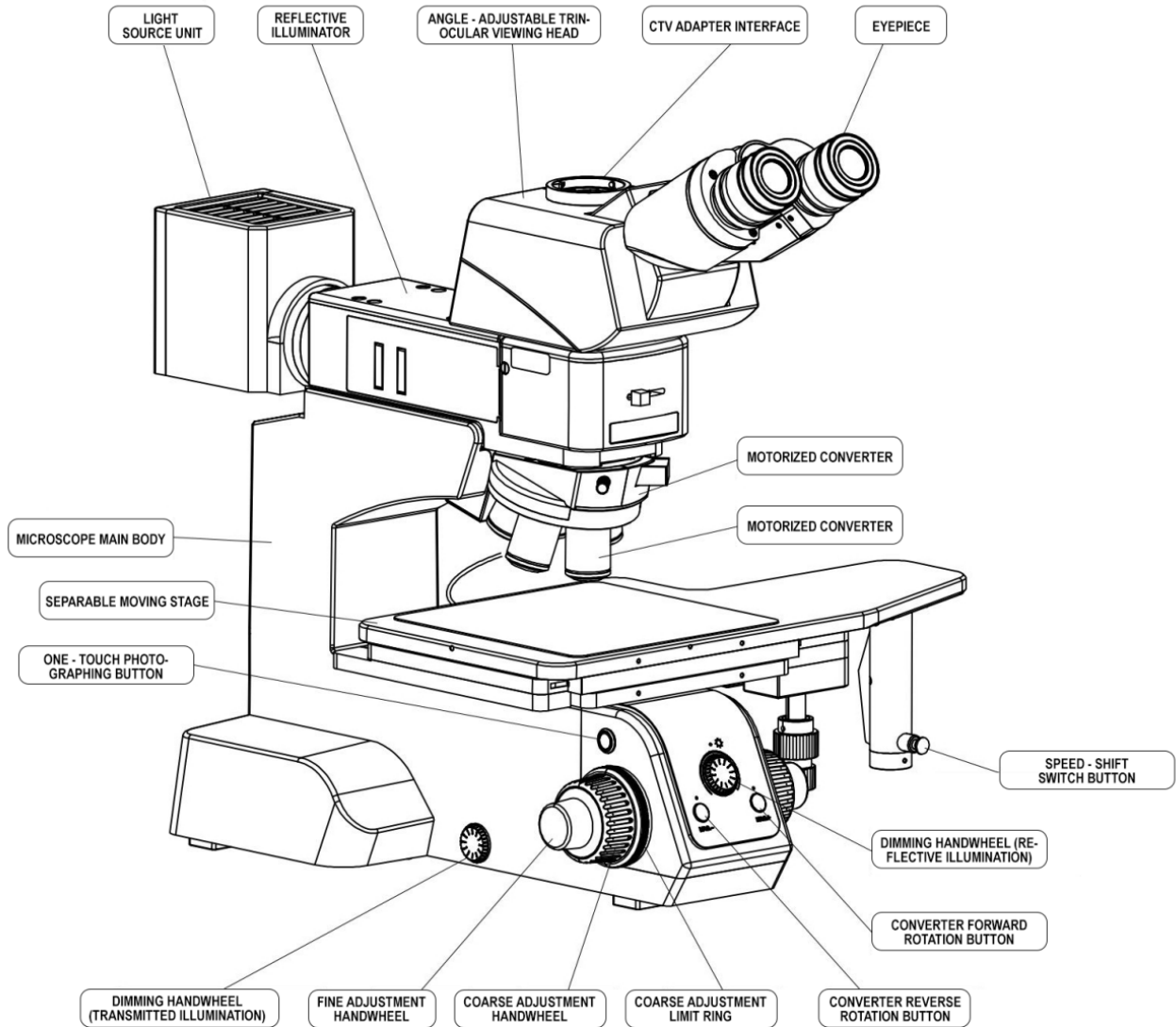
4. Never disassemble any parts of the microscope. This will affect the function of the microscope or damage it.

5. When not using the microscope, cover it with a dust cover.

III. Safety Marks

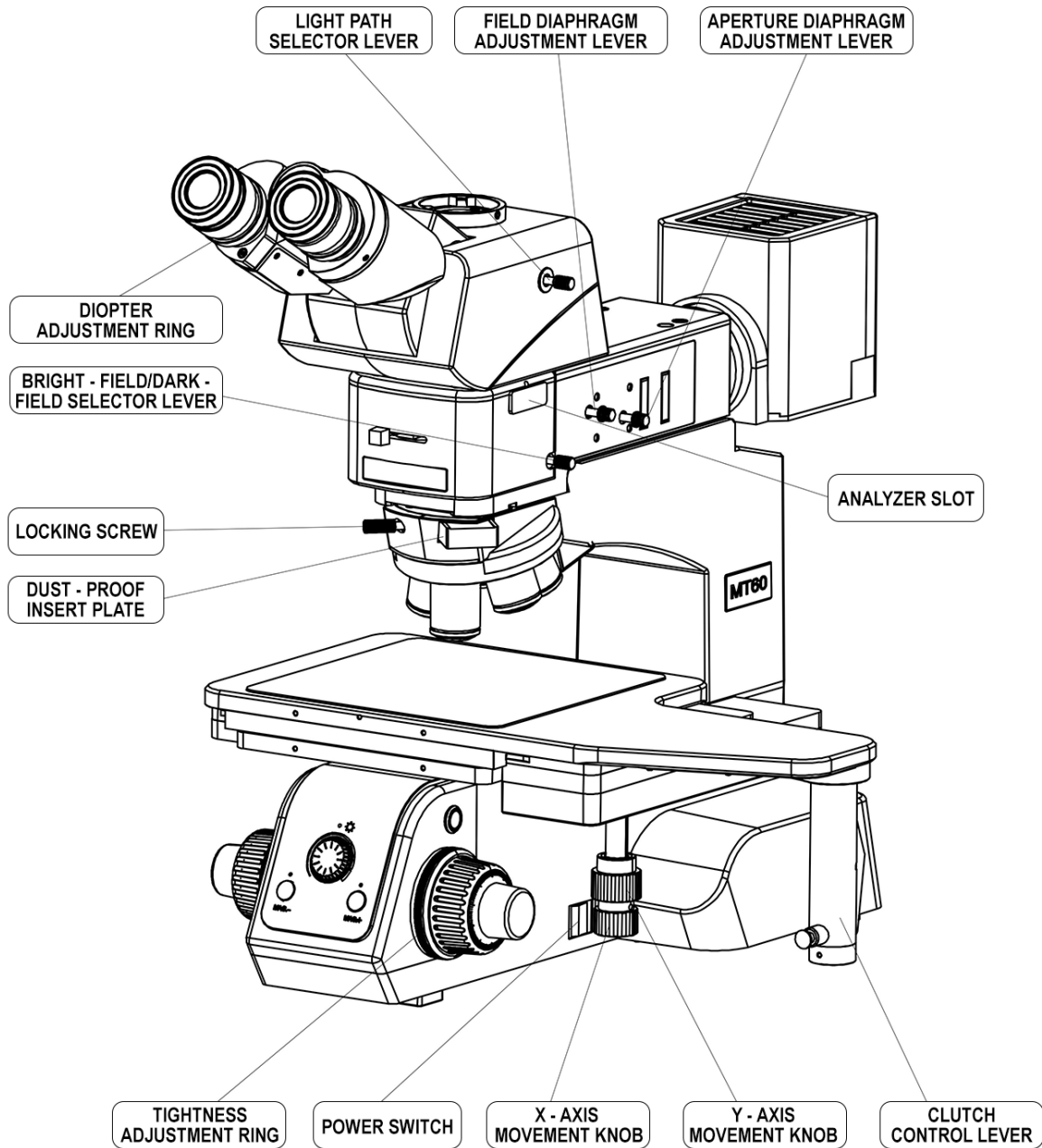
	Indicates that the surface becomes hot and cannot be touched with bare hands.
	Read the instruction manual carefully before use. Improper operation may cause personal injury or equipment failure.
	Main switch ON
	Main switch OFF

1.1 Names of Each Part



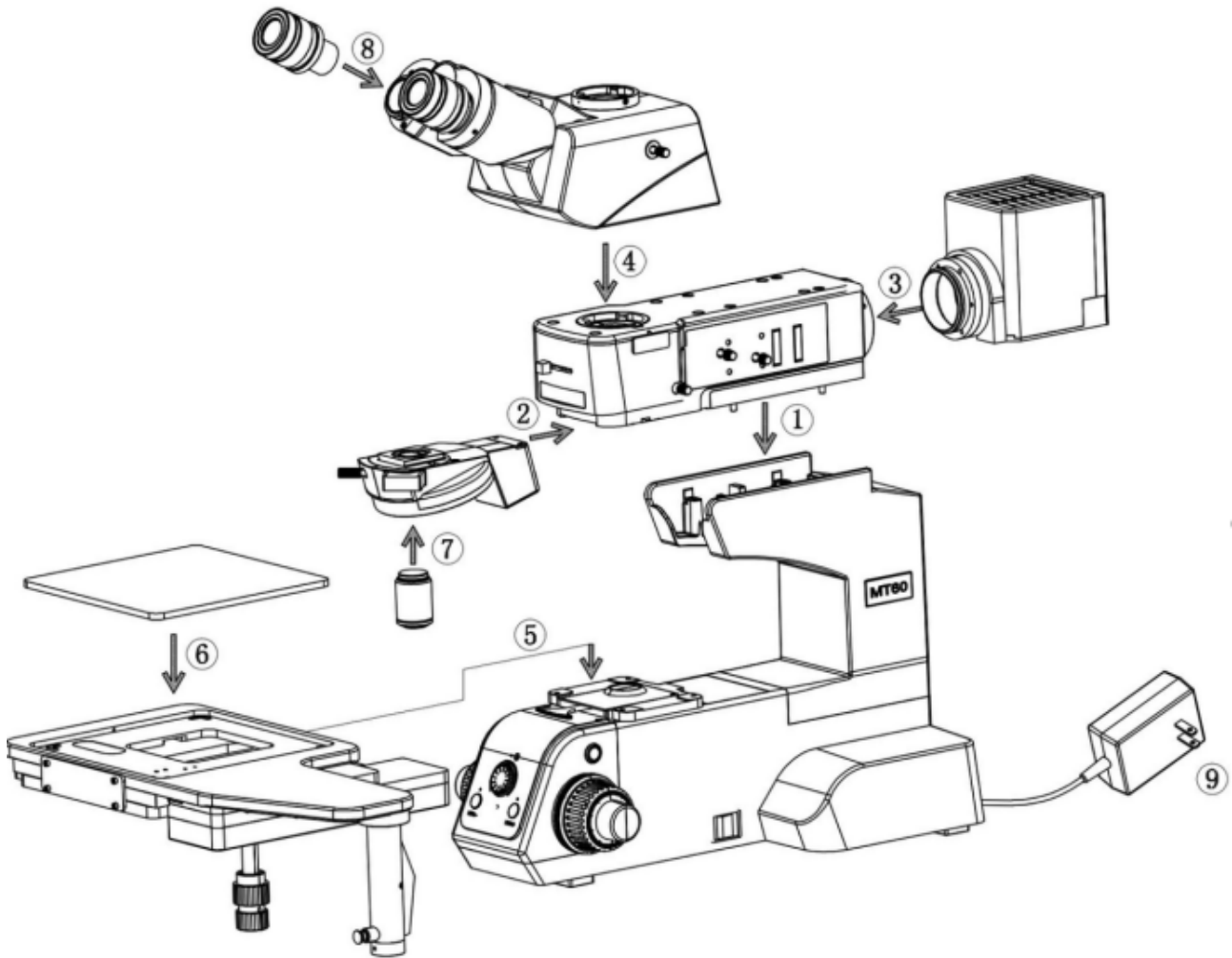
Component Names Of Upright Metallurgical Microscope

1.1 Names of Each Part



Component Names Of Upright Metallurgical Microscope

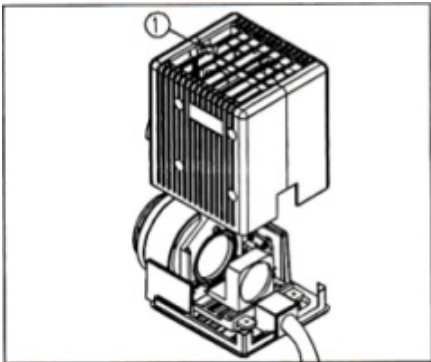
1.1 Names of Each Part



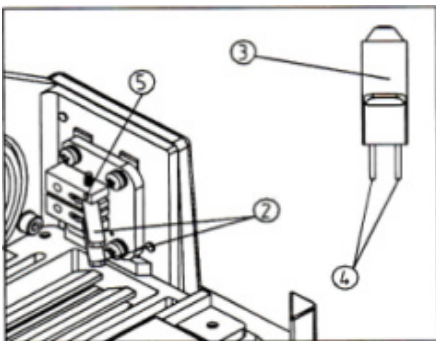
Name of the upright metallographic microscope assembly

2. Installation

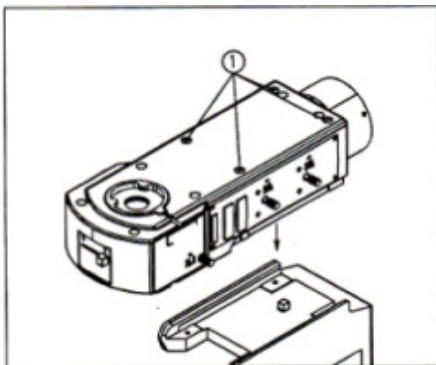
2-2 Installation Steps:



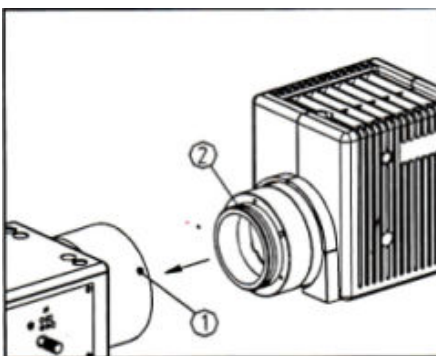
Picture 1



Picture 2



Picture 3



Picture 4

2-2-1 Installing and Replacing the Halogen Lamp

(1) Use the M4 internal hexagon wrench attached to the machine to unscrew the fixing screw ① and remove the shell. (As shown in Figure 1)

(2) Pry open the bulb locking sheet ②, and use a clean glove or cloth to hold the bulb ③. Insert the pin ④ of the bulb into the socket hole ⑤ on the socket. After insertion, it should be vertical and not skewed. (As shown in Figure 2)

(3) Loosen the bulb locking sheet ②, the bulb will be locked. Put the shell back on.

★ Do not touch the bulb with your fingers. If fingerprints are left on the bulb accidentally, wipe them off with a clean soft cloth.

★ Designated bulb: 12V/100W halogen lamp (Philips 7724).

★ Whenever replacing the bulb, first cut off the power supply and wait until the lamp socket and bulb are completely cooled before proceeding.

2-2-2 Installing the Reflective Illuminator

(1) Use a thin and small pointed tool to align with the notch of the cap ① on the illuminator, and remove the cap ①. (As shown in Figure 3)

(2) Place the illuminator into the mirror body along the matching angle of the side surface, and then push it towards the light source direction until the incident illuminator is flush with the mirror body.

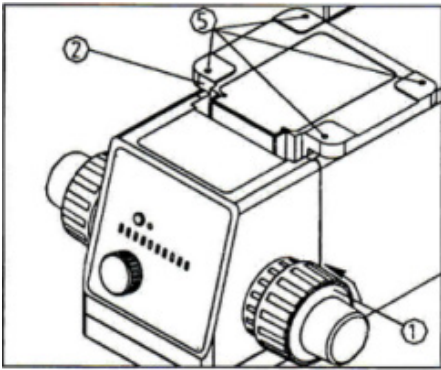
(3) Use an M5 internal hexagon wrench to tighten the four M5 internal hexagon screws in the illuminator, and then put the cap back to its original position.

2-2-3 Installing the Light Source Unit

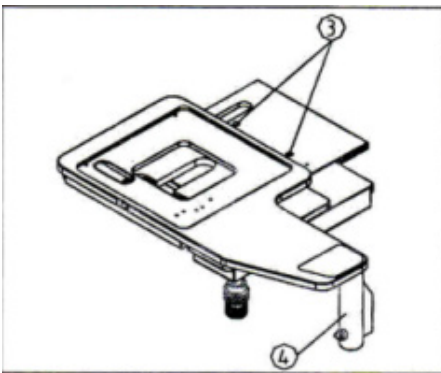
(1) Fully loosen the locking screw ① on the light source connection base.

(2) Gently insert the light source connection base ② into the light source connection socket, push it to the bottom, and then tighten the locking screw ①. (As shown in Figure 4)

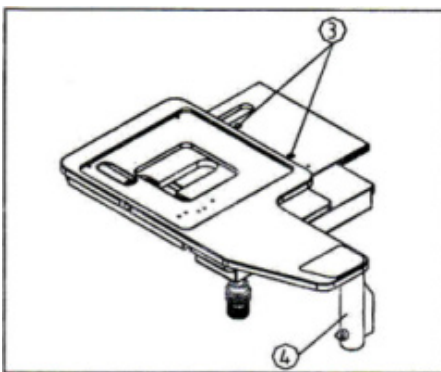
2. Installation



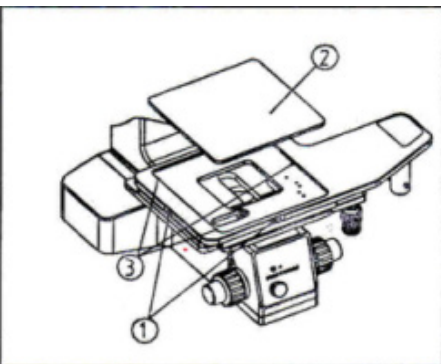
Picture 5



Picture 6



Picture 7



Picture 8

2-2-4 Installing the Stage

(1) Rotate the handwheel ① in the direction of the arrow to lower the stage carrier ② to the lowest position. (As shown in Figure 5)

(2) Lift the stage and turn the end of the stage clutch controller ④ towards the right. Gently place it at the center position of the stage carrier ② .

(3) Move out the stage sliding platform until the screw holes ③ on the fixed platform are exposed. (As shown in Figure 6)

(4) Align the screw holes ③ of the fixed platform with the screw holes ⑤ on the stage carrier, and fix them with screws.

(5) Move the stage sliding platform backward until the screw holes ⑦ on the fixed platform are exposed. Then use screws to fix the screw holes ⑤ and ⑥ . (As shown in Figure 7)

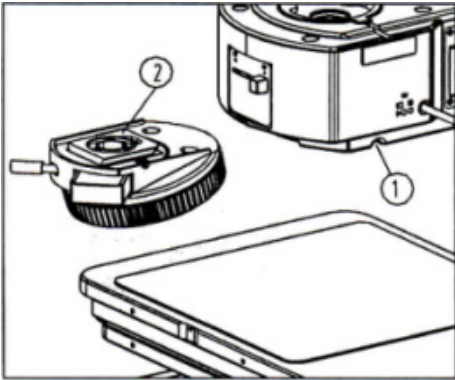
(6) Adjust the front - back and left - right positions of the stage. After it is level, lock the four fixing screws.

2-2-5 Installing the Glass Platform

Use a small flathead screwdriver to open the platform locking screw ① of the stage. Gently place the glass platform ② into the groove of the stage, and then lock the platform locking screw ① . (As shown in Figure 8)

★ The glass platform can be made perpendicular to the optical axis by adjusting the three internal hexagon set screws ③ .

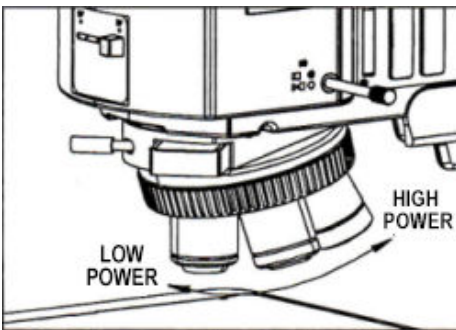
2. Installation



Picture 9

2-2-6 Installing the Converter

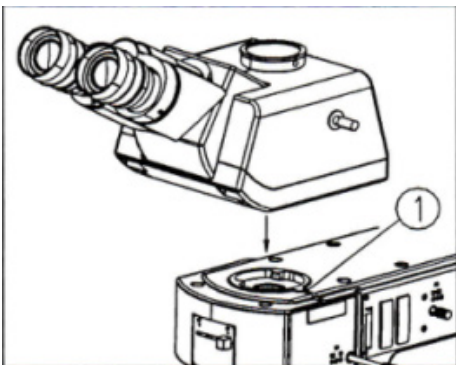
(1) Loosen the locking screw ① on the illuminator. (As shown in Figure 9)(2) Align the dovetail interface ② on the converter with the dovetail groove on the illuminator, insert it all the way to the innermost position, and then tighten the locking screw ① .



Picture 10

2-2-7 Installing the Objective Lens

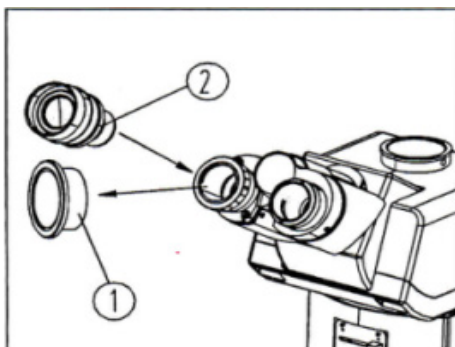
Rotate the coarse adjustment handwheel to lower the stage. Then install the objective lens onto the objective lens converter in the direction shown in the diagram, following the order from low magnification to high magnification. (As shown in Figure 10)



Picture 11

2-2-8 Installing the Observation Tube

(1) Fully loosen the locking screw ① of the observation tube.(2) Insert the dovetail interface at the bottom of the observation tube into the circular hole on the illuminator, slightly to the right of the center. Insert it along the hole, make the binoculars of the observation tube face forward, and then tighten the locking screw. (As shown in Figure 11)

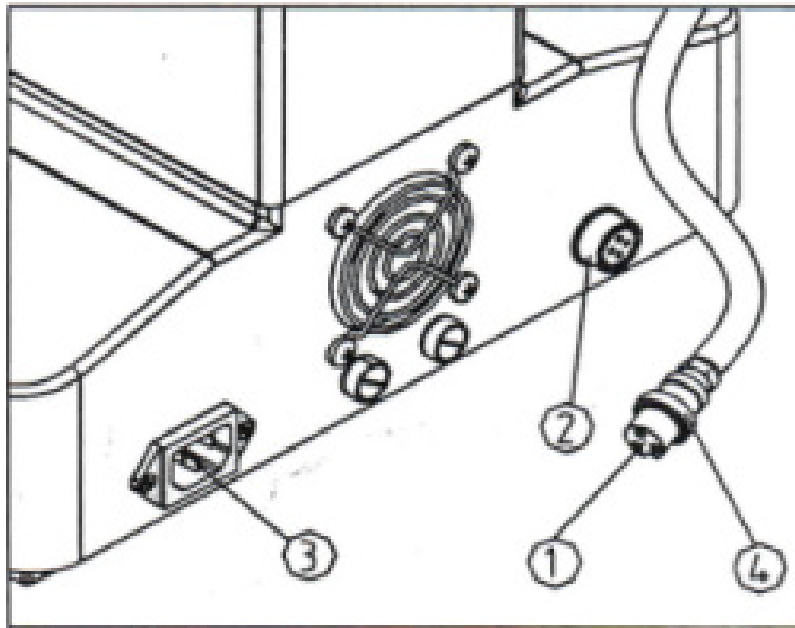


Picture 12

2-2-9 Installing the Eyepiece

(1) Remove the eyepiece tube cap ① . (As shown in Figure 12)(2) Insert the eyepiece ② into the eyepiece tube until it reaches the bottom.

2. Installation



Picture 13

2-2-10 Connecting the Power Cord

(1) Ensure the switch is in the "O" (OFF) position.

(2) Align the notch of the lamp box power cord connector ① with the notch of the connector ② on the microscope. Insert it into the connector ② of the microscope until it reaches the bottom, and then tighten the screw ④ . (As shown in Figure 13)

(3) Insert one end of the power cord into the power socket ③ of the microscope.

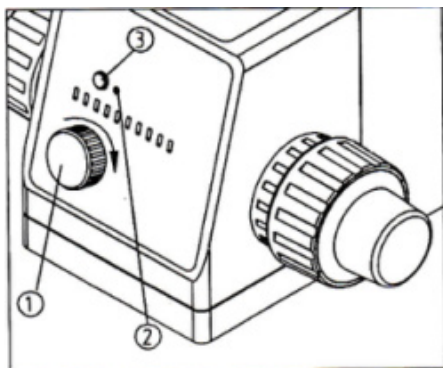
(4) Insert the other end of the power cord into the power supply socket.

★ When bending or coiling, the power cord is easily damaged. Do not use excessive force.

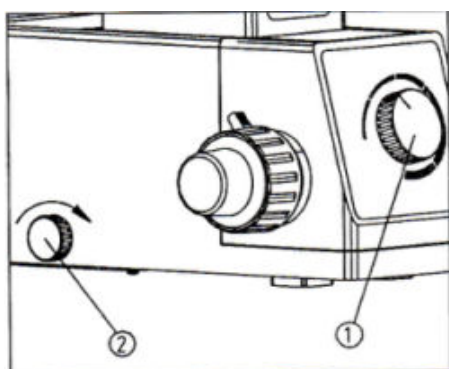
★ Always use the power cord provided by our company. If lost or damaged, select another suitable power cord.

★ Connect the power cord correctly to ensure the instrument is grounded.

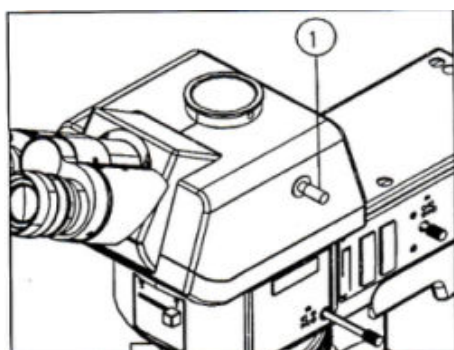
3. Operating Instructions



Picture 14



Picture 15



Picture 16

3-1 Illumination For Reflective Type

(1) Connect to the power supply and set the main switch to the “—” position.

(2) Adjust the dimming handwheel ① to set the illumination brightness to a comfortable level for observation. Rotate the dimming handwheel clockwise to increase the brightness; rotate it counterclockwise to decrease the brightness. (As shown in Figure 14)

(3) You can use the dimming reset button ③ to restore the illumination brightness to the set position. The set illumination brightness can be adjusted by rotating the setting screw ② with a small flathead screwdriver. Rotate it clockwise to increase the set brightness; rotate it counterclockwise to decrease the set brightness.

For Transmissive Type

(1) Connect to the power supply and set the main switch to the “—” position.

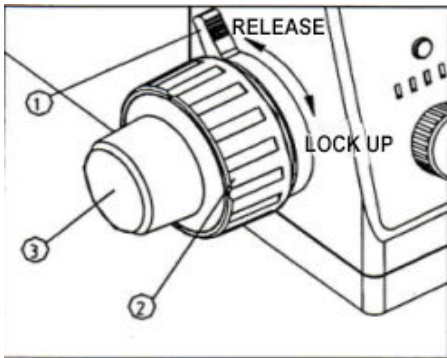
(2) When using reflective illumination, adjust the dimming handwheel ① to set the illumination brightness to a comfortable level for observation. Rotate the dimming handwheel clockwise to increase the brightness; rotate it counterclockwise to decrease the brightness. (As shown in Figure 15) When using transmissive illumination, adjust the dimming handwheel ② to set the illumination brightness to a comfortable level for observation. Rotate the dimming handwheel clockwise to increase the brightness; rotate it counterclockwise to decrease the brightness.

3-2 Selection of Optical Path

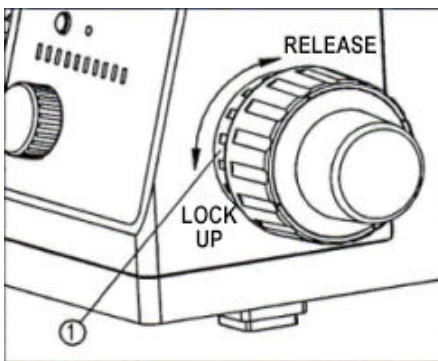
Push the optical path selection lever ① to the innermost position, and the light will enter the binocular tube for visual observation. (As shown in Figure 16)

When the selection lever is pulled to the outermost position, the light will enter the trinocular observation tube for photography and imaging.

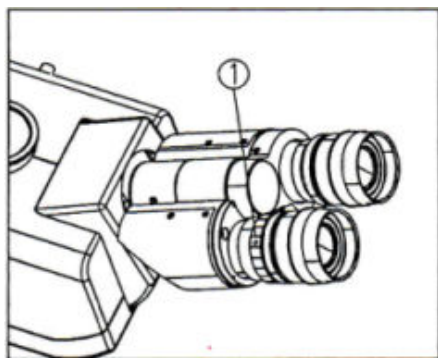
3. Operating Instructions



Picture 17



Picture 18



Picture 19

3-3 Focusing

(1) Place the sample to be observed on the stage and move the 5X objective into the optical path. ★ When placing the sample, the observation surface should be perpendicular to the objective lens. If necessary, plasticine can be used to assist in placing the sample.

(2) Loosen the coarse adjustment upper limit handwheel ①, set the diopter adjustment ring on the left side of the observation tube to "0" (see 3-5 Diopter Adjustment for details), observe the right eyepiece with the right eye, turn the coarse adjustment handwheel ② until the outline of the observation sample appears in the field of view, and then lock the coarse adjustment upper limit handwheel. (As shown in Figure 17)

★ When using diopter-adjustable eyepieces, set the diopter of the eyepiece to zero.

★ The coarse adjustment upper limit handwheel can prevent the objective lens from colliding with the sample during focusing, so as to avoid damaging the objective lens or the sample.

★ The coarse adjustment upper limit has no effect on the fine adjustment handwheel.

(3) Turn the fine adjustment handwheel ③ to make the details of the sample clear.

3-4 Adjustment of the tightness of the focusing mechanism

If the hand feel is heavy and uncomfortable during coarse focusing, or the sample leaves the focal plane quickly after focusing, and the stage drops by itself, these can be solved by adjusting the tightness adjustment ring ①. Rotating in the direction shown in the figure can change the tightness of the focusing mechanism. (As shown in Figure 18)

3-5 Diopter adjustment

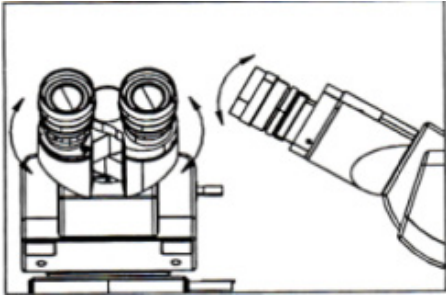
After the image of the right eyepiece is clear, observe the left eyepiece with the left eye. If it is not clear, rotate the diopter adjustment ring ① until the image is clear. (As shown in Figure 19).

There are ± 5 diopters on the adjustment ring, and the value aligned with the straight marking line on the seat is the diopter value of the eye. The indicator dot "." on the left also plays an identifying role.

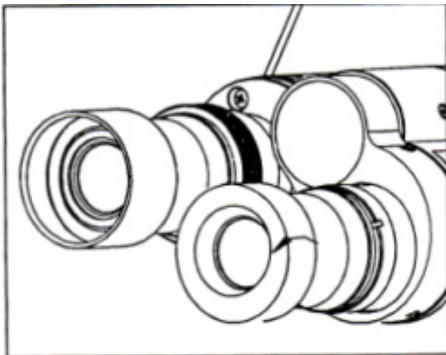
When using a diopter-adjustable eyepiece, first set the diopter of the eyepiece to zero. During use, the diopter of the eyepiece can also be adjusted to make the image clear.

★ Remember the diopter value of your own eyes for next use.

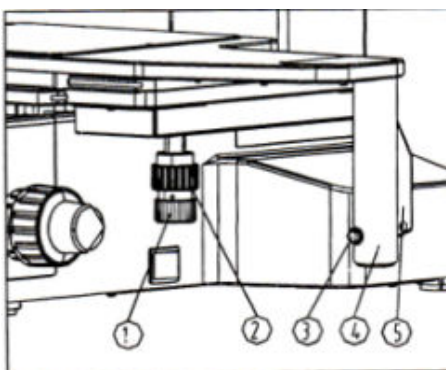
3. Operating Instructions



Picture 20



Picture 21



Picture 22

3-6 Interpupillary Distance Adjustment

(1) Use both hands to hold the left and right lens holders respectively and pull them up and down. Adjust the height of the (hinge) according to your own sitting posture.

(2) When observing with both eyes, hold the left and right lens holders and rotate the hinge to adjust the interpupillary distance. Until the left and right visual fields merge into one and the observation is comfortable. (As shown in Figure 20).

Interpupillary distance adjustment range: 50 - 76mm.

The indicator dot "·" above the left eyepiece points to the scale on the interpupillary distance indicator panel, indicating the size of the interpupillary distance.

★ Remember your own interpupillary distance for next use.

3-7 Using the Eye Shield

(1) For users wearing glasses, when observing, lower the eye shield. This can prevent the glasses from touching the eyepiece and avoid damaging the glasses and the eyepiece.

(2) For users not wearing glasses, when observing, open the eye shield. This can prevent stray light from interfering with the observation. (As shown in Figure 21)

3-8 Stage Adjustment

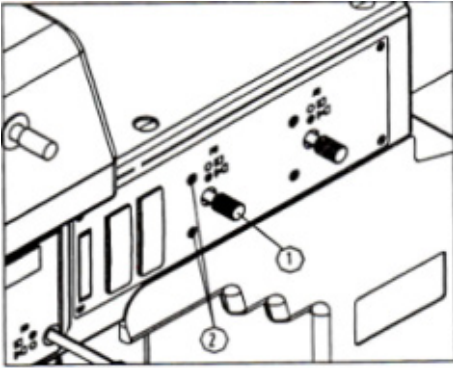
(1) Place the sample to be observed on the stage and move the 5X objective into the optical path.

(2) Rotate the X-axis moving handwheel (2) and Y-axis moving handwheel (1) of the stage to move the sample to the center position (align with the center of the objective lens).

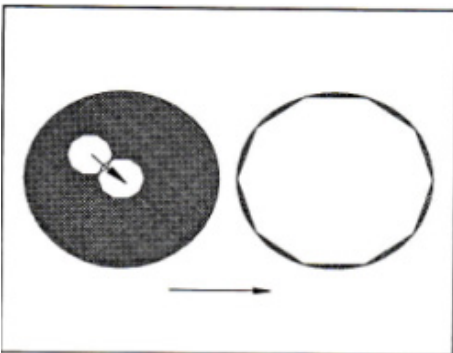
(3) If the sample position to be moved during multi-sample observation is far from the central area of the objective lens, the platform's rapid movement function can be used. The specific operation method is: first, press and hold the combined control lever (6) towards the handle (5) direction and then release it. That is, the platform can be quickly moved in both XY directions. If you need to cancel the rapid movement function, press the shift conversion button (4), the combined control lever (6) resets, and the rapid movement function stops.

(4) The mechanical platform has an X and Y axis movement stroke of 158x158mm. (As shown in Figure 22)

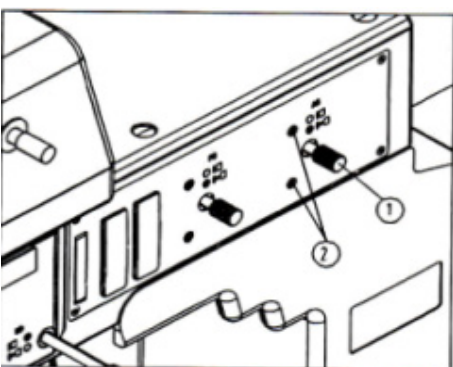
3. Operating Instructions



Picture 23



Picture 24



Picture 25

3-9 Field Diaphragm Adjustment

The field diaphragm limits the diameter of the light beam entering the condenser lens, thereby eliminating the peripheral light and enhancing the image contrast. When the image of the field diaphragm just appears at the outer edge of the visual field, the objective lens can perform at its optimal performance and obtain the clearest image.

- Applicable to reflected illumination

Pull the field diaphragm adjustment lever ① to the outermost position, that is, open the field diaphragm to the minimum. (As shown in Figure 23)

(2) Observe through the eyepiece. At this time, the image of the field diaphragm can be seen in the field of view.

(3) Adjust the two field diaphragm centering screws ② to center the image of the field diaphragm in the field of view.

(4) Gradually open the field diaphragm. If the image of the field diaphragm is tangent to the field of view, it indicates that the field diaphragm has been correctly centered. (As shown in Figure 24)

(5) In actual use, slightly enlarge the field diaphragm so that its image just coincides with the field of view.

- Applicable to transmitted illumination

Rotate the field diaphragm adjustment ring ③ clockwise, the field diaphragm becomes larger; on the contrary, the field diaphragm becomes smaller. (As shown in Figure 25)

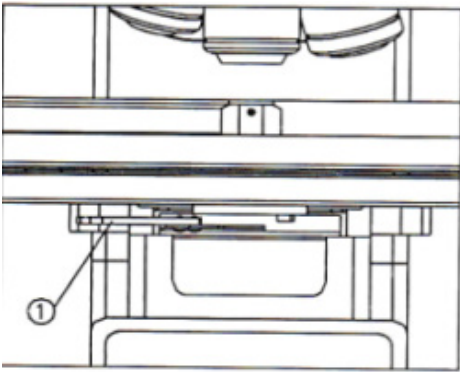
3-10 Aperture Diaphragm Adjustment

The aperture diaphragm determines the numerical aperture of the illumination system. The numerical aperture of the illumination system matches the numerical aperture of the objective lens, which can provide better image resolution and contrast, and increase the depth of field.

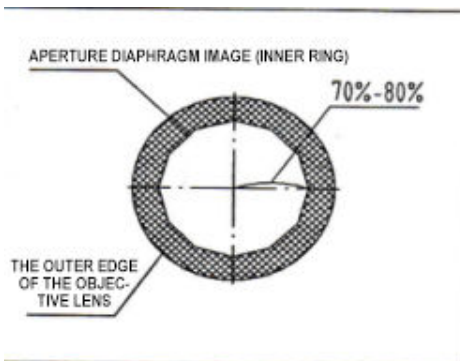
- Applicable to reflected illumination

The direction of change of the aperture diaphragm size is the same as that of the field diaphragm. Control the size of the diaphragm by adjusting the aperture diaphragm adjustment lever ①. Adjust the two aperture diaphragm centering screws ② on the left and right to center the image of the aperture diaphragm in the aperture. If necessary, remove the eyepiece, observe from the eyepiece tube, and adjust the aperture diaphragm adjustment lever ① until the image shown in Figure 26 is seen to adjust the proportion. (As shown in Figures 25, 27)

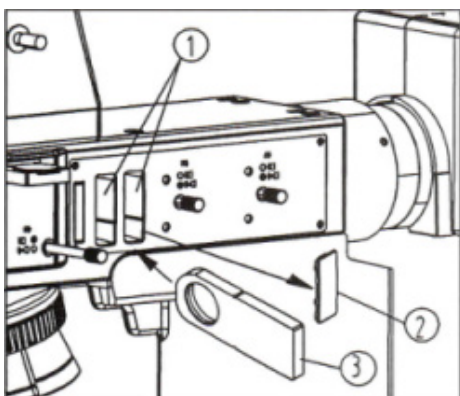
3. Operating Instructions



Picture 26



Picture 27



Picture 28

- Applicable to transmitted illumination

Adjust the aperture diaphragm adjustment handle ① to control the size of the diaphragm. If necessary, remove the eyepiece, observe from the eyepiece tube, and adjust the aperture diaphragm adjustment handle ① until the image shown in Figure 27 is seen. (As shown in Figures 26, 27)

In actual use, the size of the aperture diaphragm can be adjusted according to the size of the image contrast of the observed sample, so that the observation is comfortable and the contrast is good.

3-11 Use of Color Filters

Using color filters can make the background light of the image more appropriate to improve the contrast of the image.

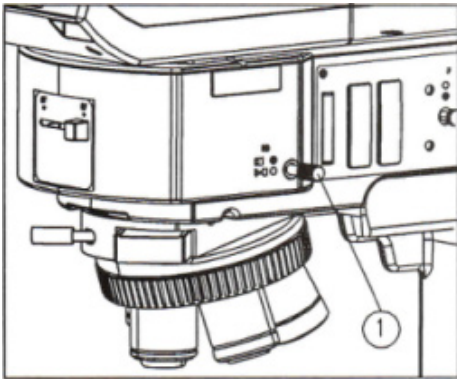
★ When not using color filters, insert the empty insert sheet provided with the machine into this slot. When using an external color filter or ND color filter, first remove the dust cover ② on the reflection illuminator socket ①, then insert the color filter into the socket ③ in the direction shown in the figure, with the front facing forward into the reflection illuminator socket. (As shown in Figure 28)

★ Color filters are available in four colors: green, blue, red, and white.

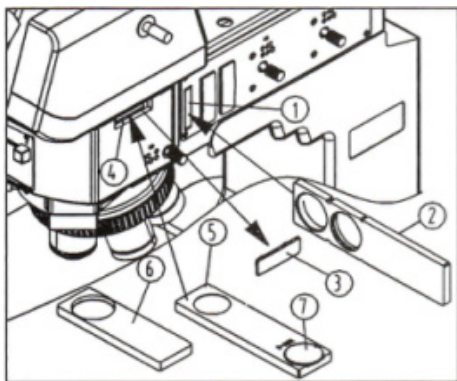
★ When not using color filters, cover the dust cover. When using the built-in ND50 color filter, push the lever ① inward and push it to the innermost position, that is, the color filter moves into the optical path; on the contrary, pull the lever to the outermost position, that is, move out of the optical path. (As shown in Figure 29)

★ When placing the color filter, place the rough side of the color filter facing down.

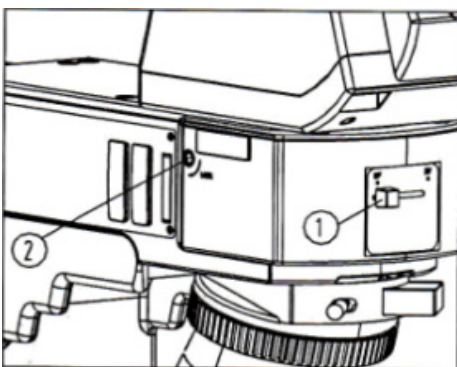
3. Operating Instructions



Picture 29



Picture 30



Picture 31

3-12 Use of Simple Polarizing Device

The simple polarizing device includes a polarizer and an analyzer.

(1) Remove the dust shield ① in the socket of the reflection illuminator, then insert the polarizer shield ② into the socket of the reflection illuminator in the direction shown in the figure, with the front facing forward. After hearing two "clicks", the polarizer moves into the optical path. (As shown in Figure 30)

★ When using the polarizer, pull out the color filter.

(2) Remove the dust cover ③ on the analyzer socket of the reflection illuminator, and insert the 360-degree rotating analyzer shield ④ or the fixed analyzer shield ⑤ into the analyzer socket of the reflection illuminator in the direction shown in the figure, with the front facing upward, and insert it to the positioning position.

(3) When the 360-degree rotating analyzer is zeroed (or when using a fixed analyzer), the polarizer and analyzer are in a perpendicular state.

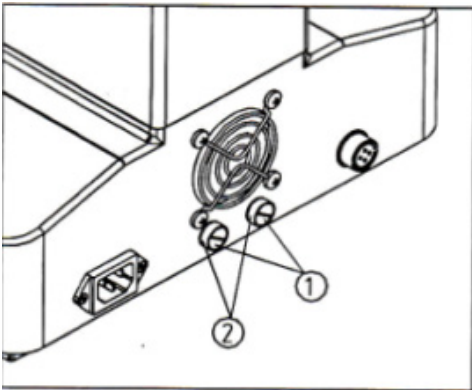
(4) Rotating the dial ⑦ of the rotating analyzer can change the perpendicular state of the plane-polarized light.

3-13 Switching Between Bright Field and Dark Field

The bright field and dark field of the system can be switched by the (switch block) ①. When the switch block is pushed to the leftmost position, the system is in bright field observation; on the contrary, the system is in dark field observation. (As shown in Figure 31)

Insert the ND50 color filter on the reflection illuminator into the optical path (for specific operations, see "3-11 Use of Color Filters"), lock the screw ②, and the ND50 color filter is integrated with the dark field mechanism, that is, the ND50 color filter is always in the optical path during dark field observation.

3. Operating Instructions



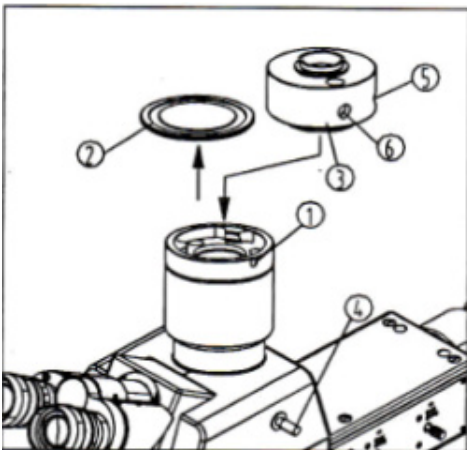
Picture 32

3-14 Replacement of Fuse

Before replacing the fuse, be sure to set the switch to "O" (OFF), and pull out the main power cord. Use a flathead screwdriver to unscrew the fuse holder ① of the fuse set, take out the fuse, replace it with a new fuse, and then screw the fuse holder back into the fuse base. (As shown in Figure 32)

★ The rated value of the fuse is 250V, 8A.

3-15 Use of CTV Adapter



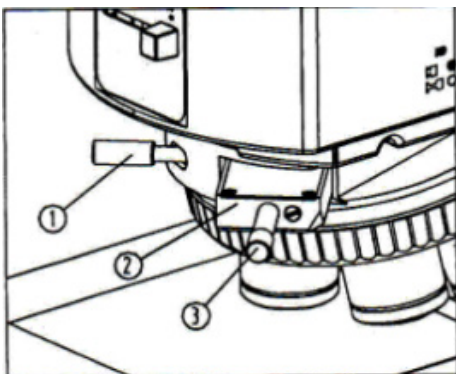
Picture 33

(1) Loosen the locking screw ① on the trinocular observation tube, and take out the three-way dust cover ② . (As shown in Figure 33)

(2) Take down the adapter ③ , remove the dust cover at both ends of the three-way port, and insert the adapter into the three-way port of the trinocular observation tube in the direction shown in the figure, then lock the locking screw ① .

(3) Connect the CCD or camera to the adapter ③ .

(4) Perform binocular observation. After the image is clear, pull the optical path selection lever ④ to the outermost position, observe the image. If it is not clear, loosen the locking screw ⑤ , adjust the focusing screw ⑥ until the image is clear, and then tighten the locking screw ⑤ .



Picture 34

3. Operating Instructions

3-16 Use of DIC Components

- (1) Under bright field observation, use a 10× or 20× objective lens to focus on the specimen to make the image of the specimen clear.
 - (2) Push both the polarizer and the analyzer into the optical path to ensure that the polarizer and the analyzer are in a crossed state, that is, the field of view is the darkest. (For details, see 3-12 Use of Simple Polarizing Device)
 - (3) Loosen the locking screw ① in front of the converter, pull out the dust-proof insert plate, then insert the DIC component ② into the slot with the front side up, push it all the way in, and tighten the locking screw ① . (Figure 34)
 - (4) Adjust the fine-tuning knob ③ to make the interference colors in the field of view tend to be consistent, and select a background interference color suitable for observation, so that the image of differential interference contrast reaches the best effect, that is, the embossing effect is the most obvious.
 - (5) The fine-tuning knob ③ can control the background interference color to change continuously from off-white to purple-red.
- ★ At the same time, the aperture diaphragm can be adjusted to achieve the best contrast effect;
 - ★ Due to the high sensitivity of differential interference contrast, there should be no contaminants and dust on the surface of the slice.
 - ★ Substances with birefringence cannot achieve the effect of differential interference contrast microscopy.

4. Troubleshooting

If the performance of the microscope cannot be fully utilized due to unfamiliarity with its use, the following table can provide you with some solutions.

Problems	Causes	Solutions
I. Optical Part		
(1) The light in the field of view is very dim even though the bulb is bright	The field diaphragm is not opened wide enough	Open the field diaphragm wider
	Polarizer and analyzer inserts are used	Pull out the inserts
	The converter is not in the indexing position	Rotate to the indexing position of the converter
(2) The edge of the field of view is dark or the brightness is uneven	There are dirt on the lenses (objective lens, eyepiece)	Clean the lenses
	The color filter, polarizer, and analyzer inserts are in the correct positions	Insert or remove the inserts from the optical path
	The bright/dark field lever is not pulled to the correct position	Pull to the correct position
(3) There are dirty things in the field of view	The optical path selection lever is not pulled to the correct position	Pull to the correct position
	There are dirt on the specimen	Clean the specimen
	There are dirt on each lens	Clean the lenses
	There is a cover glass on the surface of the sample	Use a sample without a cover glass
(4) The image is not clear	The surface of the sample is not perpendicular to the objective lens	Adjust
	The aperture diaphragm is opened too wide or too narrow	Adjust appropriately
	There are dirt on the incident lens of the eyepiece	Clean the lens
	The bright/dark field lever is not pulled to the correct position	Pull to the correct position
(5) One side of the image is dim or the image moves during focusing	The optical path selection lever is not pulled to the correct position	Pull to the correct position
	The specimen is in a floating state	Fix the specimen
(6) Eyes get tired easily and the left and right fields of view do not coincide	The converter is not in the indexing position	Rotate to the indexing position
	The interpupillary distance is incorrect	Adjust the interpupillary distance
	The diopter adjustment is incorrect	Adjust the diopter
	The eyepieces used by the left and right eyes are different	Use the same eyepieces

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Anhui Mikrosize Precision Instrument Co.,Ltd

Factory Producing Add: N013 Shuiku Road Shatou, Changan Town, Dongguan, China.

International Trading Office: A-4035 RuiFeng Business Expo , Wuhu City, China.

Web: www.mikrosize.com Email: mikrosize@mikrosize.com

