

O V/72 Series Biological Microscope Manual

This manual expatiates the using method, troubleshooting and maintenance about MT-50 series biological microscope. Please study this manual thoroughly before operating, and keep it with the instrument. The manufacturer reserves the rights to the modifications by technology development. On the basis of operation ensured, technical specifications may be subject to changes without notice.

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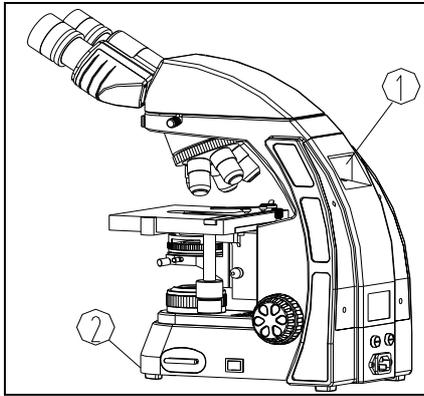
1. Operation Notice

Fig. 1

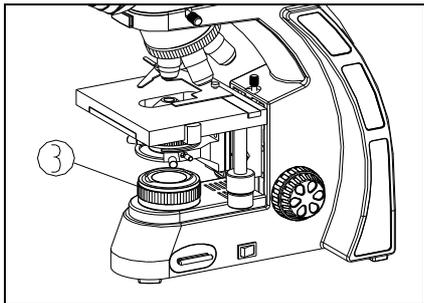


Fig. 2

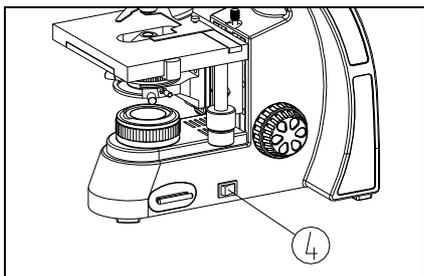


Fig. 3

1. As the microscope is a high precision instrument, always operate it with care, and avoid physical shake during the operation.

2. Do not expose the microscope in the sun directly, either not in the high temperature, damp, dust or acute shake. Make sure the worktable is flat and horizontal.

3. When moving the microscope, use both hands to hold its back hand-clasping ① and the front base ②, and lay it down carefully (see Fig. 1).

★ **It will damage the microscope by holding the stage, focusing knob or head when moving.**

4. When working, the surface of condenser will be very hot. Make sure there is enough room for the heat dissipating around the condenser③ (see Fig. 2).

5. Connect the microscope to the ground to avoid lightning strike.

6. For safety, make sure the power switch ④ is at “0” (off) and power it off before replacing the bulb or fuse, and wait until the lamp cools down (see Fig. 3).

★ **Bulb selected only: 3.3V 3W LED (class 3B) light 6V 30W HAL.**

7. Wide voltage range is supported as 100~240V. Additional transformer is not necessary. Make sure the voltage is in this range.

8. Use the special wire supplied by our company.

9. All power OFF devices have not been set in the position where is difficult to operate.

2. Maintenance

1. Wipe the lens gently with a soft tissue. Carefully wipe off the oil marks and fingerprints on the lens surfaces with a tissue moistened with a small amount of 3:7 mixture of alcohol and ether or dimethylbenzene.

★ **As the alcohol and ether is flammable, don't place these chemical near to fire or fire source. For example, when turning on or turning off the electrical device, please use these chemical in a ventilated place.**

2. Don't use organic solution to wipe the surfaces of the other components. Please use the neutral detergent if necessary.

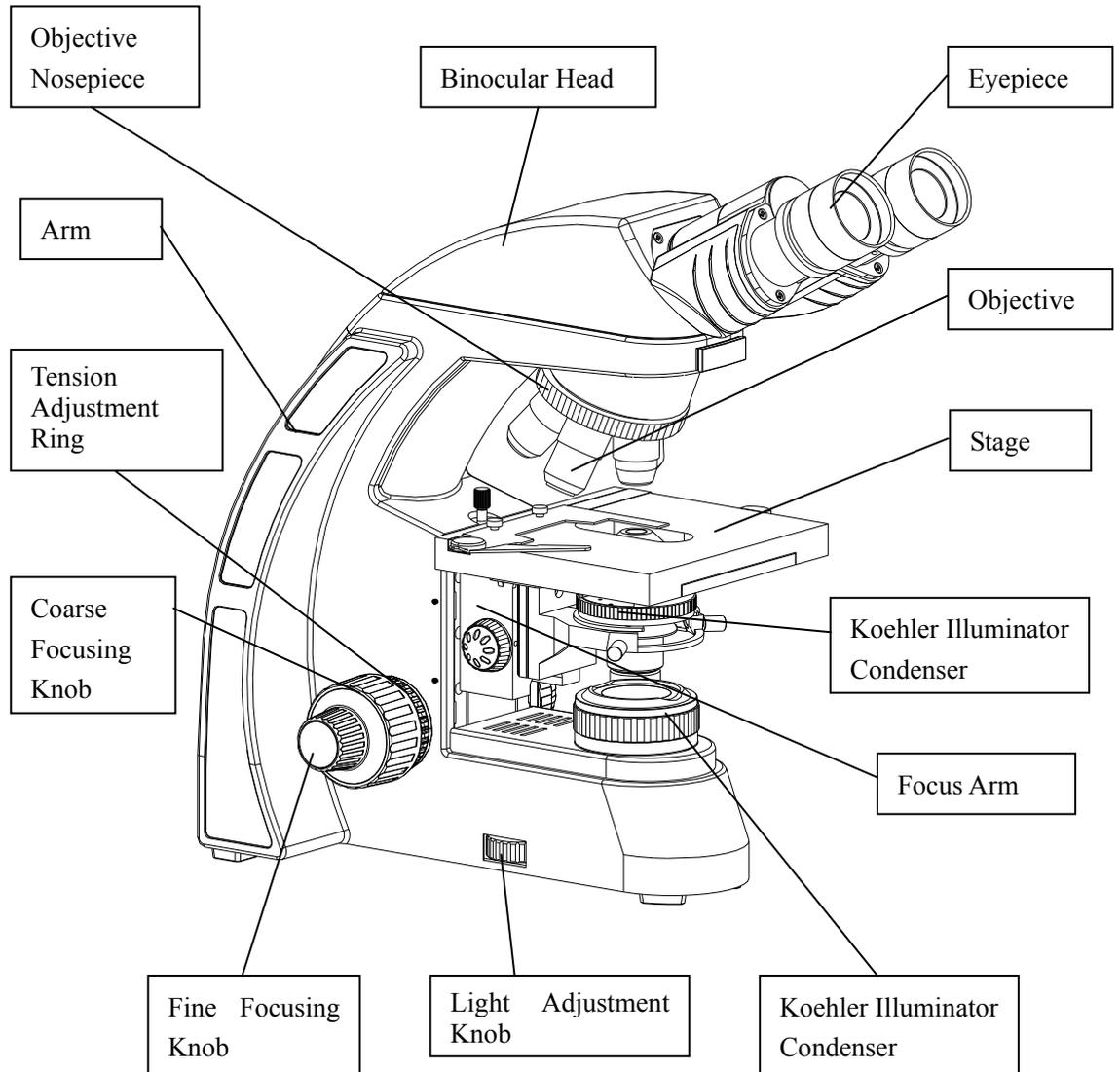
3. If the microscope is damped by liquid when using, please power it off immediately and wipe it dry.

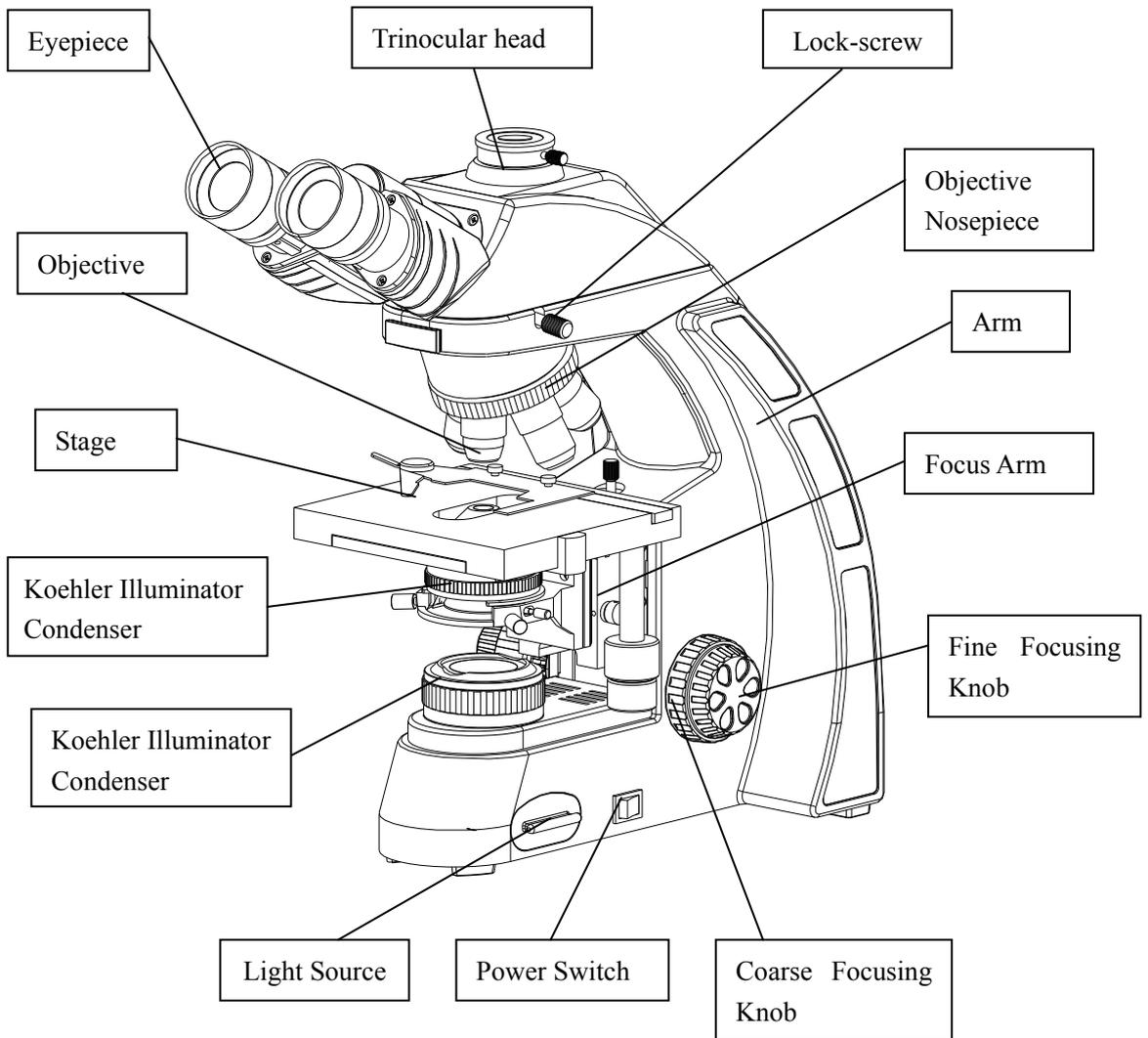
4. Never disassemble the microscope, otherwise the performance will be affected or the instrument will be damaged.

5. After using, cover the microscope with a dust cover.

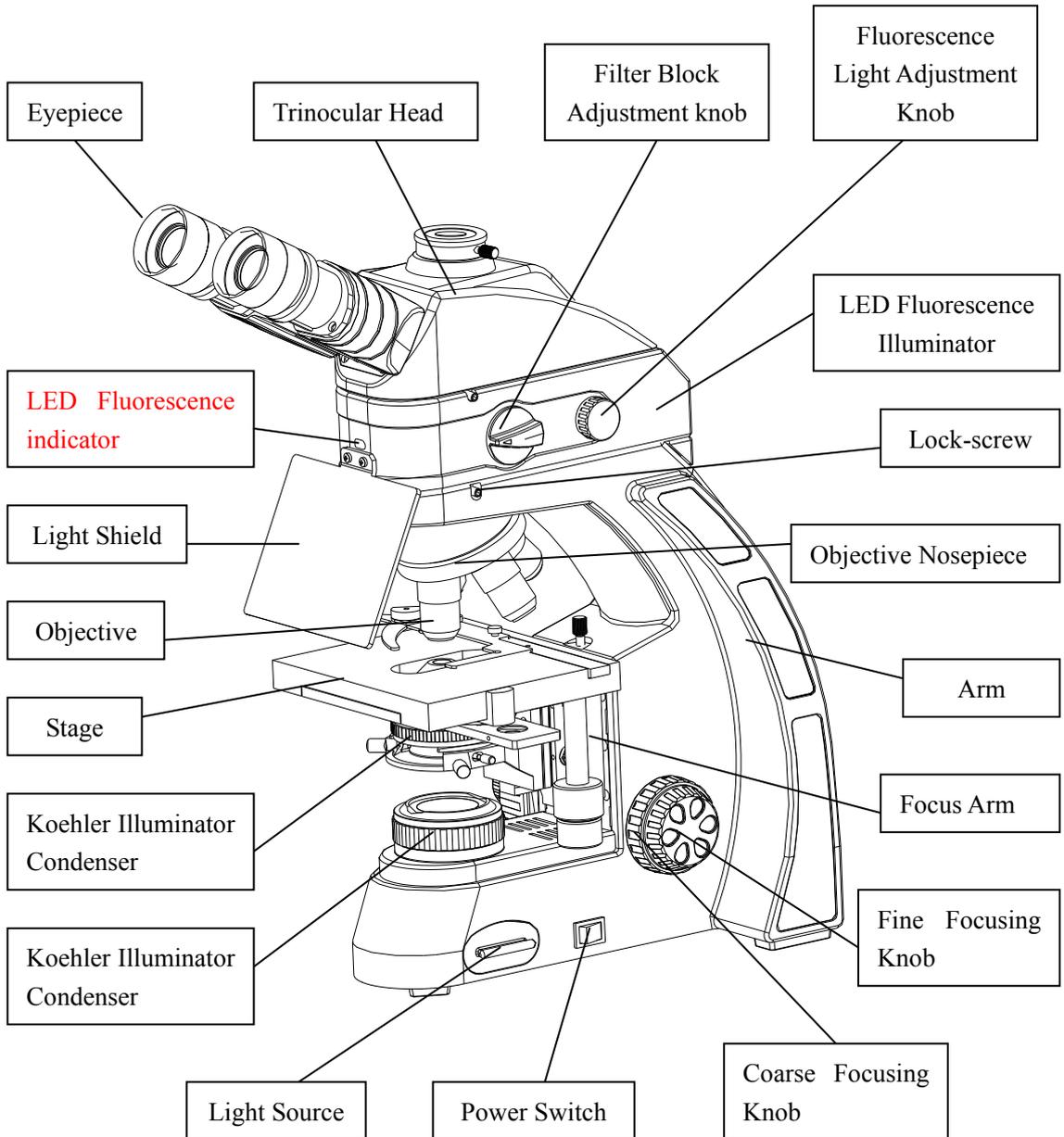
3. Safety Sign

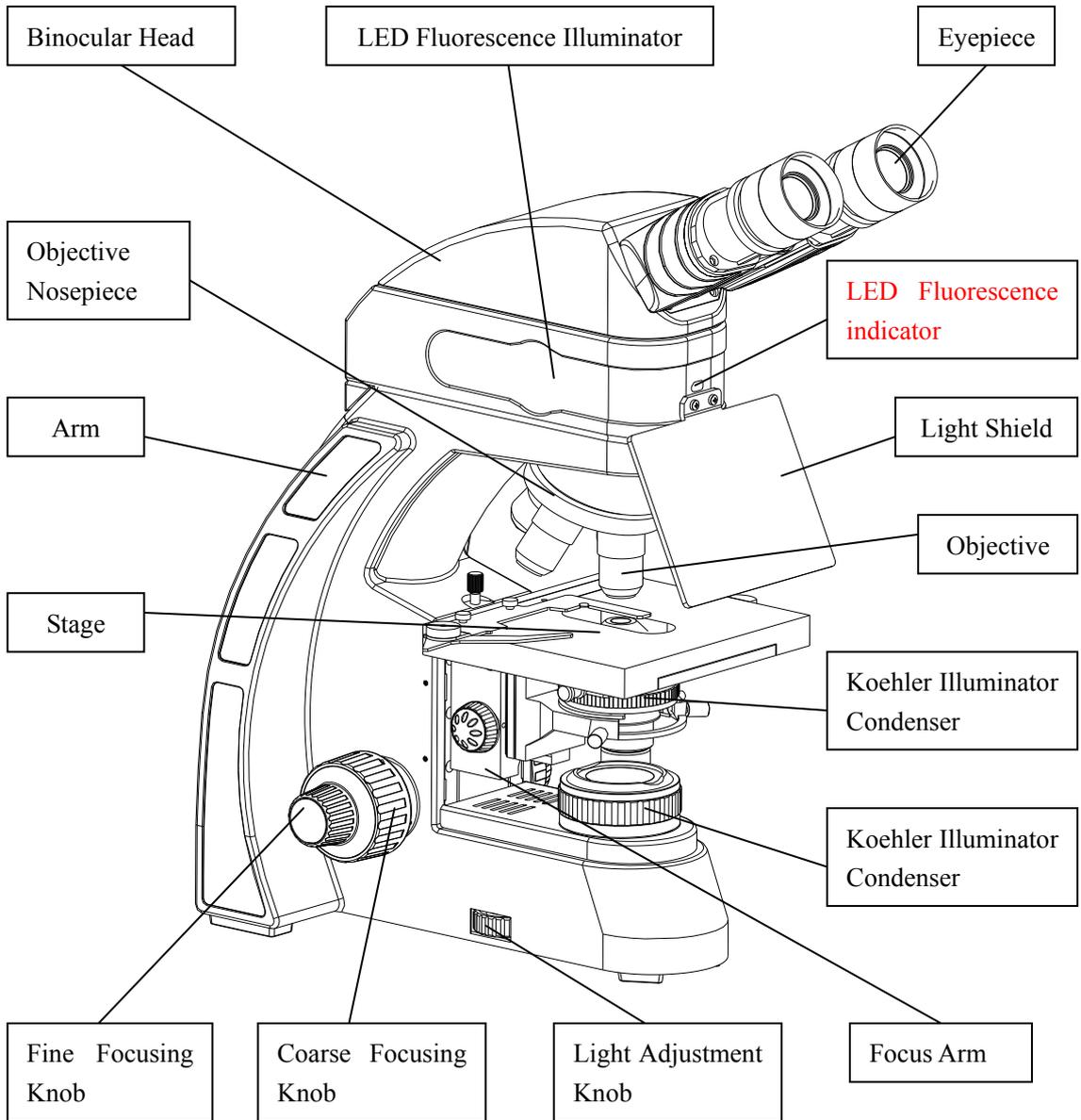
Sign	Signification
	Study the instructions before use. Unsuitable operation would lead to person hurt or instrument faulty.
	Main switch ON
O	Main switch OFF





LED Fluorescence Microscope

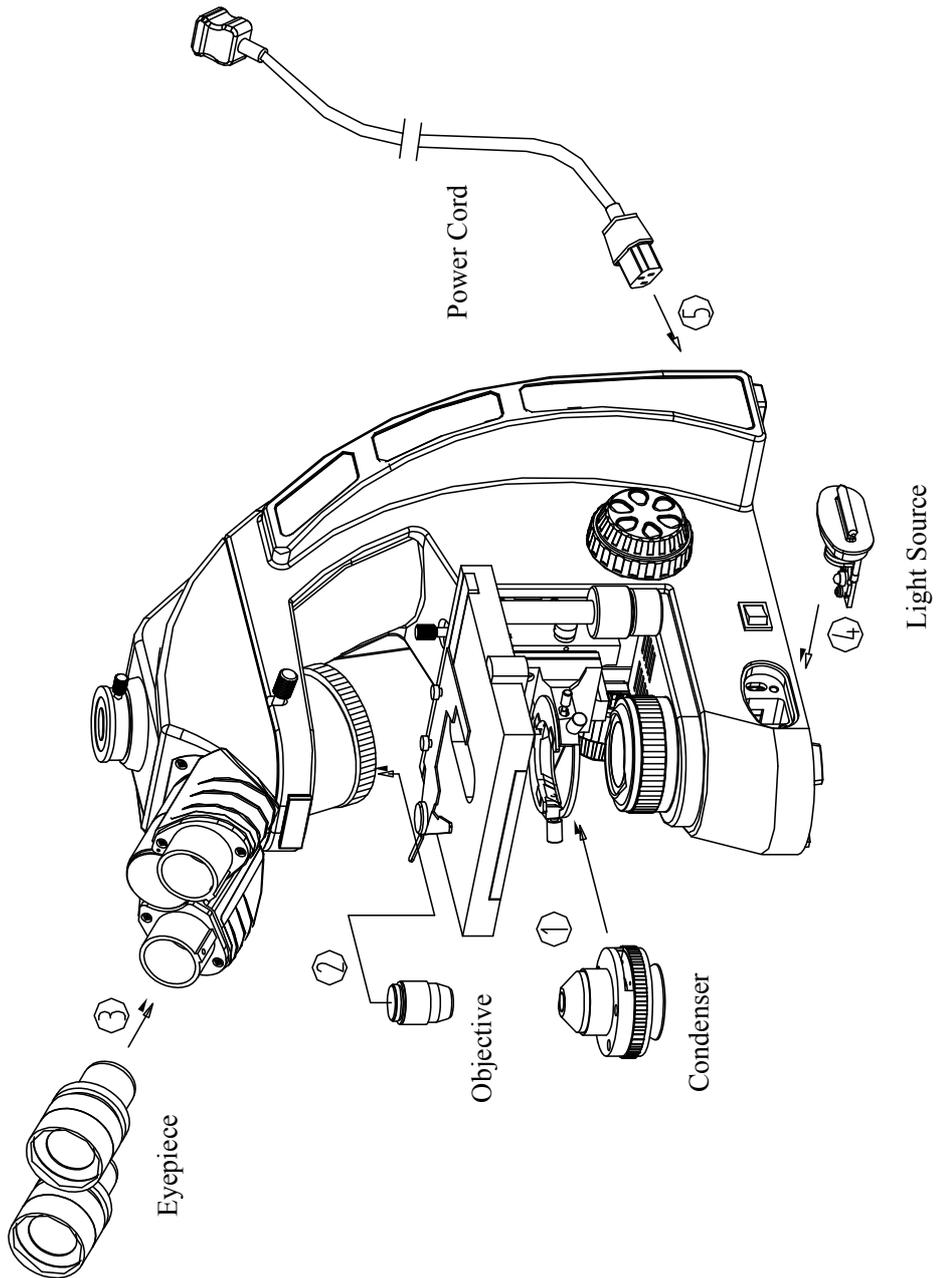




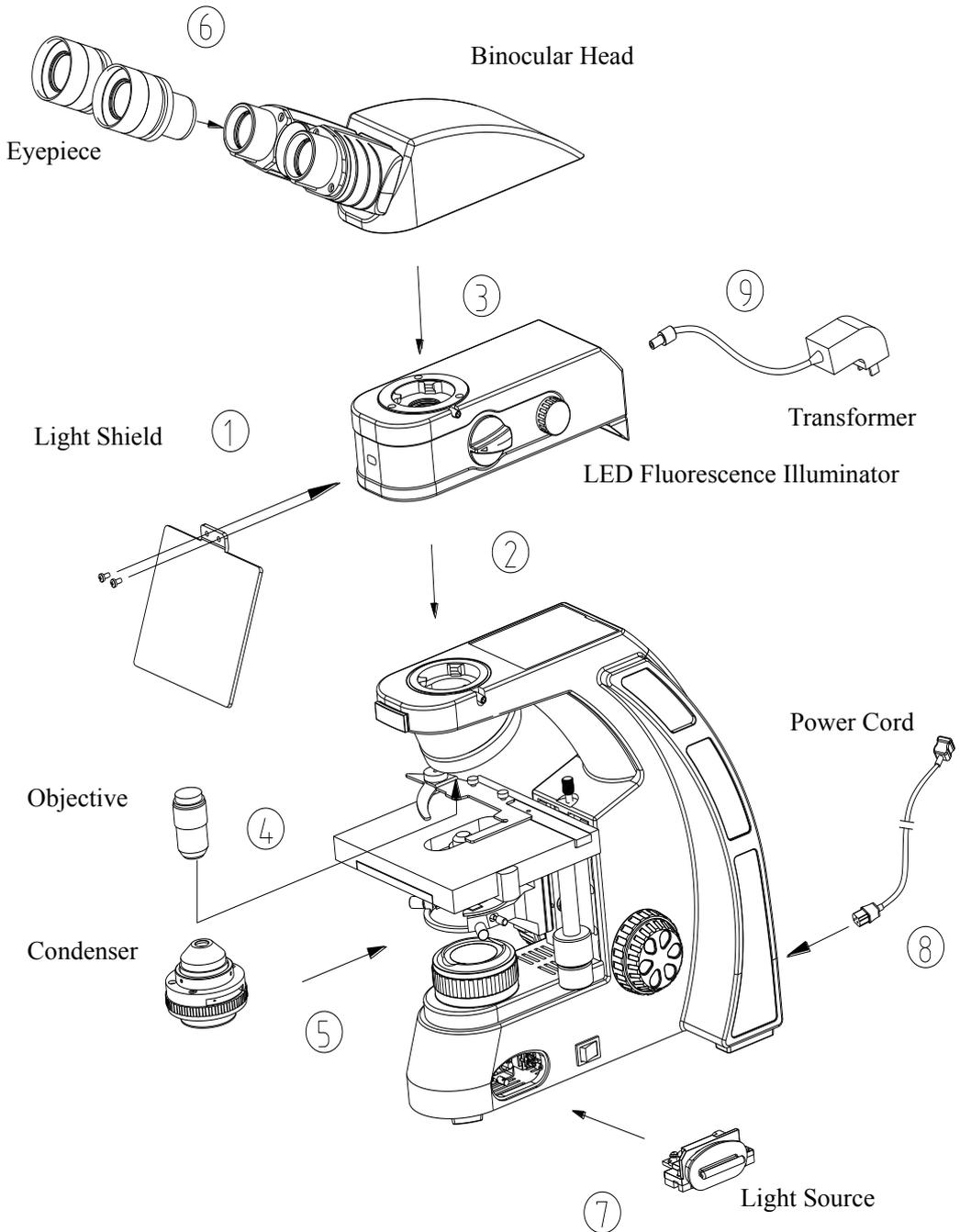
2-1 Assembling Scheme

Following is the Assembling Scheme, and the numbers denote the assembling order.

- ★ Before assembling, make sure there is no dust or dirt. Assemble carefully and do not scrap any part or touch the glass surface.



LED Fluorescence Microscope



2-2 Assembling Steps

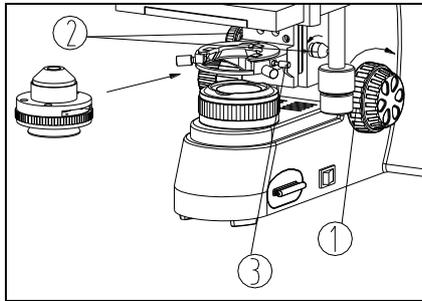


Fig. 4

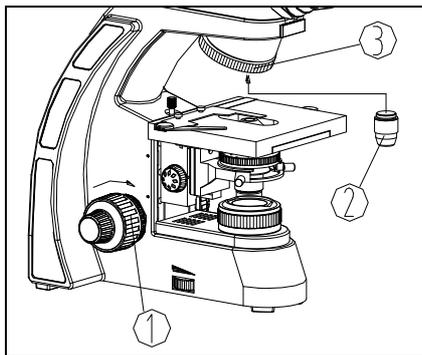


Fig. 5

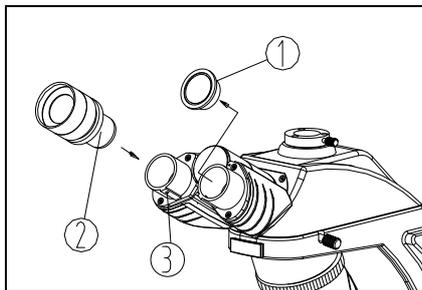


Fig. 6

2-2-1 Assemble the Condenser

Assemble Koehler Illuminator Condenser

1. Rotate the coarse focusing knob① to raise the stage to the highest position (see Fig. 4).
2. Rotate the condenser up-down knob② to lower the bracket of condenser to the suitable position.
3. Fully loosen the condenser lock-screw③.
4. Insert the condenser into the hole of stand according to the arrowhead, until the condenser is equal with the stand, and then rotate the condenser to make the handle frontward.
5. Tighten the lock-screw③ of condenser, then raise the condenser with the up-down knob to the highest position.

2-2-2 Assemble the Objective

1. Rotate the coarse focusing knob① to lower the stage to a suitable position (see Fig. 5).
2. Install the objectives② into the objective nosepiece③ from the lowest magnification to the highest in a clockwise direction from the rear.

★ When operating, first use the low magnification objective (4X or 10X) to search for specimen and focus, and then replace with high magnification objective to observe.

★ When replacing the objective, rotate the objective nosepiece until it sounds “ka-da”, to make sure the objective wanted is in the center of optical path.

2-2-3 Assemble the Eyepiece

1. Take down the cover of eyepiece tube①.
2. Insert the eyepiece② into the eyepiece tube, until it touches the surface (see Fig. 6).
3. When adjusting diopter by adjustable eyepiece, lock eyepiece with hexagon lock-screw③ to avoid the eyepiece group② rotating in eyepiece tube, as the figure shows.

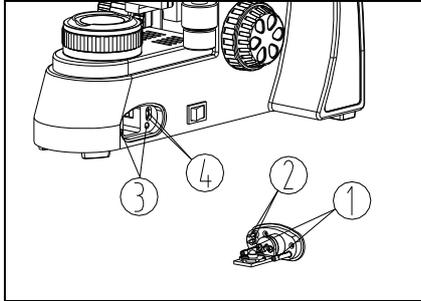


Fig. 7

2-2-4 Assemble light source

1. Align the oriented pin① and power pin② on the light source to oriented holder③ and power socket④, and then push light source into arm smoothly and plug it thoroughly (see Fig. 7).

★ Whenever replacing the bulb, turn off the main power and wait until the bulb and holder cool down.

★ LED illumination, replace whole LED light source if LED bulb is burnt out. The assembling for halogen bulb light source is as same as LED light source's.

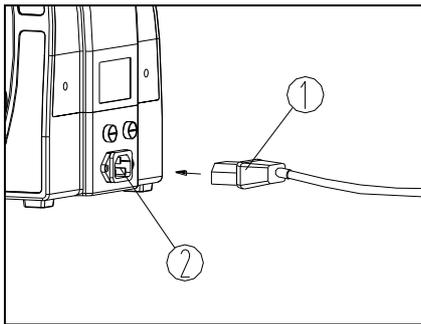


Fig. 8

2-2-5 Connect the Power Cord

★ Don't use strong force when the power cord is bended or twisted, otherwise it will be damaged.

1. Make sure the power switch is at "0" (OFF) before connecting.

2. Insert the connector① of power cord into the power socket②, and make sure it connects well (see Fig. 8).

3. Insert the other connector into the socket of power supply, and make sure it connects well.

★ Use the special wire supplied by our company. If it's lost or damaged, choose one with the same specifications.

★ Wide voltage range is supported as 100~240V.

★ Connect the power cord appropriately to make sure the instrument is connected to ground.

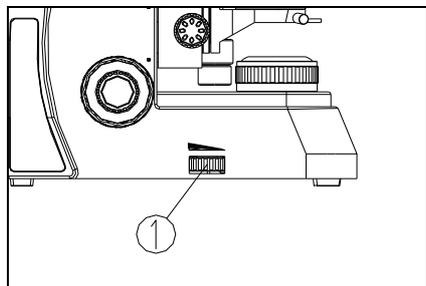


Fig. 9

3-1 Set Illumination

1. Put through the power and turn on the main power switch to “—”.
2. Adjust the light adjustment knob ① until the illumination is comfortable for observation. Rotate the light adjustment knob clockwise to raise the voltage and brightness. Rotate the light adjustment knob counterclockwise to lower the voltage and brightness (see Fig. 9).

★ Use of bulbs in the low-voltage state can extend the bulb life.

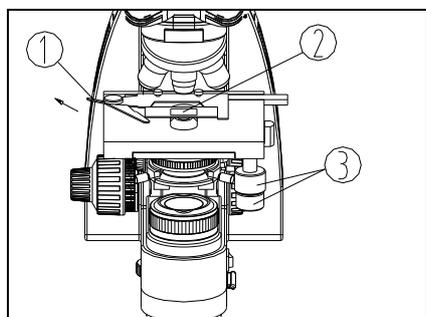


Fig. 10

3-2 Place the Specimen Slide

1. Push the wrench ① of the specimen holder backwards.
2. Loosen the wrench ①, and clamp the slide ② by the clips while the cover glass faces up (see Fig. 10).
3. Rotate the X and Y-axis knob ③. Move the specimen to the center (alignment with the center of the objective).

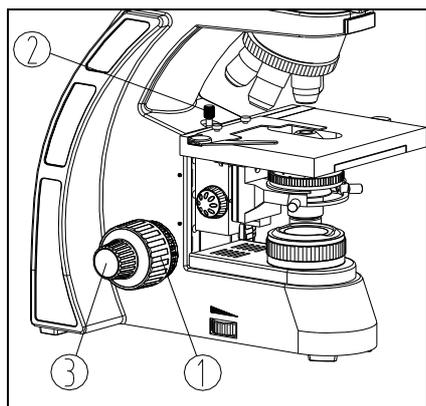


Fig. 11

3-3 Adjust the Focus

1. Move the objective 4X to the optical path.
2. Rotate the position screw ② to top, observe the right eyepiece with right eye. Rotate the coarse focusing knob ① until the image appears (see Fig. 11).
3. Rotate the fine focusing knob ③ for clear details and lock the position screw ②.

★ The position screw can stop the objective touching the clips.

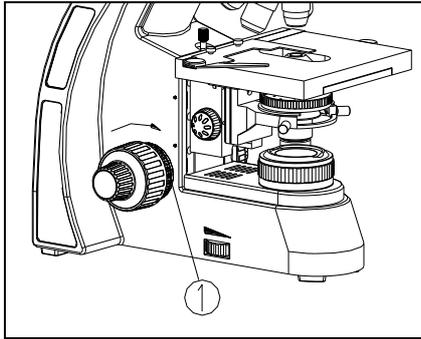


Fig. 12

3-4 Adjust the Focusing Tension

If the handle is very heavy when focusing or the specimen leaves the focus plane after focusing or the stage declines itself, please adjust the tension adjustment ring① (see Fig. 12).

To tighten the focusing arm, rotate the tension adjustment ring① according to the arrowhead pointed; to loosen it in the reverse direction.

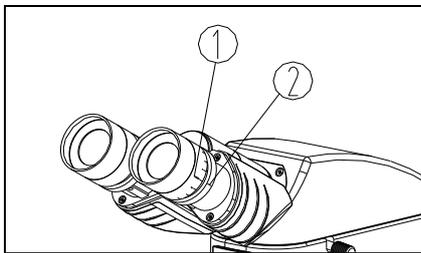


Fig. 13

3-5 Adjust the Diopter

Align the scale “0” of diopter adjustment ring① with the scale②, and then focus to get a clear image. Then observe through the other eyepiece, rotate the diopter adjustment ring until it is clear. (see Fig.13).

★ There is ± 5 diopter on the ring. To align with the scale value is your eye’s diopter.

★Remember your eye’s diopter, so that you could use next time.

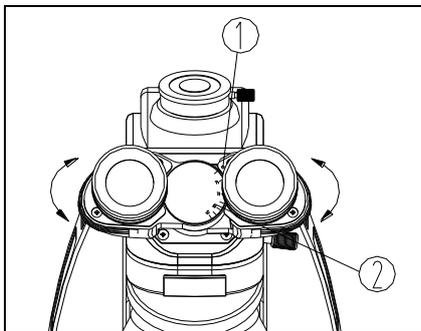


Fig. 14

3-6 Adjust the Interpupillary Distance

When observe with two eyes, hold the base of the prism and rotate them around the axis until there is only one field of view.

“。”① on the eyepiece base points to the scale② of interpupillary indication, which means the value of interpupillary distance (see Fig. 14).

Range: 50~75mm.

★Remember your interpupillary distance for further operation.

★ This Gemel eyepiece tube can be rotated 360°. User can select corresponding eyepoint height according to his own height. Like the interpupillary distance is 65mm, rotate front part of eyepiece tube 180° can increase eyepoint 34mm (see Fig. 15).

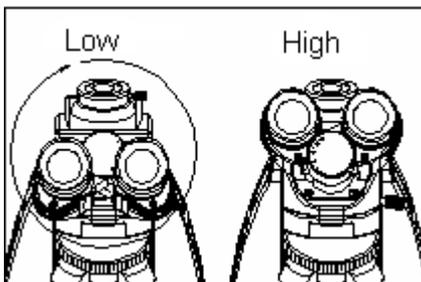


Fig. 15

3-7 Center the Condenser

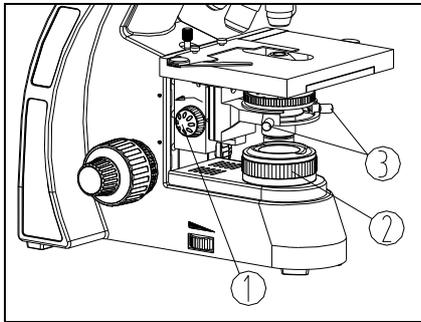


Fig. 16

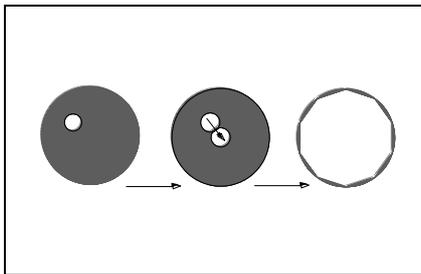


Fig. 17

1. Rotate the condenser up-down knob ① to raise it to the highest position (see Fig. 16).
2. Rotate the objective 10X to the light path and focus the specimen.
3. Rotate the field diaphragm adjustment ring ② to put the field diaphragm to the smallest position.
4. Rotate the condenser up-down knob ①, and adjust the image to be clearest.
5. Adjust the center adjustment screw ③ and put the image to the center of the field of view (see Fig.17).
6. Open the field diaphragm gradually. If the image is in the center all the time and inscribed to the field of view, it shows condenser has been centered correctly.
7. In fact, you can enlarge the field diaphragm a bit and make the image circumscribed to the field of view.

3-8 Adjust the Field Diaphragm

By limiting the diameter of the beam entering the condenser, the field diaphragm can prevent other light and strengthen the image contrast. When the image is just on the edge of the field of view, the objective can show the best performance and obtain the clearest image.

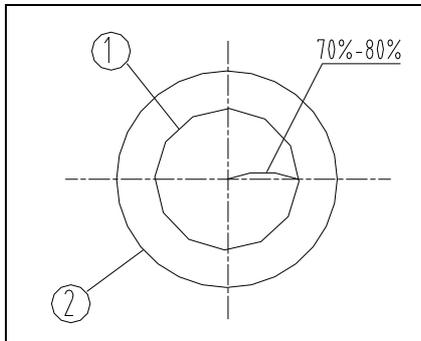


Fig. 18

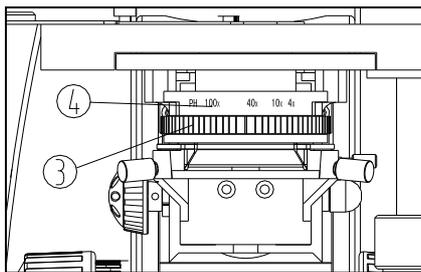


Fig. 19

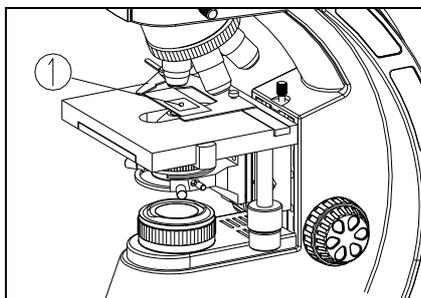


Fig. 20

3-9 Adjust the Aperture Diaphragm

1. The aperture diaphragm decides the numerical aperture of the illumination. Only when the N.A. of illumination is matching with the N.A. of the objective, it can obtain better resolution and contrast, and also increase the depth of field.

2. As the contrast is usually low, rotate the diaphragm adjust ring ③ to make the arrowhead pointed to the related magnification position on condenser base ④, namely, to adjust the N.A. of illumination to 70%-80% of the N.A. of objective. The eyepiece can be taken off when it's necessary to observe from the tube.

Adjust the ring ③ until see the figure as shown in Fig. 18, to adjust the proportion (see Fig. 18&19, ① is the image of aperture diaphragm, ② is the edge of objective).

3-10 Use the Oil Objective (100X)

1. Use objective 4X to focus the specimen.
2. Place a drop of oil ① on the specimen (see Fig. 20).
3. Rotate the nosepiece counterclockwise and rotate the oil objective (100X) to the light path. Then use the fine focusing knob to focus.

★ **Make sure there is no air bubble in the oil for fear affect the image.**

A. Move the eyepiece to examine the air bubble. Open the aperture diaphragm and field diaphragm fully and observe the edge of the objective from the tube (It seems round and light).

B. Rotate nosepiece slightly and swing the oil objective for some times to remove the air bubble.

4. After using, wipe the front lens with a tissue moistened with a small amount of 3:7 mixture of alcohol and ether or with dimethylbenzene. Wipe oil on the specimen.

★ **Don't put another objective to the light path before the oil is wiped to avoid wetting the dry objective.**

★ **Too much dimethylbenzene would dissolve the lens's stickiness.**

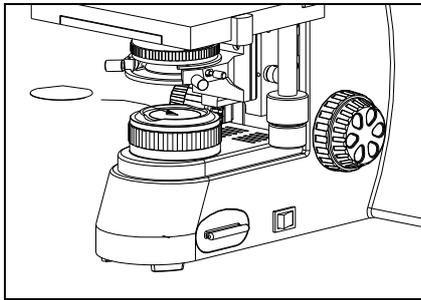


Fig. 21

3-11 Use the Filter

Filter can make the background more suitable and increase the contrast (see Fig. 21).

- ★ There are three kinds of filter: blue, green and yellow.
- ★ Place the filter's rough side downward.

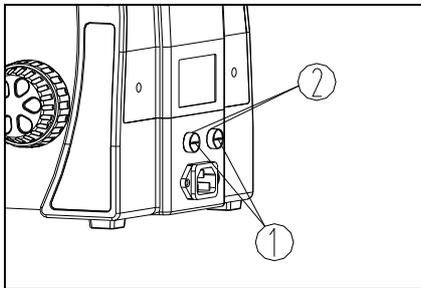


Fig. 22

3-12 Replace the Fuse

Turn the main switch to "0" (OFF) before replacing the fuse. Pull out the power cord. Then screw off the fuse group ① from the fuse base ② with a "-" type screwdriver. Install a new fuse and screw it on the fuse base (see Fig. 22).

- ★ Specification of the fuse: T250V, 3.15A.

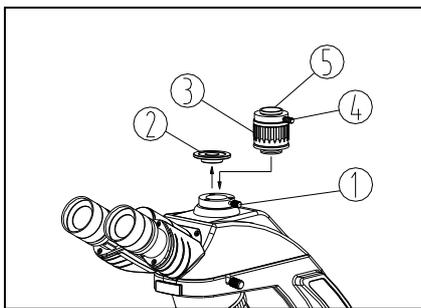


Fig. 23

3-13 Assemble and Use of the TV Device

1. Loosen the lock-screw ① on the trinocular head and get down the dust-cover ② of the trinocular (see Fig.23).
2. Get down the dust-cover caps of the TV adapter ③. Insert the ③ into the trinocular according to the direction of the figure. Screw on the lock-screw ① tightly.
3. Loosen the lock-screw ④. Get down the C mount ⑤ from ③. Screw onto CCD and then install the orifice to ③. Screw on the lock-screw ④ tightly.
4. Observe through binocular till image clear, then observe through CCD, if the image is unclear, rotate the adjustment tube ③ until it is clear.

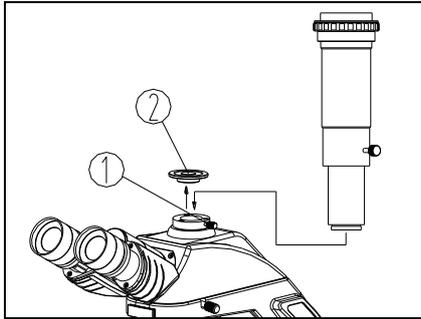


Fig. 24

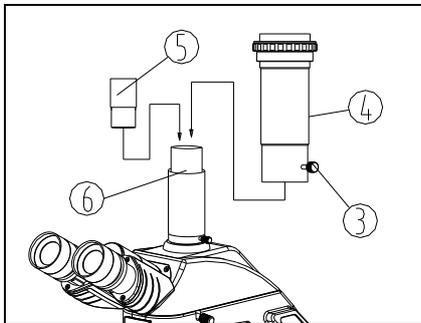


Fig. 25

3-14 Assemble the Photography Device

1. Loosen the lock-screw ① on the trinocular head and get down the dust-cover ② of the trinocular.
2. Insert photography device to the trinocular. Screw on the lock-screw ① (see Fig.24).
3. Loosen the lock-screw ③ on the photo tube and get down the photo tube ④ (see Fig.25).
4. Insert the photography eyepiece 3.2X ⑤ to the eyepiece base ⑥. Insert ④ and screw on the ③ tightly.
5. After observing clearly for binocular. Then operate it according to the introduction of the photography device.

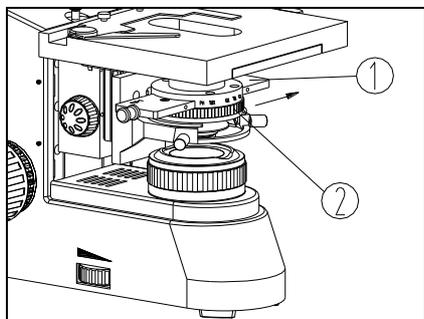
4-1 Assembling and Operation of Phase Contrast Flapper

Fig. 26

1. Keep the phase contrast flapper① face up (upward the face with word), insert it from left to right into the condenser flapper socket as the direction of the arrow pointed (see Fig. 26).
2. Every diaphragm or hole has its corresponding position, one diaphragm or hole is inserted into the center of optical path when it sounds “ka-da” during phase contrast flapper rotating.
3. When observing phase contrast, keep the adjusting ring of the aperture diaphragm ② indicator to “PH” position.

★ Each magnification phase contrast objective is used with matched ring diaphragm (Like 10X phase contrast objective corresponding to 10X ring diaphragm).

★ As the ring diaphragm is pre-centered, it doesn't need to be adjusted in operation in normal cases.

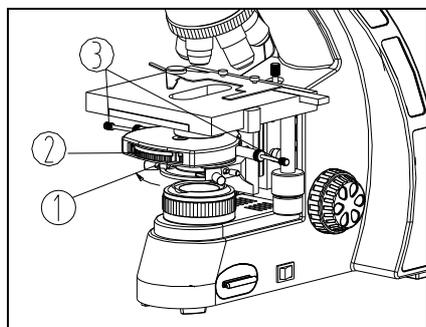
4-2 Assembling and Operation of Disc Phase Contrast Condenser

Fig. 27

1. Assembling of Condenser please refer to 2-2-1, change the objective on the nosepiece to phase contrast objective. Center the phase contrast condenser before use.
2. Rotate the phase contrast ring② to “BF” position in bright field observation. When it sounds “ka-da” in rotating, it indicates that one diaphragm or hole is rotated into the center of optical path (see Fig. 27).

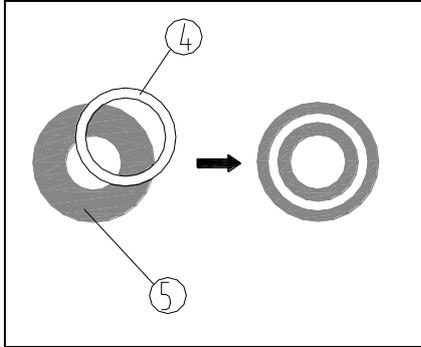


Fig. 28

4-2-1 Centering Halo

In phase contrast microscopy observation, slide the aperture diaphragm lever ① to the most left as the direction of the arrow pointed (always keep aperture diaphragm at maximum). (see Fig. 27)

1. Put specimen on the stage and focus.
2. Take out one observation eyepiece and insert one CT (centering telescope) into the tube
3. Confirm the corresponding phase ring (in phase contrast objective) and halo (in phase contrast disc ②) are moved into optical path.
4. Adjust centering telescope to get a clear image of phase ring and halo in field of view (see Fig. 28).
5. Center by phase contrast adjusting lever ③ until halo ④ center overlap the phase ring center (see Fig. 27, Fig. 28).
6. Adjust phase ring and halo of other magnification phase contrast objective according to above steps.

★ It can not get the phase contrast microscopy observation effect if the halo is not centered correctly.

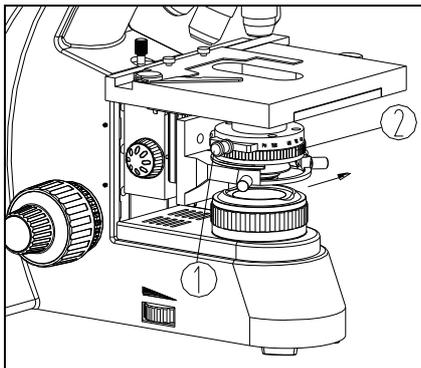


Fig. 29

4-3 Assembling and Operation of Dark Field Flapper

1. Keep phase contrast flapper face up (upward the face with word), insert it from left to right into condenser flapper socket as the direction of the arrow pointed (see Fig. 29).
2. Every diaphragm or hole has corresponding position, when it sounds “ka-da” in dark field flapper rotating, it indicates that one diaphragm or hole is inserted into the center of optical path.
3. In dark field observation, adjust aperture diaphragm adjusting ring to maximum position.

★ Dark field ring diaphragm is on the left side of flapper.

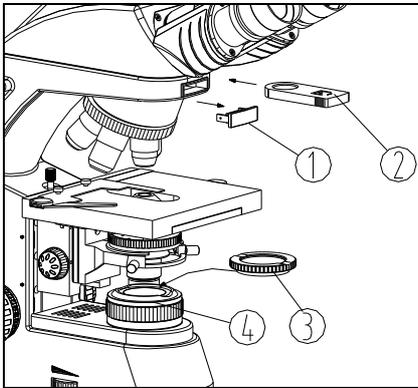


Fig. 30

4-4 Assembling and Operation of Simple Polarizing

1. Simple polarizing includes analyzer② and polarizer③ (see Fig. 30).
2. Unplug analyzer dust-cover① from the arm, and insert analyzer face up.
3. Put the polarizer into the condenser④ groove as the figure shows.
4. Rotate the polarizer③ can change the orthogonal status of polarization.

★ When view field of eyepiece is darkest, it is polarization.

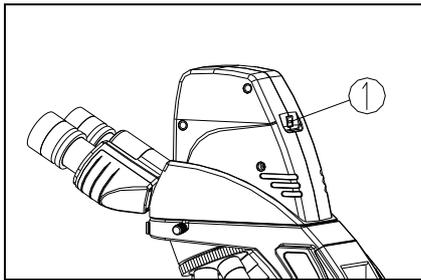


Fig. 31

4-5 Operation of Digital Observation Head

Insert one side of USB data cable into USB output port on the back of observation head (see Fig. 31). View the microscope video with two eyes by the corresponding video capture and analysis software.

Digital USB interface:

Voltage is 5V, Current ≤500mA.

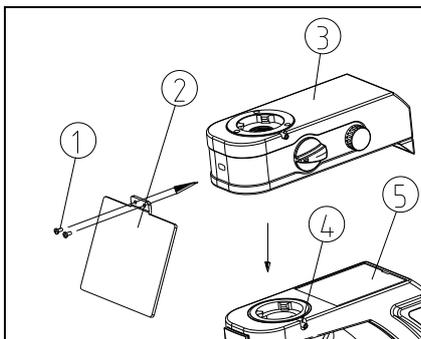


Fig. 32

4-6 Assembling and Operation of the LED Fluorescence attachment

4-6-1 Assembling and Operation of the LED Fluorescence Illuminator

1. Fix the light shield ② on the LED fluorescence illuminator ③ with the screw ①. (See Fig. 32)
2. Put the LED fluorescence illuminator ③ on the arm ⑤, and fix it with the lock screw ④ by the hexagon spanner. (See Fig. 32)

★ Assemble the light shield ② when observing in UV lighting.

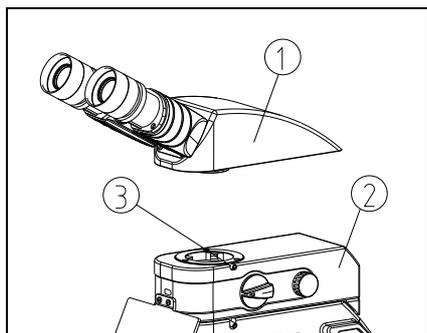


Fig 33

3. Put the binocular/ trinocular Head ① on the LED fluorescence illuminator ②, and fix it with the lock screw ③ by the hexagon spanner. (See Fig. 33)

4. When observing the fluorescence slide, should pull the light barrier ① left into light path to stop transmission light. (See Fig.34)

★ When observing under transmission light, should pull the light barrier right in order to keep the transmission light unobstructed.

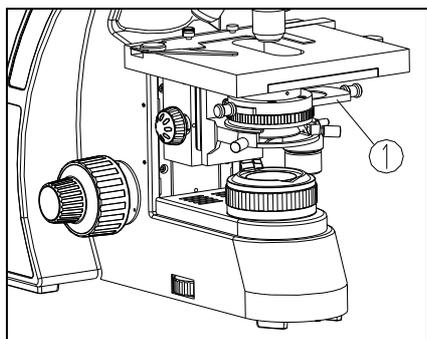


Fig 34

5. LED fluorescence filter block adjustment knob ① can be rotated in 180 degrees according to the arrow pointed, to switch between the transmission bright field and the LED fluorescence. “Flourescence” means flourescence observation, and “Brightfield” means bright field observation. (See Fig. 35)

6. Illumination: rotate the light adjustment knob ② in clockwise, turn on the LED fluorescence lamp when a sound of “DiDa” is heard, and rotate it in clockwise to make the LED brighter. Rotate the light adjustment knob ② in counterclockwise to make the LED darker, and turn off it until a sound of “DiDa” is heard (See Fig. 35)

★ Switch to „Flourescence“, the fluorescence indicator is lighten, fluorescence observation is available. On the contrary, switch to „Brightfield“, the fluorescence indicator is out.

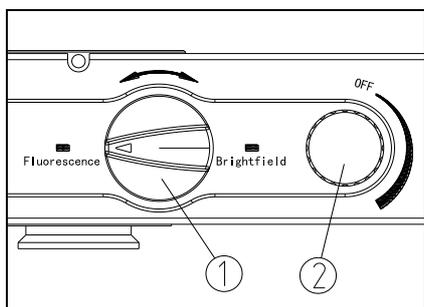


Fig 35

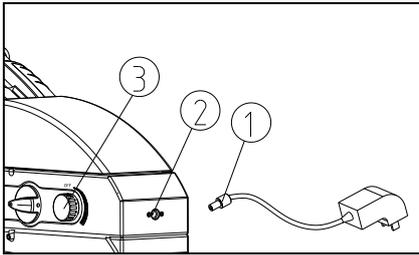


Fig 36

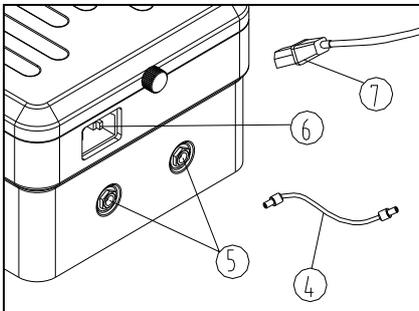


Fig 37

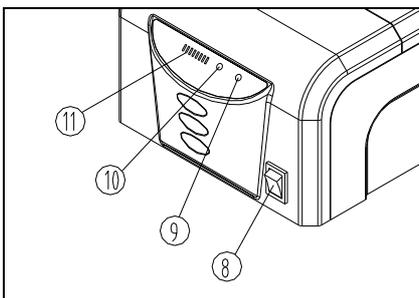


Fig 38

4-6-2 Power supply for LED fluorescence attachment

a) Transformer power supply. First insert one end of transformer ① into LED fluorescent illuminator power socket ②. Then insert the other end directly into electric outlet. (See Fig.36)

★ Before connecting an external transformer, should rotate the light adjustment knob ③ to “OFF”. (See Fig.36)

b) The battery pack for power supply.

(Recommended when the power failure)

(1) First insert one end of the power cable ④ into LED fluorescence illuminator power socket ②. Then insert the other end into the battery pack output port ⑤ (can be connected to any output port). (See Fig.36、 37)

(2) Turn on the switch ⑧ on the battery pack to start power supplying. The indicator ⑨ is green in normal while the indicator ⑩ is orange (the indicator ⑩ becomes green when the pack is fully charged.) At the same time, the last bulb of the light strip ⑪ is red while other bulbs are green. When it is low battery, the indicator ⑨ is orange while the indicator ⑩ is orange. At the same time, only the last bulb of the light strip ⑪ is red. (See Fig.38)

★ Before connecting the power cable, should push the switch of battery pack to “O” (OFF) and should rotate the light adjustment knob ③ to “OFF”. (See Fig.36、 37、 38)

(3) Charge the battery pack when it is low power. Connect the power cord ⑦ with the outlet and the interface ⑥ on the pack.

Keep the switch ⑧ to “I” (ON), the indicator ⑩ is orange when charging. It ⑩ becomes green and all the bulbs of light strip ⑪ lighten (the last bulb is red while others are green) after fully charged.

(See Fig.37、 38)

5. Troubleshooting

MT-50 Series

As the performance of microscope can't play fully due to unfamiliar operations, the table below can provide some solutions.

Problem	Cause	Solution
1. Optical Part		
(1) The LED light is bright, but it's dark in the field of view.	Field diaphragm is not large enough.	Enlarge the field diaphragm.
	Condenser is too low.	Adjust the condenser.
	Condenser centered incorrectly.	Center the condenser.
(2) The side of the field of view is dark or not even.	The nosepiece is not in the right position.	Turn the nosepiece into the right position.
	Stain or dust has accumulated on the condenser, objective, eyepieces, and base lens.	Clean the lens.
(3) Stain or dust is observed in the field of view.	Stains have accumulated on the specimen.	Clean the specimen.
	Stains have accumulated on the lens.	Clean the lens.
(4) Unclear image	No cover glass on the specimen slide.	Add the cover glass.
	The cover glass is not standard.	Use a standard cover glass with thickness 0.17mm.
	The cover glass faces down.	Put the cover glass to face up.
	The immersion oil has accumulated on the dry objective.	Clean thoroughly.
	The immersion oil is not used for oil objective 100XR.	Use immersion oil.
	Air bubble in the immersion.	Get rid of the air bubble.
	Use wrong immersion oil.	Use a correct one.
	The aperture is not opened correctly.	Adjust the iris diaphragm.
	Stain or dust has accumulated on the lens in the inlet of the head.	Clean the lens.
The condenser is not in the right position.	Adjust the condenser.	
(5) One side of the field of view is dark or the image moves while focusing.	The specimen slide is not fixed.	Fix with clips.
	The nosepiece is not in the right position.	Turn the nosepiece into the right position.
	Condenser centered incorrectly.	Center the condenser.

Problem	Cause	Solution
(6) The eyes feel tired easily. The right field of view doesn't superpose with the left.	Interpupillary distance is wrong.	Adjust the interpupillary distance.
	Diopter adjustment is wrong.	Adjust the Diopter.
	The eyepieces for the right are different from the left.	Use the same eyepieces.
2. Mechanical Part		
(1) Can not get the objective focused.	The cover glass faces down.	Put the cover glass to face up.
	The cover glass is not standard.	Use a standard cover glass with thickness 0.17mm.
(2) The objective touches the cover glass while turning the nosepiece.	The cover glass faces down.	Put the cover glass to face up.
	The cover glass is not standard.	Use a standard cover glass with thickness 0.17mm.
(3) Coarse focusing knob is too tight.	Tension knob is too tight.	Loosen a little.
(4) Stage declines itself.	Tension knob is too loose.	Tighten a little.
(5) Coarse focusing knob can't rise.	The limit stop knob is locked.	Loosen the knob.
(6) Coarse focusing knob can't decline.	The base of the condenser is too low.	Raise the base.
(7) Can not move the slide smoothly.	The slide is not fixed correctly.	Adjust it correctly.
	The movable specimen holder is not fixed properly.	Adjust it correctly.
(8) The image moves obviously when touching the stage.	The stage is fastened incorrectly.	Fasten the stage correctly.
3. Electrical Part		
(1) The LED light does not work.	No power supply.	Check the connection of the power cable.
	The LED light is not inserted correctly.	Insert it correctly.
	The LED lights burnt out.	Replace it.
(3) The field of view is not bright enough.	The use of light adjustment knob is wrong.	Adjust correctly.
(4) The bulb flickers or the brightness is not stable.	The wire doesn't connect all right	Connect correctly