OPTIKA®
ITALY

**B-510 Series**

# INSTRUCTION MANUAL

| Model |
|---|
| B-510BF |
| B-510ERGO |
| B-510ASB |
| B-510PH |
| B-510FL |
| B-510LD4 |
| B-510LD4-SA |
| B-510LD4D |
| B-510-2 |
| B-510-2F |
| B-510-3 |
| B-510-5 |

Ver. 3.4 2023

CE UKCA

## Table of contents

## 1. Warning

This microscope is a scientific precision instrument designed to last for many years with a minimum of maintenance. It is built to high optical and mechanical standards and to withstand daily use. We remind you that this manual contains important information on safety and maintenance, and that it must therefore be made accessible to the instrument users. We decline any responsibility deriving from incorrect instrument use uses that does not comply with this manual.

## 2. Safety Information

**Avoiding Electrical Shock**

Before plugging in the power supply, make sure that the supplying voltage of your region matches with the operation voltage of the equipment and that the lamp switch is in off position. Users should observe all safety regulations of the region. The equipment has acquired the CE safety label. However, users have full responsibility to use this equipment safely. Please follow the guidelines below, and read this manual in its entirety to ensure safe operation of the unit.

## 3. Package content

### 3.1 B-510BF/B-510ERGO


① Microscope frame
② Eyepieces
③ Objectives
④ Observation head
⑤ Immersion oil
⑥ Allen wrench
⑦ Tension adjustment tool
⑧ Dust cover
⑨ Power supply

### 3.2 B-510PH


① Microscope frame
② Eyepieces
③ Objectives
④ Observation head
⑤ Centering telescope
⑥ Immersion oil
⑦ Allen wrench
⑧ Tension adjustment tool
⑨ Dust cover
⑩ Green filter
⑪ Power supply

### 3.3 B-510ASB


① Microscope frame
② Eyepieces
- 10x (one pair)
- 12,5x (one pair)

③ Objectives
④ Observation head
⑤ Centering telescope
⑥ Immersion oil
⑦ Allen wrench
⑧ Tension adjustment tool
⑨ Dust cover
⑩ Green filter
⑪ Power supply

### 3.4 B-510-2/B-510-2F/B-510-3/B-510-5


① Microscope frame
② Eyepieces
- 10x/22 (one pair for main head)
- 10x/20 (one pair for B-510-2/2F)
- 10x/20 (two pairs for B-510-3)
- 10x/20 (four pairs for B-510-5)

③ Objectives
④ Main observation head
⑤ Side observation heads
- one for B-510-2/2F
- two for B-510-3
- four for B-510-5

⑥ Immersion oil
⑦ Allen wrench
⑧ Tension adjustment tool
⑨ Dust cover
⑩ Power supply

### 3.5 B-510FL


① Microscope frame
② Eyepieces
③ Objectives
④ Observation head
⑤ Lamp housing
⑥ Epi-illuminator
⑦ HBO bulbs
⑧ Allen wrench
⑨ Tension adjustment tool
⑩ Dust cover
⑪ UV protection shield
⑫ Power supply
⑬ Power cord
⑭ Fluorescence power supply
⑮ Light excluding plate
⑯ Immersion oil

### 3.6 B-510LD4/B-510LD4-SA


① Microscope frame
② Eyepieces
③ Objectives
- B-510LD4: W-PLAN series
- B-510LD4-SA: W-PLAN F series

④ Observation head
⑤ Epi-illuminator
⑥ Allen wrench
⑦ Tension adjustment tool
⑧ Immersion oil
⑨ Dust cover
⑩ Power supply
- 6V for transmitted light
- 12V for fluorescence

⑪ Light excluding plate
⑫ UV protection shield

### 3.7 B-510LD4D


① Microscope frame
② Eyepieces
③ Objectives
④ Observation head
⑤ Epi-illuminator
⑥ PC stick
⑦ Allen wrench
⑧ Tension adjustment tool
⑨ Immersion oil
⑩ Dust cover
⑪ Power supply + power cord
⑫ Light excluding plate
⑬ Camera with mounting bracket
⑭ “C” mount
⑮ Wireless mouse + Wireless keyboard
⑯ UV shield
⑰ PC monitor
⑱ Multipower cable
⑲ HDMI cable
⑳ USB cable

## 4. Unpacking

The microscope is housed in a moulded Styrofoam container. Remove the tape from the edge of the container and lift the top half of the container. Take some care to avoid that the optical items (objectives and eyepieces) fall out and get damaged. Using both hands (one around the arm and one around the base), lift the microscope from the container and put it on a stable desk.

Do not touch with bare hands optical surfaces such as lenses, filters or glasses. Traces of grease or other residuals may deteriorate the final image quality and corrode the optics surface in a short time.

## 5. Intended use

**Standard models**

For research and teaching use only. Not intended for any animal or human therapeutic or diagnostic use.

**IVD Models**

Also for diagnostic use, aimed at obtaining information on the physiological or pathological situation of the subject.

## 6. Symbols and conventions

The following chart is an illustrated glossary of the symbols that are used in this manual.

**CAUTION**

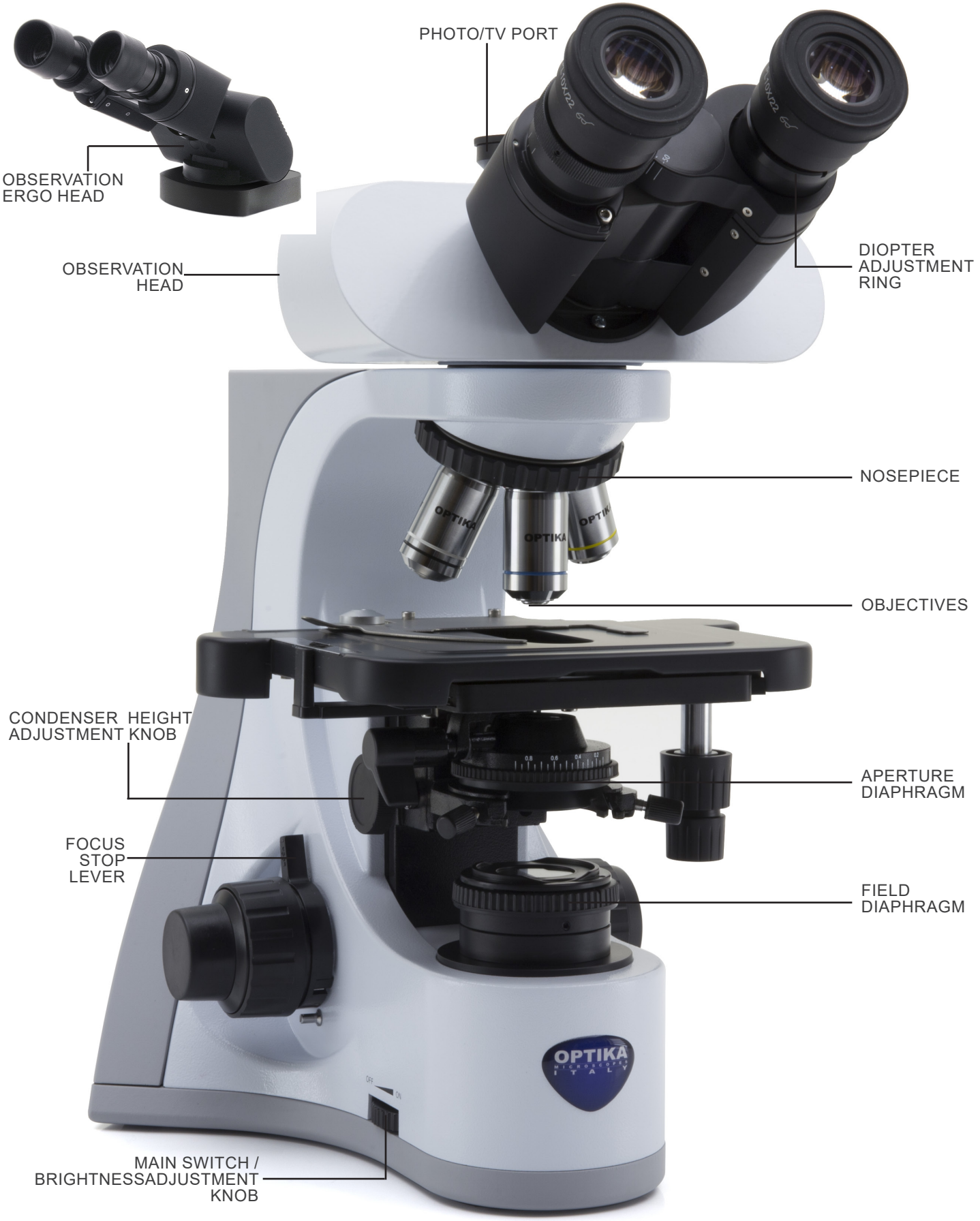
This symbol indicates a potential risk and alerts you to proceed with caution.

**ELECTRICAL SHOCK**

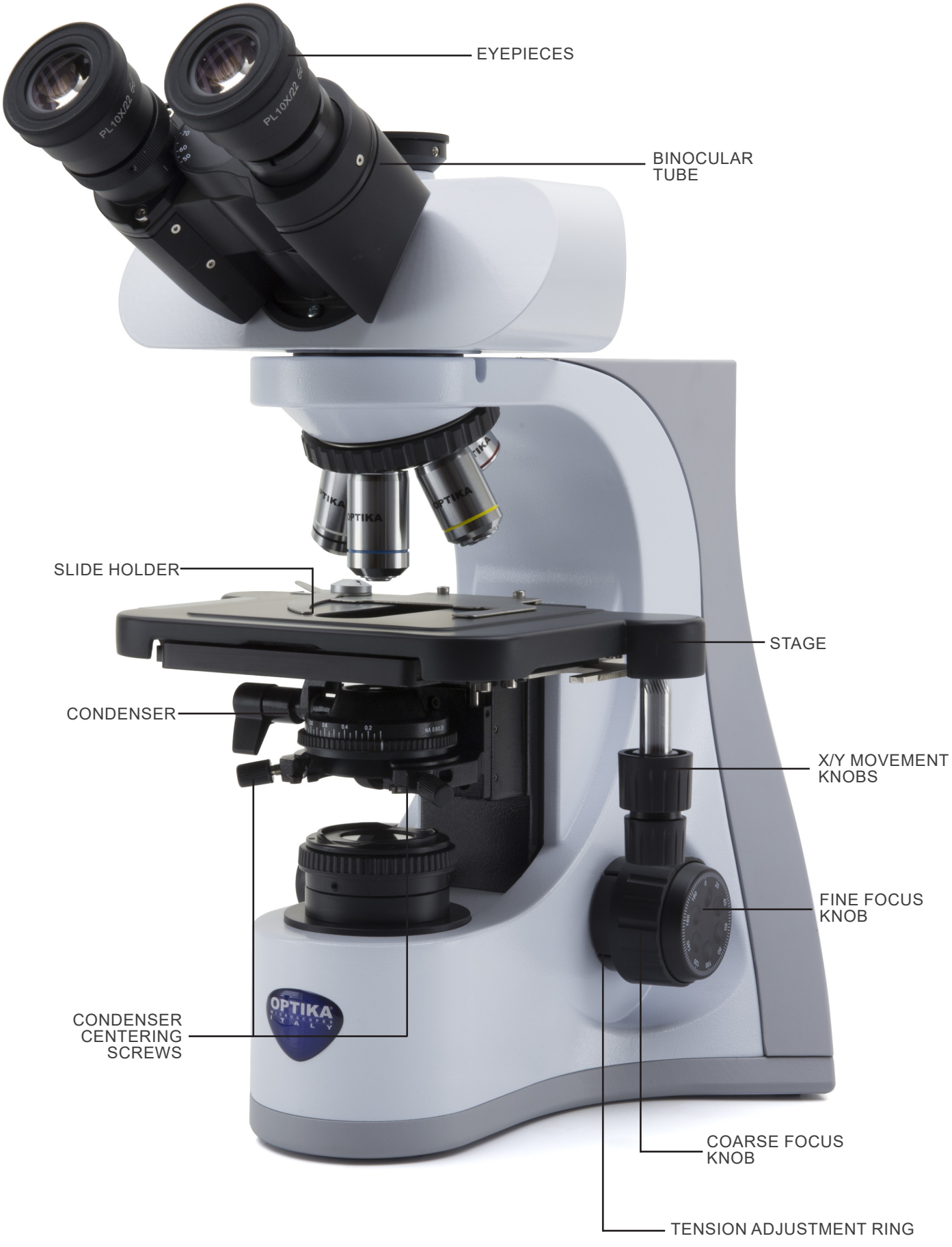
This symbol indicates a risk of electrical shock.

# 7. Instrument description

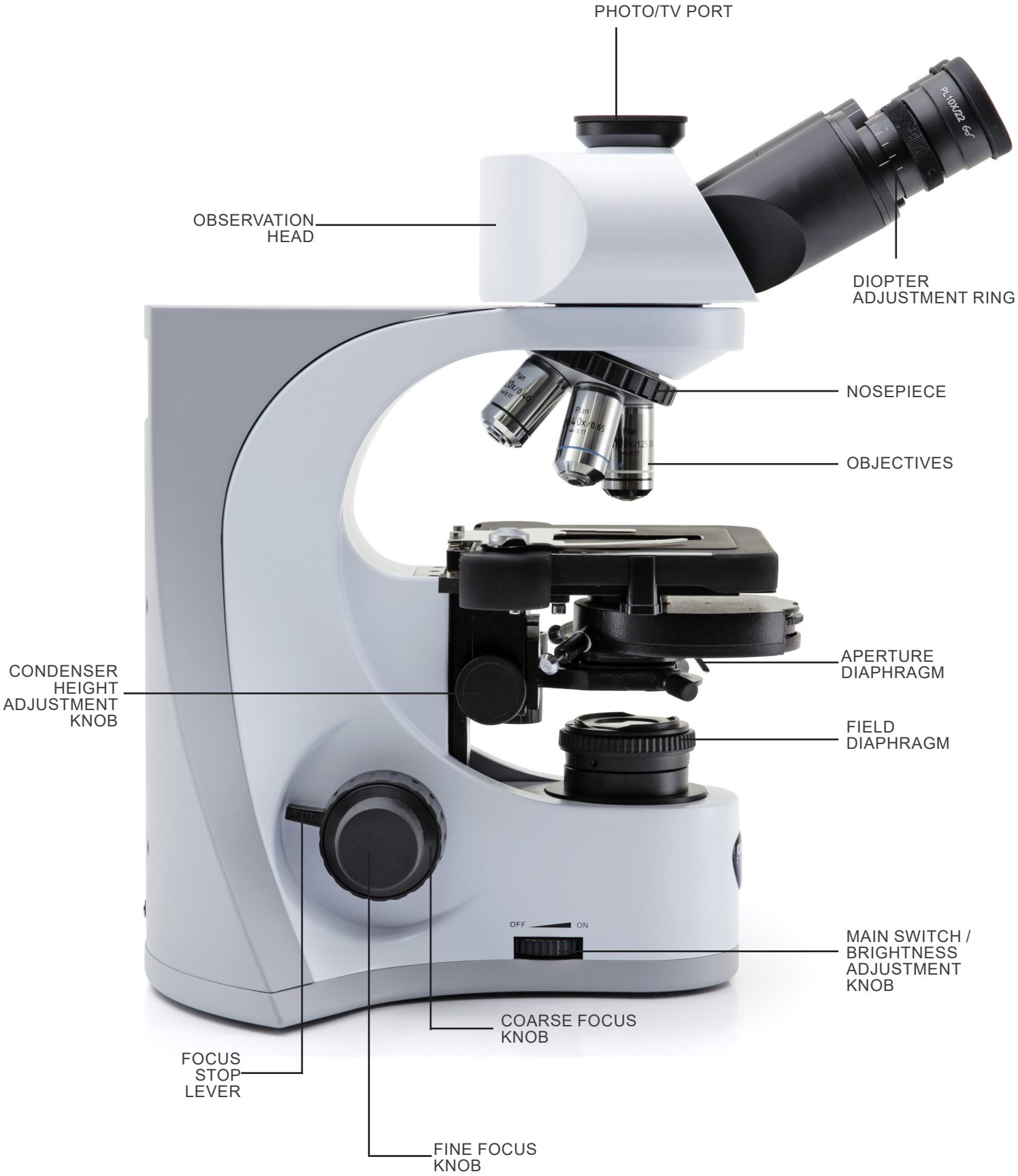
## 7.1 B-510BF/B-510ERGO



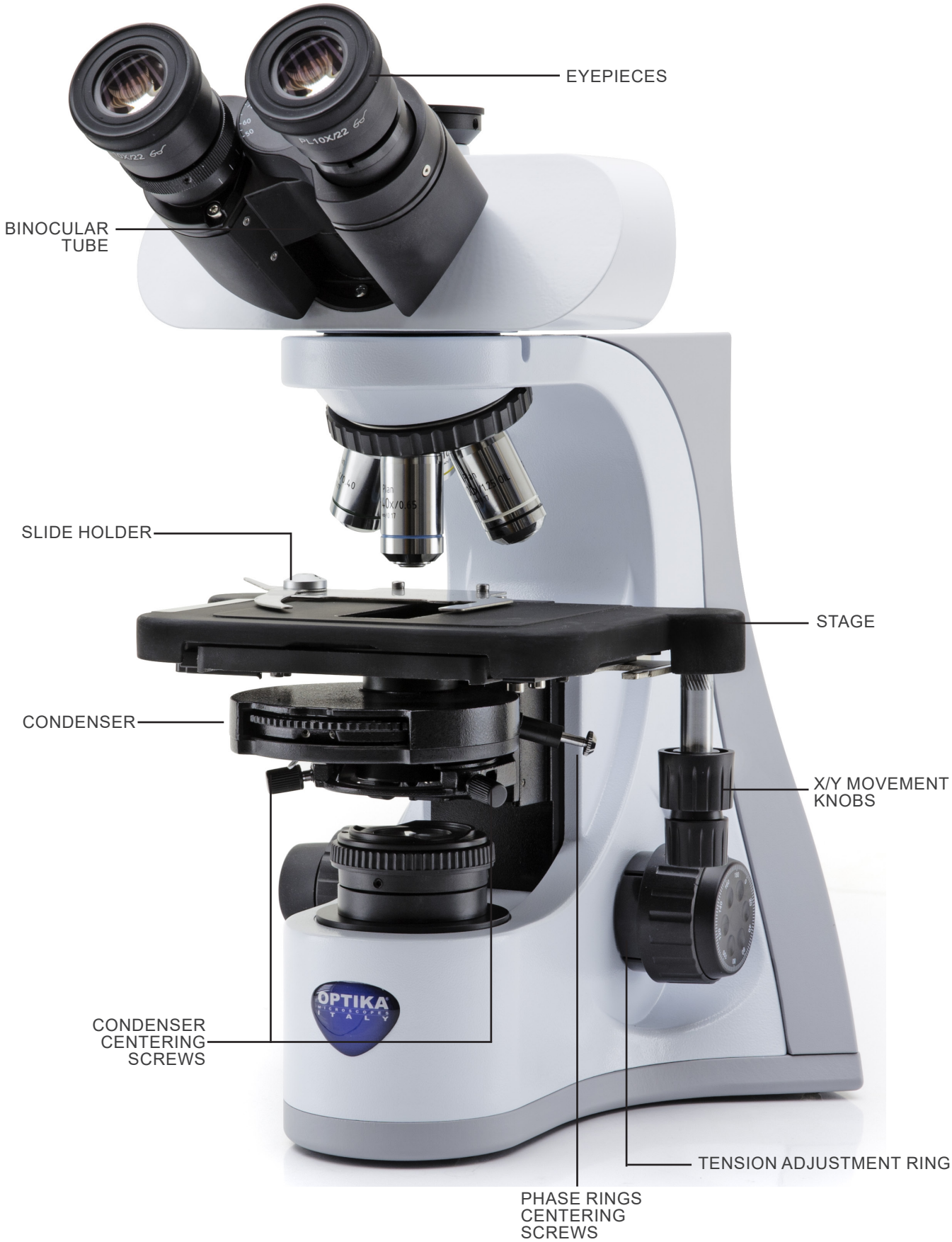
**B-510BF/B-510ERGO (opposite side)**



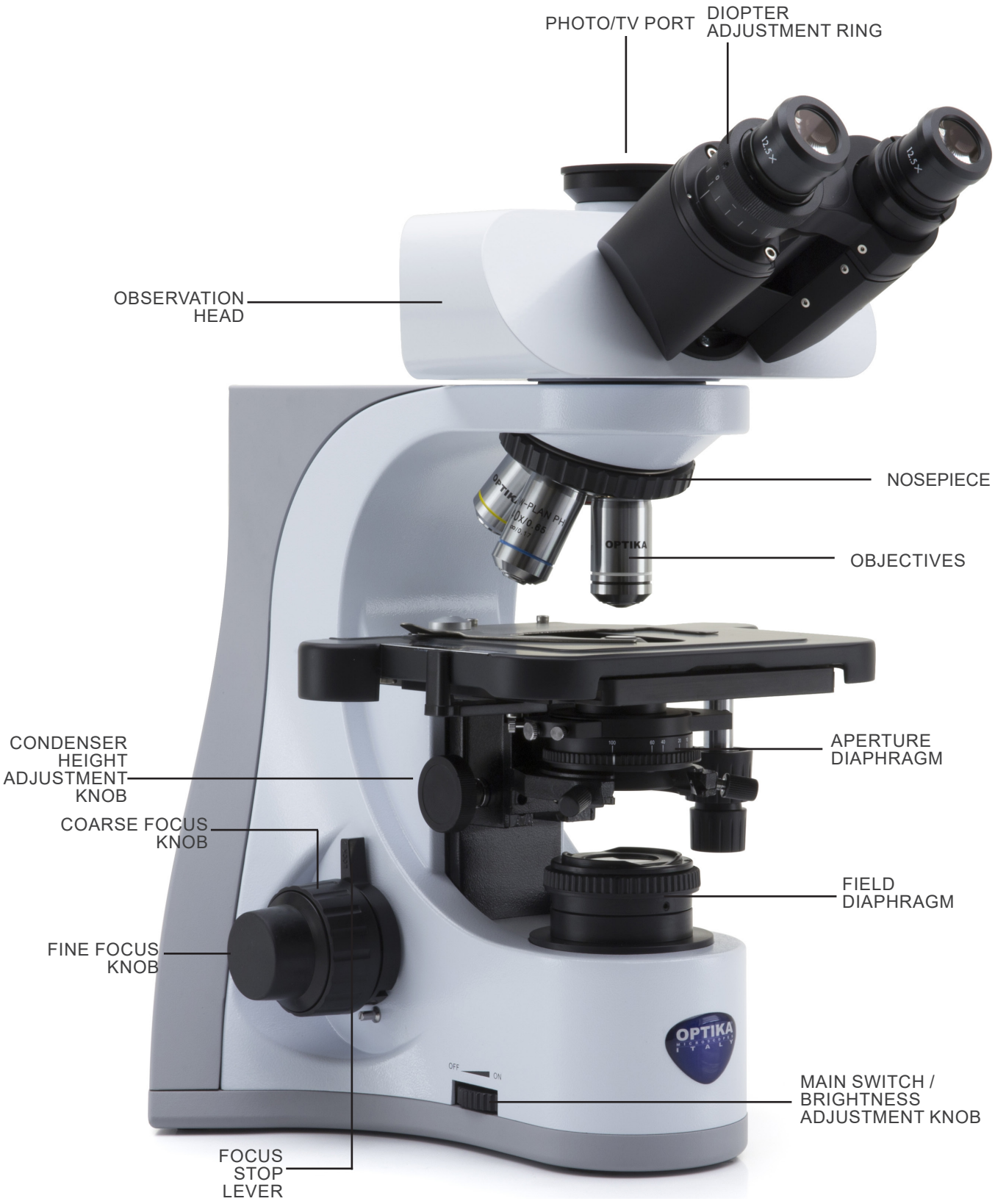
## 7.2 B-510PH


PHOTO/TV PORT
OBSERVATION HEAD
DIOPTER ADJUSTMENT RING
NOSEPIECE
OBJECTIVES
APERTURE DIAPHRAGM
CONDENSER HEIGHT ADJUSTMENT KNOB
FIELD DIAPHRAGM
MAIN SWITCH / BRIGHTNESS ADJUSTMENT KNOB
COARSE FOCUS KNOB
FOCUS STOP LEVER
FINE FOCUS KNOB

**B-510PH (opposite side)**



### 7.3 B-510ASB


PHOTO/TV PORT
DIOPTER ADJUSTMENT RING
OBSERVATION HEAD
NOSEPIECE
OBJECTIVES
CONDENSER HEIGHT ADJUSTMENT KNOB
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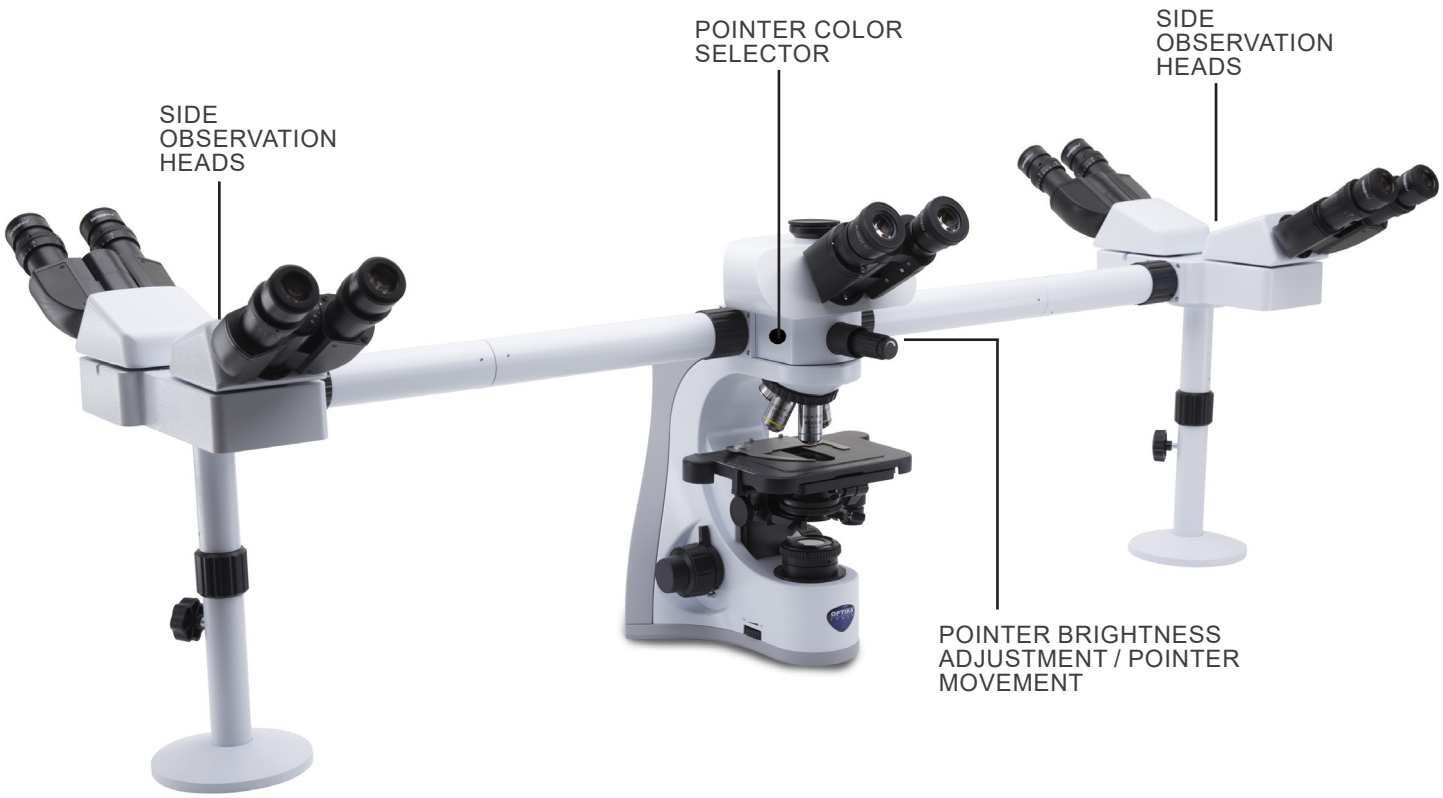
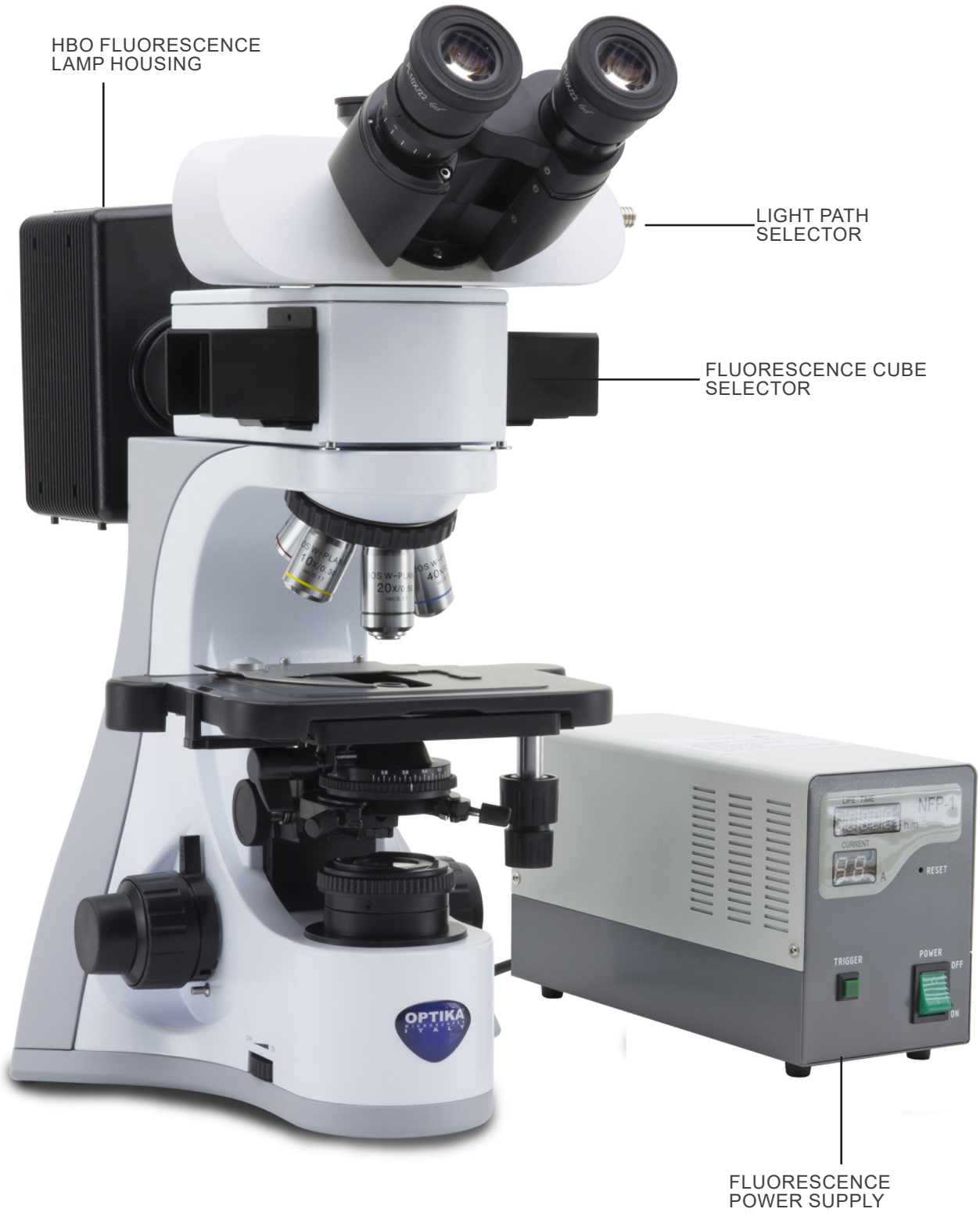
COARSE FOCUS KNOB
FIELD DIAPHRAGM
FINE FOCUS KNOB
MAIN SWITCH / BRIGHTNESS ADJUSTMENT KNOB
FOCUS STOP LEVER

## 7.4 B-510-2/B-510-2F/B-510-3/B-510-5



### 7.5 B-510FL

The main microscope commands remain unchanged: only the fluorescence parts are highlighted.



### 7.6 B-510LD4/B-510LD4-SA

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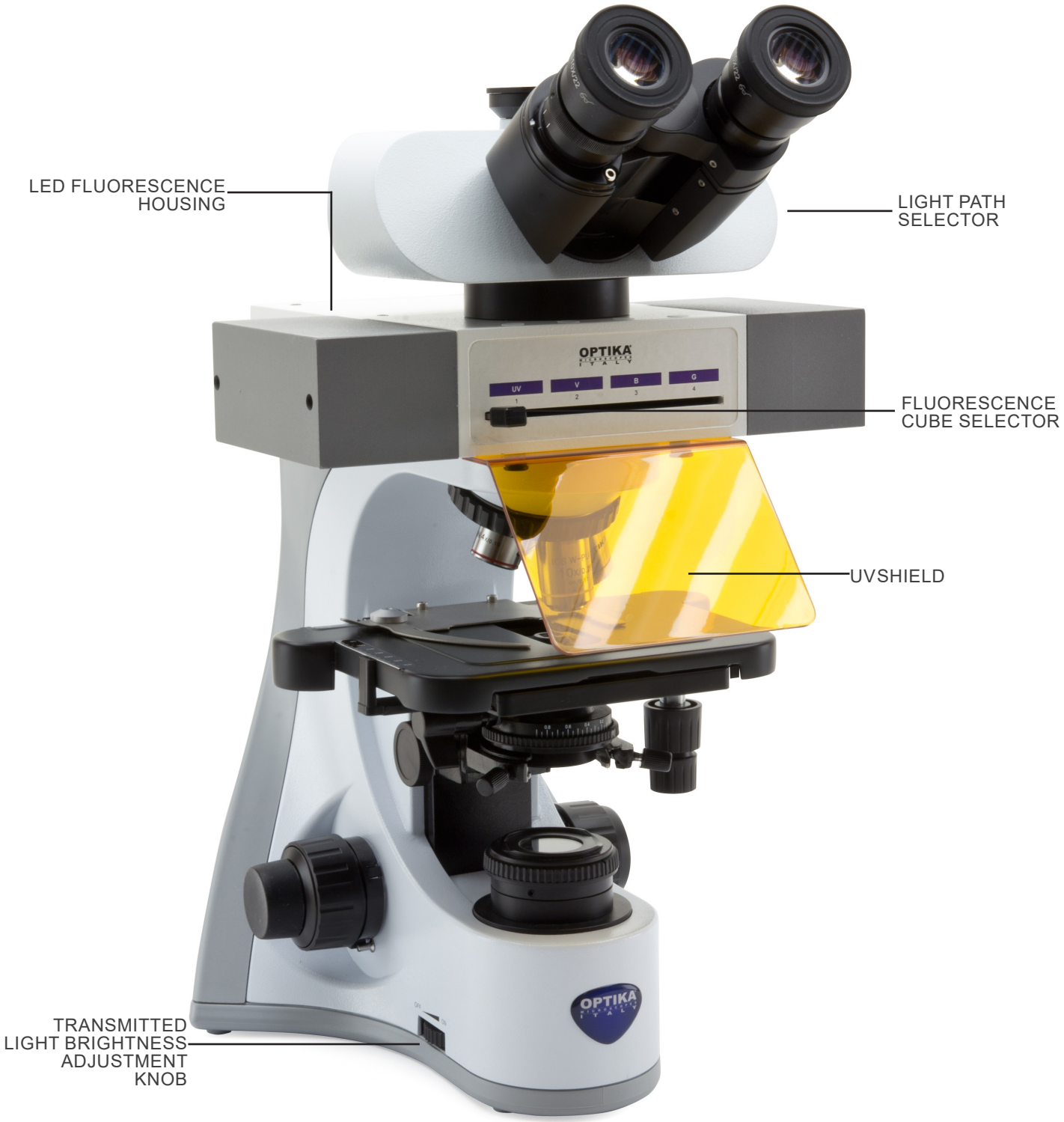
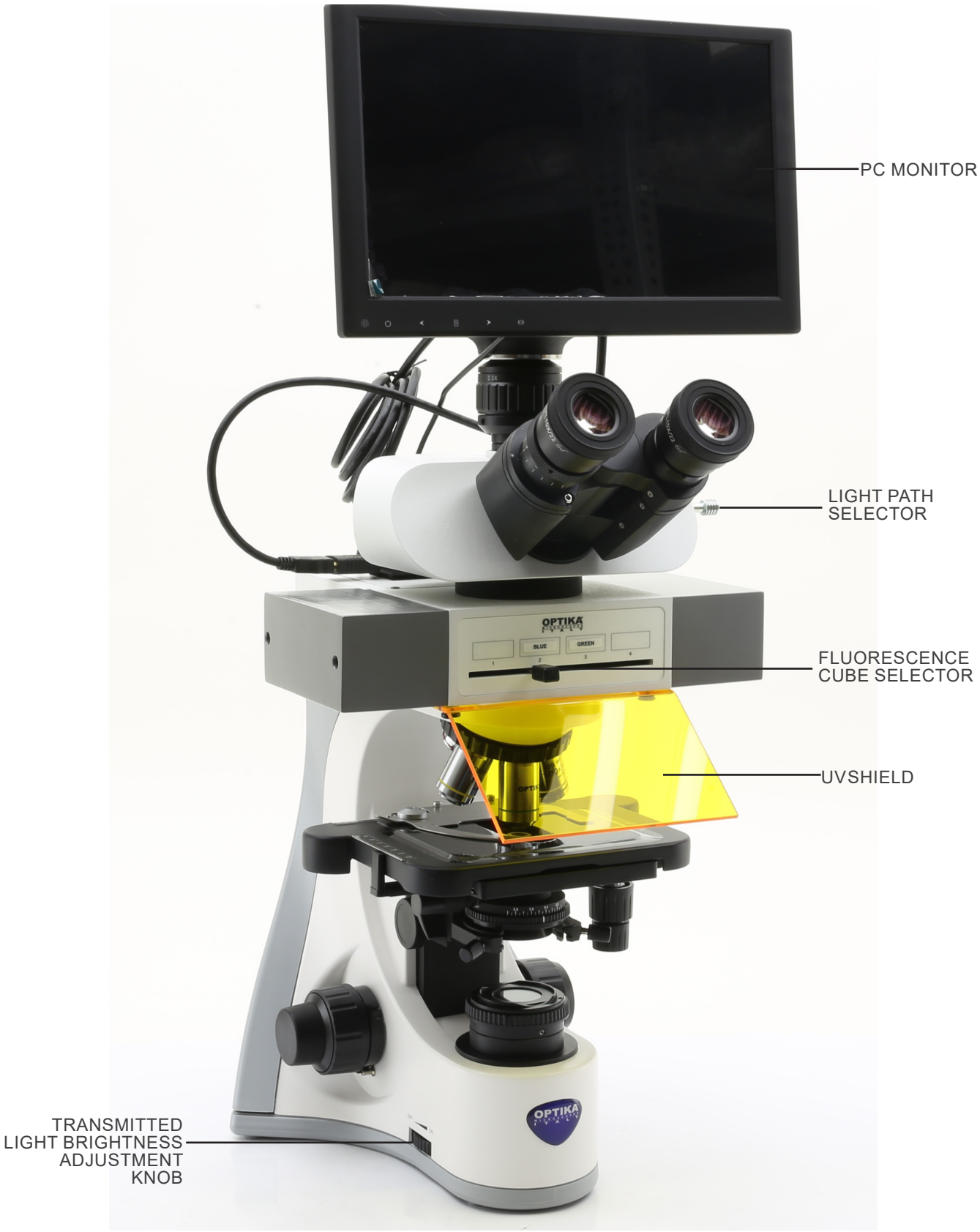
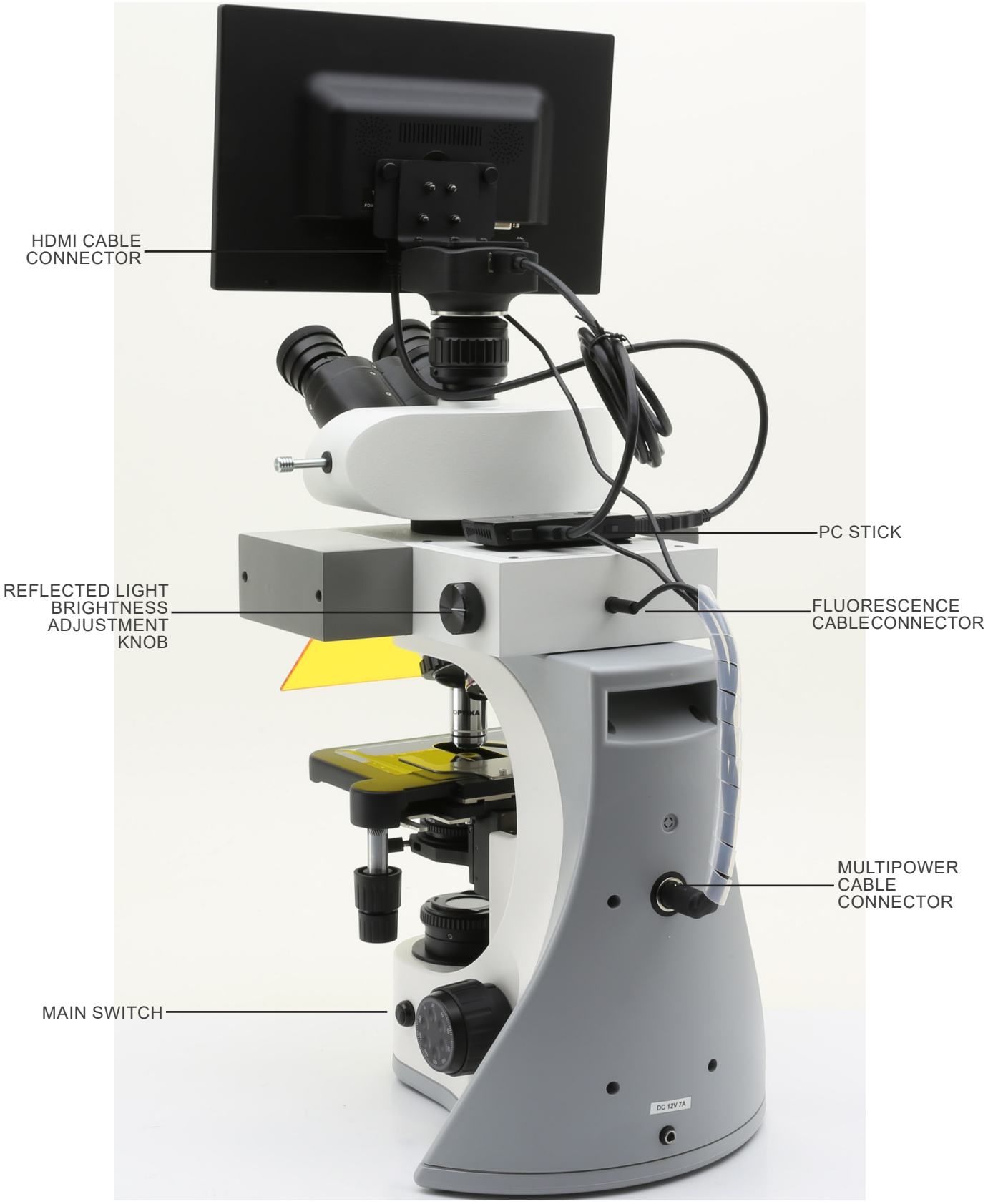


### 7.7 B-510LD4D

The main microscope commands remain unchanged: only the fluorescence and digital parts are highlighted.



**B-510LD4D (back side)**



# 8. Assembling

## 8.1 B-510BF/ERGO/PH/ASB

1. Insert the optical head above the stand and tighten the screw. (Fig. 1)

- **Hold the head with one hand during the locking in order to avoid that the head falls**.


Fig. 1

2. Insert both eyepieces into the tubes of the optical head. (Fig. 2)
3. Condenser is pre-installed in the factory. To remove the condenser use an Allen wrench 1,5 mm diam and operate on the locking screw placed on the right side of the condenser holder.


Fig. 2

4. Screw each objective into the thread of the nosepiece, clockwise with increasing magnification. (Fig. 3)


Fig. 3

5. Insert the power supply jack in the connector placed at the rear side of the microscope. (Fig. 4)


Fig. 4

### 8.2 B-510-2/B-510-2F/B-510-3/B-510-5

1. Place the splitter attachment of the multi-discussion system and tighten the lock screw ① on the right side of the frame. (Fig. 5)

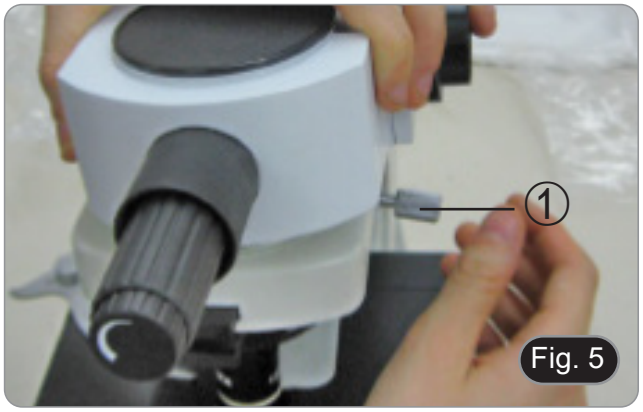


Fig. 5

2. Connect the 5Vdc power supply to the rear socket of the splitter attachment. (Fig. 6).

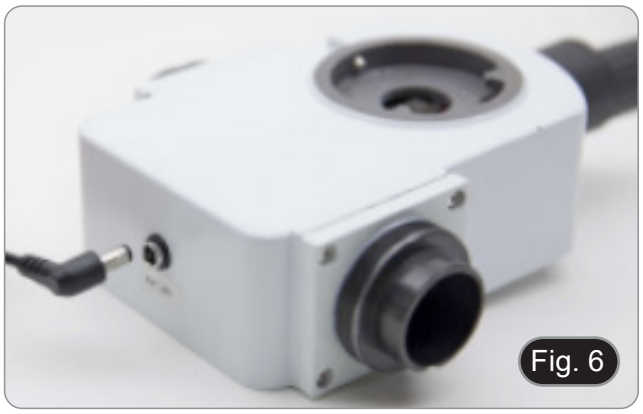


Fig. 6

3. Connect the first part of the extension tube to the optical splitter. Insert the tube into the splitter all the way down and screw on the black sealing ring completely. (Fig. 7-8).

- **Every connection is labeled with a letter printed on both sides of the connection. Make sure to match the letters in order to correctly assemble the microscope.**

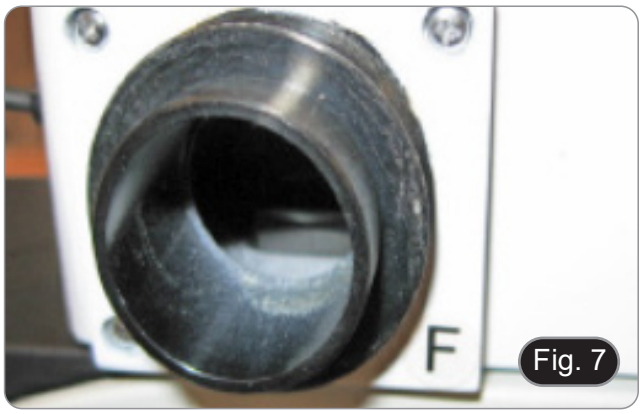


Fig. 7

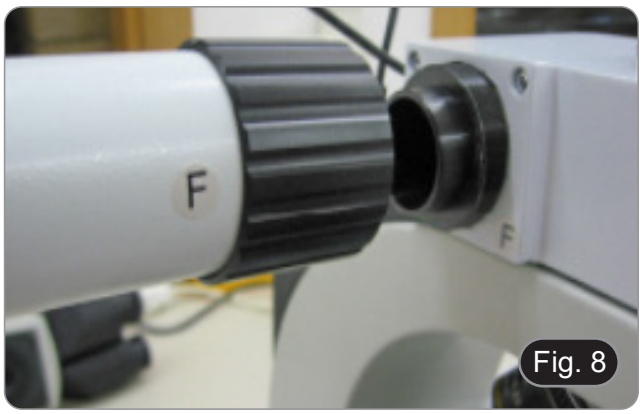


Fig. 8

4. Insert the second part of the extension tube. (Fig. 9)
5. Fully insert the second extension tube in the right position. Using the provided Allen wrench (small one) lock the fixing screws ① to block the extension tube.

- **At the end of the first extension tube there is a lens (Fig. 10). Make sure it is free from dirt, dust or other contaminants before to proceed with the assembling of the second extension tube.**

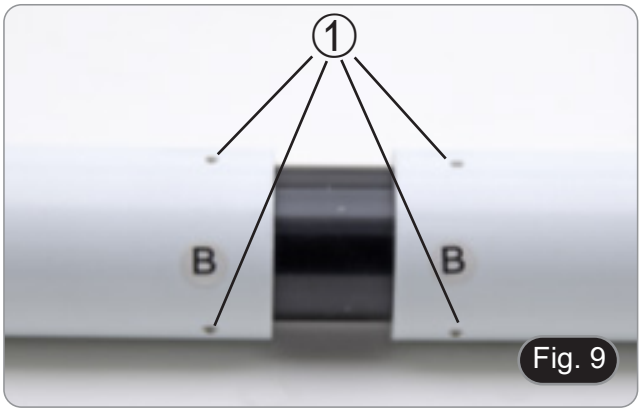


Fig. 9

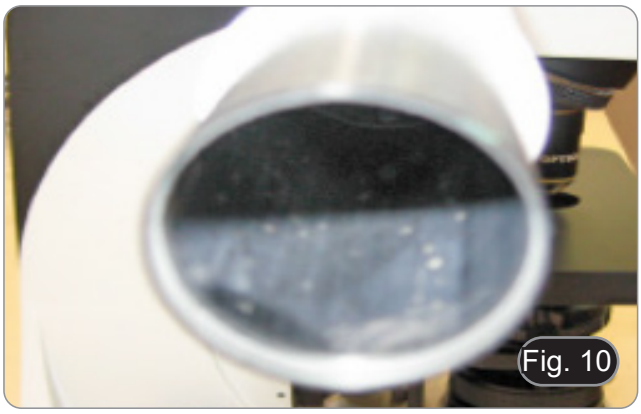


Fig. 10

6. Adjust the height of the multi-head holder. Loosen the base fixing knob ②, unscrew the base ③ in order to reach the desired height, then lock the knob. (Fig. 11). Make sure that each extension tube is perfectly horizontal.

Fig. 11

7. Insert the binocular heads, matching the reference letter. (Fig. 12)

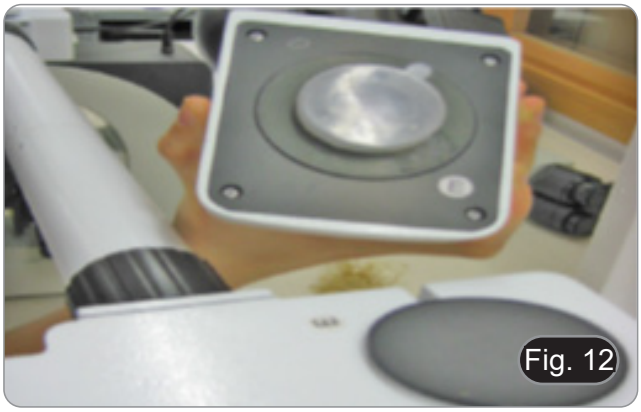


Fig. 12

8. Insert the provided eyepieces (WF10X/20) into binocular heads. (Fig. 13)
9. Repeat all the above operations for each observation point.

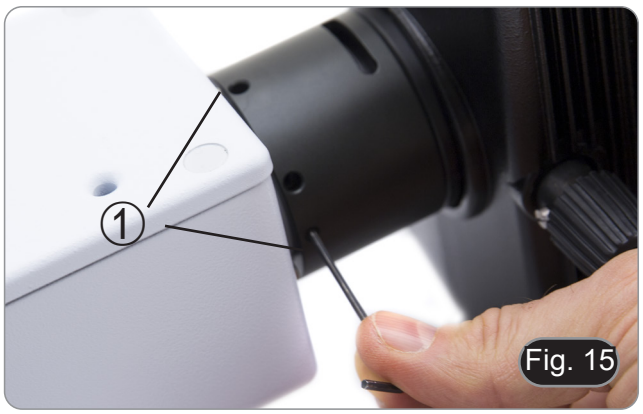

Fig. 13

10. Install the trinocular head over the splitter. (Fig. 14)
11. Continue with the installation of all other components as described in the paragraph 8.1.


Fig. 14

### 8.3 B-510FL

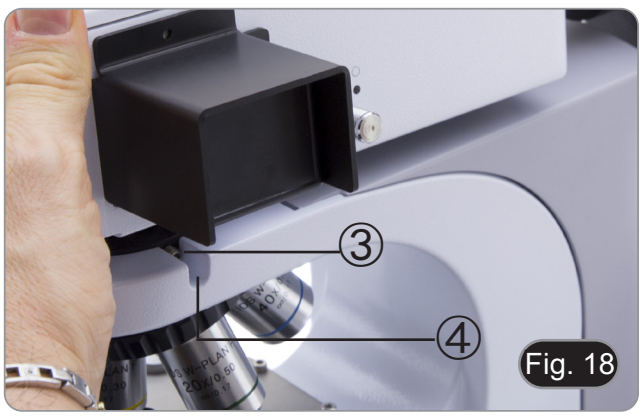
1. Using the provided Allen wrenches, remove the lamp housing from the illuminator using the tightening screws ①. (Fig. 15)




2. Insert the lamp housing extension tube and tighten the screws ②. (Fig. 16)


3. Reassemble the lamp housing and tighten the screws ①. (Fig. 17)


4. Insert the round dovetail socket of the illuminator ③ into the hole in the microscope body and tighten the locking screw ④. (Fig 18)



5. Open the lamp housing using the door lock screw ⑤ and remove the lamp holder. (Fig. 19)

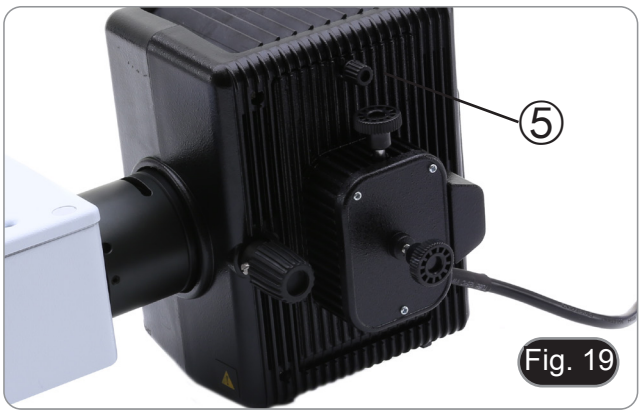


Fig. 19

6. Remove the plastic block ⑥ from the lamp holder (or the exhausted lamp in case of replacement) by loosening the two locking screws ⑦. (Fig. 20)

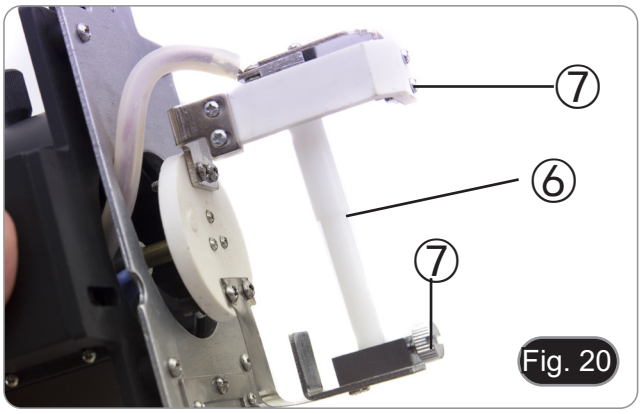


Fig. 20

7. Insert the mercury bulb ⑧ (respect the polarity of the bulb), tighten the locking screws and refit the lamp holder into the lamp housing. (Fig. 21)

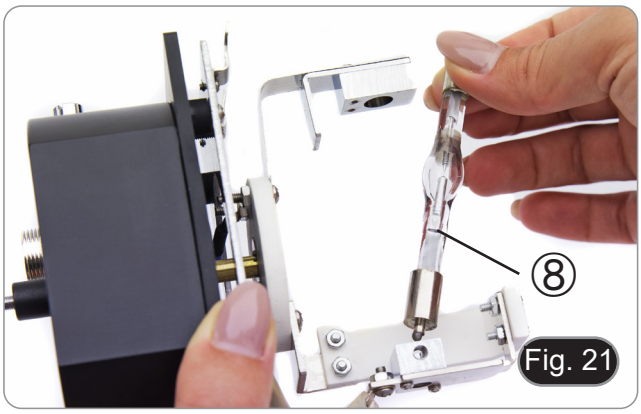


Fig. 21

- **Disconnect all electrical cables before installing or replacing the bulb.**
- **The bulb has an anode and a cathode of different sizes. Respect the polarity during assembly, respecting the bulb dimensions.**
- **Do not touch the bulb of the lamp with bare hands to leave no traces of grease on the bulb. If this happens, clean the bulb with a soft cloth before turning on the lamp.**

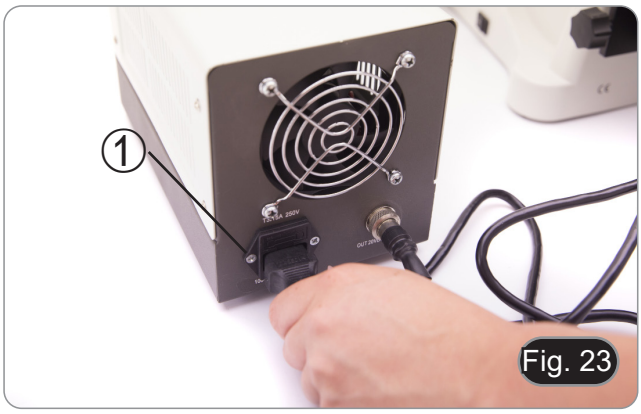
- **The bulb has an average life of about 200-250 hours: a time counter and a voltage indicator are shown on the bulb power supply. Replace the bulb when the hour count exceeds 250 or if the voltage drops below 4.5A.**
- **During use, the bulb, the lamp housing and the surrounding environment become hot.**
- **Before replacing the lamp, switch off the power supply, disconnect all cables and wait for the bulb and the lamp housing to cool.**

- **After switching on the bulb, wait at least 10-15 minutes before switching it off.**
- **After switching off the bulb, wait for 5-10 minutes before switching it on again so that the mercury vapors have time to condense.**
- **The bulb contains ultraviolet radiation that could be harmful to eyes and skin. Always look at the bulb arc through the provided orange screen.**

8. Insert the lamp housing cable into the fluorescent power supply, aligning the notches on the connectors. (Fig. 22)


9. Insert the power cord into the socket ①. (Fig. 23)

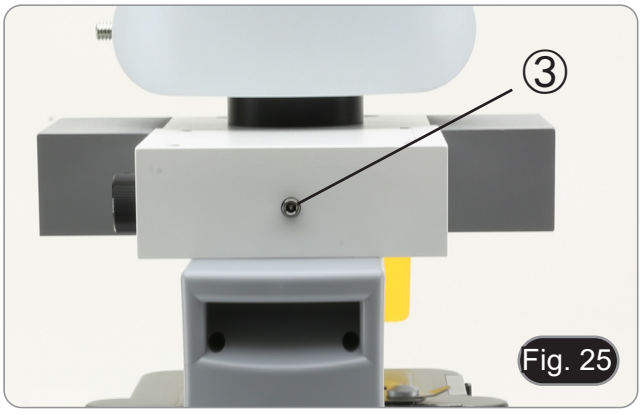
**Before connecting the power cord, secure the lamp housing cable to the power supply.**
**If the power cord is connected before, there may be a risk of electrical shock.**




### 8.4 B-510LD4/B-510LD4-SA

1. Insert the round dovetail socket of the illuminator ① into the hole in the microscope body and tighten the locking screw ②. (Fig. 24)


2. Insert the power supply jack in the connector ③ placed at the rear side of the illuminator. (Fig. 25)



### 8.5 B-510LD4D

1. Insert the round dovetail socket of the illuminator ① into the hole in the microscope body and tighten the locking screw ②. (Fig. 24)

2. Insert the multipower cable jack in the connector ③ placed at the rear side of the microscope. (Fig. 26)

Fig. 26

### 8.6 Installing the PC screen (B-510LD4D)

- For the camera installation, please refer to chapter 17.1.

1. Align and screw the fixing knobs ① with the holes ② on the monitor. (Fig. 27)

Fig. 27

### 8.7 Cable connection (B-510LD4D)

1. Connect the USB mouse / keyboard receiver in the slot “A” of the PC stick. (Fig. 28)

Fig. 28

2. Plug the USB3.0 cable in the slot “B” of the PC stick. (Fig. 29)

Fig. 29

3. Using the multipower cable, plug the PC stick power supply cable. (Fig. 30)

Fig. 30

4. Plug the HDMI cable in the slot “C” of the PC stick. (Fig. 31)

Fig. 31

5. Plug the other side of the HDMI cable in the HDMI plug ① of the monitor. (Fig. 32)
- For an easier connection, use the outer HDMI plug.

6. Using the multipower cable, plug the monitor power supply in the connector ② on the monitor. (Fig. 32)

Fig. 32

7. Plug the USB3.0 cable in the back side of the camera. (Fig. 33)


Fig. 33

8. Using the multipower cable, plug the fluorescence power supply in the connector ① on the back side of the fluorescence illuminator. (Fig. 34)

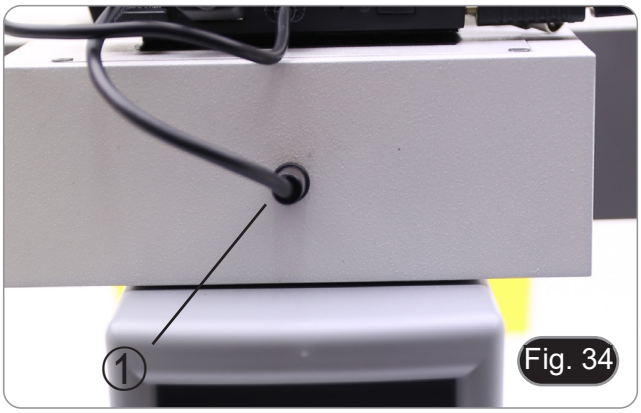


Fig. 34

9. Insert the power supply jack in the connector ② placed at the rear side of the microscope. (Fig. 35)

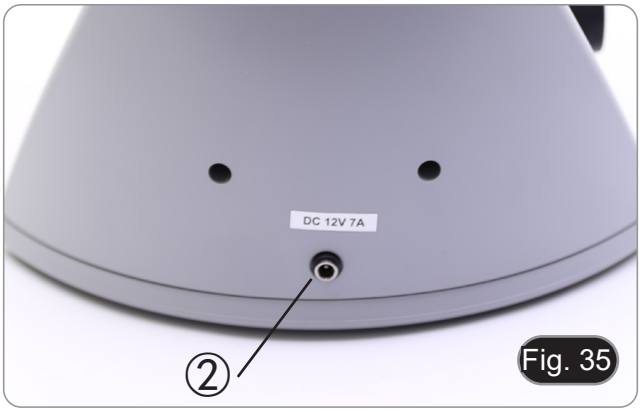


Fig. 35

### 8.8 Installing fluorescence filter (B-510FL)

1. Remove the illuminator from the stand and place it on the desk.
2. Loosen the locking screw ① of the filter slider with an Allen wrench provided. (Fig. 36)

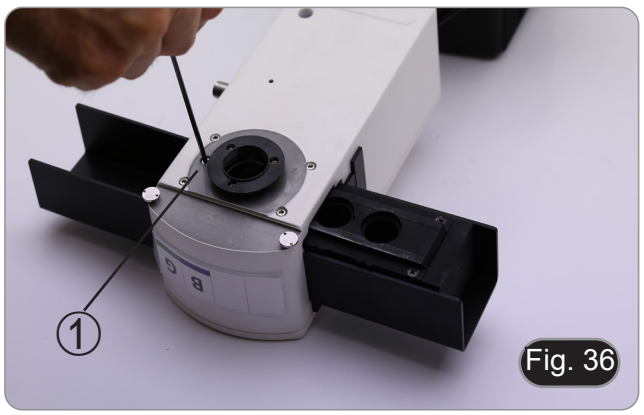


Fig. 36

3. Remove the filter slider from the illuminator.
4. Use a Phillips screwdriver to unscrew the four screws ② to open the filter slider. (Fig. 37-38)

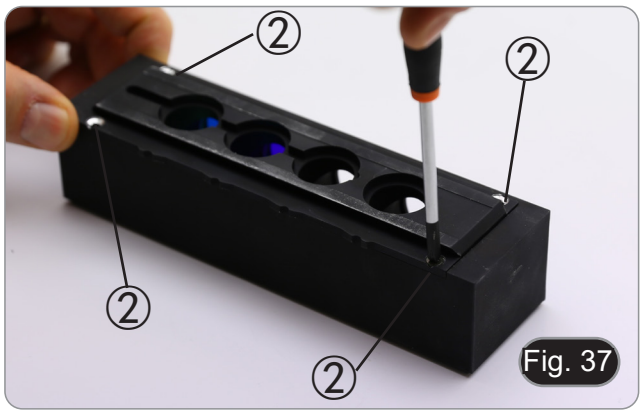


Fig. 37

5. The filter slider consists of a holder for the excitation filter and dichroic mirror ③ and a holder for the emission filter ④. (Fig. 38)

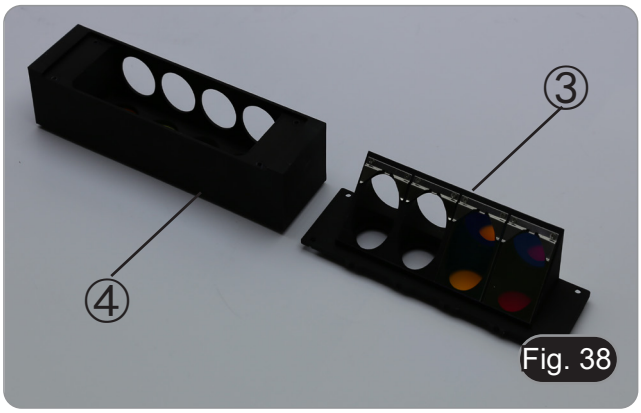


Fig. 38

6. Insert the excitation filter into the holder ③ making sure that the arrow ⑤ marked on the filter is pointing inward. (Fig. 39)
7. Once the filter is in place secure it with a dot of glue.

• **Use an "Anti-blooming" type glue to avoid that during the drying of the glue the vapors condense on the filter causing an opacification of the filter itself.**

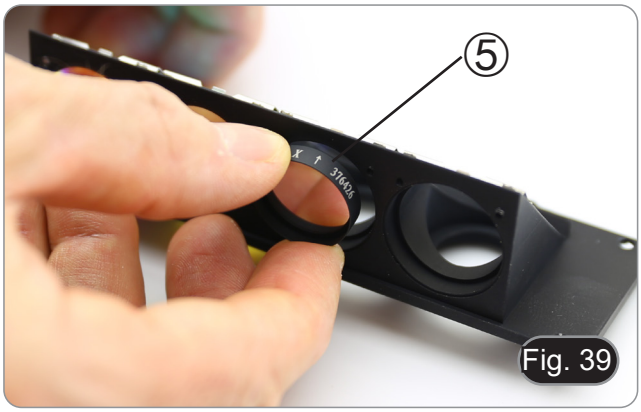


Fig. 39

8. Use a Phillips screwdriver to loosen the screws ⑥ that secure the dichroic mirror holder. (Fig. 40)

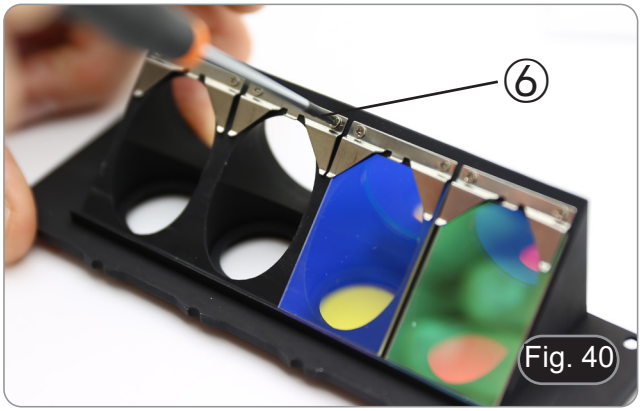


Fig. 40

9. Lift the tabs to install the dichroic mirror with the arrow (highlighted on one side of the filter itself) pointing inward. (Fig. 41)
10. Once the filter is in place, tighten the screws ⑥.


Fig. 41

11. Install the emission filter on the holder ④ always making sure that the arrow on the filter is pointing inward. (Fig. 42)
12. Once the filter is in place secure it with a dot of glue.

- **Use an “Anti-blooming” type glue to avoid that during the drying of the glue the vapors condense on the filter causing an opacification of the filter itself.**

13. Reassemble the filter slider.

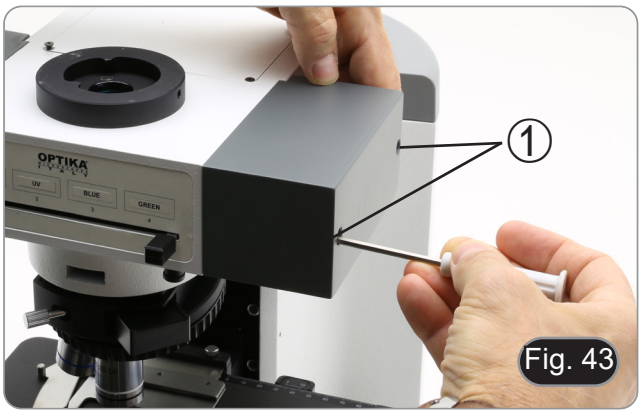
14. Reassemble the slide on the illuminator and tighten the locking screw ①.


Fig. 42

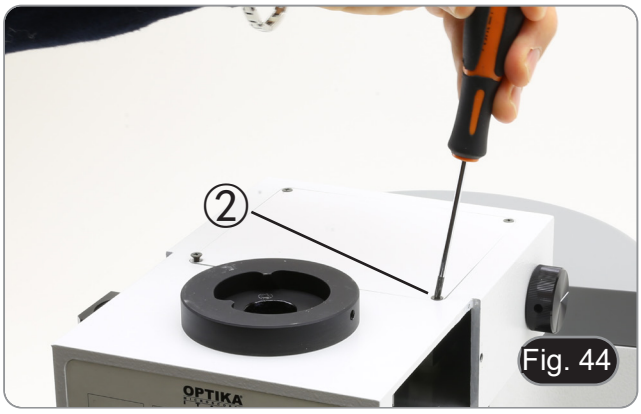
### 8.9 Installing fluorescence filter (B-510LD series)

1. Disconnect the power supply plug from the fluorescence illuminator.
2. Open the side cover of the illuminator, by unscrewing the side screws ①. (Fig. 43)

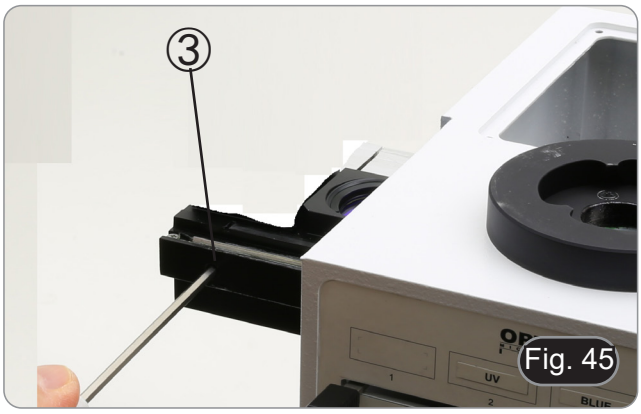
- It could be helpful to remove the observation head.
- The cubes are mounted on the opposite side of the cover: opening the left cover acts on the right side of the slider and vice versa.



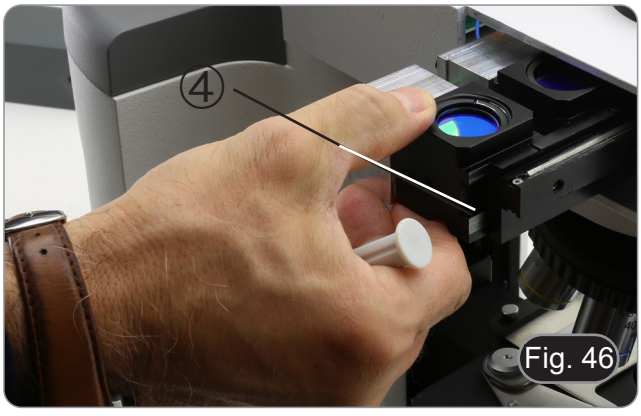

3. Open the top door of the fluorescence illuminator by unscrewing the four screws ② and release the cover. (Fig. 44)




4. Loosen the front locking screw ③ on the fluorescence cube slider, corresponding to the fluorescence cube to be installed or replaced. (Fig. 45)




5. Insert the fluorescence cube into the dovetail ④ of the cube slider and move it to the click position. (Fig. 46)
6. Tighten the locking screw ③. (Fig. 45)



7. Connect the plug of the fluorescence cube ⑤ in one of the free connectors ⑥ to power the LED. (Fig. 47)

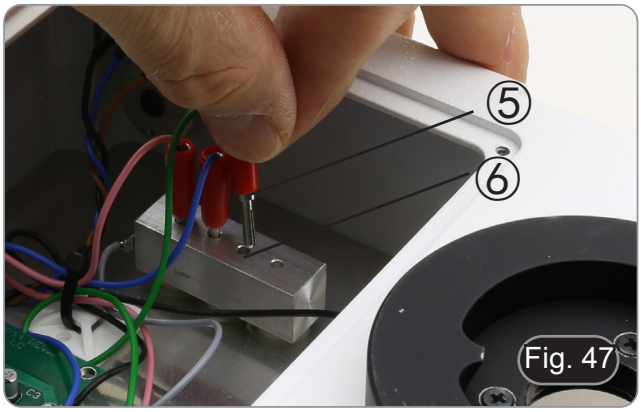


Fig. 47

8. Apply the adhesive marker ⑦ for the fluorescence cube on the illuminator. (Fig. 48)
9. Close the top door.
10. Close the side cover.
11. Connect the power supply.
12. Start working.

Fig. 48

### 8.10 Replacing fluorescence filter (B-510LD series)

1. Disconnect the power supply plug from the fluorescence illuminator.
2. Open the side cover of the illuminator, by unscrewing the side screws ①. (Fig. 43)

- It could be helpful to remove the observation head.
- The cubes are mounted on the opposite side of the cover: opening the left cover acts on the right side of the slide and vice versa.

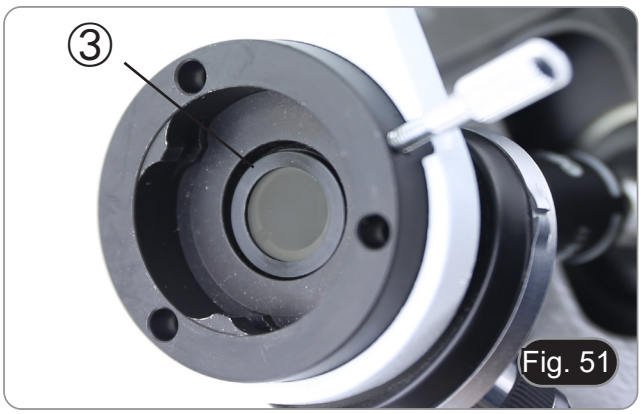
3. Open the top door of the fluorescence illuminator by unscrewing the four screws ② and release the cover. (Fig. 44)
4. Loosen the front locking screw ③ on the fluorescence cube slider. (Fig. 45)
5. Disconnect the plug ⑤ related to the cube you want to replace. (Fig. 47)
6. Remove the fluorescence cube from the dovetail ④ of the cube slider.
7. Repeat steps 4. to 9. of paragraph 8.9 to install a new fluorescence cube.

### 8.11 Polarizing set (optional)

1. Place the polarizer on the light exit ① at the base of the microscope. (Fig. 49)

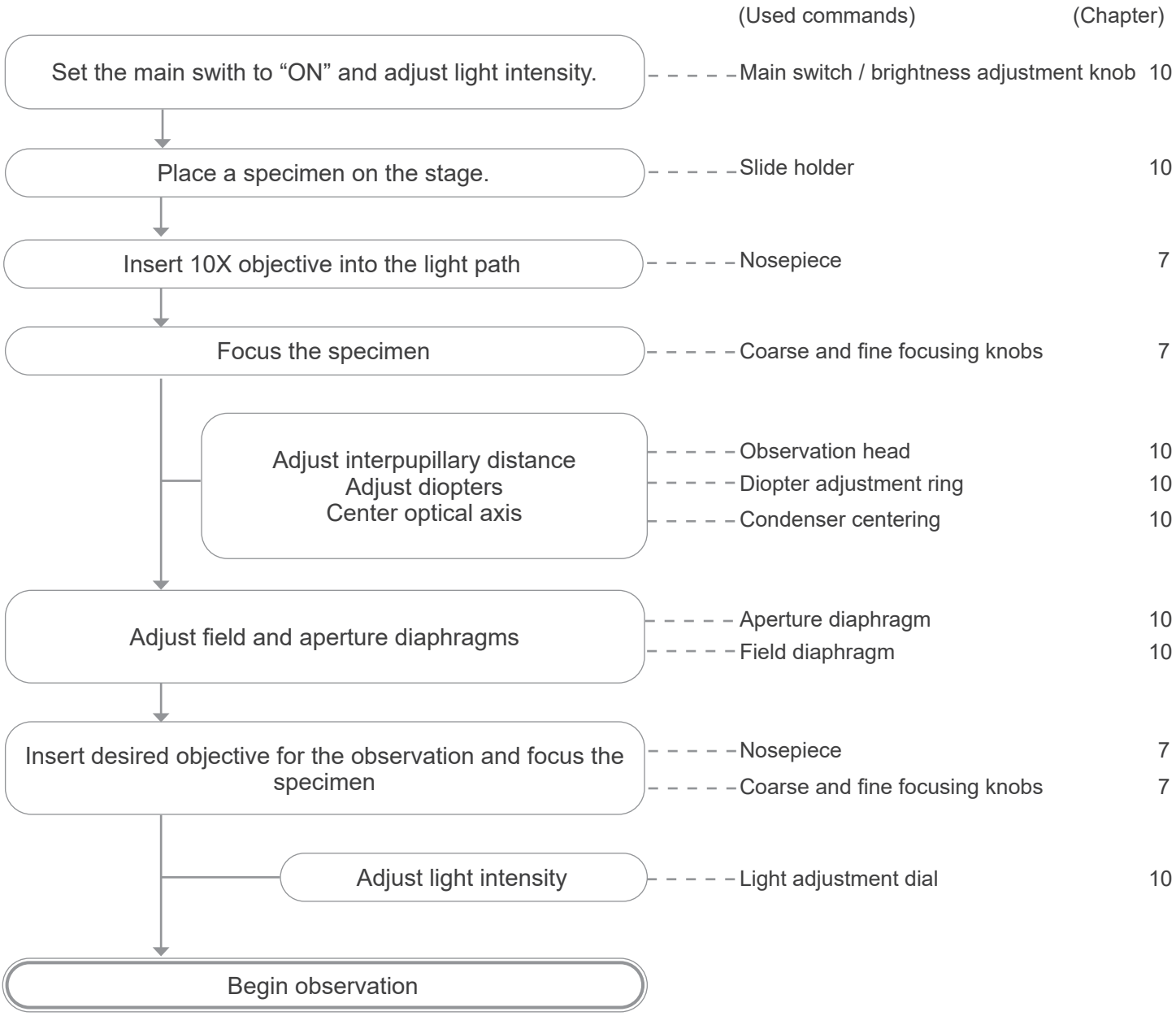

2. Loosen the head fixing knob ② and remove the head from the microscope frame. (Fig. 50)


3. Insert the analyzer into the hole inside the frame ③. (Fig. 51)
4. Put back the head into its original position and lock the fixing knob.




- **The use of the polarization set, although possible for models B-510FL, B-510LD4, B-510LD4SA and B-510LD4D, is not recommended. The presence of the analyzer within the optical path, during the use of fluorescence, causes a significant reduction in the amount of light projected on the sample, resulting in difficulty of observation.**

## 9. Brightfield observation procedures (B-510BF/B-510ERGO)



## 10. Use of the microscope (B-510BF/B-510ERGO/B-510-2-2F-3-5)

### 10.1 Light intensity adjustment

Operate on the light intensity adjustment knob to turn ON/OFF the microscope and to increase/decrease the illumination voltage ①. (Fig. 52)

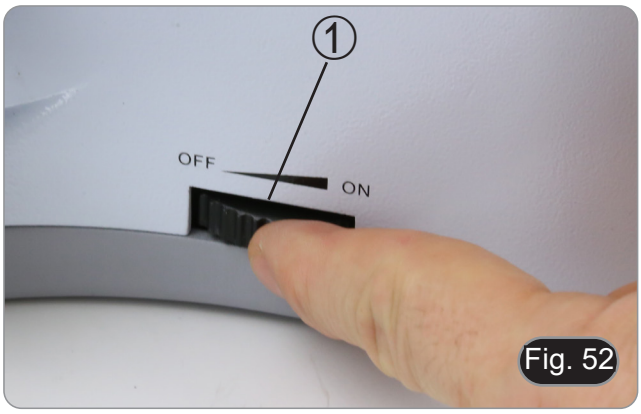


Fig. 52

- **For B-510LD4D only: The microscope has a main switch located on the right side of the stand. (Fig. 53)**

Fig. 53

### 10.2 Coarse focus tension adjustment

- **Adjust the tension using the provided tool.**

The coarse knob tension is pre-set in the factory.
To modify the tension according to personal's needs, rotate the ring ② using the provided tool. (Fig. 54)
- Clockwise rotation increases the tension.

If the tension is too loose, the stage could go lower by itself or the focus easily lost after fine adjustment. In this case, rotate the knob in order to increase the tension.

Fig. 54

### 10.3 Coarse upper limit lever

The upper limit knob has two functions: prevent the contact between slide and objective and acts as "focus memory".

1. After focusing the specimen, pull the lever ③ toward the front of the microscope and lock it. (Fig. 55).
- In this way the focus upper limit is set.
2. Now one can lower the stage with coarse focus knob, replace the specimen and raise again the stage up to the upper limit: specimen will be in approximate focus and will need a fine adjustment to get the proper focus.
- **Fine focus movement is not affected by the coarse focus lock.**
- **To unlock, move the lever in the opposite direction to the one used for the locking.**

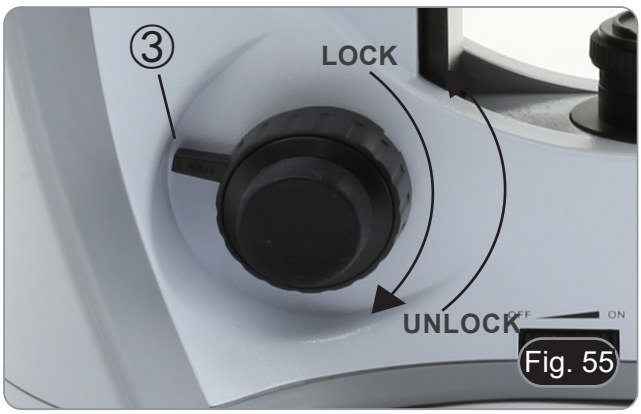


Fig. 55

### 10.4 Stage

Stage accepts standard slides 26 x 76 mm, thickness 1,2 mm with coverlside 0,17 mm.
It is possible to place two slides side by side on the stage.

- **Open the spring arm of the slide holder ① and place frontally the slides on the stage. (Fig. 56)**
- **Gently release the spring arm of the slide holder.**
- **A sudden release of the spring arm could cause the falling of the slide.**


### 10.5 Diopter adjustment

1. Look into the right eyepiece with your right eye only, and focus on the specimen.
2. Look into the left eyepiece with your left eye only. If the image is not sharp, use the diopter adjustment ring ② to compensate. (Fig. 57)

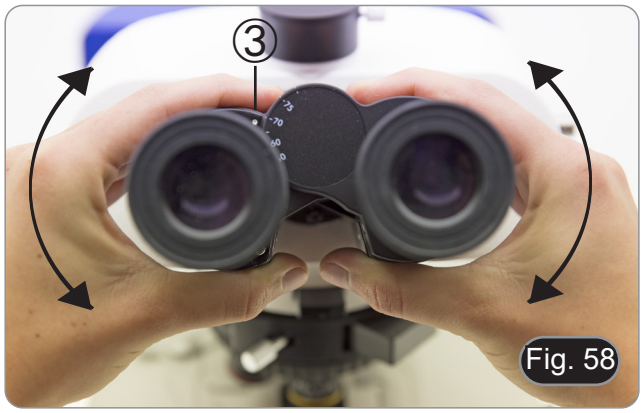
- **The adjustment range is ±5 diopter. The number indicated on the adjustment ring graduation should correspond to the operator's diopter correction.**


### 10.6 Adjusting the interpupillary distance

Observing with both eyes, hold the two eyepiece prism assemblies. Rotate them around their common axis until the fields of view coincide.

- **The graduation on the interpupillary distance indicator ③, pointed by the spot "." on the eyepiece holder, shows the distance between the operator's eyes. (Fig. 58)**

The range of the interpupillary distance is 48-75 mm.

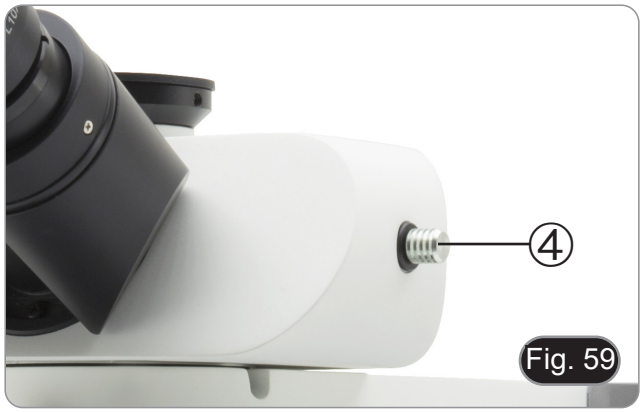



### 10.7 Light path selection (only fluorescence models)

- The observation head is equipped with an optical path selector that allows the light to be split to the eyepieces and to the photo/TV port.

1. Move the selector ④ to one of the two possible positions to split the light. (Fig. 59)

| POSITION | LIGHT |
|---|---|
| IN | 100% EYEPIECES |
| OUT | 100% TV |



### 10.8 Use of eye shields

- **Use with eyeglasses**

Fold rubber eyeshields with both hands. Folded eyeshields avoid scratching the lenses of eyeglasses. (Fig. 60)


Fig. 60

- **Use without eyeglasses**

Raise eye shields and observe at the microscope placing eyes to the shields, avoiding external light to disturb the observation. (Fig. 61)


Fig. 61

### 10.9 Centering the condenser

1. Place the specimen on the stage, insert 10x objective into the light path and focus.
2. Insert the front lens of the swing-out condenser ①. (Fig. 62)
3. Rotate the field diaphragm ring ② in counterclockwise direction, to fully close the diaphragm.
4. Rotate the condenser height adjustment knob ③ to focus the edges of the diaphragm.
5. Rotate the two centering screws ④ to bring the bright spot in the center of the field of view.
6. Gradually open the diaphragm. The condenser is centered when the diaphragm image is symmetrical to the field of view.
7. In normal use, open the diaphragm until it circumscribes the field of view.

Fig. 62

### 10.10 Effects of the field diaphragm

Field diaphragm adjusts the illuminated area to obtain a high contrast image.
Set the diaphragm according to the objective in use until it circumscribes the field of view, in order to eliminate unnecessary light to eyepieces. (Fig. 63)

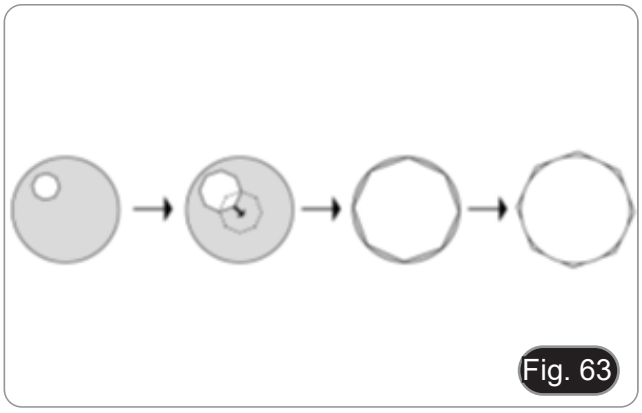


Fig. 63

### 10.11 Aperture diaphragm

- The Numerical Aperture (N.A.) value of the aperture diaphragm affects the image contrast. Increasing or reducing this value one can vary resolution, contrast and depth of focus of the image.
- With low contrast specimens set the numerical aperture value ① (printed on the condenser ring) to about 70%-80% of the objective's N.A. (Fig. 64) If necessary, remove on eyepiece and, looking into empty sleeve, adjust the condenser's ring in order to obtain an image like the one in fig. 65.

**Example: with objective PLAN 40x/0,65 set the scale to 0.65 x 0.8 = 0,52**

Fig. 64

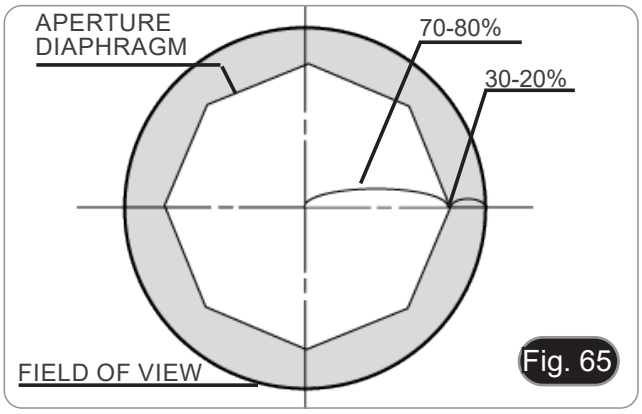


Fig. 65

### 10.12 Use of oil immersion objective

1. Focus the specimen with a low power objective.
2. Lower the stage (remembering to lock the coarse upper limit lever).
3. Put a drop of oil (provided) on the area of the specimen to be observed. (Fig. 66)

- **Make sure that there are no oil bubbles. Air bubbles in the oil damage the image quality.**
- To check for bubbles: remove an eyepiece, fully open the aperture diaphragm and observe the objective exit pupil. (The pupil must be round and bright).
- To remove the bubbles, gently move the nosepiece to the right and left to move the immersion objective a few times and allow the air bubbles to move.

4. Insert immersion objective.
5. Return the stage to the upper focusing point and obtain an optimal focus using the fine focus knob.
6. After use, gently remove the oil with a soft paper towel or a lightly moistened optic paper with a mixture of ethyl ether (70%) and absolute ethyl alcohol (30%).

- **The immersion oil, if not immediately cleaned, could crystallize creating a glass-like layer. In this situation the observation of the specimen would be difficult if not impossible due to the presence of an additional thickness on the objective.**

Fig. 66

### 10.13 Use of the pointer

#### 10.13.1 (B-510-2/3/5)

1. By moving the joystick of the pointer ① it is possible to change the position of the luminous arrow within the observation field. (Fig. 67)
2. This arrow is used by the teacher to indicate an interesting portion within the observed sample.

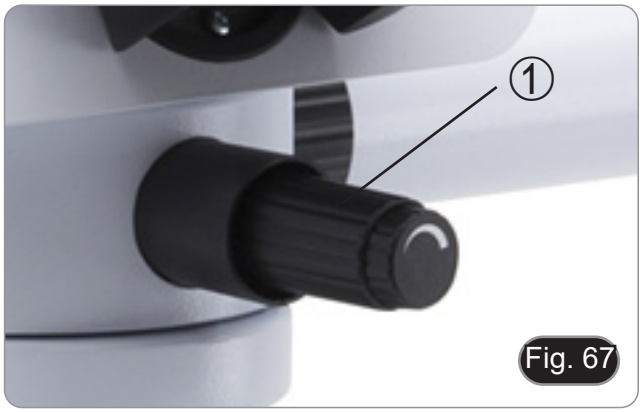


Fig. 67

3. Press the colour selection button ② on the left side of the switch to change the colour of the light arrow. Repeated pressure cyclically changes the colour in this sequence: RED → GREEN → BLUE → OFF. (Fig. 68)

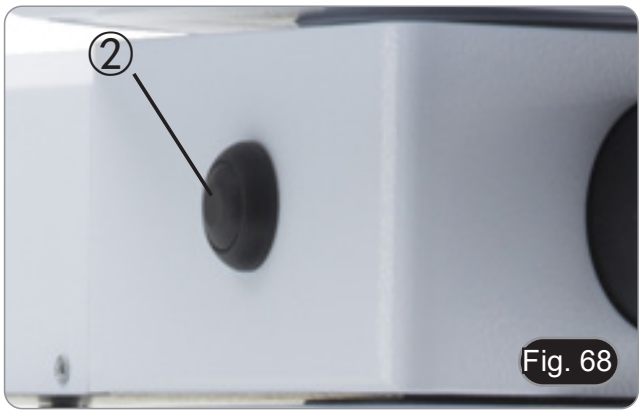


Fig. 68

4. Turn the intensity control switch ③ to change the brightness of the arrow (Fig. 69). Adjust the intensity according to the sample under examination.

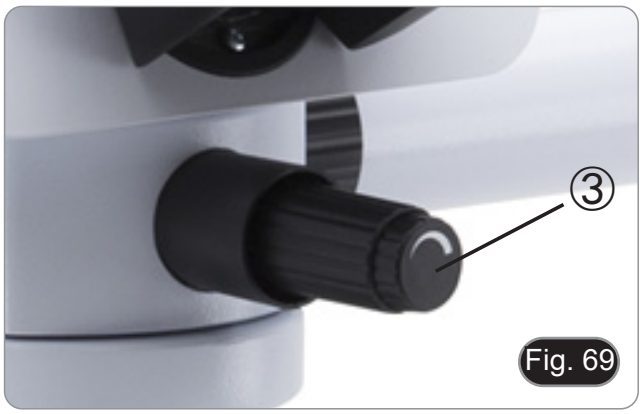


Fig. 69

### 10.13.2 (B-510-2F)

1. By moving the joystick of the pointer ① it is possible to change the position of the luminous arrow within the observation field. (Fig. 70)
2. This arrow is used by the teacher to indicate an interesting portion within the observed sample.

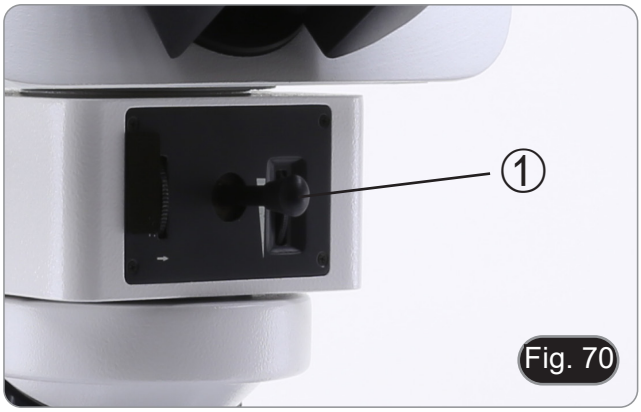


Fig. 70

3. Press the colour selection button ② on the left side of the switch to change the colour of the light arrow. Repeated pressure cyclically changes the colour in this sequence: RED → GREEN → BLUE → OFF. (Fig. 71)

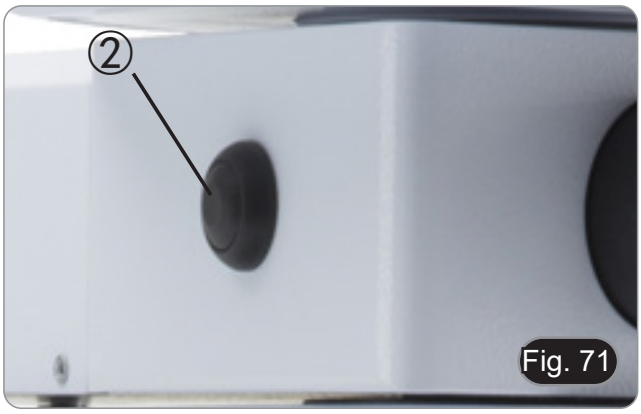


Fig. 71

4. Turn the intensity control cogwheel ③ to change the brightness of the arrow (Fig. 72). Adjust the intensity according to the sample under examination.
5. By turning the cogwheel ④, it is possible to rotate the arrow on itself (360° rotation) in order to direct the arrowhead exactly to the desired point

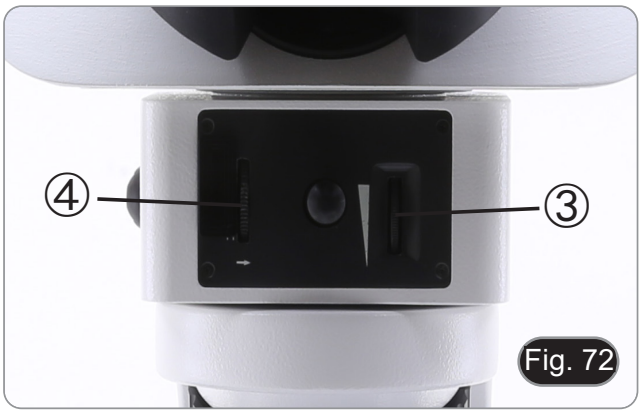


Fig. 72

### 10.14 Use of the polarizer (optional)

1. Remove the specimen from the stage.
2. Looking inside the eyepieces, rotate the polarizer until the darkest position is achieved.
3. Once the dark is achieved (“extinction” or “Crossed Nicol” position) it is possible to begin the observation.

## 11. Condenser for Brightfield/Darkfield/Phase Contrast (B-510PH)

Universal condenser provided with B-510PH allows observation in brightfield, darkfield and phase contrast.

Fig. 73

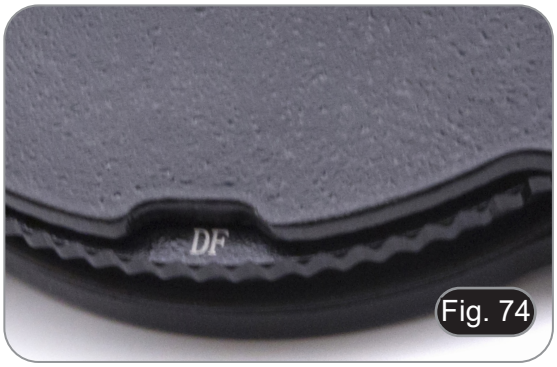


Fig. 74

Fig. 75

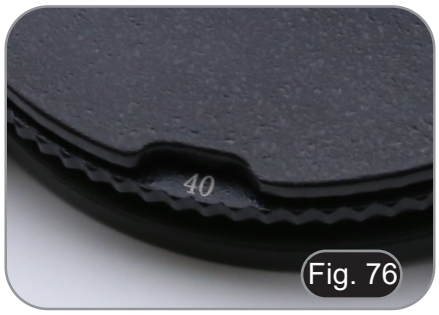


Fig. 76

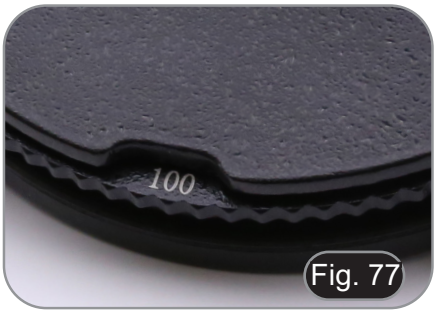


Fig. 77

| Observation mode | Condenser Turret position |
|---|---|
| Brightfield | BF (Fig. 73) |
| Darkfield | DF (Fig. 74) |
| Phase contrast 10x | 10/20 (Fig.75) |
| Phase contrast 20x | 10/20 (Fig. 75) |
| Phase contrast 40x | 40 (Fig. 76) |
| Phase contrast 100x | 100 (Fig. 77) |

### 11.1 Brightfield Observation (BF)

1. Rotate the condenser turret to insert the “BF” position.
2. Now repeat the steps described in the procedure “*Brightfield observation procedures*”.

### 11.2 Darkfield Observation (DF)

1. Rotate the condenser turret to insert the “DF”position.

- **By inserting the darkfield ring, the aperture diaphragm opens automatically. This is a desired effect and should not be considered a defect**.

2. Place a specimen on the stage and focus.
3. Observing into eyepieces raise or lower the condenser until a homogeneous illumination of the specimen can be achieved, thus obtaining a proper darkfield effect.

- **Darkfield requires a huge amount of light. Switching from darkfield to brightfield, one could be dazzled. Do not keep your eyes on the eyepieces when moving the condenser turret from DF to BF.**
- **“Dry” darkfield observation, that is, without the use of oil, is only possible with objectives with N.A. lower than 0,7.**
- **Observing in darkfield, it may be necessary to raise the condenser from the normal position to obtain a more homogeneous illumination. This is not a defect.**

### 11.3 Phase Contrast Observation (PH)

1. Center the condenser as already described in the chapter 10.9.
- This condenser does not have a swing-out lens, so the operation described in step 2 is not necessary.
2. Rotate the condenser turret to insert the “10/20” position.
3. Insert 10x objective into the light path.
- **By inserting any phase ring, the aperture diaphragm opens automatically. This is a desired effect and should not be considered a defect.**
4. Place a specimen on the stage and focus.
5. Remove one eyepiece and insert the centering telescope. (Fig. 78)
6. Rotate the upper part of the centering telescope until the two phase rings (one dark and one bright) visible in the telescope are in focus. (Fig. 79)
7. Using centering screws on the condenser ① (Fig. 80), center the phase rings to make the bright ring ② be concentric to the dark ring ③. (Fig. 81)
8. Insert 20x objective (do not rotate the condenser turret) and check the centering of the two rings.
9. Repeat the same operation with other objectives to check the ring centering: 40x objective – turret position “40”, 100x objective – turret position “100”.
10. At the end remove the centering telescope, reinstall the eyepiece and begin observation.
- **With 40x and 100x objectives it may be useful to slightly raise the condenser, to obtain a better projection of the phase rings. This is not a defect.**
- **With the 4X objective, the condenser could have a dark halo at the periphery of the field of view. This is not to be considered a defect.**

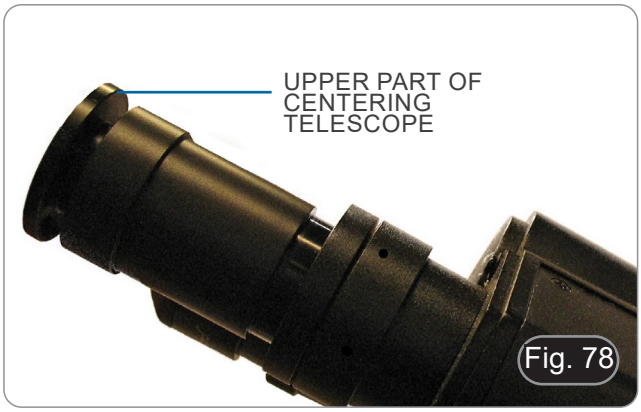


Fig. 78

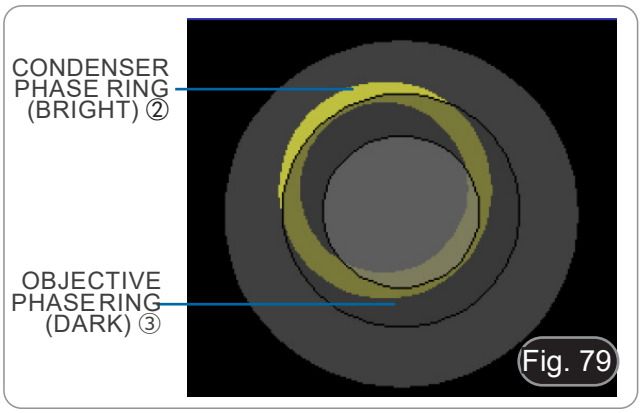


Fig. 79

Fig. 80


Fig. 81

### 11.4 Use of the green filter

- The green filter is used to increase the contrast of the image during phase contrast observation.
- Place the filter on the field lens of the microscope (Fig. 82) and begin the observation.
- For observation in brightfield or darkfield it is advisable to remove the filter from the optical path.


Fig. 82

## 12. Condenser for Brightfield/Phase Contrast (B-510ASB)

Slider condenser provided with B-510ASB allows observation in brightfield and in phase contrast with 40x objective.

Fig. 83

Fig. 84

| Observation mode | Slider position |
|---|---|
| Brightfield | O (Fig. 83) |
| Phase contrast 40x | 40 (Fig. 84) |

### 12.1 Brightfield Observation (BF)

1. Move the condenser slider all the way toward left to insert the empty position. (Fig. 85)
2. Now repeat the steps described in the chapter "*Brightfield observation procedure*".

Fig. 85

### 12.2 Phase Contrast Observation (PH)

1. Center the condenser as already described in the chapter 10.9.

• This condenser does not have a swing-out lens, so the operation described in step 2 is not necessary.

2. Move the condenser slider all the way toward right to insert the phase ring dedicated to 40X objective. (Fig. 86)
3. Insert 40x objective into the light path.
4. Open aperture diaphragm.
5. Place a specimen on the stage and focus.
6. Remove one eyepiece and insert the centering telescope. (Fig. 78)
7. Rotate the upper part of the centering telescope until the two phase rings (one dark and one bright) visible in the telescope are in focus. (Fig. 78-79)
8. Using centering screws on the slider ① (Fig. 87), center the phase rings as already described in the chapter 11.3.
9. At the end remove the centering telescope, reinstall the eyepiece and begin observation.

Fig. 86

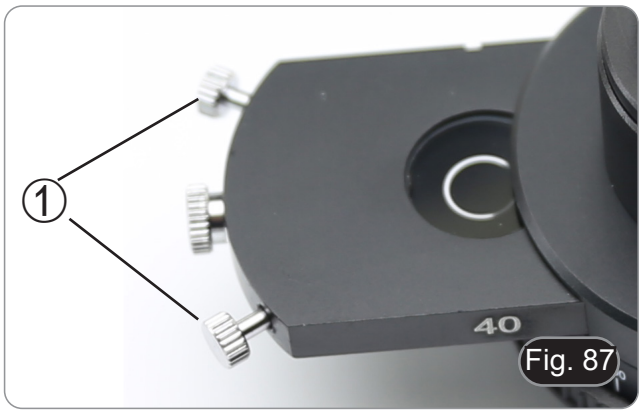


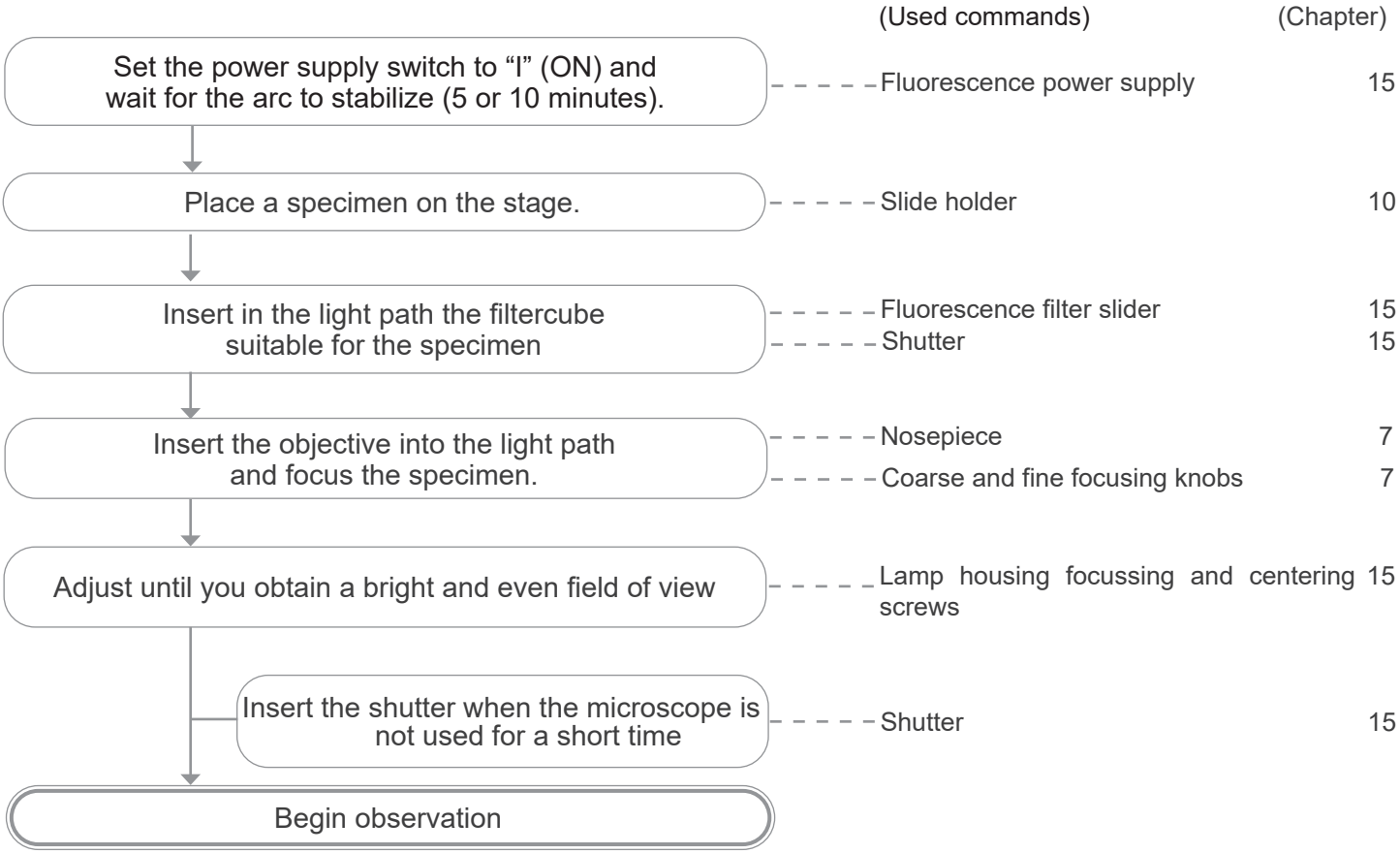
Fig. 87

• **With 40x objective it may be useful to slightly raise the condenser, to obtain a better projection of the phase rings. This is not a defect.**

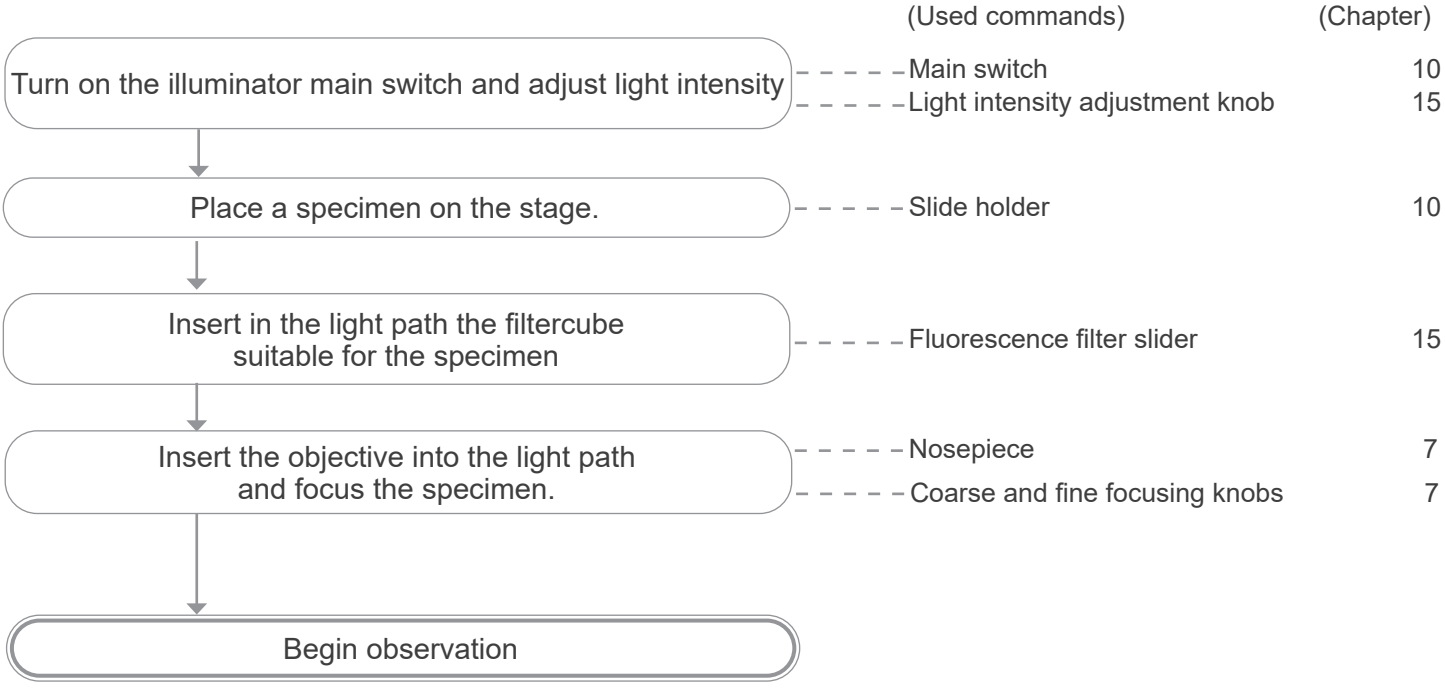
• **With the 4X objective, the condenser could have a dark halo at the periphery of the field of view. This is not to be considered a defect.**

10. For observation of asbestos fibres in phase contrast, remove the provided 10X eyepieces and insert the 12.5X eyepieces.

## 13. Fluorescence observation procedures (B-510FL)




## 14. Fluorescence observation procedures (B-510LD series)



## 15. Use of the microscope (B-510FL/B-510LD4/B-510LD4-SA/B-510LD4D)

**This section refers exclusively to the use of the reflected light fluorescence microscope.**
**For transmitted light operations, refer to this manual in chapters 9-10-11-12.**

### 15.1 Microscope setting (B-510FL)

**Centering the HBO mercury bulb.**

- **Wait around 5 minutes before proceeding with this operation to allow the bulb to warm up properly.**

1. Turn on the mercury bulb by operating the power supply main switch ①. (Fig. 88)

Fig. 88

2. Turn the nosepiece into an empty position (without objectives) and remove the protective cap, or remove an objective from the nosepiece.
3. Place a piece of white paper on the stage and insert the fluorescent cube “B” into the optical path. (Fig. 89)

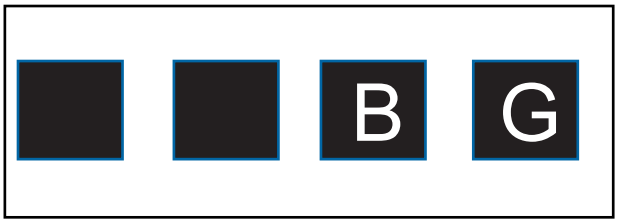


Fig. 89

4. Acting on the focus screw of the collector lens ② and on the centering screws ③ try to obtain the light spot of the bulb’s arc. (Fig. 90-91)

Fig. 90

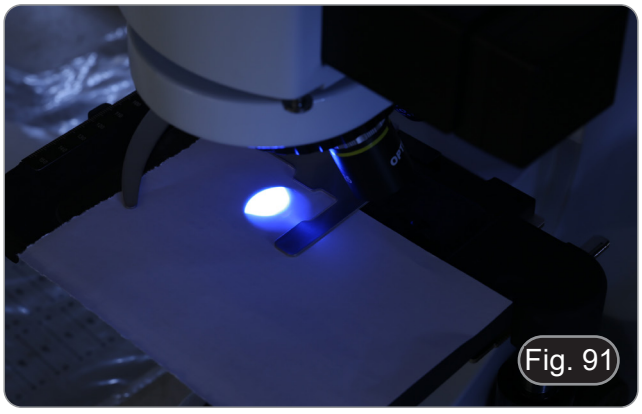


Fig. 91

5. Using the focus screw of the collector lens ②, put the image of the arc projected onto the paper. The light spot must be brighter and sharper as possible. (Fig. 92)

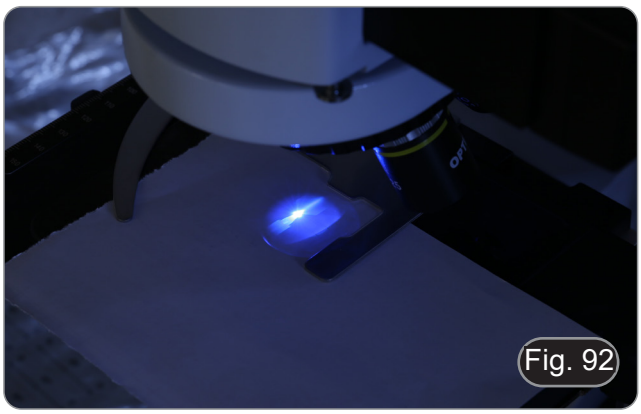


Fig. 92

6. Using the centering screws ③ on the side of the lamp housing, center the image of the arc. (Fig. 92-93)

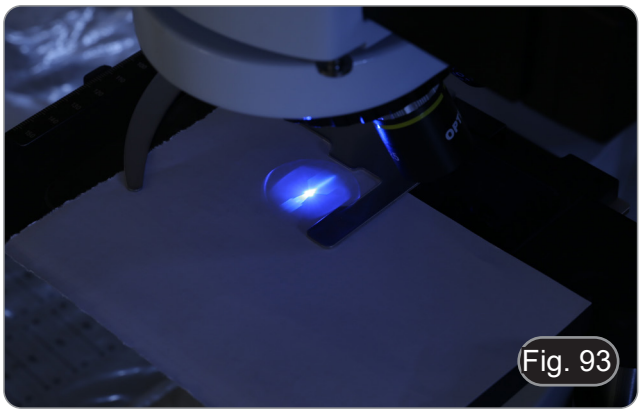


Fig. 93

7. Using the focusing screw of the collector lens ② enlarge the image until a homogeneous illumination is achieved. (Fig. 94). At this point, insert an objective into the optical path and, looking into the eyepieces, optimize the illumination always using the screws ② and ③.

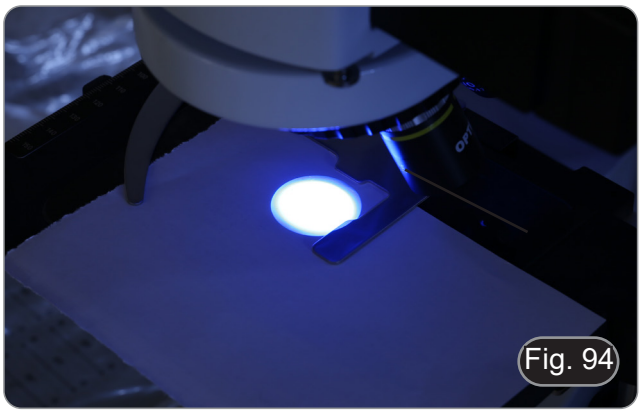


Fig. 94

8. After replacing the exhausted bulb, reset the time counter on the power supply by pressing the “Reset” button ④. (Fig. 95)

Fig. 95

### 15.2 Use of the microscope (B-510FL)

1. Turn on the power supply ① for the mercury bulb and wait 5 minutes for the arc to stabilize. (Fig. 96)

Fig. 96

2. Move the filter selector ② to one of the four available positions until the click stop. (Fig. 97)

- The microscope has a 4-position filter holder slider. The positions 1 and 2 are empty to house additional filters, position 3 houses a B filter and position 4 a G filter.

Fig. 97

| FILTER NAME | EXCITATION FILTER | DICHROIC MIRROR | BARRIER FILTER | APPLICATIONS |
|---|---|---|---|---|
| B* | 460-490 nm | 505 nm | 515LP nm | • FITC<br>• GFP |
| G* | 510-550 nm | 570 nm | 575LP nm | • Rhodamine<br>• TRITC<br>• Propidium Iodide |
| UV** | 325-375 nm | 415 nm | 435LP nm | • DAPI<br>• Hoechst |
| V** | 390-420 nm | 440 nm | 455LP nm | • Coumarin<br>• Pacific Blue |

(*) Already installed in the microscope
(**) Optional

#### 15.2.1 Use of the shutter (B-510FL only)

- **The microscope is equipped with a shutter ③ located on the right side of the fluorescent illuminator. (Fig. 98)**

1. Close the shutter in order to interrupt the observation for a limited time and not subjecting the sample to unnecessary lighting in the period in which it is not observed. (Switching off and switching on frequently the HBO lamp considerably reduces its duration).

Fig. 98

### 15.3 Use of the microscope (B-510LD series)

The filter turret is provided with 4 positions.

- In each of the four positions a fluorescence filter can be inserted, which can be selected from the options shown in the table below.
- **You can always add an additional filter after the first installation (see section 8.6).**
- **If all four turret positions are full, the observation in transmitted light will be affected by the presence of the fluorescence filter.**

1. Turn on the main switch ①. (Fig. 99)

- **For the model B-510LD4D: turn on the microscope using the main switch on the right side of the frame. (Fig. 53)**

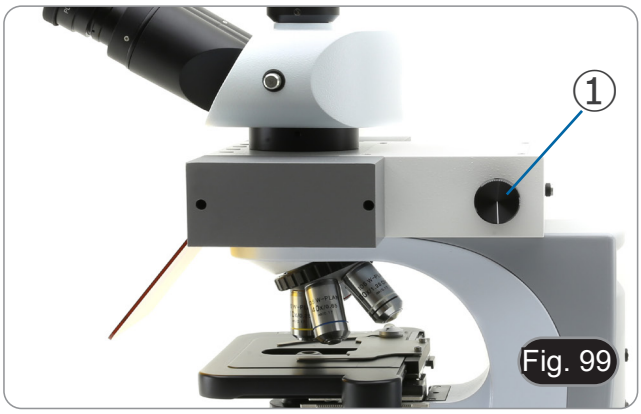


Fig. 99

2. Move the filter selector ② to one of the available positions until the click stop. (Fig. 100).

- When the filter is in the correct position, the dedicated LED lights up.

3. Adjust to the desired brightness by rotating the dial ①.

- **When switching the fluorescence filter, the LED light goes out. This is not a defect.**

Fig. 100

| FILTER NAME | EXCITATION FILTER | DICHROIC MIRROR | BARRIER FILTER | APPLICATIONS |
|---|---|---|---|---|
| M-1223 | 325-375 nm | 415 nm | 435LP nm | • DAPI<br>• Hoechst |
| M-1223.1 | 340 - 390 nm | 405 nm | 420 - 470 nm | • DAPI<br>• Hoechst |
| M-1222 | 390-420 nm | 440 nm | 450LP nm | • Coumarin<br>• Pacific Blue |
| M-1220 | 455-495 nm | 500 nm | 510LP nm | • FITC<br>• GFP |
| M-1220.1 | 455-495 nm | 500 nm | 518 - 542 nm | • FITC<br>• GFP |
| M-1221 | 510-550 nm | 570 nm | 575LP nm | • Rhodamine<br>• TRITC<br>• Propidium Iodide |
| M-1221.1 | 510-550 nm | 570 nm | 585 - 625 nm | • Rhodamine<br>• TRITC<br>• Propidium Iodide |
| M-1228 | 582-603 nm | 610 nm | 615-645 nm | • Red#2 FISH |
| M-1224 | 590-650 nm | 660 nm | 665LP nm | • Cy5 |
| M-1225 | 595-645 nm | 655 nm | 665-715 nm | • Cy5<br>• AlexaFluor 647<br>• Draq5 |
| M-1226 | 623-678 nm | 685 nm | 690-750 nm | • Cy5.5 |
| M-1227 | 720-760 nm | 770 nm | 780LP nm | • Li_Cor IR dye 800 |

### 15.4 Use of light excluding plate

- **Microscope is provided with a light excluding plate that can be placed on the stage and prevents flare and reflections coming from the condenser front lens.**

The plate can be used in two different ways.

Mode n° 1: place the plate on the stage (under the slide holder) and place the slide directly over the plate. (Fig. 101)

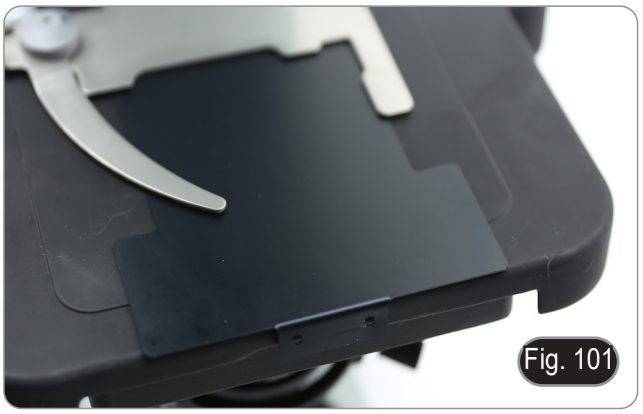


Fig. 101

Mode n° 2: lower the condenser and insert the plate between the two layers of the stage. (Fig. 102)

- **In both cases it is possible to move the sample using the stage X-Y translation knobs.**

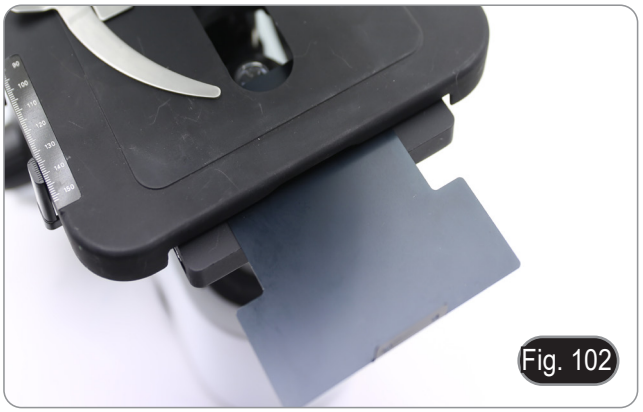


Fig. 102

### 15.5 Use of UV shield

- **Microscope is provided with a UV protection shield. This can be used to protect user from unwanted UV rays coming from the fluorescence light source.**

1. Loosen the two locking screws ①. (Fig. 103)

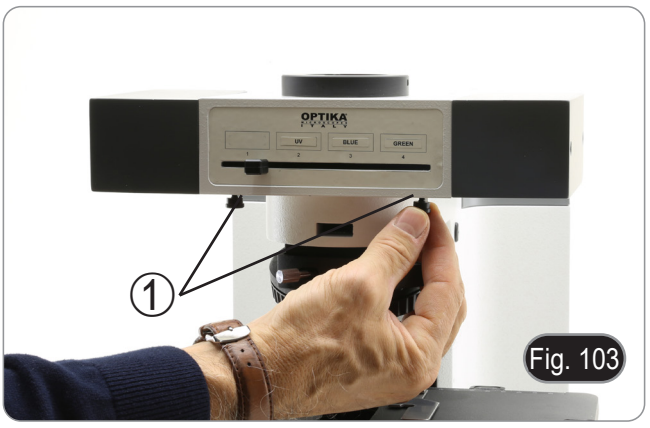


Fig. 103

2. Insert the grooves of the UV shield ② into the holes (Fig. 104) and tighten the screws ① again.

Fig. 104

## 16. Simultaneous observation in Phase Contrast + Fluorescence

- **This microscope allows observation in transmitted light Phase contrast in combination with reflected light Fluorescence. Samples with rapid decay must first be observed in Fluorescence and then in Phase Contrast. The combined observation allows you to easily identify some areas of the sample that emit fluorescence.**

### 16.1 B-510FL

1. Turn on the power supply for the HBO fluorescent bulb and wait 5 minutes before the arc stabilizes.
2. Move the filter selector to an empty position or, if the filter holder is full, to the position containing the UV filter.
3. Insert the desired PH objective and move the phase contrast slider to the position containing the corresponding phase ring.
4. Focus the sample.
5. Adjust the light intensity of the transmitted light.
6. Move the fluorescence filter selector to the desired position.
7. To obtain the proper observation of the sample, adjust the light intensity of the transmitted light to modulate the intensity of the fluorescence with the one of the phase contrast.

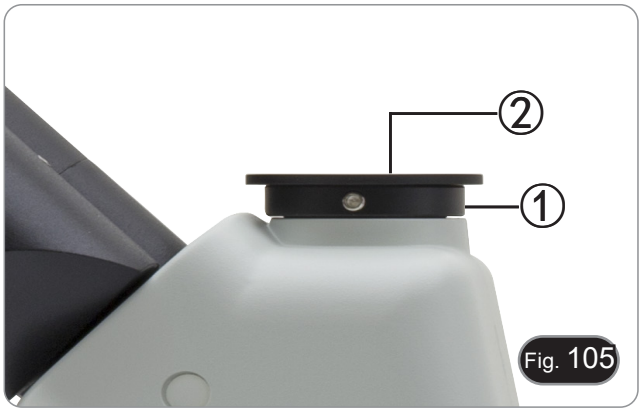
### 16.2 B-510LD series

1. Turn on the microscope main switch.
2. Move the filter selector to an empty position or, if the filter holder is full, to the position containing the UV filter.
3. Insert the desired PH objective and move the phase contrast slider to the position containing the corresponding phase ring.
4. Focus the sample.
5. Adjust the light intensity of the transmitted light.
6. Move the fluorescence filter selector to the desired position.
7. Adjust the light intensity of the reflected light.
8. To obtain the proper observation of the sample, adjust the light intensity of the transmitted light to modulate the intensity of the fluorescence with the one of the phase contrast.

# 17. Microphotography

## 17.1 Use of C-mount cameras

1. Loosen the clamping screw ① on the trinocular port and remove the dust cap ②. (Fig. 102)




2. Screw the C-mount adapter ③ to the camera ④ and insert the round dovetail of the C-mount into the empty hole of the trinocular port, then tighten the clamping screw ①. (Fig. 103)


## 17.2 Use of reflex cameras

1. Insert the Reflex adapter ① into the relay tube to the microscope ②.
2. Screw the “T2” ring ③ (not provided) to the reflex adapter.
3. Connect the Reflex camera ④ to the “T2” just installed (Fig. 104).
4. Mount the other end of the relay tube ② into the empty hole of the trinocular port, then tighten the clamping screw. (Fig. 102)

- “T2” ring is not provided with the microscope, but is commercially available.
- While shooting dark specimens, darken eyepieces and viewfinder with a dark cloth to minimize the diffused light.
- To calculate the magnification of the camera: objective magnification * camera magnification * lens magnification.
- **If using an SLR camera, mirror movement may cause the camera to vibrate.**
- **We suggest lifting the mirror, using long exposure times and a remote cord.**

## 18. Maintenance

### Microscopy environment

This microscope is recommended to be used in a clean, dry and shock free environment with a temperature of 5°-40°C and a maximum relative humidity of 85 % (non condensing). Use a dehumidifier if needed.

### To think about when and after using the microscope

- The microscope should always be kept vertically when moving it and be careful so that no moving parts, such as the eyepieces, fall out.
- Never mishandle or impose unnecessary force on the microscope.
- Never attempt to service the microscope yourself.
- After use, turn off the light immediately, cover the microscope with the provided dust-cover, and keep it in a dry and clean place.

### Electrical safety precautions

- Before plugging in the power supply, make sure that the supplying voltage of your region matches with the operation voltage of the equipment and that the lamp switch is in off-position.
- Users should observe all safety regulations of the region.
- The equipment has acquired the CE safety label. However, users do have full responsibility to use this equipment safely.

### Cleaning the optics

- If the optical parts need to be cleaned try first to: use compressed air.
- If that is not sufficient: use a soft lint-free piece of cloth with water and a mild detergent.
- And as a final option: use the piece of cloth moistened with a 3:7 mixture of ethanol and ether.
- **Note: ethanol and ether are highly flammable liquids. Do not use them near a heat source, near sparks or near electric equipment. Use these chemicals in a well ventilated room**.
- Remember to never wipe the surface of any optical items with your hands. Fingerprints can damage the optics.
- Do not disassemble objectives or eyepieces in attempt to clean them.

**For the best results, use the OPTIKA cleaning kit (see catalogue).**

If you need to send the microscope to Optika for maintenance, please use the original packaging.

## 19. Troubleshooting

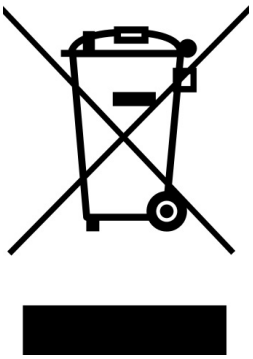
Review the information in the table below to solve operating problems.

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| **I. Optical Section:** | | |
| LED operates, but field of view remains dark. | Power supply is unplugged. | Connect |
| | Brightness is too low | Set brightness to a proper level |
| | Fluorescence filter selector is not in a click stop | Move the selector to a click stop |
| | Fluorescence shutter is closed | Open the shutter |
| | Fluorescence filter is not suitable for the specimen | Use a suitable filter |
| Field of view is obscured or not evenly illuminated | Revolving nosepiece is not correctly engaged. | Make sure that the revolving nosepiece clicks properly into place. |
| | The turret of the phase contrast condenser is in an incorrect position | Move the turret to a click stop |
| Dirt or dust is visible in the field of view. | Dirt/dust on the specimen | Clean the specimen |
| | Dirt/dust on the eyepieces | Clean the eyepieces |
| Image looks double | Aperture iris diaphragm is stopped down too far. | Open aperture iris diaphragm. |
| | The condenser is not well centered or it is in a wrong height | Set the condenser according to Koehler settings. |
| Visibility is poor.<br>• Image is poor.<br>• Contrast is poor.<br>• Details are indistinct.<br>• Phase contrast is poor | Revolving nosepiece is in an incorrect position | Move the nosepiece to a click stop |
| | Aperture iris diaphragm is too closed or too open. | Adjust aperture iris diaphragm. |
| | Dust or dirt on lenses (condenser, objectives, eyepieces and slide) | Clean thoroughly. |
| | For transmitted light observation, the coverglass thickness must not exceed 0.17mm | Use a coverglass with thickness 0.17mm |
| | For phase contrast observation, a brightfield objective is used instead a phase contrast one | Usa a phase contrast objective |
| | Phase rings of objective and condenser are not well centered | Operate on centering screws |
| | Objective in use is not compatible with condenser phase ring | Use a compatible objective |
| | Focus is not even | Slide holder is not flat. Move the specimen to a flat position. |
| One side of the image is unfocused | Revolving nosepiece is in an incorrect position | Move the nosepiece to a click stop |
| | Slide is mounted not in a flat position (tilted) | Place the specimen in a flat position on the stage |
| | Poor quality of the glass slide | Use a glass slide with higher quality |
| **II. Mechanical Section:** | | |
| Coarse focus knob is hard to turn | Tension adjustment ring is too tight | Loosen tension adjustment ring |
| Focus is unstable | Tension adjustment ring is too loose | Tighten tension adjustment ring |
| **III. Electrical Section:** | | |
| LED doesn't turn on. | Power supply not connected | Check for proper connection |
| Brightness is not enough | Brightness setting is too low | Adjust brightness |
| Light blinks | Power supply not well connected | Check for proper connection |

| | | |
|---|---|---|
| **IV. Observation tube:** | | |
| Field of view of one eye does not match that of the other. | Interpupillary distance is incorrect. | Adjust interpupillary distance. |
| | Incorrect diopter adjustment. | Adjust diopter. |
| | Your view is not accustomed to microscope observation. | Upon looking into eyepieces, try looking at overall field before concentrating on specimen range. You may also find it helpful to look up and into distance for a moment before looking back into microscope. |
| **V. Microphotography:** | | |
| Image edge is unfocused | To a certain extent it is due to achromatic objectives features | To minimize the problem, set the aperture diaphragm in a proper position |
| Bright spots appear on the image | Stray light entering in the microscope through eyepieces or camera viewfinder | Cover eyepieces and viewfinder with a dark cloth |

## Equipment disposal

Art.13 Dlsg 25 July 2005 N°151. “According to directives 2002/95/EC, 2002/96/EC and 2003/108/EC relating to the reduction in the use of hazardous substances in electrical and electronic equipment and waste disposal.”




The basket symbol on equipment or on its box indicates that the product at the end of its useful life should be collected separately from other waste. The separate collection of this equipment at the end of its lifetime is organized and managed by the producer. The user will have to contact the manufacturer and follow the rules that he adopted for end-of-life equipment collection. The collection of the equipment for recycling, treatment and environmentally compatible disposal, helps to prevent possible adverse effects on the environment and health and promotes reuse and/or recycling of materials of the equipment. Improper disposal of the product involves the application of administrative penalties as provided by the laws in force.