Fluorescence microscope

OBN-14

OBN 141, OBN 142, OBN 147, OBN 148

PROFESSIONAL MEASURING

english version

Fluorescence microscope operating instructions

Version 1.1
2024-09
en
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english

KERN Optics OBN-14

Fluorescence microscope

Fluorescence microscope operating instructions

Version 1.1 2024-09 english version

Table of contents:

1 Technical data

Kern model	OBN 141	OBN 142	OBN 147	OBN 148
Item number/type	OBN 141	OBN 142	OBN 147	OBN 148
Dimensions (WxDxH)	530x220x490 mm			
Tubus Art	Trinocular			
Optical system	Infinity			
Revolving nosepiece screw-in positions	5			
Lens quality	Infinity Plan			
Standard objectives	4x 10x 20 40x 100x			
Eyepiece field width	HWF			
Illuminance Transmitted light / incident light	5W		20W	
Type of lighting Transmitted light	LED		Halogen	
Lighting equipment	Transmitted light Incident light			
Condenser type	ABBE			
Condenser aperture	1,25			
Input voltage power supply / current [Max]	100 - 240V AC 50/60Hz 0.3A		100 - 240V AC 50/60Hz 2A	
Input voltage device / current [Max]	5V, 1A		100 - 240V AC 50/60Hz 2A	
Plug-in power supply type	Plug-in power supply Built-in power supply unit			
Fuse	-		2A 5x20mm	
Focusing mechanism	Coaxial coarse and fine drive			
Packaging dimensions	430x220x490 mm			
Net weight	16 kg			
Gross weight	24 kg			

2 Declaration of conformity

The current EC/EU Declaration of Conformity can be found online at:
https://www.kern-sohn.com/shop/de/DOWNLOADS/

NOTE:

The fluorescence microscopes of the OBN-14 series can be divided into two main components:

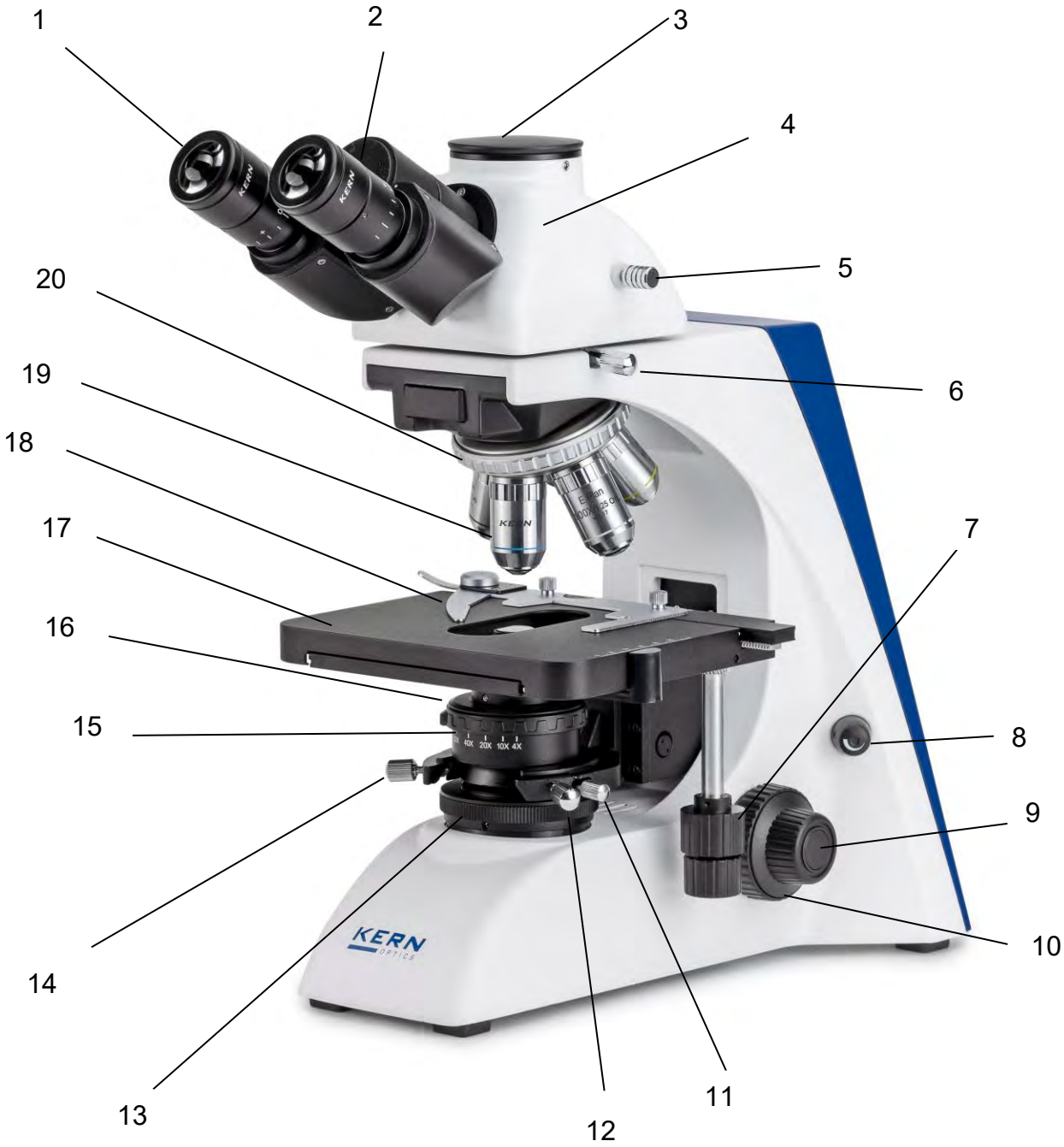
- Transmitted light microscope (KERN Professional Line)
- Fluorescence incident light unit

The following operating instructions initially relate purely to the transmitted light microscope itself.

The fluorescence incident light unit is discussed at the end of chapter *10. Operation*.

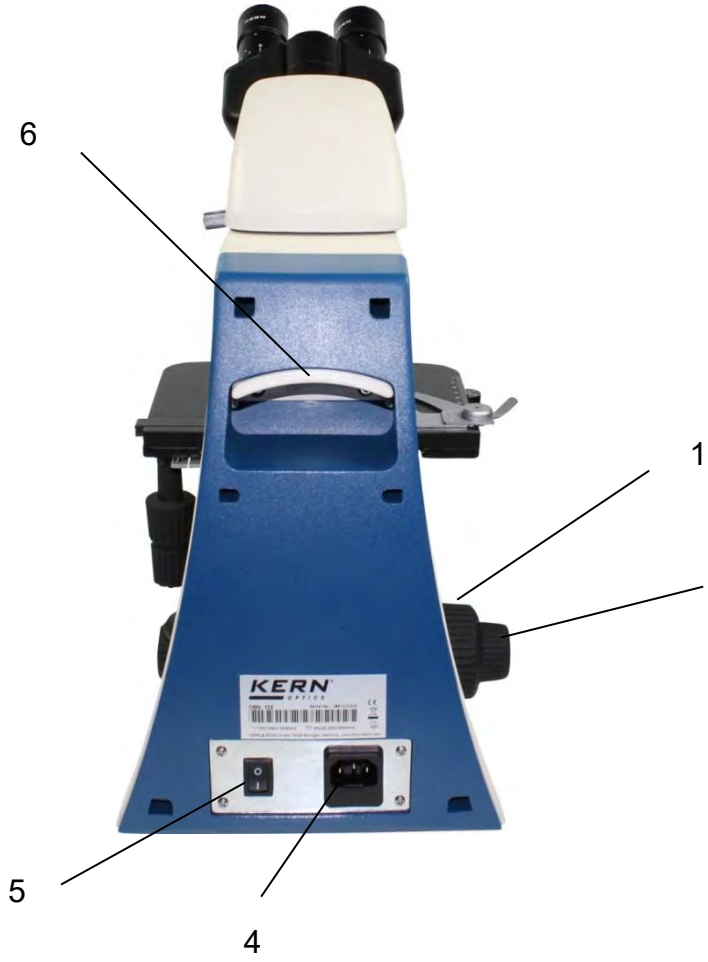
3 Overview of the device

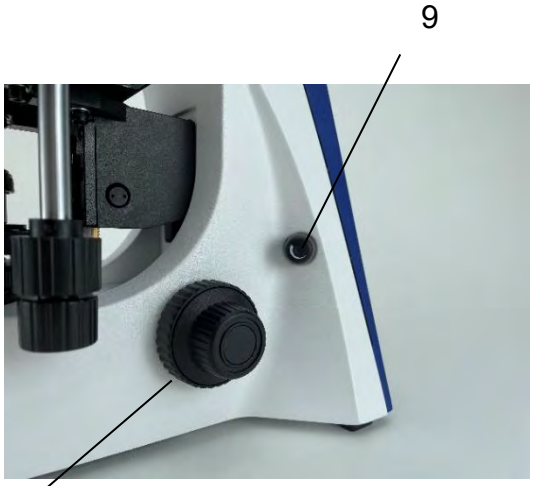
3.1 Nomenclature



	Description
1	Eyepieces
2	Tube connectors with dioptre adjustment ring
3	Camera adapter connection with adjusting screw
4	Microscope head / tube
5	Trinocular switching rod
6	Adjusting screw Microscope head
7	Setting wheel X - Y axis Object table
8	ON/OFF switch Dimmer
9	Fine drive
10	Coarse drive
11	Adjusting screw Condenser
12	Centering screw Condenser
13	Field lens with Luminous field diaphragm
14	Centering screw Condenser
15	Aperture setting Condenser
16	Condenser
17	Object table
18	Object holder
19	Objective
20	Nosepiece

3.2 Rear view





	Description
1	Coarse drive
2	Fine drive
3	Mains connection (for OBN 141/142)
4	Mains connection and fuse (for OBN 147/148)
5	Main switch (for OBN 147/148)
6	Carrying handle
7	Condenser Focus wheel
8	Adjustment ring Torque
9	Main switch (for OBN 141/142) and dimmer

4 Before use

4.1 General information

The packaging must be opened carefully to prevent the accessories inside from falling to the floor and breaking.

In general, a microscope should always be handled with great care, as it is a sensitive precision instrument. Avoiding abrupt movements during operation or transportation is therefore particularly important, especially to avoid endangering the optical components.
You should also avoid dirt or fingerprints on the lens surfaces, as in most cases this impairs the sharpness of the image.

If the performance of the microscope is to be maintained, it must never be disassembled. Parts such as objective lenses and other optical components should therefore be left as they are at the start of operation.

5 Basic information (general)

5.1 General information on warnings

Warnings are used in these operating instructions to warn you of possible personal injury or damage to property in certain situations.

Signal word	Description
DANGER	Failure to observe the instructions will lead directly to serious injury, permanent impairment (e.g. loss of a limb) or death of the user or third parties
WARNING	Failure to observe the instructions may result in serious injury, permanent impairment (e.g. loss of a limb) or death of the user or third parties
CAUTION	Failure to observe the instructions may result in minor injuries or temporary damage to the user or third parties (e.g. minor cuts)
NOTE	Failure to observe the instructions may result in damage to property

Symbols in warning notices :

Icon	Meaning
Warning signs	Warning signs warn you of dangers that may lead to personal injury. The symbol indicates the type of hazard.
	Indicates general hazards or a danger point
	Warning of electrical voltage
	Warning of optical radiation
	Warning of explosive substances
	Warning of flammable substances
	Indicates electrostatic sensitive devices

Icon	Meaning
Commandment sign	Mandatory signs prescribe measures that you must take to avoid personal injury or damage to property. The symbol indicates the necessary actions or objects to prevent damage.
	Indicates a prescribed action

5.2 Intended use

The OBN-14 is used in particular for the visualization of cell components of sophisticated preparations (e.g. living mammalian cells, tissue, possibly also microorganisms, immunofluorescence, FISH, DAPI staining, etc.).
Important applications include the specific staining of proteins with fluorescently labeled ligands, antibodies or fluorescent proteins. These techniques enable the localization of proteins in the cell, the visualization of cell structures and the observation of protein interactions. In addition, cell types can be identified and processes in living cells can be tracked.

5.3 Improper use

Do not use the device in potentially explosive atmospheres or for measurements in liquids or on live parts.
Unauthorized structural changes, additions and conversions to the appliance are prohibited.

5.4 Warranty

Warranty expires with

- Non-compliance with our specifications in the operating instructions
- Use outside the described applications
- Modifying or opening the device
- Mechanical damage and damage caused by media, liquids, natural wear and tear
- Improper set-up or electrical installation
- Improper assembly or electrical installation

6 Basic warnings and safety instructions

6.1 Observe the notes in the operating instructions

Read the operating instructions carefully before commissioning/using the device, even if you already have experience with KERN devices. Always keep the instructions in the immediate vicinity of the appliance.

6.2 Staff training

The appliance may only be used by persons who have read and understood the operating instructions, in particular the chapter on safety.

6.3 Safety

⚠ WARNING	
	**Read all safety information and instructions.** Failure to observe the safety information and instructions may result in electric shock, fire and/or serious injury**.** **Keep all safety information and instructions for future reference.** ● The design of the device must not be modified. This can lead to incorrect measurement results, safety defects and destruction of the device ● Do not operate the appliance in potentially explosive rooms or areas and do not install it there. ● Do not operate the device in an aggressive atmosphere. ● Do not immerse the appliance in water. Ensure that no liquids penetrate the inside of the device. The device may only be used in a dry environment and under no circumstances in rain or relative humidity above the operating conditions. ● Protect the device from permanent direct sunlight. ● Do not expose the appliance to strong vibrations. ● Do not remove any safety signs, stickers or labels from the device. Keep all safety signs, stickers and labels in a legible condition ● Do not open the device ● The lamp generates a lot of heat during operation. Avoid touching the lamp housing during operation and for some time afterwards. ● Do not operate the device in an aggressive atmosphere. **Important warnings regarding the use of an HBO lamp** ●The lamp generates a lot of heat during operation. Avoid touching the lamp housing during operation and for some time afterwards. ● Under no circumstances should the lamp be switched off during the pre-glow time. This will result in a considerable reduction in service life. ● Similarly, the lamp must not be switched on again immediately after it has been switched off. ● During a pause in observation, the control lever for the lighting should always be pushed in to interrupt the light beam.

	The light spectrum of the HBO lamp can often be harmful to microorganisms. ● Never look into the eyepieces when the beam path is open (using the control lever for illumination) and an empty filter position is selected on the FL module. There is an acute risk of blindness here.

⚠ WARNING	
	**Risk of injury due to electric shock!** ● Risk of short circuit due to penetration of liquids into the housing! ● Do not immerse the appliance or accessories in water. Make sure that no water or other liquids get into the housing. ● Work on electrical components may only be carried out by an authorized specialist company! ● Take care not to twist or kink the mains cable. ● Only use the original adapter supplied

⚠ WARNING	
	**Choking hazard!** Do not leave the packaging material lying around carelessly. It could become a dangerous toy for children. ● The appliance is not a toy and does not belong in the hands of children. ● This appliance can be dangerous if it is used improperly or not as intended by untrained persons! Observe the personnel qualifications!

⚠ WARNING	
	**Electrostatic sensitive device!** ● The device can be destroyed by electrostatic discharges. Connectors for HF signals are particularly at risk. ● Please observe the handling instructions for electrostatically sensitive components.

⚠ WARNING	
 	Never touch the glass housing of the built-in HBO replacement lamp with bare hands. Contamination increases the risk of explosion during operation. The lamp must be cleaned if it becomes contaminated. ● An HBO lamp has a certain service life. The closer it is brought to its limit, the greater the risk of the lamp exploding and releasing toxic mercury vapor. This must be prevented by all means.

⚠ WARNING

There is a risk from optical radiation!
Gas discharge lamps, LED lights and other white light sources generate intense optical radiation, including UV (ultraviolet), visible light (VIS) and IR (infrared). This radiation can cause both skin and eye damage. The extent of the damage is determined by the wavelength, the duration of exposure and the operating mode (continuous or pulsed).
● Do not expose eyes and skin to radiation.
● Do not insert any reflective objects into the beam entrance.
● If necessary, use suitable protective equipment/protective clothing.
● Never remove the cover or cladding during operation.
● Never look into the eyepieces when the beam path is open (using the control lever for illumination) and an empty filter position is selected on the FL module. There is an acute risk of blindness here.

CAUTION

Keep a sufficient distance from heat sources.
Do not use the device in environments with high humidity or water mist

NOTE

● To avoid damaging the device, do not expose it to extreme temperatures, extreme humidity or moisture.
● Do not use harsh cleaners, abrasive cleaners or solvents to clean the appliance.

7 Transportation and storage

7.1 Note

If you store or transport the device improperly, the device may be damaged. Observe the information on transporting and storing the appliance.

7.2 Transportation

We recommend using the original packaging for shipping, transportation or storage of the microscope components. To prevent damage from shocks, all moving parts that can be assembled and disassembled must be packed separately.

7.3 Storage

Avoid exposing the device to direct sunlight, high or low temperatures, shocks, dust and high humidity.

The suitable temperature range is 0 - 40 °C and a relative humidity of 85% should not be exceeded.

The appliance should always be placed on a firm, smooth and horizontal surface.

When the microscope is not in use, it is best to cover it with the dust cover supplied. Dust or dirt inside the optics of a microscope can in many cases lead to irreversible malfunctions or damage.

Accessories consisting of optical elements, such as additional lenses, are preferably stored in a drying box with desiccant.

7.4 Packaging/return transportation

Returns are only possible within the limits of the general terms and conditions Keep all parts of the original packaging for any necessary return transportation.

- Only the original packaging is to be used for return transportation.
- Disconnect all connected cables and loose/movable parts before shipping.
- Refit any transportation locks provided.
- Secure all parts against slipping and damage.

8 Unpacking and commissioning

8.1 Unpacking

! In the event of a return, please follow the instructions in the chapter "Packaging/return transportation

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On receipt of the device, you should first check that no damage has occurred during transportation, that the outer packaging, the housing, other parts or even the device itself have not been damaged. If any damage is evident, please notify KERN GmbH immediately.

8.2 Initial commissioning

To ensure the function of the microscope, it must be cleaned as described in chapter 9.

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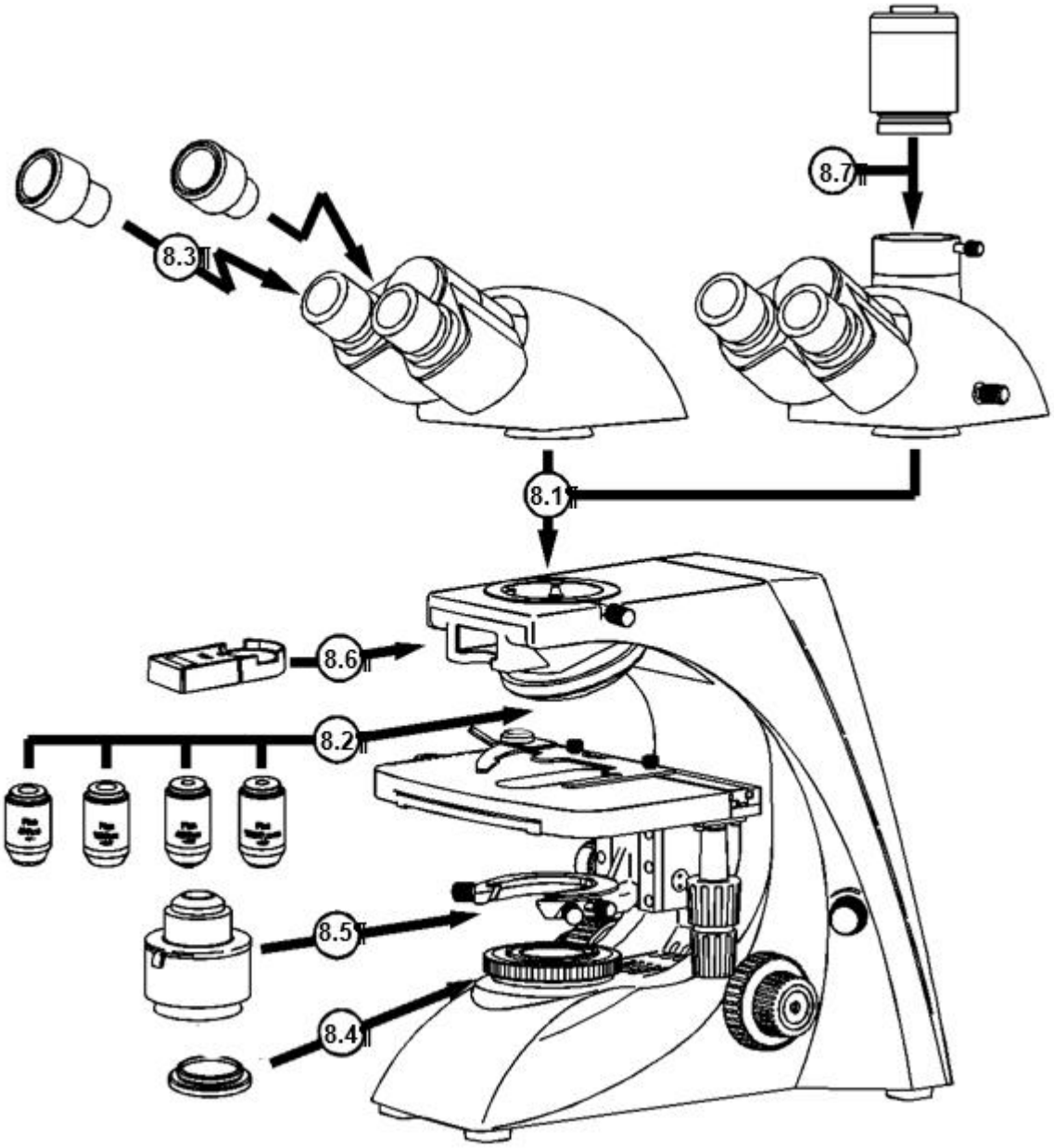
9 Assembly



9.1 Microscope head

First you must loosen the fixing screw on the tube connection point and remove the black protective cover. You can then insert the round dovetail bracket on the head into the round dovetail bracket on the housing and fix it with the fixing screw. When doing this, you should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.

9.2 Objectives

The specimen stage must be in its lowest position so that the objectives can be screwed into the nosepiece. You can then screw the objectives into the nosepiece so that when you turn the nosepiece in a clockwise direction, the objective with the next strongest magnification appears. You must make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures. For objectives which are marked “OIL”, you must use an immersion oil with the lowest level of inherent fluorescence..

9.3 Eyepieces

Eyepieces with the same magnification for both eyes must always be used. These are simply placed on the tube sockets once the plastic protective caps have been removed. Care should always be taken to ensure that the lenses are not touched with bare fingers and that no dust enters the openings.

9.4 Color filter (OBN 147, OBN 148)

The blue color filter included in the scope of delivery can simply be placed in the ring holder of the field lens.

9.5 Condenser

We recommend that you use the course adjustment knob to bring the specimen stage to its uppermost position. Use the focus dial of the condenser to move the condenser holder to the central position. In this way the condenser can be fitted at the right place in the condenser holder and fixed with the adjusting screw. When doing this, you should be able to read the scale from the front. You should avoid touching the optical lenses with bare fingers.

For points 9.6 (polarization unit) and 9.7 (camera connection), see 13 Use of optional accessories.

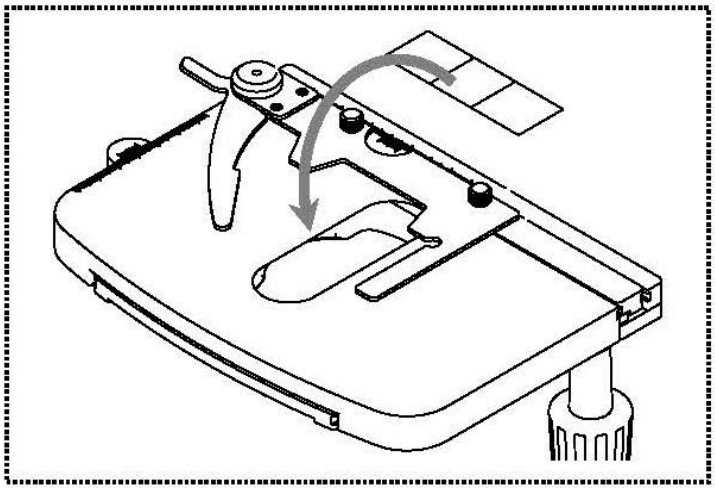
10 Operation

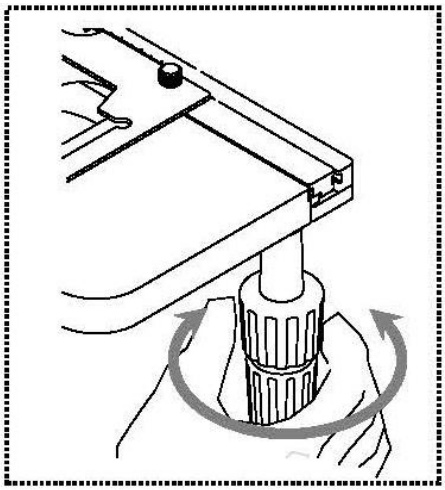
10.1 First steps

When the microscope is ready for use after assembly, it must first be connected to the mains via the mains cable. Only insert the mains plug into a suitable socket. Ensure that the mains cable is laid correctly.
The following sections describe all the important functions that are useful for operating the device.

The first thing to do is to **connect the power supply using the mains plug**. The **light intensity control (dimmer)** should first be set to a **low level so that** the eyes are not immediately exposed to too much light when looking into the eyepieces for the first time. The **lighting** can now be switched on using the **main switch**.

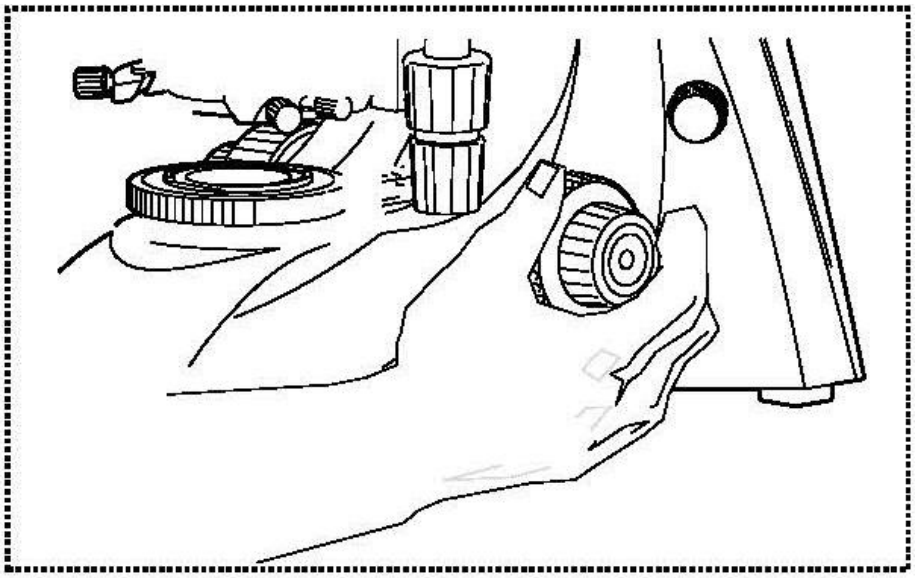
The next step is to **place a slide** with a sample on the stage. The cover glass must be facing upwards for this. The object holder can be used to fix the slide on the stage (*see illustration on the left*). To move the sample into the beam path, the adjustment wheels on the right-hand side of the mechanical stage must be operated accordingly (*see illustration on the right*).
A total of two slides can be placed at the same time.





10.2 (Pre-) focusing

When you are observing an object, you must have the correct distance to the objective to achieve a sharp image. In order to find this distance at the beginning (without other default settings of the microscope) place the objective with the lowest magnification in the beam path, look through the right eyepiece with the right eye and turn it slowly using the coarse adjustment knob (see illustration).



The simplest way of doing this would be to first raise the specimen stage (using the coarse adjustment knob) until it is just under the objective and then lower it slowly. As soon as an image is recognisable (no matter how sharp), then you should only adjust the focus using the fine adjustment knob..

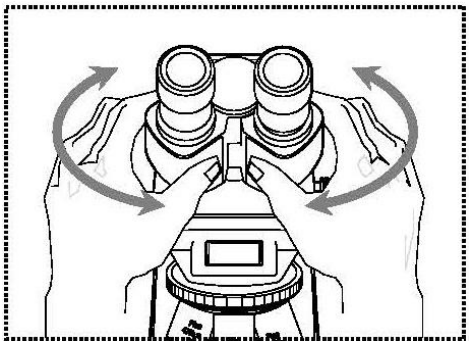
Adjusting the torque of the coarse and fine adjustment knob

Next to the left adjustment wheel for the coarse and fine adjustment knob there is a ring which you can use to alter the torque of these wheels. Turning it in a clockwise direction reduces the torque and turning it in an anti-clockwise direction increases it. On one hand, this function can help to make it easier to adjust the focus and on the other hand it can prevent the specimen stage from slipping down unintentionally.

Important

In order to avoid damaging to the focussing system, the left and right adjustment wheels for the coarse and fine adjustment knob must never be rotated at the same time in opposite directions.

10.3 Adjusting the interpupillary distance



With binocular viewing, the interpupillary distance must be adjusted accurately for each user, in order to achieve a clear image of the object. While you are looking through the eyepieces, use your hands to hold the righthand and lefthand tube housing firmly. By pulling them apart or pushing them together, you can either increase or reduce the interpupillary distance (see illustration). As soon as the field of views of the lefthand and righthand eyepieces completely overlap each other, i.e. they combine to form a circular image, then the interpupillary distance is set correctly.

10.4 Dioptre adjusment

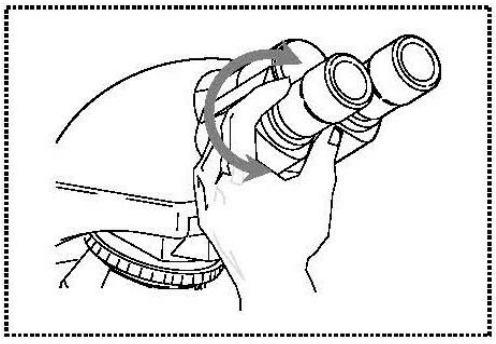
The eye strengths of each eye of the microscope user can often be slightly different, which in daily life has no consequences. But when using a microscope this can cause problems in achieving precise focussing.

You can use a mechanism on both tube connectors (dioptre adjustment rings) to compensate for this as follows.

Put the right dioptre adjustment ring to position 0.

Look through the right eyepiece with the right eye and bring the object into focus by using the coarse and fine adjustment knob.

Then look through the left eyepiece with the left eye and use the lefthand dioptre adjustment ring to focus the image. To do this, you just need to turn the ring in both directions (see illustration), to find out where the image is at its most focussed.

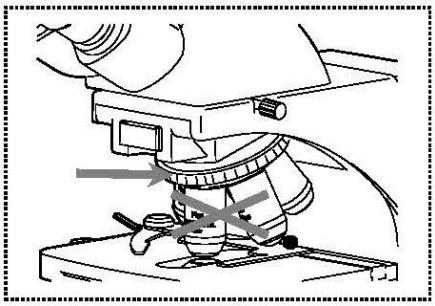


10.5 Adjusting the magnification

After pre-focusing has been carried out using the objective with the lowest magnification (*see 10.2*)you can then adjust the overall magnification using the nosepiece, as necessary. By turning the nosepiece you can bring any one of the four other objectives into the beam path.

When adjusting the nosepiece, you must take the following points into account:

- The required objective must be properly locked in place at all times.



- The nosepiece should not be rotated by holding individual objectives, you should use the silver ring above the objectives (see illustration).

- When rotating the nosepiece you must always make sure that the objective which is about to be positioned in the beam path does not touch the object holder. This can lead to significant damage to the objective lens. We recommend that you always check from the side to make sure that there is sufficient leeway. If this should not be the case, the specimen stage must be lowered accordingly.

If you have focussed the object to be observed for a specific magnification, then if you select the objective with the next greatest magnification, then the object will be slightly out of focus. Use the fine adjustment knob to make a slight adjustment and restore the focus

10.6 Adjusting the Koehler Illumination

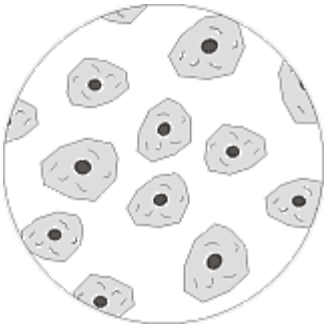
To make sure that perfect image results are achieved during microscopic observation, it is important that the direction of light of the microscope is optimised. If, as with the devices in the KERN OBN-14 series, the lighting can be set in accordance with Koehler, the result is homogenous illumination of the slide and avoidance of disruptive stray light.

The necessary control elements for this are

- Height-adjustable and centre-adjustable condenser with aperture diaphragm
- Field diaghragm

When adjusting the Koehler lighting for the first time, you must first select the lowest possible objective magnification, so that you can carry out the following steps.

1. Use the condenser focus wheel to position the condenser directly below the specimen stage. Switch on the lighting and use the coarse and fine adjustment knob to bring the slide with the cover glass positioned facing upwards into focus.



2. Close the field diaphragm completely using its adjusting ring. When you look in the microscope a blurred image appears in the aperture. If the microscopic image is completely dark, the image for the field diaphragm is outside the field of view and must be brought into the field of view using the centring screws on the condenser.

3. Adjust the height of the condenser until the image from the field diaphragm appears clearly in the field of view. For some microscopes there is a risk that you will lift the condenser up so high that it collides with the object holder. Therefore care is needed when doing this.

4. Use the centring screws of the condenser holder to bring the image from the field diaphragm into the centre of the field of view.

5. Open the field diaphragm until it just disappears out of the field of view. If necessary, simply re-centre using the centring screws on the condenser holder.
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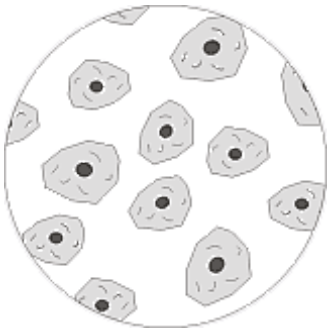
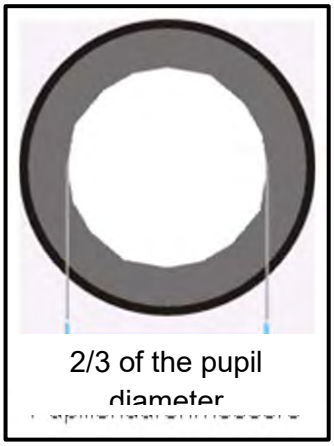


6. Use the aperture diaphragm of the condenser to find the very best compromise between contrast and resolution for the microscopic image. The scale divisions on the condenser can be used as a guideline. Select in accordance with the objective being used. The aperture diaphragm of the condenser can be used.

   The view in the tube without the eyepiece should look something like the illustration on the right. The diameter of the aperture diaphragm which is then visible should make up approximately 2/3 of the pupil diameter.


2/3 of the pupil diameter

   If the eyepiece should be removed, for checking, then please make sure that no dirt or dust falls into the tube

7. It is possible to alter the brightness of the bulb using the **dimmer**. The brightness is always controlled by the bulb brightness and not by the aperture diaphragm.

8. Possibly there is the need of re-adjusting the focus and x-y axis.

9. Observe the object.

If another magnification is selected afterwards, then the Koehler illumination does not have to be reset from scratch, only the aperture diaphragm and field diaphragm need to be adjusted as required. As a result you can always check whether the condenser needs to be re-centred

10.7 Using the eyecups

The eye cups supplied with the microscope can basically be used at all times, as they screen out intrusive light, which is reflected from light sources from the environment onto the eyepiece and the result is a better image quality.

But primarily, if eyepieces with a high eye point (particularly suitable for those who wear glasses) are used, then it may also be useful for users who don't wear glasses, to fit the eye cups to the eyepieces.

These special eyepieces are also called High Eye Point eyepieces. They can be identified by the glasses symbol on the side. They are also marked in the item description by an additional "H" (example: HSWF 10x Ø 23 mm).

When fitting the eye cups, make sure that the dioptre setting is not moved. We would therefore advise that you hold the dioptre compensation ring on an eyepiece with one hand while you fit the eye cup with the other.

Before using the microscope, users who wear glasses must remove the eye cups, which you may find on High Eye Point eyepieces.

As the eye cups are made of rubber, you must be aware that when you are using them, they can become slightly dirty through grease residues. In order to maintain hygiene, we would therefore recommend that you clean the eye cups regularly (e.g. with a damp cloth).

Eyecups

High Eye Point eyepiece
(recognizable by the glasses symbol)

10.8 Use of oil immersion lenses

The 100x objectives of the OBN-14 series are objectives which can be used with oil immersion (they are always marked with the word “OIL”). Using these generates a particularly high resolution for microscopic images.

To use oil immersion correctly, please follow these steps.

Place a drop of oil on the cover slip (with a standard thickness of 0.17 mm) of the preparation.

Lower the stage and bring the 100x objective into the beam path.

Very slowly move the specimen stage or the specimen towards the objective until light contact is made.

Observe the object.

The object slide and objective must not be pressed against each other. The oil constitutes the contact layer.

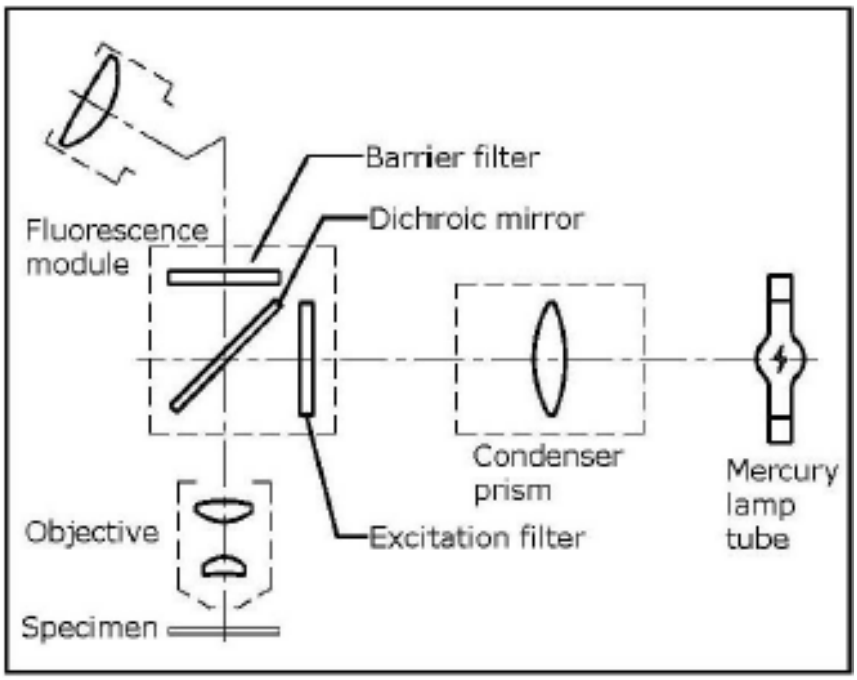
If the contact is made too jerky, there is a chance that existing air bubbles in the oil cannot escape. This would have a negative impact on image clarity.

After use or before changing the slide, any components which have been in contact with the oil must be cleaned thoroughly. *See chapter Maintenance and cleaning.*

10.9 Fluorescence incident light unit

There are samples, which can be excited by light beams and thereby show emissions, which have different wave lengths than the previous excitation beams. The wave length of the emission is always bigger than the wave length of the excitation (Stokes shift). This process is called fluorescence and can serve as the base of a microscopic contrasting method. For the most common way to realise this, an upright light microscope is extended by a fluorescence reflected light unit..

Principle



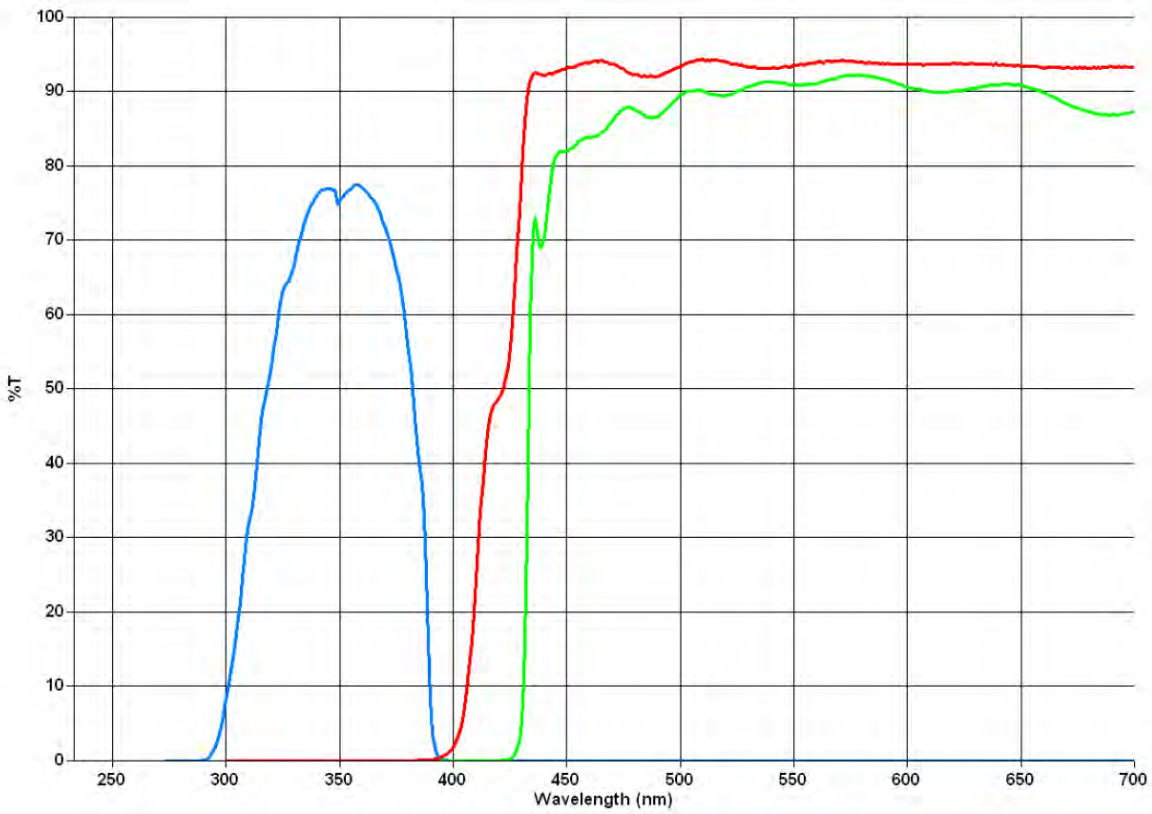
Depending on the sample there is an excitation light needed, that is contained in the spectrum of the light source (HBO or LED). The excitation filter is only permeable for the according wave length. After that the excitation light hits a dichroic mirror, which reflects it towards the objective and the sample. After the sample absorbed the excitation light, the emission of the fluorescent light occurs (with a bigger wave length than the excitation light). The part of the fluorescent light, which is beamed into the objective, can pass the dichroic mirror. The dichroic mirror additionally prevents the remaining part of the excitation light from advancing towards the eyepieces. The barrier filter finally eliminates all wave ranges out of the beam path not belonging to the observed fluorescence. Thus the resulting image is just developed by the fluorescent light emitted from the sample.

Overview of the wavelengths for excitation and emission per excitation filter

UV	Wavelength range for excitation:	330-380nm
	Wavelength range for emission:	435nm
V	Wavelength range for excitation:	380-420nm
	Wavelength range for emission:	460nm
B	Wavelength range for excitation:	420-490nm
	Wavelength range for emission:	520nm
G	Wavelength range for excitation:	500-550nm
	Wavelength range for emission:	590nm

Blue line: Wavelength excitation
Green line: wavelength emission

U:



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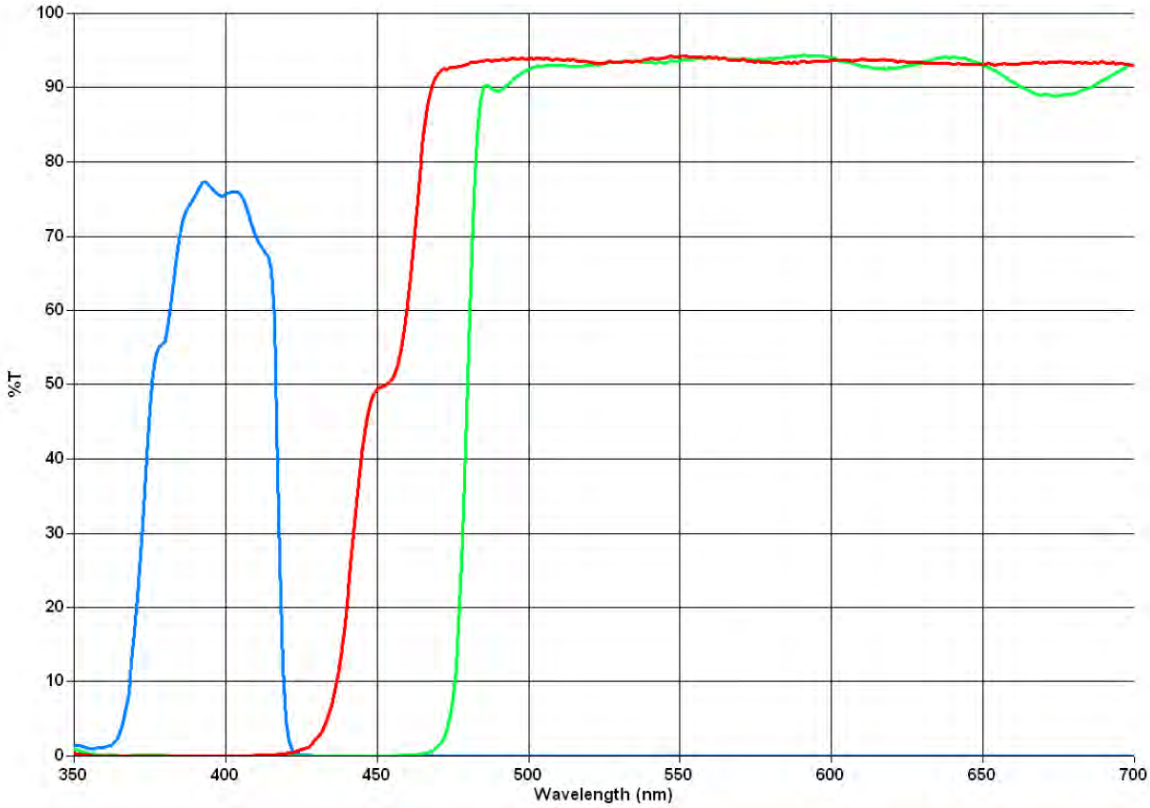
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Wavelength (nm)

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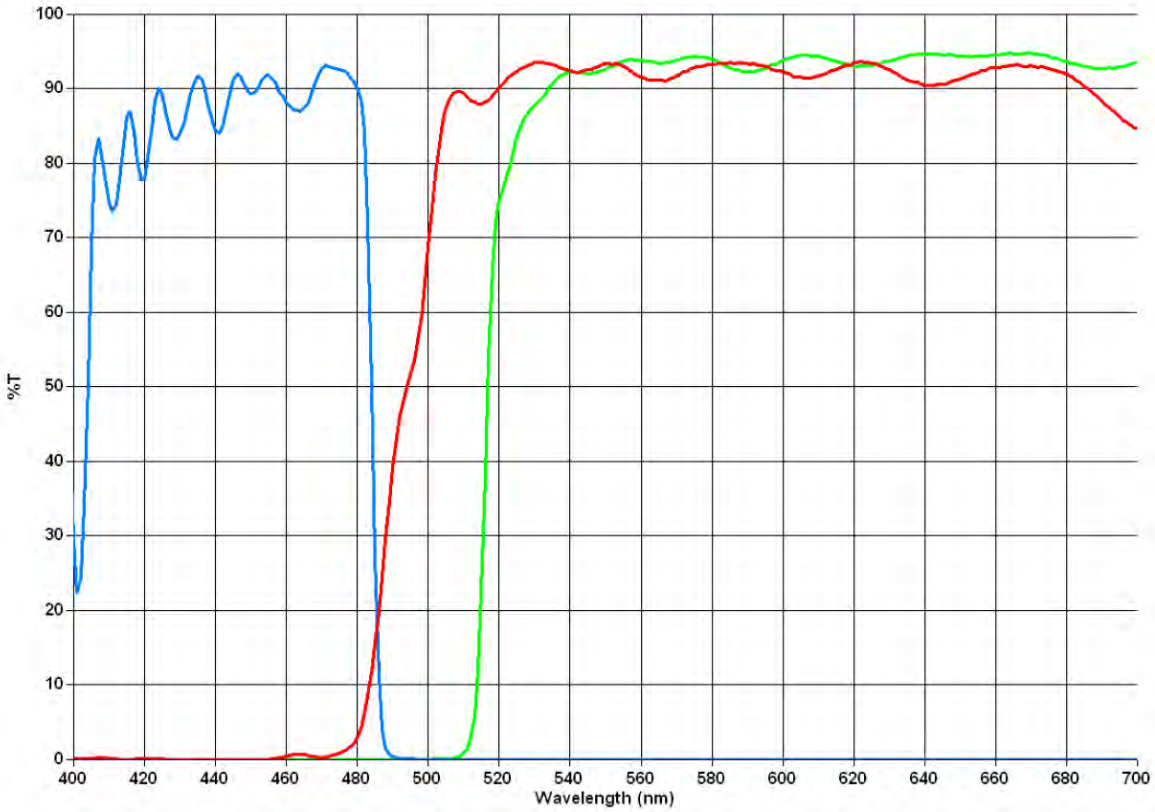
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Wavelength (nm)

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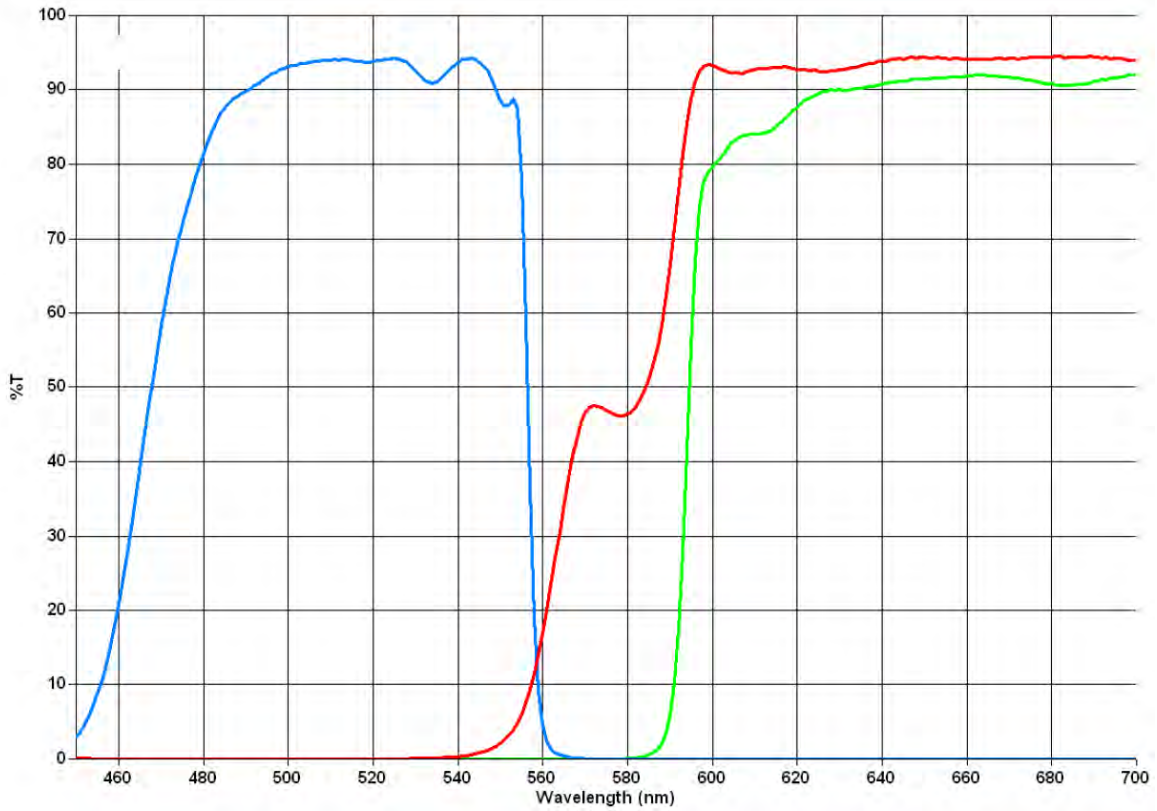
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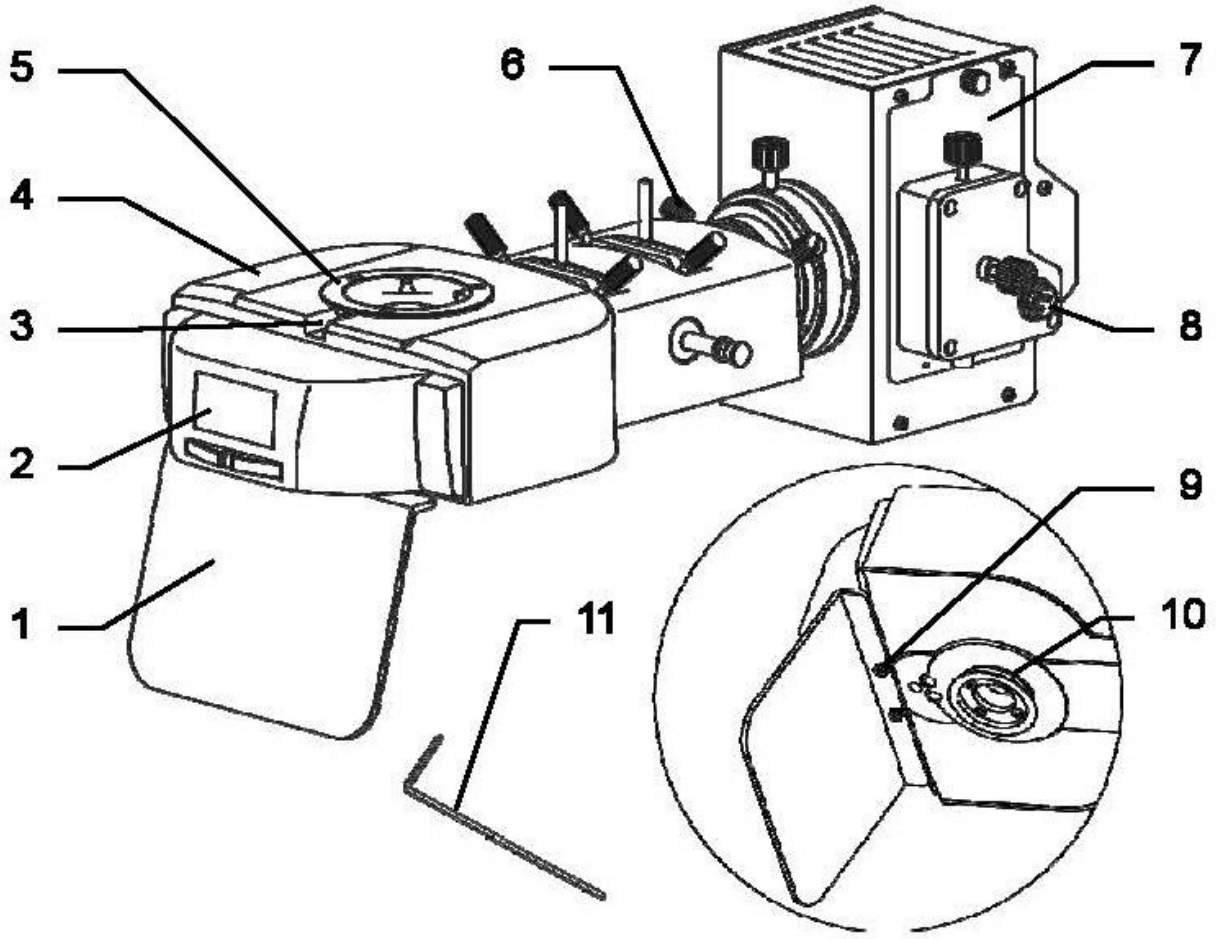
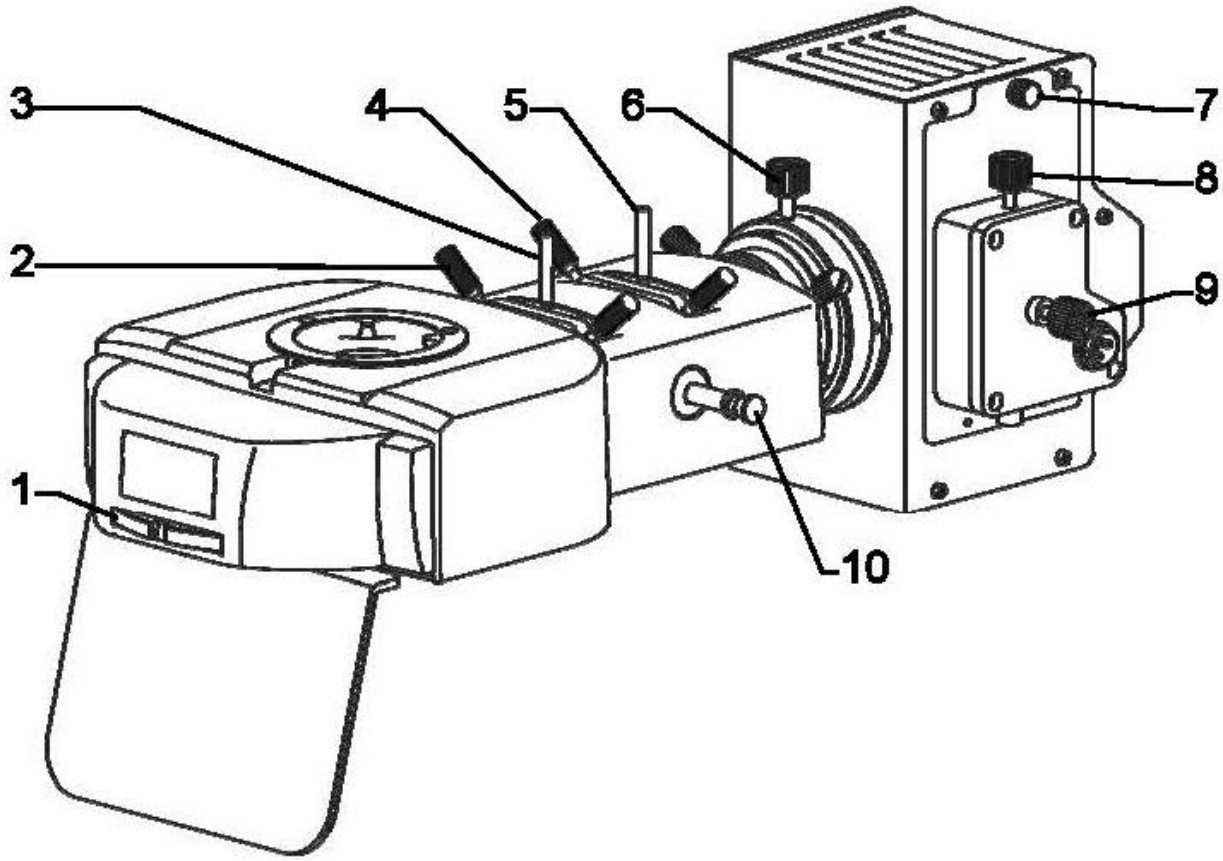
Wavelength (nm)

Nomenclature (components) for OBN 147/148



	Description
1	Protective plate
2	Cover for FL module
3	Fixing Allen screw for microscope head
4	Main body
5	Connection point for microscope head
6	Fixing screw for lamp housing
7	HBO lamp housing
8	Power connection
9	Screw for mounting the protective plate
10	Connection point for microscope head housing
11	Allen wrench

Nomenclature (control elements) for OBN 147/148

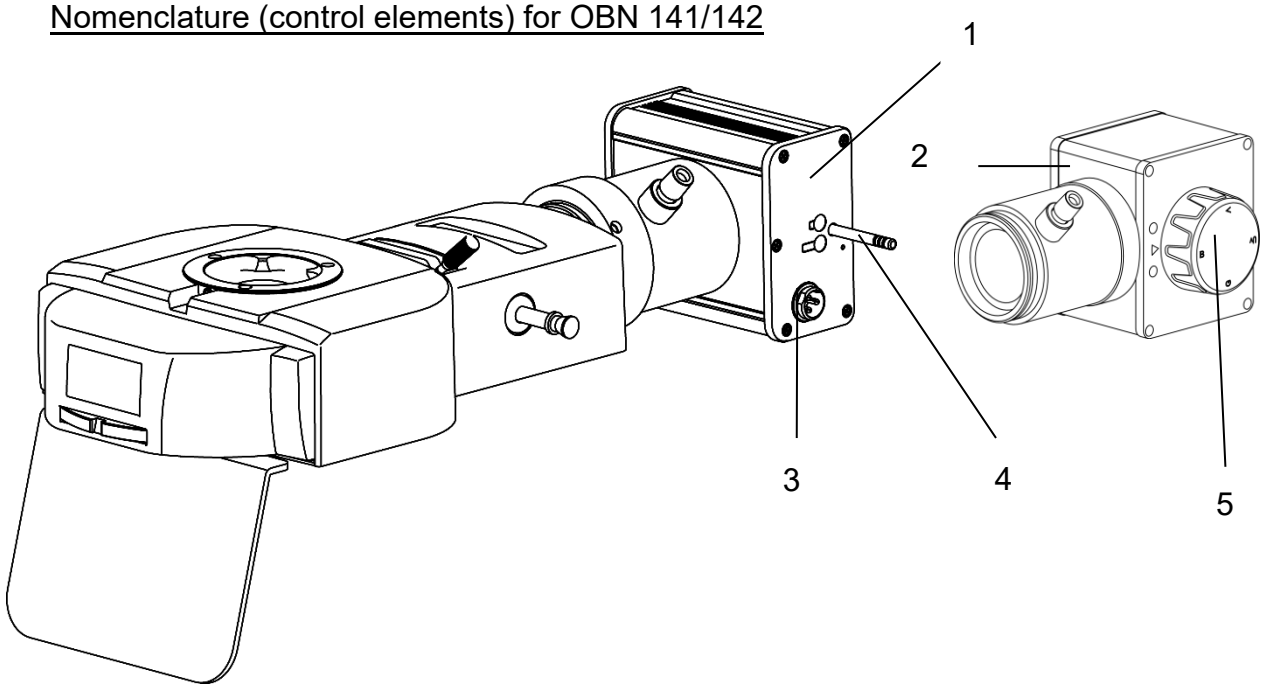


	Description
1	FL module control wheel
2	Centering device for field diaphragm
3	Adjustment lever for field diaphragm
4	Centering device for aperture diaphragm
5	Adjustment lever for aperture diaphragm
6	Condenser control
7	Screw for cover of lamp housing
8	Centering screw for lamp (vertical)
9	Centering screw for lamp (horizontal)
10	Control lever for illumination

Nomenclature (power supply unit for HBO lamp)

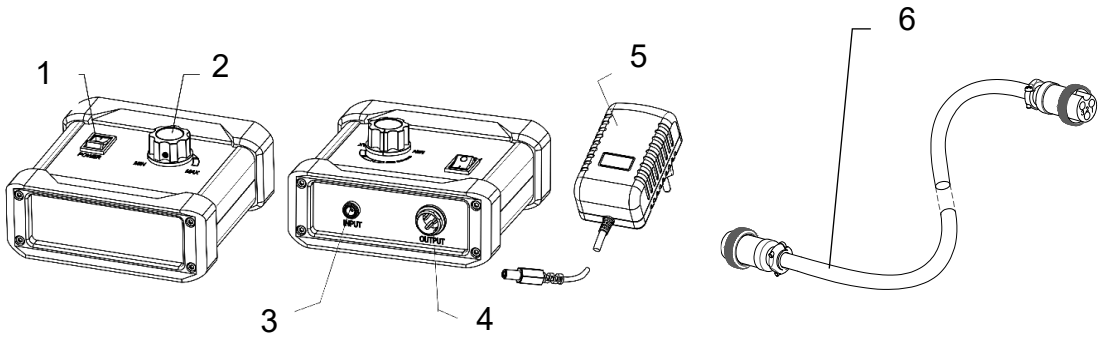
	Description
1	Operating time
2	Ampere meter
3	Main switch

Nomenclature (control elements) for OBN 141/142



	Description
1	3W epi-fluorescence unit (B/G) with OBN 141
2	3W epi-fluorescence unit (B/G/UV/V) with OBN 142
3	Input socket Connection cable for fluorescence unit
4	LED switch lever (B/G)
5	LED changeover wheel (B/G/UV/V)

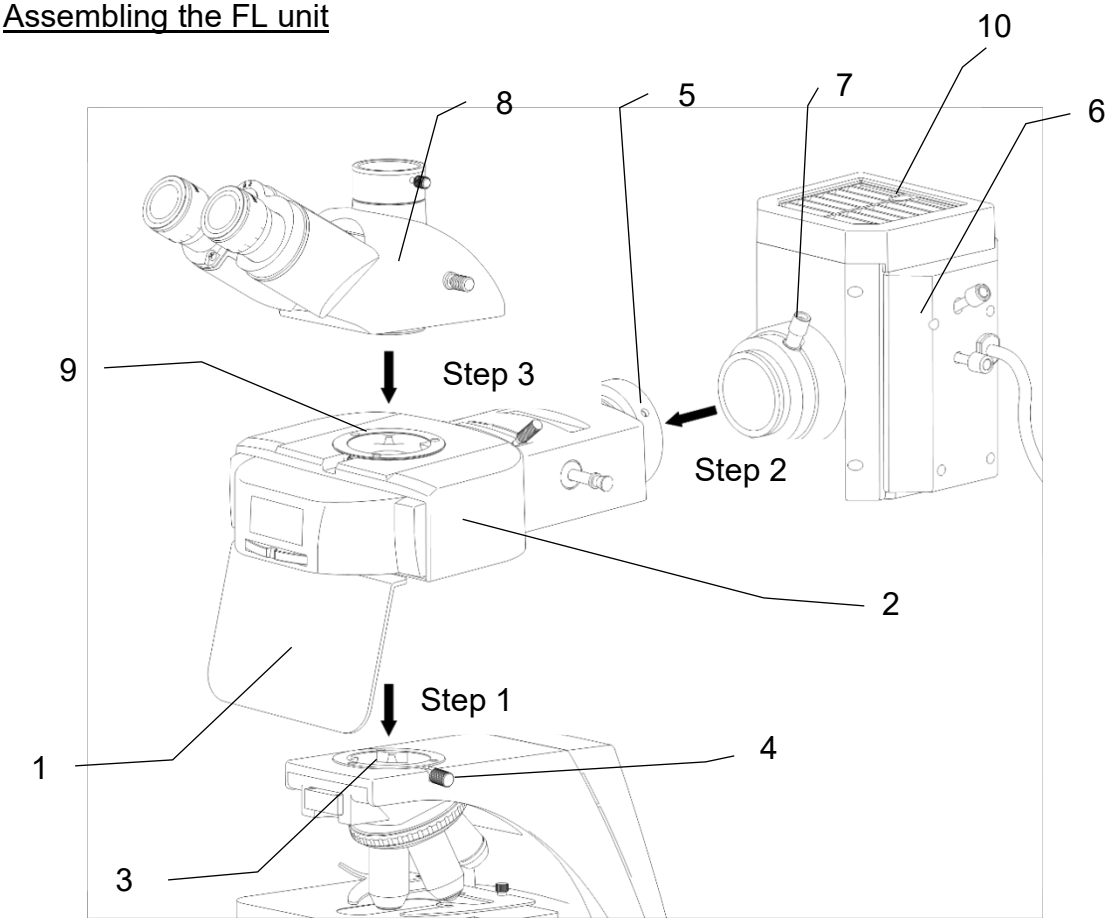
Nomenclature (power supply unit for LED lamp: OBN 141/ OBN 142



5W LED Power Box (front) **DC input LED Power Box (rear)** **DC input LED power cable**

	Description
1	ON/OFF switch
2	Dimmer
3	External power connection
4	LED powerbox output socket
5	DC/AC adapter
6	Connection cable for fluorescence unit

Assembling the FL unit



Step 1:

Take the components out of the packaging box, remove the protective packaging and place the microscope on an open work surface.

Install the microscope as described in the installation steps.

First remove the fluorescence unit, turn it over, insert the protective disk (1) into the pre-assembled fastening screws and tighten the screws from below using an Allen key. Attach the main part of the FL unit (2) to the designated connection point on the microscope head (3) and secure it with the side fixing screw (4).

Step 2:

HBO lamp (for OBN 147/148)

Use the hexagonal wrench to loosen the fixing screw (5) for the lamp housing (6), connect the front connection of the FL unit to the rear connection of the lighting unit, adjust the FL unit and tighten the fixing screw (7).

Plug the connection cable of the lighting unit into the power supply unit of the HBO lamp and secure the screw connection properly. Before using the FL incident light unit for the first time, the HBO lamp must first be mounted in the lamp housing.

For the procedure, see "Replacing the bulb" chapter 11 (Remove the previously fitted bulb transport lock for this). To open the lamp housing, loosen the hexagon socket screw (10) with a hexagon wrench.

LED lamp (for OBN 141/142)

Use the Allen key to loosen the fixing screw for the lamp housing, connect the front connection of the FL unit to the rear connection of the lighting unit, adjust the FL unit and tighten the fixing screw.

Plug the connection cable of the lighting unit into the LED power box (for OBN 141/142) and secure the screw connection properly.

Step 3:

Loosen the fixing screw for the microscope head using the Allen key.

Insert the connection point of the microscope head (8) into the opening provided in the centerpiece (9). Secure the microscope head with the locking screw using an Allen key.

The microscope is now fully assembled.

Operation

Before the reflected light unit is put into operation for special fluorescence applications, it is advantageous to set up the microscope in bright field mode. This includes sample placement, setting the interpupillary distance, pre-focusing, diopter compensation, etc. You can then proceed to use the fluorescence reflected light unit.

1. When using an HBO lamp, you must first ensure that the control lever for the lighting is pushed in.
2. Establish the power connection. When using an HBO lamp, the correct input voltage must be selected on the back of the power supply unit using a slider (100V/240V).
3. Actuate the main switch. When using an HBO lamp, it must then be switched on by pressing in the ignition.
   It takes about 15 minutes for the lamp to develop maximum and stable luminosity.
4. Once the sample has been placed, the desired objective can be brought into the beam path.
5. Move the FL module control wheel to the desired position.
6. When using an HBO lamp, the control lever for the lighting can now be pulled out.
7. Start of observation.

Control elements for the lighting

The following control elements for the illumination play a role in fluorescence microscopy:

- Field diaphragm, aperture diaphragm, condenser:
  Optimization of contrast and luminous efficacy

- Control lever for lighting:
  In the middle position, the illumination is attenuated via a filter so that samples for which the full luminosity of the light source is too strong can also be observed.

Important warnings regarding the use of an HBO lamp

- The lamp generates a lot of heat during operation. Avoid touching the lamp housing during operation and for some time afterwards.
- Under no circumstances should the lamp be switched off during the pre-glow period. This will result in a considerable reduction in service life.
- Similarly, the lamp must not be switched on again immediately after it has been switched off.
- During a pause in observation, the control lever for the lighting should always be pushed in to interrupt the light beam. The light spectrum of the HBO lamp can often be harmful to microorganisms.
- Never look into the eyepieces when the beam path is open (using the control lever for illumination) and an empty filter position is selected on the FL module. There is an acute risk of blindness here.
- An HBO lamp has a certain service life. The closer it is brought to its limit, the greater the risk of the lamp exploding and releasing toxic mercury vapor. This must be prevented by all means.
  The following instruments provide information on the need to replace lamps (applies to 100W HBO lamps):
  - Ammeter on the power supply unit
    As soon as the current exceeds or falls below a range of 4A to 6A, a lamp change is recommended
  - Operating time display on the power supply unit
    As soon as 100 h are reached→ Lamp replacement required
- Before putting a new lamp into operation, press the reset button on the power supply unit next to the ammeter with a pointed object.

Lamp centering (HBO)

As the operating time of the HBO lamp progresses, it is possible that its holder will become deformed due to the strong heat development and thus move from its center. As this means that the field of view is no longer evenly illuminated, this situation must be corrected as follows if it occurs.

1. Screw the centering objective into the turret instead of a standard objective.
2. Bring the centering lens into the beam path.
3. Set the FL module to position G (this setting produces a relatively subdued light, which is pleasant for the eyes).
4. When looking through the eyepieces, a crosshair and the off-centered light spot of the lamp (also cross-shaped) appear.
5. Now use the two centering screws on the lamp housing to move the light spot into the center of the crosshairs (caution: heat build-up on the lamp housing).

11 Lamp replacement

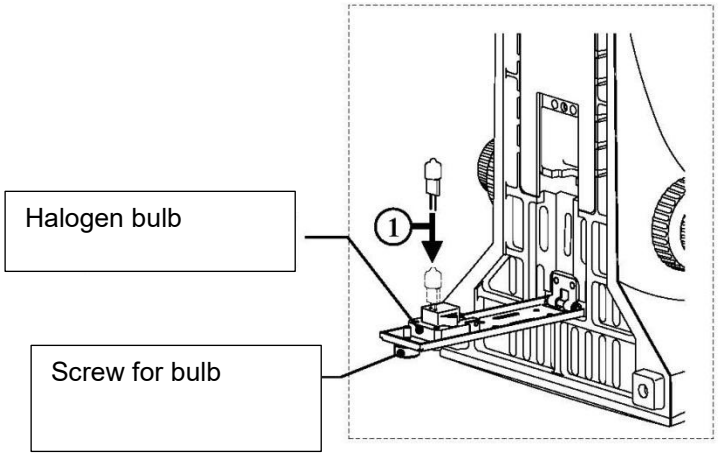
Halogen

Do not change the bulb immediately after operating the microscope, as the bulb is still hot and there is a risk of burns. The device must be switched off and disconnected from the power supply before changing the bulb.

To change the lamp, the device must be carefully tilted backwards or to the side. Make sure that all components of the microscope are firmly secured. The lamp holder is located on the underside of the device. It can be folded out by loosening the screw on it (*see illustration*). Here, too, it is best to check again that there is no more heat development. The defective bulb can now be pulled out of the socket and replaced with a new one. Once the bulb holder has been folded back in and secured to the underside of the appliance, the bulb has been replaced.

Important:

The new bulb may only be handled with sterile gloves or with the aid of its packaging film in order to insert it into the holder. Grease or dust residues can have a negative impact on the light quality and service life.



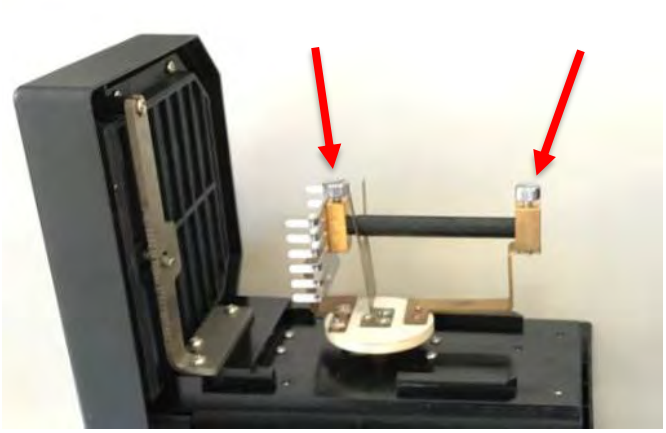
Lamp replacement (HBO)

1. Disconnect the FL reflected light unit from the power supply.
2. Check whether the lamp housing has cooled down.
3. Loosen the Allen screw (3mm) on the top of the lamp housing.

4. Pull the upper part of the housing upwards until it separates from the lower part (see illustration)

5. The bracket in which the lamp is to be installed is located in the upper part.

6. Loosen the two fixing screws at both ends of the HBO lamp.



7. Replace the defective lamp or the transport fuse with a new lamp.
8. Tighten the two fixing screws again.
9. Push the upper part, on which the lamp is mounted, back into the housing and screw it down.

Under no circumstances should the glass housing of the built-in replacement lamp be touched with bare hands. Contamination increases the risk of explosion during operation.

If soiling does occur, the lamp must be cleaned. We recommend using a lint-free cloth moistened with an ether/alcohol mixture (ratio: 70/30).

LED

The OBN 141 and OBN 142 are equipped with LEDs.

Due to the long service life of LED lighting, regular lamp replacement will not be necessary with this microscope.

In most cases, problems with the lighting would therefore be caused by defects in the electrical system. In such a case, our Technical Service can help.

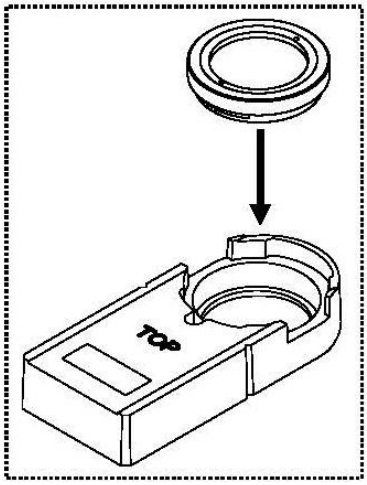
12 Fuse replacement (OBN 147 / OBN 148)

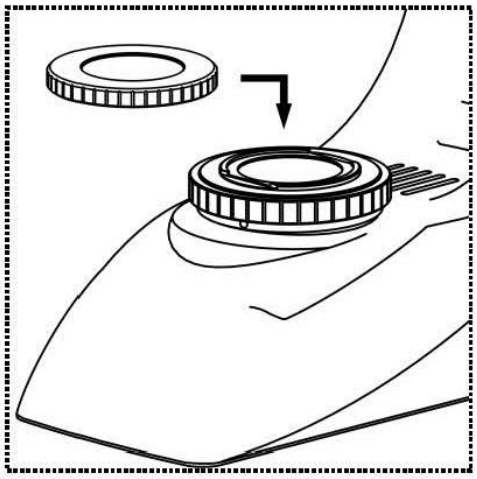
The fuse housing is located at the rear of the microscope below the mains plug connection. When the device is switched off and the mains plug is removed, the housing can be pulled out. It is advisable to use a screwdriver or similar tool to help with this. The defective fuse can now be removed from its housing and replaced with a new one.
The fuse housing must then be reinserted into the slot below the mains plug connection

13 Use of optional accessories

13.1 Polarization unit

The polarization unit consists of two parts: Polarizer and analyzer.
Both parts consist of a round glass plate with an outer retaining ring. To attach the analyzer, a slider with holder is attached to the front of the microscope directly above the nosepiece (*see illustration on page 16*), where the analyzer can be easily inserted (*see illustration on the left*).
The polarizer, on the other hand, is simply placed on the ring holder of the field lens (*see illustration on the right*).





There are two points to note for the subsequent use of the polarization unit:

The aperture setting of the condenser must be in position PH.

For its starting position, the polariser must be turned to the position in which you can see the highest level of darkness in the field of view (without object slide).

13.2 Camera connection

Due to the trinocular tube, which is a standard fitting for the whole OBN-14 series, it is possible to connect microscope cameras to the device, in order to digitally record images or sequences of images of an object being observed.

After the plastic cover has been removed from the camera adapter connector on the top of the microscope head, then a suitable adapter must be fitted. In general there are two C-mount adapters available for this (1x and 0.57x magnification). After fitting one of these adapters it can be fixed with the fixing screw. A camera which has a C-mount thread is then screwed on top of the adapter.

We recommend that you first adjust the field of view using the eyepieces on the device for the existing requirements, and then carry out the observation using the microscope camera (i.e. using the PC screen which is connected). To do this, the trinocular toggle rod on the righthand side of the microscope head must be pulled out. The light from the microscope lighting is deflected so that it is completely in the beam path for the camera, which causes a dark field of view in the eyepieces. This means that it is not possible to simultaneously observe by the eyepieces and PC screen.

For C-mount adapters, which have their own integrated magnification, the image which is shown on the camera connected to the device can often have a different level of focus compared with the image on the eyepiece. In order to be able to bring both images into focus, the focus can be adjusted by those adapters.

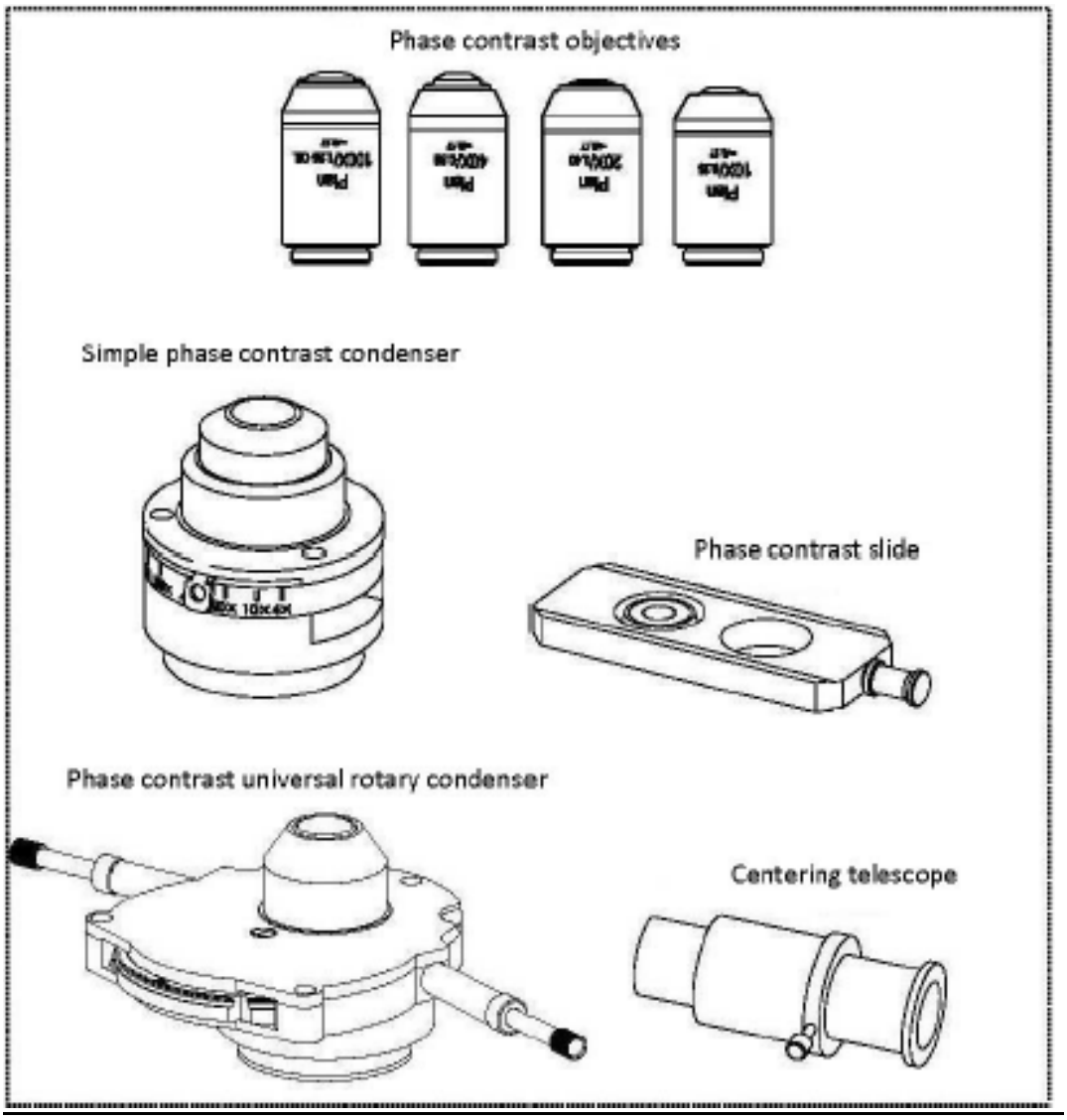
13.3 Dark field units

The following option is available for realizing dark field applications.

A special dark field condenser can be used in place of the standard condenser. This is a paraboloid construction and also meets the requirements of professional application fields, in contrast to a dark field attachment.

13.4 Phase contrast units

Basically, there are two different ways to enable the use of phase contrast methods. A simple and a more extensive method.



1. Simple phase contrast unit

   It consists of a simple PH condenser, a PH objective with a specific magnification (10x, 20x, 40x or 100x), a PH slider adapted to the objective included, a centering eyepiece and two green filters.
   To use it, replace the stand condenser of the microscope with the PH condenser. Any objective in the turret is also replaced by the PH objective and this is placed in the light path.
   The PH slider is pushed into the insertion point of the PH condenser with the surface labeled "TOP" facing upwards until it engages for the first time. In this first position, the phase ring of the PH slider is now in the beam path. If the aperture setting on the PH condenser is now set to "PH", the phase contrast application can begin. To return to the bright field application, the PH slider must be moved further

to the second click-in position. At this position there is no PH ring as at position 1, here the light beam can pass through the PH slider without being affected.

The PH lens has a PH ring in its lens system, just like the PH slider. These two rings must be matched to each other in terms of both their size and their positioning in the optical path. The position of the ring in the lens cannot be changed, whereas the position of the ring in the slider cannot. Although it is pre-centered, it may be necessary to re-center it after a certain period of use by means of three Allen screws on the side surfaces of the slider and the centering eyepiece.

Depending on the preferences of the observer, the use of a green filter can produce a more pleasant-looking image. To do this, it must be screwed onto the underside of the PH condenser.

2. Comprehensive phase contrast unit

This consists of a PH universal rotary condenser, four PH objectives (10x, 20x, 40x and 100x), a centring telescope, two centring turnscrews and a green filter. To use this, you need to replace the standard condenser of the microscope with the PH universal rotary condenser. The required objectives are also screwed into the nosepiece and one of these is positioned in the beam path. The two centring turnscrews can be fitted to the relevant points on the sides of the condenser using the screw connection on their spring retainer.
The condenser has a hub with six positioning options. Four of these are fitted with a phase ring, which matches only one specific objective magnification. When doing this you must note the marking on the rotary knob at the relevant position. The other two positions are intended for bright field applications.

A PH objective has a PH ring in its lens system, just like the individual positions of the PH universal rotary condenser. Due to their size on one hand and their positioning on the other, the two related rings must be aligned to one another in the beam path. The position of the ring in the objectives cannot be altered, that of the rings in the condenser disc however can be.

The adjustment procedure is as follows.

a. First adjust the microscope using bright field mode

b. Move the dial to the desired PH position (e.g. "10x").

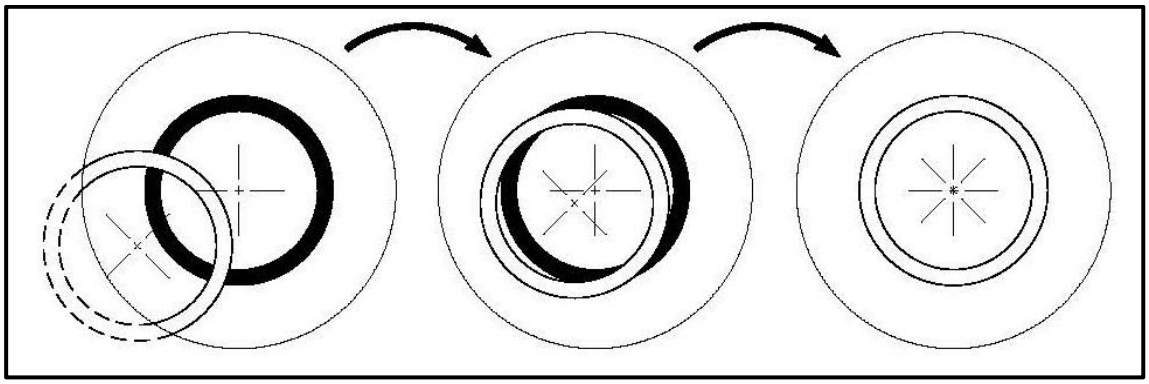
c. Open the aperture diaphragm on the condenser to the maximum (slide to the left).

d. Bring the corresponding PH objective (e.g. 10x) into the beam path.

a. Place the centring telescope onto one of the two tube connectors, in place of a standard eyepiece.

b. Undo the fixing screw of the centring telescope and pull out (move) the front part of the telescope, so that you can focus both phase rings in the field of view. You can also use the focus wheel of the condenser holder when doing this. Then retighten the screws.

In the field of view you will now see the image of a white (condenser) and a black (objective) ring. The black one is central and the white one possible is pushed to one side (*see left illustration*).



c. Now press the turnscrews fitted on the side of the condenser towards the centre until they grip the screws. Then by turning the screws and at the same time watching the rings through the centring telescope, move the white ring to the centre (*see central illustration*).

d. As soon as both the rings overlap each other (*see right illustration*) the adjustment is successfully completed and can also be carried out for the pairs of rings of the other magnifications.

e. After the adjustment, the centring telescope must be replaced by the standard eyepiece, so that you are able to observe the object on the angle table in phase contrast mode

Depending on the preferences of the user, using a green filter can produce a more effective and pleasant image. To achieve this, the green filter must be screwed onto the underside of the PH condenser.

14 Troubleshooting

Problem	Possible causes
Lamp does not burn	Mains plug not plugged in correctly
	No power available at the socket
	Lamp defective
	Fuse defective
Lamp burns out immediately	The prescribed lamp or fuse is not used
Field of vision is dark	Aperture diaphragm and/or field diaphragm are not open wide enough
	The beam path selector slider is set to "Camera"
	The condenser is not centered correctly
Brightness cannot be adjusted	The brightness control is set incorrectly
	The condenser was not centered correctly
	The condenser is lowered too far
Field of vision is dark or not correct illuminated	The lens was not swiveled in correctly
	The beam path selector slide is in an intermediate position
	The object turret is not mounted correctly
	The condenser is not fitted correctly
	A lens is used that does not match the illumination range of the condenser
	The condenser was not centered correctly
	The luminous field diaphragm is closed too far
	The lamp is not mounted correctly
The field of vision of one eye does not match that of the other eye	The interpupillary distance is not set correctly
	The diopter setting was not made correctly
	Different eyepieces are used on the right and left
	The eyes are not used to microscopy

Problem	Possible causes
Blurred details Bad picture Poor contrast Vignetted field of view	Aperture diaphragm is not open wide enough
	Condenser is lowered too far
	The objective does not belong to this microscope
	The front lens of the lens is dirty
	An immersion lens is used without immersion oil
	The immersion oil contains air bubbles
	The condenser is not centered
	The recommended immersion oil is not used
	Dirt / dust on the lens
	Dirt / dust on the front lens of the condenser
Dirt or dust in the field of vision	Dirt / dust on the eyepieces
	Dirt / dust on the front lens of the Condensers
	Dirt / dust on the object
One side of the image is blurred	The table was not assembled correctly
	The lens is not correctly swiveled into the beam path
	The nosepiece is not mounted correctly
	The object rests with the top side facing down.
The picture flickers	The nosepiece is not correct mounted
	The lens is not mounted correctly swiveled into the beam path
	The condenser was not installed correctly centered
The coarse drive is difficult to turn	The adjusting wheel/torque is too Tightened
	The cross table is operated by a Solid body blocked.
The table moves down by itself The fine adjustment drive adjusts itself	The adjusting wheel/torque is not tightened enough

Touching the table blurs the image	The table was not assembled correctly

15 Service

If, despite studying these operating instructions, you still have questions about commissioning or operation, or if, contrary to expectations, a problem should occur, please contact your specialist dealer. The device may only be opened by trained service technicians authorized by KERN.

16 Power supply

16.1 Mains connection

The microscope may only be connected to the mains if the information on the microscope (sticker) and the local mains voltage are identical.

Important:

- Check the mains cable for damage before commissioning
- Ensure that the power supply unit does not come into contact with liquids
- The mains plug must be accessible at all times.

17 Maintenance, servicing and disposal

Disconnect the appliance from the power supply before carrying out any maintenance, cleaning or repair work.

17.1 Cleaning

The appliance must always be kept clean and regularly freed from dust.
Before wiping the appliance when wet, make sure that the power is switched off.

Glass components should preferably be wiped lightly with a lint-free cloth if they become dirty.

To wipe oil stains or fingerprints from lens surfaces, the lint-free cloth is moistened with a mixture of ether and alcohol (70/30 ratio) and then cleaned

Ether and alcohol must always be handled with care as they are highly flammable substances. It is therefore essential to keep them away from naked flames and electrical appliances that are switched on and off and only use them in well-ventilated rooms.

However, organic solutions of this type should not be used to clean other components of the appliance. This could cause changes to the paintwork. It is sufficient to use a neutral cleaning agent for this purpose.

Other cleaning agents for the optical components include

- Special cleaner for optical lenses
- Special optical cleaning cloths
- Bellows
- Brush

If handled correctly and checked regularly, the microscope will function smoothly for many years.

17.2 Maintenance and repair

Do not make any changes to the device and do not install any spare parts. Contact the manufacturer for repair or device inspection.

17.3 Waste disposal

Old appliances and accessories must not be disposed of with household waste.

The operator must dispose of the packaging and the device at the place of use in accordance with the applicable national or regional legislation The device consists of various components and materials, such as

- Electronic components (printed circuit boards, electrical cables
- Plastic (housing)
- Metal

Improper disposal of the appliance can have harmful effects on people and the environment.

Proper and environmentally friendly disposal can prevent harmful effects and recover raw materials.

18 Further information

The illustrations may differ slightly from the product.

The descriptions and illustrations in these operating instructions are subject to change without notice. Further developments to the device may result in such changes.

All language versions include a non-binding translation. The original German document is binding.