Metallurgical Inverted Microscope

OLM 1

OLM 171

PROFESSIONAL MEASURING

english version

Operating Instructions Metallurgical Inverted Microscope

Version 1.1
2025-09
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KERN OPTICS

English

KERN Optics OLM 1

Metallurgical Inverted Microscope

Operating Instructions Metallurgical Inverted Microscope

Version 1.1 2025-09 English

Table of contents:

1 Technical data ... 3
2 Declaration of conformity ... 4
3 Overview of the device ... 5
3.1 Nomenclature ... 5
4 Before use ... 8
4.1 General information ... 8
5 Basic information (general) ... 9
5.1 General information on warnings ... 9
5.2 Intended use ... 10
5.3 Improper use ... 10
5.4 Warranty ... 10
6 Basic warnings and safety instructions ... 11
6.1 Observe the notes in the operating instructions ... 11
6.2 Staff training ... 11
6.3 Security ... 11
7 Transportation and storage ... 14
7.1 Note ... 14
7.2 Transportation ... 14
7.3 Storage ... 14
7.4 Packaging/return transportation ... 14
8 Unpacking and commissioning ... 15
8.1 Unpacking ... 15
9 Assembly ... 16
9.1 Reflected light unit ... 17
9.2 Objectives ... 18
9.3 Eyepieces ... 19
9.4 Specimen stage ... 19
10 Operation ... 20
10.1 Getting started ... 20
10.2 (Pre-)focusing ... 21
10.3 Adjusting the interpupillary distance ... 22
10.4 Diopter compensation ... 22
10.5 Adjusting the magnification ... 23
10.6 Use of the eyecups ... 24
10.7 Adjusting the illumination ... 25
11 Changing the bulb ... 26
12 Changing the fuse ... 27
13 Using optional accessories ... 28
13.1 Camera connection ... 28
14 Troubleshooting ... 29
15 Service ... 32

16 Power supply 33
16.1 Mains connection 33
17 Maintenance, servicing, and disposal 34
17.1 Cleaning 34
17.2 Maintenance , and repair 34
17.3 Waste disposal 35
18 Further information 36

1 Technical data

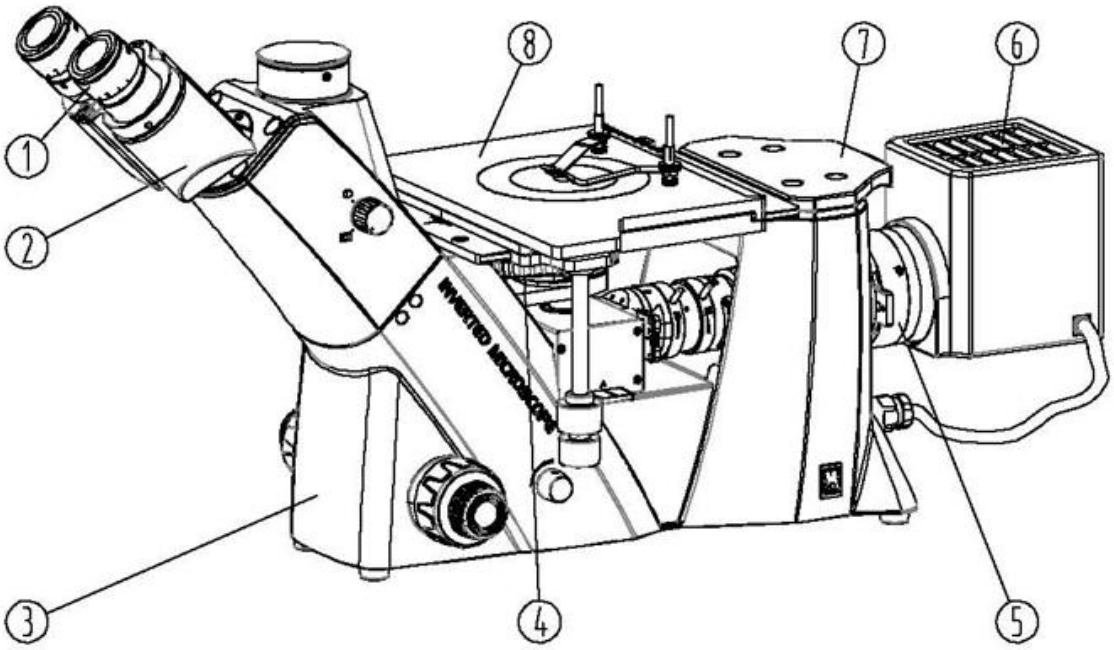
Kern model	OLM 171
Item number/type	TOLM 171-A
Dimensions (WxDxH)	747x271x379 mm
Tubus type	Trinocular
Optical system	Infinity
Revolving nosepiece screw-in positions	4
Lens quality	Infinity Plan
Standard objectives	5x 10x 20x 50x
Eyepiece field width	HWF
Illuminance	50W
Type of lighting	Halogen
Lighting equipment	Incident light
Condenser type	Standard
Input voltage Power supply / current [max]	100–240 V 50/60Hz
Input voltage device / current [max]	100–240V
Power supply type	Cold device cable
Focusing mechanism	Coaxial coarse and fine drive
Packaging dimensions	660x610x350 mm
Net weight	13 kg
Gross weight	17 kg

2 Declaration of conformity

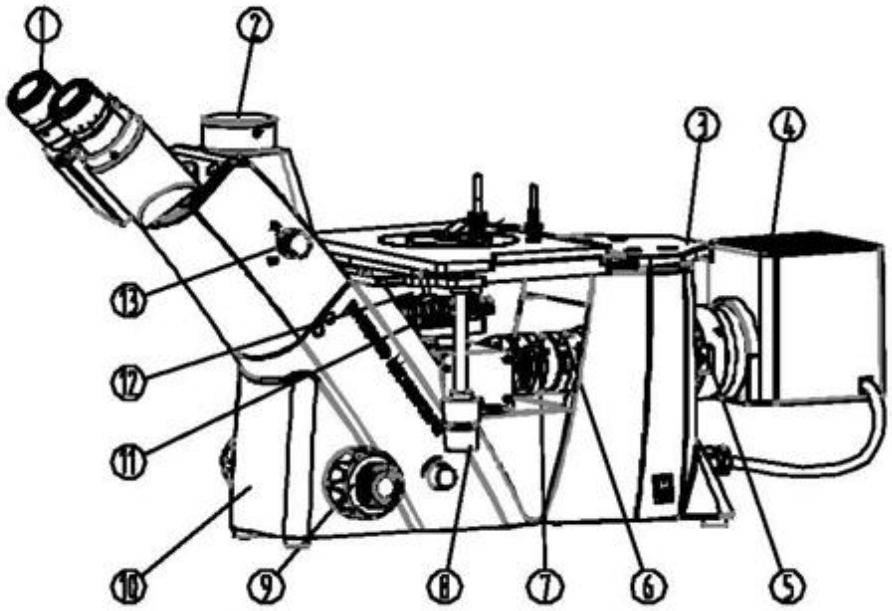
The current EC/EU declaration of conformity can be found online at:
https://www.kern-sohn.com/shop/de/DOWNLOADS/

3 Overview of the device

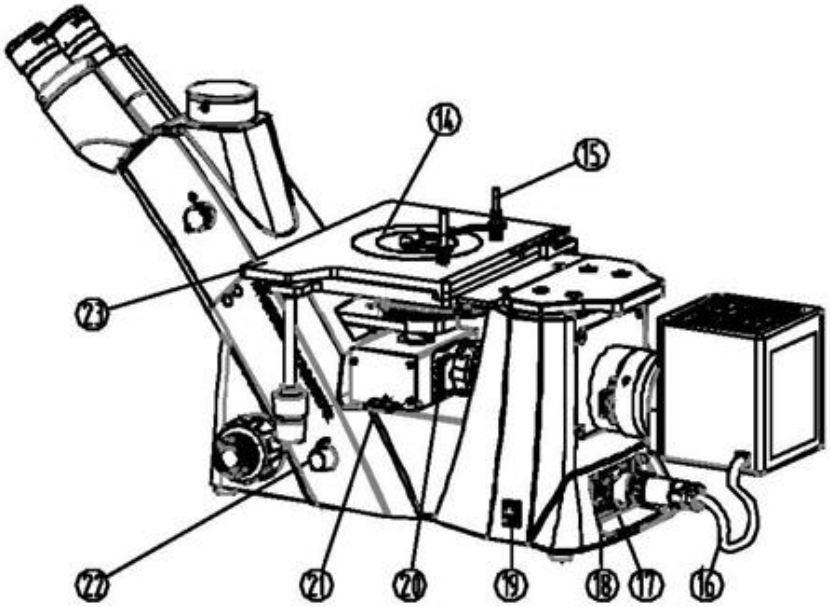
3.1 Nomenclature



	Description
1	Eyepiece
2	Microscope head
3	Housing
4	Nosepiece
5	Reflected light Illumination
6	Lamp housing
7	Carrier handle
8	Specimen stage



	Description
1	Eyepiece
2	Trinocular connection
3	Carrier handle
4	Lamp housing
5	Filter slide
6	Lever for aperture diaphragm
7	Lever for field diaphragm
8	Control dial specimen stage
9	Coarse and fine adjustment
10	Housing
11	Nosepiece
12	Objectives
13	Trinocular toggle wheel



	Description
14	Stage plate
15	Object holder
16	Power cable for illumination
17	Socket
18	Fuse housing
19	Main switch
20	Polarizer slide
21	Analyzer slide
22	Dimmer
23	Specimen stage

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 this warning will result in serious injury, permanent disability (e.g., loss of a limb), or death of the user or third parties.
WARNING	Failure to observe this warning may result in serious injury, permanent disability (e.g., loss of a limb), or death of the user or third parties.
CAUTION	Failure to observe this warning may result in minor injury or temporary impairment to the user or third parties (e.g., minor cuts).
NOTE	Failure to observe this warning may result in property damage.

Symbols in warning notices :

Symbol	Meaning
Warning signs	Warning signs warn you of hazards that could potentially cause personal injury. The symbol indicates the type of hazard.
	Indicates general hazards or a hazardous location
	Warning of electrical voltage
	Warning of optical radiation
	Indicates electrostatic sensitive equipment

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

5.2 Intended use

The OLM 171 is versatile and is mainly used for analyzing opaque and thick specimens, workpieces (surface, fracture edge, coating).

5.3 Improper use

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

5.4 Warranty

The guarantee expires in the event of

- 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 device.

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..

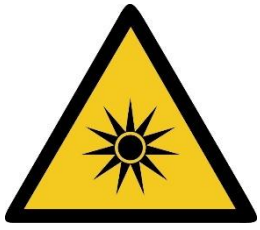
6.3 Security

⚠ 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 device 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

⚠ 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 device is not a toy and should be kept out of the reach of children. ● This device can be dangerous if used improperly or for purposes other than those intended by untrained persons! Observe the personnel qualifications!

⚠ WARNING	
	**Electrostatically sensitive device!** ● The device can be destroyed by electrostatic discharge. Connectors for RF signals are particularly at risk. ● Please observe the handling instructions for electrostatic-sensitive components.

⚠ 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 damage to the device, do not expose it to extreme temperatures, extreme humidity, or moisture.
● Do not use harsh cleaners, abrasives, or solvents to clean the device.

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, transporting, or storing the microscope components. To prevent damage from vibrations, all movable 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 provided. 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, should preferably be stored in a dry 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 observe the instructions in the chapter "Packaging/return transportation

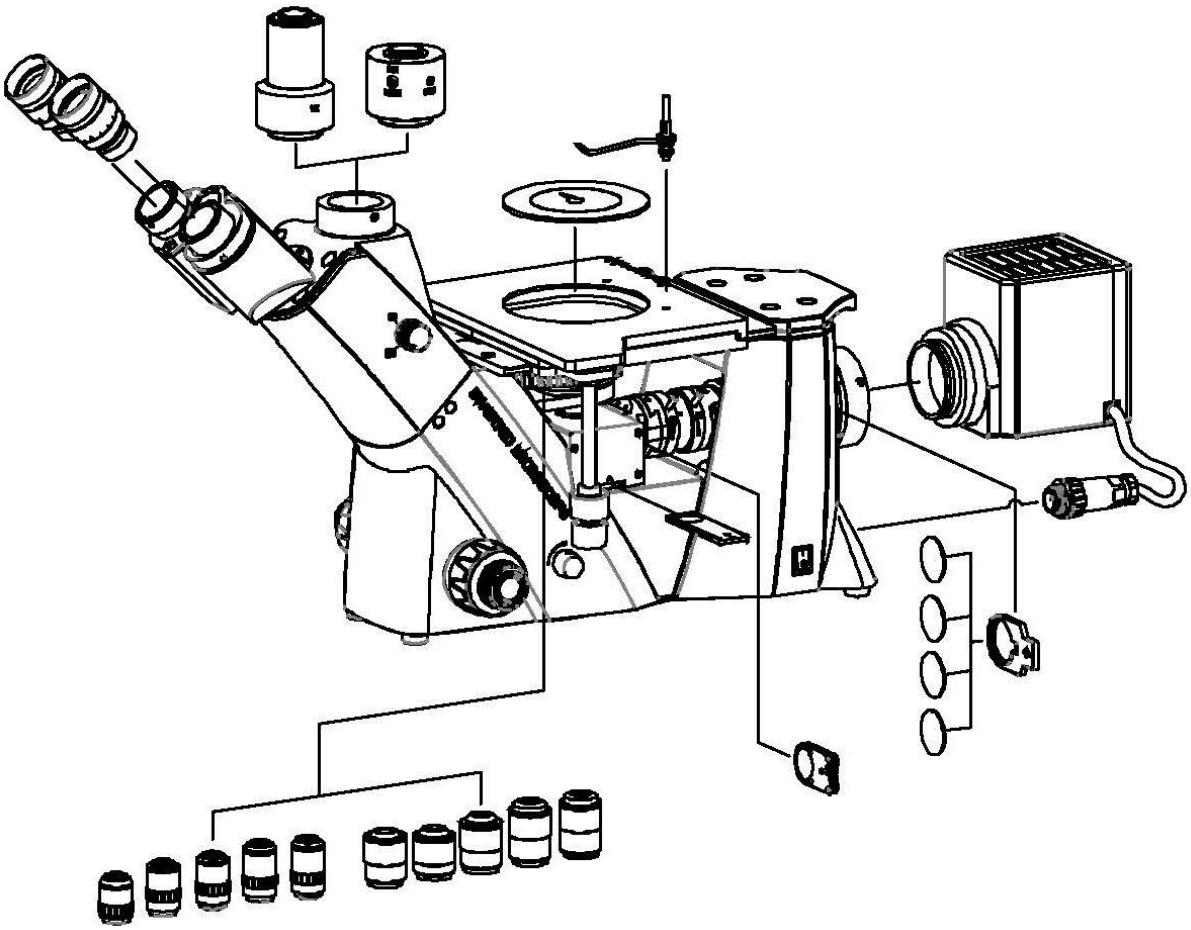
---

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.

Initial commissioning

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

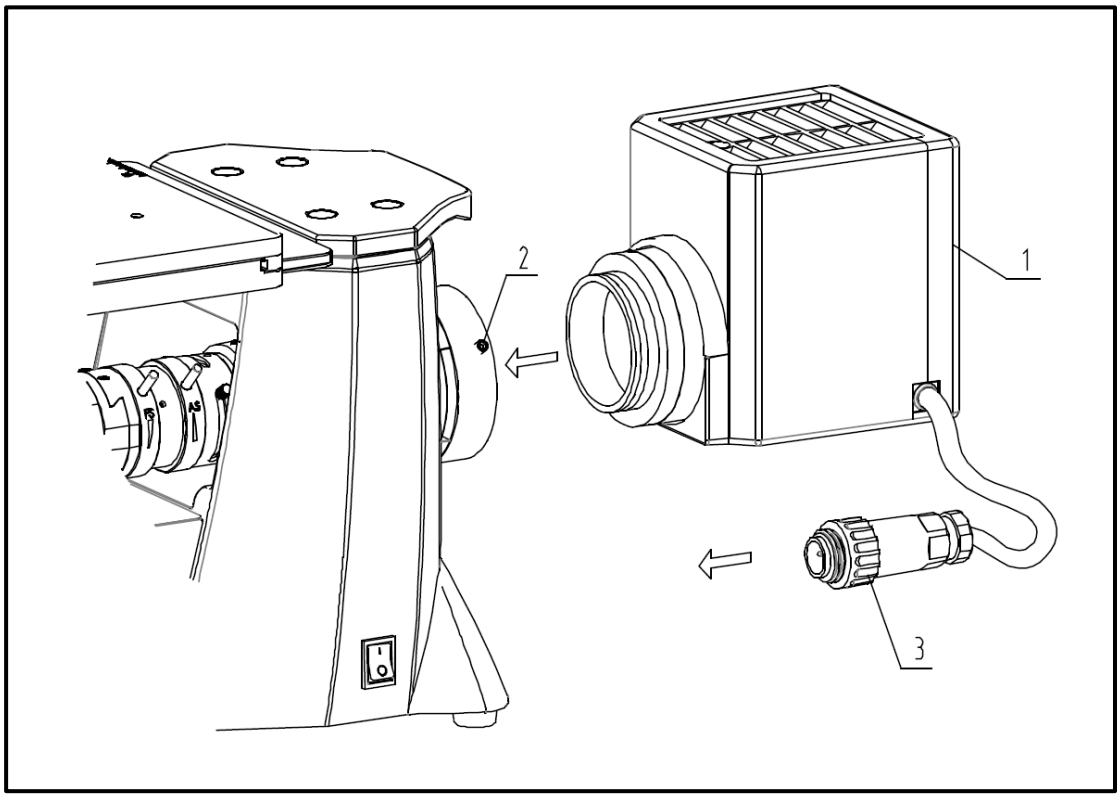
9 Assembly



9.1 Reflected light unit

At first you have to unite the lamp housing [1] and the reflected light unit on their connection points. After that the connection has to be fixated by two Allen screws, which are attached to the connection point [2]. 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.

Afterwards you must establish the electrical connection between the lamp housing and the integrated power supply unit of the microscope. The plug of the connection cable [3] has to be installed to the according socket on the rear of the microscope housing. Please do also use the screw lock on the plug.



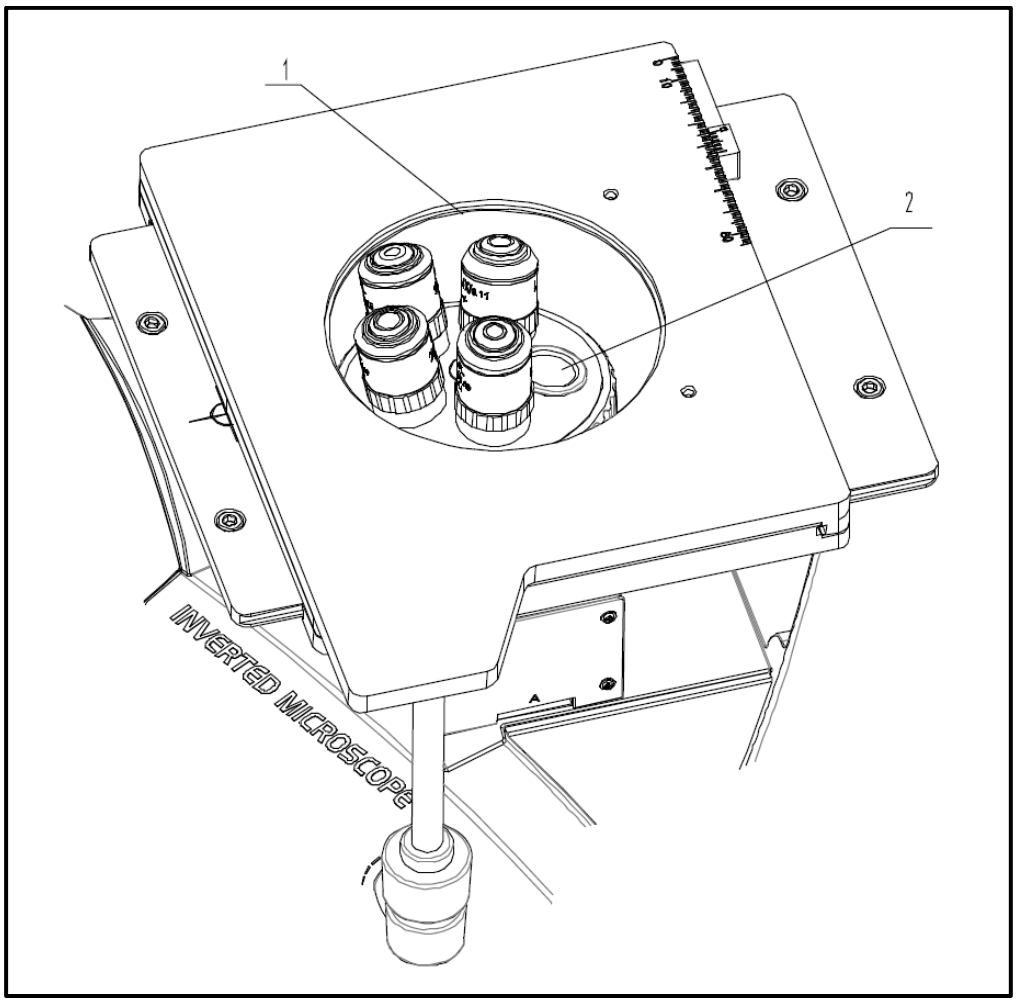
The analyzer, polarizer, and color filter sliders can now be inserted into the appropriate slots.

See chapter3.1 :

Analyzer slider / *bears the inscription "A"*: **21)**
Polarizer slider / *bears the inscription "P"*: **20)**
Color filter slider / *the supplied blue filter needs to be previously inserted*: **5)**

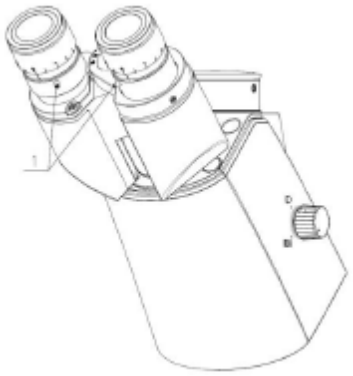
9.2 Objectives

The nosepiece must be in its lowest position so that the objectives [1] can be screwed into it. You can then pass the objectives through the opening of the specimen stage and screw them 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.
To the screw locations which are not filled with an objective [2], you must attach the protective cap.



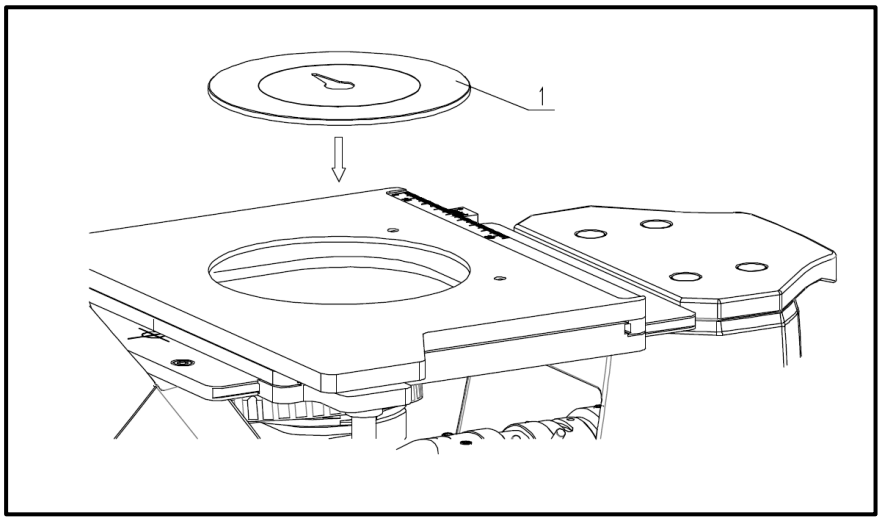
9.3 Eyepieces

You must always use eyepieces with the same magnification for both eyes. These are simply placed onto the tube connectors, once you have first removed the plastic protective caps. There is a way of fixing them by an Allen screw [1] for each eyepiece that is located on the tube connector (see illustration). You should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.



9.4 Specimen stage

The supplied stage plate [1] needs to be fitted to the opening of the specimen stage, in order to get a support area for relatively small observation objects and to protect the objectives which are located underneath.
Furthermore you can attach an object holder to one of the threads on stage surface.



For information on connecting a microscope camera, see chapter 13 Use of optional accessories.

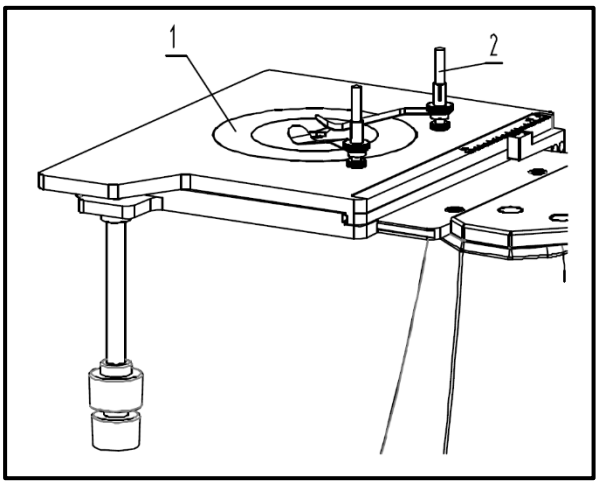
10 Operation

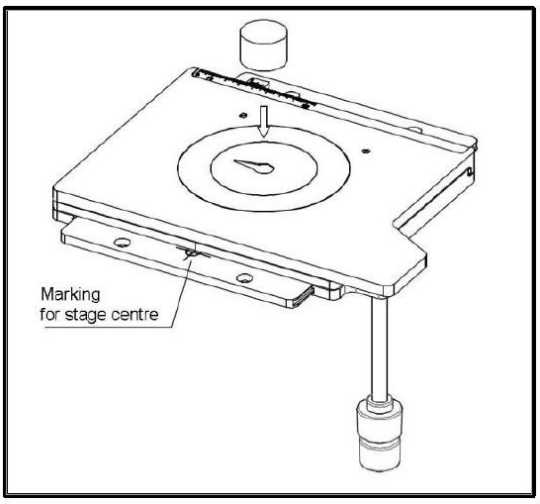
10.1 Getting started

The very first step is to establish a power connection using the mains plug. You should first adjust the dimmer to a low level, so that when you look through the eyepiece for the first time, your eyes are not immediately subject to a high level of light. You can now switch on the lighting using the main switch.

The next step is to place a sample on the specimen stage (see left illustration [1]). For the models of the OLM-1 series you can fixate the samples on the stage with help of the object holder.

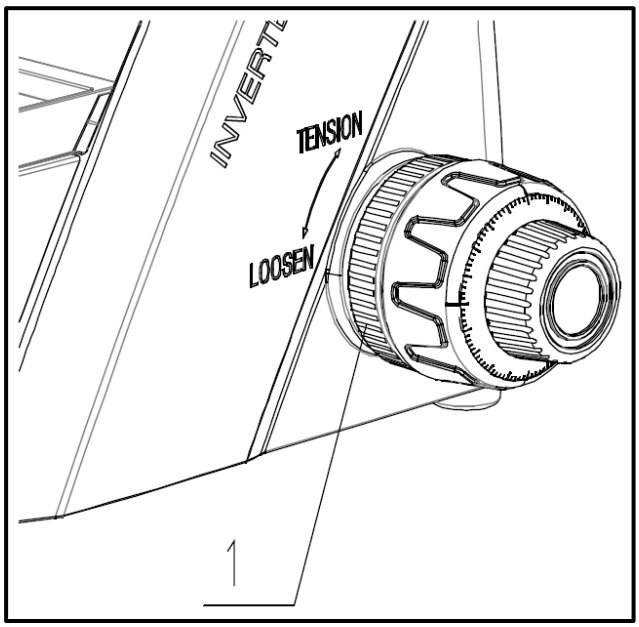
To move the part to be observed of the sample into the beam path, you must use the adjustment wheels on the right of the specimen stage. For centre-adjusting the specimen stage you can take the according markings on the side of the stage as points of reference (see right illustration).





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.



The easiest way to do this would be to move the stage (also using the coarse adjustment knob) to just below the objective lens and then slowly lower it. As soon as an image (regardless of how sharp) can be seen, the correct focus should be set using only the fine adjustment knob.

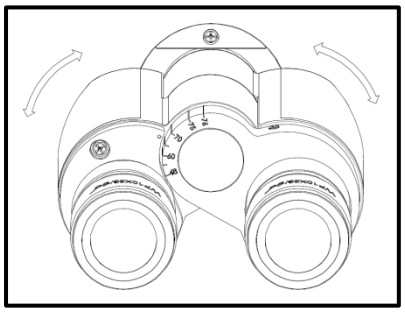
Torque adjustment of coarse and fine adjustment knobs

Next to the left adjustment wheels of the coarse and fine drive is a ring that can be used to change the torque of these wheels. Turning clockwise reduces the torque and turning counterclockwise increases it.
This function can be used to facilitate the focus adjustment and to prevent the object stage from slipping down unintentionally.

Important

In order to avoid damaging to the focusing 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 Diopter compensation

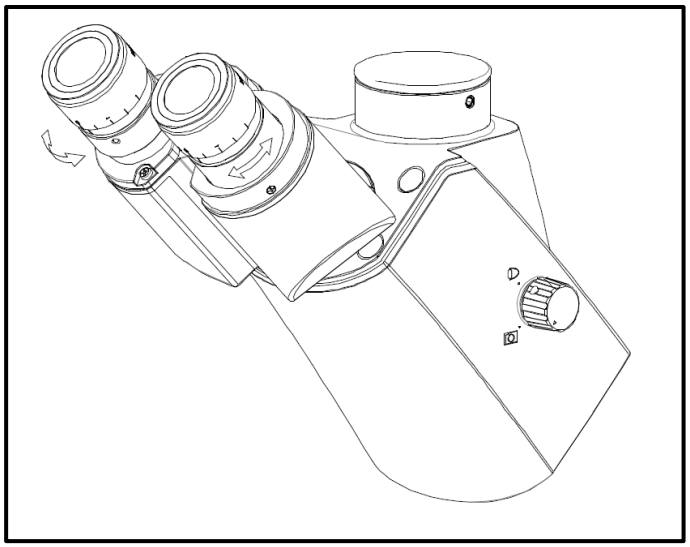
The visual acuity of the eyes of a person using the microscope can very often show minor differences, which have no consequences in everyday life but can cause problems with exact focusing when using a microscope.

This difference can be compensated for using a mechanism on the two tube connectors (diopter adjustment rings) as follows.

1. Set the right diopter adjustment ring to position 0.

2. Look through the right eyepiece with your right eye and focus the image using the coarse and fine adjustment knob.

3. 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 the both directions (see illustration), to find out where the image is at its most focused.



10.5 Adjusting the magnification

After pre-focusing has carried out using the objective with the lowest magnification (*see section 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 black ring below the objectives.

- 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 stage plate. 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 nosepiece 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, the object will be slightly out of focus. Use the fine adjustment knob to make a slight adjustment and restore the focus.

10.6 Use of 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 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 diopter setting is not moved. We would therefore advise that you hold the diopter 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
(identified by the eyeglass symbol)

10.7 Adjusting the 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 optimized.
The following components of the reflected light unit can be adjusted according to the application requirements.

Field diaphragm and aperture diaphragm
(*see chapter 3.1*)

The field diaphragm is responsible for the optimum illumination of the field of view. It is able to reduce undesired stray light.
The aperture diaphragm is used to find the very best compromise between contrast and resolution for the microscopic image.
To open and close these diaphragms you have to operate the levers located at the top of the reflected light unit.

Color filter
(*see chapter 3.1*)

The color filter slider has one round aperture. If needed, the supplied blue filter has to be inserted into this aperture. Subsequently the filter slide must be put into the slot on the connection point between the reflected light unit and the lamp housing

Polarization unit (analyzer/polarizer)
(*see chapter 3.1*)

The OLM 171 offers the option of using the contrast method of polarized light. The analyzer and polarizer (both components are included) are used for this purpose.

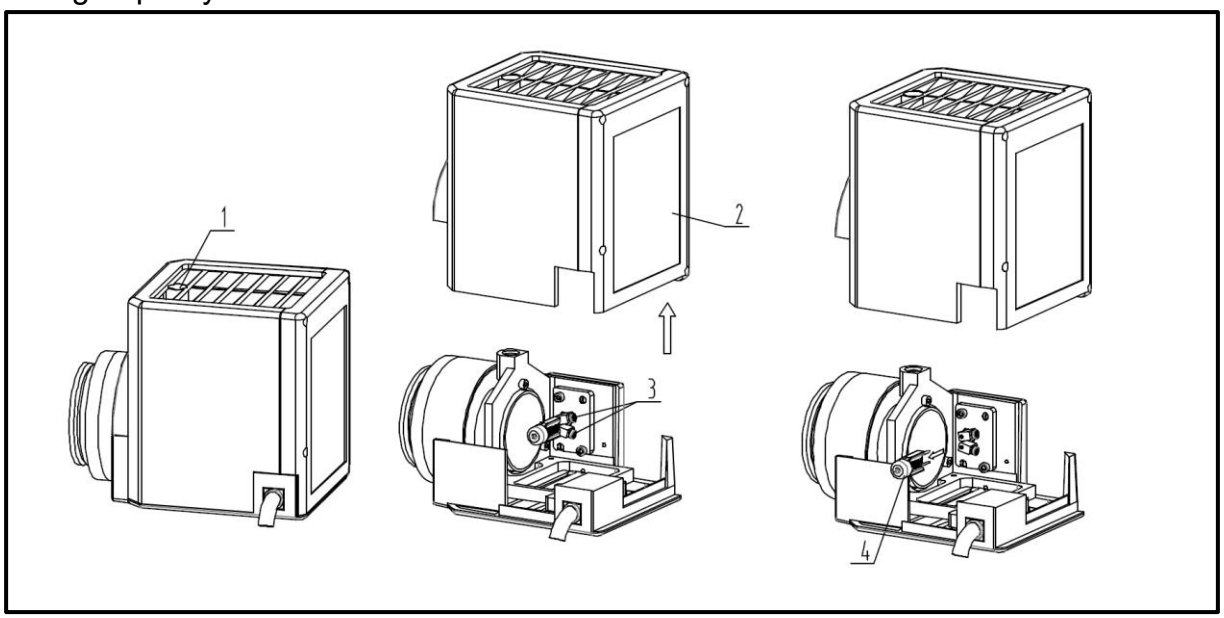
To insert the analyzer into the beam path, the analyzer slider must be inserted into the slot below the nosepiece. Both the slider and the slot are marked with the letter "A."

The insertion point for the polarizer slider is located next to the aperture and field diaphragm. Both the slider and the insertion point are marked with the letter "P." After attachment, the integrated rotary wheel on the polarizer slider points outward. This can be used to set the desired orientation of the polarizer.

11 Changing the bulb

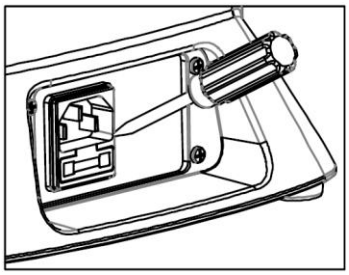
You must not attempt to change the bulb immediately after the microscope has been used, as the bulb will still be hot and so there is a risk that the user could be burnt. Before changing the bulb the device must be switched off and unplugged.
To change the bulb the cover of the lamp housing [2] needs to be removed. Therefore you previously have to loosen the appropriate Allen screw [1]. Now the defective bulb can be pulled out of the socket and be replaced with a new one [4]. We recommend that here you should also test again, to check that heat is no longer being produced. After the cover has been reattached and fixated, the bulb replacement procedure is complete.

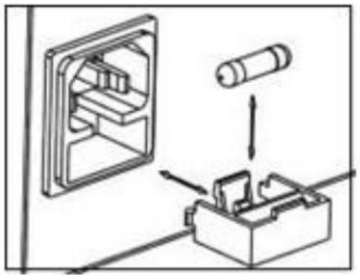
Important:
When fitting the new bulb into the socket, it must only be handled with sterile gloves or using the bulb packaging film. Grease and dust residue can have a negative effect on the light quality and service life.

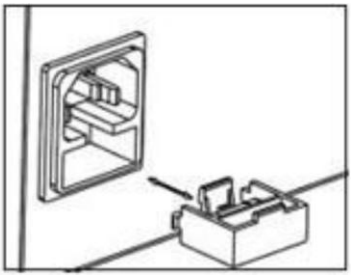


12 Changing the fuse

The fuse housing is on the rear of the microscope below the mains power supply socket. With the device switched off and unplugged, you can pull out the housing. When doing this, it is helpful to use a screwdriver or similar tool (see left illustration). The defective fuse can be removed from its housing and be replaced with a new one (see middle illustration).
After that, you just need to insert the fuse housing back into the insertion point below the mains power supply socket (see right illustration).







13 Using optional accessories

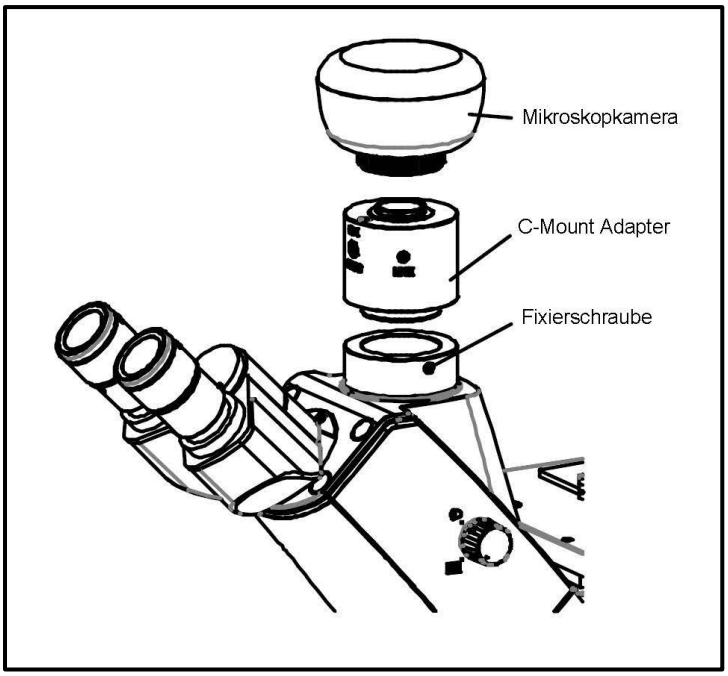
13.1 Camera connection

The trinocular tube allows microscope cameras to be connected to the device in order to digitally document images or sequences of an observation object.

After removing the plastic cover on the camera adapter connection at the top of the microscope head, a suitable adapter must first be attached to it.
There are generally two C-mount adapters available for this purpose (1x and 0.5x magnification). After attaching one of these adapters, it can be secured with the locking screw. A camera with a C-mount thread is now screwed onto the 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 wheel on the righthand side of the microscope head must be set to the position “Camera”. 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.



14 Troubleshooting

Problem	Possible causes
The bulb does not light	The mains plug is not correctly plugged in
	There is no power at the socket
	Defective bulb
	Defective fuse
The bulb blows immediately	The specified bulb or fuse has not been used
The field of view is dark	The aperture diaphragm and/or field diaphragm are not opened wide enough
	The selector switch for the beam path is set to “Camera”
	The condenser is not correctly centred
You cannot adjust the brightness	The brightness control has been set incorrectly
	The condenser has not been correctly centred
	The condenser is too low
The field of view is dark or is not correctly illuminated	The objective is not positioned correctly on the beam path
	The selector switch for the beam path is between two settings
	The nosepiece is not correctly fitted
	The condenser is not correctly fitted
	An objective is being used which doesn’t match the lighting area of the condenser
	The condenser has not been correctly centred
	The field diaphragm is closed too tightly
	The bulb is not correctly fitted
The field of view of one eye does not match that of the other eye	The interpupillary distance is not correctly adjusted
	Dioptre setting has not been carried out correctly
	Different eyepieces are used for the righthand and lefthand side
	The eyes are not used to using a microscope

Problem	Possible causes
Blurred details Bad image Bad contrast Vignetted field of view	The aperture diaphragm is not opened wide enough
	The condenser is too low
	The objective does not belong to this microscope
	The front lens of the objective is dirty
	An immersion object has been used without immersion oil
	The immersion oil contains air bubbles
	The condenser is not correctly centred
	The recommended immersion oil has not been used
	Dirt / dust on the objective
	Dirt /dust on the front lens of the condenser
Dirt or dust in the field of view	Dirt / dust on the eyepieces
	Dirt / dust on the front lens of the condenser
	Dirt / dust on the object
One side of the image is blurred	The stage was not correctly fitted
	The objective is not positioned correctly on the beam path
	The nosepiece is not correctly fitted
	The upper side of the object is facing down
The image flickers	The nosepiece is not correctly fitted
	The objective is not positioned correctly on the beam path
	The condenser has not been correctly centred
The coarse adjustment knob is difficult to turn	The rotational resistance brake is too tight
	The angle table is blocked by a solid body
The stage moves down on its own The fine adjustment knob moves on its own	The rotational resistance brake is not tight enough

When you move the table, the image becomes blurred	The stage was not correctly fitted

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 power supply if the information on the microscope (sticker) and the local mains voltage are identical.

Important:

- Check the power cord for damage before use
- 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 performing 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 it gets 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 modifications to the device or install 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 this user manual 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.