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User instructions
Polarisation microscope

KERN OPE-1

OPE 118

Version 1.0
01/2016

GB

KERN OBE-1

Version 1.0 01/2016

User instructions

Transmitted light microscope

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1 Before use

1.1 General notes

You must open the packaging carefully, to make sure that none of the accessories in the packaging fall on the floor and get broken.

In general, microscopes should always be handled carefully because they are sensitive precision instruments. When using or transporting the microscope it is particularly important to avoid abrupt movements, as this may damage the optical components.

You should also avoid getting dirt or finger prints on the lens surface, because in most cases this will reduce image clarity.

To maintain the performance of the microscope, it must never be disassembled. So components such as lenses and other optical elements should be left as they were before use. Also the electrical parts on the rear and base of the device must not be tampered with, as in this area there is an additional risk of triggering an electric shock.

1.2 Notes on the electrical system

Before connecting to a mains power supply, you must make sure that you are using the correct input voltage. The information to select the correct mains cable is located on the device, on the rear of the product directly above the connection socket. You must comply with this information. If you do not comply with these specifications, then fires or other damage to the device could occur.

The main switch must also be switched off before the mains cable is connected. In this way you will avoid triggering an electric shock.

If you are using an extension cable, then the mains cable you use must be earthed.

If the original fuse should blow, it must only be replaced by an appropriate fuse. Suitable replacement fuses are included with the delivery.

When carrying out any procedures whereby you come into contact with the electrical system of the device, such as, for example, changing the bulb or fuse, only carry out these procedures when the power is disconnected.

1.3 Storage

You should ensure that the device is not exposed to direct sunlight, temperatures which are too high or too low, vibrations, dust or a high level of humidity.

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

The device should always be located on a rigid, smooth, horizontal surface.

When the microscope is not being used, you should cover it with the enclosed dust protective cover. When doing this, the power supply is stopped by switching off at the main switch and unplugging the mains cable. If the eyepieces are being stored separately, the protective caps must be fitted to the tube connectors. In most cases, if dust and dirt gets inside the optical unit of a microscope this can cause irreversible errors or damage.

The best way to store accessories which consist of optical elements, such as, for example, eyepieces and objectives, is in a dry box with desiccant.

1.4 Maintenance and cleaning

In any event, the device must be kept clean and dusted regularly.
If any moisture should be occur, before you wipe down the device you must ensure that the mains power is switched off.

When glass components become dirty, the best way to clean them is to wipe them gently with a lint-free cloth.

To wipe oil stains or finger prints off the lens surface, moisten the lint free cloth with a mixture of ether and alcohol (70 / 30 ratio) and use this to clean the lens.

You must be careful when handling ether and alcohol, as these are highly flammable substances. You must therefore keep it away from naked flames and electrical devices which can be switched on and off, and only use it in well-ventilated rooms.

However organic solutions of this type should not be used to clean other components of the device. This could lead to damage to the paint finish. To do this, it is sufficient to use a neutral cleaning product.

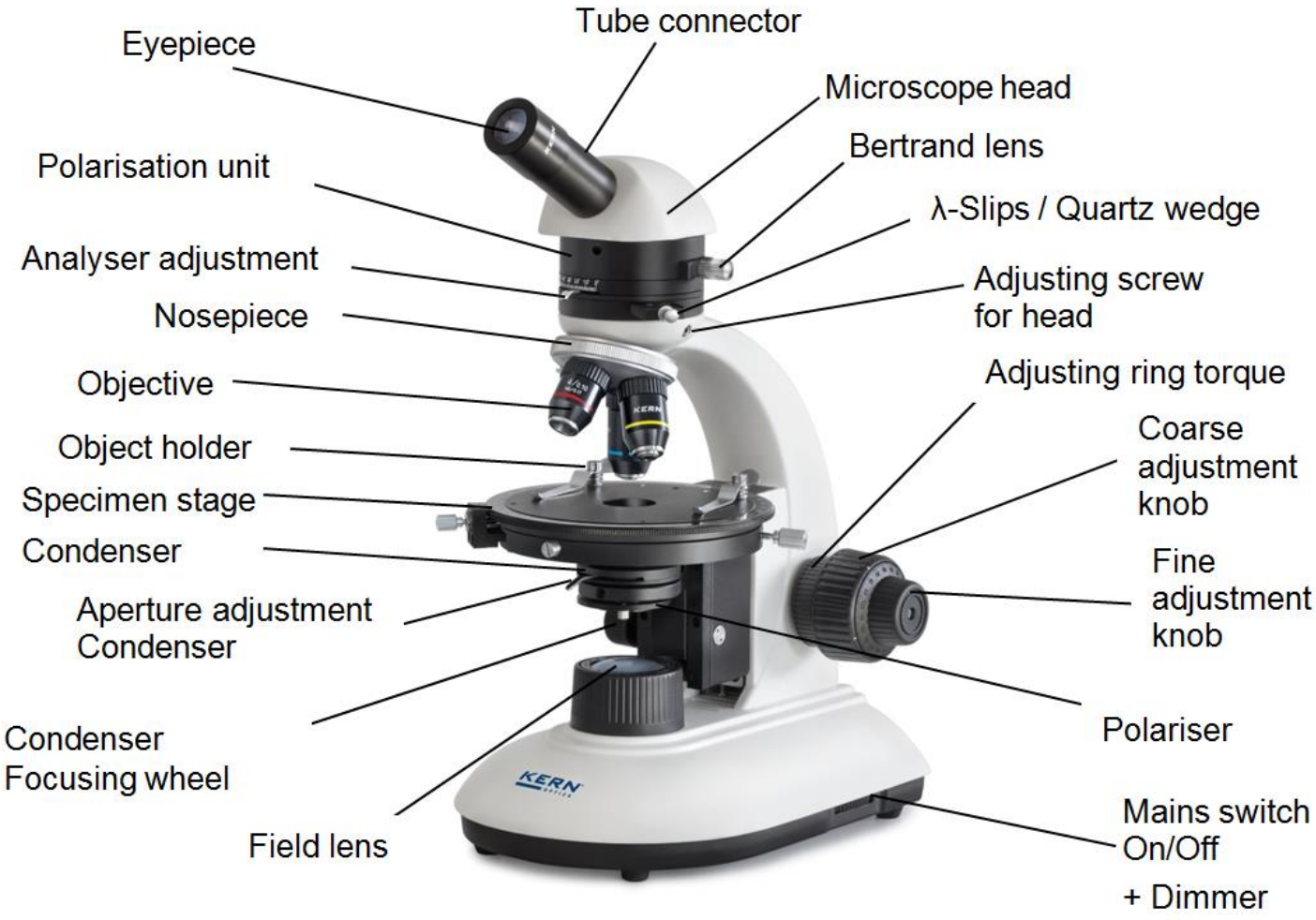
You could also use the following cleaning products to clean the optical components:

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

When handled correctly and checked regularly, the microscope should give many years of efficient service.

Should repairs still be necessary, please contact your KERN dealer or our Technical Department.

2 Nomenclature



3 Technical data / Features

Model KERN	Standard configuration				
	Optical system	**Tube**	**Eye pieces**	**Objectives**	**Illumination**
OPE 118	Finite	Monocular	WF 10x / Ø 18 mm	Achromatic 4x/10x/40x	6V / 20W Halogen (Transmitted)

Product dimensions: 360x200x400 mm

Packaging dimensions: 440x340x240 mm

Net weight: 5,5 kg

Gross weight: 6 kg

Input voltage: AC 100-240V, 50-60Hz

Output voltage: DC 1,2-6V

Fuse: 2A 5x20mm

Model outfit		Model KERN	Order number	
		OPE 118		
Eyepieces	WF 10x / Ø 18 mm (reticule 0,1mm) (non-adjustable)	●	OBB-A1349	
	WF 16x / Ø 13 mm	o	OBB-A1354	
Non-stress achromatic objectives	4x / 0,10	●	OBB-A1280	
	10x / 0,25	●	OBB-A1278	
	40x / 0,66 (spring)	●	OBB-A1281	
	20x / 0,40	o	OBB-A1279	
	60x / 0,80 (spring)	o	OBB-A1282	
Monocular tube	30° inclined, 360° rotatable	●	OBB-A1227	
Nosepiece	Quadplex	●		
Analyser unit	0 – 90°, can be moved out of the optical path for single polarising observe	●	OBB-A1118	
Bertrand lens	Can be moved out of the optical path	●	OBB-A1120	
λ + ¼ λ Slip	λ Slip and ¼ λ Slip (combination)	●	OBB-A1316	
Quartz wedge	I – IV class	o	OBB-A1320	
Revolving round stage	360° rotatable, division 1°, Vernier division 6', lockable	●		
Polarising attached mechanical stage	Polarising attached mechanical stage	o	OBB-A1337	
Condenser	Abbe N.A. 1,25 (aperture diaphragm)	●	OBB-A1101	
Polarising unit	Can be moved out of the optical path	●	OBB-A1285	
Filter	Blue	●	OBB-A1173	
Illumination	6V / 20W Halogen spare bulb (transmitting)	●	OBB-A1370	

● = Standard configuration o = Option

4 Assembly

4.1 Polarisation unit + Microscope head

Inside the packaging the microscope head is already mounted but inclined towards the rear. At first it must be removed by loosening the fixing screw on the connection point of the tube and then taking it off from the connection point.
Instead of the head now the polarisation unit can be attached and fixed by the fixing screw.
Thereby the unit can only be aligned in a certain position.
This ensures a pin, attached on the bottom side of the unit. This pin needs to be inserted into the according socket on the rear of the connection point.
After that, the head is fitted onto the top of the connection point of the polarisation unit and fixed by three fixing screws.
Preferably the head needs to be aligned in a way of pointing centrally towards the front.
You should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.
The Bertrand lens and the analyser are inherent parts of the polarization unit. The Lambda slip however, needs to be mounted additionally.
Please also see section 5.6 Adjusting the polarization unit.

4.2 Objectives

All three objectives are already mounted to the nosepiece. After removing the protective foil they are ready for use. They are ranged in such a way that if you turn the nosepiece clockwise, the objective with the next higher magnification appears. When the objectives need to be dismounted, you should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.

4.3 Eyepieces

The eyepiece is simply placed onto the tube connectors, when the protective cover is removed before. There is no possibility of fixating the eyepiece. You should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.

4.4 Colour filter

Standardly the microscopes of the OPE-1 series are equipped with a blue colour filter. This filter is firmly connected to a holding ring an you can simply put it onto the housing of the field lens in case of usage.

4.5 Condenser + Polariser

The condenser is firmly fixed onto a holding ring (condenser holder) underneath the microscope stage. The lever for the aperture diaphragm is directed towards the front. There is the ability to adjust the height of the condenser, but not to centre it.
Right beneath the condenser the polariser is attached. According to the application requirements it can be swung in or out of the beam path.
We recommend that you use the course adjustment knob to bring the specimen stage to its uppermost position when you need to remove the condenser. Then use the focus dial of the condenser to move the condenser holder to a low position. In this way the condenser can be taken off after loosening the three screws on the holding ring. You should avoid touching the optical lenses with bare fingers.

5 Operation

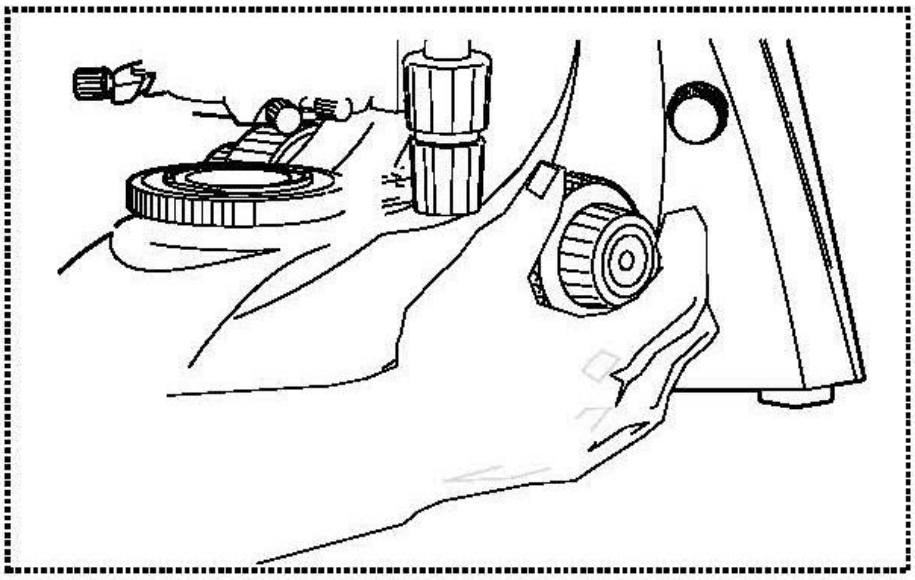
5.1 Getting started

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 slide** with the sample on the round table. The object must be prepared accordingly in order to be suitable for applications with polarised transmitting or reflected light. With help of the object holder you can fix the specimen slide to the table.
The object can be only observed if it is located inside of the beam path.

5.2 (Pre-) focussing

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:

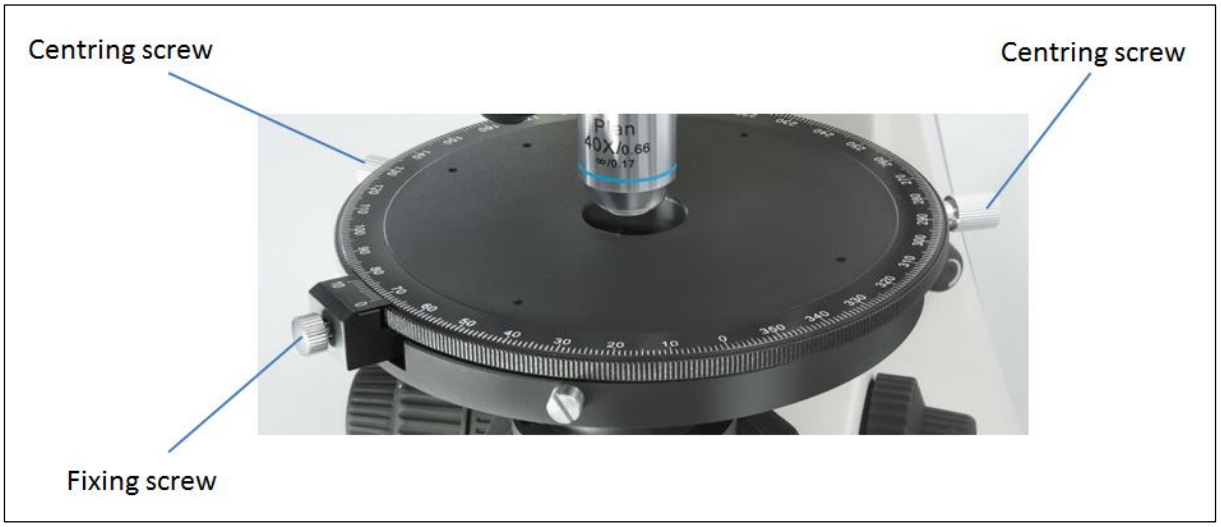
In order to avoid damaging to the focussing system, the left and right adjustment wheels for the coarse and fine adjustment knob must never be rotated at the same time in opposite directions.

5.3 Centre-adjusting the stage

In order to analyse certain objects with help of the polarization method, it is important to be able to revolve the table. Thus, the contrasting of the object can be observed depending on its angle position between polariser and analyser.
For getting ideal results the centre of the rotation axis of the table must be aligned to the centre of the optical beam path.

The microscopes of the OPE-1 series are correctly set at factory.
However we recommend to regularly check before the first use and every now and then if the table is centre-adjusted.

In case of a decentration the following steps have to be carried out.



1. Bring the 10x objective into beam path.

2. Assure, that one eyepiece with scale is attached to (one of) the tube connector(s).

3. Locate an appropriate specimen slide onto the table.
   This slide should preferably be equipped with a micro reticule.
   It would be also possible to use an object which includes plenty of single dots and for which one of those dots has such a size, so that it aligns with the centre cross point of the scale, visible inside of the eyepiece(s).

4. Locate the specimen slide to that point, that, when observing through the eyepiece(s), the centre of the reticule is on the centre of the eyepiece scale.

5. Assure, that the fixing screw of the table is loosened, in order to be able to revolve the table.
   If the table is not or heavy to revolve, even though the fixing screw is loosened, this serves as an evidence for a significant decentration of the table.

6. If the table is perfectly centre-adjusted, you will note that, during a complete rotation of the table, both centres stay always aligned to each other.
   In this case, the procedure would be finished at that point.

7. If the table is not centre-adjusted, you will note that the centre of the reticule moves, directly after the beginning of the rotation of the table, away from the centre of the eyepiece scale. And it matches again only after the complete rotation.

8. Estimate the centre of the circular motion, which the reticule is doing, and move the specimen slide, so that the centre of the reticule matches this estimated centre.

9. Operate the centring screws, so that the centre of the reticule and the centre of the eyepiece scale are aligning to each other again.

10. Repeat steps 6 - 9.

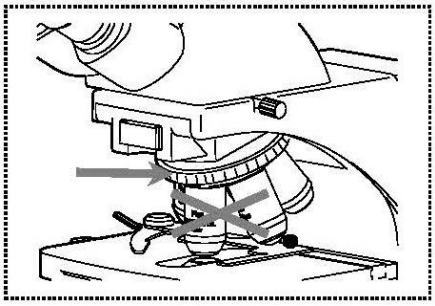
5.4 Adjusting the magnification

After prefocussing has been carried out using the objective with the lowest magnification *(see section 5.2)*, 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.

5.5 Adjusting the illumination

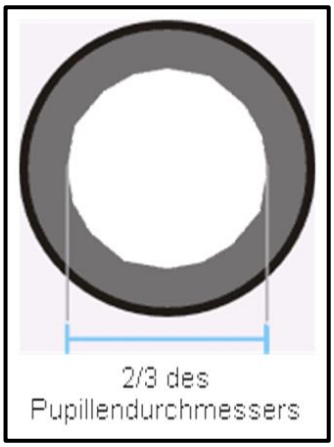
To make sure that perfect image results are achieved during microscopic observation, it is important that the direction of light of the microscope is optimised.

The necessary control elements for this are the height-adjustable condenser with aperture diaphragm.

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

1. Adjust the height of the condenser by turning the condenser focus dial to get a good contrast of the microscopic image. Normally therefore you have to bring the condenser to just below the maximum height.

2. Use the aperture diaphragm of the condenser to find the very best compromise between contrast and resolution for the microscopic image. For the objective with the lowest magnification the lever of the aperture diaphragm should be placed almost completely on the right-side limit, so that the opening of the diaphragm is very small. The higher the magnification of an objective, the larger the opening should be selected by pushing the lever towards the left-side limit.

   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.

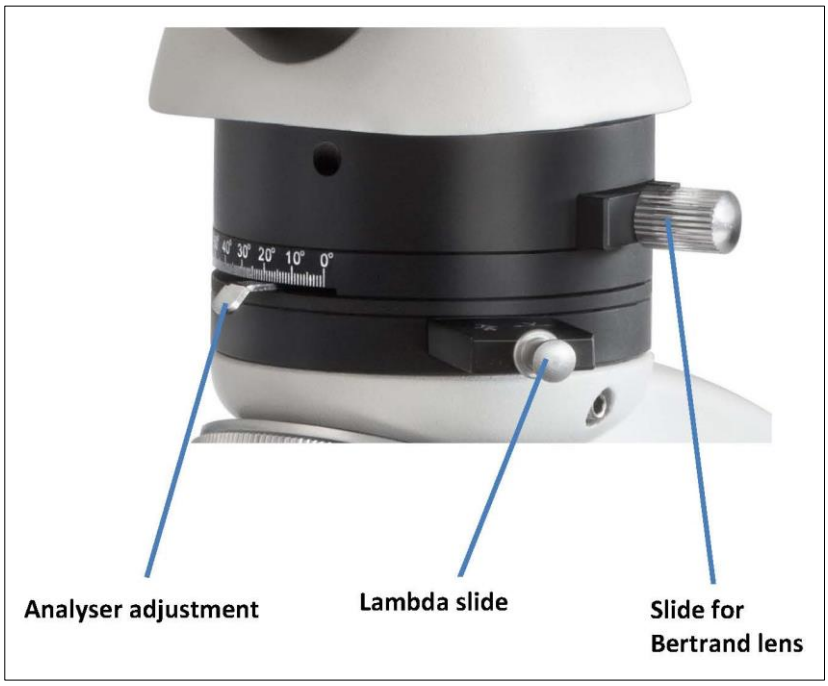
   If the eyepiece should be removed, for checking, then please make sure that no dirt or dust falls into the tube.

3. The brightness is always controlled by the bulb brightness (using the dimmer) and not by the aperture diaphragm.

5.6 Adjusting the polarisation unit

In order to be able to apply the polarisation method, besides of the bright field method, certain components need to be adjusted.

At first you must put the polariser into the beam path. It is attached to the bottom side of the condenser and can be swung in and out. It is important, that the polariser is swung in up to the stop in case of usage.



The setting of the analyser now has to be done with help of the according lever, which needs to display 0°. As a result the orthogonality between polariser and analyser, which is required for common polarisation applications, is ensured.
An indication for this orthogonality is the maximum obscuration, which can be thereby observed in the field of view.

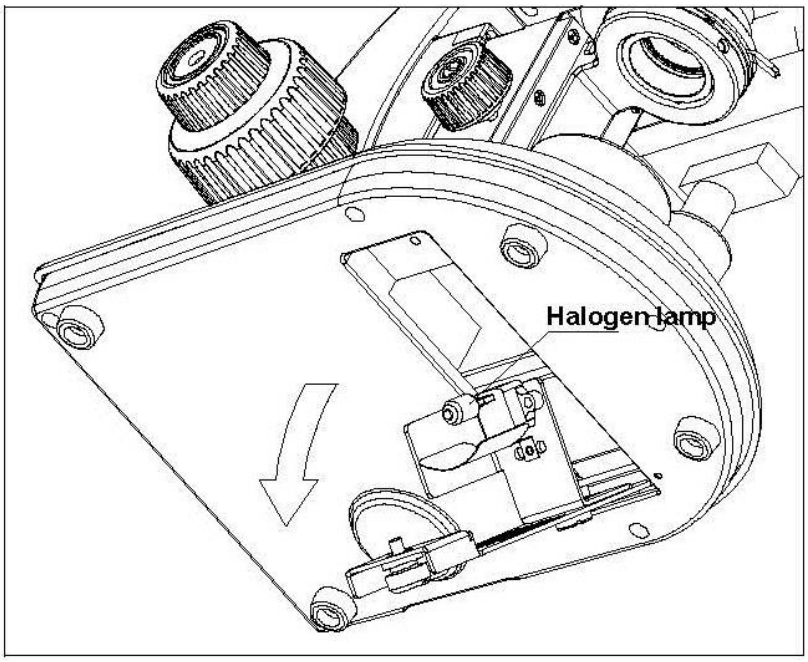
The slide of the Bertrand lens needs to be in the pulled out position for standard polarisation processes.
It can be moved into the beam path in order to observe the interference pattern of a sample in regards to conoscopic analysis.

If needed, you can use the Lambda filters, which are parts of the standard equipment. Therefore you need to insert the according slide into the appropriate slot. (*Previously remove one of the retaining screws and reattach it after the insertion again*).
This slide contains three apertures, which can be brought in each case into the beam path with help of a snap-in function. The middle aperture does not contain any filter, at this position you can apply the standard polarising method.
Each of the two other apertures contains one Lambda filter (¼ λ and λ). They can be used in order to adjust the interference colours, which are the result of polarised light colliding with the sample.

6 Changing the bulb

Halogen

Before changing the bulb the device must be switched off and unplugged.
To change the bulb, tip the device carefully to the back or side. When doing this, please make sure that all microscope components are firmly fixed. The bulb holder is on the underside of the device. It can be opened by undoing the screws on the holder *(see illustration)*. The defective LED module can be removed by loosening the two screws fixing the module and unraveling the connection point of its cable. Now the new module has to be mounted in the same why as the original one. After the bulb holder has been replaced in the underside of the device and the screws replaced, the bulb replacement procedure is complete.



7 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. The defective fuse can be removed from its housing and be replaced with a new one.
After that, you just need to insert the fuse housing back into the insertion point below the mains power supply socket.

8 Trouble shooting

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

9 Service

If, after studying the user manual, you still have questions about commissioning or using the microscope, or if unforeseen problems should arise, please get in touch with your dealer. The device may only be opened by trained service engineers who have been authorised by KERN.

10 Disposal

The packaging is made of environmentally-friendly materials, which you can dispose of at your local recycling centre. Disposal of the storage box and device must be carried out by the operator in accordance with all national or regional laws in force in the location of use.

11 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 on the device may lead to these changes.

All language versions contain a non-binding translation.
The original German document is the binding version.