

User instructions

Polarisation microscope

KERN OPM-1, OPN-1, OPO-1

OPM 181
OPN 182, OPN 184
OPO 183, OPO 185

Version 1.0
01/2016





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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.

Under no circumstances should you touch the integrated halogen bulbs either during operation or directly after use. These bulbs produce significant heat and therefore there is a risk that the user could be severely burnt. So before handling the bulbs, you must check that they have cooled down.

The microscope housing, on the other hand, is constructed so that no significant heat radiation emanates from the device and that there is absolutely no risk of the user burning themselves from the housing outer surfaces.

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 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.

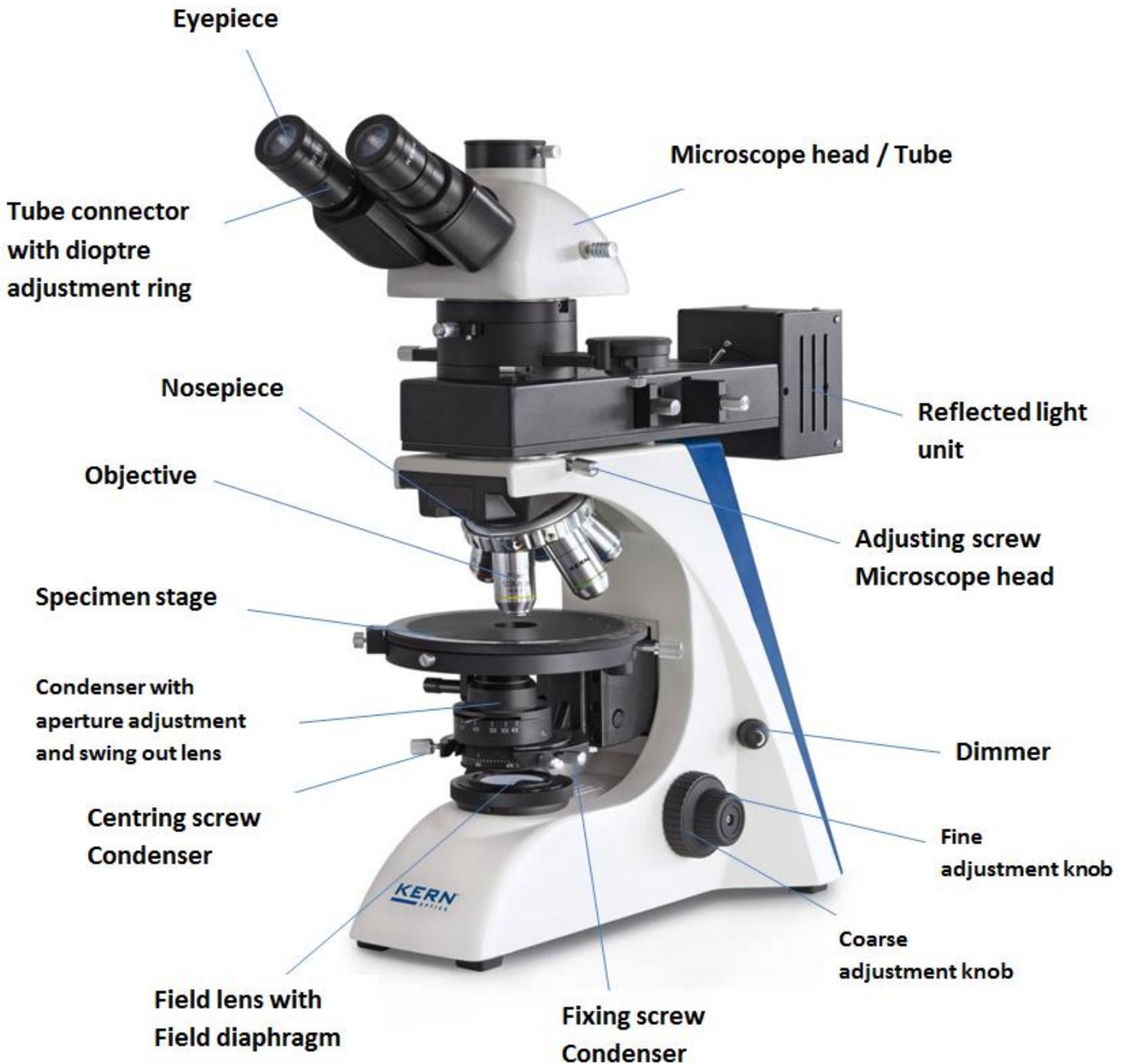
You could also use the following cleaning products to clean the optical components:

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

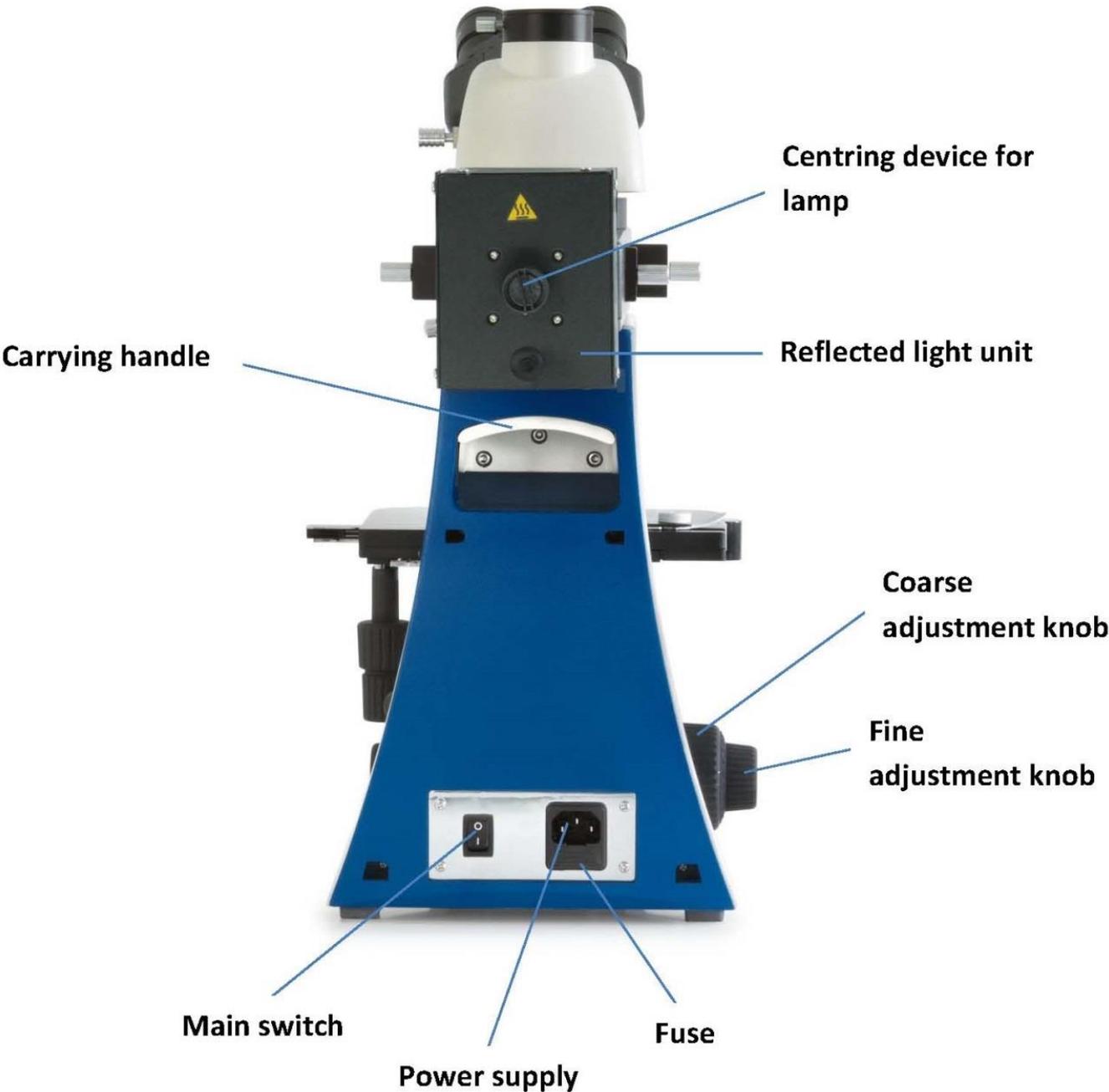
When handled correctly and checked regularly, the microscope should give many years of efficient service.

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

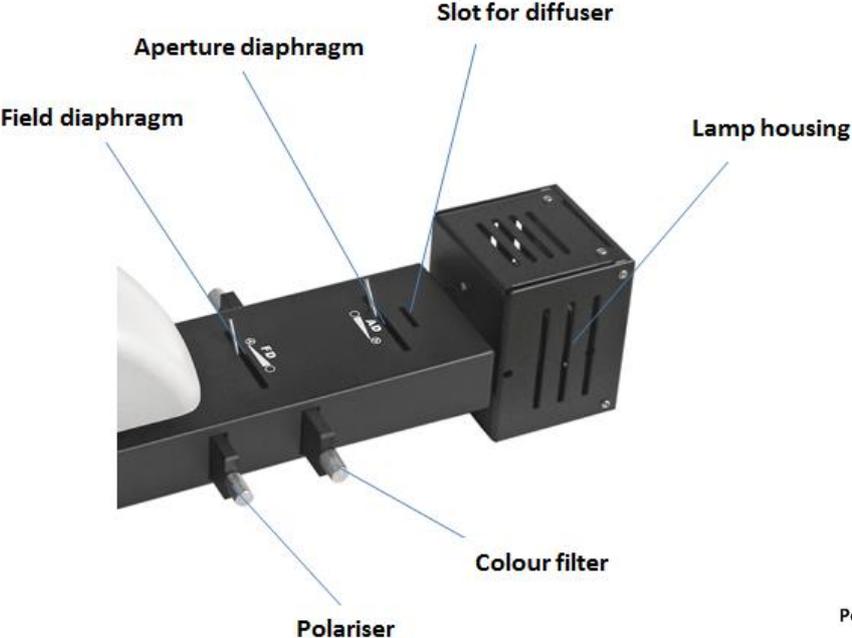
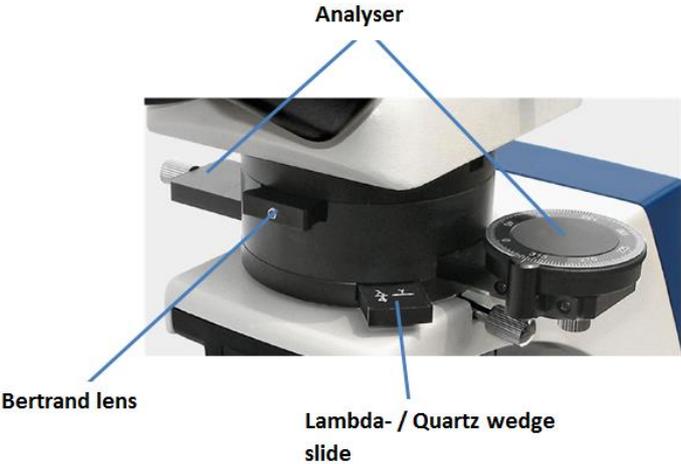
2 Nomenclature



Rear view



Analyser unit / Reflected light unit



Power supply unit for reflected light unit



3 Technical data / Features

Model	Standard configuration		
	Optical system	Tube	Illumination
KERN			
OPM 181	Infinity	Binocular	6V / 20W Halogen (transmitting)
OPN 182	Infinity	Binocular	12V / 50W Halogen (reflecting)
OPO 183	Infinity	Binocular	12V / 50W Halogen (reflecting) + 6V / 20W (transmitting)
OPN 184	Infinity	Binocular	12V / 100W Halogen (reflecting)
OPO 185	Infinity	Binocular	12V / 100W Halogen (reflecting) + 6V / 20W (transmitting)

Eyepieces: WF 10x / Ø 18 mm

Objectives: Non-stress 4x / 10x / 20x / 40x
OPM 181, OPN 182, OPN 184

Objectives: Non-stress 4x / 10x / 20x / 40x / 60x
OPO 183, OPO 185

Product dimension: 500x200x500 mm

Net weight: 14,5 kg

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

Output voltage: DC 1,2-6V

Fuse: 2A 5x20mm

Model outfit		Model KERN	Order number	
		OPM 181		
Eyepieces	WF10 / Ø 20 mm	●	OBB-A1351	
	WF 10x / Ø 20 mm (reticule 0,1 mm) (adjustable)	●	OBB-A1352	
Non-stress Infinity plan objectives	4x / 0,10	●	OBB-A1294	
	10x / 0,25	●	OBB-A1289	
	20x / 0,40 (spring)	●	OBB-A1290	
	40x / 0,65 (spring)	●	OBB-A1292	
	60x / 0,80 (spring)	○	OBB-A1296	
Binocular tube	<ul style="list-style-type: none"> • Siedentopf, 30° inclined, 360° rotatable • Interpupillary distance: 50 - 75 mm • With diopter adjustment (one-sided) 	●	OBB-A1125	
Trinocular tube	<ul style="list-style-type: none"> • Siedentopf, 30° inclined, 360° rotatable • Interpupillary distance: 50 - 75 mm • Light distribution: 100:0 • With diopter adjustment (one-sided) 	○	OBB-A1344	
Professional dedicated polarising binocular head	To keep the reticular cross in the right-hand eyepiece in the same position, independent of the adjustment of the tube.	○	OBB-A1209	
Professional dedicated polarising trinocular head		○	OBB-A1210	
Nosepiece	Quintuple	●		
Analyser unit with scale	360° rotatable, lockable	●		
Bertrand lens	Built-in, center-adjustable	●	OBB-A1121	
λ + ¼ λ Slip	λ Slip and ¼ λ Slip (combination)	●	OBB-A1316	
Quartz wedge	I - IV Class	●	OBB-A1321	
Revolving round stage	360° rotatable, center-adjustable, division 1°, Vernier division 6'	●		
Polarising attached mechanical stage	Polarising attached mechanical stage	○	OBB-A1337	
Swing-out condenser	N.A. 0,9 / 0,13 swing-out achromatic condenser (aperture diaphragm)	●	OBB-A1107	
Polarising unit with scale	360° rotatable, lockable	●		
Koehler illumination	6V / 20W Halogen spare bulb (transmitting)	●	OBB-A1370	
Filter	Blue	●	OBB-A1172	
	Amber	○	OBB-A1165	
	Green	○	OBB-A1189	
	Neutral	○	OBB-A1198	
C-Mount	1x	○	OBB-A1140	
	0,57x (focus adjustable)	○	OBB-A1136	

● = Standard configuration

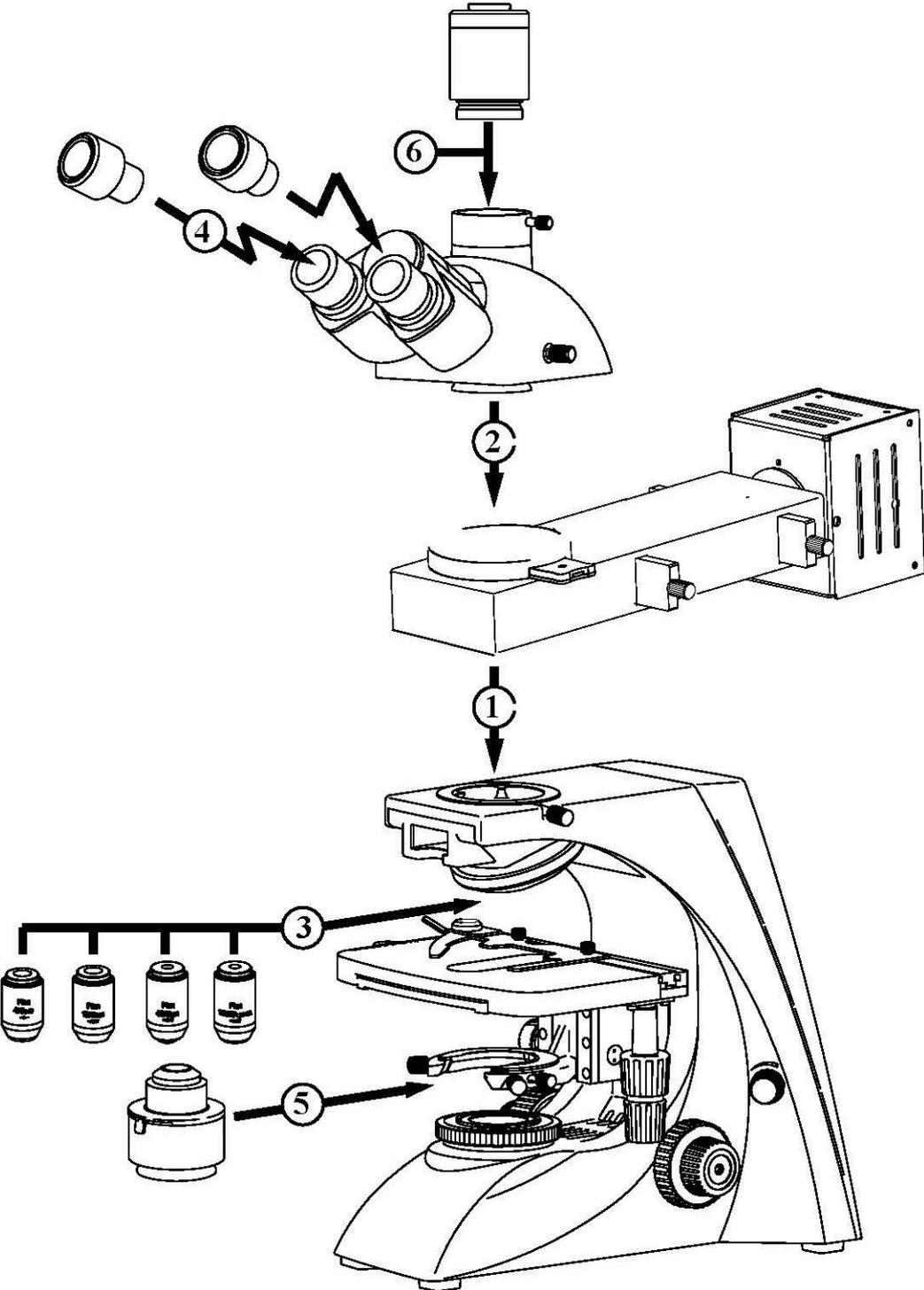
○ = Option

Model outfit		Model KERN				Order number	
		OPN 182	OPO 183	OPN 184	OPO 185		
Eyepieces	WF 10x / 18 mm	●	●	●	●	OBB-A1347	
	WF 10x / 18 mm (reticule 0,1 mm) (adjustable)	●	●	●	●	OBB-A1350	
Non-stress Infinity Plan objectives	4x / 0,10	●	●	●	●	OBB-A1294	
	10x / 0,25	●	●	●	●	OBB-A1289	
	20x / 0,40 (spring)	●	●	●	●	OBB-A1290	
	40x / 0,65 (spring)	●	●	●	●	OBB-A1292	
	40x / 0,65 (spring) (no cover glass)	●	○	●	○	OBB-A1288	
	60x / 0,80 (spring)	○	●	○	●	OBB-A1296	
Infinity Plan objectives (no cover glass) for LWD	LWD 20x / 0,40 (spring) W.D. 8,35 mm	○	○	○	○	OBB-A1291	
	LWD 40x / 0,65 (spring) W.D. 3,90 mm	○	○	○	○	OBB-A1293	
	LWD 50x / 0,70 (spring) W.D. 1,95 mm	○	○	○	○	OBB-A1295	
	LWD 80x / 0,80 (spring) W.D. 0,85 mm	○	○	○	○	OBB-A1297	
Binocular tube	<ul style="list-style-type: none"> • Siedentopf, 30° inclined, 360° rotatable • Interpupillary distance: 50 - 75 mm • With diopter adjustment (one-sided) 	●	●	●	●	OBB-A1125	
Trinocular tube	<ul style="list-style-type: none"> • Siedentopf, 30° inclined, 360° rotatable • Interpupillary distance: 50 - 75 mm • Light distribution: 100:0 • With diopter adjustment (one-sided) 	○	○	○	○	OBB-A1344	
Professional dedicated polarising binocular head	To keep the reticular cross in the right-hand eyepiece in the same position, independent of the adjustment of the tube.	○	○	○	○	OBB-A1209	
Professional dedicated polarising trinocular head		○	○	○	○	OBB-A1210	
Nosepiece	Quintuple	●	●	●	●		
Analyser unit with scale	360° rotatable, lockable	●	●	●	●		
Bertrand lens	Built-in, center-adjustable	●	●	●	●	OBB-A1121	
$\lambda + \frac{1}{4} \lambda$ Slip	λ Slip und $\frac{1}{4} \lambda$ Slip (combination)	●	●	●	●	OBB-A1316	
Quartz wedge	I - IV class	●	●	●	●	OBB-A1321	
Revolving round stage	360° rotatable, center-adjustable, division 1°, Vernier division 6'	●	●	●	●		
Polarising attached mechanical stage	Polarising attached mechanical stage	○	○	○	○	OBB-A1337	
Swing-out condenser	N.A. 0,9 / 0,13 swing-out achromatic condenser (aperture diaphragm)		●		●	OBB-A1107	
Polarising unit with scale	360° rotatable, lockable		●		●		
Koehler illumination	6V / 20W Halogen spare bulb (transmitting)		●		●	OBB-A1370	
Filter	Blue	●	●	●	●	OBB-A1172	
	Amber	○	○	○	○	OBB-A1165	
	Green	○	○	○	○	OBB-A1189	
	Neutral	○	○	○	○	OBB-A1198	
Reflecting polarising unit replacement bulb	12V / 50W Halogen	●	●	○	○	OBB-A1207	
	12V / 100W Halogen	○	○	●	●	OBB-A1377	
C-Mount	1x	○	○	○	○	OBB-A1140	
	0,57x (focus adjustable)	○	○	○	○	OBB-A1136	

● = Standard configuration

○ = Option

4 Assembly



4.1 Analyser unit (+ reflected light unit)

For devices without reflected light unit (OPM-1) it is only needed to mount the analyser unit. For devices, which are equipped with a reflected light unit (OPN-1, OPO-1), the analyser unit and the main part of the reflected light unit are already firmly connected.

At this you firstly have to unite the lamp housing and the reflected light unit on their connection points. After that the connection has to be fixated by an Allen screw, which is attached to the right-hand side of the connection point of the lamp housing. Now the slides for analyser, polariser and colour filter can be attached to the appropriate slots (*see page 8*).

Afterwards in order to install the reflected light unit to the microscope, 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 light unit 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.

Finally you must establish the electrical connection between power supply unit and reflected light unit. The plug of the connection cable, attached to the rear of the light unit has to be installed to the socket on the rear of the power supply unit. Please do also use the screw lock on the plug.

4.2 Microscope head

First you must loosen the fixing screw on the tube connection point of the reflected light unit / analyser unit and remove the black protective cover.

You can then insert the round dovetail bracket on the head into the round dovetail bracket on the reflected light unit 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.

4.3 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.

4.4 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 no way of fixing them. You should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.

4.5 Condenser (Swing out) / Transmitting light polariser

OPM-1, OPO-1

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.

There is a transmitting light polariser (incl. scale) located on the bottom side of the condenser. It is fastened with an Allen screw on the side of the condenser. When loosening this screw the polariser can be turned in both directions.

For point 6 (Camera connection), please see Chapter 8 Use of optional accessories.

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**.

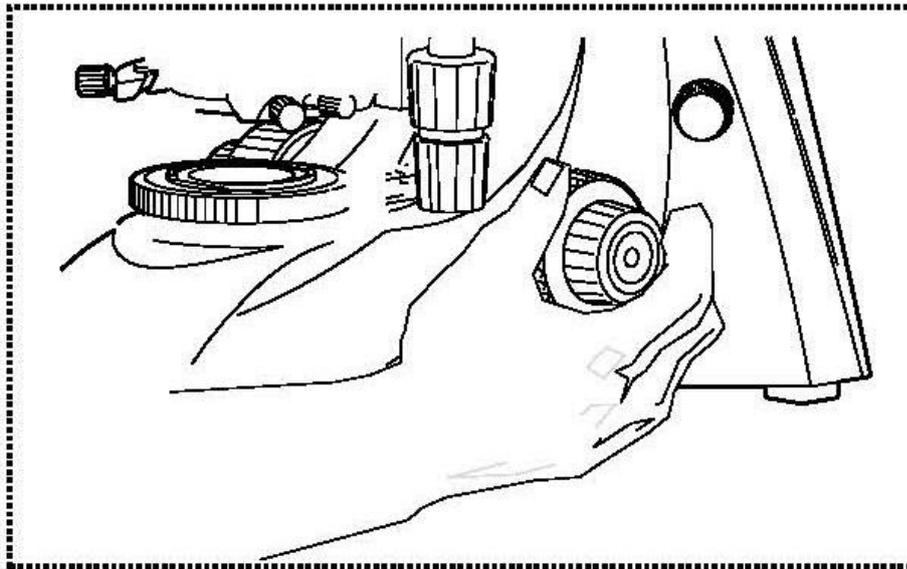
The next step is to **place a slide** with the sample on the round table. The object must be prepared accordingly in order to be suitable for applications with polarised transmitting or reflected light. With help of the object holder you can fix the specimen slide to the table.

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.

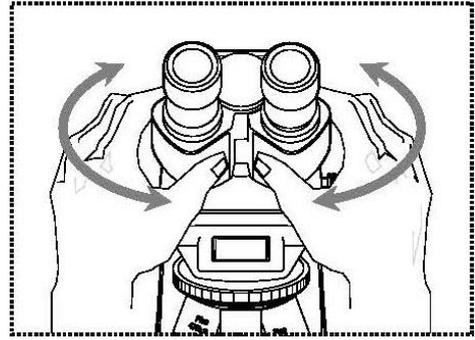
Important:

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 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.

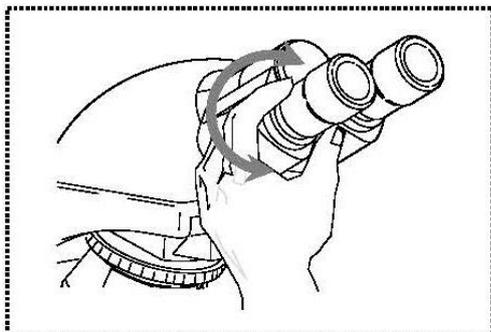


5.4 Dioptre adjustment

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.

1. Put the right dioptre adjustment ring to position 0.
2. Look through the right eyepiece with the right eye and bring the object into focus by 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 both directions (*see illustration*), to find out where the image is at its most focussed.



5.5 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 OPM-1, OPN-1 and OPO-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.



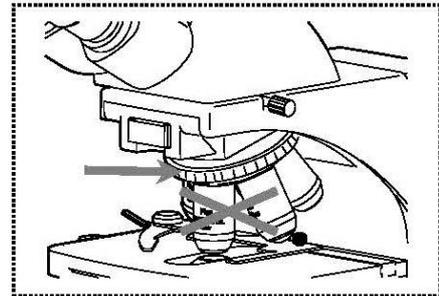
1. Bring the 10x objective into beam path.
2. Assure, that one eyepiece with scale is attached to (one of) the tube connector(s).
3. Locate an appropriate specimen slide onto the table.
This slide should preferably be equipped with a micro reticule.
It would be also possible to use an object which includes 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.

5.6 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.

5.7 Using eye cups

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 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).



Eye cups



High Eye Point eyepiece
(identified by the glasses symbol)

5.8 Adjusting the analyser unit

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

Basically, therefore the correct interaction between polariser and analyser is required.

The analyser is located in one of the round apertures of a certain slide, the other aperture is empty (glass plate).

This slide is additionally equipped with a rotary knob (incl. scale). If the analyser needs to be used, it has to be inserted into the appropriate slot (*see page 8, top figure*) and then pushed forward to the second snap-in position.

After the usage the analyser can be pulled out to the first snap-in position, in order to bring it out of the beam path.

The analyser unit is the counter part for both the transmitting light polariser and the reflected light polariser.

The transmitting light polariser is located on the bottom side of the transmitting light condenser, it can be rotated if needed. The reflected light polariser is located in one of the slides for the reflected light unit (*see section 5.10*).

The setting of the analyser now has to be done with help of the rotary knob, which needs to display 0° . As a result, provided that the transmitting light polariser is set to 0° as well, 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 ($\frac{1}{4} \lambda$ and λ). They can be used in order to adjust the interference colours, which are the result of polarised light colliding with the sample.

5.9 Adjusting the Koehler illumination for transmitted light

OPM-1, OPO-1

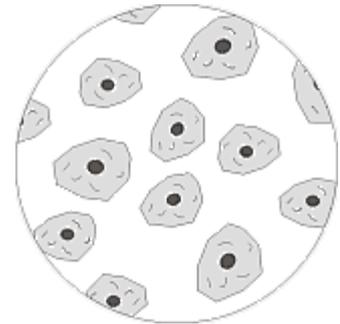
To make sure that perfect image results are achieved during microscopic observation, it is important that the direction of light of the microscope is optimised. If, as with the devices in the KERN OPM-1 and OPO-1 series, the lighting can be set in accordance with Koehler, the result is homogenous illumination of the slide and avoidance of disruptive stray light.

The necessary control elements for this are:

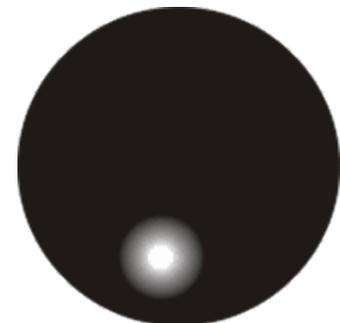
- Height-adjustable and centre-adjustable condenser with aperture diaphragm
- Field diaphragm

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.

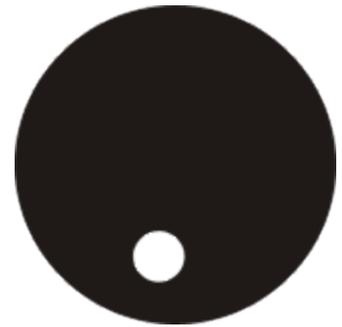
1. Use the condenser focus wheel to position the condenser directly below the specimen stage. Switch on the lighting and use the coarse and fine adjustment knob to bring the slide with the cover glass positioned facing upwards into focus.



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.



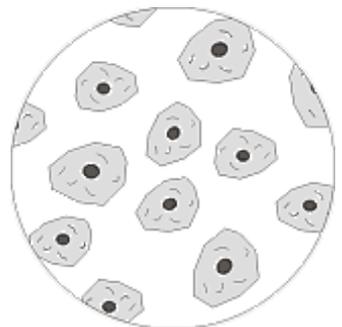
3. Adjust the height of the condenser until the image from the field diaphragm appears clearly in the field of view. For some microscopes there is a risk that you will lift the condenser up so high that it collides with the object holder. Therefore care is needed when doing this.



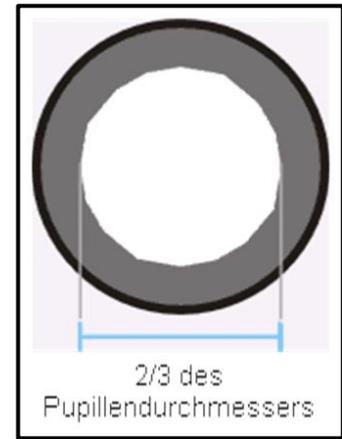
4. Use the centring screws of the condenser holder to bring the image from the field diaphragm into the centre of the field of view.



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.



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 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.

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.

5.10 Adjusting the illumination for incident light

OPN-1, OPO-1

Just like the components of the transmitted illumination those ones of the incident illumination can be adjusted according to the application requirements as well.

The following components are provided on this occasion:

Field diaphragm and aperture diaphragm

Both of the diaphragms have the same functions like described for the adjustment of the transmitted light (see *section 5.9*). To open and close these diaphragms you have to operate the levers located at the top of the reflected light unit.

Colour filter

The colour filter slide has two round apertures. One of them is with an integrated blue filter, the other one is empty. This slide is marked with the number “2” and therefore it has to be attached to the slot marked with the number “2” as well. If necessary, one of the two apertures has to be snapped into the beam path.

Polariser

The polariser slide has two round apertures. One of them is with an integrated polariser, the other one is empty. This slide is marked with the number “1” and therefore it has to be attached to the slot marked with the number “1” as well. If necessary, one of the two apertures has to be snapped into the beam path.

Diffuser

Directly behind the aperture diaphragm there is a slot for the diffuser. It is integrated in a round aperture of a little black slide. That slide can be attached in order to equally disperse the light of the halogen lamp.

Centring of the lamp

When using the reflected light unit for a long time, the lamp holder possibly moves out of its centre due to the heat development. In this case the illumination is no longer efficiently adjusted. This circumstance can be identified by the user when the background brightness of the field of view has an uneven distribution.

This malposition can be corrected by performing the following method.

1. Make sure, that the lamp housing has cooled down.
2. Switch on the reflected light unit.
3. Choose the objective with the lowest magnification for the beam path.
4. Remove all the (filter) slides from the beam path.
5. If there is one, remove the object (slide) from the stage.
6. Remove one of the eyepieces from the tube.
7. While watching through the tube connector, close the aperture diaphragm of the reflected light unit, so that its border can be seen clearly.
8. The decentred image of the lamp filament can now be seen as well.
9. Loosen the rotary knob on the rear of the lamp housing, so that you can move it together with the attached lamp holder.
10. Look through the tube connector and move the rotary knob in order to bring the image of the lamp filament back to the centre of the opening of the aperture diaphragm.
11. Fixate the rotary knob again.

6 Changing the bulb

6.1 Transmitted light

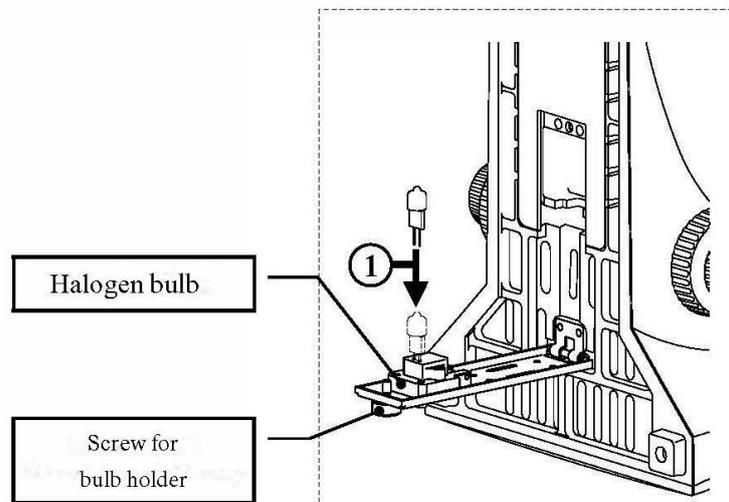
OPM-1, OPO-1

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, 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*). We recommend that here you should also test again, to check that heat is no longer being produced. The defective bulb can be pulled out of the socket and be replaced with a new one. After the bulb holder has been replaced in the underside of the device and the screws replaced, 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.



6.2 Reflected light

OPN-1, OPO-1

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.

All 8 screws on the rear edges of the lamp housing have to be removed.

Thus the holder of the halogen lamp can be separated from the rest of the housing.

The defective bulb can be pulled out of the socket and be replaced with a new one.

Finally the lamp housing is screwed together again.

7 Changing the fuse

7.1 Transmitted light

OPM-1, OPO-1

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.

7.2 Reflected light

OPN-1, OPO-1

The fuse housing is on the rear of the power supply unit of the reflected light unit. With the device switched off and unplugged, you can pull out the housing. 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 Using optional accessories

8.1 Camera connection (only for trinocular version)

Due to the trinocular tube, which can be optionally fitted for the OPM-1, OPN-1 and OPO-1 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, see *Chapter 3 Features*). 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.

9 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 or dust in the field of view	Dirt / dust on the objective
	Dirt /dust on the front lens of the condenser
	Dirt / dust on the eyepieces
One side of the image is blurred	Dirt / dust on the front lens of the condenser
	Dirt / dust on the object
	The stage was not correctly fitted
	The objective is not positioned correctly on the beam path
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 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

10 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.

11 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.

12 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.