

# User instructions

## Transmitted light school microscope

### KERN OBT-1

OBT 101, OBT 102, OBT 103, OBT 104,  
OBT 105, OBT 106

Version 1.0  
01/2020







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Version 1.0 01/2020

## User instructions

### Transmitted light microscope

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#### Table of contents

<b>1</b>	<b>Before use .....</b>	<b>3</b>
1.1	General notes.....	3
1.2	Notes on the electrical system.....	3
1.3	Storage .....	4
1.4	Maintenance and cleaning.....	5
<b>2</b>	<b>Nomenclature .....</b>	<b>6</b>
<b>3</b>	<b>Technical data / Features .....</b>	<b>7</b>
<b>4</b>	<b>Assembly .....</b>	<b>9</b>
4.1	Microscope head .....	9
4.2	Objectives .....	9
4.3	Eyepieces .....	9
4.4	Condenser .....	9
<b>5</b>	<b>Operation .....</b>	<b>10</b>
5.1	Getting started .....	10
5.2	(Pre-) focussing .....	11
5.3	Adjusting the interpupillary distance .....	12
5.4	Dioptre adjustment .....	12
5.5	Adjusting the magnification .....	13
5.6	Adjusting the illumination .....	14
5.7	Using oil immersion objectives .....	15
<b>6</b>	<b>Changing the bulb .....</b>	<b>16</b>
<b>7</b>	<b>Verwendung von Batterien.....</b>	<b>16</b>
<b>8</b>	<b>Trouble shooting.....</b>	<b>17</b>
<b>9</b>	<b>Service .....</b>	<b>19</b>
<b>10</b>	<b>Disposal.....</b>	<b>19</b>
<b>11</b>	<b>Further information.....</b>	<b>19</b>

# **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.

When carrying out any procedures whereby you come into contact with the electrical system of the device, such as, for example, changing the bulb, 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 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:

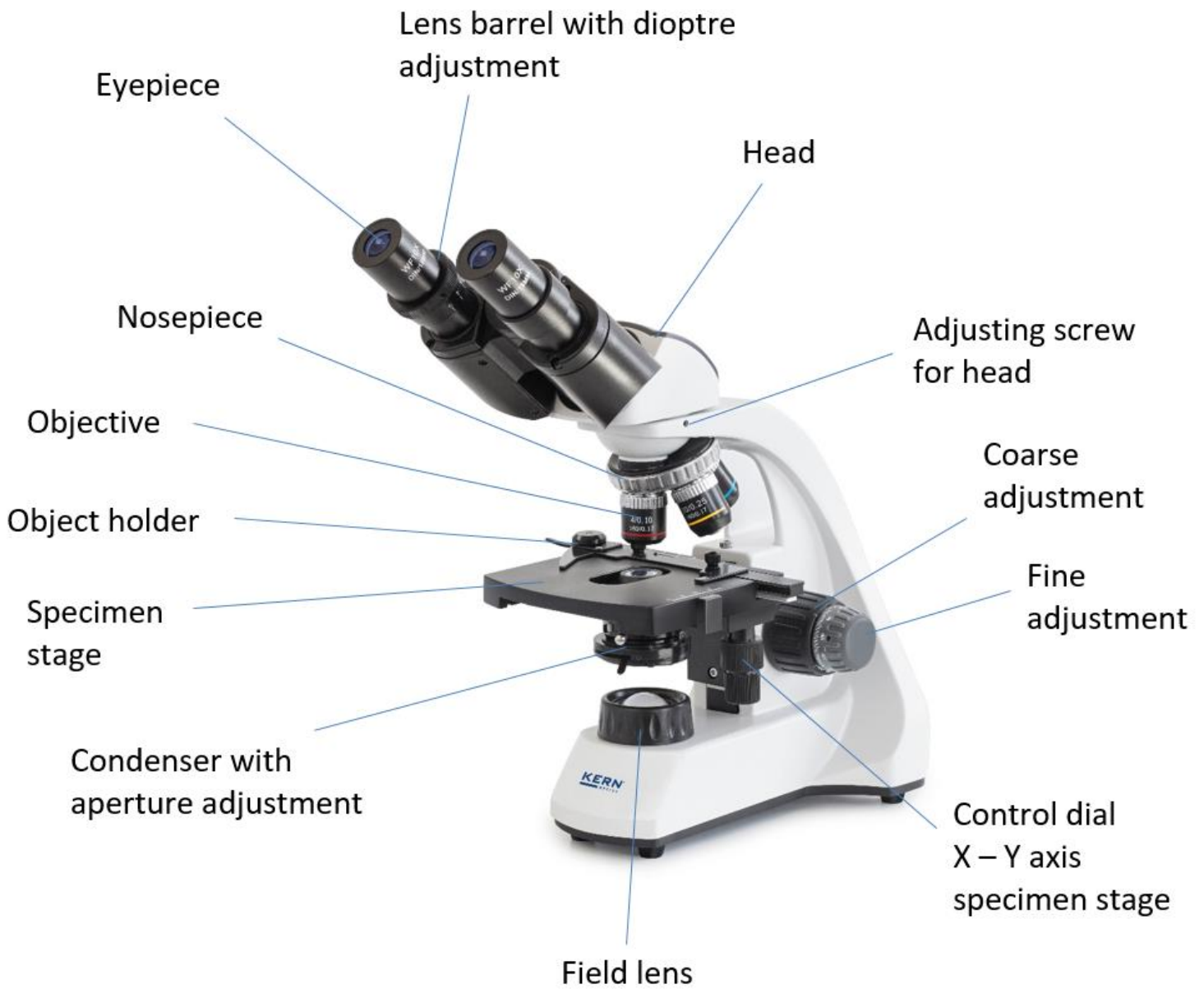
- Special cleaner for optical lenses
- Special optical cleaning cloths
- Bellows
- Brush

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

Example: OBT 106 (Binocular, mechanical stage)



### 3 Technical data / Features

Model	Standard configuration					
	Tube	Eyepiece	Objective quality	Objectives	Illumination	Stage
<b>KERN</b>						
<b>OBT 101</b>	Monocular	HWF 10×/∅ 18 mm	Achromatic	4×/10×/40×	1W LED (transmitted)	fix
<b>OBT 102</b>	Monocular	HWF 10×/∅ 18 mm	Achromatic		1W LED (transmitted)	fix
<b>OBT 103</b>	Monocular	HWF 10×/∅ 18 mm	Achromatic		1W LED (transmitted)	mechanical
<b>OBT 104</b>	Binocular	HWF 10×/∅ 18 mm	Achromatic		1W LED (transmitted)	mechanical
<b>OBT 105</b>	Monocular	HWF 10×/∅ 18 mm	Achromatic		1W LED (transmitted)	mechanical
<b>OBT 106</b>	Binocular	HWF 10×/∅ 18 mm	Achromatic		1W LED (transmitted)	mechanical

**Product dimensions:** 130x300x310 mm

**Packaging dimensions:** 400x280x195 mm

**Net weight:** 3 kg

**Gross weight:** 5 kg

**Input voltage:** DC 4,5V, 1000mA



Model outfit		Model KERN						Order number
		OBT 101	OBT 102	OBT 103	OBT 104	OBT 105	OBT 106	
Eyepieces (23,2 mm)	WF 10×/∅ 18 mm	✓	✓	✓	✓✓	✓	✓✓	OBB-A3200
	WF 10×/∅ 18 mm (with Pointer)	○	○	○	○	○	○	OBB-A3201
	WF 10×/∅ 18 mm (reticule 0,1 mm)	○	○	○	○	○	○	OBB-A3202
Achromatic objectives	4×/0,10 W.D. 27 mm	✓	✓	✓	✓	✓	✓	OBB-A3203
	10×/0,25 W.D. 7 mm	✓	✓	✓	✓	✓	✓	OBB-A3204
	40×/0,65 (spring-loaded) W.D. 0,6 mm	✓	✓	✓	✓	✓	✓	OBB-A3205
	100×/1,25 (oil) (spring-loaded) W.D. 0,2 mm	○	○	○	○	✓	✓	OBB-A3206
	60×/0,85 (spring-loaded) W.D. 0,4 mm	○	○	○	○	○	○	OBB-A3207
Monocular tube	45° inclined/360° rotatable	✓	✓	✓	○	✓	○	OBB-A3221
Binocular tube	<ul style="list-style-type: none"> <li>• Siedentopf 45° inclined/360° rotatable</li> <li>• Interpupillary distance 48-75 mm</li> <li>• Diopter adjustment: One-sided</li> </ul>	○	○	○	✓	○	✓	OBB-A3222
Fixed stage	<ul style="list-style-type: none"> <li>• Stage size W×D 115×110 mm</li> <li>• Coaxial coarse and fine focusing knobs, scale: 2 µm</li> </ul>	✓	✓					
Mechanical stage	<ul style="list-style-type: none"> <li>• Stage size W×D 115×110 mm</li> <li>• Travel 52×20 mm</li> <li>• Coaxial coarse and fine focusing knobs, scale: 2 µm</li> <li>• One slide holder</li> </ul>			✓	✓	✓	✓	
Condenser	Simple condenser N.A. 0,65	✓						
	Abbe N.A. 1,25 (aperture diaphragm)		✓	✓	✓	✓	✓	
Illumination	1 W LED spare bulb (transmitted)	✓	✓	✓	✓	✓	✓	OBB-A3208
Colour filters for transmitted illumination	Blue	○	○	○	○	○	○	OBB-A3212
	Green	○	○	○	○	○	○	OBB-A3210
	Yellow	○	○	○	○	○	○	OBB-A3211
	Grey	○	○	○	○	○	○	OBB-A3209

## **4 Assembly**

### **4.1 Microscope head**

Inside the packaging the microscope head is already mounted but inclined towards the rear. For the correct usage of the microscope the head has to be turned to the front. In case of removing the head completely from the housing (Loosen the Allen screw at first), you should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures.

### **4.2 Objectives**

All four 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 dismantled, you should always make sure that you do not touch the lenses with your bare fingers and that no dust enters the apertures. For objectives which are marked "OIL", you must use an immersion oil with the lowest level of inherent fluorescence.

### **4.3 Eyepieces**

You must always use eyepieces with the same magnification for both eyes. These are already placed onto the tube connectors and each is fixed with a small silver screw under the eyepiece on the tube connectors, so that they are turnable but you cannot pull them out of the tube. When changing the eyepieces, you must loosen these screws and once the new eyepiece is fitted, then they must be re-tightened. 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 Condenser**

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. When using the silver lever on the side of the condenser appropriately, it can be moved up and down. You should avoid touching the optical lenses with bare fingers.

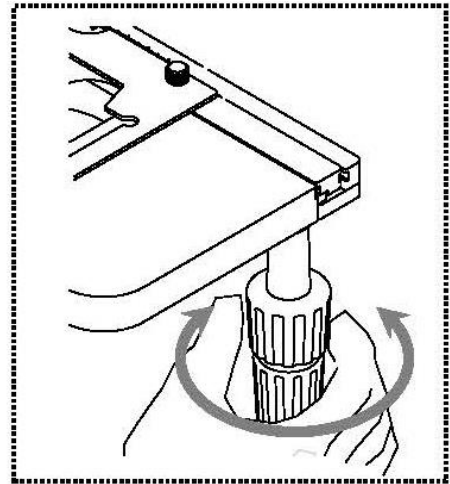
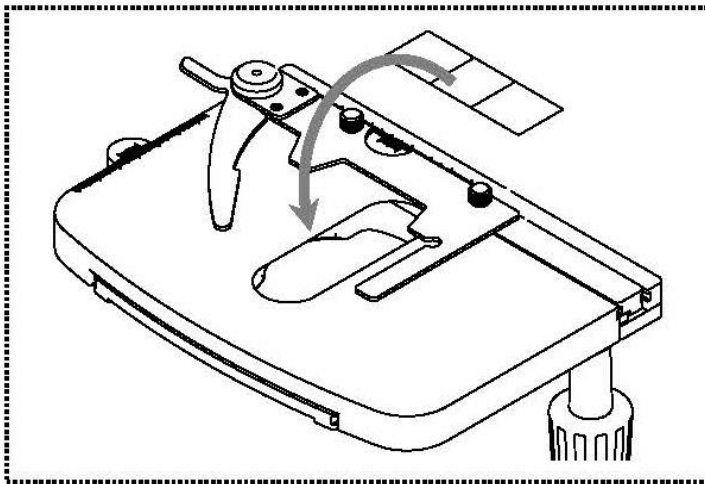
## 5 Operation

### 5.1 Getting started

The very first step is to establish a power connection using the mains plug. After switching on the lighting 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.

The next step is to **place an object holder** with the sample on the mechanical stage. To do this, the cover glass must be facing upwards. You can fix the object holder to the stage using the slide holder (see *illustration on the left*). Depending on the type of the stage you can move the sample into the beam path manually (OBT 101, OBT 102) or by using the adjustment wheels on the right of the stage (OBT 103-106) (see *illustration on the right*).

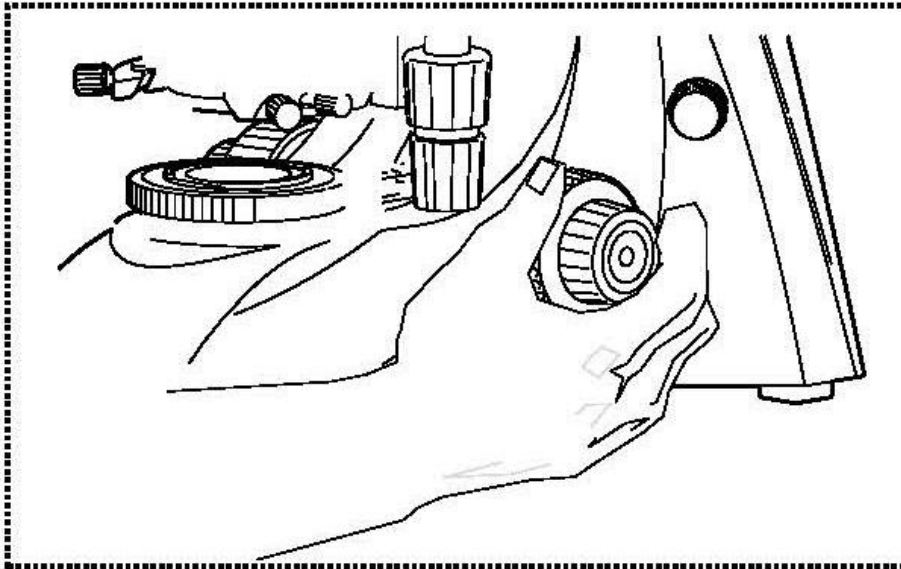
You can position only one object holder.



## 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*).

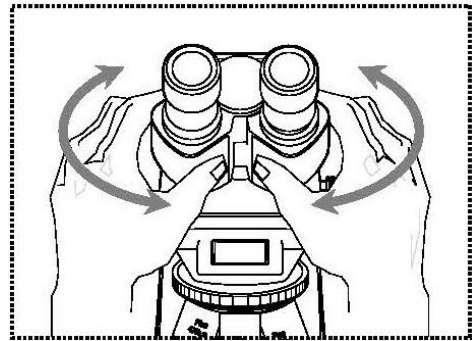


The simplest way of doing this would be to first raise the specimen stage (using the coarse adjustment knob) until it is just under the objective and then lower it slowly. As soon as an image is recognisable (no matter how sharp), then you should only adjust the focus using the fine adjustment knob.

### 5.3 Adjusting the interpupillary distance (For binocular and trinocular devices)

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.

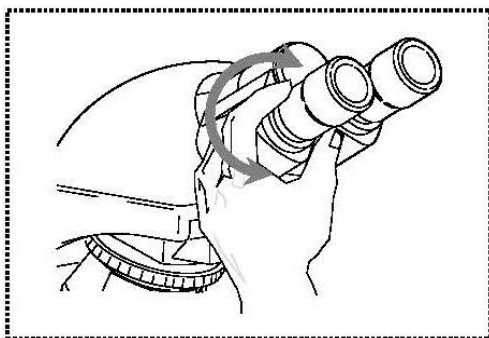


### 5.4 Dioptre adjustment (For binocular and trinocular devices)

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 the left tube connector (dioptre adjustment ring) 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.

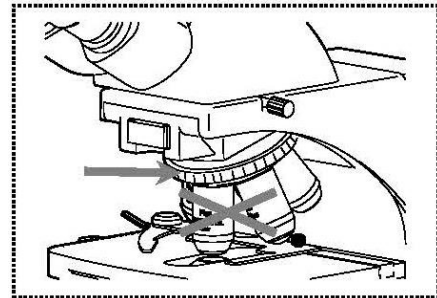


## 5.5 Adjusting the magnification

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.

## 5.6 Adjusting the illumination

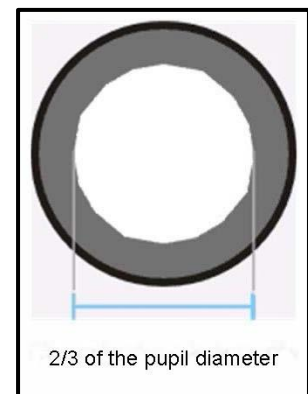
To make sure that perfect image results are achieved during microscopic observation, it is important that the direction of light of the microscope is optimised.

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  $\frac{2}{3}$  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.

## 5.7 Using oil immersion objectives

The 100x objectives of the OBT-1 series are objectives which can be used with oil immersion (they are always marked with the word "OIL"). Using these generates a particularly high resolution for microscopic images.

To use oil immersion correctly, please follow these steps.

1. Put a drop of oil on the cover glass (with standard thickness of 0.17 mm) of the object slide.
2. Lower the specimen stage and position the 100x objective in the beam path.
3. Bring the specimen stage or object slide to the objective very slowly until there is slight contact.
4. Observe the object.

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

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

After use or before changing the slide, any components which have been in contact with the oil must be cleaned thoroughly. *See also 1.4 Maintenance and cleaning.*



## 6 Changing the bulb

Before changing the bulb, the device must be switched off and unplugged.

To change the bulb, the housing of the field lens needs to be completely unscrewed. The LED can simply be pulled out of its socket. It is mounted into a housing that includes plug connectors (see *illustration*).



In case of a defect, please contact your KERN dealer or our Technical Department for the required replacement parts.

**It is absolutely important to be aware of its correct alignment when mounting the new LED.**

**Pay attention to the indicated polarity (+/-) both on the housing of the LED (see illustration) and on the microscope's lamp socket.**



## 7 Verwendung von Batterien

In order to use batteries as power supply you have to open the battery compartment on the bottom of the bottom of the microscope (Loosen Allen screw at first). You require 3x 1.5V AA batteries to insert into the battery compartment.

Battery operation is only possible if the power plug has been removed from the power socket of the microscope beforehand.

## 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
The bulb blows immediately	The specified bulb has not been used
The field of view is dark	The aperture diaphragm and/or field diaphragm are not opened wide enough
	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 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 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

<b>Problem</b>	<b>Possible causes</b>
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
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.

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