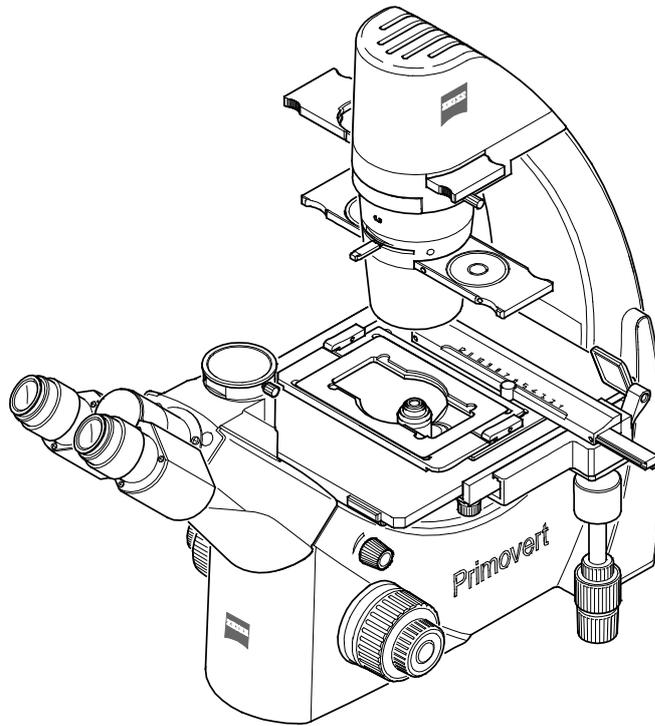


Primovert



Instruction Manual



Knowledge of this Instruction Manual and the included safety instructions is required for operation of the device. You should therefore familiarize yourself with the contents of these instructions, paying particular attention to instructions concerning the safe handling of the device.

We reserve the right to make changes to the product in the interest of technological advancements. The operating manual is not subject to updating or revision.

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| 3 | 05/2022 | Implementation of revision history Adaptation to Regulation (EU) 2017/746 (IVDR) |

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1 Notes on Instrument Safety

1.1 General Safety Notes

Please read this operating manual carefully before starting up the microscope.

If you need supplementary information, contact the Carl Zeiss Service or an authorized agency.

To ensure safe operation and troublefree function of the microscope, strictly observe the precautions and warnings given in this manual.

The following warning and information symbols are used in this Instruction Manual:

| Symbol | Explanation |
|---|--|
|  | CAUTION <i>This symbol indicates a potential hazard to the user.</i> |
|  | CAUTION <i>LED radiation! Do not stare at operating lamp.</i> |
|  | CAUTION <i>Hot surface! Do not touch.</i> |
|  | CAUTION <i>Disconnect the instrument from the power supply before opening!</i> |
|  | ATTENTION <i>This symbol indicates a potential hazard to the instrument or system.</i> |
|  | NOTE <i>This symbol indicates an instruction which requires particular attention.</i> |
|  | CE marking (Conformité Européene) |
|  | UKCA marking (UK Conformity Assessed) |
|  | CSA label: product tested by CSA to meet U.S. and Canadian standards. CSA approval master number optionally given adjacent to this symbol |
|  | Manufacturer |
|  | Country of manufacture. "CC" is the country code, e.g. "DE" for Germany, "CN" for China. Date of manufacture optionally given adjacent to this symbol |
|  | Authorized representative in the European Community |
|  | Swiss authorized representative |
|  | In-vitro diagnostic medical device |

| Symbol | Explanation |
|---|---|
|  | Serial number |
|  | Catalogue number |
|  | Importer |
|  | WEEE label: Do not discard as unsorted waste. Send to separate collection facilities for recovery and recycling |

1.2 Instrument Safety and EMC

The Primovert microscopes have been designed, produced and tested in compliance with the following regulations and guidelines:

- EN 61010-1 (IEC 61010-1), IEC 61010-2-101 "Safety requirements for electrical equipment for measurement, control and laboratory use"
- EN 61326-1 (IEC 61326-1), IEC 61326-2-6 "Electrical equipment for measurement, control and laboratory use - EMC requirements".

The instrument meets the requirements of the European Directive IVDR 2017/746 EU (European Regulation on in-vitro diagnostic medical devices).

It also meets the requirements of the EC RoHS Directive 2011/65/EU, including Directive 2015/863.

The microscope carries the  mark.

The instrument has to be disposed of in compliance with the WEEE Directive 2012/19/EU.

1.2.1 EMC Information

Use of this microscope in a dry environment, especially if synthetic materials are present (synthetic clothing, carpets, etc.), may cause electrostatic discharges that may cause erroneous results.

Do not use this instrument in proximity to sources of strong electromagnetic radiation, as these may interfere with the proper operation.

The Primovert microscopes are intended to be used in a basic electromagnetic environment and conform to Group 1 Class B requirements of CISPR 11 for EMI performance.

Increased electromagnetic emissions and reduced immunity to interference when using non-specified accessories, converters of all types, cables, portable HF telecommunication devices or optional accessories from the field of information technology.

Optional information technology auxiliary parts (e.g. iPad, router, additional monitors) which are connected to the medical device must be class B conforming to CISPR 32 or comparable devices.

If in doubt, contact a ZEISS service representative.

1.3 Unpacking, Setup, Transportation, Storage

Please observe the following safety notes for unpacking, transportation and storage of the microscope:

- The microscope is supplied packed to commercial standards in a plastic case with outer cardboard package; use the original packaging for transportation.
- Retain the original packaging for a longer storage of the microscope or its return to the manufacturer.
- When unpacking the equipment, check all components for completeness according to the delivery note.



Keep transport and storage temperatures as specified in the Technical Data.
Set up the microscope on a stable worktable with solid and smooth tabletop.



Only use the handle, if applicable, for transport of the microscope. Otherwise hold the microscope with one hand and the base plate with the other hand.



While using the microscope and up to about 10 minutes after the use there is risk of burns due to the hot lamp housing.

1.4 Disposal

Please observe the following safety notes for disposing of the microscope:



Defective microscopes should not be disposed of with household waste; dispose of them in compliance with the provisions of the law.



The manufacturer of the device is under the legal obligation to take back defective devices.

1.5 Operation

The microscope including its original accessories must not be used for microscopic techniques other than those described in this operating manual.

Please observe the following safety notes when using the microscope:



Any serious incident that has occurred in relation to the microscope and its components shall be reported to these institutions:

- the competent authority of the Member State in which the user is established
- ZEISS
 - for users within the EU: Carl Zeiss Microscopy GmbH, Jena, Germany
 - or users outside the EU: Carl Zeiss Suzhou Co., Ltd., Suzhou, China



The manufacturer cannot assume any liability for other applications, including those of individual modules or single components. This also applies to any service or repair work that is not carried out by authorized service personnel. In case of non-compliance, all warranty claims shall be forfeited.



Do not operate the devices and their accessories included in the delivery in potentially explosive areas nor in the presence of volatile anesthetics or combustible solvents, such as alcohol, benzine or similar chemicals.



Dirt and dust may impair the performance of the devices. The devices must therefore be protected from such influences to the greatest possible extent and covered with the dust cover when not in use. Before covering the devices always check whether they have been switched off or have switched off themselves automatically in AUTO-OFF mode (then, the blue power-on LEDs on the right and left side of the stand are off).



The microscope may only be operated by trained personnel who are aware of possible dangers involved in microscopy and the particular application concerned. The microscope may only be operated if set up on a stable, solid, smooth and hardly flammable surface.



The microscope is a high-precision instrument that may be impaired in its performance or even destroyed when handled improperly.



The microscope is equipped with a plug-in power unit allowing line voltages in the range between 100 and 240 V \pm 10%, 50 / 60 Hz, without the need for changing the voltage setting on the instrument.



The plug-in power unit meets the requirements of protection class II (with protective insulation). If its casing is damaged, put the plug-in power unit out of operation. The microscope may be operated only with the plug-in power unit supplied.



If any protective measures are no longer effective, the device must be taken out of service and secured against inadvertent operation. Please contact a Zeiss service agency or the Carl Zeiss Microscopy Service to have the device repaired.



Always disconnect the power cable before opening the instrument and changing the bulb or LED. Wait for the bulb to cool down before replacing it and do not leave fingerprints on the new bulb.



The instrument may only be opened by instructed specialists or service staff.

The operation of the instrument in explosion-risk environments is not allowed.





Do not replace detachable power cables by power cables with inadequate specifications. Only the specified power cables should be used.



The microscope can only safety disconnect from line power, when the plug-in power unit is disconnected from line power. The rotary knob for switching the microscope off (Fig. 11/19) switches only to stand by.



Never look into the light beam - neither with nor without optical instruments, even not if you simply want to observe the specimen. Your eyes may be damaged in case of non-observance!



When using immersion oil, read in any case the safety data sheet.



Immersion oil irritates the skin. Avoid any contact with skin, eyes and clothing.



After skin contact, wash the oil off with plenty of water and soap.

After eye contact, immediately rinse the eye with plenty of water for at least five minutes. If the irritation persists, consult a medical specialist.

Proper disposal of immersion oil: Take care to ensure that immersion oil does not enter surface water or the sewage system.



The microscope is not equipped with special devices for the protection from corrosive, potentially infectious, toxic, and radioactive or other substances that may be hazardous to health. If you handle such substances, be sure to observe all legal requirements, in particular the relevant national accident prevention regulations.



Before transporting the instrument, switch it off and let it cool down (hot surface on the lamp housing).



The plug-in power unit must not get in contact with moisture.



Obstruction or covering of ventilation slits may result in heat build-up which may damage the instrument and in extreme cases cause fire. Always keep the ventilation slits clear and ensure that no objects enter the instrument through the ventilation slits.



Direct contact with the eyepieces can be a potential way of passing on bacterial and viral infections.

- The risk can be lowered by using personal eyepieces or eyecups. If eyepieces need to be disinfected frequently, ZEISS recommends to use the eyepieces without eyecups.
- To avoid infections, the use of personal protective equipment (PPE), e.g. gloves, for operation, cleaning, and decontamination is highly recommended. Disposable gloves can be decontaminated with alcohol for example, if necessary, or should be changed frequently to minimize the risk of contamination.



Incorrect handling of consumables and cleaning agents can lead to property damage or skin and eye injuries. Consumables that are not approved by ZEISS can lead to property damage. Consult your ZEISS Sales & Service Partner to learn what consumables you can order and how to handle them.



Ensure adequate ventilation in closed rooms. In case of insufficient ventilation, wear respiratory protective equipment. Remove any harmful residue. Allow the device to dry off after disinfection, particularly after disinfection of eyepieces. Do not inhale vapors. When using disinfectants, do not eat, drink or smoke. Avoid contact with eyes and skin. Remove contaminated clothing and wash before reuse.

1.6 Warranty Notes

The Primovert microscopes including their original accessories must not be used for microscopic techniques other than those described in this operating manual. The manufacturer cannot assume any liability for other applications.

Please consider the following warranty notes for the microscopes:

- The manufacturer guarantees that the device is free from material or manufacturing defects when delivered.
- Any defects must be notified to us immediately and steps be taken to minimize damage.
- If notified of such a defect, the manufacturer is obligated to rectify it at its discretion, either by repairing the instrument or by delivering an intact replacement.
- No guarantee is provided for defects caused by natural wear (wearing parts in particular) and improper use.
- The instrument manufacturer shall not be liable for damage caused by faulty operation, negligence or any other tampering with the microscope, particularly the removal or replacement of microscope components, or the use of accessories from other manufacturers.

Unauthorized tampering with the instrument shall lead to a forfeit of all warranty claims.

1.7 Warning and Information Labels

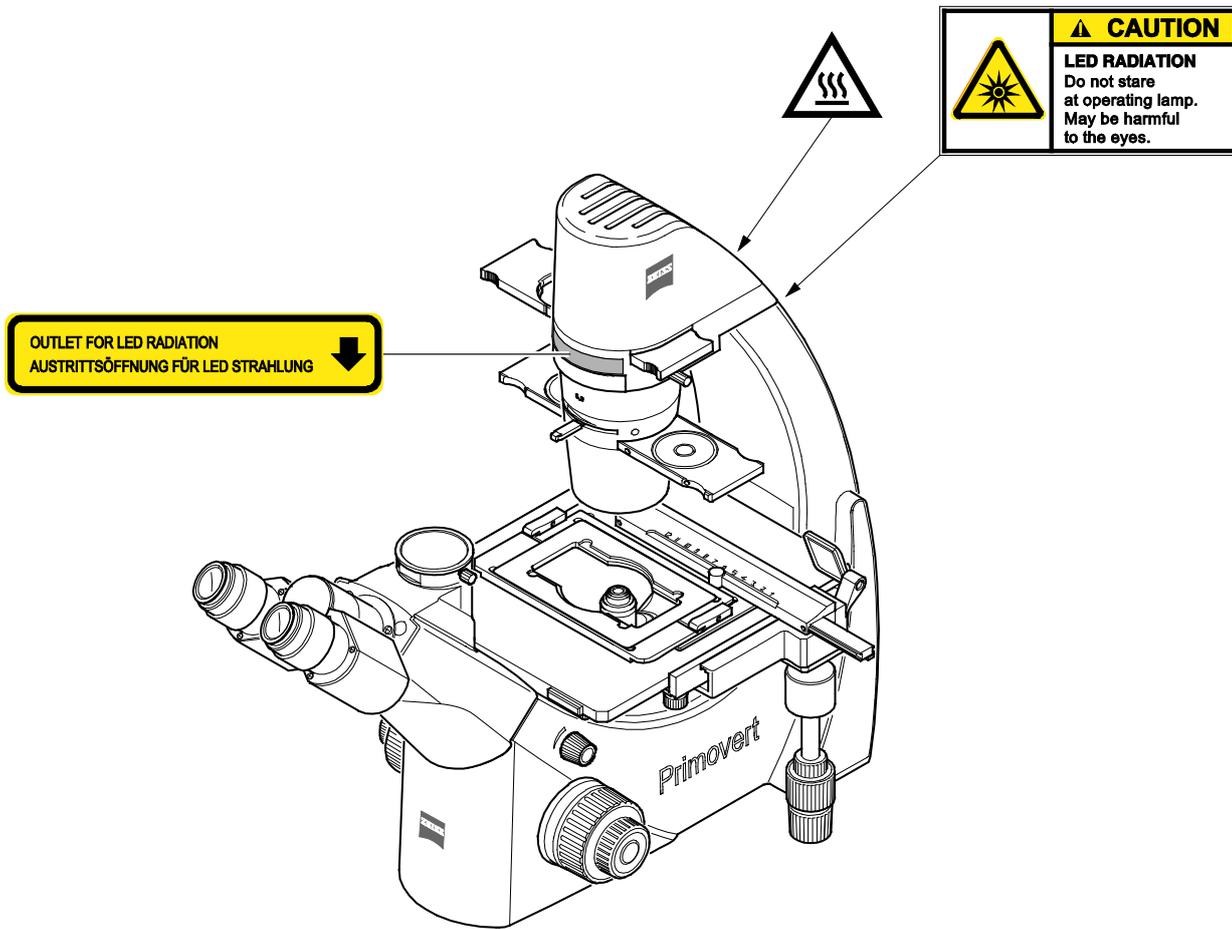
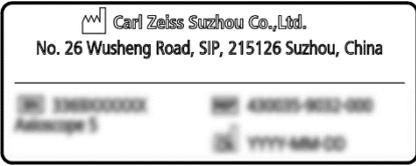
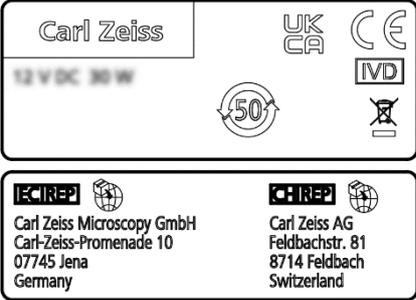


Fig. 1 Warning and information labels on the Primovert

1.8 Meaning of Warning and Information Labels

| Symbol | Description |
|---|--|
|  | <p>Microscope type label Position: front side of the stand</p> |
|  | <p>Microscope type and importer label Position: front side of the stand</p> |
|  | <p>Outlet for LED radiation Austrittsöffnung für LED-Strahlung</p> |
|  | <p>CAUTION LED RADIATION Do not stare at operating lamp. May be harmful to the eyes.</p> |
|  | <p>Hot surface! Do not touch.</p> |

2 Description

2.1 Designation, Intended Purpose, and Typical Applications

Designation

Primovert microscopes include Primovert and Primovert iLED.

Intended Purpose

The inverted microscopes Primovert are instruments for general microscopic imaging for the in vitro-examination of various biological samples including samples collected from humans or animals. This imaging provides information to further assess physiological and pathological conditions. The microscopes are intended to be used by trained professionals only.

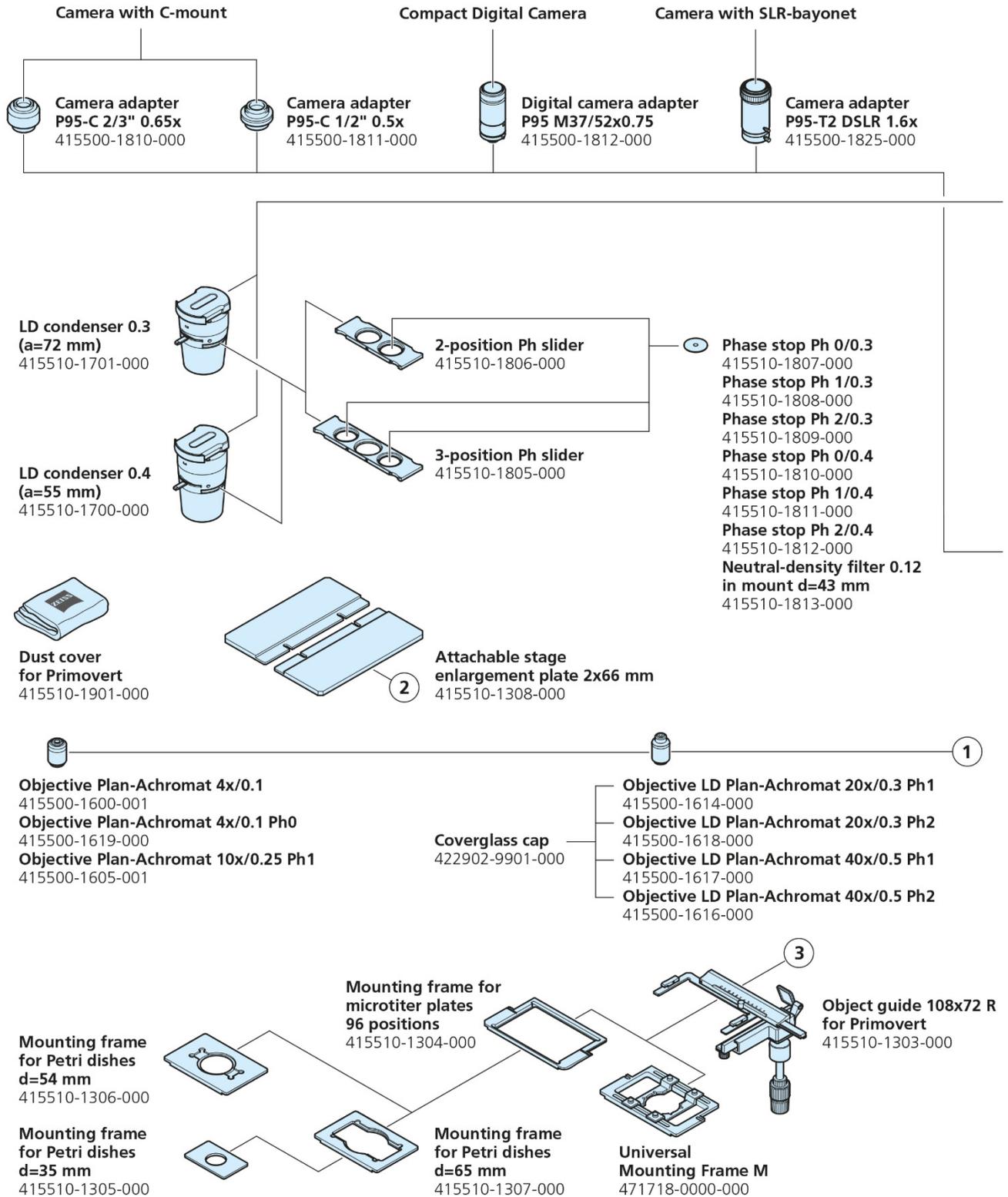
Typical applications

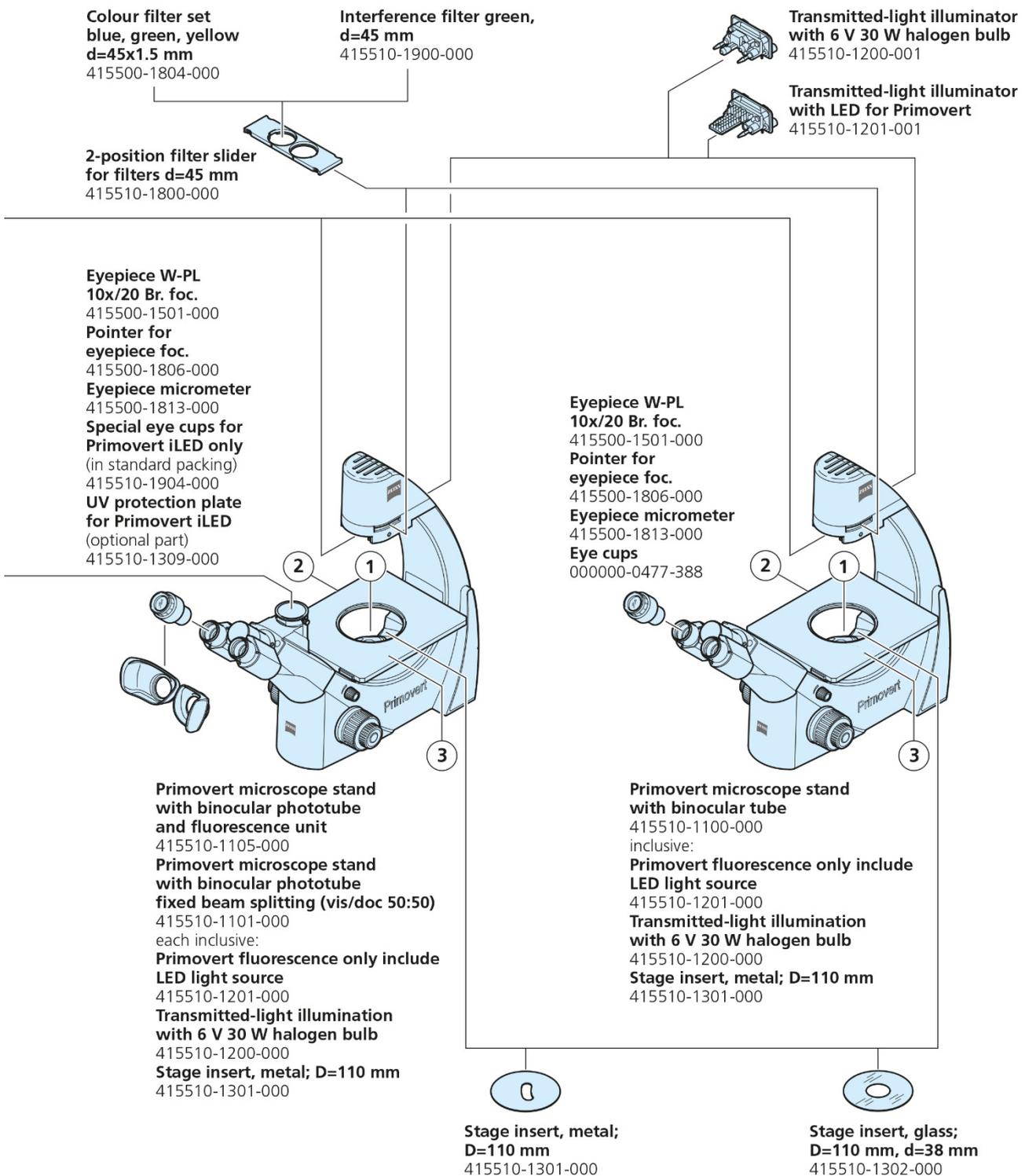
- Medical examinations in laboratories (research), clinics and medical practices
- Science and research (colleges, universities) in the fields of medicine and biology
- Industrial applications (pharmacology, food technology)

2.2 Lifetime

A microscope is an opto-electronic device. Its availability for use is significantly determined by the performed maintenance. ZEISS guarantees the ability for maintenance and repair within eight years after initial operation. This is ensured by a corresponding service and spare parts concept, thus enabling the intended purpose within this duration.

2.3 System Overview





2.4 Instrument Description and Main Features

The Primovert microscopes are inverted transmitted-light microscopes of compact design with a small footprint.

The user can choose from among three types of stands for the brightfield and phase contrast in transmitted light microscopic techniques.

- Stand-type Primovert with binocular tube
- Stand-type Primovert Photo with binocular phototube for photo and video documentation
- Stand-type Primovert iLED with integrated LED-fluorescence unit (one channel) and binocular phototube

Important features of the microscope are:

- Stand equipped with a binocular tube or a binocular phototube (50 % vis, 50 % doc) with an ergonomically favorable tube angle of 45°. The binocular part can be tilted upward and downward and adapted to the individual eye distance. As there is an upper and lower binocular part position, the user can choose between two viewing heights.
- Illumination either by a 6 V / 30 W halogen lamp insert or an LED.
- Continuously adjustable illumination intensity.
- Blue light-intensity indicators installed on both sides, which are visible from a distance.
- External plug-in power unit with cable (incl. cable with multiple plug and country-specific plug inserts).
- Plastic-coated carrying handle integrated in the stand for setting up, demounting and transporting the device.
- Convenient coaxial coarse and fine focusing drive; adjustable torque of coarse focusing drive.
- Fixed specimen stage suitable for inserting metal or glass plates and attaching the stage enlargement plates and the specimen guide.
- Quadruple nosepiece with W 0.8" lens thread running on ball bearing.
- Infinity-corrected "Plan-ACHROMAT" objectives with magnifications of 4x and 10x for brightfield and phase contrast, as well as LD "Plan-ACHROMAT" objectives with long working distance and magnifications of 20x and 40x for brightfield and phase contrast.
- Preadjusted phase contrast: Use of only one phase stop for objectives with magnifications of 10x, 20x and 40x for phase contrast.
- Adjustable eyepieces 10x for field-of-view number 20, suitable for spectacle wearers.

2.5 Objectives

The objectives are the optical heart of the microscope. The objectives may be labeled as follows:

LD Plan-ACHROMAT 40x/0.5 Ph 1 ∞ /1.0



Fig. 2 Objective (mounting position)

Where:

LD Long working distance
 40x Objective magnification, with a defined color ring on the objective being assigned to each magnification step (Carl Zeiss color code)

0.5 Numerical aperture

∞ Infinite mechanical tube length

1.0 Usable with cover glass thickness
 $D = 1.0$ mm, similar data for other glass cover thicknesses in millimeters

or

0 Usable without cover glass

– Usable with cover glass thickness $D = 0$ or 0.17 mm

Other labels:

Ph Phase contrast objective with green inscription

The total visual magnification of the stand with tube / phototube is obtained by multiplying objective magnification by eyepiece magnification, e.g., $40 \times 10 = 400x$.

Numerical aperture multiplied by 1000, e.g. $0.5 \times 1000 = 500x$, presents the maximum useful magnification; there is no resolution for further details above that limit.

If glass cover slips are employed, objectives can also be used with other cover glass thicknesses.

Available objectives:

| Objective | Magnification | NA | Description | Working distance (mm) | Order No. | Field of view (mm) |
|------------------|---------------|------|-------------|-----------------------|-----------------|--------------------|
| Plan-Achromat | 4x | 0.10 | HF | 12 | 415500-1600-001 | 20 |
| Plan-Achromat | 4x | 0.10 | Ph0 | 12 | 415500-1619-000 | 20 |
| Plan-Achromat | 10x | 0.25 | Ph1 | 4.4 | 415500-1605-001 | 20 |
| LD Plan-Achromat | 20x | 0.30 | Ph1 | 4.6 | 415500-1614-000 | 20 |
| LD Plan-Achromat | 40x | 0.50 | Ph1 | 2.8 | 415500-1617-000 | 20 |
| LD Plan-Achromat | 20x | 0.30 | Ph2 | 4.6 | 415500-1618-000 | 20 |
| LD Plan-Achromat | 40x | 0.50 | Ph2 | 2.8 | 415500-1616-000 | 20 |

3 Start-Up and Operation

3.1 Starting up the Microscope

3.1.1 Setting up the Microscope

-  Before installing and starting up the microscope, be sure to carefully read and subsequently observe the notes on instrument safety (see Section 1).

The microscope is supplied completely assembled and, inclusive of its accessories, packed to commercial standards.

The accessories and individual microscope components (such as sliders, filters or phase stops, specimen holders, specimen guides or the stage enlargement plates) are delivered in separate packages and must still be mounted to the microscope.

- Take the microscope out of the transport case and put it on the worktable, using the handle on the back of the stand. Do **not** hold the microscope on the front side by the eyepiece part, but by the neck of the stand between the eyepiece part and the stand base or at the front and at the back of the stand base.

-  Retain the original packaging for a longer storage of the microscope or its return to the manufacturer.

3.1.2 Screwing in the Objectives

- Remove the dust caps from the location holes of the nosepiece (Fig. 3/2).
- Screw the objectives (Fig. 3/1) in ascending order into the location holes until the stop is reached.
- Affix the supplied stickers (Fig. 3/3) indicating the objective magnification, to the corresponding positions of the nosepiece.

-  **Recommendation:**
Affix the stickers so that you can read from the left side (Fig. 3/3) the magnification of the objective just positioned in the light path.

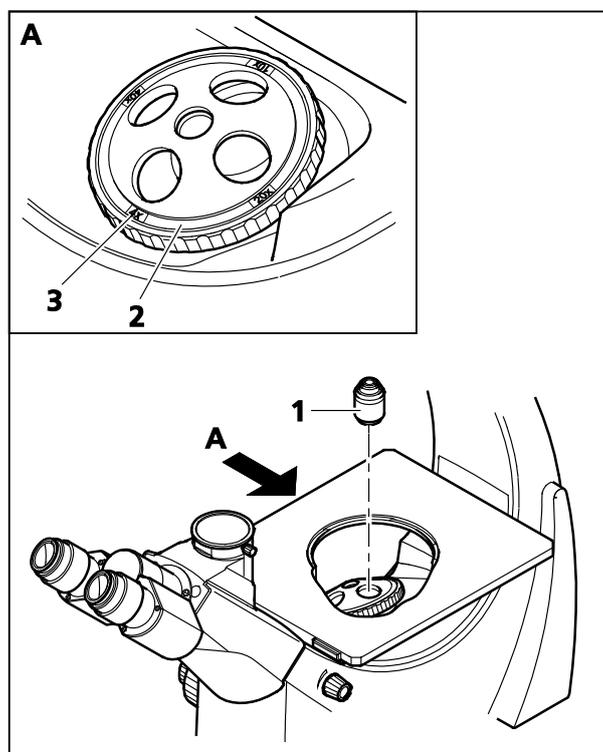


Fig. 3 Screwing in the objectives

3.1.3 Inserting the Condenser

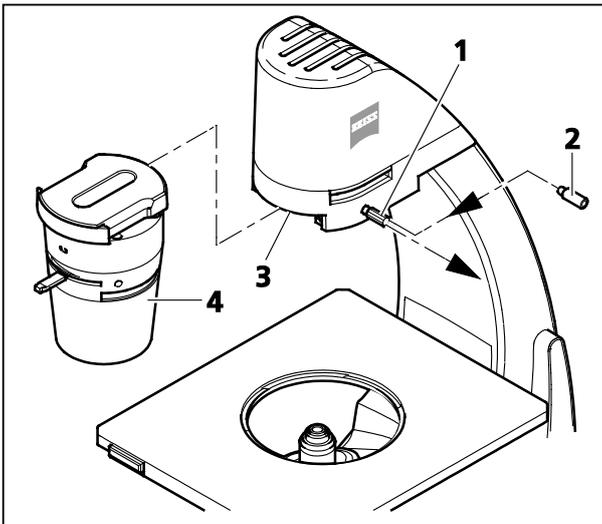


Fig. 4 Inserting the condenser

- Remove the condenser cap.
- Insert the condenser (Fig. 4/4) from the front into the guide (Fig. 4/3) and push it in to stop.
- Lock the condenser by tightening the socket head cap screw or the knurled thumb screw (Fig. 4/1), which is equally supplied with the microscope.



Recommendation:

If condensers are frequently exchanged or whenever larger glass vessels are to be used frequently without a condenser, the knurled thumb screw supplied rather than the socket head cap screw (Fig. 4/2) should be employed to lock the condenser.

3.1.4 Inserting the Filter Slider

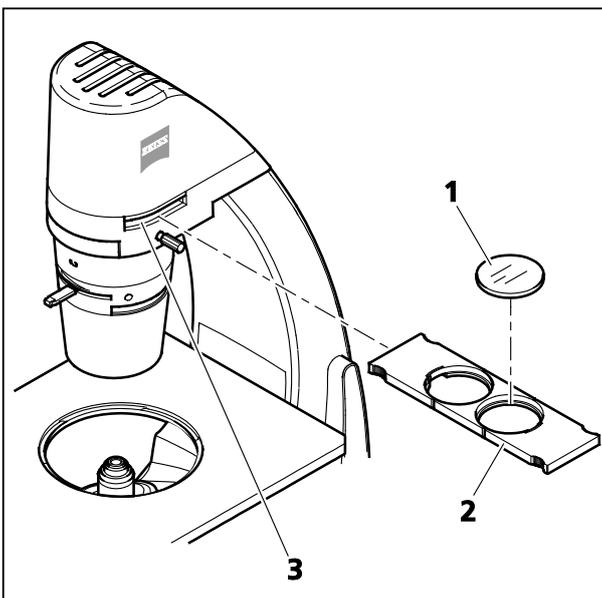


Fig. 5 Inserting the filter slider

- Put the color filter (Fig. 5/1) or the green interference filter (diameter $d=45$ mm) into the opening of the filter slider.



As the filters are clamped in the filter slider only slightly, not twist-proof, the filter slider should not be turned or tilted in order to avoid that the filters fall out and get damaged.

- Push the 2-position filter slider (Fig. 5/2) from the left or the right side into the slot (Fig. 5/3) of the upper part of the stand until it engages in the desired position.



When using the Primovert iLED in fluorescent mode, use the yellow filter inserted into the filter slider (included in the delivery). It prevents scattered fluorescent background generated by unwanted transmitted LED source phosphor.

3.1.5 Inserting the Phase Contrast Slider

The 2-position Ph slider (Fig. 6/1) and the 3-position Ph slider (Fig. 6/2) are delivered completely, with phase contrast stops mounted.

- Push the Ph slider (Fig. 6/1 or 2) from the right or the left side, with the inscription facing upwards, into the condenser slot (Fig. 6/3) until it engages in the desired position.



If necessary, the neutral filter can be inserted into the free position of the corresponding phase contrast slider. This prevents the user from being dazzled when the slider position is changed.

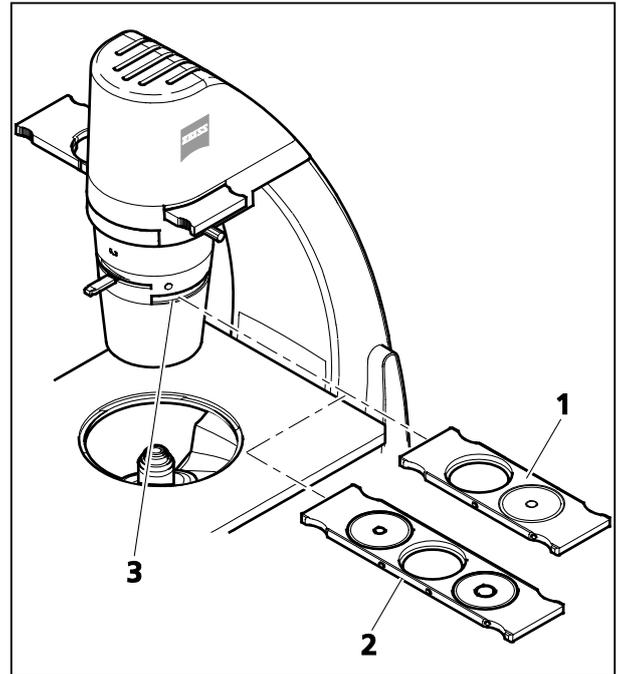


Fig. 6 Inserting the phase contrast slider

3.1.6 Inserting the Stage Inserts and Attaching the Stage Enlargement Plates

- Insert either the metal insert (Fig. 7/5) or the glass insert (Fig. 7/6) into the specimen stage.

The metal insert with a bean-like opening is to be used to prevent an objective with short working distance (e.g. 40x) from colliding with the sample container when being rotated into the light path. Because of the longer working distance, LD objectives (LD = long distance) can also be used. The stage insert with bean-like opening is provided with an orientation pin to fix its position.

- If the size of the stage surface does not suffice, stage enlargement plates (Fig. 7/1 and 3) can be attached to both the left and the right side. The stage enlargement plates have to be attached to the stage (Fig. 7/4) from below and fixed using the two knurled screws (Fig. 7/2) included in the delivery.

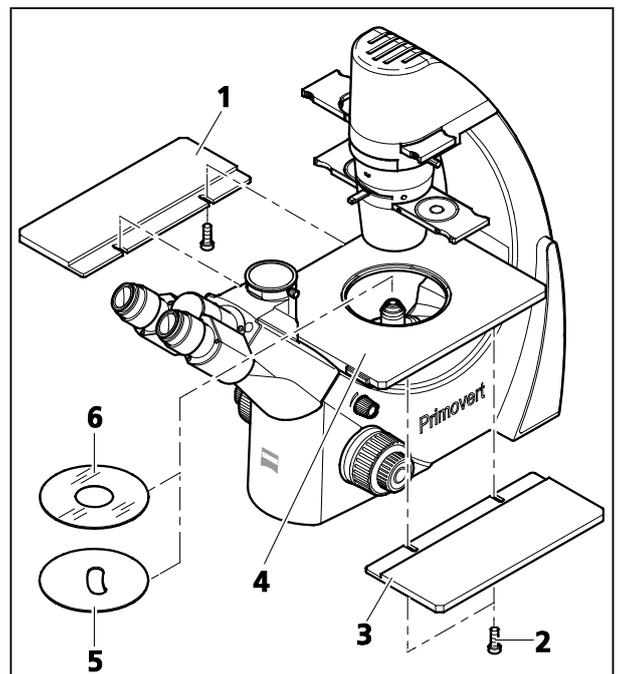


Fig. 7 Inserting the stage inserts and attaching the stage enlargement plates



If the specimen guide is used, it is not possible to use the stage enlargement plate on the right side of the stage.

3.1.7 Mounting the Specimen Guide and Inserting the Mounting Frame

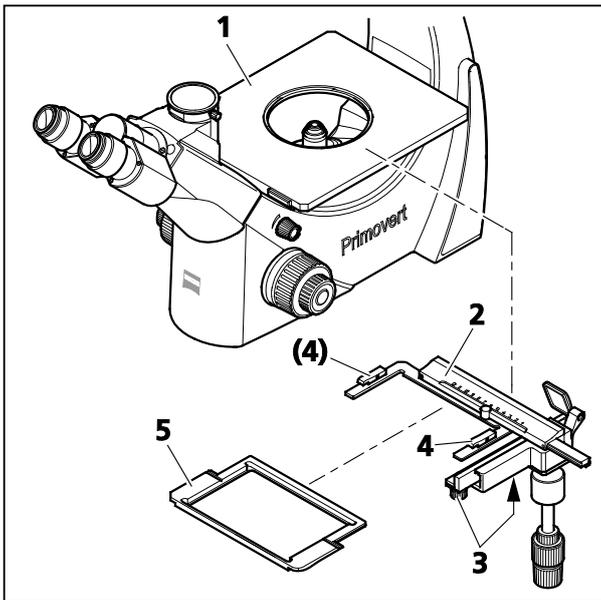


Fig. 8 Mounting the specimen guide and inserting the mounting frame

- If attached, remove the stage enlargement plate from the right side of the stage.
- Attach the specimen guide (Fig. 8/2) from below to the right side of the stage (Fig. 8/1) and fasten it with the two knurled screws (Fig. 8/3) of the specimen guide.
- Insert the universal mounting frame M or the mounting frame for 96-position microtiter plates (Fig. 8/5) into the specimen guide, depending on the sample vessel used. Make sure that the mounting frame stops properly in the two fixing clips (Fig. 8/4).

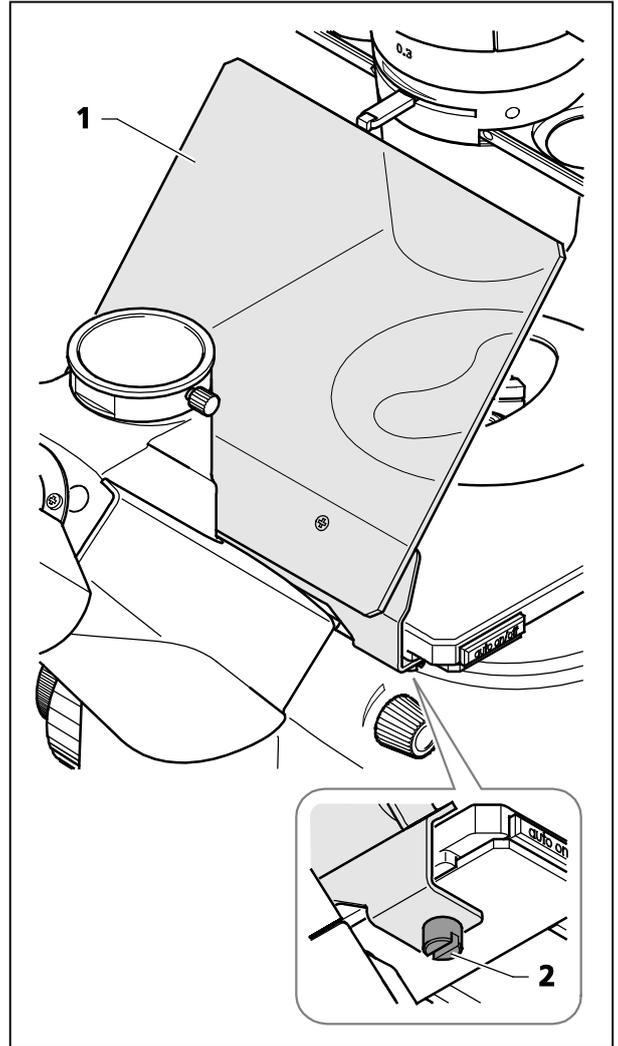
For Petri dishes with 65 mm or 54 mm diameter, insert the corresponding mounting frame into the mounting frame for microtiter plates.



If required, the mounting frame for Petri dishes $d=35$ mm can be inserted additionally into the mounting frame for Petri dishes $d=65$ mm.

3.1.8 Mounting UV Protection Plate onto Primovert iLED

- Put the UV protection plate (Fig. 9/1) on the Primovert fluorescence stand.
- Fix it with the screws (Fig. 9/2) on both sides.



- 1 UV protection plate
2 Screws

Fig. 9 Mounting UV protection plate onto Primovert iLED

3.1.9 Transmitted-Light Illuminator: Inserting the LED

The microscope is delivered with the transmitted-light illuminator with halogen bulb 6 V 30 W/LED 3 W already mounted.

If the transmitted-light illuminator with LED (halogen bulb) is to be additionally employed, it must be inserted into the stand instead of the transmitted-light illuminator with halogen bulb (LED) (see Section 3.8.1).

3.1.10 Connecting the Stand with Binocular Tube or Phototube to the Power Supply System

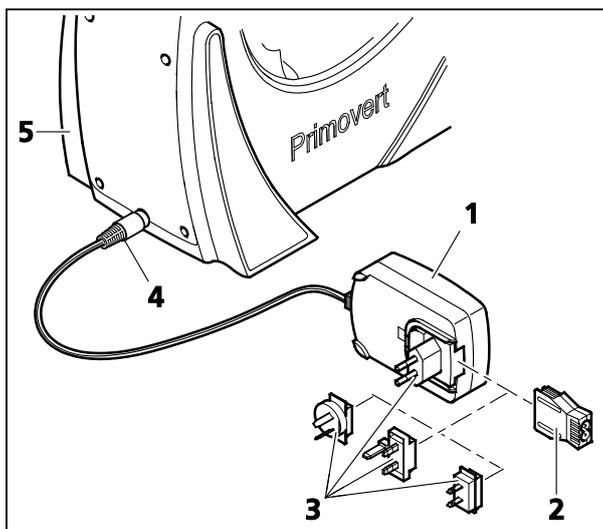


Fig. 10 Connecting the plug-in power unit

- If necessary, replace the power supply adapter attached to the plug-in power unit (Fig. 10/1) by one of the country-specific adapters supplied (Fig. 10/3), pulling off the existing adapter and inserting the desired one.
- Insert the plug (Fig. 10/4) of the plug-in power unit into the connection socket located on the rear of the stand (Fig. 10/5).
- Connect the plug-in power unit (Fig. 10/1) with a power outlet.
- If the plug-in power unit cannot be plugged into the chosen power outlet because of limited space, replace the power outlet adapter by the supplied IEC adapter (Fig. 10/2). This allows the plug-in power unit to be put flat onto the tabletop and connected to the power outlet through a country-specific appliance cable.

3.2 Operating the Microscope

3.2.1 Operational and Functional Elements of the Primovert Microscope

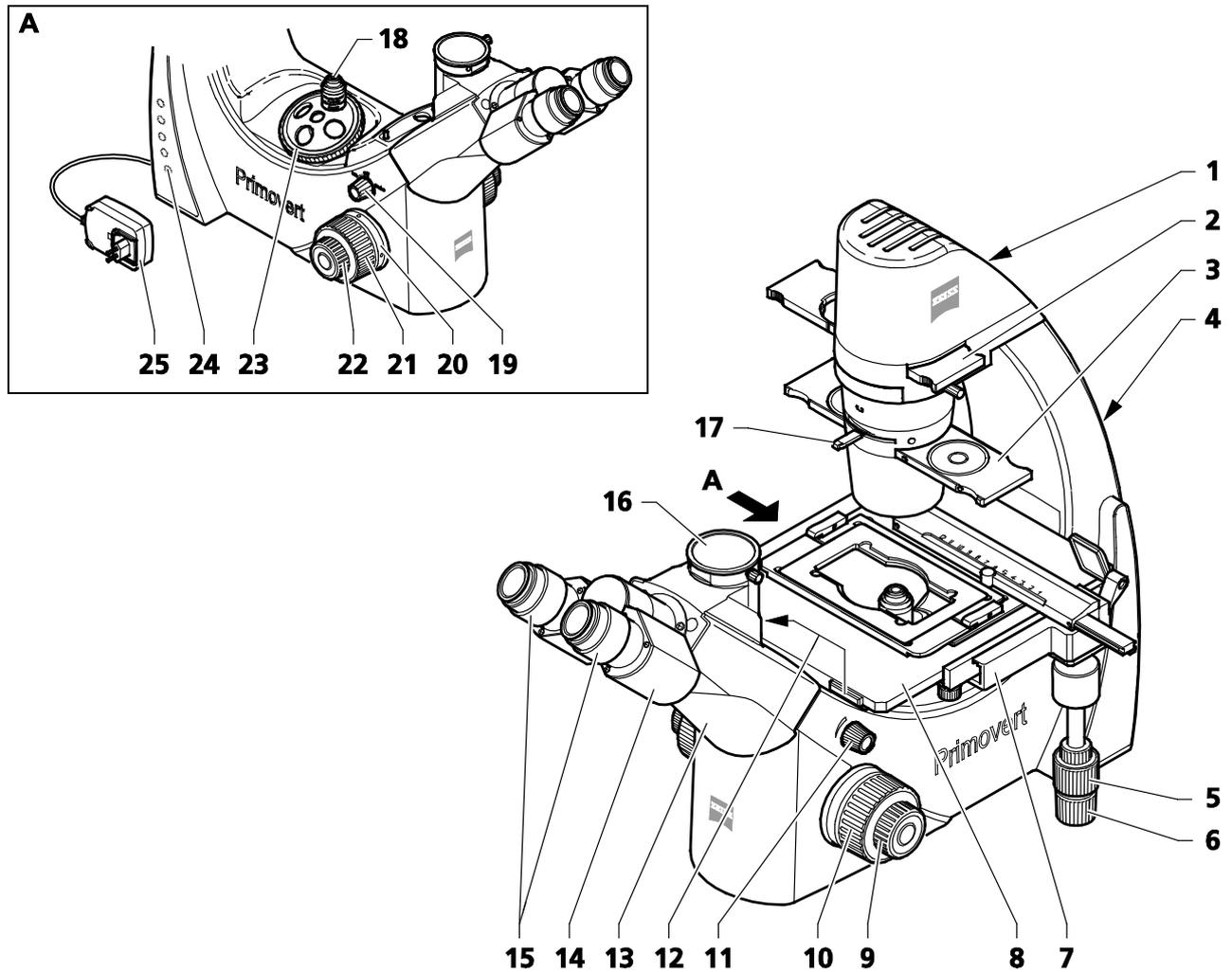


Fig. 11 Operational elements of Primovert with binocular tube, ergotube and phototube

Legend to Fig. 11:

- 1 Transmitted-light illuminator (built-in)
- 2 Filter slider
- 3 Slider with phase stops
- 4 Handle (rear)
- 5 Control knob for Y travel of specimen guide (travel readable on alphabetic scale reflected in the mirror)
- 6 Control knob for X travel of specimen guide (travel readable on numeric scale)
- 7 Specimen guide
- 8 Specimen stage
- 9 Fine focusing drive (right side)
- 10 Coarse focusing drive (right side)
- 11 Rotary knob for adjusting the illumination intensity
- 12 On/off switch for illumination; active with rotary knob in AUTO position
- 13 Tube
- 14 Binocular part of the tube
- 15 Eyepieces
- 16 Camera port (only stand with binocular phototube)
- 17 Lever for adjusting the aperture diaphragm of the condenser
- 18 Objective
- 19 Rotary knob for switching the microscope on and off, with ON, OFF and AUTO positions
- 20 Ring for adjusting the torque of the coarse focusing drive
- 21 Coarse focusing drive (left side)
- 22 Fine focusing drive (left side)
- 23 Nosepiece
- 24 Illumination intensity indicators (on both sides of the stand)
- 25 Plug-in power unit

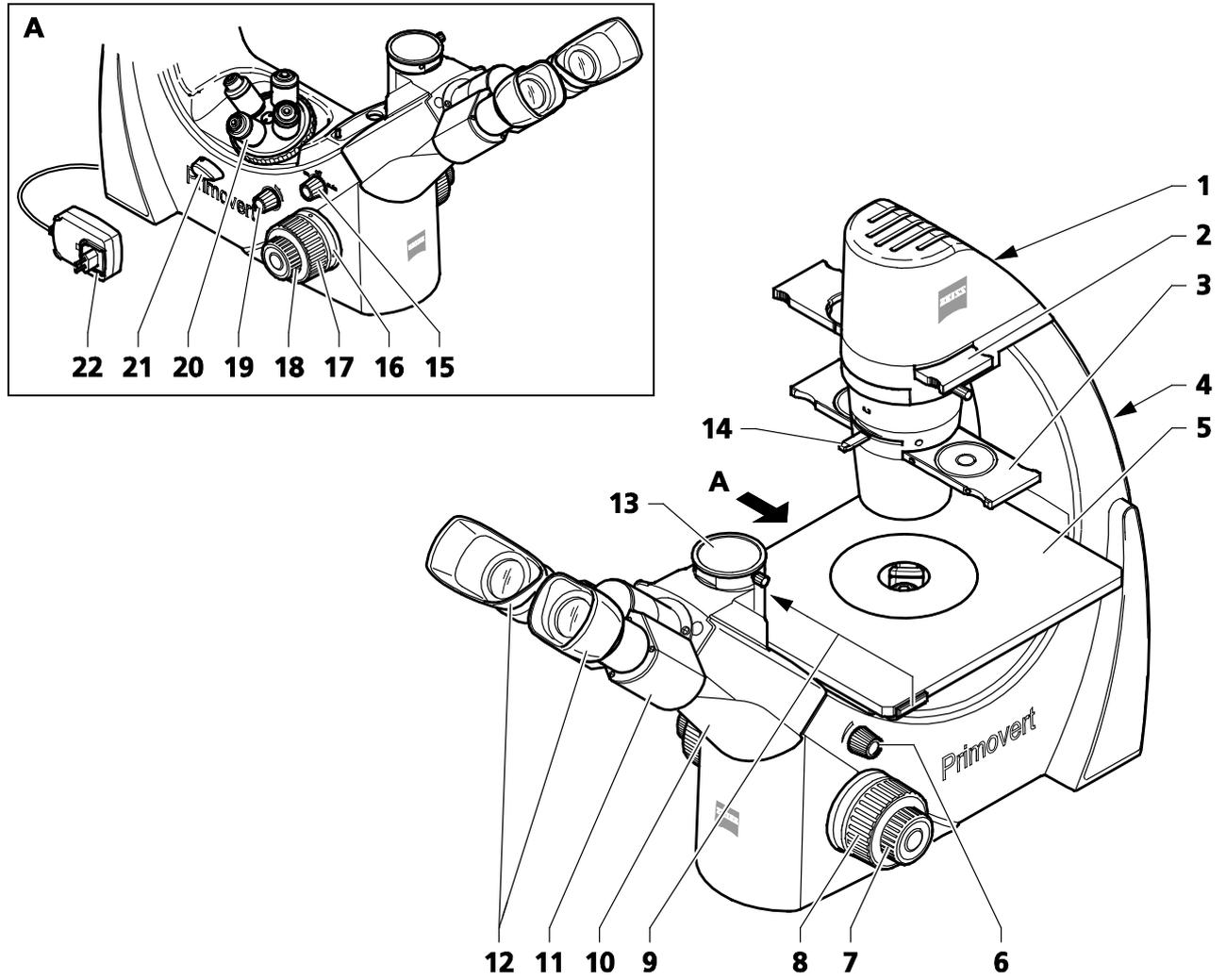


Fig. 12 Operational elements of Primovert iLED with integrated fluorescence unit

Legend to Fig. 12:

- 1 Transmitted-light illuminator (built-in)
- 2 Filter slider
- 3 Slider with phase stops
- 4 Handle (rear)
- 5 Specimen stage
- 6 Rotary knob for adjusting the transmitted light illumination intensity
- 7 Fine focusing drive (right side)
- 8 Coarse focusing drive (right side)
- 9 On/off switch for illumination; active with rotary knob in AUTO position
- 10 Tube
- 11 Binocular part of the tube
- 12 Eyepieces with eyecups
- 13 Camera port (only stand with binocular phototube)
- 14 Lever for adjusting the aperture diaphragm of the condenser
- 15 Rotary knob for switching the microscope on and off, with ON, OFF and AUTO positions
- 16 Ring for adjusting the torque of the coarse focusing drive
- 17 Coarse focusing drive (left side)
- 18 Fine focusing drive (left side)
- 19 Rotary knob for adjusting the fluorescent illumination intensity
- 20 Nosepiece
- 21 Transmitted light / reflected light changeover switch (Brightfield / Fluorescence)
- 22 Plug-in power unit

3.3 Switching the Microscope On / Off

- Switch on the microscope using the rotary knob (Fig. 13/2) (**ON** or **AUTO** position).
 - **ON** position:
The two ON/OFF switches (Fig. 13/1) on the specimen stage for quickly switching the transmitted-light illuminator on and off are inactive. The illuminator remains continuously switched on.
 - **AUTO** position:
The ON/OFF switches (Fig. 13/1) for quickly switching the transmitted-light illuminator on and off are active. So, the illuminator can be switched off and on again quickly. After an operation time of 15 minutes, the illuminator switches off automatically and goes to standby mode. Upon actuating one of the ON/OFF switches, the illuminator switches on again. When actuating the switch once more during operation, the 15-minute period will start again from the beginning.



Recommendation:

If you want to use the microscope only for a short time, you should use the **AUTO** function. This saves energy and extends the lifetime of the transmitted-light illuminator.

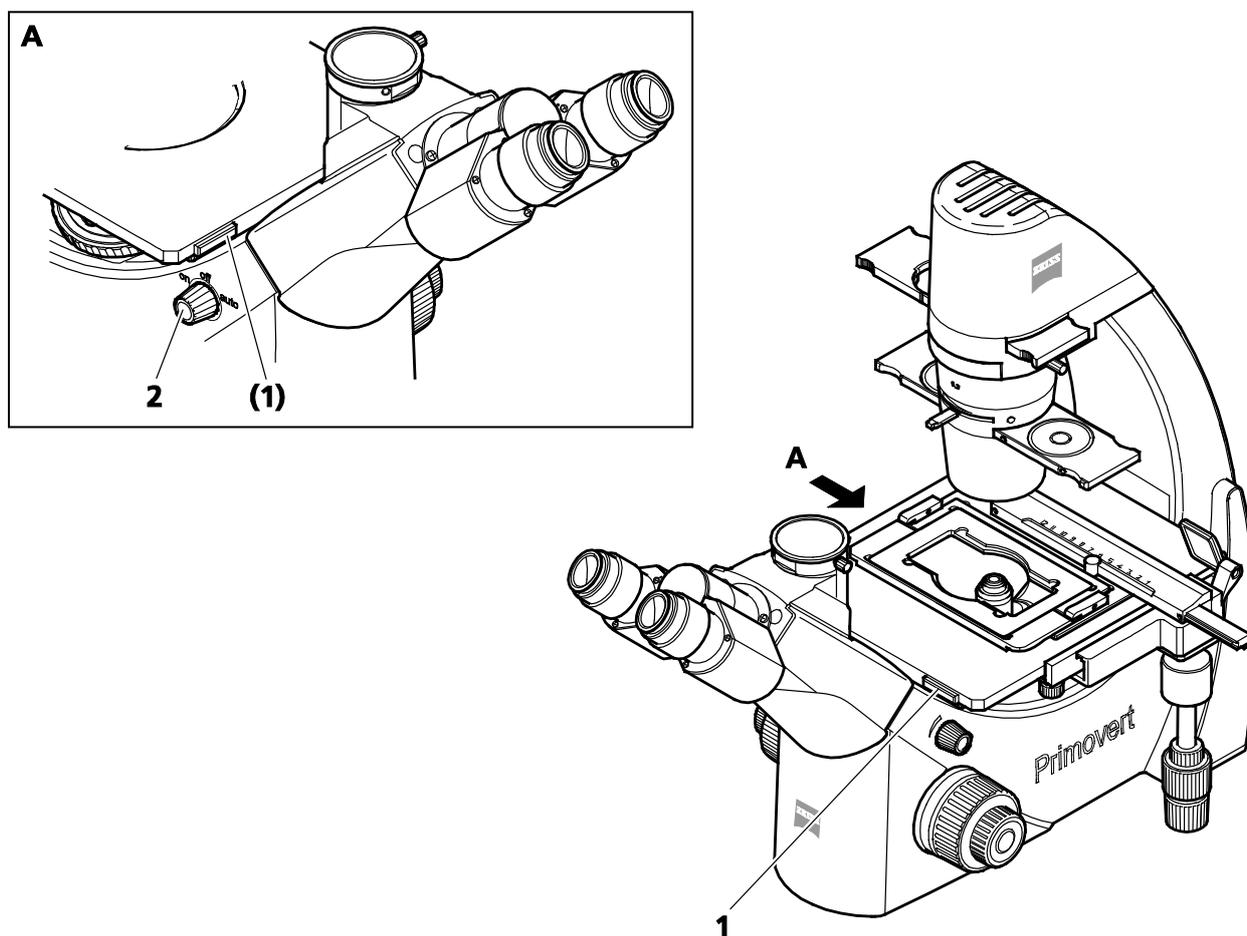


Fig. 13 Switching the microscope on or off

- Adjust the desired illumination intensity using the rotary knob (Fig. 11/11).

The selected intensity is indicated in five steps by the blue light-emitting diodes (Fig. 11/24) arranged on both sides of the stand.

- The torque of the coarse focusing drive is factory-adjusted and can be readjusted if required. For this purpose, insert a screwdriver into one of the four radially arranged holes of the ring (Fig. 11/20), hold the coarse focusing knob (Fig. 11/21) in position and turn the ring with the screwdriver to the right or left in order to adjust the torque of the coarse drive as desired.
- After finishing work, switch off the microscope with the rotary knob (Fig. 13/2) (**OFF** position).
- Cover the microscope with the dust cover.

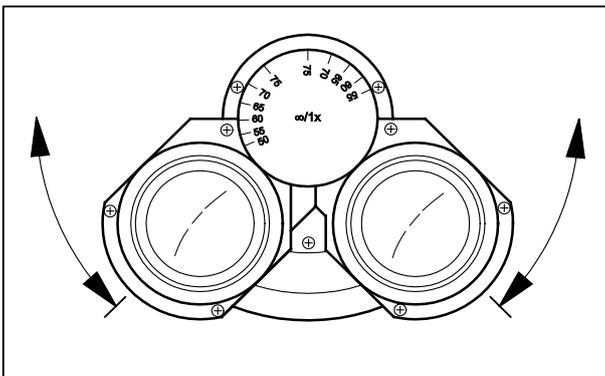


Fig. 14 Adjusting the interpupillary distance

3.4 Adjusting Interpupillary Distance and Viewing Height

- Rotate the eyepiece tubes symmetrically toward or away from one another to adjust the distance between the tubes to your individual interpupillary distance (Fig. 14).

With the correct interpupillary distance you see only **one** round image while looking through both eyepieces!

- Swivel the eyepiece tubes upward (Fig. 15/A) or downward (Fig. 15/B) to adjust the viewing height to your individual requirements.

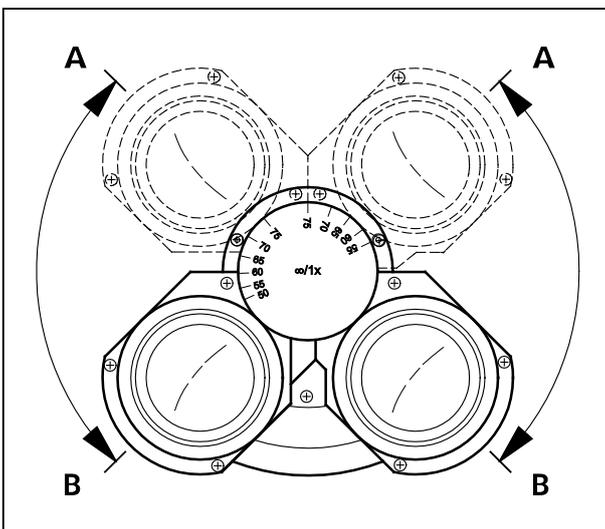


Fig. 15 Adjusting the viewing height

3.5 Compensating Defective Vision at the Eyepieces and Inserting the Eyepiece Pointer or Eyepiece Micrometer

The eyepieces (Fig. 16/3) can be equipped with fold-over rubber eyecups (Fig. 16/1: pulled out; Fig. 16/2: folded over). Die eyecups are supplied together with the eyepieces, but are not yet mounted.

Both eyepieces are suitable for spectacle wearers. They contain additionally a focusing ring for the compensation of defective vision. The provided diopter scale serves to facilitate finding the correct setting.

If required, an eyepiece pointer or an eyepiece micrometer with a diameter of 23 mm can be inserted in one eyepiece.

To this end, follow this procedure:

- Unscrew the stop (Fig. 16/5) by hand from the eyepiece.
- Insert the eyepiece pointer (Fig. 16/4a) or the eyepiece micrometer (Fig. 16/4b) into the eyepiece (with the coated side facing your eyes).
- Screw in the stop again.
- Insert the eyepiece into the tube.
- Attach the eyecups.
- Turn the focusing ring of the eyepiece (Fig. 16/3) to focus on the wedge-shaped figure of the eyepiece pointer.
- Put the specimen onto the specimen stage. Look at the specimen through the eyepiece with the eyepiece pointer and bring the microscopic image into focus using the focusing drive.
- When in the above-mentioned eyepiece both the microscopic image and the eyepiece pointer appear sharply defined, focus the image for the second eye by turning the focusing ring of the second eyepiece.

Having done so, both microscopic images inclusive of the eyepiece pointer are focused.

From now on, you should focus onto the specimen using the focusing drive only.

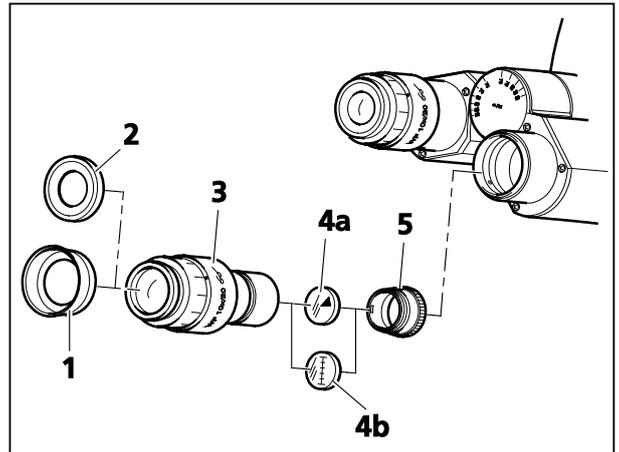


Fig. 16 Inserting the eyepiece pointer or eyepiece micrometer

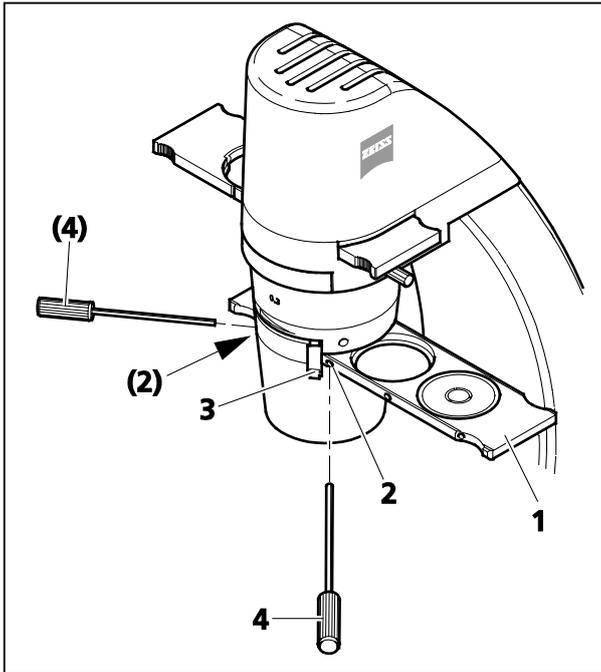


Fig. 17 Inserting the slider

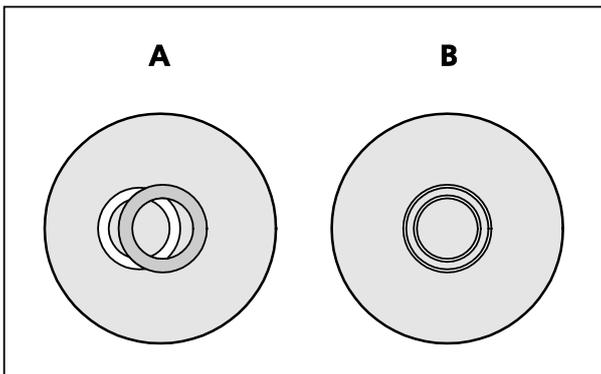


Fig. 18 Centering the phase stop

3.6 Adjusting Transmitted-Light Phase Contrast

- First, adjust the microscope as you do for brightfield.
- Turn the nosepiece to position the phase-contrast objective (for Ph 0, Ph 1 or Ph 2) into the light path.
- Open the aperture diaphragm completely by means of the lever (Fig. 17/3) on the condenser.
- Introduce the slider (Fig. 17/1) into the condenser so that the phase stop position suitable for the objective used (Ph 0, Ph 1 or Ph 2) is in the light path. Pay attention to the correct detent position.
- Adjust the illumination intensity as needed.

Stand with Binocular Tube or Phototube

- Check the centering of the phase stop according to the drawing in Fig. 18. To this end, remove one eyepiece and replace it by the diopter.
- Center the phase stop, if necessary (Fig. 18/A), by turning the two adjusting screws (Fig. 17/2) of the corresponding slider position by means of the two Allen keys SW 1.5 (Fig. 17/4) until the image corresponds to that shown in Fig. 18/B.
- Afterwards, replace the diopter by the eyepiece again.

Stand with Monitor

- Put on the standard phase contrast specimen.
- Use the two adjusting screws to center the annular diaphragms on the monitor display, while taking the following into account:
 - Ensure even monitor display illumination for the purpose of coarse adjustment.
 - For fine adjustment, set the contrast to maximum, so that the texture is as bright as possible, while the background is as dark as possible.

3.7 Reflected-Light Fluorescence

- Turn the transmitted light / reflected light changeover switch (Fig. 19/1) upward to the reflected-light position (Fluorescence).
- Switch on the reflected-light illuminator using the rotary knob (Fig. 19/2) and adjust the desired illumination intensity.

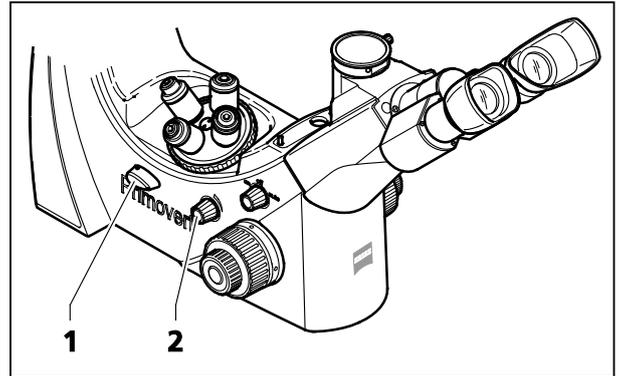


Fig. 19 Adjusting reflected-light fluorescence

3.8 Retrofitting the Microscope



Unplug the plug-in power unit from line power before retrofitting the microscope.

3.8.1 Replacing the Halogen Bulb 6 V / 30 W of the Transmitted-Light Illuminator or the Transmitted-Light Illuminator with LED



Switch off the microscope before replacing the transmitted-light illuminator with LED or the halogen bulb 6 V / 30 W, allow for a sufficient cool-down time and remove the plug-in power unit from the socket.

- Press down the clamping lug of the cover (Fig. 20/1) and remove the cover from the stand.
- Loosen both fastening screws (Fig. 20/2) of the transmitted-light illuminator (e.g. transmitted-light illuminator with halogen bulb, Fig. 20/3). In doing so, slightly press the screws against the spring and turn them by 90°: Turn left and right screw clockwise.
- Pull the transmitted-light illuminator (Fig. 20/3) out of the stand.
- Pull the halogen bulb (Fig. 20/4) out of the lamp carrier and insert the new halogen bulb. Do not touch the new lamp with bare fingers as this will decrease the life of the bulb.
- If the illumination background is not homogeneous, center the halogen bulb by slightly rotate the both screws (Fig. 21/1 and 2) with the SW 2.5 hexagonal key.

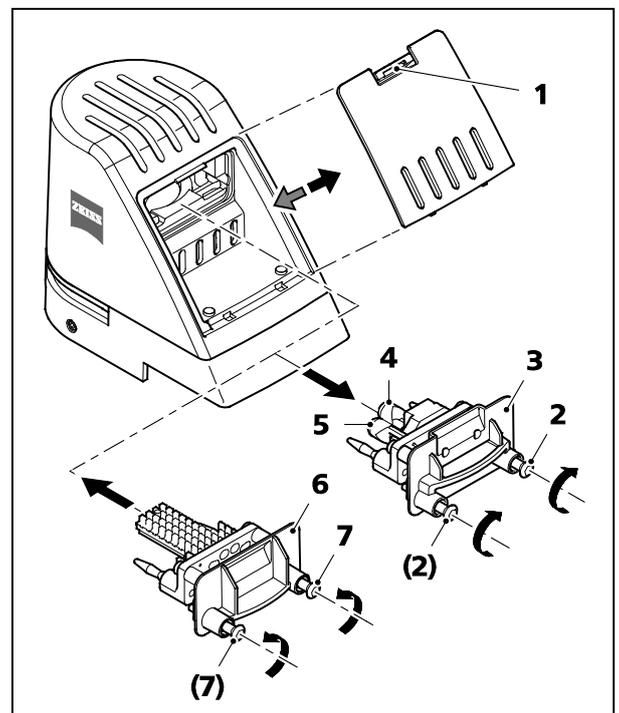


Fig. 20 Replacing the halogen bulb 6 V / 30 W or the transmitted-light illuminator with LED

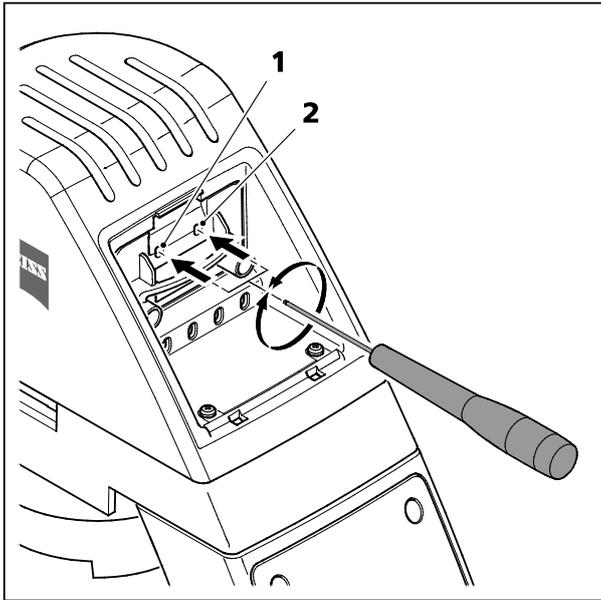


Fig. 21 Centering the halogen bulb



A spare bulb (Fig. 20/5) can be placed in the transmitted-light illuminator with halogen bulb and remain there during the operation.



The transmitted-light illuminator with LED has to be replaced completely. The LED alone cannot be replaced.

- Push the transmitted-light illuminator (e.g. transmitted-light illuminator with LED, Fig. 20/6) into the stand and fasten it with the two screws (Fig. 20/7). In doing so, slightly press the screws against the spring and turn them by 90°: Turn right and left screw counterclockwise.
- Attach the cover (Fig. 20/1) again to the stand and let it snap into place.

3.8.2 Attaching a Camera to the Stand with Binocular Phototube

You can attach a digital camera, a video camera or a compact digital camera of your choice to the microscope with binocular phototube using the four available camera adapters (see Section 2.1).

- Loosen the clamping screw (Fig. 22/7) and remove the dust cap from the camera port (Fig. 22/8) of the binocular phototube.

Attaching a Compact Digital Camera

- Sliding mount (Fig. 22/4), thread adapter ring M37/52 (Fig. 22/3) and lens mount (Fig. 22/6) are supplied pre-assembled as Digital Camera Adapter P95 M37/52x0.75. The opposite drawing shows this unit dismantled. Furthermore, you may unscrew the thread adapter ring M37/52 (Fig. 22/3) from the sliding mount (Fig. 22/4) (not shown) so that you can also attach cameras with M37 thread.
- Mount the adapter ring (Fig. 22/2) (optional accessory for the corresponding camera) to the camera (Fig. 22/1) (see the operating instructions of the camera).
- Screw the unit consisting of sliding mount (Fig. 22/4), thread adapter ring M37/52 (Fig. 22/3) and lens mount (Fig. 22/6) into the adapter ring (Fig. 22/2).

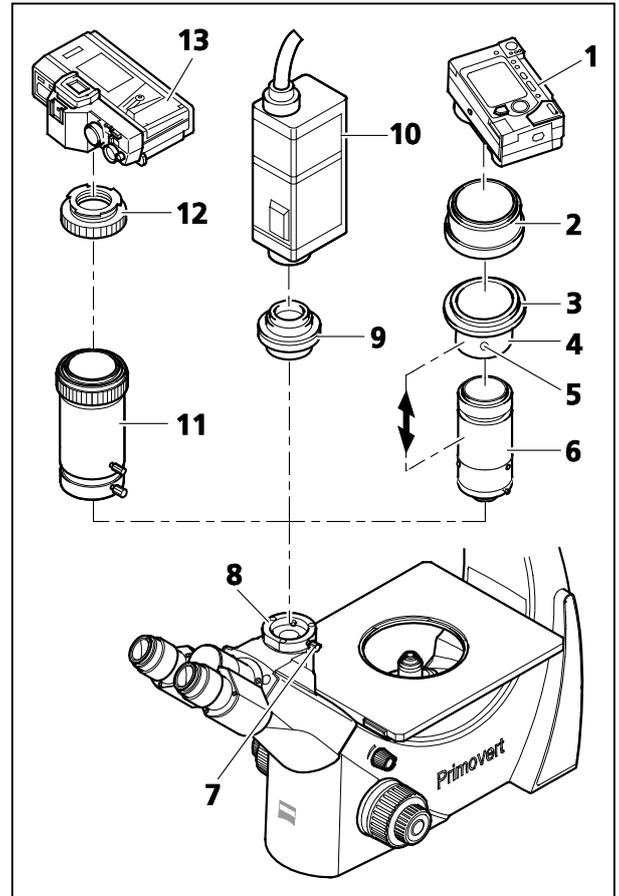


Fig. 22 Attaching the camera

- Insert the camera with adapter into the phototube as far as it will go. Align it and fasten it with the clamping screw (Fig. 22/7).
- Depending on the microscope equipment or the camera used, it may be necessary to optimize the distance between camera lens and lens mount (Fig. 22/6) (see double-headed arrow). This will be necessary in particular if it is impossible to obtain an unvignetted image in any of the zoom positions of the camera lens. To this end, adjust the camera as follows:
 - Switch off autofocus.
 - Set the object distance to ∞ .
 - Set aperture-priority auto exposure mode.
 - Choose an aperture as large as possible (i.e. small aperture number!).

Not all cameras provide these options. Please consult the operating manual of the camera used.

- Loosen the set screw (Fig. 22/5).
- Vary the camera lens/lens mount distance gradually, i.e. displace the sliding mount with camera on the lens mount in defined steps.
- Zoom the camera lens through from wide angle (W) to tele position (T).
- Carry out this test until the image is format-filling without masking or vignetting.
- Retighten the set screw (Fig. 22/5).



With camera/adapter combinations that have not been recommended expressly by Zeiss, it may be quite impossible to obtain an unvignetted image.

Attaching a Digital Camera, Single-Lens Reflex Camera or Video Camera with C-Mount Thread

Cameras with C-mount thread are to be connected to the phototube of the microscope by means of the camera adapter P95-C 2/3" 0.65x or P95-C 1/2" 0.5x (Fig. 22/9).

- Put the video camera (Fig. 22/10) or single-lens reflex camera (Fig. 22/13) (using the T2 adapter for this camera (Fig. 22/12) together with the corresponding camera adapter (Fig. 22/9 or 11) into the phototube as far as it will go, align it and fasten it with the clamping screw (Fig. 22/7).

3.9 Care, Maintenance and Troubleshooting

3.10 Instrument Care

Care of the microscope is restricted to the following operations:

- Cover the instrument with the dust cover after every use and do not expose the instrument to ultraviolet radiation without any protection.
- Do not install the microscope in a humid room; maximum humidity < 75%.
- Cover open tubes with the dust caps.
- Remove dust and loose dirt from visible optical surfaces with a brush, blower brush, cotton swab, optics cleaning tissue, or a cotton cloth.
- Remove water-soluble dirt (coffee, cola, etc.) by blowing on it and then wiping it off with a dust-free cotton cloth or a cloth moistened with water to which you may also add a mild detergent.
- Wipe off stubborn oily or fatty dirt (immersion oil, fingerprints) with cotton cloths or a dust-free cotton cloth moistened with the optics cleaning solution L.

The cleaning solution consists of 90 vol% gasoline and 10 vol% isopropanol (IPA). Its individual constituents are also known as:

| | |
|--------------|---|
| Gasoline: | Surgical spirit, petroleum ether |
| Isopropanol: | 2-propanol, dimethyl carbinol, 2-hydroxypropane |

Clean optical surfaces by polishing them in circles from the middle and to the edges using slight pressure only.

Before cleaning the plug-in power unit, disconnect it from line power. Avoid in any case the penetration of moisture into the plug-in power unit.

For using the microscope in warm and humid climatic zones, it comes with all optical components already protected against fungus attack.

3.11 Troubleshooting on the Microscope

| Problem | Cause | Remedy |
|--|--|--|
| Field of view is not completely visible. | Nosepiece with objective has not been switched into click-stop position. | Switch nosepiece with objective into click-stop position. |
| | Condenser has not been set correctly. | Set condenser correctly. |
| | Filter slider has not been inserted correctly into the filter mount. | Push filter slider to click-stop position. |
| | Slider for phase contrast has not been adjusted correctly. | Centering the phase stop for phase contrast, push the slider to click-stop position. |
| Low resolving power, poor image contrast. | Aperture diaphragm has not been opened to correct size. | Open the aperture diaphragm to 2/3 for brightfield, or completely for phase contrast. |
| | Use of wrong cover glass thickness for transmitted light objectives corrected for 1 mm or 0.17 mm cover glass. | Use standard 1 mm or 0.17 mm cover glass. |
| | Dirt or dust on the optical surfaces of objectives, eyepieces, condensers, or filters. | Clean the respective optical components. |
| Major focus differences after changing the objective. | Diopter setting of the eyepieces has not been correctly adjusted. | Adjust the diopter setting of the eyepieces, so it matches your visual acuity, or set it to zero when using glasses or contact lenses. |
| | Objectives has not been correctly screwed in. | Screw in objectives correctly. |
| The 6 V 30 W halogen bulb or the LED source does not light up although the microscope has been switched on. | Power plug has not been inserted into power outlet, plug-in power unit has not been connected with stand. | Insert power plug into power outlet, connect plug-in power unit with stand. |
| | 6 V 30 W halogen bulb or LED source is defective. | Replace the defective 6 V 30 W halogen bulb or the LED module. |
| | Pins of the 6 V 30 W halogen bulb have not been inserted properly into lamp holder. | Insert the pins of the 6 V 30 W halogen bulb properly into the lamp holder. |
| | Transmitted-light illuminator has not been properly screwed in. | Tighten fastening screws of the transmitted-light illuminator. |
| The 6 V 30 W halogen bulb is flickering, its light intensity is unstable, the illumination is inhomogeneous. | End of average service life of 6 V / 30 W halogen lamp has been reached. | Replace the 6 V 30 W halogen bulb. |
| | Power cable has not been installed correctly or broken. | Connect the power cable correctly or replace it. |
| | Pins of 6 V 30 W halogen bulb has not been inserted correctly into lamp holder. | Insert the pins of the 6 V 30 W halogen bulb correctly into the lamp holder. |
| | Pins of 6 V 30 W halogen bulb not inserted symmetrically into lamp holder. | Insert the pins of the 6 V 30 W halogen bulb symmetrically into the lamp holder. |

| Problem | Cause | Remedy |
|--|--|---|
| Image focus is unstable. | Adjusted torque of coarse focusing drive is too low. | Increase the torque of the coarse focusing drive to make motion stiffer. |
| The fluorescence light source doesn't lighten on. | Fluorescence light source or circuit board is defective. | Contact service person for further checking. If necessary, change LED source or PCB. Replacement requires special tools and can thus not be carried out by the customer. |
| Greenish background when working in fluorescent illumination mode. | The yellow filter is not inserted. The transmitted LED phosphor generates fluorescent background. | Insert filter slider with yellow filter (which is a part of the standard delivery) whenever changing to fluorescence mode. |

4 Technical Data

Dimensions (width x depth x height)

| | |
|----------------|------------------------------------|
| Primovert | approx. 261 mm x 550 mm x 494 mm |
| Primovert iLED | approx. 215.5 mm x 552 mm x 494 mm |

Weight (without accessories and packaging)

| | |
|----------------|-----------------|
| Primovert | approx. 11 kg |
| Primovert iLED | approx. 11.5 kg |

Ambient Conditions

| | |
|--|---|
| Transportation (in packaging): Admissible ambient temperature | -40 to +70 °C |
| Storage: Admissible ambient temperature Admissible air humidity | +10 to +40 °C max. 75 % at 35 °C (no condensation) |
| Operation: Operating environment Operating altitude Admissible ambient temperature Admissible air humidity Atmospheric pressure | closed rooms max. 2000 m +10 to +40 °C max. 75 % at 35 °C (no condensation) 800 hPa to 1060 hPa |

Operating Data

| | |
|-------------------------------------|---|
| Protection class | II |
| Protection type | IP20 |
| Electrical safety | in compliance with EN 61010-1 (IEC 61010-1), IEC 61010-2-101 including CSA and UL directives |
| Pollution degree | 2 |
| Overvoltage category | II |
| Radio interference suppression | in compliance with EN 61326-1, IEC 61326-2-6 |
| Line voltage | 100 to 240 V (± 10 %) wide-range input power supply, i.e. voltage setting of the instrument need not be changed! |
| Line frequency | 50 / 60 Hz |
| Power consumption Primovert iLED | max. 30 W |
| Power supply Primovert iLED Input: | 100-240 V DC; 50-60 Hz, max. 0.8 A |
| Power supply Primovert iLED Output: | 12 V DC, max. 2.5 A |
| Microscope 12 V / 6 V DC | adjustable from 1.5 V to 6 V |
| LED class of complete device | Risk group 2 in compliance with IEC 62471 |

Light Sources

| | |
|--|---|
| Halogen lamp | HAL 6 V, 30 W |
| Adjustability of light source | continuous, from 1.5 to 6 V DC |
| Color temperature at 6 V | 2800 K |
| Luminous flux | 765 lm |
| Average life | 100 h |
| Luminous area | 1.5 x 1.5 mm |
| iLED illumination | |
| Fluorescent illumination | blue LED, peak wavelength 470 nm, LED risk group 2 according to IEC 62471 |
| Homogeneous filed illumination | 20 mm |
| Analogous brightness adjustment from | approx. 15 to 100 % |
| LED illumination | White light LED, LED risk group 2 according to IEC 62471 |
| Constant, brightness-independent color temperature | 7000 K |
| Homogeneous field illumination | 20 mm diameter |
| Suitable for objectives with magnifications of | 4x to 40x |
| Analogous brightness adjustment from | approx. 15 to 100 % |

Optical/Mechanical Data

| | |
|--|--|
| Stand with stage focusing drives | |
| With coarse focusing drive | 45 mm/rev. |
| With fine focusing drive | 0.5 mm/rev. |
| Total stage lift | 15 mm |
| Objective change | manual via quadruple nosepiece |
| Objectives | infinity-corrected objective range of Primo class with W 0.8 mounting thread |
| Eyepieces with field-of-view number 20 | 30 mm tube diameter WF 10x/20 Br. foc. |
| Specimen stage | fixed |
| Dimensions (width x depth) | 200 x 239 mm |
| Specimen guide | right side |
| Verniers with numerical and alphabetic scale | X direction: numerical scale, readable from right to left Y direction: alphabetic scale, readable in the mirror |
| Coaxial drive | right side |
| LD condenser 0.3 | for V_{obj} 4x to 40x, $a = 72$ mm |
| LD condenser 0.4 | for V_{obj} 4x to 40x, $a = 55$ mm |
| Primovert with binocular tube | |
| Maximum field-of-view number | 20 |
| Interpupillary distance | adjustable from 48 to 75 mm |
| Tube angle | 45° |
| Viewing height | 350 to 390 mm |
| Viewing port | tube factor 1x |

| | |
|---|---|
| Primovert with binocular phototube | |
| Maximum field-of-view number | 20 |
| Interpupillary distance | adjustable from 48 to 75 mm |
| Tube angle | 45° |
| Viewing height | 350 to 390 mm |
| Viewing port | tube factor 1x |
| Photo/video port | tube factor 1x, 60 mm mount |
| Fixed beam splitting | 50 % vis / 50 % doc |
| Primovert with binocular ergotube | |
| Maximum field-of-view number | 20 |
| Interpupillary distance | adjustable from 48 to 75 mm |
| Tube angle | 30° to 60°, continuously adjustable |
| Viewing height | 360 to 480 mm |
| Viewing port | tube factor 1x |
| Primovert with integrated fluorescence unit | |
| Maximum field-of-view number | 20 |
| Illumination | Reflected illumination (Fluorescent) / Transmitted illumination |
| Fluorescent source | LED central wavelength 470 nm |
| Transmitted source | LED 7000 K |
| Interpupillary distance | adjustable from 48 mm to 75 mm |
| Tube angle | 45° |
| Viewing height | 350 mm to 390 mm |
| Viewing port | tube factor 1x |
| Photo / video port | tube factor 1x, 60 mm |
| Fixed beam splitting | mount 50 % vis / 50 % doc |

5 Accessories

| Name | Description/Info |
|-----------------|--|
| Objectives | The performance of the microscope objectives affects the image quality of your microscope like no other system component. Whether you work with histological samples, cell samples or entire organisms – the suitability of microscope objectives for your application depends on various factors. More detailed information on available and recommended objectives can be found at https://www.micro-shop.zeiss.com/de/de/shop/objectives or ask your ZEISS Sales & Service Partner. |
| Sliders | The following sliders are available: <ul style="list-style-type: none"> – Phase stop Ph 0, Ph1, Ph2 for Primovert – 2 position Ph slider – 3 position Ph slider – 2 position filer slider |
| Filters | The following fillters are available <ul style="list-style-type: none"> – Neutral-density filter – Interference filter green – Color filter set blue, green, yellow |
| Eyepieces | The following eyepieces are available <ul style="list-style-type: none"> – Eyepiece 10x/20 Br. foc. For Primo – Eyepiece eyecup – pointer for eyepieces foc. For Primo – Crossline micrometer 10:100 |
| Condensers | The following condensers are available <ul style="list-style-type: none"> – LD condenser 0.4 (WD=55mm) for objective magnifications 4x...40x – LD condenser 0.3 (WD=72mm) for objective magnifications 4x...40x |
| Stage inserts | The following stage inserts are available <ul style="list-style-type: none"> – Stage insert, metal; D=110 mm – Stage insert, glass; D=110 mm, d=38 mm |
| Objective guide | The following objective guide is available <ul style="list-style-type: none"> – Object guide 108x72 R for Primovert |
| Mounting frame | The following mounting frames and accessories are available <ul style="list-style-type: none"> – Mounting frame for Petri dishes d=35 mm – Mounting frame for Petri dishes d=54 mm and specimen slides 76x26 mm – Mounting frame for Petri dishes d=65 mm – Mounting frame Flex M – Mounting frame insert Flex M, petridishes and sliders and chambers – Universal mounting frame M-X and frame M – Attachable stage enlargement 2x66 mm left and right for Primovert – Stage micrometer for transmitted light – Heatable universal mounting frame and TempController |

| Name | Description/Info |
|---------------|--|
| Light sources | The following light sources and accessories are available <ul style="list-style-type: none">– Transmitted-light illumination with 6V 30W halogen bulb for Primovert– Transmitted-light illumination with LED for Primovert– Bulb 6V 30W halogen for Primo– Protection Plate UV Fluorescence for Primovert iLED |
| Cameras | The following cameras and accessories are available <ul style="list-style-type: none">– AxioCam Erc 5s Rev. 2– AxioCam Erc 5s Rev. 2 Accessory kit for the use of camera without PC– Camera Adapter P95-C 2/3" 0.65x for Primo– Camera Adapter P95-C 1/2" 0.5x for Primo– Digital Camera Adapter P95 M37/52x0.75 for Primo– T2 adapter for Minolta, Nikon F,, Contax, Minolta, Canon EOS– Adapter P95-T2 1.6x DSLR for Primo |