

Primo Vert
Operating Manual

Knowledge of this manual is required for the operation of the instrument. Would you therefore please make yourself familiar with the contents of this manual and pay special attention to instructions concerning the safe handling of the instrument.

Subject to alterations in the interest of technical progress. The manual is not covered by an update service.

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Manual number: M60-2-0051 e

Date of issue: Version 6, 12/17/2009

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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.

They are set off herein as follows:

**CAUTION**

Hazard to the user of the instrument if safety notes are not observed.

**ATTENTION**

Hot surface!

**ATTENTION**

LED risk group 2 according to IEC 62471, LED radiation is emitted.
Do not look into the LED beam. It can be dangerous to the eyes.

**ATTENTION**

Disconnect the plug-in power unit from line power before opening the microscope!

**ATTENTION**


This symbol indicates a possible hazard to the instrument or system.

**NOTE**

Working instructions to be observed when using the microscope.

1.2 Instrument Safety and EMC

The Primo Vert microscopes have been designed, produced and tested in compliance with the standards DIN EN 61010-1 (IEC 61010-1) and IEC 61010-2-101 "Safety Requirements for Electrical Measuring, Control and Laboratory Equipment".

The Primo Vert microscopes meet the requirements of the EC Directive 98/79/EC Annex 1 and carry the  mark.

The instruments have to be disposed of in compliance with the WEEE Directive 2002/96/EC.

1.3 Unpacking, 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.
- Be careful not to leave your fingerprints on optical surfaces.



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:



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, benzene 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.



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.

1.6 Warranty Notes

The Primo Vert 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

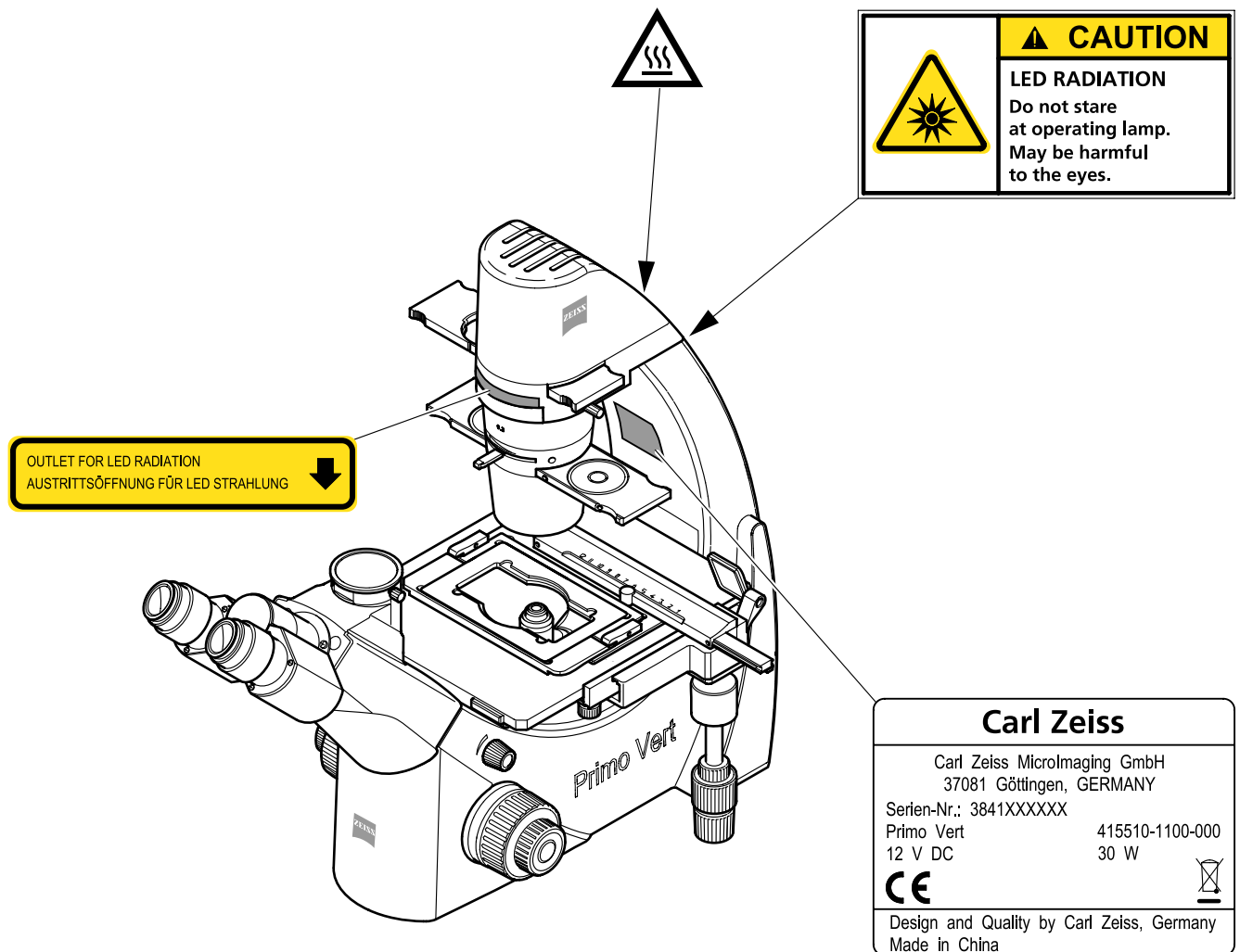
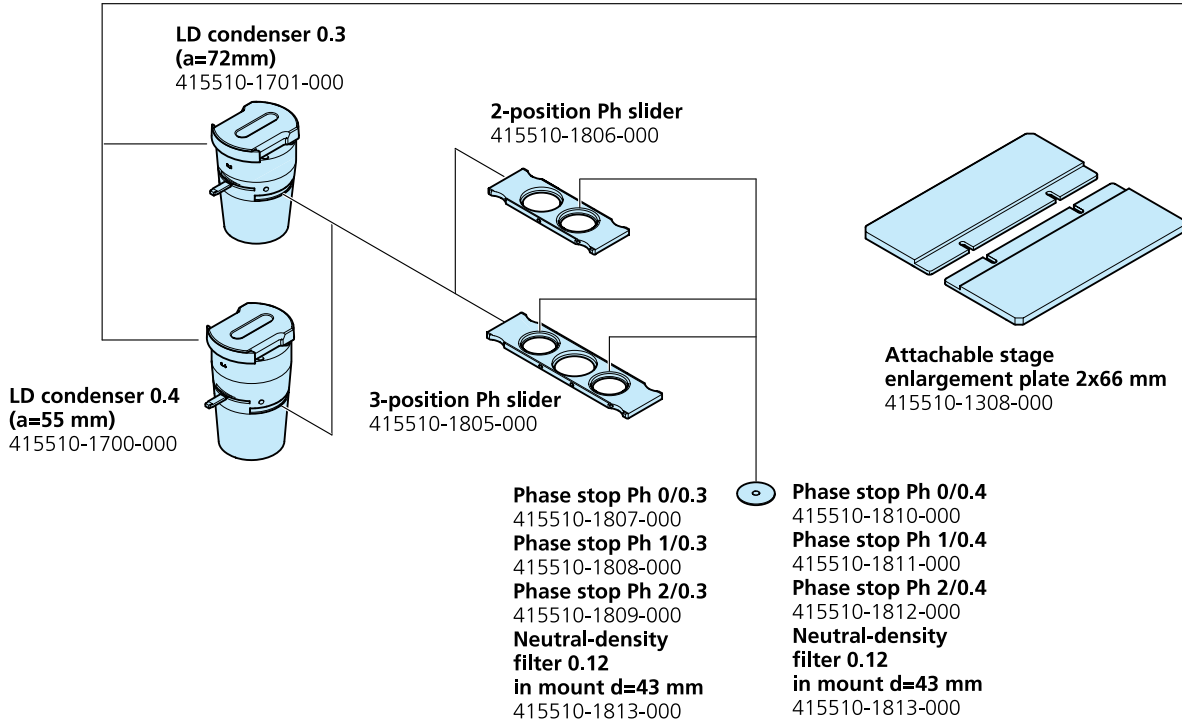
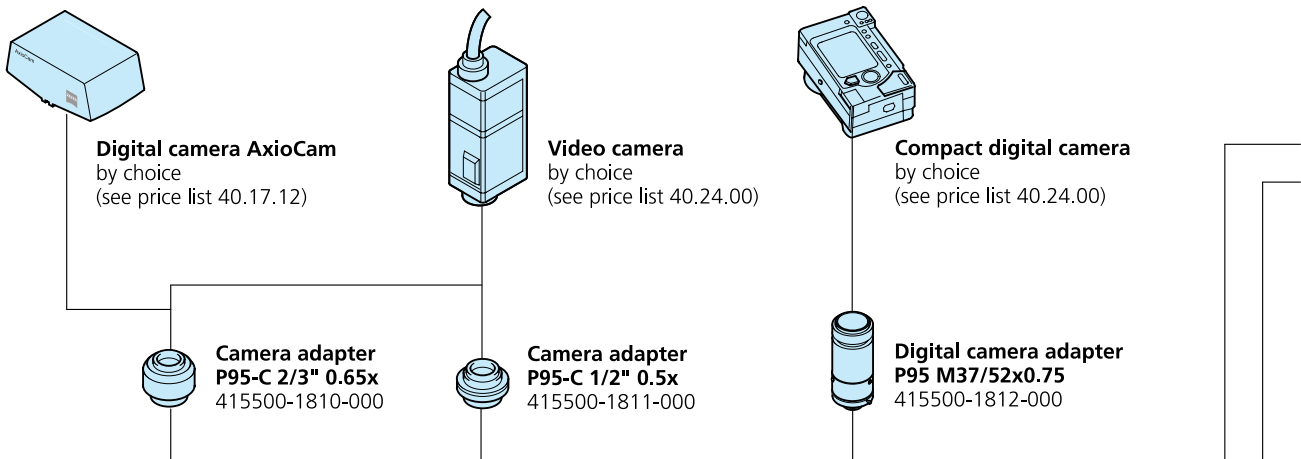


Fig. 1 Warning and information labels on Primo Vert

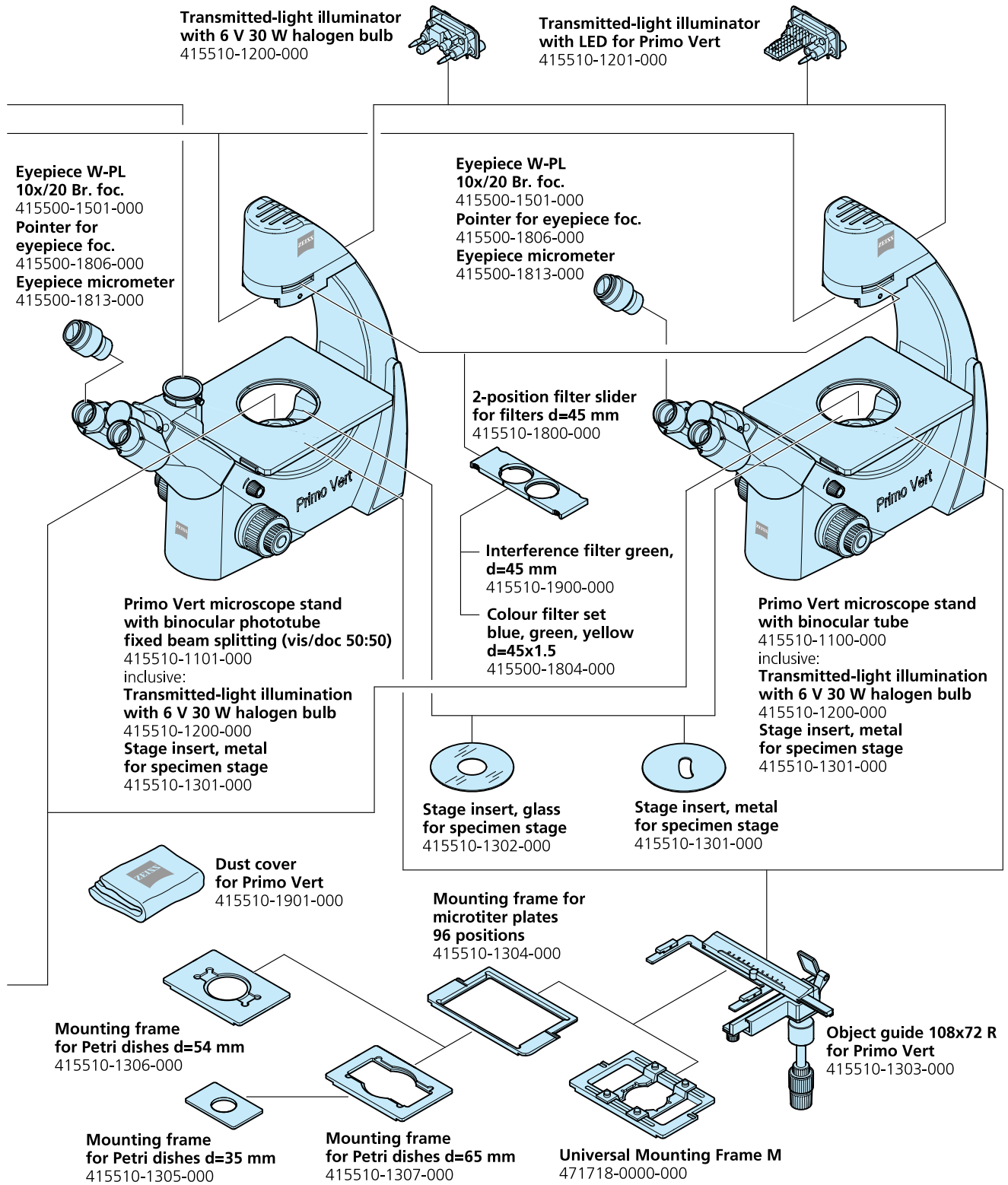
2 DESCRIPTION

2.1 System Overview



- Objective Plan-Achromat 4x/0.1**
415500-1600-001
- Objective Plan-Achromat 4x/0.1 Ph0**
415500-1619-000
- Objective Plan-Achromat 10x/0.25 Ph1**
415500-1605-001

- Objective LD Plan-Achromat 20x/0.3 Ph1**
415500-1614-000
- Objective LD Plan-Achromat 20x/0.3 Ph2**
415500-1618-000
- Objective LD Plan-Achromat 40x/0.5 Ph1**
415500-1617-000
- Objective LD Plan-Achromat 40x/0.5 Ph2**
415500-1616-000



2.2 Intended Use

The Primo Vert microscopes are universally applicable light microscopes of inverted design (inverted microscopes). They are primarily used to examine cell and tissue cultures as well as sediments in culture flasks, Petri dishes and microtiter plates.

Typical applications:

Examination of blood and tissue samples from the human body, observation of intracellular processes on living cell cultures, cell-cell interactions, motility, growth.

When handling hazardous substances, observe the instructions on intended operation, correct use and statutory safety precautions.

2.3 Instrument Description and Main Features

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

For the microscopy techniques of transmitted-light brightfield and phase contrast, either a stand with binocular tube or a stand with trinocular tube (camera port) for photo and video documentation is available to the user.

Important features of the microscope are:

- Stand equipped with a binocular tube or a trinocular phototube (50 % vis, 50 % doc) with an ergonomically favorable tube angle of 45°; the swiveling eyepiece part can be adapted to the user's interpupillary distance and viewing height.
- Illumination either by a 6 V / 30 W halogen lamp insert or an LED insert.
- Continuously adjustable illumination intensity.
- Automatic stand-by for illumination, timed switching on and off of illumination via two buttons on the specimen stage.
- Blue light-intensity indicators installed on both sides, which are still well 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 objective 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 10x, 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 numbers 20, suitable for spectacle wearers.

2.4 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

Where:

- | | |
|----------|---|
| LD | Long working distance |
| 10x | 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 |
| 0.17 | Usable with cover glass thickness
D = 0.17 mm |
| 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 |
|----|---|



Fig. 2 Objective (mounting position)


Objective magnification multiplied by eyepiece magnification results in overall visual magnification, e.g. $10 \times 10 = 100x$.


Numerical aperture multiplied by 1000, e.g. $0.25 \times 1000 = 250x$, presents the maximum useful magnification; there is no resolution for further details above that limit.

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 observe the notes on instrument safety (see Section 1).

 Do not touch optical surfaces when unpacking the microscope to avoid fingerprints!

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.

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

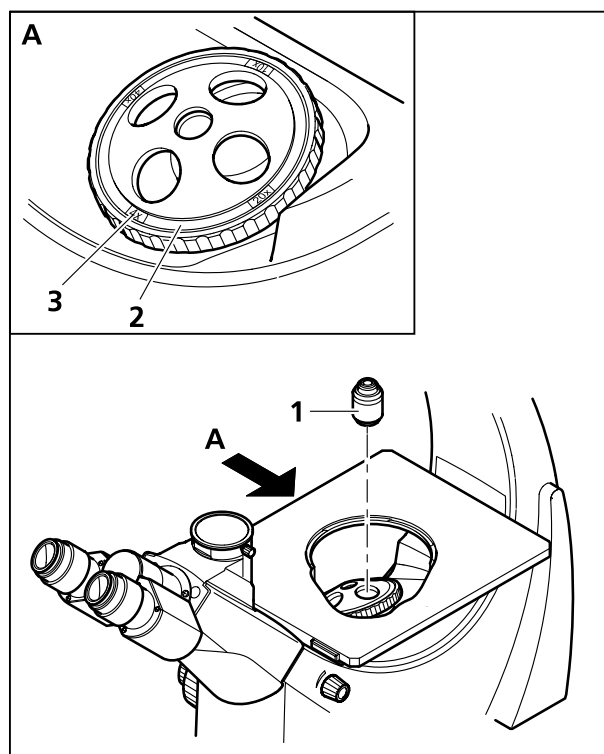



Fig. 3 Screwing in the objectives

3.1.2 Screwing in the Objectives

- Remove the dust caps from the location holes of the objective 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 objective 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.

3.1.3 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.
- Fix the condenser by tightening the knurled screw (Fig. 4/1).



Recommendation:

If the knurled screw used to fix the condenser is in the way when working with the microscope, or if the condenser never needs to be changed, it can be fixed as well with the Allen screw (Fig. 4/2) included in the delivery, instead of using the knurled screw.

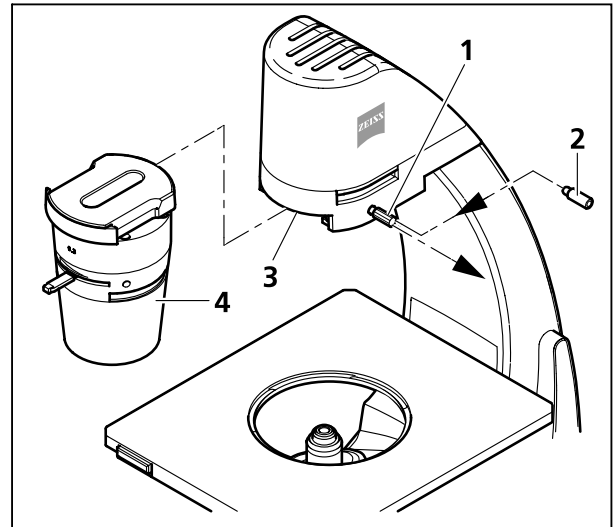


Fig. 4 Inserting the condenser

3.1.4 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.

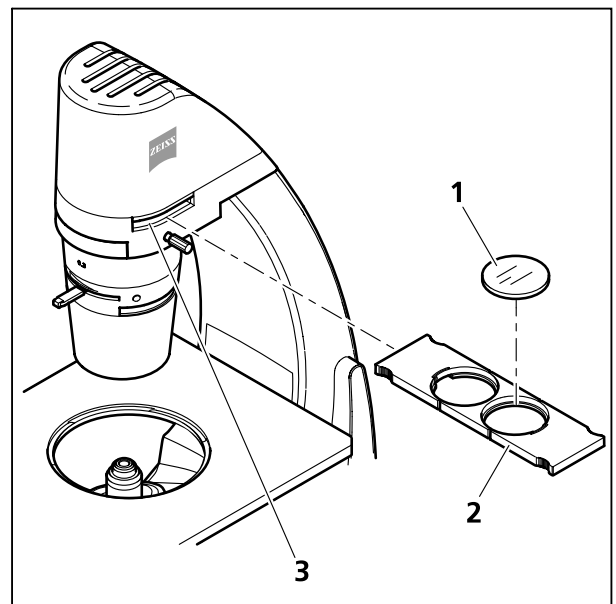


Fig. 5 Inserting the filter slider

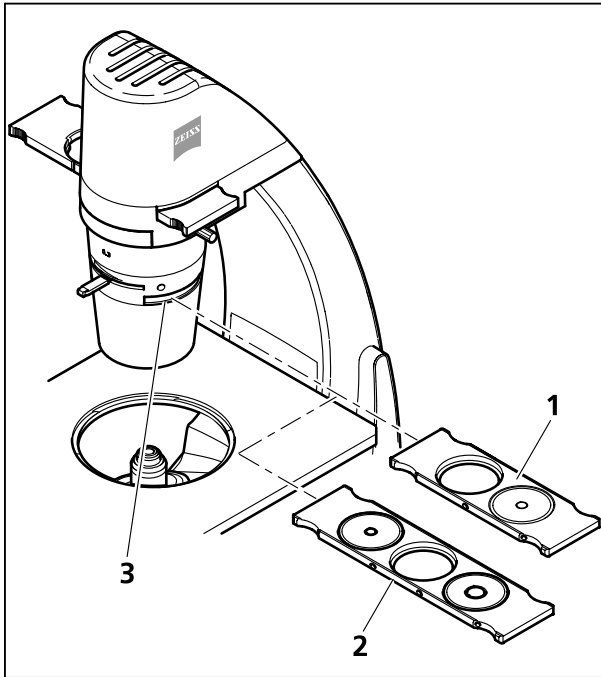


Fig. 6 Inserting the phase contrast slider

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.

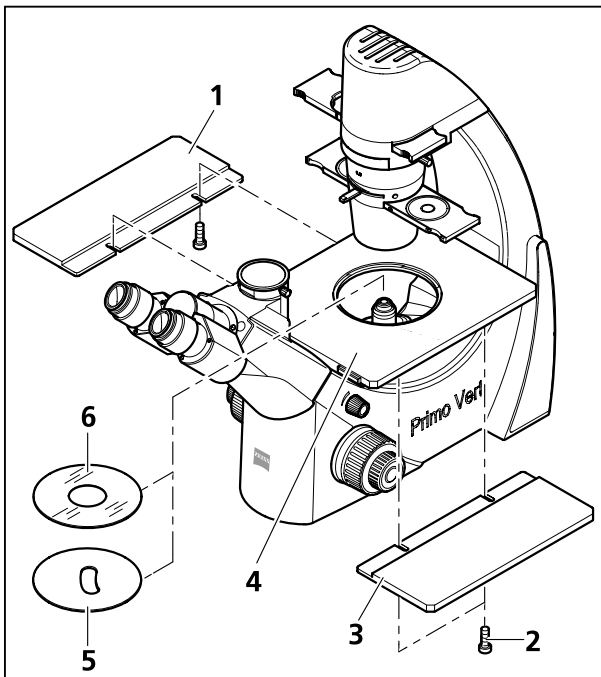


Fig. 7 Inserting the stage inserts and attaching the stage enlargement plates

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. As an alternative, LD objectives (LD = long distance) can be used because of their longer working distance. 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.



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

- 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.

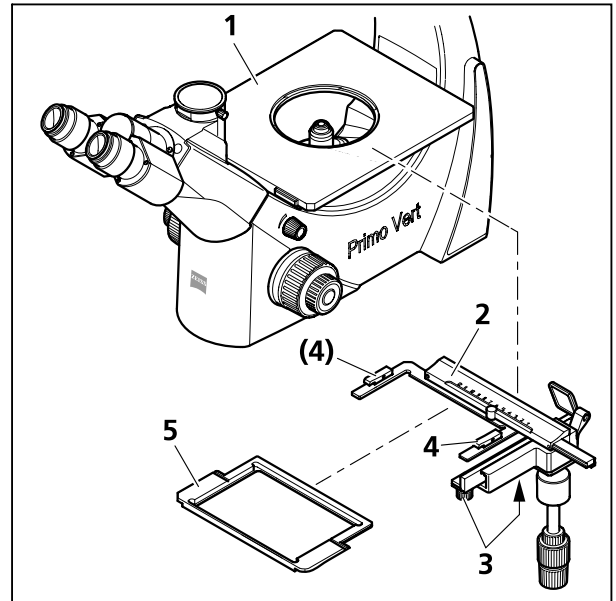


Fig. 8 Mounting the specimen guide and inserting the mounting frame



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 Inserting the Transmitted-Light Illuminator with LED

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

If the transmitted-light illuminator with LED has been ordered and shall be used, it must be inserted into the stand instead of the transmitted-light illuminator with halogen bulb (see Section 3.3.1).

3.1.9 Connecting the Plug-in Power Unit

- If necessary, replace the power supply adapter attached to the plug-in power unit (Fig. 9/1) by one of the country-specific adapters supplied (Fig. 9/2), pulling off the existing adapter and inserting the desired one.
- Insert the plug (Fig. 9/3) of the plug-in power unit into the connection socket located on the rear of the stand (Fig. 9/4).
- Connect the plug-in power unit (Fig. 9/1) with a power outlet.

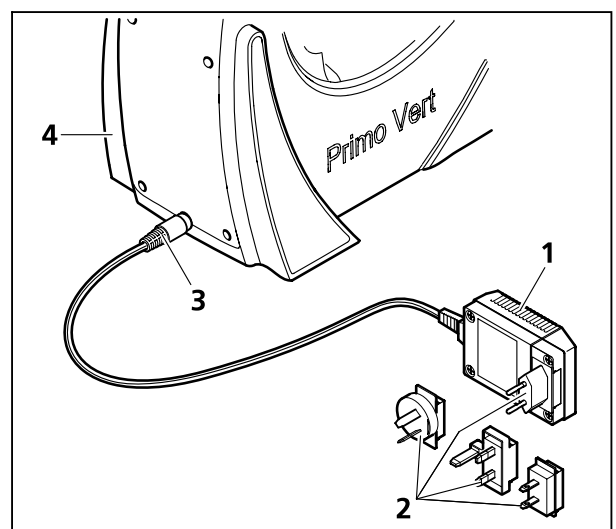


Fig. 9 Connecting the plug-in power unit

3.2 Operating the Microscope

3.2.1 Operational and Functional Elements of the Primo Vert Microscope

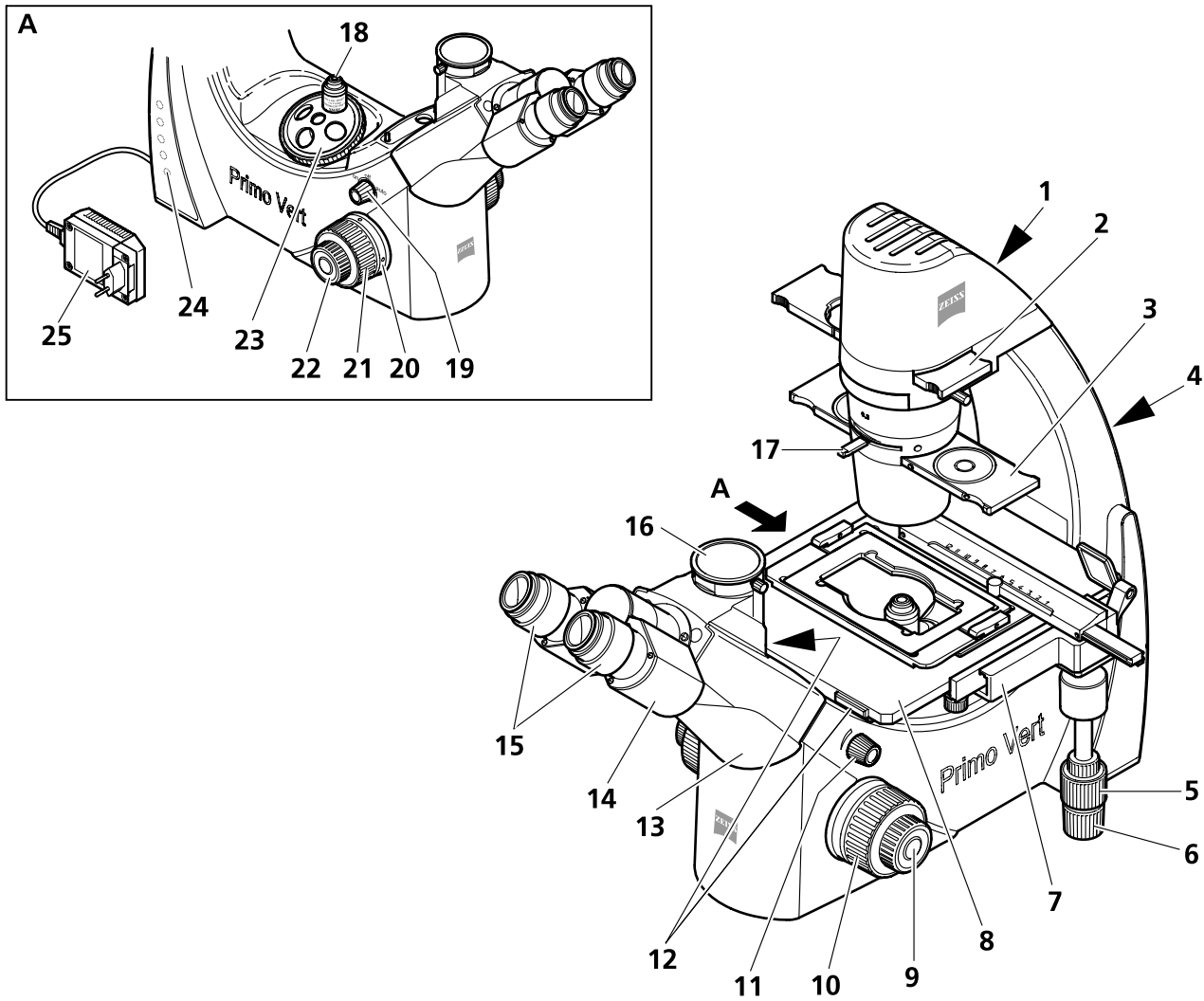


Fig. 10 Operational elements of Primo Vert

Legend to Fig. 10:

- 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 Course 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 trinocular tube)
- 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 course focusing drive
- 21 Course focusing drive (left side)
- 22 Fine focusing drive (left side)
- 23 Objective nosepiece
- 24 Illumination intensity indicators (on both sides of the stand)
- 25 Plug-in power unit

3.2.2 Switching the Microscope On / Off

- Switch on the microscope using the rotary knob (Fig. 11/2) (**ON** or **AUTO** position).
 - **ON** position:
The two ON/OFF switches (Fig. 11/1) 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. 11/1) 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.

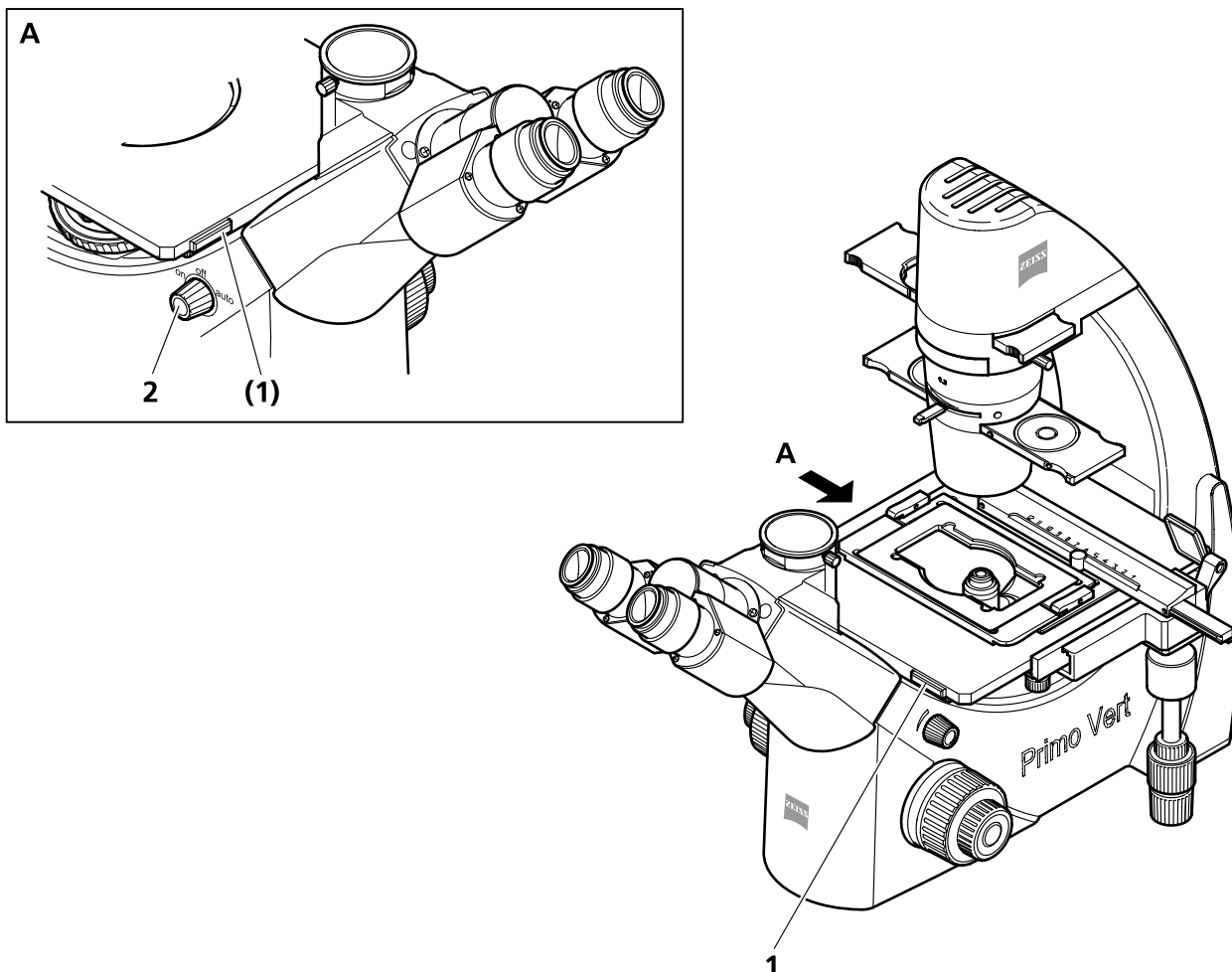


Fig. 11 Switching the microscope on or off

- Adjust the desired illumination intensity using the rotary knob (Fig. 10/11).

The selected intensity is indicated in five steps by the blue light-emitting diodes (Fig. 10/24) 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. 10/20), hold the coarse focusing knob (Fig. 10/21) 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. 11/2) (**OFF** position).
- Cover the microscope with the dust cover.

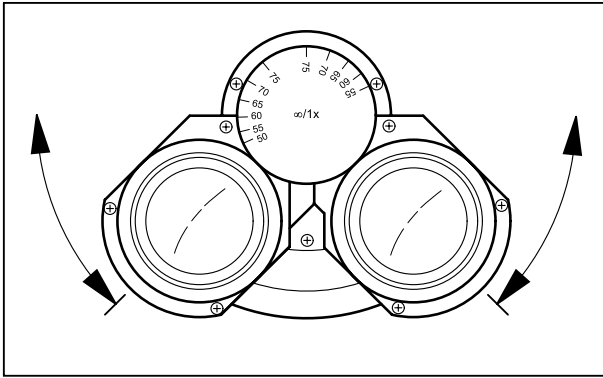


Fig. 12 Adjusting the interpupillary distance

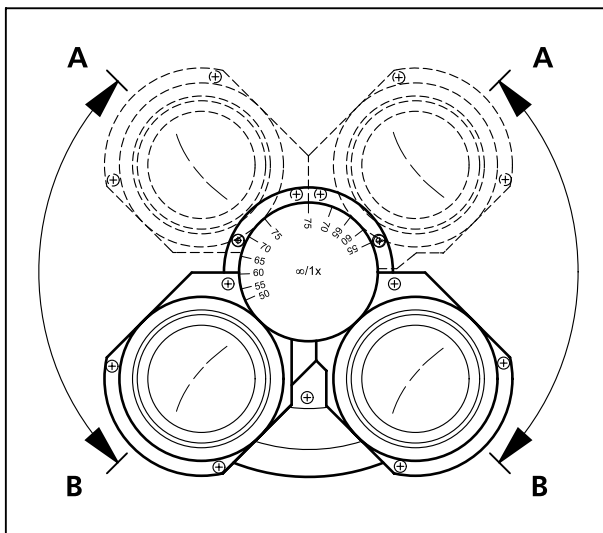


Fig. 13 Adjusting the viewing height

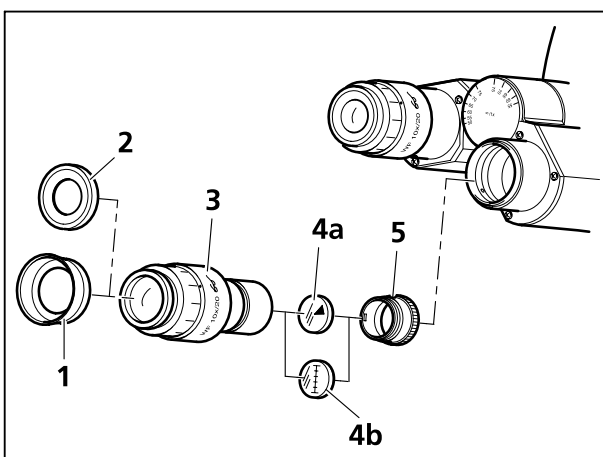


Fig. 14 Inserting the eyepiece pointer or eyepiece micrometer

3.2.3 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. 12).

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

- Swivel the eyepiece tubes upward (Fig. 13/A) or downward (Fig. 13/B) to adjust the viewing height to your individual requirements.

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

The eyepieces (Fig. 14/3) can be equipped with fold-over rubber eyecups (Fig. 14/1: pulled out; Fig. 14/2: 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. 14/5) by hand from the eyepiece.
- Insert the eyepiece pointer (Fig. 14/4a) or the eyepiece micrometer (Fig. 14/4b) 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. 14/3) 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.

3.2.5 Adjusting Transmitted-Light Brightfield on the Microscope

The Primo Vert microscope is supplied factory-adjusted. Operation for brightfield applications is restricted to few manipulations.

- Put the specimen on the specimen stage or into the mounting frame of the specimen guide.
- Remove the filter slider or position it for free passage of light.
- Remove the slider for phase contrast or position it for free passage of light.
- Adjust the desired magnification by rotating the corresponding objective into the light path. If appropriate, use first a less magnifying objective.
- Focus onto the specimen using the focusing drive.
- To optimize contrast, set the aperture diaphragm of the condenser with the lever to about 2/3 of the maximum value.
- Turn the rotary knob on the microscope stand to adjust the illumination intensity to a level pleasant for observation.

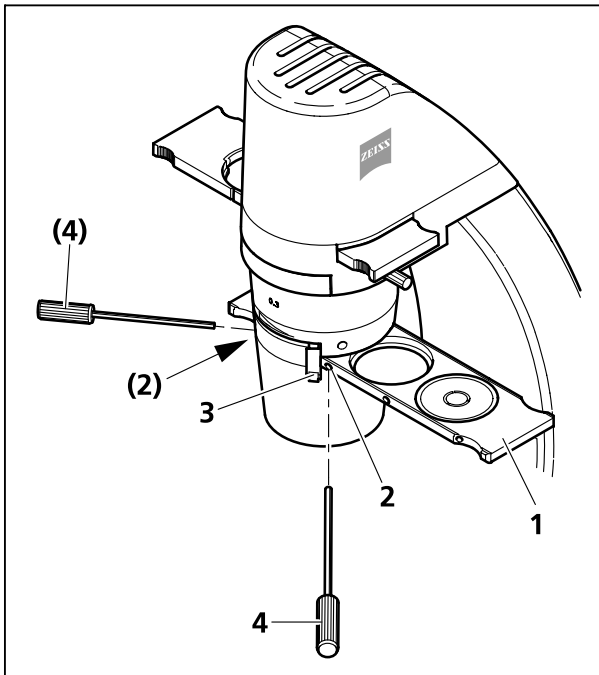


Fig. 15 Inserting the slider

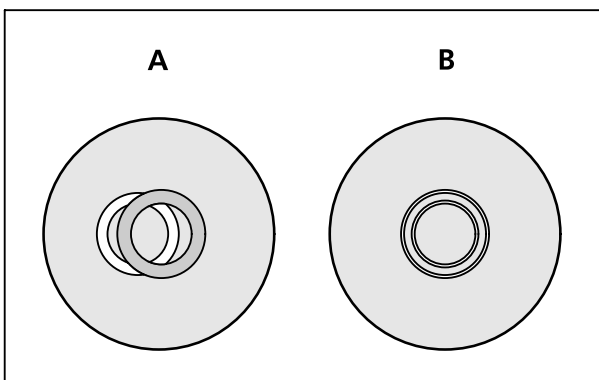


Fig. 16 Centering the phase stop

3.2.6 Adjusting Transmitted-Light Phase Contrast or Transmitted-Light Darkfield

- 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. 15/3) on the condenser.
- Introduce the slider (Fig. 15/1) 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.
- Check the centering of the phase stop according to the drawing in Fig. 16. To this end, remove one eyepiece and replace it by the diopter.
- Center the phase stop, if necessary (Fig. 16/A), by turning the two adjusting screws (Fig. 15/2) of the corresponding slider position by means of the two Allen keys SW 1.5 (Fig. 15/4) until the image corresponds to that shown in Fig. 16/B.
- Afterwards, replace the diopter by the eyepiece again.

3.3 Retrofitting the Microscope





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

3.3.1 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. 17/1) and remove the cover from the stand.
 - Loosen both fastening screws (Fig. 17/2) of the transmitted-light illuminator (e.g. transmitted-light illuminator with halogen bulb, Fig. 17/3). 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. 17/3) out of the stand.
 - Pull the halogen bulb (Fig. 17/4) 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.
-  A spare bulb (Fig. 17/5) 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. 17/6) into the stand and fasten it with the two screws (Fig. 17/7). 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. 17/1) again to the stand and let it snap into place.

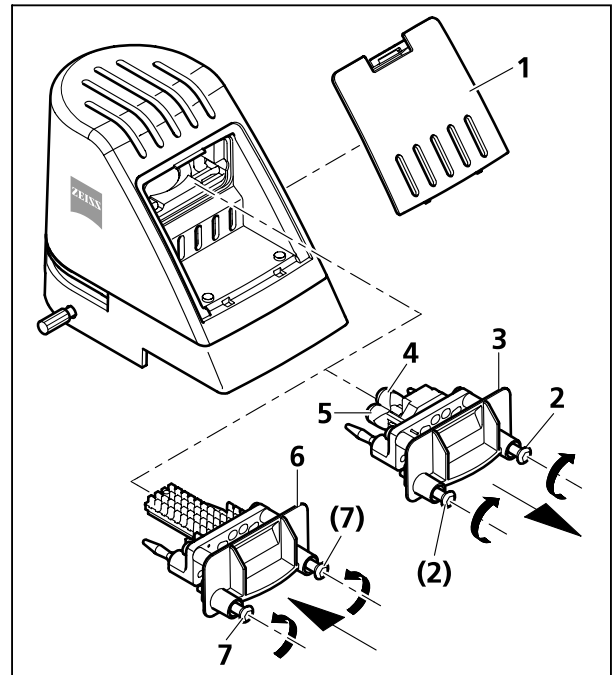


Fig. 17 Replacing the halogen bulb 6 V / 30 W or the transmitted-light illuminator with LED

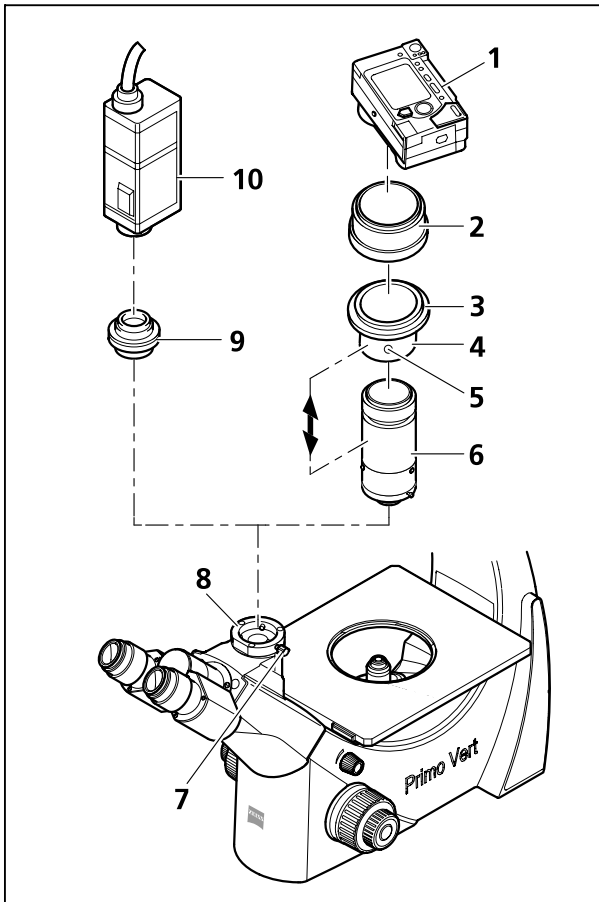


Fig. 18 Attaching the camera

3.3.2 Attaching a Camera

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

- Loosen the clamping screw (Fig. 18/7) and remove the dust cap from the camera port (Fig. 18/8) of the trinocular tube.

Attaching a Compact Digital Camera

- Sliding mount (Fig. 18/4), thread adapter ring M37/52 (Fig. 18/3) and lens mount (Fig. 18/6) 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. 18/3) from the sliding mount (Fig. 18/4) (not shown) so that you can also attach cameras with M37 thread.
- Mount the adapter ring (Fig. 18/2) (supplied with the camera) to the camera (Fig. 18/1) (see the operating instructions of the camera).
- Screw the unit consisting of sliding mount (Fig. 18/4), thread adapter ring M37/52 (Fig. 18/3) and lens mount (Fig. 18/6) into the adapter ring (Fig. 18/2).

- Insert the camera with adapter into the phototube as far as it will go. Align it and fasten it with the clamping screw (Fig. 18/7).
- Depending on the microscope equipment or the camera used, it may be necessary to optimize the distance between camera lens and lens mount (Fig. 18/6) (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. 18/5).
- 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. 18/5).



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 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. 18/9).

- Put the camera (Fig. 18/10) together with the corresponding camera adapter (Fig. 18/9) into the phototube as far as it will go, align it and fasten it with the clamping screw (Fig. 18/7).

4 CARE AND TROUBLESHOOTING

4.1 Instrument Care

Care of the microscope is restricted to the following operations:

- Cover the instrument with the dust cover after every use.
- 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 a cotton swab 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.

4.2 Troubleshooting

Problem	Cause	Remedy
Field of view not completely visible.	Nosepiece with objective not switched into click-stop position.	Switch nosepiece with objective into click-stop position.
	Condenser not correctly snapped into place.	Arrest condenser correctly.
	Filter slider not correctly snapped into place.	Push filter slider to click-stop position.
	Slider for phase contrast not correctly snapped into place.	Push slider for phase contrast to click-stop position.
Low resolving power, poor image contrast.	Aperture diaphragm not 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 measured 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.	Adjustable eyepieces not correctly adjusted.	Adjust the adjustable eyepieces acc. to the corresponding defective vision.
	Objectives not correctly screwed down.	Screw down 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 not inserted into power outlet, plug-in power unit not 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 defective.	Replace the defective 6 V 30 W halogen bulb or the LED module.
	Pins of the 6 V 30 W halogen bulb not inserted properly into lamp holder.	Insert the pins of the 6 V 30 W halogen bulb properly into the lamp holder.
	Transmitted-light illuminator not properly screwed down.	Tighten fastening screws of the transmitted-light illuminator.
The 6 V 30 W halogen bulb is flickering, its light intensity unstable, the illumination inhomogeneous.	End of average life of 6 V 30 W halogen bulb.	Replace the 6 V 30 W halogen bulb.
	Power cable incorrectly installed or broken.	Connect the power cable correctly or replace it.
	Pins of 6 V 30 W halogen bulb not 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.
Image focus is unstable.	Adjusted torque of coarse focusing drive too low.	Adjust stronger torque of the coarse focusing drive.

5 ANNEX

5.1 Technical Data

Dimensions (width x depth x height)

Primo Vert	approx. 261 x 550 x 494 mm
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Weight

Primo Vert (without accessories and packaging)	approx. 11 kg
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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: Admissible ambient temperature Admissible air humidity Atmospheric pressure	+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 DIN EN 61010-1 (IEC 61010-1) including CSA and UL directives
Pollution degree	2
Overtoltage category	II
Radio interference suppression	in compliance with EN 61326
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	70 VA; secondary voltage of external power supply 12V
Plug-in power unit 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
LED illumination	White light LED, peak wavelength 450 nm, LED risk group 2 according to IEC 62471
Constant, brightness-independent color temperature	7480 K
Homogeneous field illumination	20 mm diameter
Suitable for objectives with magnifications of	4x to 100x
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 objective nosepiece
Objectives	infinity-corrected objective range with W 0.8 mounting thread
Eyepieces	30 mm tube diameter
with field-of-view number 20	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
Binocular tube 45°/20	
Maximum field-of-view number	20
Interpupillary distance	adjustable from 48 to 75 mm
Tube angle	45°
Viewing height	360 to 397 mm
Viewing port	tube factor 1x
Trinocular (photo)tube 45°/20	
Maximum field-of-view number	20
Interpupillary distance	adjustable from 48 to 75 mm
Tube angle	45°
Viewing height	360 to 397 mm
Viewing port	tube factor 1x
Photo/video port	tube factor 1x, 60 mm mount
Fixed beam splitting	50 % vis / 50 % doc