

Primovert 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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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 Primovert 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 equipment for measurement, control and laboratory use".

The Primovert microscopes meet the requirements of the EC Directive 98/79/EC Annex 1, RoHS Directive 2011/65/EC and carry the **CE** mark.

The instruments have to be disposed of in compliance with the WEEE Directive 2011/65/EU and RoHS Directive 2012/19/EU.

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.



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.



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.

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

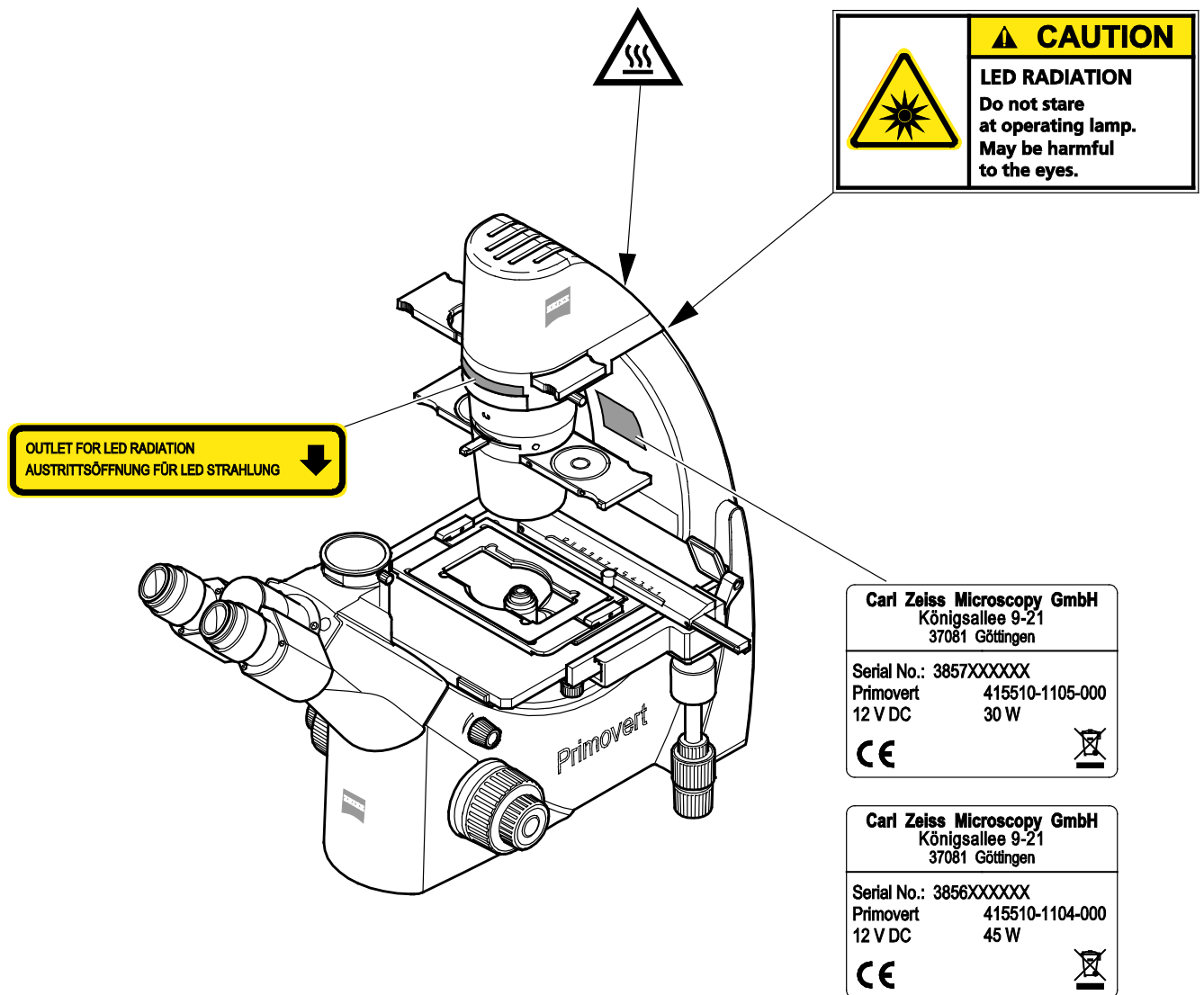
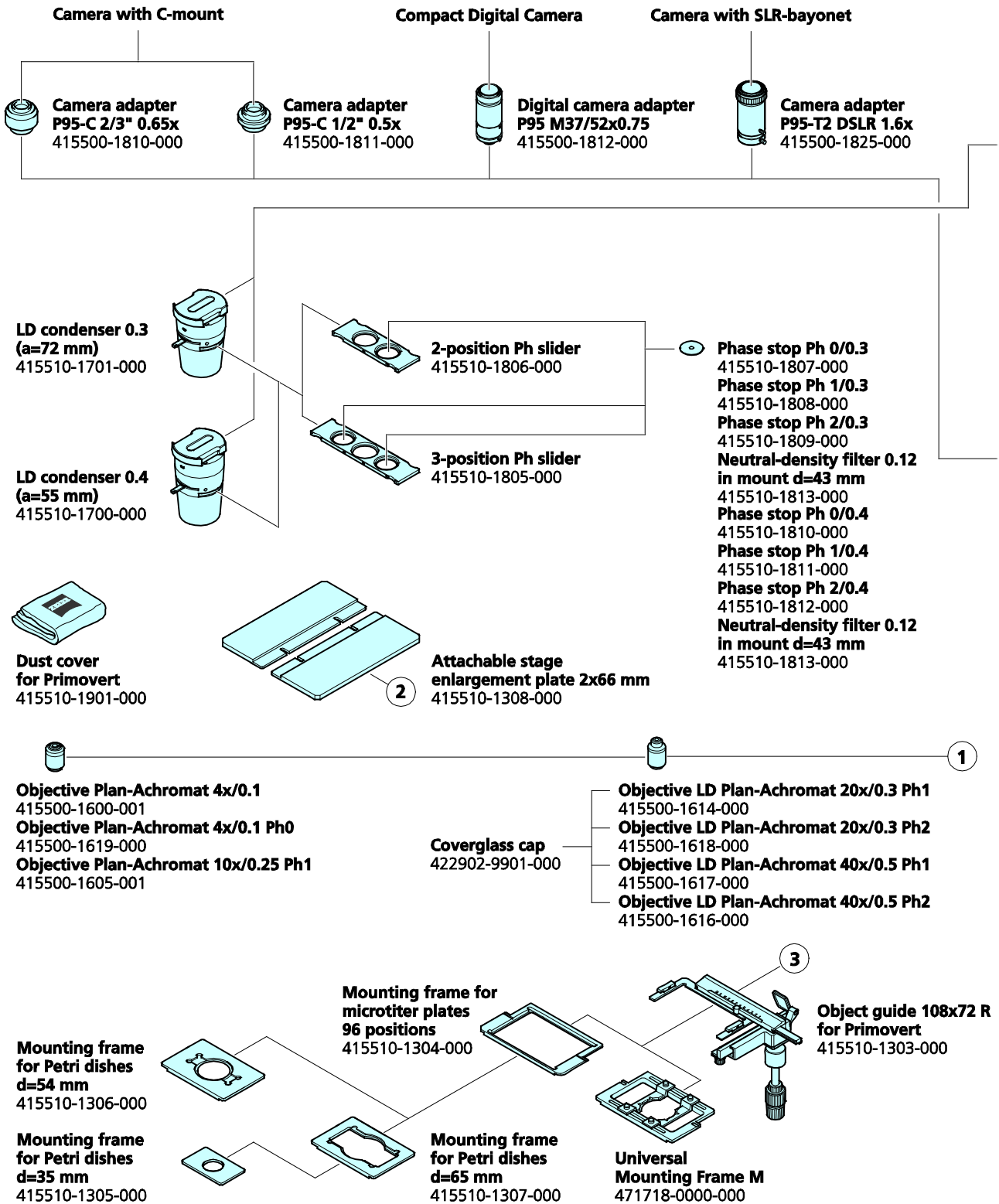
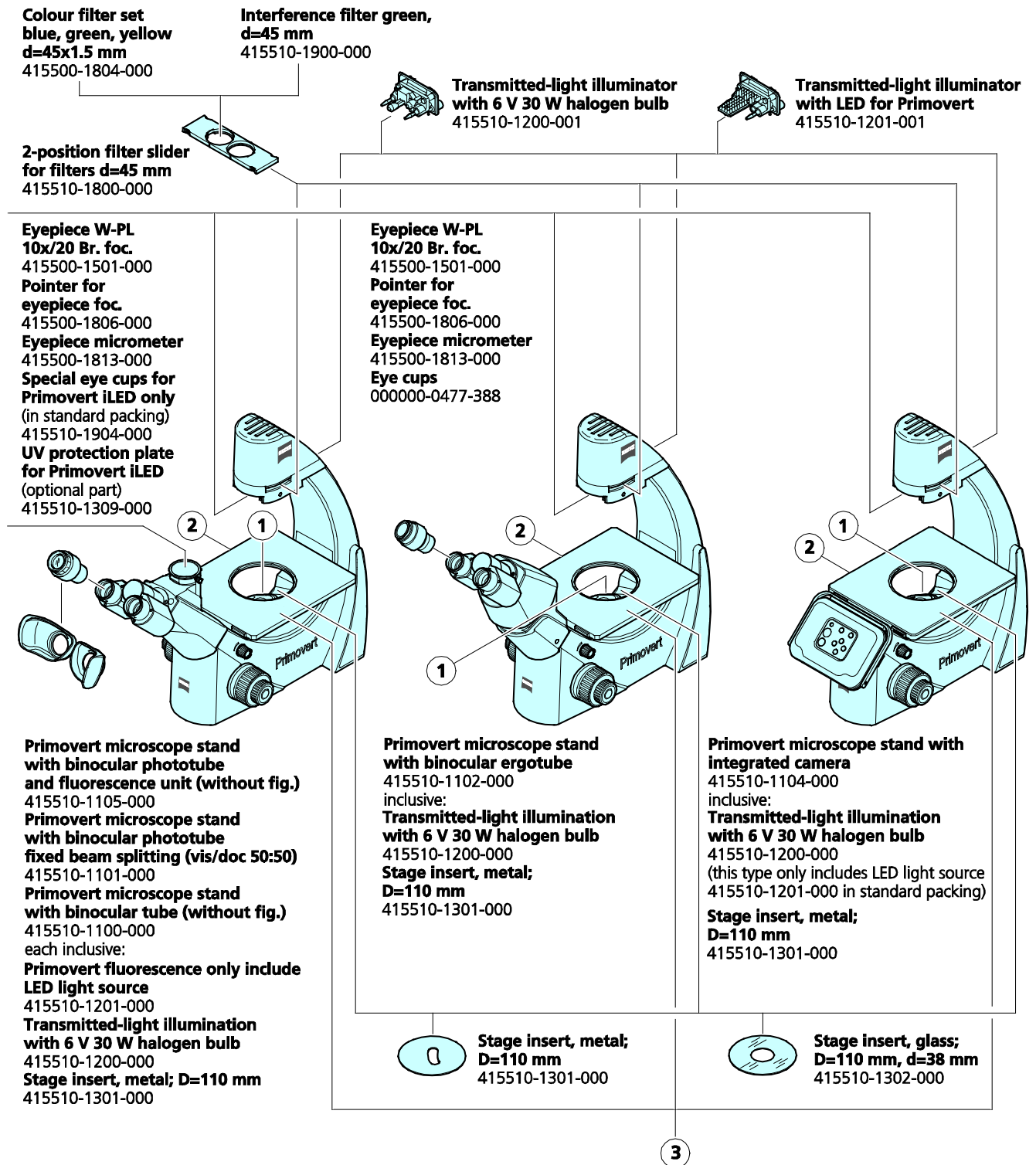


Fig. 1 Warning and information labels on the Primovert

2 DESCRIPTION

2.1 System Overview





2.2 Intended Use

The Primovert 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 (examples):

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

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

2.3 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 five 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 Ergo with binocular ergotube, continuous angle adjustment from 30° to 60°
- Stand-type Primovert HDcam with integrated HD IP CMOS camera and various interfaces and setting options
- 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.
- Stand equipped with an ergotube with variable tube angle, continuously tiltable in the range from 30° to 60°; the binocular part can be tilted upward and downward and adapted to the individual eye distance.
- 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.

2.4 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

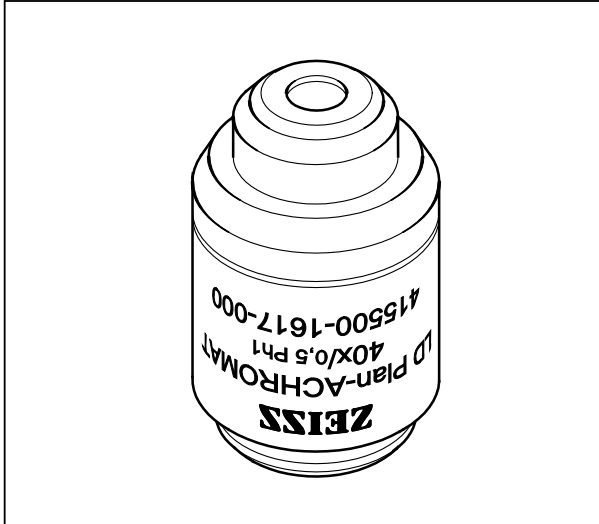


Fig. 2 Objective (mounting position)

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.

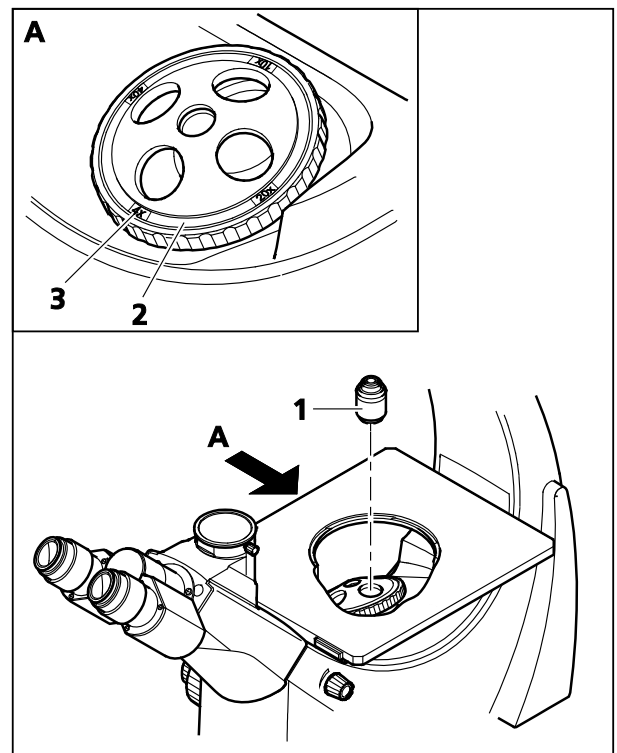


Fig. 3 Screwing in the objectives

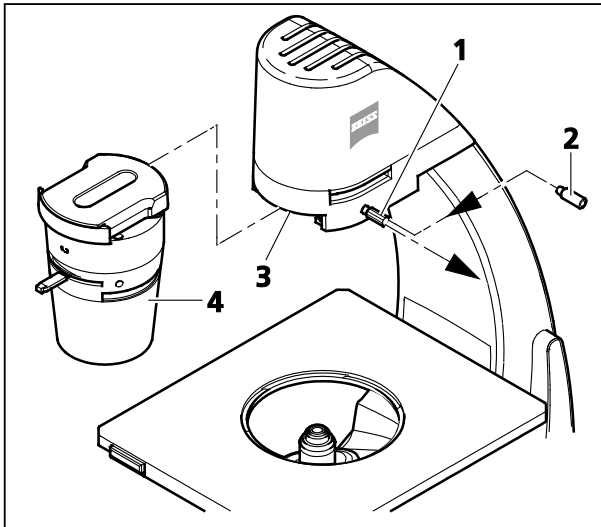


Fig. 4 Inserting the condenser

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.
- 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.

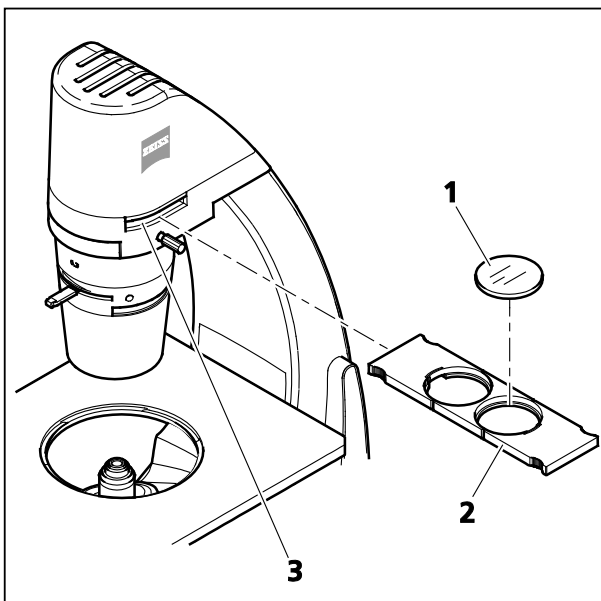


Fig. 5 Inserting the filter slider

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.



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.

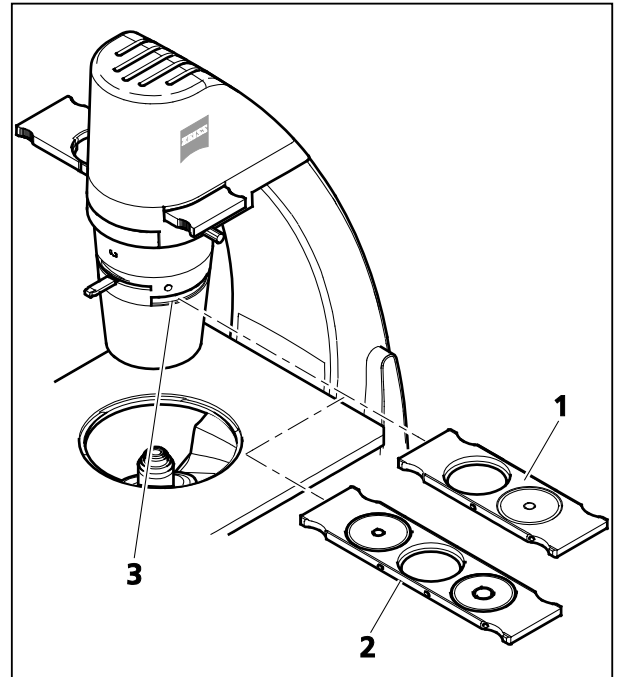


Fig. 6 Inserting the phase contrast slider

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.

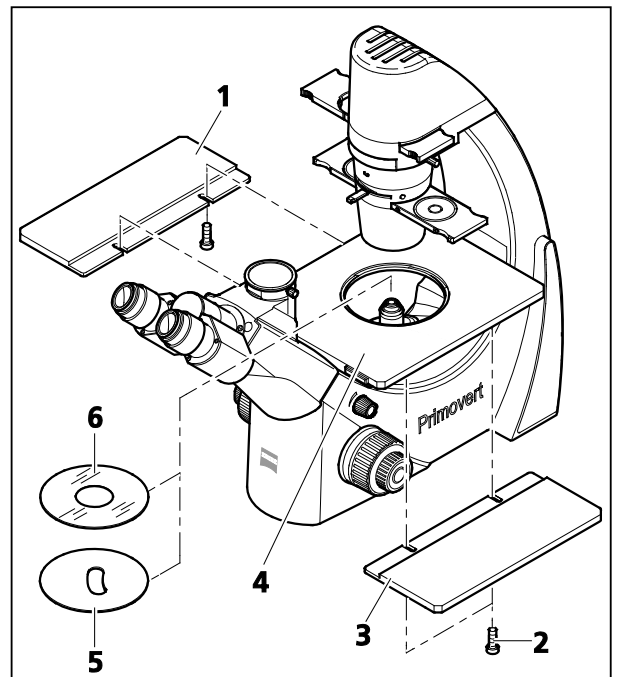


Fig. 7 Inserting the stage inserts and attaching the stage enlargement plates



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

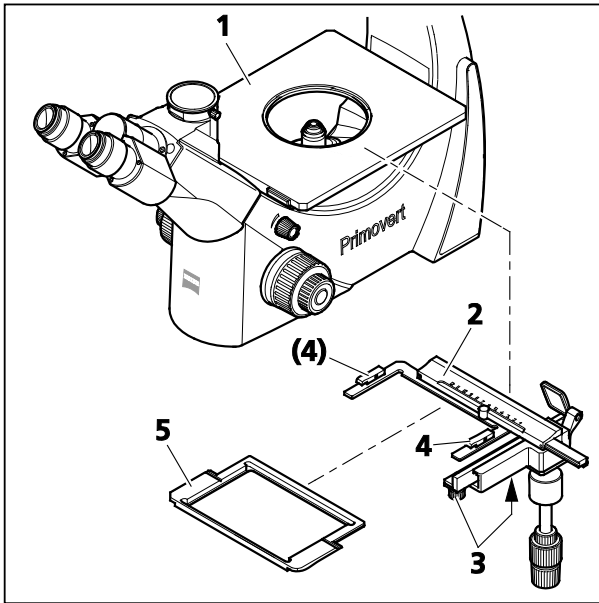


Fig. 8 Mounting the specimen guide and inserting the mounting frame

3.1.7 Mounting the Specimen Guide and Inserting the Mounting Frame

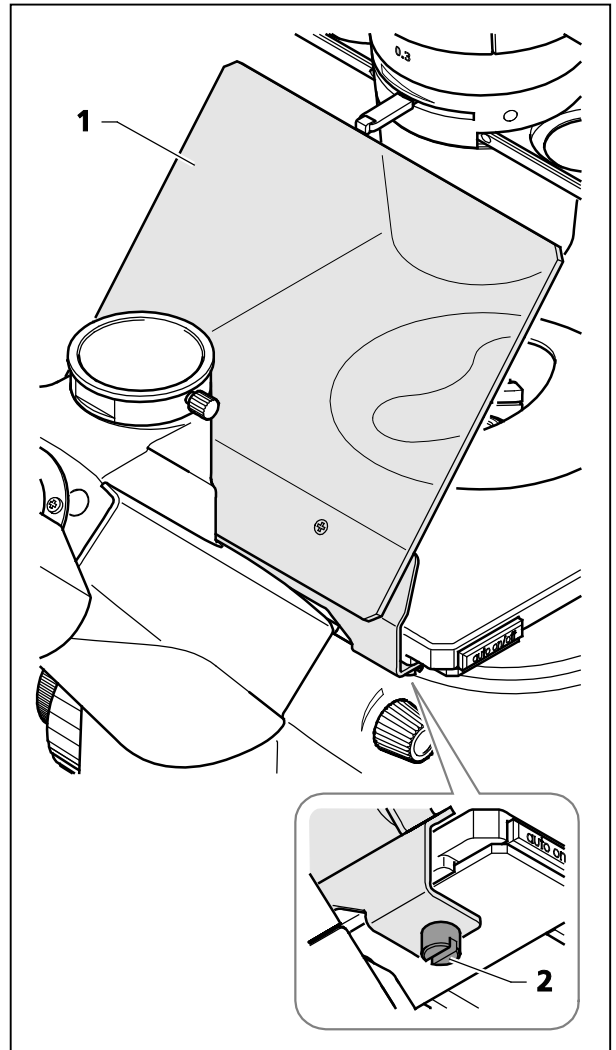
- If attached, remove the stage enlargement plate from the right side of the stage.
- Attach the specimen guide (Fig. 8/2) from below to the right side of the stage (Fig. 8/1) and fasten it with the two knurled screws (Fig. 8/3) of the specimen guide.
- Insert the universal mounting frame M or the mounting 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.



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 3.9.1).

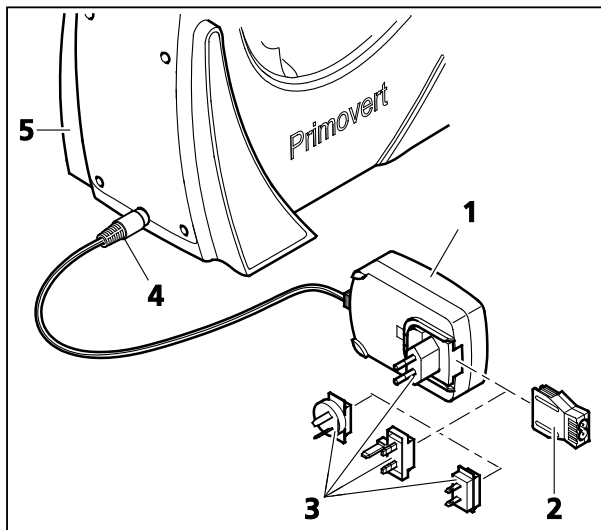


Fig. 10 Connecting the plug-in power unit

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

- 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

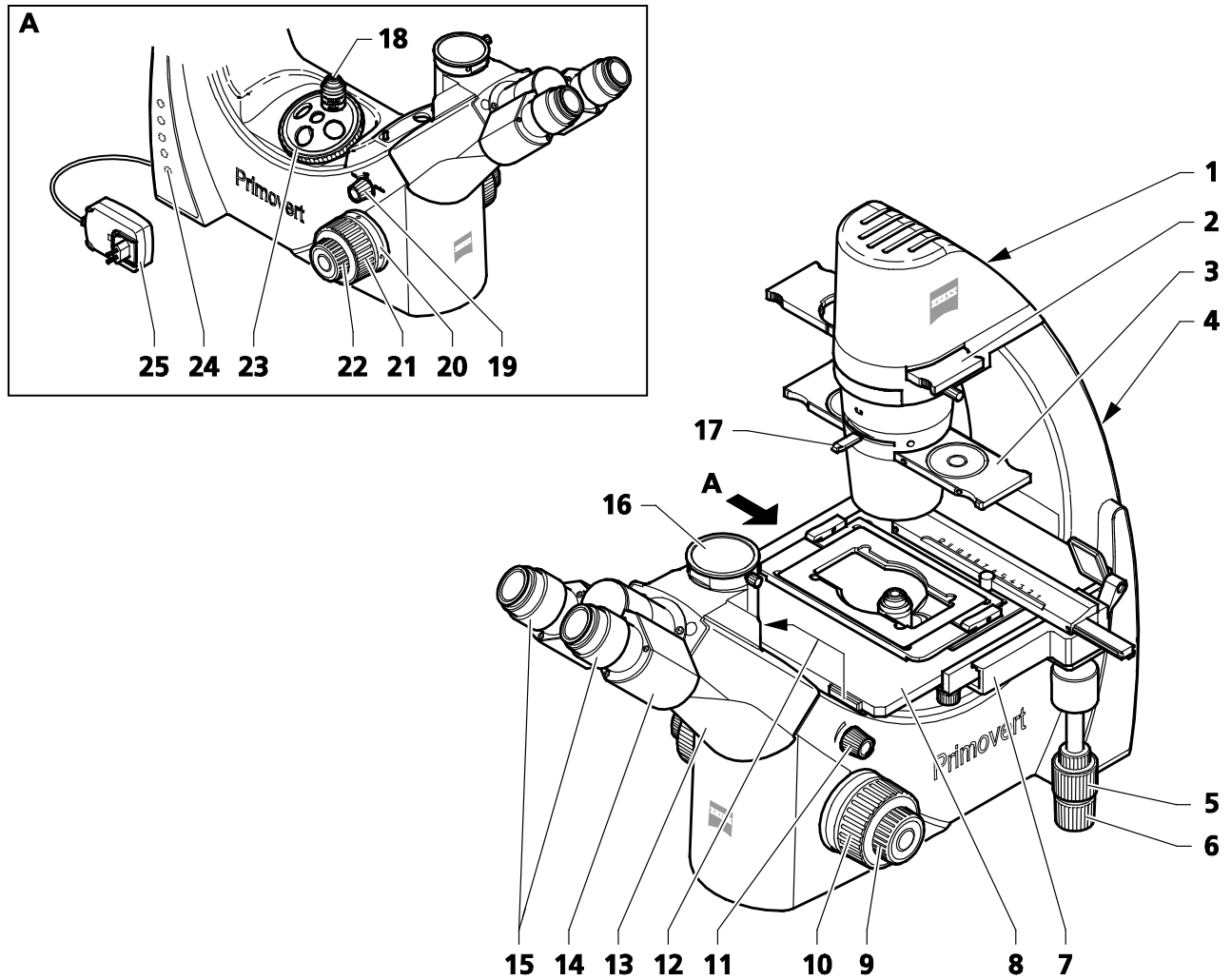


Fig. 11 Operational elements of Primovert with binocular tube, ergotube and phototube

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

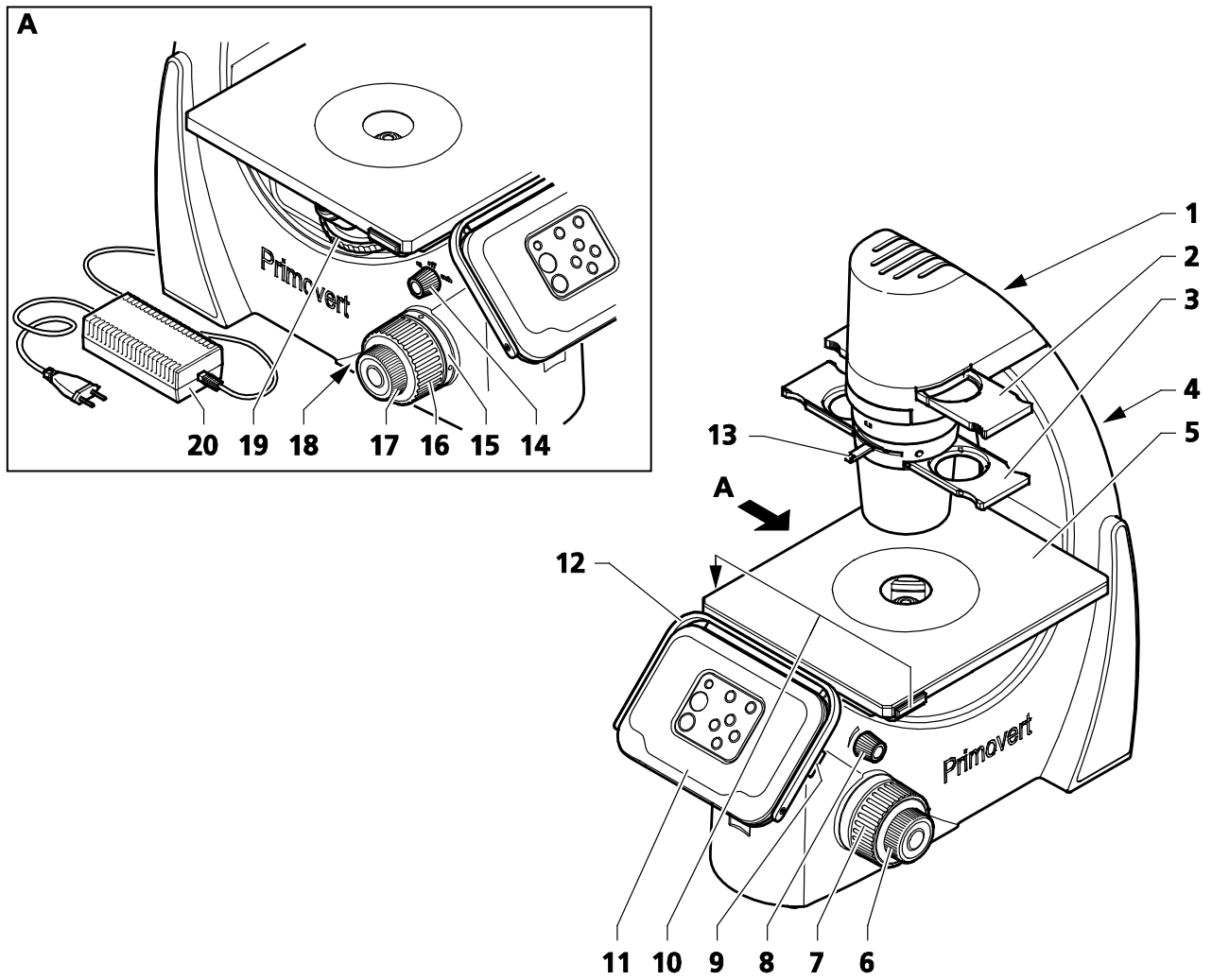
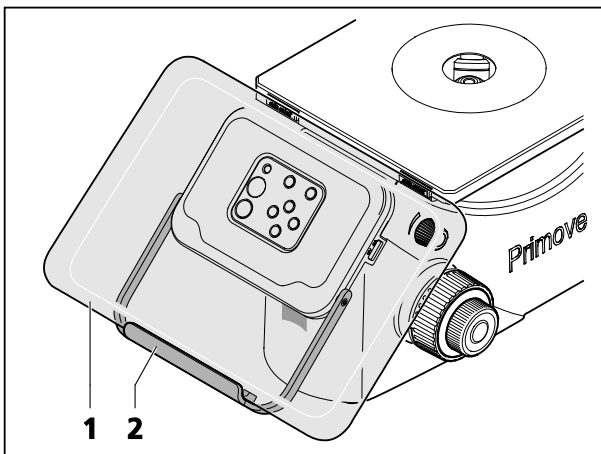


Fig. 12 Operational elements of Primovert HDcam with integrated camera

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 Fine focusing drive (right side)
- 7 Coarse focusing drive (right side)
- 8 Rotary knob for adjusting the illumination intensity
- 9 USB socket (5 V / 2 A) for iPad charging
- 10 On/off switch for illumination; active with rotary knob in AUTO position
- 11 Control elements
- 12 Holder for iPad
- 13 Lever for adjusting the aperture diaphragm of the condenser
- 14 Rotary knob for switching the microscope on and off, with ON, OFF and AUTO positions
- 15 Ring for adjusting the torque of the coarse focusing drive
- 16 Coarse focusing drive (left side)
- 17 Fine focusing drive (left side)
- 18 SD card slot
- 19 Nosepiece
- 20 Plug-in power unit

Operating of Primovert HDcam with integrated camera with iPad

- 1 iPad
- 2 Holder

Fig. 13 Usage of Primovert HDcam with iPad

- Swivel down the holder (Fig. 13/2) and insert the iPad (Fig. 13/1).

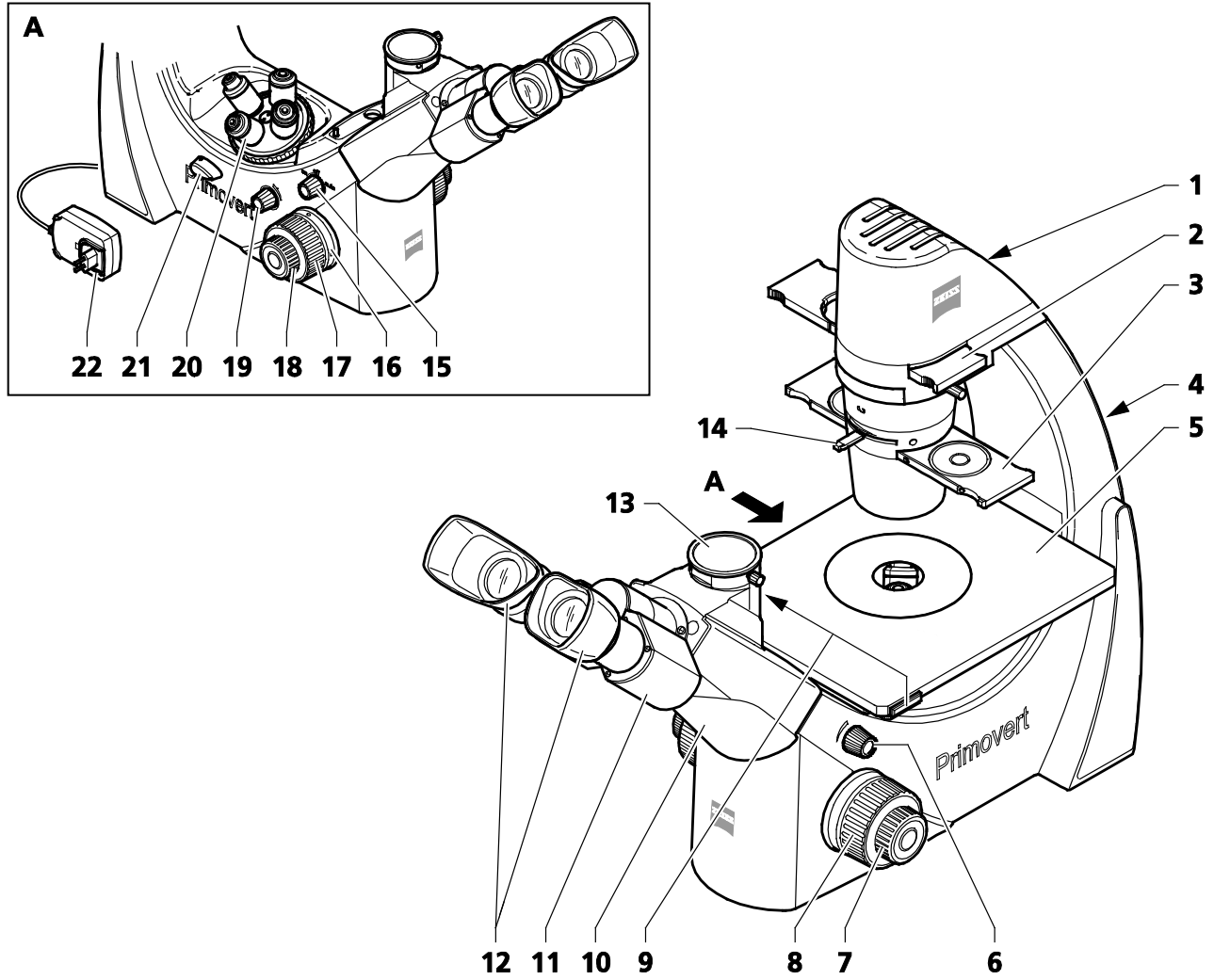


Fig. 14 Operational elements of Primovert iLED with integrated fluorescence unit

Legend to Fig. 14:

- 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

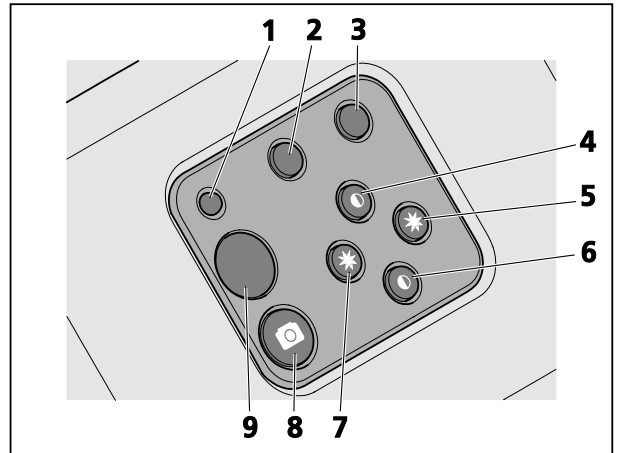
3.3 Primovert HDcam

3.3.1 Control and Functional Elements of the Integrated Camera



Do not operate the camera in a potentially explosive environment! Operation of the camera in a potentially explosive environment, in the presence of volatile anesthetics or flammable solvents such as alcohol, benzene or similar may result in explosions or deflagrations.

- **Briefly** press the snap button (Fig. 15/8) to trigger an exposure.
- Press the snap button for **longer** to start a video recording.
- During a video recording **briefly** press the snap button to stop recording.
- Press the menu button (Fig. 15/2) to open the On Screen Display (OSD) menu.



- 1 LED display
- 2-7 Function buttons, explanation see Table 1
- 8 Snap button
- 9 Infrared sensor for remote control

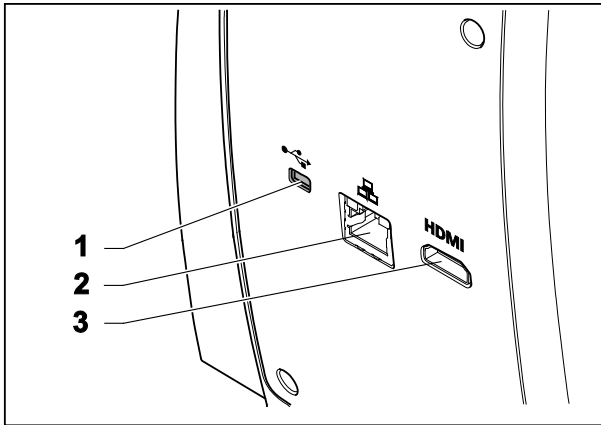
Fig. 15 Control elements of the integrated camera

Pos. No.	Standard function	Function in OSD menu
2	Activate menu	Exit menu
3	AWB (trigger automatic white balance)	OK (apply value)
4	Increase contrast	Up / increase value
5	Increase brightness	Right
6	Reduce contrast	Down / reduce value
7	Reduce brightness	Left

Table 1 Key assignment standard function / function in OSD menu



The visualized images of the integrated camera may only be used for training and research. Direct generation of diagnostic results from these images is not proposed.



- 1 USB 2.0
- 2 Netport in Primovert HDcam
- 3 HDMI

Fig. 16 Interfaces on reverse side

The camera has a number of ports:

- USB 2.0 port (Fig. 16/1) for data communication when connected to PC, as well as power supply, see section 3.3.3.2
- HDMI port (Fig. 16/3) for image data transfer to a monitor, TV or projector, see section 3.3.3.3
- Fast Ethernet port (Fig. 16/2) for communication and image data transfer, Ethernet port can connect to external router, see section 3.3.3.4

The microscope stand has a SD / SDHC card port (Fig. 18/2) at the left side for storing image data, see section 3.3.3.1.

The following connecting cables are required for use of the ports:


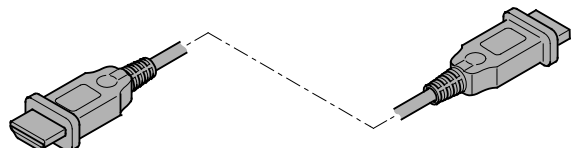
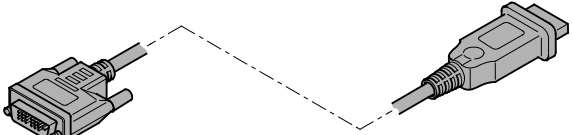

Item	Name	Figure	Remarks
1	USB 2.0 cable		Connection between integrated camera and PC
2	HDMI cable (not supplied)		Connection between integrated camera and monitor, TV or projector
3	HDMI / DVI adapter cable (not supplied)		Connection between integrated camera and monitor or projector
4	Ethernet cable		Connection between integrated camera and network or WLAN router

Table 2 Connections

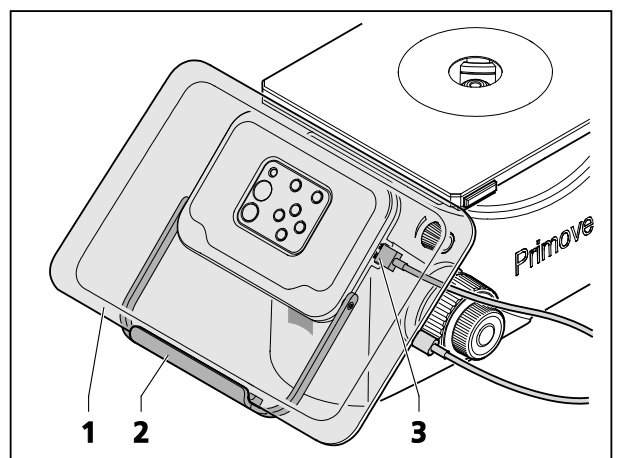
The various states of the integrated camera are displayed by LED.

System status	LED display / operating mode
Start sequence	LED lights up green
Start sequence completed	LED flashes green
Ready for operation	LED lights up green
Storage process	LED flashes green
Error	LED flashed red for approx. 5 seconds

Table 3 LED status displays

3.3.2 Connect iPad to USB charge port

- If you want to load the iPad use the USB charge port (Fig. 17/3) for iPad.
- Connect the iPad via USB cable with the USB charge port in front of the iPad holder.
- For this purpose swivel down the holder (Fig. 17/2) and insert the iPad (Fig. 17/1).
- Insert the mini USB plug into the USB 2.0 port on the iPad.
- Insert the USB plug into the USB charge port (Fig. 17/3) in front of iPad holder.



- 1 iPad
- 2 Holder
- 3 USB charge port for iPad

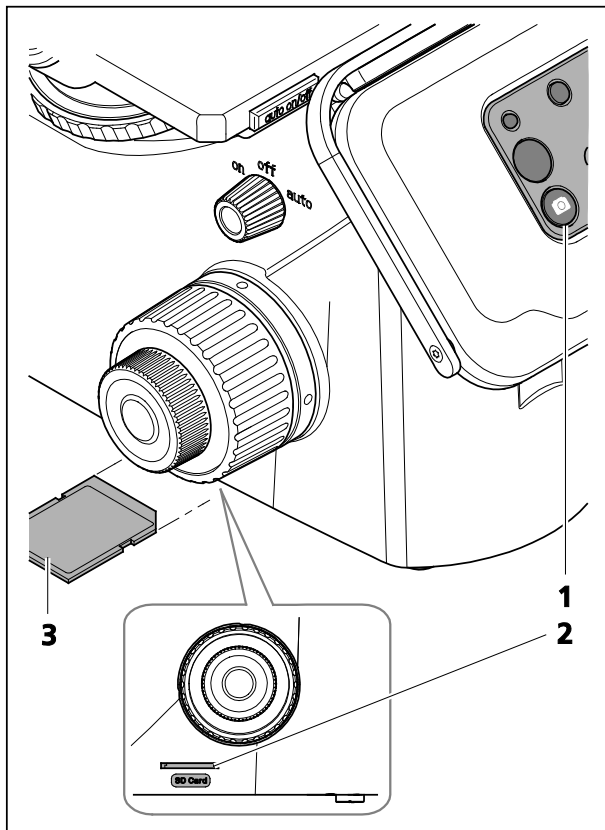
Fig. 17 Connect iPad to USB charge port

3.3.3 Ports and their Possible Uses

3.3.3.1 Saving Data to the SD Card via SD Card Port



An SD card has a max. capacity of 4 GB, an SDHC (HC = high capacity) up to 32 GB. Prior to use on the PC, the SDHC card must be formatted in the format FAT32.



- Insert an SD / SDHC card (Fig. 18/3) into the card slot (Fig. 18/2).
- Briefly press the snap button 1 second (Fig. 18/1) to trigger an exposure.
- The images are saved on the SD / SDHC card in JPG format.
- Press the snap button (Fig. 18/1) for 2 seconds to start a video recording. Briefly pressing the snap button once again stops the video recording.

Fig. 18 Inserting SD / SDHC card



Videos are recorded in MPEG-4 advanced video coding format (H.264) and saved as a .h264 file. The videos can be played back using standard software, e.g. with the VLC player.



The visualized images of the integrated camera may only be used for training and research.

Direct generation of diagnostic results from these images is not proposed.

3.3.3.2 Data Transfer to the PC via USB 2.0 Port

The USB port is used for data transfer to the PC. A mini USB 2.0 cable is required for transferring data to the PC.

The built-in camera is compatible with ZEN or ZEN lite.

- Insert the mini USB plug (Fig. 19/1) of the USB cable into the USB 2.0 port (Fig. 19/2) on the reverse side of microscope.
- Insert the USB 2.0 plug (Fig. 19/3) into the PC (Fig. 19/4).

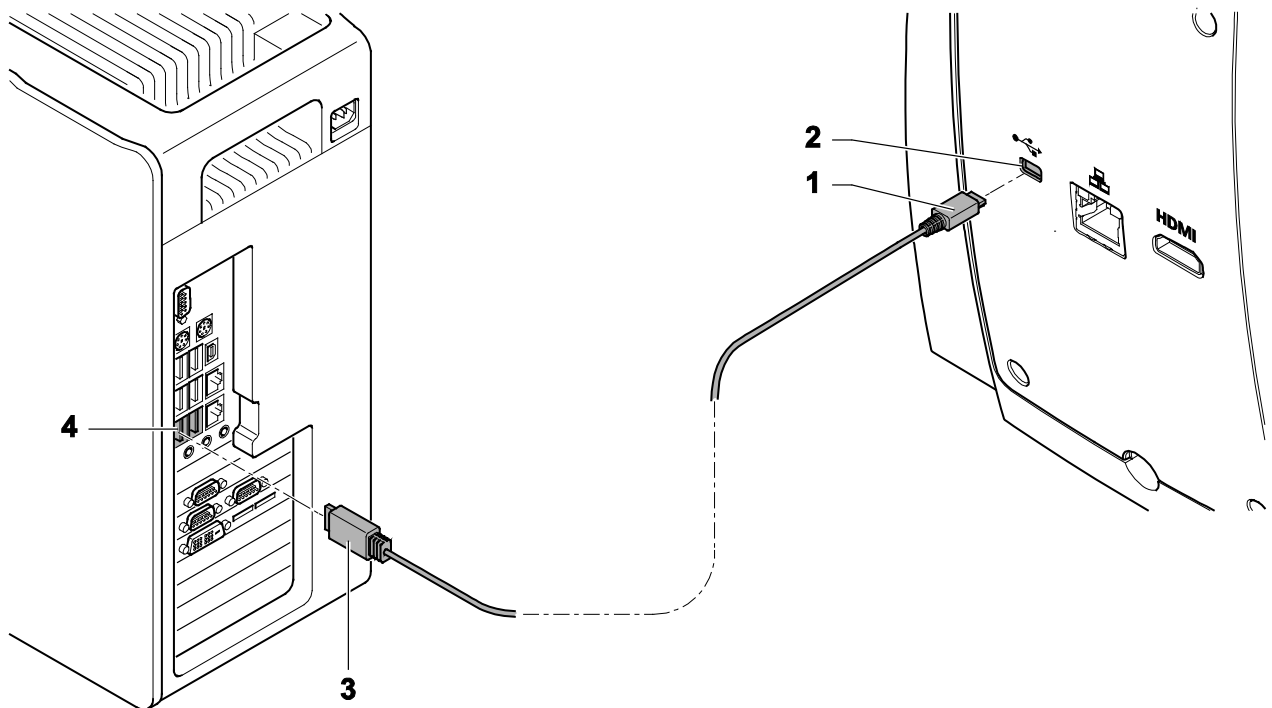


Fig. 19 Data transfer to the PC via USB port




The visualized images of the integrated camera may only be used for training and research.

Direct generation of diagnostic results from these images is not proposed.

3.3.3.3 Visualization of Data via HDMI Port

The integrated camera can be connected to a monitor, TV or projector for visualization of the live image data.

 The data at the HDMI output is in DVI format. Further HDMI functions (e.g. audio, communication between monitor and camera) are not supported.

 To enable the display the high-resolution images in HD format in this quality, it is recommended that only HD-capable devices be connected.

- Connect the monitor / projector to the integrated camera using the HDMI cable. To do this, insert the HDMI plug (Fig. 20/1) into the jack on the reverse side of the microscope (Fig. 20/2) and the monitor / projector (Fig. 20/3). Secure the HDMI plug on the jack on the monitor / projector.

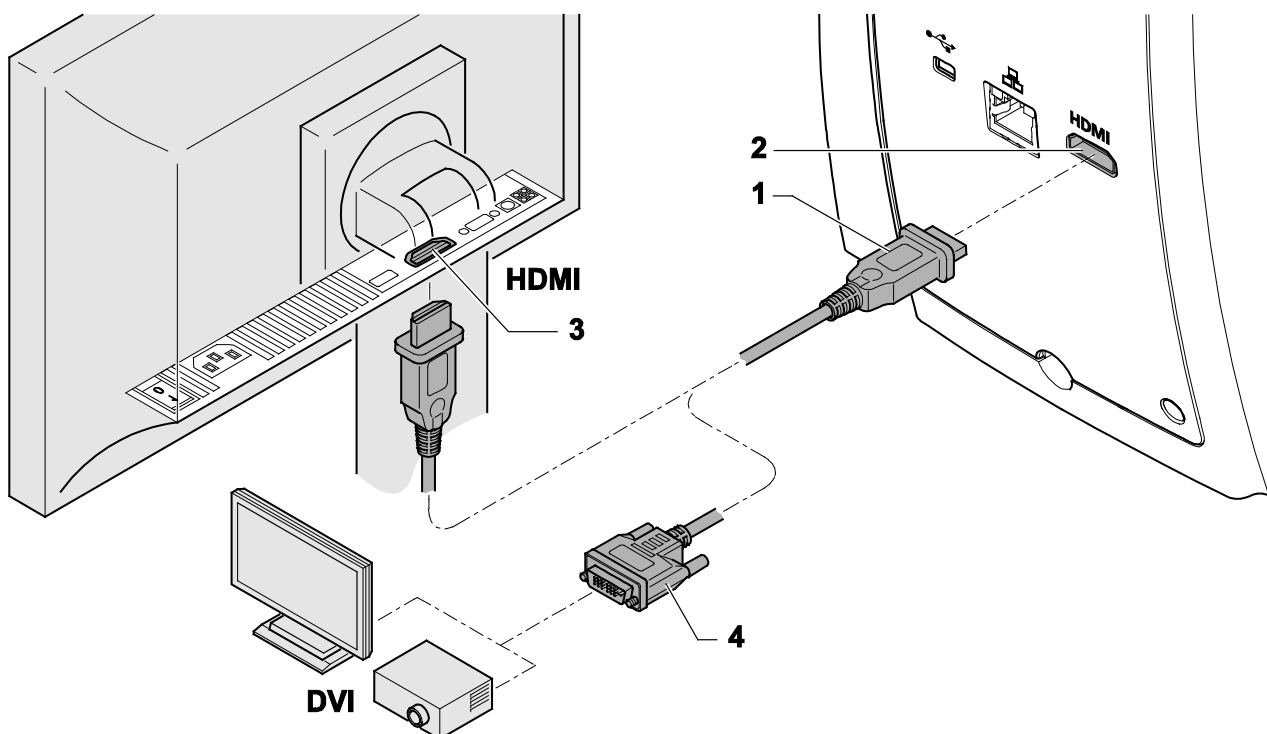


Fig. 20 Connecting the integrated camera to a monitor / projector


 If a monitor / projector is used, an HDMI / DVI adapter cable (Fig. 20/4) or HDMI / DVI adapter will be required for the reproduction of image data.

 A default resolution of 720p60 has been set.

- For further camera settings using the on-screen display menu (OSD) see section 3.3.4.

 Live image data can be documented by photo or video recording, see section 3.3.3.1.

- Connect the integrated camera to the mains supply, see section 3.1.10 on page 27.

 The visualized images of the integrated camera may only be used for training and research. Direct generation of diagnostic results from these image is not proposed.

3.3.3.4 Integrate the Camera into the Network via an Ethernet Port

The integrated camera has a fast Ethernet port for communication and image data transfer.

- Integrate the camera into the network via the fast Ethernet port.

To do this, insert the Ethernet cable (Fig. 21/1) into the jack on the reverse side of the microscope (Fig. 21/2).



A WLAN router will be required to use the built-in camera together with the ZEISS Labscope app. Existing WLAN infrastructure may be used¹ or a separate microscope WLAN set up².

The integrated camera will identify itself automatically to the network (Fig. 21/3) on Dynamic Host Configuration Protocol (DHCP) and will be automatically recognized by Labscope, provided the iPad (Fig. 21/4) is in the same network.



Consult your network administrator for further guidance.

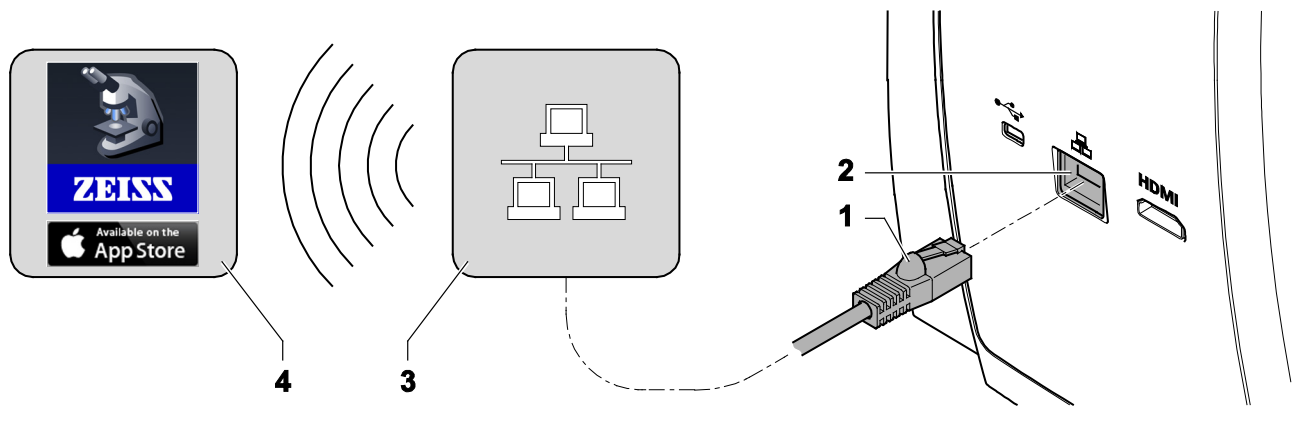


Fig. 21 Establishing a network connection



Further information on the Labscope app can be found at www.zeiss.com/labscope.
For an overview of all ZEISS Microscopy apps visit www.zeiss.com/micro-apps.



The visualized images of the integrated camera may only be used for training and research.
Direct generation of diagnostic results from these images is not proposed.

¹ Prerequisite: High-performance 802.11n WLAN with sufficient free bandwidth. In the event of an overloaded or slow WLAN the live image of the built-in camera may be delayed or incorrectly displayed on the iPad.

² For further information on this subject visit www.zeiss.com/micro-apps.

3.3.4 Remote Control of Integrated Camera

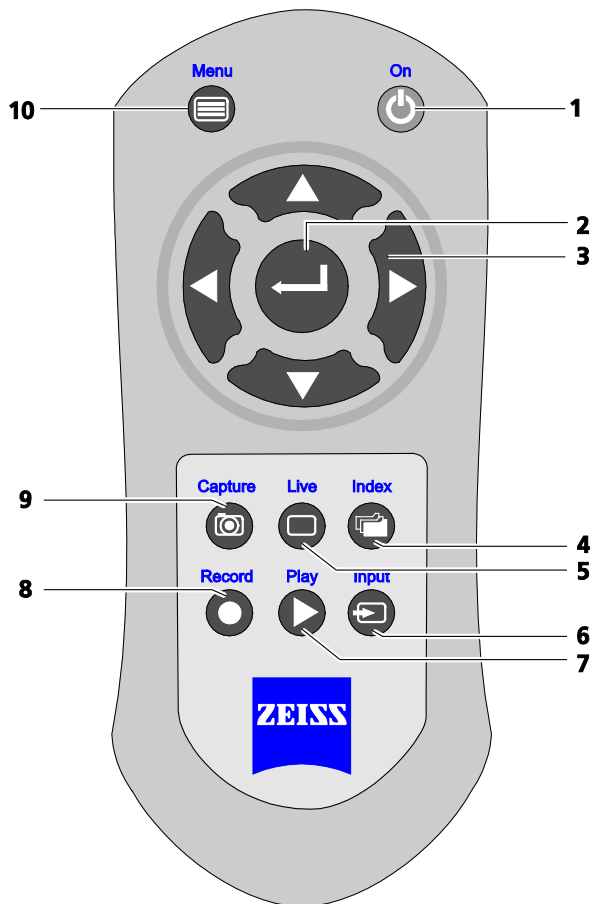


Fig. 22 Remote control

No.	Button	Standard function	Function in OSD menu
1	On	Turn On / Off HDMI output	Turn On / Off HDMI output
2	Enter	Trigger automatic white balance	OK (apply value)
3	Arrow Up	Increase contrast	Up / increase value
	Arrow Down	Reduce contrast	Down / reduce value
	Arrow Left	Reduce brightness	Left
	Arrow Right	Increase brightness	Right
4	Index	None	Go to top tier of menu
5	Live	Clear screen of windows	Exit menu
6	Input	Toggle between 720p60 and 1080p30 outputs	Toggle between 720p60 and 1080p30 outputs
7	Play	Clear screen of windows	Exit menu
8	Record	Start / Stop recording video	Start / Stop recording video
9	Capture	Capture an image to SD card	Capture an image to SD card
10	Menu	Activate menu	Exit menu

Table 4 Key assignment standard function / function in OSD menu of remote control

3.3.5 Configuring the Integrated HD IP Camera

- Press the Menu button on the control panel.
The OSD menu for adjusting the settings will appear.

The following menus are available for configuring the camera:



Fig. 23 Color menu

AWB	<p>The purpose of white balance is to calibrate the camera to the color temperature of the light source used. The AWB function of the integrated camera supports the Continuous / Push button modes.</p> <p>In Continuous mode the white balance is carried out continuously. In certain specimens this may result in incorrect colors.</p> <p>To ensure that the white balance applies to the light source and not the main color of the specimen, the Push button mode can be set. Here the white balance is carried out only once if the AWB / OK button is pressed outside the OSD menu.</p>
Color temp.	<p>This creates a white balance bias towards yellow (left) or blue (right). If AWB (see above) is set to push button, the effect of this regulator is only visible after a white balance has been carried out with the AWB button (outside the OSD menu).</p>
Saturation	<p>The camera's images are in sRGB color space with an 8 bit color depth per channel. The color saturation per RGB value can be adjusted.</p> <p>Extreme left: Gray scales Extreme right: Maximum color saturation</p>
Gamma	<p>The gamma correction of the camera can be adjusted. A choice of Gamma 1 and 0.45 is available.</p>

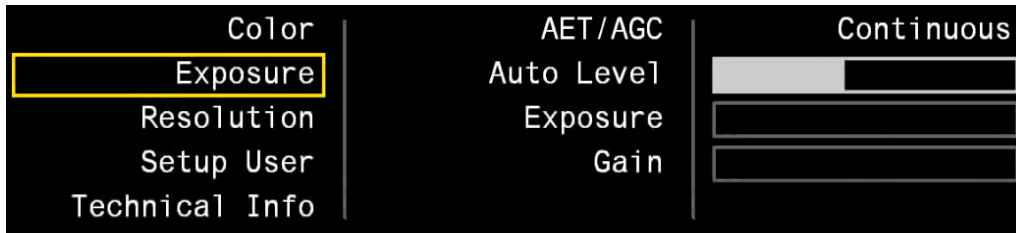


Fig. 24 Exposure menu

AET / AGC	<p>AET (automatic exposure time) and AGC (auto gain control) automatically ensure the correct brightness of the image when the setting is at Continuous. The settings are Once / Continuous / Off.</p> <p>In some situations (e.g. strong contrasts on the specimen) the automatic setting may cause the image to be under- or overexposed. In this case the automatic setting can be deactivated by switching to Off.</p> <p>A shorter exposure time with higher amplification (= more noise, but smoother live image) or a longer exposure with lower amplification (= less noise, less smooth live image) can be selected in Off mode.</p> <p>In Once mode a one-time automatic adjustment will be carried out when confirmed with OK, but then deactivated again.</p>
Auto level	<p>Influences the AET / AGC control when Continuous mode is set.</p> <p>Extreme left: very dark image Extreme right: very light image</p>
Exposure	<p>The exposure time can be set within the range 20 μs to ~2s. The exposure time may be set automatically or manually. Manual setting is possible by selecting the AET / AGC control in Off mode.</p> <p>Extreme left: 20 μs Extreme right: 2000 ms (2 s)</p>
Gain	<p>The sensor amplification function can be set within the range 1x to 8x. Sensor gain may be set automatically or manually. Manual setting is possible by selecting the AET / AGC control in Off mode.</p> <p>Extreme left: no increased amplification (less image noise, less light sensitivity of sensor)</p> <p>Extreme right: maximum amplification (strong image noise, high light sensitivity of sensor)</p>

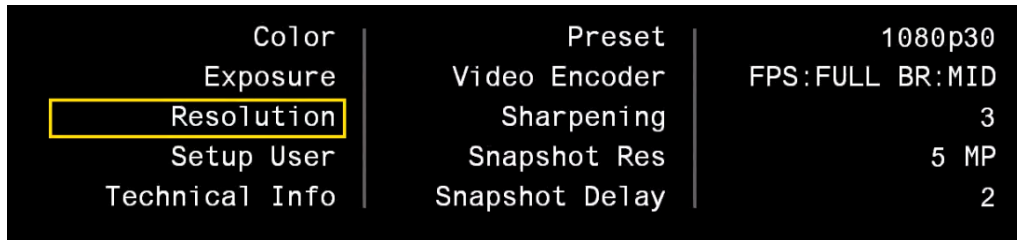


Fig. 25 Resolution menu

Preset	<p>The following options are available:</p> <p>720p60: HD resolution, 1280x720, 60 Hz</p> <p>1080p30: Full HD resolution, 1920x1080, 30 Hz</p> <p>A default resolution of 720p60 has been set.</p> <p>Please observe the following: Prior to conversion to the full HD resolution (1080p30), check that the monitor supports this option. If 1080p30 has already been activated and the monitor displays no image, please follow the instructions as described in section 3.13 on page 47.</p>
Video Encoder	<p>The live image and video recordings are influenced by this setting. The following settings are possible:</p> <p>FPS:HALF BR:HIGH: Half frame rate, high data rate (8 Mbit / s)</p> <p>FPS:HALF BR:MID: Half frame rate, medium data rate (4 Mbit / s)</p> <p>FPS:HALF BR:LOW: Half frame rate, low data rate (2 Mbit / s)</p> <p>FPS:FULL BR:HIGH: Full frame rate, high data rate (8 Mbit / s)</p> <p>FPS:FULL BR:MID: Full frame rate, high data rate (4 Mbit / s)</p> <p>FPS:FULL BR:LOW: Full frame rate, low data rate (2 Mbit / s)</p> <p>Half frame rate results in improved image quality with the same data rate.</p>
Sharpening	<p>Value range: 0 to 3.</p> <p>Edge flickering may occur in some HDMI monitors with a default value of 3, but this will disappear with lower values.</p>
Snapshot Res (Res = resolution)	<p>The snapshot resolution for exposures to the SD card can be defined here.</p> <p>The following modes can be set:</p> <ul style="list-style-type: none"> ▪ as monitor on the HDMI port: <ul style="list-style-type: none"> - 1920x1080 (16:9 side ratio), when the camera is in 1080p mode (see default settings) - 1280x720 (16:9 side ratio), when the camera is in 720p mode (see default settings) <p>Advantages: Snap lasts < 1 second, small file sizes due to comparatively low resolution</p> ▪ 5 MP: <ul style="list-style-type: none"> - 2560x1920 (4:3 side ratio) – full sensor resolution, 5 megapixels <p>Advantages: full resolution, wider vertical image field</p> ▪ 2560x1440 <ul style="list-style-type: none"> - 2560x1440 (16:9 side ratio) <p>Advantages: high resolution (3.7 megapixels), same image field as in live image</p>
Snapshot Delay	<p>This setting is useful when images are to be captured using the snap button on the tube. Because pressing the button causes the microscope to shake, motion blur would be visible in the image with immediate exposure. This effect is eliminated by snapshot delay.</p> <p>The snapshot delay can be set between 0 and 10 seconds.</p>



Fig. 26 Setup User menu

Date / Time	Date and time in year-month-day / hour-minute-second format. Each element can be adjusted using the up / down buttons. The new time can be set by pressing the OK button. Date and time are integrated into the folder and file names on the SD card.
Flip image	The following modes are available for image mirroring: FLIP H+V: horizontal and vertical mirroring FLIP V: only vertical mirroring FLIP H: only horizontal mirroring OFF: no mirroring Default setting: the image position on the monitor or iPad corresponds to that in the eyepiece.
Load Settings	The previously saved user settings (USER 1-4) can be loaded in this menu. Selecting FACTORY DEFAULT reinstates the default camera settings. After confirmation with OK the camera will be restarted. This may take several seconds. If the OSD menu is not available, the factory settings can be reinstated using the short-cut Snap + AWB / OK (keep depressed for two seconds).
Save Settings	The current settings can be saved in a user storage location (USER 1-4). They can be automatically loaded in the Load Settings (see above) or Startup Set menus (see below) at a later point in time or each time the camera is switched on Please observe the following: If the settings are saved, Startup Set is automatically set to this storage location.
Startup Set	This setting determines which user storage location (USER 1-4) is to be loaded each time the camera is switched on.

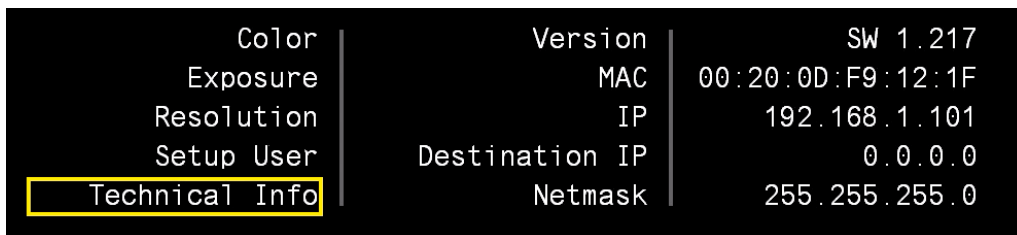


Fig. 27 Technical Info menu

Version	Current firmware version
MAC	MAC address of the built-in camera
IP	Currently used IP address
Destination IP	Currently used multicast target address
Netmask	Currently used netmask

3.4 Switching the Microscope On / Off

- Switch on the microscope using the rotary knob (Fig. 28/2) (**ON** or **AUTO** position).
 - **ON** position:
The two ON/OFF switches (Fig. 28/1) 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. 28/1) 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.

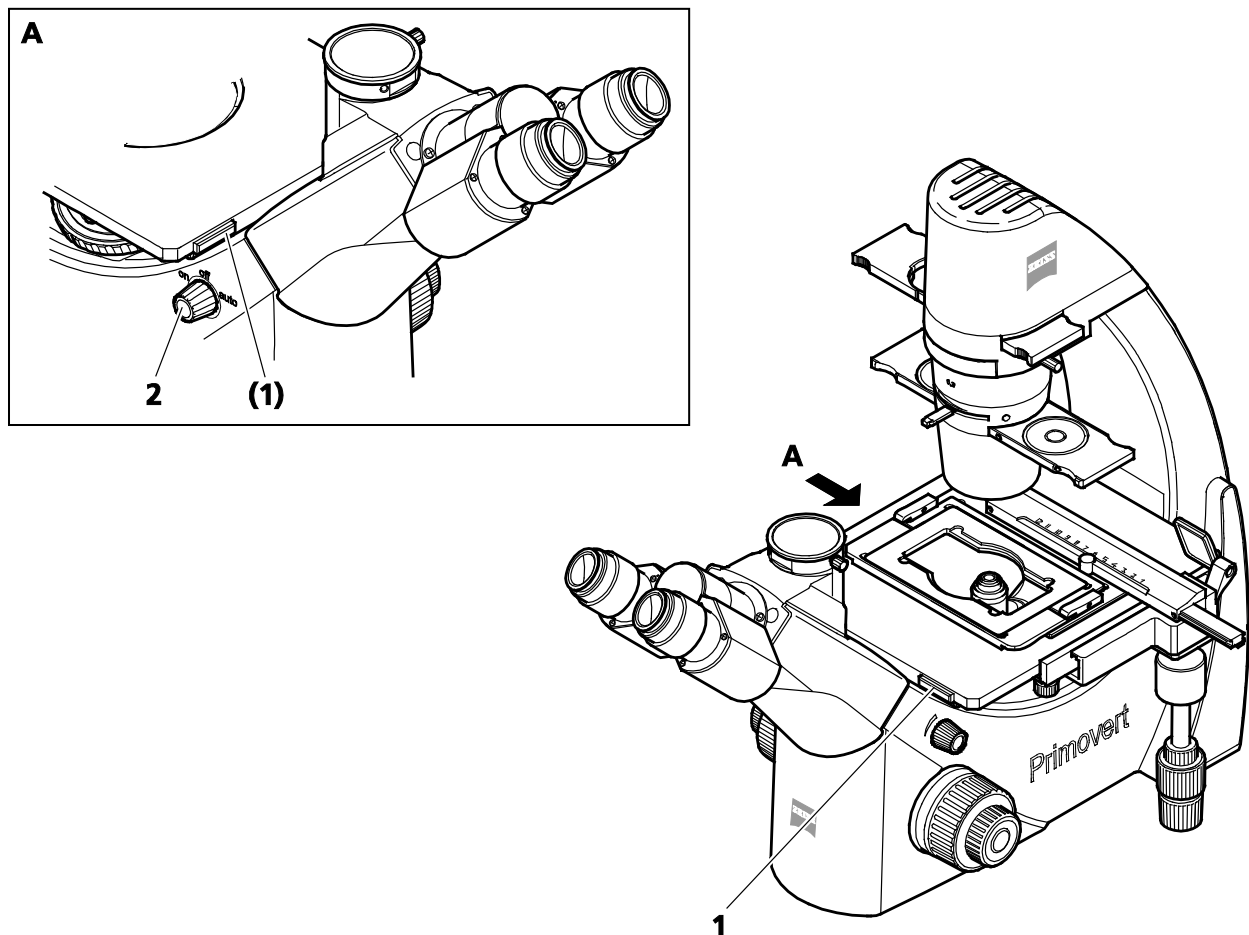


Fig. 28 Switching the microscope on or off

- 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. 28/2) (**OFF** position).
- Cover the microscope with the dust cover.

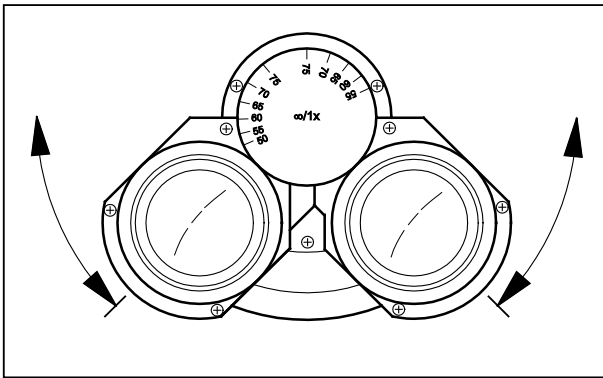


Fig. 29 Adjusting the interpupillary distance

3.5 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. 29).

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

- Swivel the eyepiece tubes upward (Fig. 30/A) or downward (Fig. 30/B) to adjust the viewing height to your individual requirements.

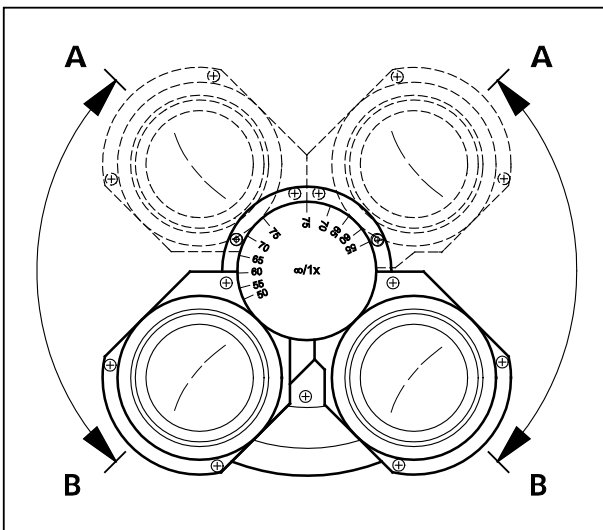


Fig. 30 Adjusting the viewing height

- With the stand model Primovert with ergotube the tube angle can be adjusted in the range from 30° to 60° according to individual requirements.

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

The eyepieces (Fig. 32/3) can be equipped with fold-over rubber eyecups (Fig. 32/1: pulled out; Fig. 32/2: 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. 32/5) by hand from the eyepiece.
- Insert the eyepiece pointer (Fig. 32/4a) or the eyepiece micrometer (Fig. 32/4b) 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. 32/3) 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.

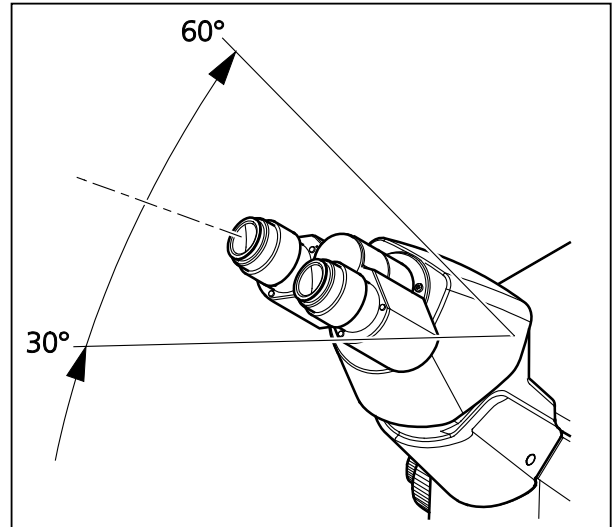


Fig. 31 Tilting range of ergotube

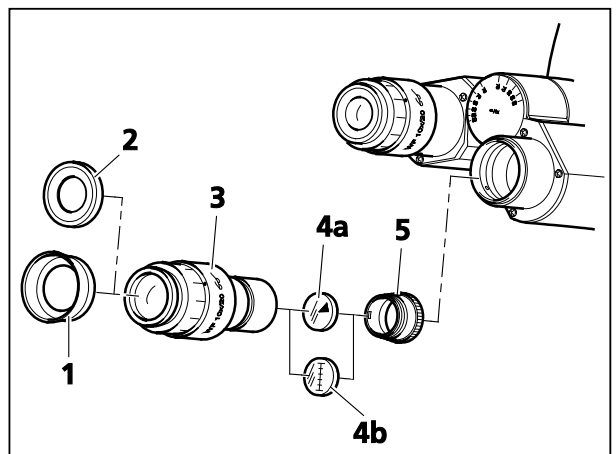


Fig. 32 Inserting the eyepiece pointer or eyepiece micrometer

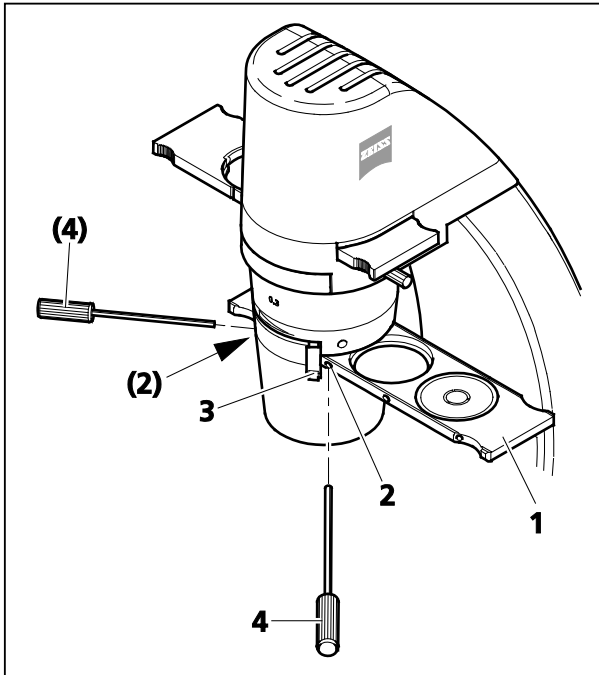


Fig. 33 Inserting the slider

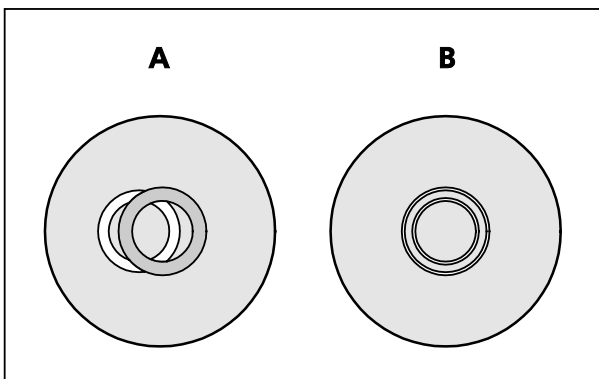


Fig. 34 Centering the phase stop

3.7 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. 33/3) on the condenser.
- Introduce the slider (Fig. 33/1) 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. 34. To this end, remove one eyepiece and replace it by the diopter.
- Center the phase stop, if necessary (Fig. 34/A), by turning the two adjusting screws (Fig. 33/2) of the corresponding slider position by means of the two Allen keys SW 1.5 (Fig. 33/4) until the image corresponds to that shown in Fig. 34/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.

3.8 Reflected-Light Fluorescence

- Turn the transmitted light / reflected light changeover switch (Fig. 35/1) upward to the reflected-light position (Fluorescence).
- Switch on the reflected-light illuminator using the rotary knob (Fig. 35/2) and adjust the desired illumination intensity.

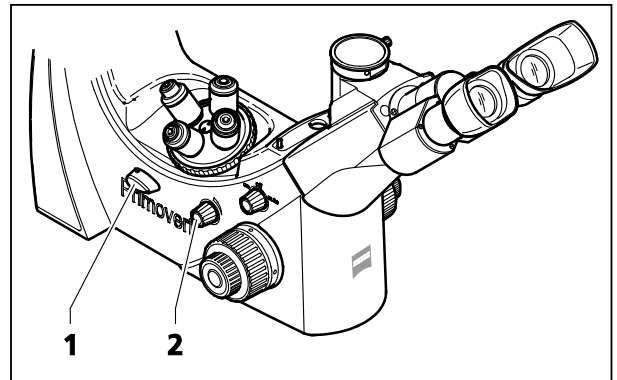


Fig. 35 Adjusting reflected-light fluorescence

3.9 Retrofitting the Microscope



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

3.9.1 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. 36/1) and remove the cover from the stand.
- Loosen both fastening screws (Fig. 36/2) of the transmitted-light illuminator (e.g. transmitted-light illuminator with halogen bulb, Fig. 36/3). 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. 36/3) out of the stand.
- Pull the halogen bulb (Fig. 36/4) 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.

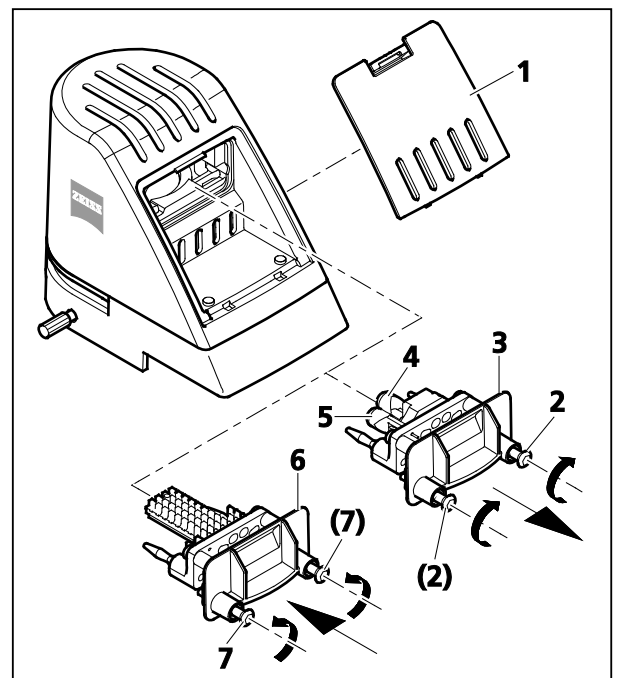




Fig. 36 Replacing the halogen bulb 6 V / 30 W or the transmitted-light illuminator with LED

 A spare bulb (Fig. 36/5) 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. 36/6) into the stand and fasten it with the two screws (Fig. 36/7). 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. 36/1) again to the stand and let it snap into place.

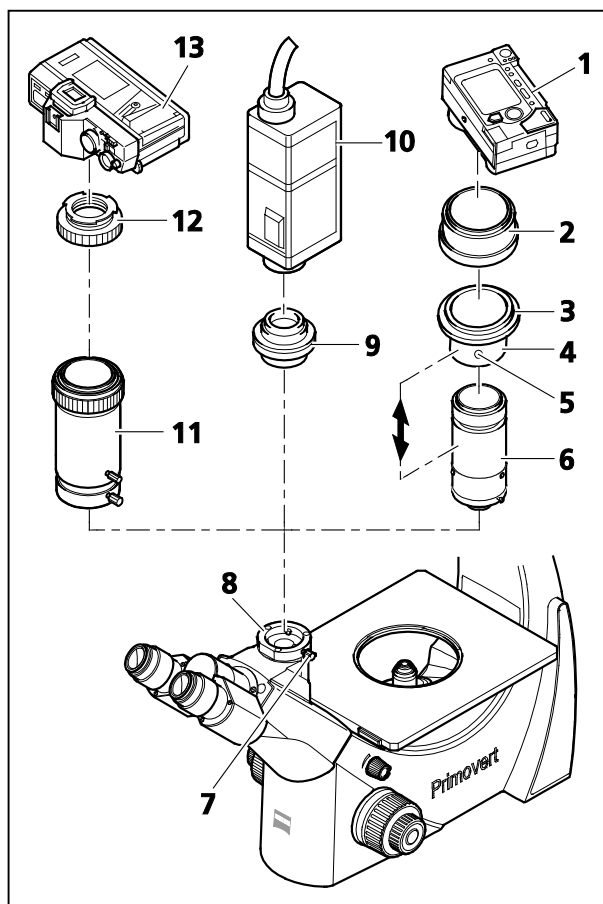


Fig. 37 Attaching the camera

3.9.2 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. 37/7) and remove the dust cap from the camera port (Fig. 37/8) of the binocular phototube.

Attaching a Compact Digital Camera

- Sliding mount (Fig. 37/4), thread adapter ring M37/52 (Fig. 37/3) and lens mount (Fig. 37/6) 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. 37/3) from the sliding mount (Fig. 37/4) (not shown) so that you can also attach cameras with M37 thread.
- Mount the adapter ring (Fig. 37/2) (optional accessory for the corresponding camera) to the camera (Fig. 37/1) (see the operating instructions of the camera).

- Screw the unit consisting of sliding mount (Fig. 37/4), thread adapter ring M37/52 (Fig. 37/3) and lens mount (Fig. 37/6) into the adapter ring (Fig. 37/2).
- Insert the camera with adapter into the phototube as far as it will go. Align it and fasten it with the clamping screw (Fig. 37/7).

-
- Depending on the microscope equipment or the camera used, it may be necessary to optimize the distance between camera lens and lens mount (Fig. 37/6) (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. 37/5).
- 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. 37/5).



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. 37/9).

- Put the video camera (Fig. 37/10) or single-lens reflex camera (Fig. 37/13) (using the T2 adapter for this camera (Fig. 37/12) together with the corresponding camera adapter (Fig. 37/9 or 11) into the phototube as far as it will go, align it and fasten it with the clamping screw (Fig. 37/7).

3.10 Care, Maintenance and Troubleshooting

3.11 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.

3.12 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 light 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.

3.13 Troubleshooting on the Integrated HD IP Camera

Problem-solving notes for the use of the built-in camera in conjunction with the network / WLAN and Labscope app are to be found separately at the Zeiss website www.zeiss.com/labscope.

Problem	Cause	Troubleshooting
LED does not light	The camera does not draw power via the stand power cable.	Check the power supply. Check if stand power is on. If it is in auto mode, try to press auto on/off button on stage.
	Cable is not connected to a certified PSU.	Requirements: 5 V DC with at least 950 mA at output.
	Cable is not suitable. Be sure that power is on. Or either LED or camera is broken.	Use the supplied original cable. Contact service to further check. If LED is broken, change button control PCB. If camera is broken, replace the camera. Replacement requires special tools and can thus not be carried out by the customer.
LED flashes red	The camera indicates an error.	SD card is full: Insert a new card or delete images from the current card, SD card is write-protected: Push the locking slide on the card to "unlocked". SD card is defective or not formatted: Format SD card; replace SD card if error message does not disappear
Buttons do not react, LED flashes red when a button is pressed.	The buttons are temporarily locked, as the camera is being accessed exclusively from the PC or network.	Control the camera via PC software or Zeiss app, or close the PC software or Zeiss app.
Firmware update not functioning.	For an update an SD card must be inserted and the firmware update must be saved to a specified subfolder on the SD card.	Insert a formatted, unsecured SD card with at least 10 MB free memory space. Be sure to carefully follow the instructions enclosed with the firmware update.
The live image of the camera is not displayed in ZEN.	The camera is not recognized by the Zeiss imaging software.	Several cameras have been connected to the PC: select the correct camera "AxioCamER" from the menu list.
Newly captured images are not visible in Microsoft Windows Explorer on the memory card.	Microsoft Windows Explorer has not updated the contents of the card.	Remove the memory card from the camera, wait for three seconds and re-insert it. Microsoft Windows Explorer will read in the contents of the card again.
The camera "forgets" the date / time.	The buffer battery is empty.	Contact service to replace the buffer battery. Replacement requires special tools and can thus not be carried out by the customer.

Problem	Cause	Troubleshooting
The image has severe noise.	The amplification (gain) is set too high.	Reduce the gain and increase the exposure time instead.
The image is too dark or too light.	AET / AGC (automatic exposure time / automatic gain control) has not been activated.	Activate AET / AGC and select Continuous mode or manually adjust the exposure time so that the setting is correct for the current light situation.
Monitor connected via HDMI / DVI does not display an image.	The camera is not delivering a signal, or signal is not compatible with the monitor.	<p>Monitor switches to stand-by mode: Ensure that the camera has been switched on for at least 30 seconds and the LED lights up green. Check the plug connections on the tube and monitor.</p> <p>Monitor displays an error message that after switch-over to 1080p resolution the signal is outside the monitor specifications.</p> <p>The monitor may not support a 1080p30 signal. Hold down the Menu and OK buttons for two seconds to return the camera to 720p60 resolution.</p>
The camera forgets the settings (e.g. manual white balance, resolution) if the power supply is disrupted.	Settings were not stored.	If settings have been made for regular use, they must be saved before disconnecting the power.
Camera otherwise behaves abnormally.	The camera may have been brought into a non-intended state.	Restore all default camera settings via the OSD menu or by pressing the Snap and AWB / OK buttons for two seconds. The camera will then restart and should be in a normal state.
When recording a video to the SD card, the camera generates several short video files.	The "Snap" button was pressed too long.	To record a single video, press and hold the "Snap" button and release it as soon as the LED starts blinking.

4 TECHNICAL DATA

Dimensions (width x depth x height)

Primovert	approx. 261 mm x 550 mm x 494 mm
Primovert HDcam	approx. 215.5 mm x 473 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 HDcam	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	+10 to +40 °C
Admissible air humidity	max. 75 % at 35 °C (no condensation)
Operation:	
Operating environment	closed rooms
Operating altitude	max. 2000 m
Admissible ambient temperature	+10 to +40 °C
Admissible air humidity	max. 75 % at 35 °C (no condensation)
Atmospheric pressure	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
Overvoltage category	II
Radio interference suppression	in compliance with EN 61326-1
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 HDcam	max. 45 W
Power supply Primovert HDcam Input:	100-240 V DC; 50-60 Hz, max. 1.6 A
Power supply Primovert HDcam Output:	12 V DC, max. 5 A
Power consumption Primovert iLED	max. 30 W
Power supply Primovert iLED Input:	100-240 V DC; 50-60 Hz, max. 0.7 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	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
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 5 MP HD IP camera	
Acquired visual field of the camera	11.4 mm x 8.56 mm (14.2 mm diagonal)
Fixed built-in camera adapter	0.63x
Output	HDMI / USB2.0 / Ethernet port/ SD card
iPad holder	tiltable 40-80 degree
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

HD-CMOS-camera

Sensor-specific data	
Sensor	Micron MT9P031
Sensor size	1/2.5", 5.7 mm x 4.28 mm (7.1 mm diagonal)
Pixel size	2.2 µm x 2.2 µm
Sensor type	1/2.5" CMOS, color
Readout mode	Progressive scan
No. of pixels (H x V), full field	2560 x 1920 pixels active, 5 megapixels
Live image, movie	1920 x 1080 pixels, 30 Fps (H264 max. 16 Mbits / s)
Spectral sensitivity (without IR filter)	400 nm to 700 nm

Signal processing / interface-specific data

Digitization / color depth	24 bit, 3 x 8 bit / pixel
Amplification	0-18 dB
Interfaces	USB 2.0 mini USB plug LAN via RJ 45 jack, 100 Mbit SD card (secure digital) 1-32 GB, slot for SD and SDHC HDMI (1080p/30 or 720p/60)
Remote release	IR sensor
Duo LED	Ready (green), exposure (flashing green), not ready (red), error (flashing red)
Key matrix	White balance, snap, contrast, brightness, menu
Exposure time	10 μ s to 2 s



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