

**Operating Manual**  
**Axio Zoom.V16**  
**Zoom microscope**



You have purchased a high quality product from Zeiss. Before using the instrument the first time, please read this operating manual in order to maintain the high quality of the instrument and ensure reliable work with it for a long time.

Knowledge of this manual is required for the operation of the device. You should therefore familiarize yourself with the contents of this manual and pay special attention to instructions concerning the safe operation of the instrument.

We reserve the right to make changes in the interest of technological advancement; the Operating Manual is not subject to updating or revision.

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## 1 INTRODUCTION

### 1.1 General information

Axio Zoom.V16 microscopes have been designed, manufactured and tested in compliance with DIN EN 61010-1 (IEC 61010-1) and IEC 61010-2-101 Safety requirements for electrical equipment for measurement, control and laboratory use.

The instruments meet the requirements of EC Directive IvDD 98/79/EC (In vitro diagnostic medical devices); they are marked with the **CE** mark.

The manual contains all information and warnings the operator must comply with.

The following warning and information symbols are used in this manual:

**CAUTION**

*This symbol indicates a potential hazard to the user.*

**CAUTION**

*Optical radiation is emitted.*

*Do not look into the laser beam! It may be injurious to the eyes (see Section 2.4).*

**CAUTION**

*Risk of pinching fingers!*

**CAUTION**

*Hot surface!*

**CAUTION: High-energy UV radiation!**

*Risk of injury to the eyes and skin!*

**CAUTION**

*Disconnect the instrument from the power supply before opening!*

**ATTENTION**

*This symbol indicates a potential hazard to the instrument or system.*

**NOTE**

*This symbol indicates an instruction which requires particular attention.*

## 1.2 Notes on instrument safety



Axio Zoom.V16 microscopes and original accessories are to be used for the microscopy procedures described in this operating manual only. The manufacturer cannot assume any liability for other applications of the instrument, including those of individual modules or single parts.

Modifications and repairs to this instrument and any devices operated in combination with the microscope are to be carried out by our service department or by authorized personnel only. The manufacturer accepts no liability for damage caused by unauthorized access to the interior of the instrument. Failure to comply with this shall also render any warranty claims invalid.



Set-up and operation of the Axio Zoom.V16 in conjunction with the SYCOP 3 control panel and respective EMS 3 controller are described in a separate operating manual (Order No. 435611-9010-701, English edition).

Set-up and operation of the Axio Zoom.V16 in conjunction with the Fluar Illuminator Z mot. for fluorescent applications are described in a separate operating manual (Order No. 435180-9060-701, English edition).



Instruments may only be operated by trained personnel, who must be aware of the possible dangers involved with microscopy and the particular application concerned. The microscope is a high-precision instrument that can be impaired in its performance or destroyed when handled improperly.



Before setting up the instrument, check whether it is suitable for the available line voltage. The plug-in power supply must always be disconnected from the mains socket before opening the device!



The HIP power supply and mains plug of devices with a metal housing may only be connected to sockets with a protective contact. The protective capacity must not be rendered ineffective by using an extension cable without a ground wire. The plug-in power supply should not be brought into contact with moisture.



If it is determined that protective measures are no longer effective, the instrument must be switched off and secured against inadvertent operation. Please contact a Zeiss service agency or the Carl Zeiss Microscopy Service to repair the instrument.



On microscopes with motorized focusing drive there is a **risk of pinching fingers** in the working area when lowering the body of the microscope.



- Do not reach into the work area or beneath the motorized focusing drive during lowering.
- Automatic travel can be interrupted by pressing the STOP button on the focusing drive (Fig. 28/1, page 43) or by moving the knurled knob on the HIP up and down.
- The lower limit switch of the motorized focusing drive must always be set to prevent the objective from colliding with the stage equipment/specimen (see Section 4.6, page 44).



The instruments are not equipped with any special devices for protection against substances that are corrosive, potentially infectious, toxic or radioactive, or other substances that could be hazardous to health. All legal regulations must be observed when handling such substances, particularly the relevant national accident prevention regulations.



Do not operate the supplied equipment

- in areas in which there is a danger of explosion,
- in the presence of volatile anaesthetics or flammable solvents, such as alcohol, benzene, etc.



Do not switch on the instrument unless all cables have been connected; switch it off before disconnecting any cables.



If more than one CAN component is used, these can be connected either to each other or to the focus motor. In such cases only **one** power supply unit may be connected to the microscope system.



VisLED annular lights S are LED Class 1 equipment. Do not look directly into the LED light. To avoid glare during transmitted light applications, swivel in anti-glare shield (Fig. 3/1, page 12).



If the device is operated with an external cold light source (high-energy light) never look directly into the light guide exit of the cold light source. There is otherwise a risk of dazzling or blinding.



The lamps on the light guide source must be replaced in accordance with the manufacturer's instructions. If the instructions are not complied with there is a risk of burning or explosion when the lamps are replaced.

 Dust and dirt may impair the instrument's performance. The instrument must therefore be protected as far as possible from such influences and covered with the dust cover when not in use. Always check whether the instrument is switched off before you cover it. Broad temperature fluctuations, direct sunlight and vibrations should be avoided.

 Clogged or covered ventilation slats may lead to heat build-up that will damage the instrument and, in extreme cases, cause a fire. Always keep the ventilation slats clear and ensure that no objects enter the instrument through the ventilation slats. All electrical components and parts must be set up at least 15 cm from inflammable objects and walls.

 For transporting over long distances the instrument must be dismantled and wrapped in the original packaging. For **Relocation of the device** please observe Section 5.2.2, page 58.

 Defective instruments are not to be disposed of as ordinary domestic waste. They should be disposed of in accordance with the relevant regulations (see section 5.4, page 60). Samples should also be disposed of in compliance with the relevant legal requirements and internal operating procedures.

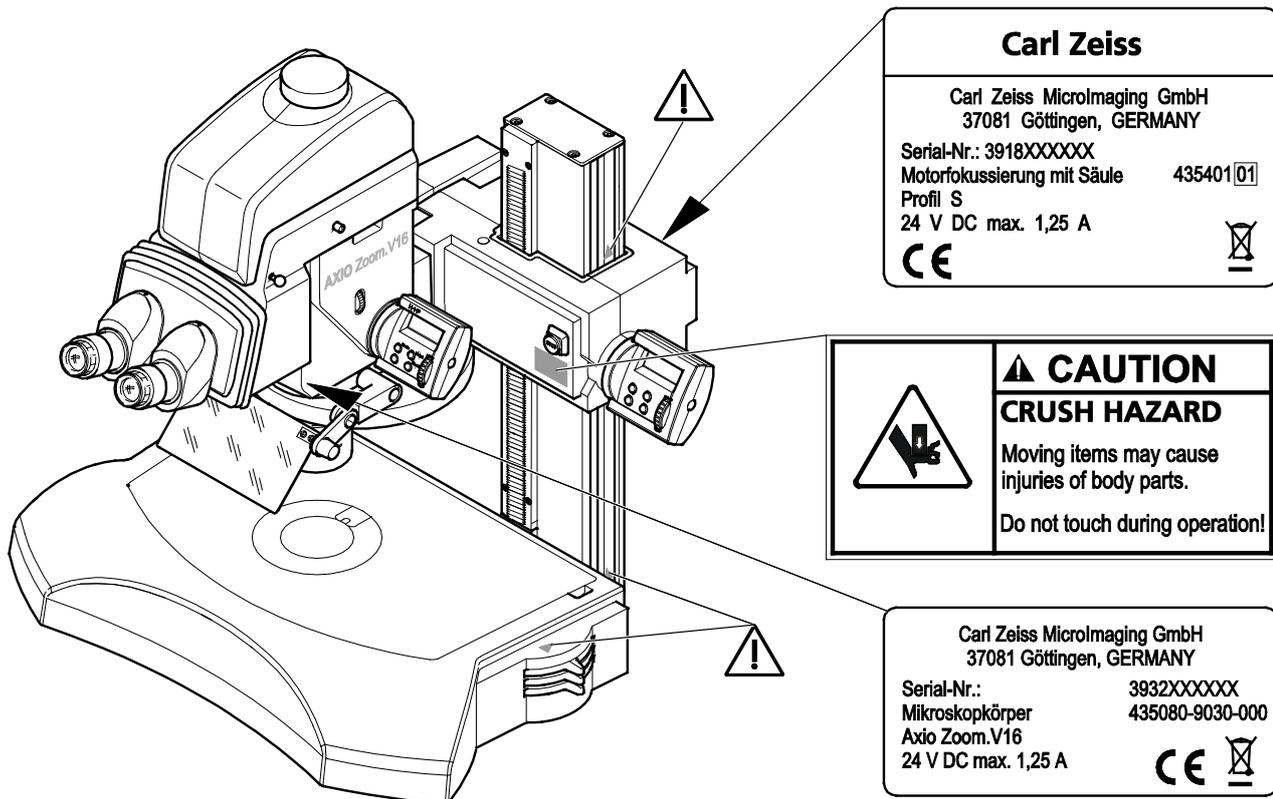


Fig. 1 Warning and information labels on the device

**1.3 Notes on warranty**

The manufacturer guarantees that the instrument is free of material or manufacturing defects when delivered. Possible defects must be notified to us immediately and steps taken to minimize damage. If notified of such a defect, the manufacturer is obligated to rectify it at his discretion, either by repairing the instrument or 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 instrument, particularly the removal or replacement of instrument components, or the use of accessories from other manufacturers. Such actions will render any warranty claims invalid.

With the exception of the work described in this manual, no maintenance or repair work is to be carried out on these microscopes. Repairs are only to be performed by Carl Zeiss service staff or personnel specifically authorized by Carl Zeiss. In the event of a problem with the instrument occurring, please contact the Carl Zeiss microscopy service team or your local Carl Zeiss overseas representative.

**2 DESCRIPTION****2.1 Proper use of zoom microscopes**

Manufacturer's designation: **Axio Zoom.V16 zoom microscope**

The Axio Zoom.V16 zoom microscope is an all-purpose light microscope for observing, preparing, sorting and microsampling (dissecting, stimulating, manipulating) objects and samples of various types and compositions down to the  $\mu\text{m}$  range. Classic sample preparation is not necessary.

With a high optical imaging quality even in larger object fields, this microscope is equally suited to binocular, visual observation and comprehensive image documentation and analysis including 3D imaging possibilities. With its modular design, different equipment configurations are possible; further components and functions can be added as needed.

Modern cold light sources and gas discharge lamps enable a selection of different illumination methods in:

<b>Reflected light:</b>	- Brightfield	<b>Transmitted light:</b>	- Brightfield
	- Dark field		- Dark field
	- Oblique light		- Oblique light
	- Fluorescence illumination		

The Axio Zoom.V16 was designed for use in biomedical laboratories, material science and forensic institutes, as well as in industrial research, manufacture and quality assurance. Use in diagnostic human medicine is expressly prohibited.

Proper use of the Axio Zoom.V16 requires compliance with the relevant environmental and operating conditions (see Section 2.4, Technical data, page 13 ff.).



Axio Zoom.V16 microscopes and original accessories are to be used for the microscopy procedures described in this operating manual only. The manufacturer cannot assume any liability for other applications of the instrument, including those of individual modules or single parts. 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.



The set-up and operation of the Axio Zoom.V16 in conjunction with optional components such as the SYCOP 3 control panel with the EMS 3 controller or Fluar Illuminator Z mot. for fluorescent applications are described in separate operating manuals.



Instruments may only be operated by trained personnel, who must be aware of the possible dangers involved with microscopy and the particular application concerned.



The microscope is a high-precision instrument that can be impaired in its performance or destroyed when handled improperly. These devices may only be used in conformance with the stated environmental conditions in enclosed, dust-free spaces which are free of oil-bearing and other chemical vapors (see Section 2.4, Technical data).

2.2 Microscope systems

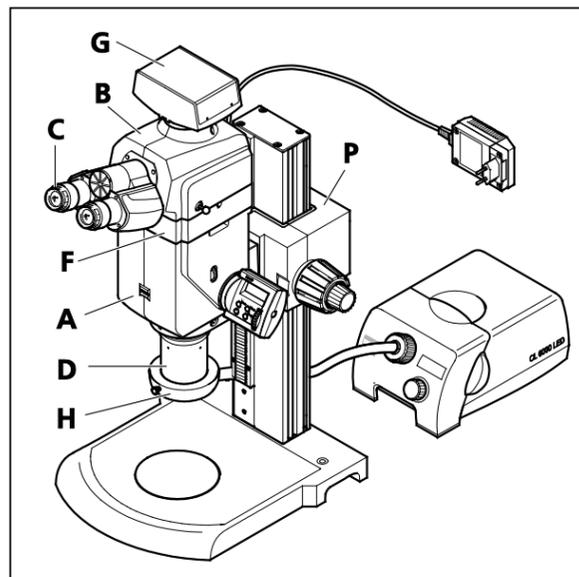


Fig. 2 Axio Zoom.V16 with coarse/fine drive

- Axio Zoom.V16 microscope with coarse/fine drive**
- A Microscope body (Axio Zoom.V16) with control unit (HIP)
  - B Binocular photo tube
  - C Eyepiece
  - D Objective
  - F Intermediate tube
  - G Camera adapter with microscope camera (AxioCam)
  - H Reflected light illumination (slit-ring illuminator with cold light source CL 6000 LED)
  - P Stand base with coarse/fine drive

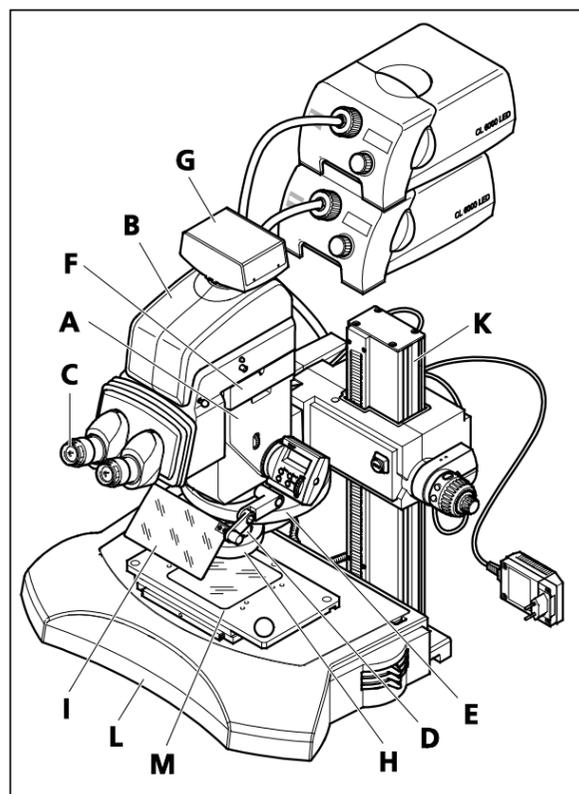


Fig. 3 Axio Zoom.V16 with focus motor

- Axio Zoom.V16 with focus motor**
- A Microscope body (Axio Zoom.V16) with control unit (HIP)
  - B Binocular photo tube
  - C Eyepiece
  - D Objective
  - E Nosepiece
  - F Intermediate tube (Fluar Illuminator Z mot.)
  - G Camera adapter with microscope camera (AxioCam)
  - H Reflected light illumination (slit-ring illuminator with cold light source CL 6000 LED)
  - I UV/visual glare shield
  - K Stand base with focus motor with control unit (MaRC)
  - L Transmitted light illumination (transmitted light illuminator S)
  - M Specimen stage (gliding stage)

The items of microscope equipment shown here are examples and may differ from those actually provided!

2.3 Mechanical interfaces

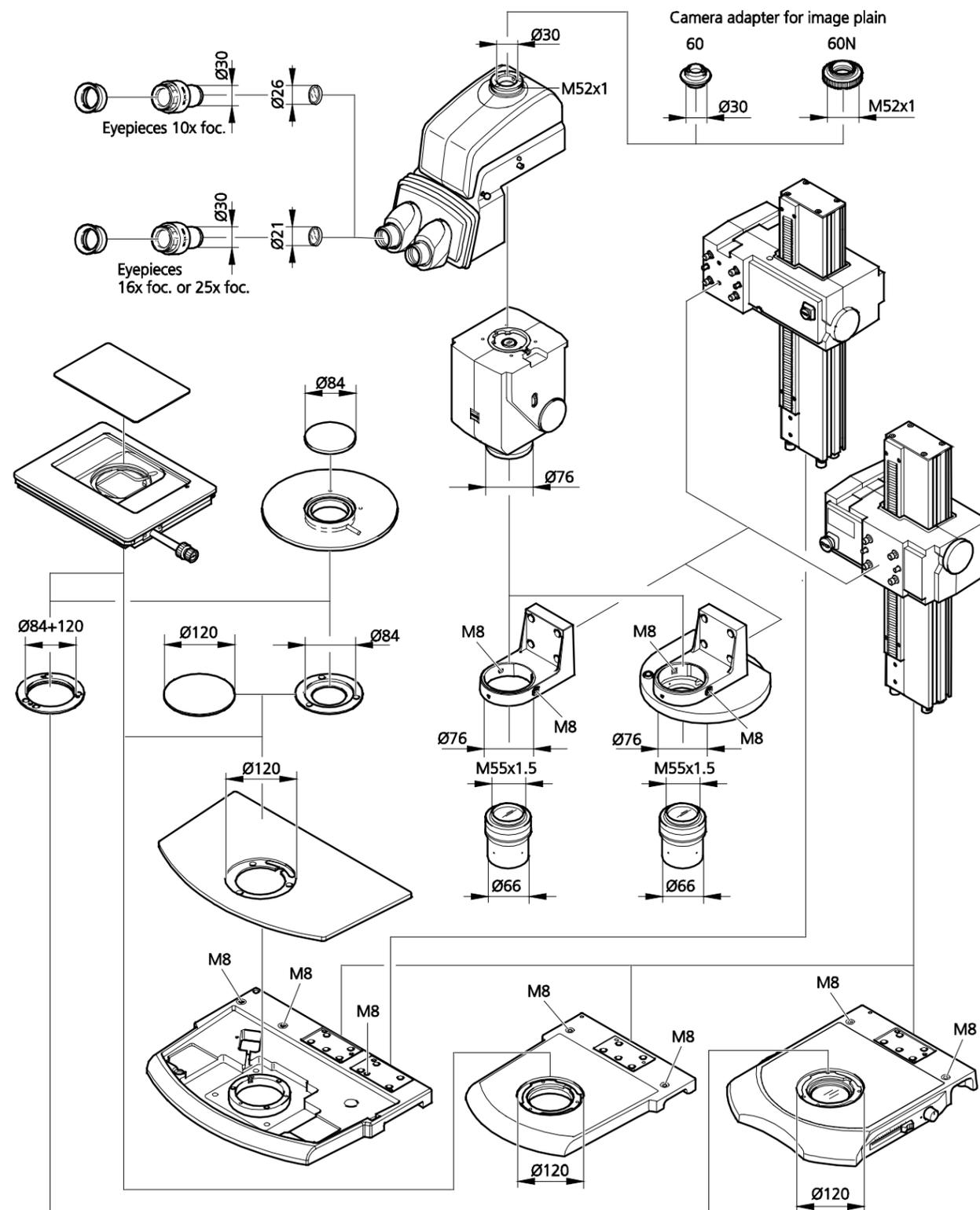
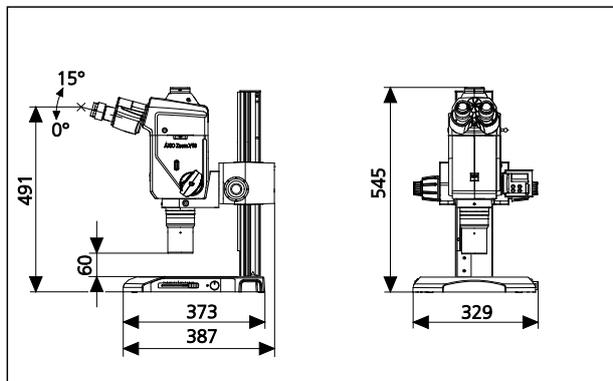


Fig. 4 Mechanical interfaces

**2.4 Technical data**

**Axio Zoom.V16 with coarse/fine drive, without illumination (example)**

**Dimensions**

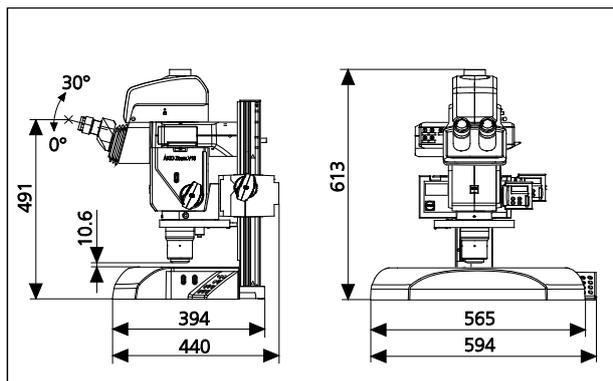


**Weight**

Microscope body V16 .....	2.7 kg
Binocular phototube Z 15° .....	2.5 kg
Coarse/fine drive profile column 490 mm .....	9.3 kg
Base 300 for reflected light .....	5.2 kg
Bracket S with seat d=76 mm .....	0.6 kg
PlanApo objective 1.0x/0.25 .....	1.7 kg
<b>Total weight .....</b>	<b>≥ 22 kg</b>

**Axio Zoom.V16 with focus motor and transmitted light (example)**

**Dimensions**



**Weight**

Microscope body V16 .....	2.7 kg
Binocular ergo phototube Z .....	3.5 kg
Motor focus with profile column 490 mm .....	9.5 kg
or	
Focus motor 3 with central profile column .....	9.8 kg
Nosepiece Z 2x cod. ....	1.8 kg
PlanApo objective 0.5x/0.125 .....	0.7 kg
PlanApo objective 1.5x/0.25 .....	1.7 kg
Stand base 450 for profile S .....	8.9 kg
Transmitted light unit S .....	5.8 kg
or transillumination top 450 mot. ....	4.8 kg
<b>Total weight .....</b>	<b>≥ 33.6 kg</b>

**Optical risk group classification acc. to DIN EN 62471:2009**

Axio Zoom.V16 microscope system with:

HXP 200 C .....	Risk group 1 acc. to DIN EN 62471:2009
CL 9000 LED .....	LED risk group 1 acc. to DIN EN 62471:2009
Transillumination top 450 mot. ....	LED risk group 1 acc. to DIN EN 62471:2009
Transillumination base 300 .....	LED risk group 1 acc. to DIN EN 62471:2009



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**Focusing drive**

Movement range .....	340 mm
Maximum sample height (including stage and a parfocalized objective) with the use of:	
Nosepiece .....	200 mm
Carrier with 76 mm holder, bottom .....	205 mm
Carrier with 76 mm holder, top .....	300 mm
Reduction of maximum specimen height by transmitted light unit S .....	55 mm
Stroke per turn of manual focusing drive	
Coarse focusing drive 350.....	27.6 mm
Coarse focusing drive 500.....	27.6 mm
Fine focusing drive 350.....	2.2 mm
Fine focusing drive 500.....	2.8 mm
Step size of motorized focusing drive .....	0.35 $\mu$ m

**Optical data for Axio Zoom.V16**

Objective...			... with eyepiece PL 10x/23 Br. Foc for large and bright object fields		... with eyepiece PL 16x/16 Br. Foc for high resolution	
	Factor	FWD <sup>1)</sup> in mm	Magnification	Object field in mm	Magnification	Object field in mm
<b>PlanApo Z*</b>	<b>0.5x</b>	<b>114</b>	3.5x ... 56x	66 ... 4.1	5,6x ... 90x	46 ... 2.9
<b>PlanApo Z*</b>	<b>1.0x</b>	<b>60</b>	7x ... 112x	33 ... 2.0	11x ... 179x	23 ... 1.4
<b>PlanNeoFluar Z**</b>	<b>1.0x</b>	<b>56</b>	7x ... 112x	33 ... 2.0	11x ... 179x	23 ... 1.4
<b>PlanNeoFluar Z***</b>	<b>2.3x</b>	<b>10.6</b>	16x ... 258x	14 ... 0.9	26x ... 412x	9.9 ... 0.6

<sup>1)</sup> FWD – free working distance

\* Parfocal distance 164 mm

\*\* Parfocal distance 133 mm

\*\*\* Parfocal distance 105 mm

---

## 3 SET-UP

### 3.1 General information

Because of the complexity of the equipment and to ensure correct function, the instrument will be installed and set up for use on site by your Zeiss customer service team.

This includes the following services:

- Set-up and adjustment of all components
- Connecting cables and supply lines
- Firmware installation (ex works) and configuration
- Training



Read the **Notes on instrument safety** carefully prior to set-up and operation (see Section 1.2, page 8).



The column is supplied with the focusing drive installed. Do not lift or carry the device by the focusing drive!



If more than one CAN component is used, these can be connected either to each other or to the focus motor. In such cases only **one** power supply unit may be connected to the microscope system.



Do not transport the installed, upright standing system over long distances. Avoid severe shocks to the focusing drive, as this could damage the rack of the column. See Section 5.2.2, page 58.



After installing and connecting the instrument, the mechanical end stops must be adjusted for the travel of the motorized focusing drive (see Section 4.6, page 44).



Provide sufficient space for setting up the add-on units (required bench area is approx. W x D: 800x 800 mm).

The Axio Zoom.V16 is normally delivered together with the required tools and optional accessories in several packages.

- Remove all components from the packaging and check that all components described on the delivery note are present.
- Remove all shipping braces (adhesive tape or similar).
- Keep the original packaging for storage or for returning the instrument to the manufacturer, or dispose of it properly.
- Some components are supplied in special packaging, e.g. the PlanApo Z objective. You are strongly advised to use the special packaging for storing these components during extended periods of non-use or for shipping.

### 3.2 Installing stand components

 To avoid damage to the motorized focusing drive (e.g. focus motor with profile column 490 mm Fig. 5A), it should only be set down on the **back** of the column (Fig. 5/a) using sufficiently high supporting blocks (Fig. 5/c) (do **not** put it onto the rack side). The focusing unit (Fig. 5/b) of the focusing drive may not be used as a support.

Only lift or carry the focusing drive by holding it at the focusing column with the blue rack facing upwards! Avoid severe shocks to the focusing drive.

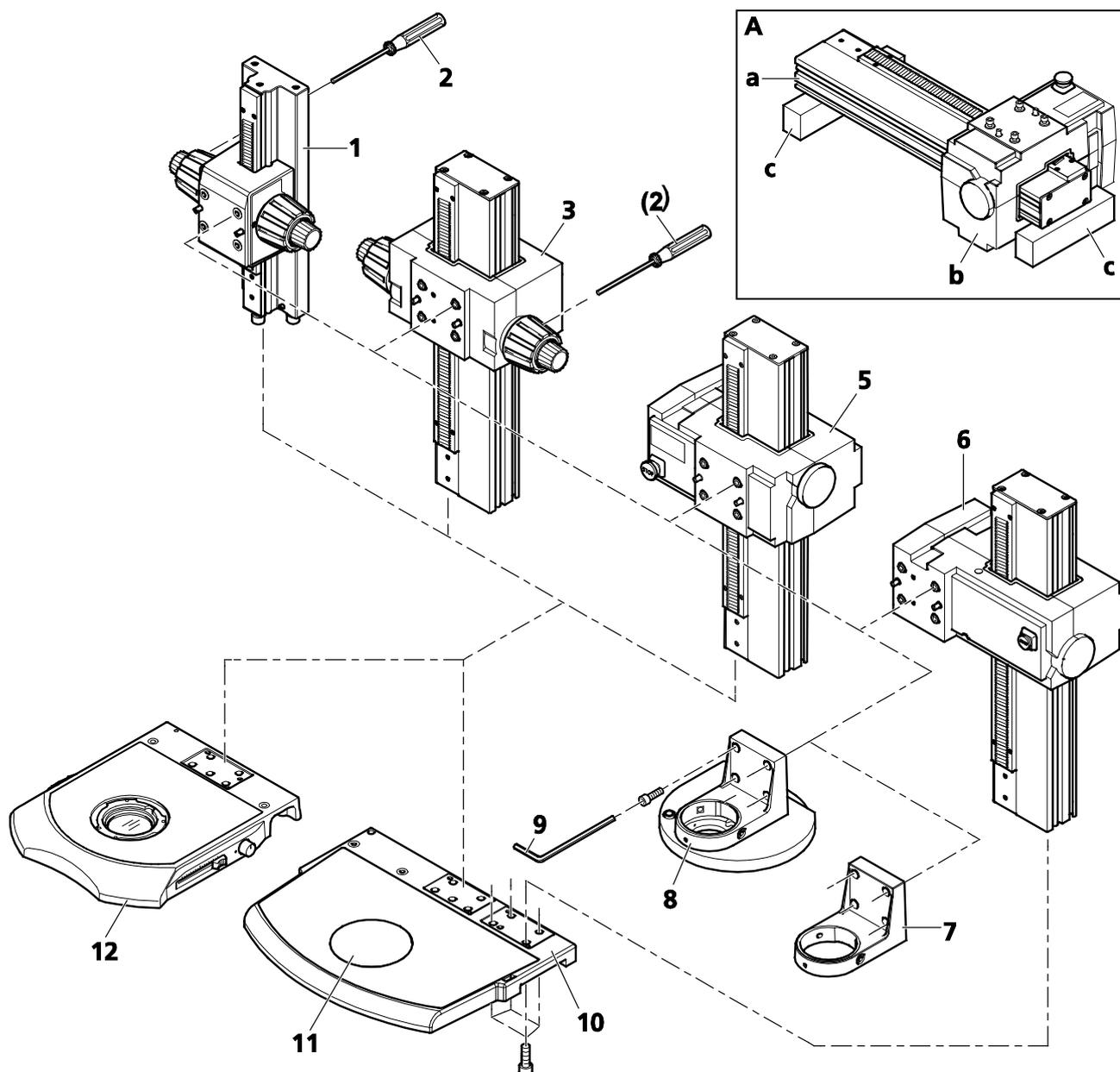


Fig. 5 Setting up the stand

- Set the column of the focusing drive on the provided mounting face of the stand base and secure with four hexagon socket screws (SW 8) from below.
-  The stand base 450 (Fig. 5/10) has two mounting faces for the focusing drive. The mounting face on the right-hand side is only used for the motor focus with profile column 490 mm (Fig. 5/4). The stand base 300 (Fig. 5/12) has on the central mounting face.
-  If the optional transmitted light unit S or transillumination top 450 mot. is to be used, see Section 3.9, page 31.
-  If a stage is to be used, see Section 3.7, page 26.
- Push the carrier (Fig. 5/7) or nosepiece Z 2x cod. (Fig. 5/8) onto the focusing drive until the orientation screws engage; hold it steady until the first screw has been tightened.
- Tighten all four hexagon socket screws (SW 5) with the Allen key (Fig. 5/9).
-  Install the carrier (Fig. 5/5) rotated by 180° to enable observation of taller samples.
- Insert plate (Fig. 5/11).

### Changing insert plate 450

See Section 3.9, page 31.

### Setting the torque of the manual focusing drive (coarse/fine drive)

The torque of the manual focusing drive may need to be readjusted if the latter slips down by itself (e.g. due to additional weight on the microscope body or the nosepiece). In this case, the torque must be increased. The tension has been set correctly if the drive no longer slips.

With additional weights of 10 kg or more on the carrier or nosepiece, it is advisable to use the motorized focusing drive.

If the drive is too tight, the torque may also be reduced to enable it to move more freely.

-  With a coarse/fine drive with column 490 (Fig. 5/3) the torque-adjusting ring is on the right-hand focusing knob, with a coarse/fine drive with column 350 (Fig. 5/1) it is on the left focusing knob.
- Insert the supplied ball-head screwdriver with SW 3 mm (Fig. 5/2) into one of the radially arranged bores on the torque-adjusting ring.
- To increase the tension (braking force), hold the coarse-focusing knob tight with your hand and turn the torque-adjusting ring clockwise. To reduce the tension of the focusing drive, turn the torque-adjusting ring counterclockwise.

## 3.3 Mounting the microscope

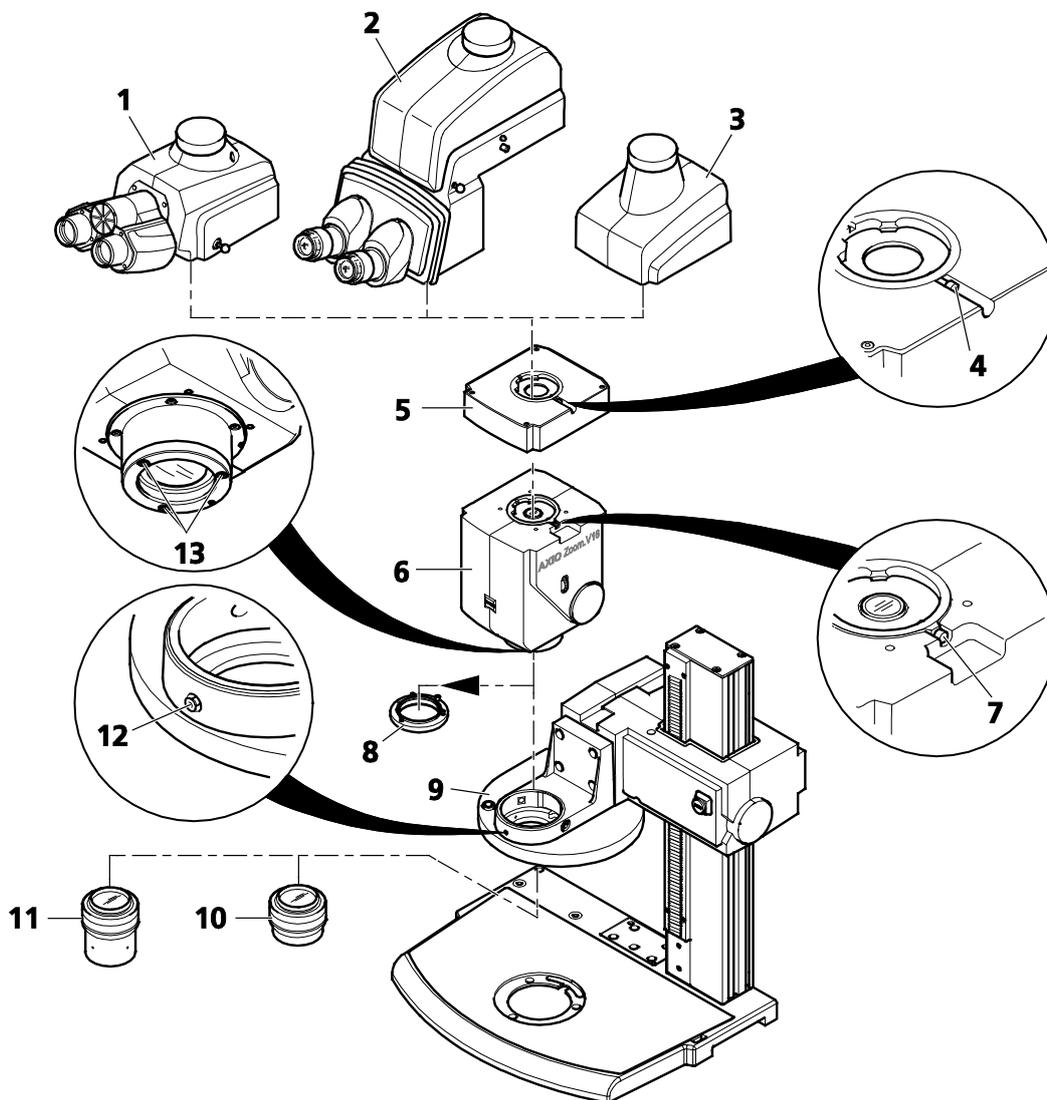
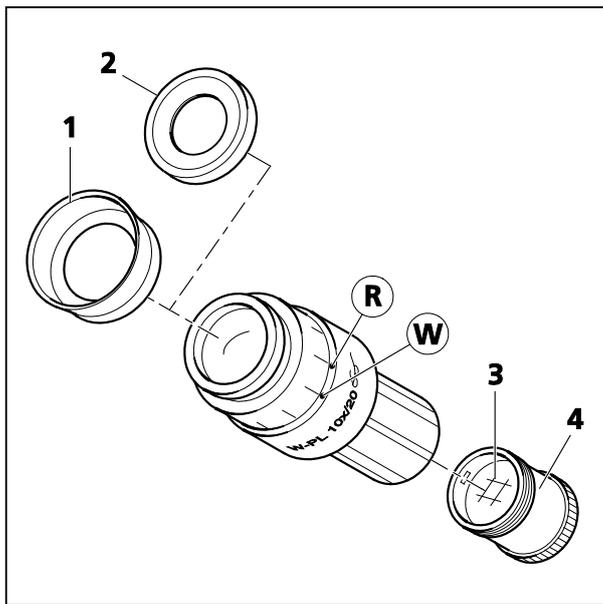


Fig. 6 Mounting the microscope

-  All grub screws (SW 3) for fixing components should be unscrewed until they no longer project into the inside diameter of the mount.
- Remove the dust caps.
-  If the nosepiece is used, the threaded ring (Fig. 6/8) on the front lens of the microscope body must be removed. To do this, unscrew the three captive socket head screws (Fig. 6/13).
- Insert the body of the microscope (Fig. 6/6) into the mount ( $\varnothing$  76 mm) of the carrier or nosepiece (Fig. 6/9), align it and hand-tighten it (Fig. 6/12).
-  For secure mounting, always hold the objective with both hands. Leave the protective cap on the objective while screwing it in! Always store the objective in the special packaging.

- Screw the objective (Fig. 6/10) counterclockwise into the body of the microscope until it engages. Screw a second objective (Fig. 6/11) into the nosepiece as required.
  - Insert the tubes (Fig. 6/1, 2, 3) or intermediate tubes (Fig. 6/5) with dovetail mount into the body of the microscope and hand-tighten it with a socket head screw (Fig. 6/7 or 4) using a ball-head screwdriver.
-  If the binocular ergo phototube Z is used, remove the shipping screw (socket head screw SW 3) on the underside and store it for use at a later date.
-  Either an intermediate tube (spacer tube, Fig. 6/5) or Fluar Illuminator Z mot.) may be mounted between the body of the microscope and the binocular phototube. This increases the eyepoint height by 40 mm.
-  Should the microscope mounted on the manual focusing drive slip under its own weight, please adjust the torque (see page 19).



**Fig. 7** Inserting the eyepiece reticle

### 3.4 Inserting eyepieces

- Remove the dust caps from the binocular tube.
- Insert both eyepieces into the binocular tube by pushing them until they engage.

#### Attaching fold-over eyecups

The eyepieces have rubber protection rings to prevent the lenses from being scratched. These may be replaced by fold-over eyecups (Fig. 7/1) as desired.

- Remove the eyeglass protection rings (Fig. 7/2) from the eyepieces and attach the eyecups (Fig. 7/1).

#### Inserting the eyepiece reticles

The focusing eyepieces are intended for use with eyepiece reticles.

- Unscrew the existing mount (Fig. 7/4) with eyepiece reticle from the eyepiece without exerting heavy radial pressure on the diaphragm unit in order to avoid deformation and jamming.
- Replace it with a new mount containing the eyepiece reticle (Fig. 7/3) required.

 When inserting an eyepiece reticle in the unscrewed mount, bear in mind that the writing appears reversed before and non-reversed after screwing the mount back into the eyepiece.

The slight image shift caused by the additional path through glass is taken into account on the diopter scale by the fact that the zero point position is indicated not by the white dot (Fig. 7/W) but by the red dot (Fig. 7/R).

In eyepiece W-PL 10x/23 Br. foc. (455043-0000-000) and E-PL 10x/20 Br. foc. (444132-9902-000) the eyepiece reticles (Fig. 7/3) have been glued to screw-in mounts for easy replacement (Fig. 7/4). Complete mounts with reticles adhered can be ordered directly from Zeiss.

### 3.5 Installing and connecting the human interface panel (HIP)

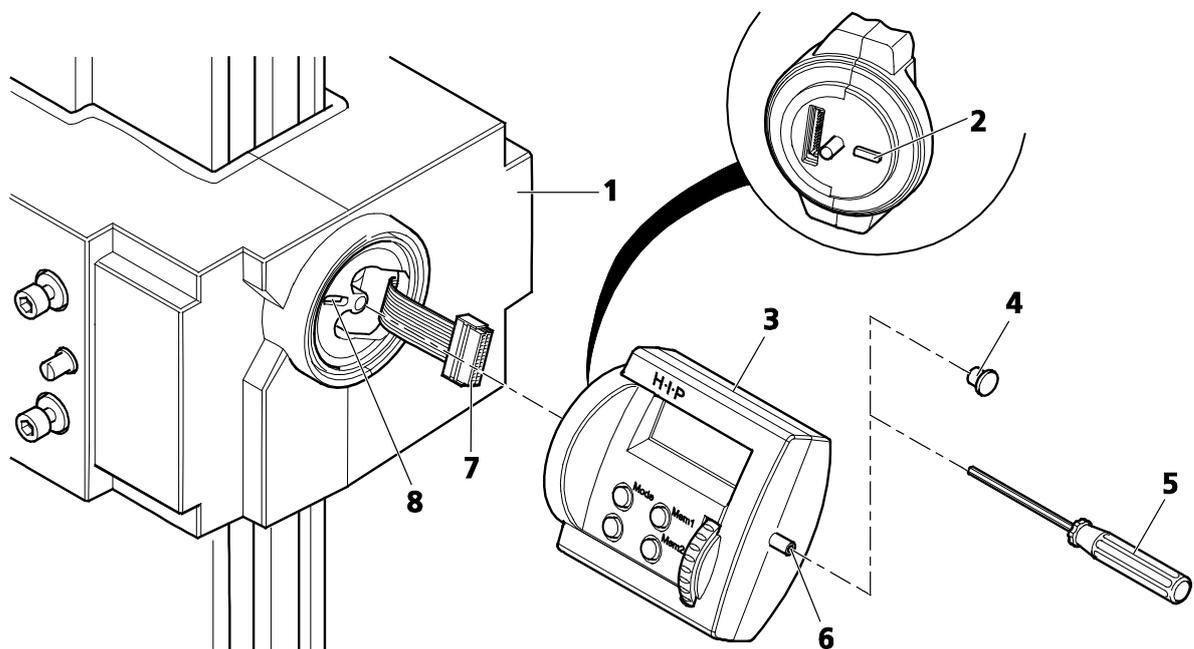


The HIP can be swiveled by about 30° around its longitudinal axis to achieve a convenient viewing angle. Be sure not to exceed the stated swivel range. Forcible twisting may result in damage to the device.



The plug-in power supply is supplied with four plug adapters (EURO, US, UK, AUS). Before connecting it to the power outlet, choose the appropriate adapter and push it onto the plug-in power supply.

Install the HIP (Fig. 8/3) to the microscope body (zoom function) or motorized focusing drive (focus function) as follows:



**Fig. 8** Installing the HIP control unit

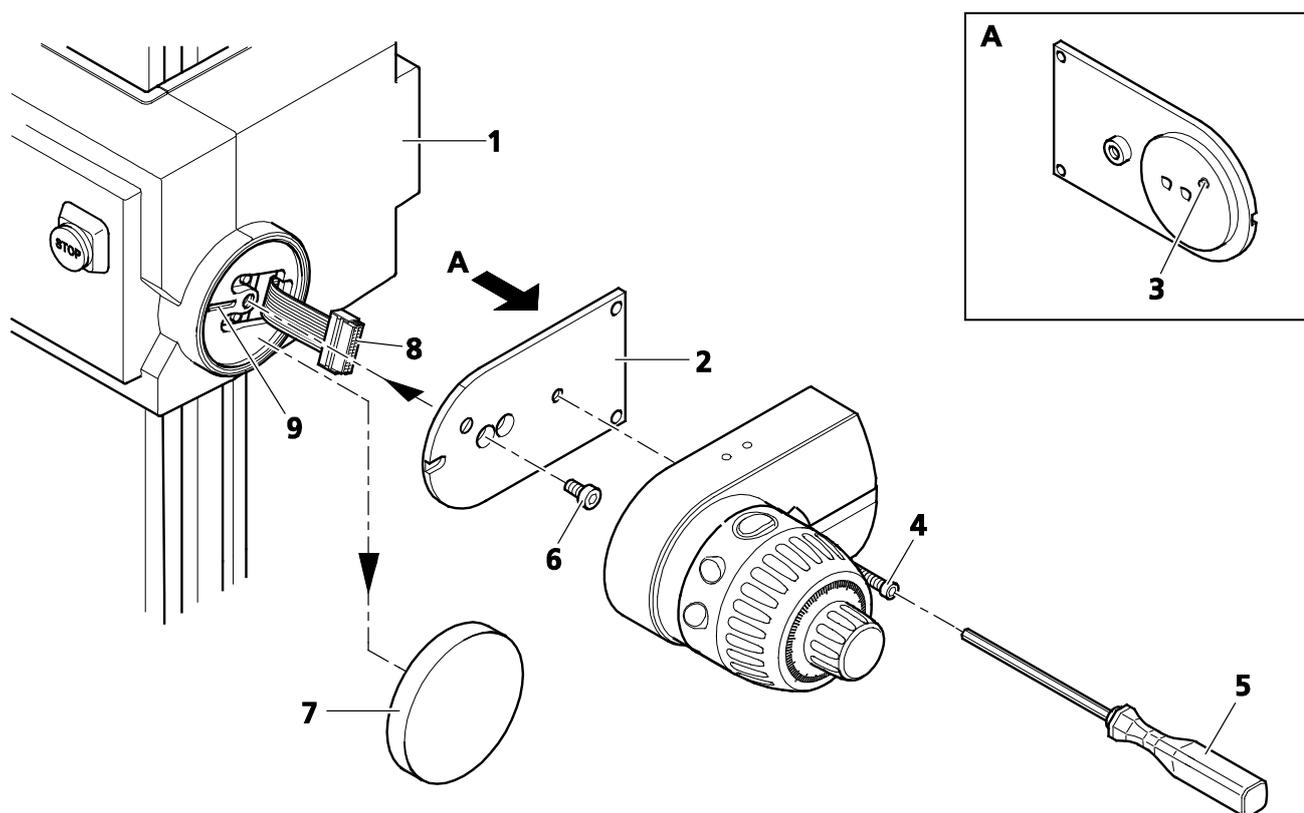
- Remove the cover (right) from the microscope body or focusing drive (Fig. 8/1).
- Pull out the connecting cable (Fig. 8/7) slightly without applying force and connect it carefully to the corresponding HIP connector socket.
- Push the cable fully back into the casing without bending it; carefully attach the HIP so that the nose (Fig. 8/2) on the HIP engages in the groove provided (Fig. 8/8).
- Screw in the socket head screw (SW 3) (Fig. 8/6) as far as it will go using the ball-head screwdriver (Fig. 8/5).
- Push the cover cap onto the HIP (Fig. 8/4).
- Connect the plug-in power supply to the mains supply.

### 3.6 Mounting and connecting Manual Rotary Control (MaRC)

MaRC is a component used to control the focus motor, and may be mounted either directly on the focusing drive (Fig. 9/1) or as a table-top version with table-top base (Fig. 10/1) independently of the microscope.

 The MaRC can also be mounted on the body of the microscope instead of the HIP.

#### Mounting the MaRC on the microscope body or motorized focusing drive:



**Fig. 9** Installing the MaRC control unit

- Remove the mounting plate (Fig. 9/2) from the MaRC after loosening the socket head screw (SW 3; Fig. 9/4) on the MaRC.
- Remove the cover (Fig. 9/7) on the focusing drive (Fig. 9/1).

 Ensure that the connecting cable (Fig. 9/8) remains completely inside the housing, as it will not be needed.

- Attach the mounting plate (Fig. 9/2) with a screw (Fig. 9/6) securely to the flange of the focusing drive (Fig. 9/1) (or microscope body). The screw must be inserted into the left hole of the mounting plate. Please ensure that the orientation pin (Fig. 9/3) of the mounting plate is seated in the groove provided (Fig. 9/9).
- Screw the MaRC to the attached mounting plate (Fig. 9/2) with a socket head screw (SW 3; Fig. 9/4) using a ball-head screwdriver (Fig. 9/5).
- Plug the CAN cable RJ 45 into one of the two CAN bus ports on the MaRC (base) and connect it to the motorized focusing drive.

### Mounting the MaRC on the table-top base:

- Secure the mounting plate (Fig. 10/2) with screw (Fig. 10/3) on the table-top base (Fig. 10/1). The screw must be inserted into the right hole of the mounting plate.
- Screw the MaRC (Fig. 10/4) to the attached mounting plate with a socket head screw (SW 3; Fig. 10/5) using a ball-head screwdriver (Fig. 10/6).
- Plug the CAN cable RJ 45 (Fig. 11/3) into one of the two CAN bus ports of the MaRC (through the underside of the table-top base, Fig. 11/1) and connect to the motorized focusing drive.
- Pull the CAN cable RJ 45 to the outside through one of the two cut-outs (right or left, Fig. 11/2).
- Place the table-top base with MaRC beside the microscope to the right or left.

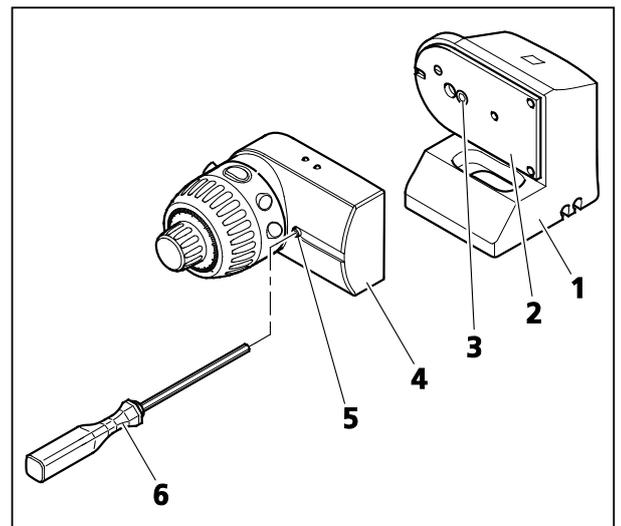


Fig. 10 Mounting the MaRC on the table-top base

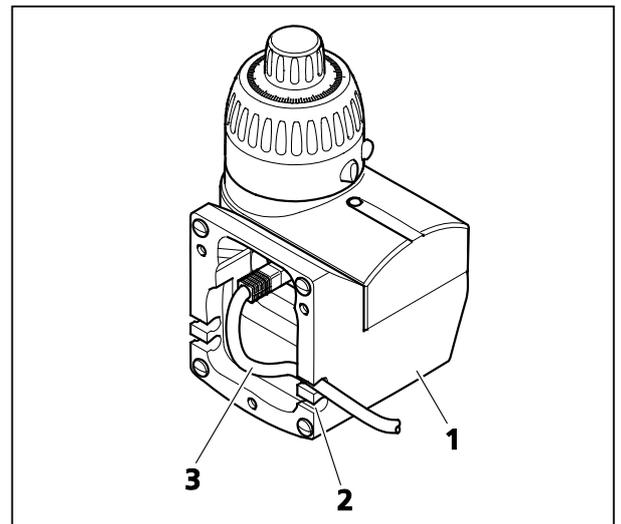


Fig. 11 Connecting CAN cable RJ 45 to MaRC with table-top base

### 3.7 Mounting the stages

 Remove the shipping braces from the stages before assembly.

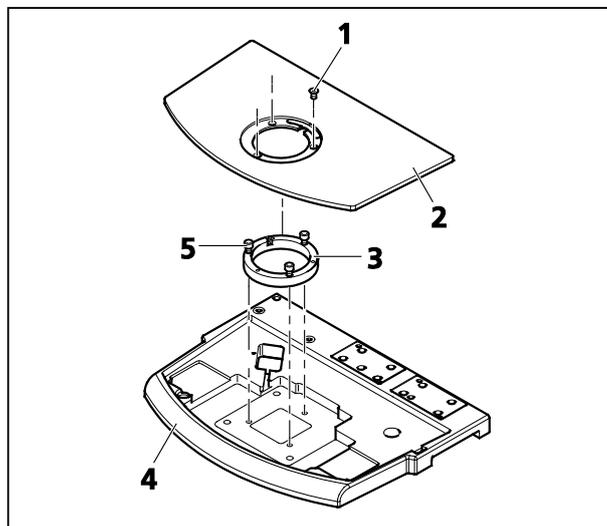


Fig. 12 Mounting the adapter ring

#### 3.7.1 Adapter ring for stand base 450

 When using stand base 450 it must be ensured that the adapter ring (Fig. 12/3) has been mounted for holding stages.

- Removing stage insert plate (Fig. 12/2). Remove the three screws (Fig. 12/1).
- Insert the adapter ring (Fig. 12/3) into the stand base (Fig. 12/4) and secure with the three captive screws (Fig. 12/5).
- Attach the stage insert plate and screw it tight.

 This adapter ring is already integrated into stand base 300 (base 300 for reflected light or transillumination base 300).

#### 3.7.2 Adapter for stages with 84 mm and 120 mm mounting faces

Different adapters are required for mounting stages with an 84 mm mounting face:

Stand base	Stage with mounting face	
	84 mm	120 mm
Stand base 450	Adapter 84/120	No adapter
Base 300 for reflected light	Adapter 84/120	No adapter
Transillumination base 300	Adapter 84+120	Adapter 84+120

#### Stand base 450

- Remove the three short socket head screws (SW 3) from the insert plate (Fig. 13/3) of stand base 450 (Fig. 13/4).
- Screw on adapter 84/120 (Fig. 13/5) with the three longer socket head screws through the insert plate and hand-tighten.

#### Base 300 for reflected light and transillumination base 300

- Screw adapter 84/120 (Fig. 13/5) directly to the base 300 for reflected light or adapter 84+120 (Fig. 13/5) to transillumination base 300 (Fig. 13/2) and hand-tighten.

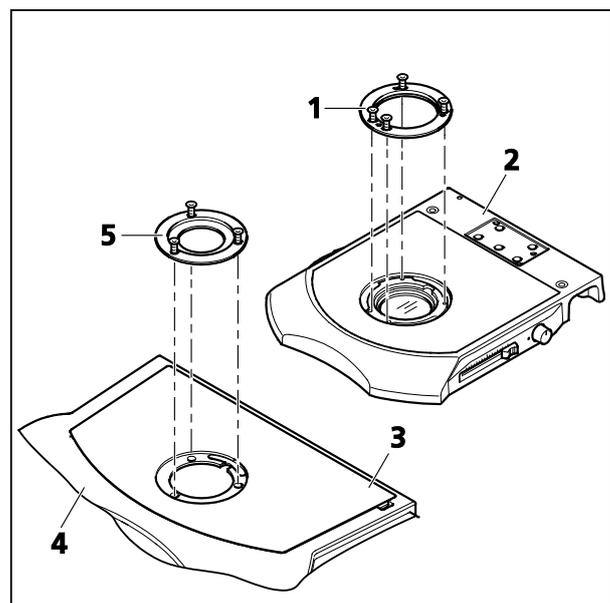


Fig. 13 Mounting adapter 84/120 or 84+120

### 3.7.3 Stages with an 84 mm mounting face

 Stages with an 84 mm mounting diameter must be attached to the stand base with the aid of adapter 84/120 or 84+120 (see Section 3.7.2).

- Insert the stage (Fig. 14/2) into stage adapter (Fig. 14/4) and align.
- Throw eccentric clamping lever (Fig. 14/3) over to secure the stage in the stage adapter.
- Place the insert plate (Fig. 14/1) into the stage interface.

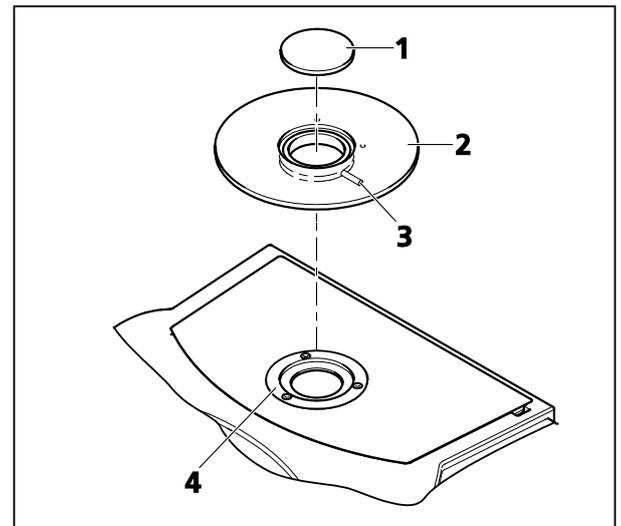


Fig. 14 Mounting stage with 84 mm mounting face

### 3.7.4 Stages with an 120 mm mounting face

 On transillumination base 300 adapter 84+120 must be mounted for holding stages (see Section 3.7.2). This is not required for base 300 for reflected light and stand base 450.

#### Securing with clamps

- Insert stage with mounted clamping ring (Fig. 15/2 and 3) into the adapter (Fig. 15/5) or stand base and align.
- Secure the clamping ring (Fig. 15/3) in the adapter ring by turning the socket head screw (SW 3) (Fig. 15/4) clockwise.
- Install the insert frame or plate (Fig. 15/1).

#### Securing with screws

- Set stage (Fig. 15/6) on the adapter or stand base. Ensure that any existing orientation elements on the underside of the stage engage correctly in the corresponding grooves.
- Secure the stage with the three captive screws (Fig. 15/7).
- Install the insert frame or plate (Fig. 15/8).

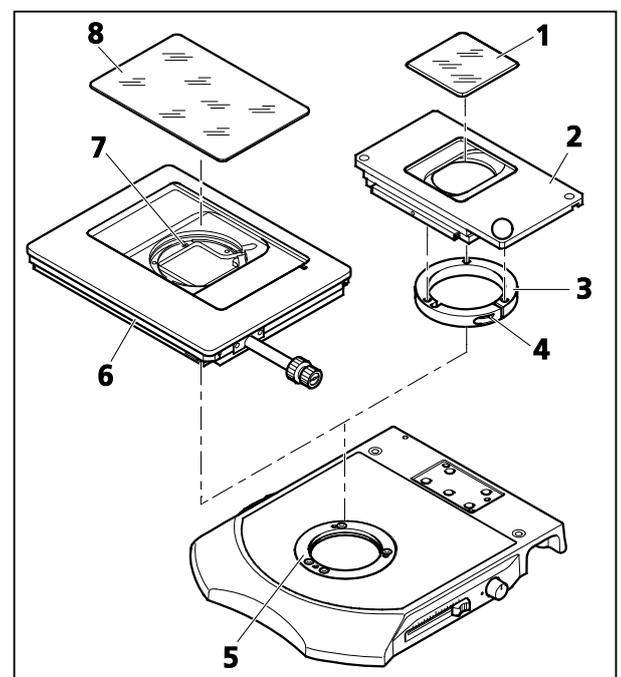


Fig. 15 Mounting stage with 120 mm mounting face on transillumination base 300

### 3.8 Mounting the reflected light illumination

Depending on the application, different reflected light illumination units are used.

The required mounting faces are provided on the microscope.

#### 3.8.1 Mounting on the objective ( $\varnothing$ 66 mm)

The following reflected light illumination units are mounted on the objective:

- Fiber-optic ring illuminator (slit-ring illuminators)
- LED ring illuminator
- Diffusor S

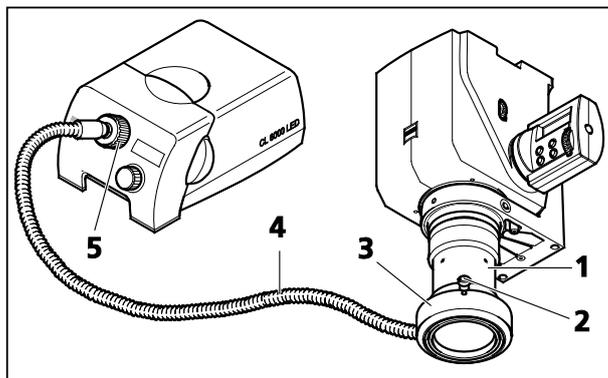


Fig. 16 Mounting the slit-ring illuminator

- Push the illuminating unit (Fig. 16/3) onto the objective (Fig. 16/1) from below until it engages and secure with the clamp screws (Fig. 16/2) provided.
  - Insert the light guide input (Fig. 16/4) into the light guide receptor (Fig. 16/5) of the cold light source until it engages and secure with the knurled ring.
-  Special ring illuminators are available for easier handling on the nosepiece.

- Insert the end sleeve of the light guide (Fig. 17/6) into the light guide receptor on the upper side of the nosepiece (Fig. 17/1).
- Insert the required light-conducting rod (Fig. 17/5) onto the fiber input (Fig. 17/4) of the slit-ring illuminator (Fig. 17/3) as required.
- Fit the slit-ring illuminator onto the objective from below, push it upwards until the fiber input or light guide is fully inside the hole in the nosepiece and secure with the knurled screw (Fig. 17/2).
- Connect the light guide to the cold light source (see above).

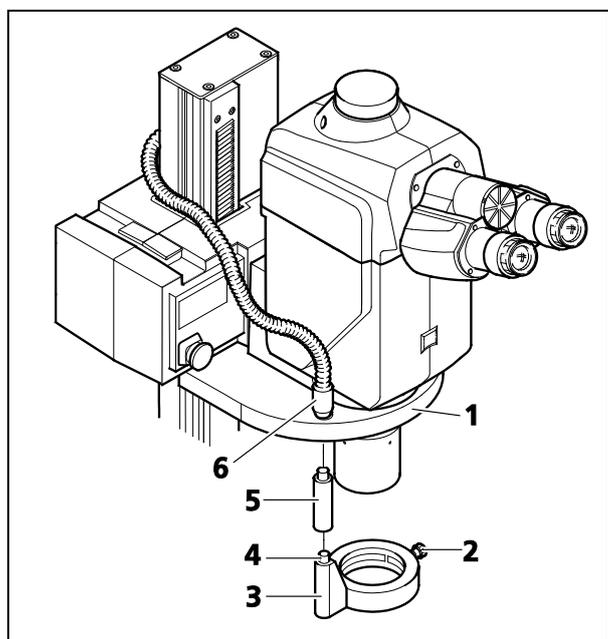


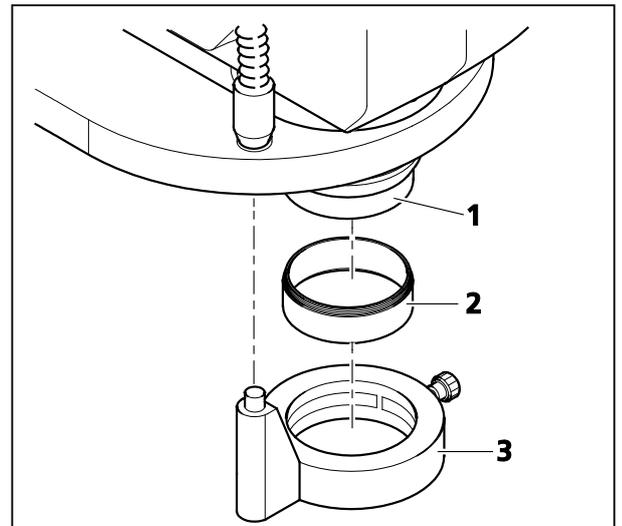
Fig. 17 Slit-ring illuminator with light-conducting rod

Depending on the objective used, the following light-conducting rods should be employed:

Objective	Light-conducting rod
PlanApo Z 0.5x	none
PlanApo Z 1.0x	51 mm
Apo Z 1.5x	51 mm
PlanNeoFluar 1.0x	13 mm
PlanNeoFluar 2.3x	unsuitable



The front side of the PlanApo Z 0,5x (Fig. 18/1) objective must be extended using spacer ring M62 (Fig. 18/2) for clamping the ring illuminator without light guide (Fig. 18/3).

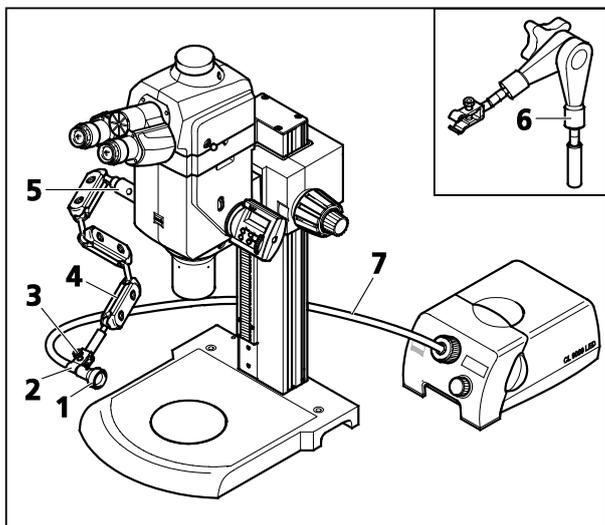


**Fig. 18** Mounting the spacer ring for PlanApo Z 0.5x

### 3.8.2 Attachment with carrier and holder (M8 tapped hole)

The following reflected light illuminators are attached with M8 tapped holes:

- Flexible light guide with focusing attachment
- Surface light
- Line light S



**Fig. 19 Mounting the focusing attachment with light bracket**

 M8 tapped holes are located on the stand bases (both sides of column), on both sides of carrier S and on the nosepiece (see also Section 2.3, page 12).

#### Light bracket S (Fig. 19/4)

- Screw light bracket S (Fig. 19/4) into the tapped hole on the stand or carrier/nosepiece either directly or using spacer S (Fig. 19/5) and tighten. To do this, insert the socket wrench SW 3 into the through-hole of the light bracket S or spacer.
- Screw clamp S (Fig. 19/2) on the underside of the light bracket S tightly.
- Insert focusing attachment (Fig. 19/1) into clamp S and secure with the knurled screw (Fig. 19/3).
- Insert the light guide into the focusing attachment and secure; connect to the cold light source (see Fig. 16).

#### Articulated arm S (Fig. 19/6)

- Mount the reflected light illuminators analogously to the light bracket S.

 Instead of clamp S, the surface lamp or line light are secured to the light bracket or articulated arm S using the enclosed adapter M8/M6.

### 3.9 Mounting transmitted light unit S

- Remove the base insert plate (Fig. 20/3). To do this loosen the short socket head screws (Fig. 20/2), lift the insert plate (use recessed grip on the right edge of stand base (Fig. 20/5) for the purpose) and lift securely with both hands.
- Loosen the three socket head screws (SW 3) on the adapter ring (Fig. 20/4) using a ball-headed screwdriver and remove the adapter ring.
- Insert the transmitted light unit (Fig. 20/6) onto the stand base. The two large plastic taper pins on the bottom of the transmitted light unit must click into the stand base.
- Use the ball-head screwdriver (Fig. 20/9) to screw down the four countersunk socket head screws (SW 3) hand-tight on the transmitted-light unit.
- Lay the base insert plate (Fig. 20/3) onto the transmitted light unit (Fig. 20/6).
- Insert the opal glass plate  $\varnothing$  84 mm (Fig. 20/8) to prevent screws and other small parts from being lost in the course of further installation work.
- Use the three short socket head screws (Fig. 20/2) to fasten the base insert plate (Fig. 20/3) (without stage adapter) to the transmitted-light equipment.



If a stage is to be used, see Section 3.7, page 23.

- Replace the opal glass plate  $\varnothing$  84 mm (Fig. 20/8) with insert 52/84 (Fig. 20/7).
- Insert glass plate 120 mm (Fig. 20/1); press on rear edge to remove it again.

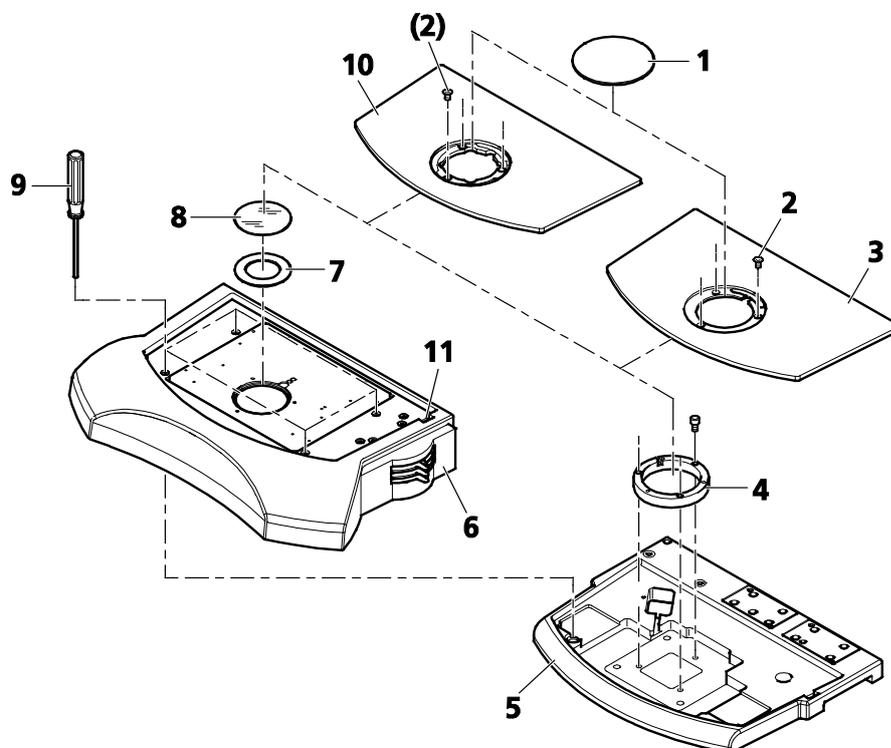


Fig. 20 Mounting transmitted light unit S

## Changing insert plate 450



**CAUTION!** Risk of pinching fingers!

When inserting or removing the ferromagnetic insert plate 450 or the heatable ferromagnetic insert plate 450, use the supplied flat plastic material to avoid pinching fingers.



The controller SC 300 must be switched off before installing or removing the heatable ferromagnetic insert plate 450.



Let the heatable ferromagnetic insert plate 450 cool down to room temperature before removing it.



**CAUTION!** Hot surface!



**ATTENTION!** Danger of breakage!

The glass insert plate 120 mm is only 1.1 mm thick and thus fragile. It must be handled with care! Do not apply pressure to the glass. Hold it only by the metal frame!

The following standard options are available as an alternative to the insert plate 450:

- Ferromagnetic insert plate 450
  - Heatable insert plate 450 as part of heating unit 450
- 
- Remove glass or B/W plate (Fig. 20/8) and insert 52/84 (Fig. 20/7).
  - Remove the base insert plate (Fig. 20/3). To do this, loosen the short socket head screws (Fig. 20/2).
  - Install the ferromagnetic insert plate 450 (Fig. 20/10) or heatable insert plate 450 and secure with three socket head screws.
-  If the heatable ferromagnetic insert plate 450 is used, pass the two heating cables side-by-side through the cut-out in the insert plate and secure with three clamps. Then pass the two heating cables to the outside through the lateral cavity (Fig. 20/11) in the transmitted light unit S and connect to controller SC 300.
- For installation and operation of control unit SC 300 please refer to the separately delivered operating manual.

### 3.10 Inserting the VisiLED transmitted light unit H

#### Stand base 450

- Detach the base insert plate (Fig. 21/3) from the stand base 450 (Fig. 21/6). To do this loosen the short socket head screws (Fig. 21/2), lift the insert plate (use recessed grip on the right edge of stand base for the purpose) and lift securely with both hands.
- Place the VisiLED transmitted light unit H (Fig. 21/4) into the adapter ring (Fig. 21/5) of the stand base, insert the cable (Fig. 21/8) into the groove of the adapter ring and pull the cable with plug to the outside through the cut-out (Fig. 21/7) in the stand base.
- Install the base insert plate (Fig. 21/3) and secure it with the three screws (Fig. 21/2).
- Press the glass plate (Fig. 21/1) into the base insert plate.
- Connect the VisiLED transmitted light unit to the controller MC 1000 and plug into the respective power supply unit (see separate operating manual).

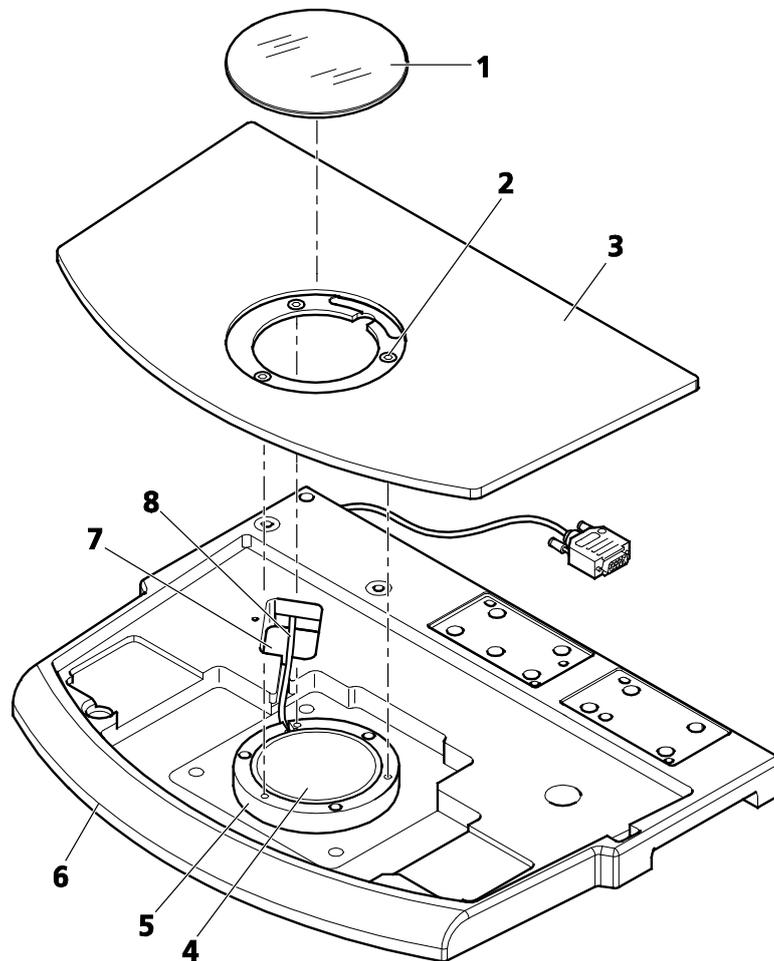
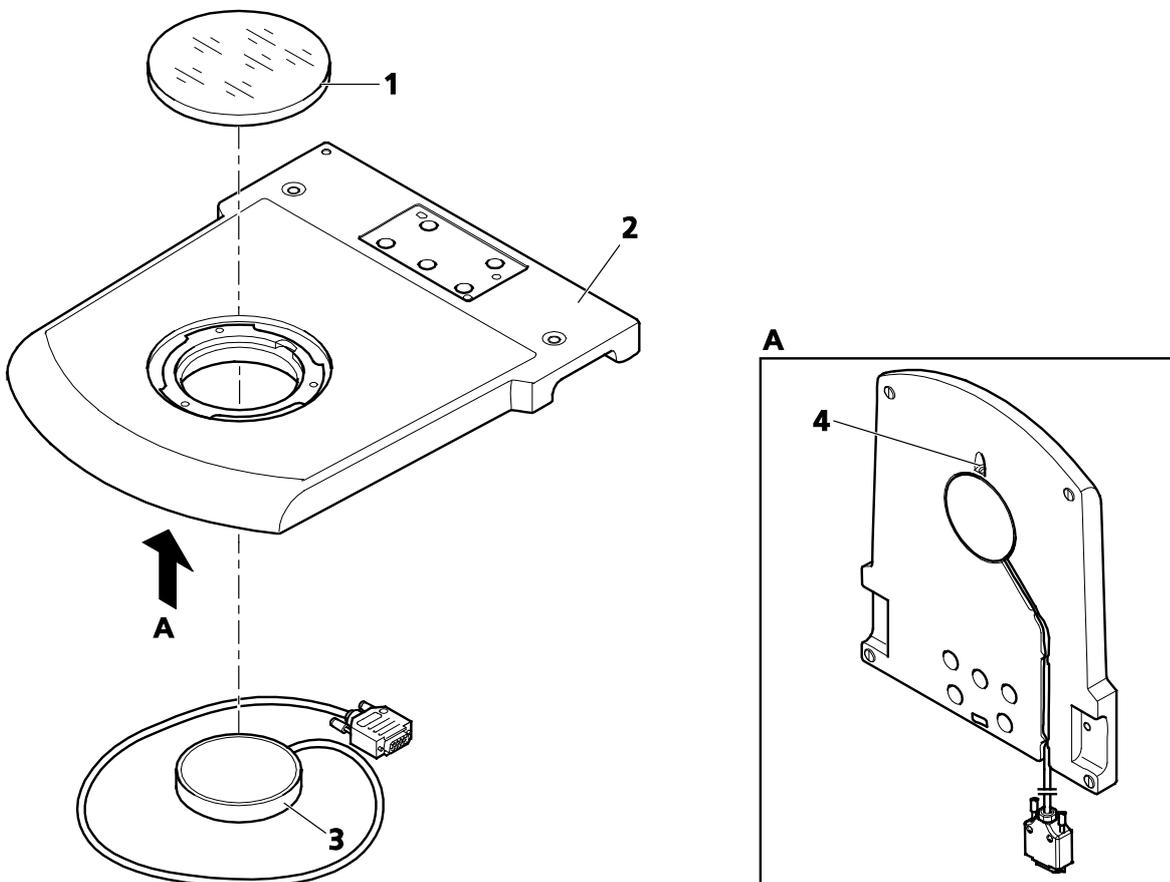


Fig. 21 Inserting the VisiLED transmitted light unit H, d=84 mm into the stand base 450

**Base 300 for reflected light**

- If necessary, remove the glass plate (Fig. 22/1) from the base 300 for reflected light.
- Insert the VisiLED transmitted light unit H (Fig. 22/3) into the base 300 for reflected light (Fig. 22/2) from below.
- Insert the cable into the base 300 for transmitted light and pull the plug through to the outside (Fig. 22/A).
- Secure the VisiLED transmitted light unit H with a clamp screw (Fig. 22/4).
- Insert the glass plate (Fig. 22/1) into the base 300 for reflected light.
- Connect the VisiLED transmitted light unit to the controller MC 1000 and plug into the respective power supply unit (see separate operating manual).



**Fig. 22** Inserting the VisiLED transmitted light unit H, d=84 mm into the base 300 for reflected light

### 3.11 Installing the camera adapter

 The connection type "Interface 60N" is used for adapting the camera to the tubes of the Axio Zoom.V16. The known adapters for "Interface 60" (inside diameter 30 mm), however, can also be used further on.

Microscope cameras (e.g. AxioCam of Carl Zeiss), customary SLR cameras (Single Lens Reflex; 35 mm film or digital) or compact digital cameras may be mounted to the camera port.

 Use only camera adapter combinations recommended by Carl Zeiss! Clearly visible vignetting (dark edges of an image) may otherwise occur.

 The corresponding individual camera operating instructions must also be followed when working with micro-photographic equipment.

#### Adapter for Interface 60N (external thread M52 x 1)

- Mount the camera adapter 60N (Fig. 24/1; 2) on the camera.
- Remove the dust cap from the camera port.

 Please observe the following: The setscrew (SW 3) (Fig. 24/7) on the camera port should not project into either the external thread or the inner bore.

- Connect the pre-assembled unit to the camera port (Fig. 24/4, 5 or 6), align and tighten the union nut of the adapter (Fig. 24/1 or 2).

#### Adapter for Interface 60 (plug-in diameter 30 mm)

- Mount the camera adapter 60 (Fig. 24/3) on the camera.
- Remove the dust cap from the camera port.
- Set the pre-assembled unit on the camera port (Fig. 24/4, 5 or 6). Ensure that the setscrew (Fig. 24/7) does not project too far into the inner bore. Retract as necessary.
- Turn the setscrew (SW 3) on the tube (Fig. 24/7) clockwise until the adapter sits securely.

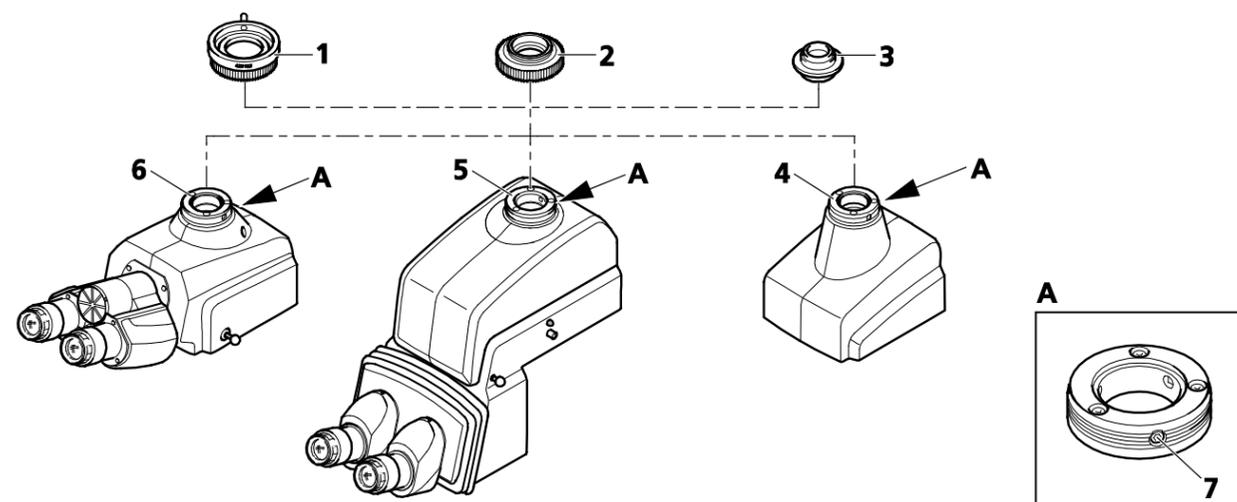


Fig. 24 Using the camera adapter

#### Basic microscope settings - brief summary

1. Switch on the microscope and illumination.
2. Insert a specimen and align as necessary.
3. Set the smallest zoom/magnification setting.
4. Set the interpupillary distance.
5. Focus on a detail of the specimen.
6. Set the highest zoom/magnification setting.
7. Focus on a detail of the specimen.
8. Compensate for lack of definition on the adjustable eyepiece for each eye separately.

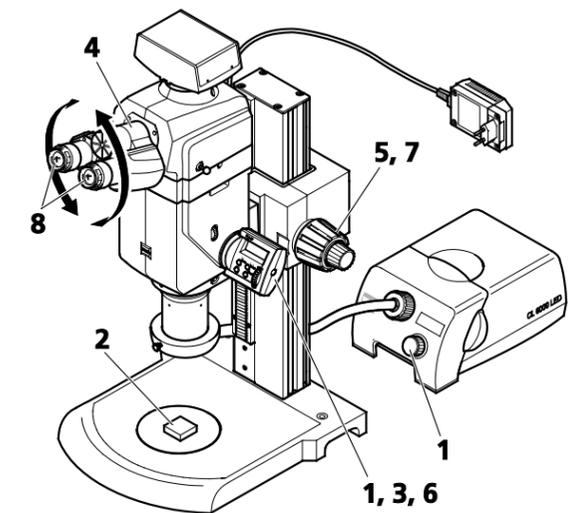


Fig. 23 Adjusting the microscope

 For detailed information on adjusting the microscope please refer to Section 4.7, page 45 ff.

3.12 Making electrical connections



Do not switch the microscope on until all cables have been connected.

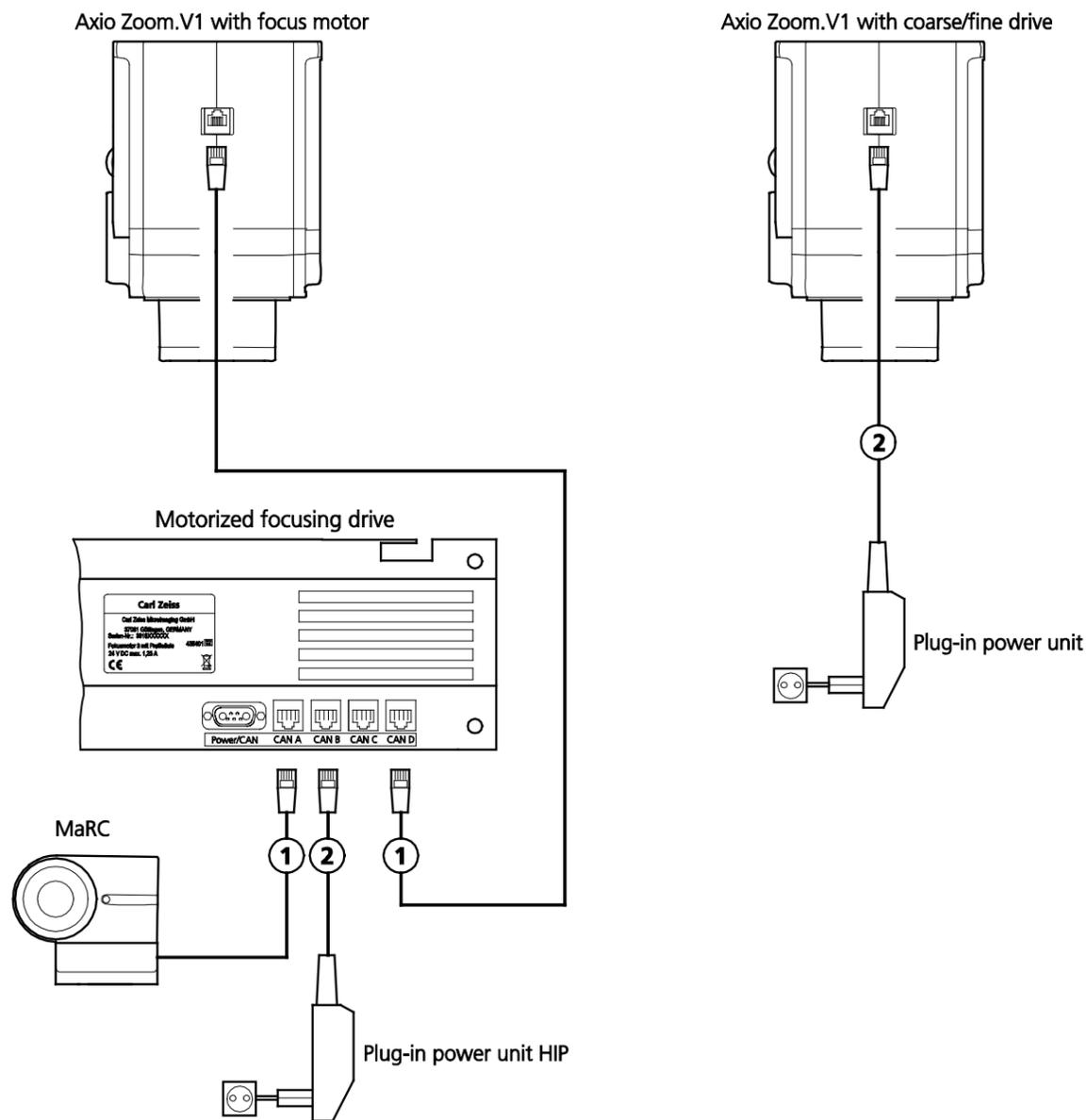


Fig. 25 Connecting the microscope

- Join the CAN bus connections of the CAN components used in any sequence to the **CAN A** to **CAN D** ports of the focusing drive.

In the absence of the motorized focusing drive (focus motor) each electronic CAN component can be operated with a separate PSU. In this case, the body of the Axio Zoom.V16 microscope must be connected directly to the mains via the plug-in power supply.

If two or more CAN components are connected to each other, only **one** power supply unit may be used.

Item No. (Fig. 25)	Name/Order No.	Figure	Remarks
①	CAN cable RJ 45 Included with each CAN component		Connection between focus motor 3 and body of the Axio Zoom.V16 microscope and between focus motor 3 and MaRC L=500 mm or L=1000 mm
②	Plug-in power supply		Power supply to focus motor 3 or body of the Axio Zoom.V16 microscope with coarse/fine drive

## 4 OPERATION

### 4.1 Human interface panel control unit (HIP)

The microscope is controlled and configured using the HIP control unit.

One HIP controls the motorized zoom (Fig. 2/A or Fig. 3/A, page 12) in the body of the microscope, the other HIP or a MaRC control unit (Fig. 3/K) the motorized focusing drive.

The HIP has a two-line display.

It also has four function keys: **Mode**,  $\text{\textcircled{1}}$  (ON/OFF), **Mem1** and **Mem2**.

The knurled wheel can be moved upwards and downwards or pressed.

The **Basic mode** is for microscope operation and the **Setting mode** for the adjustment of specific parameters.

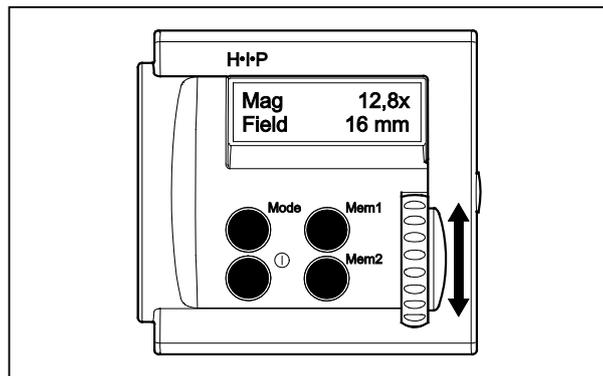


Fig. 26 Set-up of the control unit HIP

#### 4.1.1 Functional elements on the HIP

Zoom control unit	Focus control unit
<p><b>Two-line display</b></p> <p>Basic mode:</p> <ul style="list-style-type: none"> <li>– top line displays the magnification level (mag)</li> <li>– bottom line displays additional parameters:                             <ul style="list-style-type: none"> <li>– Apert: Opening of aperture diaphragm in %</li> <li>– NA: numerical aperture of overall system</li> <li>– Field: visible object field</li> <li>– Resol: Resolution</li> <li>– Depth: Depth of focus</li> </ul> </li> <li>– Press the <b>Mode</b> button briefly to toggle between parameters</li> </ul> <p>Setting mode:</p> <ul style="list-style-type: none"> <li>– displays parameters and the current or selected value</li> </ul>	<p><b>Two-line display</b></p> <p>Basic mode:</p> <ul style="list-style-type: none"> <li>– top line displays the focus position z</li> <li>– Press the <b>Mode</b> button briefly to reset the focus value to zero</li> </ul> <p>Setting mode:</p> <ul style="list-style-type: none"> <li>– displays parameters and the current or selected value</li> </ul>

Zoom control unit	Focus control unit
<p><b>Knurled wheel</b>  </p> <ul style="list-style-type: none"> <li>–  set a higher zoom value</li> <li>–  set a lower zoom value</li>   <li>–   in Setting mode: Select list entry</li> </ul> <p><b>Mem1/Mem2 buttons</b></p> <ul style="list-style-type: none"> <li>– Press briefly to access previously saved zoom and aperture values</li> <li>– Press for two seconds (acknowledgement signal) to save the current zoom and aperture values</li> </ul> <p><b>Mode button</b></p> <ul style="list-style-type: none"> <li>– Press slightly several times to consecutively display the field of view, resolution or depth of focus</li> <li>– Press for two seconds to change to Setting mode</li> <li>– In Setting mode: press briefly to select parameters</li> </ul> <p>NOTE: Press for two seconds to change to Basic mode and permanently save newly selected parameter settings.</p> <p><b>Button</b> </p> <ul style="list-style-type: none"> <li>– Switch on/off HIP (standby)</li> </ul>	<p><b>Knurled wheel</b>   <b>with pushbutton function</b></p> <ul style="list-style-type: none"> <li>–  Move microscope upwards (focusing)</li> <li>–  Move microscope downwards (focusing)</li> <li>– press briefly: Toggle between different focusing modes (slow, medium, fast)</li> <li>–   in Setting mode: Select list entry</li> </ul> <p><b>Mem1/Mem2 buttons</b></p> <ul style="list-style-type: none"> <li>– Press briefly to access previously saved focusing position</li> <li>– Press for two seconds (acknowledgement signal) to save the focusing position</li> </ul> <p><b>Mode button</b></p> <ul style="list-style-type: none"> <li>– Press the <b>Mode</b> button briefly to reset the focus value to zero</li> <li>– Press for two seconds to change to Setting mode</li> <li>– In Setting mode: press briefly to select the focus parameter</li> </ul> <p>NOTE: Press for two seconds to change to Basic mode and permanently save newly selected parameter settings.</p> <p><b>Button</b> </p> <ul style="list-style-type: none"> <li>– Switch on/off HIP (standby)</li> </ul>

#### 4.1.2 Menu guidance in Setting mode

 The parameters for the zoom control are in part different from those of the focus control (see following parameter table).

Please enable the **Beep level** function for acoustic confirmation of new values.

Change from the Basic mode to the Setting mode to modify the parameters.

- To do this, press the **Mode** button for two seconds until an acknowledgement signal (1x short) is heard and the display switches over.

The first parameter and corresponding current value will be shown on the display, e.g.

Set Lens 1x

- Press the **Mode** button briefly several times to select the desired parameter
- To change a parameter value, move the knurled wheel up or down (▲ ▼) until the desired value is displayed, e.g.  
Set Lens 0.5x ▲ 1.0x ▲ 2.3x

- To select other parameters, press the **Mode** button again.

Once all parameters have been set, you may change to the **Basic** mode.

- To do this, press the **Mode** button for two seconds until an acknowledgement signal (1x long) is heard and the display switches over. All modified values are now saved.



The new values will not be permanently saved until you switch to Basic mode. Switching off with the Ⓟ button or cutting the power supply in **Setting** mode will result in a loss of the modified values.

General parameters		Values	Remarks
Backlight	Adjustment of display backlight	12-stage progress bar	▲ Increasing background brightness ▼ Reducing background brightness
Beep Level	Switch acknowledgement signal on/off	ON → OFF	Activation recommended

Zoom parameters (only zoom control)		Values	Remarks
Set Lens	Changing objective enlargement	PlanApo Z 0.5x PlanApo Z 1.0x PlanNeoFluar Z 1.0x PlanNeoFluar Z 2.3x Apo Z 1.5x	required for correct display of magnification
Set Eyepiece	Change eyepiece magnification	25x/10foc 16x/16Br foc 10x/23Br foc 10x/20Br foc	required for correct display of magnification
Confirmation	Activating/deactivating the start query	ON → OFF	Start query is useful only if the magnification level of objectives/eyepieces is to be changed frequently
Zoom speed	Setting the speed	1 → 2 → 3	flat → steep speed profile
Reset Param?	Reset to factory default	NO → YES	

Focus parameters (only focusing control)		Values	Remarks
Focus Speed	Setting the speed	1 → 2 → 3 slow → fast	only relevant for focus speed, not fine focus
Reset Param?	Reset to factory default	NO → YES	

## 4.2 Manual rotary control (MaRC) unit

The MaRC unit is used to operate the focus motor and zoom functions of the microscope.

Only motor focus 2 (435401-9902-000) and 3 (435403-9000-000, 435401-9902-000) can be controlled, not motor focus 1 (435401-0000-000).

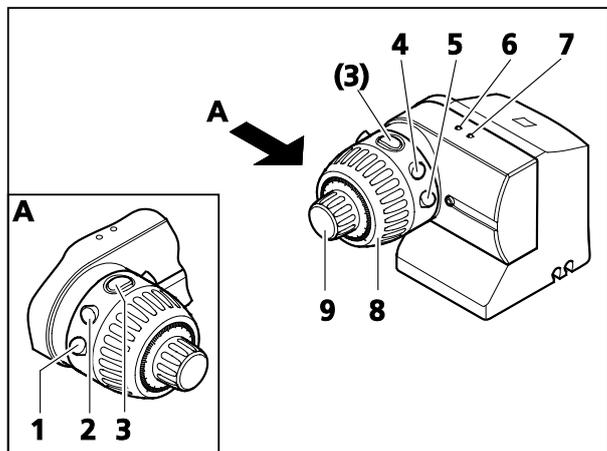


Fig. 27 Control unit on the MaRC

MaRC offers the following scope of functions:

- Control of the focus motor by coarse (Fig. 27/8) and fine drive (Fig. 27/9)
- Travel to zoom clickstop positions by briefly pressing keys **1** and **2** (Fig. 27/1 and 2).
- Quick zoom – press keys **1** and **2** (Fig. 27/1 and 2).
- Quick zoom – press keys **4** and **5** (Fig. 27/4 and 5).
- Save a focus position – key **3** (Fig. 27/3), see also Section 4.2.6, page 42.
- Travel to a pre-saved position – key **3** (Fig. 27/3), see also Section 4.2.7, page 42.
- Reversing rotation of the MaRC unit – key **3** (Fig. 27/3), see also Section 4.2.8, page 42.
- Green control lamp (Fig. 27/6) for visual confirmation of an input or acceptance of a setting (corresponds to acknowledgement signal).
- Blue control lamp (Fig. 27/7) indicates readiness of the MaRC.

### 4.2.1 ON state

The MaRC is switched on as soon as it is connected to a mains adapter (CAN cable RJ 45) and the power supply is on.

After power ON, the stored focus position will remain unchanged, provided a focus position was stored and MaRC was switched off properly the last time it was used. If it was not switched off properly, the switch-on focus position will be set as stored value.

If a focus motor ready for operation is connected, the blue LED (Fig. 27/7) will light up.

MaRC is immediately ready for operation.

#### **4.2.2 Control of the focus motor by coarse and fine drive**

The focus motor can be controlled quickly or slowly by turning the coarse (Fig. 27/8) and fine drive (Fig. 27/9).

If a motorized zoom body is used, the sensitivity of the coarse/fine drive depends on the set zoom magnification and configured objective.

#### **4.2.3 Travel to zoom clickstop positions**

When key **1** or **2** (Fig. 27/1 or 2) is briefly pressed ( $\leq 200$  ms), the zoom body will travel to the next lower or higher clickstop position.

A clickstop counter will be incremented or decremented accordingly if key **2** or **1** is pressed briefly several times.

The clickstop travel of the zoom body starts 200 ms after the last keystroke. Travel will stop exactly at the magnification level indicated on the HIP panels according to the current objective/eyepiece combination.

#### **4.2.4 Fast zooming using a key combination in a positive or negative direction**

When key **1** or **2** (Fig. 27/1 or 2) is pressed for  $> 200$  ms the zoom body will start moving; it will not stop until the respective key is released or the limit position is reached.

At first the speed will increase linearly with the duration of the keystroke until the maximum speed is reached.

The attainable maximum speed depends on the currently active speed profile set via HIP.

#### **4.2.5 Fast focusing using a key combination in a positive or negative direction**

When key **4** or **5** (Fig. 27/4 or 5) is pressed the motor control will start to move upwards (**5**) or downwards (**4**); it will not stop until the respective key is released or the limit position is reached.

At first the speed will increase linearly with the duration of the keystroke until the maximum speed is reached.

The attainable maximum speed depends on the currently active speed profile set via HIP.

#### 4.2.6 Saving a focus position

The current focus position will be stored when key **3** (Fig. 27/3) is pressed for between 2 and 5 seconds.

The green LED (Fig. 27/6) will briefly light up and **one** short beep tone on the motorized focusing system issued to indicate completion of the storing process after 2 seconds.

#### 4.2.7 Traveling to the saved focus position

When key **3** (Fig. 27/3) is pressed for < 2 seconds the motor will travel to the stored focus position.

#### 4.2.8 Reversing rotation of MaRC

The direction of rotation will be reversed if key **3** (Fig. 27/3) is pressed for more than 5 seconds.

While pressing, first of all a **single** beep tone, then **two** tones will be issued and the green control lamp (Fig. 27/6) will flash once or twice. This indicates that the reversal has been completed.

Reversal of the direction of rotation means that the MaRC control unit can be mounted and operated either to the right (for right-handed persons) or to the left of the microscope (left-handed persons)

### 4.3 Switching on

The instrument has been properly set up and connected (see Sections 3.2 to 3.12, from page 18).

- Unlock the STOP button to the right or left of the focusing drive by pulling it out.
- Briefly press the button  on the HIP.
- Switch on the illumination (see separate operating manual).

### 4.4 Switching off

- Briefly press the button  on the HIP.
- Pull the plug-in power supply from the mains socket.
- Switch off the illumination (see separate operating manual).

The instrument has now been switched off.

See the appropriate operating manual for switching off other instruments.

#### 4.5 STOP button

The STOP button is for instantaneous deactivation of a moving motorized focusing drive to prevent collision with the stage or a specimen on the latter.

- Press the STOP button (Fig. 28/1) to switch off the focusing drive. Depending on which focusing drive is used, the STOP button is on the right- or left-hand side of the drive.

The STOP button engages. The focusing movement is immediately interrupted.

The STOP button must be unlocked to restart the focusing drive.

- To unlock the STOP button, pull it out again.

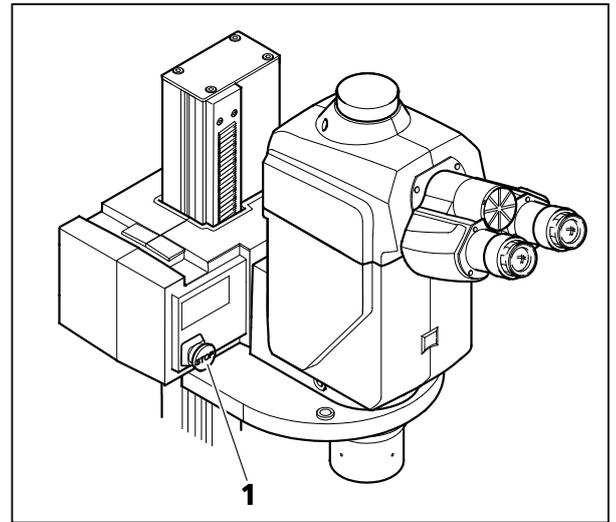


Fig. 28 STOP button



When the motorized focusing drive is lowered there is the **risk of pinching fingers** in the working area:

- Switch off the focusing drive with the STOP button (Fig. 28/1) if necessary (depending on the focusing drive version the STOP button is on the right- or left-hand side).
- Do not reach into the work area or beneath the motorized focusing drive during lowering.
- Adjust the position of the limit switch as required (see Section 4.6, page 44) to prevent damage to the instrument.

#### 4.6 Adjusting the range of travel of the motorized focusing drive

After installing and switching on for the first time the lower limit switch (Fig. 29/2) in the column (Fig. 29/1) of the focusing drive must be adjusted from the delivery position to a working position in order to prevent collision between the objective and the stage/specimen.



When the motorized focusing drive is lowered there is the **risk of pinching fingers** in the working area. Do not reach into the work area or beneath the motorized focusing drive during lowering.



Adjust the limit stop immediately to prevent damage to the microscope due to movement of the motorized focusing drive.



Prevent the objective from colliding with the stage or specimen! The motorized focusing drive should be lowered carefully until the lower limit switch has been adjusted.

- Release the lower limit switch (Fig. 29/2) using the ball-head screwdriver.
- Carefully move the microscope to the bottom position at which it cannot collide with the stage/specimen, while maintaining the sharp focus of the whole specimen.
- Insert the ball-head screwdriver into the screw head of the lower limit switch and push it against the focusing drive until it engages. Secure it in this position.

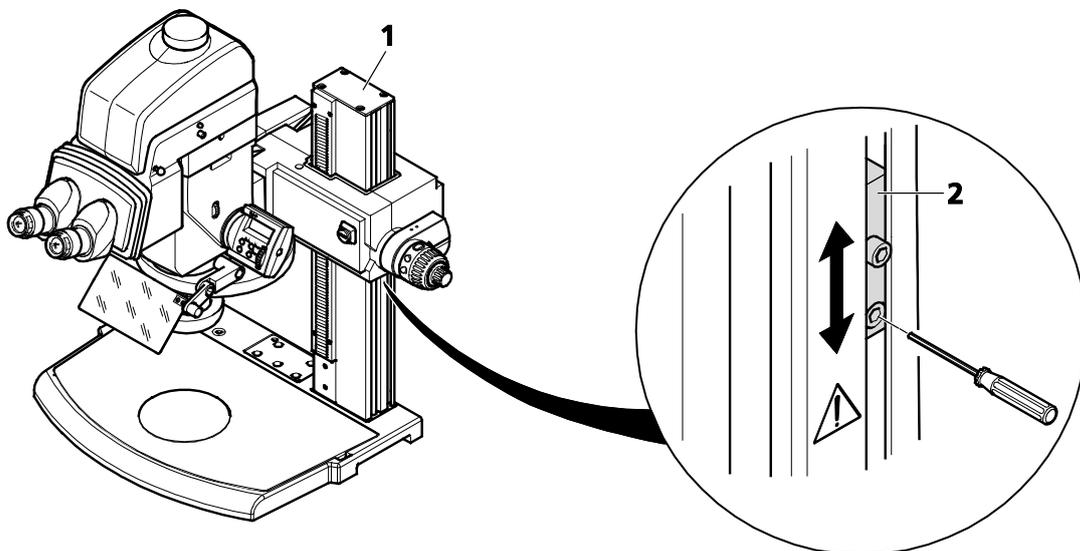


Fig. 29 Adjusting the range of travel

## 4.7 Settings

### 4.7.1 Basic microscope settings

 Prior to operating the motorized focusing drive for the first time ensure that the lower mechanical end stop (Fig. 30/6) has been adjusted (see Section 4.6, page 44).

The microscope is connected and switched on.

1. Place a specimen in the center of the round insert plate (Fig. 30/9). Switch on the illumination.
2. Ensure that the aperture diaphragm (Fig. 30/8) is completely open. To do this, briefly press or turn the knurled screw.
3. Adjust the diopter-setting ring on focusing eyepieces (Fig. 30/10) if known, otherwise set it to "0".

 "0" to the white dot (without eyepiece reticle) "0" to the red dot (with eyepiece reticle), see Fig. 32.

 Check that the eyepieces are completely housed in the tube.

4. Adjust the interpupillary distance by turning the eyepiece sockets (Fig. 30/11) and Fig. 31/1), i.e. when looking into the eyepieces with both eyes only **one** unclipped circle of light (object field) should be visible.

 In order to see only **one** circle of light when looking into the eyepieces, a distance of approx. 2 cm must be maintained between the eyes and the eyepiece.

5. Set the zoom (Fig. 30/7 or Fig. 31/5) first of all to the smallest level of magnification.
6. Focus on a prominent detail in the center of the specimen (Fig. 30/5 or Fig. 31/4).
7. Set the maximum zoom value (Fig. 30/7 or Fig. 31/5). Due to the magnification it is likely that the prominent detail is out of focus again and off-center.
8. Search for the detail by moving the specimen and precisely re-focus on it (Fig. 30/5 or Fig. 31/4).

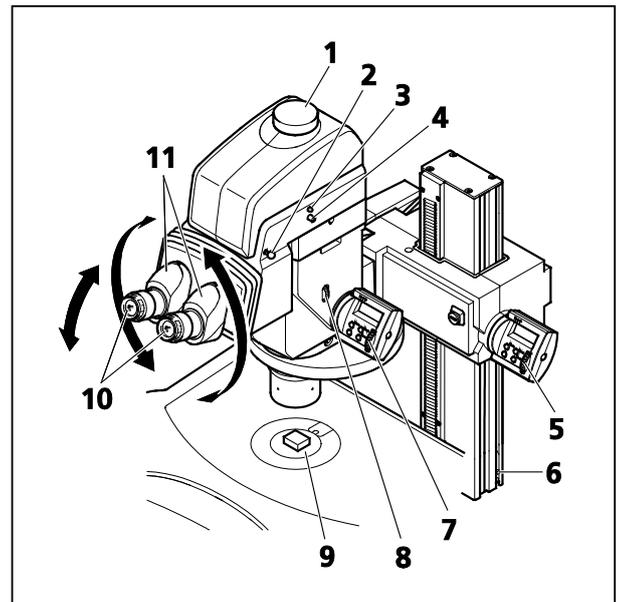


Fig. 30 Microscope, motorized focus

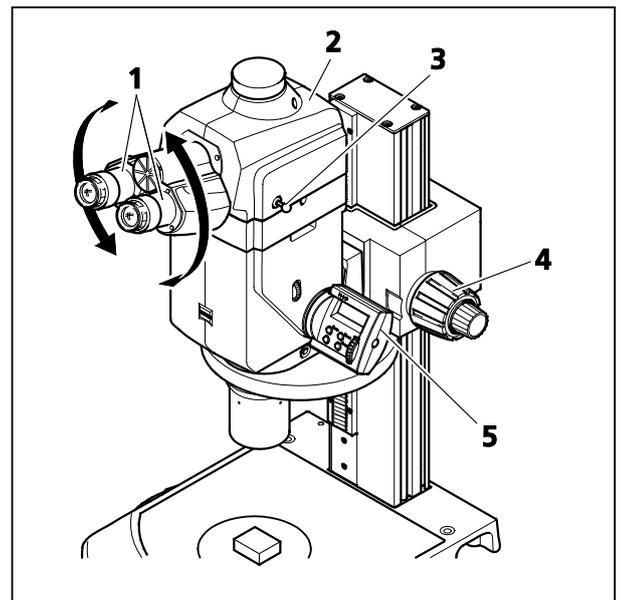


Fig. 31 Microscope, manual focus

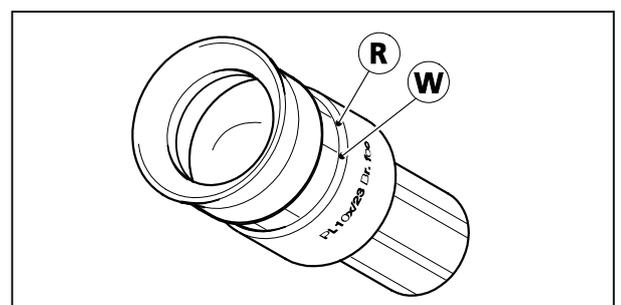


Fig. 32 Adjusting the eyepieces

9. Now set the minimum zoom again and correct for any existing image blurring by separately turning the diopter-setting rings of the focusing eyepieces to compensate for defective vision.

Once the microscope has been adjusted in this way, the image will remain focused throughout the entire zoom range.

If desired, connect a camera of your choice to the camera port (Fig. 30/1) of the ergo phototube or binocular phototube (Fig. 31/2). To switch over the light path, briefly push the control knob (Fig. 30/4) of the ergo phototube or pull out the push-pull rod (Fig. 31/3) of the phototube. The right light path is reflected 100% to the camera. On the ergo phototube this will be indicated by the blue control lamp (Fig. 30/3) lighting up.

A stereo effect in the eyepiece image can be obtained by pulling out the shutter slider (Fig. 30/2) on the ergo phototube.

 After a change of operator, repeat steps **3.** and **4.**

 After a change of objective, repeat steps **5.** to **8.**

#### 4.7.2 Setting the reflected light illumination

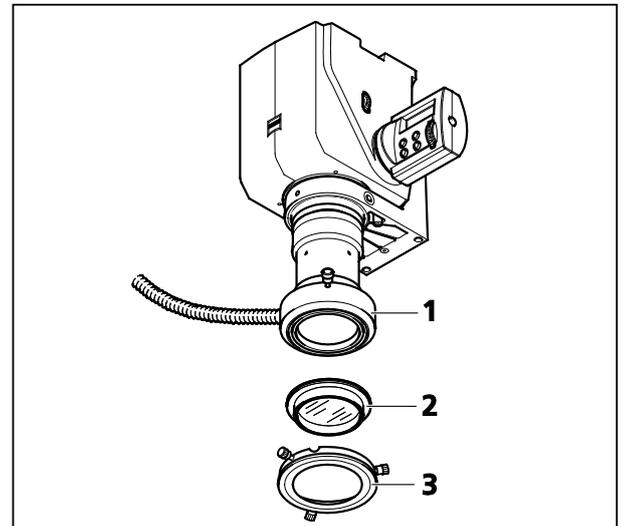
Different settings are required, depending on the reflected light illumination used:

##### Fiber-optic slit-ring illuminator (Fig. 33/1)

- Illumination: oblique 360° reflected light
- Application: shadow-free illumination of large fields, in particular in high-contrast samples
- Assembly: Push the slit-ring illuminator upwards on the objective until the free working distance of the objective is not restricted. Now secure it.

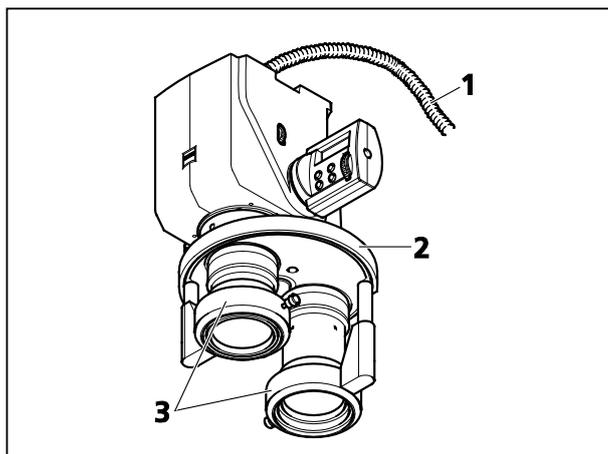


If the slit-ring illuminator is pushed too far over the objective, the center of the object field will no longer be homogeneously illuminated (dark spot in center).



**Fig. 33 Slit-ring illuminator 1500 ECO**

- Further accessories: Polarization filter set
  - Illumination: oblique 360° reflected light with reflex minimization
  - Application: Observation of high-contrast samples with weakening mirroring reflexes. Shiny parts of the sample appear dark.
  - Assembly: Grip the analyzer (Fig. 33/2) by the collar and screw it into the ring illuminator from behind. Insert the ring polarizer (Fig. 33/3) over the collar of the analyzer and push it over the ring illuminator until it engages. Prior to clamping, the semi-circular recess in the holder of the polarizer must coincide with the light guide hose. Then push the ring illuminator together with the pole filters onto the objective until it engages and secure it.
  - Operation: Turn the ring polarizer until the mirroring reflexes are reduced to the desired level.



**Fig. 34 Slit-ring illuminator without light guide on the nosepiece**

**Fiber-optic slit-ring illuminators for the nosepiece (Fig. 34/3)**

- Illumination: oblique 360° reflected light
- Application: Shadow-free illumination of large fields, in particular in high-contrast samples. Comfortable working with the nosepiece, as the ring illuminator is moved when the objective is changed.
- Assembly: Insert the light-conducting rod onto the ring illuminator or screw the spacer into the objective as necessary (according to the following table). Push the ring illuminator over the objective, thereby inserting the light guide sleeve on the underside of the nosepiece. Push the ring illuminator upwards until it engages with the light guide and secure it.

- Insert the incoming flexible light guide as far as it will go into the light guide receptor on the underside of the nosepiece.

 Each objective requires its own ring illuminator. The incoming light guide (Fig. 34/1) always supplies light to the ring illuminator on the currently swung-in objective (Fig. 34/2).

- **Unlimited** change of objectives on the turret in both directions is possible.
- The object area is free of disturbing cables or light guides.
- The polarization filter set is unsuitable.

Axio Zoom.V16 objective	Light-conducting rod 13 mm	Light-conducting rod 51 mm	Spacer M62 d = 66 mm x 16 mm
PlanApo Z 0.5x			x
PlanApo Z 1.0x	x		
PlanNeoFluar Z 1.0x		x	
PlanNeoFluar Z 2.3x	Ring illuminator unsuitable		

**LED ring illuminator** (Fig. 35/1)

- Illumination: oblique reflected light with various illumination modes by light segmentation:
  - shadow-free ring illumination,
  - low-shadow half-ring illumination
  - 90° spot illumination
  - 2-point and 4-point illumination
- Application: Illumination of spatially structured objects with selective shadow effect
- Assembly: Push the slit-ring illuminator upwards on the objective until the free working distance of the objective is not restricted. Now secure it.



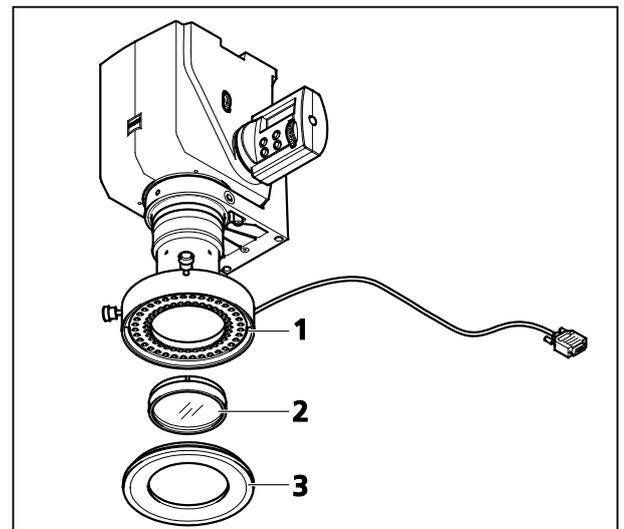
If the slit-ring illuminator is pushed too far over the objective, the center of the object field will no longer be homogeneously illuminated (dark spot in center).

- Operation: Focus on an object beneath a 360° ring illumination. Set the desired shadow effect by changing the segment mode. Highlight different object structures by "rotating" the beam direction around the object. Save the best illumination scenarios and recall them reproducibly (using Multicontroller MC 1500).
- Further accessories: Polarization filter set.
  - Assembly, use and operation of the polarizer (Fig. 35/2) and analyzer (Fig. 35/3) is similar to the fiber-optic slit-ring illuminator. Exception: the analyzer is snapped on, not screwed.

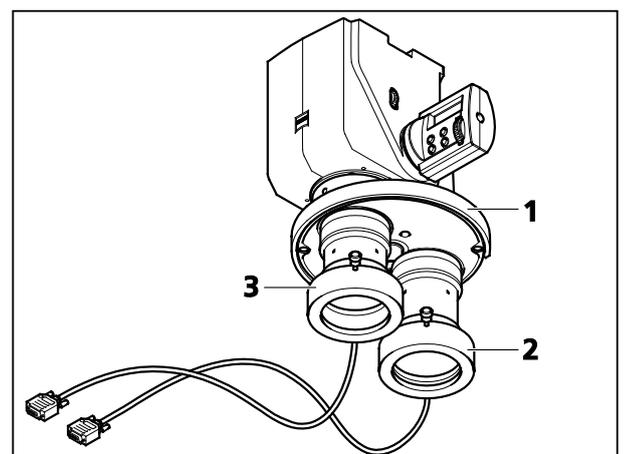


Special slim LED ring illuminators (slim VisiLED, Fig. 36/2 and 3) are also suitable for use on the nosepiece (Fig. 36/1) (turret can be swiveled up to 180°).

Polarization filter set cannot be used with the slim VisiLED.



**Fig. 35** VisiLED ring illuminator S 80-55 BF



**Fig. 36** Slim VisiLED ring illuminator S on nosepiece

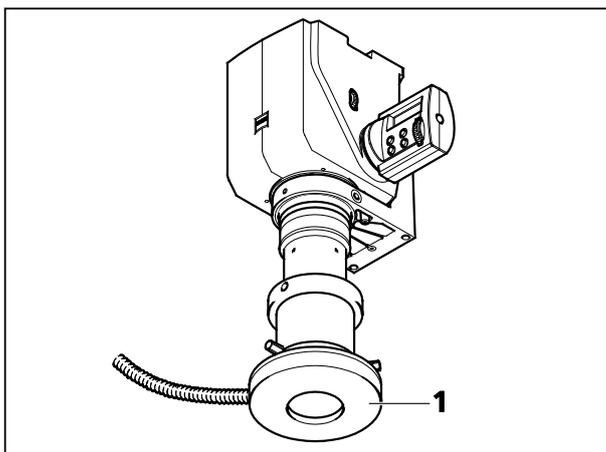


Fig. 37 Slit-ring illuminator 1500

**Fiber-optic ring illuminator and LED ring illuminator for reflected light darkfield (Fig. 37/1)**

- Illumination: all-side reflected light darkfield
- Application: Observation of flat, shiny objects  
Highlighting of finest surface structures
- Assembly: Insert the spacer onto the objective as necessary and secure. Push the ring illuminator up on the spacer until the clearance to the object level is 5 to 10 mm.

Objective	Spacer S
PlanApo Z 0.5x	57 mm
PlanApo Z 1.0x	40 mm
Apo Z 1.5x	none
PlanNeoFluar 1.0x	40 mm
PlanNeoFluar 2.3x	none

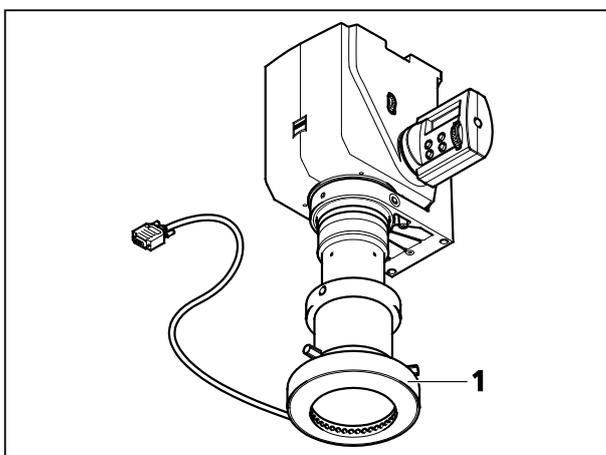


Fig. 38 VisiLED ring illuminator S 40-10 DF S

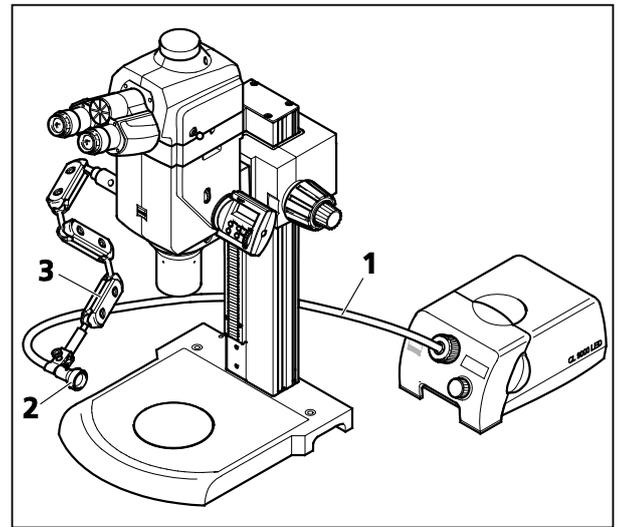


The VisiLED ring illuminator for reflected light darkfield (Fig. 38/1) has various different darkfield modes through light segmentation: Ring and half-ring illumination, 90° spot illumination, 2-point and 4-point illumination.

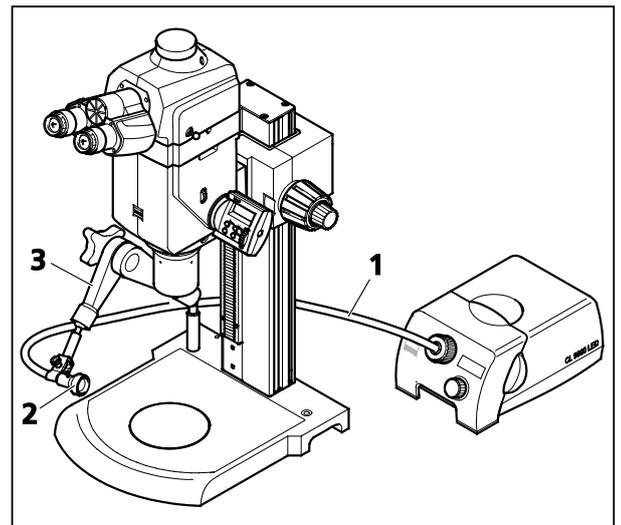
"Rotating" the illumination beam around the object enables object structures to be highlighted independently of direction.

**Flexible light guide (Fig. 39/1 and Fig. 40/1) with focusing attachment (Fig. 39/2 or Fig. 40/2)**

- Illumination: oblique reflected light spot illumination
- Application: Observation of spatial objects with selective shadow effect. The three-dimensionality of the object is strongly highlighted.
- Assembly with light bracket S:
  - Loosen the screws of the light bracket segments (Fig. 39/3) until all joints can be easily moved.
  - Align the spotlight to the object.
  - Carefully fasten the screws of the segments. Start with the segment directly on the microscope and work up to the light guide.

**Fig. 39 Focusing attachment and light guide on the light bracket S**

- Assembly with articulated arm S:
  - Loosen the clamp screw of the articulated arm (Fig. 40/3) until all joints can be moved.
  - Align the spotlight to the object.
  - Carefully tighten the clamping screw. Progressive clamping of the articulated arm holder S enables the joints to be clamped/loosened consecutively (not simultaneously).

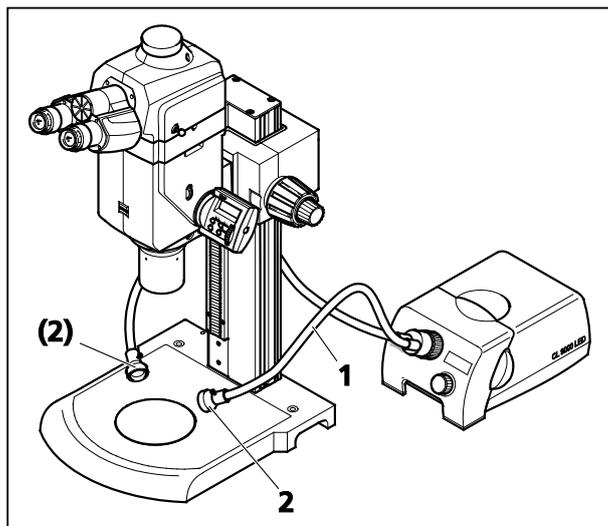
**Fig. 40 Focusing attachment and light guide on the articulated arm S**

Correct the alignment of the spot as necessary while observing the object through the eyepieces.

The flatter the spot lights up the object, the stronger the 3D effect, but also shadow formation.



Two-arm spotlights can also be installed to illuminate the object from both sides. Individual spots create dark drop shadows, double spots and brightened double shadows.



**Fig. 41 Focusing attachments on the self-supporting swan-neck light guide**

**Swan neck light guide (Fig. 41/1) with two focusing attachments (Fig. 41/2)**

- Illumination: variable oblique reflected light illumination (both sides)
- Application: Observation of spatial objects with selective shadow effect. The three-dimensionality of the object is strongly highlighted, while avoiding dark drop shadows.



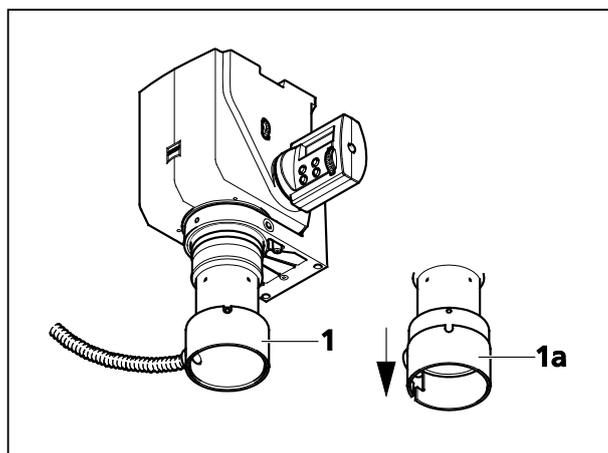
The flatter the swan-neck arms light up the object, the stronger the 3D effect, but also shadow formation.

Single-arm swan-neck light guides with a strong shadow effect can also be used

- Further accessories for flexible light guides and swan-neck light guides:

- Polarization filter

- Application: Minimization of mirroring reflexes and disturbing luster
- Assembly: Screw the polarizers into the focusing attachments. Insert the analyzer onto the objective and secure.
- Operation: Turn each polarizer separately until the disturbing reflexes are reduced to the desired level. Once all polarizers are adjusted, all mirror reflexes can be simultaneously weakened or intensified by turning the analyzer.



**Fig. 42 Diffuser S, retractable**

**Fiber optic diffuser S, retractable (Fig. 42/1)**

- Illumination: all-side, diffuse reflected light
- Application: low-reflex illumination of shiny three-dimensional objects. Shiny object parts appear bright, but without dazzling.
- Assembly: Then push the diffuser S onto the objective until it engages and secure it.



Suitable for objectives with a working distance of 60 mm and more.

- Operation:

- If necessary, pull the outer sleeve of the diffuser (Fig. 42/1a) downwards to intensify the light effect on the object.

- Align the beam direction of the incoming light guide to the object as necessary to prevent residual reflexes.
- A gliding or roller stage is recommended for optimum object alignment in the observation of three-dimensional, shiny object parts.

**Fiber-optic surface light** (Fig. 43/2)

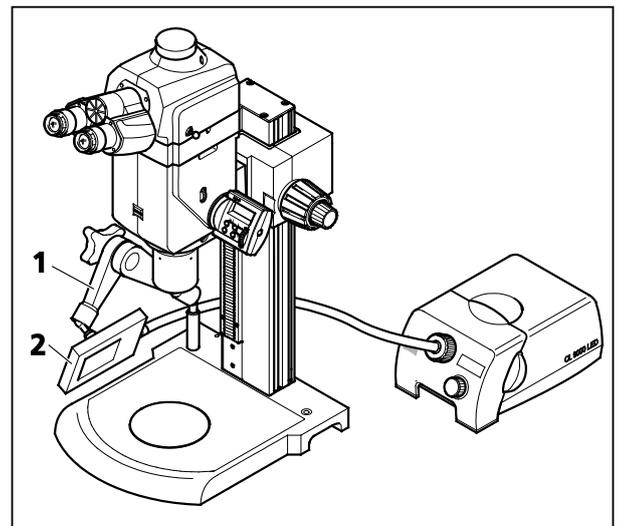
- Illumination: diffuse lateral oblique illumination
- Application: low-reflex illumination of shiny three-dimensional objects if the diffuser cannot be used.



Suitable for Axio Zoom objectives with a working distance of 10 mm and more.

Guarantees good object accessibility, particularly when the surface light is situated behind the object.

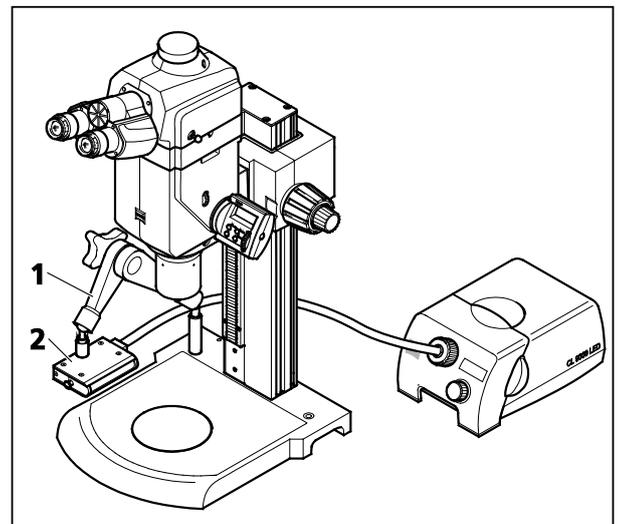
- Assembly:
  - Slacken the articulated arm (Fig. 43/1).
  - Move the surface light into an optimum position to the object and tighten the articulated arm.



**Fig. 43** Surface light M8

**Line light S** (Fig. 44/2)

- Illumination: variable oblique high-contrast illumination
- Working position: freely adjustable
- Slacken the articulated arm (Fig. 44/1) or light bracket S.
- Move the line light S into the flattest possible position to the surface of the object and secure it.



**Fig. 44** Line light S

**General remark**

- Adjust the controller for VisiLED.



For adjustment of the illumination intensity on the fiber-optic cold light source or control of the LED lights please refer to and heed the separate operating manuals for cold light sources and LED illumination!



The LED illumination is LED Class 1 equipment. Do not look directly into the LED light.



Avoid looking directly into the cold light source, light guide or LEDs, or into reflections on reflective surfaces.



It is expedient to combine several of the illumination systems described here. (Mixed light illumination)

### 4.7.3 Setting the transmitted light illumination

#### Transmitted light illuminator S

The transmitted light illuminator S is connected and switched on.

- For low levels of magnification insert the  $\varnothing$  84 mm opal glass plate.
- To void glare by transmitted light, swivel in the anti-glare shield.
- Adjust the illumination intensity to the cold light source.
- Set the desired procedure (Fig. 46) with the lighting control (Fig. 45/1).

To set the illumination method (brightfield, darkfield, oblique lighting) the mirror can be moved in several degrees of freedom by means of a slide control.

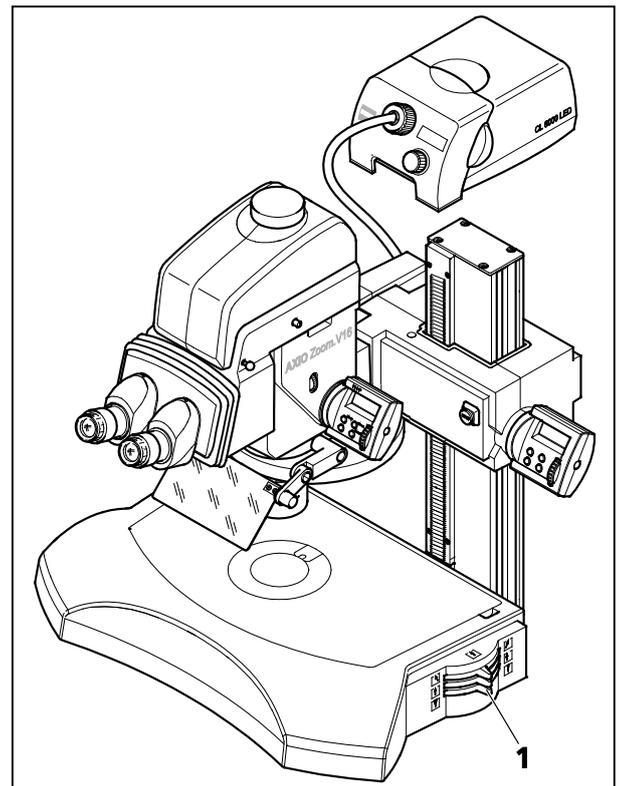
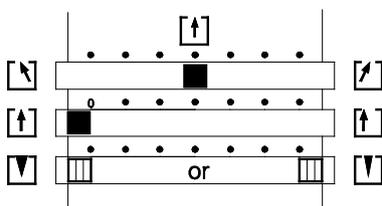
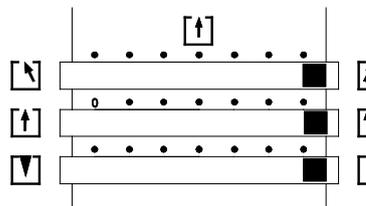


Fig. 45 Lighting control

#### Transmitted-light - brightfield



#### Transmitted-light darkfield



#### Transmitted-light oblique illumination

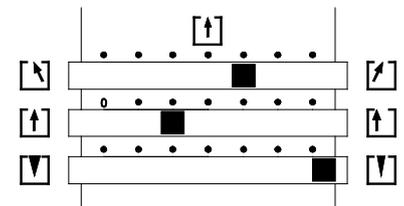
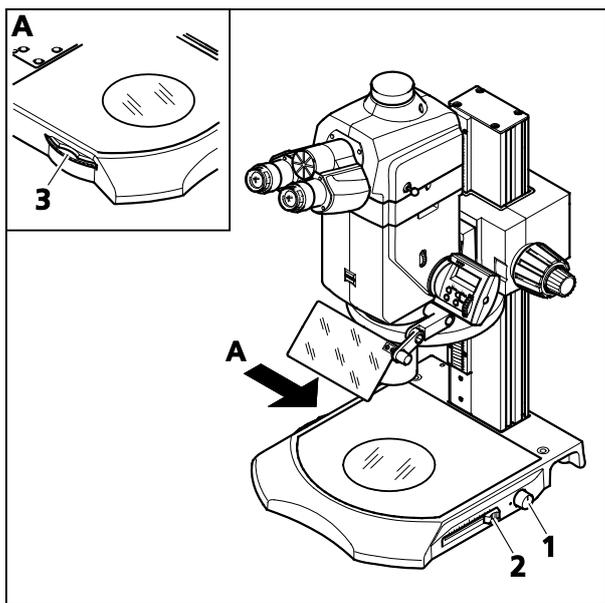


Fig. 46 Adjusting the illumination of the transmitted light illuminator S

A number of other intermediate positions can be used to optimize contrast.

Symbol	Technical description	Applicative description
	<b>Inclination</b> of the light bundle to the observer (risk of glare!)	Oblique illumination
	<b>Inclination</b> of light bundle away from the observer	Oblique illumination
	Light bundle emerges vertically (reflector inclined 45°)	Bright field
	<b>Translation</b> of the light bundle to the observer	Oblique illumination
	White reflector surface of the mirror	Diffuse light quality
	Mirroring reflector surface of the mirror	Directed light quality (more contrast)



**Fig. 47 Adjusting transillumination base 300**

**Adjusting transillumination base 300**

The transillumination base is connected.

- Switch on using the rotary knob (Fig. 47/1) and regulate illumination intensity. The blue power indicator lights up when switched on.
- Select the desired illumination method using the setting wheel (Fig. 47/3).

Different effects can be achieved with the shutter slider (Fig. 47/2) in the individual illumination methods.

Symbol	Technical description	Applicative description
BF	Bright field	Soft contrast by oblique illumination
BF+	Higher contrast brightfield	Stronger contrast by oblique illumination
DF	All-side darkfield	Step-by-step reduction of all-side to one-side darkfield illumination

 The diaphragm slide (Fig. 47/2) should initially be at the rear stop in order to achieve a large homogeneous luminous field.

Pull it slowly to the front while observing the microscopic image to achieve the desired effect.

 The transmitted light illumination can be completely covered with the shutter slider (front stop) to achieve a dark background, e.g. for fluorescence illumination.

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## 5 CLEANING, MAINTENANCE AND SERVICE

### 5.1 Care

The only care required for equipment is as follows:



The instruments are not equipped with any special devices for protection against substances that are corrosive, potentially infectious, toxic or radioactive, or other substances that could be hazardous to health. All legal regulations must be observed when handling such substances, particularly the relevant national accident prevention regulations.

- Eliminate contaminations on the instrument according to the rules for prevention of accidents.
- The equipment must be disconnected from the mains supply after use. Protect devices from dust and moisture with a suitable cover.
- Never expose equipment to adverse climatic conditions (extreme humidity and temperature) for longer periods.



The equipment must be disconnected from the mains supply before cleaning. Make sure that no cleaning fluids are allowed to penetrate to the inside of the device.

Stubborn stains on glass surfaces, e.g. fingerprints and grease stains, are best cleaned with a cotton swab wrapped round a wooden stick and a small amount of distilled water or non-aggressive cleaning agent.

- Distilled water: Clean the glass surface with a moist cotton swab using a circular motion from the center to the edge.
- Optical cleaning agent, consisting of 15 % isopropanol and 85 % rubbing alcohol (gasoline): Clean the glass surface with a moist cotton swab using a circular motion from the center to the edge.
- Remove dust from optical surfaces using a natural hair brush or blow it off with an air blower.
- Plastic surfaces must be cleaned with a standard cleaning agent (without solvents!). Stubborn stains can be carefully treated with benzine or spirits.
- Labels on the components may only be cleaned using a dry cotton cloth.



The plug-in power supply should not be brought into contact with moisture.

- The plug-in power supply must be disconnected from the mains supply before cleaning.

## 5.2 Maintenance

### 5.2.1 Safety inspections



When the motorized focusing drive is lowered there is the **risk of pinching fingers** in the working area.

Perform regular checks of the travel range of the motorized focusing drive to ensure that the limit switches are working properly in accordance with Section 4.6, page 44.

### 5.2.2 Relocation of the device



Do not transport the installed, upright standing system over long distances. Avoid severe shocks to the focusing drive, as this could damage the rack of the column.



For transporting over long distances dismantle the instrument and ship it in the original packaging.

To relocate the instrument over short distances, e.g. within a hospital, proceed as follows:

- Move the focusing drive to the lower stop.
- Switch the instrument off and pull all cable connections.
- Dismantle the phototube, spacer tube, objective(s) and microscope body. For this purpose see Section 3.3, page 20 (reverse order for dismantling).
- If it has been used, dismantle the transmitted light unit S or transillumination top 450 mot. For this purpose see Section 3.9, page 31 (reverse order for dismantling).



Please note that the center of gravity is located above the stand base. For this reason the instrument should not be carried over long distances. Do not tilt or overturn the instrument. Use the recessed grips on the edge of the stand base to lift and set down the instrument.

- Lift the instrument by the recessed grips on the stand base, not by taking hold of the focusing drive.
- Re-assemble components, connect the instrument as specified and switch it on.

### 5.2.3 Wearing parts

The following wearing parts can be ordered directly from Carl Zeiss:

Designation	Catalogue No.	Remarks
Opal glass plate, d = 84 mm	000000-1052-281	
B/W plastic plate, d = 84 mm	475290-9901-000	
B/W plastic plate, d = 120 mm	435430-0120-010	
Clear glass plate, d = 120 mm	435501-0002-000	
Clear glass plate, d = 84 mm	475265-0001-000	
Eyecup	444801-0000-000	2x required
Dust protection set	434303-0000-000	
Ball-head screwdriver 3 mm	000000-0069-551	
Plug-in power supply RJ45-CAN 24 V/1.25 A	000000-0514-784	
CAN cable 0.5 m	000000-0423-039	
CAN cable 1.0 m	000000-0451-206	

### 5.3 Service

Repairs to mechanical, optical or electronic components within the microscope may only be performed by Carl Zeiss service staff or specially **authorized** personnel.

To ensure optimum setting and trouble-free function of your microscope over a longer period of time, we recommend that you enter into a service/maintenance agreement with Carl Zeiss.

For subsequent orders or when service is required, please get in touch with your local Carl Zeiss representative.

#### **5.4 Disposal of the product**

The product has been developed, tested and manufactured in accordance with the applicable environmental regulations and directives of the European Union.

The product and the relevant accessories meet the requirements of EU Directives 2002/95/EC (RoHS) and 2002/96/EC (WEEE, as well as the provisions of the German Law on Electrical and Electronic Equipment (ElektroG).

The product contains electronic components which must not be disposed of in household waste. Rather, they have to be disposed of as specified in WEEE Directive 2002/96/EC and in compliance with the national laws in force.

Please contact your Carl Zeiss dealership or customer service organization if you need more information on disposal and recycling.

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**6 ANNEX****6.1 List of abbreviations**

BF	Brightfield
Br	suitable for spectacle wearers
CAN	Data bus (controller area network)
CL	Cold light
DF	Darkfield
DIN	German industrial standard
EMS 3	Electronic module stereo microscope, Version 3
EN	European standard
Ergo	Ergonomic
Foc	focusable
FWD	free working distance
HIP	Control unit for motorized zoom bodies or motorized focusing unit (human interface panel)
IEC	International Electrotechnical Commission
IP	Internal protection (through housing)
IvDD	In vitro diagnostics
CL	Cold light
LED	Light emitting diode
MaRC	Control unit for motorized zoom bodies or motorized focusing unit (manual rotary control)
MC 1500	VisiLED Multi-Controller 1500
Obj	Objective
RC	Relief contrast
RL	Reflected light
SYCOP 3	System control panel
SW	Width across flats
b/w	black/white
TL	Transmitted light
USB	Fast serial connection for PC peripherals
UV	Ultraviolet
VisiLED	Light diode in visible range
V16	Vario/continuously adjustable with factor 16

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**6.2 Troubleshooting**

<b>Error description</b>	<b>Error cause</b>	<b>Remedy</b>
Microscope cannot be switched on at the HIP	Mains supply interrupted. STOP button pressed	Check and restore mains supply Unlock the STOP button by pulling out.
No image visible in eyepieces	Beam path in phototube switched to camera output	Set beam path to binocular observation

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