

SteREO Discovery Stereomicroscope Operating Manual

You have purchased a product of the House of Zeiss. Before using the instrument the first time, please read this 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 instrument. Would you therefore please make yourself familiar with the contents of this manual and pay special attention to hints concerning safe operation of the instrument.

The specifications are subject to change; the manual is not covered by an update service.

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1 INTRODUCTION

1.1 General

The SteREO Discovery stereomicroscopes have been designed, produced and tested in compliance with the standard DIN EN 61010-1 (IEC 61010-1) and the IEC 61010-2-101 safety regulations for electrical measuring, control and laboratory instruments.

The instruments meet the requirements of the European Directive IvDD 98/79/EC (In vitro Diagnostic Agents Directive) and carry the **CE** marking.

This operating manual includes information and warnings that must be observed by the user.

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

**NOTE**

This symbol refers you to advice that you must observe under all circumstances.

**CAUTION**

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

**CAUTION**

This symbol indicates a possible hazard to the user of the instrument.

**CAUTION**

Disconnect the instrument from line power before opening it!

**CAUTION**

Crushing hazard!

**CAUTION**

Emission of UV radiation!

1.2 Notes on instrument safety



The SteREO Discovery stereomicroscopes, including original accessories, must not be used for applications other than those described in this manual. 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.

The instrument and the equipment operated in combination with it may only be modified and repaired by service technicians employed with or authorized by Carl Zeiss. The manufacturer is not liable for damage caused by unauthorized persons tampering with the instrument; such tampering will also forfeit any rights to claim under warranty.



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



The power plug must be inserted in an outlet with a grounding (earth) contact. The protective capacity must not be rendered ineffective by using an extension cable without a ground wire.



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 have the instrument repaired.



Before switching on the instrument, check whether it is suitable for the available line voltage. Always disconnect the instrument from the power outlet before opening it and changing the fuses.

Only use fuses appropriate for the rated current as specified in the Technical data. The use of makeshift fuses and short-circuiting of the fuse holders are not permitted.



On stands with motorized focusing drive, there is the **risk of hand crushing** when lowering the microscope body.



- Before switching on the device, verify that the joystick on the SYCOP is in zero position and not displaced.
- Do not reach with your hands into its operating area or under the motorized focusing drive.
- You can stop automatic movement of the drive by pressing the STOP button on the focusing drive (Fig. 4/15) or moving the joystick on the SYCOP up or down, turning the knurled wheel on the HIP or pressing the Memory1/2 keys.
- To prevent the objective from colliding with the stage unit or specimen, make sure to adjust the lower limit switch of the motorized focusing drive (refer to Section 3.11).



Gas-discharge lamps, e.g. HBO 100, emit ultraviolet radiation, which can cause burns to the eyes and skin. Therefore, never look directly into the light of these lamps and avoid direct, unprotected incidence of their light on your skin. When using the microscope, always use the protective devices belonging to the instrument (e.g. special attenuation filters or the fluorescence shield). When they are hot, gas-discharge lamps are under high internal pressure. Therefore, change them only when they have cooled down, and make sure to wear protective gloves and a face guard.



Avoid touching the hot lamp housing. Always pull the power plug before changing the lamps and allow the instrument to cool down for some 15 minutes.



When working with UV excitation light, the object surface is exposed to ultraviolet radiation. Make sure to avoid direct skin exposure. Take appropriate precautions for manipulations in the object plane (e.g. use of gliding stage, gloves and UV protective ointment, etc.).



When using fluorescence excitation, there is the risk of being dazzled. Strictly avoid dazzling of your eyes, particularly by the invisible UV excitation light. Install the dazzle protector and observe the specimen surface only through the dazzle protector!
Close the shutter, when excitation is not needed.



The instruments are not equipped with any special devices for protection from corrosive, potentially infectious, toxic, and radioactive or other substances that may be hazardous to health. Make sure to observe all legal regulations when handling such substances, particularly the relevant national accident prevention regulations.



Do not operate the equipment delivered in potentially explosive atmospheres, the presence of volatile anesthetics or flammable solvents, such as alcohol, benzene or similar chemicals.



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



The LED illumination system is a Class 1 laser device. Avoid looking directly into the LED light. Swing in the dazzle protector to avoid dazzling in transmitted-light applications.



If you use an external cold-light source (high energy) for the SteREO Discovery, never look directly into the light guide exit of the cold-light source to avoid the risk of being dazzled and going blind.



Change the lamps of the cold-light source according to the operating instructions of the manufacturer. Non-observance of the relevant instructions may lead to burns and explosion when changing the lamp.



Never look into the light beam - neither with nor without optical instruments, and not to simply observe the specimen either. In case of non-observance your eyes may be damaged!



Take appropriate protective measures if the specimen releases noxious gases, dust, and vapors, secondary radiation or explosive substances as a result of the UV radiation!



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. Avoid great variations in temperature, direct exposure to sunlight and vibrations.



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. Set up all electrical units and components at least 15 cm away of flammable objects and walls.



For transporting the device over longer distances, it must be disassembled and packed in its original packaging. For short-distance transport, observe Section 3.12.



Defective microscopes must not be disposed of with household waste, but should be disposed of in compliance with the relevant legal requirements (see Section 5.5). Specimens must also be disposed of properly in compliance with the valid legal requirements and in-house working instructions.

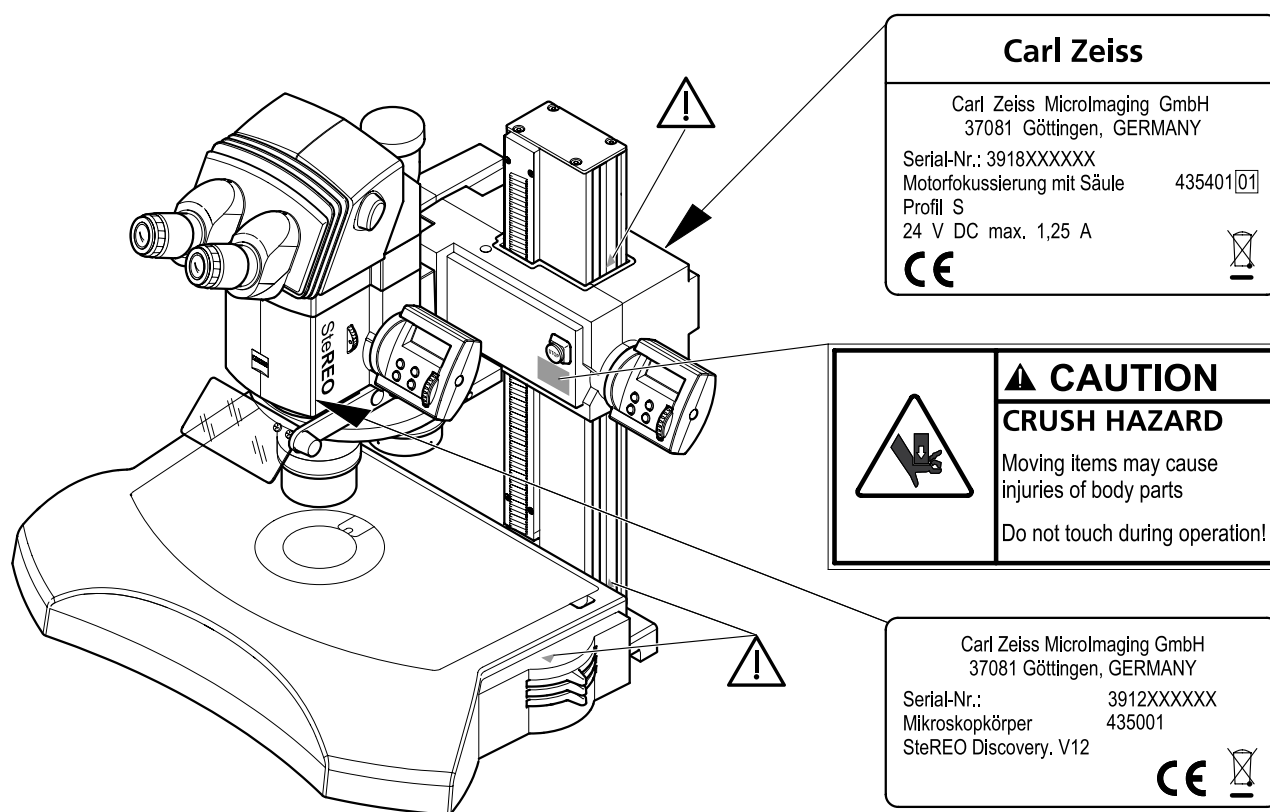


Fig. 1 Warning and information labels on the instrument

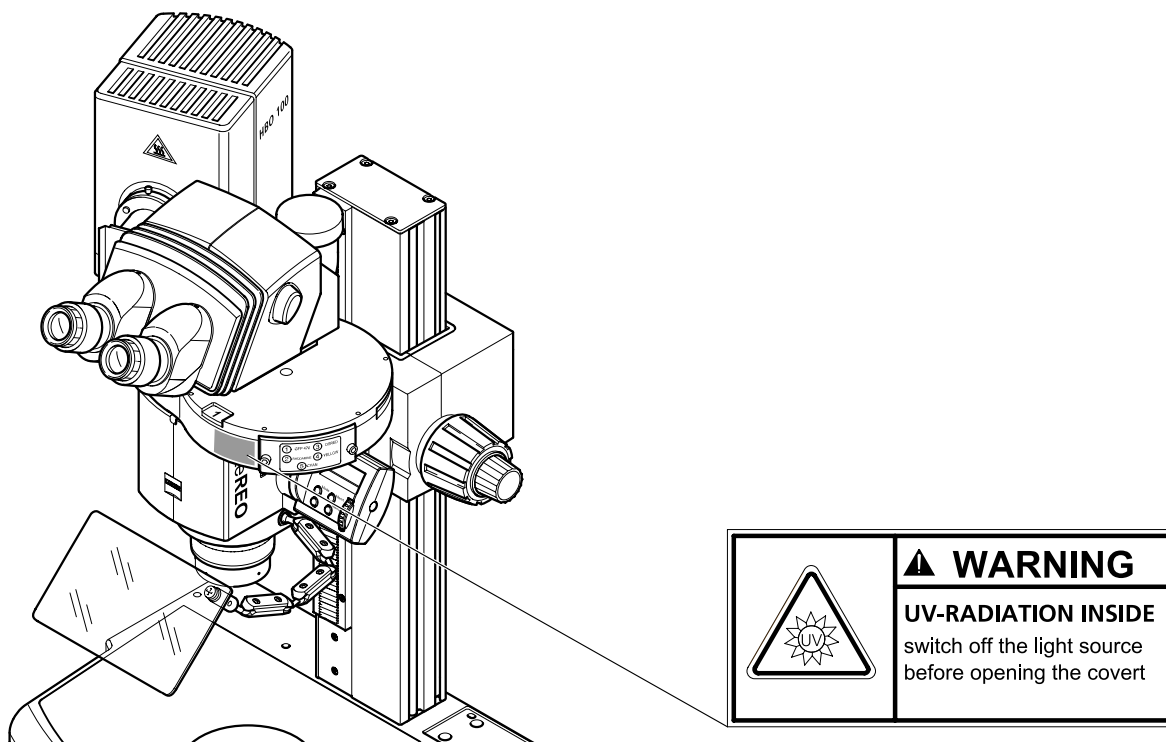


Fig. 2 Warning label on PentaFluar S vertical illuminator

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 be 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. Any such action shall lead to a forfeit of all warranty claims.

With the exception of the work specified in this manual, no maintenance or repair of the instrument may be undertaken. Repairs may only be carried out by Carl Zeiss service staff or persons expressly authorized by Carl Zeiss. In case of any malfunction of the device, contact the responsible Carl Zeiss service agency.

1.4 General use of stereomicroscopes

The SteREO Discovery stereomicroscopes are microscopes designed for 3D observation of small objects at simultaneous magnification.

The basic equipment of stereomicroscopes features relatively low total magnifications (approximately 5x to 60x), wide object fields (of up to about 30 mm) and large working distances (approx. 80 mm) between object and microscope front optics.

Special preparation of specimens is not required for stereomicroscopes, which makes them suitable for the observation, preparation, sorting, manipulation and documentation of specimens of most diverse nature and composition.

The SteREO Discovery stereomicroscopes are designed according to the telescope principle with both optical paths using a common main objective (CMO = Common Main Objective).

The designation "V8" stands for a magnification of zoom optics variable by a factor of 8 and covering a magnification range of 1.0x to 8.0x. Magnification is changed manually by means of a rotary knob.

The designation "V12" stands for a magnification of zoom optics variable by a factor of 12.5x and covering a magnification range from 0.8x to 10x. The magnification is changed motorized via the Human Interface Panel (HIP) or the System Control Panel (SYCOP).

Accordingly, the SteREO Discovery.V20 zoom optics factor is 20x, an unequalled feature worldwide. The variable magnification range extends from 7.5x to 15x. Also in this case change of magnification is motorized and effected via the HIP or SYCOP control panel.

The pancratic magnification changer ensures high-contrast, focused images throughout the entire zoom range. After the basic adjustment of the stereomicroscope, the image remains exactly in focus.

Attachable optical systems (objectives, eyepieces and camera adapters) allow the total magnification to be varied additionally as required.

Progressive cold light sources, an innovative LED illumination system and gas-discharge lamps provide the following choice of techniques:

Transmitted light:

- Bright field
- Dark field
- Oblique illumination

Reflected light:

- Bright field
- Dark field
- Oblique illumination
- Fluorescence excitation

Within the product family of Carl Zeiss stereomicroscopes, the SteREO Discovery stereomicroscopes rank as follows:

Greenough design

Stemi DV4 Stereomicroscope
Stemi DV 4 SPOT Stereomicroscope
Stemi 2000 Stereomicroscope
Stemi 2000 C Stereomicroscope
Stemi 2000 CS Stereomicroscope

Telescope design

SteREO Discovery.V8 Stereomicroscope
SteREO Discovery.V12 Stereomicroscope
SteREO Discovery.V20 Stereomicroscope
SteREO Lumar.V12 Fluorescence Stereomicroscope

2 DESCRIPTION

2.1 Intended use

Manufacturer's designation: **SteREO Discovery.V8 Stereomicroscope**
SteREO Discovery.V12 Stereomicroscope
SteREO Discovery.V20 Stereomicroscope

The SteREO Discovery Stereomicroscopes are universally applicable telescope-type stereomicroscopes featuring a high optical image quality and modular design with mechanical interfaces meeting international standards. Besides visual stereoscopic observation, it provides diverse options of photomicrographic and video image documentation in connection with the optionally fitted camera port.

The basic requirement for using the SteREO Discovery devices as intended is that the relevant environmental and operating conditions are met (see Section 2.5, Technical data).

The SteREO Discovery microscopes are intended for an enlarged, tridimensional observation of small objects. They have been designed for being used in biomedical laboratories and material-scientific institutes, as well as in industrial research, development, quality assurance and manufacture.

Main applications of the instrument include:

- | | |
|------------------------------------|--|
| Biology and medicine | <ul style="list-style-type: none">– Developmental biology– Microbiology– Anatomy |
| Materials engineering and sciences | <ul style="list-style-type: none">– Materials testing– Semiconductor industry– Glass-fiber engineering |
| Miscellaneous | <ul style="list-style-type: none">– Forensic medicine– Restoration– Education |

The stereomicroscope is designed for applications in biology and medicine for the examination of blood and/or tissue specimens taken from the human body. Applications in the field of diagnostic medicine are expressly ruled out except for the field of medical research.



The SteREO Discovery stereomicroscopes, including original accessories, must not be used for applications other than those described in this manual. 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.



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



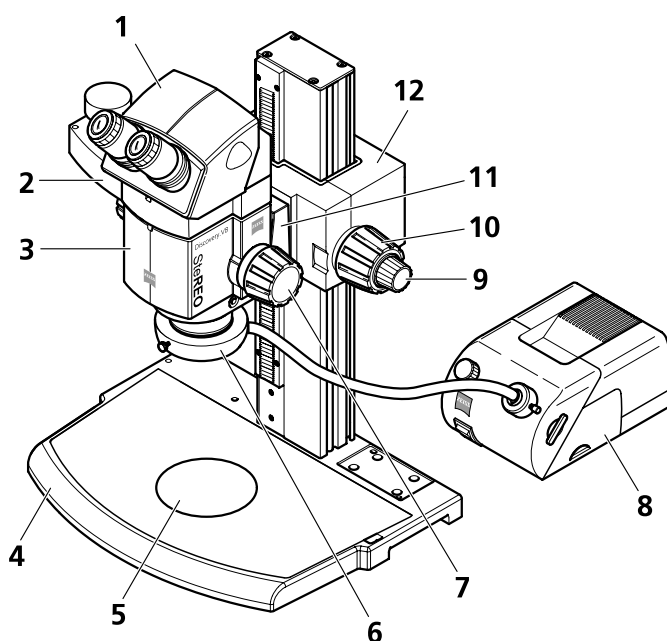
The stereomicroscope is a high-precision instrument that can be impaired in its performance or even be destroyed when handled improperly. It may only be used in compliance with the specified ambient conditions in closed, dust-free rooms, which are free of oily and other chemical vapors (see Section 2.5).

2.2 Description of the instrument



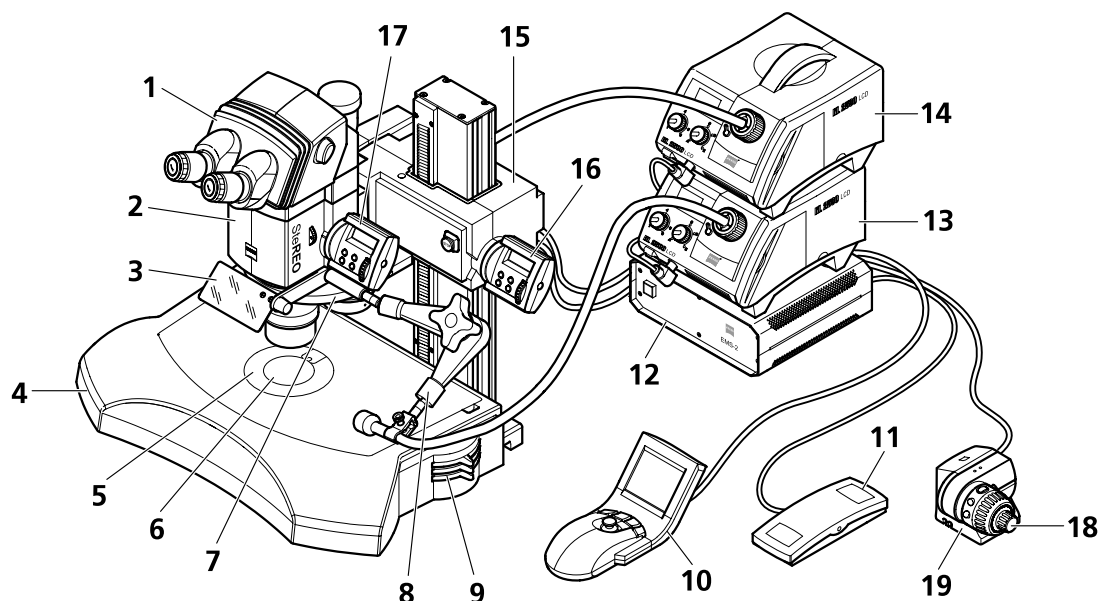
The microscope configurations shown here may differ from that of your microscope!

2.2.1 Stereomicroscope SteREO Discovery.V8



- 1 Binocular tube S 35° for the accommodation of eyepieces
- 2 Intermediate phototube S, left 100/100
- 3 SteREO Discovery.V8 microscope body
- 4 Stand plate 450, Profile S, with insert plate
- 5 Scratch-proof B/W plate, d=120 mm, for holding specimens
- 6 Slit-ring illuminator ECO
- 7 Control knob for magnification change (zoom)
- 8 Cold-light source Zeiss CL 1500 ECO
- 9 Fine-focusing control
- 10 Coarse-focusing control
- 11 Mount S with d=76 mm support for microscope body and objective
- 12 Coarse/fine drive with Profile S column

Fig. 3 Main control and functional elements on SteREO Discovery.V8

2.2.2 Stereomicroscope SteREO Discovery.V12/V20

- 1 Binocular tube for holding eyepieces and a camera via adapter
- 2 SteREO Discovery.V12/V20 microscope body
- 3 Dazzle protector, swivel-type; provides dazzle-free microscopy in transmitted light
- 4 Transmitted-light equipment in combination with cold-light source
- 5 Support (120 mm diameter) for holding specimens or mounting stages via 84 mm/120 mm stage adapter
- 6 Support for opal glass plate of transmitted-light equipment (84 mm diameter)
- 7 Objective nosepiece, coded, for holding up to three objectives and the microscope body;
allows stereo or vertical position of the objectives and the connection of coupled-motion slit-ring illuminators without light guide;
Alternatively (without picture): mount S (diameter: 76 mm) to hold the microscope body equipped with one objective
- 8 Oblique incident-light system with flexible light guide and focusing attachment (alternatively, various light guides for reflected light are available)
- 9 Light intensity control for transmitted-light microscopy
- 10 System Control Panel SYCOP
- 11 Foot pedal for focus or zoom control
- 12 Electronics module EMS-2 (part of SYCOP); provides connection of various functional units
- 13 Cold-light source KL 2500 LCD for reflected light; controllable through EMS-2/SYCOP; for installation and operation please see the separate manual
- 14 Cold-light source KL 2500 LCD for transmitted light, to provide the transmitted-light equipment S (Fig. 4/4) with light; controllable through EMS-2/SYCOP; for installation and operation please see the separate manual
- 15 Motorized focusing drive on column with STOP button for quick switch-off of the focusing drive

Control units alternatively or additionally to EMS-2/SYCOP:

- 16 Focus control unit HIP (Human Interface Panel); plug-in power unit for operation without EMS-2/SYCOP included in scope of supply
- 17 Zoom control unit HIP (Human Interface Panel); plug-in power unit for operation without EMS-2/SYCOP included in scope of supply
- 18 Manual Rotary Control MaRC, for sensitive operation of the motor focus by using the wheel and for operating motor focus and motor zoom by using press buttons; can be mounted instead of the HIP device to the microscope body, motor focus or table-top base for MaRC
- 19 Table-top base for MaRC

Fig. 4 Control and functional elements on SteREO Discovery.V12/V20

The system overview is shown on the following pages.

2.3 System overview

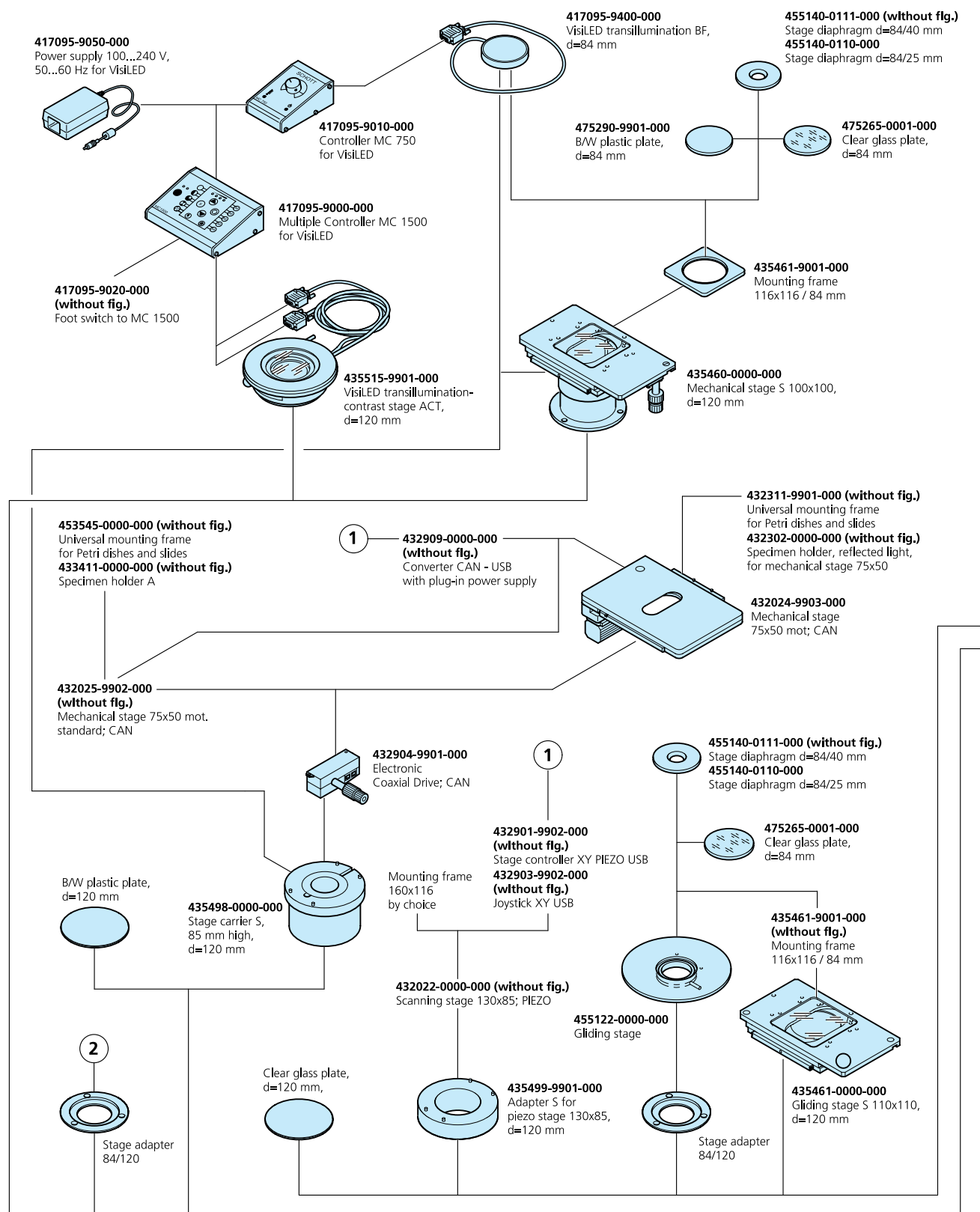


Fig. 5 **System overview (page 1)**

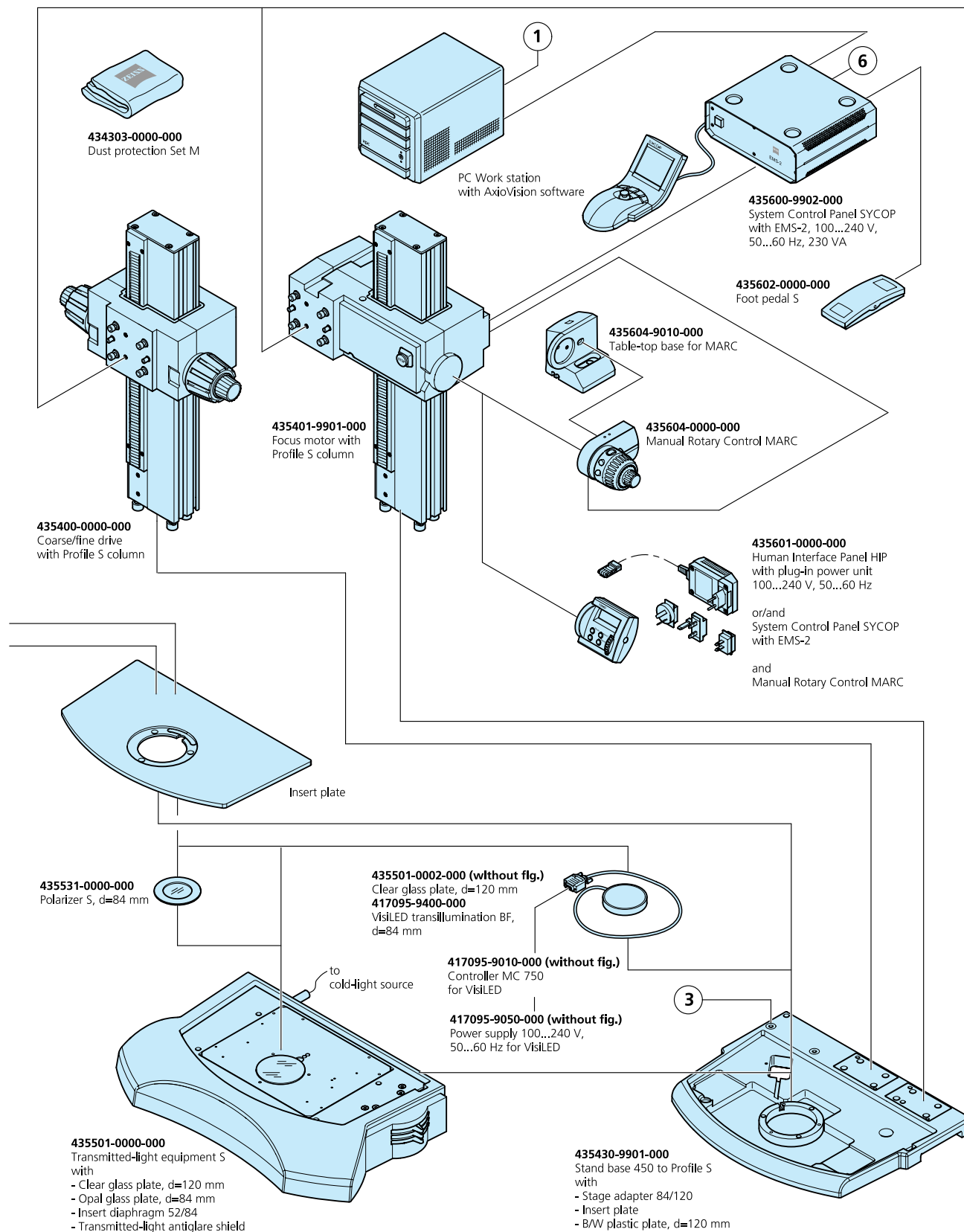


Fig. 6 System overview (page 2)

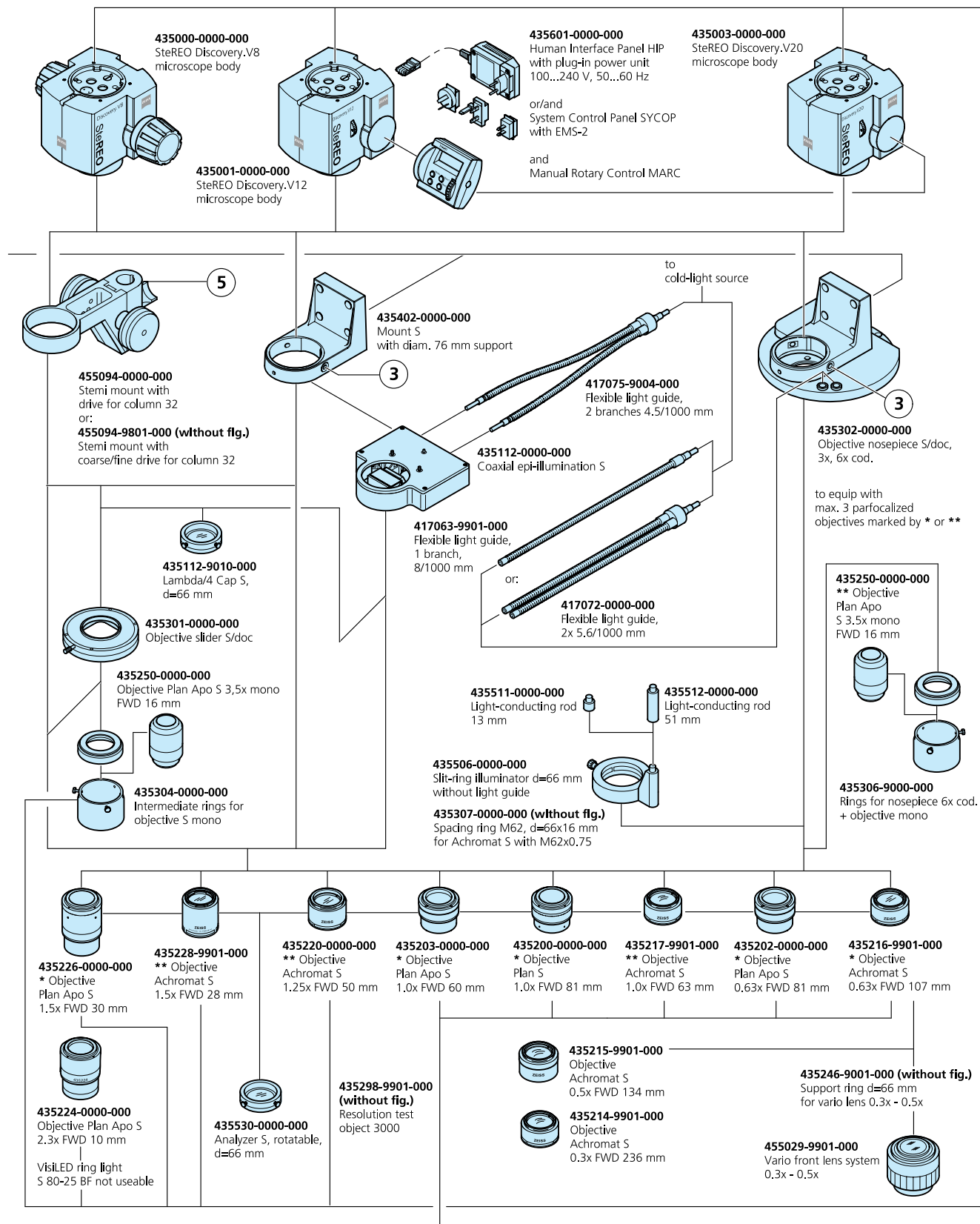


Fig. 7 System overview (page 3)

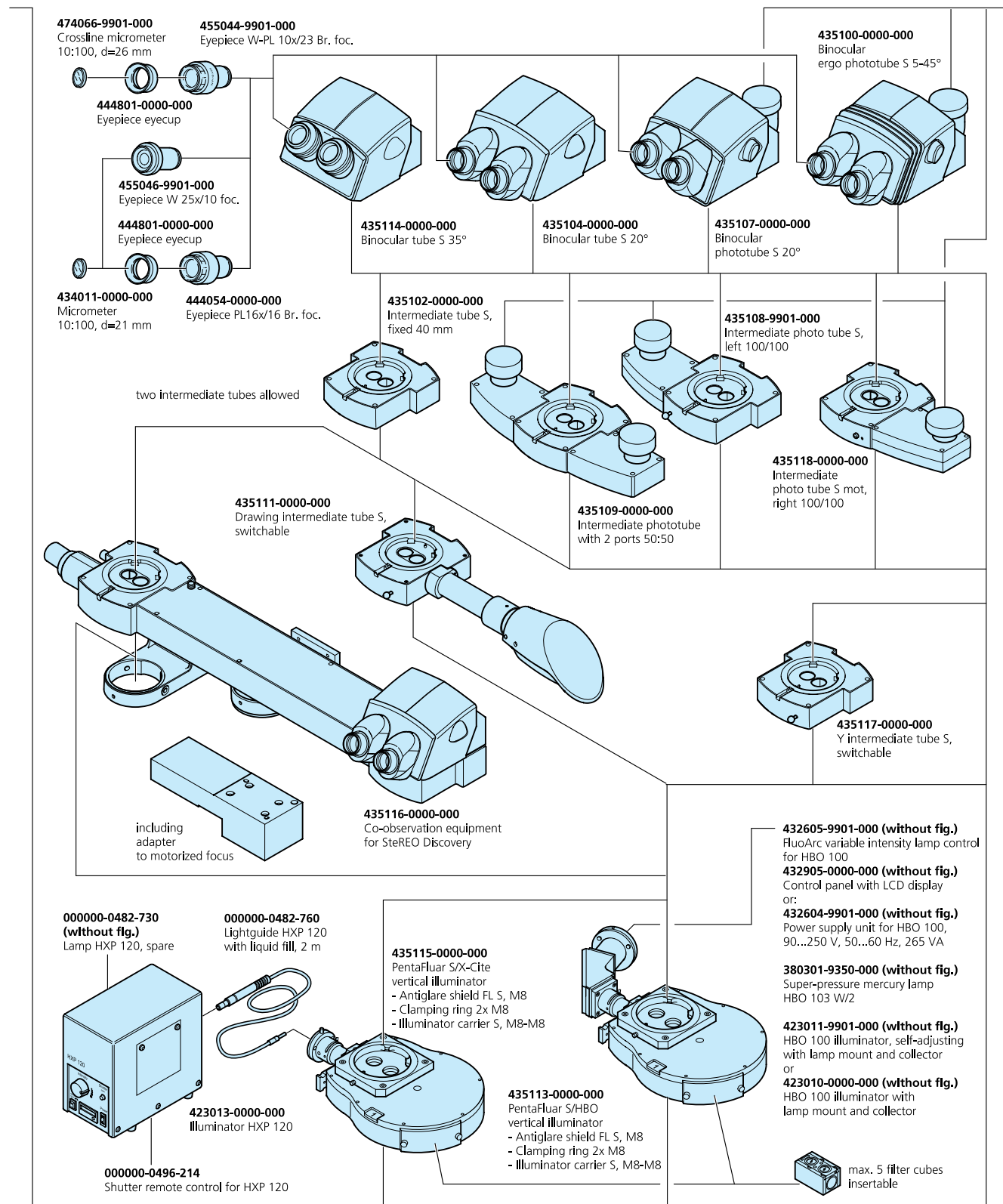


Fig. 8 System overview (page 4)

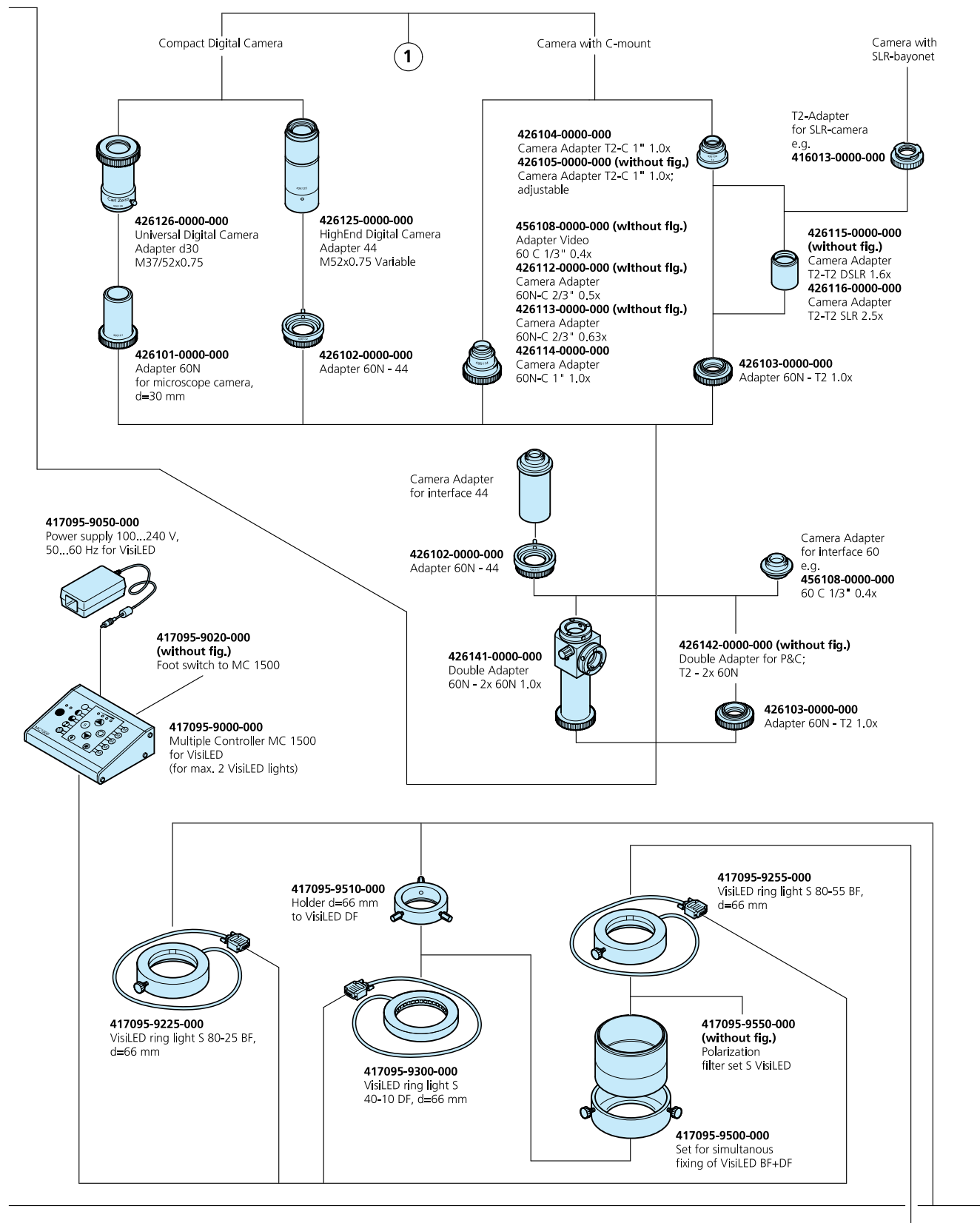


Fig. 9 System overview (page 5)

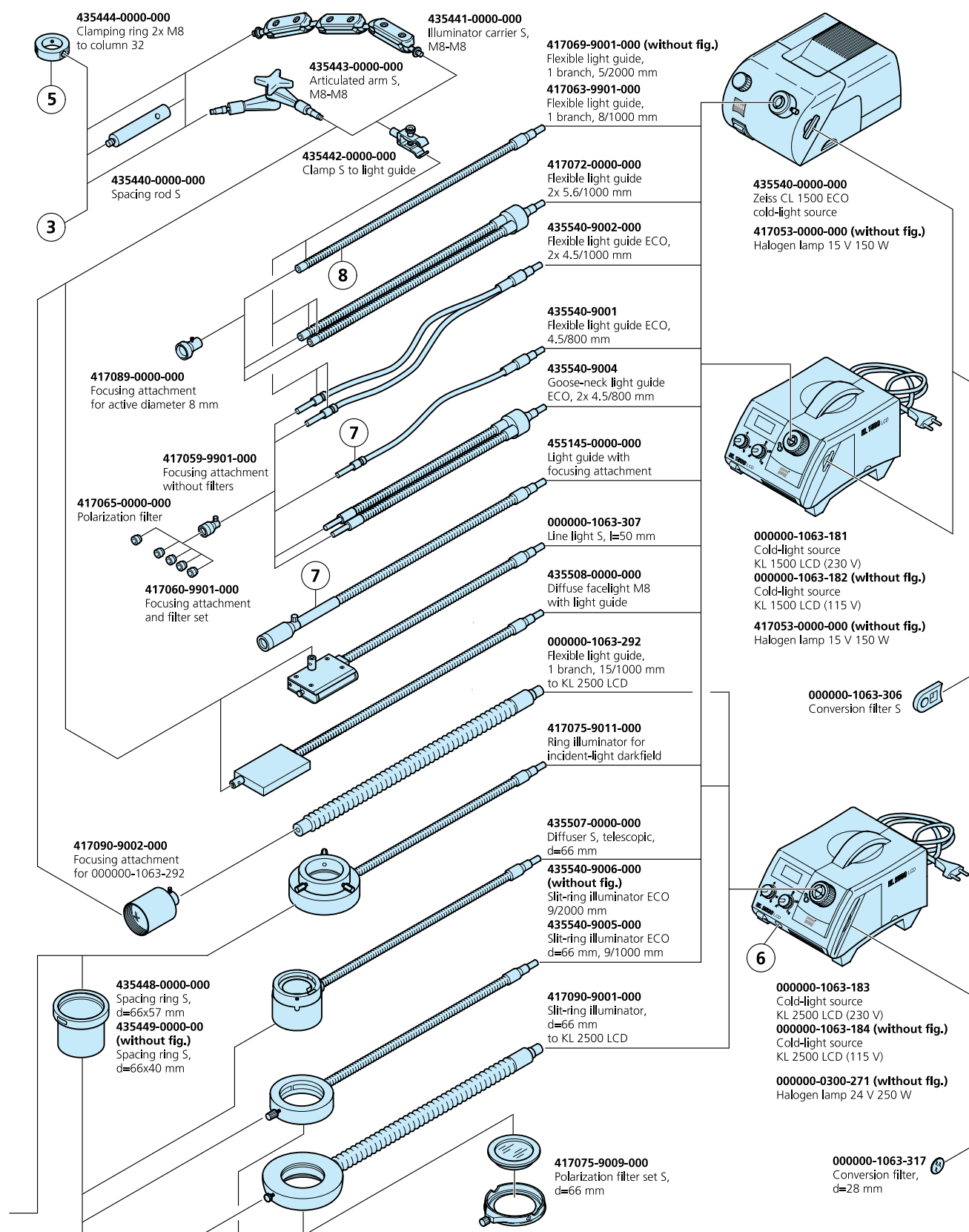


Fig. 10 System overview (page 6)

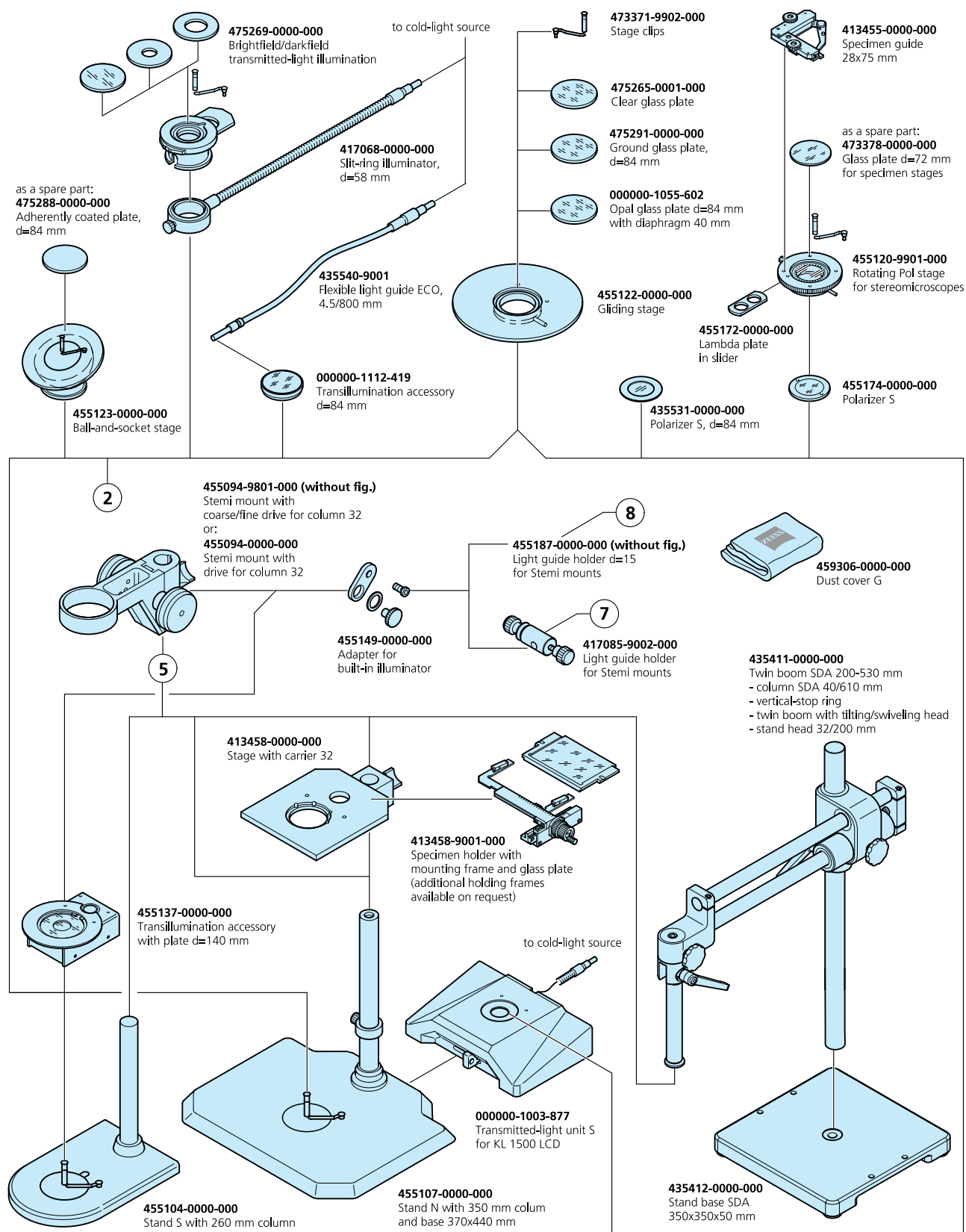
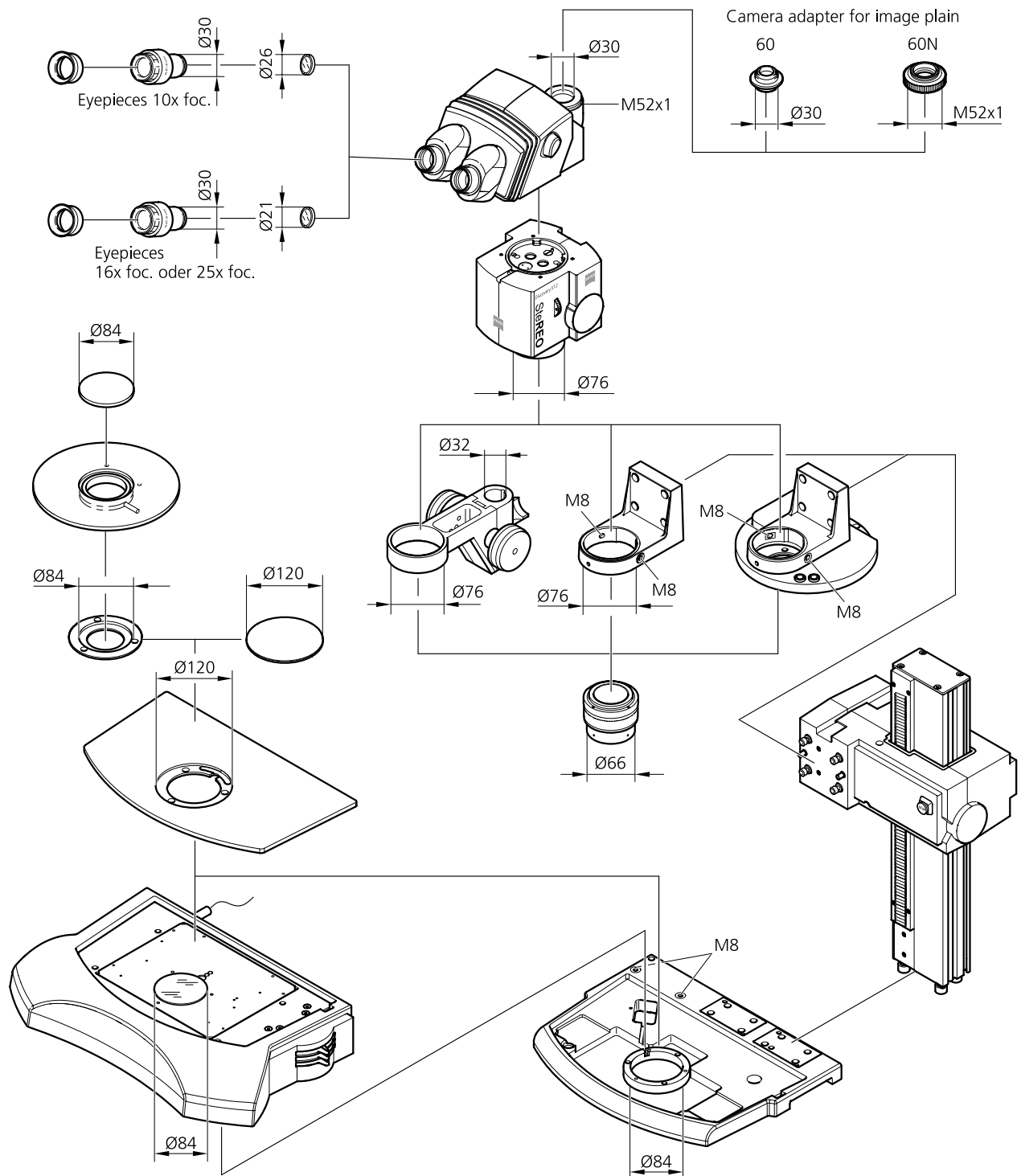
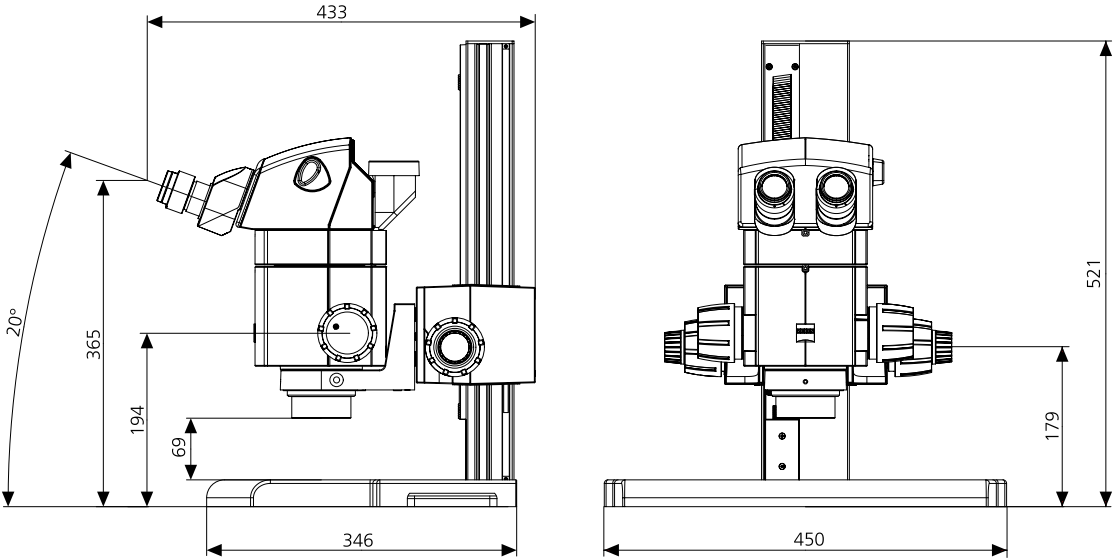


Fig. 11 System overview (page 7)

2.4 Mechanical interfaces on SteREO Discovery**Fig. 12 Mechanical interfaces on SteREO Discovery**

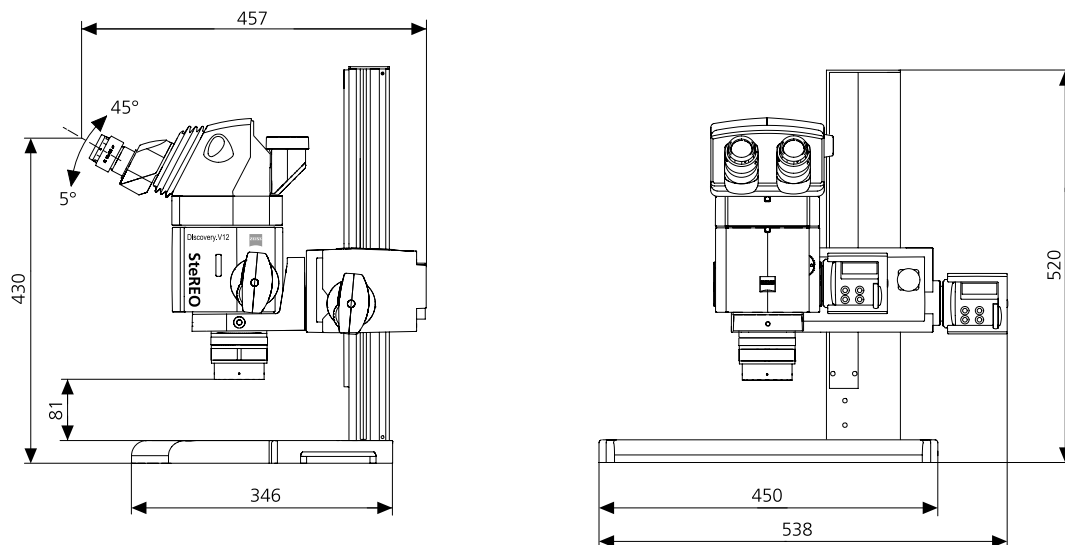
2.5 Technical data

Dimensions of SteREO Discovery.V8



Weight of SteREO Discovery.V8

Microscope body	1.4 kg
Binocular tube S 35°	1.1 kg
Coarse/fine drive with Profile S column	9.3 kg
Stand plate, Profile S	9.1 kg
Total weight	≥ 25 kg

Dimensions of SteREO Discovery.V12/V20**Weight of SteREO Discovery.V12/V20**

Microscope body V12	2.0 kg
Microscope body V20	2.0 kg
Binocular ergo phototube	2.0 kg
Motorized focusing system with Profile "S" column.....	9.5 kg
Stand base, Profile S	9.1 kg
Total weight	≥ 30 kg

Ambient conditions for SteREO Discovery**Storage (in packaging)**

Permissible ambient temperature	+10 to +40 °C
Permissible relative humidity	max. 75 % at +35 °C (no condensation)

Transport (in packaging)

Permissible ambient temperature	-40 to +70 °C
---------------------------------------	---------------

Operation

Permissible ambient temperature	+10 to +40 °C
Permissible relative humidity	max. 75 %
Atmospheric pressure	800 hPa to 1060 hPa
Pollution degree	2

Operating data**1.) EMS-2 Electronic Module as part of SYCOP**

Electrical protection class	I
Protection type	IP 20
Electrical safety	in compliance with EN 61010-1 (IEC 1010-1) under consideration of CSA and UL directives
Overvoltage category	II
Radio interference suppression.....	in accordance with EN 55011 class B
Noise immunity.....	in accordance with EN 61326
Line voltage (wide input).....	100 to 240 V \pm 10 %
Line frequency	50 to 60 Hz
Power consumption	230 VA
Fuses	2x T 2.5 A/E, 250 V, 5x20 mm
Output voltage	24 V DC, stabilized, 4.5 A, 108 W

2.) Plug-in power unit as part of HIP

Electrical protection class	II
Protection type	IP 40
Line voltage (wide input).....	100 to 240 V \pm 10 %
Line frequency	50 to 60 Hz
Power consumption	700 mA
Output voltage	24 V DC; stabilized; 1.25 A; 30 W

Focusing drive

Travel	340 mm
Maximum specimen height (including stage equipment and parfocalized objective) when using	
Objective nosepiece.....	200 mm
Support with 76 mm mount, bottom	205 mm
Support with 76 mm mount, top.....	300 mm
Reduction of maximum specimen height by transmitted-light equipment	55 mm
Travel per revolution of manual focusing drive	
Coarse focusing drive	27.9 mm
Fine focusing drive	2.2 mm
Step size of motorized focusing drive.....	0.35 μ m

Optical data of SteREO Discovery.V8

Objective...			... with eyepiece WPL 10x/23 Br. foc		... with eyepiece PL 16x/16 Br. foc		... with eyepiece W 25x/10 foc	
	Factor	FWD ¹⁾ in mm	Magnification	Object field in mm	Magnification	Object field in mm	Magnification	Object field in mm
PlanApo S*	0.63x	81	6.3x ... 50.4x	36.5 ... 4.6	10.1x ... 80.6x	25.4 ... 3.2	15.8x ... 126x	15.9 ... 2.0
PlanApo S*	1.0x	60	10x ... 80x	23.0 ... 2.9	16x ... 128x	16.0 ... 2.0	25x ... 200x	10.0 ... 1.3
PlanApo S*	1.5x	30	15x ... 120x	15.3 ... 1.9	24x ... 192x	10.7 ... 1.3	37.5x ... 300x	6.7 ... 0.8
PlanApo S	2.3x	10	23x ... 184x	10.0 ... 1.3	37x ... 294x	7.0 ... 0.9	57.5x ... 460x	4.3 ... 0.6
PlanApo S ** ***	3.5x mono	16	35x ... 280x	6.6 ... 0.8	56x ... 448x	4.1 ... 0.51	87.5x ... 700x	2.6 ... 0.33
Plan S*	1.0x	81	10x ... 80x	23.0 ... 2.9	16x ... 128x	16.0 ... 2.0	25x ... 200x	10.0 ... 1.3
Achromat S	0.3x	236	3x ... 24x	76.7 ... 9.6	4.8x ... 38.4x	53.3 ... 6.7	7.5x ... 60x	33.3 ... 4.2
Achromat S	0.5x	134	5x ... 40x	46.0 ... 5.8	8x ... 64x	32.0 ... 4.0	12.5x ... 100x	20.0 ... 2.5
Achromat S*	0.63x	107	6.3x ... 50.4x	36.5 ... 4.6	10.1x ... 80.6x	25.4 ... 3.2	15.8x ... 126x	15.9 ... 2.0
Achromat S**	1.0x	63	10x ... 80x	23.0 ... 2.9	16x ... 128x	16.0 ... 2.0	25x ... 200x	10.0 ... 1.3
Achromat S**	1.25x	50	12.5x ... 100x	18.4 ... 2.3	20x ... 160x	12.8 ... 1.6	31.3x ... 250x	8.0 ... 1.0
Achromat S**	1.5x	28	15x ... 120x	15.3 ... 1.9	24x ... 192x	10.7 ... 1.3	37.5x ... 300x	6.7 ... 0.8

¹⁾ FWD - Free Working Distance

* for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 137 mm

** for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 93 mm

*** The PlanApo S 3.5x mono objective can be used exclusively in the objective slider S/doc or in the objective nosepiece S/doc, 3x, 6x cod. for one-channel imaging. Stereoscopic observation is not possible.

Optical data of SteREO Discovery.V12

(for resolving power and depth of focus, see HIP or SYCOP display)

Objective...			... with eyepiece WPL 10x/23 Br. foc		... with eyepiece PL 16x/16 Br. foc		... with eyepiece W 25x/10 foc	
	Factor	FWD ¹⁾ in mm	Magnification	Object field in mm	Magnification	Object field in mm	Magnification	Object field in mm
PlanApo S*	0.63x	81	5.0x ... 63x	46 ... 3.7	8.1x ... 101x	32 ... 2.5	12.6x ... 158x	20 ... 1.6
PlanApo S*	1.0x	60	8.0x ... 100x	29 ... 2.3	12.8x ... 160x	20 ... 1.6	20x ... 250x	12.5 ... 1.0
PlanApo S*	1.5x	30	12.0x ... 150x	19 ... 1.5	19.2x ... 240x	13.3 ... 1.1	30x ... 375x	8.3 ... 0.7
PlanApo S	2.3x	10	18.4x ... 230x	12 ... 1.0	29.4x ... 368x	8.7 ... 0.7	46x ... 575x	5.4 ... 0.4
PlanApo S ** ***	3.5x mono	16	35x ... 280x	6.6 ... 0.8	56x ... 448x	4.1 ... 0.51	87.5x ... 700x	2.6 ... 0.33
Plan S*	1.0x	81	8.0x ... 100x	29 ... 2.3	12.8x ... 160x	20 ... 1.6	20x ... 250x	12.5 ... 1.0
Achromat S	0.3x	236	2.4x ... 30x	96 ... 7.7	3.8x ... 48x	66.7 ... 5.3	6.0x ... 75x	41.7 ... 3.3
Achromat S	0.5x	134	4.0x ... 50x	58 ... 4.6	6.4x ... 80x	40.0 ... 3.2	10x ... 125x	25.0 ... 2.0
Achromat S*	0.63x	107	5.0x ... 63x	46 ... 3.7	8.1x ... 101x	32 ... 2.5	12.6x ... 158x	20 ... 1.6
Achromat S**	1.0x	63	8.0x ... 100x	29 ... 2.3	12.8x ... 160x	20 ... 1.6	20x ... 250x	12.5 ... 1.0
Achromat S**	1.25x	50	10x ... 120x	124 ... 1.8	16x ... 200x	16 ... 1.3	25x ... 313x	10 ... 0.8
Achromat S**	1.5x	28	12.0x ... 150x	19 ... 1.5	19.2x ... 240x	13.3 ... 1.1	30x ... 375x	8.3 ... 0.7

¹⁾ FWD – Free Working Distance

* for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 137 mm

** for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 93 mm

*** The PlanApo S 3.5x mono objective can be used exclusively in the objective slider S/doc or in the objective nosepiece S/doc, 3x, 6x cod. for one-channel imaging. Stereoscopic observation is not possible.

Optical data of SteREO Discovery.V20

(for resolving power and depth of focus, see HIP or SYCOP display)

Objective...			... with eyepiece WPL 10x/23 Br. foc		... with eyepiece PL 16x/16 Br. foc		... with eyepiece W 25x/10 foc****	
	Factor	FWD ¹⁾ in mm	Magnification	Object field in mm	Magnification	Object field in mm	Magnification	Object field in mm
PlanApo S*	0.63x	81	4.7x ... 94.5x	48.7 ... 2.4	7.6x ... 151x	33.9 ... 1.7	11.8x ... 236x	21.1 ... 1.1
PlanApo S*	1.0x	60	7.5x ... 150x	30.7 ... 1.5	12x ... 240x	21.3 ... 1.1	18.8x ... 375x	13.3 ... 0.7
PlanApo S*	1.5x	30	11.3x ... 225x	20.4 ... 1.0	18x ... 360x	14.2 ... 0.7	28.1x ... 563x	8.9 ... 0.4
PlanApo S	2.3x	10	17.3x ... 345x	13.3 ... 0.7	27.6x ... 552x	9.3 ... 0.5	43.1x ... 863x	5.8 ... 0.3
PlanApo S ** ***	3.5x mono	16	26.3x ... 525x	8.8 ... 0.4	42x ... 840x	5.5 ... 0.27	65.6x ... 1312.5x	3.5 ... 0.18
Plan S*	1.0x	81	7.5x ... 150x	30.7 ... 1.5	12x ... 240x	21.3 ... 1.1	18.8x ... 375x	13.3 ... 0.7
Achromat S	0.3x	236	2.3x ... 45x	102 ... 5.1	3.6x ... 72x	71.1 ... 3.6	5.6x ... 113x	44.4 ... 2.2
Achromat S	0.5x	134	3.8x ... 75x	61.3 ... 3.1	6x ... 120x	42.7 ... 2.1	9.4x ... 188x	26.7 ... 1.3
Achromat S*	0.63x	107	4.7x ... 94.5x	48.7 ... 2.4	7.6x ... 151x	33.9 ... 1.7	11.8x ... 236x	21.1 ... 1.1
Achromat S**	1.0x	63	7.5x ... 150x	30.7 ... 1.5	12x ... 240x	21.3 ... 1.1	18.8x ... 375x	13.3 ... 0.7
Achromat S**	1.25x	50	9.4x ... 188x	24.6 ... 1.2	15x ... 192x	17.0 ... 0.9	23.5x ... 469x	10.6 ... 0.6
Achromat S**	1.5x	28	11.3x ... 225x	20.4 ... 1.0	18x ... 360x	14.2 ... 0.7	28.1x ... 563x	8.9 ... 0.4

¹⁾ FWD - Free Working Distance

* for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 137 mm

** for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 93 mm

*** The PlanApo S 3.5x mono objective can be used exclusively in the objective slider S/doc or in the objective nosepiece S/doc, 3x, 6x cod. for one-channel imaging. Stereoscopic observation is not possible.

**** When the eyepiece W25/10x foc is used, one goes clearly beyond the useful magnification range. A reduced image contrast due to an empty magnification may result.

Optical data of the converter S 1.5x mono

Every Discovery stereo objective can be combined with the converter S 1.5x mono. The converter is screwed between the microscope body and the objective. It effectuates an increase in magnification and resolution by the factor of 1.5x, related to the single objective, and a decrease in the depth of focus by the factor of 2.25x. The working distance of the stereo objective remains unchanged, the parfocal distance, however, increases by 51 mm.

The correction of the objective does not change either, i.e. the combination of an apochromatic objective with the converter is apochromatically corrected and the combination of an achromatic objective with the converter is achromatically corrected.

Example:

Combining the objective PlanApo S 1,0x - free working distance 60 mm and parfocal distance 137 mm - with the converter S 1.5 mono will yield a total objective magnification of 1.5x, a free working distance of 60 mm and a parfocal distance of 188 mm with apochromatic correction. The resolution will increase by 1.5x.

The combination of stereo objectives and converter is only possible on the objective slider S/doc or the objective nosepiece S/doc, 3x, 6x cod. in the mono position for single-channel observation.

For binocular observations we recommend the combination with the Y intermediate tube S, switchable.

Objective...			... with eyepiece WPL 10x/23 Br. foc		... with eyepiece PL 16x/16 Br. foc		... with eyepiece W 25x/10 foc****	
	Factor	Con- verter	Magnification	Object field in mm	Magnification	Object field in mm	Magnification	Object field in mm
PlanApo S*	0.63x	1.5x	9.5x ... 75.6x	24.3 ... 3.0	15.1x ... 121x	16.9 ... 2.1	23.6x ... 189x	10.6 ... 1.3
PlanApo S*	1.0x	1.5x	15x ... 120x	15.3 ... 1.9	24x ... 192x	10.7 ... 1.3	37.5x ... 300x	6.7 ... 0.8
PlanApo S*	1.5x	1.5x	22.5x ... 180x	10.2 ... 1.3	36x ... 288x	7.1 ... 0.9	56.3x ... 450x	4.4 ... 0.6
PlanApo S	2.3x	1.5x	34.5x ... 276x	6.7 ... 0.8	55.2x ... 441.6x	4.6 ... 0.6	86.3x ... 690x	2.9 ... 0.4
PlanApo S ** ***	3.5x mono	1.5x	52.5x ... 420x	4.4 ... 0.5	84x ... 672x	3.0 ... 0.4	131.3x ... 1050x	1.9 ... 0.24
Plan S*	1.0x	1.5x	9.5x ... 75.6x	15.3 ... 1.9	24x ... 192x	10.7 ... 1.3	37.5x ... 300x	6.7 ... 0.7
Achromat S	0.3x	1.5x	4.5x ... 36x	51.1 ... 6.4	7.2x ... 57.6x	35.5 ... 4.4	11.3x ... 90x	22.2 ... 2.8
Achromat S	0.5x	1.5x	7.5x ... 60x	30.7 ... 3.8	12x ... 96x	21.3 ... 2.7	18.8x ... 150x	13.3 ... 1.7
Achromat S*	0.63x	1.5x	9.5x ... 75.6x	24.3 ... 3.0	15.1x ... 121x	16.9 ... 2.1	23.6x ... 189x	10.6 ... 1.3
Achromat S**	1.0x	1.5x	15x ... 120x	15.3 ... 1.9	24x ... 192x	10.7 ... 1.3	37.5x ... 300x	6.7 ... 0.8
Achromat S**	1.25x	1.5x	18.8x ... 150x	12.3 ... 1.5	30x ... 240x	8.5 ... 1.1	46.9x ... 375x	5.3 ... 0.7
Achromat S**	1.5x	1.5x	22.5x ... 180x	10.2 ... 1.3	36x ... 288x	7.1 ... 0.9	56.3x ... 450x	4.4 ... 0.6

1) FWD - Free Working Distance

* for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 137 mm

** for objective nosepiece S/doc, 3x, 6x cod. parfocalized objectives with parfocal distance 93 mm

*** The PlanApo S 3.5x mono objective can be used exclusively in the objective slider S/doc or in the objective nosepiece S/doc, 3x, 6x cod. for one-channel imaging. Stereoscopic observation is not possible.

**** When the eyepiece W25/10x foc is used, one goes clearly beyond the useful magnification range. A reduced image contrast due to an empty magnification may result.

Optical data of Vario front lens system 0.3x - 0.5x

Vario front lens system 0.3x - 0.5x for	Factor	FWD ¹⁾ in mm
Achromat S 0.5x	0.04x - 0.14x	1500 - 300
Achromat S 0.63x	0.14x - 0.26x	404 - 141

1) FWD - Free Working Distance

Vario front lens system 0.3x - 0.5x for	Factor	SteREO Discovery.V8 with eyepiece WPL 10x/23 Br. foc		SteREO Discovery.V12 with eyepiece WPL 10x/23 Br. foc		SteREO Discovery.V20 with eyepiece WPL 10x/23 Br. foc	
		Magnification	Object field in mm	Magnification	Object field in mm	Magnification	Object field in mm
Achromat S 0.5x	0.14x	1.4x - 11.0x	167 - 21	1.1x - 13.8x	208 - 17	1.0x - 20.6x	223 - 11
	0.04x	0.4x - 3.2x	575 - 72	0.32x - 4.0x	719 - 58	0.3x - 6.0x	767 - 38
Achromat S 0.63x	0.26x	2.7x - 21.8x	84 - 11	2.1x - 26.5x	108 - 8.7	2.0x - 40x	115 - 5.8
	0.14x	1.4x - 10.8x	170 - 21	1.1x - 13.5x	213 - 17	1.0x - 20.3x	227 - 11


3 START UP


3.1 Installation


Because of the complexity of the equipment, and to ensure perfect functioning, Carl Zeiss service will install and start up the instrument the first time.


The services in particular include the following:


- Installation and adjustment of all components
- Establishing cable connections and connecting the supply cables
- Firmware installation (factory-set) and configuration
- Introduction into instrument operation

 Before installation and start up, make sure to read the **Notes on instrument safety** carefully (refer to Section 1.2).

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

 Do not transport the installed, upright standing system over long distances. Avoid heavy shocks to the focusing drive as this might damage the rack of the column. For this, see Section 3.12.

 After having installed and connected the instrument, you should adjust the mechanical end stops for the travel of the motorized focusing drive (see Section 3.11).

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

The SteREO Discovery, including necessary tools and optional accessories, is supplied packed to commercial standards in several packages.

- Remove all units from the packaging and verify that all parts specified on the delivery note are present.
- Remove any transport locks (adhesive tapes or similar items).
- Keep the original packaging for any extended periods of non-use or return to the manufacturer, or dispose of it in compliance with the relevant regulations.
- Some components are supplied in special packaging, e.g. the Plan Apo S objective. You are strongly advised to use the special packaging for storing these components in extended periods of non-use or for their transport.

3.1.1 Installing stand components



The microscope configuration shown here may differ from that of your microscope!



To avoid any damage to the motorized focusing drive (Fig. 13/A), put it down only on the **back** of the column (Fig. 13/a) using sufficiently high supporting blocks (Fig. 13/c) (do **not** put it onto the rack side). The focusing unit (Fig. 13/b) of the focusing drive must not be used as support. Do not lift or carry the focusing drive by holding it at the focusing unit (Fig. 13/b)! Avoid heavy shocks to the focusing drive.

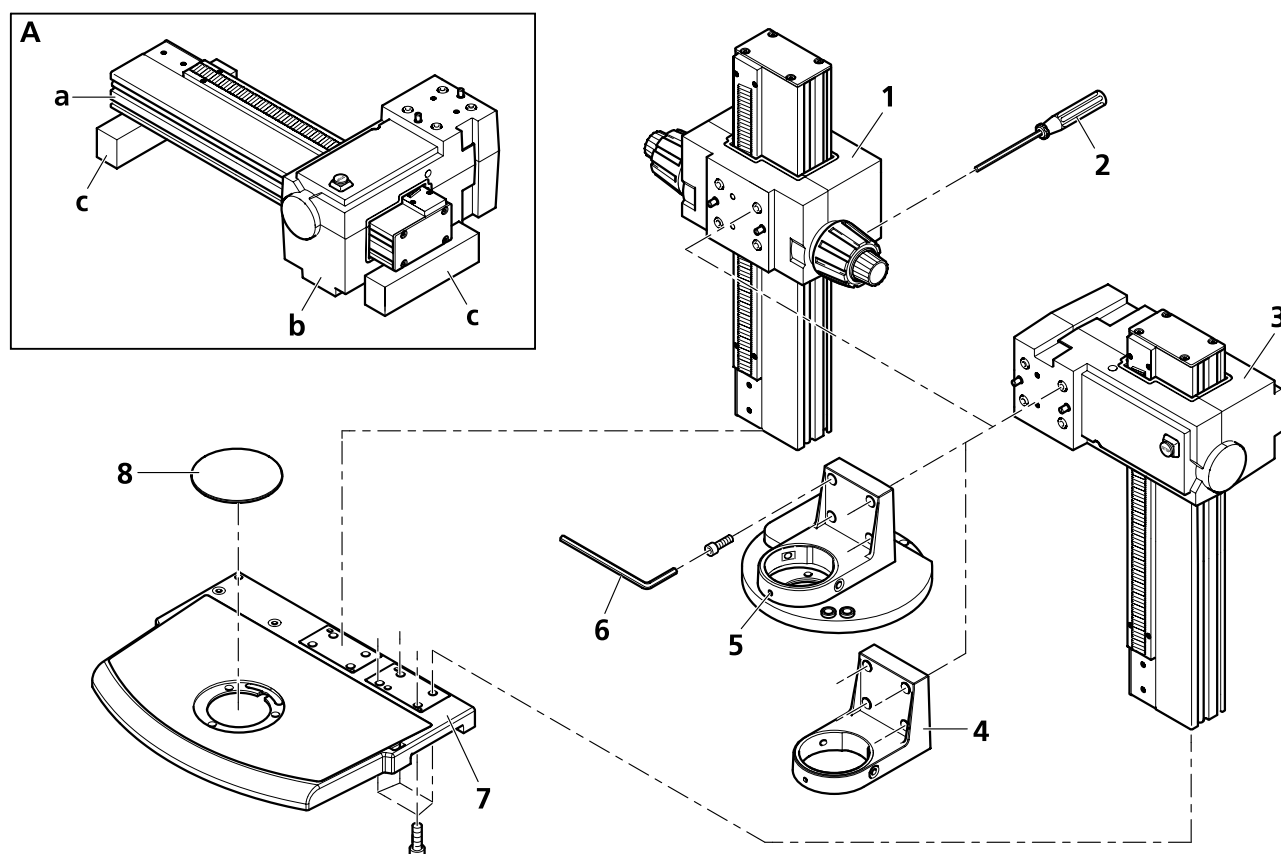


Fig. 13 **Setting up the stand**

- Attach the column of the *motorized focusing drives* (Fig. 13/3) to the **right** mounting surface of the stand base (Fig. 13/7) or the column of the *manual focusing drive* (Fig. 13/1) to the **left** mounting surface and let the two locating screws click into place.
- Screw on the column tightly by screwing four Allen screws (SW 8) through the stand base (Fig. 13/7).
- Set up stand base (Fig. 13/7) with screwed on column.



Refer to Section 3.1.2 if you intend to use the optional transmitted-light equipment S.



Proceed with Section 3.1.3 if you intend to use a stage.

- Put carrier (Fig. 13/4) or objective nosepiece (Fig. 13/5) onto the focusing drive letting the two locating screws click into place and keeping hold of the respective unit until the first screw has been tightened.



Mount the carrier (Fig. 13/4) rotated by 180° if you want to examine higher samples.

- Screw down all four Allen screws (SW 5). Use the long leg of the offset Allen key (Fig. 13/6) to screw the screws in, and the short leg to fasten them hand-tight.
- Insert 120 mm B/W plastic plate (Fig. 13/8); press on its rear edge to remove it again.

Adjusting the travel of the motorized focusing drive

See Section 3.11, page 61.

Adjusting the torque of the manual focusing drive

Readjustment of the torque of the manual focusing drives becomes necessary, if the drive moves down by itself (e.g. because of an additional load on the microscope body or the objective nosepiece). In this case, the torque of the focusing drive must be increased. The torque has been adjusted correctly if the drive no longer moves down by itself. With additional loads of 10 kg or higher on the carrier or the nosepiece, it is advisable to use the motorized focusing drive.

If the motion of the drive is too stiff, the torque may also be reduced to improve the movability of the drive.


- Insert the supplied ball-headed screwdriver with SW 3 mm (Fig. 13/2) in one of the bores that are radially arranged on the torque-adjusting ring.
- To increase the torque (braking force), hold the coarse-focusing knob tight with your hand and turn the torque-adjusting ring clockwise. To reduce the torque of the focusing drive, turn the torque-adjusting ring counterclockwise.

Conversion work

- If the adapter ring (Fig. 14/4) is not mounted (e.g. after the removal of the transmitted-light equipment S), use three Allen screws (SW 3) to fasten it to the stand base (Fig. 14/5); then, put the insert plate (Fig. 14/3) onto the base.
- Fasten the insert plate (Fig. 14/3) without stage adapter to the adapter ring (Fig. 14/4) by means of three short Allen screws (Fig. 14/2).

3.1.2 Installing the optional transmitted-light equipment S

- Remove the insert plate (Fig. 14/3). To this end, loosen the three short Allen screws (Fig. 14/2), lift up the insert plate (using the grip hollow at the right edge of the stand base (Fig. 14/5)) and, taking hold of it with both hands, remove it safely.
- Loosen the three Allen screws (SW 3) of the adapter ring (Fig. 14/4) with the ball-headed screwdriver and remove the adapter ring.
- Put the transmitted-light equipment S (Fig. 14/6) laterally correct onto the stand base. Verify that the two large plastic taper pins on the bottom of the transmitted-light equipment S engage with the respective holes of the stand base.
- Use the ball-headed screwdriver (Fig. 14/9) to screw down the four countersunk Allen screws (SW 3) hand-tight on the transmitted-light equipment S.
- Put the insert plate (Fig. 14/3) onto the transmitted-light equipment S (Fig. 14/6).
- Insert the opal glass plate \varnothing 84 mm (Fig. 14/8) to avoid that screws and other small parts get lost during the further installation work.
- Using the three, short Allen screws (Fig. 14/2) fasten the insert plate (Fig. 14/3) (without stage - adapter) to the transmitted-light equipment S.

 Refer to Section 3.1.3 if you intend to use a stage.

- Replace the opal glass plate \varnothing 84 mm (Fig. 14/8) by insert 52/84 (Fig. 14/7).
- Insert the 120 mm glass plate (Fig. 14/1); to remove it again, press on its rear edge.

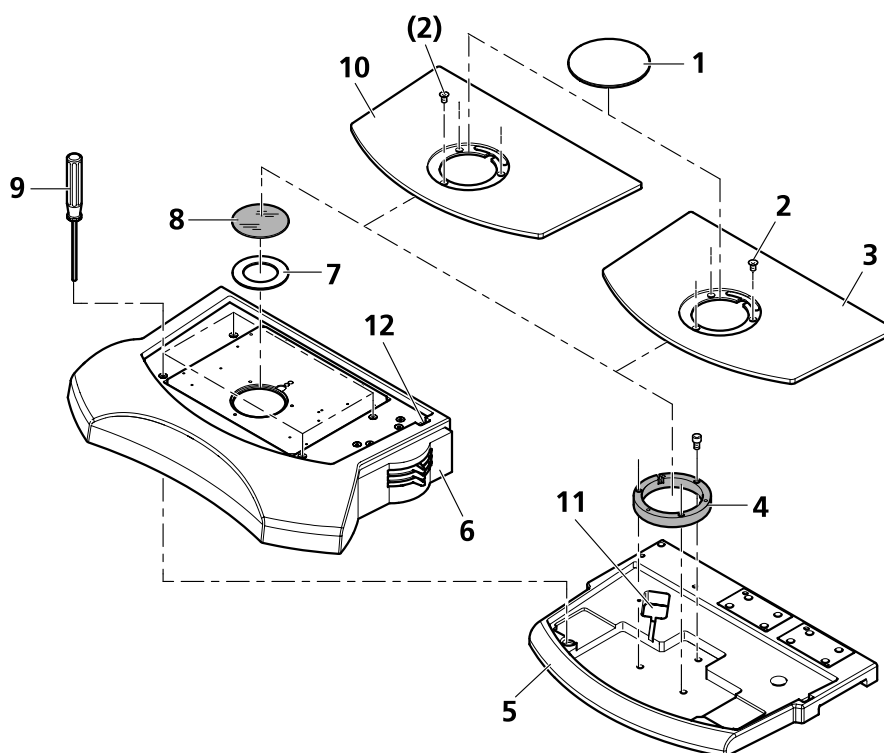


Fig. 14 Installing the transmitted-light equipment S

3.1.3 Mounting the optional ferromagnetic insert plate 450 and the heatable ferromagnetic insert plate 450



If working with manipulators with magnetic feet (e.g. YOU-1 manipulator set, GJ-1 magnetic stand or TSA-Z magnetic stand of Narishige), the ferromagnetic insert plate 450 (Fig. 14/10) can be inserted alternatively to the stand insert plate (Fig. 14/3).


Alternatively to the ferromagnetic insert plate 450, a heatable ferromagnetic insert plate 450 can be inserted and fixed. The heatable ferromagnetic insert plate 450 is a component part of the sales unit "heating device S 450" and includes a heatable glass insert. Also included in the delivery scope of the heating device S 450 is the controller SC 300.


Mounting the insert plate to the transmitted-light equipment S:

- Fasten the ferromagnetic insert plate 450 (Fig. 14/10) with three short Allen screws (Fig. 14/2) (without stage adapter 84/120 mm) to the transmitted-light equipment S (Fig. 14/6).
- If you use the heatable ferromagnetic insert plate 450, pass the two heating cables through the lateral cavity (Fig. 14/12) in the transmitted-light equipment S and then to the outside.
- Fasten the heatable ferromagnetic insert plate 450 (Fig. 14/10) with three short Allen screws (Fig. 14/2) (without stage adapter 84/120 mm) to the transmitted-light equipment S.
- Insert the heatable glass insert into the 120 mm outer diameter.
- Connect the two heating cables to the controller SC 300.

 For installing and operating the controller SC 300 please see the manual included separately in the delivery.

 Attention, crush hazard!
 When you insert and remove the ferromagnetic insert plate 450 or the heatable ferromagnetic insert plate 450, use the flat plastic material included in the delivery to avoid the danger of jamming your fingers.

 To mount or dismount the heatable ferromagnetic insert plate 450, the controller SC 300 must be switched off.

 Before you remove the heatable ferromagnetic insert plate 450, let it cool down to room temperature.

Mounting the insert plate to the stand plate:

- Fasten the ferromagnetic insert plate 450 (Fig. 14/10) with three short Allen screws (Fig. 14/2) (without stage adapter 84/120 mm) to the adapter ring (Fig. 14/4) of the stand plate (Fig. 14/5).
- If you use the heatable ferromagnetic insert plate 450, pass the two heating cables through the recess (Fig. 14/11) formed in the stand plate and then to the outside.
- Fasten the heatable ferromagnetic insert plate 450 (Fig. 14/10) with three short Allen screws (Fig. 14/2) (without stage adapter 84/120 mm) to the adapter ring (Fig. 14/4) of the stand plate (Fig. 14/5).
- Connect the two heating cables to the controller SC 300.



For installing and operating the controller SC 300 please see the manual included separately in the delivery.



Attention, crush hazard!



When you insert and remove the ferromagnetic insert plate 450 or the heatable ferromagnetic insert plate 450, use the flat plastic material included in the delivery to avoid the danger of jamming your fingers.



To mount or dismount the heatable ferromagnetic insert plate 450, the controller SC 300 must be switched off.



Before you remove the heatable ferromagnetic insert plate 450, let it cool down to room temperature.

3.1.4 Installing the stage

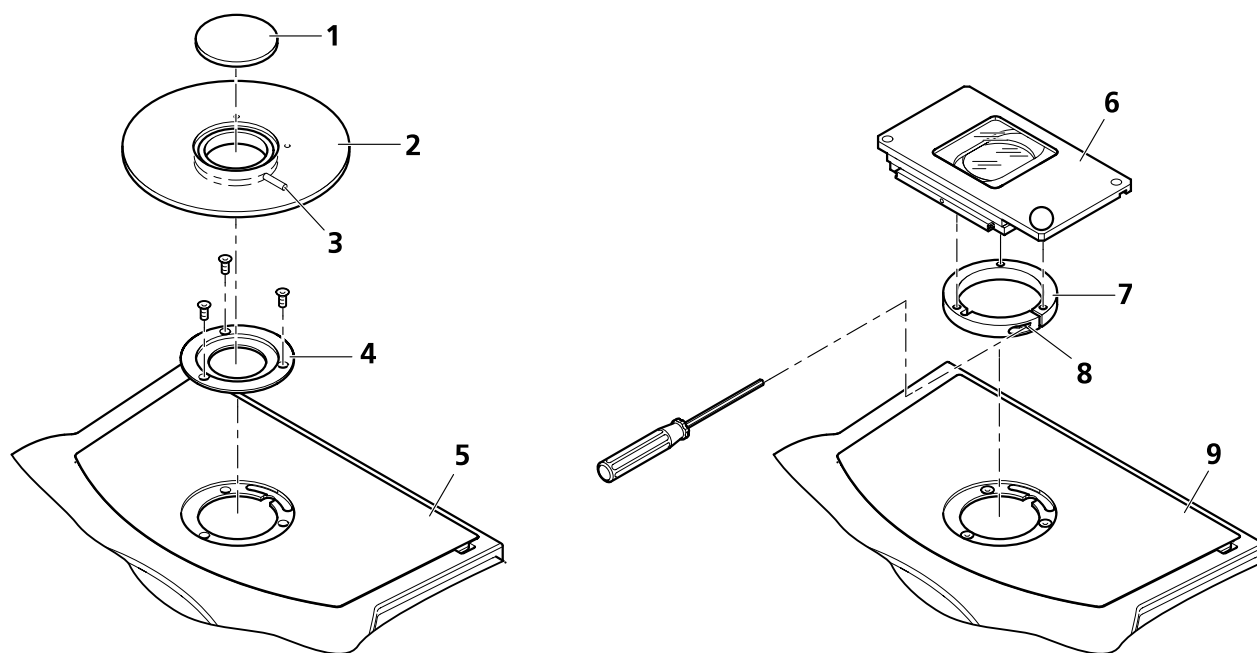




Fig. 15 Installing the stage

Stages with 84 mm interface

 Stages with 84 mm interface should be fastened to the stand base by means of the 84/120 mm stage adapter (Fig. 15/4).

- Unscrew three short Allen screws (SW 3) from insert plate (Fig. 15/5).
- Use three longer Allen screws (SW 3) to screw down the stage adapter (Fig. 15/4) hand-tight through the insert plate.
- Put the stage (Fig. 15/2) onto the stage adapter and align it.
- Throw eccentric clamping lever (Fig. 15/3) over to clamp the stage in the stage adapter.
- Put the round 84 mm plate (Fig. 15/1) into the stage interface.

Stages with 120 mm interface

 Stages with 120 mm interface (Fig. 15/6) should be fastened to the insert plate (Fig. 15/9) by means of the stage-clamping ring mounted to the stage (Fig. 15/7). Do not remove the stage-clamping ring.

- Put the stage with installed stage-clamping ring (Fig. 15/6 and 7) onto the insert plate (Fig. 15/9) and align it.
- Clamp the stage-clamping ring in the insert plate by turning the Allen screw (SW 3) (Fig. 15/8) clockwise.

3.1.5 Installing the SteREO microscope

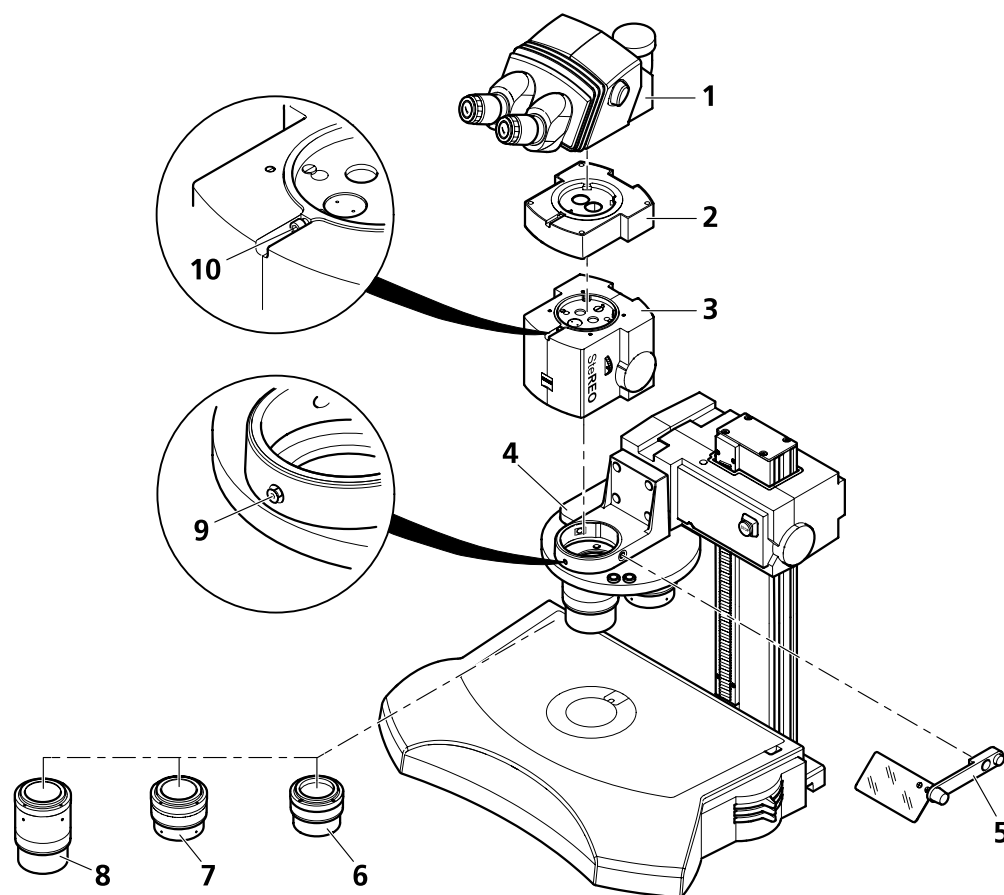


Fig. 16 Installing the microscope

- Verify that the grub screw (SW 3) on the carrier or objective nosepiece (Fig. 16/9) does not project into the opening of the holder. Turn it counterclockwise by a few turns, if necessary, using the ball-headed screwdriver (but do not fully unscrew it!).
- Put the microscope body (Fig. 16/3) into the mount (\varnothing 76 mm) of the carrier or objective nosepiece (Fig. 16/4) and align it.
- Fasten the grub screw (Fig. 16/9) on the carrier or objective nosepiece hand-tight.






Always hold the objective with both hands to ensure safe installation. When installing the objective, use its lens-protective cap! Always store the objectives in the special packaging.



Order of installation: At first, install the shortest objective (Fig. 16/6), then the medium one (Fig. 16/7) and finally the longest one (Fig. 16/8). To remove the objectives, proceed reversely.

- Take up the objective (Fig. 16/6) with both hands and screw it counterclockwise into the microscope body or objective nosepiece (upside down right-hand thread).
- Insert binocular tube (Fig. 16/1) in dovetail mount and clamp it by screwing down the Allen screw (Fig. 16/5) hand-tight using the ball-headed screwdriver.

-  You can use up to two 40 mm high intermediate tubes (Fig. 16/2) to increase the viewing height by a maximum of 80 mm. Clamp them in the same way as the binocular tube.
-  To avoid being dazzled in transmitted light, fix the dazzle protector (Fig. 16/5) to the carrier or the objective nosepiece (Fig. 16/4) and swing it in.
-  If the microscope mounted to the manual focusing drive should come down by its own weight, please readjust the torque of the drive (see page 36).

3.1.6 Fitting the binocular tube

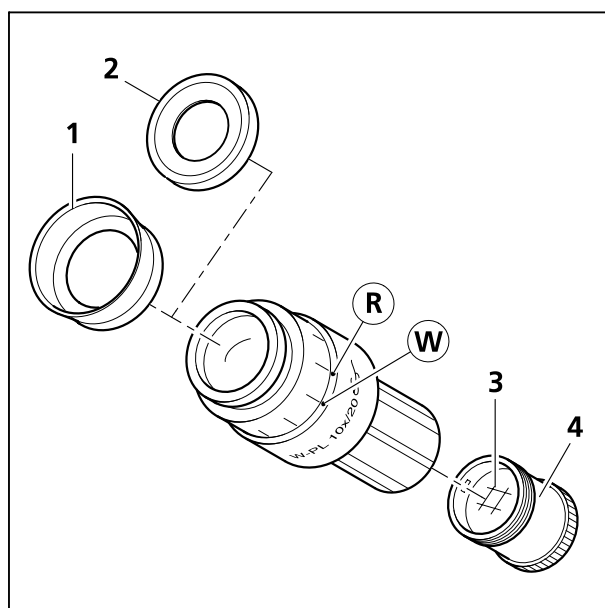


Fig. 17 Inserting the eyepiece reticle

Inserting eyepieces

- Remove both dust caps from the tube.
- Insert both eyepieces into the tube pushing them down up to the stop.

Attaching the fold-over eyecups

The eyepieces have a rubber ring each to protect the lenses of spectacles against scratches. The protection rings can be replaced with fold-over eyecups (Fig. 17/1) when required.

- Remove the protection rings (Fig. 17/2) from the eyepieces and attach the eyecups (Fig. 17/1).
- Sometimes the eyeglass protection rings are seated very tightly in the eyepiece groove, so you may need a blunt object (stick) to prod them off.

Inserting eyepiece reticles

The focusing eyepieces are intended for use with eyepiece reticles.

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. 17/W), but the red dot (Fig. 17/R).

In the eyepiece W-PL 10x/23 Br. foc. (455043-0000-000) and E-PL 10x/20 Br. Foc. (444132-9902-000) the eyepiece reticles (Fig. 17/3) have been adhered to screw-in mounts (Fig. 17/4) by the manufacturer for easy replacement. Complete mounts with reticles adhered can be ordered directly from Zeiss.

To change the mount, proceed as follows:

- Unscrew the existing mount (Fig. 17/4) with eyepiece reticle (Fig. 17/3) 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 required.



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

Installing camera adapters



On the SteREO Discovery, a new port type, "60N interface", is used for connecting cameras. However, you can continue using the well-known "60 interface" adapters (30 mm inside diameter).

The following cameras can be connected to the camera port: microscope cameras (e.g. Carl Zeiss AxioCam), commercial SLR cameras (Single Lens Reflex; 35-mm film or digital) or compact digital cameras.



Only use camera/adaptor combinations recommended by Carl Zeiss! Otherwise, clearly visible vignetting will appear (dark marginal areas of the image).



Additionally observe the separate operating instructions of the cameras used when you work with photomicrographic equipment.

Adapter for 60N interface (M52 x 1 external thread)



Before using the interface 60N-T2 1x (426103-0000-000) for SLR camera, verify that large-sized camera bodies (with a sensor diagonal of less than 18 mm) do not knock against the tube. Use an additional camera adapter with additional magnification, if necessary.

- Attach the camera adapter "60N" (Fig. 18/1; 2) to the camera.
- Remove the dust cap from the camera port.



Please note: The three grub screws (SW 3) (Fig. 18/5) at the camera port must project neither into the external thread nor into the inner aperture.

- Put the pre-assembled unit onto the camera port (Fig. 18/4 or 6), align it and fasten the sleeve nut of the adapter (Fig. 18/1 or 2) hand-tight.

Adapter for 60 interface (30 mm inside diameter)

- Attach the camera adapter "60" (Fig. 18/3) to the camera.
- Remove the dust cap from the camera port.
- Put the pre-assembled unit onto the camera port (Fig. 18/4 or 6). Take care that the three grub screws (Fig. 18/5) do not project too far into the inner aperture; unscrew them slightly, if necessary.
- Turn the three grub screws (SW 3) on the tube (Fig. 18/5) counterclockwise until the adapter is firmly seated.

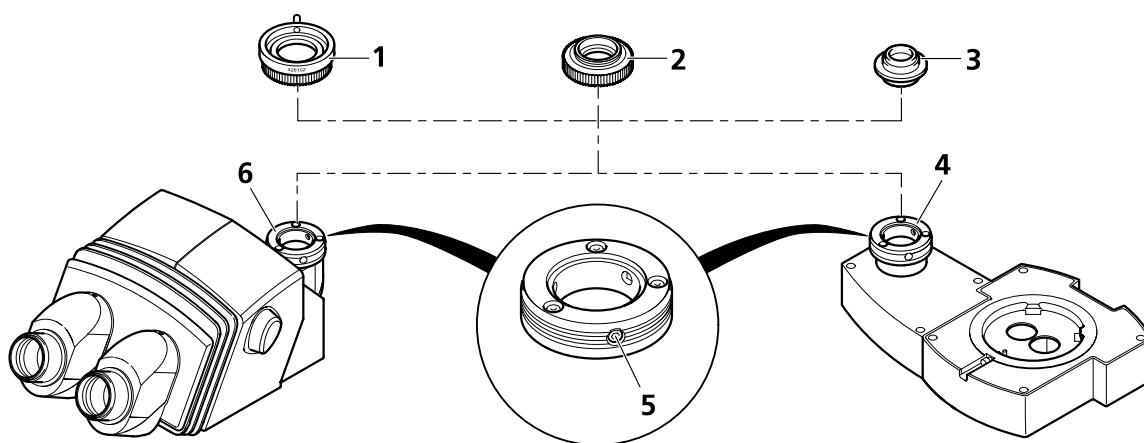


Fig. 18 **Using camera adapters**

3.1.7 Installing incident-light illuminators



- **Flexible light guide with focusing attachment** (Fig. 19/3 and 6):
To be fastened to objective nosepiece, microscope carrier or stand base (Fig. 19/8) by means of the articulated arm and the clamp.
- **Fiber-optical ring illuminators and LED ring illuminators** (Fig. 19/10):
The fiber-optical slit-ring illuminators without light guide are used for illumination purposes on objectives mounted to the objective nosepiece, see Section 3.6. It is also possible to attach a slit-ring illuminator ECO to an objective. With each objective change, however, it is necessary to detach this illuminator and to attach it again to the then used objective.

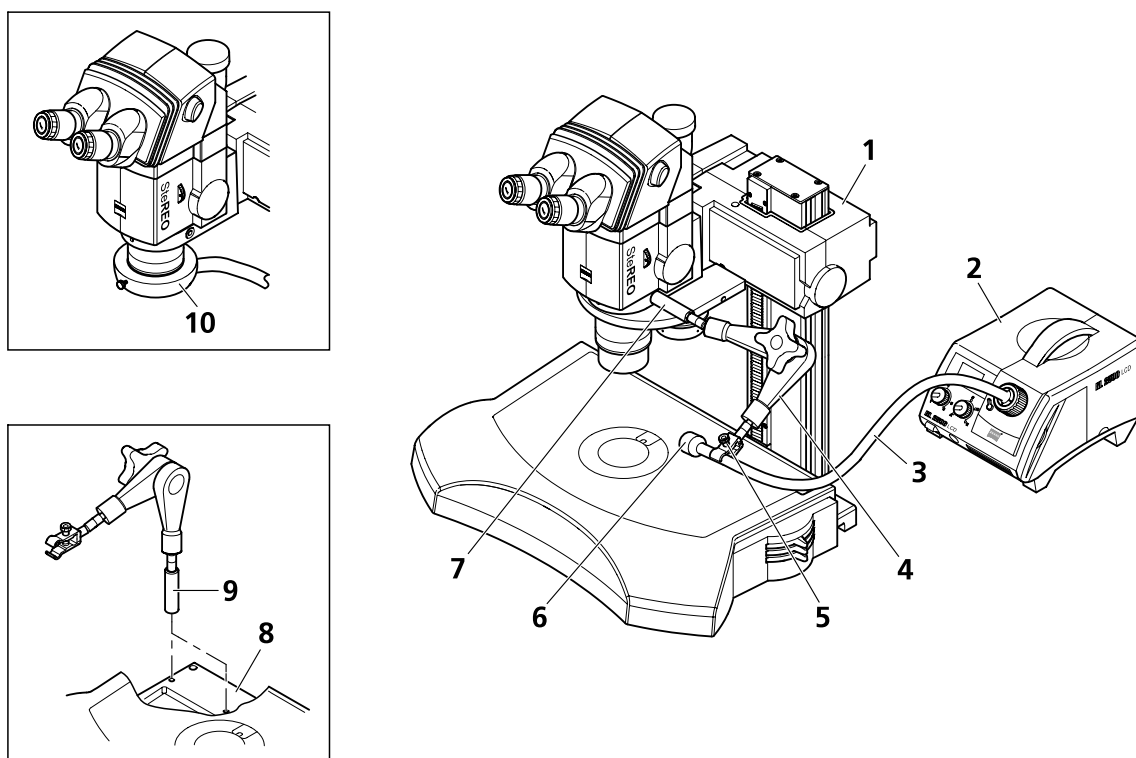



Fig. 19 Installing the incident-light illuminator

Installing the flexible light guide with focusing attachment

- Screw in the spacing rod (Fig. 19/7), if necessary.
- Hold the articulated arm (Fig. 19/4) in such a way that the label is correctly readable. Then, screw the clamp for the light guide (Fig. 19/5), the line light or the appropriate focusing attachment (Fig. 19/6) onto the upper end of the articulated arm.
- Screw the bottom end of the articulated arm (Fig. 19/4) into the spacing rod or one of the tapped holes on the stand. Tighten the tensioning screw on the articulated arm so that the latter can be used as lever.
- Successively clamp the three joints of the articulated arm from bottom to top by means of the clamping screw; loosening the joints is in reverse order, i.e. from top to bottom.
- Connect the light guide (Fig. 19/3) to the cold-light source (Fig. 19/2).

-  The articulated arm may also be fixed to the stand base (Fig. 19/8). To this end, screw in the spacer (Fig. 19/9).


Installing the fiber-optical slit-ring illuminators (Ø 66 mm)


- Push the slit-ring illuminator (Fig. 19/10) onto the objective and clamp it by means of the knurled screw.
- Connect the light guide to the cold-light source (Fig. 19/2).

-  Do not look directly into the light source and avoid reflections at reflecting surfaces.

Installing LED ring illuminators (Ø 66 mm)

- Push the LED ring illuminator onto the objective and clamp it by means of the knurled screw.

-  For the installation and operation of the VisiLEDs MC Series, observe the corresponding separate operating instructions.

-  The LED illuminator is an LED class 1 device. Avoid directly viewing into the LED light.

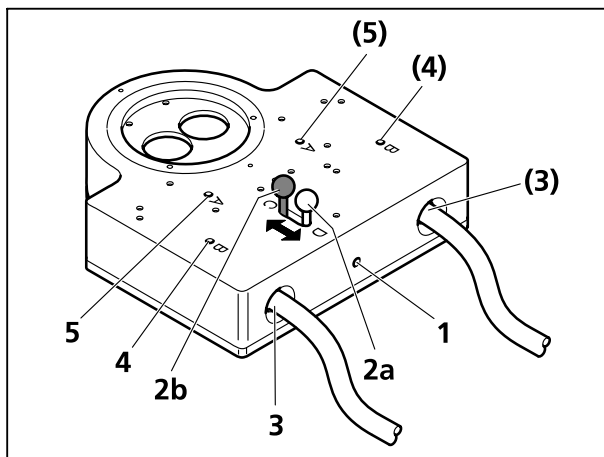


Fig. 20 Coaxial epi-illumination (bottom side)

3.2 Installing the coaxial epi-illumination S

- The switching lever for light guide positioning and optimization of the specimen field illumination can optionally be screwed in at the back or at the bottom. Preferably together
 - with manual coarse/fine drive:
Screw in the switching lever at the bottom (Fig. 20/2) after fitting the unit to mount S.
 - with objective slider S/doc:
Screw in the switching lever at the back (Fig. 20/1) **before** fitting the unit to mount S.
- Move the switching lever backwards to position **D** (Fig. 20/2a) and retain it.

- Insert both light guide arms carefully into the back holes (Fig. 20/3), thread them into the light guide slot and push them to stop.
- Tighten the clamping screws through the drill holes **B** (Fig. 20/4) using the Allen key 3 mm.
- Unscrew the objective (Fig. 23/3) from the microscope body.
- Insert the coaxial epi-illumination S (Fig. 23/2) with the guide pin (Fig. 23/4) facing upward into the drill hole underneath mount S (Fig. 23/1).
- Screw both screws of the coaxial epi-illumination (Fig. 23/5) through the drill holes **A** (Fig. 23/5) into the mount S.



Attention during unscrewing: Do not continue to turn the screws after you have unscrewed them from mount S!

- Screw the objective into the coaxial epi-illumination or mount the objective slider S/doc (see B 46-0010).



For vertical observation with the objective slider S/doc use the lambda-quarter cap positioned in front of the objective and clamped at its 66 mm outer diameter.

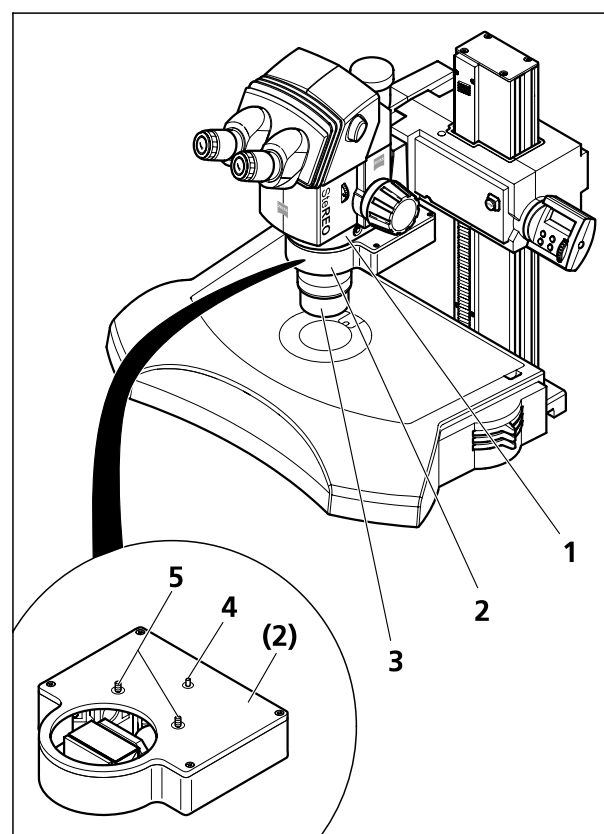


Fig. 21 Coaxial epi-illumination (upper side)

To achieve a more homogeneous illumination for magnifications equal to or larger than those indicated in the following table, you can adjust the lever at front position **C** (Fig. 20/2b) without additional vignettation also for **objectives S 1.0x**.

Objective S	Avoidance of vignettation in standard front position C above	
	(in units of zoom magnification)	(total magnification with eyepieces 10x/23)
Plan Apo S 1.0x	1.1x	11.0x
Plan S 1.0x	1.4x	13.6x
Achromat 1.0x	1.8x	17.8x

3.3 Installing and connecting the PentaFluar vertical illuminator

3.3.1 Installing PentaFluar vertical illuminator and dazzle protector to the microscope body

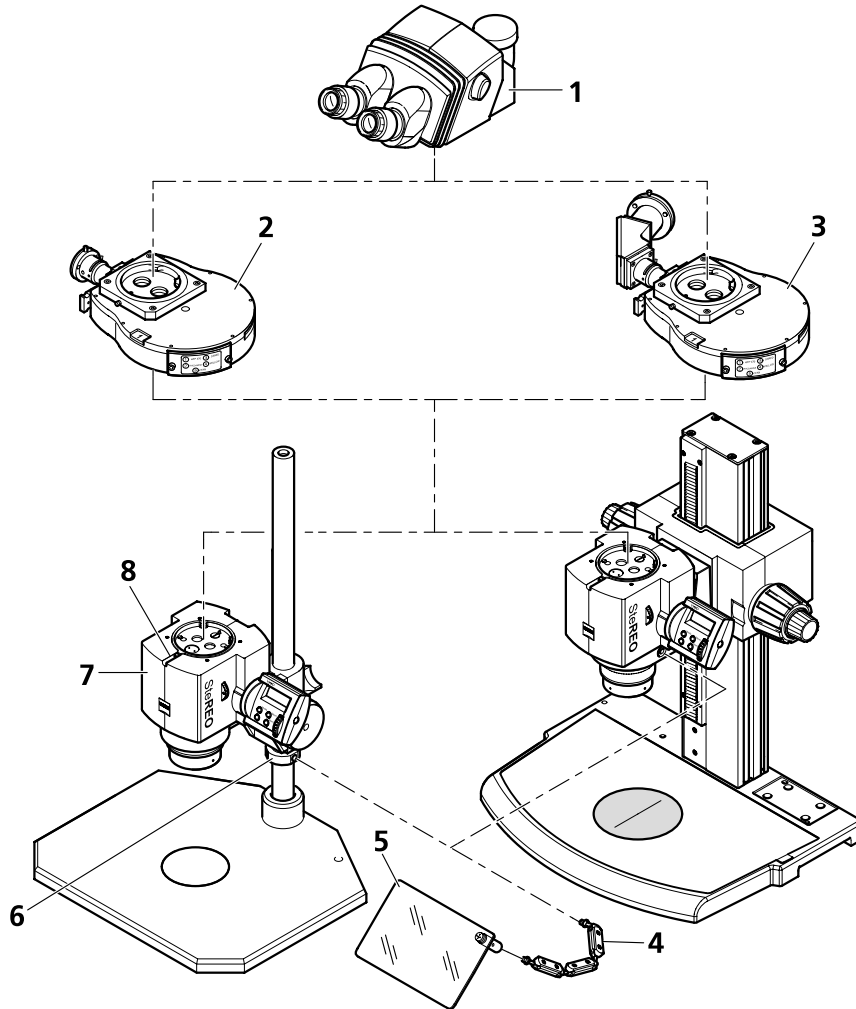


Fig. 22 Installation of PentaFluar S/X-Cite or S/HBO

- Loosen clamp screw (Fig. 22/8) using an SW 3 Allen key and remove the tube (Fig. 22/1). If attached, remove the intermediate tube in the same way.
- Depending on the chosen equipment, attach the PentaFluar S/X-Cite (Fig. 22/2) or the PentaFluar S/HBO (Fig. 22/3) vertical illuminator to the microscope body (Fig. 22/7), align it (the connector for the illumination equipment should point to the left) and tighten the clamp screw (Fig. 22/8).
- Using the plugged through SW 3 ball-headed screwdriver, screw the support (Fig. 22/4) of the dazzle protector into the M8 tapped hole on the carrier of the microscope body.



The support of the dazzle protector can be mounted to both sides of the microscope body.

- At the other side of the support (Fig. 22/4), screw on the dazzle protector (Fig. 22/5) and tighten it with the SW 3 ball-headed screwdriver plugged through.

- Move the spherical joints of the carrier to adjust the dazzle protector so that you cannot be dazzled during microscopic work. To this end, slightly loosen the clamp screws on the spherical joints or the clamp screw on the dazzle, if necessary. After the adjustment, retighten the clamp screws.



When using the dazzle protector on column stands, before installing the Stemi mount, first slip the clamping ring (Fig. 22/6) for the dazzle protector over the column and fix it by means of its clamp screw. The clamping ring has two M8 tapped holes, into which you may optionally screw in the support of the dazzle protector.

3.3.2 Inserting and changing filter blocks



Make sure the light source is switched off or the shutter slider (Fig. 24/5) pulled out.

- Undo both screws (Fig. 23/5) and remove the cover (Fig. 23/4) from the mounting aperture of the PentaFluar vertical illuminator (Fig. 23/1).
- Insert the filter block (Fig. 23/3) in one of the five positions of the filter mount. To this end, push in the filter block through the installation aperture, until the magnetic fixation device catches the filter block and positions it in the correct place. When pushing the filter block in, take care that the barrier filters point up and the exciter filter points outward.
- Turn on the filter wheel at its knurling (Fig. 23/2) by one position and insert the next filter block.
- Insert the other filter blocks in the same way.
- Reattach the cover and tighten the screws.



The filter position swung into the light path is displayed in the read-out window (Fig. 23/6). To move this filter position into the installation aperture, turn on the filter wheel counterclockwise by two positions.

Affix the supplied self-adhesive labels for the filter combinations to the cover (Fig. 23/4) allocated to the corresponding position numbers.

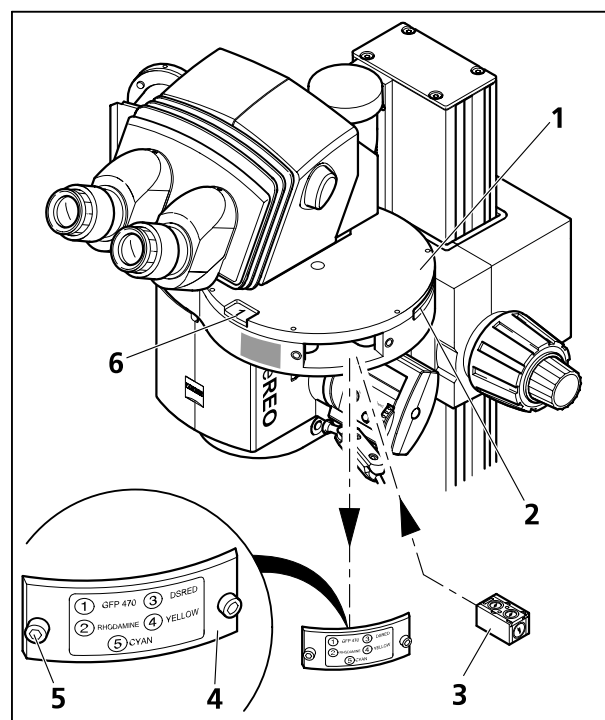


Fig. 23 Inserting filter blocks

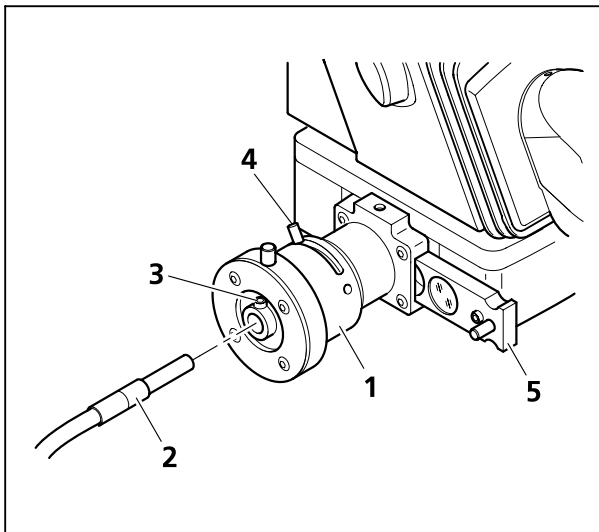


Fig. 24 Connecting the optical fiber of the X-Cite illuminator to the PentaFluar S/X-Cite

3.3.3 Connecting the X-Cite illuminator to the PentaFluar S/X-Cite vertical illuminator

- Undo clamp screw (Fig. 24/3) for optical fiber on the mounting port (Fig. 24/1) of the PentaFluar S/X-Cite vertical illuminator using the SW 1.5 mm offset Allen key.
- Push the optical fiber (Fig. 24/2) as far as it will go into the mounting port and clamp the clamp screw (Fig. 24/3) using the SW 1.5 mm key.
- Lever (Fig. 24/4) serves to open and close the iris diaphragm.
- The shutter and filter slider (Fig. 24/5) has three functional positions:

Pulled out:	Blocking position
Middle position:	Free aperture, working position
Pulled in:	Additional filter BG38 for attenuation of a possible reddish background

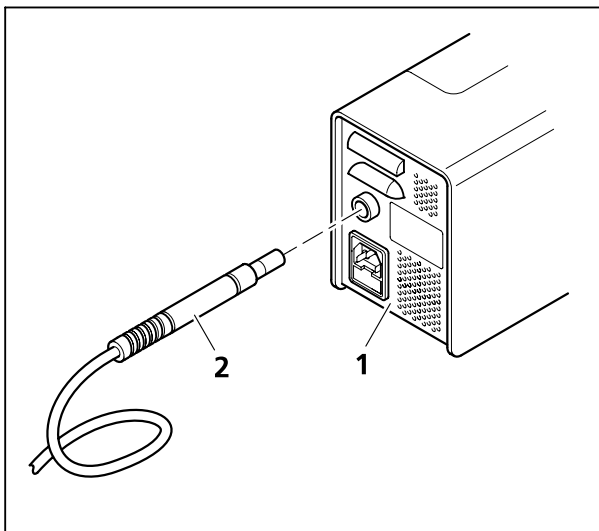


Fig. 25 Connecting the optical fiber to the X-Cite illuminator

- Plug the other end of the optical fiber (Fig. 25/2) as far as it will go into the X-Cite illuminator (Fig. 25/1).
- Connect the power cable of the X-Cite illuminator to the power outlet.



Do not switch on the illuminator unless both ends of the optical fiber are correctly mounted to avoid health hazards by UV radiation!



The liquid optical fiber has a minimum bending radius of 40 mm; if bent too sharply it will be destroyed! At normal room climate (23 °C, 60 %), the optical fiber has a lifetime of four years. The lifetime may be prolonged by cool and humid storage (refrigerator).



The liquid optical fiber of the HXP 120 can be connected to the corresponding light source in the same way.

3.3.4 Connecting the HBO 100 illuminator to the PentaFluar S/HBO vertical illuminator

- Loosen clamp screw (Fig. 26/3) on the mounting port (Fig. 26/2) of the PentaFluar S/HBO vertical illuminator.
- Attach the HBO 100 illuminator (Fig. 26/1) to the mounting port, align it and tighten the clamp screw.
- Connect the cable of the HBO 100 illuminator to its transformer.
- Connect the power cable of the transformer to the power outlet.
- The start-up and the adjustment of the illuminator are described in Section 4.1.6 and the Operating Manual of the HBO 100.



Note that UV radiation is emitted when using the filter block 58 Cascade Yellow!

Align the dazzle protector with particular care; do not look past it into the light.

Do not leave your hands in the specimen compartment for longer periods but rather use the gliding stage.



The PentaFluar S/HBO vertical illuminator is also equipped with a shutter and filter slider (see Section 3.3.3).

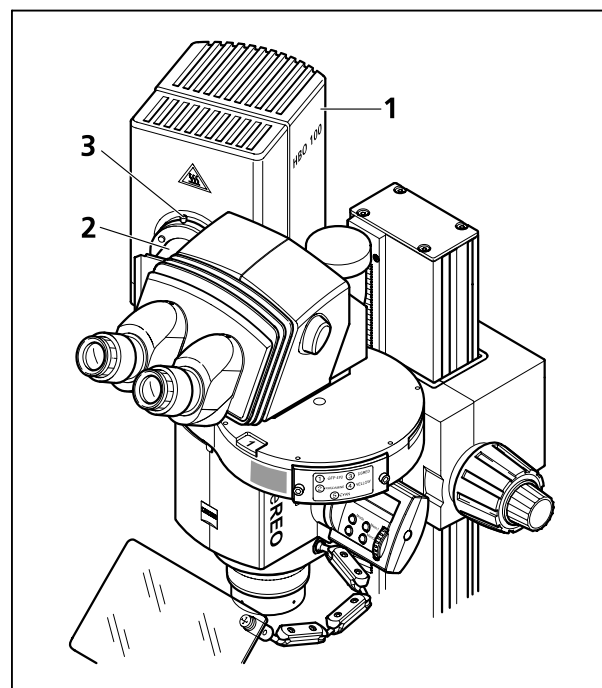


Fig. 26 Connecting the HBO 100 illuminator to the PentaFluar S/HBO 100

3.4 Installing and connecting the Human Interface Panel (HIP)



You can swivel the HIP by about 30 degrees about its longitudinal axis to adjust it to a favorable viewing angle. Make sure not to exceed the stated swivel range. Forcible twisting will result in damage to the device.



If you connect the HIP and SYCOP units simultaneously to the system, the functional range of the HIP will be restricted to zoom and focus control via knurled wheel and memory keys. Besides, you must not connect the plug-in power unit to a power outlet, as in this case the HIP will be powered via the microscope body/focusing drive.



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

Install the HIP (Fig. 27/3) to the microscope body (zoom function) or to the motorized focusing drive (focus function) by following this procedure:

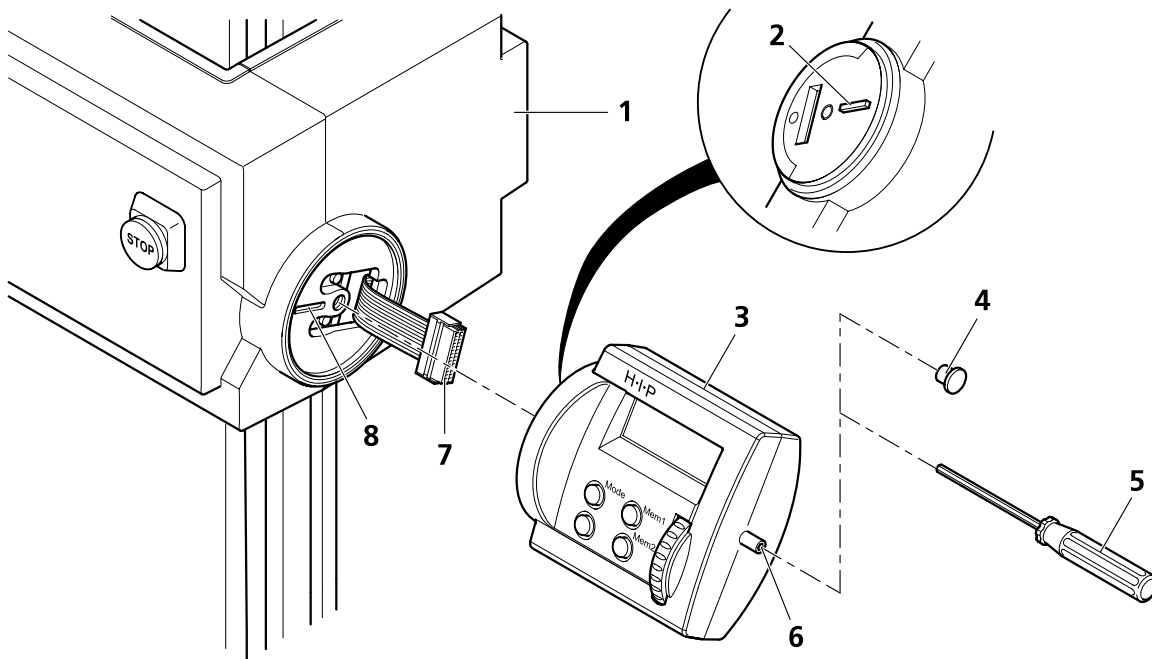


Fig. 27 Installing the HIP control unit

- Remove the cover (right) from the microscope body (only on SteREO Discovery.V12/V20) or the focusing drive (Fig. 27/1) and the cover cap from the HIP (Fig. 27/4).
- Slightly pull out the connecting cable (Fig. 27/7) without applying force and connect it to the corresponding connector on the HIP.
- Push the cable fully back into the casing without folding it; carefully attach the HIP so that the nose (Fig. 27/2) on the HIP engages with the provided groove (Fig. 27/8).
- Screw in the Allen screw (SW 3) (Fig. 27/6) with the ball-headed screwdriver (Fig. 27/5) as far as it will go.

- Re-attach the cover cap (Fig. 27/4) to the HIP.
- Connect the cable of the plug-in power unit to the rear panel of the microscope body (only on SteREO Discovery.V12/V20) or the focusing drive and connect the plug-in power unit to the power outlet.

3.5 Mounting and connecting the Manual Rotary Control (MaRC)

MaRC is a component used to control motor focus and zoom, respectively, and may be mounted to the focusing drive (Fig. 28/1), the microscope body (only on SteREO Discovery.V12/V20) or the table-top base (Fig. 29/1).

Mounting MaRC to the microscope body or to the motorized focusing drive:

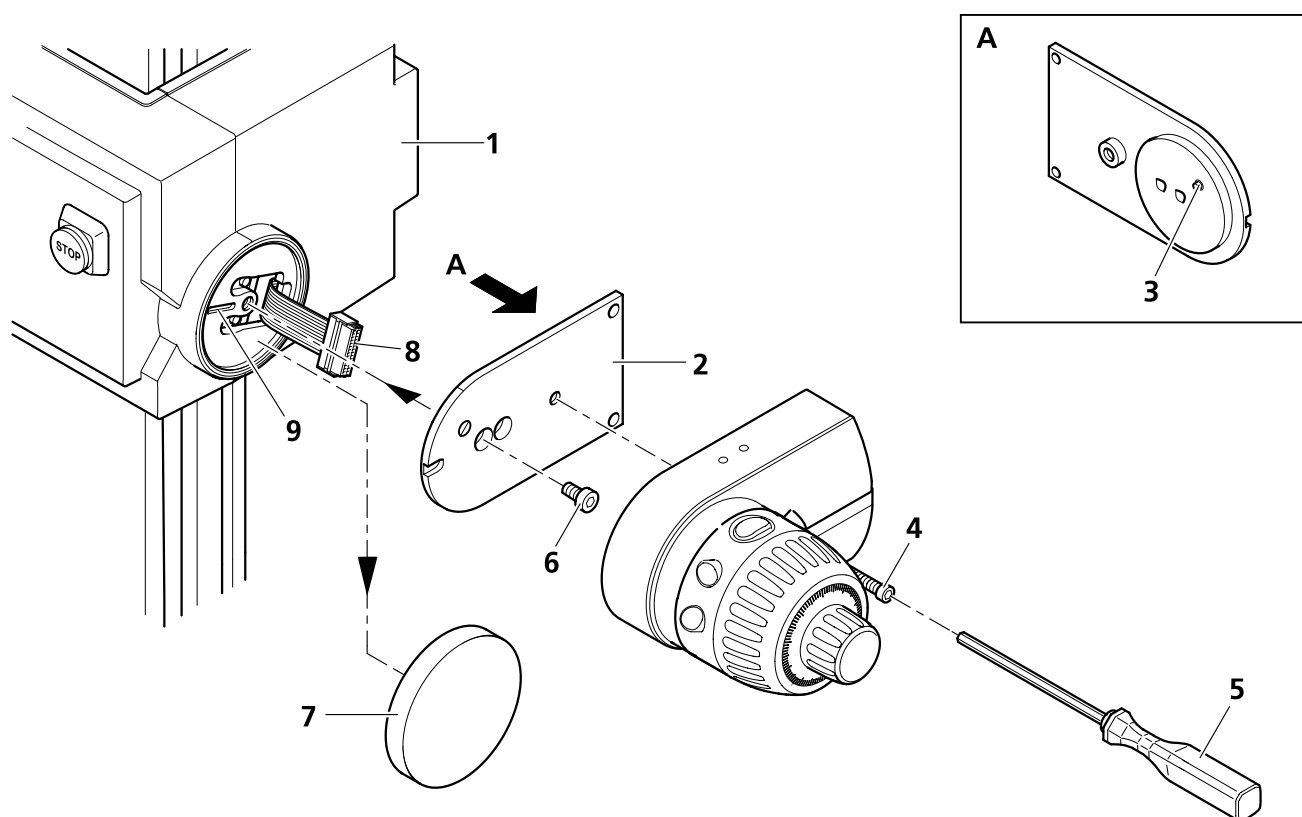


Fig. 28 Mounting the MaRC control unit (e.g.: to the focusing drive)

- Remove the mounting plate (Fig. 28/2) from the MaRC unit after loosening the Allan screw (SW 3; Fig. 28/4).
- Remove the cover (Fig. 28/7) from the focusing drive (Fig. 28/1) or from the microscope body (only on SteREO Discovery.V12/V20).
- Pull the connecting cable (Fig. 28/8) fully back into the casing without folding it.

- Bolt the mounting plate (Fig. 28/2) with the screw (Fig. 28/6) to the flange of the focusing drive (Fig. 28/1) (or the microscope body), putting the screw through the left hole of the mounting plate. Make sure that the orientation pin (Fig. 28/3) of the mounting plate engages with the groove (Fig. 28/9) provided for this purpose.
- Bolt MaRC by means of the Allan screw (SW 3; Fig. 28/4) to the fixed mounting plate (Fig. 28/2) using the ball-headed screwdriver (Fig. 28/5).
- Connect the patch cable to the CAN bus connectors of MaRC (underside) and to the motorized focusing drive.

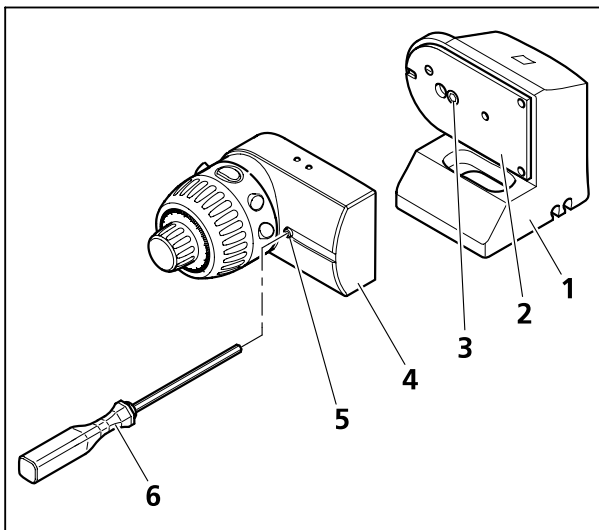


Fig. 29 Mounting the control unit MaRC to the table-top base

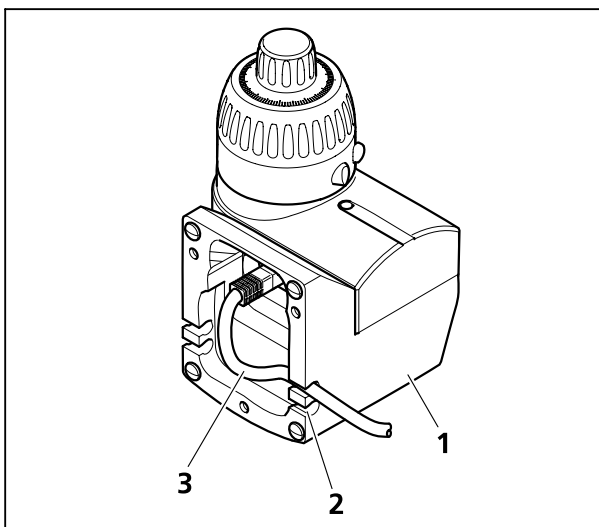


Fig. 30 Connecting the patch cable to MaRC mounted to the table-top base

Mounting MaRC to the table-top base:

- Bolt the mounting plate (Fig. 29/2) with the screw (Fig. 29/3) to the table-top base (Fig. 29/1), putting the screw through the right hole of the mounting plate.
- Bolt MaRC (Fig. 29/4) with the Allan screw (SW 3; Fig. 29/5) to the fixed mounting plate using the ball-headed screwdriver (Fig. 29/6).
- Connect the patch cable (Fig. 30/3) to the CAN bus connectors of MaRC (through the underside of the table-top base, Fig. 30/1) and the motorized focusing drive.



The patch cable can also be connected directly to a CAN bus connector of the EMS Electronic Module.

- Lead the patch cable through the table-top base bending it in a radius as large as possible (do not fold it) and pass it through one of the cut-outs (on the right or left, Fig. 30/1) to the outside.
- Place the table-top base with MaRC on the right or left beside the microscope.



If MaRC is used in a system without focus motor or EMS, the handwheel has to be connected to the motorized zoom body by means of a patch cable. Power is then supplied to the second CAN bus connector of MaRC via the patch cable connection of the power supply unit delivered for the HIP panel.

3.6 Mounting the objective nosepiece S/doc, 3x, 6x cod.

The objective nosepiece S/doc, 3x, 6x cod. is a microscope component for three objectives, which can be used in stereo position as well as in the macroscope / mono / documentation position (doc). The objective positions are coded, allowing the selected objective and the corresponding position (3D for stereo or 2D for mono) to be indicated in the SYCOP and AxioVision devices.

Furthermore, a special fiber-optic slit-ring illumination element, the slit-ring illuminator $d = 66$ mm without light guide, may be attached to the objectives of the nosepiece. If necessary, light-conducting rods of different lengths may be inserted between the light transmission interface and the slit-ring illuminator to adapt the system to the working height required.

Mounting the objective nosepiece S/doc

The objective nosepiece may be attached to the motorized focusing drive with Profile S column as well as to the manual coarse/fine focusing drive with Profile S column (see also Section 3.1.1).

- Attach the objective nosepiece (Fig. 31/2) to the focusing drive of the column used (Fig. 31/1), let the two locating screws click into place and keep hold of the unit until the first screw has been tightened.
- Screw down the four Allen screws (SW 5). Use the long leg of the offset Allen key (Fig. 31/4) to screw the screws (Fig. 31/3) in, and the short leg to fasten them hand-tight.

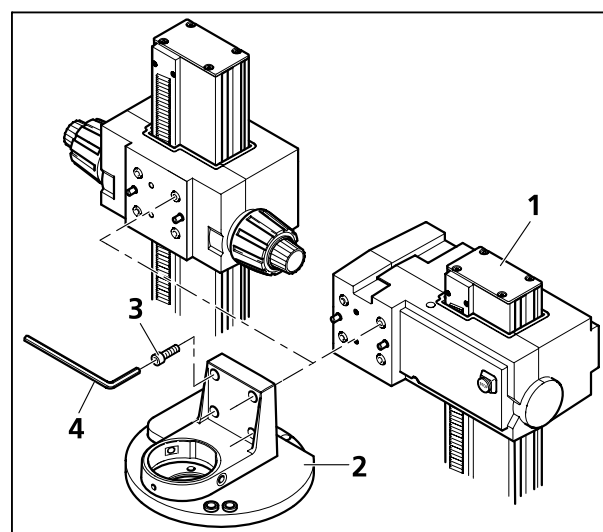


Fig. 31 Mounting the objective nosepiece to the column

Inserting objectives into the objective nosepiece S/doc

- The objective nosepiece is suited for 2 groups of parfocalized objectives:
 1. Objectives with parfocal distance 137 mm:
PlanApo S 0.63x; PlanApo S 1.0x; PlanApo S 1.5x; Plan S 1.0x; Achromat 0.63x
 2. Objectives with parfocal distance 93 mm:
PlanApo S 3.5x mono; Achromat 1.0x; Achromat 1.5x
- To insert the PlanApo S 3.5x mono, the adapter ring included in the set "rings for nosepiece 6x cod + objective mono" is required.



Please note that the PlanApo S 3.5x mono objective can be used only with the objective nosepiece being in macroscope position.



Please do not insert the PlanApo S 1.5x together with objectives having a parfocal distance of 93 mm or the PlanApo S 2.3x into the objective nosepiece to avoid collision with the microscope stage or the specimen.

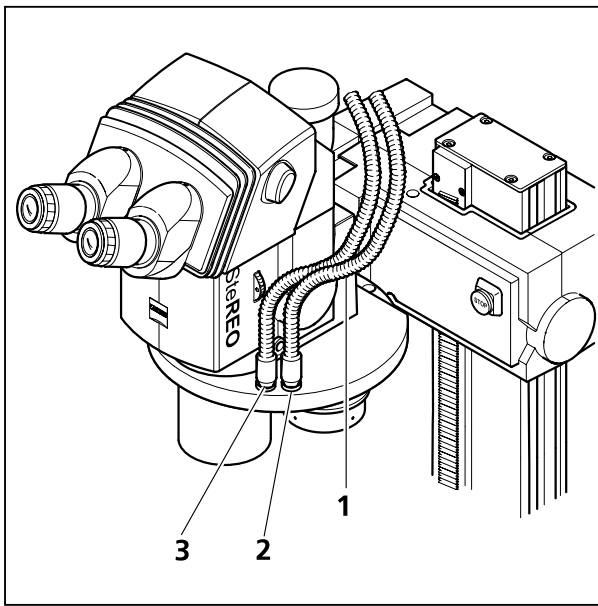


Fig. 32 Light guide mount

Illumination

A light guide mount is used for central supply of light to the slit-ring illumination system. It allows the light coming from a standard light guide to be conducted to the fiber-optical ring illuminator attached to the currently used objective.

That means that the light guide mount is a transmission interface between the supplying light guide and the downstream slit-ring illuminator. Upon rotating another objective into working position, also another ring illuminator will be situated downstream of the light guide.

The light guide mount is located vertically on top of the nosepiece plate. It has an internal diameter of 10 mm and a length of 10 mm for fixing the end sleeves of a flexible standard light guide. There are two light guide mounts one beside the other - one for stereo position and one for macroscope position.

- Insert the end sleeve of the one-branch light guide, or both end sleeves in case of the two-branch light guide, into the corresponding light guide mount(s).
- If you use the flexible one-branch light guide, it must be re-positioned when changing from the stereo position (Fig. 32/3) to the macroscope position (Fig. 32/2).
- This is not necessary if you use the flexible two-branch light guide (Fig. 32/1).
- To avoid re-positioning, you can use two one-branch light guides combined with two light sources.

Attaching fiber-optical slit-ring illuminators to the objective nosepiece S/doc

Special adapters are required to adapt the slit-ring illuminator ($d = 66$ mm without light guide) to different working heights, conditioned by different objective lengths:

Objective	Light-conducting rod 13 mm	Light-conducting rod 51 mm	Spacing ring $d = 66 \times 16$ mm for Achromat S
PlanApo S 0.63x			
PlanApo S 1.0x	X		
PlanApo S 1.5x		X	
PlanApo S 3.5x mono	X		
Plan S 1.0x			
Achromat S 0.3x			X
Achromat S 0.5x			X
Achromat S 0.63x			X
Achromat S 1.0x			X
Achromat S 1.25x			
Achromat S 1.5x	X		
Converter S 1.5 mono		X*	

* If the objectives are used with a converter S 1,5x mono, for each of them an additional light-conducting rod of 51 mm is necessary.

If one or two objective nosepiece positions shall not be provided with a slit-ring illuminator $d = 66$ mm without light guide, the corresponding light opening in the nosepiece plate must be closed with a stopper **prior to** mounting the objective nosepiece to the stand.

Inserting/Removing the stopper

- Rotate the nosepiece plate (Fig. 33/3) accordingly to make the light opening (Fig. 33/2) of the corresponding nosepiece position accessible at the rear of the nosepiece.
- Put the stopper (Fig. 33/1) from above into the hole, with the taper hole of the stopper facing downwards.



CAUTION

During operation, the stoppers may become hot. That is why you should let the stoppers cool down for at least 5 minutes before removing them from the objective nosepiece.

- If you want to attach slit-ring illuminators later, you can remove the stopper as well with the objective nosepiece remaining mounted to the microscope. For this purpose, lift the stopper from below out of the nosepiece plate using the Allan key SW 3 and remove it sideways.

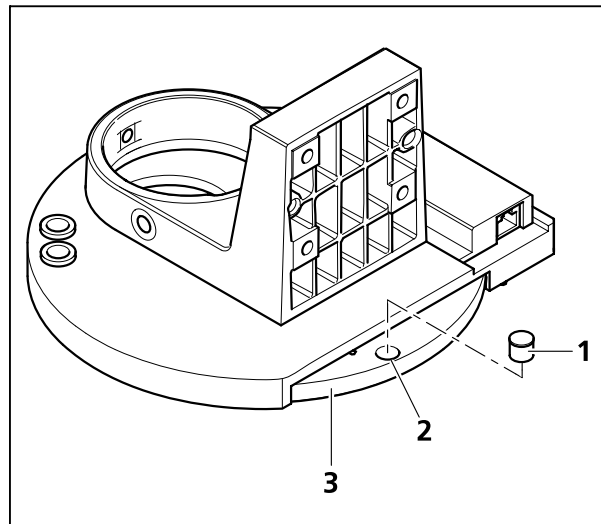


Fig. 33 Inserting a stopper

Attaching the slit-ring illuminator $d = 66$ mm without light guide

- Put the appropriate light-conducting rod (Fig. 34/1; 13 mm or 51 mm) onto the fiber input (Fig. 34/2) of the slit-ring illuminator (Fig. 34/3).
- If necessary, screw a spacing ring from below on the Achromat objective.
- Put the slit-ring illuminator from below on the corresponding objective and push it upwards until the light-conducting rod touches the mechanical stop in the corresponding hole at the underside of the objective nosepiece (Fig. 34/5).
- Fix the slit-ring illuminator with the knurled knob (Fig. 34/4) in this position.

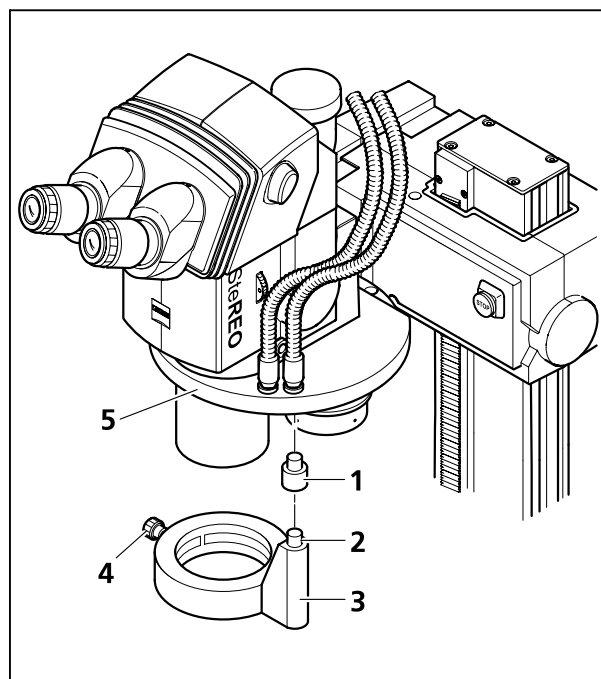


Fig. 34 Slit-ring illuminator

Mounting the Y intermediate tube to the microscope

To get a binocular image in the macroscope position, the Y intermediate tube S can be mounted between the microscope body and the binocular tube (see Section 3.1.5).

3.7 Establishing electrical connections via SYCOP



Do not turn on the microscope unless all cables have been connected.

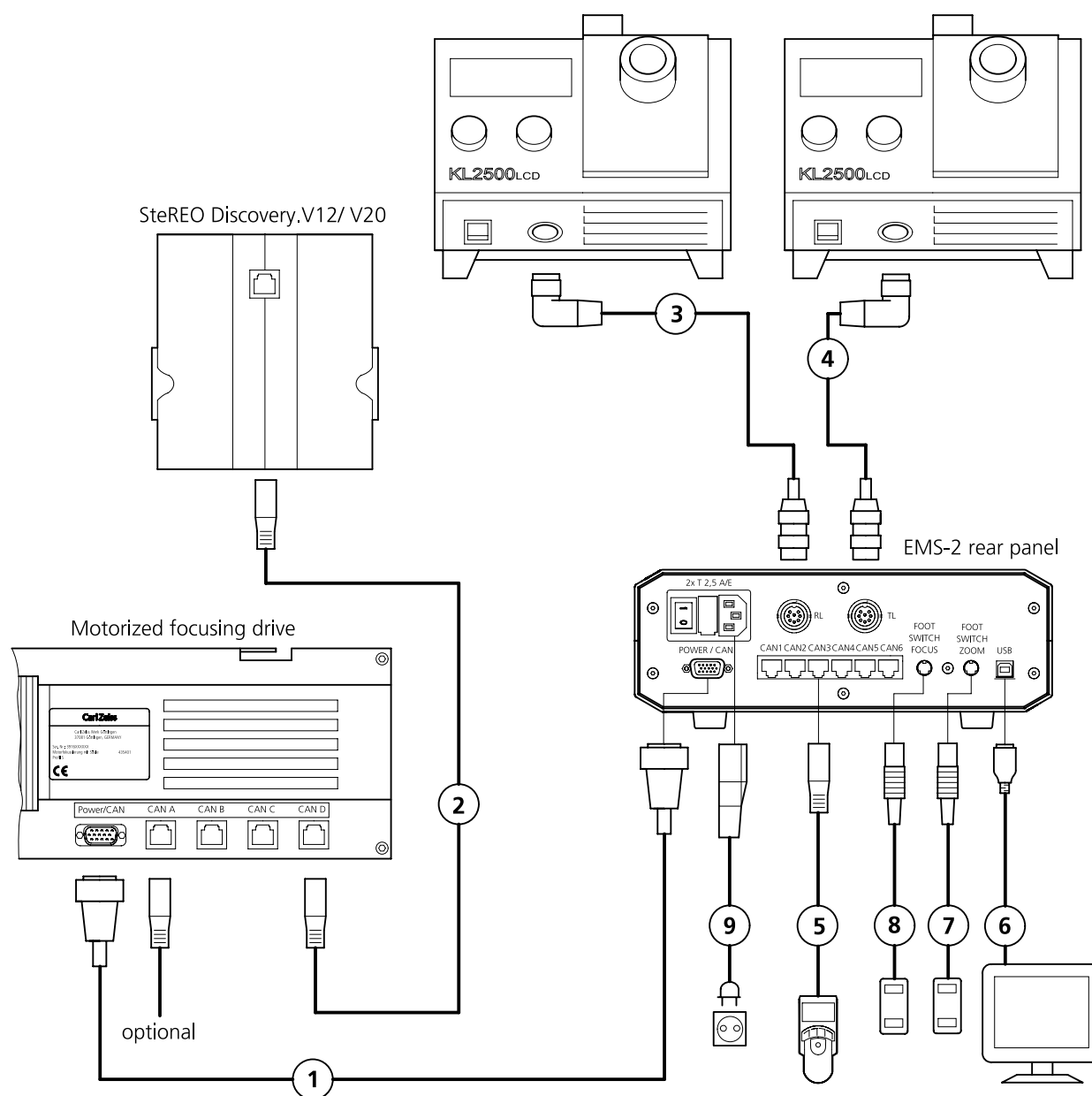


Fig. 35 Connecting the SteREO microscope

3.7.1 Connecting the motorized focusing drive



Always connect the CAN bus cable of the driven components, e.g. the microscope body, to the connector panel of the motorized focusing drive **CAN A** to **CAN D** to avoid any damage.

- Connect the Power/CAN bus cable (Fig. 35/1) to the rear side of the focusing drive **Power-CAN** and secure it in place with two screws.
- Connect the CAN bus cables to the focusing drive in a freely selectable order from **CAN A** to **CAN D**:
 - Zoom drive of microscope body (Fig. 35/2)
 - Other moving CAN bus cables (Fig. 35/optional), such as that for objective nosepiece.

3.7.2 Connecting the EMS-2 Electronic Module



The EMS-2 Electronic Module is part of the SYCOP System Control Unit. For the installation of the HIP, refer to Section 3.4. If you use the manual focusing drive only, connect all CAN bus cables to the EMS-2.

- Connect the following devices to the rear panel of the EMS-2 Electronic Module (Fig. 35):
 - Power/CAN bus cable (Fig. 35/1), which should be secured with two screw
 - SYCOP (Fig. 35/5) to a freely selectable CAN bus connector **CAN 1** to **CAN 5**
 - Control cable of cold-light source for incident light to connector **RL** (Fig. 35/3)
 - Control cable of the cold-light source for transmitted light to connector **TL** (Fig. 35/4)
 - Foot pedal for focus control (Fig. 35/8), if used
 - Foot pedal for zoom control (Fig. 35/7), if used
 - Power cable (Fig. 35/9) to be connected to EMS-2 and power outlet.

On the EMS-2 Electronic Module, you need not adjust the line power. It is adjusted automatically to the available line power (110 V - 240 V wide input range).



A PC may be connected to the USB port (Fig. 35/6) of the EMS-2 Electronic Module. For more information, refer to the corresponding software description.

3.7.3 Connecting the cold-light source



KL 2500 LCD type cold-light sources can be operated via the SYCOP control unit after connection to the EMS-2 Electronic Module. This is not possible with other types, e.g. the KL 1500 LCD. For starting up cold-light sources, see the respective operating instructions.

- Connect the control cable for incident light coming from connector **RL** of the Electronic Module (Fig. 35/3) to the KL 2500 LCD cold-light source.
- Connect the light guide for incident-light (**RL**) to the cold-light source (see Section 3.1.7 on how to fasten it).
- Connect the control cable for transmitted light coming from connector **TL** on the Electronic Module (Fig. 35/4) to the second KL 2500 LCD cold-light source.
- Connect the light guide (part of transmitted-light equipment "S") for transmitted light (**TL**) to the cold-light source.

3.8 Switching on

Requirement: The instrument has been properly installed and connected (see Sections 3.1 and 3.4).

 The switch-on procedure depends on the existing configuration of the system.

Operation via HIP


- Briefly press **⓪** button on HIP.

Operation via SYCOP

- Before switching on the device, verify that the joystick on the SYCOP is in zero position and not displaced.
- Switch power switch on rear panel of EMS-2 to **I**.

- Set the toggle switch(es) on the cold-light source(s) used to **I**.
- If you intend to use the LED illuminator, set the switch on the rear panel of the VisiLED controller to **I**.

3.9 Switching off

 The switch-off procedure depends on the existing configuration of the system.

Operation via HIP

- Briefly press **⓪** button on HIP.
- Disconnect the plug-in power unit from the power outlet.


Operation via SYCOP


- Briefly press the **⓪** button (standby) on the EMS-2 Electronic Module or the **Shut Down** key on the SYCOP.
- Set the power switch on the rear panel of the EMS-2 Electronic Module to **O**.

- Set the toggle switch(es) on the cold-light source(s) used to **O**.
- If the LED illuminator is used, set the switch on the rear panel of the VisiLED controller to **O**.

The instrument is now switched off. For switching off further devices used, refer to the respective operating instructions.

3.10 Standby mode

 For breaks and short interruptions, it will do to press the **⓪** button on the EMS-2 or the **⓪** button on the HIP. In this case, the instrument is not disconnected from line power, i.e. it is still powered.
To restart it, press the **⓪** button on the EMS-2 or the **⓪** button on the HIP once more.

 The current settings (e.g. Z coordinate) of the SYCOP will be stored permanently only after you have pressed the **⓪** button (standby) or the **Save Settings** button or the **Shut Down** button. Immediate actuation of the power switch or disconnection of the power cable will lead to a loss of the data of the current instrument settings!

3.11 Adjusting the travel of the motorized focusing drive

After the first installation, the lower limit switch (Fig. 36/3) in the column (Fig. 36/1) must be adjusted from the delivery position to an appropriate working position by means of the ball-headed screwdriver. The upper stop (Fig. 36/2) may also be readjusted. Adjust the limit switches instantly to prevent the microscope from being damaged by the movement of the motorized focusing drive.



When you move the motorized focusing drive down, there is the risk of hand crushing in the operating area. While the drive is moving down, do not reach with your hands into the operating area or under the motorized focusing drive.



Take care to avoid colliding of the objective with stage equipment or the specimen! Lower the motorized focusing drive only carefully unless you have adjusted the lower limit switch. The SteREO Discovery provides additional software-assisted specimen protection to prevent collision between objective and specimen. For this, refer to Section 4.6.3.5.



The operation of the HIP and the SYCOP is described in Sections 4.1.4 and 0.

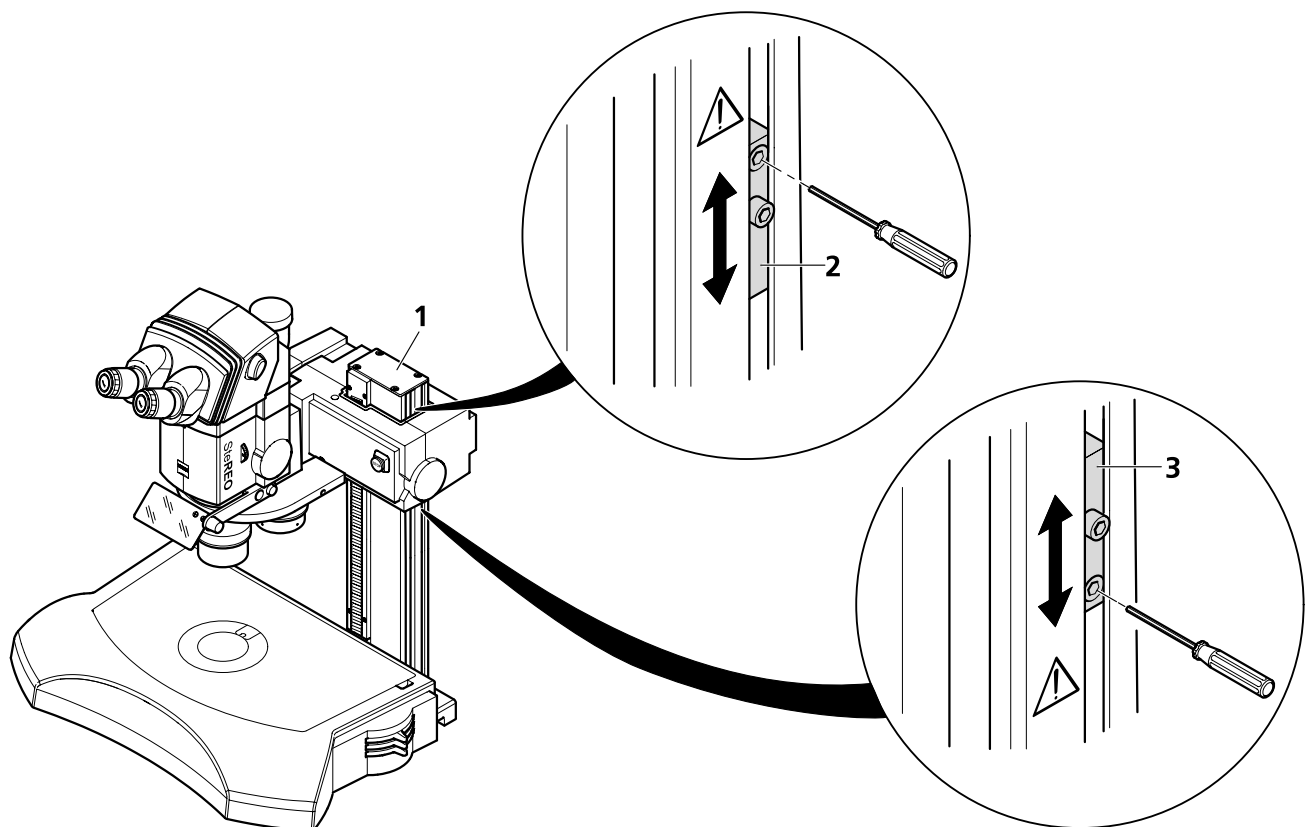


Fig. 36 Adjusting the travel of the focusing drive

The instrument has been properly installed, connected and switched on (see Sections 3.1 and 3.4). A printed sheet of paper has been put onto the specimen support:

If you intend to examine specimens that are higher than 20 mm, use the flattest specimen to be examined in place of the sheet of paper.

- When using the objective nosepiece, swing in the objective with the greatest length.
- Loosen the screw (SW3) at the lower limit switch (Fig. 36/3) and push the switch downward. Tighten the screw again.
- Move the joystick on the SYCOP or turn the knurled wheel on the HIP or the coarse/fine drive on the MaRC downward, at first under direct observation and then while looking through the eyepieces, until the print on the paper is in focus. Stop moving on the drive!
- If the lower limit switch releases too soon, loosen the screw (SW3), push the limit switch a little bit down and re-tighten the screw.
- Check the position of the limit switch by moving the focusing drive up and down.
- Repeat this procedure until a collision between objective and stage is effectively prevented.
- Readjust the position of the upper limit switch as described above, if necessary, to prevent the motorized focusing drive from colliding with objects right next to the instrument (shelves, etc.).

3.12 Short-distance transport



Do not move the installed, upright standing system over longer distances. Avoid heavy shocks to the focusing drive as this might damage the rack of the column.



For transporting the device over longer distances, it must be disassembled and packed in its original packaging.

For short-distance transport, e.g. for relocating the device within a laboratory, follow this procedure:

- Move the focusing drive down to its bottom mechanical stop.
- Switch the device off and disconnect all cable connections.
- Remove binocular tube, intermediate tube, objective, and microscope body. For this, refer to Section 3.1.5 (consider that the order of operations for disassembly is reverse).
- If used, remove the transmitted-light equipment S. For this, refer to Section 3.1.2 (consider that the order of operations for disassembly is reverse).



Consider that the center of mass of the device is above the stand base. Therefore, do not carry the device over longer distances. Do not tilt or incline the device. To lift up and put down the device, hold it by the laterally arranged recessed grip wells.








- Taking the device by the recessed grip wells at the stand base, lift it up and carry it; do not hold and lift it up by the focusing drive.
- Reinstall disassembled components, establish all cable connections correctly to the device and switch it on.

4 OPERATION

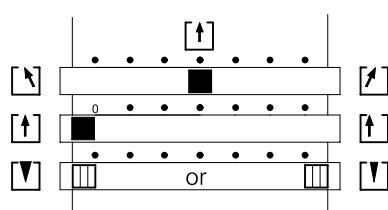
4.1 Adjustments

4.1.1 Setting transmitted-light illumination

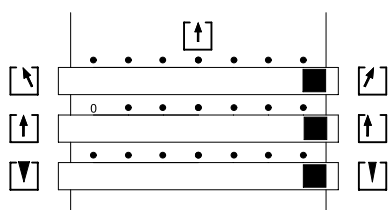
- Connect the light guide for transmitted light (TL) to the cold-light source.
- For low magnifications, insert the Ø 84 mm opal glass plate.
- To avoid dazzling in transmitted light, swivel in the dazzle protector.
- Turn on the cold-light source for transmitted light (TL) at the toggle switch (position I).
- Use the two left keys on SYCOP or cold-light source to adjust the illumination intensity as required.
- Select the desired technique via the illumination control on the transmitted-light equipment (Fig. 37). Use intermediate positions to optimize the contrast by oblique light.

 The bundle of light emerges vertically (reflector inclined by 45°)	
 Inclination of the bundle of light towards the operator (risk of being dazzled!)	 Inclination of the bundle of light off the operator
 Bundle of light emerges centrally	 Translation of the bundle of light towards the operator
 Diffuse light quality through white reflector surface	 Directed light quality through specular reflector surface

Transmitted light - brightfield



Transmitted light - darkfield



Transmitted light - oblique light

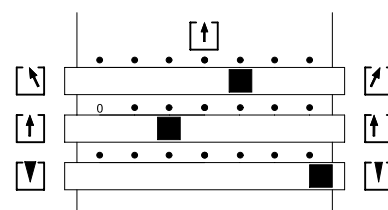


Fig. 37 Setting illumination control on transmitted-light equipment

4.1.2 Setting incident-light illumination

- Connect the light guide for incident light to the cold-light source (RL) (cf. Sections 3.1.7 and 3.7.3). Clamp the ring illuminator onto the single objective (not to the nosepiece).
- Turn on the cold-light source for incident light (RL).
- Adjust the light guide to the specimen.
- Use the two right keys on SYCOP or cold-light source to adjust the illumination intensity as required.

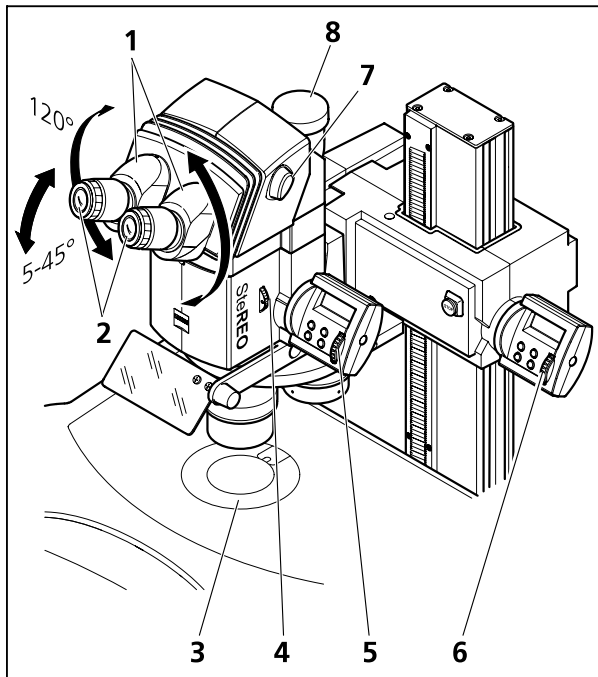


Fig. 38 Adjusting the stereomicroscope (motorized zoom and focusing)

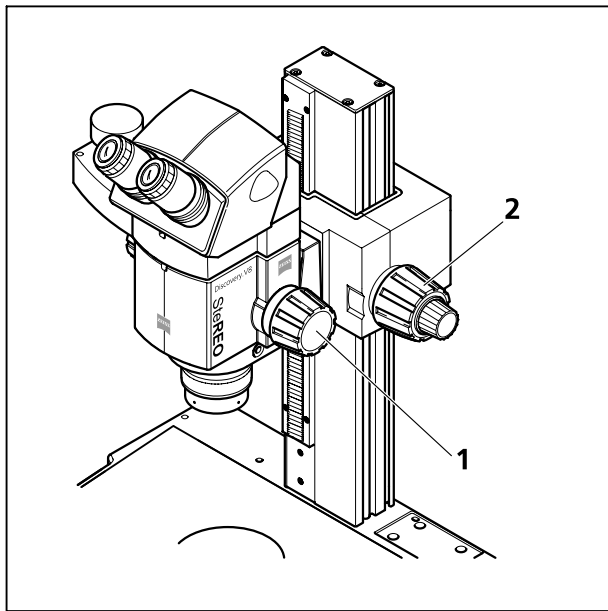


Fig. 39 Adjusting the stereomicroscope (manual zoom and focusing, e.g. SteREO Discovery.V8)

4.1.3 Adjusting the stereomicroscope



Before using the motorized focusing drive for the first time, you must adjust the mechanical stops for the travel range (see Section 3.11).

The stereomicroscope has been connected and switched on. Focus and zoom can be controlled via HIP or SYCOP. See Section 4.2 or 0 for more information.

1. Place the specimen in the center of the round stage insert (Fig. 38/3).
2. Set the diopter-setting ring on focusing eyepieces (Fig. 38/2) to the required value, if known, otherwise set it to "0".
3. Select the desired viewing height by swiveling the eyepiece sockets (Fig. 38/1) by maximally 120°; adjust them to your interpupillary distance. You should see an unclipped circle of light when you look into the eyepieces.



Verify that the eyepieces have been pushed down in the tube up to the stop.

4. Adjust the viewing angle in the range of 5° to 45° by tilting the binocular body.
5. Turn knurled wheel (Fig. 38/4) to open the aperture diaphragm.
6. At first, set the zoom (Fig. 38/5) to minimum magnification to find the object to be examined.
7. Focus on a small, prominent feature in the center of the image (Fig. 38/6).
8. Adjust the maximum zoom value (Fig. 38/5). Because of the high magnification, it is likely that the feature appears blurred again and off center.
9. Search for the feature by moving the specimen and exactly re-focus on it (Fig. 38/6).
10. Then, set the minimum zoom again (Fig. 38/5) and correct for any existing image blurring by separately turning the diopter-setting rings of the focusing eyepieces (Fig. 38/2) 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 of the ergo phototube (Fig. 38/8). To switch the light path over, turn the lever (Fig. 38/7) over. The right light path is reflected at 100 %.



After the operator has changed, steps 2 ... 4 must be repeated.



After having changed the objective, repeat steps 6 through 9. If no objective nosepiece and no control via SYCOP are used, set the currently used objective on the HIP (see Section 4.2.2).

4.1.4 Coaxial epi-illumination

The coaxial epi-illumination S is mainly intended for the non-reflecting illumination of plane reflecting objects. A distinction is made between regular (mirroring) and diffuse reflection.

4.1.4.1 Diffuse reflection

In case of diffuse scattering objects, the switching lever for the illumination adjustment should be positioned for **all objectives** in front position **C** (Fig. 40/2), because with such objects no vignettation is produced and the illumination in this position is brighter and more homogeneous.

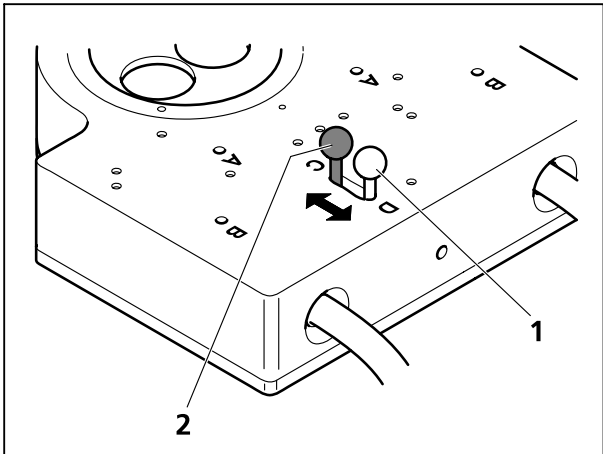



Fig. 40 Switching lever for optimizing the illumination of the specimen field (mounted at the bottom side)

4.1.4.2 Regular reflection

For **objectives S 1.0x** the switching lever, used for optimizing the illumination of the specimen field for different objectives, has to be in rear position **D** (Fig. 40/1). For **all other objectives** the lever has to be in front position **C** (Fig. 40/2).

To achieve a more homogeneous illumination for magnifications equal to or larger than those indicated in the table on page 2, you can place the lever to front position **C** (Fig. 40/2) without additional vignettation also for objectives S 1.0x.

Objective S	Avoidance of vignettation in standard front position C above	
	(in units of zoom magnification)	(total magnification with eyepieces 10x/23)
Plan Apo S 1.0x	1.1x	11.0x
Plan S 1.0x	1.4x	13.6x
Achromat 1.0x	1.8x	17.8x

 For vertical observation with the objective slider S/doc the lambda-quarter cap has to be used.

Hints for application with regular reflection:

In case of regular reflection, i.e., with objects reflecting the light of the illumination source directly into the objective, vignettations of the field of view are possible when using low zoom magnifications.

Using SteREO Discovery.V12/V20 with eyepieces 10x/23, the Plan Apo S 1.0x objective works nearly without vignettation.

Using SteREO Discovery.V8 with eyepieces 10x/23, the Plan Apo S 1.0x, Plan S 1.0x, and Achromat S 1.5x objectives are nearly without vignettation. The documentation remains unimpaired in these cases.

With objectives < 1.0x the maximum specimen fields are smaller than with objectives 1.0x because of extensive vignettations.

With objectives > 1.0x higher magnifications and a better resolution can be achieved. Vignettation, however, should be considered when choosing the eyepiece, and the cold-light source KL 1500 LCD should be used as an optimal light source.

The brightest and most detailed image will be obtained with activated auxiliary optics of the cold-light source KL 1500 LCD, the most homogeneous image will be obtained without auxiliary optics. The cold-light source KL 2500 LCD is recommended for controlling by SYCOP. It has to be used with deactivated auxiliary optics.

4.1.4.3 Light Manager

The Light Manager can be activated to hold the light intensity constant when using the coaxial epi-illumination S with the cold-light source KL 2500.

Select the RL MANAGER **Regular reflection** for bright, reflecting objects illuminated with the coaxial epi-illumination and activate it with **ACTIVATE RL MANAGER**.

Use the RL MANAGER **Diffuse reflection** for all diffuse reflecting objects and activate it with **ACTIVATE RL MANAGER**.

Use the highest zoom value to adjust the appropriate light intensity (e.g. maximum) of the cold-light source. After activating the Light Manager, the system will readjust the light intensity of the light source automatically when zooming, providing the observer with an image that has a nearly constant brightness in all zoom positions.

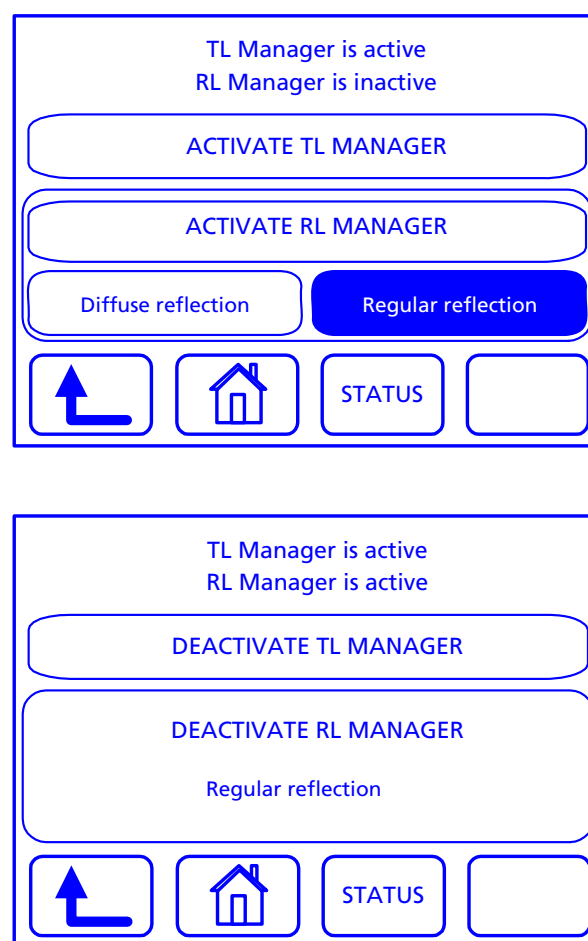


Fig. 41 Activating the Light Manager RL

4.1.5 Adjusting the PentaFluar S/X-Cite or S/HBO vertical illuminator

Check the adjustment of the HBO 100 illuminator of the PentaFluar S/HBO vertical illuminator before every critical examination, after every lamp and objective change. If necessary, readjust the illuminator (see Section 4.1.6).



When working with UV excitation light, ultraviolet radiation is incident on the object surface. Strictly avoid direct exposure to the skin. Take appropriate precautions when manipulating in the object plane (e.g. gliding stage, gloves, UV protection cream, etc.).

When working with UV light, always swing in the fluorescence protection screen (dazzle protector, Fig. 43/7) in front of the specimen to protect your eyes from scattered light.

Before swinging in another filter block, make sure to pull the slider (Fig. 42/1) on the vertical illuminator always to the frontmost position (blocking position).



Make sure the stereomicroscope has been adjusted according to Sections 4.1.2 to 4.1.3.

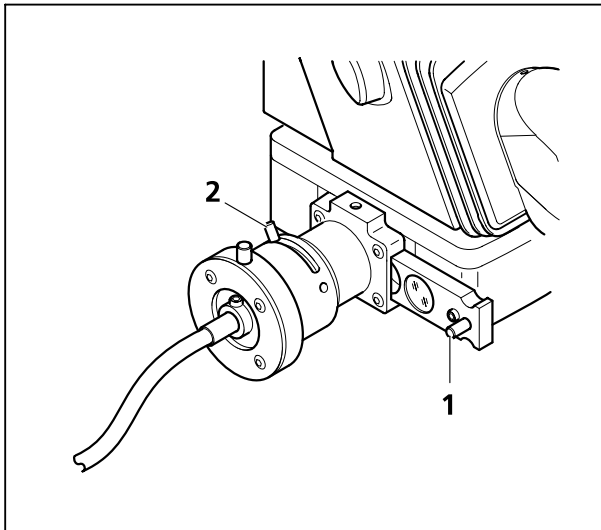


Fig. 42 Adjusting the vertical illuminator

1. Pull slider (Fig. 42/1) on PentaFluar vertical illuminator into the frontmost position (blocking position).
2. Switch on the PentaFluar vertical illuminator (X-Cite or HXP 120 on the illuminator; HBO on transformer) and let it warm up (X-Cite approx. 5 min.; HBO approx. 10 min.).
3. Put the object into the center of the round stage insert (Fig. 38/3).
4. Turn the filter wheel (Fig. 43/4) of the vertical illuminator to move a filter position into the light path.
5. Push the slider on the PentaFluar vertical illuminator into the mid-position (blank aperture) or the backmost position (position with red attenuation filter).

6. Open the iris diaphragm (Fig. 42/2) of the vertical illuminator completely by pushing the lever fully back.

7. Focus the specimen and choose the desired magnification.



To minimize bleaching of the specimen, you may first focus on it with brightfield illumination (if available) before using the vertical illuminator.

4.1.6 Adjusting the HBO 100 of the PentaFluar S/HBO vertical illuminator

The adjustment of the HBO 100 illuminator of the PentaFluar S/HBO vertical illuminator should be checked before every critical examination, after every lamp and objective change, and the illuminator readjusted, if necessary.



Adjustment of the HBO 100 illuminator is strictly necessary after any lamp change. The lamp change is described in Operating Manual B 46-0063.



When working with the filter block 58, ultraviolet radiation is incident on the object surface. Strictly avoid direct exposure to the skin. Take appropriate precautions when manipulating in the object plane (e.g. use of gliding stage, gloves, UV protection cream, etc.). Make sure to swing down the fluorescence screen (dazzle protector, Fig. 43/7) again after every change of the objective!



Make sure the stereomicroscope has been adjusted according to Sections 4.1.2 to 4.1.3.

- Pull slider (Fig. 42/1) on vertical illuminator into its frontmost position (blocking position).
- Switch on the HBO 100 illuminator on the transformer and let it warm up for approximately 10 min.
- Put a suitable fluorescence specimen onto the stage.
Optimal are those specimens that have both well-structured areas and sufficient unstructured background areas in the magnification range you prefer. With this kind of specimen, the homogeneity of illumination can be assessed more easily.
- On the filter wheel, swing a filter block for strong, contrasty fluorescence into the light path.

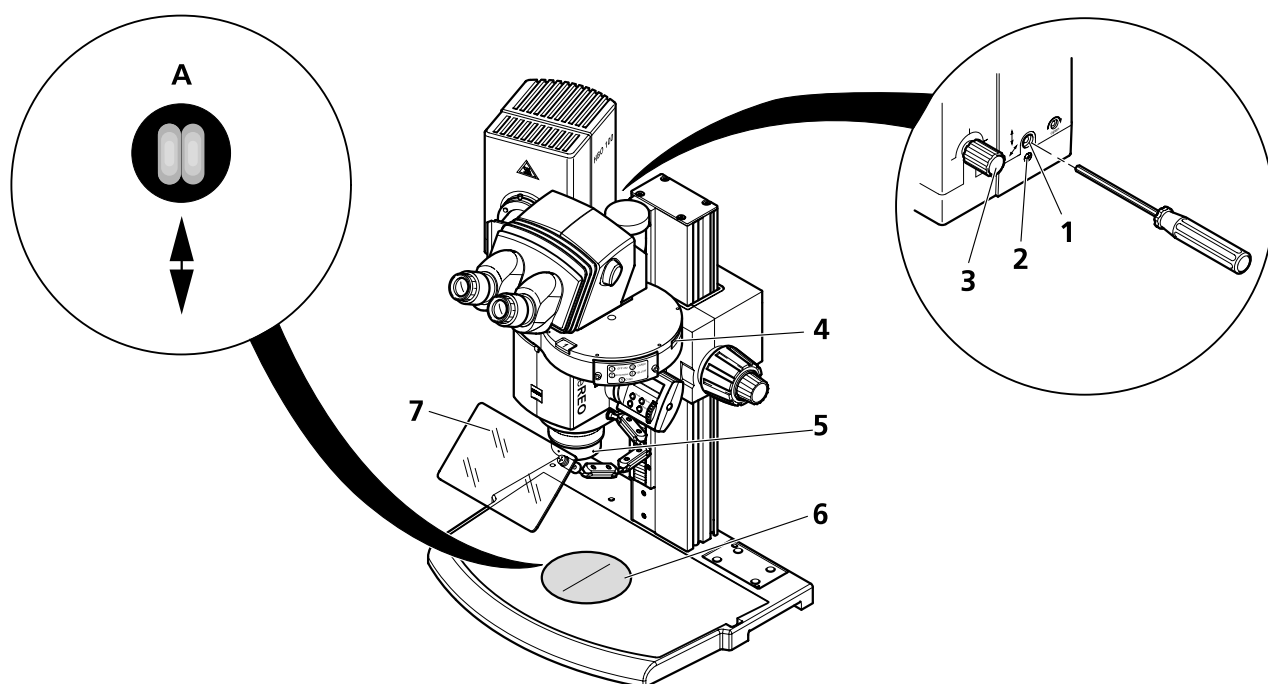


Fig. 43 Adjusting the HBO 100 illuminator

- Push the slider on the PentaFluar vertical illuminator (Fig. 42/1) into mid-position (working position).
- Open the iris diaphragm (Fig. 42/2) of the vertical illuminator completely by pushing the lever fully back.
- Choose the highest magnification (zoom value) and fully open the iris diaphragm on the microscope body.
- Focus on the specimen.
- Remove the specimen and put the adjustment circle, $d = 120\text{ mm}$ (Fig. 43/6), onto the stage (see page 120 for a description of the adjustment circle).
- Choose the lowest magnification stage (zoom value).
- Holding the objective (Fig. 43/5) safely **with both hands**, unscrew it from the microscope body or the objective nosepiece.
- Turn the collector knob (Fig. 43/3) on the HBO 100 until a focused image of the lamp arc/reflected image appears on the adjustment circle.
- Turn the screw for vertical adjustment (Fig. 43/1) until the lamp arc and its reflected image appear at the same level (Fig. 43/A).
- Turn the screw for horizontal adjustment (Fig. 43/2) in such a way that lamp arc and its reflected image appear, if possible, on both sides of the vertical line at the same level (Fig. 43/A).
- Holding the objective (Fig. 43/5) with both hands, turn it into the microscope body or the objective nosepiece.
- Turn the collector knob (Fig. 43/3) to adjust homogeneous illumination.
- Remove the adjustment circle (Fig. 43/6) and put the fluorescence specimen onto the stage.

4.2 Human Interface Panel (HIP)

The HIP control unit can be used to operate the microscope (without SYCOP). One HIP controls the motorized focusing drive (Fig. 4/15), while the second one controls the microscope body (Fig. 4/17). With the SYCOP unit connected, the HIP is not necessary and usable only to a limited extent.

The HIP contains a two-line display.

Besides, it has four function keys: **Mode**, ① (Standby), **Mem1** and **Mem2**.

The knurled wheel can be moved up and down and pressed.

Two modes are selectable: **Basic Mode** for microscope operation and the **Setting Mode** for adjusting specific parameters.

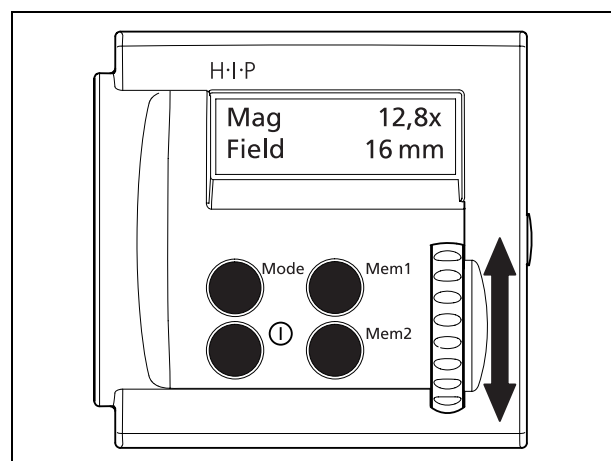



Fig. 44 Design of HIP control unit

4.2.1 Functional elements on HIP

Zoom control unit	Focus control unit
Two-line display <ul style="list-style-type: none"> – Display of magnification (Mag) in the top line – Press the Mode key briefly to display further parameters. – In Setting Mode: Display of parameters and the current or selected value Knurled wheel ↑↓ <ul style="list-style-type: none"> – ↑ Adjustment of a higher zoom value – ↓ Adjustment of a lower zoom value – ↑↓ In Setting Mode: Selects list entry Mem1/Mem2 keys <ul style="list-style-type: none"> – Press briefly to set the stored zoom value – Press for two seconds (confirmation beep) to store the currently set zoom value 	Two-line display <ul style="list-style-type: none"> – Display of focus position Z in the top line – Press the Mode key briefly to set the focus value to zero. – In Setting Mode: Display of parameters and the current or selected value Knurled wheel ↑↓ with key function <ul style="list-style-type: none"> – ↑ Moves focusing drive up – ↓ Moves focusing drive down – Press briefly: Switches between various focusing modes (see Section 4.6.3.1) – ↑↓ In Setting Mode: Selects list entry Mem1/Mem2 keys <ul style="list-style-type: none"> – Press briefly to set the stored focus position – Press for two seconds (confirmation beep) to store the currently set focus position

Zoom control unit	Focus control unit
<p>Mode key</p> <ul style="list-style-type: none"> – Briefly press this key repeatedly to display field size (Field), resolving power (Resol) and depth of focus (Depth) successively. – Press it for two seconds to switch to the Setting Mode – In Setting Mode: Press it briefly to select parameters <p>NOTE: Press the key for two seconds to switch to Basic Mode and permanently store the newly selected parameter values.</p> <p>① key</p> <ul style="list-style-type: none"> – Switches HIP ON/OFF (Standby) 	<p>Mode key</p> <ul style="list-style-type: none"> – Press Mode key briefly to reset the focus value to zero. – Press it for two seconds to switch to the Setting Mode – In Setting Mode: Press it briefly to select focus parameters <p>NOTE: Press the key for two seconds to switch to Basic Mode and permanently store the newly selected parameter values.</p> <p>① key</p> <ul style="list-style-type: none"> – Switches HIP ON/OFF (Standby)

4.2.2 Menu guidance in Setting Mode

 The parameters of the zoom control unit are partly different from those of the focus control unit (see the following parameters table).
For acoustic confirmation of new values, please activate the **Beep Level** function.

To change any parameters, switch from Basic Mode to Setting Mode.

- To this end, press the **Mode** key for two seconds until a confirmation beep (2x briefly) is generated and the display switches over.


On the display, the first parameter and the corresponding value are displayed, e.g.:

Set Lens 1x

- Press the **Mode** key several times to select the desired parameter.
- To change the value of the selected parameter, move the knurled wheel up or down (▲ ▼) until the desired value is displayed, e.g.:
Set Lens 0.63x ▲ 1x ▲ 1.5x
- Press the **Mode** key once more to select the next parameter.

If you have set all parameters, you can return to the Basic Mode.

- To this end, press the **Mode** key for two seconds until a confirmation beep (1x long) is generated and the display switches over. All changed values are being stored now.

 The new values will be stored permanently only after switchover to the Basic Mode. Switching the device off at the ① key or disconnecting the power supply in Setting Mode will result in losing the changed values.

General parameters		Values	Remarks
Backlight	Adjustment of display backlight	12-stage progress bar	⬆ Increase background brightness ⬇ Reduce background brightness
Beep Level	Switching the confirmation beep ON/OFF	ON → OFF	Activation is recommended

Zoom parameters (Zoom control unit only)		Value	Remarks
Set Lens	Change of objective magnification	Achro 1.5x Achro 1.25x Achro 1.0x Achro 0.63x Achro 0.5x Achro 0.3x PlanApo 3.5x PlanApo 2.3x PlanApo 1.5x PlanApo 1.0x PlanApo 0.63x Plan 1.0x	Required for the correct display of magnification
Conv. 1.5x ?	Converter 1.5x mono	NO → YES	Use/do not use the converter S 1.5x mono
Set Eyepiece	Change of eyepiece magnification	25x/10foc 16x/16Br foc 10x/23Br foc 10x/20Br foc	Required for the correct display of magnification
Confirmation	Activating/deactivating the start query	ON → OFF	Start query is useful only if the magnifications of objectives/eyepieces are to be changed frequently
Zoom Speed	Adjustment of setting speed	1 → 2 → 3	Flat → steep speed profile
Reset Param?	Reset to factory defaults	NO → YES	

Focus parameters (Focus control unit only)		Values	Remarks
Focus Speed	Adjustment of setting speed	1 → 2 → 3 Slow → fast	Relevant only to Focus Speed not to Fine Focus
Reset Param?	Reset to factory defaults	NO → YES	

4.3 Manual Rotary Control unit (MaRC)

The MaRC unit is used to operate the motor focus and zoom functions of the microscope (also without SYCOP).

Only focus motor 2 (435401-9901-000) can be controlled, not focus motor 1 (435401-0000-000).

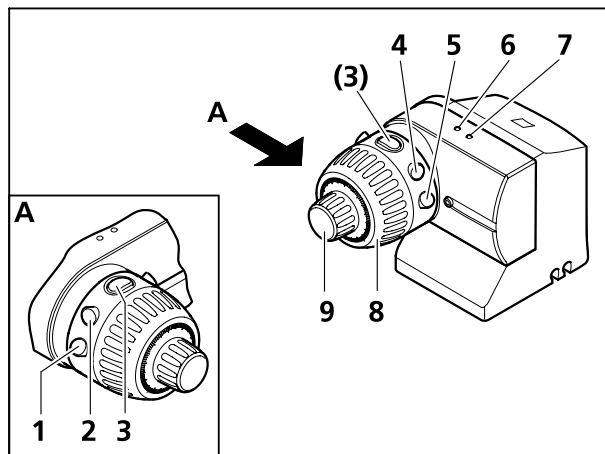


Fig. 45 MaRC control unit

MaRC offers the following scope of functions:

- Control of focus motor by using the coarse (Fig. 45/8) and fine drive knob (Fig. 45/9).
- Travel to zoom clickstop positions by pressing briefly keys **1** and **2** (Fig. 45/1 and 2).
- Quick zooming in positive and negative directions by means of a pair of keys – long press of keys **1** and **2** (Fig. 45/1 and 2).
- Quick focusing in positive and negative directions by means of a pair of keys – long press of keys **4** and **5** (Fig. 45/4 and 5).
- Storing a focus position – key **3** (Fig. 45/3).
- Travel to the stored position – key **3** (Fig. 45/3).
- Reversing the sense of rotation of the MaRC unit – key **3** (Fig. 45/3).

4.3.1 On-position

In systems provided with the EMS module, MaRC is switched on by switching on the EMS module. In systems without EMS, MaRC is switched on as soon as it is connected to a mains adapter (patch cable) via the CAN bus.

After power ON, the stored focus position will remain unchanged, provided that a focus position was stored and MaRC was switched off properly by **Shut Down** after it was used the previous time. If it has not been 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. 45/7) will be lighting.

MaRC is immediately ready for operation.

4.3.2 Control of motorized focus by means of coarse and fine drive

The motorized focus can be controlled quickly or slowly by turning the coarse (Fig. 45/8) or the fine drive (Fig. 45/9).

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

4.3.3 Travel to zoom clickstop positions

By briefly (≤ 200 ms) pressing key **1** or **2** (Fig. 45/1 or 2), the zoom body will travel to the next lower or next 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 position indicated on the HIP/SYCOP panels according to the current objective/eyepiece combination.

4.3.4 Quick zooming in positive or negative direction by means of a pair of keys

By pressing key **1** or **2** (Fig. 45/1 or 2) for more than 200 ms, the zoom body will start traveling and not stop until you release the respective key or the end of travel is reached.

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

The reachable maximum speed depends on the currently active speed profile settable via HIP/SYCOP.

4.3.5 Quick focusing in positive or negative direction by means of a pair of keys

By pressing key **4** or **5** (Fig. 45/4 or 5), the motorized focusing system will start traveling upwards (**5**) or downwards (**4**) until you release the respective key or the end of travel is reached.

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

The reachable maximum speed does not depend on the currently active speed profile settable via HIP/SYCOP.

4.3.6 Storing a focus position

The current focus position will be stored when key **3** (Fig. 45/3) is being pressed between 2 s and 5 s.

The green LED (Fig. 45/6) briefly lighting up and **one** short beep tone on the motorized focusing system will indicate the completion of the storing process after 2 s.

4.3.7 Traveling to the stored focus position

When pressing key **3** (Fig. 45/3) for less than 2 s, the motorized focusing system will travel to the stored focus position.

4.3.8 Reversing the sense of rotation of MaRC

The sense of rotation will be reversed when key **3** (Fig. 45/3) will be pressed for more than 5 s.

The green LED (Fig. 45/6) briefly lighting up twice and **two** short beep tones on the motorized focusing system will indicate that change-over has been completed.

That means that, altogether, key **3** must be pressed until the green diode has lighted up **three times** and **three** beep tones have been produced by the motorized focusing system.

4.4 Operating the objective nosepiece S/doc, 3x, 6x cod.



CAUTION

Before changing the objective, it is imperative to switch off the Parfocality Manager (see section 4.6.3.3 on page 91).

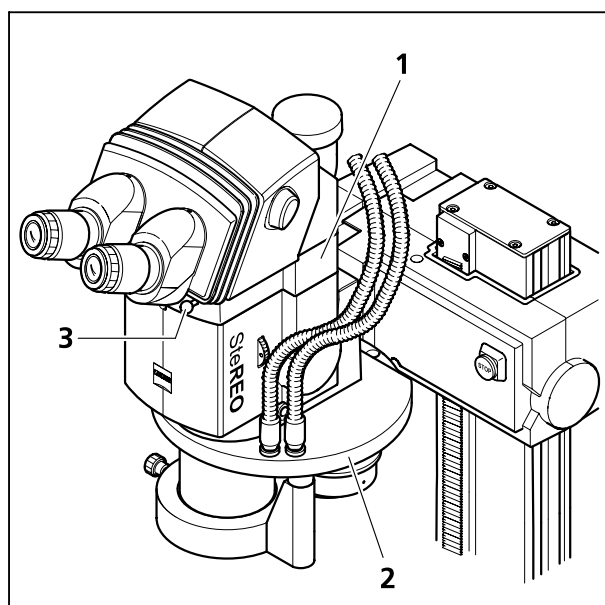


Fig. 46 Objective nosepiece S/doc, 3x, 6x cod.; Y intermediate tube S

The objectives are changed by rotating the objective nosepiece (Fig. 46/2) to the lock-in position of the desired objective. It is recommended to hold the nosepiece on the right by the slit-ring illuminator $d = 66$ mm without light guide.

For each objective, a lock-in position for stereo (S) and another for documentation (doc) is available.

The selected objective and the position (3D - stereo or 2D - mono) are displayed on the SYCOP and AxioVision modules after the first configuration.

If an Y intermediate tube (Fig. 46/1) has been attached, a binocular image can be produced in the macroscope position of the objective by pushing in the lever (Fig. 46/3).

For documenting purposes via the binocular phototube it is recommendable to use the stereo position of the Y intermediate tube also in the macroscope position of the objective in order to allow the full amount of light to pass to the camera.

Without the Y intermediate tube, no image will appear in the left eyepiece when the objective is in macroscope position.



CAUTION

When operating the objective nosepiece S/doc manually with the left coarse focusing knob without paying attention, there is a possible danger of injury due to the edges of the objective nosepiece S/doc.

**CAUTION**

Take care to avoid colliding of the objective with the stage equipment or the specimen! If you use the objective nosepiece S/doc, adjust the travel of the motorized focusing drive (see section 3.11 on page 61) in such a way that there is sufficient space between the objective with the largest end-to-end dimension and the microscope stage.

If you use the objective nosepiece, not all objectives can be combined with each other. The following table shows you the possible combinations with and without the converter S 1.5x mono:

Combination of objectives with/without converter when using the objective nosepiece combinable not combinable	PlanApo S 0.63x	PlanApo S 1.0x	PlanApo S 1.5x	PlanApo S 2.3x	PlanApo S 3.5x	Plan S 1.0x	Achromat S 0.3x	Achromat S 0.5x	Achromat S 0.63x	Achromat S 1.0x	Achromat S 1.25x	Achromat S 1.5x	C1.5x PA 0.63x	C1.5x PA 1.0x	C1.5x PA 1.5x	C1.5x PA 2.3x	C1.5x Plan 1.0x	C1.5x A 0.3x	C1.5x A 0.5x	C1.5x A 0.63x	C1.5x A 1.0x	C1.5x A 1.25x	C1.5x A 1.5x
PlanApo S 0.63x	X																						
PlanApo S 1.0x		X																					
PlanApo S 1.5x			X																				
PlanApo S 2.3x				X																			
PlanApo S 3.5x					X																		
Plan S 1.0x						X																	
Achromat S 0.3x							X																
Achromat S 0.5x								X															
Achromat S 0.63x									X														
Achromat S 1.0x										X													
Achromat S 1.25x											X												
Achromat S 1.5x												X											
C1.5x PA 0.63x													X										
C1.5x PA 1.0x														X									
C1.5x PA 1.5x															X								
C1.5x PA 2.3x																X							
C1.5x Plan 1.0x																	X						
C1.5x A 0.3x																		X					
C1.5x A 0.5x																			X				
C1.5x A 0.63x																				X			
C1.5x A 1.0x																					X		
C1.5x A 1.25x																						X	
C1.5x A 1.5x																							X

4.5 Documentation equipment

4.5.1 Objective slider S/doc

**CAUTION**

The objective slider can be used only in combination with mount S (with Ø 76 mm support). It is non-operational in combination with the objective nosepiece S/doc, 3x.

**CAUTION**

After mounting the objective slider, the lower limit switch on the motorized focusing drive must be readjusted (see section 3.11 on page 61).

Minimum equipment required for Z image stacks in reflected light and for extended depth of sharpness:

- Motorized focusing drive
- Reflected-light ring illuminator
- AxioCam
- SYCOP
- PC incl. software AxioVision 4

Minimum equipment required for measuring specimen contours in transmitted light brightfield:

- Coarse/fine drive
- VisiLED transmitted light unit
- MC 750 stage micrometer
- AxioCam MR
- PC incl. software AxioVision 4

The following phototubes and intermediate phototubes can be used in combination with the objective slider S/doc:

- Binocular ergo phototube S (4351000-0000-000)
- Binocular phototube S (435107-0000-000)
- Intermediate phototube S mot., right 100/100 (435118-0000-000)
- Intermediate phototube S, left 100/100 (415108-9901-000)
- Intermediate phototube S with two output ports 50/50 (435109-0000-000)

4.5.1.1 Mounting

- Move the focusing drive upwards to create a free space of about 20 cm.
- Unscrew the objective (Fig. 47/5) from the microscope body (Fig. 47/1). Attach the lens-protective cap.
- Hand-tighten the clamping screw (Fig. 47/4) onto the objective slider.
- Hold the objective slider (Fig. 47/3) with both hands and screw it into the microscope body (Fig. 47/1) as far as it will go.
- Screw the objective (Fig. 47/5) into the objective slider (Fig. 47/3) as far as it will go. Remove the lens protective cap again.
- Loosen the clamping screws (Fig. 47/2 and 4).
- Align the clamping screw (Fig. 47/4) of the objective slider and the joint of the microscope body (Fig. 47/1) with the clamping screw (Fig. 47/2) (Fig. 47/6).
- Hand-tighten the clamping screws (Fig. 47/2 and 4).

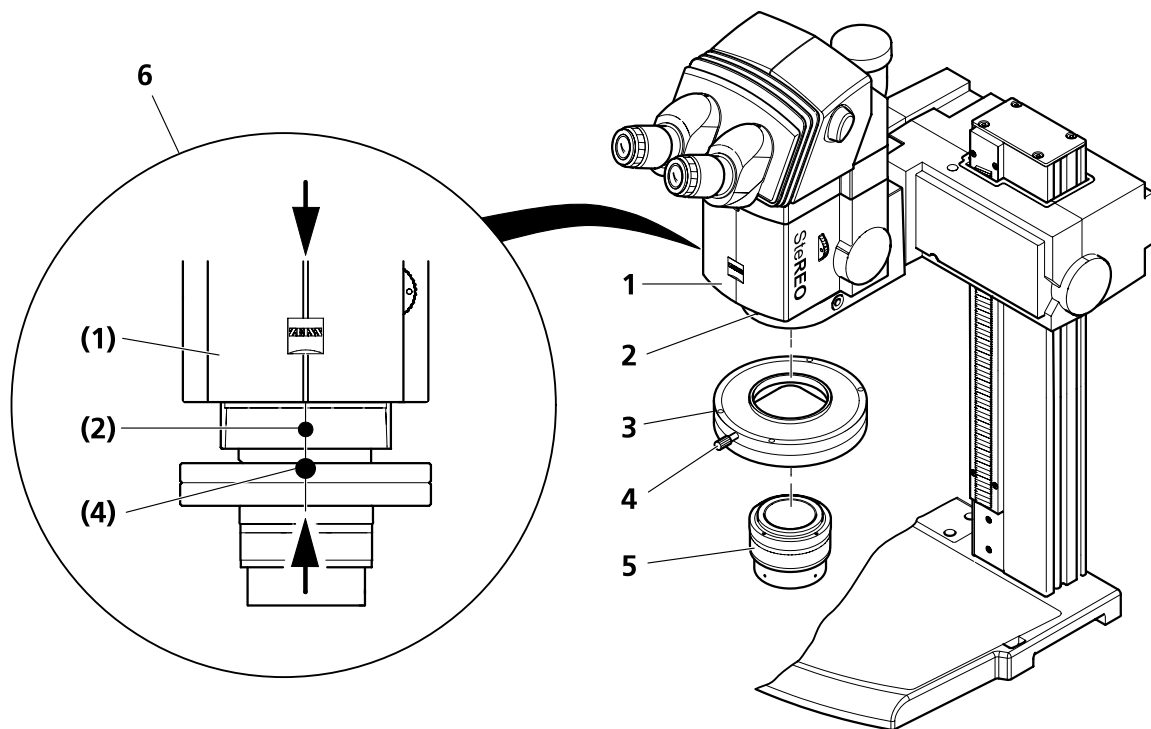


Fig. 47 **Mounting the objective slider S/doc**

4.5.1.2 Operation

The objective slider allows you to position the objective in the following three click-stop positions:

← LEFT:

for vertical and monocular imaging, via the left light path, of a specimen detail 12 mm to the left from position **A** (Fig. 48).

MIDDLE:

for stereoscopic imaging of the specimen detail (**A**).

RIGHT →

for vertical and monocular imaging, via the right light path, of a specimen detail 12 mm to the right from position **A** (Fig. 49).

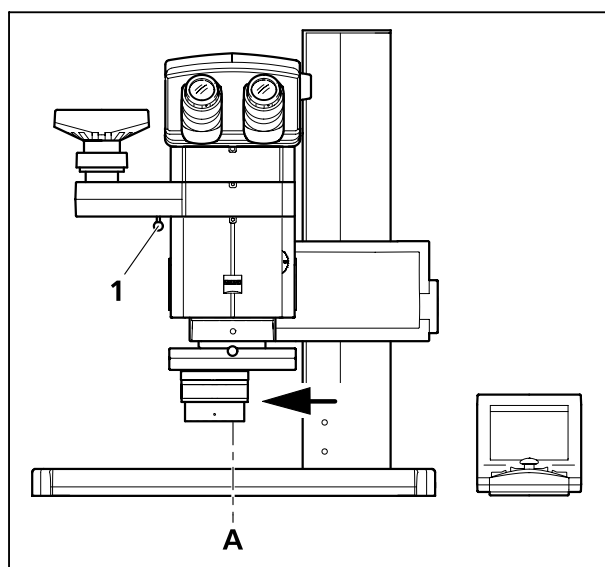


Fig. 48 Objective slider S/doc with intermediate phototube

Documentation using intermediate phototubes:

- Push the sliding knob (Fig. 48/1) to the front stop position to deflect the light ray to the camera port.
- Move the objective carefully to the left stop position of the objective slider.

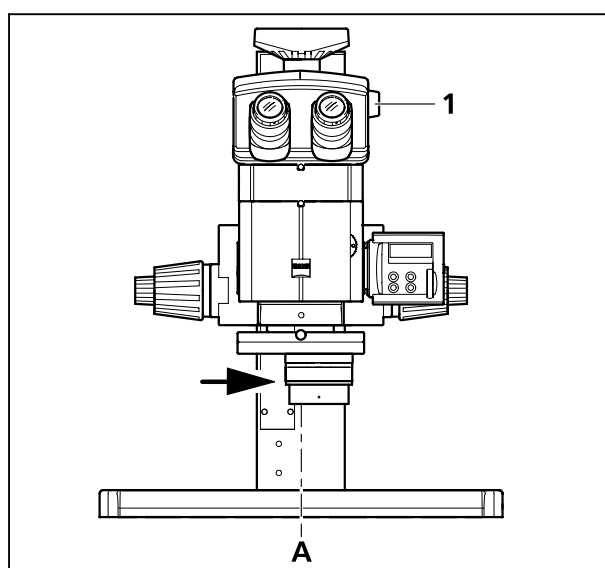


Fig. 49 Objective slider S/doc with ergo phototube

Documentation using ergo phototubes:

- Turn the lever (Fig. 49/1) to the rear position to deflect the light ray to the camera port.
- Move the objective carefully to the right stop position of the objective slider.

4.5.2 Intermediate phototube S mot., right 100/100

Using the intermediate tube S mot., right 100/100, a camera can be connected on the right side of the microscope body.

- Mount the intermediate phototube between the microscope body and the binocular tube (see Section 3.1.5).
- Link the CAN bus port of the intermediate tube (on the back) with:
 - CAN bus connector of the focus motor or
 - CAN bus connector of the EMS Electronic Module or
 - a free CAN bus connector of another CAN bus accessory component or
 - HIP plug-in power unit (directly).
- Change over the beam path between the camera port (doc) and the binocular tube by briefly pressing the button (Fig. 50/2). If the camera port is active, the blue LED (Fig. 50/1) in the front part of the intermediate phototube is lighting.

The intermediate phototube may also be switched via SYCOP or AxioVision.

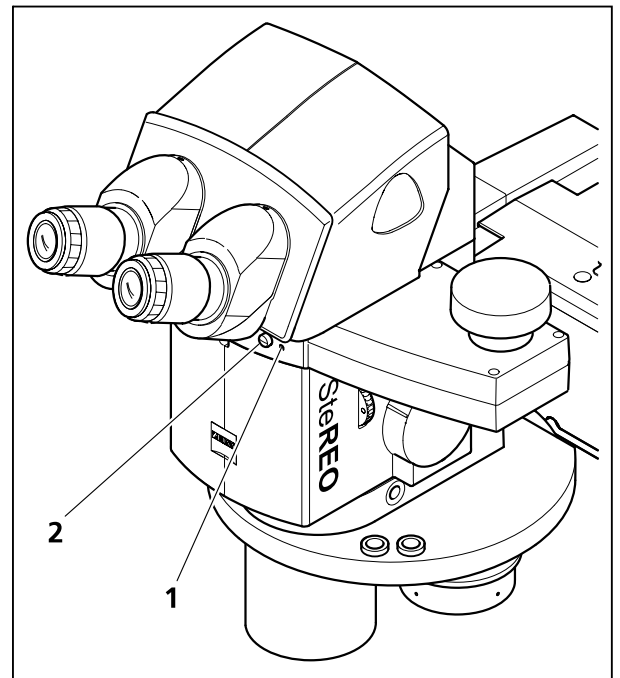


Fig. 50 Intermediate phototube S mot., right 100/100

4.5.3 Y intermediate tube S

With the help of the Y intermediate tube S, a binocular image can be generated.

It is preferably used with the objective nosepiece S/doc, 3x, 6x cod. being in macroscope position.

- Push in the slide rod (Fig. 46/3) on the Y intermediate tube (Fig. 46/1) in order to obtain a binocular image in the macroscope position.
- Pull out the slide rod (Fig. 46/3) for stereoscopic observation.

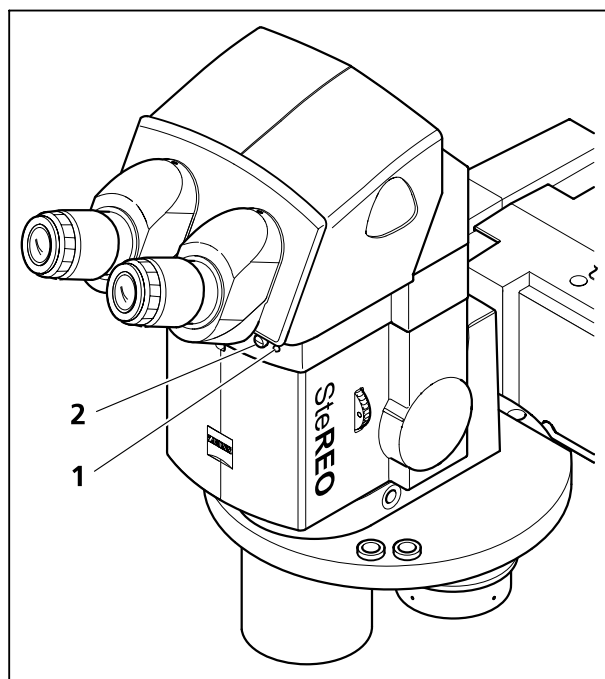


Fig. 51 **Intermediate tube S mot. with analyzer**

4.5.4 Intermediate tube S mot mono with analyzer

Using the intermediate tube S mot mono, a polarization filter can be swung into/out of the right stereo channel.

- Mount the intermediate tube between the microscope body and the binocular tube (see section 3.1.5).
- Link the CAN bus port of the intermediate tube (on the back) with:
 - CAN bus connector of motor focus,
 - CAN bus connector of the electronic module,
 - EMS or a free CAN bus connector of another CAN bus accessory component or HIP plug-in power unit (directly)
- Press the button (Fig. 51/2) briefly to swing the polarization filter into/out of the light path. If the filter is active, the blue LED (Fig. 51/1) at the front of the intermediate tube with analyzer is lighting.

The filter may also be swung into/out of the light path via SYCOP or AxioVision.

The direction of transmission of the intermediate tube with analyzer is east-west.

The polarizers of the associated reflected-light/transmitted-light device have to be adjusted with respect to the intermediate tube with analyzer.

As additional components for binocular observation, the objective slider S/doc or the objective nosepiece S/doc, 3x, 6x cod. and the Y intermediate tube S are recommended.

4.6 System Control Panel (SYCOP)

The SYCOP System Control Panel combines three functional elements in a single unit (Fig. 52):

- (1) Touch-sensitive screen (in brief: touch screen)
- (2) Four push buttons for light intensity control
- (3) Joystick for the operation of motorized zoom and focusing functions

SYCOP is operated with one hand. You can operate the joystick and the four push buttons without the need for looking away from the specimen.

Via the touch screen, on the one hand you can view significant optical parameters at a glance, and on the other hand activate and store diverse microscope settings.

The functions correspond to the default assignment (factory setting) of the SYCOP. You may change the assignment, if necessary, or reset it to the default setting (see Section 4.6.6.4).

The SYCOP includes the EMS-2 Electronic Module (Fig. 52/4), which serves as central connection unit for all other system components.

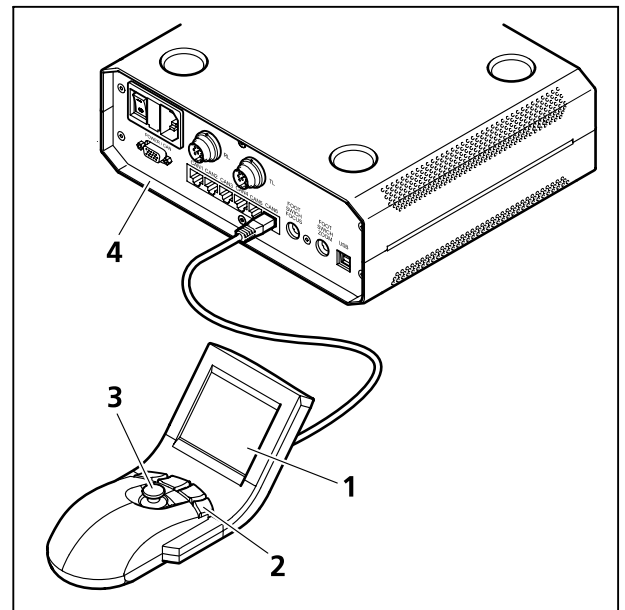


Fig. 52 Design of SYCOP

4.6.1 Functional elements

4.6.1.1 STOP button

The STOP button serves for a fast switch-off of the moving focusing drive to prevent collisions with the stage or the specimen on the stage.

- Push in the STOP button (Fig. 53/1) to switch off the focusing drive.

The STOP button snaps in. The movement is instantly stopped. To reuse the focusing drive, the STOP button must be unlocked.

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

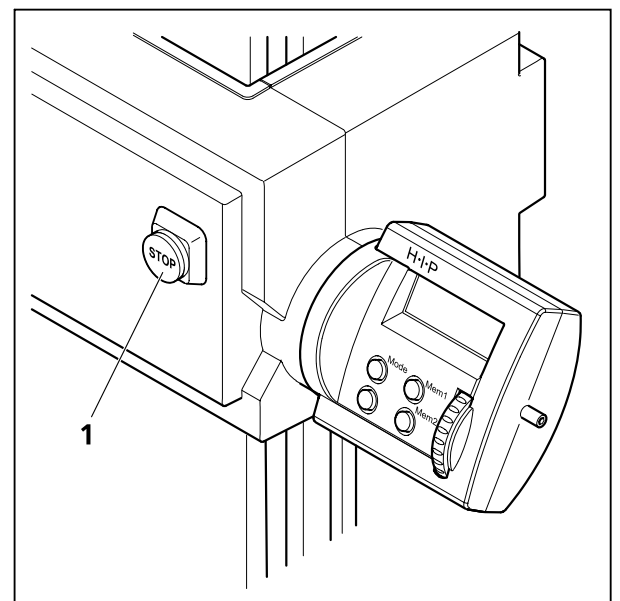


Fig. 53 STOP button

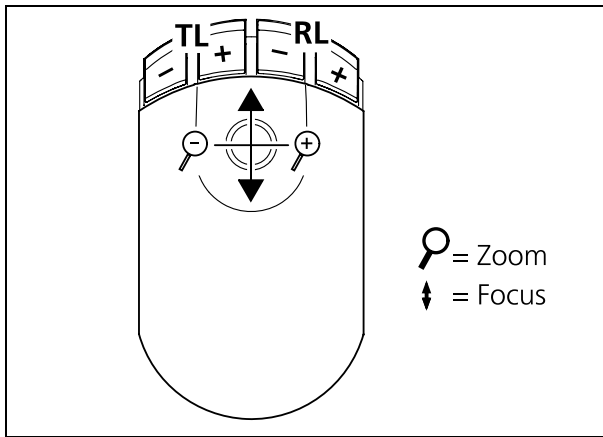


Fig. 54 Functional elements on SYCOP

4.6.1.2 Joystick

- Move to the left to reduce the zoom value
- Move to the right to increase the zoom value
- Move up to move the focusing drive up
- Move down to move the focusing drive down

Full displacement of the joystick activates the highest speed. Minor displacement corresponds to a lower speed.



When the motorized focusing drive is moved down, there is the **risk of hand crushing** in the operating area:

- Switch off the focusing drive with the STOP button, if necessary.
- While the drive is moving down, do not reach with your hands into the operating area or under the motorized focusing drive.
- Adjust the position of the limit switches as required (see Section 3.11), to prevent damage to the instrument.
- Use the specimen protection function to prevent damage to the specimen (see Section 4.6.3.5).

4.6.1.3 Push buttons for light intensity control (for KL 2500 LCD only)



The four push buttons can be used only for adjusting the light intensity of cold-light sources of the KL 2500 LCD type.

With the two left push buttons, you can adjust the intensity of transmitted-light illumination (Fig. 54/**TL**), with the two right push buttons, that of incident-light illumination (Fig. 54/**RL**).

The adjusted light intensity can be read from the touch screen.

- Reduced the brightness/double click turns the illumination off.
- Increases the brightness or turns illumination on again.



The functions of the joystick buttons and push buttons for light intensity can be changed (see Section 4.6.6.4).

4.6.1.4 Touch screen - Main menu

The touch screen is a touch-sensitive panel. To activate a specific function, tap with your finger on the corresponding key.

After switch on, the main menu shows the following settings:

- Time and date (can be edited via **SETUP - Date/Time**)
- Visual total magnification (**MAG**)
- Selected objective (**Obj**), stereo (**3D**) or mono position (**2D**) (**2D** or **3D** will be indicated only if the objective nosepiece S/doc, 3x, 6x cod. is connected and configured), and eyepiece (**Eyep**)



If the objective PlanApo 3,5x is used in combination with the converter S 1,5x mono, only the 2D position can be used. When moving the objective to the 3D position, an error message will appear (Fig. 56).

The error message will disappear again as soon as the objective is moved back to the 2D position.

- Converter S 1,5x mono selected/not selected (**Con**)
- **Field of view** size, **Resolution** and **Depth of focus**
- Current Z position (focus position)
- Four menu keys (**FUNCTION**, **MEMORY**, **STATUS**, **SETUP**)
- Two function keys (**SAVE SETTINGS**, **SHUT DOWN**)
- Illumination intensity as progressive bar with current setting in percent and color temperature in Kelvin for incident light (**RL**) and transmitted light (**TL**)



The visual total magnification (Mag) is calculated from the objective/eyepiece combination. Therefore, take care that the objective and eyepiece data entered are correct. If not, enter the data of the actually used components via **SETUP – Objective (Nosepiece)/Eyepiece** (see Section 4.6.6). Total magnification will not be displayed unless objectives and eyepieces have been defined.

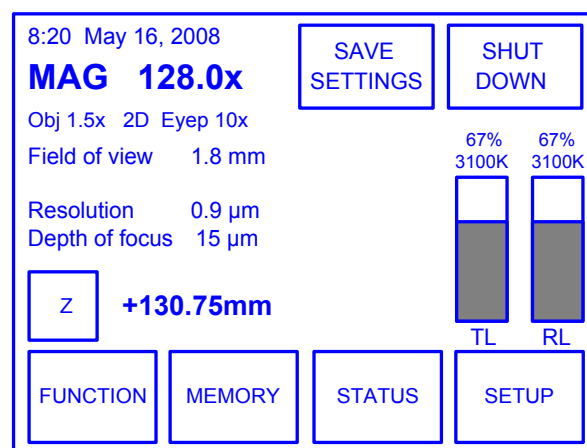


Fig. 55 Touch screen – Main menu

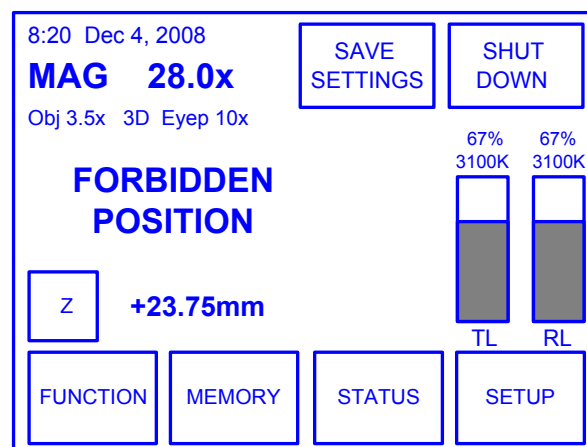


Fig. 56 Error message "Forbidden Position"

The fields edged in blue are keys that respond to touches:

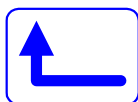
- Touch the **Z** key to set the current focus position to zero.
- Touch the **SAVE SETTINGS** key to save the current SYCOP settings.
- Touch the **SHUT DOWN** key to switch the system to the standby mode. Switch it on again via the ① key (standby) on the EMS-2; current settings are saved automatically.
- Pressing the **FUNCTION**, **MEMORY**, **STATUS** or **SETUP** keys activates further menus (see Section 4.6.2).



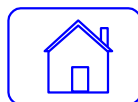
The displayed values of resolving power (**Resolution**) and depth of focus (**Depth of focus**) are obtained only under optimum conditions, i.e. at optimum illumination and opened aperture diaphragm. For information on correct microscope adjustment, refer to Sections 4.1.1 to 4.1.3.

4.6.2 Overview of menu guidance

FUNCTION Display and adjustment of system-dependent functions	MEMORY Activation/storage of user-specific microscope settings	STATUS Information of user about current system status	SETUP Displaying and editing of instrument parameters
<div data-bbox="225 450 496 600"> Focus Speed Selection of speed profile (slow, medium, fast or Fine Focus) focus manager </div> <div data-bbox="225 629 496 779"> Light Manager Activation/deactivation of autom. control of incident and/or transmitted light source via SYCOP </div> <div data-bbox="225 808 496 958"> Parfocality Parfocality manager and Parfocality wizard </div> <div data-bbox="225 987 496 1137"> Photo Tube Control of motorized intermediate phototube and image recording </div> <div data-bbox="225 1167 496 1317"> Pol Tube Control of motorized intermediate analyzer tube </div> <div data-bbox="225 1346 496 1496"> Spec. Protection Driving to lowest, collision-free focus position and activation of specimen protection </div> <div data-bbox="225 1525 496 1675"> Zoom Clickstop Selection of zoom standard magnifications (objective/eyepiece/zoom combination) </div> <div data-bbox="225 1704 496 1854"> Zoom Speed Selection of speed profile (slow, medium, fast) </div>	<div data-bbox="560 450 831 539"> M1 to M8 Storage positions </div> <div data-bbox="560 562 831 651"> Start call up the actual storage position </div> <div data-bbox="560 674 831 763"> Mag Store/delete individual magnification </div> <div data-bbox="560 786 831 875"> Z-pos Store/delete individual Z position </div> <div data-bbox="560 898 831 1021"> RL Store/delete individual incident-light intensities </div> <div data-bbox="560 1043 831 1167"> TL Store/delete individual transmitted-light intensities </div> <div data-bbox="560 1189 831 1312"> Phot Store/delete switch position of the phototube </div> <div data-bbox="560 1335 831 1458"> Pol Store/delete individual polarisation settings </div> <div data-bbox="560 1480 831 1581"> FocSp Store/delete focus speed </div> <div data-bbox="560 1603 831 1727"> ZoomSp Store/delete zoom speed </div> <div data-bbox="560 1749 831 1872"> Reset Delete the selected storage position </div>		<div data-bbox="1230 450 1501 663"> Without coded nosepiece: Objective selecting objective from list With coded nosepiece: Nosepiece assigning objectives from list to 3 nosepiece mounts </div> <div data-bbox="1230 685 1501 797"> Eyepiece Selection of eyepiece used from list </div> <div data-bbox="1230 819 1501 931"> User Selection of four user-specific settings, editing user names </div> <div data-bbox="1230 954 1501 1301"> Key Settings Displaying and editing the function assignment of the 4 SYCOP keys, footswitches and the joystick button <div data-bbox="1246 1099 1485 1189"> Change Settings Changing the function assignment of keys </div> <div data-bbox="1246 1211 1485 1301"> Set Default Activation of default key functions </div> </div> <div data-bbox="1230 1323 1501 1469"> Backlight/Contrast/Beep Adjustment of SYCOP brightness and contrast, activation/deactivation of confirmation beep </div> <div data-bbox="1230 1491 1501 1603"> Date/Time Setting date/time </div> <div data-bbox="1230 1626 1501 1738"> Reset Parameter Setting all parameters to factory defaults </div> <div data-bbox="1230 1760 1501 1872"> Display Selection of initial window after start-up </div> <div data-bbox="1230 1895 1501 2007"> Info Displaying information on system components </div>



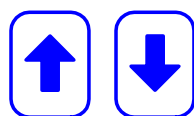
Press this key (**Back**) to return to the previous menu.



Press this key (**Home**) to return to the Main menu.



Press these keys to increase or reduce the value of the selected parameter, or also to activate and deactivate a function.



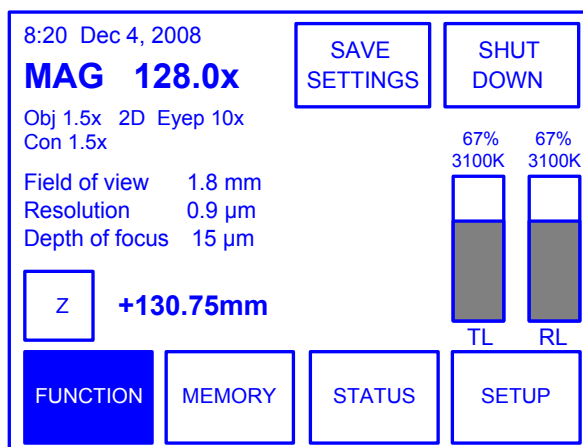
Press these keys to scroll up or down through a selection list to display all list entries.

4.6.3 FUNCTION menu

The **FUNCTION** menu provides access to important functions required for operation:

- Zoom Clickstops (standard magnifications)
- Specimen protection function
- Light Manager
- Speed profile for focusing drive
- Speed profile for zoom drive
- Control of motorized intermediate phototube
- Control of motorized intermediate tube with analyzer
- Press the **FUNCTION** key to activate this submenu.

The accessible functions are described in the following.



4.6.3.1 Setting the speed profile of the motorized focusing drive (Focus Speed)

The setting speed of the motorized focusing drive can be adjusted in steps. In addition, the **Focus Manager** or **Fine Focus** modes can be selected.

The speed of the drive is influenced by the degree of displacement of the joystick/knurled wheel:

- Partial displacement: Speed depends on the angular displacement and the set speed profile.
- Full displacement: After a short delay, the drive is accelerated to maximum speed of the profile.
- Press the **FOCUS SPEED** key to activate the corresponding submenu.
- Press the **FOCUS SPEED 1** key to set the slowest speed profile.
 - FOCUS SPEED 1: Slow
 - FOCUS SPEED 2: Medium
 - FOCUS SPEED 3: Fast

Or:

- Press the **FOCUS MANAGER** key to activate or deactivate this function.

The **Focus Manager** links the focusing speed to the magnification (zoom). At a low magnification of 12x, for instance, the focusing speed is faster than at a high magnification (150x).

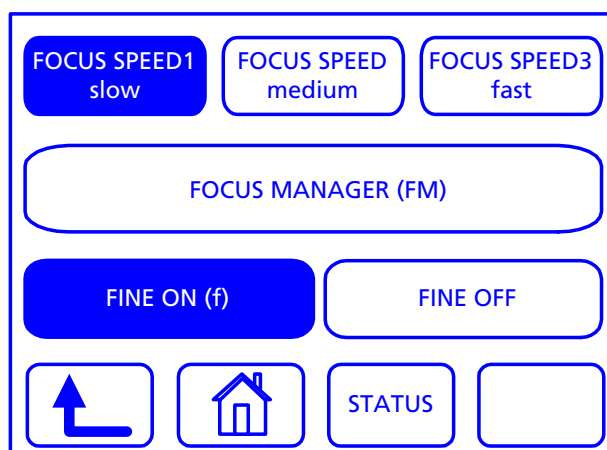
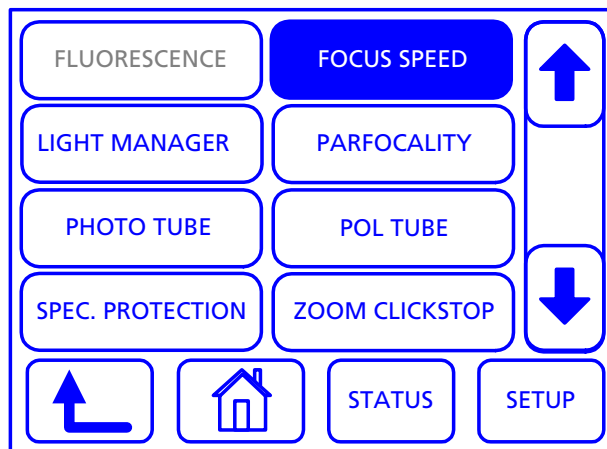
- Press the **FINE ON (f)** key or the **FINE OFF** key to activate or deactivate the subfunction of **Focus Speed** or **Focus Manager**.

With **Fine Focus** being active, a very low focusing speed is set to ensure accurate focusing by very small travels.

The beginning of the fine focusing process is indicated by an acoustic signal.



Quick switchover between the **Focus Speed / Focus Manager** and **Fine Focus** functions is performed by pressing the joystick on the SYCOP or the knurled wheel on the HIP.




4.6.3.2 Light Manager

The Light Manager provides automatic adaptation of the light intensity of the KL 2500 LCD cold-light sources while the magnification (zoom) is changed. In this way, the brightness impression in the image remains nearly constant.

The function can be activated/deactivated separately for the transmitted light (TL) and incident light (RL) cold-light sources.


- Press the **LIGHT MANAGER** key.

 The Light Manager function is available only for the cold-light sources of the KL 2500 LCD type.

The upper part of the display shows whether the respective Light Managers are active or not.

- To activate the Light Manager, press the respective **ACTIVATE RL MANAGER** key. The key label will change accordingly.

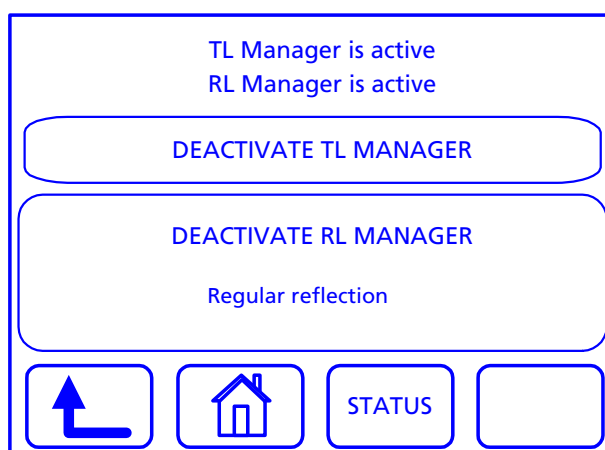
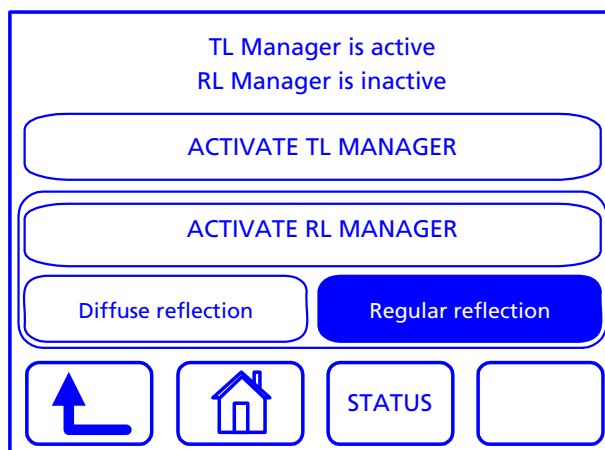
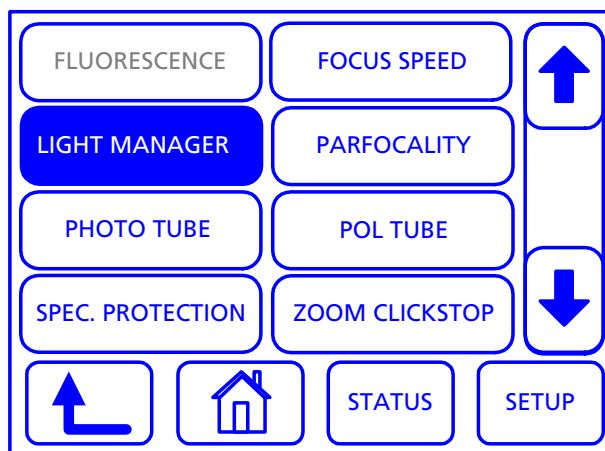
The RL Light Manager is being activated. To deactivate it again, press the key once more.

 The Light Manager function has an effect on the color temperature.


Select the RL MANAGER **Regular reflection** for bright, reflecting objects illuminated with the coaxial epi-illumination and activate it with **ACTIVATE RL MANAGER**.

Use the RL MANAGER **Diffuse reflection** for all diffuse reflecting objects and activate it with **ACTIVATE RL MANAGER**.

Use the highest zoom value to adjust the appropriate light intensity (e.g. maximum) of the cold-light source. After activating the Light Manager, the system will readjust the light intensity of the light source automatically when zooming, providing the observer with an image that has a nearly constant brightness in all zoom positions.



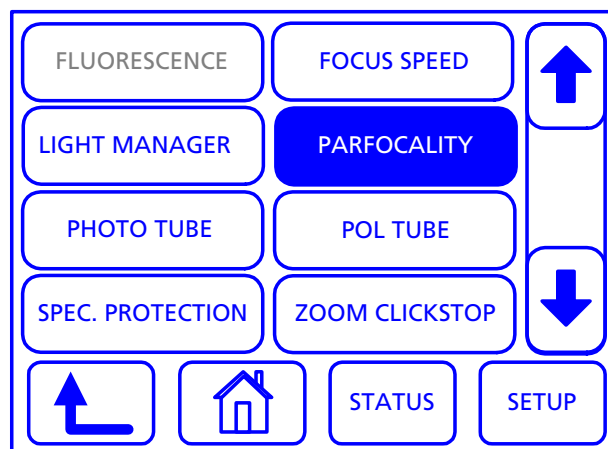
4.6.3.3 Parfocality Manager

 The Parfocality Manager is only available if the objective nosepiece S/doc, 3x, 6x cod. is being used.

The **PARFOCALITY** function allows you to switch the Parfocality Manager on and off.


With the Parfocality Manager switched on, the Z position will be adapted automatically when moving another objective into the light path. The object remains in focus.

The Parfocality Wizard is used to configure the Parfocality Manager.




How to proceed:


- Press the **PARFOCALITY** key to call the submenu.
- The Parfocality Manager is switched on and off by pressing the **ON** and **OFF** keys.

 If you use the Parfocality Manager for the first time, or if you use it after having exchanged an objective, the **ON** key is deactivated.

In this case you must (re-)configure the Parfocality Manager first. For this purpose, press the **PARFOCALITY WIZARD** key and proceed according to the description on page 91f.

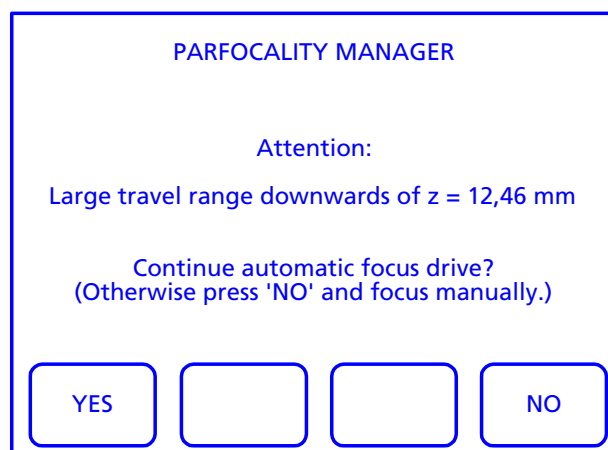


 Switch off the Parfocality Manager prior to exchanging an objective.

 If the Parfocality Manager is in switched-on state and another objective is moved into the light path, a safety query will appear as soon as the new Z position is more than 2 mm below the current one.

- Confirm the safety query by pressing the **YES** key. The new Z position will be approached.

Pressing the **NO** key will stop the process and the object can be focused manually.



Parfocality Wizard

- Check all objectives indicated in the Parfocality Wizard for correct configuration.
- Press the **SETUP NOSEPIECE** key for a change in the objective configuration.

PARFOCALITY WIZARD


Plan 1.0x PlanApo 0.63x PlanApo 1.5x

OK **SETUP NOSEPIECE**

Confirm correct nosepiece configuration with 'OK'.
Otherwise please set up nosepiece.

CANCEL

- Select the corresponding objective types and confirm by pressing the **OK** key.

 Please see section 4.6.6.1 on page 102 for the detailed description of the procedure.

Plan 1.0x PlanApo 0.63x PlanApo 1.5x

EMPTY Plan 1.0x

PlanApo 0.63x PlanApo 1.0x

PlanApo 1.5x PlanApo 2.3x

OK CANCEL

↑

↓

Some objectives are not compatible with each other. If you select such a combination, an error message will appear.

- Confirm the error message with **OK**.
- Exchange the objective.
- Select another objective type.

ATTENTION

The following objectives are not compatible:

PlanApo 2.3x <-> PlanApo 3.5x

Danger of collision during focusing process.
Please reconfigure nosepiece!

OK

- Press the **OK** key if all objectives are indicated correctly.

PARFOCALITY WIZARD

Plan 1.0x PlanApo 0.63x PlanApo 1.5x

OK SETUP NOSEPIECE

Confirm correct nosepiece configuration with 'OK'.
Otherwise please set up nosepiece.

CANCEL

- Swing in the objective with the highest magnification. This is the reference objective.
- Select maximum magnification and focus the object.
- Press the **SET REF** key.

PARFOCALITY WIZARD

Plan 1.0x PlanApo 0.63x **PlanApo 1.5x**
Ref.Objective

SET REF

Swing in reference objective.
Focus object at maximum zoom and press 'SET REF'.

CANCEL

- Now, swing in the other objectives one after another, select maximum magnification and focus the object.
- Press the **SAVE FOC** key for each objective. The relative Z positions with respect to the reference objective are indicated beneath the corresponding objective.
- Press **OK** after having adjusted all objectives. The Wizard is finished and the Parfocality Manager can be used.

PARFOCALITY WIZARD

Plan 1.0x PlanApo 0.63x **PlanApo 1.5x**
Ref.Objective

SAVE FOC **SAVE FOC** **SET REF**

-0.82 mm 1.34 mm 0.00 mm

Finish Parfocality Wizard with 'OK'.

OK **CANCEL**

4.6.3.4 Controlling the motorized intermediate phototube and image recording

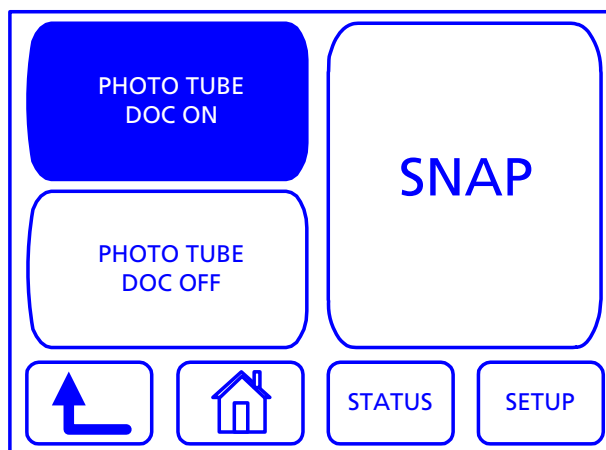
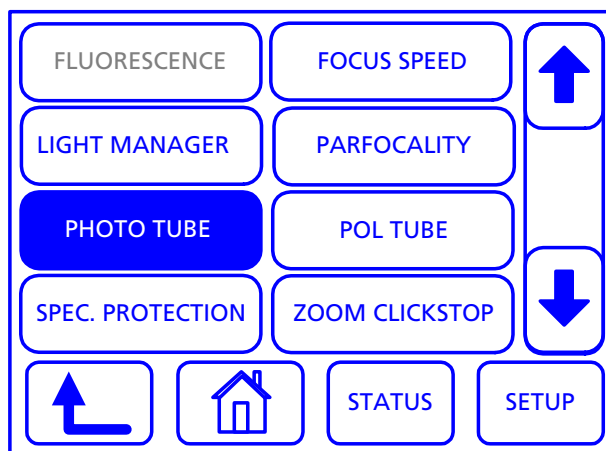
The **PHOTO TUBE** function is used to control the motorized intermediate phototube S and to acquire images.

Please proceed as follows:

- Press the **PHOTO TUBE** key to open the submenu.
- Toggling between the doc and stereo function is made via the **PHOTO TUBE DOC ON** and **PHOTO TUBE DOC OFF** keys.
- The active key is highlighted.
- By pressing the **SNAP** key, the camera connected to the microscope will take a picture supported by the AxioVision 4.7 software.

Before the picture is taken, the current position of the intermediate phototube is checked and the system is moved to the doc position if it is not yet there.

After the picture has been taken, the intermediate phototube will return to its starting position.



4.6.3.5 Setting up the specimen protection function (Spec. Protection)

The specimen protection function serves to prevent collisions between objective and specimen.



While the drive is moving down, do not reach with your hands into the operating area or under the focusing drive.

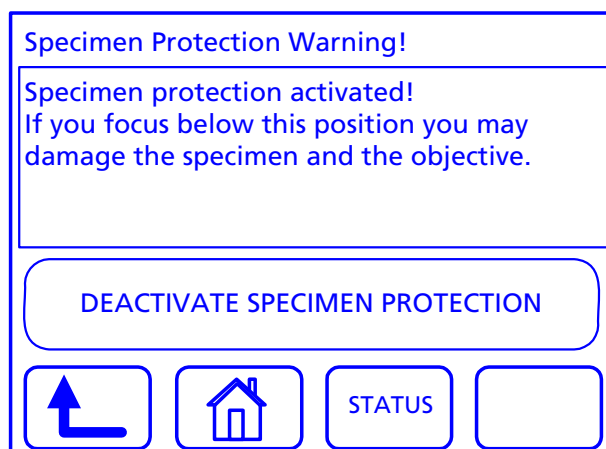
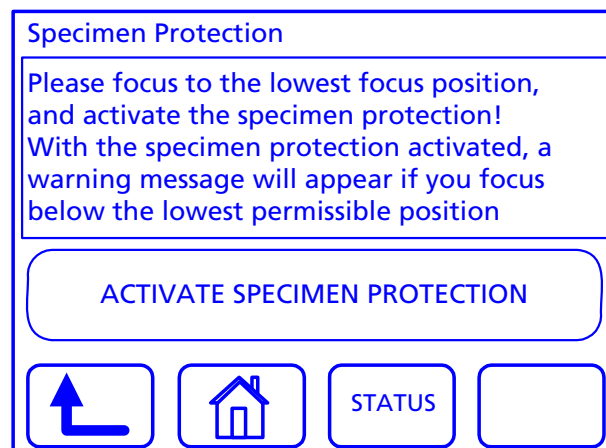
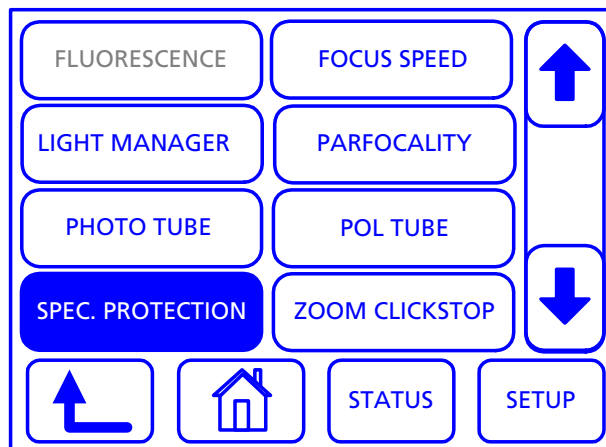
- Put a typical specimen onto the stage.
- If you use the objective nosepiece, swing in the longest objective.
- Press the **SPEC. PROTECTION** key.
- Operate the joystick to move the focusing drive downward until the lowest position without specimen contact has been reached.
- ☞ For a lower driving speed, displace the joystick slightly downward only.
- Press the **Activate SPECIMEN PROTECTION** key. The position is being stored in the device.

☞ By activating this protection function, collisions between objective and specimen can be prevented. However, when you use another specimen and/or objective, make sure to readjust the position of the protection function!

If you arrive at the lowest focus position in microscopic work, two short warning beeps are generated and a corresponding message is displayed on the screen. The motorized focusing drive will automatically stop.



If it is necessary to work below the set focus position, you can deactivate the protection function by means of the **Deactivate SPECIMEN PROTECTION** key. Take care that the objective does not touch the specimen!




4.6.3.6 Setting standard magnifications (Zoom Clickstop)

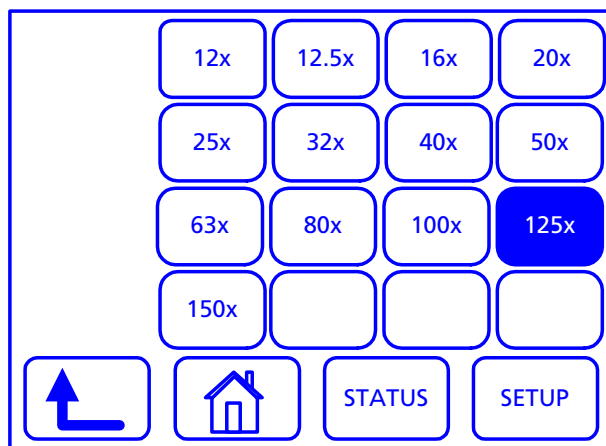
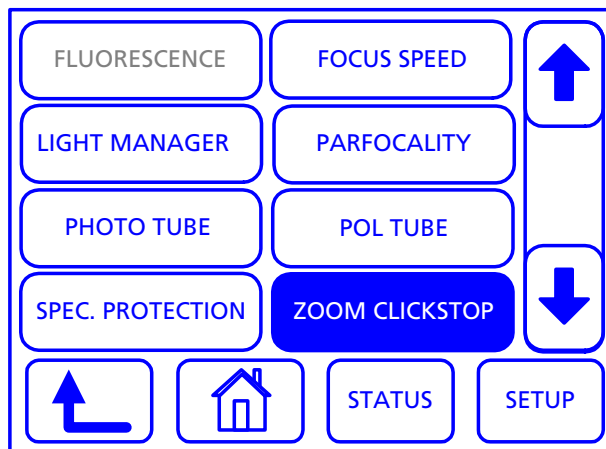
Zoom Clickstops are pre-defined standard magnifications (zoom factors).

A list of standard magnifications is firmly preset. The total magnification range provided is based on the eyepiece and the objective used. The Zoom Clickstop submenu displays the standard magnifications and the lowest and highest possible magnifications of this range.

Procedure:

- Press the **ZOOM CLICKSTOP** key. The appearing list shows all standard magnifications selectable.
- Choose the desired magnification, e.g. press the **12x** key. The zoom drive of the microscope will automatically set the selected zoom factor.

 The displayed standard magnifications depend on the eyepieces and objective used and thus may differ (cf. Sections 4.6.6.1 and 4.6.6.3).

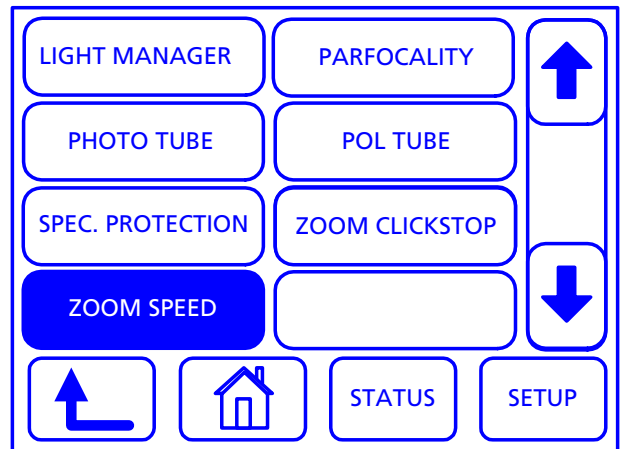


4.6.3.7 Setting the speed profile of the zoom drive (Zoom Speed)


The setting speed of the zoom drive can be adjusted in steps.

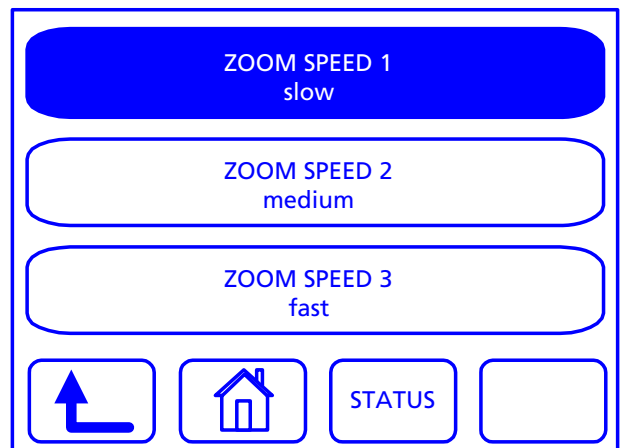
The speed is influenced by the degree of displacement of the joystick/knurled wheel:

- Partial displacement: Speed depends on the set speed profile.
- Full displacement: After a short delay, the drive is accelerated to maximum speed independent of the set profile.
- Press the **ZOOM SPEED** key to activate the corresponding submenu.



- Press the **ZOOM SPEED 1** key to activate the slowest speed profile.
 - ZOOM SPEED 1: Slow
 - ZOOM SPEED 2: Medium
 - ZOOM SPEED 3: Fast

 The third profile is more than twice as fast as the first one.



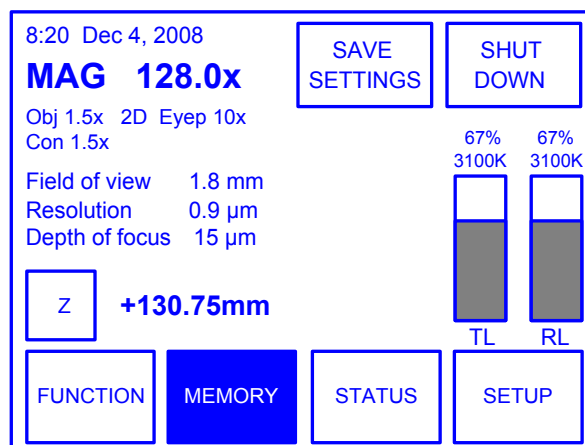
4.6.4 MEMORY menu

The **MEMORY** menu allows user-specific instrument settings to be stored and activated for the following functional units:

- Magnification (Mag)
- Z position (Z-Pos)
- Reflected light (RL)
- Transmitted light (TL)
- Tube port VIS/Camera (Phot)
- Polarization (Pol)
- Focusing speed (FocSp)
- Zoom speed (ZoomSp)

- Press the **MEMORY** key to activate the corresponding submenu.

The storage and activation of user-specific instrument settings is described below.



Do not reach with your hands into the operating area of the motorized focusing drive while it is moving down – **risk of hand crushing**.



You can stop the automatic travel of the focusing drive that has been released by a memory key by pressing the STOP button on the focusing drive (Fig. 4/16), moving the joystick on the SYCOP or the knurled wheel on the HIP up or down, or by pressing another focus memory key.

4.6.4.1 Storing values

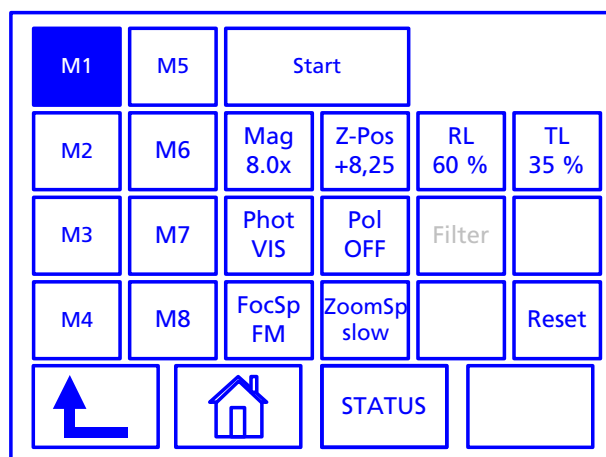
Eight memory positions are available for the functional units mentioned above. The memory positions can contain one or several functional units stored.

As the storing procedure is the same for all functional units, we will explain it below only in the example of the magnification.

- Press one of the memory keys **M1** to **M8**.

The magnification currently set on the microscope is indicated in the **Mag 8.0x** key (here 8.0x).

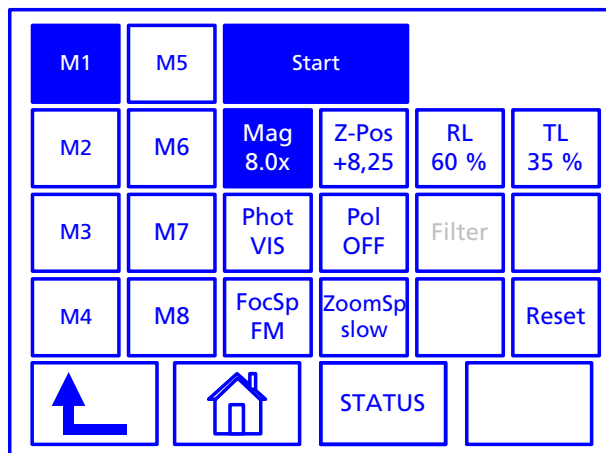
- Press the **Mag 8.0x** key to store the magnification value.
The key is active now. The stored value is indicated.




4.6.4.2 Calling stored values

You can call stored values directly in the MEMORY menu or by pressing a key defined beforehand in the Key Settings submenu (see Section 4.6.6.4 on page 107).

- Press the **M1** to **M8** keys to select a memory position. The functional units stored in each case are indicated.
- Press the **Start** key. The functional units stored are called and adjusted in the microscope.
The **Start** key converts into **M1 active**. This shows that the stored values have been adjusted.

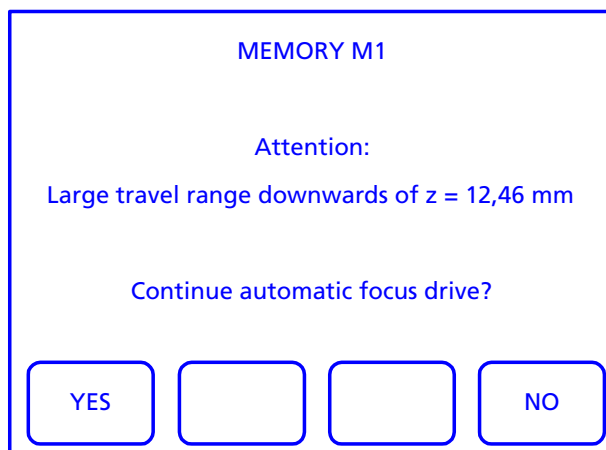



 When a stored Z position is called, a safety query will appear if the Z position called is more than 2 mm below the current one.

- Confirm the safety query by pressing the **YES** key. The stored Z position will be approached.

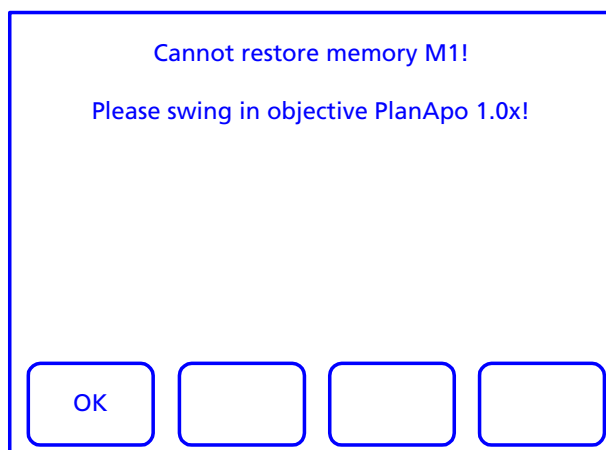
Pressing the **NO** key will stop the process.

- You can confirm the safety query also by a double click on the key defined in the Key Settings submenu.



 If you use an objective nosepiece and the swung-in objective is not the one for which the functional units have been stored, an error message will appear.

- Confirm the error message by pressing the **OK** key.
- Swing in the correct objective.
- Press the **Start** key again.

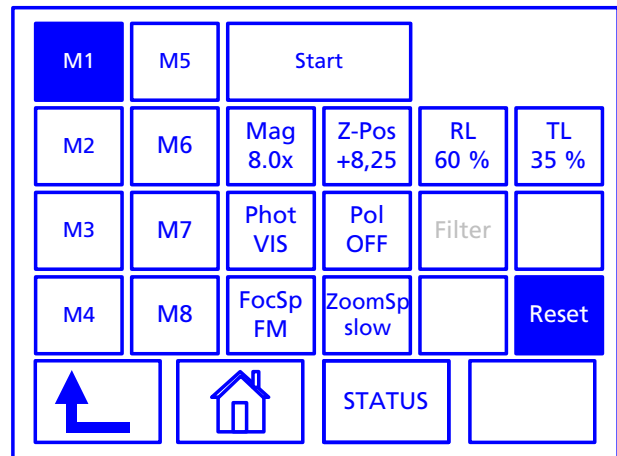


4.6.4.3 Deleting stored values

You can delete individual functional units as well as complete memory positions.

How to delete individual functional units:

- Press the **M1** to **M8** keys to select a memory position. The functional units stored in each case are indicated.
- Press the key of the functional unit which shall be deleted (e.g. the **Mag 8.0x** key). Now, the key is inactive and the value has been deleted.



How to delete the complete memory position:

- Press the **M1** to **M8** keys to select a memory position. The functional units stored in each case are indicated.
- Press the **Reset** key. All functional units of the selected memory position are deleted.

4.6.5 STATUS menu

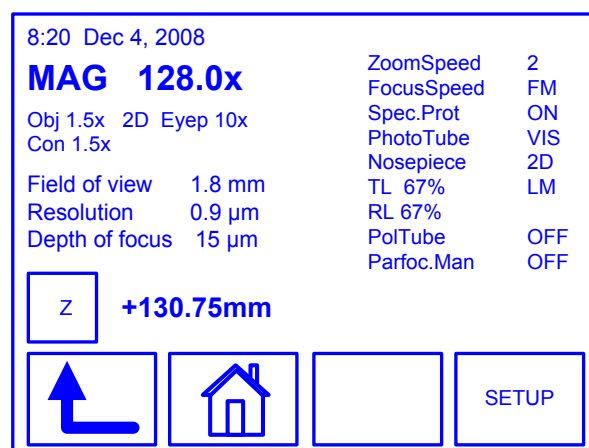
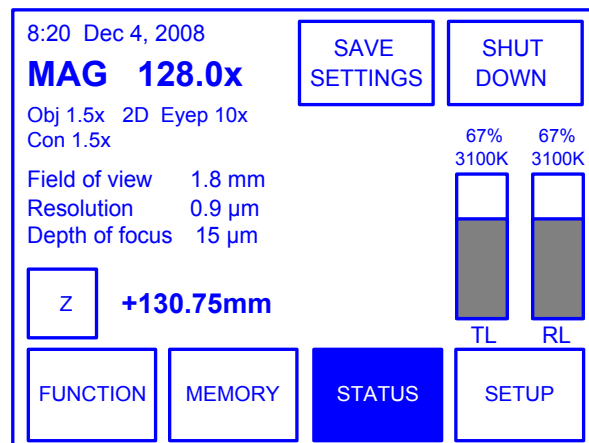
The **STATUS** menu informs the user about the current status of the system.

- Press the **STATUS** key to open the submenu.

In the left part, the information will be displayed that is also shown in the left part of the main menu.

In the right part, the status of the following functions will be displayed:

- Zoom speed,
- Focus speed,
- Specimen protection,
- Motorized intermediate phototube S,
- Objective nosepiece,
- Light Manager,
- Illumination intensity - transmitted light,
- Illumination intensity - reflected light,
- Motorized intermediate analyzer tube S
- Parfocality Manager




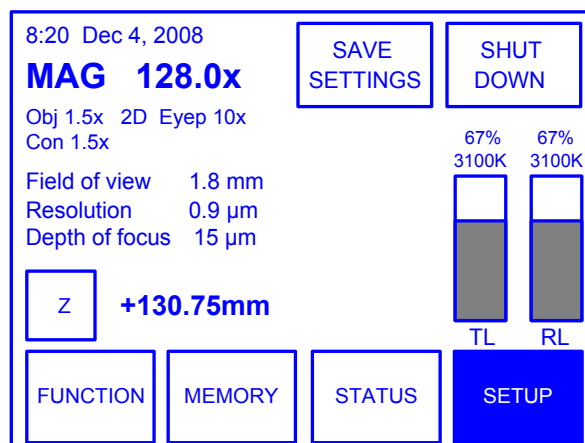
4.6.6 SETUP menu

On the **SETUP** menu, you can edit and store the most important instrument settings.

- Press the **SETUP** key to activate the corresponding submenu.

The individual setting options provided are described in the following sections.


 To confirm and save the settings, and exit the setup menu, press the **OK** key; if you press **CANCEL**, the settings so far remain set. Some of the settings will be stored permanently only after system switch-off (see Section 3.9).

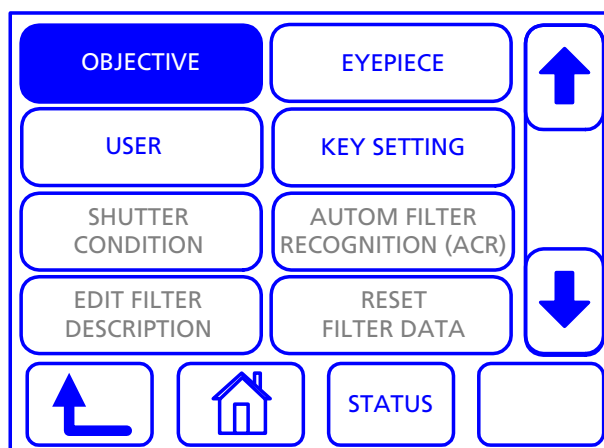


4.6.6.1 Selecting the objective type

The selection procedure is the same for the nosepiece and the individual objectives. For the nosepiece, three objective positions are to be selected. When using individual objective, you need only select the one to be used.


If the selected objective type does not agree with the objective actually used the displayed settings will be wrong (cf. Section 4.6.1.4)!

 The change of objectives is described in Section 3.1.5.

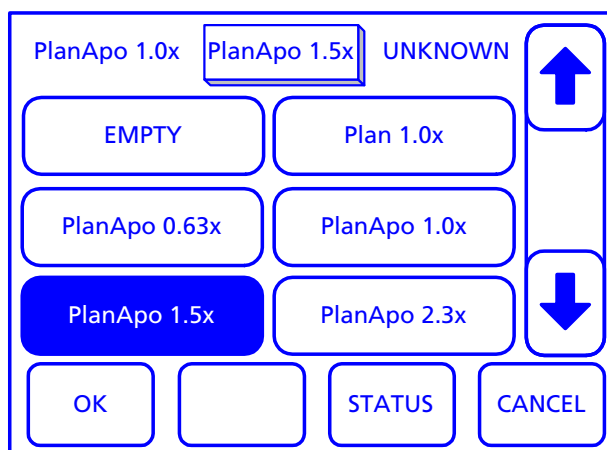



- Press the **OBJECTIVE** or **NOSEPIECE** key to bring up the objective selection list.


The top line of the display shows the used objective types.

- Swing in the desired nosepiece position. The selected position appears framed.
- Press the  key to display further available objectives.
- Choose the desired objective by pressing the corresponding key, e.g. **PlanApo 1.5x**.

The new selection will appear in the top line. Proceed analogously to select the other nosepiece positions.

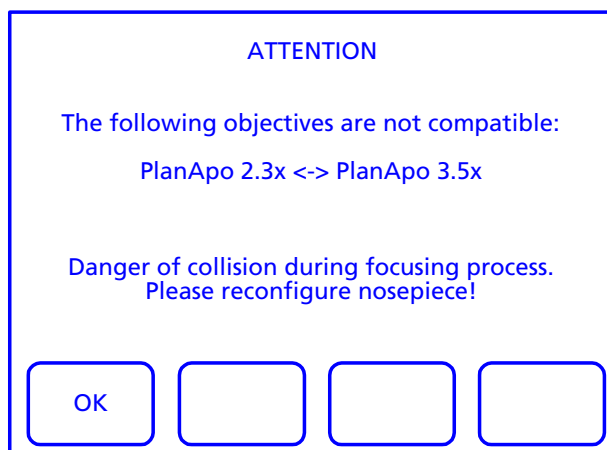


 After any change of an objective, you must readjust the focus position (see Section 4.1.3). Therefore, it is useful to store the focus position of frequently used objectives (see Section 4.6.4).

 The selected objectives will be stored permanently only after switching in standby mode by pressing one of the keys **SAVE SETTINGS** or **SHUT DOWN** in the main menu or the Standby key on the EMS-2 Electronic Module.
In the case of power failure or instantaneous switch off at the power switch, the new selection of objectives will get lost!

If you use an objective nosepiece, please consider the following:
Some objectives are not compatible with each other. If you select such a combination, an error message will appear.


- Confirm the error message with **OK**.
- Exchange the objective.
- Select another objective type.



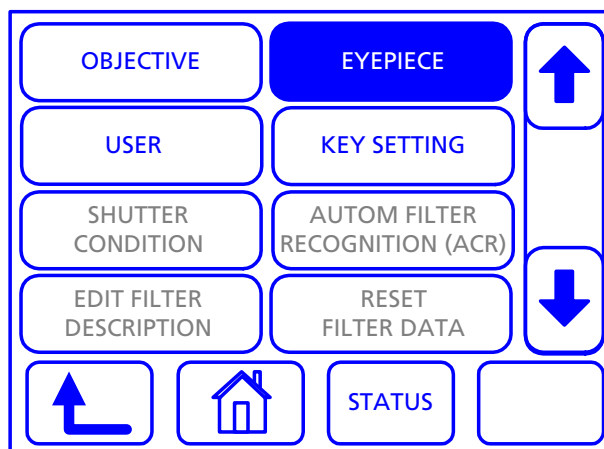
4.6.6.2 Selecting the eyepiece type

Here you can select the appropriate eyepiece type.

If the selected eyepiece type does not agree with the eyepieces actually used the displayed settings will be wrong (cf. Section 4.6.1.4)!

 The change of eyepieces is described in Section 3.1.6.

Press the **EYEPIECE** key to bring up the eyepiece selection list.

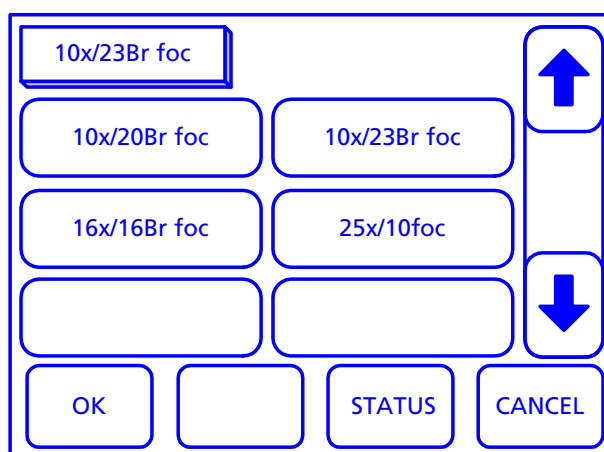



The top line of the display shows the used eyepiece type.

- Press the **↓** key to display further available eyepieces.
- Choose the desired eyepiece by pressing the corresponding key, e.g. the **10x/23Br foc** key.

The new selection will appear in the top line.

- To exit the eyepiece selection list and save the new setting, press **OK**. To keep the setting used so far, exit the window with **CANCEL**.



 The selected eyepiece type will be stored permanently only after switching in standby mode by pressing one of the keys **SAVE SETTINGS** or **SHUT DOWN** in the main menu or the Standby key on the EMS-2 Electronic Module.

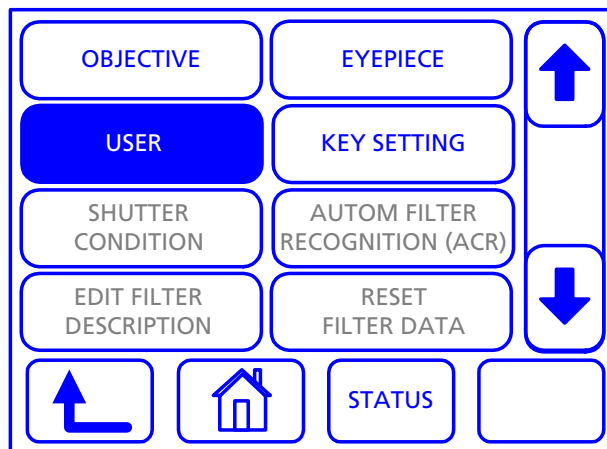
In the case of power failure or immediate switch off at the power switch, the new eyepiece selection will get lost!

4.6.6.3 Activating, editing and resetting the user profile

Four different user profiles can be stored and activated. The user names are editable. The following settings are user-specific:

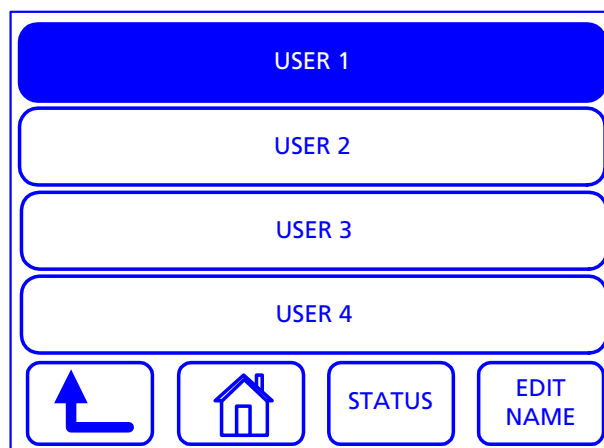
- Function (specimen protection, Light Manager, Focus/Zoom Speed, Zoom Clickstop)
- Memory (all memory values)
- Setup (Contrast/Backlight/Beep Level)
- Display
- Key Setting
- To activate the user profile list, press the **USER** key.

In the following, activation, resetting and editing of user profiles are described.



Activating a user profile

- Press **USER 1** to select User Profile 1.
- 👉 All changes to the device-specific settings apply to the selected user, but not to the other user profiles.
- To select another user profile, press **USER x** key. The system will automatically load all menu settings stored for this user profile.



Editing the user name

- Press the **EDIT NAME** key, to activate the Edit window.


The name of the active user is displayed in the edit field.

- Enter the desired name via the displayed keyboard. To this end, select the character using the joystick and transfer it to the edit field by pressing the joystick button. One character is always active.

The character is inserted left of the cursor. Use the arrow keys to move the cursor. Pressing the **CLEAR** key deletes the character left of the cursor (if there is no character any more, the character right of the cursor will be deleted).

- To exit the Edit window and save the user name, press **OK**. You must enter at least **one** character. The entry of a blank character only is not permissible.
- With **CANCEL** you can exit the Edit window without any changes to the user name so far.

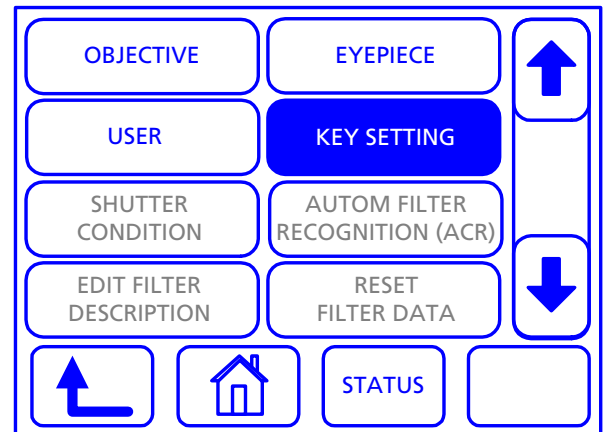
MUSTERMANN						←	→	CLEAR	
1	2	3	4	5	6	7	8	9	0
Q	W	E	R	T	Y	U	I	O	P
A	S	D	F	G	H	J	K	L	/
Z	X	C	V	B	N	M	-	Blank	
Choose with Touchpen or Joystick (Center)									
OK						CANCEL			

 You may also operate the keys by means of a touch pen. After pressing a character, it is instantly entered in the edit field.

4.6.6.4 Displaying and changing key assignments

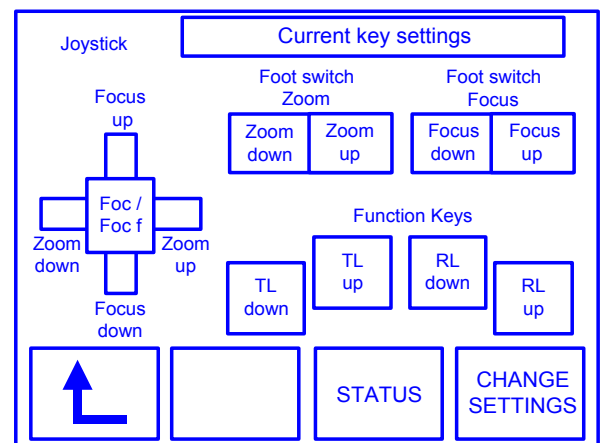
In the **Key Setting** submenu, you may display or change the assignment of the four keys of the SYCOP, the two footswitches and the joystick button. If required, the modified settings can be reset to the default (factory) settings.

- To activate the Key Settings submenu, press the **KEY SETTING** key.



In the **Key Setting** submenu, the current assignment of the keys of the SYCOP, the footswitches and the joystick button is displayed.

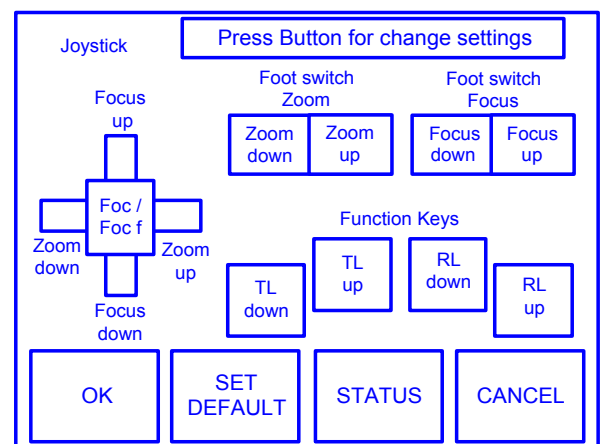
- If you want to change the key assignment, press the **CHANGE SETTING** key, which will bring up another submenu.




In the **Change Settings** submenu, choose the key to be configured:

- Any of the four function keys of the SYCOP (**Function Keys**) individually
- Any footswitch as control element
- Joystick button

- Press the desired key to change its function.
- In the following menu, change the settings as desired and confirm them with **OK**. If you want to abort this process, press **CANCEL**. The system returns to the previous menu, where you can start changing the functions of other keys.



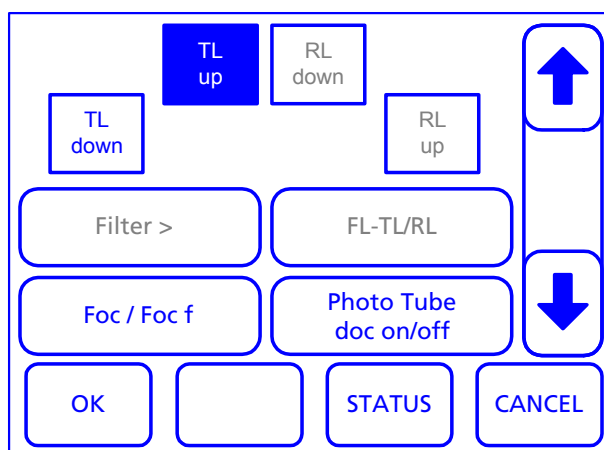
- By pressing the **SET DEFAULT** key, the function keys, the footswitches and the joystick button are reset to their default functions:
 - Function keys: TL and RL
 - Footswitch Zoom: Zoom
 - Footswitch Focus: Focus
 - Joystick button: Foc / Foc f (focus / fine focus)

-  The system allows you to assign the same function to several keys. In this case, it may be that another specific function cannot be used any more.
The Key Settings are stored as user-specific parameters.

The following sections describe how to change function assignment of the keys of the SYCOP, the footswitches and the joystick button.


Changing the function assignment of SYCOP keys

- Choose the key to change its function.
- Tap on the desired function (e.g. **Foc / Foc f**).
The label of the selected key is being changed.
- Change the function assignment of the other keys analogously.
- Press **OK** if you want to accept the changes made, or **CANCEL** to abort the process and return to the previous **Change Settings** menu.
- Exit the **Change Settings** menu with **OK** to store the modified settings.




The following functions may be assigned to the SYCOP keys:

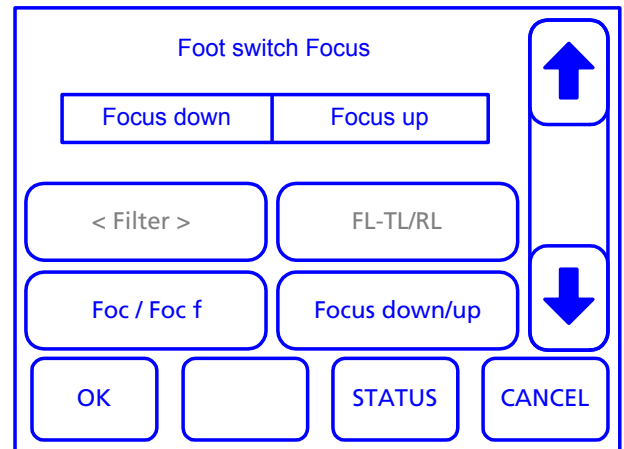
- Foc / Foc f
- Photo Tube doc on/off
- RL down or RL up
- TL down or TL up
- SNAP
- Call memory position

-  Using the arrow keys, you can scroll through all available functions.
Grayed out functions are not accessible.
Light-setting functions are assigned in pairs each (both left or both right keys, e.g. TL up / TL down). If an individual function (e.g. Foc / Foc f) is assigned to a key of a key pair so far (e.g. TL up / TL down), the other key of the pair will remain without function.
The TL up / TL down functions may be assigned to the two left keys only, the RL up / RL down functions to the two right keys only.

Changing the footswitch functions

 For distinguishing the footswitches, the connectors on the EMS-2 Electronic Module are labeled accordingly, and in the menu for changing the functions of the keys **Foot switch Zoom** or **Foot switch Focus** appears in the title bar.

- The procedure for changing the functions of the two footswitches is analogous to that of the SYCOP keys (see page 108).
- Accept the changes made with **OK** or abort the procedure with **CANCEL**. In both cases, you will return to the **Change Settings** menu.
- Exit the **Change Settings** menu with **OK** to store the modified settings.



The following functions may be assigned to the **Foot switch Focus** keys:

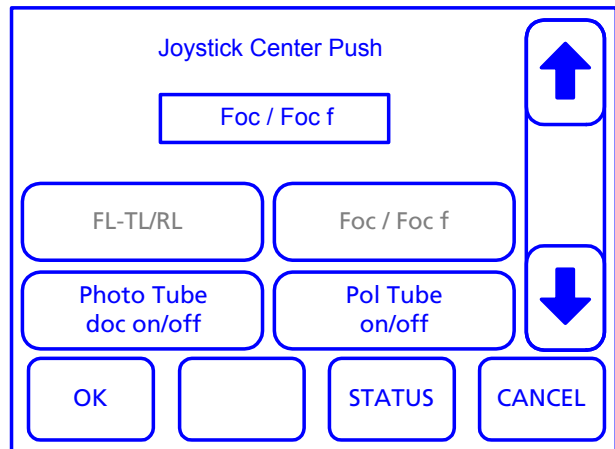
- Focus down/up
- Foc / Foc f
- RL down/up
- TL down/TL up
- Call memory position

The following functions may be assigned to the **Foot switch Zoom** keys:

- Zoom down/up
- Foc / Foc f
- RL down/up
- TL down/ up
- Call memory position

Changing the function of the joystick button

- The procedure for changing the function of the joystick button is analogous to that of the SYCOP keys (see page 108).
- Accept the changes made with **OK** or abort the procedure with **CANCEL**. In both cases, you will return to the **Change Settings** menu.
- Exit the **Change Settings** menu with **OK** to store the modified settings.



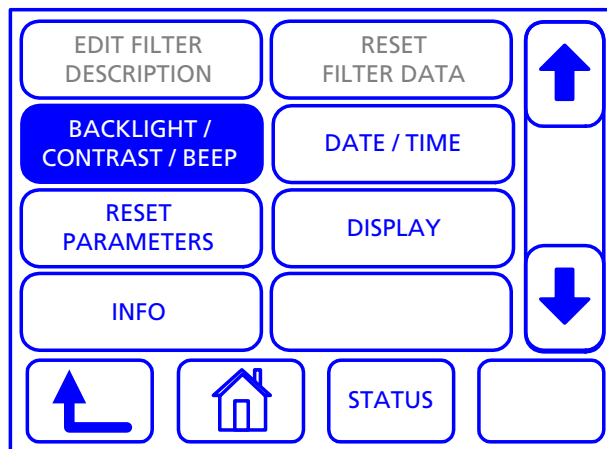
The following functions can be assigned to the joystick button:

- Foc / Foc f
- Photo Tube doc on/off
- SNAP
- Call memory position


4.6.6.5 Adjusting backlight and confirmation beep level

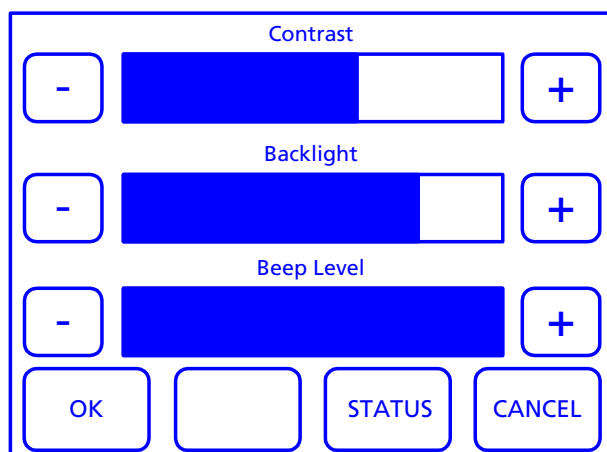
The intensity of backlight and the level of the confirmation beep can be adjusted as follows:

- Press the **BACKLIGHT/CONTRAST/BEEP LEVEL** key to bring up the corresponding submenu.



- Contrast: To reduce the contrast, press the **-** key; to increase it press the **+** key.
- Backlight: Press the **-** key to reduce the intensity or the **+** key to increase it.
- Beep Level: Press **-** key briefly to deactivate the confirmation beep or the **+** key to activate it.

 It is advisable to leave the confirmation beep on by default for the confirmation of memory settings.

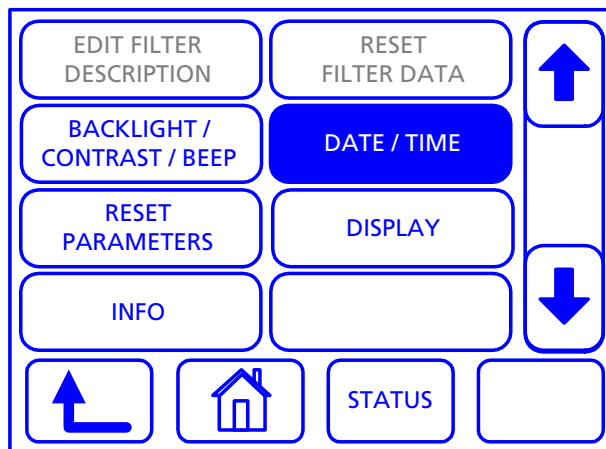


- To exit the selection window and save the new setting, press **OK**. To keep the setting used so far, exit the window with **CANCEL**.

4.6.6.6 Setting date and time


You can set date and time by following this procedure:

- Press the **DATE/TIME** key to bring up the corresponding submenu.

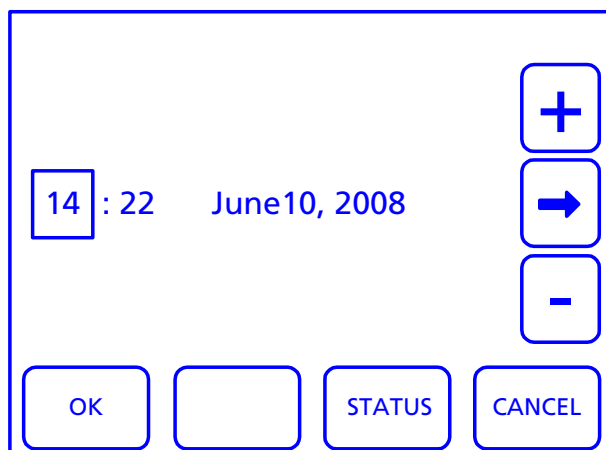


The value to be edited appears framed.

- Press the **-** key to reduce the value or the **+** key to increase it.
- Switch to the next value by pressing the **→** key and set it as described above.

 Date and time appear in the main window (see Section 4.6.1.4).


- To exit the selection window and save the new setting, press **OK**. To keep the setting used so far, exit the window with **CANCEL**.

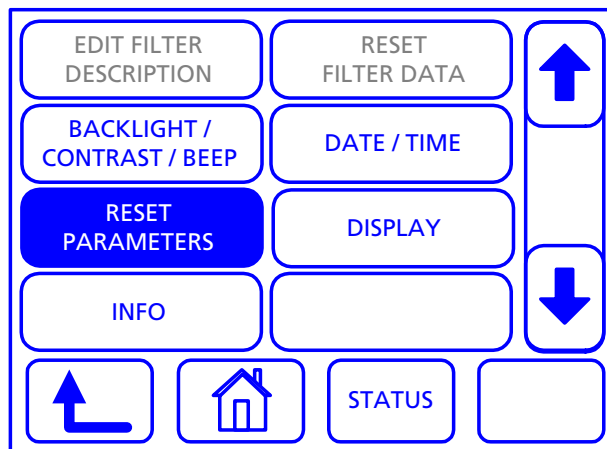


4.6.6.7 Resetting instrument parameters

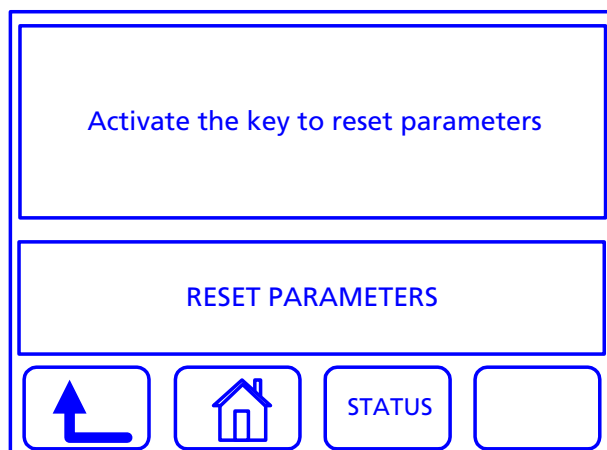
You can reset all previously changed parameters to factory defaults (delivery state) by following this procedure:

- Press the **RESET PARAMETERS** key to activate the corresponding submenu.

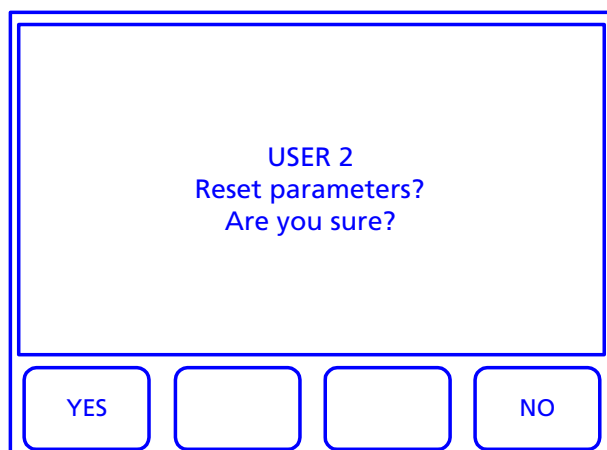
 All changed **Memory**, current **User** and **Setup** settings will get lost!



- Press the **RESET PARAMETERS** key in the submenu. A safety query appears asking you if you really want to reset the parameters.



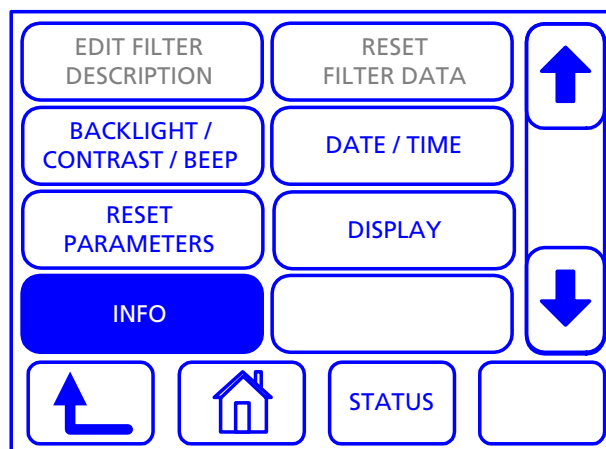
- For resetting, press the **YES** key, otherwise cancel the procedure by pressing **NO**.



4.6.6.9 Displaying firmware information

Using this function, you can view firmware information of various system components.

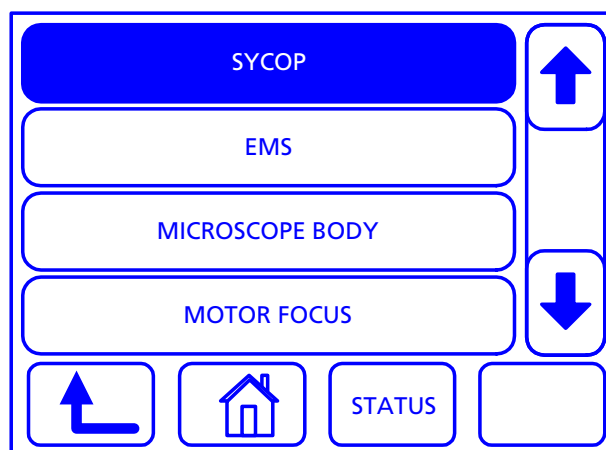
- Press the **INFO** key to bring up the corresponding submenu.



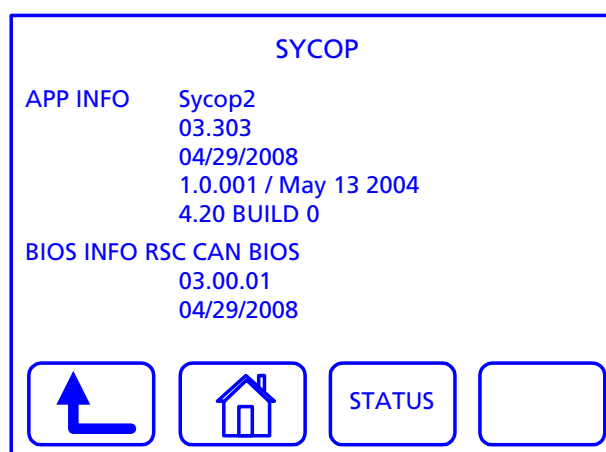
- Press the **↓** key to display further component information options.

The following component information can be solicited: SYCOP, EMS, MICROSCOPE BODY, MOTOR FOCUS, NOSEPIECE, PHOTO TUBE, HANDWHEEL.

- To display the information, press the respective key, e.g. **SYCOP**.



The appearing window shows the information on the selected component.



5 CARE, MAINTENANCE AND SERVICE

5.1 Care

Care of the instrument is restricted to the following operations:



The instruments are not equipped with any special devices for protection from corrosive, potentially infectious, toxic, and radioactive or other substances that may be hazardous to health. Make sure to observe all legal regulations when handling such substances, particularly the relevant national accident prevention regulations.



- Remove any instrument contamination in compliance with the relevant national accident prevention regulations.
- Switch off the instrument each time after use and place the instrument cover on it to protect it from dust and humidity.
- Never expose the instrument to impermissible climatic conditions (increased humidity and temperature) for extended periods.



Disconnect the devices from line power before cleaning them. Take care that no cleaning liquid enters the interior of the device.

Stubborn dirt on glass surfaces, such as fingerprints and traces of grease, is best removed with a cotton swab wrapped around a round stick and moistened slightly with distilled water or a non-corrosive solvent:

- Distilled water: Clean the glass surface with a slightly moistened cotton swab polishing in circles starting in the center and moving to the edges.
- Optics cleaning solution consisting of 15 % isopropanol and 85 % gasoline: Clean the glass surface with a slightly moistened cotton swab polishing in circles starting in the center and moving to the edges.
- Remove dust from optical surfaces using a natural-hair brush or an air blower.
- Clean plastic parts with a commercial cleansing agent (no solvent!). Stubborn dirt may be treated carefully with benzine or spirit.

5.2 Maintenance

5.2.1 Safety tests



When the motorized focusing drive is moved down, there is the **risk of hand crushing** in the working area.

Regularly check the travel of the motorized focusing drive for perfect functioning of the limit switches according to Section 3.11.

5.2.2 Replacing the fuse on the EMS-2



Before replacing the fuse, disconnect the power cable!

The fuse to be replaced is located at the appliance plug on the rear side of the EMS-2.

- Switch the device off (see Section 3.9) and disconnect it from line power.
- Pull out the fuse insert (Fig. 57/1) at the rear side of the EMS-2. To do this, press the snap-in mechanisms on the top and on the bottom of the fuse insert.
- Replace the defective fuse (Fig. 57/2) (fuse type: T 2.5 A/E, 250V, 5x20mm).
- Push in the fuse insert paying attention to the correct position of the snap-in mechanisms.

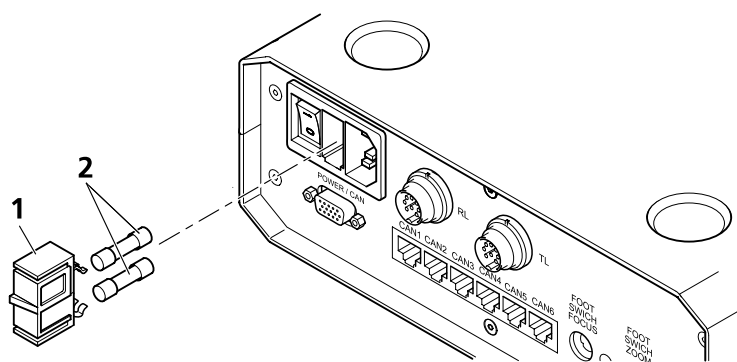


Fig. 57 Replacing the fuse on the EMS-2

5.3 Consumables

You may order the following consumables directly from Carl Zeiss:

Designation	Cat. 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	

Designation	Cat. No.	Remarks
Clear glass plate, d = 120 mm	435501-0002-000	
Clear glass plate, d = 84 mm	475265-0001-000	
Halogen lamp, 24 V 250 W	000000-0300-271	
Halogen lamp, 15 V 150 W	417053-0000-000	
Eyecup (2x)	444801-0000-000	
Dust protection set	434303-0000-000	
Ball-headed screwdriver, 3 mm	000000-0069-551	
Power/CAN bus cable, 15-pin; 1.6 m	435600-8316-000	
Control cable of cold-light source	435600-8306-000	
USB 2.0 cable; 2.0 m	000000-0446-321	
Plug-in power unit, 24 V/1.25 A	000000-0460-275	
CAN cable, 0.5 m	000000-0423-039	
CAN cable, 1.0 m	000000-0451-206	

5.4 Service

All repairs of mechanical, optical or electronic components inside the SteREO Discovery 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 an extended period, we recommend that you enter into a service/maintenance agreement with Carl Zeiss.

Please get in touch with your local Carl Zeiss representative for re-ordering any components or when service is required.

5.5 Product disposal

The product was developed, tested and produced in compliance with the regulations and guidelines of Environmental Law of the European Union in force.

The product and the corresponding accessories meet the requirements of the EU Directives 2002/95/EG (RoHS) and 2002/96/EG (WEEE) coming into force in 2005 or 2006, respectively, as well as the requirements of the German Law on Electrical and Electronic Devices (ElektroG).

Until the above-mentioned regulations come into force, we have introduced a procedure for the returning and the recycling of the devices within the member states of the European Union that ensures suitable exploitation according to the EU guidelines.

For detailed information on the disposal and the recycling, please contact your local Carl Zeiss sales or service representative.

The product must not be disposed of as household waste or by municipal waste disposal businesses. When reselling the equipment, the reseller has to inform the buyer that the equipment must be disposed of in compliance with the above-mentioned regulations.

The device contains electronic components that have to be disposed of separately. At the end of the service life of the instrument, dispose of the instrument in compliance with relevant national law:

Designation	Installed in	Remarks
Battery	SYCOP	
Touch screen	SYCOP	
Display	HIP	

6 ANNEX**6.1 List of abbreviations**

Br	For spectacle wearers
CAN	Controller Area Network
CMO	Common main objective
EMS-2	Electronic Module Stereomicroscopes, Version No. 2
Eyep	Eyepiece
Fl	Fluorescence
Foc	Focusable
FocSp	Focusing speed
FWD	Free working distance
HBO	Gas-discharge lamp
HIP	Human Interface Panel, stand-alone control panel for zoom body or motorized focusing device
KL	Cold light
Mag	Magnification
MC 1500	VisiLED Multiple Controller 1500
Obj	Objective
PentaFluar S	Fluorescence illuminator with space for max. 5 FL filter cubes
RL	Reflected light
RS232	Recommended Standard 232
SpProt	Specimen protection
Stemi DV4	Double lens vario stereomicroscope with zoom factor 4
Stemi 2000C	Stemi 2000 stereomicroscope with camera port 100/100
Stemi 2000CS	Stemi 2000 stereomicroscope with camera port and permanent beam splitting 70/30
SteREO	Redefine In Ergonomy and Optics in Stereomicroscopy
SYCOP	System Control Panel
s/w	Black/white
TL	Transmitted light
USB	Universal Serial Bus
UV	Ultra violet
VisiLED	Light emitting diode in visible range
V8	Vario/zoom with factor 8
V12	Vario/zoom with factor 12
V20	Vario/zoom with factor 20
WPL	Plane field, stereo
ZoomSp	Zoom speed

6.2 Adjustment circle for the adjustment of the HBO 100 illuminator

 Use a copy of the adjustment circle, if necessary (original size = 120 mm).

- Cut out the adjustment circle and put it onto the 120-mm stage insert as shown.
- Adjust the HBO illuminator as described in Section 4.1.6 on page 69.

