Axio Observer
Inverted microscope
Operating manual

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

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

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CONTENTS

1 INTRODUCTION

Axio Observer microscopes have been designed, manufactured and tested in accordance with DIN EN 61010-1 (IEC 61010-1) "Safety requirements for electrical equipment for measurement, control and laboratory use". They comply with RoHS directive 2011/65/EU.

The Axio Observer models 3, 5 and 7 for BIO-MED applications also comply with standard DIN EN 61010-2-101 and the requirements of the EC Directive 98/79/EC annex 1 for IvD products (in vitro diagnostics) and are marked with the CE mark.

Axio Observer models 3 materials, 5 materials and 7 materials for material applications (MAT) meet the requirements of the European low voltage directive 2014/35/EU and the EMC directive 2014/30/EU and are marked with the CE mark.

These Safety Instructions contain all information and warnings to be observed by the operator.

The devices must be disposed of in compliance with the WEEE Directive 2012/19/EU.

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

CAUTION
This symbol indicates a potential hazard to the user.

CAUTION
Disconnect the instrument from the power supply before opening!

CAUTION
Optical radiation is emitted.
Do not look into the laser beam! It may be injurious to the eyes.

CAUTION
Energy-rich UV radiation!
Risk of injury to the eyes and skin!

CAUTION
Inflammable substances, fire hazard!

CAUTION
Hand and fingers can be caught.

CAUTION
Hot surface!

CE *The CE mark of conformity confirms that the product conforms with all valid European directives applicable to it.*

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

ATTENTION
Read the Operating Manual

ATTENTION
Stand-by: The device is not disconnected from the power supply.

NOTE
This symbol indicates an instruction which requires particular attention.

2 SAFETY INSTRUCTIONS

2.1 General Information

Regulations for occupational health and safety must be observed when operating the HXP 120 V source of UV radiation. The national legal requirements must also be observed.

- Follow the operating manual for the HXP 120 V illuminator as supplied by the manufacturer.
- The lamp must be replaced according to the manufacturer's instructions. There is otherwise a risk of burning or explosion when the lamp is replaced.

- The user should not expose him/herself to UV radiation from the HXP 120 V illuminator.

- Never look directly into the optical fiber when the HXP 120 V illuminator is switched on. Failure to observe this precaution may result in irreversible eye injuries!

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

Observe the operation manuals for the illumination systems Colibri.2 and Colibri 7 (423052-7244-001 and 423052-7344-001).

The Axio Observer may not be put into operation if the dust cover is still on. Before putting on the dust cover, always check that the device is switched off and has cooled down, otherwise this could cause a fire.

Immersol 518 F® immersion oil is a skin irritant. Avoid contact with skin, eyes and clothing.

In the event of contact with the skin, rinse with plenty of water and soap. In the event of contact with the eyes, rinse the eye immediately with plenty of water for at least five minutes. If irritation persists, consult a physician.

Proper disposal of Immersol 518 F® immersion oil: Ensure that immersion oil does not enter surface water or the sewage system.

Users must read the safety data sheet for Immersol 518 N®

Fluorescence illuminators such as the HBO 100 or Colibri.2 emit ultraviolet radiation which may cause burns to eyes and skin. Never look directly into the light and avoid direct skin exposure. When using the microscope, always use the device's protective equipment (e.g. special attenuation filters).

Gas discharge lamps such as HBO 100 develop high internal pressure when hot. They should therefore only be replaced when cool. Protective gloves and eyewear should be worn (for detailed information, please see operating manual 423010-7144-001).

When connecting new CAN components to the stand, this must be disconnected from mains supply, i.e. first remove the power plug of the stand or from the external power supply unit VP232-2.

If there are reflector modules in the reflector turret which are fitted with neutral beam splitters or partial mirrors in the beam-splitting mirror position or if these are fitted in the reflector turret itself, looking into the eyepiece can cause injury to the eye if an HBO 100 or HXP 120 V lamp is switched on. This applies particularly if the specimen or the specimen holder has reflective properties. Appropriate radiation attenuation measures must be taken (e.g. the use of neutral filters) to prevent damage to the eyes.

When using fluorescence filters, the heat protection filter, which provides protection from radiant heat emitted by the microscope illuminator, must not be removed. Fluorescence filters are heat-sensitive and their function may be impaired if the heat protection filter is removed.

The reflected and transmitted LED illumination lamps are assigned to LED risk category 2 under DIN EN 62471:2009. Do not look directly into the illumination light.

The desktop power supply units which are available as a microscopy accessory permit mains voltages in the 100 to 240 V ±10%, 50 – 60 Hz range without the voltage setting on the instrument having to be changed.

Desktop power supply units available as microscopy accessories should not come into contact with moisture. If the housing is damaged, the desktop power supply unit should be taken out of use. The microscope must only be operated with the desktop power supply unit contained in the scope of delivery.

The operating manuals of the light sources and the software as well as the quick reference guides “Auto Immersion Module” (433801-7044-001) and “Filter wheel excitation 8-pos. mot. for filters d = 25 mm; CAN and dual filter wheel mot. for beam splitting and emission; CAN” (452358-7044-001) must be strictly observed.

If it is determined that protective measures are no longer effective, the instrument must be taken out of service and secured against inadvertent operation. Please contact ZEISS Service or the ZEISS Microscopy Service to repair the instrument.

Please note that the Axio Observer is a precision opto-electronic device. Incorrect handling can easily impair the functioning of the device, or even damage it, and will render any warranty claims invalid.

Switching the Axio Observer 5, 5 materials, 7, 7 materials off using the standby button only turns off the internal computer. The mains supply is not switched off.

The Axio Observer 7, 7 materials can only be disconnected from the mains supply using the on/off switch on the external VP232-2 power unit. To disconnect the Axio Observer 5, 5 materials from the mains voltage, pull the power cable from the socket.

Keep hands out of the path of the motorized X/Y scanning stages when these are being moved or positioned to avoid pinching fingers or hands.

Do not dispose of defective instruments in regular domestic waste; these should be disposed of in accordance with prevailing legal requirements.

Specimens should also be disposed of in compliance with the prevailing legal requirements and internal operating procedures.

Axio Observer and its original accessories are to be used for the microscopy procedures described in these safety instructions only. The manufacturer cannot assume any liability for any other applications of the instrument, including the use of individual modules or components.

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

The Axio Observer microscopes 3, 3 materials and 5, 5 materials are equipped with a power supply unit integrated in the stand allowing line voltages to be used in the ranges 100 V to 127 V and 200 V to 240 V ±10 %, 50 – 60 Hz, without the voltage setting on the instrument having to be changed. The power supply unit automatically adapts to the mains voltage.

Voltage is supplied to the Axio Observer 7, 7 materials by the external VP232-2 power supply unit that belongs to the stand. This is designed for use in the ranges 100 V to 240 V ±10 %, 50 – 60 Hz, without the voltage setting on the instrument having to be changed. The power supply unit automatically adapts to the mains voltage.

The power supply units (ballast units) for HBO 100 (ebqb 100-04-z) and HXP 120 V are designed for use in the range from 100 V AC to 240 V AC, 50 – 60 Hz. The devices automatically adapt to the mains voltage.

Do not install the device close to heat sources such as radiators, or in direct sunlight. Broad temperature fluctuations and vibrations should be avoided.

The power plugs may only be connected to sockets with earth contact. The protective capacity must not be rendered ineffective by the use of extension cables with no grounding conductor.

Do not replace detachable power cables with power cables that do not meet the specifications. Only the specified power cables should be used.

Before connecting the power cable, ensure that the mains voltage matches that on the type plate of the Axio Observer

Only specially authorized experts or service staff are permitted to open the device. The Axio Observer may only be operated in enclosed areas.

Disconnect the device from the mains power supply before gaining access to the interior of the device or changing the fuse.

Only use fuses for the given rated current which comply with the specifications on the fuse holders and in this manual. Use of makeshift fuses and short-circuiting of the fuse holders are not permitted.

Do not use portable multiple sockets. Cables are to be laid so that there is no risk of tripping, or they are to be covered.

Never disconnect the power cable while the device is in use. Use the power switch to turn the device off.

To ensure proper function of the device, the Axio Observer should be subjected to an annual safety inspection. The safety inspection must be carried out by an authorized ZEISS service technician. All national safety checks should be carried out.

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 or fall into the instrument through the ventilation slats.

Dust and dirt may impair the device's performance. The devices must be effectively protected from such influences and covered with the dust cover when not in use. This should only be put on once the device has been switched off and has cooled down. Otherwise this could cause a fire.

Do not operate the supplied equipment in areas in which there is a danger of explosion or in the presence of volatile anaesthetics or flammable solvents, such as alcohol, benzene, etc.

Only operate the device on a hard, non-flammable surface.

The devices are not equipped with any special equipment to protect them against corrosive, potentially infectious, toxic, radioactive, or other substances that could be hazardous to health. All legal regulations must be complied with when handling such substances, particularly the prevailing national rules for accident prevention.

☞ To prevent the device from damage, ensure that the generation of electrostatic charges is avoided through suitable design of the workplace environment.

2.2 Warranty information

The manufacturer guarantees that the device is free of material or manufacturing defects when delivered. Any defects must be reported immediately and steps taken to minimize damage. If such a defect is reported, the device manufacturer shall be obliged to correct the default, either by repairing the instrument or replacing it with a new one, at the manufacturer’s discretion. No warranty is given for defects caused by natural wear (particularly of wearing parts) and improper use of the device.

The instrument manufacturer shall not be liable for damage caused by misuse, negligence or any other tampering with the instrument, particularly the removal or replacement of instrument components, or the use of accessories from other manufacturers. Such actions shall invalidate any warranty claims.

With the exception of the work described in these safety instructions, no maintenance or repair work is to be carried out on these microscopes. Repairs may only be performed by ZEISS Service or individuals specially authorized by ZEISS Service. In the event of a problem with the instrument, please contact the ZEISS microscopy service team in Germany or your local ZEISS overseas representative.

2.3 Warning and information labels on the device

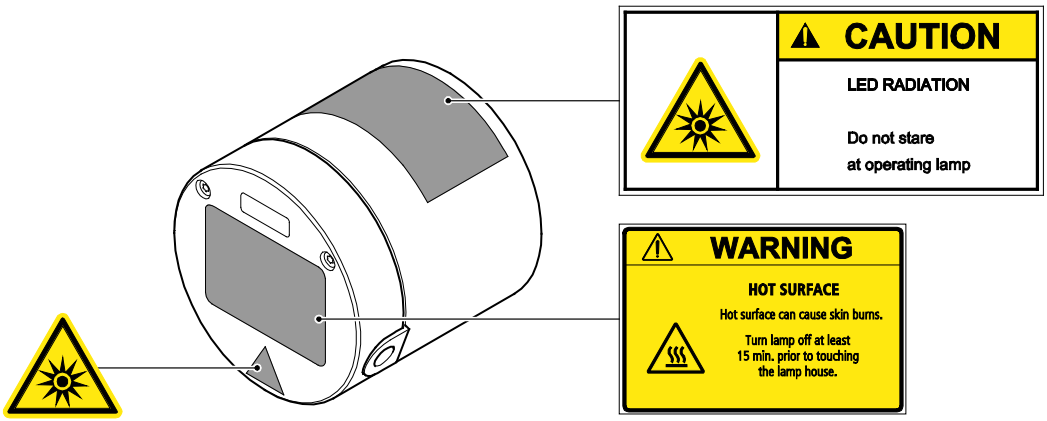


Fig. 1 Warning labels on the microLED attachment lamp

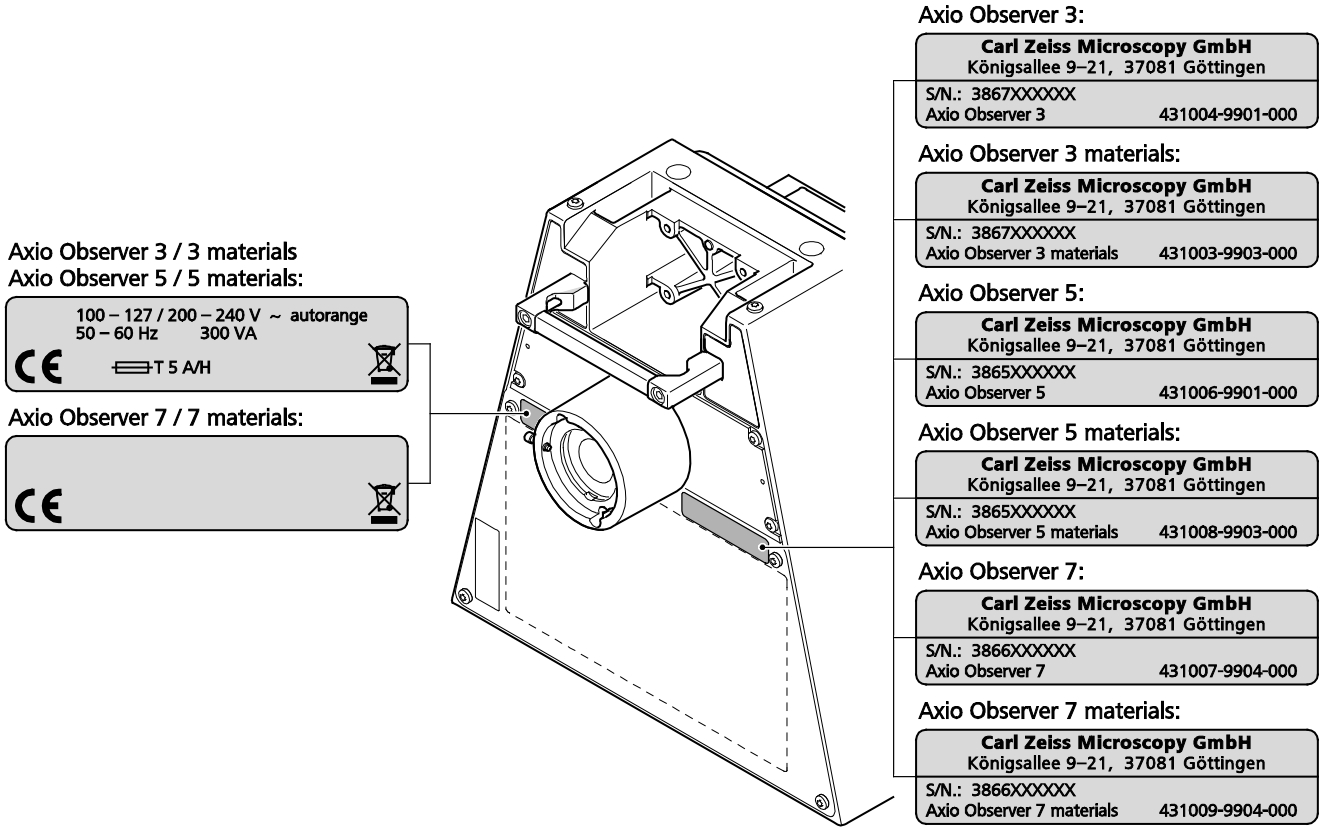


Fig. 2 Labels on the Axio Observer

3 DESCRIPTION OF THE DEVICE

3.1 Designation and intended use

Manufacturer's designation:

Inverted microscope for transmitted light and reflected light fluorescence
(Axio Observer 3, Axio Observer 5 and Axio Observer 7)

Inverted reflected light microscope with optional transmitted light equipment
(Axio Observer 3 materials, Axio Observer 5 materials and Axio Observer 7 materials)

Short designation:

Axio Observer 3, Axio Observer 3 materials
(manual / coded version)

Axio Observer 5, Axio Observer 5 materials
(coded / semi-motorized version)

Axio Observer 7, Axio Observer 7 materials
(fully motorized version, including motorized Z drive)

Axio Observer microscopes 3, 5, 7 (Fig. 3) are inverted light microscopes for universal use. They are used primarily for examining cell and tissue cultures and sediments in culture flasks, Petri dishes and microtiter plates under transmitted and reflected light. Also human cells and blood can be examined.

Typical fields of applications are:

- Examination of blood and tissue samples from the human body
- Observation of intracellular processes in living cell cultures, cell/cell interactions, motility, growth
- Measurement of potentials, drug detection
- Microinjection, IVF (in-vitro fertilization)
- Toxicity studies, patch-clamp techniques, ion measurements
- Digital recordings, time lapse studies with automated processes
- Z-sectioning, deconvolution, visualization of molecular structures
- Fura (Ca measurement), GFP
- Optical tweezers and scissors
- Single molecule detection

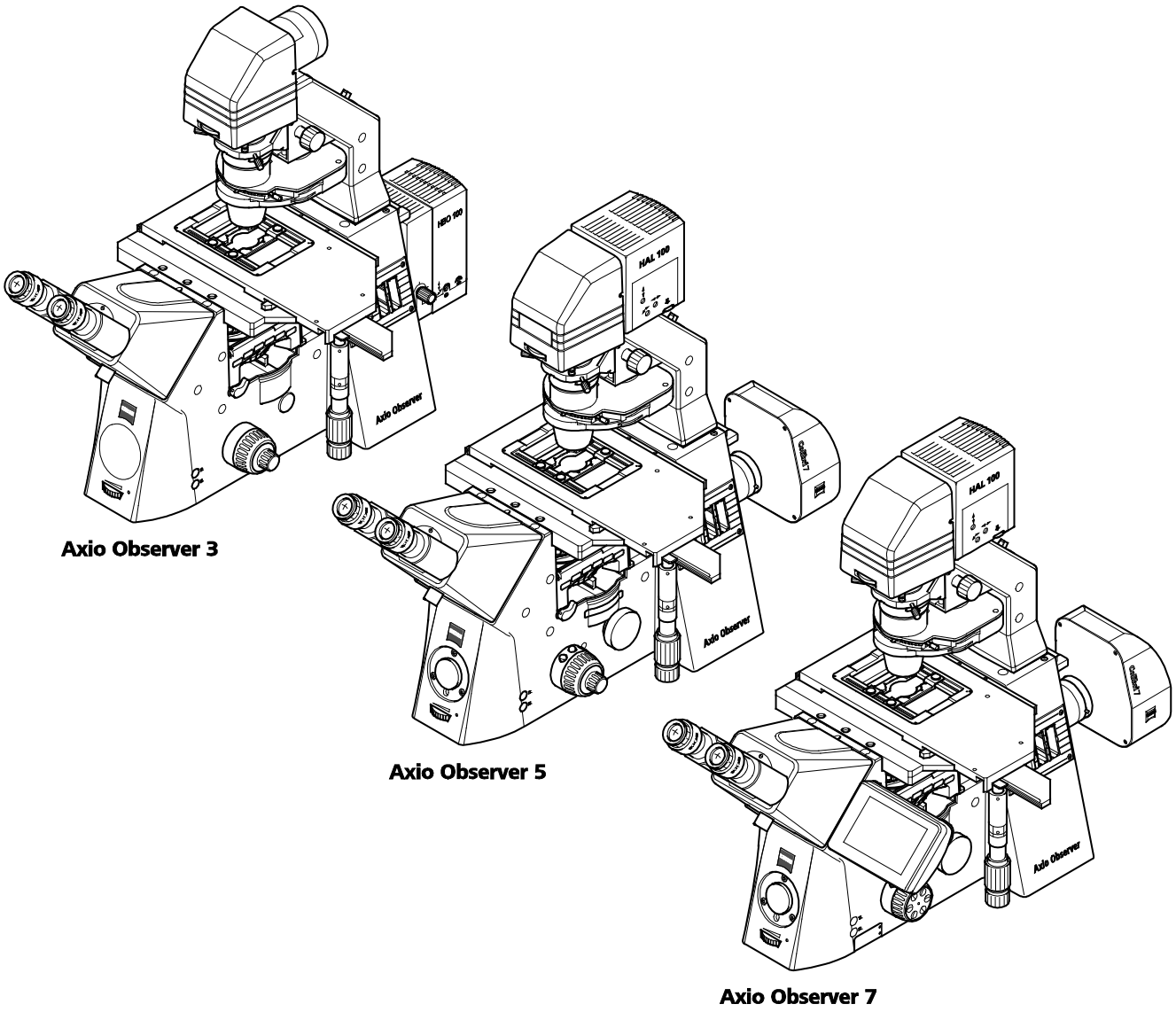


Fig. 3 Bio / Med microscopes Axio Observer 3, 5 and 7

Axio Observer materials microscopes 3 materials, 5 materials, 7 materials (Fig. 4) are inverted light microscopes for universal use. They are used in all areas of research-based and industrial microscopy. Inverted microscopes permit the unrestricted use of conventional samples as a result of the highly accommodating sample compartment. This facilitates the examination of samples, workpieces etc. of large dimensions.

Typical fields of applications are:

- Inspection of material samples and components, checking of process results, such as determination of component surface parameters, coating thicknesses

- Identification of microstructure types, study of the heat-affected zone around welded joints
- Assessment of the composition and structure of materials, finding the causes of component failures, in-process inspection of cast, worked or machined components and semi-finished products.
- Various investigations of composite materials and material compounds, increasingly including those made from renewable resources or combinations of organic and inorganic substances (epidermis cells on prosthesis or implant materials).

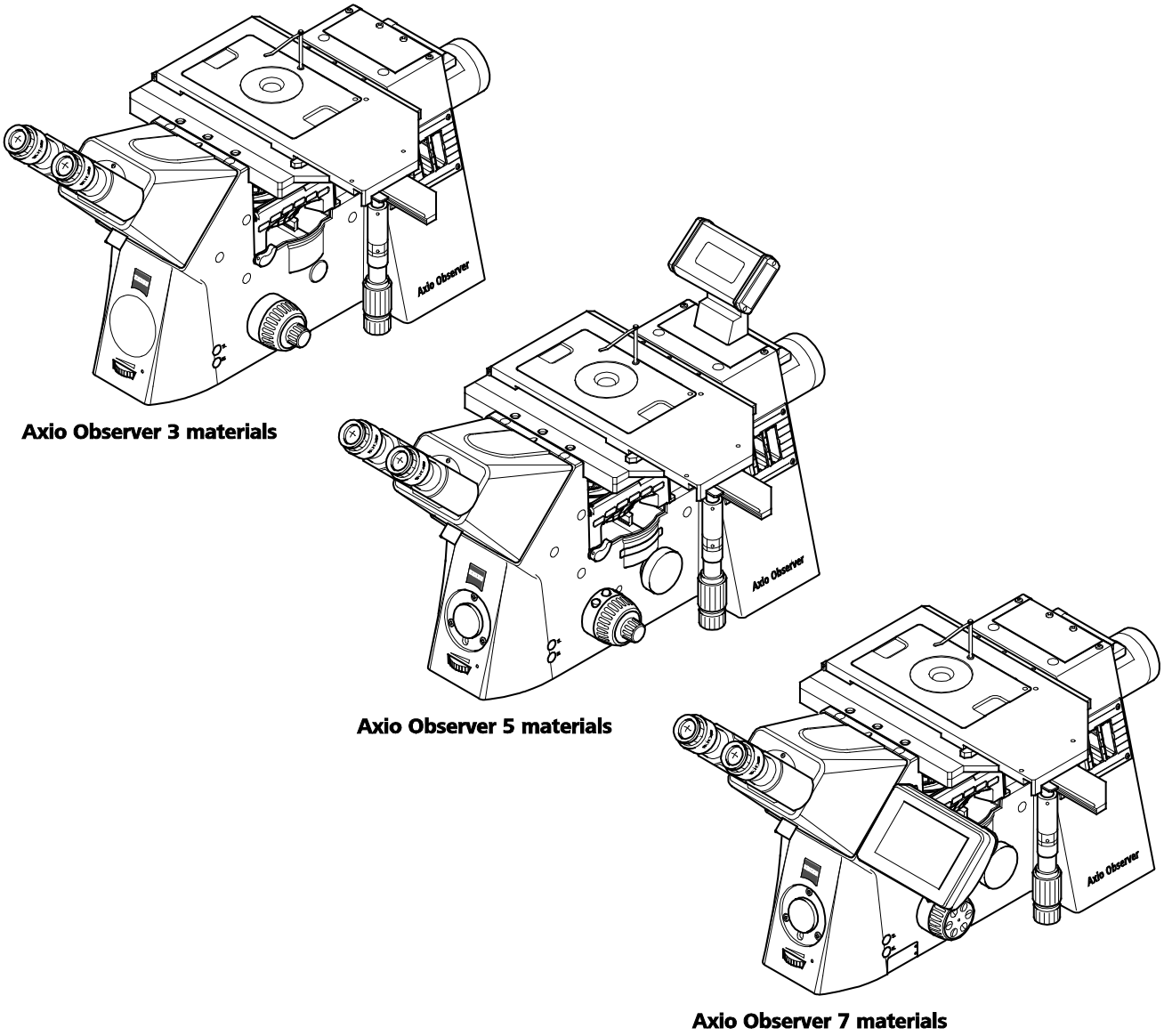


Fig. 4 Material microscopes Axio Observer 3 materials, 5 materials and 7 materials

3.2 Instrument description and main features

The Axio Observer microscopes can be supplied with three stand fittings:

- manual / coded (Axio Observer 3, 3 materials),
- coded / semi-motorized (Axio Observer 5, 5 materials),
- fully motorized (Axio Observer 7, 7 materials)

Accessory components have a modular design.

For the documentation of microscopy examinations, the Axio Observer stand can be equipped with up to five camera / TV ports as required.

Depending on the configuration of your microscope, the following microscopy and contrast techniques are available:

Transmitted light:

- Brightfield
- Phase contrast
- Differential Interference Contrast (DIC)
- PlasDIC Contrast
- iHMC (improved Hoffman Modulation Contrast)
- Simple polarization contrast

Reflected light:

- Brightfield
- Polarization contrast
- Darkfield
- Differential Interference Contrast (DIC)
- Differential Interference Contrast in circularly polarized light (C-DIC)
- Total Interference Contrast in circularly polarized light (TIC)
- Fluorescence contrast

The instrument's main features are as follows (see also overview of equipment variations in section 3.3):

- ICS optics for image generation
- High thermal and mechanical stability
- High degree of flexibility for documenting results
- Improved ergonomics
- Display of device parameters via LCD (Axio Observer 5, 5 materials)
- Display of device parameters and device control using a TFT display (Axio Observer 7, 7 materials)
- 23 mm field of view
- Light Manager, Contrast Manager
- Modular design for optimum adaptation for different applications
- 6-position nosepiece
- 6-position reflector turret; can be loaded in situ or removed for loading
- 5 or 6-position condenser turret
- Dual filter wheel mot. for beam splitting and emission; CAN
- Filter wheel excitation 8-pos. mot. for filters d = 25 mm; CAN

- 3-position Optovar turret
- Removable aperture diaphragm and luminous-field diaphragm sliders for reflected light
- Fluorescence shutter (internal standard shutter or external high-speed shutter)
- HAL 100, HBO 100, HBO 50, VIS-LED and microLED illuminators
- All major microscope functions are motorized (Axio Observer 7, 7 materials)

3.3 Equipment and compatibility table

3.3.1 Axio Observer 3, 5 and 7

Equipment	Option	Axio Observer		
		3	5	7
Stand	manual	+	+	-
	motorized	-	O*	+
Coding	PC readable	+	+	+
Display	LCD display	-	O**	-
	TFT display	-	-	+
	Docking station	-	-	O
Interfaces	CAN	+	+	+
	RS 232	-	+	+
	USB	+	+	+
	TCP/IP	-	+	+
	Socket for external UNIBLITZ shutter	-	+	+
	Trigger socket (IN/OUT) for shutter	-	+	+
4-position CAN hub		O	O	O
Light Manager		+***	+	+
Contrast Manager		-	-	+
Control ring	right	-	+	+
	left	-	-	+
Z-focus drive	manual (2 mm / 0.2 mm)	+	+	-
	motorized, stepper motor drive (z-step size 10 nm)	-	-	+
Adjustable vertical stop for Z drive (focus stop)	manual	-	+	-
Automatic **C**omponent **R**ecognition (ACR)	Nosepiece ACR	-	-	O
	Reflector turret ACR	-	O	O
Power supply unit	internal	+	+	-
	external	-	-	+
Z drive control (flat control knob)	right	O	-	O
	left	O	+	O
Z drive extended travel range (13 mm)	manual	O	O	-
	motorized	-	-	O
Nosepiece	6-position H DIC cod.	+	+	-
	6-position H DIC mot.	-	-	O
	6-position H DIC mot. ACR	-	-	O
Definite Focus	including 6-position nosepiece H DIC mot. ACR	-	-	O
Auto immersion module		-	-	O
Objectives autocorr		-	-	O

Equipment	Option	Axio Observer		
		3	5	7
Transmitted light contrast method	PlasDIC	O	O	O
	PlasDIC with contrast slider	O	O	-
Tube lens mount, fixed / Optovar turret	1-position tube lens mount, fixed	+	O	O
	Optovar turret 3-position, coded	-	O	-
	Optovar turret 3-position, mot.	-	-	O
Sideport (type)	2 or 3-position, manual (port only on left)	+	-	-
	2 or 3-position, man. L/R	-	+	-
	3-position, mot. L/R	-	-	+
Sideport (component)	60N L, 2 switching positions (100% vis : 0% L / 20% vis : 80% L)	O	O	-
	60N L 100, 2 switching positions (100% vis : 0% L / 0% vis : 100% L)	O	O	-
	60N L, 3 switching positions (100% vis : 0% L / 0% vis : 100% L / 50% vis : 50% L)	O	O	O
	60N R, 3 switching positions (100% vis : 0% R / 0% vis : 100% R / 50% vis : 50% R)	-	O	O
	60N L/R, 3 switching positions (100% vis : 0% LR / 0% vis : 100% L / 20% vis : 80% R)	-	O	O
	60N R/L 100, 3 switching positions (100% vis : 0% LR / 0% vis : 100% L / 0% vis : 100% R)	-	O	O
	60N L 80/R 100, 3 switching positions (100% vis : 0% LR / 20% vis : 80% L / 0% vis: 100% R)	-	O	O
Path deflection to the tube (VIS only)		+	O	O
Beam path switching (for VIS/frontport/baseport)	manual	-	O	-
	motorized	-	-	O
Baseport / frontport		-	O	O
Scanning stages	Scanning stage 130x85 mot. CAN	O	O	O
	Scanning stage 130x100 STEP	O	O	O
	Scanning stage Piezo 130x100	O	O	O
	Scanning stage XY DC 110x90 with stage attachment Z-Piezo/ Rot.En.	O	O	O
Stage attachment Z-PIEZO		O	O	O
Carrier for transmitted-light illumination	without LCD display	O	-	O
	with LCD display	-	O**	-
Transmitted light illuminator	microLED, VIS-LED, HAL100	O	O	O
Condensers	LD 0.35 / LD 0.55, manual	O	O	O
	LD 0.55, motorized	-	O	O
	Axio Imager 0.8/1.4 with adapter	O	O	O
Shutter for transmitted light	internal	-	O	O
	external, high speed (with internal control system)	-	O	O

Equipment	Option	Axio Observer		
		3	5	7
Reflected light illuminator	manual	O	O	O
	motorized	-	O	O
Slider for reflected light illuminator	manual	O	O	O
	motorized	-	O	O
Shutter for reflected light	Shutter FL, internal	O	O	O
	High-speed, external (with internal control)	-	O	O
Illumination system	Colibri 7	O	O	O
Reflector turret	6-position, manual	O	O	-
	6-position, coded	-	O	O
	6-position, motorized	-	O	O
	6-position, motorized ACR	-	O	O
Switching mirror mot.; CAN	motorized	-	O	O
Filter wheels	Dual filter wheel mot. for beam splitting and emission; CAN	-	-	O
	Filter wheel excitation 8-pos. mot. for filters d=25 mm; CAN	-	-	O
Laser safety upgradeable	Spinning Disk / DirectFRAP	-	-	O
	LSM	-	-	O
ApoTome / ApoTome.2		-	O	O

+ = included in stand
O = optionally available
O* = optional: reflector turret mot., reflected-light illuminator mot., LD condenser 0.55 mot.
O** = required (either carrier for transmitted-light illumination with LCD display (423922-0000-000) or holder with LCD display and Light Manager (432923-0000-000)
+*** = „simple“ Light Manager
- = not available

3.3.2 Axio Observer 3 materials, 5 materials and 7 materials

Equipment	Option	Axio Observer		
		3 m	5 m	7 m
Stand	manual	+	+	-
	motorized	-	O*	+
Coding	PC readable	+	+	+
Display	LCD display	-	O**	-
	TFT display	-	-	+
	Docking station	-	-	O
Interfaces	CAN	+	+	+
	RS 232	-	+	+
	USB	+	+	+
	TCP/IP	-	+	+
	Socket for external UNIBLITZ shutter	-	+	+
	Trigger socket (IN/OUT) for shutter	-	+	+
4-position CAN hub		O	O	O
Light Manager		+	+	+
Contrast Manager		-	-	+
Control ring	right	-	+	+
	left	-	-	+
Z-focus drive	manual (2 mm / 0.2 mm)	+	+	-
	motorized, stepper motor drive (z-step size 10 nm)	-	-	+
Adjustable vertical stop for Z drive (focus stop)	manual	-	+	-
Automatic **C**omponent **R**ecognition (ACR)	Nosepiece ACR	-	-	+
	Reflector turret ACR	-	O	O
Power supply unit	internal	+	+	-
	external	-	-	+
Z drive control (flat control knob)	right	O	-	O
	left	O	+	O
Z drive extended travel range (13 mm)	manual	O	O	-
	motorized	-	-	O
Nosepiece	6 position HD DIC cod.	+	+	-
	6 position HD DIC mot. ACR	-	-	+
Compensator mount 6x20		+	+	+
Tube lens mount, fixed / Optovar turret	Tube lens mount, 1-position, fixed	+	O	O
	Optovar turret 3-position, coded	-	O	-
	Optovar turret 3-position, mot.	-	-	O

Equipment	Option	Axio Observer		
		3 m	5 m	7 m
Sideport (type)	2 or 3-position, manual (port only on left)	+	-	-
	2 or 3-position, man. L/R	-	+	-
	3-position, mot. L/R	-	-	+
Sideport (component)	60N L, 2 switching positions (100% vis : 0% L / 20% vis : 80% L)	O	O	-
	60N L 100, 2 switching positions (100% vis : 0% L / 0% vis : 100% L)	O	O	-
	60N L, 3 switching positions (100% vis : 0% L / 0% vis : 100% L / 50% vis : 50% L)	O	O	O
	60N R, 3 switching positions (100% vis : 0% R / 0% vis : 100% R / 50% vis : 50% R)	-	O	O
	60N L/R, 3 switching positions (100% vis : 0% LR / 0% vis : 100% L / 20% vis : 80% R)	-	O	O
	60N R/L 100, 3 switching positions (100% vis : 0% LR / 0% vis : 100% L / 0% vis : 100% R)	-	O	O
	60N L 80/R 100, 3 switching positions (100% vis : 0% LR / 20% vis : 80% L / 0% vis: 100% R)	-	O	O
Path deflection to the tube (VIS only)		+	O	O
Beam path switching (for VIS/front port/base port)	manual	-	O	-
	motorized	-	-	O
Baseport / frontport		-	O	O
Scanning stages	Scanning stage 130x85 CAN	O	O	O
	Scanning stage 130x100 STEP	O	O	O
	Scanning stage 130x100 PIEZO	O	O	O
Holder with LCD display			O**	
Carrier for transmitted-light illumination for HAL 100 lamp and micro LED	without LCD display	O	-	O
	with LCD display	-	O**	-
Condensers	LD 0.35 / LD 0.55, manual	O	O	O
	LD 0.55, motorized	-	O	O
	Axio Imager 0.8/1.4 (s. PL 40.19.04)	O	O	O
Shutter for transmitted light	internal	-	O	O
	external, high speed (with internal control system)	-	O	O
Reflected light illuminator	manual	+[1)]	O	O
	motorized	-	O	O
Slider for reflected light illuminator	manual	O	O	O
	motorized	-	O	O
Polarizer slider RL 6x30 mm, 90° rotatable		O	O	O

Equipment	Option	Axio Observer		
		3 m	5 m	7 m
Shutter for reflected light	Shutter FL, internal	O	O	O
	High-speed, external (with internal control)	-	O	O
Reflector turret	6-position, manual	O	O	-
	6-position, coded	-	O	O
	6-position, motorized	-	O	O
	6-position, motorized ACR	-	O	O
Filter wheel excitation 8-pos. mot. for filters d = 25 mm; CAN	motorized	-	O	O
Switching mirror mot.; CAN	motorized	-	O	O
ApoTome / ApoTome.2		-	O	O

\+ = included in stand
+[1)] = includes reflected-light illuminator HD Pol FL (423608-9001-000)
O = optionally available
O* = optionally: motorized reflector turret, reflected-light illuminator, LD condenser 0.55
O** = either holder with LCD display and light manager (432923-0000-000) or carrier for transmitted-light illumination with LCD display (423922-0000-000)
\- = not available

3.4 System overview Axio Observer Bio / Med

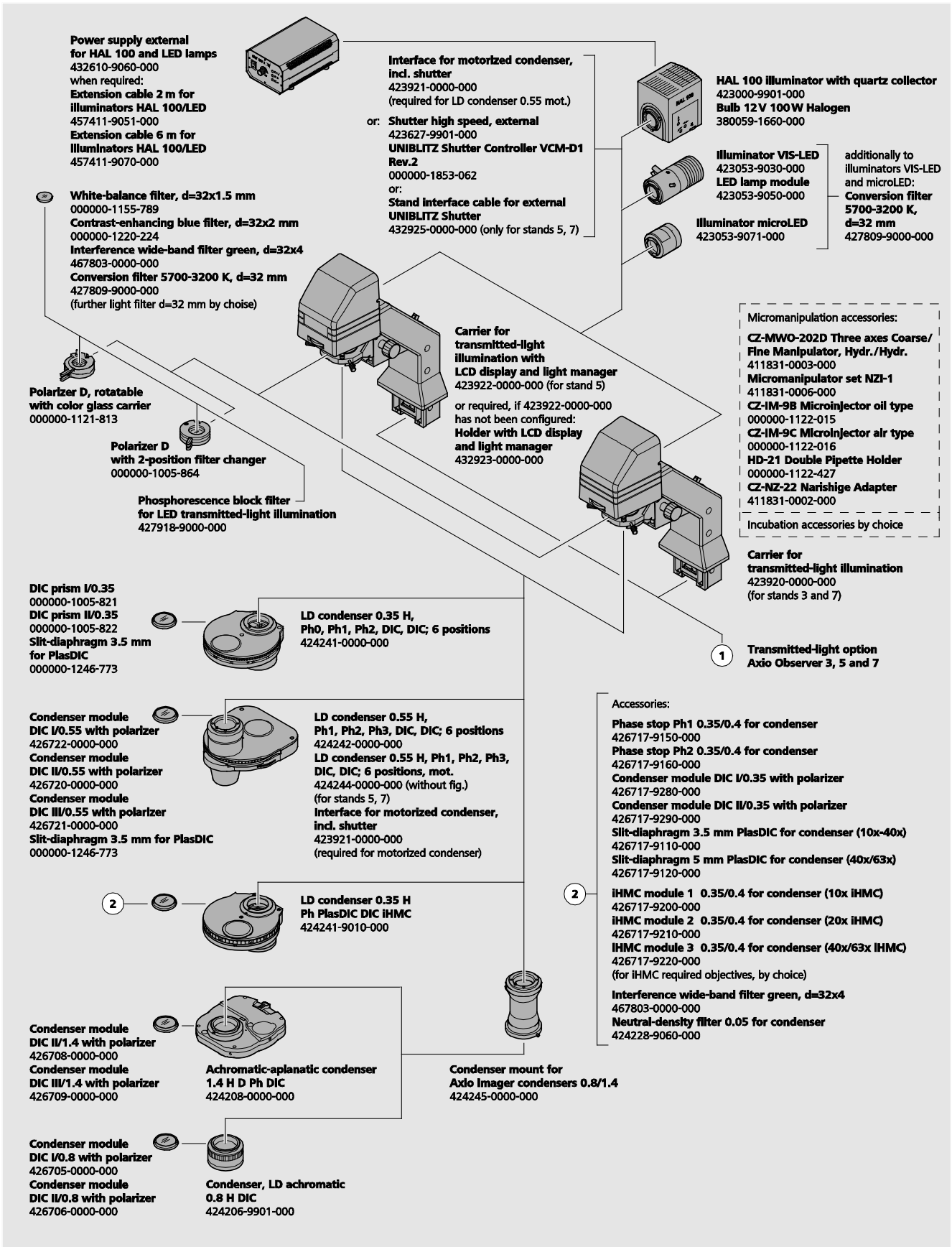


Fig. 5 System overview Axio Observer Bio / Med (Sheet 1)

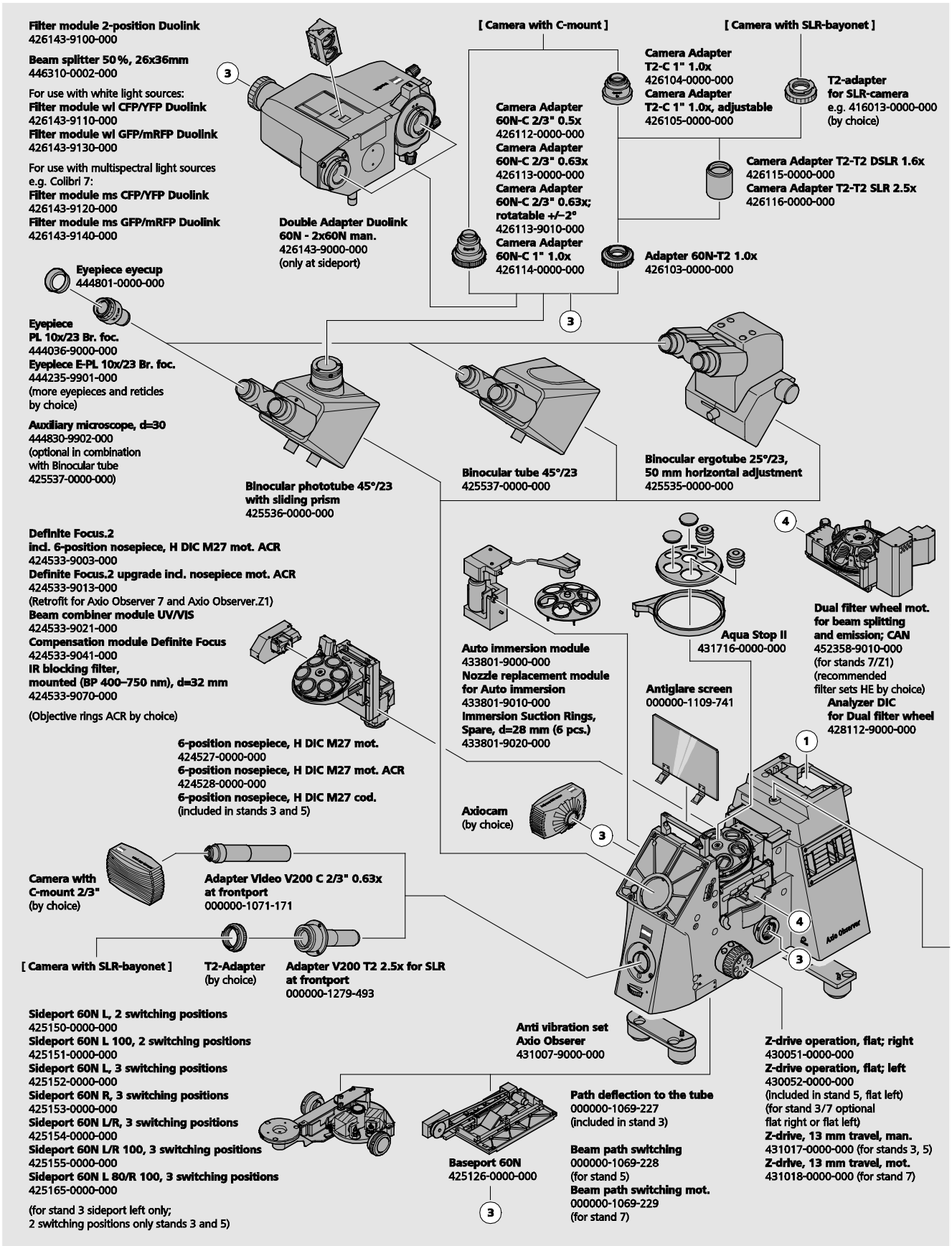


Fig. 6 System overview Axio Observer Bio / Med (Sheet 2)

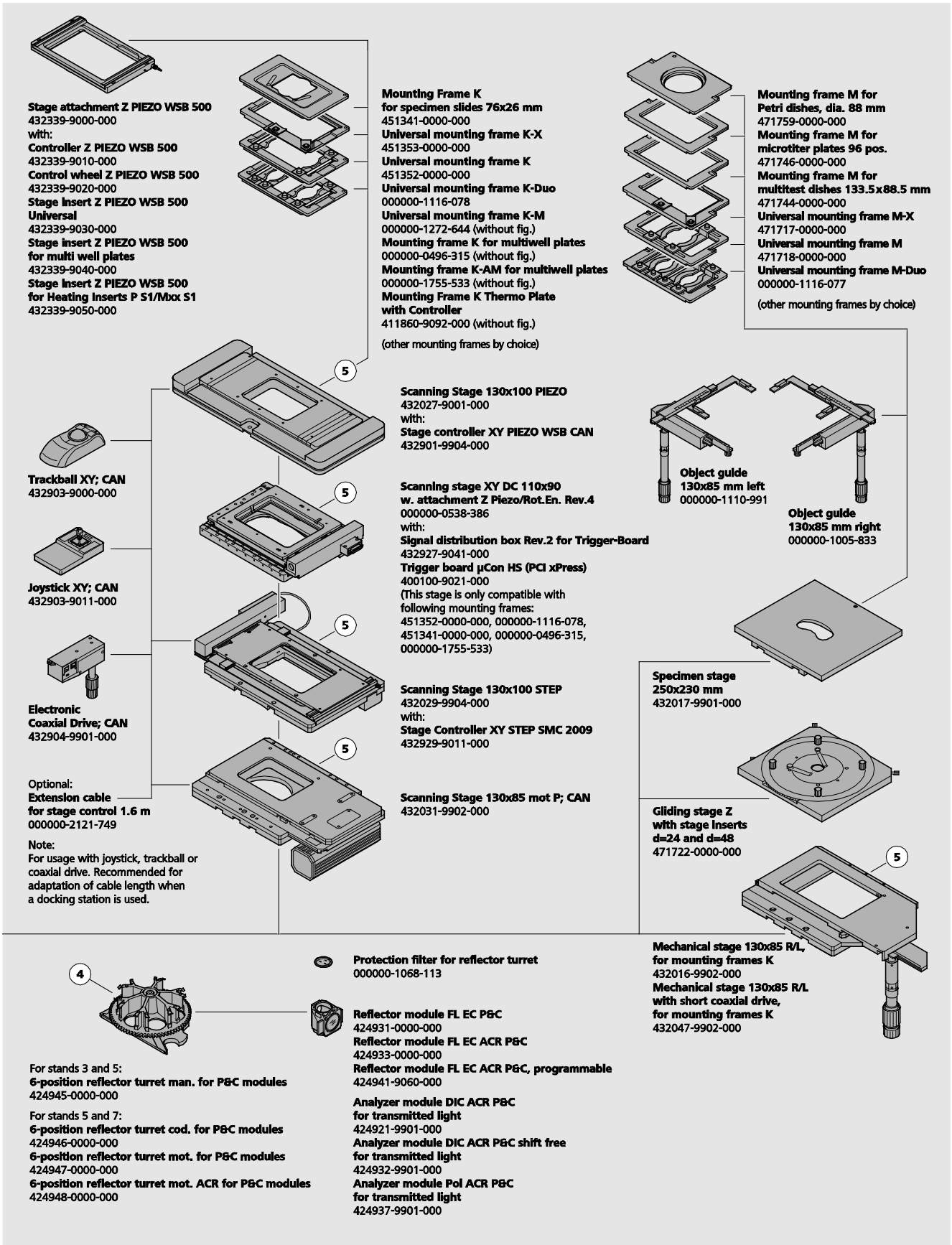


Fig. 7 System overview Axio Observer Bio / Med (Sheet 3)

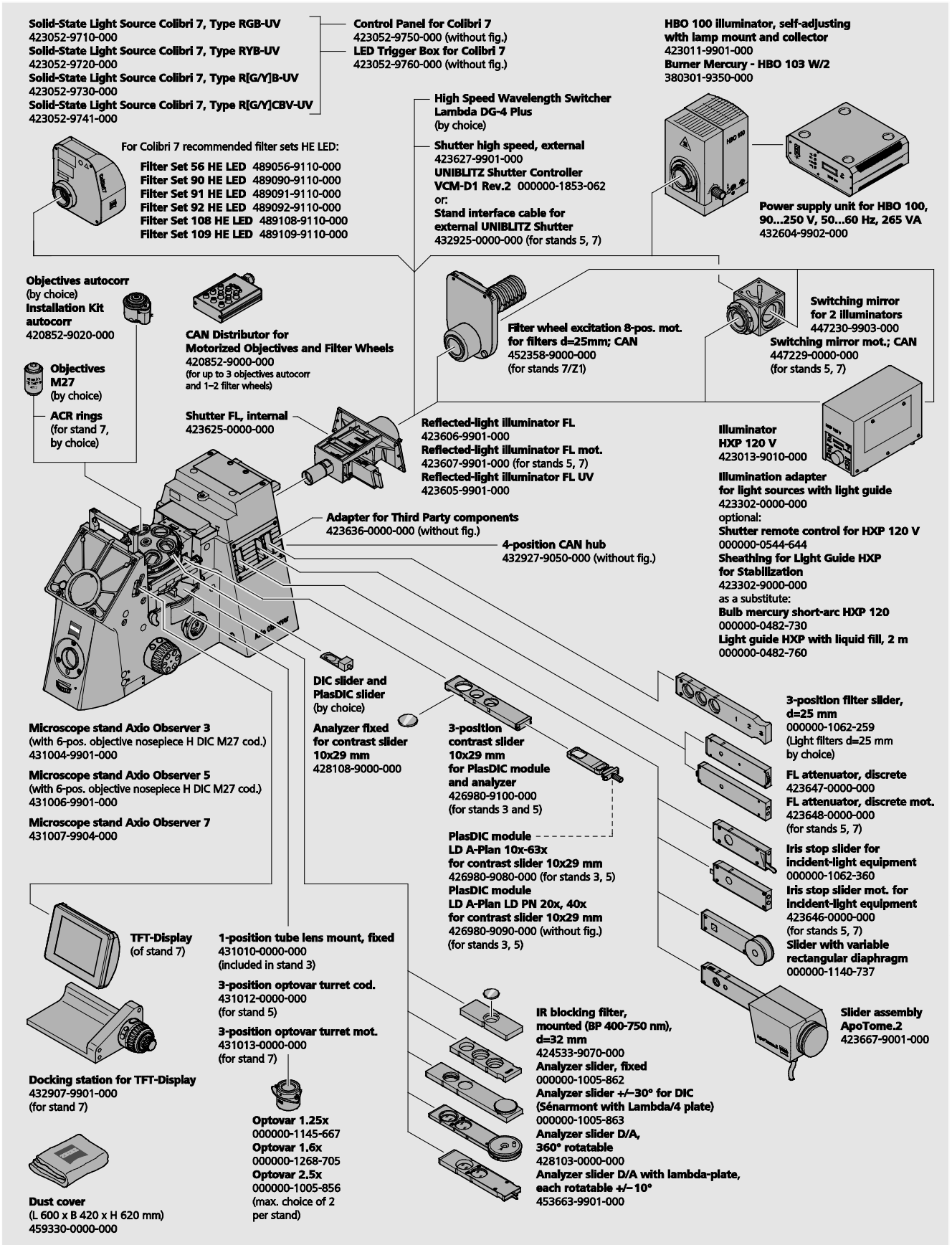


Fig. 8 System overview Axio Observer Bio / Med (Sheet 4)

3.5 System overview Axio Observer materials (Mat)

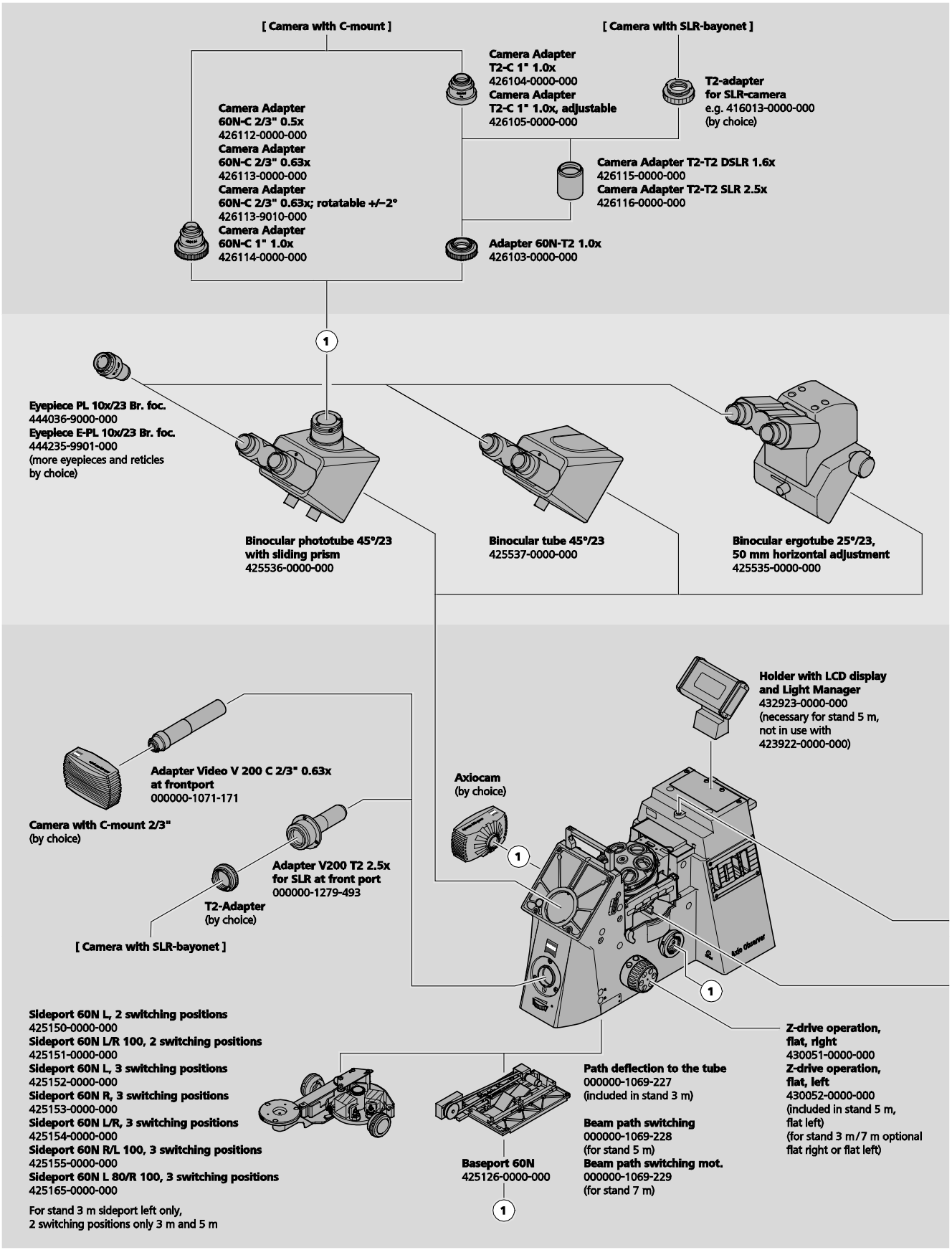


Fig. 9 System overview Axio Observer materials (Sheet 1)

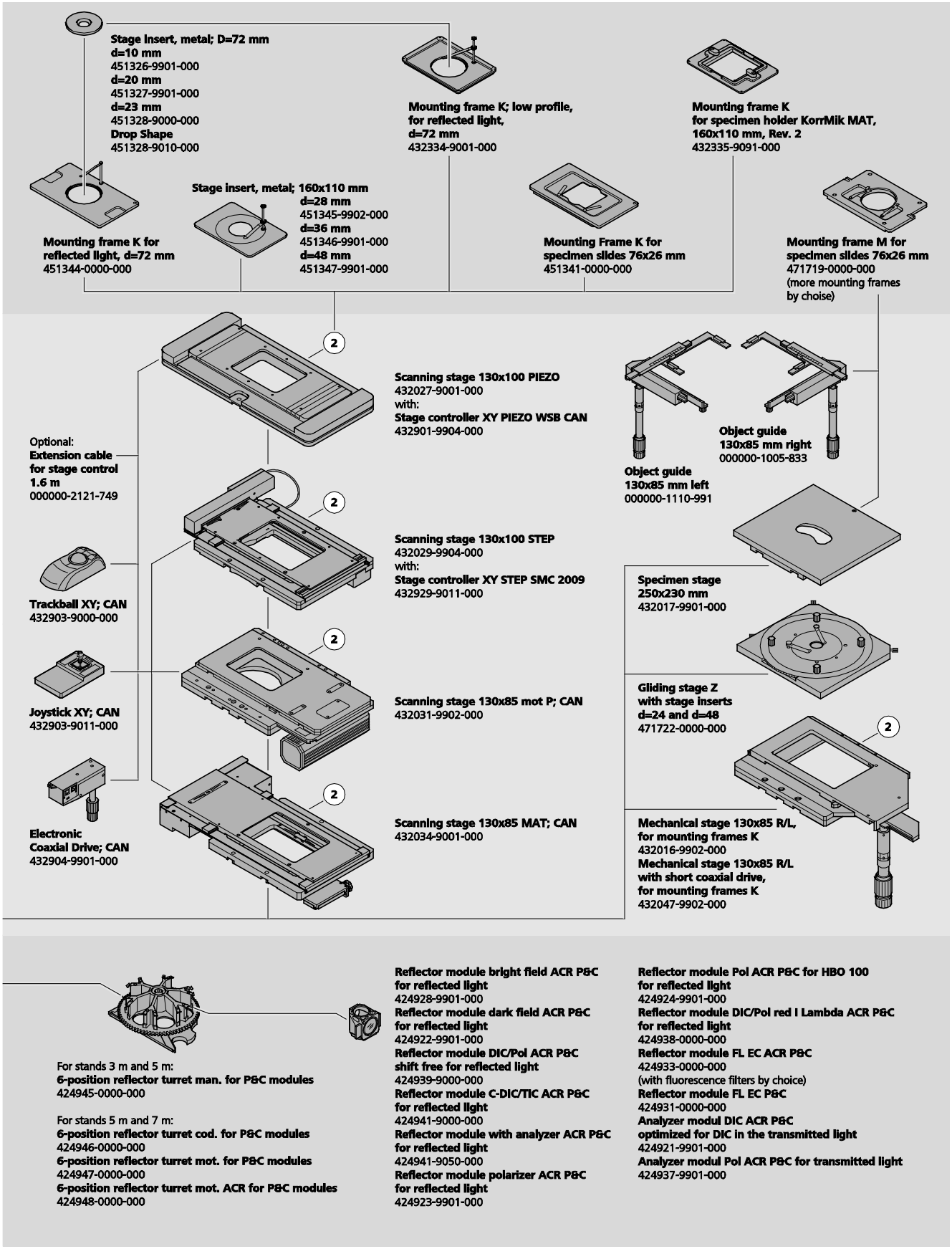


Fig. 10 System overview Axio Observer materials (Sheet 2)

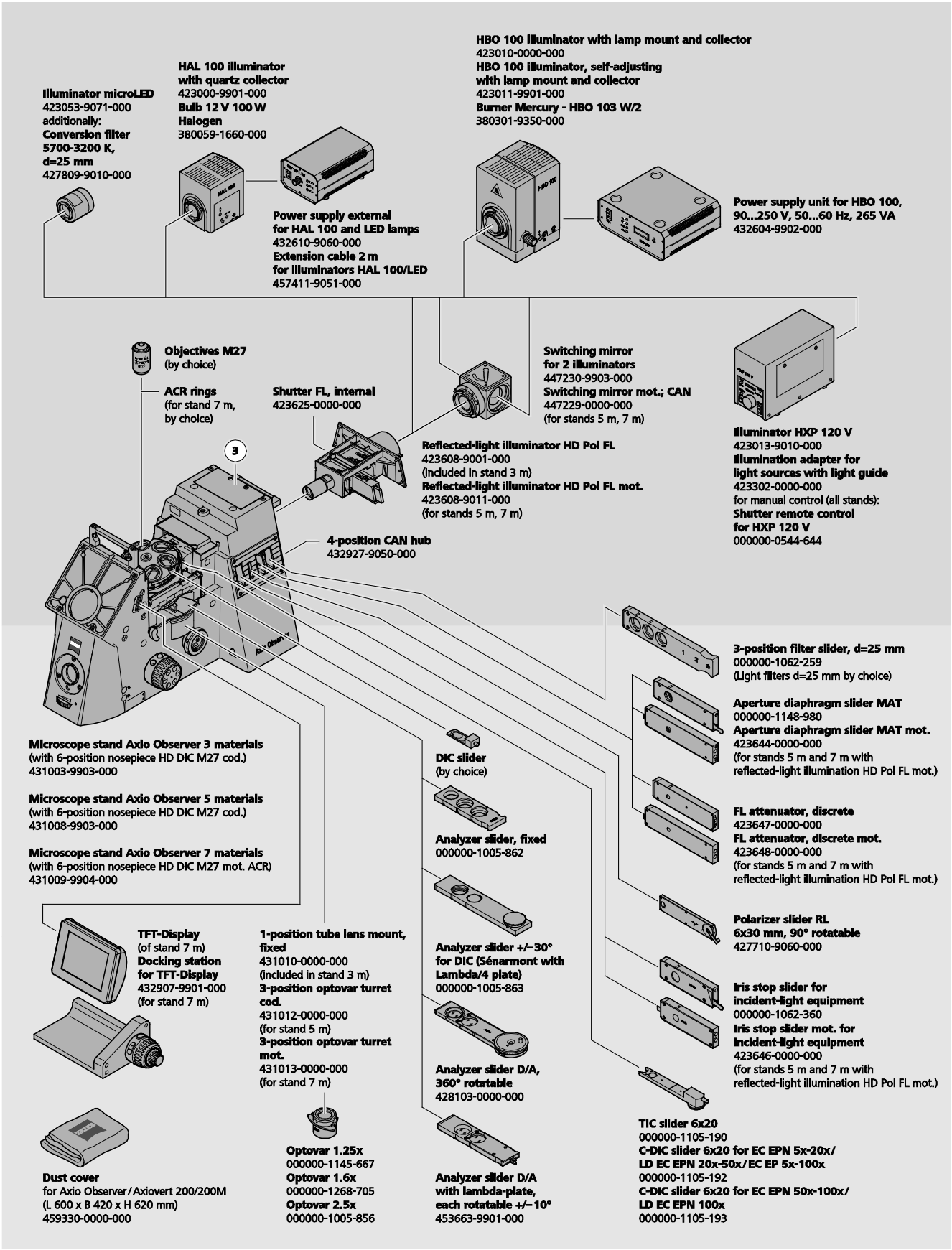


Fig. 11 System overview Axio Observer materials (Sheet 3)

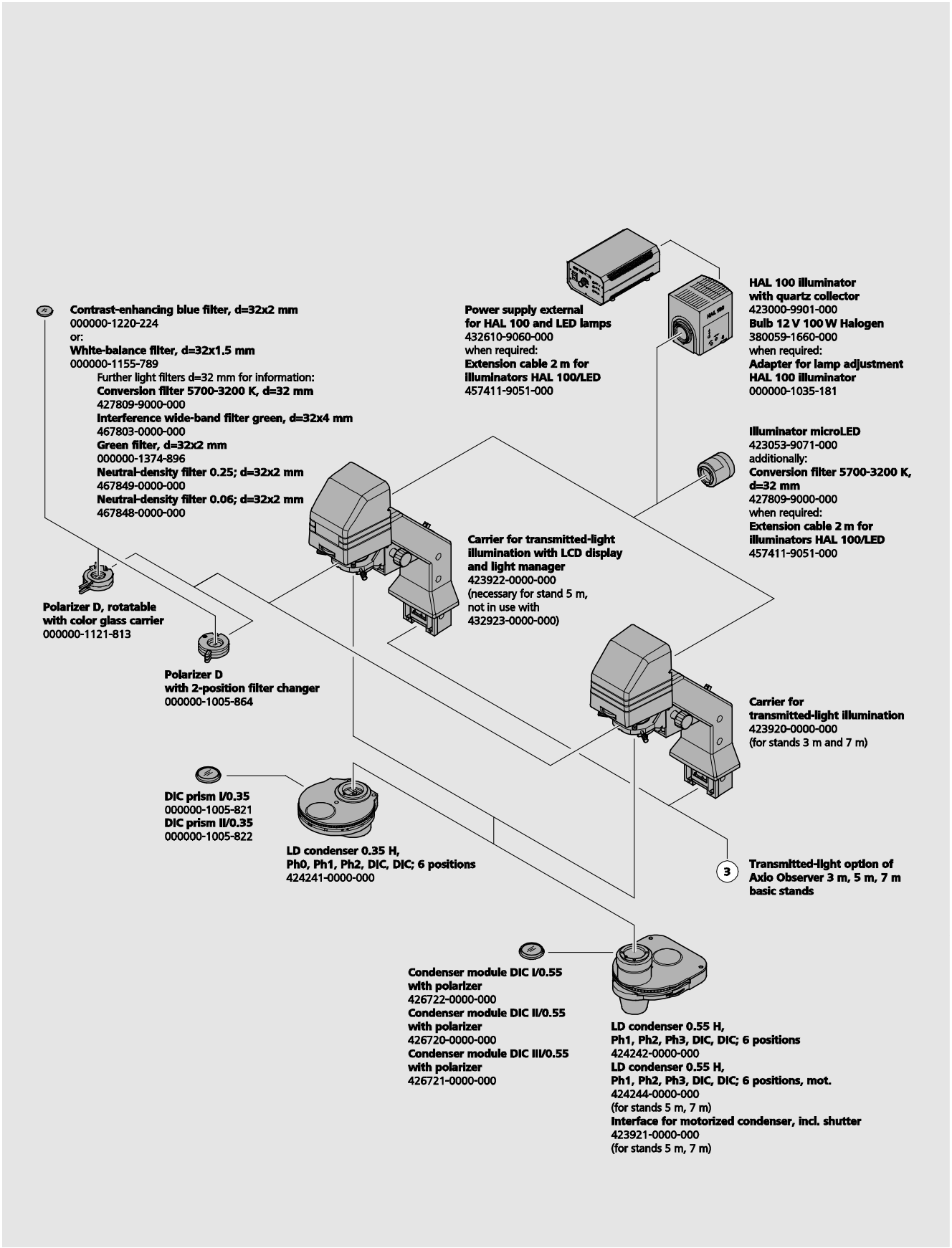


Fig. 12 System overview Axio Observer materials (Sheet 4)

3.6 Ambient conditions

Storage (in packaging)

Permissible ambient temperature .....+10 °C to +40 °C
Permissible air humidity (without condensation)..... max. 75 % at +40 °C

Transport (in packaging):

Permissible ambient temperature .....-40 °C to +70 °C
Permissible air humidity (without condensation)..... max. 75 % at +35 °C

Operation

Permissible ambient temperature ..... +10 °C to +35 °C, optimally 22 °C
Permissible air humidity.....max. 65 % at 30 °C
Air pressure.....800 hPa to 1060 hPa
Degree of pollution..... 2
Altitude of operating site ..... max. 2000 m

3.7 Technical data

Dimensions (width x depth x height)

Stand Axio Observer 3, 3 materials;
Stand Axio Observer 5, 5 materials and
Stand Axio Observer 7, 7 materials..... approx. 295 mm x 805 mm x max. 707 mm

Weight

Axio Observer 3, 3 materials ..... approx. 27 kg
Axio Observer 5, 5 materials ..... approx. 30 kg
Axio Observer 7, 7 materials ..... approx. 36 kg

Operating data for Axio Observer 3, 3 materials and 5, 5 materials with integrated power supply unit, and Axio Observer 7, 7 materials with external power supply unit VP232-2

Operating area ..... Enclosed rooms
Protection class I
Ingress protection rating ..... IP 20
Electrical safety ..... DIN EN 61010-1 (IEC 61010-1)
and conforming to CSA and UL regulations
Overvoltage category..... II
Suppression of interference .....in accordance with EN 55011 Class B
Noise immunity .....in accordance with DIN EN 61326-1
Line voltage .....100 to 127 V and 200 V to 240 VAC ±10 %
(Axio Observer 3, 3 materials / 5, 5 materials)
Line voltage of external power supply unit of Axio Observer 7 materials ..... 100 V to 240 VAC ±10 %
A change of the line voltage is not required!
Mains frequency..... 50 Hz – 60 Hz
Power consumption Axio Observer 3, 3 materials and 5, 5 materials ..... max. 300 VA
Power consumption of external power supply unit of Axio Observer 7, 7 materials ..... max. 190 VA

Power supply unit (ballast unit) HBO 100

Operating area ..... Enclosed rooms
Protection class I
Ingress protection rating ..... IP 20
Line voltage .....100 V to 240 VAC
Mains frequency..... 50 Hz – 60 Hz
Power consumption if operating with HBO 100..... 155 VA

Fuses in accordance with IEC 127

Microscope stand Axio Observer 3, 3 materials and 5, 5 materials..... T 5 A/H / 250 V, 5x20 mm
Power supply unit VP232-2 for Axio Observer 7, 7 materials ..... T 4.0 A/H / 250 V, 5x20 mm
HBO 100 power supply unit (ballast unit) ..... T 2.0 A/H / 250 V, 5x20 mm

Light sources

HBO 50W/AC mercury vapor short-arc lamp
Output ..... 50 W
Average service life ..... 100 h
HBO 103 W/2 mercury vapor short-arc lamp..... 100 W

Desktop power supply unit for external filter wheel

Protection class I
Desktop power supply unit input ..... 100 V to 240 V ±10%, 50 – 60 Hz
Desktop power supply unit output ..... 24 VDC24 VDC, max. 2.5 A

Optical-mechanical data

Stand with stage focusing .....with coarse focusing drive approx. 2 mm/rotation and fine focusing drive approx. 1/10 coarse/fine focus transmission ratio, total travel approx. 10 mm, 13 mm also possible
Change of objective..... via 6-position nosepiece, H DIC M27
Objectives .....with M27 screw thread
Eyepieces .....Plug-in diameter 30 mm, field number 23

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

HBO 100..... Risk group 2 acc. to DIN EN 62471:2009
HXP 120 V..... Risk group 2 acc. to DIN EN 62471:2009
HAL 100..... Risk group 1 acc. to DIN EN 62471:2009
VIS-LED ..... Risk group 1 acc. to DIN EN 62471:2009
microLED..... Risk group 1 acc. to DIN EN 62471:2009

4 INSTALLATION INSTRUCTIONS AND FIRST-TIME SET-UP

4.1 Installation instructions and space requirements

The following requirements apply regarding installation of the device:

- Dimensions of Axio Observer stand (width x depth x height):
  approx. 295 mm x 850 mm x max. 707 mm
- Distance of the system to the wall, at least 3 cm

It must also be ensured that the floor on which the support/table stands is subject to the least possible vibration. Only operate the device on a hard, non-flammable surface.

The parameters described in sections *Ambient* conditions and *Technical data* must also be observed (see page 33 and 34).

4.2 First-time set-up

Because of the complexity of the equipment and to ensure correct function, the Axio Observer microscopes will be installed and set up for use on site by your ZEISS representative.

This includes the following services:

- Installation of the microscope, assembly and adjustment of all components (where these are not factory-adjusted)
- Connection of cables and power supply
- Training

4.3 Unpacking and installing the microscope

The basic instrument is delivered packed to commercial standards in a polyethylene case with cardboard packaging.

The package includes the stand, binocular tube, objectives, eyepieces, condenser, microLED or halogen illuminator, fluorescence illuminator and a number of small components such as filter sliders and diaphragm sliders, DIC slider, dust cover and tools.

Further optional accessories are supplied in a separate case.

- Remove all components from the packaging and check that all components described on the delivery note are present.
- Place the stand (Fig. 13/**1**) on a flat, low-vibration work surface.
- Dispose of the original packaging properly or keep it for storage during prolonged non-use of the instrument or for its return to the manufacturer for repair.
- Unscrew and remove the transport handle (Fig. 13/**2**) using the 4 mm Allen key.

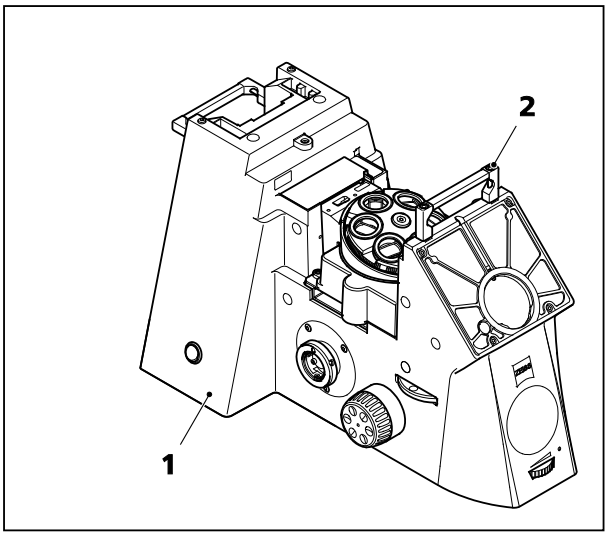


Fig. 13 Installing the microscope

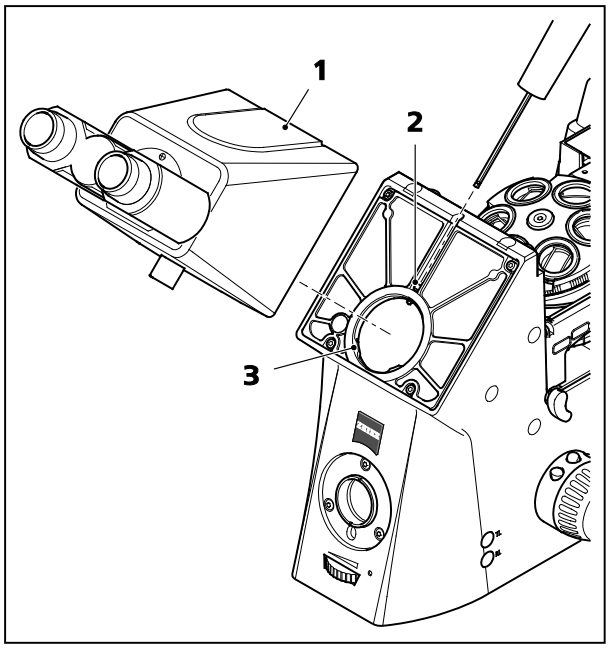


Fig. 14 Attaching the binocular tube

4.4 Attaching the binocular (photo) tube

All binocular tubes listed in the system overview can be fitted to the Axio Observer, Axio Observer materials stands as described below.

Proceed as follows to fit or change the binocular tube:

- Loosen Allen screw (Fig. 14/**2**) using the 3 mm ball-headed screwdriver. When changing the binocular tube, hold the tube firmly during unscrewing and remove it forwards.
- Remove the dust cap from the binocular tube which is to be attached.
- Insert the binocular tube (Fig. 14/**1**) with the dovetail ring into the tube mount (Fig. 14/**3**) on the stand, align it with the stand and tighten the Allen screw (Fig. 14/**2**) using the ball-headed screwdriver.

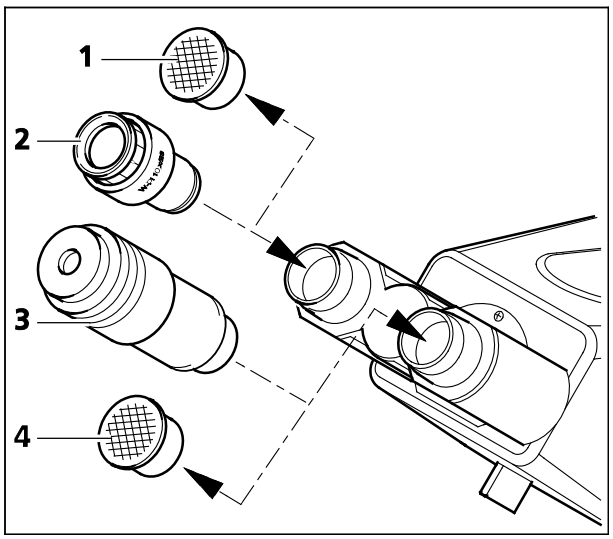


Fig. 15 Inserting eyepieces

4.4.1 Inserting the eyepieces and auxiliary microscope

- Remove the two dust caps (Fig. 15/**1** and **4**) from the binocular tube.
- Remove the two eyepieces (Fig. 15/**2**) from their cases and insert them into the binocular tube as far as they will go.
- The auxiliary microscope (Fig. 15/**3**), which is used to view the aperture stops and phase stops and to center the phase stops, can be inserted in one of the tubes in place of one of the eyepieces. The adjustable eyepiece lens can be used to focus on these stops.

4.4.2 Inserting the eyepiece reticle

Eyepiece reticles can be set into focusable eyepieces.

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. 16/**W**) but by the red dot (Fig. 16/**R**).

The eyepiece reticles (Fig. 16/**1**) are glued to screw-in mounts (Fig. 16/**2**) for easy fitting and removal.

To replace an eyepiece reticle, simply unscrew the screw-in mount (Fig. 16/**2**) with eyepiece reticle (Fig. 16/**1**) and insert the new screw-in mount with the required eyepiece reticle.

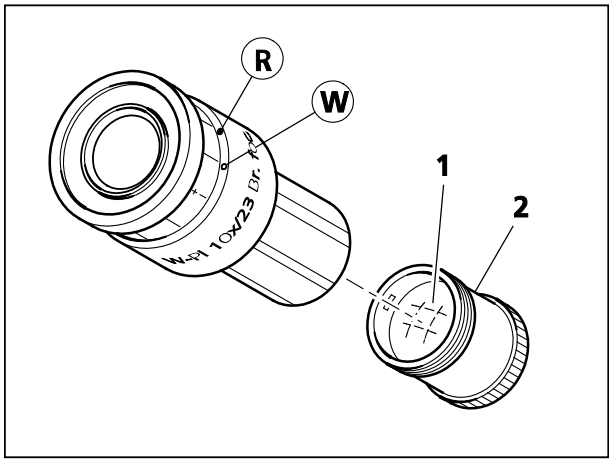


Fig. 16 Inserting the eyepiece reticle

☞ If you wish to insert an eyepiece reticle into a mount, you should ensure that the labeling on the eyepiece is still visible in the correct position after the eyepiece has been reinserted.

Adjusting for compensation of ametropia when using eyepiece reticles

Correct use of an eyepiece reticle requires two focusable eyepieces, so that the user can compensate for differences in visual acuity between their two eyes.

- Use the eyepiece focus control to bring the eyepiece reticle into focus. If no eyepiece reticle is used, focus on the edge of the field of view.
- Once the eyepiece has been adjusted, bring the image of the specimen into focus using the focus drive.
- Now adjust the second eyepiece to bring the microscope image into focus for the second eye. The position of the focusing drive on the microscope stand should not be changed after this.

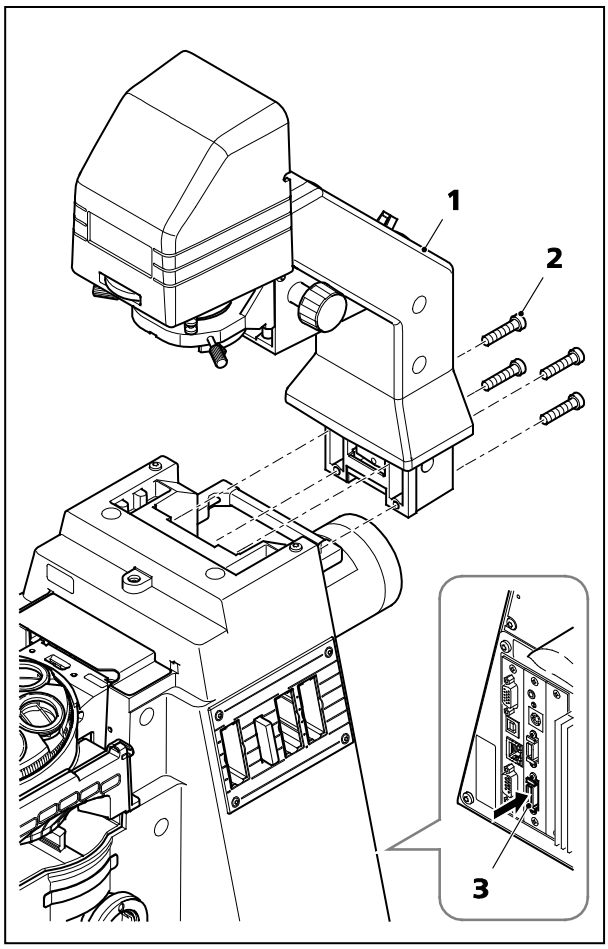


Fig. 17 Fitting the carrier for transmitted-light illumination

4.5 Fitting the carrier for transmitted-light illumination

- Remove cover if necessary.
- Place the mount (Fig. 17/**1**) in position against the rear of the stand and screw into place using the four Allen screws provided (Fig. 17/**2**) and the 4 mm Allen key.
- Insert the LCD display connector (Axio Observer 5 and 5 materials only) into the socket for the carrier for transmitted-light illumination with LCD display (Fig. 17/**3**) on the rear of the stand.

☞ The carrier for transmitted-light illumination does not require any adjustment.

4.6 Fitting the holder with LCD display on 5, 5 materials stand

The holder with LCD display (Fig. 18/**1**) has a magnetic base. It can be placed on a microscope if this is not equipped with a transmitted light illuminator or beside it.

Before connecting the LCD display to the stand, switch the instrument off to prevent damage (to the electronic components)!

- Place the holder with the LCD display (Fig. 18/**1**) in position on the cover plate (Fig. 18/**2**) of the transmitted light illuminator contact surface so that the two recesses are positioned on top of the two screws.
- Insert the LCD display plug into the socket (Fig. 18/**3**) for the display (carrier for transmitted-light illumination) on the rear of the 5 materials stand.

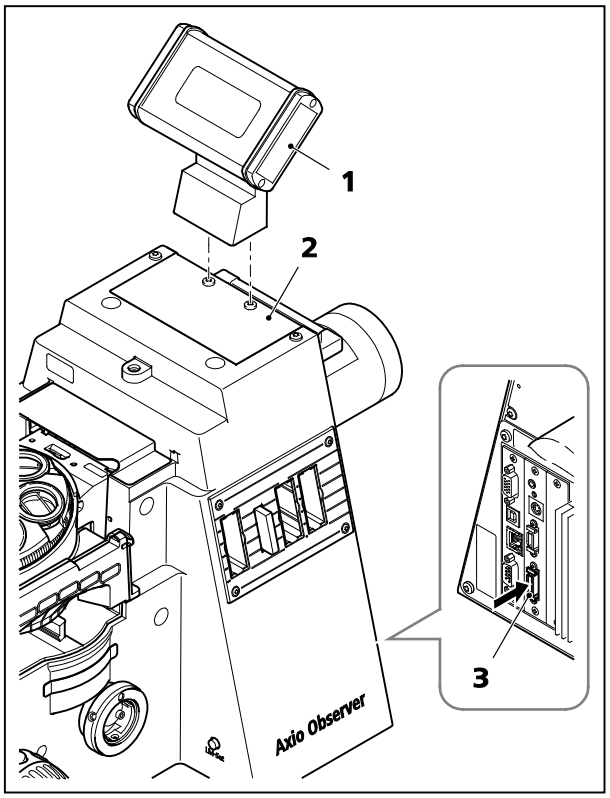


Fig. 18 Fitting the holder with LCD display

4.7 Screwing in the objectives

If Aqua Stop II is used, first refer to section 4.8.

- Remove the dust caps (Fig. 19/**2**) from the openings in the nosepiece.
- Remove the objectives (Fig. 19/**3**) from the case and screw them into the nosepiece (Fig. 19/**1**), starting with position 1 (see engraved number), in increasing order of magnification. Ensure that the objectives are screwed in correctly and securely.

Always replace the dust caps on any empty positions on the nosepiece.

When using autocorr objectives, observe the quick start guide "Installation and configuration of autocorr objectives" (420852-7144-001).

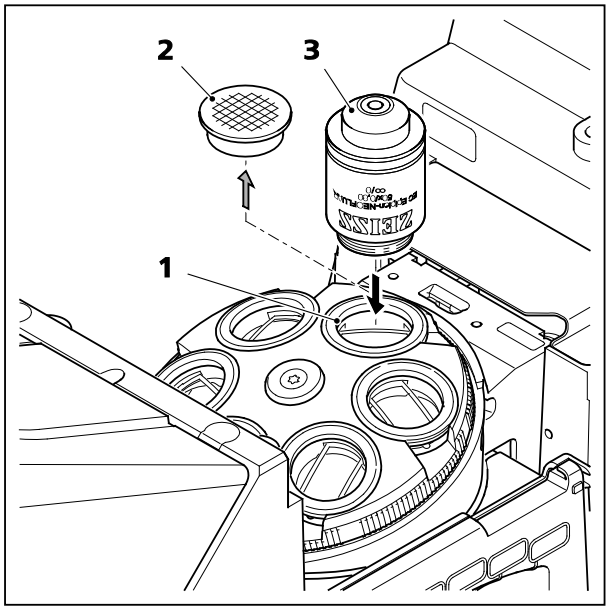


Fig. 19 Screwing in the objectives

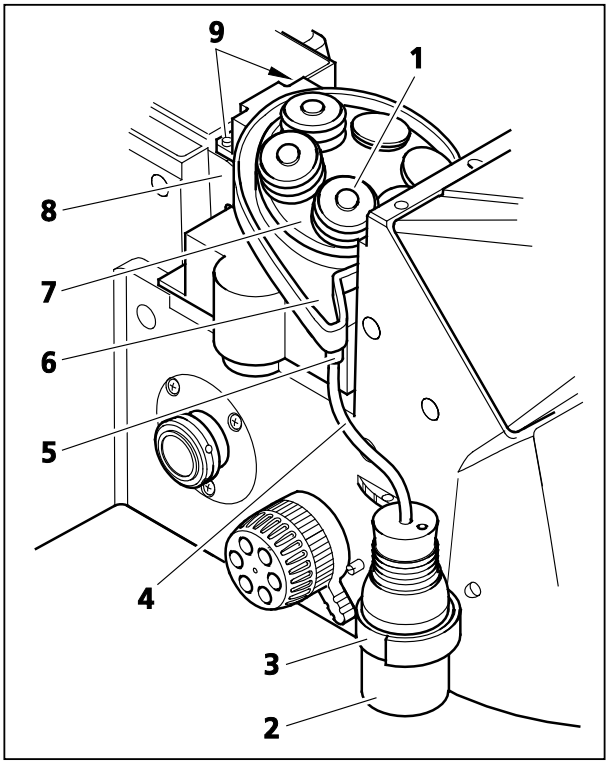


Fig. 20 Fitting the Aqua Stop II

4.8 Fitting the Aqua Stop II

The Aqua Stop II should be used to protect the objective and nosepiece when working with liquid specimens.

- Detach the microscope stage and screw out the objectives.
- Place the collecting trough (Fig. 20/**6**) onto the nosepiece mount (Fig. 20/**8**) and screw in place using two screws (Fig. 20/**9**).
- Place the cover disk (Fig. 20/**7**) onto the nosepiece.
- Load the nosepiece with the required objectives.
- Pull a suitably sized lens hood (Fig. 20/**1**) over each objective.

☞ Ensure that each lens hood is pulled up to the cover disk.

Two types of lens hoods are available - size 1 (small) and size 2 (large).

- Objectives with a front diameter of **16 - 22.5 mm** should be protected using the **DMR small lens hood** (431716-0160-000).
- Objectives with a front diameter of **27.5 - 34 mm** should be protected using the **DMR large lens hood** (431716-0170-000).

☞ When attaching the lens hoods ensure that the upper edge does not form a drip tray.

Unused nosepiece openings should be sealed using the caps supplied.

- Attach the drainage tube (Fig. 20/**4**) to the drainage connector (Fig. 20/**5**). Insert the other end of the tube through the bung on the collecting bottle (Fig. 20/**2**) so that it projects 3 to 4 mm through the bung.

☞ Adjust the tube in such a way, that the drain gutter of the collecting vessel is not bent when focusing.

- Insert the bung firmly into the collecting bottle.
- Attach the enclosed Velcro fastener (Fig. 20/**3**) to the stand. Attach the collecting bottle to the stand using the Velcro fastener.
- Reattach the microscope stage.

In the event of any kind of accident involving liquids, the microscope stage should be removed and any drops of liquid soaked up using a lint free cloth. In particular, the front lens of the objective must be cleaned in order to continue to obtain optimum performance from the objective.

☞ Cleaning instructions can be found in the brochure “The Clean Microscope”.

4.9 Fitting the microscope stages

If you work on microscope stages with a recessed mounting frame or insert frame the microscope stages should be mounted on the stand using spacer disks (see table).

Use the following spacer disks:

Stage	Order number:	Spacer disks
Mechanical stage 130x85 R/L for mounting frame K	432016-9902-000	4 mm
Mechanical stage 130x85 R/L with short coaxial drive, for mounting frame K	432047-9902-000	4 mm
Scanning stage 130x100 PIEZO	432027-9001-000	4 mm
Scanning stage XY DC 110x90 with stage attachment Z-Piezo/ Rot.En. Rev.4	000000-0538-386	4 mm
Scanning stage 130x100 STEP	432029-9904-000	4 mm
Scanning stage 130x85 mot. P, CAN *	432031-9902-000	4 mm
Scanning stage 130x85 MAT, CAN	432034-9000-000	6 mm
Scanning stage 130x85 MAT, CAN	432034-9001-000	4 mm

* When using the scanning stage 130x85 mot. P, CAN in combination with HD objectives, the recessed mounting/inserting frames must be used.

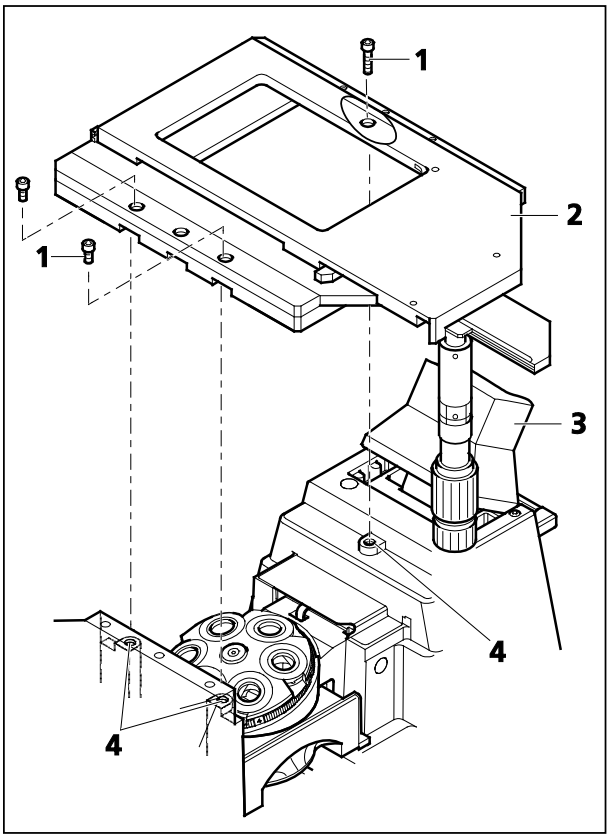


Fig. 21 Mounting the mechanical stage 130x85

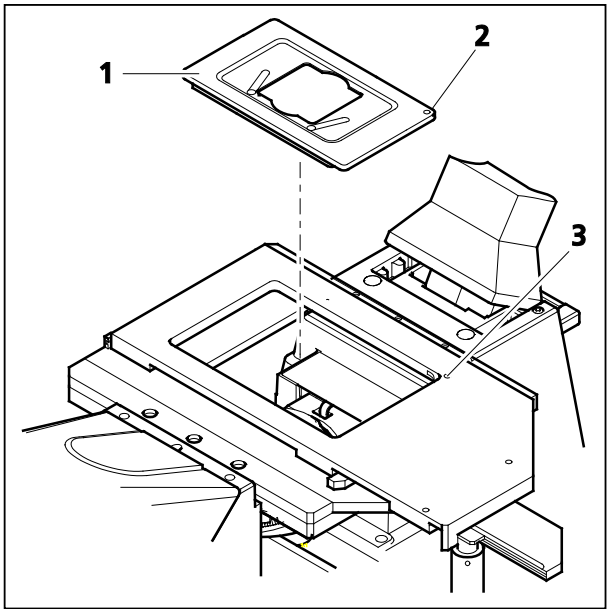


Fig. 22 Inserting the mounting frame K

4.9.1 Mounting the mechanical stage 130x85 and mounting frame K for mechanical stage

The mechanical stage is fitted directly to the stand via three contact points with drilled screw holes.

- To improve access during stage assembly, the carrier for transmitted-light illumination (Fig. 21/**3**) (if available) can be tilted backwards.
- Place the mechanical stage (Fig. 21/**2**) on the three contact points (Fig. 21/**4**) of the stand and fix it in position using three Allen screws (Fig. 21/**1**) (two at the front, one at the rear).

☞ Appropriate spacer disks are included with each stand and stage.

If using flat mounting frames which are flush to the stage (e.g. 451344) and 160x110 stage pinhole apertures (e.g. 451345-9902) **do not use** spacer disks (on mechanical and scanning stages)!

Mechanical stage 130x85 R/L can be attached with the drive controls either on the left or right side. To this end, the mechanical stage has three countersunk holes on the front and three on the rear side.

- Now insert the mounting frame K (Fig. 22/**1**) into the mechanical stage.
  To do this, place the mounting frame corner with the red dot (Fig. 22/**2**) on the mechanical stage also marked with a red dot (Fig. 22/**3**). Then press the mounting frame diagonally against the springs and downwards into the recess. Ensure that the mounting frame is seated correctly.

4.9.2 Fitting scanning stages

- Scanning stages are fitted in the same way as the mechanical stage. All stands and stages are supplied with appropriate spacer disks for use of recessed mounting frames.
- Scanning stage 130x100 STEP must be connected to the separate stage controller XY STEP SMC 2009 using a cable.
- Scanning stage 130x100 PIEZO must be connected to the stage controller XY PIEZO WSB CAN using a cable (in accordance with the supplied manufacturer's operating manual).

Scanning stage 130x100 STEP is not compatible with "Mounting frame K; low profile" (432334-9001-000).

Risk of collision!

Remove the front handle prior to using the microscope stand with a scanning stage.

Because of the extensive travel range of scanning stage 130x100, the stage frame may collide with the objectives at the end of the stage travel.

Supplementary information for fitting and using scanning stage 130x85 mot. P, CAN:

- After mounting the stage on the stand, the transport securing pin (Fig. 23/**1**) at the bottom of the stage must be unscrewed.

The transport securing pin must always be screwed back when transporting the stage.

The scanning stage travel ranges in X and Y direction can be limited if required as follows:

X direction:

- To adjust the right-hand or left-hand mechanical stop in X direction, loosen the relevant stop screw (Fig. 23/**2**) at the bottom of the stage, move the stop as required and then retighten the screw.

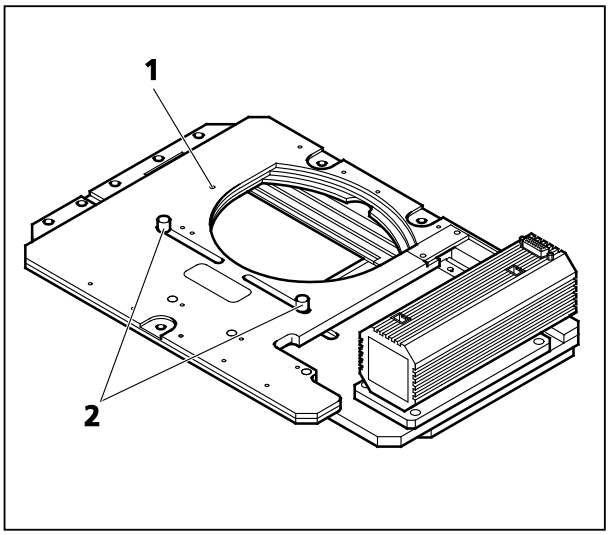


Fig. 23 Scanning stage 130x85 mot. P, CAN, bottom side

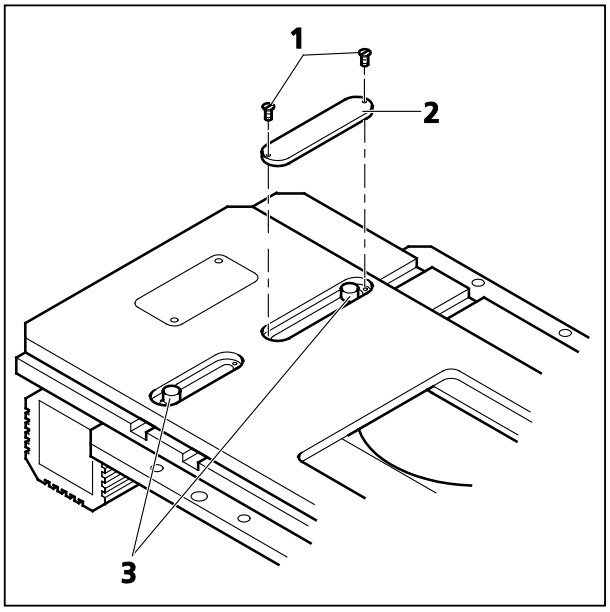


Fig. 24 Scanning stage 130x85 mot. P, CAN, top side

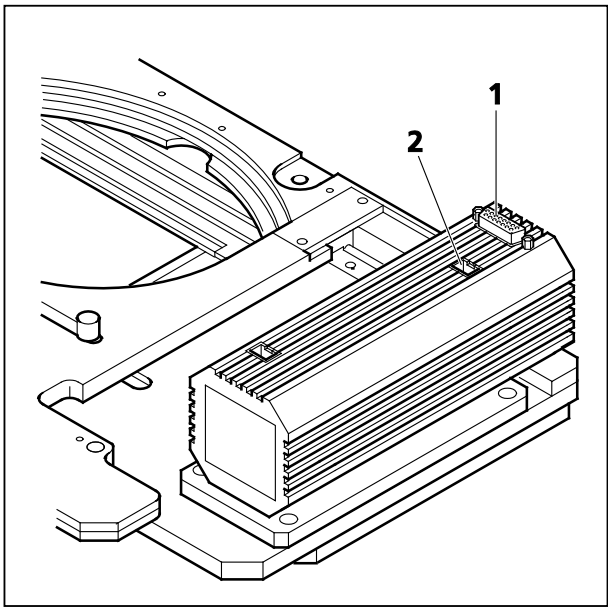


Fig. 25 Scanning stage 130x85 mot. P, CAN, connections on bottom side

Y direction:

- To adjust the front or rear mechanical stops in Y direction, first loosen the screws (Fig. 24/**1**) at the covers on the top side of the stage and remove the covers (Fig. 24/**2**).
- Then loosen the stop screws (Fig. 24/**3**), move the stop as necessary and retighten the screws.
- Then retighten the screws of the covers.

☞ Scanning stage 130 x 85 mot. CAN is not compatible with the Aqua Stop!

- After fitting the stage onto the microscope stand, connect the cables to the XY drive (Fig. 25/**1**) and to the stand (Fig. 25/**2**).

4.9.3 Fitting the scanning stage 130x100 STEP

Scanning stage 130x100 STEP rests directly on three contact points which have drilled screw holes for fastening.

- To improve access during stage assembly, the carrier for transmitted-light illumination (Fig. 26/**4**) (if fitted) can be tilted backwards.
- Place the scanning stage 130x100 STEP (Fig. 26/**1**) on the three contact points (Fig. 26/**5**) of the stand and fix it in position using three Allen screws (two at the front (Fig. 26/**3**), one at the rear (Fig. 26/**2**)).

☞ All stands and stages are supplied with appropriate spacer disks.

If using flat mounting frames which are flush to the stage (e.g. 451344) and 160x110 stage pinhole apertures (e.g. 451345-9902) do not use spacer disks (in case of mechanical and scanning stages)!

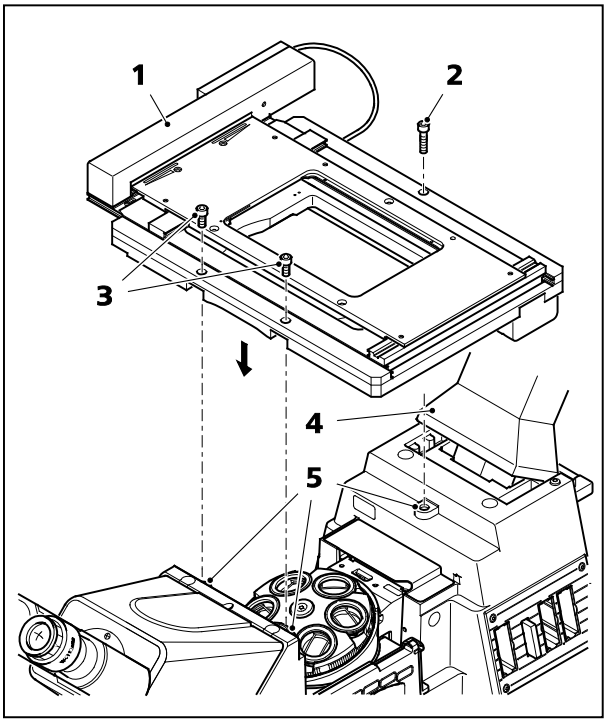


Fig. 26 Fitting the scanning stage 130x100 STEP

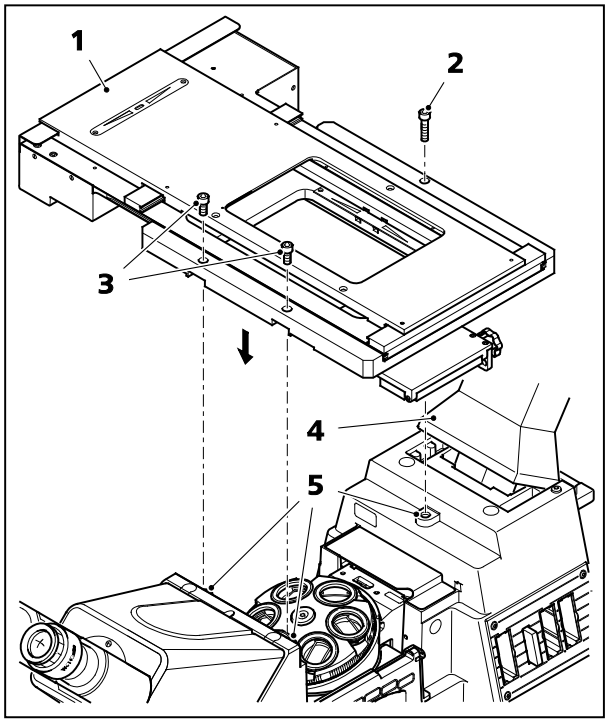


Fig. 27 Fitting the scanning stage 130x100 MAT; CAN

4.9.4 Fitting the scanning stage 130x85 MAT; CAN

Scanning stage 130x100 MAT; CAN rests directly on three contact points which have drilled screw holes for fastening.

- To improve access during stage assembly, the carrier for transmitted-light illumination (Fig. 27/**4**) (if fitted) can be tilted backwards.
- Place scanning stage 130x100 MAT; CAN (Fig. 27/**1**) on the three contact points (Fig. 27/**5**) of the stand and fix it in position using three Allen screws (two at the front (Fig. 27/**3**), one at the rear (Fig. 27/**2**)).

☞ All stands and stages are supplied with appropriate spacer disks.

Spacer disks of 4 mm or 6 mm are necessary when using recessed mounting frames.

If using flat mounting frames which are flush to the stage (e.g. 451344) and 160x110 stage pinhole apertures (e.g. 451345-9902) do not use spacer disks (in case of mechanical and scanning stages)!

4.9.5 Fitting the specimen stage 250x230, object guide and mounting frame M for the object guide

The specimen stage is fitted to the stand using a spacer bar and a spacer disk.

- To improve access during stage assembly, the carrier for transmitted-light illumination (Fig. 28/**4**) can be tilted backwards.
- Using the two shorter Allen screws (Fig. 28/**8**), screw the spacer bar (Fig. 28/**6**) to the two front attachment points (Fig. 28/**5**).
- Place the spacer disk (Fig. 28/**3**) onto the rear attachment point.
- Place the specimen stage (Fig. 28/**1**) onto the stand and screw to the rear attachment point from above using the longer Allen screw (Fig. 28/**2**). Ensure that the screw passes through the hole in the spacer disk.
- Screw the specimen stage to the spacer bar from below using two Allen screws (Fig. 28/**7**), left and right.
- Tighten the rear screw (Fig. 28/**2**).
- Attach the object guide (Fig. 29/**1**) to the left or right side of the specimen stage and fix it in position from below using three Allen screws (Fig. 29/**2**).
- Then push mounting frame M for object guide (Fig. 29/**3**) under the two springs of the object guide from the front until it clicks into position.

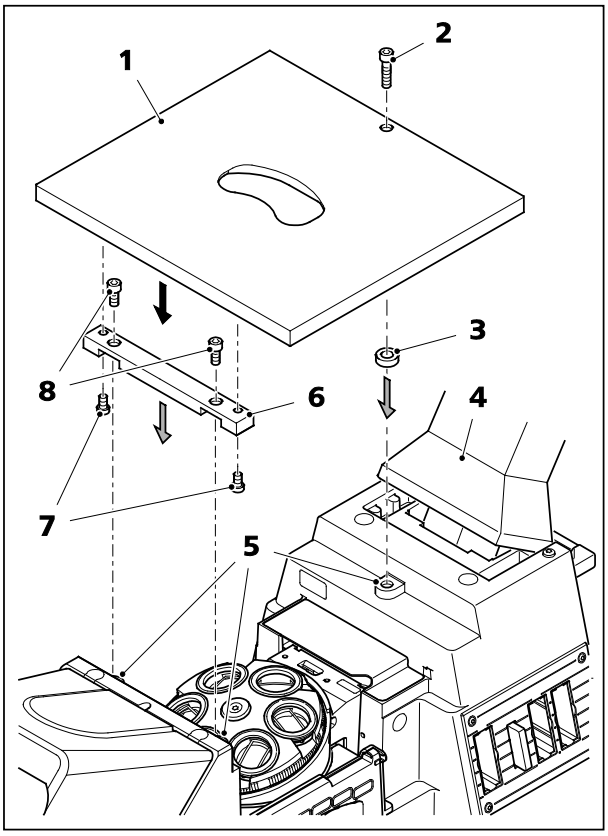


Fig. 28 **Fitting the specimen stage 250x230 mm**

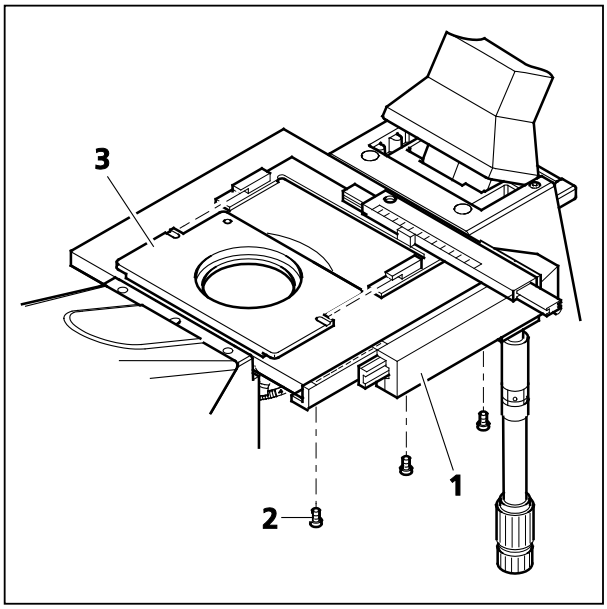


Fig. 29 **Fitting the object guide and mounting frame**

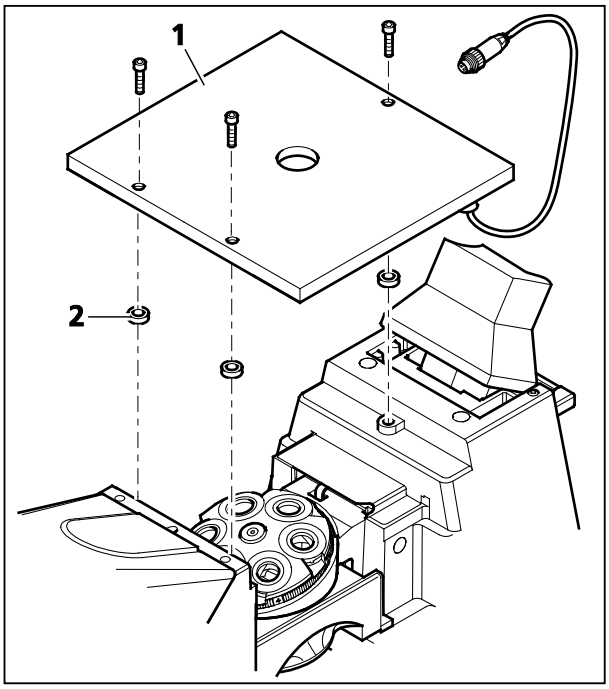


Fig. 30 Fitting the heatable microscope stage S1

4.9.6 Fitting the heatable microscope stage S1

The heating stage is fitted to the contact points of the stand using three spacer disks.

- If required, remove the microscope stage and additional mounting components.
- Place the spacer disks (Fig. 30/**2**) on the three contact points of the stand.
- Place the heating stage (Fig. 30/**1**) onto the stand and screw into place from above using three Allen screws. Ensure that each screw passes through the hole in the relevant spacer disk.
- Connect the heating stage to the mains power supply as described in the separate operating manual.

If the heating stage is used, the nosepiece must be lowered fully using the focus drive before changing objectives, as otherwise the objective may collide with the heated stage.

4.9.7 Fitting the gliding stage Z

Use three spacer disks to mount the gliding stage.

- Before attaching the gliding stage to the stand, the three support elements on the underside of the gliding stage must be unscrewed.
- Place spacer disks on the three contact points of the stand.
- Place the gliding stage on the stand and screw in place using the three Allen screws from above. Ensure that each screw passes through the hole in the relevant spacer disk.

If the gliding stage is used, the nosepiece must be the lowered fully using the focus drive before changing objectives - otherwise the objective may collide with the gliding stage.

If required, tilt the carrier for transmitted-light illumination back into the working position (forwards).

4.10 Condensers

4.10.1 Attaching condensers for the Axio Observer

- Insert the condenser (Fig. 31/**1**) into the condenser carrier on the carrier for transmitted-light illumination, with the dovetail ring facing upwards. Ensure that the locating pin on the condenser is at the front and engages precisely with the guide groove on the condenser socket.
- Fix the condenser in place using the clamping screw (Fig. 31/**2**).
- In the case of motorized condensers, connect the cable to the outlet socket on the mount (left).

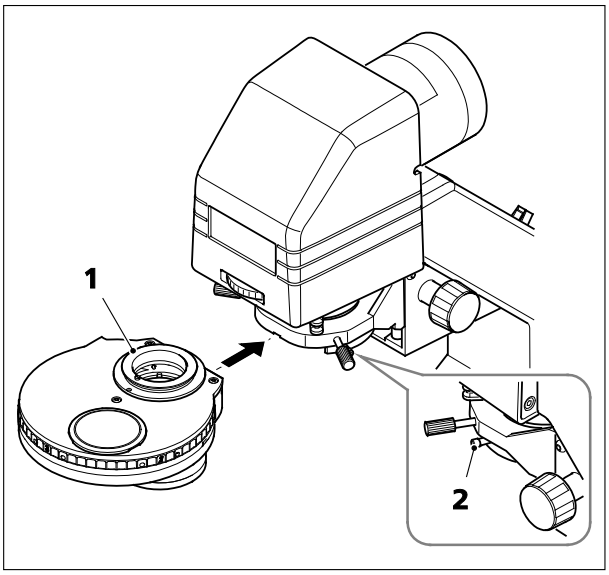


Fig. 31 Attaching the condensers

ATTENTION
When using stage top incubation solutions such as the PM S1 incubator, there is a risk of glass breakage. Always fit the condenser with the carrier for transmitted-light illumination tilted backwards. After fitting, tilt the mount carefully back into the forward position. Ensure that the glass of the incubator is not destroyed. If required, rotate the condenser carrier to the highest position.

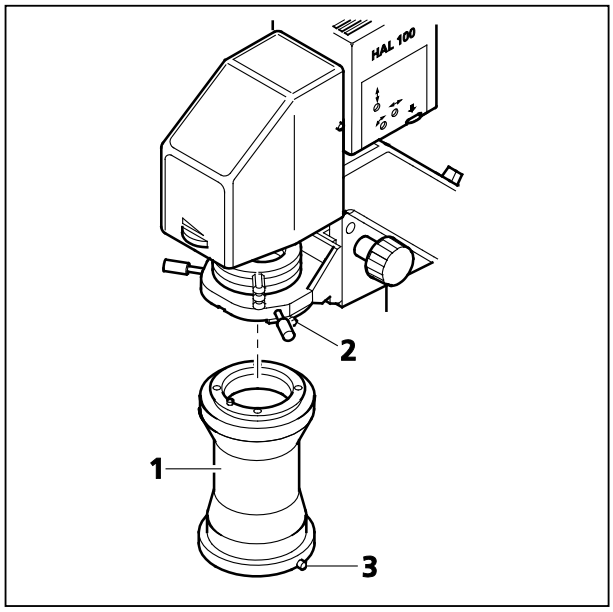


Fig. 32 Fitting the condenser mount

4.10.2 Fitting condensers from the Axio Imager range

The following condensers from the Axio Imager range can be used:

- Condenser, LD achromatic 0.8 H DIC (424206-9901-000)
- Achromatic aplanatic condenser 1.4 H D Ph DIC (424208-0000-000)

☞ The Axio Observer's inverted design means that these condensers must be fitted "backwards" (with the turret at the rear), such that the controls are at the back and the labeling is upside down.

- Tilt the carrier for transmitted-light illumination (Fig. 28/**4**) backwards and rotate the condenser carrier to the highest position.
- Insert the condenser mount (Fig. 32/**1**) into the condenser carrier on the carrier for transmitted-light illumination with the dovetail ring facing upwards. Ensure that the locating pin on the condenser is at the front and engages precisely with the guide groove on the condenser carrier.
- Fix the condenser mount in place using the clamping screw (Fig. 32/**2**).
- Insert the required condenser into the dovetail ring of the condenser mount, checking that it is correctly orientated, and fix into position using the clamping screw (Fig. 32/**3**).
- Carefully tilt the carrier for transmitted-light illumination (Fig. 28/**4**) back into the forward position. Ensure that the condenser does not hit the specimen or the mounting frame.
- Set the illumination to "KÖHLER".

☞ Condensers from the Axio Imager range may only be used for specimen on slides.

It is not possible to combine them with the mounting frame K for reflected light (451344-0000-000) or the objective piezo focusing units.

When using the achromatic-aplanatic condenser 1.4 it is recommended to use only mounting frames with clamping springs for clamping the specimen slides.

4.10.3 Changing the DIC prism in the condenser turret

If a motorized condenser is being used, first switch the instrument off and disconnect the connection plug. You may only move the condenser turret manually after this has been done, otherwise the condenser will be damaged.

Remove the DIC prism as follows:

- To replace a DIC prism, remove the condenser and place it on a stable surface.
- Remove the plastic cover (Fig. 33/**1**) from the mounting hole on the condenser (Fig. 33/**4**).
- Position the turret disk containing the DIC prism which is to be replaced in the mounting hole and hold it in position using the knurled ring.
- Unscrew the retaining ring (Fig. 33/**2**) using the mounting plate from the tool set.
- Turn the condenser upside down and allow the DIC prism (Fig. 33/**3**) to slide out onto a soft surface.

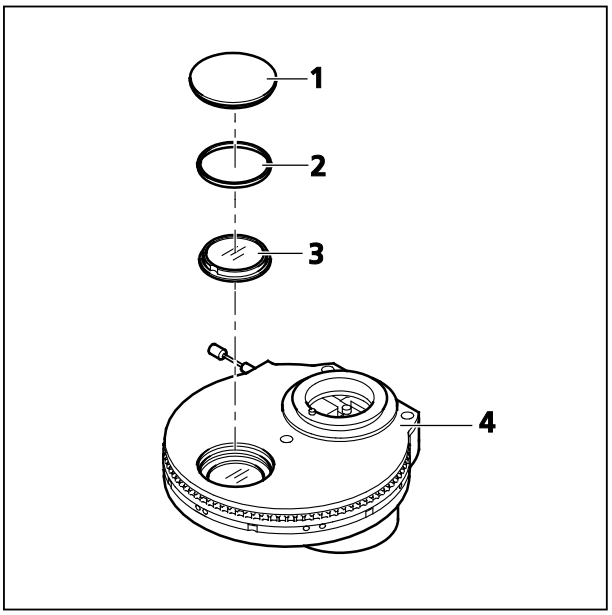


Fig. 33 Changing the DIC prism

The new DIC prism is fitted in the reverse order:

- Carefully insert the new DIC Prism with the label facing up into the mount. If required, use a pair of tweezers and grip the DIC prism carefully by its outer ring. Ensure that the DIC prism is correctly oriented relative to the mount (the notch of the DIC prism must engage with the mount lug).
- Carefully reinsert the retaining ring and screw in place using the mounting plate.
- Replace the plastic cover of the blank aperture.
- Ensure that the correct labeling is displayed on the knurled ring of the turret.
- Turn the condenser over and reinsert it into the carrier for transmitted-light illumination.

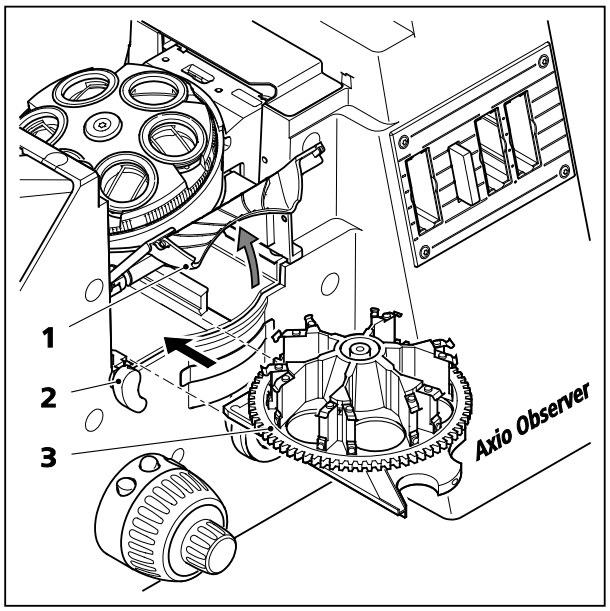


Fig. 34 Fitting the reflector turret

4.11 Reflector turret

4.11.1 Fitting the reflector turret

The reflector turret (manual or motorized) is inserted into the stand from the right.

Switch the instrument off before inserting the motorized reflector turret. Close the RL shutter when changing the reflector turret to prevent the emission of refracted light.

- Rotate the locking lever (Fig. 34/**2**) downwards and open the cover (Fig. 34/**1**).
- Insert the loaded or unloaded reflector turret (Fig. 34/**3**) into the opening beneath the nosepiece as far as it will go.
- Close the cover flap (Fig. 34/**1**) and rotate the locking lever (Fig. 34/**2**) upwards.

☞ Instead of the reflector turret the dual filter wheel mot. can be inserted into the stand. See Quick Reference Guide "Filter wheel excitation 8-pos. mot. for filters d = 25 mm; CAN and Dual filter wheel mot. for beam splitting and emission; CAN" (452358-7044-001).

4.11.2 Loading the reflector turret

To load the reflector turret with reflector modules, it can be retracted from the stand either half-way or completely.

- Rotate the locking lever (Fig. 34/**2**) downwards and raise the cover (Fig. 34/**1**).
- Pull the reflector turret (Fig. 34/**3**) or (Fig. 35/**1**) out of the stand to the first stop position (or remove from the stand completely and place on a suitable surface (stable desk).
- Insert the reflector modules (Fig. 35/**4**) in the relevant reflector position according to the filter combination (see position marking Fig. 35/**6**), starting with position 1 (emission filter is at the bottom). To insert the reflector modules, insert the retaining elements (Fig. 35/**5**) on the left and right of the module into the two lower spring clips (Fig. 35/**3**) diagonally from above, then push the module against the upper spring clips (Fig. 35/**2**) from the front until it clicks into position.

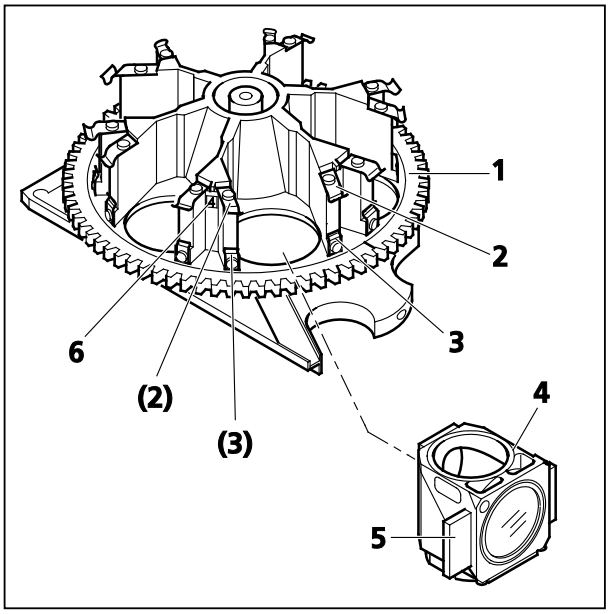


Fig. 35 Fitting the reflector modules

- To remove a reflector module which is not longer needed, pull it first out of the upper spring clips, then out of the lower clips.
- After loading, reinsert the reflector turret into the stand.
- Close the cover and rotate the locking lever upwards.

☞ If a protection glass for the reflector turret was supplied on first-time delivery, it will already be mounted.

If the equipment was retrofitted, sales personnel has fitted it.

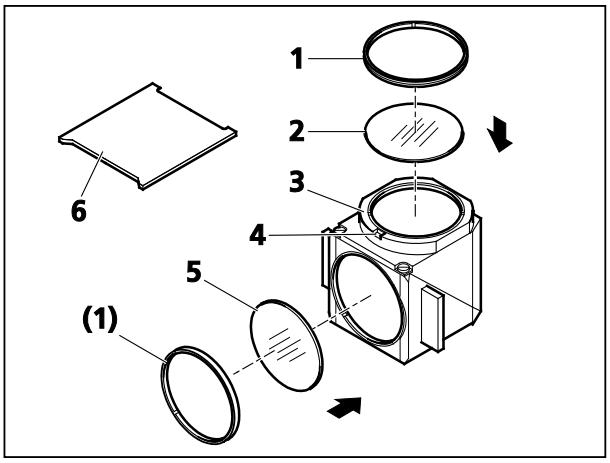


Fig. 36 Changing the filter set in the reflector module FL P&C

4.11.3 Changing the filter set in the reflector module FL P&C

The filter sets for the FL P&C reflector module can be complied and fitted by the user as required. Suitable filter sets or complete FL P&C reflector modules can be ordered from ZEISS.

- Remove reflector module FL P&C (Fig. 36/**3**) from the reflector turret and put it down (refer also to section 4.11.2).
- Use mounting plate (Fig. 36/**6**) from the tool set to unscrew the retaining ring (Fig. 36/**1**).
- Turn the reflector module so that the filter (Fig. 36/**2** or **5**) falls out on a soft surface.
- Insert the barrier filter (emission filter) at (Fig. 36/**2**), and the exciter filter at (Fig. 36/**5**). Secure both filters with the retaining rings (Fig. 36/**1**).

Barrier filter and exciter filter may bear a designation and an arrow on their circumference. The arrow indicates the direction in which the filter must be inserted into the reflector module; it must always point inwards (see arrows in Fig. 36).

To minimize image offset in multiple fluorescence imaging, the emission filter may bear an additional label indicating the orientation of the wedge angle.

When inserting the respective barrier filter into a reflector module, align this label with the orientation notch (Fig. 36/**4**). This will ensure that the wedge angles of the barrier filters used in all reflector modules in the turret have identical, defined positions. Although image offset between modules is intrinsically very small with ZEISS filter sets, it can be further minimized or even fully compensated by the above measure.

If you need to insert filters which have no direction indicator (arrow), we recommend proceeding as follows:

Insert the filters with reflective dielectric coatings so that the reflective coating (Fig. 37/**6**) of the excitation filter (Fig. 37/**5**) faces outward (relative to the reflector module). On the barrier filter (Fig. 37/**1**), the reflective coating (Fig. 37/**2**) should face inward (Fig. 37).

The reflective coating (Fig. 37/**4**) of the beam splitter (Fig. 37/**3**) should face downward when fitted.

The arrows (Fig. 37/**7**) mark the illumination and imaging beam path.

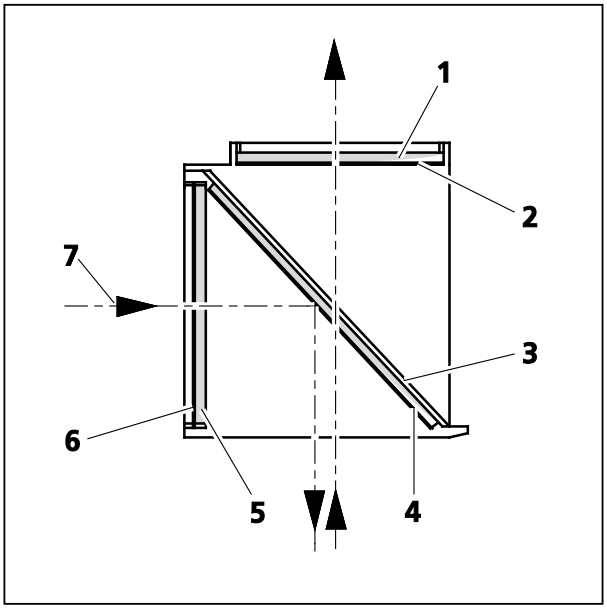


Fig. 37 Inserting the filters and the beam splitter

4.11.4 Changing the beam splitter in reflector module FL P&C

Fitting the filters and the beam splitter requires utmost care to prevent damage to and contamination of the optical components.

We recommend ordering fully equipped reflector modules FL P&C, since changing the beam splitter requires considerable skill.

If you have to change the beam splitter, proceed as follows:

- Remove the reflector module FL P&C from the reflector turret (also refer to section 4.11.2).
- Loosen both slotted screws (Fig. 38/**1**) using a screwdriver.
- Hold both halves of the reflector module together (**emission** half (Fig. 38/**2**) and **excitation** half (Fig. 38/**3**), turn them in the position opposite to the installation position and put them down.

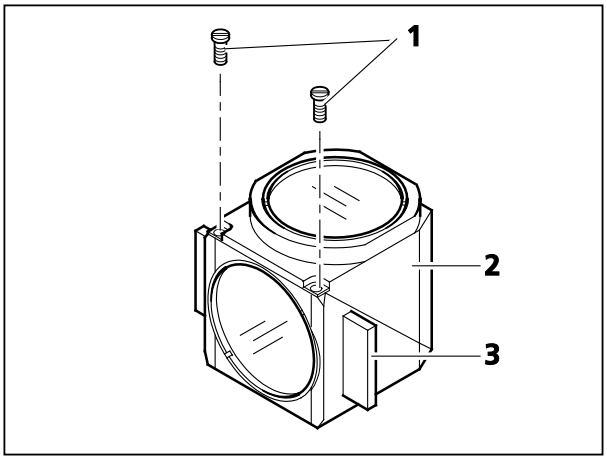


Fig. 38 Changing the beam splitter

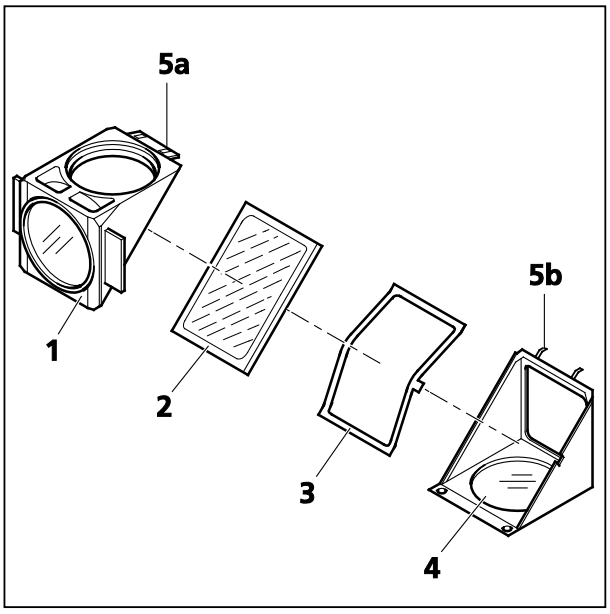


Fig. 39 Changing the beam splitter

- Tilt up the **excitation** half (Fig. 38/**1**), which now is on top, and remove it from the retaining elements (Fig. 38/**5b**) of the lower half (**emission**) (Fig. 38/**4**).
- Remove beam splitter (Fig. 38/**2**) and spring-loaded frame (Fig. 38/**3**) from the lower half of the module.
- Remove the old beam splitter and carefully place the new one on the spring-loaded frame (Fig. 38/**3**) with the reflecting side facing up and place both parts together into the lower half of the module. Ensure that the catch on the side of the spring-loaded frame is positioned in the recess in the lower half of the module.

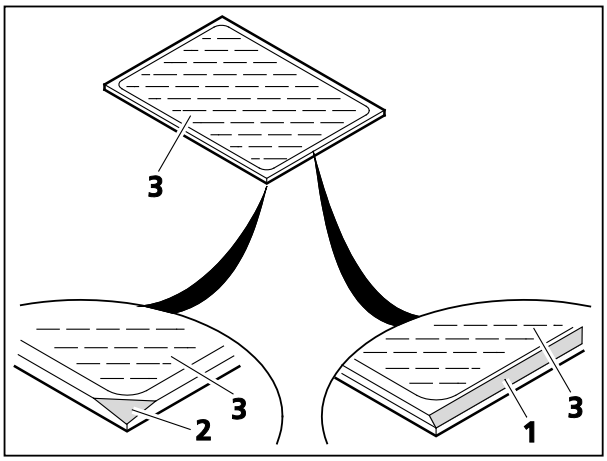


Fig. 40 Labeling on the beam splitter

☞ The reflective (coated) side (Fig. 40/**3**) of the beam splitter has a beveled edge (Fig. 40/**1**) or corner (Fig. 40/**2**).

- Place the **excitation** half of the module (Fig. 38/**1**) on top of the **emission** half (Fig. 38/**4**) (retaining elements Fig. 38/**5b** engage with eyelets Fig. 38/**5a**). Holding the two halves together, turn the module back into the position for insertion.
- Reinsert the slotted screws and screw tight.
- Finally, attach the adhesive label with the name of the filter combination to the side of the module.

4.12 Fitting the TFT display to the 7, 7 materials stand

Switch off the microscope before fitting the TFT display.

- Prior to fitting the TFT display insert the supplied spacer disks into the stand recesses.
- Place the TFT display (Fig. 41/**2**) on the right side of the stand. Ensure that the pin contact (Fig. 41/**1**) is inserted precisely into the relevant opening.
- Screw the TFT display tight using the three screws (Fig. 41/**3**).

The stand and TFT display are electrically connected via the pin contact.

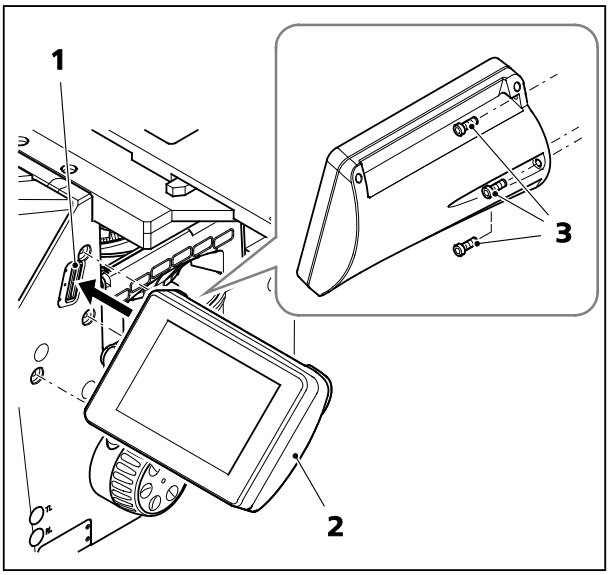


Fig. 41 Fitting the TFT display

4.13 Fitting the TFT display to the docking station

Switch off the microscope before fitting the TFT display and docking station.

- If the TFT display is fitted to the 7, 7 materials stand, it must first be removed from the stand.
- After this, cover the screw holes and the plug contact opening on the stand with the cover caps supplied.
- Put the TFT display (Fig. 42/**3**) on the docking station (Fig. 42/**1**) and screw it on, using the long Allen screwdriver provided. Ensure that the pin contact (Fig. 42/**2**) is inserted precisely into the relevant opening.

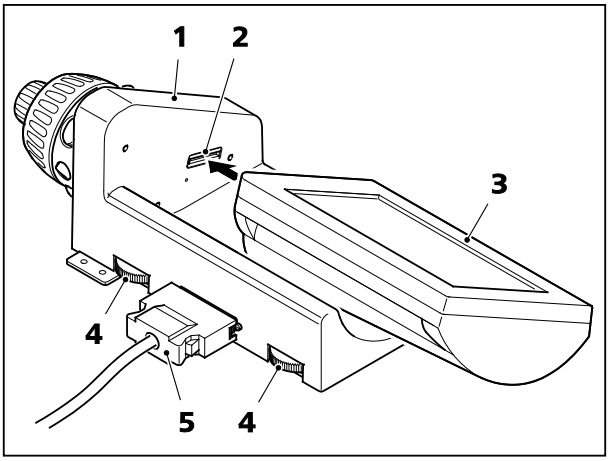


Fig. 42 Fitting the TFT display to the docking station

- To connect the docking station to the 7, 7 materials stand, the appropriate plug-in module must be installed at the rear of the stand.

The plug-in module should only be installed by ZEISS Service or sales personnel.

- Insert the docking station cable (Fig. 42/**5**) into the connector on the rear of the stand.
- The angle of the TFT display can be adjusted using the two knurled screws (Fig. 42/**4**) on the rear of the docking station.

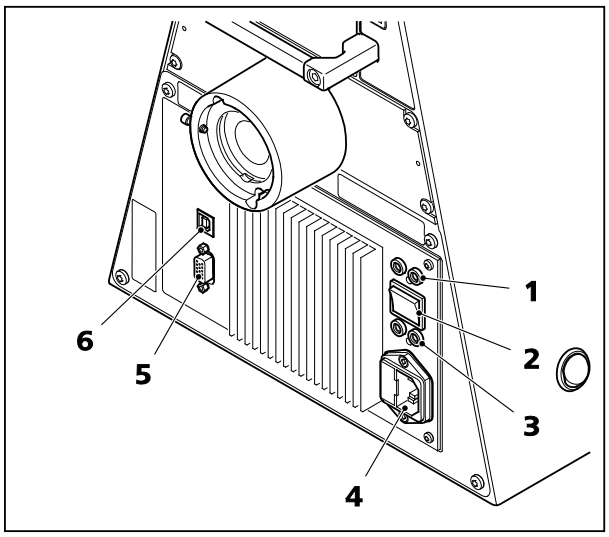


Fig. 43 Axio Observer 3, 3 materials (rear)

4.14 Connectors on the rear of the Axio Observer 3, 3 materials

Switch the microscope off before connecting any components.

Key to Fig. 43:

1 Connector for transmitted light LED / halogen illuminator (output 1)
2 Transmitted light/reflected light toggle switch (LED / halogen illuminator)
3 Connector for reflected light LED / halogen illuminator (output 2)
4 Power socket
5 CAN connecting socket
6 USB port

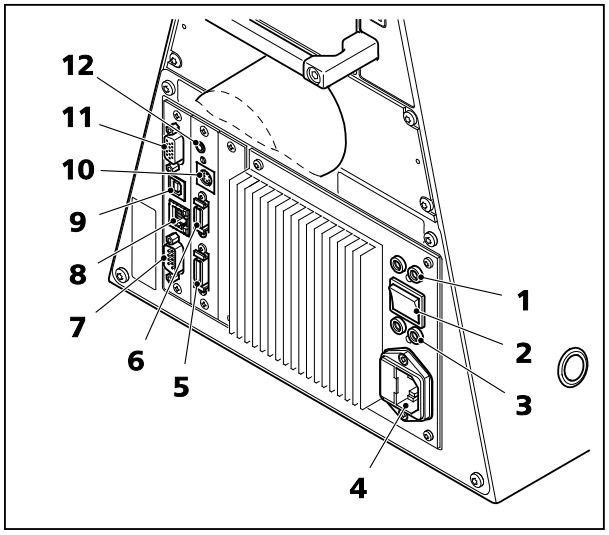


Fig. 44 Axio Observer 5, 5 materials (rear)

4.15 Connectors on the rear of the Axio Observer 5, 5 materials

Key to Fig. 44:

1 Connector for transmitted light LED / halogen illuminator (output 1)
2 Transmitted light/reflected light toggle switch (LED / halogen illuminator)
3 Connector for reflected light LED / halogen illuminator (output 2)
4 Power socket
5 Socket for LCD display
Transmitted light illumination carrier
6 Connector for transmitted light shutter
7 RS-232 port
8 TCP/IP port
9 USB port
10 External high speed shutter connector
11 CAN connecting socket
12 Trigger socket (IN/OUT) for shutter

4.16 Connectors on the rear of the Axio Observer 7, 7 materials

Key to Fig. 45:

1 Connector for closed-loop sensor Z drive (Axio Observer 7 only))
2 Socket for power supply unit VP232-2
3 Connecting socket for transmitted light LED / halogen illuminator
4 CAN connecting sockets
5 not used
6 RS-232 port
7 Connector for transmitted light shutter
8 TCP/IP port
9 USB port
10 External high speed shutter connector
11 CAN connecting socket
12 Trigger socket (IN/OUT) for shutter

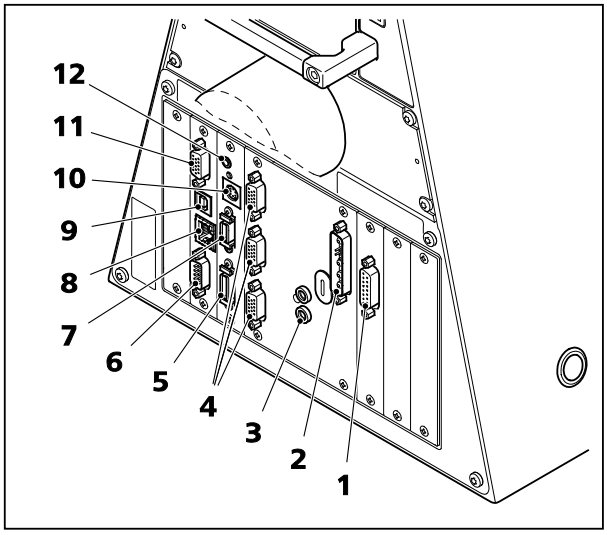


Fig. 45 Axio Observer 7, 7 materials (rear)

4.17 Connectors on the CAN distributor box and Axio Observer 7

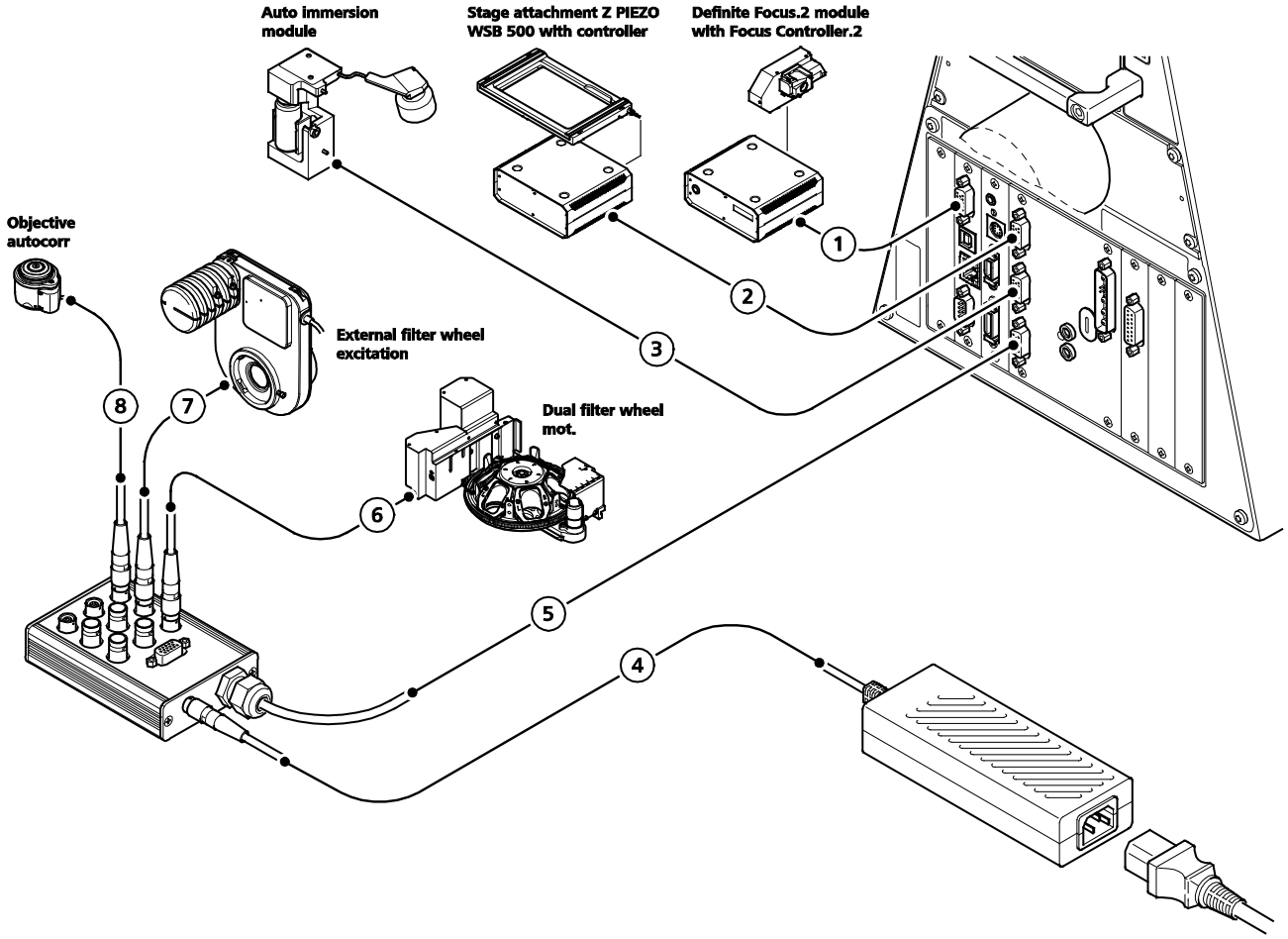


Fig. 46 Connectors on the CAN distributor box and Axio Observer 7 (rear)

Key to Fig. 46:

1 Connector of Definite Focus.2 module with Focus Controller.2 to stand
2 Connector of stage attachment Z-PIEZO WSB 500 with controller to stand
3 Connector of auto immersion module to stand
4 Connector of desktop power supply unit to CAN distributor box
5 Connector of CAN distributor box to stand
6 Connector of dual filter wheel mot. for beam splitting and emission to CAN distributor box
7 Connector of external filter wheel excitation 8-pos. mot. to CAN distributor box
8 Connector of objective autocorr to CAN distributor box

4.18 Connecting the microscope to the mains

- Plug the power supply cable into the power socket of the Axio Observer 3, 3 materials or Axio Observer 5, 5 materials.

The Axio Observer 7, 7 materials is supplied with voltage from the external power supply unit VP232-2.

- Insert the connecting plug of the power supply unit VP232-2 into the corresponding socket (Fig. 45/**2**) on the rear side of the stand.
- Plug the power supply cable of the power supply unit VP2322 into a power outlet.

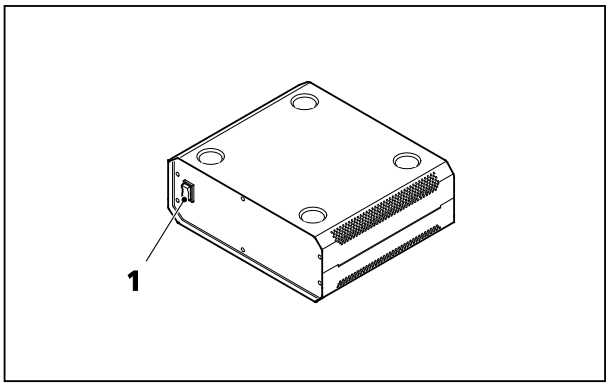


Fig. 47 External power supply unit VP232-2 for Axio Observer 7, 7 materials

4.19 Switching the microscope and the power supply (ballast) unit for the HBO 100 on and off

Axio Observer 3, 3 materials:

- Switch the microscope on and off using the power switch (on the left of the stand, Fig. 48/**1**).

Axio Observer 5, 5 materials:

- Switch the microscope on and off using the standby button (Fig. 48/**1**).

Axio Observer 7, 7 materials:

- Switch on the external power supply unit VP232-2 using the power switch (Fig. 47/**1**).
- Start up the microscope using the standby button (on the left of the stand, Fig. 48/**1**).

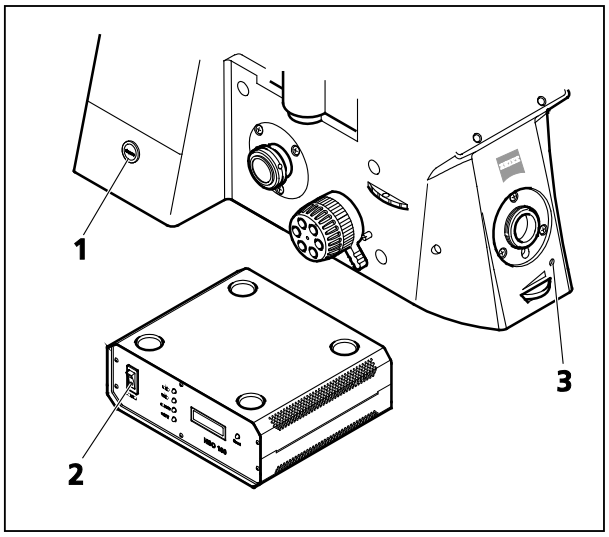


Fig. 48 Axio Observer and power supply unit (ballast unit) for HBO 100

- To switch the microscope off, press the standby button then switch off the external power supply unit.

☞ The monitoring LED (Fig. 48/**3**) lights up when the microscope is switched on.

Power supply unit (ballast unit):

- If a fluorescence illuminator (e.g. HBO 100) is connected, switch the power supply unit on (Fig. 48/**2**) and off using the power switch.

4.20 Disconnect the microscope from mains supply

Axio Observer 3, 3 materials:

- Disconnect the microscope from mains supply using the power switch on the microscope.

Axio Observer 5, 5 materials:

- Shut down the internal computer of the microscope by using the standby button on the stand.

  The device has not yet been disconnected from mains supply.
- To disconnect the microscope unplug the power supply cable from the mains outlet socket.

Axio Observer 7, 7 materials:

- Shut down the internal computer of the microscope by using the standby button on the stand.

  The device has not yet been disconnected from mains supply.
- To disconnect the microscope from the mains supply (e.g. If it is not used for a longer period) switch off the power supply unit VP232-2 using its power switch.

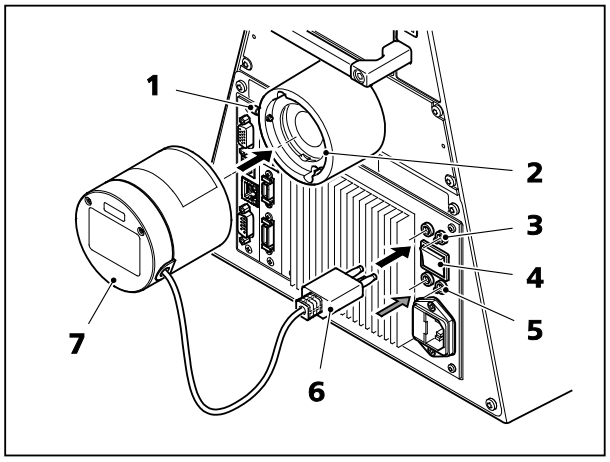


Fig. 49 Mounting the microLED illuminator

4.21 Mounting the microLED illuminator for transmitted and reflected light

The microLED illuminator can be used for both transmitted light and reflected light.

Do not look directly into the LED light.

Always make sure that the instrument is switched off when mounting the microLED illuminator onto the reflected light socket or dismounting it.

- Loosen clamping screw (Fig. 49/**1**) on reflected light socket (Fig. 49/**2**) and remove the halogen lamp.
- Insert the attachment lamp (Fig. 49/**7**) with the dovetail ring into the socket (Fig. 49/**2**) and, using the 3 mm ball-headed screwdriver, fix it using the clamping screw (Fig. 49/**1**).
- Connect the 3-pin illuminator plug (Fig. 49/**6**) to the upper or lower 3-pin socket 12 V / 100 W for transmitted light (Fig. 49/**3**) or (Fig. 49/**5**) for reflected light on the rear side of the instrument.
- For the coded stands 3 and 5, set the transmitted light/reflected light toggle switch (Fig. 49/**4**) to the corresponding position for transmitted light (DL) or reflected light (AL). If you use the motorized stand, switching between reflected light and transmitted light is done via touch screen on the TFT display.

4.22 HAL 100 illuminator

The HAL 100 illuminator is used as a light source for transmitted light and reflected light techniques (excluding fluorescence) on the Axio Observer. The procedure is essentially the same for fitting the halogen illuminator to the reflected light and transmitted light sockets.

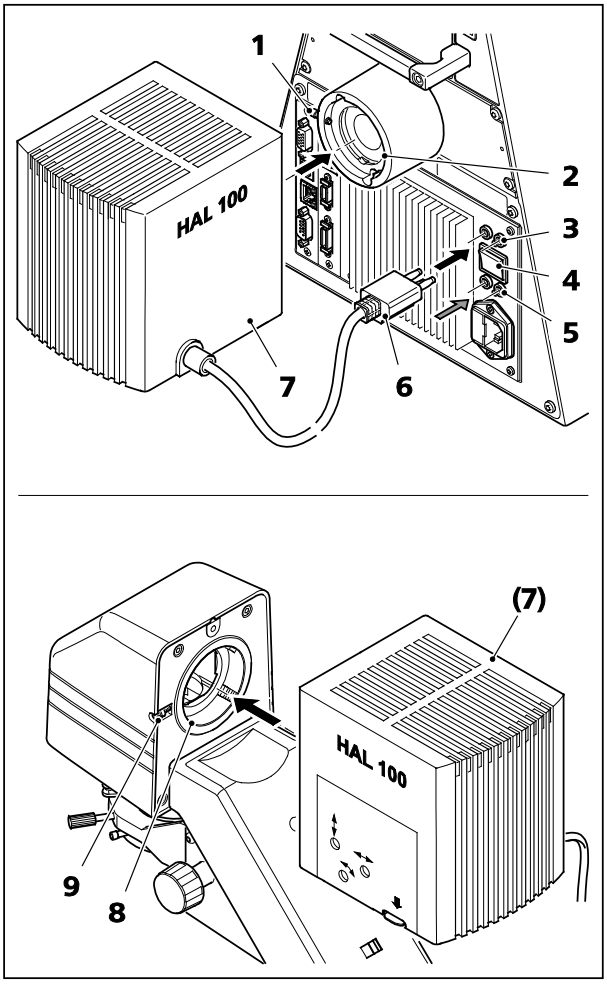


Fig. 50 Fitting the HAL 100 illuminator

4.22.1 Fitting the HAL 100 illuminator

Before using the HAL 100 illuminator, the bulb replacement tool must be removed from the housing. Otherwise, it might be damaged by heat (see section 4.22.3).

- Remove the protective cap from the reflected light or transmitted light socket.
- Insert the dovetail ring of the lamp housing (Fig. 50/**7**) into the corresponding socket (Fig. 50/**8** or Fig. 50/**2**) and, using the 3 mm ball-headed screwdriver, tighten it with clamping screw (Fig. 50/**1** or Fig. 50/**9**).
- Insert the 3-pin lamp plug (Fig. 50/**6**) into the corresponding 3-pin socket (Fig. 50/**3** for transmitted light or Fig. 50/**5** for reflected light) on the rear of the instrument.

☞ Only **one** halogen or LED illuminator can be connected directly to the 7, 7 materials stand.

- Switch the transmitted light / reflected light toggle switch (Fig. 50/**4**) to the required position.

☞ The Light Manager function depends on the position of the reflected light / transmitted light toggle switch.

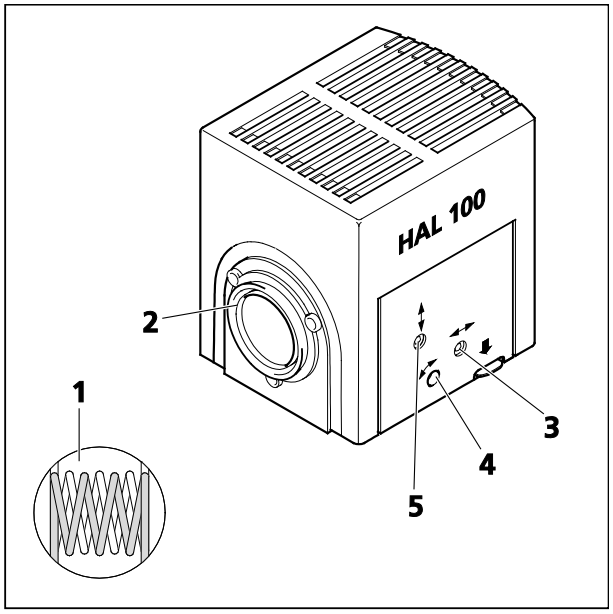


Fig. 51 Adjusting the HAL 100 illuminator

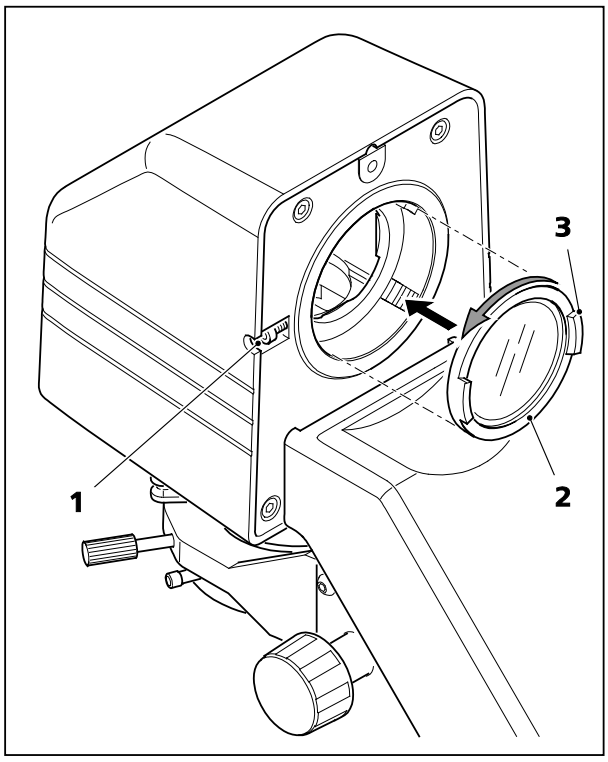


Fig. 52 Fitting/removing the diffusion disk

4.22.2 Adjusting the HAL 100 illuminator

(1) Coarse adjustment

- After loosening the clamping screw (Fig. 50/**1** or Fig. 50/**8**), remove the halogen illuminator (Fig. 51/**3**) which is ready for use from the microscope stand.
- Switch on the microscope.
- Direct the light beam to a projection surface (wall) at a distance of at least 3 m.

Do not look into the light exit aperture of the illuminator.

- Using a 3 mm ball-headed screwdriver, turn the adjusting screw (Fig. 51/**3**) until both images of the lamp filament appear as sharp as possible on the projection surface.
- Then turn the two adjusting screws (Fig. 51/**4** and **5**) until the lamp filament of one image exactly fills the gaps in the reflected filament image (Fig. 51/**1**).

(2) Fine adjustment

- If necessary, loosen the clamping screw (Fig. 52/**1**) and remove the HAL 100 from the transmitted light illumination mount.
- Manually unscrew the diffusion disk (Fig. 52/**2**) from the mount (anti-clockwise). Hold the edge of the diffuser by the projections on the disk (Fig. 52/**3**).
- Reattach the HAL 100 and tighten the locking screw.
- Remove filters (if inserted) from the optical path or deactivate them.
- Focus on the specimen using a ≤ 40x objective and find a free area on the specimen.
- Remove the eyepiece and center the lamp filament and its reflection in the pupil image using the adjusting screws (Fig. 51/**4** and **5**).
- Turn the adjusting screws (Fig. 51/**3**) until the illumination of the visible image is as homogeneous as possible.
- Once you have completed the adjustment, remove the HAL 100.
- Manually screw the diffuser into the adaptor.
- Reattach the HAL 100 and activate the filters.

4.22.3 Replacing the halogen bulb 12 V 100 W

Hot surface!

The lamp housing does not need to be removed from the stand in order to replace the halogen bulb. The bulb replacement tool (Fig. 53/**7**) is **not** to be stored in the lamp housing when the illuminator is in use.
The spare bulb (Fig. 53/**8**) can remain in place in the lamp housing.

- Switch off the microscope and remove the plug (Fig. 50/**6**) from the 12 V/100 W socket (Fig. 50/**3** for reflected light or Fig. 50/**5** for transmitted light). Allow to cool for about 15 min.
- Press the release button (Fig. 53/**3**) on the HAL 100 illuminator (Fig. 53/**1**) downwards and remove the bulb holder (Fig. 53/**2**) completely. Place it on a flat surface.
- Press down the two spring levers (Fig. 53/**5**) and remove the old halogen bulb (Fig. 53/**6**) by pulling it upwards.
- Press down the two spring levers and insert the new bulb into the bulb socket (Fig. 53/**4**). Release the spring levers. Always hold the halogen bulb by means of the bulb replacement tool (Fig. 53/**7**), as traces of grease on the bulb may shorten bulb life.
- Briefly depress the spring levers once more to center the bulb.
- Reinsert the bulb holder until you feel it click into place.

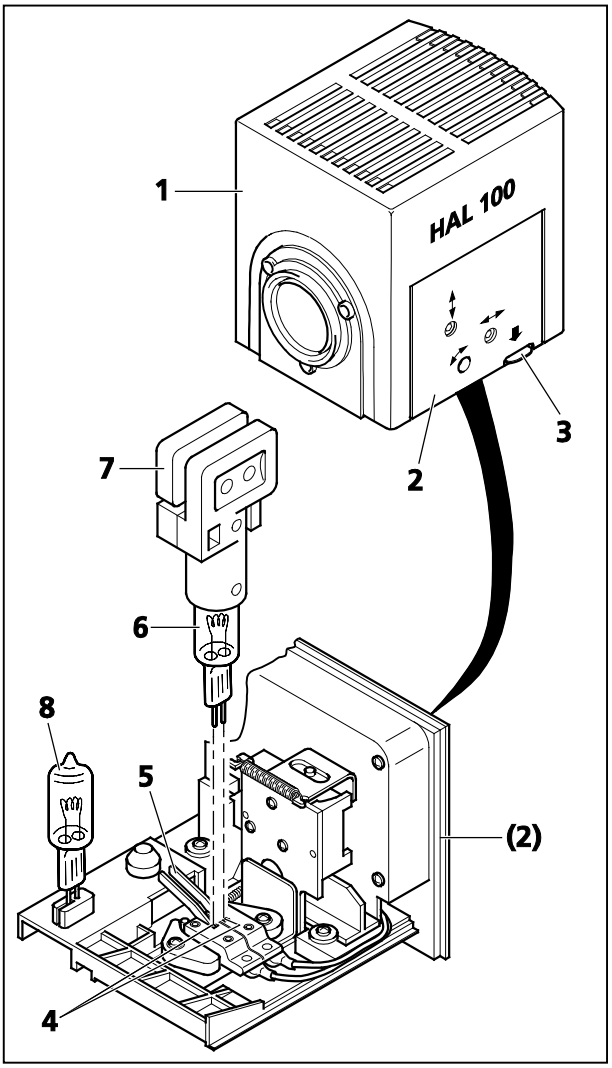


Fig. 53 Replacing the halogen bulb

4.23 HBO 100 illuminator

4.23.1 Inserting the HBO 103 W/2 mercury vapor short-arc bulb

For safety reasons, the HBO 100 illuminator and the HBO 103 W/2 mercury vapor short-arc bulb are packed separately.

The first step in setting up the illuminator is therefore to insert the HBO 103 W/2 bulb into the lamp housing.

Instructions on inserting or replacing the HBO 103 W/2 bulb can be found in the operating manual supplied with the illuminator.

An FL attenuator, discrete (manual or motorized) should be fitted into reflected-light illuminator FL to change the transmission.

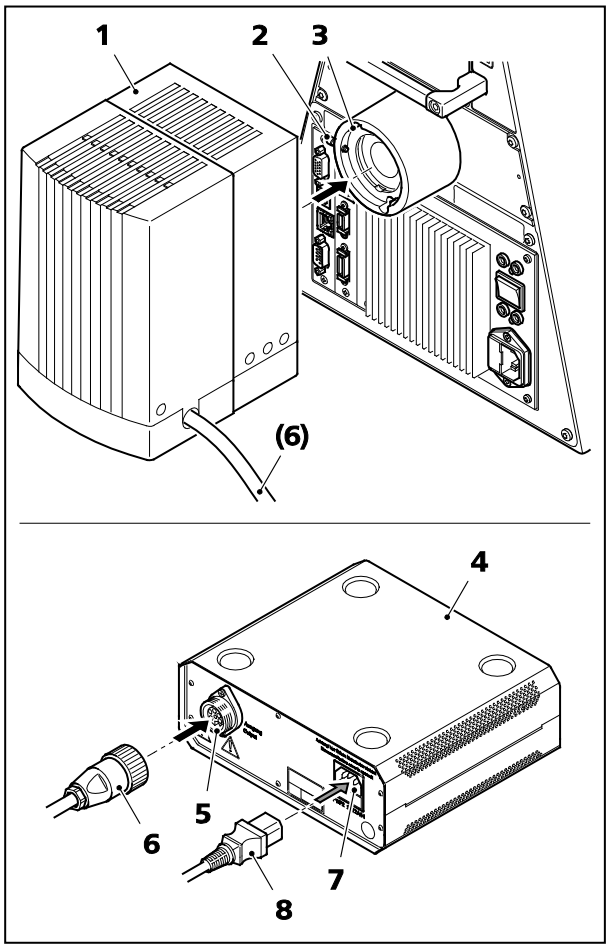


Fig. 54 Power supply unit (ballast unit) for HBO 100

4.23.2 Fitting the HBO 100 illuminator

- Remove the cover from the reflected light socket (Fig. 54/**3**).
- Insert the dovetail of the lamp housing (Fig. 54/**1**) into the reflected light socket (Fig. 54/**3**) on the rear of the instrument and tighten the clamping screw (Fig. 54/**2**) using the 3 mm ball-headed screwdriver.
- Insert the multi-pin plug of the HBO 100 illuminator (Fig. 54/**6**) into the device socket (Fig. 54/**5**) on the HBO 100 power supply unit (Fig. 54/**4**) and secure with the coupling ring.
- Insert the power supply cable (Fig. 54/**8**) into the power connector (Fig. 54/**7**) on the HBO 100 power supply unit, then insert the cable plug into a mains socket.

4.23.3 Adjusting the HBO 100 illuminator

Two versions (manual and automatic adjustment) of the HBO 100 illuminator (Fig. 55/**1**) are available.

The self-adjusting HBO 100 (423011-9901-000) adjusts the illumination automatically after the power supply unit is switched on.

The instructions below describe adjustment of the manually adjusted version of the HBO 100 illuminator (423010-0000-000).

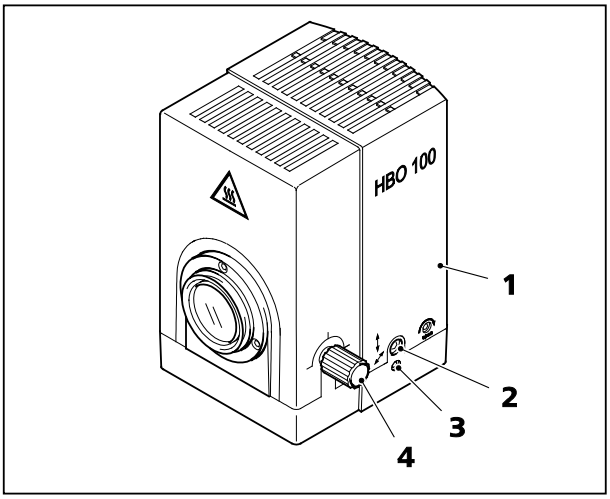


Fig. 55 Adjusting the HBO 100

Adjustment

Never look directly into the lamp when lit in order to avoid irreparable damage to the eye. Wear protective goggles such as sunglasses to protect the eyes during observation of the bright focal spot.

- Unscrew an objective and check that the light source image has free access to the specimen plane (on the specimen stage) using a piece of paper.
- Focus the collector using the knurled knob (Fig. 55/**4**) to ensure that the brighter arc is sharply focused.
- Use the 3 mm ball-headed screwdriver and the adjusting screws for height (Fig. 55/**2**) and lateral adjustment (Fig. 55/**3**) to position the light arc image centrally next to the arc.
- Screw the objective back into the nosepiece.

4.24 HXP 120 V illuminator

☞ When using the HXP 120 V illuminator / compact light source observe the supplied operating manual No. 41 04 01-001-26B.

4.25 Colibri.2 and Colibri 7 illumination system

☞ When using the Colibri.2 or Colibri 7 illuminator observe the attached operating manual 423052-7244-001 or 423052-7344-001.

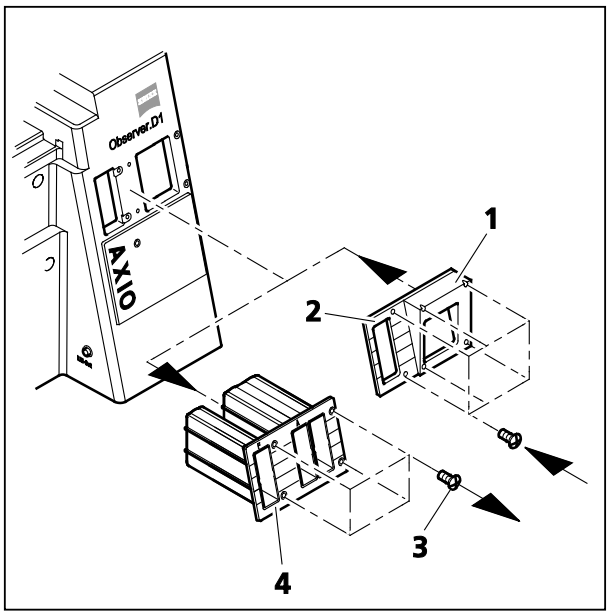


Fig. 56 Mounting adapter for third party components on the stand

4.26 Mounting adapter for third party components on the stand

- Loosen the four screws (Fig. 56/**3**) from the plastic cover (Fig. 56/**4**) and remove the cover from the stand by pulling to the right.
- Mount the mounting adapter (Fig. 56/**2**) to the stand and fix with six screws.
- Mount the desired third-party component over the wedge (Fig. 56/**1**) of the mounting adapter into the stand.

5 OPERATION

The Axio Observer microscopes is available with six different stand versions.

- Axio Observer 3, 3 materials (manual / coded version)
- Axio Observer 5, 5 materials (coded / semi-motorized version)
- Axio Observer 7, 7 materials (fully motorized version, including motorized Z-drive)

The Operation section describes basic settings, Light Manager and Contrast Manager settings, TFT display operation, and illumination and contrast procedures on the Axio Observer (operating functions of the six stand versions are described in sections 5.1 and 5.2).

The Axio Observer 5 stand is equipped with an LCD on the transmitted light carrier and the Axio Observer 5 materials stand with a holder with LCD display.

The TFT display can only be used with the Axio Observer 7, 7 materials stand. Operation of the microscope using the TFT display touchscreen is described separately in section 5.11.

This manual does not describe operation of the motorized Axio Observer 7, 7 materials using a connected PC.

The Axio Observer 3, 5, 7 microscopes have been designed for use with incubators and micromanipulators. For information on connection and operation of these units, please see the relevant operating manuals.

5.1 Operating and function controls - overview

5.1.1 Axio Observer 3 (manual with coded nosepiece)

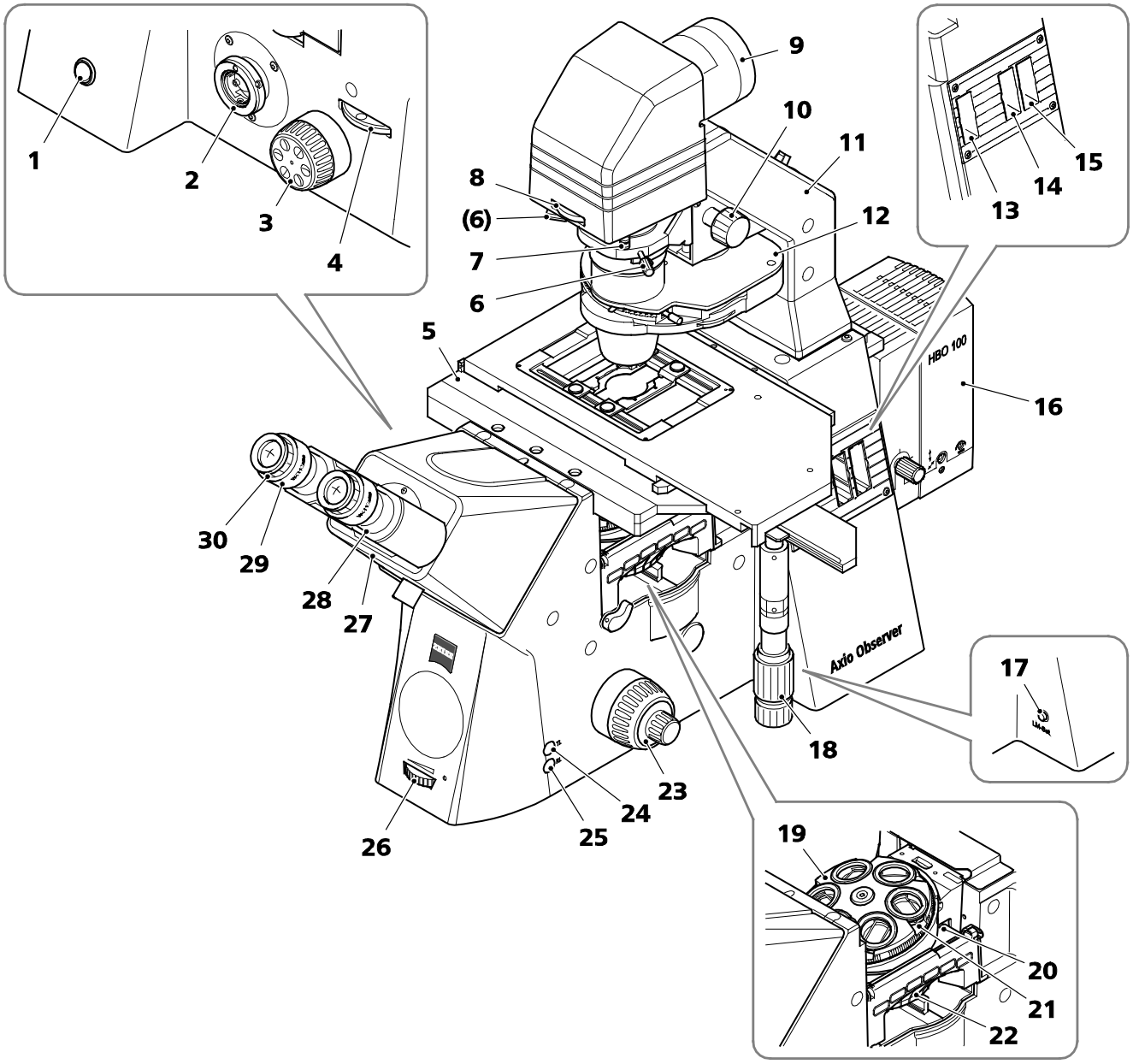


Fig. 57 Axio Observer 3 (manual with coded nosepiece)

Key to **Fig. 57**:

1 On / Off switch (see page 84)
2 Left sideport (see page 84)
3 Coarse / fine focus drive (left side) with finger wheel for fine focus, flat (see page 84)
4 Light path selector wheel (left sideport / vis) (see page 84)
5 Microscope stage with inserted universal mounting frame K
6 Centering screws for condenser (see page 86)
7 Polarizer D with 2-position filter changer or 3-position filter changer (see page 86)
8 Knurled wheel of luminous-field diaphragm (see page 86)
9 microLED illuminator
10 Condenser height control knob (see page 86)
11 Carrier for transmitted-light illumination
12 Condenser (see page 87)
13 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (see page 88)
14 Slot A for iris diaphragm slider as reflected light aperture diaphragm or FL attenuator (see page 88)
15 Slot for 3-position filter slider, d=25 mm (see page 88)
16 HBO 100 illuminator
17 LM-Set button (see page 92)
18 Drive knobs for controlling XY positioning of the mechanical stage (see page 89)
19 6-position nosepiece H DIC M27 coded (see page 85)
20 Slot for 3-position contrast slider 10x29 mm for PlasDIC module and analyzer
21 Slot for DIC slider / PlasDIC slider
22 Reflector turret (see page 90)
23 Coarse / fine focus drive (right side) (see page 90)
24 TL button for switching the transmitted light LED / halogen illuminator on and off or for opening and closing the transmitted light shutter (see page 90)
25 RL button for switching the reflected light shutter (fluorescence) on and off (see page 90)
26 Control wheel for LED / halogen illuminator illumination intensity control (see page 90)
27 Binocular tube (see page 91)
28 Binocular section of tube (see page 92)
29 Eyepiece (see page 92)
30 Eyepiece focusing ring (see page 92)

5.1.2 Axio Observer 5 (coded, semi-motorized)

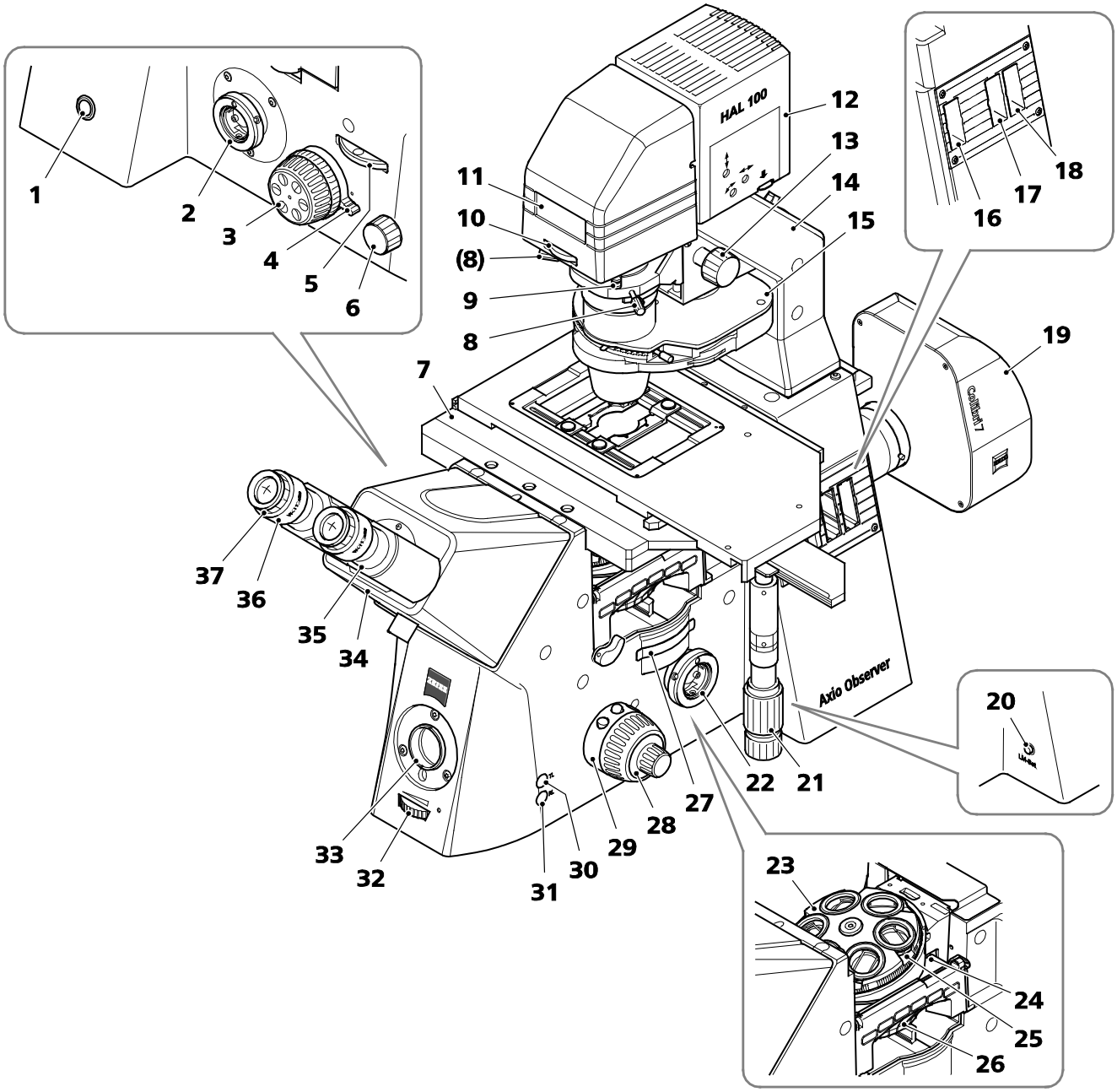


Fig. 58 Axio Observer 5 (coded, semi-motorized)

Key to **Fig. 58**:

1 Standby button (see page 84)
2 Left sideport (see page 84)
3 Coarse / fine focus drive (left side) with finger wheel for fine focus, flat (see page 84)
4 Vertical stop for focus drive (see page 93)
5 Light path selector wheel (left / right sideport / vis) (see page 84)
6 Light path selector wheel (baseport / vis / frontport)
7 Microscope stage with inserted universal mounting frame K
8 Centering screws for condenser (see page 86)
9 Polarizer D with 2-position filter changer or 3-position filter changer (see page 86)
10 Knurled wheel of luminous-field diaphragm (see page 86)
11 LCD display (see page 93)
12 HAL 100 illuminator
13 Condenser height control knob (see page 86)
14 Carrier for transmitted-light illumination
15 Condenser (manual or motorized) (see page 87)
16 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (manual or motorized) (see page 88)
17 Slot for iris diaphragm slider as reflected light aperture diaphragm (manual or motorized) or FL attenuator (manual or motorized) (see page 88)
18 Slot for 3-position filter slider, d=25 mm (see page 88)
19 Colibri 7 illumination system
20 LM-Set button (see page 92)
21 Drive knobs for controlling XY positioning of the mechanical stage (see page 89)
22 Right sideport
23 6-position nosepiece H DIC M27 cod (see page 85)
24 Slot for 3-position contrast slider 10x29 mm for PlasDIC module and analyzer
25 Slot for DIC / PlasDIC slider
26 Reflector turret (coded or motorized) (see page 90)
27 Optovar turret selector wheel (max. 3 positions) (see page 92)
28 Coarse / fine focus drive (right side) (see page 90)
29 Control ring, right (see page 94)
30 TL button for switching the transmitted light LED/ halogen illuminator on and off or for opening and closing the transmitted light shutter (see page 90)
31 RL button for switching the reflected light shutter (fluorescence) on and off (see page 90)
32 Control wheel for LED / halogen illuminator illumination intensity control (see page 90)
33 Frontport
34 Binocular tube (see page 91)
35 Binocular section of tube (see page 92)
36 Eyepiece (see page 92)
37 Eyepiece focusing ring (see page 92)

5.1.3 Axio Observer 7 (motorized)

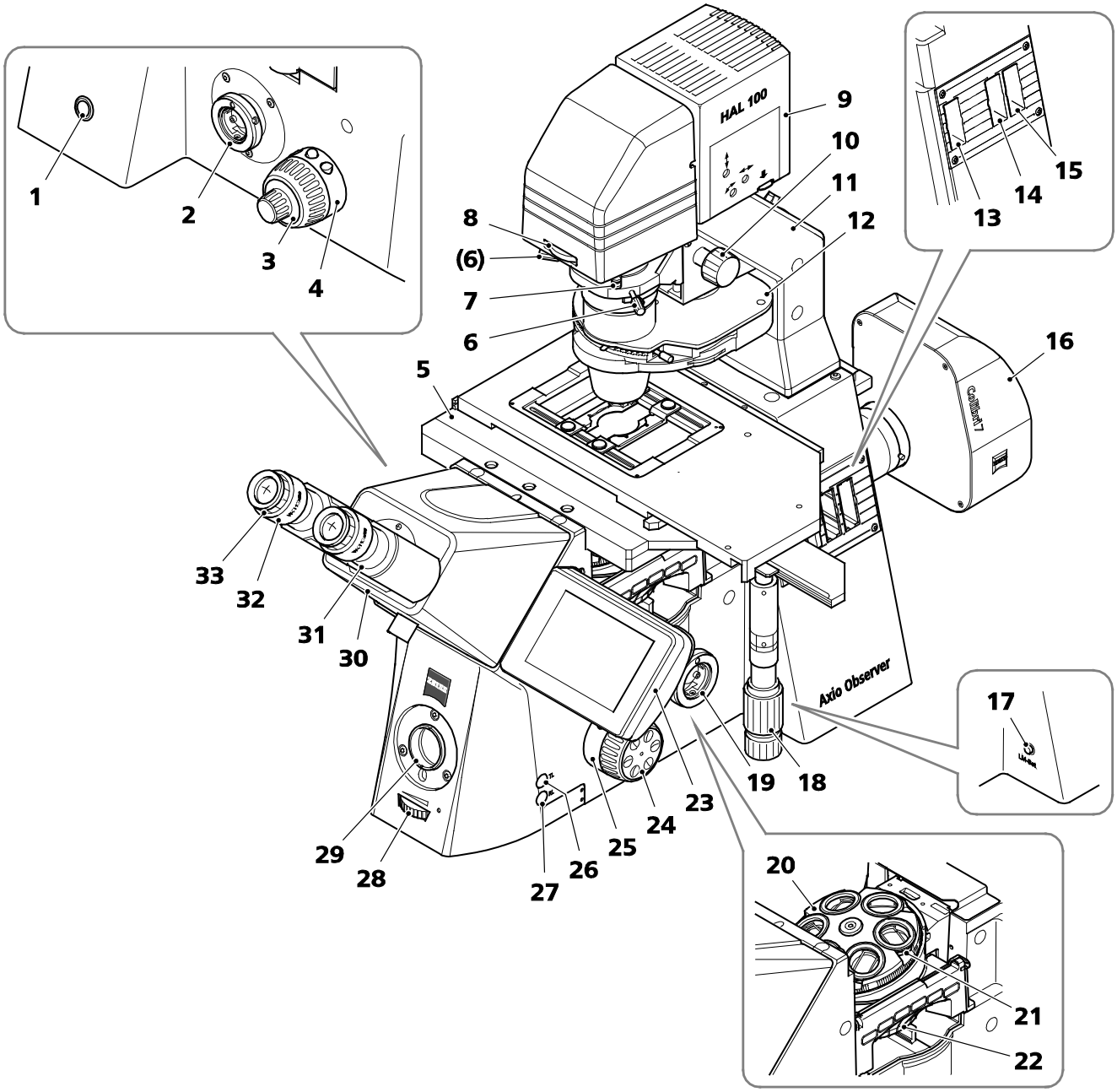


Fig. 59 Axio Observer 7 (motorized)

Key to **Fig. 59**:

1 Standby button (see page 84)

2 Left sideport (see page 84)

3 Coarse / fine focus drive (left side) (see page 84)

4 Control ring, left (see page 95)

5 Microscope stage with inserted universal mounting frame K

6 Centering screws for condenser (see page 86)

7 Polarizer D with 2-position filter changer or 3-position filter changer (see page 86)

8 Knurled wheel of luminous-field diaphragm (see page 86)

9 HAL 100 illuminator

10 Condenser height control knob (see page 86)

11 Carrier for transmitted-light illumination

12 Condenser (manual or motorized) (see page 87)

13 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (manual or motorized) (see page 88)

14 Slot for iris diaphragm slider as reflected light aperture diaphragm (manual or motorized) or FL attenuator (manual or motorized) (see page 88)

15 Slot for 3-position filter slider, d=25 mm (see page 88)

16 Colibri 7 illumination system

17 LM-Set button (see page 92)

18 Drive knobs for controlling XY positioning of the mechanical stage (see page 89)

19 Right sideport

20 6-position nosepiece HD DIC M27 mot. (optional: ACR and Definite Focus.2) (see page 85)

21 Slot for DIC / PlasDIC slider

22 Reflector turret (coded or motorized) (see page 90)

23 TFT display (see page 93)

24 Coarse / fine focus drive (motorized) with finger wheel for fine focus, flat (right side) (see page 90)

25 Control ring, right (see page 94)

26 TL button for switching the transmitted light LED / halogen illuminator on and off or for opening and closing the transmitted light shutter

27 RL button for switching the reflected light shutter (fluorescence) on and off (see page 90)

28 Control wheel for LED / halogen illuminator illumination intensity control (see page 90)

29 Frontport

30 Binocular tube (see page 91)

31 Binocular section of tube (see page 92)

32 Eyepiece (see page 92)

33 Eyepiece focusing ring (see page 92)

5.1.4 Axio Observer 3 materials (manual with coded nosepiece)

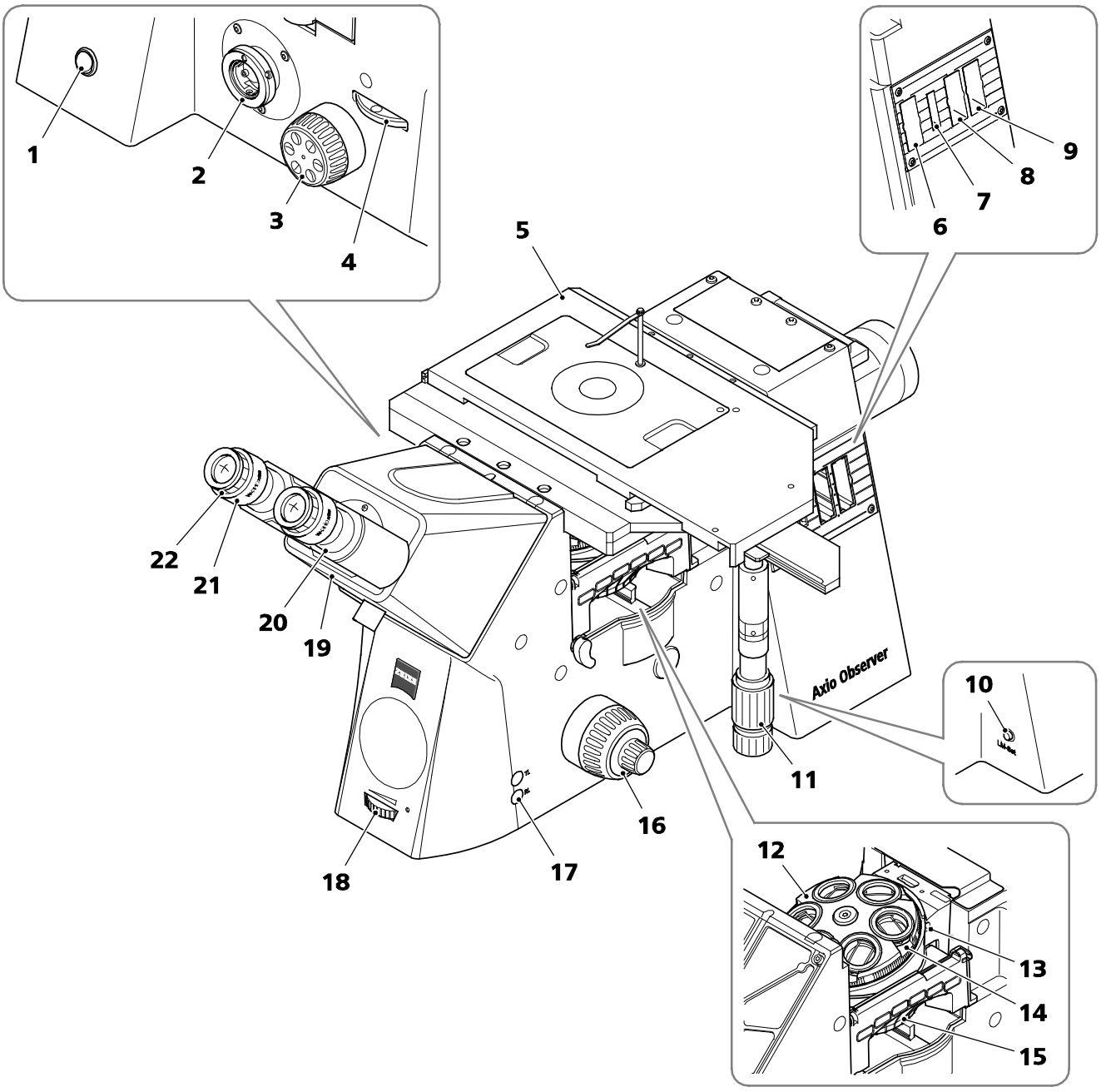


Fig. 60 **Axio Observer 3 materials (manual with coded nosepiece)**

Key to **Fig. 60**:

1 On / Off switch (see page 84)
2 Left sideport (see page 84)
3 Coarse / fine focus drive (left side) with finger wheel for fine focus, flat (see page 84)
4 Light path selector wheel (left sideport / vis) (see page 84)
5 Microscope stage (with inserted K mounting frame for reflected light and stage pinhole aperture)
6 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (see page 89)
7 Slot for Polarizer slider RL 6x30 mm, 90° rotatable
8 Slot A for aperture diaphragm slider MAT or FL attenuator (see page 89)
9 Slot for 3-position filter slider, d=25 mm (see page 88)
10 Light manager set button (see page 92)
11 Drive knobs for controlling XY positioning of the mechanical stage (see page 89)
12 6-position nosepiece HD DIC M27 coded (see page 85)
13 Slot 6x20 for slider C-DIC and TIC
14 Slot for DIC slider
15 Reflector turret (see page 90)
16 Coarse / fine focus drive (right side) (see page 90)
17 RL button for switching the LED or the reflected light shutter (fluorescence) on and off (see page 90)
18 Control wheel for LED / halogen illuminator illumination intensity control (see page 90)
19 Binocular tube (see page 91)
20 Binocular section of tube (see page 92)
21 Eyepiece (see page 92)
22 Eyepiece focusing ring (see page 92)

5.1.5 Axio Observer 5 materials (coded, semi-motorized)

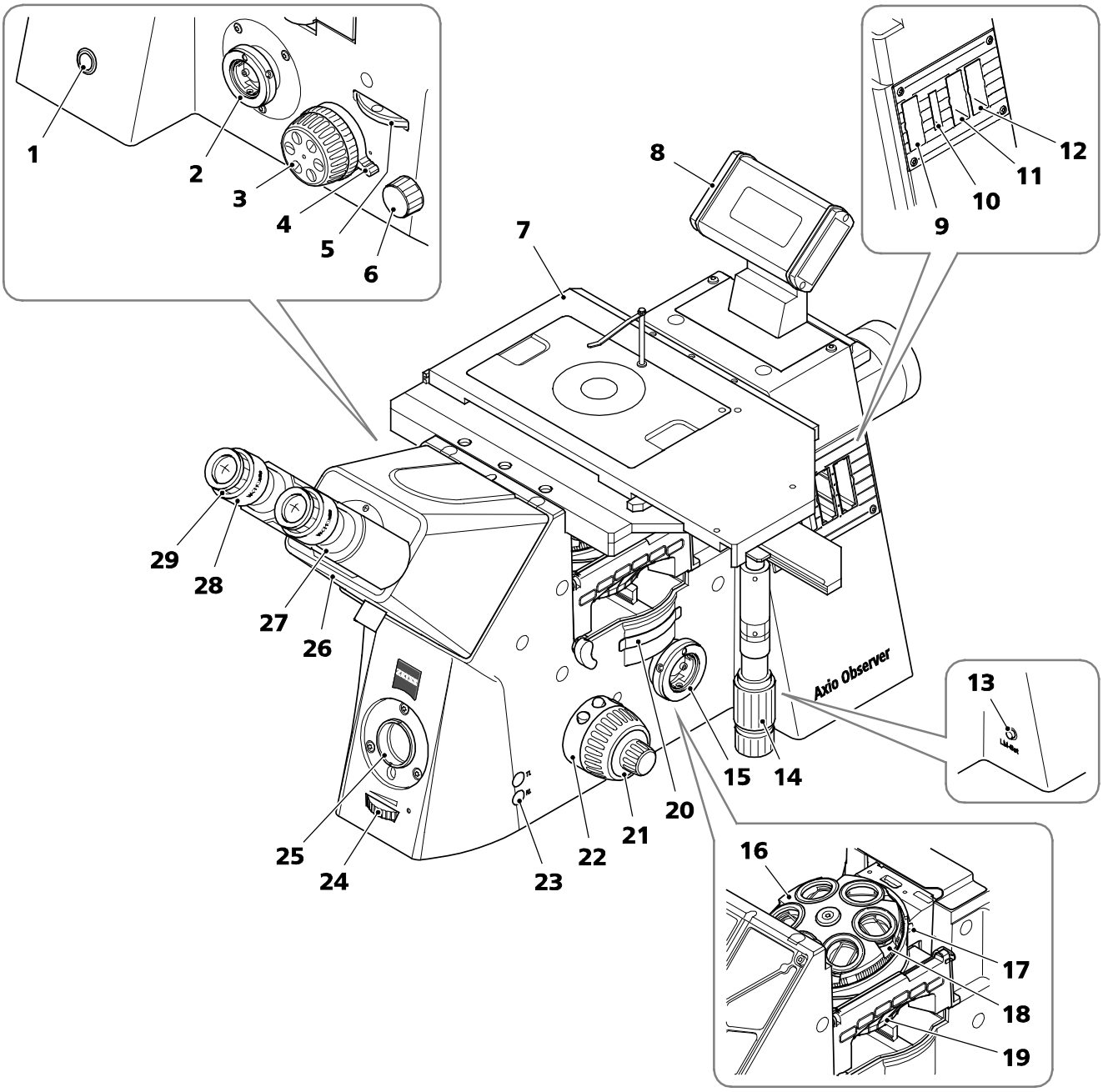


Fig. 61 Axio Observer 5 materials (coded, semi-motorized)

Key to **Fig. 61**:

1 Standby button (see page 84)
2 Left sideport (see page 84)
3 Coarse / fine focus drive (left side) with finger wheel for fine focus, flat (see page 84)
4 Vertical stop for focus drive (see page 93)
5 Light path selector wheel (left / right sideport / vis) (see page 84)
6 Light path selector wheel (baseport / vis / frontport)
7 Microscope stage (with inserted K mounting frame for reflected light and stage pinhole aperture)
8 Holder with LCD display (see page 94)
9 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (manual or motorized) (see page 89)
10 Slot for Polarizer slider RL 6x30 mm, 90° rotatable
11 Slot A for aperture diaphragm slider MAT or FL attenuator (manual or motorized) (see page 89)
12 Slot for 3-position filter slider, d=25 mm (see page 88)
13 LM-Set button (see page 92)
14 Drive knobs for controlling XY positioning of the mechanical stage (see page 89)
15 Right sideport
16 6-position nosepiece HD DIC M27 coded (see page 85)
17 Slot 6x20 for slider C-DIC and TIC
18 Slot for DIC slider
19 Reflector turret (coded or motorized) (see page 90)
20 Optovar turret selector wheel (max. 3 positions) (see page 92)
21 Coarse / fine focus drive (right side) (see page 90)
22 Control ring, right (see page 94)
23 RL button for switching the LED illuminator / HAL illuminator or the reflected light shutter (fluorescence) on and off (see page 90)
24 Control wheel for LED / halogen illuminator illumination intensity control (see page 90)
25 Frontport
26 Binocular tube (see page 91)
27 Binocular section of tube (see page 92)
28 Eyepiece (see page 92)
29 Eyepiece focusing ring (see page 92)

5.1.6 Axio Observer 7 materials (motorized)

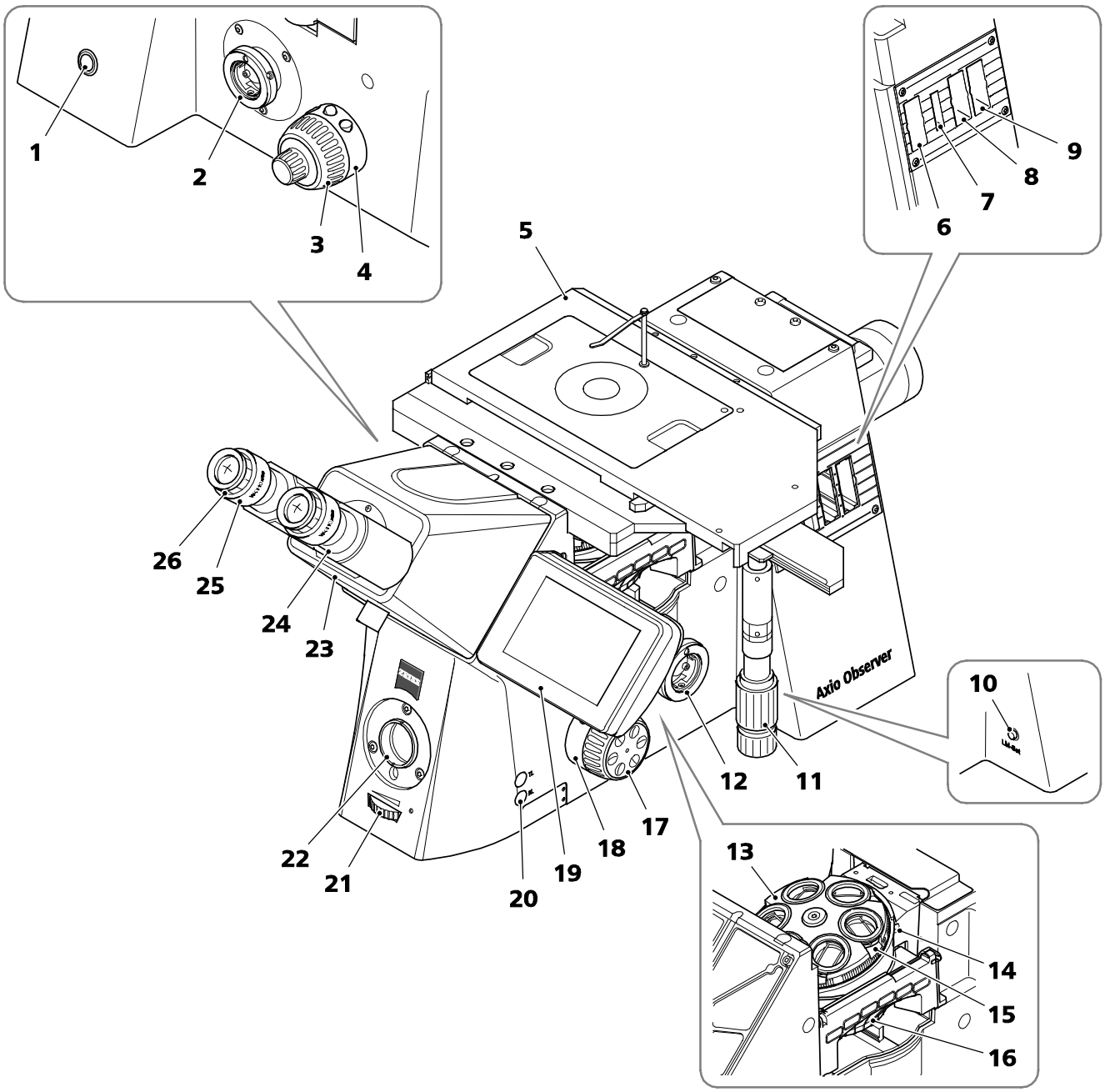


Fig. 62 Axio Observer 7 materials (motorized)

Key to **Fig. 62**:

1 Standby button (see page 84)
2 Left sideport (see page 84)
3 Coarse / fine focus drive (left side) (see page 84)
4 Control ring, left (see page 95)
5 Microscope stage (with inserted K mounting frame for reflected light and stage pinhole aperture)
6 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (manual or motorized) (see page 89)
7 Slot for Polarizer slider RL 6x30 mm, 90° rotatable
8 Slot A for aperture diaphragm slider MAT or FL attenuator (manual or motorized) (see page 89)
9 Slot for 3-position filter slider, d=25 mm (see page 88)
10 LM-Set button (see page 92)
11 Drive knobs for controlling XY positioning of the mechanical stage (see page 89)
12 Right sideport
13 6-position nosepiece HD DIC M27 mot. ACR (motorized) (see page 85)
14 Slot 6x20 for C-DIC and TIC slider
15 Slot for DIC slider
16 Reflector turret (coded or motorized) (see page 90)
17 Coarse / fine focus drive (motorized) with finger wheel for fine focus, flat (right side) (see page 90)
18 Control ring, right (see page 94)
19 TFT display (see page 93)
20 RL button for switching the LED / HAL illuminator or the reflected light shutter (fluorescence) on and off (see page 90)
21 Control wheel for LED / halogen illuminator illumination intensity control (see page 90)
22 Frontport
23 Binocular tube (see page 91)
24 Binocular section of tube (see page 92)
25 Eyepiece (see page 92)
26 Eyepiece focusing ring (see page 92)

5.2 Operating and function controls - description

On / off switch (Fig. 57/1) or standby button (Fig. 58/1)

- When the microscope is on, the power LED on the front of the stand lights up (see also section 4.19)

Left sideport (Fig. 57/2)

- Port for connecting documentation equipment
- Various splitting ratios for left sideport and visual observation (vis), depending on instrument configuration

Manual (Fig. 57/3) or motorized focusing drive (Fig. 59/3), left side

- Coarse focusing drive approx. 2 mm/revolution and fine focusing drive approx. 1/10 of coarse/fine focus transmission ratio
- Total travel approx. 10 mm, 13 mm also possible
- Coarse adjustment (large knob), fine adjustment (small knob or disk)
- Optional: fine drive, flat right or left, 5, 5 materials stand always flat (already included in stand)

Light path selector wheel (left / right sideport / vis) (Fig. 57/4)

- Selects beam splitting for right sideport (doc), left sideport (doc) and visual (vis) observation (3, 3 materials stand: left sideport / vis only)
- 2 or 3 switch positions with various beam splitting ratios
- Instrument configuration with sideport 60N left (L 80); 2 switch positions (425150-0000-000):
  100 % vis: 0 % doc
  20 % vis : 80 % doc left
- Instrument configuration with sideport 60N left (L 100); 2 switch positions (425151-0000-000):
  100 % vis: 0 % doc left
  0 % vis : 100 % doc left
- Instrument configuration with sideport 60N left (L 100, L 50); 3 switch positions (425152-0000-000):
  100 % vis: 0 % doc
  0 % vis : 100 % doc left
  50 % vis : 50 % doc left
- Instrument configuration with sideport 60N right (R 100, R 50); 3 switch positions (425153-0000-000):
  100 % vis: 0 % doc
  0 % vis : 100 % doc right
  50 % vis : 50 % doc right
- Instrument configuration with sideport 60N left (L 100) and right (R 80); 3 switch positions (425154-0000-000):
  100 % vis: 0 % doc
  0 % vis :100 % doc left
  20 % vis : 80 % doc right

- Instrument configuration with sideport 60N right (R 100) and left (L 100); 3 switch positions (425155-0000-000):
  100 % vis: 0 % left/right
  0 % vis : 100 % doc left
  0 % vis : 100 % doc right
- Instrument configuration with sideport 60N right (R 100) and left (L 80); 3 switch positions (425165-0000-000):
  100 % vis: 0% doc
  0 % vis :80 % doc left
  0 % vis : 100 % doc right

Nosepiece with objectives (Fig. 57/19)

- 6-position nosepiece H, DIC (Fig. 63/**1**) with DIC slider slots (Fig. 63/**2**) in all objective positions in manual, coded or motorized versions
- Manual and coded nosepieces: rapid objective change by rotating the nosepiece using the adjustment ring (Fig. 63/**3**)
- Motorized nosepiece: rapid objective change e.g. by using the pair of buttons on the right control ring (Fig. 77/**1**)
- The nosepiece can also be operated manually.

If a heating stage or gliding stage is used, the nosepiece must be lowered fully using the focus drive before changing objective - otherwise the objective may collide with the stage.

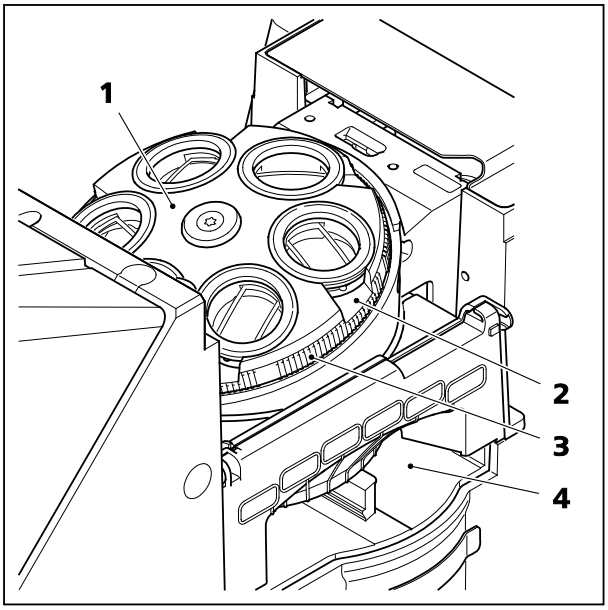


Fig. 63 **Nosepiece with slot for DIC slider and PlasDIC slider; analyzer slider slot**

Slot for analyzer slider (Fig. 63/4)

- For fixed analyzer sliders with two ∅ 32 mm filter positions, or ±30° analyzer sliders for DIC (available for all stands)

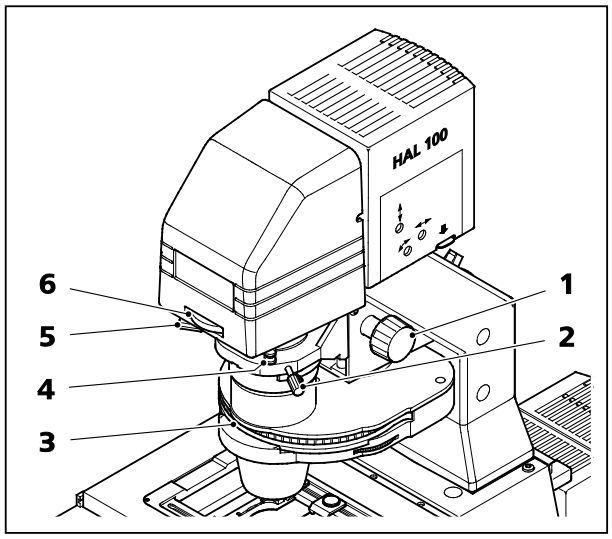


Fig. 64 Operating and function controls on transmitted light unit

Vertical adjustment knob for condenser (Fig. 64/1)

- Adjustment knob on the carrier for transmitted-light illumination for raising and lowering the condenser to set KÖHLER illumination

Centering screws (Fig. 64/2 or 5) for the condenser (Fig. 64/3)

- Centering screws on both sides of the carrier for transmitted-light illumination for centering the condenser

3-position filter changer, polarizer D with 2-position filter changer or polarizer D, rotatable, with color glass holder (Fig. 64/4)

- The polarizer and filter positions can be swiveled into and out of position separately
- There are stops for the swiveled in positions

Knurled wheel for luminous-field diaphragmfor transmitted light (Fig. 64/6)

- A knurled wheel attached to the carrier for transmitted-light illumination for opening or closing the transmitted light luminous-field diaphragm for setting KÖHLER illumination
- Turn the knurled wheel to the right: luminous-field diaphragm will be closed
- Turn the knurled wheel to the left: luminous-field diaphragm will be opened

Manual condensers (Fig. 64/3), (Fig. 65 and (Fig. 66)

Depending on the version, condensers (Fig. 65/**1**) are equipped with the following:

- 6-position turret disk for:
  bright field: H
  phase contrast: Ph0, Ph1, Ph2, Ph3 with centerable stops
  interference contrast: DIC
  PlasDIC: with 3.5 mm slit aperture for PlasDIC
- The aperture diaphragm (iris diaphragm) is opened and closed using the knurled knob (Fig. 65/**2**)
- Rotate the turret wheel (Fig. 65/**3**) to swivel the brightfield insert or contrast stops into the optical path
- The short designation for the turret position (e.g. **H**) is displayed on the front of the turret, facing the user.
- The condensers 0.35 and 0.55 for phase contrast require the use of one 1.5 mm Allen screwdriver each (plugged in at Fig. 66/**1**) to center the phase stops

☞ The condenser turrets feature a so-called automatic diaphragm mechanism. The aperture diaphragm (iris diaphragm) is opened fully when a phase stop turret position is selected. The aperture diaphragm opening is automatically reset to the previous setting when another turret position is selected.

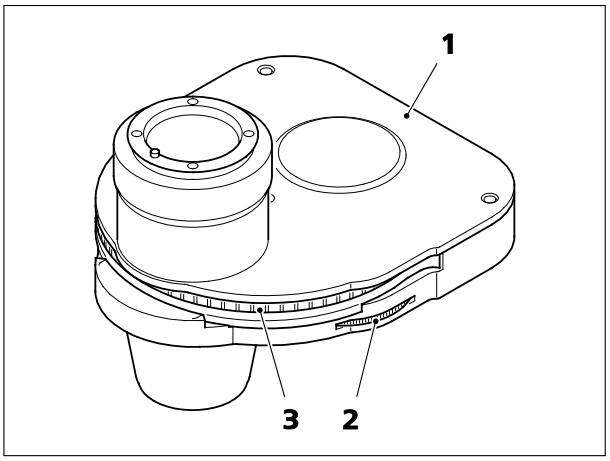


Fig. 65 **LD condenser 0.55 H, Ph1, Ph2, Ph3, DIC; 6 positions**

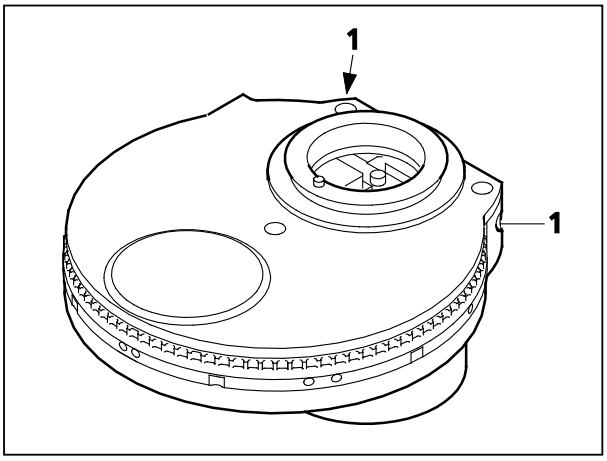


Fig. 66 **LD condenser 0.35, 6-position, H, Ph0, Ph1, Ph2, DIC, DIC**

☞ When using the iHMC condenser (424241-9010-000) observe the separate operating manual (424241-9010-701).

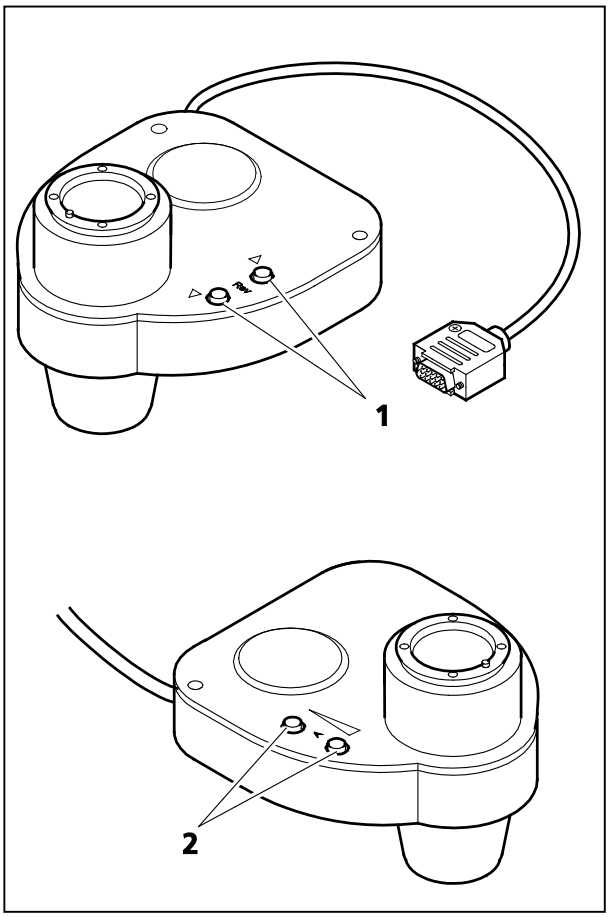


Fig. 67 **LD condenser 0.55 H, Ph1, Ph2, Ph3, DIC, DIC; 6 positions, mot.**

Motorized condensers (Fig. 67)

- The turret is moved by pressing the **Rev** △ ▽ (forwards and backwards, Fig. 67/**1**) keys on the right side of the condenser
- Motorized aperture diaphragm operation using the **A** key (open and close, Fig. 67/**2**) on the left side of the condenser
- If a phase stop is in the optical path, the aperture diaphragm is always fully opened automatically (NA = 0.55)

Manual or motorized microscope stages with specimen holders (Fig. 57/5)

- Specimens are held, positioned and fixed by the specimen holder (Fig. 29)
- Depending on instrument configuration, includes:
  Specimen stage 250x230 mm with object guide 130x85 and mounting frame M for object guide;
  Mechanical stage 130x85 R/L;
  Mechanical stage 130x85 R/L with short coaxial drive;
  Scanning stage 130x100 PIEZO;
  Scanning stage XY DC 110x90 with attachment Z-Piezo/Rot.En. Rev.4;
  Scanning stage 130x100 STEP;
  Scanning stage 130x85 MAT; CAN;
  Scanning stage 130x85 mot P; CAN and
  Mounting frame K for mechanical and scanning stages;
  Z gliding stage

Slot for 3-position filter slider, d=25 mm (Fig. 57/15)

- For 3-position filter slider, d=25 mm
- Insert the filter slider with the labeling visible from the front to the required stop position

Slot for Polarizer slider RL 6x30 mm, 90° rotatable, 427710-9060-000 (Fig. 60/7)

- Application see Fig. 157 on page 162

Slot F or slot A for iris diaphragm slider for reflected light and FL attenuator (Fig. 57/13 or 14)

- For Axio Observer 3, 5 and 7 stands
- Slot for iris diaphragm slider (Fig. 68/**1**) as aperture / luminous field diaphragm for setting KÖHLER illumination
- The FL attenuator should only be used in the aperture diaphragm plane (slot **A**)
- Insert the slider into the slot until it clicks into place. The aperture opening symbol (wedge) should be facing towards the user
- The FL attenuator should only be used in the aperture diaphragm plane (slot A)

Slot A for aperture diaphragm slider MAT or slot F for iris diaphragm slider as luminous-field diaphragm (Fig. 60/8 or 6)

- For Axio Observer 3 materials, 5 materials and 7 materials stands
- Insert the aperture diaphragm slider MAT into slot **A**
- Insert the iris diaphragm slider (Fig. 68/**1**) as luminous-field diaphragm into slot **F**
- Insert the slider into the slot until it clicks into place
- The aperture opening symbol (wedge) should be facing towards the user

Manual iris diaphragm slider as luminous-field diaphragm, manual FL attenuator or manual aperture diaphragm slider MAT

- The lever (Fig. 68/**4**) on the slider is used to open and close (lower position) the iris diaphragm
- The two centering screws (Fig. 68/**2** and **3**; socket head SW 3) permit the stop to be centered in the beam path
- The FL attenuator is used to attenuate the light in the fluorescence path when using the HBO 100 (slot **A**)
- The FL attenuator has six labeled positions which are selected by turning the control wheel

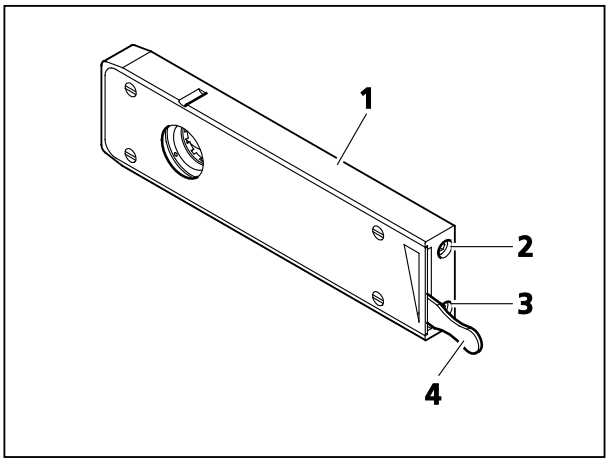


Fig. 68 Iris diaphragm slider, manual

Motorized iris diaphragm slider as luminous-field diaphragm, motorized FL attenuator or motorized aperture diaphragm slider MAT

- The motorized slider and motorized FL attenuator can be inserted only with a motorized reflected light path (only Axio Observer 5, 5 materials and 7, 7 materials stands)
- The diaphragm is opened or closed by pressing the appropriate button on the slider
- The motorized (or manual) FL attenuator is used to attenuate the light in the fluorescence path when using the HBO 100 (slot **A**)
- The FL attenuator has six positions which can be selected in forward or reverse order by pressing buttons (Fig. 69/**1**) and (Fig. 69/**2**)

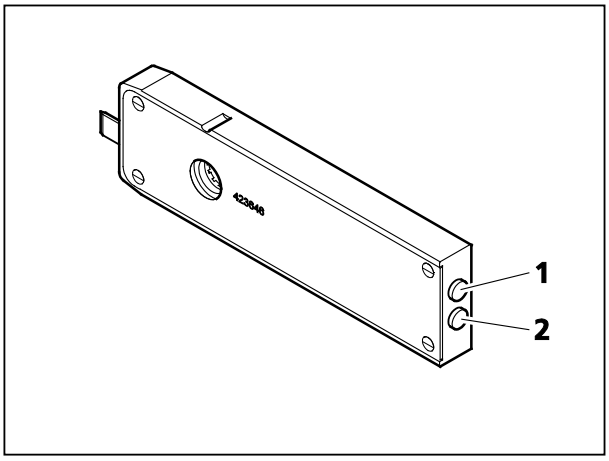


Fig. 69 FL attenuator, motorized

Drive knobs for controlling XY positioning of the mechanical stage (Fig. 57/18) or object guide (if the 250x230 specimen stage with object guide is fitted)

- Upper drive knob: movement in the Y-direction
- Lower drive knob: movement in the X-direction

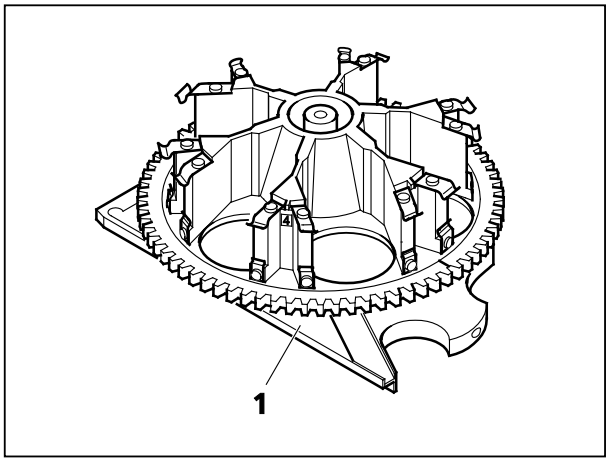


Fig. 70 6-position reflector turret

Manual, coded or motorized reflector turret 6-position (Fig. 57/22)

- Can be loaded with a maximum of six reflector modules for reflected light fluorescence
- Manual, coded reflector turret: Rapid reflector change by rotating the adjustment ring. The activated reflector is marked by a line on the right of the reflector turret
- Motorized reflector turret: Rapid reflector change e.g. by using the pair of buttons on the right control ring (Fig. 77/**1**)

Dual filter wheel mot. for beam splitting and emission; CAN

- Observe the Quick Reference Guide 452358-7044-001 for the operation of the dual filter wheel mot.

Manual or motorized focusing drive, right side (Fig. 57/23)

- Coarse focusing drive approx. 2 mm/revolution and fine focusing drive approx. 1/10 of coarse/fine focus transmission ratio
- Total travel approx. 10 mm, 13 mm also possible
- Coarse adjustment (large knob), fine adjustment (small knob)
- Optional: Fine drive, flat right or left, stand 5 materials always flat-left (already included in stand)

TL button (Fig. 57/24)

- Pressing briefly switches the halogen or LED illuminator on or off. If a transmitted light shutter is built into the carrier for transmitted-light illumination, it will be opened or closed alternately
- Pressing and holding down for > 1 s sets the brightness to the 3200 K value for color photography

RL button (Fig. 57/25)

- Pressing briefly (< 1 s) activates or deactivates the external or internal fluorescence shutter (reflected light) alternately

Control wheel for illumination intensity control of the microLED, HAL 100 or Colibri 7 illuminator (Fig. 57/26)

- Controls the brightness of the microLED, HAL 100 or Colibri 7 illuminator
- Adjustable voltage range from 0 to 12 V
- The maximum is limited by a stop on the 3, 3 materials stand
- On the 5, 5 materials and 7, 7 materials stands, an acoustic signal sounds when the maximum brightness is reached. The rotation of the control wheel is not limited by a stop in these stands

Binocular tubes (Fig. 57/27)

– The binocular tubes provided allow the interpupillary distance to be individually adjusted and the viewing height to be adjusted within defined limits

Binocular tube 45°/23 with manual shutter vis (Fig. 71)

– Switch the shutter on or off by turning the rotary button (Fig. 71/**1**):

100 % vis

0 % vis (light shutter)

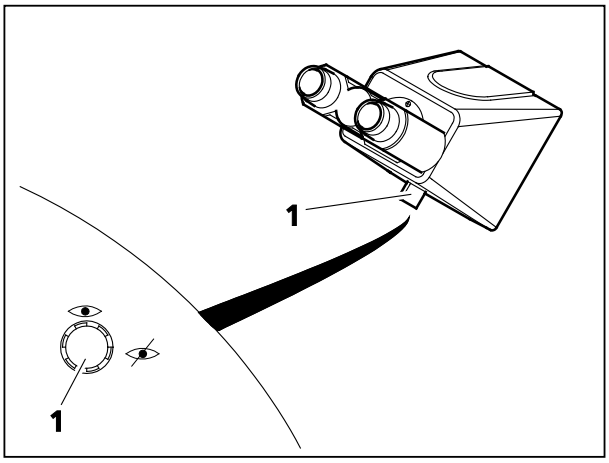


Fig. 71 Binocular tube 45°/23

Binocular phototube 45°/23 with sliding prism for vis / doc, Bertrand lens and manual vis shutter (Fig. 72)

– Switch the shutter on and off by sliding the rotary / sliding button (Fig. 72/**1**):

100 % vis

0 % vis (light shutter)

Bertrand lens

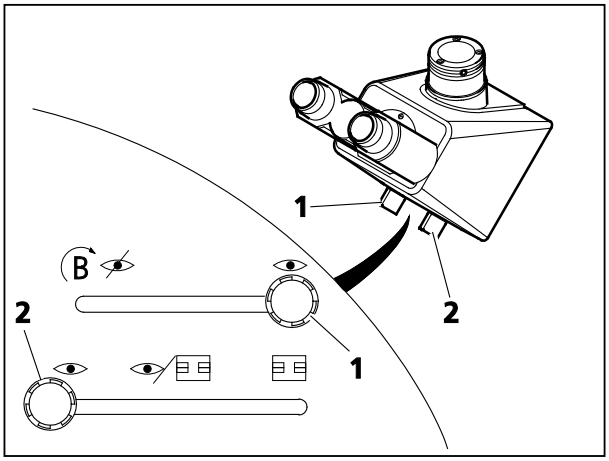


Fig. 72 Binocular tube 45°/23

– The Bertrand lens is focused by rotating the rotary / sliding button (with the Bertrand lens in position)
– Switch the beam path (sliding prism vis / doc) with the sliding button (Fig. 72/**2**):

0 % vis: 100 % doc

50 % vis: 50 % doc

100 % vis: 0 % doc

☞ The binocular phototube camera port is recommended up to 18 mm camera field (related to intermediate image) e.g. for an Axiocam with 0.63x camera adapter.

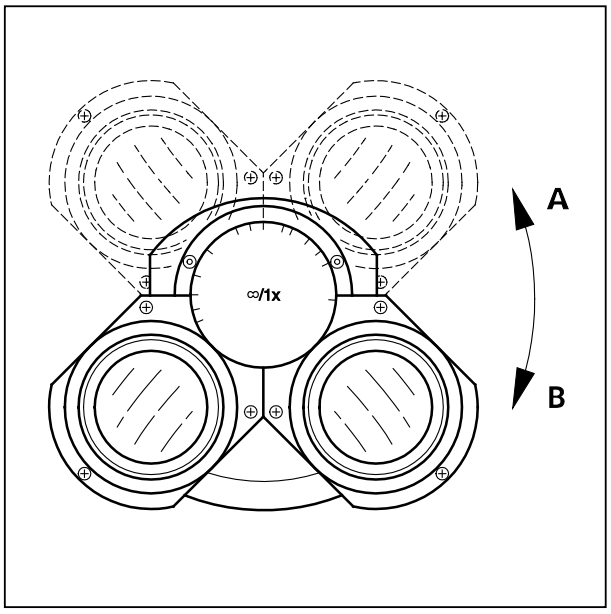


Fig. 73 Setting the interpupillary distance on the binocular tube

Binocular section of tubes (Fig. 57/28)

- The eyepieces are adjusted for the interpupillary distance by swiveling the two eyepiece sockets towards or away from each other (Fig. 73/**A** and **B**)
- Two different height settings are available by rotating the binocular section through 180°

Eyepiece / eyepiece focusing ring (Fig. 57/30)

- Both eyepiece models allow for correction of ametropia and can be fitted with eyepiece reticles (see also section 4.4.2)

LM-Set button (Fig. 57/17)

- Pressed briefly (< 1 s):
  Light Manager values are saved
- Pressed long (> 2 s):
  Configuration mode is activated (only Axio Observer 5, 5 materials)

Optovar turret selector wheel (Fig. 58/27)

- Fitted to 5, 5 materials stands, if 1-position tube lens mount has not been configured
- Maximum 3 positions with:
  Tube lens 1x (always fitted)
  Optovar 1.25x
  Optovar 1.6x
  Optovar 2.5x
- A maximum of two Optovars can be configured
- If less than three optical components are to be mounted, the empty positions are blocked

Vertical stop for focus drive (Fig. 58/4)

- On 5, 5 materials stand only
- For limiting the upper position of the focus drive (to protect the specimen)
- The operating principle of the stop is explained by a diagram on the stand
- Adjusting the vertical stop:
  Rotate the locking lever of the stop (Fig. 74/**2**) upwards to the stop pin.
  Move the stage to the required position using the focus drive.
  Rotate the knurled wheel (Fig. 74/**1**) clockwise as far as it will go.
  Press the clamping lever downwards to lock the stop position.

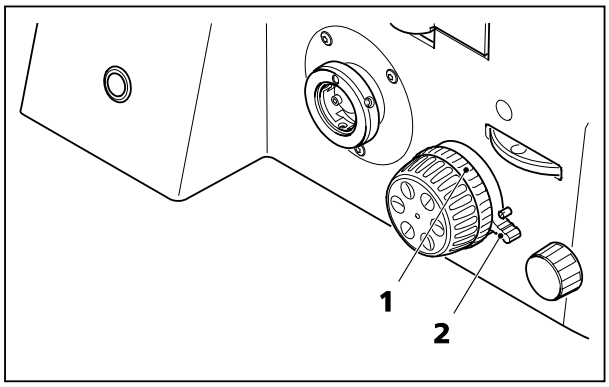


Fig. 74 Vertical stop for focus drive

LCD display (Fig. 58/11)

- On 5, 5 materials stand only
- LCD display with four lines of 16 characters each, located on the carrier for transmitted-light illumination

Main information displayed:

- Line 1 (Fig. 75/**1**):
  Name of the objective
- Line 2 (Fig. 75/**2**):
  Objective magnification and possible contrast techniques
- Line 3 (Fig. 75/**3**):
  Overall magnification, lamp voltage and TL shutter details, condenser parameters
- Line 4 (Fig. 75/**4**):
  Details on reflected light, if not fitted: Optovar magnification

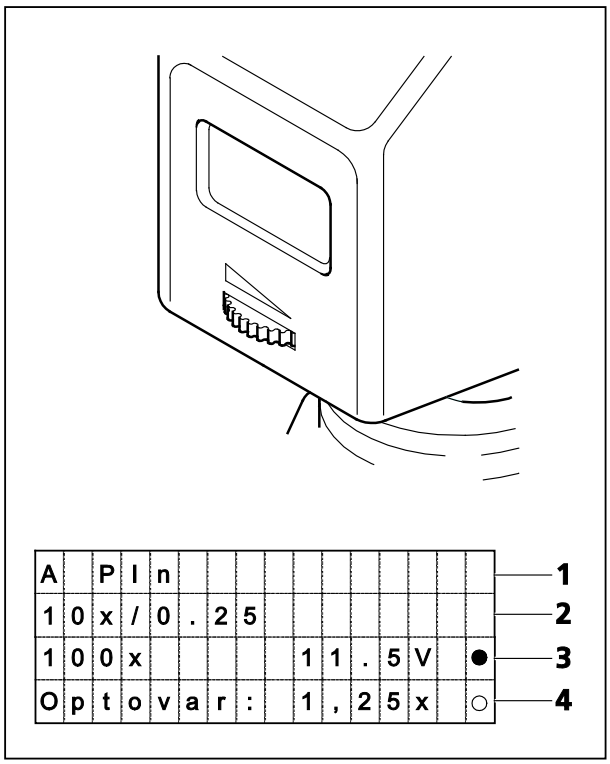


Fig. 75 LCD display

TFT display (Fig. 59/23):

- On 7, 7 materials stand only.
- For control and configuration of the microscope using the touchscreen, see section 5.11.

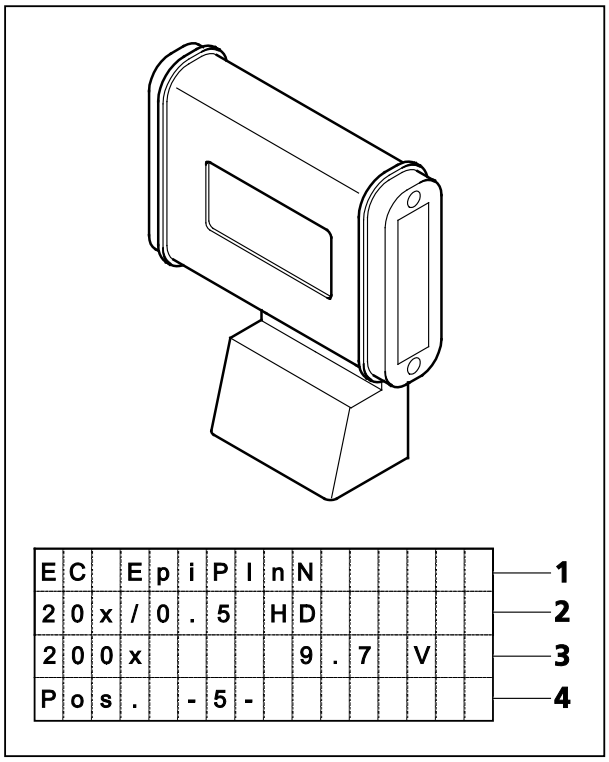


Fig. 76 Holder with LCD display

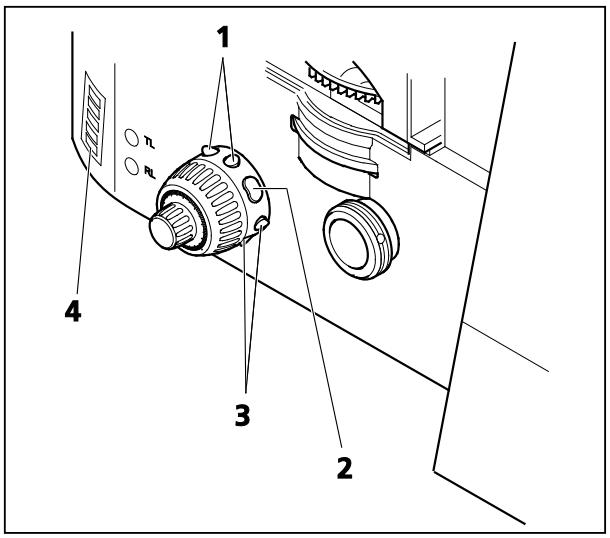


Fig. 77 Control ring, right (view from rear)

Holder with LCD display (Fig. 61/8)

- Use on 5, 5 materials stand only
- LCD display with four-line display, each line with 16 characters

Main information displayed:

- Line 1 (Fig. 76/**1**):
  Name of the objective
- Line 2 (Fig. 76/**2**):
  Objective magnification / aperture and possible contrast techniques
- Line 3 (Fig. 76/**3**):
  Overall magnification, lamp voltage details, status display of reflected light shutter
- Line 4 (Fig. 76/**4**):
  Information on contrast techniques (position of reflector turret)

Control ring, right (Fig. 58/29)

- On 5, 5 materials and 7, 7 materials stand only
- Two pairs of buttons (Fig. 77/**1** and **3**) and one single button (Fig. 77/**2**) for operating motorized components or illumination settings

The factory set default button configuration is shown on the adhesive label (Fig. 77/**4**) affixed to the stand.

5, 5 materials stand:

- If a motorized condenser is used, pressing the middle button will display the current condenser settings on the LCD display
- If the button allocation is changed, the adhesive label affixed to the stand should be updated using the additional adhesive labels supplied

7, 7 materials stand:

- Changes to the default button allocation can be made using the TFT display
- If the button allocation is changed, the adhesive label affixed to the stand should be updated using the additional adhesive labels supplied

Control ring, left (Fig. 59/4)

- On 7, 7 materials stand only
- Two pairs of buttons (Fig. 78/**2** and **3**) and one single button (Fig. 78/**4**) for operating motorized components or illumination settings
- The factory set default button configuration is shown on the adhesive label (Fig. 78/**1**) affixed to the stand
- Changes to the default button allocation can be made using the TFT display
- If the button allocation is changed, the adhesive label affixed to the stand should be updated using the additional adhesive labels supplied

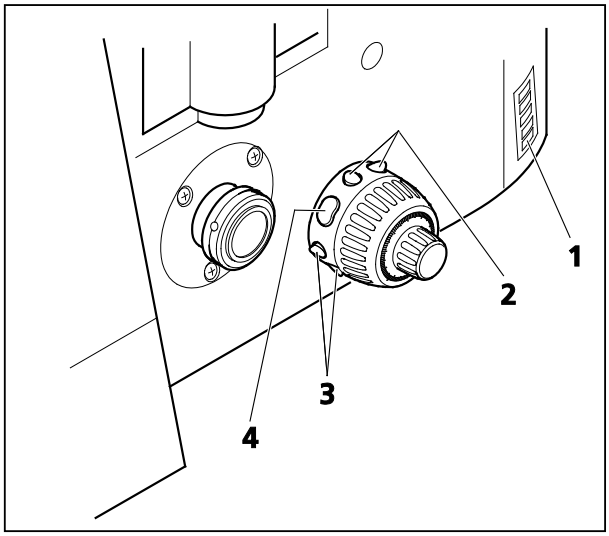


Fig. 78 Control ring, left (view from rear)

Docking station

- For use with the 7, 7 materials stands only
- If it is inconvenient to operate the microscope stand from the right side, the functions of the touchscreen TFT display (Fig. 79/**3** on the docking station), the right control ring (corresponds to Fig. 79/**2** on the docking station) and the focus drive on the right (corresponds to Fig. 79/**1** on the docking station) can be performed using the docking station detached from the stand
- Changes to the default button allocation can be made using the TFT display
- The angle of the TFT display can be adjusted using the two knurled screws (see also Fig. 42/**4**) on the rear of the docking station

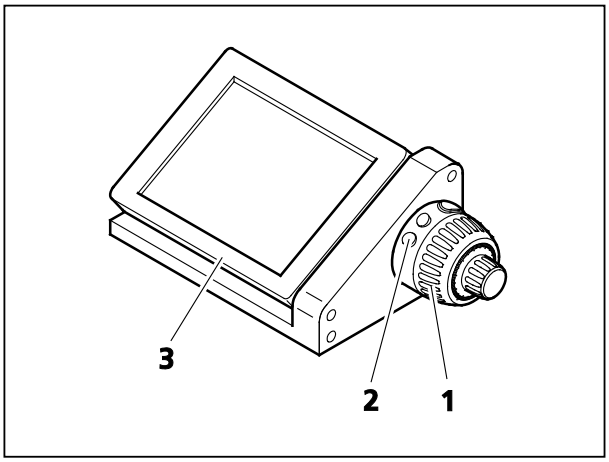


Fig. 79 Docking station with TFT display, control ring and focusing drive

☞ When using the XLmulti S1 incubator, the docking station must be used as otherwise the TFT display cannot be mounted on the stand.

Automatic component recognition (ACR) on the 5, 5 materials and 7, 7 materials stands

Automatic component recognition (ACR) means automatic recognition of objectives and reflector modules on the Axio Observer.

When replacing an objective (7, 7 materials stands only) or a reflector module (5, 5 materials and 7, 7 materials stands), the system will register the replaced component. This is important for operator comfort and safety: It helps avoid operating errors and the need for time-consuming programming.

The differences between automatic component recognition for the nosepiece and for the reflector turret are explained below.

- Nosepiece (optional, only 7, 7 materials stand)
  Automatic component recognition for the nosepiece is initiated by pressing the appropriate button on the *Settings/Components/Objectives* screen on the TFT display (see section 5.11.9.1)

☞ For the 7 stand the nosepiece is an optional component (see also section 3.4).
This includes:
  - Standard mot. (without ACR)
  - mot. with ACR
  - Definite Focus.2 (mot. with ACR)

  The 7 materials stand is always equipped with the ACR nosepiece (part of delivery scope).

☞ For ACR functionality with objectives, these must be additionally equipped with an appropriate "ACR objective ring".

  ACR with reflector modules requires a reflector turret mot. ACR. The reflector modules must also be marked with “ACR”.

- Reflector turret (optional, 5, 5 materials, 7, 7 materials stands)
  Automatic component recognition for the reflector turret is initiated automatically as soon as the ACR reflector turret cover is closed

5.3 Using objectives

The selection of objectives co-determines the fields of use the microscope can reasonably cover. An objective might carry the following labeling:

N-ACHROPLAN 20x/0,45 ∞/0,17

Fig. 80 Objective labeling

Key:

20× Objective magnification, with a color ring on the microscope objective allocated to each magnification step (ZEISS color code)

0.45 Numerical aperture

∞ Infinite tube length

0.17 can only be used with cover slip thickness D = 0.17 mm.

or

– can be used without cover slip (D = 0 mm) or with cover slip thickness D = 0.17 mm

0 can only be used without a cover slip (D = 0 mm)

Further abbreviations:

HD Reflected light objective for brightfield and darkfield
DIC can be used for Differential Interference Contrast
Pol can be used for polarization contrast
Oil Immersion objective for oil as immersion medium
EC Enhanced Contrast
LD Long distance
i insulated
iHMC improved Hoffman Modulation Contrast
LCI Life Cell Imaging
alpha Aperture > 1.4

Objective magnification color coding:

Color ring on objective	black	brown	red	orange	yellow	green	light blue	dark blue	white
Magnification factor	1.0x; 1.25×	2.5×	4×; 5×	6.3×	10×	16×;20×; 25×; 32×	40×; 50×	63×	100×; 150×

The objective magnification (e.g. 10x) multiplied by the eyepiece magnification (e.g. 10x) and the Optovar magnification (e.g. 1.6x) yields the overall visual magnification: for example: 10 x 10 x 1.6 = 160x.

The numerical aperture x 1000, e.g. 0.20 x 1000 = 200x, is the highest useful magnification. No further detail will be resolved above this limit.

Immersion objectives are fundamentally less sensitive to differences in cover slip thickness.

With immersion objectives, the air between the cover slip and the objective is replaced with a liquid, usually immersion oil.

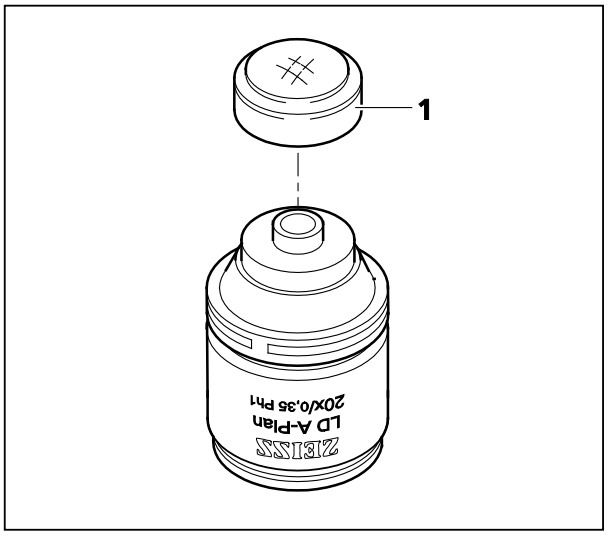


Fig. 81 Working with LD objectives

Using LD objectives

When working with inverted microscopes, vessels are common whose bottom thickness deviates significantly from the usual cover slip thickness of 0.17 mm.

Normally, working distances (a) of objectives with low magnification can bridge these distances without any problem:

- A-Plan 5x / 0.12 a= 10.9 mm (in air)

or

- A-Plan 10x / 0.25 a= 5.3 mm (in air)

However, in the mid-range magnification area these working distances shrink usually to values around or below 1 mm. Such objectives cannot be used for thicker vessel bottoms.

To remedy this deficiency, special LD objectives (Long Distance) can be used. They have a relatively large working distance and at the same time the usual parfocal distance of 45 mm of all other objectives.

Insert the corresponding Coverglass cap 422904-9000-000 (Fig. 81/**1**) onto the objective to adapt LD A-Plan objectives to thin bottoms or cover slips.

Using corr objectives

The exact thickness of the cover slip is important for an excellent image.

For this reason, corr objectives can be adjusted for different cover slip thicknesses using a correction collar.

To do this, select an area of the specimen, and find the correction collar position which produces the optimum focus and image contrast (refocusing will always be necessary).

ATTENTION

The specimen plane must be no more than 2.5 mm above the stage plane to prevent the LD corr objective hitting the underside of the stage.

Specimen with a vessel bottom of 1 mm can be focussed if the vessel is moved using the object guide and mounting frame. Under this condition all objectives can be swiveled through the travel range on the specimen stage without collisions.

Using immersion objectives

With immersion objectives, the air between the cover slip and the objective is replaced with a liquid, the so called immersion oil.

Place a small, bubble-free drop of Immersol 518 N® (for transmitted light applications) or 518 F® (for fluorescence) on the front lens of the objective and insert the culture vessel or specimen with the cover slip pointing towards the objective onto the specimen stage or into the mounting frame.

Then carefully approach the objective and focus.

After each experiment, the immersion oil should be removed from the objective using a soft cloth (possibly with petrolether).

Excessive quantities of immersion oil can get into the mechanical components of inverted microscopes and reduce their functionality.

ATTENTION

Observe the safety instructions for using immersion oil on page 8.

☞ Cleaning instructions can be found in the brochure "The Clean Microscope".

Using autocorr objectives

When using the autocorr objectives, observe the quick start guide "Installation and configuration of autocorr objectives" (420852-7144-001)

Objectives to be used preferably with Axio Observer

☞ Objectives to be used preferably with Axio Observer microscopes can be found on the following website:

www.zeiss.com/objectives

5.4 Brightfield transmitted light microscopy - quick guide

☞ Before starting to work with the microscope, first read the sections 2, 3 and 4.

- Prepare the microscope and switch it on in accordance with section 4 (Fig. 83/**1**).
- Select the objective with the lowest magnification (e.g. objective 10x - yellow ring) on the nosepiece (Fig. 83/**13**); ensure that it clicks into position correctly. Set factor 1x on the selector wheel (Fig. 83/**16**) of the Optovar turret.
- Open the luminous-field diaphragm completely by turning the luminous-field diaphragm control (Fig. 83/**7**) on the carrier for transmitted-light illumination to the left.
- Open the aperture diaphragm completely by rotating the selector wheel on the condenser forwards as far as it will go.
- Turn the condenser turret adjustment ring (Fig. 83/**3**) to move the condenser turret to the **H** position for brightfield (if H is not available, to the **DIC** position).
- Turn the adjustment ring to move the reflector turret (if available) to a position which contains no filter combination. Ensure that it clicks into position correctly.
- If necessary remove the analyzer slider from the slot (Fig. 83/**12**) or move to the open position. Ensure that it clicks into position correctly.
- Turn the sideport selector wheel (Fig. 83/**2**) to the 100 % vis (visual) position.
- Set the beam splitting ratio to 100 % vis (Fig. 83/**20**) on the binocular (photo)tube. Remove the Bertrand lens from the optical path (where used). To do this, move the rotary / sliding button (Fig. 83/**21**) to the 100 % vis position.
- Swivel the 3-position filter changer (Fig. 83/**5**) out of the optical path.
- Place a high-contrast specimen on the microscope stage (Fig. 83/**10**).
- Match the eyepiece distance (interpupillary distance) to the user's individual interpupillary distance: For this purpose, pull apart or push together the binocular component (Fig. 83/**22**) of the tube.
- Set the ametropia correction zero point using the adjustment ring (Fig. 83/**24**) of the eyepieces (Fig. 83/**23**): without eyepiece reticles: set to the white point,
  with eyepiece reticles: set to the red point.
- To correct for ametropia, bring the selected detail of the specimen into optimum focus using the relevant eyepiece adjustment ring.
- Use the coarse / fine focus drive (Fig. 83/**17**) to focus on the selected detail of the specimen. If no light is visible in the eyepieces, check that light is being emitted from the housing of the halogen illuminator. If no light is being emitted, switch on the halogen illuminator by pressing the TL button (Fig. 83/**18**).
- Set the light intensity to a comfortable level by using the illumination control wheel (Fig. 83/**19**).

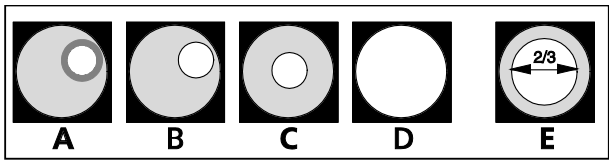


Fig. 82 Diaphragm settings in transmitted light brightfield acc. to KÖHLER

- Close the luminous-field diaphragm (Fig. 83/**7**) until it is visible in the field of view (not necessarily in focus) (Fig. 82/**A**).
- Bring the edge of the luminous-field diaphragm into focus (Fig. 82/**B**) by adjusting the height of the condenser (Fig. 83/**8**).
- Center (Fig. 82/**C**) the luminous-field diaphragm using the centering screws (Fig. 83/**4**) and open until the edge of the diaphragm just disappears from the field of view (Fig. 82/**D**).

- To set the aperture diaphragm, remove one eyepiece from the eyepiece tube and adjust the aperture diaphragm to approximately 2/3 the diameter of the exit pupil of the eyepiece (Fig. 82/**E**).
  The settings required for optimum contrast depend on the specimen.

- Reinsert the eyepiece and where necessary refocus on the specimen using the fine focusing drive.
- Adjust the light intensity using the rocker switch.

☞ The field size and objective aperture change each time the objective is changed, so that for optimal results the luminous-field diaphragm and aperture diaphragm should be readjusted whenever the objective is changed.

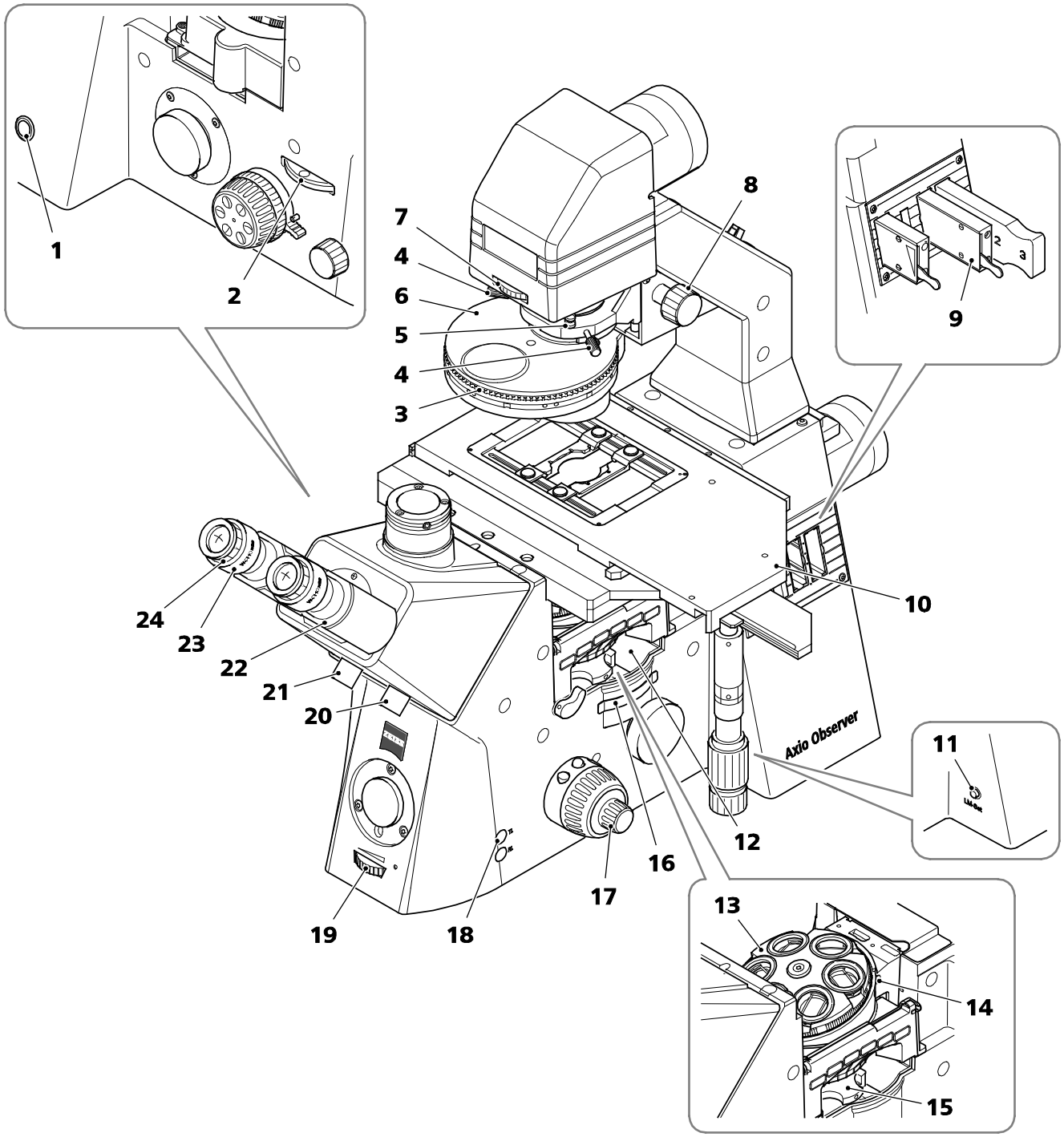


Fig. 83 Axio Observer 5

Key to Fig. 83:

1 On / off switch (3, 3 materials stand), standby button (5, 5 materials stand and 7, 7 materials stand)
2 Sideport selector wheel
3 Condenser turret disk
4 Condenser centering screw
5 Polarizer D with 2-position filter changer
6 Condenser
7 Luminous-field diaphragm knurled wheel
8 Vertical adjustment knob for condenser
9 Slot for iris diaphragm slider and FL attenuator, discrete
10 Microscope stage (with inserted universal mounting frame K)
11 LM-Set button
12 Analyzer slider slot
13 Nosepiece
14 Compensator mount 6x20 (only for materials stands)
15 Reflector turret or dual filter wheel mot.
16 Optovar turret selector wheel
17 Coarse / fine focus drive
18 TL button for switching the LED / halogen illuminator or the reflected light shutter (fluorescence) on and off
19 Control wheel for LED light / halogen illuminator intensity control
20 Rotary / sliding button for vis / doc beam splitting
21 Rotary / sliding button for Bertrand lens and manual shutter
22 Binocular section of the tube
23 Eyepiece
24 Eyepiece focusing ring

5.5 Brightfield reflected light microscopy - quick guide

☞ Before starting to work with the microscope, first read the sections 2, 3 and 4.

- Prepare the microscope and switch it on in accordance with section 4 (Fig. 85/**17**).
- Select the objective with the lowest magnification (e.g. 10x) on the nosepiece (Fig. 85/**5**). Set factor 1x on the selector wheel (Fig. 85/**8**) of the Optovar turret (selector wheel only available on 5 and 5 materials stands).
- Open the aperture diaphragm and luminous-field diaphragm completely; to do this, move the lever of the sliders (Fig. 85/**2**, **3**) upwards to the mechanical stop.
- Swivel in the reflector module **H** for bright field (or **DIC**) on the reflector turret (Fig. 85/**7**) using the adjustment ring.
- If required, remove analyzer slider (in Fig. 85/**18**) or switch to free light path.
- Turn selector wheel for sideport right / left / vis (Fig. 85/**19**) to position 100 % vis (visual ◎).
- Set beam splitting ratio to 100 % vis (Fig. 85/**12**) on the tube. Remove the Bertrand lens from the optical path (where used). Move the rotary / sliding button (Fig. 85/**13**) to the 100 % vis position (⬬).
- Place a high-contrast specimen on the microscope stage (Fig. 85/**1**). Set the binocular section (Fig. 85/**14**).
- Use the coarse / fine focus drive (Fig. 85/**9**) to focus on the selected detail of the specimen. Should no light be visible in the eyepieces, switch on the microLED or HAL 100 illuminator using the RL switch (Fig. 85/**10**).
- Set the light intensity to a comfortable level using the illumination control wheel (Fig. 85/**11**).
- Close luminous-field diaphragm (Fig. 85/**3**) until it is visible (Fig. 84/**A**).

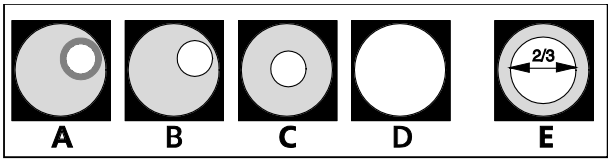


Fig. 84 **Diaphragm settings in reflected light bright field acc. to KÖHLER**

- Use the focus drive (Fig. 85/**9**) to refocus on the edge of the luminous-field diaphragm (Fig. 84/**B**).
- After this, center the luminous-field diaphragm by adjusting both adjusting screws in the slider (Fig. 85/**3**; using a 3 mm ball-headed screwdriver) (Fig. 84/**C**). Then open the luminous-field diaphragm until the edge of the diaphragm just disappears from the field of view (Fig. 84/**D**).
- Remove one eyepiece from the eyepiece tube (or swing in Bertrand lens) and set aperture diaphragm (Fig. 85/**2**) to approx. 70-80% of the diameter of the objective exit pupil (Fig. 84/**E**). The settings required for optimum contrast depend on the specimen.
- Insert the eyepiece again (or swing out Bertrand lens) and refocus, if required, via the fine drive.
- After the microscope has been set to reflected light brightfield in this way, you can now change to the specific contrasting technique (see section 5.12).

☞ If the fully motorized Axio Observer 7 materials stand is used, the motorized components can be operated using the TFT touchscreen display or other buttons (see section 5.11).

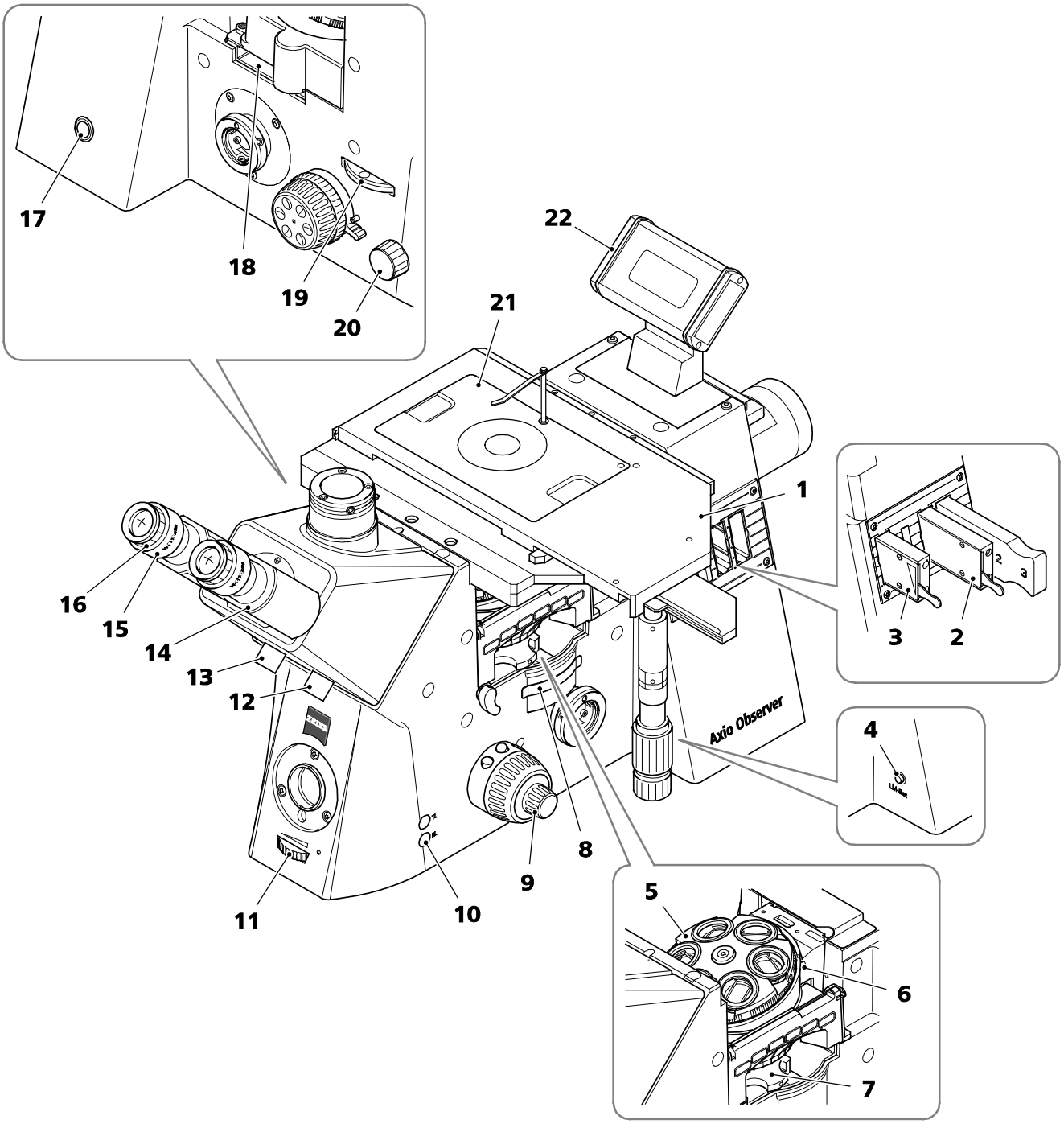


Fig. 85 Axio Observer 5 materials (example)

Key to Fig. 85:

1 Microscope stage
2 Aperture diaphragm slider MAT in slot A
3 Iris diaphragm slider (luminous-field diaphragm) in slot F
4 LM-Set button
5 Nosepiece
6 Compensator mount 6x20
7 Reflector turret
8 Optovar turret selector wheel
9 Coarse / fine focus drive
10 RL button for switching the LED / halogen illuminator or the reflected light shutter (fluorescence) on and off
11 Control wheel for LED light / halogen illuminator intensity control
12 Rotary / sliding button for vis / doc beam splitting
13 Rotary / sliding button for Bertrand lens and manual shutter
14 Binocular section of the tube
15 Eyepiece
16 Eyepiece focusing ring
17 Standby button
18 Analyzer slider slot
19 Sideport selector wheel
20 Light path selector wheel (baseport / vis / frontport)
21 Mounting frame K for reflected light with inserted stage pinhole aperture
22 Holder with LCD display

5.6 Basic settings on Axio Observer 3, 3 materials stand

Light Manager function on Axio Observer 3, 3 materials stand

The Light Manager function can be used both in reflected light (with HAL 100/microLED illuminator) and transmitted light (with HAL 100 or microLED illuminator for transmitted light if the optional transmitted light illumination mount is fitted).

The Light Manager on the Axio Observer 3, 3 materials performs the following functions:

- Pressing the LM-Set button permanently saves the current brightness value of the objective in use, i.e. the last value saved using the LM-set button is set again after switching off the microscope and switching it on again.
- Separate values are stored for reflected and transmitted light.
- A light voltage is stored for each nosepiece position.
- Dazzle protection function when changing the objective.

The default setting for the lamp voltage is 3 V for each objective position.

5.7 Basic settings on Axio Observer 5, 5 materials stand

After switching on, the instrument is initialized. The instrument status is shown on the LCD display.

LCD display during booting of the Axio Observer 5, 5 materials stand:

"Axio Observer 5 or 5 materials", the ZEISS logo and the status "Loading" are displayed while the instrument is booting.

5.7.1 Configuring of 5, 5 materials stand

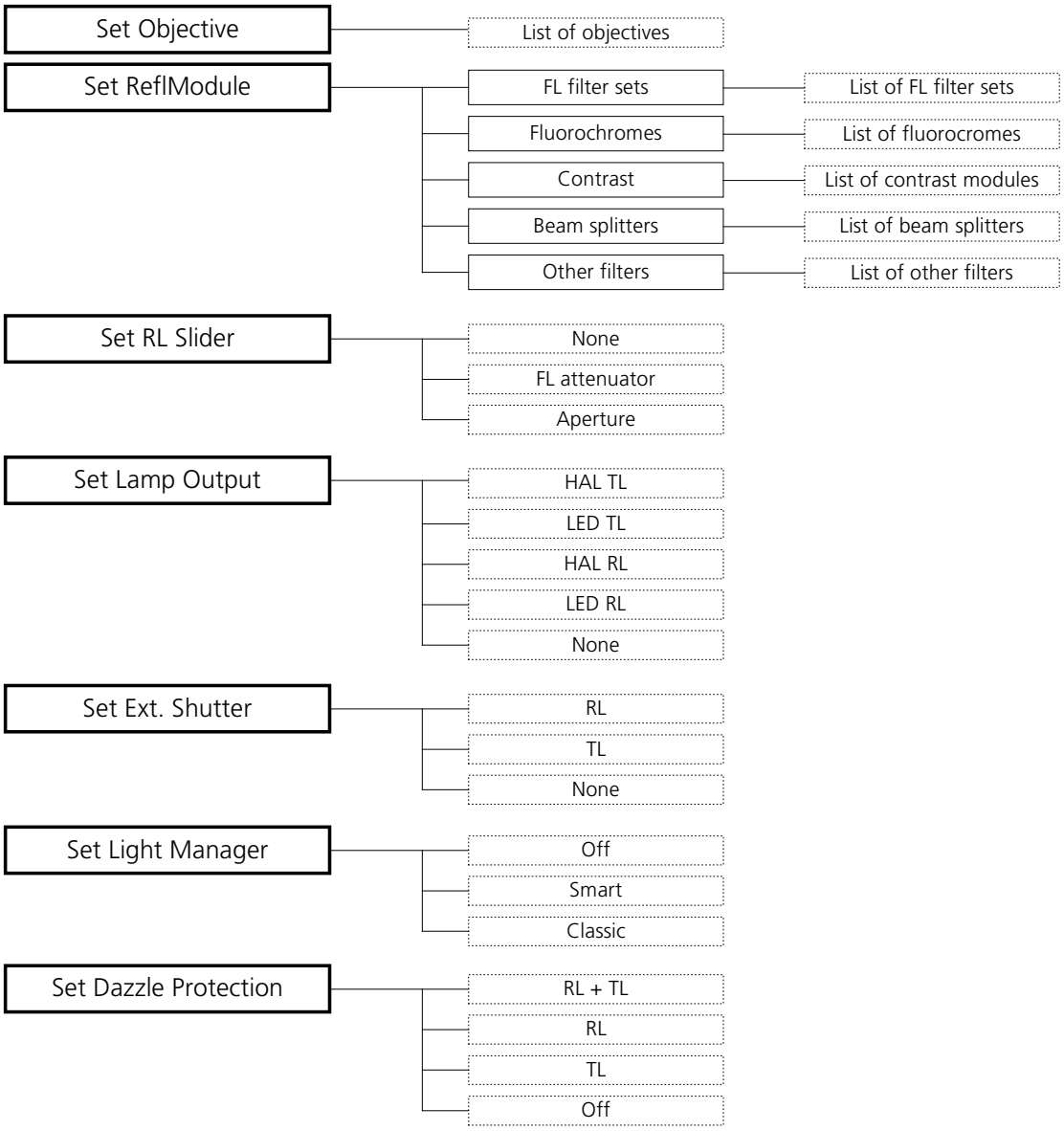


Fig. 86 Structure of configuration menu

Pressing and holding down the LM set button for > 2 s will activate configuration mode with the following menu options:

- Set Objective (nosepiece)
- Set ReflModule (reflector turret)
- Set RL Slider (A) (slider for the reflected light illuminator aperture)
- Set Lamp Output (illuminator power)
- Set Ext. Shutter
- Set Light Manager
- Set Dazzle Protection

Two beeps indicates that the system has switched to configuration mode.

The **first** line of the LCD display shows the selected menu. If a component (e.g. the reflector turret) is not available (cannot be configured), the relevant menu (e.g. Set ReflModule) will not be displayed. The current component position is shown on the right next to the menu designation (position number of the nosepiece or reflector turret).

Press the LM-Set button briefly (< 1 s, no beep) to switch to the next menu (loop).

The **second** line shows any available submenus.

The submenus can be selected using the TL and RL buttons. TL - next submenu; RL - previous submenu.

The **third** line shows the selected menu / submenu item. The **fourth** line shows the next item on the menu / submenu. For objectives, the fourth line shows the magnification, aperture and contrast technique of the selected objective.

The illumination intensity control wheel can be used to scroll through the menu. Rotating the control wheel to the right scrolls forwards, to the left backwards, through the menu. The currently selected item is indicated with an arrow (>).

During configuration, when a position (nosepiece and reflector turret) or a setting is changed, the settings are saved temporarily in RAM. Changes are only saved permanently when the user exits configuration mode. Some changes require the system to be reset before taking effect.

To exit configuration mode, press and hold the LM set button for at least 2 s. Two beeps indicates that the system is exiting configuration mode. The LCD display returns to status display mode.

5.7.2 Options during operation (when the status display is active)

The brightness of the LCD display can be adjusted by holding the RL button and rotating the illumination intensity control wheel.

The LCD display background lighting is turned on or off by pressing the RL button (> 1 s). A low lighting level or no LCD background lighting can be useful for difficult fluorescence experiments with low emission intensities.

Pressing and holding the TL button for at least 1 s automatically sets the lamp voltage to the value for 3200 K (ideal for assessing colored specimens).

If a motorized condenser is connected, pressing the single button on the control ring (focus drive, right side) and pressing either of the buttons on the condenser will display the condenser status.

To save the current illumination intensity of the halogen illuminator in Light Manager, press the LM-Set button briefly. The message "Saving Light Manager Values" will be displayed on the monitor and an acoustic signal will be emitted. Prerequisite: CLASSIC or SMART Light Managers have been activated (see following section).

☞ If you first press the TL button and then briefly press the RL button, the instrument will automatically set all necessary components (halogen lamp, all shutters, condensers and reflector turret) for you to see a brightfield image in the eyepieces. This is useful if no image or light is currently available and you do not know which component has been incorrectly set.

5.8 Light Manager on the Axio Observer 3, 3 materials

The Light Manager function can be used both in reflected and transmitted light.

The Light Manager performs the following functions:

- Pressing the **LM-Set** button permanently saves the current brightness value of the objective in use, i.e. the last value saved using the **LM-Set** button is set again after switching off the microscope and switching it on again.
- Separate values are stored for reflected and transmitted light.
  - **TL/RL** toggle switch is on **RL** for reflected light:
    A brightness value is stored for each nosepiece position.
  - **TL/RL** toggle switch is on **TL** for transmitted light:
    A brightness value is stored for each nosepiece position.
- Dazzle protection function when changing the objective.
- The default setting for the lamp voltage is 3 V for each objective position.

USB/CAN interface on Axio Observer 3, 3 materials stand for PC connection

After connecting a PC via the USB interface the following functions can be used via the software programs AxioVision and ZEN (blue edition, core edition) which are installed on the PC:

- Reading of nosepiece positions (position 1 to 6 of coded nosepiece)
- Adjusting the brightness
- Switching the Light Manager on and off including dazzle protection
- Identifying reflected and transmitted light

5.9 Light Manager on Axio Observer 5, 5 materials, and 7, 7 materials stands

The purpose of Light Manager is to generate specimen-dependent optimum illumination settings for the various contrast techniques and magnifications used, and to save these temporarily or permanently so that the user is able to reproduce these settings.

The Light Manager has three operating modes: OFF, CLASSIC and SMART. The precise function of each mode depends on certain optional stand components. Use of the Light Manager on both stand types (5, 5 materials, 7, 7 materials) requires a coded or motorized nosepiece to be used. This allows the stand electronics to detect when the nosepiece is rotated into a new position.

The Light Manager is available for transmitted light contrast techniques (brightfield, phase contrast, DIC) and for reflected light fluorescent contrast techniques.

When using reflected light, the motorized FL attenuator (where used) will be included in the Light Manager function.

The Light Manager is activated (CLASSIC or SMART) or deactivated (OFF) when the microscope is switched on, depending on the configuration.

In transmitted light, the following parameters are saved for each nosepiece position (a motorized condenser is required):

- three light intensities (brightness values) for brightfield, phase and DIC contrast techniques (different phase stops and DIC prisms are not registered) and
- for brightfield and DIC, the aperture diaphragm

On reflected light on bio /med stands, the Light Manager operates in SMART mode in precisely the same way as in CLASSIC mode. In reflected light, the Light Manager can only be used with the motorized FL attenuator (not with the iris diaphragm slider).

The current FL attenuator settings are saved for each reflector position. Once the reflector turret has been moved through all positions, the parameters can be permanently saved by pressing the LM-Set button. Temporary changes can also be made.

☞ **Important:**
Changes will only be correctly saved to the temporary memory and subsequently successfully saved permanently if the relevant shutter is open.
The Light Manager only works if all the components involved are correctly configured.

The temporary memory is cleared when the microscope is switched off.

5.9.1 Light Manager mode: OFF

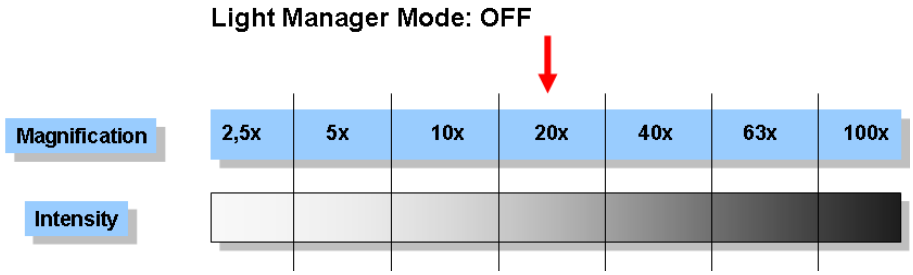


Fig. 87 Illumination intensity when looking into the eyepieces, if only the objective is to be changed (assuming 20x).

If the Light Manager is switched off, the microscope operates like a conventional light microscope.

Starting from a selected magnification and an appropriate lamp voltage, the user must readjust the voltage manually to obtain a comparable brightness with a higher or lower magnification.

5.9.2 Light Manager mode: CLASSIC

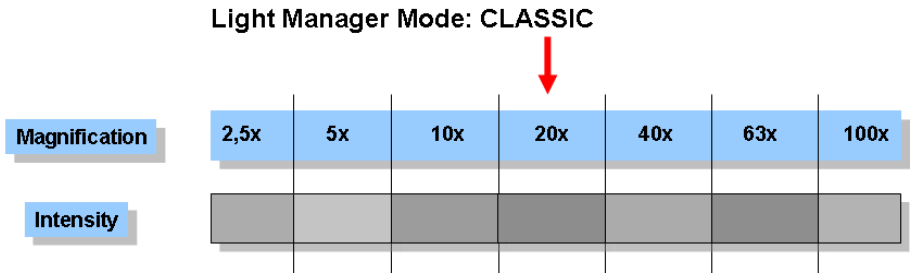


Fig. 88 Illumination intensity when looking into the eyepieces, if only the objective is to be changed (assuming 20x). The Light Manager settings for each objective have been saved previously.

If the Light Manager is being used in CLASSIC mode, the user can select his or her own optimum illumination settings for each magnification (each combination of objective and Optovar).

The illumination must be set for all contrast techniques used (H, PH, DIC) for each objective.

The relevant values are automatically stored in Light Manager's temporary memory when the objective is changed.

To save the settings permanently (thereby permitting them to be accessed after the microscope has been switched off), press the LM-Set button on the right of the stand before switching off the microscope. A beep will be emitted to confirm that the settings have been permanently saved. This will be followed approximately 3 seconds later by a second beep. It is now safe to switch off the microscope.

Permanently saved settings can be changed temporarily during a session. If these settings are not saved permanently by pressing the LM-Set button, they will be discarded when the microscope is switched off. When the microscope is switched back on, the permanent settings will be restored.

5.9.3 Light Manager mode: SMART

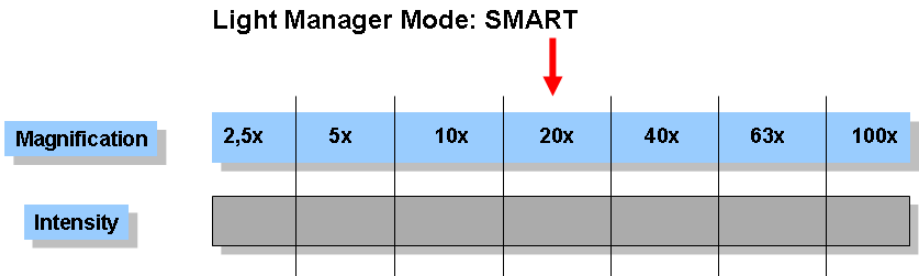


Fig. 89 Illumination intensity when looking into the eyepieces, if only the objective is to be changed (assuming 20x). Settings for one objective have been saved previously.

In SMART mode, the Light Manager automatically calculates the optimum brightness for all objectives configured using the LCD or TFT display (or MTB 2011) for a given contrast technique.

For a given contrast technique: when the illumination intensity is changed for one objective, the correct illumination intensity will be calculated for all other objectives based on the magnification. This will then be adjusted when the objective is changed.

The Optovar turret, if used, will also be considered in the brightness calculation.

As in CLASSIC mode, the illumination values can be permanently saved by pressing the LM-Set button on the right side of the stand. Permanently saved settings can be changed temporarily during a session.

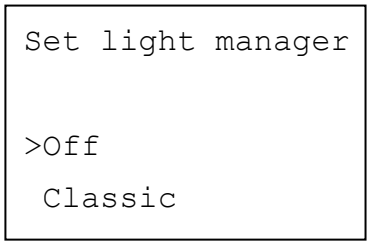


Fig. 90 Selecting the Light Manager mode

5.9.4 Selecting the Light Manager mode on 5, 5 materials stand

The light manager mode is selected on the 5, 5 materials stand using the LCD display.

- Select configuration mode by pressing and holding the LM-Set button for > 2 s. Two beeps indicates that the system has switched to configuration mode.
- Select the **Set Light Manager** menu, to set the Light Manager mode by pressing the LM-Set button briefly (< 1 s, no beep).

The current menu is displayed on the first line of the LCD display (Fig. 90).

The third line, marked with an arrow (>), shows the current setting, the fourth line the next selectable setting.

- Rotate the illumination intensity control wheel until the required mode is displayed on the line marked with an arrow.
- Exit configuration mode by pressing and holding the LM-Set button for > 2 s. Two beeps indicates that the system is exiting configuration mode.

5.9.5 Selecting and configuring Light Manager mode on the 7, 7 materials stand

- The Light Manager can be deactivated or activated in the selected mode by pressing either **Off**, **Classic** or **Smart**.
- If temporary Light Manager values must be reset to the last settings made using the LM-Set button, press the **User defined** button. The temporary settings are discarded and the permanently saved settings are set as active.
- Press the **Default** button if the manufacturer's default settings are to be used instead. The default values will be loaded, written to the temporary memory and set as active. If standard settings are to be permanently used, they must be written to the permanent memory by pressing the LM-Set button. It is not possible to overwrite the manufacturer's default settings.

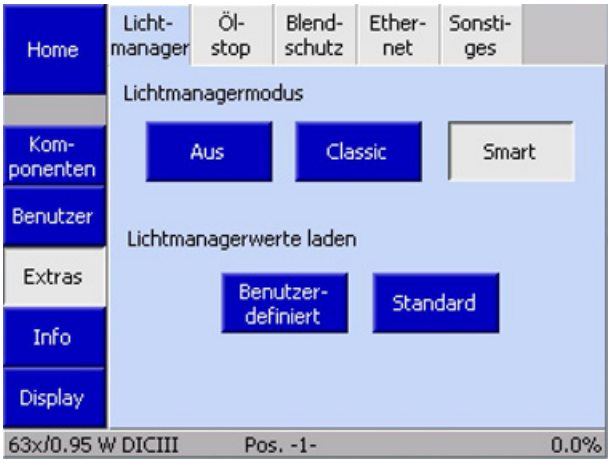


Fig. 91 **Selecting and configuring Light Manager mode**

5.10 Contrast Manager on the Axio Observer 7, 7 materials

The Contrast Manager is only available on the 7, 7 materials stand.

It is used for rapid switching between contrast techniques and for configuring mixed contrasts. This facilitates the finding of contrasted cells and the allocation of fluorescence signals to a particular position in the cell.

When a new objective is moved into the optical path, all necessary settings for the contrast technique used will be applied. This includes both shutter settings and the position of the condenser turret.

If, for example, the user is working with phase contrast, the condenser turret position with the phase stop for the current objective will automatically be moved into the optical path. The shutter positions will be retained.

Using the Contrast Manager's buttons (FL, BF, PH, DIC), it is possible to combine contrast techniques as required, e.g.: brightfield, phase contrast,or DIC with fluorescence.

5.11 TFT display touchscreen on the Axio Observer 7, 7 materials

5.11.1 Screen layout

On the motorized Axio Observer, the user can operate and configure the microscope and utilize optional functions using the TFT display. The TFT display is designed as a touch-sensitive screen.

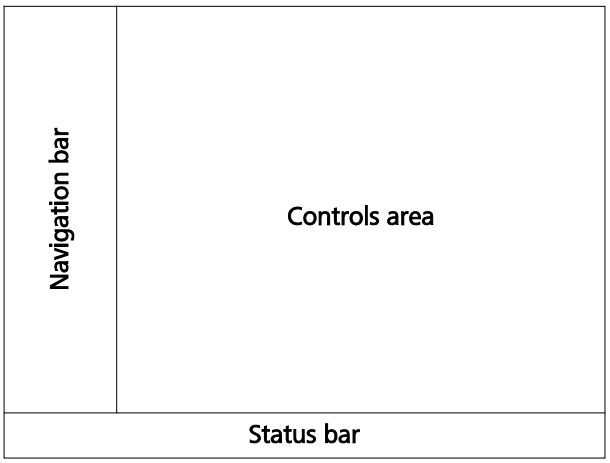


Fig. 92 Main TFT display areas

The controls and information displays are arranged on a series of tabs. A page on the TFT display is generally split into the following main areas (see Fig. 92).

5.11.1.1 Navigation bar

The navigation bar, on the left side of the screen, contains buttons for navigating between pages. The buttons displayed depend on the current page. The following buttons are available on all pages:

- **Home** Calls up the home page
- **Display** Calls up the display page

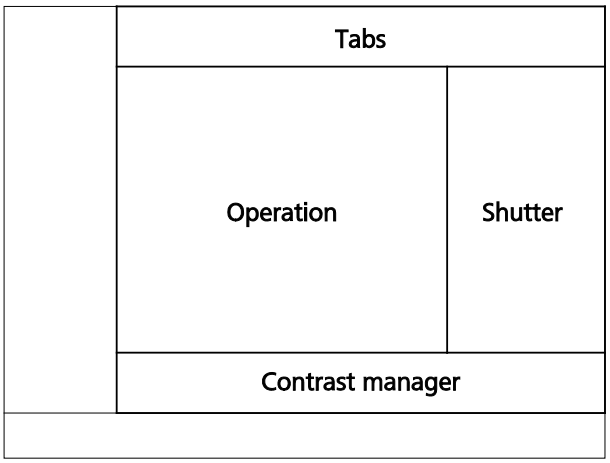


Fig. 93 Controls area of the TFT display

5.11.1.2 Status bar

The status bar at the bottom of the screen displays information on the current settings of the microscope.

5.11.1.3 Controls area

The controls area is subdivided into further subsections (see Fig. 93):

- Tabs
- Illumination/shutter
- Operation
- Contrast manager
- Pop-up windows

(1) Tabs

Tabs are used to select subsidiary functions. These are displayed in the *controls* area. A maximum of six tabs are available per page.

(2) Illumination/shutter

The RL shutter button for reflected light and TL shutter button for transmitted light are displayed on the right side of the controls area. For transmitted light, the shutter is switched according to configuration. The **Off** and **On** buttons function as switches, i.e. the shutter in the optical path of the microscope is either open or closed.

(3) Operation

This area contains controls relevant to the option selected on the navigation bar and the selected tab.

(4) Contrast Manager

At the bottom of the controls area, there is a bar on which are displayed buttons for selecting the contrast technique. The contrast techniques available depend on the current microscope configuration. The following contrast techniques may be available:

Abbr.	Procedure
FL	Fluorescence
BF	Brightfield
PH	Phase contrast
DIC	Differential interference contrast

☞ The contrast techniques arise from the interaction between the condenser, reflector turret, shutter positions and other parameters. The current contrast technique is displayed on the TFT display. No contrast technique is displayed for manual settings (e.g. empty reflector turret position with open RL shutter).

(5) Pop-up windows

Pop-up windows are displayed in order to:

- prompt the operator for additional entries. The user must make a selection (e.g. adjust the configuration after initialization, enter values, etc.)
- display error messages or special information. Some messages require the user to acknowledge the message by pressing **Close**
- display the operating status (waiting time). These windows close automatically

☞ When a pop-up window is open, it is not possible to operate the page underneath.

5.11.2 Menu overview

☞ The menu overview shown below may differ from the available menus for your microscope configuration. It represents all possible menu options including optional components and menu items which are accessible only if the user has administrator privileges. (Any user not logged in as an administrator has only read privileges).

☞ The **Microscope -> Control** page has different tabs depending on the stand type (**Bio / Med** or **MAT**) set under **Settings -> User -> Stand type** (see page 140). The menu overview below shows both versions.

The *first level* buttons shown on the extreme left are displayed on the navigation bar (Fig. 94). Press **Microscope**, **Settings** or **Display** to change the buttons displayed on the navigation bar.

The buttons on the *second level* of the navigation bar call up the corresponding tabs. Touching the tabs causes the corresponding buttons to be displayed on the controls area.

All operating functions are exclusively displayed in the *Controls area* (*third level*) (see page 114) or in a *Pop-up windows* (see page 115). They are not displayed in the status bar.

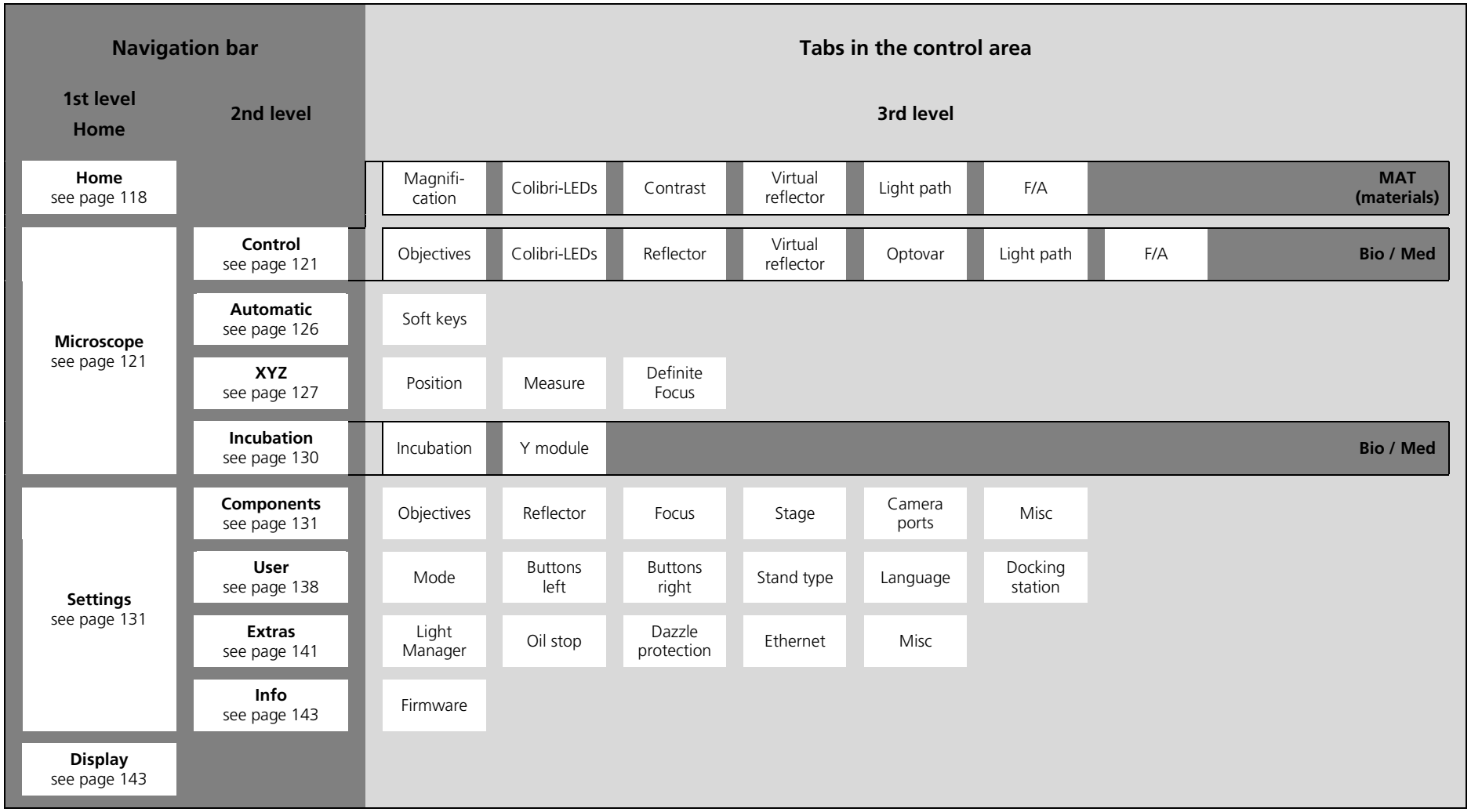


Fig. 94 Menu overview

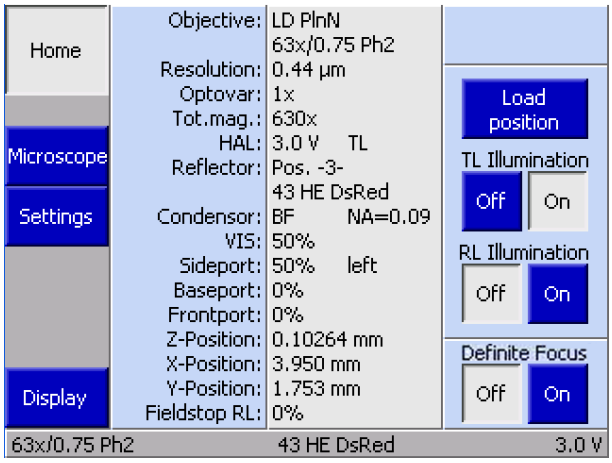


Fig. 95 **Home page, typical for a Bio / Med stand type**

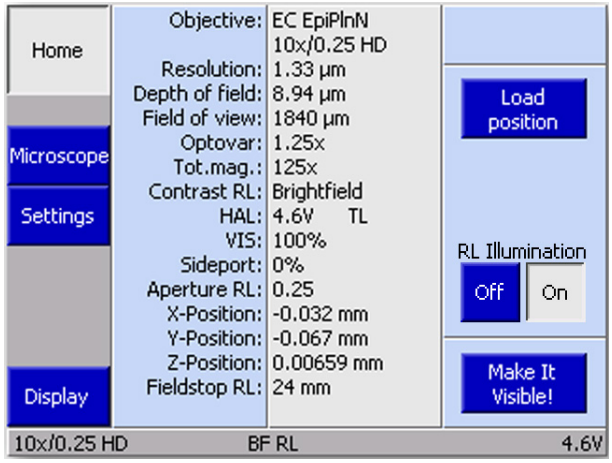


Fig. 96 **Home page, typical for a MAT stand type**

5.11.3 Home page

After switching on, the microscope is initialized. This process takes a few seconds. Under normal circumstances, the **Home page** (Fig. 95 or Fig. 96) will then be displayed.

☞ If any coded or motorized microscope components have been changed or removed while the microscope was switched off, the new components will require configuration after switching on (see also section 5.11.9).

All menu pages can be accessed using the buttons on the navigation bar on the left.

The middle section of the controls area displays the configuration. All coded and motorized control elements which are recognized during initialization are shown in the status field, otherwise the "-" character will be displayed.

The control elements are arranged from top to bottom according to their significance.

The following controls are displayed on the right side:

Load position button

When the Load position button is pressed, the nosepiece moves to the load position. Nosepiece movement can be interrupted by pressing **Stop** (Fig. 98). Once the loading position as been reached, the **Load position** pop-up window (Fig. 97) containing the following controls appears:

Moves the nosepiece back to the working position.

Moves the nosepiece upwards towards the working position until the button is released.

Moves the nosepiece downwards until the button is released (up to nosepiece limit stop).

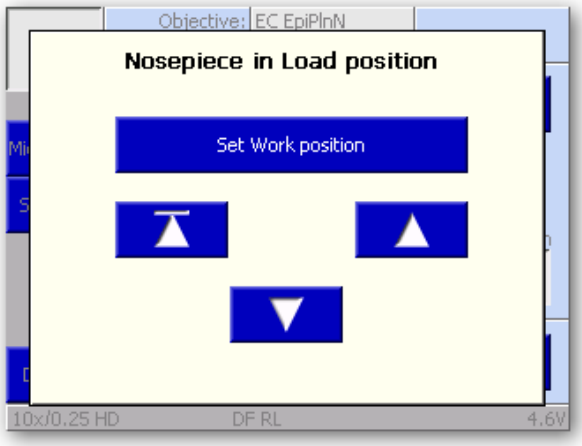


Fig. 97 Nosepiece in load position

Fig. 98 STOP button

When the focusing drive is used in a regular way, a pop-up window (Fig. 99) will appear as soon as the upper or lower limit stop is reached.

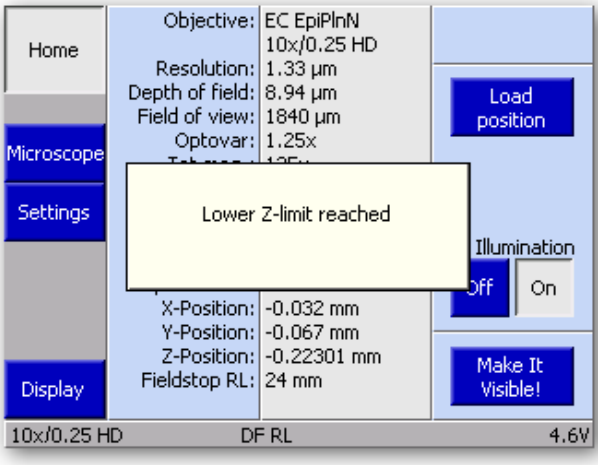


Fig. 99 Motorized focus drive reaches limit switch

TL / RL illumination switch

The **Off** and **On** switches open or close the shutter for reflected light (RL) and transmitted light (TL) or switch the illuminators on and off.

Definite Focus switch

The **Off** and **On** switches switch Definite Focus on and off.

☞ If the system does not have Definite Focus, the Make it visible! Button will appear in place of the Off and On switch.

Make it visible! button

If the microscope is so poorly adjusted that no image of the specimen is visible, this button can be used to reset the microscope to a standard state in which the specimen is visible.

The following settings are adapted in this basic state:

Bio / Med stand:

- transmitted light illuminator is set to medium brightness (3 V)
- aperture diaphragm is opened
- TL shutter open, RL shutter closed
- Motorized condenser is switched to brightfield
- reflector turret is rotated to the nearest brightfield position
- Light path switching is set to 100 % vis

MAT (materials) stand:

- Reflected light illuminator (HAL 100 or LED) set to medium brightness
- TL shutter closed
- RL shutter opened
- Reflector turret in brightfield reflected light position (alternatively contrast module)
- reflected light luminous-field diaphragm opened
- reflected light aperture diaphragm opened
- Optovar turret in position 1: Optovar 1x
- Sideport in position 1 (100% vis)
- Baseport in position 2 (100% vis)

The nosepiece position (and, if entered, the objective) will be shown on the left of the status bar, the halogen illuminator voltage on the right.

5.11.4 Microscope

Pressing **Microscope** on the navigation bar of the **Home** page brings up the **Microscope** page.

The **Control**, **Automatic**, **XYZ** and **Incubation** pages are available from the **Microscope** page.

Different tabs will be displayed on the **Microscope -> Control** page depending on the stand type selected (**Bio / Med** or **MAT**) in **Settings -> User -> Stand type** (see page 140).

5.11.5 Microscope -> Control

The **Microscope -> Control** page can contain the following tabs depending on the optional configurable motorized components.

- Objectives (only Bio / Med stands)
- Colibri-LEDs
- Reflector
- Virtual reflector
- Optovar (only Bio / Med stands)
- Light path
- F/A
- Magnification (only materials type stands)
- Contrast (only materials type stands)

5.11.5.1 Objectives

For objective positions which have already been configured, the magnification and, where applicable, the following additional information is displayed:

Oil	Oil immersion objective
W	Water immersion objective
Imm	Immersions

- To move an objective into the optical path, touch the button for that objective.

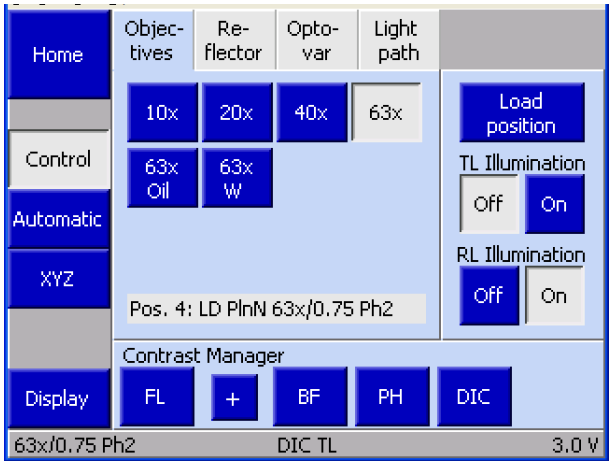


Fig. 100 Microscope -> Control -> Objectives page

☞ If an Auto immersion module is installed on the microscope and a water objective is swiveled in, the Immersion bar will be displayed on the TFT display showing the four buttons **Create**, **Renew**, **Setup** and **Prime** for auto immersion. Instructions for the use of auto immersion are to be found in the Quick Reference Guide Auto Immersion Module (433801-7044-001).

If the Light Manager is active, the brightness will be readjusted automatically when the objective is changed.

If a contrast technique was set in the Contrast Manager before changing the objective, this will automatically adapt the process to the new objective (i.e. the condenser and reflector turret positions may change - contrast adjustment). If the contrast technique is not available for the objective, the system will switch to brightfield.

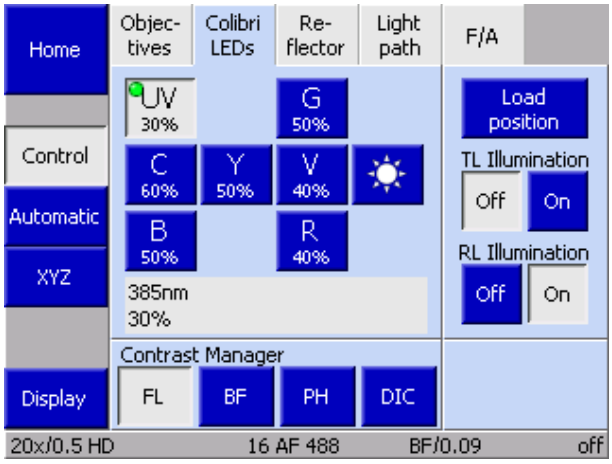


Fig. 101 Microscope -> Control -> Colibri LEDs page

5.11.5.2 Colibri LEDs

Instructions for the use of Colibri LEDs are to be found in the separate operating manual Colibri 7 (423052-7344-001).

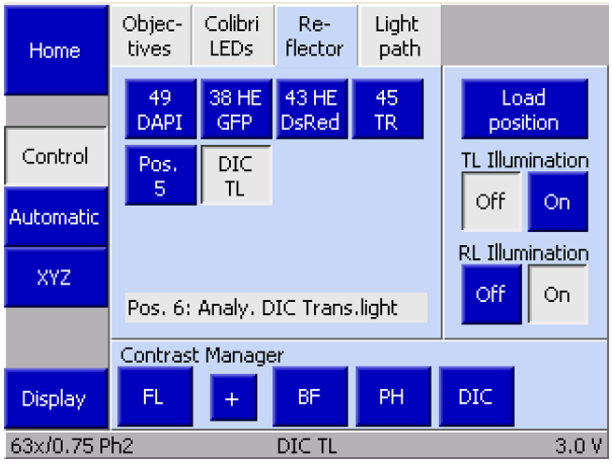


Fig. 102 Microscope -> Control -> Reflector page

5.11.5.3 Reflector

☞ This tab will not be available if no motorized reflector turret is installed. The active reflector module will only be displayed on the status page (Fig. 95).

Up to six controls can be displayed for reflector positions 1 to 6 depending on the reflector turret mounted. Reflector modules which have already been configured are identified by the description on the button.

- To swivel in the desired reflector module, press the relevant button.

5.11.5.4 Virt. Reflector

Instructions for the virtual reflector wheel can be found in the separate Quick Reference Guide for the filter wheel excitation 8-pos. mot. and dual filter wheel mot. (452358-7044-001).

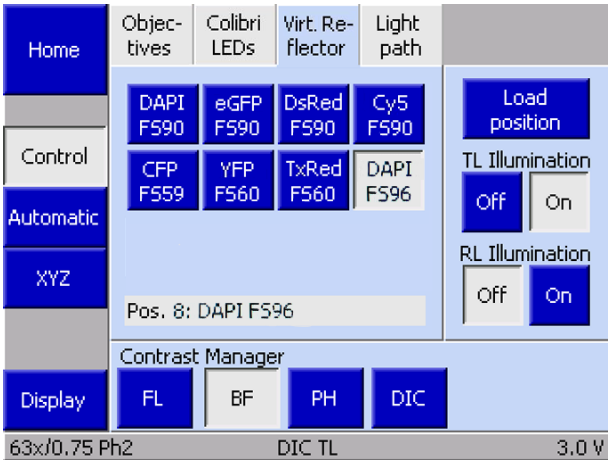


Fig. 103 Microscope -> Control -> Virt. Reflector page

5.11.5.5 Optovar

☞ This tab will not be displayed if there is no motorized Optovar turret installed.

If an equipped Optovar turret is fitted, the available magnifications are displayed.

- Touch the button for the Optovar required to move it into the optical path.

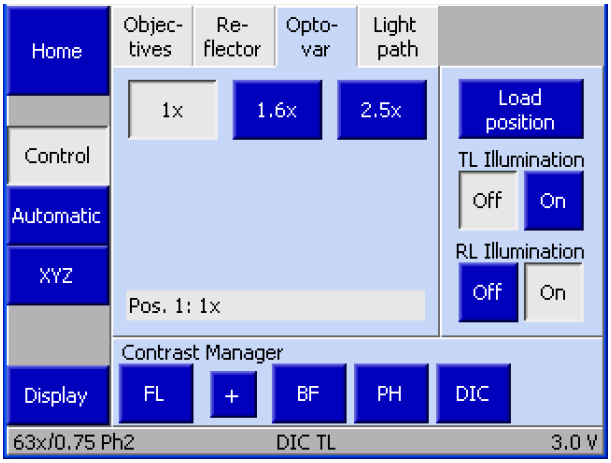


Fig. 104 Microscope -> Control -> Optovar page

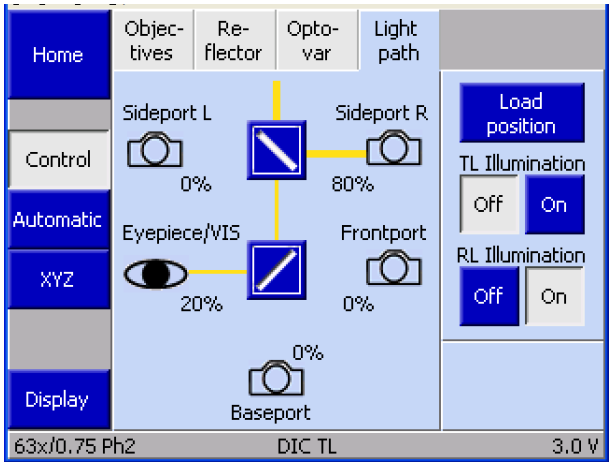


Fig. 105 **Microscope -> Control -> Light path page**

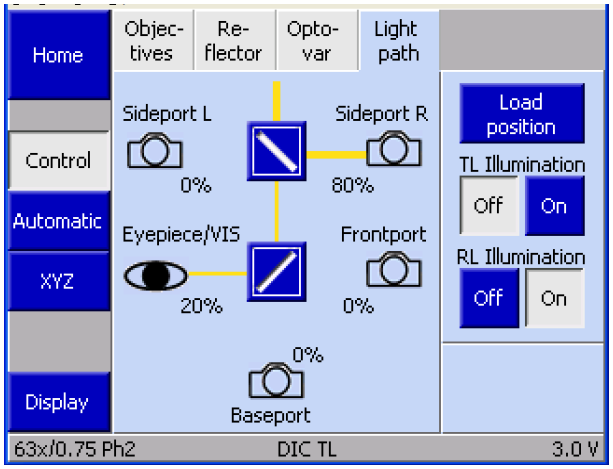


Fig. 106 **Light path, two active mirrors, light paths in yellow**

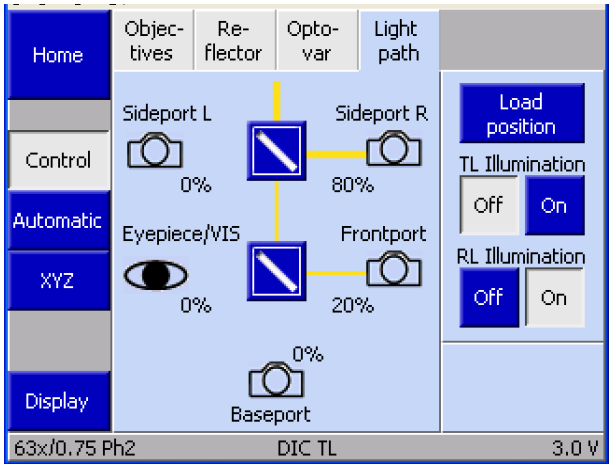


Fig. 107 **Light path, eyepiece/VIS active**

5.11.5.6 Light path

Below the **Light Path** tab, the light path of the microscope is displayed schematically.

The following controls are available:

Active beam splitter: pressing this button switches through the available splitting ratios.

The diagram shown, or similar, is displayed in the operating section to represent the light path. The configuration is determined during initialization of the microscope.

Two mirrors (sideport, frontport/baseport) are active.

The active light paths are shown in yellow. The width of the active light paths is a function of the amount of light transmitted.

Pressing one of the icons (e.g. **Eyepiece/VIS**) will cause the maximum possible amount of light to be transmitted to this item.

5.11.5.7 F/A (luminous-field diaphragm/aperture diaphragm)

The **F/A** tab is used to configure the motorized iris diaphragm slider for luminous-field diaphragm (field stop) and the aperture stop.

The aperture is controlled using the arrow buttons. The current value is shown below the bar display.

The **Prev.** and **Max.** buttons reset the stops to the previous and maximum values respectively.

If a motorized FL attenuator is fitted, it cannot be set via the TFT display. The lower aperture diaphragm display is then not available.

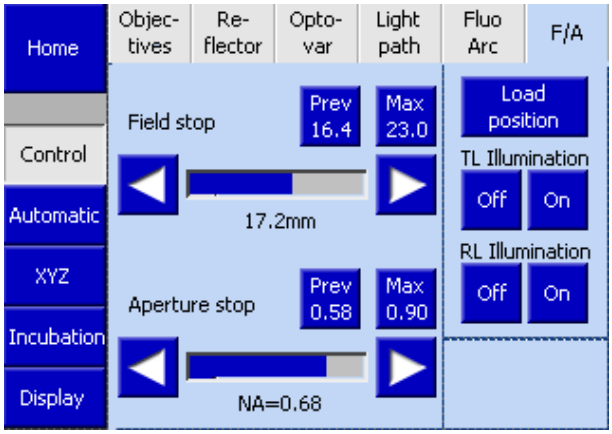


Fig. 108 Microscope -> Control -> F/A page

5.11.5.8 Magnification

For objective and / or Optovar positions which have already been configured, the magnification and, where applicable, the following additional information is displayed:

Oil Oil immersion objective

If an equipped Optovar turret is fitted, the available magnifications are displayed.

- Touch the button for the Optovar required to move it into the optical path.
- To move an objective / Optovar into the optical path, press the button for that objective.

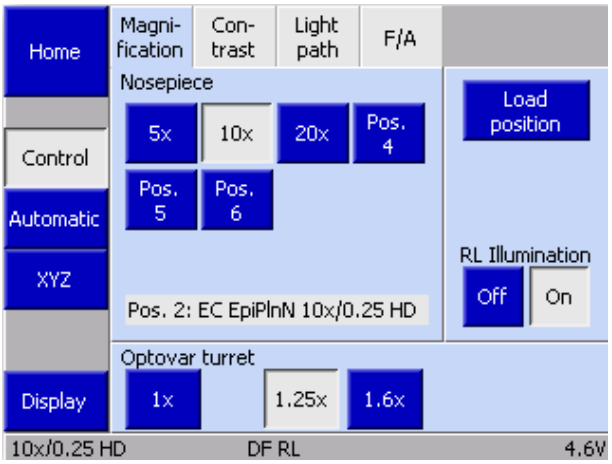


Fig. 109 Microscope -> Control -> Magnification page

☞ This tab will not be displayed if there is no motorized Optovar turret installed.

If the Light Manager is active, the brightness will be readjusted automatically when the objective is changed.

If a contrast technique was set in the Contrast Manager before changing the objective, this will automatically adapt the process to the new objective (i.e. the reflector and condenser turret positions may change - contrast adjustment). If the contrast technique is not available for the objective, the system will switch to brightfield.

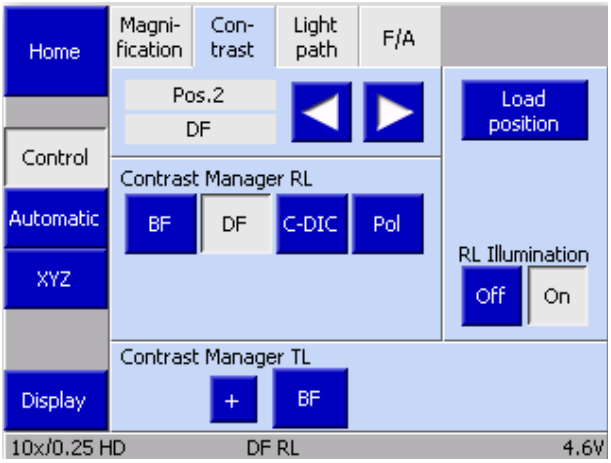


Fig. 110 Microscope -> Control -> Contrast page

5.11.5.9 Contrast

☞ This tab will not be displayed if there is no motorized reflector turret installed. The active reflector module will only be displayed on the status page (Fig. 96).

Depending on the reflector modules configured, up to six controls for reflector positions 1 to 6 will be displayed.

- To swivel in the desired reflector module, press the relevant button.
- To switch back or forth press the ◀ or ▶ button.

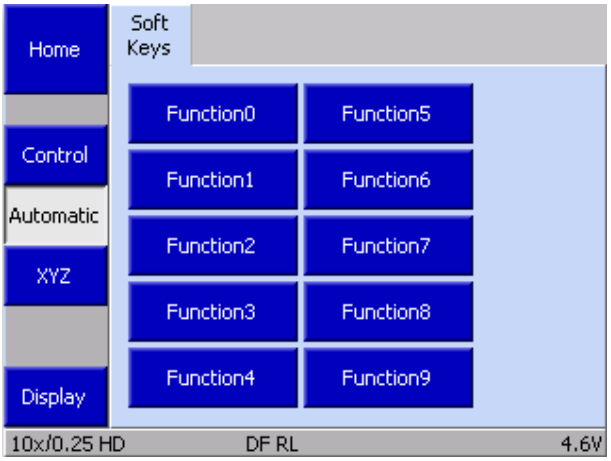


Fig. 111 Microscope -> Automatic -> Soft keys page

5.11.6 Microscope -> Automatic

5.11.6.1 Soft keys

This tab is used to access hardware which have been previously generated, named and made available using the AxioVision software program.

These scripts are activated by touching the relevant button on the TFT screen.

5.11.7 Microscope -> XYZ

☞ The display of the **XYZ** page depends on the microscope stage used.

- Motorized stages (only CAN bus stages directly connected to 7, 7 materials stands):
- Manual stage:
  Z focus drive settings only (no XY controls are available), **Measure** tab is not available
- Manual stage / manual Z focus drive:
  XYZ page is not available

☞ The system detects whether a motorized stage is installed during microscope initialization. The stage should therefore only be changed when the microscope is switched off.

The **Microscope -> XYZ** page contains the tabs **Position**, **Measure** and **Definite Focus**.

5.11.7.1 Position

The controls area of the **Position** tab is divided into three blocks.

☞ If you are not using a motorized stage, the XY controls are replaced by a **Start** button (see the following section *(2) Measure*).

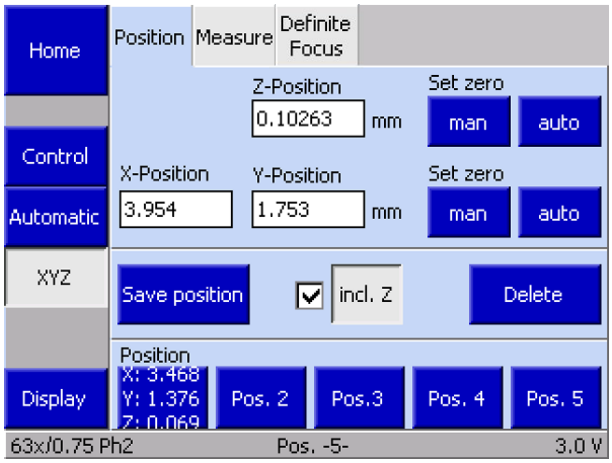


Fig. 112 Microscope -> XYZ -> Position page

(1) Current position display / Set zero

The current Z, X and Y positions are displayed in millimeters (mm).

☞ The Z position displays the height of the nosepiece position. The X and Y positions display the stage position.

The two **Set Zero** buttons function for XY and Z as follows:

man	*Manually* sets the zero point. The current position is defined as the zero point and the display is set to zero.
auto	*Automatically* sets the zero point. The stage / nosepiece moves to the end position which has been defined as the zero point. The display is then set to zero.
Unit	Selects unit [mm] or [inch]

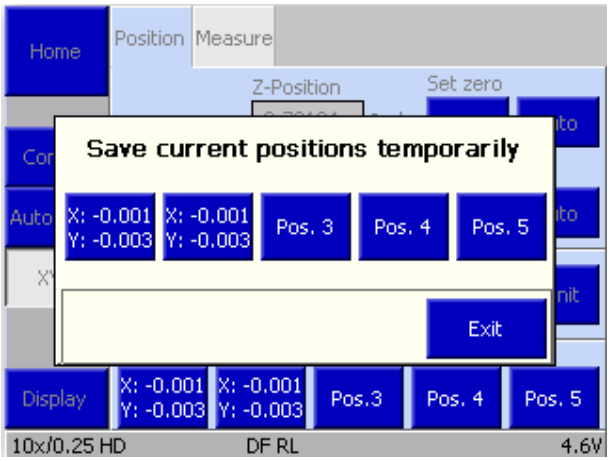


Fig. 113 Microscope -> XYZ -> Save positions page

(2) Save position

The **Save position** button is used to define coordinate positions for the five position buttons. To define a position proceed as follows:

- Move to the desired XYZ position.
- If you wish to save the Z value, activate the **incl. Z** checkbox.
- Press the **Save Position** button. The **Save current positions temporarily** window will pop up.

The window contains five buttons: **Pos.1** to **Pos.5**. If coordinates have already been assigned to a button, the XYZ values will be displayed, otherwise the position number will be displayed.

- Save the current position by touching one of the position buttons. If coordinates have already been assigned to this button, you will be asked to confirm that you wish to overwrite them.
- Close the window by pressing **Exit**.
- To delete a set of coordinates, press **Delete**, select the position button and confirm by pressing **Yes**.

(3) Moving to a saved position

There are five buttons in the lower Position area of the screen. Press a button to move to the saved coordinate position. For details of how to save coordinates, see *(2) Save Position* above.

5.11.7.2 Measure

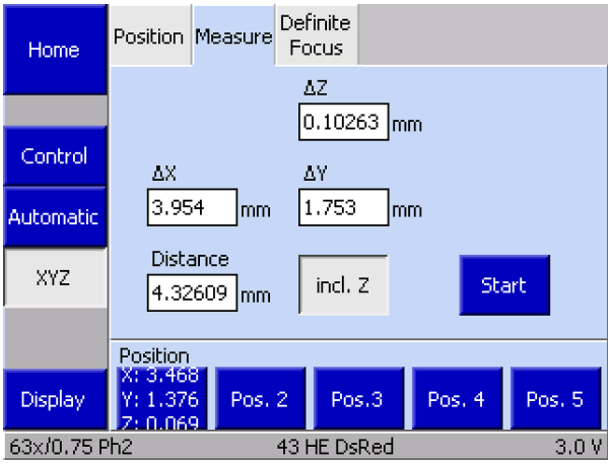


Fig. 114 Microscope -> XYZ -> Measure page

☞ This tab is only accessible if a motorized (CAN bus) stage is used. Otherwise, the **Start** button and a display for the Z-distance ΔZ are displayed on the **Position** tab.

The **Measure** tab can be used to perform simple distance measurements in millimeters (mm). Three options are available for these measurements:

- Distance between two manually set positions
- Distance between a manually set position and a defined position
- Distance between two defined positions

☞ If the Z distance shall be measured, activate the **incl. Z** button.

- Move the stage to the initial position.
- Press the **Start** button. On doing so, the display fields ΔX, ΔY and ΔZ will be set to zero.

All stage movements are displayed in the ΔX, ΔY and ΔZ fields.

The function of the position buttons is described under *(1) Position* above.

5.11.7.3 Definite Focus

The **Definite Focus** tab can be used to switch on or off the focus stabilization of the Definite Focus function using the **On** and **Off** buttons in the **Stabilization** field.

The **Current position** field displays the current coordinates.

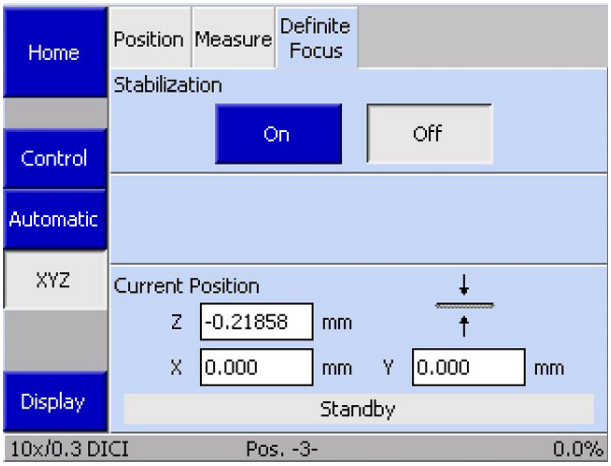


Fig. 115 Microscope -> XYZ -> Definite Focus page

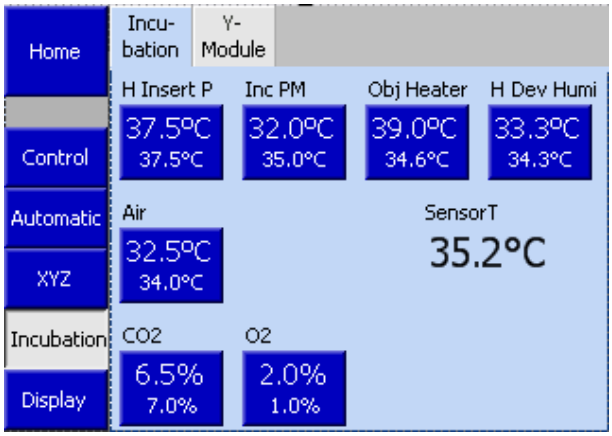


Fig. 116 Microscope -> Incubation -> Incubation page

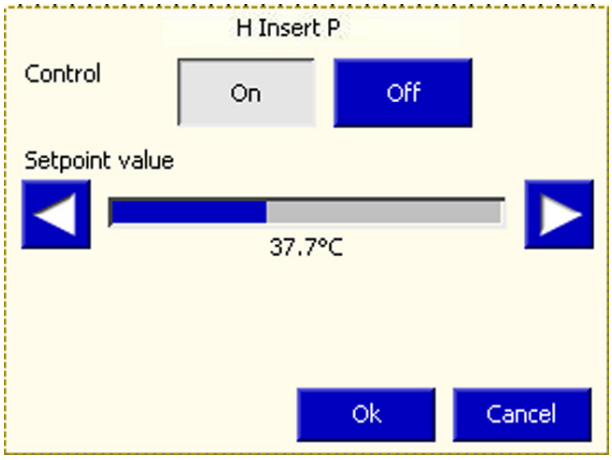


Fig. 117 Pop-up window„H Insert P“

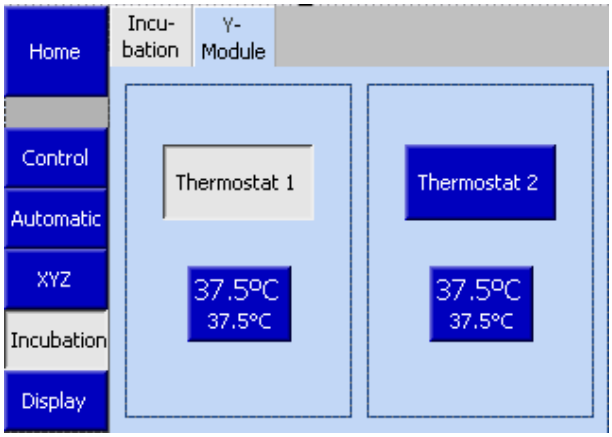


Fig. 118 Microscope -> Incubation -> Y module page

5.11.8 Microscope -> Incubation

The **Microscope -> Incubation** page is only available for **Bio / Med** stand types. It contains the two tabs **Incubation** and **Y module**.

These tabs are used to control incubation components and thermostats connected to the microscope.

5.11.8.1 Incubation

The **Incubation** tab lists all fitted incubation components. Each button shows the target (bottom) and actual (top) temperatures for temperature control.

Click on the appropriate button to call up the corresponding pop-up window (e.g. **H Insert P**). In this window you can switch the temperature control on or off and set a target temperature value.

5.11.8.2 Y module

The **Y module** tab lists the thermostats connected to the microscope. Each button shows the target (bottom) and actual (top) temperatures for temperature control.

In the same way as for incubation components, thermostats can be switched on or off and target temperatures can be set from the pop-up thermostat window.

5.11.9 Settings

The **Settings** page can be accessed from the **Home** page by pressing the **Settings** button on the navigation button bar.

The **Settings** page provides access to the following pages: **Components**, **User**, **Extras** and **Info**.

5.11.9.1 Settings -> Components

The **Settings -> Components** page contains the six **Objectives**, **Reflector**, **Focus**, **Stage**, **Camera ports** and **Misc** tabs.

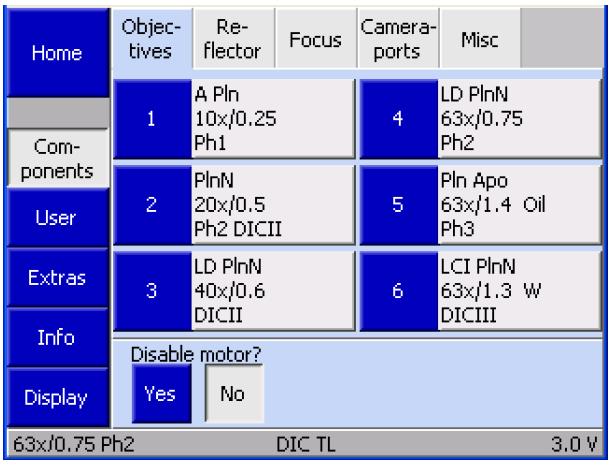


Fig. 119 Settings -> Components -> Objectives page

(1) Objectives

The user can configure the nosepiece fittings using this tab.

Up to six buttons are displayed. Before any objectives have been configured, the buttons are labeled only with the numbers of the nosepiece positions.

After an objective position has been configured, the following data is displayed: objective name, magnification, numerical aperture (NA), immersion

☞ Once a new objective has been assigned, the corresponding objective button on the **Microscope -> Control** page will be labeled with the magnification and immersion type.

☞ The **Disable motor? - Yes** button can be used to deactivate the motor if an objective heater or a piezo focus is fitted under the objective.

- Press the relevant button to configure a turret position.

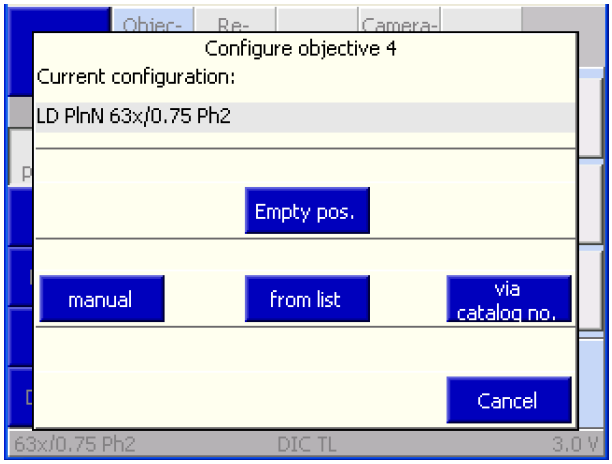


Fig. 120 **Settings -> Components -> Objectives -> Configure Objective # page**

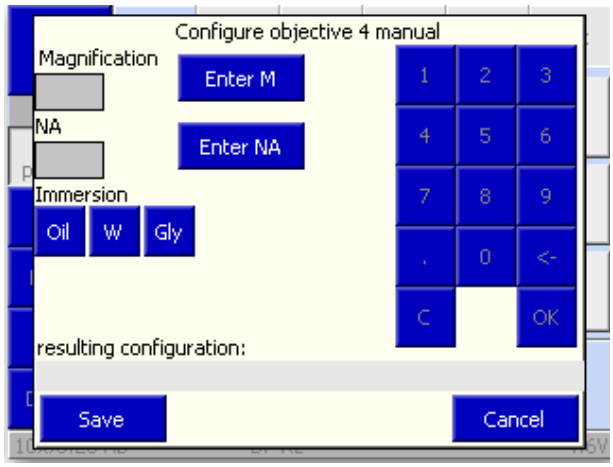


Fig. 121 **Settings -> Components -> Objectives -> Configure Objective # -> manual page**

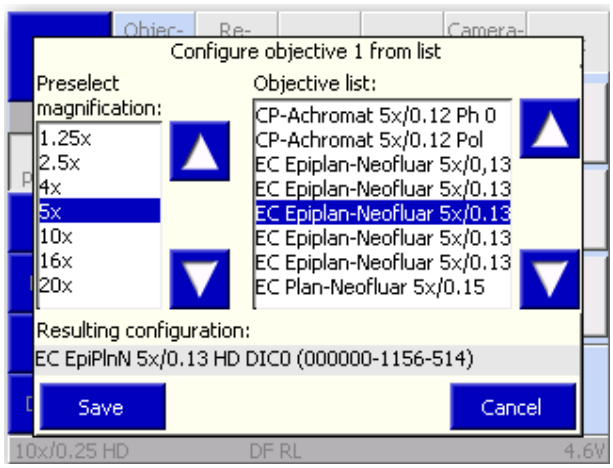


Fig. 122 **Settings -> Components -> Objectives -> Configure Objective # -> from list page**

The following options can be selected from the **Configure Objective #** pop-up window:

- **manual** button
  The user must manually enter magnification, numerical aperture (NA) and immersion information.

- **from list** button
  The user selects the magnification from the **Preselected magnification** list, and a suitable objective from the **Objective list**.

- **via catalog no.** button
  The user must enter the ZEISS catalog number (XXXXXX-XXXX-XXX) to select an objective.

☞ Press **Empty pos.** to clear the current objective selection. Select the relevant nosepiece position and confirm by pressing **Yes**.

- Press the **Save** button to save the objective configuration for the selected nosepiece position or press **Cancel** to close the pop-up window without saving the objective selection.
- If you are overwriting an existing objective configuration, confirm by pressing **Yes**.

☞ When entering the 13-digit ZEISS catalog number, the prefixed six zeros or the affixed seven zeros should not be entered (after 123456 enter a hyphen (-) or enter 1234-567 and press **OK**). The missing zeros will be added automatically.

(2) Reflector

This tab is used to configure the reflector turret.

Up to six buttons are displayed, depending on the actual number of turret positions. The system detects the number of nosepiece positions during initialization (and when the **Settings -> Components** page is opened). Before any reflectors have been configured, the buttons are labeled only with the numbers of the turret positions.

After a reflector has been configured, the following data is displayed: designation (Type), reflected light module (RL), transmitted light position / module (TL)

☞ Once a reflector has been assigned to a position, the corresponding reflector button on the **Microscope -> Control** page will be labeled accordingly.

- Press the relevant button to configure a turret position.
- Select the appropriate reflector from the list in the **Configure reflector position # in Reflector turret** window. The current selection is shown in the **Resulting configuration** line.
- Select **RL** and / or **TL**.
- Press the **Save** button. If the turret position has already been configured, a confirmation prompt will be displayed.

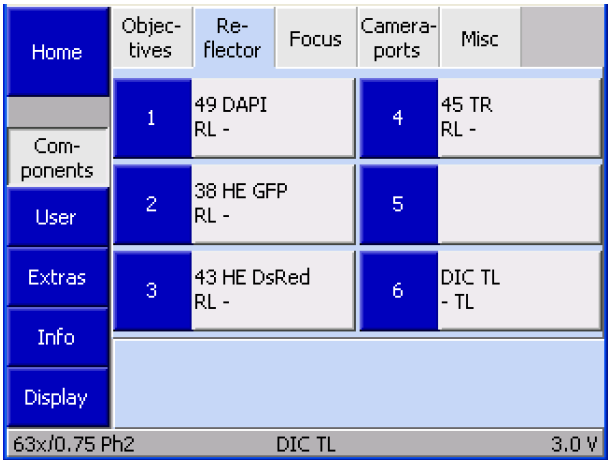


Fig. 123 **Settings -> Components -> Reflector page**

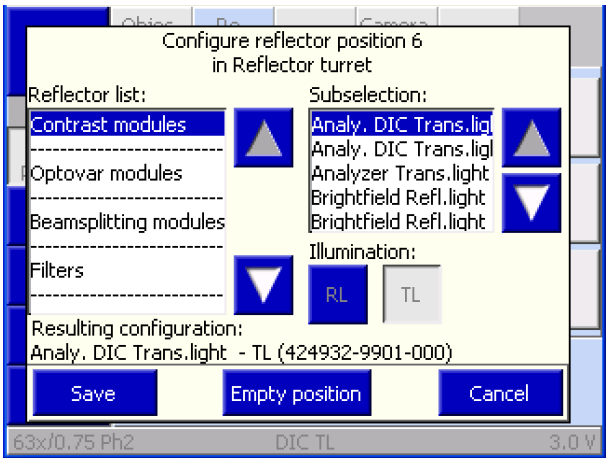


Fig. 124 **Settings -> Components -> Reflector -> Configure reflector position # in Reflector turret page**

(3) Focus

On this tab, you can enter the firmware settings for the focus drive. The speed of the focus drive can be set individually for each objective.

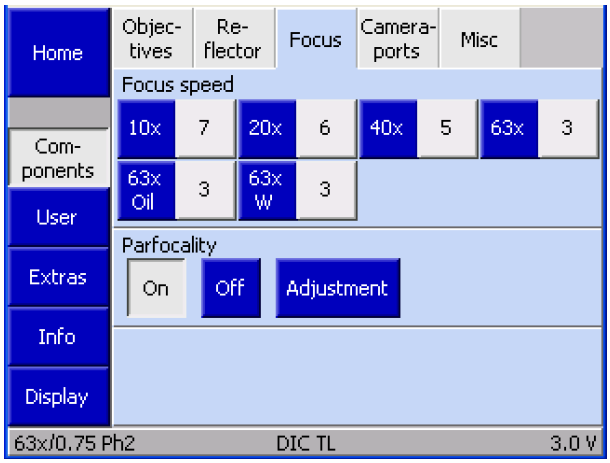


Fig. 125 **Settings -> Components -> Focus page**

a) Focus speed

Up to six buttons are displayed, depending on the actual number of turret positions. The system detects the number of nosepiece positions during initialization (and when the **Settings -> Components** page is opened). Before any objectives have been configured, the buttons are labeled only with the numbers of the nosepiece positions.

After an objective is assigned to a specific button, the magnification appears on the left (blue) half of the button. The right, gray part of the button shows the focus speed.

- To change the focus speed for an objective, press the respective gray part of the button.
- The speed can be set between values of 1 and 10 using the ◄► buttons in the **Focus speed for objective #** pop-up window. The higher the numerical value, the higher the focus speed in the selected magnification.

The following factors are recommended for the focus control speed, depending on the objective magnification.

Objective magnification	Factors for focus control speed
1x	10
1.25x	8
2.5x	8
5x	7
10x	7

Objective magnification	Factors for focus control speed
20x	6
40x	5
50x	4
63x	3
100x	3

- Press the **Save** button.

b) Setting the parfocality/parcentricity

The parfocality function is activated or deactivated by using the **On** and **Off** buttons.

To configure the parfocality function press the **Adjustment** button. This will activate a wizard which will guide you through the configuration procedure.

All the objectives must be focused in sequence. Start with all dry objectives from the highest to the lowest magnification. Then, proceed with all immersion objectives from the highest to the lowest magnification. Press the **Next Objective** button to rotate the nosepiece to the next objective. After all objectives have been focused, press the **End** button.

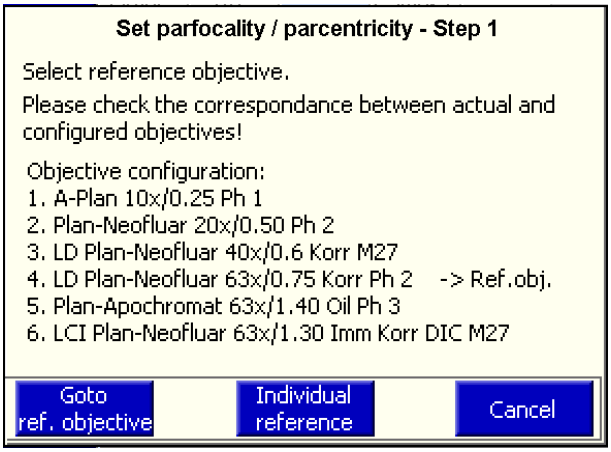


Fig. 126 Settings -> Components -> Focus -> Set parfocality / parcentricity page

(4) Stage

This tab will be displayed if a scanning stage mot. P; CAN is used.

Here, the user adapts the XY stage movement to the objective magnification.

This influences the functions provided by the **Load position** button on the **Microscope -> Control** page.

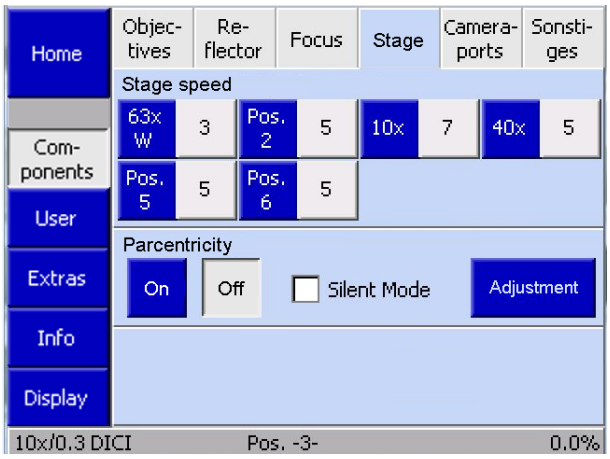


Fig. 127 Settings -> Components -> Stage page

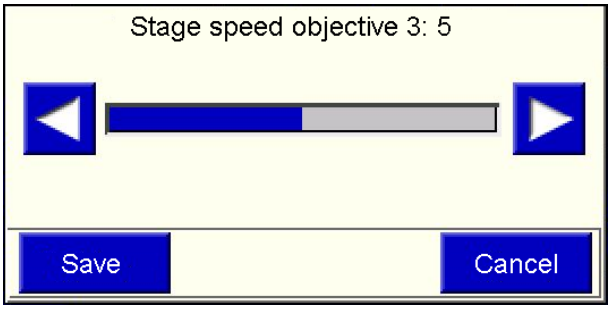


Fig. 128 Settings -> Components -> Stage -> Stage speed objective page

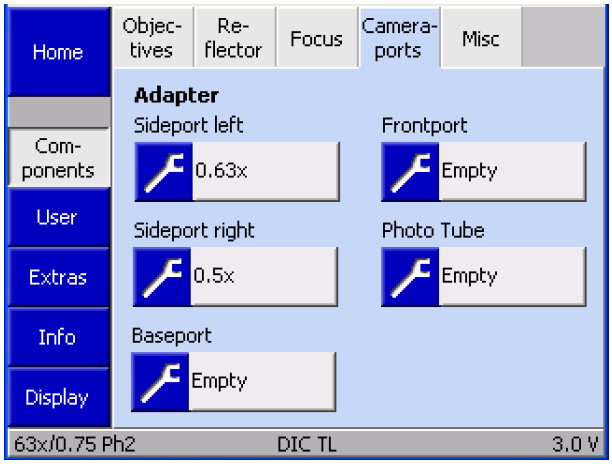


Fig. 129 **Settings -> Components -> Camera-ports page**

(5) Camera-ports

Use this tab to configure the adapter for the camera ports (frontport / baseport / sideport / photo tube).

Adapters

Up to five buttons are displayed depending on the camera mirroring on the left and the tube used. The system detects the status of the ports during initialization (and when the **Settings -> Components** page is opened).

- To assign an adapter to a port, press the gray button.
  The **Select Camera Adapter** list will be displayed.
- Select the appropriate adapter from the list using the ▲ ▼ buttons.
- Press the **Save** button to assign the selected adapter to the port. Press the **Cancel** button to close the window without any selection.

The magnification is now shown on the button. Assign adapters to the other ports in the same way.

(6) Misc

The **Misc** tab is used to configure additional, optional microscope components.

☞ The number of buttons displayed depends on the components detected during initialization or when the **Settings -> Components** page is opened.

- Press the relevant button to configure a component.
  The related selection list will be opened.
- Press the ▲ ▼ keys to select a setting.
- Press the **Save** button to store the selected setting. Press the **Cancel** button to close the window without any selection.

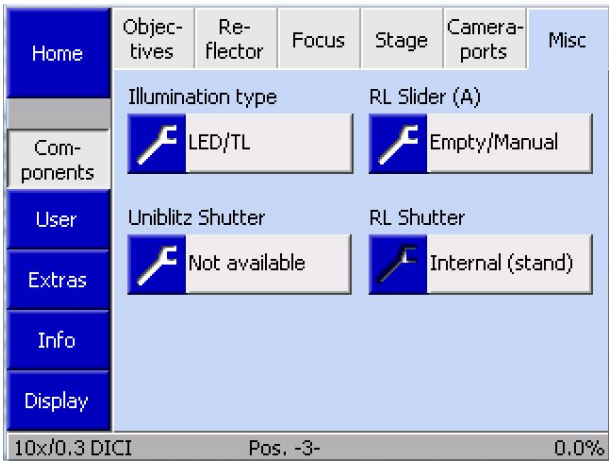


Fig. 130 Settings -> Components -> Misc page

Illumination type

This is used to enter the type of illuminator you are working with: halogen illuminator or LED illuminator.

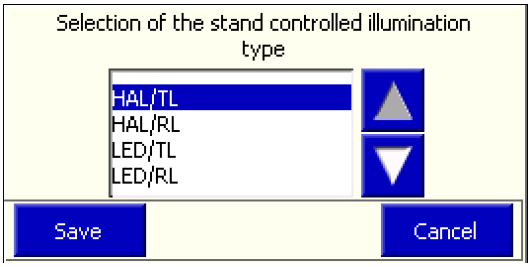


Fig. 131 Illumination type

RL slider (A)

If a motorized diaphragm slider or an FL attenuator are used in reflected light, these components must be specified in this window. The settings will be applied after the microscope has been restarted.

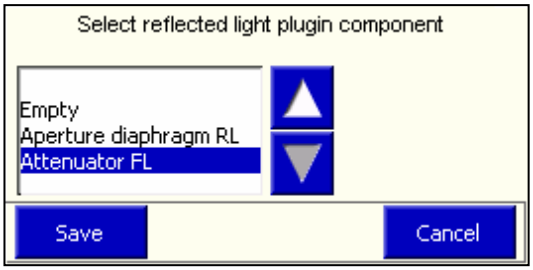


Fig. 132 RL slider (A)

Uniblitz shutter

Here, the user should select whether the Uniblitz shutter is fitted in the transmitted or reflected light beam path or if it is not available.

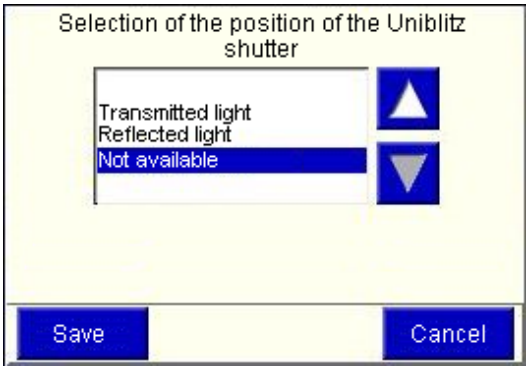


Fig. 133 Uniblitz shutter

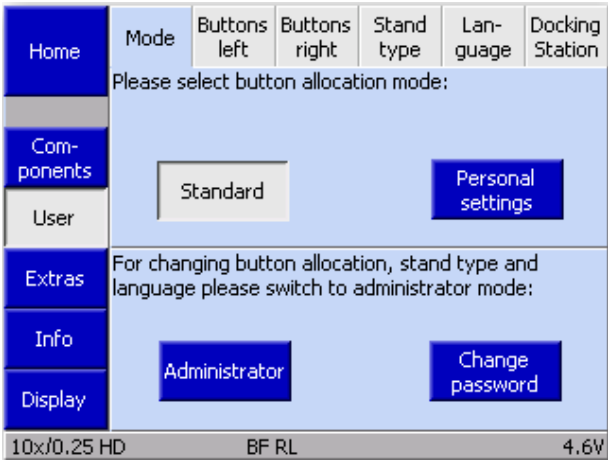


Fig. 134 Settings -> User -> Mode page

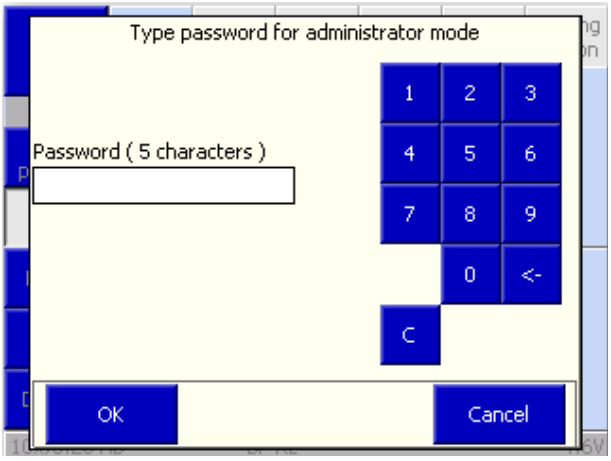


Fig. 135 Settings -> User -> type password for administrator mode page

5.11.9.2 Settings -> User

Press the **User** button in the navigation bar to access the **User** page with its five **Mode**, **Buttons left**, **Buttons right**, **Stand type**, **Language** and **Docking Station** tabs (7, 7 materials stand only).

(1) Mode

This tab is used to select between **Standard** and **Personal settings** modes.

In Standard mode, all default functions (factory set) are active.

In Personal settings mode, administrator defined settings are active for the following controls:

- five buttons on the Z focus drive, right / left

An administrator password must be entered before the button configuration can be changed.

Ensure that access to the administrator password is restricted.

The factory-set password is "12345".

(2) Buttons left

☞ An administrator password must be entered before the button configuration can be changed. Users who do not have administrator privileges will be able to view the button configuration, but will not be able to edit it.

This tab is used to configure the buttons on the left control ring. The controls are shown symbolically. The two upper buttons and two lower buttons are configured as pairs.

- Press the gray button to open a drop-down list.
- Use the ▲ ▼ buttons to select a function from the list. Only functions which are actually available with the current microscope configuration are listed.
- Press **Save** to assign the required function. Press **Cancel** to close the window without selecting a function.

Use the same method for all other button assignments.

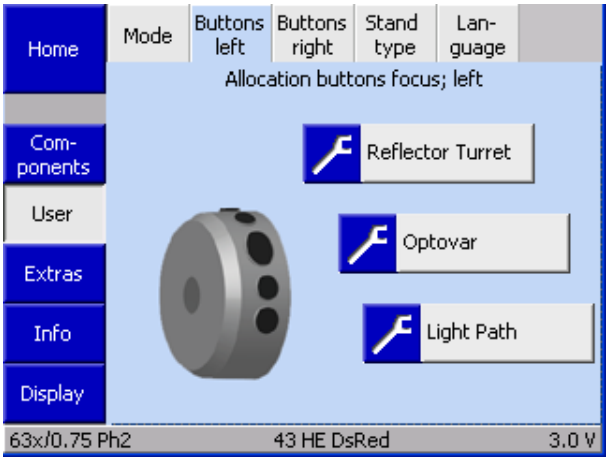


Fig. 136 Settings -> User -> Buttons left page

(3) Buttons right

☞ An administrator password must be entered before the button configuration can be changed. Users who do not have administrator privileges will be able to view the button configuration, but will not be able to edit it.

To set the button configuration for the right control ring, see the description for the previous section *(2) Buttons left*.

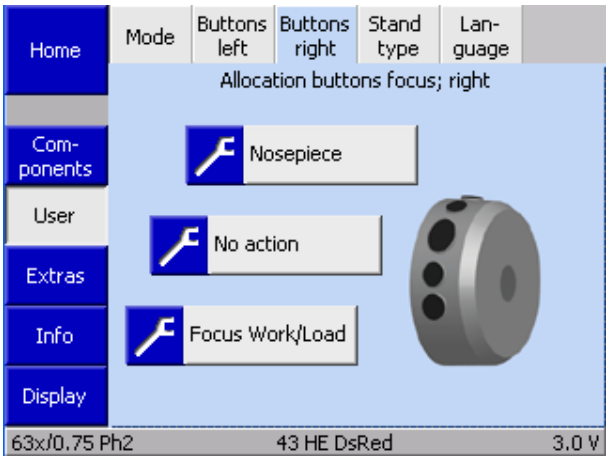


Fig. 137 Settings -> User -> Buttons right page

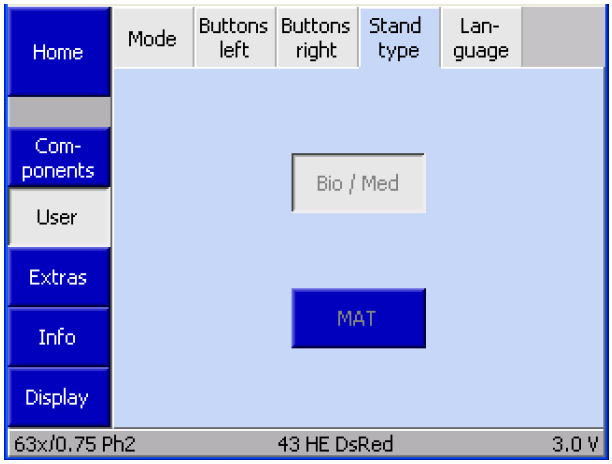


Fig. 138 Settings -> User -> Stand type page

(4) Stand type

This tab is used to select whether the Axio Observer should be configured as a Bio / Med microscope or a materials microscope (MAT/materials). Changes to the basic settings will take effect after the microscope has restarted automatically.

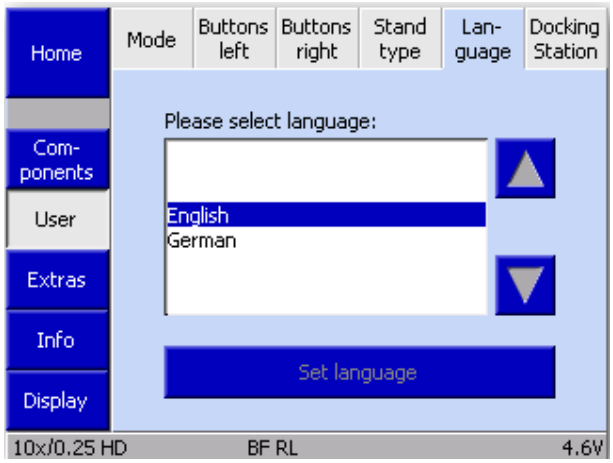


Fig. 139 Settings -> User -> Language page

(5) Language

This tab can be used to select the TFT display language. At present, the available languages are English and German. Changes to this setting will take effect once the microscope has restarted automatically.

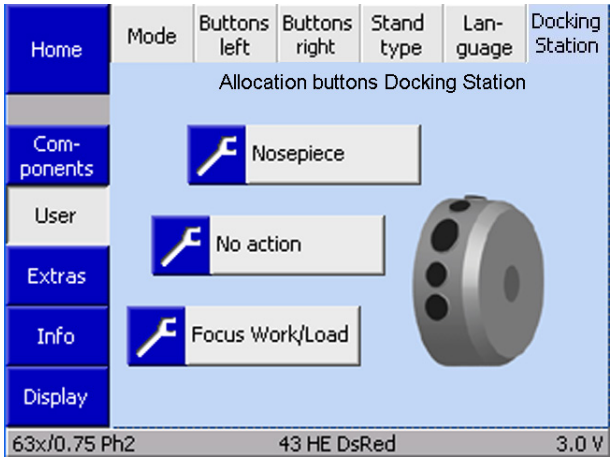


Fig. 140 Settings -> User -> Docking Station page

(6) Docking Station

If a docking station is used, this can be configured in the same way as the button configuration of the control ring see the description in the previous section *(2) Buttons left*.

5.11.9.3 Settings -> Extras

The **Settings -> Extras** page includes the **Light manager**, **Oil stop**, **Dazzle protect**, **Ethernet** and **Misc** tabs.

(1) Light Manager

This tab is used to activate or deactivate Light Manager or to change the Light Manager mode. Light Manager is used for automatic brightness adjustment (see section 5.8).

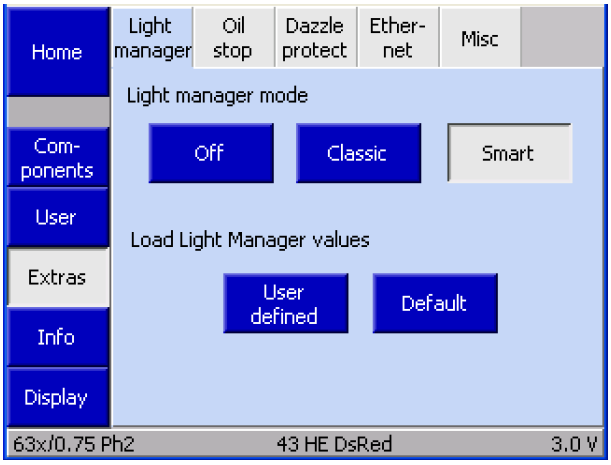


Fig. 141 Settings -> Extras -> Light Manager page

(2) Oil stop

The Oil stop tab is used to activate or deactivate the oil stop function. The oil stop function prevents a dry objective from being moved into the immersion fluid. The nosepiece is always lowered when switching between a dry and an immersion objective.

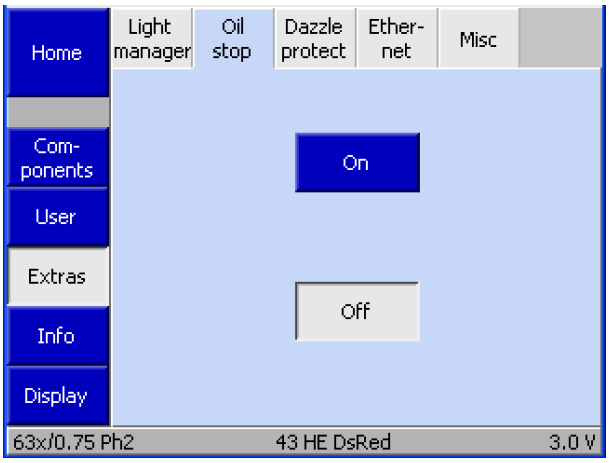


Fig. 142 Settings -> Extras -> Oil stop page

(3) Dazzle protection

The Dazzle protect tab is used to activate or deactivate the Dazzle protect function.

Note:

If the Dazzle protect function is deactivated globally, all other fields on this tab will be grayed out.

If one of the above components is not installed, the corresponding buttons will not be displayed.

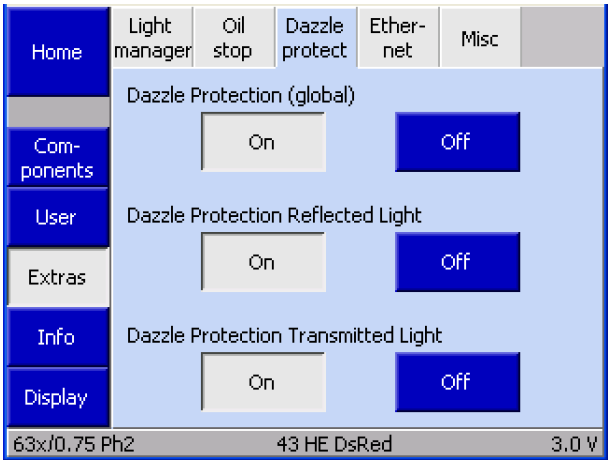


Fig. 143 Settings -> Extras -> Dazzle protect page

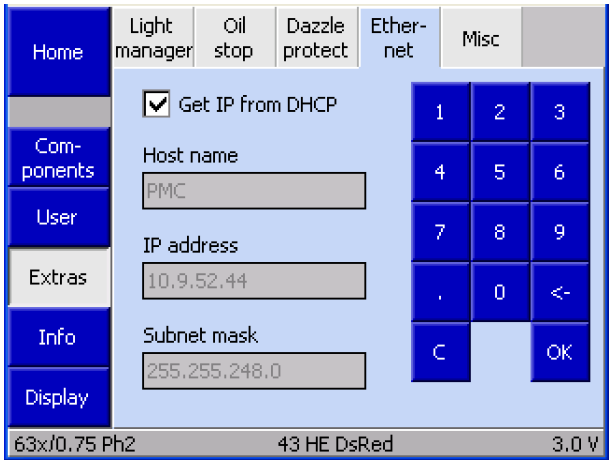


Fig. 144 Settings -> Extras -> Ethernet page

(4) Ethernet

This tab is used to configure the Axio Observer's Ethernet connection.

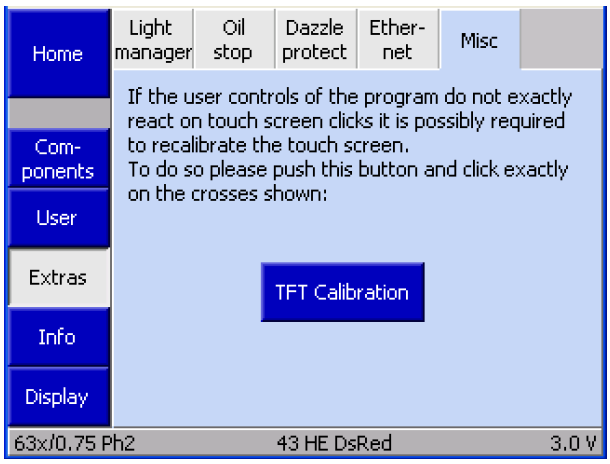


Fig. 145 Settings -> Extras -> Misc page

(5) Misc

The Misc tab is used to calibrate the TFT display.

Once the **TFT Calibration** button has been pressed, crosses will appear in various positions. A blunt pencil should then be pressed exactly on the center of the crosses. This ensures that the matrix for touching image displays is aligned.

5.11.9.4 Settings -> Info

The **Settings -> Info** page only contains the **Firmware** tab.

The Firmware tab shows the firmware version.

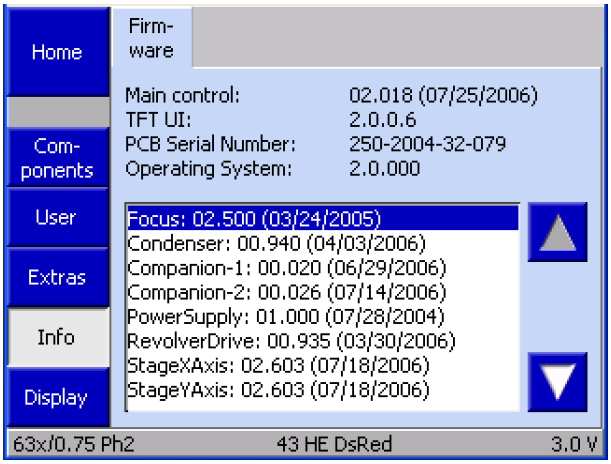


Fig. 146 Settings -> Info -> Firmware page

5.11.10 Display

Press **Display** on the navigation bar of the **Home** page to call up the **Display** page.

On the **Display** page, the user can adapt the TFT display brightness using the ◄► buttons.

Press and hold **Display** on the navigation bar for at least one second to dim the TFT display. Touching anywhere on the TFT display again switches the display back on.

Pressing the **Display off** button switches the TFT display off. Press it again to switch the TFT display back on.

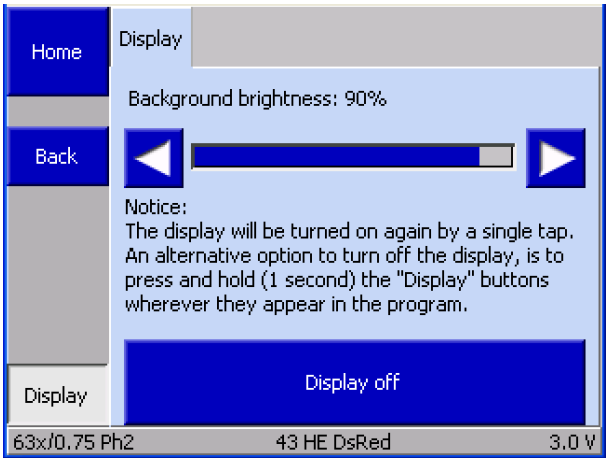


Fig. 147 Display page

☞ After the TFT display is switched off, it returns from the **Display** page to the page from which it was activated. This page will be displayed when the display is switched back on.

5.12 Illumination and contrast techniques

5.12.1 Setting up transmitted light bright field according to KÖHLER

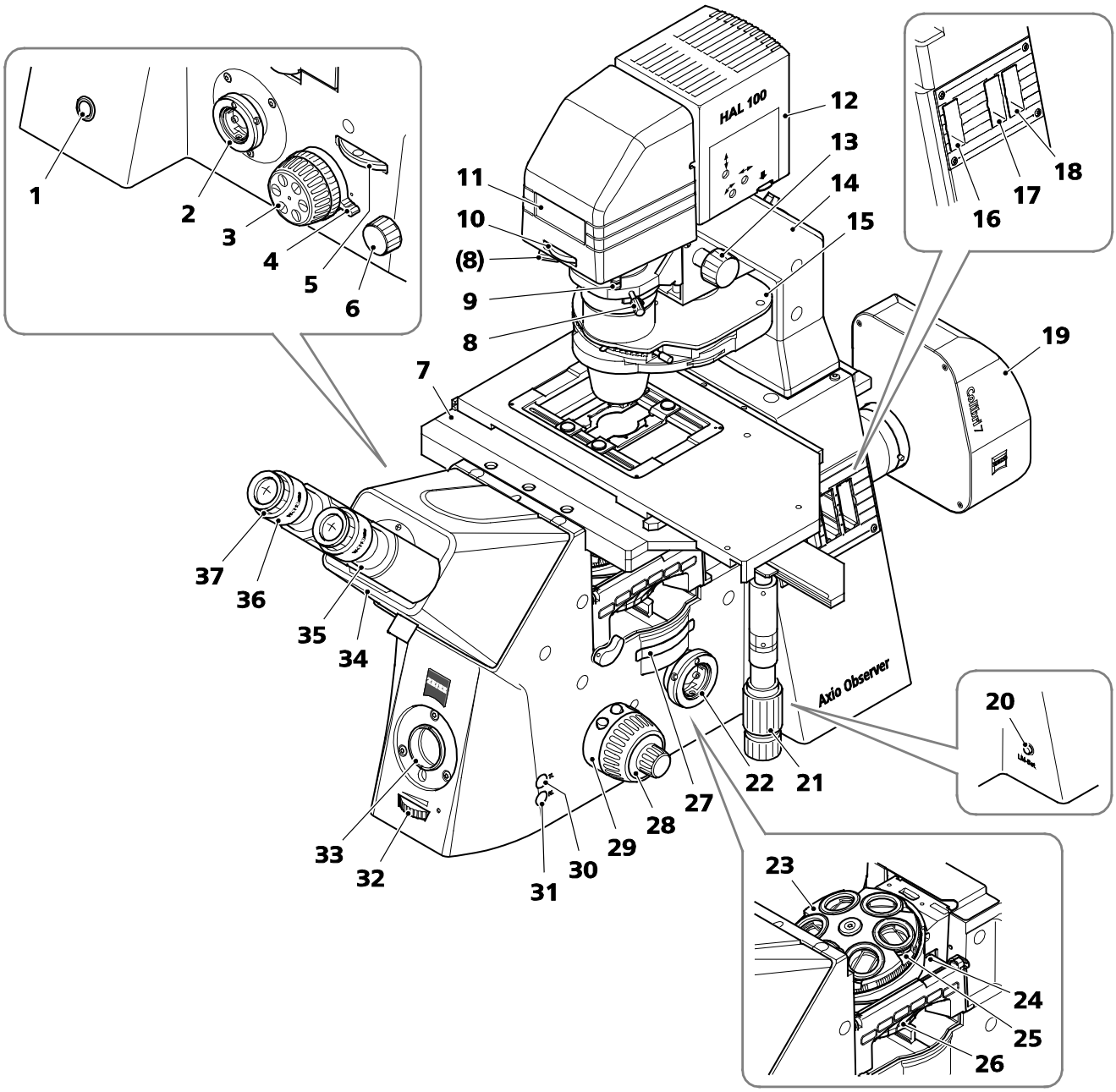


Fig. 148 Setting transmitted light brightfield (Axio Observer 5)

Key to Fig. 148:

1 Standby button
2 Left sideport
3 Coarse / fine focus drive (left side) with finger wheel for fine focus, flat
4 Vertical stop for focus drive
5 Light path selector wheel (left / right sideport / vis)
6 Light path selector wheel (baseport / vis / frontport)
7 Microscope stage with inserted universal mounting frame K
8 Condenser centering screws
9 Polarizer D with 2-position filter changer or 3-position filter changer
10 Luminous-field diaphragm knurled wheel
11 LCD display
12 HAL 100 illuminator
13 Vertical adjustment knob for condenser
14 Carrier for transmitted-light illumination
15 Condenser (manual or motorized)
16 Slot F for iris diaphragm slider as reflected light luminous-field diaphragm (manual or motorized)
17 Slot A for iris diaphragm slider as reflected light aperture diaphragm (manual or motorized) or FL attenuator (manual or motorized)
18 Slot for 3-position filter slider, d=25 mm
19 Colibri 7 illumination system
20 LM-Set button
21 Drive knobs for controlling XY positioning of the mechanical stage
22 Right sideport
23 6-position nosepiece H DIC M27 coded
24 Slot for 3-position contrast slider 10x29 mm for PlasDIC module and analyzer
25 Slot for DIC / PlasDIC slider
26 Reflector turret (coded or motorized)
27 Optovar turret selector wheel (max. 3 positions)
28 Coarse / fine focus drive (right side)
29 Control ring, right
30 TL button for switching the transmitted light LED / halogen illuminator on and off or for opening and closing the transmitted light shutter
31 RL button for switching the reflected light shutter (fluorescence) on and off
32 Control wheel for LED light / halogen illuminator intensity control
33 Frontport
34 Binocular tube
35 Binocular section of the tube
36 Eyepiece
37 Eyepiece focusing ring

5.12.1.1 General operating principle

Transmitted light bright field microscopy is the simplest of all optical microscopy techniques, since it allows high contrast and stained specimens (e.g. blood smears) to be viewed quickly and easily.

In addition to so-called direct beam bundles, indirect bundles which are diffracted and scattered by the specimen details, are of major importance for obtaining as true an image as possible. The greater the portion of indirect bundles (aperture), the truer, according to ABBE, the microscope image.

To make use of the microscope's full optical performance, and in particular that of the objective, the condenser, luminous-field diaphragm and aperture diaphragm should be adjusted in line with the requirements for KÖHLER illumination. This basic rule of microscopy is described in detail in section 5.12.1.3.

5.12.1.2 Transmitted light brightfield instrument equipment

Every Axio Observer microscope is equipped with the components required to carry out transmitted light bright field microscopy.

5.12.1.3 Setting transmitted light brightfield according to KÖHLER (example: stand 5)

- The microscope has been started properly as described in section *4 INSTALLATION INSTRUCTIONS AND FIRST-TIME SET-UP.*
- The microscope has been switched on.

- Select the objective with the lowest magnification (e.g. 10x - yellow code ring) on the nosepiece (Fig. 148/**23**), ensure that it clicks into position correctly.
- Set factor 1x on the selector wheel (Fig. 148/**27**) of the Optovar turret (selector wheel only available on 5 and 5 materials stands); ensure that it clicks into position correctly.
- Open the luminous-field diaphragm completely by turning the luminous-field diaphragm control (Fig. 148/**10**) on the carrier for transmitted-light illumination to the left.
- Open the aperture diaphragm completely by rotating the selector wheel on the condenser forwards as far as it will go.
- Turn the condenser turret selector wheel (Fig. 148/**15**) to move the condenser turret to the **H** position for brightfield (if H is not available, to the **DIC** position).
- Turn the adjustment ring to move the reflector turret (if available) to a position which contains no filter combination. Ensure that it clicks into position correctly.
- If necessary remove the analyzer slider from the slot or move to the open position. Ensure that it clicks into position correctly.
- Rotate the sideport control wheel (Fig. 148/**5**) to the 100 % vis (visual) position (only for 3 and 5 stands, motorized for 7 stands).
- Set the beam splitting ratio to 100 % vis on the binocular (photo) tube. Remove the Bertrand lens from the optical path (where used). To do this, move the rotary / sliding button to the 100 % vis position.
- Swivel the 3-position filter changer (Fig. 148/**9**) out of the optical path.
- Place a high-contrast specimen on the microscope stage (Fig. 148/**7**).
- Match the eyepiece distance (interpupillary distance) to the user's individual interpupillary distance: For this purpose, pull apart or push together the binocular component (Fig. 148/**35**) of the tube.
- Set the ametropia correction zero point using the adjustment ring (Fig. 148/**37**) of the eyepieces (Fig. 148/**36**): without eyepiece reticles: set to the white point,
  with eyepiece reticles: set to the red point,
- To correct for ametropia, bring the selected detail of the specimen into optimum focus using the relevant eyepiece adjustment ring.
- Use the coarse / fine focus drive (Fig. 148/**28**) to focus on the selected detail of the specimen. If no light is visible in the eyepieces, check that light is being emitted from the housing of the halogen illuminator. If no light is being emitted, switch on the halogen illuminator by pressing the TL button (Fig. 148/**30**).

- Set the light intensity to a comfortable level by using the illumination control wheel (Fig. 148/**32**).
- Close the luminous-field diaphragm (Fig. 148/**10**) until it is visible in the field of view (not necessarily in focus) (Fig. 149/**A**).
- Bring the edge of the luminous-field diaphragm into focus (Fig. 149/**B**) by adjusting the height of the condenser (Fig. 148/**13**).
- Center (Fig. 149/**C**) the luminous-field diaphragm using the centering screws (Fig. 148/**8**) and open until the edge of the diaphragm just disappears from the field of view (Fig. 149/**D**).

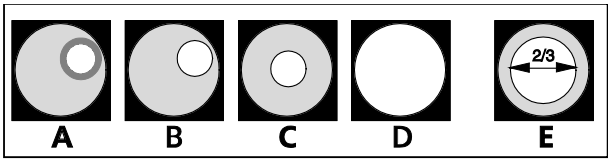


Fig. 149 Diaphragm settings in transmitted light brightfield acc. to KÖHLER

- To set the aperture diaphragm, remove one eyepiece from the eyepiece tube and adjust the aperture diaphragm of the condenser to approximately 2/3 the diameter of the exit pupil of the eyepiece (Fig. 149/**E**).
  The settings required for optimum contrast depend on the specimen.
- Reinsert the eyepiece and where necessary refocus on the specimen using the fine focusing drive.
- Adjust the light intensity using the rocker switch.

☞ The field size and objective aperture change each time the objective is changed, so that for optimal results the luminous-field diaphragm and aperture diaphragm should be readjusted whenever the objective is changed.

5.12.2 Setting up transmitted light phase contrast

5.12.2.1 General operating principle

The phase contrast technique is ideal for examining thin, unstained specimens such as cultured cells. The human eye is generally unable to perceive phase differences (differences in refractive index and thickness) between the various components of the cell.

The phase contrast technique uses "phase stop and phase plate" optical modulators and interference procedures in forming the intermediate image in order to transform small phase differences into differences in intensity and color which are visible to the human eye.

The high-intensity, direct light components are attenuated and given a constant phase shift by the annular channel defined optically by the "phase stop and phase plate". By contrast, the indirect light components, diffracted by various cell components, bypass this optical channel and their phase is determined by differences in refractive index and thickness of the specimen.

In the intermediate image plane these two beams interfere and are enhanced or attenuated depending on their phase position. This interference results in images with intensity and color differences which can be perceived by the human eye.

The use of objectives with two phase plates enables the user to switch rapidly between positive and negative contrast by changing the aperture using the condenser turret. Positive phase contrast is useful for thin cell structures (e.g. filopodia), negative contrast for thicker parts of the cell, as fine structures are also better visualized.

5.12.2.2 Instrument equipment

- Phase contrast objectives with phase plates Ph 0, Ph 1, Ph 2 or Ph 3 for various mid-range numerical apertures. They can also be used for bright field techniques without any limitations.
- Condenser with turret containing centerable phase stops Ph 0, Ph 1, Ph 2 and Ph 3 for various mid-range numerical apertures.
- The active condenser phase stop must match the designation on the objective, e.g. Ph 1.

5.12.2.3 Setting up transmitted light phase contrast

- Swivel the phase contrast objective, e.g. Ph 1, into the optical path.
- On the condenser turret select the phase stop with the same designation as the phase contrast objective (e.g. Ph 1).
- To check the centering and the congruence of the bright phase stop (in the condenser) with the dark phase plate (in the objective), remove one eyepiece from the tube and replace it with the centering telescope. Using the centering telescope's correction facility, focus on the phase stop and the phase plate in the exit pupil of the objective.

If the phototube is used, the Bertrand lens can also be inserted in order to observe the exit pupil of the objective. Where the Bertrand lens is used, the Optovar turret selector wheel must be set to factor 1x.

- If the congruence is not perfect (Fig. 151/**A**), the bright stop must be centered using two 1.5 mm Allen keys (Fig. 150/**1**) until it is completely congruent with the dark phase plate (Fig. 151/**B**).
- Finally, remove the centering telescope from the tube and replace it with an eyepiece / remove the Bertrand lens from the optical path.

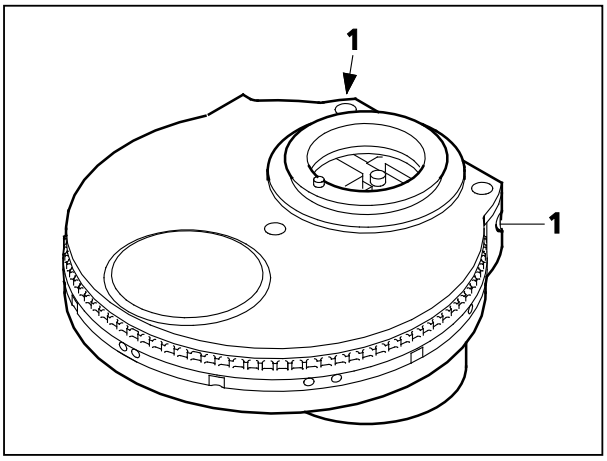


Fig. 150 Centering the phase stop on the condenser

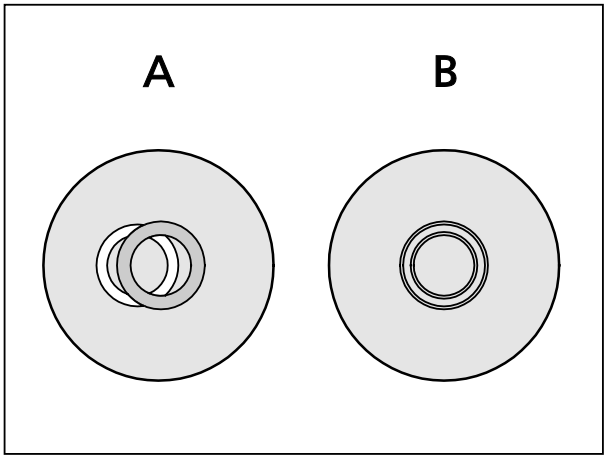


Fig. 151 Centering the phase stop (bright ring in condenser) to the phase ring (dark ring in objective)

It is not usually necessary to center the phase stops, as they are factory centered.

To enhance image contrast, a wide-band interference filter, green 32 x 4, can be inserted in the filter changer. Perfect phase contrast is only achieved if the bright phase stop (in the condenser) and the dark phase plate (in the objective) are precisely congruent in the illumination beam path (Fig. 151/**B**).

☞ All phase contrast objectives used require adjustment of the phase plates. When examining liquid objects in small vessels, the optical path must be aligned to the center of the vessel, as liquids at the edge of a vessel act as a lens and adversely affect the microscope image.

5.12.3 Setting up differential interference contrast (DIC) for transmitted light

5.12.3.1 General operating principle

The transmitted light DIC technique is used to produce high-contrast, 3D images of transparent specimen details.

Light which has been linearly polarized by a polarizer is split into two beams in a birefringent prism. These two beams pass through adjoining regions of the specimen a small distance apart and experience different path differences as a result of different refractive indices and specimen thicknesses. The two beams are then recombined by a second birefringent prism and after passing through the analyzer have the same direction of vibration. This allows the two beams to interfere in the intermediate image, with the path differences being transformed into differences in intensity (gray scale).

5.12.3.2 Instrument equipment

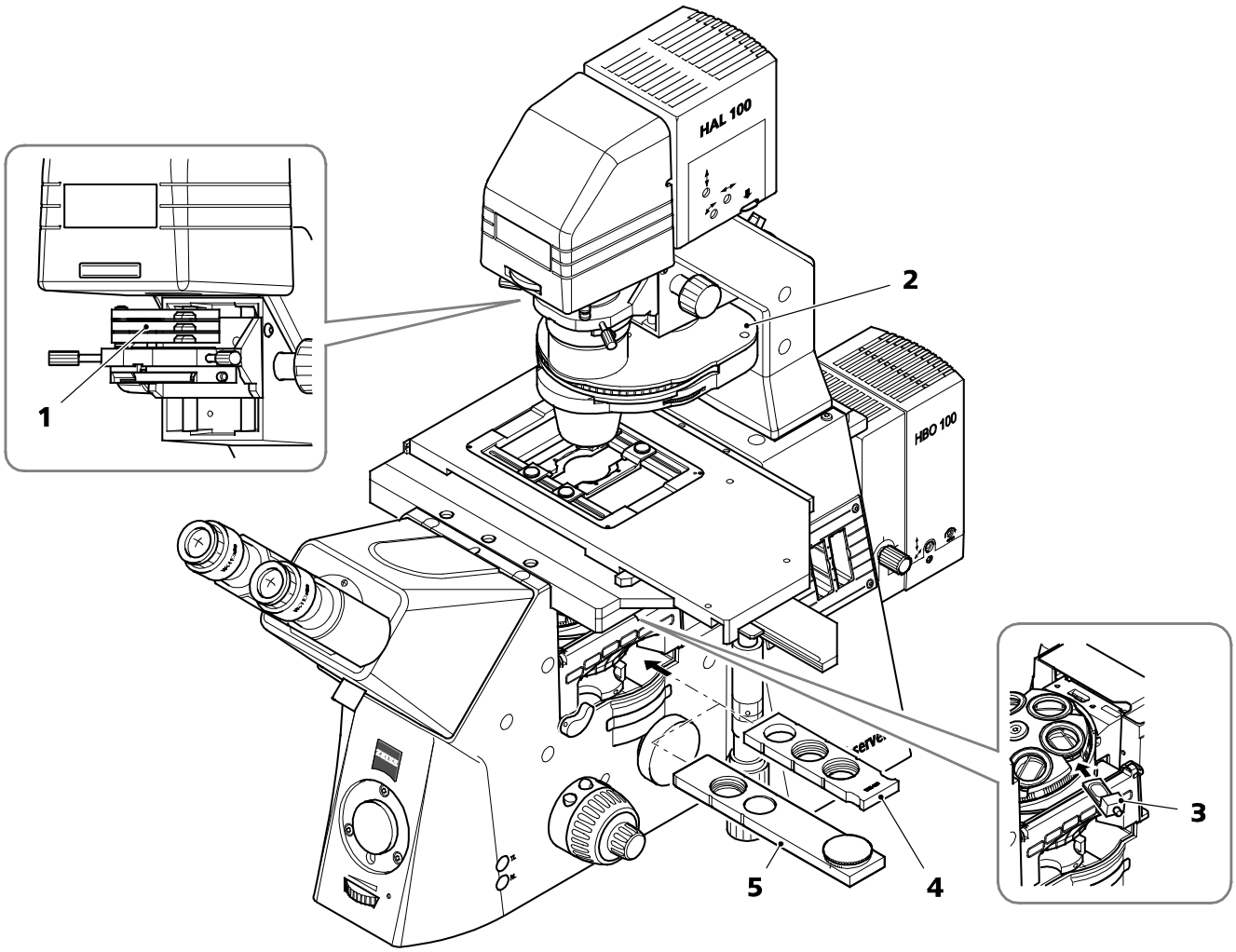
- Objectives offered for DIC equipment, e.g. EC Plan-Neofluar DIC.
- DIC slider suitable for the objectives used
- Condenser with turret disk equipped with DIC prisms (DIC I, DIC II, DIC III) or DIC condenser module
- Polarizer, e.g. polarizer D with 2-position filter changer (only required where the condenser used does not have a DIC prism with integrated polarizer).
- Analyzer module Pol ACR P&C for transmitted light in the reflector turret or analyzer, e.g. fixed analyzer slider or ±30° analyzer slider (de SÉNARMONT)

5.12.3.3 Setting up transmitted light DIC

- Select an objective suitable for DIC on the nosepiece. Insert the corresponding DIC slider (Fig. 152/**3**) into the slot on the nosepiece. Ensure that the DIC slider clicks into position.
- Select the appropriate DIC prism I, II or III on the condenser turret.
- Insert the analyzer slider (Fig. 152/**4**) into the stand. Ensure that it clicks into position correctly.

(1) Transmitted light DIC with fixed analyzer slider

- Move the polarizer (Fig. 152/**1**) on the carrier for transmitted-light illumination into position. Ensure that it clicks into position correctly.
- Place the specimen onto the stage.
- Configure the luminous-field diaphragm and aperture diaphragm on the condenser (Fig. 152/**2**) for KÖHLER illumination.
- Set the optimum contrast using the knurled screw on the DIC slider. Symmetrical adjustment of the DIC slider around its center position allows specimen details to be viewed in 3D as if raised or lowered.



1 Polarizer D (fixed, optional: rotatable)
2 Condenser
3 DIC slider
4 Analyzer slider, fixed
5 ±30° analyzer slider

Fig. 152 Components required for transmitted-light DIC (Axio Observer 5)

(2) Transmitted light DIC with ±30° analyzer slider (de SÉNARMONT)

☞ This technique can only be applied using the 0.35 H/DIC condenser.

If the ±30° analyzer slider is used, the DIC slider must first be centered.

- Move the polarizer (Fig. 152/**1**) into position and adjust the ±30° analyzer (Fig. 152/**5**) to the 0° (dark) position (polarizer and analyzer are perpendicular).
- Deselect the DIC prism on the condenser turret (e.g. use bright field or phase contrast).
- Remove one eyepiece and replace with the centering telescope (or swivel the Bertrand lens into position on the phototube).
- If the field is viewed using the centering telescope (or Bertrand lens), a diagonal black line on the DIC slider (left top to bottom right) will be visible.
- Move the diagonal black line to the center of the field of view by adjusting the knurled screw on the DIC slider.
- Remove the centering telescope and reinsert the eyepiece (or move the Bertrand lens out of the optical path).
- Select the DIC position on the condenser.
- Place the specimen onto the stage.
- Using the analyzer selector wheel, rotate the analyzer away from the 0° position until optimum contrast is obtained.

☞ Because the DIC technique uses polarized light, it will be disrupted if birefringent objects, e.g. foils occasionally used with histological sections, are positioned between the polarizer and analyzer. This problem may also arise with Plexiglas culture chambers if the chamber bottom is made of plastic. In such cases, it is advisable to use chambers with glass bottoms to avoid impairment of the optical performance.

5.12.4 Setting up transmitted light PlasDIC contrast

5.12.4.1 General operating principle

PlasDIC is an innovative transmitted light interference contrast technique that provides a relief-like image and is particularly useful for thicker specimens. The contrast can be varied.

Microtiter plate wells can be contrasted right up to the edge.

Culture vessels with a glass bottom are not required, but are also suitable.

5.12.4.2 Instrument equipment

Objectives:

- LD A-Plan 10x to 63x (4212xx-xxxx-xxx)
- LD Plan-Neofluar 20x/0.4 Corr M27
- LD Plan-Neofluar 40x/0.6 Corr M27
- LD Plan-Neofluar 63x/0.75 Corr M27

☞ At least one of these objectives must be available.

Condensers:

- LD condenser 0.35 H, Ph0, Ph1, Ph2, DIC, DIC; 6-position (424241-0000-000)
- LD condenser 0.55 H, Ph1, Ph2, Ph3, DIC, DIC; 6-position (424242-0000-000)
- LD condenser 0.55 H, Ph1, Ph2, Ph3, DIC, DIC; 6-position (424244-0000-000)

  with

  - Slit aperture 3.5 mm PlasDIC (000000-1246-773)

or

- LD condenser 0.35 H, Ph PlasDIC DIC iHMC (424241-9010-000)

  with

  - Slit aperture 3.5 mm PlasDIC for condenser (10x-40x) (426717-9110-000)
  - Slit aperture 5 mm PlasDIC for condenser (40x/63x) (426717-9120-000)

☞ Swivel the slit aperture for PlasDIC, which is fitted into the condenser, into the beam path. The size of the slit aperture to be used (for PlasDIC) depends on the objective used.

PlasDIC components:

- Contrast slider 3-position 10x29 mm for PlasDIC module and analyzer (426980-9100-000, only for BioMed stands Axio Observer 3 and Axio Observer 5)

  with

  - PlasDIC module LD A-Plan 10x-63x (426980-9080-000)

  or

  - PlasDIC module LD PN 20x, 40x (426980-9090-000)

☞ The PlasDIC module can be inserted in the contrast slider 3-position 10x29 mm and can only be used with this.

The PlasDIC module combines a DIC prism with polarizer and analyzer and thus replaces individual PlasDIC sliders (with polarizer) for each objective and a separate analyzer.

or

- PlasDIC slider for LD A-Plan 10x-63x (426980-9060-000)
- Individual PlasDIC sliders for objectives LD Plan-Neofluar Corr (20x, 40x, 63x)

☞ The PlasDIC slider for LD A-Plan 10x-63x and individual PlasDIC sliders for objectives LD Plan-Neofluar Corr (20x, 40x, 63x) are PlasDIC sliders including a DIC prism and polarizer.

A separate analyzer will be required, e.g.

- Analyzer slider, fixed (00000-1005-862)
- Analyzer module Pol ACR P&C for transmitted light (424937-9901-000) (analyzer module, to be inserted in a reflector turret).

5.12.4.3 Setting up PlasDIC

☞ The microscope has been started properly as described in section 4.

- Place a specimen.
- Set the specimen for transmitted light brightfield.
- Select a PlasDIC objective.
- Insert the PlasDIC slider (Fig. 153/**3**) into the DIC slot of the objectives to be used and additionally swivel or slide an analyzer, e.g. the analyzer module Pol ACR P&C of the reflector turret or the analyzer slider, fixed, into the optical path.

  or
- Insert the 3-position contrast slider (Fig. 153/**1**) with fitted PlasDIC module (Fig. 153/**2**) into the slot below the nosepiece.

☞ If the PlasDIC module has not yet been fitted into the 3-position contrast slider:
- Loosen the screws (Fig. 153/**1.2**) on the cover (Fig. 153/**1.1**) of the contrast slider and remove the cover.
- Insert the PlasDIC module (Fig. 153/**2**) into the contrast slider and fix with the screws (Fig. 153/**1.2**).

☞ When using the PlasDIC module in the 3-position contrast slider an analyzer is not required.

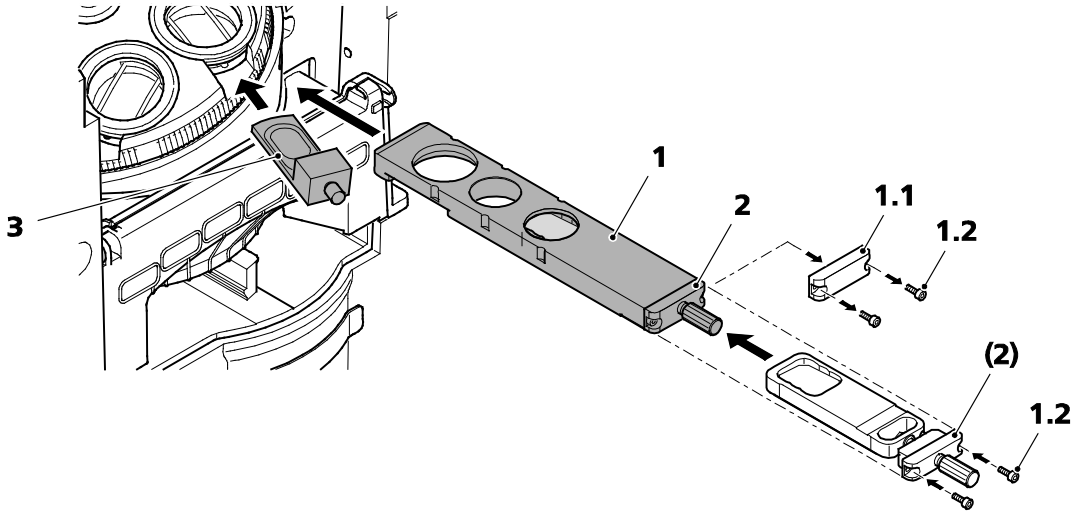


Fig. 153 Setting the PlasDIC contrast

- Open the condenser aperture diaphragm fully.
- Swivel in the slit aperture 3.5 mm PlasDIC (or 5 mm, depending on objective and condenser) on the condenser including the modulator disk.
- When switching from bright field to PlasDIC, the brightness should be increased.
- Adjust the contrast using the knurled screw on the PlasDIC slider or PlasDIC module.

Structures can be visualized in relief or pseudo-dark field.

Relief offers the best contrast.

5.12.5 Setting up reflected light bright field

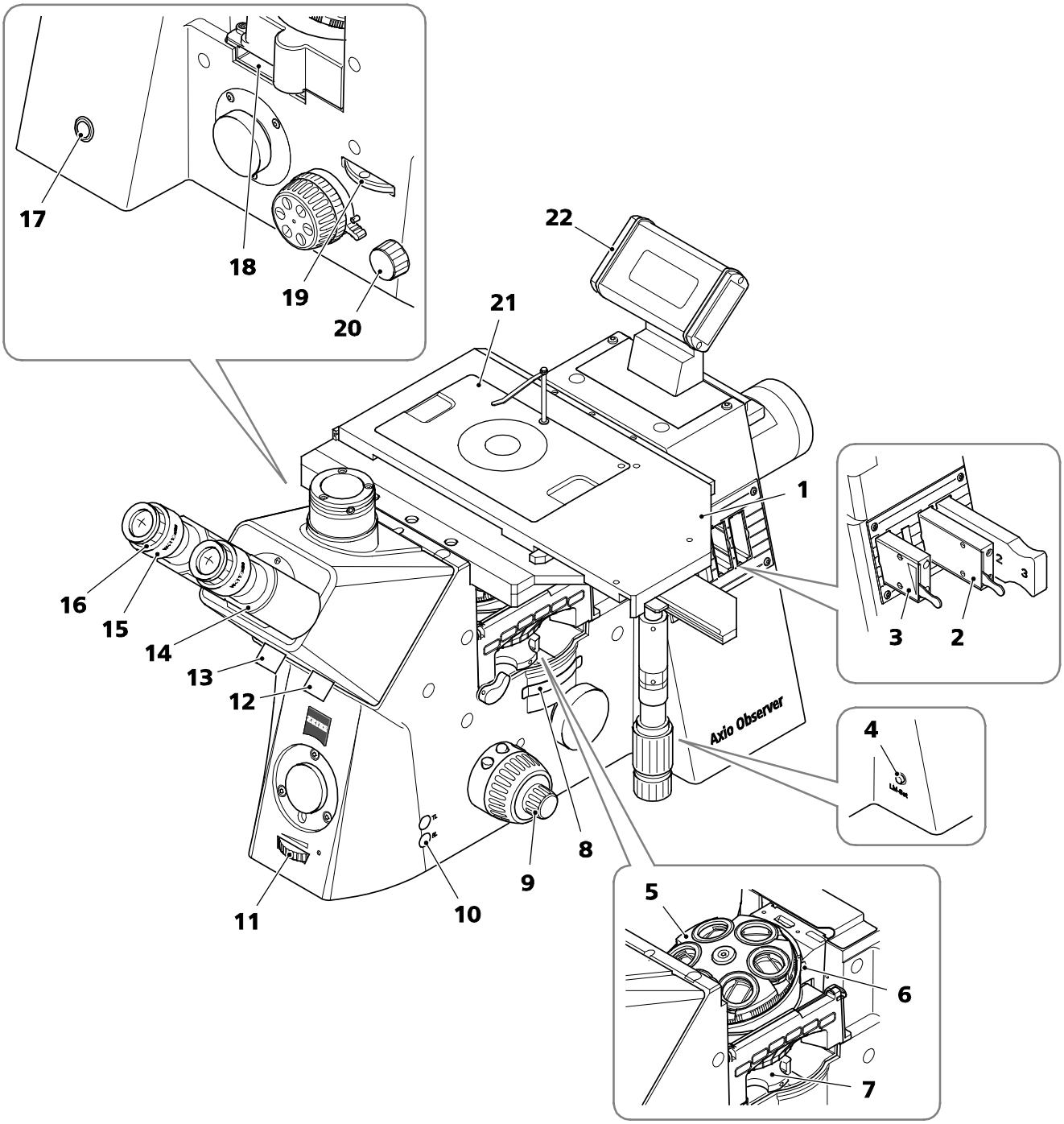


Fig. 154 Setting reflected light brightfield (Axio Observer 5 materials)

Key to Fig. 154:

1 Microscope stage
2 Aperture diaphragm slider MAT in slot A
3 Iris diaphragm slider for reflected light (as luminous-field diaphragm) in slot F
4 LM-Set button
5 Nosepiece
6 Compensator mount 6x20
7 Reflector turret
8 Optovar turret selector wheel
9 Coarse / fine focus drive
10 RL button for switching the LED / halogen illuminator or the reflected light shutter (fluorescence) on and off
11 Control wheel for LED light / halogen illuminator intensity control
12 Rotary / sliding button for vis / doc beam splitting
13 Rotary / sliding button for Bertrand lens and manual shutter
14 Binocular section of the tube
15 Eyepiece
16 Eyepiece focusing ring
17 Standby button
18 Analyzer slider slot
19 Sideport selector wheel
20 Light path selector wheel (baseport / vis / frontport)
21 Mounting frame K for reflected light with inserted stage pinhole aperture
22 Holder with LCD display

(1) Application

The reflected-light bright field microscopy is the simplest and most widely used microscopy technique which is used to examine opaque samples or specimens e.g. polished sections or wafers.

For a true-to-object imaging, indirect ray bundles, i.e. ray bundles diffracted and scattered on the specimen details, are of major importance in addition to the so-called direct ray bundles. The higher this portion of indirect rays (aperture), the more realistic the microscope image will be, according to ABBE's rule.

The incoming, bundled light from the reflected-light illuminator is reflected by a neutral-colored beam splitter. Then it passes to the objective which focuses the beams onto the specimen surface (so-called condenser function). The objective collects the light reflected by the object and generates the intermediate image of the microscope together with the tube lens, which is then observed visually or can be documented objectively.

(2) Instrument equipment

- Axio Observer materials with attached microLED or adjusted HAL 100 illuminator
- Reflector module H P&C in reflector turret
- EC Epiplan, EC Epiplan- Neofluar objective

(3) Setting reflected light brightfield according to KÖHLER

– The microscope has been started properly as described in section *4 INSTALLATION INSTRUCTIONS AND FIRST-TIME SET-UP*.

– The microscope has been switched on.

- Switch on the HAL 100 or microLED illuminator for reflected light using the RL button (Fig. 154/**10**) on the microscope stand.
- Adjust the light intensity by turning the control wheel (Fig. 154/**11**) on the microscope stand.
- Place a high contrast reflected-light specimen on the microscope stage.
- Turn the nosepiece (Fig. 154/**5**) to swivel in the 10x objective (yellow ring, see also section 5.3).
- Use focus drive (Fig. 154/**9**) to focus on the specimen. In doing so, always focus away from the specimen, if possible, to avoid any collision between objective and specimen.
- Move the aperture diaphragm slide MAT setting lever (Fig. 154/**2** or Fig. 156/**4**) into the central position (roughly half opened or closed).
- Use the control lever (Fig. 156/**4**) of luminous-field diaphragm slider (Fig. 154/**3**) to narrow the luminous-field diaphragm until it becomes visible in the field of view (Fig. 155/**A**).
- Turn the focus drive (Fig. 154/**9**) to refocus on the edge of the luminous-field diaphragm (Fig. 155/**B**) and use the centering screws (Fig. 156/**2**, **3**) to center the luminous-field diaphragm with the edge of the field of view (Fig. 155/**C**).

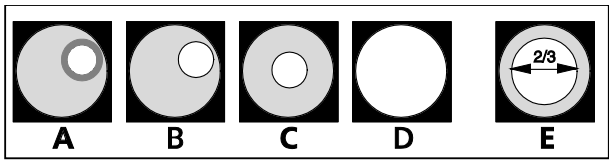


Fig. 155 Diaphragm settings in reflected light brightfield acc. to KÖHLER

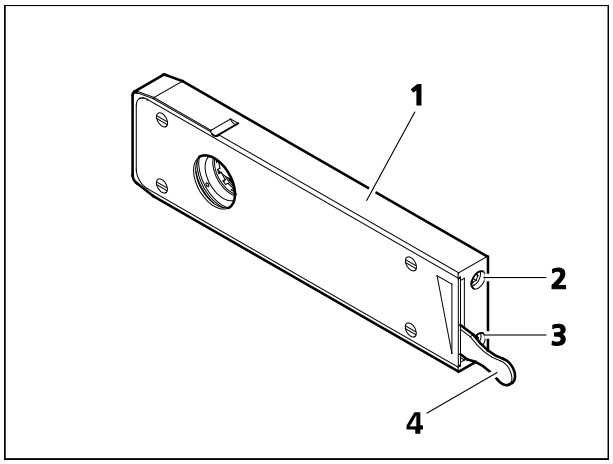


Fig. 156 Iris diaphragm slider for reflected light

- Then, open the luminous-field diaphragm (Fig. 154/**3**) so that it just disappears from the field of view (Fig. 155/**D**).
- To set the aperture diaphragm (image contrast), remove one eyepiece (Fig. 154/**15**) from the binocular tube and look into the tube with your naked eye or insert the auxiliary microscope in place of the eyepiece.
- Center the aperture diaphragm with the centering screws on the aperture diaphragm slider MAT (Fig. 154/**2**); for specimens with medium contrast, set the control lever to about 2/3 to 4/5 of the exit pupil diameter of the objective (Fig. 155/**E**).

In most applications, this aperture diaphragm setting provides optimum contrast at almost ideal resolution, and is therefore the best compromise for the human eye.

- Finally, reinsert the eyepiece, refocus with the focus drive (Fig. 154/**9**) and adapt the image brightness with control wheel (Fig. 154/**11**) to the reflected light specimen.

☞ Never use the aperture diaphragm to adjust image brightness. Use the illumination intensity control wheel (Fig. 154/**11**) for this purpose!

5.12.6 Setting up reflected light fluorescence contrast

5.12.6.1 General operating principle

The reflected light fluorescence technique enables high-contrast images of fluorescent substances to be displayed in typical fluorescence colors. In the reflected light fluorescence microscope, light generated by a high-performance illuminator reaches the excitation filter through a heat-absorbing filter. The filtered, short-wave excitation light is reflected by a dichroic beam splitter and focused on the specimen via the objective. The specimen absorbs the short-wave light and then emits the long-wave fluorescent radiation (Stoke's law), which is then gathered by the objective and transmitted by the dichroic beam splitter. The light finally passes through a barrier filter which only transmits the long-wavelength light emitted by the specimen.

Exciter and barrier filters must be perfectly matched from a spectral viewpoint. They are arranged in an FL reflector module together with the corresponding dichroic beam splitter.

5.12.6.2 Instrument equipment

- Recommended objectives: brightfield objectives
- Reflector turret fitted with fluorescence filter set in FL P&C reflector module
  or
  FL filter set fitted in dual filter wheel mot. and filter wheel excitation 8-pos. mot.
- Optional: Fluorescence illuminator HXP 120 V, HBO 100, HBO 50 or Colibri 7
- microLED illuminator or HAL 100 for transmitted light illumination
- Recommended: Switching mirror for 2 illuminators and a further iris diaphragm slider for slot A.

☞ Before using the reflected light fluorescence technique, ensure that the mercury vapor short-arc lamp is aligned as described in section 4.23.3. Re-alignment may be necessary depending on the operating time. The self-adjusting HBO 100 can also be used.

5.12.6.3 Setting reflected light fluorescence

The initial reflected light fluorescence set up is much simpler if you begin with the Plan Neofluar 20x/0.5 objective or EC Plan Neofluar 20x/0.5 objective and a strongly fluorescing specimen. Demonstration specimens may also be used.

- First search for the specimen in the reflected light brightfield (see section 5.12.5) or transmitted light brightfield (see section 5.12.1).
- Switch the light path from the microLED or HAL 100 illuminator in transmitted light to HXP 120 V or HBO illuminator in reflected light.
- If in use, replace the aperture diaphragm slider MAT by the iris diaphragm slider.
- First use the internal fluorescence shutter to keep the light path in the reflected light section closed by pressing the RL button (Fig. 154/**10**).

- Switch on the HXP 120 V or HBO 100 fluorescence illuminator and leave to warm up to operating temperature for approx. 15 minutes.
- On the reflector turret (Fig. 154/**7**) or the virtual reflector turret (if dual filter wheel mot. is available), select the desired fluorescence filter combination (depending on the desired kind of excitation) and switch on.
- Open the fluorescence shutter by pressing the RL button.

For reflected light fluorescence, two iris diaphragm sliders are used as aperture and luminous-field diaphragms. However, since the aperture diaphragm is not visible during the reflected light fluorescence procedure, the aperture diaphragm slider must first be centered in the luminous-field diaphragm slot and then inserted in the aperture diaphragm slot.

The aperture diaphragm and luminous-field diaphragm are centered in the same way:

- Insert an iris diaphragm slider into the luminous-field diaphragm F slot (Fig. 154/**3**) until it clicks into place.
- Using the lever (Fig. 156/**4**), close the diaphragm until it becomes visible in the field of view.
- Center the diaphragm using the two adjusting screws (Fig. 156/**2**, **3**) on the slider (using a 3 mm ball-headed screwdriver). Finally, open the diaphragm until the entire field is clear.
- Insert the centered slider into the slot A (Fig. 154/**2**) for the aperture diaphragm until it clicks into place.
- Insert a further iris diaphragm slider into the luminous-field diaphragm slot.
- Close the luminous-field diaphragm until it becomes visible in the field of view.
- Center the luminous-field diaphragm F to the edge of the field of view using the two centering screws.
- Either open the luminous-field diaphragm until it just disappears from the edge of the field of view or, if there is a risk of bleaching the specimen, close it until it is visible in the field of view.
- Finally, refocus on the specimen and optimize the position of the fluorescence illuminator (HBO 100, HBO 50). For this purpose, use the knurled knob on the fluorescence illuminator to set the collector so that the field of view is illuminated as evenly as possible when using the short-wave excitation reflector module. When long-wave excitation modules are used, no correction of the collector position is required.

5.12.7 Setting up reflected light polarization

(1) Application

Reflected light polarization presents a further contrasting option for polished sections of ore minerals, coals, ceramic products, certain metals and metal alloys, as these specimens often exhibit varied reflection behavior in linearly polarized light depending on the orientation of the crystals and specimen features.

The illumination light is linearly polarized by the polarizer and directed through the objective onto the specimen surface, where it is reflected. Here, the light rays experience structure-dependent path differences or polarization-optical rotations, which on passing the analyzer appear as different gray-scale values.

With very low magnification objectives, a rotatable λ/4 plate in front of the objective (Antiflex cap) permits the reflections to be eliminated even with "dark" specimen surfaces, which otherwise would be unavoidable.

(2) Instrument equipment

- Axio Observer materials with attached microLED or adjusted HAL 100 illuminator
- EC Epiplan-Neofluar, EC Epiplan objectives.
- Fixed analyzer slider and Pol P&C or DIC P&C reflector module.

(3) Setting reflected light polarization

- Prepare the microscope as described in section 5.12.5 for reflected light brightfield.
- Remove DIC slider (if inserted).
- Swivel reflector module DIC/Pol P&C on reflector turret (Fig. 154/**7**) into the beam path or insert Pol P&C reflector module and analyzer slider.
- Focus and view the specimen in the polarization contrast which is now available.

Alternatively, a rotatable polarizer can be used on Axio Observer 3 materials, 5 materials and 7 materials stands which have a slot for Polarizer slider RL 6x30, 90° rotatable (Fig. 157/**3**).

The use of the rotatable polarizer has the advantage that birefringence and pleochroism of anisotropic samples can also be made visible even when no turntable is available.

In addition, some ore phases exhibit anisotropy in polarized reflected light which, depending on the position of the polarizer, produces a color change a few degrees + or - of the crossed position.

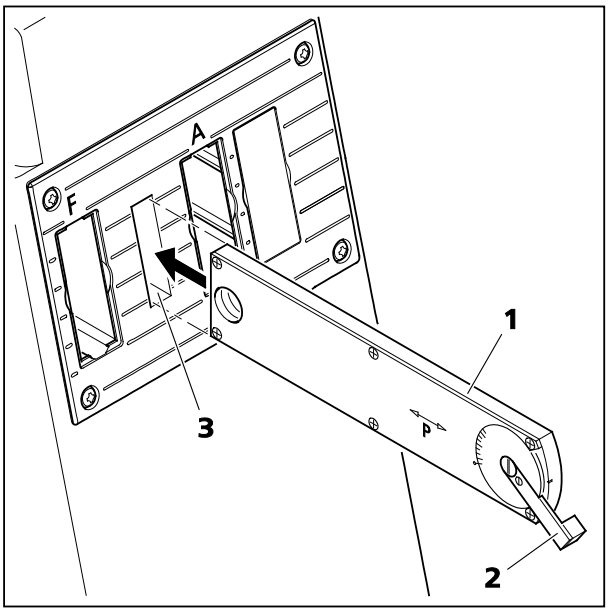


Fig. 157 Slot for Polarizer slider RL 6x30 mm, 90° rotatable

(3) Setting reflected light polarization on 3 materials, 5 materials or 7 materials stands

Additional equipment:

- Polarizer slider RL 6x30 mm, 90° rotatable, 427710-9060-000 (Fig. 157/**1**) (section 3.3)
- Analyzer slider, fixed, and reflector module brightfield ACR P&C for reflected light or reflector module analyzer for reflected light
- Slot for Polarizer slider RL 6x30 mm, 90° rotatable (Fig. 157/**3**)
- Strain-free objectives marked Pol

The Axio Observer 5 materials and 7 materials stands must also be equipped with one of the following reflected light illuminators, since only they have strain-free optics.

- Reflected light illuminator HD POL FL (423608-9001-000/ -9000-000)
- Reflected light illuminator HD POL FL (423608-9011-000/ -9010-000)

- Place the specimen onto the stage.
- Set the desired magnification.
- Focus.
- View the specimen first in reflected light brightfield.
- Insert the analyzer slider or the reflector module analyzer.
- Insert the polarizer slider (Fig. 157/**1**) into the slot (Fig. 157/**3**).
- Select the desired contrast using the lever (Fig. 157/**2**).

There is often an interplay of color a few degrees before or after the 0° position.

5.12.8 Setting up reflected light darkfield

(1) Application

The reflected light darkfield technique is used to examine specimens that do not only have reflective surfaces of different reflectivity (ideal brightfield objects), but also exhibit scratches, cracks, pores, or in a nutshell, flat surface deviations. All these light-scattering details shine brightly in the darkfield whilst the reflective flat surfaces stay dark.

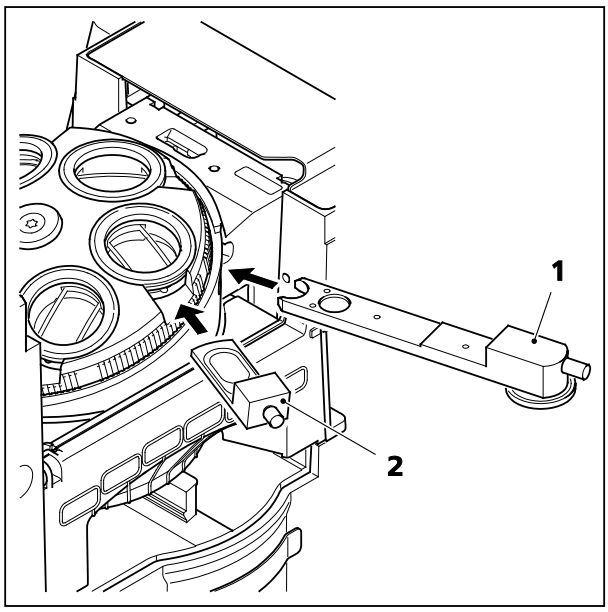
(2) Instrument equipment

- Axio Observer materials with attached microLED or adjusted HAL 100 illuminator
- EC Epiplan-Neofluar or EC Epiplan objectives additionally labeled with "HD".
- ACR P&C dark reflector module.

(3) Setting reflected light darkfield

- Prepare the microscope as described in section 5.12.5 for reflected light brightfield. Fully open the luminous-field diaphragm.
- Rotate the ACR P&C darkfield reflector module on the reflector turret (Fig. 154/**7**) into the beam path.
- Select the position with darkfield (HD) objective on the nosepiece (Fig. 154/**5**).
- Fully open luminous-field diaphragm (Fig. 154/**3**) and aperture diaphragm (Fig. 154/**2**); remove any neutral filter from the beam path.
- If necessary, refocus and view the specimen in the darkfield.

5.12.9 Setting up reflected light DIC and reflected light C-DIC



1 C-DIC or TIC slider , 6x20
2 DIC slider

Fig. 158 DIC / C-DIC reflected light components on Axio observer materials

(1) Application

The reflected light DIC and reflected light C-DIC technique (DIC = Differential Interference Contrast, C-DIC = Differential Interference Contrast in Circularly polarized light) produces high-contrast images of phase specimens, i.e. those specimens which only change the phase of the light in contrast to amplitude specimens.

(2) Instrument equipment

- Axio Observer materials with attached microLED or adjusted HAL 100 illuminator
- Objectives: EC Epiplan-Neofluar or Epiplan with additional designation "DIC" or "Pol".
- DIC slider matching the respective objective (its magnification and aperture are engraved on the top side of the slider)or C-DIC slider (in combination with reflector module CDIC P&C).
- DIC/Pol P&C reflector module or DIC/Pol Red I P&C in reflector turret or
  C-DIC/TIC P&C reflector module (in combination with C-DIC slider 6x20).

(3) Reflected light DIC

- Prepare the microscope as described in section 5.12.5 for reflected light brightfield. Open the luminous-field diaphragm until the edge just disappear from the field of view to avoid reflections.
- Swivel in the reflector module DIC/Pol P&C on the reflector turret into the beam path. To produce color contrasts, use reflector module DIC/Pol Red I P&C, which is of advantage in case of large retardation (> 1λ).
- Rotate the nosepiece to swivel in the objective position with DIC slider slot.
- Insert the DIC slider (Fig. 158/**2**) into the slot on the nosepiece.
- Place the specimen on the stage, bring it into focus until the specimen structure of interest appears at maximum contrast.
- To optimize the contrast, turn the knurled screw on the DIC slider.

(4) Reflected light C-DIC

- Prepare the microscope for reflected light brightfield.
- Rotate reflector turret to swivel C-DIC/TIC P&C reflector module (Fig. 154/**7**) into the beam path.
- Insert the C-DIC slider 6x20 (Fig. 158/**1**) into the slot for C-DIC slider.
- If necessary, refocus and rotate the selector wheel on the C-DIC slider 6x20 (Fig. 158/**1**) until the structure of interest is visible at maximum contrast.
- Additional contrasting effects can be produced by adjusting the selector wheel on the C-DIC slider.

(5) Additional note

Differential interference contrast or differential interference contrast with circularly polarized light is created by a (pseudo) relief in the specimen. Therefore, it depends on whether linear structures are oriented in the "light-shadow" direction (very faint contrast) or vertical to this direction (maximum contrast).

If you use the C-DIC slider 6x20, you can turn the selector wheel of the C-DIC slider to align the structures vertically to the "light-shadow" direction and thus achieve maximum contrast.

5.12.10 Setting up reflected light TIC

(1) Application

The reflected-light TIC technique (microinterferometry; TIC = Total Interference Contrast in circularly polarized light) can be used to image and measure object structures available in different azimuths.

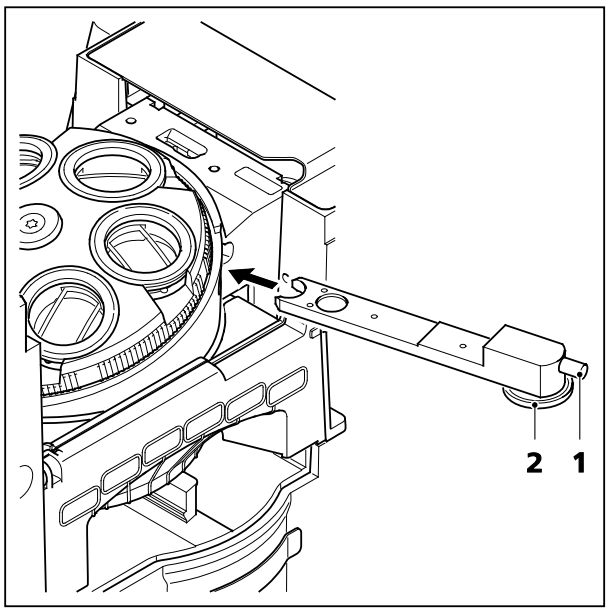


Fig. 159 TIC slider 6x20

(2) Instrument equipment

- Axio Observer materials with attached microLED or adjusted HAL 100 illuminator
- EC Epiplan-Neofluar or Epiplan objectives with additional designation "DIC" or "Pol".
- 6x20 TIC slider with accompanying C-DIC P&C reflector module.

(3) Setting reflected light TIC

- Place the specimen (e.g. a step-shaped object) on the stage and prepare the microscope as described in section 5.12.5 for reflected light brightfield.
- Swivel in the C-DIC/TIC P&C reflector module on he reflector turret (Fig. 154/**7**) into the beam path.
- Insert TIC slider 6x20 (see Fig. 159) into the slot below the nosepiece. In the field of view, colored interference fringes appear.
- To select the structure to be measured, turn selector wheel (Fig. 159/**2**) of TIC slider or modulator turret until the interference fringe pattern is vertical to the splitting direction of the specimen. Use the adjusting screw (Fig. 159/**1**) of the TIC slider to shift the interference fringes.

The step height is then determined using to the following formula:

$$d = \frac{n\Delta}{2} = \frac{\lambda b}{2a}$$

where: d = step height in nm
n = refractive index of the environment, usually air (n = 1)
Δ = path difference
a = spacing of interference fringes
b = offset of interference fringes at the step
λ = wavelength of the illumination in nm

The values for a and b (see Fig. 160) are determined using the eyepiece reticle or the micrometer eyepiece.

If you are working with white light (without interference filter), λ = 550 nm must be used. When using interference filters, their center wavelength applies.

The measured path difference is aperture-dependent and decreases with increasing illumination aperture.

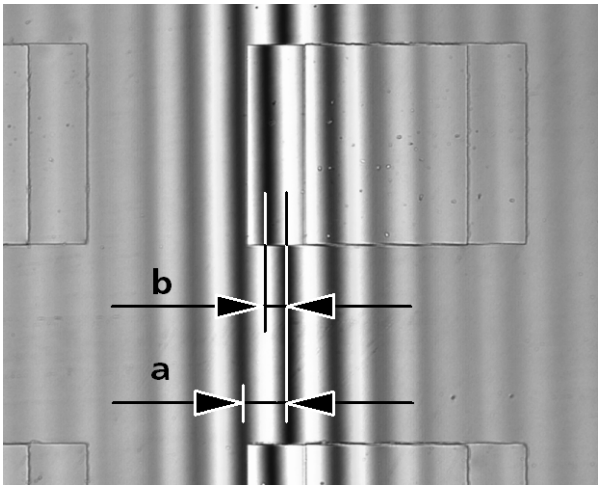


Fig. 160 Interference fringe pattern

Accordingly, the following correction values must be taken into account depending on the objective used:

Objective	Correction factor k
5x/0.15	1.0057
10x/0.25	1.0161
10x/0.30	1.0236
20x/0.4	1.0436
20x/0.50 and 50x/0.75	1.0718
50x/0.60	1.1111
50x/0.75 and 100x/0.75	1.2038
50x/0.80	1.2500
50x/0.90 and 100x/0.90	1.3929
100x/0.95	1.5241

Table 1: Aperture-dependent correction

Example:

a = 11 mm b = 5 mm

λ = 550 nm Objective 20x/0.50

$$d = \frac{\lambda \cdot b \cdot k}{2a} = \frac{550\ \text{nm} \cdot 5\ \text{mm} \cdot 1.0718}{22\ \text{mm}} = 134\ \text{nm}$$

Attention:

- If the step and the environment are of different materials, the phase jumps inherent to the material must be taken into account. The phase jump for all non-conductors is 180° and for semiconductors it only deviates slightly from 180°, i.e. the measuring error is negligible, however, the measured values may be falsified for metals on glass for example. The phase jumps in table 2 calculated for vertically incident light and compact material are to serve as recommended values because it can be assumed that the phase jumps depend on the layer thickness and the angle of incidence of the light. Accurate determination of the thickness is only possible by coating the entire object with a homogeneous layer and then measuring the path difference.
- If the layers or steps are transparent such as silicon dioxide on silicon, the interference fringes may change their color. Determination of the interference order then become problematical. This can also be remedied by additionally coating the surface with a homogenous layer.

Material	**Phase jump ϕ**
Copper	140.0°
Gold	142.5°
Silver	151.0°
Bismuth	151.0°
Nickel	157.0°
Iron	157.5°
Zinc	159.0°
Platinum	160.0°
Aluminium	160.0°
Tin	160.5°
Chromium	165.0°
Carbon	160.0°
Graphite	165.0°
Silicon	177.0°
Glass	180.0°

Table 2: Calculated phase jumps for compact material and vertically incident light

Half the difference of the phase jumps is included in the determination of the thickness:

$$d = \frac{\Delta}{2} - \frac{\delta\phi}{2}$$

Example: Extreme case of copper on glass

$\Phi_{copper} = 140°$, $\Phi_{glass} = 180°$, therefore part of the phase jump

$$\frac{\delta\phi}{2} = 20° \text{ or } \frac{\lambda}{18} = 30 \text{ nm}$$

without taking the phase jump inherent in the material into account the measured value would be 30 nm too large.

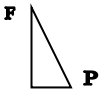
5.13 Image orientation of camera outputs for documentation

Depending on the configuration, Axio Observer microscopes are fitted with up to five documentation ports:

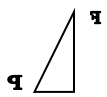
- Frontport for connecting an SLR, video or digital camera (e.g. ZEISS Axiocam) via a special video or camera adapter.
- Sideport (right or left) for connecting record-keeping equipment via a 60N mm port.
- Baseport (bottom) for connecting record-keeping equipment via a 60N mm port.
- Binocular phototube with 60N port.

The following table gives a detailed overview of image orientation at the Axio Observer materials camera outputs.

The descriptions are based on an object, such as a stage micrometer, with readable figures or letters to illustrate the orientation:

Original object:  Viewed without microscope

The object is placed on the microscope stage with the **readable side**, as shown above, **towards the objective** and then appears, as viewed from above by the microscope user, as follows:

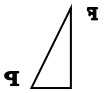
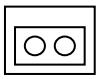
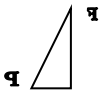
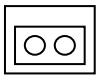
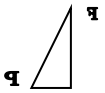
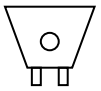
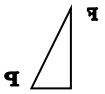
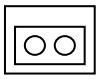
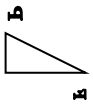
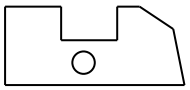
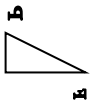
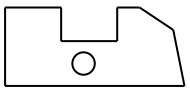
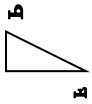
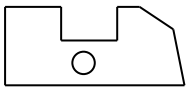
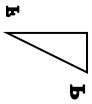
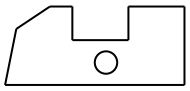
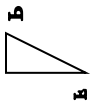
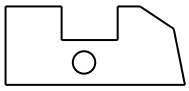
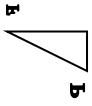
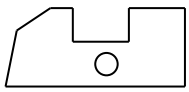
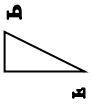
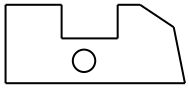
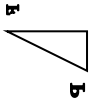
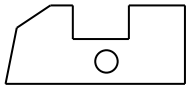


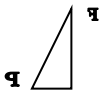
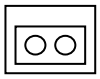
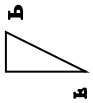
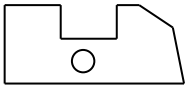
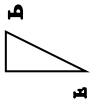
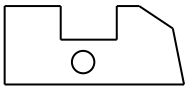
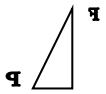
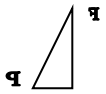
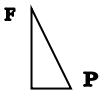
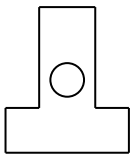
This view is the reference view for the following description.

Also viewed from above, a movement of the specimen stage in the Y direction backwards (thick arrow) and in the X direction to the right (thin arrow) looks like this:

For a given viewing angle for a particular stand component, the table provides the following information:

the intermediate image of the object / monitor image, as captured by the camera, and the direction of object movement when the stage is moved.

Catalog number/ Description	Viewed with / switch position	Intermediate image / monitor	Direction of object motion	Viewing direction schematic
425537-0000-000 Binocular tube	Eyepieces (100% vis)			
425536-0000-000 Binocular photo tube	(100% vis): 0% doc			
	50% vis : 50% doc 0% vis: 100% doc			
425535-0000-000 Binocular ergotube	Eyepieces (100% vis)			
425150-0000-000 Sideport 60N, left, 2 switch positions	20% vis : 80% doc			
425151-0000-000 Sideport 60N, left, 2 switch positions	0% vis : 100% L			
425152-0000-000 Sideport 60N, left, 3 switch positions	50% vis : 50% L 0% vis: 100% L			
425153-0000-000 Sideport 60N, right, 3 switch positions	(50% vis): 50% R 0% vis: 100% R			
425154-0000-000 Sideport 60N left and right, 3 switching positions	0% vis : 100% L			
	20% vis : 80% R			
425155-0000-000 Sideport 60N left and right, 3 switch positions	0% vis : 100% L			
	0% vis : 100% R			

Catalog number/ Description	Viewed with / switch position	Intermediate image / monitor	Direction of object motion	Viewing direction schematic
425165-0000-000 Sideport 60N L80 /R100, 3 switch positions	0% doc left/right			
	20 vis : 80% doc left			
	0 vis : 100% doc right			
000000-1069-228 Beam path switching	100% frontport			
00-1069-229 Beam path switching mot.	100% frontport			
425126-0000-000 baseport	100% doc			

Use of camera adapters which work without using intermediate imaging does not affect image orientation. The same applies to the frontport with connectors V200 T2 2.5x for SLR (000000-1279-493) and video adapter V200 C 2/3" 0.63x (000000-1071-171).

The use of Optovars (e.g. 1.25x or 1.6x) also does not change the image orientation.

The above description applies equally to all other specimens.

5.14 Interface 60N (external thread M52 x 1)

Sideport right / left: Interface 60 N

Baseport: Interface 60 N

A new "interface 60N" connection type is used on the Axio Observer for camera adaptation for the right/left sideport (Fig. 161/**2**), and for the baseport (Fig. 161/**1**). The familiar adapter for "interface 60" (30 mm internal diameter) can still be used.

Microscope cameras (e.g. Axiocam from ZEISS), standard SLR (Single Lens Reflex; 35 mm film or digital) cameras or compact digital cameras can be coupled to the camera port of the Axio Observer stand.

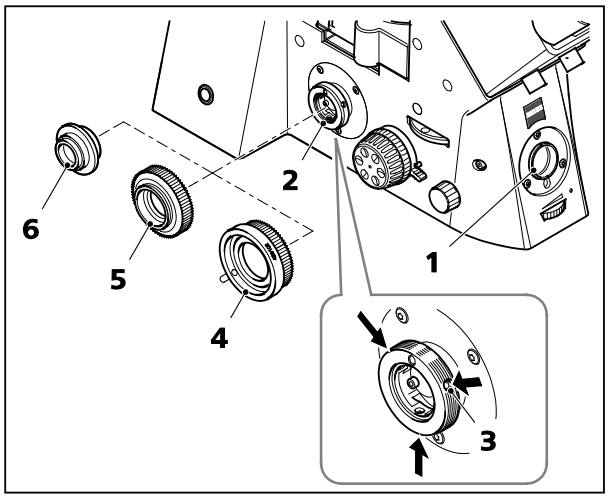


Fig. 161 Making connections to sideport / baseport

When working with microphotographic devices, consult the corresponding manuals of the cameras as well.

- Fix the camera adapter 60N (Fig. 161/**4** or **5**) to the camera.
- Remove the dust cap from the camera port.

☞ The three set screws (3 mm) (Fig. 161/**3**) at the camera port must not extend either to the external thread or into the internal bore hole.

- Attach the pre-assembled unit to the camera port, adjust it and fasten the union nut of the adapter (Fig. 161/**4** or **5**) fingertight.

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

- Attach the camera adapter 60 (Fig. 161/**6**) to the camera.
- Remove the dust cap from the camera port.
- Insert the pre-assembled unit in the camera port (do not screw in set screws too deeply).
- Turn the three set screws (3 mm) on the coupling point (Fig. 161/**3**) clockwise until the adapter is tight.

5.15 Photomicrography with SLR camera

The Axio Observer microscopes 5, 5 materials and 7, 7 materials permit the beam path to be switched to 100% vis (visual observation through eyepieces and an open position for activation of the right or left sideport), 100% frontport (port pointing to the front for photomicrography) or 100% baseport (port pointing downwards).

Since this is a 100% switching position, simultaneous visual observation during photography is not possible.

The V200 T2 2.5x adapter for SLR and the camera-specific T2 adapter permit commercially available 35 mm SLR (DSLR) cameras to be connected to the microscope.

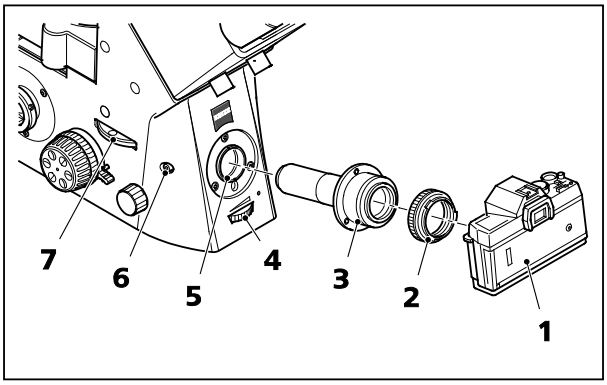


Fig. 162 Connection of a SLR camera

- Remove dust cover or camera lens from the camera housing (Fig. 162/**1**).
- Attach appropriate T2 adapter (Fig. 162/**2**) to the camera housing.
- Remove the dust cover from the V200 T2 2.5x adapter for SLR (Fig. 162/**3**).
- Screw the V200 T2 2.5x for SLR adapter into the thread of the T2 adapter.
- Remove dust cover from the camera port.
- Attach the pre-mounted camera system to the frontport (Fig. 162/**5**), align it horizontally and tighten clamping screw (Fig. 162/**6**) using the 3 mm ball-headed screwdriver.
- Select the object area to be photographed via the binocular tube.
- After switching the beam path (Fig. 162/**7**) from visual observation to the frontport, 100 % of the light is now available for the camera.
- To operate the camera system, please observe the manufacturer's manual.

☞ The photographic magnification on the film or image sensor is the product of objective magnification, Optovar magnification and the 2.5 factor of the V200 T2 2.5x SLR camera adapter.

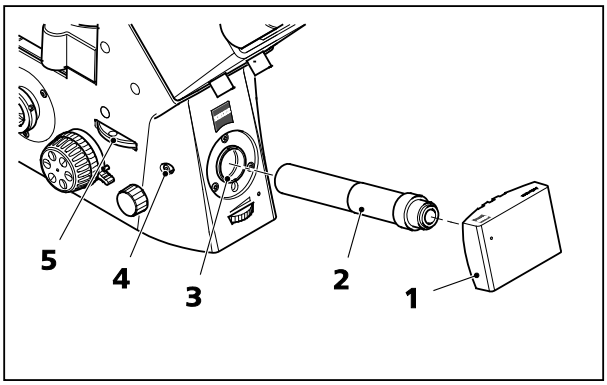


Fig. 163 Video attachment

5.16 Photomicrography using a digital camera and videomicroscopy

- The Axio Observer microscopes 5, 5 materials and 7, 7 materials permit the connection of one video camera or one digital camera (e.g. Axiocam digital camera from ZEISS), (Fig. 163/**1**) to the frontport via the V200 C 2/3" 0.63x video adapter (Fig. 163/**2**).
- Attaching the video adapter is analogous to the photo adapter. Attach the pre-mounted video adapter (Fig. 163/**2**) to the frontport (Fig. 163/**3**), align it and tighten clamping screw (Fig. 163/**4**) using the 3 mm ball-headed screwdriver.
- After switching the beam path (Fig. 163/**5**) from visual observation to the frontport, 100 % of the light is now available for the camera.

6 CARE, MAINTENANCE, TROUBLESHOOTING AND SERVICE

6.1 Care

Care of the microscope is limited to the following procedures:

- Cover the instrument with the dust cover after each use.
- Do not install the instrument in damp areas.
- Cover all open tubes with dust-protective caps.

Switch the device off and remove the power plug before cleaning.

Make sure that no cleaning fluids or moisture are allowed to penetrate to the inside of the instrument. This may lead to a short circuit in the microscope.

- Remove dust and loose dirt on visible optical surfaces with a brush, blower brush, cotton bud, optics cleaning tissue or cotton cloth.
- Labels on the components and the desktop power supply unit may only be cleaned using a dry cotton cloth. Otherwise, the labels may detach.
- Remove water-soluble dirt (coffee, cola, etc.) by breathing on it and wiping with a dust-free cotton cloth or a moistened cloth. You may add a mild detergent to the water.
- Remove stubborn, oily or greasy dirt (immersion oils, finger prints) using cotton wool buds or a dust-free cotton cloth and Optical Cleaning Mixture L.
  This cleaning solution consists of 90 vol% gasoline and 10 vol% isopropanol (IPA). The individual components are also known as:
  Benzine: Medical alcohol, petrolether
  Isopropanol: 2-propanol, dimethyl carbinol, 2-hydroxypropane

Clean the optical surface using a circular motion working from the middle outwards. A light pressure should be exerted on the optical surface.

The following instructions should be followed where the Axio Observer is used in warm, humid climates:

- Keep the microscope in a bright, dry, well-ventilated room with a humidity of less than 65%. Sensitive components and accessories, such as objectives and eyepieces, should be stored in a dry cabinet.
- If the microscope is to be stored in closed containers for a prolonged period, fungicide-soaked cloths should be placed in the containers to prevent mould.

The following conditions always present a risk of mould growth on fine opto-mechanical instruments:

- exposure to a relative humidity > 75 % and a temperature of +15 to +35 °C for a period longer than three days.
- installation in poorly-ventilated, dark rooms and
- dust deposits and fingerprints on optical surfaces.

The devices are not provided with special equipment to protect them from corrosive, potentially infectious, toxic and radioactive or other samples that may be hazardous to health. All legal regulations must be complied with when handling such substances, particularly the prevailing national rules for accident prevention.

- Eliminate contaminations on the instrument according to the rules for prevention of accidents.
- Switch off the instrument each time after use and place the instrument cover on it to protect it from dust and humidity.

6.2 Maintenance

6.2.1 Checking the instrument

The following checks should usually be performed every six months.

General

- Check the power cable and plugs for damage.
- If any damage is visible, switch off the instrument and prevent its use. Any damage should be repaired by the ZEISS service team.
- Check that the maximum operating times of the halogen and HBO illuminators have not been exceeded (weekly).

Illumination

- Check that the halogen/LED and HBO or HXP 120 V illuminators are correctly configured.
- Check the electrical contacts of the illuminators.

Optics

- Visual inspection of the cleanliness of objectives and eyepieces

6.2.2 Changing the fuses in the Axio Observer 3, 3 materials, and 5, 5 materials stands

Pull out the power plug before changing fuses.

The power fuses for the input voltage are located in the back of the stand of the Axio Observer 3 materials and 5 materials. The fuse compartment is integrated into the power socket and contains two T 5.0 A/H 250 V 5 x 20 mm fuses. If the device fuses fail the cause must first of all be ascertained and technical problems properly remedied.

- Pull out the power plug.
- Pull out the fuse holder (Fig. 164/**2**) frontward.
- Remove the fuses from the fuse holder and insert new fuses.
- Reinsert the fuse holder into the fuse compartment (Fig. 164/**1**) until it clicks into place.
- Plug in the power plug.

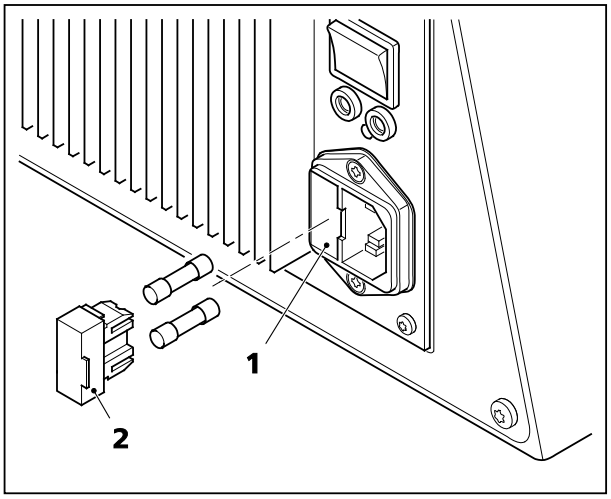


Fig. 164 Changing the fuses in the Axio Observer 3, 3 materials and 5, 5 materials

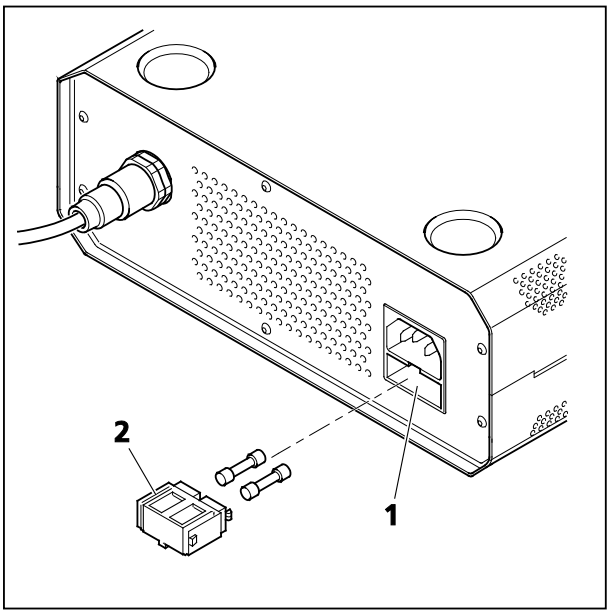


Fig. 165 **Changing fuses on the external power supply unit for Axio Observer 7, 7 materials**

6.2.3 Changing fuses on the external power supply unit of Axio Observer 7, 7 materials

Pull out the power plug before changing fuses.

The Axio Observer 7, 7 materials is supplied with voltage from the external power supply unit VP232-2. The fuse compartment of the VP232-2 power supply unit is located at the rear of the unit and contains two type T 4.0 A/H / 250 V fuses.

- Pull out the power plug.
- Pull out the fuse holder (Fig. 165/**2**) frontward.
- Remove the fuses from the fuse holder and insert new fuses.
- Reinsert the fuse holder into the fuse compartment (Fig. 165/**1**) until it clicks into place.
- Plug in the power plug.

6.2.4 Changing the fuses in the ballast unit for the HBO 100

Pull out the power plug before changing fuses.

The fuse holder for the F1 and F2 fuses is located on the rear of the ballast unit. The fuse holder is integrated into the power socket and contains two T 2.0 A/H 250 V 5 x 20 mm fuses.

If the device fuses fail the cause must first of all be ascertained and technical problems properly remedied.

- Pull out the power plug.
- Remove the fuse holder (Fig. 166/**1**) from the fuse compartment (Fig. 166/**2**) by pulling it towards you.
- Replace the defective fuse.
- Reinsert the fuse holder into the fuse compartment until it clicks into place.
- Plug in the power plug.

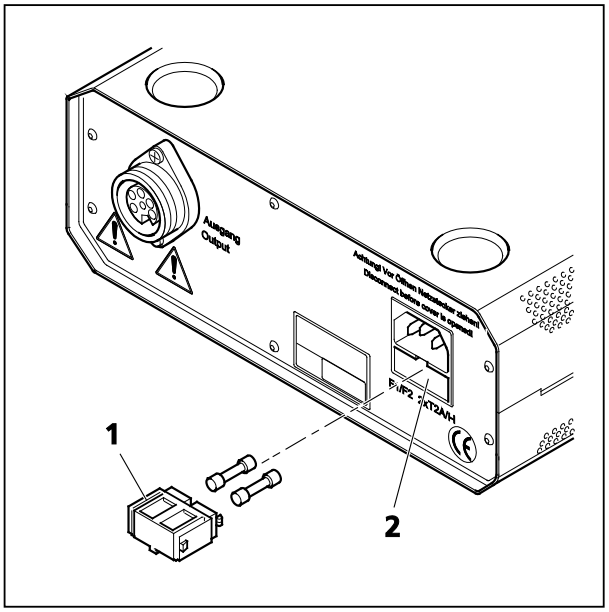


Fig. 166 Changing fuses in the ballast unit (power supply unit)

6.3 Service

Any repairs to optical components or moving parts inside the instrument or any work on the power supply may only be carried out by service technicians or specially **authorized** personnel.

If servicing is required, please contact your local representative or

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7 APPENDIX

7.1 List of abbreviations

a	Free working distance
AC	Alternating current
ACR	Automatic component recognition
A-Plan	Achromatic objectives featuring improved image flatness (ICS line)
BF	Bright field
Br.	Suitable for spectacle wearers
C-DIC	Differential Interference Contrast in circularly polarized light
CAN bus	Controller Area Network Communication Bus
Cod.	coded
CSA	Canadian Standards Association
D	Transmitted light / cover slip thickness
d	Diameter
DC	Direct current
DIC	Differential Inference Contrast
DIN	Deutsches Institut für Normung (German Standards Institute)
doc	Documentation
EC	European Community
EEC	European Economic Community
EMC	Electromagnetic Compatibility
EN	European standard
foc.	focusable
H	Brightfield
HAL	Halogen illuminator
HBT	Mercury vapor short-arc lamp
HD	Bright / dark field
HF	Brightfield
ICS	Infinity Color-Corrected System
IEC	International Electrotechnical Commission
iHMC	improved Hoffman Modulation Contrast
IP	Ingress protection rate (enclosure type)
ISO	International Organization for Standardization
LCD	Liquid Crystal Display
LD	Long distance
LED	Light Emitting Diode

M, mot.	motorized
Man	manual
N. A.	Numerical aperture
Ph, PH	Phase contrast
PL	Plan
PlasDIC	Plastic differential interference contrast
RL	Reflected light
SLR	Single lens reflex
SW	Wrench size across flats
T	Slow-blow (fuse type)
TIC	Total Interference Contrast in circularly polarized light
TFT	Thin film transistor
TL	Transmitted light
TV	Television
UL	Underwriter Laboratories (a US testing agency)
USB	Universal serial bus
VIS, vis	visual

7.2 List of illustrations

7.3 Index

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7.4 Patent rights

Instruments, instrument components or methods described in this manual are protected by patents.

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