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Operating Manual
Axio Examiner
Research Microscope

Knowledge of these instructions is required for operating this equipment. Please make yourself familiar with the manual's contents, and, in particular, follow every instruction which concerns the safe operation of this equipment.

These instructions are subject to modifications for promoting further technical development. This manual is not covered by any updating service.

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Edited by: Carl Zeiss Microscopy GmbH
Carl-Zeiss-Promenade 10
07745 Jena, Germany

microscopy@zeiss.com
www.zeiss.com/microscopy

Carl Zeiss Microscopy GmbH
Königsallee 9-21
37081 Göttingen, Germany

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1 INTRODUCTION

1.1 Equipment safety notices

Axio Examiner microscopes have been designed, manufactured and inspected pursuant to the DIN EN 61010-1 (IEC 61010-1) and IEC 61010-2-101 standards regarding "Safety requirements for electrical equipment for measurement, control and laboratory use."

These units comply with the requirements of Directive 98/79/EC, and they are marked with the CE sign.

The present operating manual contains information and warnings which are to be observed by the operator.

The following notices and warning symbols are used in this operating manual:

NOTE
This symbol indicates a notice which requires particular attention.

CAUTION
This symbol indicates a hazard which may be caused to the equipment or to an equipment system.

CAUTION
This system indicates a hazard to which a user may be exposed.

CAUTION
Hot surface!

CAUTION
Emission of UV radiation!

CAUTION
Unplug the power plug before starting any intervention in the equipment!

Axio Examiner microscopes including any original accessories may not be used unless for the microscopy procedures as described in this operating manual.

The following instructions should be observed in particular:

The manufacturer will not assume any liability whatsoever for any other use even if such other use only refers to single assemblies or parts. This shall also be applicable to any servicing or repair work not performed by authorized service personnel. All guarantee or warranty claims will be void in addition.

No operation of this equipment is allowed in a potentially explosive environment.

Do not operate this equipment unless positioned on a hard and nonflammable basis.

Do not insert the power plug into any connector receptacle not provided with an earth/ground contact. Do not bypass the protective effect by using an extension cable without a protective conductor.

Shut down the equipment and prevent it from being used inadvertently whenever a protective measure is found not to be effective any longer. For restarting the equipment, call the Zeiss customer service or the Carl Zeiss Microscopy Service.

The external power supply unit for 12 V DC 100 W for HAL 100 is designed for using line voltage values within a range of between 100 and 240 V ±10 %, 50 / 60 Hz. There is no need to switch over between different voltage values.
The power supply units for HBO 103 (ebq 100 dc) or XBO 75 (ebx 75 isolated) are designed for a voltage range of between 100 and 240 V AC, with 50 to 60 Hz. These units automatically adapt to the line voltage applied. Accordingly, the voltage does not need to be switched over for these devices either.

Before you switch on the equipment, check whether it is suitable for the line voltage available.

Unplug the power plug before opening the equipment and before replacing any fuse. Do not use any fuse unless it is suitable for the rated current provided. Do not use any makeshift fuse, and do not short-circuit the fuse holders.



Axio Examiner microscopes are not equipped with any particular device for protection against caustic, potentially infectious, toxic, radioactive or other specimens which might impair health. Please observe all statutory requirements, and especially all national regulations for accident prevention whenever working with such specimens.



Gas discharge lamps as, e.g., HBO 100 emit ultraviolet radiation which might cause burning to the eyes and to the skin. Accordingly, do not look directly into the light source, and avoid any direct incidence of light on your skin. Whenever working on the microscope, always use the protection devices belonging to the equipment (e.g., specific attenuating filters or the fluorescence protection screen). Gas discharge lamps are under a high internal pressure when hot. Accordingly, they should only be replaced after having cooled down, and using both protective gloves and a protective mask.



When using a fluorescence filter, do not remove the heat filter for protection against the heat radiation emitted by the microscope lamp since fluorescence filters are heat sensitive, and heat may impair proper functioning.



Avoid touching the hot lamp housing. Prior to lamp replacement, unplug the power plug from the corresponding power supply unit, and allow approximately 15 minutes for the lamp to cool down.



Dust and contamination may impair the equipment's operational reliability. So, the equipment should be protected against any such influence as far as possible. Cover the equipment with the dust cover whenever it is not in use. Before covering the equipment, always check that all lighting devices have been switched off.



Clogged or covered venting slots may lead to heat buildup which may damage the equipment and even cause a fire in extreme cases. Venting slots should always be kept free and open, and no object should be inserted or allowed to fall in.



This equipment must not be operated unless by duly instructed personnel. Such personnel must be instructed about possible hazards related to microscopy and to the corresponding field of application. Axio Examiner microscopes are precision instruments, and their operability may be impaired, or the equipment may be destroyed by any inexpert treatment or intervention.



Make certain to read the safety data sheets for Immersol 518 N® and 518 F®.



Immersol 518 N® and 518 F® immersion oils are irritating to the skin. Avoid any contact with skin, eyes, or clothing.
Wash with abundant water and soap in the event of any skin contact.
After eye contact, immediately rinse with abundant water for not less than 5 minutes. Consult a specialist physician if irritation persists.



Appropriate disposal (Immersol 518 N® and 518 F®):
Do not allow to be discharged into surface waters or sewage drains.



Defective microscopes do not belong into household waste; they should be disposed of pursuant to statutory provisions.
Specimens should also be disposed of according to good professional practice, observing both the applicable statutory provisions and in-house work instructions.

1.2 Warning and information signs at the equipment

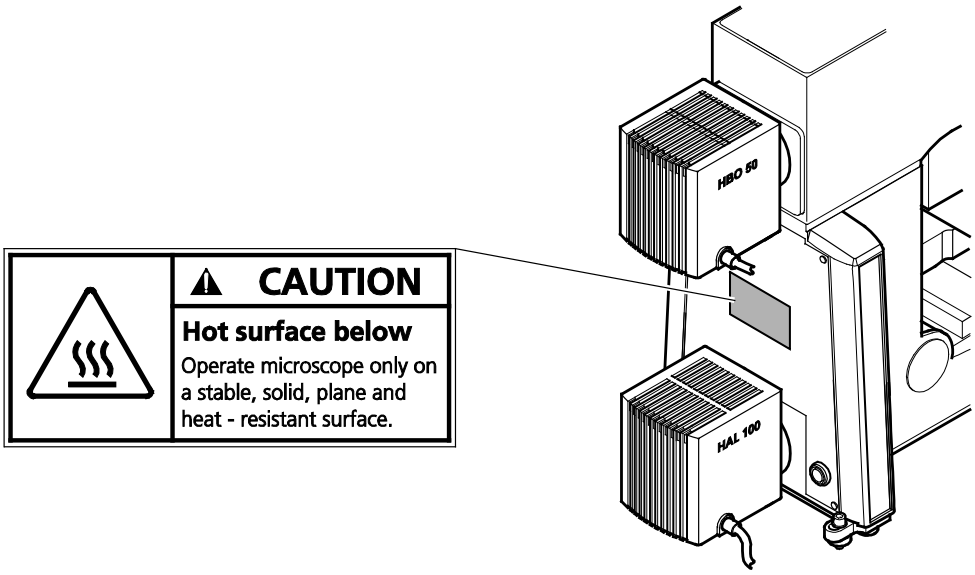


Figure 1-1 Warning and information signs at the equipment

1.3 Warranty instructions

The equipment manufacturer warrants that the equipment is free from any defect in material or workmanship at the time of delivery. Any defect which may occur should be notified immediately, and everything should be done to minimize any damage. When such a defect is notified, the equipment manufacturer agrees to correct such defect, at the equipment manufacturer's sole option, either by repair or by delivering equipment which is free from defects. No warranty is granted for defects which are either due to natural wear and tear (especially for wearing parts), or to improper handling.

The equipment manufacturer shall not be liable for any damage caused by wrong operation, negligence or miscellaneous interventions in the equipment, especially by removing or replacing equipment parts or by using accessories made by other manufacturers. In such an event, all warranty claims shall be void.

No maintenance or repair work may be conducted on the microscopes except for the activities as described in this operating manual. Repair shall only be allowed to the Carl Zeiss customer service or to a person especially authorized by the Carl Zeiss customer service. Whenever a fault occurs in the equipment, please first call the Carl Zeiss Microscopy Service in Germany (see page 88), or your Carl Zeiss representation if you are located in another country.

1.4 List of interfaces

The following figure provides an overview of the interfaces available at the microscope stand.

The interfaces vary according to the stand top or bottom part combination selected.

Legend for Figure 1-2:

1 Microscope camera
2 Magnification changer
3 Tube
4 Upper microscope part
5 A 14 x 40 mm stop slider
6 A 14 x 40 mm stop slider or FL attenuator
7 Achromatic illumination adapter
8 Adapter
9 Segmented stop slider
10 Lower microscope part
11 Filter in the transmitted light filter wheel
12 Condenser carrier
13 Condenser
14 DIC slider
15 Objective mount
16 Stage carrier
17 Stage

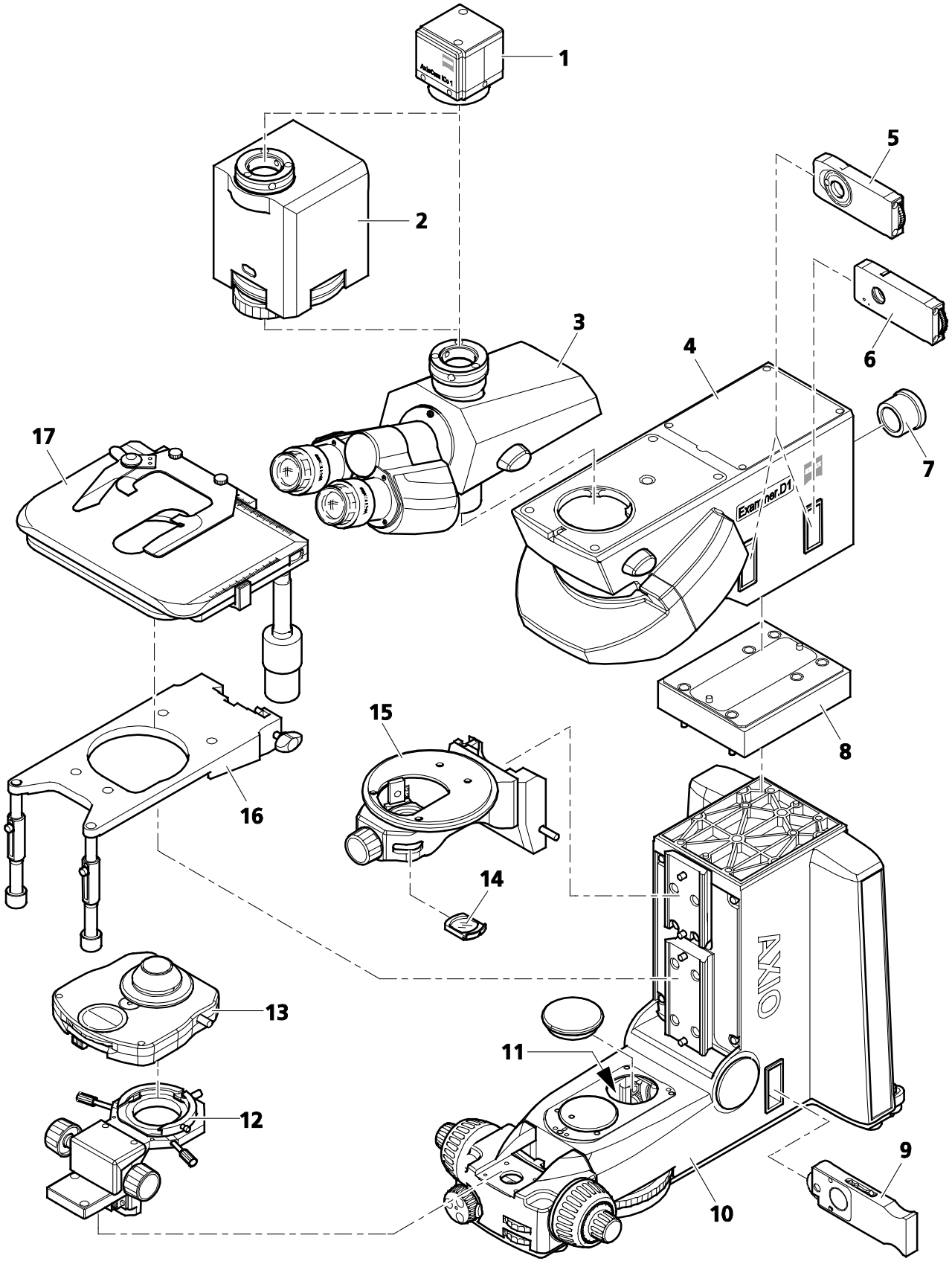


Figure 1-2 List of interfaces

1.5 Controls and functional elements for Axio Examiner man.

Legend for Figure 1-3:

1 Eyepieces
2 Shutter AL shift knob
3 Visual examination / microphotography shift knob
4 Binocular tube part
5 Stop slider or FL attenuator
6 Reflected-light illumination
7 Transmitted-light illumination
8 Segmented stop slider
9 Pinion knob for mechanical stage positioning along the Y axis
10 Pinion knob for mechanical stage positioning along the X axis
11 Centering screw for condenser (on both sides)
12 Filter wheel, 6x (operable on both sides)
13 Pinion knob for condenser height adjustment
14 Focusing gear - precision adjustment (on both sides)
15 Focusing gear - coarse motion (on both sides)
16 Transmitted-light illumination level thumb wheel
17 VIS / infrared change-over switch
18 Luminous-field diaphragm adjusting lever
19 Segmented stop thumb wheel, radial
20 Condenser
21 Lens position switching knob
22 Reflector turret

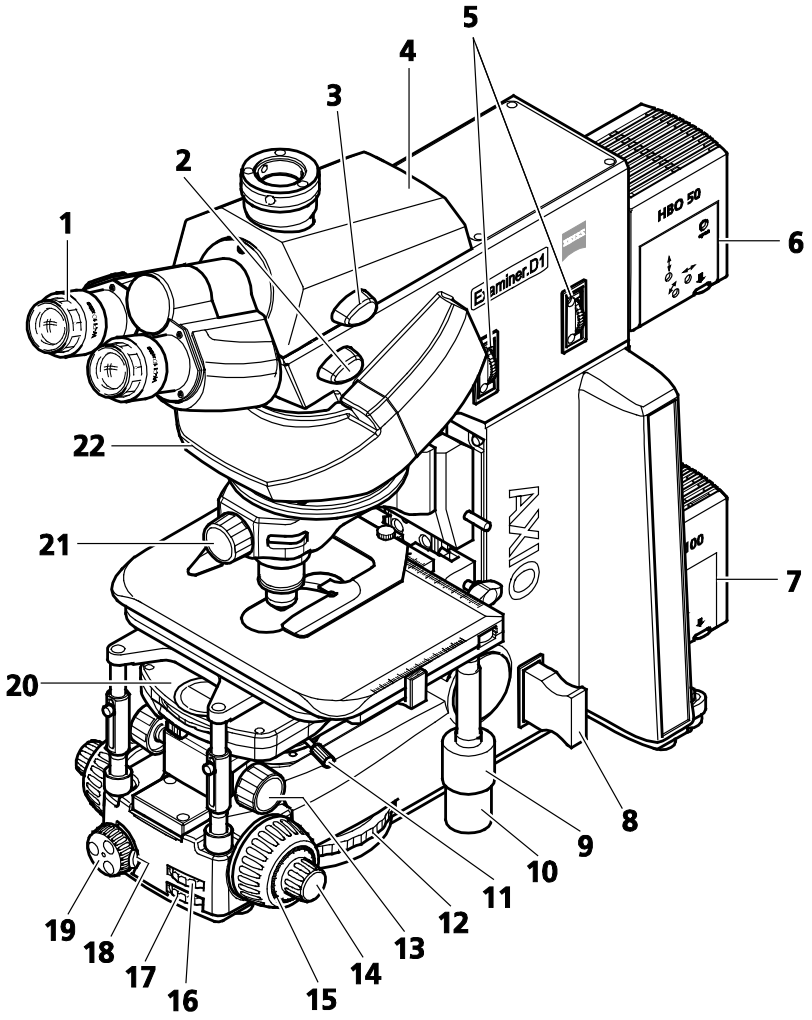


Figure 1-3 Controls and functional elements for Axio Examiner man.

1.6 Controls and functional elements for Axio Examiner mot.

Legend for Figure 1-4:

1 Eyepieces
2 Shutter AL shift knob
3 Visual examination / microphotography shift knob
4 Binocular tube part
5 Stop slider or FL attenuator
6 Reflected-light illumination
7 Transmitted-light illumination
8 Docking station with TFT display
9 Segmented stop slider
10 Pinion knob for mechanical stage positioning along the Y axis
11 Pinion knob for mechanical stage positioning along the X axis
12 Centering screw for condenser (on both sides)
13 Filter wheel, 6x (operable on both sides)
14 Focusing gear - precision adjustment (on both sides)
15 Focusing gear - coarse motion (on both sides)
16 Key ring, right-hand
17 Transmitted light illumination level thumb wheel
18 VIS / infrared change-over switch
19 Motor LED indicator light
20 Luminous-field diaphragm adjusting lever
21 Segmented stop thumb wheel, radial
22 Pinion knob for condenser height adjustment
23 Condenser
24 Lens position switching knob
25 Reflector turret

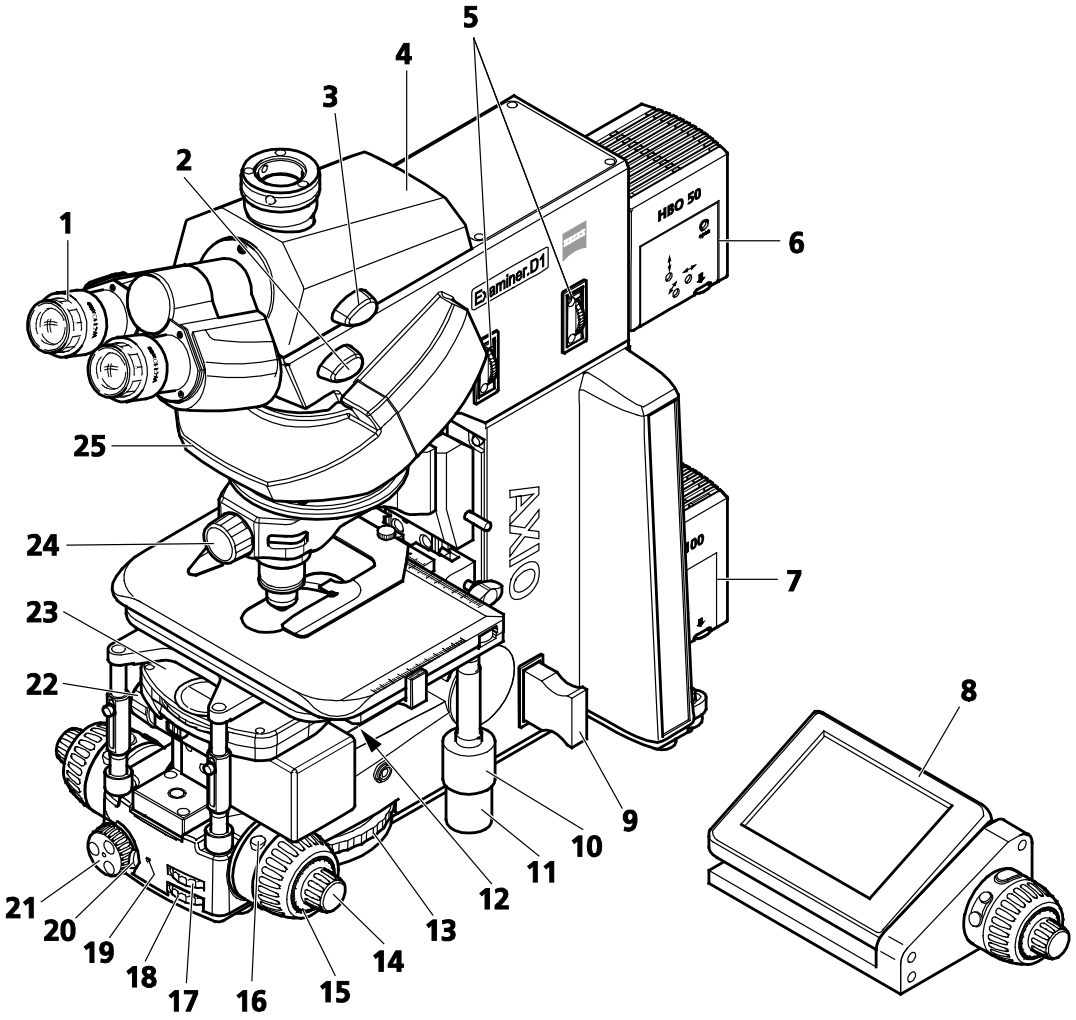


Figure 1-4 Controls and functional elements for Axio Examiner mot.

2 EQUIPMENT DESCRIPTION

2.1 Designation and designated use

Manufacturer's designation: Axio Examiner.A1 microscope
Axio Examiner.D1 microscope
Axio Examiner.Z1 microscope

Axio Examiner microscopes have been designed especially for the electrophysiological area. They may be used as transmitted-light microscopes or as combined transmitted-light and reflected-light microscopes if equipped with a reflected-light fluorescence system. These microscopes are intended for medical applications to examine tissue samples obtained from the human body.

The following microscopy or contrast procedures are possible, depending on the equipment level of the unit concerned:

Transmitted light

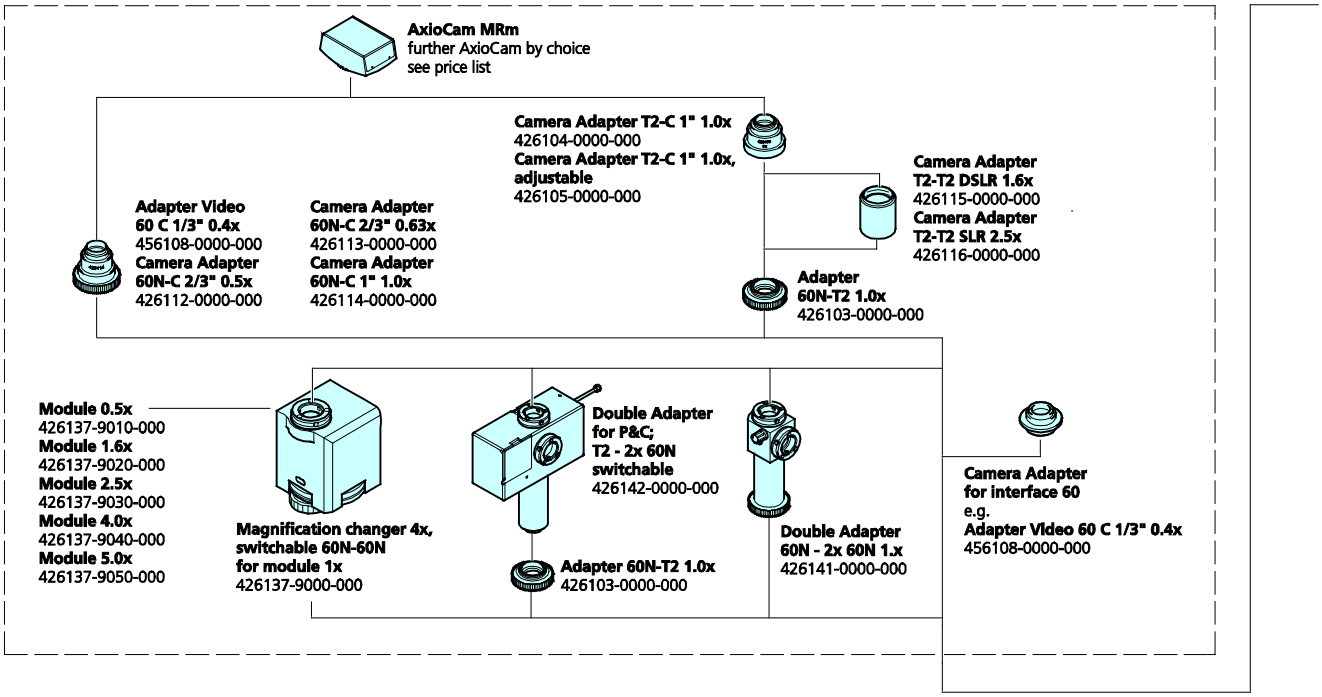
- **Bright field (H)**
- **Differential interference contrast (DIC)**
- **Oblique illumination**

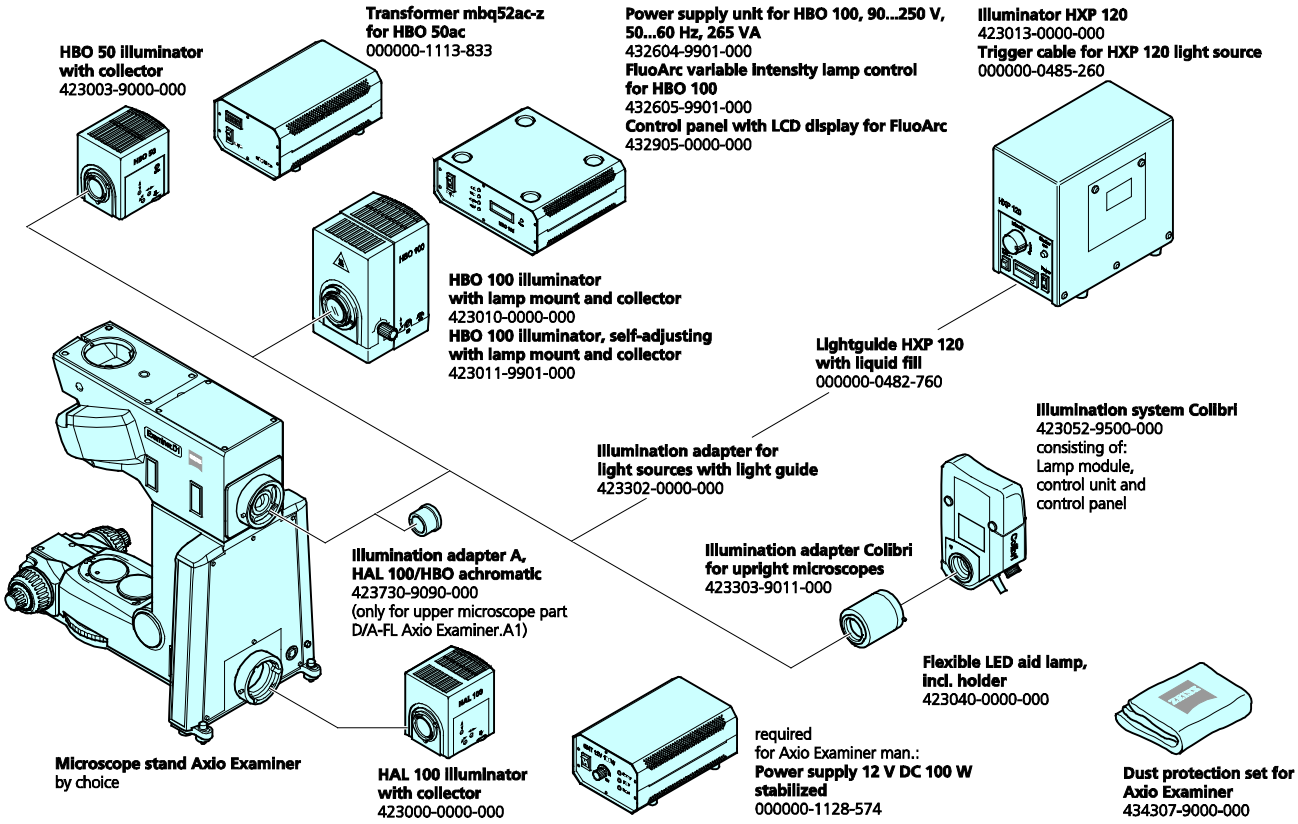
Reflected light

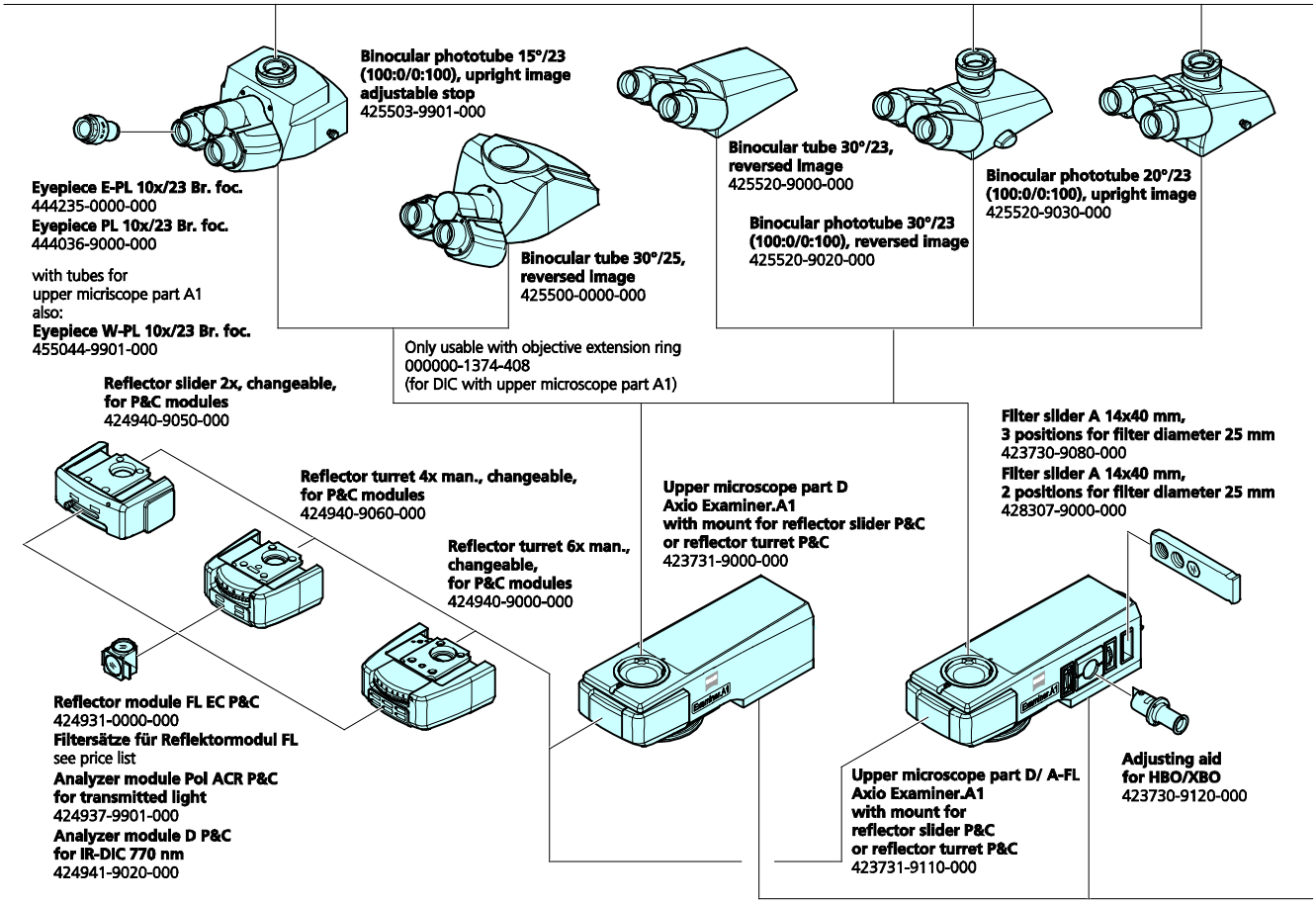
- **Fluorescence**

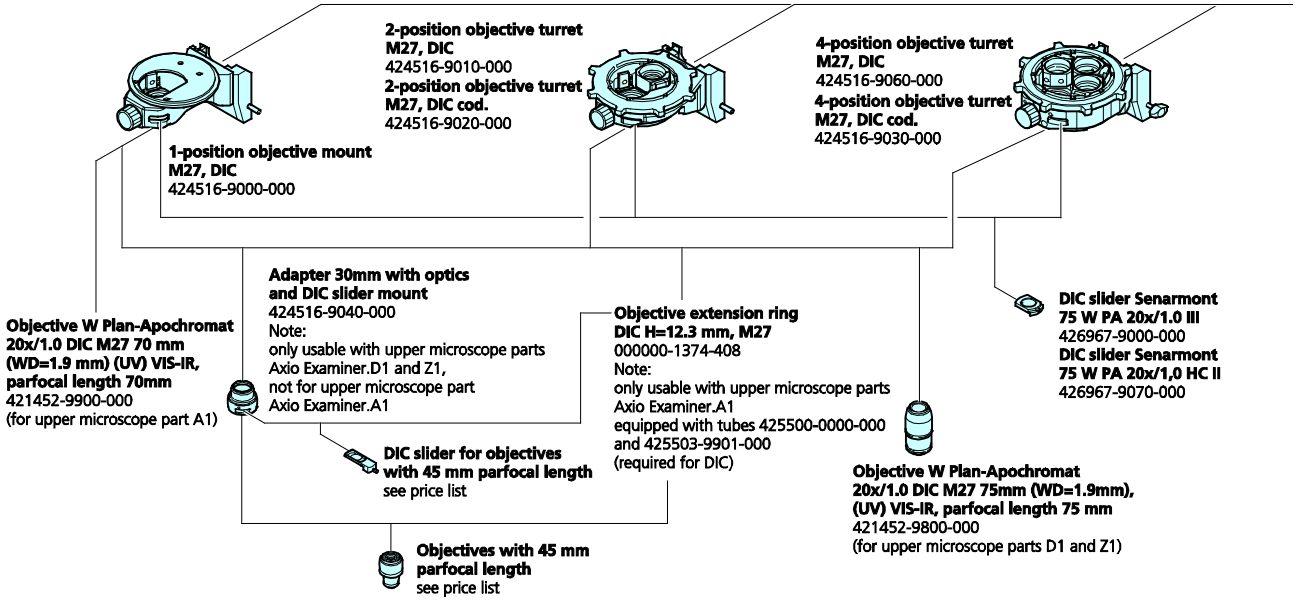
The binocular phototubes allow the connection of a maximum of two microscope cameras, reflex cameras or digital and video cameras for pictorial documentation using the corresponding adapters.

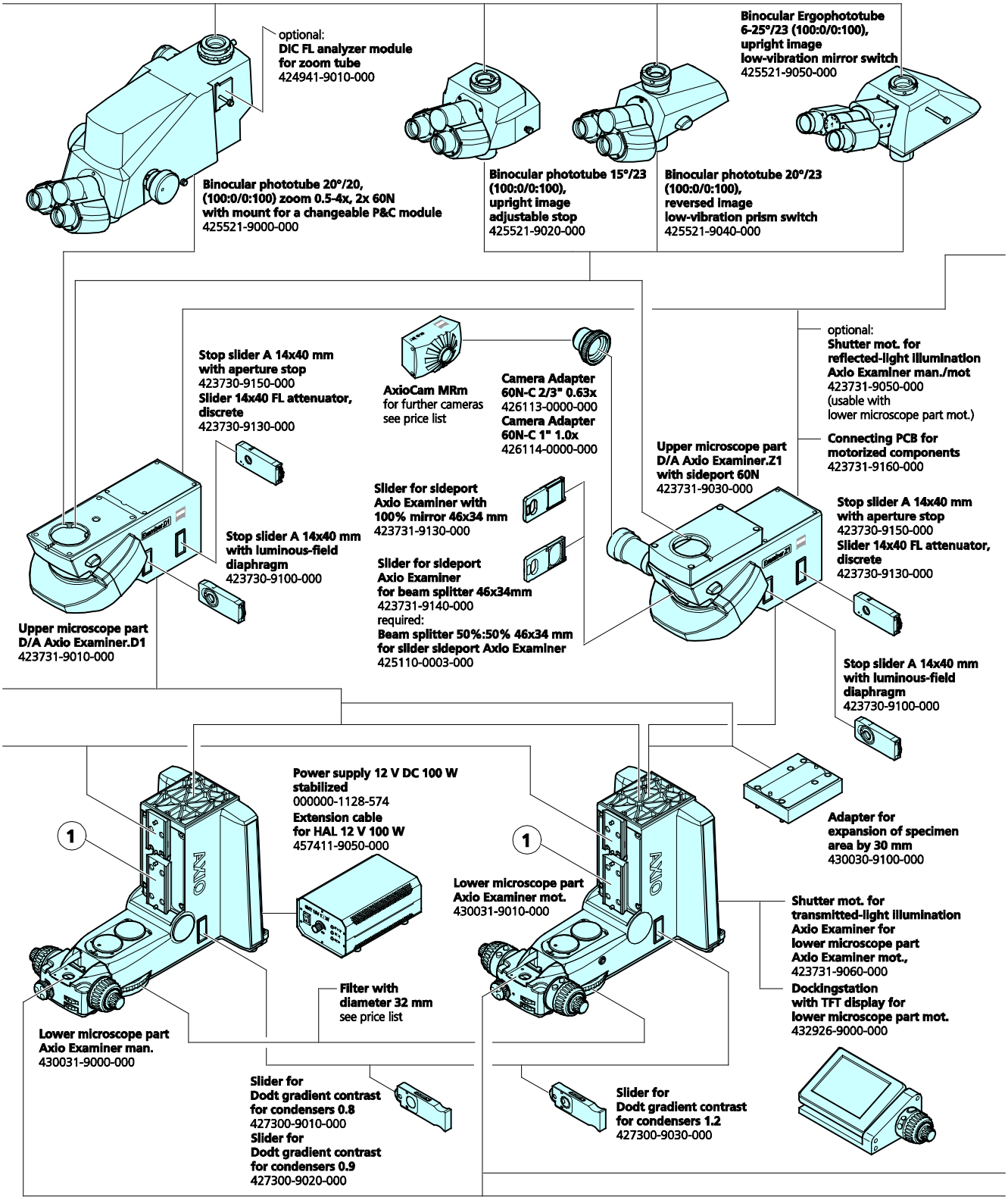
2.2 System overview

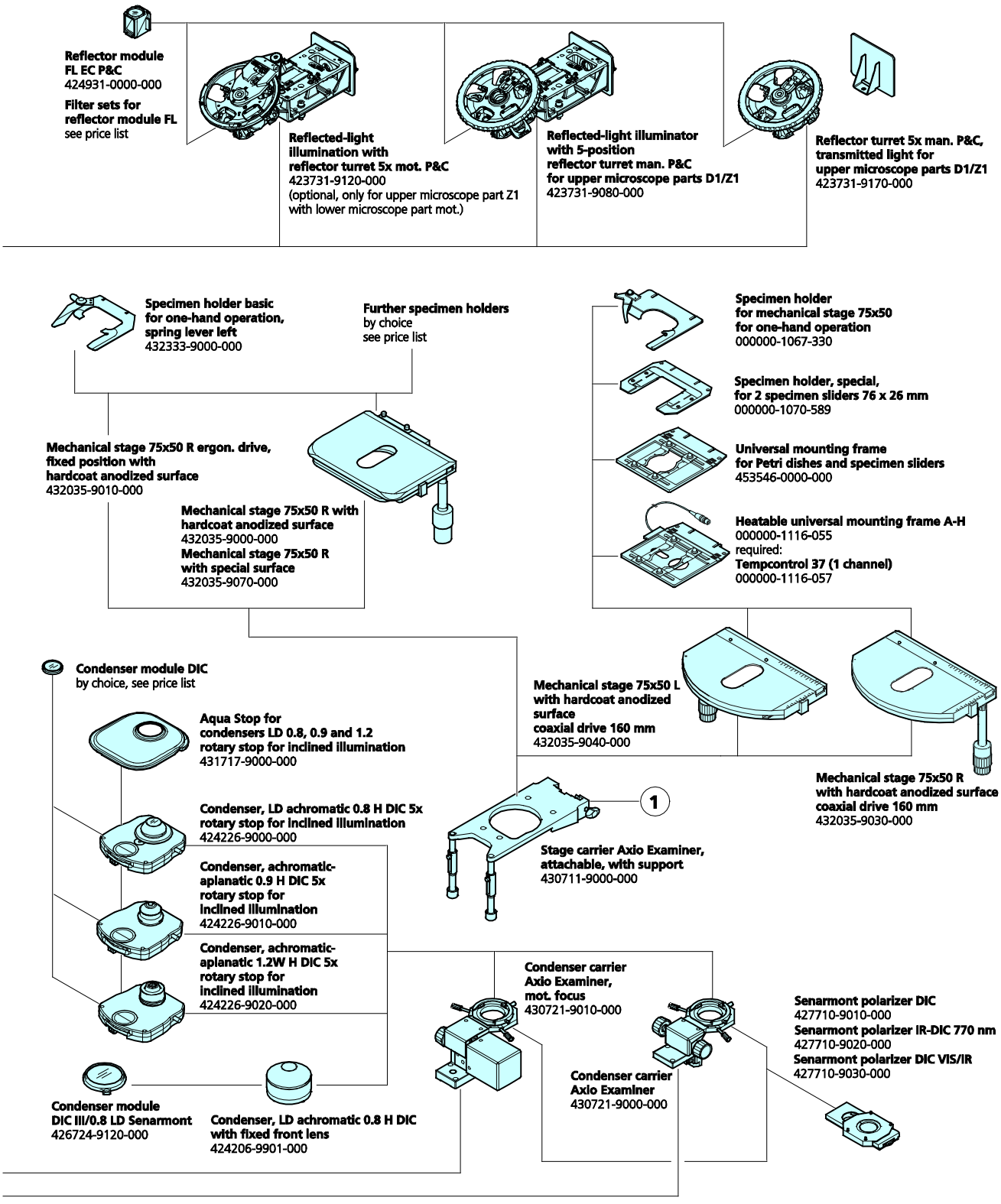





Binocular phototube 15°/23
(100:0/0:100), upright image
adjustable stop
425503-9901-000
Eyepiece E-PL 10x/23 Br. foc.
444235-0000-000
Eyepiece PL 10x/23 Br. foc.
444036-9000-000
with tubes for
upper micriscope part A1
also:
Eyepiece W-PL 10x/23 Br. foc.
455044-9901-000
Binocular tube 30°/25,
reversed image
425500-0000-000
Binocular tube 30°/23,
reversed image
425520-9000-000
Binocular phototube 30°/23
(100:0/0:100), reversed image
425520-9020-000
Binocular phototube 20°/23
(100:0/0:100), upright image
425520-9030-000
Only usable with objective extension ring
000000-1374-408
(for DIC with upper microscope part A1)
Reflector slider 2x, changeable,
for P&C modules
424940-9050-000
Reflector turret 4x man., changeable,
for P&C modules
424940-9060-000
Reflector turret 6x man.,
changeable,
for P&C modules
424940-9000-000
Upper microscope part D
Axio Examiner.A1
with mount for reflector slider P&C
or reflector turret P&C
423731-9000-000
Filter slider A 14x40 mm,
3 positions for filter diameter 25 mm
423730-9080-000
Filter slider A 14x40 mm,
2 positions for filter diameter 25 mm
428307-9000-000
Reflector module FL EC P&C
424931-0000-000
Filtersätze für Reflektormodul FL
see price list
Analyzer module Pol ACR P&C
for transmitted light
424937-9901-000
Analyzer module D P&C
for IR-DIC 770 nm
424941-9020-000
Upper microscope part D/ A-FL
Axio Examiner.A1
with mount for
reflector slider P&C
or reflector turret P&C
423731-9110-000
Adjusting aid
for HBO/XBO
423730-9120-000


2-position objective turret
M27, DIC
424516-9010-000
2-position objective turret
M27, DIC cod.
424516-9020-000
4-position objective turret
M27, DIC
424516-9060-000
4-position objective turret
M27, DIC cod.
424516-9030-000
1-position objective mount
M27, DIC
424516-9000-000
Adapter 30mm with optics
and DIC slider mount
424516-9040-000
Note:
only usable with upper microscope parts
Axio Examiner.D1 and Z1,
not for upper microscope part
Axio Examiner.A1
Objective extension ring
DIC H=12.3 mm, M27
000000-1374-408
Note:
only usable with upper microscope parts
Axio Examiner.A1
equipped with tubes 425500-0000-000
and 425503-9901-000
(required for DIC)
DIC slider Senarmont
75 W PA 20x/1.0 III
426967-9000-000
DIC slider Senarmont
75 W PA 20x/1,0 HC II
426967-9070-000
Objective W Plan-Apochromat
20x/1.0 DIC M27 70 mm
(WD=1.9 mm) (UV) VIS-IR,
parfocal length 70mm
421452-9900-000
(for upper microscope part A1)
DIC slider for objectives
with 45 mm parfocal length
see price list
Objectives with 45 mm
parfocal length
see price list
Objective W Plan-Apochromat
20x/1.0 DIC M27 75mm (WD=1.9mm),
(UV) VIS-IR, parfocal length 75 mm
421452-9800-000
(for upper microscope parts D1 and Z1)


optional:
DIC FL analyzer module
for zoom tube
424941-9010-000
Binocular Ergophototube
6-25°/23 (100:0/0:100),
upright image
low-vibration mirror switch
425521-9050-000
Binocular phototube 20°/20,
(100:0/0:100) zoom 0.5-4x, 2x 60N
with mount for a changeable P&C module
425521-9000-000
Binocular phototube 15°/23
(100:0/0:100),
upright image
adjustable stop
425521-9020-000
Binocular phototube 20°/23
(100:0/0:100),
reversed image
low-vibration prism switch
425521-9040-000
Stop slider A 14x40 mm
with aperture stop
423730-9150-000
Slider 14x40 FL attenuator,
discrete
423730-9130-000
AxioCam MRm
for further cameras
see price list
Camera Adapter
60N-C 2/3" 0.63x
426113-0000-000
Camera Adapter
60N-C 1" 1.0x
426114-0000-000
optional:
Shutter mot. for
reflected-light illumination
Axio Examiner man./mot
423731-9050-000
(usable with
lower microscope part mot.)
Connecting PCB for
motorized components
423731-9160-000
Upper microscope part
D/A Axio Examiner.Z1
with sideport 60N
423731-9030-000
Slider for sideport
Axio Examiner with
100% mirror 46x34 mm
423731-9130-000
Stop slider A 14x40 mm
with luminous-field
diaphragm
423730-9100-000
Slider for sideport
Axio Examiner
for beam splitter 46x34mm
423731-9140-000
required:
Beam splitter 50%:50% 46x34 mm
for slider sideport Axio Examiner
425110-0003-000
Upper microscope part
D/A Axio Examiner.D1
423731-9010-000
Stop slider A 14x40 mm
with aperture stop
423730-9150-000
Slider 14x40 FL attenuator,
discrete
423730-9130-000
Stop slider A 14x40 mm
with luminous-field
diaphragm
423730-9100-000
Power supply 12 V DC 100 W
stabilized
000000-1128-574
Extension cable
for HAL 12 V 100 W
457411-9050-000
Adapter for
expansion of specimen
area by 30 mm
430030-9100-000
1
1
Lower microscope part
Axio Examiner mot.
430031-9010-000
Shutter mot. for
transmitted-light illumination
Axio Examiner for
lower microscope part
Axio Examiner mot.,
423731-9060-000
Dockingstation
with TFT display for
lower microscope part mot.
432926-9000-000
Filter with
diameter 32 mm
see price list
Lower microscope part
Axio Examiner man.
430031-9000-000
Slider for
Dodt gradient contrast
for condensers 0.8
427300-9010-000
Slider for
Dodt gradient contrast
for condensers 0.9
427300-9020-000
Slider for
Dodt gradient contrast
for condensers 1.2
427300-9030-000


Reflector module
FL EC P&C
424931-0000-000
Filter sets for
reflector module FL
see price list
Reflected-light
illumination with
reflector turret 5x mot. P&C
423731-9120-000
(optional, only for upper microscope part Z1
with lower microscope part mot.)
Reflected-light illuminator
with 5-position
reflector turret man. P&C
for upper microscope parts D1/Z1
423731-9080-000
Reflector turret 5x man. P&C,
transmitted light for
upper microscope parts D1/Z1
423731-9170-000
Specimen holder basic
for one-hand operation,
spring lever left
432333-9000-000
Further specimen holders
by choice
see price list
Mechanical stage 75x50 R ergon. drive,
fixed position with
hardcoat anodized surface
432035-9010-000
Mechanical stage 75x50 R with
hardcoat anodized surface
432035-9000-000
Mechanical stage 75x50 R
with special surface
432035-9070-000
Specimen holder
for mechanical stage 75x50
for one-hand operation
000000-1067-330
Specimen holder, special,
for 2 specimen sliders 76 x 26 mm
000000-1070-589
Universal mounting frame
for Petri dishes and specimen sliders
453546-0000-000
Heatable universal mounting frame A-H
000000-1116-055
required:
Tempcontrol 37 (1 channel)
000000-1116-057
Condenser module DIC
by choice, see price list
Aqua Stop for
condensers LD 0.8, 0.9 and 1.2
rotary stop for inclined illumination
431717-9000-000
Condenser, LD achromatic 0.8 H DIC 5x
rotary stop for inclined illumination
424226-9000-000
Condenser, achromatic-
aplanatic 0.9 H DIC 5x
rotary stop for
inclined illumination
424226-9010-000
Condenser, achromatic-
aplanatic 1.2W H DIC 5x
rotary stop for
inclined illumination
424226-9020-000
Condenser module
DIC III/0.8 LD Senarmont
426724-9120-000
Condenser, LD achromatic 0.8 H DIC
with fixed front lens
424206-9901-000
Mechanical stage 75x50 L
with hardcoat anodized
surface
coaxial drive 160 mm
432035-9040-000
Mechanical stage 75x50 R
with hardcoat anodized surface
coaxial drive 160 mm
432035-9030-000
1
Stage carrier Axio Examiner,
attachable, with support
430711-9000-000
Condenser carrier
Axio Examiner,
mot. focus
430721-9010-000
Condenser carrier
Axio Examiner
430721-9000-000
Senarmont polarizer DIC
427710-9010-000
Senarmont polarizer IR-DIC 770 nm
427710-9020-000
Senarmont polarizer DIC VIS/IR
427710-9030-000

2.3 Technical data

Dimensions (width x depth x height)

Axio Examiner.A1 with phototube and HAL 100 ..... 240 mm x 622 mm x 497 mm
Axio Examiner.Z1 with phototube and HAL 100 ..... 335 mm x 630 mm x 470 mm
Axio Examiner.A1 with phototube and HBO 100 ..... 240 mm x 653 mm x 497 mm
Axio Examiner.Z1 with phototube and HBO 100 ..... 335 mm x 661 mm x 470 mm
Axio Examiner.A1 with ergonomic phototube and HAL 100 ..... 240 mm x 687 mm x 497 mm
Axio Examiner.Z1 with ergonomic phototube and HAL 100 ..... 335 mm x 695 mm x 470 mm
Axio Examiner.A1 with ergonomic phototube and HBO 100 ..... 240 mm x 718 mm x 497 mm
Axio Examiner.Z1 with ergonomic phototube and HBO 100 ..... 335 mm x 726 mm x 470 mm

Weight

Axio Examiner.A1 ..... approx. 19 kg
Axio Examiner.D1 ..... approx. 21 kg
Axio Examiner.Z1 incl. control box ..... approx. 28 kg (control box: approx. 5.5 kg)

Environmental conditions

Transportation (in packaging):

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

Storage:

Permissible ambient temperature ..... +10 to +40 °C
Maximum permissible atmospheric humidity (without condensation) ..... 75 % at 35 °C

Operation

Permissible ambient temperature ..... +10 to +40 °C
Maximum permissible relative humidity ..... 75 % at 35 °C
Maximum altitude for operation ..... 2000 m
Barometric pressure ..... 800 hPa to 1060 hPa
Pollution degree 2

Operational data

Field of application ..... indoor
Safety class I
Degree of protection ..... IP 20
Electrical safety ..... as per DIN EN 61010-1 (IEC 1010-1) taking account of CSA and UL specifications
Overvoltage category .....
Radio and television interference suppression ..... as per EN 55011 class B
Noise immunity ..... as per DIN EN 61326/ A1
Power frequency ..... 50 to 60 Hz

Power consumption:
Axio Examiner man. (with external power supply unit SNT 12 V DC 100 W) ..... 220 VA
Axio Examiner mot. (with examiner control) ..... 260 VA

Transformer mbq52ac-z for HBO 50

Field of application ..... indoor
Safety class I
Degree of protection ..... IP 20
Line voltage switch-selectable between ..... 100, 110, 120, 127 VAC and 230, 240 VAC
Power frequency switch-selectable between ..... 50 and 60 Hz
Maximum power consumption for operation with HBO 50 ..... 350 VA

External power supply unit 12 V DC 100 W, stabilized

Field of application ..... indoor
Safety class I
Degree of protection ..... IP 20
Line voltage ..... 100 to 240 V ±10 %
No line voltage adjustment is required.
Power frequency ..... 50 to 60 Hz
Power consumption for operation with HAL 100 ..... 220 VA

HBO 100 W power supply unit

Field of application ..... indoor
Safety class I
Degree of protection ..... IP 20
Line voltage ..... 100 to 240 VAC
Power frequency ..... 50 to 60 Hz
Power consumption for operation with HBO 103 ..... 155 VA

Fuses as per IEC 127

Transformer mbq52ac-z for HBO 50 ..... 100 V, 127 V: 2x T 4 A
..... 220 V - 240 V: 2x T 2.5 A
External power supply unit 12 V DC 100 W ..... 2x T 5.0 A/H, 5x20 mm
HBO 100 W power supply unit ..... T 2.0 A/H, 5x20 mm
Examiner control ..... 2x T 5.0 A/H, 5x20 mm

Light sources

Halogen lamp ..... 12 V / 50 W
Light source controllability ..... continuously variable approx. between 3 and 12 V
Halogen lamp ..... 12 V / 100 W
Light source controllability ..... continuously variable approx. between 3 and 12 V
Mercury vapor short arc lamp ..... HBO 50
Power consumption for HBO 50 ..... 50 W

Mercury vapor short arc lamp..... HBO 103 W/2
Power consumption for HBO 103 W/2 ..... 100 W
Colibri illumination system
Power consumption .....70 VA

Examiner control:

Field of application ..... indoor
Safety class.....I
Degree of protection .....IP 20
Line voltage.....100 … 127 V / 200 … 240 VAC
No line voltage adjustment is required.
Power frequency..... 50 to 60 Hz
Power consumption.....260 VA

Optical and mechanical data:

Stand with manual objective focusing

Coarse adjustment ..... 2 mm / revolution
Fine adjustment .....0.2 mm / revolution; 0.2 µm scale interval
Maximum stroke range .....15 mm
Height stop.....mechanically adjustable
Condenser.....achromatic-aplanatic 0.9 H DIC, 5x
.....for bright field, dark field, phase contrast 1, 2, 3 and DIC
Manual objective exchange..... using an objective mount, 2x, M27, DIC coded
.....using a four-position objective nosepiece 4x, M27, DIC coded
Manual reflector module exchange .....using a 2x reflector slider
.....Reflector turret, 4x, 5x or 6x

Stand with motor-driven objective focusing

Stroke .....15 mm
Focusing..... using motor controller and keypad
Focusing speed.....variable
Limit switch for operating range.....electronically adjustable
Approach of stored focus positions ..... up to 5 storable positions
Defined moving in and out of the last working position ..... using the home function
Focusing in defined steps.....smallest increment: 25 nm

3 START-UP

The Axio Examiner may be installed or converted, and put into operation by the customer on his or her own. But if requested, the microscope may also be installed or converted by the Zeiss customer service subject to a fee at the customer's premises.

☞ Be sure to read and understand the **Equipment Safety Notices** carefully before you install the microscope, or start using it (see page 8).

3.1 Installing standard components

3.1.1 Unpacking and installing the microscope

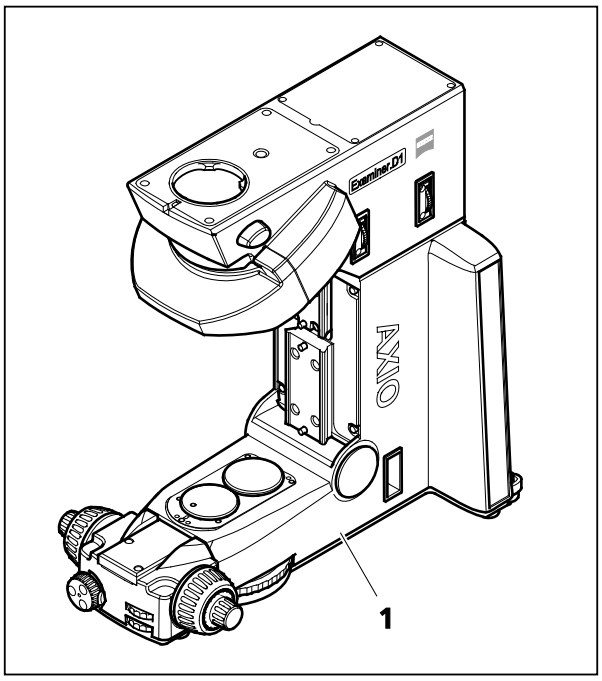


Figure 3-1 Installing the microscope

- Take all assemblies out of the package, and check them for completeness as per delivery note.
- Place the microscope stand (Figure 3-1/**1**) on a vibration-free, level and non-inflammable surface.
- Either store the original package to allow long-term storage or return to the manufacturer, or dispose of the package properly.

3.1.2 Fastening the microscope to a tabletop

The lower microscope part has three screws for fastening the microscope to a perforated panel. Proceed as follows:

- Remove the condenser carrier, if any (see section 3.1.9).
- Align the microscope.
- Screw in and tighten the screw located inside the upper microscope part (Figure 3-2/**1**) and the two screws at the rear side (Figure 3-2/**2**).
- Attach the condenser carrier again if required (see section 3.1.9).

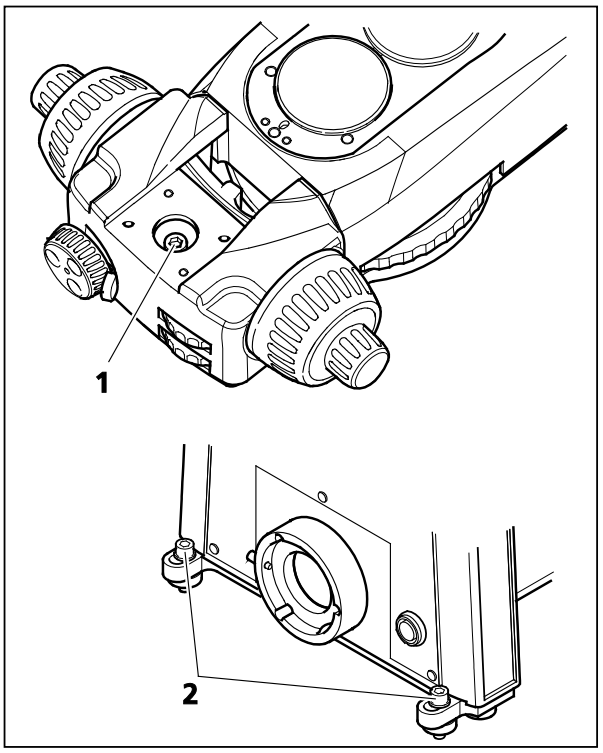


Figure 3-2 Fastening the stand to a tabletop

3.1.3 Attaching a binocular tube / phototube

Every binocular tube included in the system overview (see section 2.2) may be attached to the Axio Examiner stand. Proceed as follows:

- Loosen the hexagon socket head screw (Figure 3-3/**3**) using a ball head-screwdriver, width A/F 3. Remove the dust caps (Figure 3-3/**2** and **5**) from the tube bottom side and from the stand's dovetail socket.
- Attach the binocular tube (Figure 3-3/**1**) by inserting the dovetail ring into the socket (Figure 3-3/**4**). Rotate the binocular tube into the desired viewing position, and tighten the hexagon socket head screw (Figure 3-3/**3**) using a ball-head screwdriver again.

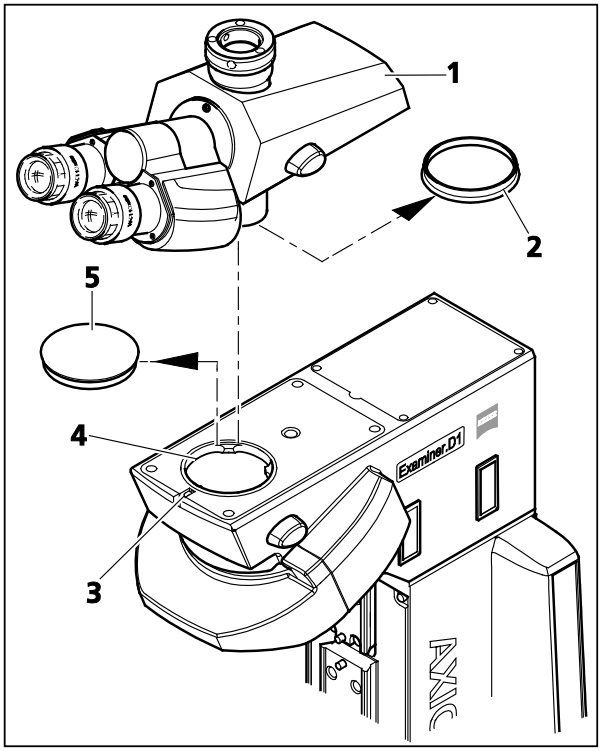


Figure 3-3 Attaching the binocular (photo)tube

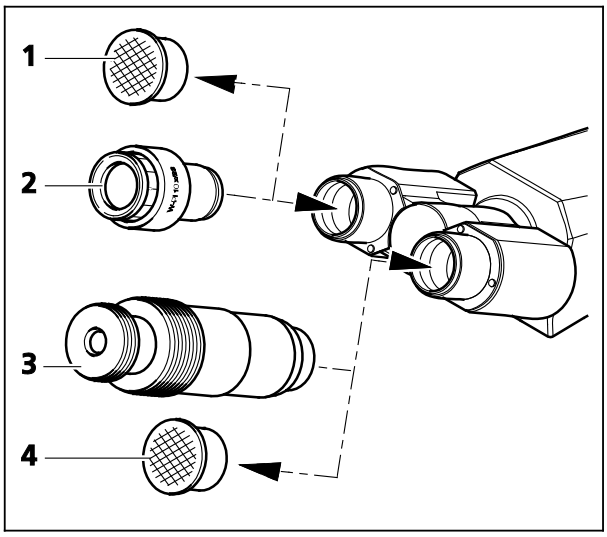


Figure 3-4 Inserting eyepieces

3.1.4 Inserting eyepieces or an auxiliary microscope

- Remove both dust caps (Figure 3-4/**1** and **4**) from the binocular tube.
- Take both eyepieces (Figure 3-4/**2**) out of their containers, and insert them into the binocular tube until they reach the stop.
- The auxiliary microscope (Figure 3-4/**3**) may be inserted into one of the binocular sockets instead of an eyepiece, and it is used for observing aperture stops, phase stops and dark-field stops, or for centering phase stops and dark-field stops. The adjustable eyepiece lens may be used for focusing these stops, and the setting may be defined by tightening a clamping screw.

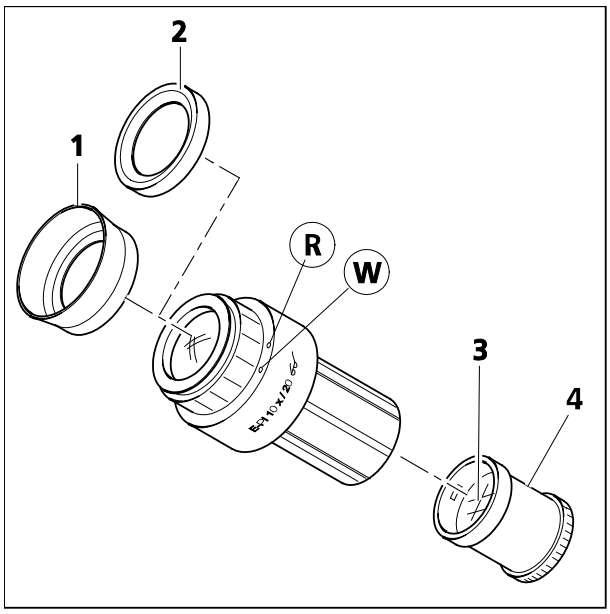


Figure 3-5 Inserting an eyepiece reticule

(1) Inserting an eyepiece reticule

Eyepieces PL 10x/23 Br. foc. are intended for use together with eyepiece reticules.

The slight image displacement caused by the additional length of the glass path is taken into account on the diopter scale by the fact that the zero position is not indicated by the white dot (Figure 3-5/**W**) but rather by the red dot (Figure 3-5/**R**).

To allow easy replacement, the manufacturer has bonded the eyepiece reticules (Figure 3-5/**3**) into screw-in stop parts (Figure 3-5/**4**). Complete stop parts with glued reticules are available directly from Zeiss.

To exchange a stop part, proceed as follows:

- Unscrew the existing stop part (Figure 3-5/**4**) with the eyepiece reticule (Figure 3-5/**3**) from the eyepiece. Screw in the stop part with the eyepiece reticule.

☞ Whenever you insert an eyepiece reticule into an unscrewed stop part, make certain that the lettering inside the eyepiece may be read true to side when it is screwed in again.

(2) Inserting fold-down eyecups

To avoid scratches on glasses, the eyepieces are provided with glass protection rings made of rubber These rings may be replaced by fold-down eyecups on an optional basis.

- To do so, pull off the glass protection rings (Figure 3-5/**2**) from the eyepieces, and put on the eyecups (Figure 3-5/**1**).

Sometimes, the glass protection rings may stick very firmly in the eyepiece grooves, requiring a blunt object (wood stick) to press them off.

3.1.5 Installing and removing "Push&Click" modules

- FL EC P&C reflector module,
- DIC FL analyzer module,
- Pol ACR analyzer module,
- D for IR-DIC analyzer module.

3.1.5.1 Reflector turret 5x

The 5x reflector turret is permanently installed to the Axio Examiner.D1/.Z1 microscope top parts. To either install or remove the modules, take off the cap and proceed at an angle from the front side.

(1) Installing a module

- Set the shutter AL shift knob (Figure 3-6/**1**) to the CLOSE position.
- Pull off the cap (Figure 3-6/**6**) toward the front.

☞ The cap (Figure 3-6/**6**) is locked when the shutter is not closed. Never use force to remove the cap.

- Move the reflector turret position to be loaded to an oblique front left-hand or right-hand position.
- Insert the module (Figure 3-6/**3**) with the holder elements (Figure 3-6/**2**) mounted to module's right and left hand at an angle from below into the upper spring elements (Figure 3-6/**5**) at the reflector turret.
- Then tilt the module down (see Figure 3-6/**4**) to ensure that the module also locks safely into the lower spring elements of the reflector turret.

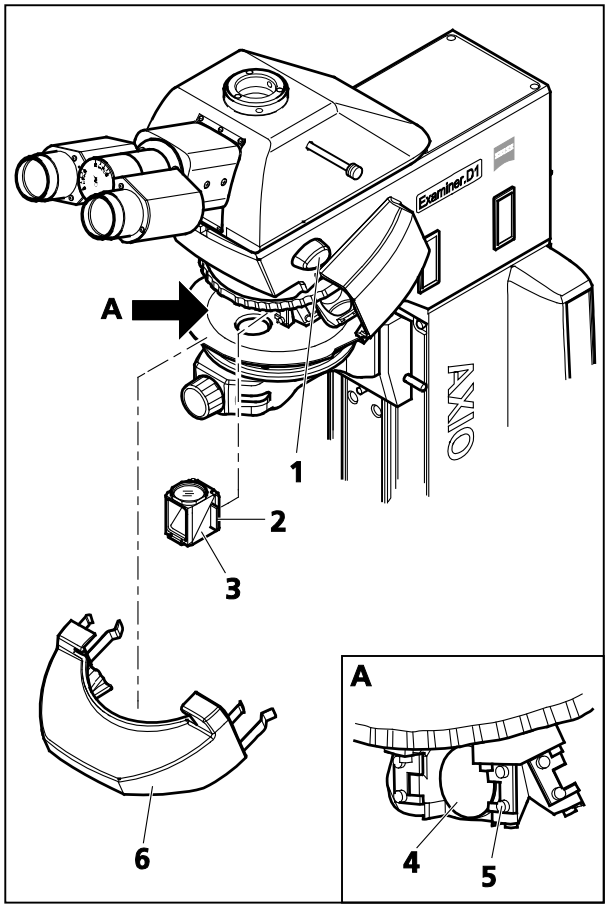


Figure 3-6 Replacing the reflector module - reflector turret 5x

(2) Removing a module

- Move the reflector turret to a corresponding oblique front left-hand or right-hand position.
- Slightly tilt and pull the module (Figure 3-6/**4**) first out of the lower spring elements (Figure 3-6/**5**), and then out of the upper spring elements, and then take it out completely.
- After removing or installing the reflector modules, insert the cap (Figure 3-6/**1**) into the stand casing, and press it on until it locks into place.
- Set the shutter AL shift knob (Figure 3-6/**1**) to the OPEN position. The cap is locked now.

3.1.5.2 Reflector inserts

☞ Only for microscopes with an Axio Examiner.A1 top part.

To either install or remove the modules, the reflector insert (reflector turret 4x or 6x, or reflector slider 2x) needs to be taken out of the stand top part.

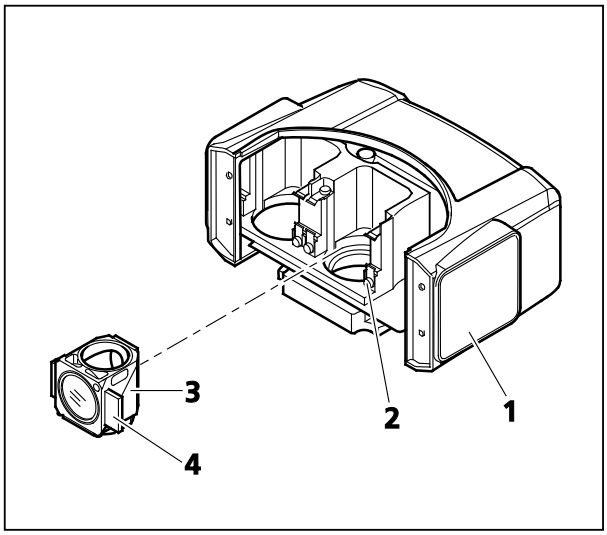


Figure 3-7 Replacing a reflector module in the reflector insert

(1) Installing a module

- Take the reflector insert (Figure 3-7/**1**) out of the stand top part (see section 3.1.6), turn it to the top side, and lay it down.
- Insert the module (Figure 3-7/**3**) with the holder elements mounted to the right and to the left (Figure 3-7/**4**) at an angle from above into the lower spring brackets (Figure 3-7/**2**) of the reflector holder.
- After this, press on the module at the upper side until it also locks safely into the upper spring brackets of the reflector turret.

(2) Removing a module

- Slightly tilt and pull the module first out of the upper spring elements, and then out of the lower spring elements, and take it out completely.
- After having either removed or installed the reflector modules completely, install the reflector insert again, or put on the cap.

3.1.6 Installing a reflector insert

☞ Only for microscopes with the Axio Examiner.A1 top part.

- Insert the ball head screwdriver (width A/F 3 mm) into the borehole (Figure 3-8/**2**), turn the locking screw counterclockwise until it reaches its stop, and pull off the closing cap (Figure 3-8/**1**) toward the front side.
- Slide the reflector insert (Figure 3-8/**3**) equipped with reflector modules, e.g., reflector turret 6x, up to its stop into the stand top part, keep it pressed on, and tighten the locking screw clockwise.

☞ When the reflector insert is pulled out, the reflected-light optical path is blocked automatically to prevent any dazzling.

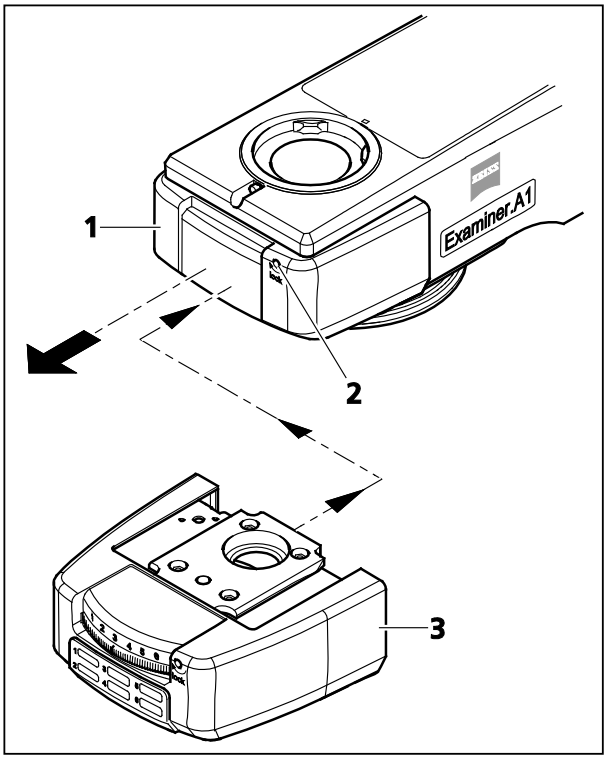


Figure 3-8 Installing a reflector insert

3.1.7 Installing an objective mount or objective nosepiece

To attach the objective mount or objective nosepiece to the stand, please proceed as follows:

- For installation, move to the lowest Z position possible using the pinion knob (Figure 3-9/**4**).
- Hold the objective mount or objective nosepiece (Figure 3-9/**6**) with your left hand, and slide it in a slightly oblique position on the left-hand side first into the upper dovetail guide (Figure 3-9/**2**) at the stand.
- Hold the objective mount or objective nosepiece as horizontally as possible, and push it against the left-hand guide surfaces. While doing so, turn the objective mount or objective nosepiece to the right in order to engage the right-hand side into the dovetail guide at the stand as well.
- Put the objective mount or objective nosepiece on the lower stop screw (Figure 3-9/**3**).
- Tighten the clamping screw (Figure 3-9/**5**) with your right hand.

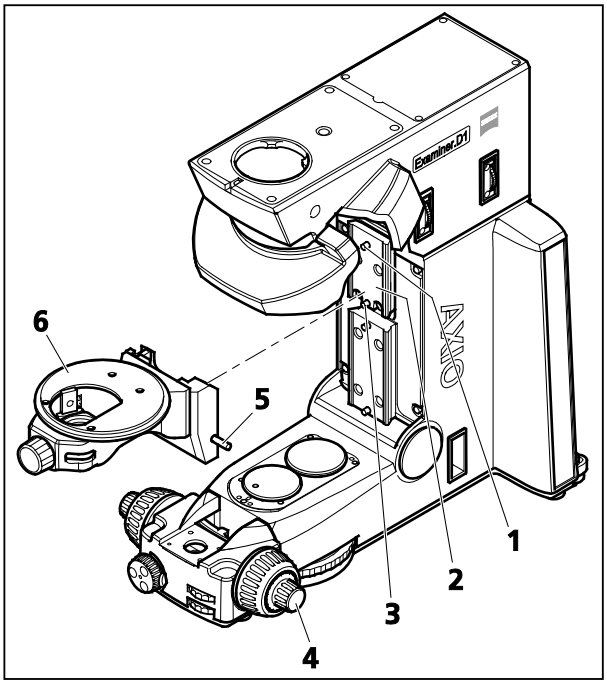


Figure 3-9 Installing an objective mount or objective nosepiece

☞ If the adapter is used for expanding the specimen area (430030-9100-000), push the objective mount or objective nosepiece against the upper stop screw (Figure 3-9/**1**).

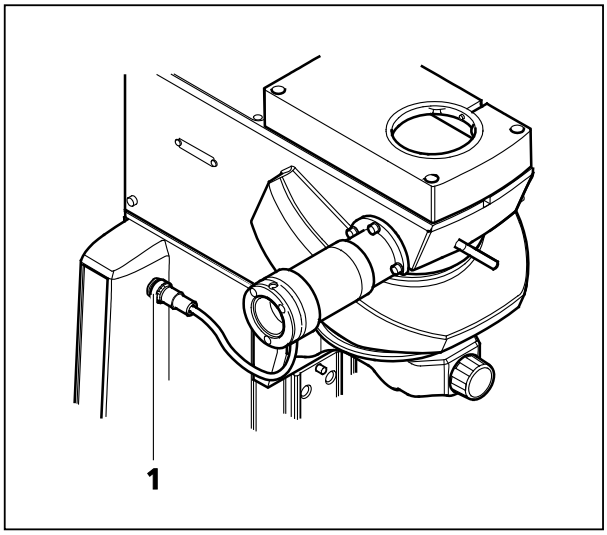


Figure 3-10 Connecting the objective mount or objective nosepiece cod.

☞ The control cable (Figure 3-10/**1**) needs to be connected in order to take advantage of automatic lens recognition when the 2x objective mount cod. (424516-9020-000), or the 4x objective nosepiece cod. (424516-9030-000) is used at a motor-operated lower microscope part.

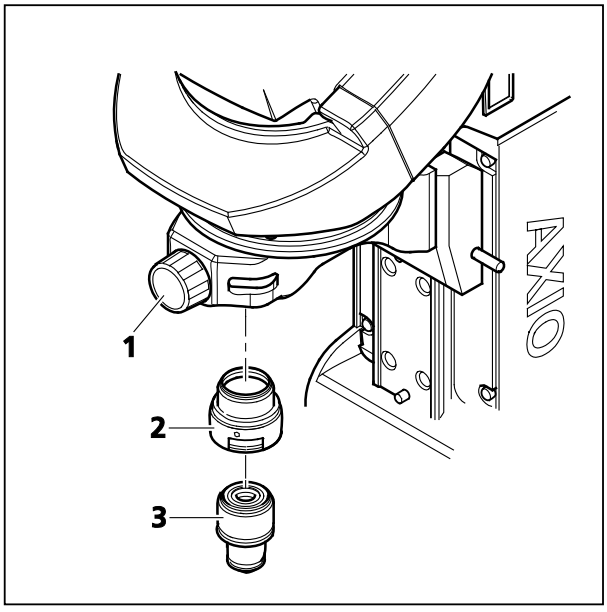


Figure 3-11 Screwing in objectives

3.1.8 Screwing in objectives

- Use the shift knob (Figure 3-11/**1**) to move the objective mount or objective nosepiece into the WORK position.
- Take the dust caps, if any, out of the corresponding openings at the objective mount or objective nosepiece.
- Take the objective(s) (Figure 3-11/**3**) out of their container, and screw them into the objective mount or objective nosepiece. Use an objective adapter (Figure 3-11/**2**) if required.

☞ Use only the objectives as indicated for the following microscope top parts (also see the System Overview on page 19 and the following):

Axio Examiner.A1	**Axio Examiner.D1**	**Axio Examiner.Z1**
all 45 mm objectives	all 75 mm objectives	all 75 mm objectives
all 45 mm objectives with 11 mm adapters for DIC procedures	all 45 mm objectives with 30 mm adapters	all 45 mm objectives with 30 mm adapters
70 mm W Plan-Apo 20x (no DIC possible)		

3.1.9 Attaching and removing the condenser carrier

(1) Attaching the condenser carrier

- Unscrew the two hexagon socket screws (Figure 3-12/**1**) in the cover plate at the stand, and take off the cover plate.
- Put the condenser carrier (Figure 3-12/**2**) on the stand, and fasten it using the two socket screws (Figure 3-12/**1**).

(2) Removing the condenser carrier

- Hold the condenser carrier (Figure 3-12/**2**) with one hand, and unscrew the two hexagon socket screws (Figure 3-12/**1**).
- Take off the condenser carrier and lay it down safely.

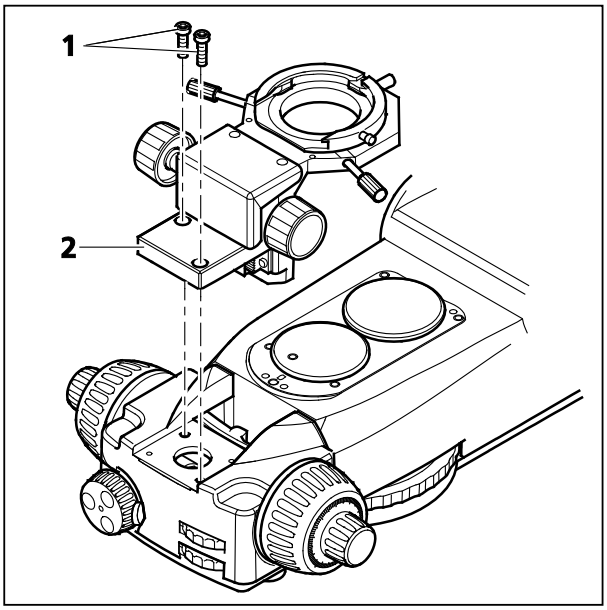


Figure 3-12 Attaching & removing the condenser carrier

3.1.10 Installing the condenser

☞ To replace the condenser, take off the stage carrier first (see section 3.1.12).

- Put the condenser (Figure 3-13/**1**) on the condenser carrier. To do so, direct the stud at the condenser bottom toward the slot (Figure 3-13/**2**).
- Slide the condenser into the condenser carrier until it reaches its stop, and secure it using the clamping screw (Figure 3-13/**3**).

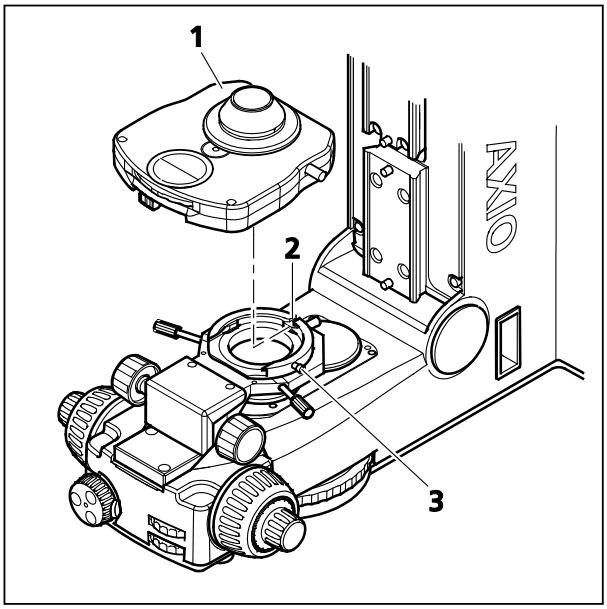


Figure 3-13 Putting on the condenser

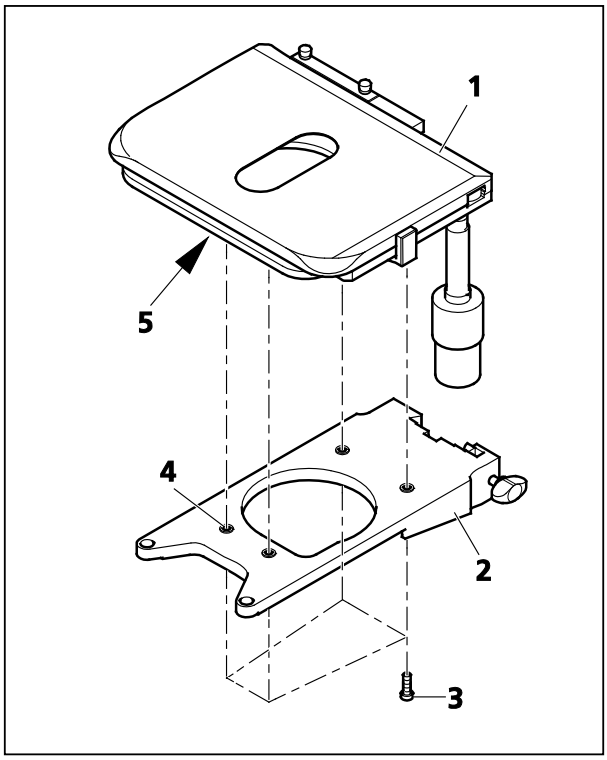


Figure 3-14 Installing the mechanical stage on the stage carrier

3.1.11 Installing the mechanical stage on the stage carrier

- Put the stage (Figure 3-14/**1**) on the stage carrier (Figure 3-14/**2**), aligning the four threaded boreholes in the lower table side (Figure 3-14/**5**) above the through holes (Figure 3-14/**4**) of the stage carrier.
- Insert the four fastening screws (Figure 3-14/**3**) from below through the stage carrier, and screw them into the stage bottom side.
- Align the stage in XY direction, and tighten the fastening screws.

3.1.11.1 Readjusting the drive length at the ergonomic drive

At mechanical stages provided with an ergonomic drive, the drive length for **X** and **Y** axis positioning may be increased by a **maximum of 15 mm** by displacing the pinion knobs in axial direction.

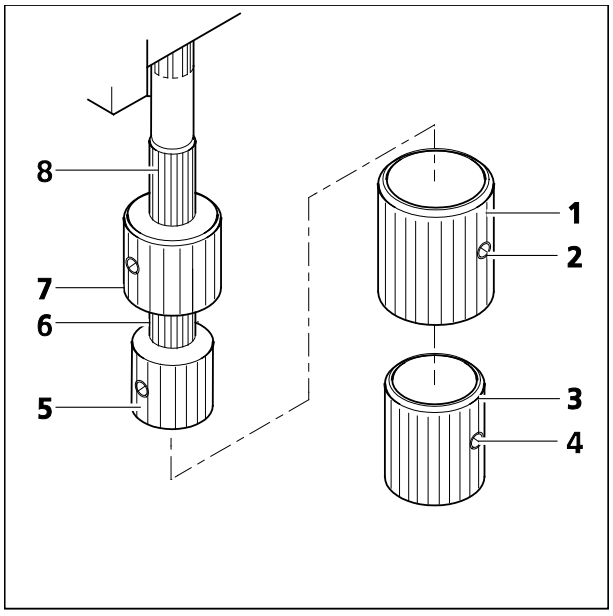


Figure 3-15 Setting the ergonomic drive

3.1.11.2 Removing or installing additional sleeves

Both pinion knobs are provided with additional sleeves. They allow an even more sensitive setting of object positions. But they can be removed if it is more important to be able and move the objects quicker.

- First unscrew the two clamping screws (Figure 3-15/**4**) of the lower additional sleeve (Figure 3-15/**3**), and pull it off downwards, then unscrew the two clamping screws (Figure 3-15/**2**) of the upper additional sleeve (Figure 3-15/**1**), and also pull it off downwards.
- Put the additional sleeves in reverse order onto the pinion knobs again, and tighten both clamping screws.

3.1.11.3 Setting the easy motion (torque) of the two ergonomic drive pinion knobs

The ergonomic drive has been set to a medium easy motion value in the factory. This setting may be modified as follows.

X axis setting:

- Remove the additional sleeves (Figure 3-15/**1** and **3**) from the pinion knobs, if any. To do so, unscrew the clamping screws.
- Slide the X pinion knob down (Figure 3-15/**5**), and slide the Y pinion knob upwards (Figure 3-15/**7**).
- Hold the X pinion knob (Figure 3-15/**5**) in position, and turn the light-colored knurled ring (Figure 3-15/**6**) located above either to the right (easy) or to the left (heavy) until the desired easy motion is obtained.

Y axis setting:

- Hold the Y pinion knob (Figure 3-15/**7**) in position, and turn the light-colored knurled sleeve (Figure 3-15/**8**) located above either to the right (easy) or to the left (heavy) until the desired easy motion is obtained.
- Slide on the additional sleeves if required, and tighten the clamping screws.

☞ To ensure a long useful life for your stage, make certain to remove the wear debris caused by object slides at regular intervals. When doing so, make certain that the abrasion debris do not enter the X positioning guide mechanism.

3.1.11.4 Replacing the universal mounting frame

- Unscrew the two countersunk head screws (Figure 3-16/**1**) using an Allen wrench, width A/F 2 (Figure 3-16/**3**).
- Lift the universal mounting frame (Figure 3-16/**2**) up and off the mechanical stage (Figure 3-16/**4**).
- Put the desired mounting frame or specimen holder(Figure 3-16/**5**) on the mechanical stage, and screw it down using the two countersunk head screws.

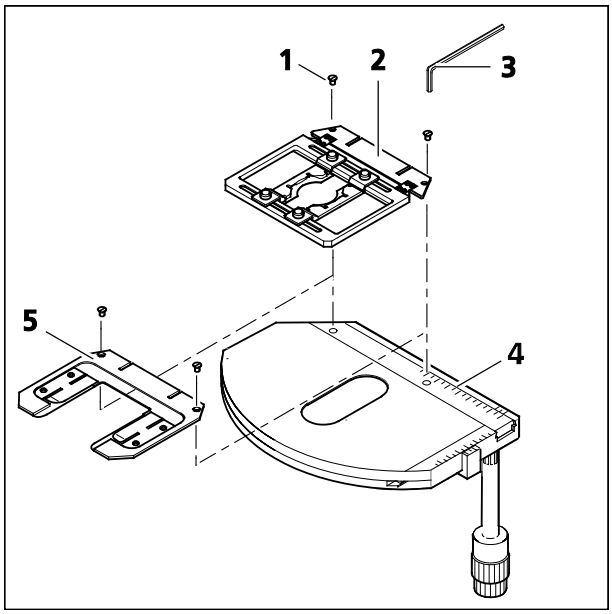


Figure 3-16 Replacing the universal mounting frame

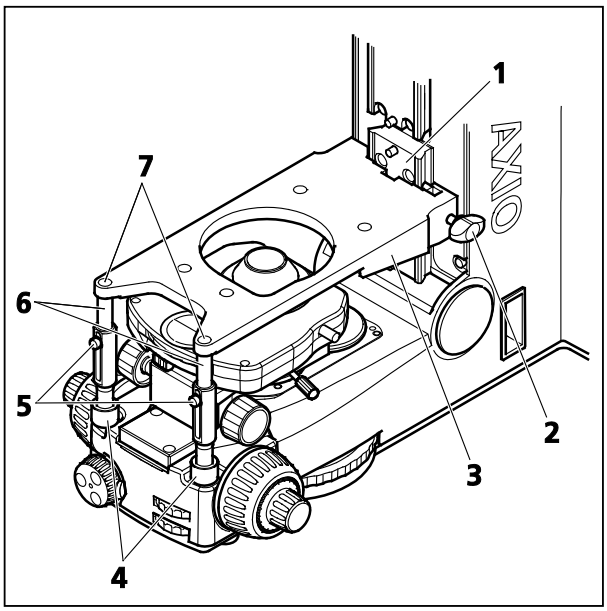


Figure 3-17 Attaching the stage carrier (stage not shown in the drawing)

3.1.12 Attaching, removing and adjusting the height of a stage carrier

(1) Attaching the stage carrier

To attach the stage carrier at the stand, please proceed as follows:

- Hold the stage carrier (Figure 3-17/**3**) and the mounted stage with your left hand, and insert it at a slight angle first into the dovetail guide (Figure 3-17/**1**) at the stand.
- Hold the stage carrier as horizontally as possible, and push it against the left-hand guide surfaces. While doing so, swivel the stage carrier to the right to ensure that the right-hand side also engages in the dovetail guide at the stand.
- Tighten the clamping screw (Figure 3-17/**2**) slightly with your right hand.
- Align the stage carrier correspondingly at the lower stop screw, and tighten the clamping screw (Figure 3-17/**2**) without using excessive pressure.

☞ If the adapter is used for expanding the specimen area (see section 3.3.1), align the stage carrier at the upper stop screw.

- Loosen the adjusting screws (Figure 3-17/**5**) at the stage carrier supports using a ball head screwdriver.
- Push in the supports (Figure 3-17/**6**) and fasten them at the stage carrier to the right and to the left using screws (Figure 3-17/**7**).
- Pull the supports down until the clamping rings (Figure 3-17/**4**) rest on the stand.
- Tighten the adjusting screws (Figure 3-17/**5**).
- Tighten both clamping rings (Figure 3-17/**4**) until you feel a slight resistance.

☞ Do not overtighten the clamping rings. Otherwise, the stage carrier will be pushed up and/or bent.

(2) Removing the stage carrier

Objectives are screwed in best and the condenser is inserted best when the stage carrier is removed. All other assemblies installed like, e.g., the mechanical stage may remain at the stage carrier when this is done.

Please proceed as follows:

- Loosen the clamping rings (Figure 3-17/**4**).
- Unscrew the screws (Figure 3-17/**7**), and remove the supports (Figure 3-17/**6**) from the stage carrier if required.
- Hold the stage carrier (Figure 3-17/**3**) in position with your left hand.
- Loosen the clamping screw (Figure 3-17/**2**) by approx. 5 turns with your right hand.
- Swivel the stage carrier horizontally to the left to slide it out of the dovetail guide (Figure 3-17/**1**) at the right-hand side.
- Then, remove the stage carrier from the stand by pulling it toward the front, and lay it down on the table preventing it from overturning.

3.1.13 HAL 100 halogen lamp

3.1.13.1 Attaching the HAL 100 halogen lamp



Before using the halogen lamp, the exchange tool located inside the casing needs to be removed because it might be damaged by the heat effect otherwise (cf., section 3.1.13.3).

- Remove the transmitted-light socket cap (Figure 3-18/**1**).
- Insert the illuminator casing (Figure 3-18/**5**) with the dovetail into the socket (Figure 3-18/**1**), and secure it with the clamping screw (Figure 3-18/**2**) using a ball head-screwdriver (width A/F 3).
- Connect the three-pole illuminator plug (Figure 3-18/**4**) to the rear side of the external power supply unit (Figure 3-18/**3**).
- Connect the illumination control cable of the external power supply unit (Figure 3-18/**3**) to the stand.

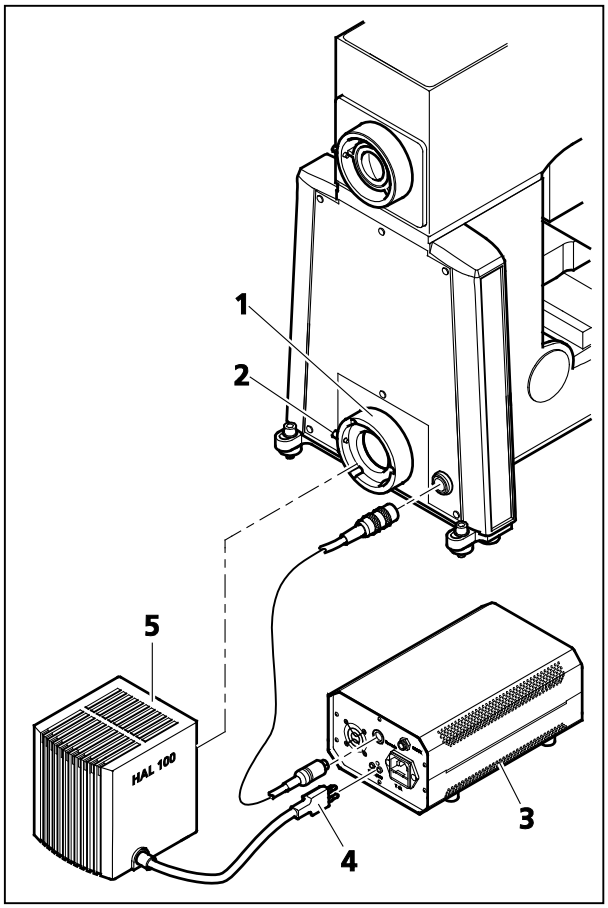


Figure 3-18 Attaching the HAL 100 halogen lamp

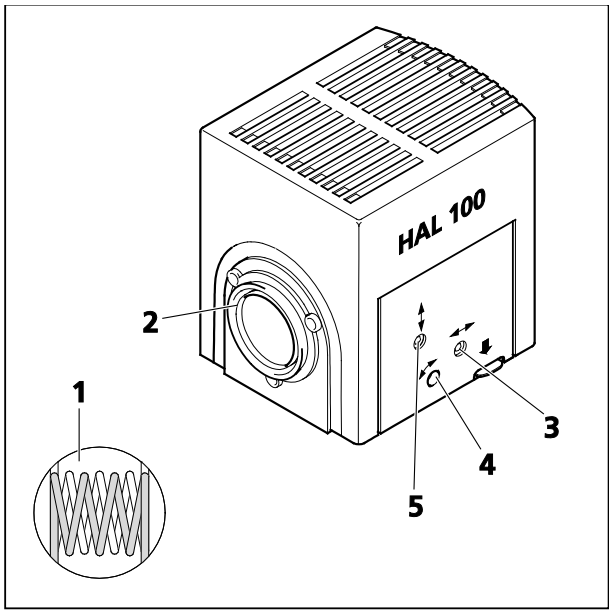


Figure 3-19 Adjusting the HAL 100 halogen lamp

3.1.13.2 Adjusting the HAL 100 halogen lamp

(1) Coarse adjustment

- Loosen the clamping screw (Figure 3-18/**2**), and remove the ready-to-operate halogen illuminator from the microscope stand.
- Switch on the 12 V DC 100 W external power supply unit (see section 3.2.2).
- Direct the light beam against a projection surface (wall) which is at least 3 m away.

Do not look into the illuminator's light exit opening.

- Set the adjusting screw (Figure 3-19/**3**) using a ball head screwdriver (width A/F 3) to reach the best focus possible for both images of the lamp filaments on the projection surface.
- Then, set the adjusting screws (Figure 3-19/**4** and **5**) to a value at which the lamp filaments of one image exactly fill out the gaps in the reflector image (Figure 3-19/**1**).

(2) Fine adjustment

- Attach the microscope lamp and locate it in position using the clamping screw at the microscope stand again.
- If required, switch out the transmitted-light diffusing screen, and remove the filter drawer from the corresponding holder compartment.
- Focus the ≤ 40x lens on the specimen, and find a free object position.
- Remove the eyepiece, and center the lamp filament and the lamp filament's mirror image in the pupil image using the adjusting screws (Figure 3-19/**4** and **5**).
- Set the adjusting screws (Figure 3-19/**3**) to optimize the uniform illumination of the pupil image.
- If required, switch on the diffusing screen, and insert the filter drawer again.

3.1.13.3 Replacing a 12 V, 100 W halogen lamp

CAUTION
Hot surface!

☞ To replace the halogen lamp, the lamp housing does not need to be removed from the stand. **DO NOT** keep the attached exchange tool (Figure 3-20/**7**) for the halogen lamp inside the lamp housing while the illuminator is in operation.
The replacement bulb (Figure 3-20/**8**) may remain pinned up inside the lamp housing.

- Switch off the external power supply unit of HAL 100 (see section 3.2.2). Pull off the HAL 100 three-pole connector.
- Push down the unlock key (Figure 3-20/**3**) of the HAL 100 halogen lamp (Figure 3-20/**1**), pull out the bulb holder (Figure 3-20/**2**) completely, and put it down separately.
- Push down both spring levers (Figure 3-20/**5**), and pull out the old halogen lamp (Figure 3-20/**6**) upwards.
- Push down both spring levers, insert the new lamp into the lamp base (Figure 3-20/**4**), and release the spring levers. For holding/grasping the halogen lamp, use only the exchange tool (Figure 3-20/**7**), since any trace of fat on the halogen lamp may compromise its useful life.
- Briefly press down the spring levers once again to center the lamp.
- Insert the bulb holder again, and push it in until you feel that it has locked into place.
- Insert the HAL 100 three-pole connector again.

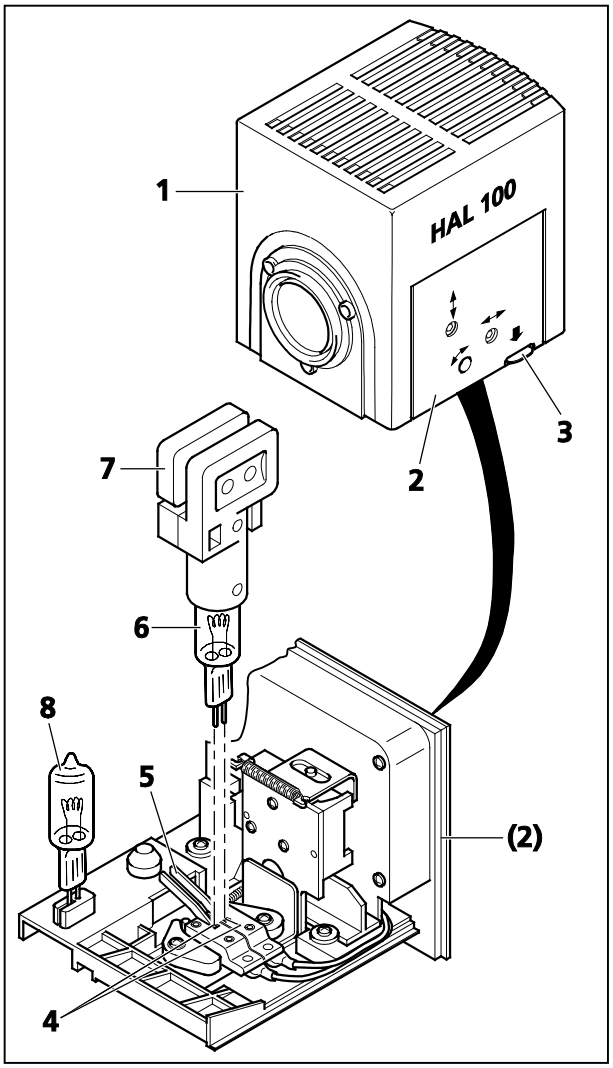


Figure 3-20 Replacing a halogen lamp

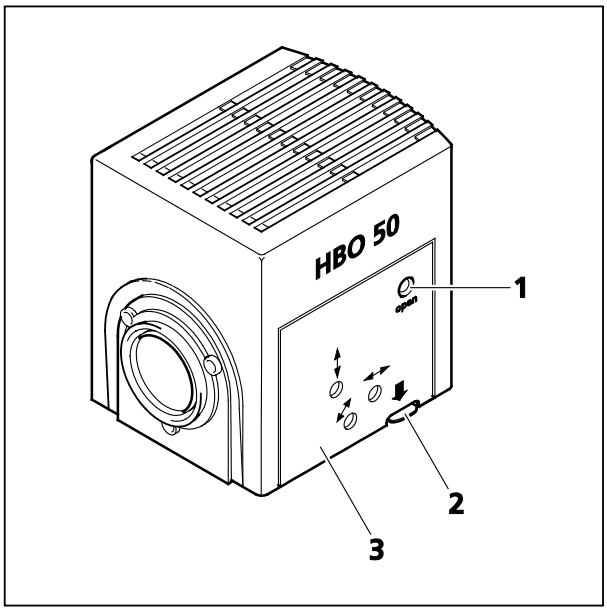


Figure 3-21 Opening the HBO 50

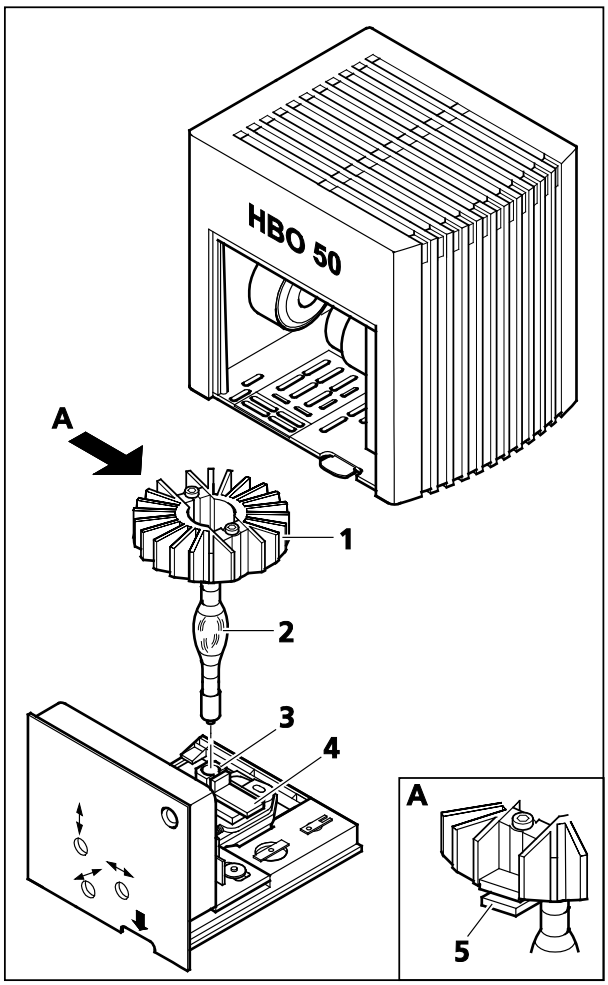


Figure 3-22 Replacing the burner

3.1.14 HBO 50 illuminator

3.1.14.1 Inserting or replacing the HBO 50 illuminator burner

Caution - Burn hazard!
To replace the burner, switch out the HBO 50 at its transformer, and pull out the transformer power plug. Allow at least 15 minutes for the illuminator casing to cool down. Then, first remove the HBO 50 from the stand top part, and put it down on a flat working area.

- Unscrew the clamping screw (Figure 3-21/**1**) using a ball head screwdriver (width A/F 3).
- Push down the unlock key (Figure 3-21/**2**) of the HBO 50, pull out the bulb holder (Figure 3-21/**3**) completely, and lay it down separately.
- Press the spring lever (Figure 3-22/**5**) at the heat sink, pull the heat sink (Figure 3-22/**1**) upwards and off the inserted dummy or off the used burner (Figure 3-22/**2**), and lay it down carefully.

Make certain not to damage or remove the label at the heat sink.

- Press down the spring lever (Figure 3-22/**4**), and pull off the dummy or burner (Figure 3-22/**2**) upwards from the lamp socket (Figure 3-22/**3**). Release the spring lever.

Dispose of used burners as required by statutory provisions. Observe the manufacturer's instructions.

- Press down the spring lever again (Figure 3-22/**4**), and insert the burner into the lamp socket (Figure 3-22/**3**). Make certain that you do not touch the burner's glass bulb while doing so. Release the spring lever.

Avoid or immediately remove any finger marks on the burner's glass parts.

- Press the spring lever (Figure 3-22/**5**) at the heat sink, and put the heat sink (Figure 3-22/**1**) over the burner.
- Check for correct fit, and release the spring lever (Figure 3-22/**5**).
- Insert the bulb holder into the lamp housing, and push it in until it locks into place. Tighten the clamping screw (Figure 3-21/**1**).
- Write down the counter reading shown at the hours-run meter (transformer). Replace the burner when it has reached its nominal useful life of 100 hours.

3.1.14.2 Attaching the HBO 50 illuminator

- Attach and align the HBO 50 illuminator (Figure 3-23/**3**) at the connector socket (Figure 3-23/**1**) in the stand top part, and tighten the clamping screw (Figure 3-23/**2**).
- Connect the HBO 50 connection cable to the transformer, and connect the transformer to a mains outlet.
- Use the power button at the power-supply unit front side to switch the HBO 50 illuminator either on or off. The lamp will ignite automatically when switched on.

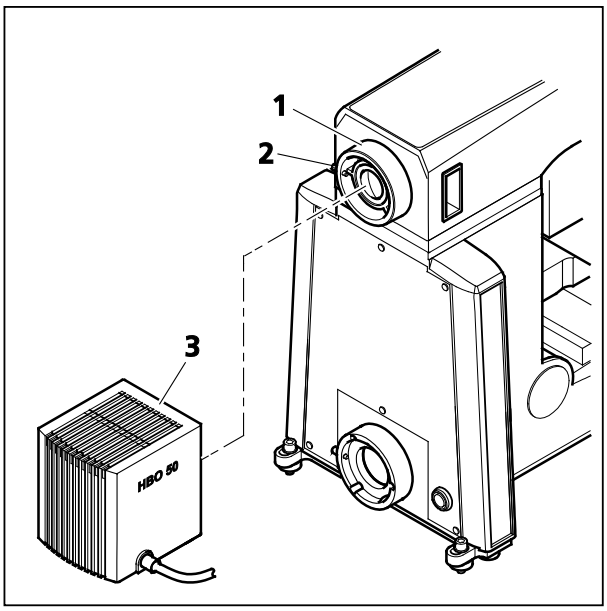


Figure 3-23 Attaching the HBO 50

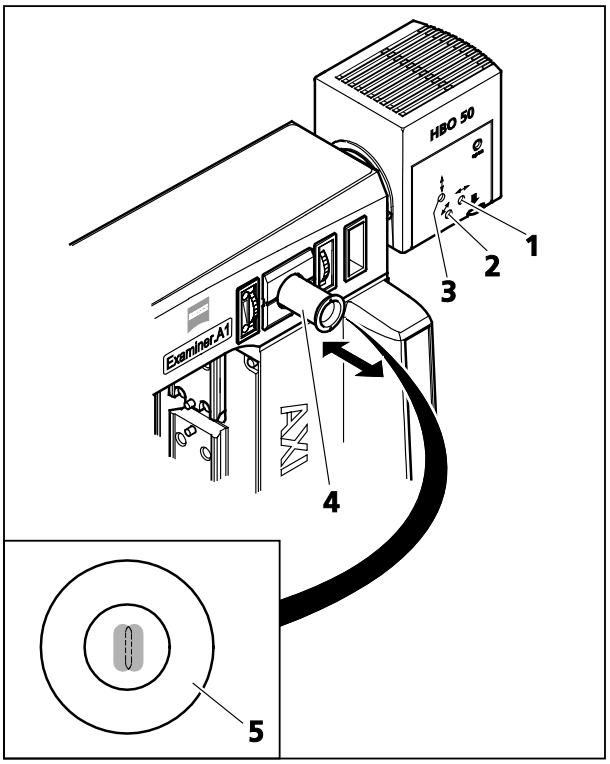


Figure 3-24 Adjusting the HBO 50

3.1.14.3 Adjusting the HBO 50 illuminator

☞ If the FL attenuator is in the reflected light optical path, it should be set to 100 % transmission for adjustment.

(1) Axio Examiner.A1 with adjusting aid:

If the Axio Examiner.A1 is provided with an adjusting aid (which may be ordered on a separate basis), the HBO 50 may remain at the fluorescence reflected-light illuminator during burner adjustment.

- Switch on the fully connected illuminator by actuating the button at the transformer. The burner will ignite automatically.
- Pull out the adjusting aid (Figure 3-24/**4**). The adjusting aid's observation window (Figure 3-24/**5**) shows the electric arc of the burner (brighter) and its mirror image (somewhat darker).
- Turn the adjusting screw (Figure 3-24/**1**) to set the burner in axial direction to the mirror, ensuring that both electric arcs appear in the same size in the adjusting aid observation window (see Figure 3-24/**5**).
- Turn the adjusting screws for height adjustment (Figure 3-24/**3**) or lateral adjustment (Figure 3-24/**2**) to position electric arc and mirror image in a centered location in parallel to one another within the adjusting circle in the observation window (Figure 3-24/**5**). Electric arc and mirror image should not be superimposed one on top of the other.

(2) Axio Examiner.D1/.Z1 and Axio Examiner.A1 without adjusting aid:

If the upper microscope part is not equipped with an adjusting aid, proceed as follows:

- Unscrew the objective from the objective mount or objective nosepiece.
- Switch on the fully connected illuminator by actuating the switch at the transformer. The burner will ignite automatically.
- Hold a wide sheet of paper approx. 11 mm under the objective mount or objective nosepiece holder, such that the electric arc of the burner (brighter) and its mirror image (somewhat darker) appear as a sharp image.
- Turn the adjusting screw (Figure 3-24/**1**) to set the burner in axial direction to the mirror, ensuring that both electric arcs appear in the same size (see Figure 3-24/**5**).
- Turn the adjusting screws for height adjustment (Figure 3-24/**3**) or lateral adjustment (Figure 3-24/**2**) to position electric arc and mirror image in a centered location in parallel to one another within the adjusting circle in the observation window (Figure 3-24/**5**). Electric arc and mirror image should not be superimposed one on top of the other.
- Screw the objective in again.

3.1.15 HBO 100 illuminator

3.1.15.1 Inserting the HBO 103 W/2 mercury vapor short arc lamp

For safety reasons, the HBO 100 illuminator and the HBO 103 W/2 mercury vapor short arc lamp will be delivered to the customer each in a separate package.

Accordingly, the first step before starting up this illuminator is to insert the HBO 103 W/2 lamp into the illuminator casing.

The insertion or replacement of the HBO 103 W/2 lamp is described in the operating manual which accompanies the device.

CAUTION
Use an FL attenuator for changing transmission (unless permanently installed). Neutral-density filters will not last in the long run.

3.1.15.2 Attaching the HBO 100 illuminator

- Remove the cap from the reflected light socket (Figure 3-25/**1**).
- Insert the illuminator casing (Figure 3-25/**3**) with the dovetail ring into the reflected light socket (Figure 3-25/**1**) at the unit's rear side, and secure by a clamping screw (Figure 3-25/**2**) using a ball head-screwdriver (width A/F 3).
- Connect the multipolar illuminator plug of the HBO 100 illuminator to the appliance bushing (Figure 3-26/**1**) of the HBO 100 W transformer, and secure it by a retaining ring.
- Connect the AC power cord first to the AC power inlet (Figure 3-26/**2**) of the HBO 100 W transformer, and then to a mains outlet.

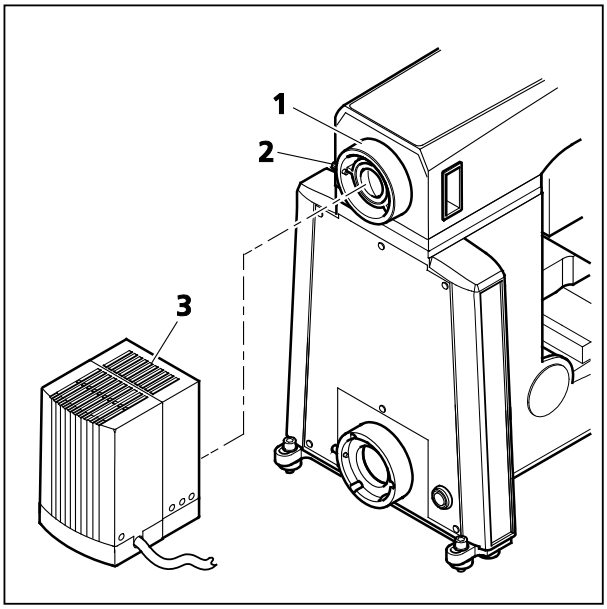


Figure 3-25 Attaching the HBO 100 illuminator

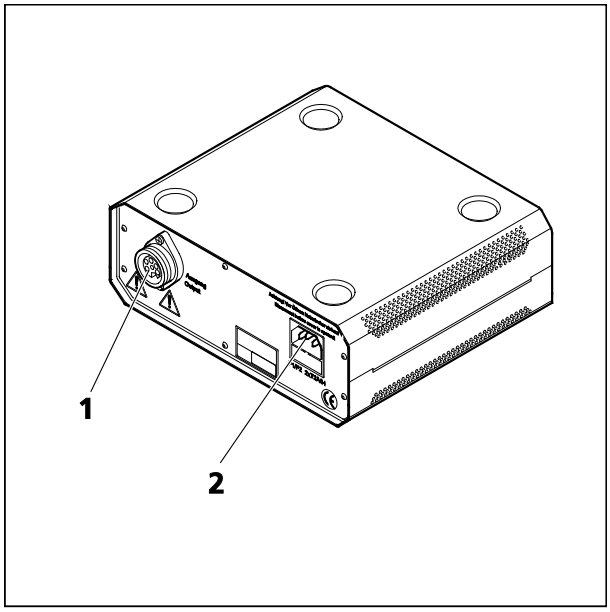


Figure 3-26 HBO 100 W power supply unit

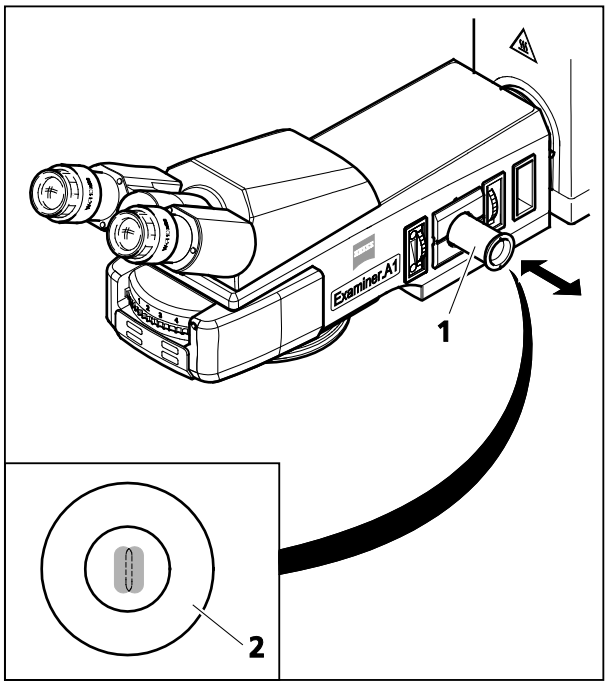


Figure 3-27 Adjusting aid

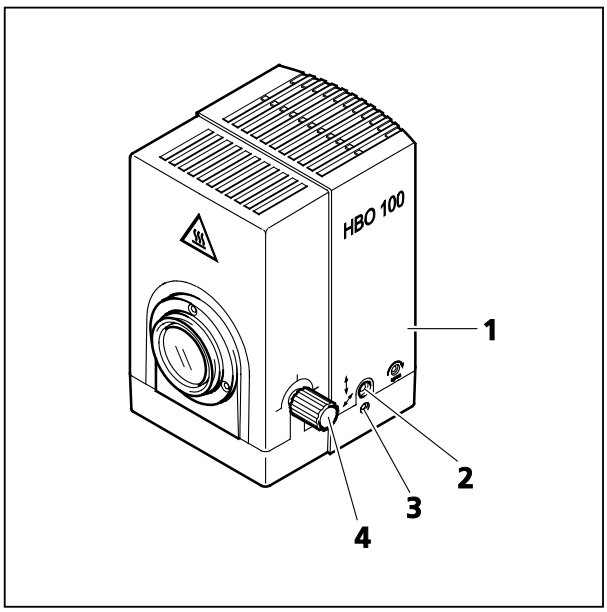


Figure 3-28 Adjusting the HBO 100

3.1.15.3 Adjusting the HBO 100 illuminator

The HBO 100 illuminator is available for delivery in two variants (manual or automatic adjustment).

The self-adjusting HBO 100 (423011-0000-000) will be adjusted automatically after the illuminator's transformer is switched on.

The setting of HBO 100 illuminator by manual adjustment (423010-0000-000) is described below.

☞ If the FL attenuator is located in the reflected light optical path, it should be set to 100 % transmission for adjustment.

(1) Axio Examiner.A1 with adjusting aid:

- Switch on the HBO 100 illuminator (Figure 3-28/**1**) using the switch at the HBO 100 W transformer (Figure 3-31/**1**), and allow it to run up to operating temperature.
- Pull out the adjusting aid (Figure 3-27/**1**) at the microscope stand. The brighter focal spot of the HBO 103 W/2 lamp and its somewhat darker mirror image will appear in the adjusting aid's black glass window.
- Turn the knurled knob (Figure 3-28/**4**) to focus the brighter focal spot using the collector adjustment.
- Turn the adjusting screws (Figure 3-28/**2** and **3**) to set the darker focal spot (burner mirror image) by analogy to the focal spot image (Figure 3-27/**2**) within the inscribed adjusting circle.

☞ The two focal spots of the HBO 103 W/2 lamp should be located close to one another within the adjusting aid's adjusting circle.

- Push the adjusting aid in again.

(2) Axio Examiner.D1/.Z1 and Axio Examiner.A1 without adjusting aid:

- Unscrew the objective from the objective mount or objective nosepiece.
- Switch on the HBO 100 illuminator (Figure 3-28/**1**) using the switch at the HBO 100 W transformer (Figure 3-31/**1**), and allow it to run up to operating temperature.
- Hold a wide sheet of paper approx. 11 mm under the objective mount or objective nosepiece holder such that the electric arc of the burner (brighter) and its mirror image (somewhat darker) appear as a sharp image.

- Turn the knurled knob (Figure 3-28/**4**) to focus the brighter focal spot using the collector adjustment.
- Turn the adjusting screws (Figure 3-28/**2** and **3**) to set the darker focal spot (burner mirror image) by analogy to the focal spot image (Figure 3-27/**2**) within the inscribed adjusting circle.

☞ The two focal spots of the HBO 103 W/2 lamp should be located close to one another within the adjusting aid's adjusting circle.

- Screw the objective in again.

3.1.16 Colibri illumination system and HXP 120 external illumination equipment

Connect and start up the Colibri and HXP 120 as described in the separate operating manual for the Colibri illumination system.

3.2 Establishing a mains connection, and switching the power supply units on or off

To avoid any voltage potential which might interfere with electrophysiological studies at the microscope, Axio Examiner microscopes have no AC power connection of their own. Accordingly, the microscope lights are each supplied by a separate power supply unit.

3.2.1 Connecting the Axio Examiner mot.

In the Axio Examiner mot. lower microscope part (430031-9010-000), focusing is insured exclusively by the motor-driven Z-axis positioning of the objective mount or turret.

A motor-operated reflector turret and a motor-operated condenser carrier may be used in addition.

The functions are operated using the key rings located at the pinion knobs of the lower microscope part or by a docking station (optional). An objective nosepiece cod. (424516-9020-000 or 424516-9030-000) for automatic objective detection may be used in connection with the docking station.

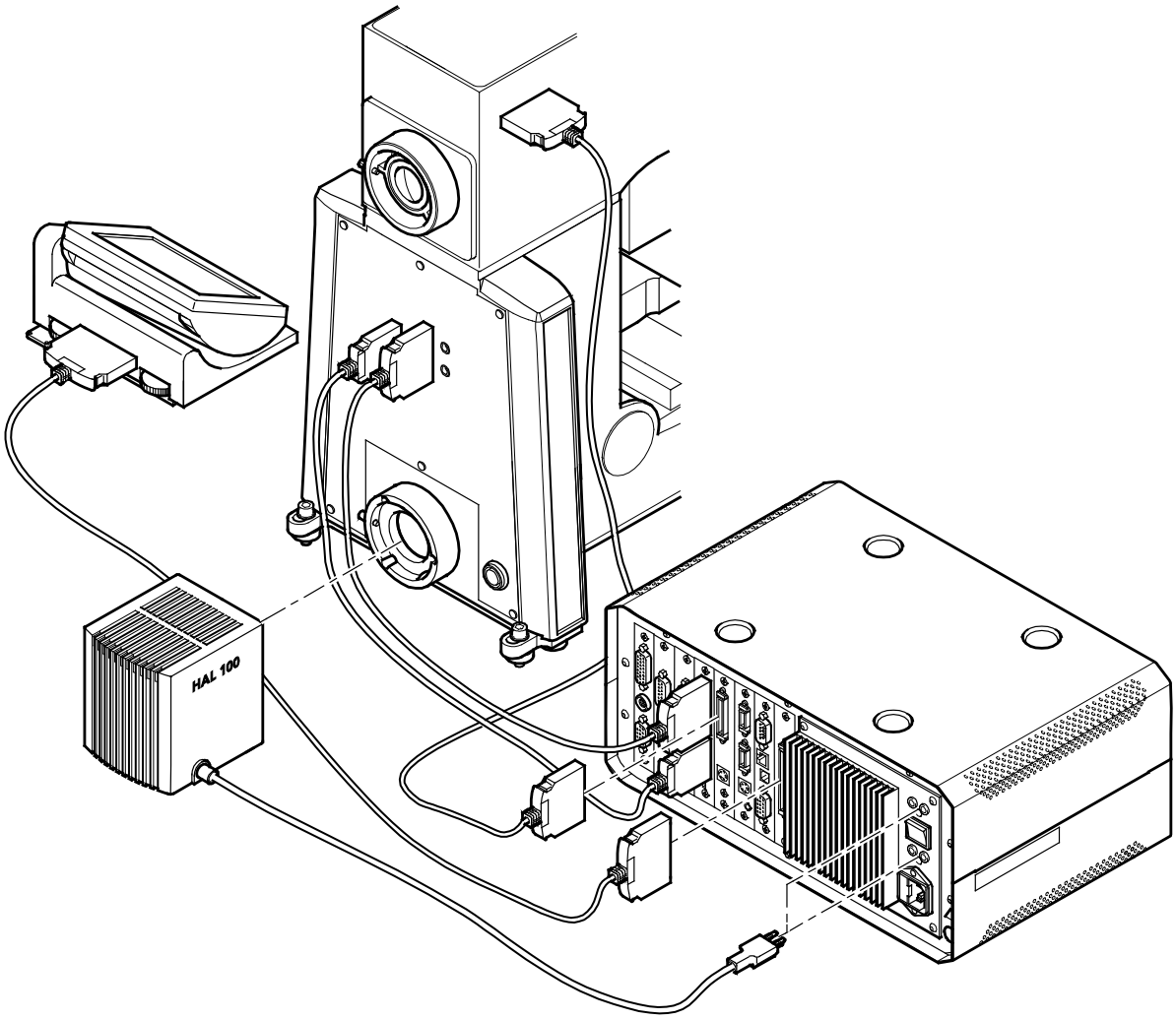


Figure 3-29 Connecting the Axio Examiner mot.

For connecting examiner control and docking station to the Axio Examiner mot., please proceed as follows:

- Connect both sockets at the lower microscope part to the sockets (Figure 3-29/**4** and **5**) at the examiner control unit.
- Connect the sockets at the upper microscope part to the sockets (Figure 3-29/**2**) at the examiner control unit.
- If required, connect the docking station to the examiner control unit (Figure 3-29/**3**).

☞ All connections at the Axio Examiner mot. have a mechanically coded design. Do not use excessive force when connecting the units.

- Connect the HAL 100 three-pole illuminator plug into the corresponding three-pole jack at the examiner control unit.

3.2.2 Connecting and switching the HAL 100 halogen lamp on or off

The HAL 100 halogen lamp is powered and switched either on or off by the external power supply unit.

The external power supply unit may be connected to a line voltage of between 100 and 240 VAC, 50 ... 60 Hz. The power supply unit will **automatically** adapt to the corresponding line voltage within that range.

- Plug the three-pole HAL 100 illuminator plug into the separate external power supply unit (Figure 3-30/**2**).
- Connect the AC power socket of the external power supply unit (Figure 3-30/**3**) to a mains outlet using an AC power cord.
- Press the power button (Figure 3-30/**1**) to switch the HAL 100 halogen lamp either on or off.

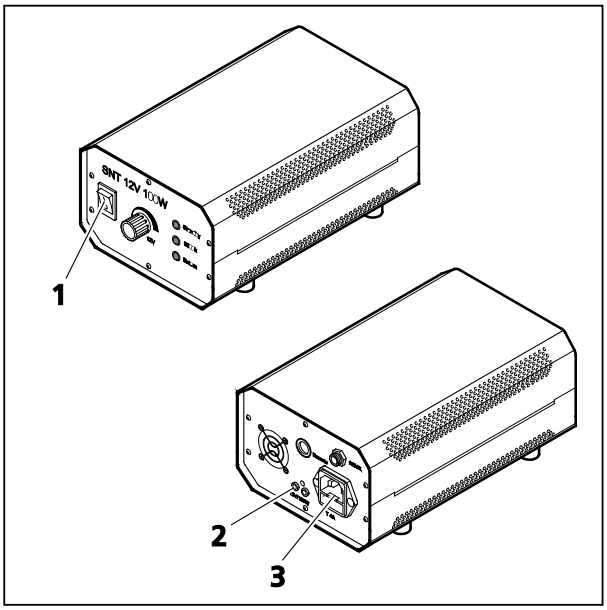


Figure 3-30 External power supply unit for HAL 100 (front and rear side)

☞ When attaching the HAL 100 halogen lamp to the transmitted light socket, connect the illumination control cable of the external power supply unit to the stand (Figure 3-18/**4**).

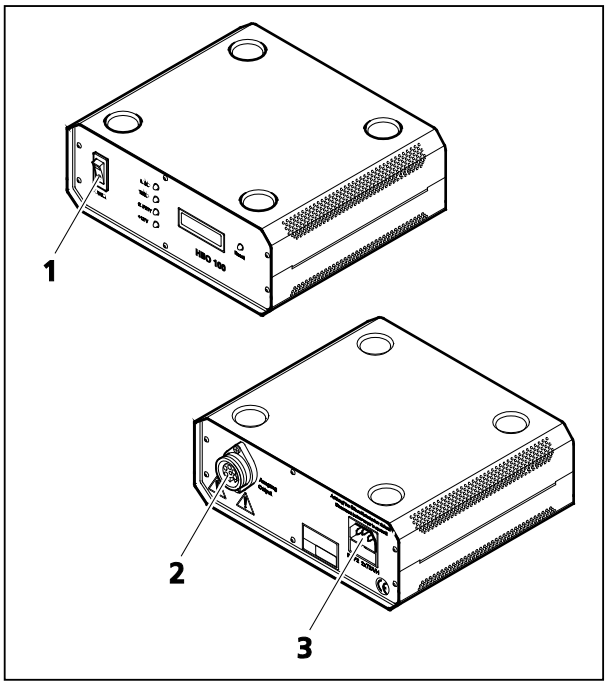


Figure 3-31 HBO 100 W power supply unit (front and rear sides)

3.2.3 Connecting and switching the HBO 100 illuminator on or off

The HBO 100 illuminator (for reflected light fluorescence) is supplied with power by a separate transformer, and it is switched either on or off at the transformer power switch.

- Connect the multipolar illuminator plug of the HBO 100 illuminator to the appliance bushing (Figure 3-31**/2**) of the HBO 100 W transformer, and secure it by a retaining ring.
- Connect the HBO 100 W transformer's AC power socket (Figure 3-31/**3**) to a mains outlet.
- Use the power switch (Figure 3-31/**1**) to switch the HBO 100 W power supply unit either on or off.

3.2.4 Connecting and switching the HBO 50 illuminator on or off

As for the HBO 100, the HBO 50 illuminator is also supplied with power by a separate transformer, and switched on or off using the transformer's power switch.

- Connect the HBO 50 illuminator to the mbq52ac-z transformer.
- Use the power switch at the transformer to toggle the illuminator.

3.3 Installing optional components

Before starting any work, pull out the power plugs of the external power supply units.

After completing conversion, the corresponding assemblies need to be restored to a functional condition again (see sections 3.1 to 1.1).

☞ For information on the possible combinations between the various components and with the various upper microscope parts stands, please refer to the System Overview (see page 19 and the following).

3.3.1 Replacing the stand top part replace and inserting an adapter for extending the specimen area

☞ Please note that the Axio Examiner.Z1 stand top part may only be used in combination with the motor-operated stand.

- Unscrew the four fastening screws (Figure 3-32/**1**) which hold the cover.
- Remove the cover (Figure 3-32/**3**) from the stand top part. To do so, insert a screwdriver into the assembly opening located at the front side, and use it to lift off the cover.
- Hold the stand top part (Figure 3-32/**4**) in position, screw out the six hexagon socket head screws (Figure 3-32/**2**), and remove the stand top part.
- If an adapter (Figure 3-32/**6**) should be installed, screw the spacer sleeves (Figure 3-32/**7**) into the stand bottom part, and put on the 30 mm adapter.

☞ To be able and use the adapter, the objective mount or the objective nosepiece and the stage carrier need to be pushed against the corresponding upper stop screw of the dovetail guide. See sections 3.1.7 and 3.1.12.

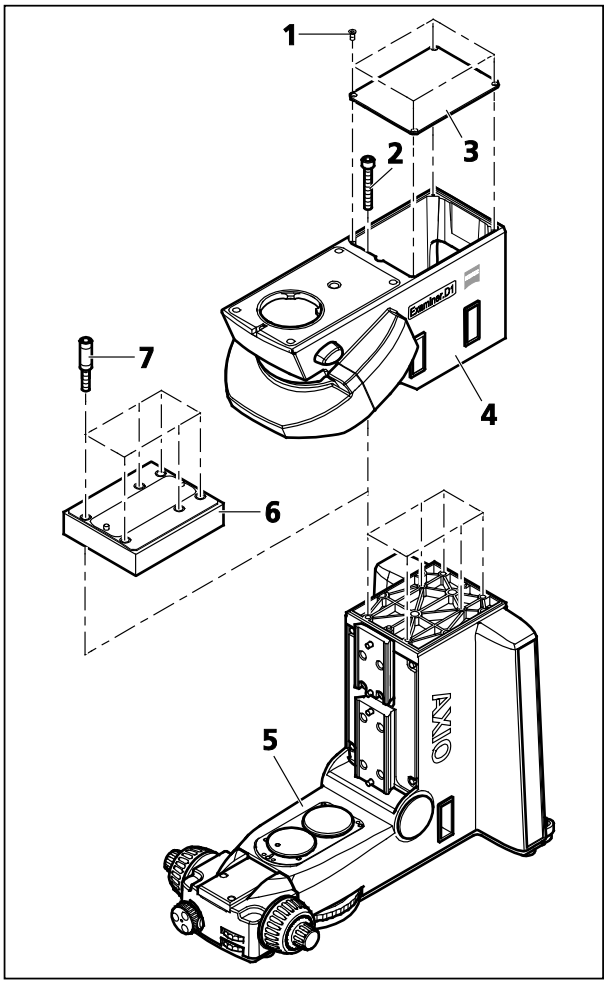


Figure 3-32 Replacing the stand top part, inserting an adapter

- Position the stand top part (Figure 3-32/**4**) to be installed onto the lower stand part (Figure 3-32/**5**) or on the adapter, hold it in position, and screw it down by tightening the six hexagon socket head screws (Figure 3-32/**2**).
- Put on the cover (Figure 3-32/**3**) again.
- Screw in and tighten the four cover fastening screws (Figure 3-32/**1**).
- Check the installation positions of objective mount or objective nosepiece and stage carrier, and modify if required (see section 3.1.7 and 3.1.12).

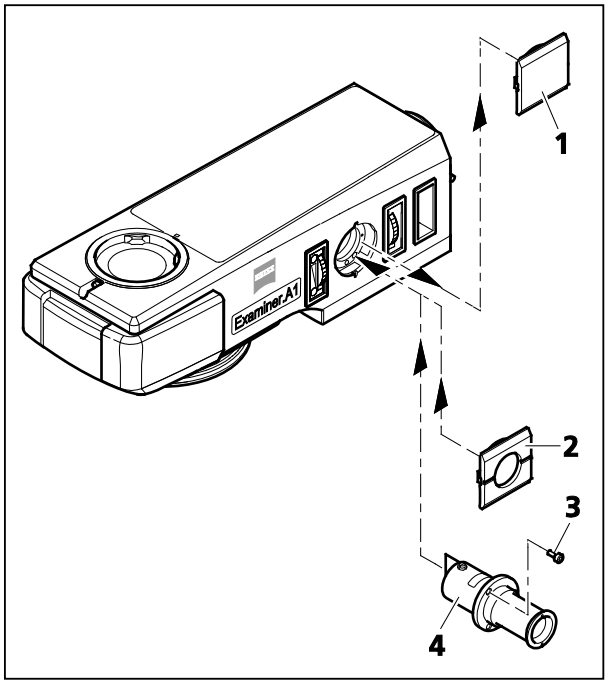


Figure 3-33 Inserting the adjusting aid

3.3.2 Inserting the adjusting aid into the Axio Examiner.A1 upper microscope part

- Remove the cap (Figure 3-33/**1**) from the assembly opening for the adjusting aid.
- Insert the adjusting aid (Figure 3-33/**4**), and screw it to the stand top part using the three accompanying screws (Figure 3-33/**3**).
- Put on the cap with the opening (Figure 3-33/**2**).
- Slide in the slidable adjusting aid socket.

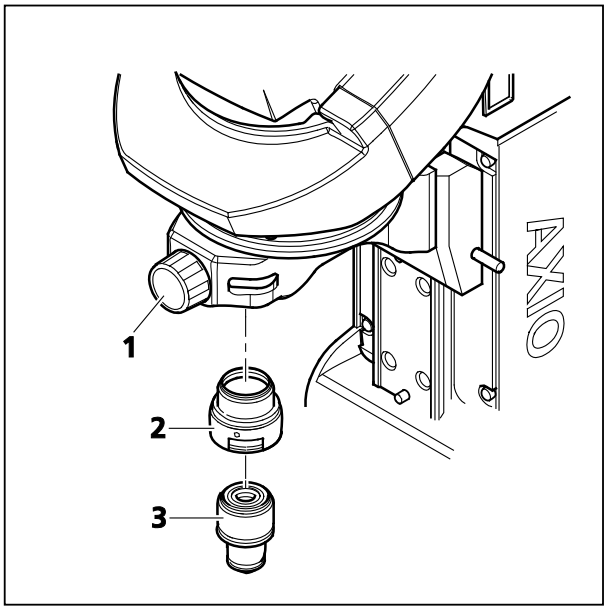


Figure 3-34 Installing an adapter for 45 mm objectives

3.3.3 Installing an adapter for 45 mm objectives

☞ Only for Axio Examiner.D1/.Z1.

- Use the shift knob (Figure 3-34/**1**) to move the objective mount into the WORK position.
- If required, unscrew the objective or remove the dust protection cap from the objective mount or objective nosepiece.
- Screw in the 30 mm adapter (Figure 3-34/**2**).
- Screw the objective (Figure 3-34/**3**) into the 30 mm adapter.

3.3.4 Attaching the magnification changer

- If required, remove the camera with adapter (or dust cap) from the phototube camera socket (Figure 3-35/**2**).
- Remove the phototube from the stand top part, and unscrew the tube lens. Put the phototube onto the stand top part again, and secure it.
- Put the magnification changer (Figure 3-35/**1**) on the camera socket, line it up, and secure it with the union nut (Figure 3-35/**3**).
- Install the camera with the corresponding adapter at the camera socket of the magnification changer.

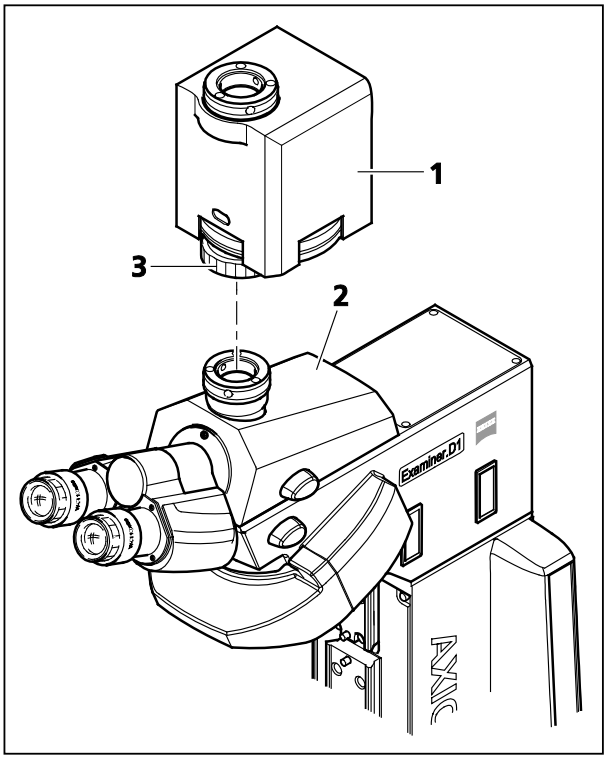


Figure 3-35 Putting on the magnification changer

3.3.5 Replacing the filter set in the FL P&C reflector module

The filter sets for the FL P&C reflector module may be combined and installed on an individual basis by the customer. Corresponding filter sets or completely assembled FL P&C reflector modules may be ordered from Carl Zeiss.

- Remove the FL P&C reflector module (Figure 3-36/**3**) from the reflector turret (see section 3.1.5).
- Use the assembly sheet metal part from the toolset to unscrew the retainer ring (Figure 3-36/**1**).
- Turn the reflector module upside down to drop the filter (Figure 3-36/**2** or **4**) on a soft surface.
- Put the barrier filter in position (Figure 3-36/**2**), put the excitation filter in position (Figure 3-36/**4**), and secure them by the retainer ring (Figure 3-36/**1**).

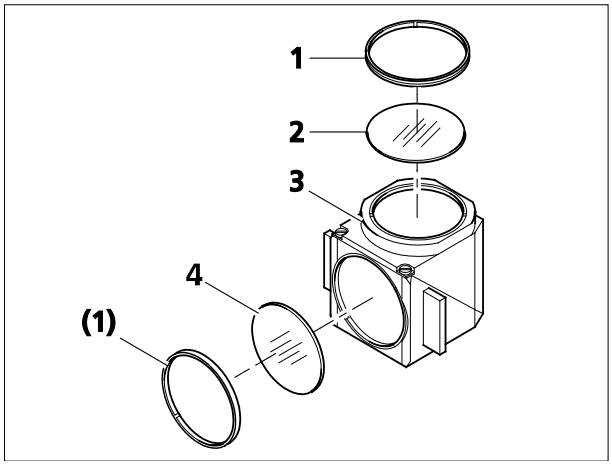


Figure 3-36 Replacing the filter set in the FL P&C reflector module

3.3.6 Replacing the beam splitter in the FL P&C reflector module

To avoid any damage or contamination of optical elements, proceed with utmost care when installing filters and the beam splitter.

We recommend ordering fully equipped FL P&C reflector modules as beam splitter replacement is more demanding.

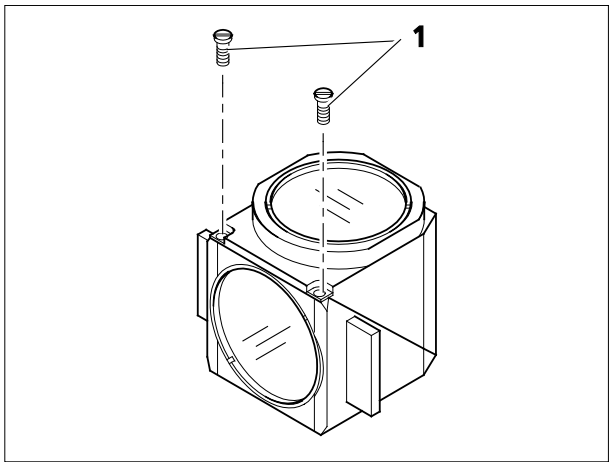


Figure 3-37 Opening a beam splitter

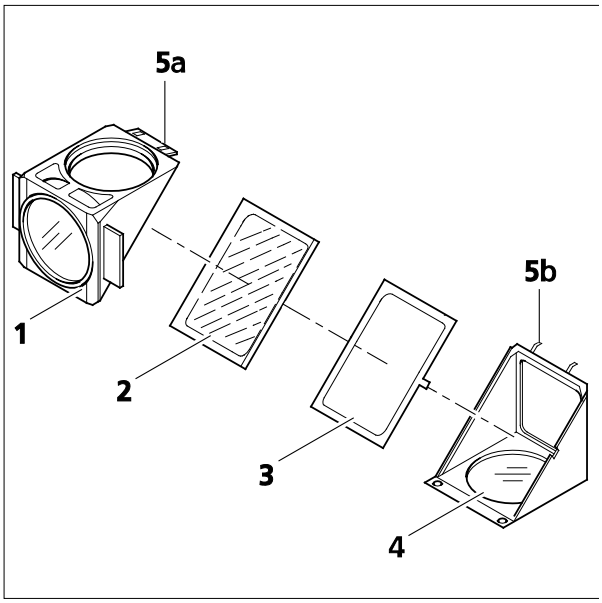


Figure 3-38 Replacing a beam splitter

Otherwise, please proceed as described below:

- Remove the FL P&C reflector module from the reflector turret (see section 3.1.5).
- Unscrew the two slotted screws (Figure 3-37/**1**) using a screwdriver.
- Hold both reflector module halves together, turn them around opposite to the mounting position, and lay them down.
- Tilt the upper half module (Figure 3-38/**1**) upwards, and lift it out of the holder elements (Figure 3-38/**5b**) of the lower half module.
- Take beam splitter (Figure 3-38/**2**) and spring frame (Figure 3-38/**3**) out of the lower half module.
- Remove the old beam splitter, and position the new beam splitter with the reflecting side pointing down onto the spring frame (Figure 3-38/**4**), and lay both parts together into the lower half module. Please make certain that the lateral spring frame tab is located in the corresponding recess at the lower half module.

The reflecting side of the beam splitter is shown by the fact that no distance between a small wood stick and its mirror image is seen when a small wood stick is placed on the beam splitter surface.

- Place the upper half module (Figure 3-38/**1**) onto the lower half module (Figure 3-38/**4**) (holder elements Figure 3-38/**5b** will engage into the eyes Figure 3-38/**5a**). Hold both halves together, and turn them back into the mounting position again.
- Insert and tighten the slotted screws again.
- Finally, attach an adhesive label indicating the designation of the filter combination to a module side.

3.3.7 Installing the Senarmont polarizer

- Remove the stage carrier (see section 3.1.12).
- Remove the condenser (see section 3.1.10).
- Remove the condenser carrier (see section 3.1.9), and store it upside down.
- Screw the mounting frame (Figure 3-39/**2**) using four screws (Figure 3-39/**4**) to the lower side of the condenser carrier (Figure 3-39/**1**).
- Attach the condenser carrier to the stand (see section 3.1.9).
- Slide the Senarmont polarizer (Figure 3-39/**3**) into the guide of the mounting frame.
- Attach condenser and stage carrier again.

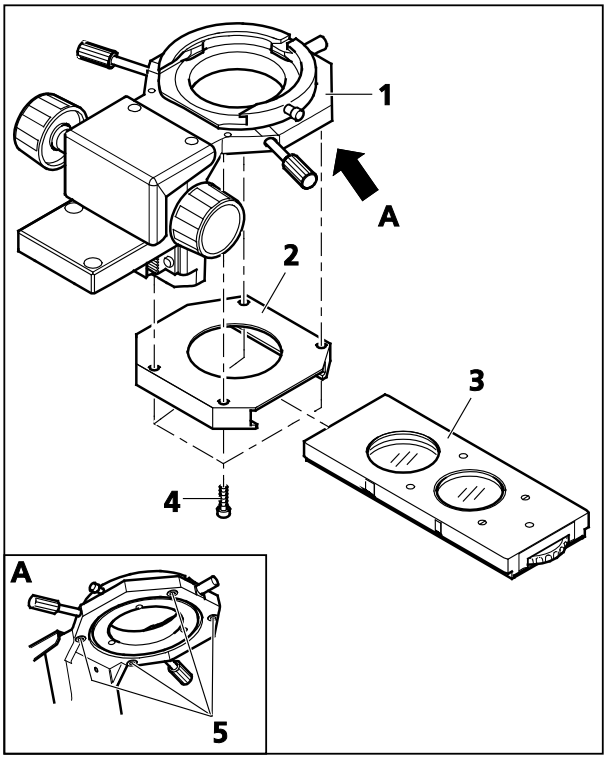


Figure 3-39 Installing the SÉNARMONT polarizer

3.3.8 Replacing the DIC prism in the condenser

- To take out the cover plate, turn the condenser cover plate (Figure 3-40/**4**) using the double function tool (Figure 3-40/**1**) to unlock the bayonet socket and allow removal.
- Unscrew the retainer ring (Figure 3-40/**2**) using the double function tool (Figure 3-40/**1**).
- Take out the DIC prism (Figure 3-40/**2**).
- To install the DIC prism, proceed in reverse order. Take particular care with the correct orientation of the DIC prism (cams must mesh with the holder notches). Check that the lettering at the knurled ring of the revolving disk is correct.

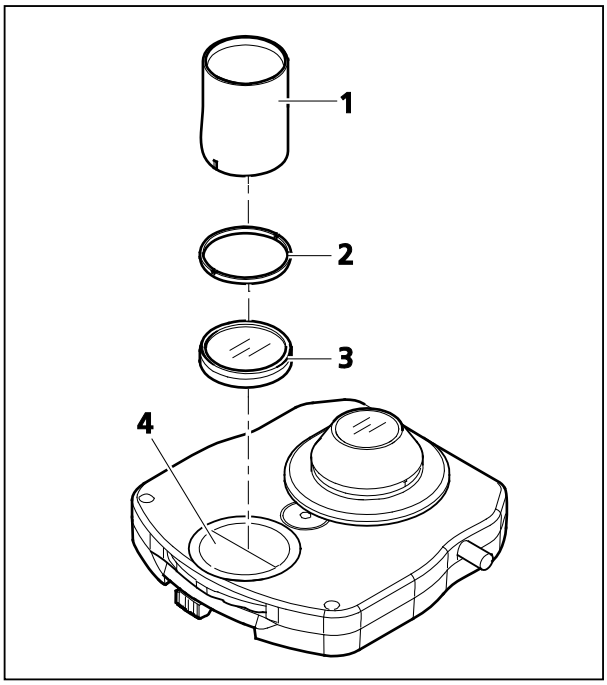


Figure 3-40 Replacing the DIC prism

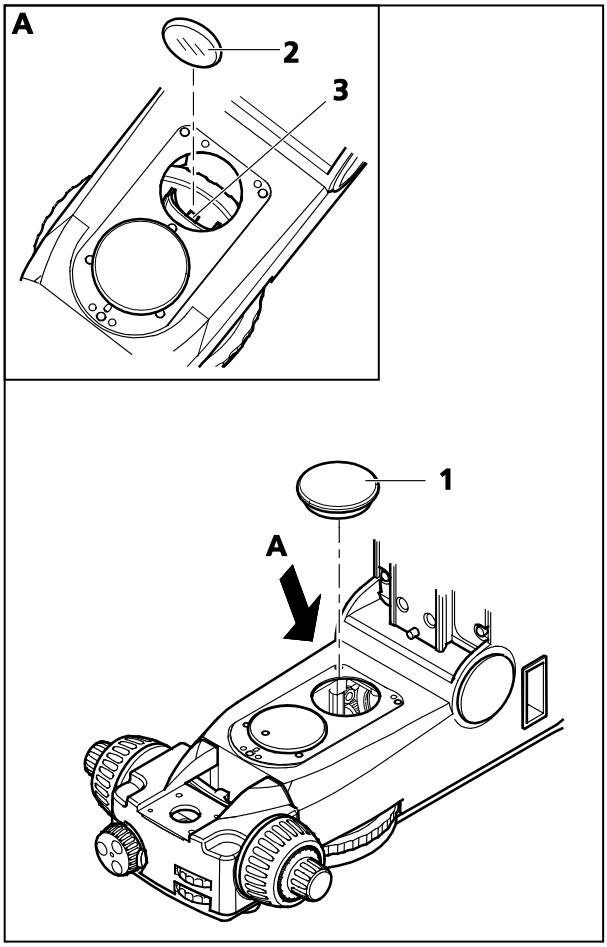


Figure 3-41 Replacing the filter in the transmitted light filter wheel

3.3.9 Replacing the filter in the transmitted light filter wheel

- Take off stage carrier, condenser, and condenser carrier (see sections 3.1.9, 3.1.10 and 3.1.12).
- Take off the cover plate (Figure 3-41/**1**) from the stand base.
- Pull the filter to be replaced (Figure 3-41/**2**) up and out of the corresponding position of the filter wheel (Figure 3-41/**3**) using a pair of tweezers.
- Insert a new filter into the filter wheel (Figure 3-41/**3**).

☞ A filter position is always designed as a permanently installed shutter position.

- Repeat the procedure for more filter wheel positions as required.
- Insert the cover plate (Figure 3-41/**1**), and press it down.
- Attach stage carrier, condenser, and condenser carrier (see sections 3.1.9, 3.1.10 and 3.1.12).

3.3.10 Installing the Aqua Stop for the condenser

- Remove the stage carrier (see section 3.1.12).
- Connect the discharge hose (Figure 3-42/**2**) to the Aqua Stop (Figure 3-42/**1**).
- Carefully put the Aqua Stop (Figure 3-42/**1**) on the condenser (Figure 3-42/**3**). The rim must fit in the slot at the condenser.
- Run the discharge hose (Figure 3-42/**2**) to a corresponding vessel (dish, etc.).
- Put on the stage carrier (see section 3.1.12).

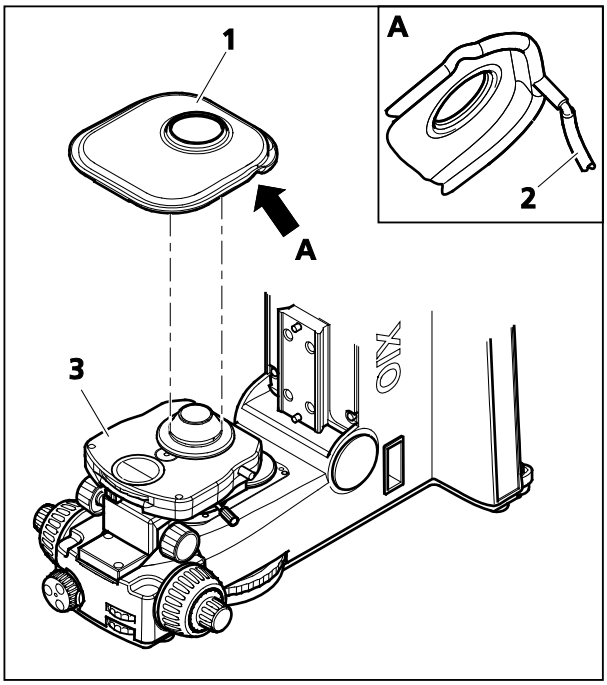


Figure 3-42 Installing the Aqua Stop

3.3.11 Attaching a condenser carrier with a motor-operated focus

To install a motor-operated condenser carrier, follow the same procedure as for a manual condenser carrier (see section 3.1.9).

- After assembly, connect the condenser carrier control cable (Figure 3-43/**1**) to the lower microscope part.

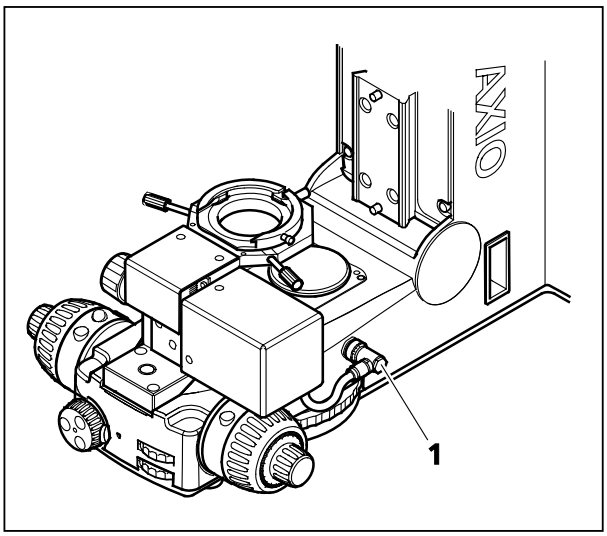


Figure 3-43 Connecting a mot. condenser carrier

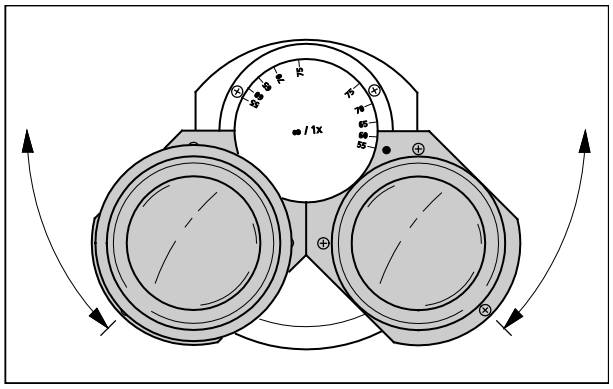


Figure 3-44 Setting the eyepiece distance at the binocular tube

3.4 Microscope basic setting

3.4.1 Setting the eyepiece distance (interpupillary distance) at the binocular tube

- Symmetrically swing the two eyepiece sockets to adapt the eyepiece distance (interpupillary distance) to the observer's individual interocular distance (Figure 3-44).

The correct interocular distance is set when the observer sees only a **single** round image when looking through both eyepieces.

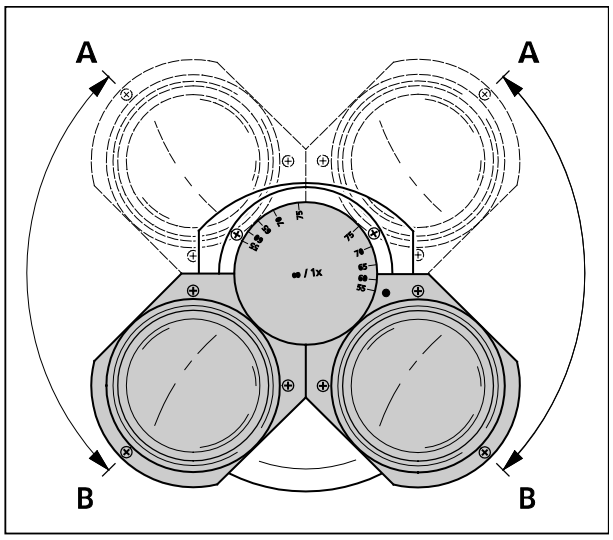


Figure 3-45 Setting the viewing height at the binocular tube

3.4.2 Setting the viewing height

- To customize the viewing height to every person, swing the eyepiece sockets either up (Figure 3-45/**A**) or down (Figure 3-45/**B**).

3.4.3 Compensating for eye deficiencies when using eyepiece reticules

The correct use of an eyepiece reticule requires two adjustable eyepieces, e.g., PL 10x/23 Br. foc. for compensating different eye deficiencies of a viewer.

- Use the focusable eyepiece lens of the adjustable eyepiece to focus on the eyepiece reticule test figure.
- Focus on the microscopic image of a loaded specimen using the focusing gear while looking through the eyepiece which includes the eyepiece reticule.
- After having focused both on the microscopic image and on the eyepiece reticule in the above-mentioned eyepiece, focus the image for the second eye using the focusable eyepiece lens of the second eyepiece.

This ensures the focusing of both microscopic images including the specimen slide. Focusing should be done exclusively using the focusing gear.

3.4.4 Setting the lock-in resistance of the 5x reflector turret

☞ Only for Axio Examiner.D1 and .Z1 microscope top parts.

The lock-in resistance of the 5x reflector turret is freely adjustable. Proceed as follows:

- Remove the binocular tube (see section 3.1.3).
- Pull the closing plug (Figure 3-46/**1**) out of the upper microscope part.
- Turn the adjusting screw (Figure 3-46/**2**) using a ball head screwdriver until the desired lock-in resistance is set.
- Insert the closing plug again (Figure 3-46/**1**).
- Put on the binocular tube (see section 3.1.3).

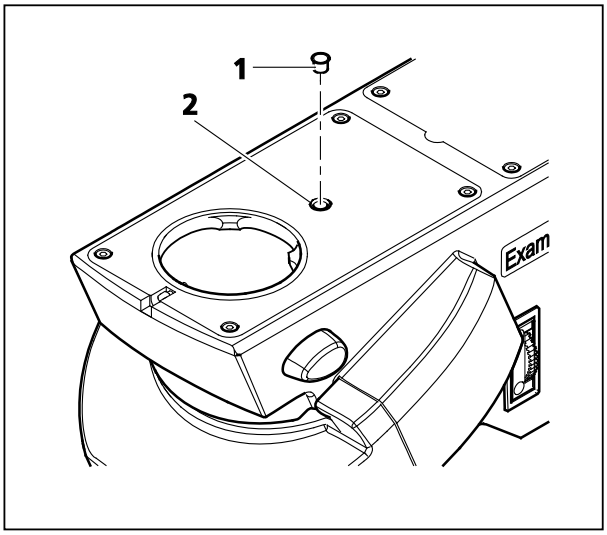


Figure 3-46 Setting the lock-in resistance

3.4.5 Setting the actuating rod

☞ Only for phototubes 425521-9020-000 and 425521-9000-000.

You can adjust the motion of the actuating rod used for toggling between eyepieces and camera output. Proceed as follows:

- Remove the phototube from the upper microscope part (see section 3.1.3).
- Lay down the phototube safely with the lower side turned upwards.
- Set the motion step using the screw (width A/F 1.5) (Figure 3-47/**1**) located on the lower side.
- Put the phototube on the upper microscope part (see section 3.1.3).

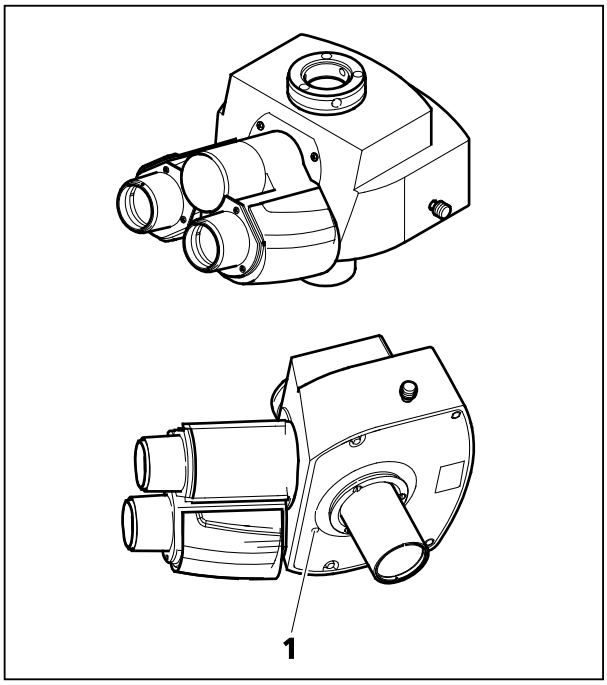


Figure 3-47 Setting the actuating rod

4 OPERATION

Axio Examiner research microscopes are offered both in a version for manual operation and in a version equipped with a motor-driven focusing gear.

The basic difference between the two microscope versions is the fact that objective focusing for the Axio Examiner.Z1 is exclusively motor-driven and operated by using the control system and the keypad. No opportunity for manual focusing control is provided directly at that microscope.

But all other operator control functions are completely identical between the manual and the motor-driven microscope.

4.1 Illumination and contrast procedures

4.1.1 Transmitted light bright field according to KÖHLER

(1) General operating principle

Transmitted-light bright-field microscopy is the most common of all optical microscopy procedures since it allows the quick and easy viewing of high-contrast or stained specimens (e.g., blood films).

In addition to so-called direct beams, indirect ray beams, i.e., beams diffracted and scattered at the specimen details, are essential for achieving an image as true to the specimen as possible. The higher the indirect beam proportion (aperture), the higher is the microscopic image's fidelity to the object according to ABBE.

To make full use of the microscope's and especially of the objective's performance, condenser, luminous-field diaphragm, and aperture stop should be adjusted according to the rules of KÖHLER's principle of illumination. These fundamental rules for microscope setting will be described in detail in the following section on the 4.1.1 (3) "Setting of a transmitted light bright field according to KÖHLER."

(2) Transmitted light-bright field equipment

Every microscope has equipment which allows the performance of the transmitted-light bright-field procedure.

All condensers available for delivery may be used for transmitted-light bright fields.

(3) Setting of a transmitted-light bright field according to KÖHLER

– The Axio Examiner has been put into operation properly (see chapter 3).

– The transmitted-light illumination is switched on at the external power supply unit (Figure 4-1/**1**).

- Set image brightness using the light intensity controller (Figure 4-1/**2**) at the external power supply unit.
- Place a high-contrast specimen in the universal mounting frame on the mechanical stage.
- Swing the front lens at the condenser in position (for objectives ≥ 10x), and set the condenser to the upper stop using the pinion knob for height adjustment (Figure 4-2/**2**). The stop must be set to ensure that the specimen will not be lifted out of position by the condenser.
- Switch the revolving disk of the condenser (where existing) using the knurled ring (Figure 4-2/**4**) to the **H** position for the bright field.
- Swing the 10x objective in position at the objective mount or objective nosepiece (Figure 4-2/**7**), and focus on the specimen using the pinion knob (Figure 4-2/**3**).
- Close the luminous-field diaphragm (Figure 4-2/**5**) until the luminous-field diaphragm also becomes visible in the visual field (even if out of focus) (Figure 4-2/**A**).
- Lower the condenser using the pinion knob for height adjustment until the bright field stop rim appears sufficiently in focus (Figure 4-2/**B**).
- Center the luminous-field diaphragm using both centering screws (Figure 4-2/**1**) at the condenser carrier (Figure 4-2/**C**), and then open it until the stop rim just disappears from the visual field (Figure 4-2/**D**).

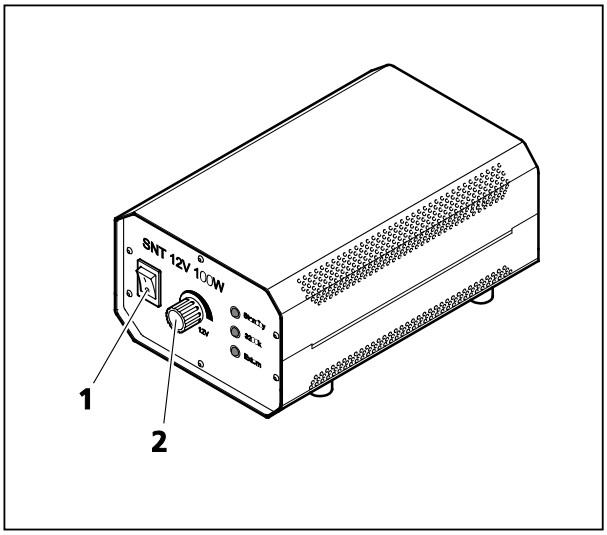


Figure 4-1 HAL 100 external power supply unit

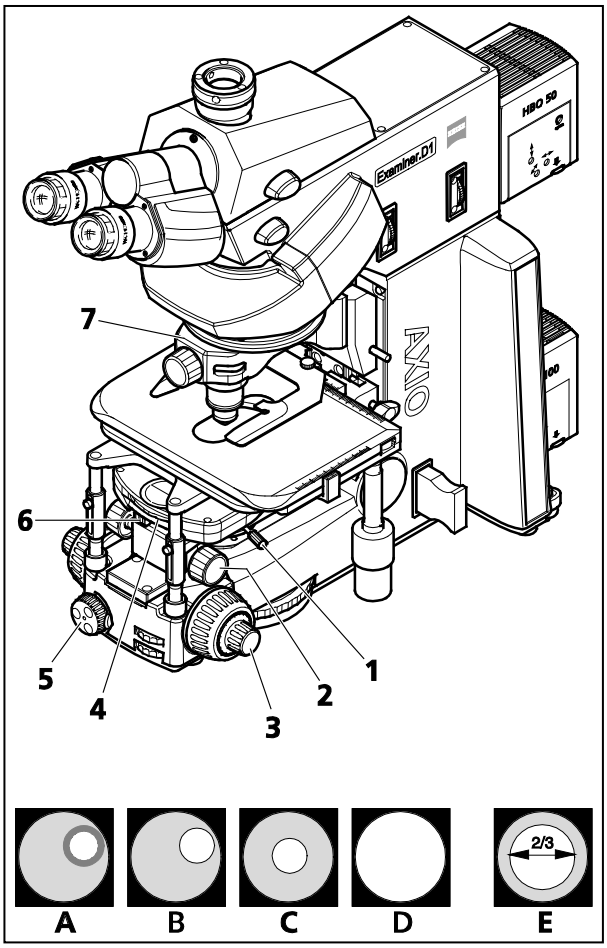


Figure 4-2 Microscope settings on the Axio Examiner in the transmitted-light bright field

- For aperture stop setting (contrast), remove one eyepiece from the tube socket, and look into the socket with a naked eye. Set the aperture stop using the adjusting lever (Figure 4-2/**6**) to approx. 2/3 ... 4/5 of the objective output pupils' diameter (Figure 4-2/**E**). This aperture stop setting provides the best contrast with almost complete resolution in most applications, and thus constitutes the best compromise for the human eye.
- Insert the eyepiece into the tube socket again.

☞ Every objective exchange changes both the visual field size and the objective aperture. This requires a new setting of bright field and aperture stop in order to achieve optimum results.

If objectives < 10x are used, the aperture stop needs to be opened completely. To achieve a better contrast for such big visual fields, the luminous-field diaphragm may also be used, reducing its opening up and into the visual field.

(4) VIS/IR toggling

To obtain a higher contrast with specimens presenting high scattering within the tissue, it is recommended to use infrared light. To change over, proceed as follows:

- Set the control wheel (Figure 1-3/**17** and Figure 1-4/**18**) at the stand from visual (white circle) to infrared (red circle).
- If required, use a Senarmont polarizer and analyzer modules for IR (see sections 3.1.5 and 3.3.7).

4.1.2 Transmitted-light differential interference contrast (DIC)

(1) General operating principle

The transmitted-light DIC procedure is a contrasting alternative for polarization applications, and allows the high-contrast plastic representation of transparent specimen details.

Light polarized in a linear manner by a polarizer is split into two component beams in a birefringent prism. These beams run through two neighboring specimen positions located at a small distance from one another, and are subjected to different path differences brought about by differences in refractive index and specimen thickness. Subsequently, both component beams are combined in a second birefringent prism, and have the same oscillation direction after passing through the analyzer. This allows interference of both component beams in the intermediate image while different path difference are transposed into different grey values (intensities). A compensator λ (lambda plate) converts the grey values into colors subsequently.

(2) Equipment

- Objectives offered with DIC equipment, e.g., EC Plan-Neofluars.
- DIC sliders suitable for the objectives used.
- Condenser with revolving disk on which DIC prisms are located (DIC I, DIC II, DIC III).
- Polarizer, e.g., SÉNARMONT polarizer.
- DIC P&C analyzer module in the reflector turret.
- Preferably a revolving mechanical stage.

☞ For Axio Examiner microscopes not ordered with DIC equipment, DIC sliders must be inserted into the objective exchange carriage or into the objective adapter, and set to a central position if any in order to be able and carry out examinations using differential interference contrast. Step (3) describes how to insert DIC sliders. Item (4) describes how to set their central position.

(3) Inserting DIC sliders

DIC sliders are already inserted and centered if your microscope equipment has been ordered for applications using interferential difference contrast.

To retrofit or replace DIC sliders, please proceed as follows:

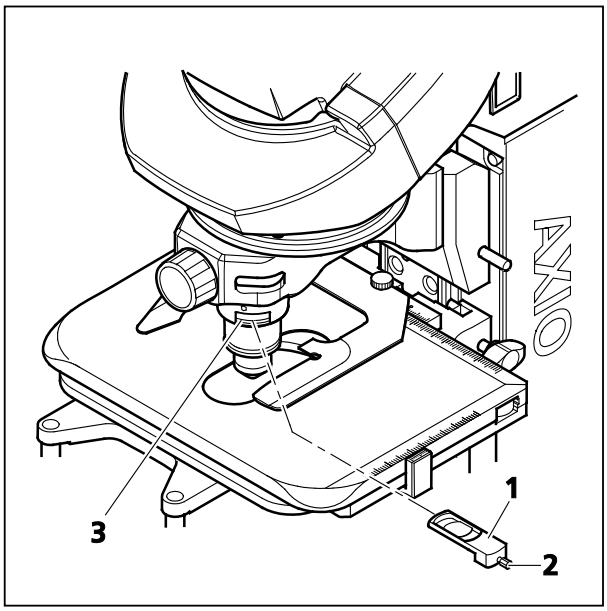


Figure 4-3 Inserting a DIC slider into an objective adapter

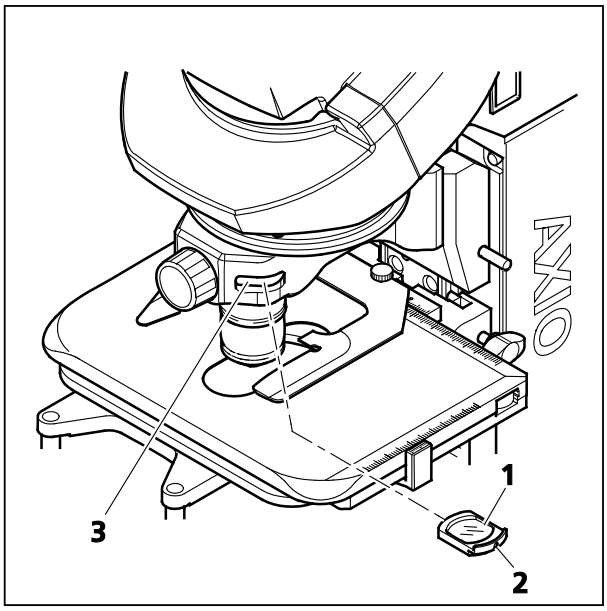


Figure 4-4 Inserting a DIC slider into an objective mount or objective nosepiece

Axio Examiner.A1/.D1/.Z1 with 45 mm objective:

☞ Use the 11 mm objective adapter for the Axio Examiner.A1.

- Lower the objective into the WORK position.
- Slide a DIC slider (Figure 4-3/**1**, see lettering) suitable for the objective into the opening (Figure 4-3/**3**) provided for this above the objective in the objective adapter.
- Make certain that the DIC slider locks exactly into position.

Axio Examiner.D1/.Z1 with W Plan-Apochromat 20x/1.0 objective, 75 mm parfocal length:

- Insert DIC slider SÉNARMONT 75 W PA (426967-9000-000 or 426967-9070-000) (Figure 4-4/**1**) into the opening (Figure 4-4/**3**) provided for it in the objective mount or turret. Ensure correct orientation as indicated by the DIC slider lettering.
- Put the ball head screwdriver into the recess (Figure 4-4/**2**) in the DIC slider, and push the DIC slider (Figure 4-4/**1**) into the slot until it locks into place.

(4) Centering the DIC slider

☞ Only for DIC sliders for objectives with a parfocal length of 45 mm.

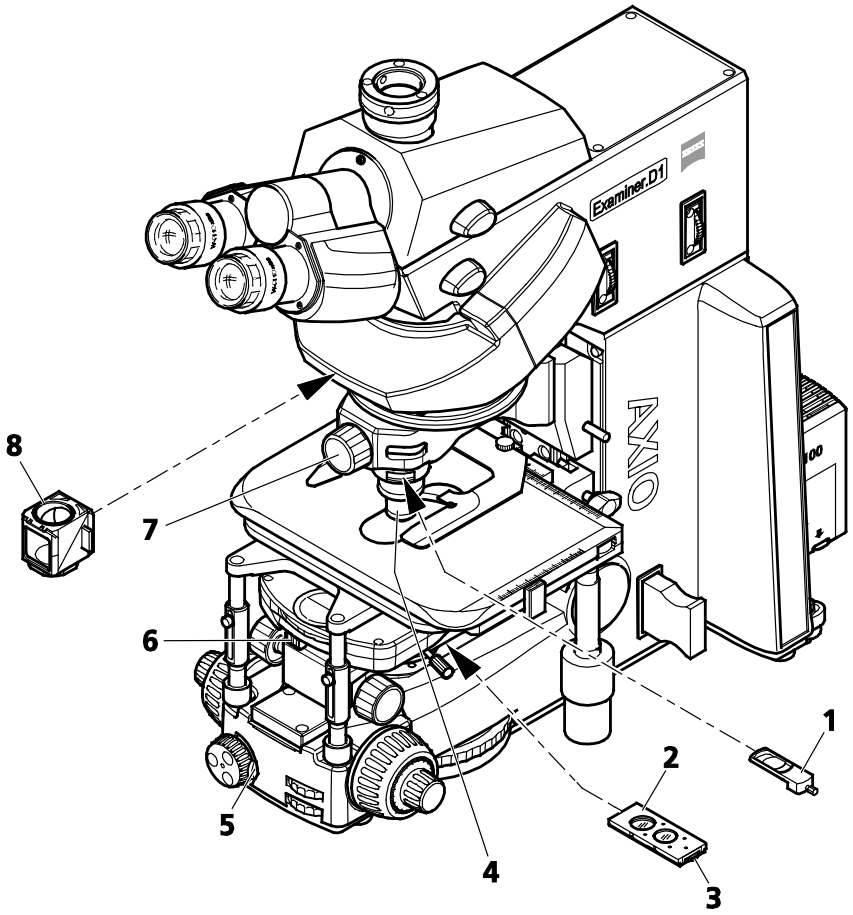


Figure 4-5 Axio Examiner.D1 with DIC equipment

- The DIC slider (Figure 4-5/**1**) is inserted properly into the objective adapter.
- The microscope adjusted for a bright field according to KÖHLER's rules.
- The 10x objective (or the overview objective used) (Figure 4-5/**4**) is in working position.
- The condenser turret has been swiveled into the bright field or into an unequipped position.

- Swing the SÉNARMONT polarizer (Figure 4-5/**2**) into the optical path.
- Turn the thumb wheel (Figure 4-5/**3**) at the SÉNARMONT polarizer to the 45° lock-in position.
- Swing in the analyzer module at the reflector turret (Figure 4-5/**8**).
- Remove one eyepiece from its eyepiece socket, and insert an auxiliary microscope.
- A diagonal black strip of the DIC slider is seen when observing the visual field through the auxiliary microscope.

- Re-adjust the knurled screw at the DIC slider (Figure 4-3/**2**), adjusting the diagonal black strip to the center of the visual field.
- Remove the auxiliary microscope, and insert the eyepiece again.

(5) Setting transmitted light DIC

- Put an objective suitable for DIC into work position using the shift knob (Figure 4-5/**7**).
- Swing in the analyzer module at the reflector turret (Figure 4-5/**8**).
- Swing in a suitable DIC prism I, II or III (number as shown at the condenser revolving disk).

☞ The condenser used must not be equipped with DIC prisms which are installed in combination with polarizing filters.

- Switch on the SÉNARMONT polarizer (Figure 4-5/**2**)(polarizer and λ/4 plate) in the lock-in position.
- Set the luminous-field diaphragm (Figure 4-5/**8**) and the aperture stop (Figure 4-5/**6**) according to KÖHLER's rules.
- To adjust the optimum contrast for SÉNARMONT DIC, turn the polarizer using the thumb wheel (Figure 4-5/**3**) of the SÉNARMONT polarizer. The λ/4 plate located above needs to be switched on at all times to ensure that contrasting works according to SÉNARMONT. If the DIC slider is in the proper center position, darkness is achieved in the SÉNARMONT polarizer lock-in position, i.e., the path difference is 0 nm in this position.

4.1.3 Oblique illumination via condenser

(1) General operating principle

Oblique illumination allows the relief representation of your specimen. This is achieved by a radially adjustable stop in the condenser which directs light at an angle to the specimen.

(2) Equipment

The equipment of every microscope allows the performance of the oblique illumination procedure.

– HAL 100 halogen lamp for transmitted-light illumination

The following condensers may be used for oblique illumination:

– Condenser 0.8 (424226-9000-000)

– Condenser 0.9 (424226-9010-000)

– Condenser 1.2 (424226-9020-000)

(3) Adjusting oblique illumination

- Switch on transmitted-light illumination.
- Set the condenser modulator disk to the position for oblique illumination ◷.
- Use the adjusting screw (width A/F 1) (Figure 4-6/**1**) at the condenser to turn the stop's slot segment into the desired position.

☞ The modulator disk is blocked and cannot be turned as long as the screwdriver is inserted for setting oblique illumination.

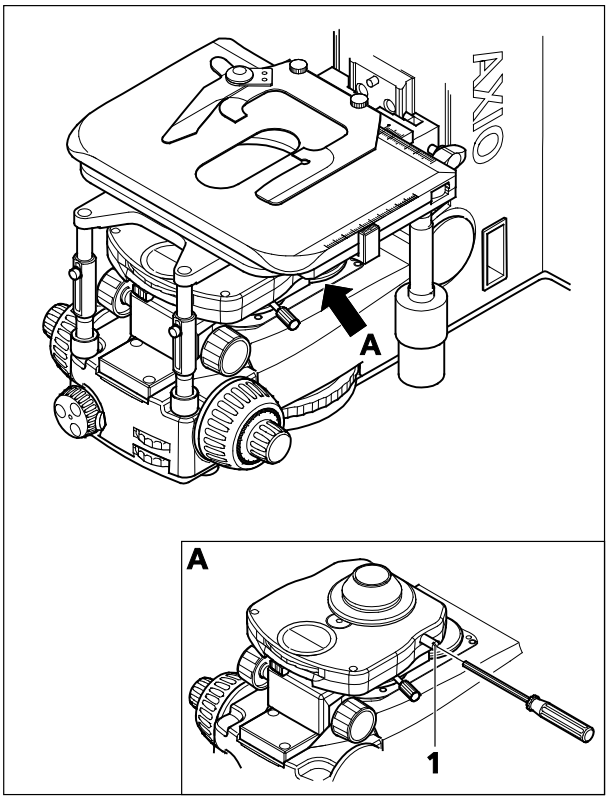


Figure 4-6 Adjusting oblique illumination

4.1.4 Oblique illumination according to DODT

(1) General operating principle

Oblique illumination allows a relief representation of your specimen. This is achieved by a radially adjustable stop which is located in the optical path, and directs light at an angle to the specimen.

For oblique illumination according to DODT, a special segmented stop is used in combination with a diffusing screen. The diffusing screen creates an intensity gradient within the diffusing cylinder. Artefacts in the image are reduced, and hard contrasts are avoided. This procedure is suitable in particular for highly scattering tissue sections.

(2) Equipment

The equipment of every microscope allows the performance of the oblique illumination procedure.

All condensers available for delivery may be used for oblique illumination.

- Corresponding segmented stop slider for the condenser;
- HAL 100 halogen lamp for transmitted-light illumination

(3) Adjusting oblique illumination

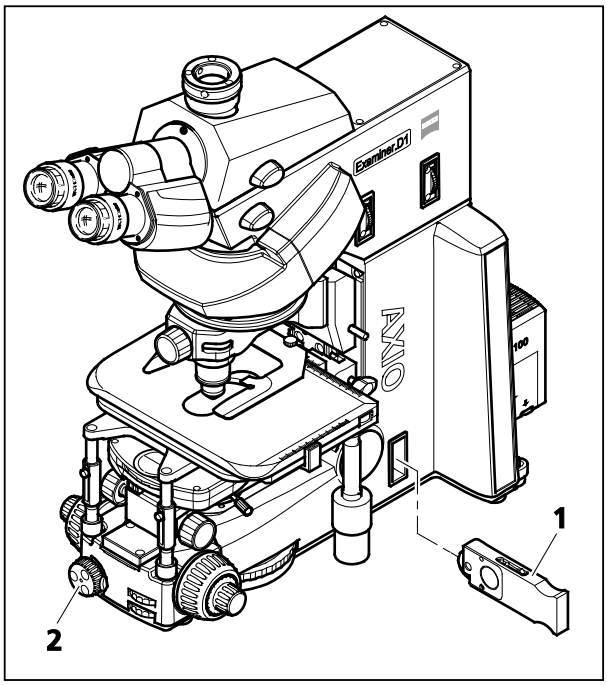


Figure 4-7 Inserting a segmented stop slider

- Insert the segmented stop slider (Figure 4-7/**1**) into the lower microscope part until it locks into place.

☞ When the water condenser 1.2 is used (424226-9020-000), the diffusing diaphragm needs to be swiveled into the condenser since the segmented stop slider has no diffusing diaphragm of its own.

- Switch on the transmitted-light illumination.
- Use the control wheel (Figure 4-7/**2**) at the stand to rotate the slot segment of the stop into the desired position.

4.1.5 Reflected-light fluorescence

(1) General operating principle

The reflected-light fluorescence method allows the high-contrast representation of fluorescent substances in typical fluorescence colors. In a reflected-light fluorescence microscope, the light generated by a powerful illuminator passes through a heat protection filter onto the excitation filter (band-pass filter). Filtered shortwave exciting radiation is reflected by a dichromatic beam splitter, and focused on the specimen by the objective. The specimen absorbs the shortwave radiation and then emits fluorescence radiation with a longer wavelength (Stoke's law) which is captured by the objective on the image side, and transmitted by the dichromatic beam splitter. Finally, the beams pass a barrier filter (long-pass/band-pass filter) which only allows the passage of the long-wave radiation emitted by the specimen.

Excitation filter and barrier filter require a very precise spectral coordination between both of them, and are located together with the corresponding dichromatic beam splitter in a FL P&C reflector module.

(2) Equipment

Every microscope allows the performance of the reflected-light fluorescence procedure.

- Recommended objectives: Plan-Neofluar or Fluar (UV excitation)
- FL P&C reflector module and shutter plate in the reflector turret
- Filter drawer A
- FL attenuator (only for Axio Examiner.D1/.Z1)
- HXP 120, HBO 100 or HBO 50 illuminator for reflected-light illumination
- HAL 100 halogen lamp for transmitted-light illumination

☞ The mercury-vapor short-arc lamp must have been adjusted in every case before applying the reflected-light fluorescence procedure (see sections 3.1.14.3 and 3.1.15.3).
A readjustment should be performed if necessary, depending on the operating time.

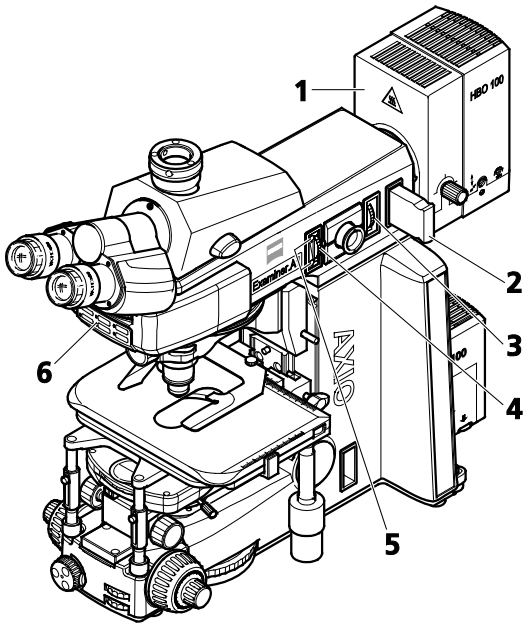


Figure 4-8 Components for reflected-light fluorescence (Axio Examiner.A1)

(3) Switch to reflected-light fluorescence

The first reflected-light fluorescence setting will be considerably easier if you begin with a highly fluorescent specimen. But demonstration specimens may also be used at the beginning.

- Switch on the HAL100 halogen lamp.
- Switch the condenser turret first to the **H** position for a transmitted-light bright field, and go the specimen position to be examined.
- Keep the optical path in the reflected-light illuminator blocked using the blocking position of the reflected-light filter drawer (Figure 4-8/**2**) for the time being.
- Switch on the HBO 100 or HBO 50 illuminator (Figure 4-8/**1**) at the illuminator's transformer (see section 3.2.3), and allow approx. 15 min to heat up to operating temperature.
- Select and switch on the FL P&C reflector module with the desired fluorescence filter combination (depending on the type of excitation) at the reflector turret (Figure 4-8/**6**).
- Enable the optical path in the reflected-light illuminator when using the reflected-light filter drawer (Figure 4-8/**2**).
- If required, set the illumination intensity of the fluorescent illuminator (HXP/HBO) using the thumb wheel at the FL attenuator (Figure 4-8/**3**).
- Close the luminous-field diaphragm (Figure 4-8/**4**) until it becomes visible in the visual field.
- Turn the two centering screws (Figure 4-8/**5**) to center the luminous-field diaphragm to the visual field border.
- Either open the luminous-field diaphragm until it just disappears behind the visual field border, or reduce the luminous-field diaphragm up and into the visual field if there is a risk that the specimen fades out.
- Finally, refocus to the specimen, and optimize the HBO 100 100 / HBO 50 collector position if required. Set the collector to a value at which the visual field illumination appears as uniform as possible using the shortwave excitation reflector module. No correction of the collector position is required any longer for modules with excitation at a longer wavelength.

4.2 Documentation

An actuating rod or a shift knob may be used to switch over from visual observation to photomicrography if the Axio Examiner is provided with a binocular phototube.

Actuating rod:

Actuating rod pushed in	Visual examination through the eyepieces
Actuating rod pulled out	Camera output enabled

Shift knob:
Turn the shift knob (Figure 1-3/**3**) to toggle between visual observation and camera output.

☞ For working with microphotography equipment, please observe the corresponding operating manual provided on a separate basis in addition to the information given in the present operating manual.

4.3 Docking station with TFT display

The optional docking station (432926-9000-000) for the motor-driven Axio Examiner may be used to operate and configure the microscope, or apply optional functions. The TFT display is designed as a touch screen monitor.

4.3.1 Screen layout

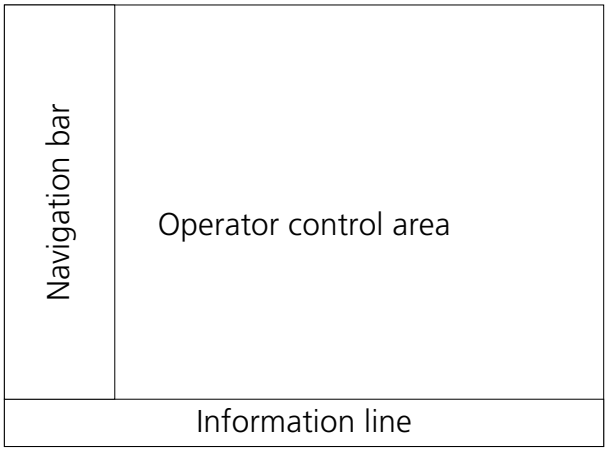


Figure 4-9 Main areas on the TFT display

Control elements and information displays are distributed over different tabs each assigned to a determined subject matter. Basically, a TFT display screen is divided into the following main areas (see Figure 4-9).

4.3.1.1 Navigation bar

The navigation bar is located at the left-hand screen side, and may be used to open all pages. The keys available depend on the current page. But the following keys are available on every page:

- **Home** Open the home page;
- **Display** Open the display page.

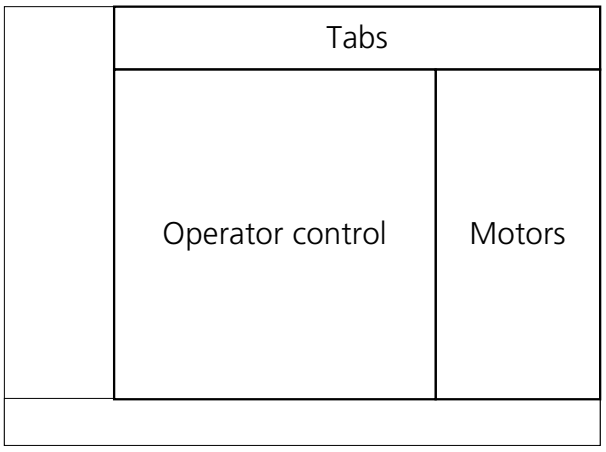


Figure 4-10 Operator control area on the TFT display

4.3.1.2 Information line

The information line at the screen bottom provides information on current microscope settings.

4.3.1.3 Operator control area

The operator control area is divided into further subsections (see Figure 4-10):

- Tabs,
- Motors & illumination,
- Operator control,
- Popup windows.

(1) Tabs

A *tab* is used by the operator to call a subfunction as desired: The subfunction will be displayed in the *Operator control* area. A maximum of three tabs is available on every page.

(2) Motors and illumination

Fields for motors, AL illumination, and DL illumination are located on the right-hand side of the operator control area. The **Off** and **On** keys work like switches.

(3) Operator control

This area contains control elements which depend on the button selected either in the navigation bar or in the tab.

(4) Popup windows

Popup windows will appear on a page:

- To ask for additional operator input; to ask the operator to make a selection (e.g., adapt configuration after initialization, enter values, etc.),
- To display error messages or particular notices; the operator may be asked to acknowledge a message by pressing the **Close** button,
- To display the work status (waiting time); this window will close automatically.

☞ The superimposed page is not available for use as long as a popup window is open.

4.3.2 Menu structure

☞ The menu structure shown below may differ from your microscope's configuration. This menu structure contains the total scope including optional components and menu items which are only available if you have administrator rights. (Read rights are available only unless you are logged in as an administrator).

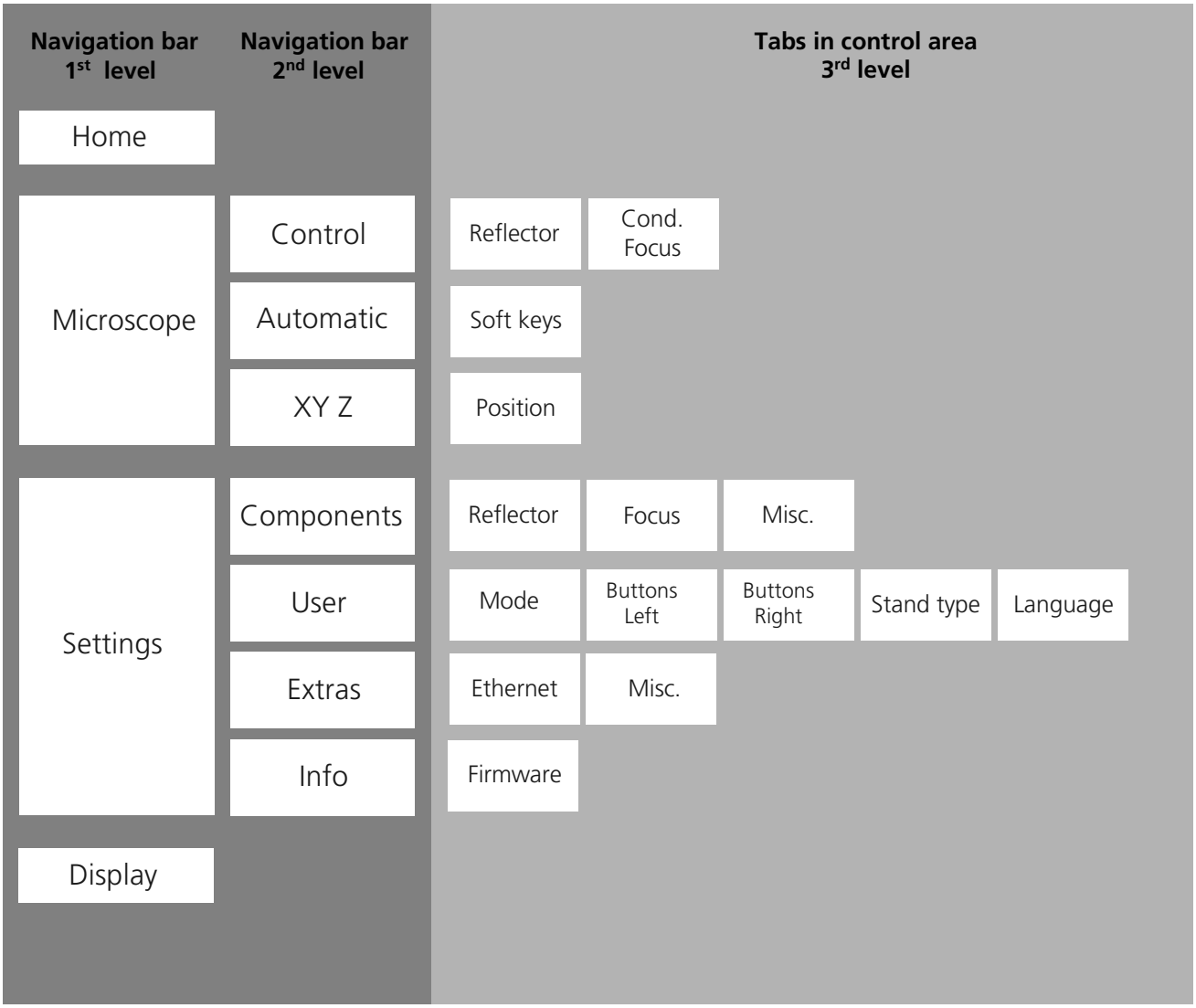


Figure 4-11 Menu structure

The buttons of the *first level* appear on the far left screen border in the navigation bar (Figure 4-11). To change the button assignment in the navigation bar, press either the **Microscope**, **Settings** or **Display** buttons.

The buttons in the *second level* of the navigation bar are used to open the tabs assigned to each of them. Press the tabs to display the corresponding buttons in the operator control area.

All operator control functions are displayed exclusively either in the operator control area or in a popup window.

4.3.3 Home page

Initialization starts when the microscope is switched on, and will take a few seconds. Normally, the **Home** page will be displayed (Figure 4-12).

☞ Whenever coded or motor-driven components have been replaced or removed in the switched-off condition, the operator will have to set up the new configuration after switching on.

The buttons located in the left-hand navigation bar may be used to open all other pages.

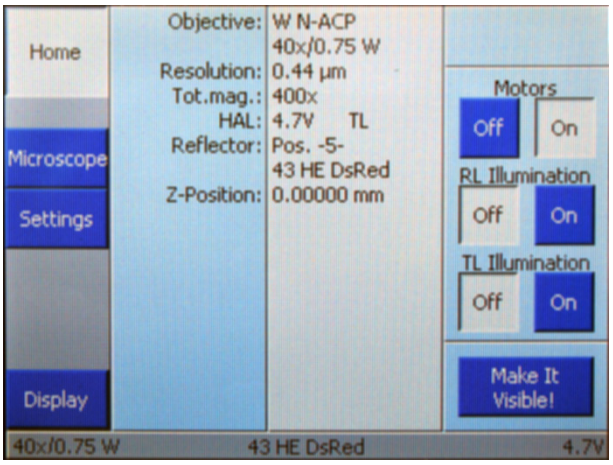


Figure 4-12 Home page

The central operator control area displays the configuration as detected. The status field shows all coded or motor-driven control elements which have been detected during initialization. The control elements are sorted from top to bottom according to their significance.

The following operator control elements appear at the right-hand border:

- **Motors**
  Press the **On** or **Off** buttons to switch all motors or sensors of the microscope either on or off. Motors and sensors will be grounded/earthed (potential free) when switched off, and the blue indicator light (Figure 1-4/**19**) will go off at the lower microscope part.
- **RL Illumination/TL Illumination**
  Press **On** or **Off** buttons to switch the reflected light (AL) illumination or the transmitted-light illumination (DL) of the microscope either on or off.
- **Make It Visible!** button
  This button is used to reset the microscope to its initial status.

4.3.4 Microscope

Press the **Microscope** button in the navigation bar on the **Home** page to go to the **Microscope** page.

The **Microscope** page provides operator access to the **Control**, **Automatic** and **XYZ** pages.

The **Reflector** (Figure 4-13) and **Cond. Focus** tabs are displayed.

(1) Reflector

Five control elements appear for reflector positions Pos. 1 to Pos. 5. Reflector modules already configured are indicated by the button caption.

- Press the corresponding button to swing in the desired reflector module.

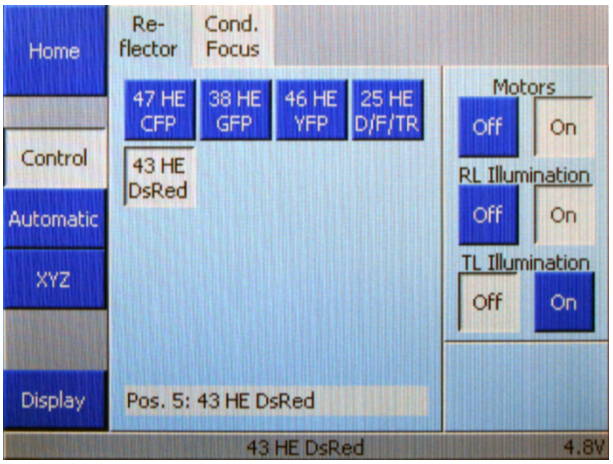


Figure 4-13 Microscope –> Control -> Reflector page

☞ The current reflector position is indicated at the screen bottom.

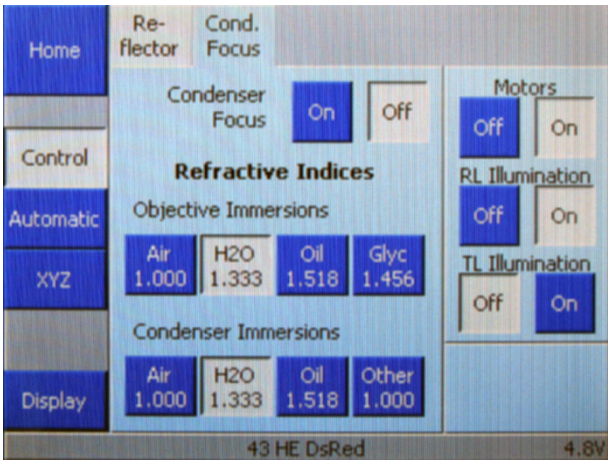


Figure 4-14 Microscope –> Control -> Cond. focus page

(2) Cond. Focus

Use the **Cond. Focus** tab (Figure 4-14) to define the settings for condenser focusing.

- Press the **On** or **Off** button to switch condenser focusing either on or off.

The refractive indices to be applied to objective immersion and condenser immersion may be selected using the corresponding buttons.



Figure 4-15 Microscope –> XYZ -> Position page

4.3.5 XYZ

The **XYZ** page contains the **Position** tab. The operator control area is divided into three functional blocks.

(1) Current position indicator / zero point setting

This tab shows the current Z position in millimeters (mm).

The two **Set zero** buttons work as follows:

– **man**
Set the zero point *manually*, i.e., the current position is defined as the zero point, and the display is set to zero.

– **auto**
Set the zero point *automatically*, i.e., the stage travels to the end position which will be defined as the zero point. The display will be set to zero after this.

(2) Save position

Press the **Save position** button to define the coordinate positions for the five lower position buttons as follows:

- Approach the desired Z position.
- Press the **Save position** button. The **Save current position as** popup window opens.

The windows shows five buttons for **Pos. 1** to **Pos. 5**. The Z value is indicated for every button which has already been assigned, while a number is displayed otherwise.

- Press a position button to save the current position. A safety prompt asking whether the corresponding memory space should be overwritten will appear if a value has already been assigned to the position button before.
- Press the **Cancel** button to close the window.

To delete a value, press the **Delete** button, select the position button, and acknowledge the safety prompt by pressing **Yes**.

Press the **Unit** button to select the desired unit (e.g., millimeters).

(3) Moving to a saved position

Five buttons are located in the position area at the bottom. When a button is pressed, the coordinate position saved under that button is approached. To save coordinate positions, see **(2) Save position** above.

4.3.6 Settings

Press the **Settings** button in the navigation bar on the **Home** page, to go to the **Settings** page.

From the **Settings** page, you can go to the **Components**, **User**, **Tools** or **About** pages.

4.3.6.1 Components

The **Settings -> Components** page contains three tabs: **Reflector**, **Focus** and **Miscellaneous**.

(1) Reflector

You can use this tab for configurating the reflector turret (Figure 4-16).

Five buttons are displayed. These buttons only show the turret position number as long as no reflector has been configured.

The following features will be indicated after a reflector has been assigned: Designation (type), reflected-light module (AL), transmitted light module (DL).

☞ When a new reflector is assigned, the corresponding reflector button will contain the appropriate information on the **Microscope -> Control** page.

- To configure a turret position, press the corresponding button.

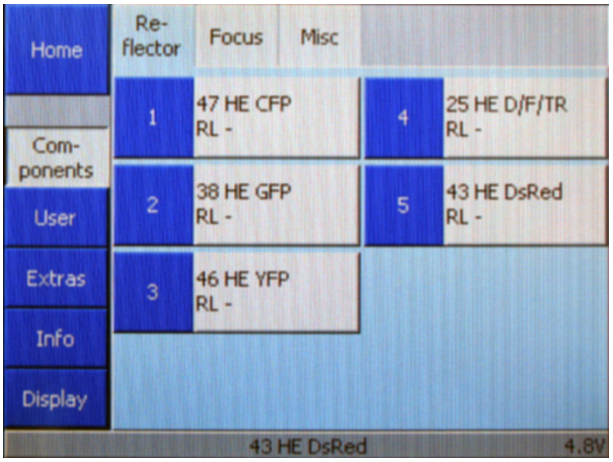


Figure 4-16 Settings –> Components -> Reflector page

- Select the appropriate reflector from the list displayed in the **Configure reflector position # in the reflector turret** popup window. You can read the current selection in the **Resulting configuration** line.
- Press the button for **RL** and / or **TL**.
- Press the **Save** button. A safety prompt will appear if the corresponding turret position has been assigned before.

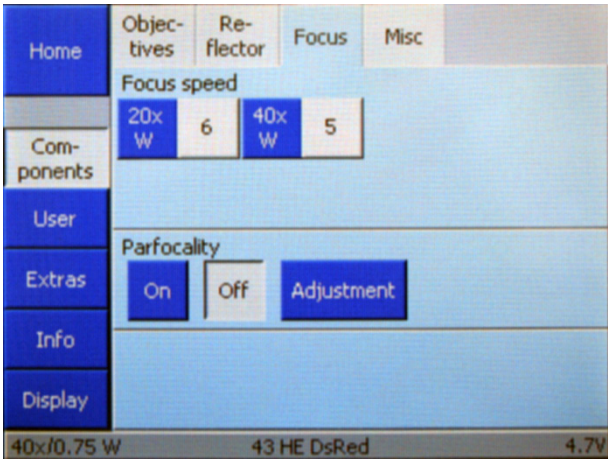


Figure 4-17 Settings –> Components -> Focus page

(2) Focus

Use this tab to set the focusing gear speed, compensate objective parfocality, or switch automatic parfocality compensation either on or off.

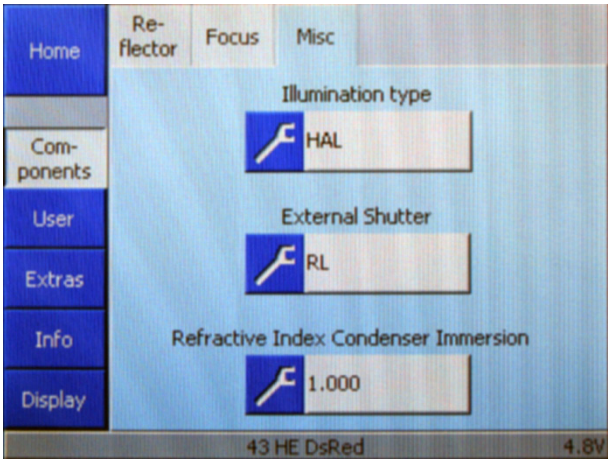


Figure 4-18 Settings –> Components -> Misc page

(3) Misc(ellaneous)

This tab enables the operator to configure additional optional components.

– **Illumination type**
Here you can select the illumination to be used.

– **External Shutter**
Here you can enter whether you use an external shutter.

– **Refractive Index Condenser Immersion**
Here you can freely configure a refraction index for condenser immersion. The refraction index entered here will be displayed in the **Misc.** button under **Microscope –> Control -> Cond. focus**.

4.3.6.2 User

Press the **User** button in the navigation bar to open the **User** page including five tabs: **Mode**, **Buttons left**, **Buttons right**, **Stand type** and **Language**.

(1) Mode

This enables you to select between either the **Standard mode** or your **Own settings**.

In the standard mode, all functions are enabled as provided for in the as-delivered condition. If own settings are selected, the settings will be enabled as defined by an administrator for the following control elements:

- Five buttons at the right / left Z focusing gear.

To modify the button assignments, the operator needs to type in an administrator password.



Please carefully check who is given access to the administrator password. Arbitrary or random changes to the button assignment may cause damage to both the microscope and the specimen.
The factory-set password is "12345".

(2) Buttons left

☞ To modify the button assignments, the operator needs to type in an administrator password. Otherwise, the operator may only view the button assignments without being able to customize them.

On this tab, you can configure the button assignments for the Z focusing gear. The control elements are shown by icons. The two upper buttons and the two lower buttons at the Z focusing gear are configured in pairs.

- Press the grey button to open the selection list.
- Use the ▲ ▼ keys to select the appropriate function from the list. The list will show only those functions which are really available at the microscope.
- Press the **Save** button to assign the function. To close this window without making any selection, press **Cancel**.

Use the same procedure for all other button assignments.

(3) Buttons right

☞ To modify the button assignments, the operator needs to type in an administrator password. Otherwise, the operator may only view the button assignments without being able to customize them.

- To configure the button assignment, see the description for **(2) Buttons left**.

(4) Stand type

Not implied for Axio Examiner.

(5) Language

In this tab, the user may select the language for the TFT display. German and English are available for selection so far. Modifications to the basic setting will be applied after an automatic restart of the equipment.

4.3.6.3 Tools

The **Settings -> Tools** page contains the **Ethernet** and **Miscellaneous** tabs.

(1) Ethernet

This tab allows settings for connecting the Axio Examiner via Ethernet.

(2) Miscellaneous

This tab enables the operator to calibrate the touch screen display.

4.3.6.4 About

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

This tab indicates the firmware version to the operator.

4.3.7 Display

Press the **Display** button in the navigation bar on the **Home** page to open the **Display** page. To darken the TFT display, keep the **Display** button in the navigation bar pressed for more than a second. To switch on the TFT display again, just touch any point on the display.

You may use the **Display** page to customize the brightness of the TFT display by pressing the ◄► buttons.

Press the **Display off** button to switch the TFT display off. Touch this button again to switch the TFT display on again.

☞ After switching out, the TFT display returns from the **Display** page to the previous page from which it was opened. The latter will be displayed when switched on again.

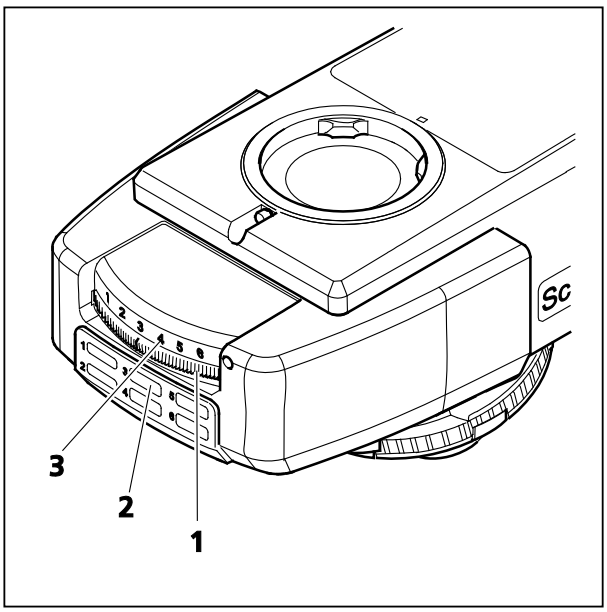
4.4 Controls and functional elements for optional components

4.4.1 Reflector turret 4x or 6x

Reflector turrets 4x or 6x each have four or six P&C reflector positions.

The reflector position is set by turning the thumb wheel. The marks show the reflector position which is located in the optical path.

To identify the reflector modules used, the data corresponding to every position may be written on the adhesive labels supplied. The labels may be glued to the fields provided.



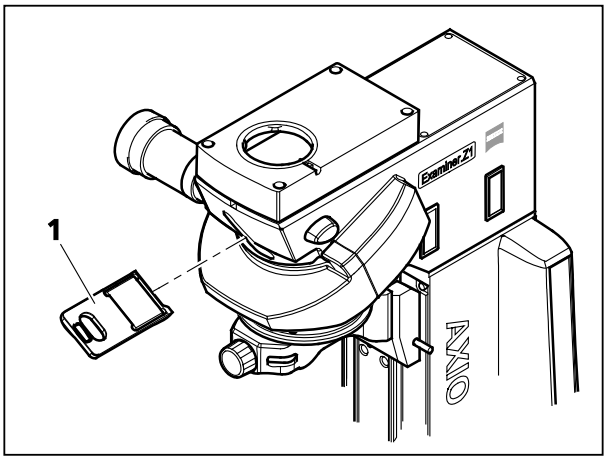
1 Thumb wheel with marking for position indicator
2 Fields for adhesive labels showing component mounting data
3 Number indicating the reflector position set

Figure 4-19 Reflector turret 6x

4.4.2 Axio Examiner.Z1 upper microscope part with sideport

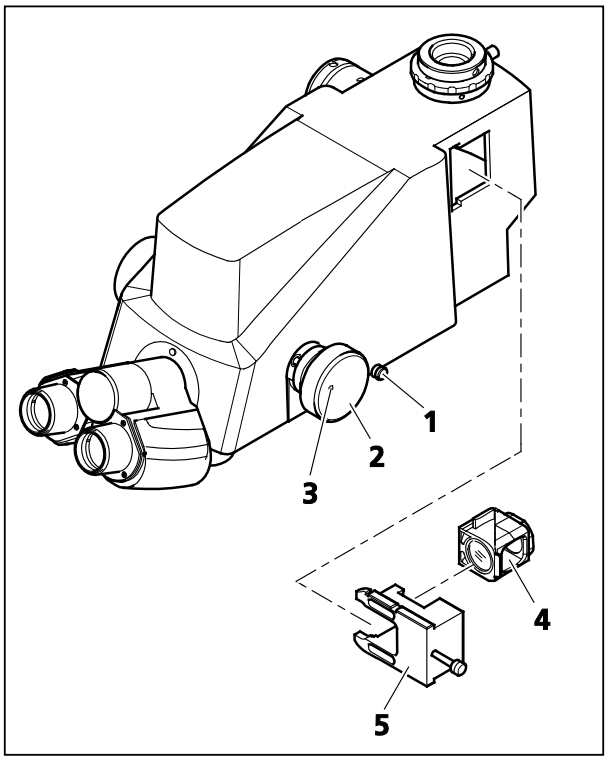
The Axio Examiner.Z1 upper microscope part with sideport has a receptacle for a slider (Figure 4-20/**1**). A beam splitter or a color splitter may be inserted into this slider.

When the 100 % mirror is used, the microscopic image will be transferred by the mirror to the sideport (camera).



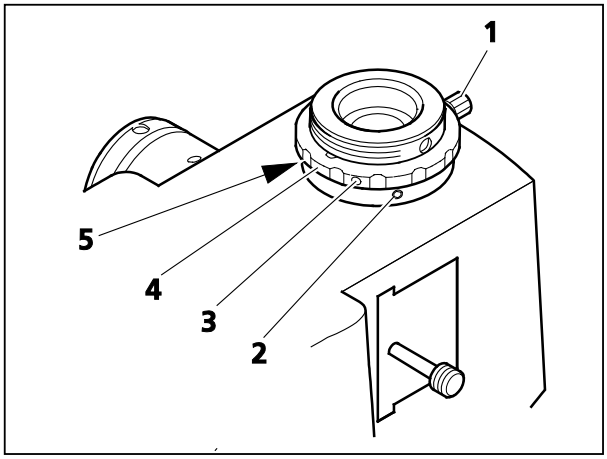
1 Slider for sideport

Figure 4-20 D/A Axio Examiner.Z1 upper microscope part



1 Actuating rod
2 Zoom knob
3 Adjusting screw
4 P&C module
5 Holder

Figure 4-21 Binocular phototube zoom 0.5 – 4x with a P&C module mount



1 Knurled screw
2 X-Y adjusting screw
3 Screw
4 Knurled ring
5 X-Y adjusting screw

Figure 4-22 Adjusting a camera

4.4.3 Binocular phototube zoom 0.5 – 4x with a P&C module mount

The binocular zoom phototube (425521-9000-000) has a zoom knob (Figure 4-21/**2**) for zooming an image either in or out.

The actuating rod (Figure 4-21/**1**) may be used to switch over from visual observation to photomicrography.

The phototube has two camera ports, allowing simultaneous picture recording. The holder (Figure 4-21/**5**) may be loaded with P&C modules (Figure 4-21/**4**). If no module is in the holder, the image will only be mirrored out through the upper camera port.

(1) Click-stop setting

The zoom knob click stop may be switched off:

- To switch off the click stop, turn the adjusting screw (Figure 4-21/**3**) at the zoom knob (Figure 4-21/**2**) by 90°.
- To enable the click stop again, rotate the adjusting screw (Figure 4-21/**3**) by 90° in the opposite direction.

(2) Adjusting the cameras to one another

If two cameras are used, they need to be adjusted to one another in order to obtain identical images (size, detail). Please proceed as follows:

- Connect the cameras to the phototube.
- Insert the holder (Figure 4-21/**5**) with the P&C module.
- Set the actuating rod (Figure 4-21/**1**) to photomicrography.
- Focus on the object using the side-mounted camera.
- Undo the screw (width A/F 1.5) (Figure 4-22/**3**) at the knurled ring (Figure 4-22/**4**) of the upper camera port.
- Turn the knurled ring (Figure 4-22/**4**) until the upper camera's Z position is adjusted to the side-mounted camera.
- Tighten the screw (Figure 4-22/**3**) again. The Z axis is adjusted now.

- Unscrew the knurled screw (Figure 4-22/**1**) at the camera port on the rear side.
- To adjust the camera in X and Y direction, turn the two adjusting screws (width A/F 1.5) (Figure 4-22/**2** and **5**).
- Tighten the knurled screw (Figure 4-22/**1**) at the camera port on the rear side again.

5 CARE, MAINTENANCE, TROUBLESHOOTING AND SERVICE

5.1 Equipment care

The care of the Axio Examiner is limited to the work described below:

- After every use, switch off the equipment, and put a protective cover on it (protection against dust and humidity).
- Never expose the equipment to unacceptable climatic conditions (increased atmospheric humidity or high temperature).

Tenacious stains on glass surfaces like, e.g., finger marks, fat traces or immersion oil residues are best removed using a swab wrapped around a small round wood stick and a small amount of distilled water or non-aggressive solvent:

- Distilled water: Clean the glass surface by circular movements from the center to the rim using a slightly moistened swab.
- Optical cleaning solution consisting of 15 % of isopropanol and 85 % of surgical spirit (gasoline): Clean the glass surface by circular movements from the center to the rim using a slightly moistened swab.
- Remove dust from optical surfaces using a natural hair brush, or blow it off using a rubber ball (air blower).

Please observe the following when you use the microscope in a warm and humid climatic zone:

- Store the unit in clear, dry and well ventilated rooms at an atmospheric humidity of less than 75 %. Keep optical assemblies and accessories sensitive to fungal attack like objectives and eyepieces in drying cabinets.
- Fungal attack may be avoided to a large extent during prolonged storage in closed containers if absorbent material soaked in fungicides is placed in the container.

Precision-mechanical or optical equipment will always be exposed to fungal attack if the following conditions exist:

- Relative humidity higher than 75 % at temperatures of between +15 °C and +35 °C over a period of more than three days.
- Installation in dark rooms without air movement.
- Dust accumulation and finger marks on optical surfaces.

5.2 Equipment maintenance

5.2.1 Checks to be performed

- Make certain that the specified system voltage values are observed (e.g., at the HBO 100 transformer).
- Inspect AC power cord and power plug for damage.

- Shut down and secure the equipment whenever a damage is found. Have damage repaired by qualified specialist personnel.
- Check that the maximum operating time is observed for halogen or mercury vapor short arc lamps.

5.2.2 Replacing fuses

Make certain to pull out the power plug before replacing any fuse.

The fuse box is located at the rear side of the corresponding power supply or examiner control unit. It is combined with the appliance inlet, and contains two fuses of the following types:

T 5.0 A/H 5x20mm
(Examiner control and 12 V DC 100 W external power supply unit)

or

T 2.0/H A (HBO 100 transformer).

or

T 4 A (mbq52ac-z 100 V, 127 V transformer)

T 2.5 A (mbq52ac-z 220 - 240 V transformer)

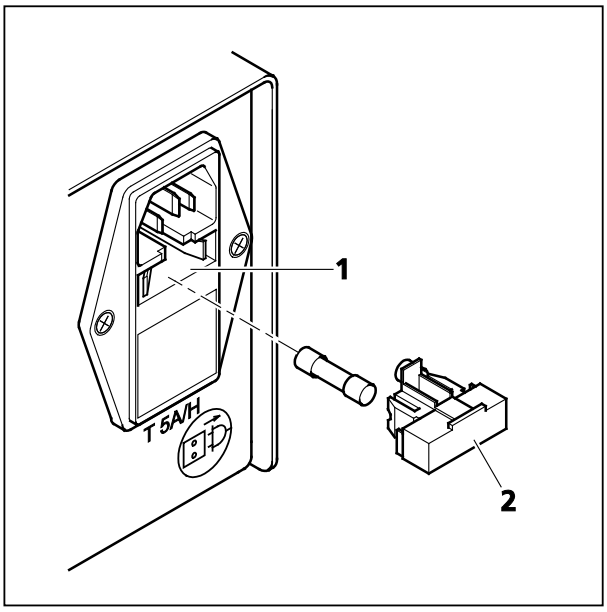


Figure 5-1 Replacing fuses, e.g., at the 12 V DC 100 W external power supply unit

- Pull out the power plug.
- Pull out the fuse holder (Figure 5-1/**2**) towards the front side, and take it completely out of the fuse box (Figure 5-1/**1**).
- Pull defective fuses out of the fuse holder, and replace them by new fuses. Make certain that the fuse has the proper fuse designation.
- Insert the fuse holder into the fuse box again, and push it in up to the stop.
- Plug in the power plug.

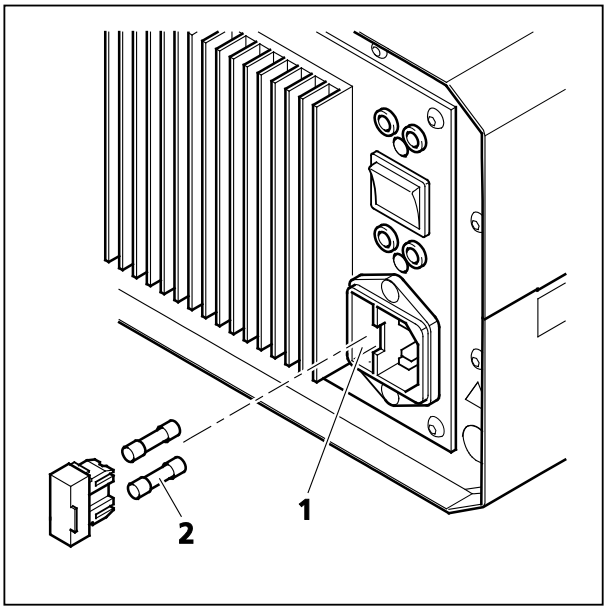


Figure 5-2 Replacing fuses at the examiner control

5.3 Trouble shooting

Problem	Cause	Correction
Shading or irregular image brightness in the microscopic visual field; visual field not visible completely.	The vis/fot push rod at the phototube is not switched on in the correct functional position (intermediate position).	Switch the vis/fot push rod at the phototube to the correct functional position (final position), see page 69.
	Objective not lowered to the working position at the objective mount or objective nosepiece.	Lower the objective to the working position at the objective mount or objective nosepiece.
	Condenser not set correctly.	Set the condenser correctly (adjustment, centering), see page 58 and the following.
	Aperture stop not set correctly.	Set the aperture stop correctly (centering, opening), see page 58 and the following.
	Luminous-field diaphragm not set correctly.	Set the luminous-field diaphragm correctly (centering, opening), see page 58 and the following.
	Filter not placed correctly into the filter holder.	Place filter correctly into the filter holder.
Low resolution and bad image contrast.	Aperture stop opening not set correctly.	Adjust the aperture stop opening according to the 2/3 rule or as per specimen condition, see page 58 and the following.
	Condenser not focused correctly.	Focus the condenser, see page 58 and the following.
	Wrong cover slip thickness used for transmitted light objectives with a cover slip thickness of 0.17 mm.	Use standardized cover slips with a thickness of 0.17 mm.
	Use of no or of unspecified immersion oil with immersion objectives.	Use Immersol 518 N® or 518 F® from Carl Zeiss.
	Air bubbles in the immersion oil.	Remove the air bubbles by applying new oil.
	Immersion oil at the front lens of a dry objective.	Clean the front lens of the dry objective, see page 82.
	Correction setting ring not set to the right cover slip thickness.	Adjust the correction setting ring to the correct cover slip thickness.
	Dirt or dust on the optical surfaces of objectives, eyepieces, condensers or filters.	Clean the corresponding optical components, see page. 82.

Problem	Cause	Correction
Asymmetric lack of image definition, e.g., one side in focus, and the other side out of focus.	Condenser not set correctly.	Set the condenser correctly, see page 58 and the following.
	Objective not lowered to its working position.	Lower the objective to its working position.
	Specimen not clamped on the mechanical stage.	Insert and clamp the specimen correctly in the specimen holder.
Major focus differences during objective exchange.	Focusable eyepieces are not adjusted correctly.	Adjust the focusable eyepieces to the eye deficiencies, see page 56.
	Objective not screwed in up to the stop face.	Screw in the objective up to the stop.
	Tube lens either not installed, or installed unnecessarily.	Either reinstall the tube lens, or remove a redundant tube lens.
Unable to combine the left-hand and right-hand visual fields into a single image.	Eyepiece distance (interpupillary distance) not set correctly at the binocular tube.	Adjust the eyepiece distance correctly, see page 56.
	Focusable eyepieces are not adjusted correctly.	Adjust the focusable eyepieces to the eye deficiencies, see page 56.
Microscopy is tiring for the eyes.	Eyepiece distance (interpupillary distance) not set correctly at the binocular tube.	Adjust the eyepiece distance correctly, see page 56.
	Focusable eyepieces are not adjusted correctly.	Adjust the focusable eyepieces to the eye deficiencies, see page 56.
	Image brightness not acceptable.	Adapt the lamp voltage or insert a conversion filter.
	Binocular tube maladjusted optically or mechanically.	Check or repair by Microscopy Service.
Dirt or dust in the visual field.	Condenser not focused correctly, and 0.9 front lens not switched correctly.	Focus the condenser, and switch the 0.9 front lens on or off correctly. see page 58 and the following.
	Aperture stop opening too small.	Adjust the aperture stop opening according to the 2/3 rule or as per specimen condition, see page 58 and the following.
	Dirt or dust on the optical surfaces of objectives, eyepieces, condensers, filters or specimens.	Clean the optical surfaces of the corresponding components, see page 82.

Problem	Cause	Correction
The 12 V 100 W halogen lamp does not light even though the on/off switch is switched on.	Power plug not plugged into the mains outlet.	Plug the power plug into the mains outlet, checking both equipment voltage and line voltage.
	The 12 V 100 W halogen lamp is not installed.	Insert he 12 V 100 W halogen lamp, see page 37.
	The 12 V 100 W halogen lamp is defective.	Replace the 12 V 100 W halogen lamp, see page 39.
	The mandatory 12 V 100 W halogen lamp is not used.	Use the mandatory 12 V 100 W halogen lamp.
	Fuses are defective.	Replace the fuses, see page 83.
The 12 V 100 W halogen lamp is flickering. Its luminosity is not stable.	The 12 V 100 W halogen lamp is at the end of its mean service life.	Replace the 12 V 100 W halogen lamp, see page 39.
	AC power cord not installed correctly or broken.	Connect the AC power cord correctly, or replace it.
	The pins of the 12 V 100 W halogen lamp are not inserted correctly into the socket.	Insert the pins of the 12 V 100 W halogen lamp correctly into the socket, see page 39.
The motor-operated lower microscope part does not react.	The microscope is not connected to its control box.	Connect the microscope, see page 46.
	The control box is either not switched on or not connected.	Connect or switch on the control box, see page 46.
	The docking station is not connected.	Connect the control cable, see page 46.
	The motors are switched off.	Check whether the blue indicator light is lit (Figure 1-4/**19**); if not, switch on the motors again, see page 73.

5.4 Spares, wearing parts and tools

Designation	Designated use
12 V / 100 W halogen lamp	For HAL 100 illuminator
HBO 103 W/2 mercury vapor short arc lamp	For HBO 100 illuminator
HBO 50 mercury vapor short arc lamp	For HBO 50 illuminator
Ball head screwdriver, width A/F 3	For tube replacement, lamp replacement
Ball head screwdriver, width A/F 2.5	
Ball head screwdriver, width A/F 1.5	For setting oblique illumination at the condenser
Eyepiece eyecup	Recommendable for reflected-light suppression during low-luminosity procedures
Eyepiece tube dust cap	For blanking off equipment openings which are not in use
Immersol 518 N® or 518 F® immersion oil	For oil immersion applications
Cleansing paper, 300 sheets	For cleaning optical function surfaces
G fuse links (5 x 20 mm); T 5.0 A/H 250 V 2x T 2.0 A/H 2x T 2.5 A 220 – 240 V 2x T 4 A 100 V; 127 V 2x	Electrical overload protection for power supply
Dust protection set for Axio Examiner	For covering the equipment after use

5.5 Service

No intervention may be performed on any mechanical, optical or electronic part inside the equipment, and no work may be carried out on the electrical systems of the Axio Examiner.A1 or Axio Examinar.Z1 microscopes unless by the Carl Zeiss customer service or by especially **authorized** expert personnel.

To ensure the optimum setting and trouble-free operation of your microscope for a long period of time, we recommend to sign a service or maintenance contract with Carl Zeiss.

For reorders or for servicing, please call your Carl Zeiss representation.

If you need service, please call either your regional representation office or:

Carl Zeiss Microscopy GmbH
Carl-Zeiss-Promenade 10
07745 Jena, Germany

microscopy@zeiss.com
www.zeiss.com/microscopy



Carl Zeiss Microscopy GmbH
Königsallee 9-21
37081 Göttingen, Germany

6 APPENDIX

6.1 List of abbreviations

AC	Alternating Current (AC voltage)
A-Plan	Achromatic objectives with improved field flattening (ICS optical product range)
Br.	Suitability for eyeglass wearers
CCD	Charge Couple Device
CSA	Canadian Standards Association
D	Cover slip thickness
d	Diameter (e.g., filter)
DC	Direct current (DC voltage)
DIC	Differential Interference Contrast
DIN	Deutsches Institut für Normung (German Standards Institution)
DL	Transmitted light
DX	Coding system for storing electronically readable information (e.g., film speed)
EG	European Community
EN	Euronorm
EMC	Electromagnetic compatibility
ENG	Electronics News Gathering
EEC	European Economic Community
FL	Fluorescence
foc.	Focusable
fot	Photographic
H	Bright field
HAL	Halogen lamp
HBO	Mercury vapor short arc lamp for fluorescence
HXP	Illuminator for fluorescence
ICS	Infinity color corrected system
IEC	International Electrotechnical Commission
IP	International Protection (degree of protection provided by the casing)
IR	Infrared
ISO	International Organization for Standardization
LED	Light emitting diode
MC	Microscope camera
mot.	Motor-operated

Ph	Phase contrast
PL	Plan
SLR	Single lens reflex (mirror reflex)
width A/F	Width across flats
T	Slow blow (a fuse type)
TV	Television
T2 Adapter	Standardized adapter for miniature cameras
UL	Underwriter Laboratories
UV	Ultraviolet
VDE	Verband Deutscher Elektrotechniker (Association of German Electrotechnical Engineers)
vis	Visual
V_{obj}	Objective magnification
W 0.8"	British Standard Whitworth thread (inch thread) 0.8"
W-PL	Wide-field eyepiece

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6.3 Industrial property rights

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