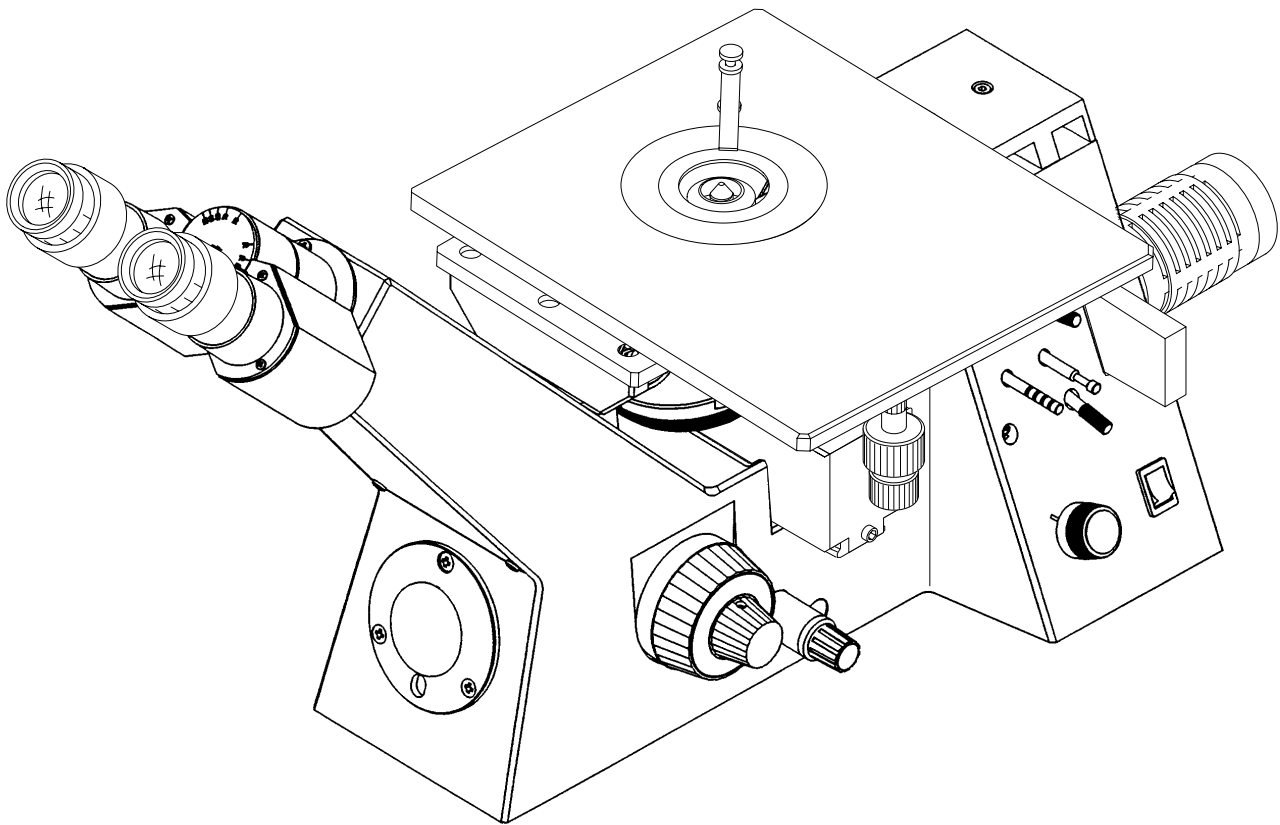


Axiovert 25 CA

Inverted Reflected Light Microscope



Operating Manual



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Number of this
manual:

B 40-026 e

Date of issue:

03/97



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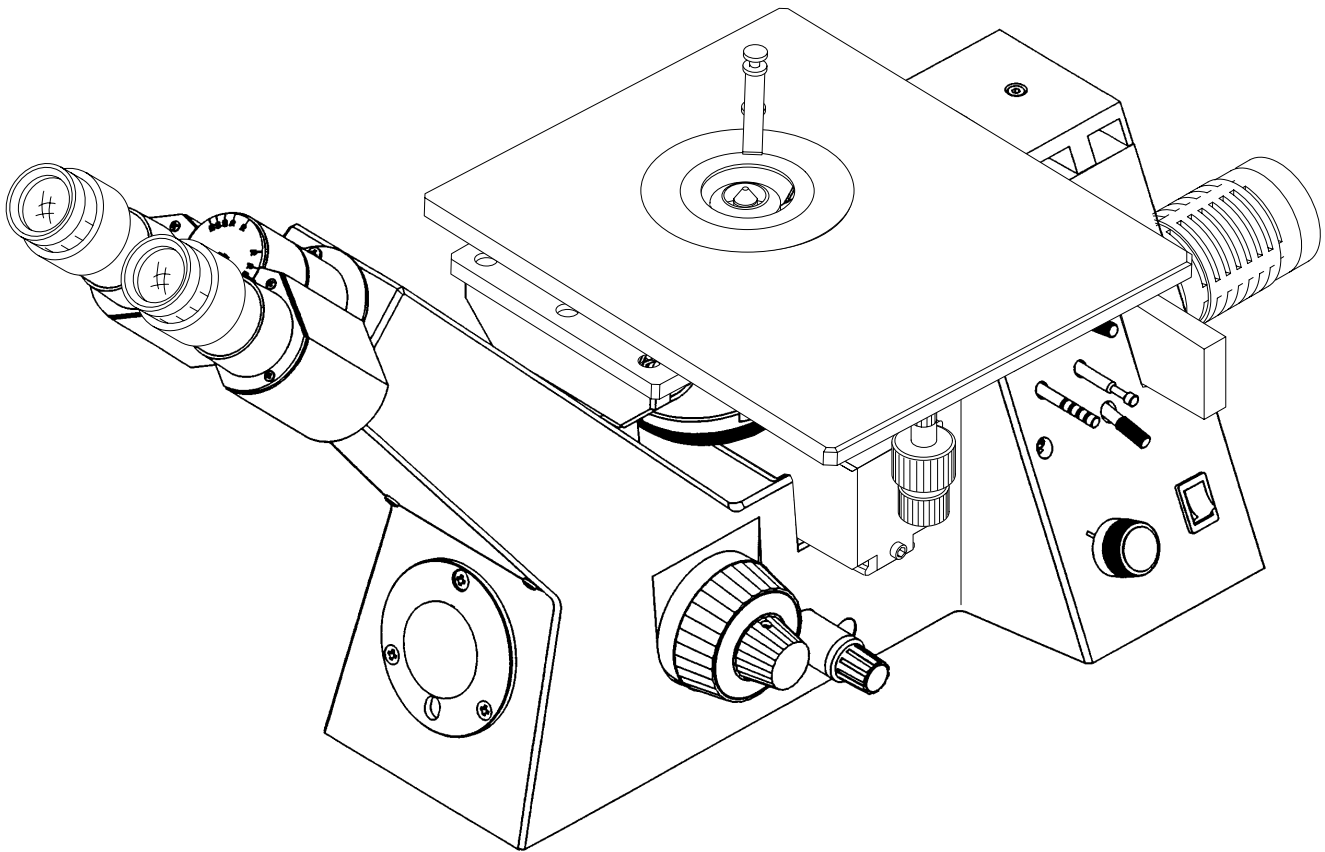
NOTE:

- The figures included in the text are numbered and captioned; "Fig. 2-8", for example, refers to figure No. 8 in section 2. For items mentioned in the text a slash and an item number are added. For example, "eyepiece tube (2-8/4)" means that the eyepiece tube in figure 8 in section 2 is marked with the item number 4.
- Abbreviations are explained in the appendix.
- This operating manual refers to the Axiovert 25 CA configurations, including accessories. The major part of this manual is also applicable for other instrument models.

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OVERALL VIEW



Axiovert 25 CA

HINTS ON INSTRUMENT SAFETY

The Axiovert 25 CA including its original accessories may be used only for the microscopy techniques described in this manual (proper use).

The manufacturer cannot take liability for any other application, including that of individual modules or components. This also applies to all servicing and repair work which has not been performed by authorized service personnel. Furthermore, this also forfeits all warranty claims for those parts which were not directly covered by the repair.

Special note should be taken of the following warnings:

- ☞ The Axiovert 25 CA microscopes have been designed, produced and tested in compliance with DIN EN 61010-1 (IEC 1010-1), "Safety regulations for electrical measuring, control and laboratory instruments", including the relevant CSA and UL directives, and left the factory in a perfect state with regard to its safety facilities.
This operating manual includes information and warnings which must be observed by the user.
- ☞ The Axiovert 25 CA microscopes have been designed, in compliance with the latest scientific and technical development, for the visual, photomicrographic and videotechnological examination of specimens. The instruments may only be used for their intended application and have not been designed for unattended constant operation!
- ☞ The microscopes are not equipped with any special devices for protection from substances which are corrosive, toxic, radioactive or otherwise hazardous to health.
- ☞ The admissible specimen weight (5 kg) must not be exceeded.
- ☞ To avoid the danger of glare of the eyes, an attenuation filter must always be inserted in the beam path. It may be removed from the beam path only if the light intensity is too low.
- ☞ In unfavorable circumstances and with improper use, gas discharge lamps can explode, flinging splinters of glass through the air and causing possible injury. Therefore, it is imperative that the safety and operating instructions of the manufacturer of the gas discharge lamp be followed. Gas discharge lamps emit ultraviolet radiation which can cause burns on the eyes and skin. Never look directly into the light of these lamps and avoid direct, unprotected incidence of their light on your skin. When using the microscope, always use the protective devices belonging to the instrument, e.g. special attenuation filters.
Gas discharge lamps are contained, for example, in our microscope illuminators HBO 50, HBO 100 and XBO 75. For the relevant safety instructions and warnings please see the operating manuals of these lamps.
- ☞ Check whether the line voltage complies with the value indicated at the rear of the instrument.
- ☞ The Axiovert 25 CA microscopes are categorized as Protection Class I Equipment.
The power plug must be inserted in a socket featuring a grounding (earth) contact. The

grounding effect must not be nullified by an extension cable which does not have a protective ground wire. If a transformer is used to adapt the line voltage, it may not nullify the effect of the ground wire.

Any nullification of the ground wire inside or outside the instrument, or the separation of the earth contact, may cause danger for the user and is therefore not permitted.

- ☞ When the microscopes have been connected to the line, connecting clamps inside the instrument may contain dangerous voltage, and the opening of covers or the removal of components (if not required for a function) may expose components containing dangerous voltage. Therefore, the instrument must be disconnected from the line before it is opened for adjustment, change of components, maintenance or repair.
If adjustment, maintenance or repair of the live instrument cannot be avoided, this must be performed by specialized personnel who is aware of the danger involved.
- ☞ The effect of existing ventilation slats on the lamp housings must not be nullified by covers. This also applies to ventilation slats on the instrument rear. Tools, objects of any kind and liquids must not enter the instrument via the ventilation slats or other instrument openings.
Always disconnect the instrument from the line before changing the lamp and allow the lamp to cool down to room temperature (cooling time approx. 15 min).
The lamp housings sometimes exhibit over heating during operation and must therefore not be touched. If the lamp housing is opened while it is still hot, the touching of the lamp and the components in its vicinity must be avoided under all circumstances.
- ☞ When replacing the instrument fuses, make sure to only use those of the rated power required and the type indicated. The use of makeshift fuses and the short-circuiting of the fuse holders are not permitted.
- ☞ If it is established that the protection measures are no longer effective, the instrument must be put out of operation and secured against unintentional operation. Authorized service personnel or the manufacturer must be contacted for the repair of the microscope.

☞ Instrument configuration is subject to change.

1 Description

1.1 Terms, intended use

The Axiovert 25 CA is an inverted incident-light microscope for materials research.

The following microscopy techniques are possible:

- in incident light:
- brightfield
 - darkfield
 - polarization
 - interference contrast
 - fluorescence
- in transmitted light:
- measuring and counting
 - brightfield
 - phase contrast using condenser 0.2
 - polarization
 - measuring and counting

1.2 Instrument description

The following models of the Axiovert 25 CA microscope are available:

- inverted incident-light microscope with camera/video port and HAL 6 V 25 W illumination
- inverted incident-light microscope with camera/video port and HAL 12V 100 W illumination

The modular design of the microscope allows the components listed in the system overview (pages 1-6 and 1-7) to be added or removed.

These are the major instrument features:

- modular design for optimum performance of applications
- compact design of the stand
- integrated 6 V 25 W power unit for 6 V 25 W illuminator
- continuous setting of illuminance
- upright and uninverted image
- Köhler illumination in incident-light brightfield
- brightness adjustment for glare-free change between darkfield and brightfield illumination via attenuation filters.

- DIC in incident light, retrofittable for every stand and every Epiplan objective available.
- incident-light contrast as an alternative to or simultaneously with transmitted-light contrast using condenser 0.2
- possibility of incident-light fluorescence applications by changing the fluorescence filter combination
- mechanical stage or 90° rotary mechanical stage
- standardized interface for objectives, eyepieces and lamps
- camera/video port for 2.5x/T2 (SLR-camera) camera adapter, video C and ENG adapters 1/2" 0.5x or video zoom adapter C 1/3" 0.32x-0.8x

1.2.1 Mechanical design

Axiovert 25 CA/25 W

- with integrated power supply for 6 V 25 W illumination, switchable from line voltage 230 V to 115 V
- with coaxial coarse and fine drive, where the focusing becomes effective via the nosepiece
- binocular tube, adjustable in two heights, with two focusing eyepieces
- quadruple nosepiece HD DIC
- mechanical stage or 90° rotary mechanical stage
- with camera/video port

Axiovert 25 CA/100 W

- like Axiovert 25 CA/25 W
- with HAL 12 V 100 W incident-light illumination

1.2.2 Optical design

The state-of-the-art ICS (Infinity Color-corrected System) optics guarantee high optical performance for all methods (field number 23, tube factor 1x). Different combinations of objectives and eyepieces permit an optimum configuration for the intended application.

A universal port is available for documentation. Suitable adapter modules for photomicrography and video technology are offered.

The correct color temperature for color photography using artificial-light film is achieved automatically at the full lamp voltage.

A selector is used to set 100% of the light either for viewing or for documentation.

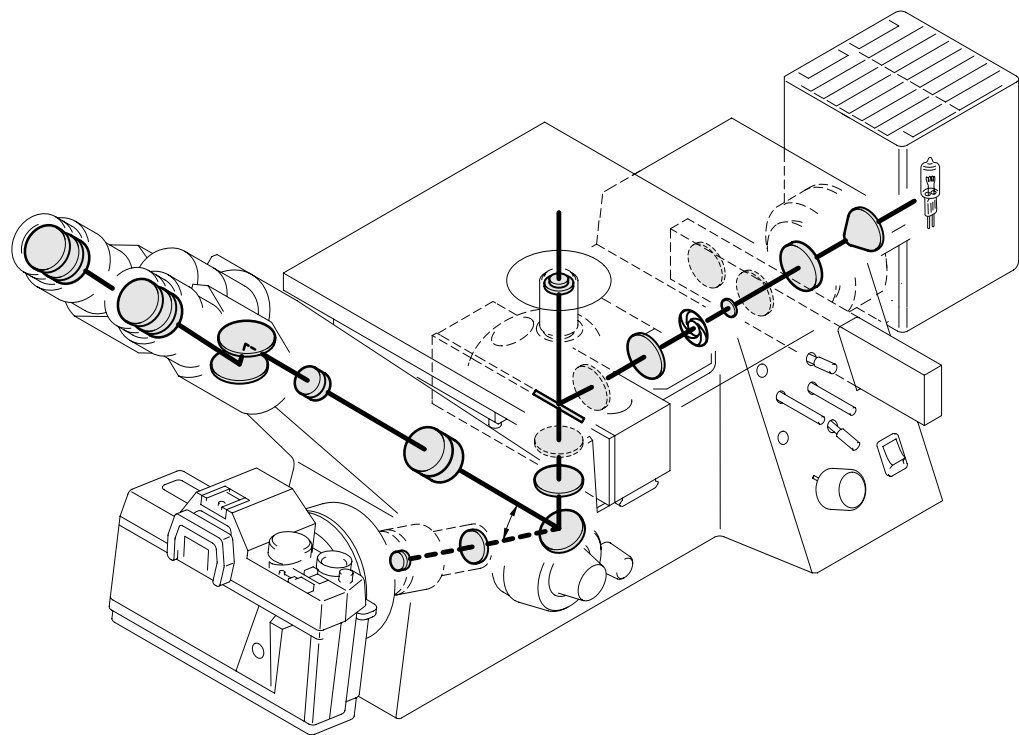


Fig 1-1 Optical design of Axiovert 25 CA



1.3 Technical Data

(1) Dimensions and weight

Dimensions (width x depth x height)

Axiovert 25 CA/6 V 25 W or 12 V 100 W 245 x 680 x 510 mm

Area required on table

Axiovert 25 CA 245 x 360 mm

Power unit for HAL 100 150 x 200 mm

Weight

Axiovert 25 CA/25 W approx. 13 kg

Axiovert 25 CA/100 W approx. 16 kg

(2) Ambient conditions

Storage and transport (in packaging)

Permissible ambient temperature -40 to +70 °C

Permissible relative humidity ≤ 100 %

Operation

Permissible ambient temperature +10 to +35 °C

Permissible relative humidity ≤ 85 %

(3) Operating data

Operation closed rooms

Protection class I

Enclosure protection IP 20

Pollution degree 2

Overvoltage category II

Altitude 2000 m

Instrument safety in accordance with IEC 1010-1, including
CSA and UL directives

Radio interference suppression in accordance with EN 55011, Class B

Interference resistance in accordance with EN 50082-1

CE – The instruments meets the requirements of EC directive 89/336 EWG and the
EMC legislation of 09.11.1992 (please also see the EC conformity declaration in the annex)

Line voltage 115 V/230 V, switchable

Permissible voltage fluctuation ± 10 %



Line frequency 50 ... 60 Hz
Label of voltage range on instrument rear
Power consumption of internal power unit 60 VA

(4) Light sources

6 V 25 W halogen lamp S 5 A 6 V/25 W AC
12 V 100 W halogen lamp 12 V/100 W DC
Mercury vapor lamp for fluorescence HBO 50 AC

(5) Opto-mechanical data

Stand with objective focusing with coarse drive (4 mm/rot)
and fine drive (0.4 mm/rot)
overall lift > 4 mm
focus position: no restriction up to 0.5 mm above the stage surface
(there may be restrictions in the case of higher values)

Binocular tube interpupillary distance adjustable between
55 and 75 mm, with constant tube length

Visual port tube factor 1x

Variable viewing height with 2 positions for interpupillary distance
56 mm → 350 or 390 mm
65 mm → 355 or 385 mm

Viewing angle 45°

Mechanical stage (width x depth) 270 x 230 mm
operating height 211 mm
travel range 30 x 30 mm

Objectives HD objectives with M 27 thread and
H objectives with W 0.8" thread and adapter

Change of objectives manually via 4x nosepiece HD DIC

Eyepieces plug-in diameter 30 mm
use of eyepieces up to field number 23
standard: W-PI 10x/23 Br. foc.

Camera/video port for connection of:
camera adapter 2.5x/T2 for 35 mm
video adapter C 1/2" 0.5x
video adapter ENG 1/2" 0.5x
video zoom adapter C 1/3" 0.32x - 0.8x

Reflector mount to allow mounting of
3 reflector modules

System overview Axiovert 25 CA

Epiplan H objectives

5x/0.13	442920
10x/0.20	442930
20x/0.40	442940
50x/0.70	442950
100x/0.75	442980

plus H "0", M27 / W 0.8" adapter for each objective 444910

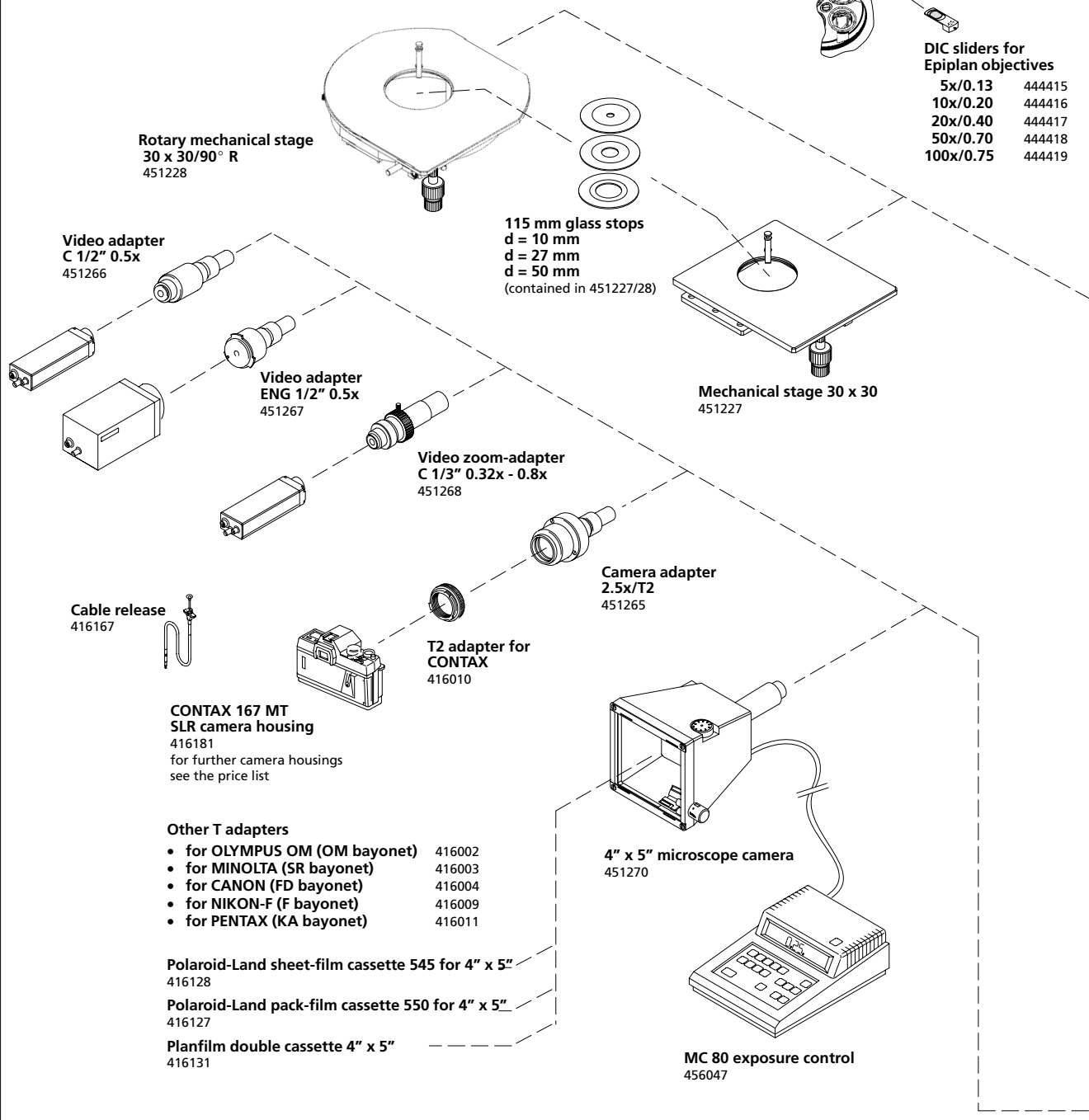
Epiplan HD objectives

5x/0.13	442924
10x/0.20	442934
20x/0.40	442944
50x/0.70	442954
100x/0.75	442984

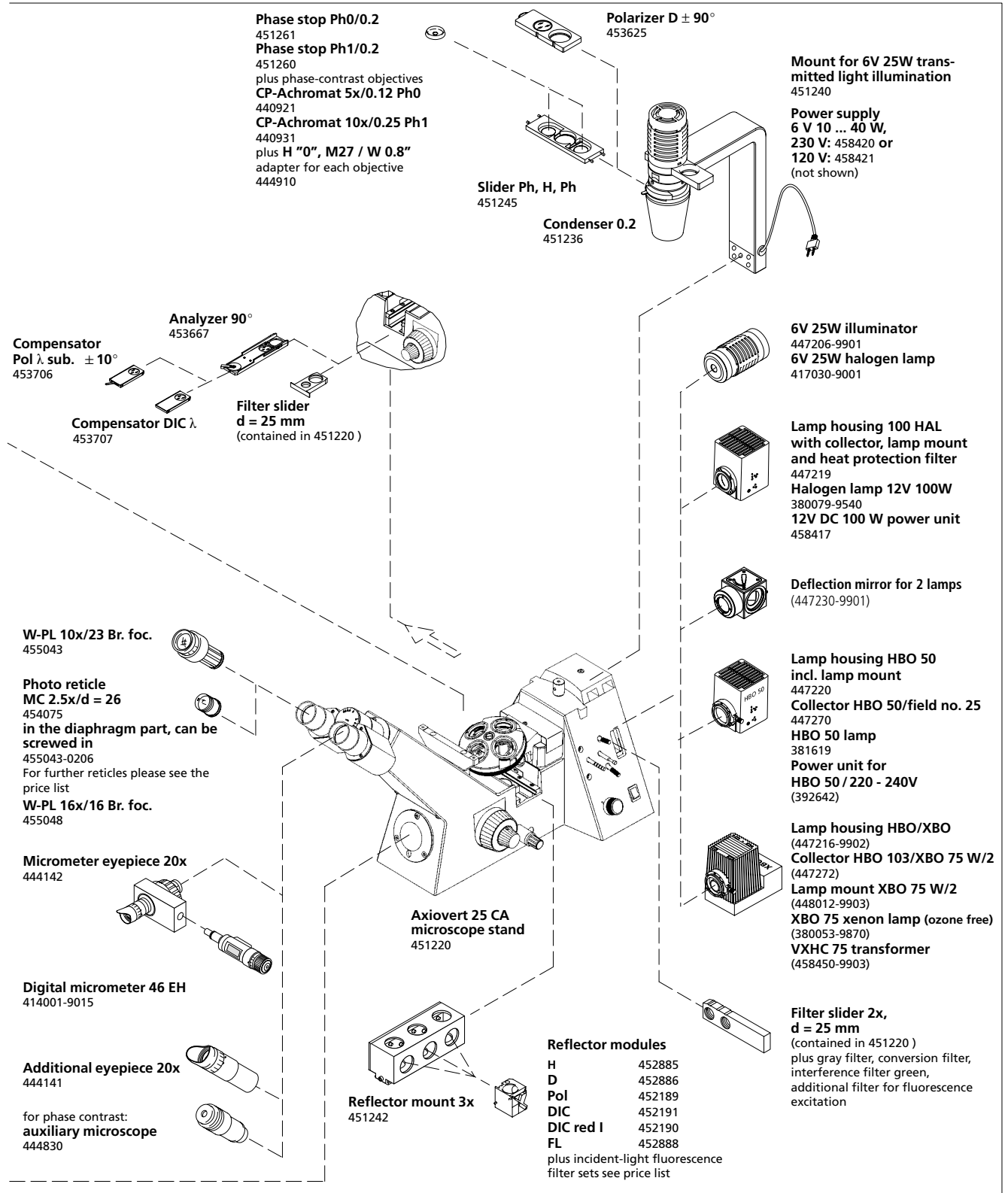
Epiplan-Neofluare are also useable

DIC sliders for Epiplan objectives

5x/0.13	444415
10x/0.20	444416
20x/0.40	444417
50x/0.70	444418
100x/0.75	444419



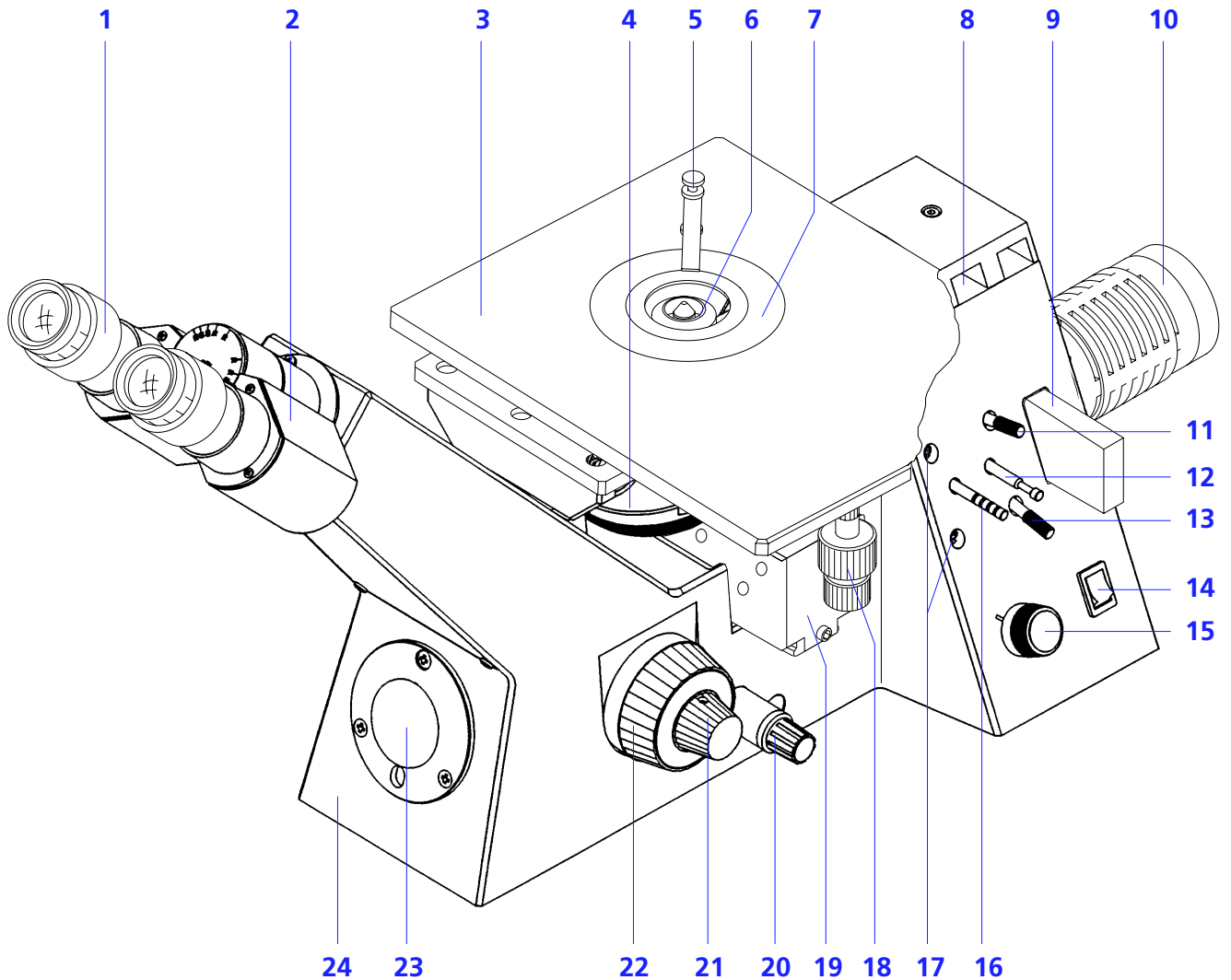
Axiovert 25 CA





2 Operation

2.1 Control and function elements



- | | |
|-------------------------------------------|------------------------------------------------|
| 1 Eyepiece | 13 Centering screw for aperture diaphragm |
| 2 Binocular tube | 14 On/Off switch |
| 3 Mechanical stage 30 x 30 | 15 Illumination control |
| 4 Nosepiece (4x) | 16 Pushrod for luminous-field diaphragm |
| 5 Stage clip | 17 Centering screw for luminous-field |
| 6 Objective | 18 Coaxial drive for x-y stage movement |
| 7 Glass stop | 19 Reflector mount (3x) |
| 8 Compartment for DIC slider | 20 Switch to change from observation to camera |
| 9 Filter slider 2x | 21 Focusing drive (fine adjustment) |
| 10 6V 25 W halogen lamp | 22 Focusing drive (coarse adjustment) |
| 11 Centering screw for aperture diaphragm | 23 Front port camera/video |
| 12 Pushrod for aperture diaphragm | 24 Microscope stand |

Axiovert 25 CA

2.2 Assembly of the instrument

2.2.1 Unpacking

The various models of the Axiovert 25 CA microscope, including accessories, are delivered in commercially available packaging. It is recommended to keep the transport containers in case the instrument must be stored for a long period of time or returned to the manufacturer.

- Open the packaging.
- Remove the cardboard box (2-1/1) containing the accessories.
- Hold the polyethylene packing (2-1/3) including the microscope at the openings (2-1/2), remove it from the cardboard box and place it on the side.
- Remove the upper part of the packing.
- Remove the microscope from the lower half of the packing, but do not touch it on the binocular tube or the illumination arm (if the optional transmitted-light equipment is attached).
- Check for completeness in accordance with the packing list.
- Store packing material in the transport box or dispose of it as indicated.

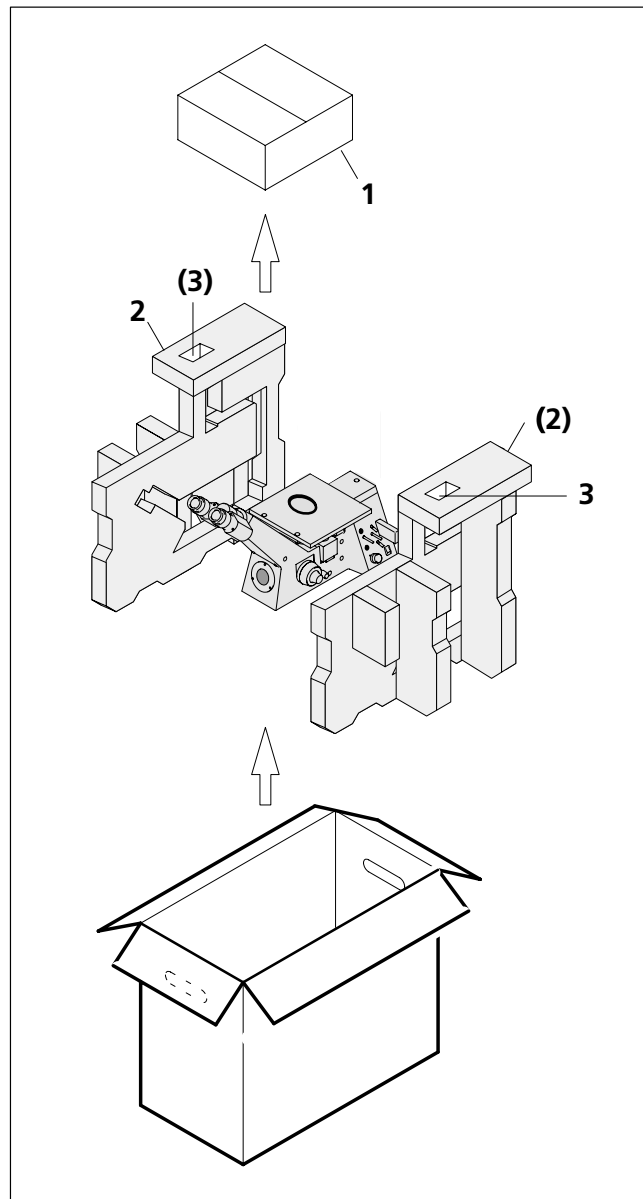


Fig. 2-1 Axiovert 25 CA packing units

2.2.2 Installation

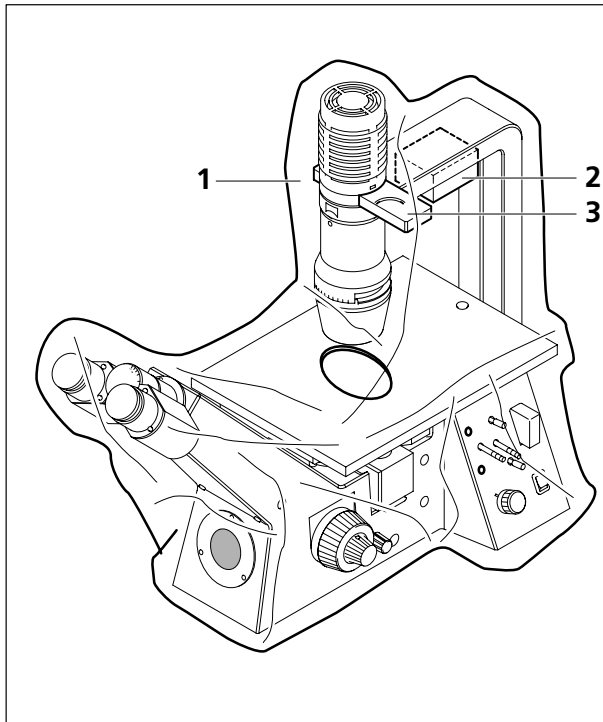


Fig. 2-2 Unpacking and installation

(1) Preparations

- Place the microscope stand on a suitable work surface.
- Remove the plastic sleeve (2-2/1)
- Remove the foam part (2-2/2) which secures the condenser slider (of optional transmitted-light equipment)
- Remove the foam part above the nosepiece (2-3/2).

NOTE The filter slider of the transmitted-light equipment (2-2/3) is firmly integrated; the suitable filters (green filter, attenuation filter) are not inserted during transport.

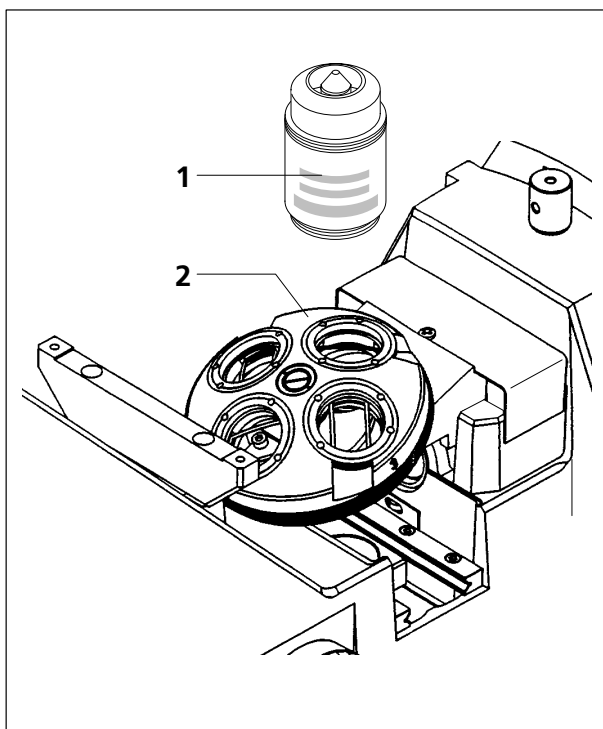


Fig. 2-3 Screwing in of objectives

(2) Screwing in of objectives

- Remove the dust covers depending on the number of objectives you wish to use and screw the objectives (2-3/1) in the nosepiece (2-3/2) in the ascending order of magnification factors. For brightfield objectives, use the adapter H "0", M 27 to W 0.8" to match the threads.

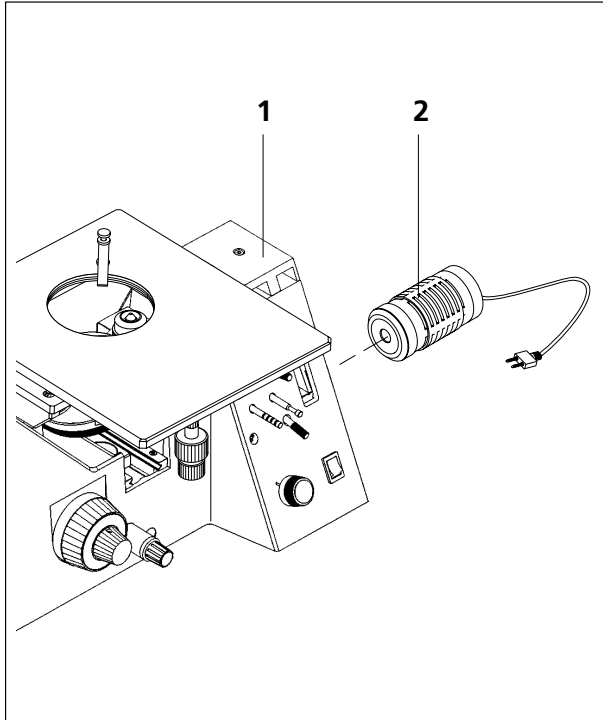


Fig. 2-4 Attachment of the HAL 25 W illuminator

(3) Attachment of the HAL 25 W or 100 W illuminator

- Attach HAL illuminators (2-4/2) equipped with lamp to the Axiovert 25 CA (2-4/1) via dovetail and tighten fixation screw (2-7/5) using SW 3 ball-head screwdriver. For information on the change of lamps please see sections 3.2 (2) and (3). Connect the 6V 25W illuminator to the socket (2-7/6) at the instrument rear.
- Establish connection to the external power unit for HAL 100, connect cable to the line.
- Switch on the power unit for HAL 100 W.

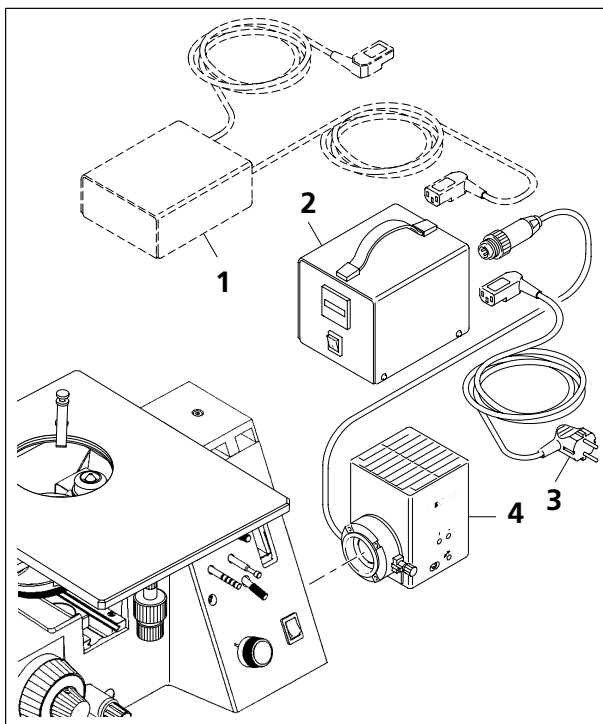


Fig. 2-5 Attachment of the HBO 50 illuminator

(4) Attachment of the HBO 50 and XBO 75 illuminators

- Attach HBO 50 (2-5/4) or XBO 75 illuminator equipped with lamp to the Axiovert 25 CA via dovetail and tighten fixation screw (2-7/5) using SW 3 ball-head screwdriver. For information on the change of lamps please see section 3.2 (4).
- Establish connection to the power unit for HBO 50/220- 240 V (2-5/2) and the VXHC 75 transformer and connect the cable (2-5/3) to the line.

NOTE The line voltage of 110/120 requires the transformer for 1200 VA (2-5/1) to be connected between the power unit for the HBO 50 and the line.

- Switch on the power unit

(5) Attachment of the mechanical stage 30 x 30

Since the microscope stand and the fixed mechanical stage are supplied in separate packages, the mechanical stage must be attached to the stand after unpacking. The fixed mechanical stage has been designed for right-handed or left-handed operation. To change the operation side, the mechanical stage must only be rotated around 180° before it is attached to the stand.

Proceed as follows to mount the mechanical stage:

- Attach mechanical stage (2-6/1) to the mounting bar (2-6/2) and cylinder (2-6/3) of the stand (2-6/9). Attach the side with the coaxial drives to the right or left of the stand, as required.
- Tighten two fixation screws at the front and one screw at the rear to fix the stage to the stand. For this, move the stage plate until the drilled holes of the stage are accessible.

NOTE If required, remove stops of the x-y movement first.

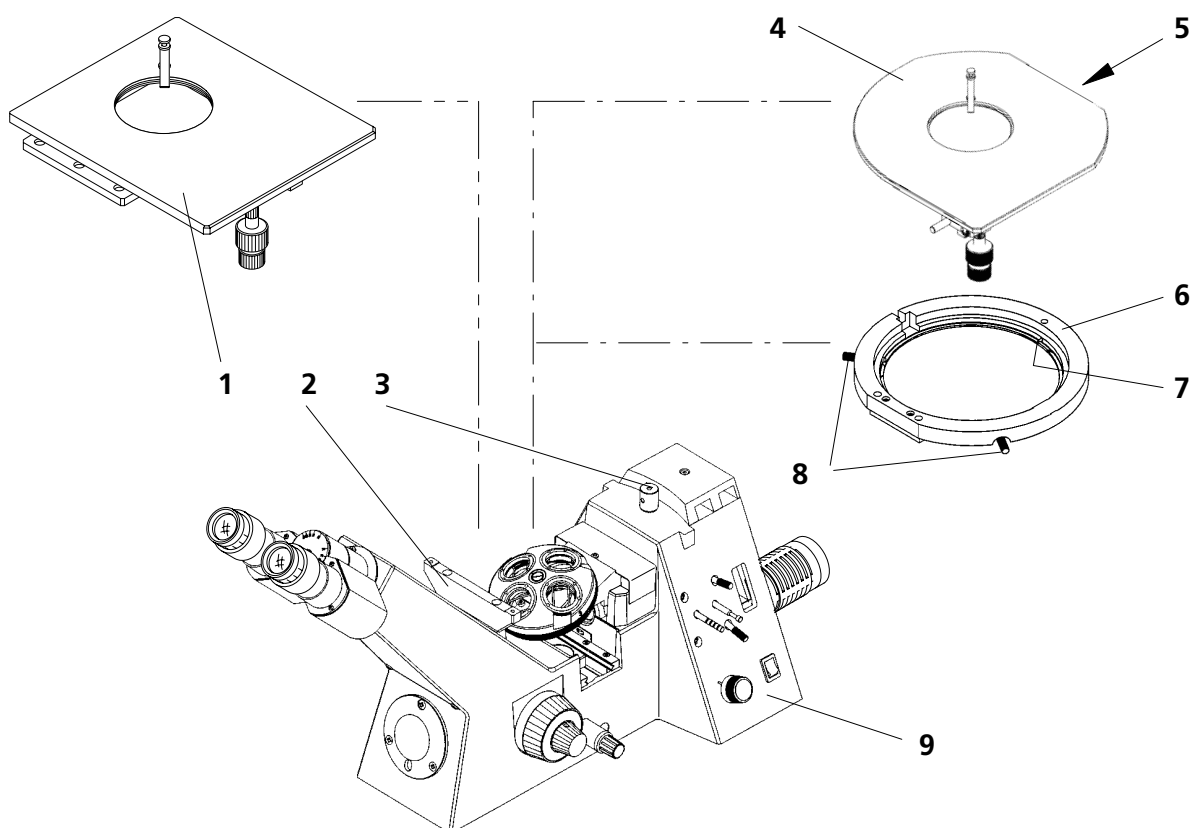


Fig. 2-6 Attachment of the microscope stage

(6) Attachment of the rotary mechanical stage 30 x 30/90° R

The rotary mechanical stage (2-6/4) is also packed separately and must be attached to the stage mount (2-6/6) after unpacking. If the Axiovert 25 CA has been ordered with rotary mechanical stage, the stage mount is already attached to the stand on delivery. The rotary mechanical stage has been designed for right-hand operation exclusively.

Proceed as follows to attach the rotary mechanical stage:

- Loosen the two stage centering screws (2-6/8) of the stage mount.
- Attach the rotary mechanical stage (2-6/4) to the stage mount (2-6/6) in such a way that the spring pins (2-6/7) of the stage carrier and the orientation notch (2-6/5) of the mechanical stage engage.
- Then insert the mechanical stage in the ring mount of the stage carrier by slightly pressing downwards and on the spring pin.
- Tighten the stage centering screws (2-6/8) until the stage can be smoothly rotated.

NOTE If required, remove stops of the x-y movement first.

(7) Connection to the line

CAUTION Check whether the voltage indicated on the instrument rear complies with the line voltage!

- Connect line cable (2-7/4) to the instrument socket and the line.
- Switch on the instrument via the On/Off switch (2-7/3) on the right of the instrument.

NOTE When the instrument is switched off, the "0" marking is visible on the line switch.

- The instrument is ready for operation when the pilot lamp is on.
- In the event of a defect, check the two G-type fuses (5 x 20 mm) (2-7/2) in accordance with IEC 127
for 230 V: T 0,4 A/250 V
for 115 V: T 0,8 A/250 V

Remove the fuse holder (2-7/1) from the housing by pressing the two springs simultaneously in the direction of the arrows.

CAUTION Only use the stipulated fuses.

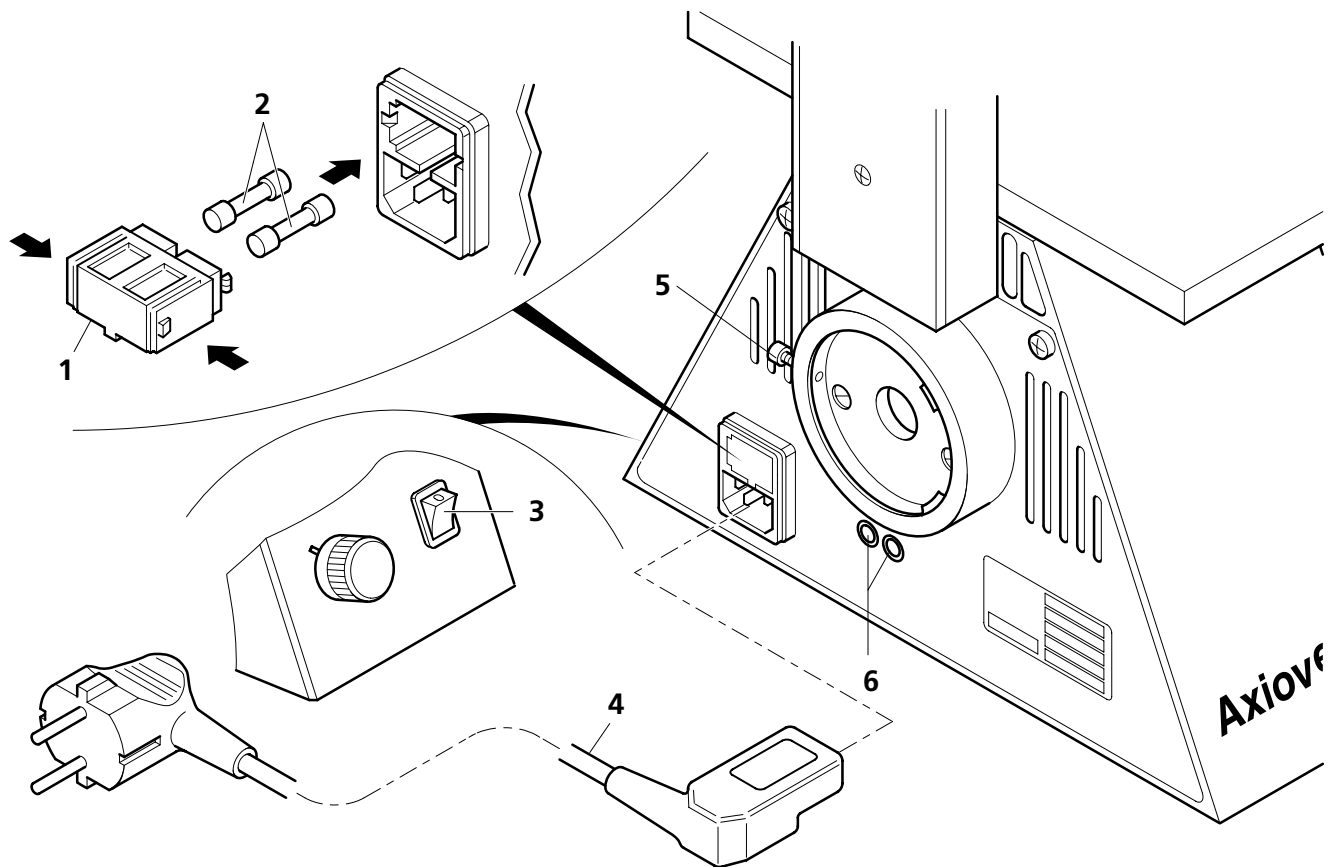


Fig. 2-7 Connection to the line

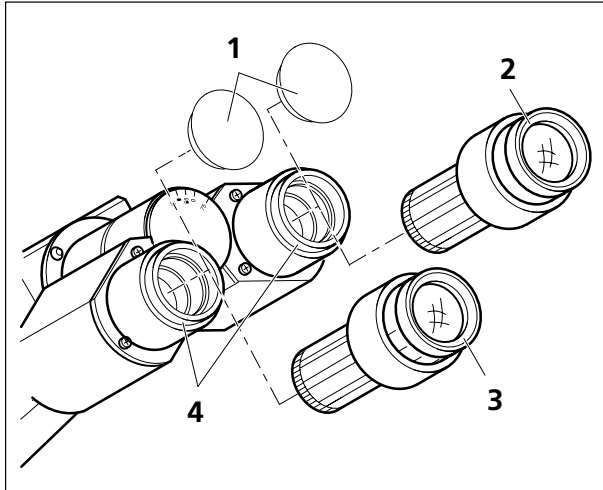


Fig. 2-8 Insertion of eyepieces

(8) Inserting the eyepieces

- Remove the dust covers (2-8/1) and insert the eyepieces (2-8/2, 3) in the eyepiece tubes (2-8/4).

(9) Compensating for myopia

1) without eyepiece reticle

- Focus on the specimen via one eyepiece and the focusing drive, while setting the eyelens of the focusing eyepiece to 0 on the diopter scale ("0" scale position coincident with white dot).
- Focus on the specimen for the second eye via the eyelens of the second eyepiece.

2) with eyepiece reticle

- Use the eyelens of the focusing eyepiece (2-8/3) to focus on the line figure of the eyepiece reticle.
- Focus on the microscope image of a specimen via the focusing drive by looking through the eyepiece with reticle.
- When the image and the eyepiece reticle are in focus in the above eyepiece, focus the image for the second eye via the eyelens of the second eyepiece.

NOTE The position of the focusing drive on the stand must not be changed.

(10) Using the binocular tube

- The eyepiece distance is matched to the individual interpupillary distance by swinging the eyepiece tubes symmetrically towards one another.
- A higher (2-9/A) or lower (2-9/B) viewing height is achieved by swiveling the tube.

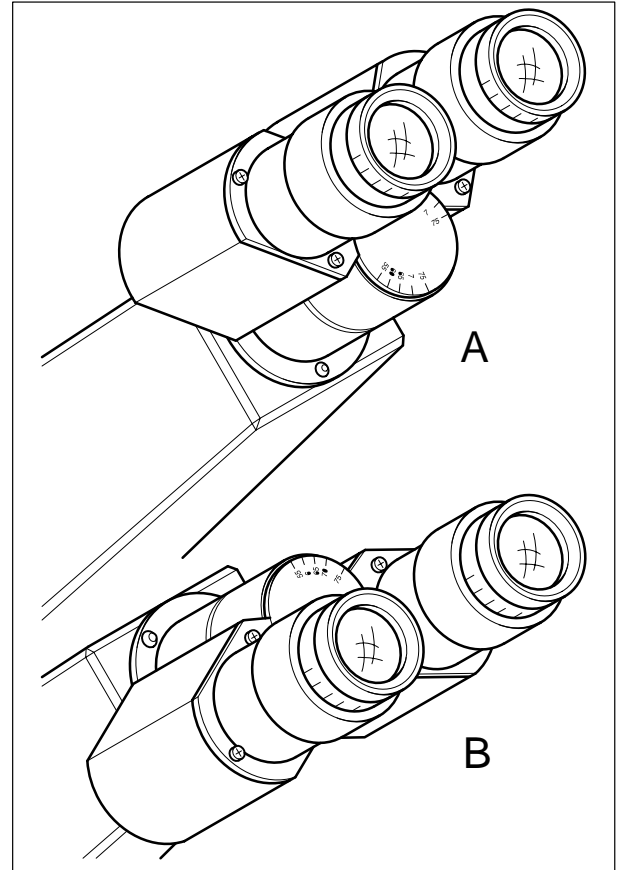


Fig. 2-9 Positions of the binocular tube

(11) Inserting an eyepiece reticle (dia. 26 mm)

- The W-PI eyepieces 10x/23 foc. are intended for use with reticles.
- The image shift produced by the additional path through the glass is taken into account on the diopter scale by the fact that the zero position is indicated not by the white dot (W) but by the red dot (R).
- The reticles (2-10/2) have been adhered to screw-in mounts (2-10/1) to allow easy replacement.
- To replace a reticle, unscrew the entire mount and replace it with one containing the required reticle.
- Finally, check the image focus and readjust it, if required (see section 2.2.2 (8)).

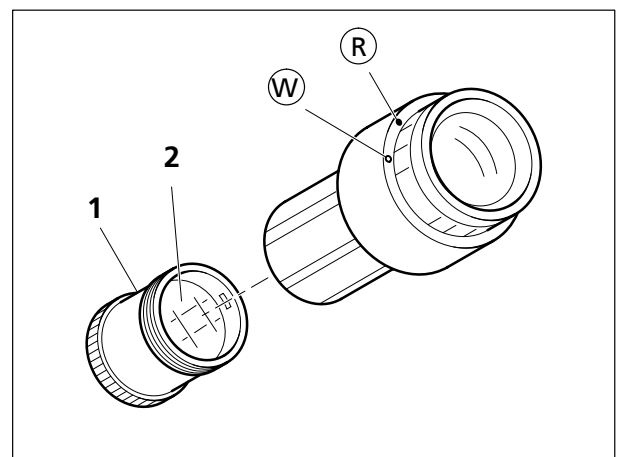


Fig. 2-10 Insertion of an eyepiece reticle

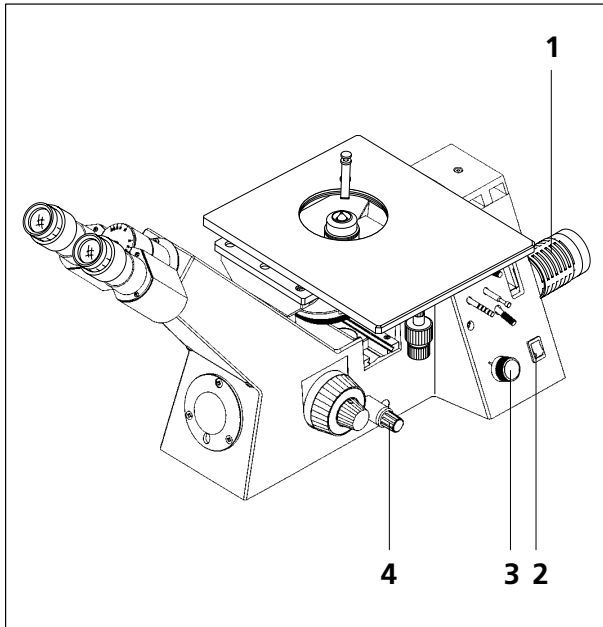


Fig. 2-11 Positioning and switching on of the instrument

(12) Positioning/switching on the instrument

- Unless already done, switch on the instrument using the On/Off switch (2-11/2).
- After switching on, the lamp in the illuminator (2-11/1) must light up.
- Set the required brightness via the illumination control (2-11/3).

NOTE If no light appears in the visual beam path of the Axiovert 25 CA, the "observation/camera" changeover switch (2-11/4) should be activated.

2.3 Start-up

When starting up the Axiovert 25 CA microscope for the first time, the instrument must be unpacked in accordance with section 2.2.1, installed in accordance with 2.2.2, connected to the line and made ready for operation.

The Axiovert 25 CA microscope is supplied with factory-aligned 6V 25W illumination. This illumination equipment requires no recentering even after an exchange of lamps by the customer.

2.4 Illumination and contrasting techniques

The description/application of illumination/contrasting techniques is based on the following microscope settings:

- Axiovert 25 CA microscope is switched on
- The "illumination" control (2-12/3) is in center position.
- The "beam path" switch (2-12/6) is in the position for observation.
- Depending on the microscopy technique to be used, the triple reflector mount (2-12/5) is equipped with the necessary reflector modules (H, D, Pol, DIC red I or FI) and labeled (for the change of reflectors see section 3.2, page 3-10).

The reflector modules can also be integrated in the reflector mount individually (depending on the application or when retrofitted). For this, it is important to insert the DIC reflector module on the right of the reflector module and to adhere the appropriate label on the left. The suitable labels are included in the delivery package.

If the reflector modules are arranged differently, the operation of the DIC prisms will be impaired. The change of reflector modules is described in detail on pages 3-10 and 3-11 using the fluorescence module as an example.

2.4.1 Brightfield in incident light

- Preparations as described in section 2.4.
- Place the object on the mechanical stage and focus at low magnification, e.g. using the Epiplan 10x objective, via the focusing drive. The **H** marking must be visible on the right of the reflector mount (2-12/5) (slider in stop position).
- Slightly close the luminous-field diaphragm (2-12/4). The edge of the luminous-field diaphragm becomes visible in the object field. Use SW 3 ball-head screwdriver to move the center of the diaphragm to the edge of the field of view.
- Slightly close the aperture diaphragm (2-12/2). Remove the eyepiece. Center the aperture diaphragm using the centering screws. Close aperture diaphragm until optimum contrast has been achieved. Check the centering.

NOTE The aperture diaphragm cannot be used to control the image brightness (loss of image quality)!

- If required, change the lamp voltage via control (2-12/3) or insert attenuation filter in the filter slider (2-12/1) and push it in the beam path.

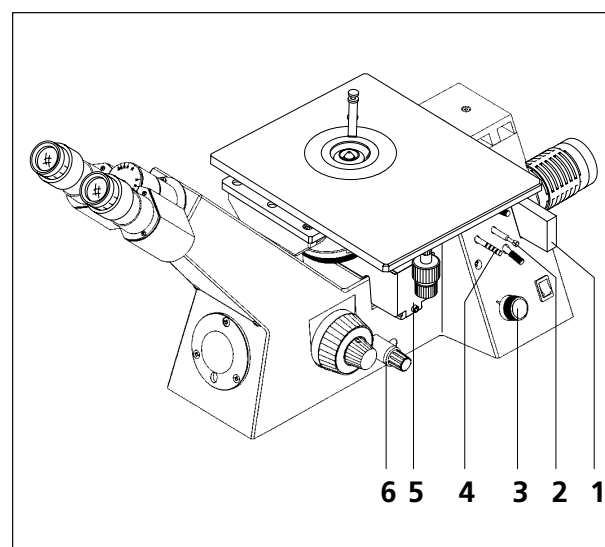


Fig. 2-12 Controls of the incident-light illumination

2.4.2 Darkfield in incident light

- Push triple reflector mount to the left until stop (only the **D** marking is visible on the right).
- Open the aperture.

NOTE The aperture diaphragm must be entirely open, since otherwise there will be a loss of intensity.

- Remove the filter from the beam path.

2.4.3 Polarization contrast in incident light

(1) Polarization contrast using the **DIC** reflector module

- Move reflector mount until the DIC marking is visible on the left.
In the **DIC** reflector module, analyzer and polarizer are fixed in a crossed position).

(2) Polarization contrast using the **Pol** reflector module

- Move reflector mount until the **Pol** marking is visible on the left. (The polarizer, which is fixed and can therefore not be rotated, is contained in the Pol reflector module.)
- Push 90° analyzer (2-13/3) in the opening below the reflector mount compartment (2-13/4). The analyzer can be rotated around 90°.
- Cross the oscillation direction of analyzer and polarizer using the lever for analyzer rotation (2-13/2) (dark position).

NOTE The Pol λ sub. $\pm 10^\circ$ compensator (2-13/1) can be used to produce color contrast of anisotropic materials. For this purpose, the compensator is laid on the analyzer.

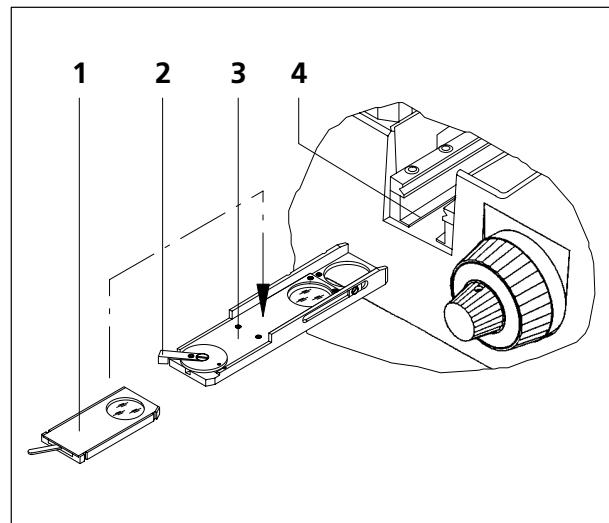


Fig. 2-13 Reflector mount compartment and analyzer

2.4.4 Differential interference contrast (DIC)

(1) DIC using the DIC or DIC red I reflector module

- Move reflector mount until the **DIC** or **DIC red I** (if available – for color DIC) marking is visible on the left (crossed polarizers).
- Push DIC slider (2-14/2) in the appropriate opening in the nosepiece (2-14/1) until it stops (remove protection slider first).

NOTE Note the labeling of the DIC slider to be used. Differential interference contrast can be obtained only if objective and DIC slider are allocated correctly to each other.

- Set optimum contrast (in accordance with the application) via the knurled knob of the DIC slider. Repeat the procedure when changing the objective.
- Use the DIC slider (2-14/2) only in differential interference contrast to avoid a decrease in image quality. Remove the DIC slider when using other techniques and insert it in the storage slots on the stand.

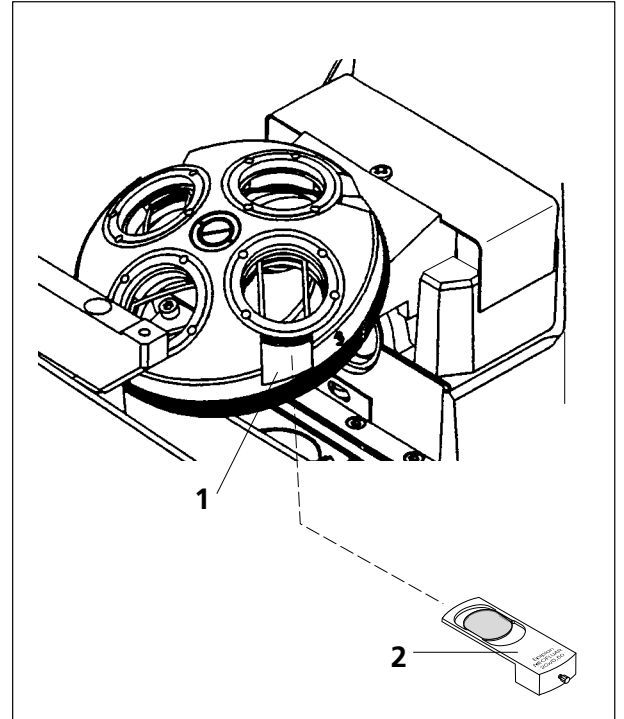


Fig. 2-14 Objective nosepiece

(2) DIC using Pol reflector module and analyzer 90°

- Move reflector mount until the **Pol** marking is visible on the left (the Pol reflector module must be contained in the right-hand side of the reflector mount to avoid impediment in the operation of the DIC sliders). Since the Pol reflector module only contains the polarizer, the analyzer 90° is also used.
- Slide analyzer 90° (2-15/3) in the opening below the reflector mount compartment (2-15/4) until stop.
- Cross the oscillation direction of polarizer and analyzer using the lever for analyzer rotation (2-15/2) ("0" position = dark position).
- Insert DIC λ compensator (2-15/1) in the analyzer to achieve colored DIC.

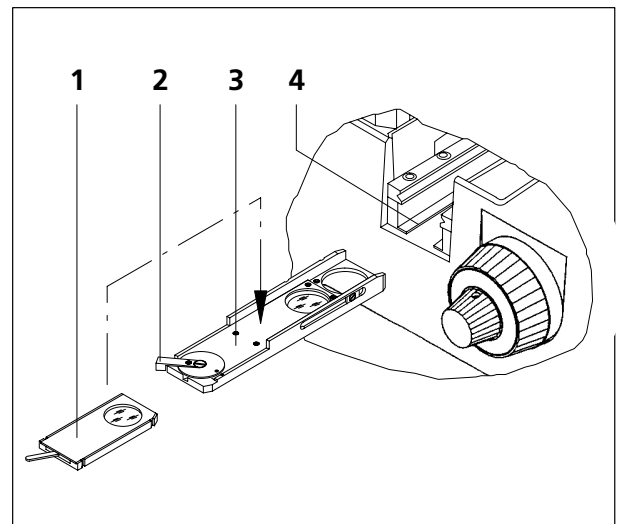


Fig. 2-15 Reflector mount compartment and analyzer

2.4.5 Incident-light fluorescence

(1) Incident-light fluorescence using the reflector module FL

Incident-light fluorescence requires attachment of the HAL 100, HBO 50 or XBO 75 illuminator and the necessary filter sets (for the change of FL filter sets please see section 3.2, page 3-10). The HAL 25 W illuminator can only be used in the case of very pronounced fluorescence intensity.

- Select an object detail in brightfield.

CAUTION Use the attenuation filter $d = 25$ mm in filter slider 2x (2-16/1) to avoid the danger of glare.

- Slide in required FI reflector module with integrated filter set (2-16/3) via reflector mount (2-16/6) and pull filter slider (2-16/1) to release the light path.
- Close luminous-field diaphragm via pushrod (2-16/4) until it is visible in the image, position it in the center via centering screws (2-16/5) and open it until the edge of the field of view.
- Open aperture diaphragm via pushrod (2-16/2).
- The filter slider 2x (2-16/1) of the FL incident-light equipment allows the insertion of additional dia. 25 mm excitation filters which must be held by zero rings.
- The filter slider 2x (2-16/1) allows no light to pass in the center stop position.

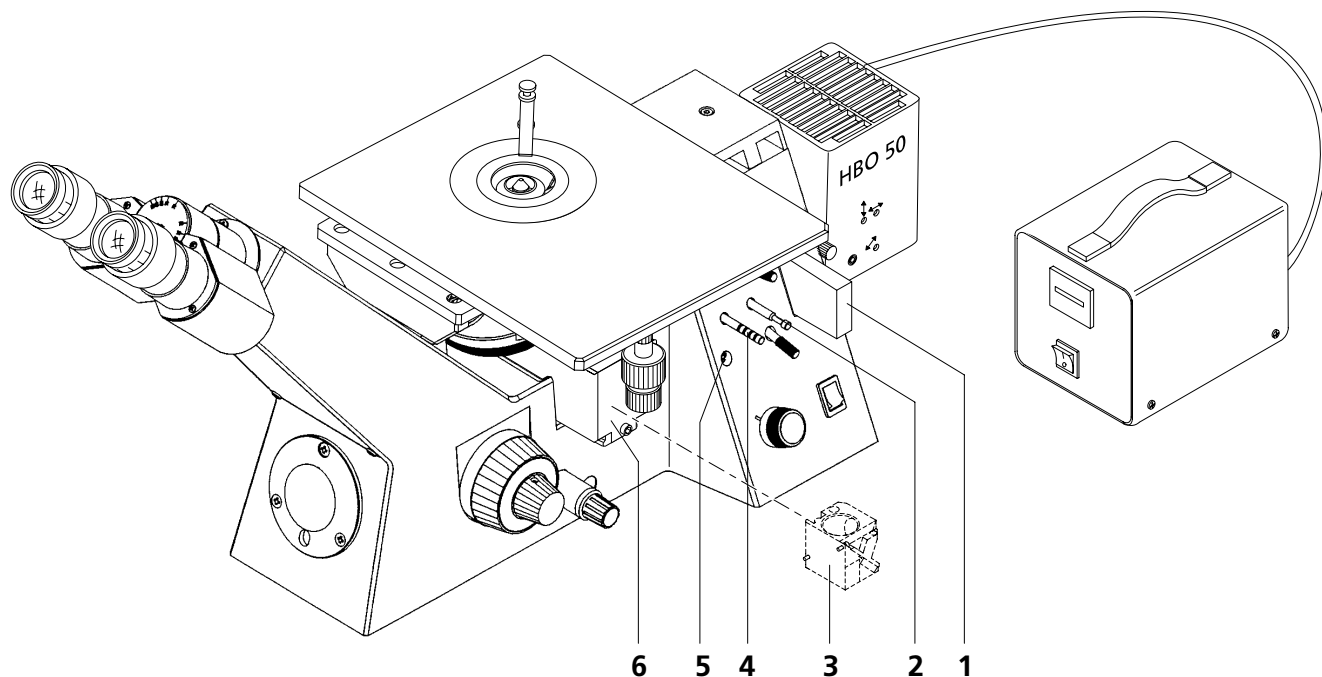


Fig. 2-16 Viewing in incident-light fluorescence

Depending on the application, the FI filter module can be equipped with one of the following fluorescence filter sets:

Application	Fluorescence filter set
bitumen, petrol products, wood	01
bitumen, petrol products, wood	18
cellulose, wood, ceramics	05
epodye infiltration of building materials	09
residual paint, contamination	14

NOTE Each fluorescence filter set requires one FI reflector module.

(2) Incident-light fluorescence using the filter slider

- Insert the excitation filters in the filter slider 2x d = 25 mm (2-16/1).
- Barrier filters can be inserted in the filter slider d = 25 mm (2-17/1) **or** in the reflector mount (see Fig. 3-8, page 3-11) or in the reflector module H.

NOTE The filter slider d = 25 mm is pushed in the microscope stand below the reflector mount compartment (2-17/1).

The following filter combination must be used for epodye fluorescence (with red transmission):

Excitation filter: IF blue filter BP 450-490, 25x3B
 Barrier filter: orange filter LP 520, 25x3A

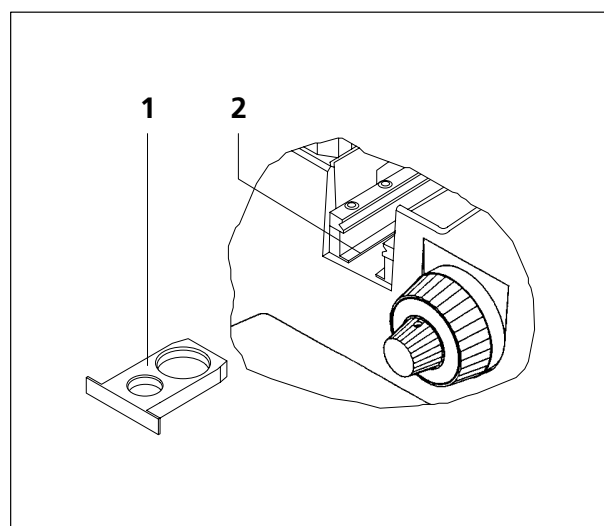


Fig. 2-17 Filter slider d = 25 mm

2.4.6 Transmitted-light illumination

Assembly

- Attach carrier of transmitted-light illumination (2-18/1) to centering pin on the rear of the stand (2-18/3) and tighten the fixation screws.
- Attach condenser 0.2 (2-18/2).
- Plug connector of transmitted-light illumination to the 6V 25W socket on the instrument rear (2-7/6), unless the incident-light lamp has been connected to it. Otherwise, provide power unit 6V, 10 ... 40 W.

Preparations

- Switch on the microscope.
- Set illumination intensity to center position.
- Place specimen on stage and focus.

NOTE The specimen can be focused until at least 0.5 mm above the glass stop.

In extreme positions of the mechanical stage and the focal plane it may become necessary to lower an objective with a short working distance before changing it.

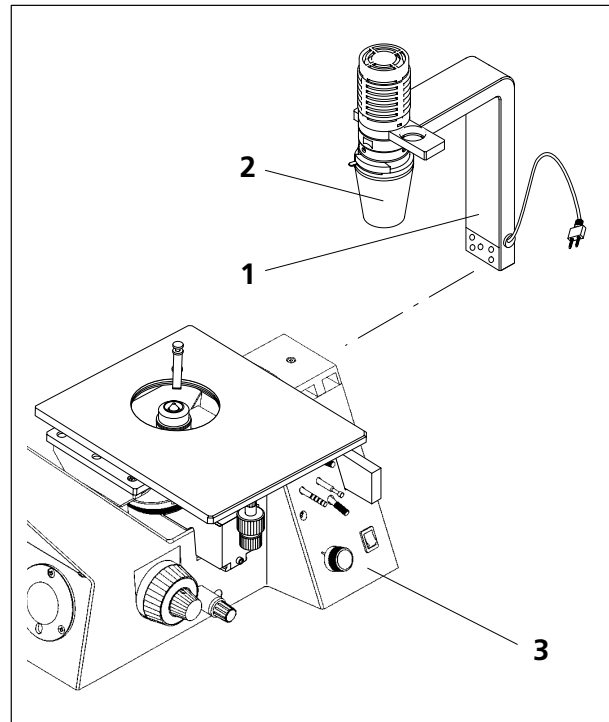


Fig. 2-18 Transmitted-light illumination

Polarization contrast in transmitted light

- Slide polarizer $\pm 90^\circ$ in the mount of the condenser 0.2.
- Move reflector mount in the stand in position **H** or **D**.
- Slide analyzer 90° in the beam path (left side of the stand below the reflector mount compartment – see Fig. 2-15).
- Cross polarizers (dark position). First move analyzer 90° to center position, then set the dark position using polarizer $\pm 90^\circ$.
- Place specimen on stage and focus.

Colored polarization contrast in transmitted light

- For colored polarization contrast, place DIC λ compensator on the analyzer (Fig. 2-15).
- For small path differences, use the Pol λ sub. $\pm 10^\circ$ compensator (Bild 2-13) instead of the DIC λ compensator.

Phase contrast in transmitted light

- Assembly and preparations in accordance with section 2.4.6.

NOTE Phase-contrast objectives are labeled in green.

- Mount phase-contrast objective (2-19/3) with intermediate ring and swing it in the beam path.
- Open the aperture diaphragm (2-19/4) entirely.
- Insert the auxiliary lens (2-19/1) in one of the tubes instead of an eyepiece and make the phase ring of the objective visible by focusing the eyelens.
- The phase ring of the phase-contrast objective appears as a gray ring in the bright pupil (A).

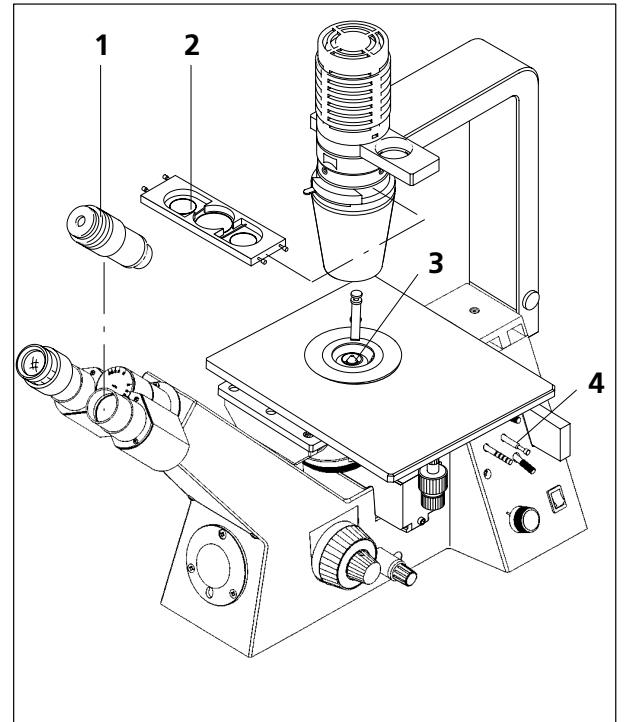


Fig. 2-19 Viewing in phase contrast

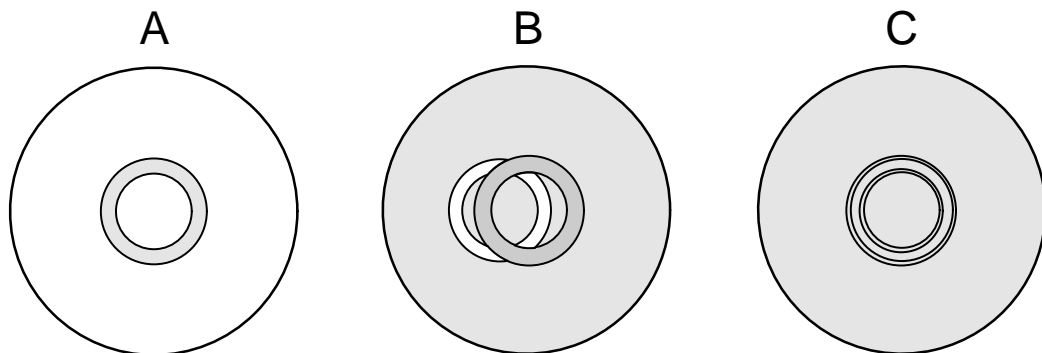


Fig. 2-20 Illustration of phase-contrast adjustment

- Slide the annular diaphragm (2-21/1) of the Ph/H/Ph slider (2-19/2) matching the objective and the inserted condenser in the beam path. The phase ring of the objective appears centrally in the field of view (A), while the bright annular stop may be out of center (B).

- Use the centering screws (2-21/3) on the Ph/H/Ph slider to move the phase ring and the annular diaphragm until they are flush.
The gray phase ring of the objective must cover the bright ring stop completely (C).

NOTE Should the setting range of the centering screws not be sufficient, please check whether the condenser is at the front stop and the Ph/H/Ph slider has engaged. Exact imaging of the annular diaphragm requires a plane-parallel object.

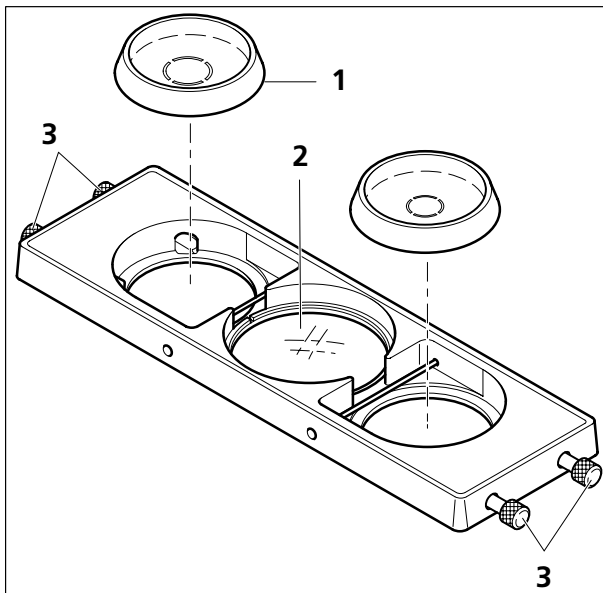


Fig. 2-21 Insertion of the annular diaphragm

- Replace the auxiliary lens with the eyepiece again.
- The center position of the Ph/H/Ph slider permits brightfield illumination, the brightness of which is matched to that of the phase-contrast image via an attenuation filter (gray filter) (2-21/2).
- When using different Ph objectives with Ph0 and Ph1, pay attention to the correct allocation of the annular diaphragms.
- Loosen the centering screws to allow the inserted annular diaphragm to be exchanged for another one.

- Switch on the microscope; when using color film (artificial light), set the "illuminance" control (2-22/11) to maximum brightness (right stop position: 3200 K) and use an attenuation filter, if required.
- Select the object detail to be photographed via the binocular tube.

NOTE To determine the image section and for the precise focusing of the image, the focusing eyepiece must be equipped with the photo reticle MC 2.5x/dia. 26.

- Switchover of the beam path (2-22/10) from observation to photomicrography releases the camera beam path and allows 100 % of the light to reach the camera.
- The camera system must be operated in accordance with the camera manual.

- NOTE**
- The magnification on the film is the product of the objective magnification and the factor 2.5 of the camera adapter.
 - The most usual T2 adapters are listed in the system overview.

2.5.2 Videomicroscopy

- The Axiovert 25 CA microscope allows videomicroscopy via the camera/video port using the video adapters ENG 1/2" 0.5x (2-23/1) or C 1/2" 0.5x or the video zoom adapter C 1/3" 0.32x - 0.8x (2-23/2).
- The video equipment is attached in the same way as the camera (described in section 2.5.1).

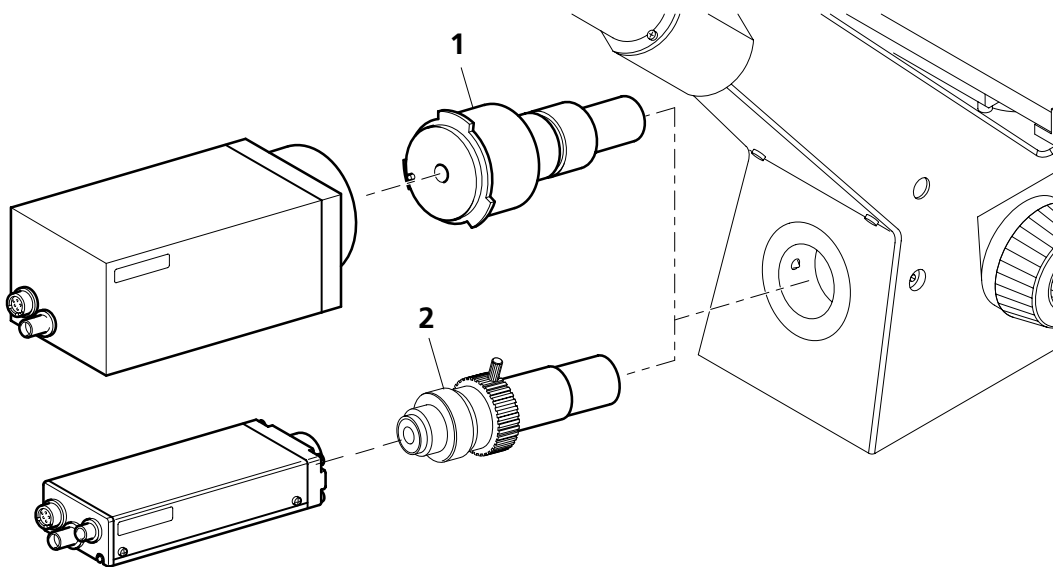


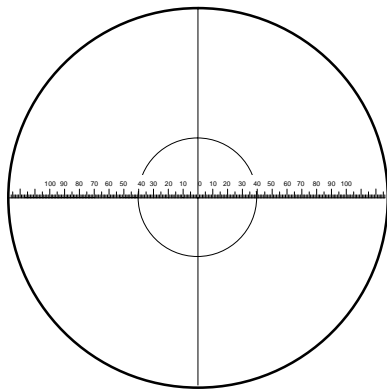
Fig. 2-23 Video attachment

2.6 Measuring, counting and comparing techniques

2.6.1 Measuring plates

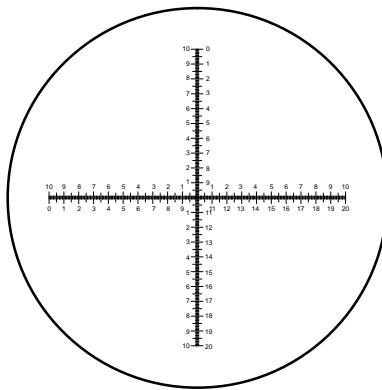
The Axiovert 25 CA microscope can be equipped with the following measuring plates:

Eyepiece measuring and counting plate 20:200



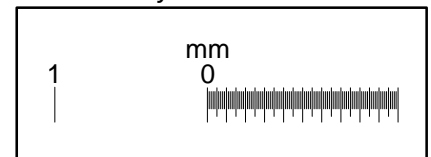
Horizontal gradation in the center of the field of view
gradation length: 20 mm
increments: 0.1 mm

Eyepiece measuring plate 2x 20:200



2 gradations 20:200 (crossing)
gradation length: 20 mm
increments: 0.1 mm

plus:
objectmicrometer for incident light,
5 + 100/100y



5 mm gradation in one direction in 5 intervals,
increments: 1 mm

gradation in the other direction:
1mm in 100 intervals
increments: 10 µm

The gradation of the eyepiece measuring plate must be calibrated if it is to be used to measure the image of object details. For calibration, an object with a known interval value (object micrometer 5 + 100/100y) is used to determine how many scale parts of the known gradation of the object micrometer correspond to the characteristic gradation interval of the eyepiece measuring plate. This results in the scale constant as the distance in the object plane which corresponds to one scale part of the eyepiece measuring plate.

NOTE The distance to be measured in the eyepiece intermediate image should be ≥ 5 mm so that the relative influence of random measuring deviations can be kept as low as possible.

Example:

Number of measured scale parts of the object micrometer $n = 30$
 Number of scale parts determined using the eyepiece measuring plate
 for 30 scale parts of the object micrometer $n' = 61.2$
 Distance between increments in object micrometer 5 + 100/100y $k = 10 \mu\text{m}$

⇒ scale constant for one scale part of the eyepiece measuring plate in the object plane

$$k' = \frac{30}{61.2} \times 10 \mu\text{m} = 4.9 \mu\text{m}$$

When the object micrometer is replaced with the specimen to be measured, the eyepiece measuring plate is used to determine the number N of scale parts representing the length of the object detail to be measured, and from this the object size L is calculated as follows using the scale constant k' :

Example (continued):

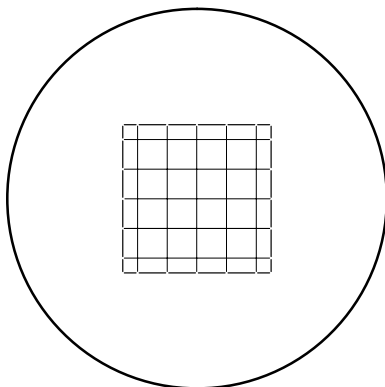
scale constant $k' = 4.9 \mu\text{m}$
 number N of scale parts for the length of the object detail
 determined using the eyepiece measuring plate $N = 14.6$ (fraction estimated)

\Rightarrow object length $L = 14.6 \times 4.9 \mu\text{m} = 71.54 \mu\text{m} = 0.07154 \text{ mm}$

2.6.2 Grain-size determination using the measuring and counting technique

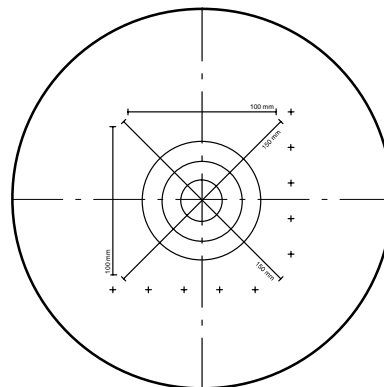
To determine the grain parameters of standard and textured structures according to the line intersection technique, the following reticles can be used:

Eyepiece reticle 25/2x2

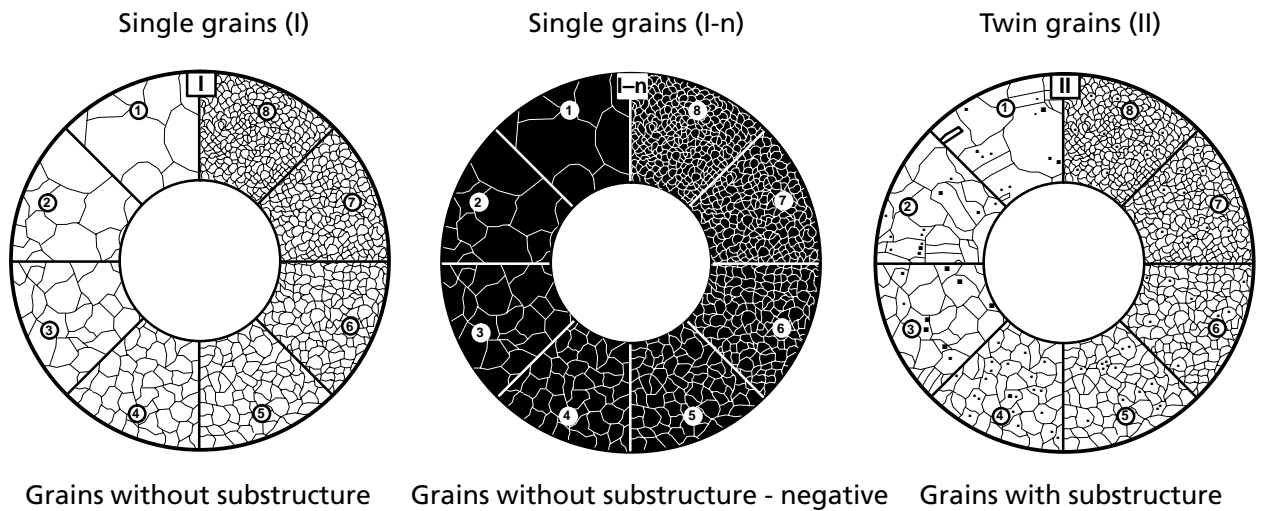


25 test points
 test line length: $25 \times 2 \times 2 \text{ mm}$
 test area: $25 \times 2 \times 2 \text{ mm}$

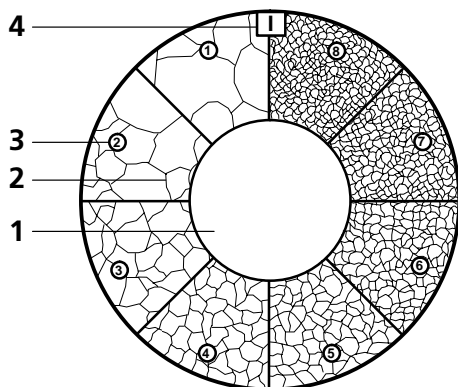
Counting reticle according to ISO



- reticle figure corresponds to ISO 643-1983 and ASTM E 112-88 with straight lines and circles
- in addition to the line intersection technique, the grain size can also be determined by the area counting technique



Design of the comparison plates:



- 1 Empty image field, dia. 10 mm
- 2 Circle ring sector with structure pattern of the image series table according to ISO 643-1983 and ASTM E 112-88 (total of 8), size of structure patterns is graded from one sector to another
- 3 Number of the sector
- 4 Description of the comparison plate (I, I-n or II)

Determining the grain parameters of the structure of samples to be examined:

- The grain size of the object imaged in the empty field must be compared to the grain sizes of the segments.
- Determine the number of the sector, the grain size of which is nearly identical to that of the object image.
- Determine the appropriate grain size number for this sector number:
With microscope magnification 100:1, the sector number corresponds to the grain size number, with magnifications > and < 100:1, the grain size number must be determined using the table "grain size numbers as a function of magnification and sector number".
- The grain parameters of the structure must be determined from the appropriate grain size number from the table "Allocation of grain size number - grain parameter".

NOTE The tables "Grain size determination as a function of magnification and sector number" and "Allocation of grain size number - grain parameter" are included in the above mentioned standards, e.g. ISO 643-1983, pages 5 and 7.

2.6.4 Digital eyepiece measuring equipment

The **digital eyepiece measuring equipment**, an accessory, is used for measuring tasks requiring a higher accuracy than what is required when using eyepiece reticles. The digital eyepiece measuring equipment is a combination of the following items:

- Additional eyepiece PI 20x/ 6 ϕ , foc (2-24/1), for binocular observation.
- Micrometer eyepiece PI 20x/ 6 ϕ , foc (2-24/2) and
- Integrated digital micrometer 46 EH (2-24/3).

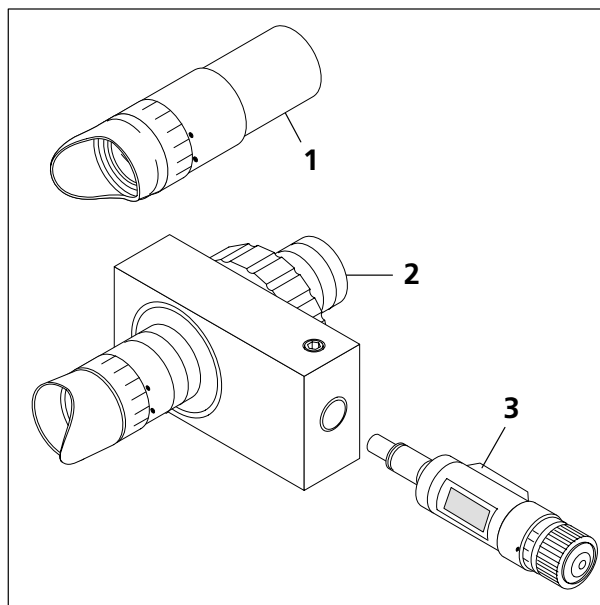


Fig. 2-24 Digital eyepiece measuring equipment

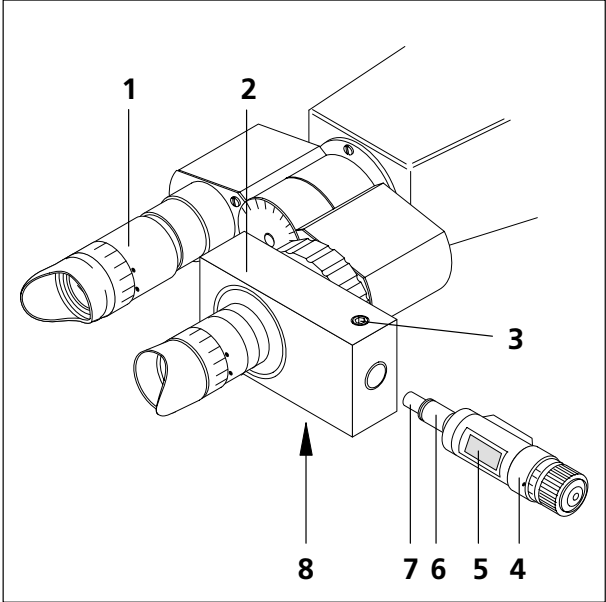


Fig. 2-25 Attaching the digital eyepiece measuring equipment

Line figures

Appearance of the dia. 18 mm intermediate eyepiece image:

- fixed positions:
 - the unnumbered millimeter gradation $l = 10 \text{ mm}$ (2-26/1) and
 - two dashed lines perpendicular to the millimeter gradation, each 3 mm to the left and right of the field center (2-26/2),
- The following adjustment markings can be shifted within a range of $\pm 5 \text{ mm}$ from the image center using the integrated micrometer:
 - a cross (2-26/3) slanted at 45° with respect to the shifting direction for scanning points on contours with a bent line;
 - a dashed line (2-26/4) perpendicular to the shifting direction (to touch convex contours or to enable congruence with straight-line edges),
 - a double line (2-26/7) to trap narrow straight lines or to touch tips, fiber ends, etc., and
 - one short line (2-26/5) perpendicular to the shifting direction and 4 mm to the left of the dashed line (2-26/4) to enable measurement of object details positioned in front of the millimeter gradation.

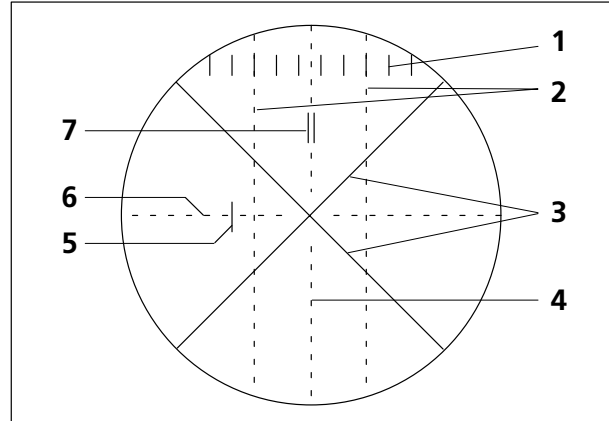


Fig. 2-26 Line figure in the intermediate eyepiece image of the digital eyepiece micrometer

The flush line (2-26/6) marks the shifting direction of the adjustment marks.

Measuring using the digital eyepiece micrometer

As for the measurement using eyepiece measuring plates (see section 2.6.1), the scale constant must also be calculated for the measurement of object sizes using the digital eyepiece micrometer. Only in the case of the eyepiece micrometer, the **scale constant** is the distance in the object plane which corresponds to one increment of digits on the digital display of the micrometer (in the case of the integrated micrometer with drum gradation: the gradation interval of the measurement drum).



graduation distance object micrometer 5 + 100/100y k = 10 μm

Therefore:

⇒ scale constant on digital eyepiece micrometer:

$$k' = \frac{30}{6054} \times 10 \mu\text{m} = 0.0496 \mu\text{m}$$

For an object detail measured using the digital micrometer (measured value 2.748 nm = 2748 scale parts) this scale constant results in the following object size:

$$\Rightarrow L = 2748 \times 0.0496 \mu\text{m} = 136.3 \mu\text{m} = 0.1363 \text{ mm}$$

▲ on the measurement procedure:

- Move the selected measuring mark until it is flush with the starting point of the object structure/ distance to be measured ⇒ 1st read-off value.
- Use the drive of the integrated measuring spindle to move the measurement mark to the end point of the object structure/distance to be measured until it is flush with the end point ⇒ 2nd read-off value.
- The difference between the two read-off values converted to scale parts is the result of the measurement.

NOTE To minimize random deviation, the object must be measured several times and the average from these single measurements must be taken as the result.

▲ on the integrated digital micrometer 46 EH:

The integrated digital micrometer 46 EH features a function selection ring and a function key. This makes it possible to choose from different measuring functions:

- Value adjustment to "+" or "-" (PRESET),
- Normal use "N".
- Zero reset of the digital display at any point of the "0" measuring range, e.g. at the starting or end point of the measured distance.
- Measuring unit of the display in mm or inches "IN/M".

The **RS 232 C data output** is available as a further feature.

For further details please see the enclosed manual "Digital micrometer 46 EH".

2.7 4" x 5" Microscope Camera

2.7.1 Attachment to the stand

- Use SW 3ball-head screwdriver to loosen the clamping screw (2-27/2, concealed).
- Remove dust cover (2-27/3) and slide the microscope camera (2-27/1) in the camera port.
A fixation pin, which must clickstop in the bored hole (2-27/4) on the stand, has been attached to the microscope camera for horizontal alignment.
- Finally, tighten clamping screw (2-27/2) using SW 3 screwdriver.

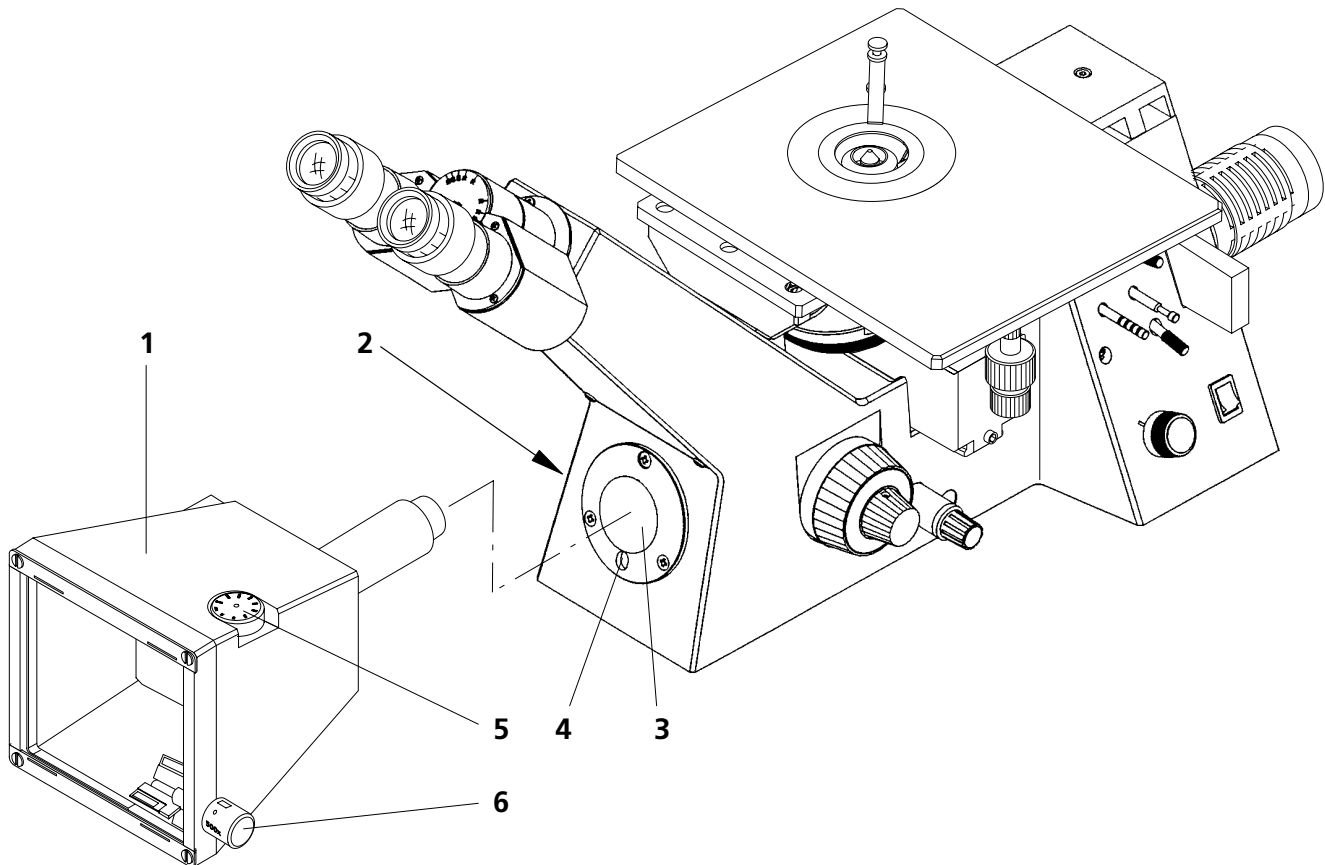


Fig. 2-27 Attachment of microscope camera

2.7.2 Control elements

- Wheel for setting the film speed (2-27/5)
- Knob for scale setting (2-27/6)



Objectives	Overall magnification (objective magnification x magnification factor of the camera)	Size of scale in the object
5x	50x	200 μm
10x	100x	100 μm
20x	200x	50 μm
50x	500x	20 μm

NOTE The method of displaying the scale is very simple and budget-priced. In the case of objects of a pronounced structure, the scale can be superimposed. The scale cannot be displayed in darkfield observation. Detailed information on the operation of the microscope camera is contained in manual G 42-407/I, MC 80 Microscope Camera.



3 Maintenance and Troubleshooting

3.1 Maintenance

Maintenance of the the Axiovert 25 CA microscope is limited to the following operations:

- Cover the instrument with the dust cover after every use.
- Clean exposed optical components whenever required.
- Carefully remove moisture deposit or precipitated aggressive vapor using a dry cloth.
- Protect the instrument from temperatures above 50 °C, frost, humidity, chemically aggressive vapor/substances.
- Remove dust from optical surfaces using a rubber blower or a natural hair brush which can be degreased in alcohol and dried afterwards. Remove stubborn dirt and fingerprints using a dust-free cloth or leather; breathe on the dirty surface, if required.
Clean the front lenses of the objectives using petroleum ether, but do not use alcohol.
- Use commercially available optics cleaning cloths to remove stubborn dirt; if necessary, lightly moisten the cloths with petroleum ether.

When using the Axiovert 25 CA microscope in humid climatic zones, proceed as follows:

- Store the Axiovert 25 CA microscope in bright, dry and well ventilated rooms with a humidity of less than 85 %; store particularly sensitive components and accessories, such as objectives and eyepieces, in a dry closet.
- When storing the equipment in closed cases for a longer period of time, the growth of fungus can be avoided by including cloths soaked in fungicide in the cases.

NOTE The risk of growth of fungus on opto-mechanical instruments always exists in the following conditions:

- relative humidity of more than 75 % and temperatures between +15 °C and +35 °C more than 3 days;
- installation in dark rooms without air ventilation;
- dust deposits and fingerprints on optical surfaces.

3.2 Troubleshooting, change of microscope stage and service

Troubleshooting on the Axiovert 25 CA is limited to only a few actions:

- Checking the line voltage
- Checking the illumination equipment
 - Change of fuses as described under (1)
 - Change of 6V 25W halogen lamp as described under (2)
 - Change of 12V 100W halogen lamp as described under (3)
 - Change of HBO 50 lamp as described under (4)
 - **Change of relector module and fluorescence filter as described under (5)**

The change of microscope stages and service are described under (6), (7) and (8).

(1) Checking the line voltage

- Check the line cable (3-1/3) and replace it, if necessary.
- Remove the fuse holder (3-1/1) by pressing in the direction of the arrows on both sides and check the fuses (3-1/2); replace defective fuses (also see page 2-5).

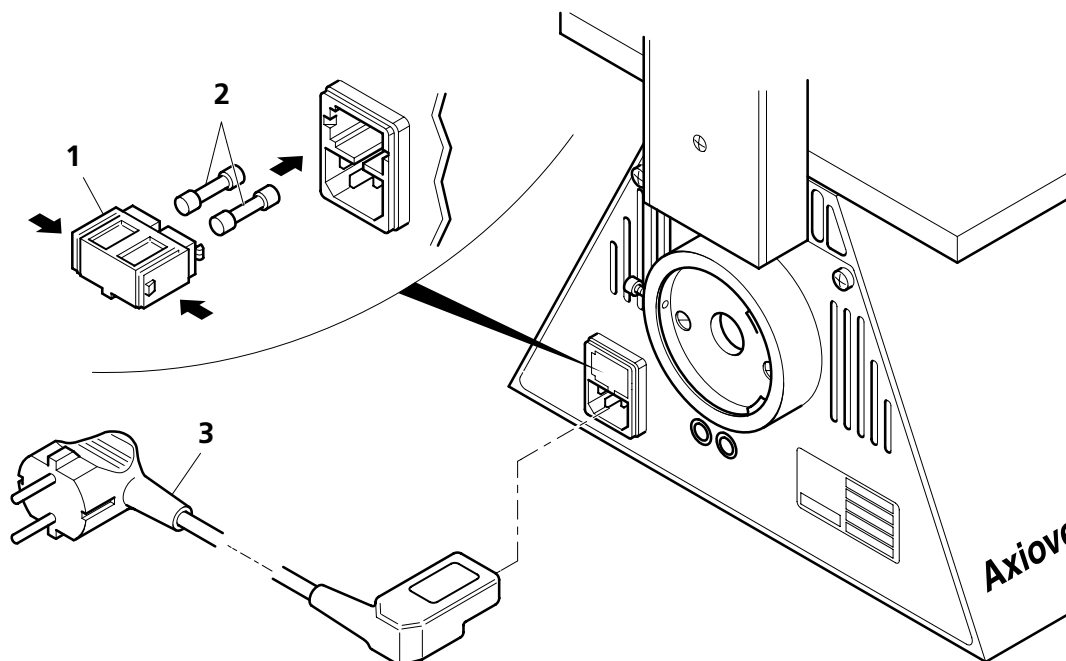


Fig. 3-1 Checking the line voltage

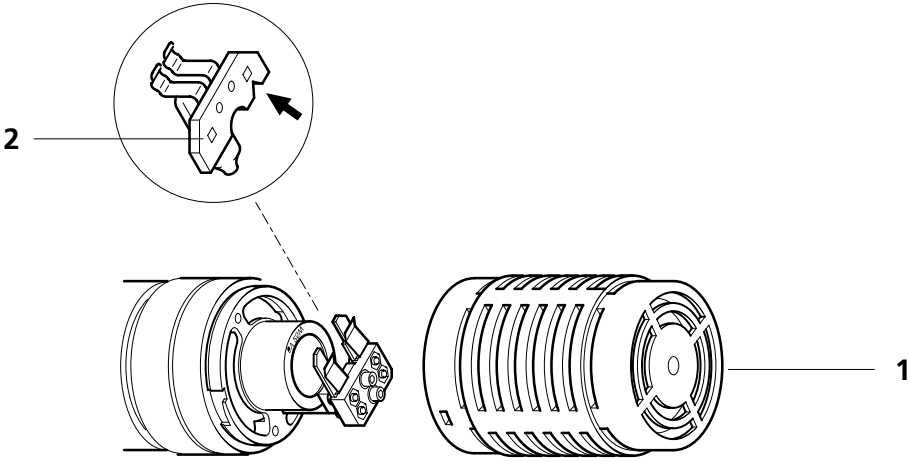


Fig. 3-2 Change of 6V 25W halogen lamp

(3) Change of 12 V 100 W halogen lamp

- Switch off the microscope and disconnect illuminator and instrument cables from the line. Allow sufficient time for the halogen lamp to cool. The illuminator can remain on the microscope while the lamp is changed.
- Loosen screw (3-3/7) and remove upper part of housing (3-3/10) in upward direction.
- Pull defective lamp out of the mount (3-3/5) while pressing down both spring levers (3-3/4).
- Pull lamp (3-3/2) out of protective sleeve (3-3/1) until the pins project entirely (avoid fingerprints).
- Use the protective sleeve to hold the bulb at its lower end and insert the lamp in the mount while pressing down the spring levers (3-3/4). Press the spring levers briefly down again to enable the automatic positioning of the lamp.
- Attach upper part of housing and tighten screw (3-3/7).
- Connect illuminator cable to the line again.
- Remove the eyepieces and insert the centering telescope (remove filter and diffusion disk), view the pupil with image of lamp coil and reflector in the tube and check whether the gaps of the reflector image are filled. If required, correct the image of the lamp coil by focusing it using screw (3-3/9) and adjusting it horizontally using screw (3-3/8) and laterally using screw (3-3/6) until the coil image fills the gaps of the reflector image (see 3-3/11). Insert eyepieces again.

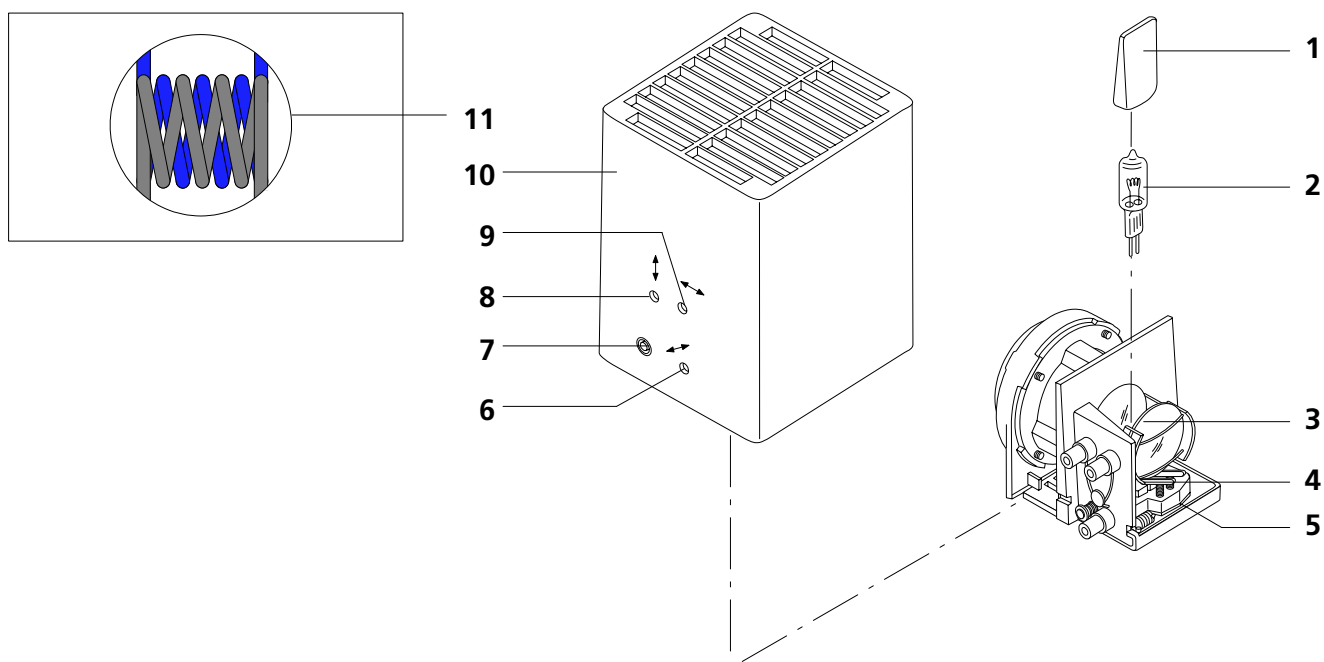


Fig. 3-3 Change of 12V 100W halogen lamp

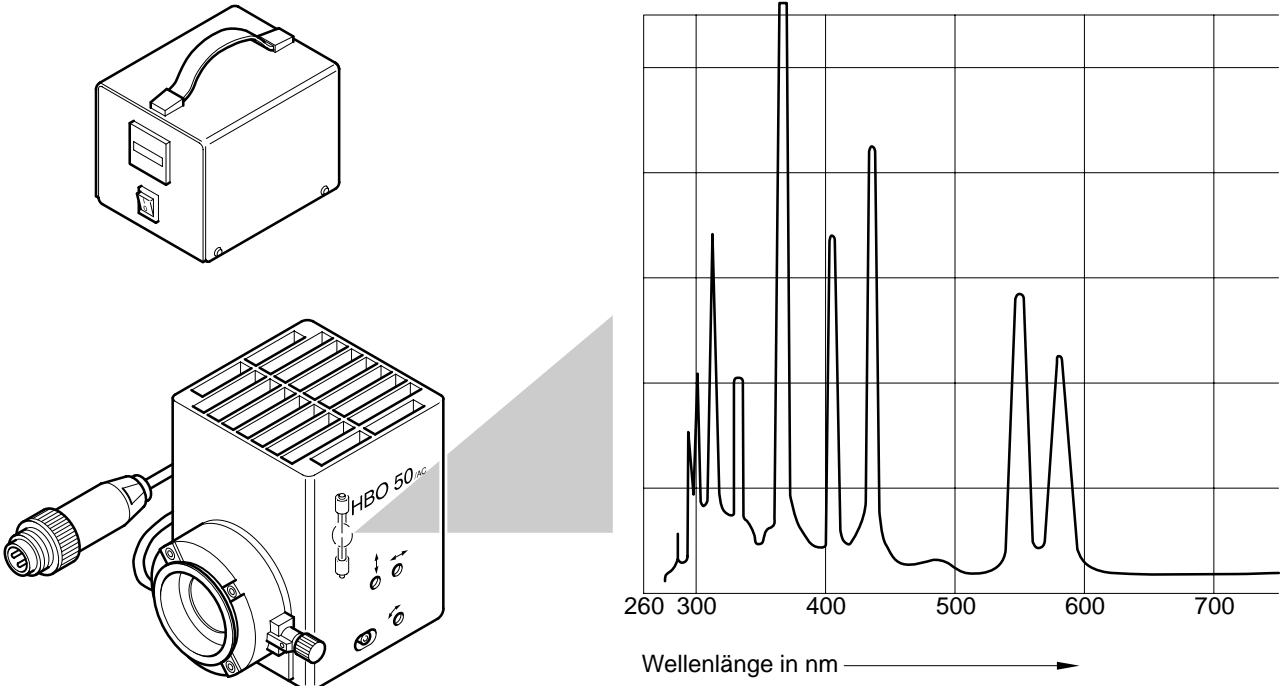


Fig. 3-4 HBO 50 illuminator and line spectrum

Safety notes for use

CAUTION The HBO 50 is under high pressure during operation. It may therefore only be operated in a closed microscope illuminator.

- The cooling process of the lamp housing must not be obstructed by covers.
- The HBO 50 must cool down for approx. 15 minutes before the lamp can be changed.
- The lamp emits UV radiation during operation. Protect your eyes and skin from this radiation. It is recommended to wear safety goggles when handling the microscope illuminator.

CAUTION The HBO 50 must be replaced after expiry of its average life of 100 h. When the average life is exceeded, the risk of explosion increases. The operating time of the HBO 50 can be read from the hour meter.



This warning plate on the rear of the illuminator means:

Caution: Hot surface!

Allow the lamp to cool down before touching it.

Change of lamp

CAUTION Switch off power unit and remove plug of lamp mount from the socket of the power unit. Allow lamp and lamp housing to cool down (approx. 15 min.).

- Remove HBO 50 illuminator from the microscope stand after loosening the clamping screw.
- Place the illuminator on a flat work surface.
- Loosen screw (3-5/1) using the SW 3 screwdriver supplied and remove the lamp housing (3-5/2).
- Press down spring lever (3-5/5), hold lamp (3-5/4) on heatsink (3-5/3) and pull it out of the lamp mount.
- Place the heatsink with lamp on the work surface in such a way that the clamping screw on the heatsink is accessible.

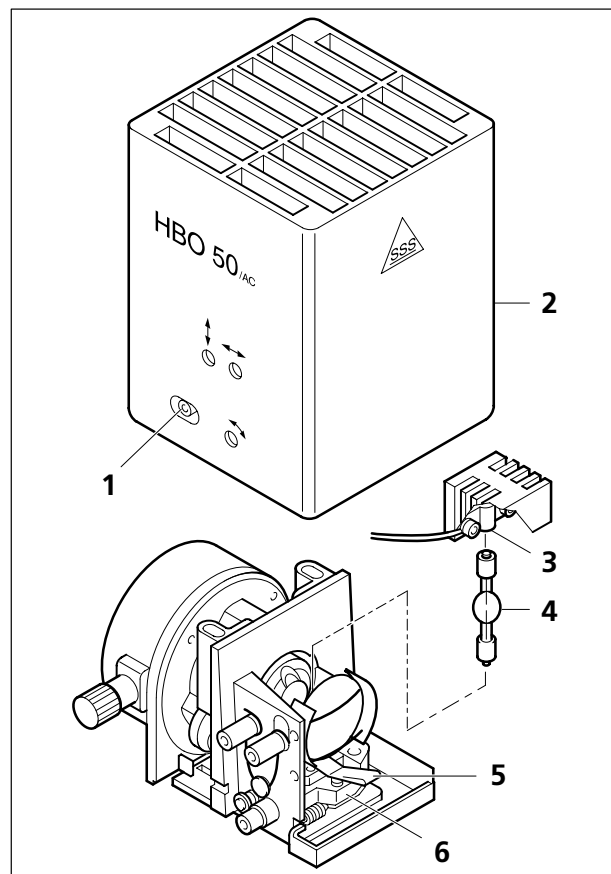


Fig. 3-5 Change of HBO 50 lamp



Axiovert 25 CA

Lamp adjustment

CAUTION Never look directly into the ignited lamp in order to avoid (irreparable) damage to your eyes. Use protective eyewear, e.g. sunglasses, to protect your eyes when observing the bright light spot.

- Unscrew an objective and check the image of the light source via the empty opening on a piece of paper in the object plane (on the object stage).
- Use the knurled knob (3-6/5) to focus the collector until both light arcs are in focus.
- Use adjusting screw (3-6/1) to set the lamp axially to the reflector until both light arcs are equally large, as shown in Fig. 3-7.

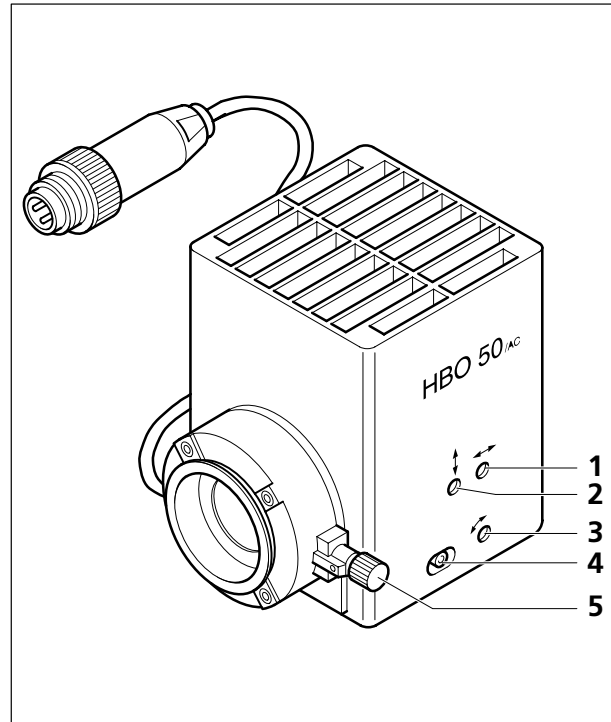


Fig. 3-6 Adjustment of HBO 50

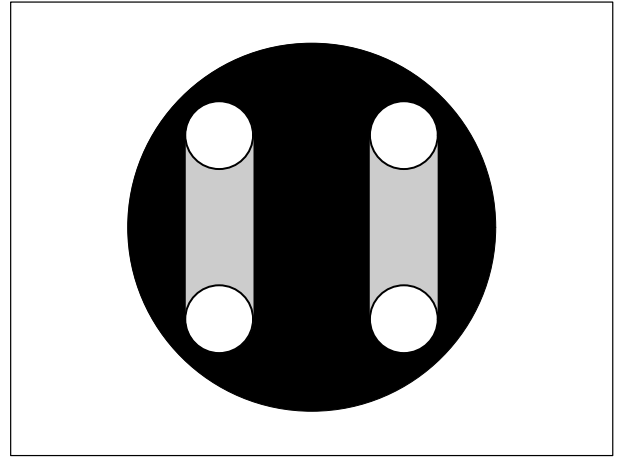


Fig. 3-7 Lamp image

(5) Change of reflector modules and fluorescence filters

The reflectors are equipped in the factory with the appropriate filter sets consisting of excitation filter, dichroic beam splitter and barrier filter, and inserted in the reflector mount as ordered. If required, the reflector modules can be replaced with others in no time (see Fig. 3-8).

The FL reflector module can be changed to be suitable for any required FL filter set (see Fig. 3-8).

Two examples of available filter sets:

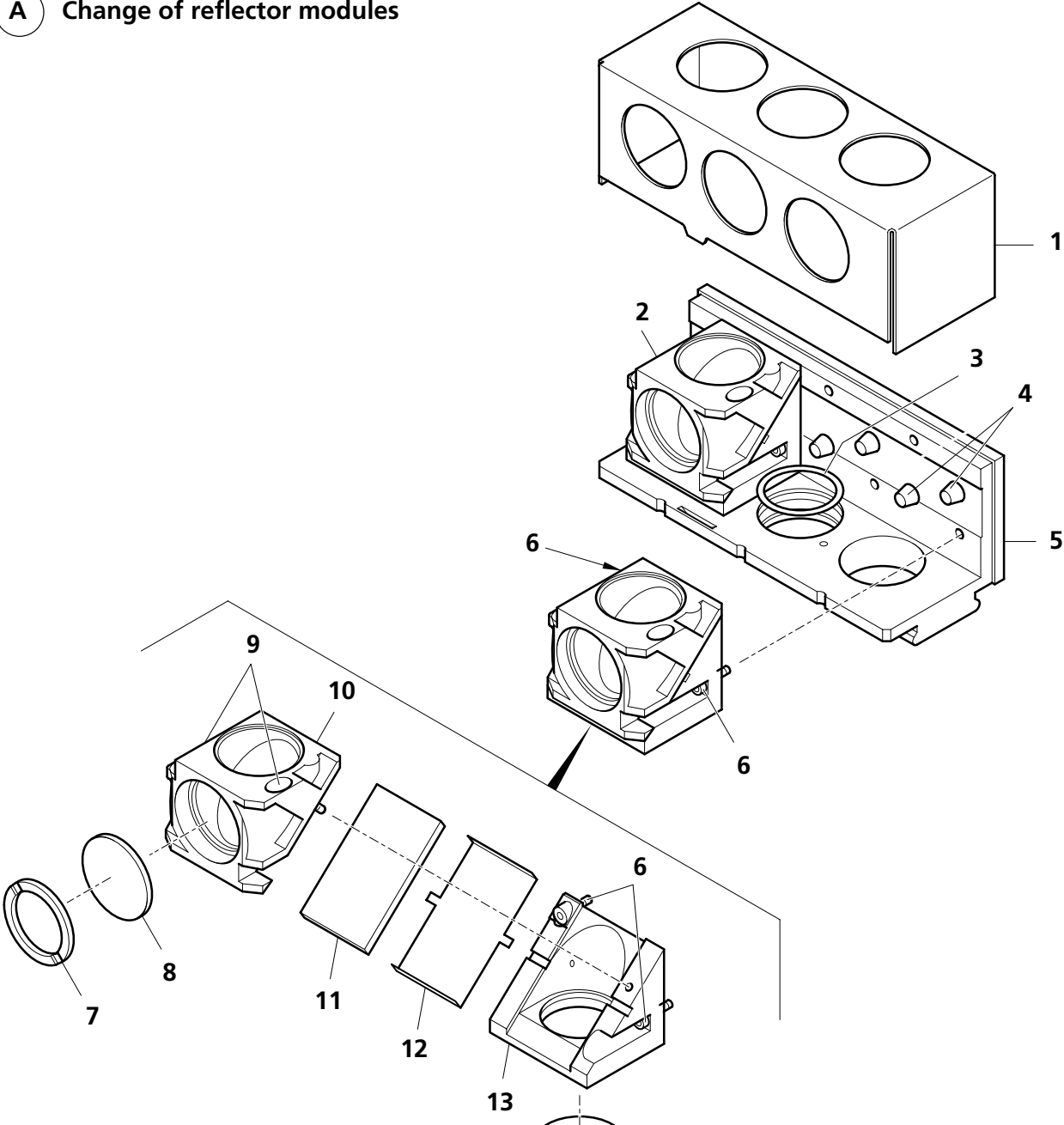
Blue 450-490 (487909)	consisting of	BP 450-490 FT 510 LP 520
Green H 546 (487915)	consisting of	BP 546/12 FT 580 LP 590

For further filter sets please see the price list!

- Pull reflector mount (3-8/5) out of the Axiovert 25 CA microscope.
- Remove cover (3-8/1).
- Loosen two screws (3-8/6) using SW 2.5 screwdriver, remove FL reflector module (3-8/2) and replace it with required, readily equipped reflector module, or proceed as follows when the FL reflector module is equipped with a new filter set:
 - Unscrew screw-on rings (3-8/7) in front of the excitation and barrier filter (3-8/8).
 - Unscrew excitation and barrier filter (3-8/8) using the suitable wrench, change filters and secure them using screw-on rings (3-8/7); follow the instructions for the installation of filters!
 - Loosen screws (3-8/9) using SW 2.5 screwdriver and remove the mount for excitation filters (3-8/10).
 - Change the dichroic beam splitter (3-8/11) in spring-mounted frame (3-8/12) and attach the frame to the mount for barrier filters (3-8/13); follow the instructions given on the information sheet included in the packaging.
 - Attach mount for excitation filters (3-8/10) to mount for barrier filters (3-8/13) with dichroic beam splitter and mounting frame and secure it using screws (3-8/9).
 - Attach equipped reflector module to the guide pins (3-8/4) in the reflector mount and secure it using screws (3-8/6).
- Mark the position of the reflector mount (window is visible when the reflector mount is pushed in) using the adhesive label supplied.
- Insert the reflector mount in the Axiovert 25 CA microscope

NOTE If more than three reflector modules are required frequently, the use of a second reflector mount, which can be ordered separately, is recommended.

A Change of reflector modules



B Change of fluorescence filters

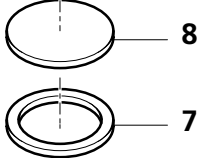


Fig. 3-8 Operating the reflector mount and the FL reflector module

(6) Changing the microscope stage

The Axiovert 25 CA microscope is usually supplied with entirely mounted microscope stage. Depending on the order, this can be the "fixed" mechanical stage 30 x 30 (standard) or the "rotary" mechanical stage 30 x 30/90° R. The fixed mechanical stage is for operation with either the right or the left hand, the rotary mechanical stage can only be operated with the right hand.

Proceed as follows to change the operation side of the fixed mechanical stage:

- Loosen and remove the fixation screws of the fixed mechanical stage (3-9/1).
- Remove the stage in upward direction, rotate it around 180° and attach it to the stand (3-9/11) again. Insert and tighten fixation screws again.

Proceed as follows to mount the rotary mechanical stage (3-9/6):

- Loosen and remove fixation screws and remove the fixed mechanical stage (3-9/1). Unscrew fixation bar (3-9/2) and mounting cylinder (3-9/3).
- Attach stage carrier (3-9/8) to the stand (3-9/11) and tighten screws.
- Attach rotary mechanical stage (3-9/6) to the stage carrier in such a way that the spring pin (3-9/9) of the stage carrier and the orientation notch (3-9/5) of the mechanical stage engage.
- Then insert the mechanical stage in the ring mount of the stage carrier by slightly pressing downwards and on the spring pin. Fix the stage rotation using screw (3-9/4).

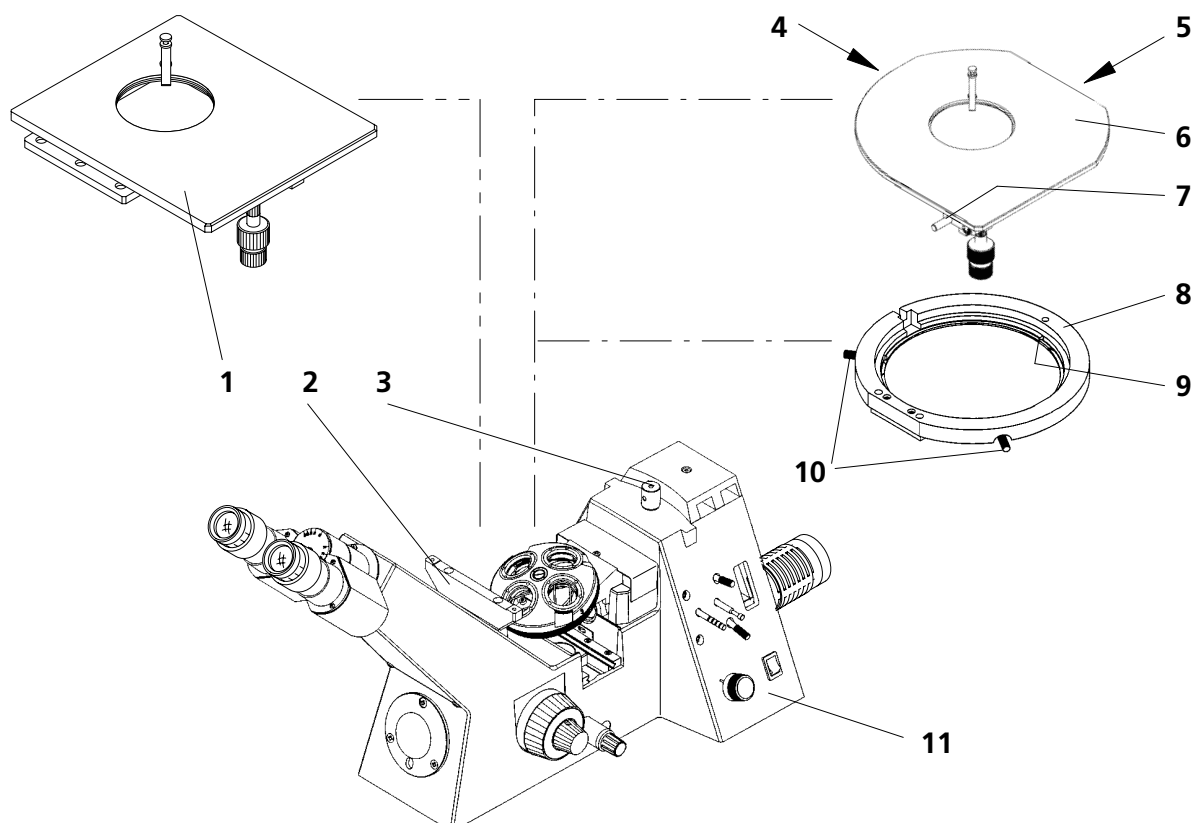


Fig. 3-9 Changing the microscope stage

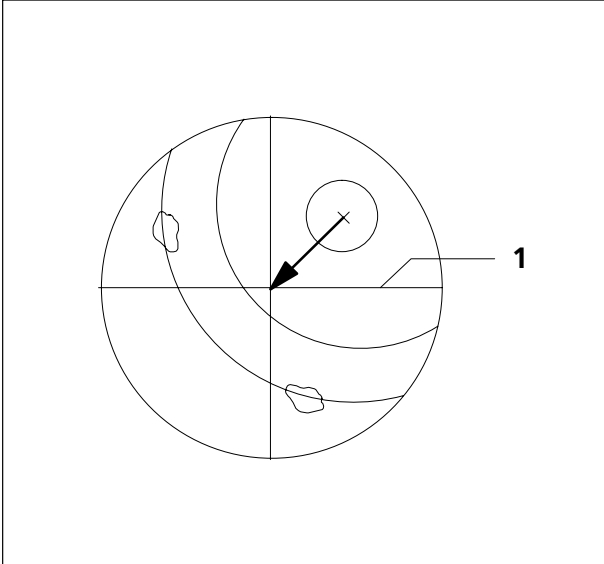


Fig. 3-10 Centering of the rotary mechanical stage





ANNEX

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List of abbreviations

A	incident light
a	free working distance
BP	bandpass
Br.	spectacle wearer
C	camera
CB	<u>C</u> onversion <u>B</u> lue (filter description)
CP	Clinical Plan
D	darkfield
DIC	differential interference contrast
DIN	German industrial standards
EG	European Community
EN	European standards
ENG	bayonet mount for video cameras (<u>E</u> lectronic <u>N</u> ews <u>G</u> athering)
FL	fluorescence
foc.	focusing
fot.	photographic
FT	dichroic beam splitter
HBO	mercury vapour short-arc lamp
H	brightfield
HD	brightfield and darkfield in incident light
HAL	halogen lamp
ICS	<u>I</u> nfinity <u>C</u> olour-corrected <u>S</u> ystem
IEC	<u>I</u> nternational <u>E</u> lectrotechnical <u>C</u> ommission
IP	<u>I</u> nternational <u>P</u> rotection
ISO	<u>I</u> nternational <u>O</u> rganization for <u>S</u> tandardization
Korr	correction mount or ring
Pol	polarization
Ph	phase
PI	flatfield
SF	field-of-view
SFZ	field-of-view number
SLR	<u>S</u> ingle <u>L</u> ens <u>R</u> eflex (camera)
SK	protection class
vis	visual
λ	lambda

