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General functions

Error statuses in a CAN-node can have different causes:
Communication errors occur if transmittance on the RS232 lines is disturbed or if data is continued to be sent in spite of the CAN-node not being ready for reception (displayed by handshake).
Timeout errors occur if a CAN-node function wants to transmit data which is not accepted by the recipient or if a function waits for receiver data which have not been transmitted.
Syntax errors occur if, for example, an incorrect command name is transmitted (fail character, name too long or too short, command not existing), or if a command is transmitted with the wrong number of parameters or wrong parameter types.
Errors in function execution occur if transferred function para-meters or combinations of parameter values result in fail values.
Hardware errors occur if there is a defect in the hardware (blocked motors, defective components, etc.).
Where errors can cause damage to the instrument, measures are taken immediately by the CAN-node (if possible) to avoid this. (For example, the motor current is switched off in the case of blocked motors).
Otherwise, it is the job of the activating program to enquire the error status and to provide suitable remedy.
Errors are displayed as follows:

- ❑ an error byte which can be read using the **Eb** command;
- ❑ a red LED which is normally off, but permanently switched on in the event of an error until backout of the error status by reading the error byte.

The following error bits occur in the error byte:

- ❑ 0 - Overrun Error (Input-Buffer Overflow)
- ❑ 1 - Transmit Error (Output-Buffer Overflow)
- ❑ 2 - Timeout on send (function waits in vain for host to be ready to receive data)
- ❑ 3 - Timeout on read (function waits in vain for data from host)
- ❑ 4 - Reserved
- ❑ 5 - Syntax error (detected by the command interpreter. Can also be caused by a transmittance error.)
- ❑ 6 - Not yet assigned
- ❑ 7 - Error during executing of function (cause: wrong parameter value or hardware error)

Test functions

To test the hardware, functions are available which permit data to be written byte-by-byte on any position in the memory address range (**TB**) or to be read from any position (**Tb**).
Furthermore, (Trn) and (Tpn) permit the A/D converter and ports of the uP 517A to be read, and (Tpn) enables the ports to be written.
The use of commands permitting a change of the memory range require detailed knowledge of the hardware because wrong application may result in a system crash.
A green LED blinking in 0.5 s intervals indicates that the processor does not yet run properly, even when the red error LED is switched on.

Start sequence

Every CAN-node runs through the following sequences during startup:

- ❑ Initialization of the processor and the hardware and checking the EPROM application, approx. 3 s.
- ❑ Waiting time of 1 s until all CAN-nodes are initialized
- ❑ Checking whether further CAN-nodes are connected to the network (the CAN-bus status is set accordingly)
- ❑ Waiting time of 1 sec until all CAN-nodes have sent queries to each other
- ❑ Starting of application program

During this start sequence, the red LED is on continuously, the green LED blinks in 0.5 s intervals.

Note: For further information, please order the detailed programming instructions from our service department.

Communication via CAN

Protocol

Communication between the connected CAN-nodes is performed via CAN-bus.
In every CAN-node , incoming data is stored in the reception buffer via an interrupt routine.
Transmission is made without interrupt in the base loop with the lowest priority.
If transmission cannot be made via the CAN-bus, the trial is interrupted after a time-out of approx 1 sec and the error byte is set.
The interrupt-controlled reception routine of a CAN-node is always active and cannot be switched off on the CAN-bus.
Data of the CAN interface: 100,000 Baud. (Can controller parameters: 4, 1C, AB).

Statuses

In the basic status, a CAN-node waits for commands from the host/control panel and simultaneously performs incremental part functions of so-called continuous functions. Continuous functions are functions which require the CPU CAN-nodes to be permanently active or which need some time and are therefore processed incrementally so that control can be forwarded to the command interpreter in the meantime. (Example: blinking of the green LED).
If a complete command has been received (via CR), it will be passed on to the command interpreter and the system adopts the status **Function Performance**.
The functions activated by the command interpreter can take data from the input buffer or write data in the output buffer. (Substatuses **Data Reception**, **Data Transmission**). The stand control returns to the basic condition from all statuses by activation of **Time Out**, if need be.

Command structure (input format)

A command consists of a sequence of ASCII-characters which is finished with Hex 0D (CARRIAGE RETURN).
Only printable ASCII-characters, and no binary-coded data (except the carriage return as end character), are permitted.
A command consists of a name and parameters. A name always consists of two letters.
The first letter (always a capital letter) normally designates the function group, the second letter (capital = WRITE, small = READ) the actual funtion.
All parameters are numeric (INTEGER, 8-bit) and strings are permitted.
String parameters are always last and are delimited by quotation marks (”). Numbers are transmitted in different fixed formats.
When a command line is executed, the syntax is checked. If a syntax error occurs, all characters up to the next CARRIAGE RETURN are bypassed!

Output format

Each numeric or non-numeric output is made in the ASCII-format. Strings are transmitted without any special delimiters (quotation marks).
The target address and source address is given before every number or every string, and the CARRIAGE RETURN character (Hex 0D) is then entered as the end character. It is therefore possible at all times to see which CAN-node the message is coming from.

Formats		
0 ... 255	0 ... 255	preceding zeros can be deleted
0 ... 255	00 ... FF	2 characters must always be transmitted (TB)
0 ... 65535	0000 ... FFFF	4 characters must always be transmitted (TD2)
0... ± 8388607	000000 ... FFFFFF	6 characters must always be transmitted
”Str1”		string format, max. 4 characters between 2 quotation marks

Important:
A message may contain max. 8 byte of information, plus 2 byte of addresses and 1 byte with the end character (CR). This means that a message is 11 byte long.

Interface Description

WARNING!

Destruction of the electronic system
Wrong interface configurations can destroy the electronic system. This interface description is therefore meant for personnel trained in the use of hardware and software only.

General

Every microscope unit, described as a CAN-node in the following, has its own address which may occur only once within the network.
(Range A...Z, switch position 1...x).
This address enables individual activation of every CAN-node via the RS 232 interface.
During communication, the target address must be sent first, then the source address and then the actual command!
A uniform BIOS (Basic Input Output System) containing the communication via RS232 and CAN is used for all CAN- nodes on the basis of the 80C517A uP.
Furthermore, the BIOS also contains a Download Routine which allows the firmware of a CAN-node, if EEPROM is present, to be changed during operation.
Further commands are available for test purposes, e.g. to test memory and ports.

CAN-BUS

The CAN-bus (**C**ontroller **A**rea **N**etwork Serial Communication Bus) has been developed in the automotive industry especially for high data security and fast reaction times. It allows the use of approx. 26 instrument units (CAN-nodes) in a network.

Technical Data:

- Transfer rate max. 1000 k Baud (100x faster than RS232 with 9600 Baud)
- single-wire transfer (can also be used for light guide transfer)
- automatic error recognition and transfer repetition
- multimaster
- real time
- approx. 40 m cable possible with 1000 k Baud and
- approx. 600 m cable with 100 k Baud

Communication via RS 232

Protocol

Communication between the CAN-network and the PC (host computer) is performed via RS232. The PC can be connected to any required CAN-node.
(For test purposes, it is also permitted to connect several PCs to the CAN-network).
Prior to transmission of each individual character, each communication partner must check whether the other partner is ready for reception. The RTS and CTS handshake lines are used for this.
Normally, the Interrupt-controlled reception routine of a CAN-node is always active. If functions are performed where time is a critical factor, or if the input buffer is full, the handshake is switched to "not ready for reception".
At 9600 Baud, overfilling of the input buffer is not possible in the practice, since the interpreter normally deals with the data faster than it can be supplied by the RS232 interface.

Data of the RS232 interface:

9600 Baud, 8 data bits, 1 stop bit, no parity.

The pin assignment of the RS 232 C interface is identical to that of the PC (see → Fig. 129).
The lines in the cable connecting the Axioplan 2 and the PC have been crossed.

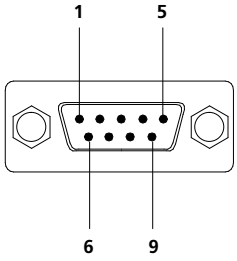


Fig. 129 **Pin assignment of RS 232 C interface (view on connector front)**

Technical Data

Range		Description
Ambient conditions		
Room temperature		+10 ...+ 35 °C
Humidity		max. 75 % at + 35 °C
Storage temperature		– 40 ... + 70 °C, humidity 10 ... 30 %
Weight		depending on configuration used
Safety		
Equipment class		I
Degree of protection		IP 20
Radio disturbance characteristics		conforming to EN 55011 (Class B)
Electromagnetic immunity		conforming to EN 50082-2 The instrument meets the requirements of the EC directive 89/336/EEC and EMV/Nov. 1992
Degree of contamination		2 (Altitude 2000 m)
Overvoltage category		II
Electrical supply		
Power connection	230 V: 115 V:	187 ... 264 V, 50/60 Hz convertible to 90 ... 127 V, 50/60 Hz
Power consumption		approx. 225 VA
Data for connection of Axiophot 2		
Voltage supply		+5 V, +15 V
Data for connection of 12V/100W microscope lamp		
DC voltage, stabilized		3 ... 12 V; suitable for photometry (continuous light)
12V/100 W halogen lamp		
Lamp voltage		12 V
Power		100 W
Color temperature at 11.5 V		3200 K
Luminous flux		3100 lm
Mean service life		50 h
Luminous surface		3.1 x 3.1 mm^2
Fuses		
Power inlet		F1/F2: 115 V / 230 V; T 4 AH / 250 V according to IEC 127

Care, Maintenance

General

The instrument back may be removed only by service personnel.

Please ensure that your instrument is not exposed to inadmissible climatic influences (humidity and temperature) for longer periods of time.

Always protect the instrument against dust and humidity. Therefore, always drape the dust cover over the instrument after use. Do not forget to switch off the lamps first.

Remove dust on optical surfaces using a natural hair brush and a squeeze-blower device.

To remove stubborn dirt or fingerprints, use commercially available cloths for cleaning optics and eyeglass lenses.

For moving your Axioplan 2 to another location on your premises, ensure that all mobile parts are secured in position or transport them separately. Also protect your instrument against toppling, cover it and ensure under all circumstances that it is not subjected to knocks or mechanical shock. If you are in doubt, please contact our customer service staff.

Lamp change

Prior to every lamp change, ensure that you read the special instructions and safety regulations of the lamp manufacturer.

Allow the lamp to cool down appropriately before you change it.

Even at room temperature, lamps filled with xenon gas are subjected to considerable internal pressure. Therefore, always wear gloves and face protection for your personal safety.

Never touch the glass of the lamps with your bare hands. Even the slightest trace of grease may impair the intensity and service life of the lamp.

Ensure that the used lamps are disposed of in a proper way.

For further information, please see the information leaflet enclosed with the mercury short-arc lamp, e.g. the HBO 103.

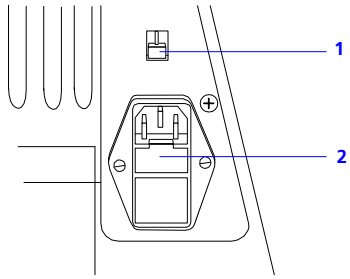
Conversion of the line supply

Your Axioplan has been designed for use with a line voltage from 187 to 264 V or from 90 to 127 V (line frequency 50 to 60 Hz). A standard voltage of 187 to 264 V is set in the factory. intended for this purpose on the rear (**1**) of the instrument. This is also where the voltage set can be visually checked.

- Insert a screwdriver of the appropriate size in the slit of the red slider knob.
- Push the knob up or down depending on its present setting.
- The line voltage now set can be read at the red knob.
  Slit at the upper end of the window = 115 V (for the voltage range 90 to 127 V)
  Slit at the lower end of the window = 230 V (for the voltage range 187 to 264 V).

Changing the fuses

Compartment (**2**) for mounting the instrument fuses is also located on the rear of your microscope. It contains two T4 AH fuses for 115/230 V.



1 Viewing window for supply voltage
2 Fuse compartment

Fig. 128 Rear of stand - Fuse compartment

- Pull out the fuse compartment in a forward direction (use a small screwdriver, if required), remove the defective fuse and insert a new one.
- Press the fuse compartment back into the rear panel of the instrument.

Fluorescence photography

The following specialties apply compared to photomicrography:

- The often low brightness requires long exposure times. Before taking the exposure, therefore select the option **100% of light to film** under **Set Exposure Function**. Reduce the brightness of the luminous frame in a useful way.
  At lowest brightness, set the beam splitting to 100 % of light for observation and again select the function **100% of light to film** before taking the exposure.
- Fluorescence light is neither daylight nor artificial light, but is generated in the specimen itself. Normally, better results are obtained in fluorescence microscopy when daylight films are used.
- Don' t be afraid of using high-speed films. The graininess of such films rarely impairs the quality of fluorescence images.
- The dark or black background will often cover a large part of the measuring field of the automatic exposure metering system (also with spot metering). Especially in the spot area, the brightness/darkness ratio can be easily estimated and corrected via exposure correction.
  If a typical measuring area of a specimen shall not remain in the image center during the exposure, you can store the appropriate exposure time, move the requires specimen section into the center and then release the exposure.
- The exposure margin is considerably large due to the high "contrast" because luminous structures in front of a dark background always stand out clearly even in different illumination.
  However, if an exact color rendition of the fluorescence dyes is important to you, an exposure series with different exposure times is recommended.
- Some fluorescence dyes bleach out quickly, especially under pronounced, high-energy excitation radiation. To protect the specimen, you can reduce - at least temporarily - the excitation intensity via the aperture diaphragm.

Note: Always remember that weak fluorescence is more visible in a dark workroom.

Exposure times and filters

The Axiophot 2 Photo module covers the following longest exposure times for 35 mm film with exposure cor rection 0:

Sensitivity of the film	Longest exposure time
100 ISO	960 s
400 ISO	240 s
1600 ISO	60 s
6400 ISO	15 s

Filters for Photomicrography	∅ 32 mm	∅ 18 mm
gray filter 0,50 (50 % transmission)	467840	
gray filter 0,12 (12 % transmission)	467841	
gray filter 0,03 (3 % transmission)	467842	
neutral-density filter 0,25 (25 % transmission)		467856
neutral-density filter 0,06 (6 % transmission)		467855
sonversion filter 3200-5500 K	467847	467854
blue filter CB 6	467851	
blue filter CB 3	467852	
interference-green filter	467803	

Correction of the color balance of color reversal films

The color balance of a type of color reversal film can differ from batch to batch.
Both these deviations and influence from the optical system on the color can be compensated using commercially available color compensating (CC) filters.
The filter density is indicated by a 2-digit number and the color by its initial letter.
Examples: 05 - B (blue, 10 - G (green), 20 - R (red)

Assessing the color balance

- View slides on a standard light box, the light source of which has the correct illuminance and the spectral energy distribution of 5000 K.
- Take test exposures of an object area with as much empty background as possible in transmitted-light brightfield.
- The empty background of an exposure series should range from dark gray, medium gray and light gray to white.

Correction the color balance

- Place CC filters in the complementary color of the color tinge on the slide to be corrected.

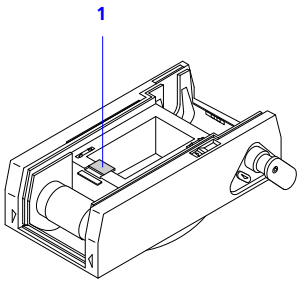
Color tinge	Color of the CC filter
blue	Yellow Y
green	purple (magenta) M
red	bluish green (cyan) C
yellow	blue B
purple	green G
bluish green	red R

If the required color balance is obtained during observation using a filter with density 10, for example, a CC filter of half th is density, i.e. density 0.5, should be used for the exposure to follow. Normally, filters of density CC-05 to CC-10 are sufficient for correction.

Note: Perfectly corrected color exposures make it necessary that the microscope setting, the developing procedure and the film batches remain unchanged.

Data projection for 35 mm photography

The data projected into the image may be poorly legible against bright object structures. We would therefore recommend you to slide the data shield (Fig. 127/**1**) on the film support into the frame window until stop. This shield masks out a field of 2.5 mm x 14 mm at the edge of the format, and the data are then clearly legible on the black background.
The data shield can be moved only before insertion of the film; it is not possible to move it while a 35 mm casette is attached! For the position of the data field please also see → Fig. 76 on page 63.



1 Data shield

Fig. 127 35 mm film cassette mot

Compensation of reciprocity failure

The automatic compensation of the reciprocity failure (RECI value) may become effective in the case of exposure times of more than 1 second.
When the film type is entered, the relevant data are automatically called from the database of the software and the exposure time is corrected.

When using films not included in the database, determine the correct value as follows:
No test exposures are required if the film manufacturer indicates the extension of the exposure time, e.g. +2 values for an exposure time of 10 s. "+ 2 values " means that the exposure time must be quadrupled, i.e. 40 s.

- First, set your microscope in so that the automatic system indicates 10 s with RECI set to 0 (in this exceptional case, you may use the aperture diaphragm to reduce the brightness).
- Now change the RECI value and you will quickly find the one which most closely approximates 40 s. This will then be the value for your film (8 in the above example).
  If no data have been indicated by the manufacturer, test exposures in the range of the required exposure time must be made using the RECI values 0 ... 9 (see → page 60).

Photomicrography with the Axiophot 2

Note: If your polarizing microscope (Axioplan 2 Pol, Axiophot 2 Pol) is equipped with an intermediate tube Pol, you must remove the wire reticle (see → Fig. 99/**3**) from the beam path if you do not want it recorded in the photo.

How to proceed for photography

- Carefully set your Axiophot 2 Photo module for observation.
  Set the beam splitter to allow simultaneous observation and photography (→ *Microscope Software)*.
- Select illumination technique, objective magnification and condenser setting as usual.
- Set the brightness required for observation (3200 K color temperature) on the stand (Fig. 3/**4**).
- Load the correct film into the film cassette and attach the Photo module.
- Select the film type used under **Film data** in **Photo** program module. Set the required exposure metering technique (normally center-weighted averaging) and the illumination technique (FL/D, H/Ph/DIC, H) under **Mode**.

The display field of the **Photo** menu now shows the exposure time, the correct data of the loaded film, and the frame counter.

- Switch on the luminous frame.
- Set the image frame and focus.

Proceed carefully. If the focusing cross and the specimen are visible in focus simultaneously, imaging on the film will also be in focus.
In the case of a low objective magnification, the use of the Optovar 2.5x or the **Focus Finder** function are absolutely required as a focusing aid.

- Click **START** to take the photo.

The following is then performed automatically:
– luminous frame disappears
– new, current exposure metering
– exposure
– data projection
– film advance
– luminous frame appears again
The next exposure can be released.

Film selection

Reversal films (films for slides) are used for color photomicrography. In general, we would recommend reversal films for artificial light (3200 K).
If daylight film is used, the conversion filter 3200/5500 is required.

Films marked "professional" feature closer tolerances in sensitivity and color balance, i.e. homogeneous results are obtained. Always use DX-coded films in their original cartridges.
We would advise against the use of long films, since light entry, scratches on the film, dirt, etc. might impair the quality or damaged cartridges can result in defective film advance.

Use of yarded films

We do not recommend the use of yarded films, since unintended illumination, scratches or dirt on the film etc. might impair the quality of the film. The use of damaged cartridges can result in defective film advance.
If you wish to work with a yarded film, please be sure to follow these instructions:

Only use DIN 4335 or ISO 1007-1977 cartridges. Make sure not to exceed the given maximum measurements.

Film cartridges are not suitable for continuous operation. Discard the cartridges after 10 loads to the most.

The front part of the film needs to be cut in accordance with DIN 4536 or ISO 1977 (→ Fig. 126).
– Do not cut through a perforation hole when cutting the front part of the film.
– The cut needs to be as long as 7 ... 9 perforation holes and must run parallel to the edge of the film.
– The corners must be rounded in order to prevent the film from jamming the cartridge opening or parts of the cassette.
– The end part of the film must be cut off at a right angle and secured tightly with adhesive tape.
– Avoid using very long films (some cartridges cannot be used for 36 exposures with every type of film). This could result in defective film advance.

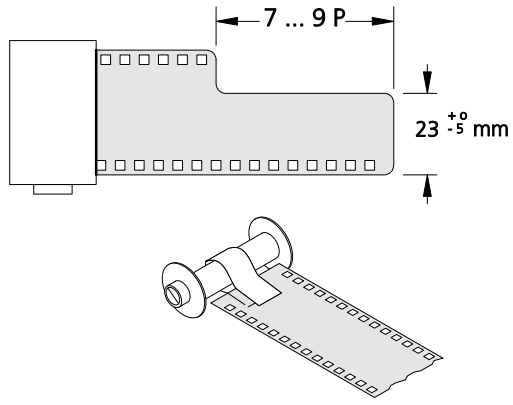


Fig. 126 Use of yarded films

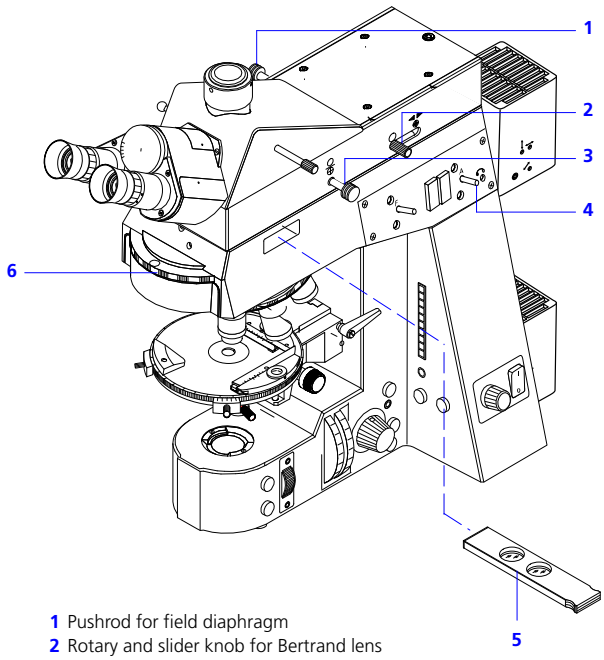
Incident-light polarization - Detection of bireflection and reflection pleochroism

Use

Polished sections of ore minerals, coals, ceramic products, specific metals and metal alloys display a different reflection behavior depending on the orientation of their crystals or object features. Thus, this technique is also another contrasting technique.

Adjustments

- Adjust your polarizing microscope for standard examinations in incident light (see → page 132).
- Bring the reflector module Pol into the beam path by turning reflector turret (**6**). The incident-light polarizer is oriented in the E-W direction.
- Insert analyzer (**5**) into the analyzer compartment. The analyzer is oriented in the N-S direction.



1 Pushrod for field diaphragm
2 Rotary and slider knob for Bertrand lens
3 Pushrod for reticle
4 Pushrod for aperture diaphragm
5 Analyzer slider
6 Reflector turret

Fig. 125 **Incident-light polarization**

- Close the aperture diaphragm by 2/3 of its diameter by pulling out pushrod (**4**) as far as required.
- Your object will display bireflection if object features possess differences in brightness or color which change when the stage is turned.
- Pleochroism is present when color changes occur in the object during the turning of the stage (incident-light polarizer in beam path, analyzer swung out).

If the polarizing microscope you use for the examination of incident-light objects is equipped with an intermediate tube Pol, you must remove the Bertrand lens from the beam path using knob (**2**) and push in the pushrods for field diaphram (**1**) and for reticle (**3**).

Note: When knob (**2**) is in its front position, the Bertrand lens is swung out of the beam path, in its rear position, the lens is in the beam path.

DIC - Differential interference contrast in incident light

Use

This technique is used for the high-contrast display of reflecting surfaces featuring height differences of several wavelengths up to the λ/20 range.

Additional equipment

- ❑ Epiplan-Neofluar Pol, DIC or HD DIC objectives
- ❑ Special HD DIC W 0.8 or HD DIC M 27 nosepiece
- ❑ DIC sliders matched to the objectives used.
  The magnification and the aperture of the suitable objective are given on the top surface of the sliders. Push DIC slider into the slot until hear it snap in.
- ❑ DIC slider+ for maximum contrast at reduced resolution provided by objective
- ❑ DIC or DIC red I reflector module

DIC enhancement

If contrast is unsatisfactory using the standard DIC equipment, use the sliders marked + which are available for the objectives listed below (overview). The increased contrast may result in decreased resolution.

Objective	DIC slider
5x / 0,15	5x / 0,15 Epi +
10x / 0,30	10x / 0,30 Epi +
20x / 0,50	20x / 0,50 Epi +
LD 20x / 0,40	LD 20x / 0,40 Epi +

Note: If you want to work with the reflector module Pol, sliders with or without a compensator λ must be used for the analyzer compartment (see → Fig. 117 on page 125).

Additional comments

In DIC, contrast is caused by surface relief. With linear structures, therefore, contrast is dependent on whether the orientation of these structures is in the "light - shadow" direction (very low contrast) or at right angles to it (maximum contrast). For this reason, it is advantageous to have the possibility of object rotation to obtain an image displaying the highest contrast. This can be achieved using either a rotary mechanical stage or a rotary polarization stage.
Colored DIC is obtained if you use the DIC red I reflector module or if you insert a reflector module Pol together with an analyzer slider and a λ plate, rotatable by ± 10° (453662).

Incident light darkfield

Use

Additional equipment

Object features which heavily scatter light, such as scratches, cracks, pores or the surfaces of metal fractures light up bright in darkfield illumination. Ideal brightfield objects such as specular surfaces including features with different degrees of reflection remain completely dark, however.

- ❑ Nosepiece with connecting thread M 27
- ❑ HD Objectives
- ❑ reflector module D

Adjustments required

- ❑ Set illumination as for brightfield.
- ❑ Then switch to darkfield by swinging in reflector D on the reflector turret.
- ❑ Open luminous field diaphragm and aperture diaphragm fully, as this work in darkfield using the incident light technique requires maximum illumination intensity.

Note: When switching back to brightfield, do not forget to close the luminous field diaphragm and the aperture diaphragm to the normal values. There will otherwise be a risk of glare.

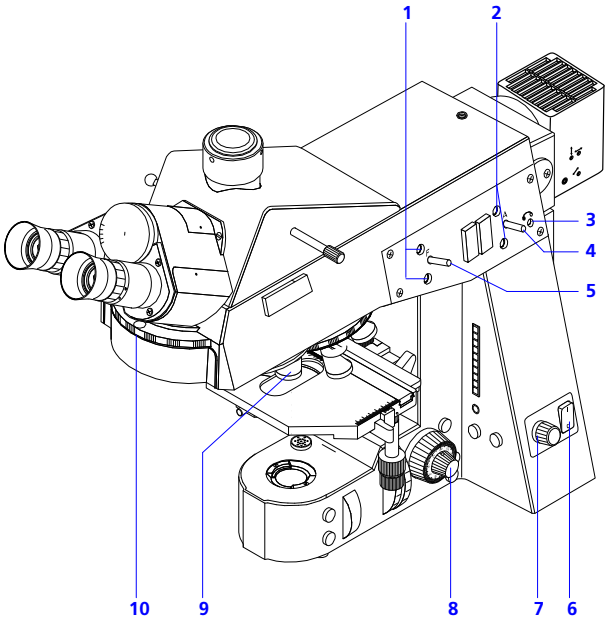
Incident light brightfield

(Fig. 124)

Note: In all incident-light techniques, the compensators 6 x 20 (see also → overview on page 115) must be removed from the beam path to prevent image quality from being impaired.

To set the incident light illumination in accordance with the KÖHLER principle, proceed as follows:

- On the rear of the instrument, switch on the incident light illumination using the toggle switch and then switch on the microscope at the ON/OFF switch (**6**).
- At voltage regulator (**7**) set approx. 3 ... 4 V as the supply voltage for the illumination.
- Place a polished specimen on the stage (align top surface parallel to support, e.g. with leveling press).



1 Centering screws for luminous field diaphragm
2 Centering screws for aperture diaphragm
3 Swing-in, swing-out facility for diffusing screen
4 Pushrod for aperture diaphragm
5 Pushrod for luminous field diaphragm
6 ON/OFF switch
7 Voltage regulator for light intensity
8 Focusing drive
9 Objective
10 Reflector turret

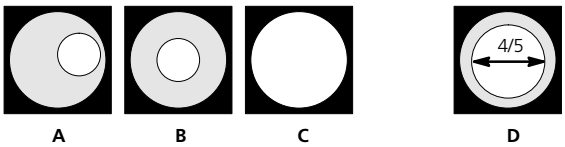


Fig. 124 Microscope setting for incident light brightfield

- Swing the 10x objective (yellow ring) (**9**) on nosepiece, and the reflector module for brightfield on reflector turret (**10**) into the beam path.
- Check the 0 positions on the eyepiece scale (→ page 98).

You should now see spots of light (the exit pupils) behind the eyepieces. If you are working with a binocular phototube, all of the light will be directed to the binocular tube if the push-rod is slid in all the way.
When you look into the tube you will see a bright circle (the eyepiece stop) with each eye.

- Merge the two circles into one by adjusting both eye-pieces tubes to your PD.
- On the illumination device, swing in the diffusing screen by turning screw SW 3 (**3**) to the black dot, and make the luminous field diaphragm narrower by pulling out push rod (**5**).
- Focus the specimen with focusing drive (**8**). The image of the luminous field diaphragm (**A**) which lies exactly in the specimen plane may be helpful here.
- Move the diaphragm image into the center of your field of view (**B**) with the aid of centering screws (**1**). Use push-rod (**5**) to open this diaphragm until the field of view is just free and no more (**C**).
- Now adjust the contrast with aperture diaphragm (**4**) to suit the needs of the specimen being examined.

Note: If you are not certain how far you should stop down, a good rule of thumb is that approx. 4/5 of the exit pupil of the objective should be illuminated (**D**). [The exit pupil is visible at the bottom of the tube when the eyepieces are removed or when the Bertrand lens is swung in and focused (Bertrand lens slider)].
If necessary, the aperture diaphragm can be brought into the center of the pupil using centering screws (**2**) and then stopped down to 4/5 its size using pushrod (**4**).

Every objective change also changes the objective aperture, i.e. the aperture diaphragm must be readjusted.
If your microscope features a light manager (motorized aperture diaphragm, at least coded nosepiece), you can store the microscope setting via the SET key (→ *Stand, Light Manager*).

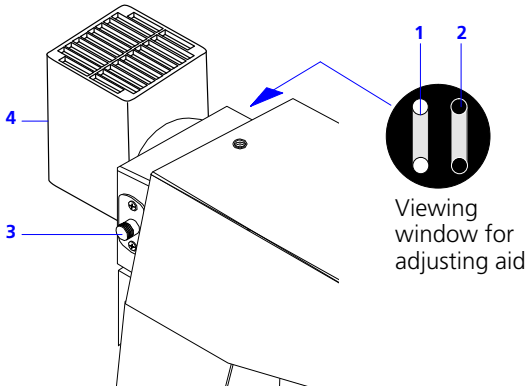
Fluorescence

Additional equipment

- ❑ Recommended: Plan-Neofluar or Fluar objectives for UV excitation
- ❑ Special reflected-light illuminator (HBO 50 and HBO 103 fluorescence lamps with appropriate electronic supply)

Adjustment of the fluorescence lamp

Use adjusting aid to adjust the adapted fluorescence lamp:



1 Image of the light arc
2 Mirror image of the light arc of the lamp reflector
3 Slide-in knob for adjusting aid activation
4 HBO 50 lamp housing

Fig. 122 Adjusting aid

- Push adjustment aid for incident light lamp in the beam path. This is located on the back left of your microscope (see → *Fig. 122*). In the viewing window for the adjustment aid on the rear back right of your microscope you can check the position of the light arc and its reflector image.
- Make any required corrections using (**3**) and adjusting screws (**4** / **6** / **7** / **8** and **9**).
- After centration and focusing of the luminous area, pull out the sliding knob of the adjusting aid.

WARNING!

Explosion hazard

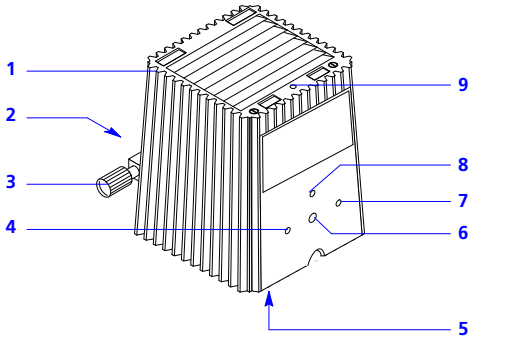
The HBO 50W mercury short arc lamp must be exchanged after expiry of the average service life of 100 hrs. The average service life of the HBO 103 is 300 hrs. Its illuminance decreases in the course of many hours of use so that homogeneous illumination of the object field can no longer be guaranteed. There is also a danger of explosion. The remaining service hours can be read off on the power supply unit.
Please refer to the manual for the HBO/XBO lamp housing for further details on how to exchange the lamps.

Adjustment of the illumination

- Adjust the selected specimen feature in brightfield or transmitted-light phase contrast using the open position of the reflector turret.
- Use the lower illuminator with halogen lamp for this. Switch on the HBO 50W mercury short arc lamp but block its light path with the barrier slider or the shutter.
- Switch off the transmitted-light illuminator by setting the filters in filter magazine 1 (transmitted light) to 100 and to 0 in filter magazine 2 (or by additionally switching off the halogen lamp in the stand program), select the required excitation type on the reflector turret and remove slider from the light path.

Normally, the aperture diaphragm should remain open during fluorescence observation.
The luminous-field diaphragm is set as follows according to the KÖHLER rules:

- Use the appropriate pushrod of the incident light part of the stand to close the luminous field diaphragm until it becomes visible in the image.
- Then center using the centering screws and open the diaphragm until the field of view is free.



1 HBO/XBO lamp housing
2 Light exit
3 Knurled knob for collector adjustment
4 Lateral adjustment of reflector image
5 Clamping screw for lamp mount (concealed in base of housing)
6 Focusing of reflector image
7 Lateral adjustment of lamp
8 Height adjustment of reflector image
9 Height adjustment of lamp

Fig. 123 HBO/XBO lamp housing

Note: To avoid eye injury, please use the fluorescence protection screen (452163 → *System Overview*).

Biaxial crystals

If biaxial crystals display a cross in conoscopic observation which resolves into the two branches of a hyberpola, the acute bisectrix (1st center line) is oriented in parallel to the viewing direction. Turn stage until the dark branches of the hyperbola (isogyres) are in the 1st and 3rd quadrants.

You work with the compensator λ:

- After you have inserted the compensator l, the following appears:
  – yellow on the outside (concave side of hyperbola) and
  – blue on the inside (convex side of hyperbola) = optically negative
  – blue on the outside and yellow on the inside = optically positive

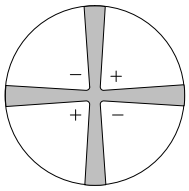
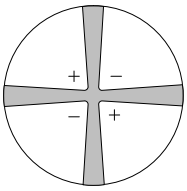
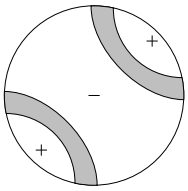
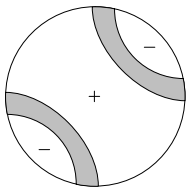
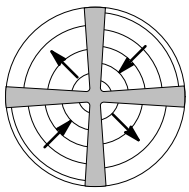
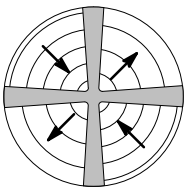
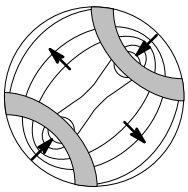
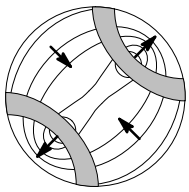
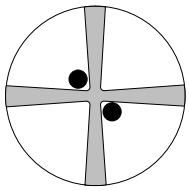
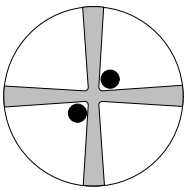
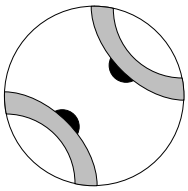
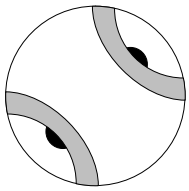
You work with the compensator λ/4:

- After you have inserted the compensator λ/4, a dark spot appears:
  – on the outside of the dark isogyre = optically negative
  – on the inside of the dark isogyre = optically positive

You work with the wedge compensator 0 - 4λ:

- After insertion of the wedge compensator 0 - 4λ, the isochromats in the 1st and 3nd quadrants are moving
  – outward = optically negative
  – inward = optically positive

Note: If an optical axis of a biaxial crystal is parallel to the viewing direction, only one branch of the hyperbola will be visible in conoscopic viewing, with the vertex of this branch lying in the center of the field of view. If the stage is turned, the branch of the hyperbola will move about its vertex. Proceed in the same manner as described above to determine the optical characteristics of the crystal.

	Optically uniaxial		Optically biaxial		
	positive	negative	positive	negative	
λ plate (white —> blue —> yellow)					+ = blue – = yellow
Quartz wedge (direction of movement during insertion)					direction of movement
λ/4 plate (position of black spots)					

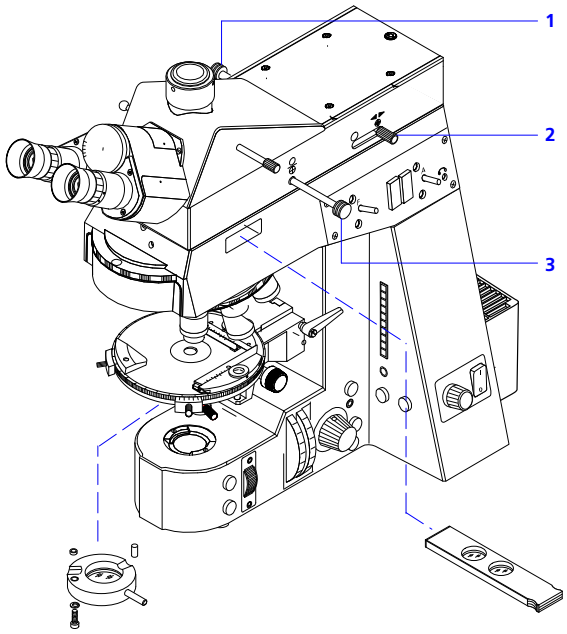
Transmitted-light polarization - Determining the optical characteristics of crystal

Use

Determining the optical characteristics of transparent and weakly absorbing crystals is part of the diagnosis of crystals. This technique is also termed concoscopic observation. Its main field of application is the classic microscopy of rocks. It is also possible, however, to identify and characterize synthetic crystals, industrial minerals and plastics (e.g. films).

Adjustments

- Adjust your polarizing microscope for standard brightfield examination (see → page121) and polarization in transmitted light (see → page 126) eingestellt.



1 Pushrod for field diaphragm
2 Rotary and slider knob for Bertrand lens
3 Pushrod for reticle

Fig. 121 Transmitted-light polarization

- Bring the low-power objective (2.5x/0.075) into the beam path. The best orientation for conoscopic observation have those crystals (e.g. a thin rock section) whose brightness level is changed as little as possibe in orthoscopic observation when you turn the stage. In this case, the optical axis of uniaxial crystals or one of the optical axes of a biaxial crystal is nearly parallel to the viewing direction.
- After selecting a crystal in this manner, position it in the center of reticle (**3**). Bring the dry objective providing the largest aperture (40x/0.85) into the beam path, swing in the condenser front lens and re-check that the condenser diaphragm is fully open. Lift the condenser until the image of the luminous field diaphragm is sharp (see → page 121).
- Close the field diaphragm (**1**) until the grain boundaries of the crystal selected are no longer visible. This ensures that the interference figures of neighboring crystals are not superimposed on the interference figures of the crystal to be examined. Thus, object features with as small a diameter as 10 mm can be eliminated from the field of view.
  When you turn the stage, the object must remain in the center of the reticle, i.e. it must also remain in the visible area (re-center, if necessary).
- Swing in the Bertrand lens (symbol ⊕) with knob (**2**) on the intermediate tube Pol. Use the Bertrand lens to focus the pupil image (interference figure).
  The conoscopic image obtained now shows you whether the crystal has one or two axes. Use the compensator λ to determine the optical characteristics of the crystal (optically positive or optically negative); the compensator λ/4 can also be used for this purpose.
  Use the wedge compensator 0 - 4λ (quartz wedge) to determine the optical characteristics of absorbent crystals (e.g. augite, hornblende) or crystals with anomalous birefringence.

Uniaxial crystals

If the optical axis of a uniaxial crystals is oriented in parallel to the viewing direction, a dark cross becomes visible in conoscopic viewing which can be surrounded by concentric interference fringes (dependent on the birefringence and the thickness of the specimen). These interference fringes are also termed isochromats (Greek isos = equal, chroma = color).
The cross remains visible while the stage is turned. Focus your attention on the NE quadrant of the cross (1st quadrant; counting is counterclockwise).
You work with the compensator λ:

- After you have inserted the compensator l, the following appears in the 1st and 3rd quadrant near the center of the dark cross:
  – yellow = optically negative
  – blue = optically positive

You work with the compensator λ/4:

- After you have inserted the compensator λ/4, a dark spot appears near the center of the dark cross:
  – in 1st and 3rd quadrants = optically negative
  – in 2nd and 4th quadrants = optically positive

You work with the wedge compensator 0 - 4λ:

- After insertion of the wedge compensator 0 - 4λ, the isochromats in the 1st and 2nd quadrant are moving
  – outward = optically negative
  – inward = optically positive

Transmitted-light polarization - Determining and measuring path differences

Use

The color chart only allows the rough estimation of path differences of transparent, anisotropic substances, such as minerals, synthetic crystals, plastics, strained glass, biocrystals or erythrocytes. For exact measurement, a compensator is needed. This compensator reduces the path difference caused by the object to zero (1st order black), i.e. it compensates for the path difference. Unlike determining the n_γ direction where the position of addition is of importance, the object must be in the position of subtraction relative to the compensator, i.e. the $n_{\gamma'}$ of the object must be turned against the n_γ direction of the compensator by 90°.

Selecting the correct compensator

We can provide the suitable compensator for every path difference measurement: rotary Brace-Köhler compensator λ/8 with a minimum measuring range from 0 to 72 nm and tilting Ehringhaus compensator E 0 - 130 λ with a maximum range from 0 to 70,000 nm. Path differences can only be measured if the path difference of the object lies within the measuring range of the compensator used. To obtain as high measuring accuracy as possible, the measuring range of the compensator used and the path difference should approximately be of the same magnitude. To find the correct compensator, insert your object in the dark field between the crossed polarizer and analyzer. Turn the stage and note the interference colors obtained (see → table below).

Measurement

- Focus on the specimen (objective 10x).
- Bring polarizer and analyzer into crossed position.
- Turn specimen
  – to extinction or standard position,
  – activate the stage clickstops,
  – set a diagonal position displaying maximum brightness at 455.

Insert the compensator selected, move it out of its zero position and watch whether:

- the interference colors become deeper, i.e. the path difference decreases. The n_γ direction of the compensator and the $n_{\gamma'}$ direction of the object are perpendicular to each other (position of subtraction). The specimen is correctly positioned for compensation.
- the interference colors become paler (position of addition), i.e. the path difference increases. The black of the 1st order never appears. In this case, turn the specimen by another 90°.
- All you have to do now is to adjust the compensator in such a way that the point of measurement is completely dark. Using the recorded angles, you can read off the path difference in nm from the relevant table or calculate the path difference when you work with the rotary Brace-Köhler compensator.

De Sénarmont compensation

The Sénarmont technique allows the measurement of path differences up to 1λ. This technique differs in the following points from the above description:

- a Sénarmont compensator 546/4 is used which is a λ/4 plate with n_γ in the east-west orientation.
- a rotary analyzer is used for measurement.
- the path difference is calculated using the angle measured.

Note: It is advisable to use monochromatic light for measurement. To achieve this, use the green interference bandpass filter 546, d=32x3 (467807) or narrow interference bandpass filter 546/2 nm (467808-9902). Always use narrow interference bandpass filter 546/2 (467808-9902) for measurements with the tilting compensator 0 - 130 λ.

Interferenc color	Using compensator λ you will obtain	Path difference	Compensator / Technique
Dark gray	colors (blue, yellow), 1st order gray present	λ/10 (approx. 50 nm)	rotary Brace-Köhler compensation λ/8
White	colors, 1st order white present	λ/2 (approx. 270 nm)	de Sénarmont technique or Ehringhaus tilting compensator 0 - 6 λ
More or less deep interference colors	colors or white, colors of 1st to 4th order are present	λ/2 to 5 λ (approx. 270 to 2700 nm)	Ehringhaus tilting compensator 0 - 6 λ
White	no colors, higher-order white present	6 λ or more (3300 nm or more)	Ehringhaus tilting compensator 0 - 130 λ

Transmitted-light polarization - Determining the n_γ direction of oscillation

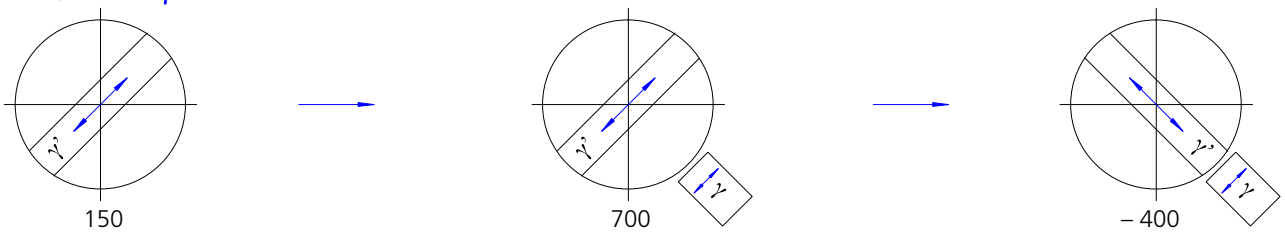


Fig. 119 **Determining the $n_{\gamma'}$ direction of oscillation using a synthetic fiber as an example**

Use

The position of the two directions with the greatest ($n_{\gamma'}$) and the smallest ($n_{\alpha'}$) refractive index (both in relative terms) or with the greatest (n_γ) or with the smallest (n_α) refractive index (both in absolute terms) relative to the morphological directions of crystal surfaces, crystal needles or fibers is an important feature used, for example, in the diagnosis of biocrystals (gout, pseudogout).

Adjustments

- Perform the adjustments described under Adjustments on page 126. The fiber lights up in the field of view.
- Turn the stage to the first clickstop, deactivate the clickstop and turn the stage in such a way that the object displays maximum darkness.
- Activate the clickstop and turn the stage by 45° to the next clickstop so that the longitudinal axis of the fiber is oriented in the NE-SW direction (Fig. 119). Here, the object displays maximum brightness (diagonal position), e.g. gray-white.
- This color corresponds to a path difference of 150 nm in the Michel-Lévy color chart (Fig. 119 and Fig. 120).
- After you have inserted the compensator λ, the color turns to yellow-orange (path difference approx. 400 nm).
- When you turn the stage by 90°, the fiber appears green-blue (path difference approx. 700 nm).

Conclusions

The n_γ direction of the compensator λ is oriented in the NE-SW direction. The color of the surroundings of the fiber is a deep red of the 1st order (path difference is one λ; approx. 550 nm). The fiber itself appears green-blue (path difference approx. 700 nm). The higher interference color (700 nm) can only be the result of the addition of the path differences of (approx. 150 nm) and compensator

The colors will be added if the n_γ of the compensator and the $n_{\gamma'}$ of the object are parallel. Hence, the $n_{\gamma'}$ of the object also lies in NE-SW direction at a higher interference color and is oriented in parallel to the longitudinal axis of the fiber.

Summary

Compare interference colors (path differences) in the two diagonal positions. The larger path difference will occur if both n_γ directions are parallel. Thus, the $n_{\gamma'}$ direction of the object has been determined.

Note:

Michel-Lévy color charts are available under Cat. No. 42-312.

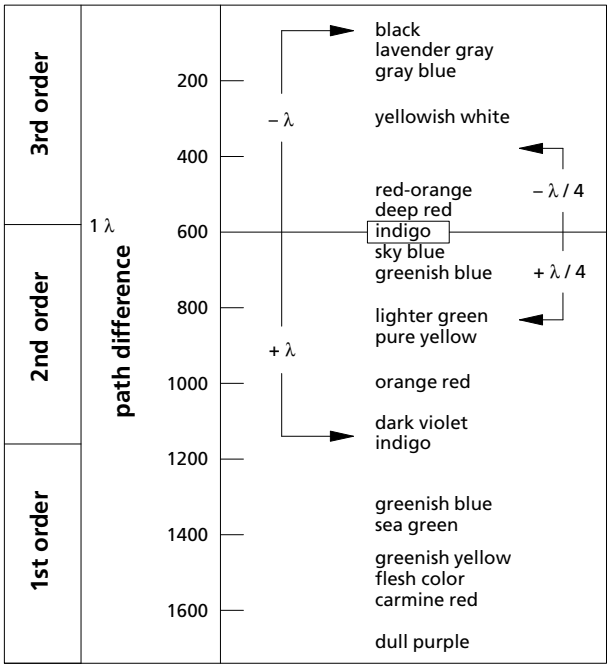


Fig. 120 **Schematic illustration of the Michel-Lévy color chart**

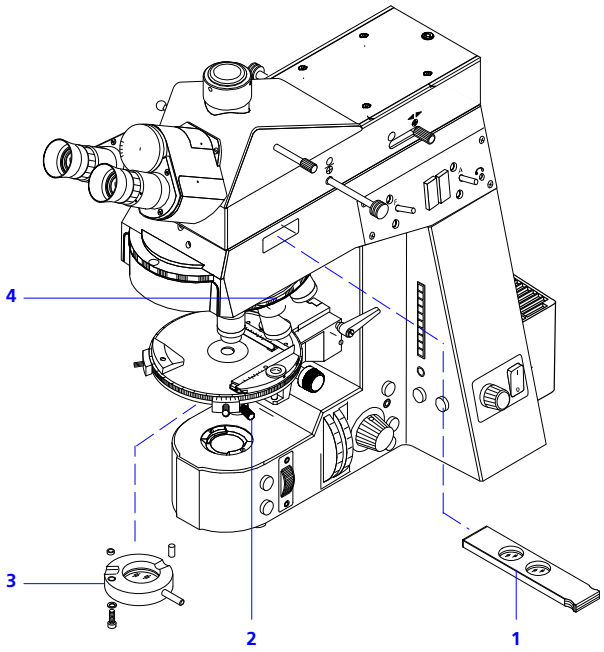
Transmitted-light polarization - Detection of birefringence

Use

This technique is used for the examination of transparent, birefringent objects. It is a characteristic feature of birefringent objects that, with polarizer and analyzer in a crossed position, the otherwise dark field of view turns bright 4 times when you rotate the object stage through 3605. In the process, interference colors from only just visible gray (e.g. biological specimens), white, red, yellow blue etc. up to higher-order white can occur, regardless of birefringence, the thickness and the orientation of the object.

Adjustments

- Adjust your polarizing microscope for standard brightfield examination (see → page 121).
- Center the rotary stage Pol (see → page 109) to ensure that the optical axis of the objective in the non-centerable turret opening has been centered on the rotary axis of the stage. If this alignment has been performed correctly, an object feature in the center of the reticle will remain in position when the stage is turned.
- Tighten screw (**2**) locking the stage in position and swing the first objective in a centerable threaded mount into the beam path. If the threaded mount is not centered, the previously focused object feature will no longer be in the center of the reticle.
- Bring the displaced feature into the center of the reticle by adjusting the two centering screws of the objective using two small Allen wrenches. The centering scews are located on the left and the right of the ojective position on he knurled ring of the nosepiece (**4**). Proceed in the same manner for the next centerable threaded mount of the nosepiece. After you have centered all objectives, loosen the screw locking the stage rotation.
- Re-check the position of each objective by turning the stage. An object feature located in the center of the reticle should now remain in the center.
  To maintain this centration, we recommend using the knurled ring of the nosepiece to change the objectives instead of the objectives themselves.
- Swing the polarizer (**3**) into the beam path and adjust it to 0°, if your microscope is equipped with a rotary polarizer.
- Insert the analyzer (**1**) until it snaps in and the field of view is dark.
  If you work with a measuring analyzer, adjust the measuring scale to 90° and secure it in position.
  If you use a ±10° rotary analyzer with a rotary λ-plate, adjust the analyzer to the central clickstop.
  The λ-plate will be ineffective if it is positioned above the analyzer, and effective if it is below the analyzer.
- Bring the object to be examined into the field of view and turn the stage including the object.
  As described above, colorless or colored changes of the object indicate the presence of birefringence. Optically anisotropic materials can also remain dark, however, if an isotropic direction, e.g. of optically uniaxial or biaxial crystals, is parallel to the viewing direction.
  In this case, you can establish whether the object is optically isotropic or anisotropic by using the conoscopic viewing method (see → page 129).



1 Analyzer slider
2 Screw for locking the stage rotation
3 Polarizer
4 Nosepiece

Fig. 118 **Transmitted-light polarization**

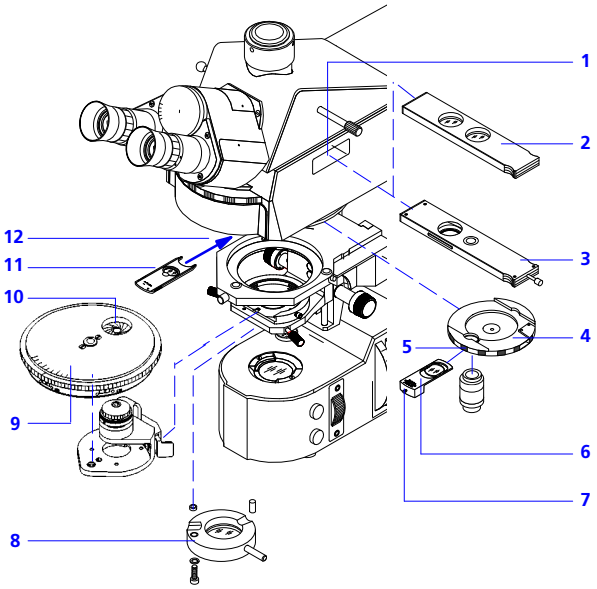
DIC - Differential interference contrast in transmitted light

Use:

- ❑ For unstained specimens which are too thick for phase contrast examination, with the result that layers of the specimen outside the focal plane impair the clarity of the image.
- ❑ If the halo typical of phase contrast impairs the observation of small details in the specimen.

Additional equipment

- ❑ normally Plan-Neofluar objectives,
- ❑ a special nosepiece (**4**) with slots (**5**) for mounting the DIC sliders,
- ❑ DIC slider (**6**) showing on its surface the magnification and aperture of the objective for which it is intended. Insert DIC slider in slot (**5**) until the click stop is reached.
- ❑ a condenser turret (**9**) with DIC positions,
- ❑ a polarizer (**8**) which is swung into position beneath the condenser and
- ❑ an analyzer slider (**2**) which is inserted in (**1**).



1 Analyzer compartment
2 Analyzer slider
3 Bertrand lens slider
4 Nosepiece
5 Slot for DIC slider
6 DIC slider
7 Knurled screw
8 Polarizer
9 Condenser turret
10 Iris diaphragm
11 Compensator
12 Compensator compartment

Fig. 117 Microscope configuration for Differential Interference Contrast

Additional adjustments

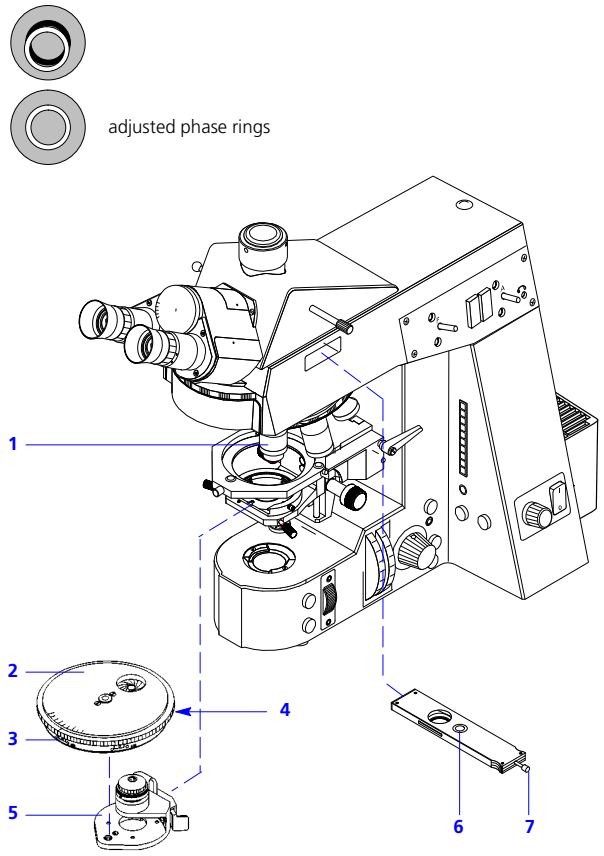
Like the 3 (or 2) Ph positions of the condenser, there are 3 (or 2) DIC positions, marked I, II, III, suitable for combination with the appropriately marked DIC sliders.
This permits the following combinations:

Objective	DIC position
10x/0.30	DIC I condenser setting
20x/0.50	DIC II condenser setting
40x/0.75	
usually ≥ 40x	DIC III condenser setting

Unlike the Ph positions, the DIC positions are provided with an iris diaphragm (**10**). Open this completely at first. To enhance contrast, it can then be closed slightly, this generally being the last stage in the adjustment (see also "KÖHLER illumination", page 121).
Optimum contrast is set by using the knurled screw (**7**) of the DIC sliders (**6**) in the nosepiece.

Additional notes

In DIC, contrast is created by (pseudo) relief and, in the case of linear structures, is therefore dependent on their orientation: with orientation in the same direction as the "light shadow", contrast is low, while in the direction perpendicular to the shadow optimum contrast is obtained. The possibility of specimen rotation is therefore (almost) imperative for adjustment. Please bear in mind that the mechanical stage can be used as a rotary stage.
To ensure reflection-free illumination, the luminous field and aperture diaphragms should not be opened any wider than allowed for the KÖHLER principle.
DIC uses polarized light and is therefore impaired if "optically active" elements are located between the polarizer and the analyzer, e.g. foils which are sometimes used for histological sections, or plexiglass culture dishes with plastic bases (dishes with glass bases are also available).
Color DIC is obtained if you use compensator λ (**11**) (473704). This slider may be used only in transmitted light. Use the reflector module DIC Red I (452190) for color DIC in incident light.
The DIC prisms in the DIC positions of the condenser are part of the front optics supplied with the condenser on delivery.



1 Objective
2 Turret disk of condenser
3 Diaphragm ring
4 Centering screws
5 Condenser
6 Bertrand lens
7 Bertrand lens adjustment lever

Fig. 116 Microscope configuration for phase contrast

Phase contrast

Use:
These techniques are used for unstained specimens in particular in order to enhance their contrast.

Additional equipment

- ❑ Objectives (**1**) designated Ph. These can also be used for brightfield.
- ❑ A condenser (**5**) with turret disk (**2**) featuring Ph positions.

Additional adjustment

The phase rings in the various objectives are of different sizes and marked Ph1, Ph2 and Ph 3 on the objective (**1**). The turret bears the same designations, e.g. Ph 1.

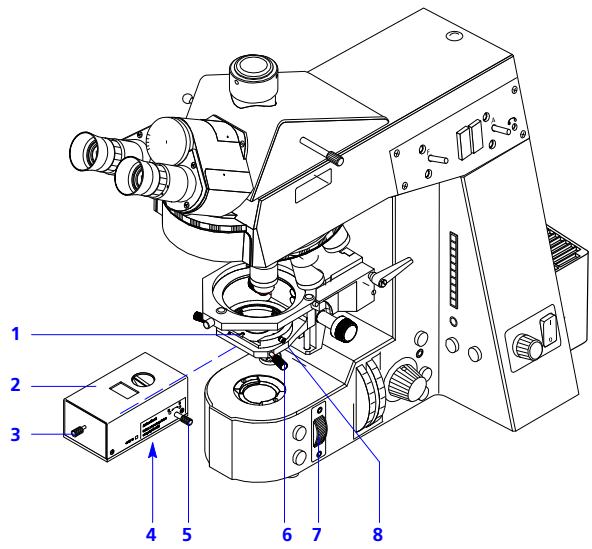
- Combine the designation on the turret disk with the corresponding objectives.

Perfect phase contrast is only obtained if the (dark) ring in the objective and the (bright) ring in the condenser exactly coincide.
The Bertrand lens slider (**3**) provides more convenient viewing of the objective pupil, especially with phase stop centering.

- Loosen screw (Fig. 109/**5**) visible on the front of the standusing Allen key SW3 until the slider can be inserted and tighten it again until the stops become effective.
- When moved to the left, the Bertrand lens, focused via a lever (**7**), is effective.

(Checking without this attachment is also possible with the eyepiece removed, in the same way as for the condenser diaphragm).
If the centration is not perfect (the two rings must coincide as shown in Fig. 116) this can be corrected by using centering screws (**4**) and SW 1.5 key. This type of centration is suitable for all condensers designed for phase contrast.
The centration remains unchanged when the condenser disk is turned or changed, and even if the entire condenser is re-moved.
To enhance the contrast, a green filter can be moved into the ray path either via the filter wheel or placed on the light exit (transmitted light) or the color glass carrier.

Note: Meticulously clean glass-to-air specimen surfaces (fingerprints) are of greater importance in phase contrast than in brightfield. Diaphragm ring (**3**) of the condenser has no function, since the Ph openings do not contain iris diaphragms. The diaphragms in the Ph positions of the condenser are part of the front optics with which the condenser was supplied; if the front optics are changed, other diaphragms are required.



1 Orientation notch on condenser carrier
2 Darkfield illuminator
3 Adjusting screw
4 Screw
5 Screw
6 Centering screws
7 Knob for luminous field diaphragm
8 Clamping screw

Fig. 115 Microscope configuration for darkfield

Darkfield illumination in low magnifications

Darkfield illuminator (2) 445314-9901
(for low magnifications from 1.25x to 20x)

Caution!

Glare hazard!
When switching from darkfield to brightfield, the lamp brightness must be reduced under all circumstances.

Setting the optimum darkfield illumination

- Insert illuminator (**2**) in lowered condenser carrier, ensuring that screw (**4**) on ring dovetail engages with orientation notch (**1**).
  Clamp with screw (**8**).
- Use screw (**5**) to select darkfield setting (see symbol).
- Move illuminator under the stage carrier with aid of condenser drive.
- Select objective 1.25x.
- Place auxiliary, strongly scattering specimen (strip of paper) on the stage and focus.
- Close luminous field diaphragm (**7**). Use screw (**3**) to produce uniform vignetting on the upper and lower edges of the field of view. Produce right/left symmetry with the two centering screws (**6**) of the condenser carrier. For technical reasons, the vignetting remaining in the upper and lower areas of the field of view is inevitable with the 1.25x objec-tive. However, the photo frame is uniformly illuminated.
- Place specimen in position; use large slides and large coverglasses, as the light-scattering edges then lie well outside the object field.
- If the image brightness is insufficient, the diffusion screen can be removed from the illumination ray path without causing any drawbacks. Opening of luminous field diaphragm (**7**) also directs more light to the specimen, but also more reflections outside the photo frame.
- When switching to next highest objective magnification (2.5x), turn screw (**3**) until the field of view is fully illuminated without reflections. Adjust the luminous field diaphragm until the image background is optimally dark. With higher objective magnifications up to 20x, adjust the luminous field only without changing the illuminator setting.
- This illuminator can also be used for brightfield by swinging out the deflection mirror via screw (**5**).

Transmitted light darkfield

Use

- ❑ To examine small and extremely small specimens and specimen features such as treponemas, spirochaetae, flagella, bacteria, etc. or emulsions if the contrast supplied by phase contrast is insufficient.
- ❑ If the inherent colors of natural, i.e. unstained, specimens such as living organisms in water (algae, protozoa, lower order animals) are clearly visible.

Additional equipment

- ❑ Always required: a condenser with a central stop whose numerical aperture is higher than that of the objective used.
- ❑ Objectives with aperture 1.0 must feature an integrated iris aperture diaphragm.

Adjustments required

- ❑ Set the illumination as for brightfield; the luminous field diaphragm must be imaged and centered. If the height of the condenser has been correctly set, an almost sharp image of the luminous field diaphragm will be obtained.
- ❑ Check the objective pupil to ensure that it really is dark.

Note: With darkfield illumination, there may be a ring of light in the pupil which you should eliminate by focusing the condenser and (if an iris objective is available) by closing the iris diaphragm. The decisive criterion of a high-quality darkfield is, of course, a totally black background in the field of view.

Additional notes

Darkfield requires even cleaner specimens than other methods; films of grease (fingerprints) in particular will cause lightening of the background.
The somewhat difficult adjustment of the darkfield is simplified by initially precentering with a low-power objective. As the luminous field can only be seen in areas where particles light up and since large areas of the specimen ultimately examined may contain no such particles, a specimen displaying uniform detail distribution should be chosen, e.g. a blood smear.

Plan-Neofluar	Plan-Apochromat	Illumination
10x/0.30 20x/0.50 40x/0.75 D	10x/0.32 20x/0.75	Ph stop 3 ≥ 0.44 darkfield stop 0.76 - 0.90
100x/1.3 oil iris	40x/1.0 oil iris 100x/1.3 oil iris	dry darkfield condenser 0.8/0.95 ultra darkfield condenser 1.2 - 1.4 oil

The table shows recommended combinations for some selected objectives

Transmitted light brightfield

To set the incident light illumination in accordance with the KÖHLER principle, proceed as follows:

- On the rear of the instrument, switch on the transmitted light illumination using the toggle switch and then switch on the microscope at the ON/OFF switch (**9**).
- At voltage regulator (**8**) set approx. 3 ... 4 volts as the supply voltage for the illumination.
- First, place a high-contrast specimen on the stage (small, thin coverglass face up!).
- Swing in 10x objective (yellow ring) (**1**) on nosepiece into beam path.
- Check the 0 positions on the eyepiece scale (→ *page 98*).
- Raise the condenser - do not swing front optics to the side to the microscope slide.
- Set H (brightfield) on index of condenser turret and use knurled ring (**3**) of turret disk to close aperture diaphragm to approx. half its size.

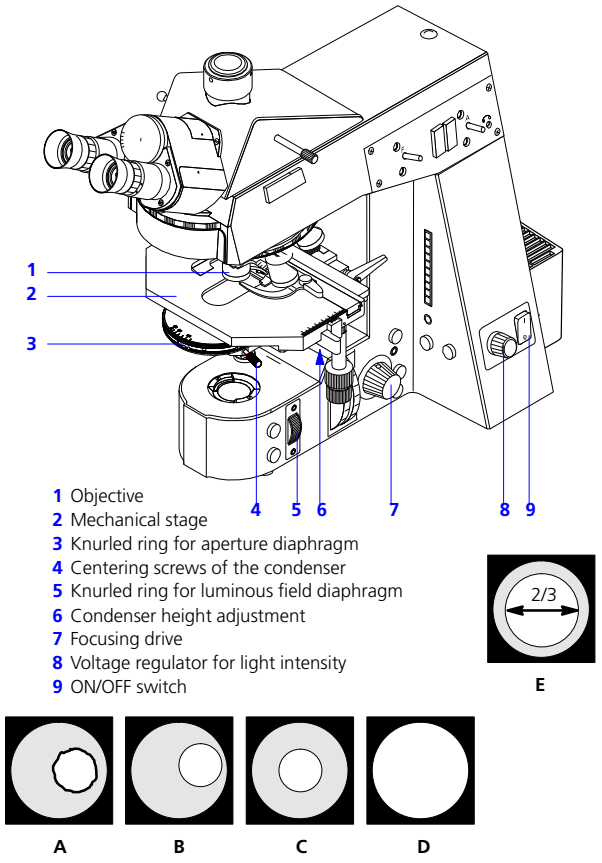


Fig. 114 Microscope setting for transmitted light brightfield

You should now see spots of light (the exit pupils) behind the eyepieces. If you are working with a binocular phototube, all of the light will be directed to the binocular tube if the push-rod is slid in all the way.
When you look into the tube you will see a bright circle (the eyepiece stop) with each eye.

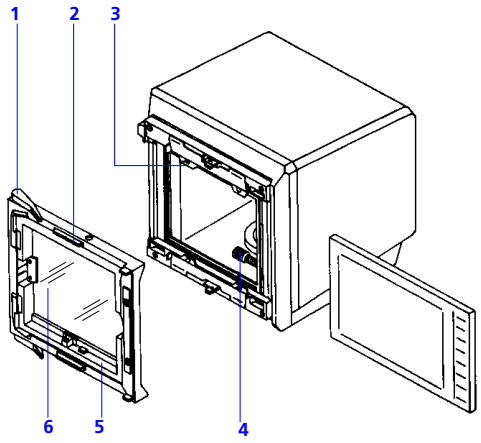
- Merge the two circles into one by adjusting both eyepieces tubes to your PD.
- Focus the specimen using the focusing drive (**7**). The eyepiece setting for spectacle wearers should be "0" (if you are working without glasses (→ *Microscope components, Eyepieces, page 98*).
- Close luminous field diaphragm with knurled ring (**5**) moderately. It will then appear unsharp in the image (**A**).
- Focus the diaphragm image (**B**) by lowering the condenser slightly with (**6**).
- Use centering screws (**4**) of the condenser to move the diaphram image to the center of the field of view (**C**).
- Open luminous field diaphragm on knurled ring (**5**) until it just disappears from the field of view (**D**).
- Now adjust the contrast with the aid of the aperture diaphragm (**3**) to suit the needs of the specimen being examined. The value of the aperture diaphragm can be read off on the scale of the condenser.

Note: If you are not certain how much to stop down, proceed as follows: for objects displaying moderate contrast, approx. 2/3 of the exit pupil of the objective should be illuminated (**E**) (eyepiece removed) using the aperture diaphragm (**3**).

Every objective change also changes the field of view and the objective aperture, i. e. the above procedure must be repeated.

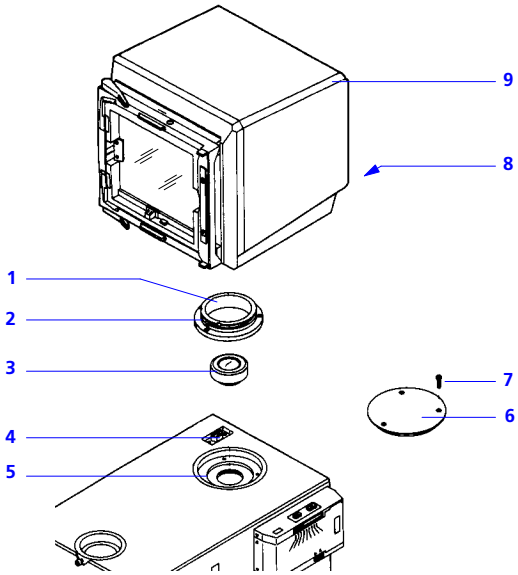
- When a low-power objective images more than the condenser can illuminate, swing the condenser front optics out of position via the lever and lower it, if required.
- If your microscope features a light manager, the illumination is set automatically. You can store the microscope setting via the SET key (→ *Stand, Light Manager*).

If your instrument is motorized and you are using the microscope software via a notebook/PC, you can store a total of 16 reproducible microscope settings (→ *Microscope Software*).



1 Lever
2 Key for unlocking
3 Lock
4 Knurled screw
5 Cassette mount
6 Groundglass

Fig. 112 4 x 5" large-format camera



1 Mounting ring
2 Notches
3 Large-format optical system
4 Socket
5 Holder
6 Cover
7 Screws
8 Clamping screw
9 4x5" large-format camera

Fig. 113 Mounting the 4x5" large-format camera

4x5" Large-Format Camera (Fig. 112)

Large-format groundglass and cassette mount (**5**). Cassettes for universal camera backs are slid behind the large-format groundglass which can be lifted with lever (**1**). To take off the groundglass:

- Press (**2**) and move it to the right; mount accordingly.

The groundglass can be used for microprojection for small discussion groups, provided there is sufficient light:
This requires that you perform the following steps in the **Photo** program module:

- Select 4x5" camera; **T** ; **START** opens the shutter for observation; pushing **START** closes it again.

Knurled screw (**4**) for the positioning of data on different film formats becomes visible at the lower right after removal of the groundglass (**6**). Control of positioning on the groundglass (ASA 12: it lights for approx 1 s).

Mounting the 4x5" large-format camera (Fig. 113)

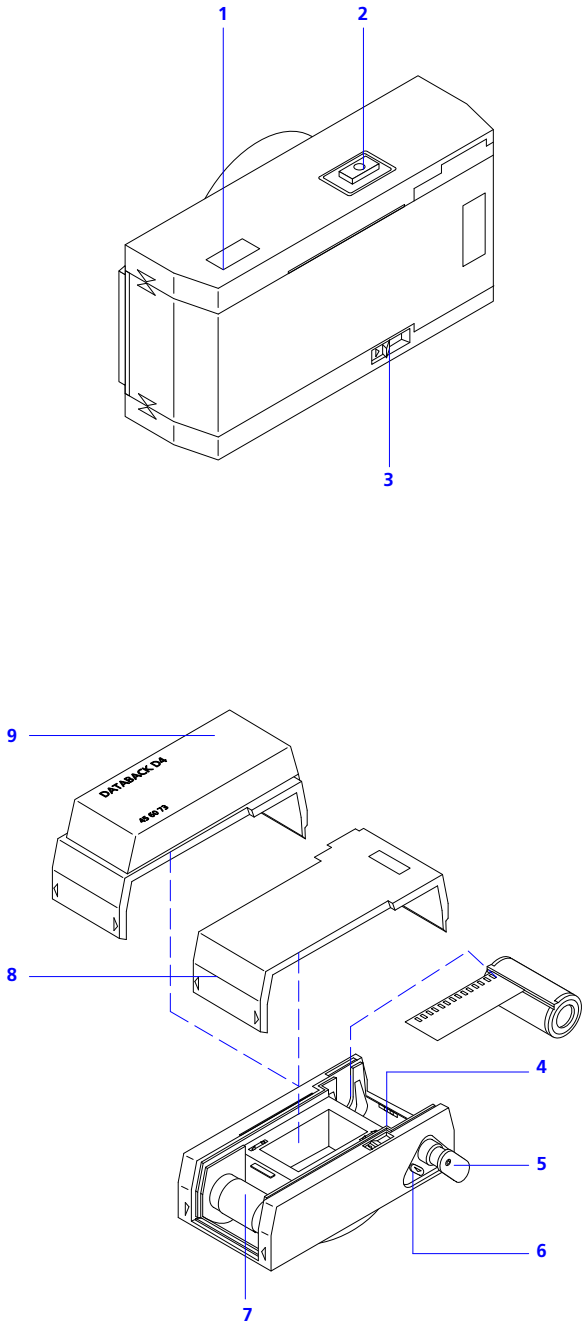
Proceed as follows to mount the 4x5" camera to your Photo (**9**) module:

- Remove cover (**6**) by screwing out 3 screws (**7**) using hexagonal screwdriver.
- Screw supplied large-format optical system (**3**) into the mount.
- Insert mounting ring (**1**) for 4x5" camera into the opening in such a way that the notches (**2**) point towards the user and tighten it using the 3 screws (**7**).
- Loosen clamping screw (**8**) at 4x5" camera and move the camera to the red dot.
- Remove protection cap. Attach 4x5" camera and make sure that the optical system exactly fits the mount.
- Swing clamping screw (**8**) to the right and tighten it.

Second TV camera

Instead of the 4x5" camera, a second TV camera can be mounted as follows:

- Remove cover (**6**) by screwing out 3 screws (**7**).
- Screw on TV adapter (452230) using the 3 screws.
- Only use TV adapter 1.0x (456105) to connect TV camera C 2/3"; TV adapter 0.63x (456007) to connect TV camera C 1/2" and TV adapter 0.50x (456006) to connect TV camera C 1/3"
- A 3C-CTV camera cannot be connected to this port.
- The camera factor of the TV camera is obtained by multiplying the factor of the TV camera by 2.5.



1 Mechanical counter
2 Eject key
3 Slider for film rewinding
4 Compartment for film cartridge
5 Cartridge holder
6 Lock for back of cassette
7 Take-up reel
8 Back of cassette
9 Data back for film cassette

Fig. 111 35 mm Mot film cassette

35 mm Mot DX film cassette

Removing the cassette

- Press eject key (**2**) and pull out cassette.

Inserting a film

- Press lock (**6**) (underside) in the direction of the arrow - the cartridge holder (**5**) jumps out. Back can be removed. Remove any dust particles in the cassette using a soft brush.
- Insert the cartridge (**4**), press in the cartridge holder (**5**).
- Pull film out of cartridge and place film leader flat on the rubber of the take-up reel (**7**).
- Insert back (**8**) on the left side (see arrows on the back and on the cassette) and press it in also on the right. Mechanical counter (**1**) is set to **S** (START).

Note: You can use film cartridges for film No. 135 (35 mm) with or without DX coding. When using reloadable film cartridges, avoid using films which are too long, since this might result in defective film advance (see page 136).

In the case of difficulties with the film advance (mechanical counter (**1**) not reset to **S** (Start)):

- Carefully clean the rubber drum of the take-up reel (**7**) (remove remainders of grease) to retain the adhesive power of the take-up reel.
- Do not pull the film leader too far out of the cartridge. The leader must lie flat on the rubber armour of the take-up reel.

Attaching the cassette

The white eject key points up.

- Hold cassette on the sides and press it on the port of the Photo module (right or left) until click stop. The eject key (**2**) jumps out. The film is automatically advanced to the first picture and the counter is set to **0**.

After film exposure (and data projection if a data back is used), the film is advanced. The number of finished photos is displayed on the mechanical counter (**1**) of the cassette.
When the end of the film is reached, the film advance is switched off and **FILM END** is displayed in the menu of the software.

Rewinding the film

Operating slider "R" (**3**) automatically rewinds the film, the END display blinks.
After unloading the film, the slider "R" is automatically set to the normal film advance position when the camera back is attached.

Data back for 35 mm Mot DX film cassette

The data back (**9**) is attached to the Mot film cassette instead of the standard back (**8**). The film cassette with data back is then attached as usual.

Microscope Components

General Information

The Axiophot 2 Photo module turns your microscope into a universal and completely new photomicroscope. Motorized control elements and operation via notebook (or PC) only makes work with the Axiophot 2 methodically richer and at the same time considerably easier.
If you opt for a microscope equipped with the Axiophoto 2 Photo module, we will supply you with the completely assembled stand, including an intermediate tube, if required.
Installation and setup of the entire instrument and retrofitting of the photo module to existing instruments (hardware and software) will be performed by our service personnel oder Außendienst.

Key features and technical data

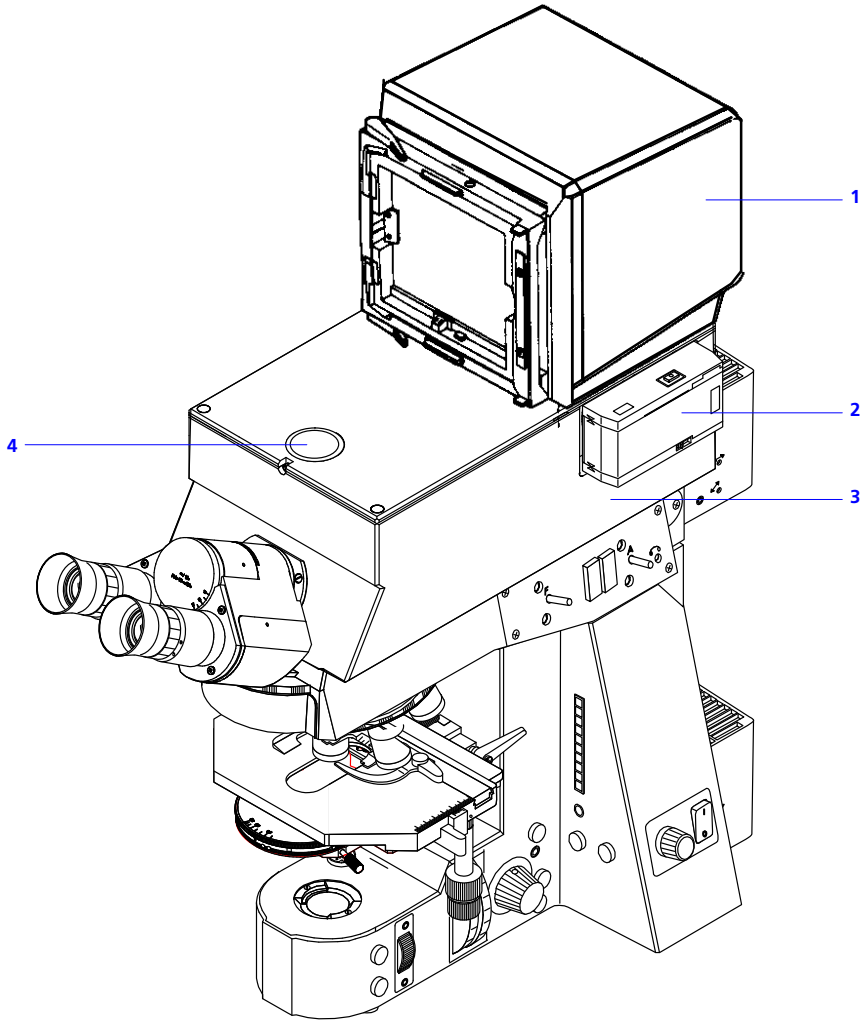
- ❑ Two 35 mm cameras (35 mm Mot film cassette) and one 4x5" camera with automatic exposure control
- ❑ With 35 mm film cassette: automatic film advance, automatic advance to 1st picture when a new film is loaded, and motorized rewinding
- ❑ Decimal display of exposure time, countdown during exposure
- ❑ Automatic exposure time extension for exposures requiring long exposure times (reciprocity failure compensation) in 9 steps
- ❑ Optional spot metering or center-weighted averaging
- ❑ Possibility of fixing the automatic exposure time for comparison photos
- ❑ Multiple exposures
- ❑ Exposure corrections: 3 exposure values; maximum correction amount: 1/3 exposure value
- ❑ Automatic autobracketing with preselected correction (calibration series, etc.)
- ❑ Illuminated frame visible with both eyes, adjustable brightness
- ❑ Projection of data and reference scale
- ❑ Motorization of following settings:
  – switchover observation/documentation
  – switchover camera/video port
  – switchover light metering/film
  – switchover center-weighted averaging/spot metering
  – switchover of cameras

Standard 35 mm film cartridges 135 (visible in the window) are used for the 35 mm Mot DX film cassette; for the 4x5" back of the large-format camera, sheet-film, Polaroid sheet-film and pack-film cassettes (545 and 550) and roll-film cassettes on plate for international back are used.
Magnification on film for 35 mm film:
objective magnification x 2.5,
for 9 x 12cm/4x5" large formats:
objective magnification x 10.

Microscope Components

Axiophot 2 Photo module

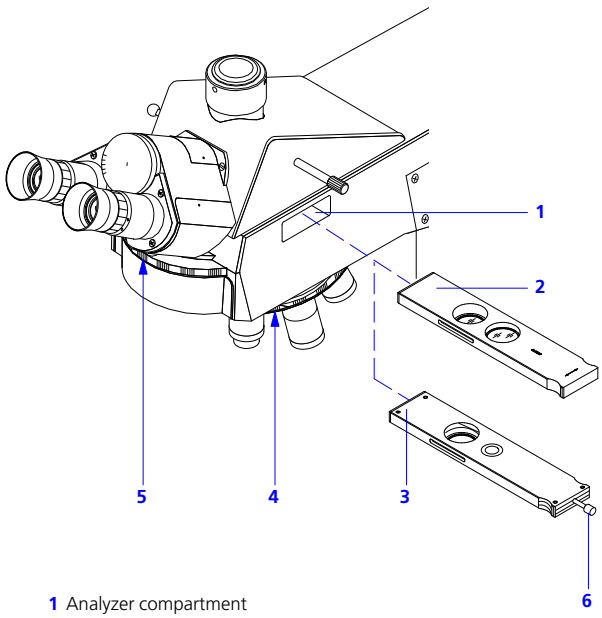
Overview



1 4x5" large-format camera
2 35 mm Mot film cassette (right)
3 Axiophot 2 Photo module
4 Port for TV camera

Fig. 110 Axiophot 2 Photo module

Microscope Components



1 Analyzer compartment
2 Analyzer slider
3 Bertrand lens slider
4 Compartment for auxiliary objects and compensators
5 Fixations screws for **2** and **3**
6 Lever for Bertrand lens setting

Fig. 109 Mounts for sliders, analyzers and auxiliary objects

General Information

(Fig. 109)

The components listed in the overview on page 115 are used to regulate the optical contrast in the microscope and to adjust the auxiliary devices necessary to regulate the contrast. Compensators are required for contrast enhancement and measurements.

In brightfield/phase contrast, the Bertrand lens slider (**3**) is inserted at (**1**), and the fixed or rotary analyzer slider (**2**) or the quartz depolarizer is included in the DIC equipment.

Compensators are inserted in compartment (**4**).

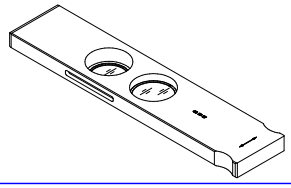
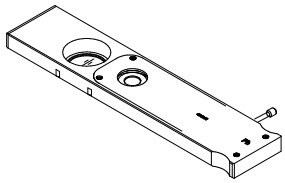
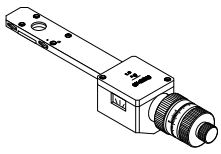
Note: To allow the use of DIC sliders, your microscope must be equipped with an objective nosepiece for DIC.

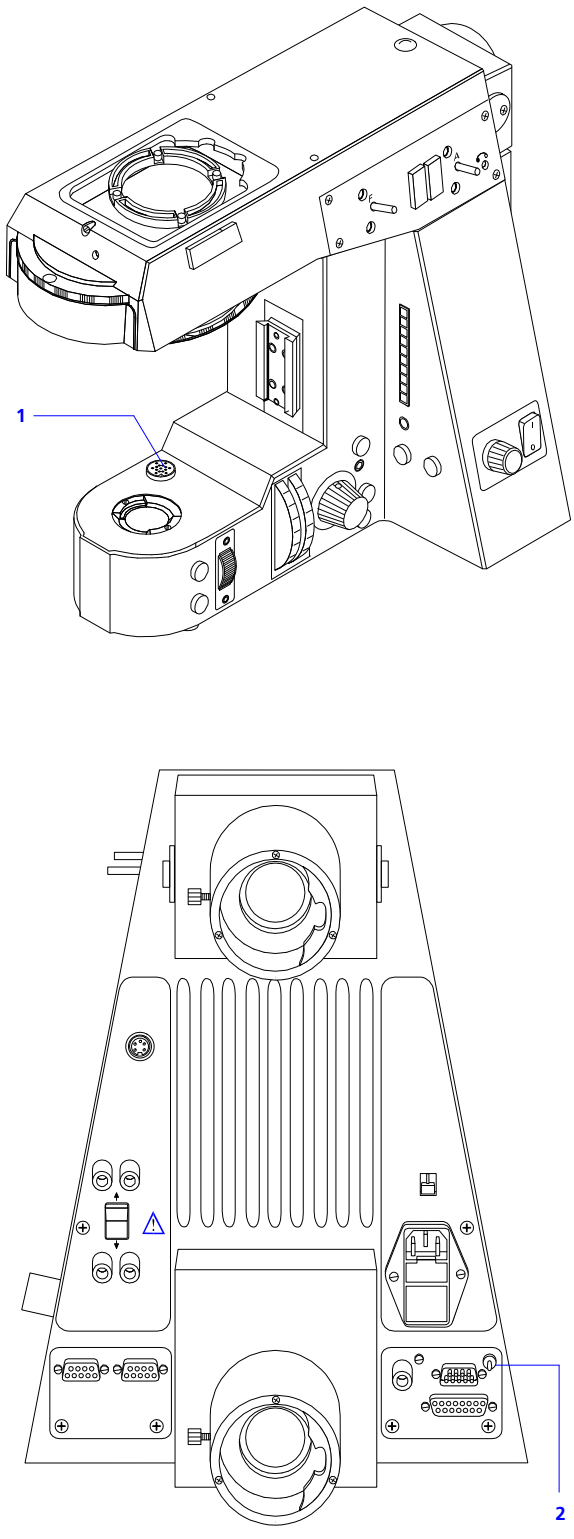
Please refer to page 125 for information on how to adjust the microscope with polarizers, analyzers and DIC prisms for differential interference contrast.

Microscope Components

Analyzers, Compensators, Auxiliary Objects and DIC Sliders

Overview

Specification		Cat. no.
Analyzers		
Fixed analyzer slider		453657
Slider with analyzer and lambda plate, rotary		453663 in preparation
Rotary analyzer		453662
Slider for quartz depolarizer		453659
Quartz depolarizer d = 32 mm (can also be used in 453657)		453653
Bertrand lens sliders		
Bertrand lens slider Ph		453671
Compensators		
Compensator λ 6 x 20 mm		473704
Compensator λ/4. 46 x 20 mm		473714
Quartz wedge 0 ... 4 λ, 6 x 20 mm		473724-9902
Sénarmont compensator 546:4, 6 x 20 mm		473718
Rotary Brace - KÖHLER compensator λ/8		473716
Tilting compensator E 0 - 6 λ		473715
Tilting compensator E 0 - 130 λ		473717
DIC-sliders for ICS optics (only usable with DIC nosepiece or nosepiece Pol 1x)		according to price list
Polarizers		
Fixed polarizer D		453615
Rotary polarizer D		453620
Fixed polarizer D with rotary λ-plate		445226



1 Connection socket for the plug of the motorized condenser
2 SET button

Fig. 108 Back of instrument

Achromatic-aplanatic condenser 1.4

The achromatic-aplanatic condenser 1.4 is equipped with fixed front lens and turret disk. The turret disk contains 6 positions and accepts max. 2 DIC prisms, 2 phase stops and 1 darkfield diaphragm. A position for brightfield with iris has been provided. The DIC prisms are inserted in the condenser 1.4 with the same orientation as in the achromatic-aplanatic system condenser. A retaining ring is used to secure them in position on the condenser 1.4.

Attachment of motorized condensers to the stand

The stand E or the motorized stand with light manager is required to enable the integration of motorized condensers. The motorized luminous-field diaphragm, mortised filter wheels and at least a coded nosepiece are available.

- Switch off instrument.
- Insert plug of the condenser into the socket on the left side of the stand base and secure it using the knurled ring.
- Insert ring dovetail of condenser into the condenser carrier and clamp it.
- Switch on instrument again. The instrument automatically recognizes the condenser type used.

Normally, the microscope is equipped with objectives and condenser in the factory and the basic settings of the light manager (object field adjustment, aperture adjustment and, if required, brightness adjustment) are performed afterwards. The parameter settings of the light manager are made with reference to the objective in the beam path and stored accordingly. If certain parameters need to be changed, this can be per-formed manually on the condenser.
The SET key (**2**, on the instrument back) permits the new parameters to be stored. The light manager will then use these parameters.
Regardless of this, it is always possible to operate motorized condensers via PC, which is even recommended for reasons of higher operating convenience.
The achromatic condenser 0.8 H D Ph mot. (445446) also offers the possibility of motorized switching of the turret disk by pressing a key on the condenser. The aperture iris diaphragm is manually set using the knurled wheel.

Note: When an objective or the entire nosepiece equipment is changed, resetting of the light manager in accordance with the new instrument configuration is absolutely necessary.

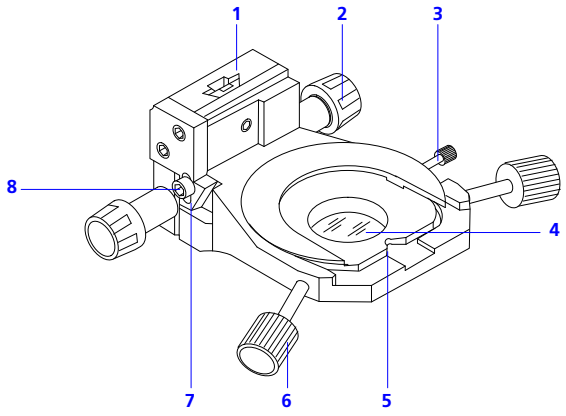
3 for phase stops and 1 for the darkfield diaphragm. All stops and DIC prisms are interchangeable.

Changing the phase stops or the darkfield diaphragm
The stops are exchanged from the underside of the turret disk after removing the appropriate screw-on ring. The shiny glass side of the stop must show downwards when the condenser is built in.

Note: Phase stops or darkfield diaphragms may be inserted only in centering openings and DIC prisms only in openings with iris diaphragm.

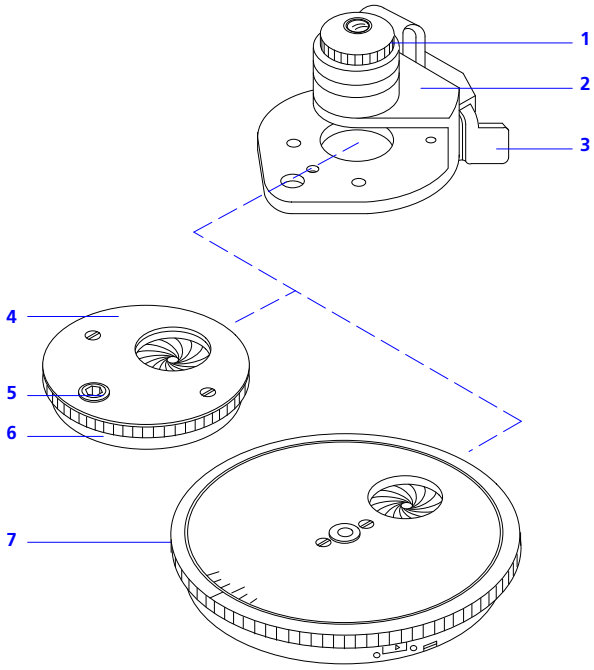
Changing the DIC prisms
The key supplied is inserted into the appropriate opening of the turret disk from below with its threaded side and screwed into the counterthread of the prism mount. Key and prism are then pulled out together in a downward direction. To insert the new prism, perform the same procedure in the opposite order. Make sure that the pin on the prism exactly engages with the appertaining drilled hole in the mount of the turret disk.
Please make sure that the prism mounting does not stick out of the frame. In this case the mounting could knock against the case of the turret disk or scratch it.
The positions of the DIC prisms are marked with I, II and III. Insert the prism marked I, II or III into the position opposite the marking I, II or III on the turret disk.
If brightfield is to be used afterwards, the condenser system can be equipped with the brightfield insert instead of the turret disk.

Note: A DIC prism can be inserted into the brightfield insert (445467) in the same way.



1 Condenser carrier
2 Height adjustment
3 Clamping screw for the condenser
4 Strain-free illumination optics
5 Orientation notch
6 Centering screw
7 Stop for height adjsutment
8 Stop screw for height adjsutment

Fig. 106 Condenser carrier



1 Front lens
2 Condenser (445350)
3 Lever to swing out the front lens
4 Brightfield insert
5 Fixation screw for brightfield insert
6 Knurled ring for aperture iris diaphragm, aperture scale below
7 Turret disk

Fig. 107 Condenser modules

Condenser carrier

(Fig. 106)
The condenser you selected is contained in the condenser carrier. These are its control elements:

- ❑ Height adjustment on both sides (max. 34 mm) (**2**). The ease of motion is factory-adjusted (to be changed only by the service staff).
- ❑ Clamping screw (**3**) for the condenser (used only for condenser exchange using SW 3 key).
- ❑ Two centering screws (**6**) for the condenser. These are used to center the luminous-field diaphragm image for the setting of KÖHLER illumination. To prevent the specimen from being pressed out of the object holder by mistake, the height movement of the condenser is limited by a stop screw.

To prevent the specimen from being pressed upward out of the object holder, the height movement of the condenser is limited by a stop screw.

The stop (**7**) is adjusted as follows:

- Loosen stop screw (**8**), pin will fall downwards.
- Adjust the specimen (use a thick specimen mount).
- Image the luminous-field diaphragm (close it until it becomes visible).
- Move the condenser slightly upwards (diaphragm image becomes unsharp).
- Press stop screw (**8**) upwards and - tighten it again.

Your specimen can now no longer be touched by the condenser.

Achromatic-aplanatic condenser system

(Fig. 107)

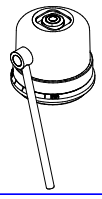
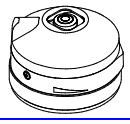
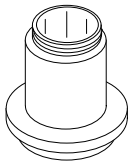
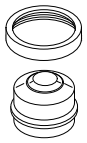
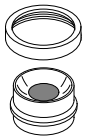
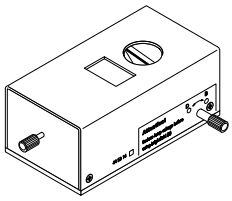
The most usual condenser is the achromatic-aplanatic swing-in condenser system (445350-9901) (Fig. 107/**2**) or 445325-9901 (Pol, DIC).
The front lens (**1**) with aperture 0.9 can be exchanged for the front lens with aperture 0.6.

Note: The condenser with front lens 0.6 can only be used for brightfield.

The achromatic-aplanatic condenser system can be equipped either with turret disk (444565 or 445466) or with the brightfield insert 445467.

Note: When inserting the turret disk in the condenser system, position the groove in the disk to the orientation screw. Slightly press backwards and downwards and then tighten the screw using the Allen key. The turret disk is used for the mounting of phase stops, darkfield stops and/or DIC prisms in altogether 7 positions. Three positions are for DIC prisms,

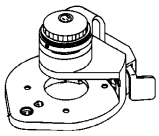
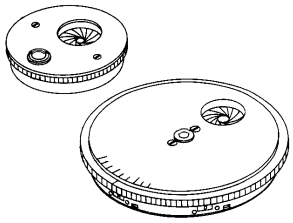
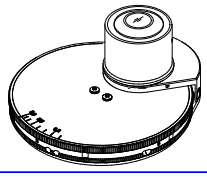
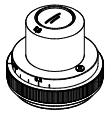
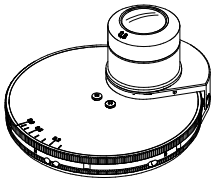
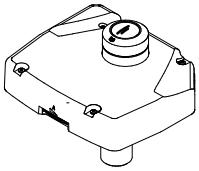
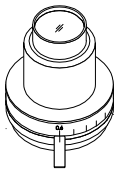
Microscope Components

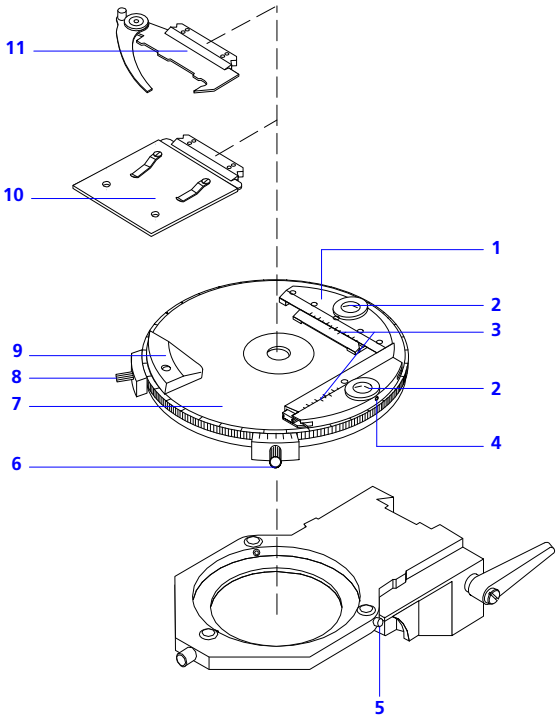
Specification	Comments	Cat. no.
Achromatic dual condenser 0.5 	brightfield condenser for objectives 1.25x ... 40x; lever for rapid change of fixed front lens; with iris diaphragm for aperture adjustment for objectives ≥ 5x	445340
Achromatic dual condenser 0.5 mot. 	like 445340, but motorized	445341
Condenser holder Z 	to allow mounting of: ultracondenser 1.2/1.4 or dry darkfield condenser 0.8/0.95	445323
Ultra condenser 1.2/1.4 	special condenser for darkfield, high magnification and apertue suitable for objectives with aperture 0.75 ... 1.0	465500 (replaces 445315)
Dry darkfield condenser 0.8/0.95 	special condenser for darkfield, medium magnification and aperture special condenser for darkfield, medium magnification and aperture, suitable for objectives with aperture 0.6...0.75	465505
Darkfield illuminator 	for unilateral darkfield illumination at low magnifications between 1.25x and 10x; switching to brightfield is possible	445314-9901
Condenser for photometry	insert suitable ICS objective in condenser carrier for photometry 452126	in preparation

Microscope Components

Condensers for Transmitted Light

Overview

Specification	Comments	Cat.no.
Achromatic-aplanatic swing in-condenser system 0.24/d = 10.7 with front lens 0.9, turret disk and brightfield insert 44 54 67  	optimum flexibility and resolution; front lens 0.9 swung in: for objectives 10x ... 100x; front lens swung out: for objectives 2.5x ... 10x front lens 0.6 swung in: for objectives 10x ... 40x; turret disk for contrasting components	455350-9901 455325-9901 (strain-free optics for DIC/Pol)
Achromatic-aplanatic condenser 1.4 H DIC 	oil immersion on the illumination side for optimum resolution in transmitted light; fixed front lens; for Differential Interference Contrast, for objectives 20x ... 100x	445452 445453 also for phase contrast and darkfield
Achromatic condenser 0.8 H 	brightfield condenser, fixed front lens, for objectives 5x ... 100x with iris diaphragm for aperture adjustment	445443
Achromatic condenser 0.8 H mot. 	like 445443, but motorized	445444
Achromatic condenser 0.8 H D Ph 	for brightfield, darkfield and phase contrast with objectives Ph 1, Ph2 and Ph3 fixed front lens; for objectives 5x ... 100x; with iris diaphragm for aperture adjustment	445445
Achromatic condenser 0.8 H D Ph mot. 	like 445445, but motorized	445446
UD condensor 0.6 	Primarily intended for use with UD stage; also suitable as LD condenser 0.4 for brightfield and polarization	445460



1 Object guide
2 Drives of the object guide
3 Vernier
4 Point stop
5 Centering screw
6 Stop device of stage rotation
7 Rotary stage Pol
8 Click stop of stage rotation
9 Counterweight
10 Specimen holder A Pol
11 Specimen holder D Pol

Fig. 104 Pol rotary stage

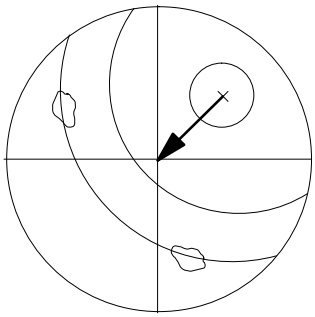


Fig. 105 Centering of Pol rotary stage

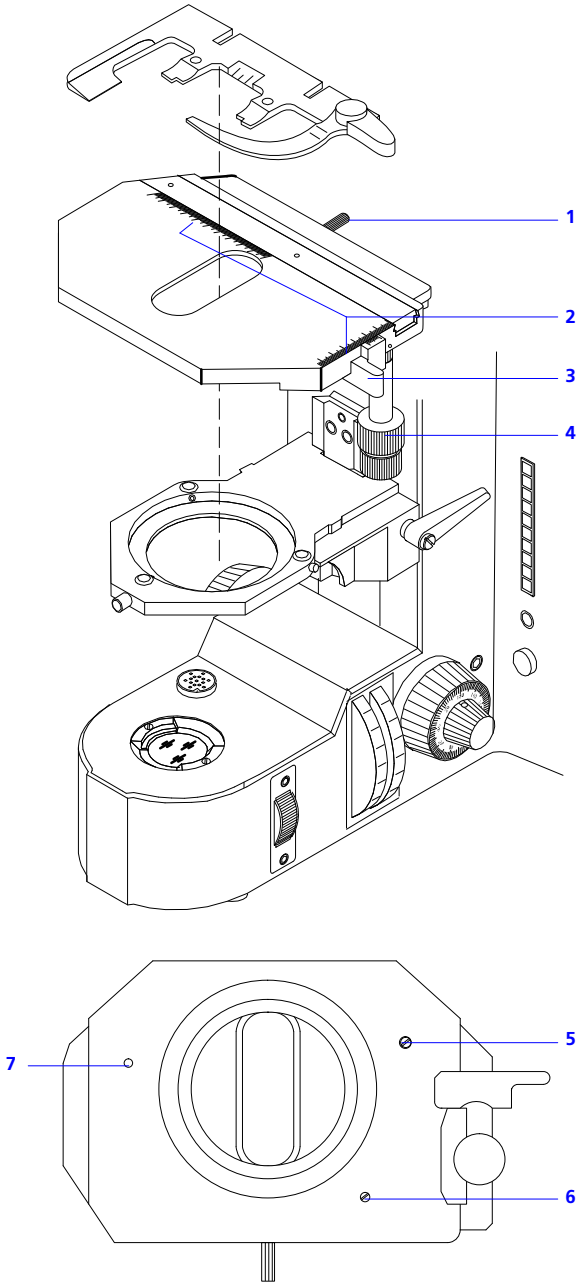
Rotary stage Pol

The rotary stage Pol (**7**), used with polarizing microscopes, is a rotatable and centerable stage with an object guide (**1**) for a travel range of 45 mm in x and 25 mm in y.
Object coordinates can be determined with an accuracy of 0.1 mm using graduations and verniers.
Either the specimen holder D Pol (**11**) or A Pol (**10**) for incident-light specimens can be attached to the object guide.
Together with a reticle in the intermediate tube, a 360° graduation (**3**) and one vernier each to read off 1/10° are used for angle measurement.
The stage rotation can be locked by screw (**6**). Tightening screw (**8**) provides a click stop every 45°.
Stage centering is required to make sure that an object feature in the center of the field of view does not migrate when the stage is turned. Checking the centering before each examination is a matter of routine for, the user of a polarizing microscope and is performed as follows:

- The nosepiece Pol of your microscope features 5 centerable threaded mounts and one fixed mount containing an objective. Swing in the objective and focus on a high-contrast specimen.
- Turn the stage. Almost all object features move on circles; the center of all these circles is the center of rotation of the stage (→ Fig. 105).
- With the small Allen wrench inserted at (**5**), bring this object spot to the point of intersection of the eyepiece cross lines, i.e. the optical axis of the 10x objective. This centering procedure may have to be repeated.

The point counter on the controls of the object guide (**1**) provides a click stop after every 0.5 mm of specimen movement (the point counter with 0.2 mm steps (453570) is optional). The point counter simplifies systematic screening of a specimen, and it can also be used for volume and quantitative analysis. The click stops are set with the supplied Allen wrench on screw (**4**) (unscrew (**4**) to activate the click stop, screw it in to deactivate it). To prevent defocusing, clip plastic rings on the drive controls (**2**) and move the controls from the side.

The attachable mechanical stage is always supplied with counterweight (**9**) which can be screwed on to the stage using the SW3 Allen wrench. It is used for symmetrical weight distribution and prevents defocusing when the stage is rotated. It should be used at high magnifications in particular. If it is not factory-mounted, please refer to the leaflet supplied with the device.



1 Knurled screw to protect the stage from rotary movement
2 Graduation and vernier
3 Grip to allow rotation of the stage without moving the specimen
4 Coaxial drive for stage movement in x and y
5 Stop screw
6 240° stop screw
7 100° marking

Fig. 103 Mechanical stage

General Information

(Fig. 103)
Mechanical stages can be rotated and centered. They can be moved in x (25 mm) and y (50 mm). There is a stage drive on the right which also moves when the stage is rotated.

Attachment/removal of stages

(→ see *Stage carriers* in the chapter *Manual stand)*

Stage centration

(→ see *Stage carriers* in the chapter *Manual stand)*

Conversion of the rotary mechanical stage

The rotary and centerable mechanical stage (453502-9904) is factory-aligned to a y-range of 28 mm and a rotation range of 240°.
The combination of the achromatic dual condenser 0.5 mot (445341, see page 83) with the rotary mechanical stage limits the turning range and the Y movement of the stage.
In the focus position of the condenser, the stage can only be turned through 1005 (standard 2405). The Y movement is limited to the length of the microscope slide.

Note: If you do not need a rotary mechanical stage (e.g. mechanical stage 453505), two microscope slides can be screened without limitation. Specimen holder 453538 is recommended for this.

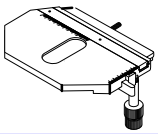
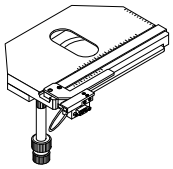
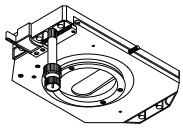
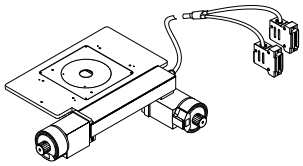
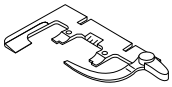
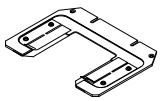
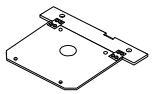
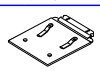
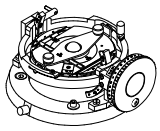
Extending the y-range to 50 mm requires conversion of the stage. The rotation range is then reduced to 100°.

- Remove mechanical stage (→ see *Stage carriers* in the chapter *Manual stand)*.
- Remove stop screw (**5**).
- Remove stop screw from the 240° marking (**6**) to the 100° marking (**7**).
- Insert mechanical stage so that the spring catches the groove of the dovetail.
- Loosen knurled screw (**1**).

Microscope Components

Stages

Overview

Specification	Comments	Cat. no.
Stages		
Mechanical stage 75 x 50 R 	Stage focusing on right; abrasion-proof coating	453505
Mechanical stage 75 x 50 R electronic 	With electronic vernier; abrasion-proof coating	453507
Pol rotary stage with object guide 	For polarizing microscopy	453550 and 453560
Rotary, centerable mechanical stage 75 x 50, 240° R 	rotatable about 240°; abrasion-proof coating	453502-9904
Scanning stage 100 x 100 		453585
Specimen holders		
Specimen holder with spring clip R 		453533
Special specimen holder 	With special fixing device, for mounting 2 specimens	453538
Specimen holder A 		453539
D Pol object guide 	Combination with 453560	453563
A Pol object guide 	Combination with 453560	453564
Universal rotary stage, centerable 	Usable with 453560 and stage carrier 452122	453565

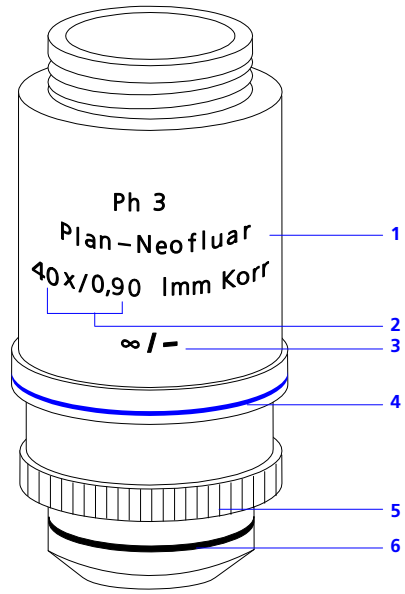


Fig. 102 Labelling of objectives

Labelling of objectives

Number	Explanation	Color	Meaning
1	The color of the labelling marks the contrasting technique intended for this objective	black	Standard
		red	Pol/DIC
		green	Ph 1, 2, 3
2	Magnification/numerical aperture	like 1	
3	Tube length/cover slip thickness; tube length ∞ marks ICS optics	like 1	
4	Color coding of the magnification	black	1.25x
		brown	2.5x
		red	4x; 5x
		orange	6.3x
		yellow	10x
		green	16x; 20x; 25x; 32x
		light blue	40x; 50x
		dark blue	63x
		white	100x; 150x; 200x
5	Mechanical setting ring (only for special objectives). For optical correction when using different immersion media or in the case of different thickness of cover slips/chamber bottoms. Also available with objectives with adjustable aperture iris		
6	Color coding for immersion liquid to be used	black	oil
		white	water
		orange	glycerin
		red	variable

Microscope Components

Objectives

General Information

All the objectives of the Axioplan 2 incorporate the principle of ICS optics, i.e. they project the image to infinity. Only the tube lens produces the intermediate image which can be viewed via the eyepieces

Abbreviations

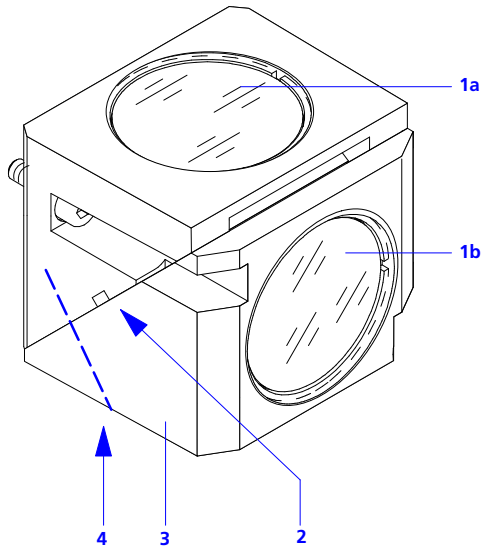
ICS	Infinitiy Color-Corrected System
H	brightfield
D	darkfield
HD	brightfield/darkfield
Ph 1, 2, 3	phase contrast; the numbers refer to the diameter of the annular diaphragm to be used: for an objective described Ph 2, use the annular diaphragm Ph 2.
DIC	Differential interference contrast
AA	working distance: distance between objective and sample surface or cover slip surface
Pol	polarization
Fl	fluorescence
N.A.	numerical aperture
Imm	immersion medium
W	water
Oil	oil
Glyc	glycerin
Korr	adjustable correction of cover slip thickness
LD	Long working distance
∞	infinity

Attachment of objectives

- Remove dust caps from the openings of the objective nosepiece.
- Screw in objectives (in the order of increasing magnifications).

Note: When using a coded nosepiece, please make sure to insert the objectives in accordance with the positions displayed in the Microscope Software.
Check the positions by comparing the objectives displayed in the program to the objectives actually inserted.

Nosepiece positions which are not required must always be covered with dust caps.



1a Barrier filter
1b Exciter filter
2 Reflecting surface of beam splitter
3 Surface for sticker attachment
4 Attachment screws for module halves

Fig. 101 Mounting of beam splitter

Mounting the beam splitter

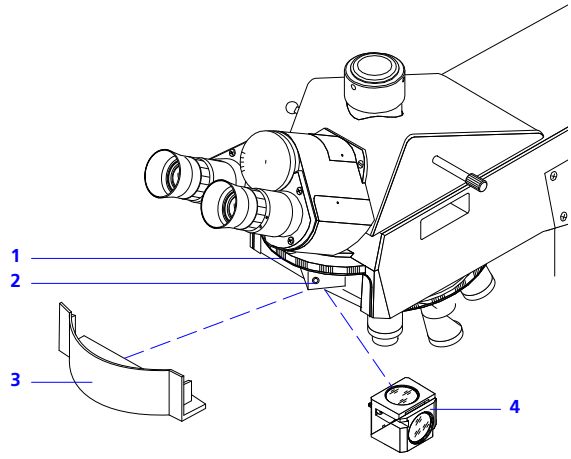
To enable the mounting of the, the reflector module is divided diagonally into two halves which are connected with two Allen screws (SW 2.5).

- Loosen the two Allen screws (**4**) using Allen key (SW 2.5).
- Carefully remove the beam splitter lying between the two reflector halves.
- Place the new beam splitter on the spring frame intended for it in one reflector half (reflecting surface showing downwards).
- Fold over the other half and screw both halves together with the two Allen screws.

Note: You can recognize the reflecting surface of the beam splitter by carefully viewing the edge: the reflection coating does not reach up to the edge.

- After the mounting work is complete, please attach the supplied sticker indicating the filter combination on the correct side of the reflector module (to the left in mounting position).

Note: Please be very extremely careful when performing the above adjustments and ensure that the filter inserts and beam splitters are not subjected to dirt and that they are not damaged.
Ideally, the integration of the filters and the beam splitter should be performed by a Carl Zeiss service engineer.



1 Reflector turret
2 Guiding pin
3 Protective cap
4 Reflector module

Fig. 100 Attachment of reflector modules

Attachment of reflector modules

Usually, the reflector turret is correctly equipped in the factory. To retrofit or change the equipment, proceed as follows:

- Swing the required opening of the reflector turret (**1**) into the beam path. Then turn the reflector turret clockwise by two clickstops (manually or using microscope software). The opening required is now accessible on the front right of the reflector turret (see Fig. 100).
- Grasp protective cap (**3**) by the top and bottom (fluted surface) and remove in a forward direction.
- Position module so that guiding pins (**2**) on the reflector turret engage with the appropriate holes on the module.
- Tighten attachment screws of the module using Allen key SW 2.5 mm. Put protective cap back on.

The reflector module requires no further adjustment.

Hinweis: If you screw the reflector module to the reflector turret from the right and turn the reflector turret counter-clockwise by two positions, the reflector module will be in the beam path. The in de ntation now visible at the front of the turret wheel can be used to attach the supplied label allowing an unmistakable positioning. Motorized/coded turrets have digits imprinted on the indentations to assign the turret position in the microscope software.

Reflector module

You can configure the reflector module (452888) for fluorescence microscopy with filters and beam splitters to meet your own personal requirements.
You can order the filter and beam splitter combination separately from us.
However, you can also purchase completely assembled reflector modules from us.

Mounting the filter inserts

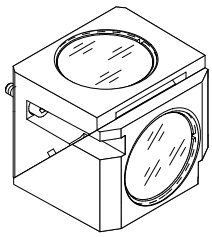
- First, remove the reflector module from the reflector turret in accordance with the above instructions.
- Use the mounting tool plate (contained in tool set) to loosen the ring screw for the filter to be changed and screw it out completely.
- Remove the filter by turning it out onto the surface of your hand.
- Insert the new filter into the opening, place the ring screw in position and re-tighten.

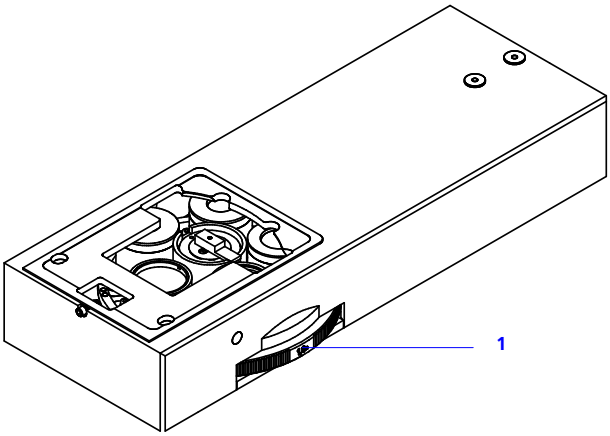
Hinweis: The reflecting surfaces of the filters must always be oriented in the direction of the illumination.

Microscope Components

Reflector modules

Overview

Specification	Application/combination	Cat. no.
Reflector module DIC Red I	Differential interference contrast, incident light, The integrated λ-plate converts optical path differences into colors.	452190
Reflector module DIC	Differential Interference contrast, incident light	452191
Reflector module H	Brightfield, incident light	452885
Reflector module D	Darkfield, incident light	452886
Reflector module Pol	Brightfield, incident light, polarization	452189
Reflector module FL 	Fluorescence, usable filter sets	452888
Optovar module 2.5x	Focusing aid for photography for additional magnification at a weak magnification, can be used only in transmitted light	452164
Optovar module 1.6x	For additional magnification in transmitted light	452194



1 Disk

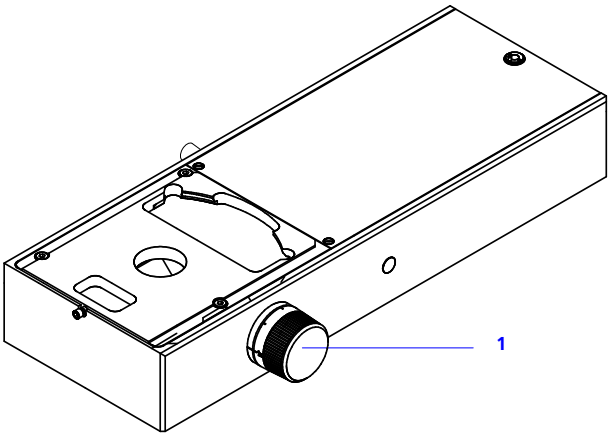
Fig. 97 Optovar intermediate tube

Optovar intermediate tube

(Fig. 97)

The Optovar intermediate tube additionally allows a convenient magnification change in the steps 1.0x, 1.25x, 1.6x, 2.0x and 2.5x. You can read the magnification factors at the projecting disk (**1**) on the right-hand side.
To set a different magnification factor, turn the disk to the appropriate click stop position.

Note: E-Pl eyepieces should be used instead of the Pl models because of their better imaging quality. Optovar in position 1x should only be used with eyepieces E-Pl 10x/25 Br.
If, when determining the microscope magnification, you do not want to work with these factors, then combine the magnification of Optovar and the 10x eyepiece and you practically have the eyepiece powers 10x, 12.5x, 16x, 20x and 25x.



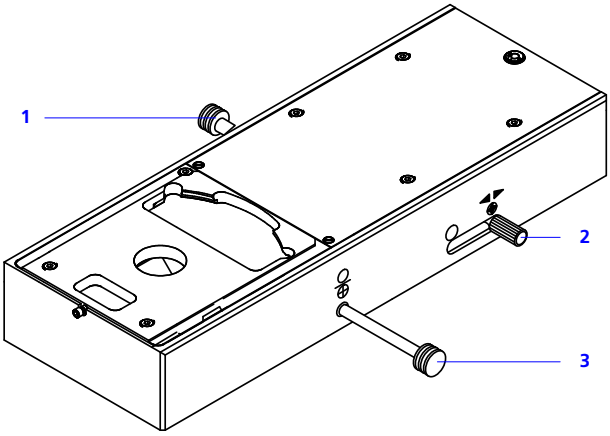
1 Knob for magnification setting

Fig. 98 Zoom intermediate tube

Zoom intermediate tube 1,0x ... 2,5x

(Fig. 98)

The intermediate tube with zoom extends the magnification range of the microscope continuously from 1x ... 2.5x. The required magnification can be set with knob (**1**) and the zoom factors can be read off at the scale.
Before installing the motorized intermediate tube (452186), remove transport lock (screw marked red) (not shown).



1 Pushrod for field diaphragm
2 Rotary and slider knob for Bertrand lens
3 Pushrod for reticle

Fig. 99 Intermediate tube Pol

Intermediate tube Pol

(Fig. 99)

The intermediate tube Pol is equipped with a Bertrand lens, a quartz depolarizer, a reticle which can be switched on/off and a field diaphragm (iris).

The combined rotary and slider knob (**2**) is used to swing in/out and to focus the Bertrand lens. In its rear position (symbol ⊕), the Bertrand lens is in the beam path (conoscopy).

Pushrod (**1**) is used to adjust the field diaphragm:
- pushrod in – diaphragm open
- pushrod out – diaphragm closed

Pushrod (**3**) is used to project a reticle into the beam path:
- pushrod in – reticle out of beam path
- pushrod out – reticle in beam path

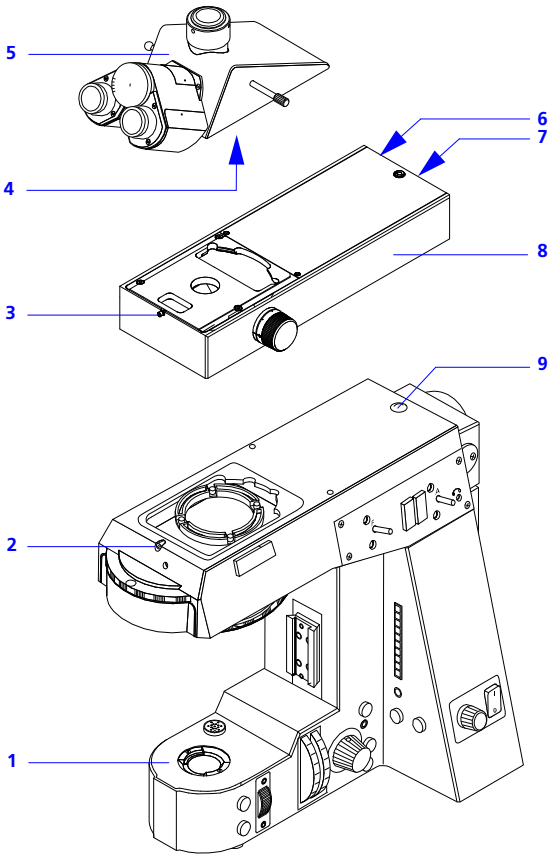


Fig. 95 Mounting of intermediate tube

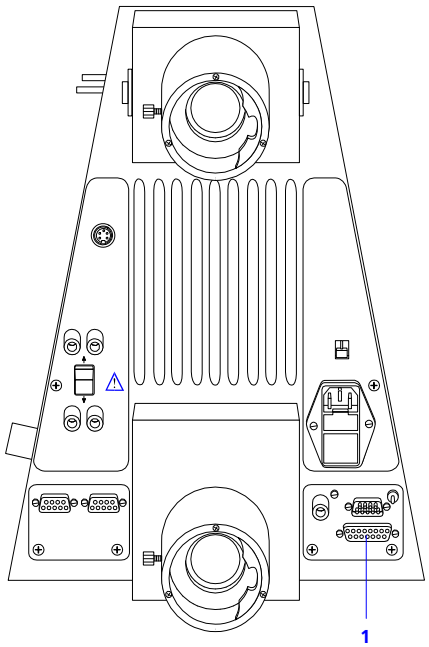


Fig. 96 Back of stand

General

Intermediate tubes are always attached to the upper part of the stand. To do this, the binocular tube must first be removed and its tube lens removed.

Note: Use the cover of the tube lens container to remove the tube lens (**4**).

Mounting of an intermediate tube

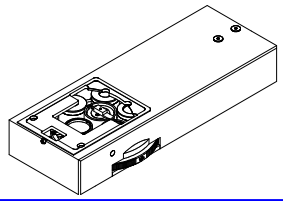
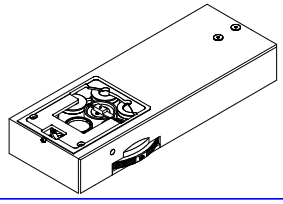
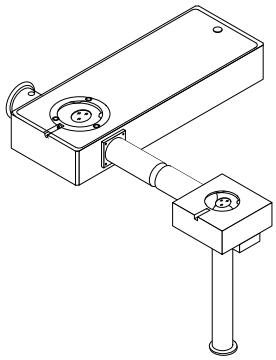
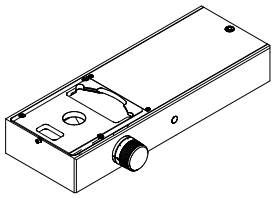
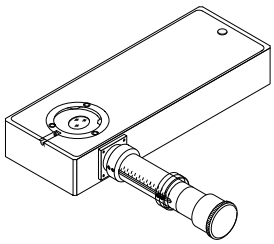
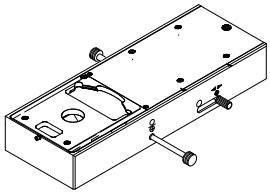
- Switch off your instrument.
- Loosen clamping screw (**2**) on stand (**1**) and remove the tube (**5**) upwards.
- Attach the intermediate tube (**8**) to the stand. Centration is made using the dovetail.
- Tighten clamping screw (**2**) on stand only slightly at first.
- Insert the supplied clamping screw with washer (**7**) into the drilled hole provided and screw it into the threaded hole (**9**) of the stand.
- Align the intermediate tube with the edges of the intermediate tube and screw tight clamping screws (**2**) and (**7**).
- Remove the tube lens (**4**) from the tube because a tube lens is integrated in the intermediate tube.
- Attach the tube (**5**) to the intermediate tube (**8**) and center via the dovetail.
- Align the tube with the edges of the intermediate tube and tighten the clamping screw (**3**).

- For coded or motorized intermediate tubes, connect the serial interface of the intermediate tube (Fig. 95/**6**) with that of the stand (Fig. 96/**1**) via the RS 232 C serial cable supplied.

Microscope Components

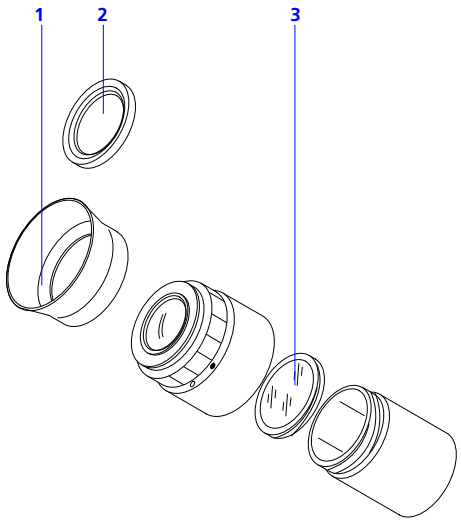
Intermediate tubes

Overview

Specification	Application/Combination	Cat. no.
Optovar 1.0x/1.25x/1.6x/2.0x/2.5x coded 	Additional magnification, in steps; for correctly dimensioned scale projection (Databack) with Axiophot 2 photo module (can also be used for microscopes without Axiophot 2 and without data transfer)	452175
Optovar 1.0x/1.25x/1.6x/2.0x/2.5x motorized 	like 452175, but motorized	452176
Coobservation equipment with light pointer 	For connection of a second binocular tube as a discussion device	452179
Zoom intermediate tube coded 	Additional magnification, stepless, coded; as motorized version	452180 452186
Intermediate tube for data projection, switchable 	Projection of data into intermediate image	452181
Intermediate tube Pol 	Crossline or iris stop can be inserted in field of view, focusing of Bertrand optics for axial image observation (conoscopy) Removal of individual object details form field of view using iris diaphragm, for Axioplan 2 Pol / Axiophot 2 Pol	452184

General

(Fig. 94)
The Zeiss microscopes are generally supplied with two focusing eyepieces. Eyeglass protective rings (**2**) are attached to the eyepieces to prevent lens scratching. Folding eyecups (**1**) can be used alternatively. Folding eyecups (1) can be helpful here.



1 Folding eyecup
2 Rubber ring for spectacle wearers (instead of **1**)
3 Reticle

Fig. 94 Eyepiece

Designations/Markings

Br.
The designation **Br.** on the eyepieces means that eyeglass-wearers can use their eyeglasses for microscopy and place them directly against the eyepieces. Users who do not wear glasses should keep a distance to the eyepieces allowing them to view the entire field.

foc.
The designation **foc.** on the eyepieces means that they are focusable. This allows you to compensate for **differences in the visual peformance of your two eyes**. For focusing, turn the eyepiece for the eye with better vision to the zero position and focus on the specimen using the fine drive. Then turn the focusing ring of the other eyepiece until you see the specimen in focus.
If you choose to wear your correctly fitted glasses when using the microscope, this adjustment is not necessary, since the compensation is performed by the glasses. Both eyepieces are set to zero. Visual defects, such as astigmatism, are not corrected. Eyeglasses or contact lenses should be worn.
If one of the eyepieces contains a reticle (**3**), you first have to focus the eyepiece on the reticle.

- To do this, remove the eyepiece from the tube and turn the upper part of the eyepiece until stop. Hold the eyepiece against a bright surface and turn the upper part in again until the reticle is visible in focus.
- Insert the eyepiece into the tube again and focus both eyepieces on the specimen (as described above).

White dot
This is the zero position of the eyepiece if no reticles are used.

Red dot
This is the zero position if a reticle is used in the eyepiece.

Note: Before looking through the microscope, check whether the eyepiece is in a zero position and set it to diopter power, if required.

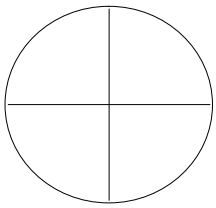
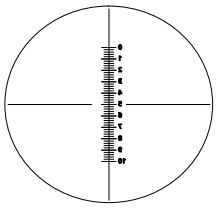
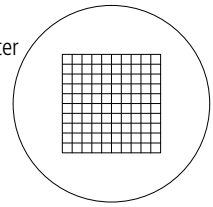
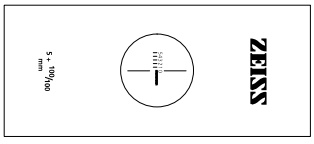
Use of reticles

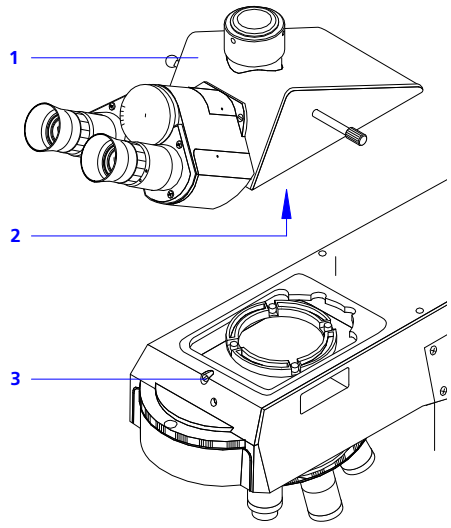
Eyepieces featuring a red dot allow the use of reticles.
Make sure that the reticle always faces the field stop.
Reticles should be inserted by the Zeiss servicing staff in dust-free conditions.

Microscope Components

Eyepieces

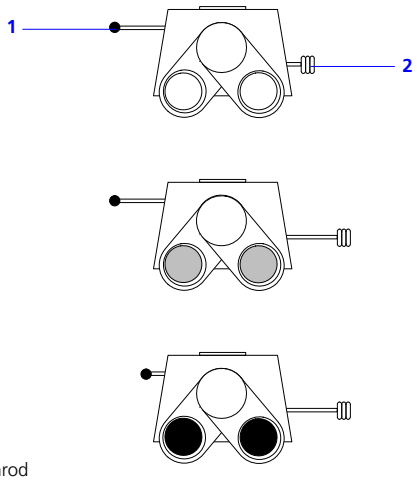
Overview

Specification	Application/Combination	Cat. no.
Eyepieces		
Eyepiece E-Pl 10x/25 Br. foc.	Standard eyepiece of research category for large field of view 25 mm	444234
Eyepiece E-Pl 10x/23 Br.foc.	High-performance aspheric eyepiece for Epiplan objectives or for use of intermediate tube Pol in field of view	444235
Eyepiece Pl 16x/16 Br.foc.	These highly magnifying special eyepieces are of help when you are working constantly with high additional magnifications	444054
Photo eyepiece S-Pl 8x/16	For the attachment of the MC 200 CHIP microscope camera	444029
Photo eyepiece S-Pl 10x/20	For the attachment of microscope cameras	444049-9902
Photo eyepiece S-Pl 12,5x/16	For the attachment of microscope cameras	
Reticles for 10x eyepieces (Measuring and counting)		
Eyepiece crossline disk 	d = 26 mm	
Eyepiece crossline micrometer 	14 : 140/d = 26 mm	
Eyepiece grid micrometer 	12,5x 12,5/5; 10/d = 26 mm	
Object micrometers (for calibrations)		
Object micrometer 	positive 5+ 100/100 µm, d = 0,17 mm	
Object micrometer for incident light 	negative 5+ 100/100 µm, d = 0	
Other aids on request.		



1 Tube
2 Tube lens
3 Securing screw

Fig. 92 Tube mounting



1 Upper pushrod
2 Lower pushrod

Fig. 93 Light splitting

General

All binocular tubes have a viewing angle of 30°. The inter-pupillary distance of can be set between 55 and 75 mm by pressing the two halves of the tube together or pulling them apart.

Note: If intermediate tubes are used, the tube lens (Fig. 92/**2**) of the binocular tubes must be removed. It can be stored in the container supplied. The cover of the container, which includs two pins, can be used as a tool for the removal.

Attaching tubes

(Fig. 92)

To attach the tubes, you need the SW 3 Allen key.

- Loosen securing screw (**3**) on the stand.
- Place tube (**1**) onto the upper part of the stand and align it.
- Tighten securing screw (**3**).

Light splitting

(Fig. 93)

The binocular tubes are equipped with pushrods fitted to the sides of the tubes. These pushrods move a sliding prism which directs part or all of the light to the photo/TV ports.

In principle, the position of the pushrods is the same for all tubes.

Upper pushrod pulled out and lower pushrod inserted: 100 % light to eyepieces.

Upper and lower pushrod (**1**) and (**2**) pulled out: 70 % light to the camera/TV ports, 30 % to the eyepieces. For tubes with three switch positions (452143, 452145), the medium position of the pushrod (**2**) splits the beam in 50 % for photo/TV and 50 % to the eyepieces.

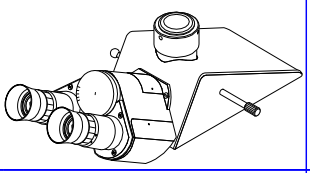
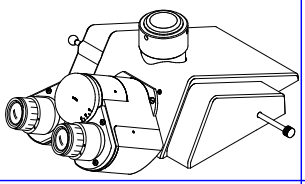
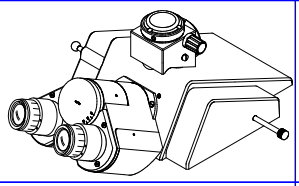
Upper pushrod (**1**) inserted: 0 % light to the eyepieces light shutter.

In tubes with more than one camera/TV port, an additional knob is included on the respective port for blocking or deflecting the light.

Microscope Components

Tubes

Overview

Specification	SFZ	Splitting	Application/Combination	Cat. no.
Binocular phototube with sliding prism30°/25 	25	100 : 0 30 : 70	2 switch positions 1 eyepiece shutter as light shutter with 30:70 ratio	452142
Binocular phototube with sliding prism 30°/25 	25	100 : 0 50 : 50 0 : 100	3 switch positions 1 eyepiece shutter as light shutter with 50:50 ratio	452143
Binocular phototube with two ports 30°/25 	25	100 : 0 50 : 50 30 : 70	3 switch positions and switching mirror in the phototube for two ports as an alternative for photo/TV	452145
Binocular phototube 25 with height adjustment (55 ... 305)	25	100 : 0 20 : 80		452146
Binocular autofocus tube 25 with height adjustment (55 ... 305)	25	100 : 0 20 : 80		452147

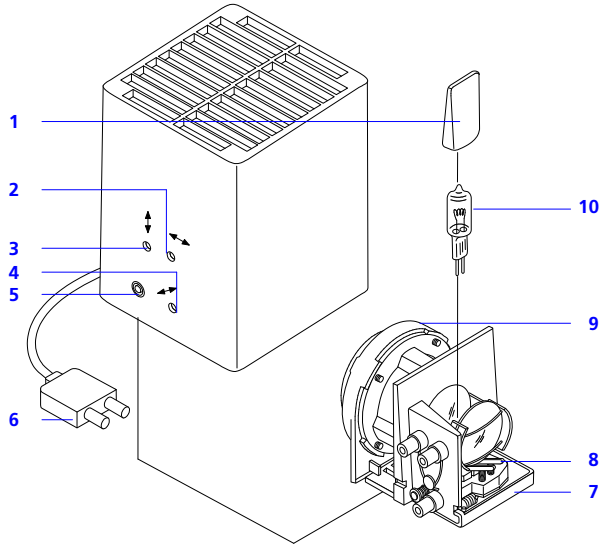
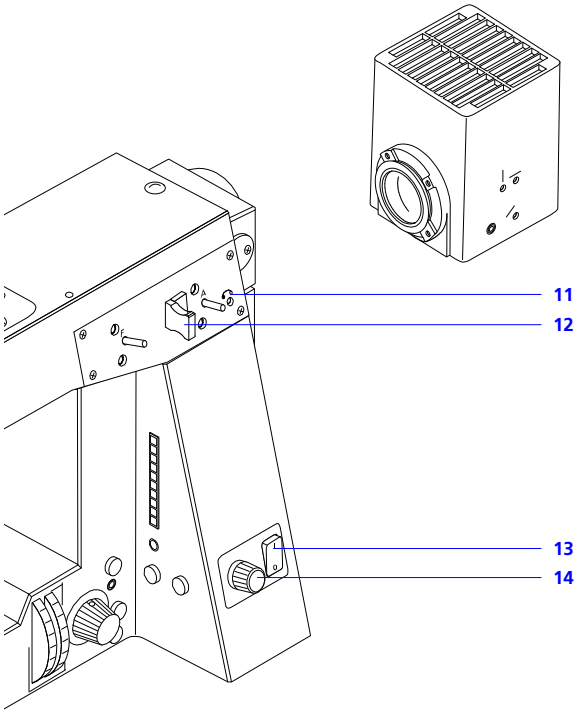


Fig. 90 Lamp housing and lamp mount



1 Protective cap
2 Focus adjustment of lamp filament
3 Vertical adjustment of lamp filament
4 Lateral adjustment of lamp filament
5 Securing screw for lamp housing
6 Plug for 12 V DC voltage supply
7 Lamp mount
8 Spring
9 Internal tube
10 Halogen lamp
11 On/Off switch for diffusing screen (incident light)
12 Filter, incident light
13 On/Off switch (I = on, 0 = off)
14 Voltage control for setting the illumination intensity

Fig. 91 Connection for incident light

Adjusting the halogen lamp

(Fig. 90; Fig. 91)

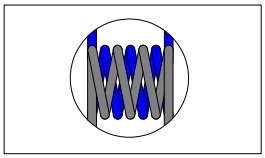
The SW 3 mm screwdriver delivered with the equipment is required to set screws (**2**), (**3**) and (**4**).

Coarse adjustment

- Remove microscope illuminator.
- Switch on Axioplan 2.
- Direct light ray towards a projection surface (wall, paper) at least 3 m away.
- Adjust screw (**2**) until the lamp filament is imaged sharply on the projection surface.
- Adjust screws (**3**) and (**4**) until the image of the lamp filament fills the gaps in the reflector image (→ *below*).

Fine adjustment

- Switch off diffusing screen and any filters present using switches (**11**) (incident light) or Fig. 3/**23** (transmitted light).
- Attach microscope illuminator.
- Focus on specimen with ≤ 40x objective and look for a free object area.
- Insert Bertrand lens or remove eyepieces so that you can observe pupil image with lamp filament and its mirror image.
- Adjust screws (**3**) and (**4**) until both images are centered.



- Reactivate diffusing screen and filters used.
- Optimize homogeneous illumination of pupil image with screw (**2**).

Changing the halogen lamp

- Remove plug (**6**) from sockets (Fig. 89/**10a**) or (**10b**).
- Remove microscope illuminator.
- Loosen screw (**5**) and pull out lamp housing in upward direction.
- The lamp mount is now accessible.
- Turn lamp housing upside down and remove old lamp by pressing spring (**8**).
- After removing protection cap (**1**), insert new lamp in socket with the springs pressed.
- Give spring short press downward to center the lamp.
- Re-attach lamp housing.

Note: Hold new halogen lamps by the protective caps (**1**) only. Even the tiniest traces of grease on the glass bulb of the lamp can impair the performance and service life of the lamp.

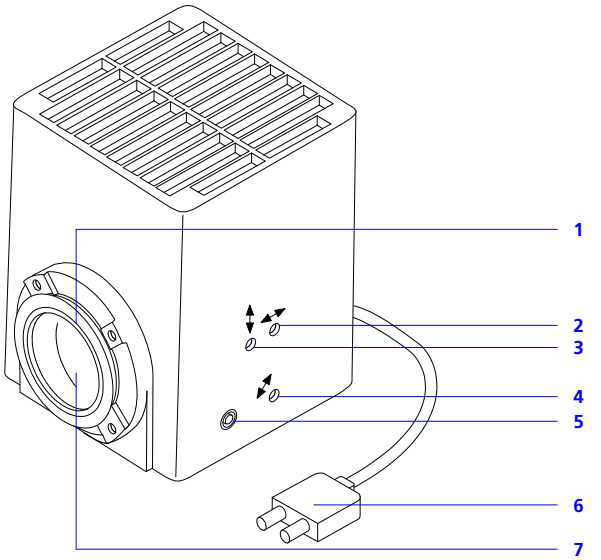
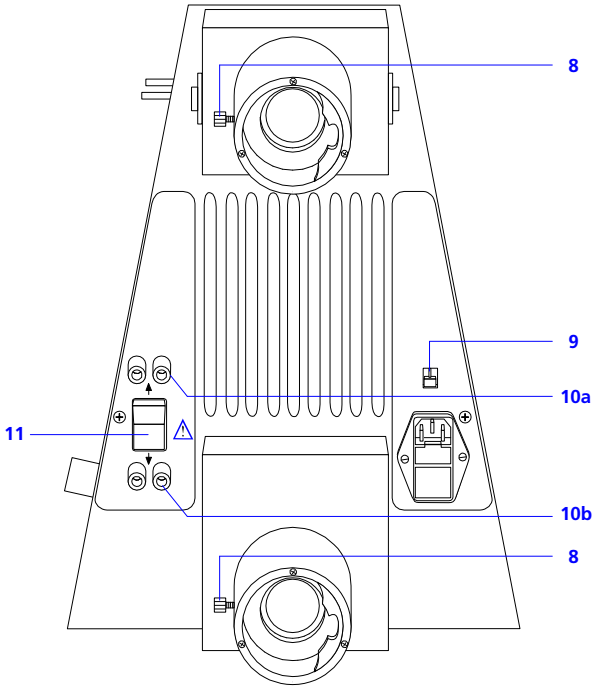


Fig. 88 HAL microscope illuminator



1 Dovetail ring
2 Focus adjustment of lamp filament
3 Vertical adjustment of lamp filament
4 Lateral adjustment of lamp filament
5 Securing screw for lamp housing
6 Plug for 12 V DC voltage supply
7 Light exit
8 Clamping screw for securing illuminator
9 Viewing window for checking the set instrument voltage
10a Socket, illuminator voltage for incident light
10b Socket, illuminator voltage for transmitted light
11 Toggle switch for switching between incident light/transmitted light

Fig. 89 Connection of microscope illuminators

HAL - halogen illuminator

(Fig. 88; Fig. 89)

The HAL microscope illuminator is suitable for transmitted light and incident light microscopy and is part of the standard equipment of the Axioplan 2.
It consists of a reflector, collector, heat-reflecting filter, lamp mount and a 12 V/100 W halogen lamp.
The illuminator is attached via a clamp system with dovetail ring (**1**) and clamping screw (**8**).

Note: A second heat-reflecting filter (467828) is required for Pol applications. The filter is installed in illumination tube using a retaining ring.

Electrical supply

The electrical supply is obtained from the power unit integrated in the stand.

WARNING!

Instrument voltage!
Before switching on the Axioplan 2, the voltage displayed in the window (Fig. 89/**9**) must correspond to the line voltage present. The instrument may otherwise be destroyed.
To convert the line voltage → chapter on *Care, Maintenance*.

- Connect illuminator to socket (**10a**) (incident light) or (**10b**) (transmitted light) via plug (**6**).
- Connect instrument to line supply and switch on with power switch (Fig. 91/**13**).
- Set toggle switch (**11**) in the appropriate position (transmitted light/incident light).
- Set light intensity with voltage regulator (Fig. 91/**14**).

After switching on and setting (**11**), the lamp may take a few seconds to light.

Note: An adjustable d.c. voltage of 3...12 volts stabilized against power fluctuations is present at sockets (**10a**) and (**10b**). Only the HAL illuminator may be connected. Other illuminators are supplied by external power units which are adapted to the powers of the respective lamps.

Microscope Components

General notes

WARNING!

Thermally sensitive fluorescence filters!
Fluorescence filters are sensitive to the thermal radiation of the microscope lamp.
Therefore, never remove the heat-reflecting filter from the illuminator tube.

Notes on the handling of lamps

CAUTION!

Risk of injury!

- Operate the lamps in the closed housing only.
- Gas discharge lamps emit intensive UV light. With longer periods of direct exposure, this can lead to skin burns and, in the long term, to skin cancer.
  Blindness or injury to the conjunctiva may result from looking directly into the lamp.
- Change lamps in cold state only: there is a risk of explosion due to the high internal pressure of warm lamps. Xenon lamps are also under pressure when cold.
  Maximum safety: protective visor and leather gloves with long cuffs.
- Always switch off the power unit and microscope prior to lamp change.
- Never touch the glass bulbs of the lamps to be changed, but use the protective caps delivered with the new lamps. Do not forget to remove the protective caps after the new lamps have been inserted.

WARNING!

Risk of damage to instrument!
Before you drape the dust cover over the microscope, switch off the microscope and the external power supply of the microscope illuminator.

WARNING!

Heat build-up!
Placing objects against or covering ventilation slots will lead to a build-up of heat which can destroy the instrument or cause a fire. For this reason, always keep the ventilation slots clear.

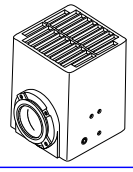
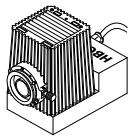
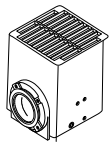
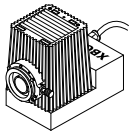
CAUTION!

Risk of burning!
Do not touch the lamp housing when using the microscope for long periods! The area of the upper ventilation slots in particular is subject to pronounced heating, resulting in a risk of burning.

Microscope Components

Microscope illuminators

Overview

Designation	Application	Component parts	Cat. no.
HAL 100 halogen illuminator 	Incident light and transmitted light All stands	Lamp housing (with collector and heat-reflecting filter, power unit integrated in Axioplan 2) 12 V/100 W halogen lamp	447219 380079-9540
HBO 100 gas discharge illuminator Mercury External power unit required! 	Epi-fluorescence All stands	HBO/XBO lamp housing HBO/XBO collector HBO 103 W/2 lamp mount HBO 100 lamp Transformer for HBO 100 (alternatively: stabilized VXHC 75/100 Kf 1b transformer)	447216-9902 447272 448016-9902 380018-4060 458451 458450
HBO 50 gas discharge illuminator Mercury External power unit required! 	Epi-fluorescence All stands	HBO/XBO lamp housing HBO 50/SF 25 collector HBO 50 lamp Power supply unit for HBO 50	44726-9902 447270 331619 392642
XBO 75 gas discharge illuminator Xenon External power unit required! 	Epi-fluorescence and for high light intensities in incident light All stands	HBO/XBO lamp housing HBO/XBO collector XBO 75 W/2 lamp mount XBO 75 lamp VXHC 75/100 Kf-1b transformer	447216-9902 447272 448012-9902 380053-9870 458450-9903

Note: For the procedure for the assembly and adjustment of the HBO 50 and HBO 100/XBO 75 illuminators, please see the separating operating manuals G 42-160 (Microscope Illuminator with HBO 50) and G 42-165 (Microscope Illuminator with HBO 100/XBO 75).

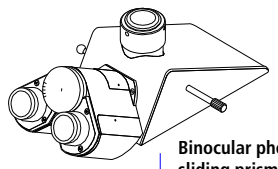
Microscope Components - Overview, Description, Instructions for Use

The Axioplan 2 incorporates the System Integration (SI) principle. This SI design allows the Axioplan 2 to be configured or converted to meet various requirements.
The following part of the manual describes all of the components with which the stands of the Axioplan 2 can be combined. Please note that some components require a specific stand model. For example, the use of parts controllable by motor is not possible with the purely manual version of the stand, but requires at least a type E stand.

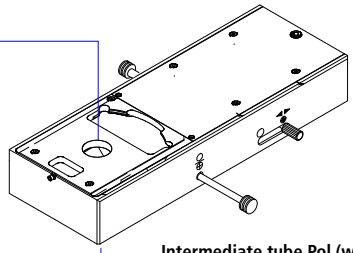
If the retrofitting of a motorized function is not possible with the equipment which you have purchased, please contact Zeiss Customer Service. It is possible that the retrofitting procedure can be performed without difficulty.
If components can only be used with the Axioplan 2 or only under certain conditions, this is indicated in the overview given for the components in question.

System Overview
Equipment for polarization

Eyepiece E - PI 10x/23 Br. foc.
(444235)



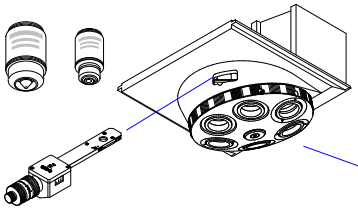
Binocular phototube with sliding prism 30°/25 (100/30.70)
(452142)

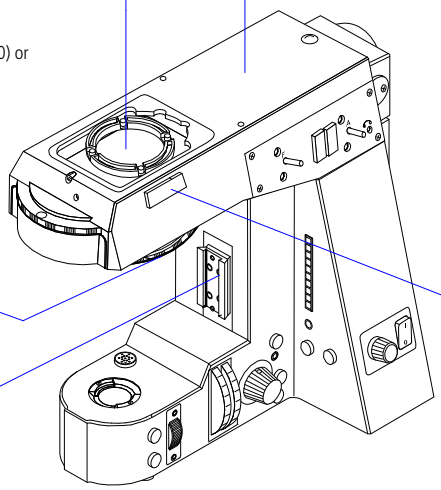


Intermediate tube Pol (with quartz depolarizer)
(452184)

Upper stand part of Axioplan 2
(452101)

6x nosepiece Pol W 0.8 cod.
(452139) up to 6 objectives Pol W 0.8 (1x with intermediate ring 444910) or 5x W 0.8 + 1 objective HD DIC M 27 and 1 DIC slider as per pricelist

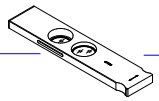




Brace – Koehler rotary compensator λ/8
(453716)
Tilting compensator E 0 – 6 λ
(453715)
Tilting compensator E 0 – 130 λ
(453717)

Stage carrier /

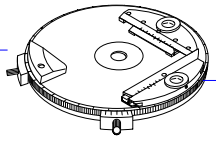
Condenser carrier



Fixed analyzer slider
(453657)

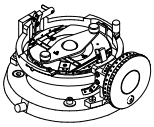
Slider für quartz depolarizer
(453659)

Quartz depolarizer d=32 mm
(453653)



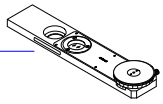
Rotary stage Pol
(453550)
with object guide Pol
(453560)

Specimen holder A Pol
(453564)



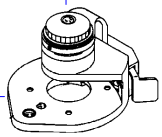
Specimen holder D Pol
(453563)

UD centering stage
(453565)
with UD condenser
(445460)
with objective Achromat UD 5x/0.13 Pol
(442001)
with objective Achromat UD 20x/0.30 Pol
(442003)
with objective Achromat UD 50x/0.60 Pol
(442005)

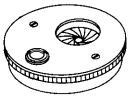


Rotatable analyzer
(453662)
Slider with analyzer with rotary lambda plate
(453663)

Condenser front lens 0.9 / d=2.9 Pol
(445331)
Condenser front lens 0.6 / d=4.2 Pol
(445330)



Achr. aplan. swing-in system condenser 0.24/d=10.7 Pol
(445325-9901)



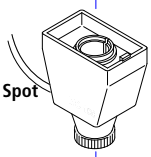
Brightfield insert
(445467)

Fixed polarizer D
(453615)
Rotatable polarizer D
(453620)
Fixed polarizer D with rotary lambda plate
(453626)
Circular polarizer D
(453623)

System Overview
Equipment for Documentation

Film cassette
35 mm Mot
(456070)

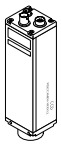
Camera-Attachment
M 4"x5"
(MC 80/MC 100)
(456056)



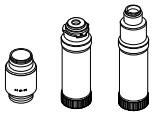
Camera body MC 100 Spot
(456014)

Camera lens S-Pl 10x/20
(444039)
Camera lens S-Pl 12,5x/16
(444049)

Camera-to-microscope adapter 30 mm dia.
(456006)



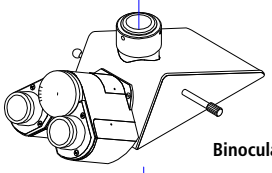
TV-Camera
(as desired)



Adapter from 60 to 44
(456140)
TV zoom 44 C 2/3" 0.5x...2.0x
(452983)
TV zoom 44 ENG 2/3" 0.5x...2.0x
(452981)
TV zoom 44 ENG 1/2" 0.5x...2.0x
(452982)

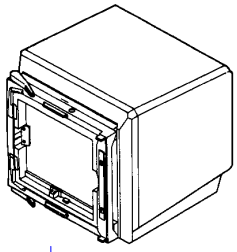
TV zoom 60 C 1/3 0.35x ... 1.6x
(456110) in preparation
TV zoom 60 ENG 1/2" 0.4x...2.0x
(456122)
TV zoom 60 ENG 2/3" 0.4x...2.0x
(456121)
TV zoom 60 C 0.4x...2.0x
(456123)

TV adapter 60 C 1/3" 0.4x
(456108)
TV adapter 60 ENG 1/2" 0.5x
(456119)
TV adapter 60 C 2/3" 1.0x
(456105)
TV adapter 60 C 1/2" 0.5x
(456106)
TV adapter 60 C 2/3" 0.63x
(456107)
TV adapter 60 ENG 2/3" 1.0x
(456115)
TV adapter 60 ENG 2/3" 0.8x
(456117)
TV adapter 60 ENG 1/2" 0.63x
(456118)



Binocular phototube

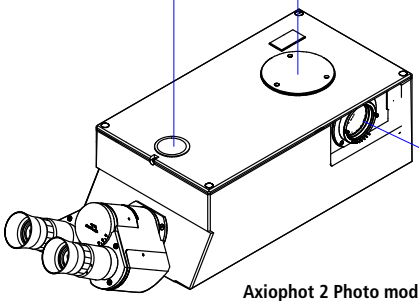
Video camera for focus finder
(412237-9450)
Cable to fokus finder
(457411-9013)
TV adapter for Axiophot 2
(452230)
TV adapter 60 C 2/3" 1.0x
(456105)



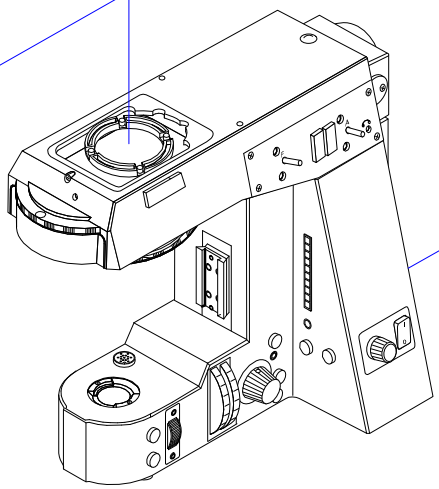
4"x5" large-format attachment
(452243)

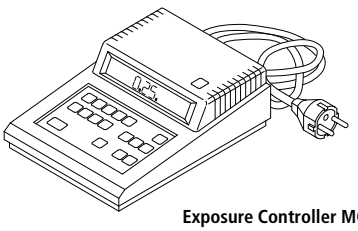
D4 Databack
(456073)

Film cassette
35 mm mot. DX
(456071)
on both sides can be attached



Axiophot 2 Photo module with center-weighted averaging and spot metering
(452237)



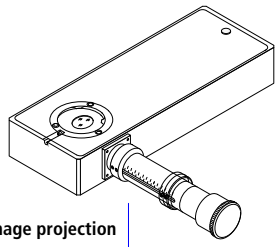


Exposure Controller MC 100
(456049)

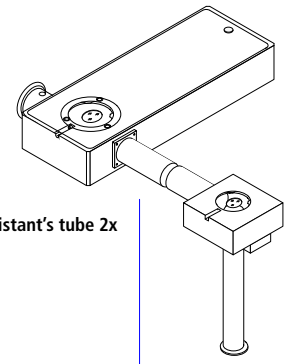
Notebook with Dual Scan Monitor
(412237-90XX)
Notebook with TFT monitor
(412237-90XX)

Software for camera module Axiophot 2
(412237-91XX)

System Overview
Intermediate tubes, Illumination, Analyzers



Intermediate tube for image projection
(452181)



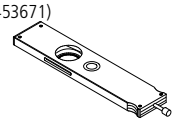
Intermediate assistant's tube 2x
(452179)

HAL 100 lamp housing with collector, lamp mount and heat-reflecting filter
(447219)

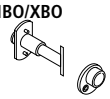
HBO 50 lamp housing with lamp mount
(447220)
Collector HBO 50/SF 25
(447270)

Power supply unit for HBO 50
(392642)

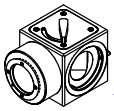
Bertrand lens slider Ph
(453671)



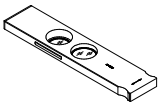
Adjusting aid HBO/XBO
(452169)



Path-deflecting mirror for two illuminators
(447230-9901)

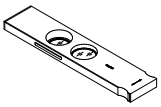


Fixed analyzer slider
(453657)

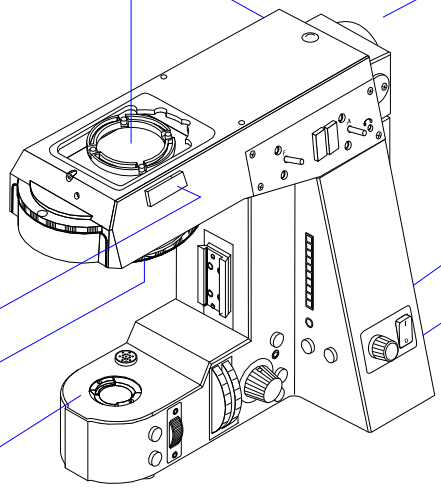


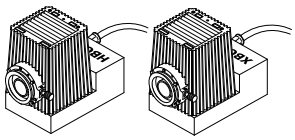
Slider with analyzer with rotary lambda plate
(453663) (in preparation)

Slider for quartz depolarizer
(453659)



Quartz depolarizer d=32 mm
(453653)





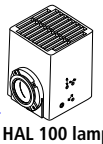
HBO/XBO lamp housing
(447216-9902)
Collector HBO 103/XBO 75 W/2
(447272)
or quartz collector HBO/XBO
(467275)
HBO 103 W/2 lamp mount
(448016-9902)
XBO 75 W/2 lamp mount
(448012-9902)

HBO 100 Power unit
(458451)
VXHC 75/100 Kf-1b power unit
(458450)

Notebook with TFT monitor
(412237-90XX)

Filter magazine D
(452155)
Filter magazine D photo
(452157)
Filter magazine D mot.
(452156)

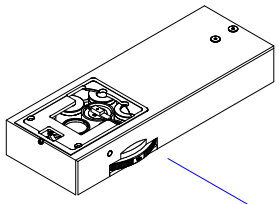
Software for Axioplan 2
(412237-92XX)



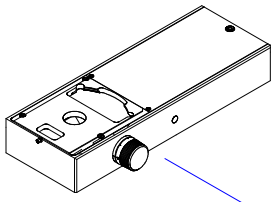
HAL 100 lamp housing with collector, lamp mount and heat-reflecting filter
(447219)

Luminous-field diaphragm insert D
(452160)
Luminous-field diaphragm insert D mot.
(452161)

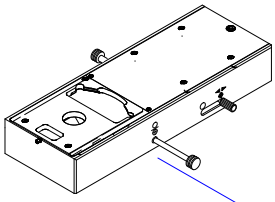
System Overview
Intermediate tubes, Nosepieces, Compensators



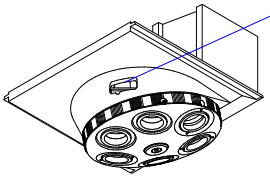
Optovar intermediate tube 1.0x/1.25x/1.6x/2.0x/2.5x cod.
(452175)
Optovar intermediate tube 1.0x/1.25x/1.6x/2.0x/2.5x mot.
(452176)



Intermediate zoom tube 1.0x ... 2,5x mot.
(452186)
Intermediate zoom tube 1.0x ... 2,5x cod.
(452180)

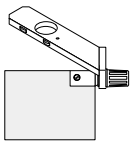


Intermediate tube Pol (with quartz depolarizer)
(452184)



7x nosepiece H W 0.8
(452130)
6x nosepiece H DIC W 0.8
(452131)
6x nosepiece H D DIC M27
(452132)
7x nosepiece H W 0.8 cod.
(452134)
6x nosepiece H DIC W 0.8 cod.
(452135)
6x nosepiece H D DIC M27 cod.
(452136)
7x nosepiece H W 0.8 mot.
(452137)
6x nosepiece H D DIC M27 mot.
(452138)
6x nosepiece Pol W 0.8 cod.
(452139)

DIC sliders
entire line according to price list



Fluorescence protection screen
(452163)

Compensator lambda 6x20
(473704)

Compensator lambda / 4 6x20
(473714)
Wedge compensator 0 - 4 lambda 6x20
(473724-9902)
Sénarmont compensator 546:4, 6x20
(473718)
Brace–Koehler rotary compensator λ/8
(453716)
Ehringhaus tilting compensator 0 –6 λ
(453720)
Ehringhaus tilting compensator 0 –130 λ
(453722)

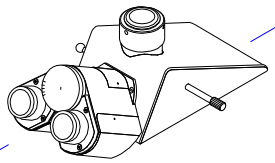
Objectives
entire line of ICS objectives according to price list

Mirau interference equipment for LD 20
for objects with thread W 0.8
(444942)

Antiflex cap for Epiplan-Neofluar 2.5 HD
(444920)
Antiflex cap for Epiplan-Neofluar 1,25x
(444921)
Antiflex cap for Epiplan-Neofluar 2.5x
(444922)

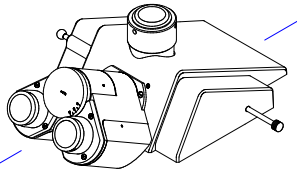
Intermediate ring M27 on W 0.8 H = 0.94
(444911)
Intermediate ring H "O" M 27 on W 0.8
(444910)

System Overview
Stand, Tubes, Eyepieces, Filters, Reflectors



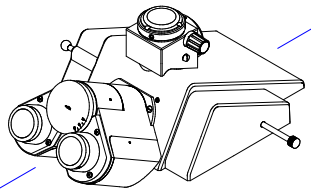
Binocular phototube with sliding prism 30°/25 (100/30:70)
(452142)

Binocular phototube with height adjustment 5-35/25 and image erection (100/30.70)
(452146) - in preparation
Binocular tube with two TV ports
(452147) - in preparation



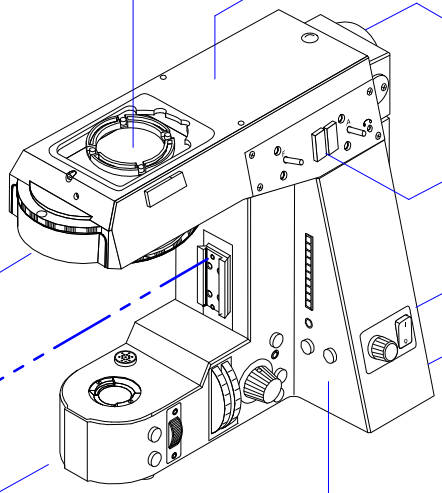
Binocular phototube with sliding prism 30°/25 (100/100/50:50)
(452143)

Eyepiece Pl 10x/25 Br.
(444033)
Eyepiece Pl 10x/25 Br. foc.
(444034)
Eyepiece Pl 16x/16 Br.
(444053)
Eyepiece Pl 16x/16 Br. foc.
(444054)
Eyepiece E - Pl 10x/25 Br. foc.
(444234)
Eyepiece E - Pl 10x/23 Br. foc.
(444235)

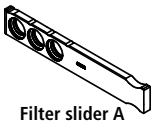


Binocular tube with two TV ports 30°/25 (100/50:50/30:70)
(452145)

Upper stand part of Axioplan 2
(452101)
Upper stand part of Axioplan 2 mot.
(452102)
Upper stand part of Axioplan 2 cod.
(452104)



Incident light illuminator
(452171)
Incident light illuminator Fl
(452170)



Filter slider A
(452174)

Integrated 12 V/100 W power unit
(452185)

Transmitted-light illumination
(452150)

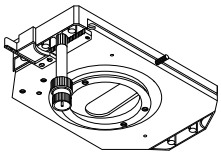
Reflector module H
(452885)
Reflector module D
(452886)
Reflector module DIC
(452191)
Reflector module DIC red I
(452190)
Reflector module Pol
(452189)
Reflector module Fl
(452888)
Optovar-module 2.5x
(452164)
Optovar-module 1.6x
(452194) in preparation

Luminous-field diaphragm insert D
(452160)
Luminous-field diaphragm insert D mot.
(452161)

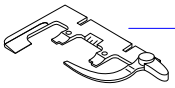
Axioplan 2 stand base
(452111)
Axioplan 2 mot. stand base
(452112)
Axioplan 2 El. stand base
(452113)

Filter magazine D
(452155)
Filter magazine D photo
(452157)
Filter magazine D mot.
(452156)

System Overview
Stage carriers, Stages, Condenser carriers

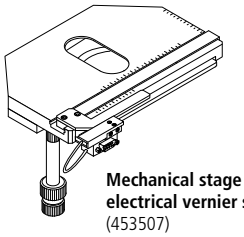


Rotary, centerable mechanical stage 75x50 / 240° R
(453502-9904)

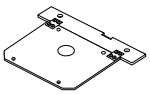


Adapter for mineralogy specimen mount
(453541)

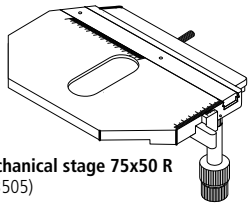
Specimen holder with spring clip R
(453533)



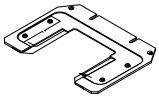
Mechanical stage 75x50 R with electrical vernier scale
(453507)



Specimen holder A
(453539)

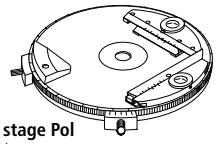


Mechanical stage 75x50 R
(453505)



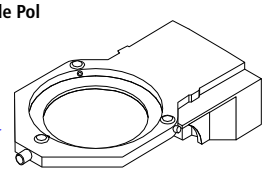
Specimen holder with special fixation for the mounting of two specimens
(453538)

Specimen holder D Pol
(453563)

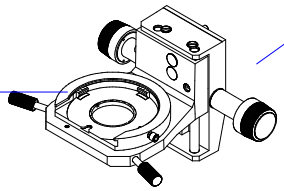


Rotary stage Pol
(453550)
with object guide Pol
(453560)

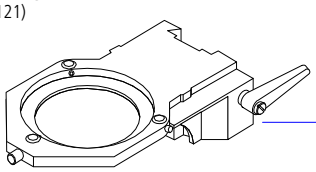
Specimen holder A Pol
(453564)



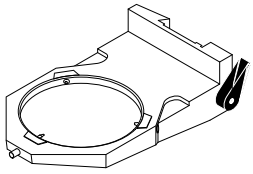
Fixed stage carrier
(452121)



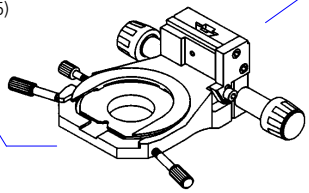
Centerable condenser carrier with height adjustment on both sides
(452125)



Lowerable and removable stage carrier
(452122)

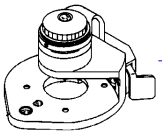


Attachable stage carrier ZA
(451826)



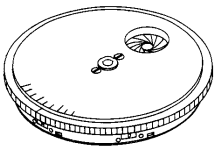
Centerable condenser carrier with height adjustment on both sides for removable stage carrier
(452127)

System Overview
Condensers



Achromatic-aplanatic swing-in condenser system 0.24/d=10.7
(445350-9901)

Achromatic-aplanatic swing-in condenser system Pol 0.24/d=10.7
(445325-9901)

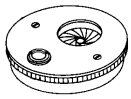


Turret disk H, D, Ph
(445465)
Turret disk H, D, Ph, DIC
(445466)

Ring stop 1/0.9
(445469)
Ring stop 2/0.9
(445470)
Ring stop 3/0.9
(445471)
Darkfield stop 0.75/0.9
(445399)

DIC prism II / 1.4
(445375)
DIC prism III / 1.4
(445376)

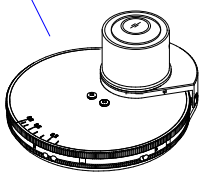
Front lens Pol 0.9 / d=2.9
(445331)
Front lens Pol 0.6 / d=4.2
(445330)



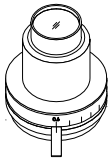
Brightfield insert
(445467)

DIC prism I / 0.9
(445372)
DIC prism II / 0.9
(445373)
DIC prism III / 0.9
(445374)

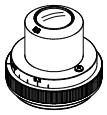
Front lens 0.9 / d=2.9
(445356)
Front lens 0.6 / d=4.2 LD, a=6.8 mm
(445356)



Achromatic-aplanatic condenser 1.4 H DIC, d=0.5 mm
(445452)
Achromatic-aplanatic condenser 1.4 H Ph DIC, d=0.5 mm
(445453)

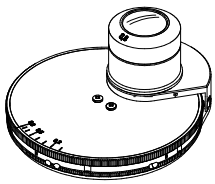


UV condenser 0.6 Pol for Axioplan 2 Pol
(445460))

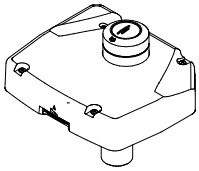


Achromatic condenser 0.8 H, d=6.7 mm
(445443)

Achromatic condenser 0.8 H mot., d=6.7 mm
(445444)



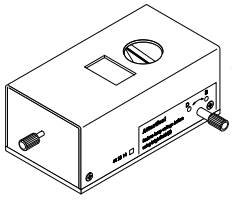
Achromatic condenser 0.8 H D Ph, d=6.7 mm
(445445)



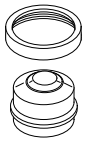
Achromatic condenser 0.8 H D Ph mot., d=6.7 mm
(445446)

Achromatic dual condenser 0.5, d=1.0 mm
(445340)

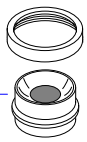
Achromatic dual condenser 0.5 mot.
(445341)



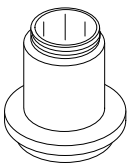
Darkfield illuminator
(445314-9901)



Ultra condenser 1.2/1.4 (0.75-1.0)
(465500)



Dry darkfield condenser 0.8/0.95 (0.6-0.75)
(465505)



Condenser holder Z
(445323)

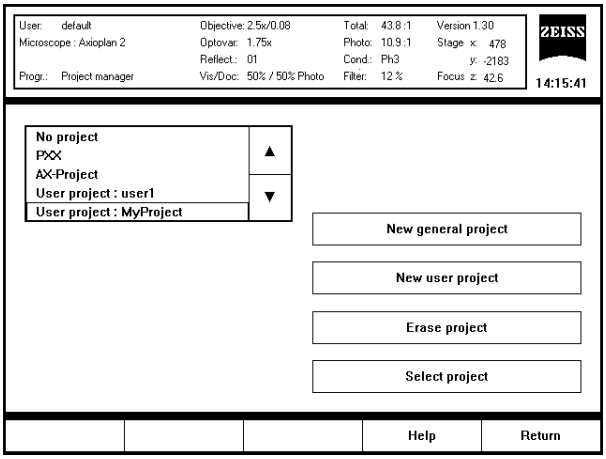


Fig. 87 Project management

Project management program module

Here you can select or create projects for photo documentation or delete existing projects.

A selected project can be used for documentation in PhotoAccess and for data recording with Databack.

Two types of projects are available

- ❑ general projects
- ❑ user projects

General projects can be used by all users with a log-in whereas user projects can only be used by the user who has created these projects.

User projects are specially marked in the project list.

Functions of the macro interpreter

The following Axioplan 2 functions can be called via the macro interpreter:

Function	Description
SetReflector n	Moves the reflector turret to position n (e.g. SetReflector 1 'FITC) The description of the position you have selected in the Setup for this position is given after the position number as a comment.
SetCamera (only for Axiophot 2)	Switches to the relevant camera: "left" left 35 mm camera "right" right 35 mm camera "middle" large-format camera "video" TV camera
SetVisDoc (only for Axiophot 2)	Switches the relevant light path: "visual" 100 % of the light for the eyepiece "visual / photo" 50 % for the eyepiece and 50 % for the still camera "photo" 100 % of the light for the still camera "visual / video" 50 % for the eyepiece and 50 % for the TV camera "video" 100 % of the light for the TV camera
SetExposureMode (only for MC 200 CHIP)	Sets the mode for the automatic determination of the exposure time: "Integral" (center-weighted) The entire image field is used for exposure metering. "Spot" or "Spot 1 %" A spot (approx. 1 % of the center-weighted averaging field) in the center of the image field is used. "Spot 0.1 %" For the determination of the exposure time (approx. 0.1 % of the center-weighted averaging field) in the center of the image field is used. "Auto - FL" for the automatic determination of the exposure time for fluorescence, polarisation or dark field specimen "Auto - BF" for the automatic determination of the exposure time for bright field specimen
SetExposureTime d	Sets a fixed exposure time d in seconds (e.g. SetExposureTime 1.35)
SetCorrection c	Sets the correcting value for the Integral and Spot mode possible values of c: –5, –4, ..., 4, 5.
StartExposure	Starts the exposure of a photo: "multi" Multiple exposure (the film is not advanced after the exposure). Without parameter Film is advanced after the exposure.
Wait d	Waits the specified period d. The time is given in seconds (0 to 86400 s - corresponds to one day).
Pause	The macro is interrupted for an undefinite period, to continue click on the **Continue** button.
Wind	The film is advanced by one frame.
UseSetting n	Loads the stored microscope setting number n (e.g. UseSetting 4 '20x bright field). As comment, you will find after the number the name assigned to the setting when saving it.

To be able to use these functions you need the Axiophot 2 camera module or the MC 200 CHIP and a motorized reflector turret.

Note: To link finished macros from other users, proceed as follows:

- Copy the macro into your data path.
- Activate a macro button.
- Click on the **Macro name** button.
- Enter the name of the macro without suffix (**.mac**) ein.
- The content of the macro appears in the left display field.

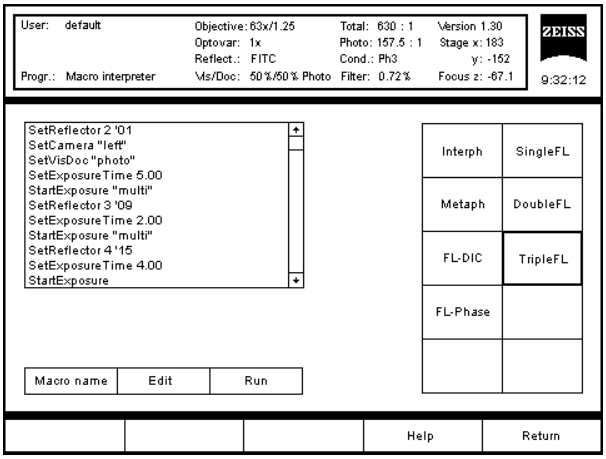


Fig. 85 Macro interpreter

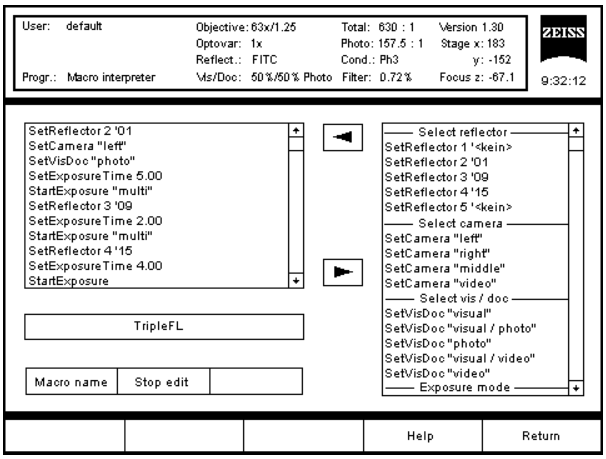


Fig. 86 Editing of a macro

Macro interpreter program module

The macro interpreter enables you to generate, load, edit and start macros.

Generation of a macro

- Select a button. An empty display field appears on the left side.
- Click on **Macro name** and enter a name for the macro.
- Click on **Macro name** again to accept the name. The name of the macro now appears on the active button.
- Now proceed as described below under **Editing of a macro**.

Editing of a macro

- Click on **Edit**. A second display field, from which you can select functions, appears on the right side.
- To include a function into the macro, mark the function in the right field, mark the position in the macro where the function is to be inserted in the left field and click on the upper arrow button.
- If you want to delete an entry from the macro, mark the relevant lines and click on the lower arrow button.
- Editing is concluded by clicking again on the same button on which **Stop edit** is now written. This automatically stores the macro under its name in the user data path.

Loading of a macro

- Click on a macro button.
- A display field appears on the left side which shows the content of the macro file.

Starting and interrupting a macro

- To start a macro, click on the **Run** button.
- You can interrupt an active macro by clicking on **STOP** (same button).

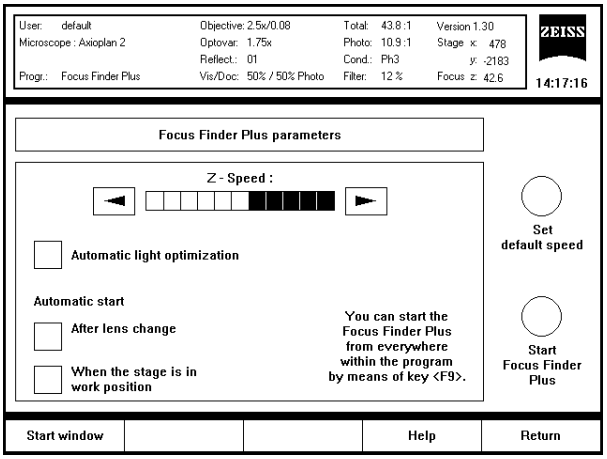


Fig. 84 Focus Finder Plus **program module**

Focus Finder Plus program module

It is often difficult to find the exact focus above all with objectives of a low magnification. This becomes even more evident if you want to take photos.
The **Focus Finder Plus** is a focusing aid to facilitate quick focus finding. As in the case of the Focus Finder, signals of a video camera are evaluated by the software.
Whereas the focus must be set by hand in the case of the **Focus Finder**, a click on a button will suffice for the **Focus Finder Plus** to find the focus automatically.
The **Focus Finder Plus** can be started out of each program part with **F9**. It is also possible to assign the start function of the **Focus Finder Plus** e.g. to the right mouse key. (→ *Axioplan 2-Mouse*).
The perfect functioning of the **Focus Finder Plus** depends on a high-contrast preparation. Inevitably there will be limitations for low-contrast specimens i.e. those that have no defined limits (e.g. weak fluorescence signals).
For objectives with low magnification (<40x), the **Focus Finder Plus** is very helpful as the focal range (depth of field) is larger and the human eye has difficulties to find the optimum focus. In the case of objectives of a higher magnification the eye works more precisely and quicker as the **Focus Finder Plus**.

Error elimination for Focus Finder Plus

Light optimization attempt unsuccesful
Cause:
To increase the contrast, an automatic light optimization is made before each focusing process. Poor light or contrast makes it impossible to find the focus.
Error elimination:
The light intensity can be increased if all (grey) filters are removed from the optical path.

Focus not found
Cause:
The reason is often a preparation lacking in contrast.
Error elimination:
With a successful light optimization it is possible to set the z speed.
A lower speed can facilitate the focus finding process.
A higher speed of the z drive may be used for uncritical and high-contrast preparations to find the focus even much quicker.

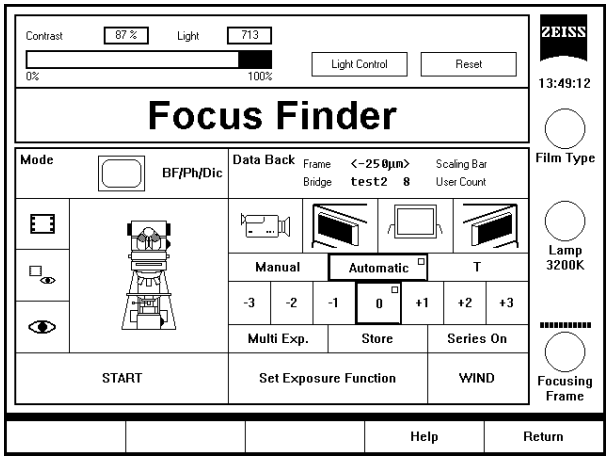


Fig. 83 Focus Finder **Screen**

Focus Finder program module

The **Focus Finder** is a focusing aid, which finds the focal plane by analyzing the image contrast.

In order to get sufficient contrast, the light intensity must be between 600 and 1000 throughout the procedure. This optimum intensity will be set automatically if you click on the **Light Control** button.

Procedure:

- Reset the Focus Finder by clicking on the **Reset** button.
- Slowly turn the focusing knob across the focal plane. (During the focus finding operation, the current contrast is indicated by the display and as a blue bar of varying length.) Once you have hit a contrast maximum, the bar turns green, and a sound signal is heard.
- To retrieve the contrast maximum, slowly turn the focusing knob back until the green bar and the display box indicate **100 % contrast**.
- To exit the **Focus Finder**, click on the **Return** button, or any other button except **Microscope Control**.

Using the Focus Finder

The Focus Finder of the Axioplan 2 assists you in the setting of the proper focal plane, provided that you have mounted a TV camera to one of the camera ports of the photo module and connected the video cable to the TV input socket on the rear side of the microscope stand.
When configuring the photo module, you must have selected the **Camera for Focus Finder exists** option in the **Setup** program.

For setting the focal plane using the Focus Finder, proceed as follows:

- Click on the **Photo** button on the Main Screen.
- Click on the **Microscope Control** button.
- Switch on the halogen lamp, then click on **Return**.
- Click on the **Focus Finder** button.
- Adjust the focal plane.

Turn the focusing knob manually, or use the motorized Z drive if you have it. Access is through **Microscope Control**.

Archiving and analysis

The digital image is stored together with the current microscope settings in the image database.
Afterwards the image is automatically handed over to the image processing system KS x00.
First open an image database in Image Access and start the program KS x00, before actuating this button.

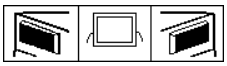
Calibration

For calibration purposes a calibration object is measured which must be positioned under the microscope before actuating this button.
The digital image is automatically handed over to KS x00 for measurement.
First open an image database in Image Access and start the program KS x00, before actuating this button.
For further images, these calibration data are computed with the respective microscope magnification.

Image file name

File name of the last image with its directory.

Display of the calibration data



Switching to photography

Beam path for the respective camera is opened.
Jump into program part **Photo**.

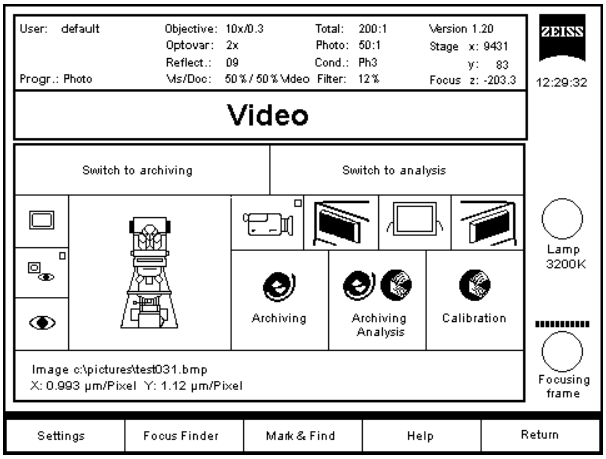


Fig. 82 Digital photography **Screen**

Digital photography

Digital photography is based on the coupling of the Axioplan 2 program with the image archiving system **Image Access** and the image processing system **KS x00**.

It is possible to capture and process digital images provided the image archiving program or the image processing software has been started beforehand.

Coupling of the programs allows also documentation of all microscope data of coded or motorized components in the image database. The respective buttons in the Axioplan software are released only after the initialization of the respective programs.

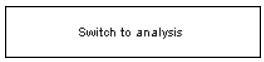
Hardware prerequisites for digital photography are:

- ❑ an **Image Access** supported framegrabber,
- ❑ a high resolution graphics card.

Frame grabbing is always done by **Image Access**. An image database must therefore be open in this program.
The **Image Access** database is compatible with the **PhotoAccess** database.

Switch to archiving

Axioplan 2 program hands over control to Image Access.
Microscope control is suspended till control is returned.



Switch to analysis

Axioplan 2 program hands over control to an image analysis program **KS x00**.
Microscope control is suspended till control is returned.

Archiving

The digital image is stored together with the current microscope settings in the image database.
Before actuating this button, an image database must have been opened in **Image Access**.

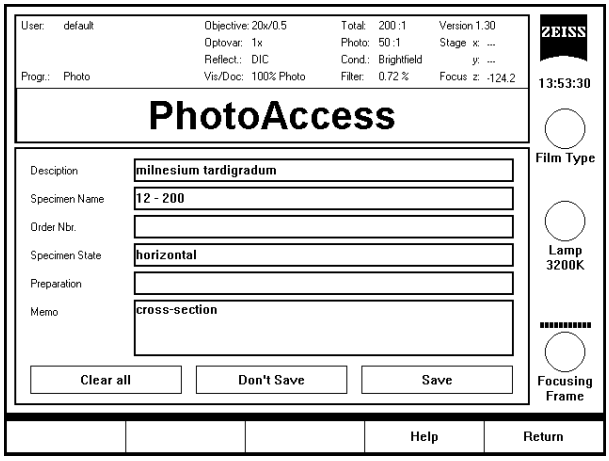


Fig. 81 PhotoAccess **Screen**

Entering Data into the Photo Database

If in the **Photo** menu under **Set Exposure Function**, you have activated **PhotoAccess**, this is an input mask that will appear after every micrograph taken.

To enter data, click on the respective text boxes.

The data entered and the following parameters of the frame taken are stored in the Photo Database by clicking the **Save** button:

- ❑ Film type, film speed, reciprocity correction, frame count
- ❑ User name, date, time of day
- ❑ Exposure parameters (exposure time, exposure mode)
- ❑ Data exposed with the Databack
- ❑ Microscope settings (objective, Optovar, reflector, filters, aperture diaphragms, illuminated field diaphragm, lamp voltage, visual / photography light shares)

To return to the **Photo** menu without storing any data or parameters for this frame, click on **Don't Save**.

Clicking on the **Clear All** button clears all of the six text boxes, and you can enter new data.

Recommendation

Recommendations

Among other data, the film database contains minimum and maximum exposure times and recommended compensating filters.

If you activate the **Recommendations** button, the exposure times are monitored in accordance with the recommendations made by the film manufacturer, and the Photo display shows the compensating filters recommended for the respective exposure time.

100% Light to Film

100% Light to Film

If this button is active, 100 % of the light is directed to the camera during an exposure, irrespective of any settings made previously.

50% Light to Film

50% Light to Film

If this button is active, 50 % of the light during an exposure is directed to the camera and 50 % to the visual observation path, irrespective of any settings made previously.

Lamp 3200K On

Lamp 3200K On

If this button is active, the lamp voltage during an exposure is changed to produce a color temperature of 3200 K.

PhotoAccess

PhotoAccess

Activate this command button if you want to file parameters and comments on each frame in the Photo Database.

For further information please see → *Entering Data into the Photo Database*.

LOG-File

LOG-File

Clicking on this button opens a text box in which you can enter a file name for a record of the exposure data.
No data will be recorded if you havn't entered a file name or if the button **LOG-File** is deactivated.

Set Exposure Function

Set Exposure Function

By clicking on this button you confirm the settings made.

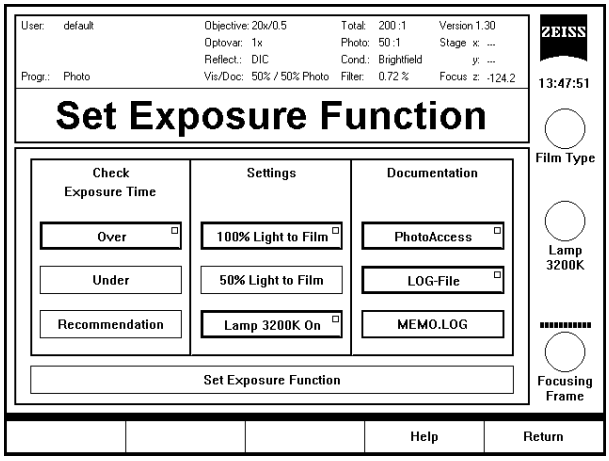


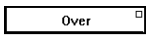
Fig. 80 Set Exposure Function **Screen**

Setting the Exposure Cycle

In the left box, **Check Exposure Time**, you can explicitly allow or disallow over- or underexposure.

In the center box, **Settings**, you can temporarily change the beam path distribution and the lamp voltage, irrespective of the current state. The settings you make here apply only for the current exposure; at the end of this exposure the original settings are reactivated. This feature allows you to take micrographs without manual manipulation of the microscope.

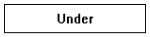
In the right box, **Documentation**, you can file a record of the main exposure data, including film number, exposure time, magnification, objective, filters, and light intensity. The contents of the record can be viewed with a word processor or with the **Show log file** function.
Here, you can also activate the **PhotoAccess** database in which comments and all microscope and photo data can be automatically stored.
Every user can create a database and edit its name.
Use the dialog box **File - Open** to select your database.



Overexposure

Here the light level of the photographic beam is checked for possible overexposure. The response to an overexposure risk depends on the status of the button:

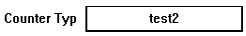
- Button **ON** (dark gray with green square):
  If the micrograph would be overexposed it cannot be taken. The status display reads **OVER**.
- Button **OFF**:
  The micrograph can be taken irrespective of overexpose.



Underexposure

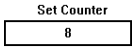
Here the light level of the photographic beam is checked for possible underexposure. The response to an underexposure risk depends on the status of the button:

- Button **ON** (dark gray with green square):
  If the micrograph would be underexposed it cannot be taken. The status display reads **UNDER**.
- Button **OFF**: The micrograph can be taken irrespective of underexpose.



Counter Type

- Clicking on this editing box opens a dialog box in which you can select or delete an existing counter type or define a new counter type.

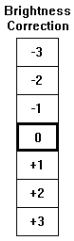


Set Film Count

- Click on this editing box if you want to change the frame counter setting.

On / Off

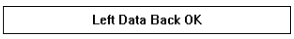
If this button is activated, the selected data are exposed after the micrograph has been exposed.



Intensity Correction

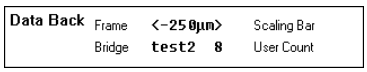
Here you can correct the light intensity for data exposure.

Positive numbers mean higher intensity, negative numbers lower intensity for data exposure.



Format OK

Click on this button to confirm the data selected for exposure. These data are displayed on the Data Back button.



- ❑ A scaling bar (**250µm**) is exposed on the frame,
- ❑ whereas a user-specific frame count (**test2**) is exposed on the bridge.

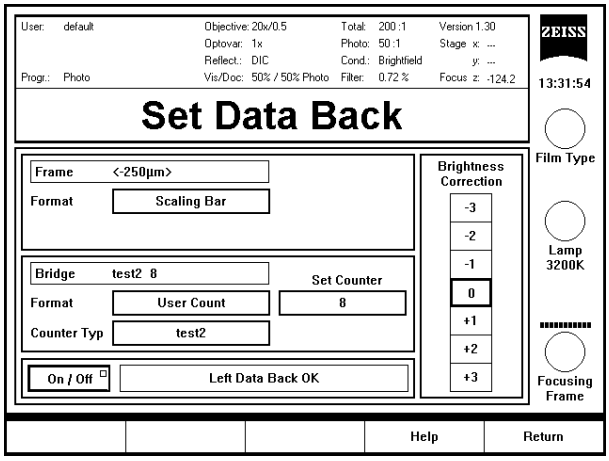
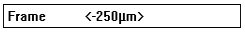


Fig. 79 Set Data Back **Screen**

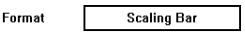
Setting the Data Back

The **Data Back** of your Axioplan 2 lets you expose data together with your micrographs, either directly in the **frame** or on the **brigde** (**gap**) between two frames.
You can select from 17 different data types, and you can expose a scale bar, which always indicates the correct magnification scale as a function of the **photographic magnification**.
The data exposure capabilities depend on the type of camera used for photomicrography.
If you have chosen a 35mm camera, you can expose 8 alphanumeric characters into the frame and another 8 alphanumeric characters on the bridge. If you use the large-frame camera, you can only expose 8 characters into the frame.
To select the data you want to expose, click on the editing box next to the **Format** button. Depending on the type of information to be exposed, further editing boxes may appear for you to edit (Counter type, Set Count, Text).



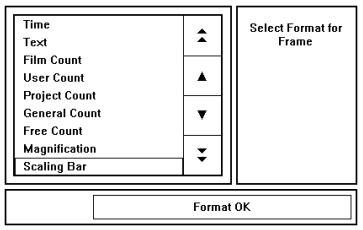
Format Display

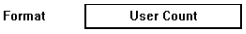
Display of the data selected for exposure on the frame or bridge.



Select Format for Frame

- By clicking on this editing box you open a list box in which you can select the information you want to expose into the micrograph frame:
- Use the arrow buttons to move up and down in the list box for convenient selection, or click directly on the respective line.
- Click on **Format OK** to return to the Databack menu.

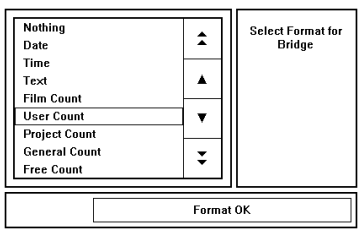




Select Format for Bridge

- By clicking on this editing box you open a list box in which you can select the information you want to expose on the bridge between two frames.

Note: This button is not available if you use the large-frame camera.



- Use the arrow buttons to move up and down in the list box for convenient selection, or click directly on the respective line.
- Click on **Format OK** to return to the Databack menu.

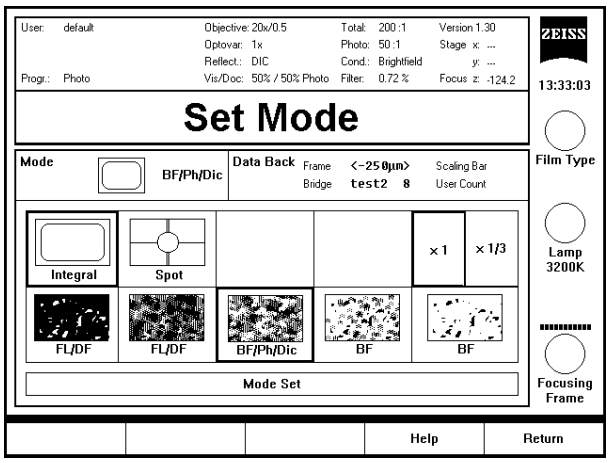


Fig. 78 Set Mode **Screen**

Exposure Mode Setting

Here you select the mode for exposure metering.
The exposure time is influenced mainly by two factors:

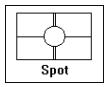
- ❑ Method of exposure metering (upper row of buttons on the screen)
- ❑ Method of illumination and contrasting (lower row of buttons on the screen)

You can select these methods by actuating the respective buttons. The mode currently set is indicated by the labeling on the **Mode** button and by the darker color shade of the buttons on the screen.

If the lower row of buttons is not available, it means that the automatic exposure timer is off. If, in this case, you actuate either the **Integral** or **Spot** button, the lower row of buttons appears, and the automatic exposure timer is switched on.

Integral

Exposure metering covers the entire image field.



Spot

Exposure is metered from a spot area (about 1 % of the area for integral metering) in the center of the image field.

x 1

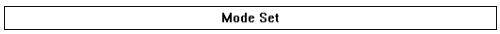
Selects a factor of 1 for exposure correction (for normal films).

x 1/3

Selects a factor of 1/3 for exposure correction (for films of very steep gradation).

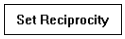
Illumination / Contrasting

Press these buttons to select the illuminating and contrasting techniques to be allowed for the determination of the exposure time.



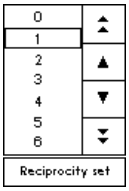
Mode Selected

By clicking on this button you confirm the exposure mode selected.



Reciprocity

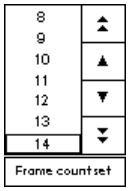
Setting the factor for compensating the Schwarzschild effect (reciprocity error).



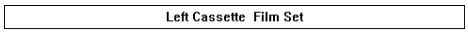
- Clicking on the **Set Reciprocity** button opens a list box in which you can select a factor:
- Use the arrow buttons to right of the list box to move up and down in the list to select the desired factor.
- If you select 0, compensation is inactive.
- Click on **Reciprocity Set** to confirm your selection and close this window.

Set Film Count

Here you can set the frame counter to an arbitrary number



- Clicking on the **Set Film Count** button opens a list box in which you can select a number:
- Use the arrow buttons to right of the list box to move up and down in the list to select the desired number.
- Click on **Film Count Set** to confirm your selection and close this window.



... Film Set

Confirms the film data entered for the camera in use.

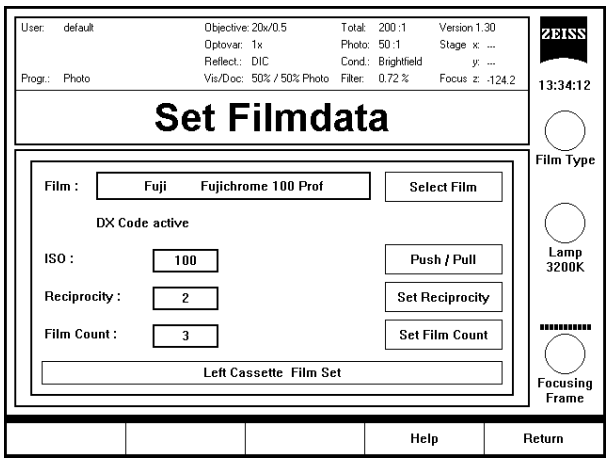


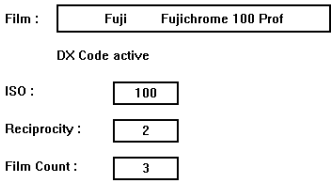
Fig. 77 Set Filmdata Screen

Entering Film Data

For the photographic camera chosen you can select from a database the film type you have loaded.

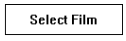
If the film cartridge is DX coded, the database automatically selects all films of the respective film speed.

Once you have selected your film type from the database, the program is automatically set to the correct **Reciprocity compensation factor** (compensation of the Schwarzschild reciprocity error). Nevertheless you can change the ISO rating and the reciprocity compensation factor if you think it is necessary. You can also change the setting of the frame counter.



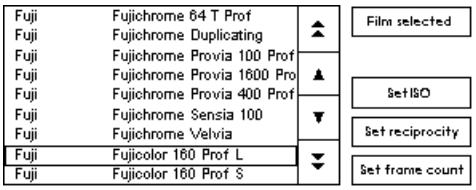
Film type

This display field shows the data of the current film in the camera selected.

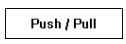


Select Film

Here you select the film type from a database.
If the film inserted in the camera is DX-coded, the list box only shows films of the respective speed.

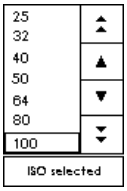


- Clicking on the **Select Film** button opens a list box showing the films contained in the database:
- Select the film by clicking on it (perhaps you need to use the arrow buttons to the right of the list box to move up and down in the list).
- Click on **Film Selected** to confirm your selection and close this window.

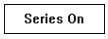


ISO

Selection of ISO film speed.



- Clicking on the **Push/Pull** button opens a list box in which you can select an ISO rating:
- Use the arrow buttons to right of the list box to move up and down in the list to select the desired speed.
- Click on **ISO Selected** to confirm your selection and close this window.



Series On

With this button you can take series of exposures on 35 mm film with different exposure corrections.

- Click on the **Series On** button, then enter all exposure correction values in the desired order (start an exposure series always with the shortest exposure time).

A single click on **START** will then release all exposures of the series in succession.

Set Exposure Function

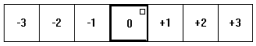
By clicking on this button you open another window in which you can check the exposure time determined by the automatic metering system.

For further information please see → *Setting the Exposure Cycle*.

WIND

A click on this button winds the film on by one frame.

During an exposure, the label of this button changes to **Cancel**, allowing you to terminate the exposure prematurely.



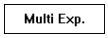
Button	Exposure Correction
0	Factor 1
+1	Factor 2
+2	Factor 4
+3	Factor 8
+4	Factor 16
+5	Factor 32
-1	Factor 0.5
-2	Factor 0.25
-3	Factor 0.125
-4	Factor 0.0625
-5	Factor 0.03125

Exposure Correction

If you have selected the factor x1 for exposure correction in the Mode Setting menu, the exposure time will be corrected in whole exposure increments.
Depending on the illumination or contrasting technique, the zero position will shift.
The various buttons activate the following multiplying factors (see table).

Example:
+1 means that 1 exposure value is added to the exposure time recommended by the automatic exposure control (twice the time: the negative will be denser, slides and Polaroid photos brighter).

The **Mode Setting** menu also provides for a factor x1/3 for fine correction by thirds of an exposure increment.
This is useful for films of very steep gradation.



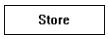
Multiple Exposure

Clicking on the **Multi Exp.** button prevents automatic film winding after an exposure.

- For this purpose, actuate this button before clicking on **START**.
- Activate the **Multi Exp.** button to expose the same frame a second time.

Possible applications:

- ❑ Multiple exposure of the same specimen detail with different illumination techniques or different fluorescence filters etc, or
- ❑ multiple exposure for overlay exposure of scales, marks, net reticules etc.

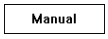


Store

If you click on this button, the exposure time found by automatic exposure metering remains constant for all subsequent exposures until you inactivate the button again.

This procedure is useful, e.g.

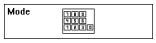
- ❑ in serial exposures of a larger specimen area (to eliminate the influence of area coverage on exposure time), and
- ❑ for demonstrating the different intensities with multiple fluorescences etc.



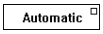
Manual

Clicking on this switch inactivates the automatic exposure system, and you can manually select a exposure time from a list box.

- Click on the respective line in the list box to select a exposure time, or use the arrow buttons on the right of the list box to move up or down in the list.
  The shortest exposure time is 0,004 s, the longest one is 8000 s.
  The exposure time is shown in the Status Display (yellow number).
- To confirm your selection, click on **OK**.



The **Mode** button shows the symbol for fixed exposure times.



Automatic

With this button you activate automatic exposure metering.

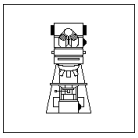
The exposure time to be expected is shown in the Status Display.

T(ime)

Clicking on this button activates a long-time exposure mode.

If this mode is active, actuation of the **START** button will only open the shutter.
The shutter will stay open until you click on the **STOP** button.

The exposure time elapsed is shown in the Status Display.



Microscope Control

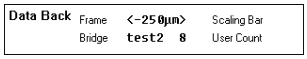
By clicking on this button you activate the menu for operating the microscope proper.

START

Clicking on this button releases an exposure according to the exposure cycle selected.
In case of 35 mm film, the exposure is followed by film advance.
The exposure time shown by the Status Display is seen counting back to zero.
The label of the **START** button changes to **EXPOSURE RUNNING**.
If you want to terminate an exposure prematurely, click on the **Cancel** button.
Shutter release is blocked

- ❑ if no film has been inserted,
- ❑ if the film is at its end, or
- ❑ during film advance or rewinding.

If you release an exposure by clicking on **START** after you clicked on the **T** (time) button, this action will only open the shutter. To close the shutter again, click on **STOP**.



Data Back

The data back permits you to expose data on the film right after the exposure of the micrograph.
Clicking on the **Data Back** button opens another window, in which you can select which data you want to expose, and where (i.e. right on the frame, or on the bridge between two frames).

For further information please see → *Setting the Data Back*.

Camera Selection

With these buttons you select the camera you want to use.

- ❑ Video camera for digital photography

- ❑ 35 mm camera mounted to the left-hand port of the photo module (active)

- ❑ Large-frame camera mounted to the rear port of the photo module

- ❑ 35 mm camera mounted to the right-hand port of the photo module

You can specify different film data for each camera.

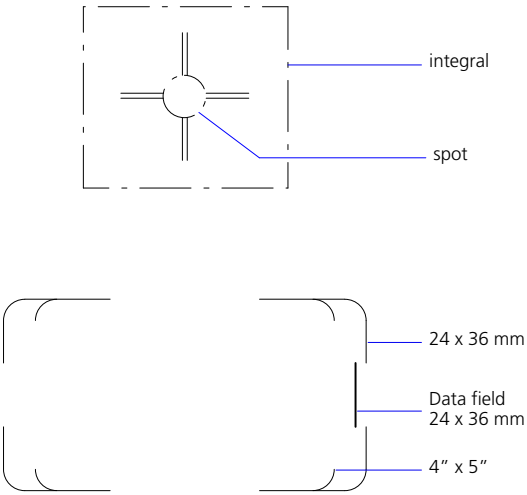
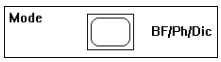


Fig. 76 Luminous frame



Focusing Frame

A click on this button overlays a frame graticule on the specimen image, consisting of a rectangle of lines of adjustable brightness.
The frame is only visible if you have selected a light sharing of 50 % photography / 50 % visual.
During exposure, the frame is automatically switched off.

In operating this button, stick to the following sequence of operations:

- Short click:
  The frame comes on.
- Keep mouse pointer depressed on button (> 0.5 s):
  Frame brightness varies automatically
  (proportional display by the light bar).
- Release :
  freezes the instantaneous brightness.
- Another short click:
  Frame comes off.

Mode

By clicking on this button you can select the mode for determining the exposure time for automatic exposure.
The active mode is indicated on the button.

For further information please see → *Exposure Mode Setting*.

Light Sharing Switches

Selection of light shares going to photographic camera, visual observation and video camera.

❑ 100 % of the light going to photographic camera

❑ 50 % of the light going to the photographic camera, 50 % to the eyepieces for visual observation

❑ 100 % of the light going to the eyepieces

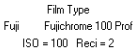
❑ 100 % of the light going to the video camera

❑ 50 % of the light going to the video camera, 50 % to the eyepieces for visual observation

Note: The buttons shown on the **Photo** menu vary depending on the camera type selected.

Exposure Time

This displays the exposure time including all corrections.
During exposure, the indicated exposure time counts down to zero.
In case of long-time exposure using the **T** control, exposure time counts up from zero.



Film

This indicates the current film type for the selected camera, together with the ISO rating and Schwarzschild reciprocity factor.

Film Count

Indicates the frame number for the selected photographic camera.
There are separate counts for the right- and left-hand 35 mm cameras and the large-frame camera.

Film type

Clicking on this button opens another window in which you can select and modify the following film data:

- ❑ Film type selected from database
- ❑ ISO speed rating
- ❑ Factor for compensating the reciprocity error
- ❑ Frame count

For further information please see → *Entering Filmdata*.

Lamp 3200K

Clicking on this button switches the illumination source to a color temperature of 3200 K.
This button is only available if your microscope is provided with a halogen lamp.

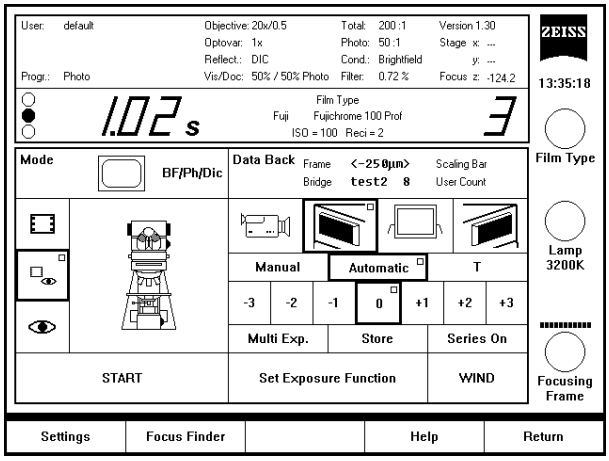


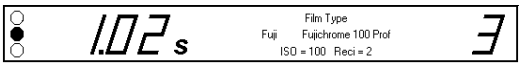
Fig. 75 Photo **program module**

Photo program module

Fig. 75 shows the control panel of the Axioplan 2 photo module.

Note: The explanations given here assume a fully configured photo module, i.e. one equipped with large-frame camera, camera for focus finder, and video camera, and with a halogen lamp installed.

Activated buttons are shown dark gray with a small green square in the top right corner.



Status Display

Display of various operating states and settings.
Normally the following items are displayed (from left to right):

- ❑ Readiness for operation
- ❑ Exposure time
- ❑ Film data
- ❑ Frame counter.

In addition, some plain text message may appear from case to case.

Readiness Display

The three display fields on the left margin of the Status Display signalize whether the light intensity in the photographic beam path is within the limits required by the automatic exposure system.
The following statuses are displayed:

- ❑ Excessive light !
  In the center of the display field the warning **OVER** appears.
  The **START** button is disabled.

- ❑ The light intensity is within the limits of the automatic exposure system.
  The **START** button is enabled.

- ❑ Lack of light !
  In the center of the display field the warning **UNDER** appears.
  The **START** button is disabled.

The First Micrograph

The instructions below step by step describe the procedure for obtaining an exact photomicrograph of the selected specimen.

Preparations:

- Carefully focus the microscope for observation.
- Select beam splitting of 50 % photography / 50 % visual.
- Attach 35mm film cassette or large-frame camera loaded with the proper film.

Actions in the Photo program module:

- Click on camera selection button (see page 61).
- Click on **Film Type** button (see page 61).
- Select film type according to the film inserted (see page 68).
- If necessary, correct ISO- and Reciprocity ratings (see page 68 f).
- Set the film counter to the desired number (see page 69).
- Click on the **... Film Set** button (see page 68).
- Click on the **Focusing frame** button (see page 61).
- Click on the **Automatic** button (see page 61).
- Click on the **Mode** button (see page 61).
- Select an automatic exposure mode, and click on the **Mode selected** button (see page 70).
- Observe the readiness signal in the status field (see page 61).
- Click on the **START** button (see page 61).

This releases taking of a photomicrograph.

When using tungsten-balanced color transparency film, you need to set the lamp to a color temperature of 3200 K. To do this, click on the **Lamp 3200K on** button (see page 62).

Determining the Reciprocity Compensation Factor

To determine the **Reciprocity Compensation Factor** for films not included in the film database, proceed as follows:

- Expose a test film, at first taking an exposure with a shutter speed faster than 1 second (use auto-exposure control).
- Reduce the light intensity by inserting neutral gray filters so that the resulting shutter speed is several seconds.
- Take several exposures with this setting and the reciprocity ratings of 1 to 9.
- Develop the test film and identify the long-exposure photo that resembles the first one most closely. The reciprocity value of this exposure is the correct one for this film. You can enter this value in the **Set Film Data** menu.

Note: See also → *Photomicrography with the Axiophot 2*, page 136.

Zoom

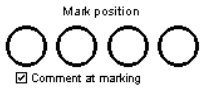
Button for zooming up the search area.
Depending on the specimen slide size selected, the slide is shown at the following magnifications, related to pixels:

Size of the program window: 640 x 480

Spec. Slide Field	Zoom off	Zoom on
76 mm x 26 mm	120 [µm/Pixel]	20 [µm/Pixel]
76 mm x 50 mm	240 [µm/Pixel]	40 [µm/Pixel]

Size of the program window: 800 x 600

Spec. Slide Field	Zoom off	Zoom on
76 mm x 26 mm	95 [µm/Pixel]	15 [µm/Pixel]
76 mm x 50 mm	190 [µm/Pixel]	30 [µm/Pixel]



Mark Position

Here you can mark a position on the specimen slide (i.e. an object or detail of the specimen).
The color of the marking is that of the marking button used.

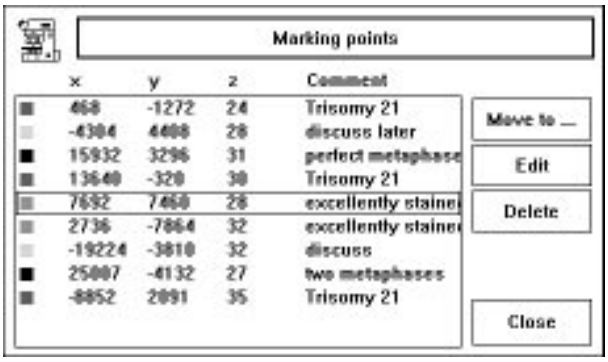
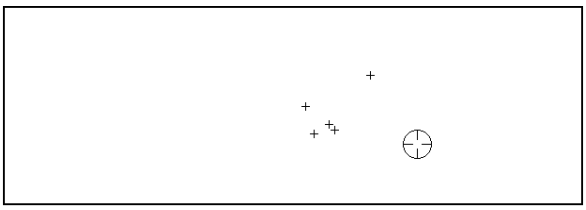


Fig. 74 **Find** function

Find

- This enables you to move to the stored positions, and to edit or delete them.
- To edit or move to markings, select individual markings and use the **Move to ...** or **Edit** buttons.
- To delete markings, you can select several markings and then click on **Delete**.
- Use **Close** to end this dialog.



Specimen Slide Field

Graphical representation of the specimen slide with a crosshair circle indicating the current position of the image field on the slide.

Slide

Select the specimen slide size by clicking on one of the two buttons.

❑ 76mm x 26mm specimen slide selected

❑ 76mm x 50mm specimen slide selected

Show Positions

Select here the color of the marked positions to be shown.
The active buttons are dark gray.
Markings colored blue, red, green and yellow are displayed.

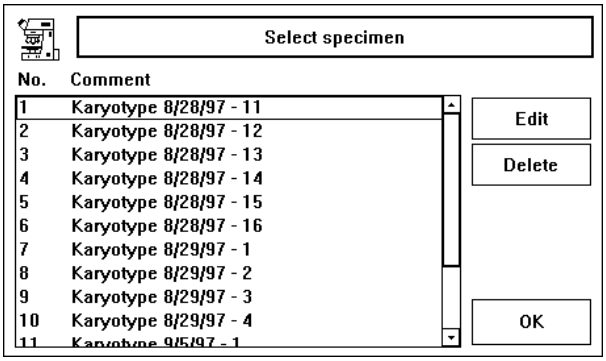


Fig. 71 Selecting / deleting of specimens

Selecting of specimens

- If you have opened a database, you can select a specimen by marking the specimen in the list and closing the dialog box via **OK**.
- You can use **Edit** to modify the comments on a selected specimen and **Delete** to delete all the selected specimens and the positions stored on them.

Deleting of specimens

- You can delete specimens by selecting them via **Select specim.** and then clicking on the **Delete** button.

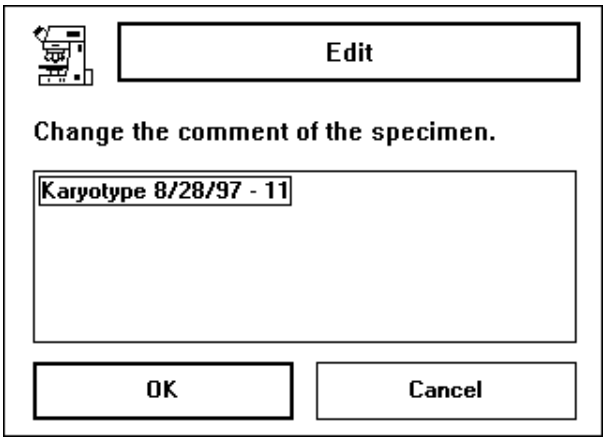


Fig. 72 Editing of specimens

Editing of specimens

- The comments on existing specimens can be changed subsequently by selecting a specimen via the **Select specim.** button and modifying the comments via **Edit**.

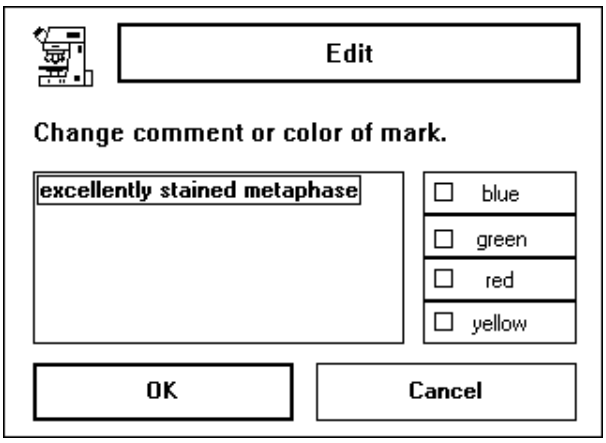
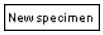


Fig. 73 Editing of markings

Editing of markings

- It is possible to modify the comments or the color of stored markings by selecting the marking via **Find** and opening the following dialog box via **Edit** (Fig. 73).



Delete positions

- You can delete either all the markings of a specimen or select individual markings for deletion.
- Individual markings are deleted with a click on the specimen with the right mouse button.
- If you click on the **Find** button, you can select all the markings you want to delete in the opened dialog box and then click on the **Delete** button.

Database

The buttons **New database** and **Open database** allow you to create a new database in any directory under any required name or to open an existing database.

New database

Open a database

Save as ...
This button enables you to save the opened database under a new name. You then continue working with this new database.

Close database

Here you can close the just opened database and continue working without using a database.

Creation of a new specimen

When you have opened a database, you can use the **New specimen** button to create a new specimen in the database and store it together with comments.

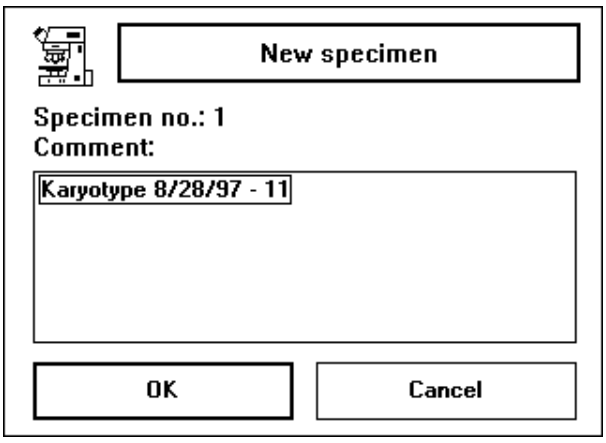


Fig. 70 New specimen

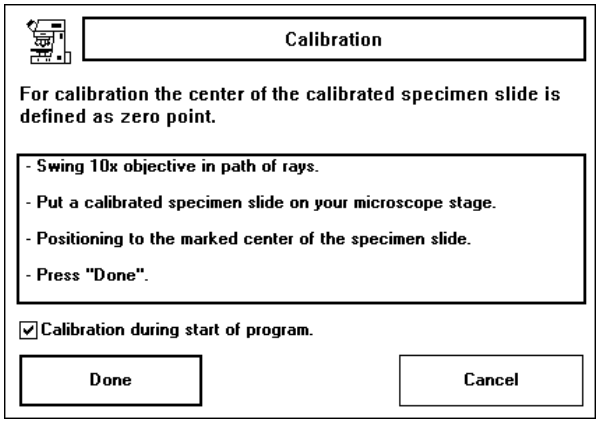


Fig. 68 Calibration 1

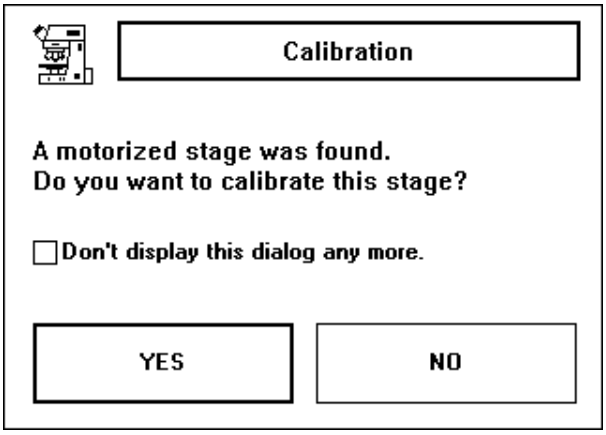


Fig. 69 Calibration 2

Calibration

For the calibration of microscope stages, the zero point of the stage coordinate system is defined in the center of a calibrated microscope slide.

A step-by-step instruction is given in the following dialog (Fig. 68).

If you activate the option **Calibration during start of program**, a calibration possibility is offered to you immediately after activation of the Axioplan program.

If you then select the option **Don't display this dialog any more** (Fig. 69), you can activate the calibration routine only via the **Calibration** button in the Mark & Find program part.

Marking a position:

- Search for the specimen spot which you want to mark.
- Position the object to be marked in the center of the image field.
- Click on a colored button in the Mark position field.
- A marking is displayed in the appropriate color in the crosslines.

With database:

- If **Comment at marking** is activated, you can now enter your comments on this marking. Close this dialog box.
- A marking in the appropriate color will appear in the crosslines, which has been stored in the database together with the comment.

Relocation of a marked position:

- Select the color of the marking to be relocated in the Show field.
- Move a coded stage manually until the marking is positioned in the crosslines.
- If you use a motorized stage, click on the marked position you want to relocate.

Your marked specimen detail is now back in the image field.

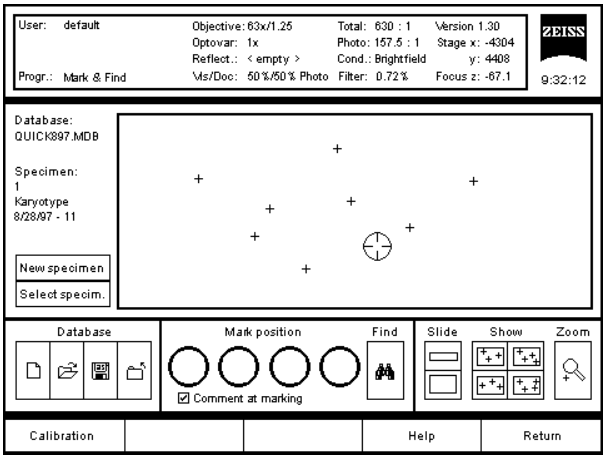


Fig. 67 Mark & Find **program module**

Mark & Find program module

This program part enables you to mark positions on your specimens, to store them in a database and to approach them again.

For this you need a coded or a motorized microscope stage.

We would recommend you to calibrate the stage first before you start working.

Brief instructions – Working without database:

- Mark position
- Relocate a marked position
- Delete markings

You can store all the markings in the database subsequently by creating a new datadase, opening an existing database or using the "Save as" button.

Brief instructions – Use of a database:

- Open a Database
- Prepare a new specimen
- Mark the positions
- Relocate marked positions
- Delete specimens and marked positions
- Edit specimens and markings

Note: You can classify the marked specimen details by selecting different colors.

Example:

blue	Must take micrograph
green	May take micrograph
red	Consult experts
yellow	Interesting

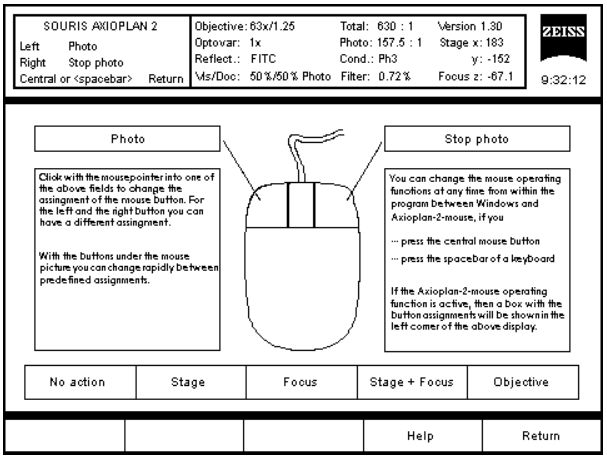


Fig. 66 Mouse Control **Screen**

Mouse Control

Here you can assign commands for controlling the microscope to the right or left mouse button.

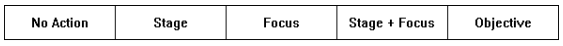
- To do this, click on the drop-down list box next to the right or left mouse button, and select a function from the list. Alternatively you may click on the shortcut buttons, which have predefined assignments.
- Now you can activate and deactivate the mouse from anywhere in the program
  – either by clicking the central mouse button
  – or by hitting the keyboard space bar.

Display

If the Axioplan 2 mouse is active, the display shows a red box with the current assignments of the mouse buttons.

Function Selecting

- If you click on the display box, a list box opens from which can select the desired function and assign it to the respective mouse button. The following functions are available:
  – No Action
  – Objective right / left: Turn objective turret to the next position on the right / left
  – Reflector right / left: Turn reflector turret to the next position on the right / left
  – Focus fine / coarse: Actuate fine / coarse focusing control
  – Stage fine / coarse: Actuate fine / coarse stage control
  – Photo / Stop Photo: Take photomicrograph / Abort taking photomicrograph
  – Start Focus Finder Plus
  – Optovar: enlarge / reduce
  – Find next marking
  – Find previous marking
  – Mark position (color)



Shortcut Function Selecting

This feature lets you quickly assign predefined functions to the mouse buttons:
– No Action
– Stage fine / coarse
– Focus fine / coarse
– Stage fine / Focus fine
– Objective right / left

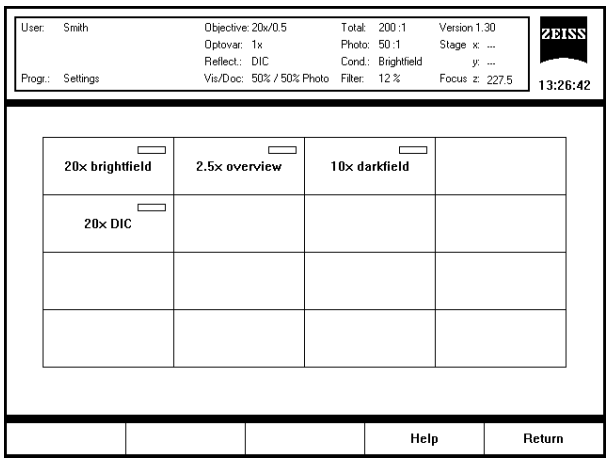


Fig. 65 Loading microscope settings

Loading Microscope Settings

With this menu you can reactivate a set of microscope settings previously stored on the **saving microscope settings** menu under a designation.

Simply by clicking on a button, you cause all microscope components to adopt the positions stored under that designation.

If the position of the objective turret was included in the settings stored, the button indicates the objective magnification by a color code. The color is that given in the ZEISS objective color code table for the respective objective. The coding on the objective is a colored ring.

To load saved microscope settings, proceed as follows:

- Click on the **Settings** button on the Main Screen.
- Click on the button that bears the respective name.

The loading of microscope settings is also possible from the **Photo** and **Microscope Control** program modules. Simply click on the **Settings** button and continue with the procedure described above.

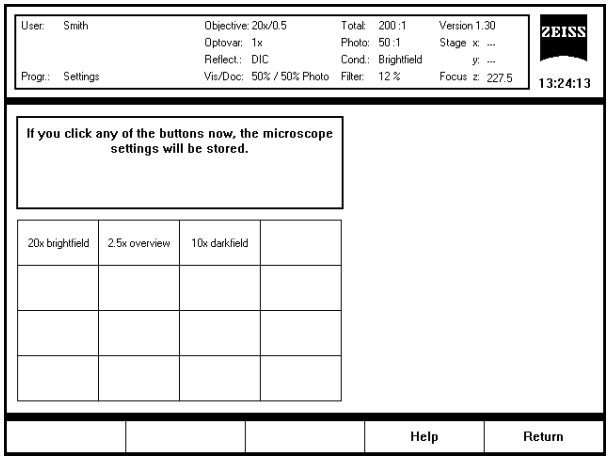


Fig. 63 Loading microscope settings

Settings program module

Frequently in microscopy there are situations in which you want to save the current settings of your microscope in order to restore them later.
Provided that you have installed the respective motorized components and configured them in the Setup program, you can save the current settings of the microscope components

- ❑ Optovar
- ❑ Reflector turret
- ❑ Objective turret
- ❑ Reflected-light aperture diaphragm
- ❑ Transmitted-light filter wheel
- ❑ Illumination (Reflected-light shutter, lamp intensity)
- ❑ Field stop
- ❑ Condenser

and restore them at a later work session.
The procedure is very simple. In a first step you define a file name for a set of settings to be saved and then you have these settings filed. At any time later you merely call up the file name to have the desired microscope components reproducibly set to the positions filed under that name.

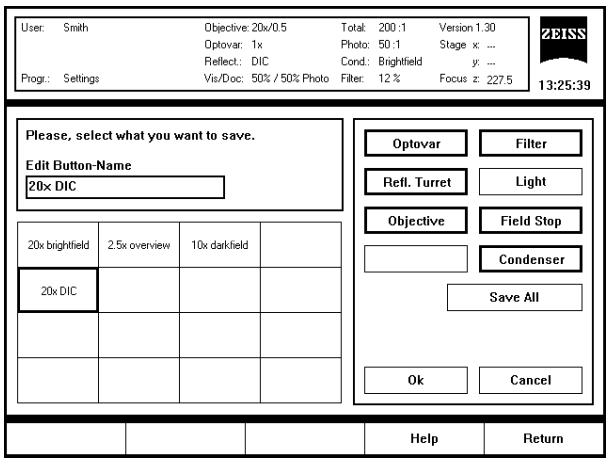


Fig. 64 Loading microscope settings

Saving Microscope Settings

Here every user can store up to 16 different sets of microscope settings. The stored settings can be reactivated by the **Loading microscope settings** function.

To save microscope settings, proceed as follows:

- Click on the **Save** button in the **Microscope Control** module (Fig. 61).
- Assign the settings to be saved to a button
- Assign a name and select the components

Clicking of any of the 16 buttons (in Fig. 63) opens another menu (Fig. 64), in which you can enter a designation for the button and select the microscope components whose settings you want to store. You may also use a button already assigned, in order to store a new set of settings or to vary a stored setting.

Intensity

Control of brightness of the 100 W halogen lamp.
If the **Digital** button is activated, brightness can be controlled via the program.
If the **Digital** switch is inactive, brightness can be controlled manually with the control knob on the microscope.

Aperture

Opening / Closing of the reflected-light aperture diaphragm.

Field Stop

Opening / Closing of the illuminated field diaphragm

Save

Here you can save your current microscope settings.
(see settings, program module on page 51). Positions of the light path in the photo module are not saved.

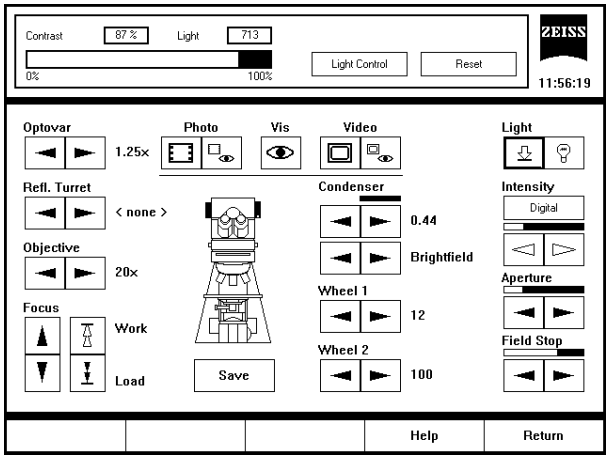


Fig. 62 **Microscope Control** with **Focus Finder**

Microscope Control with Focus Finder

This menu is a combination of **Microscope Control** and **Focus Finder**.

You can only access this menu from the **Photo** menu, by selecting **Focus Finder** and subsequently starting Microscope Control by clicking on the **Microscope** button.

This procedure lets you utilize the **Focus Finder** functions and at the same time control motorized microscope components (except switching of light beam distribution).

To return to the **Photo** menu, click on the **Return** button.

For further information please see → *Focus Finder program module*.

Light Sharing Switches

Selection of light shares going to photographic camera, visual observation and video camera.

❑ 100 % of the light going to photographic camera

❑ 50 % of the light going to the photographic camera, 50 % to the eyepieces for visual observation

❑ 100 % of the light going to the eyepieces

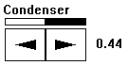
❑ 100 % of the light going to the video camera

❑ 50 % of the light going to the video camera, 50 % to the eyepieces for visual observation

Note: The buttons shown on the **Photo** menu vary depending on the camera type selected.

Condenser

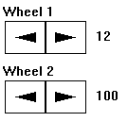
Opening / Closing the aperture diaphragm and clockwise / anticlockwise indexing of the revolving condenser wheel.



❑ Setting of the aperture diaphragm and display of the N.A. set.

❑ Setting of the achromatic condenser 0.8 H/D/Ph and display of the position set.
These buttons are only available if this condenser has been installed.

Filter Magazine



Clockwise / anticlockwise indexing of the four positions each of filter wheel 1 and filter wheel 2, and display of the filter transmittances.

Light

Actuation of the reflected-light shutter switch, and switching the illumination on and off.

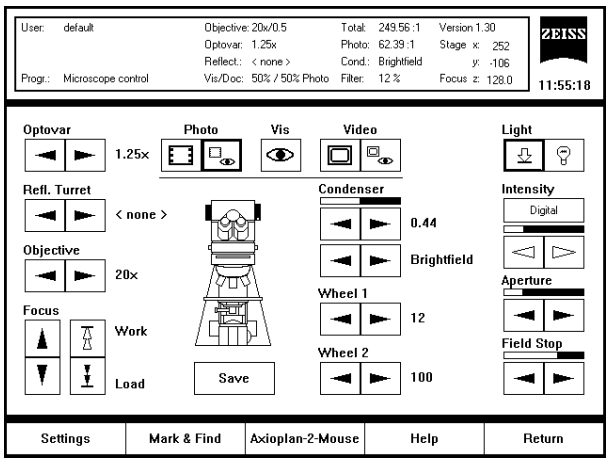


Fig. 61 Microscope Control **program module**

Microscope Control program module

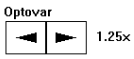
On the Microscope Control menu you can control all motorized microscope components.

Coded and mechanical components are shown as inactive, since they can only be operated manually.

The current positions of motorized or coded microscope components are also indicated in the display window.

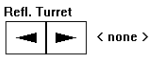
The state of some components (photo/visual light shares, illumination, brightness control) can be seen by the shade of gray (activated: dark gray; inactivated: light gray).

The control elements for photo/visual light shares in the photo module and for the condenser wheel are not shown unless they have been installed (hardware) and configured (software).



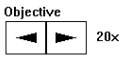
Optovar

Selection of the Optovar tube factor by clockwise / anticlockwise indexing.
The magnification factor selected is displayed.



Reflector

Selection of the reflector turret position by clockwise / anticlockwise indexing.
The reflector filter set selected is displayed.



Objective

Selection of the objective turret position by clockwise / anticlockwise indexing.

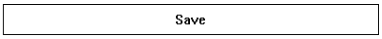
The magnification selected is displayed together with the associated numerical aperture.

Focus

Actuation of the motorized focusing (Z) drive.

Work / Load

Fast lowering and raising of the stage for specimen loading.



Save

Storing of all settings for the focusing (Z) drive and the light manager in the microscope.

Light Manager

Here you can activate and deactivate the light manager.

Light Manager – Reflected-Light Aperture

If you activate the reflected-light aperture diaphragm, it will be corrected to match the settings after every change of objectives.

Lamp Manager

If you activate the lamp manager, all light settings will be corrected after every change of objectives.
This function is not yet available for the time being.

Light Manager – Filters

If you activate the light manager and filter wheel 1 and / or 2, the filter wheels will automatically be reset to match conditions.

Light Manager – Field Stop

If the light manager and this button are activated, the illuminated field diaphragm will automatically be corrected to match conditions.

Light Manager – Transmitted-Light Aperture

If the light manager and this button are activated, the transmitted-light aperture diaphragm will automatically be corrected to match conditions.

Light Manager – Condenser Front Lens

If the light manager and this button are activated, the condenser front lens will automatically be adjusted to match conditions.

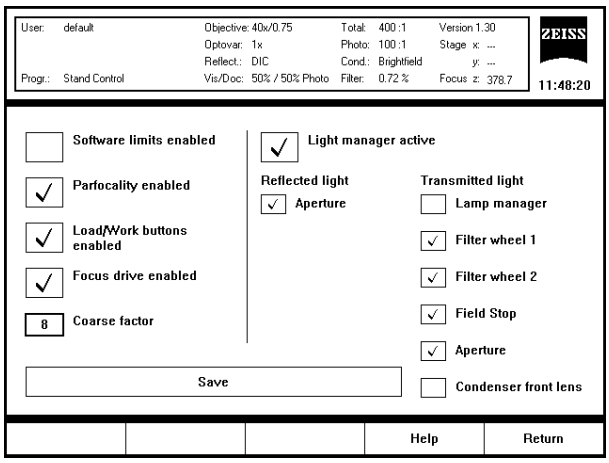


Fig. 60 Stand Control **Screen**

Stand Control

Here you can configure the light manager and the focusing position (Z drive).

When you start this menu, the program automatically reads and displays the current microscope settings.

Now you can change the settings as required. To store the settings made, click on **Save**. The settings are then stored in the microscope and will be immediately available.

Software Limits

Here you can activate or deactivate the software limits previously defined with the CLM program and filed in the microscope. Please leave this setting to our service staff. The standard setting for all objectives is 550 mm upward and 10 mm downward from the focus set.
So you can, for example, prevent collisions with the specimen.

Parfocality

Here, you can activate and deactivate the defined parfocality values (see page 22). The parfocality setting allows you to save the focus setting of each objective relative to a reference specimen. This ensures that the system is automatically focused on the specimen after a change of objectives, provided the system has been in focus before.

Work / Load (Fast Stage Lowering / Raising)

Here you can activate and deactivate the switches on the microscope for fast stage lowering and raising the purpose of specimen change.

Focus Drive

Here you can activate and deactivate the focusing knobs on the microscope.

Coarse Factor

Here you can enter the factor for the coarse focusing knobs. The coarse factor is a factor by which the increment of the manual focusing knobs in fine mode is multiplied.

Configuration program module

Here you can have the current system configuration displayed, which the Axioplan 2 program has detected at the start.

The microscope can be configured with the Setup program.

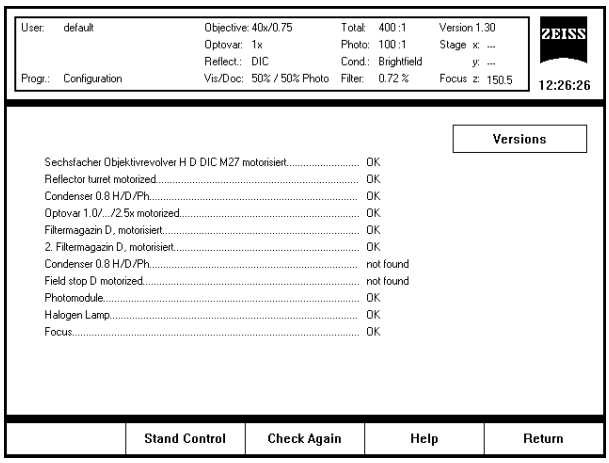


Fig. 58 Show Configuration

Show Configuration

- Click on the **Configuration** button on the Main Screen to show the configuration of your microscope.

When started, the Axioplan 2 program first checks the configuration of the microscope.

The program checks whether the components defined in the Setup Program as motorized or coded can be addressed via the communication channels.

If an error is detected during the configuration check, the respective component is labeled as **not found**.

Click on the **Versions** button to see the version numbers of all software modules.

Check Again

By clicking on this button you can have the microscope configuration checked once more and the result indicated.

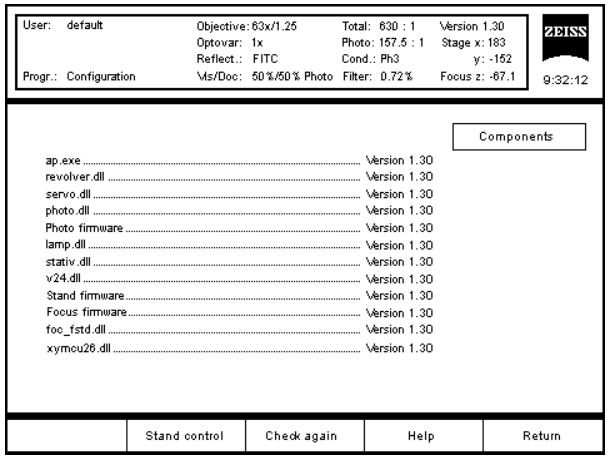


Fig. 59 Show Versions

Show Versions

When you start your Axioplan 2 program, the version numbers of all program modules needed to run the program are read and displayed.

The program will not check whether these software modules are compatible with each other.

This menu merely displays the software modules presently in use, together with their version numbers.

Click on the **Components** button to see the microscope components.

User Login

As soon as you start the Axioplan 2 Program as described in the chapter Program **Start from WINDOWS**, you are a so-called default user. To operate the system as a default user is not recommendable unless you are the only user.

The Axioplan 2 system is designed for being operated by many users. Different users can perform different assignments; each user can define their own user interface independently from the others or save microscope settings for specific applications. This capability offers you great convenience in configuring the system to suit your requirements without getting into conflict with other users using the same system.

To make use of this capability you should log in to the system (register) under a name after starting. All user-specific configurations of the user interface, user-specific microscope settings etc. will then be saved and filed under your registered user name. The total number of users that can log in to one Axioplan 2 System is 999.

If you want to log in to the Axioplan 2 System as a new user, specify your entries for the Main Screen, or make other settings, proceed as follows:

- Click on the **Login** button on the Main Screen.
- Click on the **Add New User** button
- Click on the dark-gray field next to **User Name**
- Enter your user name and hit **ENTER**.

If you want to define your own user path, proceed as follows:

- Click on the button **User File**.
- Select your data path (e.g.: **a:**) and enter the name of your user file. Hit **ENTER**.

To protect your user log-in by a password, click on the **Password** button and enter the password.

You may also specify a startup menu other than the standard Main Screen:

- Click on the dark-gray field next to **Startup Menu**.
- Select a startup menu from the list.

To configure your own startup menu, proceed as follows:

- Click on the **Main Screen Setup** button.
- Select a Main Screen button on the left side by clicking.
- Select a function from the list.

Now you see the selected function in the dark-gray field in the top left corner. On the right, headed "Button X", there is a field with a suggested name for this button. If you click on this field, you can:

- Specify the name for the button.
- Hit **ENTER**.
- Repeat these steps until you have completed your configuration, then click on **OK**.

You are now properly logged in to the system (registered) under your own user name. When you next start the Axioplan 2 program under your name, the program first presents to you the startup menu as configured by you.

Selecting an User

- Click on the **Login** button on the Main Screen (Fig. 48).
- Click on the button with your name to switch to your own special user interface (Fig. 51).
- If you have not yet created a button proceed with → *Add a New User.*

Clicking on a button makes the respective user the current Axioplan 2 user and activates the personal startup menu specified for that user.

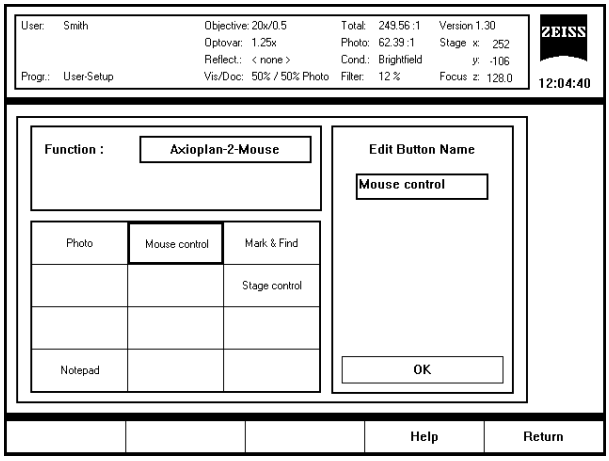


Fig. 56 Entering a Button Designation

Entering a Button Designation

Fig. 56 shows the assignment of the buttons of the Main Screen as configured for the current user.

The currently selected button to be edited is highlighted gray. The name assigned to this button is shown in the display field on the right side.

Now you can edit the button name.

Here it is not possible to select another button. If you want to do this, click on **OK** and then select another button.

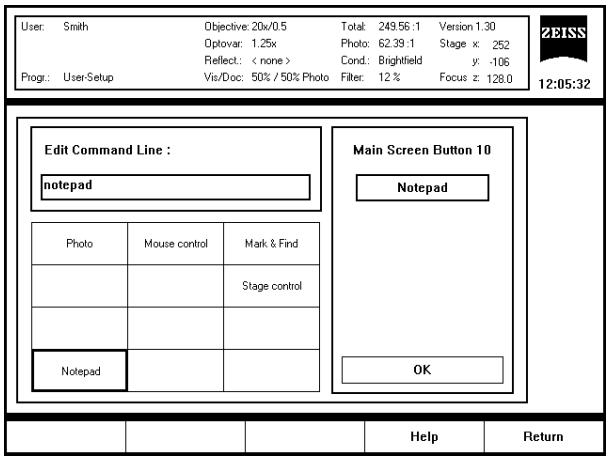


Fig. 57 Selecting an External Function

Selecting an External Function

On the screen shown in Fig. 57 you can assign the active button of the Main Screen to an external program.

The command line for selecting the external function assigned to this button is in the display field.

Now you can edit the command line.

Here it is not possible to select another button. If you want to do this, click on **OK** and then select another button.

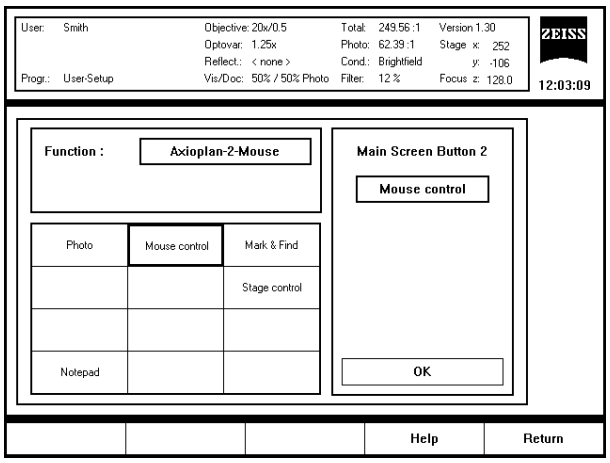


Fig. 54 Configuring the Main Screen

Configuring the Main Screen

Fig. 54 shows a screen with the assignment of the buttons of the Main Screen for the current user.

The currently selected button to be edited is highlighted gray. The Axioplan 2 function assigned to this button is shown in the display field on top.

To select any other button of the Main Screen, simply click on it.

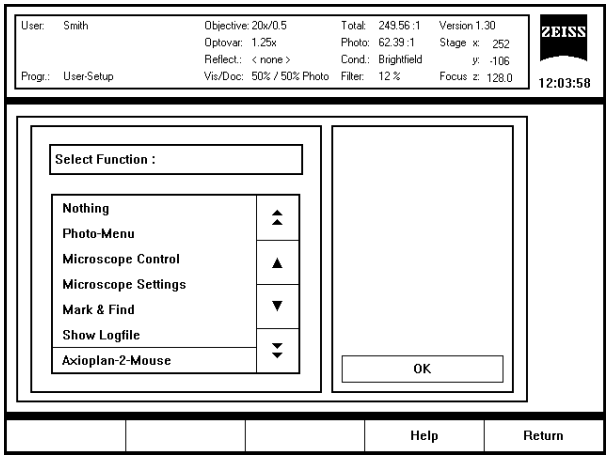


Fig. 55 Assigning a Button to an Axioplan 2 Function

Assigning a Button to an Axioplan 2 Function

On the screen shown in Fig. 55 you can assign the active button of the Main Screen to an Axioplan 2 function.

If you want to cancel an existing assignment, select the None function and delete the name of the main screen button (→ *Entering a Button Designation*).

External programs can also be assigned buttons by means of the **External Program** function (→ *Selecting an External Function*).

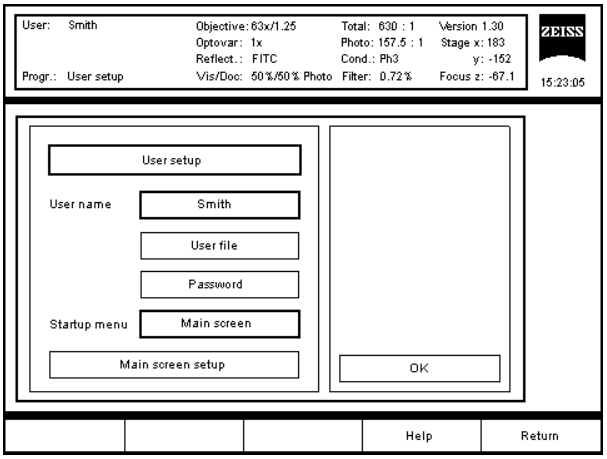


Fig. 52 User Setup **Screen**

User Setup

The screen shown in Fig. 52 allows you to operate the functions necessary for user log-in, and/or for modifying user-specific settings.

The various command buttons let you configure the Main Screen, modify the user name and the user data path, enter a password and define your startup menu. In the example shown, the user for whom the setup is to be changed is the one named Smith, a user already registered (→ *User Setup*, *Edit User Path*, *Selecting the Startup Menu* and *Configuring the Main Sreen*).

Note: If you want to modify the **User Setup** for the default user, the **User Name**, **User file** and **Password** buttons are not available.

Edit User Name

The **User Name** editing box (Fig. 52) shows the name of a user already registered, e.g. when you configure (customize) the startup menu of this user.
If you want to register a new user, the editing box first shows a default name of the type **USERxxx**.

Change User File

- To modify user path or name of user file, click this button.

Password

- Here you can enter a new password.

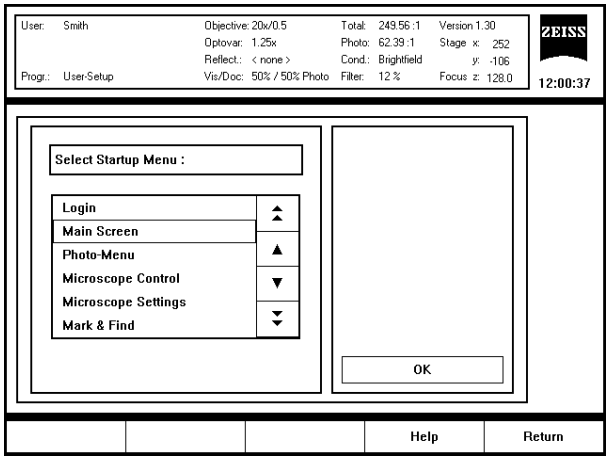


Fig. 53 Selecting the Startup **Screen**

Selecting the Startup Menu

In Fig. 53 you can select your user-specific startup menu of Axioplan 2.

A startup menu can also be specified for the **default** user.

The current startup menu shown at the moment is the Main Screen.

- Use the direction arrows to page through the field, then click on any startup menu you want to see first when starting the program.

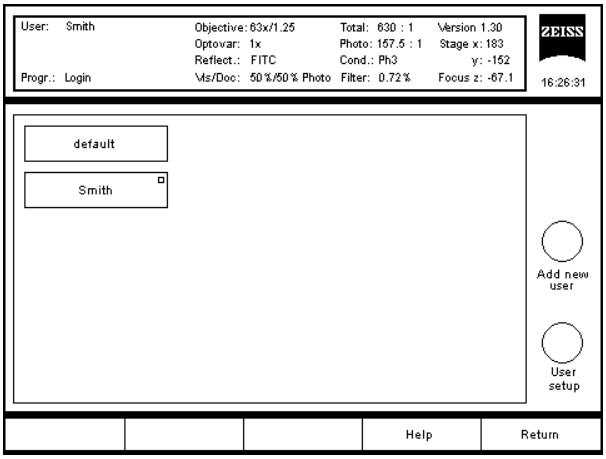


Fig. 51 Login **Screen**

Login program module

Fig. 51 shows the menu in which you can log in to the system as a registered user.

- ❑ New users can be added, and registered users deleted.
- ❑ Registered users can define their personal Startup Menus, their user names, the name of the user file, change password and configure the Main Screen to suit their specific requirements.

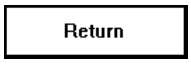
The screen shows two registered users of the Axioplan 2 system. The user named Smith (marked by a green field) is the one currently using the system. The **Add New User** button allows up to 999 users to get registered (logged in) to the system. The program provides every registered user with a separate button labeled with his/her name. In case more than 18 users are registered (the maximum number of buttons visible at a time), two page turning buttons appear on the right screen margin.
To delete users and to reset forgotten passwords, the Axioplan 2 program can be started in the administrator mode. Proceed in the same manner as for program atart with a user name but enter **admin** as user name.

Add New User

Here you can log in a new user and configure (customize) his/her startup menu (→ *User Setup*).

User Setup

Here you can specify a startup menu for the current user (highlighted green), configure (customize) the Main Screen, and modify the data path (→ *User Setup*).



Return

By clicking on this button you quit the present window and return to the previous menu.

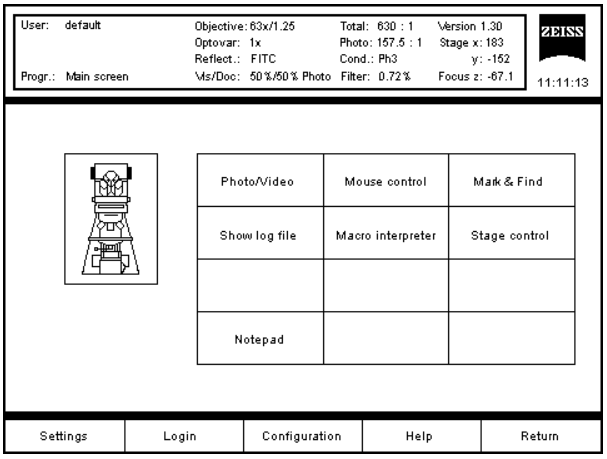


Fig. 48 Main Screen of the Microscope Software

Main Screen

Fig. 48 shows one of several possible configurations of the Main Screen. From the Main screen you can access the Axioplan 2 functions.

The Main Screen is the central operator interface from which you can call up the menus of the Axioplan 2 Software or external WINDOWS™ applications.

Via the **Login** menu you can assign functions to the command buttons of the Main Screen.

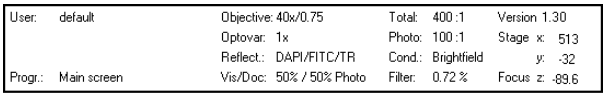


Fig. 49 Field of Displays

Display Elements

In Fig. 49 you see a field of displays.

The current positions of the motorized or coded equipment components are highlighted yellow.

If an equipment component is present only mechanically or not at all, the display only shows three yellow dashes.

Fig. 50 Task Bar

Task Bar

Settings
Here the user can store sets of microscope settings (e.g. filter positions, diaphragm apertures etc. and load (i.e. restore) them again (see page 49).

Login
Users can log into the system (i.e. get registered as a user) under a name and specify their own startup menu they want the program to show first after start.

Configuration
Display of the current system configuration.
The microscope can be configured with the Setup program.

Help
Call of the Help function for the current operator interface.

Exit Program
Terminates the Axioplan 2 program.

Microscope Software

Operator Interface

Fig. 47 shows how the operator interface is schematically divided into a number of fields. You will find this general division in all parts of the Axioplan 2 program.
The operator interface is divided into three areas:

Depending on the outfit of your computer, the Axioplan 2 functions can be actuated with a mouse or trackball, or with your finger tip on a touchscreen. To select a function, simply click on the respective command button.

The Axioplan 2 program can be reduced to symbol size by a double click on the ZEISS logo with the left mouse key. Microscope and camera monitoring will also be interrupted.

Display

The display area at the top of the screen indicates the current user, the current program menu, the time, the version number of the program, and major settings of the microscope and its accessories.

Working Area

In the operating area you control the microscope.
The various menus of the Axioplan 2 Software, or external WINDOWS™ applications, are called up from the Main Screen.

Task Bar

The command buttons on the menu bar provide fast access to other menus.

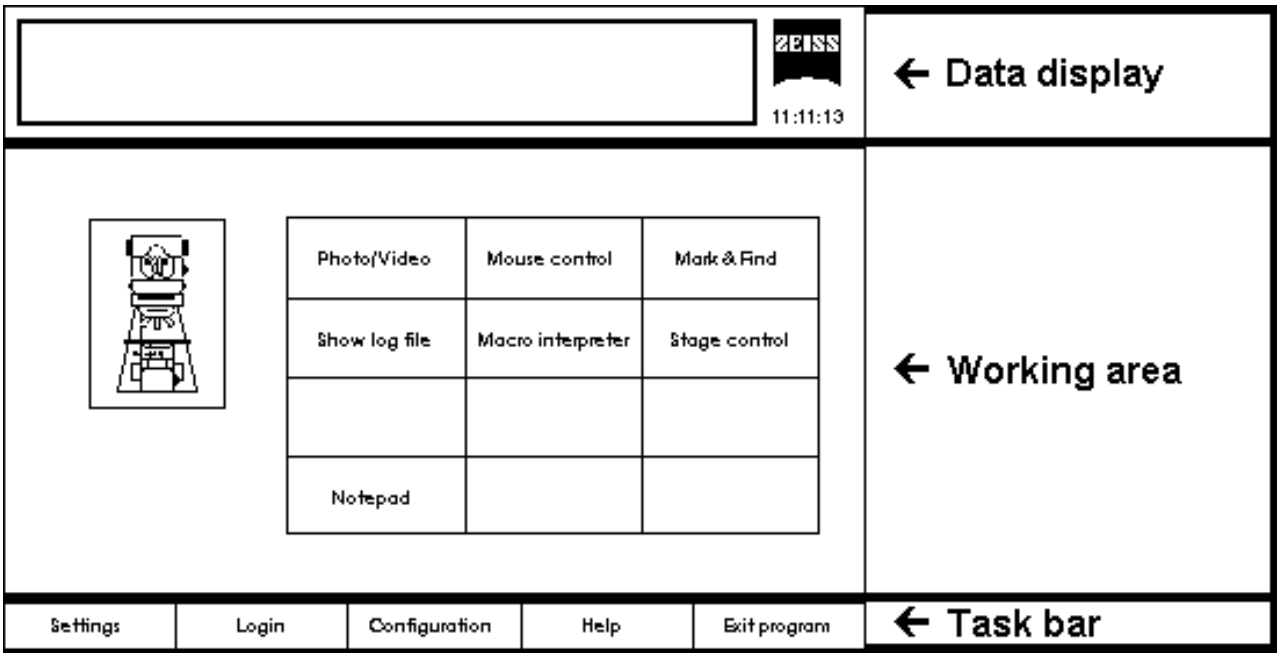


Fig. 47 Operator interface

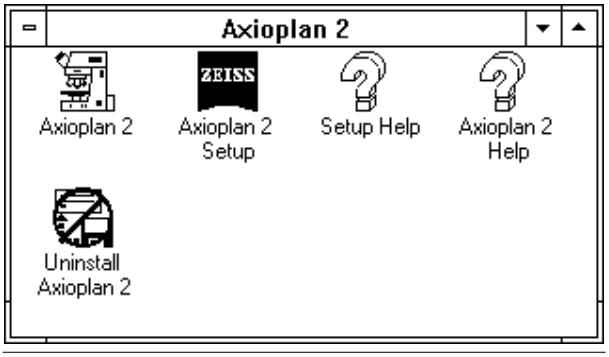


Fig. 43 Program window of the Microscop Software

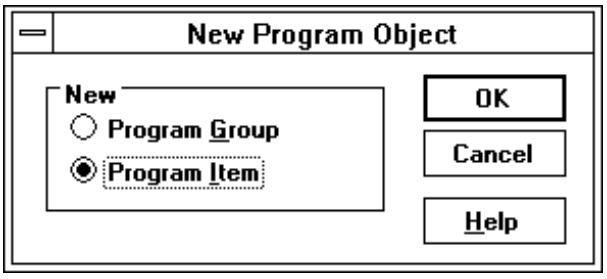


Fig. 44 New Program Object Dialog box

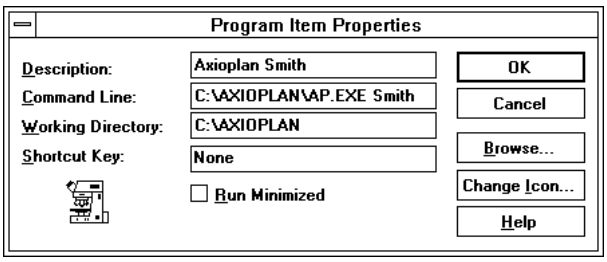


Fig. 45 Program Item Properties Dialog box

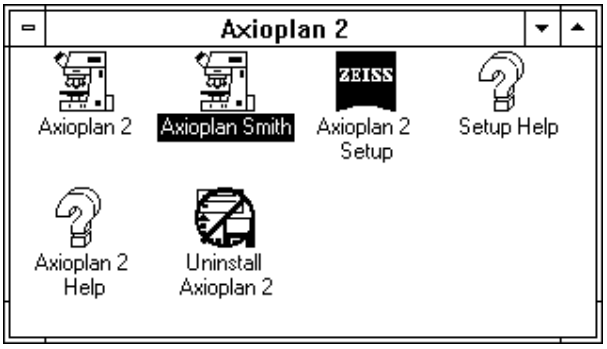


Fig. 46 Program window of the Microscope Software

Creating a User-Specific Program Icon

Proceed as follows:

- Activate the **Axioplan 2** window in the Program Manager (Fig. 43).
- In the Program Manager's **File** menu select the **New...** command.
- Select **Program Item** and then click on **OK** (Fig. 44).
- The next dialog box might contain the following entries (see Fig. 45).
  Smith is a user who has already logged in to the system under this name by means of the **Login** function.
- Then click on **OK**.

The **Axioplan 2** window now shows the new program icon for the user named **Smith** (Fig. 46).

When the user Smith who has logged in to the system under this name starts the program by clicking his/her personal icon, the program will first present the startup menu established for **Smith.**

Automatic Program Start

To start the Axioplan 2 Program from the WINDOWS™ environment, you have several possibilities to choose from:

❑ Starting via the **Autostart** program group
❑ Changing the **shell** entry in the system.ini file

Autostart

- Copy the program icon from your **Axioplan 2** program group into the **Autostart** program group of the Program Manger. This causes the Axioplan 2 Software to be started automatically whenever you start WINDOWS™.

Please consult your WINDOWS™ user manual on how to copy a program icon from one program group into another.

Changing shell=

- The [boot] section of the **SYSTEM.INI** file in the WINDOWS™ directory contains the entry **shell=progman.exe**. If you replace this by **shell=ap.exe**, the Axioplan 2 Software will be started automatically when you start WINDOWS™ next. If you quit the Axioplan 2 program, this will be automatically and immediately followed by the quitting of WINDOWS™.

Start with and without User Name

If you start your Axioplan 2 Software without entering a user name, the program automatically assumes a **default** user. The Startup Menu is, in this case, identical to the Startup Menu of the **default** user, which has been established by means of the **Login** function.

If you start your Axioplan 2 Software under a user name (which must be known to the software), the program first displays the startup menu specified for this user name.

A simple way of starting the Axioplan 2 system for a specific user can be used if every user has a specific program icon established for him in the Axioplan 2 program group. Each user known to the software can start the program with his specific startup menu and his specific settings by clicking on his own icon.

Program description

Program Start from WINDOWS™

To start the Axioplan 2 Program from the WINDOWS™ environment, you have several possibilities to choose from:

- ❑ Program start from the Axioplan 2 Program group
- ❑ Start via the command line
- ❑ Start from the File Manager

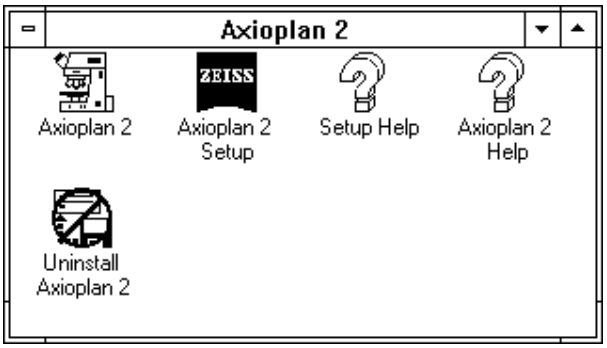


Fig. 41 Program window of the Microscop Software

Starting from the Axioplan 2 Program Group

- Activate the **Axioplan 2** program symbol with a double click (Fig. 41).

Upon start, the program first displays the startup menu of the **default** user.
This startup menu can be configured (customized) via the **Login** function.

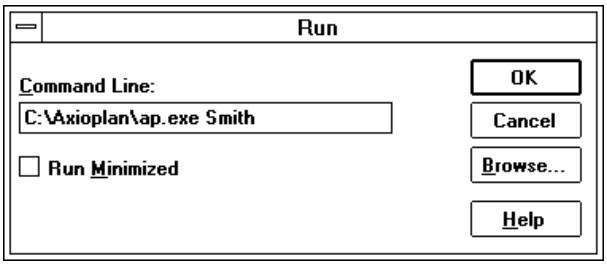


Fig. 42 Run Dialog box

Starting with the Command Line

- Select **Run** in the **File** menu of the Program Manager.
- Enter the program name in the **Command Line** text box of the dialog box, or look for the name by means of the **Browse** button.
- Then click on the **OK** button.

After calling the program you can enter in the command line name of the user to be automatically logged in to the program after it has been started (Fig. 42).

Starting from the File Manager

- Open the WINDOWS™ File Manager, look for the **c:\axioplan** directory (or any other directory in which you may have installed the software), and start the program named **ap.exe**.

Upon start, the program first displays the startup menu of the **default** user. This can be configured (customized) via the **Login** function.

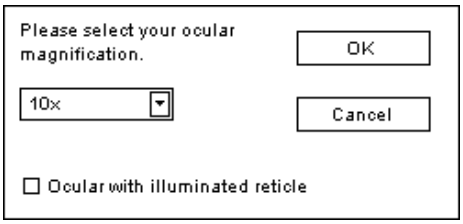


Fig. 39 Eyepieces Setup

Eyepieces Setup

Here you can specify the magnification of the eyepieces (oculars) installed on your microscope.

This number is required for the computation of the total visual magnification.

Available for the Axioplan 2 are eyepieces of 10x and 16x magnification.

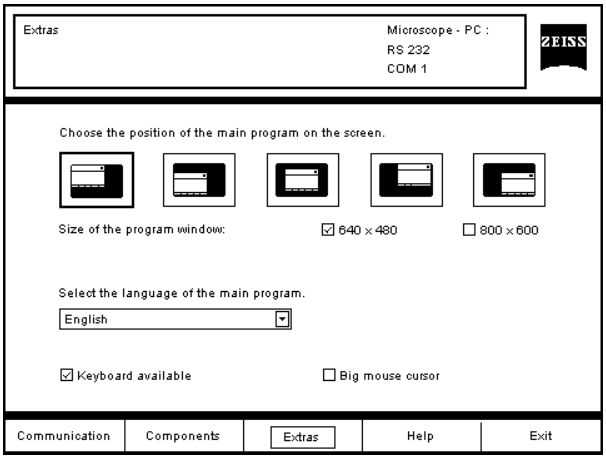


Fig. 40 Extras Setup

Extras Setup

Here you can perform general setting for the Axioplan 2 program.
You can choose the position of your Axioplan 2 program window on the screen. Please mind that this position selection only works with screens resolving more than 640 x 480 pixels.

You can select from four Languages for the Axioplan 2 Software. Available at present are German, English, French and Spanish.

If your PC has no keyboard, please deactivate **Keyboard available**. The program will then show a simulated keyboard on the screen whenever you need to type in some information.

Moreover you can switch between two mouse cursors (the standard Windows mouse cursor and the big Axioplan mouse cursor).
Mark the checkbox **Big mouse cursor**, if you want to use it.

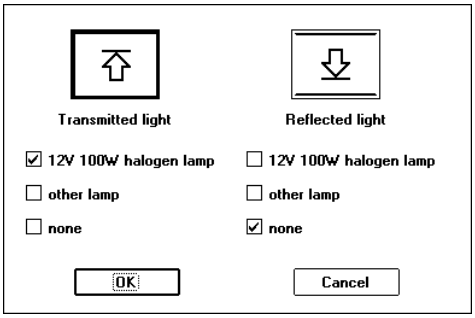


Fig. 36 Lamp Setup

Lamp Setup

Here you select the desired light path, i.e. reflected and/or transmitted light, and specify the lamps installed on your microscope.

If you use halogen lamps and have a model E or MOT microscope stand, brightness can be controlled through the software.

This is not possible with gas discharge lamps. In this case, select **other lamp**.

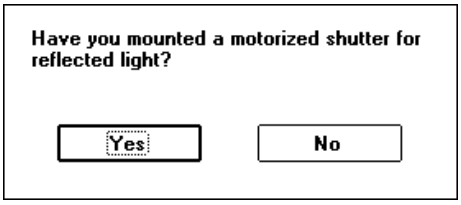


Fig. 37 Reflected Light Shutter Setup

Reflected Light Shutter Setup

Here you specify whether or not a motorized reflected light shutter is installed on your microscope.

The reflected light shutter is used for occluding the reflected light beam when the lamp is on.

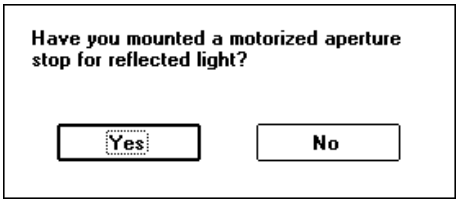


Fig. 38 Reflected Light Aperture Diaphragm Setup

Reflected Light Aperture Diaphragm Setup

Here you specify whether or not a motorized aperture diaphragm for reflected light is installed on your microscope.

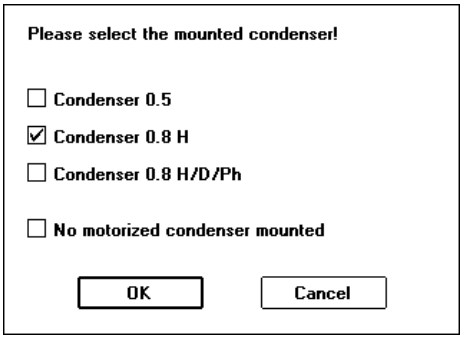


Fig. 33 Condenser Setup

Condenser Setup

Select the condenser mounted on your microscope via the check boxes.

Each of the three condensers selectable has a motorized aperture diaphragm, which can be set manually or by program control.

The condenser 0.5 has a front lens that can be switched out of the beam path.
The condenser 0.8 H is used with objectives of more than 5x magnification.
The condenser 0.8 H/D/Ph has a motorized turret with 5 positions (brightfield/darkfield/Ph 1/Ph 2/Ph 3), which can be set by program control.

If none of these three condensers is installed on your microscope, select **No motorized condenser mounted**.

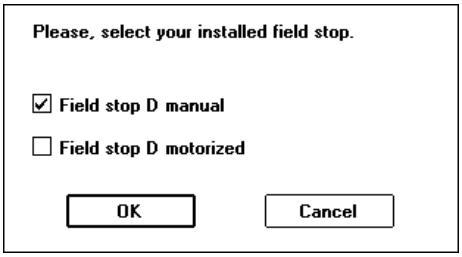


Fig. 34 Field Stop Setup

Field Stop Setup

Select the type of field stop installed.

If your microscope has a motorized field stop, the stop can be set by program control and will automatically be adapted by the light manager after an objective change.

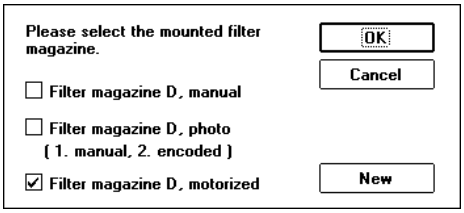


Fig. 35 Filter Magazine Selection

Filter Magazine Selection

The filter magazine consists of 2 filter wheels, each having 4 filter positions.
From here you can select one of three combinations.

Filter magazine D consists of two filter wheels for manual selection.
Filter magazine D, photo consists of one manual and one coded filter wheel. The positions of the coded wheel are digested by the photo module for micrographs taken at a color temperature of 3200 K.
Filter magazine D, motorized has two motorized filter wheels.

The **New** button is intended for the configuration of the user's own filter combinations, but it is not yet available in the present program version.

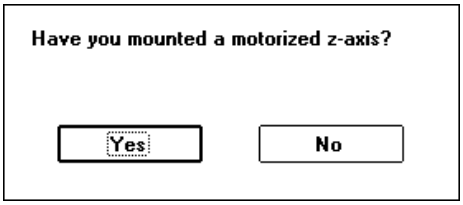


Fig. 30 Focus Setup

Focus Setup

State here whether or not your Axioplan 2 has a motorized Z (focusing) drive.
If it has, it will considerably facilitate specimen changing, among other things.

With a motorized Z drive you can move to a safe position for specimen change and, with the new specimen in place, refocus in a quick and reproducible mode.

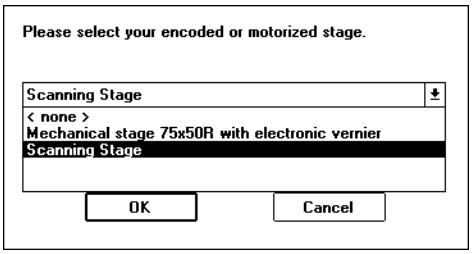


Fig. 31 Stage Setup

Stage Setup

Here you select the motorized or coded specimen stage mounted to your microscope.

For the time being, the program supports two coded mechanical stages and two motorized scanning stages.

If your microscope has one of these stages, select it and click on **OK**.

If your microscope has neither of these stages, select **< none >**.

In the next dialog (Fig. 32) you can specify the communication port and reverse the axis directions.

When selecting the communication channel, mind that you need to specify different ports for the stage and the microscope.

To reverse the directions of the X and Y axes, simply click into the axis sketch.

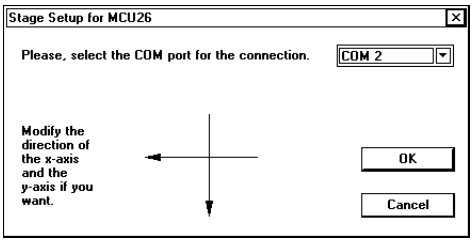


Fig. 32 Communication port and reverse the axis directions

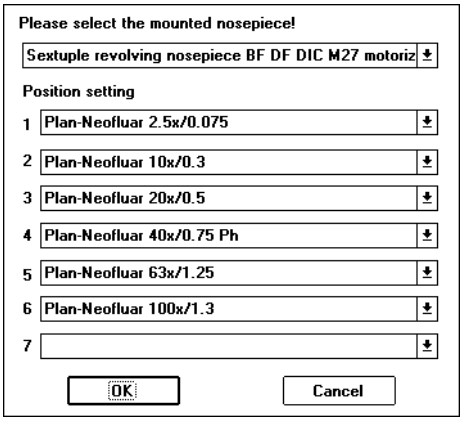


Fig. 27 Nosepiece Setup

Nosepiece Setup

Here you can select the objective nosepiece (upper list box), and specify which objective has been mounted in which position (see engraving on nosepiece).

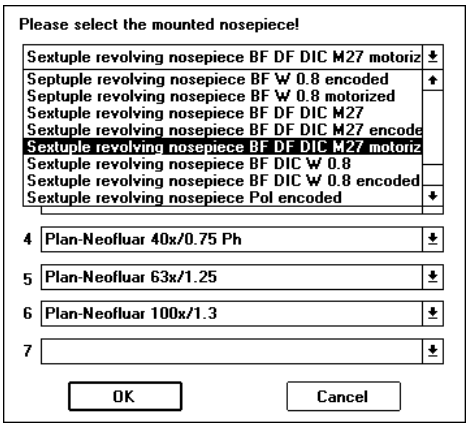


Fig. 28 Nosepiece Selection

Nosepiece Selection

In Fig. 28 you see a list of all nosepieces available for the Axioplan 2.

You can use the direction arrow buttons to move up and down in the list and select the objective nosepiece mounted on your microscope.

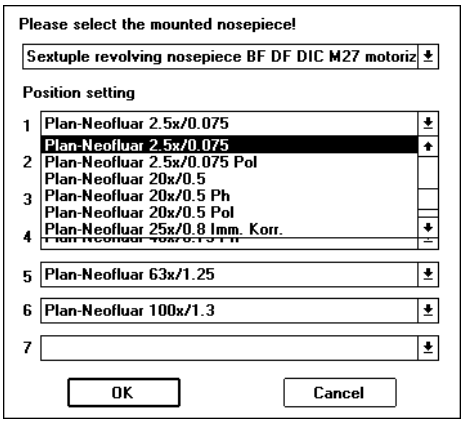


Fig. 29 Nosepiece Position Setting

Nosepiece Position Setting

In Fig. 29 you see a list of all objectives available for the Axioplan 2.

You can use the direction arrows to move up and down in the list and select the objective mounted in the respective nosepiece position.

If you have a motorized or coded nosepiece, the characteristics of the objective (magnification, numerical aperture) are indicated in the Axioplan 2 program and digested (e.g. for the exposure of a scaling bar onto a micrograph).

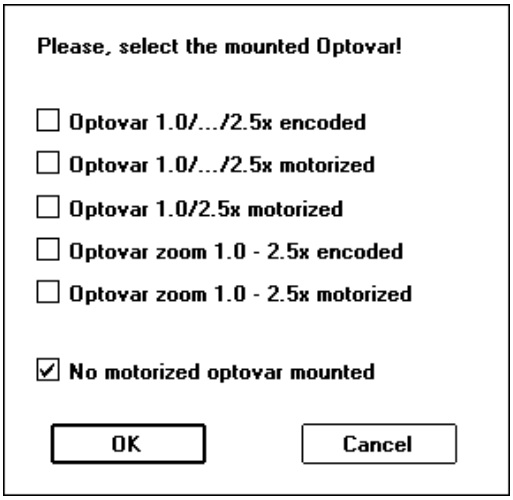


Fig. 24 Optovar Setup

Optovar Setup

If you have mounted one of the motorized or coded Optovar modules, you need to select it here.

Otherwise, activate the check box **No motorized optovar mounted**.

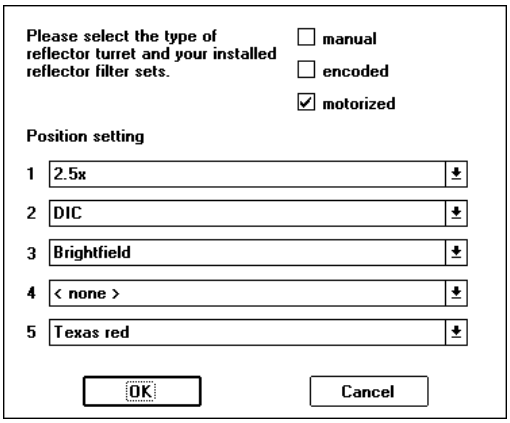


Fig. 25 Reflector Turret Setup

Reflector turret Setup

Select the type of reflector turret installed.

If your reflector turret is coded or motorized, you can specify (see Fig. 25) which set of filters is installed in which position of the reflector turret.

For this, select the number of turret position required, click on the arrow of its dropdown list and choose your module.

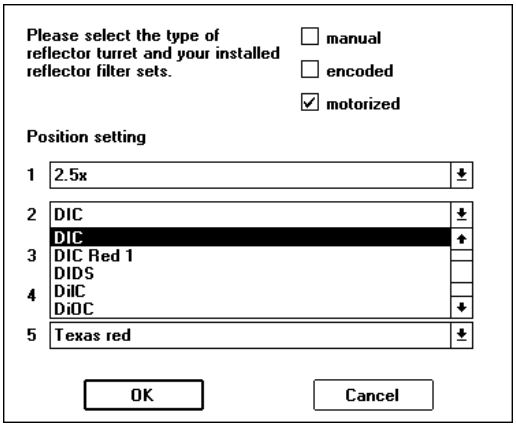


Fig. 26 Reflector Turret Position Setting

Reflector turret position setting

To indicate the positions of the reflector and Optovar modules used in the reflector turret, stick labels numbered 1...5 into the recesses on top of the turret wheel (see also page 103).

The recesses of motorized/coded turrets feature engraved numbers which define the positions of the reflector and Optovar modules.

The reflector module FL can be equipped with 25 different filter sets which, as shown in Fig. 26, are also contained in the dropdown lists (see also pages 92/103).

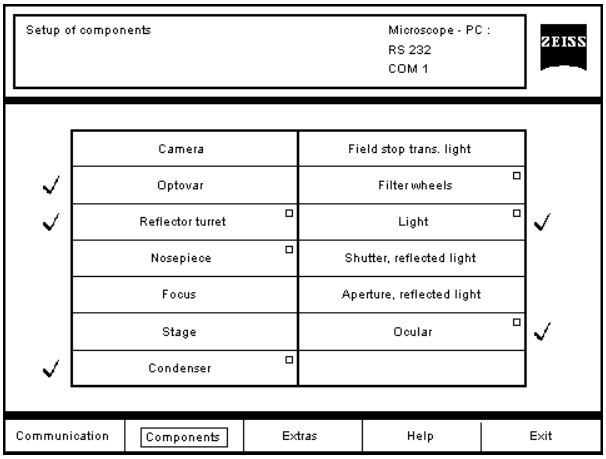


Fig. 22 Control panel for configuring the microscope components

Setup of the Microscope Components

In Fig. 22 you see the control panel for configuring the microscope components.
Here you can register and configure the microscope components provided on your microscope by clicking on the respective buttons.
If a motorized or coded microscope component has been configured, this is marked by a green square on the respective button.
If a mechanical microscope component or no component at all has been registered, there is no green mark on the respective button.
The red ticks next to the buttons mark those components that have already been configured since the start of Setup.
When you start Setup again, components already configured are indicated in the respective dialog boxes. It is therefore possible to add or delete individual components in a partial configuration.

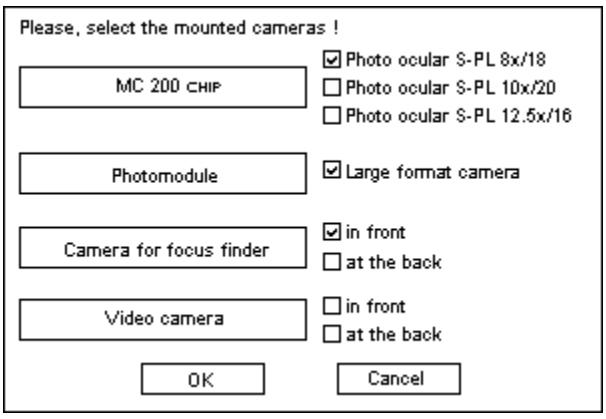


Fig. 23 Camera Setup

Camera Setup

Here you select the installed cameras.

By clicking on the buttons you can activate or deactivate the corresponding cameras the MC 200 CHIP or the photo module.
If you want to work with the MC 200 CHIP, you must activate the MC200 CHIP button and select which photo eyepiece is to be used as an adapter for the tube. The magnification factor changes depending on the selected photo eyepiece.
If you have mounted a photo module, you have to check where the cameras are installed on the photo module.
The photo module has two camera mounting ports (in front and at the back).
Mind that the large-frame camera can only be mounted at the back.
The camera for the focus finder and the video camera may be mounted on either port.
The 35mm cameras need not be configured in the Setup program, since the Axioplan 2 Software will recognize them automatically.

If you want to use the Focus Finder, the camera intended for it must have been mounted to the photo module, and you need to check the button **Camera for focus finder**.
You can then use the Focus Finder in the Axioplan 2 Software for optimum adjustment of the focal plane.
If you want to use TV microscopy you must have mounted a suitable camera to the photo module, and you need to check the button **Video camera**.

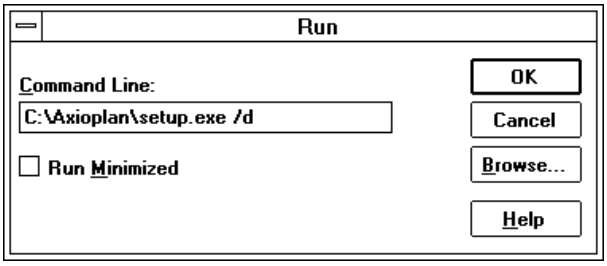


Fig. 19 Run **Dialog box**

Setup in demonstration mode

If you start the Setup program with the command line option **/d**, the screen shows a **Demo** button allowing you to switch between the demonstration and normal working modes.

On completion of the Setup program in demonstration mode, the Axioplan 2 program runs in the demonstration mode; i.e. all instrument components configured are simulated instead of being actually controlled.

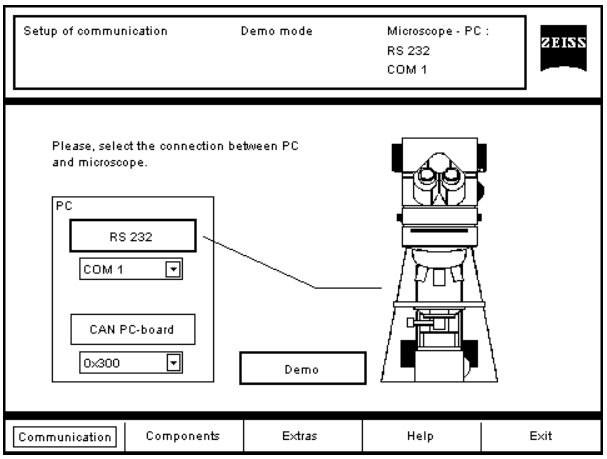


Fig. 20 **Activating the demonstration mode**

If you activate the **Demo** button, the Setup program is in demonstration mode (Fig. 20). You can switch back to normal mode by deactivating the **Demo** button.
If you have activated the demonstration mode, the display field of the Setup program shows the note **Demo mode** in red letters.

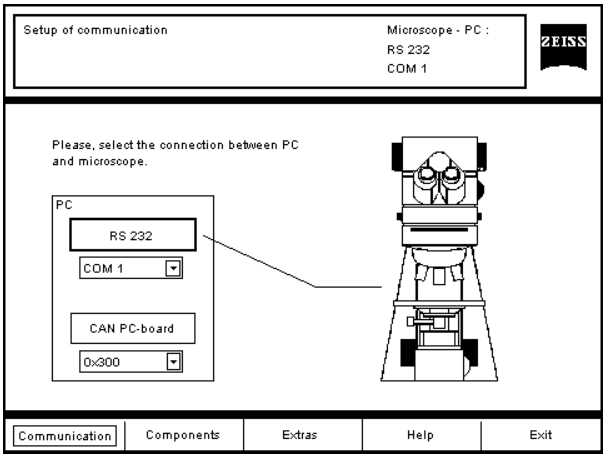


Fig. 21 **Control panel for selecting the communication channel**

Setup of the Communication Channel

Selection of the RS 232 Port

The window in Fig. 21 shows the control panel for selecting the communication channel between the PC and the microscope.
Here you see that communication via the RS 232 port has been selected.
Now you can decide which COM port is to be used (the present setting is for COM 1).
Communication via a CAN-PC board is not yet possible for the time being.
Setup has been started without a command line option.
Now you can configure your microscope.

Start of the Setup Program

The Setup program can be used in two different modes, selection of which has consequences for the Axioplan 2 Software:

- ❑ Normal mode
- ❑ Demonstration mode

Select the mode in which you want Setup to work through the command line you use in starting the program.
Command line without an option: Setup in normal mode.
Command line with option **/d**: The Setup screen shows an additional **Demo** button, for starting the Axioplan 2 Software in the demonstration mode.

In the normal mode, Setup can be started in several ways:

- ❑ Starting from the Axioplan 2 program group
- ❑ Starting from the command line
- ❑ Starting from the file manager

To start Setup in the demonstration mode, proceed as follows:

- ❑ Starting from the command line

Setup in normal (working) mode

Starting from the Axioplan 2 Program Group

Activate the **Axioplan 2 Setup** program symbol (Fig. 16).

Starting from the Command Line

Select **Run** in the **File** menu of the Program Manager (Fig. 18).
Enter the program name (**setup.exe**) in the Command Line text box of the dialog box, or look for the name by means of the **Browse** button.
Then click on the **OK** button.

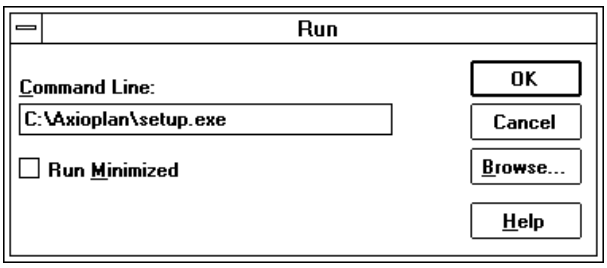


Fig. 18 **Run** Dialog box

Starting from the File Manager

Open the WINDOWS™ File Manager, look for the **c:\axioplan** directory (or any other directory in which you may have installed the Axioplan 2 Software), and start the program named **setup.exe**.

Note: When Setup in Normal Mode has been completed, you can use all functions of the Axioplan 2 program to control the microscope with its configured components.

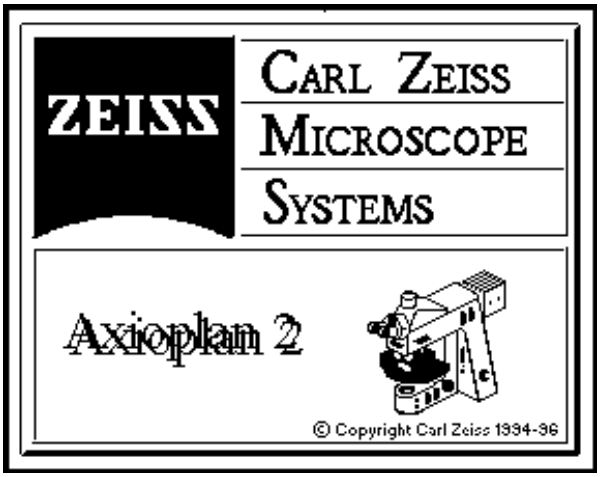


Fig. 15 Installation program

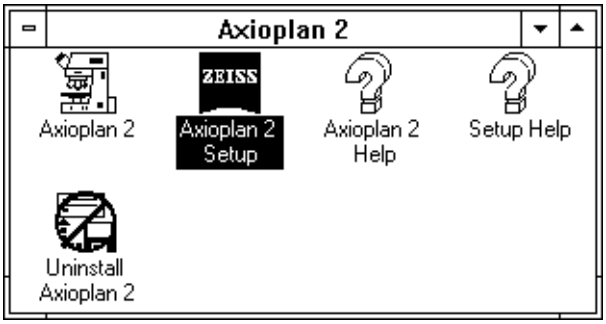


Fig. 16 Program window of the Microscope Software

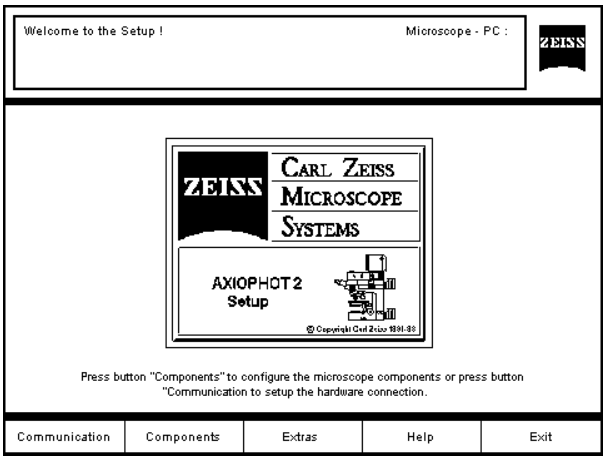


Fig. 17 Setup program

Installation

The microscope software is installed from a menu; installation is undertaken from four diskettes provided with the system. The following procedure should be followed:

- Insert the first installation diskette in the drive of your PC or Notebook.
- Select the command **Run** from Program Manager of WINDOWS™ in the menu **File**.
- A dialog box will then appear. Enter the command **a:\install** in the field **Command Line**.
- Now follow the instructions of the installation program.
- Select the language version.
- Confirm the pre-set target directory, or change this according to your wishes.
- Replace the diskettes when requested to do it.

The software will then be installed and a seperate program group will be created for the microscope software.

- Confirm the completion of the installation procedure and any restart of your computer with **OK**.

Overview of Setup

With the Setup program you can

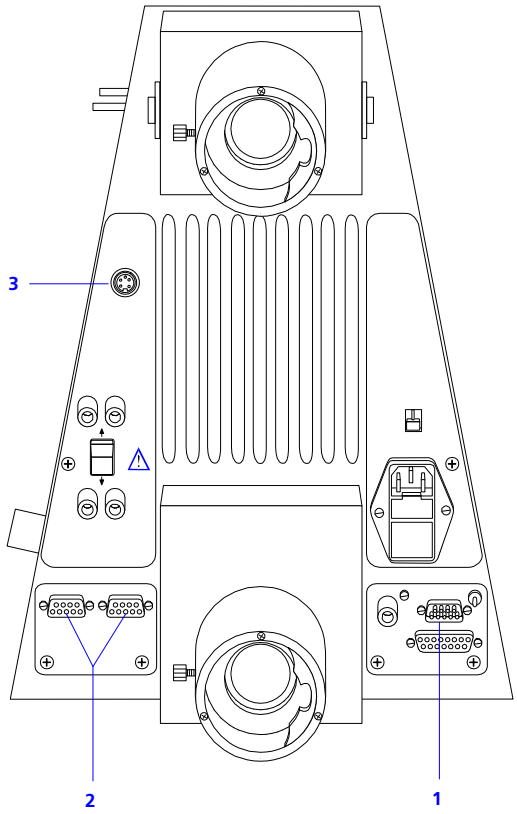
❑ define the communication between your PC and your microscope, by selection from two channels

❑ decide whether the Axioplan 2 Software is to be started in the normal (working) mode or in a demonstration mode:

Normal mode
Demonstration mode

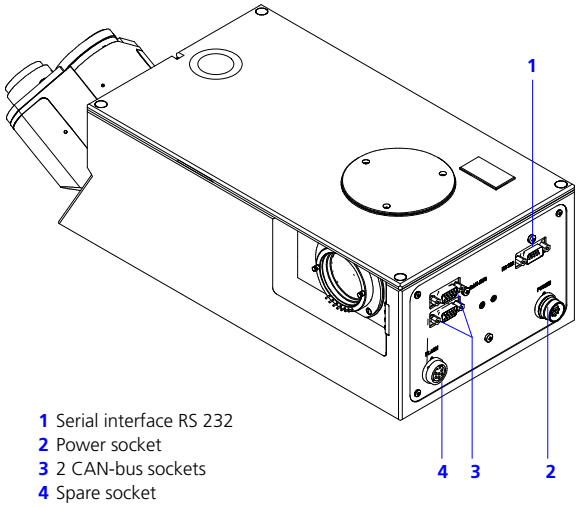
❑ register the installed microscope components.

- Click on the **Communication** button if you want to specify the communication port between the microscope and the PC.
- Click on the **Components** button if you want to configure the microscope components.
- Click on the **Extras** button if you want to select the language for the Axioplan 2 program or if you want to set the size and the position of the program window.



1 RS 232 C connection
2 CAN-bus connection
3 Socket for Axiophot

Fig. 13 Motorized stand (back)



1 Serial interface RS 232
2 Power socket
3 2 CAN-bus sockets
4 Spare socket

Fig. 14 Electrical connections of the Axiophot 2

Electrical connections

Microscope

The coupling of the Axioplan 2 with the PC or the notebook is performed via the serial interface (Fig. 13/**1**) using a connecting cable.

Axiophot 2 photo module

The electrical connections are on the back of the Axiophot 2 photo module:

- ❑ CAN-bus socket for cable connection to the stand and other microscope components (Fig. 14/**3**)
- ❑ RS 232 serial interface for the connection of a PC or notebook (Fig. 14/**1**)
- ❑ Spare socket (Fig. 14/**4**)
- ❑ Power socket (Fig. 14/**2**)

Connection to the manual stand

- Connect the supplied RS 232 C connection cable to the serial interface of the photo module (Fig. 14/**1**) and to the serial interface of your notebook/PC.
- Connect the internal voltage supply cable supplied to the POWER socket (Fig. 14/**2**) of the photo module and to socket (Fig. 13/**3**) at the back of the stand.
- Tighten all the safety screws on the plugs.

Connection to the stand E/MOT

- Use the RS 232 C cable supplied to connect the serial interface of the photo module (Fig. 14/**1**) or the stand (Fig. 13/**1**) to the serial interface of your notebook/PC.
- Connect the internal voltage supply cable supplied to the POWER socket (Fig. 14/**2**) of the photo module and to socket (Fig. 13/**3**) at the back of the stand.
- Connect photo module and stand by connecting the CAN bus cable to the appropriate CAN bus sockets (Fig. 14/**3** and Fig. 13/**2**).
- Tighten all the safety screws on the plugs.

Microscope Software

General

The microscope software for the Axioplan 2 offers you the possibility of controlling the following functions of your microscope by connecting a PC or notebook:

- ❑ focusing
- ❑ raising/lowering of stage
- ❑ switching nosepiece
- ❑ switching reflector turret
- ❑ controlling the Optovar or zoom intermediate tube
- ❑ halogen illumination ON/OFF
- ❑ adjusting the brightness of the halogen illumination
- ❑ switching shutter for incident light
- ❑ setting of incident-light aperture diaphragm
- ❑ adjusting luminous field diaphragm
- ❑ adjusting condenser
- ❑ switching filter wheels 1 and 2
- ❑ control of the Axiophot 2 photo module / MC 200 CHIP

The microscope software can only be operated if the functions on your instrument are motorized.
The entire functions of the Axiophot 2 / MC 200 CHIP are controlled solely via the **Photo** program part of the microscope software.

Further information and a detailed description is available in the on-line help of the software.

The software package includes:

- ❑ an installation program (Install.exe)
- ❑ a configuration program (Setup.exe)
- ❑ a program for reading / writing of microscope parameters (CLM.exe)
- ❑ a program for processing the PhotoAccess database (Photoacc.exe)
- ❑ and the control program itself (Ap.exe)

The control program consists of the following modules:

- ❑ main screen
- ❑ user login and edition of user settings
- ❑ configuration
- ❑ stand control
- ❑ microscope control
- ❑ microscope settings (saving an loading)
- ❑ photo
- ❑ mark & find
- ❑ Axioplan 2 mouse
- ❑ macro interpreter

If microscope components are not available, the relevant program modules can not be addressed.

System requirements

The following minimum system requirements must be met:

Processor:	Intel™ 486
Memory:	4MB RAM
	10MB spare disk storage capacity
Graphic board:	VGA, 256 colors
Software:	MS WINDOWS™ from version 3.11

Mouse, trackball or touchscreen

Handling

The microscope software is conseived for use with a touchscreen. Any necessary input of texts and data can be made from the keyboard of your PC or Notebook.
If a mouse is used, a further serial port, e.g. COM 2, must remain available in the PC for the connenction of the microscope.
The link with the WINDOWS™ user interface makes it possible to switch between the microscope control and other WINDOWS™ applications at any time without difficulty. Exact knowledge of the WINDOWS™ user interface is useful, but not essential.

Light manager

Light manager means the microscope's ability to adjust the KÖHLER illumination setting automatically. At the same time the image illumination is adjusted at a constant color temperature.
Configured settings are stored and are reproduced automatically whenever you change the position of the objective nosepiece.
It is not necessary to connect the microscope to a computer to perform this function.

Essential requirements for the light manager, however, are the motorized or coded nosepiece and the possibility of motorized adjustment for the following components:

- ❑ luminous field diaphragm for transmitted light
- ❑ aperture diaphragm for transmitted light
- ❑ filter wheels
- ❑ condenser front optics
  (only with use of achromatic motorized dual condenser 0.5, 445341)
- ❑ aperture diaphragm for incident light (only for incident-light techniques)

The KÖHLER illumination setting procedure should already have been performed prior to the inital use of your Axioplan 2 (→ *page 132*). You should also make an occasional check to ensure that this setting has not changed.

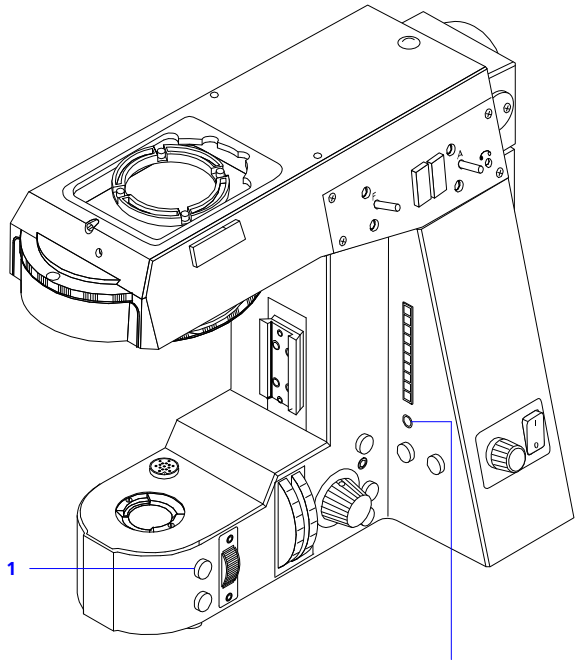
The factory-programmed setting of the light manager guarantees a practical starting situation, from which you can make your own settings and then store them with the SET key.

- Give SET key (in Fig. 11/**7**) a short press to store the setting.

Automatic balancing of focusing speed and focus position (parfocality) of different objectives

The lower part of the MOT stand is equipped with a Harmonic Drive™ of high precision which converts the hand movement in the focusing process into different sensitive vertical stage movements (proportionally to the objective's magnification). Motor focusing also compensates minor focus differences which always occur between the objectives. First, however, the following learning process needs to be activated:

- Focus dry objective exactly with the highest magnification/aperture.
- Press and hold (> 3 s) both upper switches for fast stage lowering (Fig. 12/**1** left and right) at the same time until the orange LED display (Fig. 12/**2**) lights up briefly.
  This activates the so-called "learning mode" with the dry objective mentioned above as reference system.
- If you want to adjust the focusing speed in the fine drive, press both left switches for fast lowering.
  The upper switch causes a coarse focus adjustment, while the lower switch causes a fine focus adjustment. Holding the switch slowly changes the focusing speed in the fine drive. You can now choose among approximately 40 different focusing speed parameters.
- Focus again exactly on the specimen and press briefly the upper right switch. This stores focusing speed and focus position for the reference objective currently in use.
- Now switch to the objective with the next lower magnification/aperture and adjust focusing speed and focus position accordingly. You may store the parameters for this objective by pressing briefly the upper right switch for fast lowering.
- Proceed with the other objectives accordingly. Oil immersion objectives should be adjusted last.
- Finally press and hold (> 3 s) the upper right switch for fast lowering until the orange LED display lights up briefly. This switches the "learn mode" off and you may now check the objectives' parfocality visually.



1 Fast stage lowering VIEW
2 LED

Fig. 12 Motorized stand

6 RS 232 C interface

The intermediate tube (coded or motorized) installed is connected to the microscope via this connector using the cable supplied.

7 Programming key (SET)

This key only functions in conjunction with the light manager described later.

- A short press of the SET programming key (< 3 s) stores the current settings of the following microscope parts, provided they are adjustable by motor or electronically readable:
  - ❑ aperture diaphragm for transmitted light
  - ❑ luminous field diaphragm for transmitted light
  - ❑ incident-light aperture diaphragm
  - ❑ filter wheels
  - ❑ condenser front optics
    (only with use of achromatic motorized dual condenser 0.5, 445341, the so-called pathology condenser mot.)

One separate storage is possible for each position of the nosepiece.
The stored settings are automatically activated when the respective positions of the nosepiece are adopted.
The stored values are retained after you switch off the instrument.
If you have changed the settings of the current position and now wish to call the stored settings, all you have to do is turn the nosepiece further and then return it to the previous position.

Note: Optovar and zoom intermediate tube

If you have inserted an Optovar intermediate tube on your Axioplan 2, its settings are also stored depending on the position of the objective nosepiece.

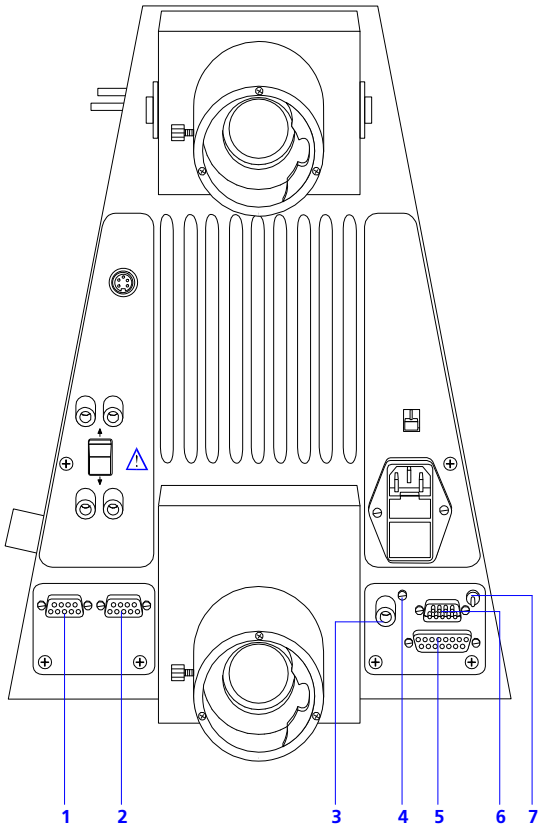
The microscope software can be used to store several settings for each mount of the nosepiece. The settings are stored by the program in parameter files and are called with these again.
The microscope software can be used to store several settings for each mount of the nosepiece. The settings are stored by the program in parameter files and are called with these again.

Coded microscope parts

Various modules of the Axioplan 2 and some additional microscope components can be coded.
Codings is beneficial when the microscope software is used. The software can recognize coded parts of the microscope and display their position or status, even if the parts involved are not motorized. For example, filter wheels as well as reflector turrets and nosepieces can be coded without being motorized. In this case, the software would record and display a manual change of the filter or turret/nosepiece position. However, the microscope software must be appropriately configured if it is to recognize the coded positions.
The configuration is performed with the aid of a setup program delivered with the instrument. Normally, the setup program has already been implemented in the factory prior to delivery of Axioplan 2.

Note: Equipping the nosepiece

The microscope software must be started via the PC before the nosepiece is fitted with objectives (normally, the nosepiece is fitted with objectives in the factory as ordered). Fit the nosepiece mounts with the objectives displayed for these mounts by the program. If the objective to be used is not displayed by the program, the setup program must be called and this objective input for a mount on the nosepiece.
Always check whether the objective position and the appropriate display correspond in the program. The same applies for the positions of the reflector turret.



1 CAN bus-1 connector
2 CAN bus-2 connector
3 TV connector (input) for the focus indicator function
4 Impedance switching for TV port
5 Connector for Optovar / zoom intermediate tube
6 RS 232 C interface
7 SET programming key

Fig. 11 Back of motorized stand

Back of stand E/MOT

1 CAN bus-1 connector

For connection of the Axiophot 2 photo module.

2 CAN bus-2 connector

These interfaces permit activation of the Axioplan 2 via a CAN bus. Normally, the signals from a PC - which must be equipped with an appropriate driver board (CAN bus interface) - are transferred to the Axioplan 2 and read off from there. The second connector also allows cascading. This enables several series-switched instruments to be activated by a PC.
The control commands for programming languages under WINDOWS™ are provided by DLLs (dynamic link libraries).
For details, please see → the chapter *Interface Description* or get in touch with our service department.

3 TV connector (input) for the focus finder function (only for Axiophot 2)

This connector is required if the focus finder function is to be performed via the microscope software. This function is used as a focusing aid in photography, preferably for lower magnifications.
The signal of the TV camera connected to the 4x5" port via adapter is forwarded to the electronic evaluation system integrated in the stand via the TV connector (**3**) and the result is transferred to the software. The software informs the user when optimum focusing is present.
Requirement for correct functioning: sufficient light intensity and sufficient contrast in the center of the field of view.

Procedure:

- Connect the TV camera via TV adapter 60/1x.
- Adapt to TV connector (use 2.5x special adapter).
- Set impedance for TV port (**4**).
- Activate the focus indicator function in the software.
- Adjust the focusing drive until the program indicates optimum focus.

4 Impedance switching for TV port

Switch position 1: for high-ohm setting

Switch position 2: 75 Ω

5 Connector for Optovar/zoom intermediate tube

The intermediate tube (coded or motorized) installed is connected to the microscope via this connector using the cable supplied.

Stand

2 Shutter switch incident light

In incident-light microscopy or when using an externally supplied gas discharge lamp, it may be necessary to block the light path without switching off the lamp. A motorized shutter is used for this, which interrupts the light path by swinging in a diaphragm.
Normally, the shutter is opened and the lamp for transmitted light therefore switched off.
A short press of switch (**2**) blocks the incident light and the transmitted-light illuminator is switched on.
If you want to combine transmitted-light fluorescence and epi-fluorescence , press switch (**2** - shutter) for more than 2 s. The incident-light or transmitted-light beam path can then be used. Pressing switch (**2**) again returns to the change mode between transmitted and reflected light.

Note: If you see no light in the transmitted or incident light technique, check by pressing switch (**2**) whether the shutter is blocking the light path.

3 Gear switchover to motor focusing

Pressing the switch changes from coarse to fine drive, and vice versa (Fig. 10/**3**).

6 Motorized focusing drive

Focusing is manual by means of a control knob (on both sides) that acts on an electronic encoder.
Difference: To change between coarse and fine drive, the gear switchover (Fig. 10/**3**) must be operated.

4, 5 Turning to the left or right of the connected motorized components (Fig. 10)

Using the keys (**4**) and (**5**) attached to the right and left of the stand you can operate two of the following motorized components:
1. Condenser turret
2. Reflector turret
3. Optovar intermediate tube
4. Nosepiece
5. Zoom intermediate tube

Key (**4**) turns the appropriate control element of the component to the right, key (**5**) to the left.
Each time the microscope is switched on, the existence of motorized components is "enquired" and recorded. The switching function for the first two components available is then assigned to keys (**4**) and (**5**) in the above sequence.
The first component found is always assigned to the keys on the right of the stand. For example, if your instrument is equipped with the motorized components 1 to 4, keys (**4**) and (**5**) on the right will switch the condenser turret and the keys on the left switch the reflector turret.

7, 8 Rapid stage lowering CHANGE/VIEW

Knobs on both sides of the stand for rapid stage lowering and moving it up again in the previous position.

Stage lowering

- Press CHANGE knob (**7**).
  Stage will be lowered. The current focus setting is stored. When the stage is lowered, motorized focusing by focusing drive is switched off.

Moving stage up

- Press VIEW knob (**8**).
  Stage moves up and the stored focus position is precisely reset.
  The user-friendly design of this function enables you to operate the CHANGE/VIEW keys with either your right or your left hand.

CAUTION!

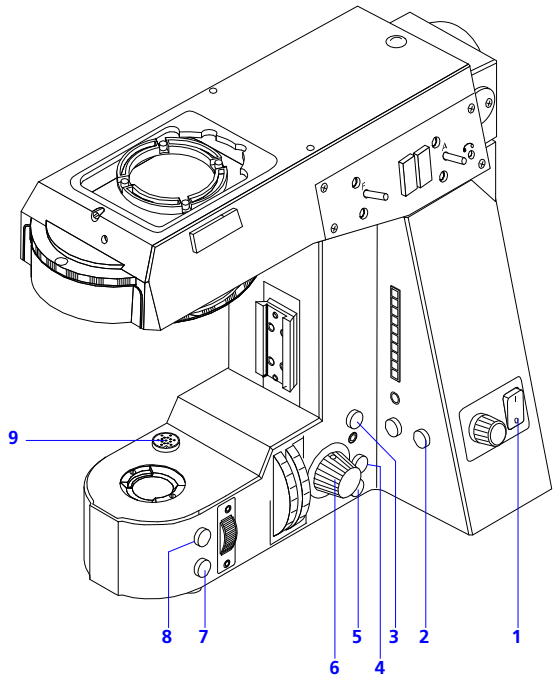
Risk of injury and instrument damage
Please do not insert your hand or any objects between the stage and the objective when the stage is moved upwards. The same applies to the downward motion: in that case, the space between condenser and stand base is reduced.

9 Socket for motorized condensers

Both the voltage supply and the control of motorized condensers is made via this socket.

- Switch off Axioplan 2
- Attach condenser to condenser carrier
- Connect plug of the condenser cable with socket (**9**) on stand base.

Note: When the Axioplan 2 is switched on, instrument initialization is performed to allow recognition of the connected modules. This means that the system cannot recognize any modules which are connected **after** the Axioplan 2 has been switched on.
If the condenser is to be activated via the Microscope control, it must be activated via the Setup program
(→ *Microscope Software*).



1 ON/OFF switch
2 Shutter switch incident light
3 Gear switchover to motor focusing
4 Turning to the right of the connected motorized components
5 Turning to the left of the connected motorized components
6 Coarse/fine drive of focusing
7 Rapid stage lowering CHANGE (on both sides of the stand)
8 Rapid stage lowering VIEW (on both sides of the stand)
9 Socket for connection of motorized condensers

Fig. 10 Motorized stand

Stand E/Stand mot

Specialities

- ❑ Integrated electronic system in the stand base
- ❑ Motor focusing (only MOT stand)

Manual operation of these stands differs only slightly from the operation of the manual stand. The following therefore describes only those stand functions which the instructions for the operation of the manual stand do not cover.

The stand described here is equipped with all the available motorized and coded functions and may therefore differ from your stand configuration.

Note: Microscope Software
Some of the motorized functions of the stands can only (or also) be operated from the PC via the software.
For a description of this function, please see → the chapter *Microscope Software*.

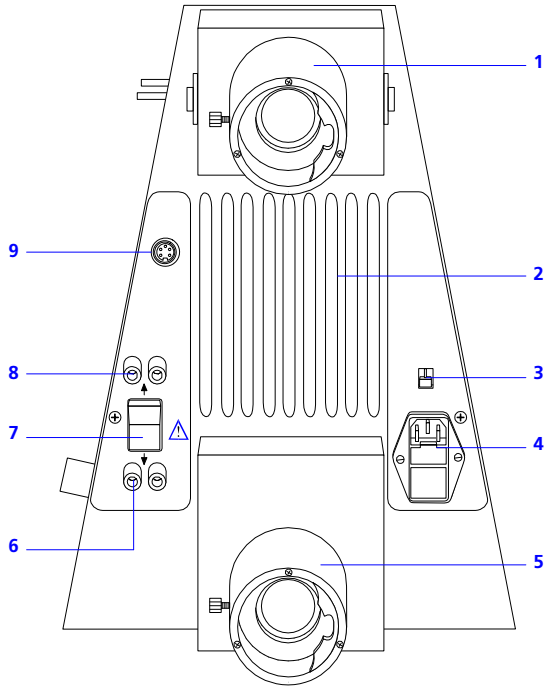
The following numbers refer to Fig. 10 (motorized stand).

1 ON/OFF switch
O Instrument switched off
I Instrument switched on

For checking the operating status, the switch lights up green in position I (for malfunctions see → chapter *Care, Maintenance*).
When the Axioplan 2 is switched on, not only the HAL 100 microscope lamp is supplied with power, but also the Axiophot 2 Photo module, (if it is attached), and the motorized and coded components.

Note: Motorized focusing and all the other motorized or codable functions are only available when the instrument is switched on.

Stand



1 Connecting tube for microscope lamps-incident light
2 Ventilation slots
3 Viewing window, line voltage
4 Socket for instrument plug
5 Connecting tube for microscope lamps-transmitted light
6 Sockets for microscope lamps-transmitted light
7 Toggle switch transmitted light/incident light
8 Sockets for microscope lamps-incident light
9 Socket for Axiophot 2 Photo module

Fig. 9 Back of manual stand, also see Fig. 2

Back of manual stand

Key to Fig. 9 (back of manual stand)

1 Connecting tube for microscope lamps-incident light with locking screw for dovetails to fix the lamps

2 Ventilation slots (always keep clear; minimum distance: 15 cm)

3 Viewing window to check the set line voltage (changing the voltage → chapter *Care, Maintenance*)

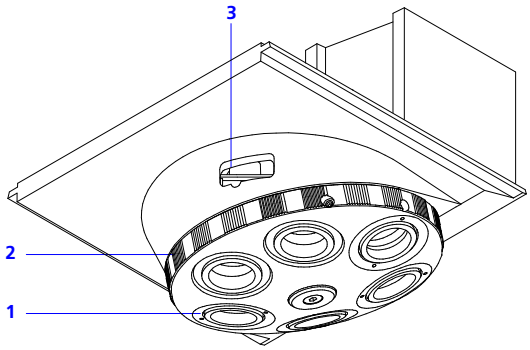
4 Sockets for instrument plug with integrated compartment for instrument fuses (change of fuses → chapter *Care, Maintenance*)

5 Connecting tube for microscope lamps-transmitted light, with locking screw for dovetails to fix the lamps

6 Sockets of the integrated power unit for HAL 100 / transmitted light microscope lamps

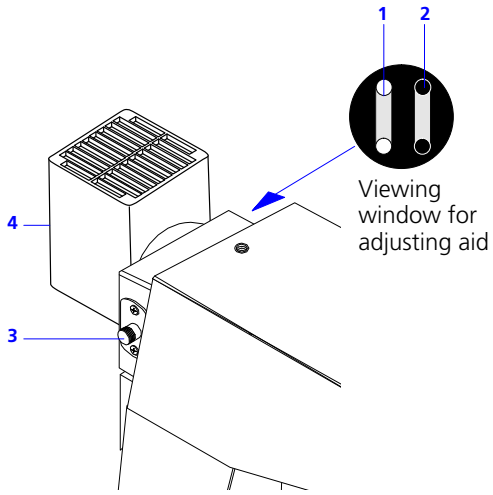
7 Toggle switch to change between incident and transmitted light.
The short delay after you push the switch helps prevent you from hurting your eyes in the unexpected bright light.

8 Sockets of the integrated power unit for HAL 100 incident light microscope lamps



1 Thread (normally W0.8", M27 for incident light darkfield) to screw in the objectives
2 Knurled ring for nosepiece rotation
3 Compartment for compensators

Fig. 7 Objective nosepiece



1 Image of the light arc
2 Mirror image of the light arc of the lamp reflector
3 Slide-in knob for adjusting aid activation
4 HBO 50 lamp housing

Fig. 8 Adjusting aid

21 Objective nosepiece

The objective nosepiece is used for mounting the objectives and changing them quickly. Depending on the application, the customer can choose from nine different nosepieces.

Note: Nosepiece positions which are not being used must be covered with dust caps.

The nosepieces for polarization is equipped with centering screws (SW 1.5) for the centration of the objectives.

Nosepieces for DIC feature one compartment for insertion of a DIC slider in each objective mount.

Note: Please do not try to remove the nosepiece from the stand, since this will result in the loss of the centration; this can only be reset by our service staff.

11 Compartment for the insertion of auxiliary objects and compensators

Fig. 7/**3** and Fig. 3/**11**
(→ *Microscope Components*)

12 Reflector turret

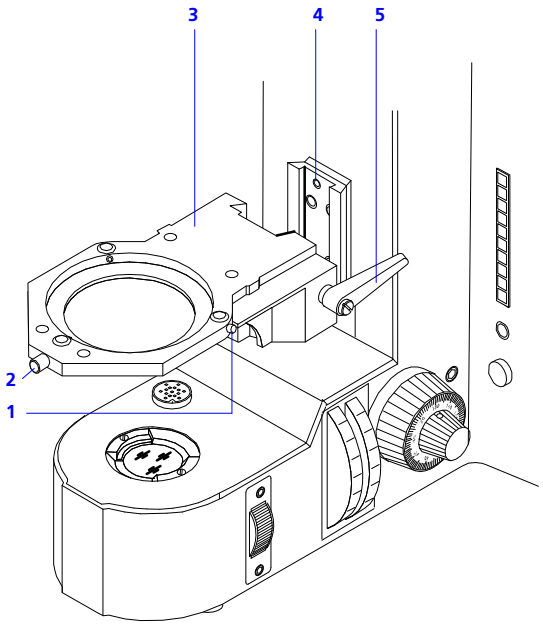
The reflector turret (Fig. 3/**12**) consists of a filter wheel with 5 click stops to which the required reflector modules are attached. Attachment and change of modules can be performed by the user (→ *Microscope Components, Reflector Modules*).

13 Analyzer Compartment

Fig. 3/**13**
(→ *Microscope Components)*

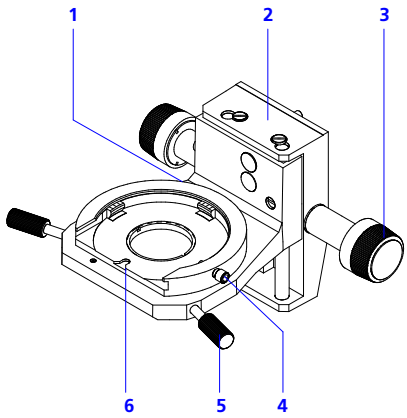
14 Adjusting aid for HBO/XBO incident microscope illuminators

(Fig. 8)
The adjusting aid simplifies optimum setting of the HBO 50/100 and XBO 75 lamps in fluorescence microscopy.
A mirror, directs the image of the light arc to a round window visible from the outside (matt black filter). Here, the position change of the focal point and its mirror image, performed by adjusting the screws on the microscope illuminator, can be viewed.
The lamp is set optimally if the image and the reflected image of the light arc are shown in the window centrally and in focus (→ *page 131*).



1 Stage centering screw for stage centration (on both sides)
2 Screw-on cap for spring pin of stage clamp
3 Stage carrier
4 Dovetail guiding device
5 Clamping lever

Fig. 5 Height adjustment of the stage carrier



1 Clamping screw for height stop, prevents the specimen from being pressed out inadvertently from below by the condenser
2 Carrier guidance
3 Height adjustment controls on both sides
4 Clamping screw to fix the condenser
5 Centering screws on both sides
6 Orientation groove for the condenser

Fig. 6 Condenser carrier

Stage centering

All stages are factory-precentered, i.e. when the stage is rotated, a set specimen feature will remain in the image center. Should a set feature move away from the image center when the stage is rotated, the stage must be centered again.

- Loosen stage clamping screw (Fig. 4/**6**).
- Correct the drift of the image part by simultaneously rotating the two stage centering screws (**1**).
- When the stage is centered, tighten the screw-on cap.

Note: When highly magnifying objectives are used the centration is only exact for one chosen objective.

Height adjustment of the removable stage carrier

(Fig. 5)
The height of the removable stage carrier is adjustable, which is very useful, for example, in the case of very high specimens (max. specimen height = 49 mm).

- Hold stage carrier (**3**) with your left hand. Loosen clamping lever (**5**).
- Change height of stage carrier, tighten clamping lever (**5**). Do not press too hard.

Note: To remove the stage carrier, loosen the clamping lever and take the carrier out of the dovetail guiding device (**2**) by moving it to the left. Orientation of the clamping lever can be selected as required by pressing against the spring and rotation in to the required position.

Condenser carrier

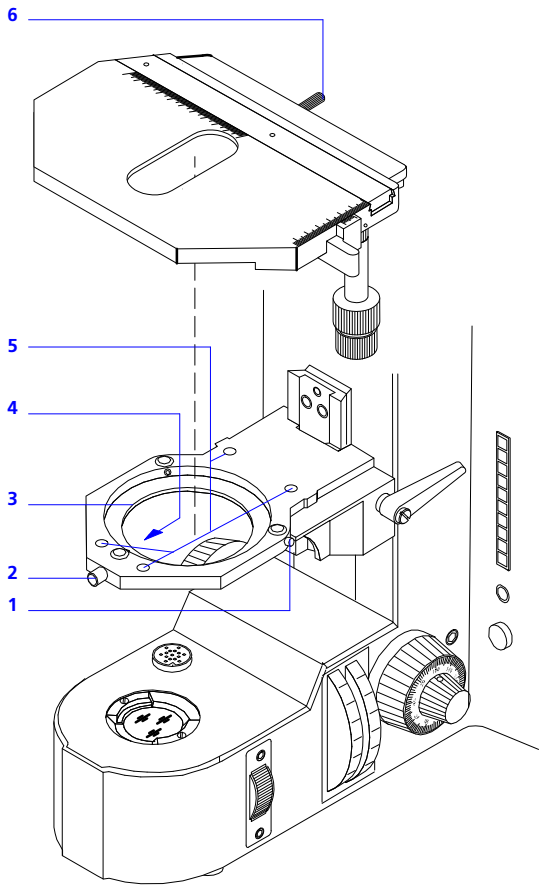
The condenser carrier is screwed to the stage carrier. All the condensers available for the Axioplan 2 are attached to the condenser carrier. The height of the carrier can be adjusted on both sides and permits the centering of the inserted condensers.

Note: For the setting of KÖHLER illumination, the image of the luminous-field diaphragm must be centered in the field of view.

Setting the height stop (Required KÖHLER illumination setting must have been performed):

- Loosen clamping screw (**1**) for height stop using SW 3.
- Set the specimen.
- Image the luminous-field diaphragm sharply (by adjusting the height of the condenser).
- Move up the condenser by approx. half a rotation of the control.
- Tighten clamping screw for height stop (**1**).

Note: Depending on which stage carrier is mounted (fixed or removable), the appropriate special condenser carrier is screwed on. Its difference mainly lies in its height adjustment, and is of interest only for incident-light microscopy and where high specimens in the range of up to 49 mm are used. If you intend to change the condenser carrier, please get in touch with our service department.



1 Stage centering screw for stage centration (on both sides)
2 Screw-on cap for spring pin of stage clamp
3 Angular guidance for attachment of dovetail for specimen stages
4 Spring pin of stage clamp
5 Drilled holes to screw on fixed stages and scanning stages
6 Stage clamping screw

Fig. 4 Stage mounting

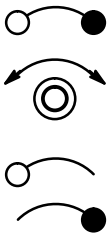
15 Pushrod

For the continuous diameter setting of the luminous-field diaphragm (incident light)
Pushed in = open diaphragm
Pulled out = closed diaphragm.

6 Manual focusing drive

The universal microscope Axioplan 2 is focused via coaxial drives on both sides of the stand.
Coarse drive (large knob on the inside):
1 revolution = approx. 2 mm, 1 increment = approx. 2 µm.
Fine drive (small knob at the outside):
Gear ratio 1:10 (1 revolution approx. 0.2 mm)

20; 23 Diffusion disk (incident and transmitted light)



Setting via right/left rotation using SW 3 ball-headed screwdriver

Diffusion disk OFF

Diffusion disk ON

The diffusion disk improves the homogeneous illumination of the object plane. Normally, it is swung into position. It can be swung out using the SW 3 ball-headed screwdriver to increase the visibility of the lamp filaments during adjustment of the microscope illuminator.

22 Stage carrier

The stage carrier is used to mount the stage and the condenser carrier to which the condenser is attached. The stage carrier is either fixed to the stand or removable. The non-rotating mechanical stage and the scanning stage are fixed to the carrier using screws.

Attaching/removing rotary mechanical stages

(Fig. 4)

- Loosen screw-on cap (**2**) (3 ... 4 mm).
- Attach notch of stage dovetail to the spring pin (**4**) at the front.
- Push stage against spring pin and lower into the stage carrier in the back, then let go.
- Tighten screw-on cap (**2**).

The stage can now be rotated to the right and left.

7, 8 Filter wheels for transmitted light

Two rotatable filter wheels (filter magazine) with 4 positions each are equipped with different filters; two different models are available. The wheels, which feature click stops, are rotated into position. The set filters are marked on the wheels.

❑ **Filter magazine D 452155**

Filter magazine for general use.

The positions of the two wheels can be combined as required.

Filter wheel 2 (**7**) 100 open position
25 neutral-density filter 0.25
6 neutral-density filter 0.06
1.5 neutral-density filter 0.015

Filter wheel 1 (**8**) 100 open position
6 neutral-density filter 0.06
G wide-band interference filter green
CB conversion filter 3200 K ... 5500 K

❑ **Filter magazine D PHOTO 452157**

Filter magazine for the brightness control at a constant color temperature of 3200 K. The 3200 K color temperature must be selected. Green LED above the key lights constantly. The positions of the two filter wheels can be combined as required.

A high current and a correspondingly bright lamp are needed to achieve the color temperature of 3200 K. Filter wheel 2 can be used to reduce the brightness of the lamp to a "normal degree" more beneficial to the eye.

The following brightness steps can be set:

Filter wheel 2 (**7**) coarse steps
100 maximum brightness at 3200 K 100 %
6 normal brightness at 3200 K 6 %
0.4 low brightness at 3200 K 0.4 %
0 transmitted light blocked

Filter wheel 1 (**8**) fine steps
100 brightness 100 % of coarse step
50 brightness 50 % of coarse step
25 brightness 25 % of coarse step
12 brightness 12 % of coarse step

Conversion or green filters are additionally inserted into the filter mount or laid onto the light exit of the transmitted-light illumination.

9 Luminous-field diaphragm

Wheel for the continuous setting of the aperture of the luminous-field diaphragm (transmitted light).

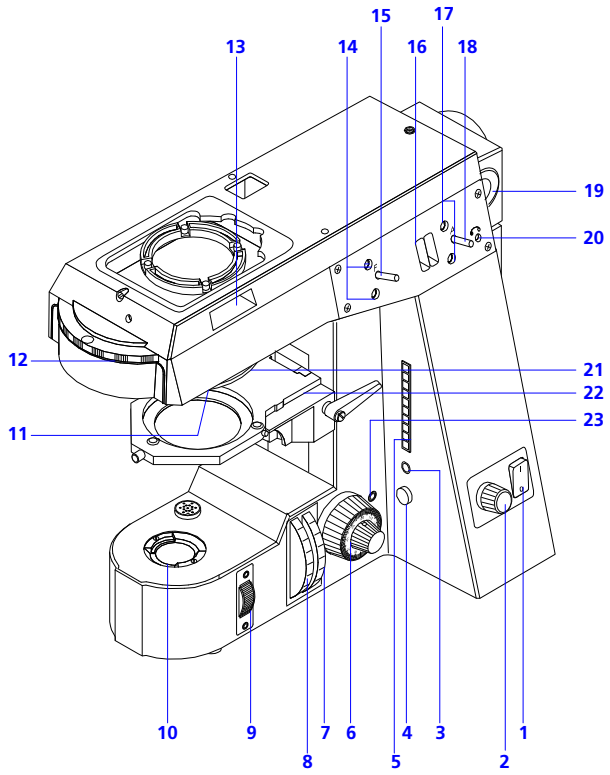
10 Light exit of transmitted-light equipment

Light filters with dia. 32 mm can be placed on the plane surface of the centering ring supplied.

Note: Additional filters can be inserted in the color glass carrier of the condenser mount.

14 Centering screws

To center the luminous-field diaphragms (incident light) using SW 3 screws.



1 ON/OFF switch
2 Light intensity control
3 On/Off display of color temperature key
4 Color temperature key
5 LED line lamp voltage
6 Focusing drive
7 Filter wheel 2
8 Filter wheel 1
9 Luminous-field diaphragm (transmitted light)
10 Light exit of transmitted-light equipment
11 Compartment for compensators
12 Reflector turret
13 Analyzer compartment
14 Centering screws for luminous-field diaphragm (incident light)
15 Pushrod for luminous-field diaphragm (incident light)
16 Slot for filter slider
17 Centering screws for aperture diaphragm (incident light)
18 Pushrod for aperture diaphragm (incident light)
19 Adjustment aid for lamp setting (incident light-option)
20 Swinging in/out of diffusion disk (incident light)
21 Objective nosepiece
22 Lowerable stage carrier
23 Swinging in/out of diffusion disk (transmitted light)

Fig. 3 Manual stand

Manual stand

The stand shown here may differ from your stand model. Most differences will be present in the upper part of the stand, i.e. they concern incident-light and polarizing microscopy. If the configuration illustrated is different from your own Axioplan 2, this does not necessarily mean that an error has been made, but is probably due to the stand equipment you have chosen for your respective application.

Controls

(The numbers refer to Fig. 3.)

1 ON/OFF switch

Position **O** = instrument switched off
Position **I** = instrument switched on
For optical status checking, the switch lights up in green in position I (for defects see *chapter Care, Maintenance*).
When the Axioplan 2 is switched on, not only the HAL 100 microscope lamp is supplied, but also the Axiophot 2 Photo module, if mounted, and the motorized internal components.

2 Light intensity control

Knob to adjust the light intensity of connected 100 HAL microscope illuminators.
The power unit integrated in the stand is highly stabilized against voltage fluctuations and supplies adjustable d.c. voltage in the range from 3 to 12 V. A yellow LED line displays the set voltage range and the light intensity.

Note: If the light intensity cannot be adjusted, please check whether the color temperature key (**4**) is switched off.

3 On/Off display of color temperature key

Lights up when the color temperature of 3200 K has been switched on.

4 Color temperature key

Knob to set the 3200 K color temperature for photomicrography using color films (artificial light). When switched on, a green LED lights above the knob.
A constant color temperature of 3200 K is required for color photography. This is achieved if a fixed d.c. voltage of 10.5 V is supplied to the HAL 100 microscope illuminator. Correct functioning can not be guaranteed if other lamps than the 12 V/100 W lamps supplied by Carl Zeiss are used.

Stand

All the stand configurations described in the following are usually tailored to the customers special requirements. For example, it is possible that the stand configuration delivered to you includes only incident-light or fluorescence equipment and that transmitted-light components are therefore not available.
The same applies to the objective nosepiece, of which nine models are available.

The following stand types exist for the Axioplan 2:

- ❑ Manual type
  This stand can only be operated manually. Motorized and codable functions cannot be easily retrofitted.
- ❑ Type E
  Unlike the manual type, this stand is equipped with an electronic system permitting the reflector turret and objective nosepiece to be motorized and coded. These functions can also be easily retrofitted.
- ❑ Motorfocus type (MOT)
  Like type E, plus motorized focusing equipment

Aside from these basic types we also use the following abbreviations in this manual:

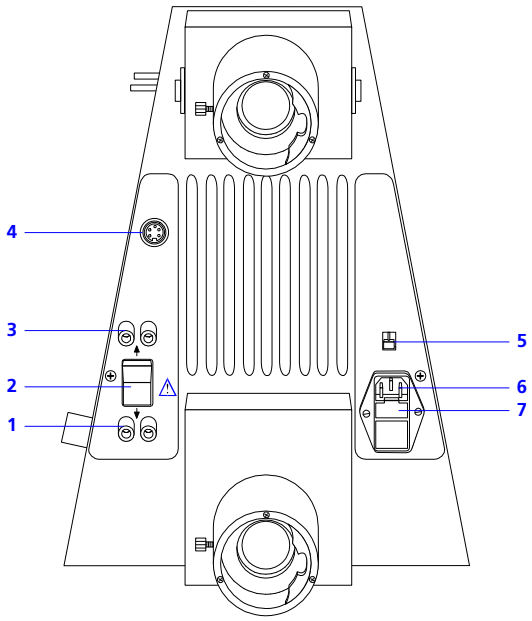
- ❑ LM/E type
  Like type E, plus additional light manager
- ❑ LM/MOT type
  Like Motorfocus type, plus additional light manager

Upgrading to include motorized or coded functions is possible, but requires the stand type E or higher.
Should you intend to upgrade your microscope to include motorized functions, please get in touch with the Zeiss service department. Retrofitting is normally possible without difficulty.

Features and components common to reflected- and transmitted-light stand types:

- ❑ lamp connection
- ❑ light exit
- ❑ power units for HAL 100 microscope illuminator and electronic control system
- ❑ switches, adjusting and display components
- ❑ mechanical parts for stage focusing

The following description of stands starts with the manual model. On this basis, only the differences and additional functions are described for the other stand models.



1 Sockets of the integrated power unit for the transmitted-light illumination
2 Toggle switch to change between transmitted and incident light
3 Sockets of the integrated power unit for the incident-light illumination
4 Socket for Axiophot 2 Photo module
5 Window to check the set line voltage and to change the voltage
6 Socket for instrument plug (line voltage)
7 Compartment for instrument fuses

Fig. 2 Axioplan 2 (instrument back)

Setting up the microscope

WARNING!

Instrument voltage!
Before the Axioplan 2 is switched on, the voltage displayed in the window on the instrument back must be identical to the line voltage. Incorrectly set voltage not corresponding to the *Technical Data* may damage the microscope or impair its function. To change the voltage, please see the chapter *Care, Maintenance*.

- Check that all connected components have been mounted correctly and are sitting properly.
- Set ON/OFF switch (Fig. 1/**10**) to position **O**.
- Connect power unit first to the instrument and then to the line.
- Make the other electrical connections, such as microscope illuminators, connecting cable to TV camera, Axiophot 2, notebook, etc.

Note: All the electrical and electronic connections must be made before switching on the instrument so that they can be recognized by the initialization routines.

- Set ON/OFF switch to position **I**.

This last setting switches on the microscope and makes it ready to use after approx. 10 s. When the instrument is equipped with the light manager, this last position is set.

- Switch on notebook or PC (if connected).

Switching off the instrument

- Set ON/OFF switch to position **O**.

Putting into Operation

Unpacking and installing the microscope

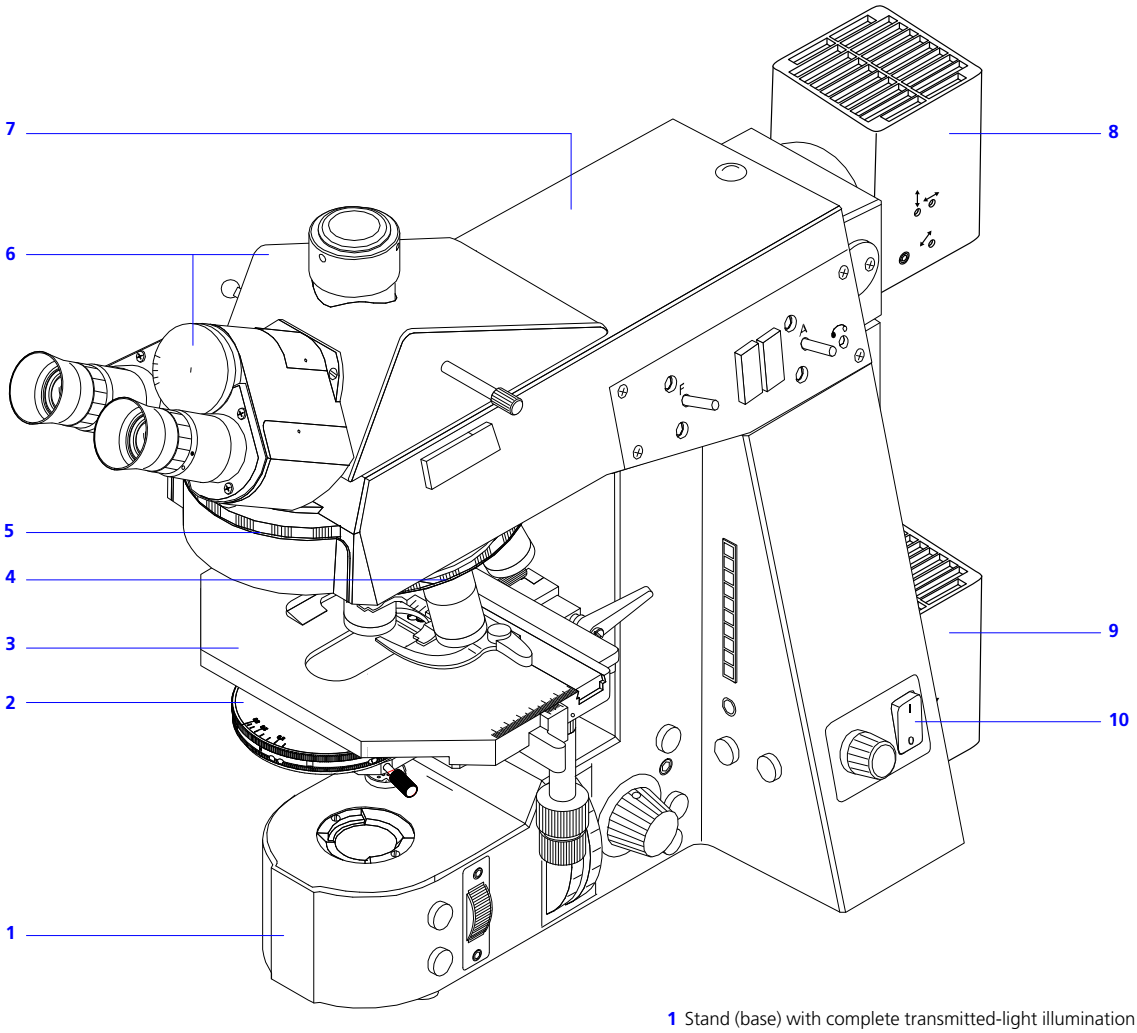
Normally, your microscope is supplied completely assembled in a specially designed container. The Axiophot 2 Photo module and the notebook required for its control, plus any required intermediate tubes, are packed separately. The transport containers include instructions for unpacking the instrument.
Please make sure that you observe the instructions contained therein.
Due to the complexity of the Axioplan 2 and the necessity to ensure its perfect functioning, it will generally be installed and set up on site by our service personnel.
The Axioplan 2 is handed over to you in a state which will enable the users to attach all the items listed in the *Microscope Components* chapter themselves. The procedures required are described.

Coded objectives and reflector modules

If your Axiplan 2 is operated with the coded objective nosepiece and reflector turret, insertion of the objectives and reflector modules in the correct positions must be ensured (→ *Microscope Software*).

Overview and Connections

The stand shown in the illustration is equipped with a wide variety of functional units. It may therefore differ from the stand you have purchased. Should you therefore see any components in the drawing which are not present on your own microscope, this does not mean that you have an incorrect Axioplan 2 configuration.
Setting and adjustment of certain components and modules of the Axioplan 2 sometimes require special tools which are included in the delivery package of the microscope. This particularly concerns the SW 3 ball-headed screwdriver and the SW 1.5 screwdriver for Allen head screws.



1 Stand (base) with complete transmitted-light illumination
2 Condenser with carrier
3 Stage with carrier
4 Objective nosepiece
5 Reflector turret
6 Tube
7 Stand (upper part) with complete incident-light illumination
8 Lamp for incident light
9 Lamp for transmitted light
10 ON/OFF switch

Fig. 1 Axioplan 2 (motorized)

Purpose

The Axioplan 2 has been designed as a universal microscope and can be used for all areas of light microscopy, provided it is configured and equipped appropriately. Depending on its equipment, it is used in the following fields:

- ❑ transmitted light microscopy
- ❑ incident light microscopy
- ❑ fluorescence microscopy
- ❑ photomicrography
- ❑ videomicroscopy.

The Axioplan 2 also performs the contrasting methods in transmitted light and incident light:

- ❑ darkfield
- ❑ phase contrast
- ❑ polarization contrast
- ❑ differential interference contrast.

Motorizable functions and the recognition of coded microscope components used permits the performace of applications in such fields as process automation and telepathology. Here, the microscope is controlled by a software which activates the programmable CAN-BUS and RS 232 interfaces. Here, the microscope is controlled by a built-in microprocessor and a control software which activates the standard interfaces CAN-BUS and RS 232 C in personal computers.

Installation conditions

- ❑ Dust-free environment
- ❑ Maximum relative air humidity 85 %
- ❑ Vibration-free worktop

Specifications concerning power supply, storage temperature and other technical details are contained in the chapter entitled *Technical Data*.

General

The Axioplan 2 is a universal microscope which is suitable for all applications relevant to light microscopy. Its modular design, numerous components and wide range of accessories allow the Axioplan 2 to be adapted and extended to perform a large number of special applications.

There is practically no field of application in light microscopy for which the Axioplan 2 cannot be used. However, users wishing to utilize the motorized and automatic functions of Axioplan 2 must take this into account when choosing the basic stand configuration. You will already have made this decision before starting to read this manual. But we would nevertheless like to point out that the configuration for which you have opted must not necessarily be the definitive one. If you wish to change your basic configuration at a later date, the possibility most certainly exists. Our specialist staff will be pleased to provide you with any advice you may need.

The aim of this manual is to describe the many possible functions of Axioplan 2. However, the sheer number of functions offered may sometimes lead to a certain amount of confusion. Therefore, if you have any doubts concerning the capabilities of your Axioplan 2, please contact our subsidiary or ourselves direct. Our address and telephone number are given on the inside cover of this manual.

In the chapter entitled *Stand* you will find the various basic versions of the Axioplan 2 stands. Starting with the manual version, this chapter deals with all stand functions available, up to and including the stand featuring all motorizable functions and the light manager.

The chapter *Microscope Components* describes the operating functions with which you yourself can equip or extend the Axioplan 2. Not all parts described there must be present on the Axioplan 2. However, if you are considering adding some of the components to your configuration, the corresponding catalog numbers are listed.

The chapter *Microscopy Techniques* provides you with information on the basic settings of the microscope, e.g. KÖHLER illumination adjustment, and contains instructions concerning the operation of the microscope for specific applications.

Abbreviations

achr.	achromatic
AL	incident light
apl.	aplanatic
Br	suitable for eyeglass wearers (eyeglasses can be placed directly against eyepieces)
C	camera
C-Mount	camera mount
D	diameter or coverglass thickness
D	darkfield
DIC	Differential interference contrast
DL	transmitted light
E-Pl	flat-field eyepieces with aspheric correction
WD	working distance
Fl	fluorescence
foc	focusable diopter compensation on eyepiece
fot.	photographic
FT	chromatic beam splitter
HAL	halogen illuminator or lamp
HBO	mercury pressure short arc lamp
HD	bright/darkfield
H	brightfield
ICS	Infinity Colour-corrected System
Korr	morrection mount
LD	long working distance
LFB	luminous field diaphragm
MC	microscope camera
MPM	microscope photometer
N.A.	numerical aperture
P	photometry
Ph 1, 2, 3	phase contrast; the numbers refer to the diameter of the ring stop used; with an objective with the designation Ph 2, you use the ring stop with the corresponding designation Ph 2.
Pol	polarization
SFZ	field of view number
SI	system integration
SLR	single lens reflex
Stemi	stereomicroscope
SW	wrench size
UD	universal rotary stage
Var	VAREL contrast
vis.	visual
W-Pl	wide angle flatfield
XBO	xenon short arc lamp
ZBE	intermediate image plane

General

Note on exchangeable components

Perfect functioning of the instrument requires that you use spare parts and components which are marketed and approved by us. In the event of doubt, please contact our service staff. The use of parts from other manufacturers may impair the performance of the Axioplan 2 or indeed damage the instrument. The use of such parts is the sole responsibility of the user.

No other care, maintenance or repair work must be carried out apart from the activities specified in → *Care, Maintenance*.

More extensive repairs may only be performed by our customer service experts or by specially authorized persons. Damage to the instrument may otherwise result.

Note: We would like to expressly emphasize here that any adjustments not described in the *Microscope Components* chapter must only be performed by persons expressly authorized by us to do so.
The Axioplan 2 is a precise optical instrument which may be impaired in its function or even damaged by inexpert handling.

Note on power unit integrated in stand

The integrated power unit is used to supply voltage to the microscope illumination, the Axiophot 2 Photo module and the coded motorized components. The power unit must not be used to supply voltage to other external power consuming devices. This can lead to overloading and destruction of the power unit.

Notes on the safe operation of the instrument

WARNING!

Dust und dirt!

Dust and dirt can impair the performance of the Axioplan 2. Therefore, protect the microscope as far as possible against these influences. Always use the dust cover if you do not intend to use the Axioplan 2 for longer periods of time (more than 6 hours).

WARNING!

Operation!

The instrument must be operated by trained staff only. They must be instructed in the hazards involved in microscopy and the respective field of application. This includes an awareness of the risk of eye injury due to intensive irradiation by light.

Notes on the safe operation of the instrument

The Axioplan 2 Universal Microscope has been designed and tested in compliance with EN 61010, part 1 (DIN VDE 0411) and IEC 1010-1 and left the factory in a perfect state with regard to its safety facilities. To ensure that this remains the case and to guarantee the safe operation of the equipment, the instructions and warnings given in this manual must be observed.
The instrument meets the requirements of the EC directive 89/336/EEC and the EMC legislation of November 9th 1992. It has been allocated the protection degree IP 20 and is categorized as Class 1 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.

For your own safety and for the protection of the instrument against damage

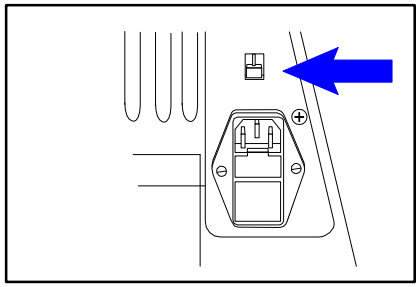
Axioplan 2 features special protective devices such as attenuation filters to protect the eyes against intense radiation, and stops to protect specimens and objectives against knocks and mechanical damage. These protective devices must be used and must not be removed. You must familiarize yourself with the protective devices provided by Axioplan 2 under all circumstances.


WARNING!

Danger of crushing!
In stands with a motorized focusing drive, there is a danger of crushing your hand between the stage carrier and stand base when the stage is lowered. For this reason, do not place your hand under stage carrier when the stage is being lowered.


WARNING!

Line voltage!
Before switching on the microscope, always check whether the instrument has been set to the line voltage present. The voltage set is shown in a viewing window on the rear of the microscope.



Incorrect voltage settings and line voltages which do not meet the specifications stipulated in the → *Technical Data* may destroy the microscope or impair its functions. The procedure required to change the set voltage is described in the chapter entitled → *Care, Maintenance*.


WARNING!

Specimens hazardous to health!
The Axioplan 2 is not equipped with any special devices for protection against corrosive, toxic, radioactive or other substances hazardous to health. All legal requirements, especially national accident regulations, must be observed when handling such specimens.


CAUTION!

Gas discharge lamps!
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 (→ chapter on *Care, Maintenance*),
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.


WARNING

Hot surfaces!
Do not touch the hot lamp housing. Always disconnect the power plug before changing a lamp and allow the unit to cool down for approx. 15 minutes.


WARNING!

Thermally sensitive fluorescence filters!
Fluorescence filters are sensitive to the thermal radiation of the microscope lamp and their performance can be permanently impaired by it. Therefore, never remove the heat-reflecting filter on the microscope illuminators when you are working with fluorescence filters.


WARNING!

Heat build-up!
Placing objects against or covering ventilation slots on the microscope or its components can lead to a build-up of heat which will damage the instrument and, in extreme cases, cause a fire.
Therefore, always keep the ventilation slots clear (minimum distance 15 cm).
Always check whether the microscope is switched off before placing the dust cover over it.

Contents

Contents

Knowledge of this manual is required for the operation of the instrument. Please therefore familiarize yourself with its contents and pay special regard to the sections dealing with the safe handling of the instrument.

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