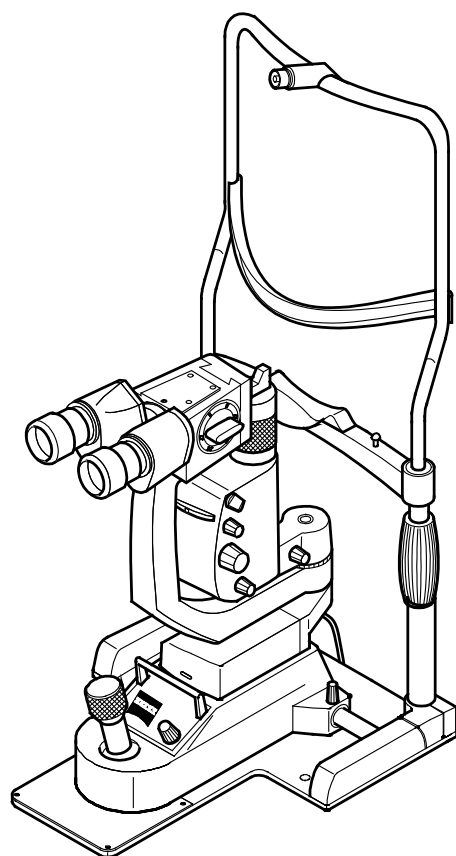


# SL 130 Slit lamp

Documentation set



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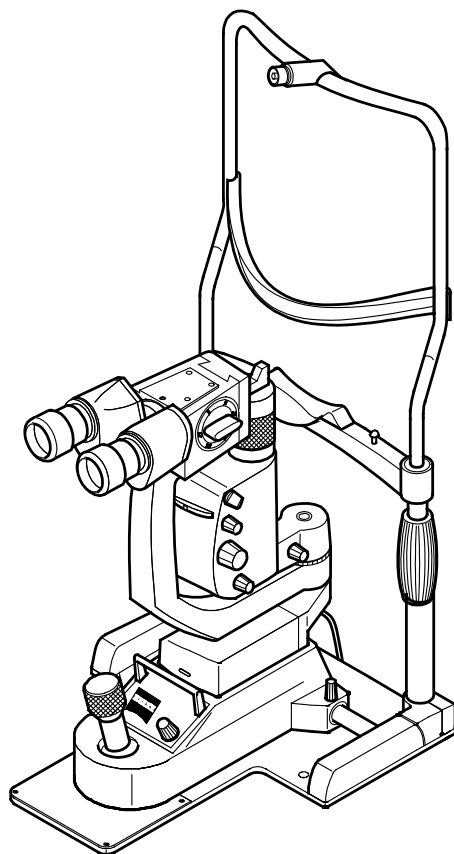
**User manual**  
**SL 130 Slit lamp**

[000000-1490-500-GA-GB-250315]



# SL 130 Slit lamp

User manual





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## **Notes on the user manual**

### **Purpose and availability of documentation**

This user manual explains the safety precautions, functions, usage, performance parameters and measures for care and maintenance of the SL 130 Slit Lamp.

Correct operation of the system is imperative for its safe and successful functioning. You should therefore ensure that you are thoroughly familiar with this user manual before setting up and using the SL 130 Slit Lamp for the first time.

The user manuals and other documentation enclosed with the SL 130 Slit Lamp should be kept accessible to users at all times to ensure that the information required for the use of the SL 130 Slit Lamp is readily available.

### **Questions and comments**

If you have any questions or comments concerning this user manual or the SL 130 Slit Lamp, please contact ZEISS service or your local dealer (Contact details see reverse).

## Explanation of symbols used

The symbols used in this user manual refer to important safety information which may warn against possible health risks or fatal injuries and contain useful notes. Whenever you see these symbols, read the accompanying information carefully and observe all safety notes and information in this user manual and on instrument labels.



### **WARNING**

Indicates a hazardous situation which could result in death or serious injury if the appropriate safety precautions are not heeded.



### **CAUTION**

Indicates a hazardous situation which could result in minor or moderate injury if the appropriate safety precautions are not heeded.

### **CAUTION - PROPERTY DAMAGE**

Indicates possible device damage if the appropriate safety precautions are not heeded.



Information, hints and advice for better understanding of the instructions to be observed in the operation of the device.

## **Package check list**

The following accessories are supplied with the instrument:

- SL 130 Slit Lamp
- Halogen bulb
- Eyepieces
- Dust cover
- Power supply unit
- Power cable
- Documentation set

## Country-specific information and labels

### Classification/Manufacturer's declaration



#### WARNING - GENERAL HAZARDS

This device may only be set up, operated and used for the specified purpose and according to national regulations, applicable industry standards and occupational safety and accident prevention regulations. Further notes on classification are to be found in section *Technical data*, page 50 and following.



This device complies with EU Medical Device Directive 93/42/EEC.

Device class according to MPG: I

Device group: 2 pursuant to ISO 15004-2:2007

EMC: See chapter *Electromagnetic compatibility*, page 52 and following.

N° UMDNS: 12-281

This declaration shall be rendered invalid if changes are made to the product without the manufacturer's authorization.

## Intended Use

The SL 130 Slit Lamp is a powerful universal instrument for observation, diagnosis, measurement and documentation of the anterior eye segment.

Responsibility for using the device other than as intended lies with the user.

### **CAUTION - RISKS ARISING FROM OPERATING ERRORS**

Do not use the SL 130 Slit Lamp in patients with the following conditions:

- Unable to follow the instructions of the user
- Unable to sit upright in front of the instrument
- Forehead or chin injuries that prevent the head from being supported on the head/chin rest



## Intended user profile



### **CAUTION - RISKS ARISING FROM OPERATING ERRORS**

This device may only be installed, operated, used and maintained by persons who have been properly trained or who have the required knowledge and experience to do so. Please also adhere to the national qualification guidelines applicable in your country.

Persons who operate the SL 130 Slit Lamp must have completed the following training:

- Ophthalmologist
- Optician
- Optometrist

## Disposal of the product

### CAUTION - RISKS OF ENVIRONMENTAL POLLUTION

Packaging materials should be retained for future relocation or repair.

If you decide to dispose of the packaging material, submit it to a recognized collection system for recycling.

The device contains electronic components. At the end of its lifetime, the product should be disposed of in accordance with the relevant national regulations.



### Disposal of the product within the EU

In accordance with applicable EU guidelines and national regulations at the time at which the product was brought onto the market, the product specified on the consignment note is not to be disposed of via the domestic waste disposal system or communal waste disposal facilities.

For further information on disposing of this product please contact your local dealer or the manufacturer or its legal successor company. Please read the latest information provided on the manufacturer's website.

If the product or its components are resold, the seller must inform the buyer that the product must be disposed of in accordance with the currently applicable national regulations.



### External labels

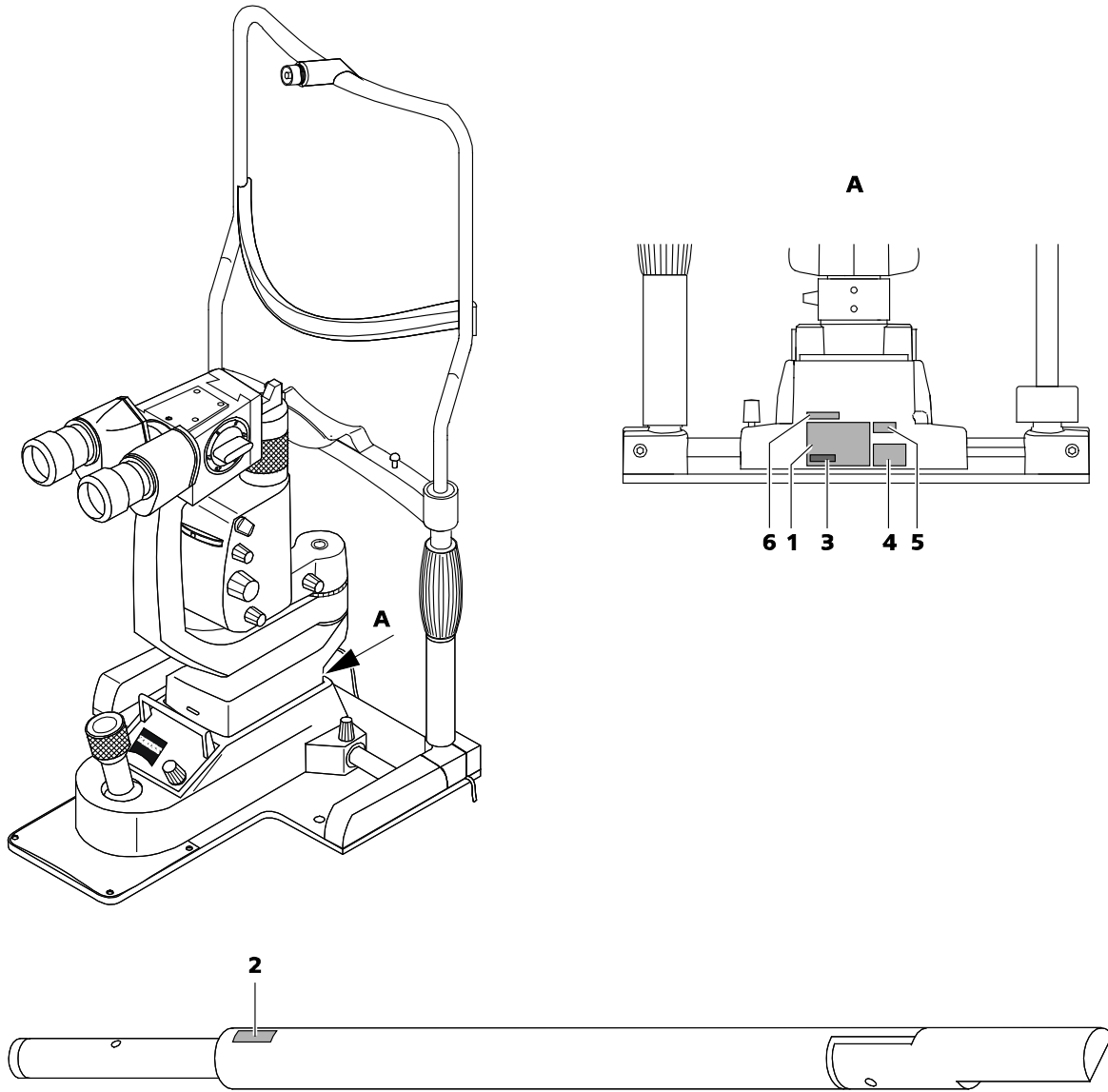


Fig. 1 Labeling of the SL 130 Slit Lamp



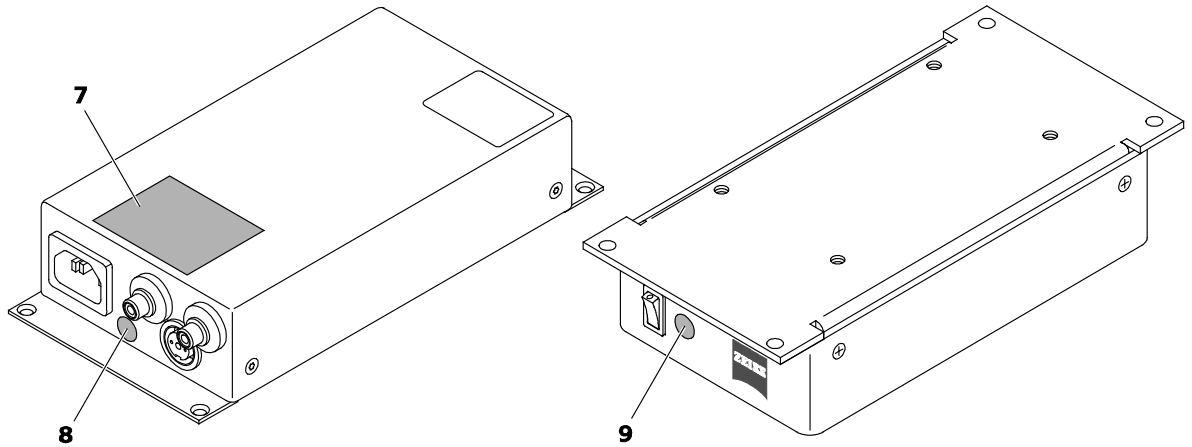










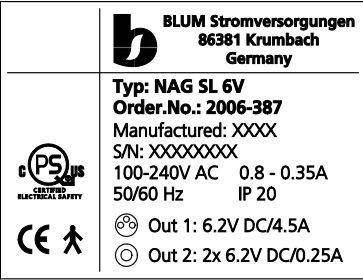







Fig. 2 Labeling of the power supply unit

Item	Label	Explanation
1		<p>SL 130 Slit Lamp type label</p> <ul style="list-style-type: none"> <li> Manufacturer</li> <li> Date of manufacture</li> <li> Application part type B conforming to IEC 60601-1</li> <li> DC voltage</li> <li><b>IP20</b> Ingress protection rating for housing (protected against solid foreign bodies of 12.5 mm in diameter and larger, no protection against penetration of water)</li> <li><b>SN</b> Serial number</li> </ul>
2		<p>Identification sign for the focusing rod as accessory of SL 130 Slit Lamp</p>
3		<p>Sign with date of manufacture</p>
4		<p>CE approval label and disposal advise for EU (for device with 2006-387 NAG SL 6V)</p> <ul style="list-style-type: none"> <li> EU conformity symbol</li> <li> Disposal advise for EU</li> </ul>
5	<p>Not applicable</p>	<p>Not applicable</p>
6	<p>Not applicable</p>	<p>Not applicable</p>
7		<p>Power supply unit type label</p> <ul style="list-style-type: none"> <li> EU conformity symbol</li> <li> CSA approval for USA and Canada</li> <li> Application part type B conforming to IEC 60601-1</li> <li><b>IP20</b> Ingress protection rating for housing (protected against solid foreign bodies of 12.5 mm in diameter and larger, no protection against penetration of water)</li> </ul>

Item	Label	Explanation
8		Information label "Disconnect device from the power supply before opening"
9		Information label "Observe user manual"

## Performance specifications

### Functional description

The SL 130 Slit Lamp allows observation, diagnosis, measurement and documentation of the anterior eye segment, including the lens and vitreous body. Additional optical elements such as contact or correction lenses also render the deeper regions of the eye and the chamber angle visible. The SL 130 Slit Lamp is designed for the complete application area from diagnosis to laser treatment. It is mainly used by ophthalmologists and optometrists.

The slit lamp consists of an instrument base (with joystick) onto which an illumination system (slit projector) and an observation unit (stereomicroscope with binocular tube and eyepieces) are mounted. The illumination system and the observation unit can be swiveled independently of each other around the same vertical axis. The head of the patient lies on the head rest. Using a fixation lamp, the user can direct the patient's eye as desired. The illumination system generates a slit image which can be modified in length, width, position and brightness and which has a specified distance from the slit lamp. The user can adjust each of the modifiable parameters of the slit image using the controls. The observation unit allows the user to observe the eye segment to be examined in five selectable magnification steps. The magnification changer is a Galilean system with telecentric beam path. The user can position the slit lamp in relation to the examined object in all three axes using the joystick of the instrument base so that the desired observation area of the eye is in focus. Using different illumination methods, variable slit images and filters, it is possible to view almost all eye segments.

The SL 130 Slit Lamp can be enhanced by optional accessories. With the AT 020 and AT 030 Goldmann applanation tonometer the user can precisely measure the intraocular pressure. The micrometer eyepiece enables the user to measure angles and lengths in a simple process. Various documentation accessories help the user capture images of the diagnosis. The single-handed operation from both sides of the illumination system allows the user to perform laser treatment with appropriate laser link systems.

## Useful life

### **WARNING - GENERAL HAZARDS**

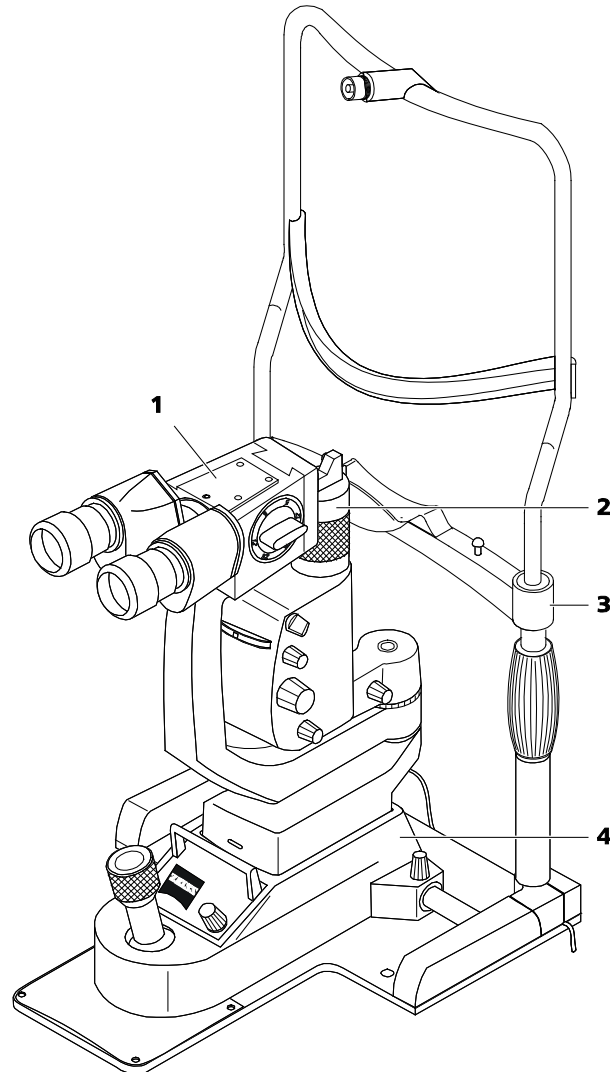
The development, production and maintenance of this device, together with associated risks, are based on an expected service life of eight years, assuming that the device is serviced at the specified intervals.

Modifications to the product or failure to follow the manufacturer's instructions may substantially reduce the expected service life and significantly increase the risks associated with the use of this device.

It is the responsibility of the institution operating this product to follow the manufacturer's instructions and to decide on the risk/benefit ratio upon expiration of the expected service life or maintenance and inspection intervals specified by the manufacturer.

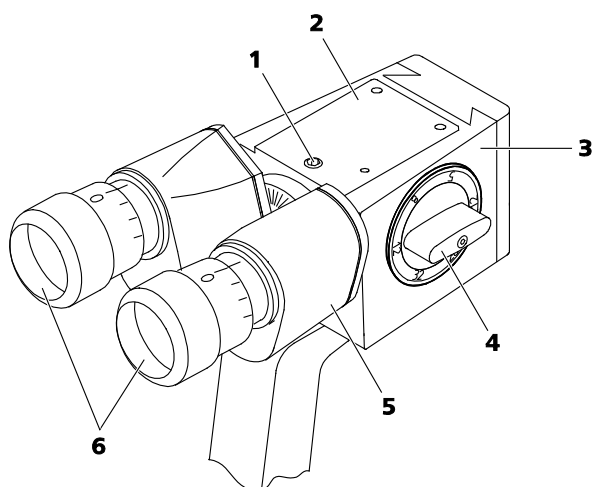


## Description of the instrument



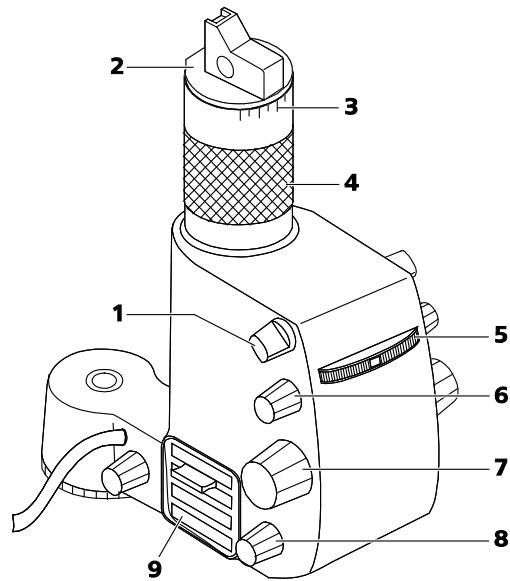
- 1 Stereo microscope comprising five-step magnification changer and binocular tube (optionally convergent or parallel tube)
- 2 Slit projector with lamp housing
- 3 Head rest
- 4 Instrument base

Fig. 3 Structure of the SL 130 Slit Lamp



- 1** Hexagon socket screw for fastening the binocular tube or the accessories for observation or documentation
- 2** Mounting plane for accessories
- 3** Stereomicroscope
- 4** Galilean magnification changer, 5-steps  
Magnifications of 5/8/12/20/32x (in combination with 10x eyepiece). The set value is facing the operator. In position 12x, which is recommended for tonometry, the rotary knob is horizontal.  
Magnifications of 6/10/16/25/40x (in combination with 12.5x eyepiece).
- 5** Binocular tube  
Two different types can be used:  
Convergence tube or parallel tube
- 6** Plug-in eyepieces super high eyepoint, with easily moved sliding eyecups, suitable for spectacle wearers

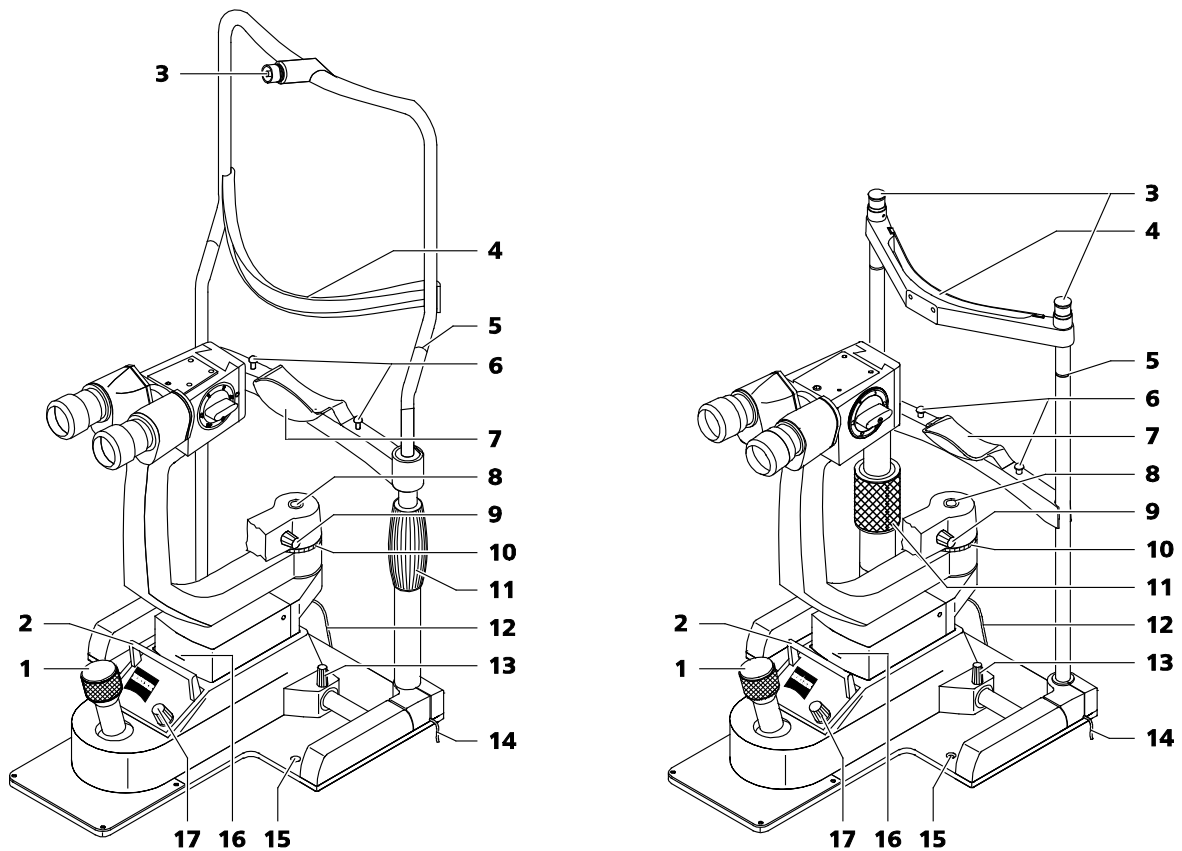
Fig. 4 Controls of the stereomicroscope



- 1 Decentering controls for retroillumination
- 2 Diffuser for diffuse illumination, can be flipped up onto the prism head.
- 3 Scale for horizontally inclined illumination
- 4 Knurled control for setting 0° to 20° horizontally inclined illumination
- 5 Filter setting wheel  
(with green filter (red-free), free aperture and blue filter)
- 6 Control for slit rotation
- 7 Slit width control, 0 mm to 14 mm, continuously adjustable, marks at 0.1/0.2/0.5/1.0 mm
- 8 Slit length control, variable in steps of 0.3/2.5/3.5/7/10/14 mm
- 9 Lamp housing cover

Fig. 5 Controls of the slit projector





- 1 3D joystick control for lateral and height adjustment (the latter by turning the control)
- 2 Quick-action lock
- 3 Fixation lamp mounting (right figure shown with cover cap)
- 4 Forehead rest
- 5 Red eye level marks (to identify the patient eye level needed for optimum observation)
- 6 Fastening pins for paper pads
- 7 Chin rest
- 8 Hole for mounting the focusing rod
- 9 Lock screw for difference angle setting
- 10 Scale indicating the angular difference between slit projector and stereomicroscope
- 11 Height adjustment for chin rest of head rest
- 12 Cable for slit illumination
- 13 Tension control
- 14 Cable for fixation lamp (to be connected to the power supply unit)
- 15 Two threaded holes for fastening screws
- 16 Red mark indicating the mid-position of the height adjusting range
- 17 Brightness control continuously adjustable, no slit light in the left final position, maximum illumination intensity in the right final position

Fig. 6 Controls of instrument base with head rest

## Installation

### Notes on installation and use



#### WARNING - GENERAL HAZARDS

Do not store or operate the device in ambient conditions other than those prescribed (see section *Technical data* on page 50 and following).

The device should be set up so that the power cables can be disconnected from the power supply quickly and easily without any tools.



#### WARNING - RISK OF ELECTRIC SHOCK

Do not use additional extension cables or portable multiple sockets.

The electrical installation must conform to IEC 60364-7-710 or the applicable national regulations. This includes the integration of a ground fault circuit interrupter (GFCI).

To avert the risk of an electric shock, this device may only be connected to a power supply with a protective ground conductor.

Ensure that the power supply plug is suitable and certified for the local connection. If the supplied power cable must be replaced, the following specifications must be adhered to as a minimum:

- Protective ground conductor resistance maximum 0.1 Ohm
- Local certification of the power cable for connection to medical devices
- Device plug C13 conforming to IEC 60320
- Cross-section at least 0.75 mm<sup>2</sup>/AWG 18  
Hospital Grade design for specific countries (e.g. USA, Canada)  
(For cables > 2.5 m the cross-section must be increased to 1.5 mm<sup>2</sup>)

The NAG SL 6 V is to be connected to mains only through a series-connected circuit breaker 6A type B.

Installation of the device with a power supply unit which has not been approved by Carl Zeiss Meditec must conform to IEC 60601-1 or relevant national requirements. Responsibility for the electrical safety of the device, including its electromagnetic compatibility (EMC), lies then exclusively with the user.



#### WARNING - FIRE HAZARD

The device is not suitable for operation in explosion risk areas (e.g. combustible mixture of anesthetic, cleaning or disinfecting agents with air, oxygen or nitrous oxide).

The electrical installation must conform to IEC 60364-7-710.

The data concerning power consumption on the type plate must be taken into account in the selection of overcurrent protection.

**CAUTION - PROPERTY DAMAGE**

Do not store or use this device in damp rooms. Do not expose the device to water splashes, dripping or sprayed water.

**CAUTION - PROPERTY DAMAGE**

Handle with care; the instrument should not be lifted or carried by the base plate.

**Unpacking****CAUTION - PROPERTY DAMAGE**

After unpacking, remove the cable clip that fastens the cable of the fixation lamp to the head rest.

After you have unpacked the slit lamp, remove the transport locks and store them for any future transportation. The transport locks are generally marked in red.

## Assembly of the SL 130 Slit Lamp

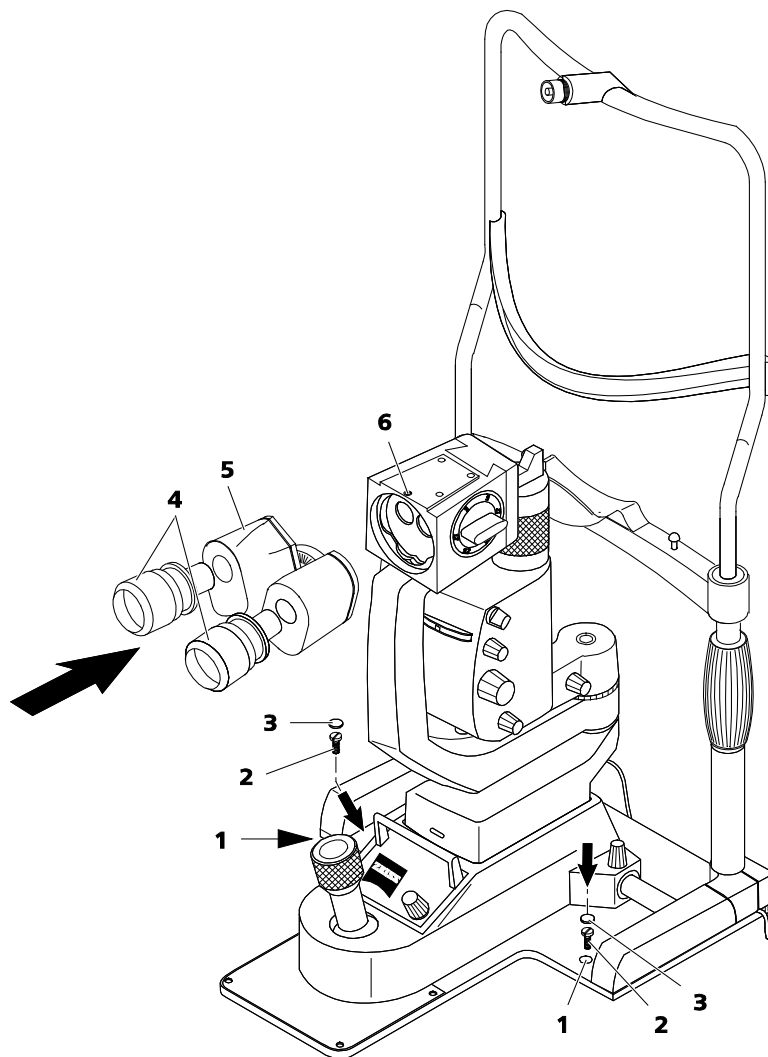


### CAUTION - DANGER FROM FALLING PARTS

When selecting a suitable table, ensure that the combination of table and instrument is stable up to an angle of tilt of 10°. Furthermore, the table must be designed for 4 times the weight of the device configuration. If the table is on castors, these must have a locking device.

Read the user manual of the instrument table and follow its instructions.

- Place the slit lamp onto the chosen instrument table and fasten it by means of two M4 screws (**2**, Fig. 7) to be screwed through the holes (**1**, Fig. 7). Afterwards cover the screws with the provided plastic caps (**3**, Fig. 7).
- Check if binocular tube (**5**, Fig. 7) is firmly mounted. Tighten up the hexagon socket screw (**6**, Fig. 7), if necessary.
- Make sure that the eyepieces (**4**, Fig. 7) have been plugged into the binocular tube (**5**, Fig. 7) as far as they will go.
- Taking the cable length into consideration the power supply unit can be placed anywhere, however it is best under the instrument table top.
- Then connect the cables of the slit lamp and fixation lamp to the power supply unit and, finally, connect the power cable of the power supply unit to a standard socket with earthing contact. The cables have different plugs to prevent misconnection.

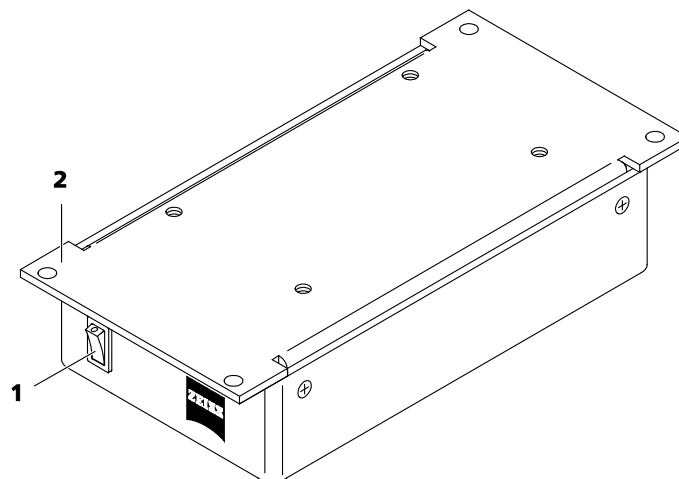


- 1 Screw holes to fix the device on the instrument table
- 2 Fastening screws
- 3 Plastic caps
- 4 Eyepieces
- 5 Binocular tube
- 6 Hexagon socket screw on the stereomicroscope

Fig. 7 Assembly of the SL 130 Slit Lamp

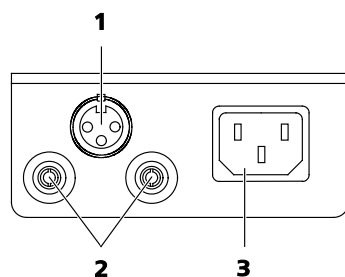
## Electrical connection

### Power supply unit



- 1 Power switch
- 2 Fastening plate with four threaded holes

Fig. 8 Front of power supply unit



- 1 Connector for slit illumination
- 2 Connectors for fixation lamp and DigiCam Illuminator
- 3 Power supply

Fig. 9 Rear of power supply unit

#### **CAUTION - PROPERTY DAMAGE**

You may use only a power cable with straight appliance socket.

## Daily use

### WARNING - GENERAL HAZARDS

Prior to using the instrument, the user must ensure that it is in good condition and fully functioning. Furthermore, the user must follow the instructions in the user manual.

The following inspections must be carried out each working day prior to use:

- Visual inspection of the housing, exterior markings, user manual, accessories and power cable to ensure that they are present and intact. If parts are missing or damage is visible, the device should not be used and should be taken out of service.



### WARNING - RISK OF ELECTRIC SHOCK

Please ensure that the following operational requirements are met each time before using the instrument and are maintained throughout further operation:

- Use the power cable supplied with the device. If the device is mounted on an instrument table of Carl Zeiss Meditec, it will be powered through this instrument table.
- The power plug must be inserted into a power outlet that has an intact protective ground connection.
- All cables and plugs may be used only if they are in perfect working condition.

Observe the warning instructions in the user manual of the instrument table.

If using a table not approved by Carl Zeiss Meditec, the user is solely responsible for ensuring the electrical safety of the instrument.



## Switching on

Switch on the SL 130 Slit Lamp using the power switch (1, Fig. 8) on the power supply unit.

## Operation of the instrument



### WARNING - RISK OF OPTICAL RADIATION

This is a group 2 device according to ISO 15004-2:2007.

The light emitted by this device may be harmful. The risk of eye damage increases with the length of exposure to rays. Exposure at maximum intensity for more than 4.9 min will exceed the hazard reference value.

Because prolonged intense light exposure can damage the retina, the use of the device for ocular examination should not be unnecessarily prolonged, and the brightness setting should not exceed what is needed to provide clear visualization of the target structures. This device should be used with filters that eliminate UV radiation (< 400 nm) and, whenever possible, filters that eliminate short-wavelength blue light (< 420 nm).

The retinal exposure dose for a photochemical hazard is a product of the radiance and the exposure time. If the value of radiance were reduced in half, twice the time would be needed to reach the maximum exposure limit.

While no acute optical radiation hazards have been identified for slit lamps, it is recommended that the intensity of light directed into the patient's eye be limited to the minimum level which is necessary for diagnosis. Infants, aphakes and persons with diseased eyes will be at greater risk. The risk may also be increased if the person being examined has had any exposure with the same instrument or any other ophthalmic instrument using a visible light source during the previous 24 hours. This will apply particularly if the eye has been exposed to retinal photography.



### WARNING - RISK OF OPTICAL RADIATION

When operating the device, avoid looking directly into the light emitting prism.

Never look into the sun through the binocular tube and eyepieces.

Take particular care when examining infants and aphakic patients.

It is not allowed to use a 90 D additional lens.



### CAUTION - GENERAL HAZARDS

The patient should not touch the instrument with his/her hands. In particular, the instrument should not be used as a support or an aid when standing up.



**CAUTION - RISK OF FALSE DIAGNOSIS**

When operating radio devices or components for radio transmission, observe the distances recommended in chapter *Electromagnetic compatibility*, page 52 and following.

**CAUTION - HAZARD DUE TO MOVING PARTS**

Before operating the rocker switch of the instrument table, ensure that there are no objects or body parts in the moving path of the table top or its extensions.

**CAUTION - RISK OF PINCHING**

On the SL 130 Slit Lamp various mechanical units can be moved relative to each other. Avoid trapping your fingers between them.



## Preparations

### Slit lamp

- Set interpupillary distance of binocular tube.
- Adjust the eyepieces:  
If you wear glasses, push the eyecups in and set the diopter setting ring to 0 D.  
Other operators should pull the eyecups out and set their refractive powers at the diopter scale of the eyepieces.
- If necessary, factor in any instrument myopia:  
The instrument myopia can be compensated using the focusing rod and the eyepieces.
- Adjusting the position of the diffusor:  
Normally, keep the diffusor in the bottom position. Flip it up only, if you need diffuse illumination for external examination of the eye.

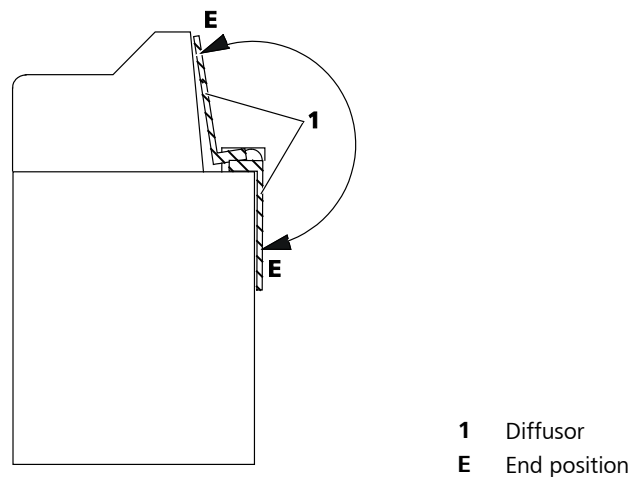


Fig. 10 Possible positions of the diffusor on the prism head



#### CAUTION - GENERAL HAZARDS

Before moving the slit lamp towards the patient, make sure that the diffusor (1, Fig. 10) on the prism head is in one of its end positions (E, Fig. 10) to avoid any eye injuries.

### Setting the slit brightness

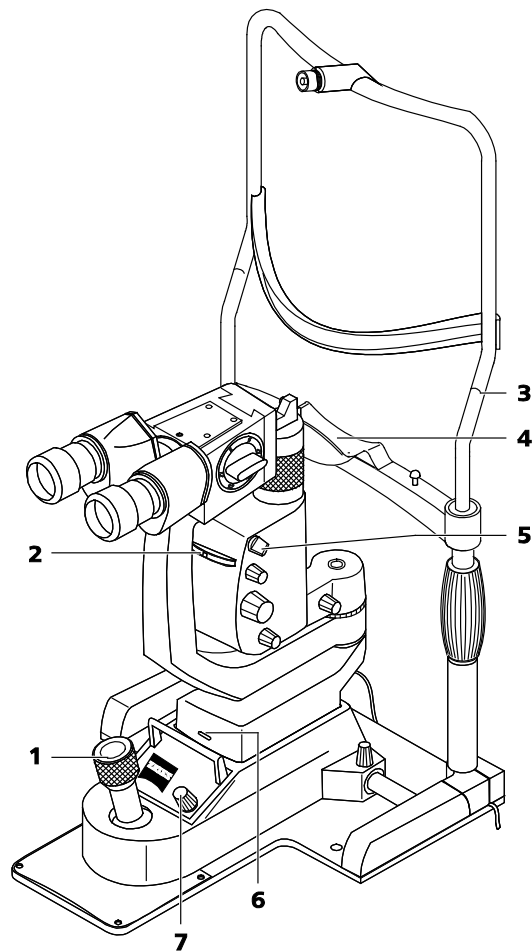
- Switch the device on at the power switch (**1**, Fig. 8) of the power supply unit.
- Then turn the brightness control (**7**, Fig. 11) on the instrument base to the desired brightness. In the left final position of the control there is no power supplied to the lamp. Turning the control allows continuous adjustment of brightness. In the right limit position the lamp brightness is at the maximum.

### Positioning the patient

- Adjust the patient's seat height as required.
- Set the table height so that the patient's chin and forehead rest firmly on the head and chin rests. The patient's seat may also be moved slightly away from the instrument or set higher for the same purpose.
- Adjust the chin rest (**4**, Fig. 11) vertically until the patient's eyes are approximately level with the red marks (**3**, Fig. 11).
- Turn the joystick (**1**, Fig. 11) to set the slit lamp to mid-position of the vertical adjustment range (red mark **6**, Fig. 11).
- Patients should rest their hands in their lap. This also assists in obtaining the correct posture with regard to the head rest.

### General notes on instrument operation

- Choose a slit length that only illuminates the section of the eye which is to be examined. Otherwise, sections of high reflectance (e.g. sclera) may be illuminated, thus causing disturbing glare.
- Turn the filter wheel (**2**, Fig. 11) to choose a filter as required.
- For retroillumination, set the illumination angle as small as possible and slightly decenter the illumination by means of control (**5**, Fig. 11).
- When using the tonometer, we recommend looking through the left eyepiece with the right eye while observing the patient with the left eye or looking through the right eyepiece with the left eye while observing the patient with the right eye.
- The use of either convergent or parallel viewing path mainly depends on personal usage preferences.



- 1 3D joystick control for lateral and height adjustment (the latter by turning the control)
- 2 Filter setting wheel (with green filter (red-free), free aperture and blue filter)
- 3 Red eye level marks (to identify the patient eye level needed for optimum measurement)
- 4 Chin rest
- 5 Decentering controls for retroillumination
- 6 Red mark indicating the mid-position of the height adjusting range
- 7 Brightness control continuously adjustable, no slit light in the left final position, maximum illumination intensity in the right final position

Fig. 11 Adjust the slit lamp

## Adjusting the illumination

The light dose is based on the illuminance and exposure time.

Very long exposure times of the same area of the retina are not typical, as slit lamp examination is a dynamic process.

The illuminance directed on the fundus can be reduced as follows:

- Reduce the lamp brightness.
- Do not dilate the patient's pupil unless it is really necessary.
- Only adjust the size of the illuminated area (slit width, slit length) as large as necessary.
- For observation, adjust the illumination angles as large as possible.
- Use color filter or, in special cases a diffusor.

## Tonometry

- The measuring prisms must be disinfected and undamaged.  
Therefore, we recommend the use of several measuring prisms.
- The instrument table must be horizontal to avoid movement of the slit lamp with attached measuring prism towards the patient. This is of particular importance when taking tonometric measurements without locking the instrument base.  
Therefore, we recommend that you always fix the instrument base as soon as the measuring prism touches the cornea.
- Refer to the manual of the AT 020 or AT 030 applanation tonometer.

## Gonioscopy

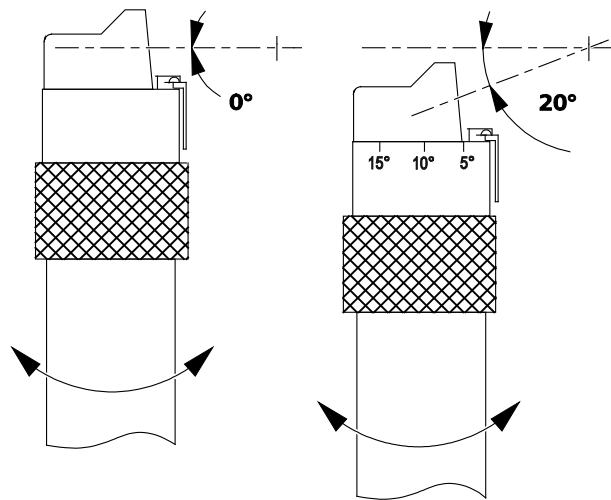


Fig. 12 Adjusting the illumination angle on the prism head

- Contact glasses must be disinfected and undamaged.
- For gonioscopy, the three-mirror contact glass is used.
- To cover different angular ranges, the illumination angle can be varied relative to the horizontal between 0° and 20° when using a tiltable prism head. For this, turn the knurled ring on the prism head. A scale permits the inclination angle to be set reproducibly.

### **CAUTION - PROPERTY DAMAGE**

Make sure not to turn on forcibly when you reach the mechanical stop while adjusting the tilting prism head.

## Shutting down

### WARNING - GENERAL HAZARDS

If one of the following occurs, switch the instrument off immediately at the power switch on the power supply unit and disconnect the cable from the power supply. For devices which are connected to the power supply via the instrument table, disconnect the power cable of the instrument table.

Label the instrument clearly as out of service and report the problem to the ZEISS service:

- Electric shock
- Penetration of substances
- Faults that cannot be remedied according to the descriptions in this user manual



## Switching off the instrument

Switch off the SL 130 Slit Lamp using the power switch (1, Fig. 8) on the power supply unit.

## Maintenance and care



### **WARNING - GENERAL HAZARDS**

Further maintenance procedures above and beyond those specified in this section (maintenance, safety inspections and repairs) may only be carried out by persons authorized by Carl Zeiss Meditec and solely according to the service instructions issued by Carl Zeiss Meditec. For planning and implementing these maintenance and care procedures please contact ZEISS service or your local dealer.

The manufacturer accepts no liability for damages resulting from unauthorized tampering with the device or from the use of unapproved accessories. Such actions will also render any warranty claims invalid.



### **WARNING - RISK OF ELECTRIC SHOCK**

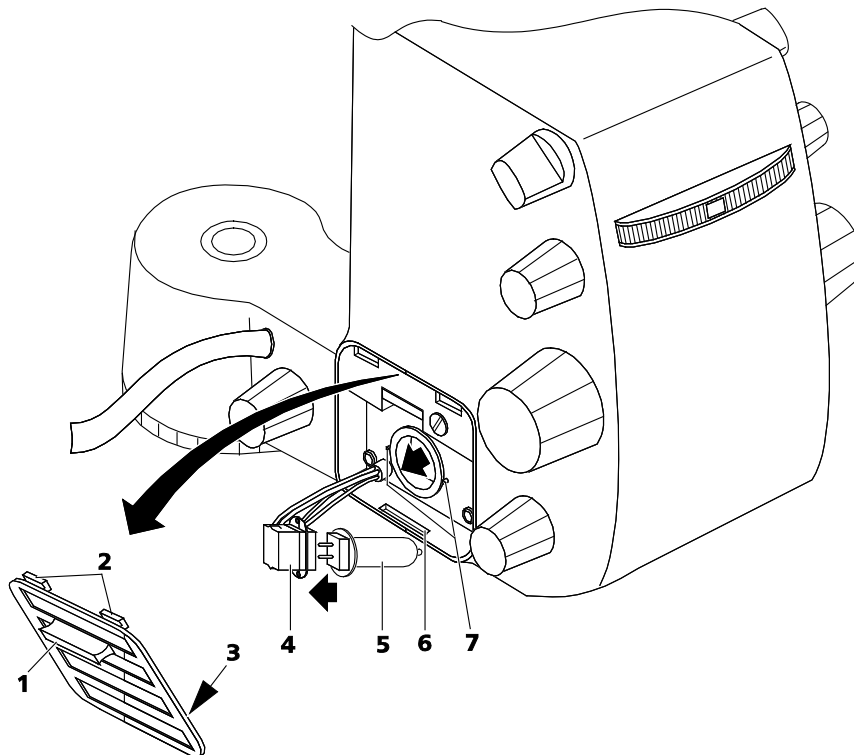
The user may only open the SL 130 Slit Lamp in order to replace the lamp. Any other action involving access to the interior of the instrument may endanger both operator and patient.



## Replacing the lamp

### CAUTION - RISK OF BURNS

Before replacing the lamp, switch the instrument off and disconnect the power cable. Allow the lamp to cool down or wear protective gloves.



- |                |                           |
|----------------|---------------------------|
| 1 Cover handle | 5 Lamp (6 V/20 W halogen) |
| 2 Lugs         | 6 Notch                   |
| 3 Lug (hidden) | 7 Locating pins           |
| 4 Lamp holder  |                           |

Fig. 13 Replacing the lamp

- To remove the cover from the lamp housing, press it downward while pulling its handle (**1**, Fig. 13).
- Withdraw the lamp holder (**4**, Fig. 13) of the lamp (**5**, Fig. 13).
- Then, pull out the defective lamp (**5**, Fig. 13). Push new lamp (6 V, 20 W) into the opening. Observe alignment of the locating pins (**7**, Fig. 13). Do not touch the glass bulb.

- Slide lamp holder (**4**, Fig. 13) onto the contact pins of the lamp (**5**, Fig. 13).
- To attach the cover, place lug (**3**, Fig. 13) into notch (**6**, Fig. 13) and fix it by pressing until lugs (**2**, Fig. 13) catch.

## Maintenance

### Care and cleaning



#### **WARNING - RISK OF ELECTRIC SHOCK**

Prevent moisture from penetrating the instrument. Disconnect the power cable from the power supply before cleaning or disinfecting the device.



#### **CAUTION - RISK DUE TO CROSS-CONTAMINATION**

Parts with which the patient has come into contact during the examination (chin rest, forehead support) should be cleaned with a disinfectant approved for the purpose. These parts are resistant to cleaning agents categorized as "low" (e.g. suds, quaternary ammonium compounds) and "intermediate" (e.g. alcohol, Javel water, iodine); classification pursuant to: Disinfectants and activity spectrum according to the Center for Disease Control and Prevention, Atlanta, USA.



#### **CAUTION - RISK OF FALSE DIAGNOSIS**

Use the supplied dust cover to protect the device from dust when not in use.

#### **CAUTION - PROPERTY DAMAGE**

The national disinfecting regulations must be observed in the choice of disinfectants and methods. Please note that some cleaning agents and disinfectants may have an adverse effect on plastic components. Damage caused by such disinfectants is not covered by our warranty. The surfaces of the instrument have been tested to withstand frequent and long-term treatment with alcoholic disinfectants and cleaning agents.

Never use aggressive or abrasive cleaning agents.

- Due to its simple and compact construction, the SL 130 Slit Lamp is almost maintenance-free. It is, however, necessary to clean the optical components (objective, eyepiece) occasionally. To remove dust from surfaces accessible from the exterior, use a soft brush.
- Clean very dirty paint surfaces with a cloth moistened (not dripping) with weak detergent.
- Do not use acetone and acetone-based cleaning agents to clean the device, as they could damage the surfaces.
- Replace the paper pads after each patient.
- Use the following utensils for cleaning the front lens:
  - Volk LensPen® cleaning pen (available from optical retailers or directly supplied by Carl Zeiss Meditec, 000000-0483-896)
- To clean the front lens, the swab or lens-cleaning instrument should be moved with a circular motion from the center of the lens to the edge. For cleaning, switch on the illumination so that you can check the cleaning effect.
- Use the supplied dust cover to protect the device from dust when not in use. Store all accessories in suitable storage boxes.
- Disinfect the forehead rest and the chin rest with a suitable and approved disinfectant.

## Safety inspections

### **WARNING - RISK OF ELECTRIC SHOCK**

The user is required to have the device inspected for safety once a year. Safety inspections may only be carried out by persons authorized by Carl Zeiss Meditec and solely according to the service instructions issued by Carl Zeiss Meditec. For planning and implementing these safety inspections please contact Carl Zeiss Meditec customer service or your local dealer.



## Optional accessories

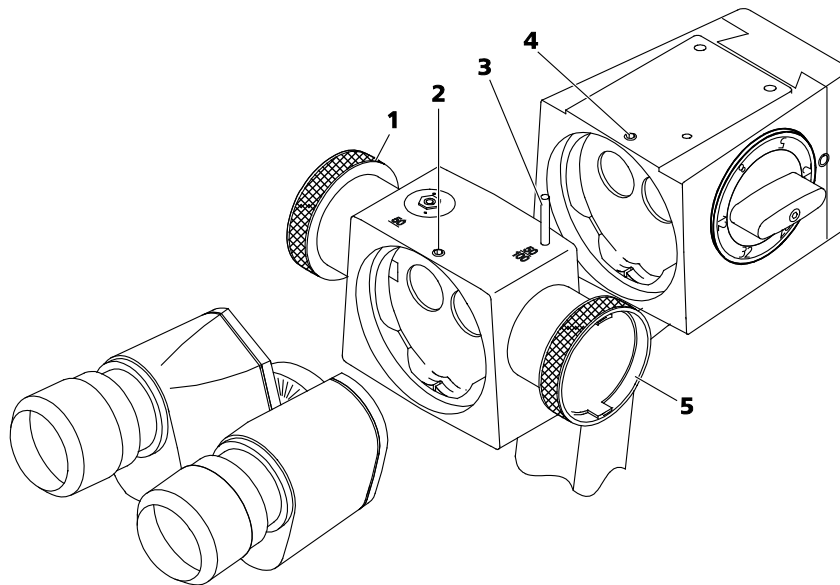
**WARNING - RISK OF OPTICAL RADIATION**

Use only accessories and spare parts approved by Carl Zeiss Meditec.

- Beam splitter (see DigiCam Set user manual)
- Filter changer with barrier filter (yellow)
- ACCENTO Ergotube
- DigiCam Adapter (see DigiCam Set user manual)
- DigiCam Illuminator (see DigiCam Set user manual)
- Focusing rod
- Fixation lamp
- AT 020/AT 030 applanation tonometer (see AT 020/AT 030 user manual)
- Special eyepieces
- ACCENTO Vario
- Co-observer accessory
- Breathing shield
- Paper pads
- IT 760 instrument table (see user manual of the instrument table)
- SL Imaging Module SL cam 5.0
- Fender plate (only for SL used in diagnostic environments)

A complete up-to-date list of accessories can be obtained from your dealer.

## Mounting the beam splitter



- 1 Left port for beam splitter
- 2 Hexagon-socket screw on the beam splitter
- 3 Prism slide
- 4 Hexagon socket screw on the stereomicroscope
- 5 Right port for beam splitter

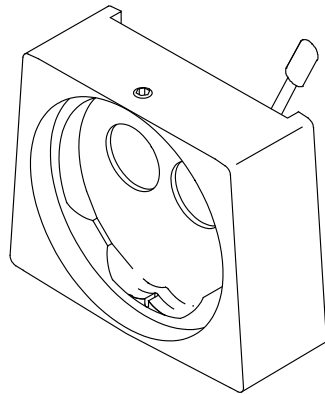
Fig. 14 Mounting the beam splitter

- Loosen hexagon socket screw (**4**, Fig. 14) and remove the binocular tube.
- Attach the beam splitter with its annular dovetail mount to the stereomicroscope and fasten socket screw (**4**, Fig. 14) again.
- Reattach the binocular tube to the beam splitter and fasten it by means of the hexagon socket screw (**2**, Fig. 14).
- The chosen accessories can then be attached to the ports (**1** and **5**, Fig. 14) of the beam splitter.
- The prism slide (**3**, Fig. 14) is moved to send either 100 % of light to the binocular tube (prism slide pushed in) or divide it into 50 % each to binocular tube and accessory attachments (prism slide pulled out).



Ensure that all screws are properly tightened and that the beam splitter and binocular tube are not misaligned.

## Mounting a filter changer with barrier filter (yellow)



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Fig. 15 Filter changer with barrier filter (yellow)

You can swing the yellow filter into the light path by means of the lever shown beside.

The filter serves as barrier filter for the work with fluorescein and with a blue filter in the observation path.

Similar to the beam splitter (Fig. 14), the filter changer with barrier filter (yellow) is mounted between the stereomicroscope and binocular tube by means of hexagon socket screws.



Ensure that all screws are properly tightened and that the filter changer and binocular tube are not misaligned.

## Mounting the ACCENTO Ergotube

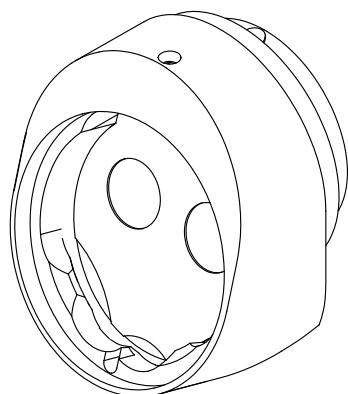


Fig. 16 ACCENTO Ergotube

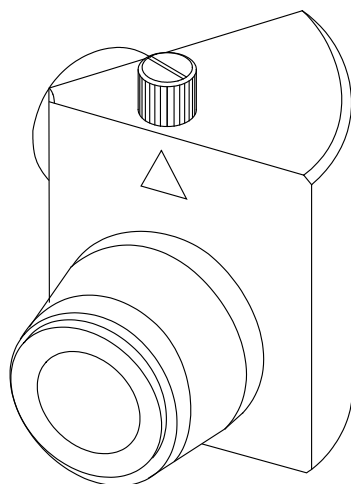
The ACCENTO Ergotube causes the convergent or parallel tube to slant upwards by 15°, relieving strain on the neck when working.

Similar to the beam splitter (Fig. 14), the ACCENTO Ergotube is mounted between the stereomicroscope and binocular tube by means of hexagon socket screws.



Ensure that all screws are properly tightened and that the ACCENTO Ergotube and binocular tube are not misaligned.

## DigiCam Adapter



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Fig. 17 DigiCam Adapter

The DigiCam Adapter allows standard digital cameras to be connected for the purpose of photographic documentation.



You can find notes on mounting and operating the DigiCam Adapter in the DigiCam Set user manual.



## DigiCam Illuminator

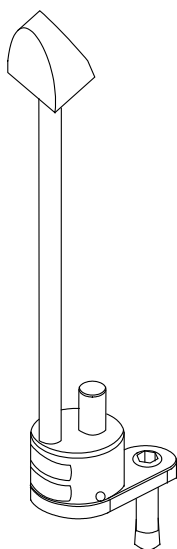


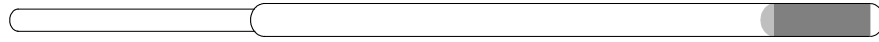
Fig. 18 DigiCam Illuminator

The DigiCam Illuminator is a separate illumination system for illuminating the area surrounding the projected slit for the purpose of photographic or video documentation.



You can find notes on mounting and operating the DigiCam Illuminator in the DigiCam Set user manual.

## Focusing rod



---

Fig. 19 Focusing rod

The focusing rod can be installed in hole **(8, Fig. 6)**. The focusing rod can be used for determining the individual diopter setting on the eyepieces to compensate for ametropia of the observer or possible instrument myopia.

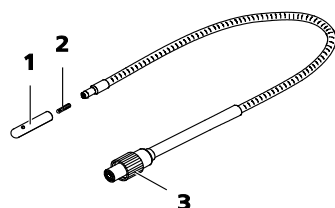
The exact adjustment of the eyepieces is a prerequisite for good examination results and is necessary when using a video or photographic camera on a slit lamp or when using the slit lamp as a laser slit lamp.

- To use the focusing rod, install it in the hole at the axis with the black observation plane towards the stereomicroscope. Push the rod as far as it will go.
- Adjust the slit width to approx. 1 mm and set the illumination angle to 0° (i.e. slit projector in middle position).
- Set the magnification to 12x.
- While carefully monitoring the slit image, a sharply focused image must be set for each eye separately by turning the diopter scale on the eyepiece (starting with high + values).



The eyepieces can be adjusted even more exactly using the optional micrometer eyepieces with length and angle scales.

## Fixation lamp



- 1 Cover
- 2 Lamp/diode
- 3 Sleeve nut to clamp the fixation lamp to the head rest

Fig. 20 Fixation lamp

The fixation lamp is the lamp on which the non-examined eye of the patient can be fixed. A plug-in socket (3, Fig. 6) with electrical contact has been provided on the head rest for mounting and power supply to the fixation lamp (see Fig. 6, page 19).

The fixation lamp is locked by a sleeve nut (3, Fig. 20). The cable of the fixation lamp (14, Fig. 6) must be connected to the power supply unit (2, Fig. 9).

The cover (1, Fig. 20) produces defined luminous fixation light spots of lamp/diode (2, Fig. 20).

## AT 020/AT 030 applanation tonometer

This instrument for intraocular pressure measurement easily mounts to the slit lamp. It is moved into the operating position by swinging its measuring arm down.

There are special user manuals for using the AT 020 or AT 030. Please follow the appropriate instructions in the user manuals for these devices.

## Special eyepieces

12.5x eyepieces and a 10x micrometer eyepiece with linear and angular scales are available.

### 10x micrometer eyepiece with linear and angular scales

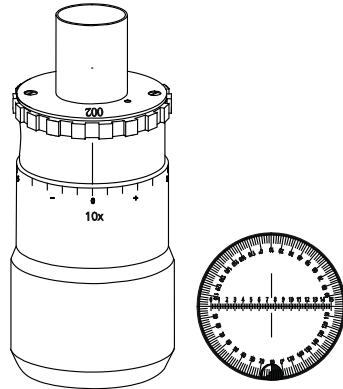


Fig. 21 10x micrometer eyepiece with linear and angular scales

This eyepiece has a linear scale of 15 mm length graduated to 0.2 mm. Use of this eyepiece requires the 8x position of the magnification changer.

A TABO angle scale graduated to  $2^\circ$  provides determination of the angle of inclination. It is not necessary to set the magnification changer to a certain position when using angular measurement.

The angle scale is for measuring the inclination when fitting toric soft contact lenses.

The contact lenses (fitted and prescription lenses) carry an index mark on their periphery outside the "optical zone". The contact lens will quickly take a preferred position by the natural movement of the eye. The index mark on the lens will no longer coincide with the horizontal line. This deviation, called inclination, is to be determined.

- Subtractive inclination:  
The index mark, the so-called DS axis (dynamic stabilization axis) lies in the first quadrant of the TABO scheme, i.e. between  $0^\circ$  and  $90^\circ$ .
- Additive inclination:  
The index mark (DS axis) lies in the second quadrant (between  $90^\circ$  and  $180^\circ$ ).

The special eyepiece has an angular scale of  $180^\circ$  graduated to  $2^\circ$  for the measurement of the inclination angle. A gravity ball (**1**, Fig. 22) produces the artificial horizon required for the angular measurement.

### Angular measurement

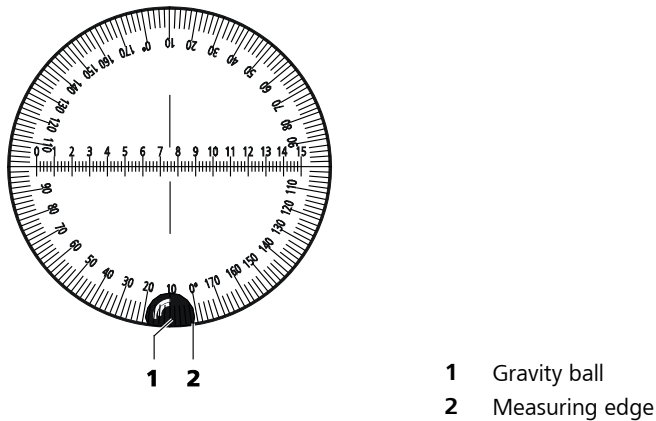


Fig. 22 Reading the inclination

Grasping the knurled ring, turn the entire eyepiece in the tube socket until the continuous line of the linear scale coincides with the index mark on the contact lens.

Read the value from the measuring edge (**2**, Fig. 22) of the gravity ball. The inclination angle is displayed according to the TABO scheme.

The reproducibility of the measurement is  $\pm 0.5^\circ$ . When taking the measurement, allow for a short settling time of the ball.

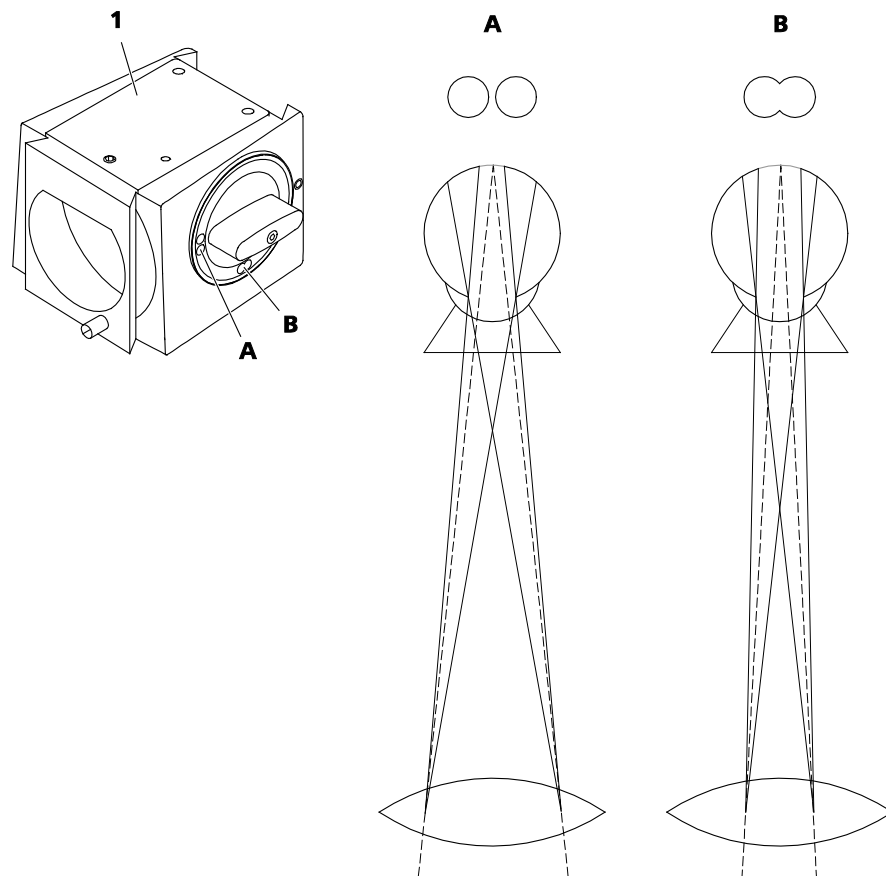
The image scale in the eyepiece plane is insignificant for the measurement of the inclination angle. Select the magnification changer setting of the slit lamp microscope only so as to obtain a sufficiently large object field.

### Length measurement

For length measurement, the magnification changer has to be set to 8x.

## ACCENTO Vario

The ACCENTO Vario is an optional accessory and will be attached between the objective (3, Fig. 4) and the magnification changer (4, Fig. 4). It is not part of the standard configuration of the slit lamp. It is installed at the factory or by qualified service staff when re-fitting to instruments. It is not recommended that the user mounts the accessory.



- 1** ACCENTO Vario
- A** Rotary knob position and beam path for stereo angle  $12.5^\circ$
- B** Rotary knob position and beam path for stereo angle  $7^\circ$

Fig. 23 Beam path of ACCENTO Vario (schematically)

The ACCENTO Vario is used to decrease the stereo angle. The standard angle between the two observation beam paths of the slit lamp is  $12.5^\circ$ . This angle allows stereoscopic observation of the anterior eye segment at a high aperture. When observing the posterior eye segment, the binocular field of view is strongly limited even with a dilated pupil or may be not seen at all. This is especially the case when examining the fundus periphery using a Goldman contact lens or when observing the chamber angle (gonioscopy).

Using the ACCENTO Vario the rotary knob allows to decrease the stereo angle from 12,5° to 7°. This leads to increased overlapping of the two observation beam paths, thereby increasing the binocular field of view and thus enabling stereoscopic observation of the fundus with a significantly improved view.

ACCENTO Vario has two working positions. Fig. 23 shows the observation beam path at a decreased stereo angle B compared to the standard setting A. Using the rotary knob the two positions can be alternated between.

## Breathing shield

- The breathing shield may be mounted to the stereomicroscope to protect the patient and physician from each other's breath.

## Paper pads

- They improve hygienic conditions.

## Fender plate

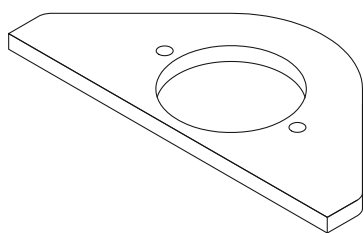


Fig. 24 Fender plate

The fender plate is used to prevent collision of slit lamp and headrest, when the slit lamp is mounted to instrument setups. Fix the fender plate below the pivot of stereomicroscope and lamp holder by means of two M4 cheese-head screws.

## Technical data

Rated voltage	100 V - 10 % to 240 V + 10 %, 50/60 Hz
Current consumption	0.8 A to 0.35 A
Protection class	I
Instrument type	B (in accordance with DIN EN 60601-1)
Ingress protection rating	IP 20
Operating mode	continuous operation
Light source for projection	6 V, 20 W, halogen lamp
Lamp voltage	continuously adjustable
Fixation lamp	5 V/1.5 W
Magnification	5x/8x/12x/20x/32x with eyepieces 10x 6x/10x/16x/25x/40x with eyepieces 12,5x
Field of view	40 mm to 6 mm with eyepieces 10x 31 mm to 5 mm with eyepieces 12.5x
Eyepiece magnification	Optional 10x or 12.5x high eyepoint, $\pm 8$ D compensation of ametropia
Slit width	0 mm to 14 mm continuously progressive
Slit length	in steps of 0.3/2.5/3.5/7/10/14 mm; triple slit
Slit image rotation	$\pm 90^\circ$ continuously
Slit decentration	$\pm 4^\circ$ horizontal, click-stop at $0^\circ$
Swivel range of slit projector	180°, scale for angular difference Click-stops at $-10^\circ$ , $0^\circ$ , $+10^\circ$
Angle of incidence	$0^\circ$ to $20^\circ$
Filter	blue, green (red-free), grey; heat absorbing filter (fixed); swing-in diffusor
Free working distance from light-exit prism to patient eye	66 mm
Travel of instrument base	30 mm (height), 110 mm (side), 90 mm (depth)
Vertical travel of head rest	58 mm
Weight	9.85 kg (basic unit), 1.25 kg (headrest)
Dimensions of the basic unit (W x H x D)	300 mm x 430 mm x 355mm
Dimensions of the head rest (height)	630 mm



**Ambient conditions for intended use**

Temperature	+10 °C to +35 °C
Rel. humidity	30 % to 75 %, non condensing
Altitude	up to 2,000 m above sea level

**Ambient conditions for storage in original packaging**

Temperature	-10 °C to +55 °C
Relative humidity	10 % to 95 %, non condensing

**Ambient conditions for transport in original packaging**

Temperature	-40 °C to +70 °C
Relative humidity	10 % to 95 %, non condensing

## Electromagnetic compatibility



### CAUTION - GENERAL HAZARDS

Portable and mobile RF communications equipment may affect the device. When operating radio devices or components for radio transmission, observe the distances to all system components recommended in this section.



### CAUTION - RISK OF ELECTROMAGNETIC RADIATION

The SL 130 Slit Lamp may not be placed next to or stacked together with other equipment, except in the device configurations described in this user manual. If operation close to or with other devices is necessary, the SL 130 Slit Lamp must be carefully observed to monitor its proper functioning in this configuration.



Special precautionary measures apply to medical electrical devices with regard to electromagnetic compatibility (EMC). Such devices must be installed and operated as specified in the EMC notes in the accompanying documents.

Replacement cables may only be purchased from Carl Zeiss Meditec or from dealers authorized by Carl Zeiss Meditec.

The use of accessories, all types of transducers and cables not specified in this user manual or not sold by Carl Zeiss Meditec as replacement parts may result in higher emissions or reduced immunity of the device.


Relevant accessories, cables and transducers:

- Power supply cable (2.00 m)
- Power supply cable (2.50 m)
- Digicam Illuminator connection cable (2.50 m)

The following guideline applies only to the accessories specified for and delivered with the device from Carl Zeiss Meditec.

<b>Guidance and manufacturer's declaration - electromagnetic emissions</b>		
The SL 130 Slit Lamp is intended for use in the electromagnetic environment specified below. The customer or the user of the SL 130 Slit Lamp should assure that it is used in such an environment		
<b>Emissions test</b>	<b>Compliance</b>	<b>Electromagnetic environment - guidance</b>
RF emissions CISPR 11	Group 1	The SL 130 Slit Lamp uses RF energy only for its internal functioning. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The SL 130 Slit Lamp is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

<b>Guidance and manufacturer's declaration - electromagnetic immunity</b>			
The SL 130 Slit Lamp is intended for use in the electromagnetic environment specified below. The customer or the user of the SL 130 Slit Lamp should assure that it is used in such an environment.			
<b>Immunity test</b>	<b>IEC 60601 test level</b>	<b>Compliance level</b>	<b>Electromagnetic environment - guidance</b>
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line(s) to line(s) ±2 kV line(s) to ground	±1 kV line(s) to line(s) ±2 kV line(s) to ground	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5 % $U_T$ (> 95 % dip in $U_T$ ) for 0.5 cycle 40 % $U_T$ (60 % dip in $U_T$ ) for 5 cycles 70 % $U_T$ (30 % dip in $U_T$ ) for 25 cycles < 5 % $U_T$ (> 95 % dip in $U_T$ ) for 5 s	< 5 % $U_T$ (> 95 % dip in $U_T$ ) for 0.5 cycle 40 % $U_T$ (60 % dip in $U_T$ ) for 5 cycles 70 % $U_T$ (30 % dip in $U_T$ ) for 25 cycles < 5 % $U_T$ (> 95 % dip in $U_T$ ) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the SL 130 Slit Lamp requires continued operation during power mains interruptions, it is recommended that the SL 130 Slit Lamp be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: $U_T$ is the a.c. mains voltage prior to application of the test level.			

<b>Guidance and manufacturer's declaration - electromagnetic immunity</b>			
The SL 130 Slit Lamp is intended for use in the electromagnetic environment specified below. The customer or the user of the SL 130 Slit Lamp should assure that it is used in such an environment.			
<b>Immunity test</b>	<b>IEC 60601 test level</b>	<b>Compliance level</b>	<b>Electromagnetic environment - guidance</b>
<p>Conducted RF IEC 61000-4-6</p> <p>Radiated RF IEC 61000-4-3</p>	<p>3 V<sub>rms</sub> 150 kHz to 80 MHz</p> <p>3 V/m 80 MHz to 2.5 GHz</p>	<p>3 V</p> <p>3 V/m</p>	<p>Portable and mobile RF communications equipment should be used no closer to any part of the SL 130 Slit Lamp, including cables, than the recommended separation distance calculated using the equation applicable to the frequency of the transmitter.</p> <p><b>Recommended separation distance</b></p> $d = 1.2 \sqrt{P}$ $d = 1,2 \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2,3 \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$ <p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,<sup>a</sup> should be less than the compliance level<sup>b</sup> in each frequency range.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
Note 1:	At 80 MHz and 800 MHz the higher frequency range applies.		
Note 2:	These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.		
<p><sup>a</sup> Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the SL 130 Slit Lamp is used exceeds the above applicable RF compliance level, the SL 130 Slit Lamp should be monitored to ensure normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the SL 130 Slit Lamp.</p> <p><sup>b</sup> Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p>			

### Recommended separation distances between portable and mobile RF communications equipment and the SL 130 Slit Lamp

The SL 130 Slit Lamp is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the SL 130 Slit Lamp can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the SL 130 Slit Lamp as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to transmitter frequency m		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5 GHz
	$d = 1.2 \sqrt{P}$	$d = 1.2 \sqrt{P}$	$d = 2.3 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.2	1.2	2.3
10	3.7	3.7	7.4
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance  $d$  in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where  $P$  is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz the separation distance of the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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## Abbreviations/Glossary

D	Diopters (unit of measurement for refractive power)
DIN	Deutsches Institut für Normung (German Standards Institute)
EMC	Electromagnetic compatibility
EN	European standard
Fig.	Figure
IEC	International Electrotechnical Commission

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SL 130 Slit Lamp  
Specifications subject to change



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