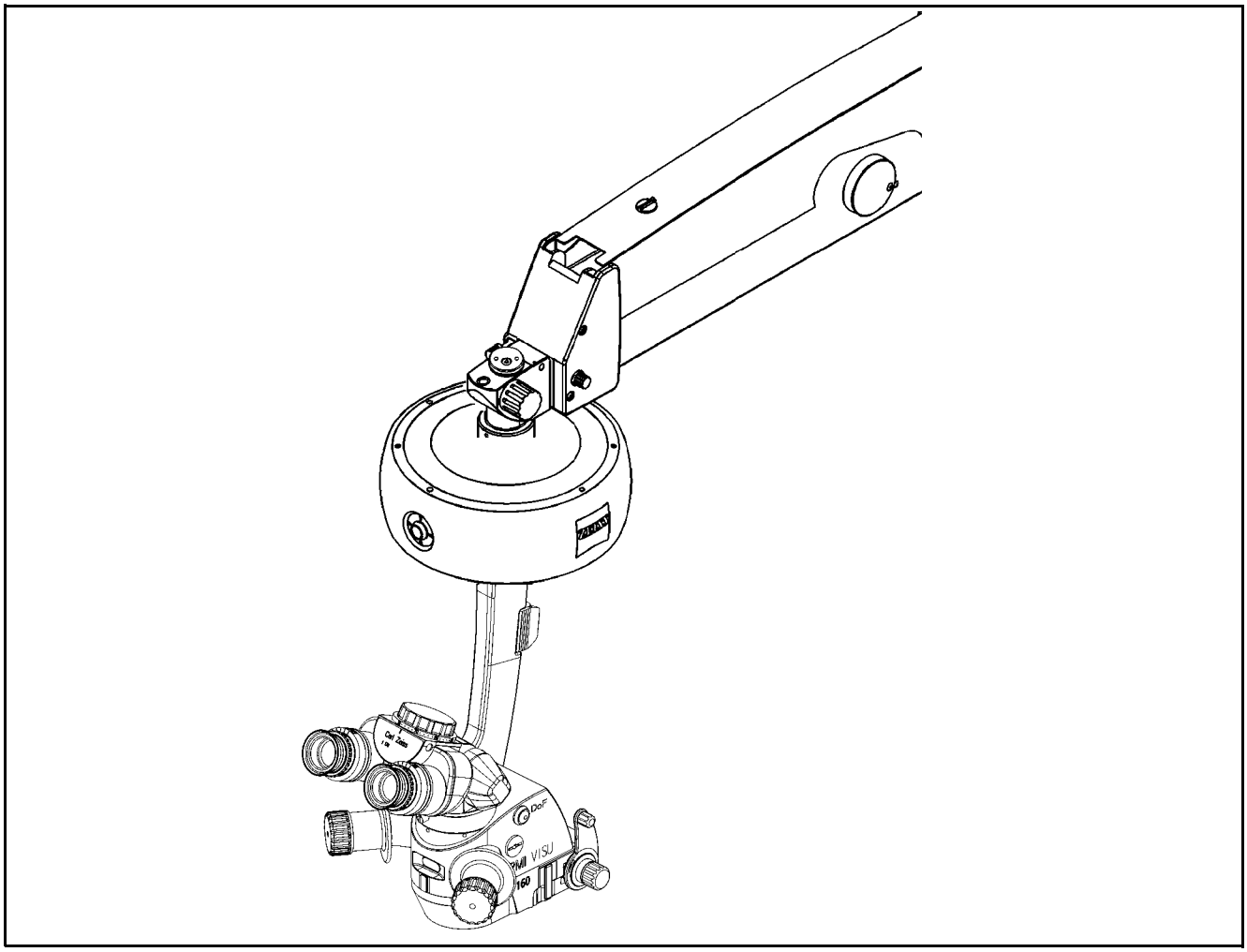
OPMI® VISU 160 on S8, S81 & S88 Suspension Systems



Instructions for use

G-30-1529-en

Issue 5.0

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Key to symbols

Different symbols used in this manual draw your attention to safety aspects and useful tips. These symbols are explained in the following.

Warning!
The **warning triangle** indicates potential sources of danger which may constitute a risk of injury for the user or a health hazard.

Caution:
The **square** indicates situations which may lead to malfunction, defects, collision or damage of the instrument.

Note:
The **hand** provides hints on the use of the instrument or other tips for the user.

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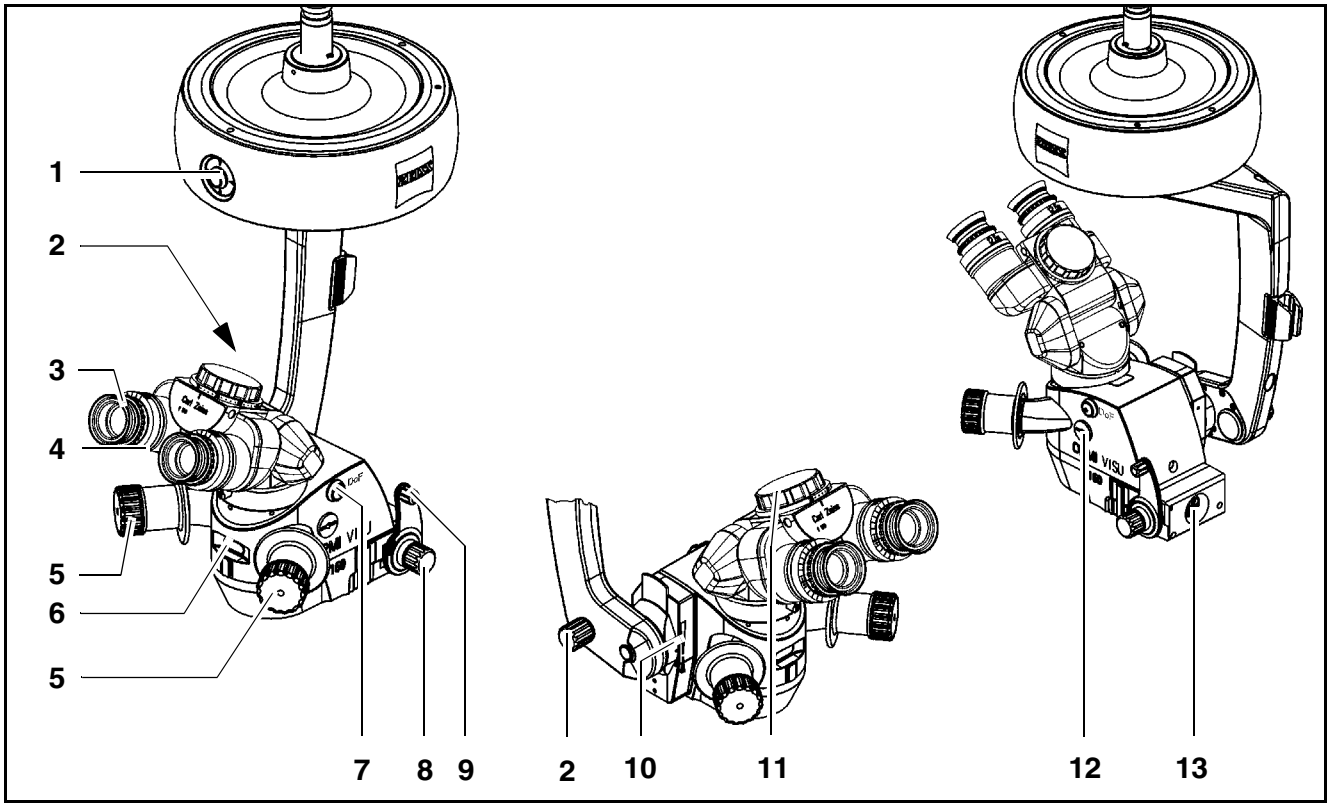

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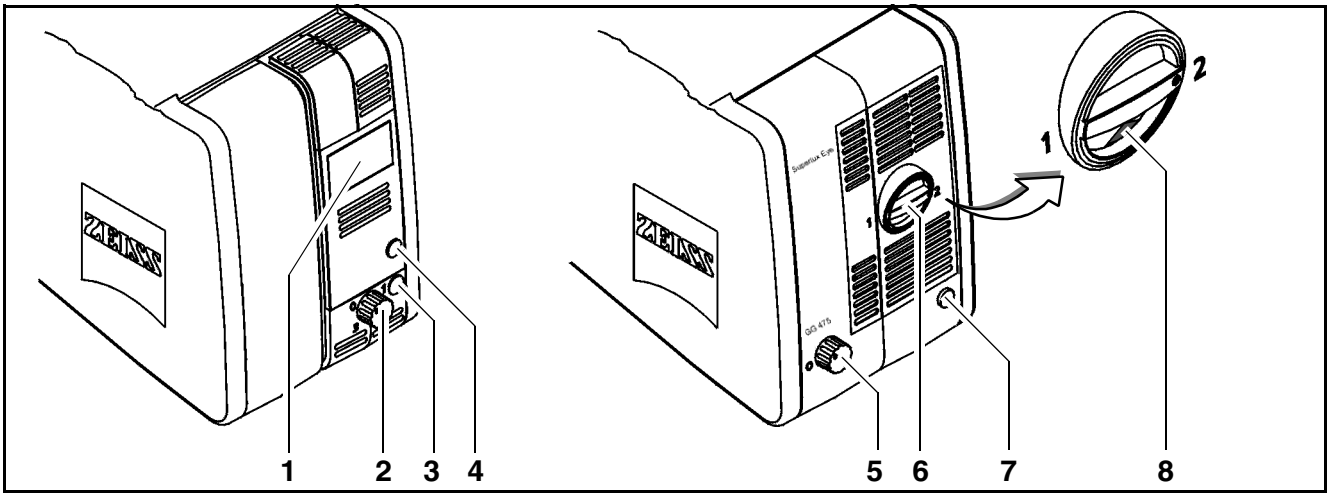

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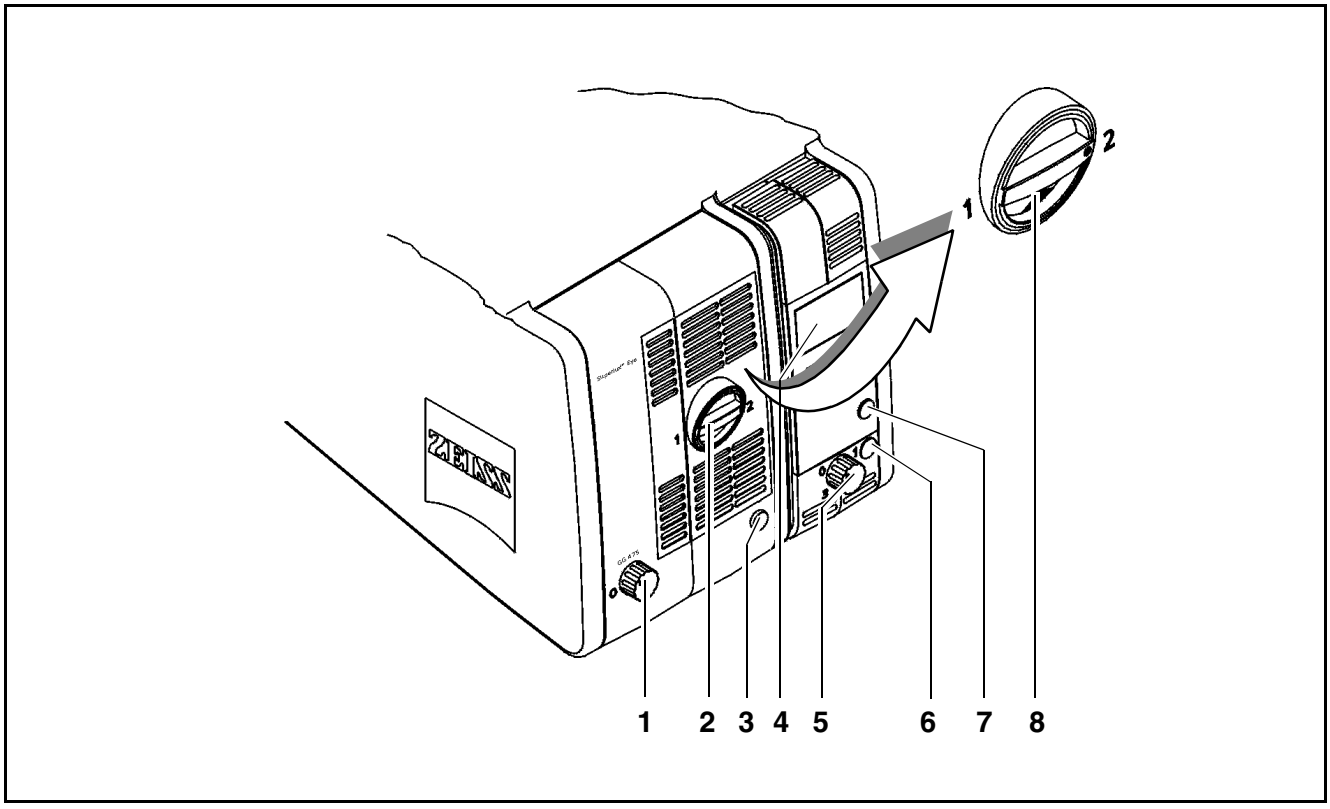

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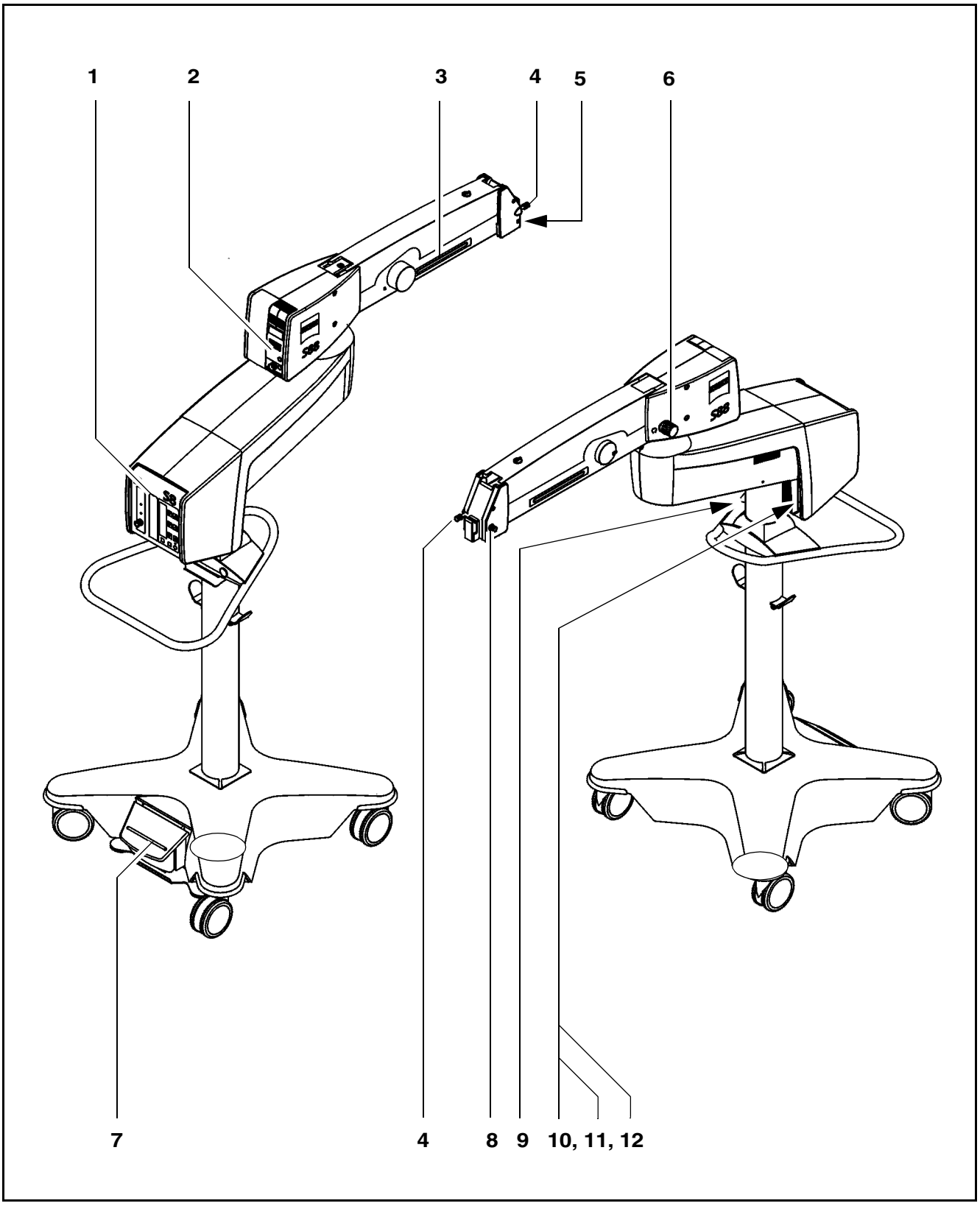
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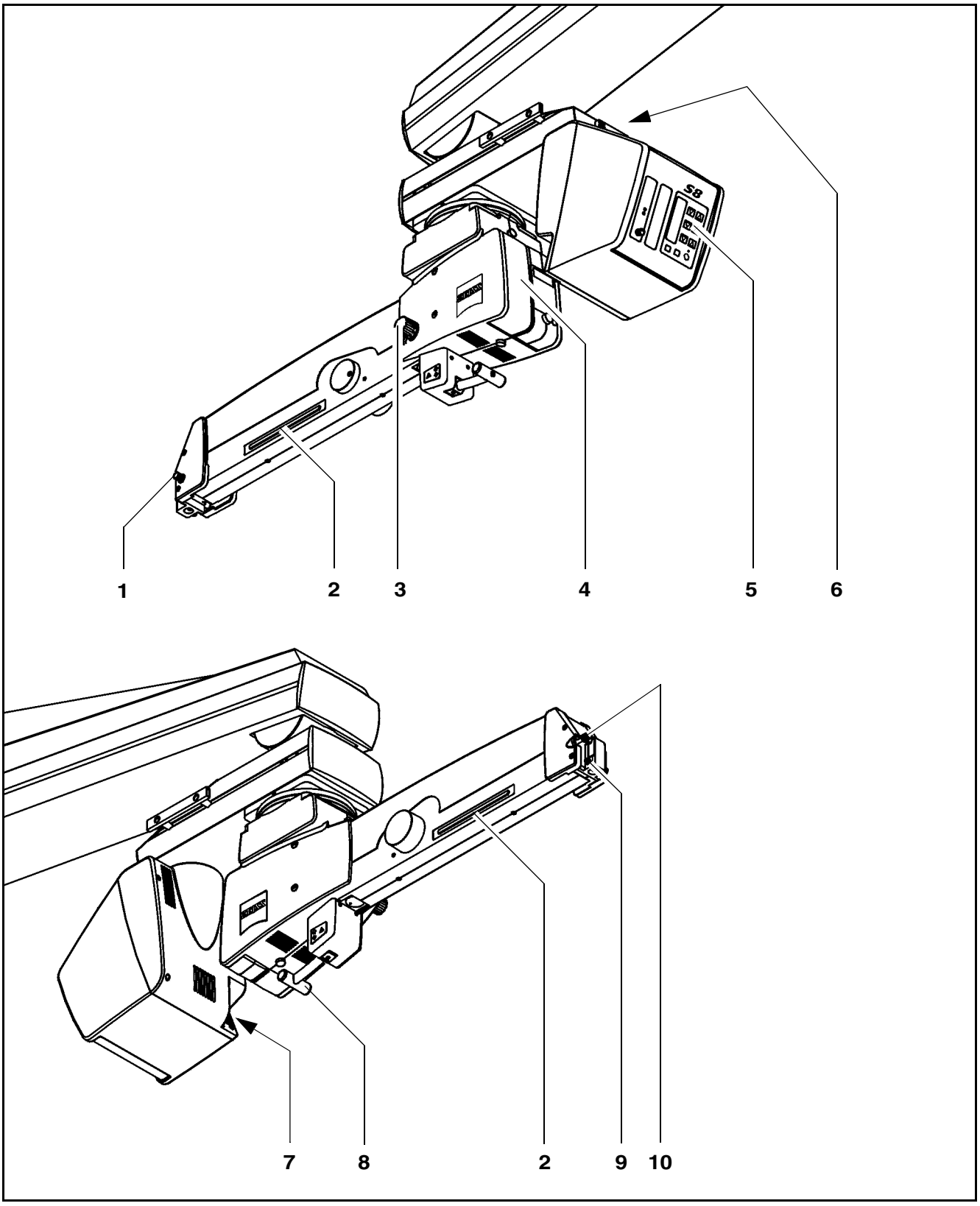
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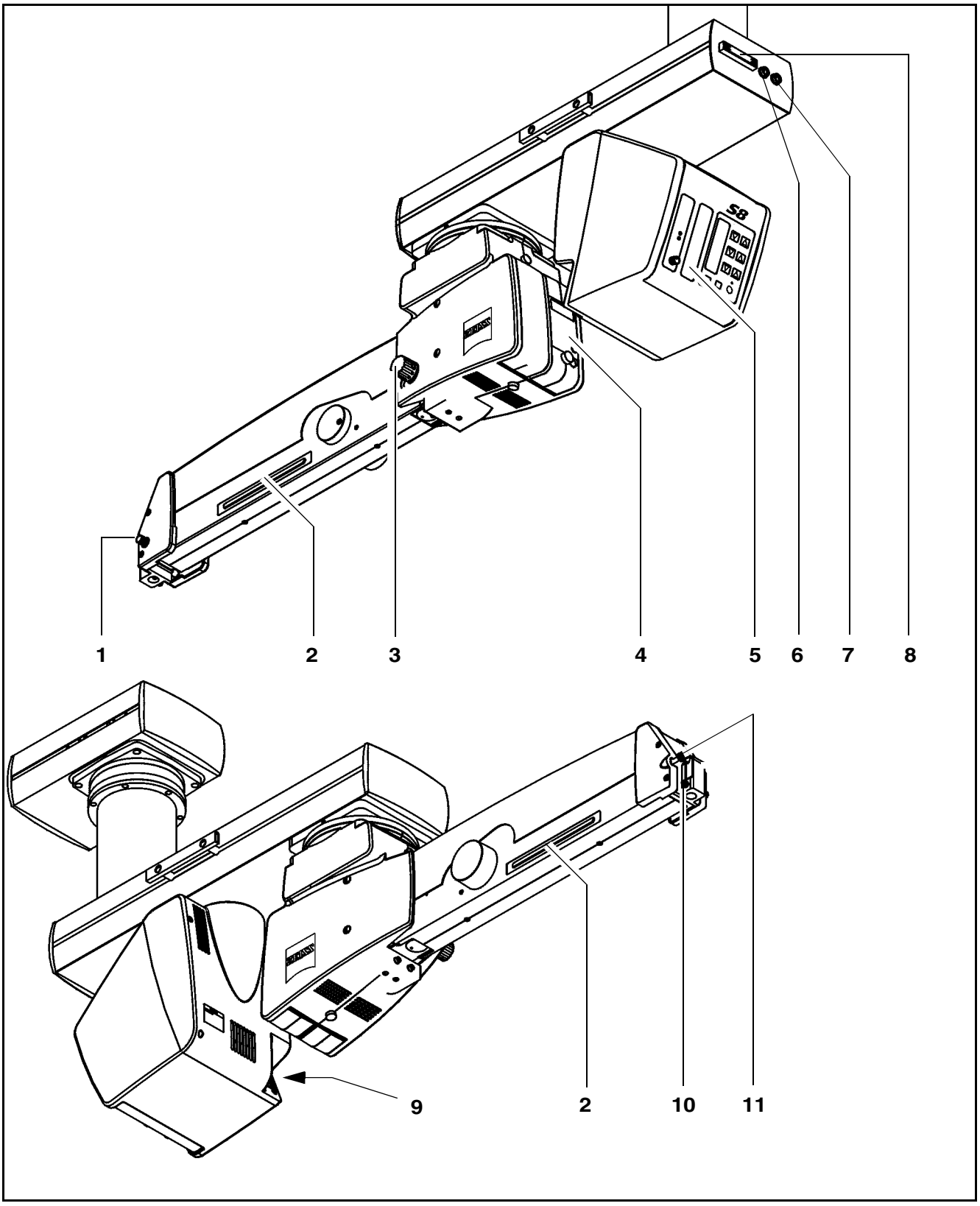
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Safety

The device described in this manual has been designed and tested in accordance with Carl Zeiss safety standards as well as German and international standards. This guarantees a high degree of instrument safety.

The system described in this user manual has been designed in compliance with the requirements of:

– EN – IEC – UL – CSA

In accordance with Directive 93/42/EEC for medical devices, the complete quality management system of the company Carl Zeiss Surgical GmbH, 73446 Oberkochen, Germany, has been certified by DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen mbH, a notified body, under registration number 250758 MP23.

– As per Directive 93/42/EEC, the unit is a Class I instrument.

– For USA: FDA classification Class I.

We would like to provide you with information about safety aspects which must be observed when handling this device. This chapter contains a summary of the most important information concerning matters relevant to instrument safety.

Important safety information has been incorporated in this manual and is marked with a warning triangle accordingly. Please give this information your special attention.

The correct use of the system is absolutely vital for safe operation. Please make yourself totally familiar with the contents of this manual prior to start-up of the instrument. Please also observe the user manuals of any additional equipment. Further information is available from our service department or from authorized representatives.

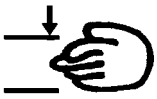
- Please observe all applicable accident prevention regulations.
- The instrument must be connected to a special emergency backup line supply in accordance with the regulations or directives which apply in your country.

Notes on installation and use

Safe working order

- Do not operate the equipment contained in the delivery package in
  - explosion-risk areas,
  - the presence of inflammable anesthetics or volatile solvents such as alcohol, benzine or similar chemicals.
- Do not station or use the instrument in damp rooms. Do not expose the instrument to water splashes, dripping water or sprayed water.
- Switch off the unit at the power switch if you notice any smoke, sparks or unusual noise. Do not use the unit until it has been repaired by our service team.
- Do not place any fluid-filled containers on top of the instrument. Make sure that no fluids can seep into the instrument.
- Do not force cable connections. If the male and female parts do not readily connect, make sure that they are appropriate for one another. If any of the connectors are damaged, have our service representative repair them.
- Potential equalization: If requested, the instrument can be incorporated into potential equalization measures.
- Do not use a mobile phone in the vicinity of the equipment because the radio interference can cause the equipment to malfunction. The effects of radio interference on medical equipment depend on a number of various factors and are therefore entirely unforeseeable.
- Modifications and repairs on these instruments or instruments used with them may only be performed by our service representative or by other authorized persons.
- The manufacturer will not accept any liability for damage caused by unauthorized persons tampering with the instrument; this will also forfeit any rights to claim under warranty.
- Over longer distances (e.g. removal, return for repair, etc), the instrument may only be transported in the original packaging or in special return packaging. Please contact your dealer or the Carl Zeiss service team.
- Use this instrument only for the applications described.

- Only use the instrument with the accessories supplied. Should you wish to use other accessory equipment, make sure that Carl Zeiss or the equipment manufacturer has certified that its use will not impair the safety of instrument.
- Only personnel who have undergone training and instruction are allowed to use this instrument. It is the responsibility of the customer or institution operating the equipment to train and instruct all staff using the equipment.
- Keep the user's manuals where they are easily accessible at all times for the persons operating the instrument.
- Never look at the sun through the binocular tube, the objective lens or an eyepiece.
- Do not pull at the light guide cable, at the power cord or at other cable connections.
- This instrument is a high-grade technological product. To ensure optimum performance and safe working order of the instrument, its safety must be checked once every 12 months. We recommend having this check performed by our service representative as part of regular maintenance work.
  If a failure occurs which you cannot correct using the trouble-shooting table, attach a sign to the instrument stating it is out of order and contact our service representative.



- Observe the labels showing the symbol "Risk of crushing“!

Notes on EMC (electromagnetic compatibility)

The system meets the EMC requirements of IEC 60601-1-2. During use of the system, the precautionary measures concerning EMC listed below must be observed.

Only use accessories that have been approved by Carl Zeiss for this system.

Do not use any portable or mobile high frequency communication devices in the vicinity of the system, as this may lead to an impairment of its function.

The system complies with the limits for a Class A device concerning radio frequency emission. However, the possibility of interference to high frequency receiving devices (e.g. TV sets or radios) being used in the surroundings cannot be ruled out. If interference of this type occurs, please inform your Carl Zeiss Service.

Connection of navigation systems (option)

The Carl Zeiss components "Surgical microscope on suspension system" can be integrated into an external navigation system. An optional navigation interface is available.

- The manufacturer of the external navigation system (system supplier) is responsible for the following:
  - Confirmation that his navigation systems have been tested and certified for operation with the respective Carl Zeiss surgical microscope on a suspension system in accordance with the requirements specified in the Carl Zeiss interface description "Navigation Interface for Carl Zeiss Surgical Microscopes".
  - Meeting all requirements (approval, qualifications, etc.) for the medical system created through coupling via the navigation interface.
  - Provision of all accompanying documents required.
  - Ensuring that the navigation system is only connected by personnel who have undergone appropriate training and instruction.
  - Contacting the local Carl Zeiss representative for any inquiries that may arise.
  - Implementation of a procedure that guarantees the calibration of the surgical microscope which is absolutely vital for the use of the Carl Zeiss components "Surgical microscope on suspension system" in combination with a connected navigation system.
    This allows the calibrated surgical microscope combined with the navigation system to be used like an optical pointer with a variable length (corresponds to the working distance).
  - Conducting complete functional testing, alignment and calibration (landmark test) of the navigation system after every subsequent installation or exchange of navigation system components
  - Incorporation of a regularly changing icon in the data injection display of surgical microscopes equipped with a data injection system, i.e. the "heartbeat" of the navigation system must be constantly visible for the user to permit data transmission errors to be immediately detected.
- To check the accuracy of the overall system, perform the test specified by the navigation system manufacturer, e.g. the landmark test, also using the surgical microscope. This allows you to ensure that the stereotactic data has been correctly generated and transmitted to the navigation system without errors.

- Do not use any rotatable tube dovetail mounts when operating the surgical microscope with a connected navigation system. If mounts of this type have been attached to the microscope, they must be carefully locked in their central positions (tighten the knurled screws for rotation).

Requirements on the antenna design (non-Zeiss antennas)

- The antenna manufacturer must confirm that his antenna has been tested and certified for operation with the respective Carl Zeiss surgical microscope on a suspension system in accordance with the requirements specified in the Carl Zeiss interface description "Navigation Interface for Carl Zeiss Surgical Microscopes".
- The following requirements, in particular, apply to the antenna:
  - The surgical microscope with accessories and the antenna must not exceed the admissible total weight (see label or the chapter "Technical data").
  - The antenna must not project over the bottom edge of the microscope body in the direction of the surgical field.
  - The antenna must neither obstruct the movement and adjustability of the accessories which can be used on the surgical microscope (usually a stereo coobservation tube, a camera adapter, a face-to-face tube for spinal surgery, MM6 laser micromanipulator) nor collide with these accessories.
  - The antenna configuration must be implemented in such a way that the localizer camera can always "see" the diodes or trackballs when the surgical microscope and its accessories are in their usual positions.
  - When the system's internal antenna wiring is used, the EN60601-1-2 standard (electromagnetic compatibility) must be complied with.
  - The output power of the LEDs or infrared LEDs (IRED) must always comply with the IEC 60825 laser safety standard, even in the event of cable defects.
  - The failure of one or several LEDs of the antenna may impair navigation or lead to navigation failure. Take the necessary precautions.

Requirements for operation

- For ceiling mounts only: Our service staff or a qualified person appointed by us will install the system on ceiling anchors which have been properly mounted by the construction engineers responsible. These ceiling anchors must comply with the specifications contained in our planning manual.
- Our service representative or an expert authorized by us will install the system. Please ensure that the following requirements are met for further operation:

– All mechanical connections (details in the user's manual) which are relevant to safety are properly connected and screw connections tightened.

– All cables and plugs are in good working condition.

– The voltage setting on the instrument conforms to the rated voltage of the line supply on site.

– The instrument is plugged into a power outlet which has a properly connected protective ground contact.

– The power cord being used is the one designed for use with this instrument.

Before every use and after re-equipping the instrument

- Make sure that all ”Requirements for operation” are fulfilled.
- Go through the checklist.
- Re-attach or close any covers, panels or caps which have been removed or opened.
- Pay special attention to warning symbols on the instrument (triangular warning signs with exclamation marks), labels and any parts such as screws or surfaces painted red.
- Do not cover any ventilation openings.

For every use of the instrument

<u>General</u>

- Never operate the system unattended.
- Avoid looking directly into the light source, e.g. into the microscope objective lens or a light guide.
- When the illumination is on, the light guide must be connected at both ends. Otherwise there is a risk of fire or burn injuries.

- Make sure that the instrument has been switched off before you change the xenon lamp module. When switched on, the ignition system generates high voltage.

Xenon lamps feature high luminance and a spectrum resembling that of natural daylight. Therefore, only special xenon lamps approved by Carl Zeiss must be used in ophthalmology.

- Any kind of radiation has a detrimental effect on biological tissue.This also applies to the light illuminating the surgical field. Please therefore reduce the brightness and duration of illumination on the surgical field to the absolute minimum required.
- When operating on the eye, always use a GG 475 protection filter to ensure that the patient's retina is not exposed to unnecessary (blue) radiation (retinal injury).

S88 floor stand

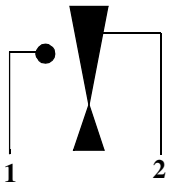
- Using the locking pedal on the base, secure the stand in position. Make sure that the stand is stable and cannot roll away.

After every use of the instrument

- Always use the main power switch of the instrument to turn it off.
- The main power switch must always be turned off when the instrument is not in use.

When using a wide-angle observation system (e.g. BIOM 3)

Risk of collision!



When using a wide-angle observation system (e.g. BIOM 3 from Oculus) which is usually installed between the surgical microscope and the patient, make sure that the patient is neither put at risk nor injured by the motorized focusing system or the movement of the suspension system arm.

Only use accessories expressly certified by the manufacturer for combination with the surgical microscopes described in this manual.

Warning!

- With the wide-angle observation system swung out of position, always position the microscope body in such a way that index dot (1) of the microscope's focus is in the middle of triangle (2) of the marking.
- Select a medium magnification (e.g. 1.0).
- Lower the surgical microscope toward the surgical field until you see the patient's cornea sharply defined.
- Turn the locking lever for limiting the downward movement clockwise as far as it will go and check without the patient that the suspension arm cannot be lowered any further.
- It is vital that you read the user manual for the wide-angle observation system used (e.g. BIOM 3 from Oculus).

Phototoxic retinal injury in eye surgery

General

Several papers[1)-5)] dealing with the problem of phototoxicity in ophthalmic surgery have been published. A comprehensive review of these publications reveals five aspects of particular concern:

– Illumination characteristics (spectral composition)

– Illumination intensity

– Angle of illumination

– Focus of the light source

– Exposure time to light

In the following, comments on these aspects are given and a description of how Carl Zeiss, as a manufacturer, makes allowance for them in its systems.

Illumination characteristics (spectral composition)

Studies on exposure of the eye to light of varying spectral composition date back to the early 1950s. These studies suggest that the potential hazard of phototoxic injury to the patient's retina can be reduced by blocking out the blue and ultraviolet light below a wavelength of 475 nm.

Carl Zeiss provides a GG 475 retina protection filter for surgical microscopes recommended for use in ophthalmic surgery. This reduces not only the light exposure of the patient's eye, but also that of the surgeon's.

It should be noted in this context that the use of filters inevitably leads to a change in the color of the light. The surgeon may therefore have to get used to the changed appearance of anatomical structures.

Illumination intensity

The majority of researchers suggest that the surgeon should use the lowest light intensity required at the patient's eye to guarantee good viewing during surgery.

Carl Zeiss has addressed this aspect by providing its systems with a device for continuously varying the brightness of the light source. This permits the surgeon to optimally adapt the light intensity at the patient's eye to the conditions existing in each case.

Angle of illumination

A number of publications[1)-4)] suggest that the microscope should be tilted to reduce the exposure of the macula to direct illumination.

Carl Zeiss ophthalmic surgical microscopes are therefore equipped with the following:

– Tilting mechanism for the microscope body

– Oblique illumination with brightness control

Focus of the light source

Studies show that injuries are likely to occur if the filament of the light source is imaged on the patient's retina. The peak intensity of a filament is considerably higher than that of an even and extended light source such as a light guide.

This is the reason why Carl Zeiss uses fiber optic illumination in its surgical microscope systems.

Exposure time to light

According to some publications, the phakic or aphakic eye should not be exposed to the light source longer than a few minutes. In every operation the exposure of the retina to light is dependent on the type and duration of surgery and on any complications which occur. It is therefore recommended in ophthalmic surgery to keep the light intensity as low as possible, or to use a device which prevents the light from entering through the patient's pupil. Also, the surrounding light sources should not cause additional strain to the patient's eye.

Carl Zeiss has provided an answer to this problem in the form of a swing-in retinal protection device for insertion into the beam path of the surgical microscope. This device ensures total eclipsing of the pupil, preventing light from entering into the patient's eye. It can be swung out when a red reflex is required.

Intensity scale

The intensity scale of our suspension system is calibrated in units of the ”spectrally weighted radiance for the photochemical hazard to the phakic eye (L_B)”[5)].

L_B is the spectral radiance $L(\lambda)$ integrated over the spectral range from 380 nm to 700 nm and weighted using $B(\lambda)$:

$$L_B = \sum_{380}^{700} L(\lambda)\, B(\lambda)\, \Delta\lambda$$

where $B(\lambda)$ is the spectral weighting function for the photochemical hazard of the retina in the phakic eye.

The quantity L_B = 500 mW/cm² sr is the reference value and is defined as 1.0 on the intensity scale of the suspension system[5)] . At this reference value, photoretinitis might be expected to occur as a result of the microscope illumination after a retinal exposure time totaling 10 minutes. This applies to the exposure of a specific point on the retina with an uninterrupted illumination beam. In cataract surgery, instruments such as the phacoemulsification handpiece, the use of fluids in the eye, manipulation in and movements of the eye ensure that the illumination beam path is interrupted. These are factors which considerably increase the period after which photoretinitis might be expected to occur.

In conclusion

Carl Zeiss recommends:

– Use of the GG 475 retina protection filter.

– Reduction of the illumination of the surgical area to the extent required for the patient's safety and for clear microscopic visualization.

– Tilting of the microscope body as required.

– Use of the retina protection device.

– Maximum reduction of the exposure of the patient's eye to light from surrounding light sources.

These measures should help the surgeon to reduce the risk of phototoxic retinal injury in the patient.

Note:
The illumination system of the VISU 160 surgical microscope always contains a UV blocking filter.

The use of this filter ensures that the illumination intensity lies below 50 $\mu W/cm^2$ in the range between 305 nm and 400 nm.

This helps the surgeon to reduce the risk of phototoxic retinal injury in the patient.

List of references

[1] H. Stiller, and B. Rassow, "Light hazards to the patient's retina from ophthalmic instruments," Applied Optics-OT 30, 2187-2196 (1991).

[2] American Conference of Governmental Industrial Hygienists, "Documentation of the Threshold Limit Values for physical agents. 7th Edition," (American Conference of Governmental Industrial Hygienists, Cincinnati, 2001).

[3] S. G. Khwarg, F. A. Linstone, S. A. Daniels, S. J. Isenberg, T. A. Hanscom, M. Geoghegan, and B. R. Straatsma, "Incidence, risk factors, and morphology in operating microscope light retinopathy," Am. J. Ophthalmol. 103, 255-263 (1987).

[4] G. Kleinmann, P. Hoffman, E. Schechtman, and A. Pollack, "Microscope-induced retinal phototoxicity in cataract surgery of short duration," Ophthalmology 109, 334-338 (2002).

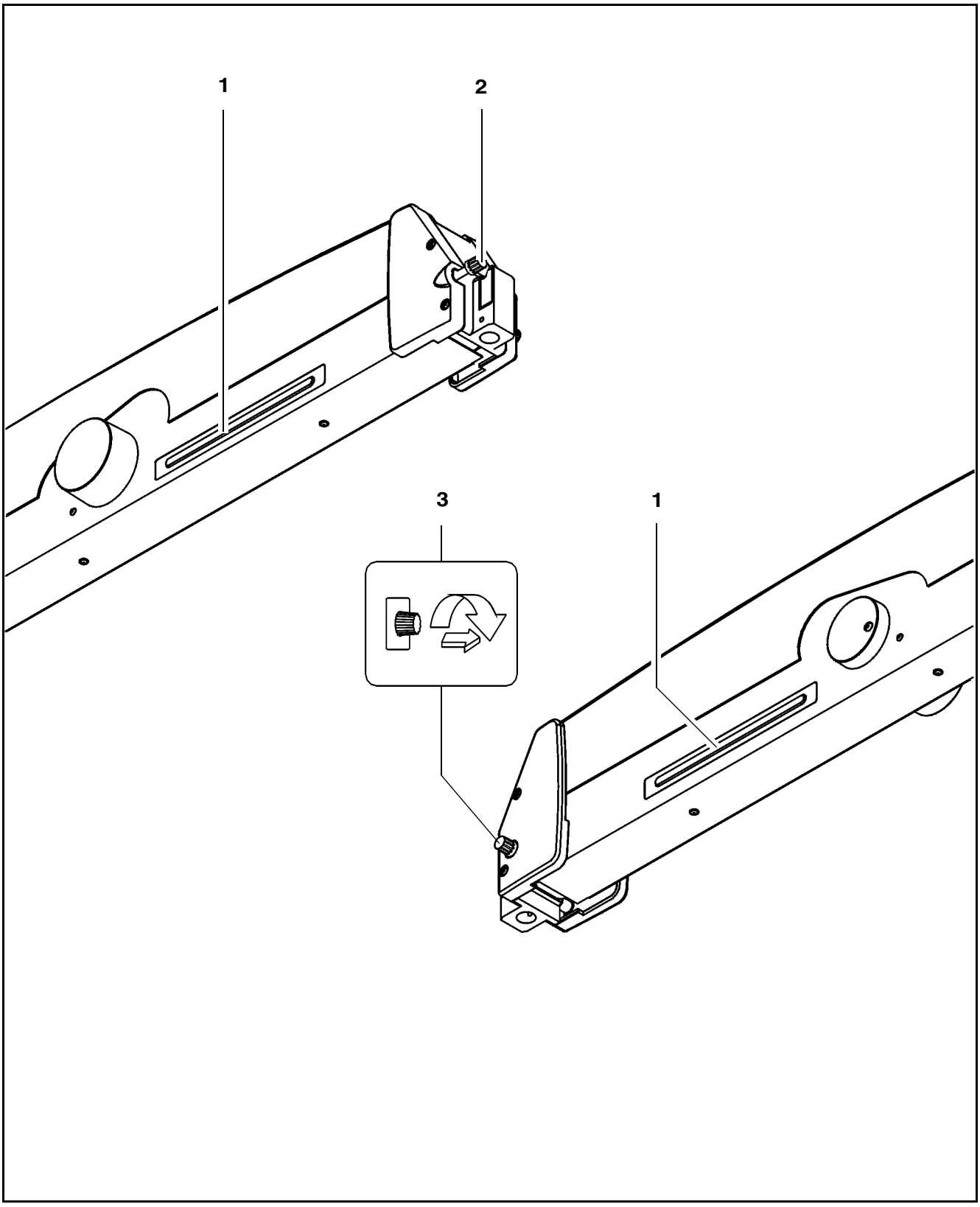
[5] ISO 10936-2:2001. Optics and optical instruments -- Operation microscopes -- Part 2: Light hazard from operation microscopes used in ocular surgery.

Safety devices of the suspension systems

1 Release bar
Allows non-sterile persons to release the magnetic brakes of the suspension system.

2 Adjustment screw for limiting the downward travel
Use this screw to set the minimum vertical distance (working distance) from the surgical field. Check this setting before each surgical procedure.

3 Locking knob
for locking the suspension arm in its horizontal position.
Before removing or attaching a unit (microscope, tube, etc.), move the suspension arm into a horizontal position. Pull out the locking knob and turn it clockwise or counterclockwise through 180°, while slightly moving the suspension arm up and down until the lock engages. When locked, the suspension arm can no longer suddenly spring upward when insufficient weight is attached. After attaching a unit, perform the balancing procedure.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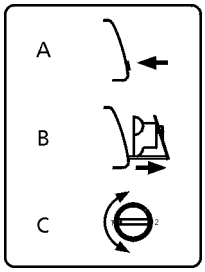
Superlux Eye illumination system

Warning!
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

Change the xenon lamp in good time.



1 Switching to the backup lamp
The lamp module contains two xenon lamps. The second lamp is used as a backup lamp which has to be swung into the illumination beam path when the first lamp fails.
If the xenon lamp fails, open the lamp module as follows:
Press button (6). The lamp module is slightly ejected. Pull out the lamp module as far as it will go. Turn knob (1) through 180° until it snaps in. This moves the backup lamp into the illumination beam path. Push the lamp module all the way back into the lamp housing.

2 Filter selector knob
The filter knob has two positions:

0 no filter

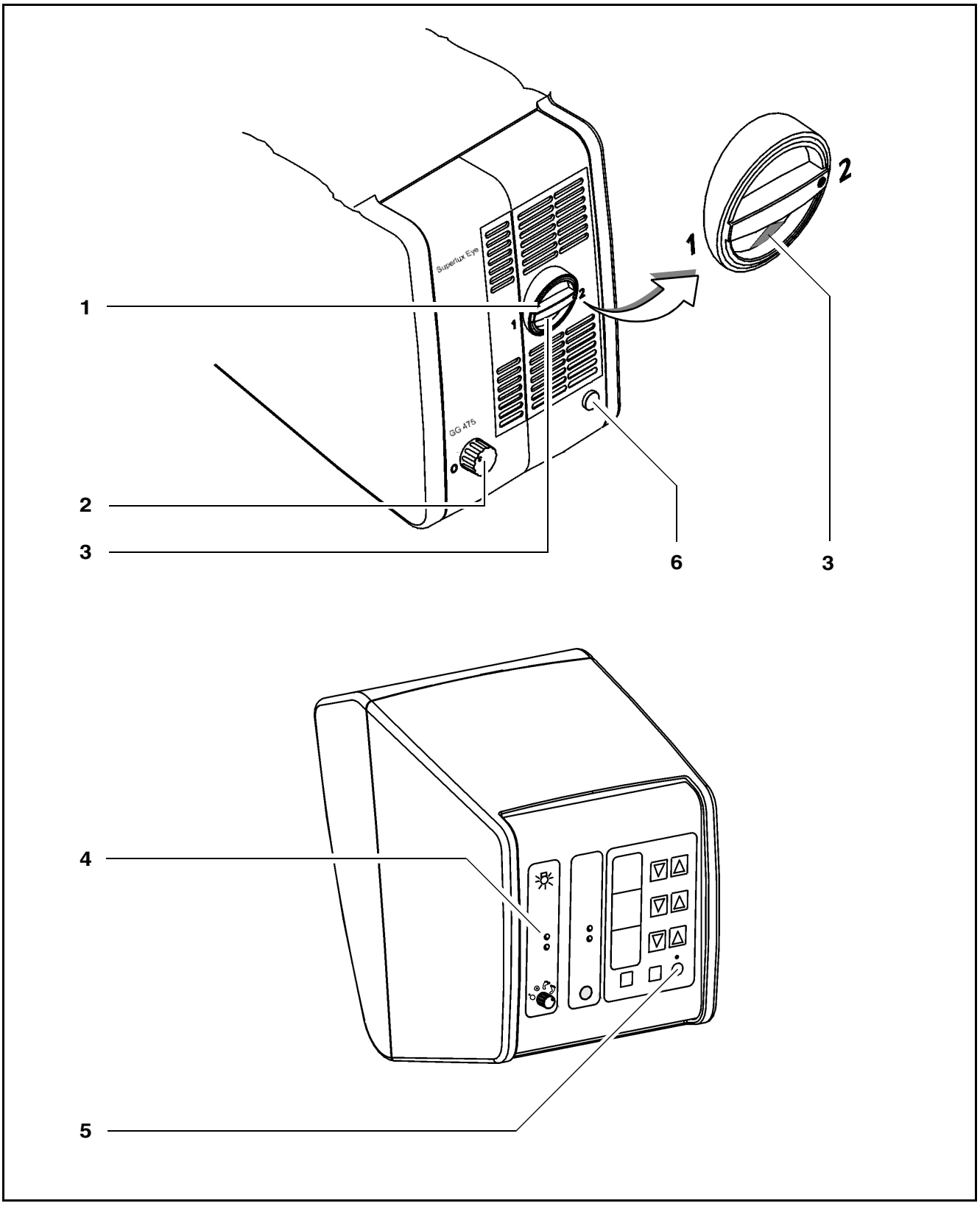
1 GG 475 filter swung in

3 Indicator: backup lamp is in use
When the red segment in knob (1) lights up, the backup lamp is in use.

Note:
If the first lamp has failed and the backup lamp is in use, make sure to have a backup lamp module ready at hand as a precaution.

4 Yellow indicator lamp
Lights when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp goes out again.

5 Manual function
When the manual function has been activated, all electrical control systems are inoperative. The lamp brightness is automatically adjusted to a fixed setting.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Superlux Eye
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Halogen illumination system

1 Flap
The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative.
- When the flap is open, the main lamp has failed. The backup lamp is on.

2 Activating the backup lamp
The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. If this automatic function fails, you can switch on the backup lamp by pressing this button.

3 GG 475 retina protection filter
When operating on the eye, always use a GG 475 protection filter to ensure that the patient's retina is not exposed to unnecessary (blue) radiation (risk of retinal injury). The filter knobs have four positions:

0 no filter

1 GG 475 filter: to protect the patient's eye during surgery against unnecessary (blue) radiation (retinal injury).

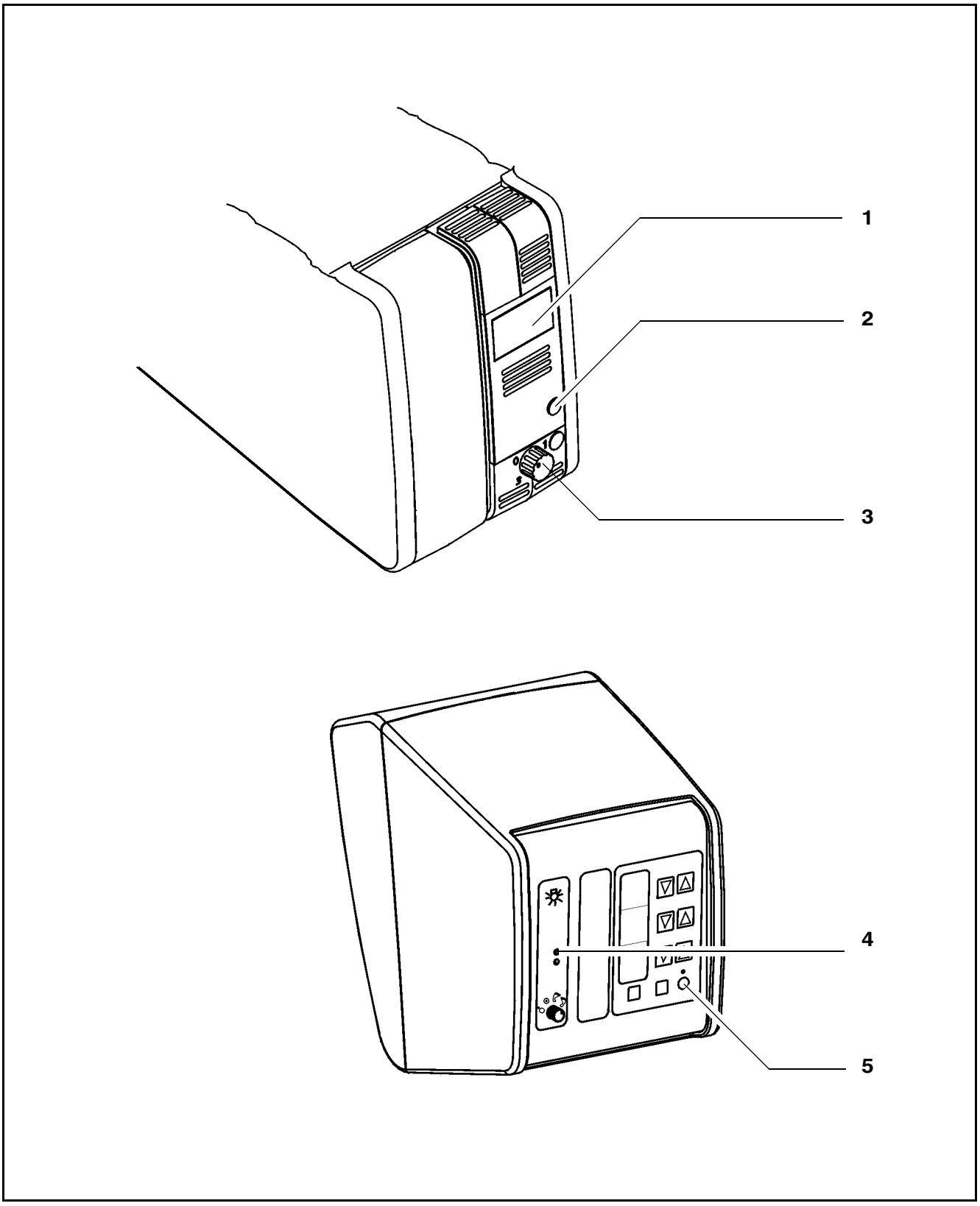
2 KK 40 filter: to increase the color temperature

3 no filter

4 Yellow indicator lamp

- Lights when the main lamp has failed. In addition, open flap (1) on the lamp module indicates that the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.

5 Manual function
When the manual function has been activated, all electrical control systems are inoperative. The lamp brightness is automatically adjusted to a fixed setting.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Superlux Eye illumination system with additional integrated halogen illumination (option)

Warning!
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

Change the xenon lamp in good time.

1 Flap
The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative.
- When the flap is open, the main lamp has failed. The backup lamp is on.

2 Activating the backup lamp
The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. If this automatic function fails, you can switch on the backup lamp by pressing this button.

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When operating on the eye, always use a GG 475 protection filter to ensure that the patient's retina is not exposed to unnecessary (blue) radiation (risk of retinal injury). The filter knobs have four positions:

0 no filter

1 GG 475 filter: to protect the patient's eye during surgery against unnecessary (blue) radiation (retinal injury).

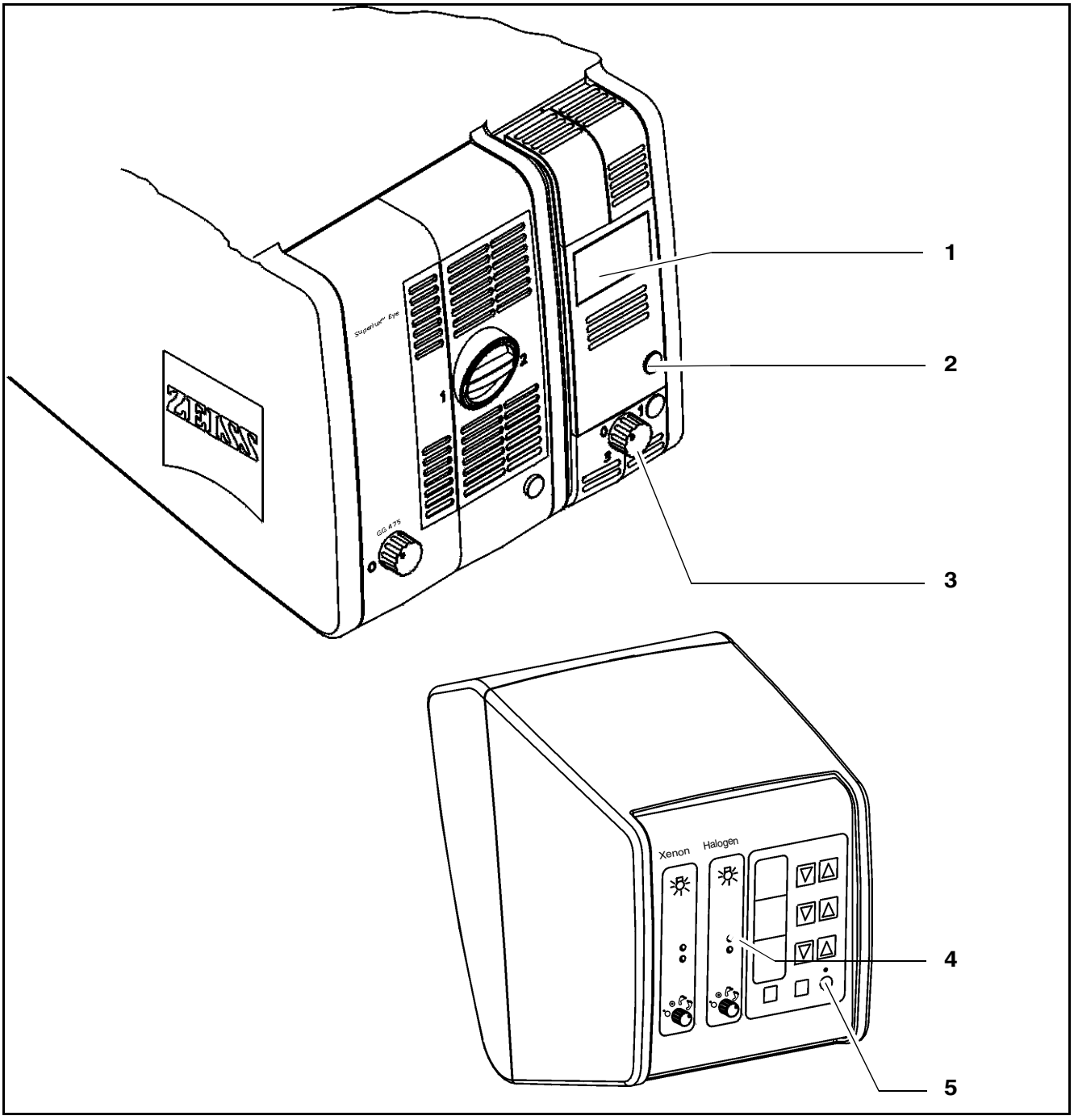
2 KK 40 filter: to increase the color temperature

3 no filter

4 Yellow indicator lamp

- Lights when the main lamp has failed. In addition, open flap (1) on the lamp module indicates that the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.

5 Manual function
When the manual function has been activated, all electrical control systems are inoperative. The lamp brightness is automatically adjusted to a fixed setting.


ZEISS
Xenon
Halogen
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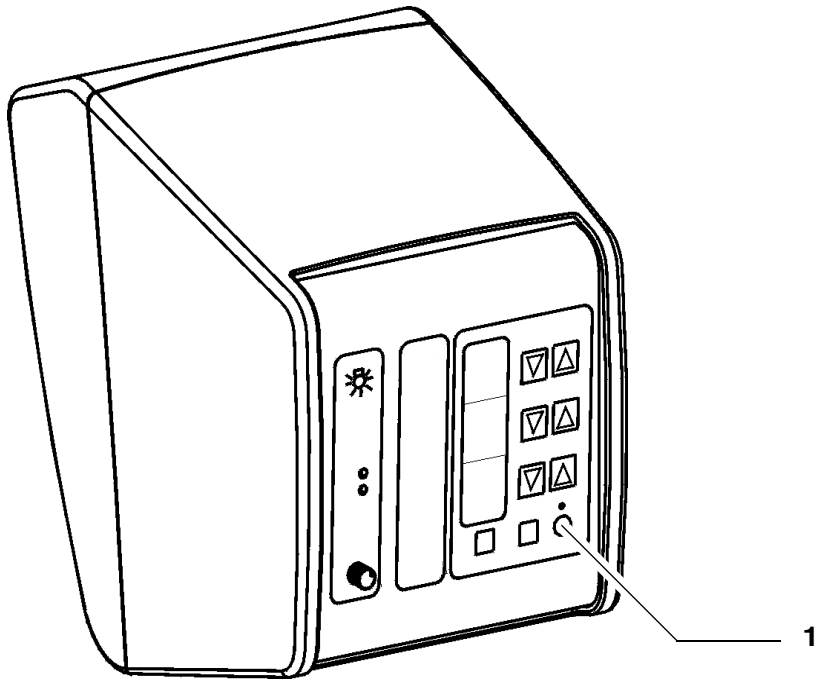
Manual function

1 Manual key
The Manual key permits you to switch to manual operation. The motorized control functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a fixed setting, the value being shown in the first display section.
When the manual mode is activated, the yellow LED is lit and the word "MANUAL" blinks in the third display section.

The surgical microscope can no longer be operated via the foot control panel, the handgrips or the display and key field.
In the manual mode, you can only switch the illumination on and off on the foot control panel and release the magnetic brakes by pressing the appropriate key on the surgical microscope.

The manual mode is retained even if you turn the power switch of the instrument off and on again.

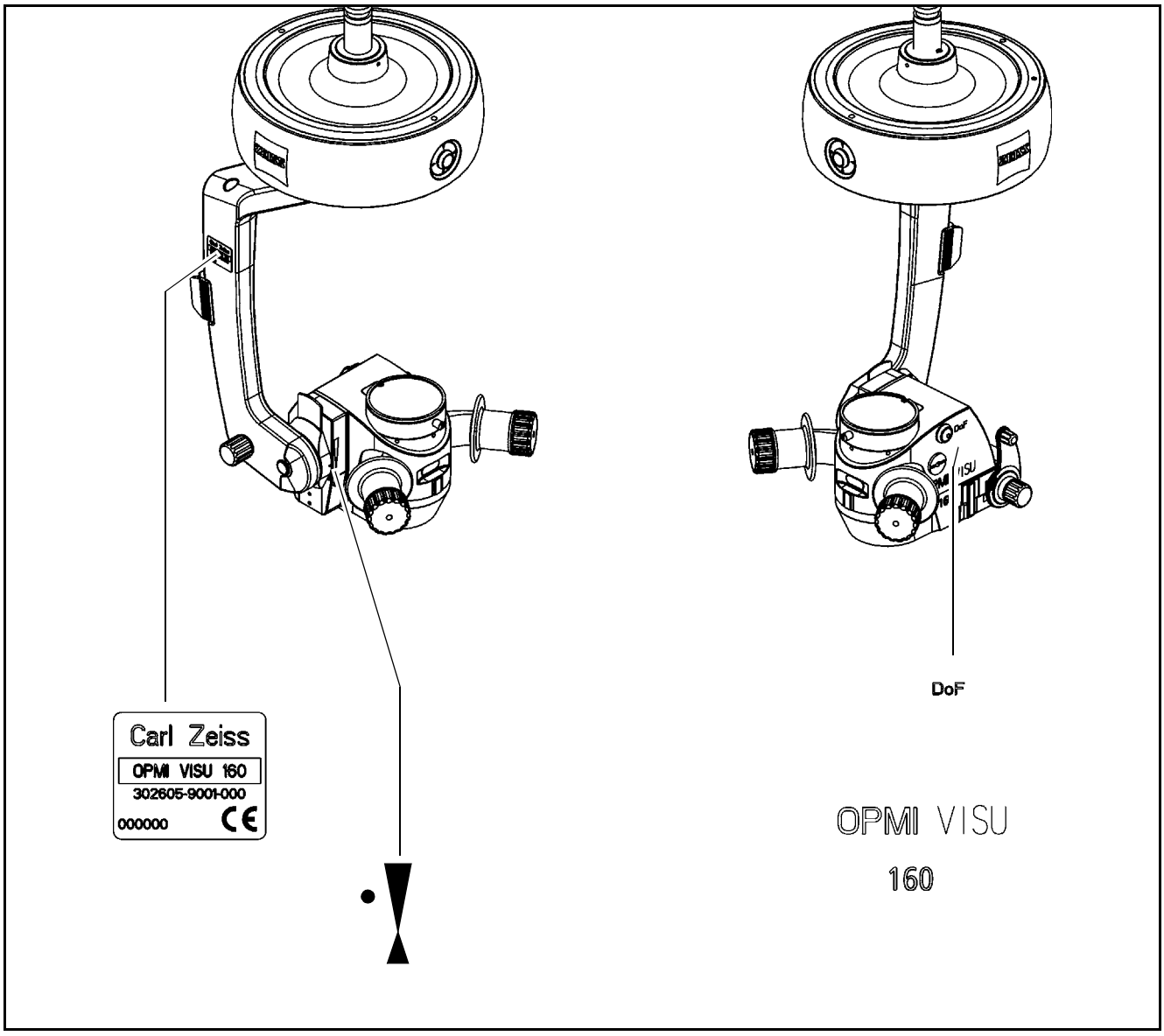
Press the Manual key once again to reactivate electronic control; the display in the display and key field then returns to the basic mode.


1

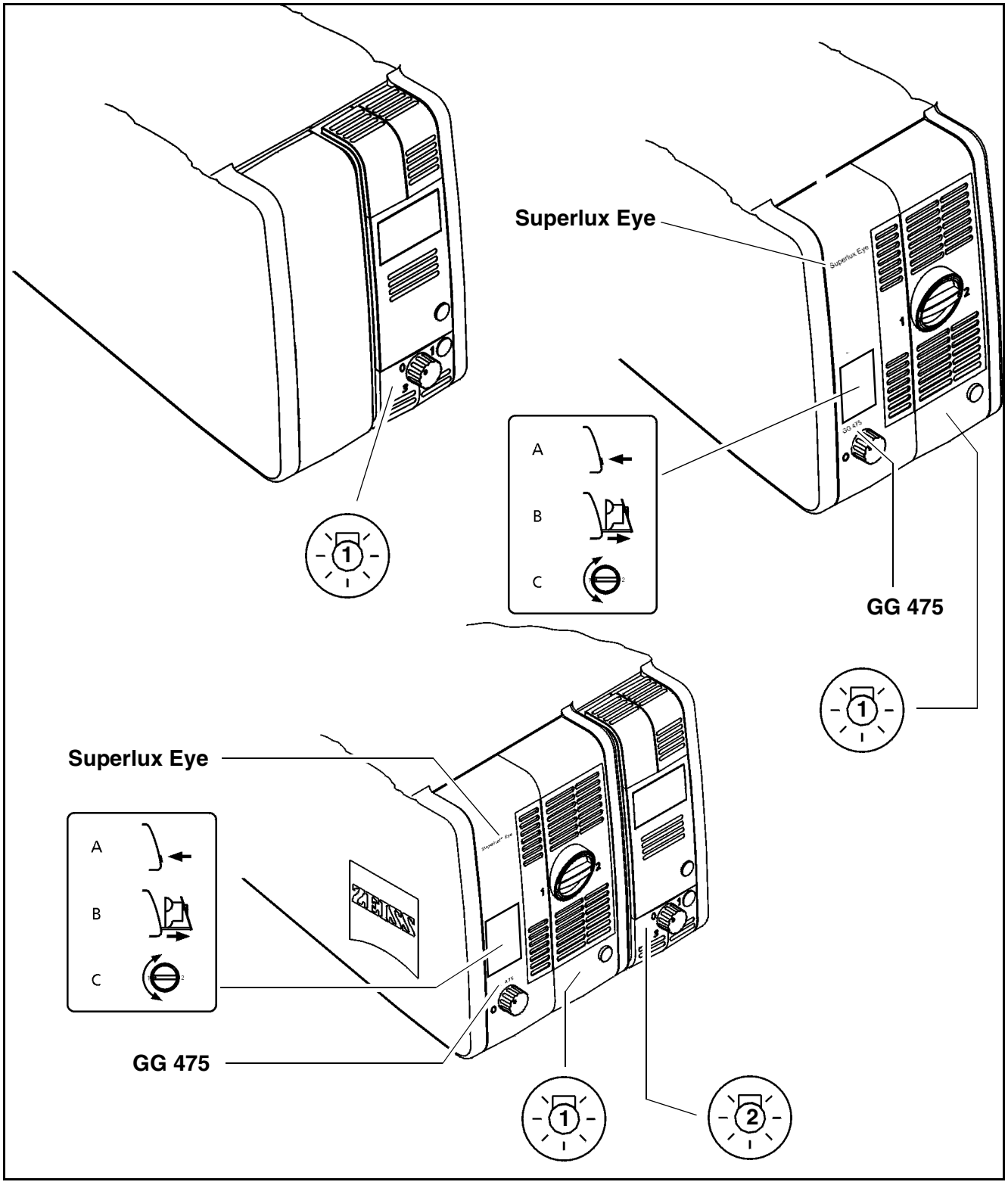
Warning labels and notes

Caution:
Observe all warning labels and notes!
If any label is missing on your instrument or has become illegible, please contact us or one of our authorized representatives. We will supply the missing labels.

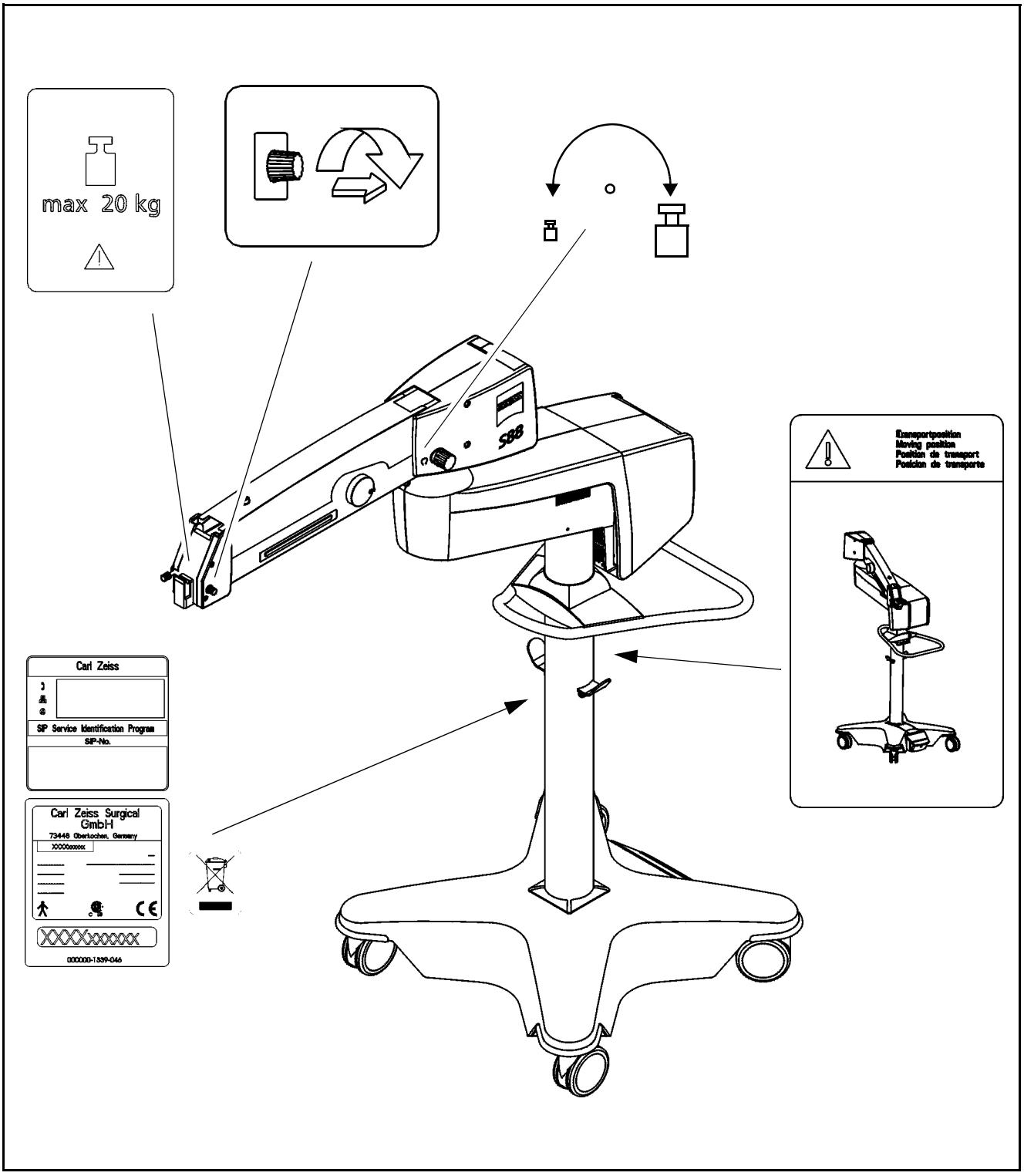
OPMI VISU 160



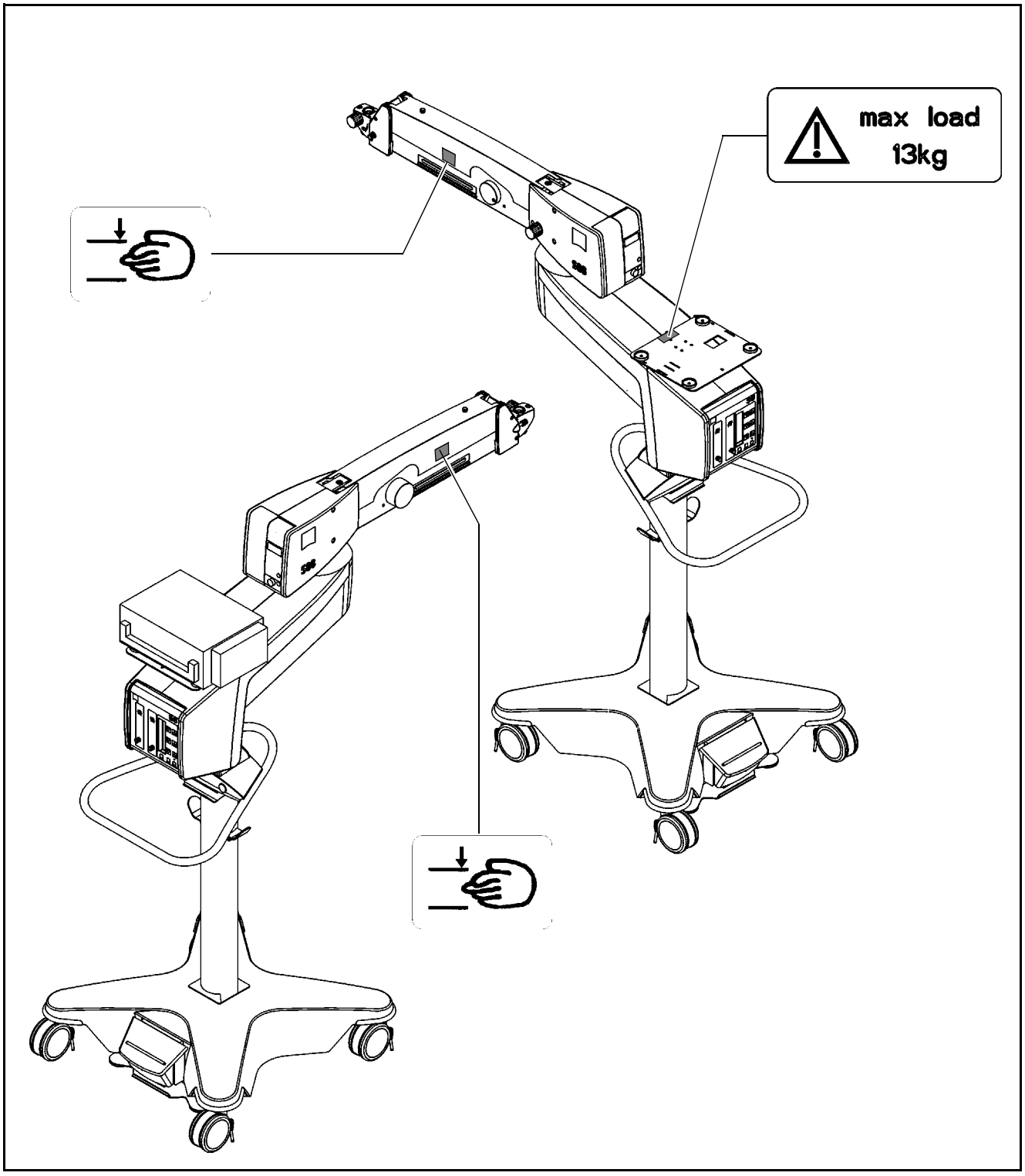
Illumination systems



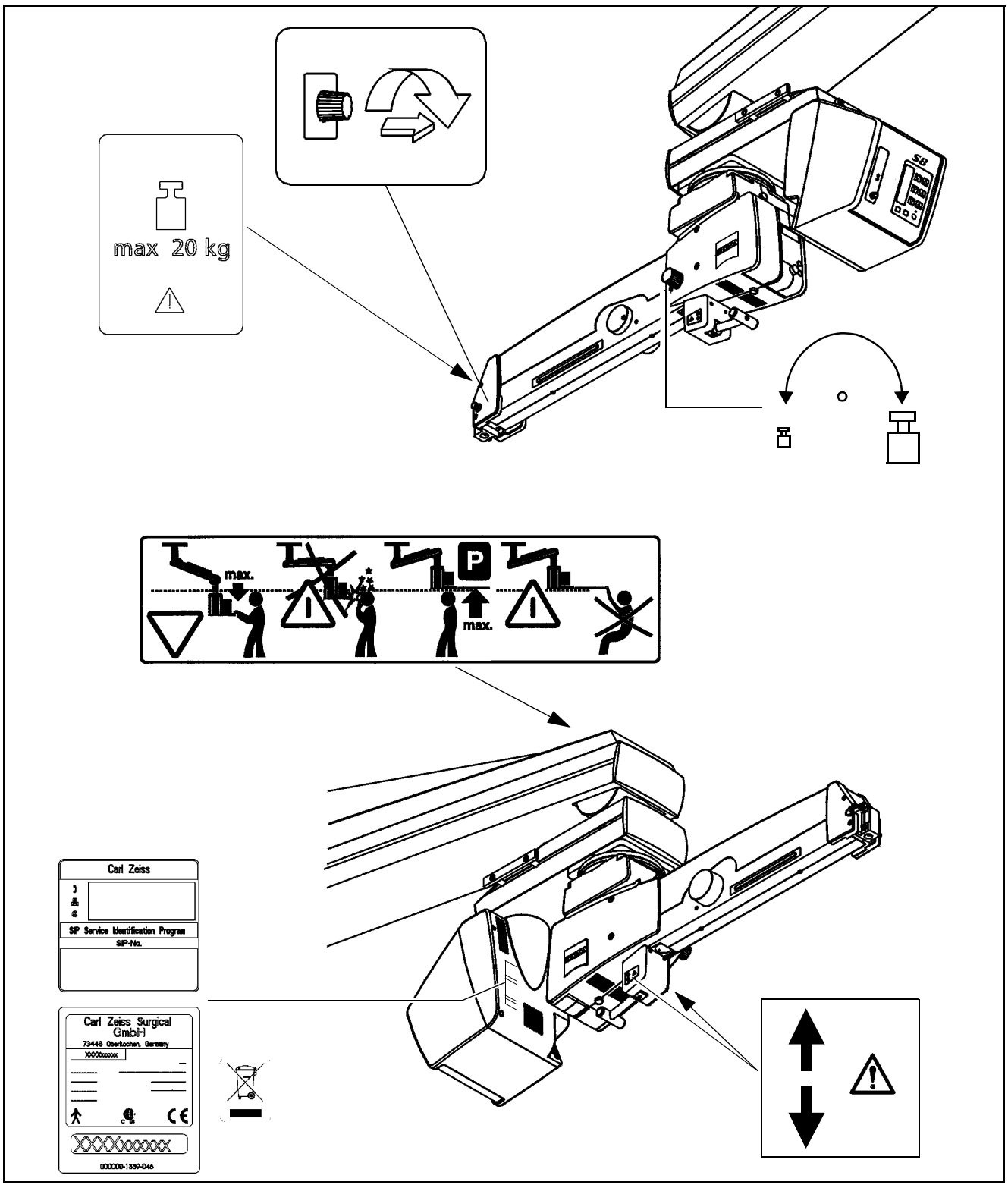
S88 floor stand



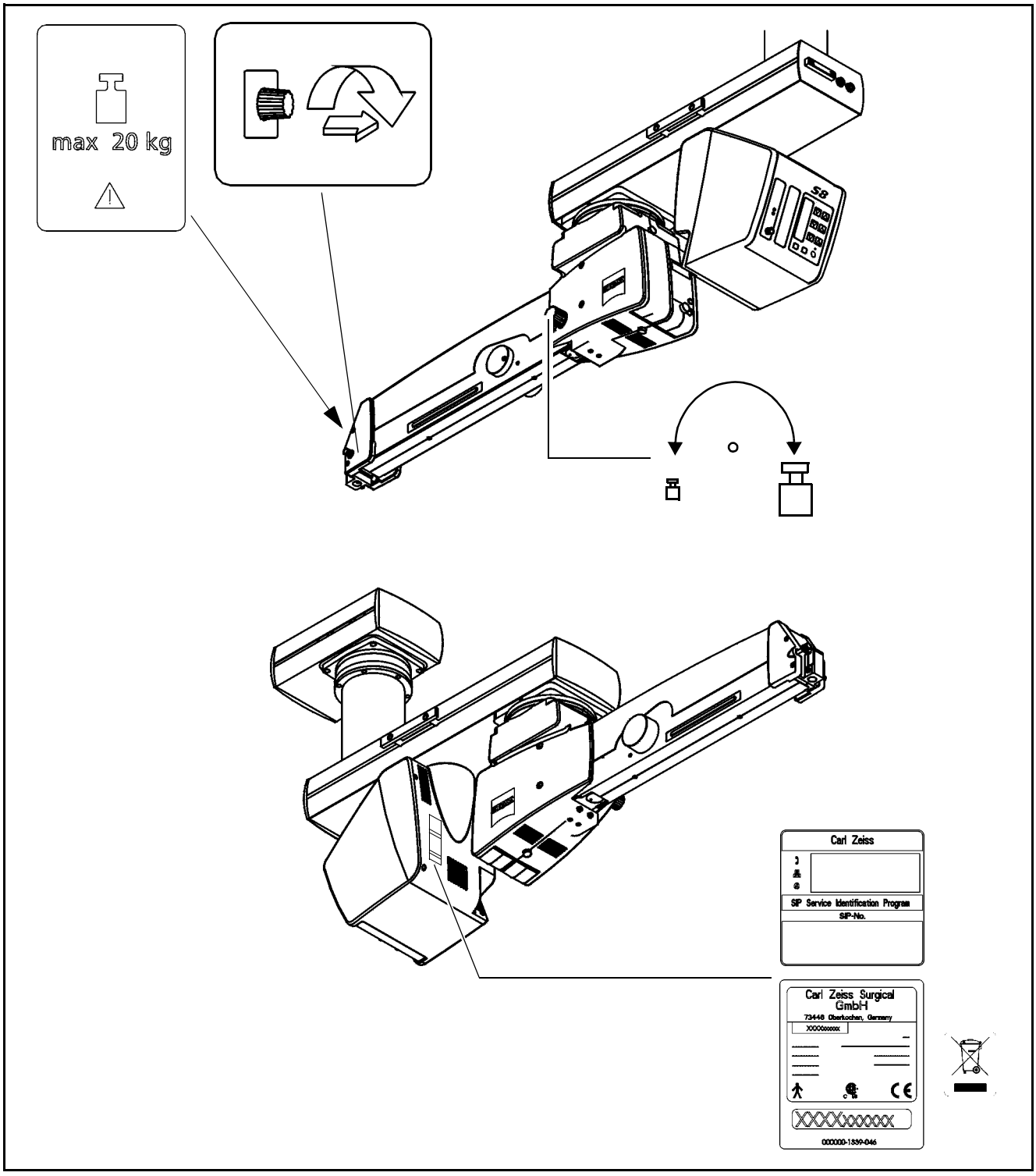
S88 floor stand with instrument tray option



S8 ceiling mount



S81 ceiling mount



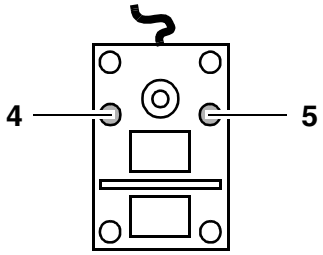
Description

VISU 160 surgical microscope

Intended use

The VISU 160 surgical microscope has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology.

Description of the modules

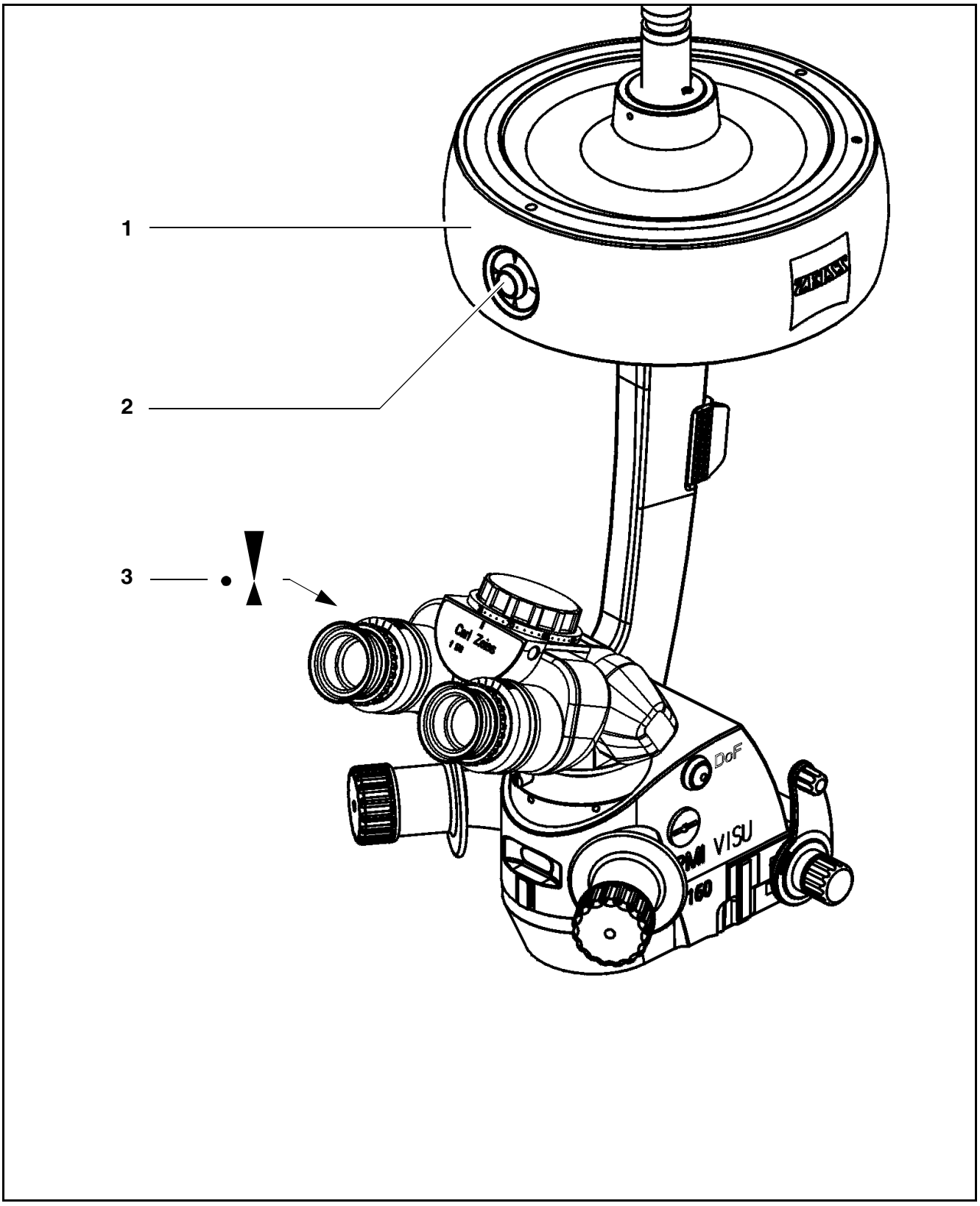


The VISU 160 surgical microscope is comprised of the following modules:

1 X-Y coupling
The X-Y coupling allows motorized fine positioning of the surgical microscope in a horizontal plane. The range of travel is 40 mm x 40 mm. The speed of travel can be set on the control panel of the suspension system.

The X-Y coupling is provided with a recentering mechanism. When you press actuator button (2) or button (4) or (5) of the foot control panel,

- the X-Y coupling adopts its center position,
- the focusing system of the surgical microscope is set to its initial position (3), if the XY-RES function has been selected in configuration mode 1, see page 167.
- the zoom system is set to a preselected magnification factor, if the XYZ-RES function has been selected. This function is only available with the S88 floor stand.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DoF
OPMI VISU
160

2 Support arm for the surgical microscope
The support arm incorporates a tilt device. This allows the viewing direction of the surgical microscope to be adapted to the requirements of the surgical field. Using the knob for fine tilt, you can position the surgical microscope in a range from +180° to -180° (+ in the direction of the surgeon and - in the opposite direction). The +90° setting is ideal for surgery on patients in a seated position or lying on their side.

Caution:
Do not tilt the microscope beyond + / - 180°, as this could damage the microscope cable or the light guide.

3 Surgical microscope
The apochromatic optics of the microscope provide superb optical quality. The microscope image displays optimum contrast and excellent detail recognition along with a large depth of field. The bright microscope image is a particular benefit in vitreoretinal surgery. A 1:6 ratio zoom system allows the magnification of the overall system to be set as required by the surgical procedure.

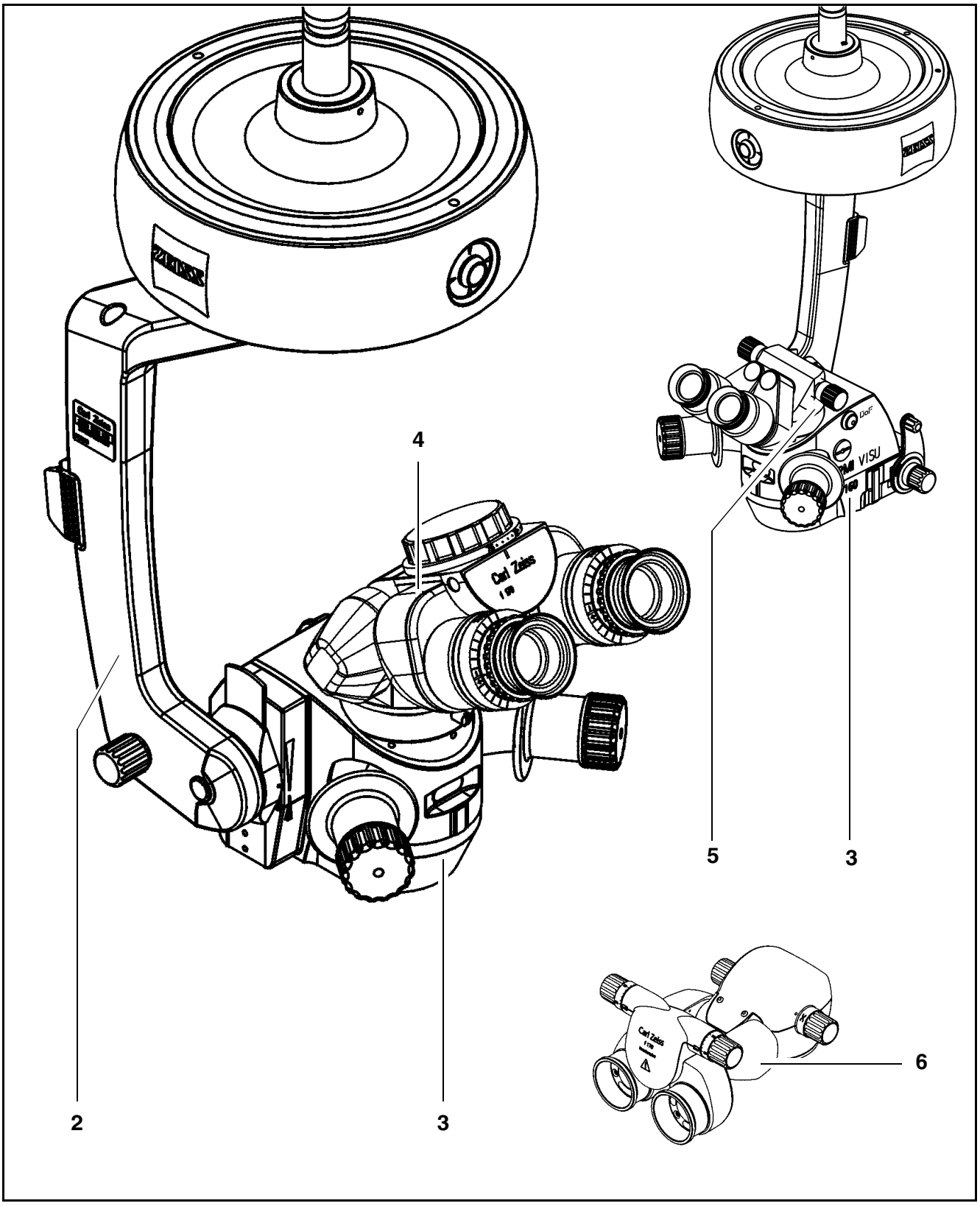
Two apochromatic objective lenses with focal lengths of 175 mm and 200 mm are available for different working distances.

4 180° tiltable binocular tube
Due to its large tilt range, the tiltable binocular tube allows optimum adaptation to extreme surgical conditions.

5 Inclined binocular tube (option)
This tube is used as a viewing device for the surgeon. The viewing angle of 45° allows work with minimum fatigue.

6 Invertertube (option)
The tiltable tube offers an inverter function for ophthalmic use. The inverter is used to bring an inverted image created by a wide-angle observation system into the correct position.
With the inverter deactivated, the tiltable tube has the optical function of a normal tiltable tube.

The standard equipment includes eyepieces with a magnification factor of 12.5x (option: 10x).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Illumination system

The illumination system has been designed for use in ophthalmology. A light guide directs the light from the light source in the suspension system to the surgical microscope.

A retinal protection device is provided to protect the patient's eye from photoretinitis. This device can be swung into the beam path if no red reflex is required.

At the light source integrated in the suspension system, a GG 475 eye protection filter can be swung into the beam path. This filter markedly reduces the exposure of the patient's and surgeon's eyes to light.

Warning!

– Avoid looking directly into the light source, e.g. into the microscope objective lens or into the light guide!

– Adjust the intensity of the illumination of the patient's eye through the surgical microscope in such a way that the fundus is exposed to as little light as possible.

– If no red reflex is required, swing the retinal protection device into the beam path. Only use the retro-illumination contrast-enhancing stop (see page 64) if the procedure requires a red reflex.

– When operating on the eye, always use a GG 475 protection filter to ensure that the patient's retina is not exposed to unnecessary (blue) radiation (risk of retinal injury).

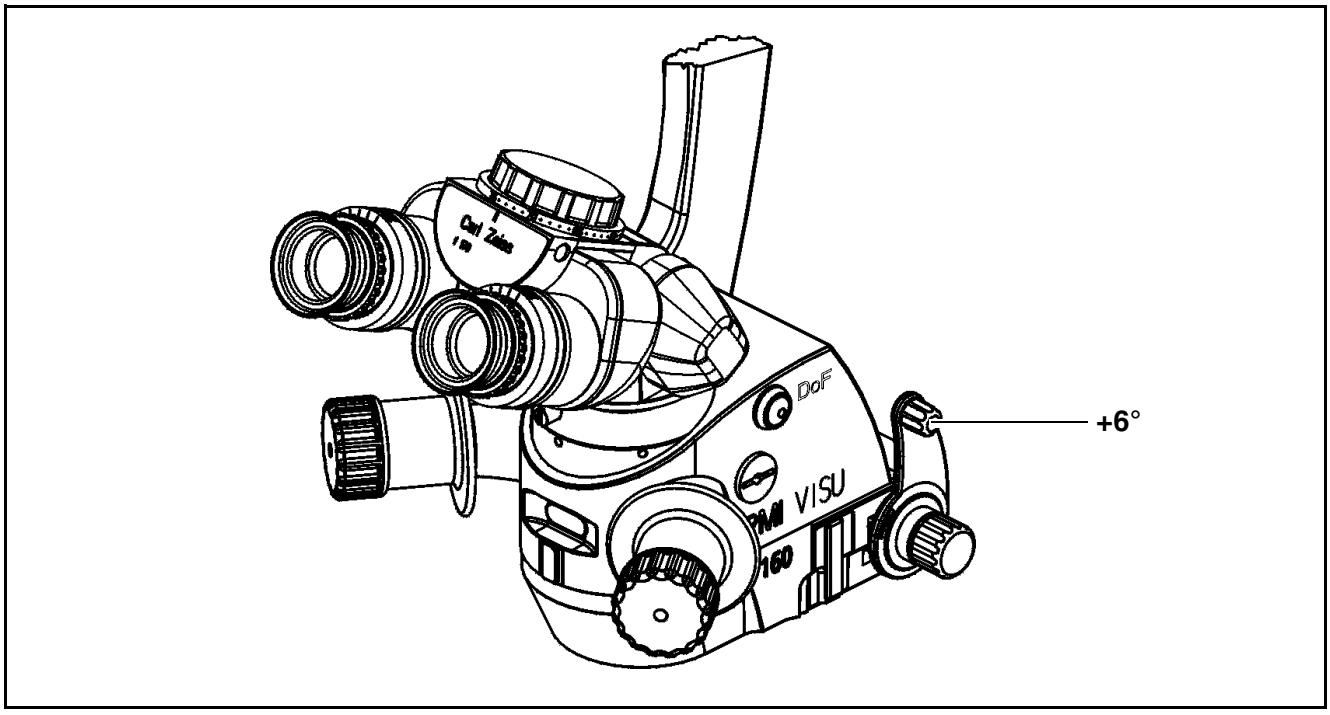
6° illumination

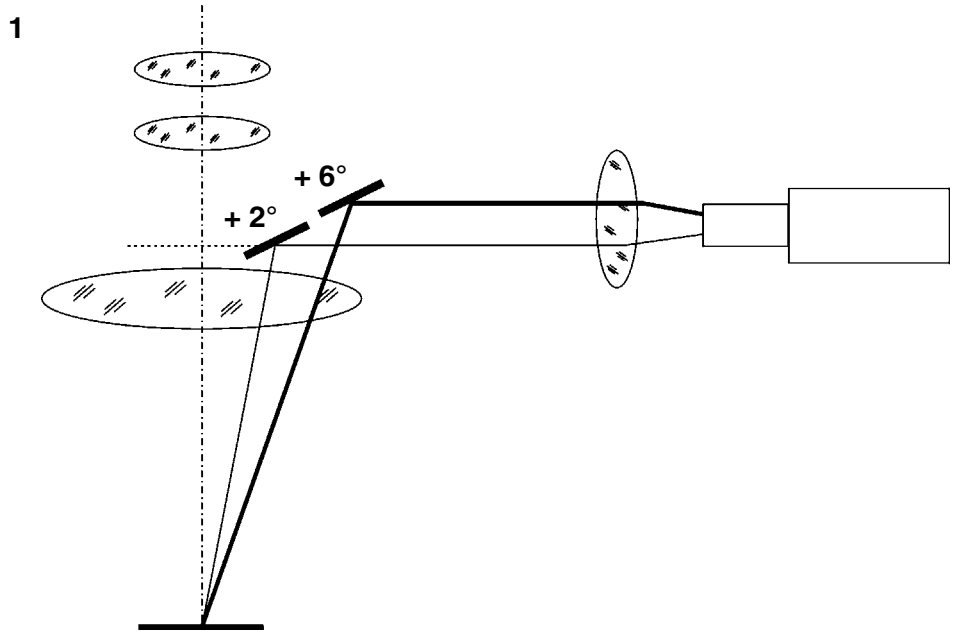
The 6° illumination can be faded out continuously. The result is a significantly reduced illumination reflex on the cornea. Despite this, the image provides high contrast and a high information content.

A slight opening (approx. 1/4) of the 6° illumination is ideal for cataract surgery.

2° illumination

2° illumination (1) provides a clearly visible red reflex. An optimized red reflex can be obtained by fading out the 6° illumination.




1
+ 6°
+ 2°

Controls, displays, connections

1 Securing screw

2 X-Y coupling

3 Actuator button

– recenters the X-Y coupling.

– resets the focus to its initial position in the focusing range

Note:
Press this button to start the recentering movement. To stop this movement, press the button again.

You can also stop the recentering movement by briefly tipping on one of the direction keys on the foot control panel.

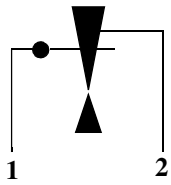
4 Cable and light guide clip

5 Support arm with tilt device

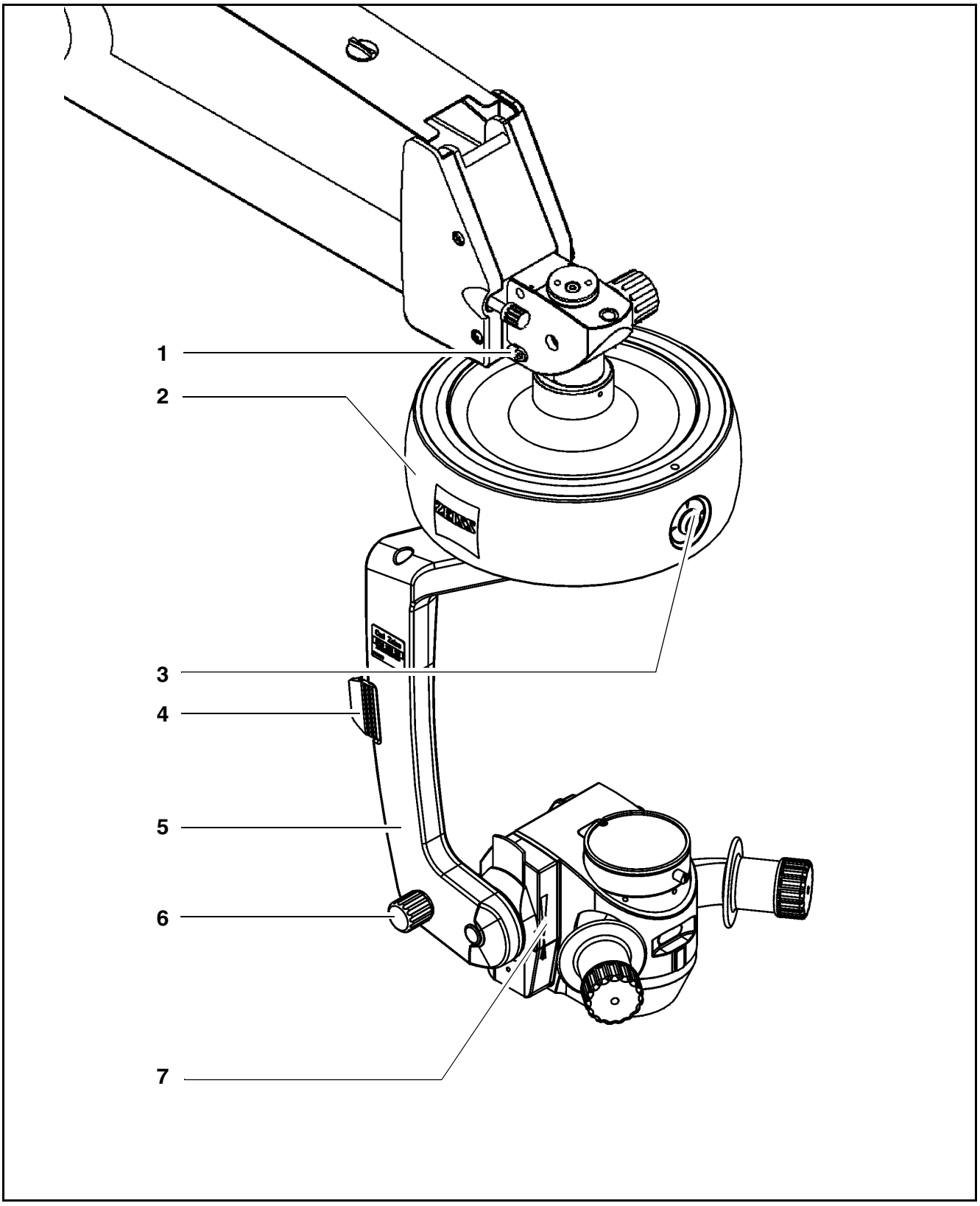
6 Knob
for setting the tilt angle of the surgical microscope;
+ 180° in the direction of the surgeon,
- 180° in the opposite direction.

7 Arrows indicating the focusing range
If the dot is located between the two arrow tips, the focusing system of the surgical microscope is in its starting position.

When using a wide-angle observation system



With the wide-angle observation system swung out of the beam path, always position the microscope body in such a way that index dot (1) for the microscope's focus is in the middle of triangle (2) of the marking (also see page 27).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8 Dust cover

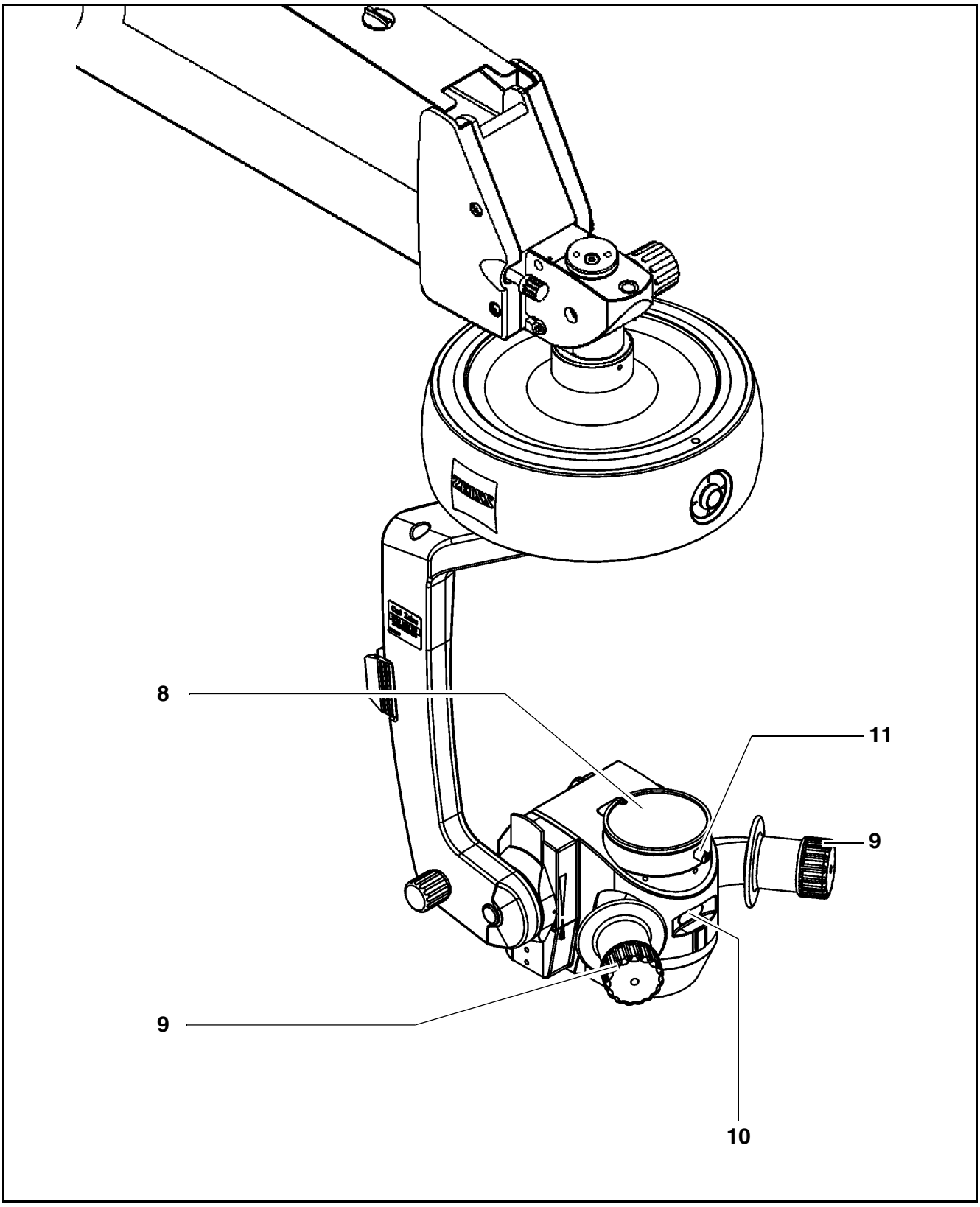
9 Handgrips with turning function for the release of the magnetic brakes of the suspension system (function only available on suspension systems with magnetic brakes)

For as long as you turn the left and/or right handgrip to the left or right and keep them in their turned position (turning function), the magnetic brakes of the suspension system are released.

– Handgrip turned and held in turned position	Magnetic brakes are unlocked, the instrument can be moved as required.
– Handgrip not turned	Magnetic brakes are locked, the instrument cannot be moved.

10 Display of the zoom system's magnification factor

11 Securing screw


8
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12 DeepView button
Permits the selection of different modes. When you switch on the system, the mode for transmission optimization is set by default. This mode is recommended for viewing the posterior segment of the eye. Press the button to activate the mode for depth of field optimization. The green LED in the button is lit. This mode is recommended for viewing the anterior segment of the eye.

The next time the system is switched on, the mode last selected will be activated.

13 Manual adjustment of the zoom system

14 Adjusting lever for 6° illumination
for gradual fading in/out the coaxial illumination. Fading out the 6° illumination improves the visualization of structures in retro-illumination.

15 Aperture selector


Retro-illumination contrast-enhancing stop.
This stop reduces the straylight reflected from the sclera.
Diameter approx. 16 mm (with objective lens f = 200 mm): Clear aperture.
Outside the diameter of approx. 16 mm: Partially transmitting periphery.


Clear aperture. The field of view is fully illuminated.

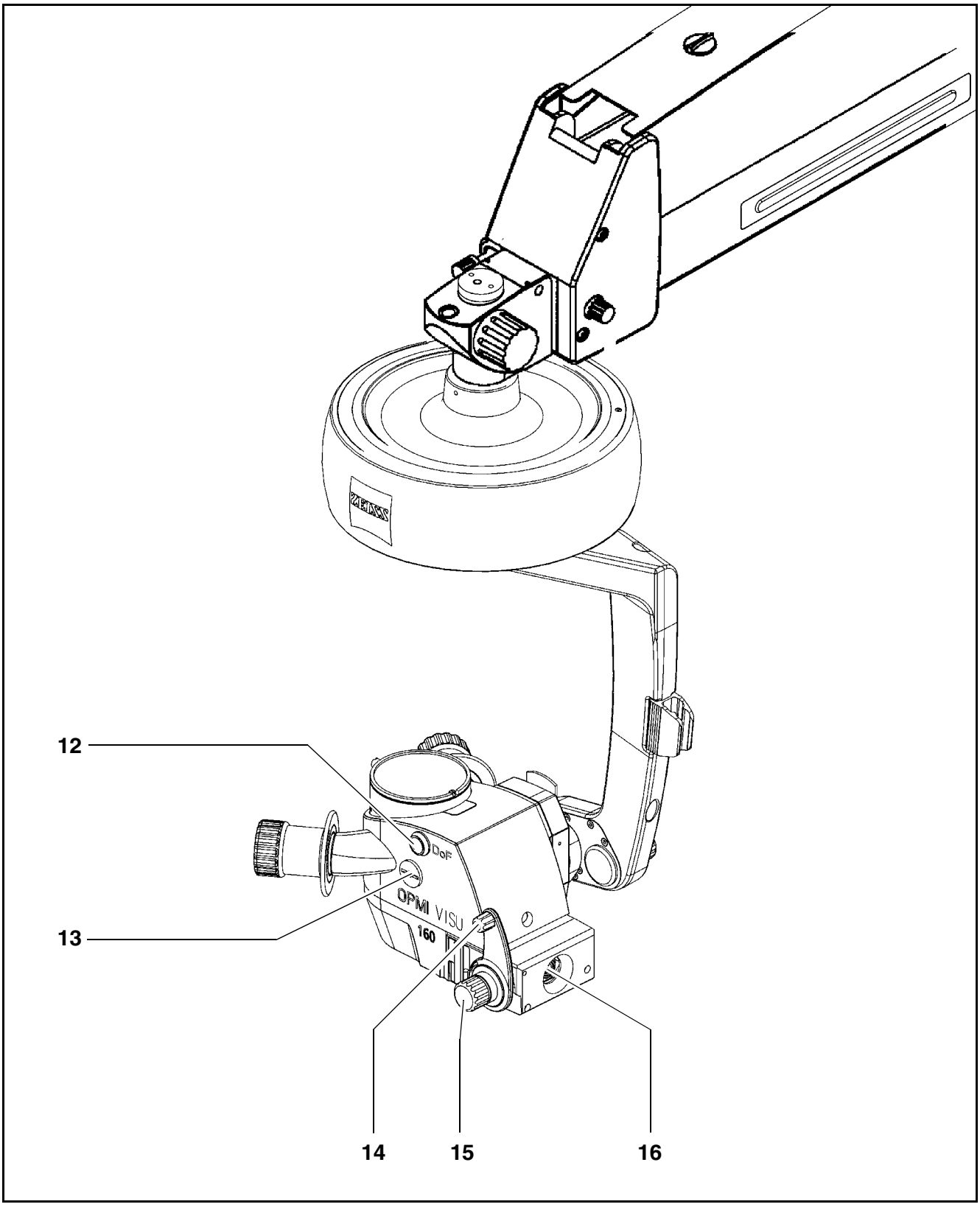

Retinal protection device. This device does not snap in, i.e. it can be moved continuously in the image.


Horizontal slit with a width of 2.5 mm. The slit can be continuously moved in the vertical direction in the field of view.


Horizontal slit with a width of 5 mm. The slit can be continuously moved in the vertical direction in the field of view.


Vertical slit with a width of 2.5 mm. The slit snaps in at the center of the field of view.

16 Light guide socket


12
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16
DoF
OPMI VISU
160

Binocular tubes and eyepieces

You can mount a 180° tiltable tube, an Invertertube or a 45° inclined tube on the VISU 160 surgical microscope as required (see the following pages).

180° tiltable tube

1 PD adjustment knob
The correct position has been reached when the two eyepiece images merge into one. You can read off the interpupillary distance set on the adjustment knob.

2 180° tiltable tube

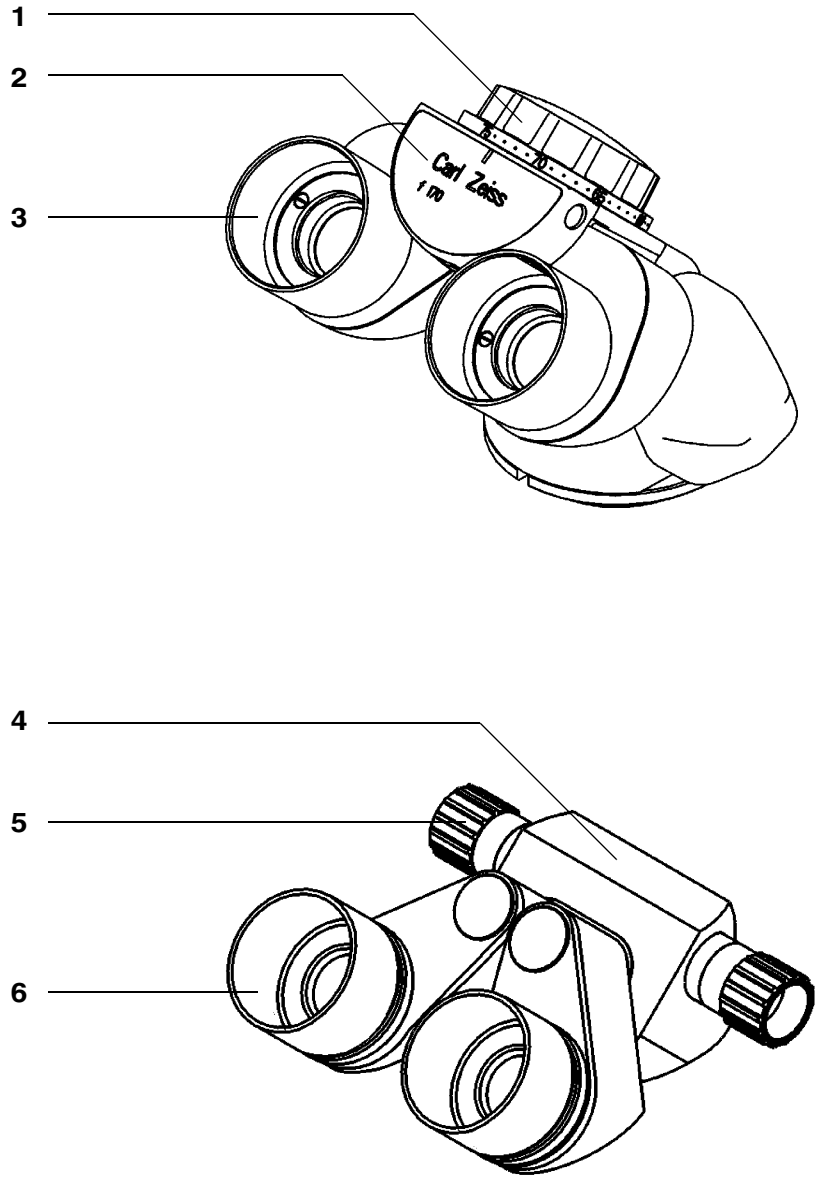
3 Eyepiece mount

45° inclined tube

4 45° inclined tube

5 PD adjustment knob
The correct position has been reached when the two eyepiece images merge into one. You can read off the interpupillary distance set on the adjustment knob.

6 Eyepiece mount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Carl Zeiss
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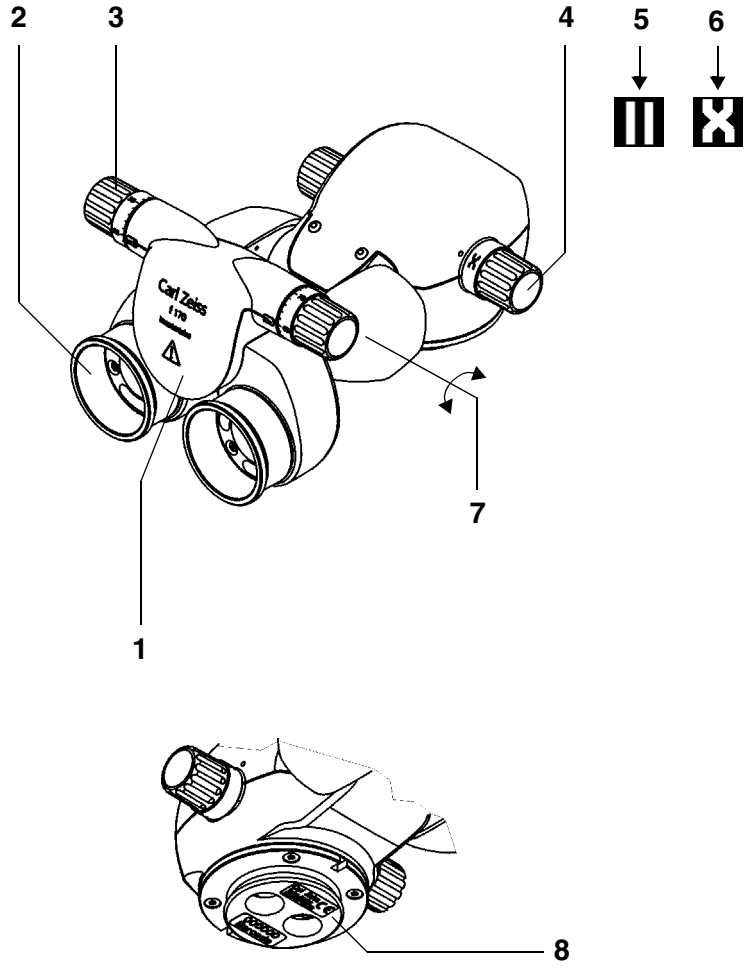
Invertertube (option)

The tiltable tube has an inverter function and has been designed for ophthalmic use. Many wide-angle observation systems for the posterior segment of the eye provide an inverted intermediate image which is viewed through the microscope. The inverter is used to erect an inverted image.
When activating the wide-angle observation system, you must also activate the inverter of the tiltable tube. When swinging out the wide-angle observation system, you must also deactivate the inverter of the tiltable tube again.
With the inverter deactivated, the tiltable tube has the same optical function as a normal tiltable tube.
To ensure sterility, the controls can be equipped with sterilizable caps.

1 Invertertube - 110° tiltable binocular tube
2 Eyepiece mount
3 Knob for setting the interpupillary distance (54 mm to 76 mm)
The correct position has been reached when the two eyepiece images merge into one.
4 Inverter selection knob
The inverter can be turned about 360° and snaps in at the two defined positions.
5 Symbol for **deactivated** inverter on the inverter selection knob
6 Symbol for **activated** inverter on the inverter selection knob
7 Tilt axis
-10° to +100°

8 Cat. No.
If you have any questions for our service staff, please always specify the relevant Cat. No.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Widefield eyepieces with magnetic coupling

Note:
When you remove these eyepieces from the tube, please note that they are fitted with a magnetic coupling. When mounted, the eyepieces display a very weak magnetic field, so that the usual rules for the handling of magnets must only be observed with eyepieces which have not been mounted on the microscope:

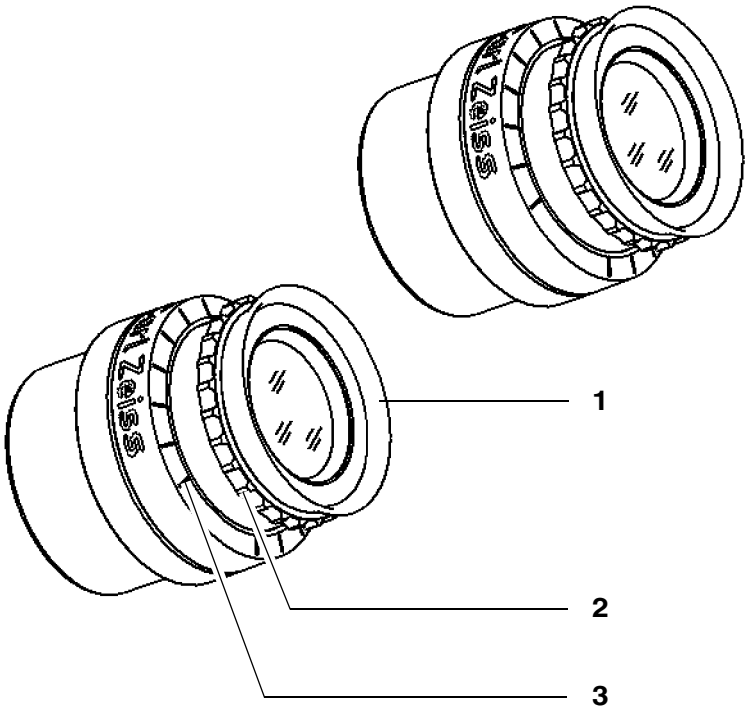
- Do not place the eyepieces close to instruments where there is any risk of magnetization.
- Do not place the eyepieces on sensitive electronic units such as infusion pumps, cardiac pace-makers, measuring instruments or magnetic data carriers such as disks, audiotapes and videotapes, or credit cards.
- Always store eyepieces not used in their original packaging.

1 Eyecup
Always adjust the eyecups in such a way that you can see the full field of view.

- Viewing with eyeglasses: Screw in the eyecups all the way.
- Viewing without eyeglasses: Screw out the eyecups until you see the full field of view.

2 Diopter adjustment ring
The eyepieces provide ametropia compensation between -8 D and +5 D. Eyeglass wearers who perform surgery wearing their glasses set the diopter adjustment ring to 0 D. Turn the ring until you have obtained the optimum setting. An integrated brake holds the ring in the position set.

3 Diopter scale
for reading the prescription set.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Illumination systems

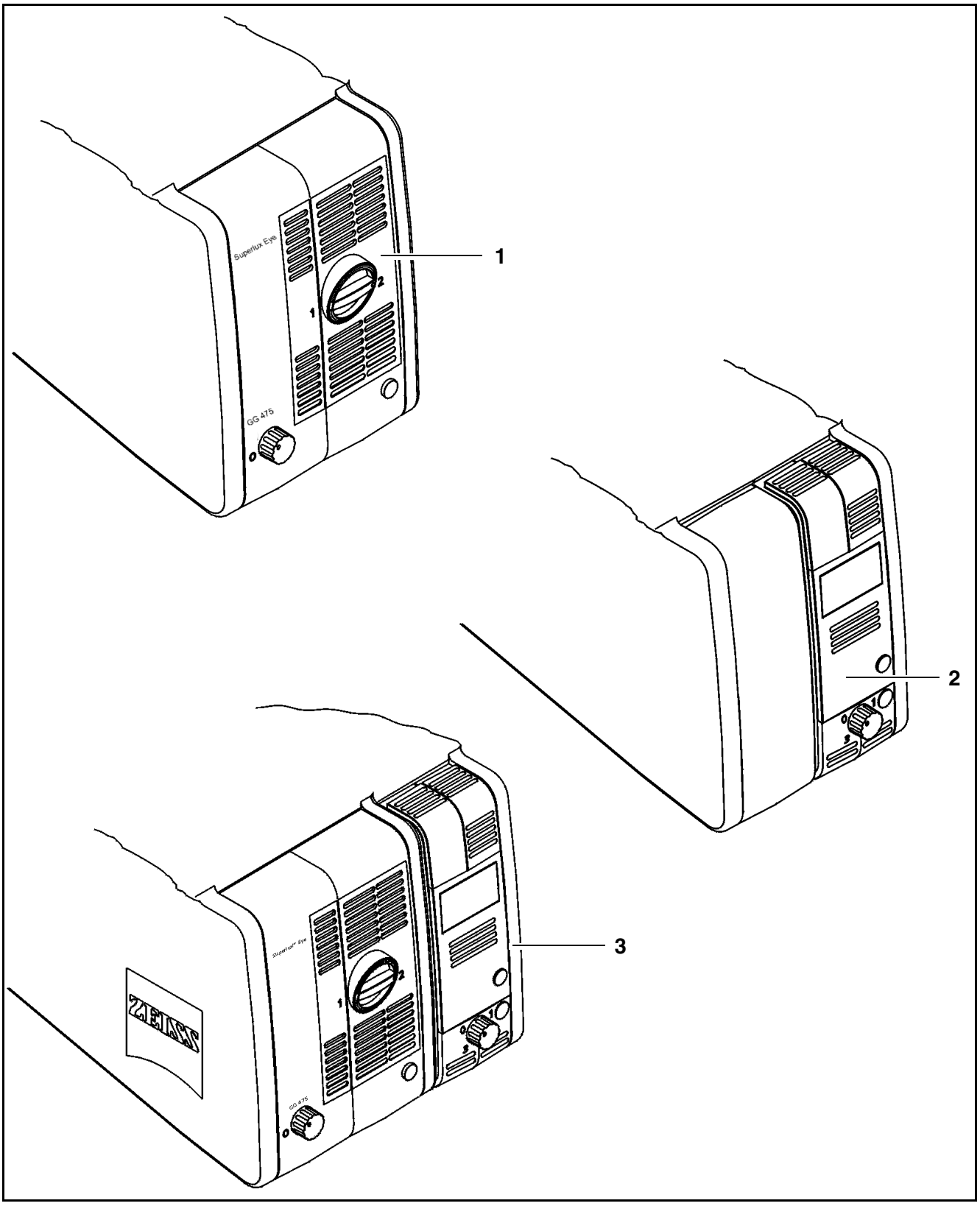
The suspension system is optionally equipped with a Superlux Eye or halogen illumination system.

1 Superlux Eye illumination
The xenon light source is equipped with an illumination system for fiber illumination. The xenon lamp generates light whose spectrum resembles that of natural daylight. Regardless of the brightness setting, the color temperature of the light always remains the same. Normal daylight film without any additional conversion filters can therefore be used for photographic documentation. The lamp module contains two xenon lamps. The second lamp is used as a backup lamp which must be manually swung into the illumination beam path when the first lamp fails. You have to pull out the lamp module all the way before being able to swing in the backup lamp.

Warning!
When using the Superlux Eye illumination system, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

2 Halogen illumination
The halogen illuminator is equipped with an illumination system for fiber illumination. The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails.
If required, the illumination system can be equipped with a second lamp housing so that two separate illumination systems are available for fiber illumination. The second illumination system can be used, for example, for a fiber slit lamp or a dual fiber illumination system.

3 Superlux Eye illumination system with additional integrated halogen illumination (option)
The additional, integrated halogen illumination is a second illumination system suitable e.g. for the use of a fiber slit lamp or dual fiber illumination system.


Superlux Eye
GG 475
1
2
1
2
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Halogen illumination system

The ceiling mount is equipped with an illumination system for fiber illumination. The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails.
If required, the illumination system can be equipped with a second lamp housing so that two separate illumination systems are available for fiber illumination.

1 Lamp module

2 Ventilation grid

Do not cover the ventilation grid! Make sure that drapes do not cover the grid. This can lead to overheating of the lamp modules and to lamp failure.

3 Flap
The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative (green light (9) is on).
- When the flap is open, the main lamp has failed. The backup lamp is operative (yellow light (8) is on).

4 Manual selection of the backup lamp
If the automatic selector system fails, press this button to switch on the backup lamp.

5 Opening the lamp module
When you press this button, the lamp module is slightly ejected. Pull out the lamp module all the way for lamp change.

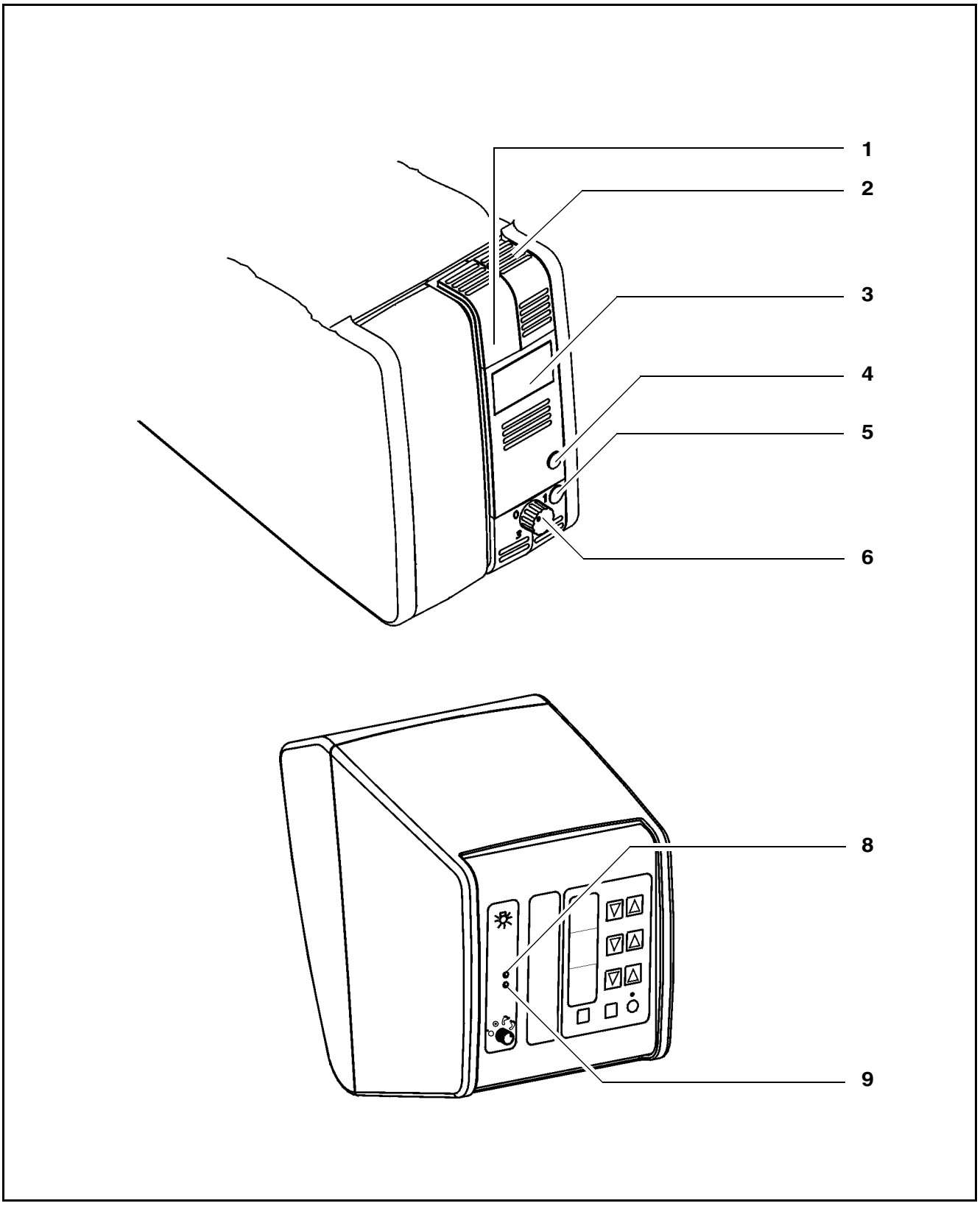
6 Filter selector knobs
The filter knobs have four positions:

0 no filter

1 GG 475 filter: to protect the patient's eye during surgery against unnecessary (blue) radiation (retinal injury).

2 KK 40 filter: to increase the color temperature

3 no filter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7 Brightness control
Brightness can be adjusted using the two keys (7) on the control panel.

Note:
If the suspension system has two lamp housings, you can also adjust the brightness of lamp 1 by pressing the appropriate button on the foot control panel.

8 Yellow indicator lamp

- Lights when the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.

9 Green indicator lamp
Indicates which illumination system is on.

10 Selector:


Illumination is off.


Illumination is on.


Illumination can be switched on/off on the **left-hand side** of the foot control panel.

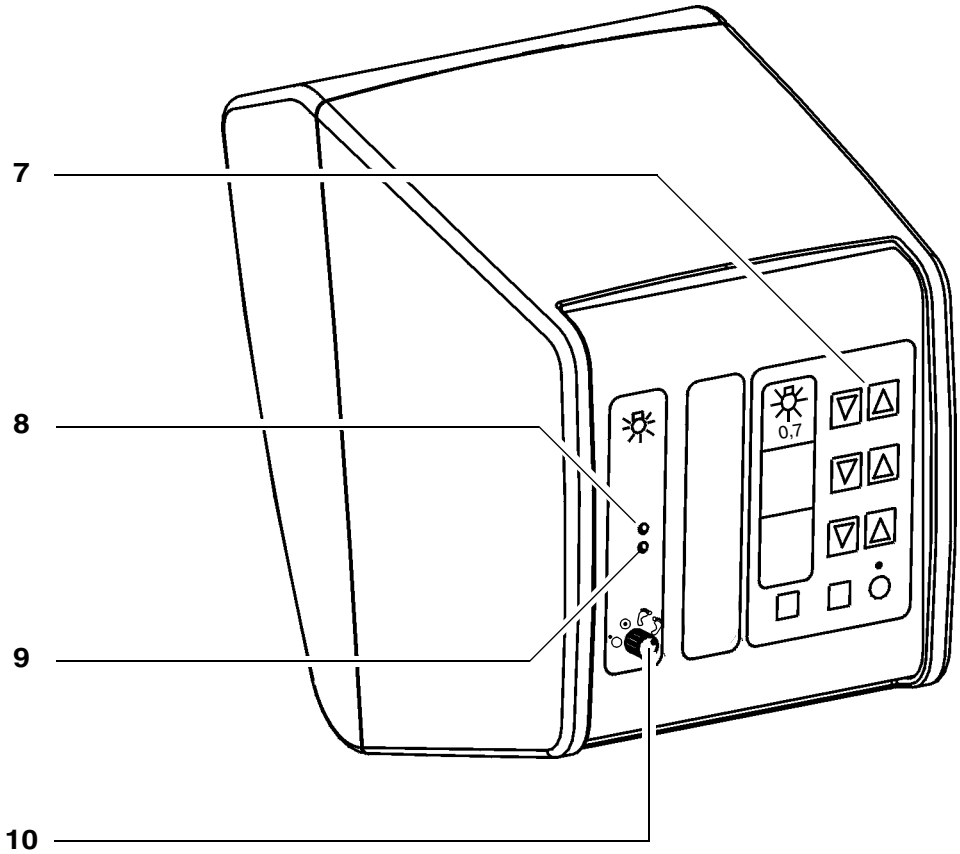

Illumination can be switched on/off on the **right-hand side** of the foot control panel.

After the instrument and one of the illumination systems have been switched on:

- If the yellow indicator lamp is lit, the main lamp has failed.
- If the yellow indicator lamp blinks, the backup lamp has failed.

Note:
If two lamp housings are available, you can set the selector switch in such a way

- that one illumination system each can be switched on the left-hand and right-hand side of the foot control panel,
- or that both illumination systems can be switched on the left-hand or right-hand side of the foot control panel.


7
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0,7

Superlux Eye illumination system

Warning!
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

Change the xenon lamp in good time.

The suspension system is equipped with a xenon illumination system for fiber illumination. The xenon lamp generates light whose spectrum resembles that of natural daylight. Regardless of the brightness setting, the color temperature of the light always remains the same. Normal daylight film without any additional conversion filters can therefore be used for photographic documentation. The lamp housing contains two xenon lamps. The second lamp is used as a backup lamp which must be swung into the illumination beam path should the first lamp fail.

Ventilation grid
Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.

1 Lamp module

2 Manual activation of the backup lamp
When the xenon lamp fails, open the lamp module as follows:
Press button (5). The lamp module is slightly ejected. Pull out the lamp module as far as it will go. Turn knob (2) through 180° until it snaps in. This moves the backup lamp into the illumination beam path. Push the lamp module all the way back into the lamp housing.

Note:
When inserting a new lamp module, make sure that knob (2) is set to "1“. If the first lamp fails, you switch to the second lamp in logical sequence.

3 Indicator: backup lamp is in use
When the red segment in knob (2) lights up, the backup lamp is in use.

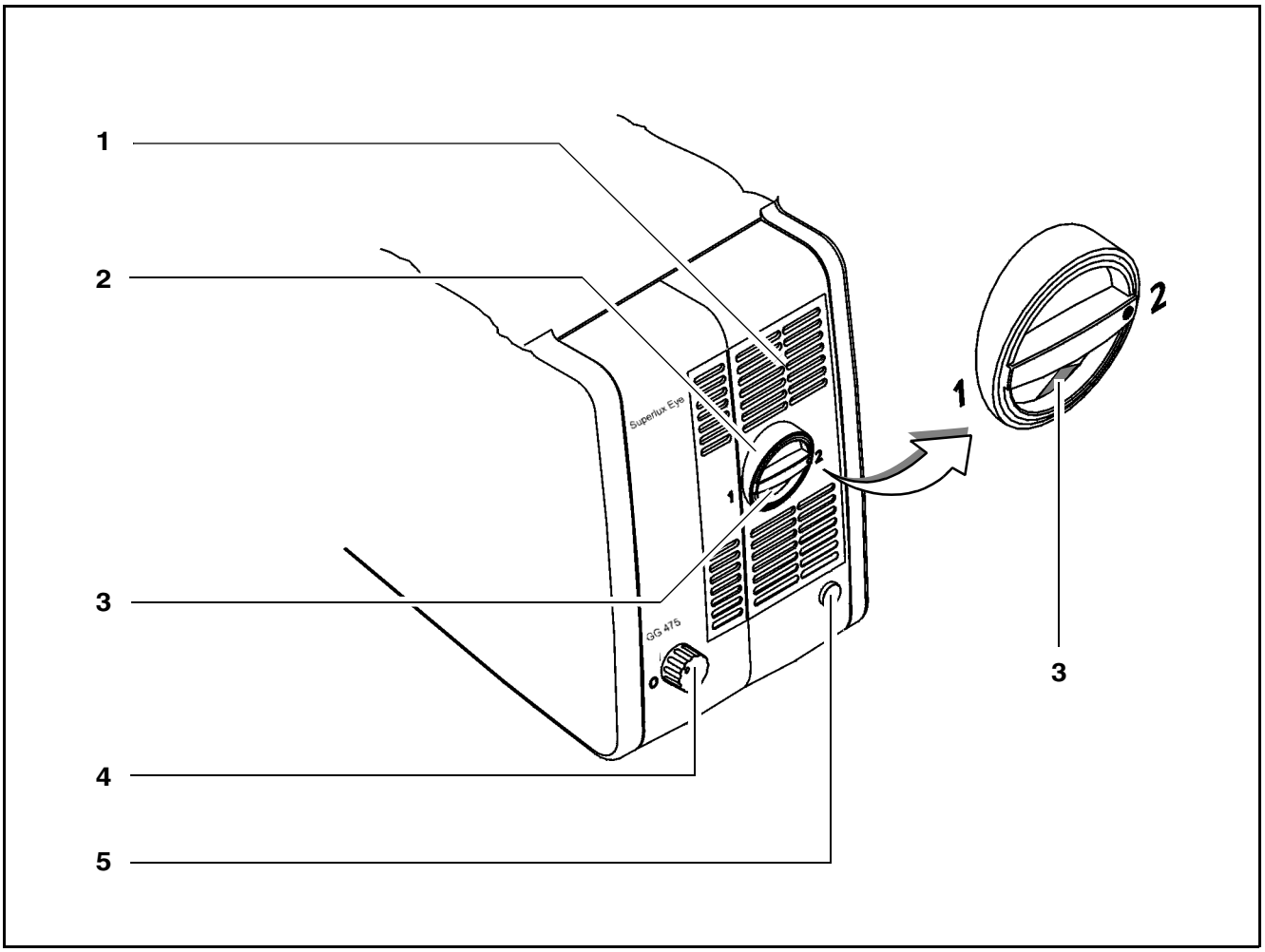
4 Filter selector knob
The filter knob has two positions:

0 no filter

1 GG 475 filter swung in

5 Opening the lamp module

When you press this button, the lamp module is slightly ejected. For changing the lamp, pull out the lamp module as far as it will go. Turn knob (2) through 180° until it snaps in. This moves the backup lamp into the illumination beam path.



6 Brightness control
You can adjust the brightness using the two control keys on the control panel.

Note:
The brightness of the xenon lamp can also be adjusted by pressing the appropriate buttons on the foot control panel.

7 Yellow indicator lamp
Lights when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp goes out again.

Note:
If the first lamp has failed and the backup lamp is in use, make sure to have a backup lamp module ready at hand as a precaution.

8 Green indicator lamp
Lights when the illumination has been switched on.

9 Selector:

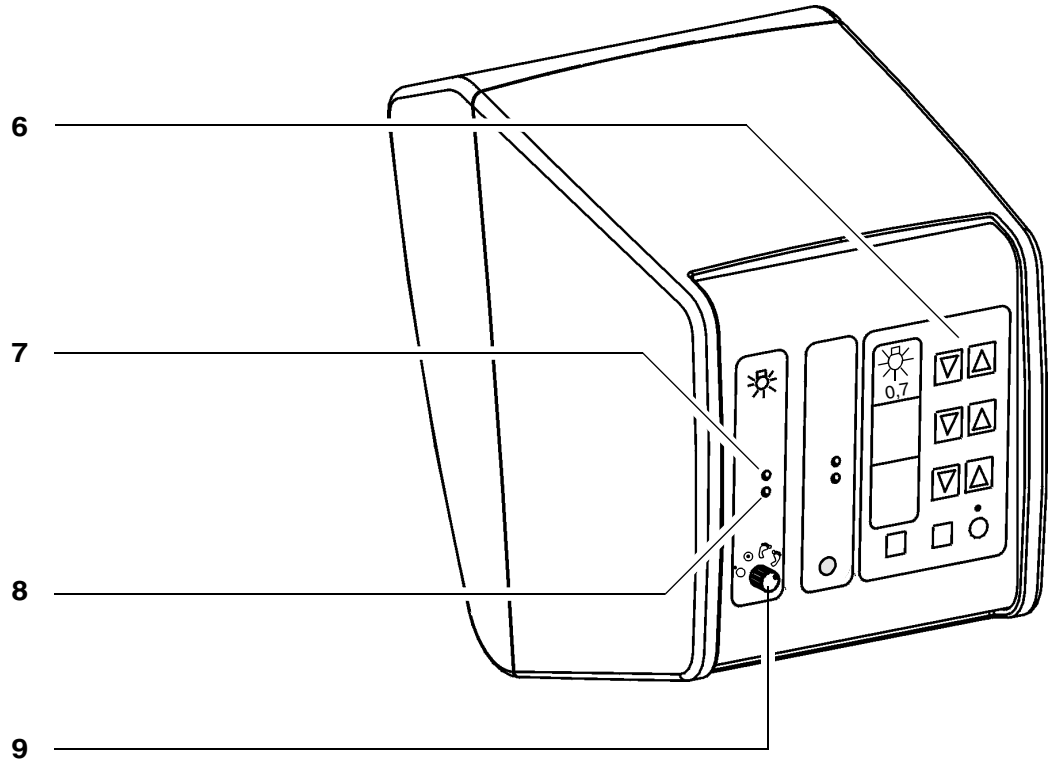
Illumination is off.

Illumination is on.

Illumination can be switched on/off on the **left-hand side** of the foot control panel.

Illumination can be switched on/off on the **right-hand side** of the foot control panel.

Note:
You can adjust the selector in such a way that you can switch the illumination on/off on the right-hand and left-hand sides of the foot control panel.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0.7

Superlux Eye illumination system with additional integrated halogen illumination (option)

Warning!
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

Change the xenon lamp in good time.

The suspension system is equipped with a xenon illumination system for fiber illumination. The xenon lamp generates light whose spectrum resembles that of natural daylight. Regardless of the brightness setting, the color temperature of the light always remains the same. Normal daylight film without any additional conversion filters can therefore be used for photographic documentation. The lamp housing contains two xenon lamps. The second lamp is used as a backup lamp which must be swung into the illumination beam path should the first lamp fail.

The suspension system can optionally be equipped with an integrated halogen illumination system for fiber illumination. The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails.

Ventilation grid
Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.

1 Filter selector knob
The filter knob has two positions:

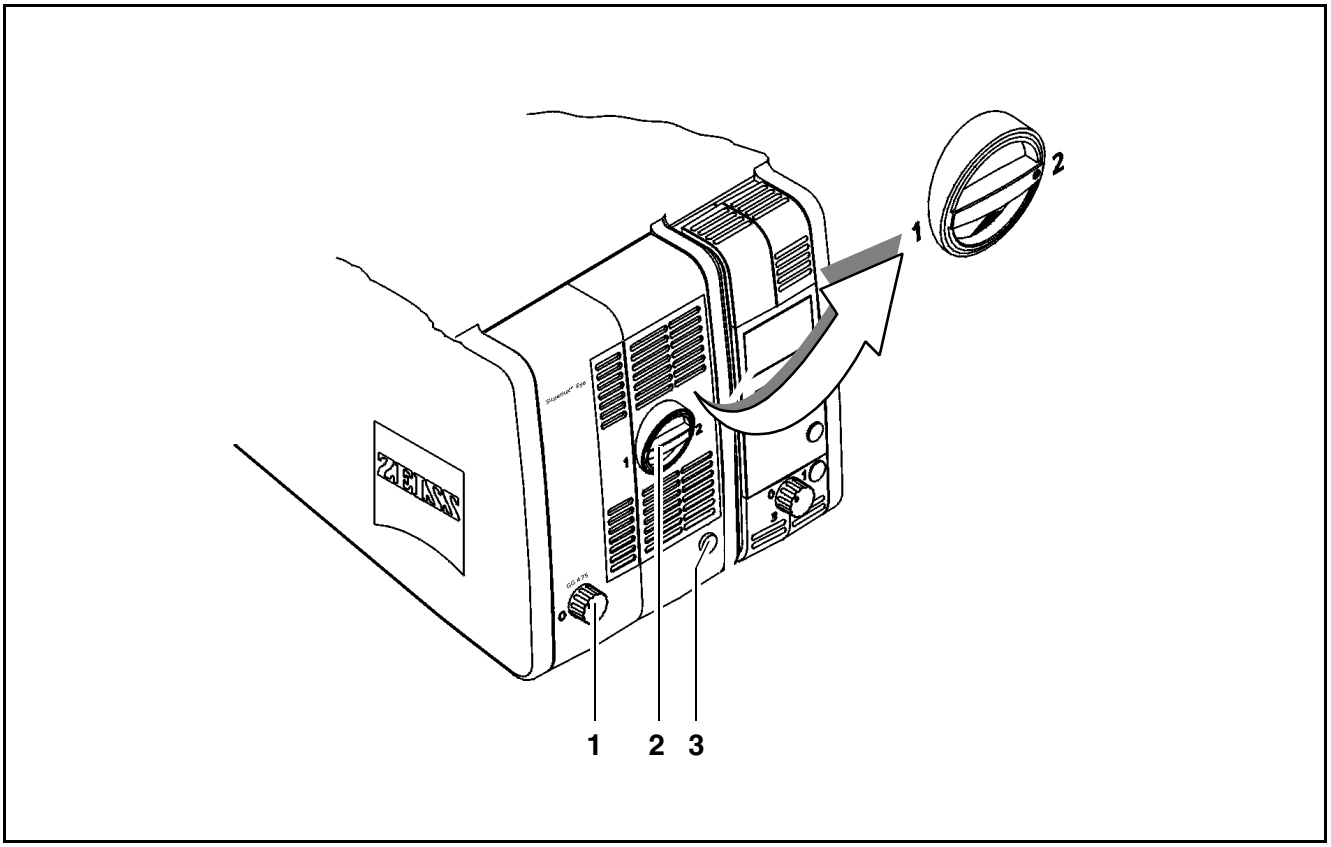
0 no filter

1 GG 475 filter swung in

2 Manual activation of the Superlux Eye backup lamp
When the xenon lamp fails, open the lamp module as follows:
Press button (3). The lamp module is slightly ejected. Pull out the lamp module as far as it will go. Turn knob (2) through 180° until it snaps in. This moves the backup lamp into the illumination beam path. Push the lamp module all the way back into the lamp housing.

Note:
When inserting a new lamp module, make sure that knob (2) is set to "1“. If the first lamp fails, you switch to the second lamp in logical sequence.

3 Opening the Superlux Eye lamp module
When you press this button, the lamp module is slightly ejected. For changing the lamp, pull out the lamp module as far as it will go. Turn knob (2) through 180° until it snaps in. This moves the backup lamp into the illumination beam path.



4 Flap
The flap is the mechanical indicator for the operating status of the halogen lamps.

- When the flap is closed, the main lamp is operative (green light (13) is on).
- When the flap is open, the main lamp has failed. The backup lamp is operative (yellow light (12) is on).

5 Filter selector knobs for additional integrated halogen illumination
The filter knobs have four positions:

0 no filter

1 GG 475 filter : to protect the patient's eye during surgery against unnecessary (blue) radiation (retinal injury).

2 KK 40 filter: to increase color temperature

3 no filter

6 Opening the lamp module of additional integrated halogen illumination
When you press this button, the lamp module is slightly ejected. Pull out the lamp module all the way for lamp change.

7 Manual activation of the halogen backup lamp
If the automatic activation system fails, press this button to switch on the backup lamp.

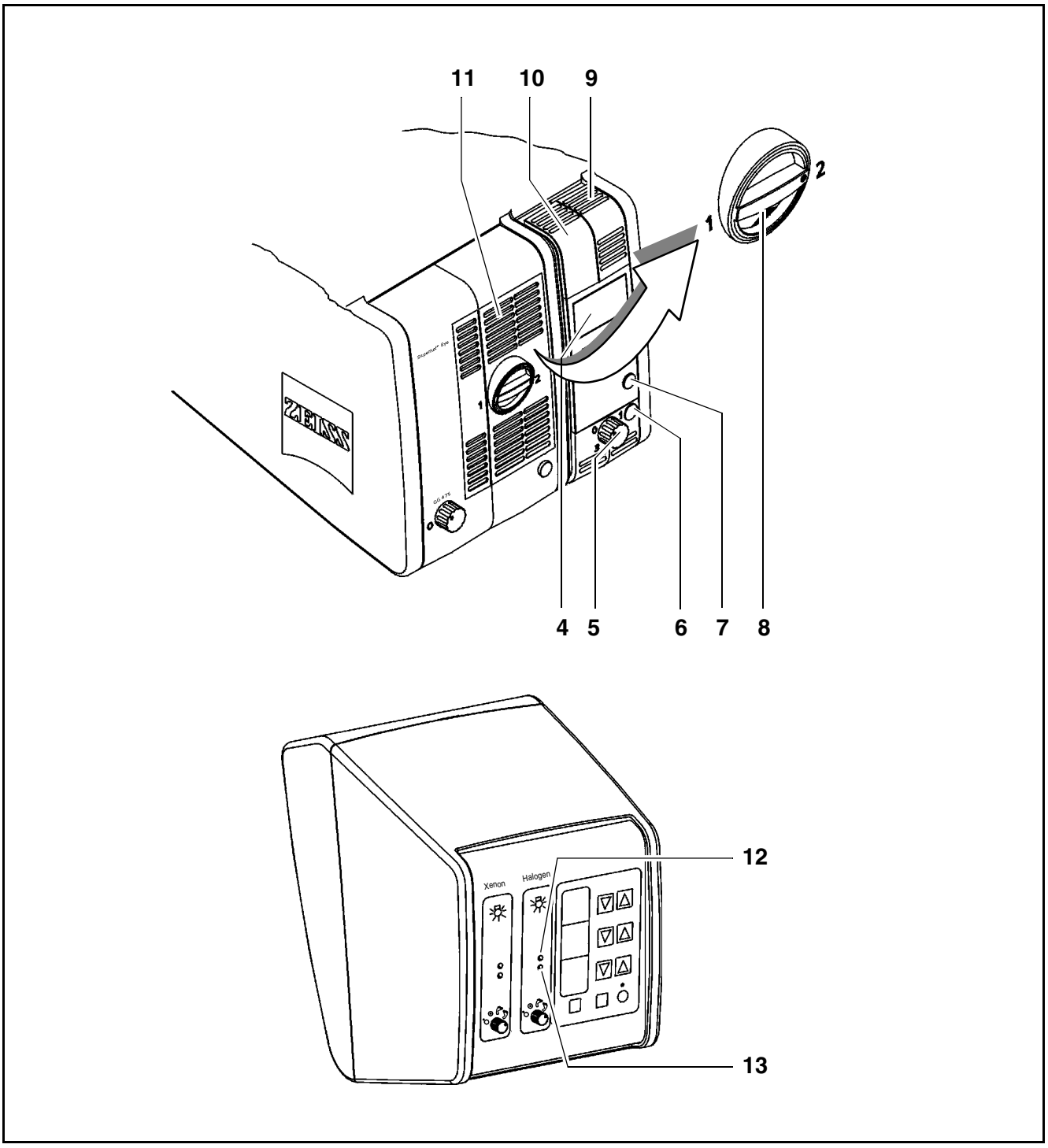
8 Indicator: Superlux Eye backup lamp is in use
When the red segment in the knob lights up, the backup lamp is in use.

9 Ventilation grid for additional integrated halogen illumination

Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp modules and to lamp failure.

10 Lamp module of additional integrated halogen illumination

11 Superlux Eye lamp module


11
10
9
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1
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7
8
Xenon
Halogen
12
13

12 Yellow indicator lamp

- Lights when the main lamp has failed. The backup lamp is on.
- Blinks when the backup lamp has failed.

13 Green indicator lamp
Indicates which illumination system is on.

14 Selector:


Illumination is off.


Illumination is on.


Illumination can be switched on/off on the **left-hand side** of the foot control panel.


Illumination can be switched on/off on the **right-hand side** of the foot control panel.

After the instrument and one of the illumination systems have been switched on:

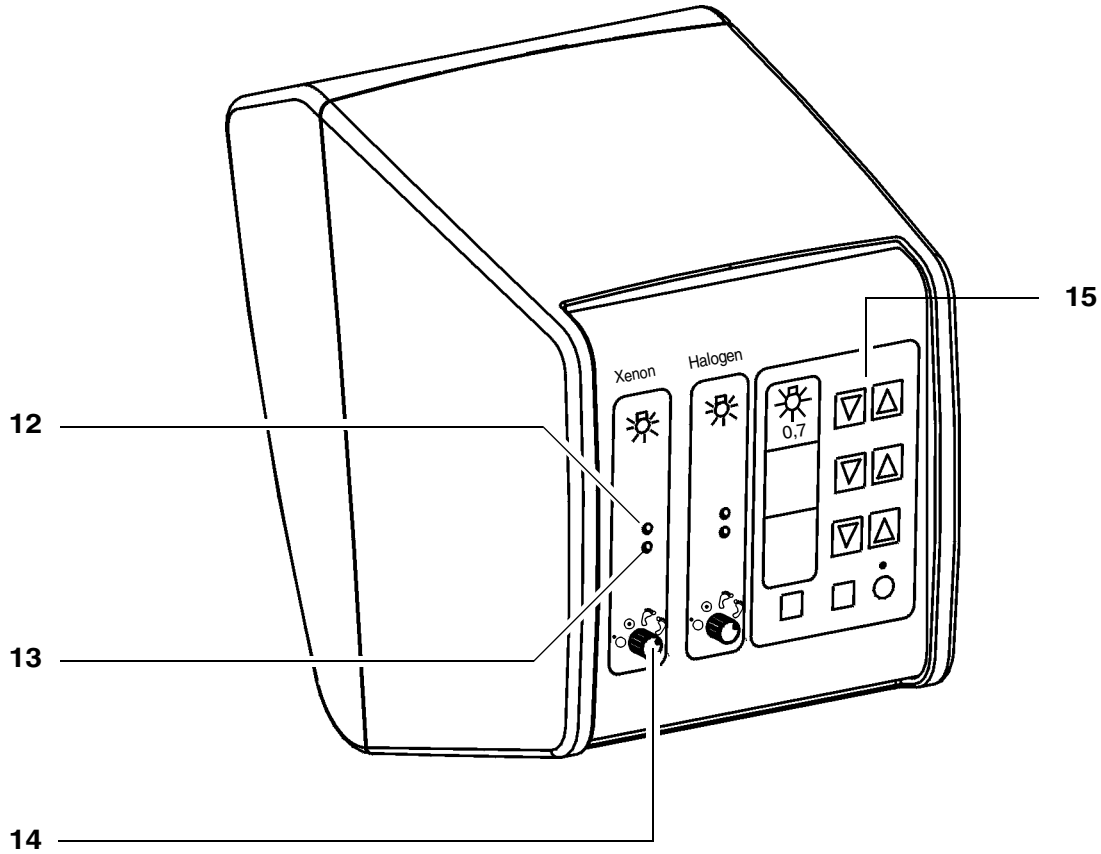
- If the yellow indicator lamp is lit, the main lamp has failed.
- If the yellow indicator lamp blinks, the backup lamp has failed.


Note:
If two lamp housings are available, you can set the selector switch in such a way

- that one illumination system each can be switched on the left-hand and right-hand side of the foot control panel,
- or that both illumination systems can be switched on the left-hand or right-hand side of the foot control panel.

15 Brightness control
You can adjust the brightness using the two control keys on the control panel.


Note:
If the suspension system has two lamp housings, you can also adjust the brightness of lamp 1 by pressing the appropriate button on the foot control panel.


12
13
14
15
Xenon
Halogen
0,7

Identical modules of the suspension systems

Suspension arm

1 Lock of the cable duct

- For opening, turn a quarter turn clockwise or counterclockwise.
- For closing, press down and turn a quarter turn clockwise or counterclockwise.

2 Adjustment screw for limiting downward movement
Use this screw to set the minimum vertical working distance from the surgical field. Bring the surgical microscope into its working position. Turn the adjustment screw for limiting downward movement clockwise as far as it will go. Adjust the downward movement limitation before each surgical procedure.

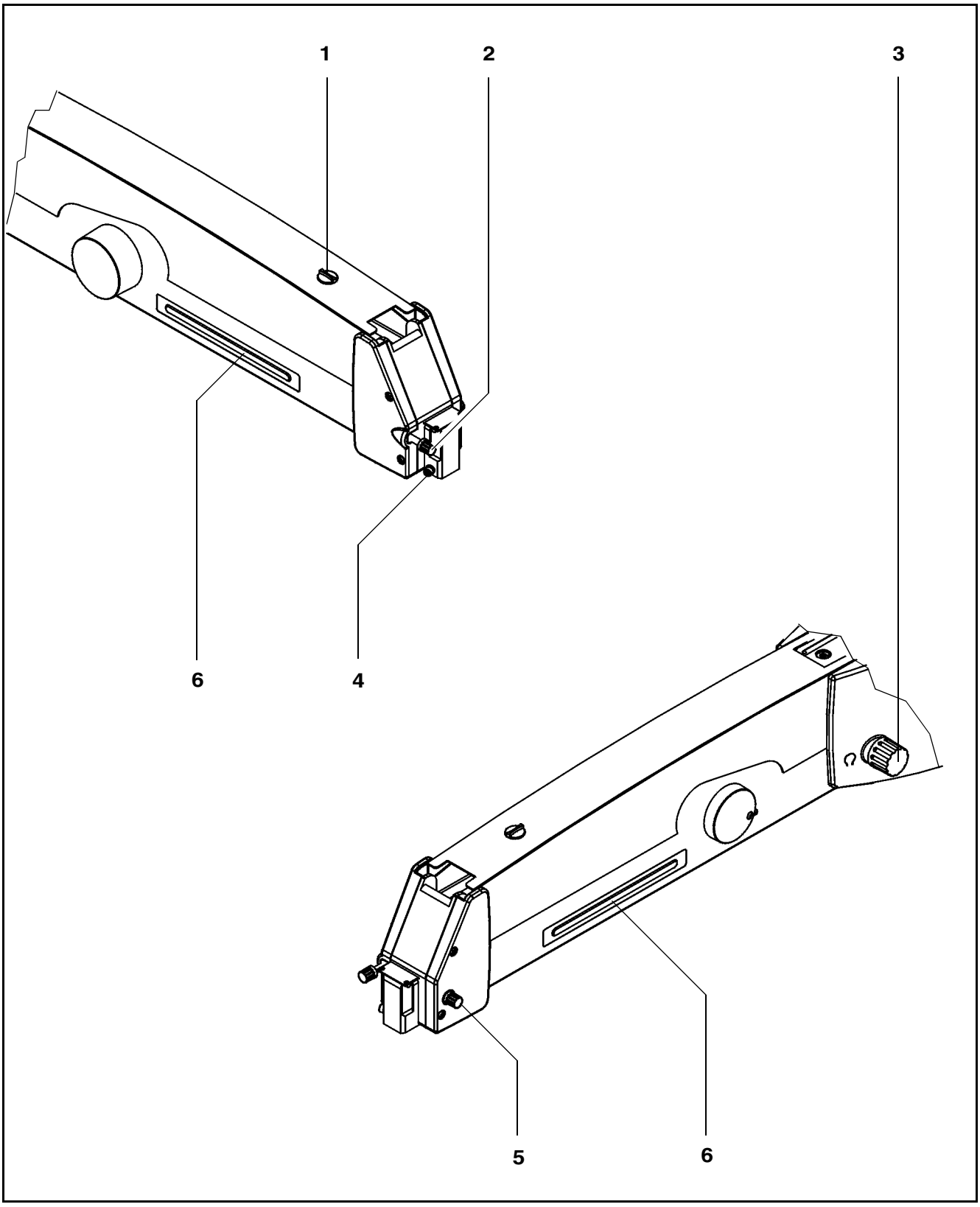
3 Balance setting screw
After mounting the surgical microscope including all accessories, adjust the balance setting of the suspension arm using this screw. Balance setting is described in detail in chapter “Operation“.

4 Securing screw
for securing the OPMI® coupling.

5 Locking knob
for locking the suspension arm in a horizontal position for mounting the surgical microscope. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached.

6 Release bar
Allows non-sterile persons to release the magnetic brakes of the suspension system.

Magnetic brake release buttons
The magnetic brake release buttons are located on the surgical microscope. For as long as you press one of these buttons, you can move the articulated arm in all directions. When you let go of the button, the magnetic brakes will lock all axes in position at the same time.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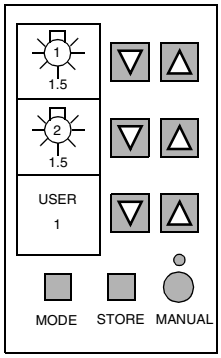
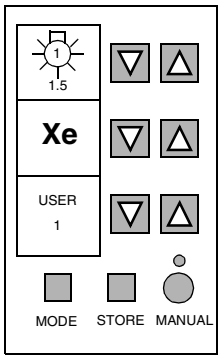
Display field with control keys

Basic mode

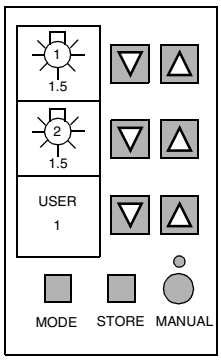
Halogen



Xenon



Xenon with halogen (option)



The display and control panel is integrated in the control unit.

The surgical microscope on the suspension system can be controlled either manually or electronically. The control software required for electronic control is installed in the electronics box of the suspension system. You operate the software via the control and display panel, where you can read off and reconfigure the current settings.

The control and display panel is structured as follows:

– Three display fields (LCD) with the associated keys "∇" and "Δ".

– One row of keys comprising the MODE, STORE and MANUAL keys, and a yellow LED above the MANUAL key.

User interface

The user interface of the suspension system comprises three display fields and keys located beside and below them.
A pair of keys "∇" and "Δ" has been assigned to every display field for making the appropriate settings.

The control functions have been combined in several modes (menu pages). The basic mode is always displayed in the normal operating status.

The following is displayed in the basic mode:

– the current lamp brightness of lamp 1 (halogen) in the upper display field,

– the current lamp brightness of lamp 2 (halogen) in the middle display field,

– the current lamp brightness of lamp 1 (xenon) in the upper display field,

– Xe for xenon in the middle display field,

– the current user ID in the lower display field.

Note:
In the Superlux Eye illumination system with additional, integrated halogen illumination (option), the lamps are numbered as follows:

Lamp 1: xenon

Lamp 2: halogen

Keys

Three keys and an LED are provided below the displays.
Use the "MODE", "STORE" and "MANUAL" keys to select the different control functions (modes).

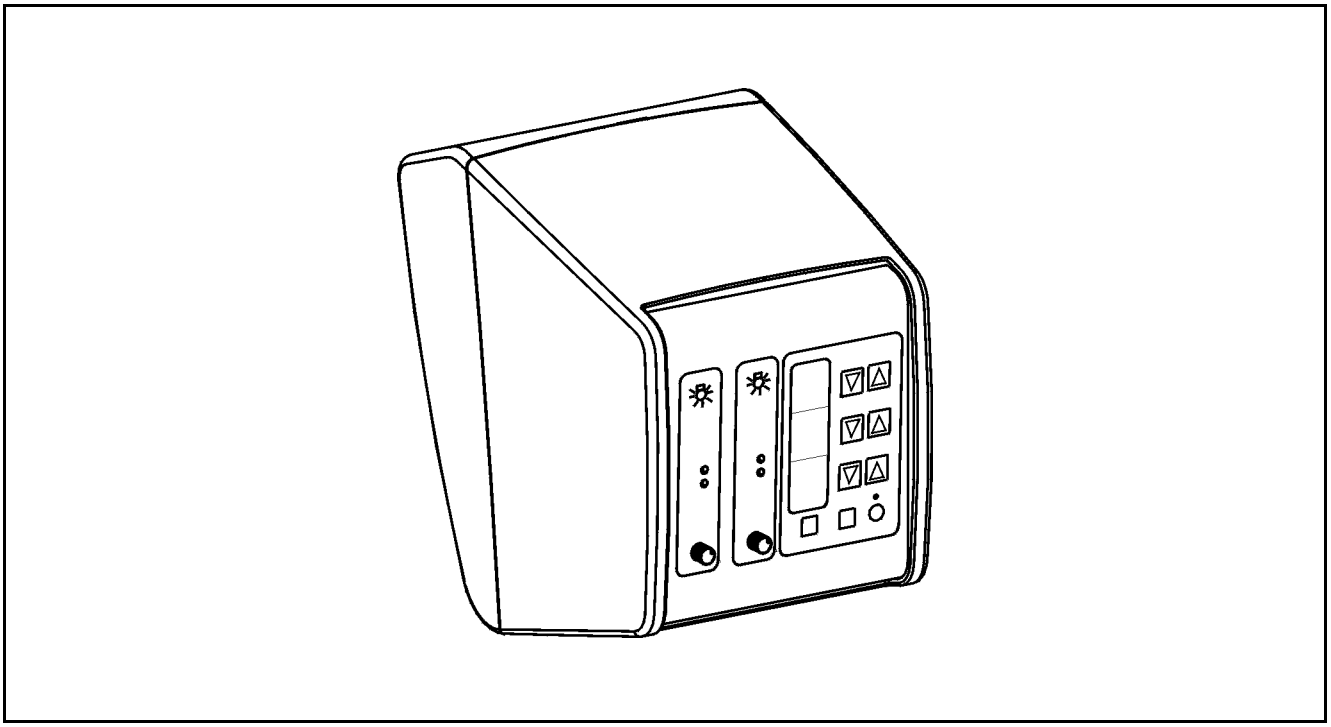
"MODE" key and "STORE" key
The "MODE" and "STORE" keys permit you to access the different modes of the user interface. For details, please see the chapter "Operation".

"STORE" key
You use the "STORE" key, for example, to save the current focus and zoom settings for OPMI® Vario on the suspension system.

"MANUAL" key
The "MANUAL" key permits you to switch to manual operation. For details, please see the chapter "Operation".

Yellow LED above the "MANUAL" key
The yellow LED is lit when you have switched to the manual mode.

The illustration shows the control and display panel of the suspension system with two halogen illumination systems (option).



S88 floor stand

Intended use

The floor stand is a suspension system for Zeiss surgical microscopes suitable for almost all surgical disciplines. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the floor stand are its superb mobility and easy operation. Four steerable casters on the stand base permit easy positioning in the OR. The motorized functions of the surgical microscope can be controlled using a foot control panel or a hand control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- fully automatic change of the halogen lamp,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- user-defined basic settings for a maximum of nine users:
  - speeds for focus, zoom and X-Y coupling
  - and configurable keys on the foot control panel for focus memory, XY inversion, camera release, swing in/out of SDI, triggering an AUX signal.

Warning!
When using the Superlux Eye illumination system, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

Description of the modules

The floor stand comprises an articulated arm, a stand column and a stand base. The articulated arm comprises a carrier arm and a suspension arm. The carrier arm contains the control unit with all electrical supply systems required for the control of a motorized surgical microscope. You can control the motorized functions via a foot control panel or a hand control panel.
The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.
A maneuvering handle attached to the stand column is used to move the stand and to attach the foot control panel. The stand column is provided on its left and right with cable supports for winding up cables before the unit is relocated. Four steerable casters on the stand base permit easy positioning near the operating table. The stand base has been designed in such a way that high stability is ensured even with unfavorable loading of the stand. A locking pedal permits the floor stand to be quickly and reliably locked in position.

Caution:
As the stand is very easy to maneuver, there is a tendency to underestimate its considerable weight. Therefore, move the stand slowly and carefully!

Design

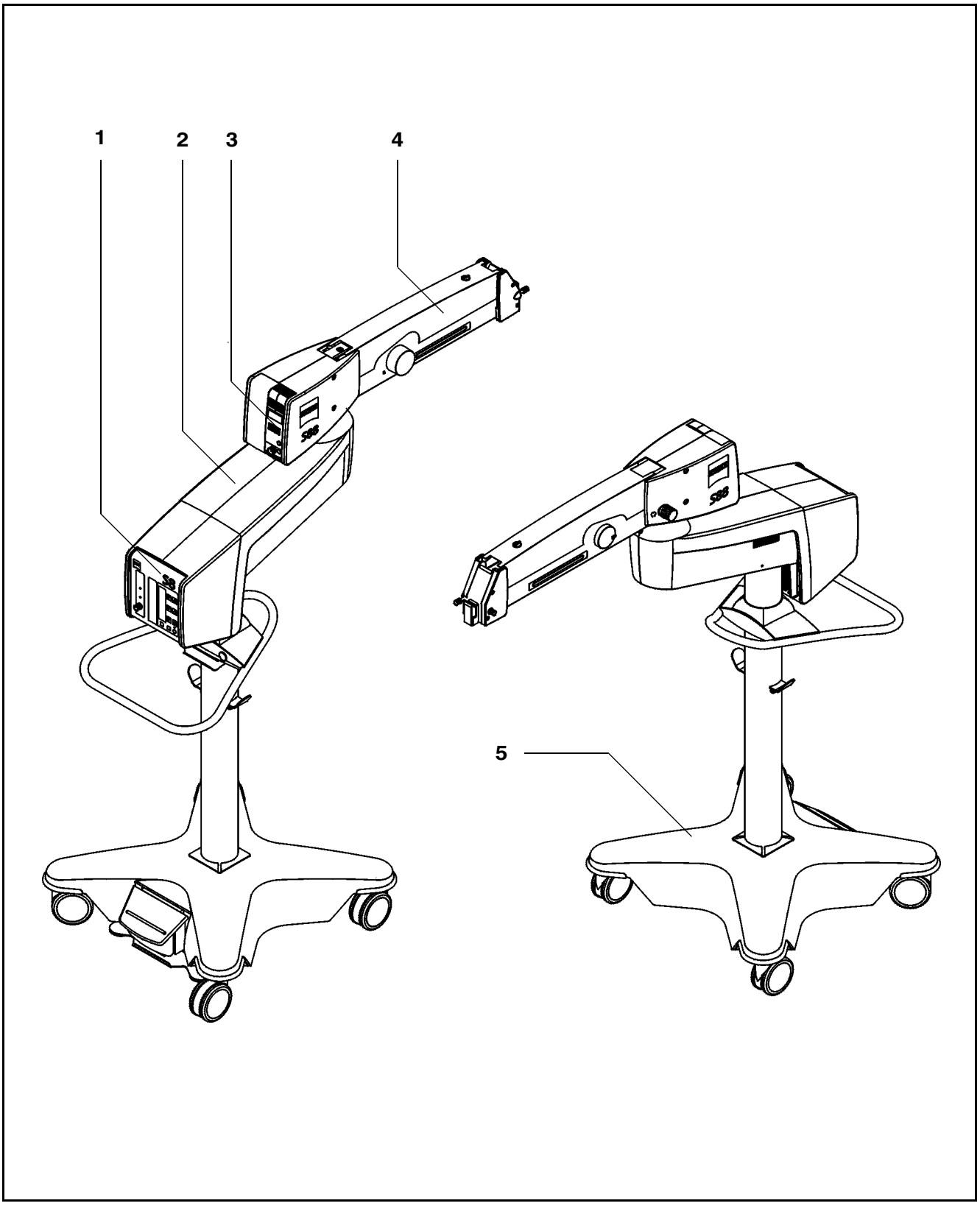
1 Control panel

2 Carrier arm

3 Illumination system, see page 72

4 Suspension arm

5 Stand base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Stand base with column

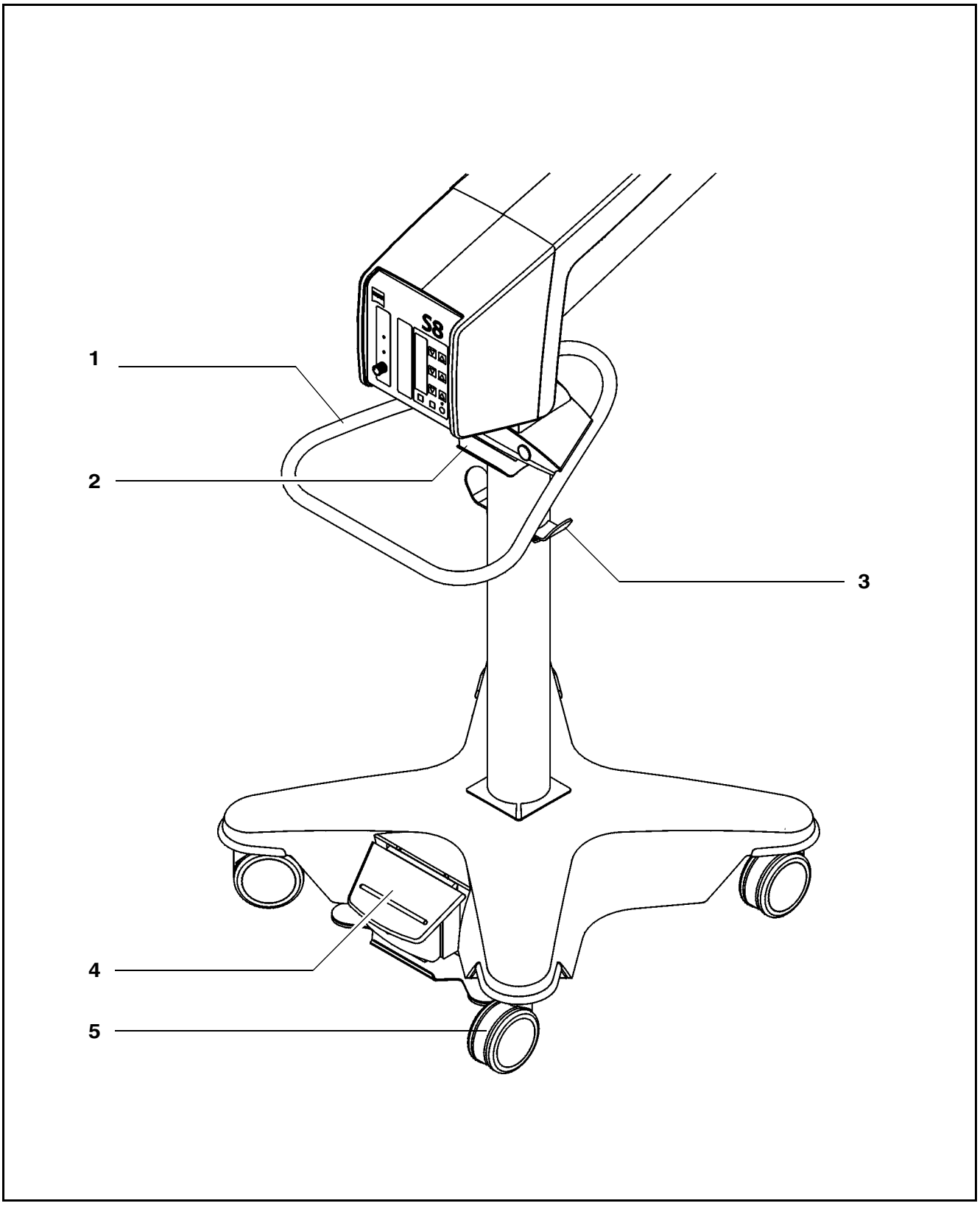
1 Maneuvering handle
for moving the stand.

2 Support
for hanging up the foot control panel during transport.

3 Cable support (2x)
for winding up the power cord and the cable of the foot control panel.

4 Locking pedal
Press once to lock the stand in position.
Press a second time to release the locking pedal.

5 Steerable casters
The four steerable casters on the stand base permit easy positioning in the OR.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Connection panel

1 Remote control socket
for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.

2 Connector for switching component
Possibility of connecting a foot control panel, hand control panel or operating chair with an appropriate footswitch.

3 Potential equalization bolt

4 Indicator window for rated voltage
The voltage shown here must correspond to the rated line voltage provided on the site of installation. You can adjust the sliding switch using a suitable tool.

Warning!
Please observe the maximum current consumption of two power outlets (4) and (5). Only connect medical devices approved by us to outlets (4) and (5). When using other instruments, make sure that safety is guaranteed regarding admissible ground leakage currents. The admissible limit value of the ground leakage current present in the suspension system's power cord must not exceed 500 µA in compliance with EN60601-1/IEC 60601-1. CSA/US certification in compliance with UL 60601-1 only allows a maximum ground leakage current of 300 µA.

5 Power outlet
for medical devices with a current consumption of max. 2 A.

Note:
The current of this power outlet is switched on/off using the S2 power switch (7).

6 Power outlet
for medical devices with a current consumption of max. 5 A.

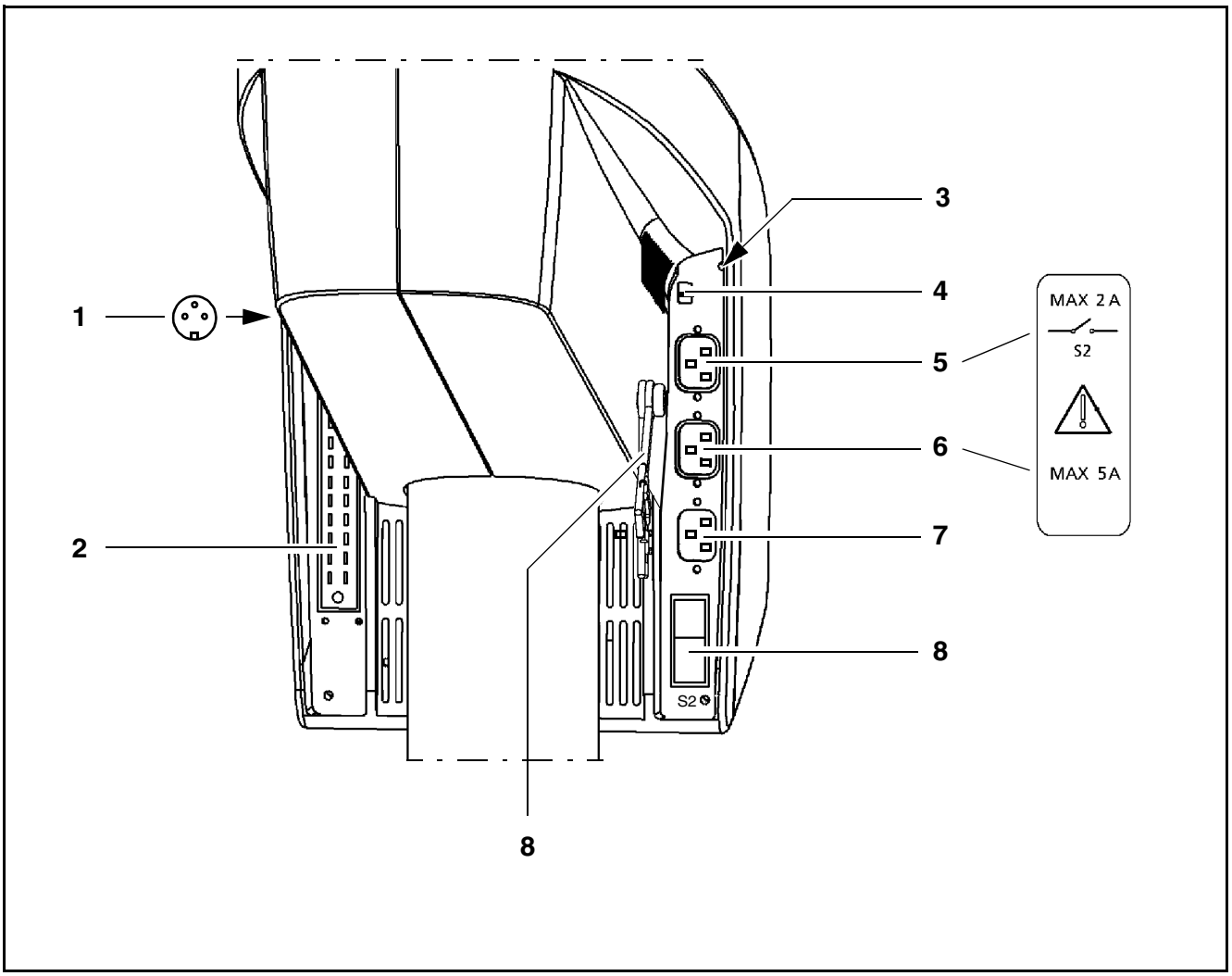
7 Power inlet

8 S2 power switch
After the stand has been switched on, the green lamp in the switch is lit.

9 Strain relief device
The strain relief device prevents inadvertent unplugging of the following electrical connections:

– power cable

– connecting cable for foot control panel, hand control panel or operating chair with an appropriate footswitch.



Instrument tray (option)

The S88 floor stand can be equipped or retrofitted with an instrument tray (1). In the case of retrofitting, our service staff or an authorized person will install the instrument tray on your suspension system.

The instrument tray (1) can carry a maximum of 13 kg. It is designed for mounting the Zeiss instruments VISULAS 532s or MediLive Trio:

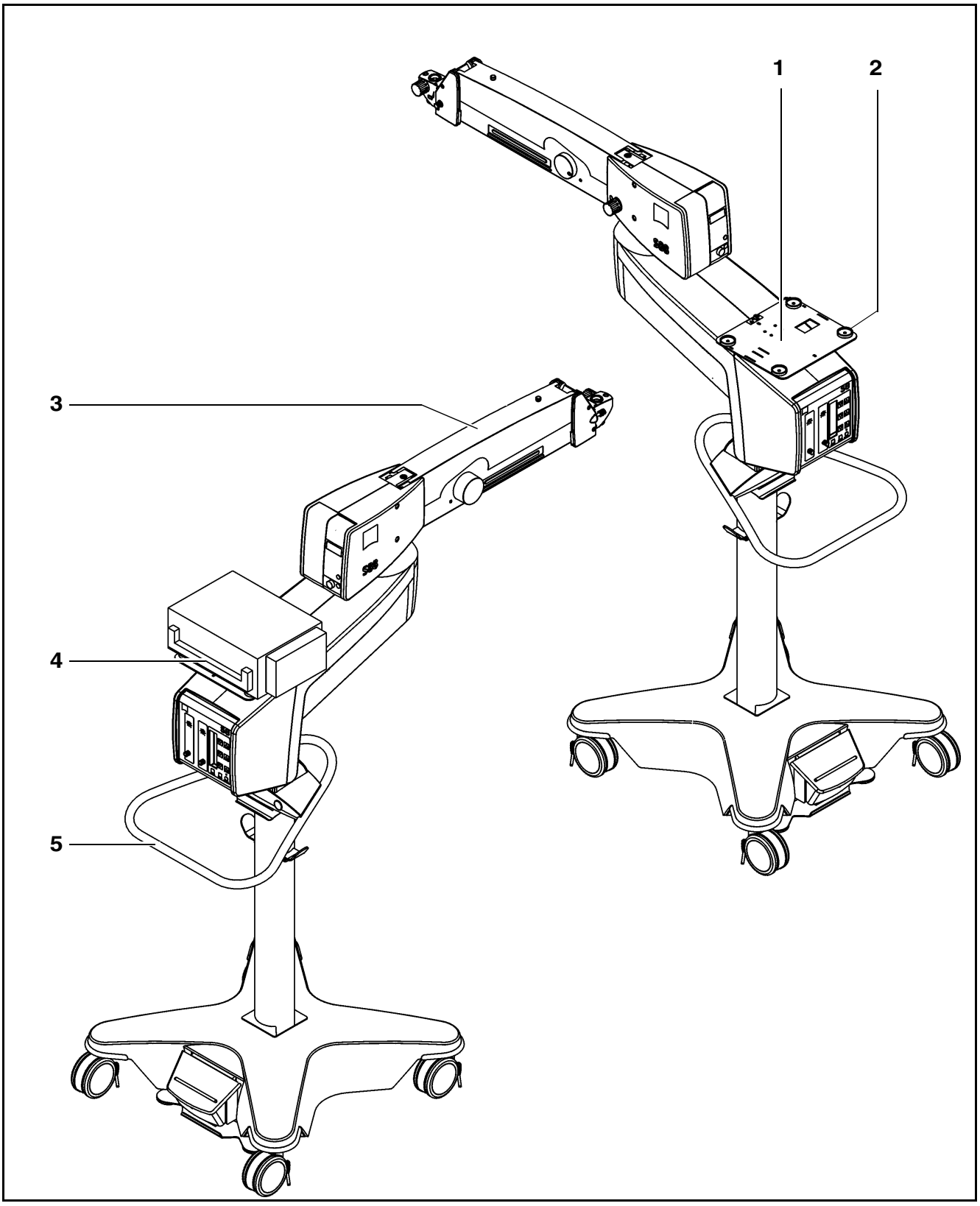
– The four receptacles (2) on the instrument tray are intended for VISULAS 532s. The VISULAS 532s is secured in position with its feet in these four receptacles.
Caution:
Secure the VISULAS 532s from being pulled accidentally downwards with the aid of the strap provided.

– The four receptacles (2) are not required for the MediLive Trio. The MediLive Trio is attached to the instrument tray with the aid of two stud bolts.

– A second MediLive Trio or other accessory equipment can be mounted on the instrument tray using the strap provided. Please note that the maximum load bearing capacity of the instrument tray is 13 kg.

Warning!

- Make sure that the accessory equipment is positioned as securely as possible on the instrument tray. Attach the second and, if required, further accessory equipment using the strap provided.
- Do not place a load of more than 13 kg on instrument tray (1).
- Remember there is a risk of collision and crushing when suspension arm (3) is folded to its moving position. A "Risk of crushing" warning label is therefore attached on the left and right of suspension arm (3).
- Please read the relevant user manual before starting up the accessory equipment.
- If you have a VISULAS 532s on the instrument tray:
  – Before start-up, familiarize yourself in particular with the safety regulations (see instruction manual) with regard to "the hazards of laser radiation".
  – Never under any circumstances pull carrying handle (4) in order to move the S88 floor stand. Always use only handle (5) to move the S88 floor stand.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S8 ceiling mount

Intended use

The S8 ceiling mount is a suspension system for Zeiss surgical microscopes. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the S8 ceiling mount are its superb mobility and easy operation. You can control the motorized functions via a foot control panel or a hand control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- fully automatic change of the halogen lamp,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- user-defined basic settings for a maximum of nine users:
  - speeds for focus, zoom and X-Y coupling
  - and configurable keys on the foot control panel for focus memory, XY inversion, camera release, swing in/out of SDI, triggering an AUX signal.

Warning!
When using the Superlux Eye illumination system, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

Description of the modules

The S8 ceiling mount comprises an articulated arm, a suspension arm with the lamp housing and a control unit.

The articulated arm consists of a lift arm and a carrier arm. The lifting function permits the ceiling mount to be moved to a standby position. A grip is provided for height adjustment of the ceiling mount.
The suspension arm with the lamp housing and the control unit is mounted on the carrier arm. The control unit is rotatable through 180° (70° if the Superlux Eye illumination system with additional, integrated halogen illumination is used) and contains all electrical supply systems required for the control of a motorized surgical microscope. You can control the motorized functions via a foot control panel or a hand control panel.

The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.

Design

1 Lift arm

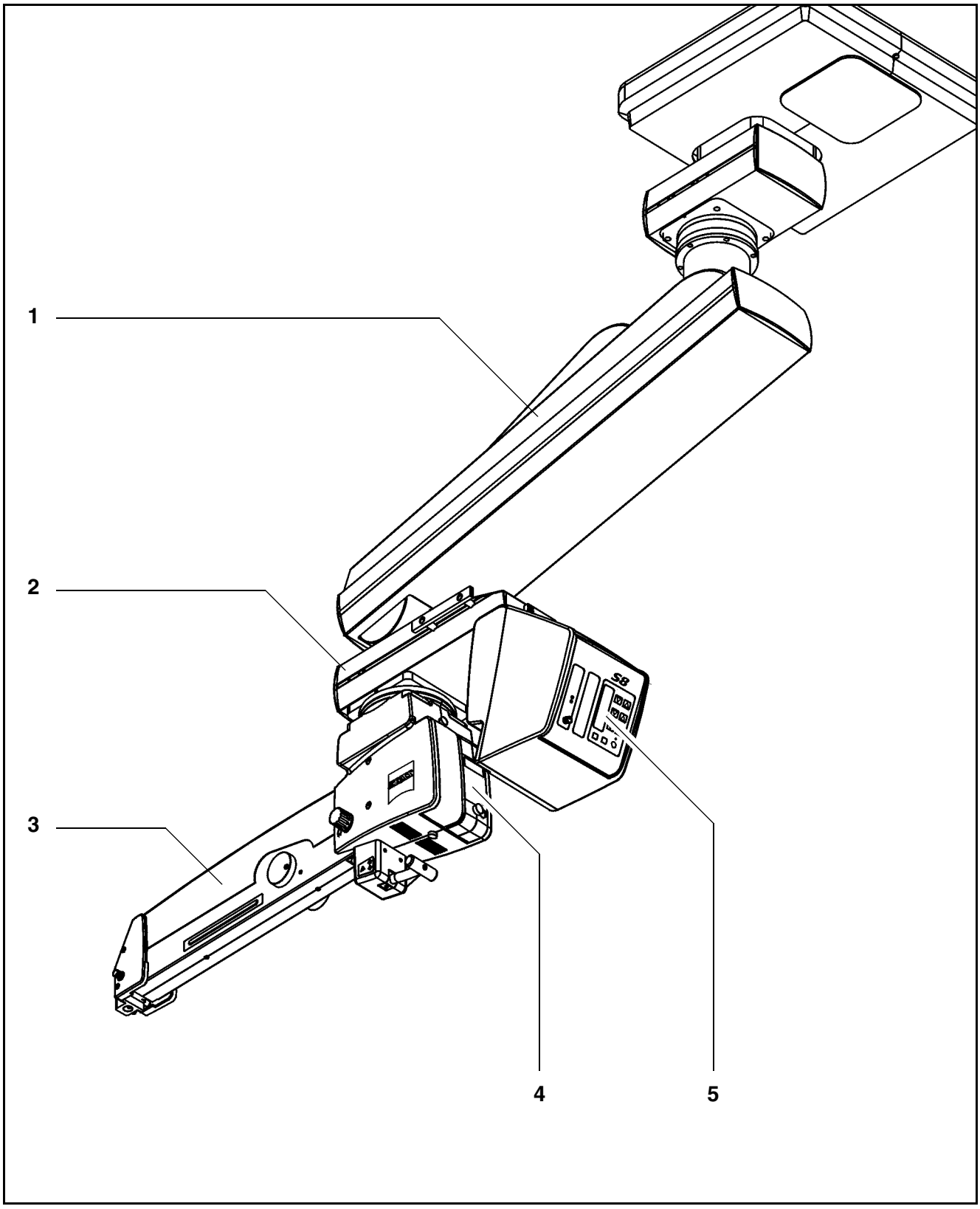
2 Carrier arm

3 Suspension arm

4 Grip
for moving the ceiling mount into the standby or working position.

5 Illumination system, see page 72

6 Control panel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S8

Power switch with connector (option)

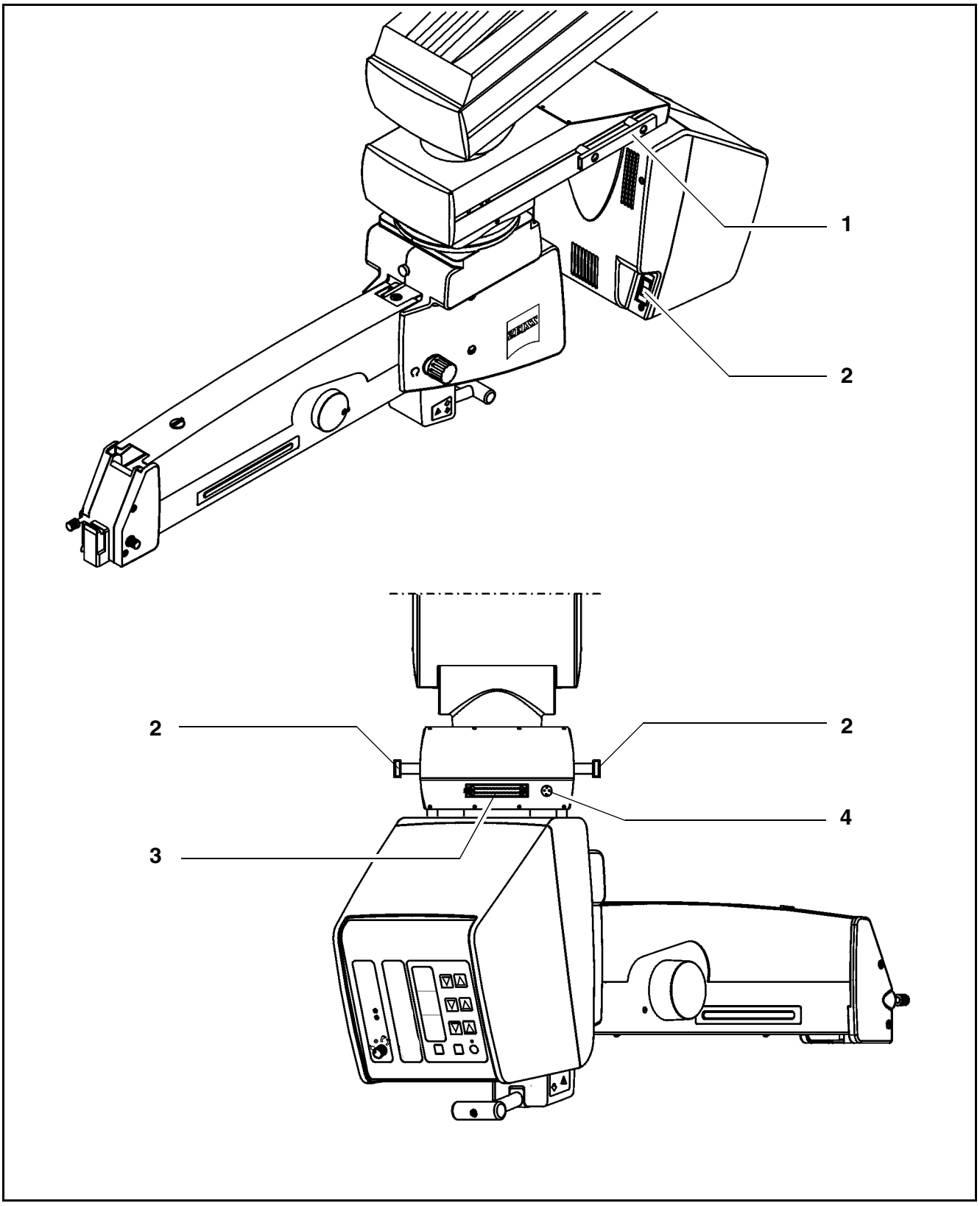
The power switch and the connector can be either installed in the OR, or they can be integrated in the ceiling mount, at the back of the carrier arm (see illustration).

1 Rail
The delivery package contains a cable clip which is used to guide the cable of the foot control panel away from the operating table. The cable clip can be easily attached to rail (1) either on the left or right side of the arm.

2 Power switch
When the suspension system is on, the green indicator light in the switch is lit.

3 Connector for control component (option)
Optional possibility of connecting a foot control panel or hand control panel. (In the standard version, the connector is integrated in the wall console).

4 Remote control socket
for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.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S81 ceiling mount

Intended use

The S81 ceiling mount is a suspension system for Zeiss surgical microscopes. It is used to power and control the motorized functions of the surgical microscope. The hallmarks of the S81 ceiling mount are its superb mobility and easy operation. You can control the motorized functions via a foot control panel or a hand control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- fully automatic change of the halogen lamp,
- brightness control via a foot control panel,
- reset of X-Y coupling, focus and zoom,
- user-defined basic settings for a maximum of nine users:
  - speeds for focus, zoom and X-Y coupling
  - and configurable keys on the foot control panel for focus memory, XY inversion, camera release, swing in/out of SDI, triggering an AUX signal.

Warning!
When using the Superlux Eye illumination system, only operate the system with special xenon lamps approved by Carl Zeiss for ophthalmic surgery. If any other than Carl Zeiss-approved xenon lamps are used, there is the risk of severe injury to the patient's eye.

Description of the modules

The S81 ceiling mount comprises a column, a carrier arm and a suspension arm.

The suspension arm with the lamp housing and the control unit is mounted on the carrier arm. The control unit is rotatable through 180° (70° if the Superlux Eye illumination system with additional, integrated halogen illumination is used) and contains all electrical supply systems required for the control of a motorized surgical microscope. You can control the motorized functions via a foot control panel or a hand control panel.

The suspension arm permits almost effortless positioning of the surgical microscope. The spring force of the suspension arm can be varied in a range from 8 to 20 kg, permitting reliable balancing of the microscope even with heavy accessory equipment. The downward movement of the suspension arm can be limited as required.

Design

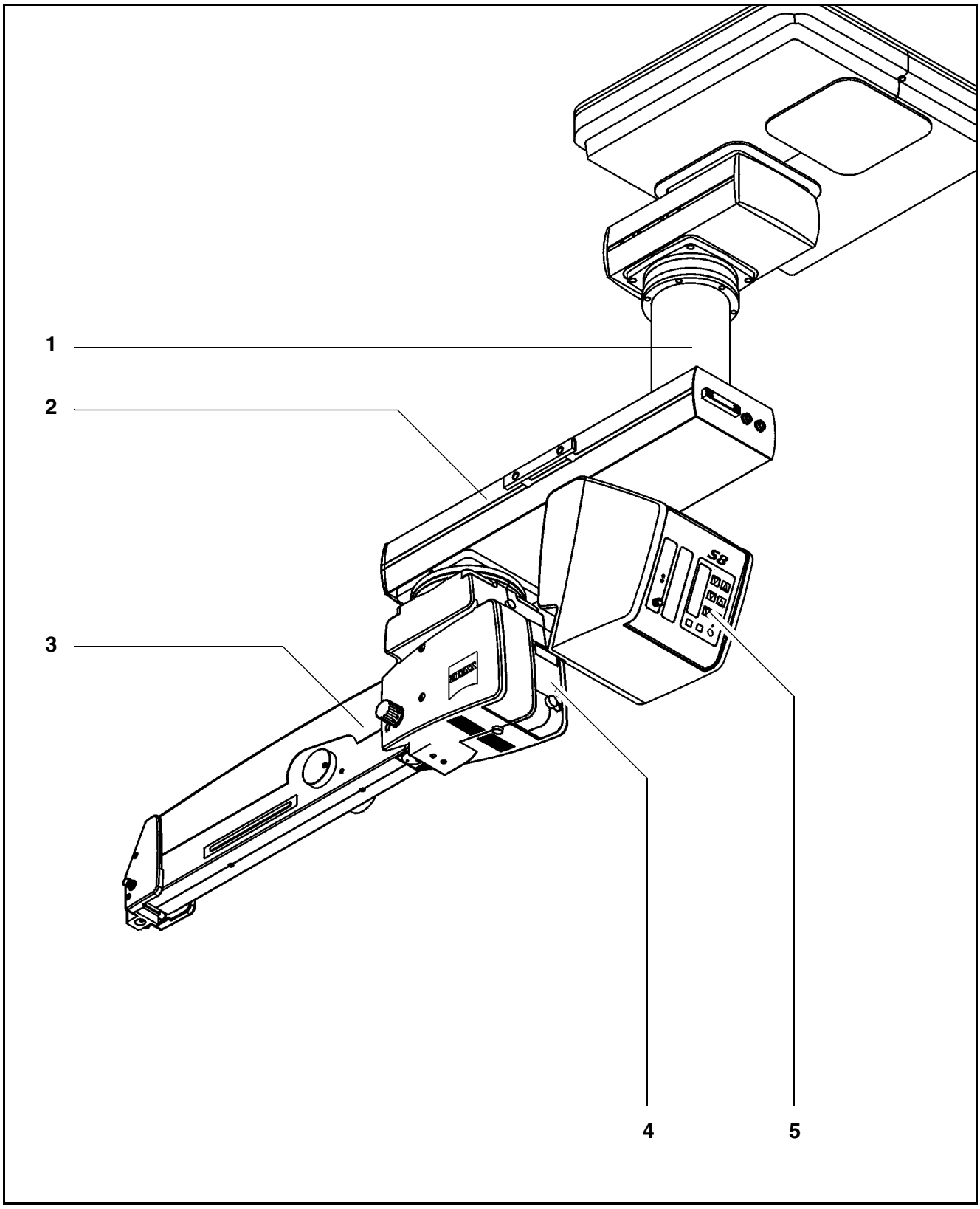
1 Column

2 Carrier arm

3 Suspension arm

4 Illumination system, see page 72

5 Control panel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S8

Power switch, connector and socket (option)

The connector and socket can be either installed in the OR, or they can be integrated in the ceiling mount, at the back of the carrier arm (see illustration).

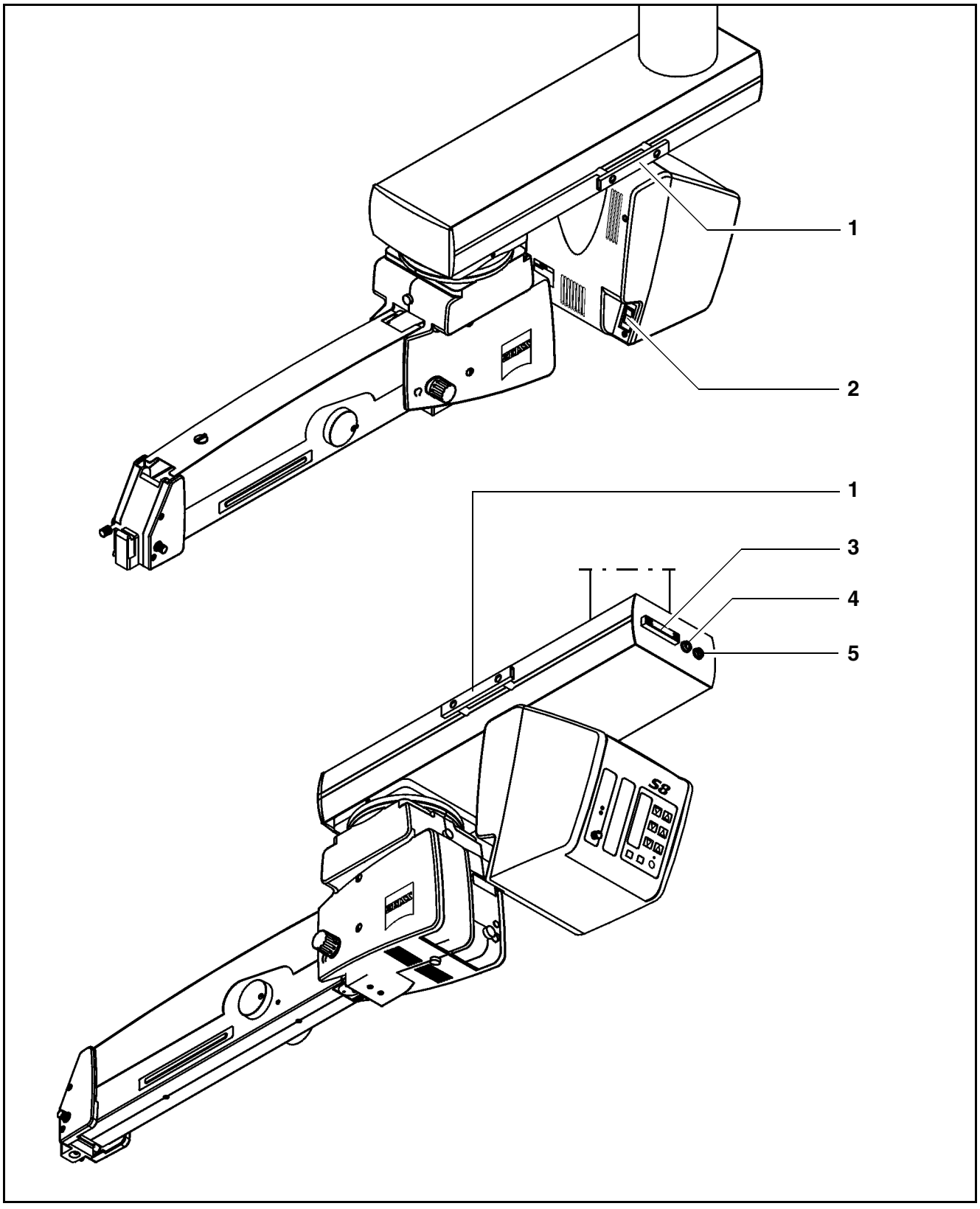
1 Rail
The delivery package contains a cable clip which is used to guide the cable of the foot control panel away from the operating table. The cable clip can be easily attached to rail (1) either on the left or right side of the arm.

2 Power switch
When the suspension system is on, the green indicator light in the switch is lit.

3 Connector for control component (option)
Possibility of connecting a foot control panel or hand control panel.

4 Socket for control component (option)
If the ceiling mount is installed on a ceiling track mount, you can use a hand control panel to move the ceiling mount to its working position or standby position.

5 Remote control socket
for triggering an AUX signal, e.g. to switch on/off an external device operating at max. 24V/0.5A.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S8

VISU 160 surgical microscope on S88 floor stand

Intended use

The VISU 160 surgical microscope has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology.

The S88 floor stand powers and controls the motorized functions of the VISU 160 surgical microscope. The hallmarks of the S88 floor stand are its superb mobility and easy operation. Four steerable casters on the stand base permit easy positioning in the OR. The motorized functions of the surgical microscope can be controlled using a foot control panel or a hand control panel.

The system is intended for use in offices, hospitals or other human medicine institutions.

The system must only be operated by physicians, nurses and other medical staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

– low vibration

– clean environment

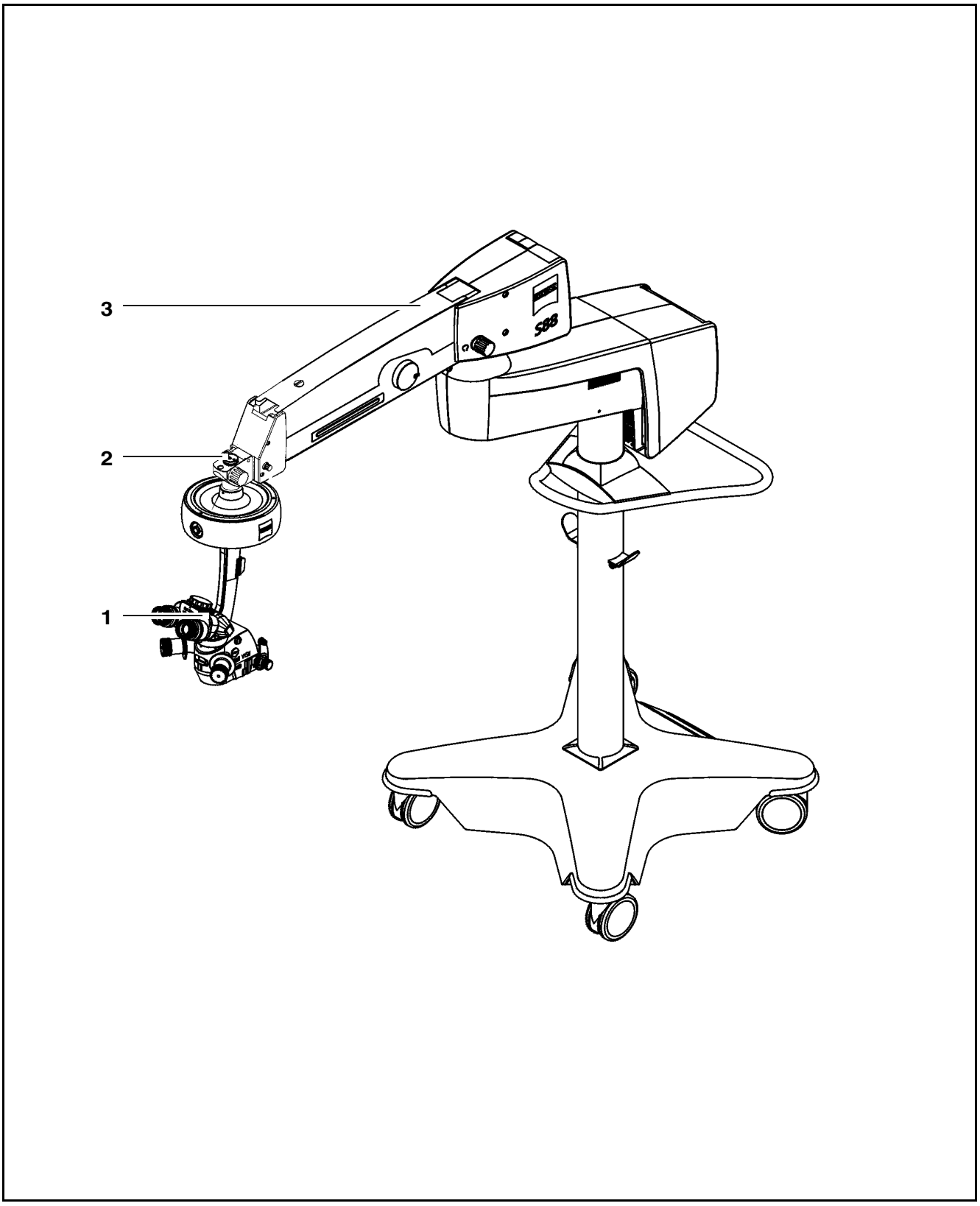
– avoidance of extreme mechanical stress.

Design

1 VISU 160 surgical microscope with X-Y coupling

2 Coupling

3 S88 floor stand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S88

VISU 160 surgical microscope on S8 ceiling mount

Intended use

The VISU 160 surgical microscope has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology.

The S8 ceiling mount powers and controls the motorized functions of the VISU 160 surgical microscope. The hallmarks of the S8 ceiling mount are its superb mobility and easy operation. The motorized functions of the surgical microscope can be controlled using a foot control panel or a hand control panel.

The system is intended for use in offices, hospitals or other human medicine institutions.

The system must only be operated by physicians, nurses and other medical staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

– low vibration

– clean environment

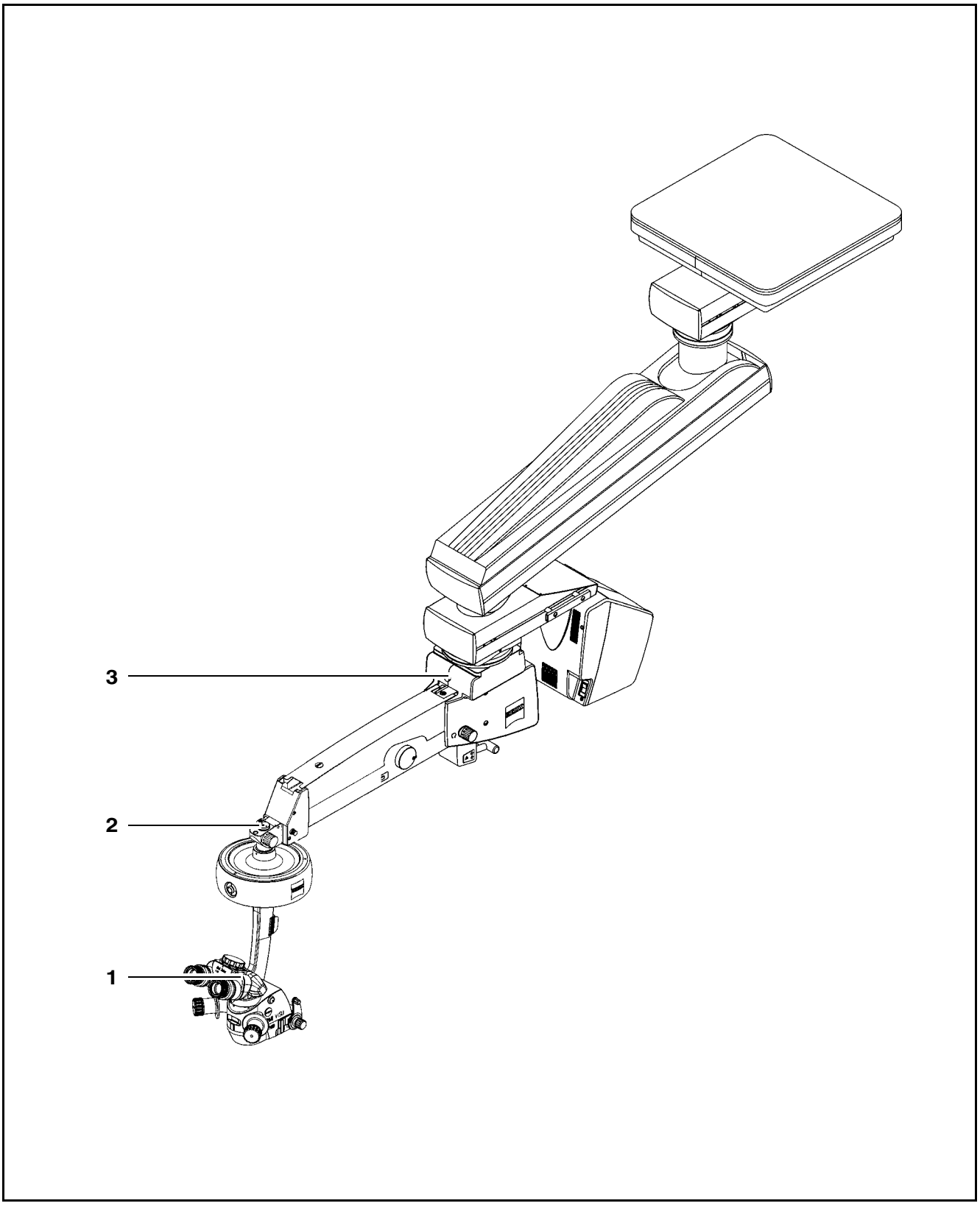
– avoidance of extreme mechanical stress.

Design

1 VISU 160 surgical microscope with X-Y coupling

2 Coupling

3 S8 ceiling mount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VISU 160 surgical microscope on S81 ceiling mount

Intended use

The VISU 160 surgical microscope has been designed for the magnified visualization of the field of view during surgical procedures in ophthalmology.

The S81 ceiling mount powers and controls the motorized functions of the VISU 160 surgical microscope. The hallmarks of the S81 ceiling mount are its superb mobility and easy operation. The motorized functions of the surgical microscope can be controlled using a foot control panel or a hand control panel.

The system is intended for use in offices, hospitals or other human medicine institutions.

The system must only be operated by physicians, nurses and other medical staff who have undergone appropriate training and observe the instructions of the user's manual. The installation conditions and the use of the system must meet microsurgical requirements:

– low vibration

– clean environment

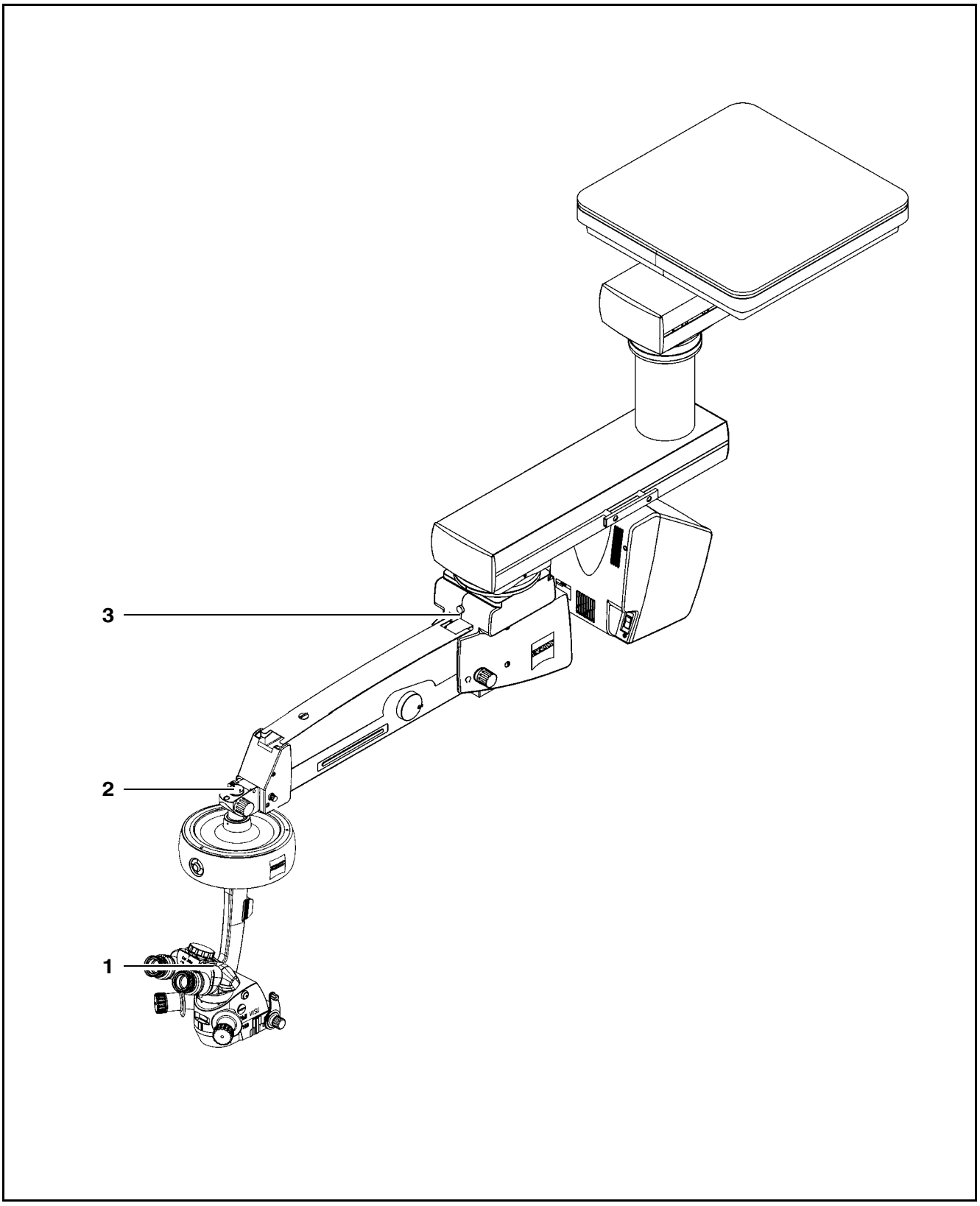
– avoidance of extreme mechanical stress.

Design

1 VISU 160 surgical microscope with X-Y coupling

2 Coupling

3 S81 ceiling mount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Foot control panel (option)

Intended use

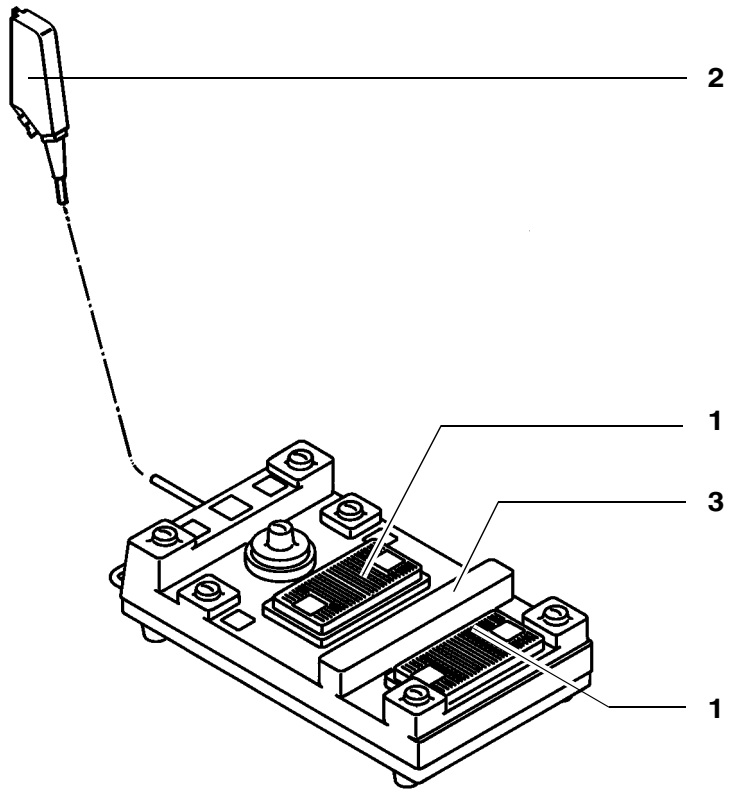
The foot control panel permits you to control 14 different functions of a suspension system or surgical microscope, provided these functions are part of your configuration (suspension system, surgical microscope). The assignment of the functions to the controls of the foot control panel is shown on the next page.

Design

The foot control panel is equipped with two rocker switches (1) for controlling the ”zoom” and ”focus” functions. The up/down movements of these functions are located on the same side, allowing you to control the two directions by toe/heel movement, without having to shift your foot. Bridge (3) between two rocker switches (1) serves as a support to rest your foot on.

Connector (2) is used to connect the foot control panel to the connector of a suspension system or wall-mounted control panel.

The foot control panel is enclosed in a water-tight rubber case.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The illustration shows the standard assignment of functions to the foot control panel. On request, our service staff can change the assignment of the focus/zoom functions and that of button (10).

1 Joystick for X-Y coupling

2 Reducing the lamp brightness

3 Recentering of the X-Y coupling and focus starting position (optional: control of Stereo Digital Inverter IIe / 3e from the company Oculus). The button is freely configurablepage 167.

4 ZOOM▼ Reducing magnification (optional: FOCUS▲ Reducing working distance)

5 ZOOM▲ Increasing magnification

6 On/Off of the lamp

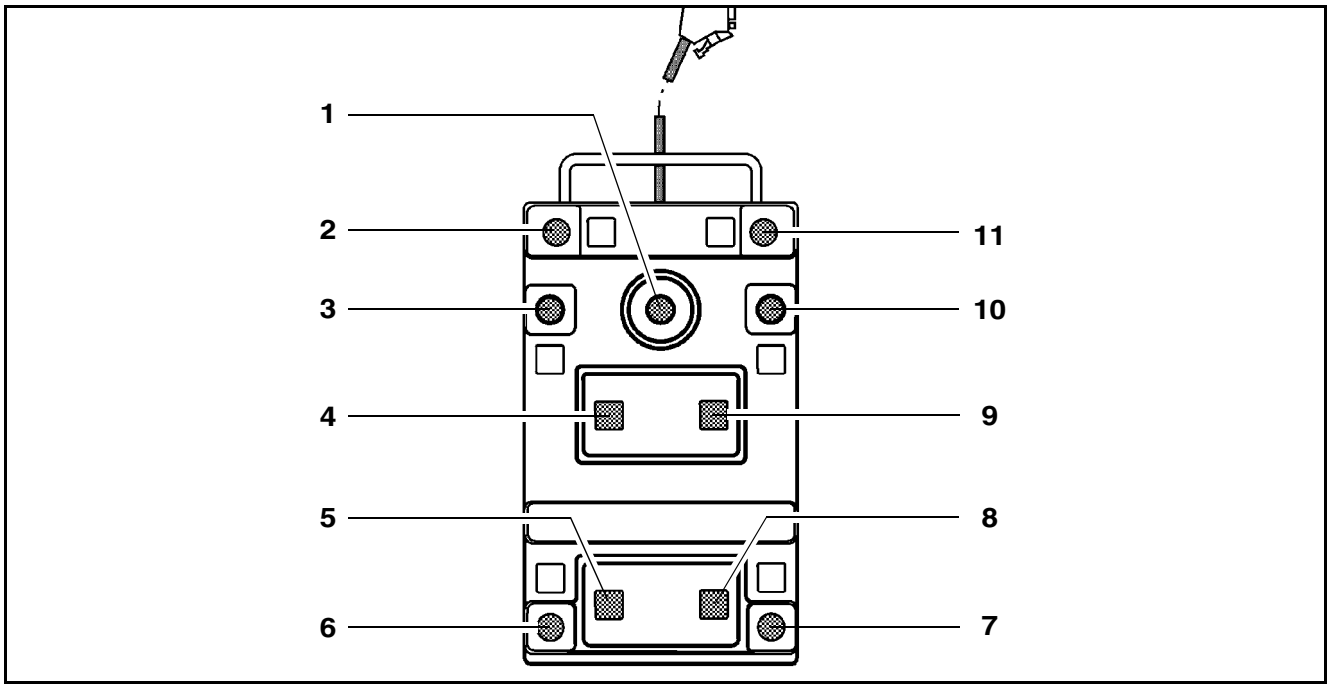
7 No function

8 FOCUS▲ Increasing working distance, (ZOOM▼ Reducing magnification)

9 FOCUS▼ Reducing working distance

10 Controlling external units using the Remote function (option: release of 35 mm camera) The button is freely configurable.

11 Increasing the lamp brightness



Preparations

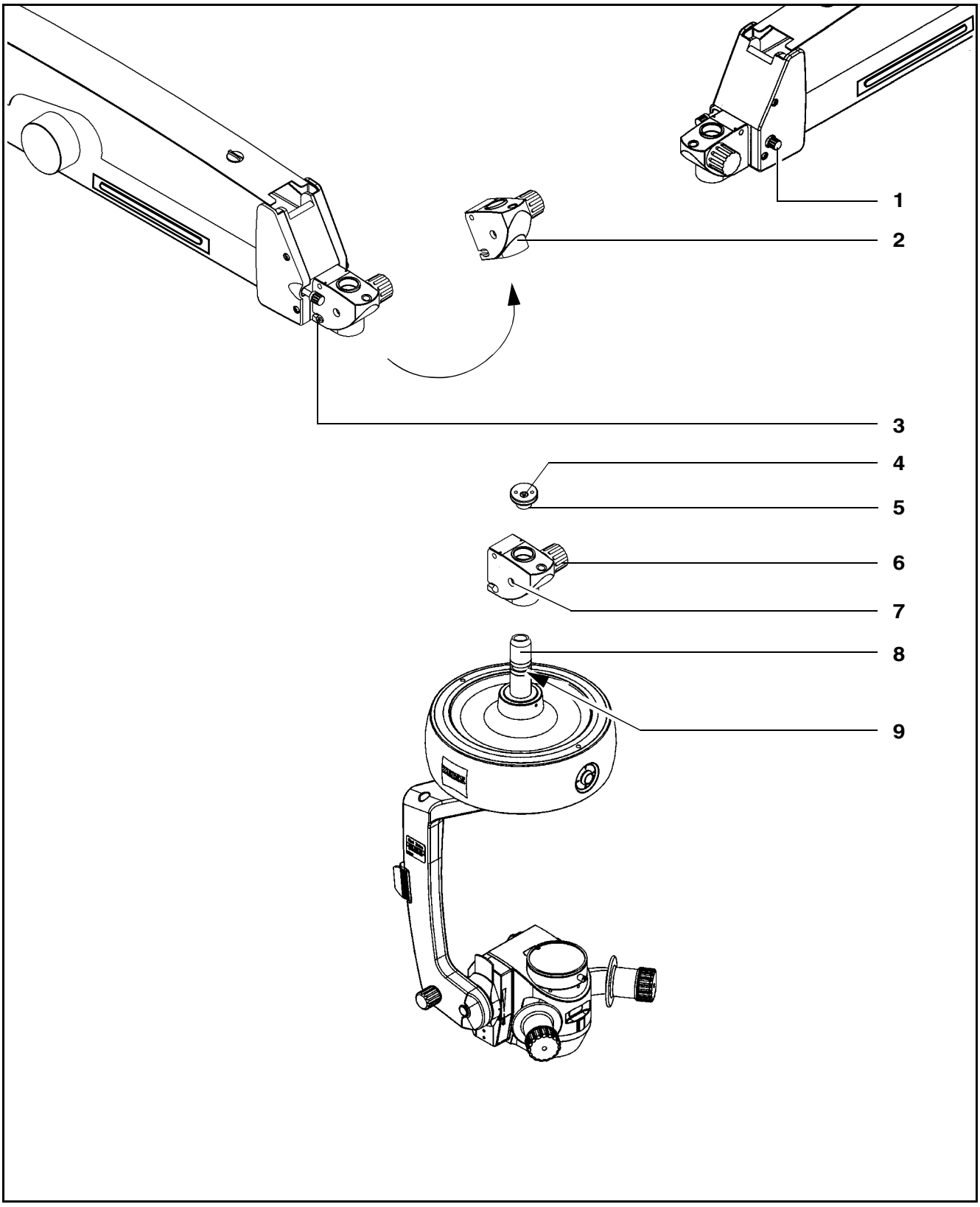
Attaching the equipment

Mounting the surgical microscope

Warning!

The maximum weight of the microscope including accessories must not exceed 20 kg!

- Bring the suspension arm into its horizontal position, pull out locking knob (1) and turn it clockwise or counterclockwise through 180°. At the same time, slightly move the suspension arm up and down until the lock snaps in. This prevents the suspension arm from uncontrollably moving upward when insufficient weight is attached.
- Turn off the system at the power switch.
- Use a hex key to loosen mounting screw (3) by a few turns.
- Tilt coupling (2) upward and remove it in the upward direction.
- Loosen locking screw (6) by a few turns.
- Give securing screw (7) a few turns to loosen it.
- Slightly lubricate microscope shaft (8) (e.g. with instrument grease or vaseline).
- Slide coupling (2) from above over microscope shaft (8). Screw in mounting screw (5) from above and firmly tighten securing screw (4) using a hex key.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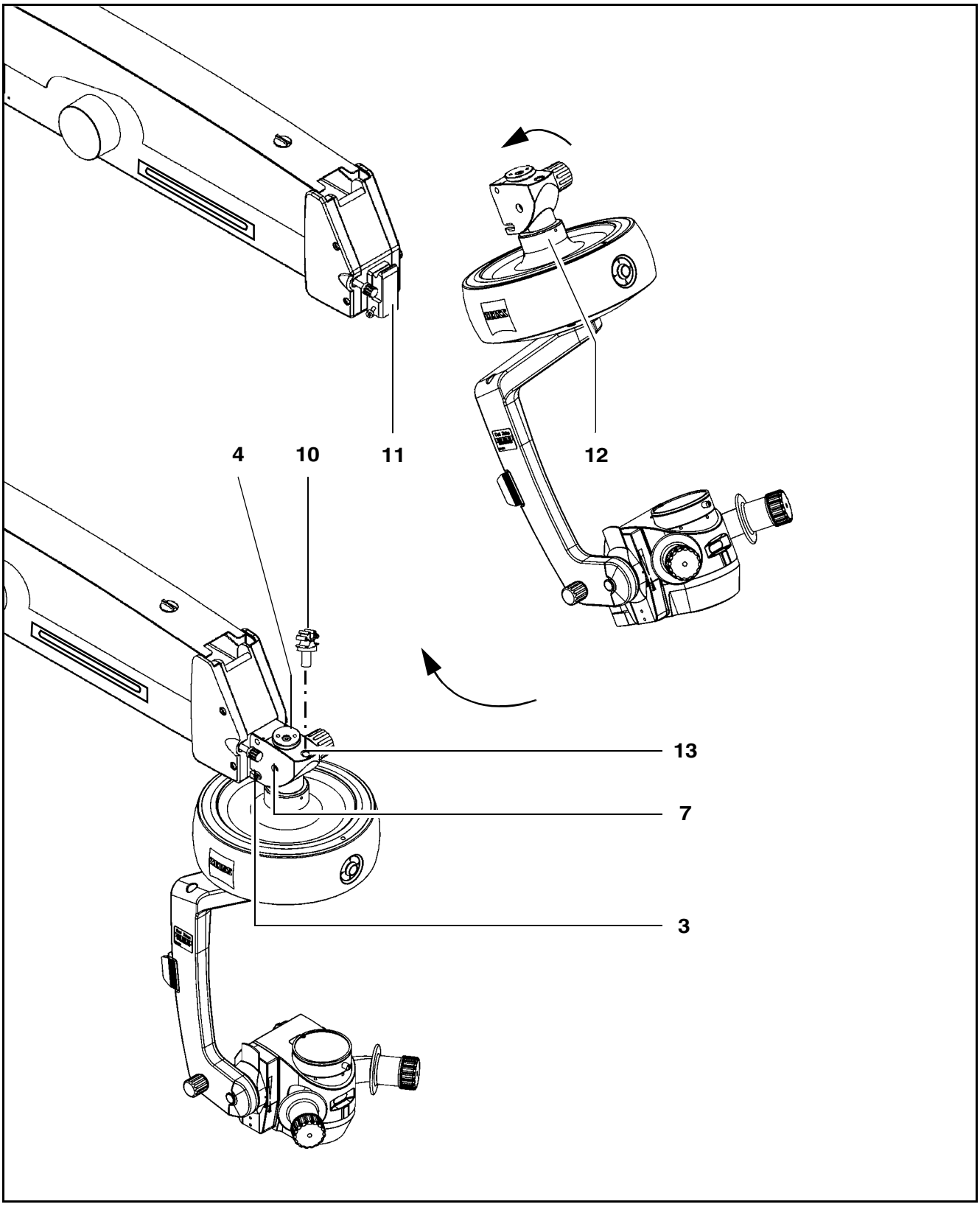
- Screw in securing screw (7) and tighten it firmly. Securing screw (7) must go into groove (9). This is ensured when the securing screw is flush with the outer surface.
- Hook coupling (12) with the attached surgical microscope from above into receptacle (11) on the suspension arm, and tilt the coupling downward into its vertical position.
- Tighten mounting screw (3) firmly using a hex key.
- Insert cable clip (10) into opening (13) of the coupling.
- Make the electrical connections as required.
- Perform the balance setting procedure.

Warning!

Before using and after re-equipping the unit, always make sure that securing screws (3), (4) and (7) have been tightened firmly.

Note:
The procedures for mounting the coupling need not be performed on surgical microscopes equipped with an integrated coupling.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Mounting the tube, the eyepieces and the objective lens

- Bring the suspension arm in a position convenient for you and firmly tighten locking knob (1).
- Loosen securing screw (5) by a few turns.
- Remove cover (3) and store it in a safe place.
- Place binocular tube (6) on the microscope body and firmly tighten securing screw (5).
- You can install further accessories between the binocular tube and the microscope body. Lock these units in position in the same way using securing screw (5).
- Insert widefield eyepieces (8) as far as they will go in mounts (7) intended for them. The magnetic coupling reliably secures them in position.
- Loosen locking knob (1) again and adjust the degree of friction as required.

Warning!

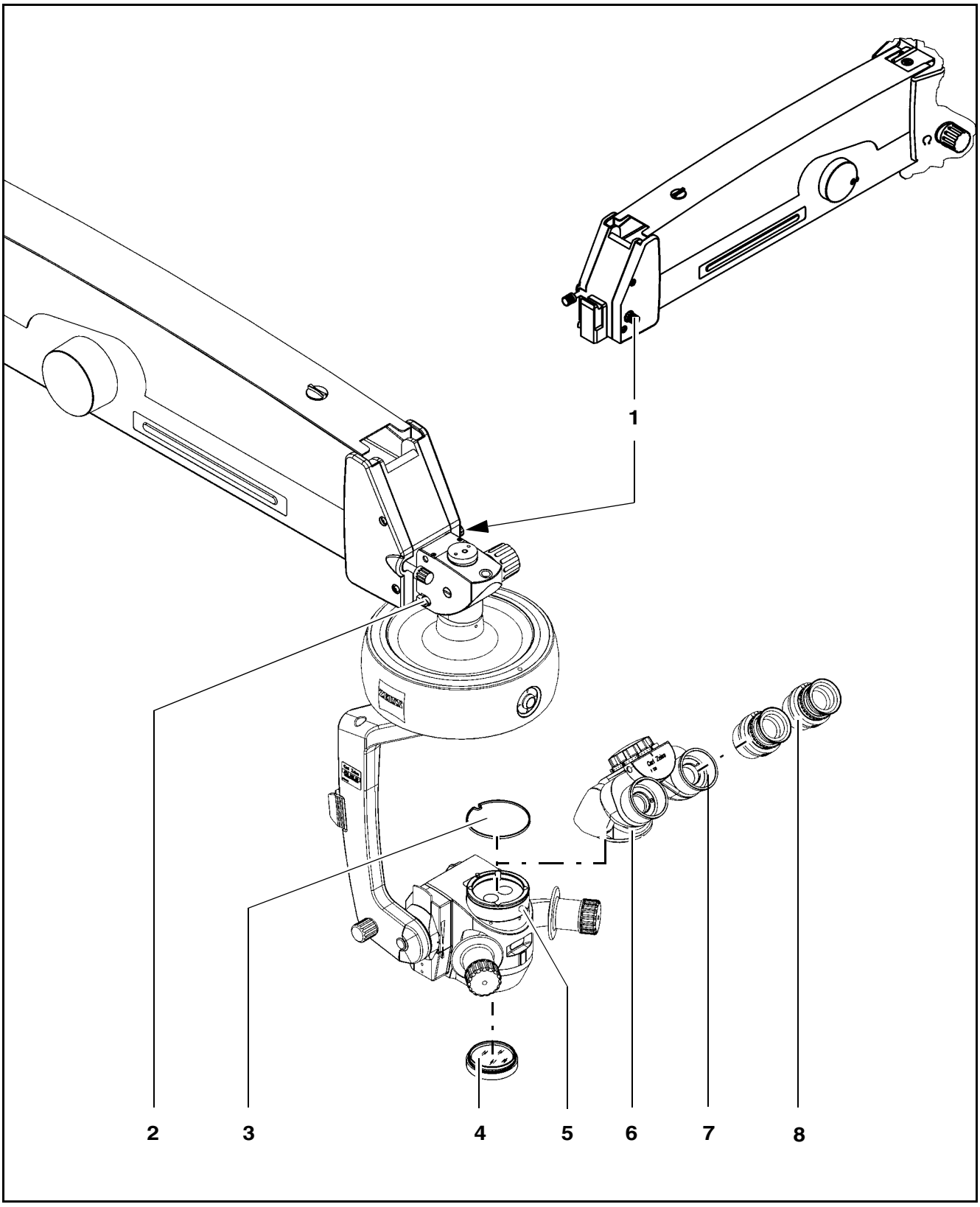
– Before every use and after re-equipping the instrument, make sure that binocular tube (6) is securely locked in position. Make sure that securing screws (2) and (5) and objective lens (4) have been firmly tightened!

– When attaching any components, take care not to damage the DeepView system.

– Re-adjust the balance of the suspension arm after every change of the equipment.

Note:
If you wish to use documentation equipment, we can supply an eyepiece with a reticle to aid focusing. The retrofitting of a reticle to an eyepiece can only be performed in the factory or by our service staff. Always install the eyepiece with the reticle on the same side of the binocular tube where the documentation equipment is located.

- Screw objective lens (4) into the microscope body and tighten it firmly.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Changing the microscope accessories

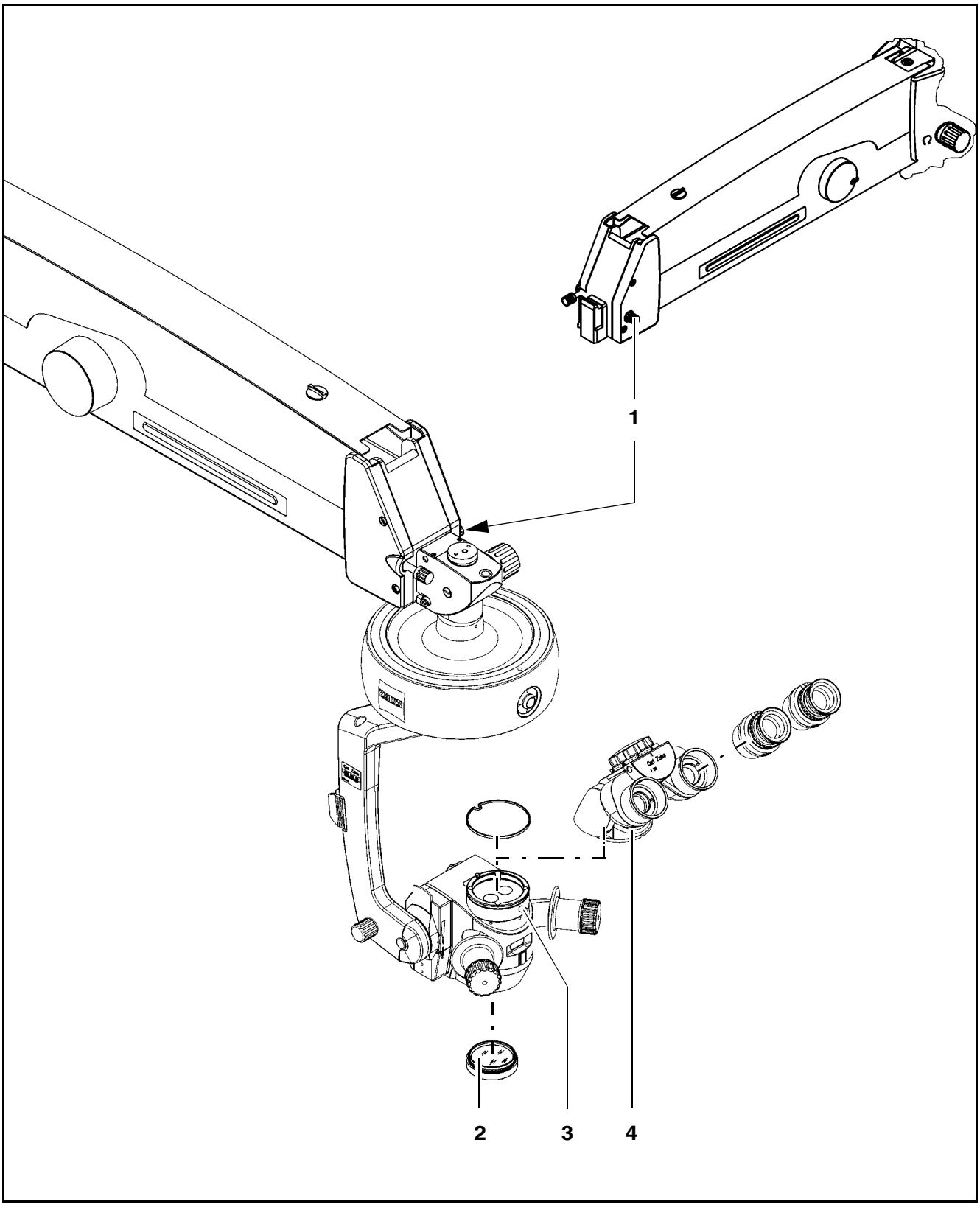
You can change the microscope accessories in reverse order to that described before. Please observe the following:

- Turn off the unit at the power switch before changing any accessories.
- Bring the suspension arm in a position convenient for you and firmly tighten locking knob (1).
- After changing the accessories, re-adjust the friction as required.

Warning!

– Before every use and after re-equipping the instrument, make sure that binocular tube (4) is securely locked in position. Make sure that securing screw (3) and objective lens (2) have been firmly tightened!

– Re-adjust the balance of the suspension arm after every change of the equipment.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Connections

Connecting the surgical microscope

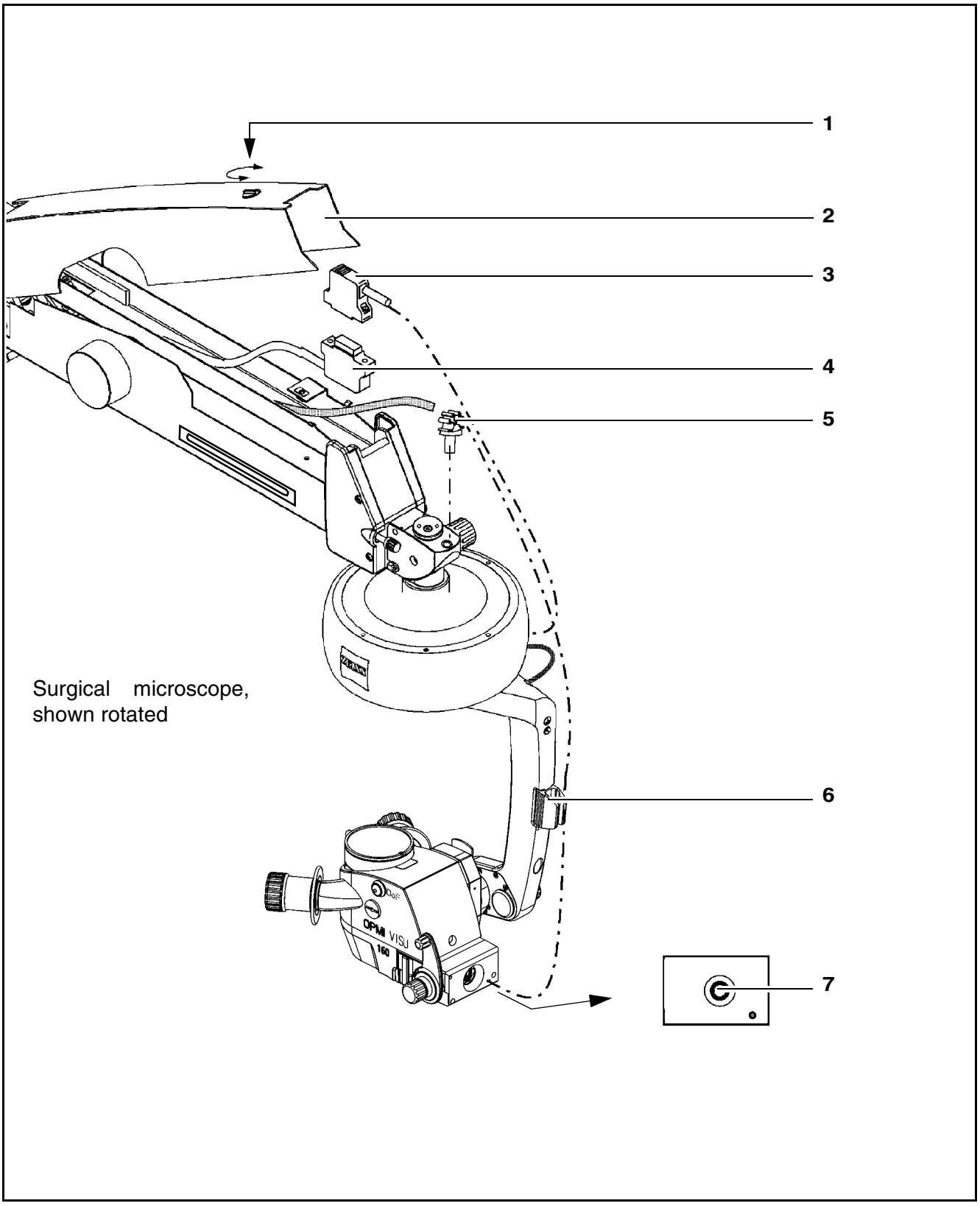
- Turn locking cap (1) by a quarter turn to the right or left and pull up cover (2).
- Plug microscope connector (3) into connector (4) and tighten the securing screws on the microscope connector.
- Press the microscope cable into cable clip (5). Install the cable in such a way that it is neither stretched nor kinked when the microscope is turned or tilted.
- Press down cover (2) as far as it will go and lock it with cap (1).

Connecting the S light guide

Warning!
Only operate the VISULUX^{TM} fiber slit lamp with xenon illumination if you can ensure that the light guide is equipped with a UV filter. A light guide with UV filter in included in the upgrade kit, see ordering data. If a light guide without UV filter is used, there is the risk of phototoxic retinal injury to the patient's eye.

- Insert the end of the light guide into light guide socket (7) of the microscope as far as it will go, and press the light guide into cable clip (6).

Note:
Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.



Surgical microscope, shown rotated

Strain relief device on S88 floor stand

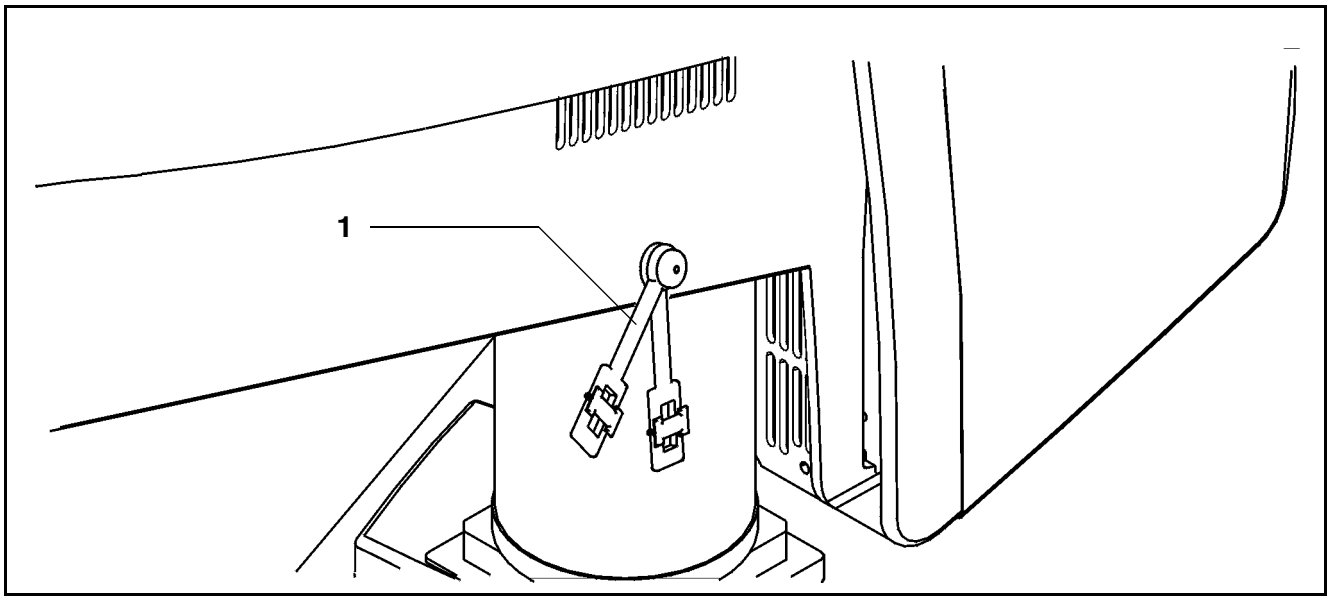
Note:
To prevent inadvertent unplugging of the power cable and of the control element connector, secure the two cables in strain relief device (1).

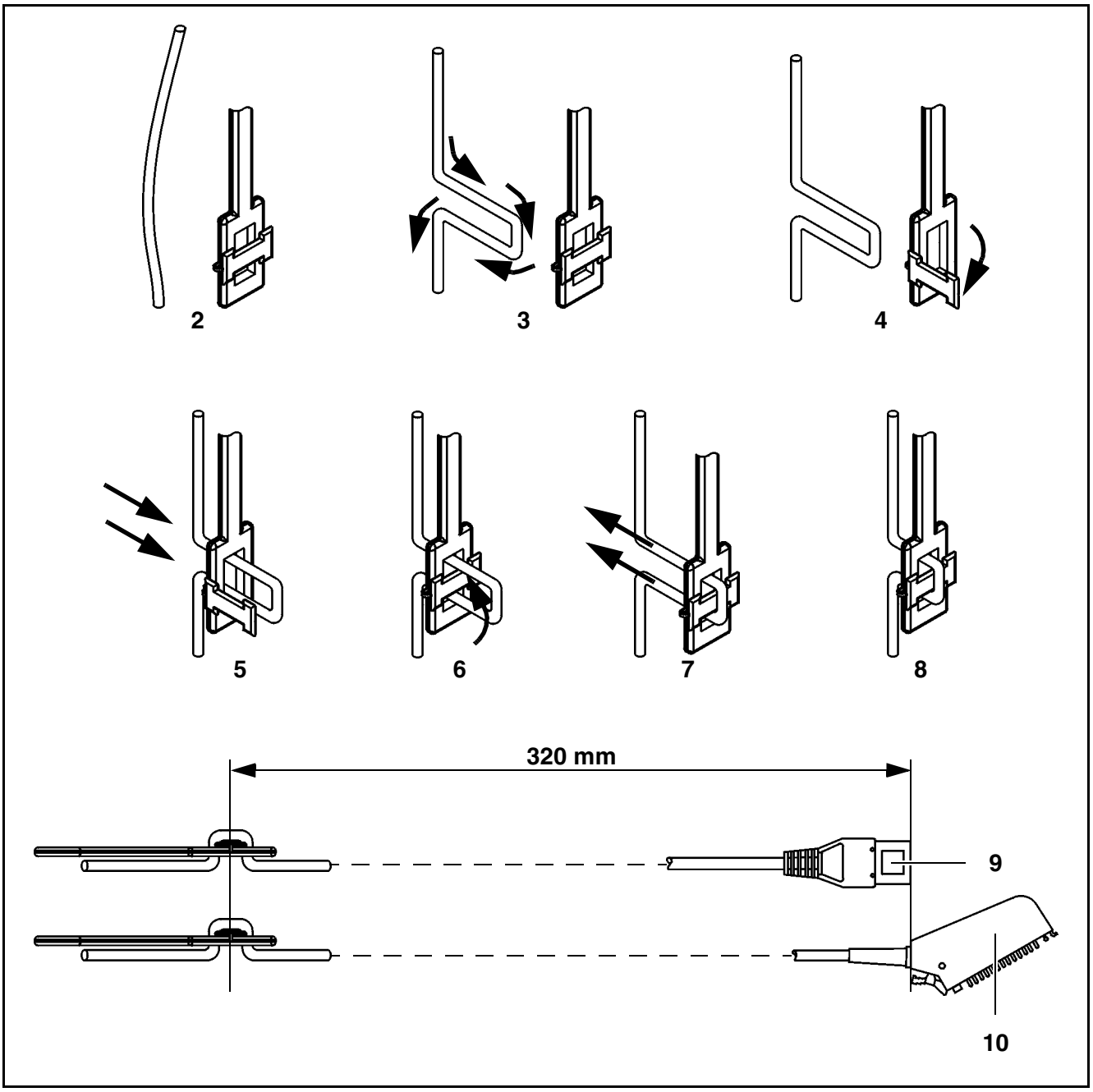
After strain relief device (1) has been mounted, the cables must have the following length:

– 320 mm from the the strain relief device up to and including power outlet (9).

– 320 mm from the the strain relief device up to connector (10) of the foot control panel, hand control panel or operating chair equipped with a footswitch.

- Form a loop with the cable as shown in (3).
- Open flap (4).
- Feed the cable through opening (5).
- Close flap (6).
- Tighten the cable until it encloses flap (7).
- Check the length of the cable.

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320 mm
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Connecting the S88 floor stand

- Check the voltage indicated at (3).

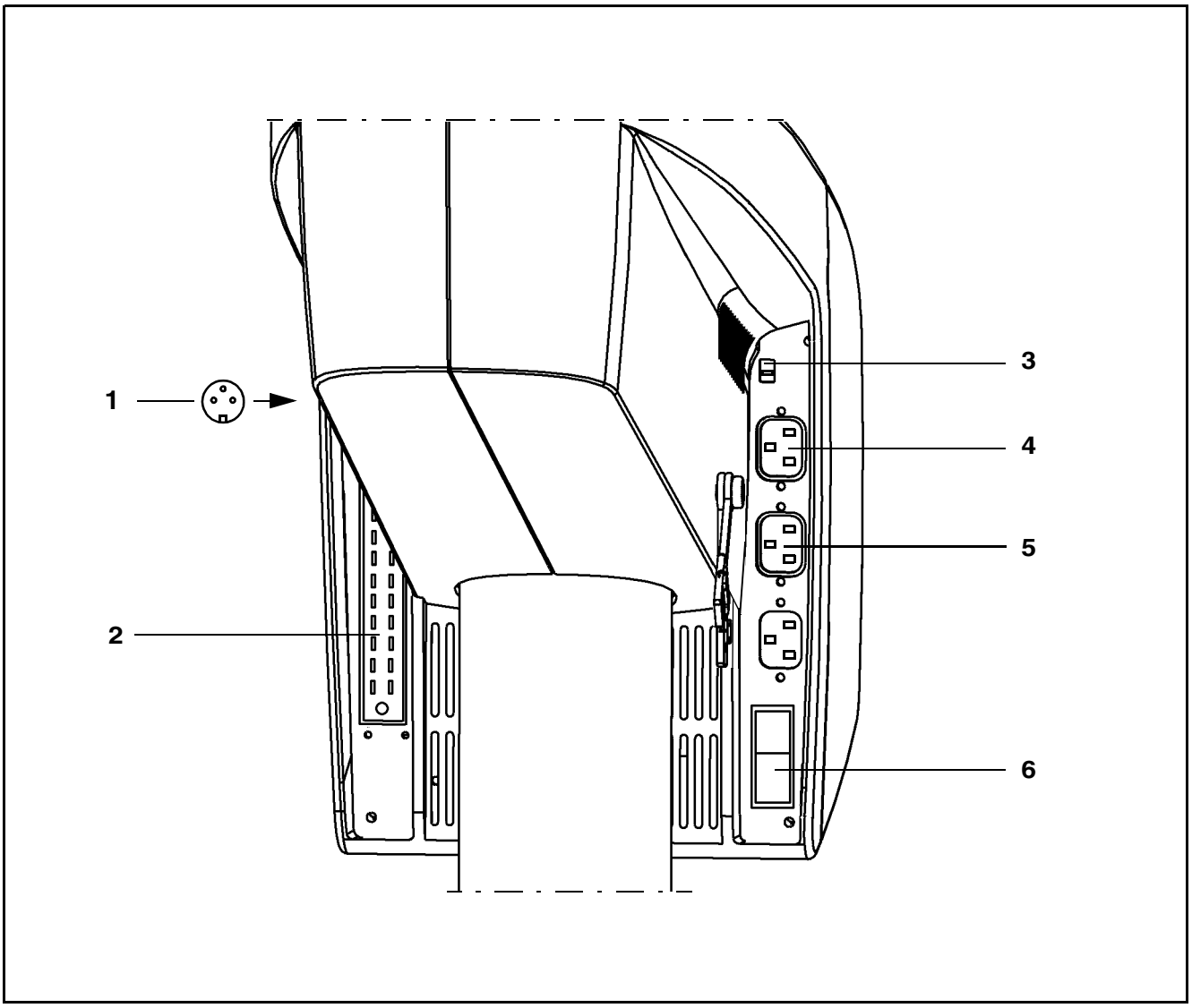
Caution:
The voltage of the stand is factory-set to the rated voltage used in the country of destination. The rated voltage indicated at window (3) must correspond to the rated voltage available at the site of installation. If this is not the case, you must re-adjust the sliding switch using a suitable tool.

Note:
Insert or remove connectors (2) and (4) only if power switch (5) is off.

- Plug the connector of the foot control panel or operating chair into connector (2) of the stand.
- Attach the microscope cable to the existing cable support in such a way that it is not stretched or bent when the microscope is swiveled.
- Secure the light guide in the cable support and insert the light into the light guide mount on the microscope until stop. Make sure that the light guide is not stretched or bent when the microscope is turned or swiveled.

Connect external instruments with max. 24 V / 0.5 A to the remote control socket (1); you must be able to switch these instruments on or off via an AUX-signal to the foot control keys which can be configured as required.

Connect the stand to line power using the power cord intended for it. Only use power outlets which are provided with a properly connected protective ground contact.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Relocating the system

Note:
As the stand is very easy to maneuver, there is a tendency to underestimate its considerable weight. Therefore, move the stand slowly and carefully!

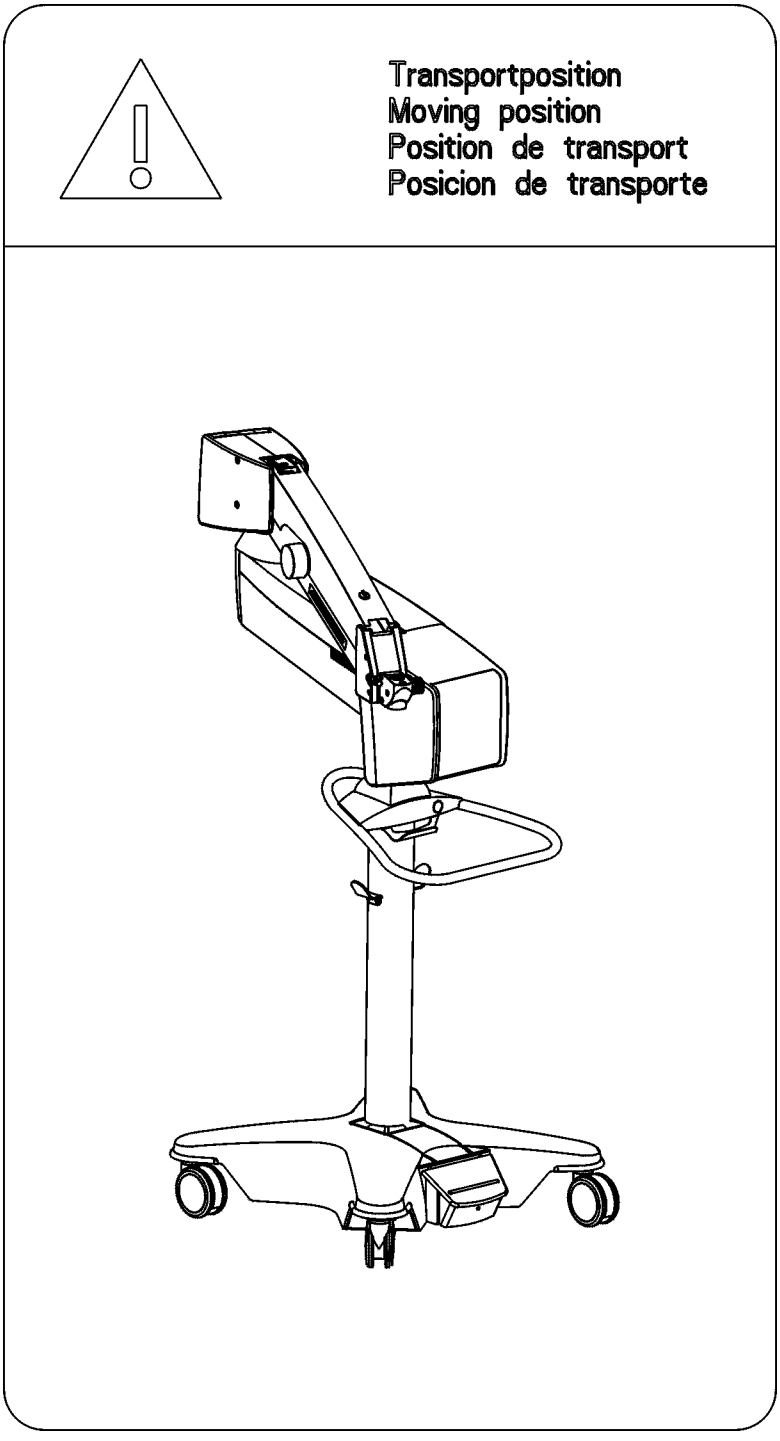
Please observe the following points when relocating the stand:

- Fold the suspension arm to its moving position (see illustration on the opposite page).
- Switch off the illumination system using the knobs, and the system at its power switch.
- Unplug the power cord from the wall outlet.
- Wind up the cable of the foot control panel on one of the cable supports, and hang the foot control panel on the handle.
- Wind up the power cord on the other cable support.
- Use the maneuvering handle for moving the stand.
- Be careful of heights when passing through doorways.
- Avoid collisions of any kind.

- Do not go over steps and edges: The stand might topple!
- Be extremely careful when moving over slopes.
- Do not park the stand on slopes.

Press the brake tab to lock the stand in position. Make sure that the stand is no longer able to roll away by itself.

Caution:
Over longer distances (e.g. removal, return for repair, etc), the instrument must always be transported in the original packaging or in special return packaging. For details, please contact your dealer or the Carl Zeiss service team.


Transportposition
Moving position
Position de transport
Posicion de transporte

Adjusting the supension system

Adjusting the balance setting of the suspension arm

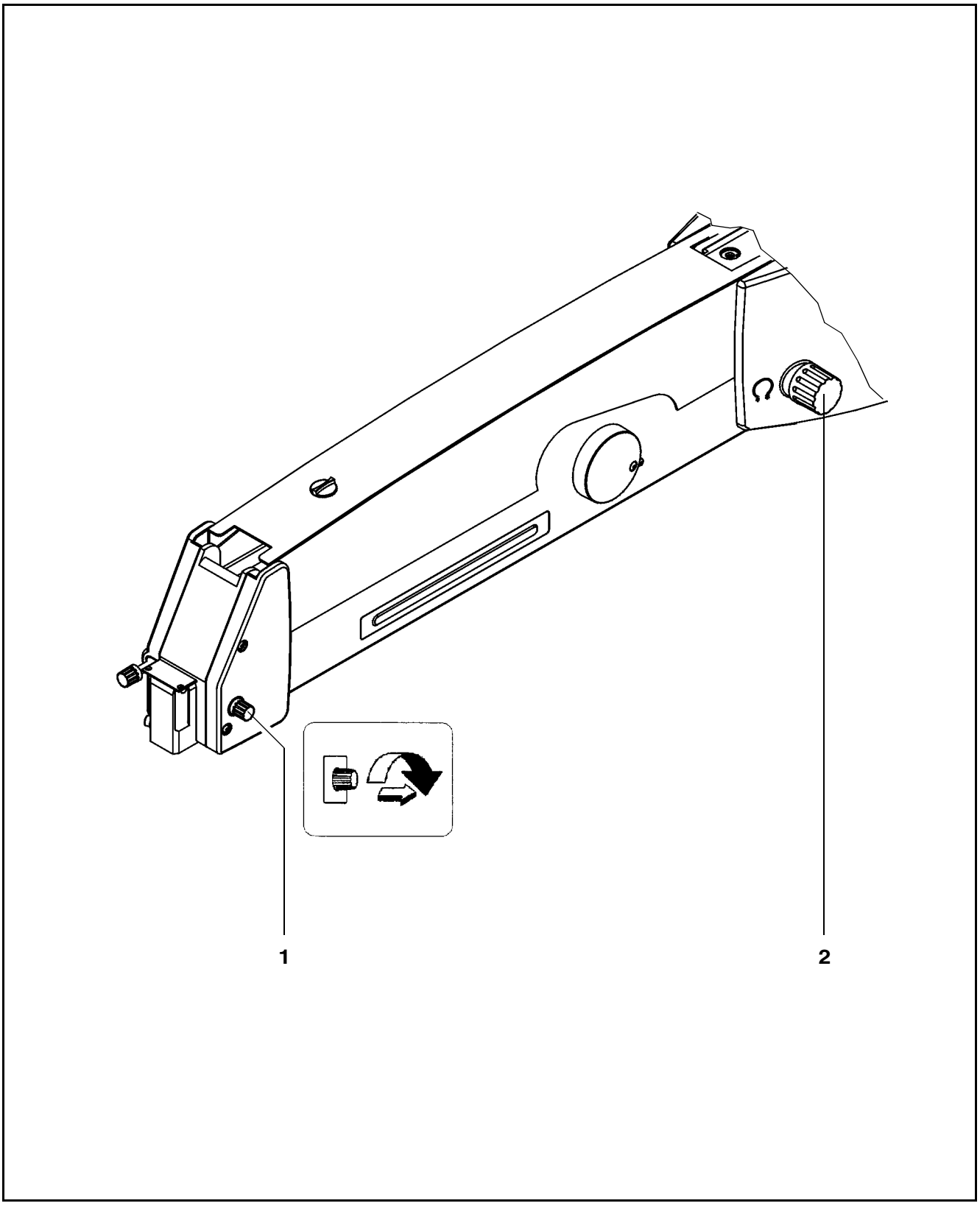
- Only perform the balance setting procedure with the complete microscope equipment attached!

Note:
We recommend that you perform coarse balancing of the suspension arm before starting with precise balance setting of the suspension arm. The suspension arm must be locked in the horizontal position for this procedure.

- For coarse balancing, move the suspension arm slightly up and down. At the same time, turn adjustment screw (2) until you think that the spring force is sufficient to compensate for the weight of the surgical microscope and accessories.

Note:
Turning the screw clockwise increases the spring force, turning it counterclockwise reduces the spring force.

- Hold the suspension arm and pull out locking knob (1). This must be possible without major effort. Otherwise, readjust the spring force using adjustment screw (2).
- During the balancing procedure, press one of the magnetic brake release buttons on the surgical microscope. Move the suspension arm up and down alternately by approx. 20 cm. Use adjustment screw (2) to adjust the spring force in such a way that the effort required to move the arm up or down is the same.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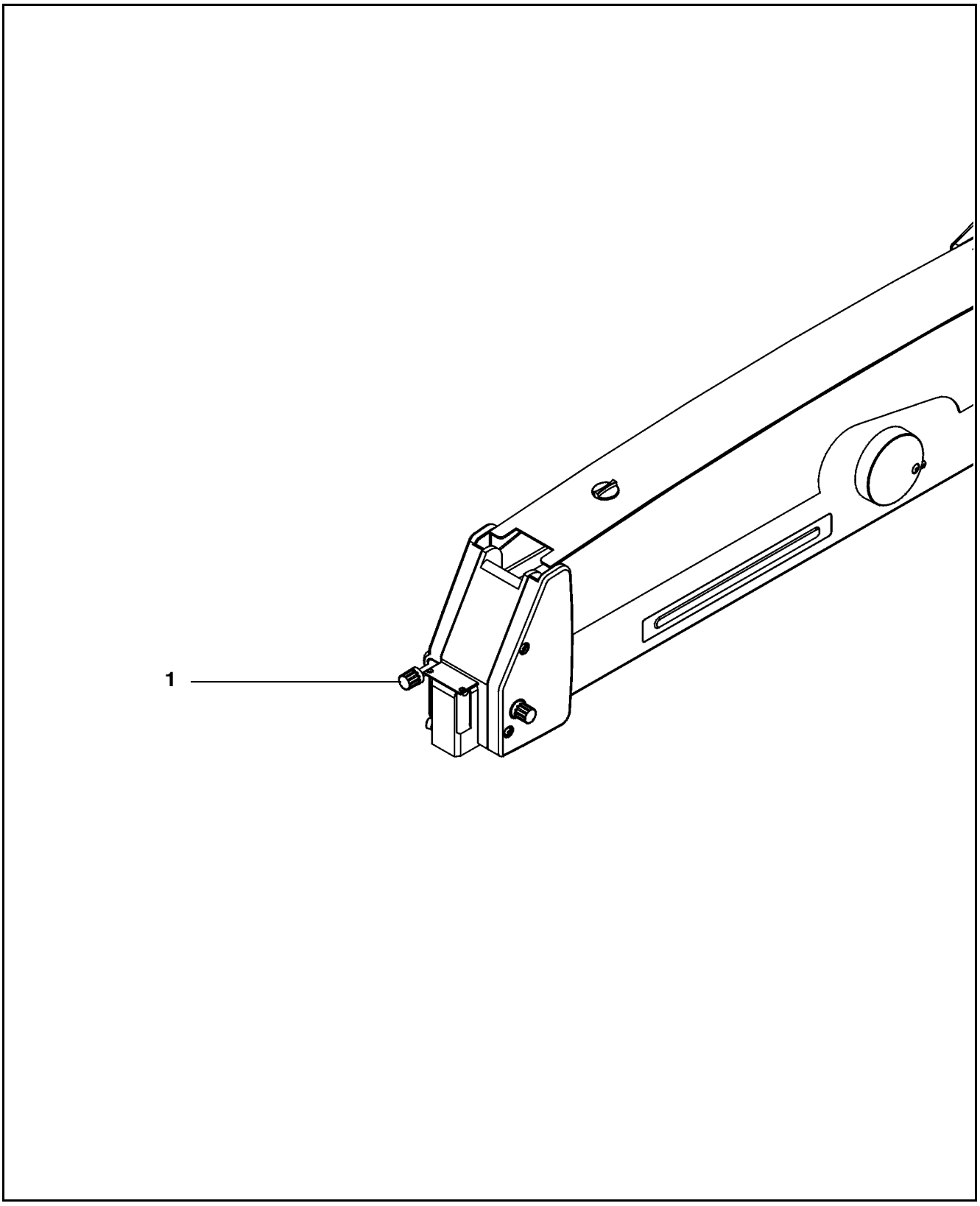
Adjusting the limit of downward movement

The downward travel of the suspension arm must be limited in such a way that no hazard is caused to the patient's safety even if the surgical microscope is inadvertently lowered.

- Give adjustment screw (1) a few turns to loosen it.
- Press one of the magnetic brake release buttons on the surgical microscope and lower the surgical microscope until it can be focused on the surgical field (depending on the focal length of the objective lens), while at the same time allowing for a sufficient safety distance from the surgical field.
- Turn adjustment screw (1) clockwise as far as it will go.
- Lower the surgical microscope again to its bottom stop and check the safety distance.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Positioning the S8 ceiling mount

1 Working position

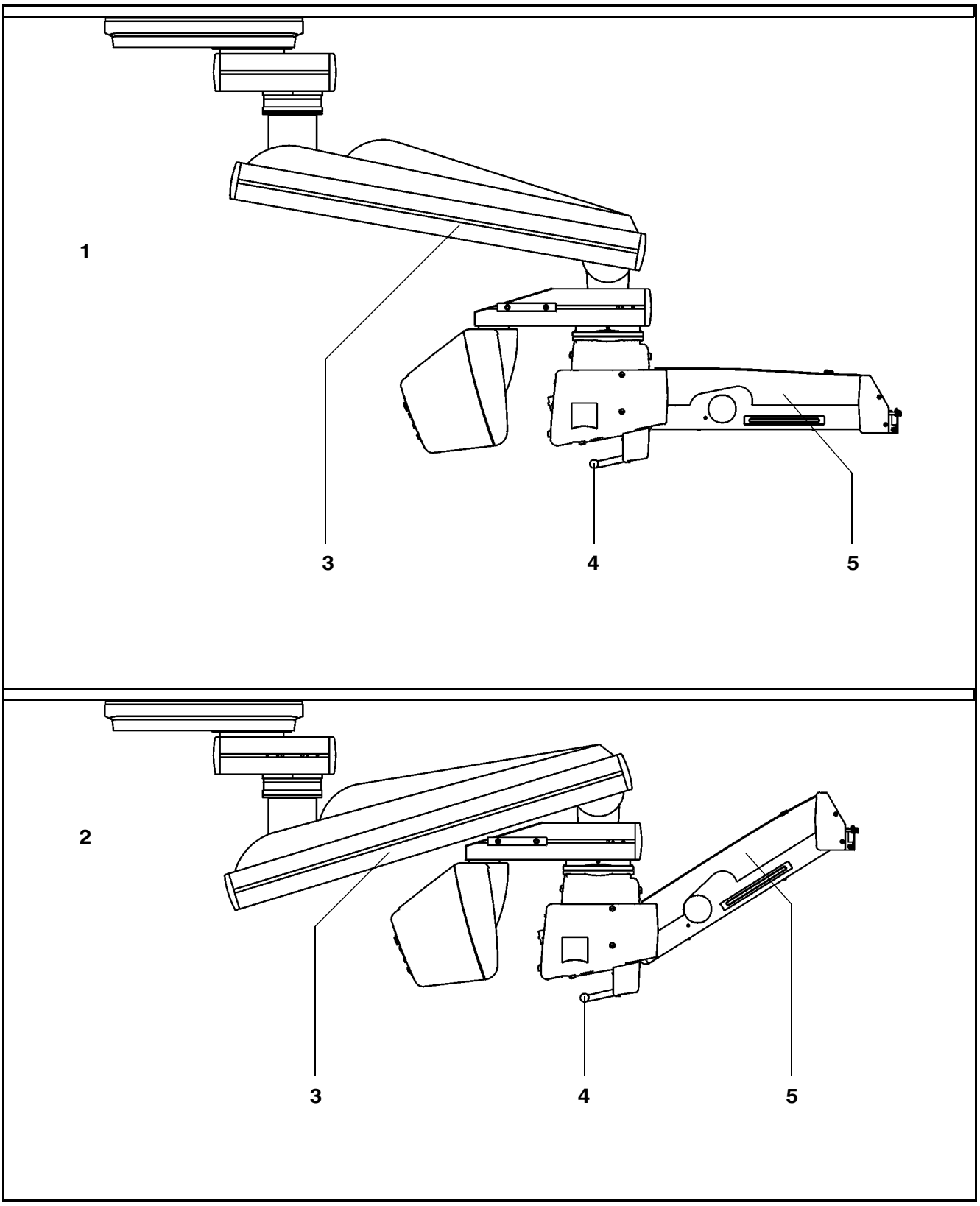
2 Parking position

Working position

- Pull the ceiling mount into the working position using the handle (4). The recommended height is approx. 1750 mm measured from the handle to the floor.
- When you release the handle (4), the lift arm (3) is locked in the working position (1).

Parking position

- Press the release key of the magnetic brakes on the surgical microscope. Move the suspension arm (5) to the highest possible position.
- Push the ceiling mount upward into the parking position using the handle (4). The parking position is the highest possible position.
- When you release the handle (4), the lift arm (3) is locked in the parking position (2).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Settings on the control and display panel

Adjusting the suspension system

- Turn on the suspension system at its power switch.
- Successively select the following functions on the suspension system:
  - lamp brightness,
  - motor speeds for zoom,
  - focus and
  - X-Y coupling.
- Set the lamp brightness as follows:

  Start with the minimum brightness setting, and gradually increase the brightness until the necessary and still admissible level has been reached.
  - Xenon: adjustment range: 1 ... 10
- Set the values required for
  - motor speeds of the functions zoom,
  - focus and
  - X-Y coupling.

  Motor speed
  Adjustment range: 1...10
  Level 1 corresponds to the lowest, level 10 to the highest motor speed.

Adjusting the surgical microscope

Bring the surgical microscope into its starting position within the focusing range. Adjust the minimum magnification on the surgical microscope. Bring the surgical microscope into the position required. Adjust your interpupillary distance on the binocular tube. Adjust your prescription on the eyepieces. Please note that instrument myopia may occur.

Emmetropes
adjust the diopter scale to 0 diopter (D).

Eyeglass wearers
(who perform surgery wearing their eyeglasses) adjust the diopter scale to 0 diopter (D).

Ametropes
(who know their prescription and perform surgery without wearing their glasses) adjust the diopter scale to their prescription.

Ametropes (who do not know their prescription and perform surgery without wearing their glasses)

Adjust both eyepieces on the main microscope to +8 D.
Adjust both eyepieces on the assistant's microscope to +8 D (if applicable).

Eyepieces without reticle:

Remove the binocular tube and the eyepieces from the microscope body and point them at a distant object*), i.e. use them like a pair of binoculars. The image of the object is still unsharp.

Turn the diopter scale of one eyepiece slowly clockwise until the object is imaged sharply. If necessary, repeat this procedure three times and take the average of the readings. Adjust the second eyepiece in the same manner.

Mount the tube and eyepieces on the microscope body and tighten the securing screw firmly.

Eyepieces with reticle:

Turn the diopter scale on the eyepiece slowly clockwise until the reticle is imaged sharply.

Focus the surgical microscope on the object. The reticle and the object must be in focus at the same time.

Adjust the second eyepiece in the same manner until the object is seen sharply.

Adjust the eyecups in such a way that you can see the full field of view. Adjust maximum magnification on the surgical microscope and focus on the object. Adjust the working magnification required. When the magnification is changed, the focal plane is retained, but the depth of field changes.

Note: If several surgeons use the instrument, it is advisable to draw up a table with the individual prescriptions and to keep it in a handy location near the instrument.

***) CAUTION:** Never use the sun as the distant object!

Adjusting the tilt angle

Using knob (1), you can position the surgical microscope in a range from +180° to -180° (+ in the direction of the surgeon and - in the opposite direction). The +90° setting is ideal for surgery on patients in a seated position or lying on their side.

Caution:
Do not tilt the main microscope beyond + / -180°, as this could damage the microscope cable or the light guide.

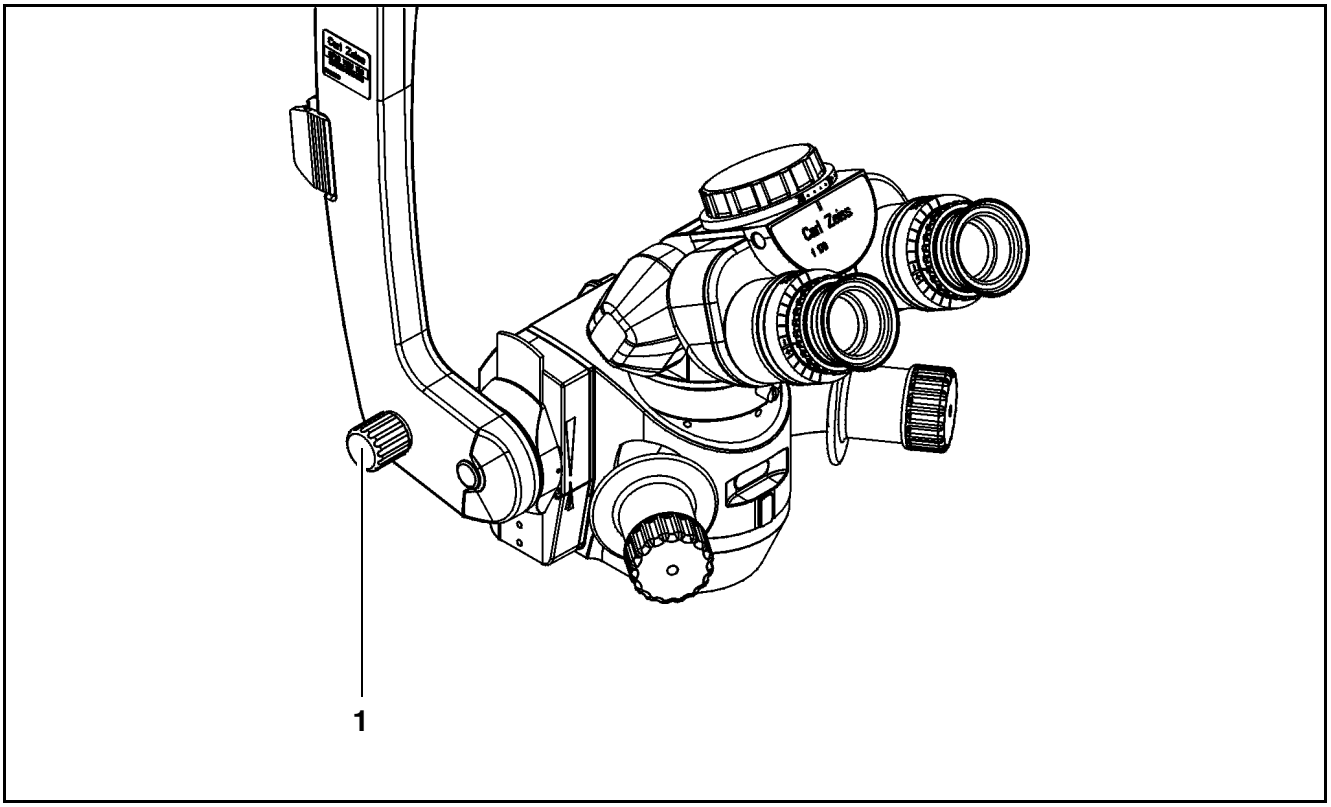
- Turn knob (1) until the surgical microscope is in the viewing position required.

After the viewing angle has been set, the surgical microscope remains in this position. The gear drive is self-locking.

Adjusting the microscope tilt to angles greater than 15°

- Remove all accessories mounted on the objective lens (e.g. 0° or 8° assistant's microscope).
- Turn knob (1) until the surgical microscope is in the viewing position required.

After the viewing angle has been set, the surgical microscope remains in this position. The gear drive is self-locking.



Operation

Checklist

Warning!
If a function fails, you must not use this instrument for safety reasons. Correct the fault (see the "Troubleshooting table“) or contact our service dept.

Always check the following points before surgery (without patient!):

– Check that the correct rated voltage has been set.

– Check that all cables have been connected.

– Check that the light guide has been connected.

• Turn on the system at the power switch of the suspension system.

VISU 160 surgical microscope

Check the zoom function
– by pressing the appropriate button on the foot control panel.

Check the focusing function
– by pressing the appropriate button on the foot control panel.

Friction adjustment of the surgical microscope
– Check that the friction of the surgical microscope's rotation has been adjusted as required using the friction adjustment knob on the suspension system.

Speeds of the surgical microscope's functions
– Check that the speeds of the microscope's functions have been adjusted as required on the suspension system.

Eyepieces / binocular tube
– Check that the surgical microscope and the tube are in a position convenient for you.

– Check that the correct interpupillary distance has been set.

– Check that the eyecups have been adjusted in such a way that you can see the full field of view.

– Check that the correct prescription has been set on the diopter scale.

– Check that image quality is the same throughout the entire magnification range.

Checking the accessories
Using the manuals provided, check that the other equipment (illumination system, video system, etc.) is functioning properly.

Suspension systems

Note:
After switching on, the suspension system automatically performs a self-test which takes approx. five seconds.

The suspension system is equipped either with a halogen illumination system, a Superlux Eye illumination system or with a Superlux Eye illumination system with additional, integrated halogen illumination (option).

Lamp brightness (halogen, xenon)

- Check that the lamp brightness display shows the minimum level (0.1) after power-on of the system.
- Change the lamp brightness across the entire control range, and check that brightness variation has an effect on the surgical field illumination (bright/dark).

Halogen illumination

– The halogen illumination has been switched on and the green indicator lamp(s) is (are) lit.

– The halogen lamps including the backup lamps are intact, i.e. the yellow indicator lamp(s) is (are) not lit.

Superlux Eye illumination

– A beep sounds after power-on of the system, and stops when the xenon lamp has ignited correctly and if no other error has occurred.

– If the beep does not stop, the system must not be used.

– The xenon illumination is on and the green indicator lamp is lit.

Note:
If the first lamp has failed and the backup lamp is in use (red segment in the switching knob lights up), make sure to have a backup lamp module ready at hand as a precaution.

Warning!
The xenon lamp has a limited service life of 500 h.

If used beyond its maximum service life, the xenon lamp may explode.

Change the xenon lamp in good time.

Please note the following guidelines - example:

– If operated for 4 hours/day on 5 days/week, the lamp needs to be exchanged after 25 weeks maximum.

– If operated for 8 hours/day on 5 days/week, the lamp needs to be exchanged after 12 weeks maximum.

Balance setting
– Check that the suspension arm has been properly balanced. When the release button on the surgical microscope is pressed, the effort required to move the arm up or down must be the same.

Limitation of downward travel
– The minimum working distance (height) from the surgical field has been set using the adjustment screw for limiting downward travel.

S88 floor stand only: Stand base
– Check that the brake tab has been pressed and that the stand is securely locked in position.

Check the accessories
– Using the manuals provided, check that the other equipment (surgical microscope, coobservation tube, video system, etc.) is functioning properly.

Foot control panel

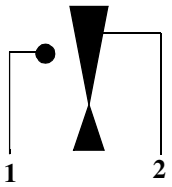
– Check that the plug of the foot control panel has been connected.

– Check that the power switch of suspension system has been switched on.

• Check that all functions assigned to the respective keys on the foot control panel are working properly.

When using a wide-angle observation system (e.g. BIOM 3)

Risk of collision!



When using a wide-angle observation system (e.g. BIOM 3 from Oculus) which is usually installed between the surgical microscope and the patient, make sure that the patient is neither put at risk nor injured by the motorized focusing system or the movement of the suspension system arm.

Only use accessories expressly certified by the manufacturer for combination with the surgical microscopes described in this manual.

Warning!

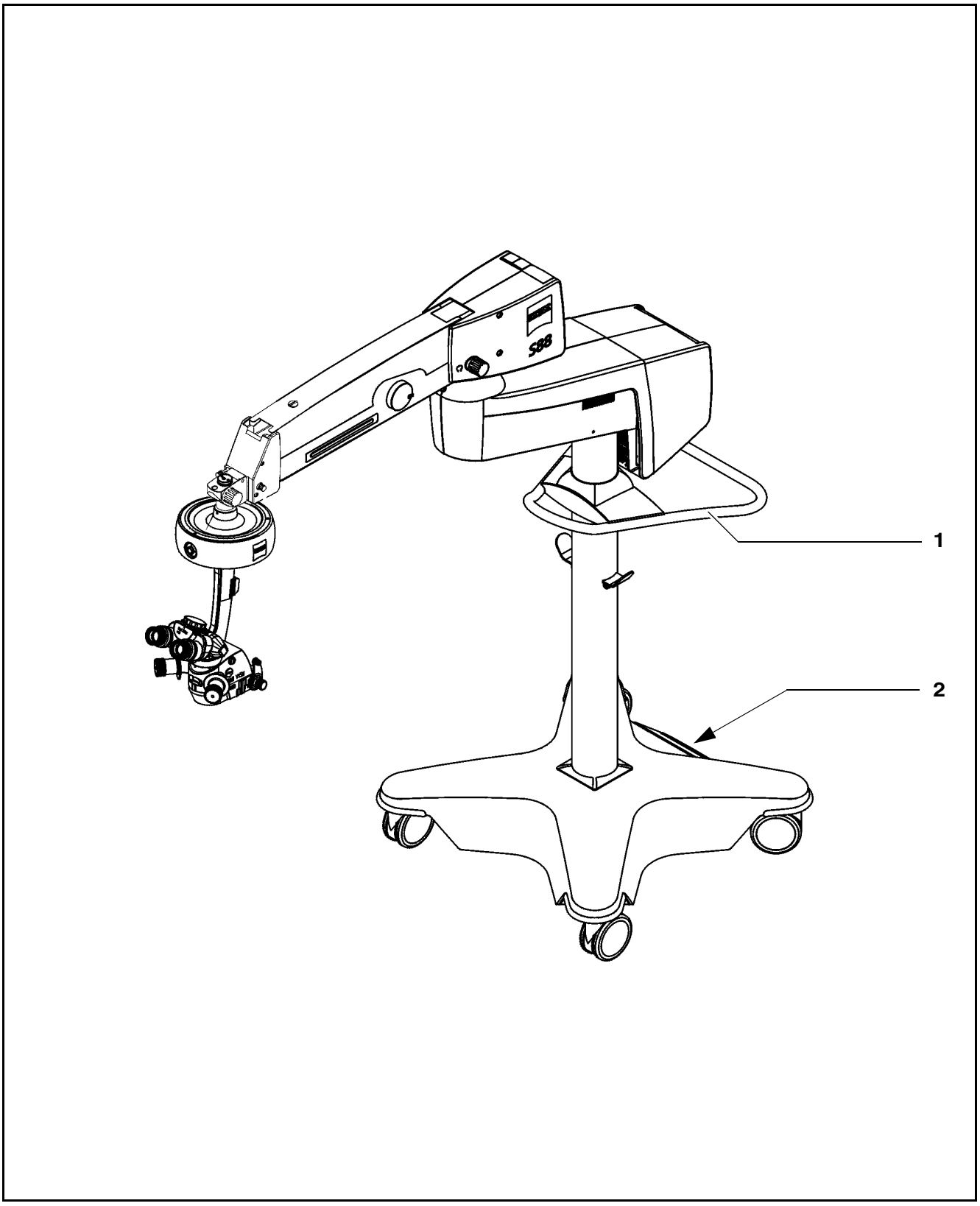
- With the wide-angle observation system swung out of position, always position the microscope body in such a way that index dot (1) of the microscope's focus is in the middle of triangle (2) of the marking.
- Select a medium magnification (e.g. 1.0).
- Lower the surgical microscope toward the surgical field until you see the patient's cornea sharply defined.
- Turn the locking lever for limiting the downward movement clockwise as far as it will go and check without the patient that the suspension arm cannot be lowered any further.
- It is vital that you read the user manual for the wide-angle observation system used (e.g. BIOM 3 from Oculus).

Positioning the S88 floor stand

Note:
Please also read the chapter: "Relocating the stand", page 138.

- Unlock brake tab (2).
- Use maneuvering handle (1) to move the stand to the site of use. Make sure that movement is not obstructed by the power cord and the cable of the foot control panel.

Caution:
Press down brake tab (2) and make sure that the stand is securely locked in position and cannot roll away by itself.


S88
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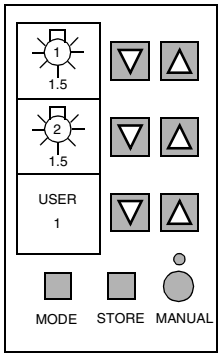
Using the display and key field

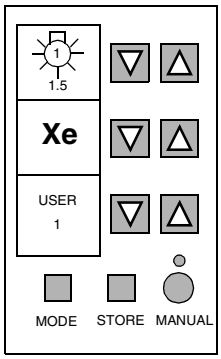
General functions

Basic mode

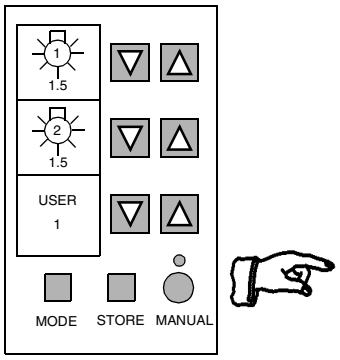
Halogen



Xenon



Xenon with halogen (option)



Operating keys "∇" and "Δ"

Keys "∇" and "Δ" always refer to the display field (LCD) on the left, i.e. you can use them to change the values or settings currently displayed in this field.

Every time you press the "∇" key, the displayed value is decremented in predefined steps down to a certain minimum.

Every time you press the "Δ" key, the displayed value is incremented in predefined steps up to a certain maximum.

Keys "Δ" and "∇" have a repeat function, i.e. if you hold down these keys, the relevant value is automatically incremented or decremented by the predefined steps until the maximum or minimum value is reached.

Operating the row of keys

"MODE" key
Press the "MODE" key to switch from the basic mode to the speed mode. The "MODE" key also brings you back from the speed mode to the basic mode.

In the configuration modes, use the "MODE" key to return to the basic mode.

"STORE" key
The function of the "STORE" key is dependent on the surgical microscope used. For details of the "STORE" key, see the user's manual of the relevant surgical microscope.

"MODE" key and "STORE" key
If you press the "MODE" and "STORE" keys simultaneously, you will get from the basic mode to the configuration mode 1. If you press the "MODE" and "STORE" keys simultaneously while you are in one of the configuration modes, the program jumps to the next configuration mode, and from the last configuration mode back to configuration mode 1, see the illustration "Overview of user interface".

Note:
If you have selected any of the modes and do not press a key in the key field, the program will return to the basic mode after 20 seconds.

"MANUAL" key

The "MANUAL" key permits you to switch to manual operation. The motorized control functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a fixed setting, the value being shown in the first display.
When the manual mode is activated, the yellow LED is lit and the word "MANUAL" blinks in the third display.

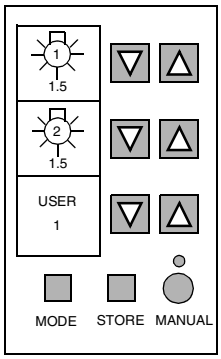
The surgical microscope can no longer be operated via the foot control panel, the handgrips or the display and key field.
In the manual mode, you can only switch the illumination on and off on the foot control panel and release the magnetic brakes by pressing the appropriate keys on the surgical microscope.

The selection of the manual mode is retained even if you turn the power switch of the instrument off and on again.

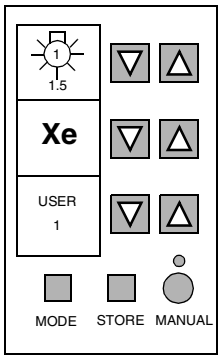
Press the "MANUAL" key once again to reactivate electronic control; the display in the display and key field then returns to the basic mode.

Basic mode

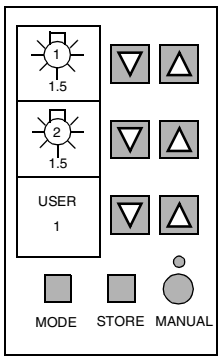
Halogen



Xenon



Xenon with halogen (option)



Basic mode

The basic mode is always displayed in the normal operating status.

In the basic mode, the following settings are displayed, depending on the installed surgical microscope:

In the upper display field	the current lamp brightness
In the middle display field	Halogen: backup lamp Xenon: Xe Xenon with additional integrated halogen illumination (option): halogen
In the lower display field	the user ID

Setting the user ID (USER)

Every time you switch on the system, the basic mode is automatically displayed.
In the basic mode, the lower display field generally shows the current USER, i.e. the user ID selected when the system was last switched off is displayed. When the system is switched on, all settings for this user will be activated, Exception: the lamp brightness, which is always set to the minimum value.

User data records can be stored for a maximum of 9 different users.

Keys "∇" and "Δ" assigned to the lower display field permit you to select a user ID between 1 and 9.

Saving parameter settings
As soon as you have entered a parameter setting, it is saved under the current user ID.

Note:
If possible, each user should be assigned his own user ID under which he can enter and save his specific parameter settings. This permits each user to call up his specific set of parameters via his user ID and to work with these settings.

Caution:
Make sure never to change the settings of another user. It is therefore advisable that you only use your own user ID for your work. Remember that all settings made are stored under the user ID currently selected.

Note:
In the Superlux Eye illumination system with additional, integrated halogen illumination (option), the lamps are numbered as follows:

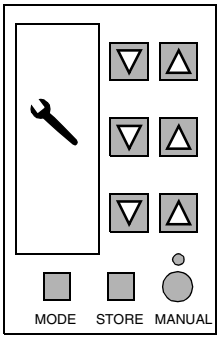
Lamp 1: xenon

Lamp 2: halogen

Acoustic signals

Three successive beeps	– Error message during the software check after power-on of the suspension system. – Error message in the case of an internal system error.
One beep	When the focus or zoom position is saved.
One beep	When brightness level 1.0 is reached.
One beep	After power-on of the suspension system.
Intermittent beep	Error of the illumination system.

Service display



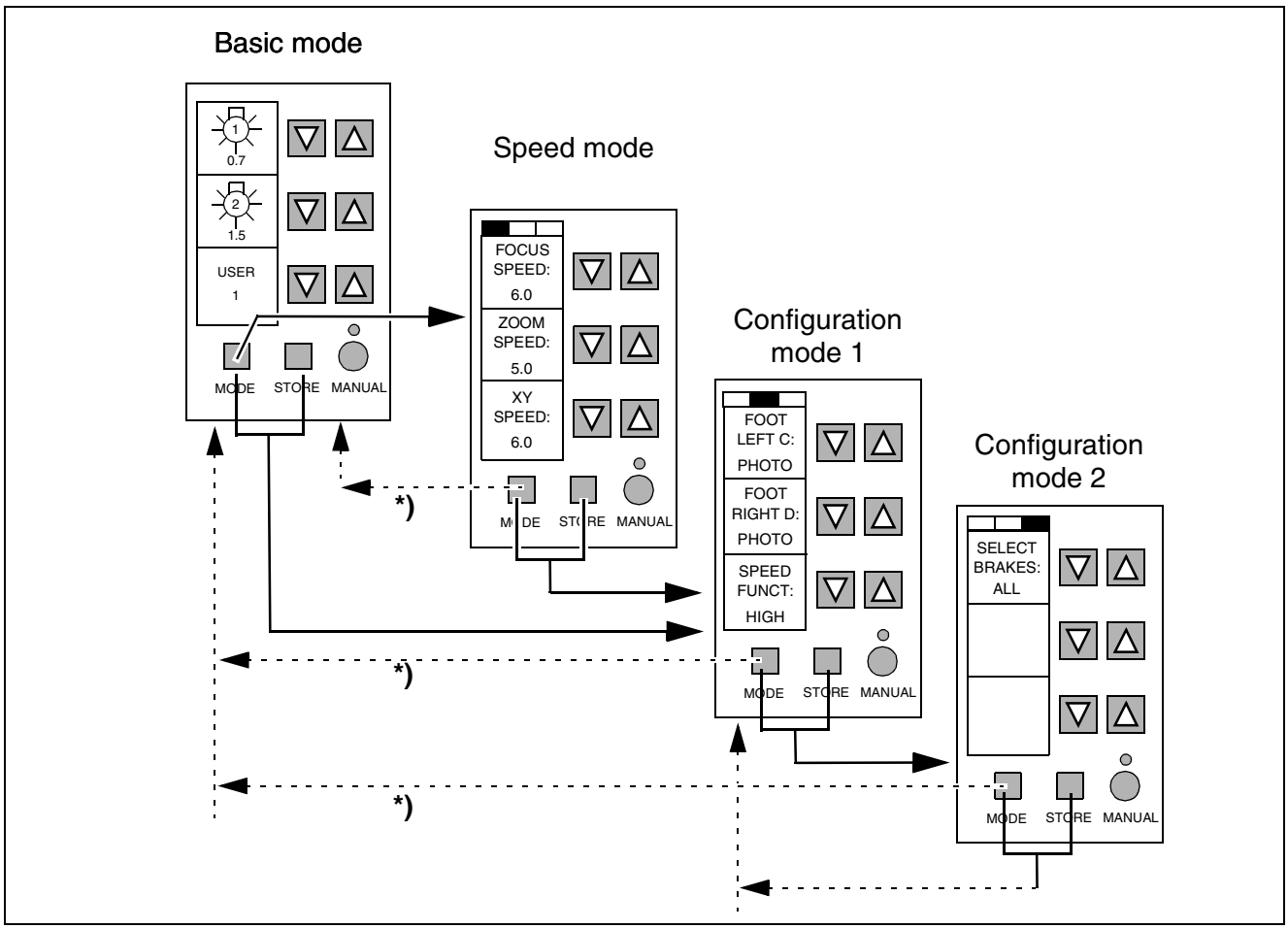
In the event of an error, e.g. during the software check following the startup of the suspension system, the display and key field displays an error message in the form of a wrench symbol, accompanied by three successive beeps.

Motorized control of the surgical microscope is not possible in this case. With the exception of the recentering of the X-Y coupling, all other functions of the surgical microscope can only be manually operated. You can still release the magnetic brakes using the appropriate key in the left or right handgrip of the surgical microscope.

If you press the "MANUAL" key, the surgical microscope can no longer be operated via the foot control panel, the handgrips or the display and key field.
You can continue to use the illumination system. The lamp brightness, however, is automatically set to a fixed value. You can switch the illumination on and off on the foot control panel.

Operating the OPMI® on the suspension system

Overview: user interface for the OPMI



Key for the overview:

Next

Back

*) If no key is pressed within 20 seconds, the program automatically returns to the basic mode.

Note:
The illustration shows the factory-adjusted default values to which you can reset your specific settings if required.

Control functions for the OPMI

The control functions for the OPMI have been combined in 4 modes:

Basic mode
- Setting the lamp brightness
- Setting the user ID

Speed mode
- Setting the speed for focusing
- Setting the speed for the zoom function
- Setting the speed for the X-Y coupling

Configuration mode 1
- Assigning a function to button C of the foot control panel
- Assigning a function to button D of the foot control panel
- Setting the focus speed depending on the zoom setting

Configuration mode 2
- Setting the magnetic brakes to be released by activating the release button in the handgrip.

The various control functions are explained below.

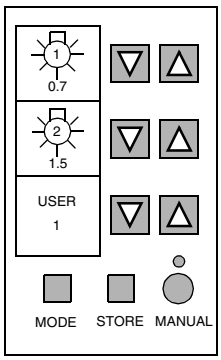
"STORE" key
In the basic mode and speed mode, the current zoom setting of the surgical microscope can be stored for the user currently selected.

The "STORE" key has no function in the configuration modes.

The current zoom value is saved as zoom memory (ZOOM-MEM).
You can set the instrument to this stored zoom value by pressing key C or D on the foot control panel if the XYZ-RES function has been assigned to one of these keys in configuration mode 1. You can also set the stored zoom value using the RESET key on the X-Y coupling.

Caution:
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Basic mode



OPMI: setting the lamp brightness

This function permits you to set the lamp brightness.

In the basic mode, the lamp brightness currently set is shown in the upper display field.
The middle display field remains empty and the associated keys "∇" and "Δ" have no function.

If the suspension system is equipped with a second halogen lamp housing, the brightness currently set for the second lamp is displayed in the middle display field.

Path: The basic mode is automatically displayed after the instrument has been switched on.

Adjusting the settings
Keys "∇" and "Δ" allow you to change the lamp brightness.

– Check that the lamp brightness can be varied and that brightness variation has an effect on the surgical field illumination. Perform this check across the entire control range:
  – Halogen: 0.1 ... 1.5
  – Xenon: 0.1 ... 1.8

The brightness can be adjusted in the following ranges:

– Halogen: 0.1 to 1.5 in steps of 0.1
– Xenon: 0.1 to 1.8 in steps of 0.1

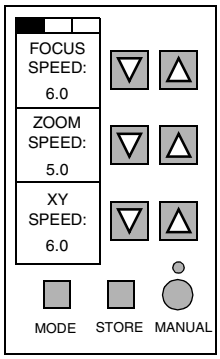
A beep sounds when brightness level 1.0 has been reached. Level 1.0 corresponds to 500 mW/cm^2 sr, see ISO 10936-2.

Acoustic signals in OPMI VISU
A beep is emitted during brightness adjustment, when level 1.0 has been reached.

Saving the settings
As soon as you have made a setting, the setting is accepted and saved under the current user number.

Exception: the brightness setting cannot be saved. It is reset to level 0.1 at the next power-on of the system.

Speed mode



OPMI: Setting the adjustment speeds

You can set the adjustment speeds for the following microscope functions:

– Focusing

– Zoom function

– Adjustment of the X-Y coupling

Path: The basic mode is automatically displayed after the instrument has been switched on.
Press the "MODE" key to access the speed mode.

Changing the settings

The speed mode is the user interface where you can select the speeds of the surgical microscope functions.

Use the "∇" and "Δ" keys to change the settings in steps.

Each of the three adjustment speeds is variable in a range from 1 (minimum) to 10 (maximum) in steps of 0.5.

With low zoom values, optical systems have a large depth of field and the focusing system has to cover a large adjustment range until the image is sharply defined. The X-Y coupling needs to be adjusted within a wide range until the position required is reached. This takes a certain time, and a high adjustment speed is therefore of advantage in this case.
With high zoom values, on the other hand, optical systems have a small depth of field. The focusing system has to be precisely positioned to obtain a sharply defined image, and the X-Y coupling needs to be precisely adjusted within a narrow range to reach the position required. A low adjustment speed is therefore preferable here.
Select the focusing speed which suits your specific work method.

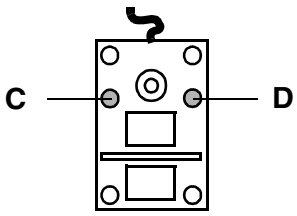
Note:
The "SPEED FUNCT" function in configuration mode 1 permits you to select dynamic speed control for focusing and for the X-Y coupling as a function of the zoom setting.
You can select a high, medium or low value for the dynamic change of speed, or deselect dynamic speed control.
If you have already set a high adjustment speed for focusing and the X-Y coupling in the speed mode, dynamic speed control may possibly not be effective across the entire zoom range, as the maximum adjustment speed is reached beforehand. For further details, please see configuration mode 1.

Saving parameter settings

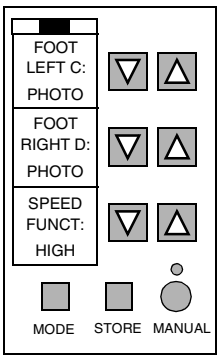
As soon as you have entered a parameter setting, it is saved under the current user ID.

Caution:
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Path: To return to the basic mode, press the "MODE" key in the speed mode or do not press any key for 20 seconds.
To switch to configuration mode 1, simultaneously press the "MODE" and "STORE" keys.



Configuration mode 1



OPMI: Assigning a function to buttons C and D of the foot control panel

Buttons C and D of the foot control panel can be configured as required.

In configuration mode 1, the upper and middle display and key fields permit you to assign one of the following functions to buttons C and D:

Display	Function of button C or D of the foot control panel		
XY-RES	RESET of XY (recentering) and focus		
XYZ-RES	Recentering of XY, reset of focus and zoom		
FOC-MEM	Focus memory	pressed for < 2 sec: pressed for > 2 sec:	triggers positioning saves position
XY-INV	Inversion of direction of X-Y coupling on foot control panel		
SDI	Triggering of SDI switchover		
PHOTO	Camera release at the camera interface		
AUX	Triggering of an AUX signal at the AUX interface (see remote control socket on the suspension system's connector panel).		

The functions are explained in detail in the following.

Path: After you have switched on the instrument, the basic mode is automatically displayed.
To access configuration mode 1 from the basic mode, simultaneously press the "MODE" and "STORE" keys.

FOOT LEFT C:
Use the upper section of the display and key field (FOOT LEFT C:) to assign one of the possible functions to key C of the foot control panel.

FOOT RIGHT D:
Use the middle section of the display and key field (FOOT RIGHT D:) to assign one of the possible functions to key D of the foot control panel.

Roll-over procedure

Use the "Roll-over procedure" to select the required function in the default sequence of the above table.

Every time you press the relevant button "∇" you advance clockwise. Every time you press the relevant button "∆" you advance counterclockwise.

→ XYZ-RES → FOC-MEM → XY-INV →
↑ ↓
← XY-RES ← AUX ← PHOTO ← SDI ←

If you have assigned FOC-MEM to key C or D of the foot control panel, you can determine by the length of time for which you press the relevant key of the foot control panel during operation whether a positioning run is to be triggered (press the key for less than 2 seconds) or whether the current position is to be saved (press the key for more than 2 seconds).

Caution:

Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Saving parameter settings

As soon as you have entered a parameter setting, it is saved under the current user ID.

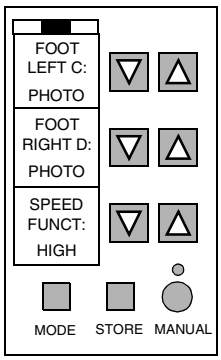
Path: To return to the basic mode, press the "MODE" key in configuration mode 1 or do not press any key for 20 seconds.
To switch to configuration mode 2, simultaneously press the "MODE" and "STORE" keys.

Description of the assignable functions:

XY-RES	Recenters the X-Y coupling and resets the focus to its initial position in the focusing range.
XYZ-RES	Recenters the X-Y coupling, resets the focus to its initial position in the focusing range, and sets the zoom to a position previously stored using the STORE key.
XY-INV	Inverts the direction of movement of the X-Y coupling. This function is useful when you are working with an image reversal system in vitreo-retinal surgery. You can now invert the direction of movement of the X-Y coupling by tipping on one of the two keys (C or D) of the foot control panel.
SDI	The optical system of the Stereo Diagonal Inverter (SDI) 2E from Oculus is moved into and out of the beam path of the surgical microscope.

FOC-MEM	To save a new focus position, press the key configured for this purpose for longer than 2 seconds. A beep is emitted when the new position has been saved. To move to a stored focus position, press the key configured for this purpose only briefly (less than 2 seconds). You can stop this process at any point by briefly tipping on the appropriate key on the foot control panel (C or D) or on one of the direction keys (joystick or one of the two rocker switches).
AUX	Triggers an AUX signal, e.g. for switching an external unit on or off.
PHOTO	Triggers the shutter of a 35 mm camera, if connected.

Configuration mode 1



OPMI: Setting the adjustment speeds of focus and X-Y coupling as a function of the zoom setting

In this mode, you can select dynamic speed control for focusing and the X-Y coupling.

The depth of field of the optical system changes as a function of the zoom setting:

– If a large field of view (low zoom value) is used, this results in a large depth of field, and the focus must be adjusted over a wide range to obtain a sharp image. The X-Y coupling therefore needs to be adjusted within a wide range to reach the position required. This means that high adjustment speeds should be used in this case.

– A small field of view (high zoom value), on the other hand, results in a small depth of field, and the focus has to be precisely set within a small range to achieve sharp image definition. The X-Y coupling therefore needs to be precisely adjusted within a narrow range until the position required is reached. This means that it is advisable to use low adjustment speeds for this purpose.

It is therefore a useful feature that the adjustment speed of the focus and X-Y coupling can be varied in accordance with the zoom setting.

The instrument has been factory-adjusted for HIGH variation of the adjustment speed as a function of the zoom setting. The best effect of dynamic speed control is achieved if an adjustment speed of 1.0 has been selected in the speed mode.

Note:
The dynamic speed control is based on the basic speed selected for focusing and the X-Y coupling in the speed mode.
If you have already set a high adjustment speed for focusing and the X-Y coupling in the speed mode, dynamic speed control may possibly not be effective across the entire zoom range, as the maximum adjustment speed is reached beforehand.

In the extreme case, if you have set the basic speed for focusing and the X-Y coupling to the maximum value of 10, dynamic speed control will have no effect at all.

In configuration mode 1, the bottom section (SPEED FUNCT:) of the display and key field permits you to select a high, medium or low value for the dynamic change of speed, or to deselect dynamic speed control:

HIGH	LOW
MEDIUM	OFF

Path: After you have switched on the instrument, the basic mode is automatically displayed.
To access configuration mode 1 from the basic mode, simultaneously press the "MODE" and "STORE" keys.

Rollover

Select the function required using a rollover run in the sequence defined in the above table.
At each press of the "∇" key, you advance in clockwise direction. At each press of the "Δ" key, you advance in counterclockwise direction:

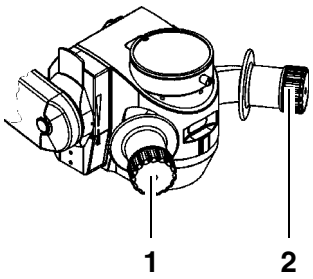
→ OFF → HIGH →
↑ ↓
← LOW ← MEDIUM ←

Caution:
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

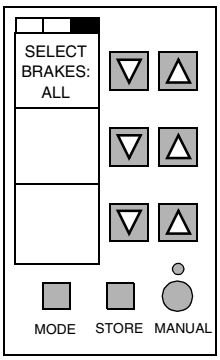
Saving parameter settings

As soon as you have entered a parameter setting, it is saved under the current user ID.

Path: To return to the basic mode, press the "MODE" key in configuration mode 1 or do not press any key for 20 seconds.
To switch to configuration mode 2, simultaneously press the "MODE" and "STORE" keys.



Configuration mode 2



OPMI®: Selecting the magnetic brakes to be unlocked

You can define which magnetic brakes of the suspension system are to be unlocked by turning the left and/or right handgrips (1) and (2) (turning function).

In configuration mode 2, the upper display and key field (SELECT BRAKES) permits you to select the following:

XY - Z	The magnetic brakes of the suspension system for X-Y movement and Z movement can be unlocked separately. For this purpose, you must turn the left handgrip (1) or the right handgrip (2) to the left or right. • To release the magnetic brakes for X-Y movement only: Turn the left handgrip (1). • To release the magnetic brakes for Z movement only: Turn the right handgrip (2). • To release all magnetic brakes, i.e. to release the magnetic brakes of the suspension system for XY and Z motion: Turn the left handgrip (1) **and** the right handgrip (2) at the same time.
ALL	All magnetic brakes are always unlocked, i.e. the suspension system's magnetic brakes are unlocked for X-Y and Z movement, irrespective of whether you turn the left handgrip (1) or the right handgrip (2).

Path: The basic mode is automatically displayed after the instrument has been switched on.
To access configuration mode 2 from the basic mode, go via configuration mode 1.
For this, simultaneously press the "MODE" and "STORE" keys twice in succession:
1. Jump from the basic mode to configuration mode 1
2. Jump from configuration mode 1 to configuration mode 2.

Selection
At each press of the "∇" or "Δ" key, the program jumps from one possible configuration to another.

Saving parameter settings
As soon as you have entered a parameter setting, it is saved under the current user ID.

Caution:
Be extremely careful when changing these settings. You should change settings only under your own user ID. Notify all users of any changes, or make sure that each user only works under his own user ID.

Path: To return to the basic mode, press the "MODE" key in the configuration mode or do not press any key for 20 seconds.
To access the next configuration mode 3, simultaneously press the "MODE" and "STORE" keys.

Procedure

Caution!

– Avoid looking directly into the light source, e.g. into the microscope objective lens or into the light guide!

– When selecting the brightness level for the patient's eye, always take care to keep the strain on the patient's eye to a minimum.

– If the red reflex is not necessary, move the retinal protection device into the beam path. Only use the retro-illumination contrast stop, if the surgical procedure requires a red reflex.

– When operating on the eye, always use a GG 475 eye protection filter to ensure that the patient's retina is not exposed to unnecessary (blue) radiation (retinal injury)!

- Switch on the power switch of the suspension system.
- Start with the lowest brightness setting on the suspension system and gradually increase brightness up to the necessary and still admissible level.
- Check the system using the checklist.
- Swing the surgical microscope over the surgical field into an ergonomic position within the working distance.
- Press the actuator button on the X-Y coupling.
  – The X-Y coupling adopts its center position.
  – The focus adopts its initial position in the focusing range.
- Select the lowest magnification (zoom function on the foot control panel).
- For coarse focusing, look through the eyepieces and lower the surgical microscope using the suspension arm until the surgical field comes into focus.
- Select the highest magnification (zoom function on the foot control panel).
- Look through the eyepieces and activate the focusing function on the foot control panel until the microscope is sharply focused on the surgical field.

- Select the magnification required (zoom). Look through the eyepieces of the binocular tube. Adjust the eyepieces in such a way that you can see both the edge of the field of view and the microscope image sharply. Also see “Adjusting the surgical microscope“.
- Switch off the instrument when you are not using it.

What to do in an emergency

Failure of the halogen lamp

Caution:
Do not cover the ventilation grid (2)! Make sure that drapes do not cover the grid. This can lead to overheating of the lamp modules and to lamp failure.

Note:
The lamp housing contains a backup lamp which is automatically swung into the illumination beam path when the first lamp fails. Open flap (3) and yellow indicator lamp (7) indicate that the backup lamp is operative.

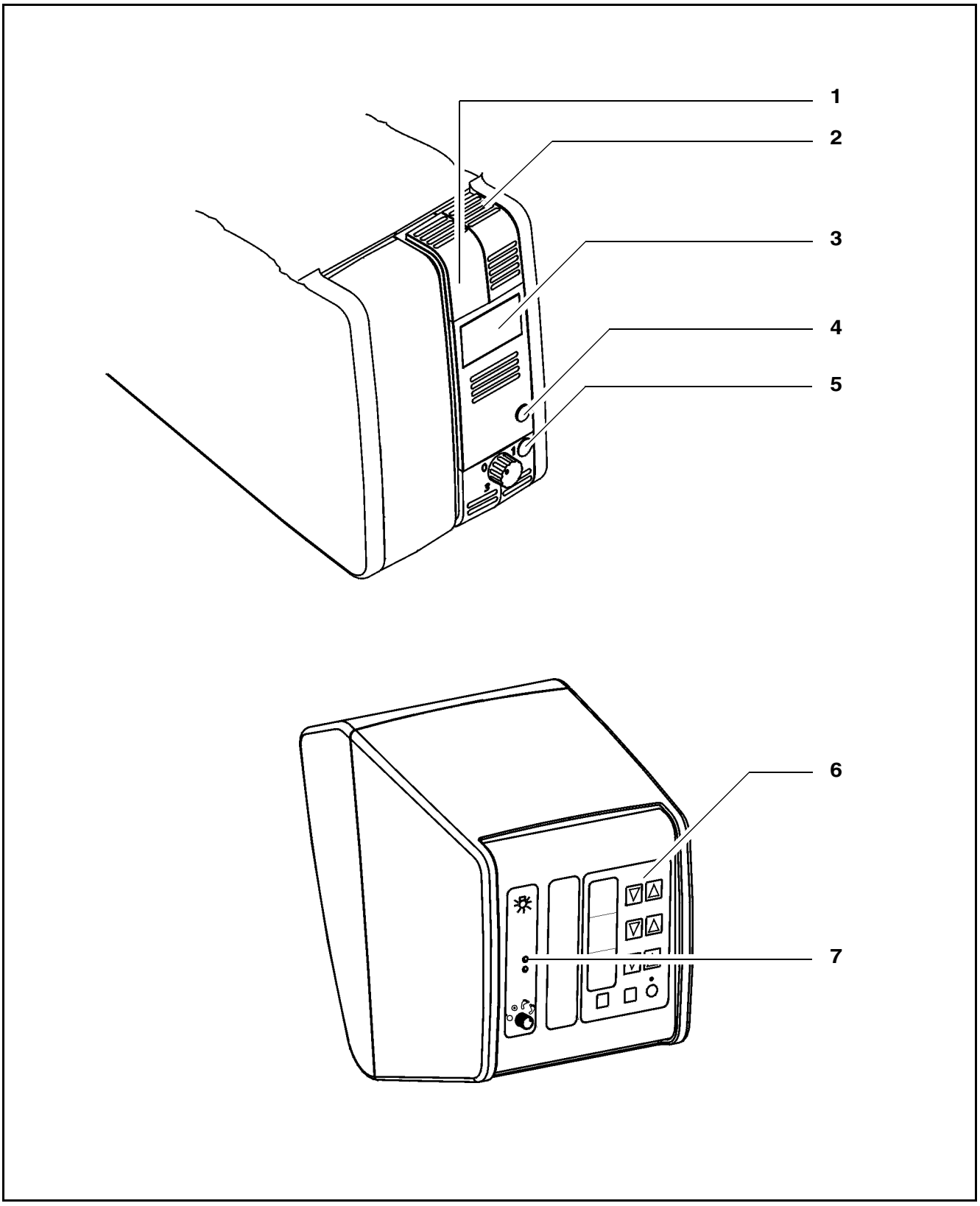
Manual switching to the backup lamp

Press button (4) to manually activate the backup lamp.

If the backup lamp fails:

Warning!
If you change the lamp shortly after it has failed, the lamp will still be very hot. Wear heat-protection gloves to avoid burns!

- Turn off the stand at the power switch.
- Press button (5) to slightly eject the lamp module (1). Pull out the lamp module and replace the lamp, or insert the lamp module of the second illumination system.
- Switch the suspensioin system back on. Set the brightness of the illumination on the display field (6) as required.


1
2
3
4
5
6
7

Lamp failure in Superlux Eye illumination system

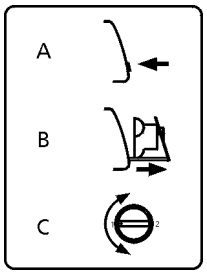
Caution:
Do not cover the ventilation grid! For example, drapes could be covering the grid. This can lead to overheating of the lamp module and to lamp failure.

Note:
Yellow indicator lamp (4) lights when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp goes out again.

Selecting the backup lamp

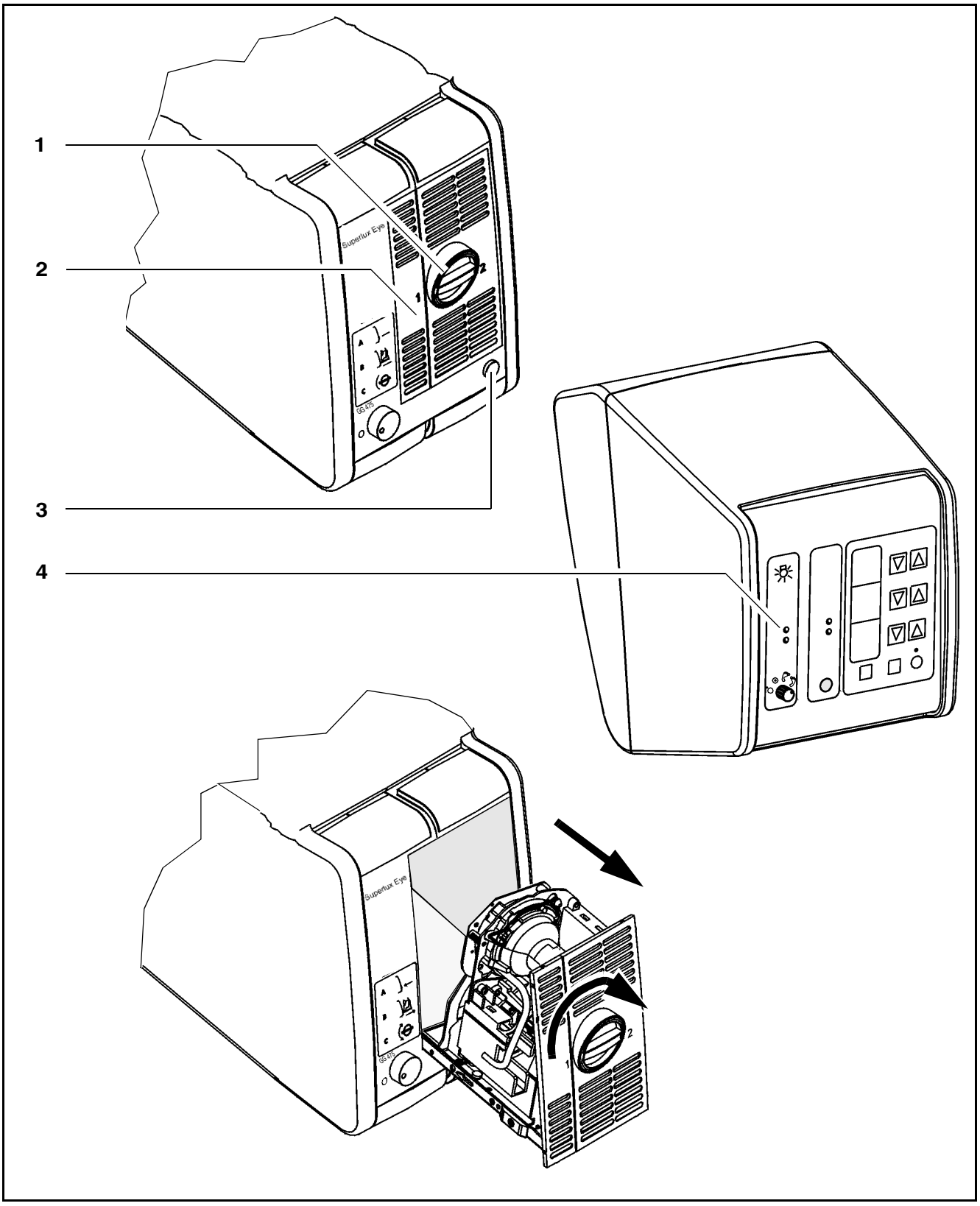
- Turn off the suspension system at the power switch before selecting the backup lamp.

The lamp module contains two xenon lamps. The second lamp is used as a backup lamp which can be swung into the illumination beam path when the first lamp fails.
If the first xenon lamp fails, you can open lamp module (2) as follows:



- Press button (3). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (1) through 180° until it snaps in. This swings the second xenon lamp (backup lamp) into the beam path.
- Push the lamp module all the way back into the lamp housing.
- Turn the suspension system back on at the power switch.

Note:
If the first lamp has failed and the backup lamp is in use (red segment in knob (1) lights up), make sure to have a backup lamp module ready at hand as a precaution.


1
2
3
4
Superlux Eye
Superlux Eye

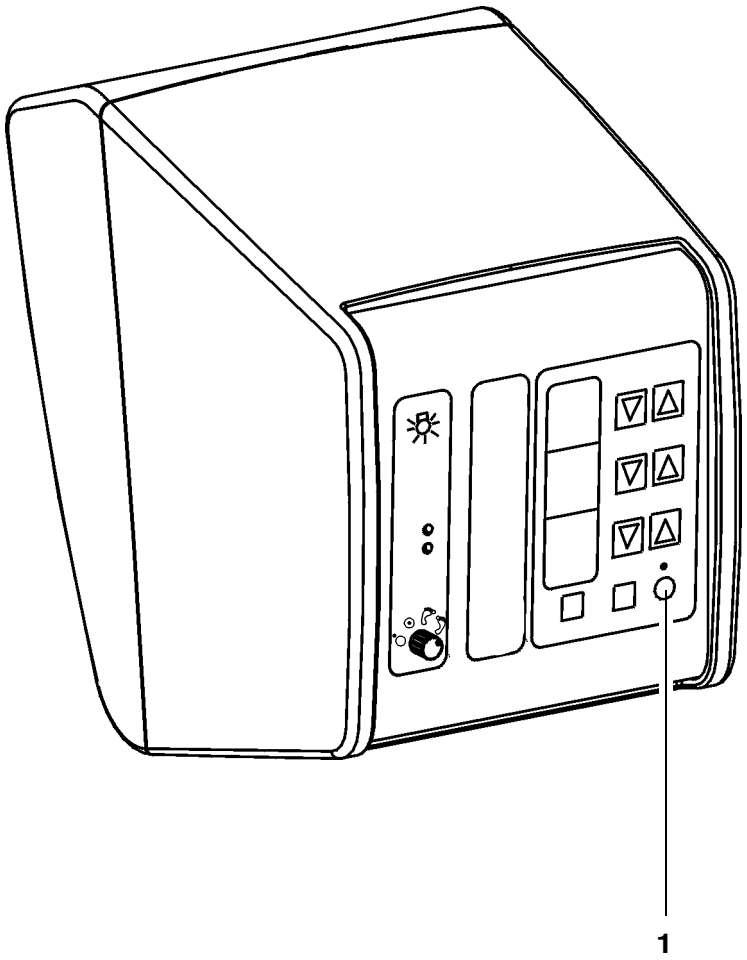
Failure of lamp control

- Press the Manual key (1) if brightness control is no longer possible.

Note:
When the manual function has been activated, all electrical control systems are inoperative. The lamp brightness is automatically adjusted to a fixed setting.

Failure of focusing system

- Press Manual key (1) if, for example, the focusing system always moves into its upper or lower end position.
- Focus by moving the suspension arm of the ceiling mount (floor stand) up or down.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Failure of magnetic brakes

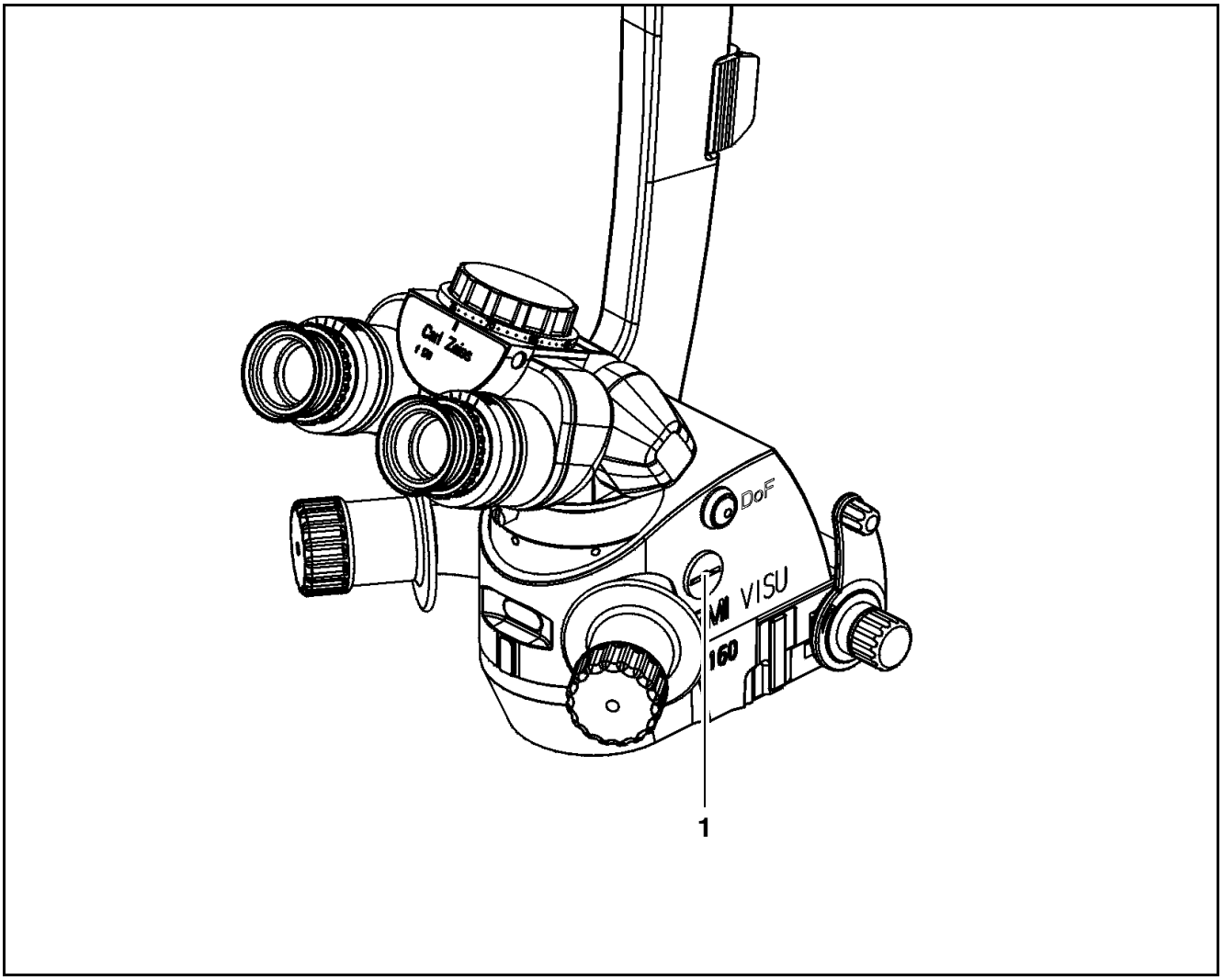
If the magnetic brakes fail (magnetic brakes are locked), you can manually position the articulated arm including the microscope by overcoming the locking effect of the magnetic brakes.

Failure of the X-Y coupling

- Disconnect the surgical microscope from the suspension system. The connector is located under the cover of the suspension arm. The illumination remains on.
- If the X-Y coupling fails, you can manually position the surgical microscope utilizing the movement possibilities of the suspension system you are using.

Failure of the zoom function

- Disconnect the surgical microscope from the suspension system. The connector is located under the cover of the suspension arm. The illumination remains on.
- Use zoom adjustment knob (1) of the microscope to manually set the magnification required (if necessary, use a tool, e.g. a screwdriver, coin, etc.)



Maintenance / Further information

Trouble-shooting

- This instrument is a high-grade technological product. To ensure optimum performance and safe working order of the instrument, its safety must be checked once every 12 months. We recommend having this check performed by our service representative as part of regular maintenance work.
  If a failure occurs which you cannot correct using the trouble-shooting table, attach a sign to the instrument stating it is out of order and contact our service representative.

VISU 160 surgical microscope

Problem	Possible cause	Remedy	See
No function at all.	Power plug of suspension system not inserted.	Plug in power cord.	--
	Power switch of suspension system not switched on.	Press power switch. Green indicator light in power switch must be on.	page 98
	Automatic circuit breaker in power switch of suspension system has been activated.	Press power switch again.	--
	Line power failure.	Contact in-house electrician.	--
Surgical field illumination on microscope not working.	Light guide not properly inserted in microscope.	Insert light guide as far as it will go.	page 132
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	--
	Lamp module in suspension system has no contact.	Insert lamp module as far as it will go.	page 194
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness using the control on the suspension system or the foot control panel.	--
	Defective light guide (illumination not uniform).	Contact service dept. Light guide probably needs to be changed.	--

Problem	Possible cause	Remedy	See
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using the control on the suspension system or the foot control panel.	--
		Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--
Focusing system inoperative.	Focusing system does not work, or moves to upper or lower end position.	Use suspension arm to set correct focal plane. Contact service dept.	--
Zoom system inoperative.	Zoom system does not work, or moves to upper or lower end position.	Manually adjust magnification using zoom knob. Contact service dept.	--
Zoom and focusing systems inoperative.	Functions not correctly set on suspension system.	Contact service dept.	--
Microscope motion too stiff.	Friction adjusting knob on suspension system tightened too firmly.	Slightly loosen friction adjusting knob.	page 124
DeepView inoperative	DeepView is on mechanical end stop.	Press the DeepView button to deactivate the function.	--

Suspension systems

Problem	Possible cause	Remedy	See
No function at all.	Line power failure.	Contact in-house electrician.	-
	Power switch of suspension system not switched on.	Press power switch.	-
	Automatic circuit breaker in power switch of suspension system has been activated.	Press power switch again.	-

Problem	Possible cause	Remedy	See
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again.	-
	Selector is set in such a way that illumination can be switched on using the foot control panel.	Switch on illumination using the foot control panel (button A or B).	-
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-
Yellow indicator lamp in display field blinks.	Defective main and backup lamps.	Change lamp or insert backup lamp module.	-
	Defective lamp module.	Illuminate surgical field using an OR illuminator. Contact service dept.	-
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on the suspension system's display field or using the foot control panel.	-
	Halogen lamp not properly plugged into lamp mount.	Properly push halogen lamp into lamp mount.	-
	Defective S light guide (illumination not uniform).	Contact service dept. Light guide probably needs to be changed.	-
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using the control on the suspension system or the foot control panel.	page 146
		Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	-
Lamp brightness cannot be adjusted.	Manual function is activated. (Yellow LED above the key lights up).	Switch off manual function.	-

Problem	Possible cause	Remedy	See
Motorized focusing and zoom functions of surgical microscope are inoperative.	Manual function is activated. (Yellow LED above the key lights up).	Switch off manual function.	-
Suspension arm is in horizontal position and cannot be moved upwards or downwards.	Suspension arm still locked.	Pull out locking device and turn though 180°.	-
 In connection with three successive beeps.	– Error message during software check after power-on of the suspension system. – Error message in the case of internal system error.	Manual operation is possible. Contact service dept.	-
S88 floor stand only: Stand wobbles.	Floor not level. Stand base not appropriately positioned.	Slightly turn stand base. Articulated arm should be positioned at a right angle with the tilt axis.	

Halogen illumination system

Problem	Possible cause	Remedy	See
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again.	-
	Selector is set in such a way that illumination can be switched on using the foot control panel.	Switch on illumination using the foot control panel (button A or B).	-
	Defective halogen lamp. - If the yellow indicator lamp is lit, the main lamp has failed. - If the yellow indicator lamp blinks, the backup lamp has failed.	Change lamp or insert backup lamp module.	page 194
	Ceramic base does not have proper contact with halogen lamp.	Plug ceramic base firmly onto contacts of halogen lamp.	page 194
	Lamp module has no contact.	Insert lamp module as far as it will go.	page 74
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-
Yellow indicator lamp in display field blinks.	Defective main and backup lamps.	Change lamp or insert backup lamp module.	page 194
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on the suspension system's display field or using the foot control panel.	
	Halogen lamp not properly plugged into lamp mount.	Properly push halogen lamp into lamp mount.	page 194

Problem	Possible cause	Remedy	See
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using the control on the suspension system or the foot control panel.	page 146
		Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	-

Superlux Eye illumination system

Problem	Possible cause	Remedy	See
Surgical field illumination on microscope not working.	Thermal cut-out activated.	Remove the cause of overheating. For example, drapes could be covering the grid. When the lamp module has cooled down, the illumination switches on again.	-
	Selector is set in such a way that illumination can be switched on using the foot control panel.	Switch on illumination using the foot control panel (button A or B).	-
	Defective xenon lamp.	Switch to backup lamp.	-
		Keep a new xenon backup lamp module ready at hand.	-
	Lamp module has no contact.	Insert lamp module as far as it will go.	-
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on the suspension system's display field or using the foot control panel.	
	Aged xenon lamp.	Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator.	
		Change xenon lamp.	page 198
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness using the control on the suspension system or the foot control panel.	page 146
		Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	-

Problem	Possible cause	Remedy	See
No surgical field illumination.	Xenon lamp does not ignite.	Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--
Xenon lamp is lit, but beep sounds intermittently.	Defective lamp control system.	Switch off illumination on suspension system. Illuminate surgical field using an OR illuminator. Contact service dept.	--

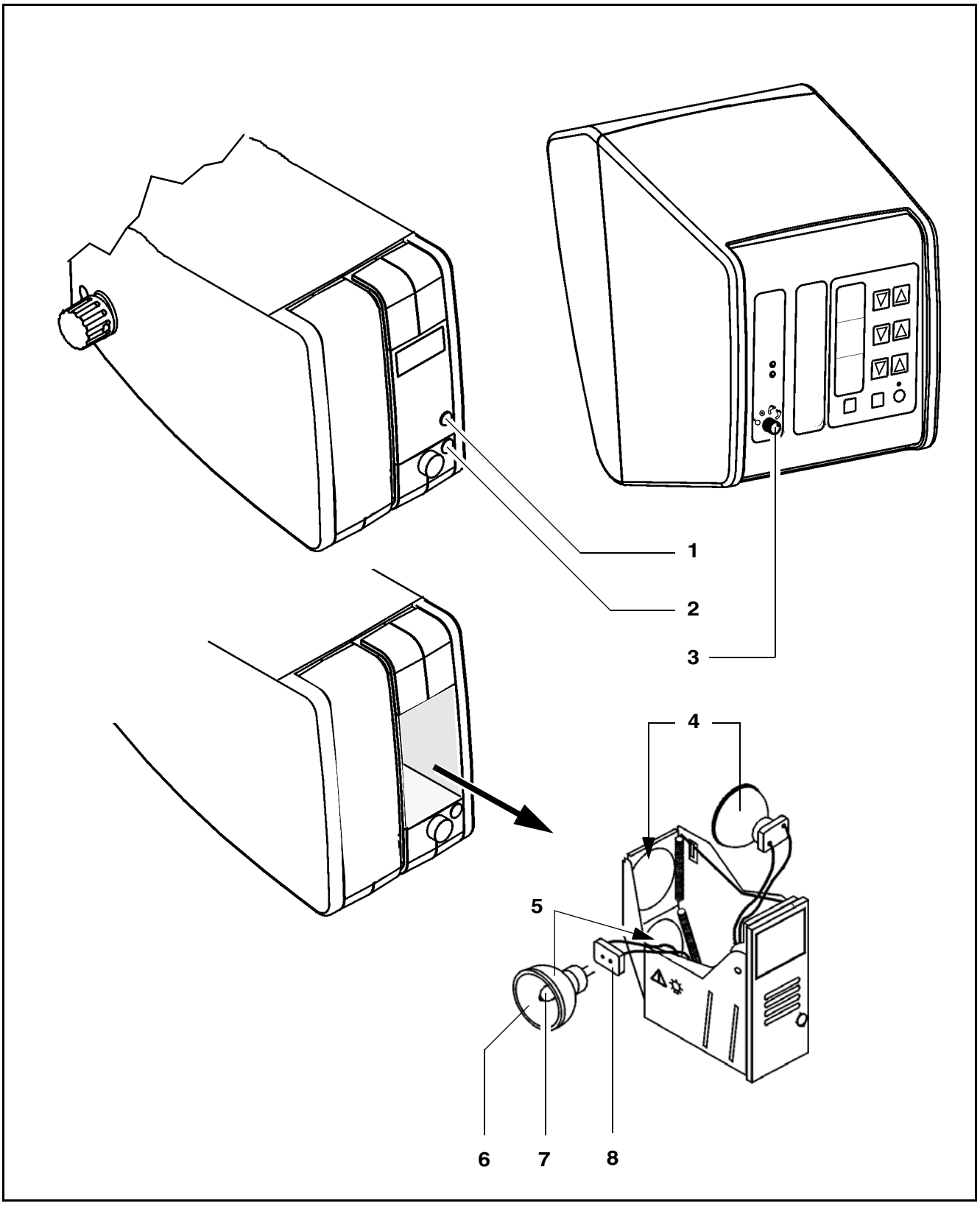
Changing the halogen lamp

Warning!
If you change the lamp shortly after it has failed, the lamp will still be very hot. Wear heat-protection gloves to avoid burns!

Note:
If both halogen lamps (4 and 5) fail during surgery, insert an available backup lamp module. Therefore, always make sure before surgery that the halogen lamp in the backup lamp module is intact.

To change the lamp, proceed as follows:

- Switch off the illumination system via knob (3) and the unit at its power switch.
- Press button (2), the lamp module is slightly ejected. Pull out the lamp module (1).
- Remove the defective halogen lamp from the spring-loaded mount.
- Pull ceramic base (8) from the contact pins of the halogen lamp.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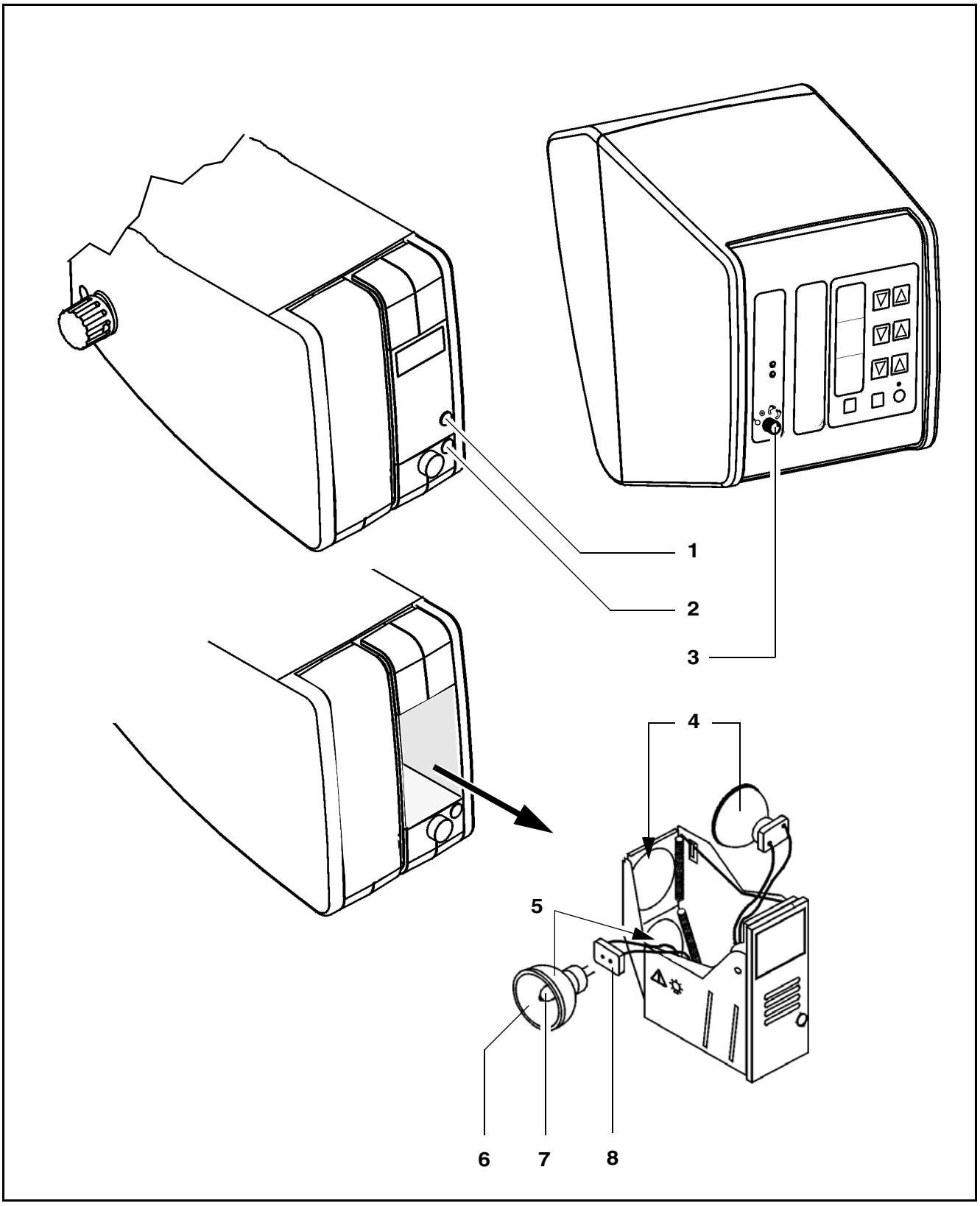
- Plug the ceramic base (8) onto the contact pins of the new halogen lamp.
- Insert the new halogen lamp. Make sure you do not touch the lamp bulb (7) or the interior of the reflector (6).
- Press the halogen lamp into the spring-loaded mount.
- Push the lamp module including the new halogen lamp back into the unit.
- Press the power switch to turn on the system, and switch on the illumination with the relevant knobs**.**

Note:

– Only use 12 V, 100 W halogen lamps available under Cat. No.: 38 00 79- 9040

To use the service life of your halogen lamps as economically as possible, we recommend that you proceed as follows: If the main lamp (4) has failed, remove it and replace it by the backup lamp (5). Install the new halogen lamp instead of the backup lamp.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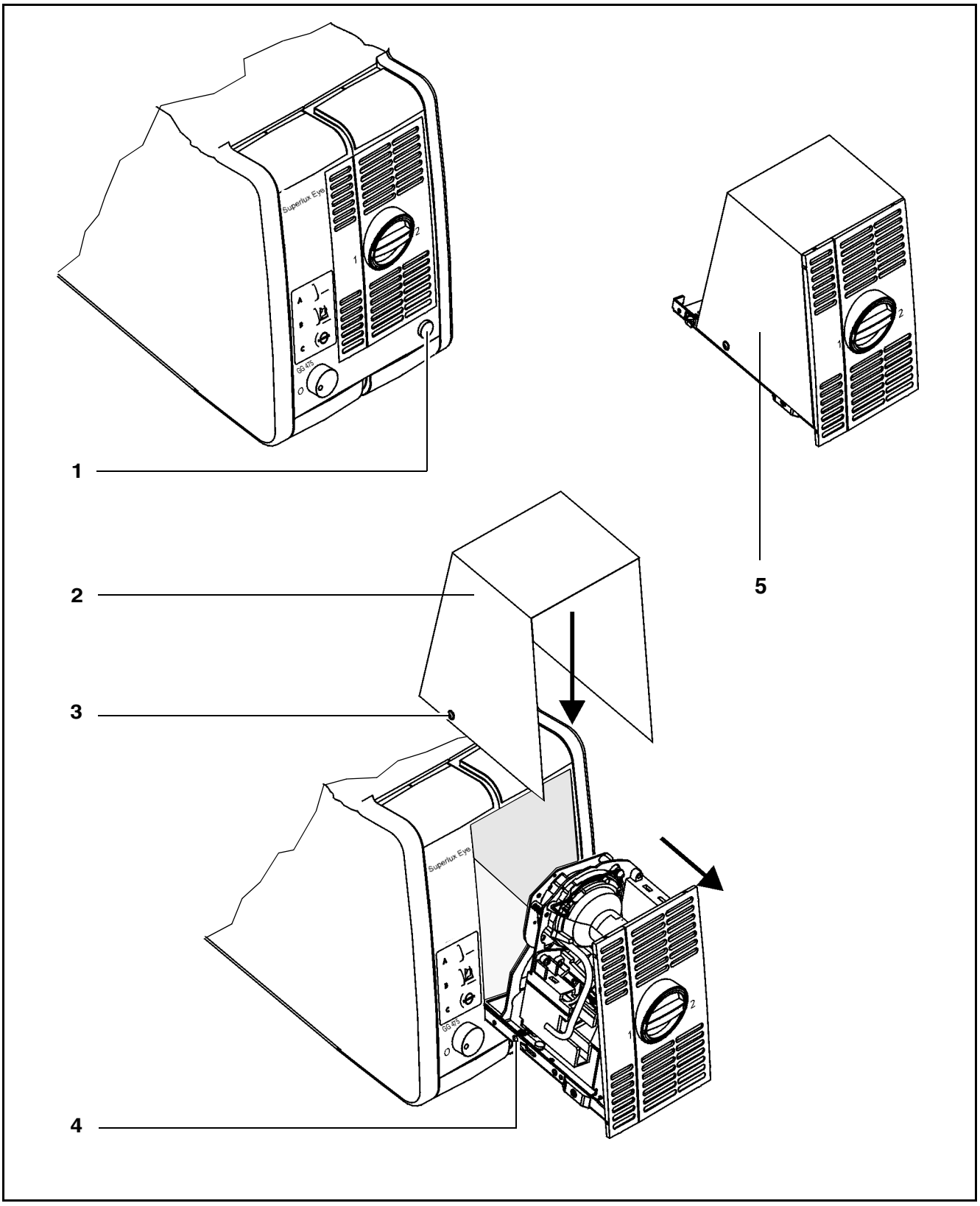
Changing the Superlux Eye xenon lamp module

Warning!
The lamp module must only be changed by appropriately trained personnel.
Improper handling of the xenon lamp may lead to damage or injury. Please observe the following points:

- First switch off the suspension system at the power switch.
- Only change the lamp module after it has cooled down completely! In the event of a malfunction, there is a risk of explosion due to the high pressure inside the lamp. The hot surface of the xenon lamp may also cause burns.
- Only change the module after switching off the system. The igniter produces high voltage when the system is on.
- Press button (1). The lamp module is slightly ejected.
- Pull out the lamp module as far as it will go.
- Slide the original transport case (2) over the module, making sure that bolt (3) engages in bore (4). This unlocks the stop.
- Remove the old module and install the new lamp module by proceeding in the reverse order.
- Check the function of the xenon lamp and backup xenon lamp.

Pack the old lamp module (5) in the transport package of the new lamp module. Fill in the enclosed return card and send the old lamp module to the nearest Carl Zeiss service agency.

Note:
- Only use the original transport case (2) as it also provides explosion protection, should xenon lamps be defective.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Magnifications / Fields of view

Using the magnification factor γ of the zoom system, you can calculate the total magnification of the surgical microscope according to the following formula:

$$M_T = \frac{f_{tube}}{f_{obj}} \cdot \gamma \cdot M_{eye}$$

where:

f_{tube} is the focal length of the binocular tube

f_{obj} is the focal length of the main objective lens

γ is the magnification factor set on the zoom system

M_{eye} is the magnification of the eyepiece

Example:

f_{tube}= 170 mm, f_{obj} = 200 mm, γ = 1.6 and M_{eye} = 12.5 x.

The resulting total magnification is:

$$M_T = \frac{170\ mm}{200\ mm} \cdot 1.6 \cdot 12.5 = 17.0$$

If the total magnification M_T of the surgical microscope is known, the field-of-view diameter FoV_D can be calculated using the formula:

$$FoV_D = \frac{FoV_N \cdot M_{eye}}{M_T}$$

The field-of-view diameter FoV_D is the diameter of the circular area of the surgical field which can be seen through the eyepieces.
FoV_N in the above formula stands for the field-of-view number of the eyepiece. This number is marked on our widefield eyepieces.

Using M_T = 17.0 from the example above, the field-of-view diameter obtained with a 12.5x eyepiece with a field-of-view number FoV_N of 18 mm is calculated as follows:

$$FoV_D = \frac{18\ mm \cdot 12.5}{17.0} = 13.2\ mm$$

Care of the unit

Warning!
If possible, the systems and accessories should be cleaned immediately after use. Contaminations should not be allowed to dry on the objects, as this would make cleaning and disinfecting more difficult.
If possible, machines should be used for disinfecting and cleaning. For details, please also see the relevant notes on sterilization equipment.

Cleaning optical surfaces

The multi-layer T* coating of the optical components (e.g. eyepieces, objective lenses) ensures optimum image quality.
Image quality is impaired by even slight contamination. To protect the internal optics from dust, the system should never be left without the objective lens, binocular tube and eyepieces. After use, cover the system to protect it from dust. Always store optical components and accessories in dust-free cases when they are not being used.

Clean the external surfaces of optical components as required:

Caution:
Do not use any chemical detergents or aggressive substances. These may damage the optical surfaces.

- Remove coarse dirt (splashes of blood etc.) using distilled water to which a dash of household dish-washing liquid has been added. Wipe the surfaces only with a damp, under no circumstances with a wet cloth.
  Any remaining marks can be easily removed using the following aids.
- For thorough cleaning of optical surfaces, use the optics cleaning set (Cat. No. 1216-071) or damp optics cleaning wipes (available from specialized dealers).
- Remove minor contaminations such as dust, streaks, etc. using a clean microfiber cleaning cloth (available from specialized dealers or under Cat.No. 1254-655).

Auxiliaries from Zeiss: **optics cleaning set, Cat. No. 1216-071**

Suitable for the cleaning of objective lenses and eyepieces of the surgical microscope at regular intervals.

Fogging of optical surfaces

To protect the eyepiece optics from fogging, we recommend using an anti-fogging agent.

Note:
Anti-fogging agents provided by eyecare professionals for use with eyeglass lenses are also suitable for Zeiss eyepieces.

- Please observe the instructions for use supplied with each anti-fogging agent.

Anti-fogging agents do not only ensure fog-free optics. They also clean the eyepiece optics and protect them against dirt, grease, dust, fluff and fingerprints.

Cleaning mechanical surfaces

All mechanical surfaces of the equipment can be cleaned by wiping with a moist cloth. Do not use any aggressive or abrasive cleaning agents.

Wipe off any residue with a mixture of 50% ethyl alcohol and 50% distilled water plus a dash of household dish-washing liquid.

Sterilization

The asepsis sets available from Carl Zeiss contain rubber caps, sleeves and handgrips which can be sterilized in autoclaves. We recommend the following program for sterilization:

Sterilization temperature:	134° C
Sterilization time:	10 minutes

Sterile single-use drapes are available to cover the system.

Note:
When draping the system, make sure there is enough slack in the drapes to allow for movement of the microscope carrier and surgical microscope. It is especially important that the drapes are completely loose around the handgrips. The surgeon must be able to operate the controls through the drape.

Disinfecting the control keys

To be able to use the system in the OR, for example, it may be necessary to disinfect the control keys. We recommend using MELISEPTOL disinfectant solution (B. Braun, Melsungen AG). Carl Zeiss keeps MELISEPTOL in stock, and you can also obtain it locally in many countries from representatives of B. Braun, Melsungen AG.

Warning!

– Wear disposable plastic gloves to prevent skin contact with the disinfectant.

– MELISEPTOL is inflammable (flame point at 31 °C). Please read the product information from B. Braun, Melsungen AG.

To apply MELISEPTOL, proceed as follows:

- Switch off the unit before disinfecting.
- Apply the disinfectant across the entire surface of the control panel. Do not let any disinfectant seep into the unit.
- Leave the disinfectant on the unit for approx. 30 minutes.
- Then carefully wipe the disinfectant off the surface using a sterile, lint-free cloth.
- Dispose of the gloves and cloth as normal waste.

You can obtain the following articles from Carl Zeiss:

	Cat. No.
1 l MELISEPTOL in vario bottle	000000-0103-907
MELISEPTOL HBV spray, 250 ml	000000-0103-910
MELISEPTOL HBV cloths	000000-0103-911

Disposable gloves:

Size 1 (large) size 8-9	000000-0117-736
Size 2 (medium) size 7-8	000000-0117-737

Ordering data

VISU 160 surgical microscope

Description	Cat. No.
VISU 160 surgical microscope including X-Y coupling	30 26 05- 9001
12.5x eyepiece (2x)	30 55 43- 9901
45° inclined tube (option)	30 37 84- 0000
Invertertube™ - 110° tiltable tube	30 37 97- 9120
180° tiltable tube	30 37 91- 0000
10x eyepiece (2x) (option)	30 55 42- 0000
Objective lens, f = 200 mm	30 26 52- 9904
Objective lens, f = 175 mm (option)	30 26 51- 9902
Dust cover	1055- 278

S88 floor stand

Description	Cat. No.
S88 floor stand	1154-525
Coupling for VISU	30 59 52- 8030
Halogen illumination system, one module	1174-210
Halogen illumination system, two modules	1174-211
Superlux Eye illumination system	30 49 77- 9010
S light guide, 2.0 m	30 34 81- 9020
Complete replacement lamp module with 2 xenon lamps in transport container and with return card; in exchange for a returned module with defective xenon lamps	30 49 77- 9036- 700
Complete xenon lamp module with 2 xenon lamps (new component) for Superlux Eye	30 49 77- 9036- 000
Foot control panel 2 with 14 functions, 6m cable	30 49 79- 9020
Upgrade kit for Superlux Eye, for retrofitting an existing xenon illumination system with additional, integrated halogen illumination (option)	30 49 77- 9020

S8 ceiling mount

Description	Cat. No.
S8 ceiling mount	1176-968
Coupling for VISU	30 59 52- 8030
Halogen illumination system, one module	1174-210
Halogen illumination system, two modules	1174-211
Superlux Eye illumination system	30 49 77- 9010
S light guide, 2.0 m	30 34 81- 9020
Complete replacement lamp module with 2 xenon lamps in transport container and with return card; in exchange for a returned module with defective xenon lamps	30 49 77- 9036- 700
Complete xenon lamp module with 2 xenon lamps (new component) for Superlux Eye	30 49 77- 9036- 000
Foot control panel 2 with 14 functions, 6m cable	30 49 79- 9020
Upgrade kit for Superlux Eye, for retrofitting an existing xenon illumination system with additional, integrated halogen illumination (option)	30 49 77- 9022

S81 ceiling mount

Description	Cat. No.
S81 ceiling mount	1176-969
Coupling for VISU	30 59 52- 8030
Halogen illumination system, one module	1174-210
Halogen illumination system, two modules	1174-211
Superlux Eye illumination system	30 49 77- 9010
S light guide, 2.0 m	30 34 81- 9020
Complete replacement lamp module with 2 xenon lamps in transport container and with return card; in exchange for a returned module with defective xenon lamps	30 49 77- 9036- 700
Complete xenon lamp module with 2 xenon lamps (new component) for Superlux Eye	30 49 77- 9036- 000
Foot control panel 2 with 14 functions, 6m cable	30 49 79- 9020

Upgrade kit for Superlux Eye, for retrofitting an existing xenon illumination system with additional, integrated halogen illumination (option)	30 49 77- 9022

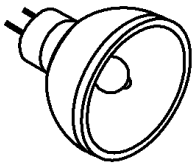
Spare parts

VISU 160 surgical microscope

Description	Cat. No.
Asepsis set, 12 mm (pack of 6)	305810-9002-000
Asepsis set, 22 mm (pack of 6)	305810-9001-000
Asepsis set for OPMI VISU handgrips	305810-9010-000
For 180° tiltable tube: Rubber cap for PD adjustment knob, internal diameter 51 mm	305810-9003-000

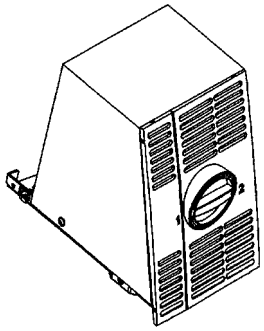
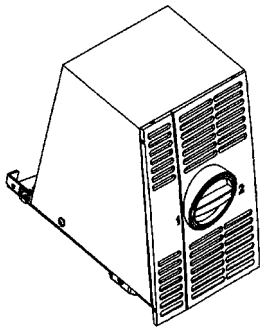
Suspension systems - halogen illumination system

Halogen illumination system

	Description	Cat. No.
	Halogen lamp 12 V, 100 W	38 00 79- 9040

Suspension systems - Superlux Eye illumination system

Superlux Eye illumination system

	Description	Cat. No.
	Complete replacement lamp module with 2 xenon lamps in transport container and with return card; in exchange for a returned module with defective xenon lamps	304977-9036-700
	Complete xenon lamp module with 2 xenon lamps (new component) for Superlux Eye	304977-9036-000

Accessories

Please observe the following:
Only operate the instrument with the accessories included in the delivery package. If you want to use other accessories, make sure that Carl Zeiss or the manufacturer of the accessories has proved and confirmed that these accessories meet the respective technical safety standards and can be used without risk.

VISU 160 surgical microscope

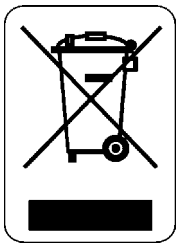
Description	Cat. No.
Objective lens, f = 200 mm	30 26 52- 9904
Objective lens in carrier ring, f = 200 mm	30 26 72- 9904
Objective lens in carrier ring, f = 175 mm	30 26 71- 9902

S88 floor stand , instrument tray option

Description	Cat. No.
S88 instrument tray, complete	1352-729

Disposal

User information
on the disposal of electrical and electronic devices



This symbol means that the product must not be disposed of as normal domestic waste.
The correct disposal of electrical or electronic devices helps to protect the environment and to prevent potential hazards to the environment and/or human health which may occur as a result of improper handling of the devices concerned.
For detailed information on the disposal of the product, please contact your local dealer or the device manufacturer or its legal successor. Please also note the manufacturer's topical information on the internet. In the event of resale of the product or its components, the seller is required to inform the buyer that the product must be disposed of in accordance with the applicable national regulations currently in force.

For end customers in the European Union

Please contact your dealer or supplier if you wish to dispose of electrical or electronic devices.

Information on disposal in countries outside the European Union

This symbol is only applicable in the European Union. For the disposal of electrical and electronic devices, please observe the relevant national legislation and other regulations applicable in your country.

Technical data

Technical data

VISU 160 surgical microscope

Optical data

Magnification	4.3x - 25.5x (with f = 200 mm and 12.5x widefield eyepieces) Motorized zoom system with apochromatic optics, 1:6 zoom ratio, magnification factor γ = 0.4x - 2.4x.
Focusing	Motorized, focusing range 50 mm At the press of a button, the focusing drive moves to the starting position of the focusing range.
Objective lens focal length	f = 200 mm (option: f = 175 mm)
Tubes / Eyepieces	180° tiltable binocular tube, f = 170 mm 12.5x widefield eyepieces (option: 10x) with magnetic coupling.
Illumination	Light guide socket for fiber optic illumination, optionally halogen or Superlux Eye (xenon) Filter against UV exposure Protection against IR exposure 6° illumination (continuous fading) 2° illumination for red reflex

Swing-in stops	Patented retinal protection device Pat. No. DE 33 39 17 2 C2 Patented field stop for reduced glare from the sclera Pat. No. G 91 03 43 3.7 Horizontal slit, 2.5 mm wide, continuously movable in the vertical direction in the field of view Horizontal slit, 5 mm wide, continuously movable in the vertical direction in the field of view Vertical slit, 2.5 mm wide, snaps in at the center of the field of view

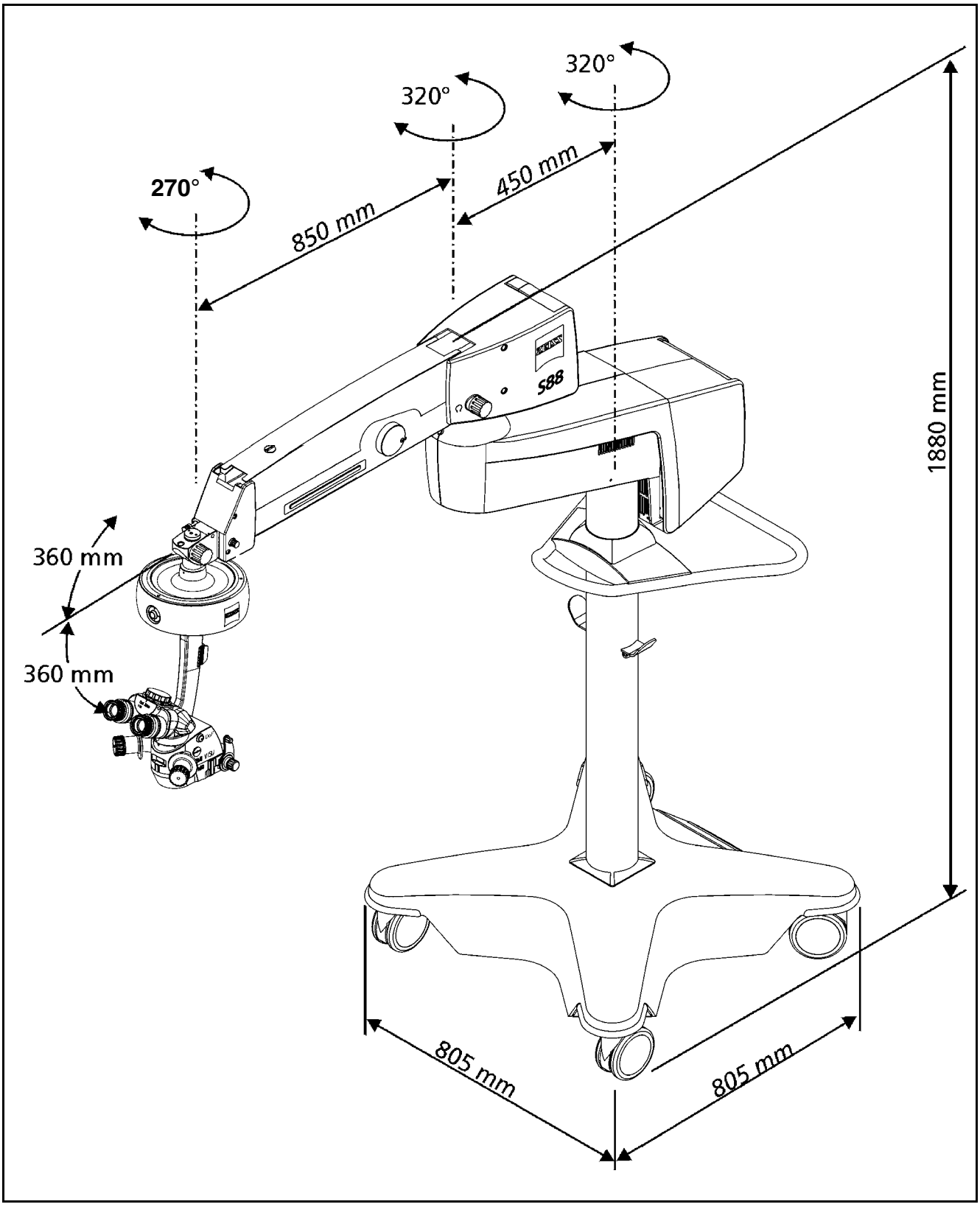
Mechanical data

Front-to-back tilt of microscope	With self-locking gear drive, manually adjustable using a knob. Tilt angle ± 180°
X-Y coupling	Adjustment range: max. 40 mm x 40 mm Automatic centering at the press of a button
Weight	approx. 8.2 kg (without tube, objective lens and eyepieces)

S88 floor stand

Mechanical data

Suspension arm	Length...850 mm Swivel angle...320° Vertical lift...± 360 mm
Carrier arm	Length...450 mm Swivel angle...320°
Stand height	1880 mm
Base	805 x 805 mm (length x width)
Admissible max. load on suspension arm	20 kg (complete microscope equipment, including accessories)
Total weight	approx. 215 kg

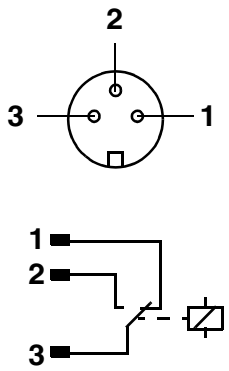

320°
320°
270°
850 mm
450 mm
1880 mm
360 mm
360 mm
805 mm
805 mm
S88

Electrical data of S88 floor stand

Power requirements	Only connect the suspension system to wall outlets which are provided with a properly connected protective ground conductor.
Rated voltage	115 VAC (100...125 VAC± 10%) 230 VAC (220...240 VAC± 10%)
Current consumption	115 VAC max.10 A 230 VAC max. 8 A
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outlets	Power outlet 115/230 VAC, max. 5 A Power outlet 115/230 VAC, max. 2 A (Via power switch) X-Y coupling Surgical microscope Remote control socket for an external signal of a maximum of 24 V / 0.5 A.
Electrical standard	Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90 Protection class I, degree of protection IPXO Type B equipment  Product classification I as per directive 93/42/EEC, Annex IX
Approval	C SA® 176164 US
EMC requirements	The system meets the EMC requirements of IEC 60601-1-2. The system meets the RFI requirements of Class A (hospital grade).

The system has been designed for continuous operation.

Remote socket
View of connector side



Halogen illumination system

Fiber optic illumination	Lamp housing with 2 halogen reflector lamps (1 backup lamp) with 12 V 100 W in quick-change modules for one light guide, with GG 475 (retina protection filter) and KK40 filter (to increase the color temperature), fully automatic lamp change when the first halogen lamp fails.

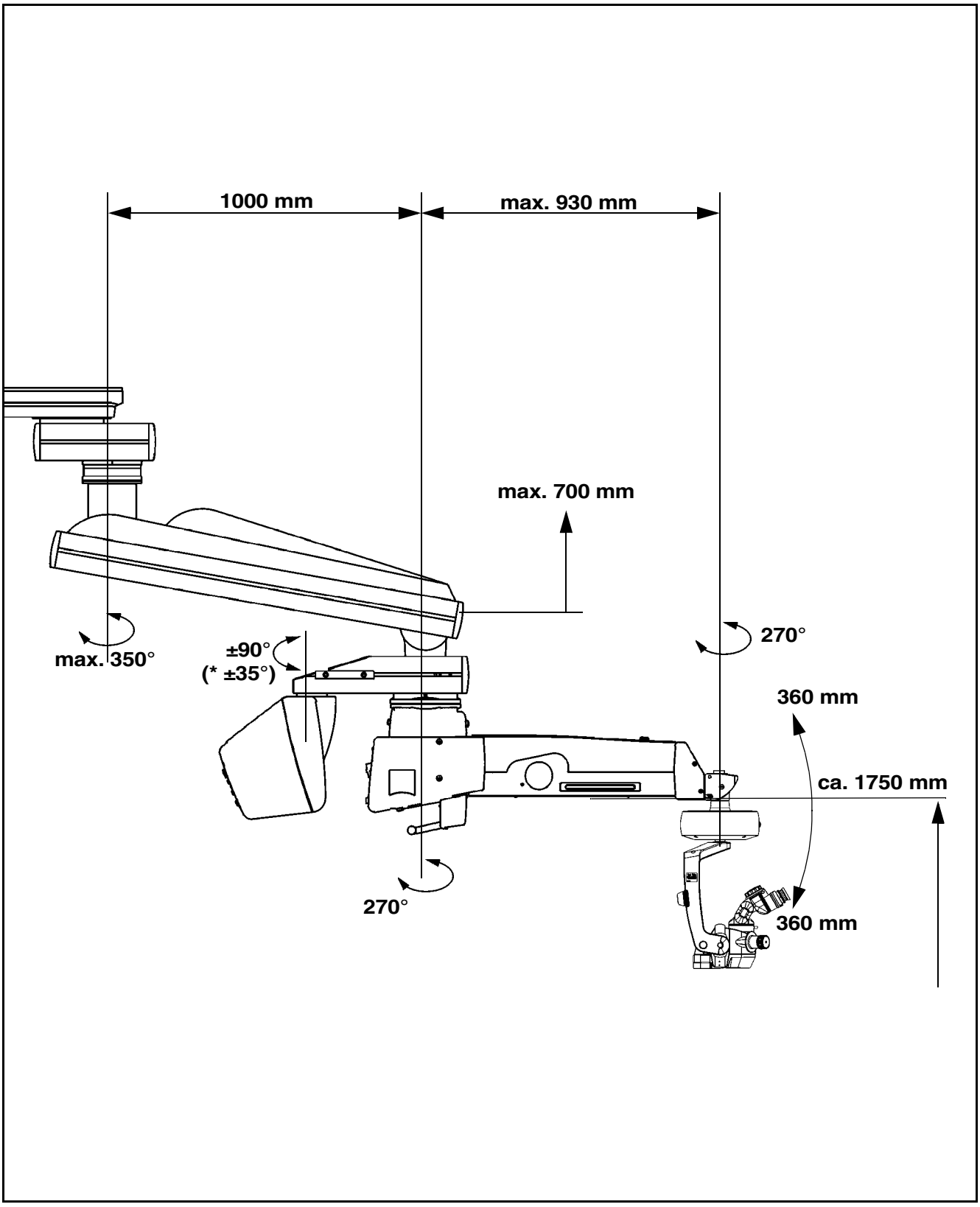
Superlux Eye illumination system

Fiber optic illumination	Xenon short-arc reflector lamp Color temperature: approx. 5000 K Rated power: approx. 100 W GG 475 retina protection filter Backup lamp in lamp housing, manually selectable.

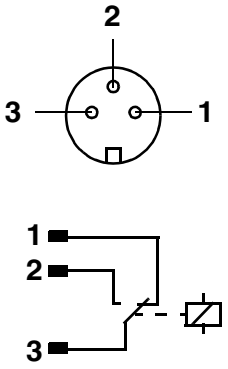
S8 ceiling mount

Mechanical data

Suspension arm	Length...930 mm Swivel angle...270° Vertical lift...± 360 mm Swivel angle of control panel...180° (± 90°) * Xenon illumination system with additional integrated halogen illumination (option) Swivel angle of control panel...± 35°
Lift and carrier arms	Length...1000 mm Swivel angle...270°
Recommended working height	approx. 1750 mm (on grip)
Admissible max. load on suspension arm	20 kg (complete microscope equipment, including accessories)
Weight of ceiling mount	approx. 200 kg


1000 mm
max. 930 mm
max. 700 mm
max. 350°
±90°
(* ±35°)
270°
360 mm
ca. 1750 mm
270°
360 mm

Remote socket
View of connector side



Electrical data of S8 ceiling mount

Rated voltage	230 VAC (220...240 VAC± 10%) 115 VAC (100...125 VAC± 10%)
Current consumption	230 VAC 3 A 120 VAC 5 A 100 VAC 6 A
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outlets	– X-Y coupling – Surgical microscope – Remote control socket for an external signal of a maximum of 24 V / 0.5 A.
Electrical standard	Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90 Protection class I, degree of protection IPXO Type B equipment Product classification I as per directive 93/42/EEC, Annex IX
Approval	C SA® 176164 US
EMC requirements	The system meets the EMC requirements of IEC 60601-1-2. The system meets the RFI requirements of Class A (hospital grade).

The system has been designed for continuous operation.

Halogen illumination system

Fiber optic illumination	Lamp housing with 2 halogen reflector lamps (1 backup lamp) with 12 V 100 W in quick-change modules for one light guide, with GG 475 (retina protection filter) and KK40 filter (to increase the color temperature), fully automatic lamp change when the first halogen lamp fails.

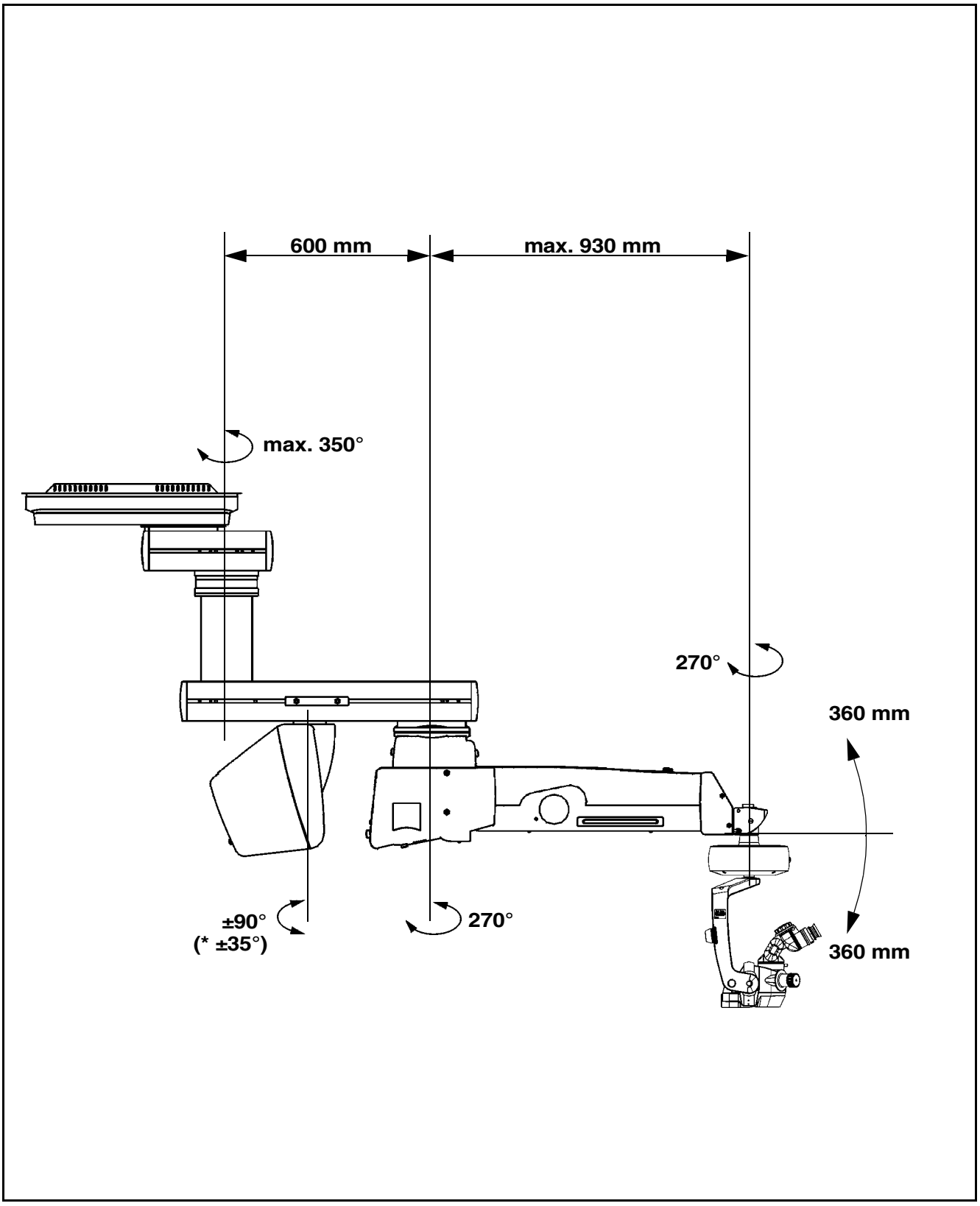
Superlux Eye illumination system

Fiber optic illumination	Xenon short-arc reflector lamp Color temperature: approx. 5000 K Rated power: approx. 100 W GG 475 retina protection filter Backup lamp in lamp housing, manually selectable.

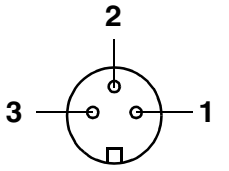
S81 ceiling mount

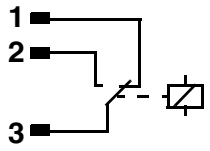
Mechanical data

Suspension arm	Length...930 mm Swivel angle...270° Vertical lift...± 360 mm Swivel angle of control panel...180° (± 90°) * Xenon illumination system with additional integrated halogen illumination (option) Swivel angle of control panel...± 35°
Carrier arm	Length...600 mm Swivel angle...270°
Recommended working height	approx. 1750 mm
Admissible max. load on suspension arm	20 kg (complete microscope equipment, including accessories)
Weight of ceiling mount	approx. 178 kg


600 mm
max. 930 mm
max. 350°
270°
360 mm
±90°
(* ±35°)
270°
360 mm

Remote socket
View of connector side





Electrical data of S81 ceiling mount

Rated voltage	230 VAC (220...240 VAC± 10%) 115 VAC (100...125 VAC± 10%)
Current consumption	230 VAC 3 A 120 VAC 5 A 100 VAC 6 A
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outlets	– X-Y coupling – Surgical microscope – Remote control socket for an external signal of a maximum of 24 V / 0.5 A.
Electrical standard	Complying with IEC 60601-1/ EN 60601-1; UL 60601-1; CAN/CSA-C22.2 No. 601.1-M90 Protection class I, degree of protection IPXO Type B equipment  Product classification I as per directive 93/42/EEC, Annex IX
Approval	
EMC requirements	The system meets the EMC requirements of IEC 60601-1-2. The system meets the RFI requirements of Class A (hospital grade).

The system has been designed for continuous operation.

Halogen illumination system

Fiber optic illumination	Lamp housing with 2 halogen reflector lamps (1 backup lamp) with 12 V 100 W in quick-change modules for one light guide, with GG 475 (retina protection filter) and KK40 filter (to increase the color temperature), fully automatic lamp change when the first halogen lamp fails.

Superlux Eye illumination system

Fiber optic illumination	Xenon short-arc reflector lamp Color temperature: approx. 5000 K Rated power: approx. 100 W GG 475 retina protection filter Backup lamp in lamp housing, manually selectable.

Ambient requirements

For operation	Temperature Rel. humidity Air pressure	+10 °C...+40 °C 30%...75% 700 hPa...1,060 hPa
For transportation and storage	Temperature Rel. humidity (without condensation) Air pressure	- 40 °C...+70 °C 10%...100% 500 hPa...1,060 hPa

CE conformity

The system meets the essential requirements stipulated in Annex I to the 93/42/EEC Directive governing Medial Devices. The system is labeled with: CE

Changes to the system

Subject to changes in design and scope of delivery as a result of ongoing technical development.

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